NISTIR XXXX Draft

Ongoing Face Recognition Vendor Test (FRVT)

Part 1: Verification

Patrick Grother
Mei Ngan
Kayee Hanaoka
Information Access Division
Information Technology Laboratory

This publication is available free of charge from:
https://www.nist.gov/programs-projects/face-recognition-vendor-test-frvt-ongoing

2019/10/16

National Institute of
Standards and Technology
U.S. Department of Commerce

ACKNOWLEDGMENTS

The authors are grateful to Wayne Salamon and Greg Fiumara at NIST for robust software infrastructure, particularly that which leverages Berkeley DB Btrees for storage of images and templates, and Open MPI for parallel execution of algorithms across our computers. Thanks also to Brian Cochran at NIST for providing highly available computers and network-attached storage.

DISCLAIMER

Specific hardware and software products identified in this report were used in order to perform the evaluations described in this document. In no case does identification of any commercial product, trade name, or vendor, imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the products and equipment identified are necessarily the best available for the purpose.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FRVT STATUS

This report is a draft NIST Interagency Report, and is open for comment. It is the sixteenth edition of the report since the first was published in June 2017. Prior editions of this report are maintained on the FRVT website, and may contain useful information about older algorithms and datasets no longer used in FRVT.

FRVT remains open: All four tracks of the FRVT remain open to new algorithm submissions indefinitely. This report will be updated as new algorithms are evaluated, as new datasets are added, and as new analyses are included. Comments and suggestions should be directed to frvt@nist.gov.

Changes since September 11, 2019:

- The report adds results for five new participants: Awidit Systems (Awiros), Momemtum Digital (Sertis), Trueface AI, Shanghai Jiao Tong University, and X-Laboratory.
- The reports adds results for five new algorithms from returning developers: Cyberlink, Hengrui AI Technology, Idemia, Panasonic R+D Singapore, and Tevian. This causes three algorithm, to be de-listed from the report per policy to list results for two algorithms per developer.

Changes since July 31 2019:

- The HTML table on the FRVT 1:1 homepage has been updated to include a column for cross-domain Visa-Border verification. Results for this new dataset appeared in the July 29 report under the name "CrossEV" - these are now renamed "Visa-Border".
- The FRVT 1:1 homepage lists algorithms according to lowest mean rank accuracy:
  $\text{Rank}(\text{FNMR}_{\text{VISA}}$ at FMR = 0.000001) +
  $\text{Rank}(\text{FNMR}_{\text{VISA-BORDER}}$ at FMR = 0.000001) +
  $\text{Rank}(\text{FNMR}_{\text{MUGSHOT}}$ at FMR = 0.00001 after 14 years) +
  $\text{Rank}(\text{FNMR}_{\text{WILD}}$ at FMR = 0.00001)
  This ordering rewards high accuracy across all datasets.
- The main results in Table 8 is now in landscape format to accomodate extra columns for the Visa-Border set, and mugshot comparisons after at least 12 years.
- The report adds results for nine new participants: Alpha SSTG, Intel Research, ULSee, Chungwa Telecon, iSAP Solution, Rokid, Shenzhen EI Networks, CSA Intellicloud, Shenzhen Intellifusion Technologies.
- The reports adds results for six new algorithms from returning developers: Innovatrics, Dahua Technology, Tech5 SA, Intellivision, Nodeflux and Imperial College, London. One algorithm, from Imperial has been retired, per policy to list results for two algorithms per developer.
- The cross-country false match rate heatmaps starting from Figure 295 have been replotted to reveal more structure by listing countries by region instead of alphabetically.
- The next version of this report will be posted around October 18, 2019.

Changes since July 3 2019:

- The HTML table on the FRVT 1:1 homepage has been updated to list the 20 most accurate developers rather than algorithms, choosing the most accurate algorithm from each developer based on visa and mugshot results. Also, the algorithms are ordered in terms of lowest mean rank across mugshot, visa and wild datasets, rewarding broad accuracy over a good result on one particular dataset.
- This report includes results for a new dataset - see the column labelled "crossEV" in Table 5. It compares a new set of high quality visa portraits with a set webcam photos that exhibit moderately poor pose variations and background illumination. The two new sets are described in sections 2.3 and 2.5. The

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

comparisons are "cross-domain" in that the algorithm must compare "visa" and "wild" images. Results for other algorithms will be added in future reports as they become available.

- This report adds results for algorithms from 9 developers submitted in early July 2019. These are from 3DiVi, Camvi, EverAI-Paravision, Facesoft, Farbar (F8), Institute of Information Technologies, Shanghai U. Film Academy, Via Technologies, and Ulucu Electronics Tech. Six of these are new participants.
- Several other algorithms have been submitted and are being evaluated. Results will be released in the next report, scheduled for September 5. That report will include results for new datasets.
- Older algorithms from Everai, Camvi and 3DiVi, have been retired, per the policy to list only two algorithms per developer.

Changes since June 20 2019:

- This report adds results for algorithms from 18 developers submitted in early June 2019. These are from CTBC Bank, Deep Glint, Thales Cogent, Ever AI Paravision, Gorilla Technology, Imagus, Incode, Kneron, N-Tech Lab, Neurotechnology, Notiontag Technologies, Star Hybrid, Videonetics, Vigilant Solutions, Winsense, Anke Investments, CEIEC, and DSK. Nine of these are new participants.
- Several other algorithms have been submitted and are being evaluated. Results will be released in the next report, scheduled for August 1.
- Older algorithms from Everai, Thales Cogent, Gorilla Technology, Incode, Neurotechnology, N-Tech Lab and Vigilant Solutions have been retired, per the policy to list only two algorithms per developer.

Changes since April 2019:

- This report adds results for nine algorithms from nine developers submitted in early June 2019. These are from Tencent Deepsea, Hengrui, Kedacom, Moontime, Guangzhou Pixel, Rank One Computing, Synesis, Sensetime and Vocord.
- Another 23 algorithms have been submitted and are being evaluated. Results will be released in the next report, scheduled for July 3.
- Older algorithms for Rank One, Synesis, and Vocord have been retired, per the policy to list only two algorithms per developer.

Changes since February 2019:

- This report adds results for 49 algorithms from 42 developers submitted in early March 2019.
- This report omits results for algorithms that we retired. We retired for three reasons: 1. The developer submitted a new algorithm, and we only list two. 2. The algorithm needs a GPU, and we no longer allow GPU-based algorithms. 3. Inoperable algorithms.
- Previous results for retired algorithms are available in older editions of this report linked here.
- The mugshot database used from February 2017 to January 2019 has been replaced with an extract of the mugshot database documented in NIST Interagency Report 8238, November 2018. The new mugshot set is described in section 2.4 and is adopted because:
  - It has much better identity label integrity, so that false non-match rates are substantially lower than those reported in FRVT 1:1 reports to date - see Figure 34.
  - It includes images collected over a 17 year period such that ageing can be much better characterized - - see Figure 126.
- Using the new mugshot database, Figure 126 shows accuracy for four demographic groups identified in the biographic metadata that accompanies the data: black females, black males, white females and white males.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

- The report adds Figure 10 with results for the twenty human-difficult pairs used in the May 2018 paper *Face recognition accuracy of forensic examiners, superrecognizers, and face recognition algorithms* by Phillips et al. [1].
- The report uses an update to the wild image database that corrects some ground truth labels.
- Some results for the child exploitation database are not complete. They are typically updated less frequently than for other image sets.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Contents

List of Tables

List of Figures

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

	Developer	Short	Seq.	Validation	Config[1]	Template		GPU	Comparison Time (ns)[3]	
	Name	Name	Num.	Date	Data (KB)	Size (B)	Time (ms)[2]		Genuine	Impostor
1	3DiVi	3divi	003	2018-10-09	191636	[146]4096 ± 0	[97]650 ± 90	No	[20]627 ± 11	[24]623 ± 32
2	3DiVi	3divi	004	2019-07-22	263670	[80]2048 ± 0	[154]984 ± 131	No	[33]794 ± 35	[35]801 ± 40
3	Adera Global PTE Ltd	adera	001	2019-06-17	0	[135]2560 ± 0	[4]97 ± 0	No	[68]1604 ± 71	[69]1649 ± 56
4	Alchera	alchera	000	2019-03-01	258450	[72]2048 ± 0	[85]587 ± 13	No	[98]3189 ± 32	[96]3031 ± 142
5	Alchera	alchera	000	2019-03-01	174013	[70]2048 ± 0	[91]627 ± 11	No	[100]3342 ± 81	[99]3243 ± 47
6	AllGoVision	allgovision	000	2019-03-01	172509	[92]2048 ± 0	[54]384 ± 8	No	[145]29903 ± 406	[146]29735 ± 194
7	AlphaSSTG	alphaface	001	2019-09-03	259849	[76]2048 ± 0	[88]613 ± 3	No	[102]3482 ± 41	[101]3279 ± 91
8	Amplified Group	amplifiedgroup	001	2019-03-01	0	[29]866 ± 2	[3]93 ± 0	No	[149]57803 ± 4210	[149]56365 ± 1196
9	Anke Investments	anke	003	2019-02-27	340160	[121]2056 ± 0	[131]811 ± 23	No	[6]425 ± 28	[8]437 ± 32
10	Anke Investments	anke	004	2019-06-27	349388	[119]2056 ± 0	[90]625 ± 1	No	[21]633 ± 22	[26]632 ± 34
11	AnyVision	anyvision	002	2018-01-31	662659	[38]1024 ± 0	[24]248 ± 0	No	[150]74069 ± 188	[150]74019 ± 198
12	AnyVision	anyvision	004	2018-06-15	401001	[34]1024 ± 0	[47]355 ± 1	No	[76]1891 ± 51	[73]1829 ± 85
13	Aware	aware	003	2018-10-19	377729	[138]3108 ± 0	[128]783 ± 10	No	[60]1392 ± 42	[62]1334 ± 80
14	Aware	aware	004	2019-03-01	427829	[131]2084 ± 0	[147]900 ± 10	No	[56]1279 ± 50	[61]1287 ± 100
15	Awidit Systems	awiros	001	2019-09-23	15499	[16]512 ± 0	[5]99 ± 8	No	[74]1868 ± 100	[89]2467 ± 78
16	Ayonix	ayonix	000	2017-06-22	58505	[39]1036 ± 0	[1]18 ± 2	No	[19]621 ± 23	[23]620 ± 26
17	Bitmain	bitmain	001	2018-10-17	287734	[1]64 ± 0	[61]444 ± 88	No	[75]1887 ± 31	[75]1877 ± 26
18	Camvi Technologies	camvitech	002	2018-10-19	236278	[36]1024 ± 0	[110]677 ± 7	No	[18]612 ± 26	[19]603 ± 20
19	Camvi Technologies	camvitech	004	2019-07-12	280733	[86]2048 ± 0	[124]759 ± 10	No	[39]948 ± 40	[41]963 ± 31
20	China Electronics Import-Export Corp	ceiec	001	2019-03-01	159618	[37]1024 ± 0	[40]314 ± 3	No	[142]22831 ± 108	[142]22813 ± 120
21	China Electronics Import-Export Corp	ceiec	002	2019-06-12	269063	[69]2048 ± 0	[87]612 ± 17	No	[84]2188 ± 57	[83]2301 ± 56
22	Chunghwa Telecom Co. Ltd	chtface	001	2019-08-06	94088	[88]2048 ± 0	[20]218 ± 12	No	[81]2089 ± 45	[80]2087 ± 23
23	Gemalto Cogent	cogent	003	2019-03-01	698290	[30]973 ± 0	[152]952 ± 0	No	[131]12496 ± 75	[130]11822 ± 163
24	Gemalto Cogent	cogent	004	2019-06-14	722919	[57]1983 ± 0	[151]941 ± 28	No	[134]14448 ± 56	[136]15882 ± 81
25	Cognitec Systems GmbH	cognitec	000	2018-10-19	474759	[109]2052 ± 0	[21]224 ± 1	No	[108]3835 ± 108	[106]3782 ± 83
26	Cognitec Systems GmbH	cognitec	001	2019-03-01	476809	[115]2052 ± 0	[36]297 ± 17	No	[112]4253 ± 59	[111]4102 ± 167
27	CTBC Bank Co. Ltd	ctbcbank	000	2019-06-28	257208	[73]2048 ± 0	[82]568 ± 43	No	[104]3551 ± 87	[114]4805 ± 209
28	Cyberextruder	cyberex	001	2017-08-02	121211	[9]256 ± 0	[146]893 ± 25	No	[46]1083 ± 16	[49]1079 ± 19
29	Cyberextruder	cyberex	002	2018-01-30	168909	[60]2048 ± 0	[71]532 ± 6	No	[73]1803 ± 14	[72]1779 ± 22
30	Cyberlink Corp	cyberlink	002	2019-06-12	222311	[111]2052 ± 0	[102]656 ± 22	No	[86]2264 ± 71	[93]2649 ± 195
31	Cyberlink Corp	cyberlink	002	2019-10-07	470949	[108]2052 ± 0	[59]424 ± 1	No	[115]4857 ± 53	[116]5168 ± 69
32	Dahua Technology Co. Ltd	dahua	002	2019-03-01	526452	[71]2048 ± 0	[92]628 ± 7	No	[8]461 ± 23	[10]454 ± 20
33	Dahua Technology Co. Ltd	dahua	003	2019-08-14	605337	[87]2048 ± 0	[73]537 ± 4	No	[24]653 ± 28	[20]606 ± 38
34	Deepglint	deepglint	001	2019-06-21	569802	[143]4096 ± 0	[115]721 ± 4	No	[105]3680 ± 35	[103]3517 ± 182
35	Tencent Deepsea Lab	deepsea	001	2019-06-03	147497	[31]1024 ± 0	[93]630 ± 7	No	[62]1401 ± 37	[65]1467 ± 50
36	Dermalog	dermalog	005	2018-02-02	0	[2]128 ± 0	[7]130 ± 11	No	[11]499 ± 22	[13]500 ± 22
37	Dermalog	dermalog	006	2018-10-18	0	[3]128 ± 0	[70]532 ± 12	No	[12]506 ± 23	[11]459 ± 23
38	Digital Barriers	barriers	002	2019-03-01	83002	[122]2056 ± 0	[17]209 ± 11	No	[133]13409 ± 228	[133]13267 ± 206
39	DSK	dsk	000	2019-06-28	11967	[18]512 ± 0	[38]304 ± 47	No	[125]7152 ± 115	[124]7134 ± 111
40	Shenzhen EI Networks Limited	einetworks	000	2019-08-13	372608	[126]2056 ± 0	[96]645 ± 3	No	[116]4876 ± 66	[115]5156 ± 77
41	Ever AI	everai	002	2019-03-01	561727	[148]4096 ± 0	[122]758 ± 0	No	[23]644 ± 14	[25]624 ± 35
42	Ever AI Paravision	everai paravision	003	2019-07-01	539802	[142]4096 ± 0	[108]674 ± 4	No	[29]699 ± 20	[30]713 ± 47
43	FarBar Inc.	f8	001	2019-07-11	272977	[68]2048 ± 0	[135]822 ± 39	No	[135]15262 ± 139	[135]15277 ± 212
44	FaceSoft Ltd.	facesoft	000	2019-07-10	370120	[103]2048 ± 0	[109]675 ± 18	No	[85]2239 ± 28	[82]2277 ± 96

Notes	
1	The configuration size does not capture static data included in libraries. We do not count these because some algorithms include common ancilliary libraries for image processing (e.g. openCV) or numerical computation (e.g. blas).
2	The median template creation times are measured on Intel®Xeon®CPU E5-2630 v4 @ 2.20GHz processors or, for GPU-enabled implementations, NVidia Tesla K40.
3	The comparison durations, in nanoseconds, are estimated using std::chrono::high_resolution_clock which on the machine in (2) counts 1ns clock ticks. Precision is somewhat worse than that however. The ± value is the median absolute deviation times 1.48 for Normal consistency.

Table 1: Summary of algorithms and properties included in this report. The red superscripts give ranking for the quantity in that column.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

	Developer	Short	Seq.	Validation	Config[1]	Template		GPU	Comparison Time (ns)[3]	
	Name	Name	Num.	Date	Data (KB)	Size (B)	Time (ms)[2]		Genuine	Impostor
45	Glory Ltd	glory	000	2018-06-06	0	[14]418 ± 0	[9]165 ± 2	No	[124]7003 ± 84	[122]6978 ± 71
46	Glory Ltd	glory	001	2018-06-08	0	[54]1726 ± 0	[56]393 ± 2	No	[129]9607 ± 128	[128]9539 ± 182
47	Gorilla Technology	gorilla	002	2018-10-17	93869	[43]1132 ± 0	[43]322 ± 14	No	[93]2715 ± 68	[92]2585 ± 84
48	Gorilla Technology	gorilla	003	2019-06-19	94409	[42]1132 ± 0	[45]334 ± 25	No	[94]2840 ± 42	[94]2865 ± 87
49	Hikvision	hik	001	2019-03-01	667866	[47]1408 ± 0	[98]651 ± 0	No	[10]488 ± 19	[12]477 ± 22
50	Hengrui AI Technology Ltd	hr	001	2019-06-04	346156	[128]2057 ± 0	[103]665 ± 3	No	[137]17816 ± 260	[137]17878 ± 464
51	Hengrui AI Technology Ltd	hr	001	2019-10-08	390059	[129]2057 ± 0	[149]904 ± 4	No	[143]24112 ± 766	[143]23859 ± 739
52	ID3 Technology	id3	003	2018-10-05	265951	[11]264 ± 0	[41]316 ± 19	No	[59]1330 ± 25	[63]1354 ± 28
53	ID3 Technology	id3	004	2019-03-01	171526	[10]264 ± 0	[77]541 ± 11	No	[47]1135 ± 23	[54]1156 ± 32
54	Idemia	Idemia	004	2019-03-01	406924	[13]352 ± 0	[39]306 ± 5	No	[119]5592 ± 518	[119]5533 ± 426
55	Idemia	Idemia	005	2019-10-11	509824	[27]588 ± 0	[69]524 ± 20	No	[126]7543 ± 370	[129]10415 ± 174
56	Institute of Information Technologies	iitvision	000	2019-03-01	237317	[35]1024 ± 0	[16]197 ± 8	No	[65]1537 ± 81	[60]1282 ± 20
57	Institute of Information Technologies	iitvision	001	2019-07-05	269176	[82]2048 ± 0	[112]699 ± 4	No	[44]1060 ± 48	[47]1074 ± 54
58	Imagus Technology Pty Ltd	imagus	000	2019-06-19	183453	[96]2048 ± 0	[60]425 ± 24	No	[48]1145 ± 25	[71]1718 ± 63
59	Imperial College London	imperial	000	2019-03-01	370120	[79]2048 ± 0	[105]669 ± 1	No	[82]2130 ± 32	[79]2052 ± 100
60	Imperial College London	imperial	002	2019-08-28	472327	[62]2048 ± 0	[83]570 ± 2	No	[114]4827 ± 69	[112]4557 ± 160
61	Incode Technologies Inc	incode	003	2019-03-01	170632	[145]4096 ± 0	[53]384 ± 11	No	[78]1928 ± 44	[74]1876 ± 81
62	Incode Technologies Inc	incode	004	2019-06-12	260224	[67]2048 ± 0	[63]479 ± 23	No	[77]1913 ± 60	[87]2443 ± 114
63	Innovatrics	innovatrics	004	2018-10-19	0	[41]1076 ± 0	[55]391 ± 0	No	[128]8573 ± 274	[126]7929 ± 244
64	Innovatrics	innovatrics	006	2019-08-13	0	[23]538 ± 0	[136]824 ± 10	No	[121]5763 ± 217	[120]5631 ± 824
65	CSA IntelliCloud Technology	intellicloudai	001	2019-08-13	220831	[101]2048 ± 0	[64]479 ± 18	No	[42]1010 ± 16	[44]1024 ± 31
66	Shenzhen Intellifusion Technologies Co. Ltd	intellifusion	001	2019-08-22	271872	[66]2048 ± 0	[125]778 ± 61	No	[107]3756 ± 59	[110]3953 ± 126
67	Intellivision	intellivision	001	2017-10-10	43692	[124]2056 ± 0	[2]62 ± 2	No	[89]2573 ± 91	[91]2544 ± 38
68	Intellivision	intellivision	002	2019-08-23	43692	[120]2056 ± 0	[46]342 ± 30	No	[136]16049 ± 195	[134]15136 ± 389
69	Intel Research Group	intelresearch	000	2019-07-08	388229	[63]2048 ± 0	[148]902 ± 6	No	[113]4800 ± 152	[113]4561 ± 97
70	Lomonosov Moscow State University	intsysmsu	000	2019-06-18	650193	[65]2048 ± 0	[72]535 ± 20	No	[16]610 ± 22	[22]613 ± 31
71	iQIYI Inc	iqface	000	2019-06-04	268819	[152]4750 ± 32	[74]538 ± 26	No	[153]636433 ± 38446	[153]632654 ± 85615
72	iSAP Solution Corporation	isap	001	2019-08-07	99049	[147]4096 ± 0	[10]171 ± 12	No	[130]12413 ± 154	[131]12251 ± 382
73	Is It You	isityou	000	2017-06-26	48010	[153]19200 ± 0	[6]113 ± 5	No	[151]237517 ± 1318	[151]237374 ± 1279
74	Innovation Systems	isystems	001	2018-06-12	274621	[58]2048 ± 0	[34]291 ± 9	No	[14]557 ± 16	[16]564 ± 22
75	Innovation Systems	isystems	002	2018-10-18	358984	[85]2048 ± 0	[134]822 ± 8	No	[31]749 ± 31	[27]632 ± 28
76	ITMO University	itmo	005	2018-10-19	482155	[151]4173 ± 0	[123]759 ± 1	No	[132]13214 ± 164	[132]12576 ± 257
77	ITMO University	itmo	006	2019-03-01	599187	[134]2121 ± 0	[132]814 ± 1	No	[144]26154 ± 148	[144]26217 ± 260
78	Kakao Corp	kakao	001	2019-03-01	107616	[33]1024 ± 0	[52]379 ± 1	No	[37]930 ± 22	[40]948 ± 38
79	Kakao Corp	kakao	002	2019-06-19	479406	[104]2048 ± 0	[119]747 ± 6	No	[71]1720 ± 62	[70]1715 ± 83
80	Kedacom International Pte	kedacom	000	2019-06-03	245292	[12]292 ± 0	[67]506 ± 3	No	[25]684 ± 14	[28]682 ± 16
81	Kneron Inc	kenron	003	2019-07-01	58366	[77]2048 ± 0	[32]281 ± 3	No	[118]5237 ± 63	[118]5274 ± 99
82	Lookman Electroplast Industries	lookman	002	2018-06-13	138200	[25]548 ± 0	[11]173 ± 1	No	[17]610 ± 19	[21]612 ± 22
83	Lookman Electroplast Industries	lookman	004	2019-06-03	244775	[24]548 ± 0	[68]507 ± 5	No	[35]871 ± 29	[39]878 ± 29
84	Megvii/Face++	megvii	001	2018-06-15	1361523	[100]2048 ± 0	[78]543 ± 0	No	[117]5228 ± 32	[117]5252 ± 60
85	Megvii/Face++	megvii	002	2018-10-19	1809564	[150]4100 ± 0	[95]644 ± 0	No	[148]50630 ± 183	[148]47591 ± 716
86	Xiamen Meiya Pico Information Co. Ltd	meiya	001	2019-03-01	280055	[106]2049 ± 0	[89]622 ± 12	No	[127]8356 ± 615	[127]8134 ± 97
87	MicroFocus	microfocus	001	2018-06-13	104524	[8]256 ± 0	[28]264 ± 18	No	[1]215 ± 8	[1]217 ± 10
88	MicroFocus	microfocus	002	2018-10-17	96288	[6]256 ± 0	[26]259 ± 18	No	[3]337 ± 34	[2]230 ± 25

Notes	
1	The configuration size does not capture static data included in libraries. We do not count these because some algorithms include common ancilliary libraries for image processing (e.g. openCV) or numerical computation (e.g. blas).
2	The median template creation times are measured on Intel®Xeon®CPU E5-2630 v4 @ 2.20GHz processors or, for GPU-enabled implementations, NVidia Tesla K40.
3	The comparison durations, in nanoseconds, are estimated using std::chrono::high_resolution_clock which on the machine in (2) counts 1ns clock ticks. Precision is somewhat worse than that however. The ± value is the median absolute deviation times 1.48 for Normal consistency.

Table 2: Summary of algorithms and properties included in this report. The red superscripts give ranking for the quantity in that column.

	Developer	Short	Seq.	Validation	Config[1]	Template		GPU	Comparison Time (ns)[3]	
	Name	Name	Num.	Date	Data (KB)	Size (B)	Time (ms)[2]		Genuine	Impostor
89	Moontime Smart Technology	mt	000	2019-06-03	372169	[105]2049 ± 0	[116]724 ± 12	No	[70]1678 ± 47	[68]1614 ± 85
90	Neurotechnology	neurotech	005	2019-03-01	270450	[7]256 ± 0	[58]399 ± 0	No	[2]238 ± 10	[3]237 ± 7
91	Neurotechnology	neurotech	006	2019-06-26	525541	[19]512 ± 0	[111]678 ± 56	No	[13]513 ± 14	[15]535 ± 26
92	Nodeflux	nodeflux	001	2019-03-01	262553	[84]2048 ± 0	[23]247 ± 1	No	[99]3242 ± 81	[100]3255 ± 93
93	Nodeflux	nodeflux	002	2019-08-13	774668	[102]2048 ± 0	[114]717 ± 16	No	[122]5922 ± 170	[125]7911 ± 367
94	NotionTag Technologies Private Limited	notiontag	000	2019-06-12	92753	[26]584 ± 0	[80]548 ± 64	No	[147]44672 ± 269	[147]44593 ± 358
95	N-Tech Lab	ntech	006	2019-03-01	7901590	[137]2600 ± 0	[120]749 ± 1	No	[43]1055 ± 93	[38]844 ± 48
96	N-Tech Lab	ntech	007	2019-06-25	2509686	[139]3348 ± 0	[129]792 ± 3	No	[51]1209 ± 59	[58]1267 ± 65
97	Guangzhou Pixel Solutions Co. Ltd	pixelall	002	2019-06-06	0	[136]2560 ± 0	[15]191 ± 1	No	[52]1223 ± 56	[56]1230 ± 47
98	Panasonic R+D Center Singapore	psl	002	2019-02-28	804934	[112]2052 ± 0	[145]888 ± 9	No	[67]1590 ± 48	[50]1133 ± 78
99	Panasonic R+D Center Singapore	psl	003	2019-10-01	1159643	[133]2120 ± 0	[142]867 ± 7	No	[110]3915 ± 50	[109]3899 ± 226
100	Rank One Computing	rankone	006	2019-02-27	0	[5]165 ± 0	[18]210 ± 1	No	[7]443 ± 26	[6]395 ± 22
101	Rank One Computing	rankone	007	2019-06-03	0	[4]165 ± 0	[22]245 ± 5	No	[26]688 ± 20	[18]601 ± 16
102	Realnetworks Inc	realnetworks	002	2019-02-28	95328	[56]1848 ± 0	[25]250 ± 2	No	[57]1285 ± 17	[57]1247 ± 42
103	Realnetworks Inc	realnetworks	003	2019-06-12	95334	[55]1848 ± 0	[13]177 ± 10	No	[64]1516 ± 29	[66]1522 ± 60
104	KanKan Ai	remarkai	000	2019-03-01	240152	[59]2048 ± 0	[137]829 ± 7	No	[36]873 ± 4	[37]835 ± 35
105	KanKan Ai	remarkai	001	2019-03-01	241857	[114]2052 ± 0	[138]831 ± 6	No	[53]1229 ± 20	[36]805 ± 56
106	Rokid Corporation Ltd	rokid	000	2019-08-01	258612	[125]2056 ± 0	[79]547 ± 2	No	[106]3711 ± 88	[105]3746 ± 209
107	Saffe Ltd	saffe	001	2018-10-19	85973	[45]1280 ± 0	[31]281 ± 1	No	[55]1274 ± 19	[59]1277 ± 26
108	Saffe Ltd	saffe	002	2019-03-01	260622	[94]2048 ± 0	[133]817 ± 11	No	[30]717 ± 7	[31]714 ± 29
109	Sensetime Group Ltd	sensetime	002	2018-10-19	531783	[107]2052 ± 0	[117]725 ± 3	No	[88]2546 ± 102	[85]2371 ± 45
110	Sensetime Group Ltd	sensetime	002	2018-10-19	531783	[116]2052 ± 0	[130]797 ± 3	No	[92]2713 ± 90	[84]2301 ± 25
111	Momentum Digital Co. Ltd	sertis	000	2019-10-07	265572	[64]2048 ± 0	[121]755 ± 0	No	[109]3883 ± 44	[108]3884 ± 66
112	Shaman Software	shaman	000	2017-12-05	0	[144]4096 ± 0	[100]653 ± 16	No	[4]380 ± 25	[5]379 ± 31
113	Shaman Software	shaman	001	2018-01-13	0	[141]4096 ± 0	[35]294 ± 2	No	[22]635 ± 19	[9]441 ± 25
114	Shanghai Universiy - Shanghai Film Academy	shu	001	2019-06-17	329513	[99]2048 ± 0	[86]612 ± 5	No	[91]2619 ± 19	[95]2987 ± 143
115	Shenzhen Inst. Adv. Integrated Tech. CAS	SIAT	002	2018-06-13	486842	[117]2052 ± 0	[84]579 ± 0	No	[32]769 ± 13	[33]750 ± 13
116	Shenzhen Inst. Adv. Integrated Tech. CAS	SIAT	004	2019-03-01	940063	[149]4100 ± 0	[106]670 ± 0	No	[111]4013 ± 45	[107]3782 ± 173
117	Shanghai Jiao Tong University	sjtu	001	2019-09-27	347115	[61]2048 ± 0	[99]651 ± 4	No	[154]2674654 ± 64798	[154]2376946 ± 202419
118	Smilart	smilart	002	2018-02-06	111826	[32]1024 ± 0	[12]176 ± 16	No	[139]18784 ± 136	[140]18795 ± 151
119	Smilart	smilart	003	2018-06-18	67339	[17]512 ± 0	[14]180 ± 12	No	[61]1395 ± 74	[45]1027 ± 66
120	Star Hybrid Limited	starhybrid	001	2019-06-19	100509	[74]2048 ± 0	[49]358 ± 82	No	[45]1075 ± 51	[48]1078 ± 53
121	Synesis	synesis	004	2019-03-01	270628	[98]2048 ± 0	[118]735 ± 15	No	[5]424 ± 14	[7]430 ± 22
122	Synesis	synesis	005	2019-06-06	146509	[83]2048 ± 0	[19]211 ± 9	No	[15]599 ± 23	[17]581 ± 32
123	Tech5 SA	tech5	002	2019-03-01	1150887	[46]1280 ± 0	[126]780 ± 10	No	[63]1406 ± 120	[46]1048 ± 57
124	Tech5 SA	tech5	003	2019-08-19	1427464	[48]1536 ± 0	[150]937 ± 39	No	[58]1313 ± 35	[64]1360 ± 41
125	Tevian	tevian	004	2019-03-01	863474	[75]2048 ± 0	[66]506 ± 30	No	[9]474 ± 31	[4]326 ± 20
126	Tevian	tevian	005	2019-09-21	921043	[91]2048 ± 0	[94]642 ± 32	No	[96]3097 ± 31	[104]3700 ± 278
127	TigerIT Americas LLC	tiger	002	2018-06-13	341638	[123]2056 ± 0	[57]393 ± 20	No	[83]2135 ± 29	[81]2137 ± 38
128	TigerIT Americas LLC	tiger	003	2018-10-16	426164	[118]2056 ± 0	[62]458 ± 21	No	[80]2031 ± 35	[78]2029 ± 38
129	TongYi Transportation Technology	tongyi	005	2019-06-12	1140701	[132]2089 ± 0	[8]165 ± 1	No	[140]18924 ± 65	[141]20158 ± 103
130	Toshiba	toshiba	002	2018-10-19	813606	[51]1560 ± 0	[76]541 ± 0	No	[103]3521 ± 369	[88]2449 ± 124
131	Toshiba	toshiba	003	2019-03-01	984125	[52]1560 ± 0	[75]540 ± 0	No	[87]2390 ± 41	[86]2407 ± 81
132	Trueface.ai	trueface	000	2019-10-08	255123	[95]2048 ± 0	[50]368 ± 11	No	[95]3040 ± 26	[97]3144 ± 51

Notes	
1	The configuration size does not capture static data included in libraries. We do not count these because some algorithms include common ancilliary libraries for image processing (e.g. openCV) or numerical computation (e.g. blas).
2	The median template creation times are measured on Intel®Xeon®CPU E5-2630 v4 @ 2.20GHz processors or, for GPU-enabled implementations, NVidia Tesla K40.
3	The comparison durations, in nanoseconds, are estimated using std::chrono::high_resolution_clock which on the machine in (2) counts 1ns clock ticks. Precision is somewhat worse than that however. The ± value is the median absolute deviation times 1.48 for Normal consistency.

Table 3: Summary of algorithms and properties included in this report. The red superscripts give ranking for the quantity in that column.

	Developer	Short	Seq.	Validation	Config[1]	Template		GPU	Comparison Time (ns)[3]	
	Name	Name	Num.	Date	Data (KB)	Size (B)	Time (ms)[2]		Genuine	Impostor
133	ULSee Inc	ulsee	001	2019-07-31	370519	[93] 2048 ± 0	[101] 654 ± 2	No	[123] 6065 ± 94	[121] 6228 ± 77
134	Shanghai Ulucu Electronics Technology Co. Ltd	uluface	002	2019-07-10	0	[81] 2048 ± 0	[143] 873 ± 42	No	[141] 19207 ± 1114	[139] 18501 ± 274
135	China University of Petroleum	upc	001	2019-06-05	0	[40] 1052 ± 0	[81] 551 ± 15	No	[97] 3114 ± 44	[98] 3165 ± 97
136	VCognition	vcog	002	2017-06-12	3229434	[154] 61504 ± 5	[48] 357 ± 25	No	[152] 296154 ± 3077	[152] 296436 ± 4183
137	Visidon	visidon	001	2019-02-26	170262	[110] 2052 ± 0	[42] 316 ± 6	No	[54] 1258 ± 38	[52] 1148 ± 109
138	Veridas Digital Authentication Solutions S.L.	veridas	001	2019-03-01	196540	[78] 2048 ± 0	[107] 671 ± 21	No	[120] 5748 ± 20	[123] 7111 ± 148
139	Veridas Digital Authentication Solutions S.L.	veridas	000	2019-03-01	193466	[22] 512 ± 0	[104] 669 ± 20	No	[72] 1733 ± 81	[76] 1934 ± 44
140	Via Technologies Inc.	via	000	2019-07-08	124422	[89] 2048 ± 0	[113] 707 ± 8	No	[41] 966 ± 28	[43] 1021 ± 44
141	Videonetics Technology Pvt Ltd	videonetics	001	2019-06-19	30875	[15] 512 ± 0	[27] 262 ± 3	No	[49] 1153 ± 38	[51] 1142 ± 65
142	Vigilant Solutions	vigilant	006	2019-03-01	343048	[50] 1548 ± 0	[140] 841 ± 8	No	[38] 939 ± 32	[29] 711 ± 37
143	Vigilant Solutions	vigilant	007	2019-06-27	255600	[49] 1548 ± 0	[65] 493 ± 6	No	[34] 803 ± 35	[34] 800 ± 40
144	Beijing Vion Technology Inc	vion	000	2018-10-19	228219	[113] 2052 ± 0	[44] 333 ± 1	No	[146] 39839 ± 3561	[145] 26830 ± 2241
145	Vision-Box	visionbox	000	2019-02-26	176501	[97] 2048 ± 0	[37] 304 ± 7	No	[69] 1648 ± 57	[55] 1192 ± 42
146	Vision-Box	visionbox	001	2019-03-01	256869	[90] 2048 ± 0	[153] 983 ± 7	No	[50] 1161 ± 22	[53] 1154 ± 20
147	VisionLabs	visionlabs	006	2019-03-01	353044	[21] 512 ± 0	[29] 270 ± 0	No	[28] 698 ± 19	[32] 734 ± 28
148	VisionLabs	visionlabs	007	2019-06-12	357204	[20] 512 ± 0	[30] 272 ± 0	No	[40] 965 ± 41	[42] 972 ± 31
149	Vocord	vocord	006	2019-03-01	559457	[28] 768 ± 0	[144] 886 ± 1	No	[79] 2020 ± 72	[77] 1969 ± 62
150	Vocord	vocord	007	2019-06-06	587489	[53] 1664 ± 0	[127] 780 ± 2	No	[90] 2593 ± 83	[90] 2526 ± 59
151	Winsense Co. Ltd	winsense	000	2019-06-17	270819	[44] 1280 ± 0	[33] 283 ± 1	No	[66] 1551 ± 31	[67] 1532 ± 42
152	X-Laboratory	x-laboratory	000	2019-09-03	520020	[127] 2056 ± 0	[139] 832 ± 38	No	[101] 3380 ± 91	[102] 3314 ± 253
153	Zhuhai Yisheng Electronics Technology	yisheng	004	2018-06-12	486351	[140] 3704 ± 0	[51] 378 ± 12	No	[27] 693 ± 137	[14] 526 ± 34
154	Shanghai Yitu Technology	yitu	003	2019-03-01	1525719	[130] 2082 ± 0	[141] 860 ± 0	No	[138] 18305 ± 71	[138] 18286 ± 62

Notes	
1	The configuration size does not capture static data included in libraries. We do not count these because some algorithms include common ancilliary libraries for image processing (e.g. openCV) or numerical computation (e.g. blas).
2	The median template creation times are measured on Intel®Xeon®CPU E5-2630 v4 @ 2.20GHz processors or, for GPU-enabled implementations, NVidia Tesla K40.
3	The comparison durations, in nanoseconds, are estimated using std::chrono::high_resolution_clock which on the machine in (2) counts 1ns clock ticks. Precision is somewhat worse than that however. The ± value is the median absolute deviation times 1.48 for Normal consistency.

Table 4: Summary of algorithms and properties included in this report. The red superscripts give ranking for the quantity in that column.

		FALSE NON-MATCH RATE (FNMR)																	
	Algorithm	CONSTRAINED, COOPERATIVE														LESS CONSTRAINED, NON-COOP.			
	Name	VISAMC		VISA		VISA		MUGSHOT		MUGSHOT12+YRS		VISABORDER		WILD		CHILDEXP			
	FMR	0.0001		1E-06		0.0001		1E-05		1E-05		1E-06		0.0001		0.01			
1	3divi-003	0.0318	109	0.0588	109	0.0097	101	0.0389	108	0.0639	105	0.0619	98	0.0867	105	0.5365	25		
2	3divi-004	0.0095	39	0.0153	42	0.0049	58	0.0097	38	0.0145	36	0.0175	46	0.0665	98	-			
3	adera-001	0.1021	124	0.1757	122	0.0368	123	0.1823	130	0.2967	128	0.1714	112	0.1965	120	0.7202	53		
4	alchera-000	0.0165	80	0.0243	70	0.0086	95	0.0125	68	0.0186	63	0.0204	52	0.0370	65	-			
5	alchera-001	0.0183	85	0.0299	83	0.0078	91	0.0142	74	0.0234	77	0.0239	60	0.0372	66	-			
6	allgovision-000	0.0346	111	0.0527	105	0.0210	114	0.0232	95	0.0339	84	-		0.0607	95	-			
7	alphaface-001	0.0065	21	0.0097	20	0.0025	21	0.0039	3	0.0063	6	0.0083	8	0.0280	9	-			
8	amplifiedgroup-001	0.5034	144	0.5848	144	0.2999	146	0.6973	144	0.8316	141	0.7807	125	0.4250	136	-			
9	anke-003	0.0131	61	0.0213	60	0.0056	64	0.0094	35	0.0175	56	0.0134	29	0.0302	32	-			
10	anke-004	0.0080	32	0.0154	43	0.0031	29	0.0073	19	0.0112	21	0.0102	16	0.0288	20	0.3577	4		
11	anyvision-002	0.0660	118	0.0898	115	0.0387	124	0.0928	123	0.1512	119	-		0.2227	122	0.6960	46		
12	anyvision-004	0.0267	103	0.0385	98	0.0081	93	0.0258	97	0.0487	100	-		0.0470	82	0.4633	12		
13	aware-003	0.0793	120	0.1161	119	0.0288	121	0.1028	124	0.1708	122	0.1698	111	0.3180	133	0.8512	66		
14	aware-004	0.0690	119	0.0949	117	0.0257	117	0.0837	121	0.1436	117	0.1171	109	0.0516	89	-			
15	awiros-001	0.4044	139	0.4622	138	0.2880	145	0.5530	139	0.6518	136	0.2008	113	0.5584	139	-			
16	ayonix-000	0.4351	141	0.4872	139	0.2299	141	0.6150	141	0.7510	138	0.6557	123	0.3635	134	0.8434	64		
17	bm-001	0.7431	150	0.9494	151	0.6188	151	0.9586	148	0.9843	145	0.9049	129	0.9935	141	0.8845	71		
18	camvi-002	0.0125	58	0.0221	65	0.0049	59	0.0089	32	0.0145	38	0.0142	30	0.0288	19	0.5760	31		
19	camvi-004	0.0171	83	0.0316	87	0.0049	57	0.0042	5	0.0049	2	0.0097	15	0.0284	14	-			
20	ceiec-001	0.0328	110	0.0475	102	0.0163	109	0.0295	103	0.0478	99	0.0621	99	0.0847	101	-			
21	ceiec-002	0.0161	78	0.0193	55	0.0124	107	0.0122	65	0.0164	52	0.0270	65	0.0465	81	0.5156	22		
22	chtface-001	0.9993	153	0.9994	153	0.9993	153	0.9999	150	-		1.0000	131	0.9980	142	-			
23	cogent-003	0.0091	35	0.0188	53	0.0032	30	0.0098	40	0.0132	30	0.0187	48	0.0406	72	-			
24	cogent-004	0.0064	20	0.0116	30	0.0024	20	0.0096	36	0.0134	31	0.0157	34	0.0379	67	0.7177	52		
25	cognitec-000	0.0116	51	0.0177	47	0.0036	35	0.0118	60	0.0167	53	0.0285	69	0.0953	108	0.8365	63		
26	cognitec-001	0.0126	59	0.0185	52	0.0047	53	0.0120	63	0.0168	54	0.0270	64	0.0598	94	-			
27	ctbcbank-000	0.0168	81	0.0250	76	0.0064	71	0.0146	77	0.0224	72	0.0211	53	1.0000	150	0.8803	69		
28	cyberextruder-001	0.1972	132	0.2547	130	0.0755	133	0.4686	138	0.6387	135	-		0.1747	117	0.7804	61		
29	cyberextruder-002	0.0811	121	0.1336	121	0.0265	118	0.1465	128	0.2266	126	-		0.1000	110	0.6105	35		
30	cyberlink-002	0.0114	50	0.0195	56	0.0044	45	0.0101	44	0.0163	49	0.0160	35	0.0298	29	0.5003	18		
31	cyberlink-003	0.0118	53	0.0192	54	0.0042	43	0.0098	41	0.0161	47	0.0153	33	0.0303	34	-			
32	dahua-002	0.0129	60	0.0157	44	0.0090	98	0.0116	59	0.0153	41	0.0134	28	0.0323	48	-			
33	dahua-003	0.0052	12	0.0068	10	0.0023	19	0.0056	10	0.0062	5	0.0113	22	0.0285	15	-			
34	deepglint-001	0.0040	6	0.0062	7	0.0014	8	0.0047	6	0.0067	7	0.0069	4	0.0278	6	0.4006	7		
35	deepsea-001	0.0136	65	0.0215	62	0.0071	87	0.0142	75	0.0214	68	0.0163	39	0.0347	59	0.5606	29		
36	dermalog-005	0.1526	130	0.1823	125	0.0658	131	0.2580	133	0.4018	130	-		0.0855	103	0.6842	43		
37	dermalog-006	0.0253	100	0.0369	96	0.0172	112	0.0171	83	0.0283	81	-		0.0623	97	0.5852	32		
38	digitalbarriers-002	0.3360	137	0.3690	135	0.0968	136	0.0877	122	0.1557	120	0.0971	108	0.0436	76	-			
39	dsk-000	0.1526	129	0.2169	127	0.0765	134	0.3787	137	0.5426	134	0.3115	118	0.2201	121	0.7313	55		
40	einetworks-000	0.0099	42	0.0180	49	0.0047	52	0.0088	30	0.0140	34	0.0130	26	0.0293	23	-			
41	everai-002	0.0104	47	0.0159	45	0.0041	42	0.0063	15	0.0112	22	0.0182	47	0.0294	25	-			
42	everai-paravision-003	0.0034	2	0.0050	3	0.0011	3	0.0036	2	0.0052	3	0.0092	12	0.0278	7	0.2669	1		
43	f8-001	0.0249	99	0.0336	88	0.0182	113	0.0178	85	0.0232	76	0.0303	76	0.0475	83	0.5272	23		
44	facesoft-000	0.0085	34	0.0112	29	0.0032	31	0.0064	16	0.0107	18	0.0091	11	0.0275	3	0.4992	17		

Table 5: FNMR is the proportion of mated comparisons below a threshold set to achieve the FMR given in the header on the fourth row. FMR is the proportion of impostor comparisons at or above that threshold. The light grey values give rank over all algorithms in that column. The pink column uses only same-sex impostors; others are selected regardless of demographics. The exception, in the green column, uses "matched-covariates" i.e. impostors of the same sex, age group, and country of birth. The pink column includes effects of extended ageing. Missing entries for border, visa, mugshot and wild images generally mean the algorithm did not run to completion. For child exploitation, missing entries arise because NIST executes those runs only infrequently.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

		FALSE NON-MATCH RATE (FNMR)													
	Algorithm	CONSTRAINED, COOPERATIVE												LESS CONSTRAINED, NON-COOP.			
	Name	VISAMC		VISA		VISA		MUGSHOT		MUGSHOT12+YRS		VISABORDER		WILD		CHILDEXP	
	FMR	0.0001		1E-06		0.0001		1E-05		1E-05		1E-06		0.0001		0.01	
45	glory-000	0.1094	125	0.1286	120	0.0514	128	0.2179	131	0.2656	127	-		0.4762	138	0.8937	72
46	glory-001	0.0902	122	0.1082	118	0.0410	125	0.1642	129	0.2065	125	-		0.4261	137	0.8831	70
47	gorilla-002	0.0256	101	0.0413	99	0.0076	90	0.0478	113	0.0912	111	-		0.0507	87	0.6157	36
48	gorilla-003	0.0165	79	0.0291	81	0.0053	61	0.0205	91	0.0437	92	0.0297	74	0.0359	63	0.9756	77
49	hik-001	0.0096	40	0.0125	32	0.0036	37	0.0093	34	0.0164	51	0.0108	19	0.0271	1	-	
50	hr-001	0.0044	9	0.0072	12	0.0019	13	0.0073	21	0.0108	19	0.0125	23	0.0303	33	0.5499	26
51	hr-002	0.0043	7	0.0059	5	0.0017	10	0.0054	7	0.0076	9	0.0076	6	0.0338	57	-	
52	id3-003	0.0361	112	0.0757	112	0.0104	105	0.0292	101	0.0476	96	0.0447	90	0.0848	102	0.5865	33
53	id3-004	0.0198	90	0.0344	91	0.0084	94	0.0238	96	0.0423	91	0.0289	71	-		-	
54	idemia-004	0.0160	77	0.0244	72	0.0065	73	0.0199	90	0.0354	87	0.0268	63	0.0309	41	-	
55	idemia-005	0.0132	62	0.0216	63	0.0057	66	0.0121	64	0.0218	71	0.0215	55	0.0294	24	-	
56	iit-000	0.1516	128	0.1981	126	0.0620	130	0.0828	120	0.1442	118	0.2214	116	-		-	
57	iit-001	0.0104	45	0.0179	48	0.0048	56	0.0099	43	0.0142	35	0.1222	110	0.3092	132	0.4836	15
58	imagus-000	0.0642	116	0.0882	113	0.0330	122	0.0497	114	0.0905	110	0.0848	104	0.1158	111	0.6936	45
59	imperial-000	0.0067	24	0.0108	27	0.0022	18	0.0080	26	0.0134	32	0.0087	10	0.0281	11	-	
60	imperial-002	0.0058	16	0.0081	15	0.0027	22	0.0055	9	0.0085	11	0.0083	9	0.0273	2	-	
61	incode-003	0.0142	68	0.0249	75	0.0054	62	0.0448	111	0.0869	109	0.0354	81	0.0318	46	-	
62	incode-004	0.0077	30	0.0132	34	0.0034	33	0.0096	37	0.0160	45	0.0171	43	0.0313	43	0.5102	19
63	innovatrics-004	0.0194	88	0.0292	82	0.0068	79	0.0344	105	0.0617	104	0.0562	95	0.0454	80	0.4650	13
64	innovatrics-006	0.0058	17	0.0089	17	0.0021	16	0.0061	14	0.0096	16	0.0096	14	0.0281	10	-	
65	intellicloudai-001	0.0142	69	0.0234	69	0.0064	72	0.0092	33	0.0145	37	0.0162	37	0.0409	73	-	
66	intellifusion-001	0.0072	27	0.0094	19	0.0028	26	0.0056	11	0.0085	12	0.0111	21	0.0289	21	-	
67	intellivision-001	0.1335	127	0.2205	128	0.0417	126	0.1090	126	0.1670	121	-		0.2445	124	0.7766	60
68	intellivision-002	0.1000	123	0.1775	123	0.0265	119	0.0610	117	0.1009	112	0.0805	103	0.0768	100	-	
69	intelresearch-000	0.0307	106	0.0578	108	0.0093	99	0.0385	107	0.0751	108	0.0409	85	0.0324	49	-	
70	intsysmsu-000	0.0135	64	0.0204	57	0.0069	81	0.0112	54	0.0161	46	0.0148	31	0.2330	123	-	
71	iqface-000	0.0091	36	0.0143	38	0.0043	44	0.0075	24	0.0110	20	0.0171	44	0.0381	68	0.6490	39
72	isap-001	0.5092	145	0.6588	146	0.2338	143	0.6899	143	0.7978	139	0.7200	124	0.1931	119	-	
73	isityou-000	0.5682	147	0.7033	147	0.4145	149	1.0000	151	-		-		1.0000	146	1.0000	81
74	isystems-001	0.0149	73	0.0245	73	0.0067	77	0.0138	73	0.0210	67	-		0.0524	92	0.5152	21
75	isystems-002	0.0118	52	0.0182	51	0.0066	74	0.0111	51	0.0162	48	-		0.0516	90	0.4876	16
76	itmo-005	0.0182	84	0.0345	92	0.0067	78	0.0181	86	0.0348	86	-		0.0433	74	0.4808	14
77	itmo-006	0.0125	57	0.0220	64	0.0046	48	0.0149	78	0.0266	80	0.0233	57	0.0329	52	-	
78	kakao-001	0.4553	143	0.5532	143	0.2034	140	0.6580	142	0.8150	140	0.4831	121	1.0000	154	-	
79	kakao-002	0.0625	115	0.1779	124	0.0168	111	0.0791	119	0.1381	116	0.0636	100	1.0000	148	1.0000	88
80	kedacom-000	0.0055	14	0.0081	16	0.0027	23	0.0111	53	0.0120	25	0.0415	86	0.2511	126	0.7650	58
81	kneron-003	0.0542	114	0.0902	116	0.0218	115	0.0346	106	0.0562	103	0.0919	106	0.3053	131	0.6962	47
82	lookman-002	0.0297	105	0.0547	107	0.0102	104	0.0339	104	0.0562	102	0.0614	97	0.2640	129	-	
83	lookman-004	0.0074	29	0.0099	22	0.0037	38	0.0124	67	0.0149	39	0.0430	89	0.2516	127	0.7664	59
84	megvii-001	0.0157	75	0.0244	71	0.0045	47	0.0392	109	0.0671	106	-		0.0916	107	0.4418	10
85	megvii-002	0.0104	46	0.0145	40	0.0036	36	0.0225	93	0.0345	85	-		0.0692	99	0.3013	2
86	meiya-001	0.0171	82	0.0275	80	0.0066	76	0.0159	82	0.0261	79	0.0311	77	0.0363	64	-	
87	microfocus-001	0.4482	142	0.5524	142	0.2309	142	0.7256	145	0.8416	142	-		0.2567	128	0.6890	44
88	microfocus-002	0.3605	138	0.5057	140	0.1566	139	0.5783	140	0.7223	137	-		0.1582	116	0.6517	40

Table 6: FNMR is the proportion of mated comparisons below a threshold set to achieve the FMR given in the header on the fourth row. FMR is the proportion of impostor comparisons at or above that threshold. The light grey values give rank over all algorithms in that column. The pink column uses only same-sex impostors; others are selected regardless of demographics. The exception, in the green column, uses "matched-covariates" i.e. impostors of the same sex, age group, and country of birth. The pink column includes effects of extended ageing. Missing entries for border, visa, mugshot and wild images generally mean the algorithm did not run to completion. For child exploitation, missing entries arise because NIST executes those runs only infrequently.

		FALSE NON-MATCH RATE (FNMR)															
	Algorithm	CONSTRAINED, COOPERATIVE												LESS CONSTRAINED, NON-COOP.			
	Name	VISAMC		VISA		VISA		MUGSHOT		MUGSHOT12+YRS		VISABORDER		WILD		CHILDEXP	
	FMR	0.0001		1E-06		0.0001		1E-05		1E-05		1E-06		0.0001		0.01	
89	mt-000	0.0100	43	0.0170	46	0.0047	51	0.0074	23	0.0118	24	0.0127	24	0.0326	51	0.3773	6
90	neurotechnology-005	0.0141	67	0.0300	84	0.0051	60	0.0108	49	0.0163	50	0.0204	51	0.0332	53	-	
91	neurotechnology-006	0.0098	41	0.0136	35	0.0040	41	0.0105	47	0.0182	60	0.0164	41	0.0303	35	0.5911	34
92	nodeflux-001	1.0000	154	1.0000	154	1.0000	154	1.0000	154	-		0.5169	122	1.0000	152	-	
93	nodeflux-002	0.0186	86	0.0340	89	0.0070	84	0.0261	98	0.0451	95	0.0548	94	0.0299	30	-	
94	notiontag-000	0.6669	148	0.7885	148	0.3222	148	0.3715	136	0.4978	133	0.8571	127	0.1807	118	0.6479	38
95	ntechlab-006	0.0078	31	0.0111	28	0.0021	17	0.0112	55	0.0227	75	0.0108	18	0.0275	4	-	
96	ntechlab-007	0.0056	15	0.0076	13	0.0018	11	0.0073	22	0.0128	28	0.0079	7	0.0276	5	0.3316	3
97	pixelall-002	0.0193	87	0.0340	90	0.0066	75	0.0127	70	0.0209	66	0.0234	59	0.0342	58	0.8963	73
98	psl-002	0.0107	48	0.0180	50	0.0048	55	0.0089	31	0.0120	26	0.0790	102	0.0295	26	-	
99	psl-003	0.0065	22	0.0099	23	0.0028	24	0.0055	8	0.0075	8	1.0000	132	0.0296	28	-	
100	rankone-006	0.0242	95	0.0460	101	0.0070	83	0.0119	61	0.0188	64	0.0315	78	0.0538	93	-	
101	rankone-007	0.0197	89	0.0366	95	0.0057	67	0.0113	57	0.0177	58	0.0286	70	0.0450	78	0.6686	41
102	realnetworks-002	0.0248	97	0.0358	93	0.0099	102	0.0513	115	0.1127	113	0.0371	83	0.0334	54	-	
103	realnetworks-003	0.0259	102	0.0372	97	0.0100	103	0.0541	116	0.1208	115	0.0378	84	0.0335	56	0.5152	20
104	remarkai-000	0.0147	72	0.0257	78	0.0062	70	0.0102	45	0.0158	43	0.0163	40	0.0304	36	-	
105	remarkai-001	0.0144	70	0.0256	77	0.0061	69	0.0102	46	0.0159	44	0.0162	38	0.0308	40	-	
106	rokid-000	0.0093	38	0.0145	39	0.0038	39	0.0073	20	0.0102	17	0.0164	42	0.0857	104	-	
107	saffe-001	0.4339	140	0.5261	141	0.2340	144	0.7539	147	0.8736	144	0.7977	126	0.3887	135	0.8973	74
108	saffe-002	0.0119	55	0.0206	58	0.0054	63	0.0107	48	0.0177	57	0.0244	61	0.0308	39	-	
109	sensetime-001	0.0063	19	0.0092	18	0.0030	27	0.0130	71	-		0.0252	62	1.0000	145	0.6997	48
110	sensetime-002	0.0068	25	0.0098	21	0.0035	34	0.0143	76	-		0.0278	68	0.9999	143	0.5309	24
111	sertis-000	0.0118	54	0.0208	59	0.0047	49	0.0080	25	0.0127	27	0.0110	20	0.0285	16	-	
112	shaman-000	0.9297	152	0.9774	152	0.9128	152	0.9990	149	-		0.9999	130	0.9575	140	0.9618	76
113	shaman-001	0.3346	136	0.4616	137	0.1360	138	0.2368	132	0.3723	129	0.3574	119	0.1498	115	0.8990	75
114	shu-001	0.0103	44	0.0140	37	0.0044	46	0.0293	102	0.0688	107	0.0172	45	0.0986	109	0.4590	11
115	siat-002	0.0091	37	0.0126	33	0.0039	40	0.0109	50	0.0190	65	0.0276	67	0.0520	91	0.4277	9
116	siat-004	0.0067	23	0.0099	24	0.0028	25	0.0152	80	-		0.0275	66	1.0000	144	-	
117	sjtu-001	0.0051	11	0.0080	14	0.0019	12	0.0211	92	0.0446	94	0.0131	27	0.0289	22	-	
118	smilart-002	0.2440	135	0.3532	134	0.0821	135	-		-		0.3785	120	-		0.6999	49
119	smilart-003	0.6944	149	0.8836	149	0.1088	137	0.0695	118	0.1193	114	0.0894	105	0.1190	112	-	
120	starhybrid-001	0.0108	49	0.0138	36	0.0058	68	0.0081	27	0.0113	23	0.0152	32	0.0350	61	0.5584	27
121	synesis-004	0.0310	107	0.0480	103	0.0166	110	0.0476	112	0.0443	93	0.0764	101	0.1319	113	-	
122	synesis-005	0.0147	71	0.0226	67	0.0073	89	0.0153	81	0.0226	73	0.0213	54	0.0334	55	0.5601	28
123	tech5-002	0.0046	10	0.0063	8	0.0009	2	0.0113	58	0.0216	70	0.0233	58	0.0310	42	-	
124	tech5-003	0.0053	13	0.0070	11	0.0014	7	0.0099	42	0.0185	61	0.0095	13	0.0306	37	-	
125	tevian-004	0.0228	93	0.0304	85	0.0069	80	0.0226	94	0.0478	97	0.0128	25	0.0394	70	-	
126	tevian-005	0.0043	8	0.0062	6	0.0020	15	0.0057	12	0.0085	13	0.0070	5	0.0300	31	-	
127	tiger-002	0.0658	117	0.0889	114	0.0227	116	0.1083	125	0.1766	123	0.0952	107	0.0512	88	0.7862	62
128	tiger-003	0.0313	108	0.0602	111	0.0087	96	0.0188	88	0.0359	88	0.0344	79	0.0482	85	0.5610	30
129	tongyi-005	0.0073	28	0.0146	41	0.0019	14	0.0187	87	0.0421	90	0.0161	36	0.0399	71	0.6195	37
130	toshiba-002	0.0134	63	0.0222	66	0.0048	54	0.0097	39	0.0154	42	-		0.0434	75	0.7103	50
131	toshiba-003	0.0125	56	0.0214	61	0.0047	50	0.0085	29	0.0131	29	-		0.0282	12	-	
132	trueface-000	0.0249	98	0.4321	136	0.0069	82	0.0119	62	0.0180	59	0.0297	75	0.0614	96	-	

Table 7: FNMR is the proportion of mated comparisons below a threshold set to achieve the FMR given in the header on the fourth row. FMR is the proportion of impostor comparisons at or above that threshold. The light grey values give rank over all algorithms in that column. The pink column uses only same-sex impostors; others are selected regardless of demographics. The exception, in the green column, uses "matched-covariates" i.e. impostors of the same sex, age group, and country of birth. The pink column includes effects of extended ageing. Missing entries for border, visa, mugshot and wild images generally mean the algorithm did not run to completion. For child exploitation, missing entries arise because NIST executes those runs only infrequently.

		FALSE NON-MATCH RATE (FNMR)															
	Algorithm	CONSTRAINED, COOPERATIVE												LESS CONSTRAINED, NON-COOP.			
	Name	VISAMC		VISA		VISA		MUGSHOT		MUGSHOT12+YRS		VISABORDER		WILD		CHILDEXP	
	FMR	0.0001		1E-06		0.0001		1E-05		1E-05		1E-06		0.0001		0.01	
133	ulsee-001	0.0151	74	0.0246	74	0.0080	92	0.0113	56	0.0185	62	0.0187	49	0.0316	45	-	
134	uluface-002	0.0081	33	0.0123	31	0.0033	32	0.0071	18	0.0095	15	0.0107	17	0.0444	77	0.6729	42
135	upc-001	0.0234	94	0.0519	104	0.0071	86	0.0291	100	0.0490	101	0.0294	72	0.0314	44	0.4224	8
136	vcog-002	0.7522	151	0.9033	150	0.5040	150	-		-		-		-		0.7523	56
137	vd-001	0.0243	96	0.0452	100	0.0093	100	0.0271	99	0.0402	89	0.0424	88	0.1389	114	-	
138	veridas-001	0.1998	134	0.2724	131	0.0742	132	0.2987	135	0.4587	132	0.2599	117	0.0501	86	-	
139	veridas-002	0.1733	131	0.2257	129	0.0528	129	0.2617	134	0.4147	131	0.2073	115	0.0450	79	-	
140	via-000	0.0216	92	0.0365	94	0.0088	97	0.0177	84	0.0287	82	0.0296	73	0.0349	60	0.7638	57
141	videonetics-001	0.5483	146	0.6446	145	0.3063	147	0.7517	146	0.8607	143	0.8664	128	0.2986	130	0.7297	54
142	vigilantsolutions-006	0.1264	126	0.3221	132	0.0136	108	0.0150	79	0.0254	78	0.0493	92	0.0321	47	-	
143	vigilantsolutions-007	0.0202	91	0.0307	86	0.0070	85	0.0136	72	0.0227	74	0.0356	82	0.0306	38	1.0000	145
144	vion-000	0.0419	113	0.0590	110	0.0288	120	0.0422	110	0.0478	98	0.0581	96	0.2479	125	0.8765	68
145	visionbox-000	0.0293	104	0.0541	106	0.0110	106	0.0197	89	0.0339	83	0.0349	80	0.0476	84	-	
146	visionbox-001	0.0159	76	0.0270	79	0.0072	88	0.0111	52	0.0173	55	0.0190	50	0.0389	69	-	
147	visionlabs-006	0.0037	3	0.0066	9	0.0012	4	0.0041	4	0.0060	4	0.0061	2	0.0285	17	-	
148	visionlabs-007	0.0038	4	0.0048	2	0.0012	6	0.0036	1	0.0048	1	0.0057	1	0.0286	18	0.3708	5
149	vocord-006	0.0062	18	0.0102	25	0.0016	9	0.0082	28	0.0151	40	0.0475	91	0.0282	13	-	
150	vocord-007	0.0039	5	0.0053	4	0.0012	5	0.0061	13	0.0094	14	0.0520	93	0.0280	8	0.8468	65
151	winsense-000	0.0140	66	0.0228	68	0.0056	65	0.0125	69	0.0215	69	0.0226	56	0.0352	62	0.8600	67
152	x-laboratory-000	0.0071	26	0.0106	26	0.0030	28	0.0123	66	0.0138	33	0.0419	87	0.0295	27	-	
153	yisheng-004	0.1988	133	0.3329	133	0.0475	127	0.1147	127	0.1849	124	0.2044	114	0.0908	106	0.7152	51
154	yitu-003	0.0015	1	0.0026	1	0.0003	1	0.0066	17	0.0085	10	0.0064	3	0.0325	50	-	

Table 8: FNMR is the proportion of mated comparisons below a threshold set to achieve the FMR given in the header on the fourth row. FMR is the proportion of impostor comparisons at or above that threshold. The light grey values give rank over all algorithms in that column. The pink column uses only same-sex impostors; others are selected regardless of demographics. The exception, in the green column, uses "matched-covariates" i.e. impostors of the same sex, age group, and country of birth. The pink column includes effects of extended ageing. Missing entries for border, visa, mugshot and wild images generally mean the algorithm did not run to completion. For child exploitation, missing entries arise because NIST executes those runs only infrequently.

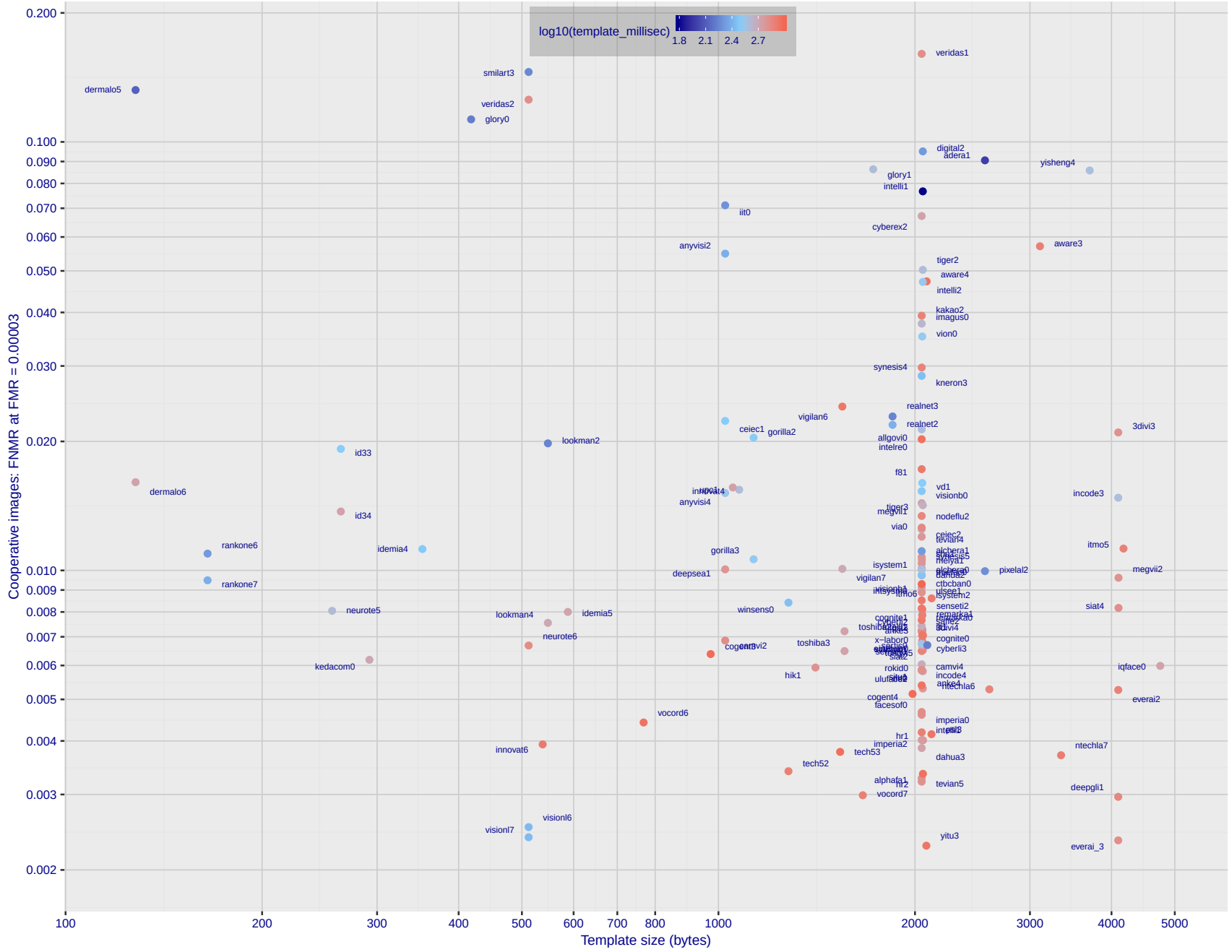


Figure 1: The points show false non-match rates (FNMR) versus the size of the encoded template. FNMR is the geometric mean of FNMR values for visa and mugshot images (from Figs. 26 and 34) at a false match rate (FMR) of 0.0001. The color of the points encodes template generation time - which spans at least one order of magnitude. Durations are measured on a single core of a c. 2016 Intel Xeon CPU E5-2630 v4 running at 2.20GHz. Algorithms with poor FNMR are omitted.

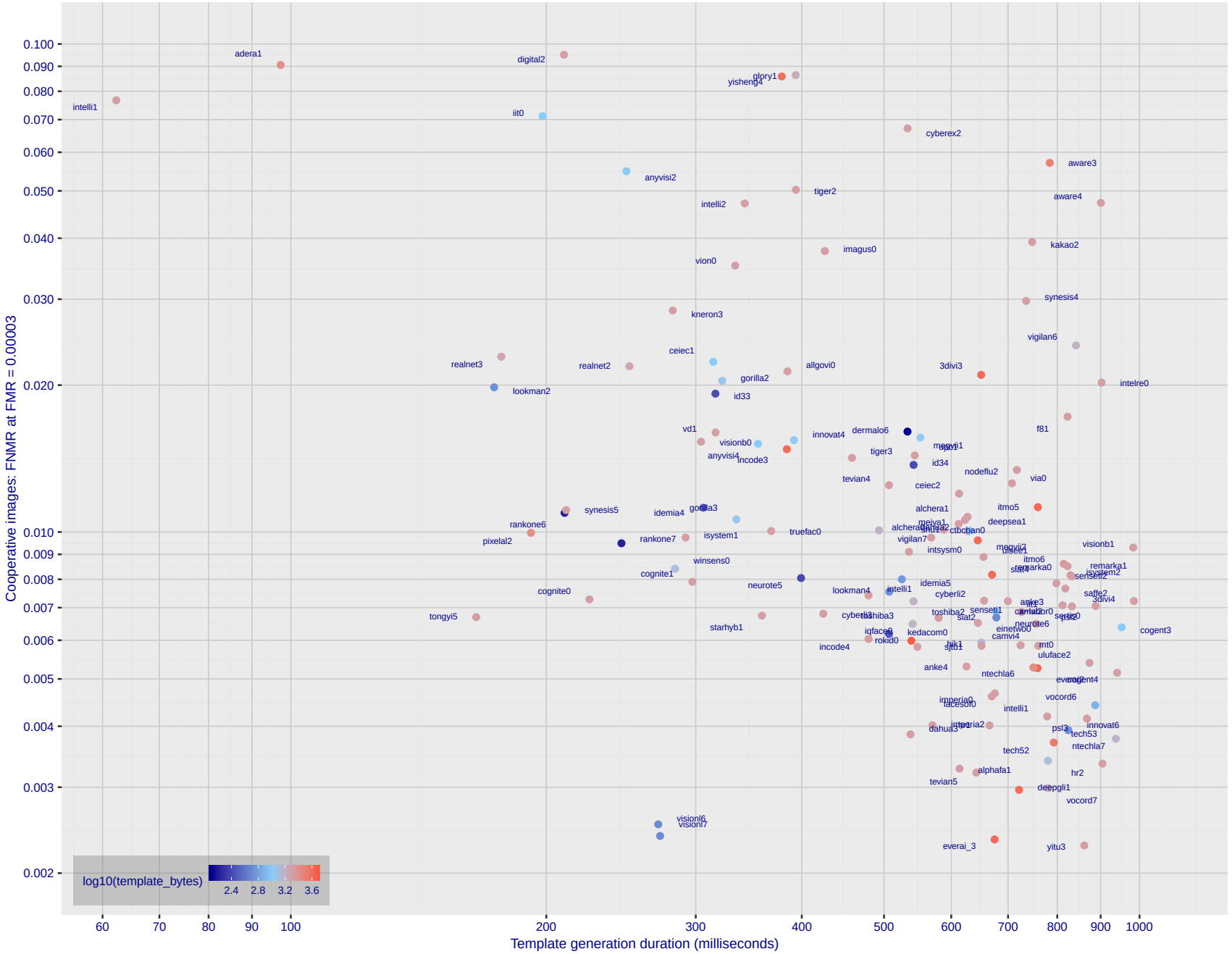


Figure 2: The points show false non-match rates (FNMR) versus the duration of the template generation operation. FNMR is the geometric mean of FNMR values for visa and mugshot images (from Figs. 26 and 34) at a false match rate (FMR) of 0.0001. Template generation time is a median estimated over 640 x 480 pixel portraits. It is measured on a single core of a c. 2016 Intel Xeon CPU E5-2630 v4 running at 2.20GHz. The color of the points encodes template size - which span two orders of magnitude. Algorithms with poor FNMR are omitted.

2019/10/16 12:43:37

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

1 Metrics

1.1 Core accuracy

Given a vector of N genuine scores, u, the false non-match rate (FNMR) is computed as the proportion below some threshold, T:

$$\text{FNMR}(T) = 1 - \frac{1}{N}\sum_{i=1}^{N} H(u_i - T) \tag{1}$$

where $H(x)$ is the unit step function, and $H(0)$ taken to be 1.

Similarly, given a vector of N impostor scores, v, the false match rate (FMR) is computed as the proportion above T:

$$\text{FMR}(T) = \frac{1}{N}\sum_{i=1}^{N} H(v_i - T) \tag{2}$$

The threshold, T, can take on any value. We typically generate a set of thresholds from quantiles of the observed impostor scores, v, as follows. Given some interesting false match rate range, $[\text{FMR}_L, \text{FMR}_U]$, we form a vector of K thresholds corresponding to FMR measurements evenly spaced on a logarithmic scale

$$T_k = Q_v(1 - \text{FMR}_k) \tag{3}$$

where Q is the quantile function, and FMR_k comes from

$$\log_{10}\text{FMR}_k = \log_{10}\text{FMR}_L + \frac{k}{K}\ [\log_{10}\text{FMR}_U - \log_{10}\text{FMR}_L] \tag{4}$$

Error tradeoff characteristics are plots of FNMR(T) vs. FMR(T). These are plotted with $\text{FMR}_U \rightarrow 1$ and FMR_L as low as is sustained by the number of impostor comparisons, N. This is somewhat higher than the "rule of three" limit $3/N$ because samples are not independent, due to re-use of images.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

2 Datasets

2.1 Child exploitation images

- ▷ The number of images is on the order of 10^4.
- ▷ The number of subjects is on the order of 10^3.
- ▷ The number of subjects with two images on the order of 10^3.
- ▷ The images are operational. They are taken from ongoing investigations of child exploitation crimes. The images are arbitrarily unconstrained. Pose varies considerably around all three axes, including subject lying down. Resolution varies very widely. Faces can be occluded by other objects, including hair and hands. Lighting varies, although the images are intended for human viewing. Mis-focus is rare. Images are given to the algorithm without any cropping; faces may occupy widely varying areas.
- ▷ The images are usually large from contemporary cameras. The mean interocular distance (IOD) is 70 pixels.
- ▷ The images are of subjects from several countries, due to the global production of this imagery.
- ▷ The images are of children, from infancy to late adolescence.
- ▷ All of the images are live capture, none are scanned. Many have been cropped.
- ▷ When these images are input to the algorithm, they are labelled as being of type ”EXPLOITATION” - see Table 4 of the FRVT API.

2.2 Visa images

- ▷ The number of images is on the order of 10^5.
- ▷ The number of subjects is on the order of 10^5.
- ▷ The number of subjects with two images on the order of 10^4.
- ▷ The images have geometry in reasonable conformance with the ISO/IEC 19794-5 Full Frontal image type. Pose is generally excellent.
- ▷ The images are of size 252x300 pixels. The mean interocular distance (IOD) is 69 pixels.
- ▷ The images are of subjects from greater than 100 countries, with significant imbalance due to visa issuance patterns.
- ▷ The images are of subjects of all ages, including children, again with imbalance due to visa issuance demand.
- ▷ Many of the images are live capture. A substantial number of the images are photographs of paper photographs.
- ▷ When these images are input to the algorithm, they are labelled as being of type ”ISO” - see Table 4 of the FRVT API.

2.3 Visa images II

- ▷ The number of images is on the order of 10^6.
- ▷ The number of subjects is on the order of 10^6.
- ▷ The number of subjects with two images on the order of 10^6.

FNMR(T) “False non-match rate”
FMR(T) “False match rate”

- ▷ The images have geometry in good conformance with the ISO/IEC 19794-5 Full Frontal image type. Pose is generally excellent.
- ▷ The images are of size 300x300 pixels. The mean interocular distance (IOD) is 61 pixels.
- ▷ The images are of subjects from greater than 100 countries, with significant imbalance due to population and immigration patterns.
- ▷ The images are of subjects of all ages, including children, again with imbalance due due to population and immigration patterns and demand.
- ▷ All of the images are live capture.
- ▷ When these images are input to the algorithm, they are labelled as being of type "ISO" - see Table 4 of the FRVT API.

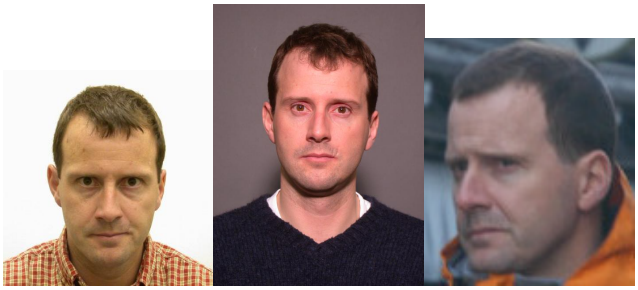
2.4 Mugshot images

- ▷ The number of images is on the order of 10^6.
- ▷ The number of subjects is on the order of 10^6.
- ▷ The number of subjects with two images on the order of 10^6.
- ▷ The images have geometry in reasonable conformance with the ISO/IEC 19794-5 Full Frontal image type.
- ▷ The images are of variable sizes. The median IOD is 105 pixels. The mean IOD is 113 pixels. The 1-st, 5-th, 10-th, 25-th, 75-th, 90-th and 99-th percentiles are 34, 58, 70, 87, 121, 161 and 297 pixels.
- ▷ The images are of subjects from the United States.
- ▷ The images are of adults.
- ▷ The images are all live capture.
- ▷ When these images are input to the algorithm, they are labelled as being of type "mugshot" - see Table 4 of the FRVT API.

2.5 Webcam images

- ▷ The number of images is on the order of 10^6.
- ▷ The number of subjects is on the order of 10^6.
- ▷ All subjects have a webcam image, and a portrait image.
- ▷ The portrait images are in poor conformance with the ISO/IEC 19794-5 Full Frontal image type.
- ▷ The webcam images are taken with at camera oriented by an attendant toward a cooperating subject. This is done under time constraints so there are role, pitch and yaw angle variation. Also background illumination is sometimes strong, so the face is under exposed. There is sometimes perspective distortion due to close range images.
- ▷ The images have mean IOD of 38 pixels.
- ▷ The images are all live capture.
- ▷ When these images are input to the algorithm, they are labelled as being of type "WILD" - see Table 4 of the FRVT API.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"



(a) Visa (b) Mugshot (c) Wild

Figure 3: The figure gives simulated samples of image types used in this report.

2.6 Wild images

- The number of images is on the order of 10^5.
- The number of subjects is on the order of 10^3.
- The number of subjects with two images on the order of 10^3.
- The images include many photojournalism-style images. Images are given to the algorithm using a variable but generally tight crop of the head. Resolution varies very widely. The images are very unconstrained, with wide yaw and pitch pose variation. Faces can be occluded, including hair and hands.
- The images are of adults.
- All of the images are live capture, none are scanned.
- When these images are input to the algorithm, they are labelled as being of type "WILD" - see Table 4 of the FRVT API.

3 Results

3.1 Test goals

- To state overall accuracy.
- To compare algorithms.

3.2 Test design

Method: For visa images:

- The comparisons are of visa photos against visa photos.
- The number of genuine comparisons is on the order of 10^4.
- The number of impostor comparisons is on the order of 10^{10}.
- The comparisons are fully zero-effort, meaning impostors are paired without attention to sex, age or other covariates. However, later analysis is conducted on subsets.

- ▷ The number of persons is on the order of 10^5.
- ▷ The number of images used to make 1 template is 1.
- ▷ The number of templates used to make each comparison score is two corresponding to simple one-to-one verification.

For mugshot images:

- ▷ The comparisons are of mugshot photos against mugshot photos.
- ▷ The number of genuine comparisons is on the order of 10^6.
- ▷ The number of impostor comparisons is on the order of 10^8.
- ▷ The impostors are paired by sex, but not by age or other covariates.
- ▷ The number of persons is on the order of 10^6.
- ▷ The number of images used to make 1 template is 1.
- ▷ The number of templates used to make each comparison score is two corresponding to simple one-to-one verification.

Method: For wild images:

- ▷ The comparisons are of wild photos against wild photos.
- ▷ The number of genuine comparisons is on the order of 10^6.
- ▷ The number of impostor comparisons is on the order of 10^7.
- ▷ The comparisons are fully zero-effort, meaning impostors are paired without attention to sex, age or other covariates.
- ▷ The number of persons is on the order of 10^4.
- ▷ The number of images used to make 1 template is 1.
- ▷ The number of templates used to make each comparison score is two corresponding to simple one-to-one verification.

For child exploitation images:

- ▷ The comparisons are of unconstrained child exploitation photos against others of the same type.
- ▷ The number of genuine comparisons is on the order of 10^4.
- ▷ The number of impostor comparisons is on the order of 10^7.
- ▷ The comparisons are fully zero-effort, meaning impostors are paired without attention to sex, age or other covariates.
- ▷ The number of persons is on the order of 10^3.
- ▷ The number of images used to make 1 template is 1.
- ▷ The number of templates used to make each comparison score is two corresponding to simple one-to-one verification.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

▷ We produce two performance statements. First, is a DET as used for visa and mugshot images. The second is a cumulative match characteristic (CMC) summarizing a simulated one-to-many search process. This is done as follows.

- We regard M enrollment templates as items in a gallery.
- These M templates come from $M > N$ individuals, because multiple images of a subject are present in the gallery under separate identifiers.
- We regard the verification templates as search templates.
- For each search we compute the rank of the highest scoring mate.
- This process should properly be conducted with a 1:N algorithm, such as those tested in NIST IR 8009. We use the 1:1 algorithms in a simulated 1:N mode here to a) better reflect what a child exploitation analyst does, and b) to show algorithm efficacy is better than that revealed in the verification DETs.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

3.3 Failure to enroll

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

	Algorithm	Failure to Enrol Rate[1]							
	Name	CHILD-EXPLOIT		MUGSHOT		VISA		WILD	
1	3divi-003	0.1806	58	0.0007	111	0.0006	105	0.0294	125
2	3divi-004	-	154	0.0008	114	0.0006	107	0.0222	124
3	adera-001	0.1928	61	0.0003	83	0.0005	101	0.0505	136
4	alchera-000	-	154	0.0004	98	0.0014	133	0.0038	94
5	alchera-001	-	154	0.0004	97	0.0014	132	0.0038	93
6	allgovision-000	-	154	0.0026	139	0.0052	151	0.0131	115
7	alphaface-001	-	154	0.0000	48	0.0004	80	0.0004	53
8	amplifiedgroup-001	-	154	0.0189	154	0.0279	156	0.1390	148
9	anke-003	-	154	0.0001	61	0.0004	71	0.0006	64
10	anke-004	0.0944	43	0.0001	62	0.0004	81	0.0006	68
11	anyvision-002	0.4866	81	0.0070	150	0.0090	153	0.1146	144
12	anyvision-004	0.1660	55	0.0001	69	0.0004	77	0.0080	104
13	aware-003	0.3314	75	0.0016	134	0.0013	129	0.0745	141
14	aware-004	-	154	0.0002	73	0.0005	89	0.0014	84
15	awiros-001	-	154	0.0386	155	0.0872	157	0.3415	152
16	ayonix-000	0.0000	3	0.0113	151	0.0137	155	0.1194	145
17	bm-001	0.0000	18	0.0000	36	0.0000	14	0.0000	11
18	camvi-002	0.0000	4	0.0000	21	0.0000	22	0.0000	18
19	camvi-004	-	154	0.0000	25	0.0000	26	0.0000	22
20	ceiec-001	-	154	0.0029	142	0.0023	140	0.0068	101
21	ceiec-002	0.2482	69	0.0036	144	0.0031	146	0.0081	105
22	chtface-001	-	154	0.0000	28	0.0000	29	0.0000	25
23	cogent-003	-	154	0.0001	58	0.0004	74	0.0009	79
24	cogent-004	0.0000	6	0.0000	4	0.0000	4	0.0000	2
25	cognitec-000	0.6342	85	0.0007	112	0.0007	113	0.0388	133
26	cognitec-001	-	154	0.0008	118	0.0010	115	0.0185	120
27	ctbcbank-000	0.3285	74	0.0011	125	0.0019	137	0.0868	143
28	cyberextruder-001	0.5338	83	0.0024	137	0.0029	144	0.0597	139
29	cyberextruder-002	0.2672	72	0.0027	140	0.0028	143	0.0335	130
30	cyberlink-002	0.1463	54	0.0004	91	0.0004	87	0.0007	69
31	cyberlink-003	-	154	0.0001	51	0.0004	62	0.0008	70
32	dahua-002	-	154	0.0024	138	0.0022	139	0.0009	76
33	dahua-003	-	154	0.0002	78	0.0003	43	0.0002	41
34	deepglint-001	0.0000	19	0.0000	14	0.0000	15	0.0000	12
35	deepsea-001	0.0000	8	0.0000	7	0.0000	7	0.0000	5
36	dermalog-005	0.1796	56	0.0013	130	0.0041	148	0.0163	118
37	dermalog-006	0.1797	57	0.0013	129	0.0041	149	0.0163	119
38	digitalbarriers-002	-	154	0.0028	141	0.0027	142	0.0071	102
39	dsk-000	0.0000	14	0.0000	11	0.0000	11	0.0000	8
40	einetworks-000	-	154	0.0002	76	0.0005	99	0.0008	71
41	everai-002	-	154	0.0002	79	0.0004	56	0.0004	59
42	everai-paravision-003	0.0705	39	0.0002	72	0.0004	63	0.0004	57
43	f8-001	0.2026	63	0.0035	143	0.0030	145	0.0087	108
44	facesoft-000	0.0000	23	0.0000	35	0.0000	36	0.0000	30
45	glory-000	0.0000	16	0.0053	148	0.0013	130	0.1565	149
46	glory-001	0.0000	11	0.0051	147	0.0010	116	0.1651	150
47	gorilla-002	0.1347	50	0.0003	90	0.0004	88	0.0117	111
48	gorilla-003	0.1347	49	0.0003	89	0.0004	86	0.0043	96
49	hik-001	-	154	0.0000	29	0.0000	28	0.0000	24
50	hr-001	0.1198	48	0.0001	50	0.0004	65	0.0003	49
51	hr-002	-	154	0.0002	75	0.0004	82	0.0004	52
52	id3-003	0.3032	73	0.0016	135	0.0011	126	0.0317	128
53	id3-004	-	154	0.0015	133	0.0011	125	-	154
54	idemia-004	-	154	0.0000	41	0.0004	59	0.0003	50
55	idemia-005	-	154	0.0000	38	0.0003	48	0.0003	45
56	iit-000	-	154	0.0007	110	0.0011	120	0.0836	142
57	iit-001	0.0843	42	0.0001	71	0.0004	78	0.0104	109
58	imagus-000	0.1107	46	0.0010	124	0.0012	128	0.0347	131
59	imperial-000	-	154	0.0000	16	0.0000	17	0.0000	14
60	imperial-002	-	154	0.0000	6	0.0000	6	0.0000	4

Table 9: FTE is the proportion of failed template generation attempts. Failures can occur because the software throws an exception, or because the software electively refuses to process the input image. This would typically occur if a face is not detected. FTE is measured as the number of function calls that give EITHER a non-zero error code OR that give a "small" template. This is defined as one whose size is less than 0.3 times the median template size for that algorithm. This second rule is needed because some algorithms incorrectly fail to return a non-zero error code when template generation fails.

[1] *The effects of FTE are included in the accuracy results of this report by regarding any template comparison involving a failed template to produce a low similarity score. Thus higher FTE results in higher FNMR and lower FMR.*

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

	Algorithm	Failure to Enrol Rate[1]							
	Name	CHILD-EXPLOIT		MUGSHOT		VISA		WILD	
61	incode-003	-	154	0.0004	102	0.0007	110	0.0014	83
62	incode-004	0.2202	64	0.0004	101	0.0007	109	0.0014	82
63	innovatrics-004	0.1170	47	0.0000	47	0.0004	79	0.0041	95
64	innovatrics-006	-	154	0.0000	43	0.0004	55	0.0003	51
65	intellicloudai-001	-	154	0.0000	34	0.0000	35	0.0001	38
66	intellifusion-001	-	154	0.0001	55	0.0003	51	0.0005	63
67	intellivision-001	0.5495	84	0.0048	146	0.0042	150	0.1358	146
68	intellivision-002	-	154	0.0012	127	0.0005	103	0.0146	116
69	intelresearch-000	-	154	0.0000	45	0.0003	50	0.0001	39
70	intsysmsu-000	-	154	0.0004	96	0.0012	127	0.0031	92
71	iqface-000	0.0000	9	0.0000	26	0.0000	27	0.0000	23
72	isap-001	-	154	0.0000	24	0.0000	25	0.0000	21
73	isityou-000	0.4714	79	0.0023	136	0.0010	118	0.0663	140
74	isystems-001	0.1421	52	0.0010	122	0.0007	111	0.0128	113
75	isystems-002	0.1421	53	0.0010	123	0.0007	112	0.0128	114
76	itmo-005	0.1353	51	0.0005	104	0.0002	38	0.0075	103
77	itmo-006	-	154	0.0004	100	0.0004	76	0.0006	67
78	kakao-001	-	154	0.0002	80	0.0005	92	0.0310	126
79	kakao-002	0.2494	70	0.0002	81	0.0005	96	0.0310	127
80	kedacom-000	0.0000	17	0.0000	13	0.0000	13	0.0000	10
81	kneron-003	0.4883	82	0.0044	145	0.0016	136	0.1823	151
82	lookman-002	-	154	0.0000	23	0.0000	24	0.0000	20
83	lookman-004	0.0000	1	0.0000	20	0.0000	21	0.0000	17
84	megvii-001	0.0274	28	0.0007	113	0.0004	61	0.0152	117
85	megvii-002	0.0274	27	0.0054	149	0.0004	60	0.0126	112
86	meiya-001	-	154	0.0004	103	0.0010	119	0.0025	89
87	microfocus-001	0.0791	41	0.0008	117	0.0016	135	0.0220	123
88	microfocus-002	0.0791	40	0.0008	116	0.0016	134	0.0220	122
89	mt-000	0.1043	44	0.0002	77	0.0004	83	0.0004	54
90	neurotechnology-005	-	154	0.0004	94	0.0004	67	0.0018	85
91	neurotechnology-006	0.1068	45	0.0004	95	0.0004	68	0.0018	86
92	nodeflux-001	-	154	0.0001	63	0.0002	40	0.0003	44
93	nodeflux-002	-	154	0.0008	115	0.0005	98	0.0008	75
94	notiontag-000	0.0000	21	0.0000	17	0.0000	18	0.0000	15
95	ntechlab-006	-	154	0.0000	37	0.0004	53	0.0003	43
96	ntechlab-007	0.0682	38	0.0001	52	0.0004	57	0.0005	62
97	pixelall-002	0.0001	24	0.0000	10	0.0000	10	0.0001	35
98	psl-002	-	154	0.0000	12	0.0000	12	0.0000	9
99	psl-003	-	154	0.0000	46	0.0004	75	0.0003	48
100	rankone-006	-	154	0.0000	32	0.0000	33	0.0000	27
101	rankone-007	0.3518	77	0.0003	85	0.0004	84	0.0043	97
102	realnetworks-002	-	154	0.0004	93	0.0003	45	0.0004	56
103	realnetworks-003	0.0076	25	0.0004	92	0.0003	44	0.0004	58
104	remarkai-000	-	154	0.0000	2	0.0000	2	0.0000	33
105	remarkai-001	-	154	0.0000	19	0.0000	20	0.0000	34
106	rokid-000	-	154	0.0001	60	0.0005	97	0.0354	132
107	saffe-001	0.0000	20	0.0000	15	0.0000	16	0.0000	13
108	saffe-002	-	154	0.0000	31	0.0000	32	0.0000	26
109	sensetime-001	0.0631	37	0.0000	40	0.0004	70	0.0003	46
110	sensetime-002	0.3345	76	0.0011	126	0.0005	102	0.0218	121
111	sertis-000	-	154	0.0000	49	0.0004	64	0.0004	55
112	shaman-000	0.0000	5	0.0000	22	0.0000	23	0.0000	19
113	shaman-001	0.0000	2	0.0000	1	0.0000	1	0.0000	31
114	shu-001	0.1822	59	0.0010	121	0.0006	104	0.0499	135
115	siat-002	0.0616	34	0.0000	44	0.0004	73	0.0048	99
116	siat-004	-	154	0.0000	42	0.0004	72	0.0003	47
117	sjtu-001	-	154	0.0005	105	0.0004	85	0.0008	73
118	smilart-002	0.2422	67	0.0003	88	0.0011	122	0.0575	138
119	smilart-003	-	154	0.0014	131	0.0013	131	0.0555	137
120	starhybrid-001	0.2340	66	0.0009	120	0.0023	141	0.0044	98

Table 10: FTE is the proportion of failed template generation attempts. Failures can occur because the software throws an exception, or because the software electively refuses to process the input image. This would typically occur if a face is not detected. FTE is measured as the number of function calls that give EITHER a non-zero error code OR that give a "small" template. This is defined as one whose size is less than 0.3 times the median template size for that algorithm. This second rule is needed because some algorithms incorrectly fail to return a non-zero error code when template generation fails.

[1] *The effects of FTE are included in the accuracy results of this report by regarding any template comparison involving a failed template to produce a low similarity score. Thus higher FTE results in higher FNMR and lower FMR.*

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

	Algorithm	Failure to Enrol Rate[1]							
	Name	CHILD-EXPLOIT		MUGSHOT		VISA		WILD	
121	synesis-004	-	154	0.0164	153	0.0035	147	0.0485	134
122	synesis-005	0.1862	60	0.0001	59	0.0005	90	0.0021	87
123	tech5-002	-	154	0.0001	57	0.0003	41	0.0000	32
124	tech5-003	-	154	0.0001	56	0.0003	42	0.0002	40
125	tevian-004	-	154	0.0002	74	0.0005	100	0.0057	100
126	tevian-005	-	154	0.0006	109	0.0006	108	0.0012	81
127	tiger-002	0.0619	35	0.0001	66	0.0004	69	0.0082	107
128	tiger-003	0.0619	36	0.0001	64	0.0004	66	0.0082	106
129	tongyi-005	0.0000	7	0.0000	5	0.0000	5	0.0000	3
130	toshiba-002	0.0000	13	0.0000	9	0.0000	9	0.0000	7
131	toshiba-003	-	154	0.0001	67	0.0001	37	0.0002	42
132	trueface-000	-	154	0.0000	33	0.0000	34	0.0000	28
133	ulsee-001	-	154	0.0000	30	0.0000	31	0.0001	36
134	uluface-002	0.0000	22	0.0000	18	0.0000	19	0.0000	16
135	upc-001	0.0450	29	0.0003	82	0.0003	49	0.0011	80
136	vd-001	-	154	0.0004	99	0.0009	114	0.0024	88
137	veridas-001	-	154	0.0001	65	0.0005	93	0.0006	65
138	veridas-002	-	154	0.0001	68	0.0005	95	0.0006	66
139	via-000	0.0000	10	0.0000	27	0.0000	30	0.0001	37
140	videonetics-001	0.4799	80	0.0015	132	0.0010	117	0.0112	110
141	vigilantsolutions-006	-	154	0.0001	54	0.0004	58	0.0005	61
142	vigilantsolutions-007	0.2538	71	0.0001	53	0.0004	54	0.0005	60
143	vion-000	0.6388	86	0.0130	152	0.0078	152	0.1389	147
144	visionbox-000	-	154	0.0005	108	0.0011	124	0.0028	91
145	visionbox-001	-	154	0.0005	107	0.0011	123	0.0028	90
146	visionlabs-006	-	154	0.0003	87	0.0005	94	0.0009	78
147	visionlabs-007	0.1939	62	0.0003	86	0.0005	91	0.0008	74
148	vocord-006	-	154	0.0003	84	0.0003	47	0.0008	72
149	vocord-007	0.0000	15	0.0001	70	0.0004	52	0.0009	77
150	winsense-000	0.0000	12	0.0000	8	0.0000	8	0.0000	6
151	x-laboratory-000	-	154	0.0005	106	0.0002	39	0.0000	29
152	yisheng-004	0.4279	78	0.0013	128	0.0006	106	0.0321	129
153	yitu-003	-	154	0.0009	119	0.0000	3	0.0000	1

Table 11: FTE is the proportion of failed template generation attempts. Failures can occur because the software throws an exception, or because the software electively refuses to process the input image. This would typically occur if a face is not detected. FTE is measured as the number of function calls that give EITHER a non-zero error code OR that give a "small" template. This is defined as one whose size is less than 0.3 times the median template size for that algorithm. This second rule is needed because some algorithms incorrectly fail to return a non-zero error code when template generation fails.

[1] *The effects of FTE are included in the accuracy results of this report by regarding any template comparison involving a failed template to produce a low similarity score. Thus higher FTE results in higher FNMR and lower FMR.*

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

3.4 Recognition accuracy

Core algorithm accuracy is stated via:

- **Cooperative subjects**
  - The summary table of Figure 8;
  - The visa image DETs of Figure 26;
  - The mugshot DETs of Figure 34;
  - The mugshot ageing profiles of Figure 126;
  - The human-difficult pairs of Figure 10
- **Non-cooperative subjects**
  - The photojournalism DET of Figure 41
  - The child-exploitation DET of Figure 45;
  - The child-exploitation CMC of Figure 48.

Figure 102 shows dependence of false match rate on algorithm score threshold. This allows a deployer to set a threshold to target a particular false match rate appropriate to the security objectives of the application.

Figure 86 likewise shows FMR(T) but for mugshots, and specially four subsets of the population.

Note that in both the mugshot and visa sets false match rates vary with the ethnicity, age, and sex, of the enrollee and impostor - see section 3.6. For example figure 57 summarizes FMR for impostors paired from four groups black females, black males, white females, white males.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

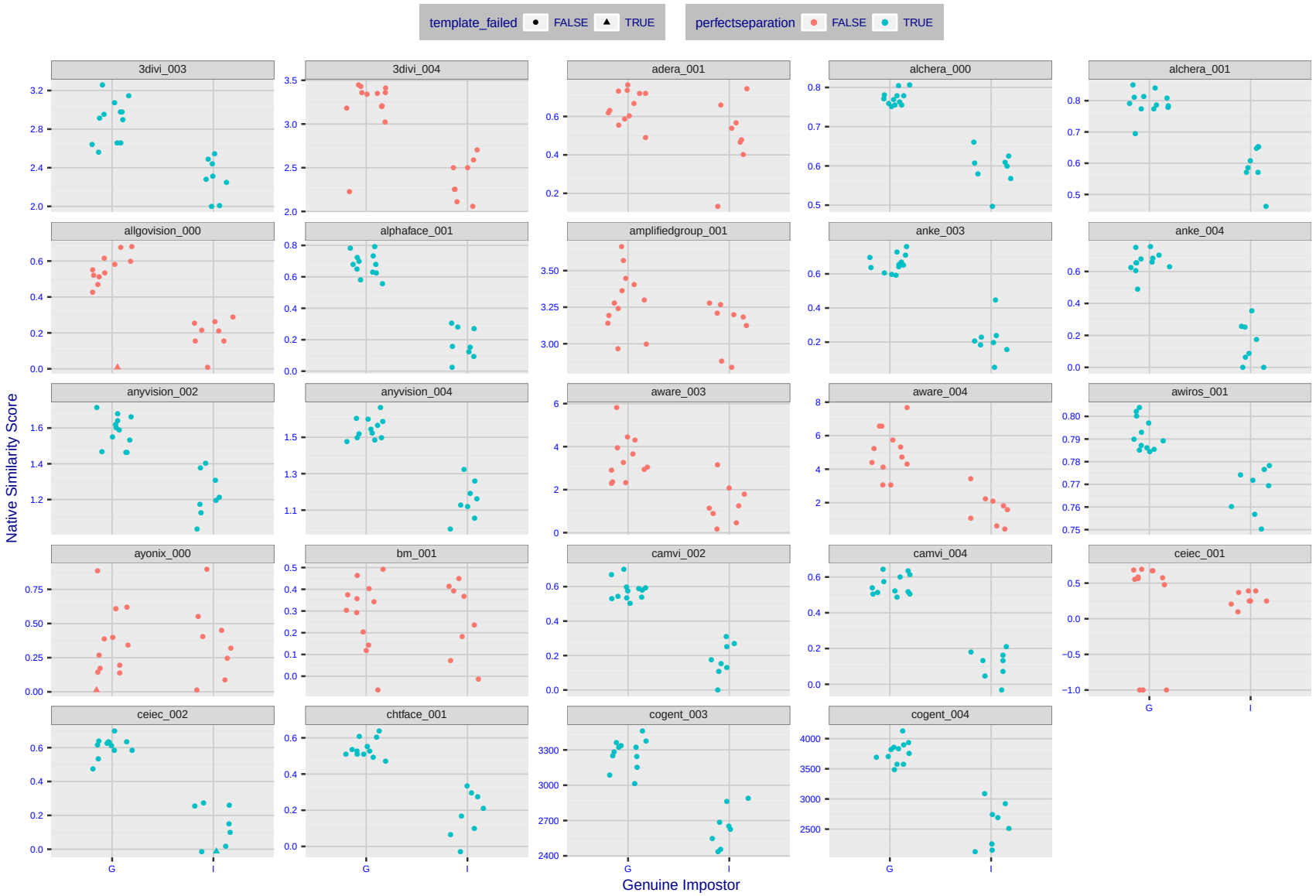


Figure 4: The Figure shows, in blue, algorithms that correctly separate the 12 genuine and 8 impostor pairs used in the May 2018 paper Face recognition accuracy of forensic examiners, superrecognizers, and face recognition algorithms *(Phillips et al. [1]). In red are algorithms that are imperfect. Some algorithms fail only because they failed to make a template e.g. due to face detection failure (shown as a triangle). Others fail because the pairs were selected for that study because they had been difficult for three leading algorithms used in FRVT 2006. Caution: Given the small sample size (n=20) the figure may change substantially if larger or different sets were used. The images can be downloaded from the* Supplemental Information *page provided with that publication.*

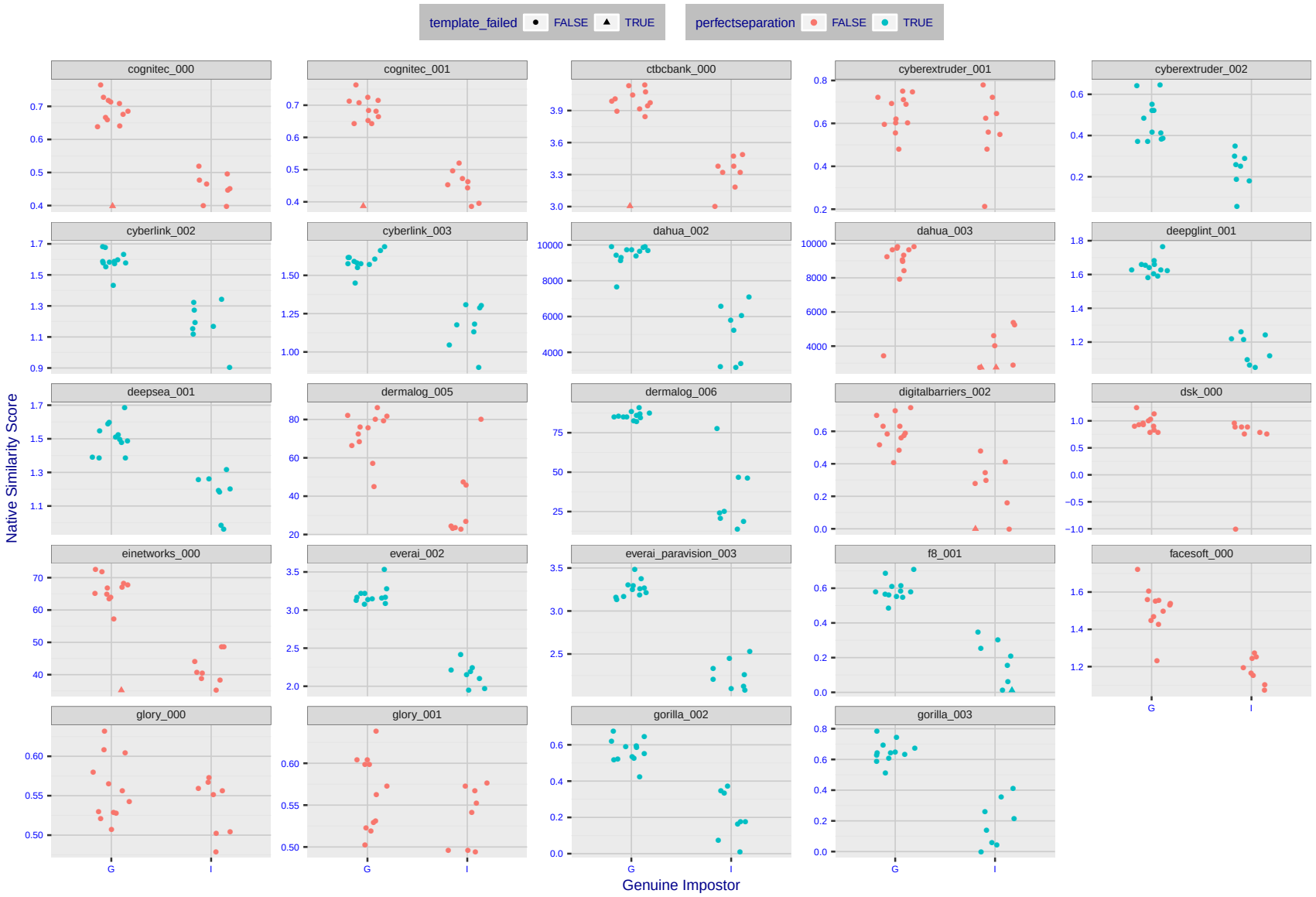


Figure 5: The Figure shows, in blue, algorithms that correctly separate the 12 genuine and 8 impostor pairs used in the May 2018 paper Face recognition accuracy of forensic examiners, superrecognizers, and face recognition algorithms *(Phillips et al. [1]). In red are algorithms that are imperfect. Some algorithms fail only because they failed to make a template e.g. due to face detection failure (shown as a triangle). Others fail because the pairs were selected for that study because they had been difficult for three leading algorithms used in FRVT 2006. Caution: Given the small sample size (n=20) the figure may change substantially if larger or different sets were used. The images can be downloaded from the* Supplemental Information *page provided with that publication.*

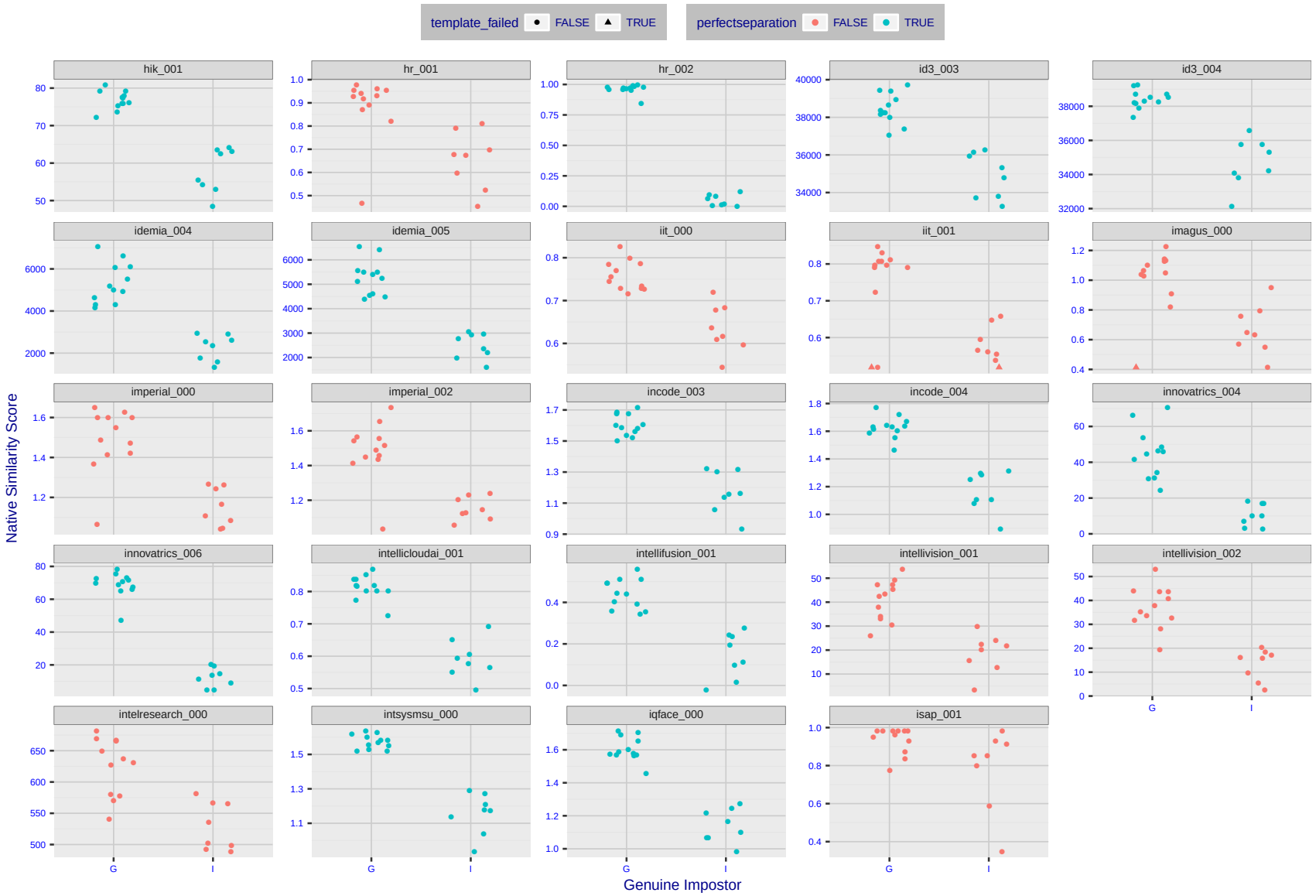


Figure 6: The Figure shows, in blue, algorithms that correctly separate the 12 genuine and 8 impostor pairs used in the May 2018 paper Face recognition accuracy of forensic examiners, superrecognizers, and face recognition algorithms *(Phillips et al. [1]). In red are algorithms that are imperfect. Some algorithms fail only because they failed to make a template e.g. due to face detection failure (shown as a triangle). Others fail because the pairs were selected for that study because they had been difficult for three leading algorithms used in FRVT 2006. Caution: Given the small sample size (n=20) the figure may change substantially if larger or different sets were used. The images can be downloaded from the* Supplemental Information *page provided with that publication.*

Figure 7: The Figure shows, in blue, algorithms that correctly separate the 12 genuine and 8 impostor pairs used in the May 2018 paper Face recognition accuracy of forensic examiners, superrecognizers, and face recognition algorithms *(Phillips et al. [1]). In red are algorithms that are imperfect. Some algorithms fail only because they failed to make a template e.g. due to face detection failure (shown as a triangle). Others fail because the pairs were selected for that study because they had been difficult for three leading algorithms used in FRVT 2006. Caution: Given the small sample size (n=20) the figure may change substantially if larger or different sets were used. The images can be downloaded from the* Supplemental Information *page provided with that publication.*

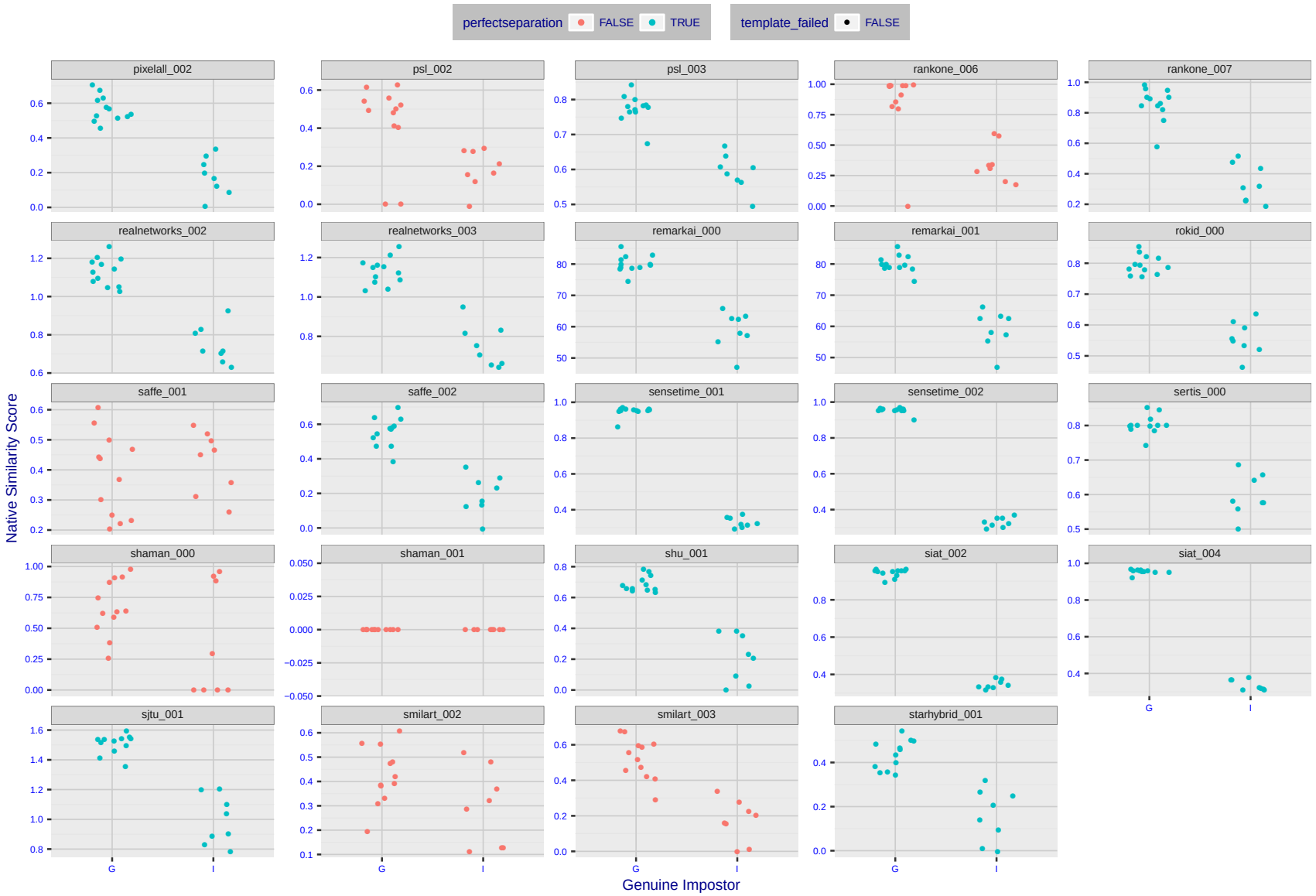


Figure 8: The Figure shows, in blue, algorithms that correctly separate the 12 genuine and 8 impostor pairs used in the May 2018 paper Face recognition accuracy of forensic examiners, superrecognizers, and face recognition algorithms *(Phillips et al. [1]). In red are algorithms that are imperfect. Some algorithms fail only because they failed to make a template e.g. due to face detection failure (shown as a triangle). Others fail because the pairs were selected for that study because they had been difficult for three leading algorithms used in FRVT 2006. Caution: Given the small sample size (n=20) the figure may change substantially if larger or different sets were used. The images can be downloaded from the* Supplemental Information *page provided with that publication.*

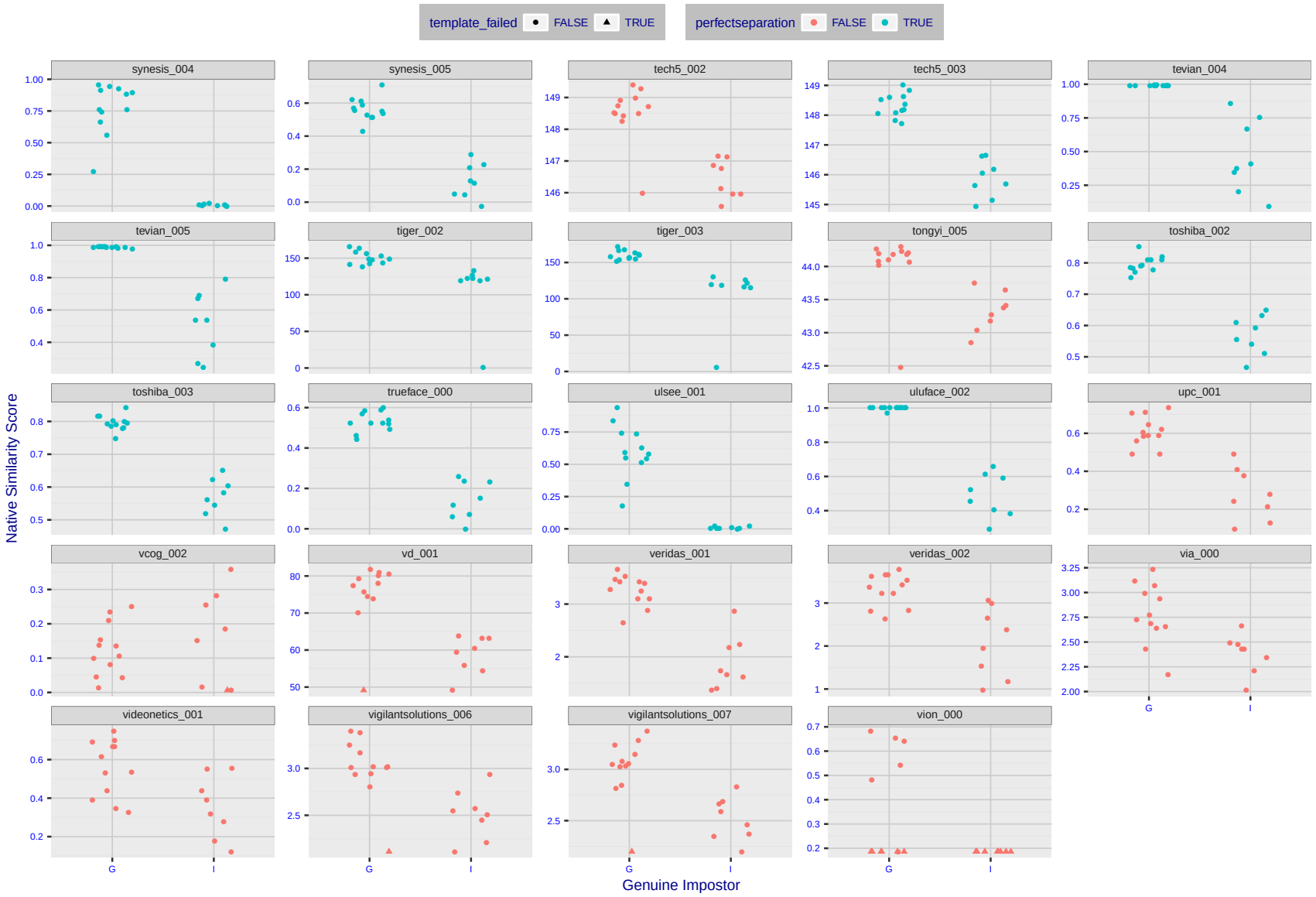


Figure 9: The Figure shows, in blue, algorithms that correctly separate the 12 genuine and 8 impostor pairs used in the May 2018 paper Face recognition accuracy of forensic examiners, superrecognizers, and face recognition algorithms *(Phillips et al. [1]). In red are algorithms that are imperfect. Some algorithms fail only because they failed to make a template e.g. due to face detection failure (shown as a triangle). Others fail because the pairs were selected for that study because they had been difficult for three leading algorithms used in FRVT 2006. Caution: Given the small sample size (n=20) the figure may change substantially if larger or different sets were used. The images can be downloaded from the* Supplemental Information *page provided with that publication.*

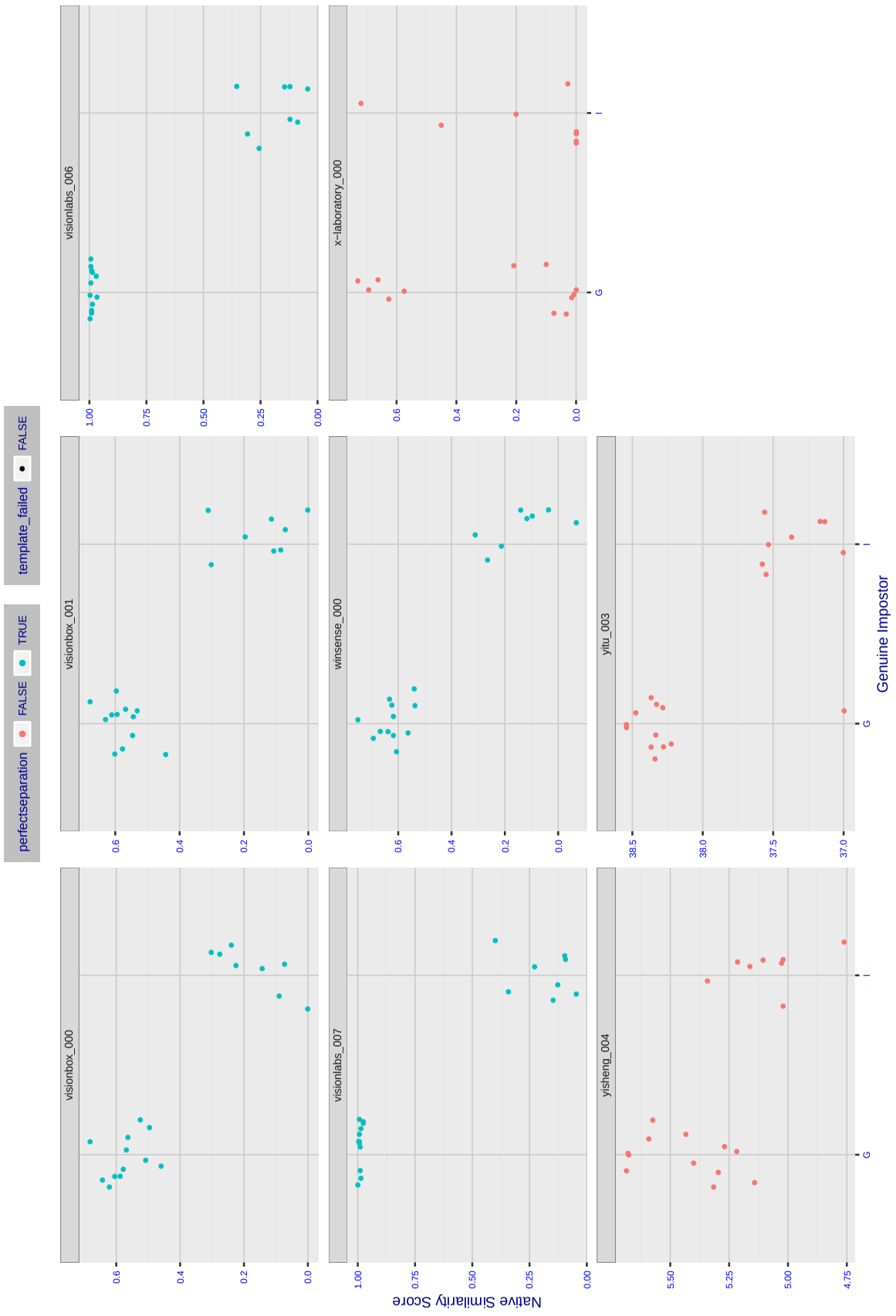


Figure 10: The Figure shows, in blue, algorithms that correctly separate the 12 genuine and 8 impostor pairs used in the May 2018 paper Face recognition accuracy of forensic examiners, superrecognizers, and face recognition algorithms (Phillips et al. [1]). In red are algorithms that are imperfect. Some algorithms fail only because they failed to make a template e.g. due to face detection failure (shown as a triangle). Others fail because the pairs were selected for that study because they had been difficult for three leading algorithms used in FRVT 2006. Caution: Given the small sample size (n=20) the figure may change substantially if larger or different sets were used. The images can be downloaded from the Supplemental Information page provided with that publication.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

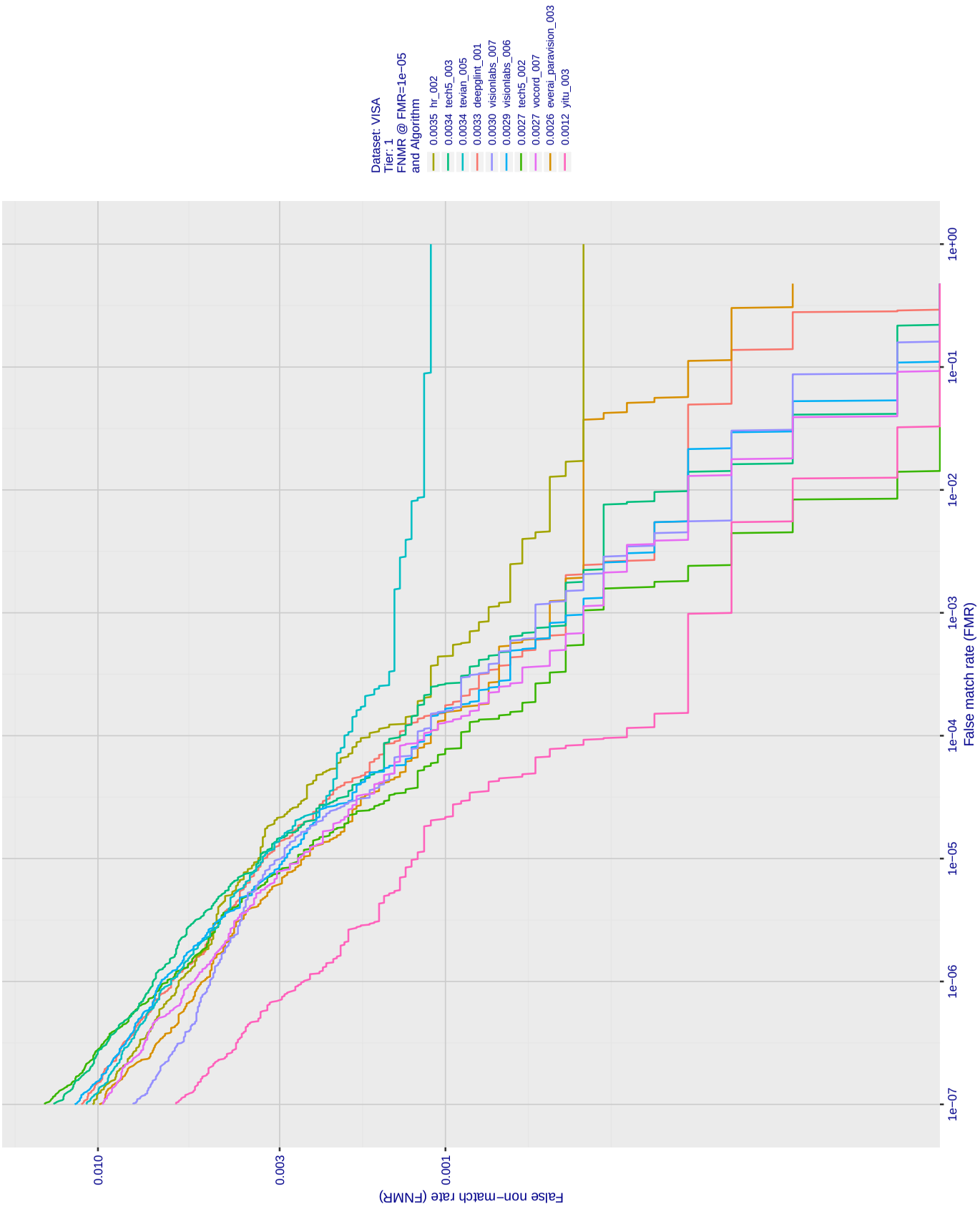


Figure 11: For the visa images, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

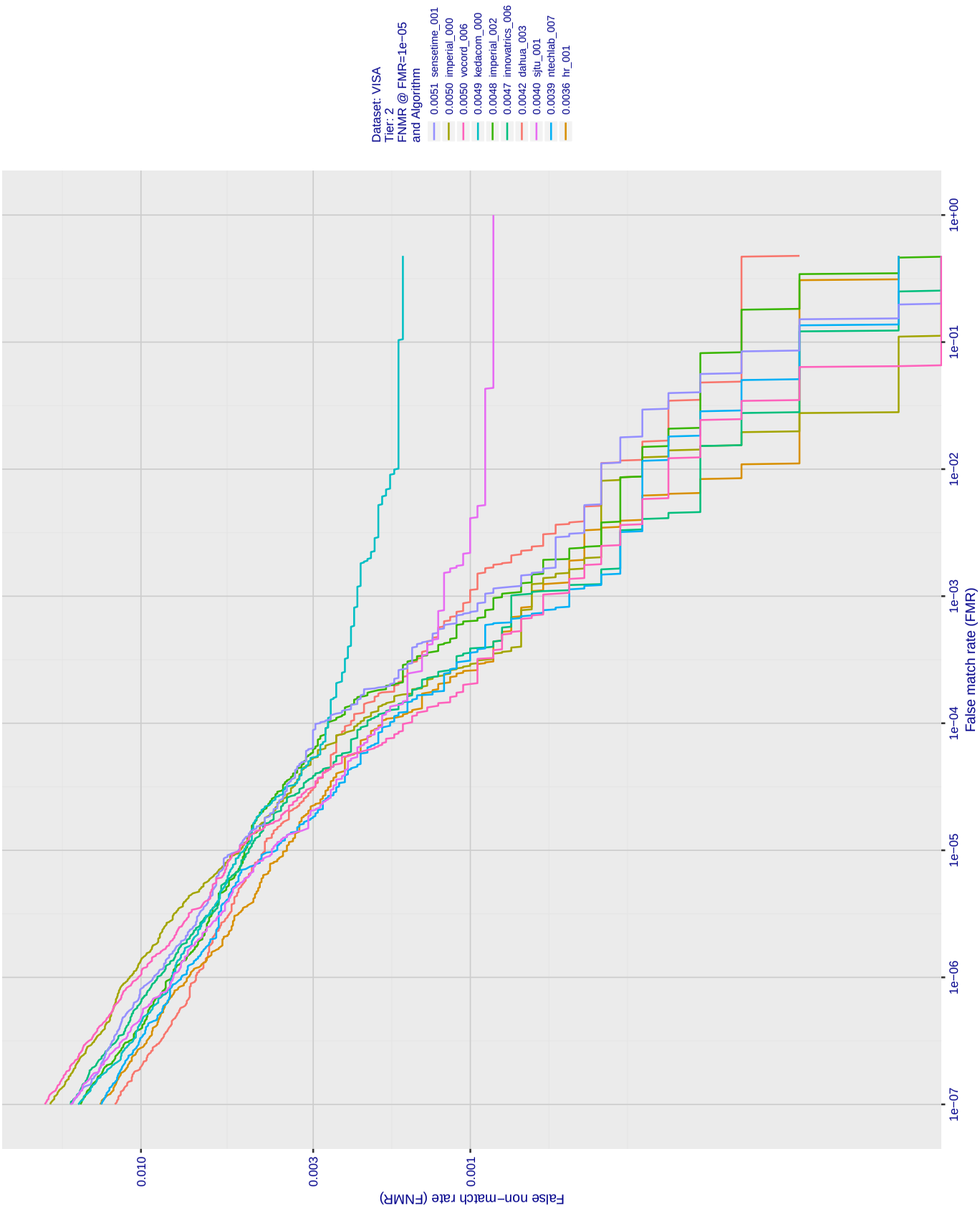


Figure 12: For the visa images, detection error tradeoff (DET) *characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

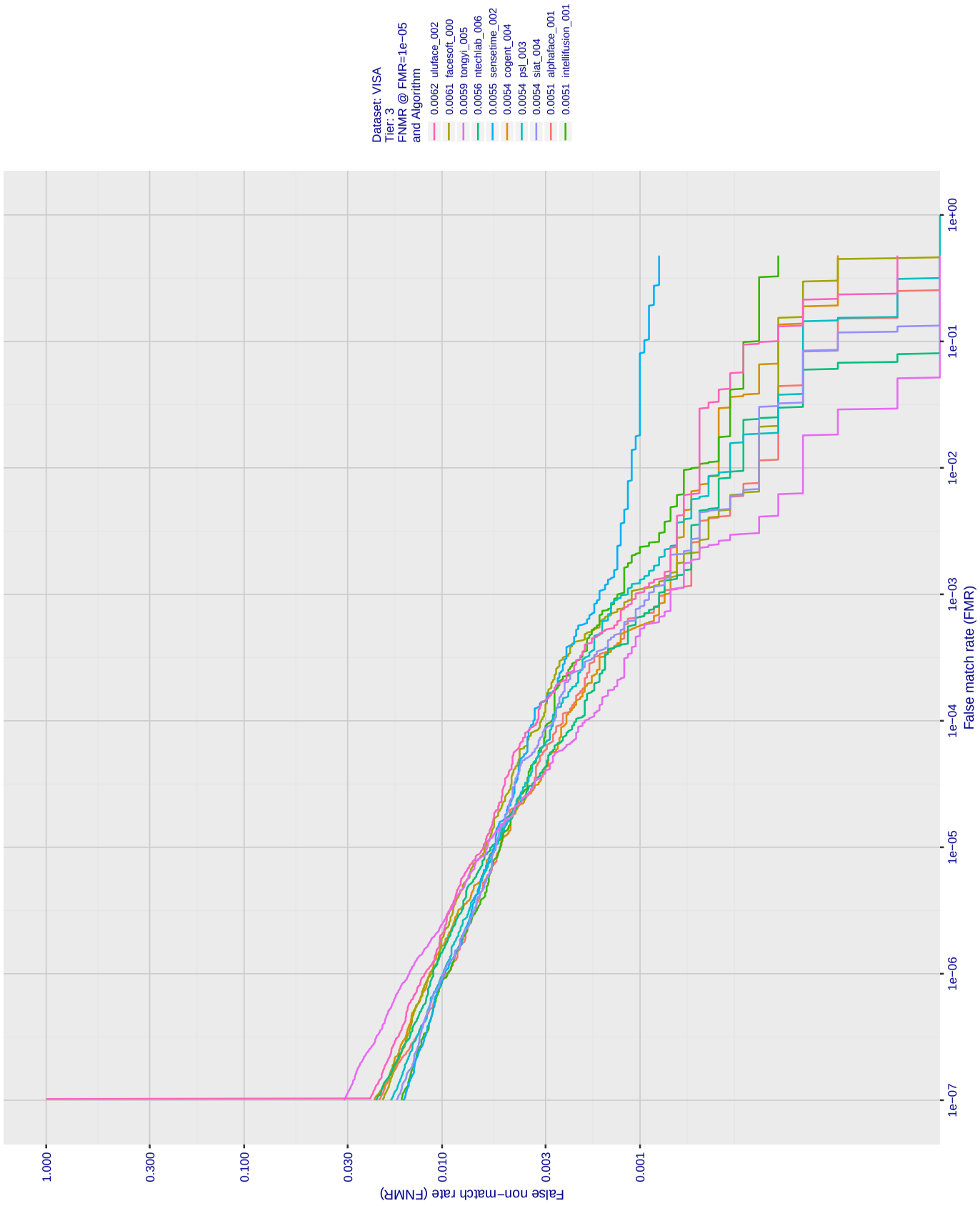


Figure 13: For the visa images, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

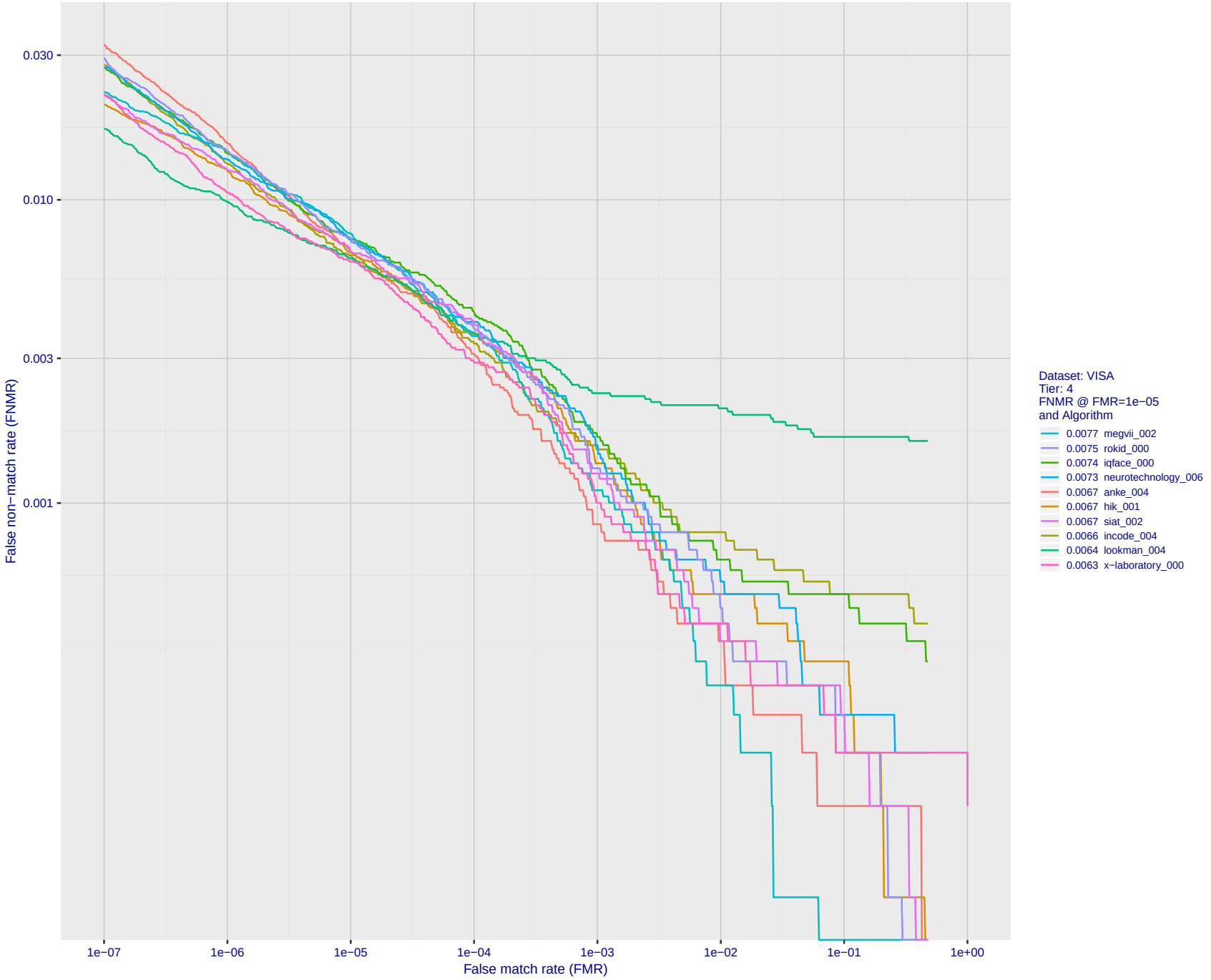


*Figure 14: For the visa images, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR*.*

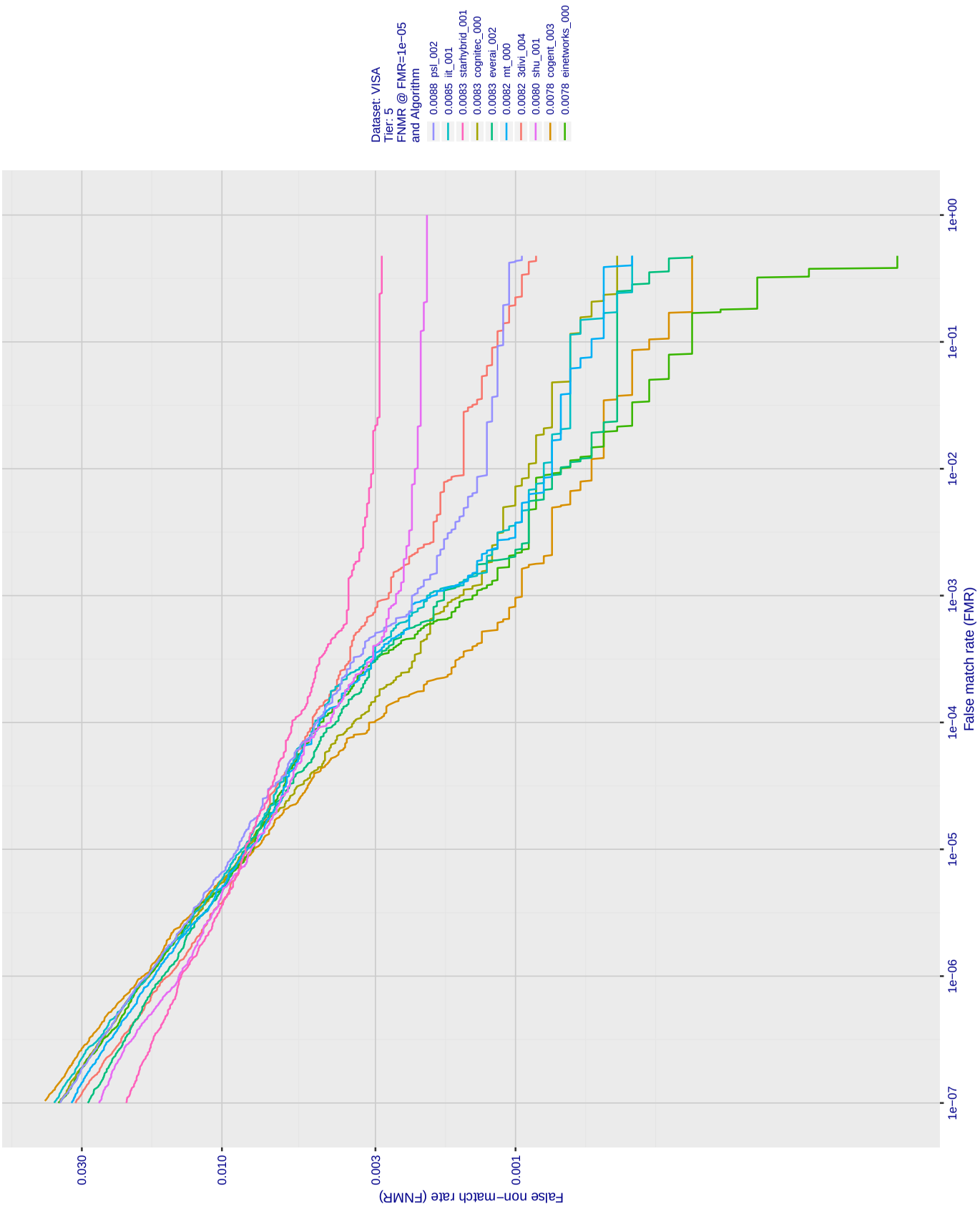


Figure 15: For the visa images, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

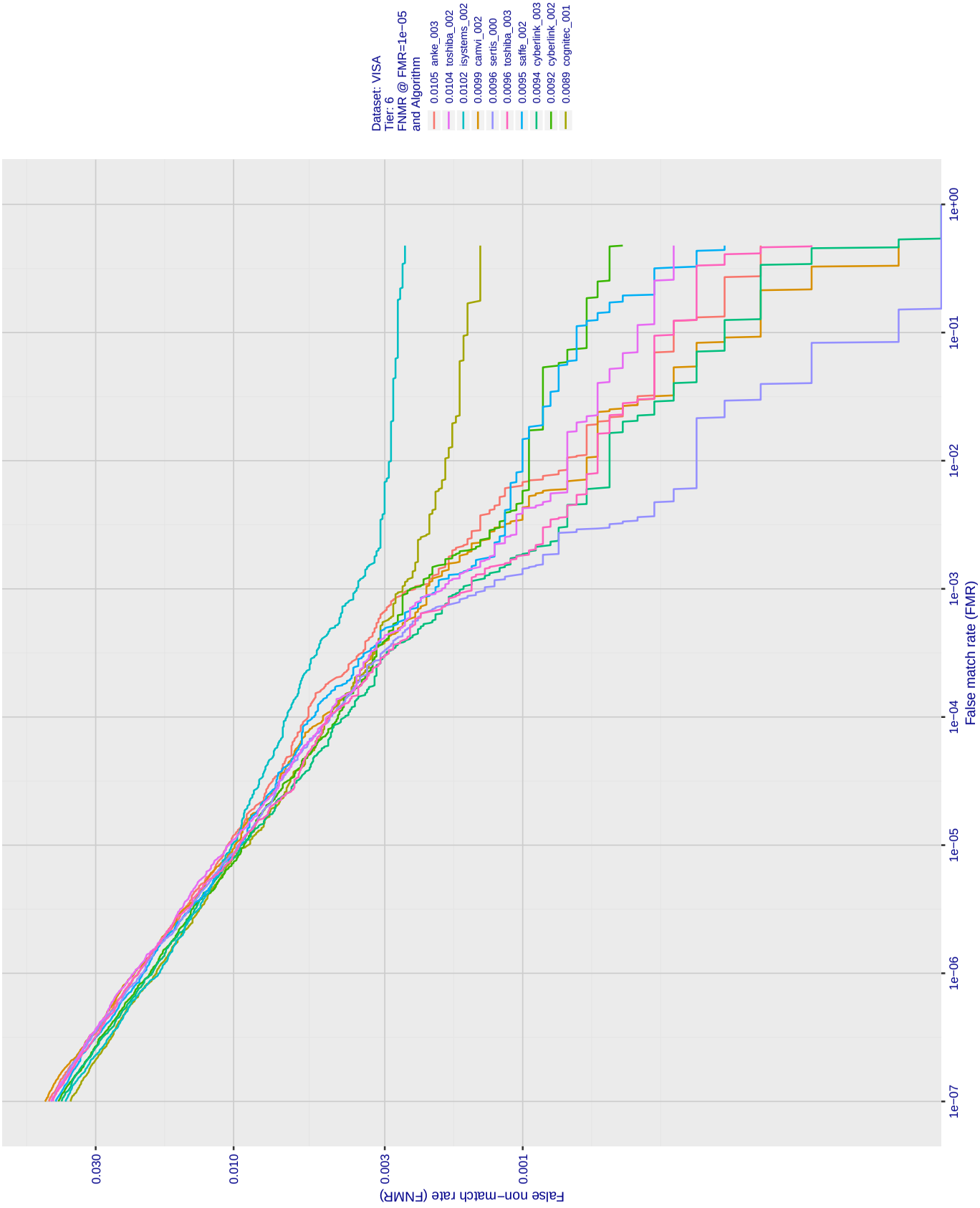


Figure 16: For the visa images, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

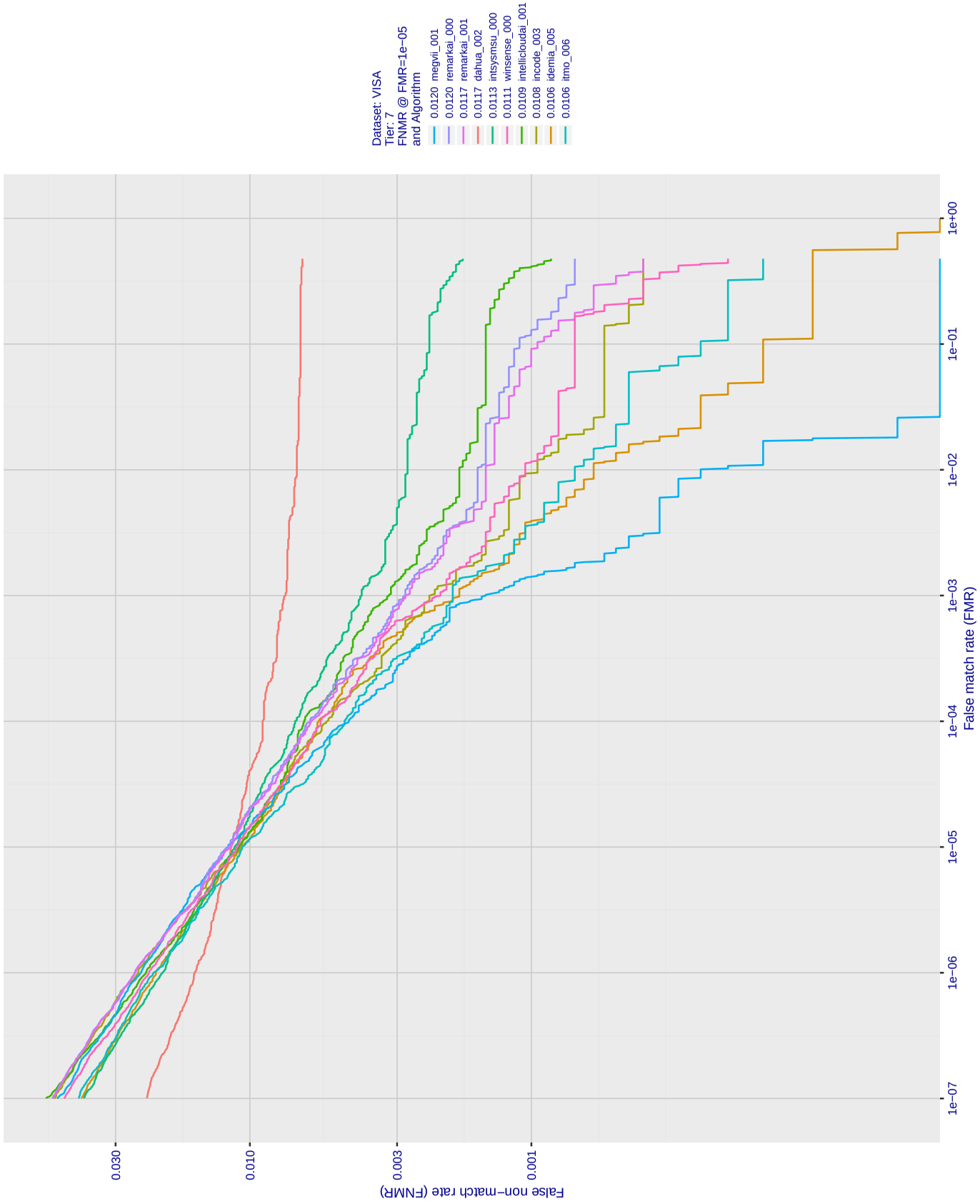


Figure 17: For the visa images, detection error tradeoff (DET) *characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

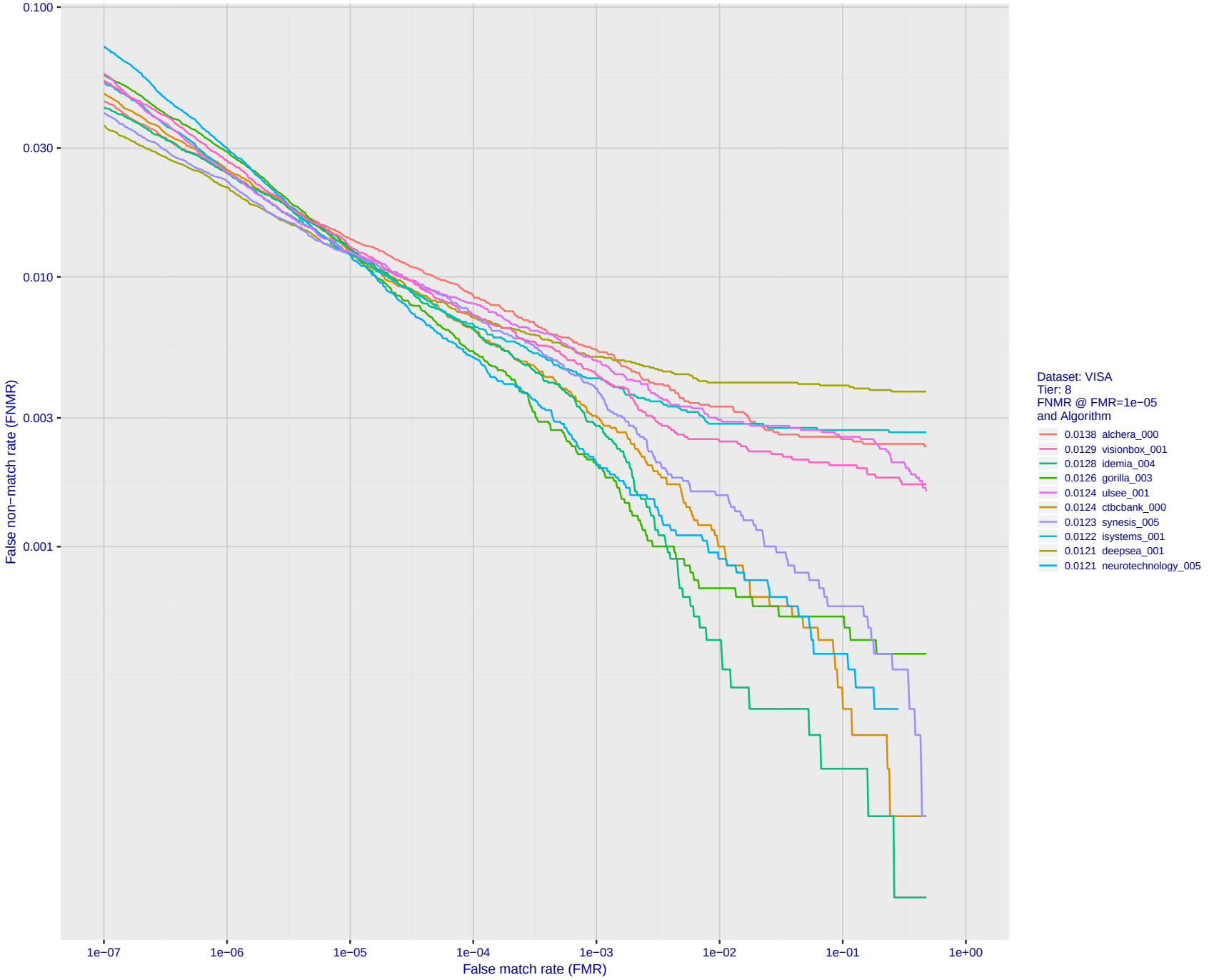


*Figure 18: For the visa images, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR*.*

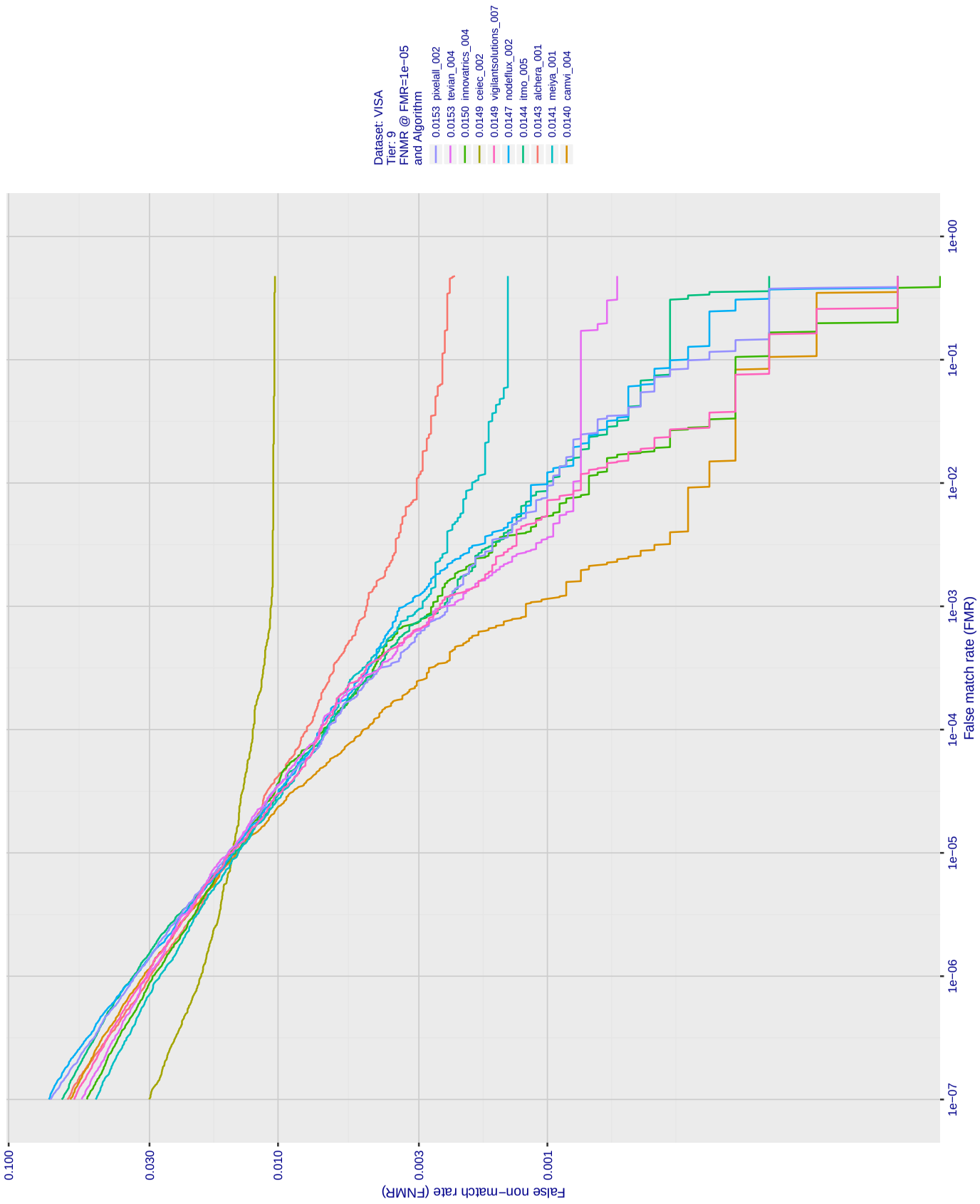


Figure 19: For the visa images, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

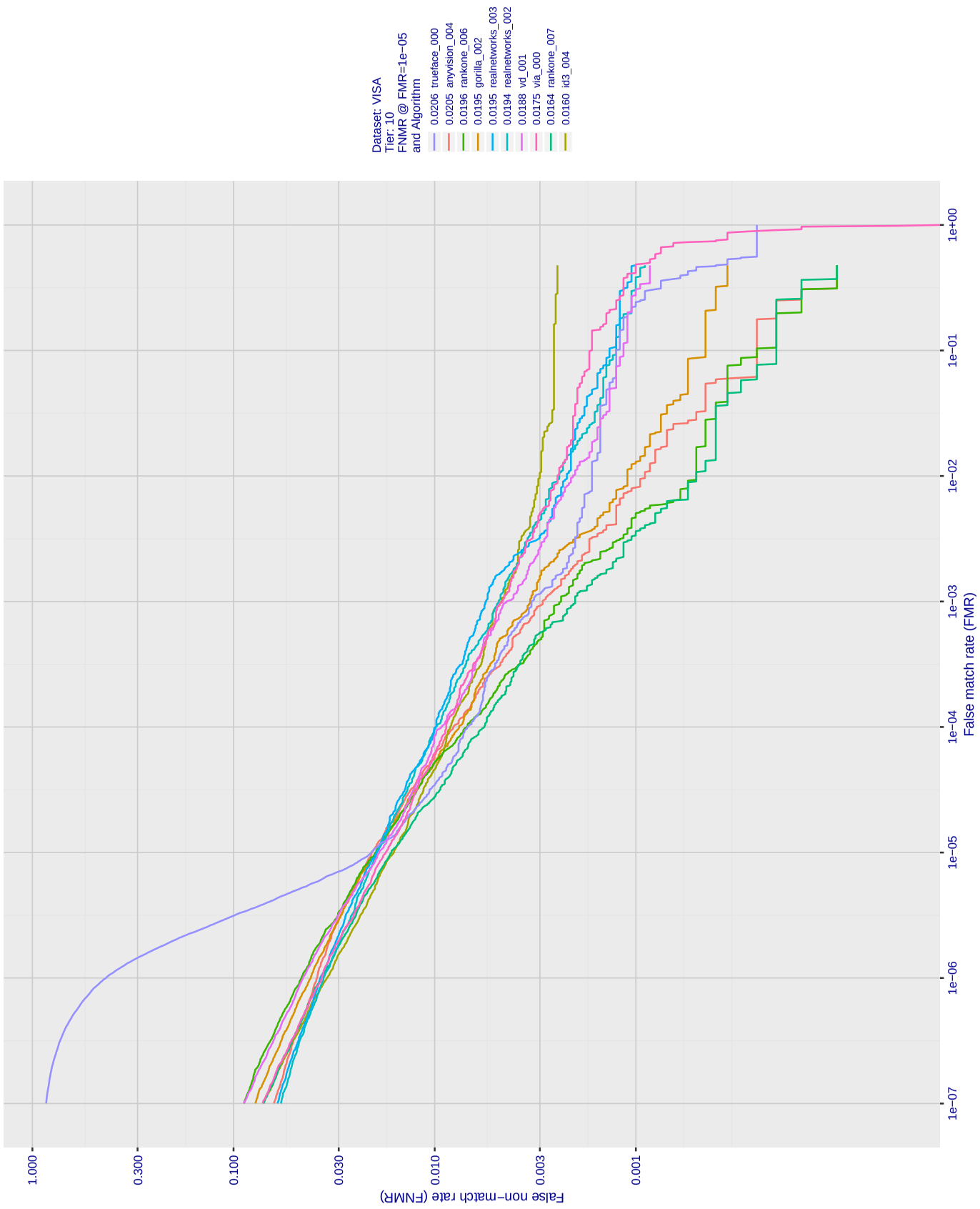


Figure 20: For the visa images, detection error tradeoff (DET) *characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

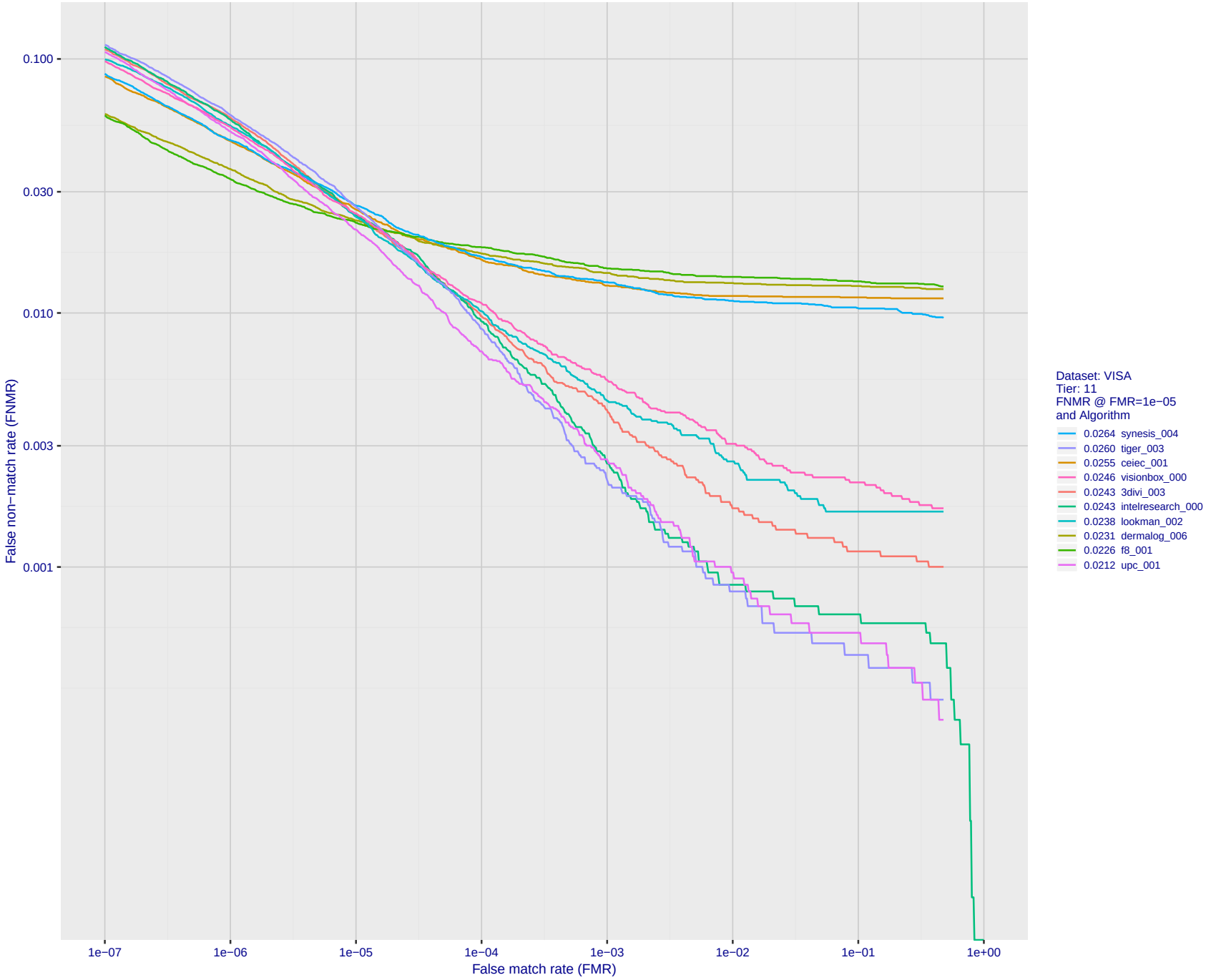


Figure 21: For the visa images, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of FMR.

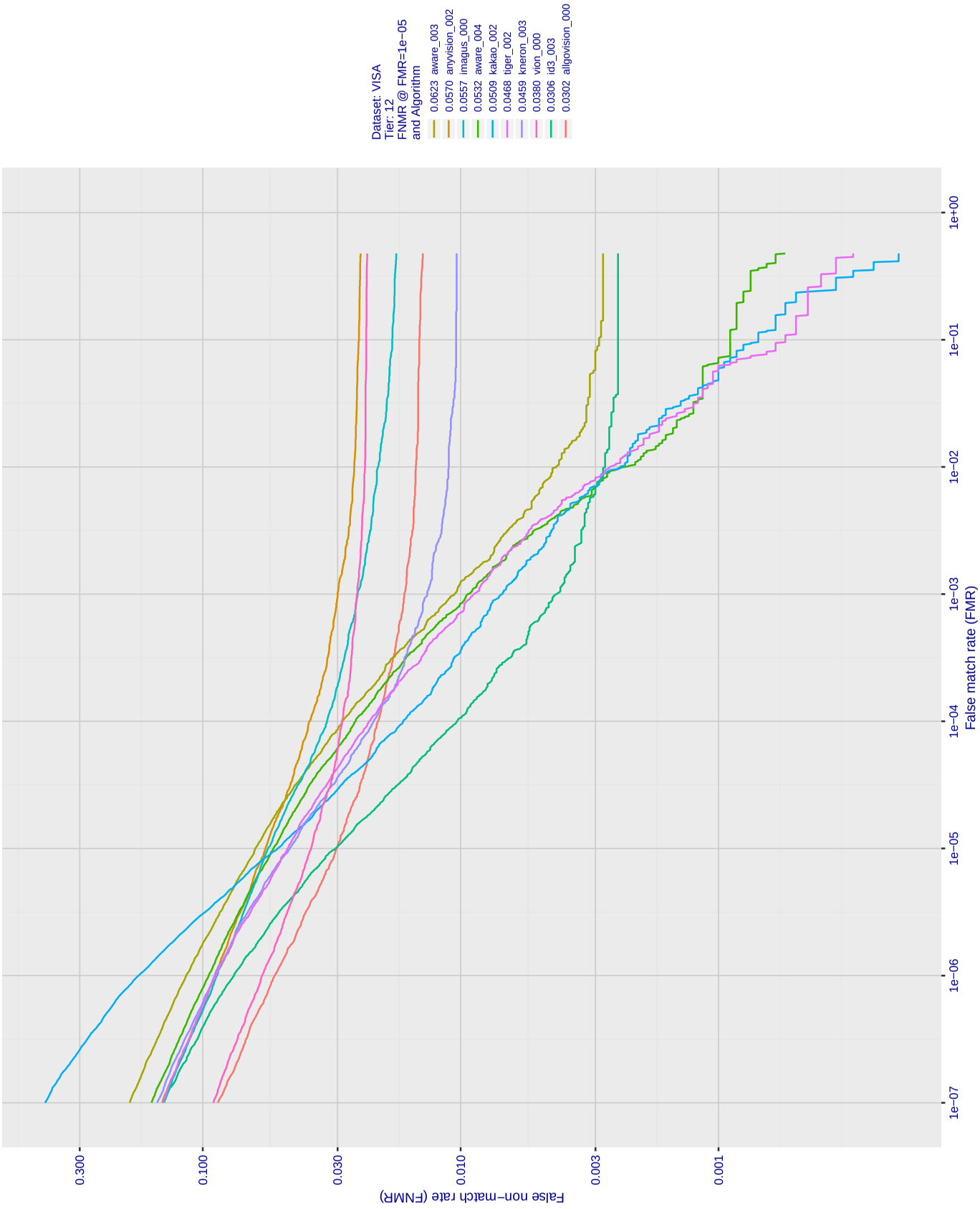


Figure 22: For the visa images, detection error tradeoff (DET) *characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

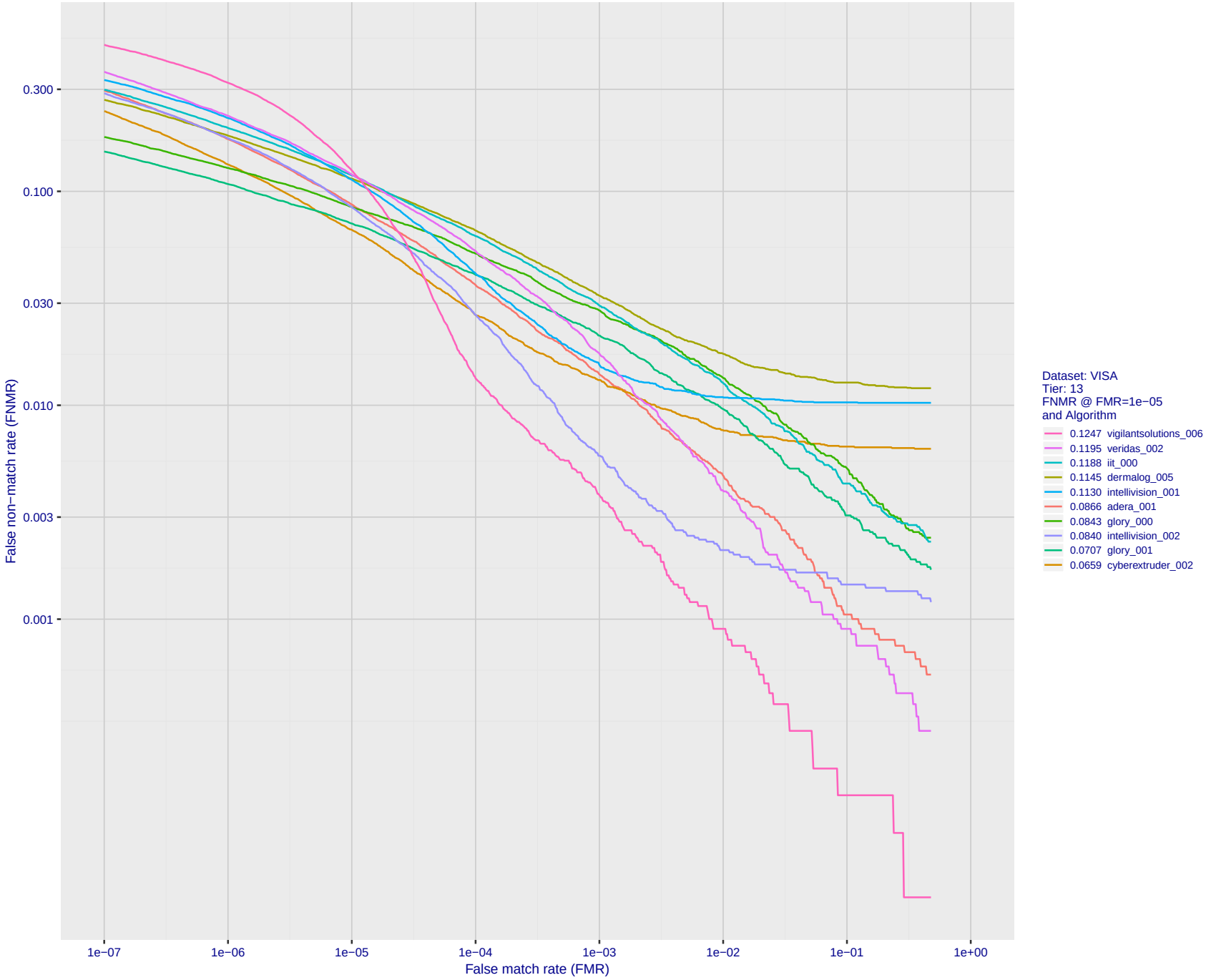


*Figure 23: For the visa images, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR*.*

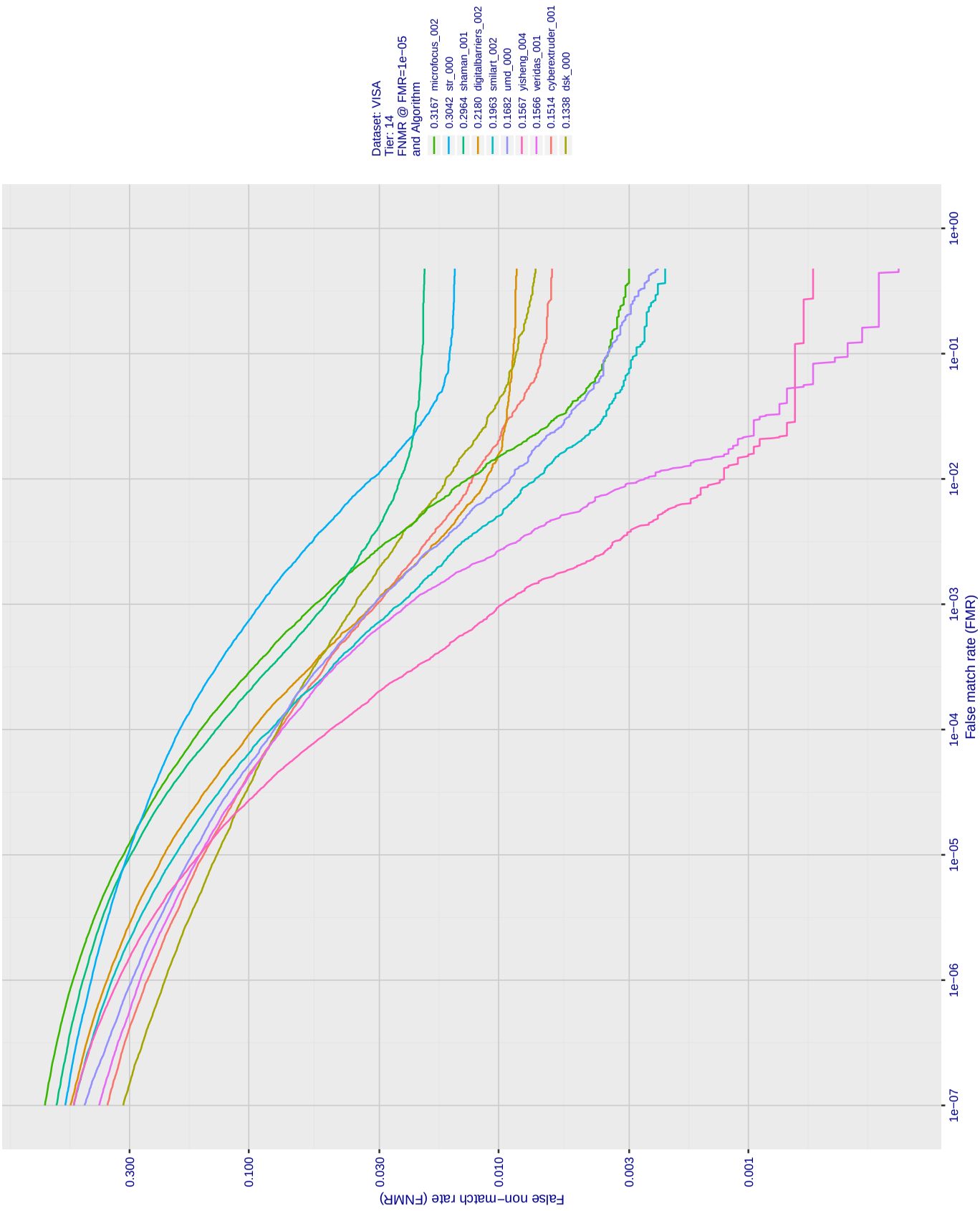


Figure 24: For the visa images, detection error tradeoff (DET) *characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

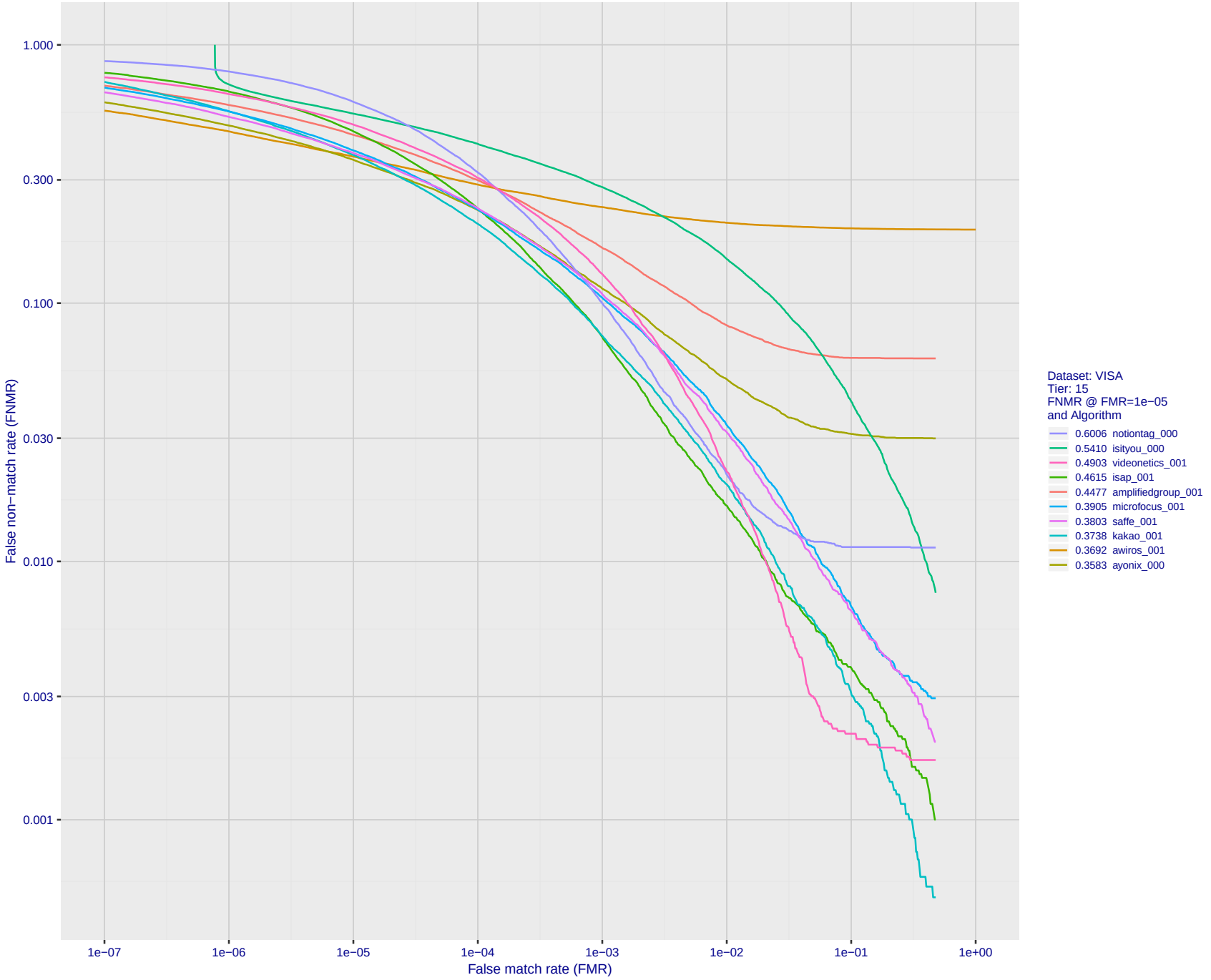


*Figure 25: For the visa images, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR*.*

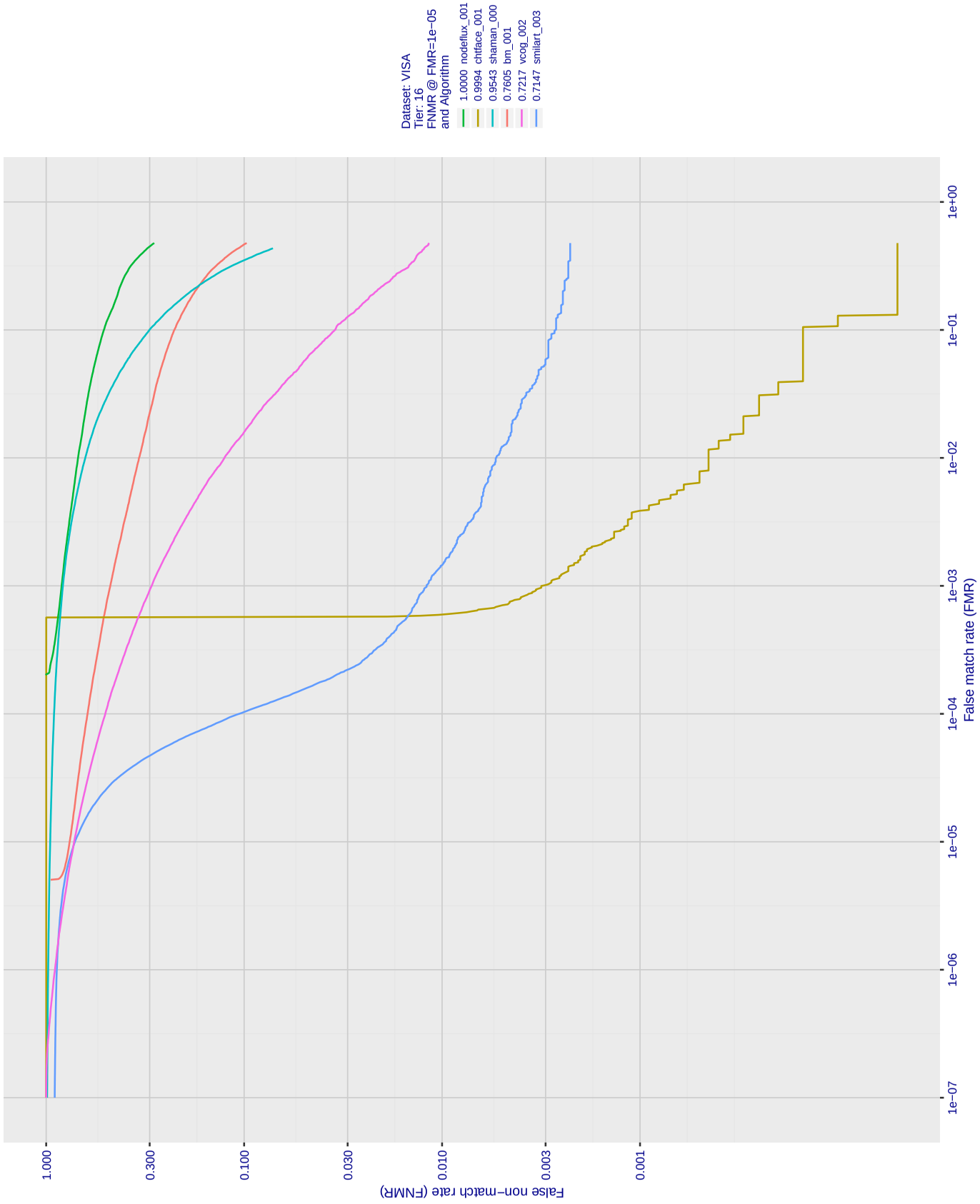


Figure 26: For the visa images, detection error tradeoff (DET) *characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

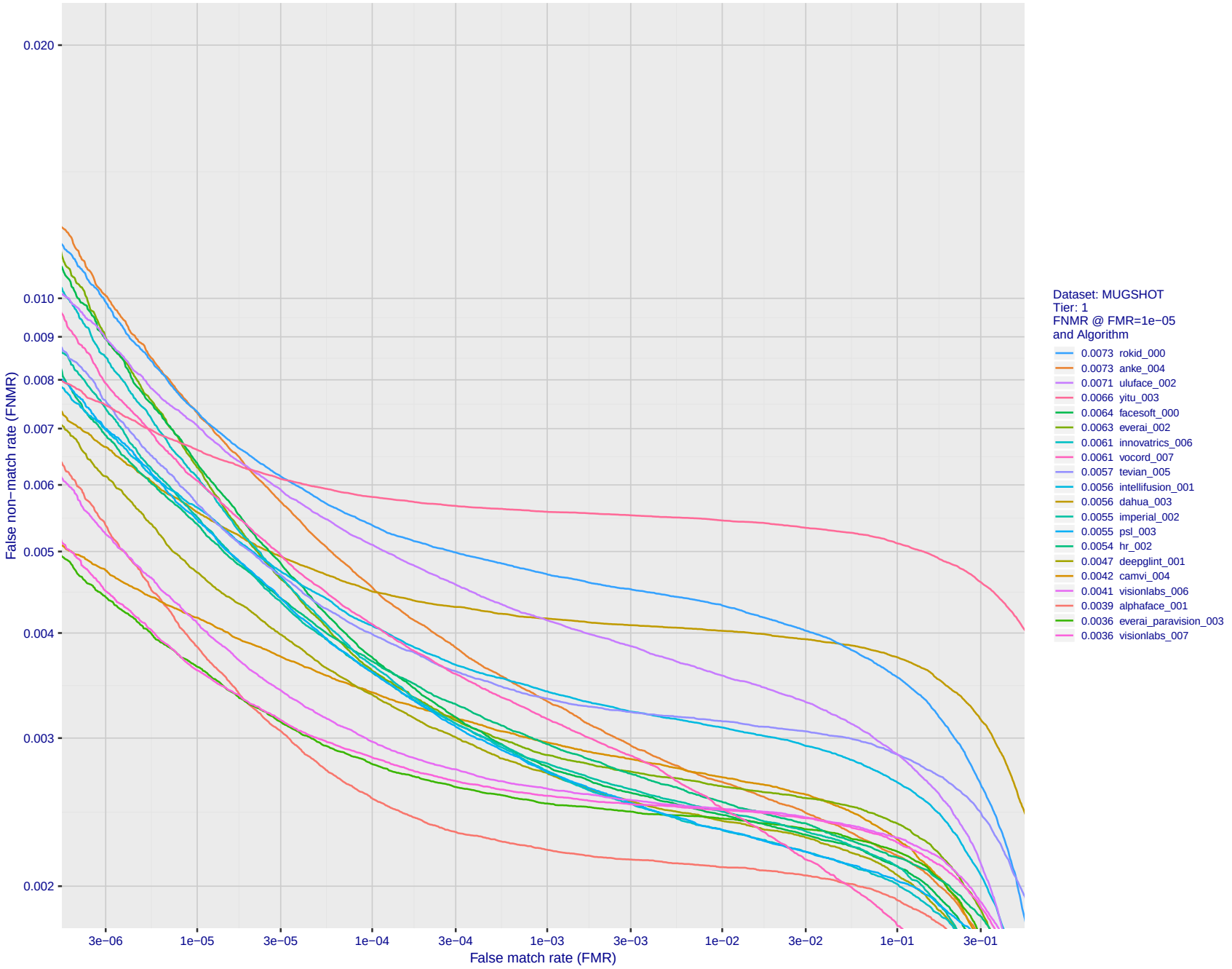


*Figure 27: For the mugshot images, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show decades of* FMR*.*

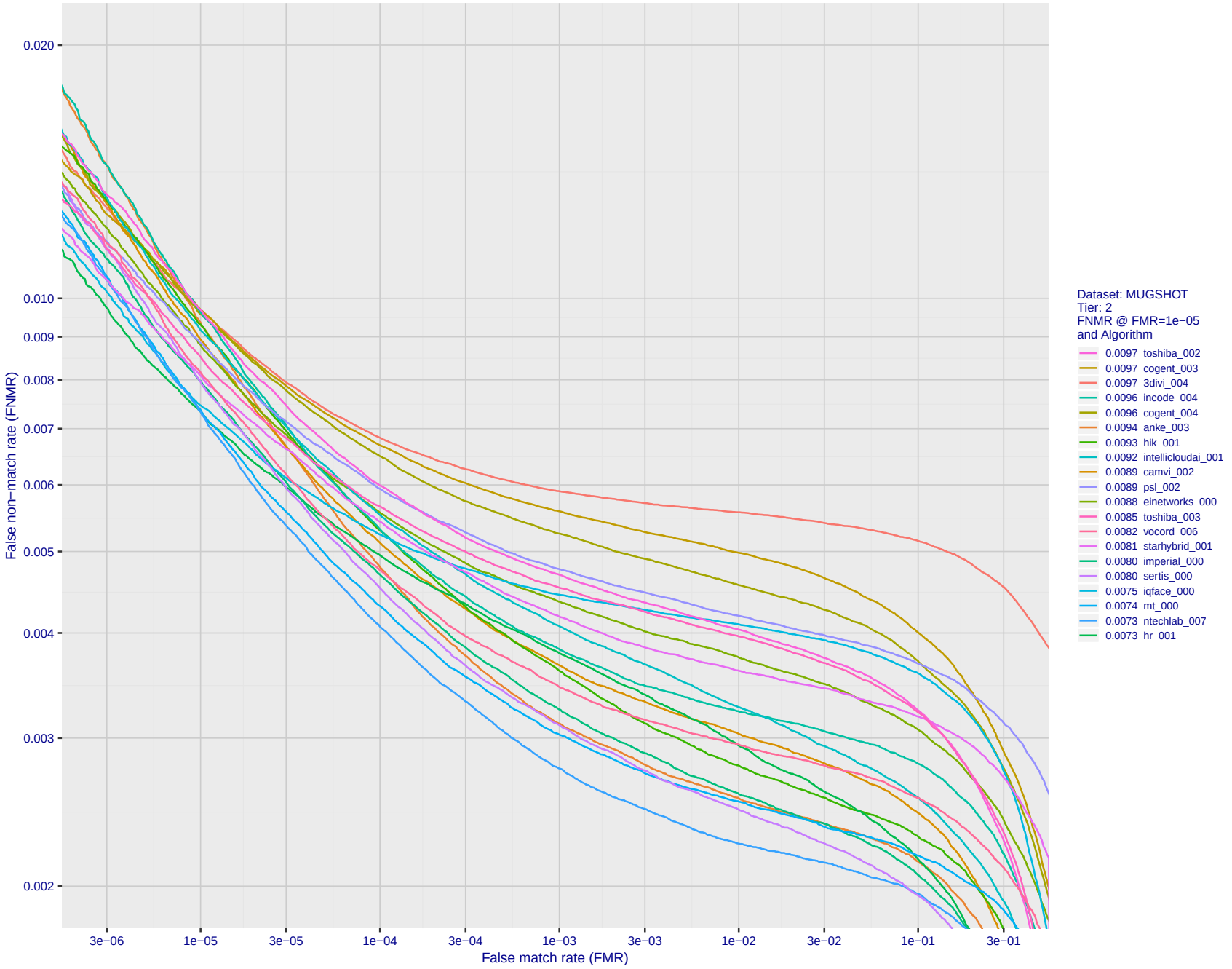


*Figure 28: For the mugshot images, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show decades of* FMR*.*

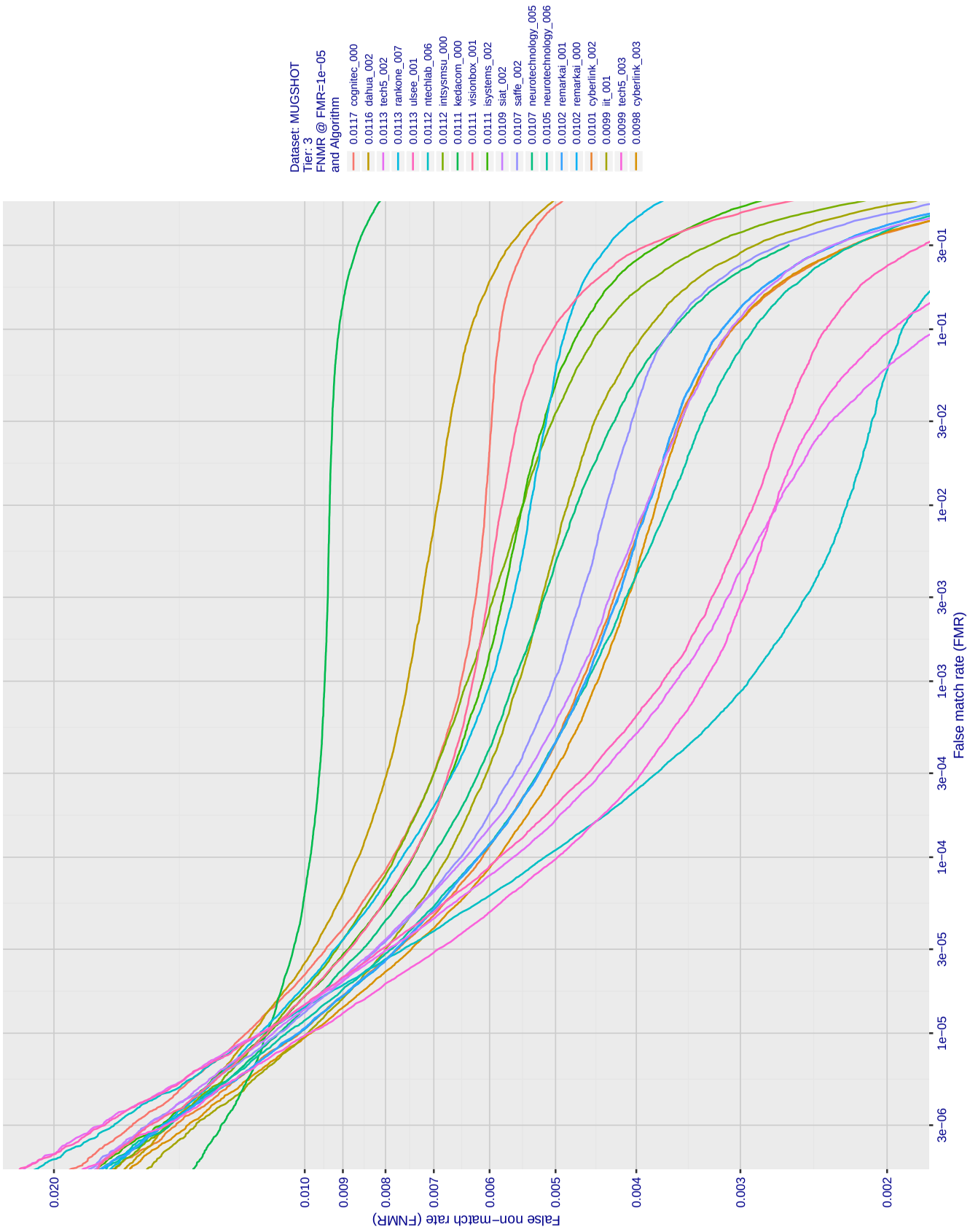


Figure 29: For the mugshot images, detection error tradeoff (DET) *characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show decades of* FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

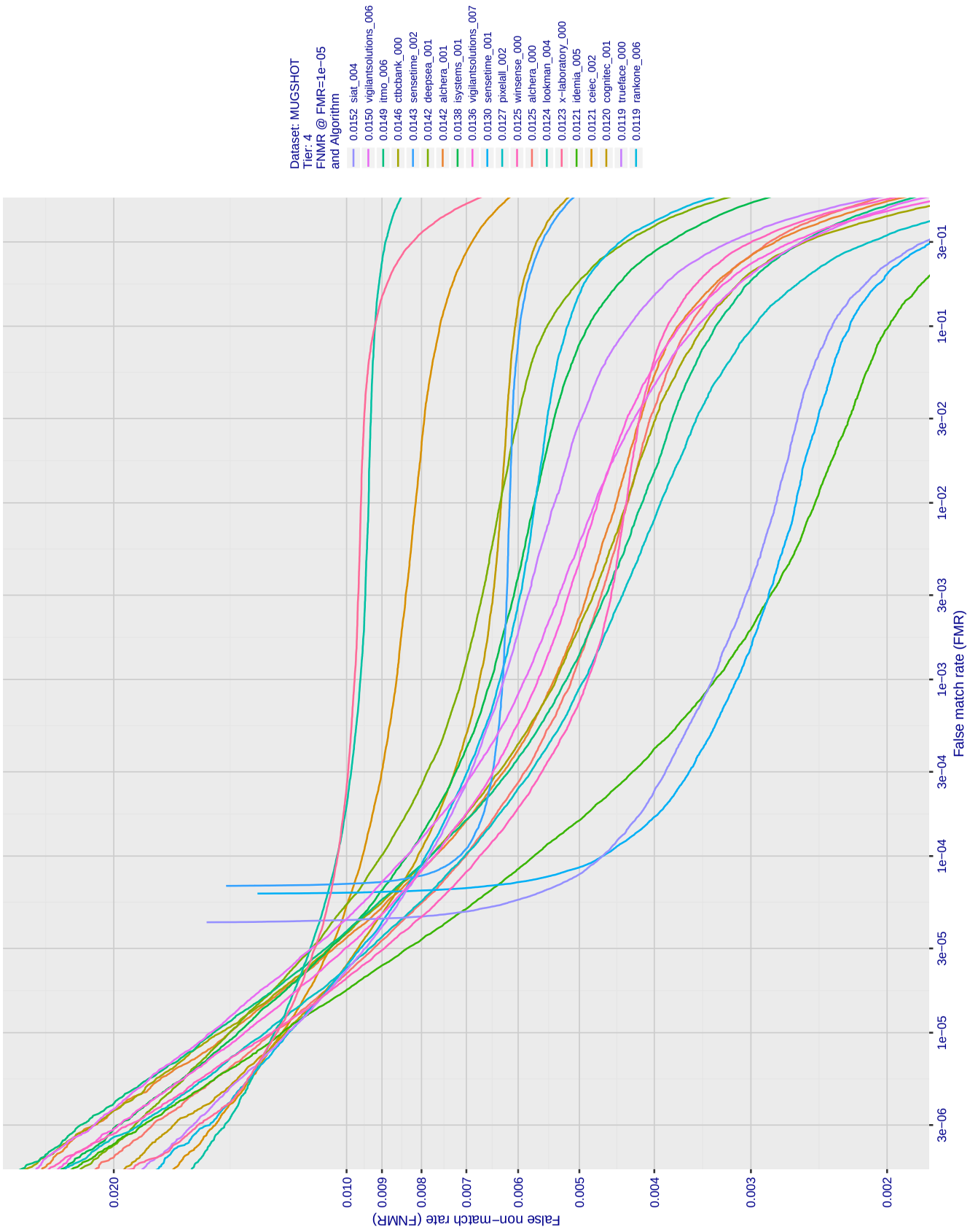


Figure 30: For the mugshot images, detection error tradeoff (DET) *characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show decades of* FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

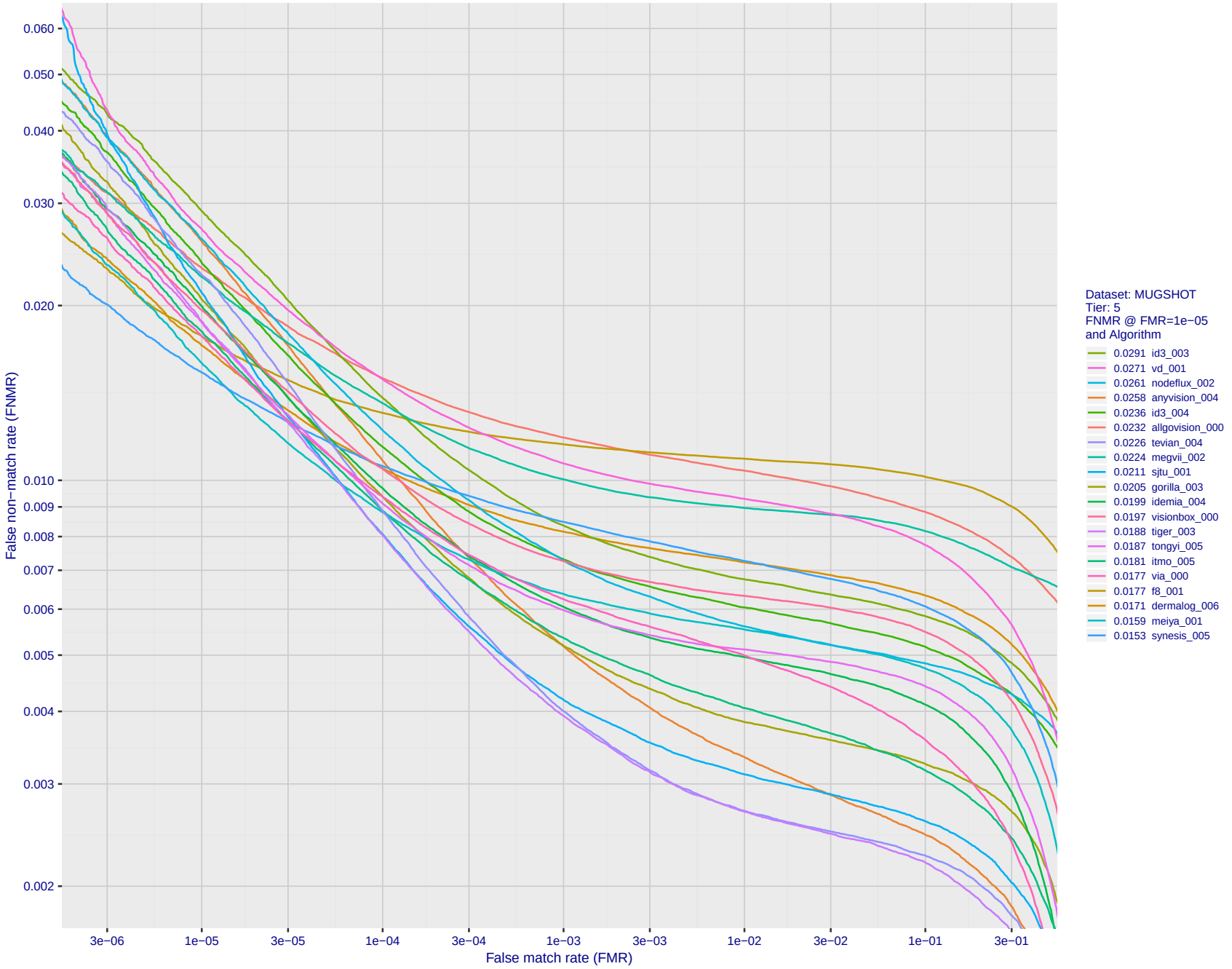


*Figure 31: For the mugshot images, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show decades of* FMR*.*

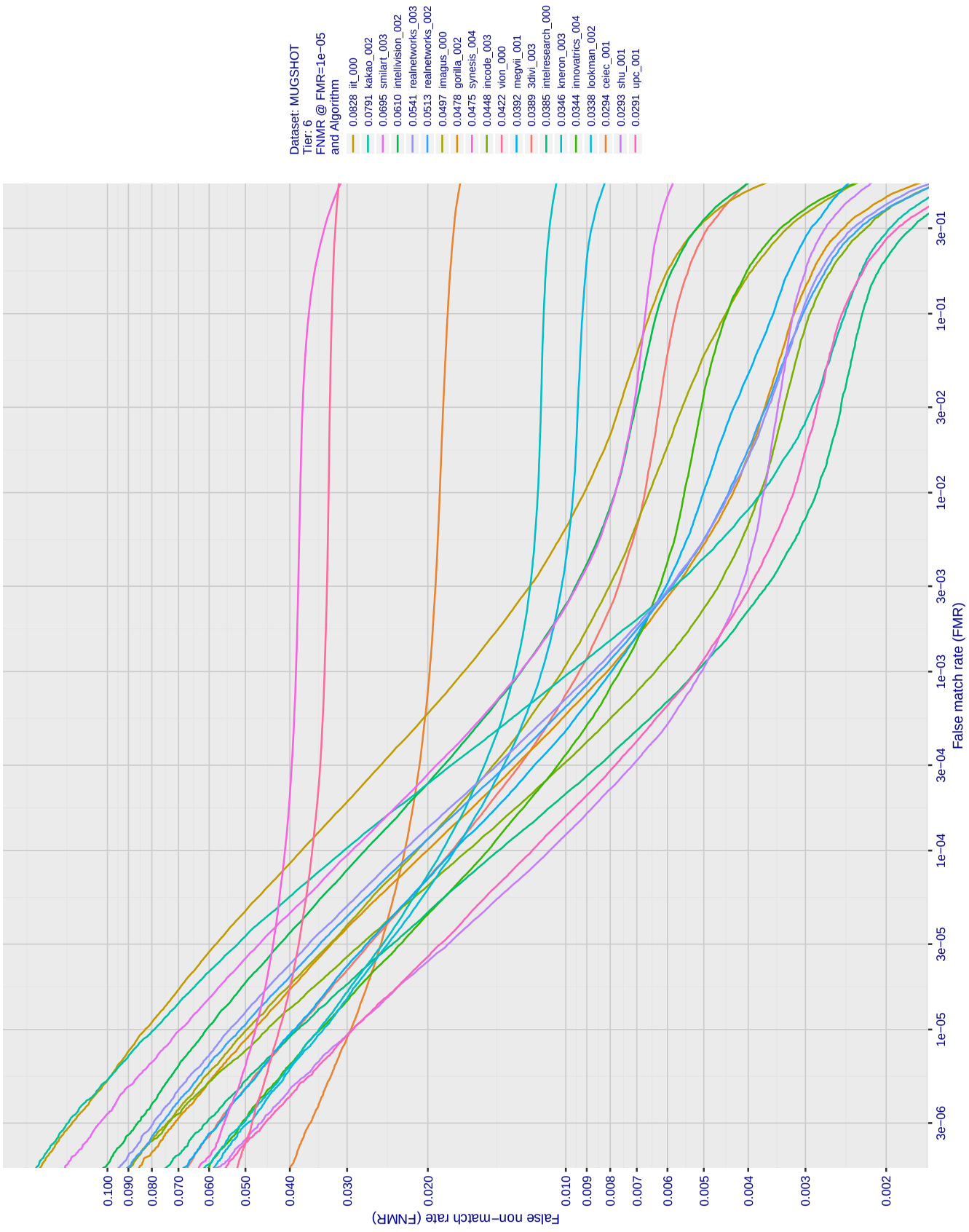


Figure 32: For the mugshot images, detection error tradeoff (DET) *characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show decades of* FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

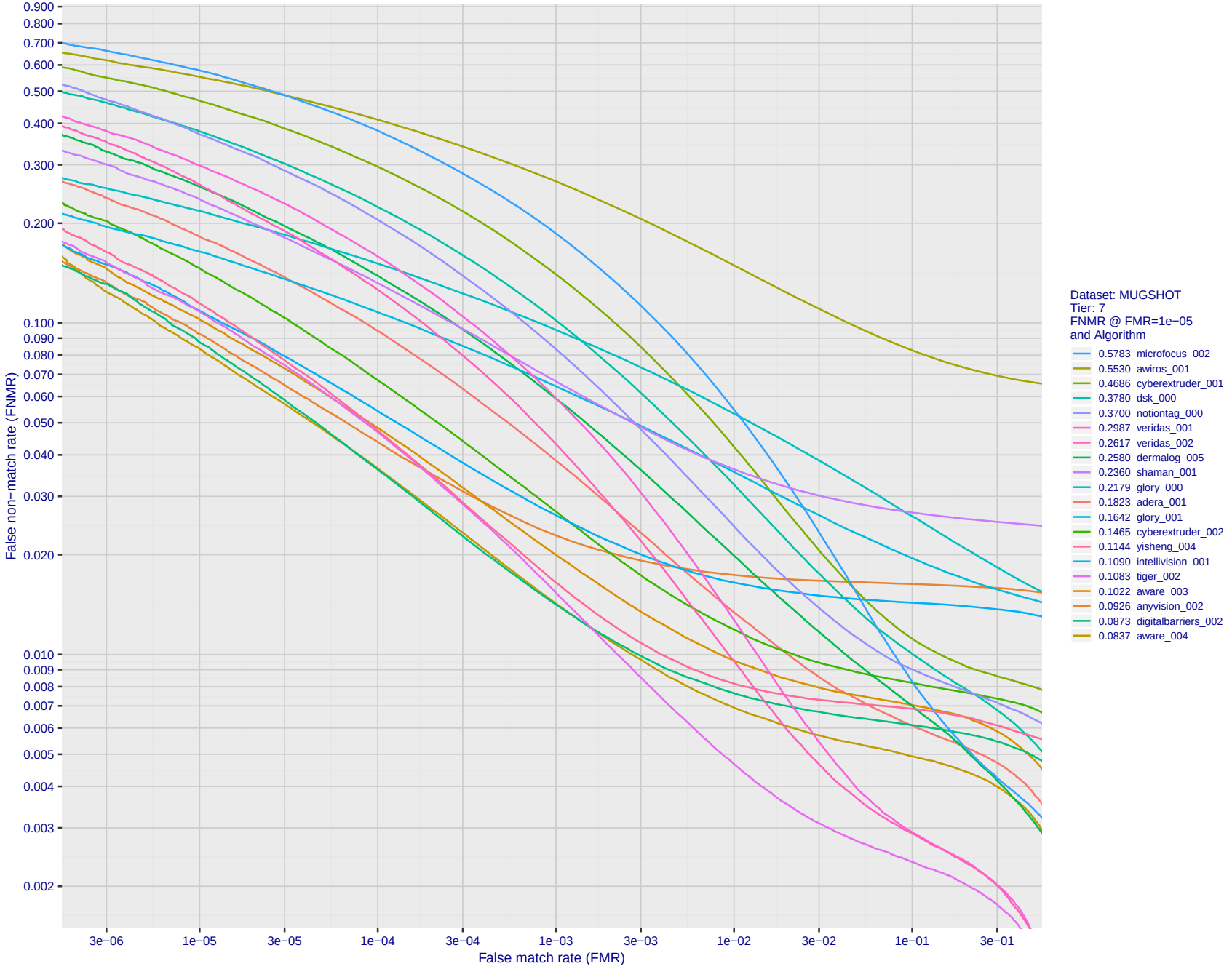


Figure 33: For the mugshot images, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show decades of FMR.

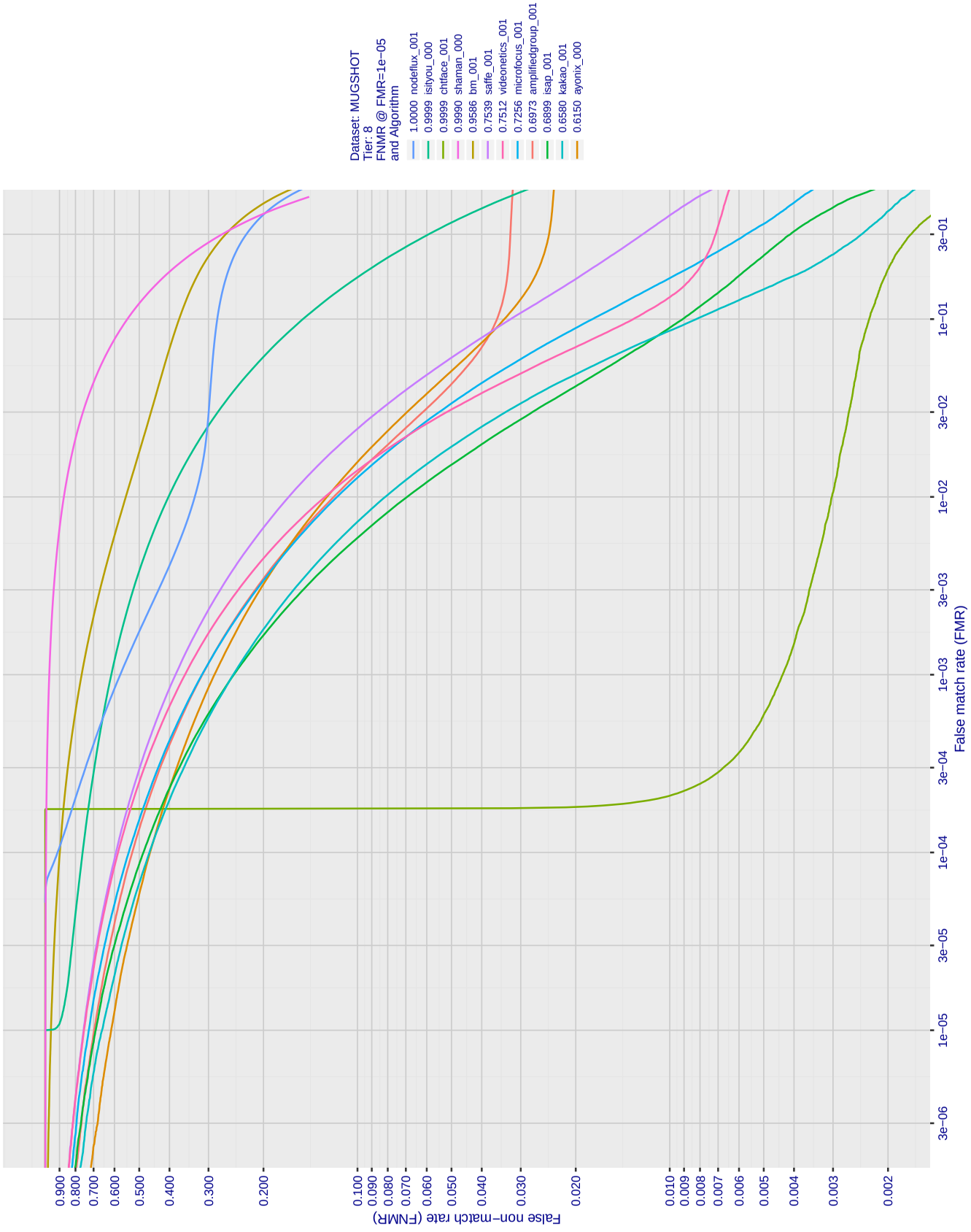


Figure 34: For the mugshot images, detection error tradeoff (DET) *characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show decades of* FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

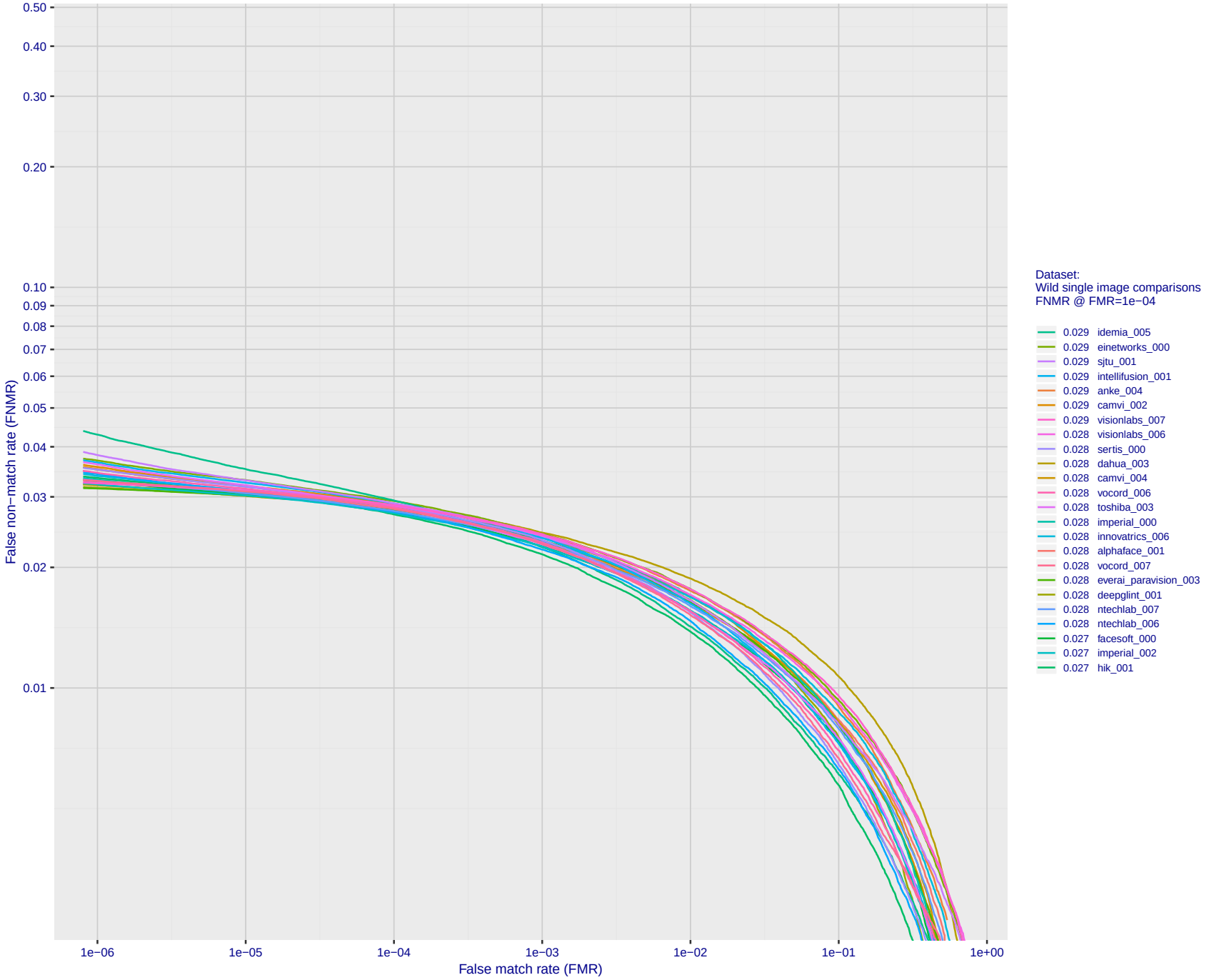


*Figure 35: For the 2018 wild image comparisons, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show several decades of* FMR*.*

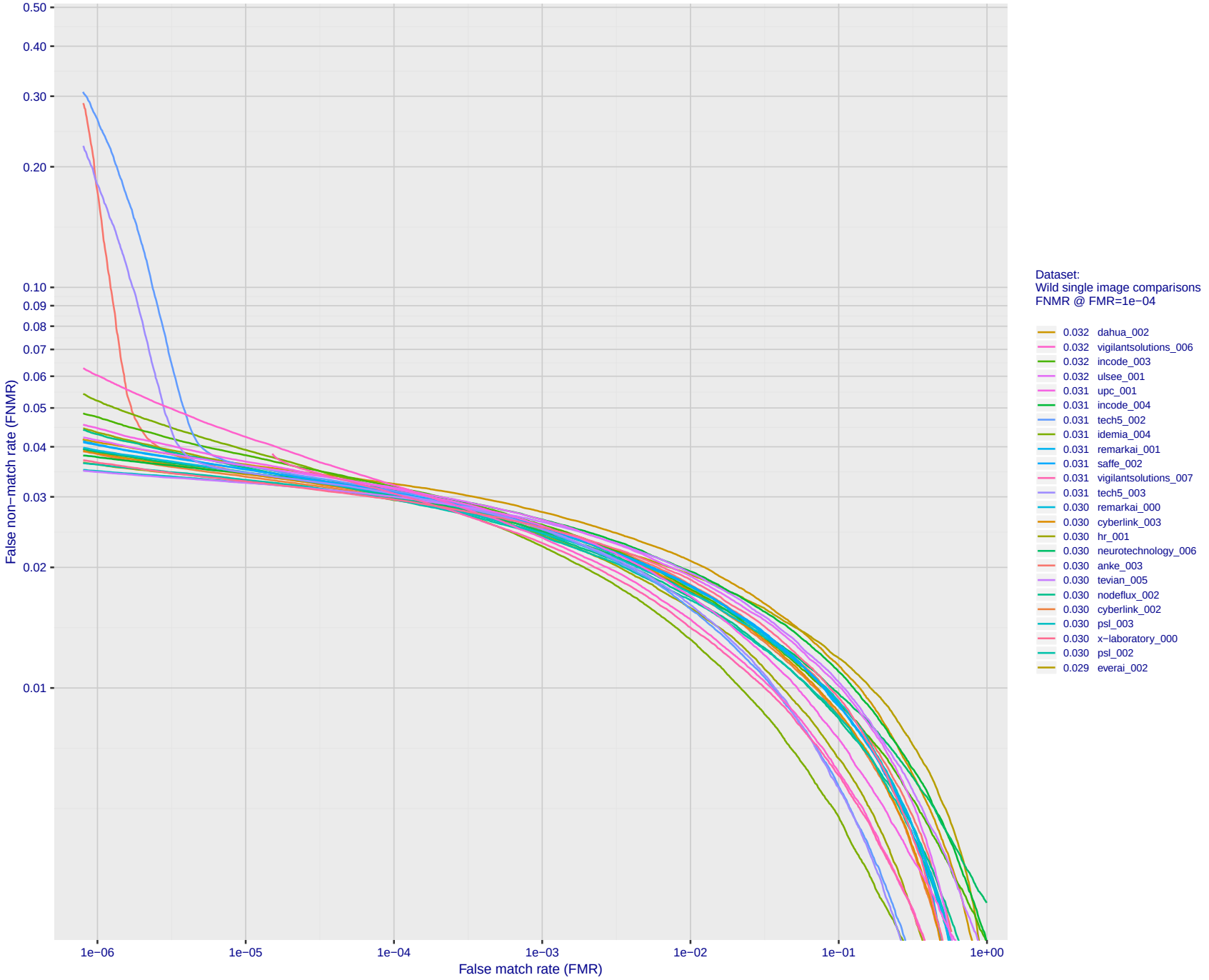


*Figure 36: For the 2018 wild image comparisons, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show several decades of* FMR*.*

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

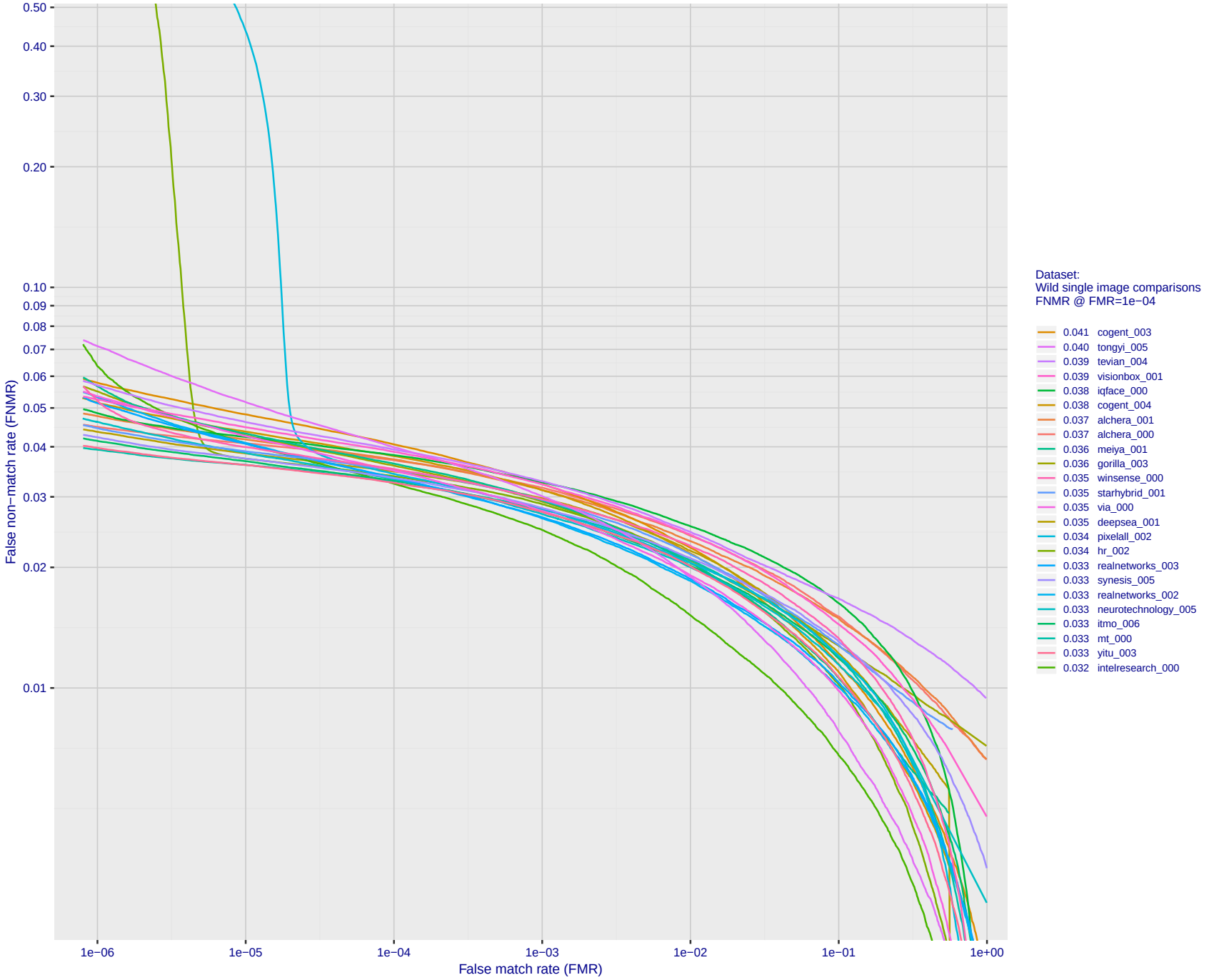


*Figure 37: For the 2018 wild image comparisons, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show several decades of* FMR*.*

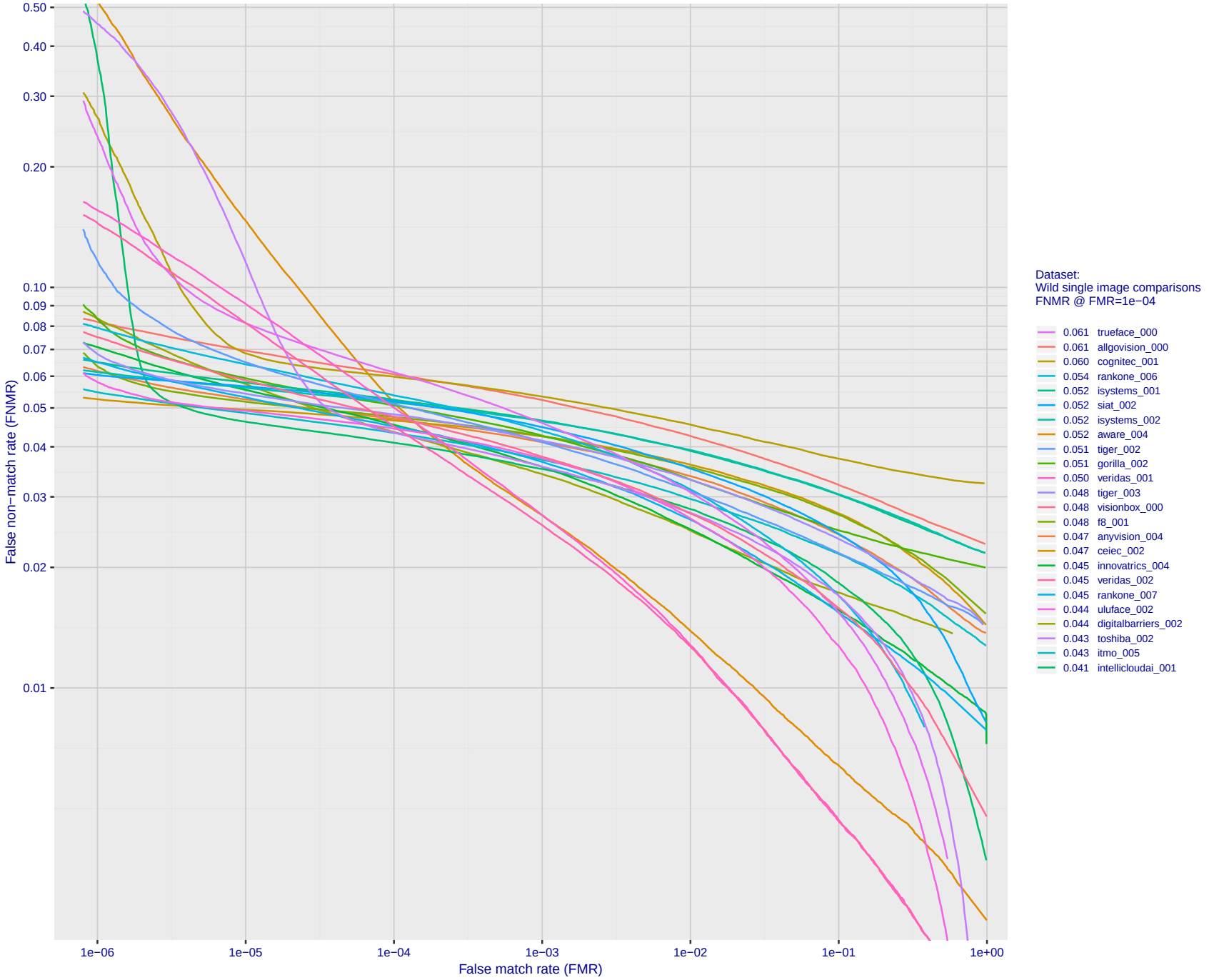


*Figure 38: For the 2018 wild image comparisons, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show several decades of* FMR*.*

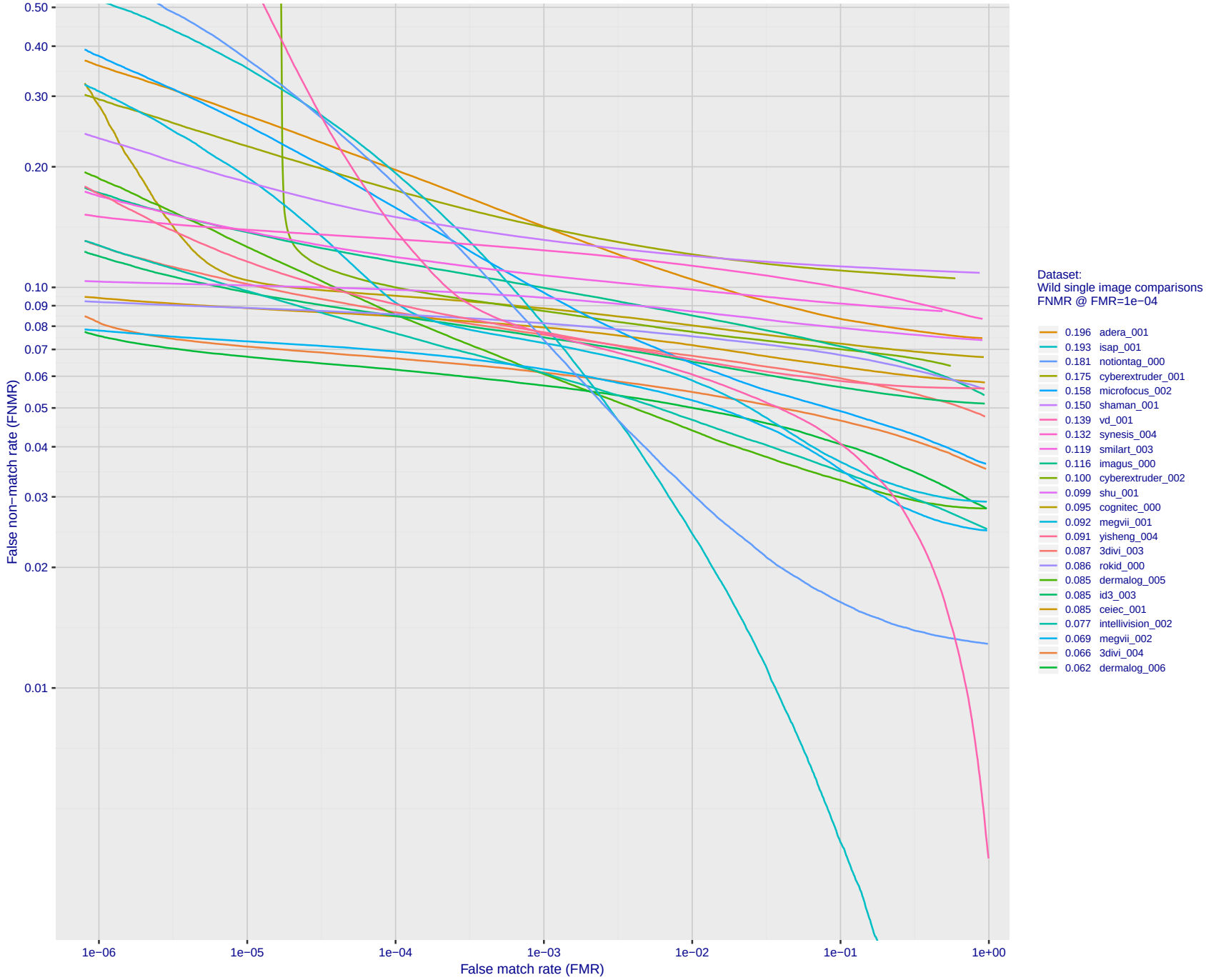


Figure 39: For the 2018 wild image comparisons, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show several decades of FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

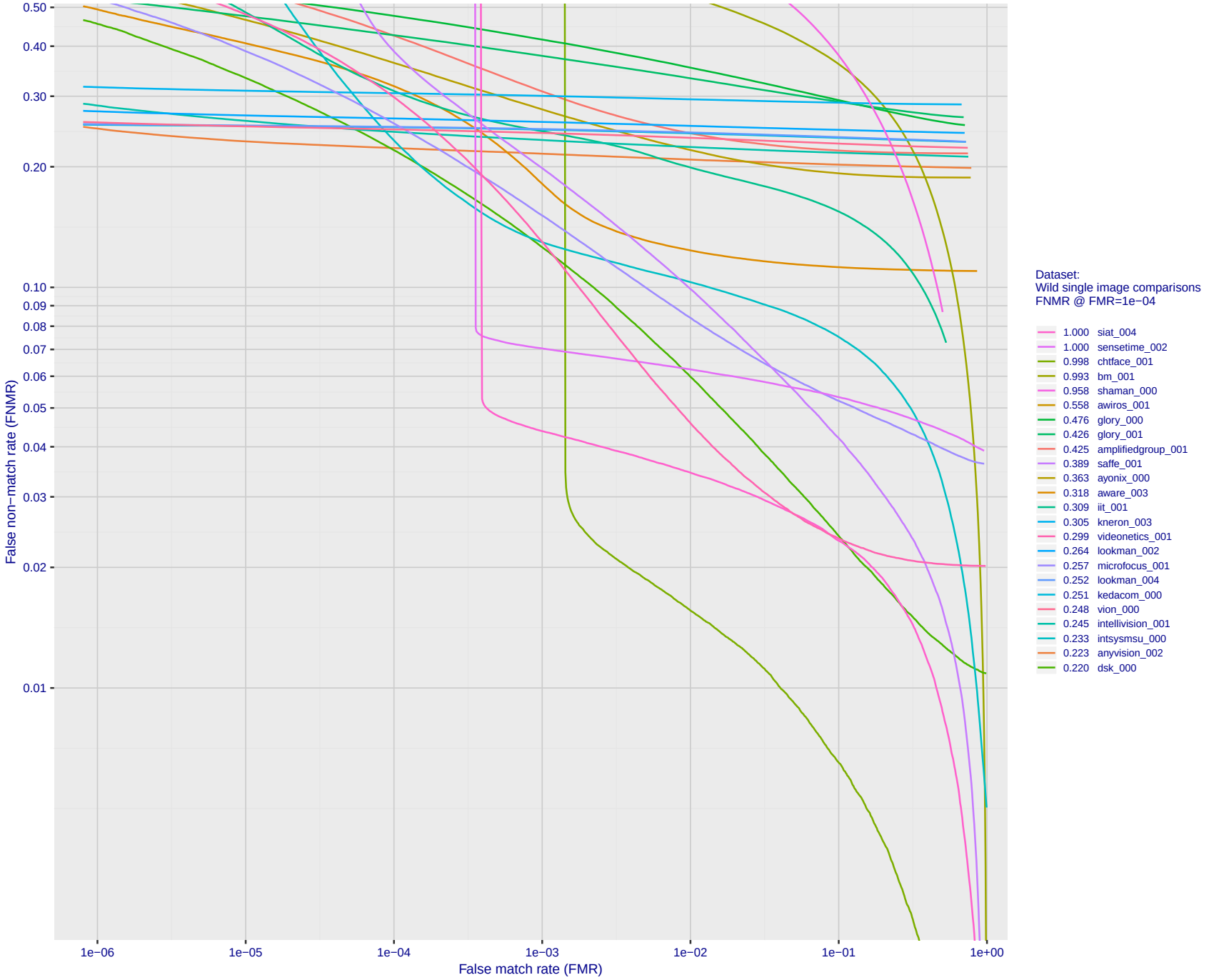


Figure 40: For the 2018 wild image comparisons, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show several decades of FMR.

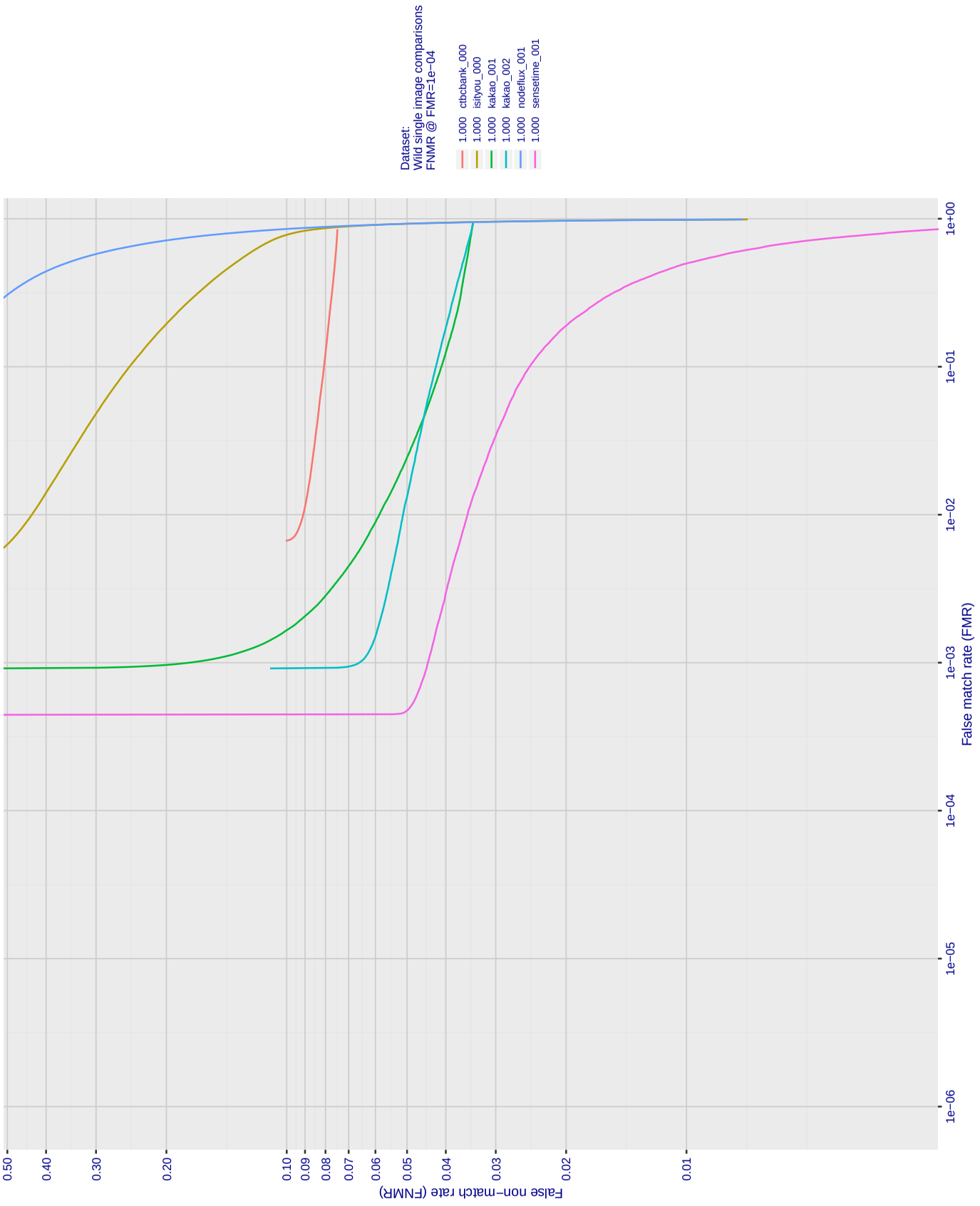


Figure 41: For the 2018 wild image comparisons, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show several decades of FMR.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

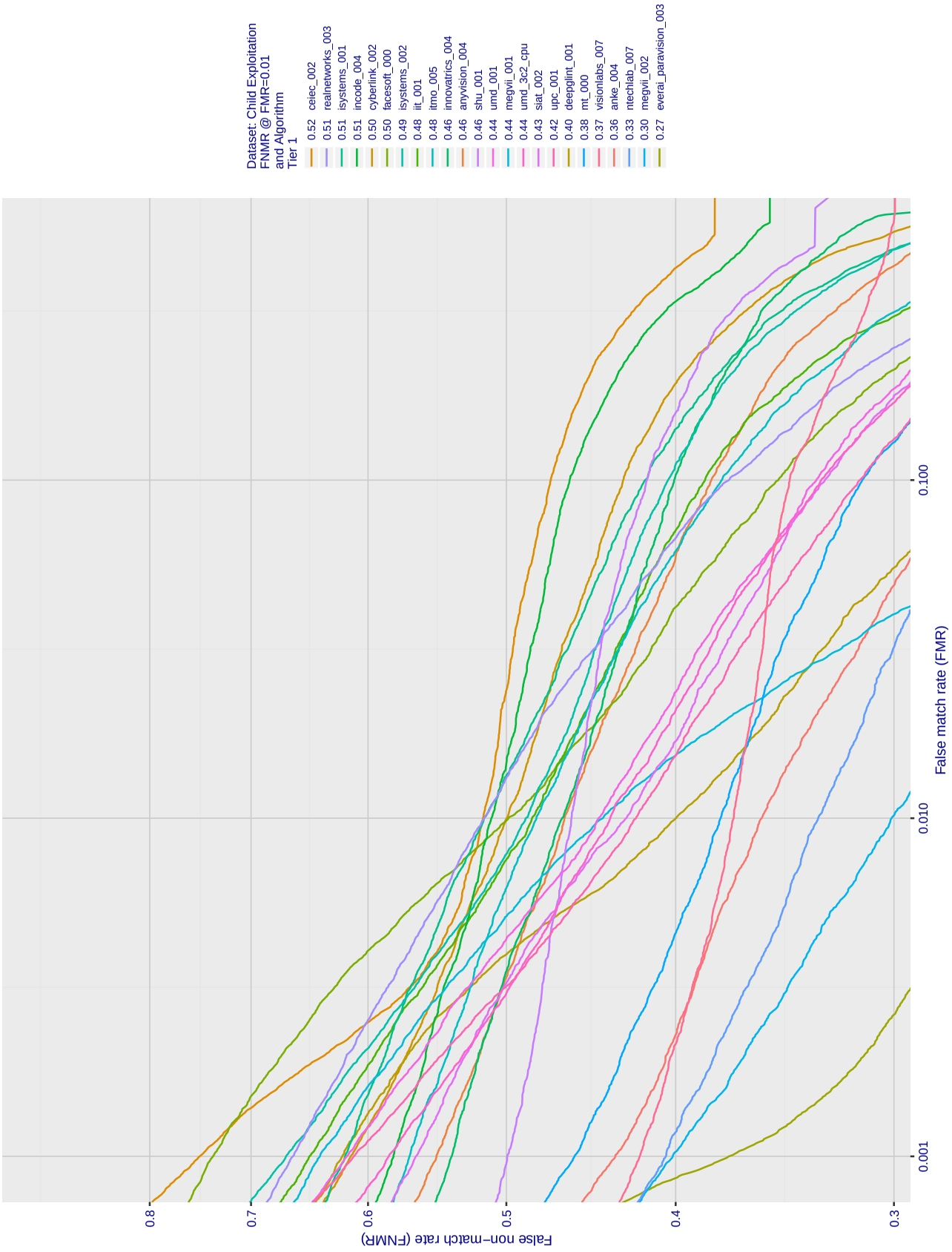


Figure 42: For child exploitation images, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of FMR. Accuracy is poor because many images have adverse quality characteristics, and because detection and enrollment fails.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

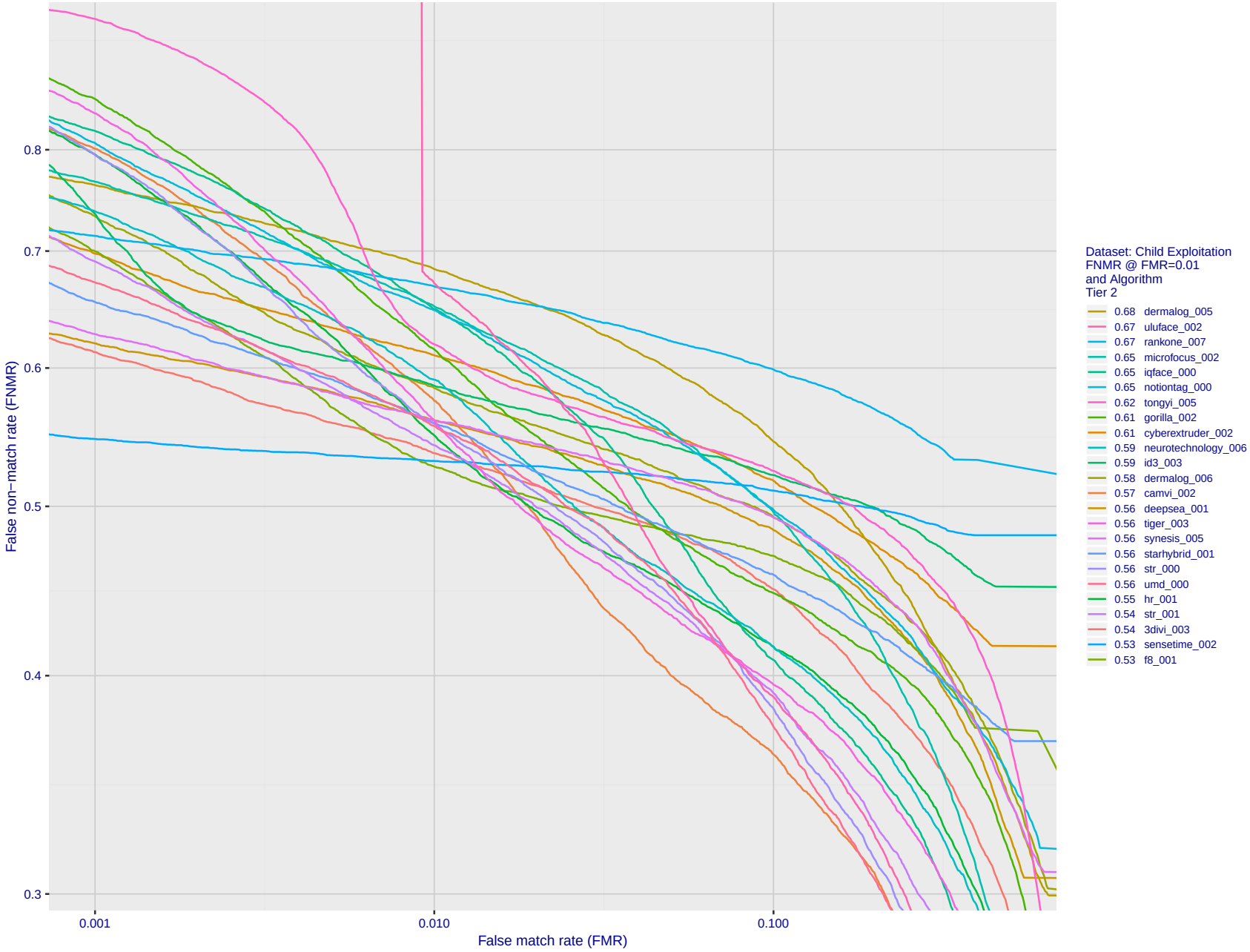


Figure 43: For child exploitation images, detection error tradeoff (DET) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of FMR. Accuracy is poor because many images have adverse quality characteristics, and because detection and enrollment fails.

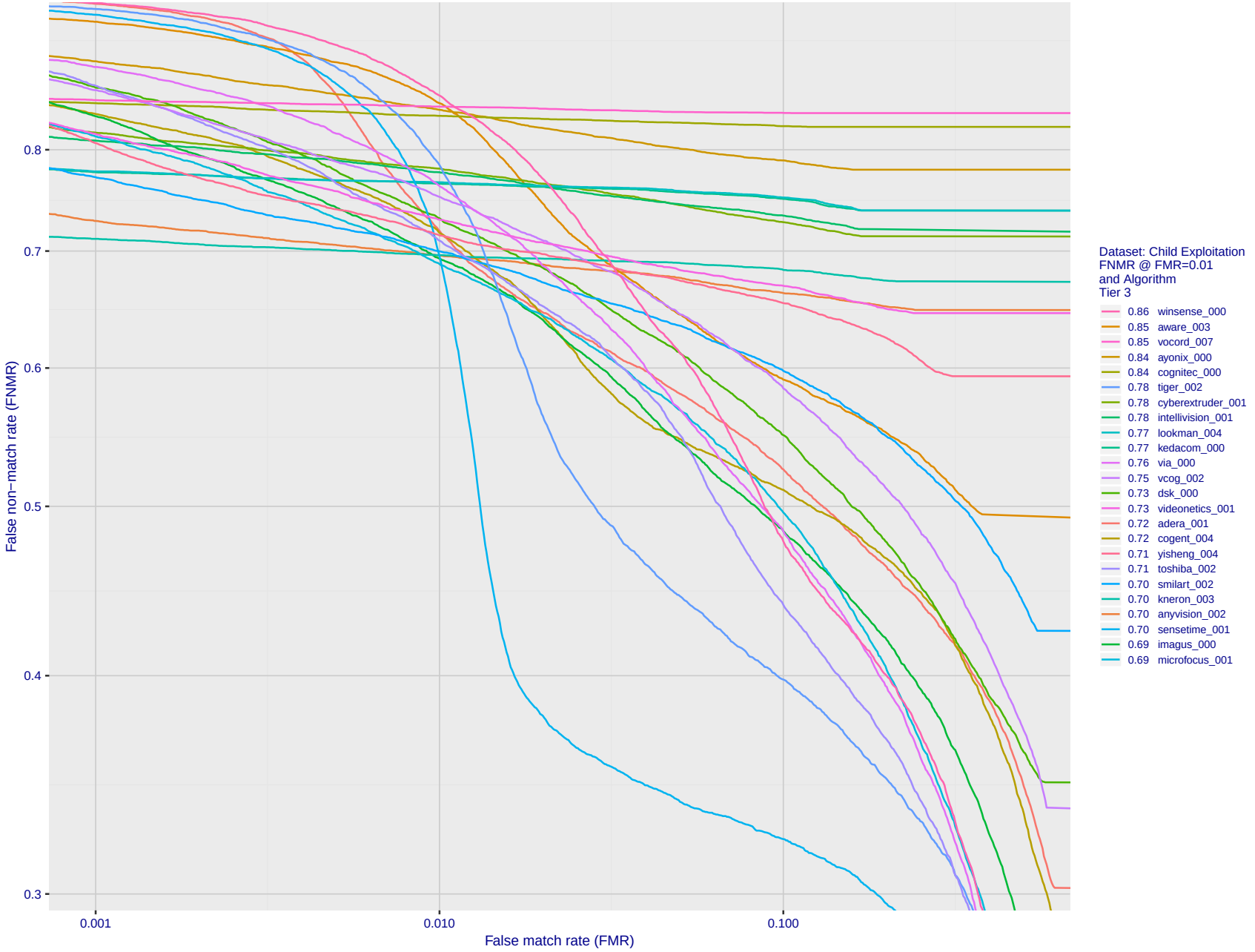


*Figure 44: For child exploitation images, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR*. Accuracy is poor because many images have adverse quality characteristics, and because detection and enrollment fails.*

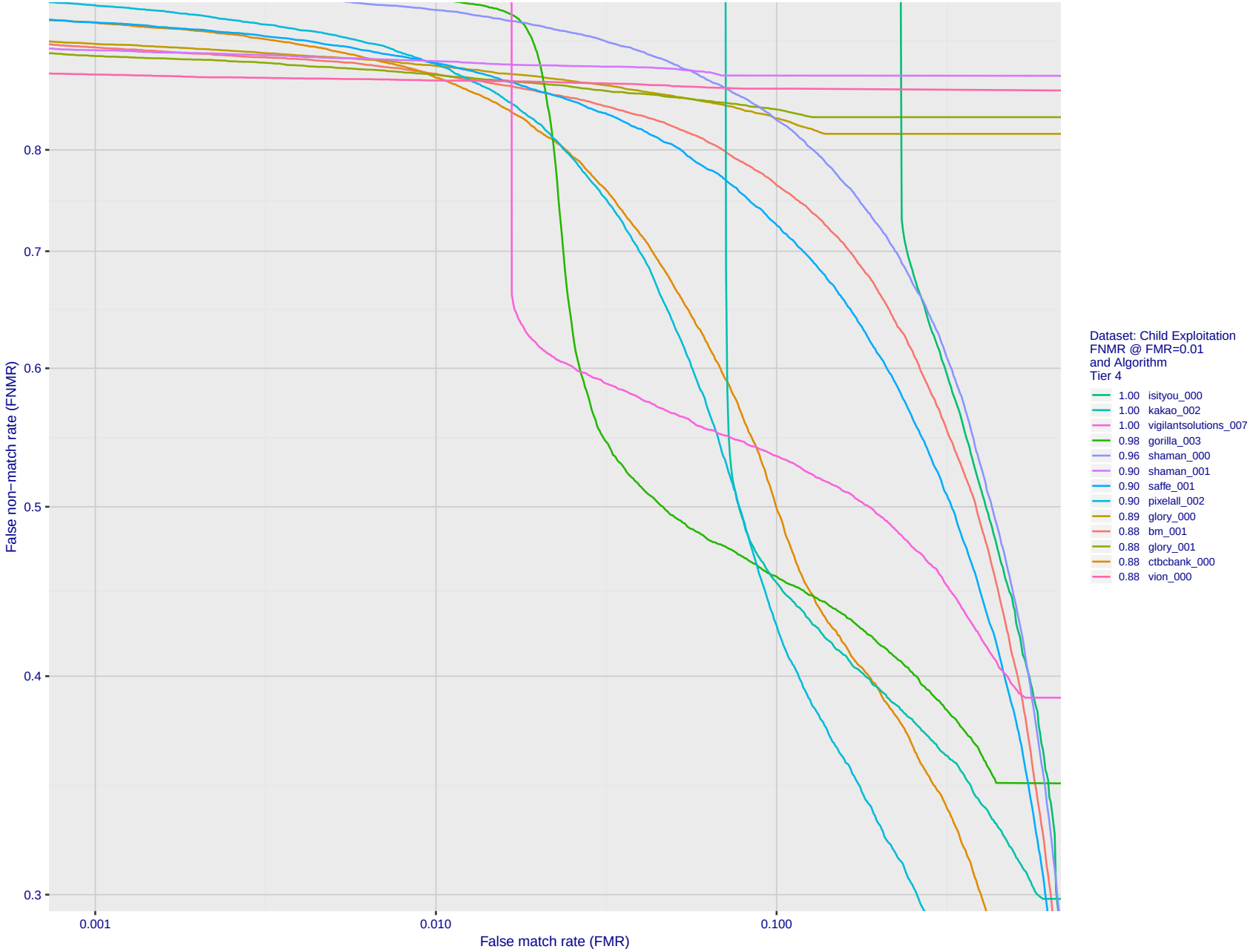


*Figure 45: For child exploitation images, detection error tradeoff (*DET*) characteristics showing false non-match rate vs. false match rate plotted parametrically on threshold, T. The scales are logarithmic in order to show many decades of* FMR*. Accuracy is poor because many images have adverse quality characteristics, and because detection and enrollment fails.*

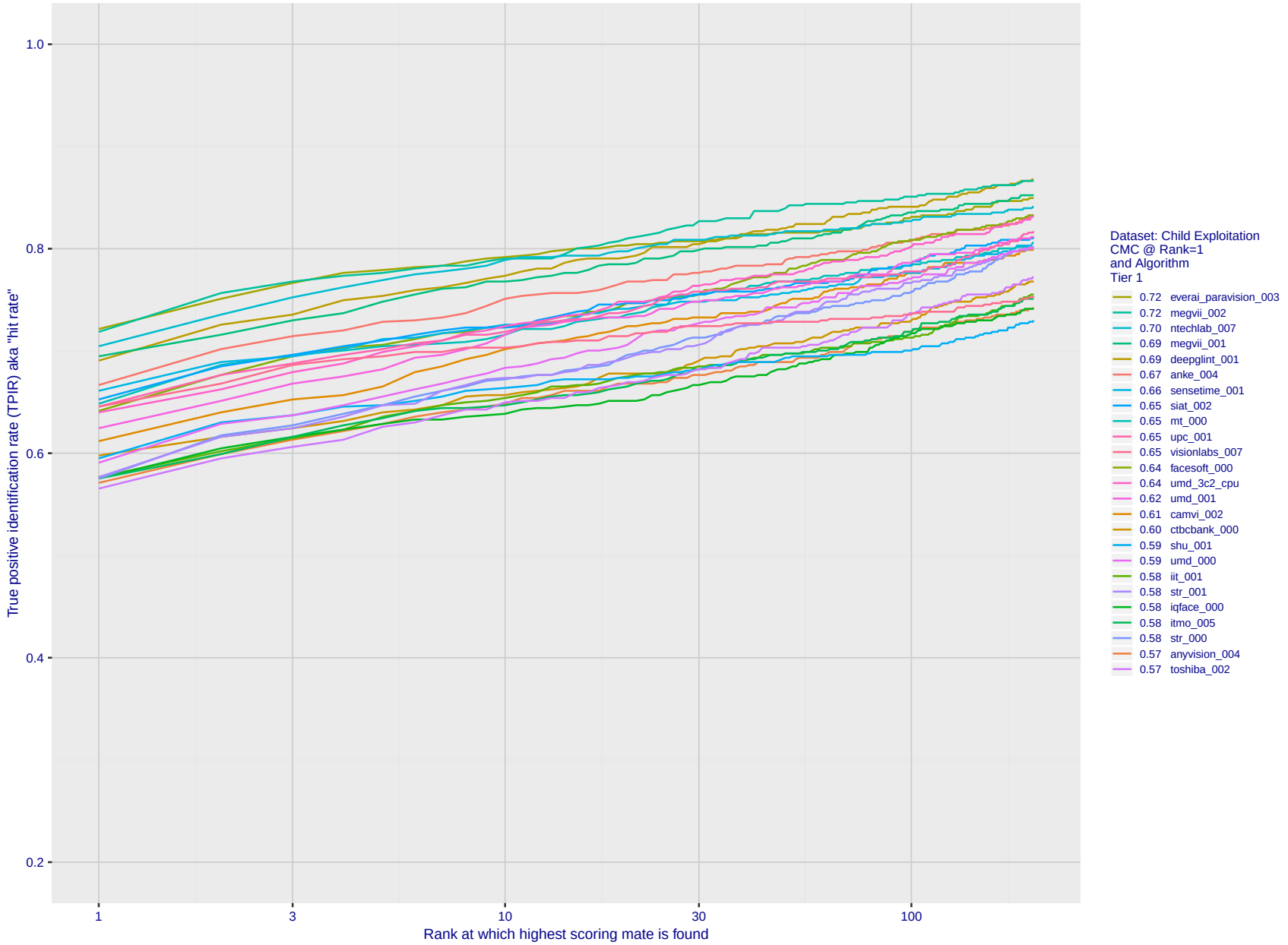


Figure 46: For child exploitation images, cumulative match characteristics (CMC) showing true positive identification rate vs. rank. This is simulation of a one-to-many search experiment - see discussion in section 3.2. The scales are logarithmic in order to show the effect of long candidate lists. Accuracy is poor but much improved relative to the 1:1 DETs of Fig. 45 because a search can succeed if any of a subject's several enrolled images matches the search image with a high score.

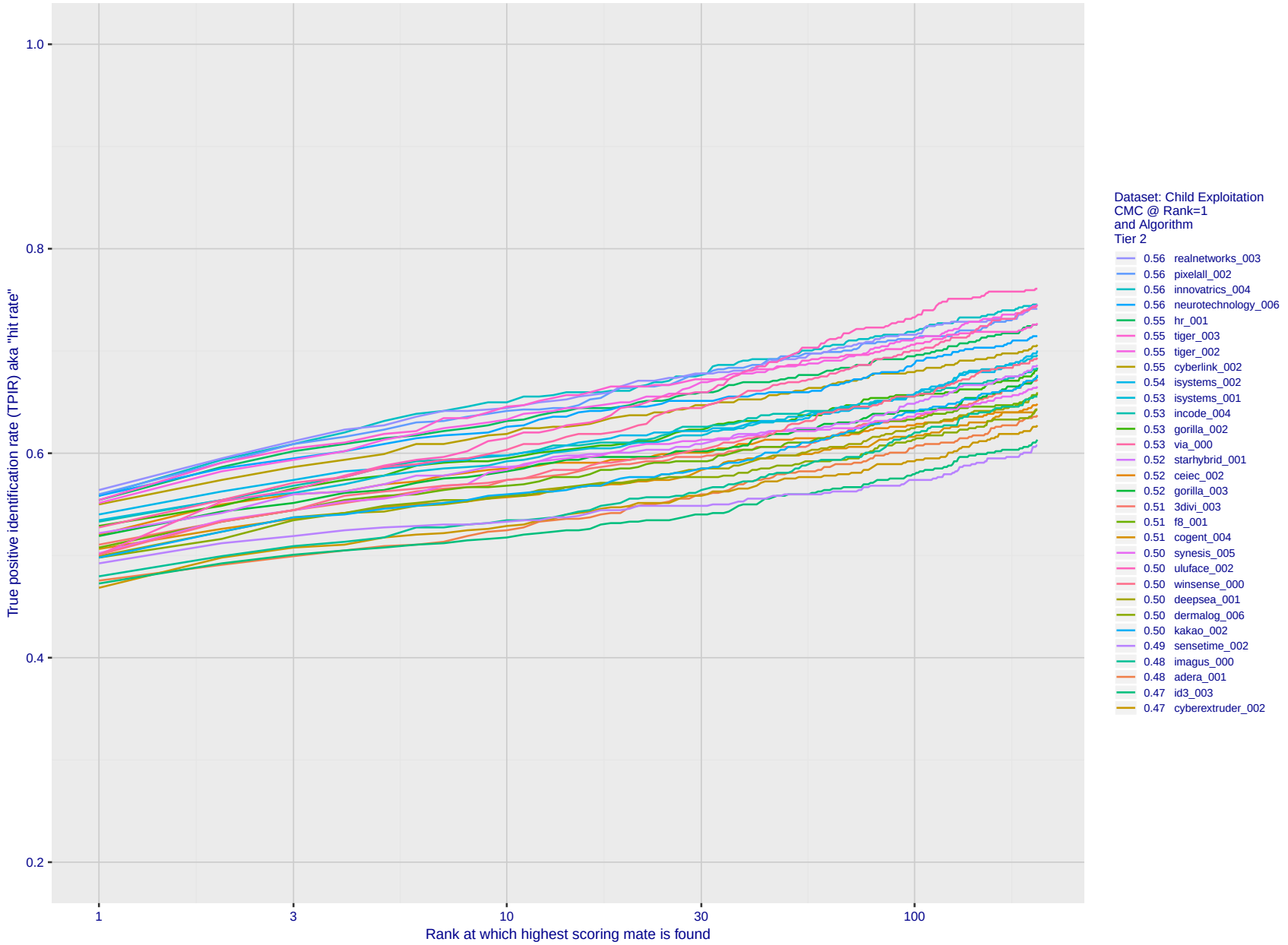


Figure 47: For child exploitation images, cumulative match characteristics (CMC) showing true positive identification rate vs. rank. This is simulation of a one-to-many search experiment - see discussion in section 3.2. The scales are logarithmic in order to show the effect of long candidate lists. Accuracy is poor but much improved relative to the 1:1 DETs of Fig. 45 because a search can succeed if any of a subject's several enrolled images matches the search image with a high score.

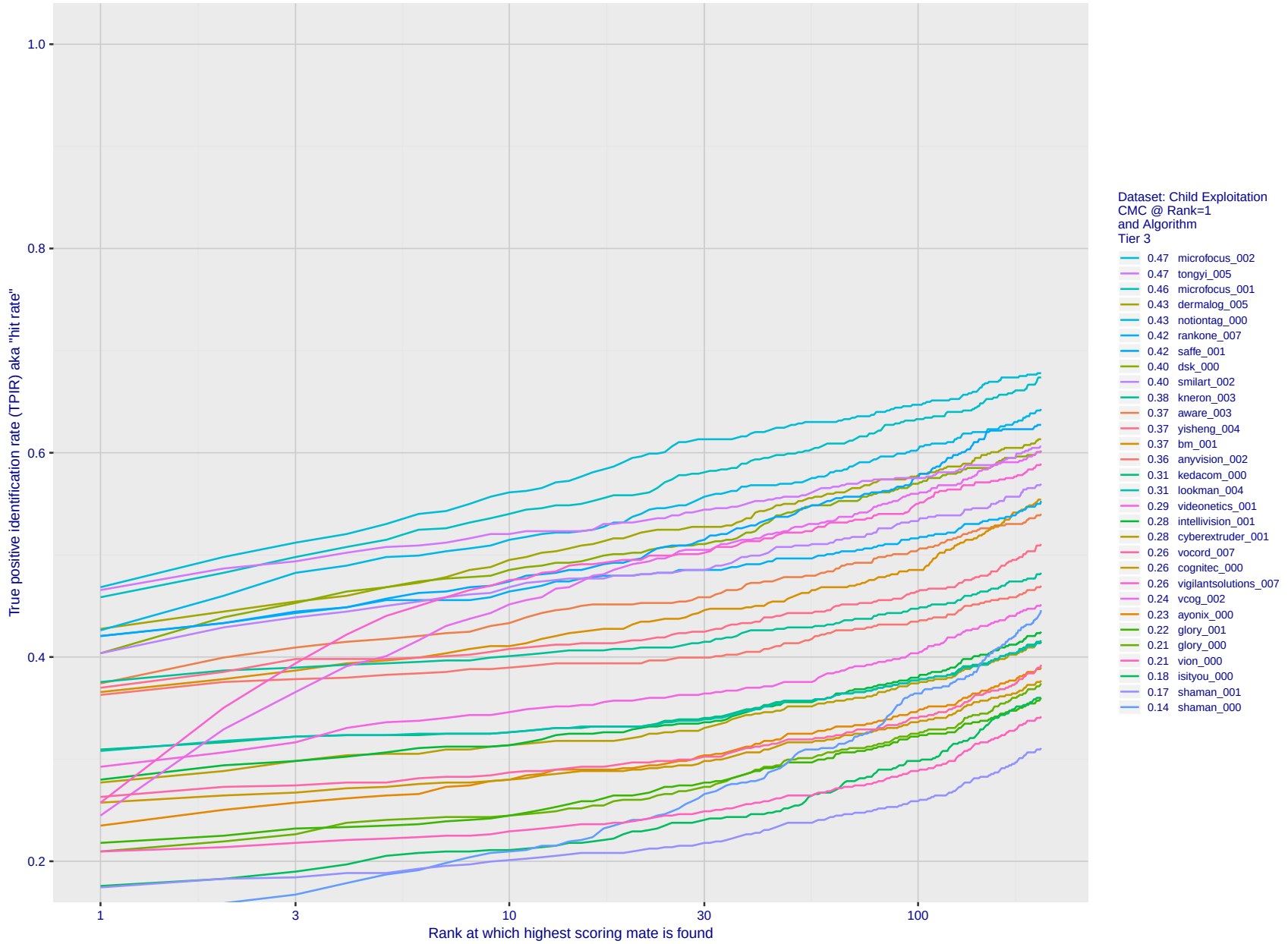


Figure 48: For child exploitation images, cumulative match characteristics (CMC) showing true positive identification rate vs. rank. This is simulation of a one-to-many search experiment - see discussion in section 3.2. The scales are logarithmic in order to show the effect of long candidate lists. Accuracy is poor but much improved relative to the 1:1 DETs of Fig. 45 because a search can succeed if any of a subject's several enrolled images matches the search image with a high score.

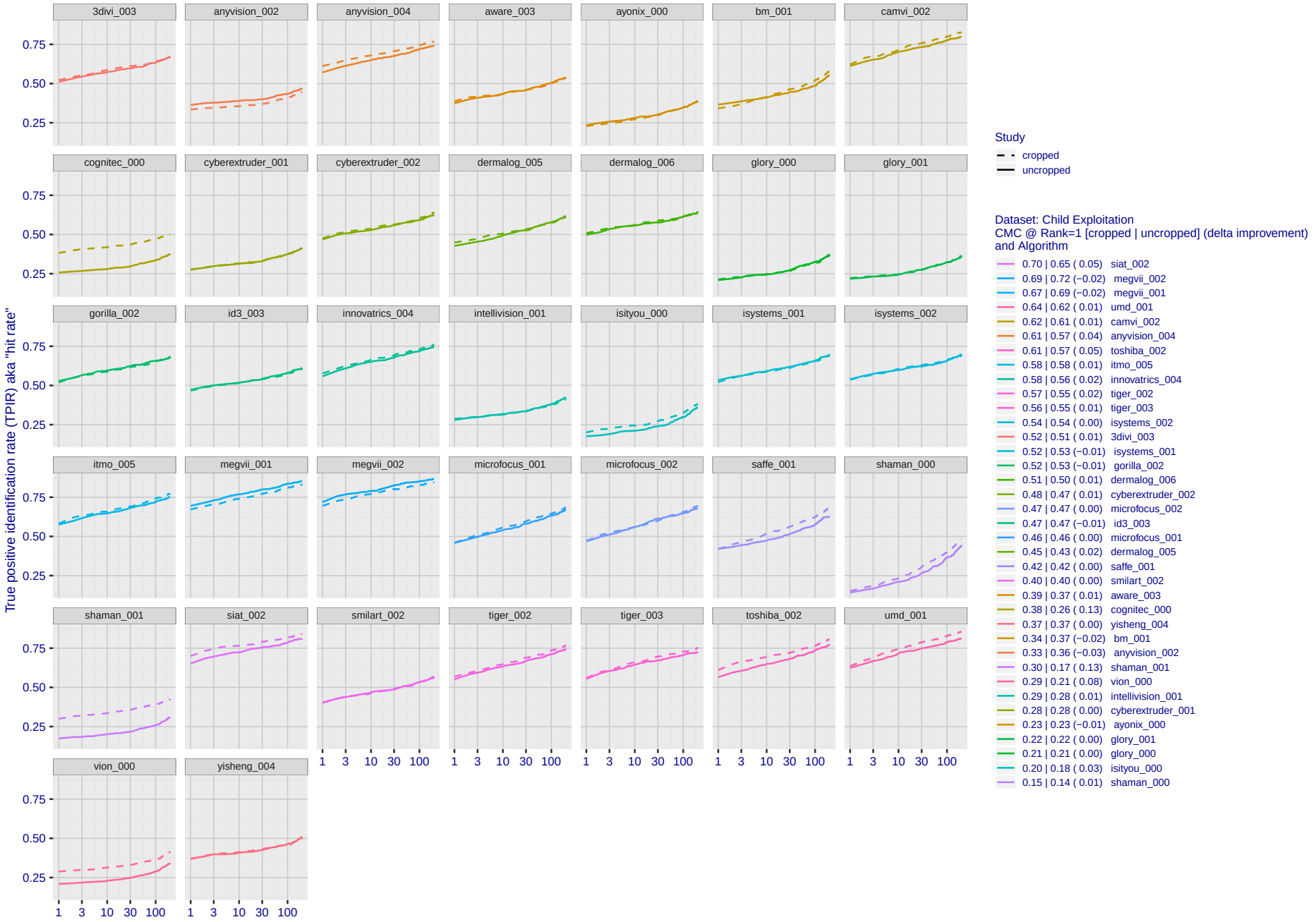


Figure 49: For child exploitation images, cumulative match characteristics (CMC) showing true positive identification rate vs. rank for two cases: 1. Whole image provided to the algorithm; 2. Human annotated rectangular region, cropped and provided to the algorithm. The difference between the traces is associated with detection of difficult faces, and fine localization.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

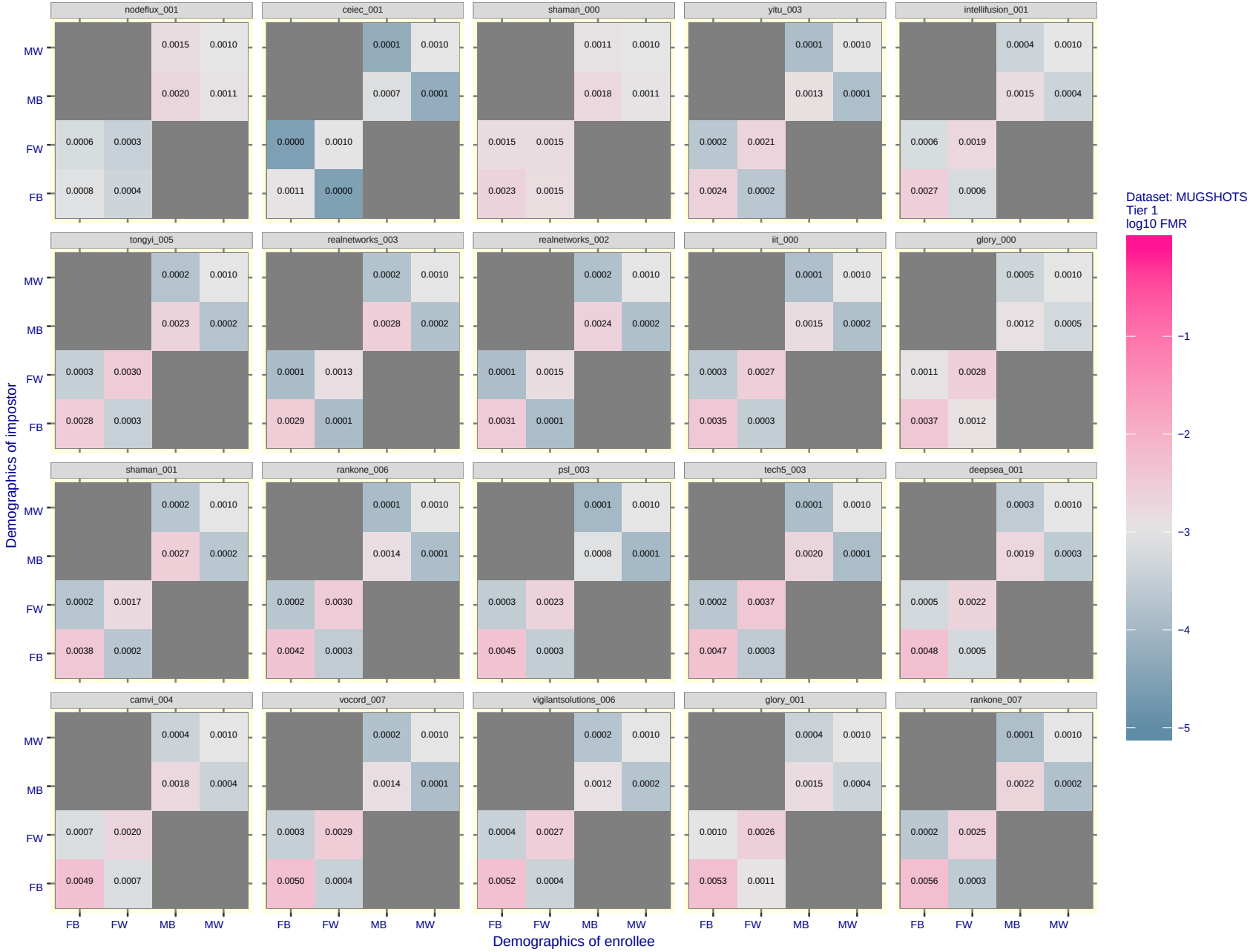


Figure 50: For the mugshot images, FMR *for same-sex impostor pairs of images annotated with codes for black female, black male, white female, white male. The threshold is set for each algorithm to give* FMR *= 0.001 for white males which is the demographc that usually gives the lowest* FMR*. This means the top right box is the same color in all panels. The panels are sorted over multiple pages in order of* FMR *on black females, which is the demographc that usually gives the highest* FMR*.*

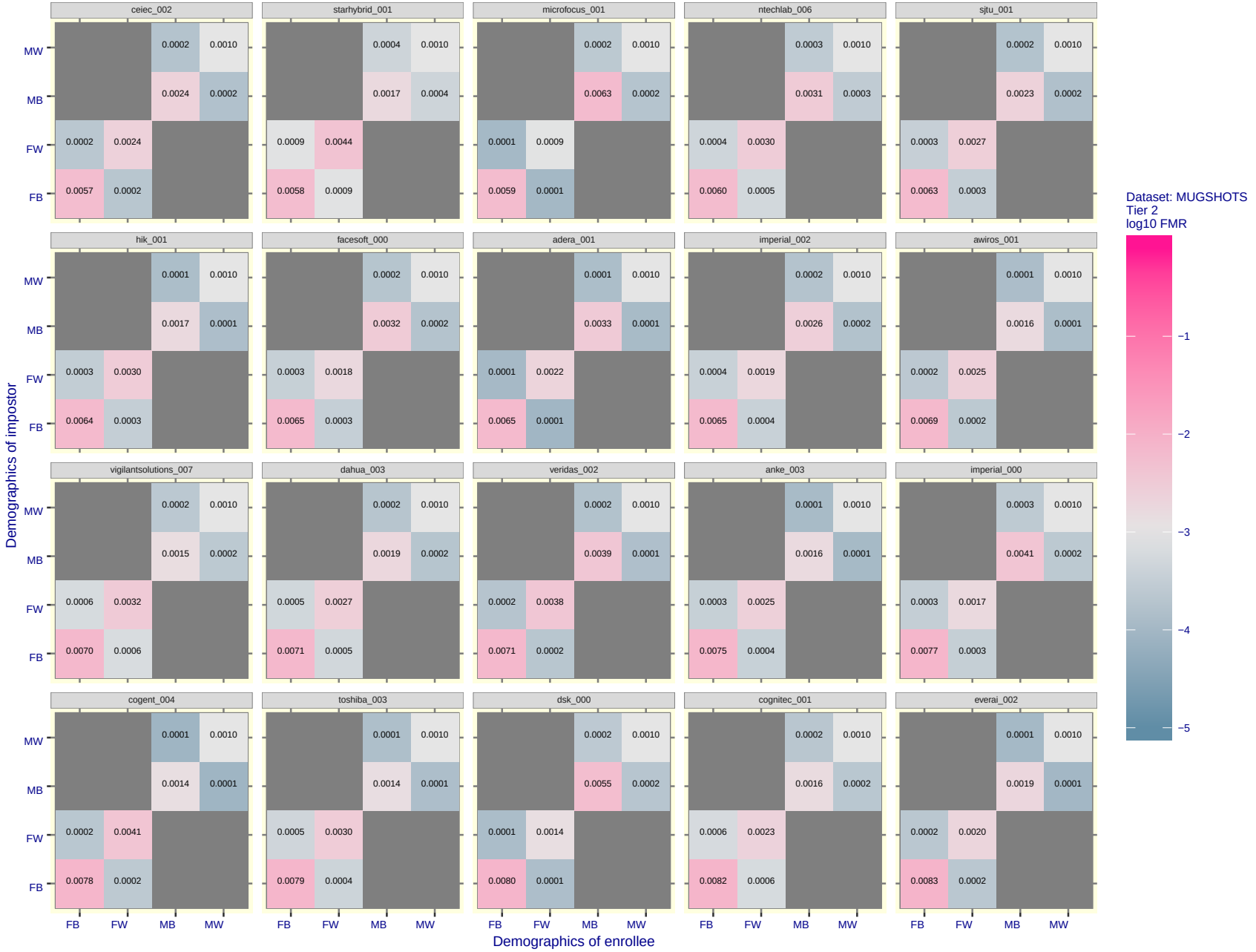


Figure 51: For the mugshot images, FMR *for same-sex impostor pairs of images annotated with codes for black female, black male, white female, white male. The threshold is set for each algorithm to give* FMR *= 0.001 for white males which is the demographc that usually gives the lowest* FMR*. This means the top right box is the same color in all panels. The panels are sorted over multiple pages in order of* FMR *on black females, which is the demographc that usually gives the highest* FMR*.*

2019/10/16 12:43:37 FNMR(T) "False non-match rate" FMR(T) "False match rate"

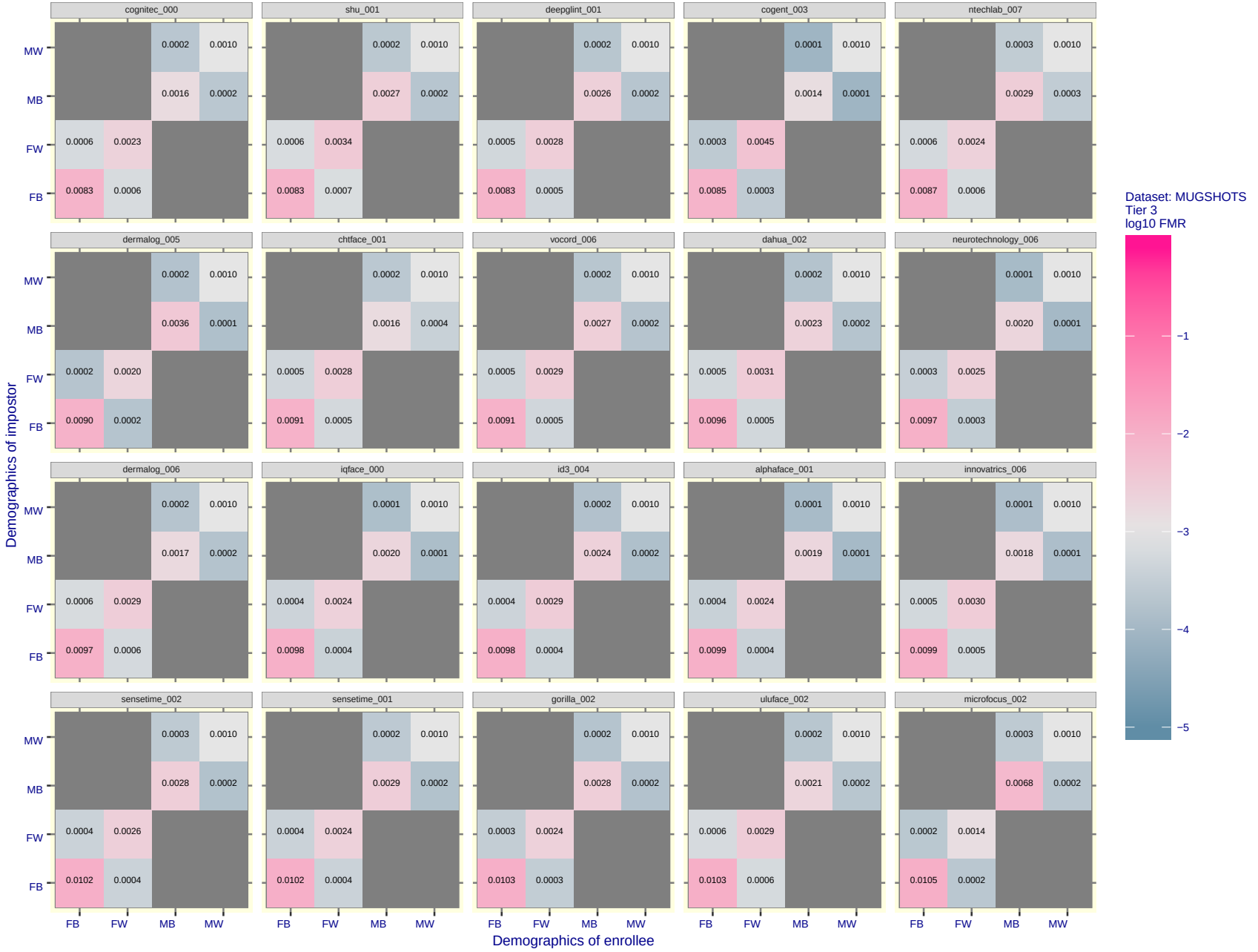


Figure 52: For the mugshot images, FMR *for same-sex impostor pairs of images annotated with codes for black female, black male, white female, white male. The threshold is set for each algorithm to give* FMR *= 0.001 for white males which is the demographc that usually gives the lowest* FMR*. This means the top right box is the same color in all panels. The panels are sorted over multiple pages in order of* FMR *on black females, which is the demographc that usually gives the highest* FMR*.*

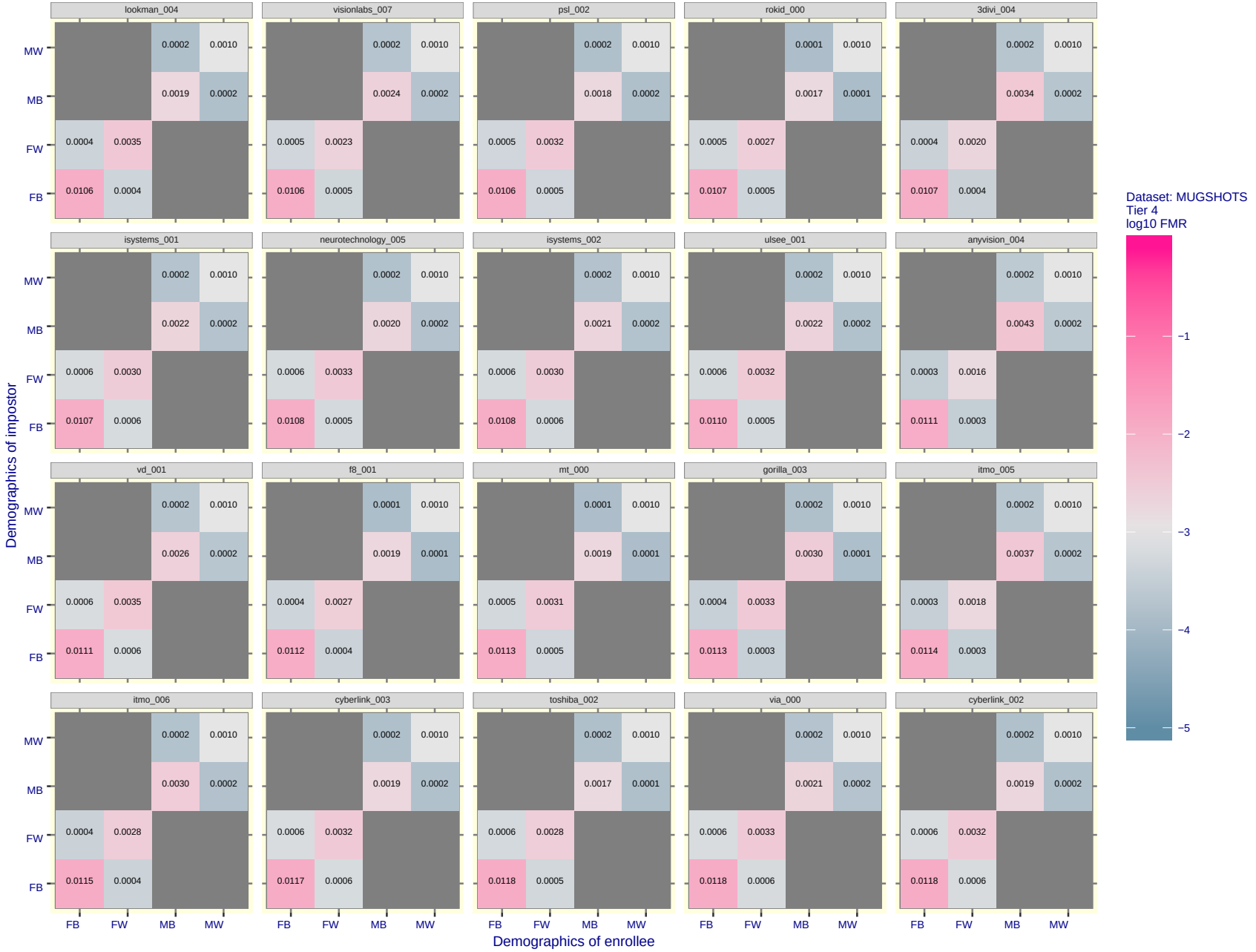


Figure 53: For the mugshot images, FMR *for same-sex impostor pairs of images annotated with codes for black female, black male, white female, white male. The threshold is set for each algorithm to give* FMR *= 0.001 for white males which is the demographc that usually gives the lowest* FMR*. This means the top right box is the same color in all panels. The panels are sorted over multiple pages in order of* FMR *on black females, which is the demographc that usually gives the highest* FMR*.*

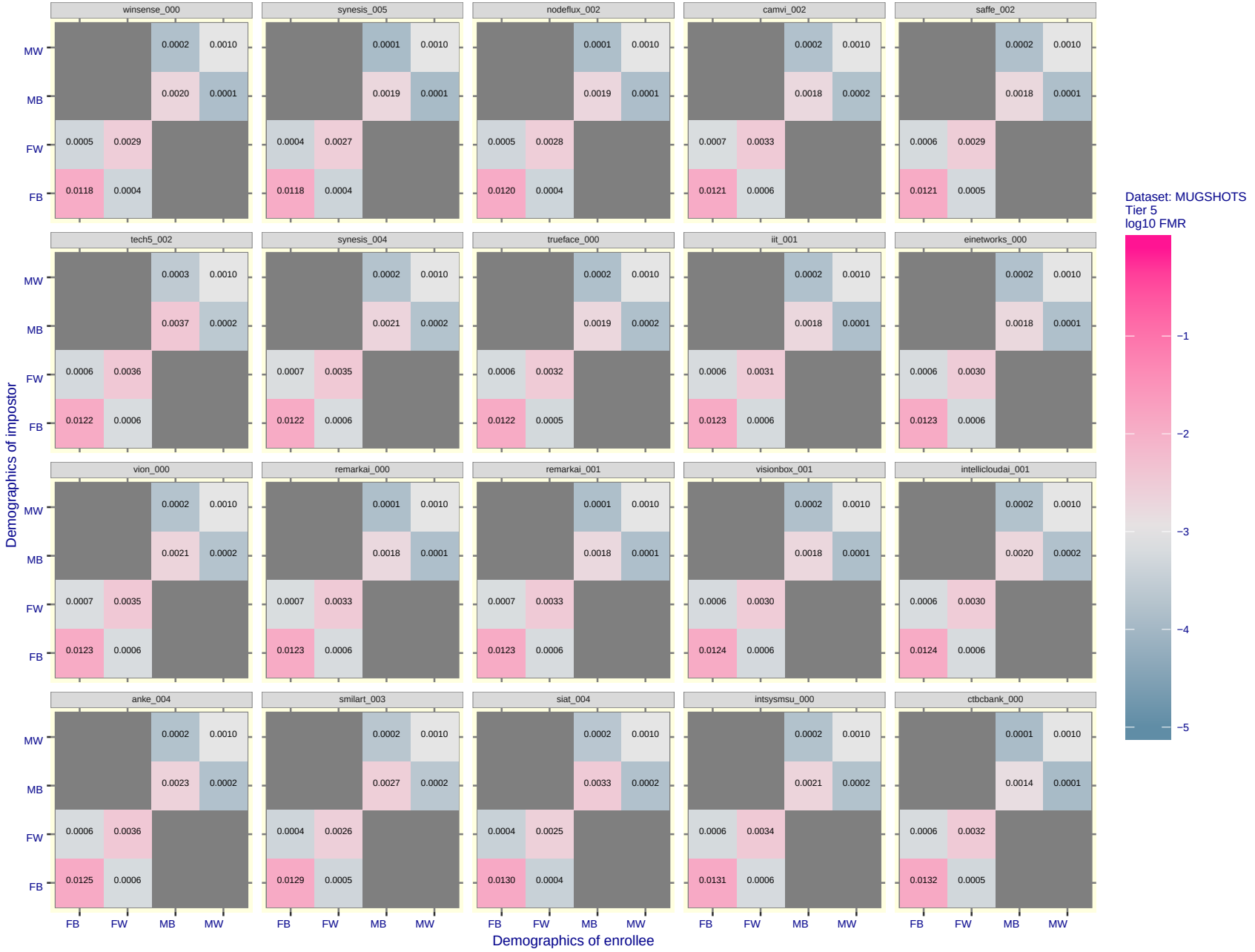


Figure 54: For the mugshot images, FMR *for same-sex impostor pairs of images annotated with codes for black female, black male, white female, white male. The threshold is set for each algorithm to give* FMR *= 0.001 for white males which is the demographc that usually gives the lowest* FMR*. This means the top right box is the same color in all panels. The panels are sorted over multiple pages in order of* FMR *on black females, which is the demographc that usually gives the highest* FMR*.*

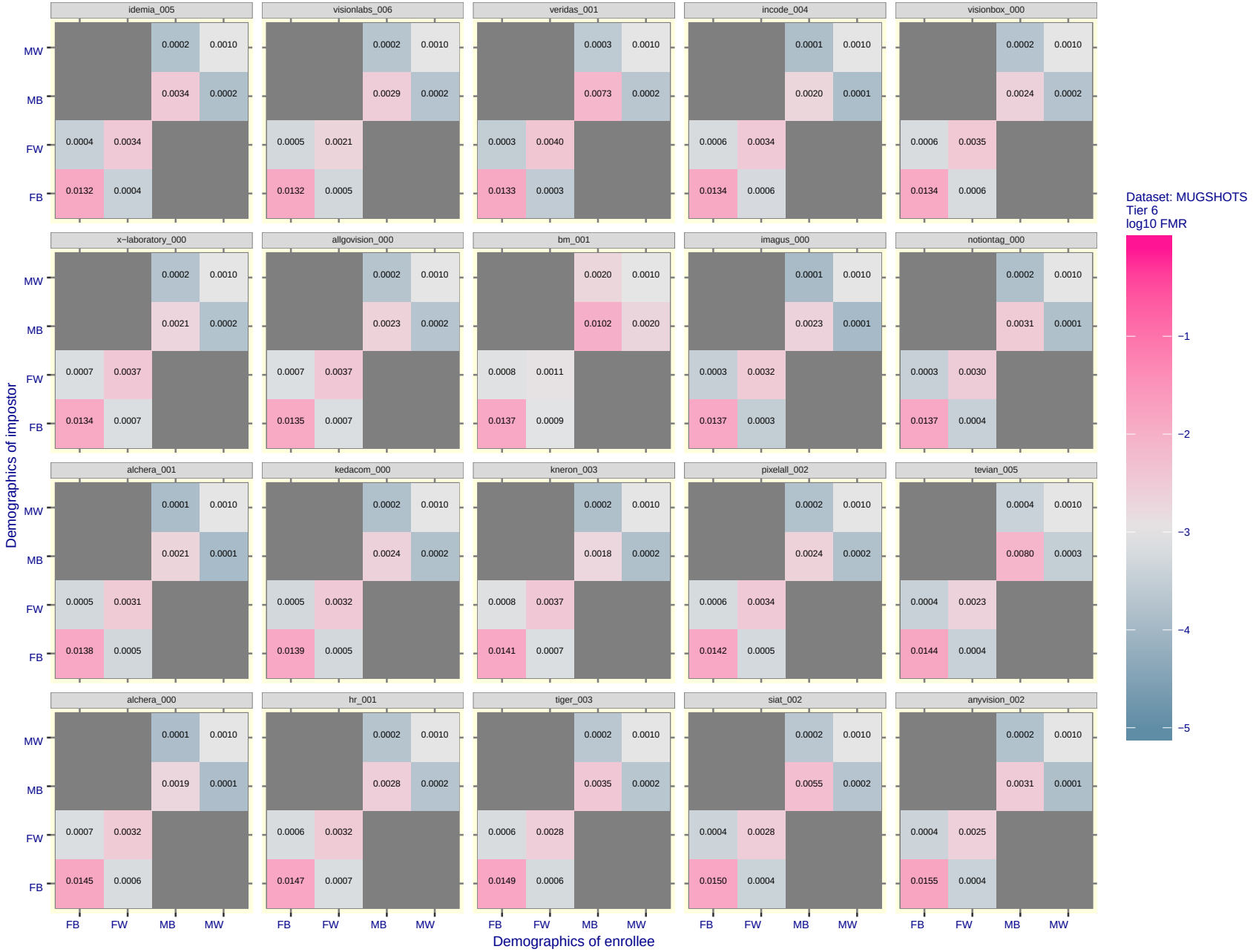


Figure 55: For the mugshot images, FMR *for same-sex impostor pairs of images annotated with codes for black female, black male, white female, white male. The threshold is set for each algorithm to give* FMR *= 0.001 for white males which is the demographc that usually gives the lowest* FMR*. This means the top right box is the same color in all panels. The panels are sorted over multiple pages in order of* FMR *on black females, which is the demographc that usually gives the highest* FMR*.*

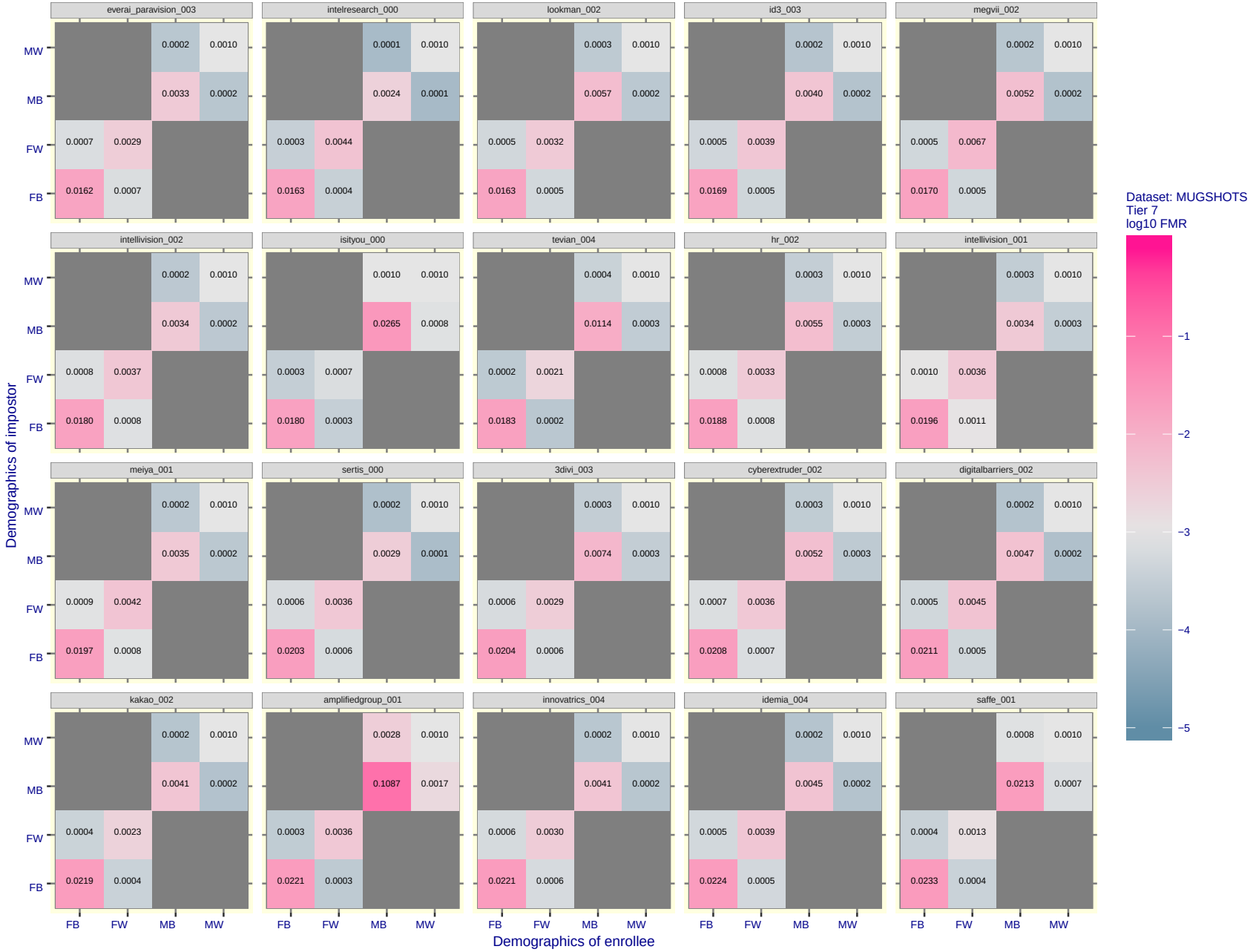


Figure 56: For the mugshot images, FMR *for same-sex impostor pairs of images annotated with codes for black female, black male, white female, white male. The threshold is set for each algorithm to give* FMR *= 0.001 for white males which is the demographc that usually gives the lowest* FMR*. This means the top right box is the same color in all panels. The panels are sorted over multiple pages in order of* FMR *on black females, which is the demographc that usually gives the highest* FMR*.*

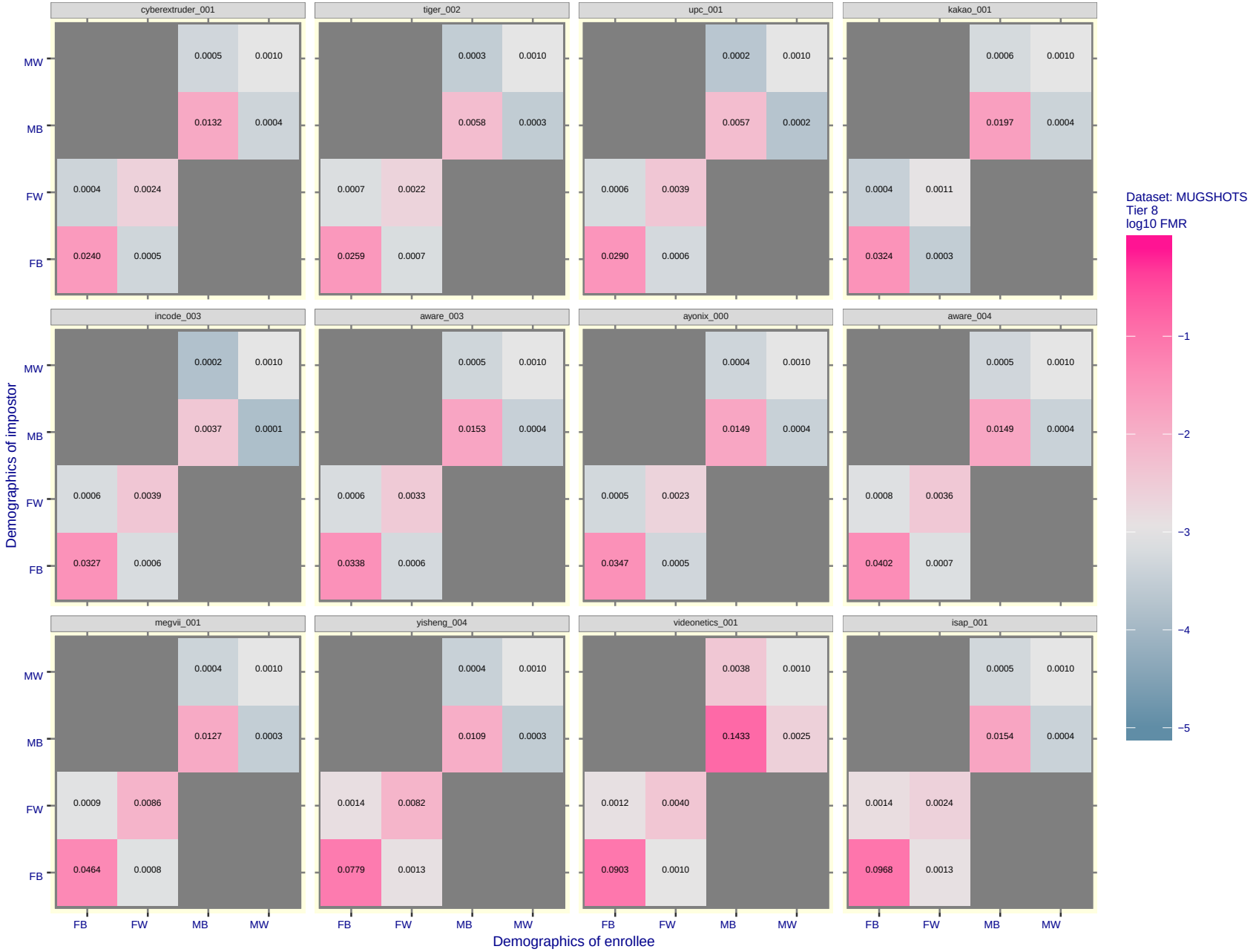


Figure 57: For the mugshot images, FMR *for same-sex impostor pairs of images annotated with codes for black female, black male, white female, white male. The threshold is set for each algorithm to give* FMR *= 0.001 for white males which is the demographc that usually gives the lowest* FMR*. This means the top right box is the same color in all panels. The panels are sorted over multiple pages in order of* FMR *on black females, which is the demographc that usually gives the highest* FMR*.*

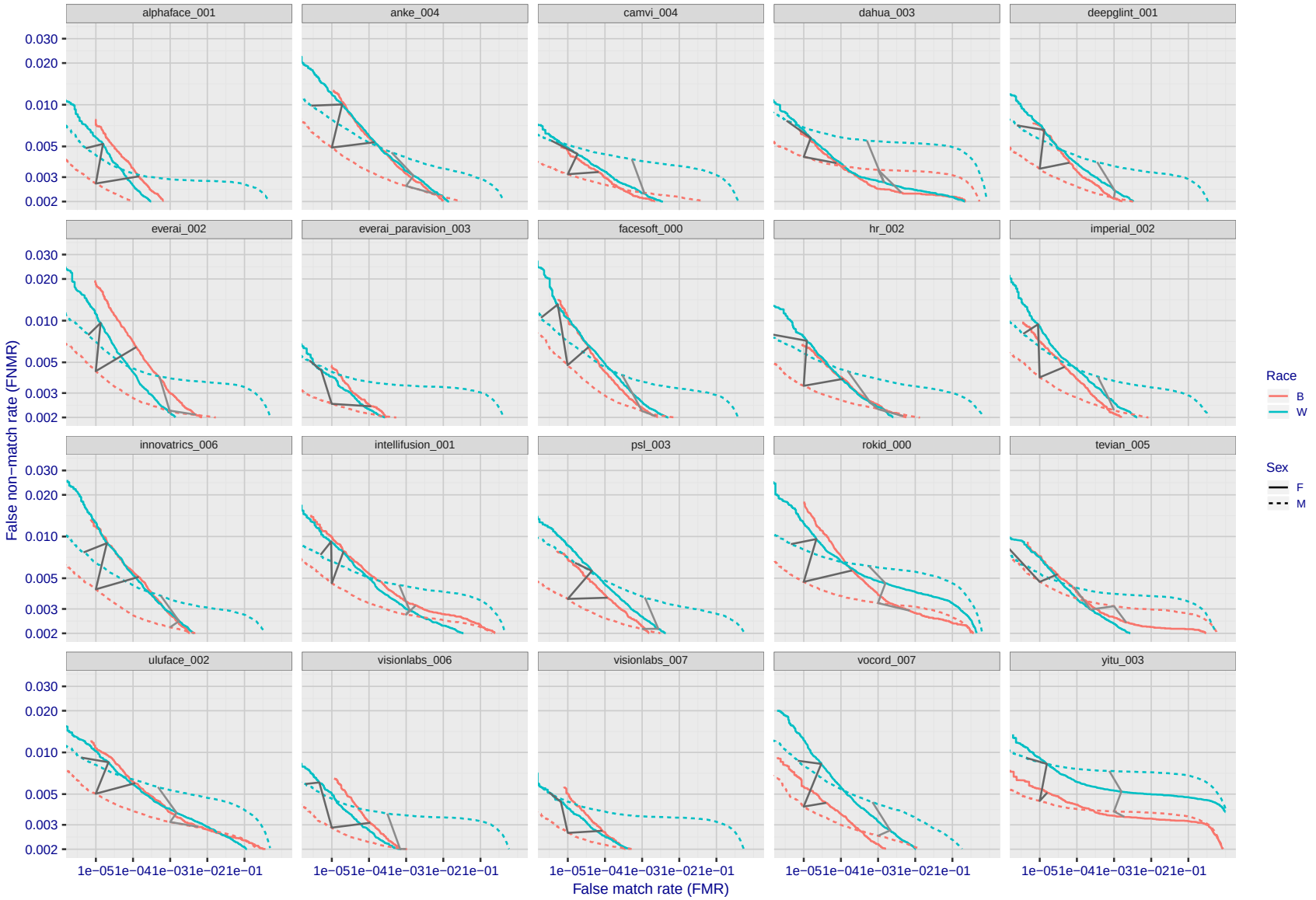


Figure 58: For the mugshot images, error tradeoff characteristics for white females, black females, black males and white males. The Z-shaped grey lines correspond to fixed thresholds, showing both *FNMR and FMR vary at one T value. Note: Many of the plots will naively be read as saying women gives worse error rates than men because the solid traces lie above the dotted ones. However, this is misleading and incomplete: The grey lines show the traces reveal horizontal shifts. Thus for the cogent-003 algorithm FNMR for men is* higher *than for women* at a fixed threshold *but, at the same time, FMR is higher for women - see Figure 86. As access control systems almost always operate at a fixed threshold, the naive interpretation is incorrect.*

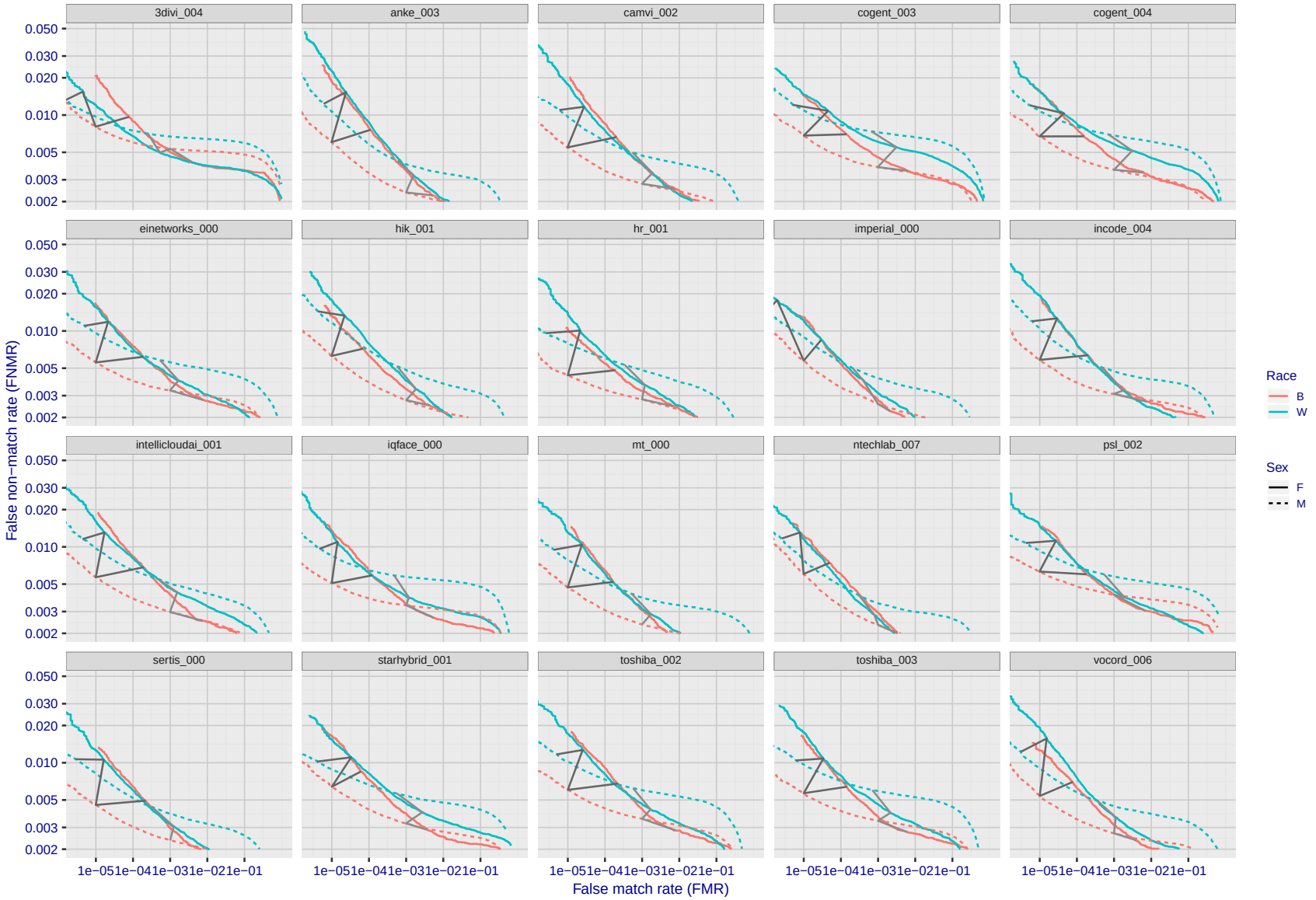


Figure 59: For the mugshot images, error tradeoff characteristics for white females, black females, black males and white males. The Z-shaped grey lines correspond to fixed thresholds, showing both *FNMR and FMR vary at one T value. Note: Many of the plots will naively be read as saying women gives worse error rates than men because the solid traces lie above the dotted ones. However, this is misleading and incomplete: The grey lines show the traces reveal horizontal shifts. Thus for the cogent-003 algorithm FNMR for men is* higher *than for women* at a fixed threshold *but, at the same time, FMR is higher for women - see Figure 86. As access control systems almost always operate at a fixed threshold, the naive interpretation is incorrect.*

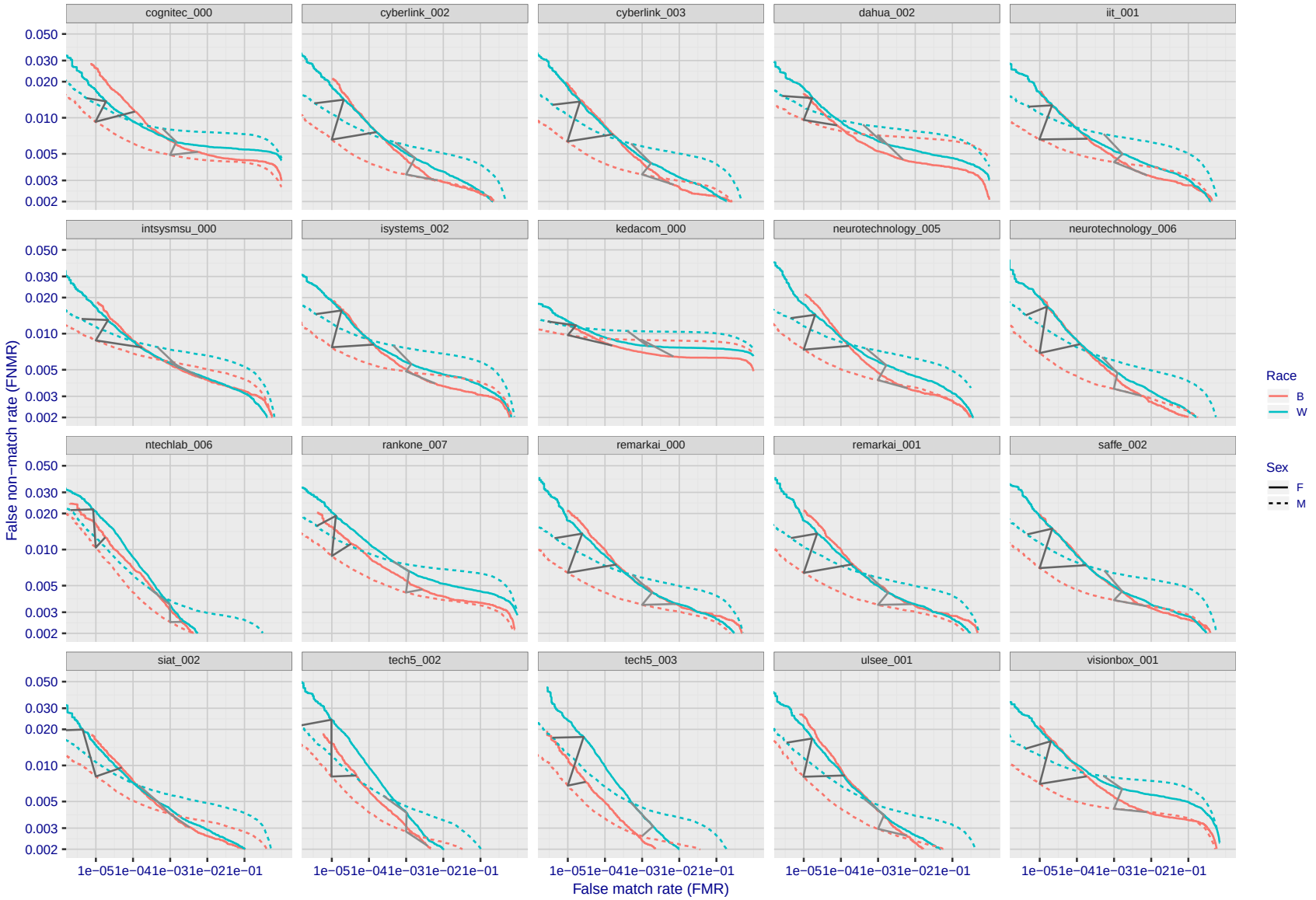


Figure 60: For the mugshot images, error tradeoff characteristics for white females, black females, black males and white males. The Z-shaped grey lines correspond to fixed thresholds, showing both *FNMR and FMR vary at one T value. Note: Many of the plots will naively be read as saying women gives worse error rates than men because the solid traces lie above the dotted ones. However, this is misleading and incomplete: The grey lines show the traces reveal horizontal shifts. Thus for the cogent-003 algorithm FNMR for men is* higher *than for women* at a fixed threshold *but, at the same time, FMR is higher for women - see Figure 86. As access control systems almost always operate at a fixed threshold, the naive interpretation is incorrect.*

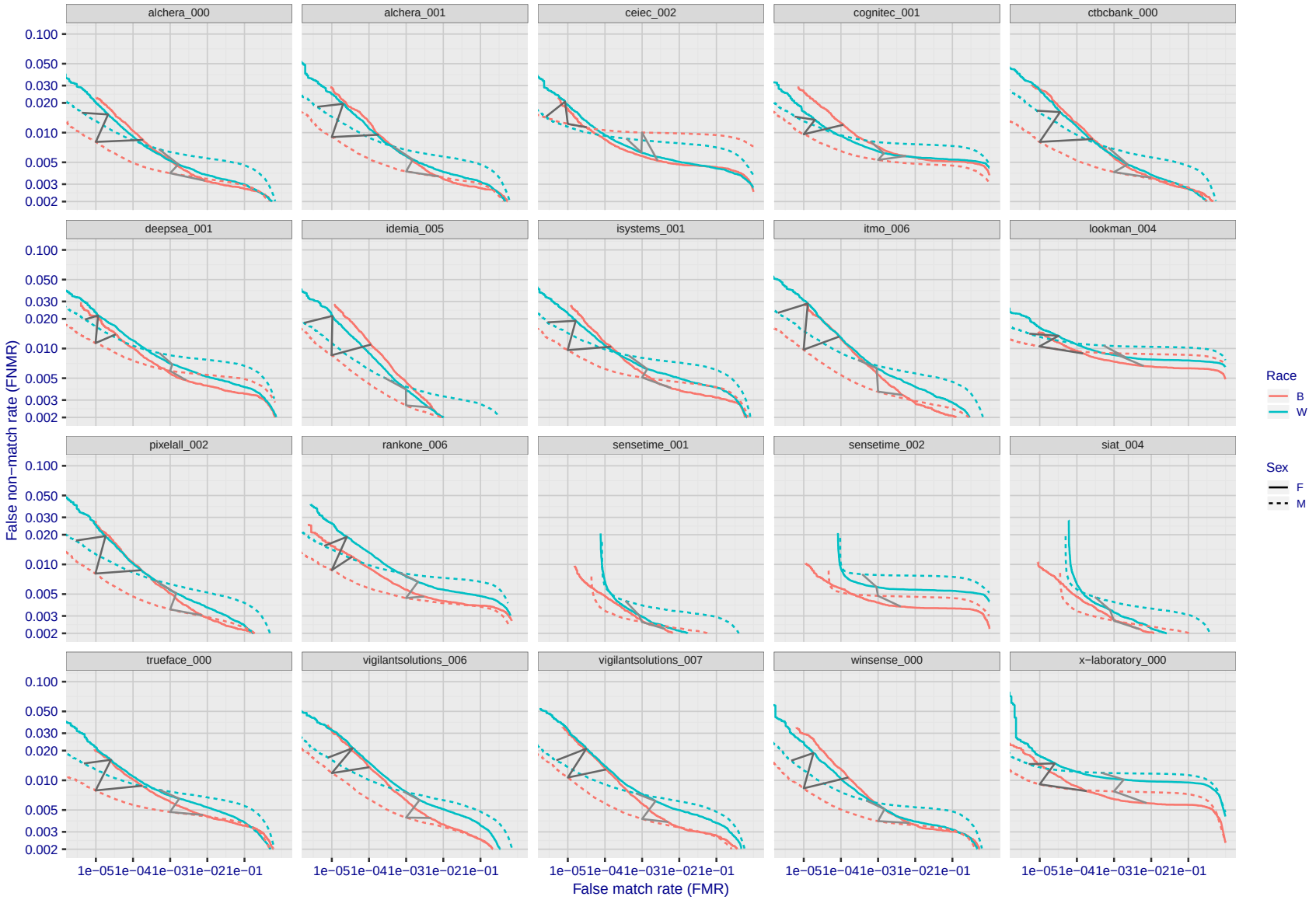


Figure 61: For the mugshot images, error tradeoff characteristics for white females, black females, black males and white males. The Z-shaped grey lines correspond to fixed thresholds, showing both *FNMR and FMR vary at one T value. Note: Many of the plots will naively be read as saying women gives worse error rates than men because the solid traces lie above the dotted ones. However, this is misleading and incomplete: The grey lines show the traces reveal horizontal shifts. Thus for the cogent-003 algorithm FNMR for men is* higher *than for women* at a fixed threshold *but, at the same time, FMR is higher for women - see Figure 86. As access control systems almost always operate at a fixed threshold, the naive interpretation is incorrect.*

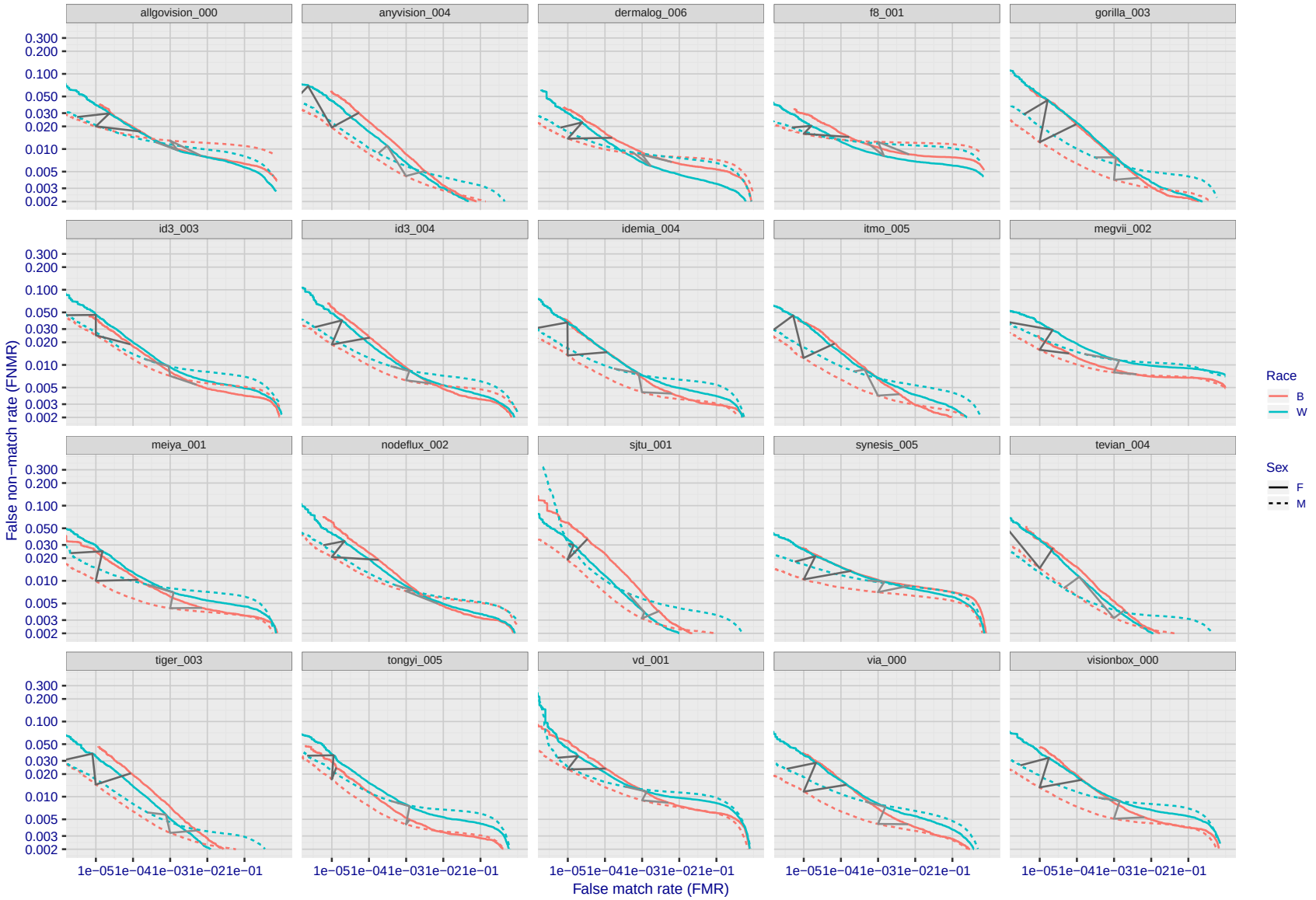


Figure 62: For the mugshot images, error tradeoff characteristics for white females, black females, black males and white males. The Z-shaped grey lines correspond to fixed thresholds, showing both *FNMR and FMR vary at one T value. Note: Many of the plots will naively be read as saying women gives worse error rates than men because the solid traces lie above the dotted ones. However, this is misleading and incomplete: The grey lines show the traces reveal horizontal shifts. Thus for the cogent-003 algorithm FNMR for men is* higher *than for women* at a fixed threshold *but, at the same time, FMR is higher for women - see Figure 86. As access control systems almost always operate at a fixed threshold, the naive interpretation is incorrect.*

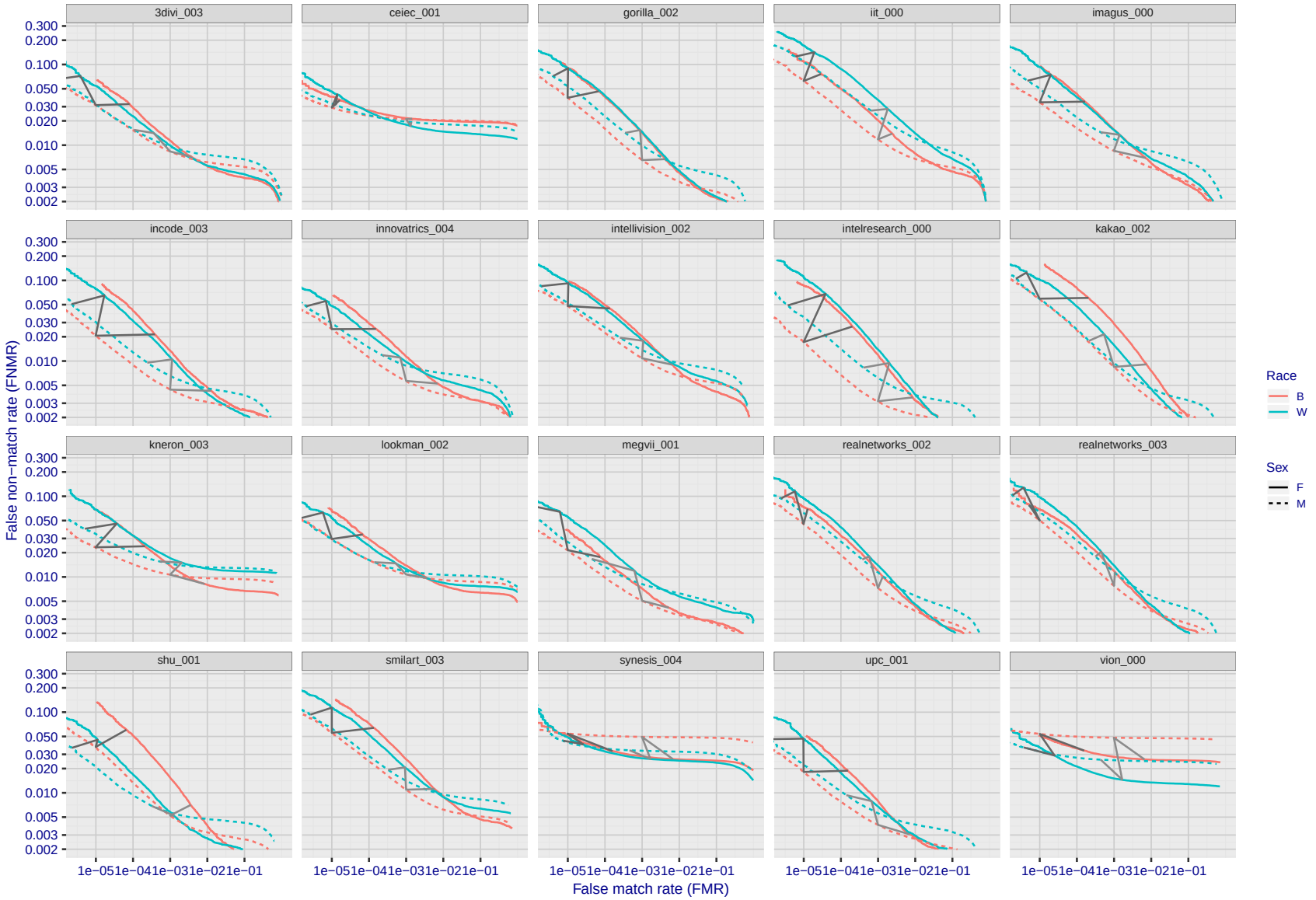


Figure 63: For the mugshot images, error tradeoff characteristics for white females, black females, black males and white males. The Z-shaped grey lines correspond to fixed thresholds, showing both *FNMR and FMR vary at one T value. Note: Many of the plots will naively be read as saying women gives worse error rates than men because the solid traces lie above the dotted ones. However, this is misleading and incomplete: The grey lines show the traces reveal horizontal shifts. Thus for the cogent-003 algorithm FNMR for men is* higher *than for women* at a fixed threshold *but, at the same time, FMR is higher for women - see Figure 86. As access control systems almost always operate at a fixed threshold, the naive interpretation is incorrect.*

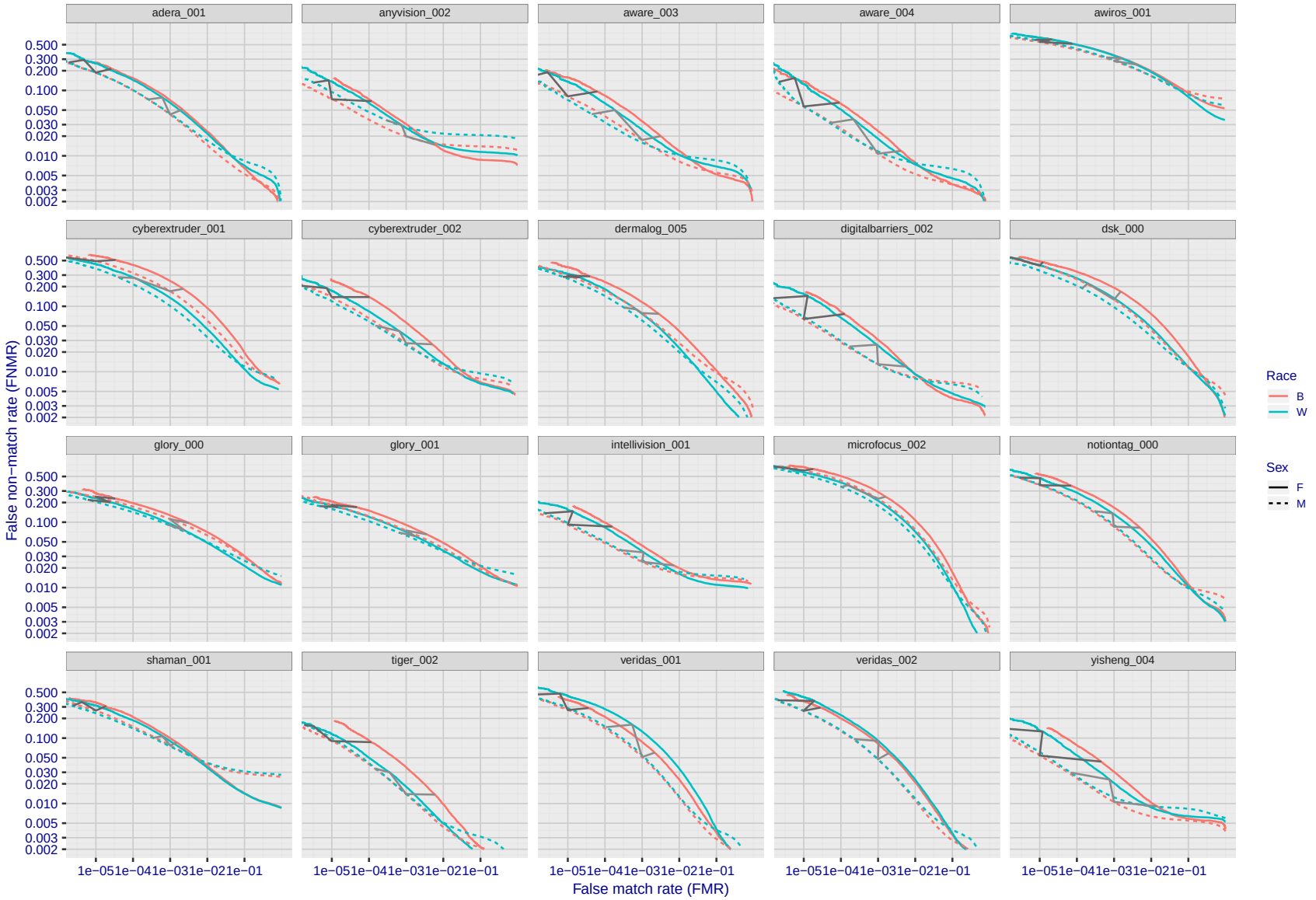


Figure 64: For the mugshot images, error tradeoff characteristics for white females, black females, black males and white males. The Z-shaped grey lines correspond to fixed thresholds, showing both *FNMR and FMR vary at one T value. Note: Many of the plots will naively be read as saying women gives worse error rates than men because the solid traces lie above the dotted ones. However, this is misleading and incomplete: The grey lines show the traces reveal horizontal shifts. Thus for the cogent-003 algorithm FNMR for men is* higher *than for women* at a fixed threshold *but, at the same time, FMR is higher for women - see Figure 86. As access control systems almost always operate at a fixed threshold, the naive interpretation is incorrect.*

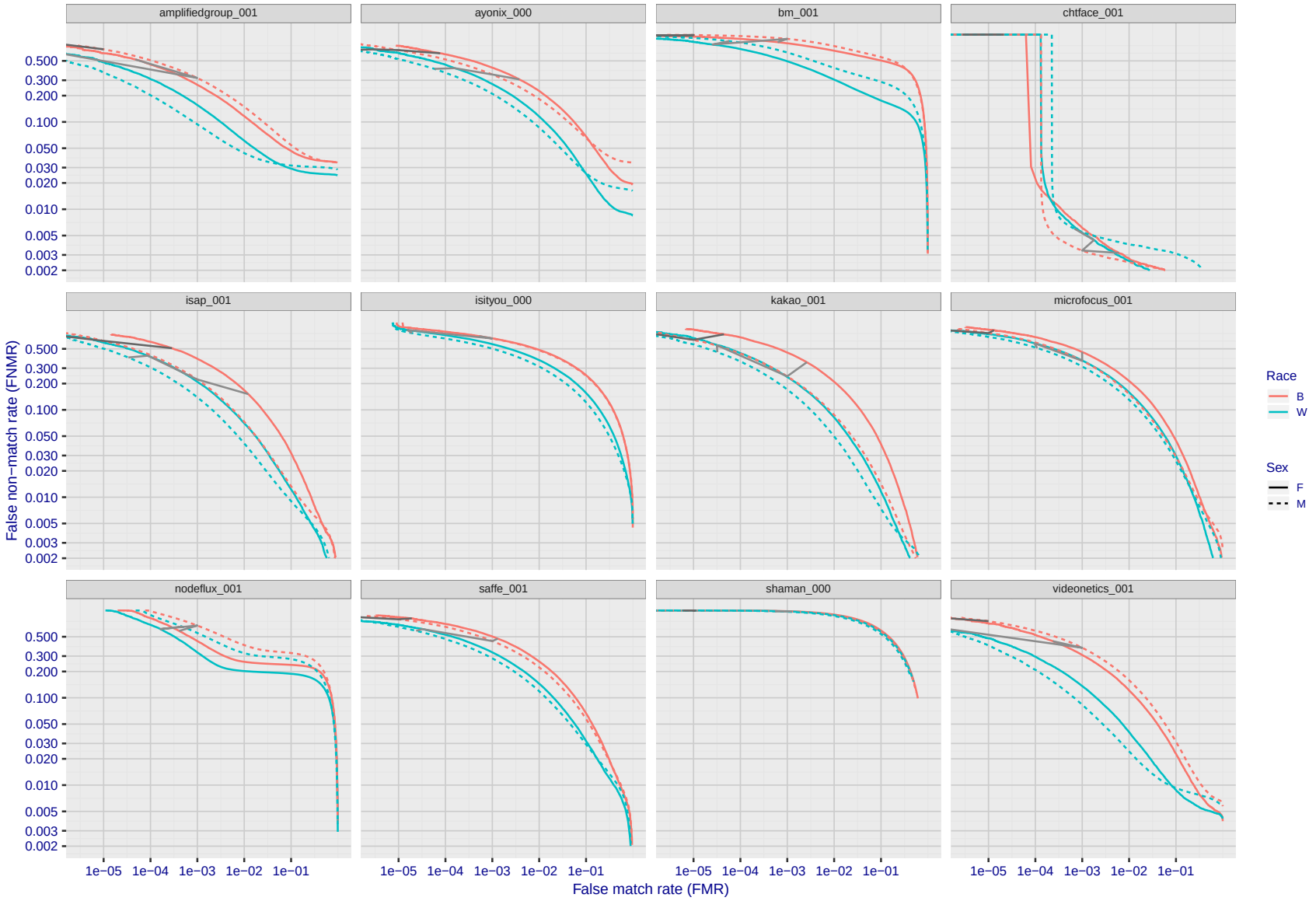


Figure 65: For the mugshot images, error tradeoff characteristics for white females, black females, black males and white males. The Z-shaped grey lines correspond to fixed thresholds, showing both *FNMR and FMR vary at one T value. Note: Many of the plots will naively be read as saying women gives worse error rates than men because the solid traces lie above the dotted ones. However, this is misleading and incomplete: The grey lines show the traces reveal horizontal shifts. Thus for the cogent-003 algorithm FNMR for men is* higher *than for women* at a fixed threshold *but, at the same time, FMR is higher for women - see Figure 86. As access control systems almost always operate at a fixed threshold, the naive interpretation is incorrect.*

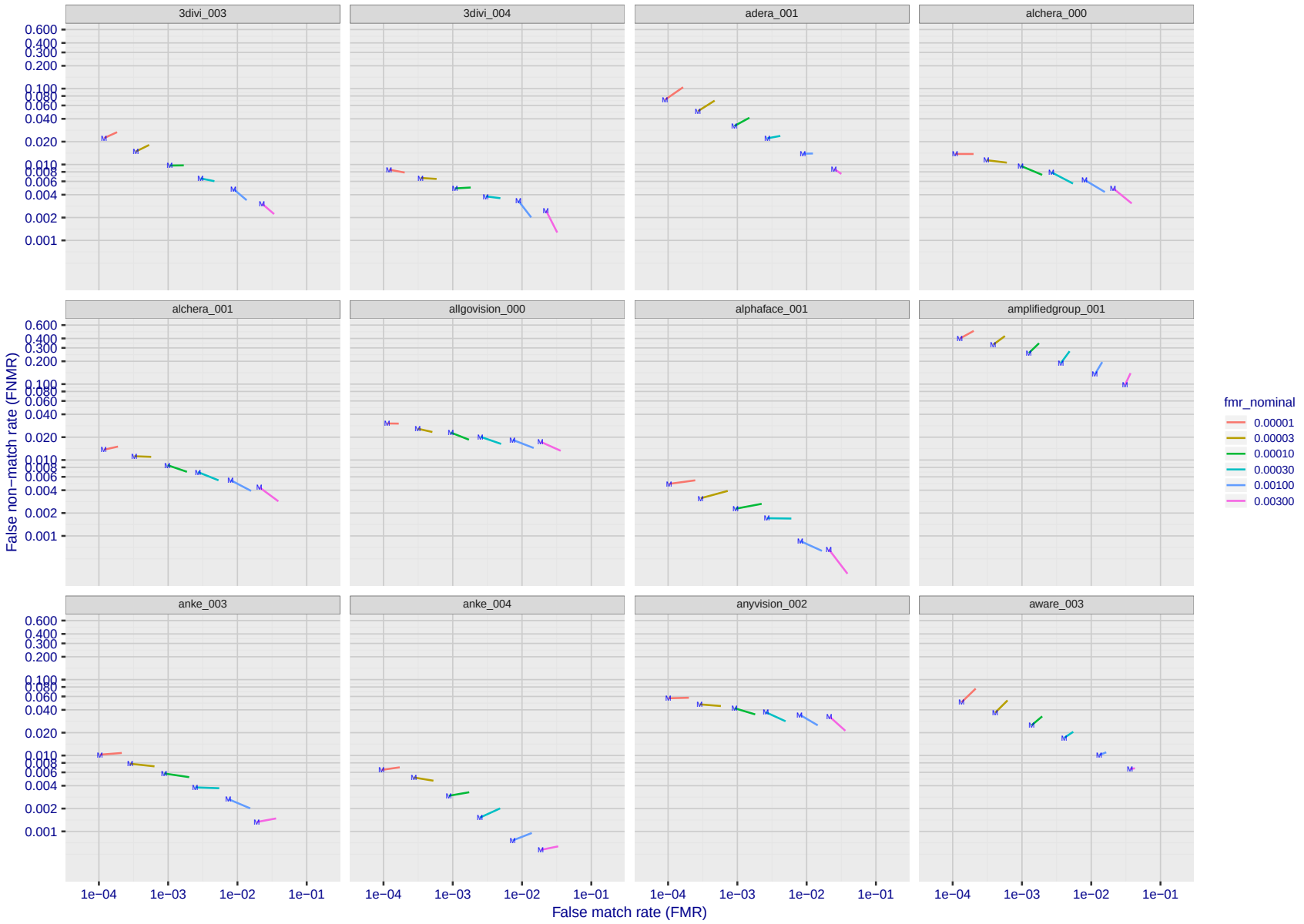


Figure 66: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

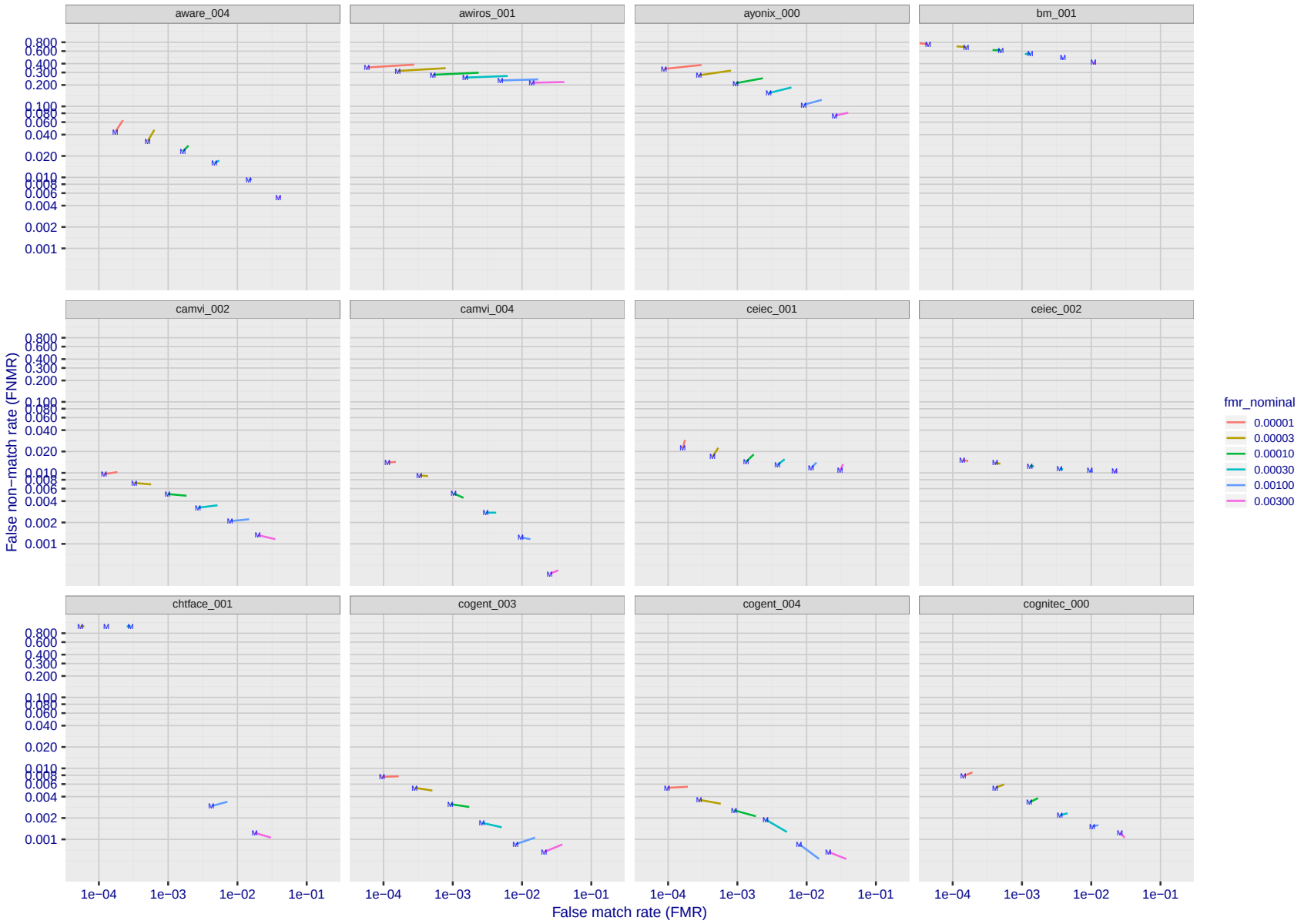


Figure 67: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

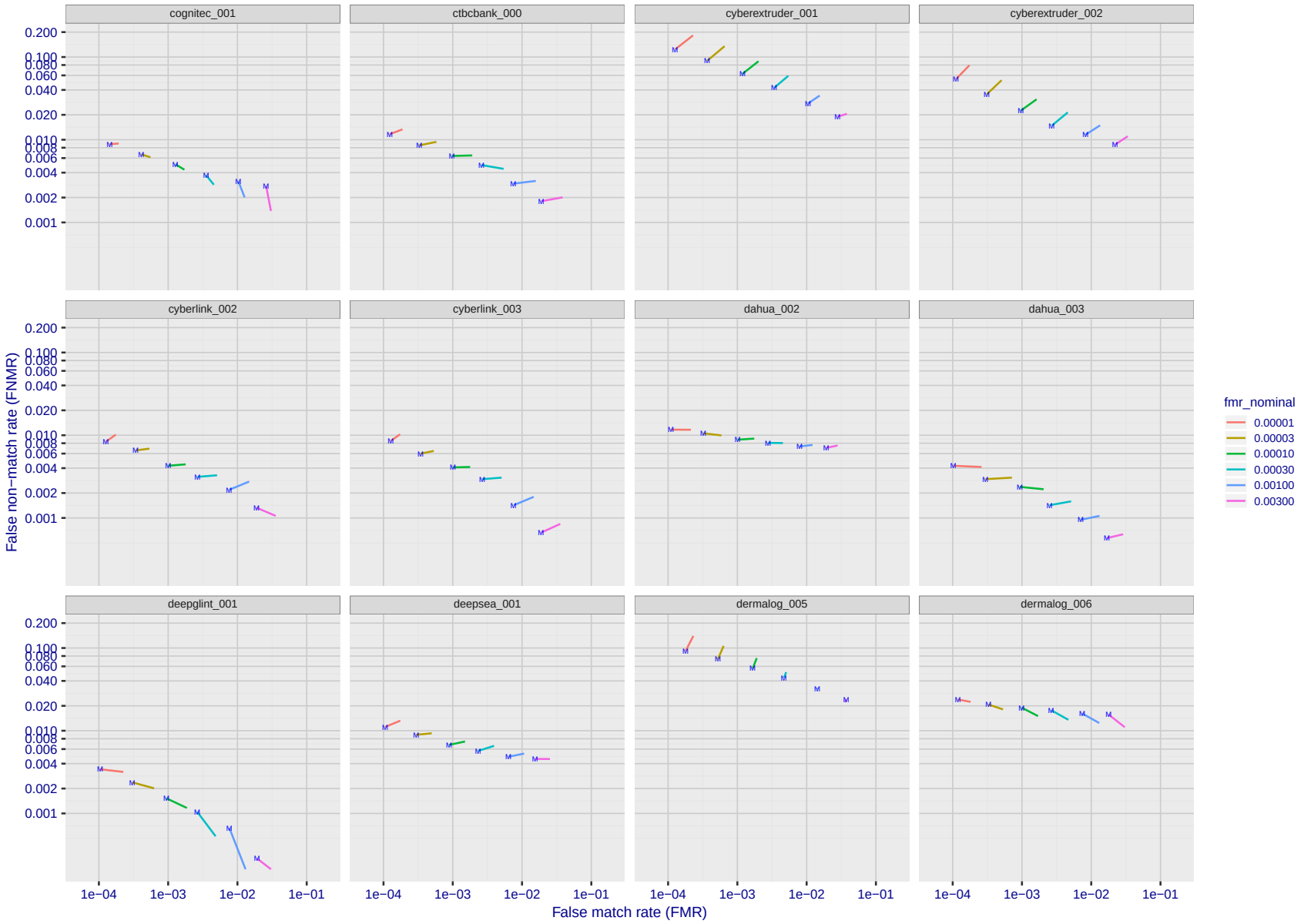


Figure 68: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

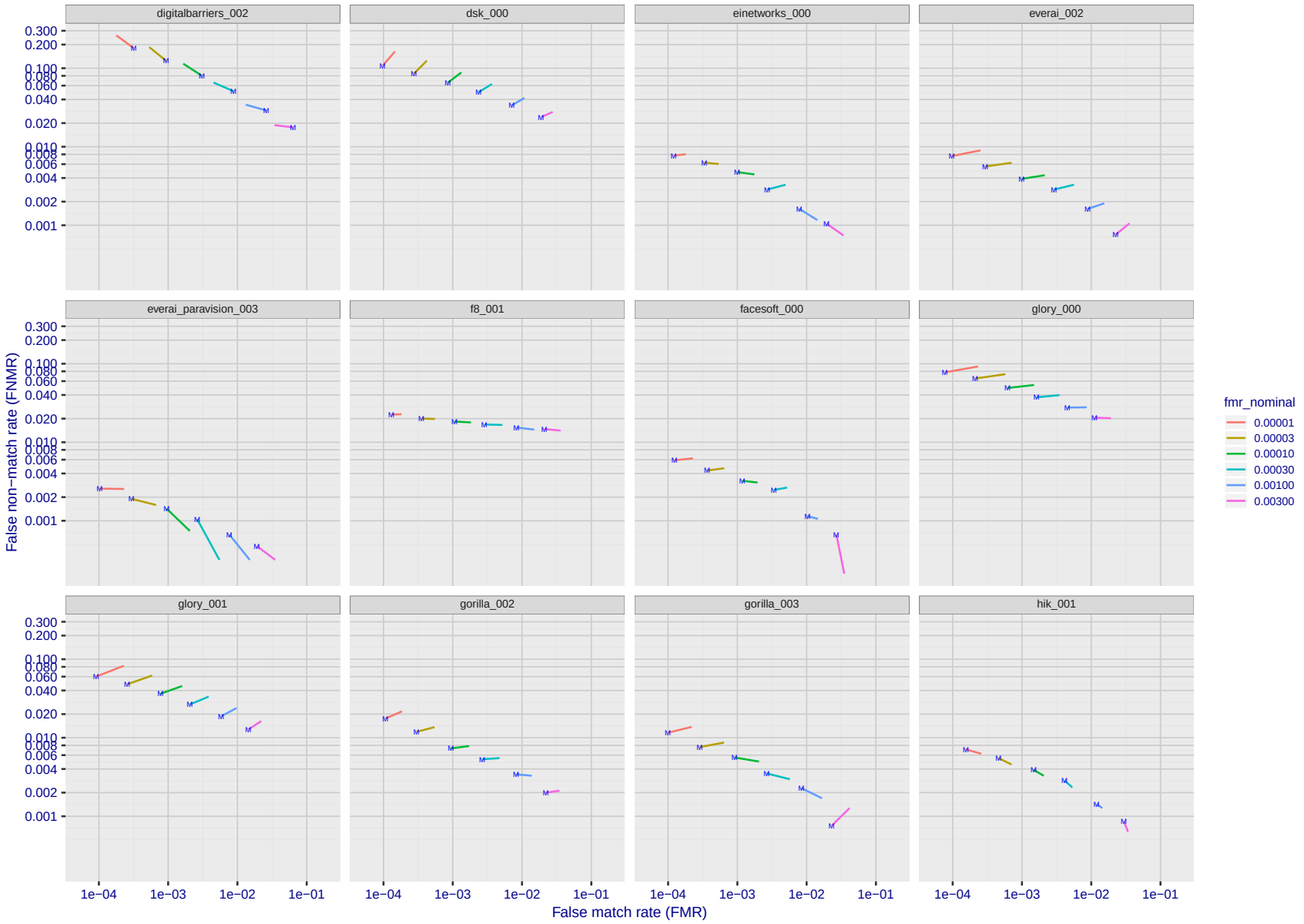


Figure 69: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

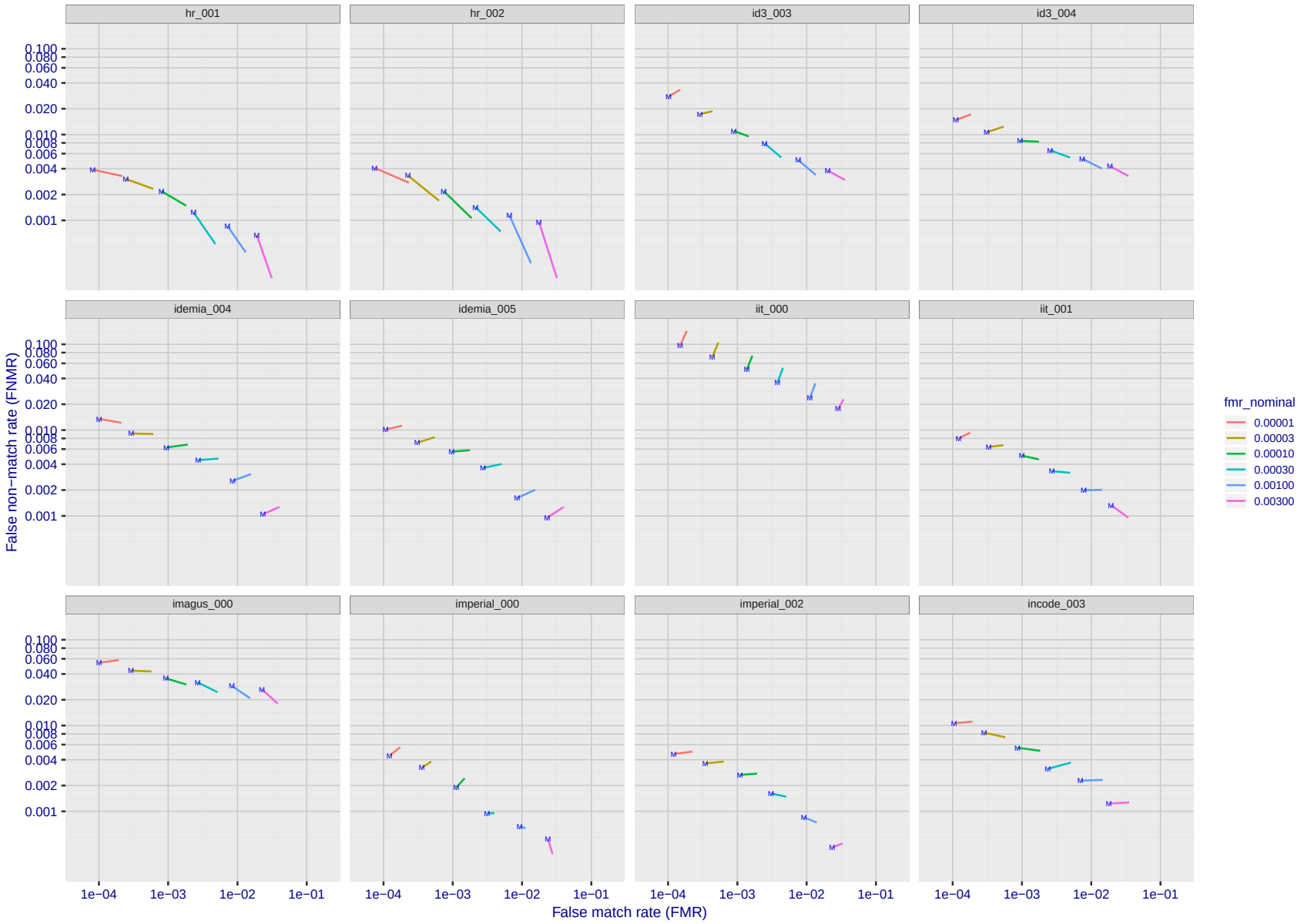


Figure 70: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

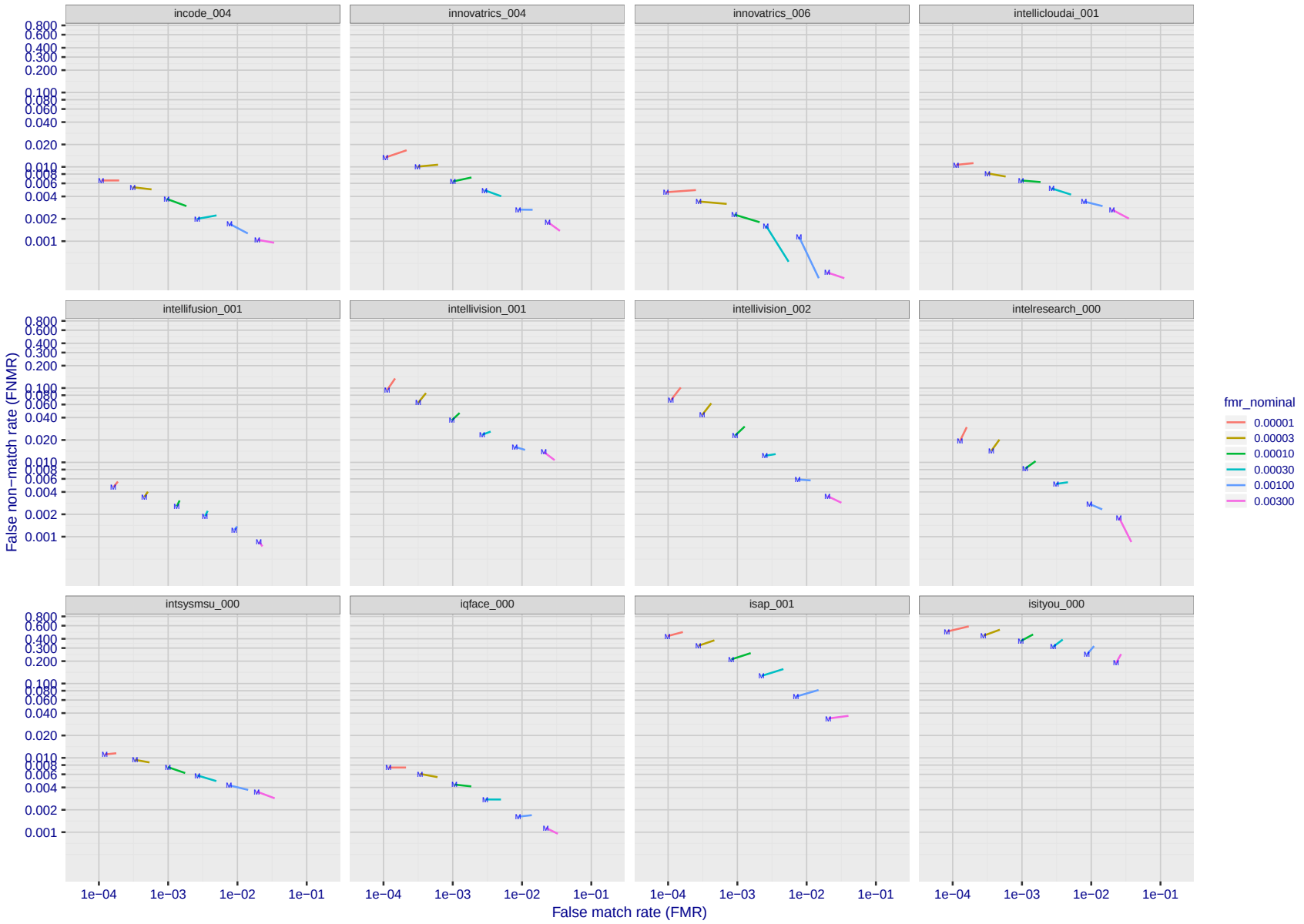


Figure 71: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

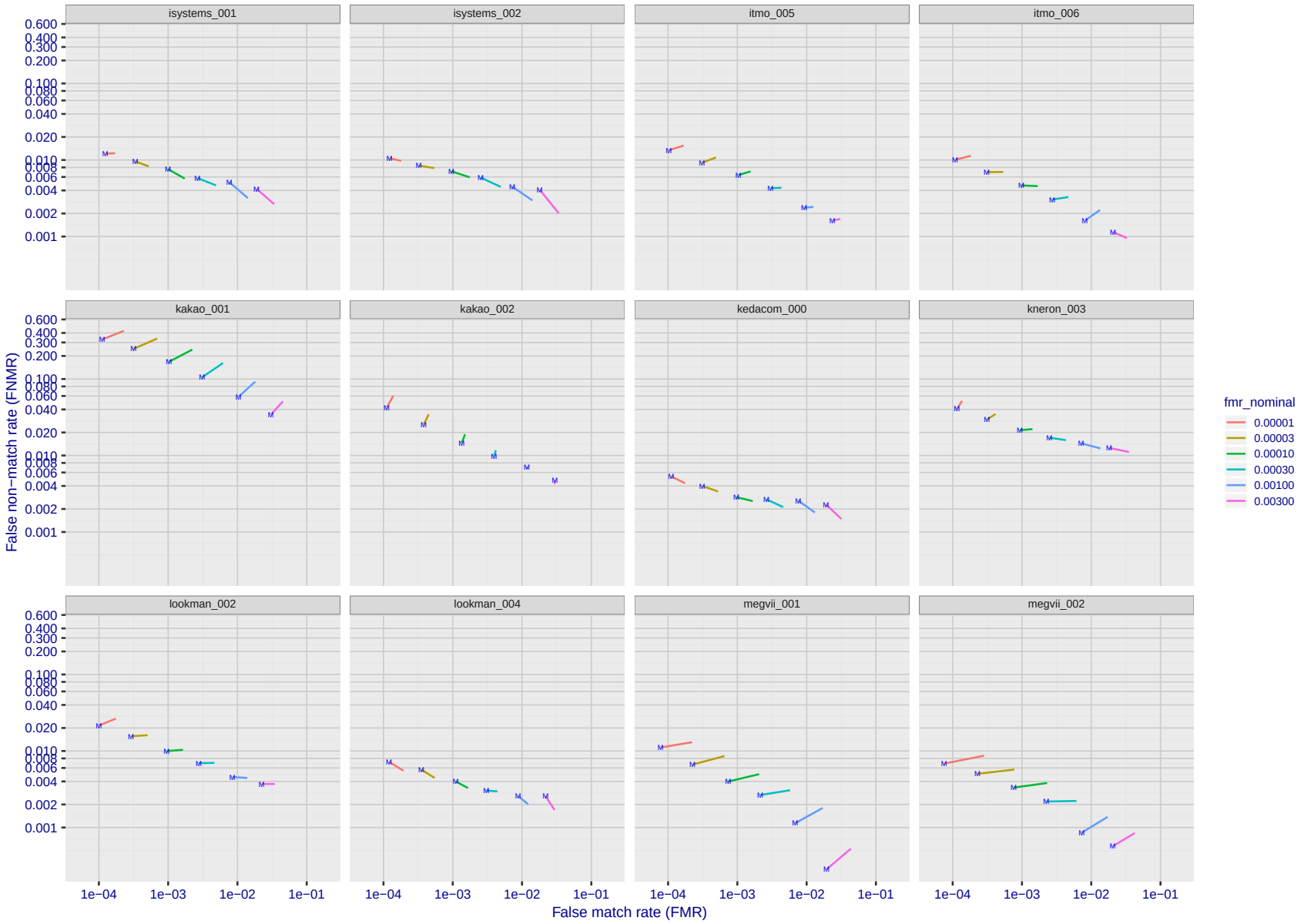


Figure 72: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

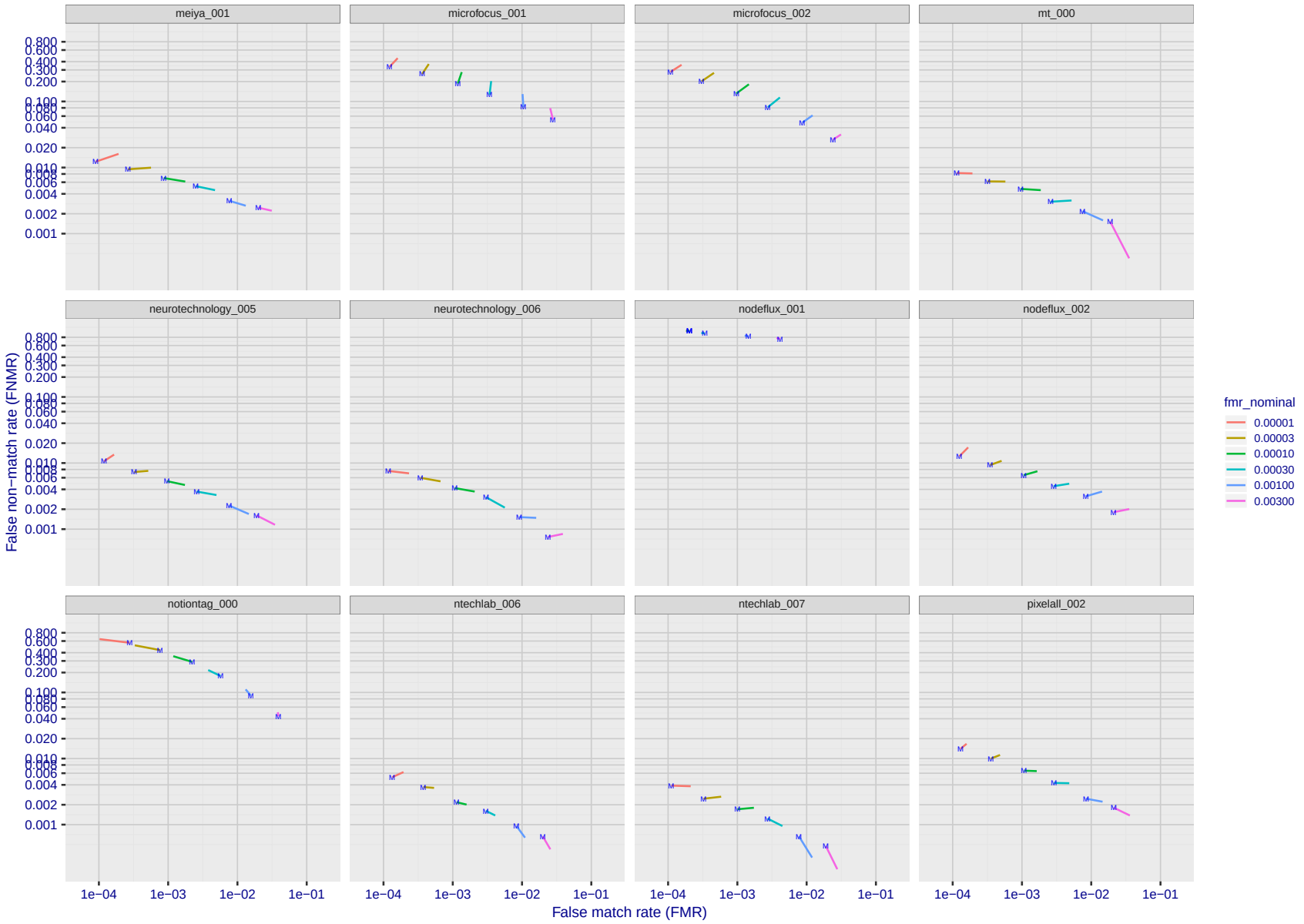


Figure 73: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

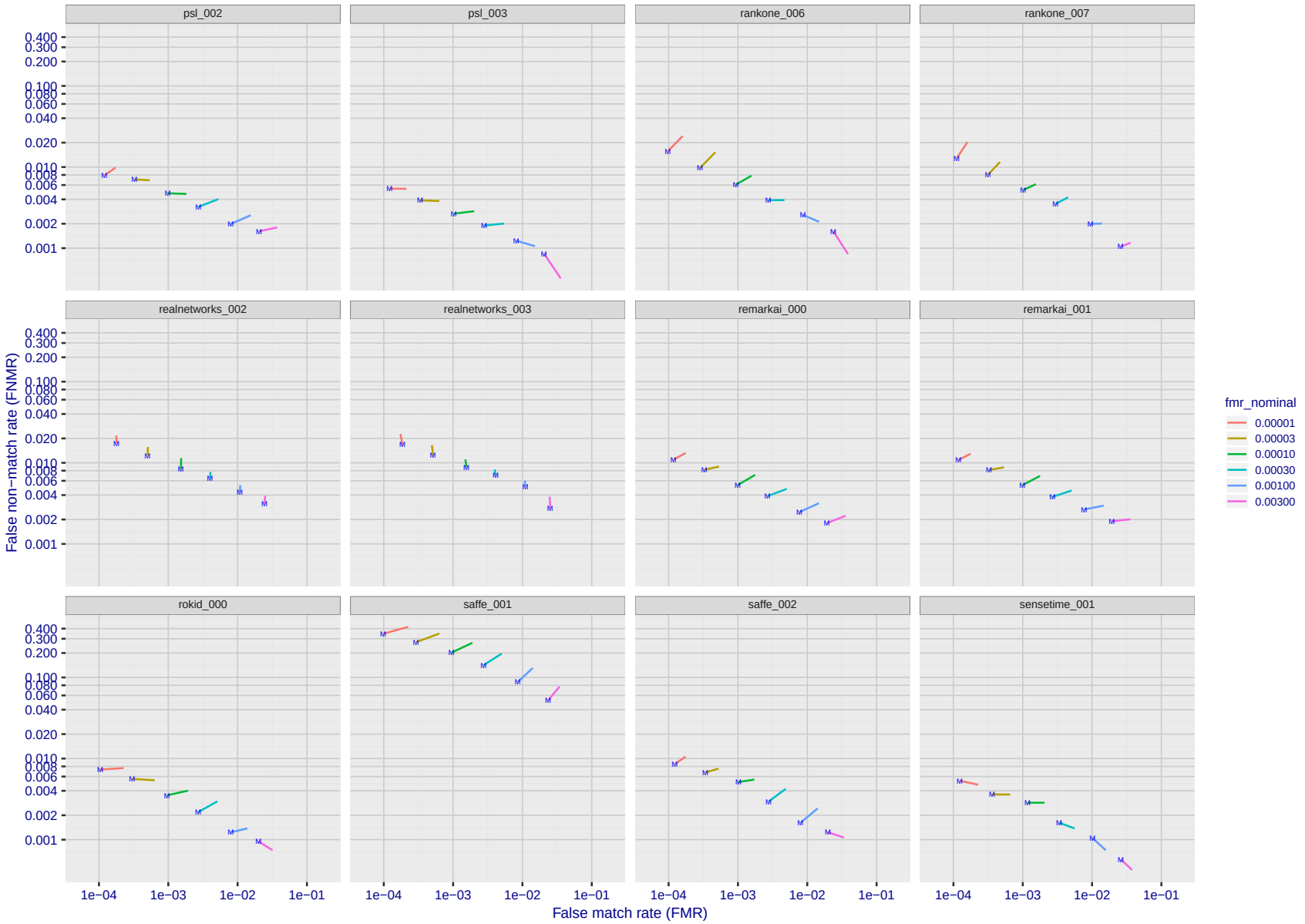


Figure 74: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

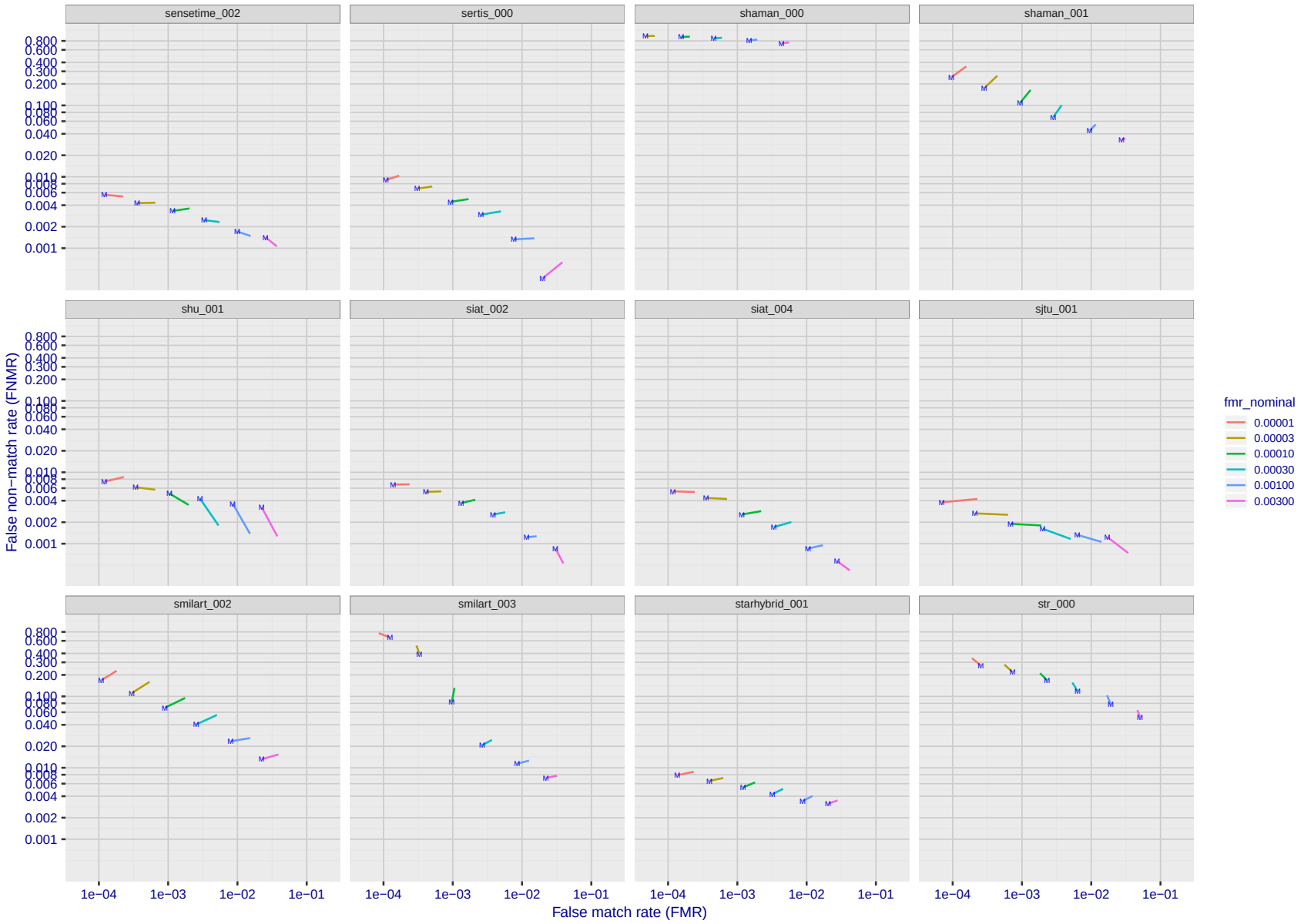


Figure 75: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

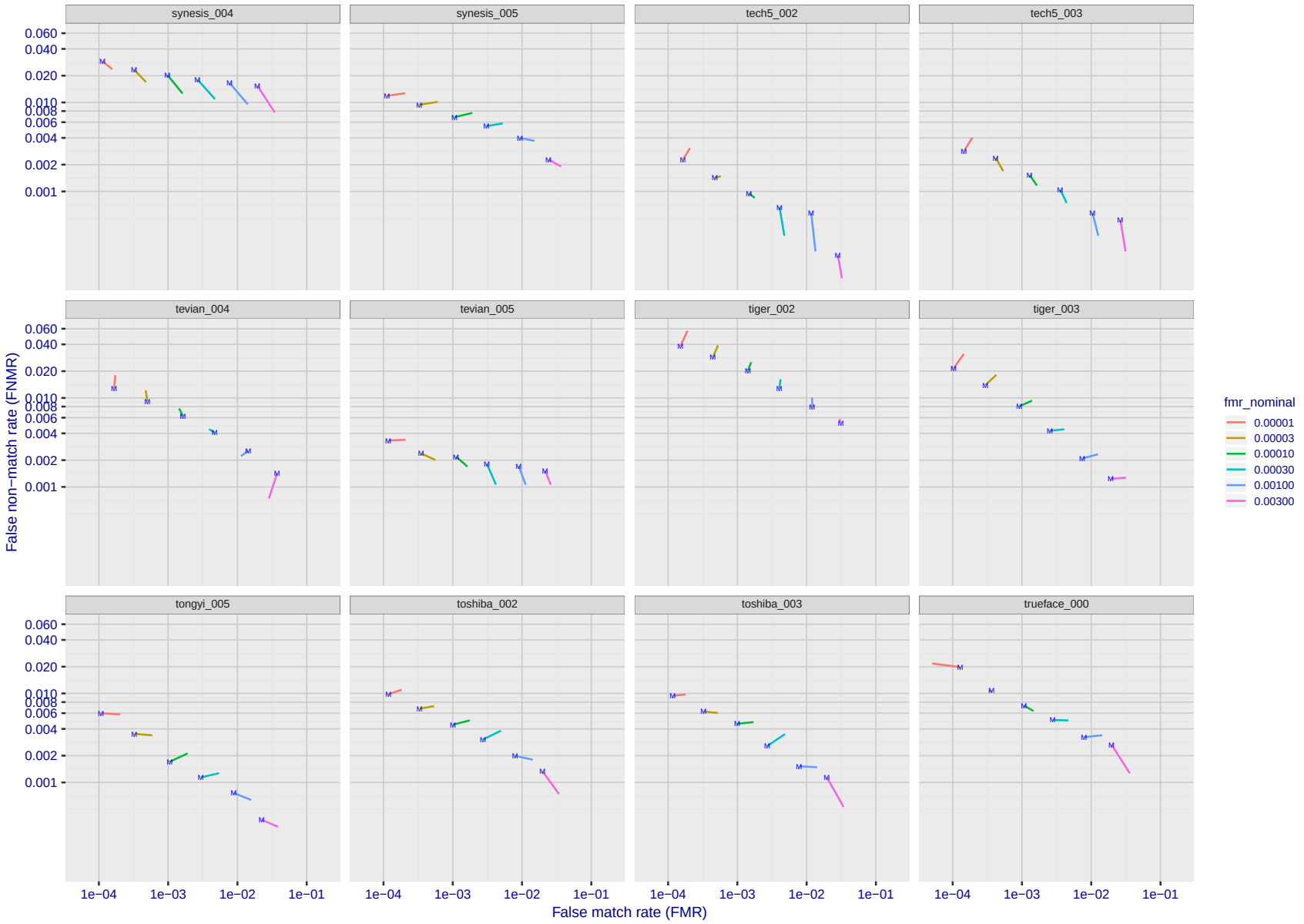


Figure 76: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

2019/10/16 12:43:37
FNMR(T) "False non-match rate"
FMR(T) "False match rate"

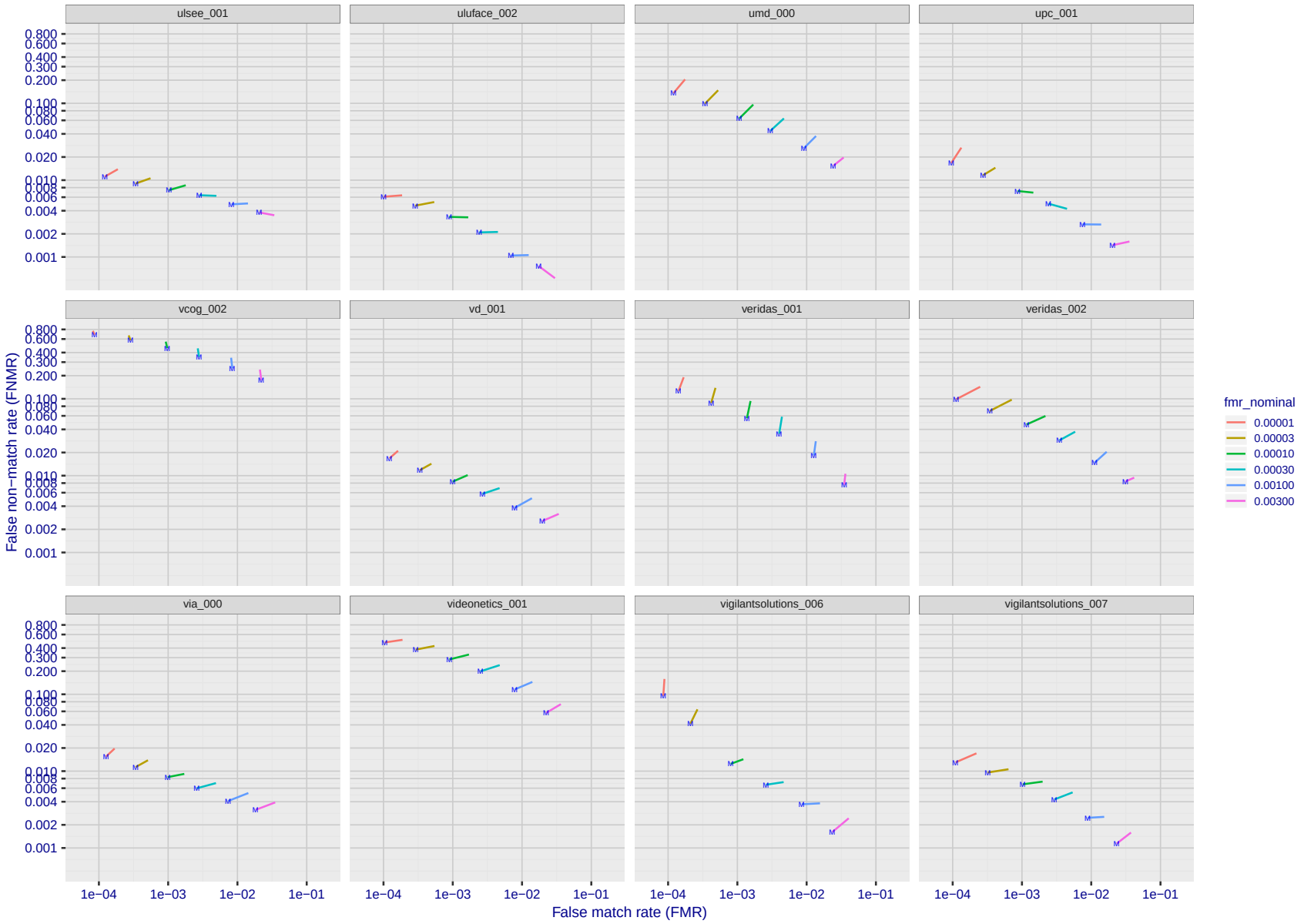


Figure 77: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

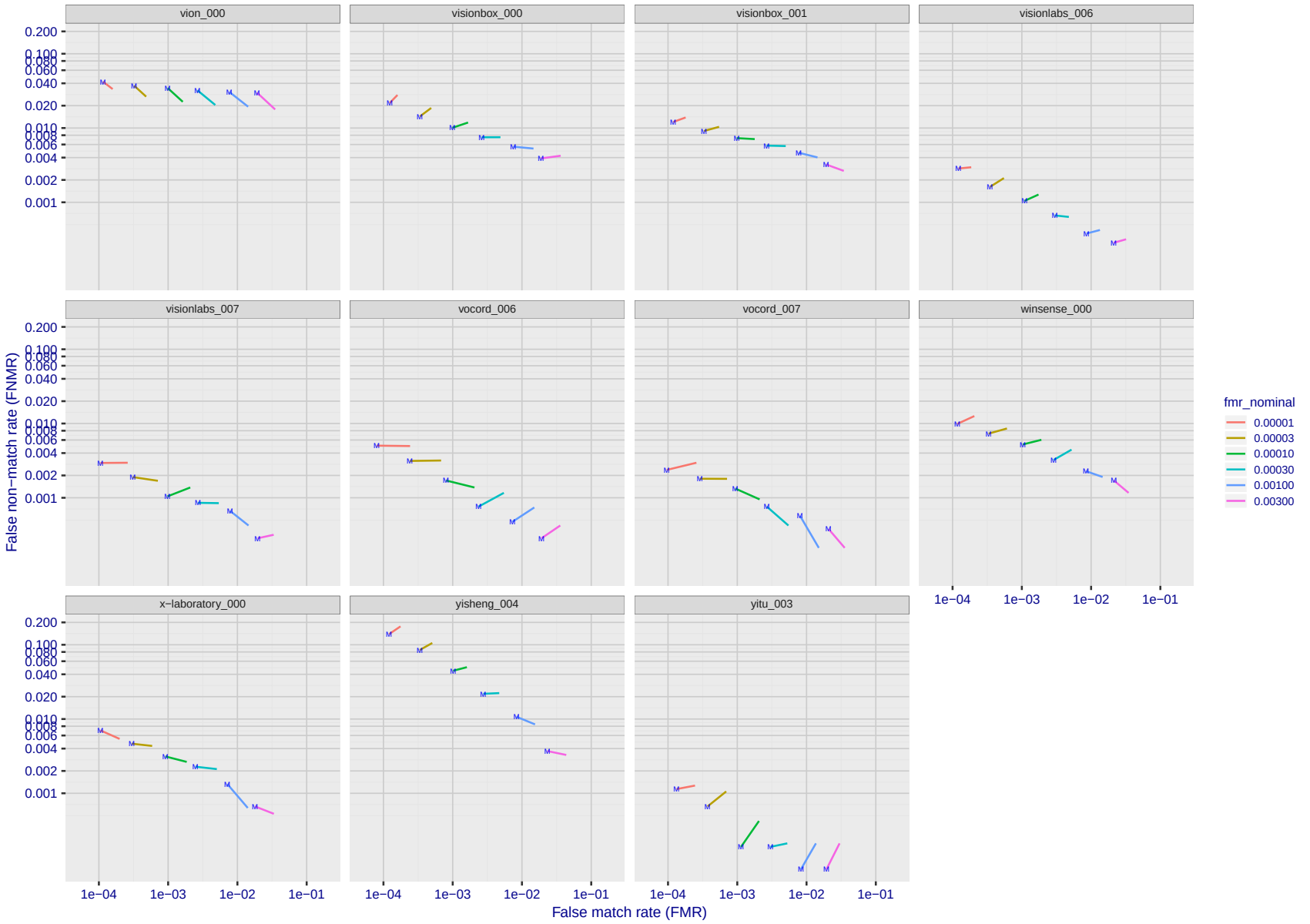


Figure 78: For the visa images, FNMR and FMR at six operating points along the DET characteristic. At each point a line is drawn between (FMR,FNMR)$_{\text{MALE}}$ and (FMR,FNMR)$_{\text{FEMALE}}$ showing how which sex has lower FMR and/or FNMR. The "M" label denotes male, the other end of the line corresponds to female. The six operating thresholds are selected to give the nominal false match rates given in the legend, and are computed over all impostor pairs regardless of age, sex, and place of birth. The plotted FMR values are broadly an order of magnitude larger than the nominal rates because FMR is computed over demographically-matched impostor pairs i.e individuals of the same sex, from the same geographic region (see section 3.6.1), and the same age group (see section 3.6.2).

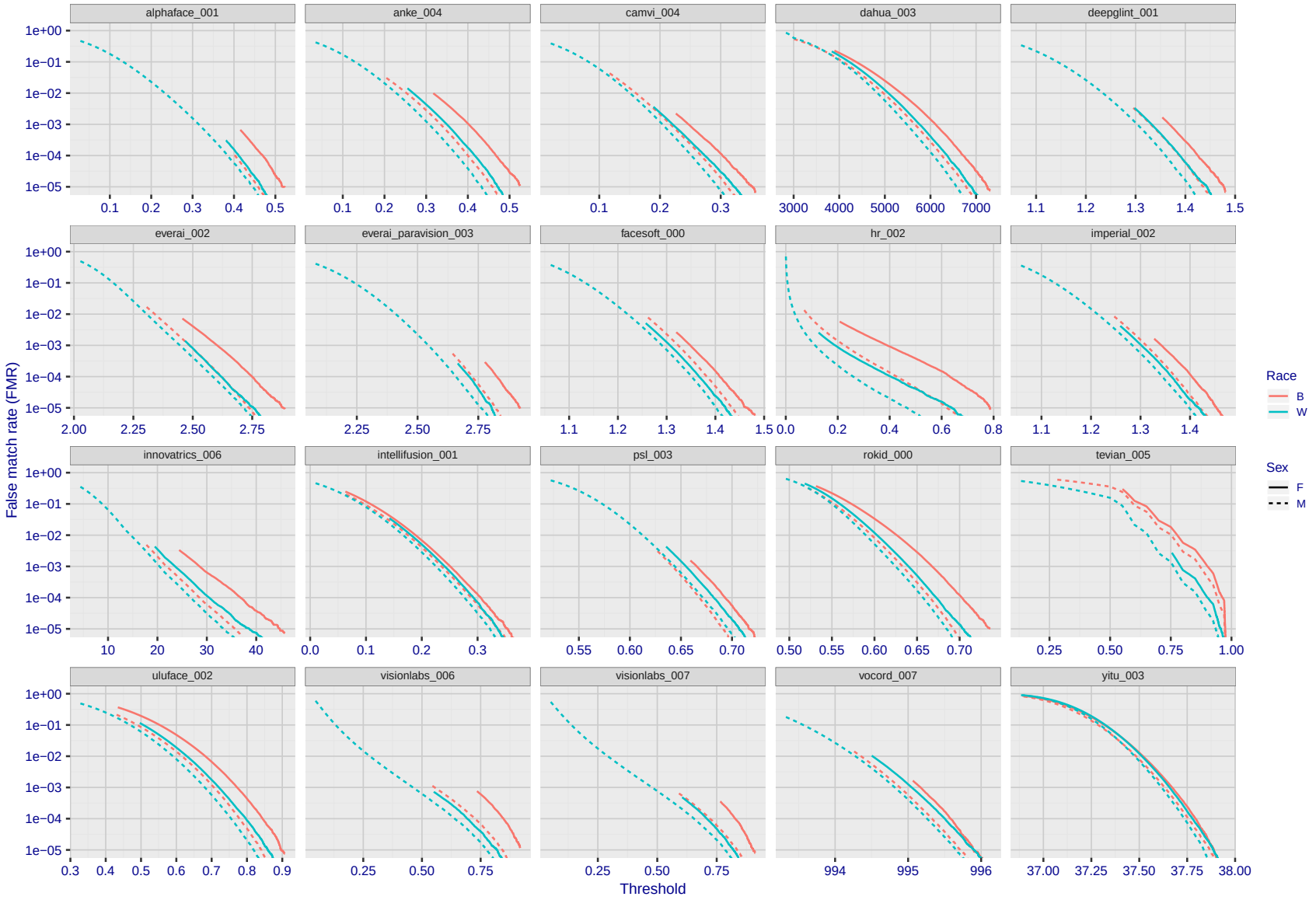


Figure 79: For the mugshot images, the false match calibration curves show false match rate vs. threshold. Separate curves appear for white females, black females, black males and white males.

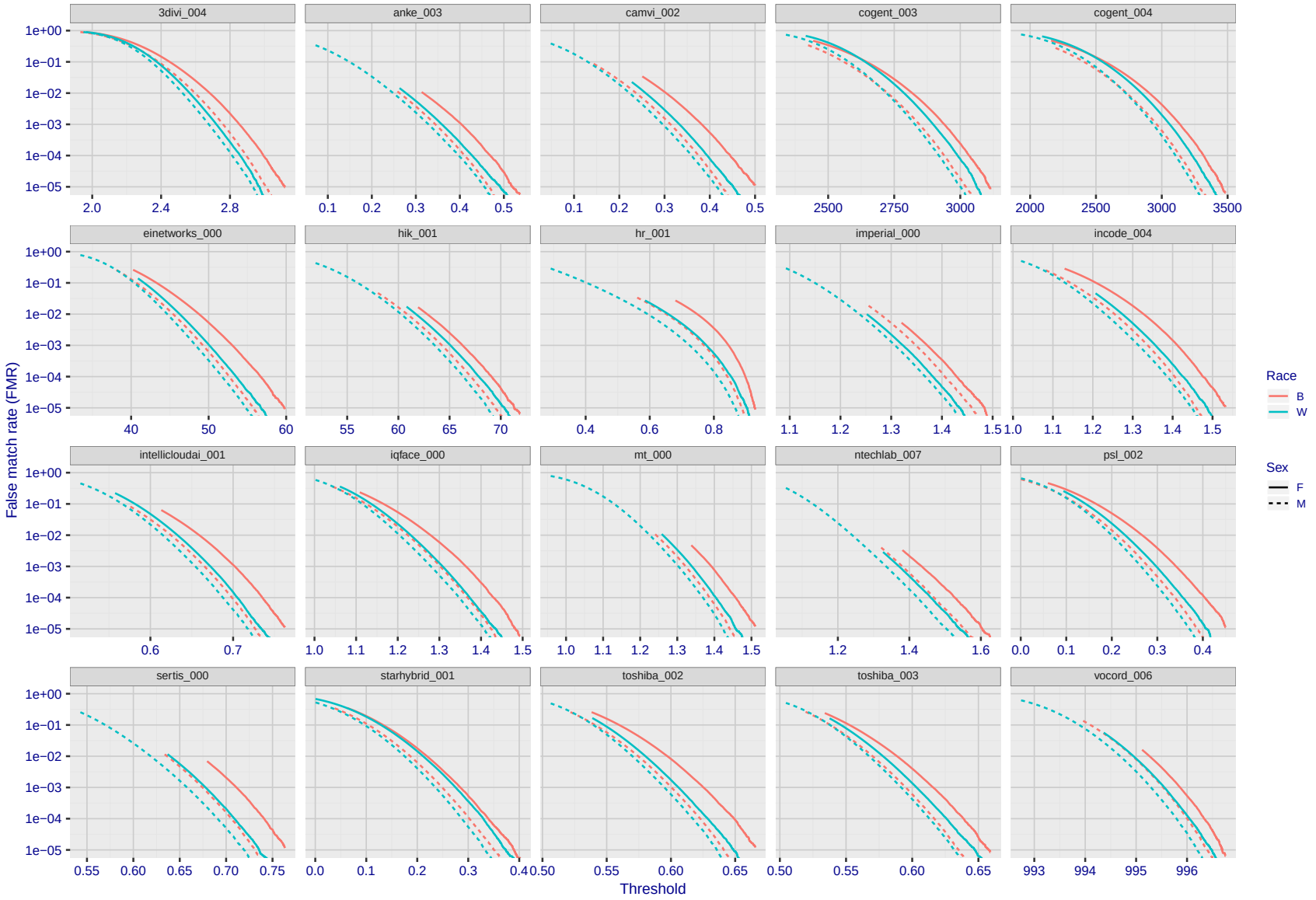


Figure 80: For the mugshot images, the false match calibration curves show false match rate vs. threshold. Separate curves appear for white females, black females, black males and white males.

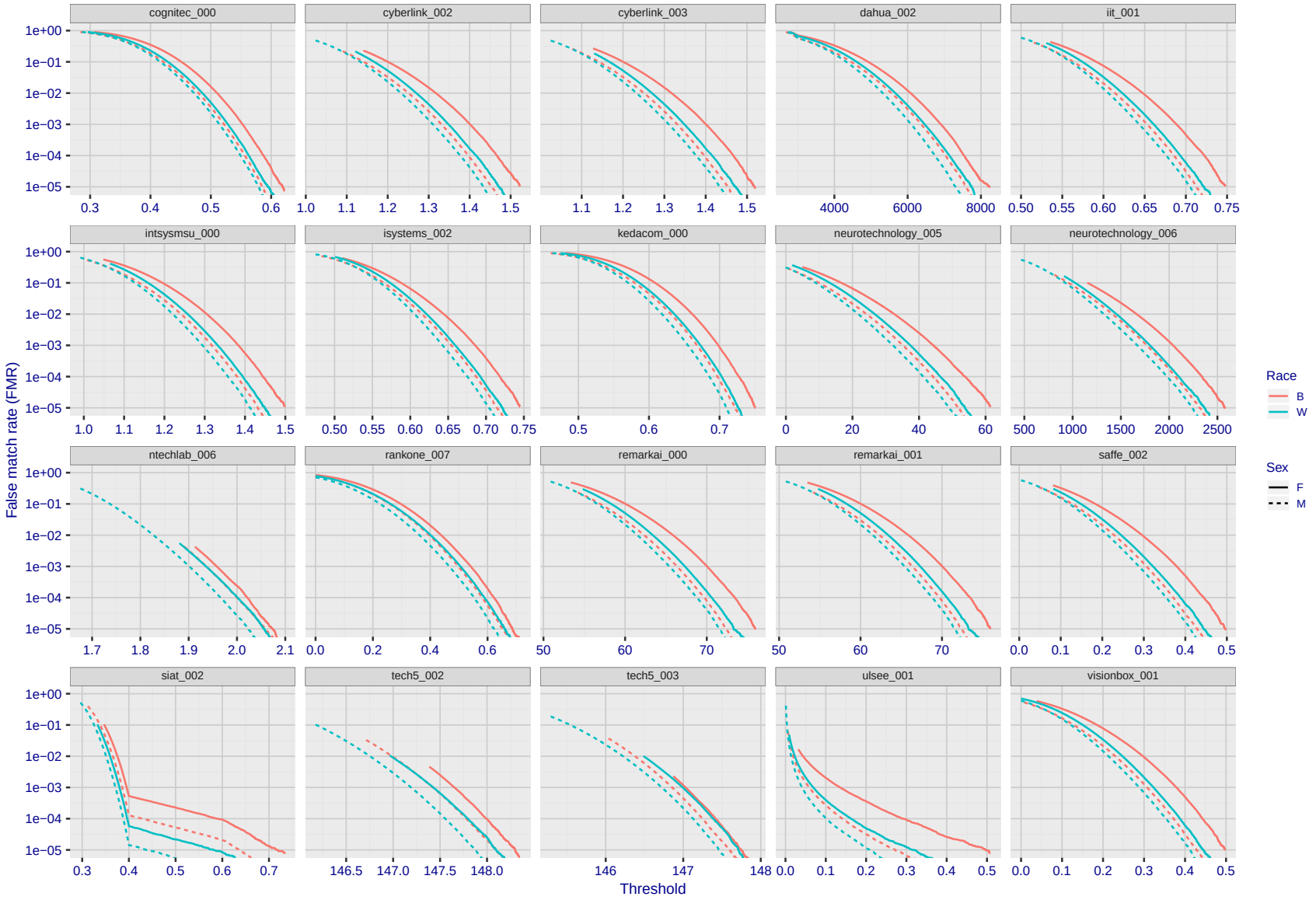


Figure 81: For the mugshot images, the false match calibration curves show false match rate vs. threshold. Separate curves appear for white females, black females, black males and white males.

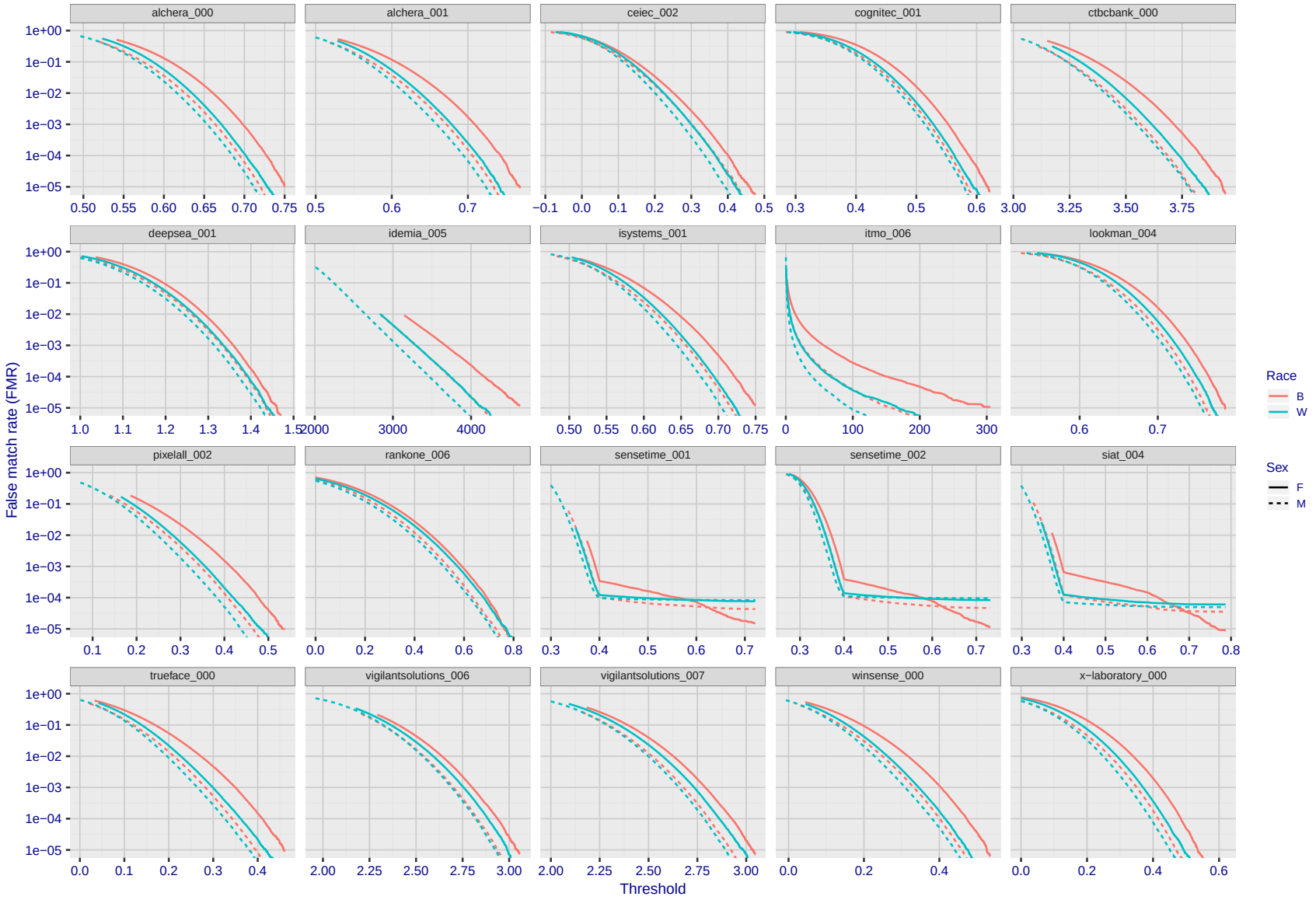


Figure 82: For the mugshot images, the false match calibration curves show false match rate vs. threshold. Separate curves appear for white females, black females, black males and white males.

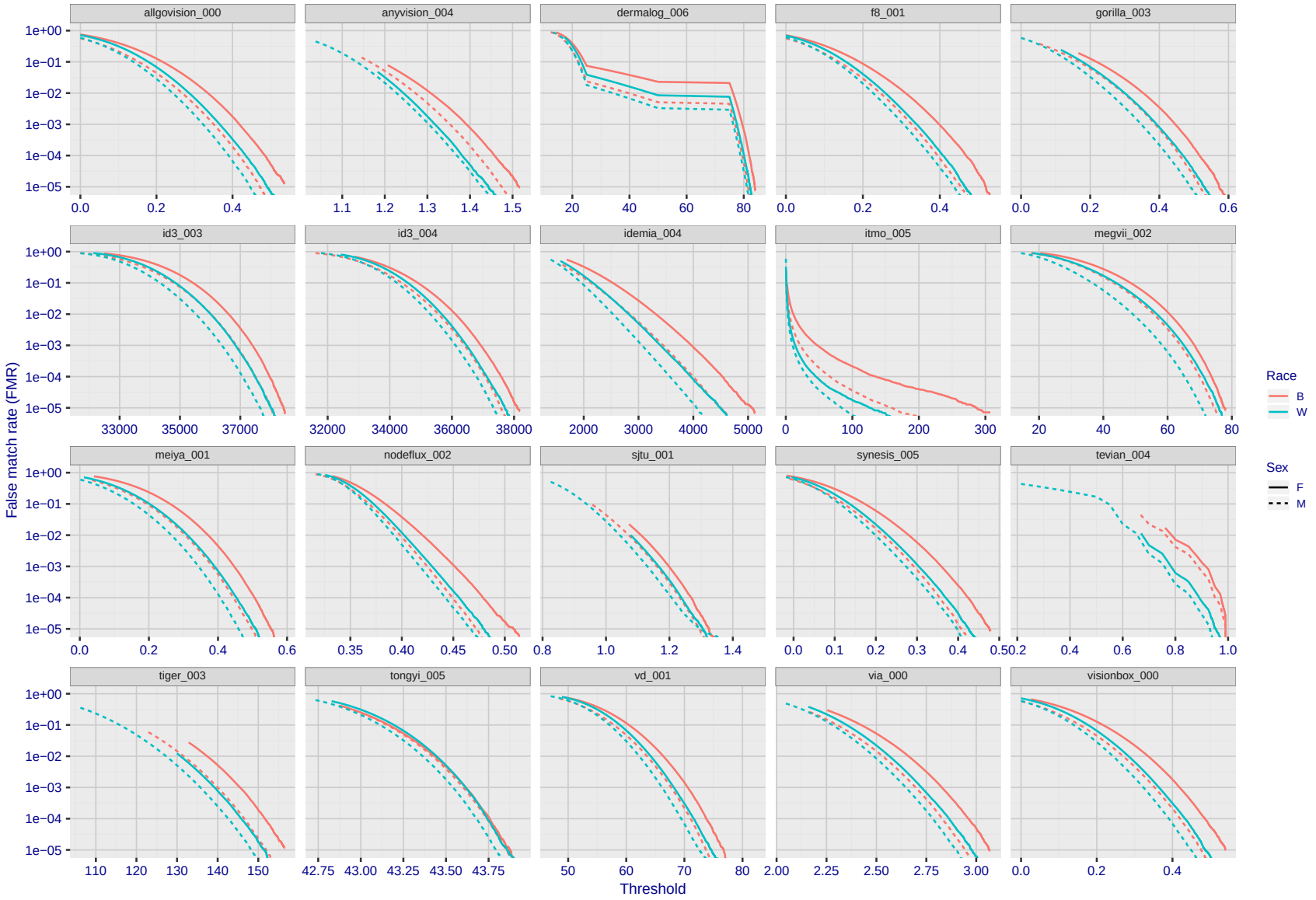


Figure 83: For the mugshot images, the false match calibration curves show false match rate vs. threshold. Separate curves appear for white females, black females, black males and white males.

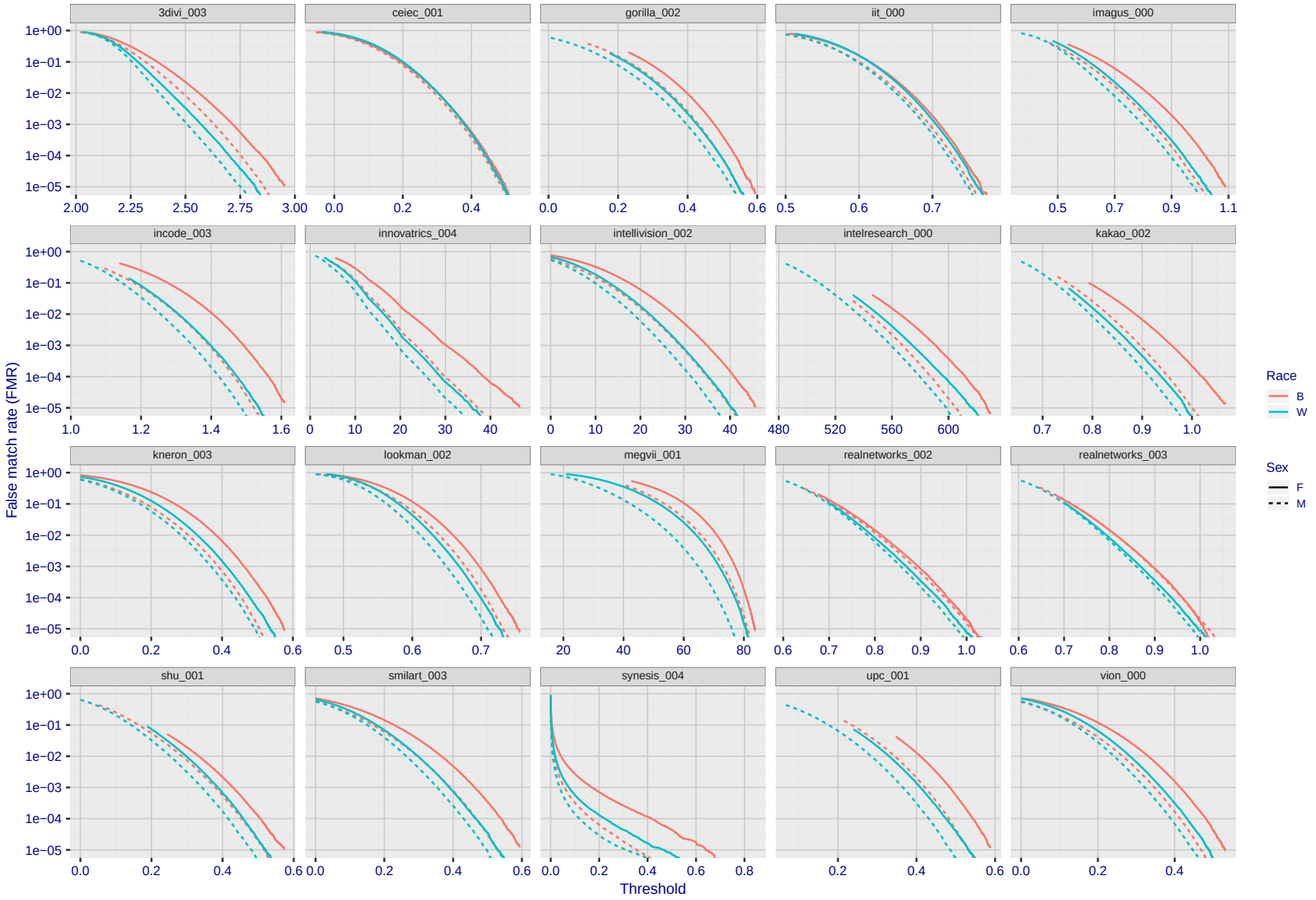


Figure 84: For the mugshot images, the false match calibration curves show false match rate vs. threshold. Separate curves appear for white females, black females, black males and white males.

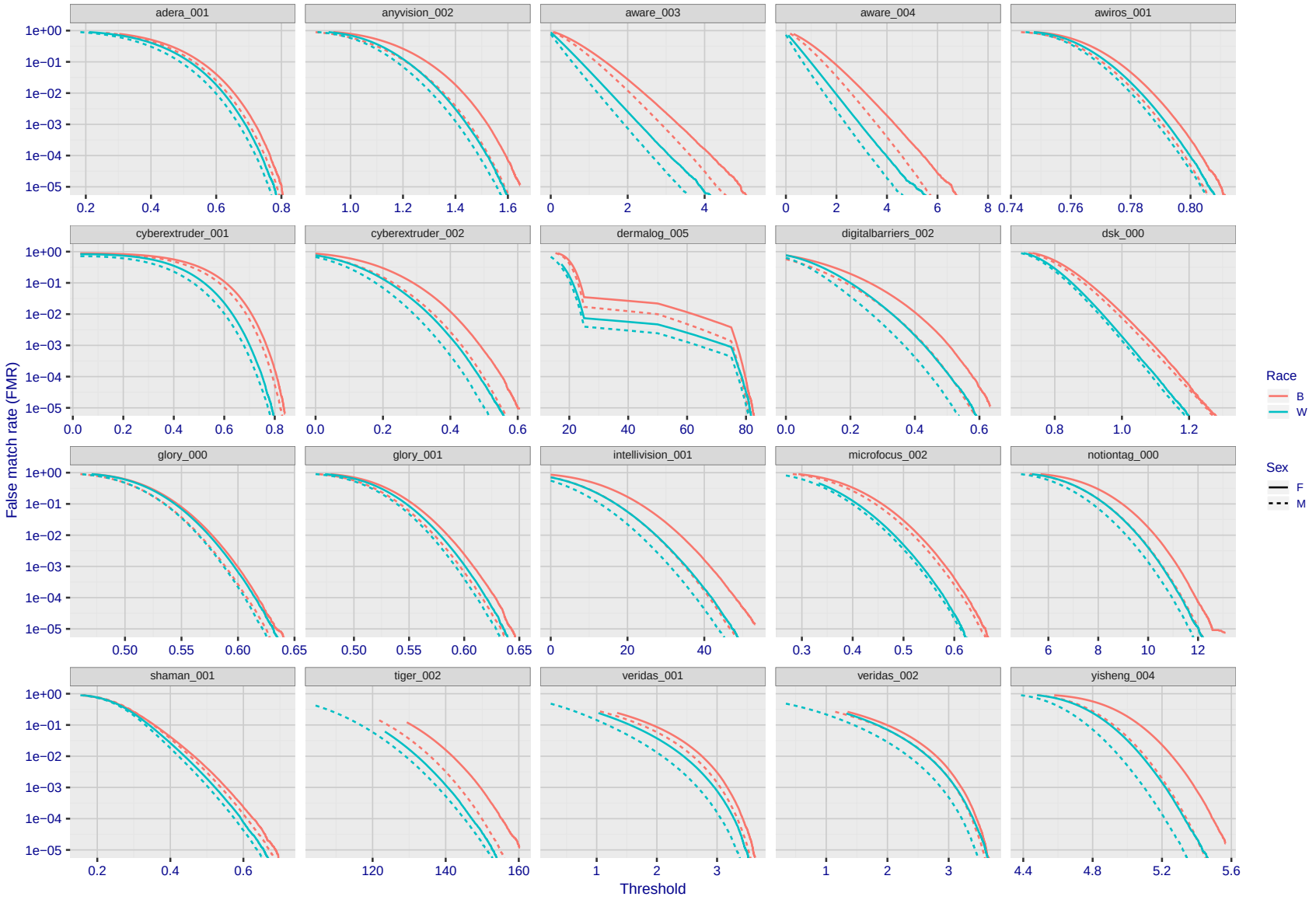


Figure 85: For the mugshot images, the false match calibration curves show false match rate vs. threshold. Separate curves appear for white females, black females, black males and white males.

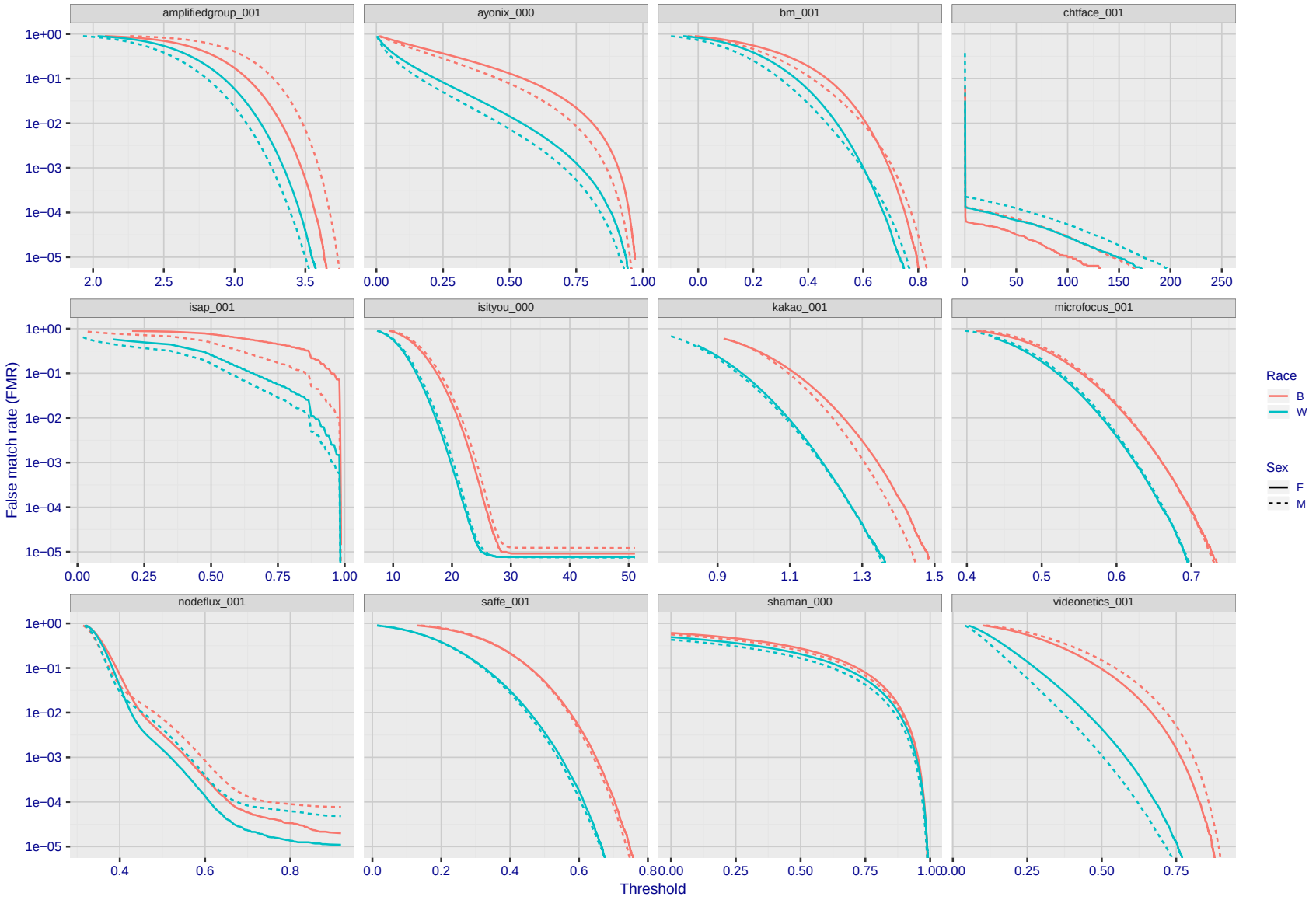


Figure 86: For the mugshot images, the false match calibration curves show false match rate vs. threshold. Separate curves appear for white females, black females, black males and white males.

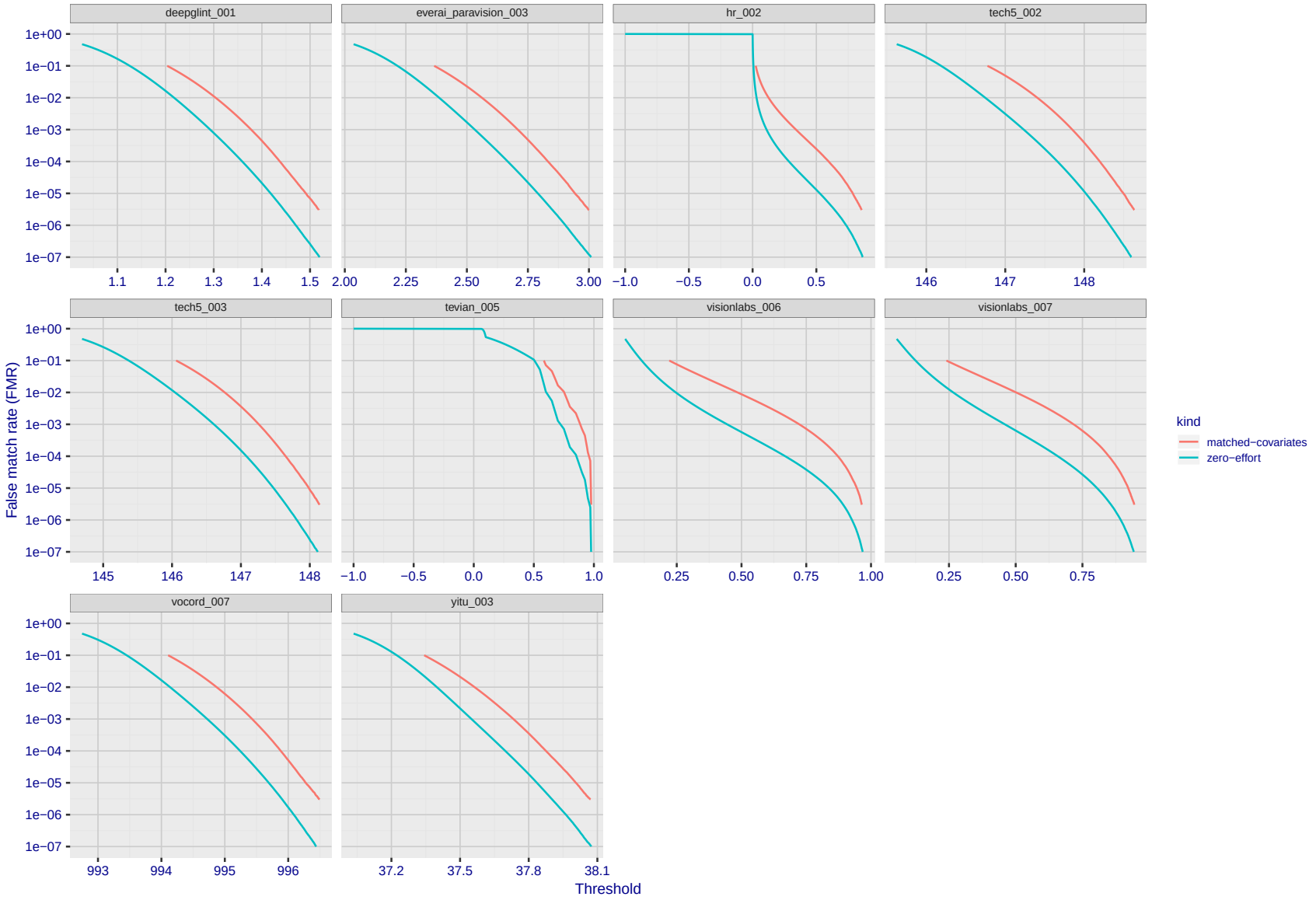


Figure 87: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

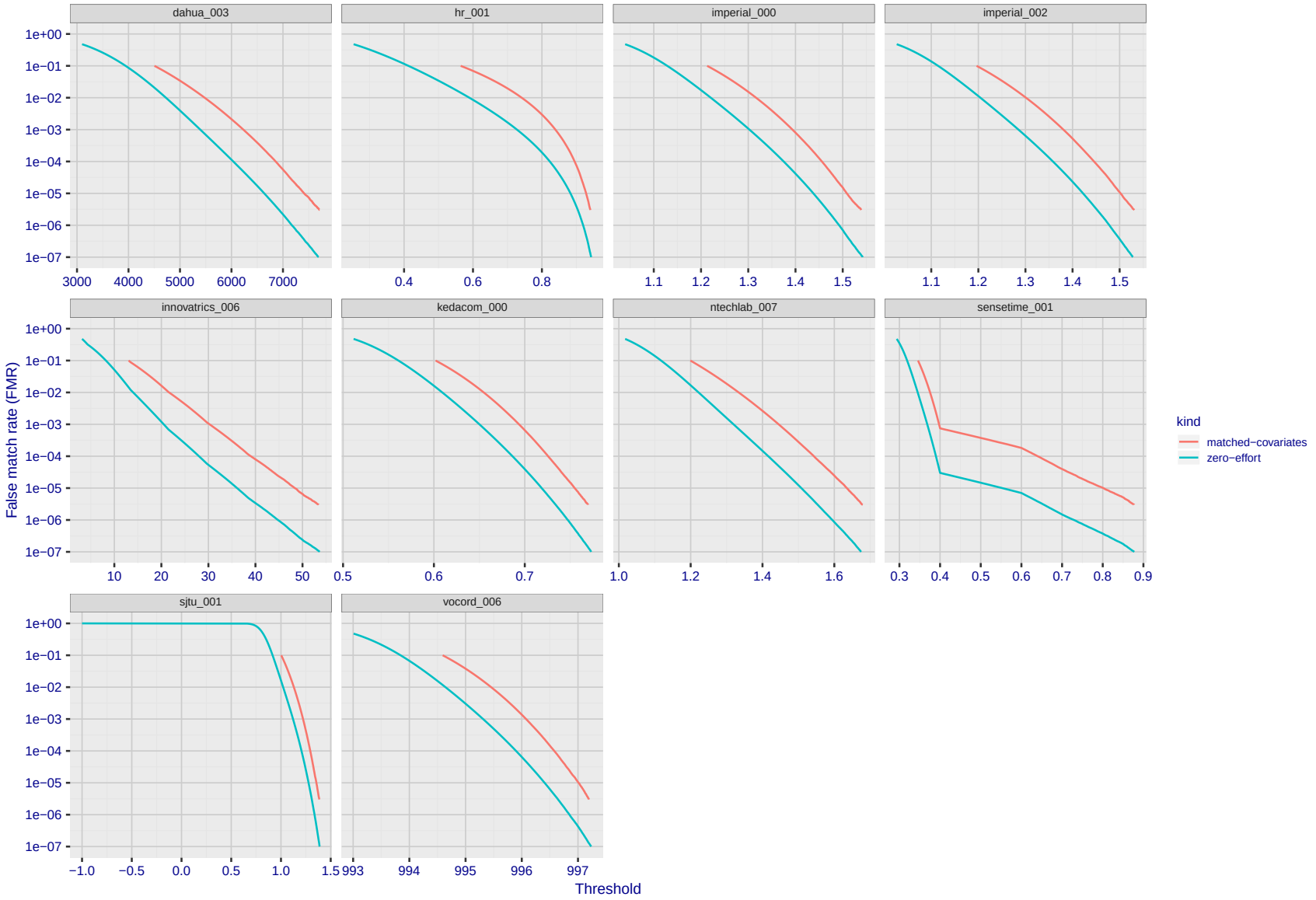


Figure 88: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

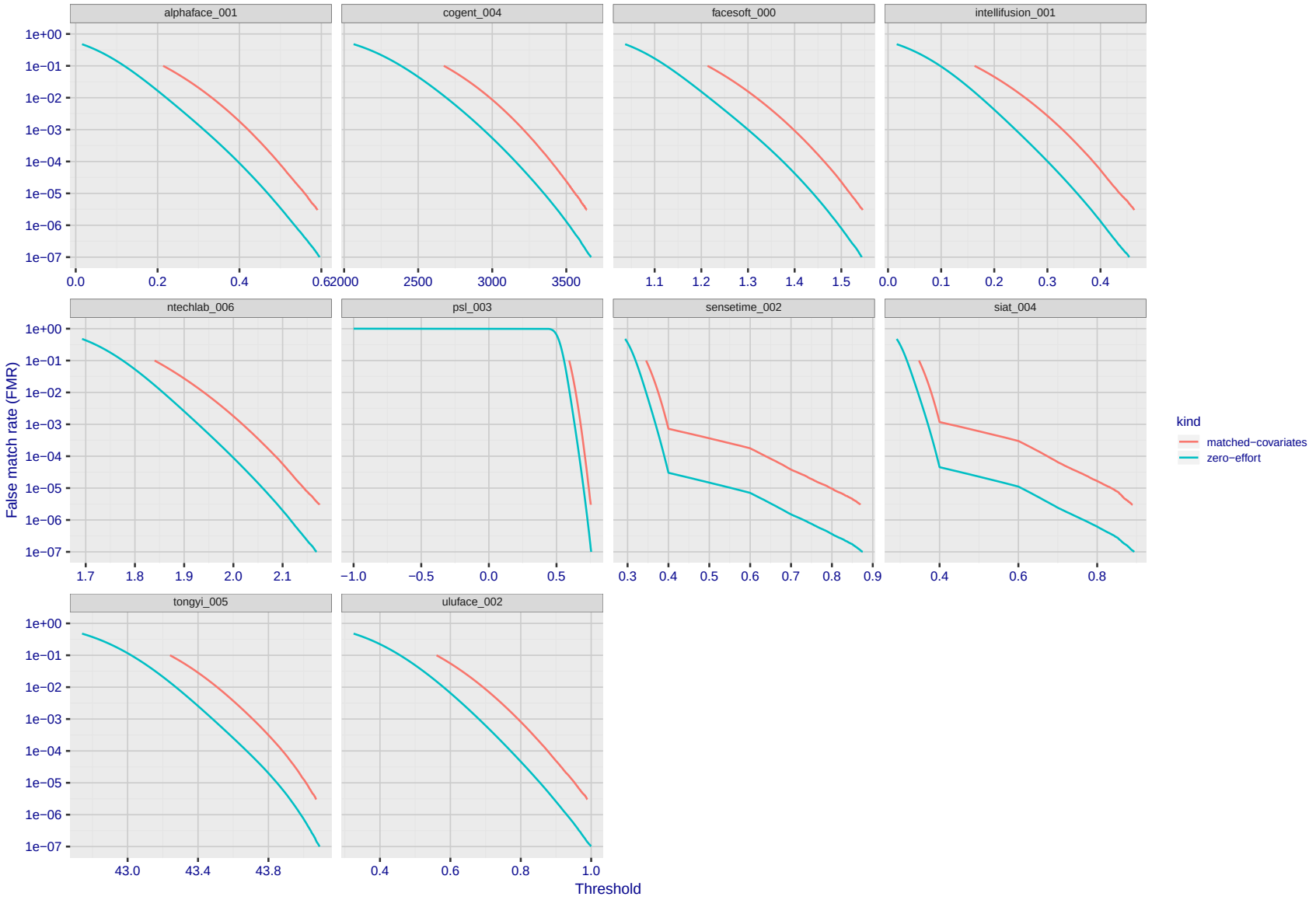


Figure 89: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

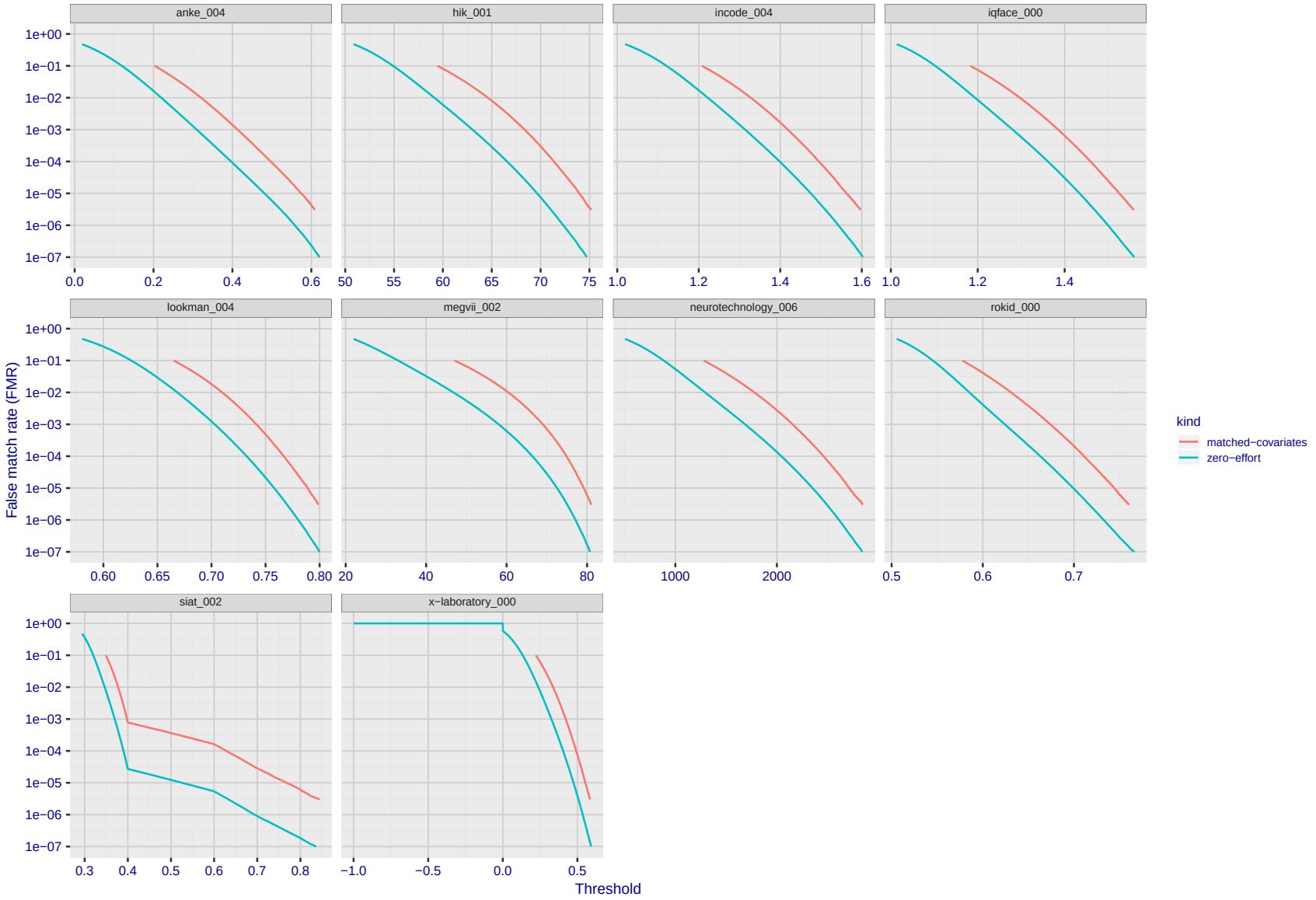


Figure 90: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

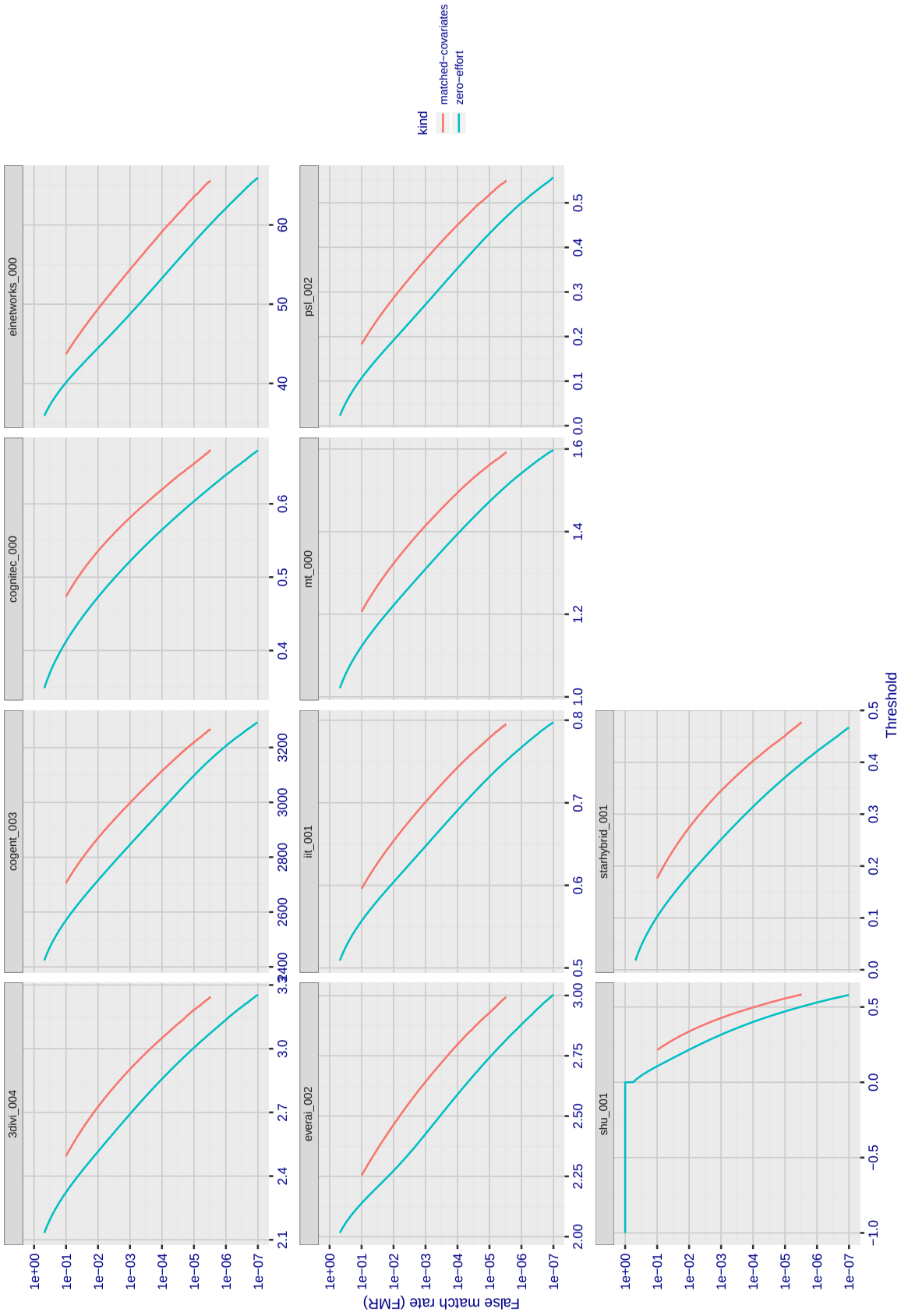


Figure 91: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

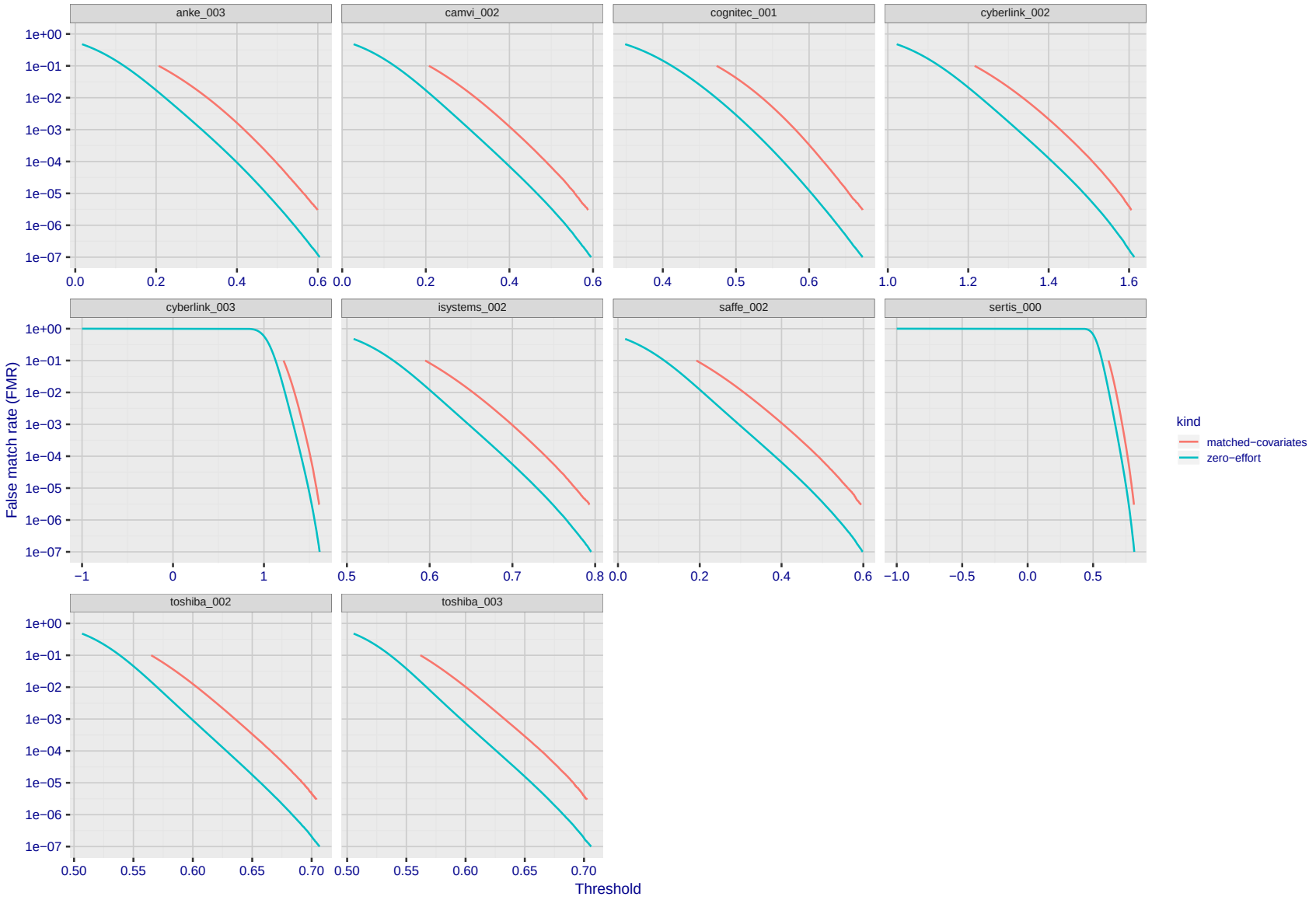


Figure 92: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

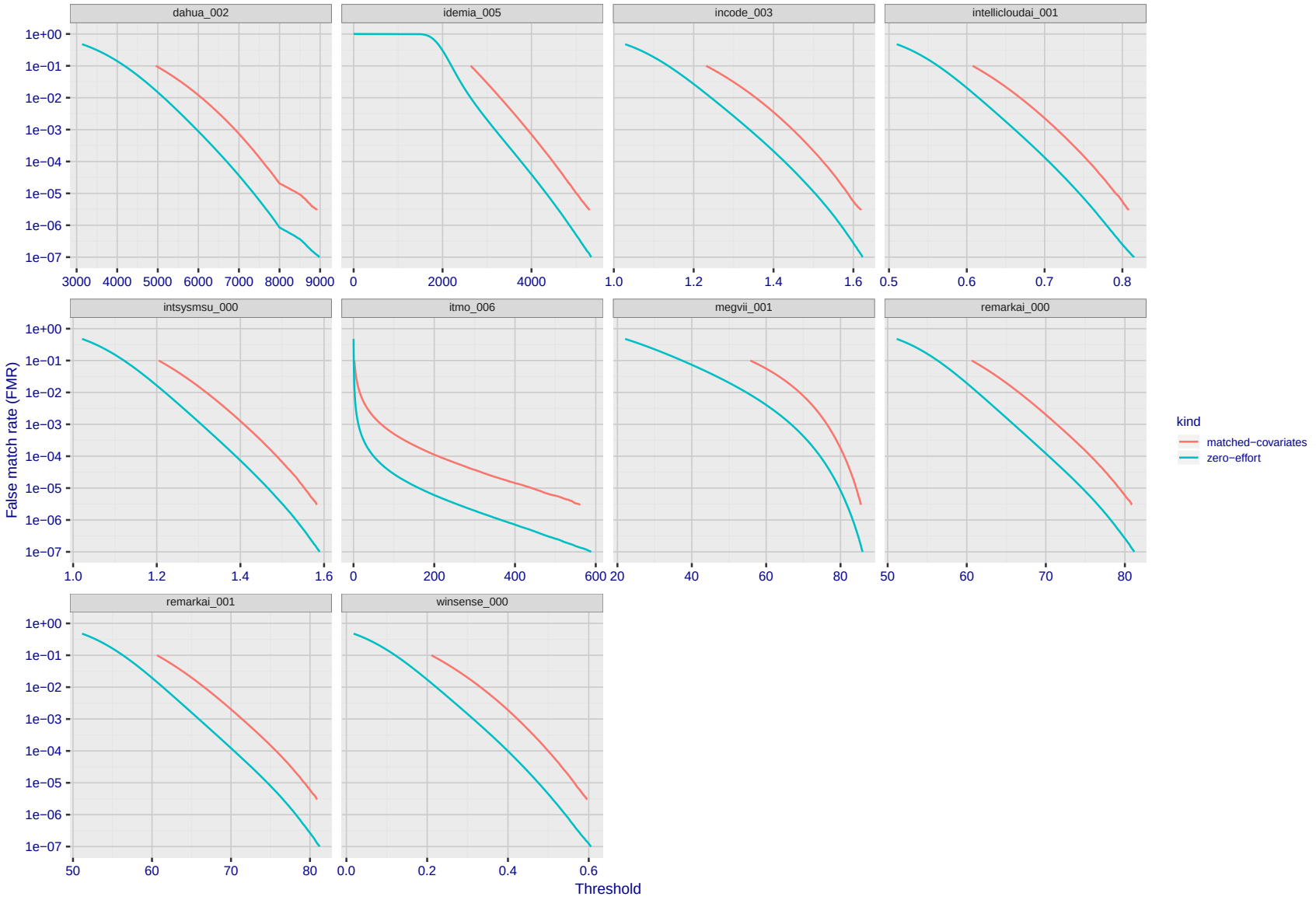


Figure 93: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

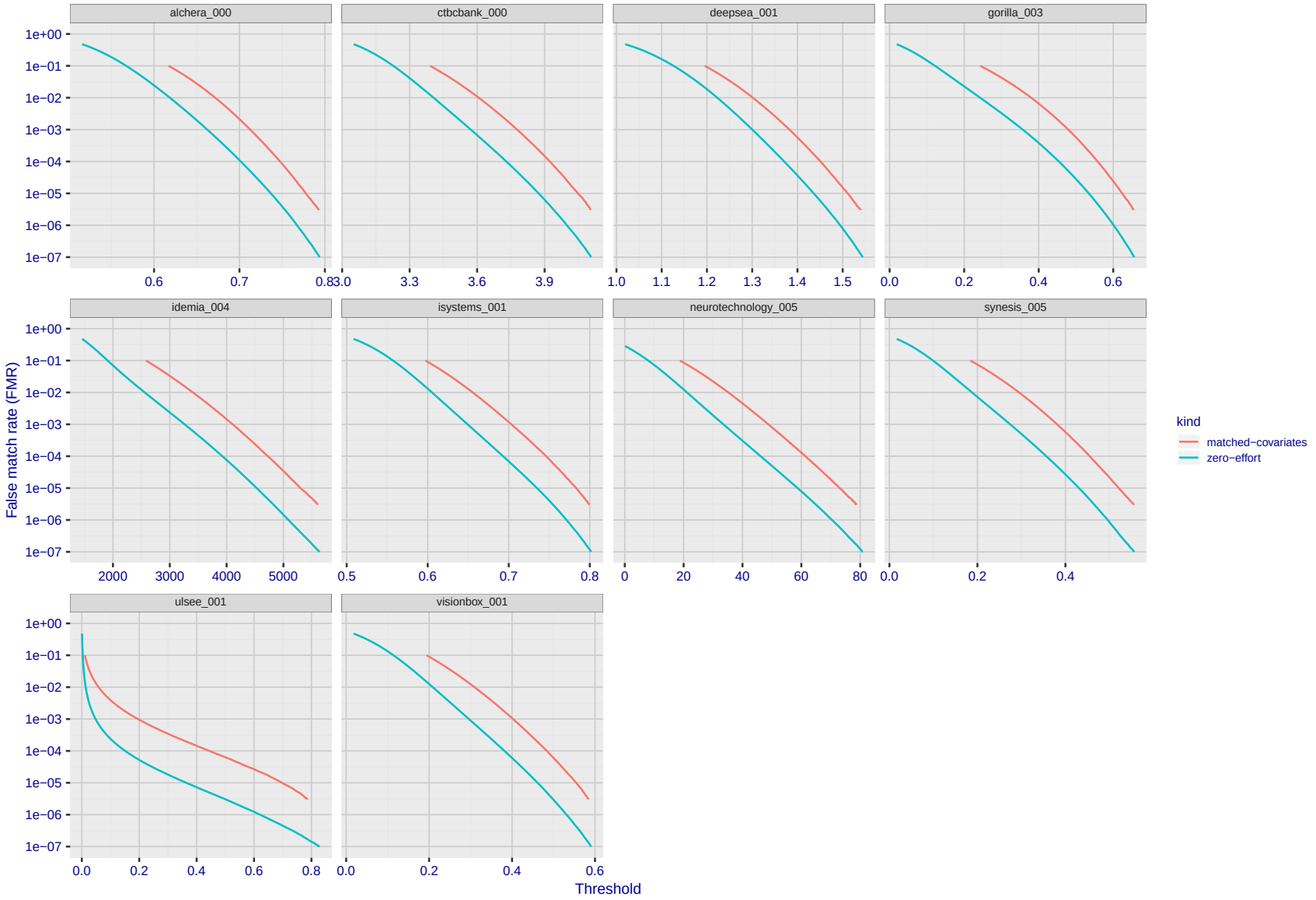


Figure 94: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

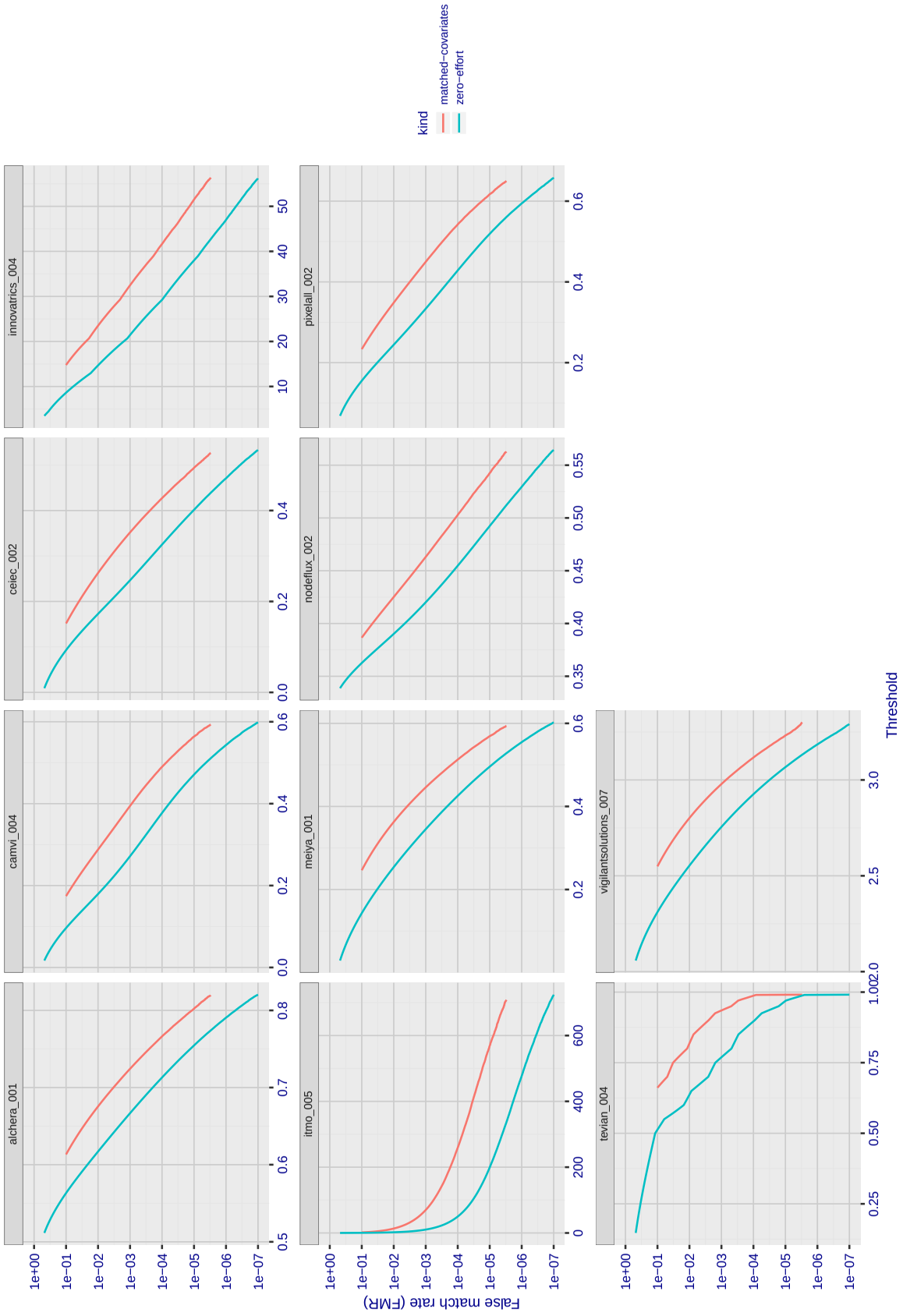


Figure 95: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

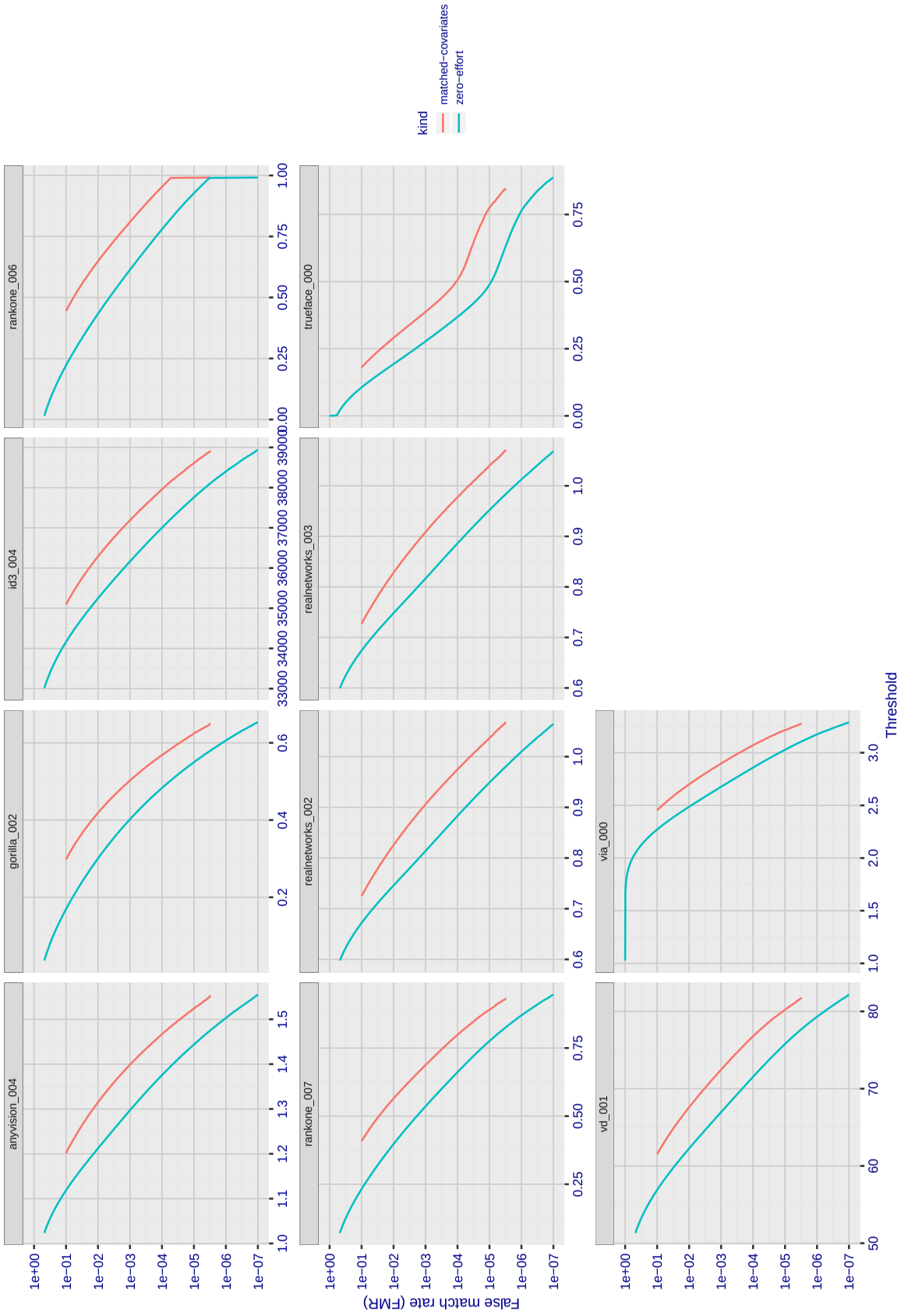


Figure 96: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

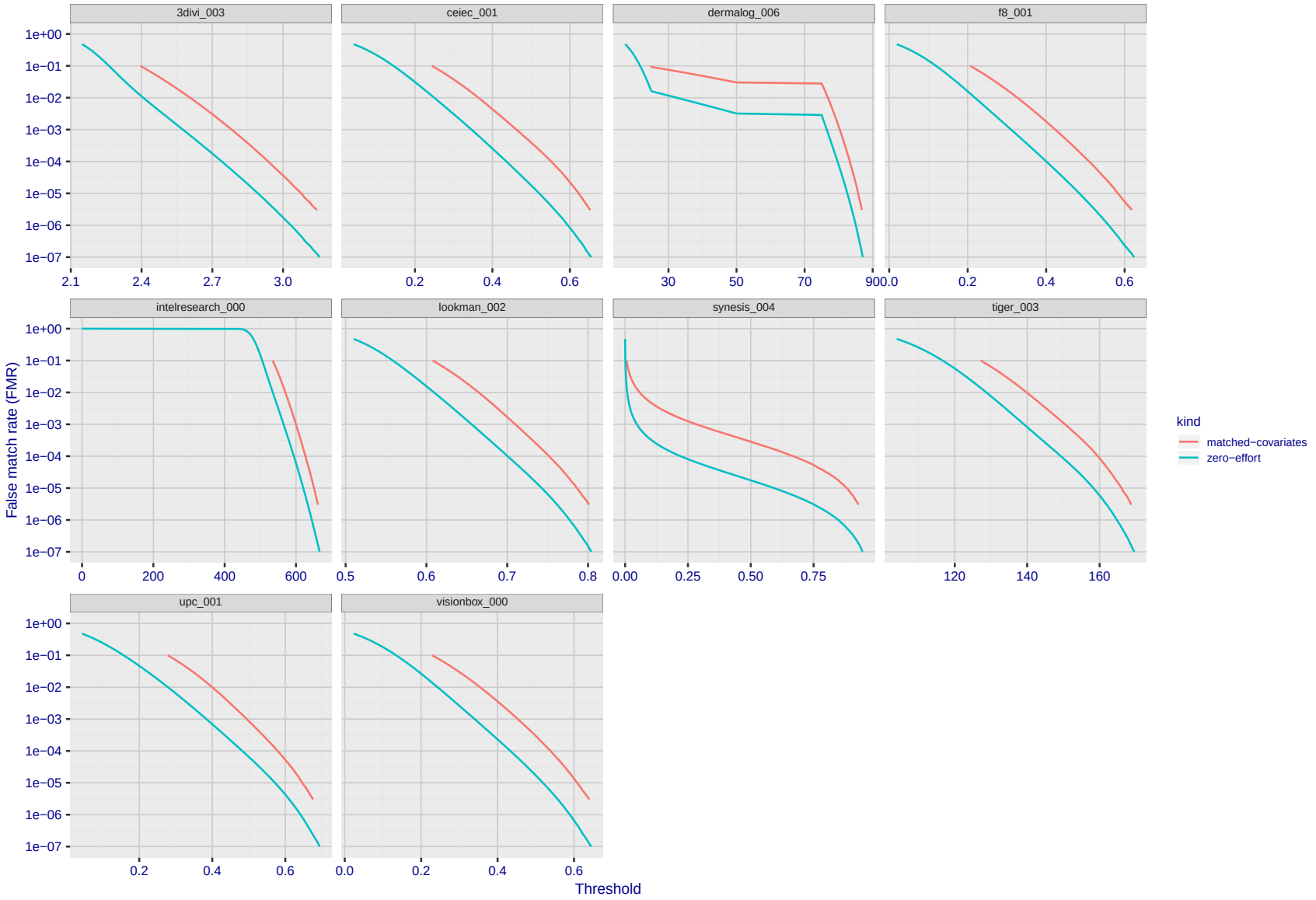


Figure 97: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

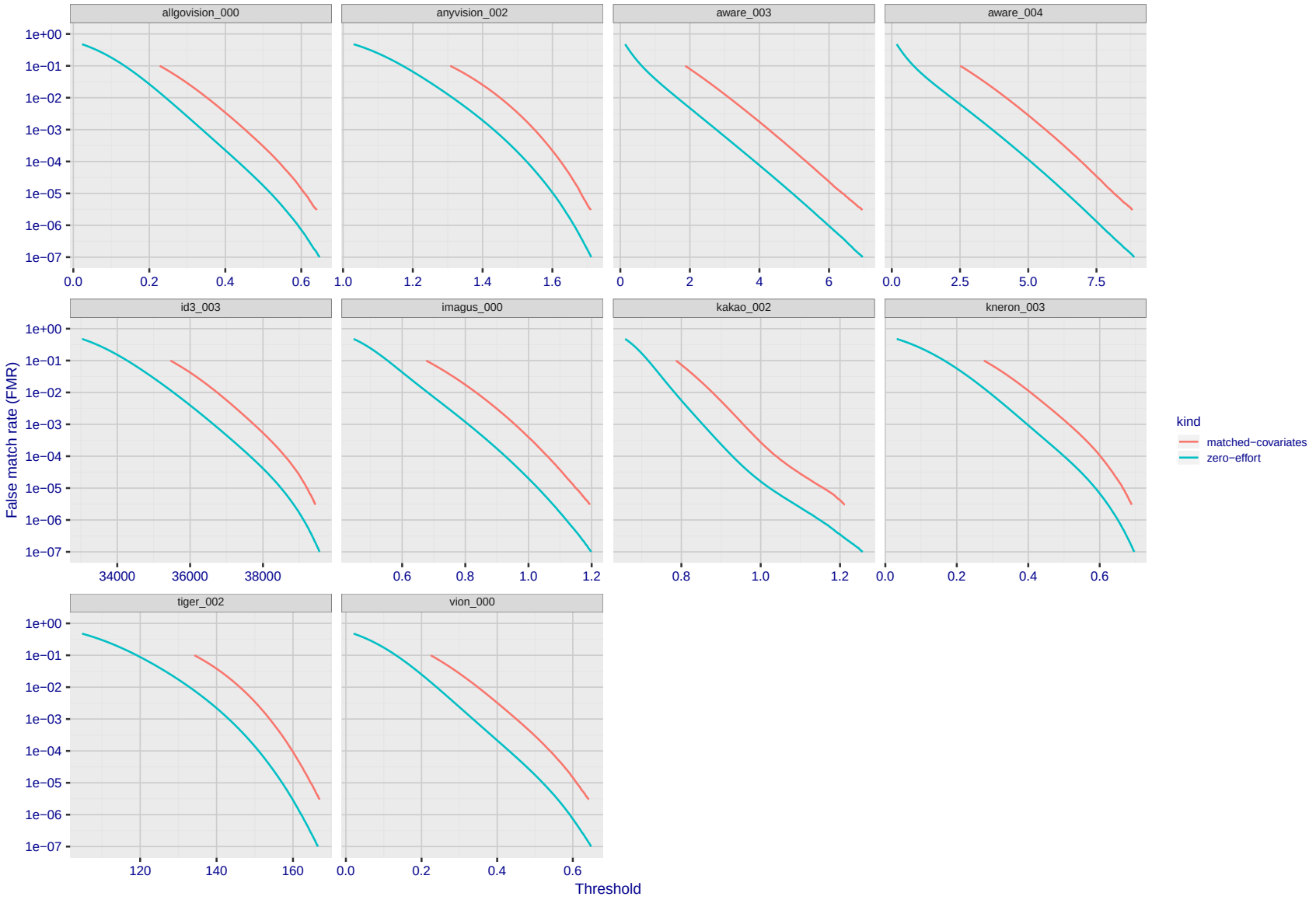


Figure 98: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

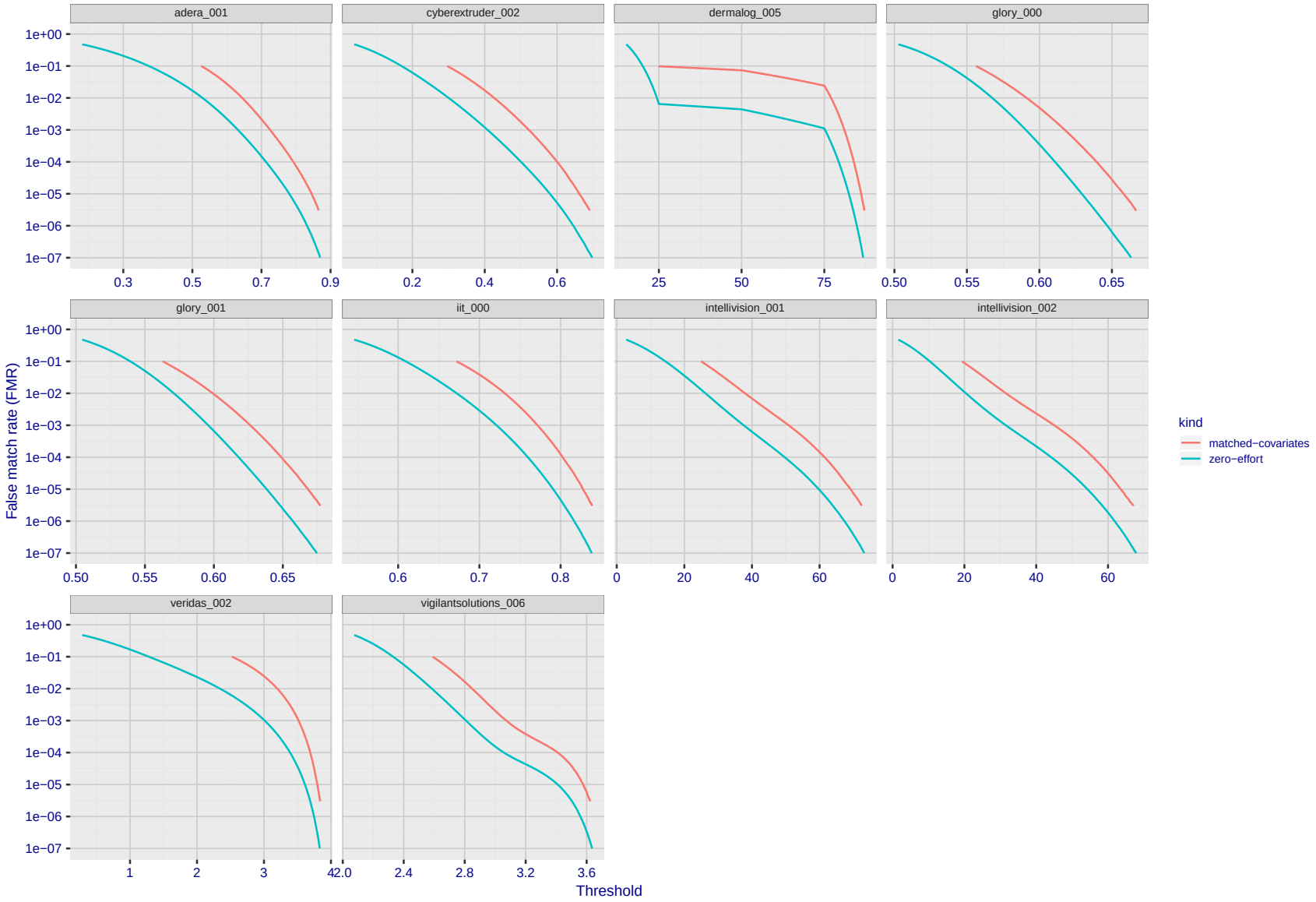


Figure 99: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

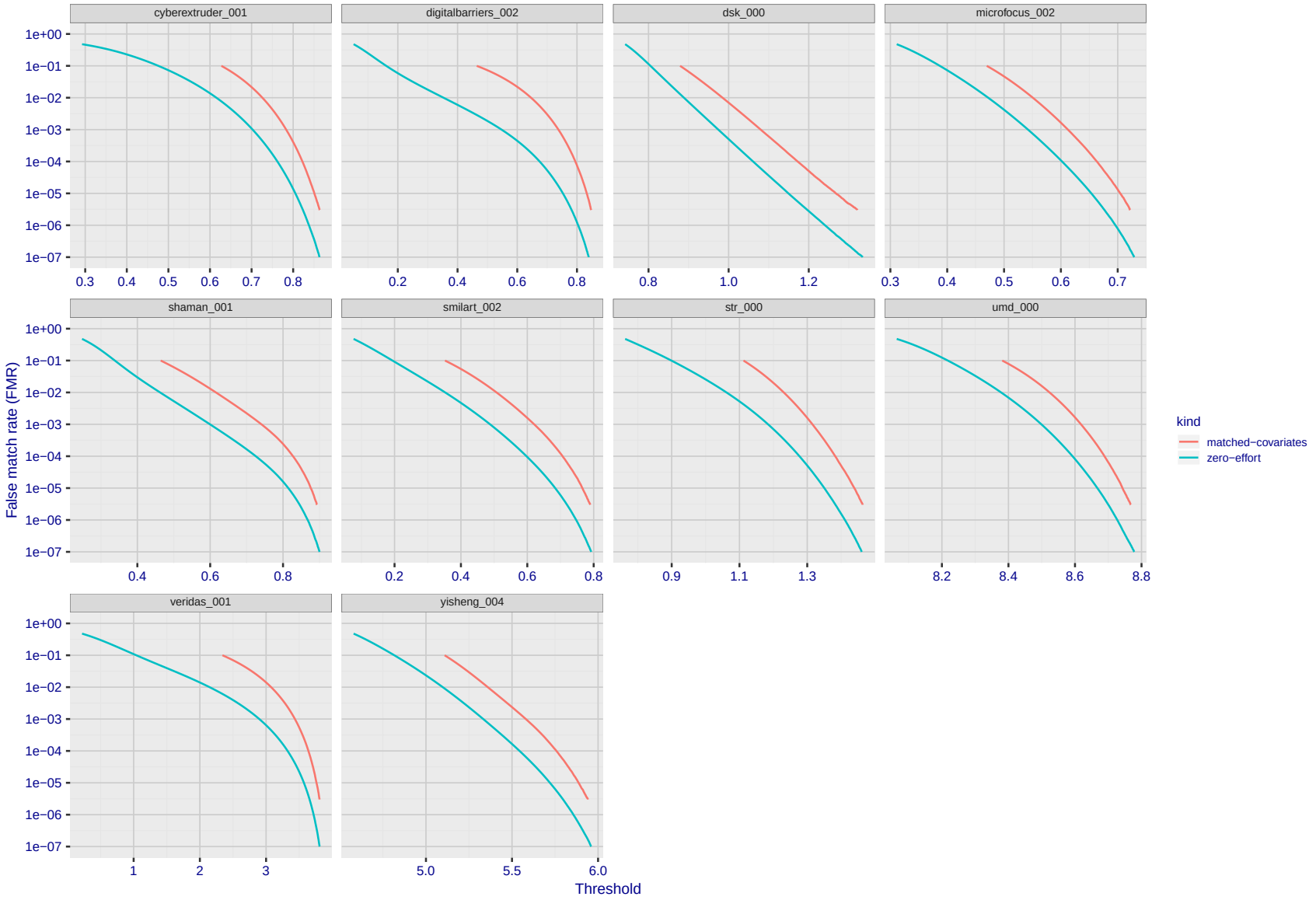


Figure 100: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

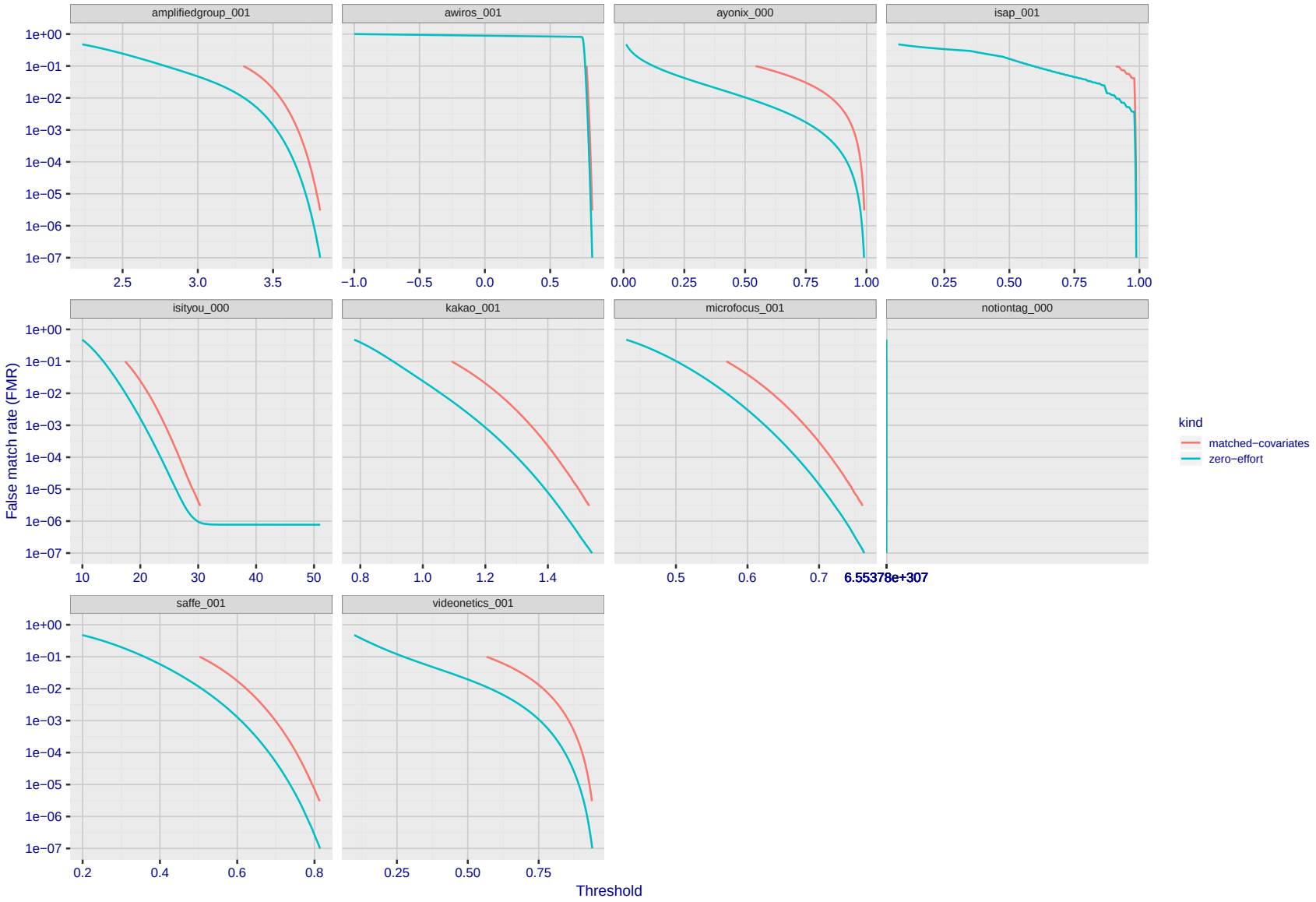


Figure 101: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

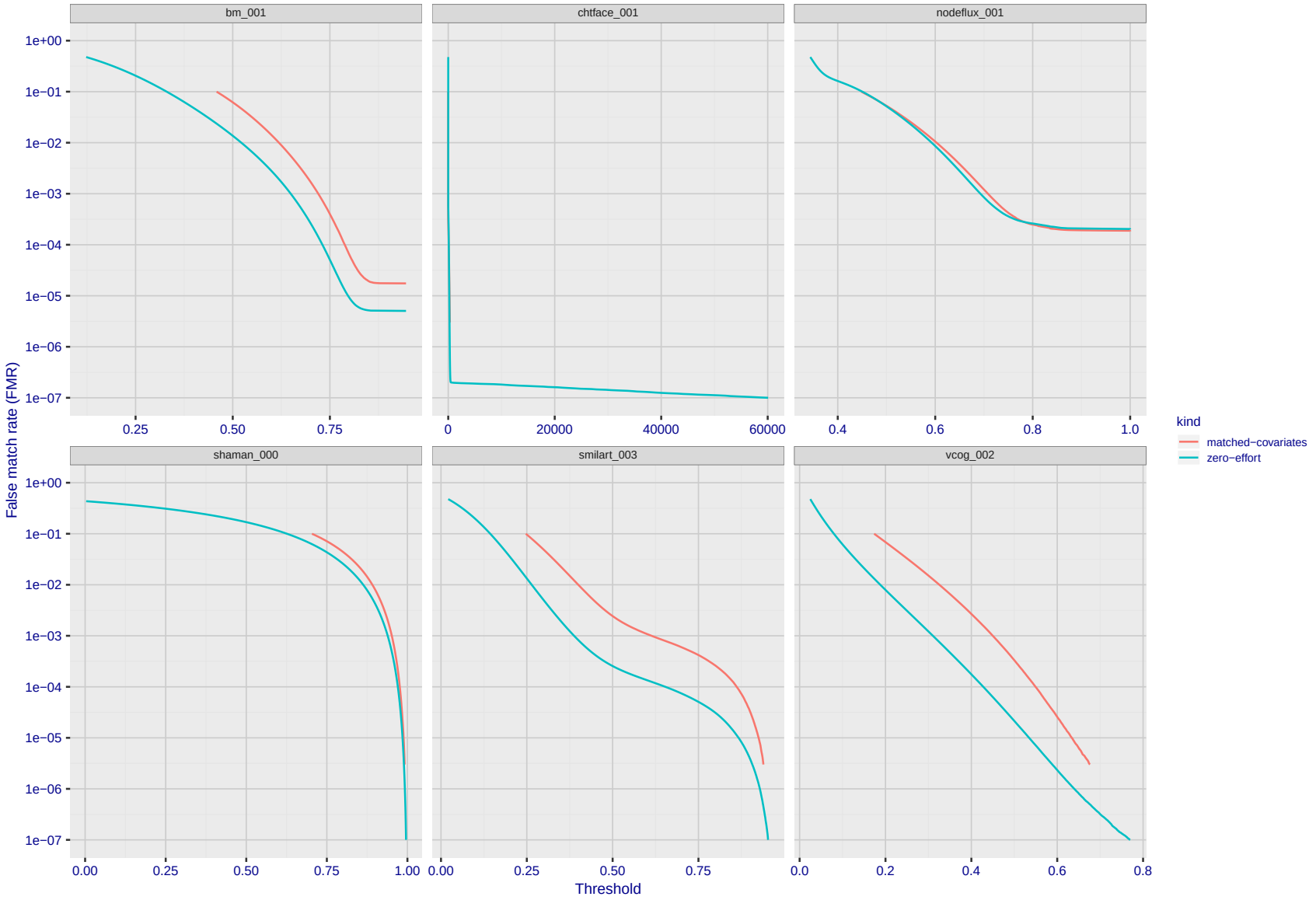


Figure 102: For the visa images, the false match calibration curves show FMR vs. threshold, T. The blue (lower) curves are for zero-effort impostors (i.e. comparing all images against all). The red (upper) curves are for persons of the same-sex, same-age, and same national-origin. This shows that FMR is underestimated (by a factor of 10 or more) by using a zero-effort impostor calculation to calibrate T. As shown later (sec. 3.6), FMR is higher for demographic-matched impostors.

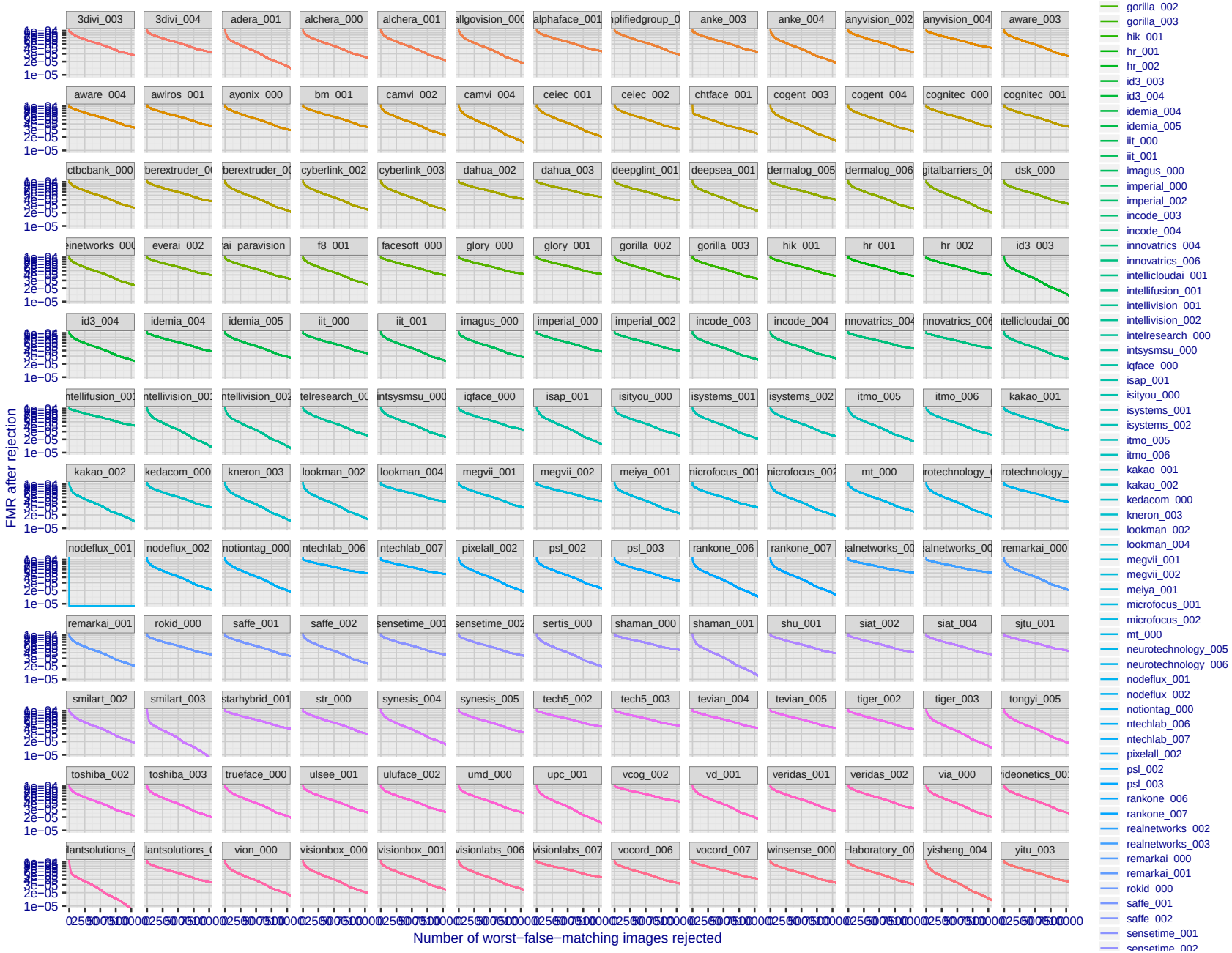


Figure 103: For the visa images, the curves show how false matches are concentrated in certain images. Specifically each line plots FMR(k) with k the number of images rejected in decreasing order of how many false matches that image was involved in. FMR$(0) = 10^{-4}$. In terms of the biometric zoo, the most "wolf-ish" images are rejected first i.e. those enrollment or verification images most often involved in false matches. A flatter response is considered superior. A steeply descending response indicates that certain kinds of images false match against others, e.g. if hypothetically images of men with particular mustaches would falsely match others.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

3.5 Genuine distribution stability

3.5.1 Effect of birth place on the genuine distribution

Background: Both skin tone and bone structure vary geographically. Prior studies have reported variations in FNMR and FMR.

Goal: To measure false non-match rate (FNMR) variation with country of birth.

Methods: Thresholds are determined that give FMR = $\{0.001, 0.0001\}$ over the entire impostor set. Then FNMR is measured over 1000 bootstrap replications of the genuine scores. Only those countries with at least 140 individuals are included in the analysis.

Results: Figure 116 shows FNMR by country of birth for the two thresholds.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

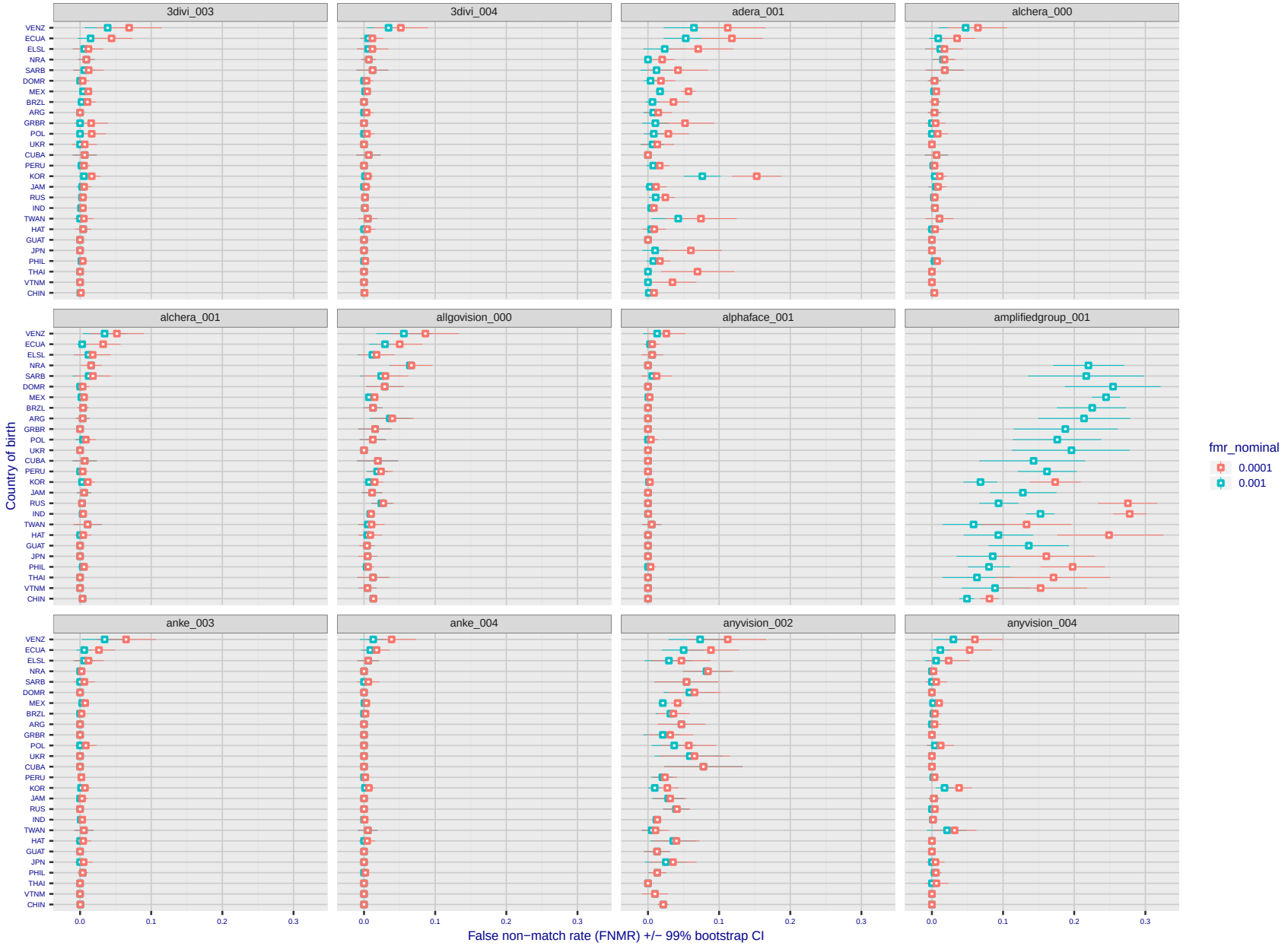


Figure 104: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

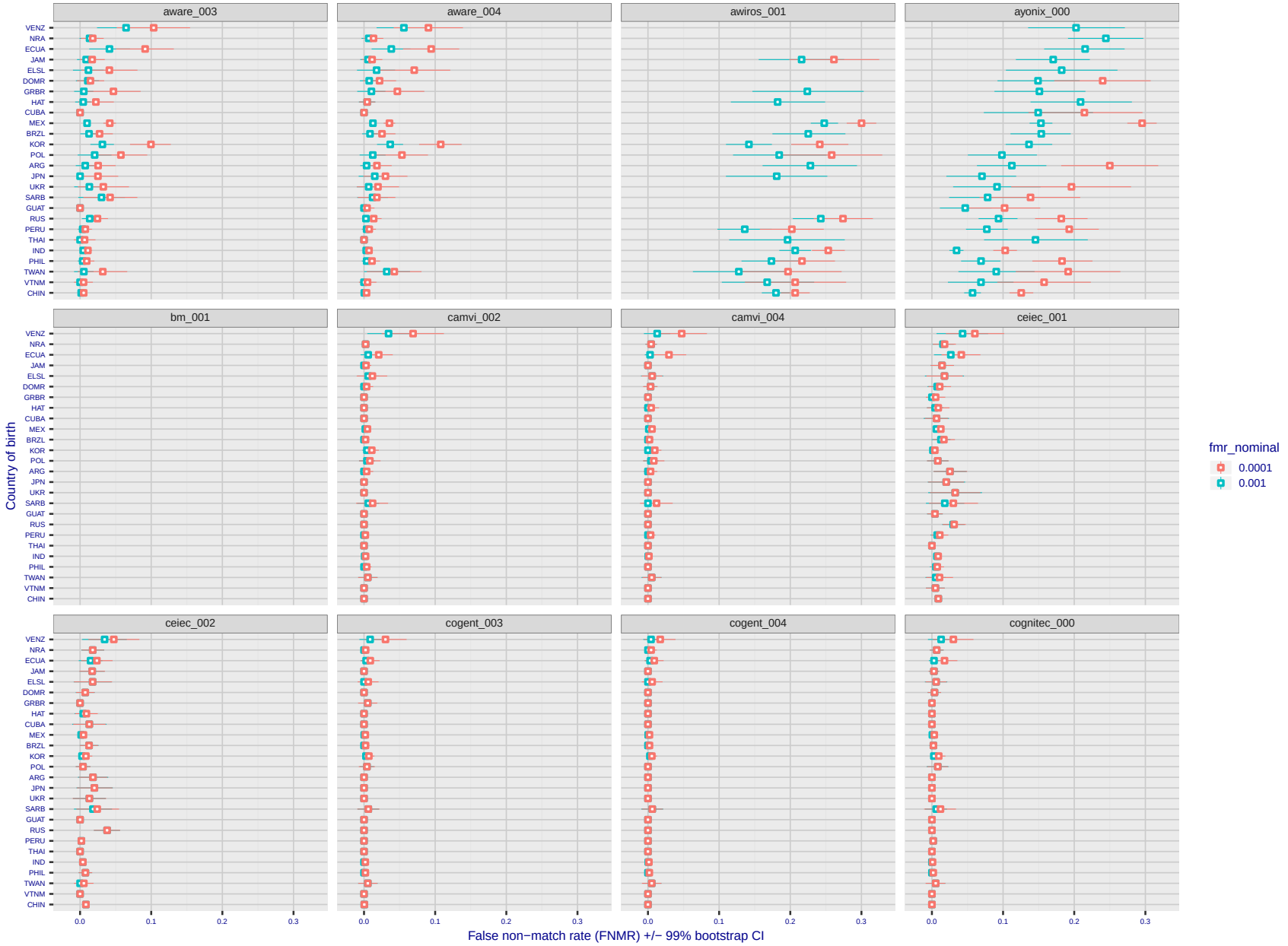


Figure 105: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

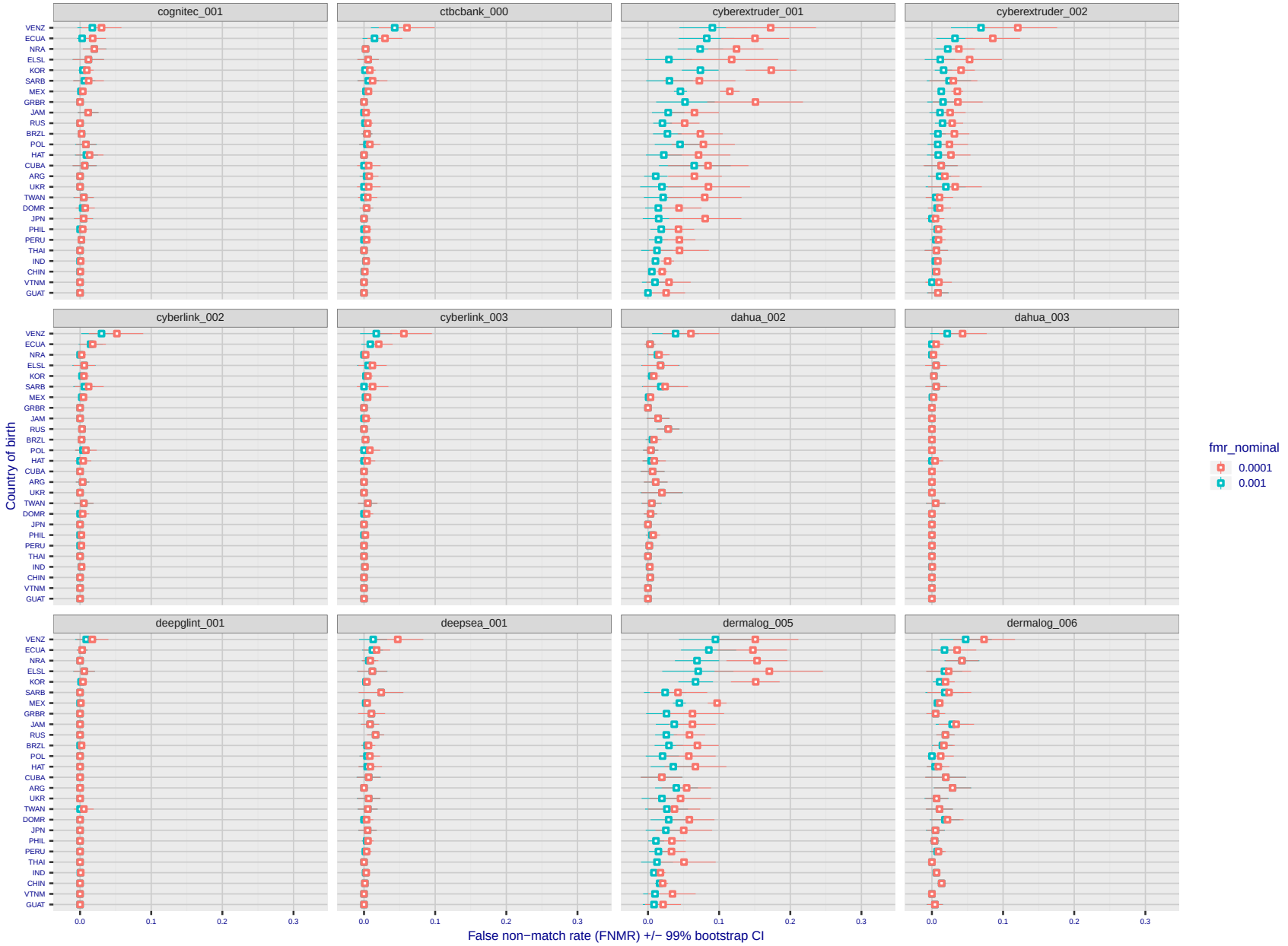


Figure 106: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

Figure 107: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

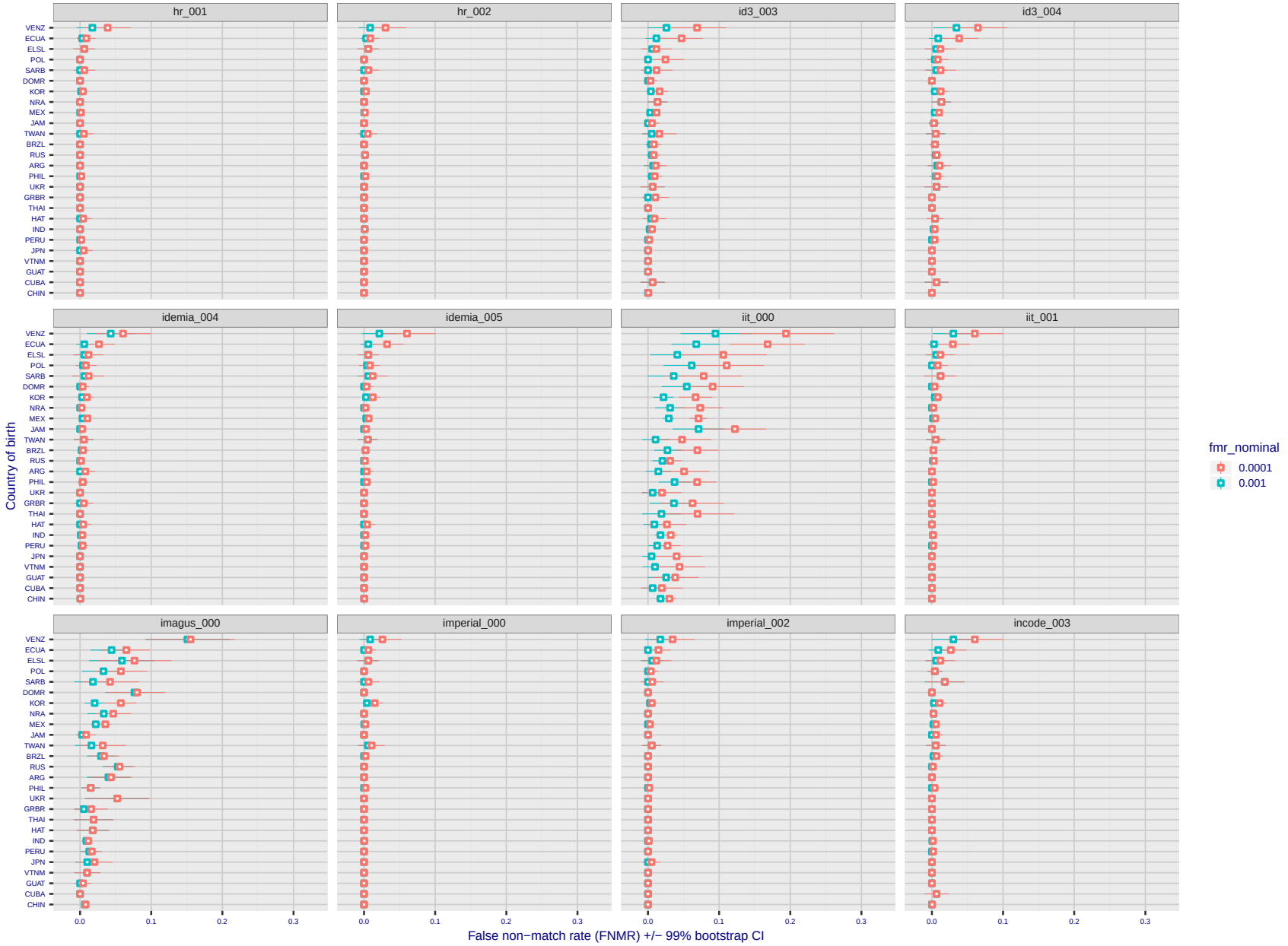


Figure 108: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

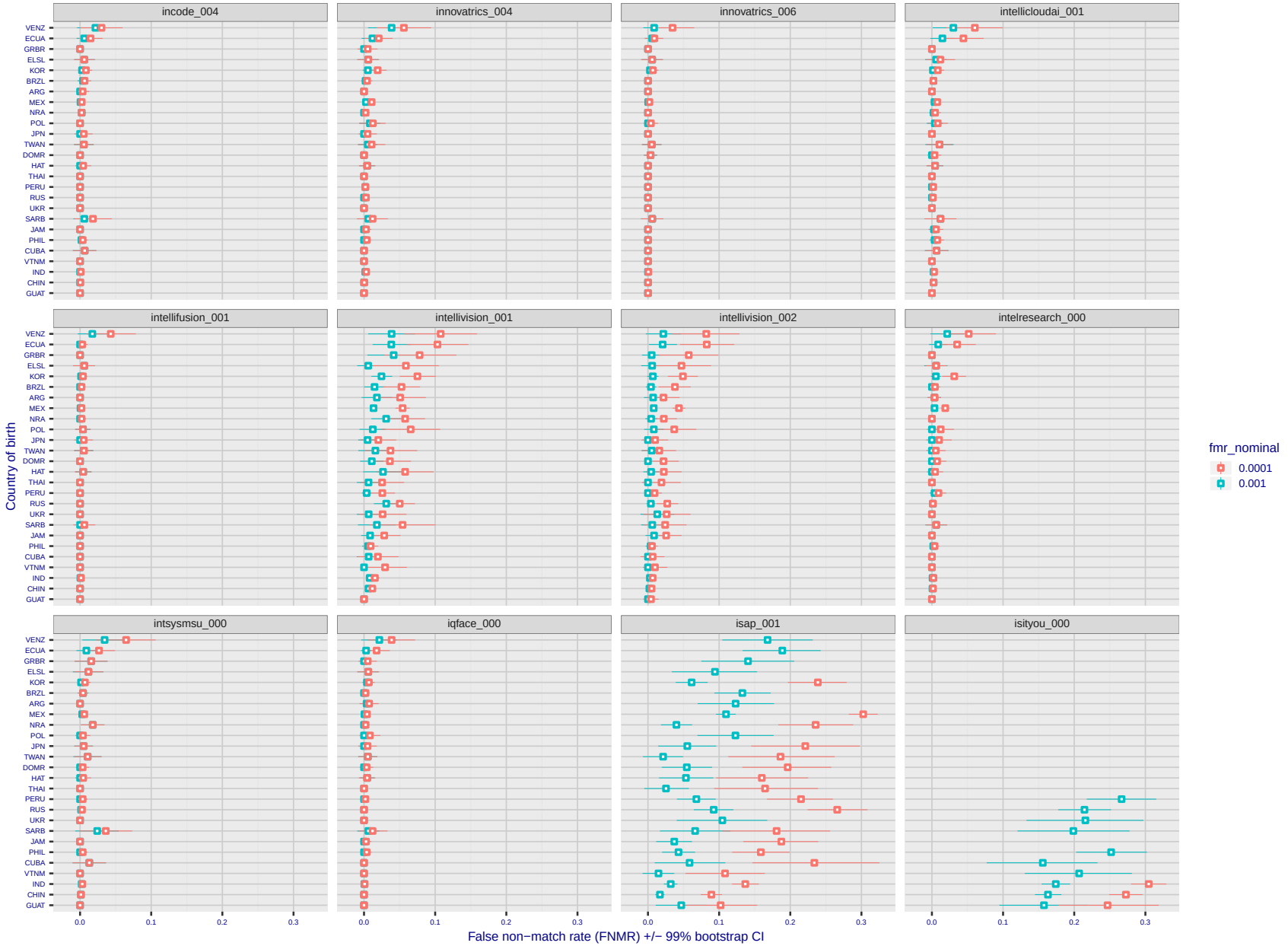


Figure 109: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

Figure 110: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

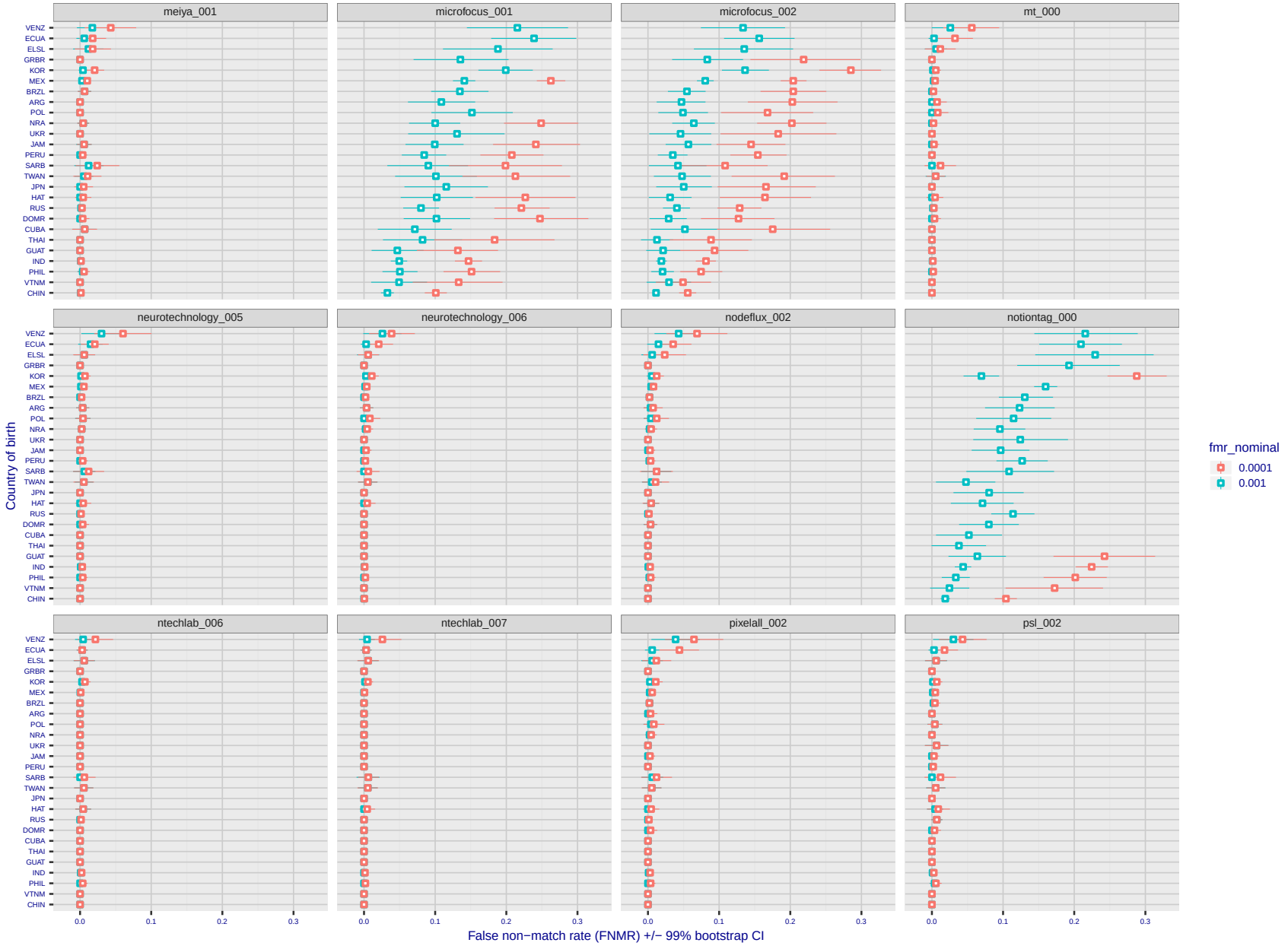


Figure 111: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

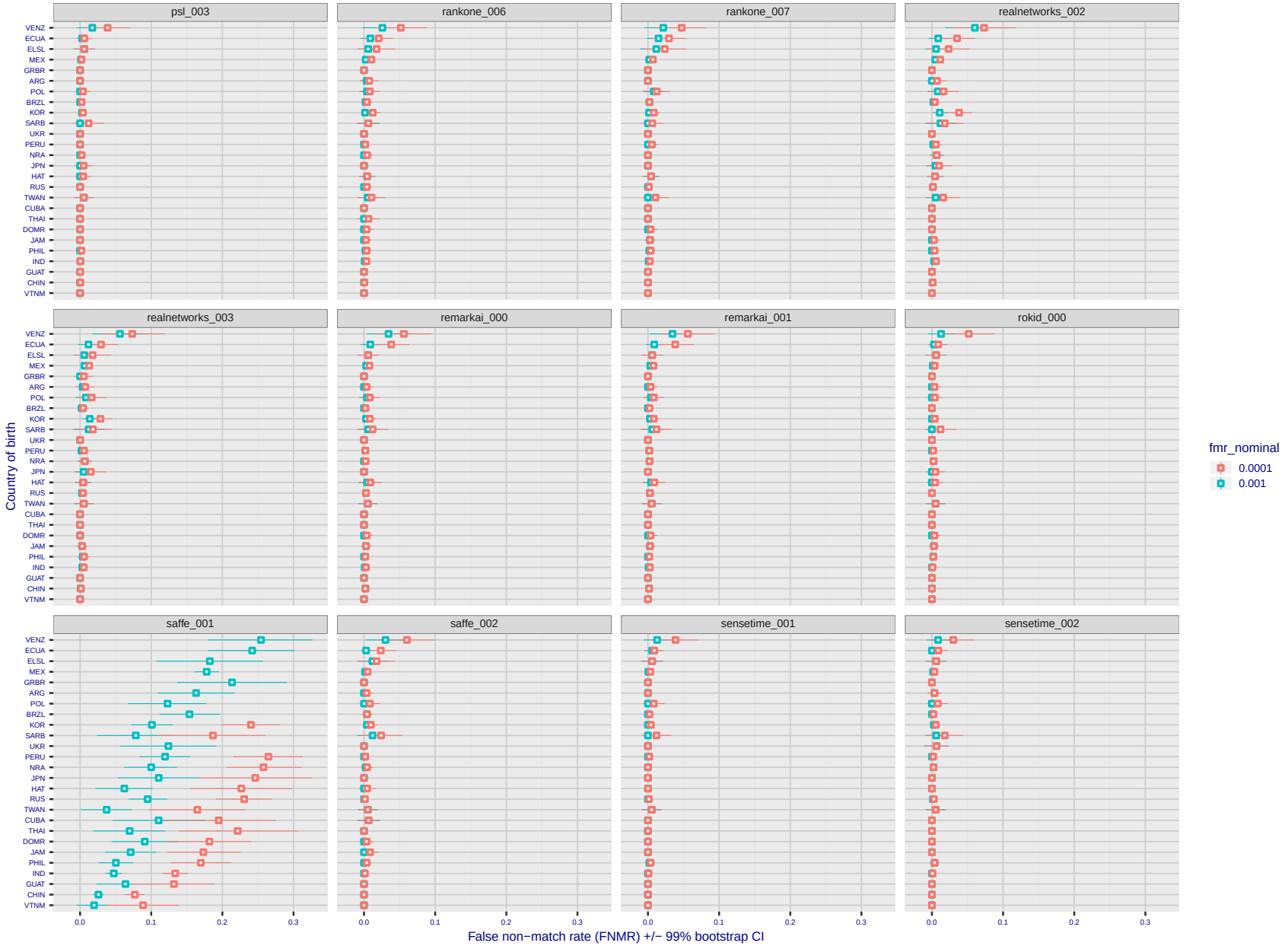


Figure 112: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

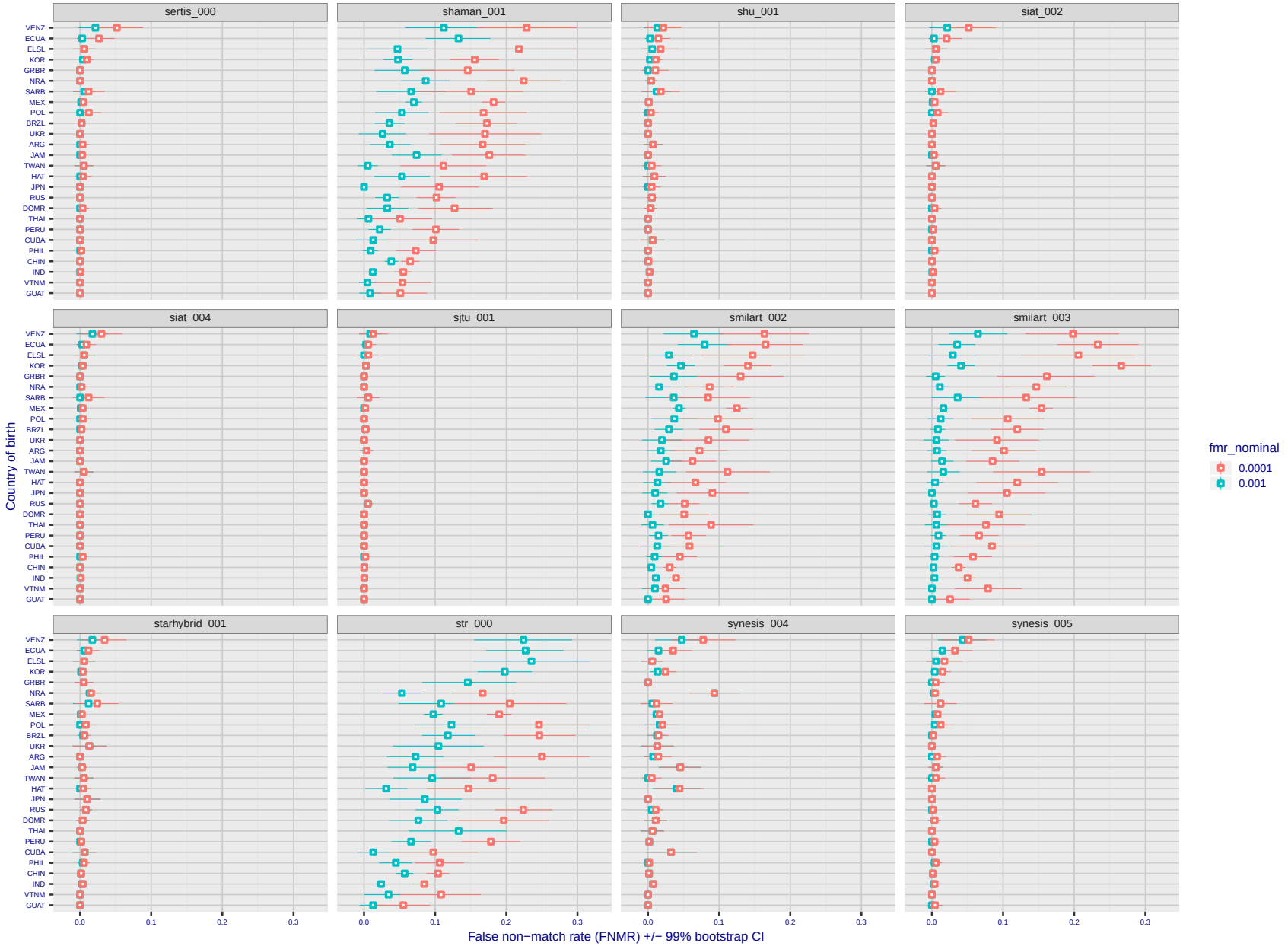


Figure 113: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

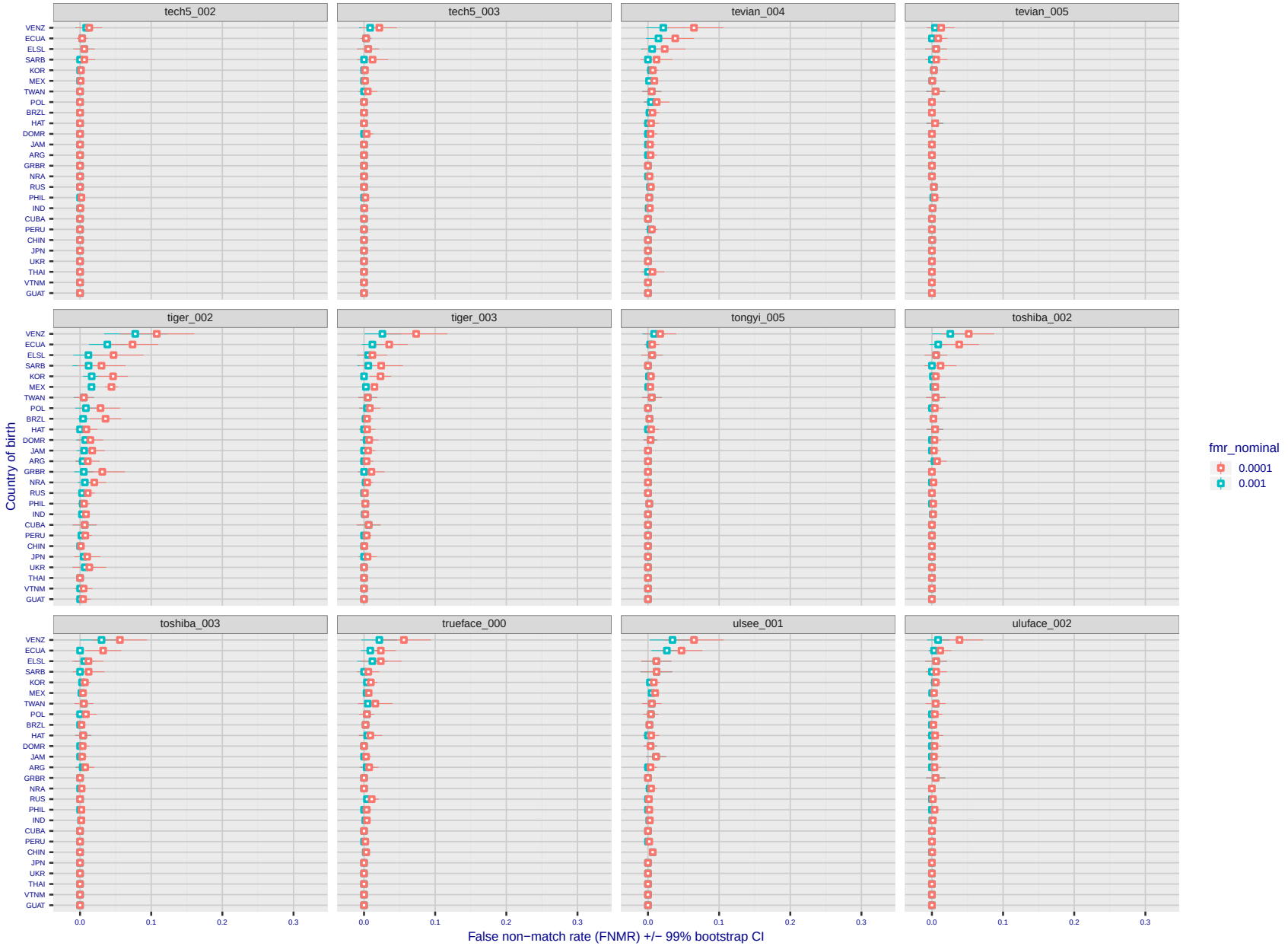


Figure 114: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

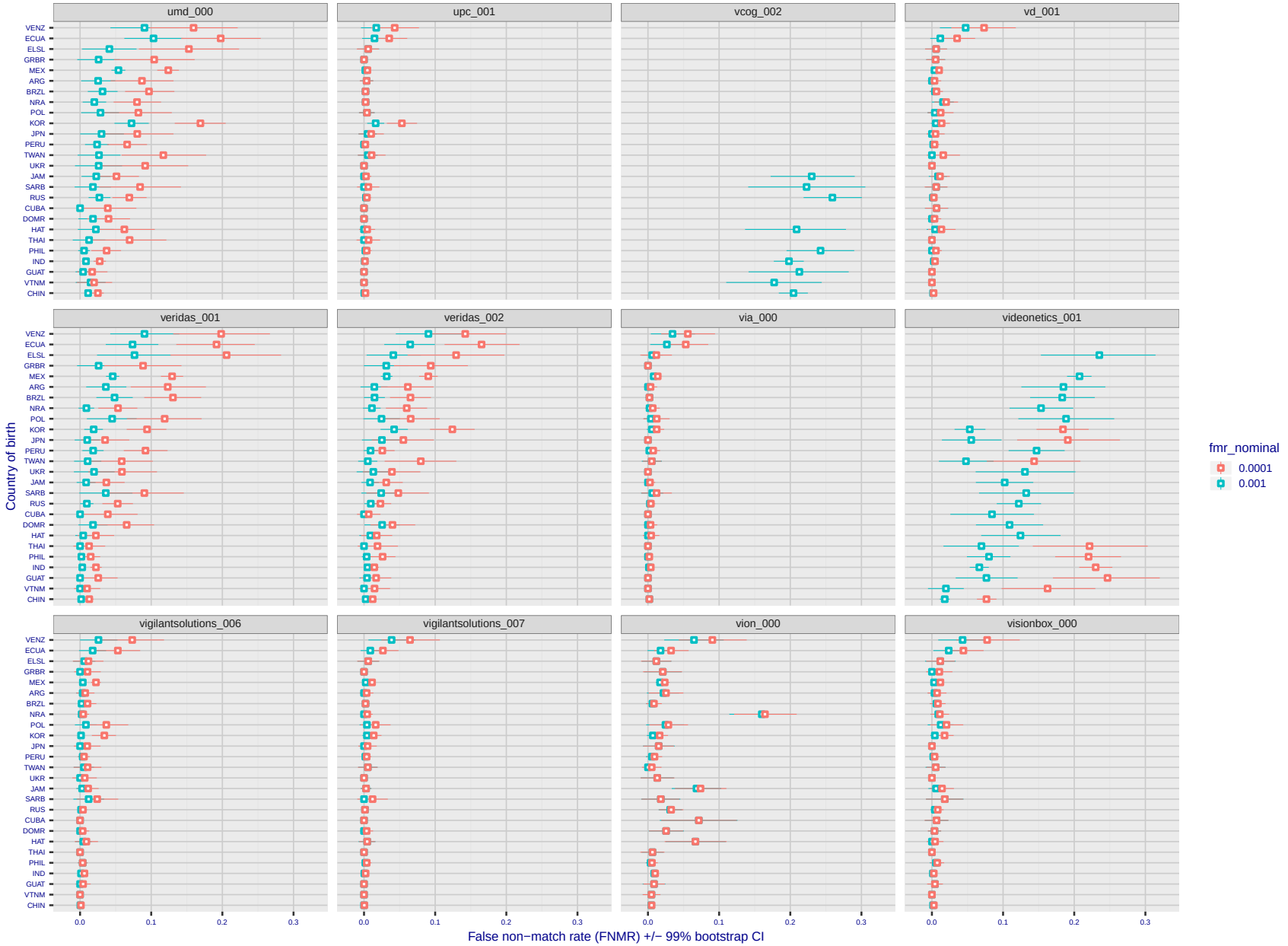


Figure 115: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

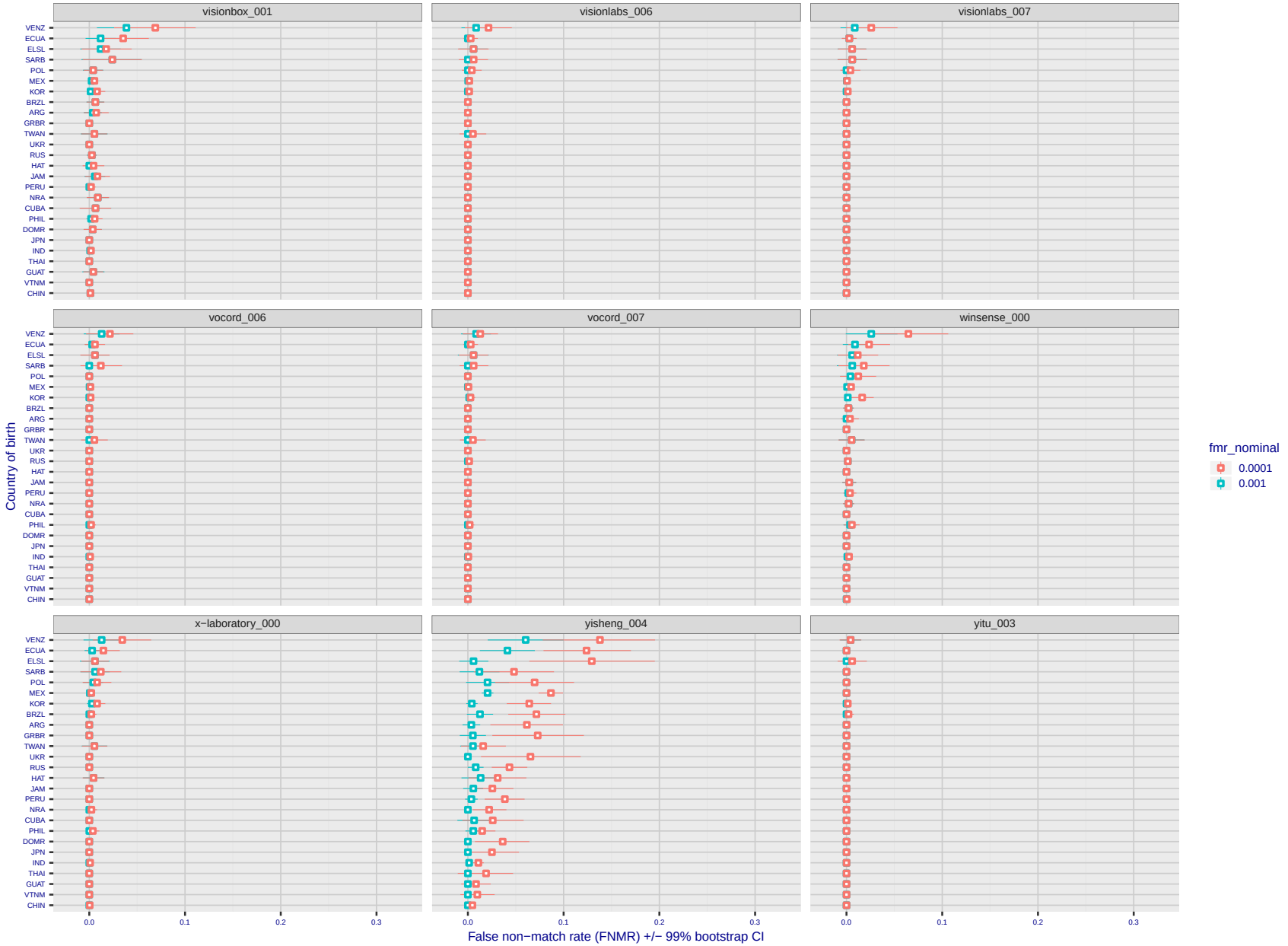


Figure 116: For the visa images, the dots show FNMR by country of birth for two globally set operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.1. The figures shows an order of magnitude variation in FNMR across country of birth; these effects are likely due quality variations, then demographics like age and race. The error rates in some cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

Caveats: The results may not relate to subject-specific properties. Instead they could reflect image-specific quality differences, which could occur due to collection protocol or software processing variations.

3.5.2 Effect of ageing

Background: Faces change appearance throughout life. This change gradually reduces similarity of a new image to an earlier image. Face recognition algorithms give reduced similarity scores and more frequent false rejections.

Goal: To quantify false non-match rates (FNMR) as a function of elapsed time in an adult population.

Methods: Using the mugshot images, a threshold is set to give FMR = 0.00001 over the entire impostor set. Then FNMR is measured over 1000 bootstrap replications of the genuine scores.

Results: For the visa images, Figure 126 shows how false non-match rates for genuine users, as a function of age group.

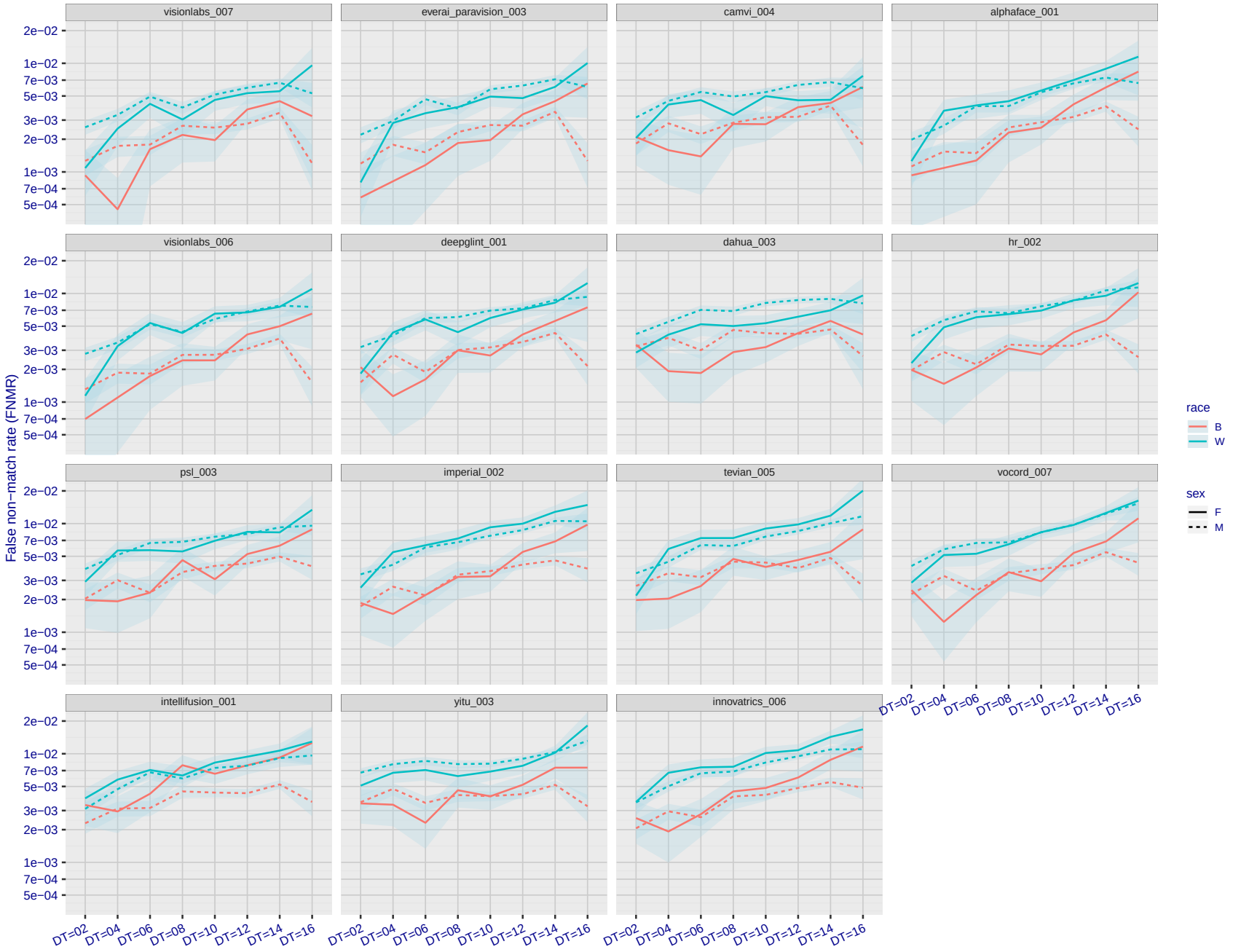


Figure 117: For the mugshot images, FNMR *as a function of elapsed time between initial enrollment and second verification images. The panels appear most accurate first, and vertical scale changes on each page. The four traces correspond to images annotated with codes for black female, black male, white female, white male. The threshold is fixed for each algorithm to give FMR = 0.00001 over all (10^8) impostor comparisons. For short time-lapses, the most accurate algorithms give very few errors (FNMR < 0.001) so that the uncertainty estimates are high.*

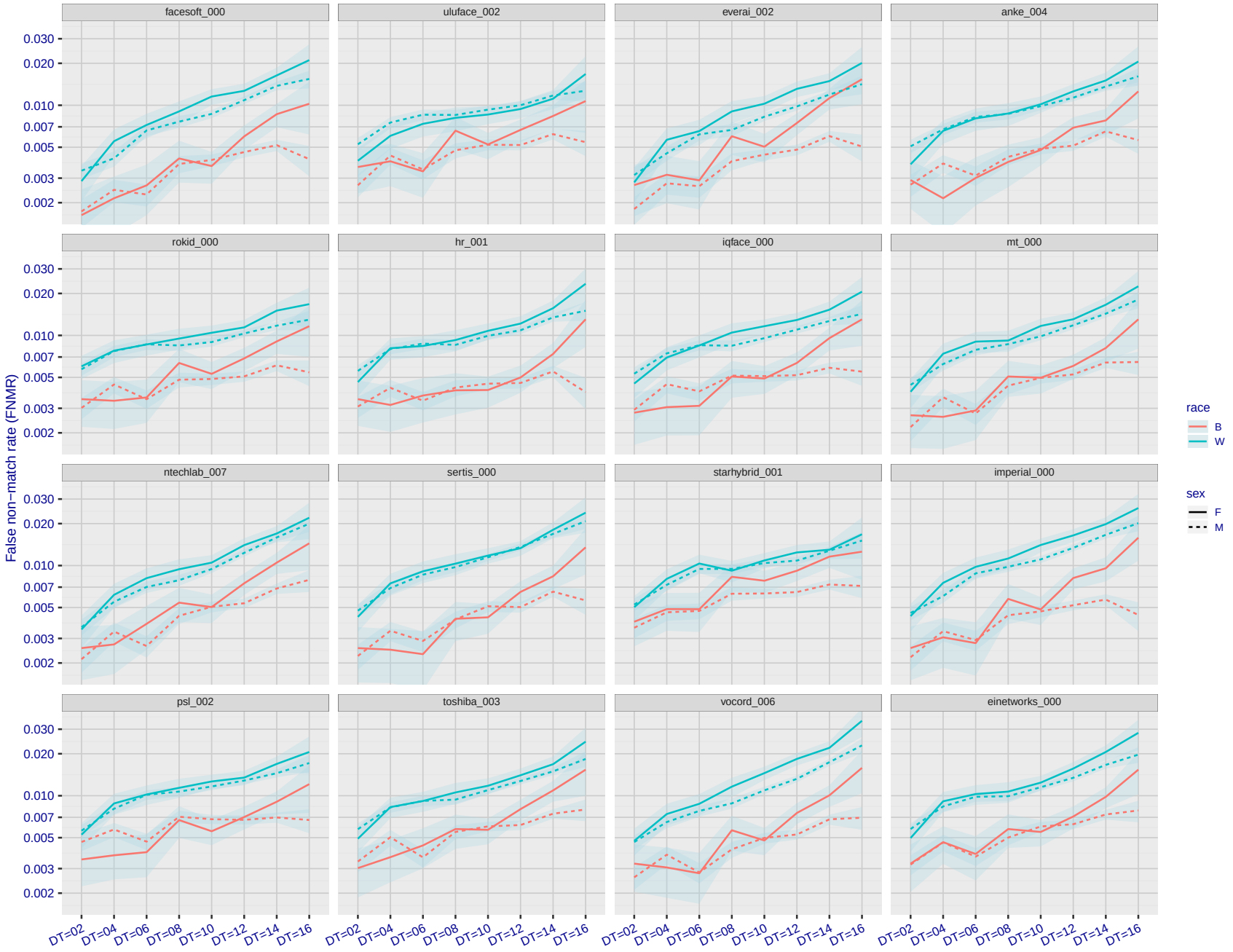


Figure 118: For the mugshot images, FNMR *as a function of elapsed time between initial enrollment and second verification images. The panels appear most accurate first, and vertical scale changes on each page. The four traces correspond to images annotated with codes for black female, black male, white female, white male. The threshold is fixed for each algorithm to give FMR = 0.00001 over all (10^8) impostor comparisons. For short time-lapses, the most accurate algorithms give very few errors (FNMR < 0.001) so that the uncertainty estimates are high.*

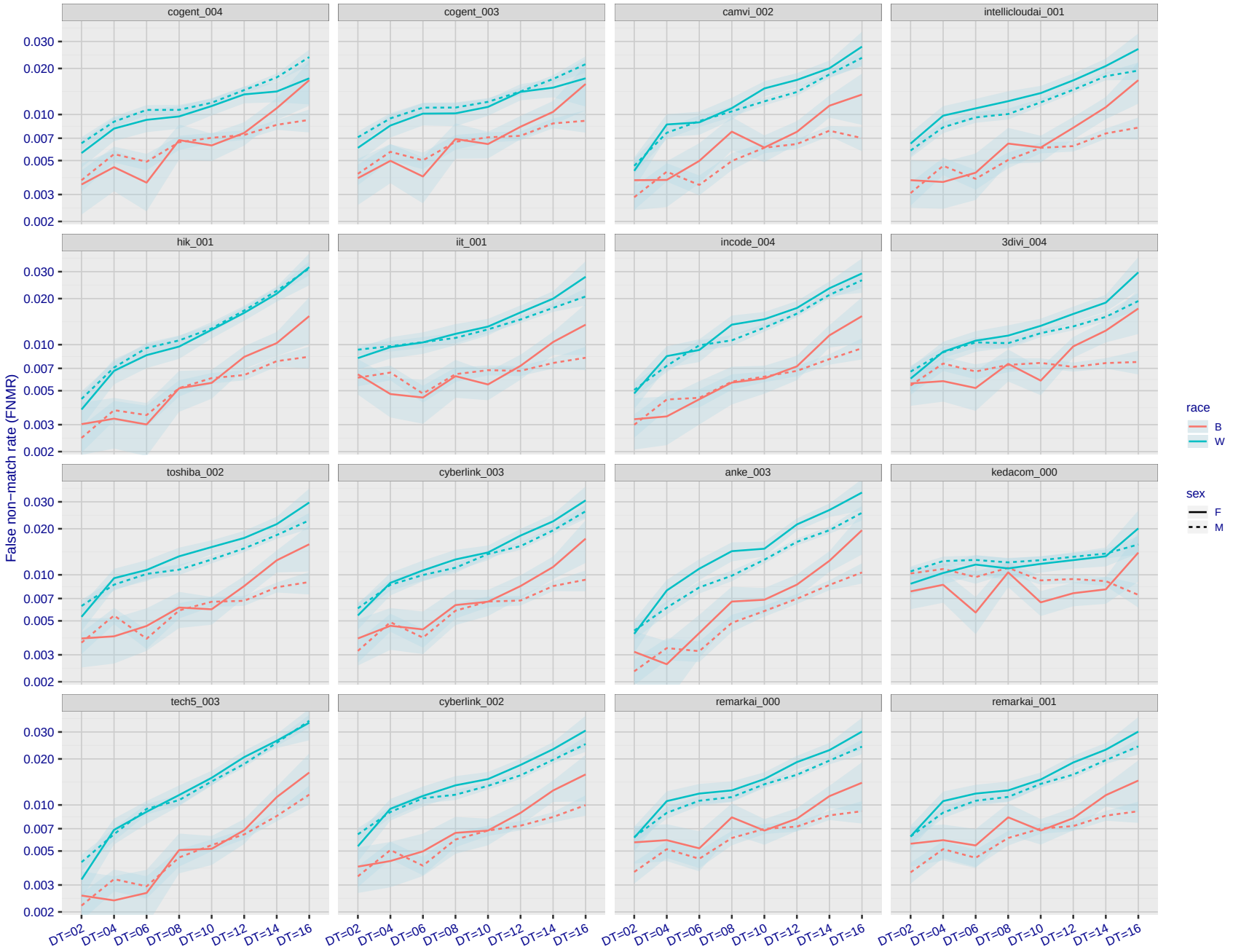


Figure 119: For the mugshot images, FNMR *as a function of elapsed time between initial enrollment and second verification images. The panels appear most accurate first, and vertical scale changes on each page. The four traces correspond to images annotated with codes for black female, black male, white female, white male. The threshold is fixed for each algorithm to give FMR = 0.00001 over all (10^8) impostor comparisons. For short time-lapses, the most accurate algorithms give very few errors (FNMR < 0.001) so that the uncertainty estimates are high.*

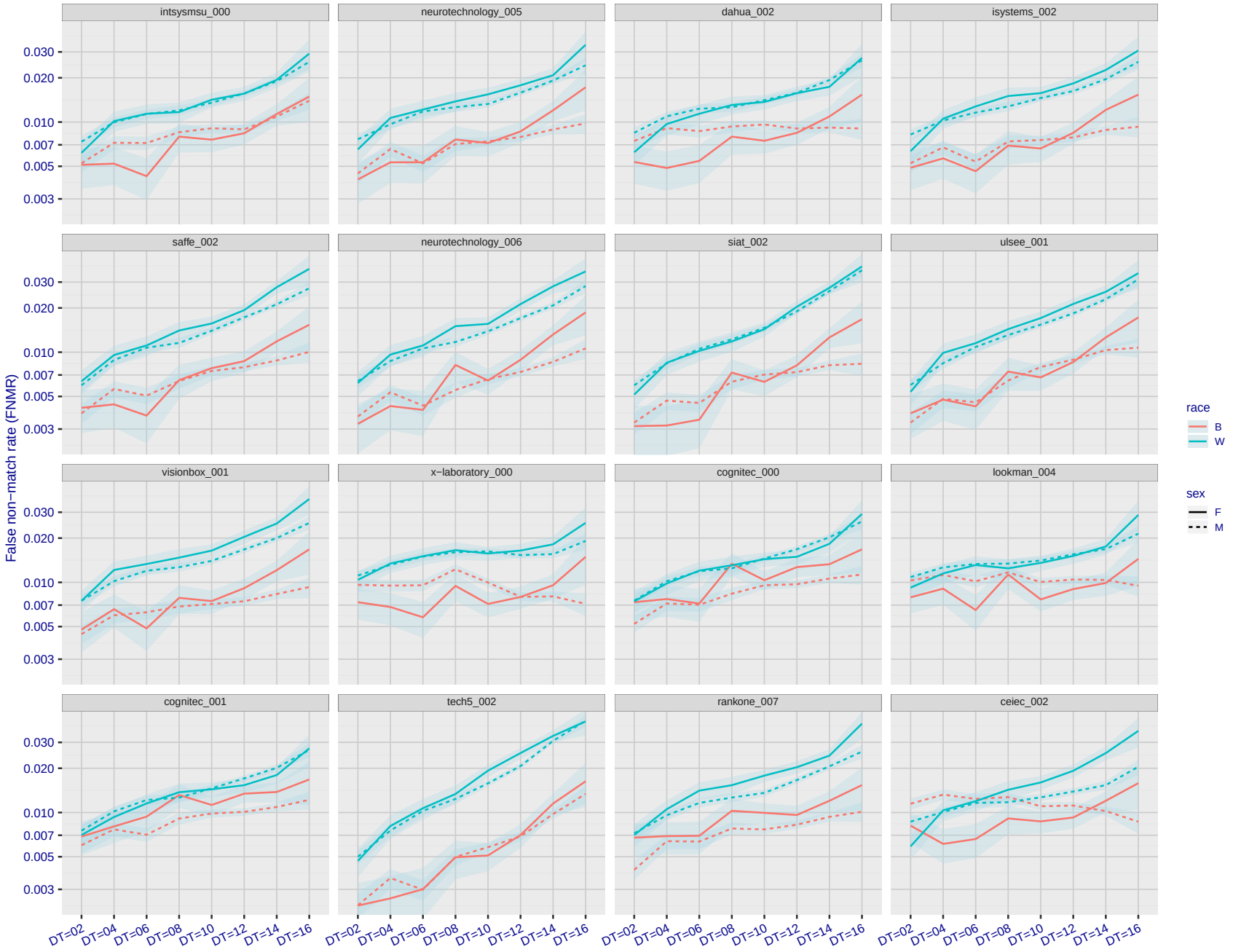


Figure 120: For the mugshot images, FNMR *as a function of elapsed time between initial enrollment and second verification images. The panels appear most accurate first, and vertical scale changes on each page. The four traces correspond to images annotated with codes for black female, black male, white female, white male. The threshold is fixed for each algorithm to give FMR = 0.00001 over all (10^8) impostor comparisons. For short time-lapses, the most accurate algorithms give very few errors (FNMR < 0.001) so that the uncertainty estimates are high.*

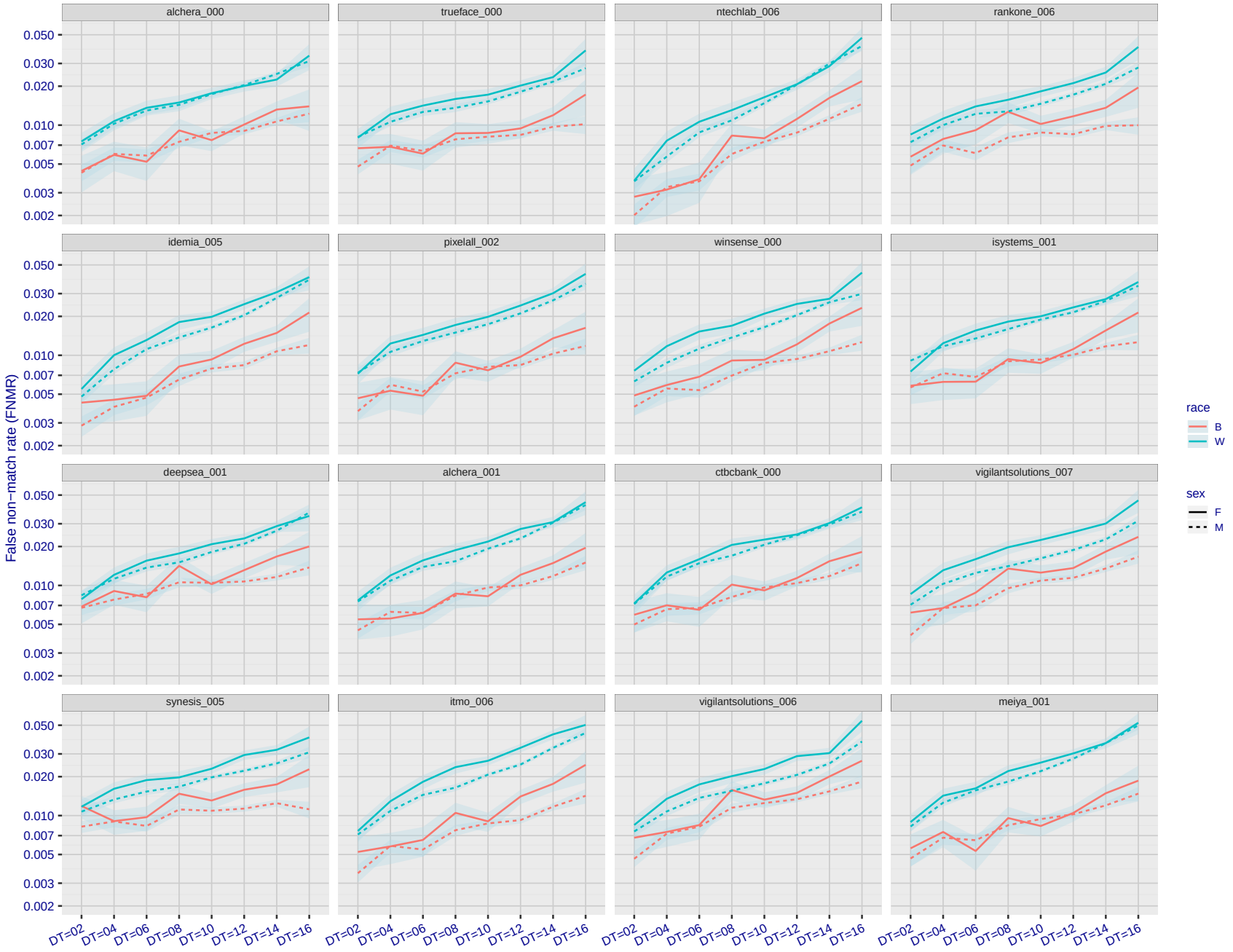


Figure 121: For the mugshot images, FNMR *as a function of elapsed time between initial enrollment and second verification images. The panels appear most accurate first, and vertical scale changes on each page. The four traces correspond to images annotated with codes for black female, black male, white female, white male. The threshold is fixed for each algorithm to give FMR = 0.00001 over all (10^8) impostor comparisons. For short time-lapses, the most accurate algorithms give very few errors (FNMR < 0.001) so that the uncertainty estimates are high.*

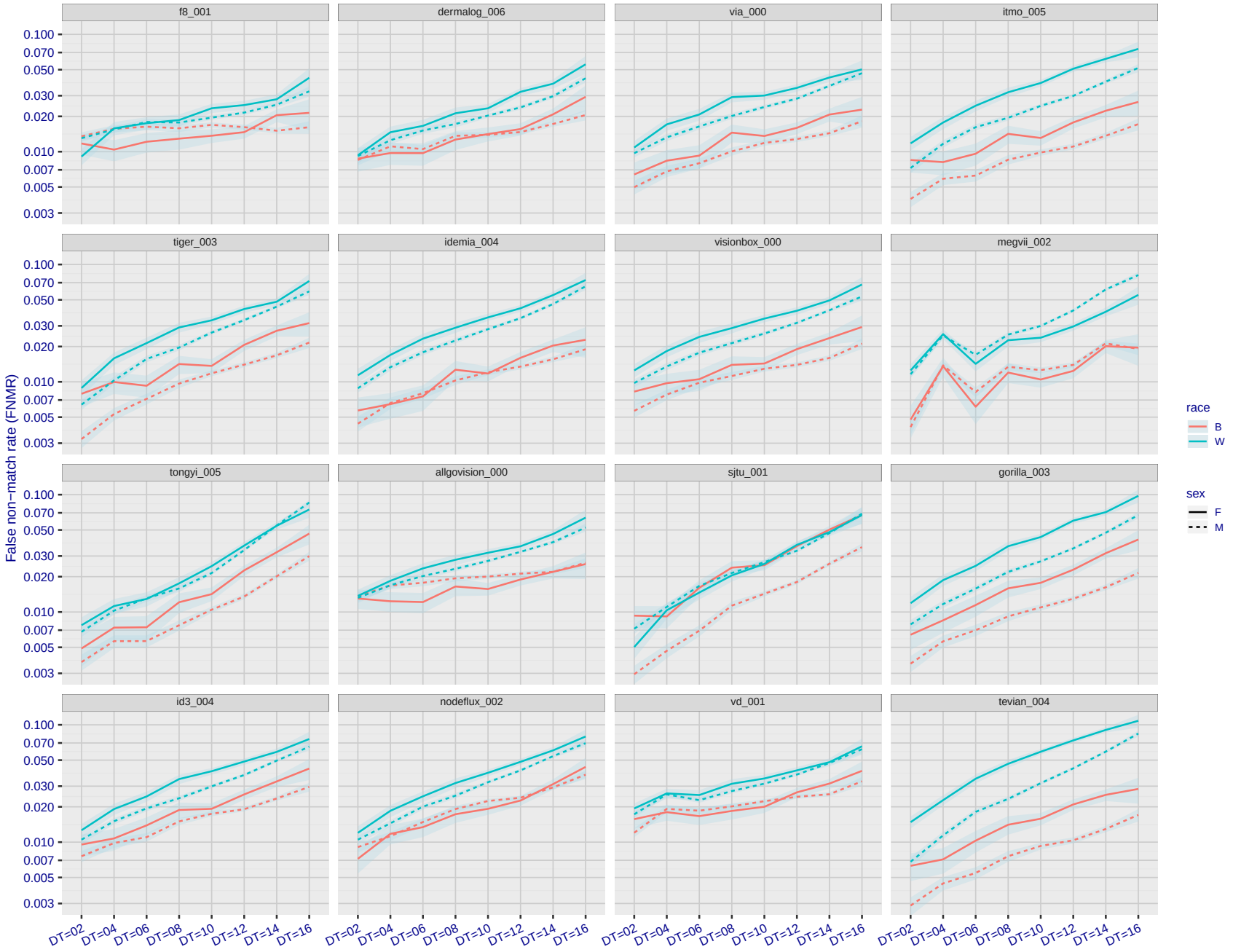


Figure 122: For the mugshot images, FNMR *as a function of elapsed time between initial enrollment and second verification images. The panels appear most accurate first, and vertical scale changes on each page. The four traces correspond to images annotated with codes for black female, black male, white female, white male. The threshold is fixed for each algorithm to give FMR = 0.00001 over all (10^8) impostor comparisons. For short time-lapses, the most accurate algorithms give very few errors (FNMR < 0.001) so that the uncertainty estimates are high.*

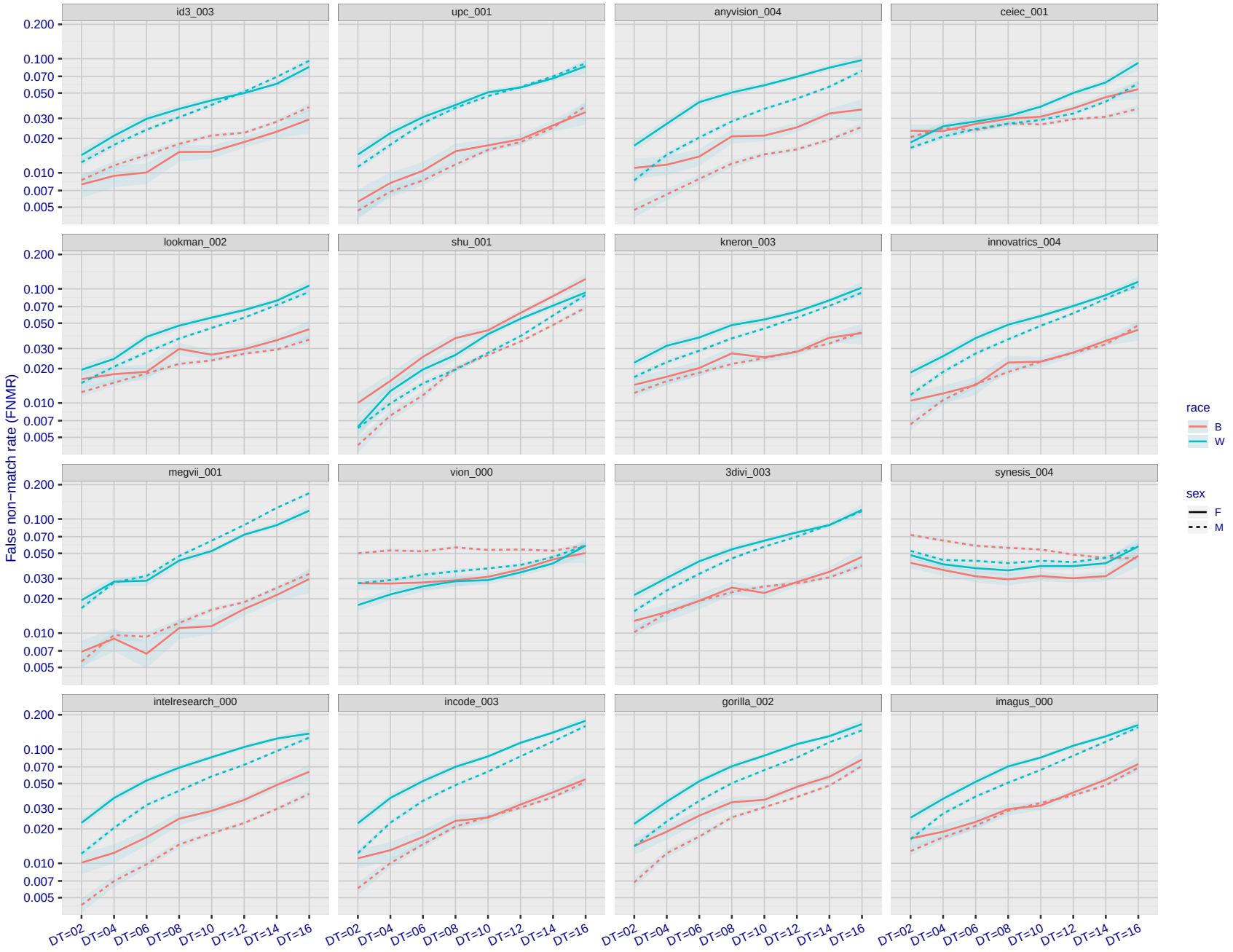


Figure 123: For the mugshot images, FNMR as a function of elapsed time between initial enrollment and second verification images. The panels appear most accurate first, and vertical scale changes on each page. The four traces correspond to images annotated with codes for black female, black male, white female, white male. The threshold is fixed for each algorithm to give FMR = 0.00001 over all (10^8) impostor comparisons. For short time-lapses, the most accurate algorithms give very few errors (FNMR < 0.001) so that the uncertainty estimates are high.

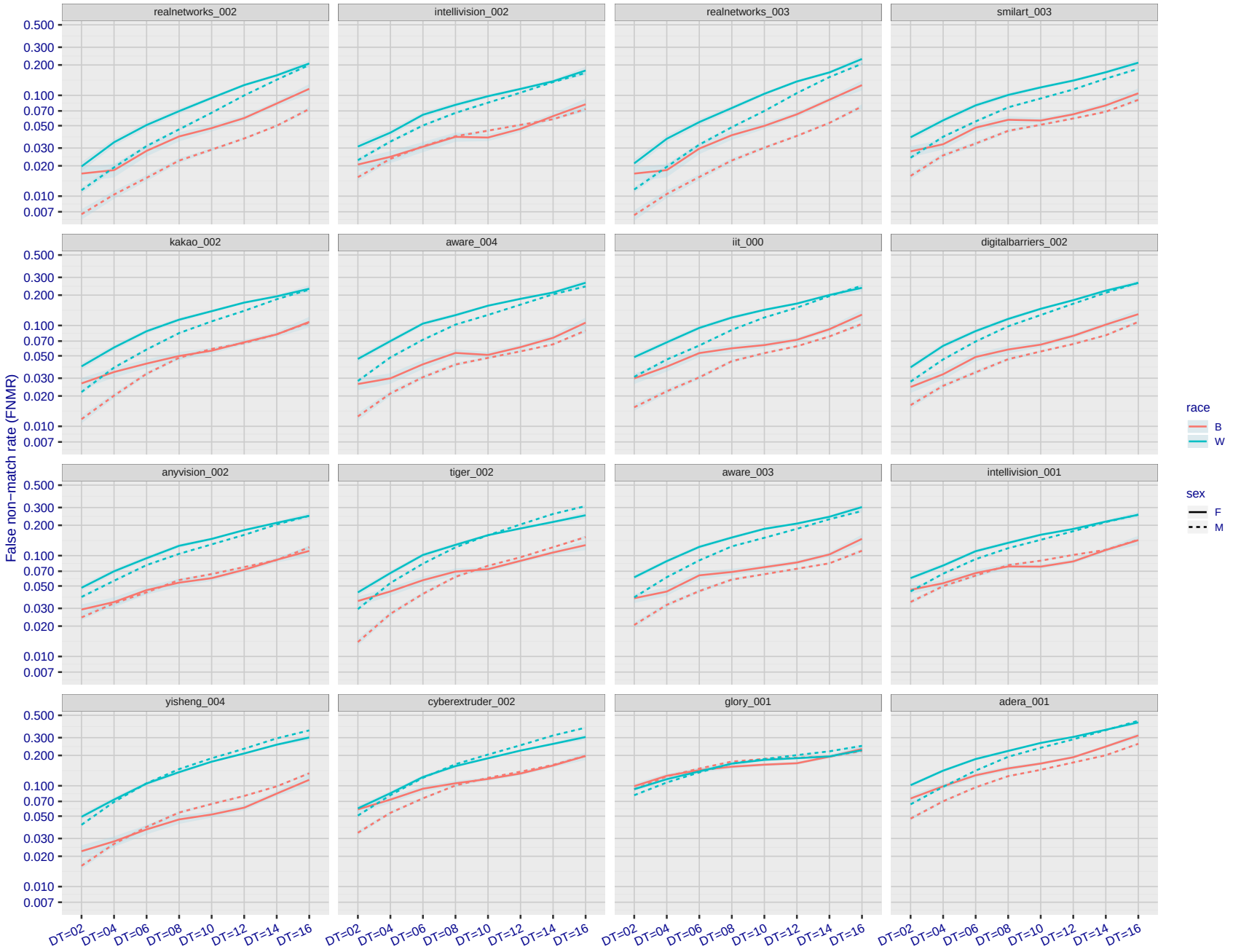


Figure 124: For the mugshot images, FNMR *as a function of elapsed time between initial enrollment and second verification images. The panels appear most accurate first, and vertical scale changes on each page. The four traces correspond to images annotated with codes for black female, black male, white female, white male. The threshold is fixed for each algorithm to give FMR = 0.00001 over all (10^8) impostor comparisons. For short time-lapses, the most accurate algorithms give very few errors (FNMR < 0.001) so that the uncertainty estimates are high.*

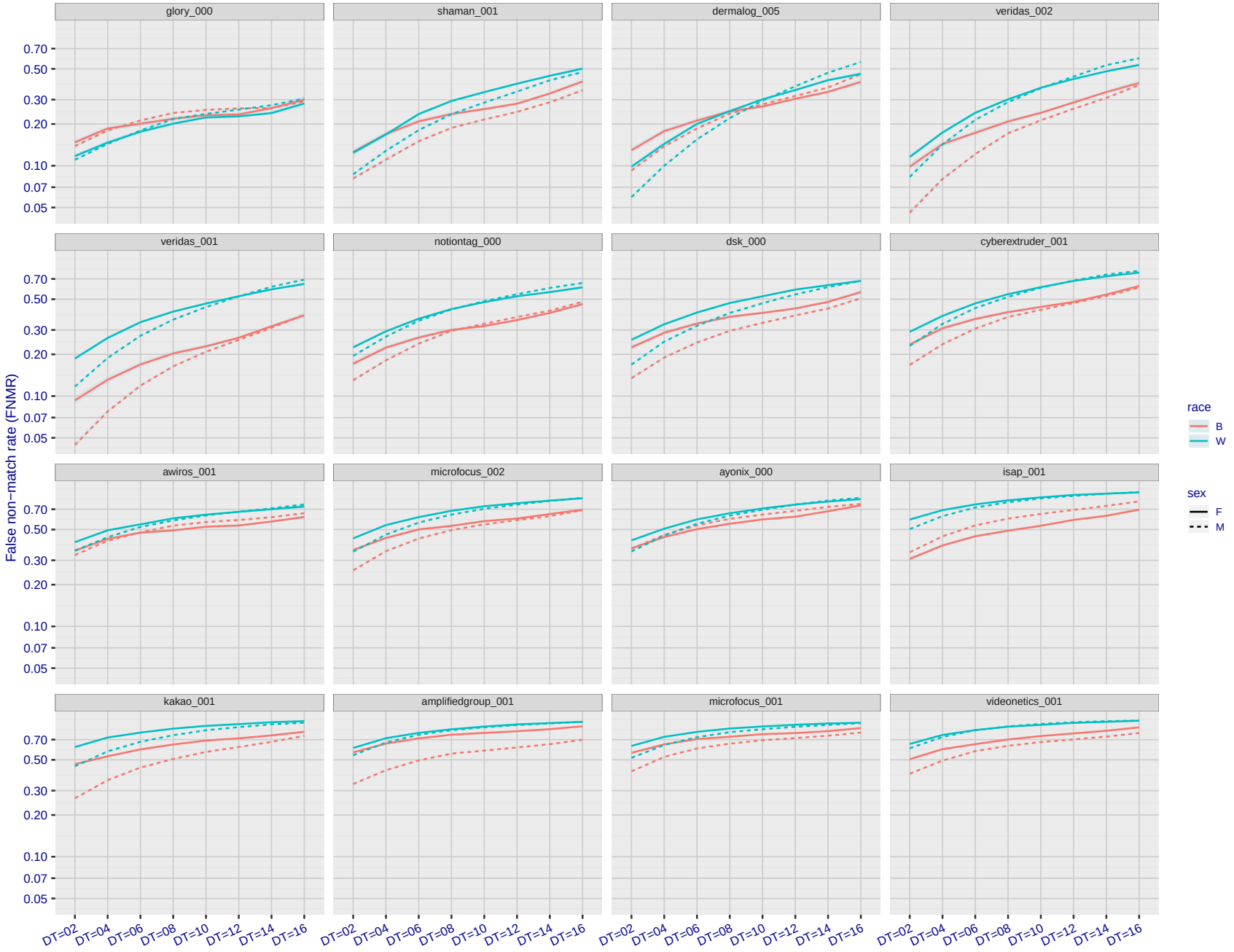


Figure 125: For the mugshot images, FNMR *as a function of elapsed time between initial enrollment and second verification images. The panels appear most accurate first, and vertical scale changes on each page. The four traces correspond to images annotated with codes for black female, black male, white female, white male. The threshold is fixed for each algorithm to give FMR = 0.00001 over all (10^8) impostor comparisons. For short time-lapses, the most accurate algorithms give very few errors (FNMR < 0.001) so that the uncertainty estimates are high.*

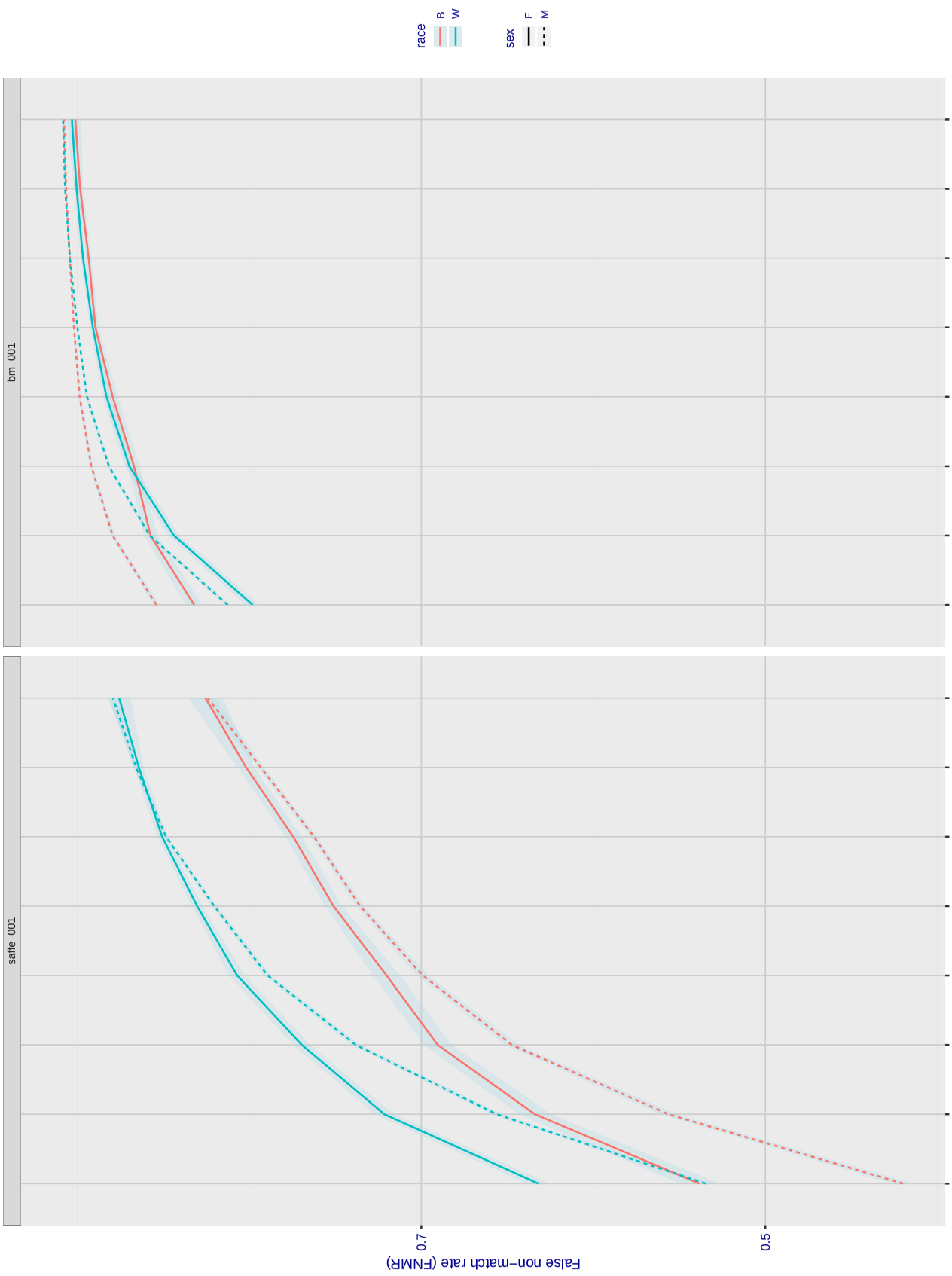


Figure 126: For the mugshot images, FNMR *as a function of elapsed time between first and second verification images. The panels appear most accurate first, and vertical scale changes on each page. The four traces correspond to images annotated with codes for black female, black male, white female, white male. The threshold is fixed for each algorithm to give FMR = 0.00001 over all* (10^8) *impostor comparisons. For short time-lapses, the most accurate algorithms give very few errors (FNMR* < 0.001*) so that the uncertainty estimates are high.*

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

3.5.3 Effect of age on genuine subjects

Background: Faces change appearance throughout life. Face recognition algorithms have previously beeen reported to give better accuracy on older individuals (See NIST IR 8009).

Goal: To quantify false non-match rates (FNMR) as a function of age, without an ageing component.

Methods: Using the visa images, which span fewer than five years, thresholds are determined that give FMR = 0.001 and 0.0001 over the entire impostor set. Then FNMR is measured over 1000 bootstrap replications of the genuine scores.

Results: For the visa images, Figure 139 shows how false non-match rates for genuine users, as a function of age group.

The notable aspects are:

- ▷ Younger subjects give considerably higher FNMR. This is likely due to rapid growth and change in facial appearance.
- ▷ FNMR trends down throughout life. The last bin, AGE $>$ 72, contains fewer than 140 mated pairs, and may be affected by small sample size.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

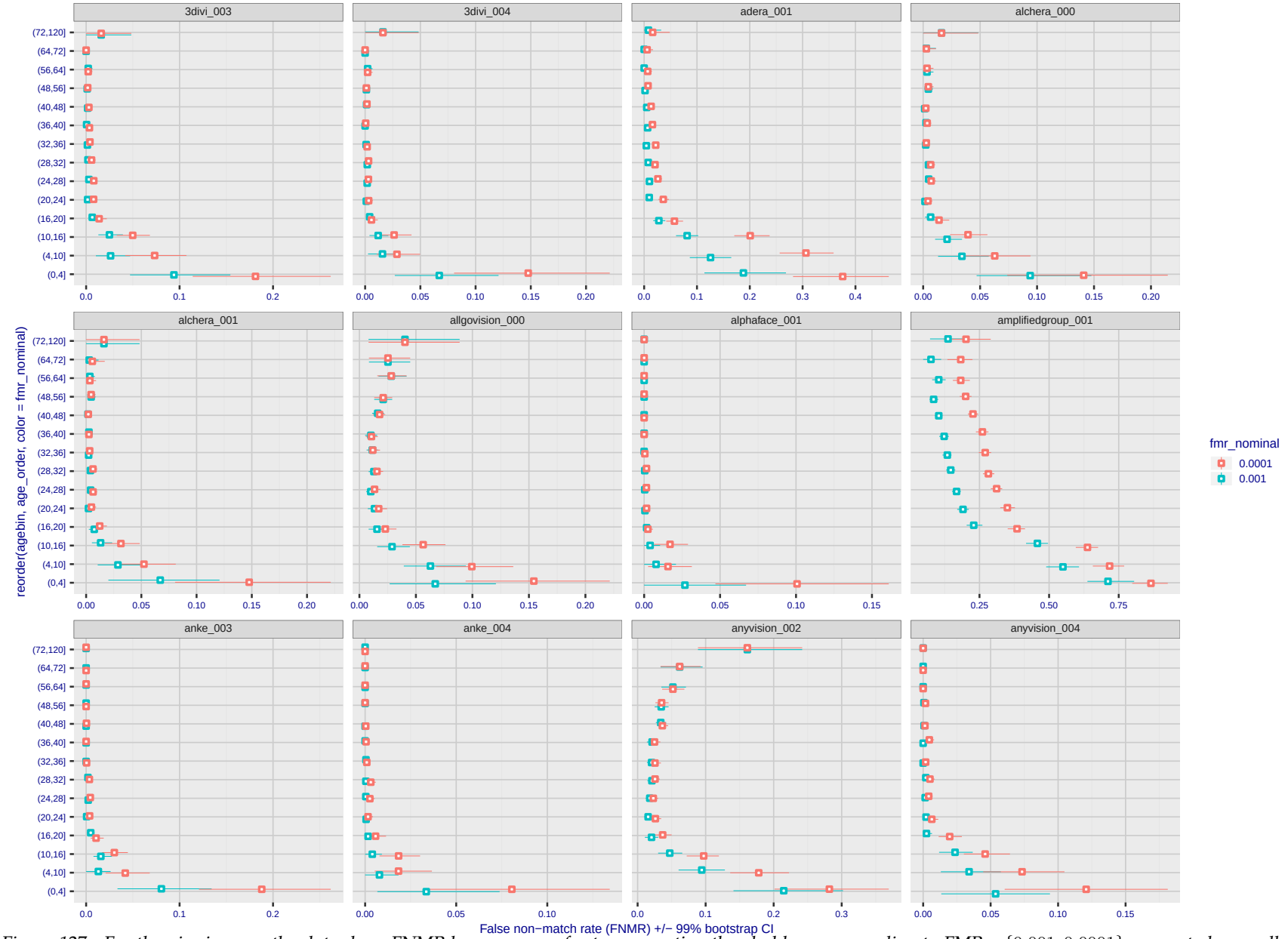


Figure 127: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

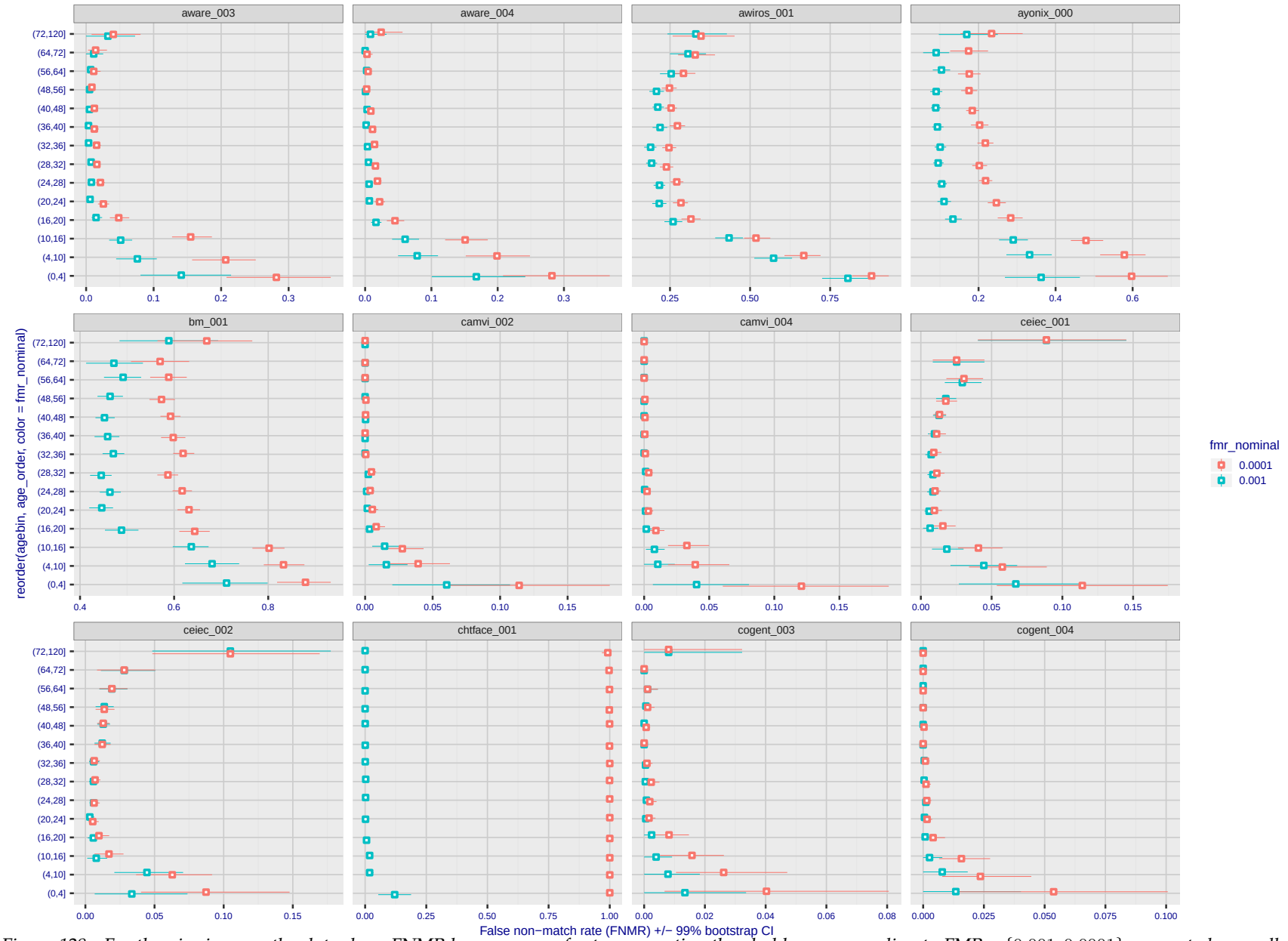


Figure 128: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

Figure 129: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

Figure 130: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

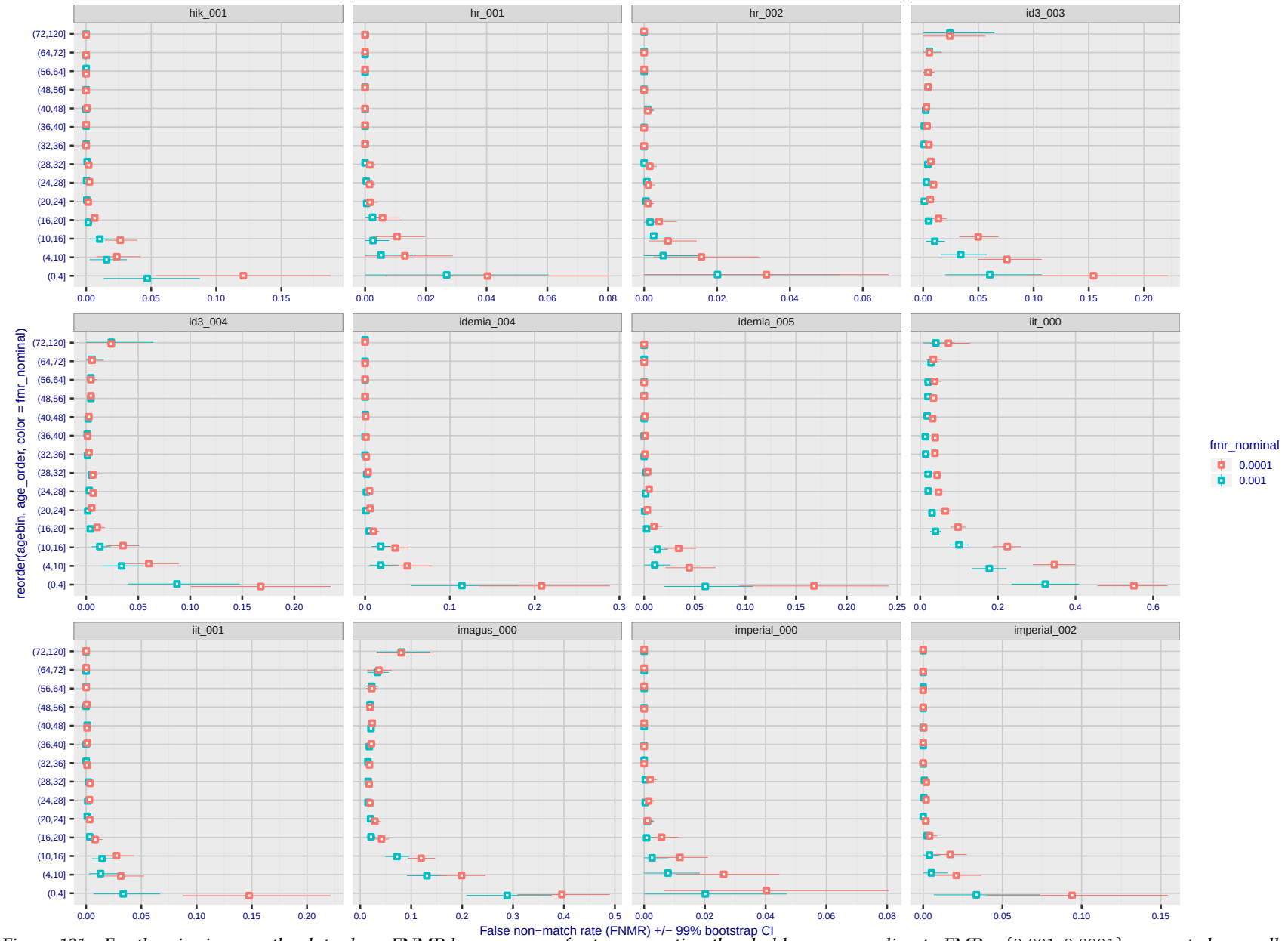


Figure 131: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

Figure 132: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

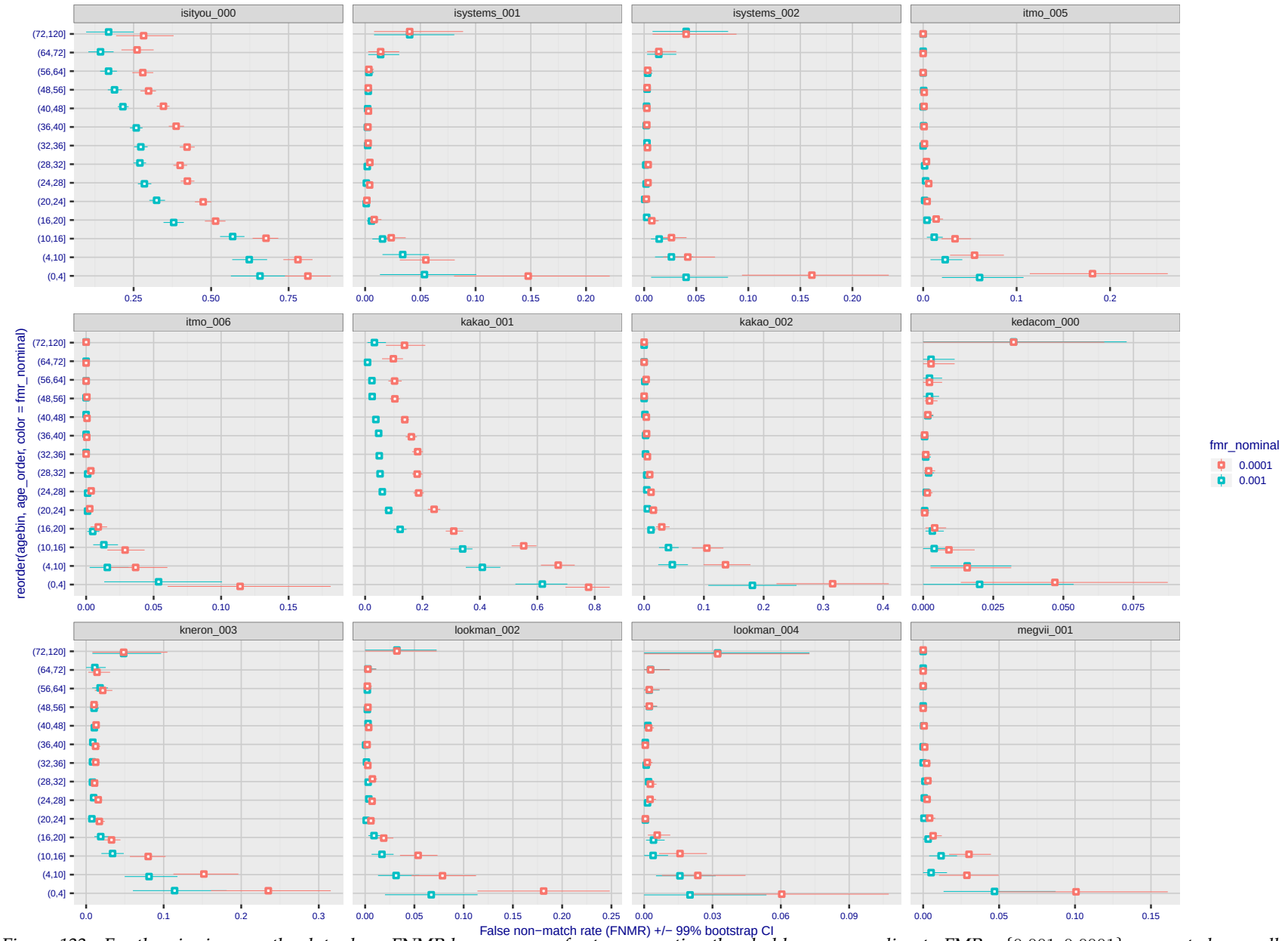


Figure 133: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

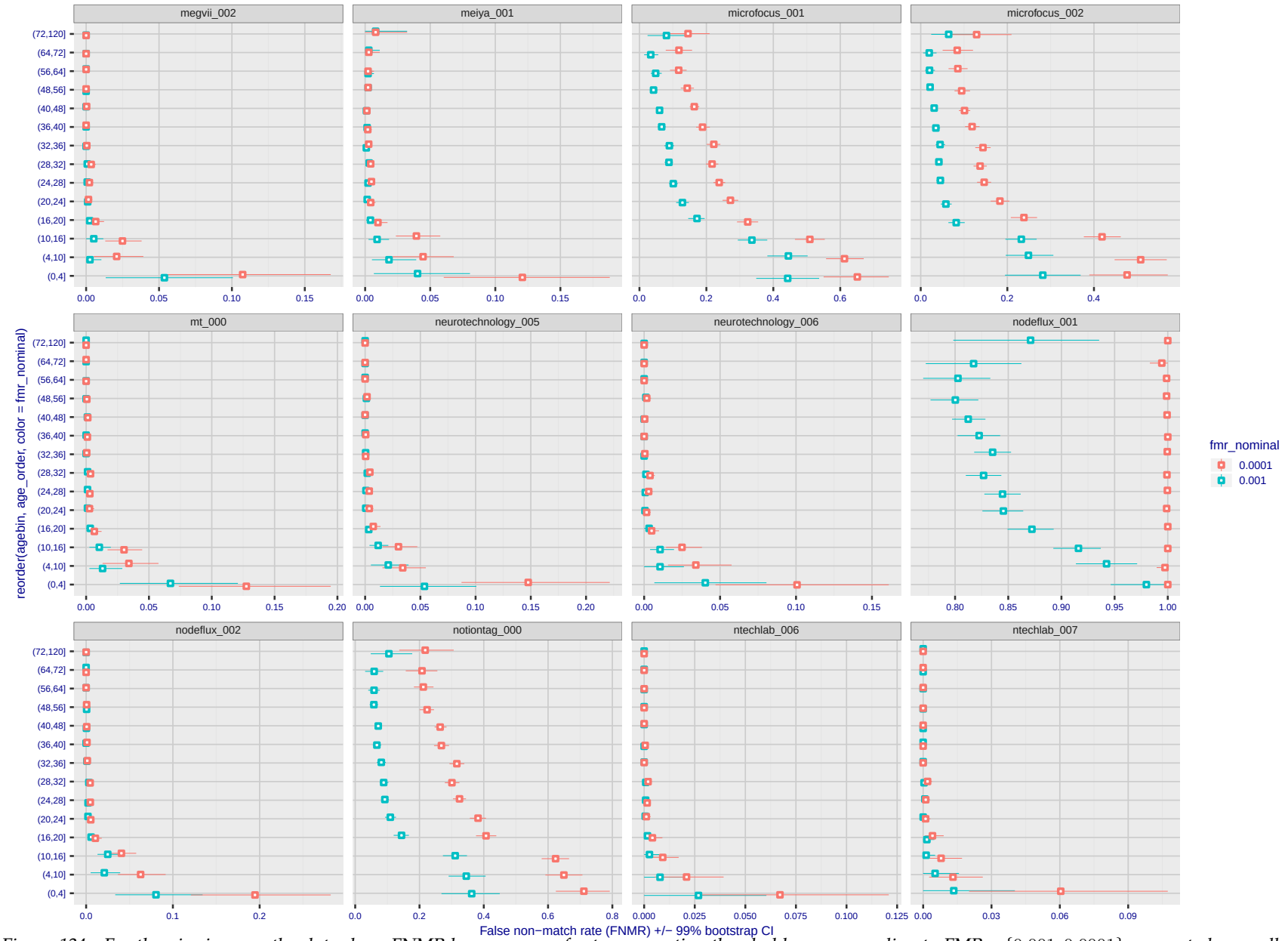


Figure 134: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

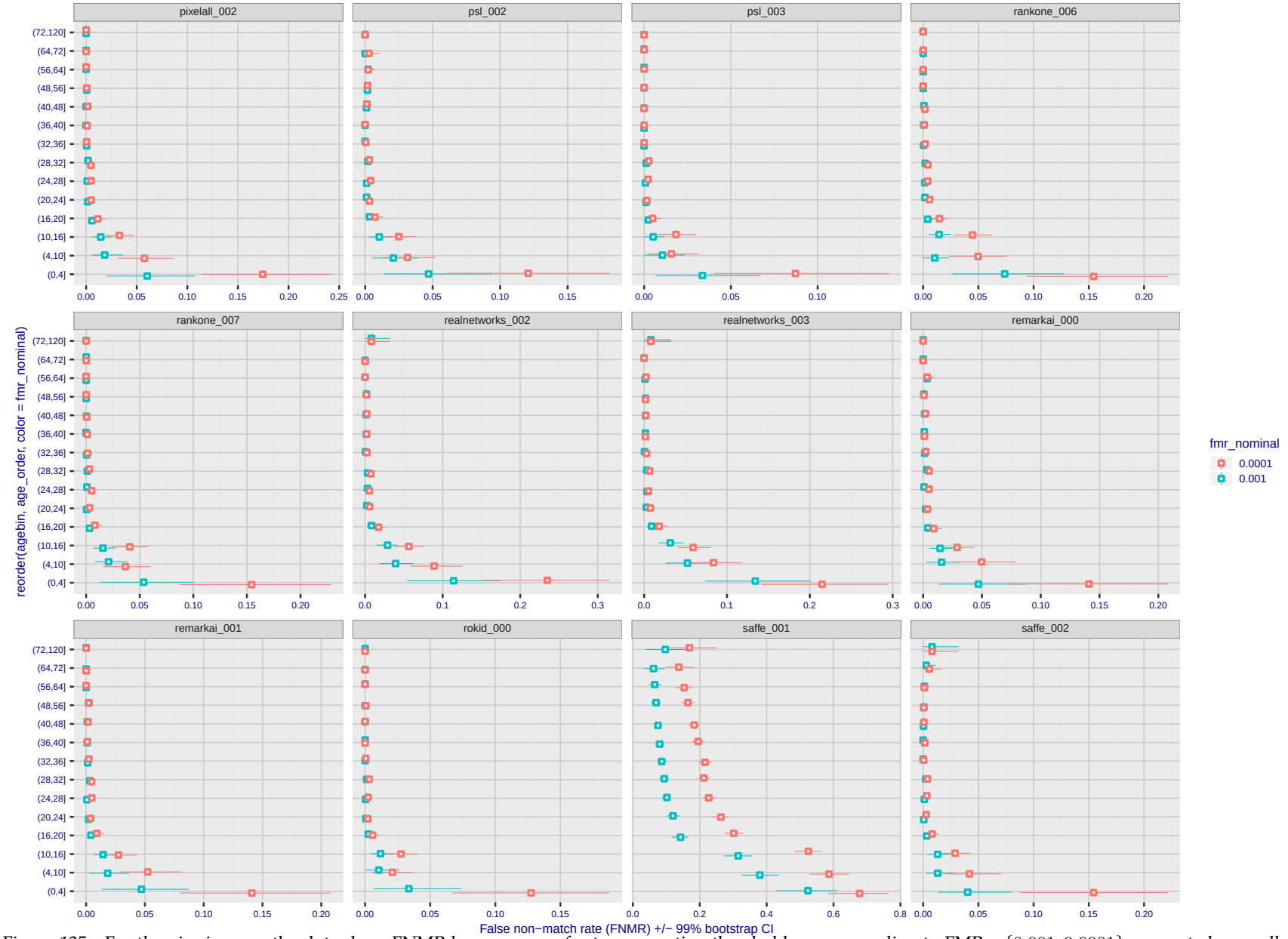


Figure 135: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

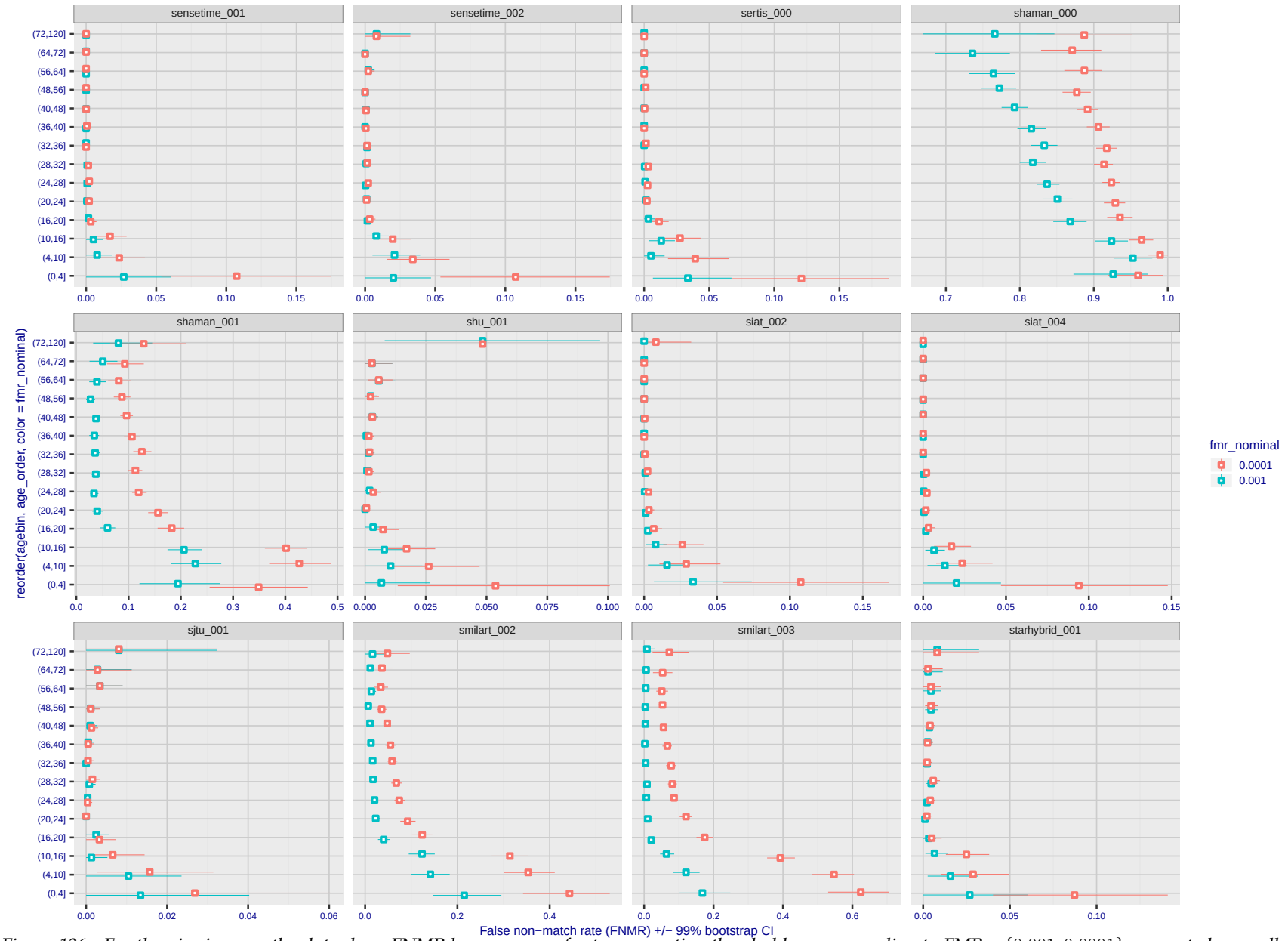


Figure 136: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

Figure 137: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

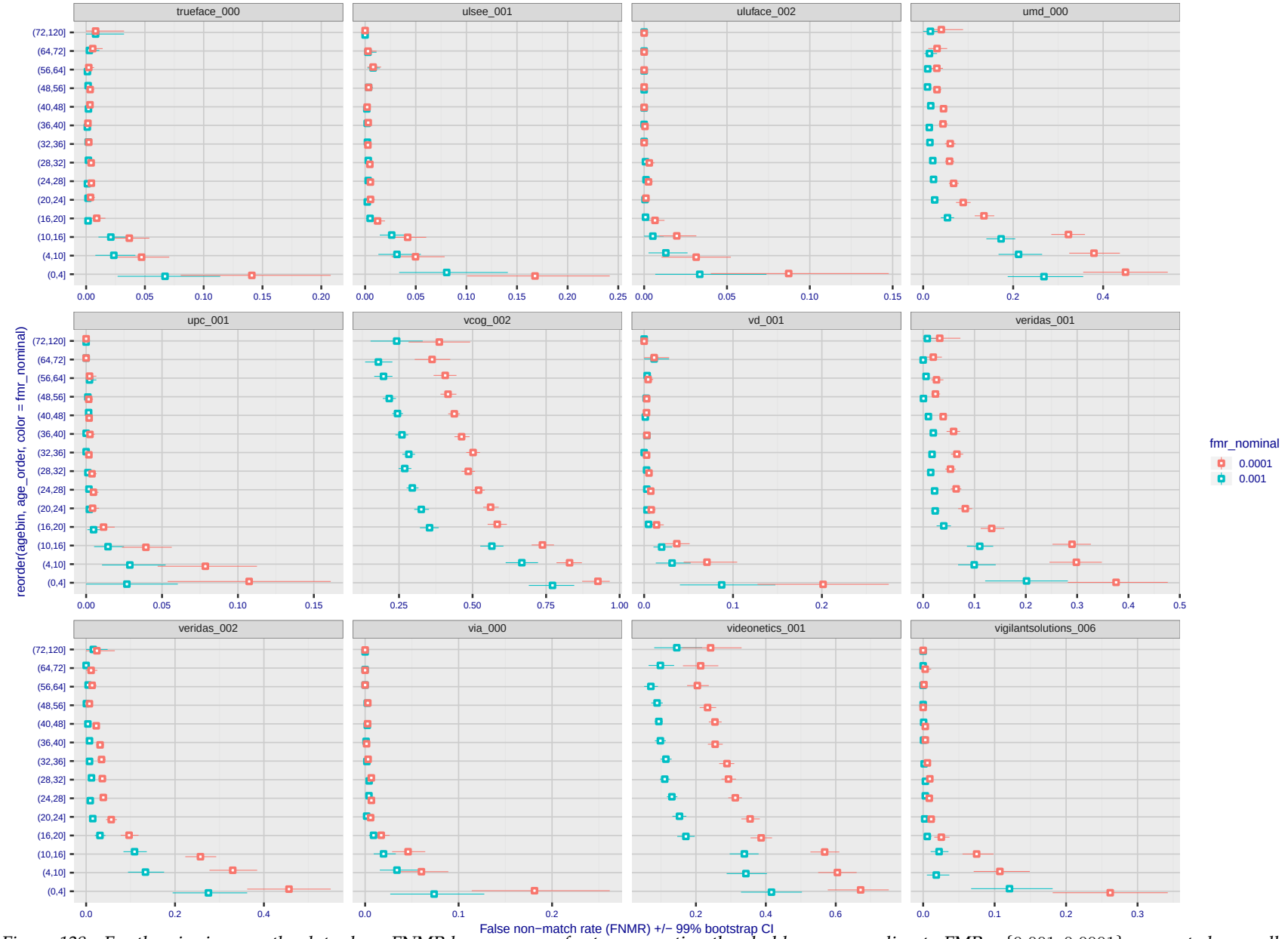


Figure 138: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

Figure 139: For the visa images, the dots show FNMR by age group for two operating thresholds corresponding to FMR = $\{0.001, 0.0001\}$ computed over all on the order of 10^{10} impostor scores. The FMR in each bin will vary also - see subsequent impostor heatmaps in sec. 3.6.2. Given a pair of face images taken at different times, we assign the comparison to the bin that is the arithmetic average of the subject's ages. This plot shows only the effect of age, not ageing. The number of comparisons in each bin is generally in the thousands, however the first and last bins are computed over 149 and 124 respectively. The error rates in some (adult) cases are zero, and in others the DET is flat so the error rates at the two thresholds are identical. The lines span 1% and 99% of boostrap replicated FNMR estimates.

Caveats: None.

3.6 Impostor distribution stability

3.6.1 Effect of birth place on the impostor distribution

Background: Facial appearance varies geographically, both in terms of skin tone, cranio-facial structure and size. This section addresses whether false match rates vary intra- and inter-regionally.

Goals:

- ▷ To show the effect of birth region of the impostor and enrollee on false match rates.
- ▷ To determine whether some algorithms give better impostor distribution stability.

Methods:

- ▷ For the visa images, NIST defined 10 regions: Sub-Saharan Africa, South Asia, Polynesia, North Africa, Middle East, Europe, East Asia, Central and South America, Central Asia, and the Caribbean.
- ▷ For the visa images, NIST mapped each country of birth to a region. There is some arbitrariness to this. For example, Egypt could reasonably be assigned to the Middle East instead of North Africa. An alternative methodology could, for example, assign the Philippines to *both* Polynesia and East Asia.
- ▷ FMR is computed for cases where all face images of impostors born in region r_2 are compared with enrolled face images of persons born in region r_1.

$$\text{FMR}(r_1, r_2, T) = \frac{\sum_{i=1}^{N_{r_1,r_2}} H(s_i - T)}{N_{r_1,r_2}} \tag{5}$$

  where the same threshold, T, is used in all cells, and H is the unit step function. The threshold is set to give FMR(T) = 0.001 over the entire set of visa image impostor comparisons.
- ▷ This analysis is then repeated by country-pair, but only for those country pairs where both have at least 1000 images available. The countries[1] appear in the axes of graphs that follow.
- ▷ The mean number of impostor scores in any cross-region bin is 33 million. The smallest number of impostor scores in any bin is 135000, for Central Asia - North Africa. While these counts are large enough to support reasonable significance, the number of individual faces is much smaller, on the order of $N^{0.5}$.
- ▷ The numbers of impostor scores in any cross-country bin is shown in Figure 444.

Results: Subsequent figures show heatmaps that use color to represent the base-10 logarithm of the false match rate. Red colors indicate high (bad) false match rates. Dark colors indicate benign false match rates. There are two series of graphs corresponding to aggregated geographical regions, and to countries. The notable observations are:

- ▷ The on-diagonal elements correspond to within-region impostors. FMR is generally above the nominal value of FMR = 0.001. Particularly there is usually higher FMR in, Sub-Saharan Africa, South Asia, and the Caribbean. Europe and Central Asia, on the other hand, usually give FMR closer to the nominal value.
- ▷ The off-diagonal elements correspond to across-region impostors. The highest FMR is produced between the Caribbean and Sub-Saharan Africa.
- ▷ Algorithms vary.

[1] These are Argentina, Australia, Brazil, Chile, China, Costa Rica, Cuba, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Germany, Ghana, Great Britain, Greece, Guatamala, Haiti, Hong Kong, Honduras, Indonesia, India, Israel, Jamaica, Japan, Kenya, Korea, Lebanon, Mexico, Malaysia, Nepal, Nigeria, Peru, Philippines, Pakistan, Poland, Romania, Russia, South Africa, Saudi Arabia, Thailand, Trinidad, Turkey, Taiwan, Ukraine, Venezuela, and Vietnam.

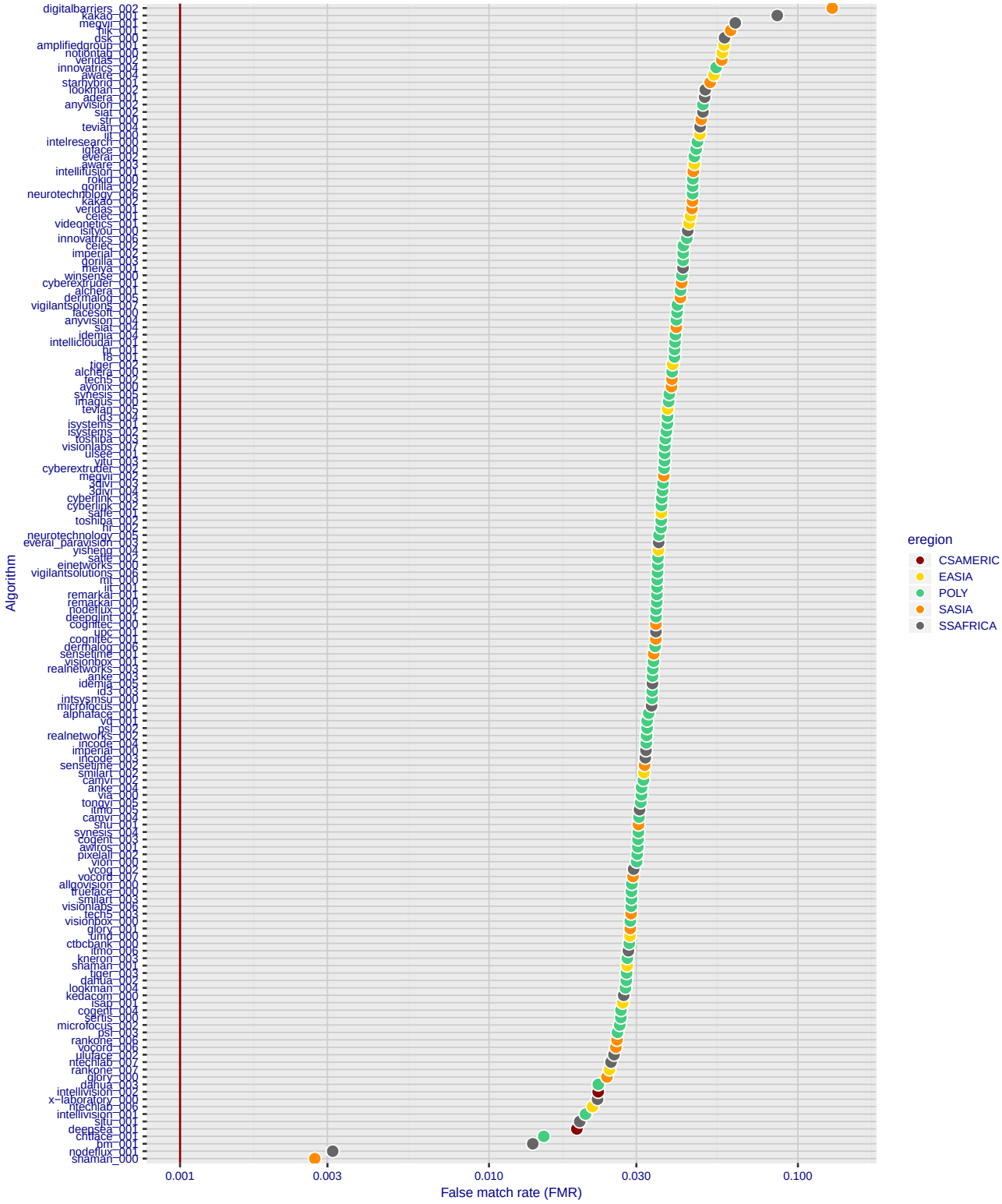


Figure 140: For the visa images, the dots show FMR for impostor comparisons of individuals of the same sex and same age group for the region of the world that gives the worst (highest) FMR when the threshold is set to give FMR = 0.001 (red vertical line) over all on the order of 10^{10} impostor scores i.e. zero-effort. The shift of the dots to right shows massive increases in FMR when impostors have the same sex, age, and region of birth. The color code indicates which region gives the worst case FMR. If the observed variation is due to the prevalence of one kind of images in the training imagery, then algorithms developed on one kind of data might be expected to give higher FMR on other kinds.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

▷ We computed the same quantities for a global FMR = 0.0001. The effects are similar.

Caveats:

▷ The effects of variable impostor rates on one-to-many identification systems may well differ from what's implied by these one-to-one verification results. Two reasons for this are a) the enrollment galleries are usually imbalanced across countries of birth, age and sex; b) one-to-many identification algorithms often implement techniques aimed at stabilizing the impostor distribution. Further research is necessary.

▷ In principle, the effects seen in this subsection could be due to differences in the image capture process. We consider this unlikely since the effects are maintained across geography - e.g. Caribbean vs. Africa, or Japan vs. China.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

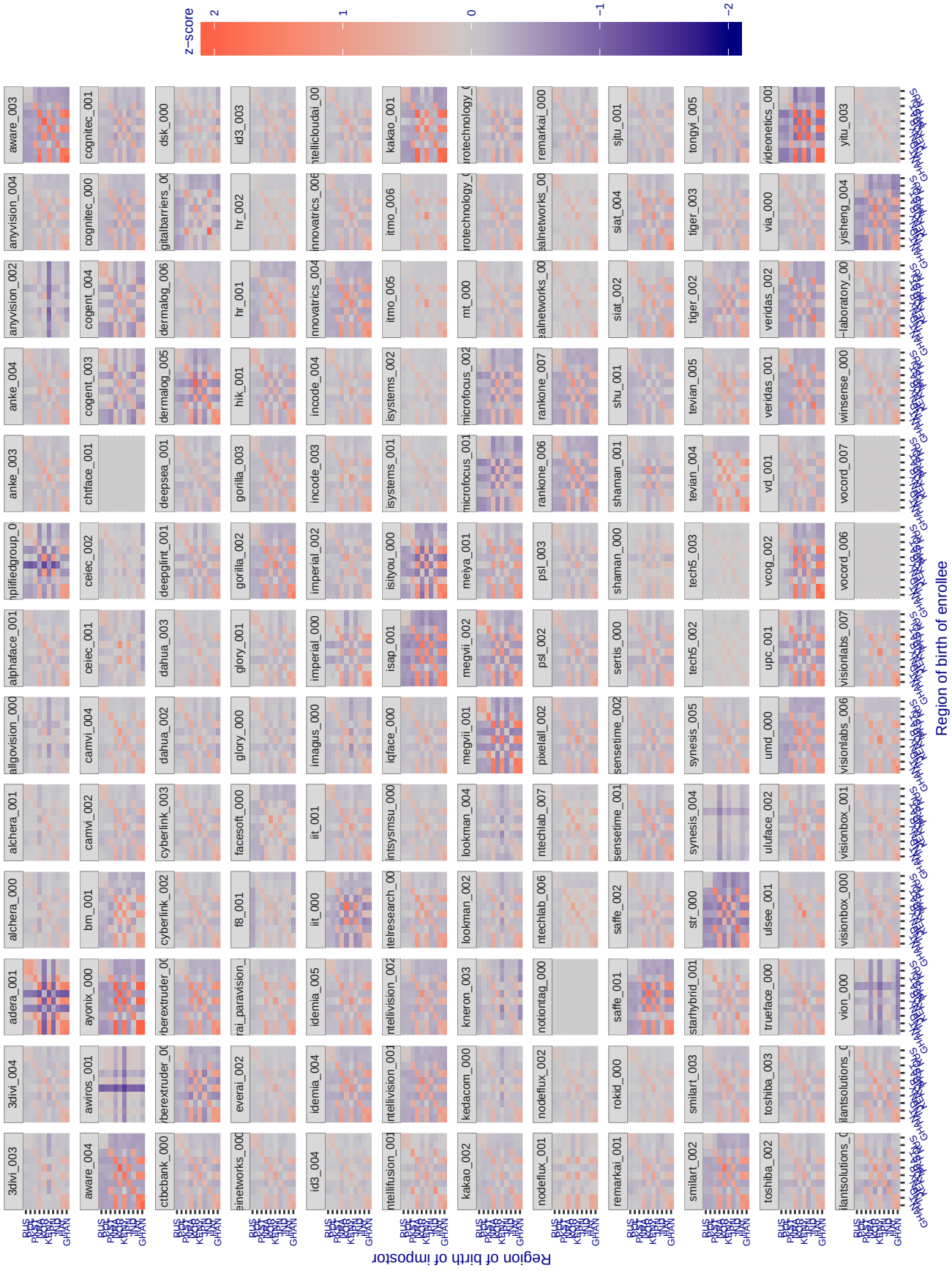


Figure 141: For visa images, the heatmap shows how the mean of the impostor distribution for the country pair (a,b) is shifted relative to the mean of the global impostor distribution, expressed as a number of standard deviations of the global impostor distribution. This statistic is designed to show shifts in the entire impostor distribution, not just tail effects that manifest as the anomalously high (or low) false match rates that appear in the subsequent figures. The countries are chosen to show that skin tone alone does not explain impostor distribution shifts. The reduced shift in Asian populations with the Yitu and TongYiTrans algorithms, is accompanied by positive shifts in the European populations. This reversal relative to most other algorithms, may derive from use of nationally weighted training sets. The Visionlabs algorithm appears most insensitive to country effects. The figure is computed from same-sex and same-age impostor pairs.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

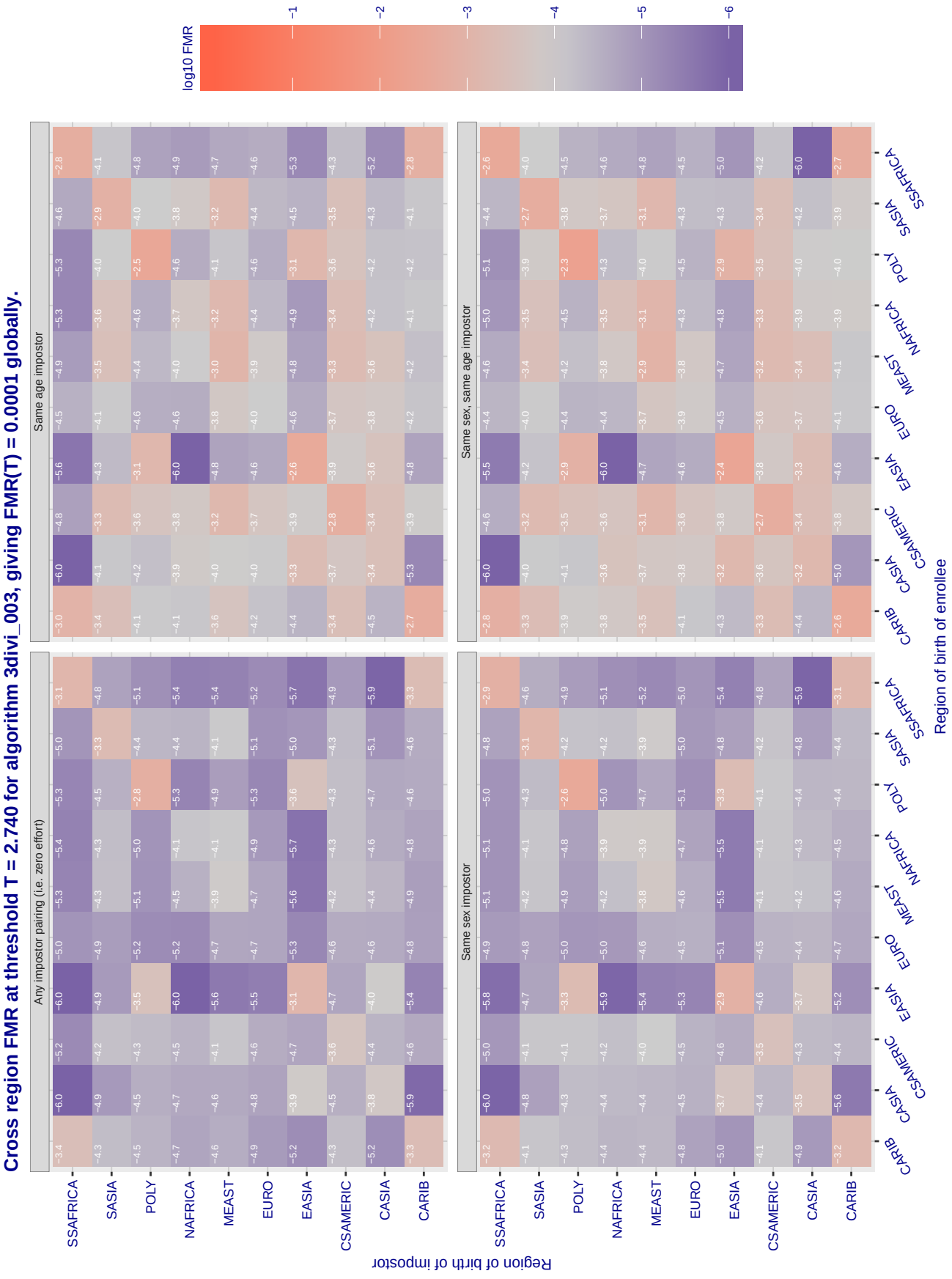


Figure 142: For algorithm 3divi-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

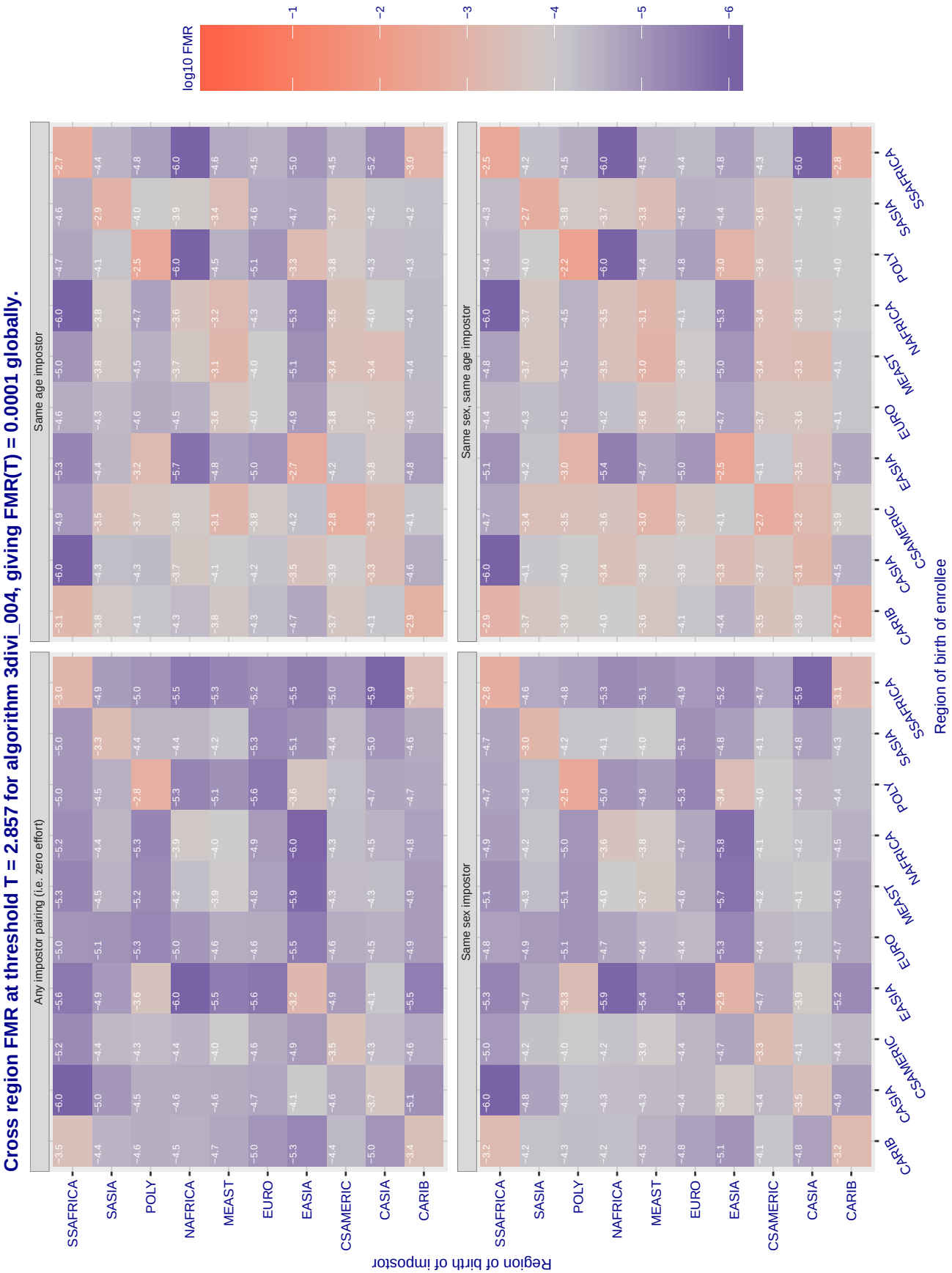


Figure 143: For algorithm 3divi-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

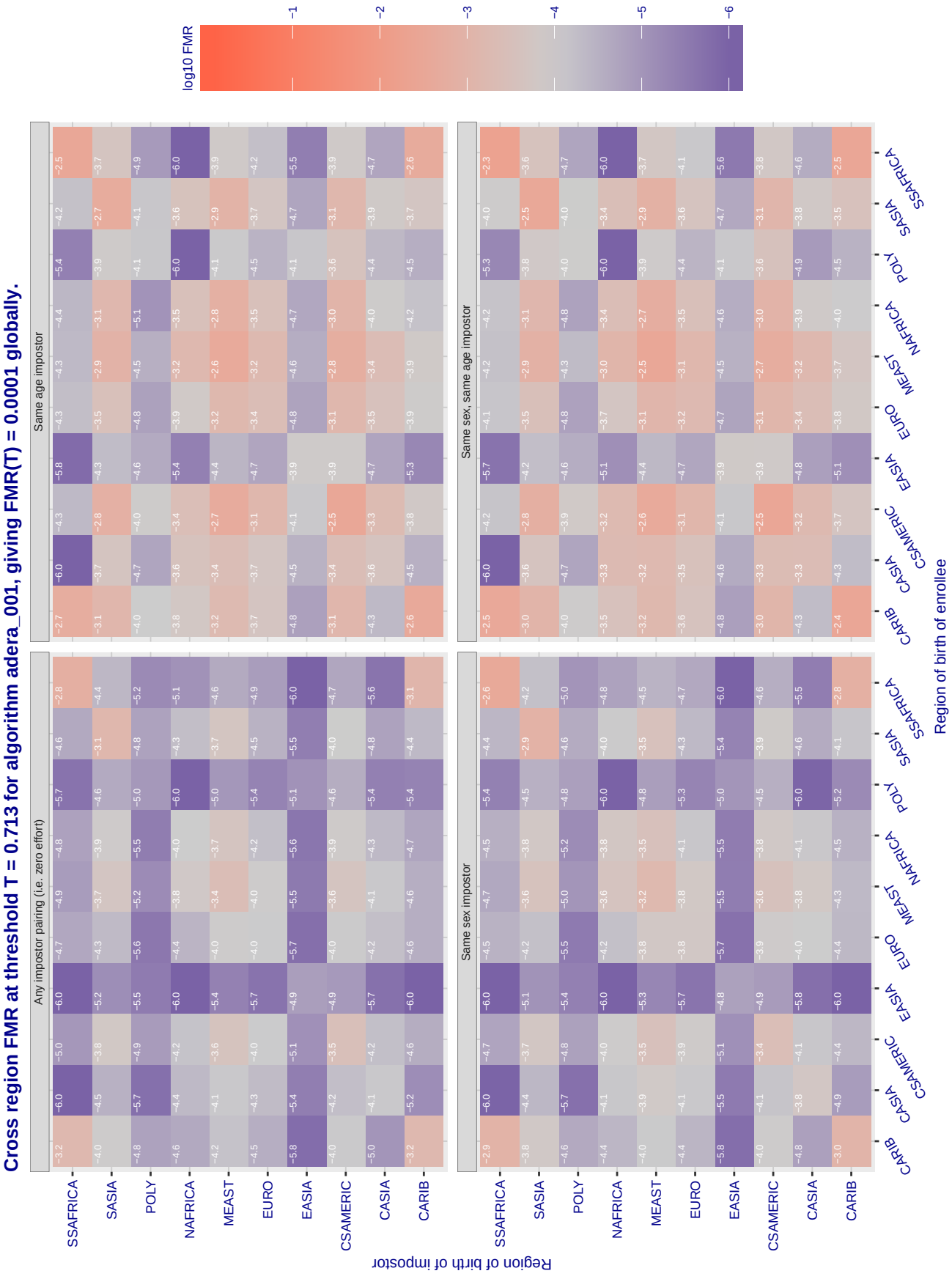


Figure 144: For algorithm adera-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

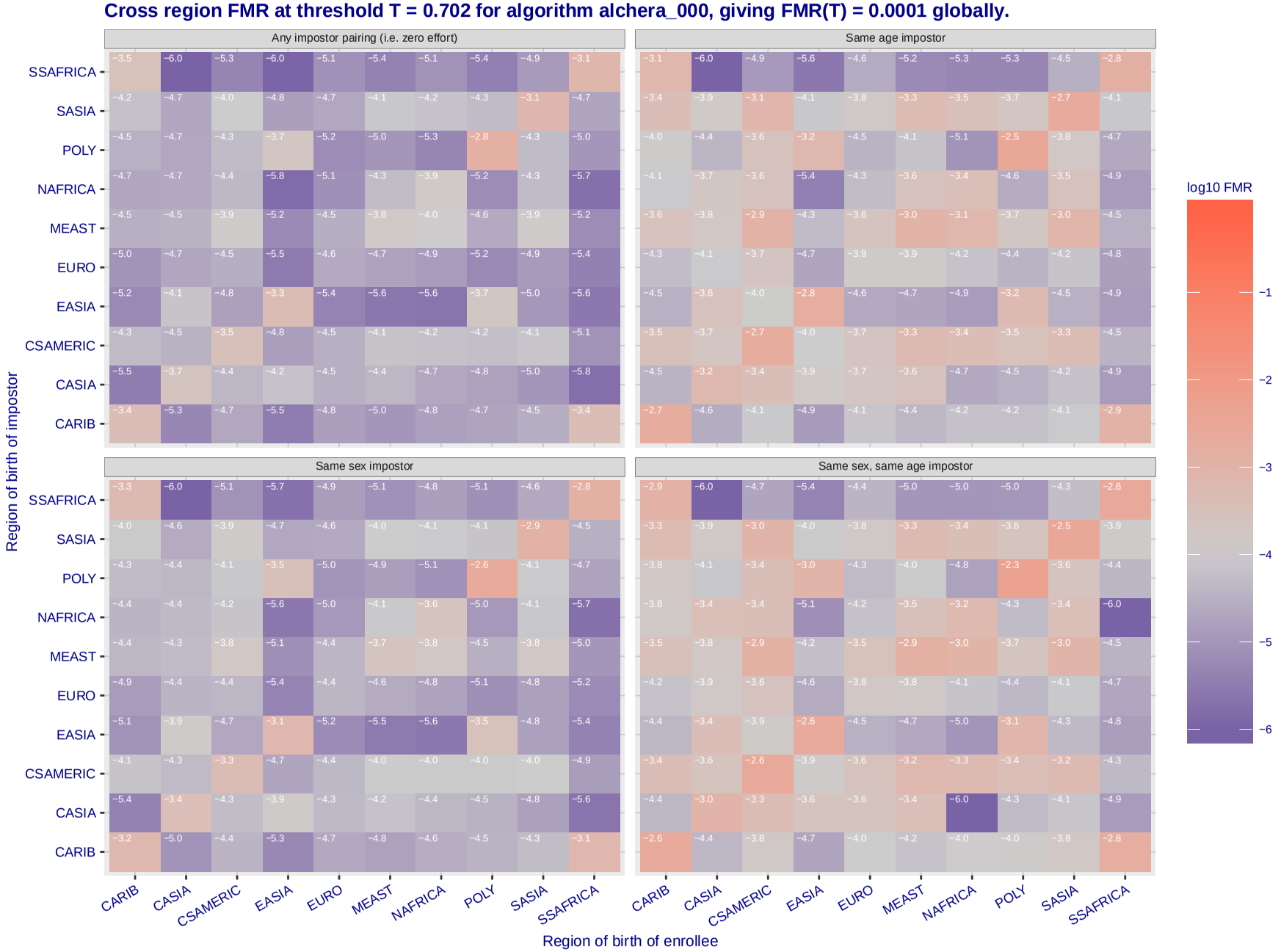


Figure 145: For algorithm alchera-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

Figure 146: For algorithm alchera-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

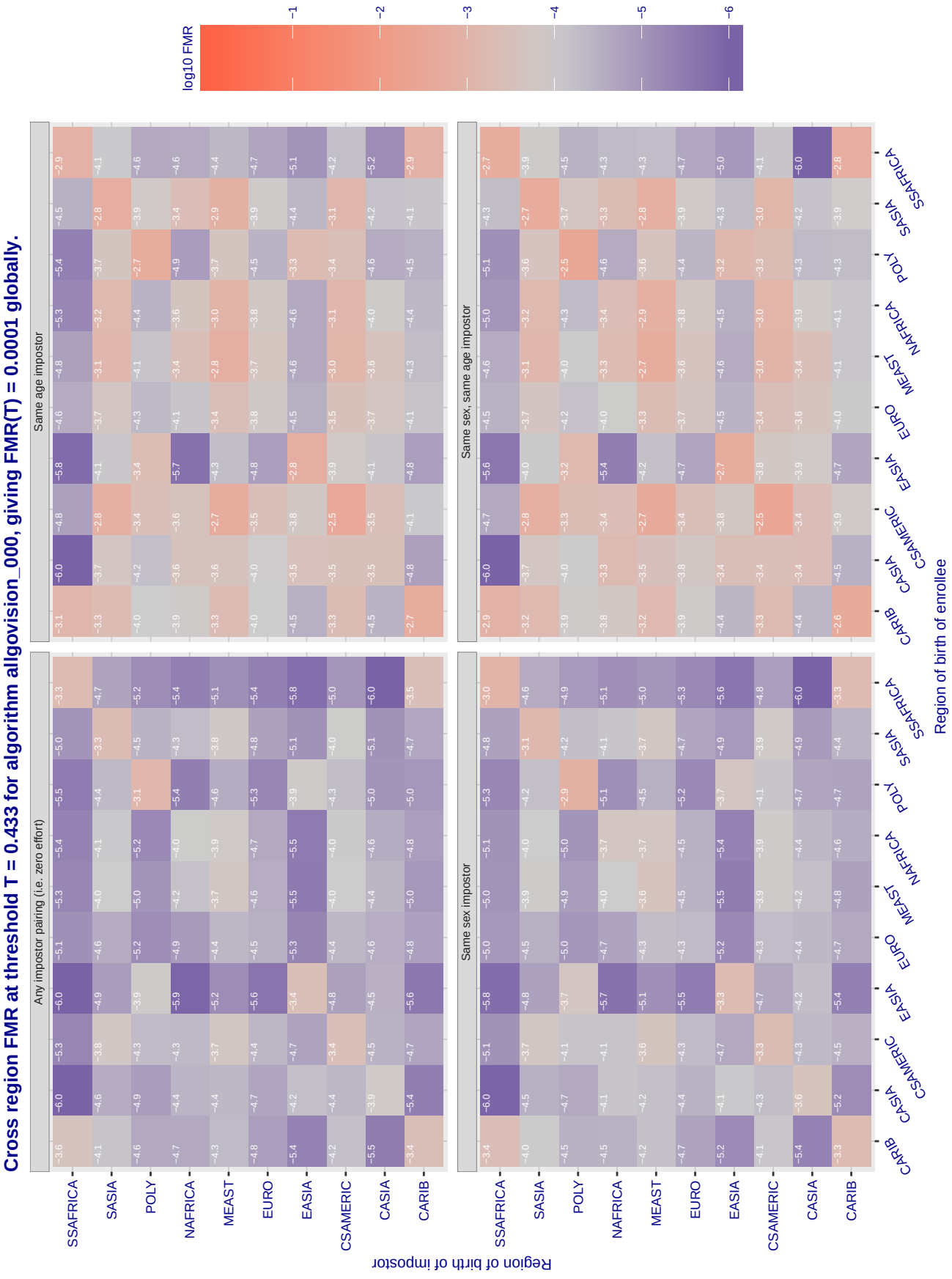


Figure 147: For algorithm allgovision-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

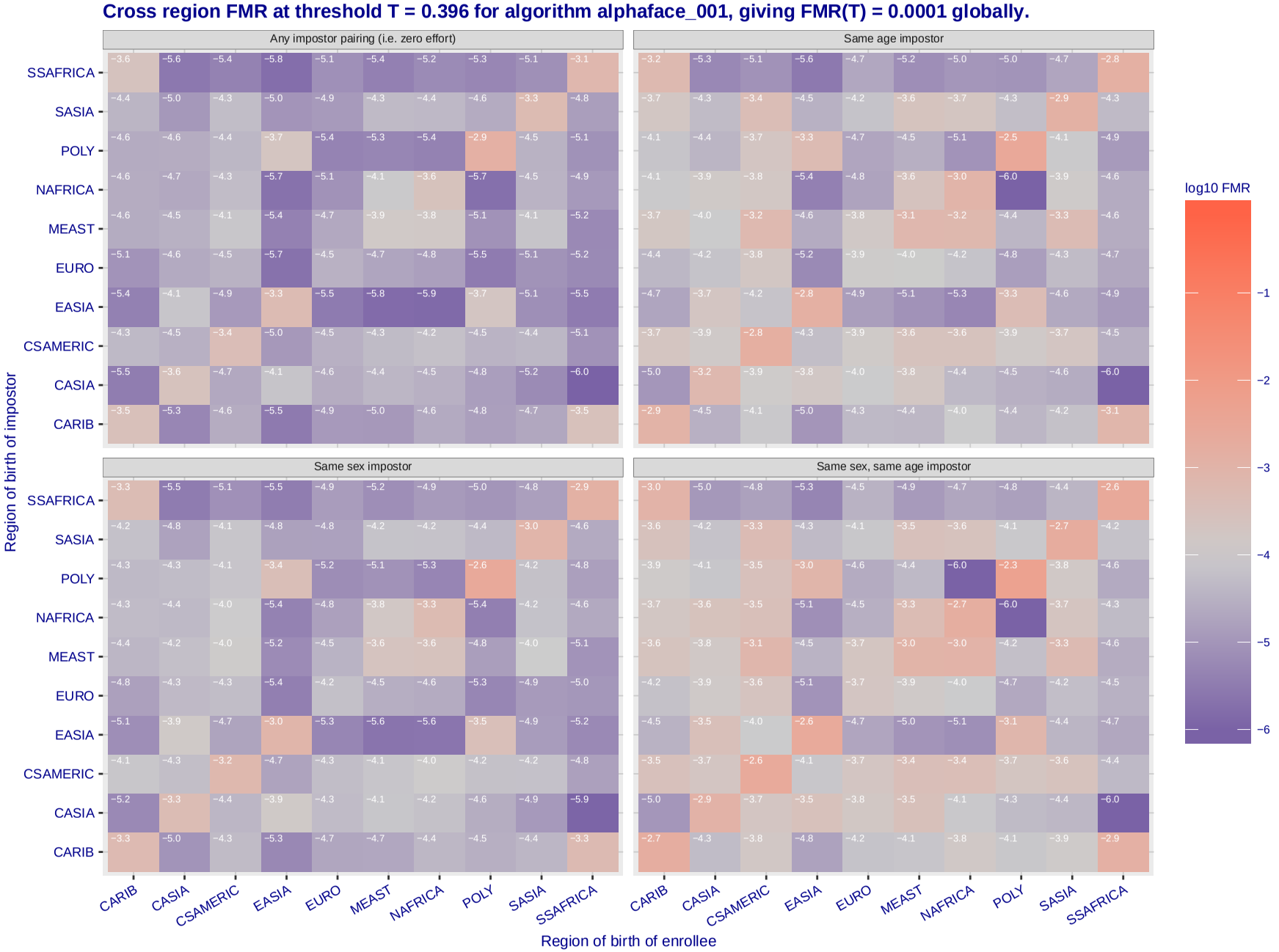


Figure 148: For algorithm alphaface-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

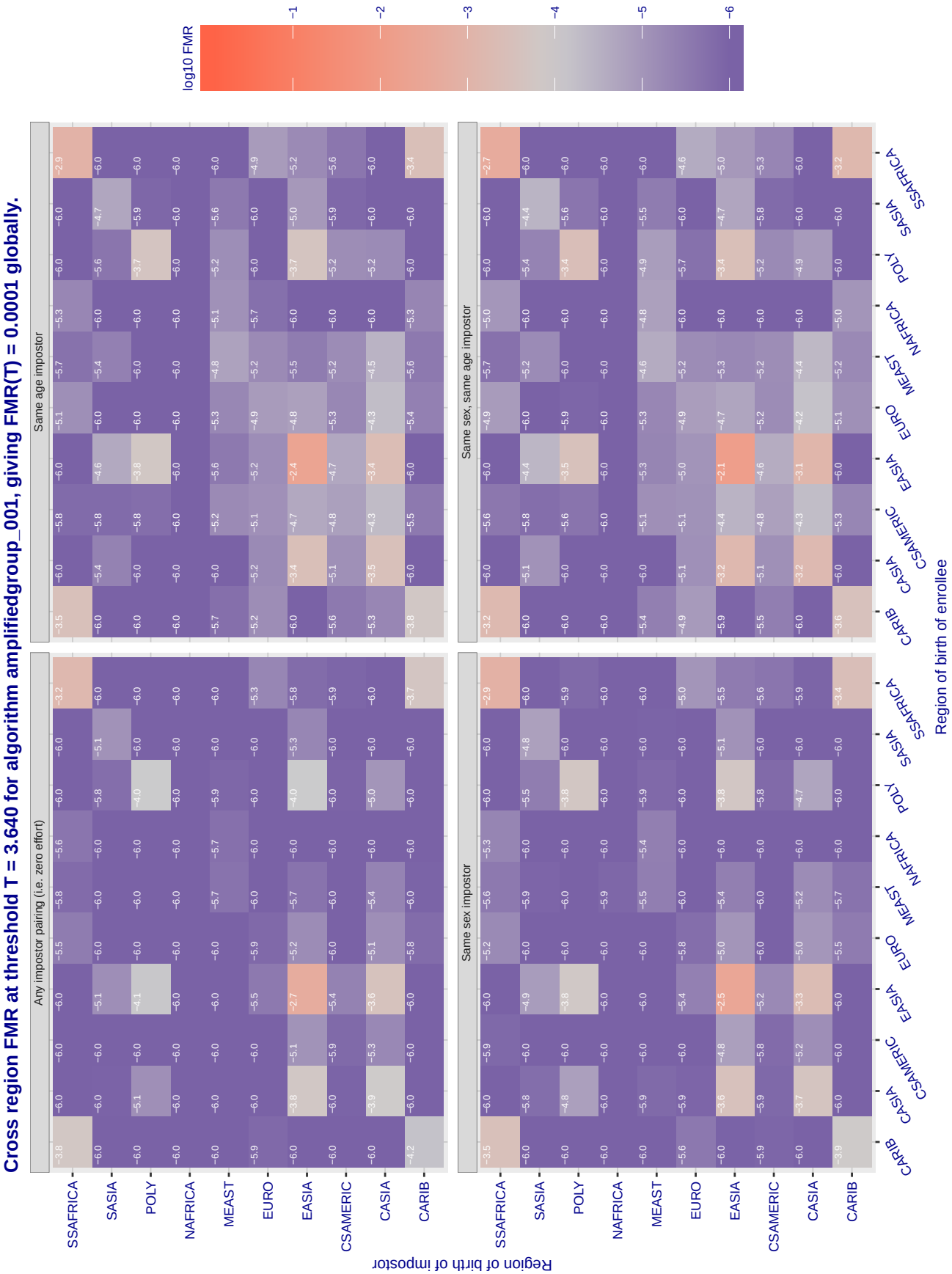


Figure 149: For algorithm amplifiedgroup-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

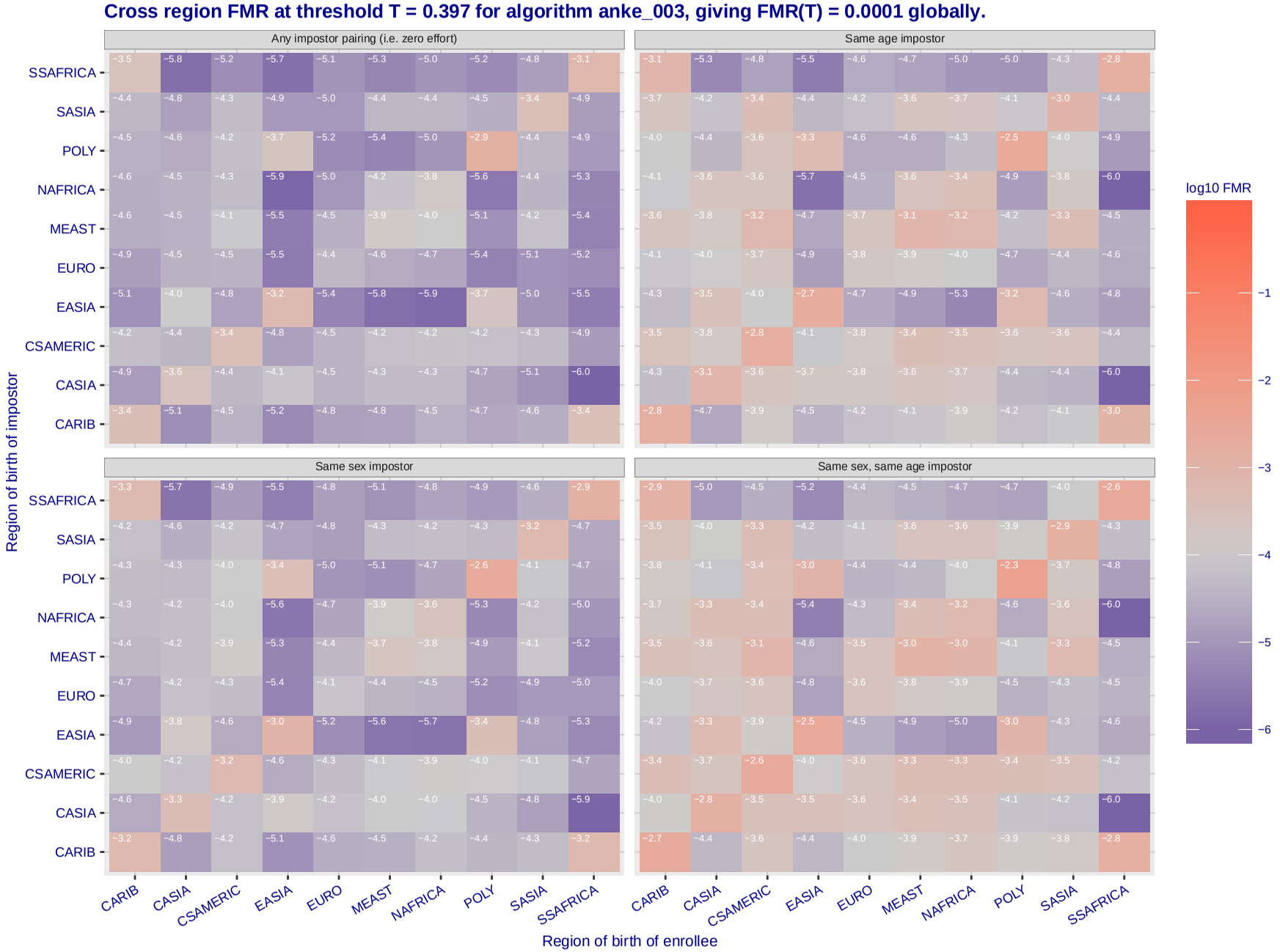


Figure 150: For algorithm anke-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

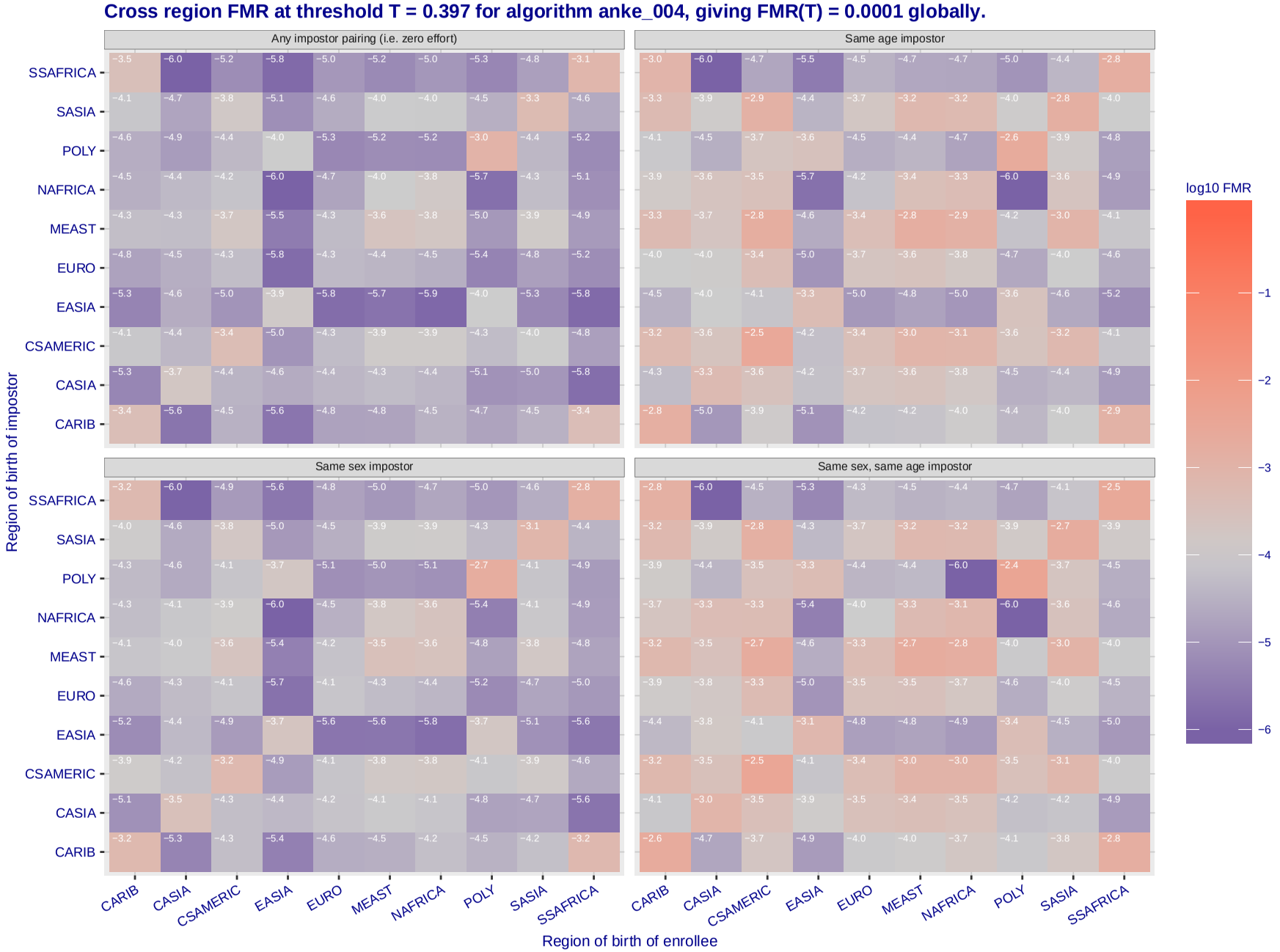


Figure 151: For algorithm anke-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

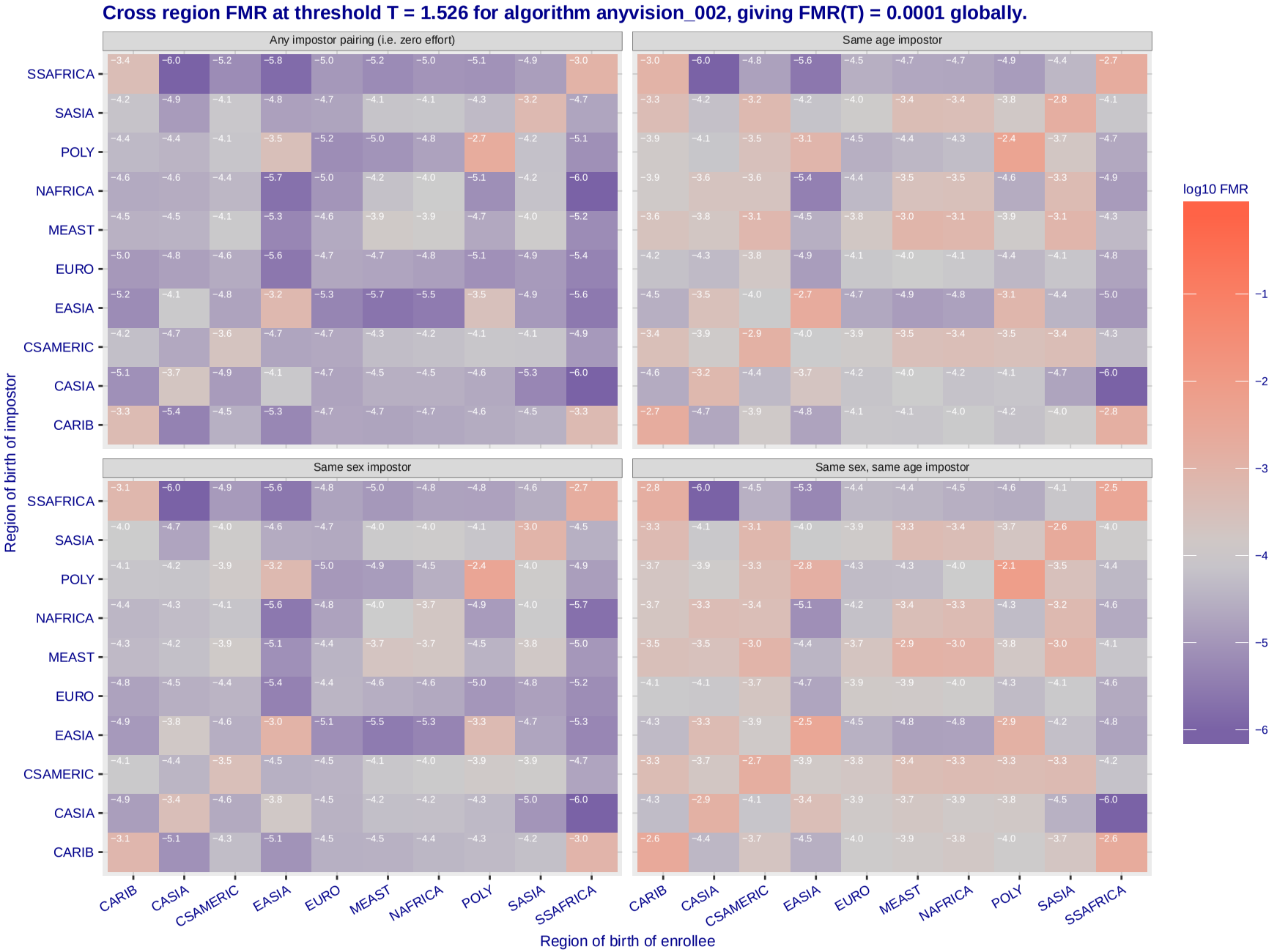


Figure 152: For algorithm anyvision-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 153: For algorithm anyvision-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

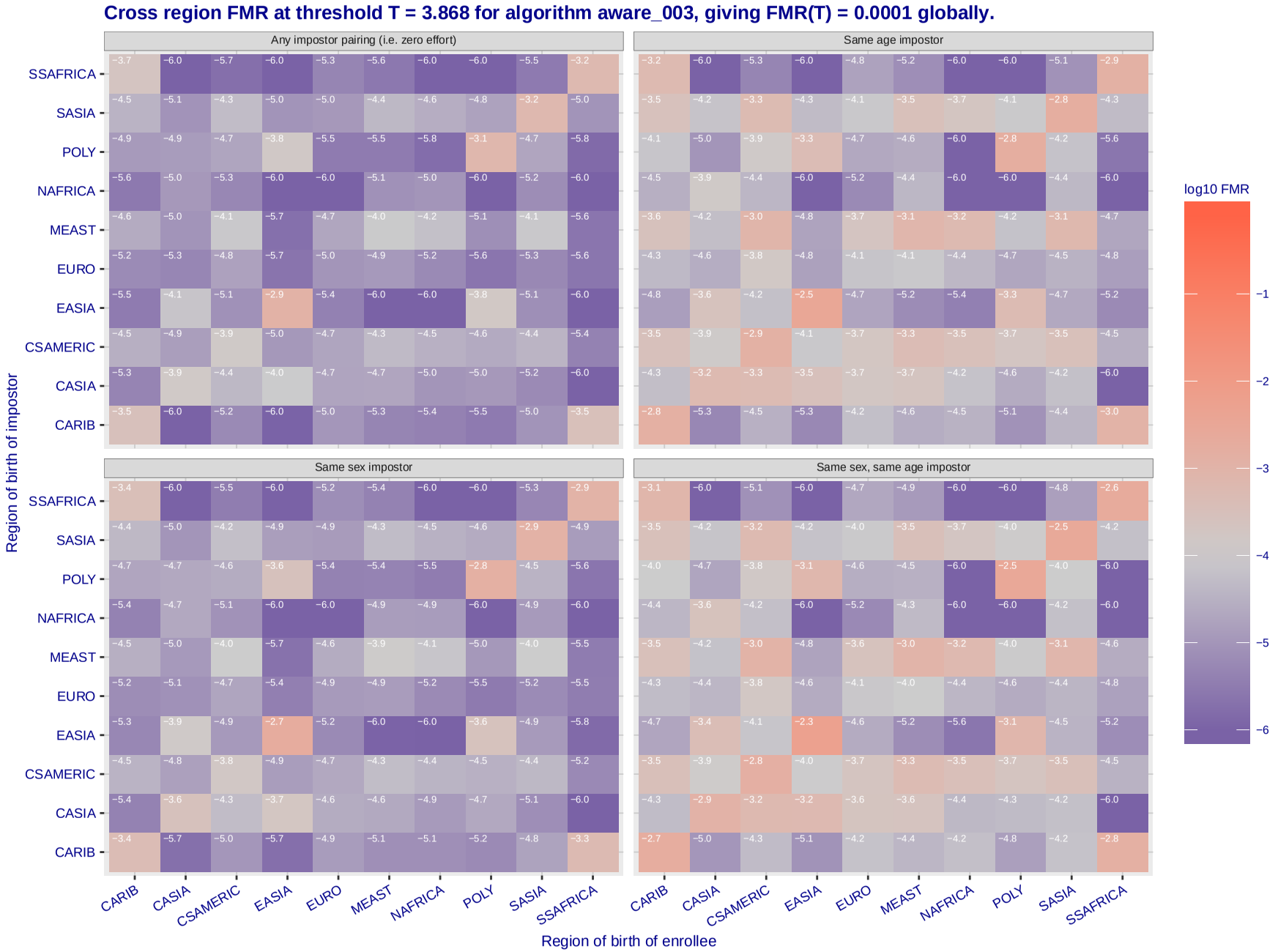


Figure 154: For algorithm aware-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

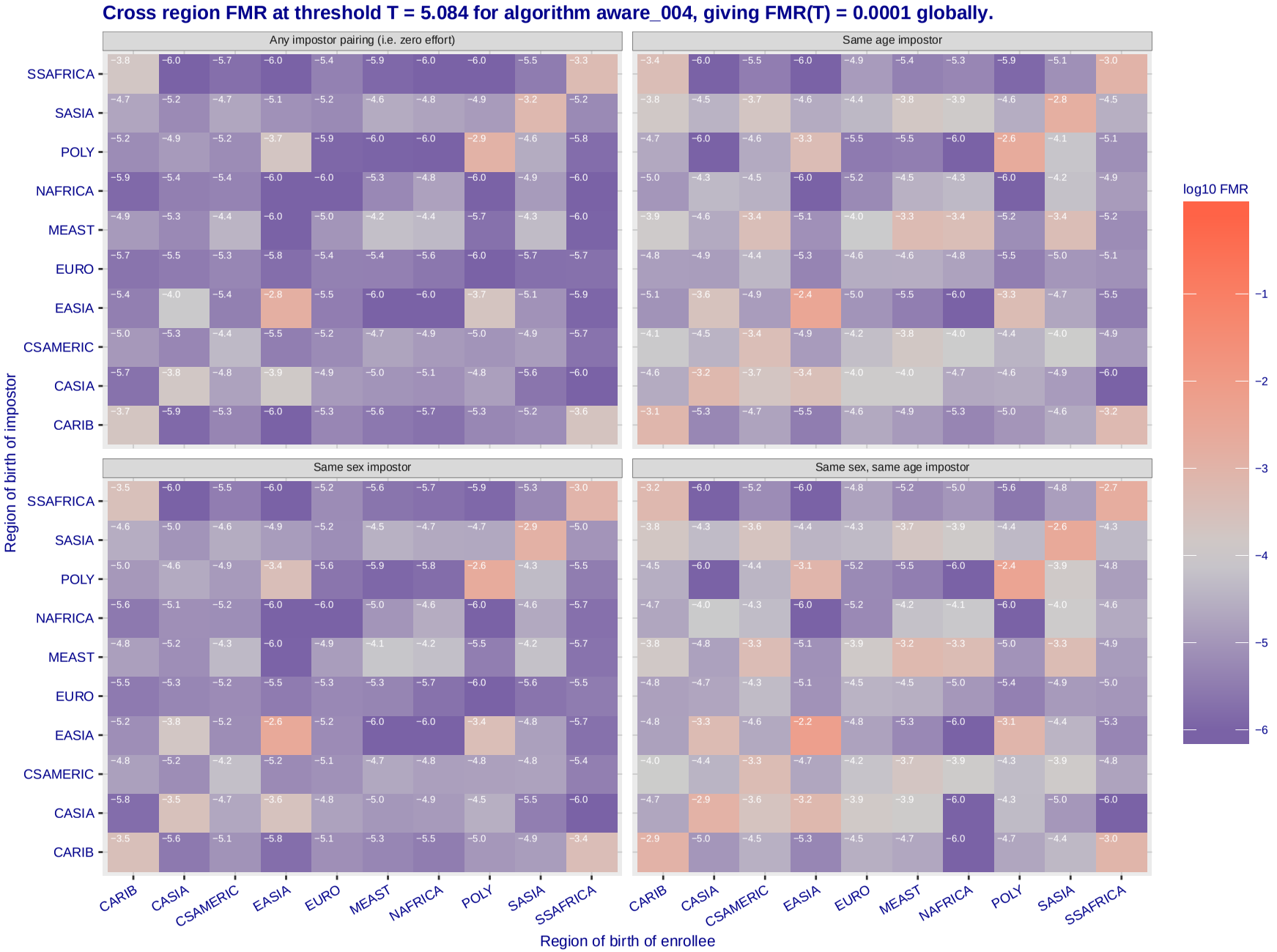


Figure 155: For algorithm aware-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

Figure 156: For algorithm awiros-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

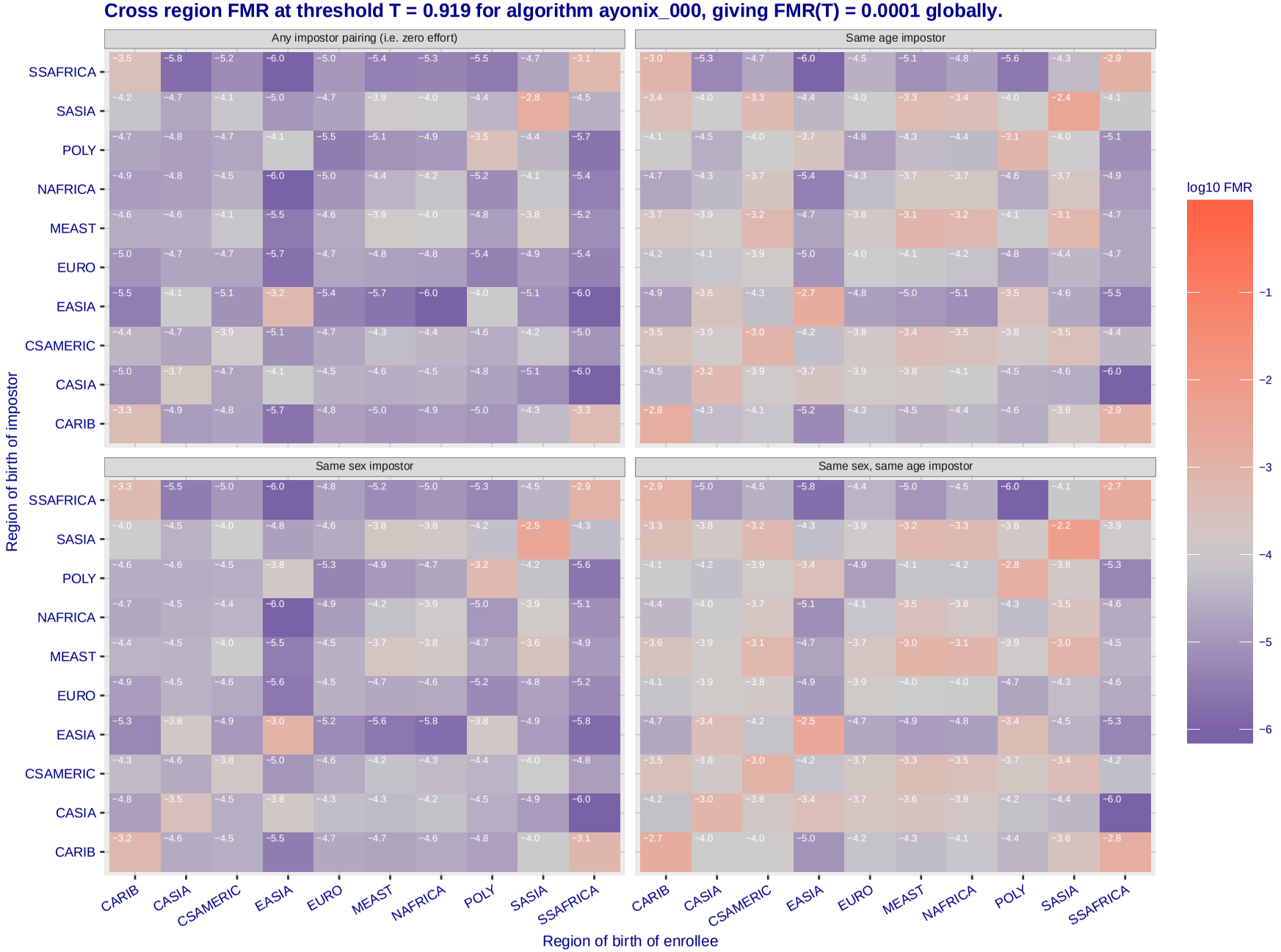


Figure 157: For algorithm ayonix-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

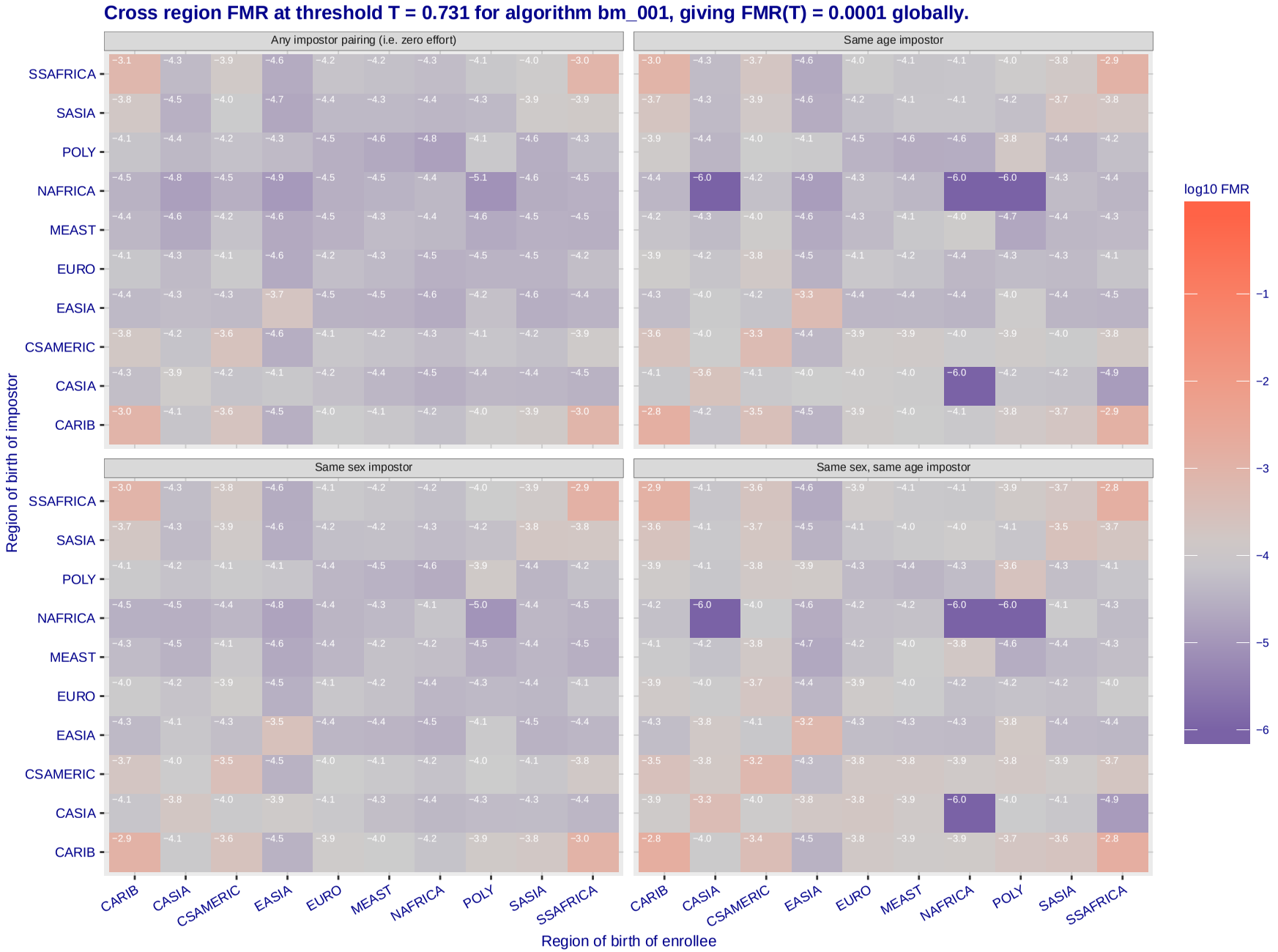


Figure 158: For algorithm bm-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

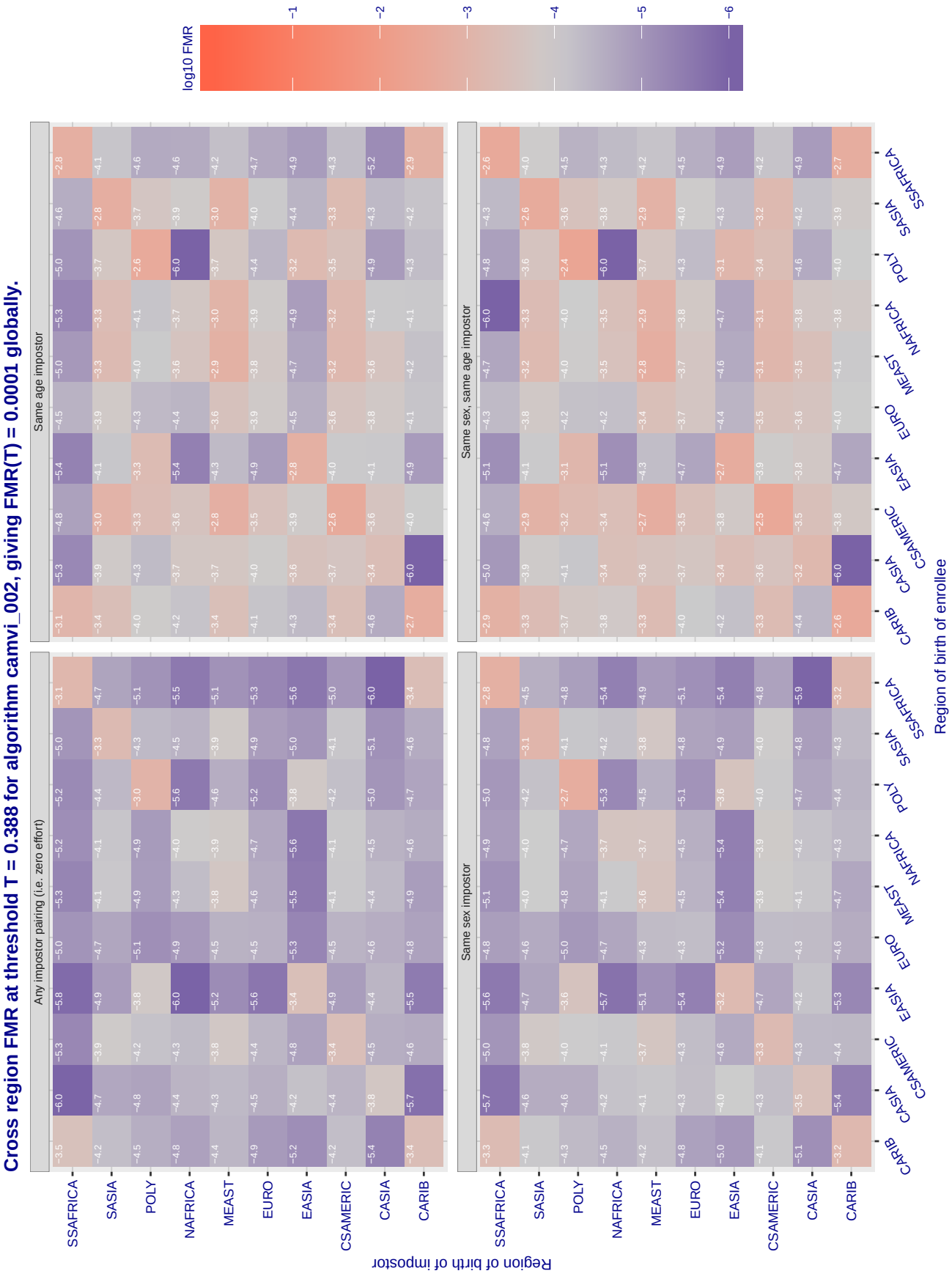


Figure 159: For algorithm camvi-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

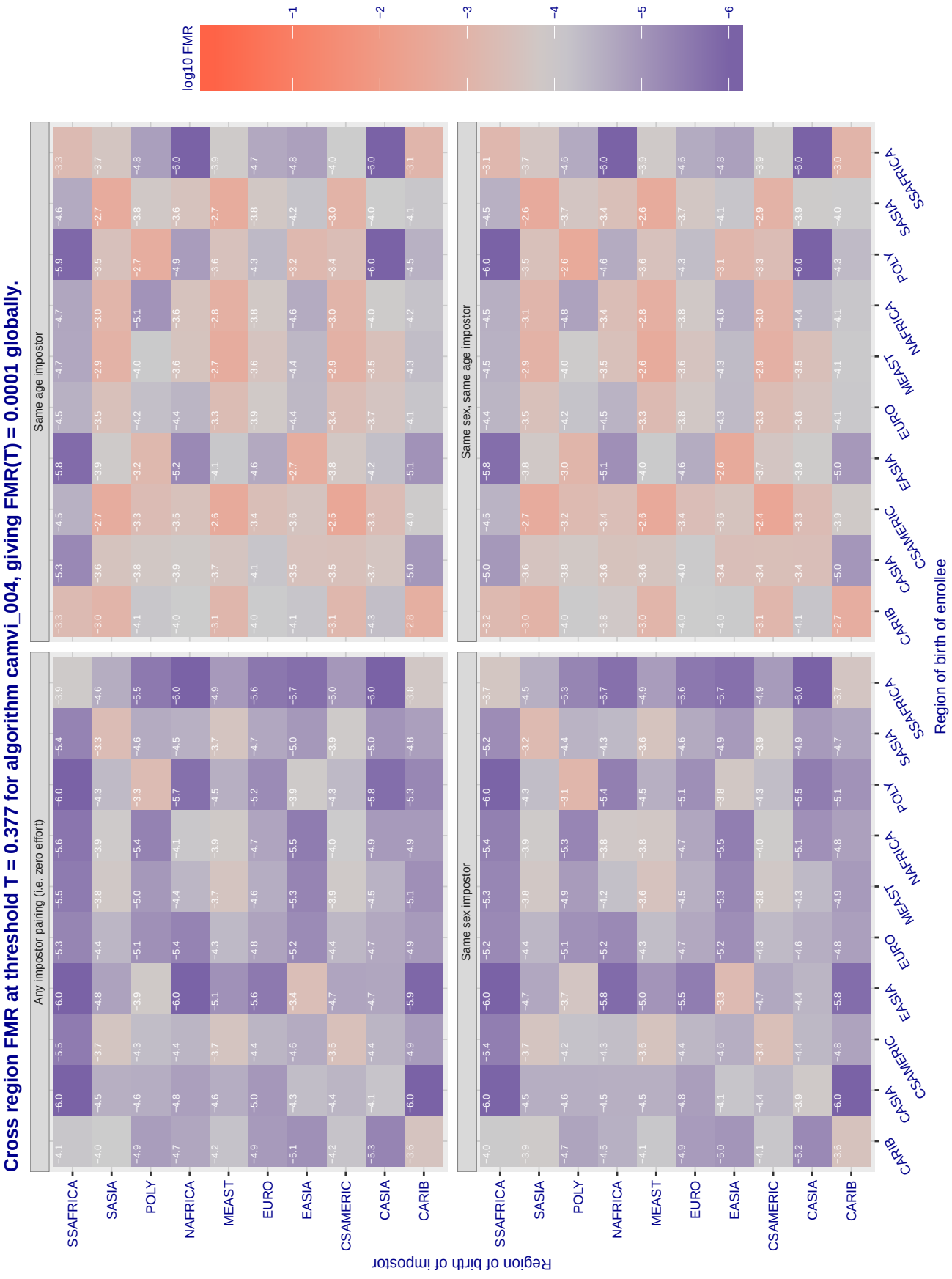


Figure 160: For algorithm camvi-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

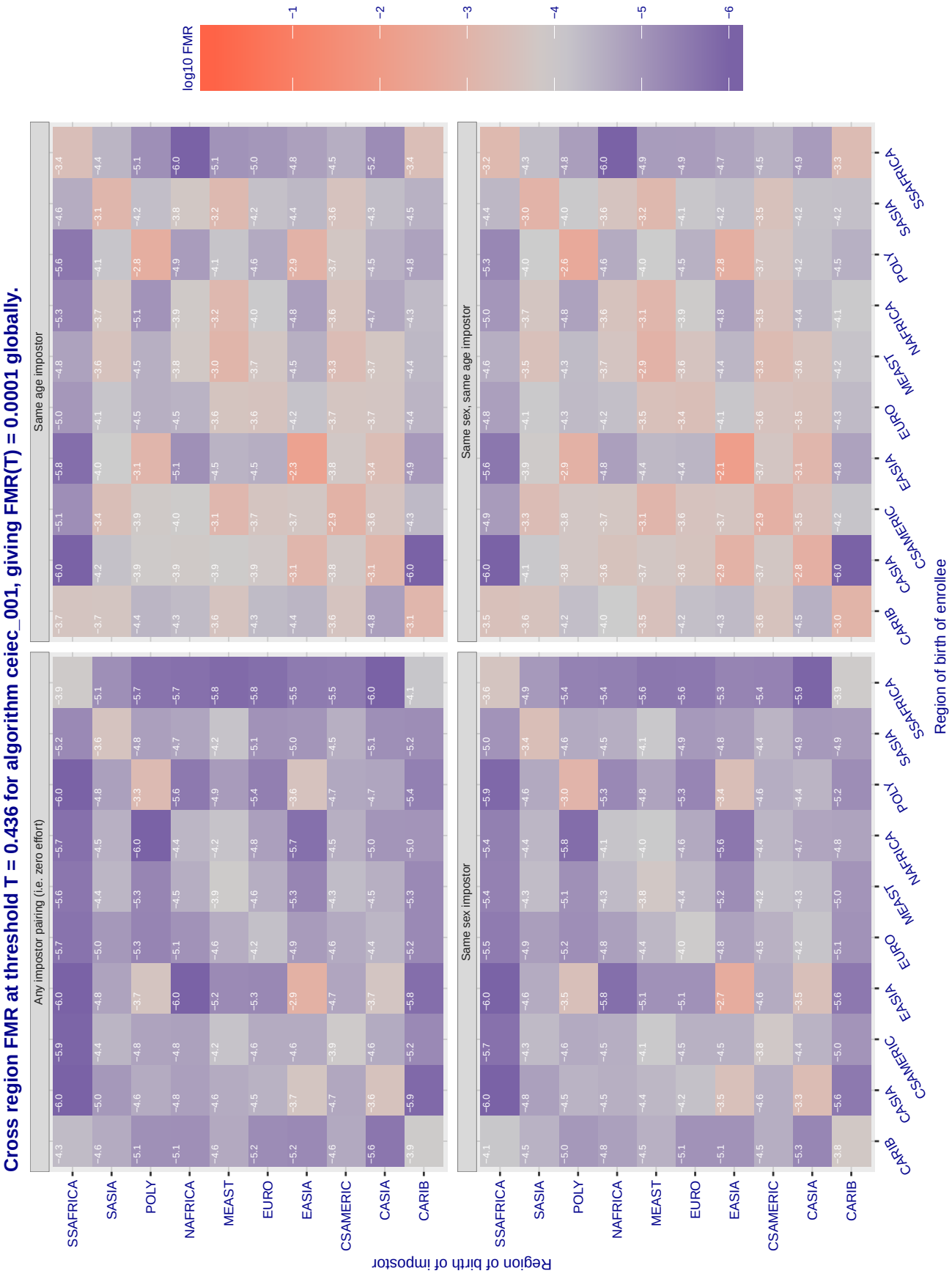


Figure 161: For algorithm ceiec-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

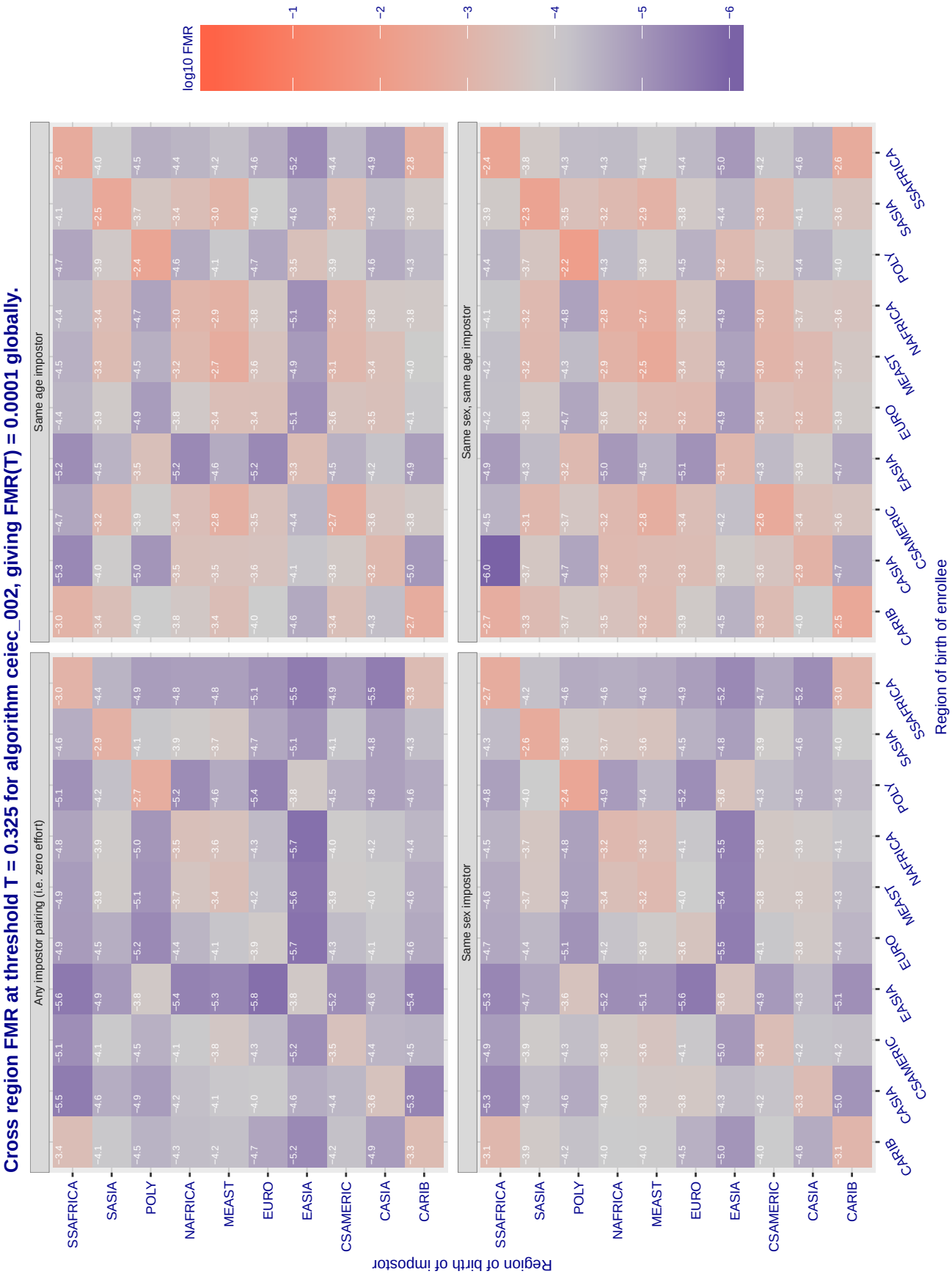


Figure 162: For algorithm ceiec-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

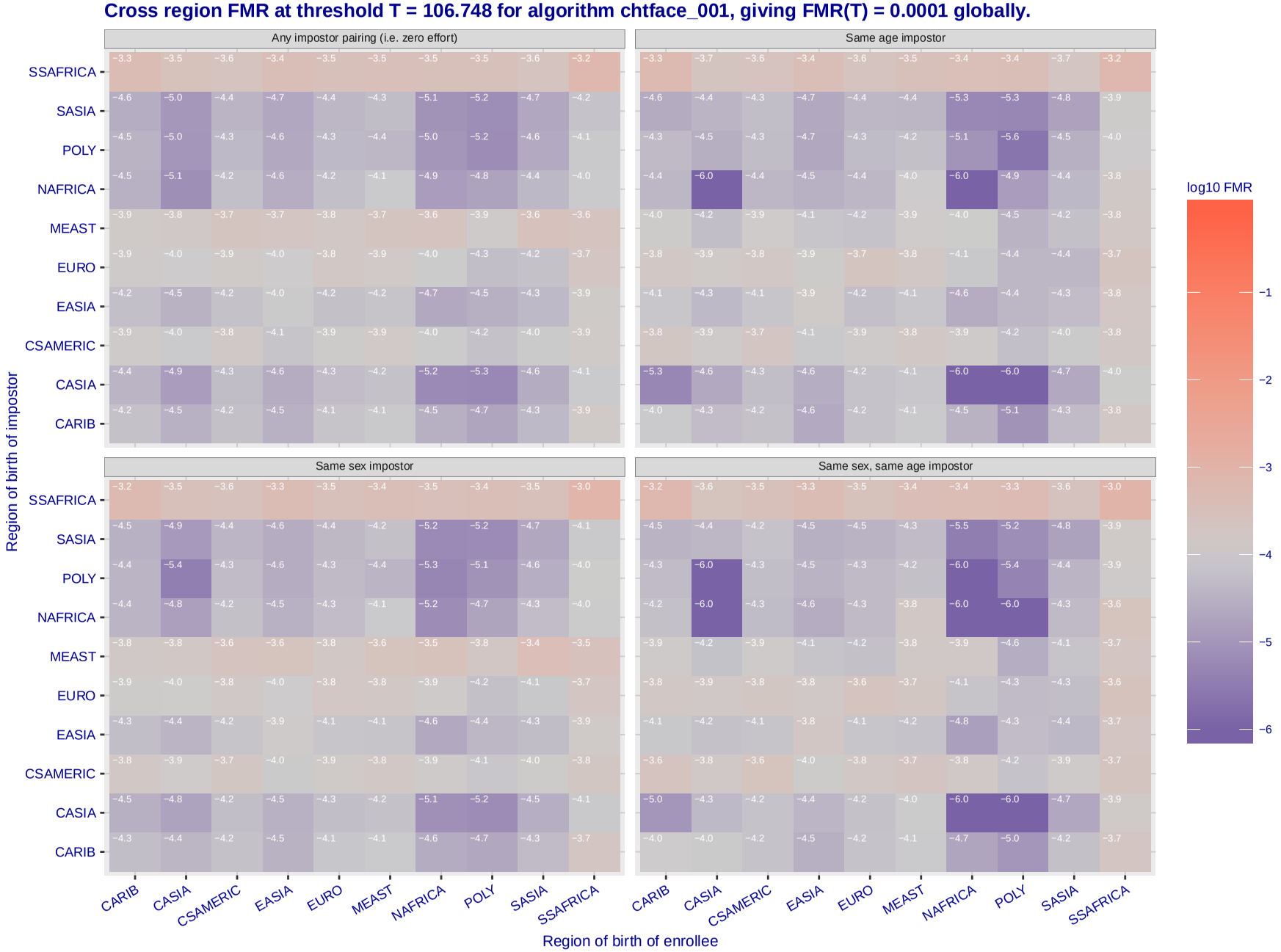


Figure 163: For algorithm chtface-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

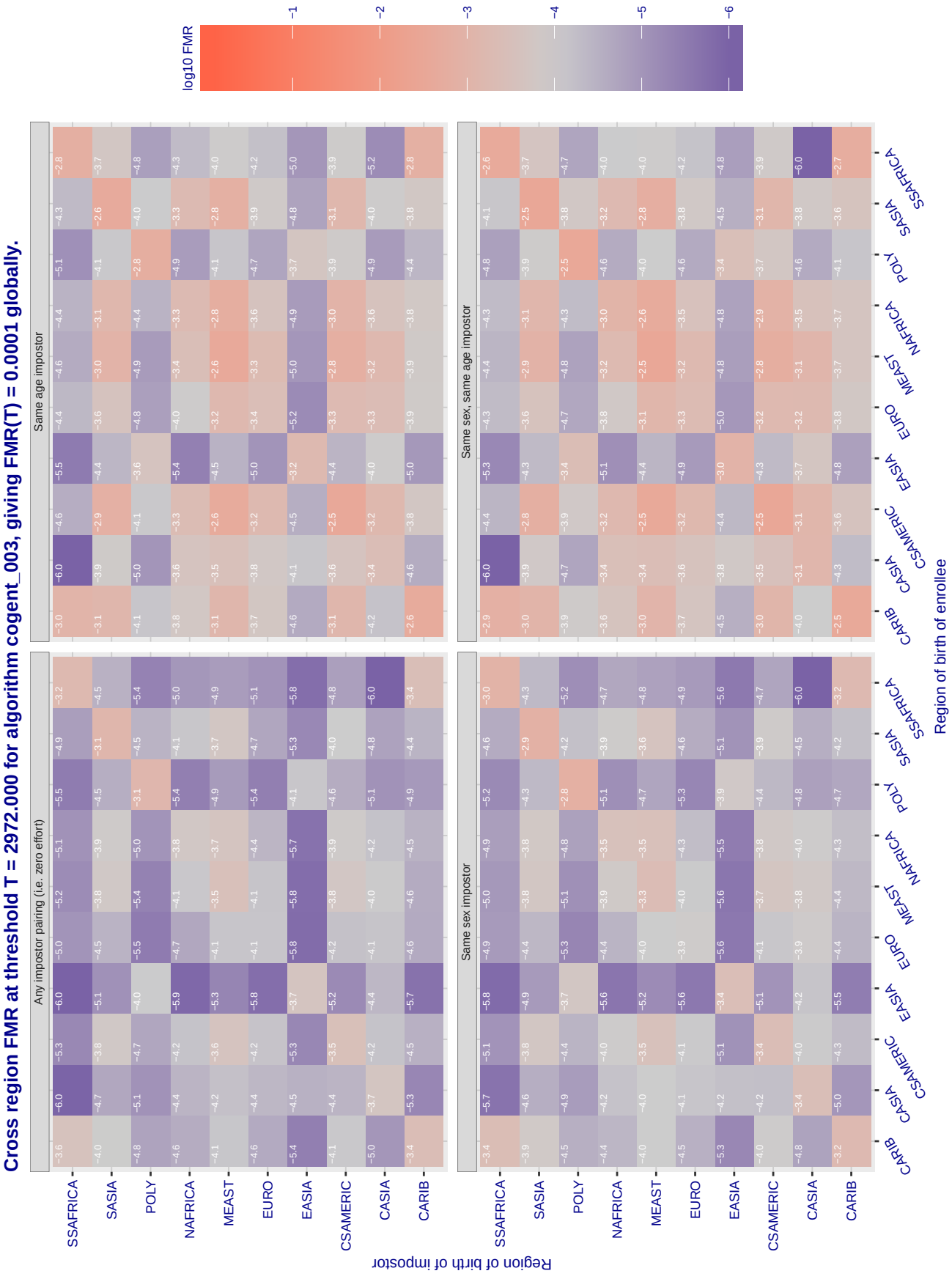


Figure 164: For algorithm cogent-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

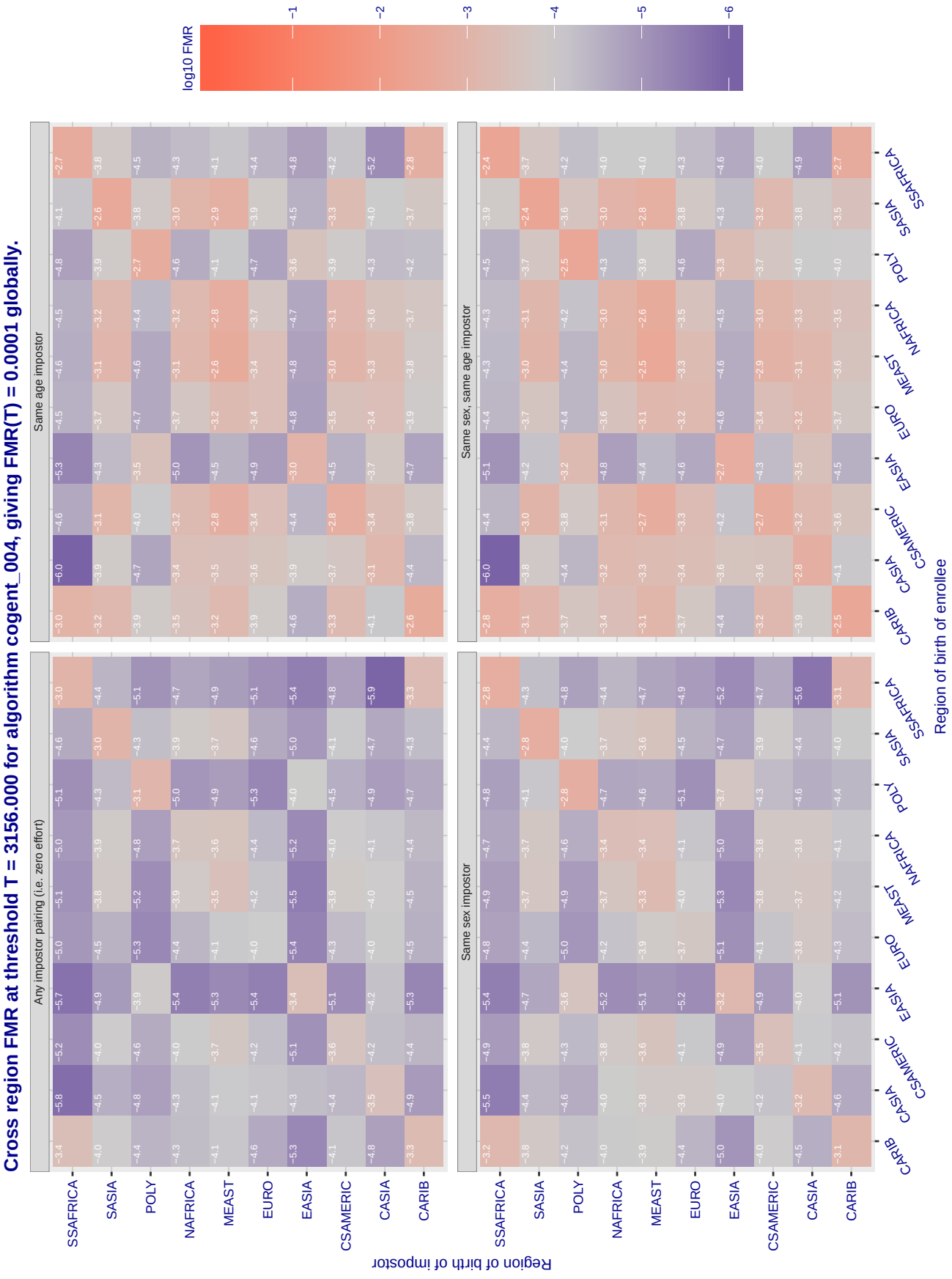


Figure 165: For algorithm cogent-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

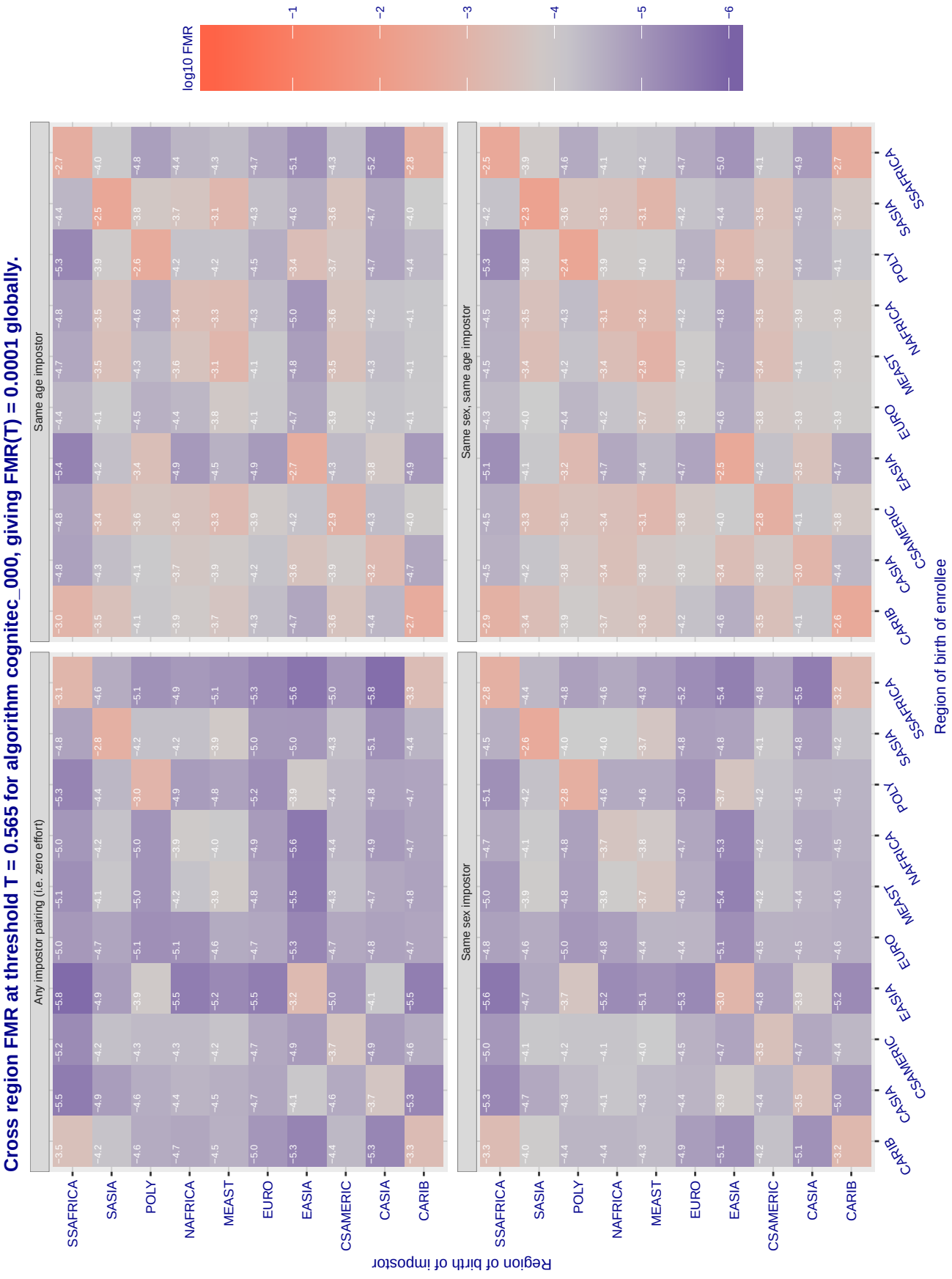


Figure 166: For algorithm cognitec-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

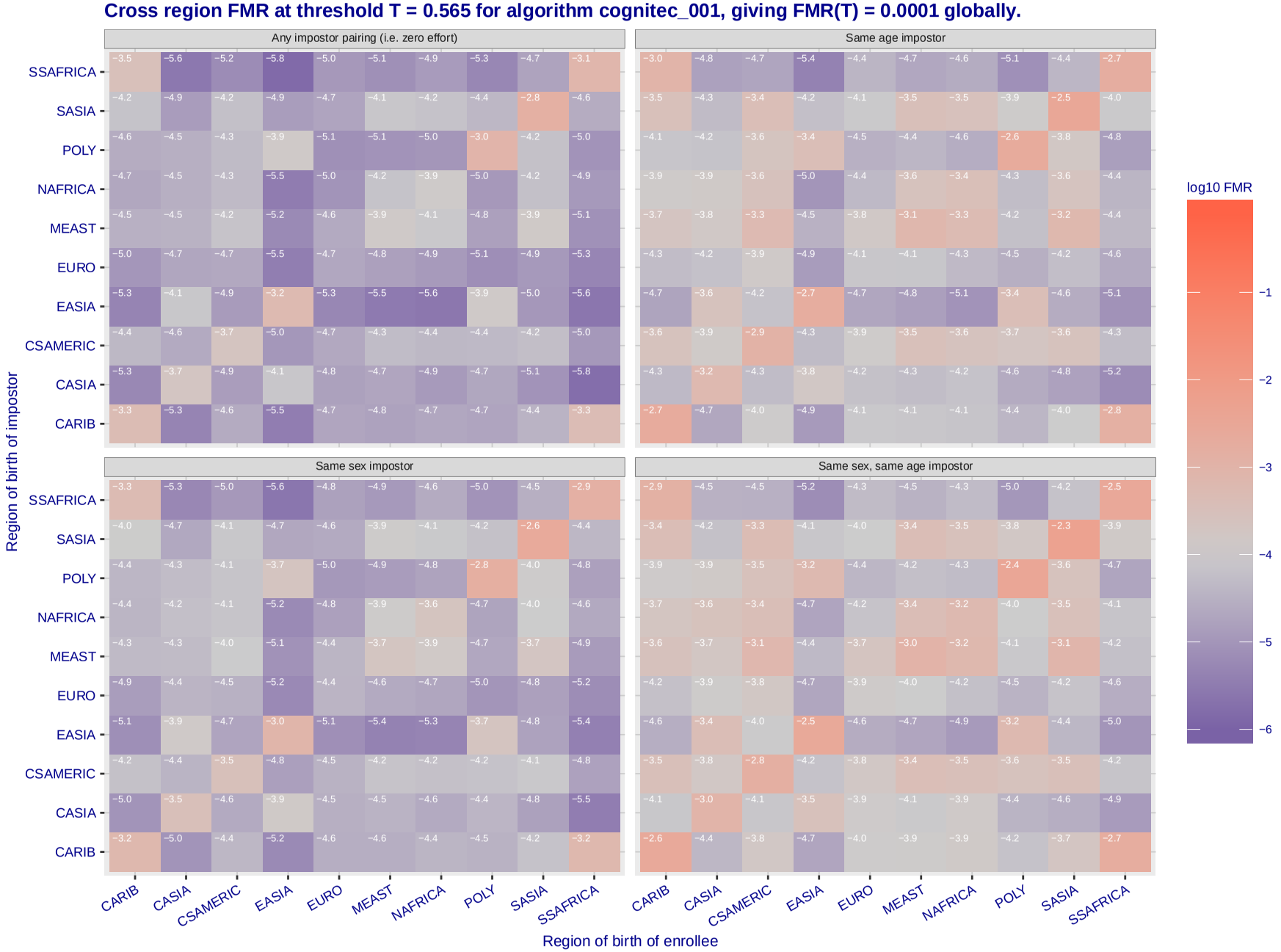


Figure 167: For algorithm cognitec-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

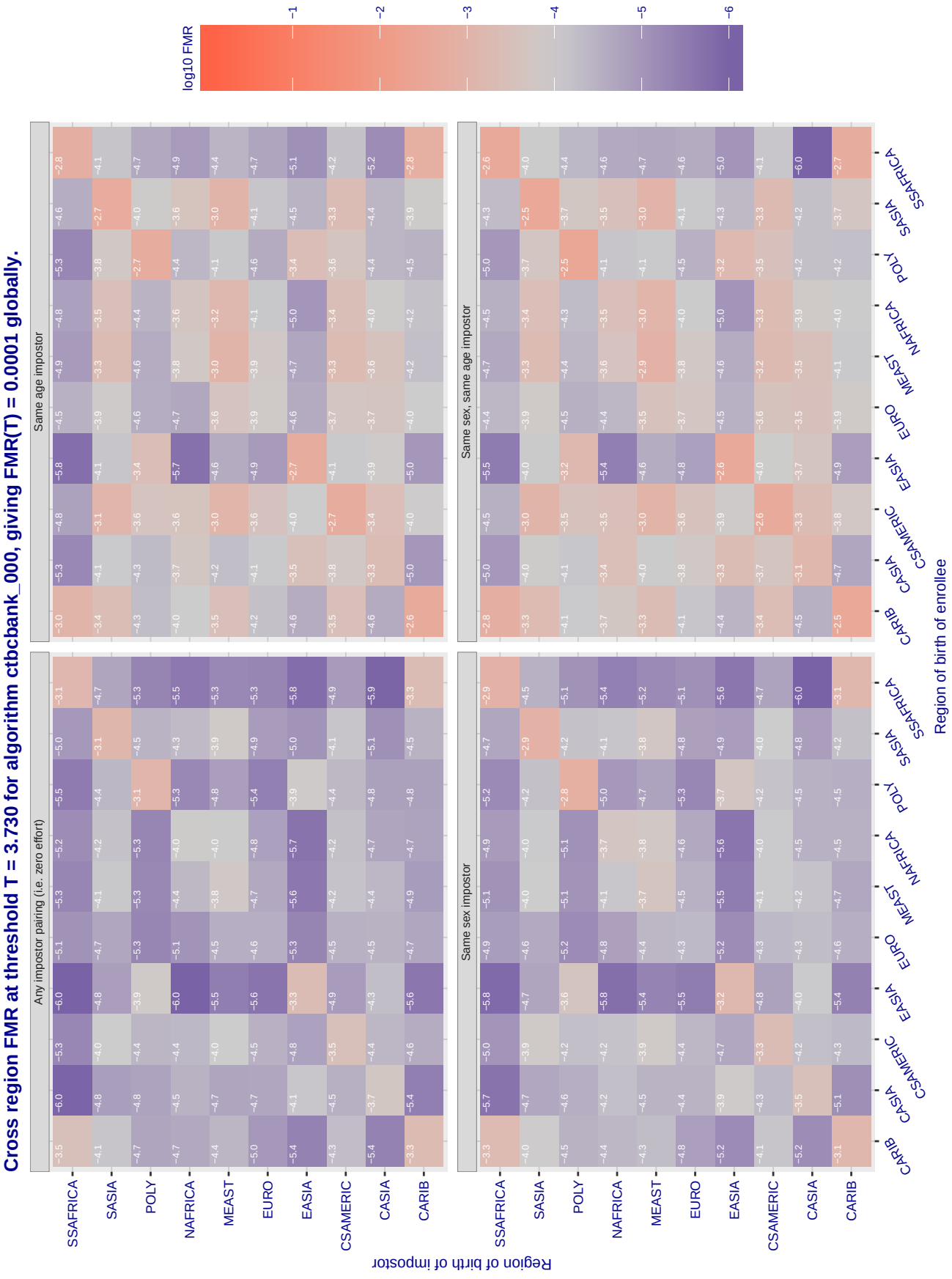


Figure 168: For algorithm ctbcbank-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

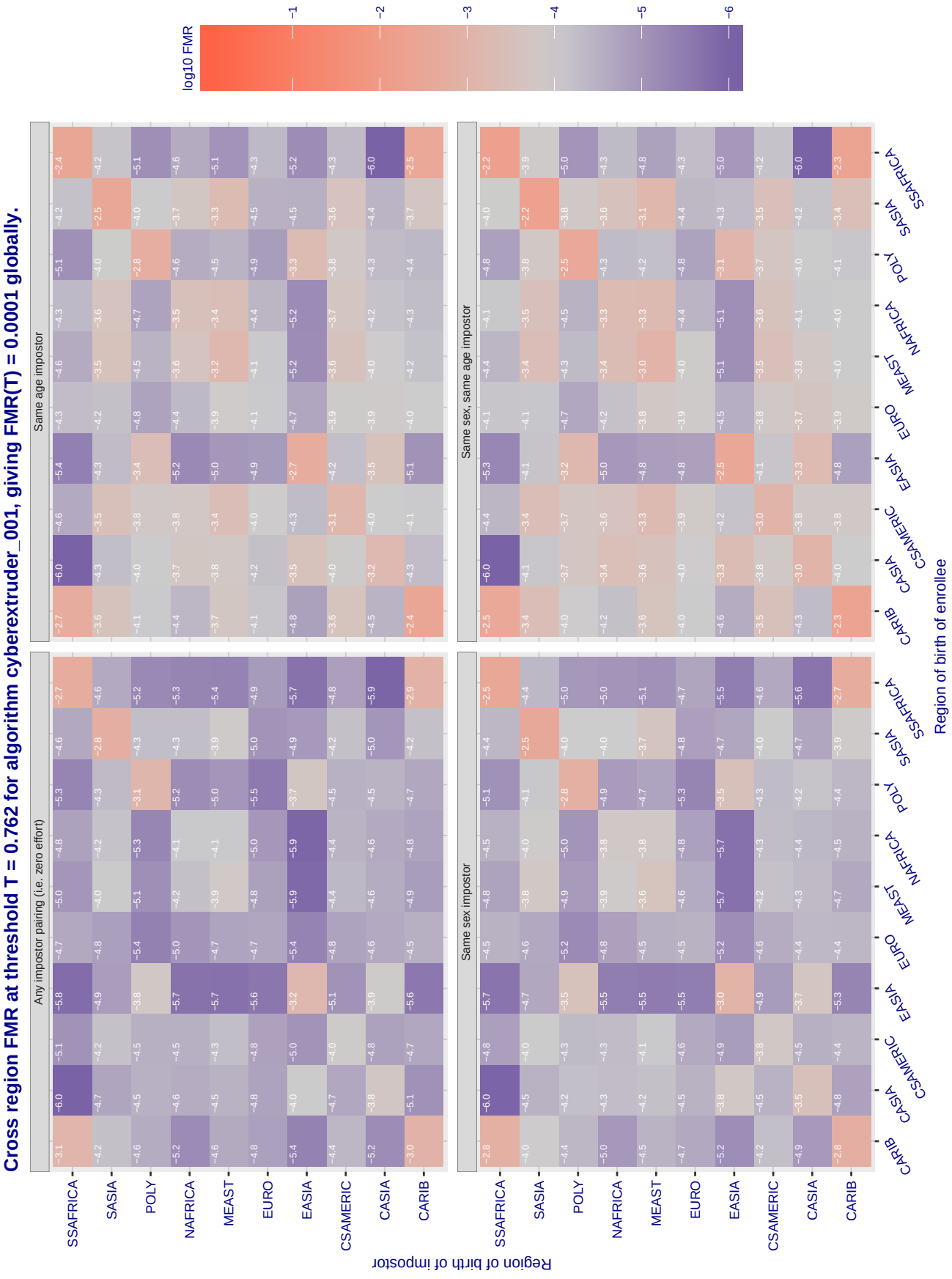


Figure 169: For algorithm cyberextruder-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

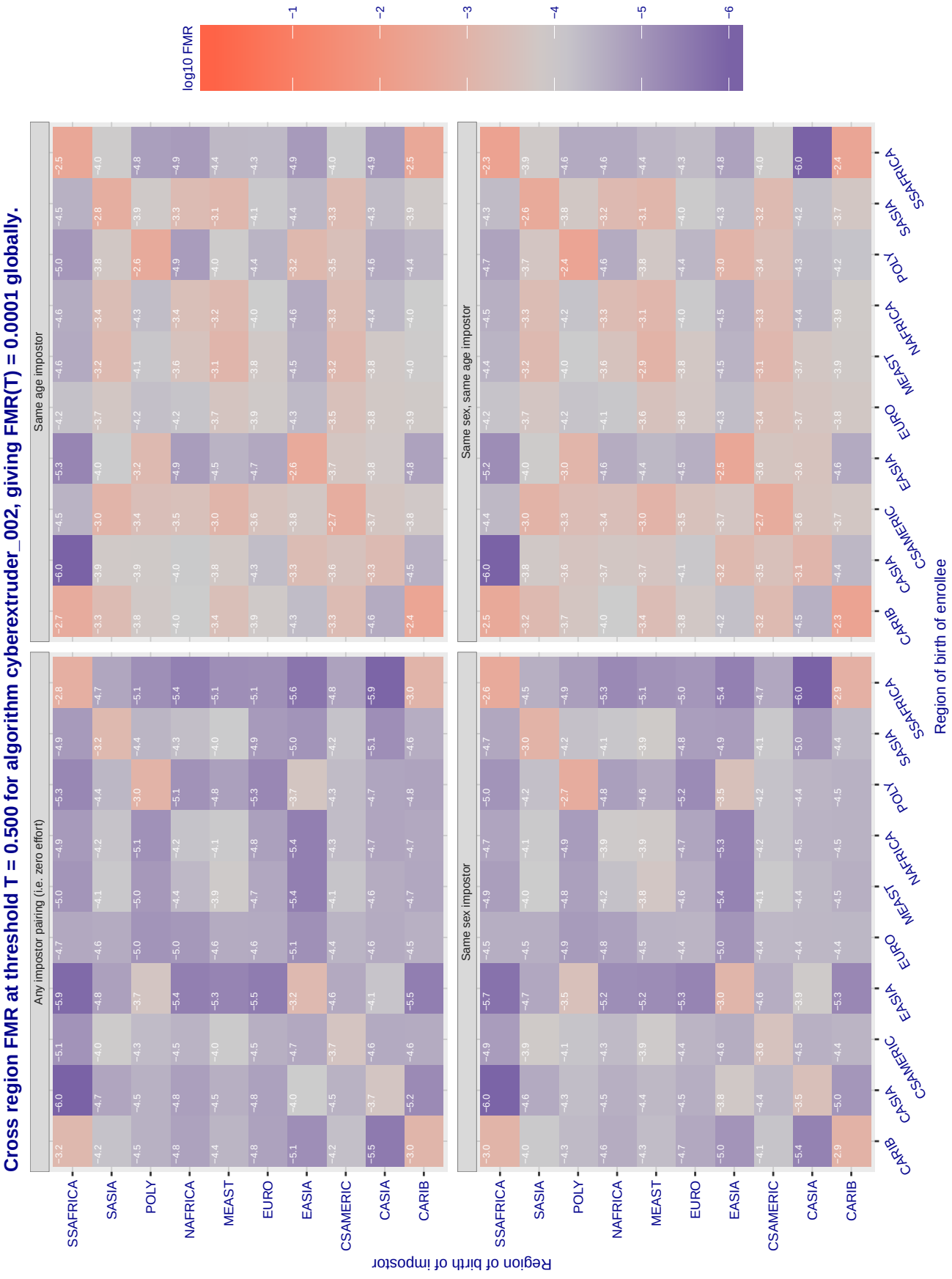


Figure 170: For algorithm cyberextruder-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

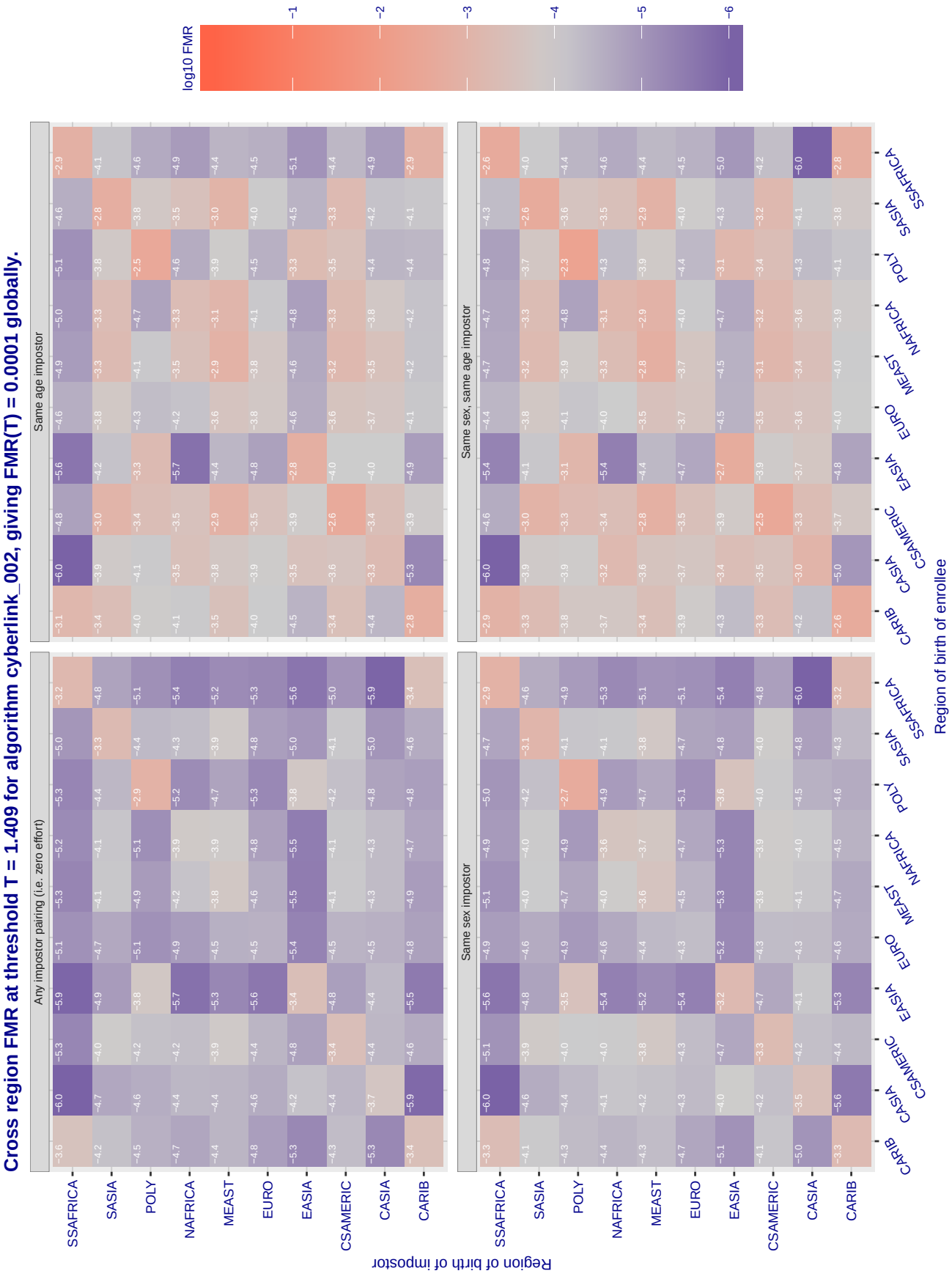


Figure 171: For algorithm cyberlink-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

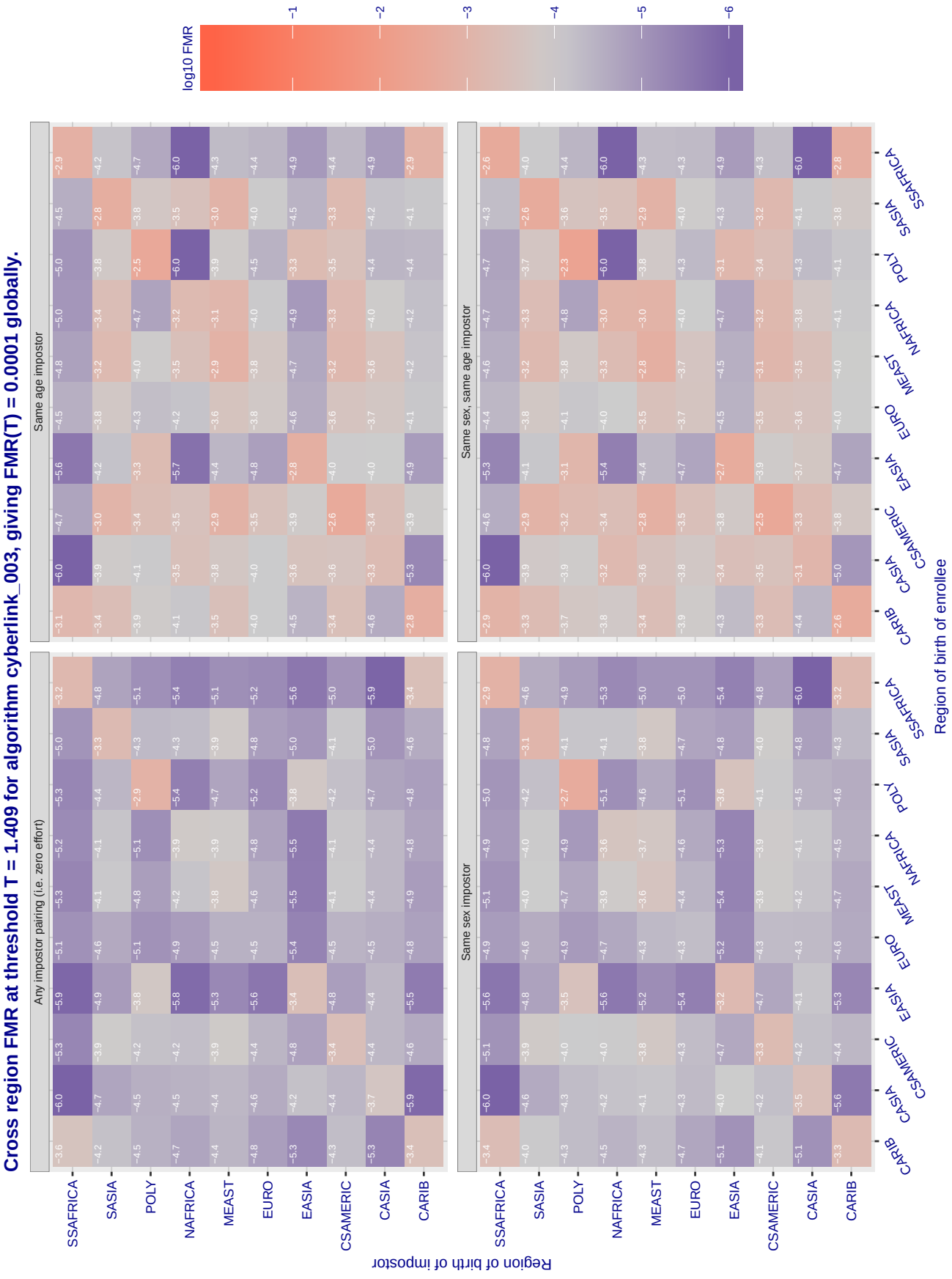


Figure 172: For algorithm cyberlink-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

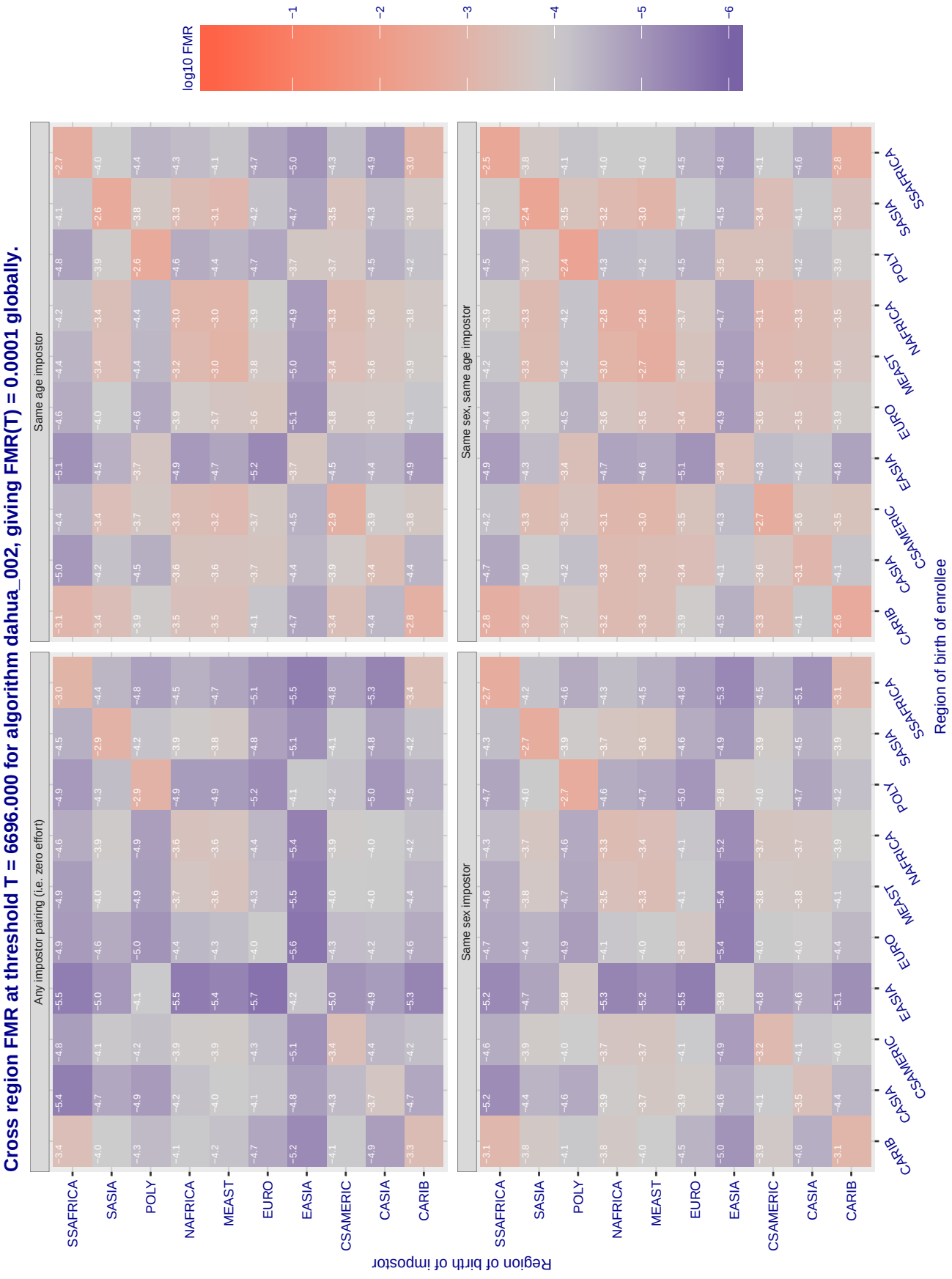


Figure 173: For algorithm dahua-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

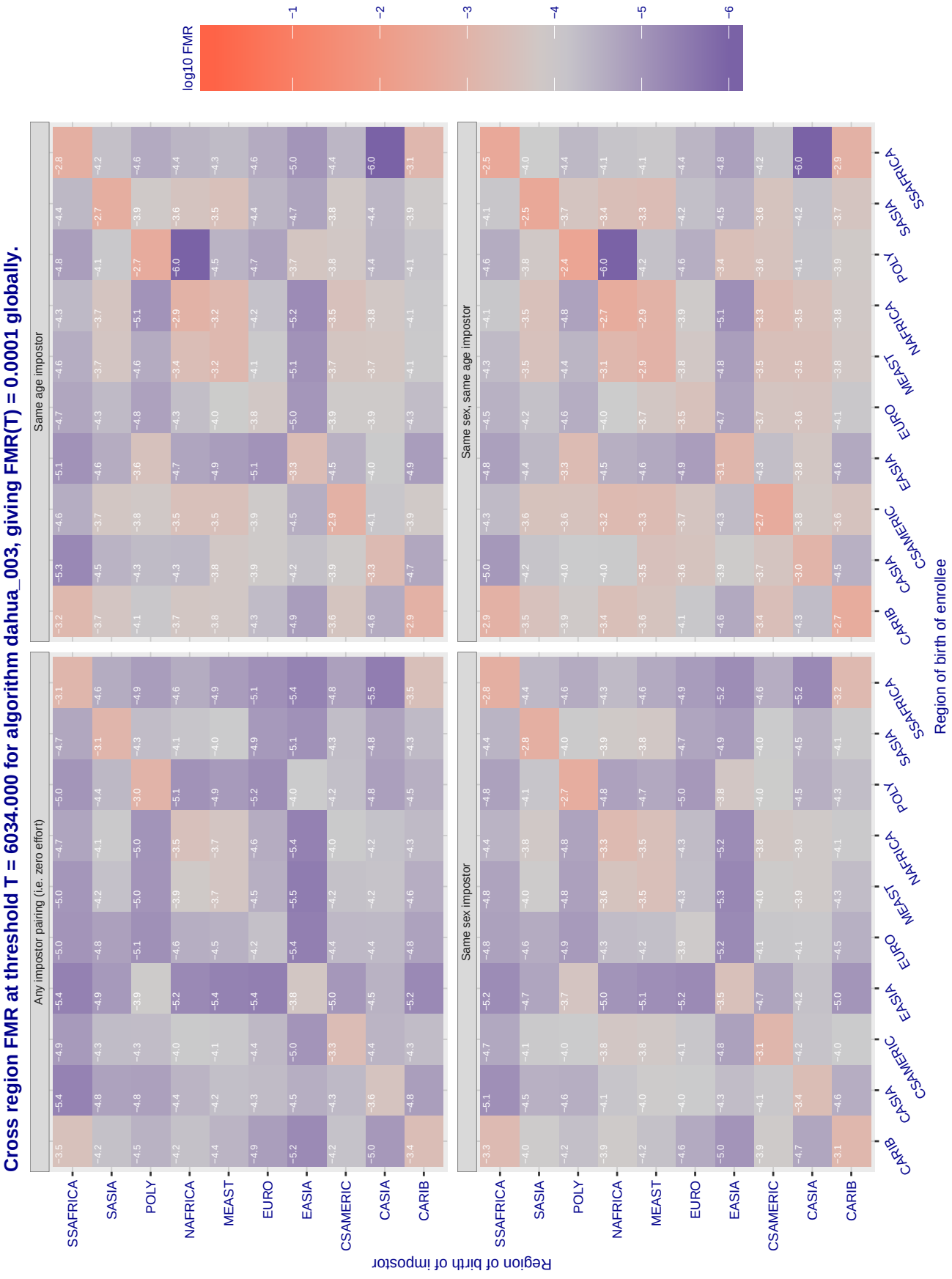
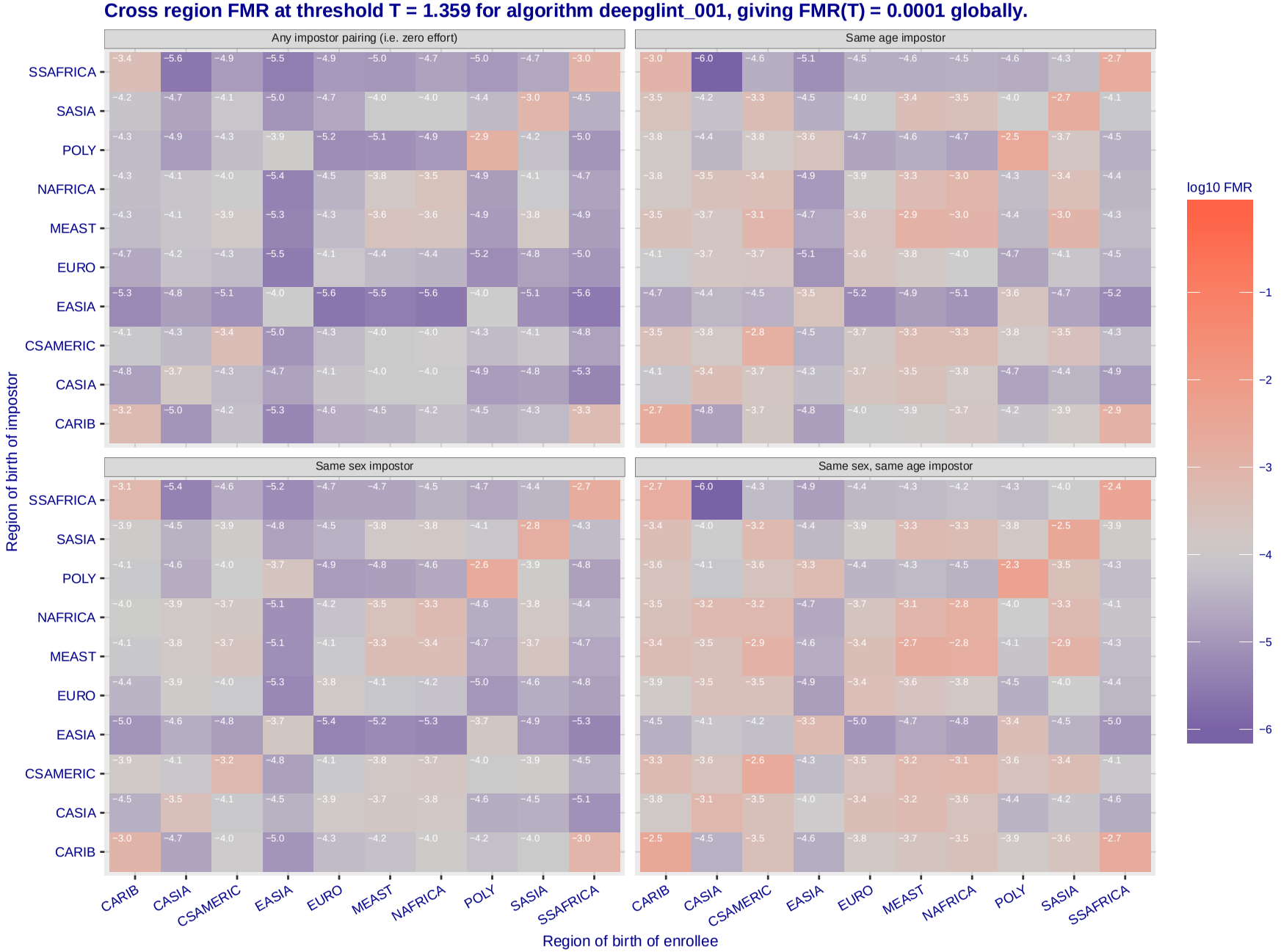


Figure 174: For algorithm dahua-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

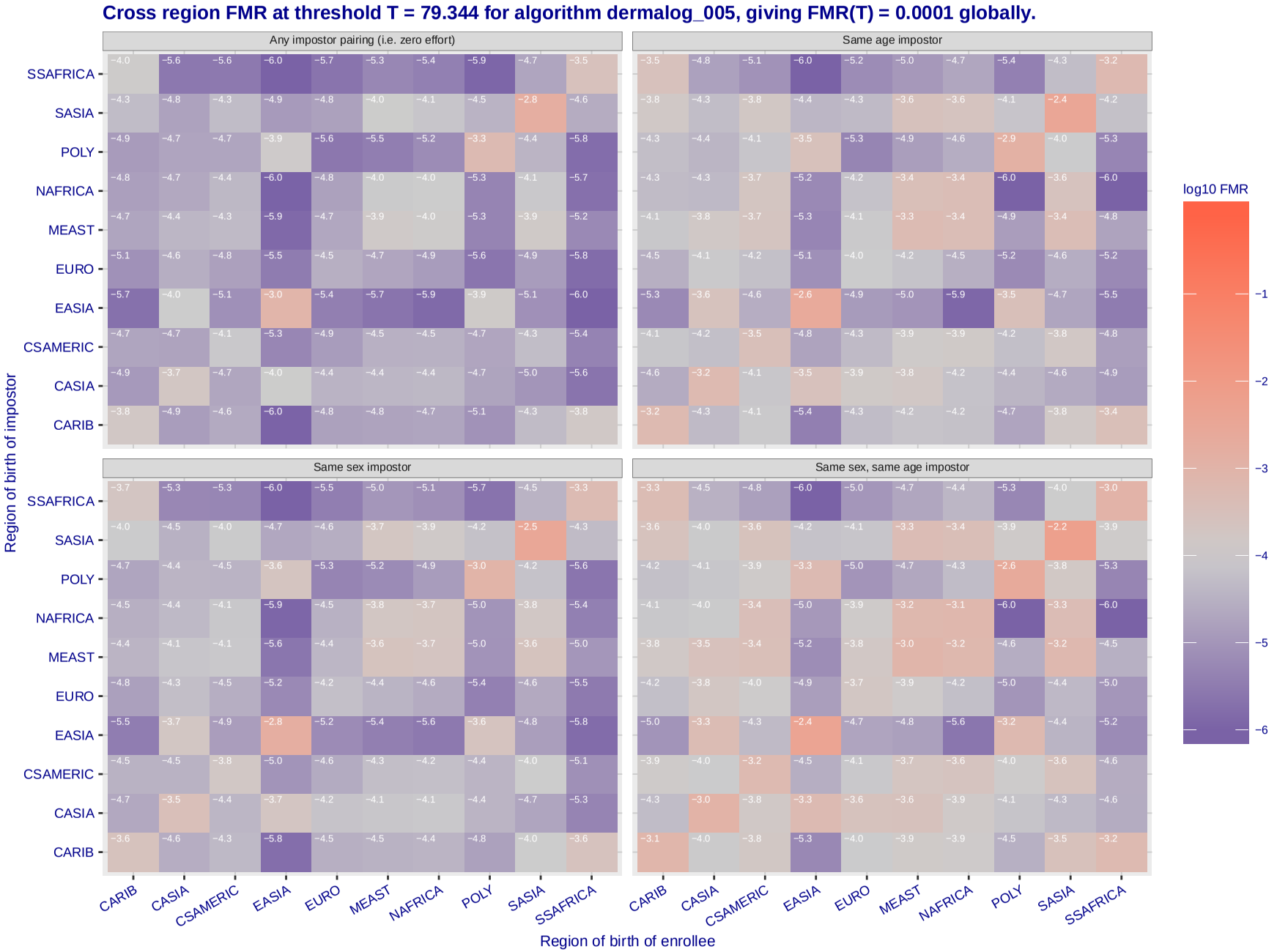
FNMR(T) "False non-match rate"
FMR(T) "False match rate"



FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 175: For algorithm deepglint-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

Figure 176: For algorithm deepsea-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.



FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 177: For algorithm dermalog-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

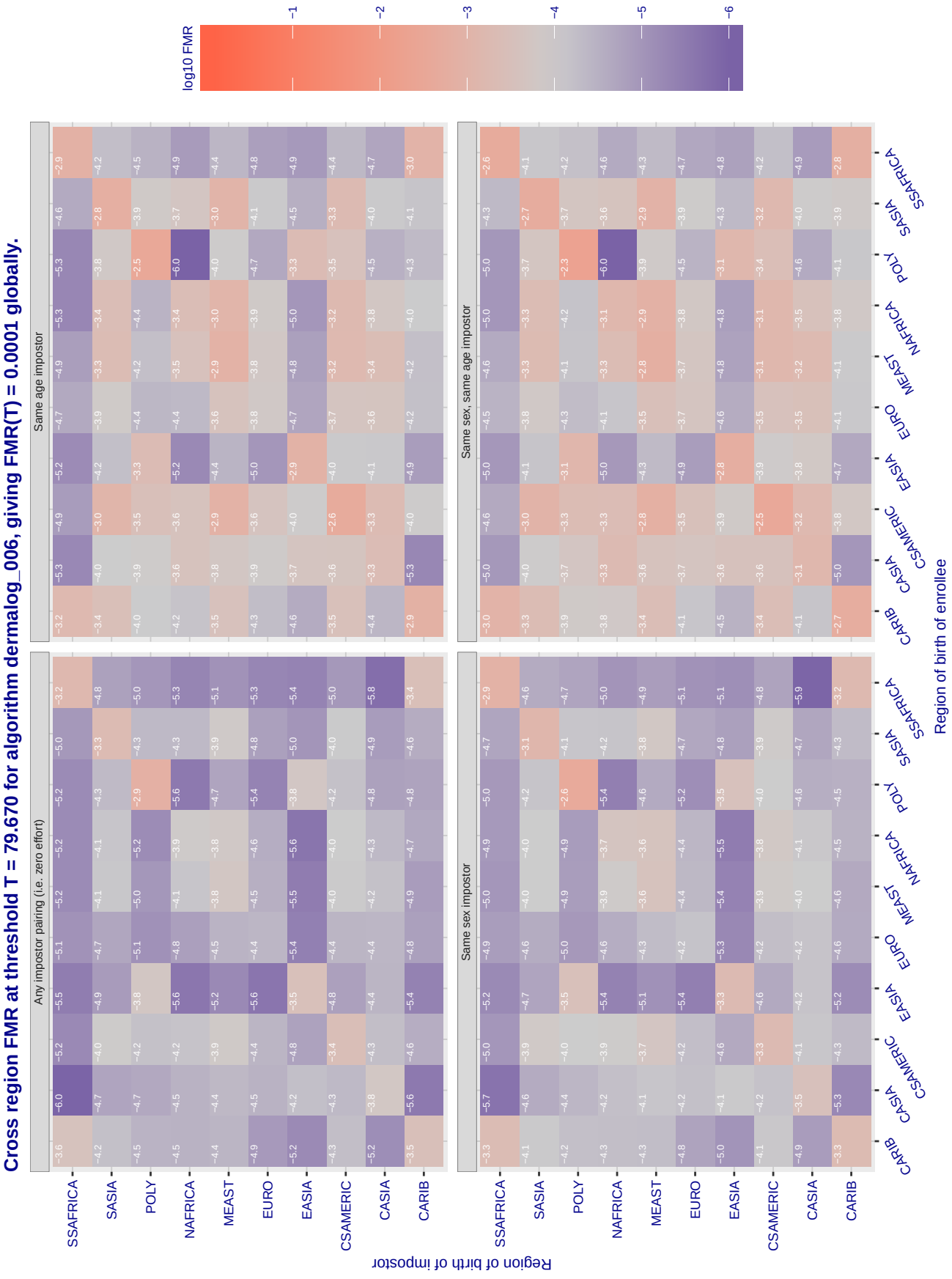


Figure 178: For algorithm dermalog-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

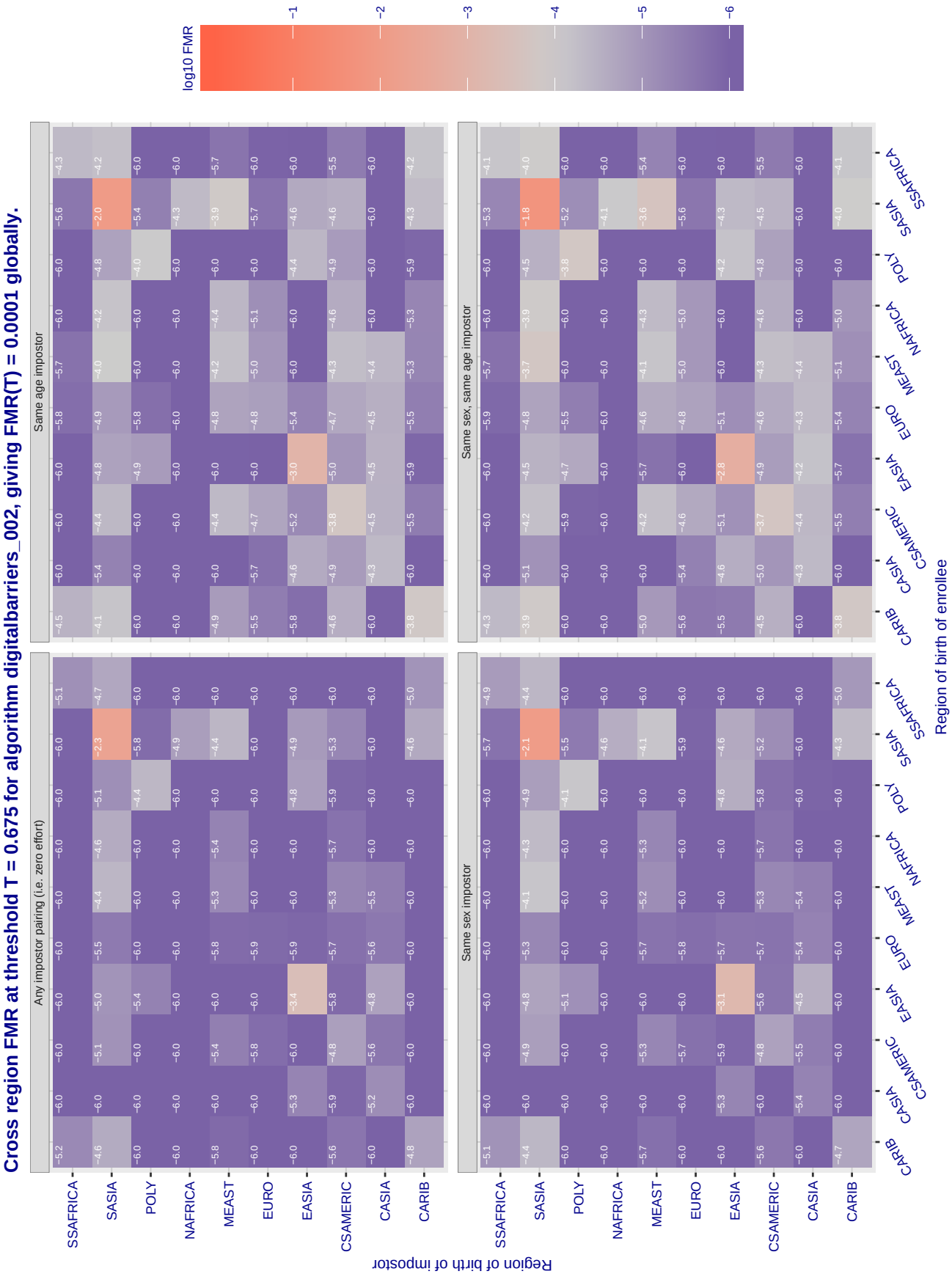


Figure 179: For algorithm digitalbarriers-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

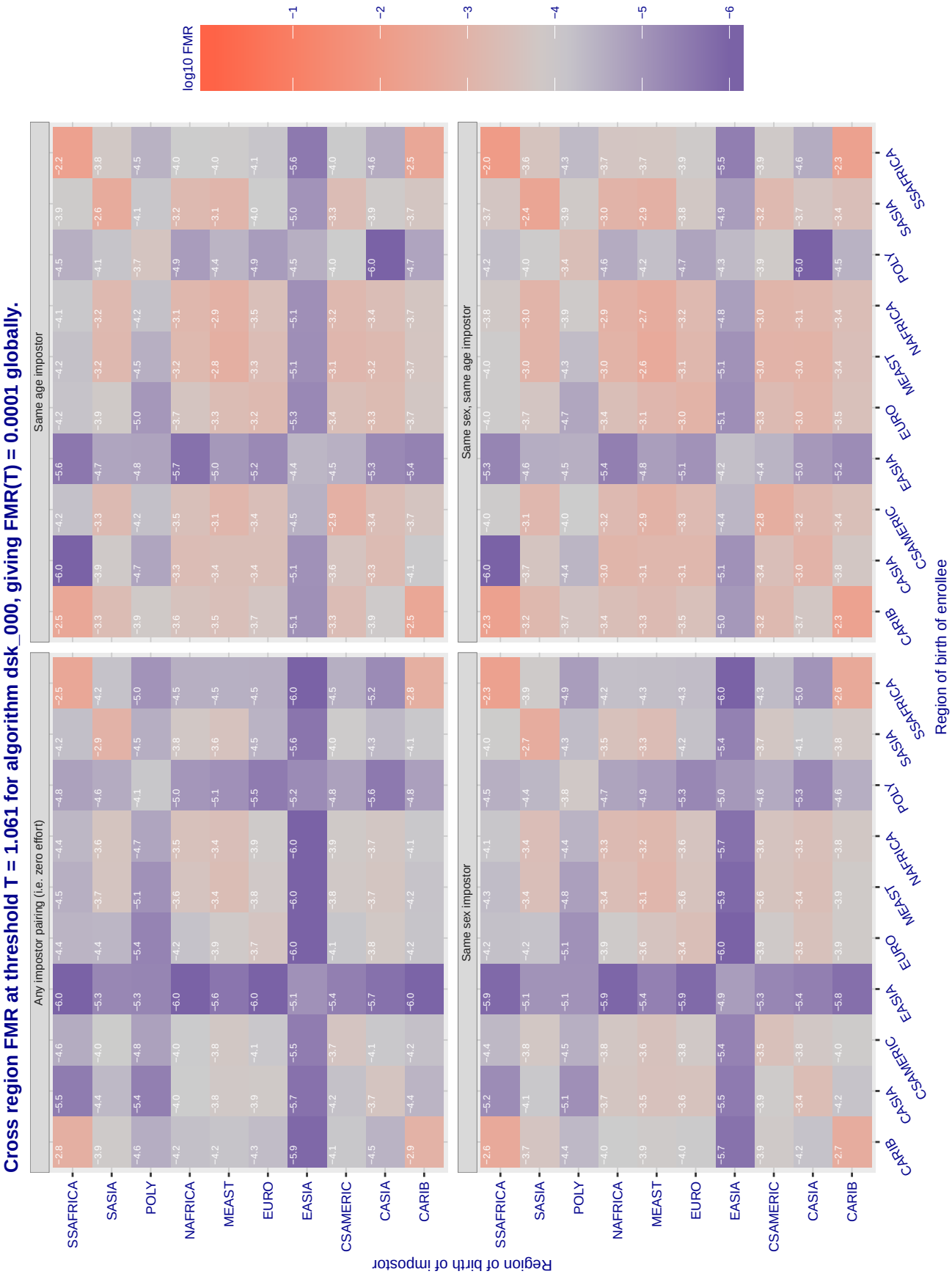


Figure 180: For algorithm dsk-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

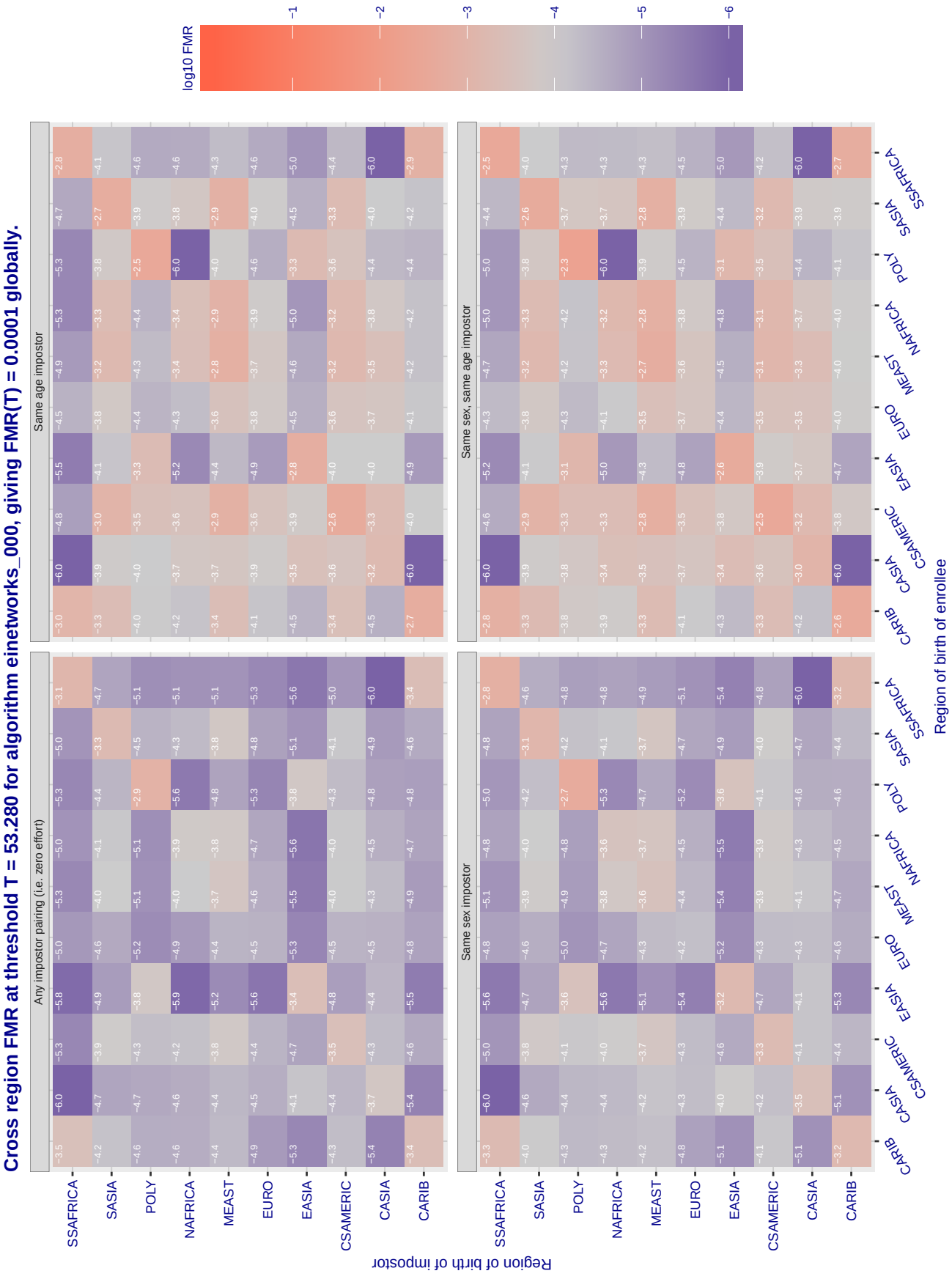


Figure 181: For algorithm einetworks-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

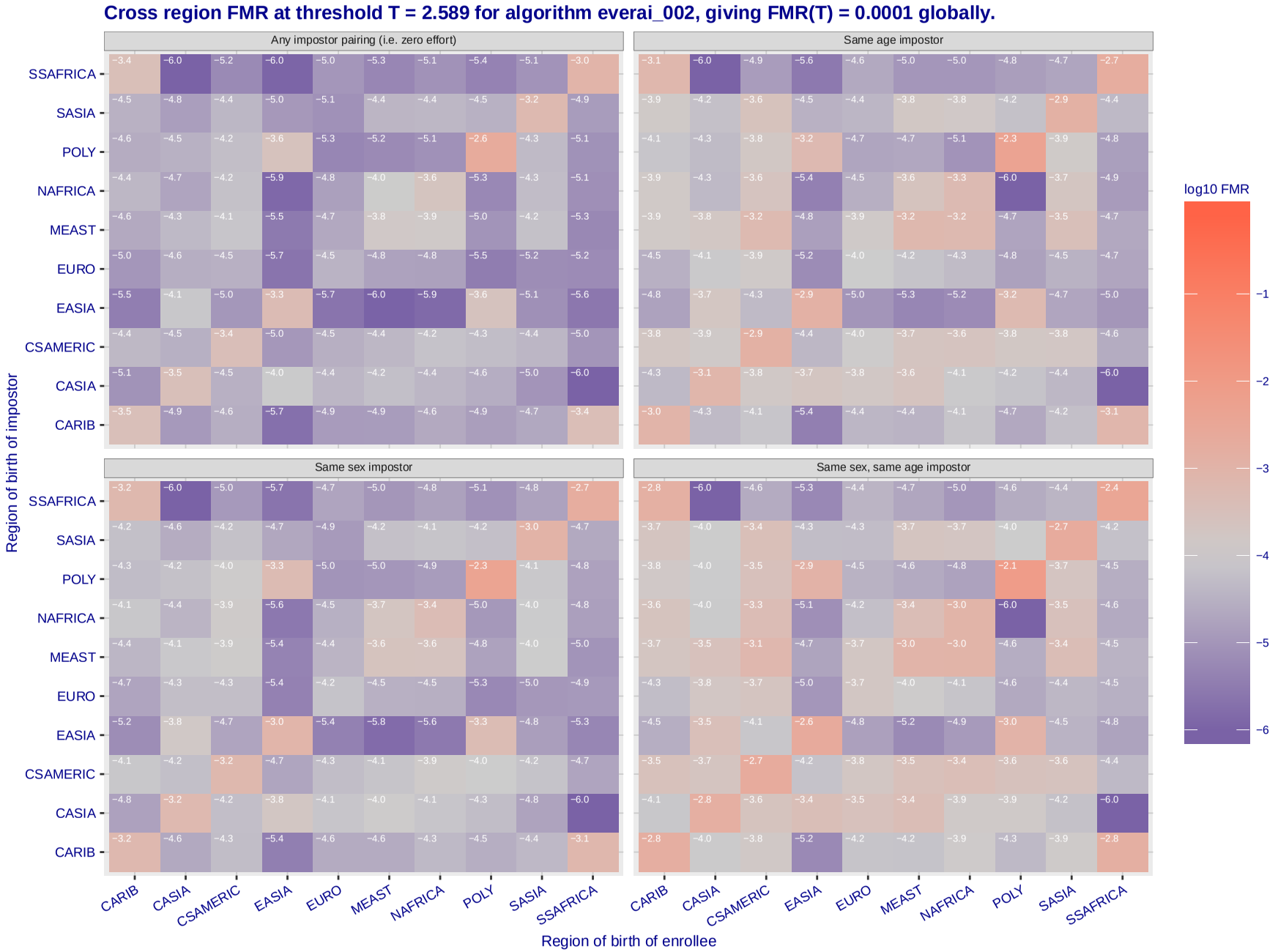


Figure 182: For algorithm everai-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

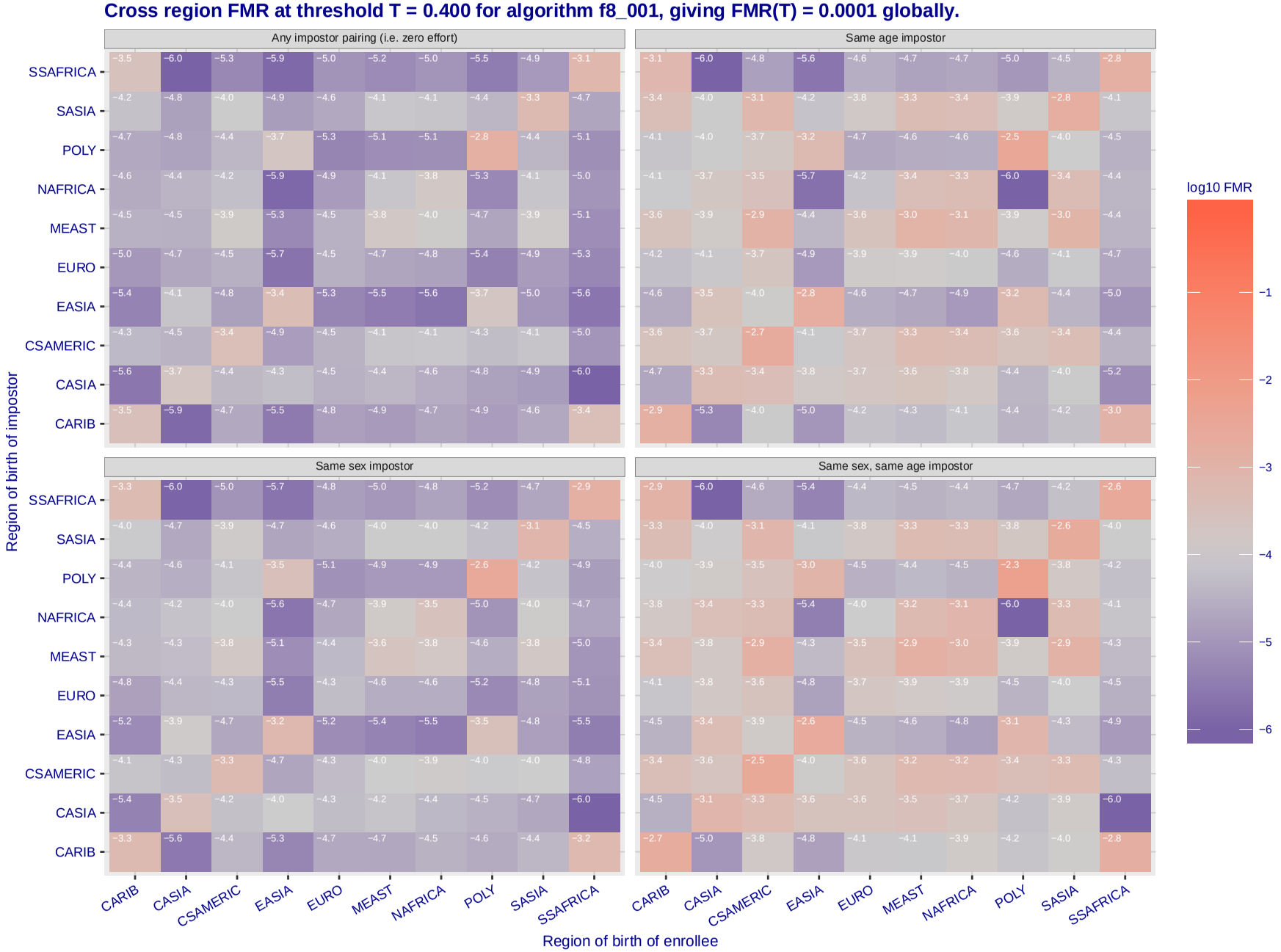


Figure 183: For algorithm f8-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

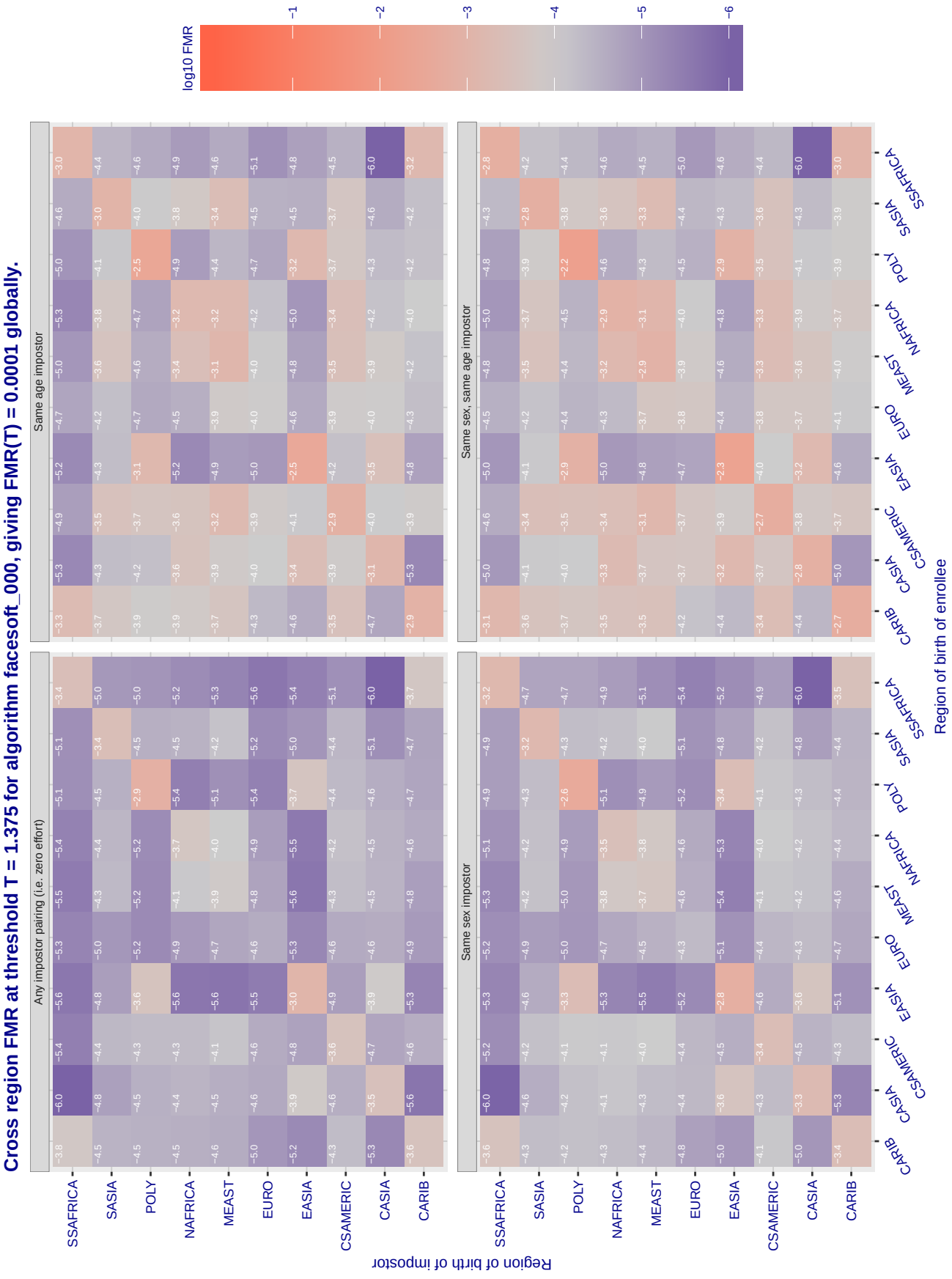


Figure 184: For algorithm facesoft-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

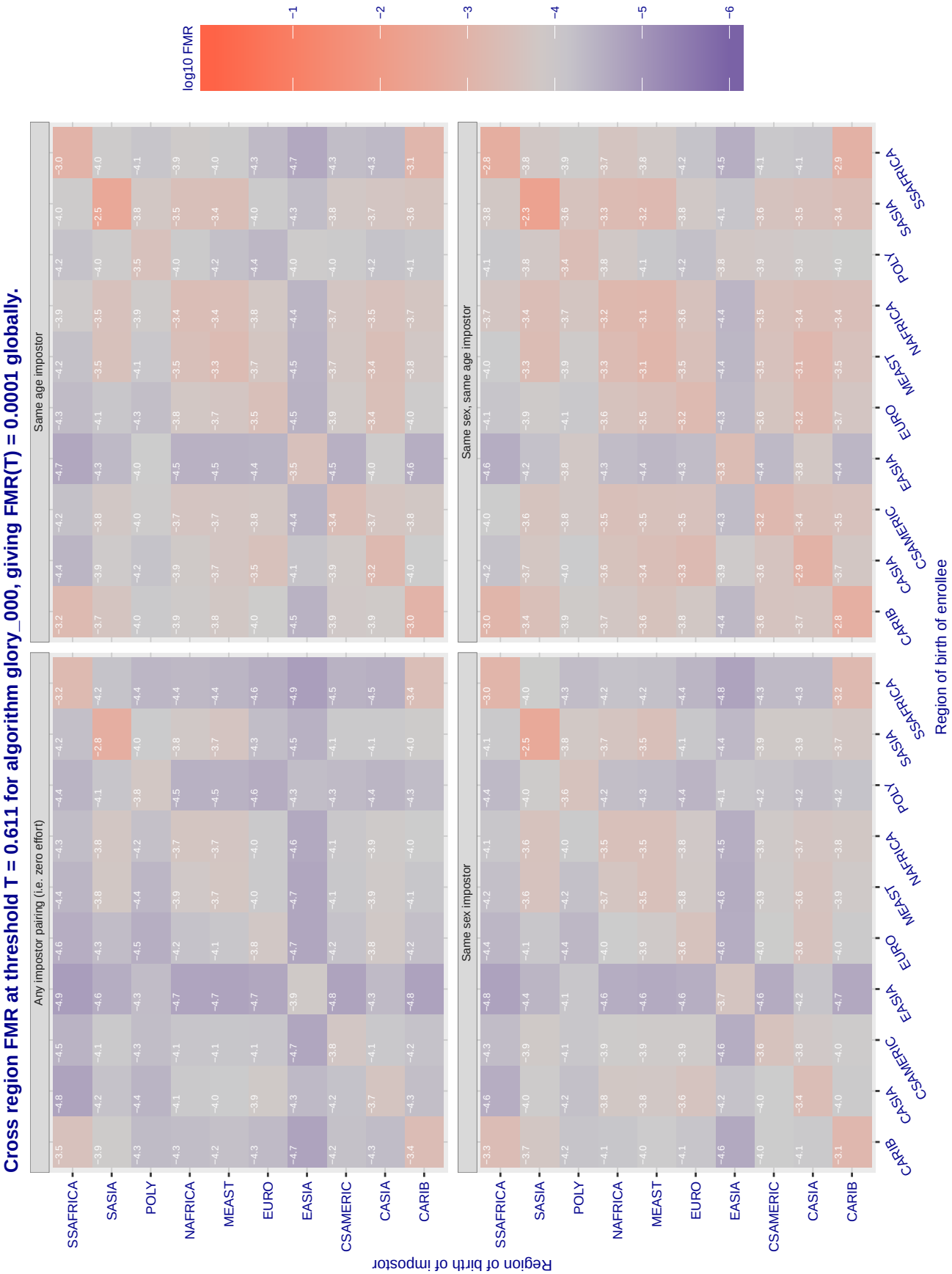


Figure 185: For algorithm glory-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

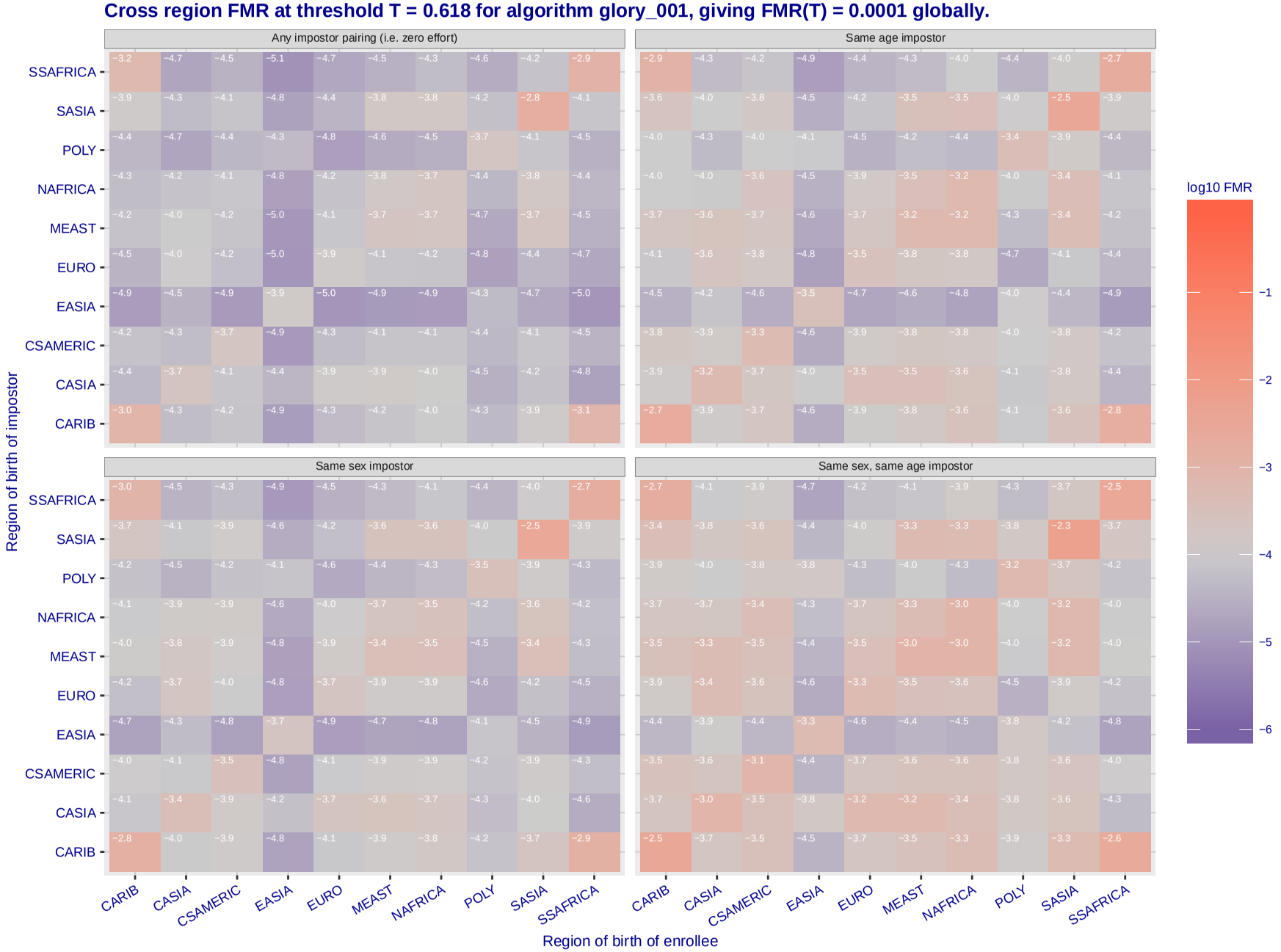


Figure 186: For algorithm glory-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

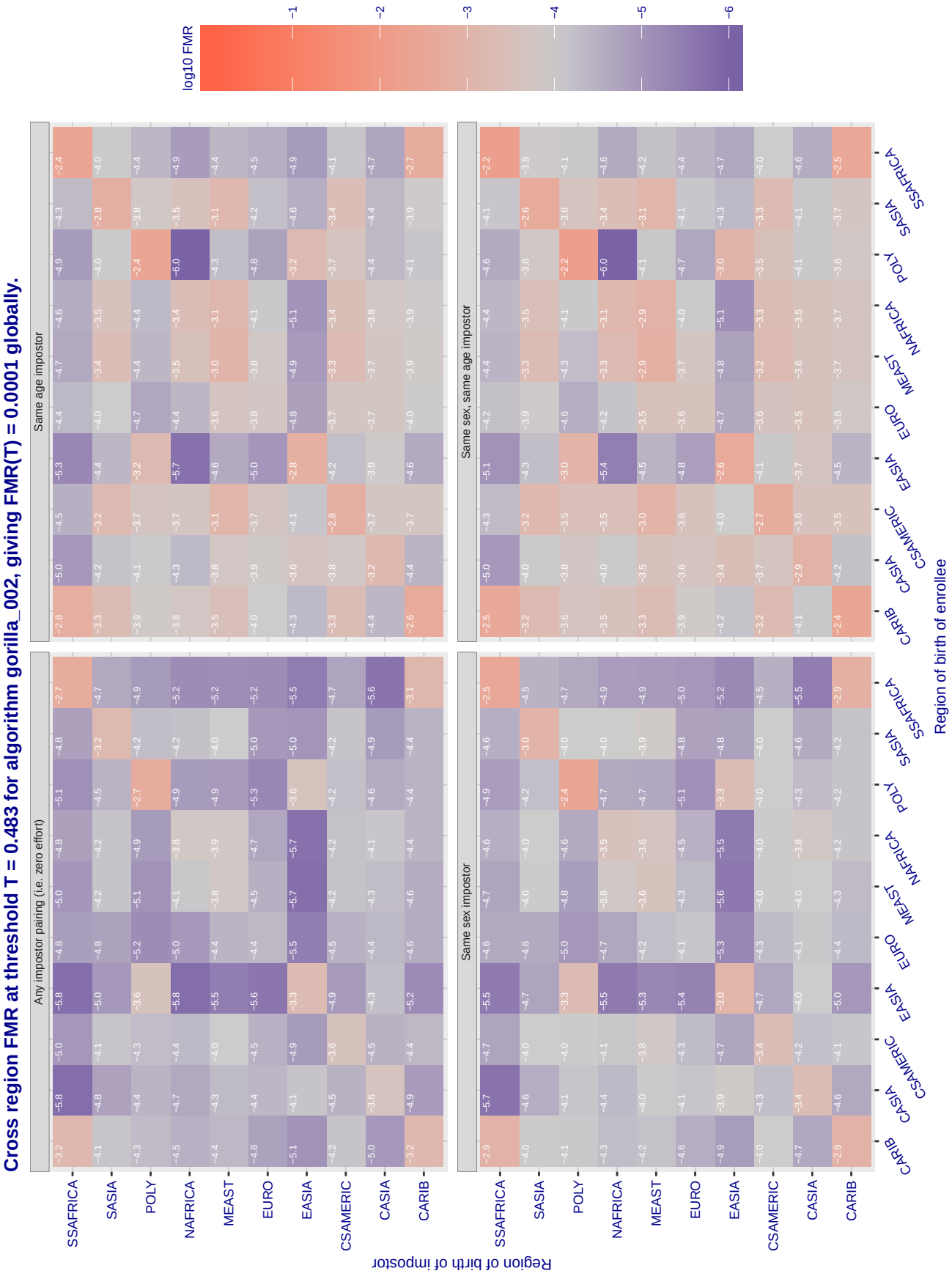


Figure 187: For algorithm gorilla-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 188: For algorithm gorilla-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

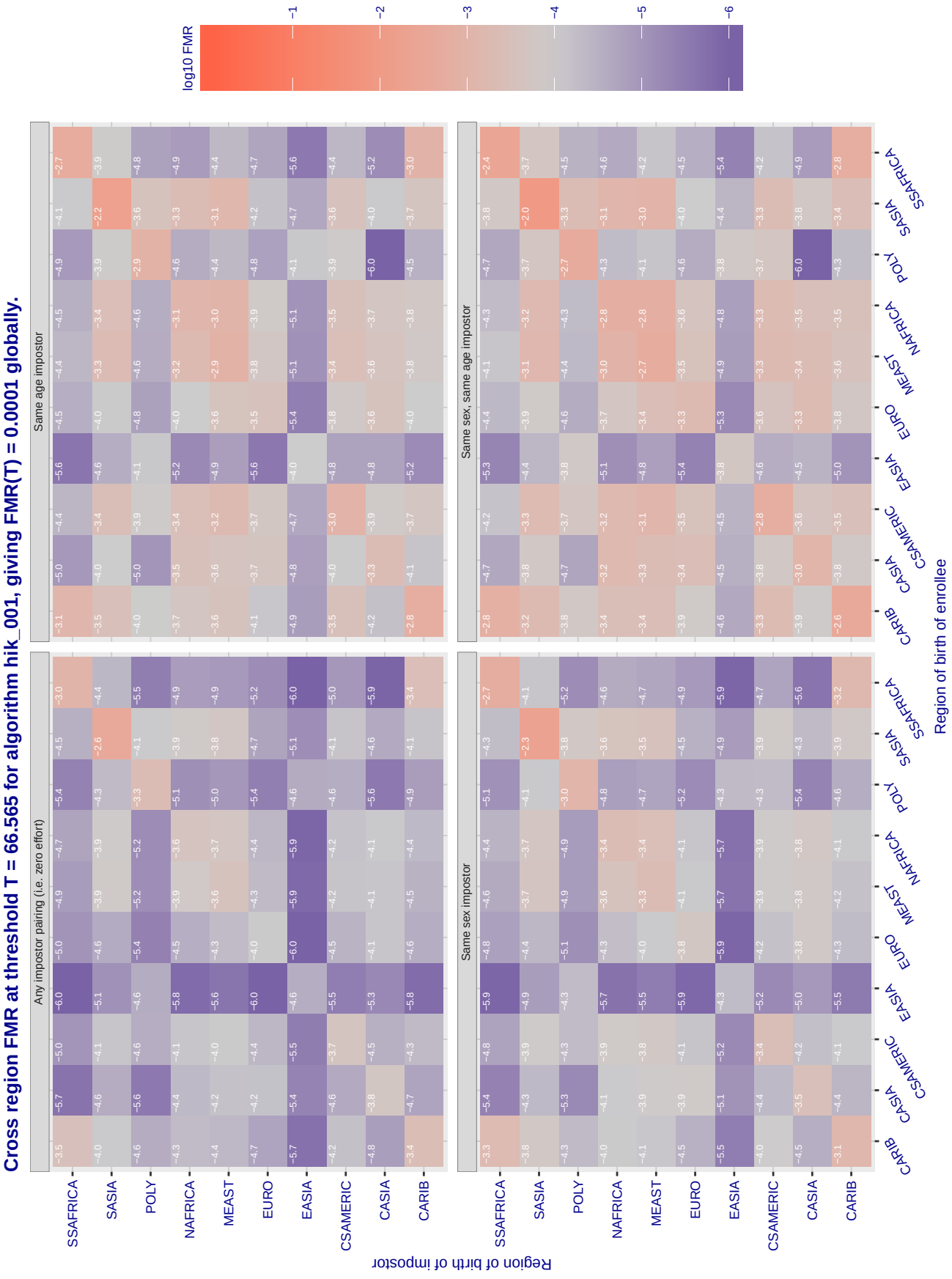


Figure 189: For algorithm hik-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

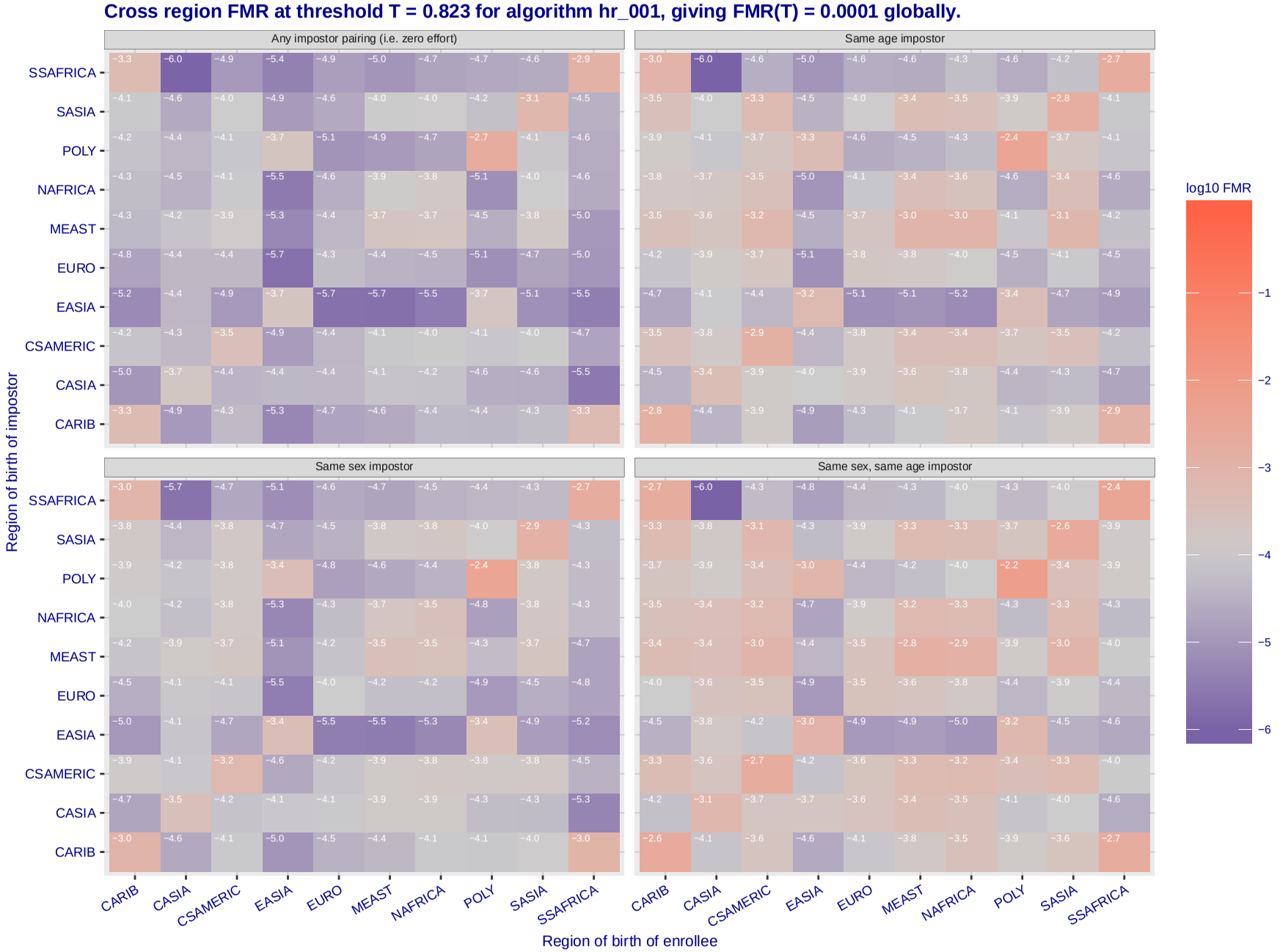


Figure 190: For algorithm hr-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

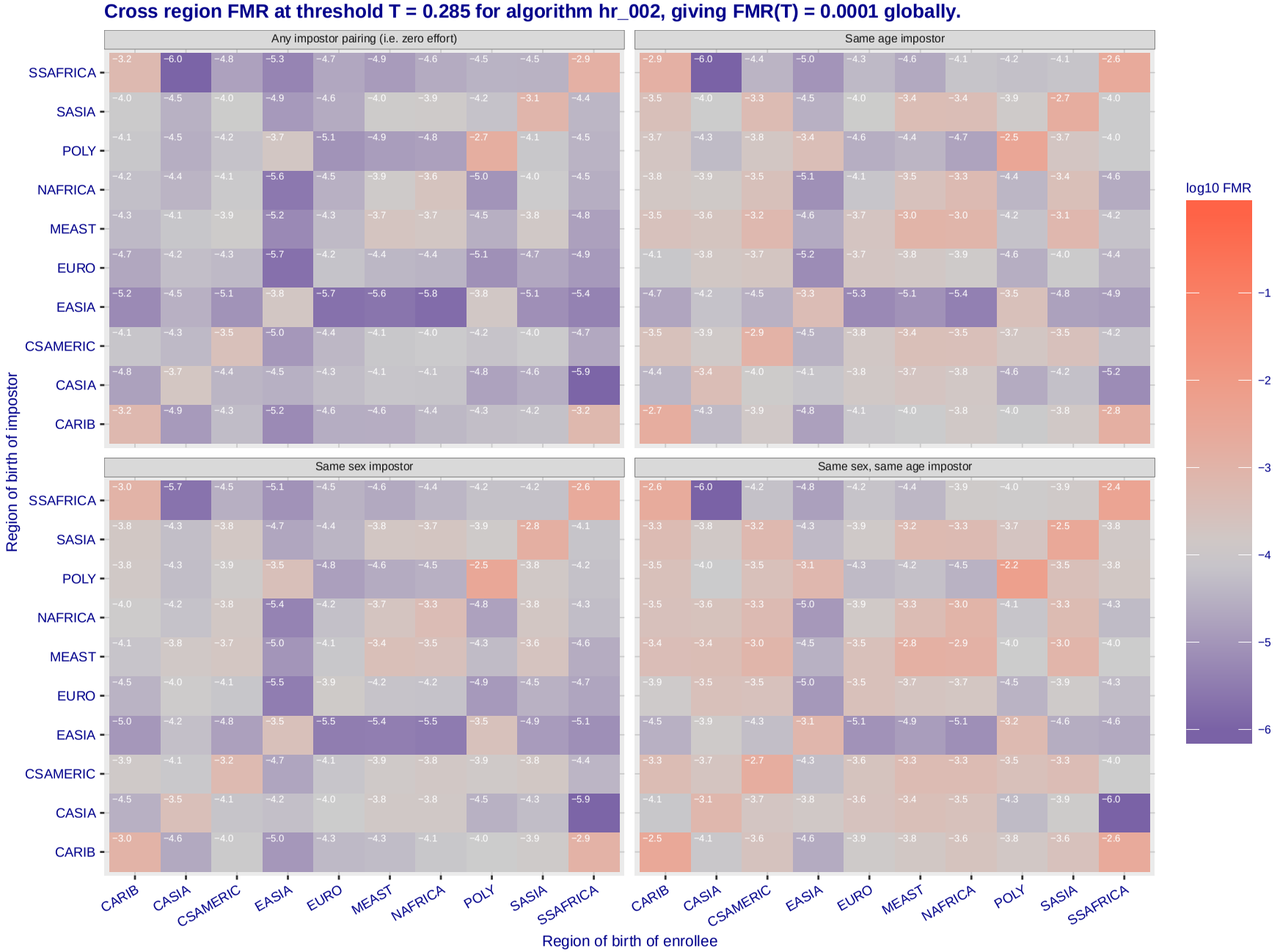


Figure 191: For algorithm hr-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

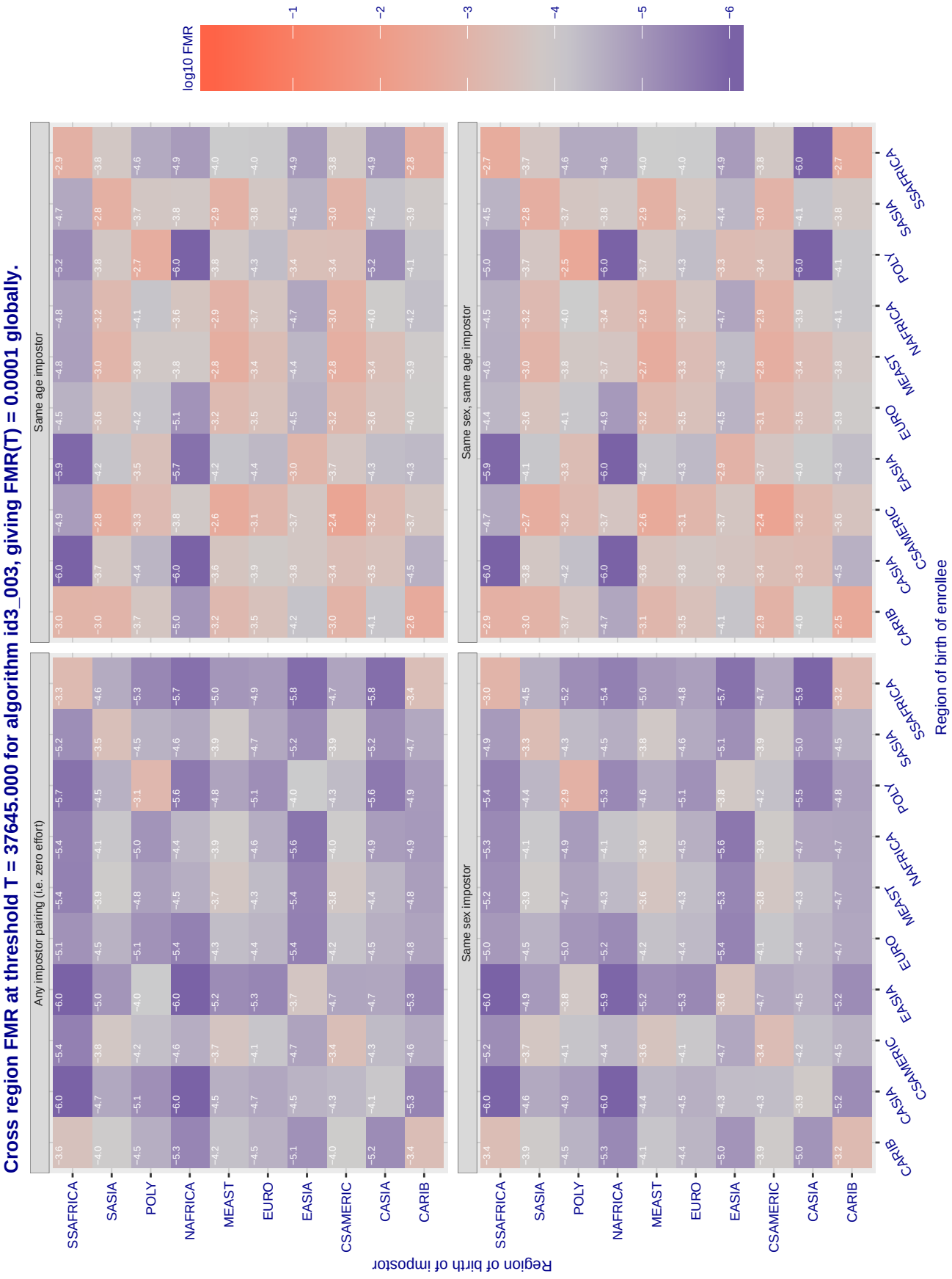


Figure 192: For algorithm id3-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

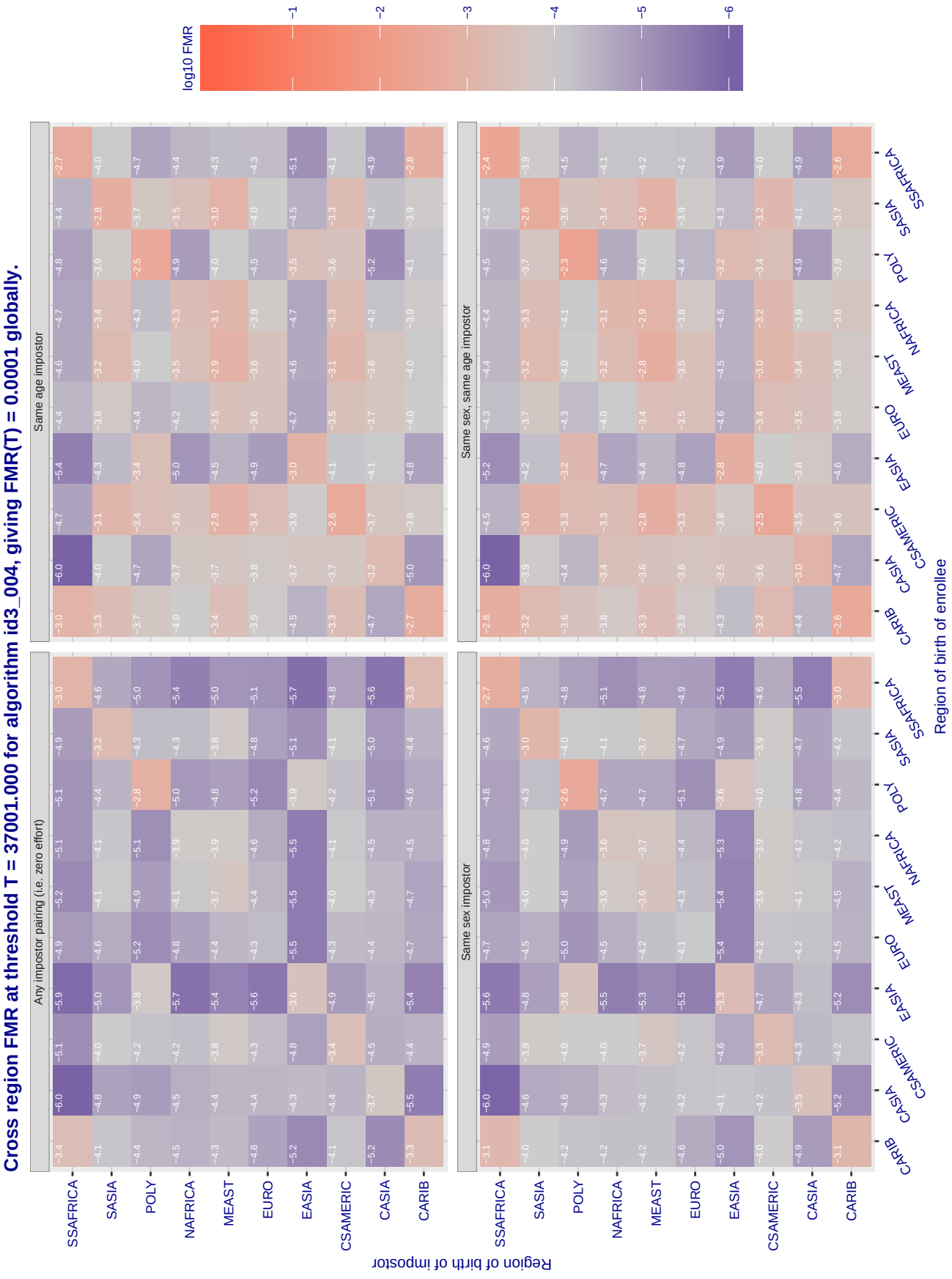


Figure 193: For algorithm id3-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

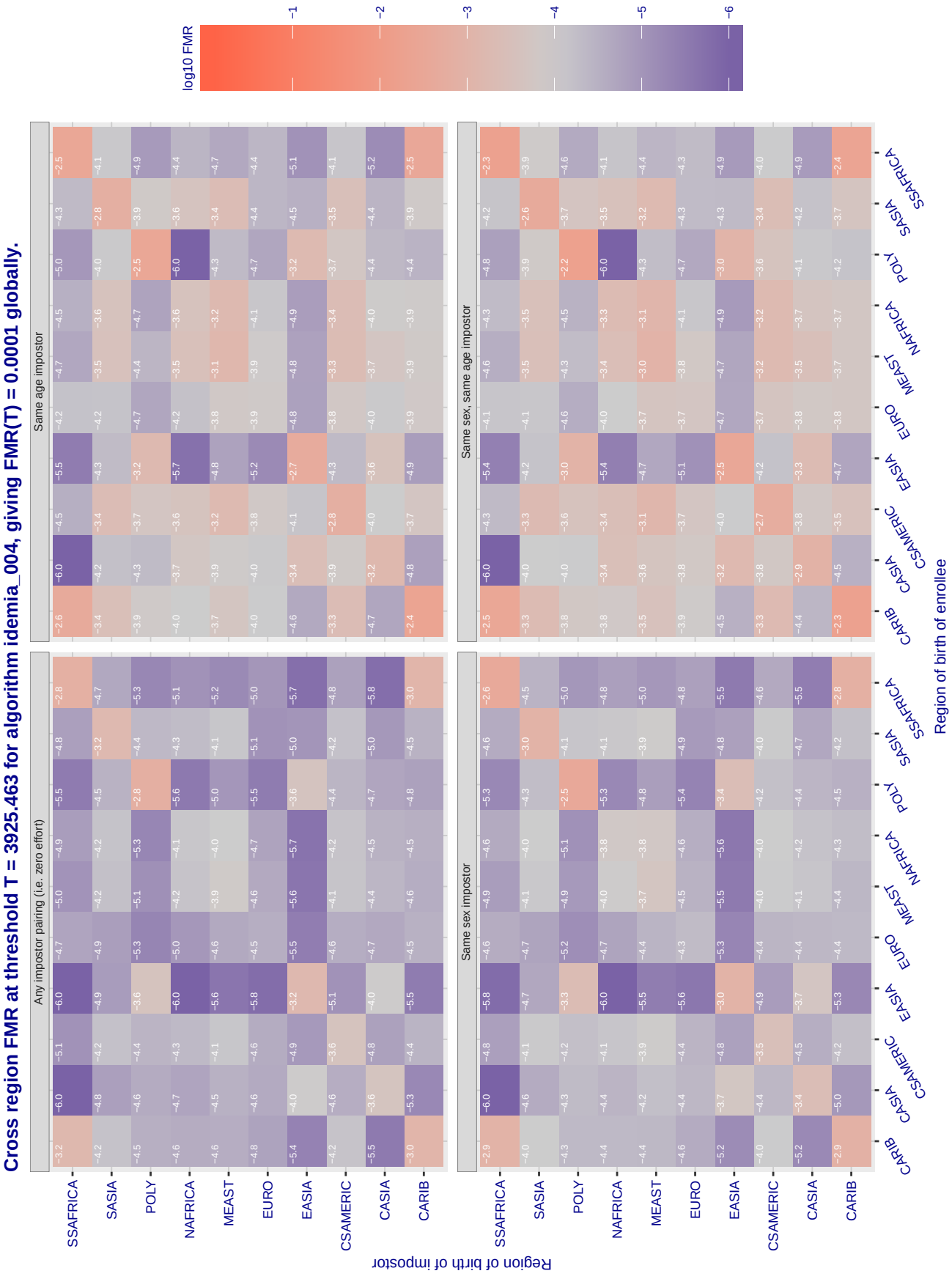


Figure 194: For algorithm idemia-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

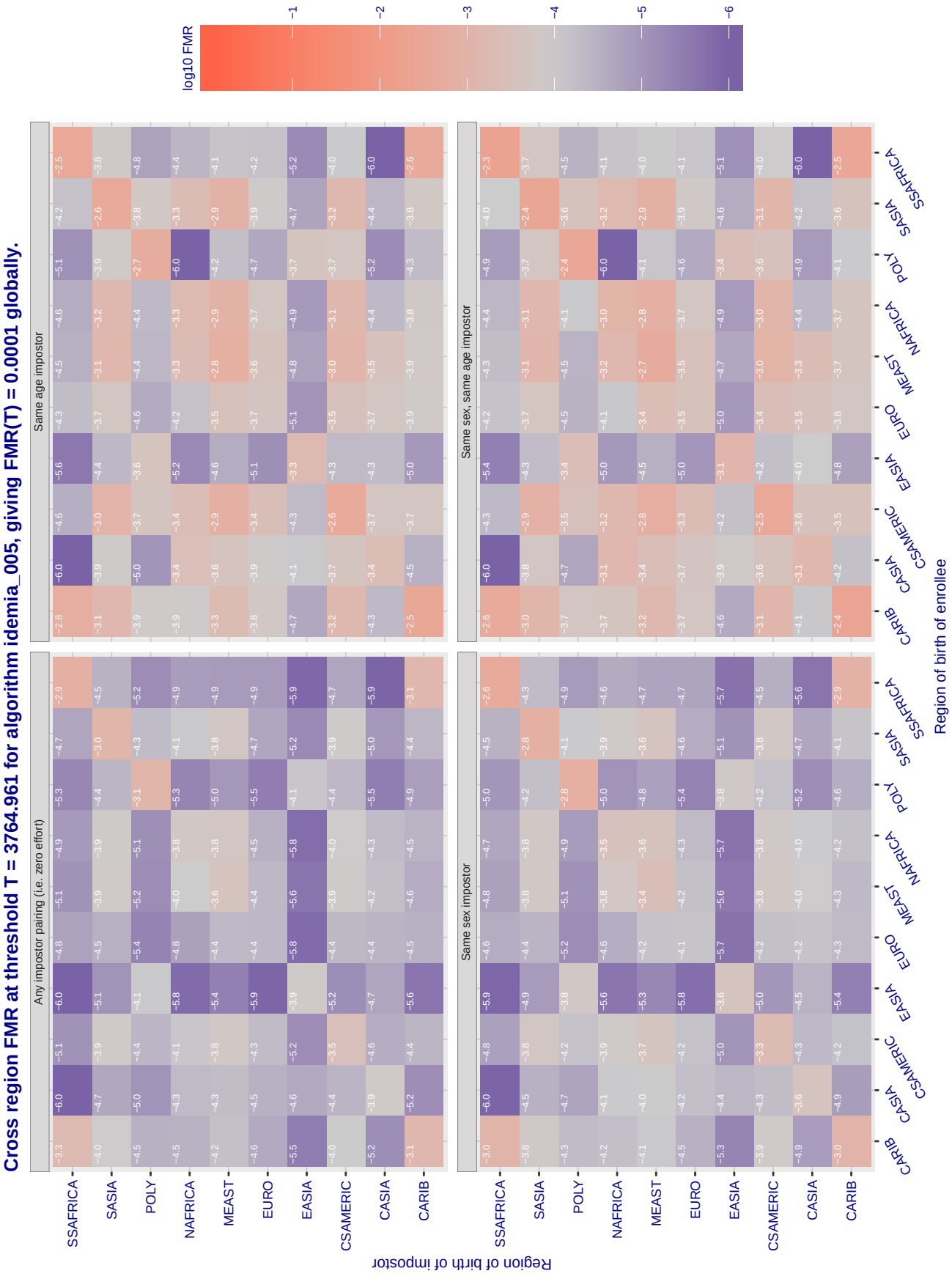


Figure 195: For algorithm idemia-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

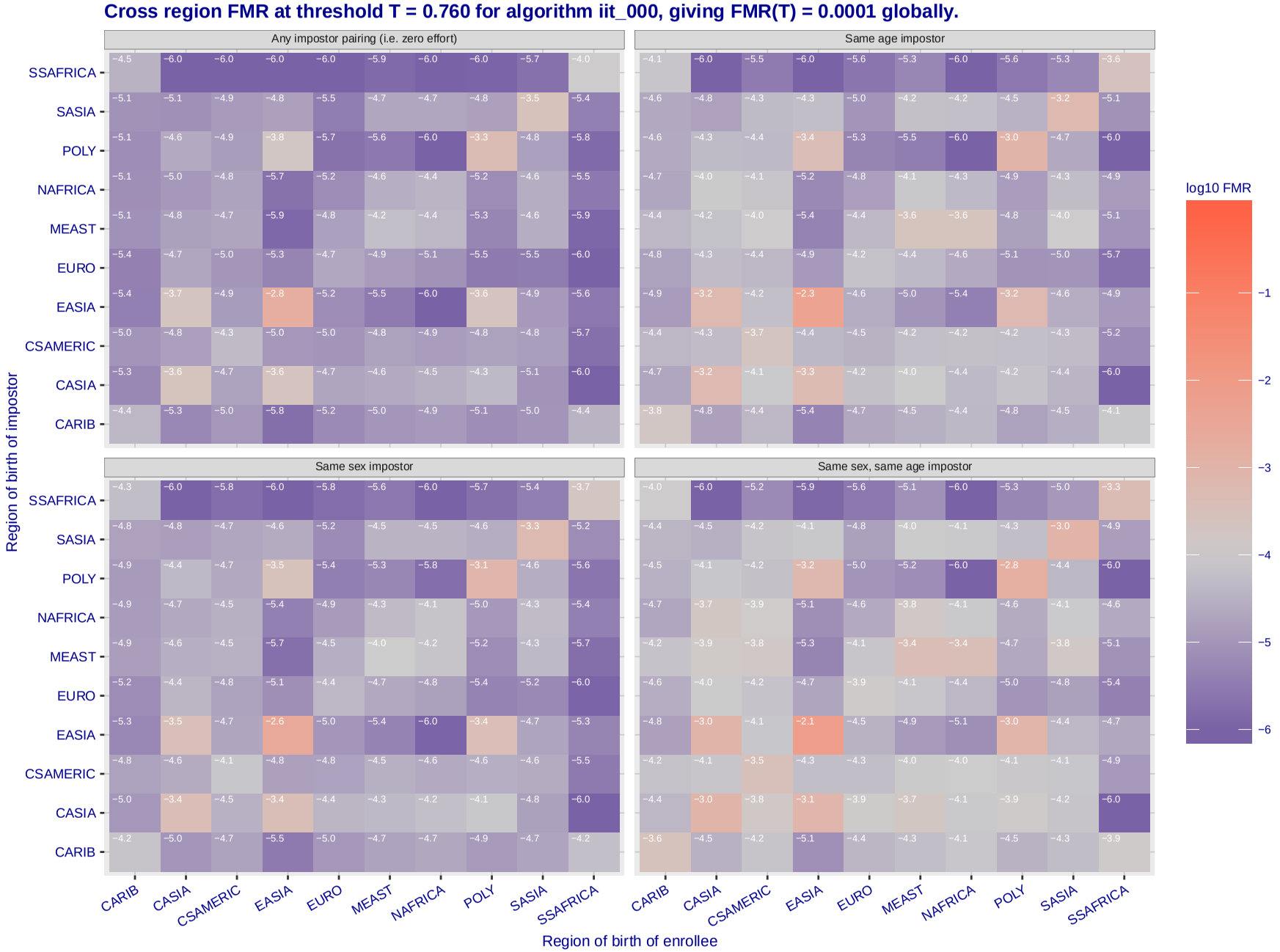


Figure 196: For algorithm iit-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

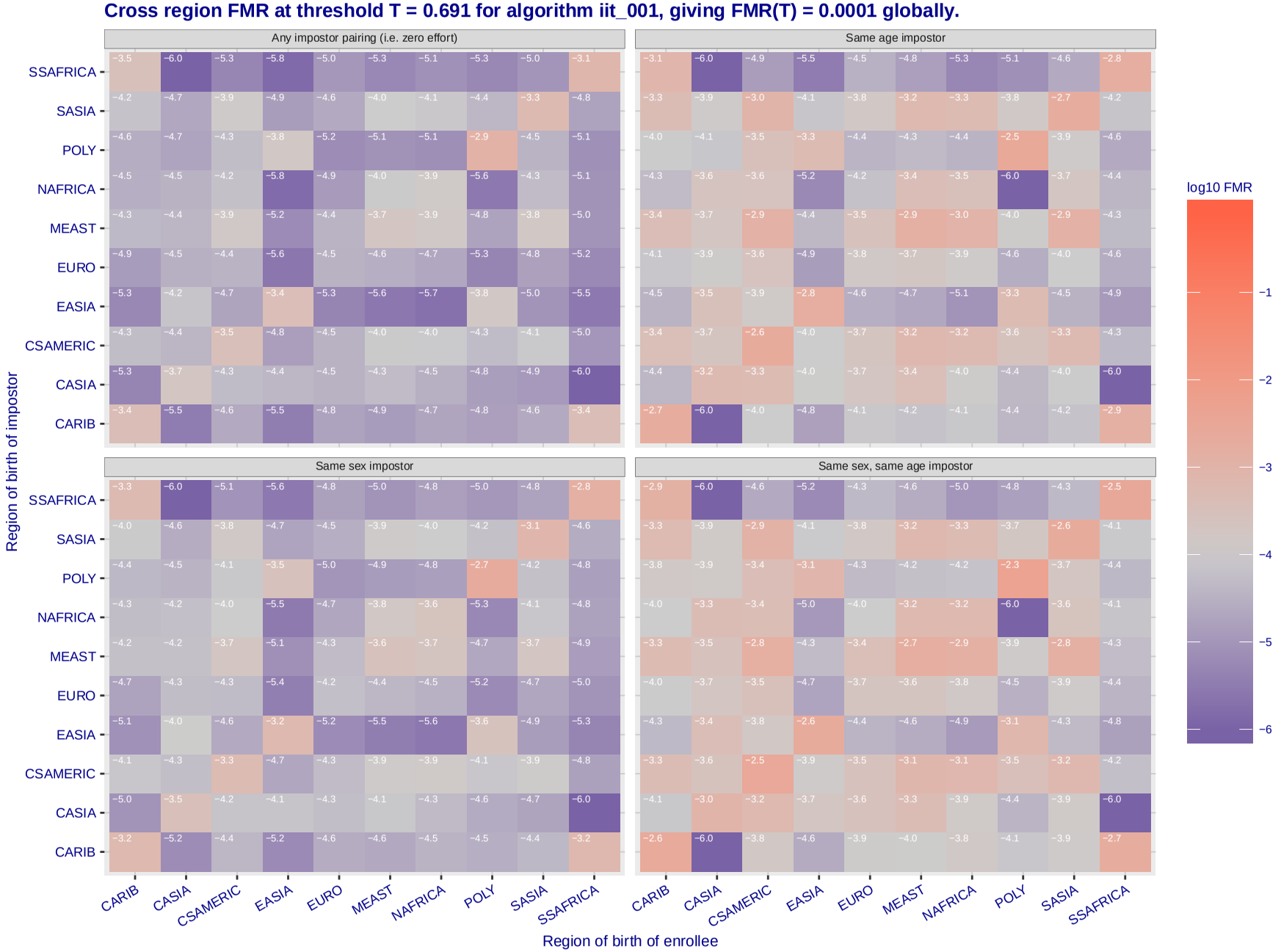


Figure 197: For algorithm iit-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

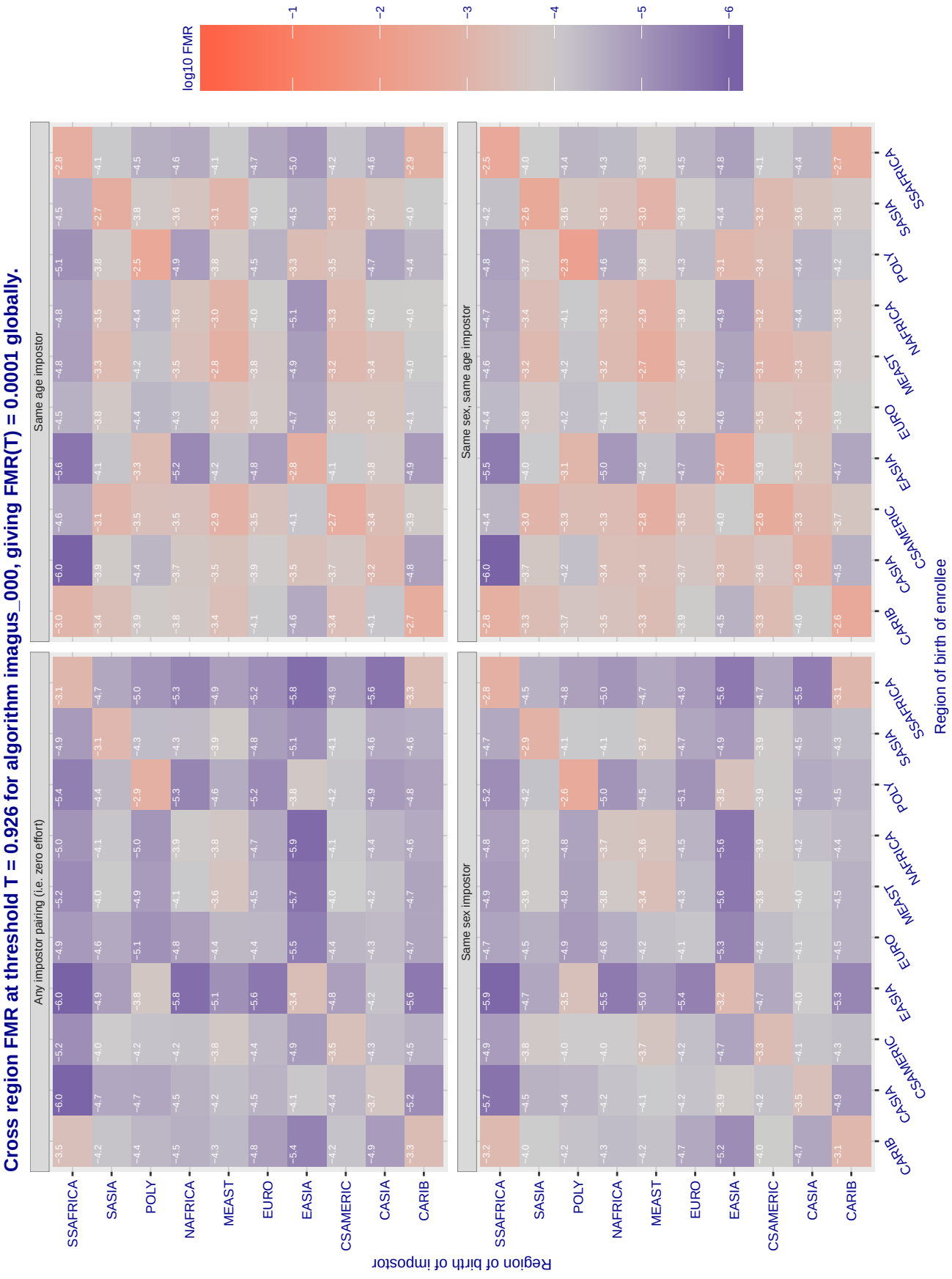


Figure 198: For algorithm imagus-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

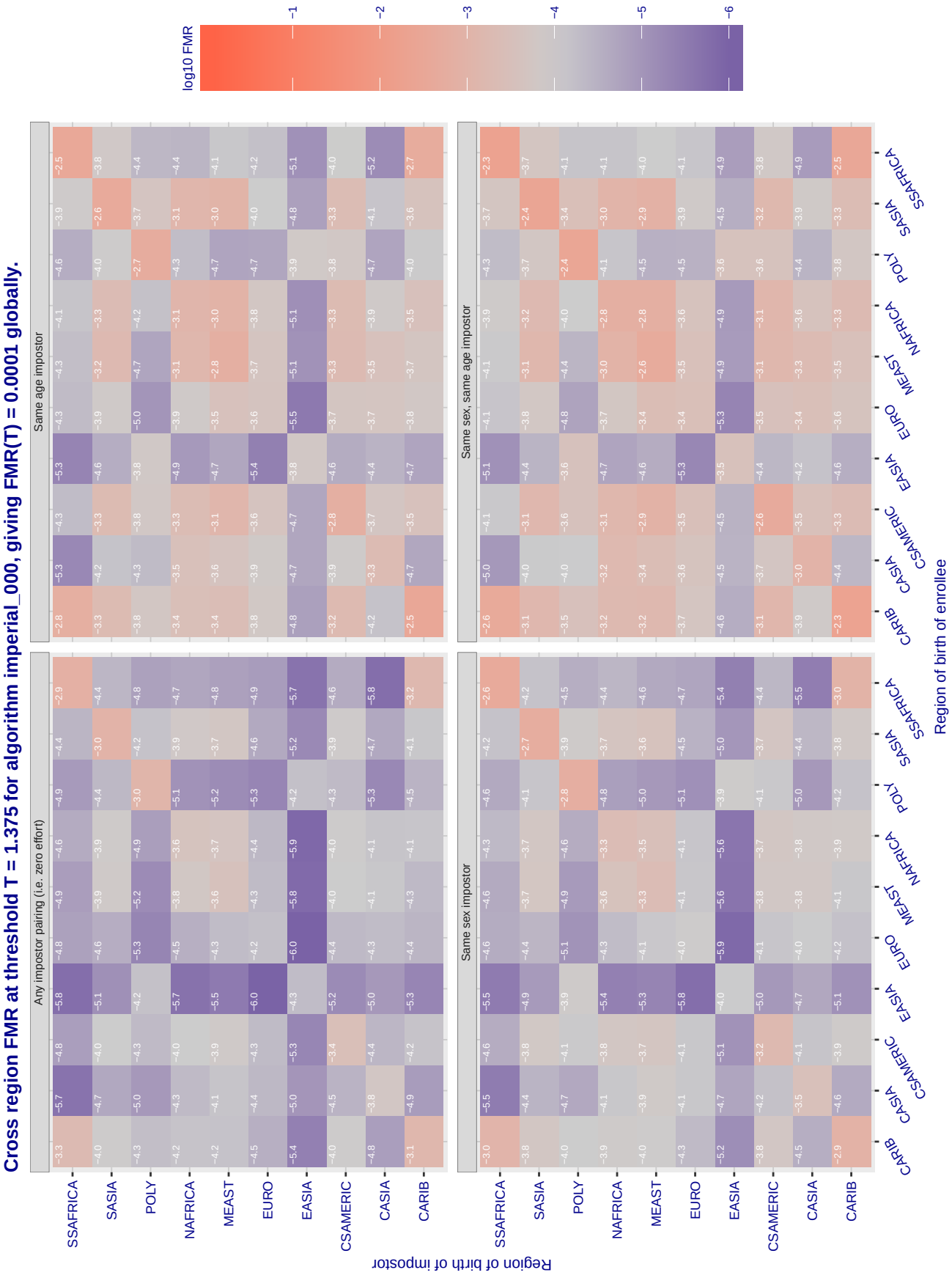


Figure 199: For algorithm imperial-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

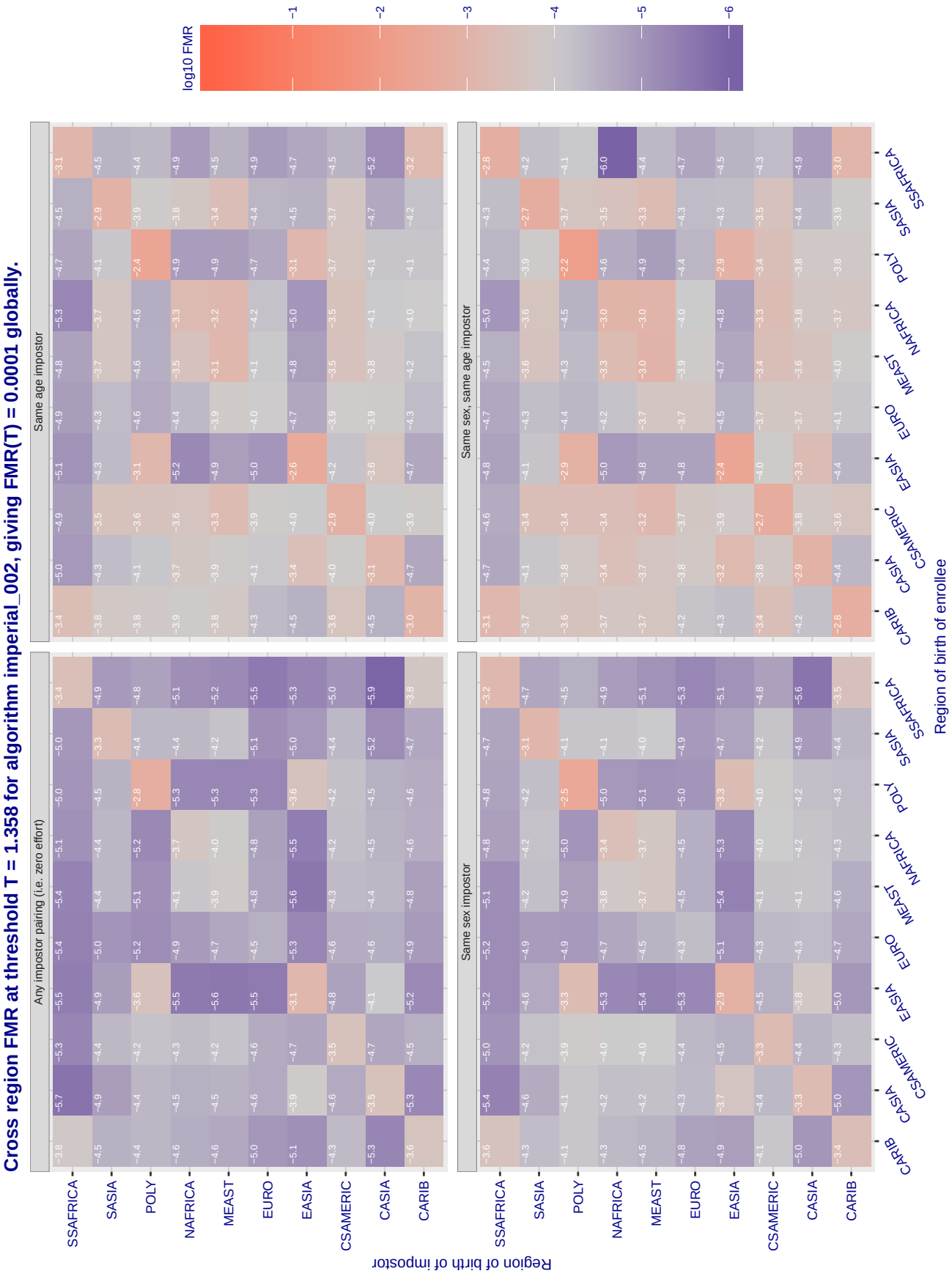


Figure 200: For algorithm imperial-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

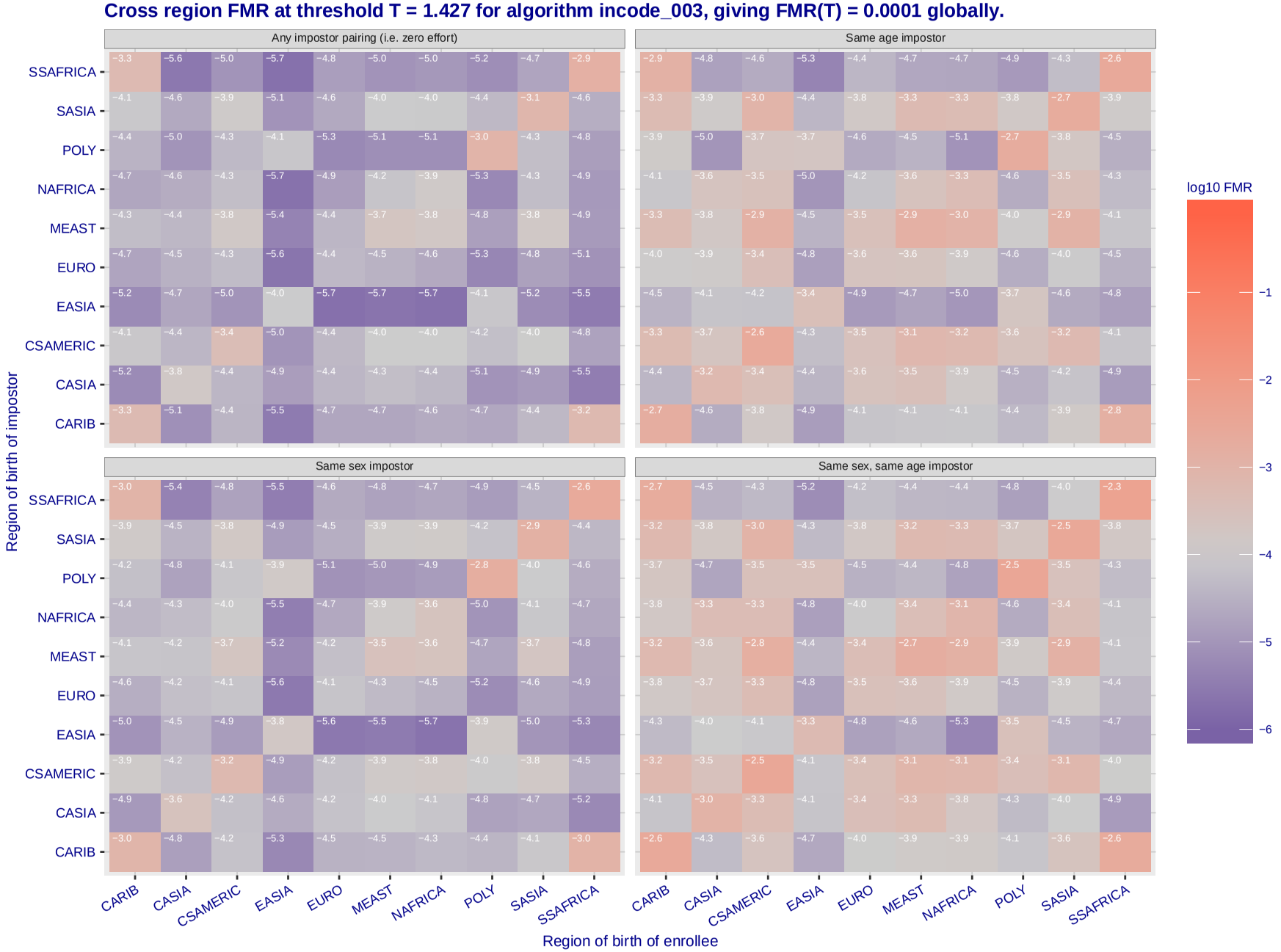


Figure 201: For algorithm incode-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

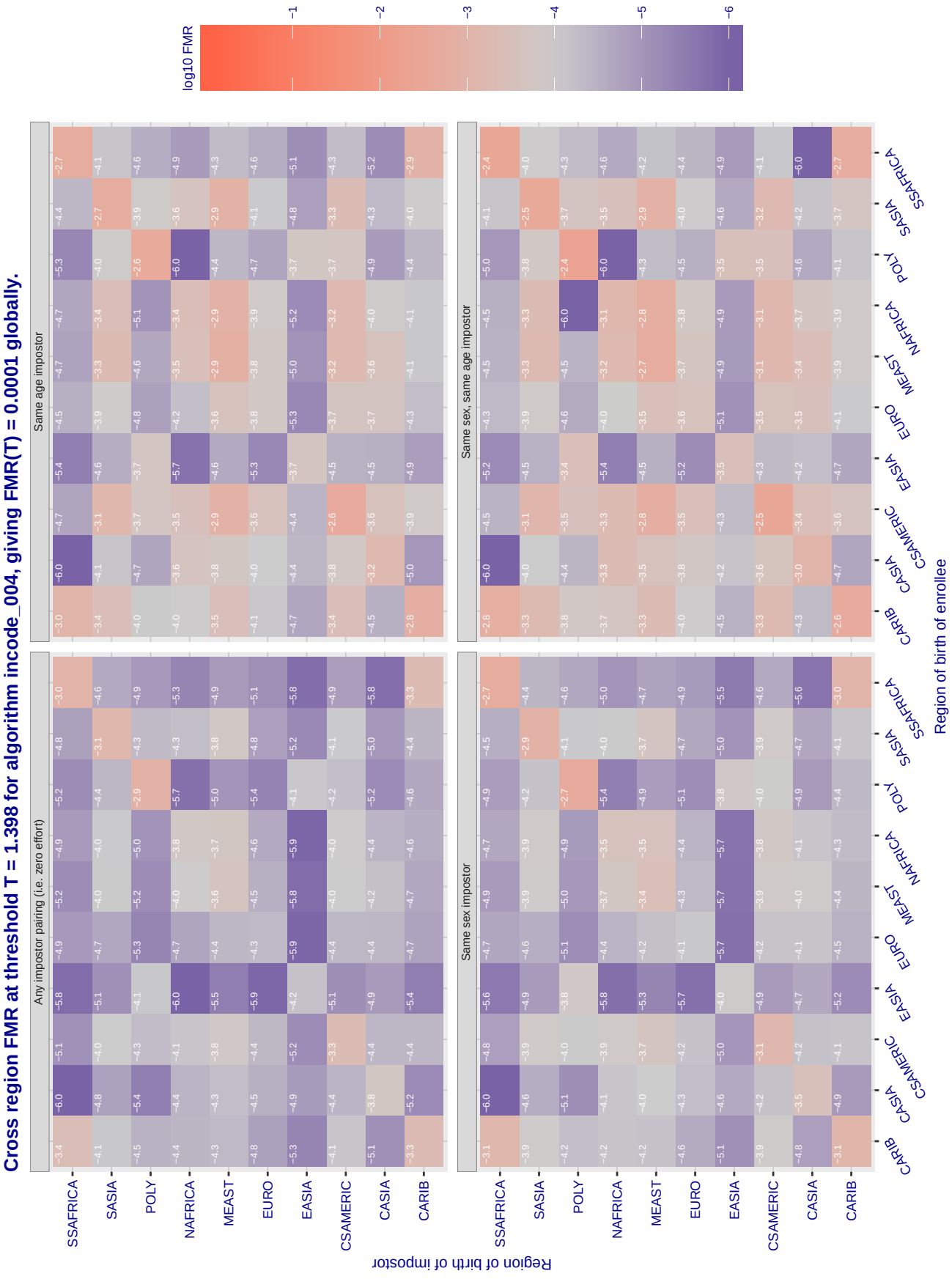


Figure 202: For algorithm incode-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

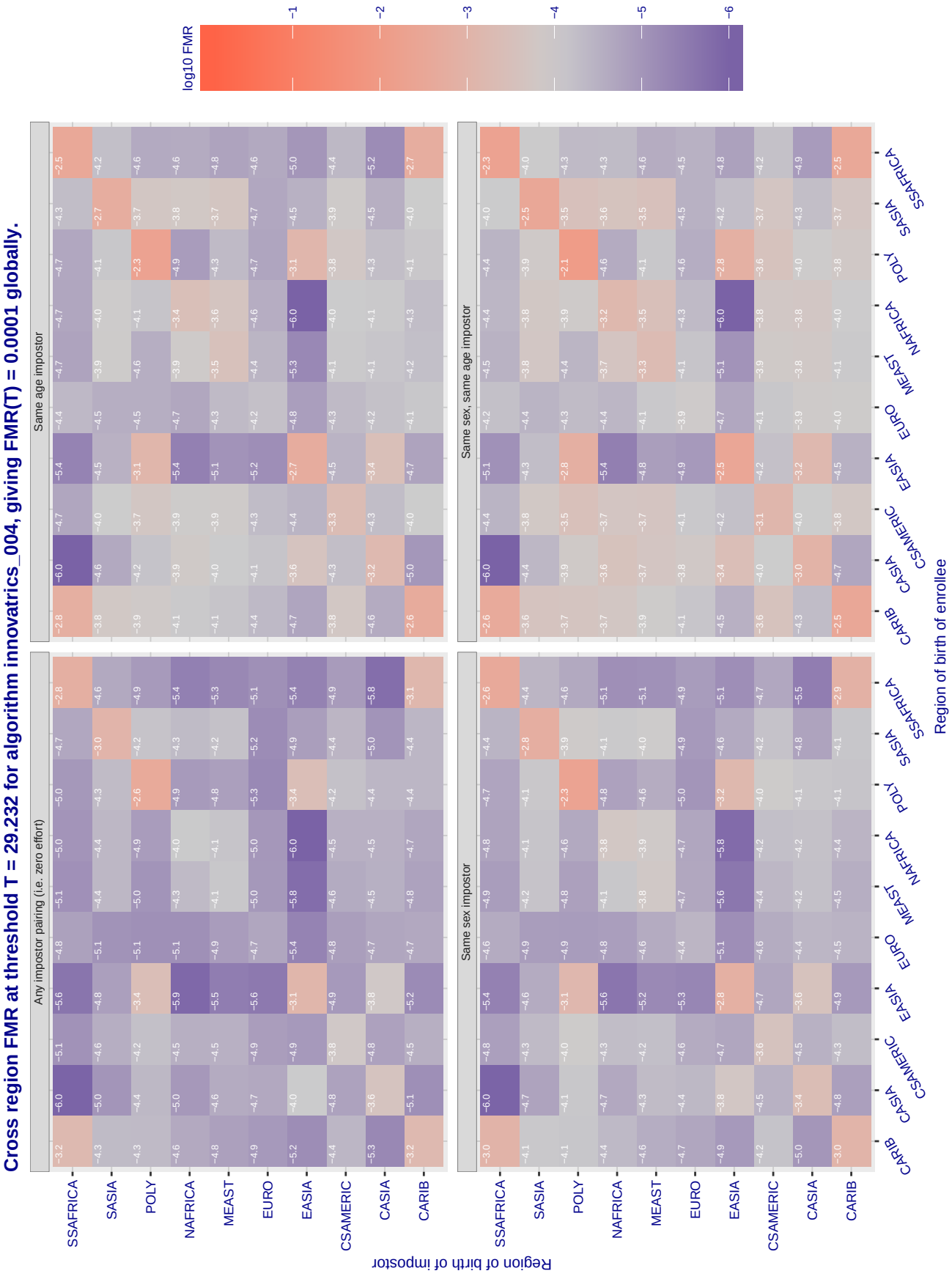


Figure 203: For algorithm innovatrics-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

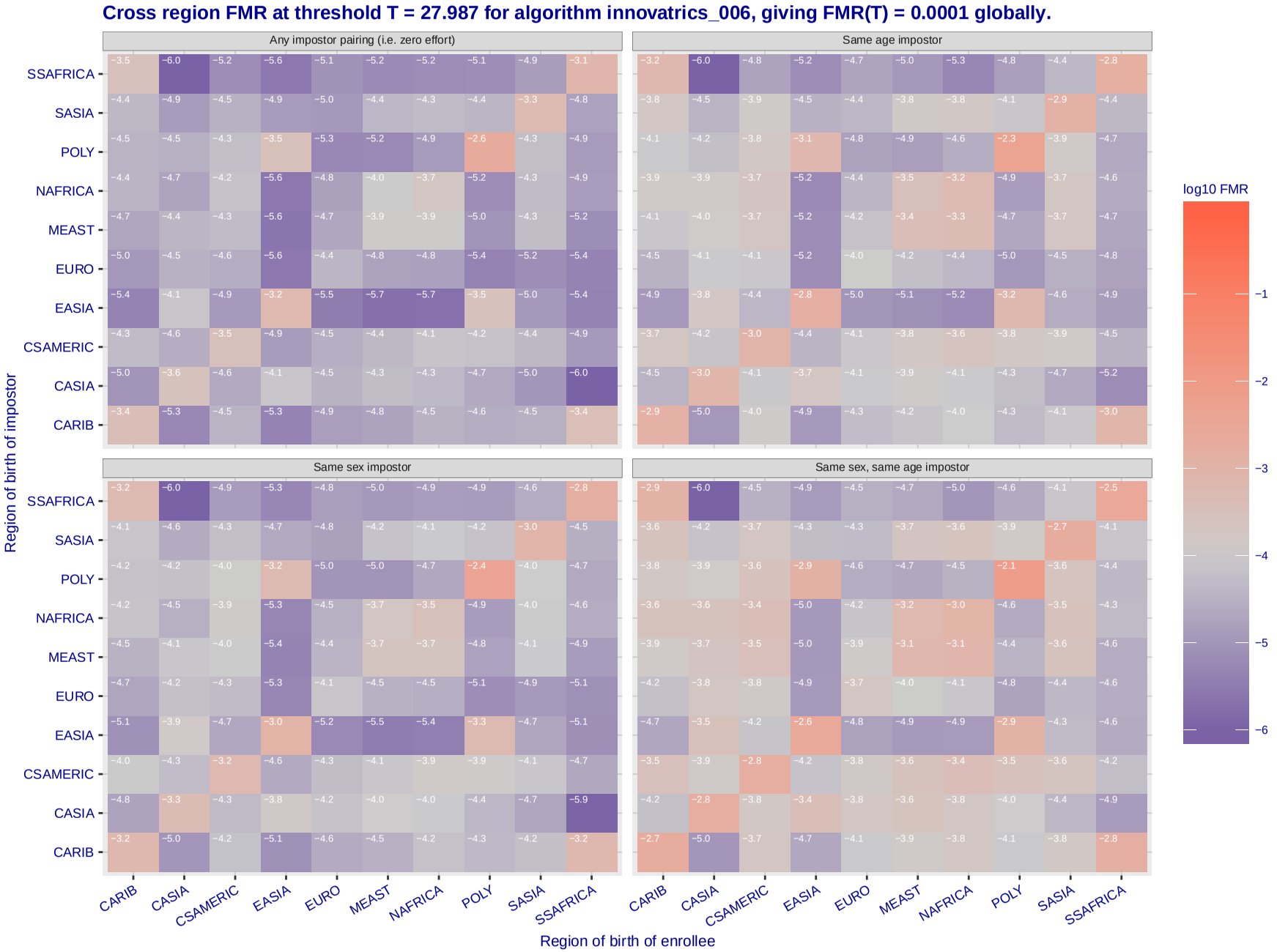


Figure 204: For algorithm innovatrics-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

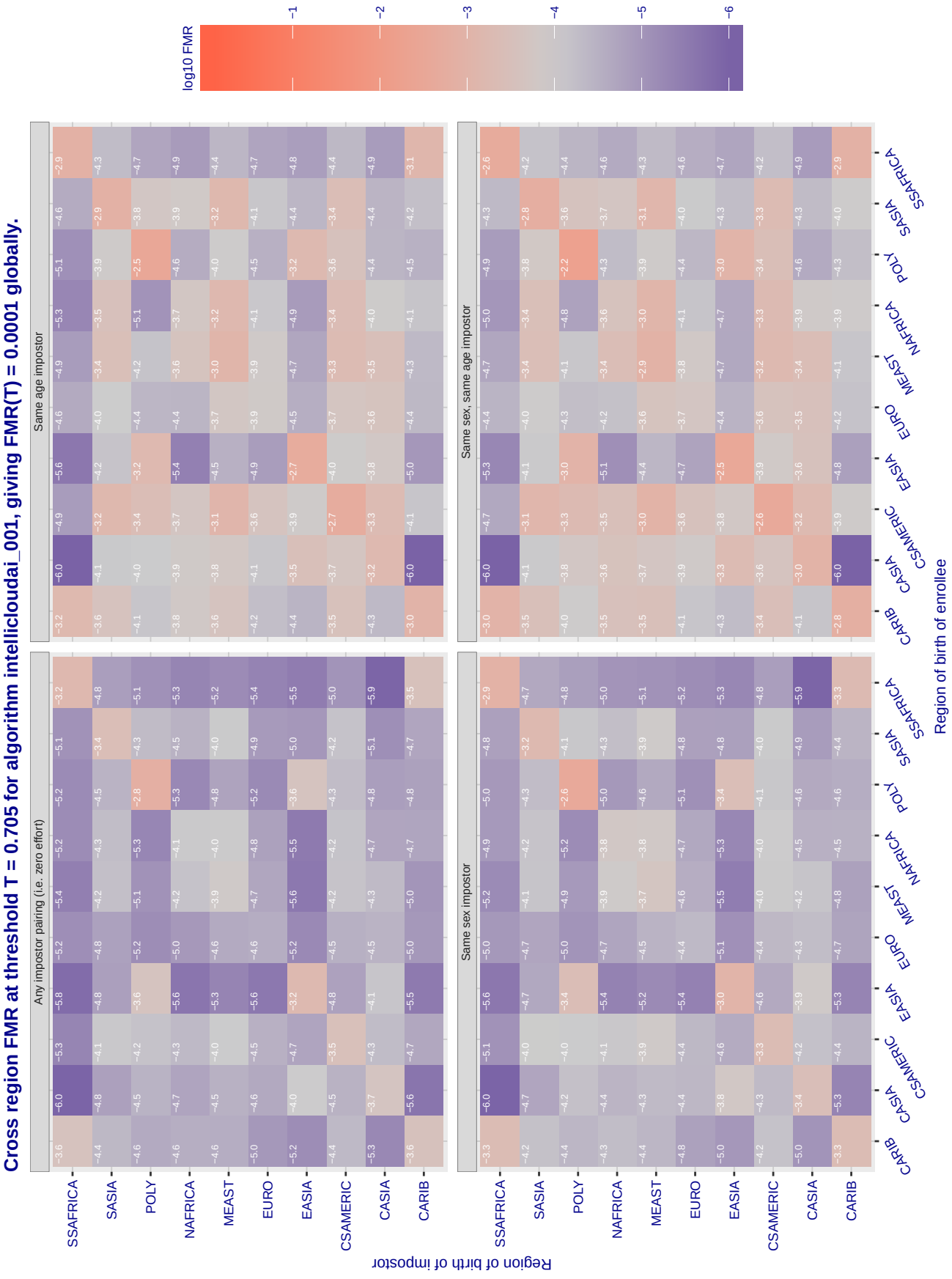


Figure 205: For algorithm intellicloudai-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

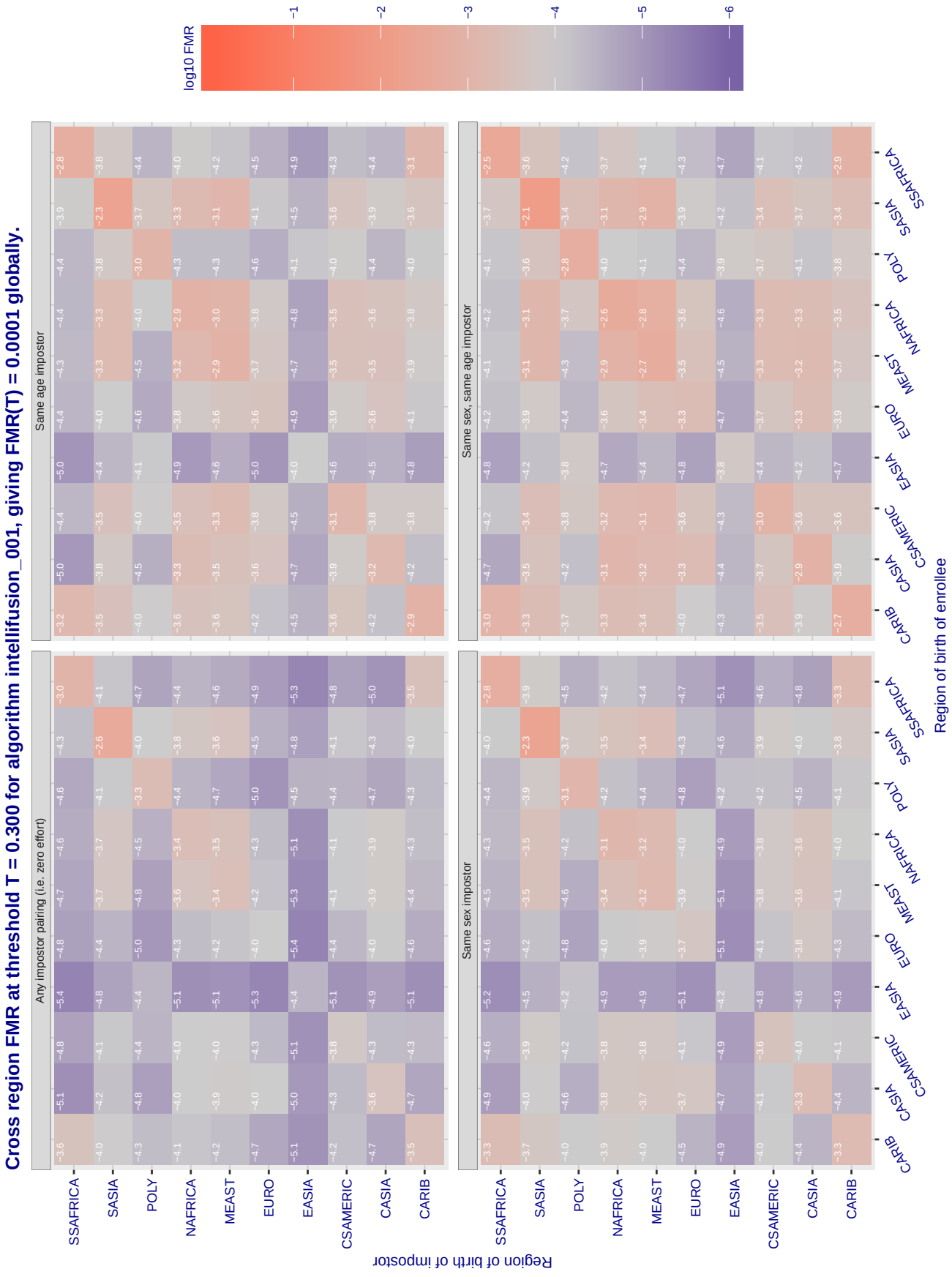


Figure 206: For algorithm intellifusion-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

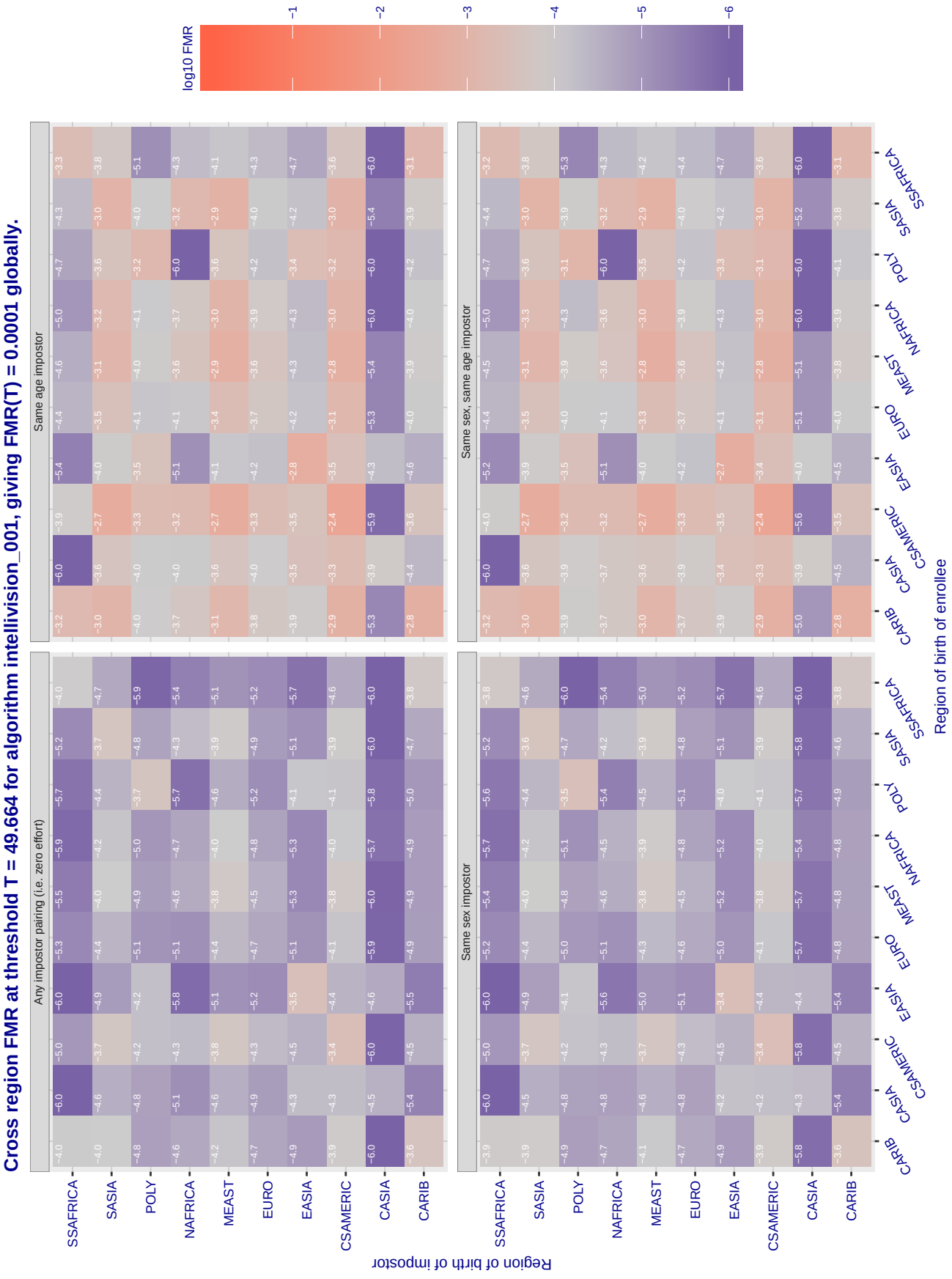


Figure 207: For algorithm intellivision-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

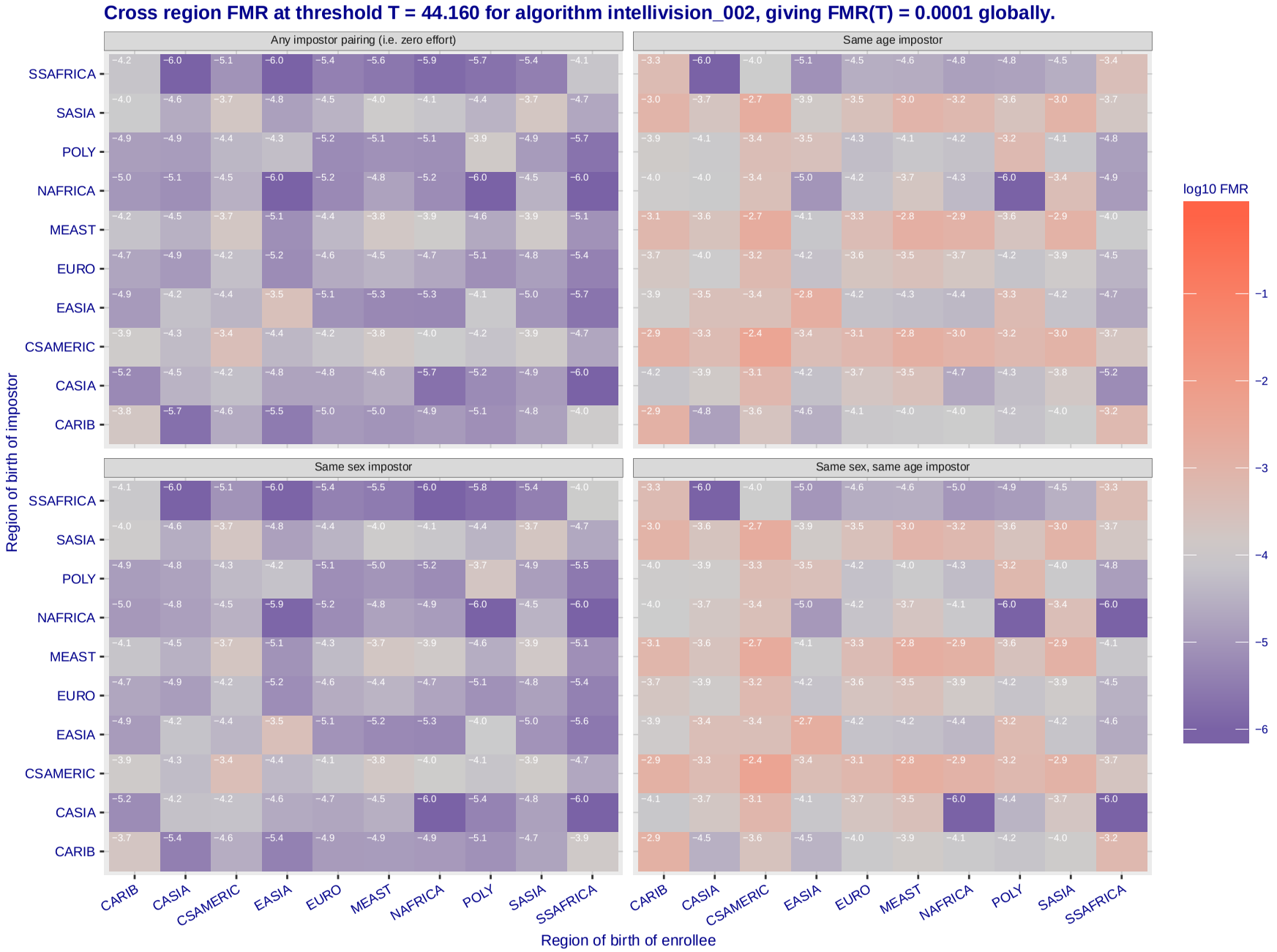


Figure 208: For algorithm intellivision-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

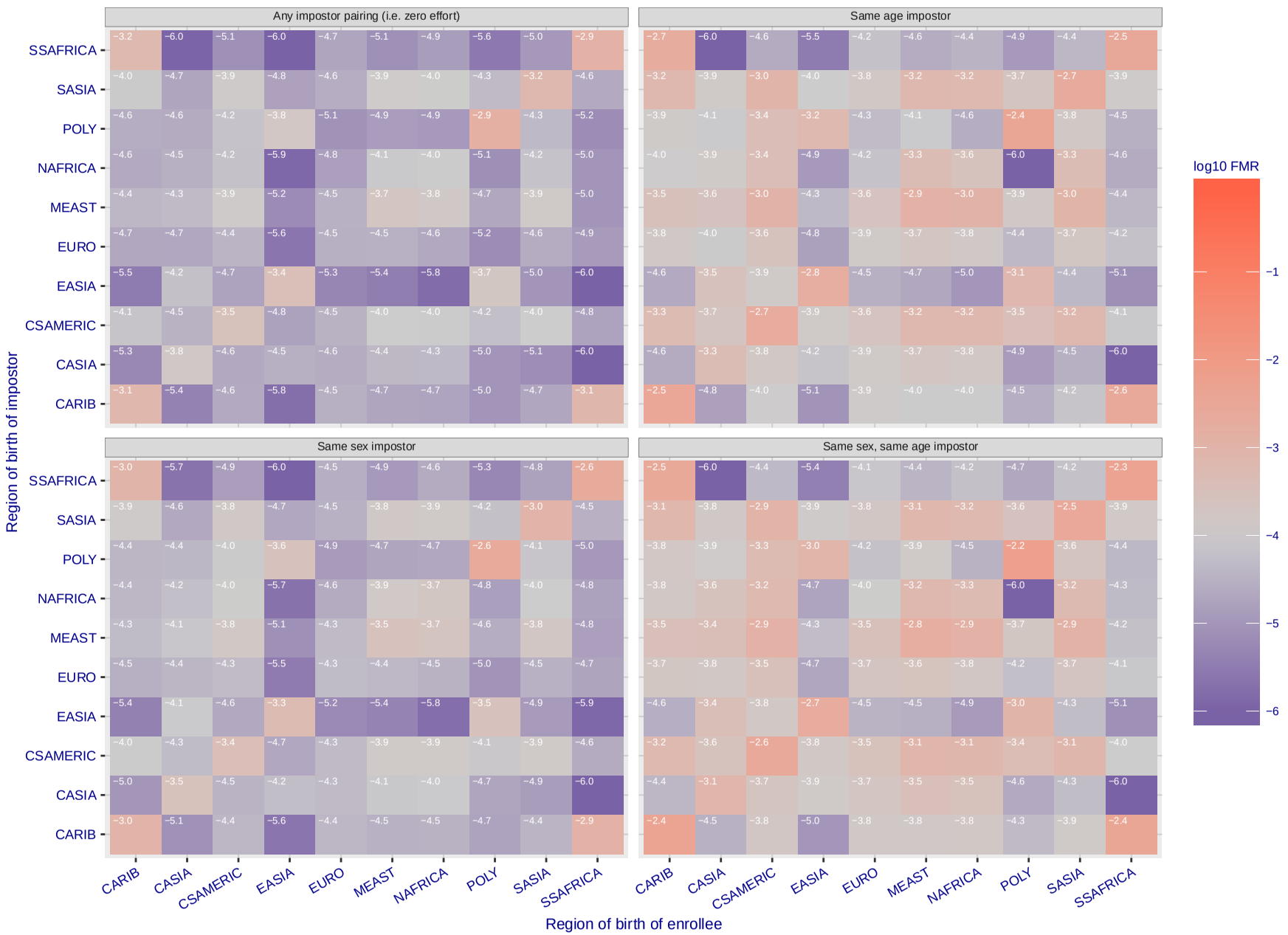


Figure 209: For algorithm intelresearch-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

Figure 210: For algorithm intsysmsu-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

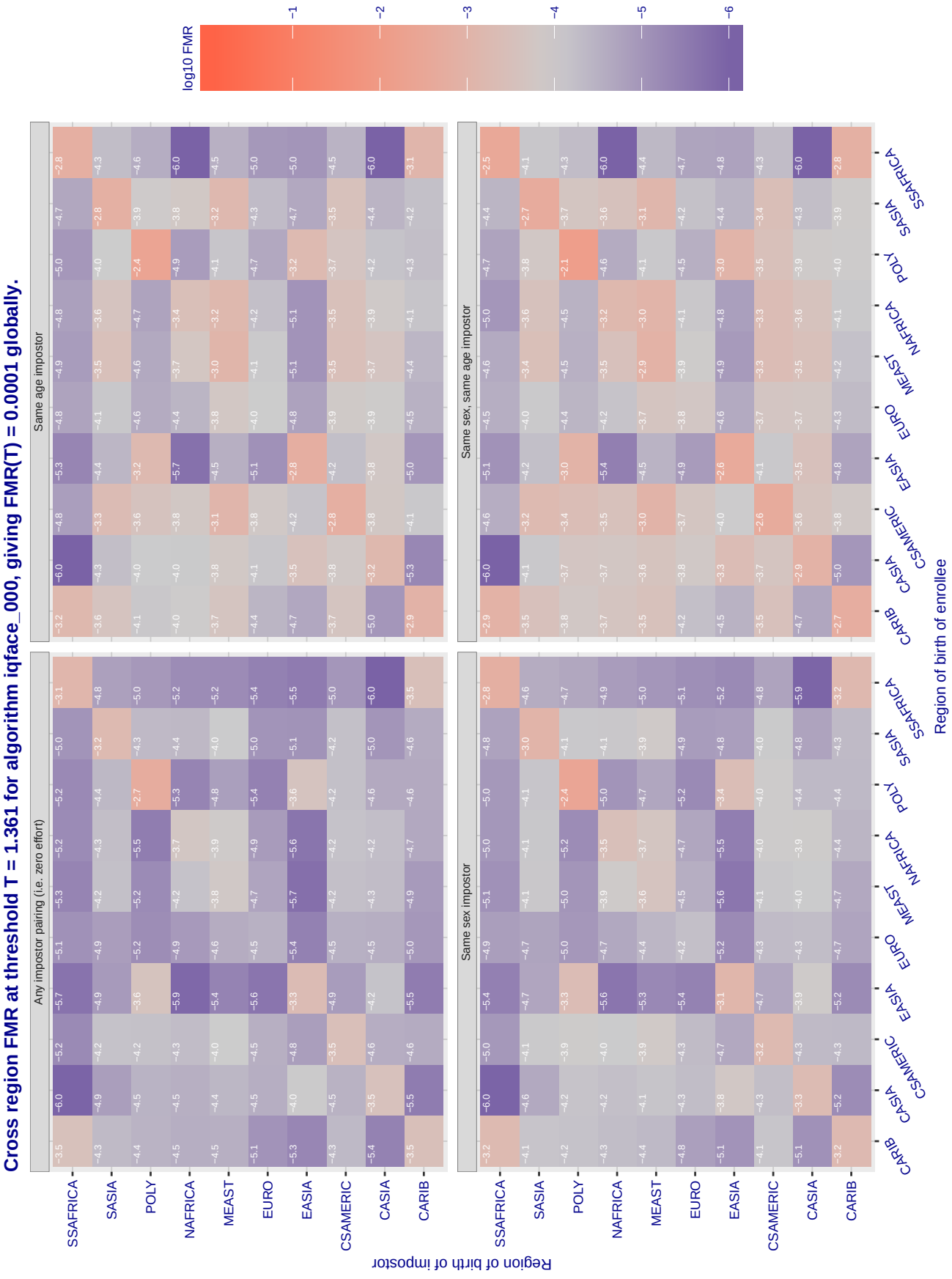


Figure 211: For algorithm iqface-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

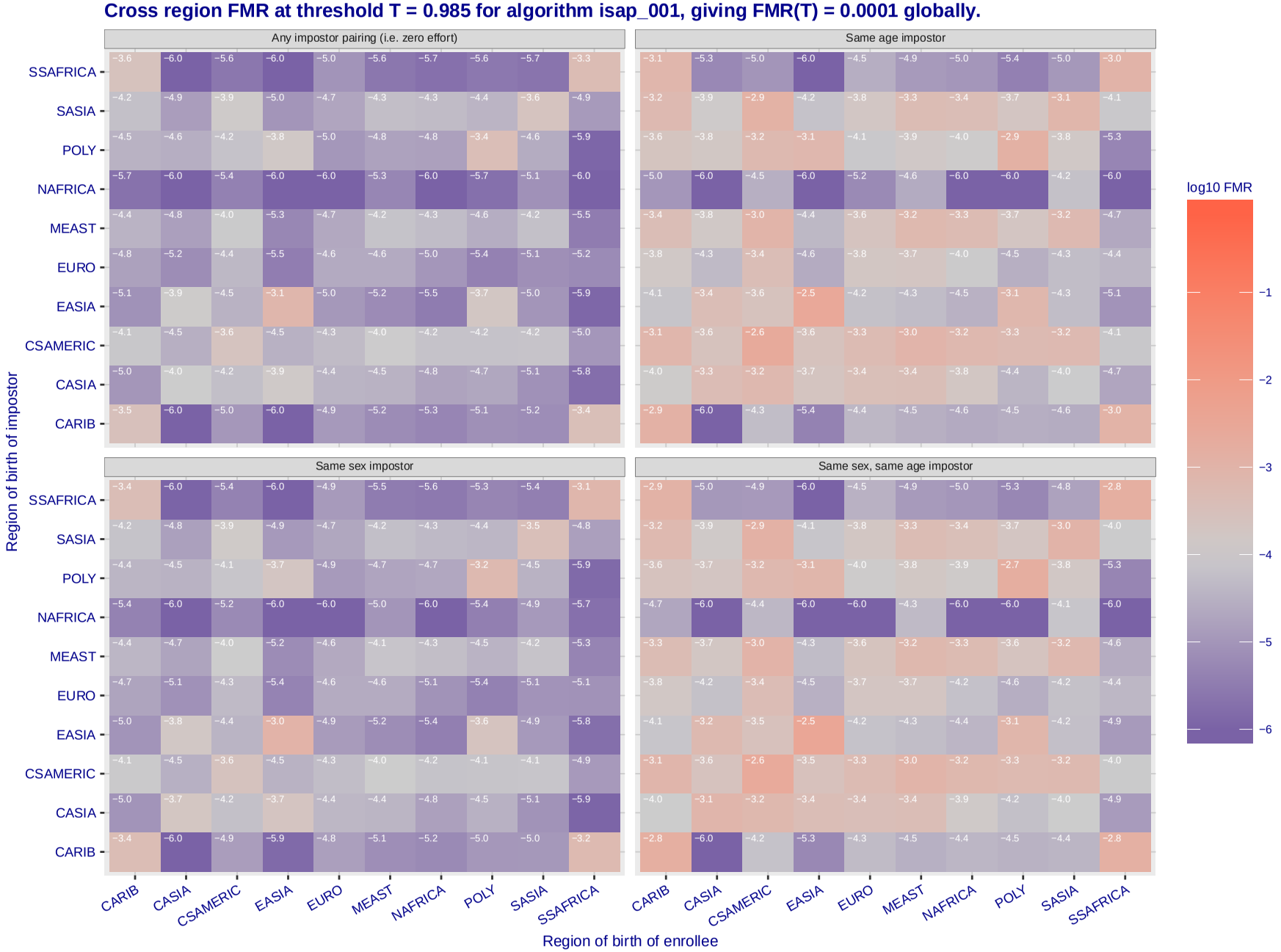


Figure 212: For algorithm isap-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

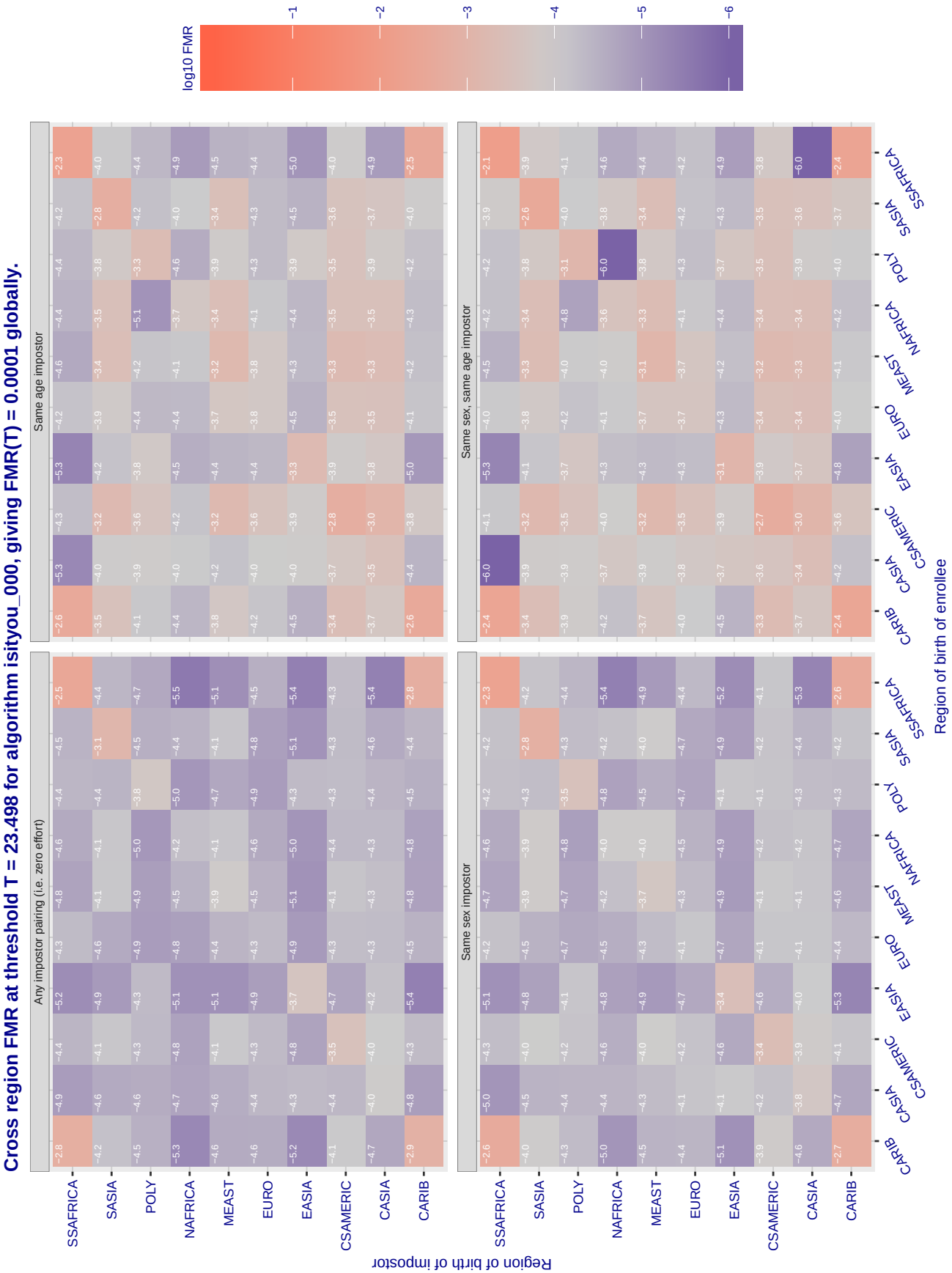


Figure 213: For algorithm isityou-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

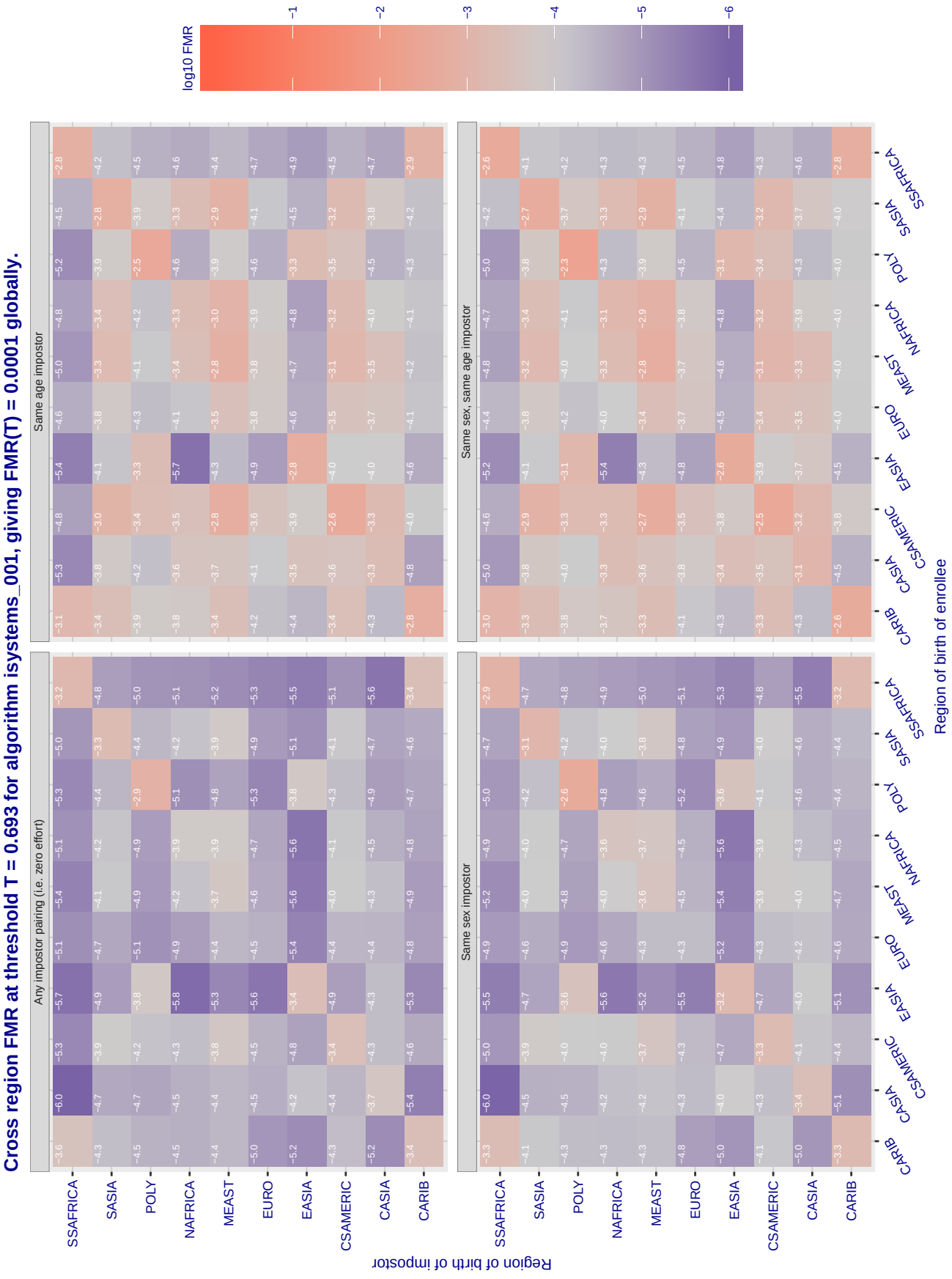


Figure 214: For algorithm isystems-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

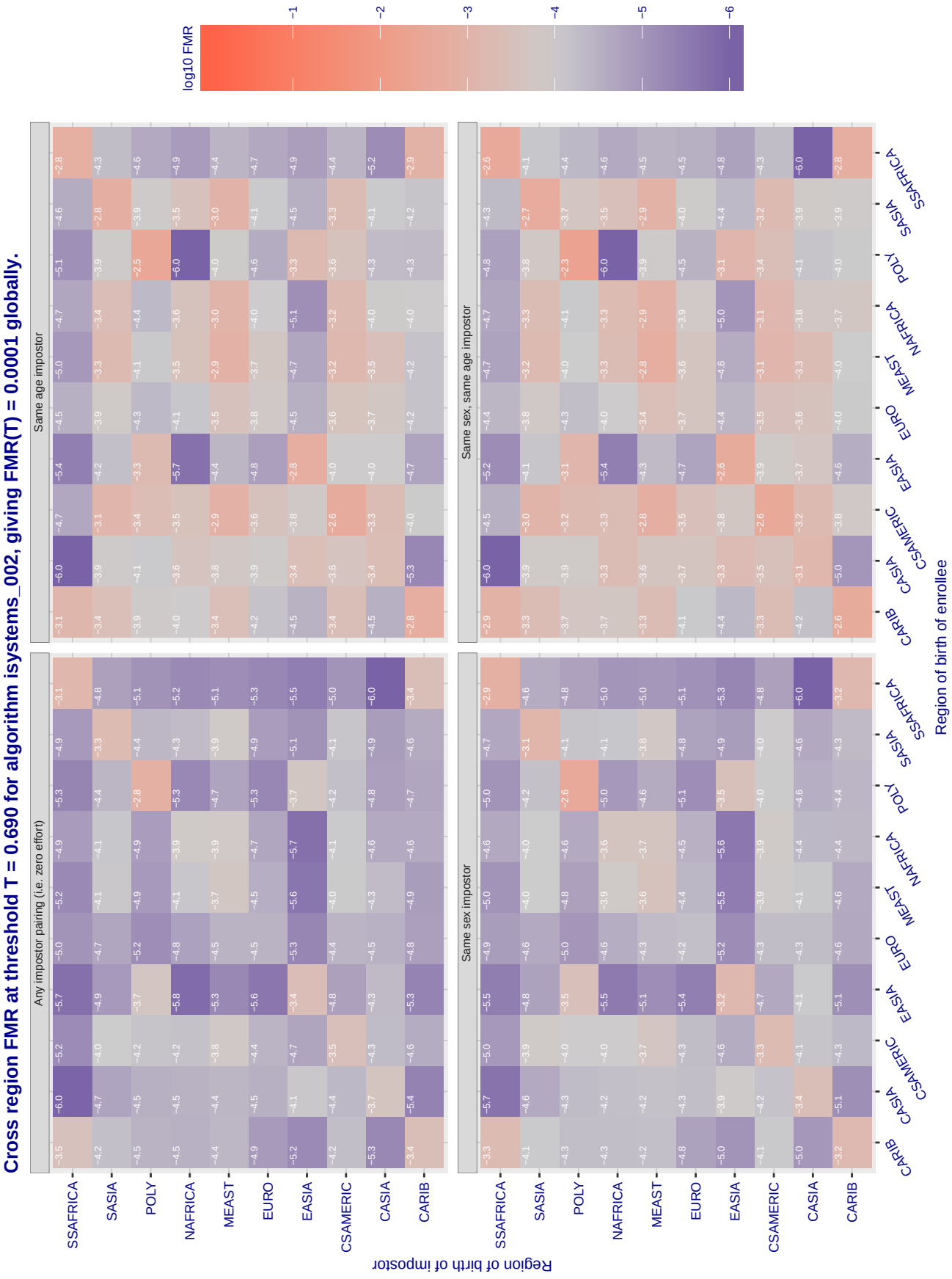


Figure 215: For algorithm isystems-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

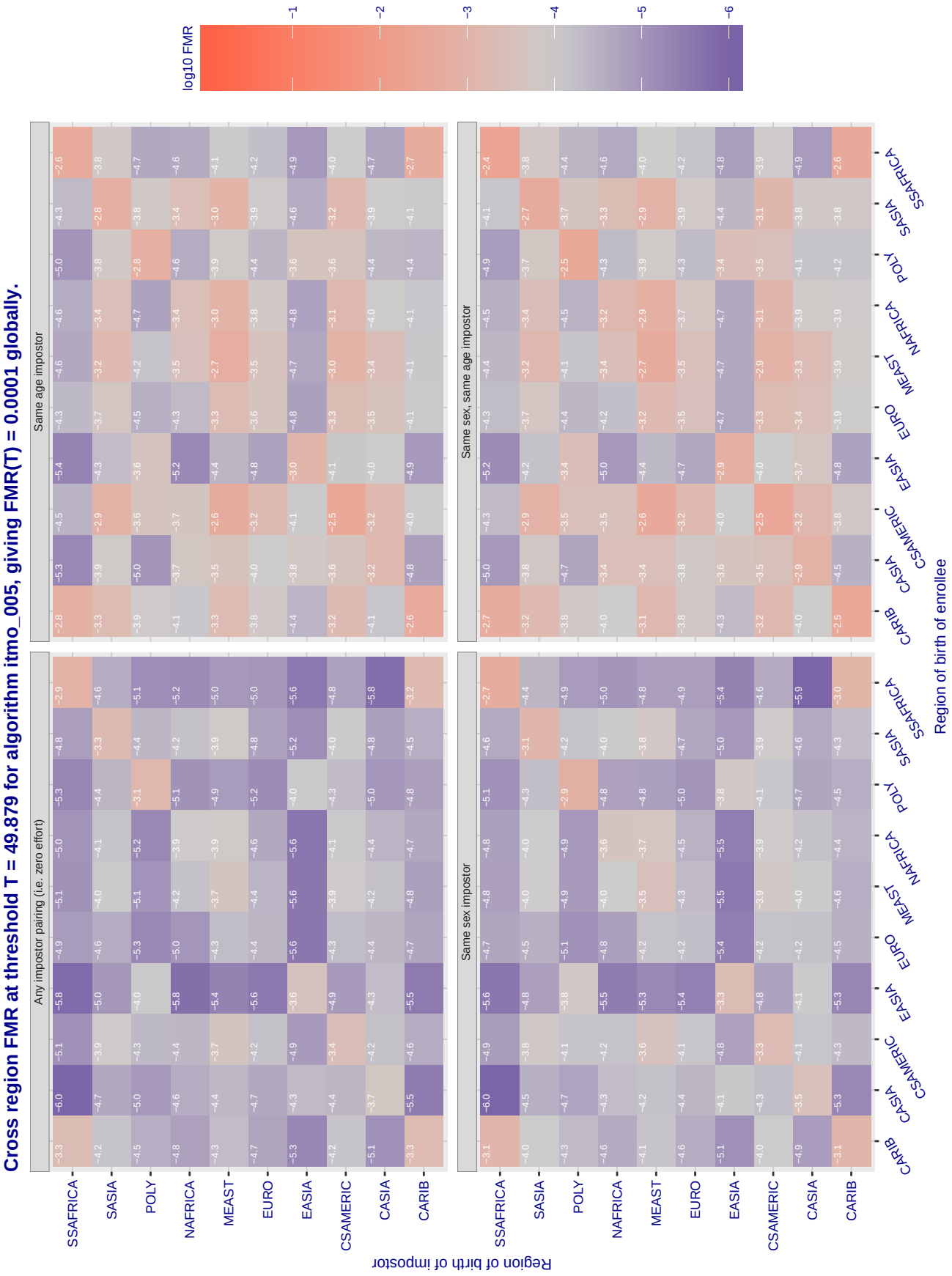


Figure 216: For algorithm itmo-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

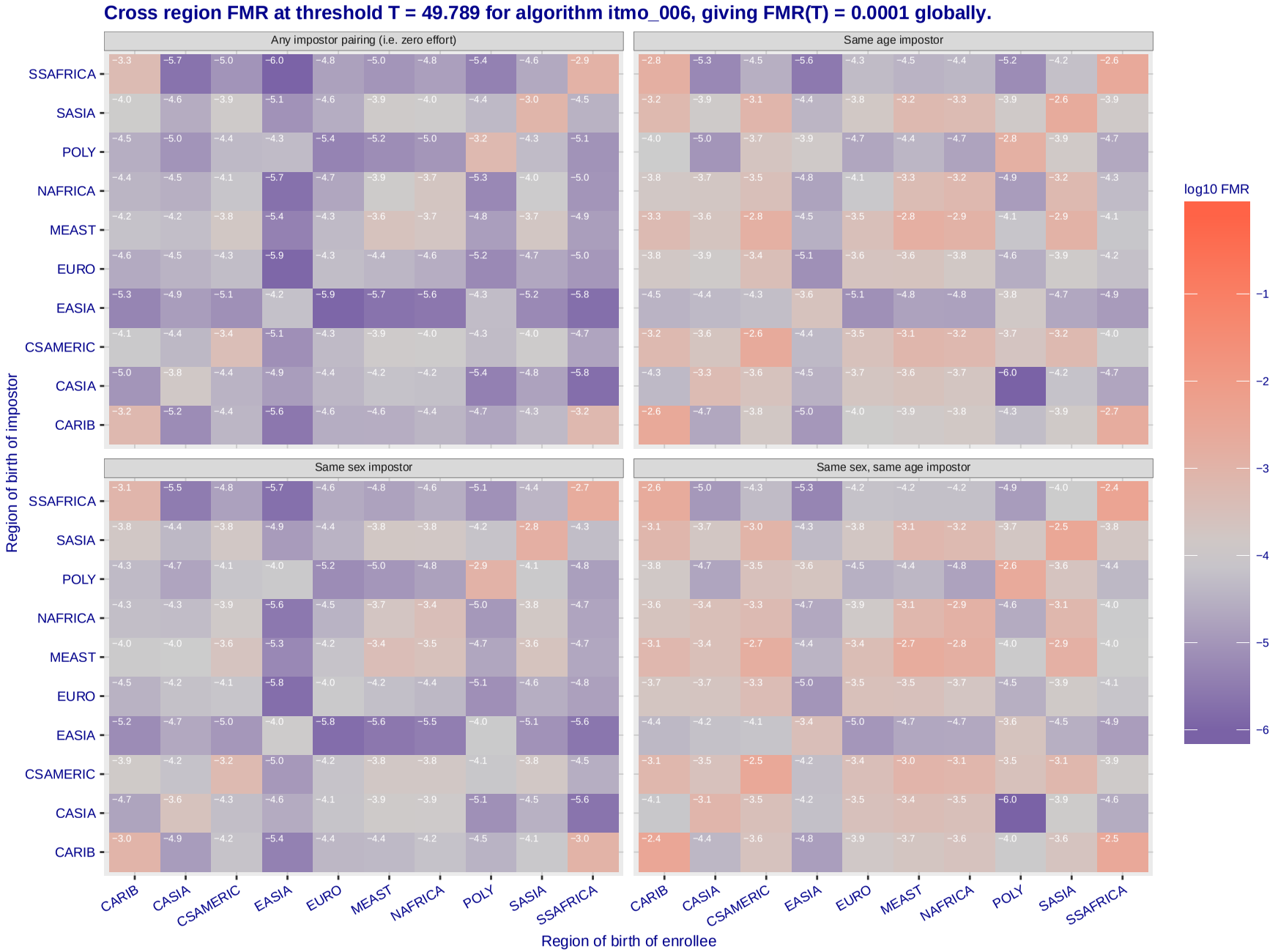


Figure 217: For algorithm itmo-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

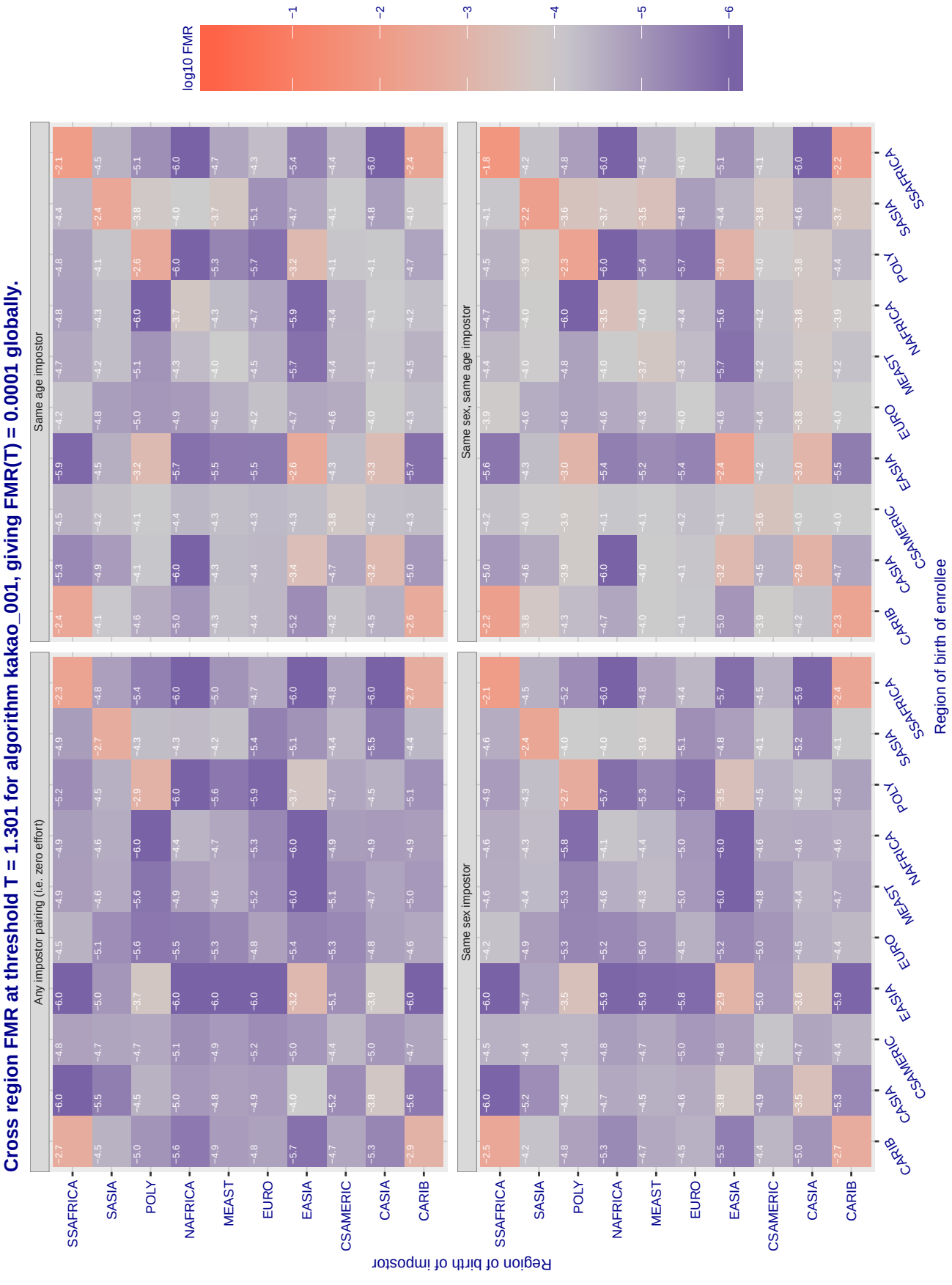


Figure 218: For algorithm kakao-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

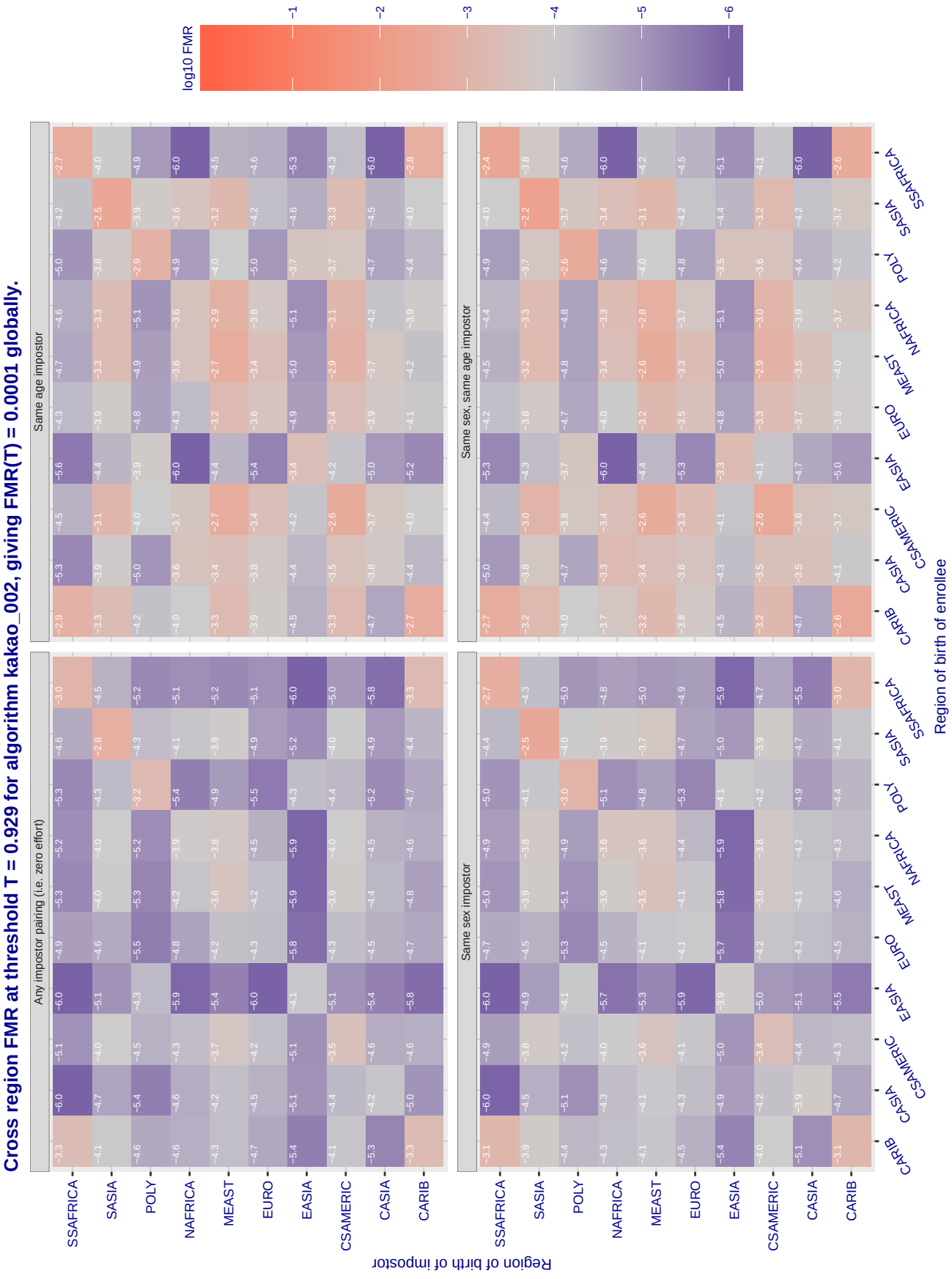
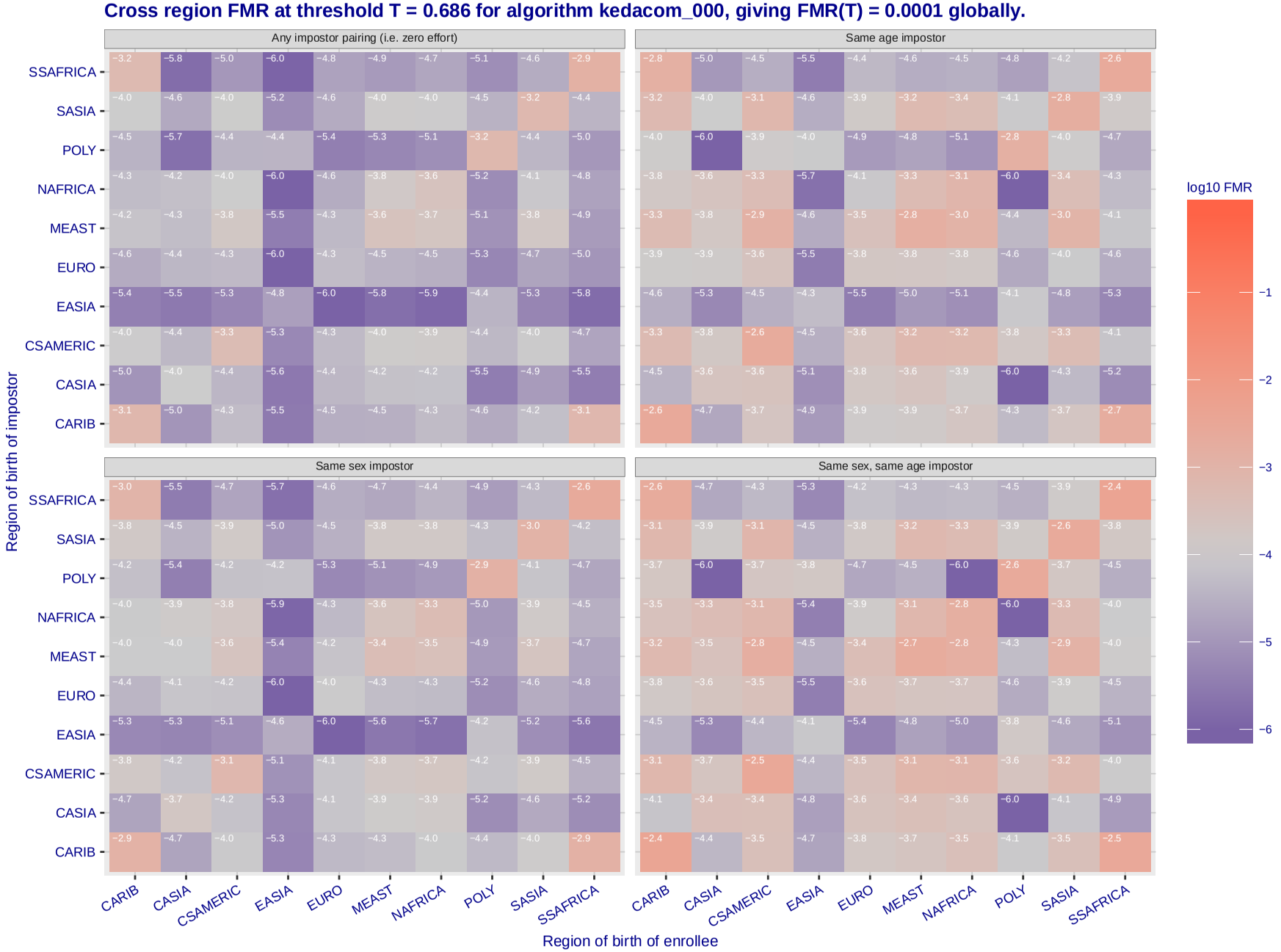


Figure 219: For algorithm kakao-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"



FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 220: For algorithm kedacom-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

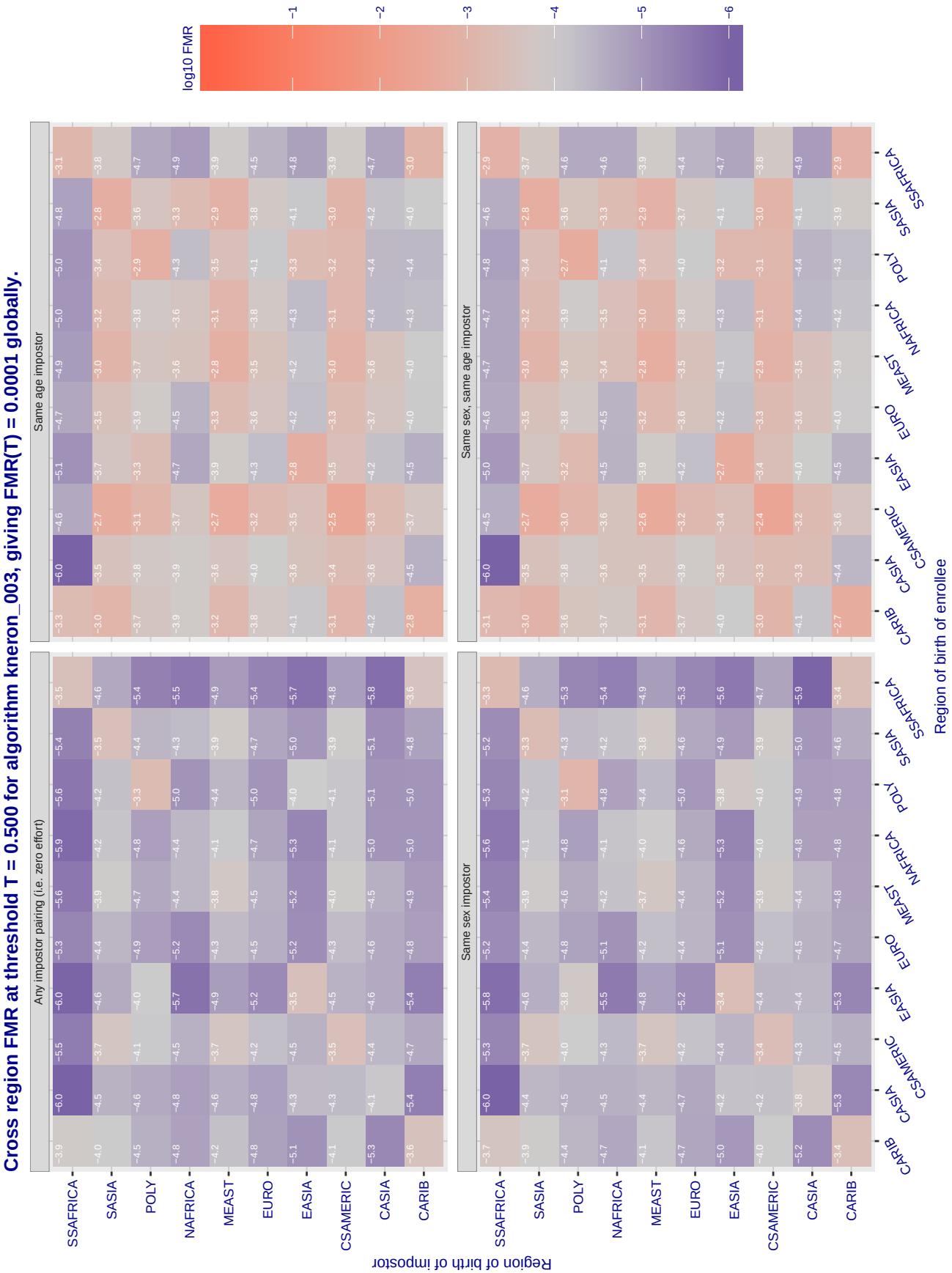


Figure 221: For algorithm kneron-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

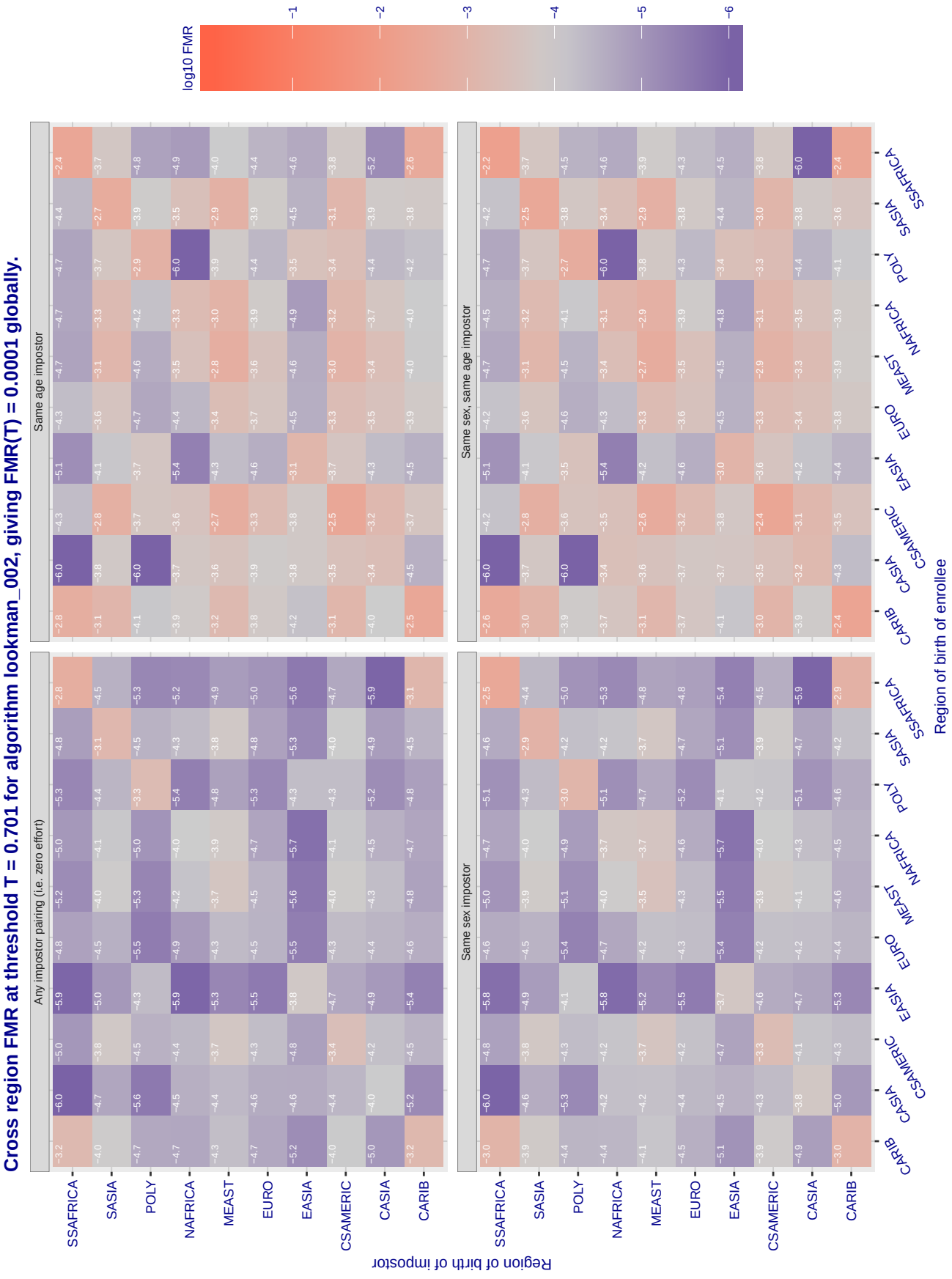


Figure 222: For algorithm lookman-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

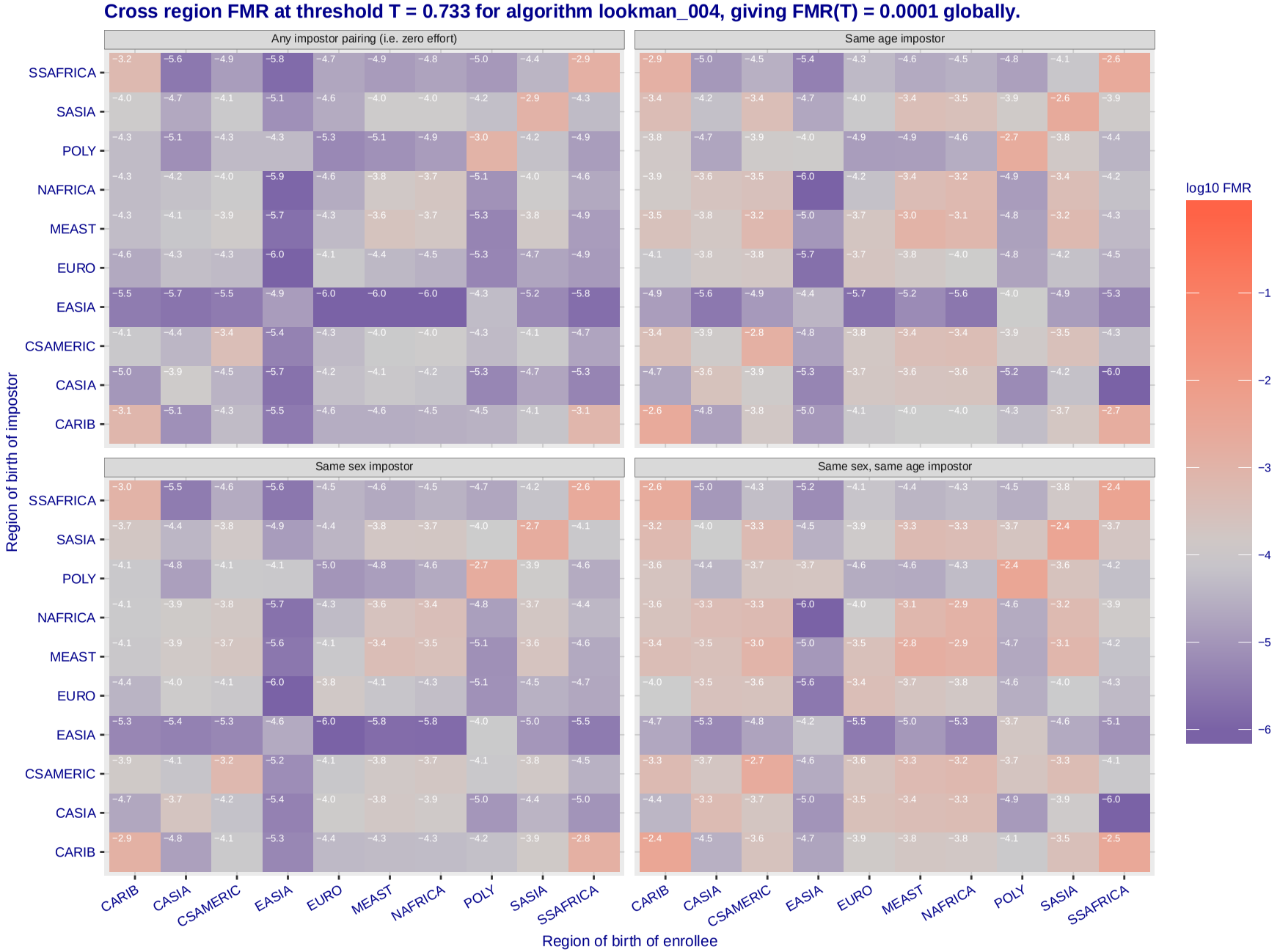


Figure 223: For algorithm lookman-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

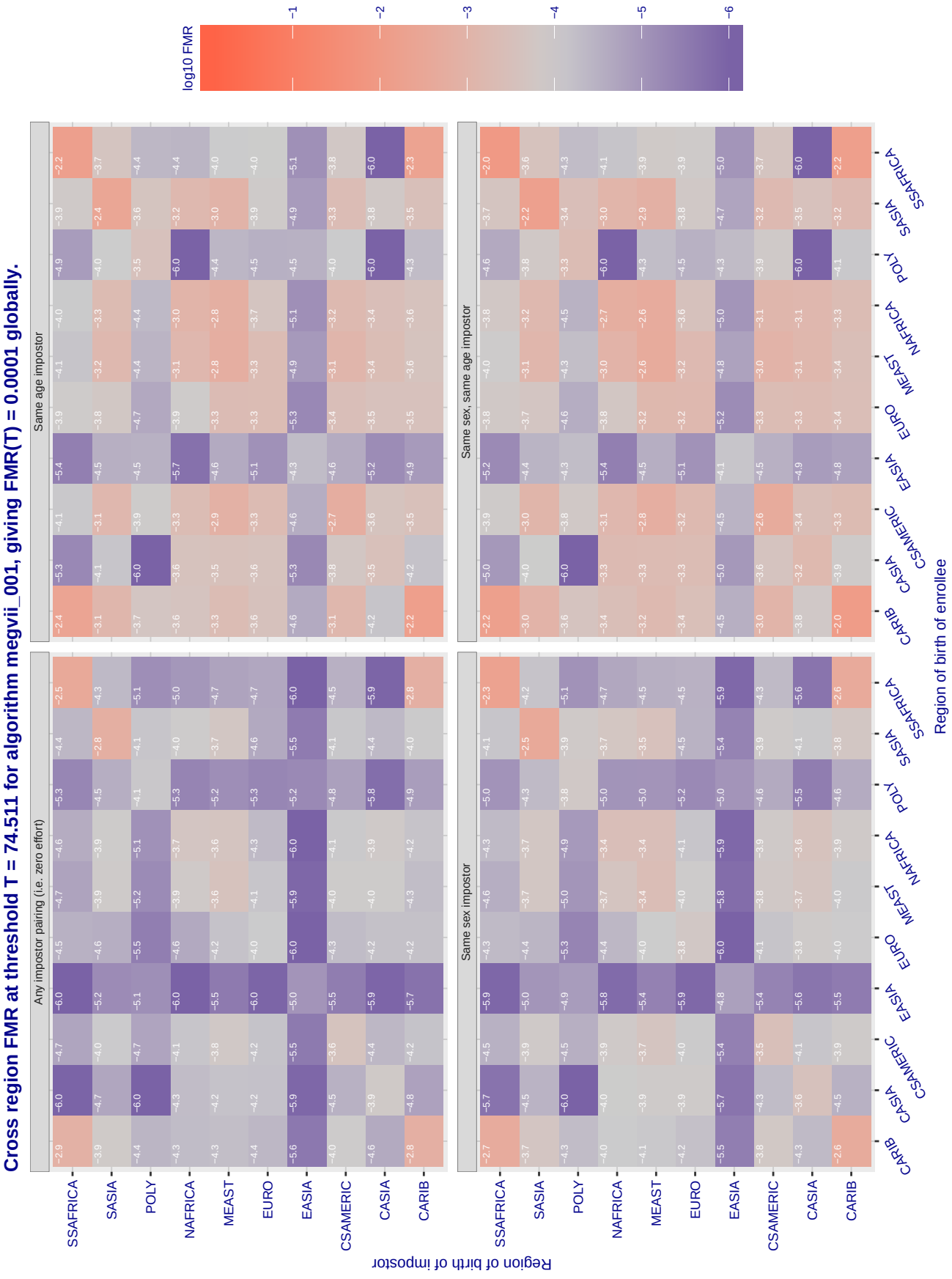


Figure 224: For algorithm megvii-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

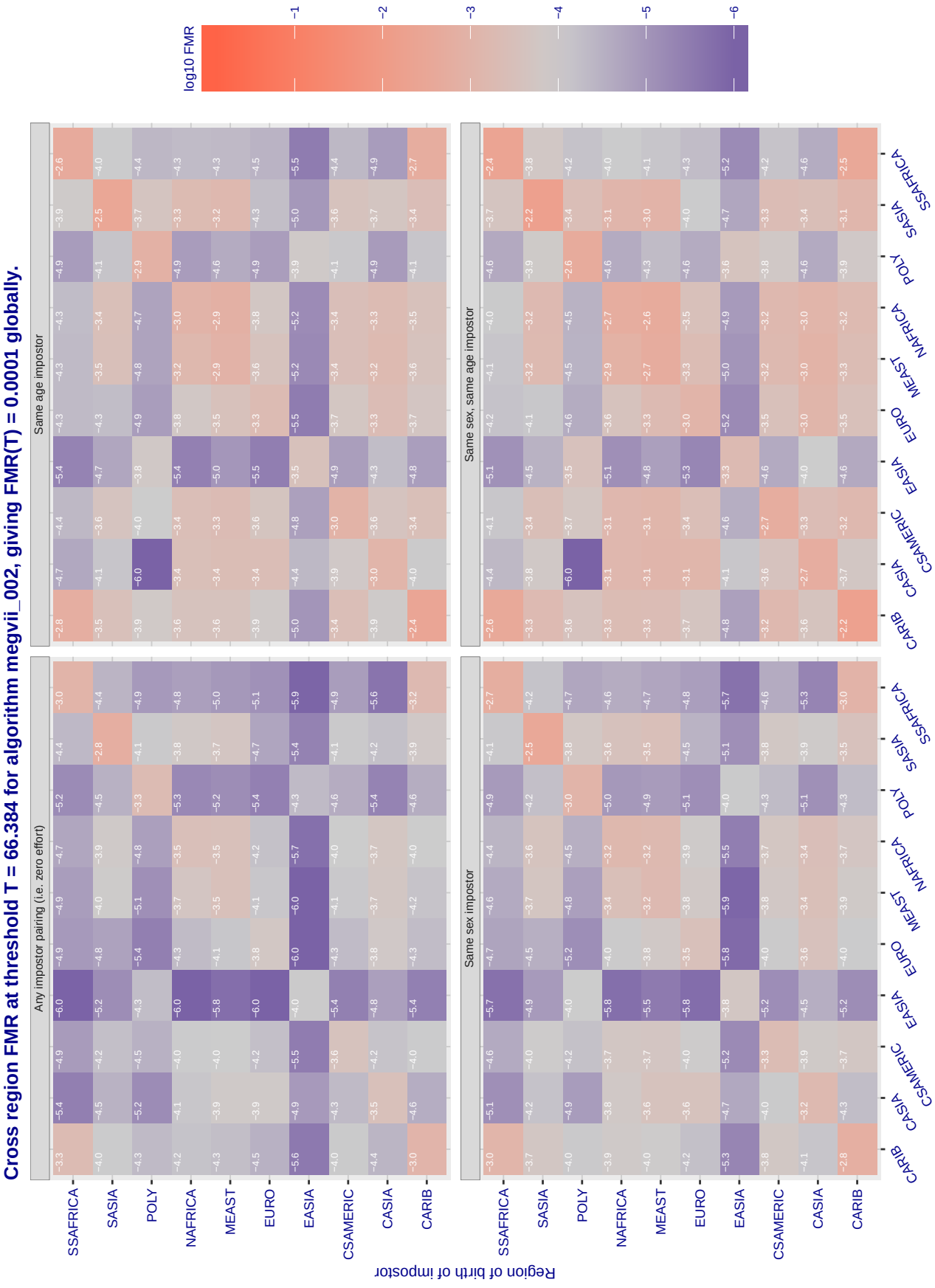


Figure 225: For algorithm megvii-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

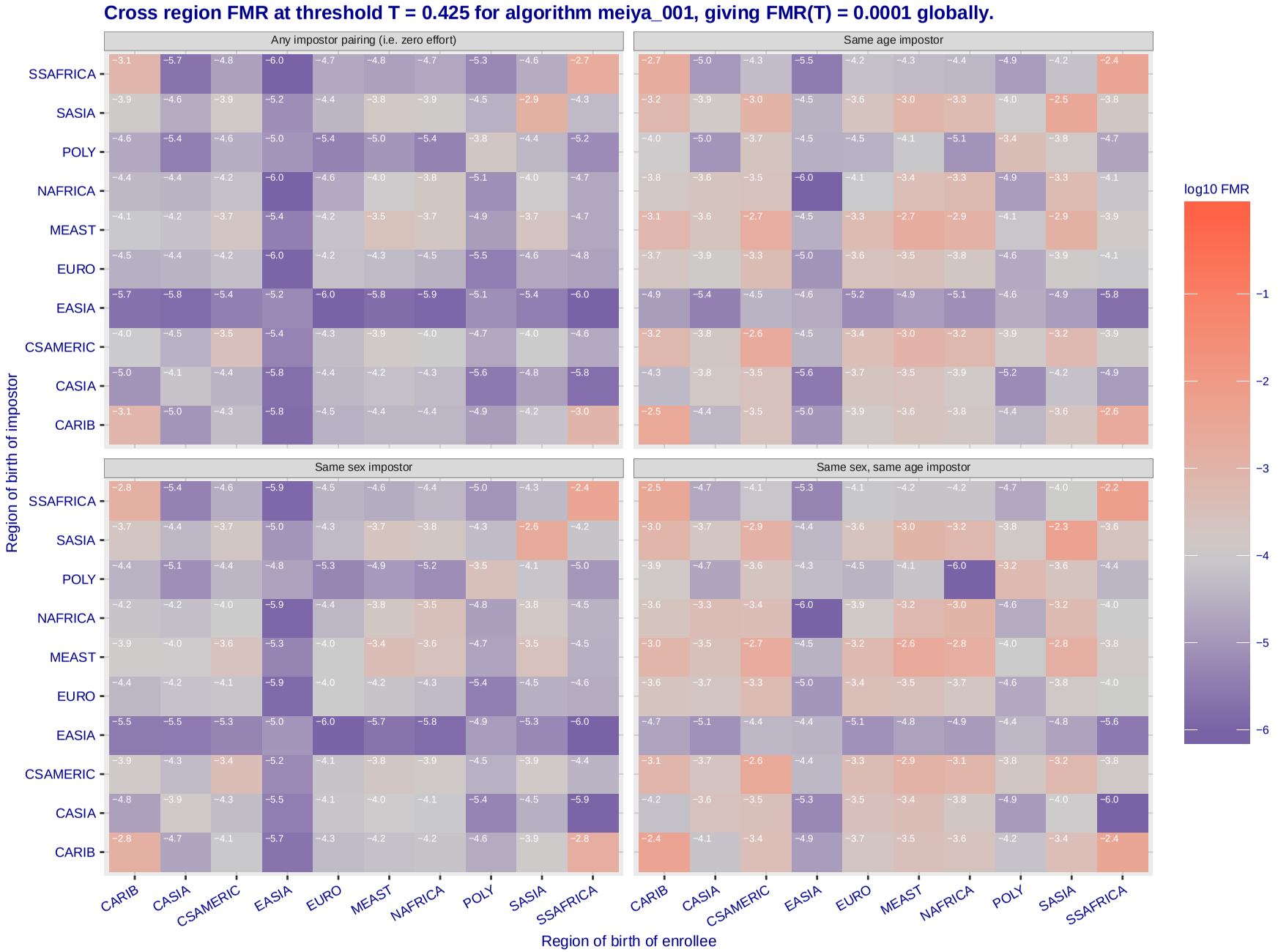


Figure 226: For algorithm meiya-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

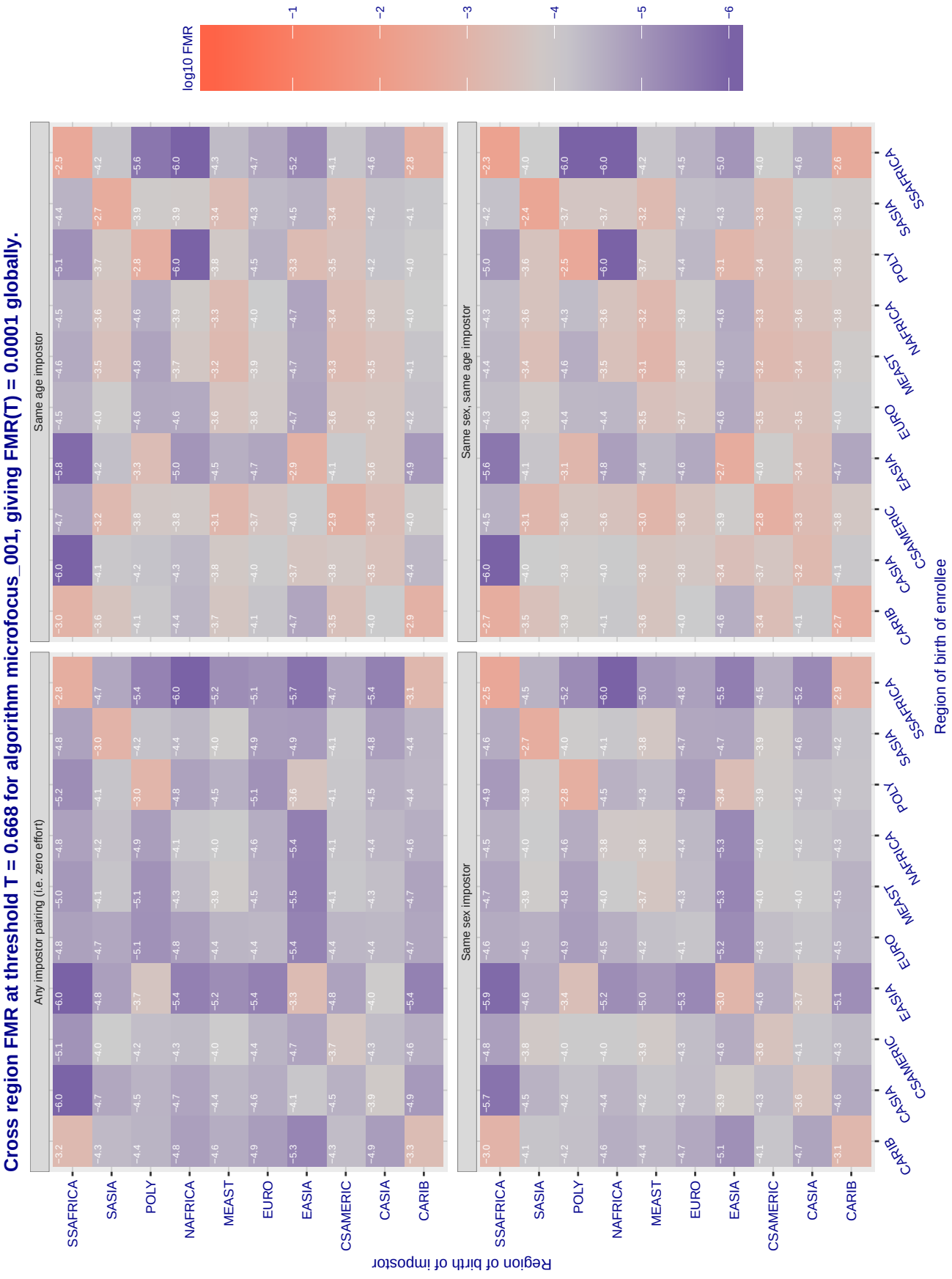


Figure 227: For algorithm microfocus-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

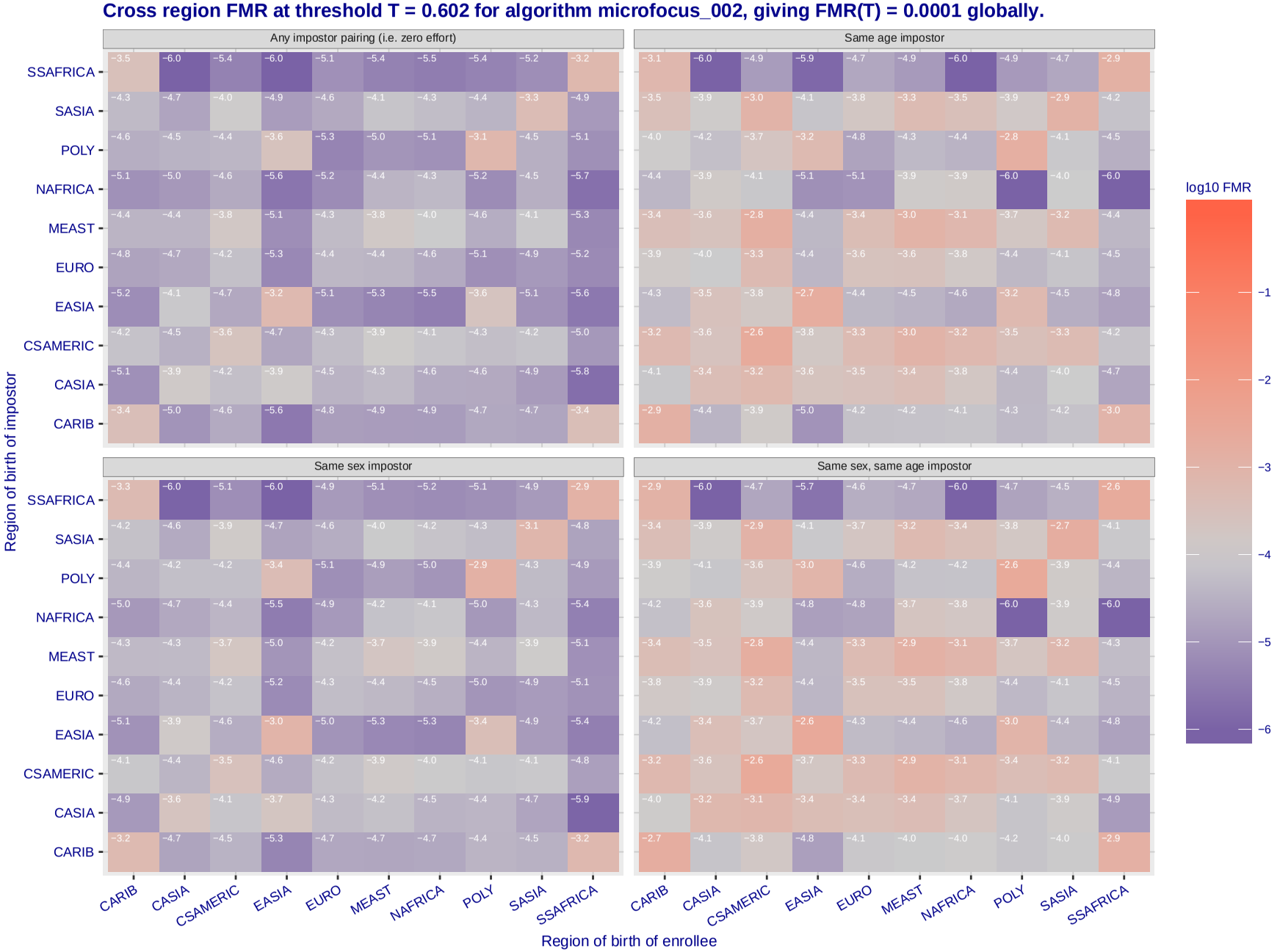


Figure 228: For algorithm microfocus-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

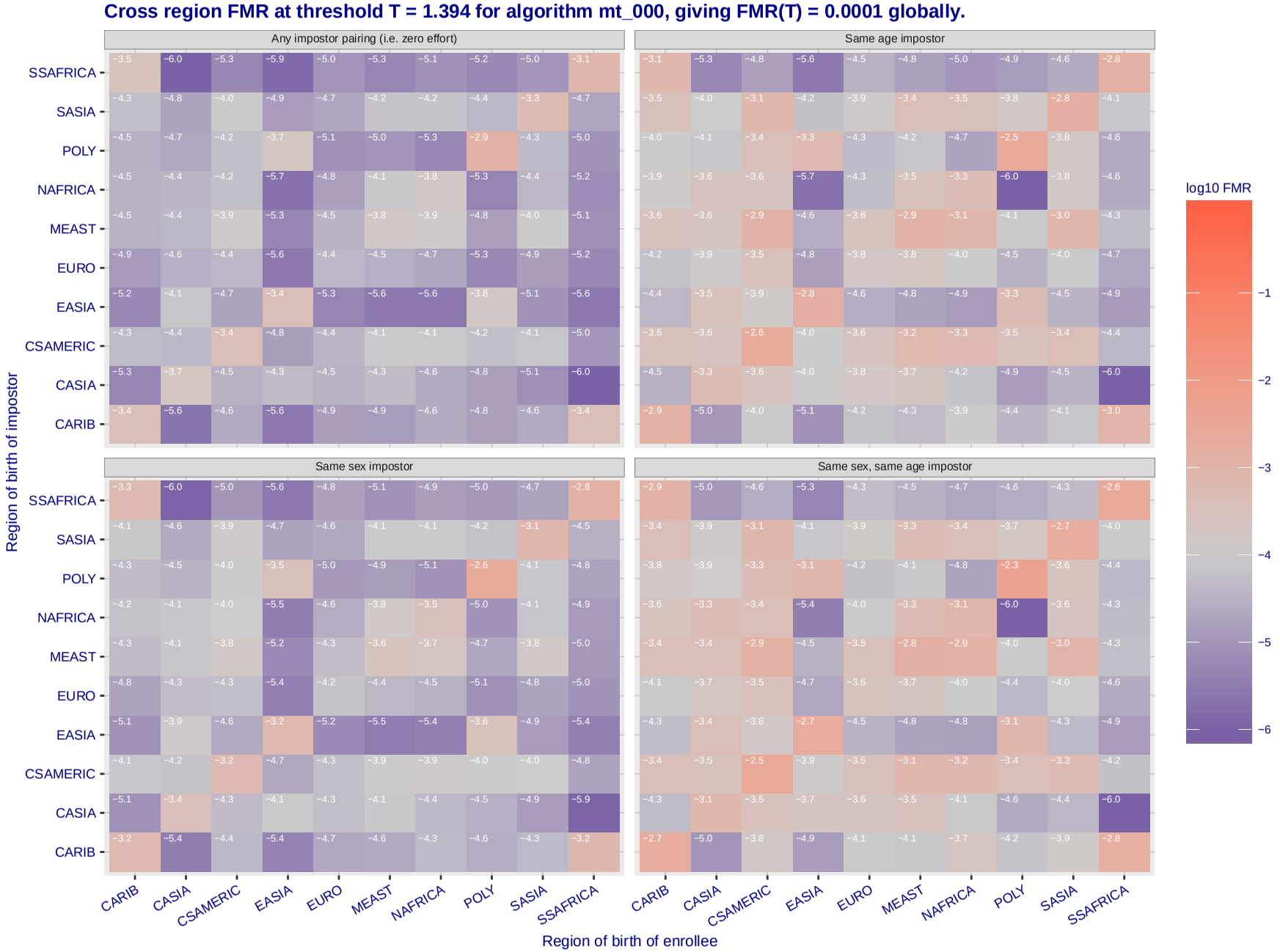


Figure 229: For algorithm mt-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

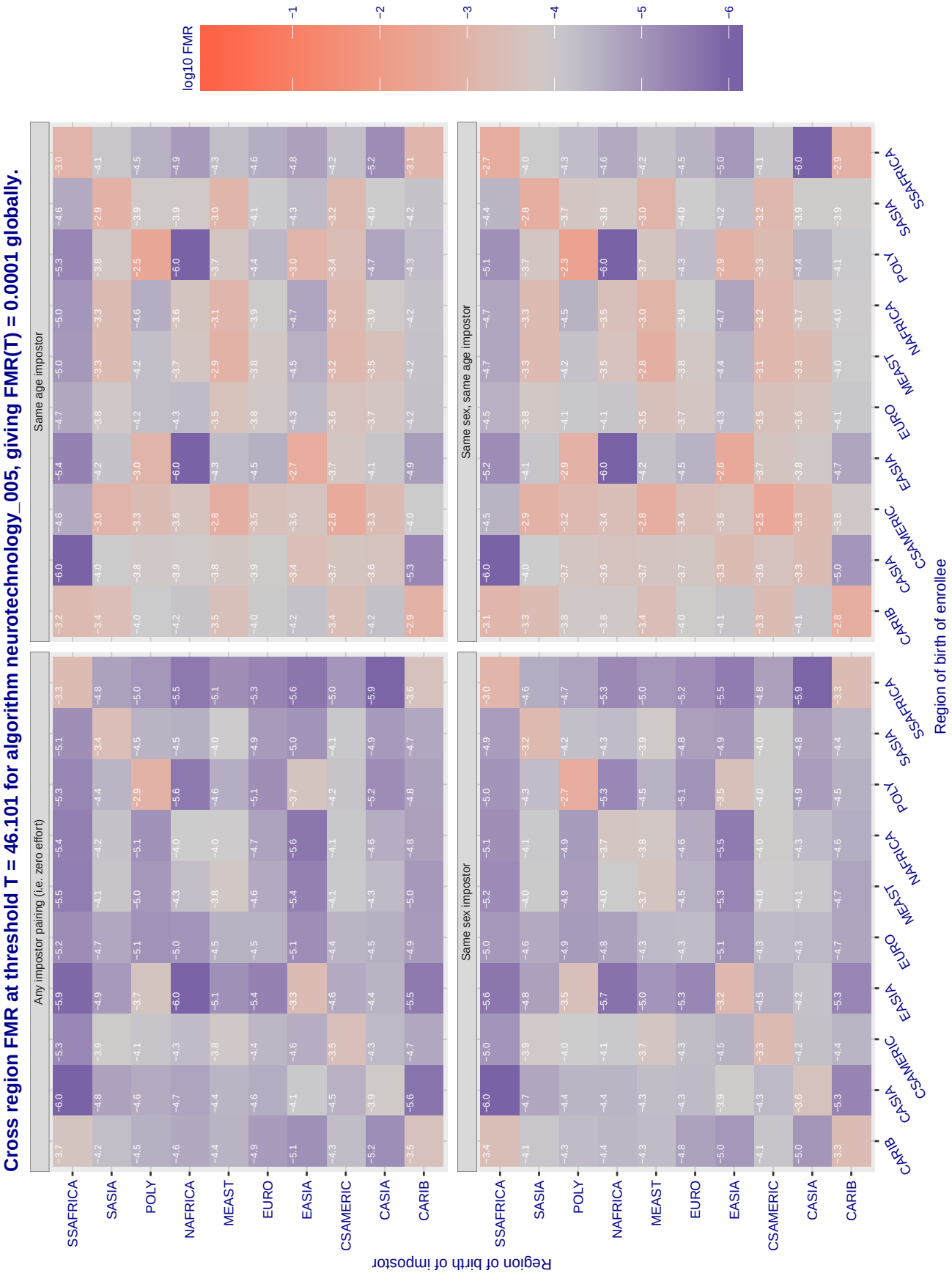


Figure 230: For algorithm neurotechnology-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

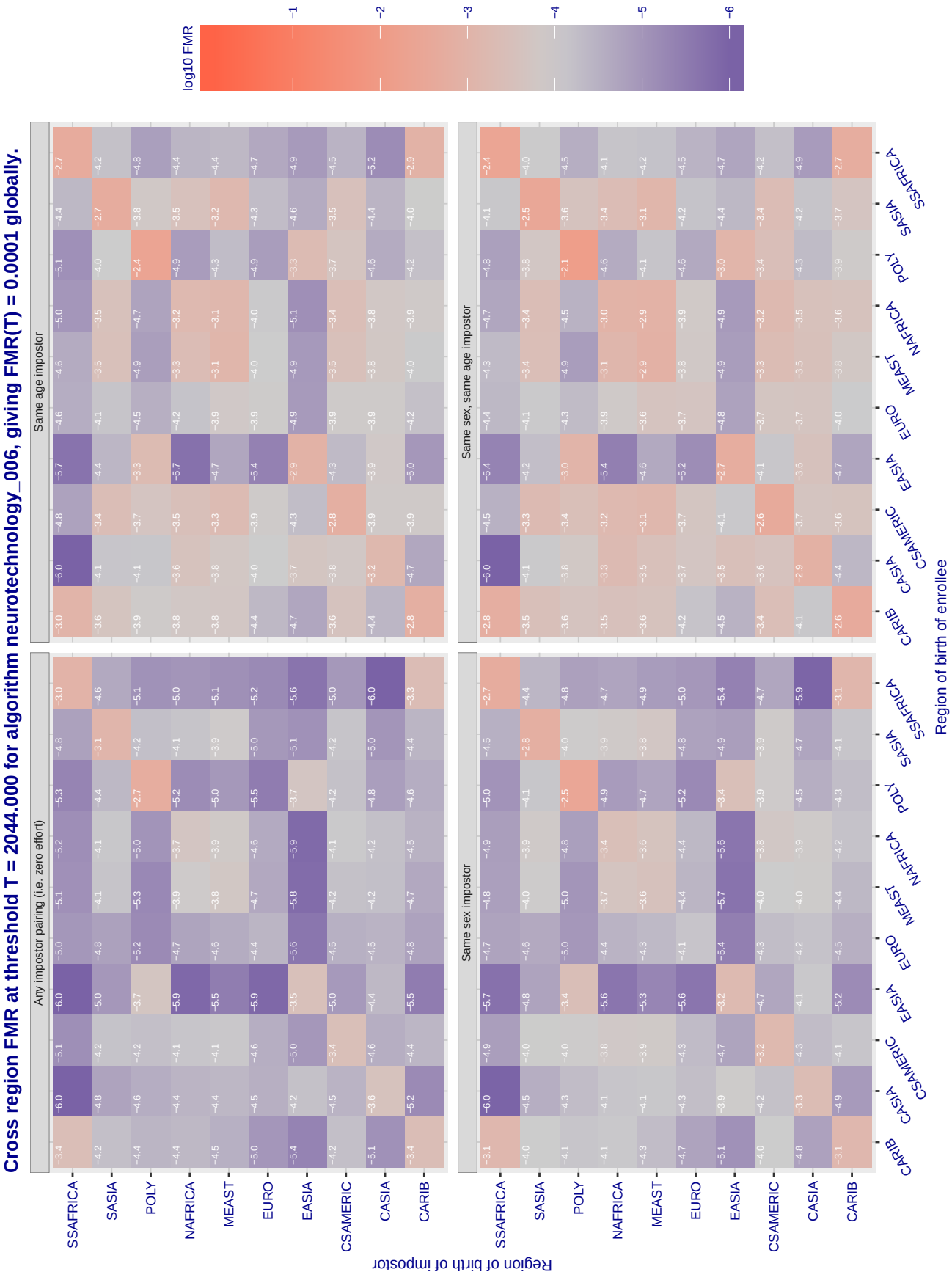


Figure 231: For algorithm neurotechnology-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

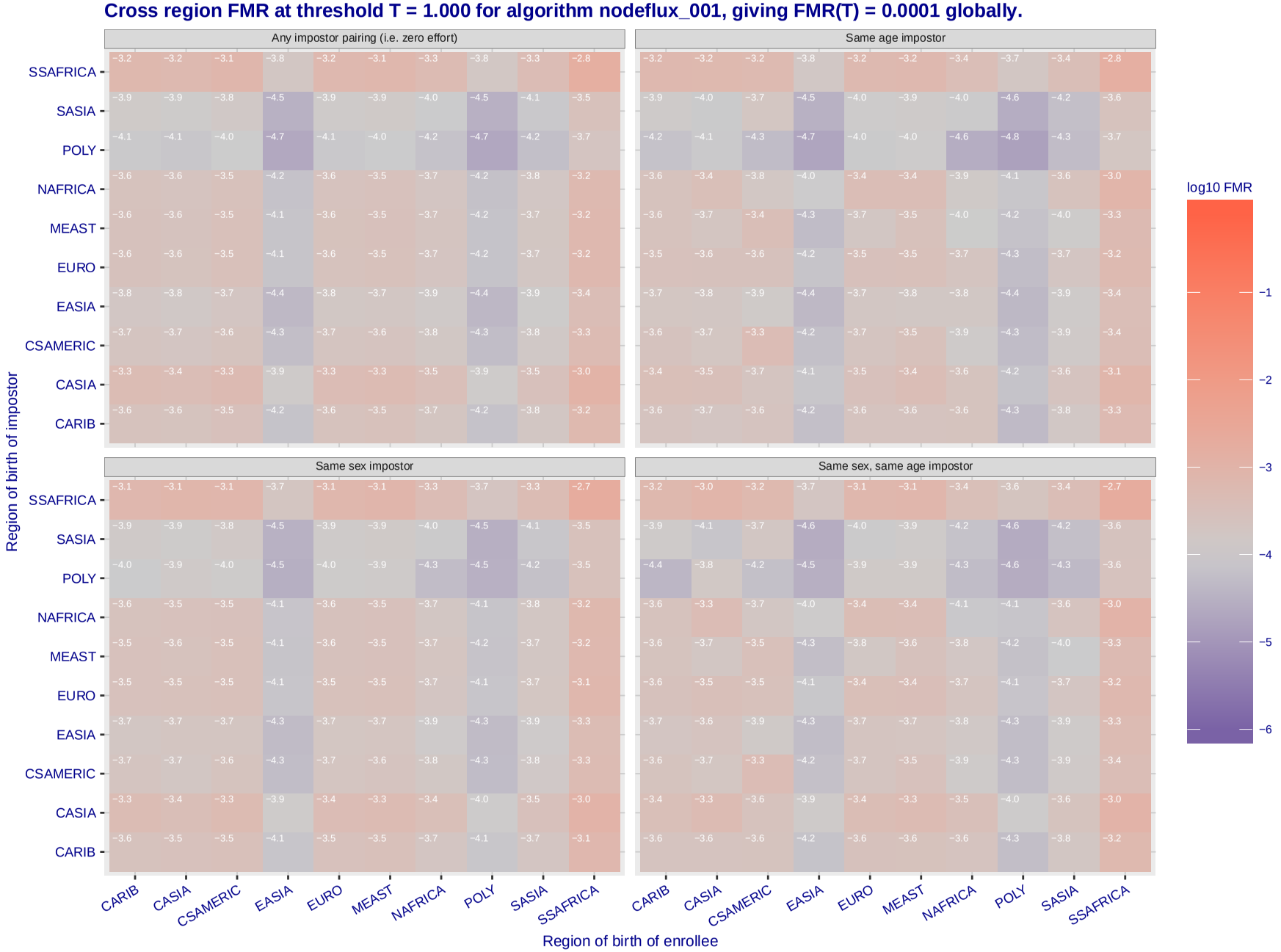


Figure 232: For algorithm nodeflux-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

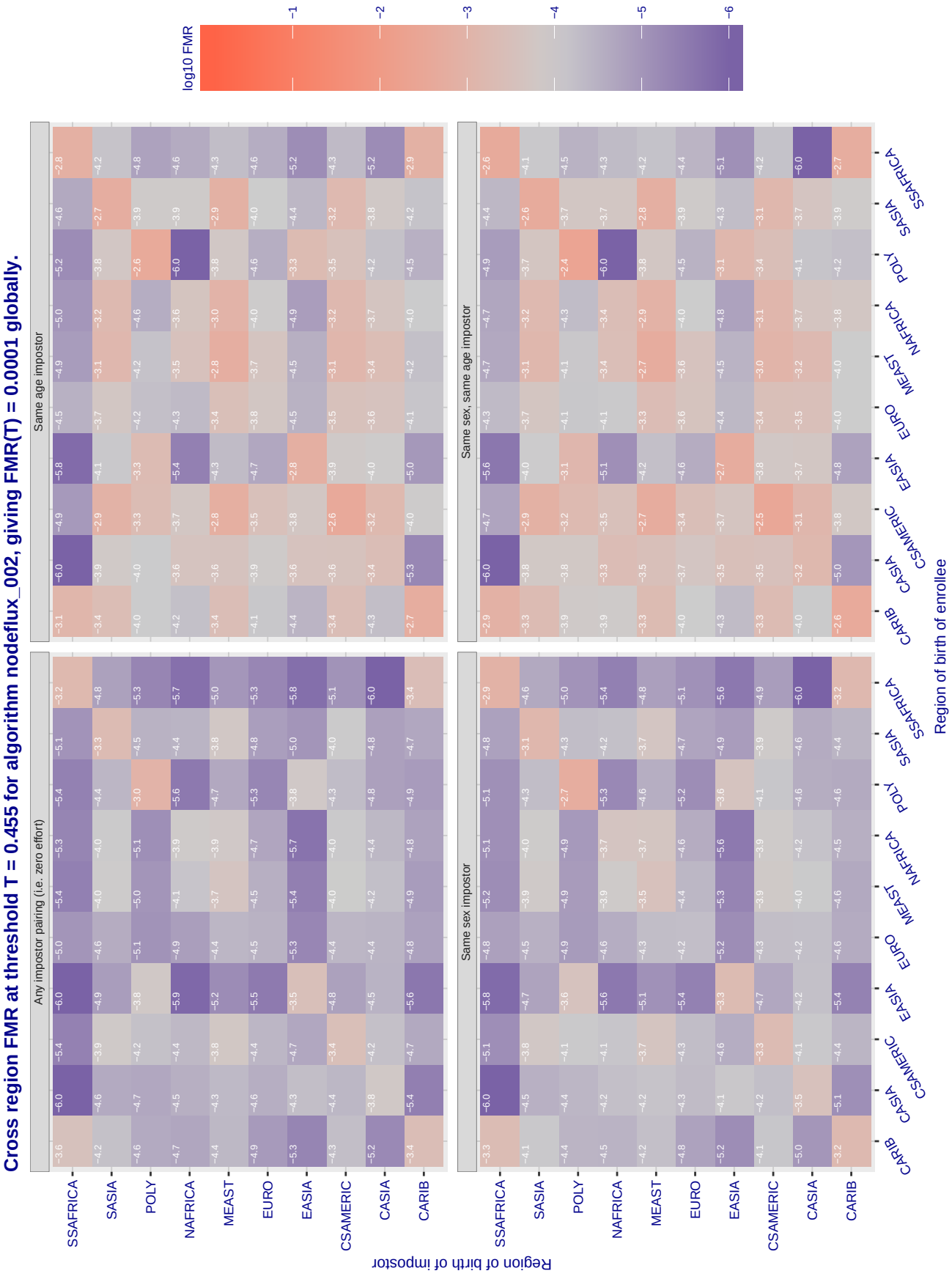


Figure 233: For algorithm nodeflux-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

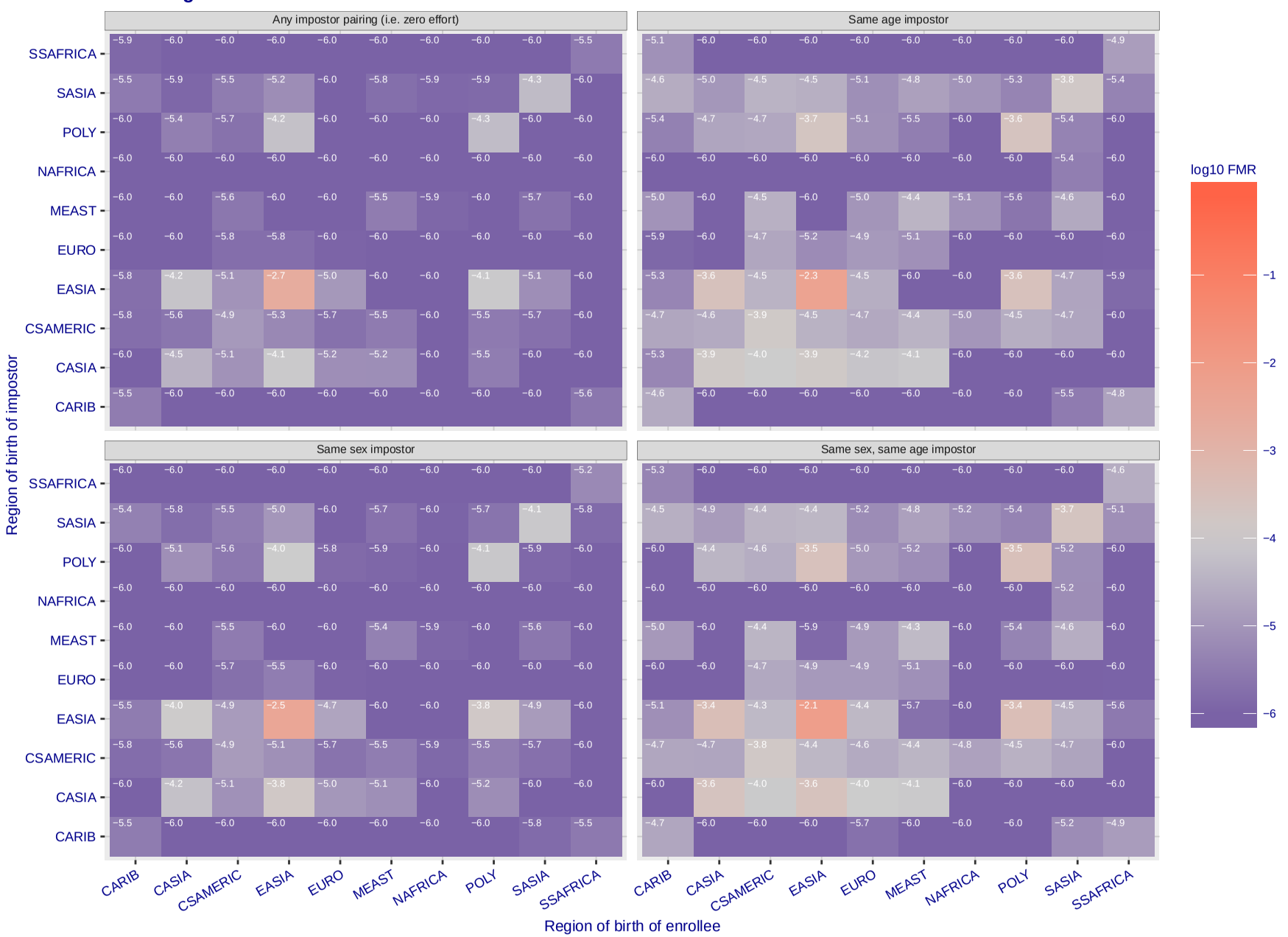


Figure 234: For algorithm notiontag-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

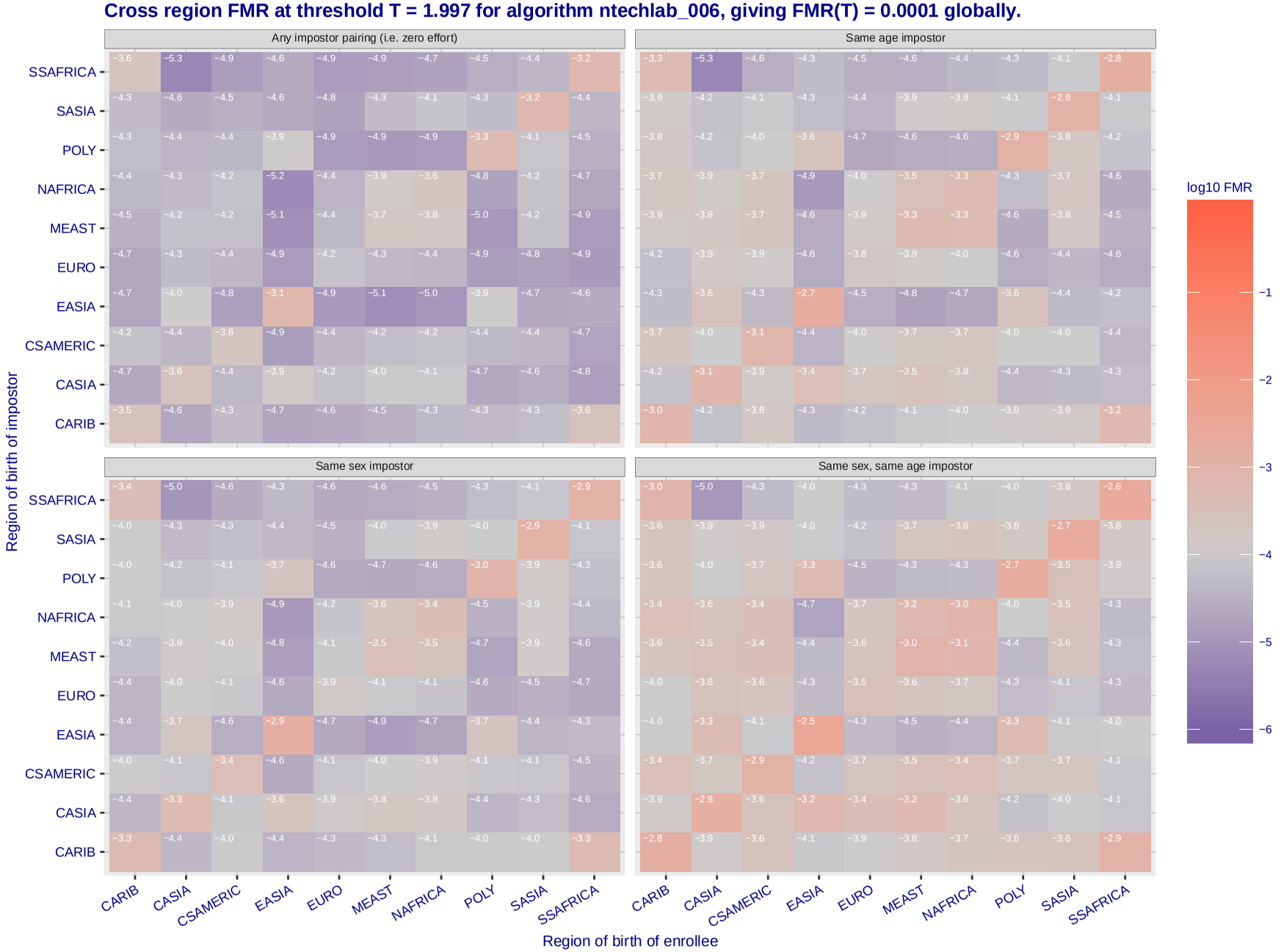


Figure 235: For algorithm ntechlab-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

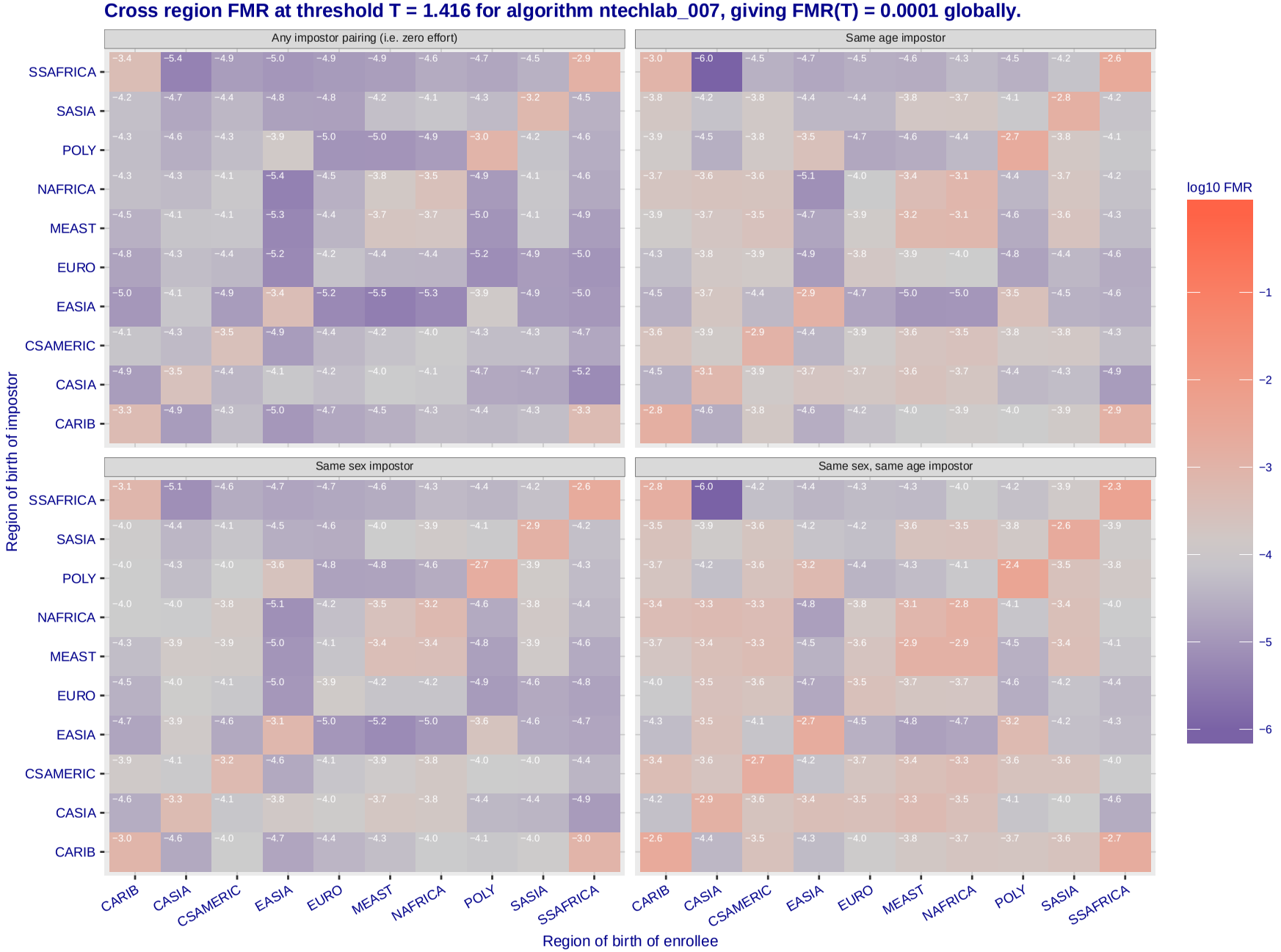


Figure 236: For algorithm ntechlab-007 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

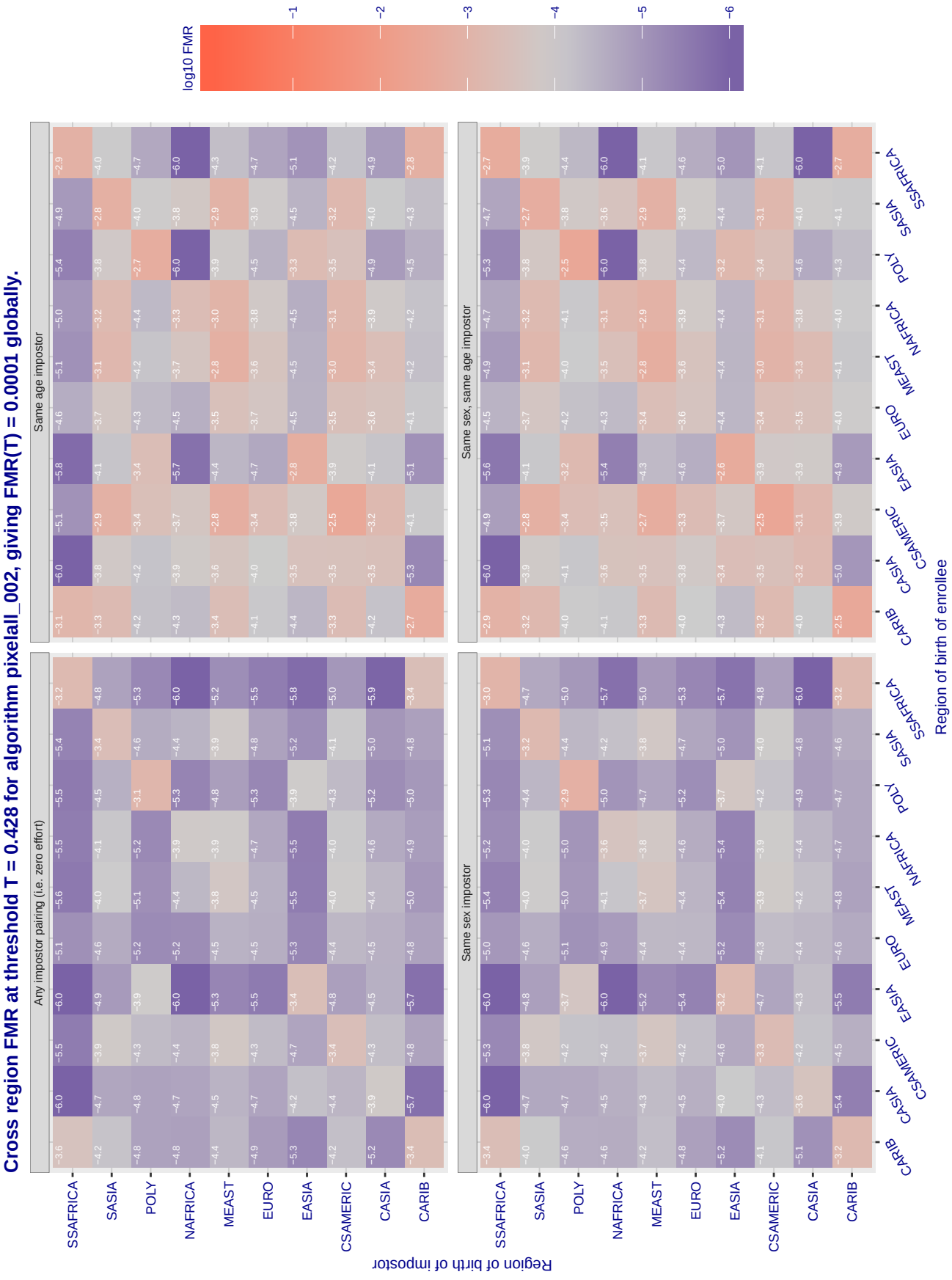


Figure 237: For algorithm pixelall-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

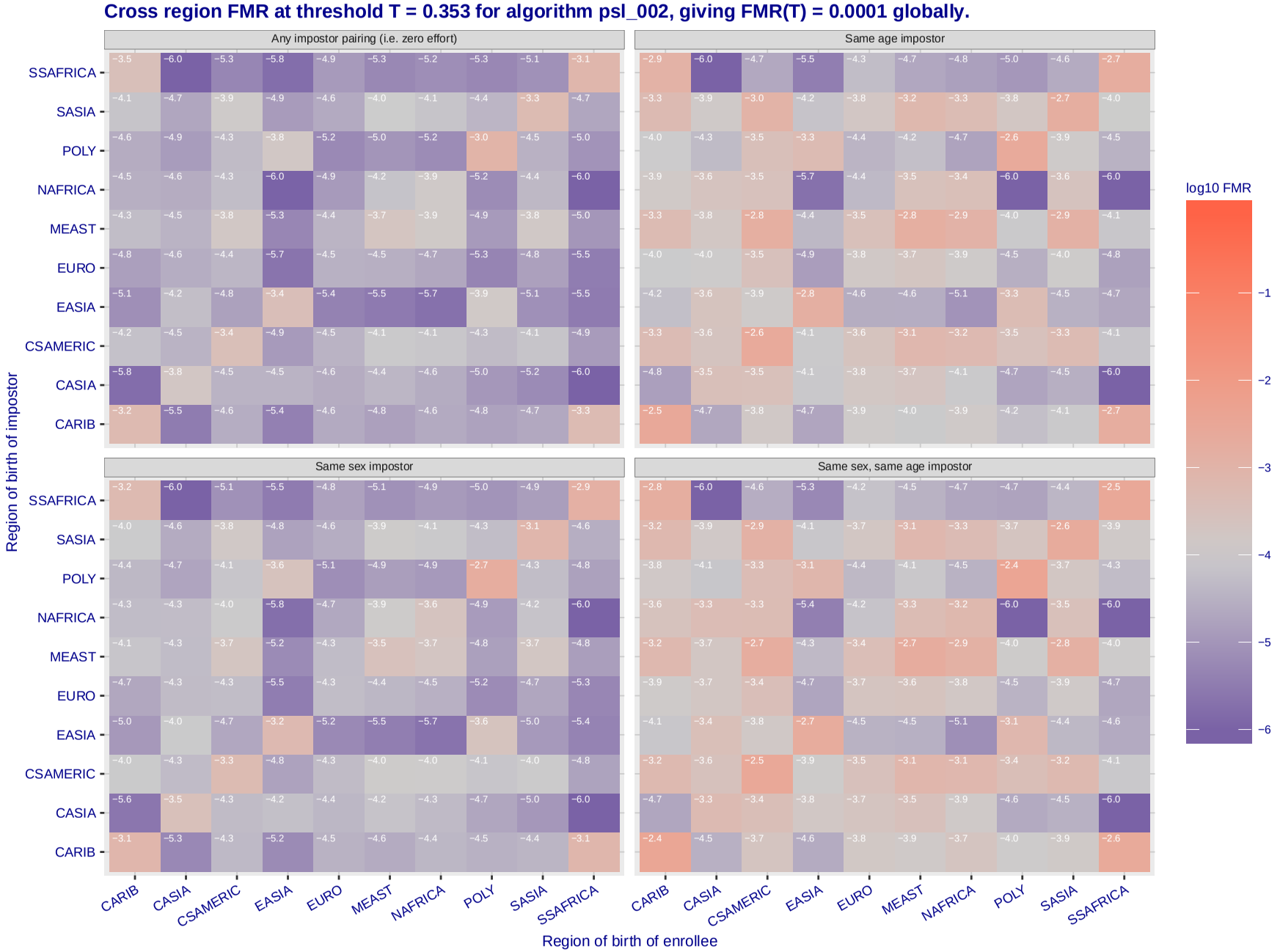


Figure 238: For algorithm psl-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

Figure 239: For algorithm psl-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

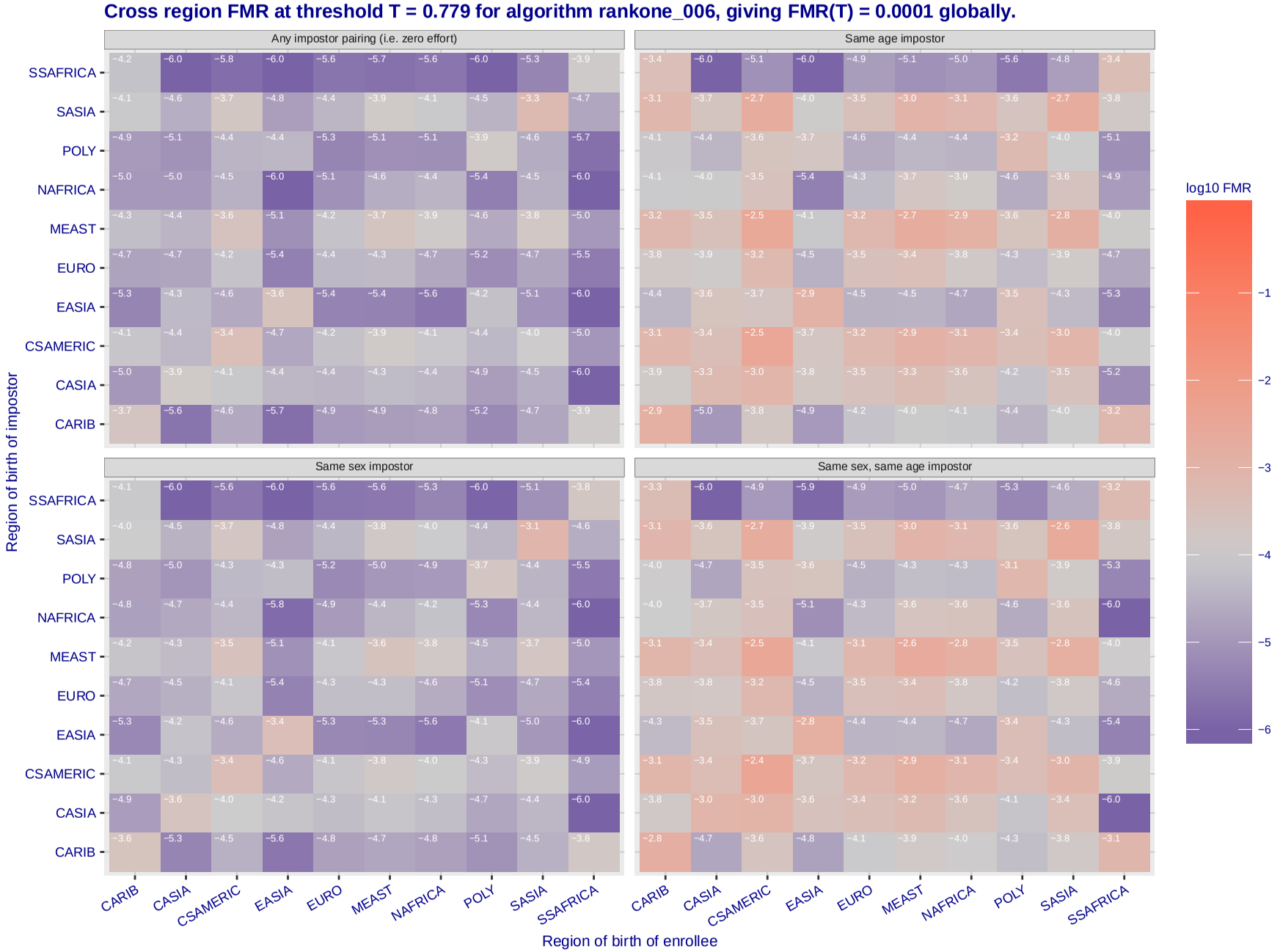


Figure 240: For algorithm rankone-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

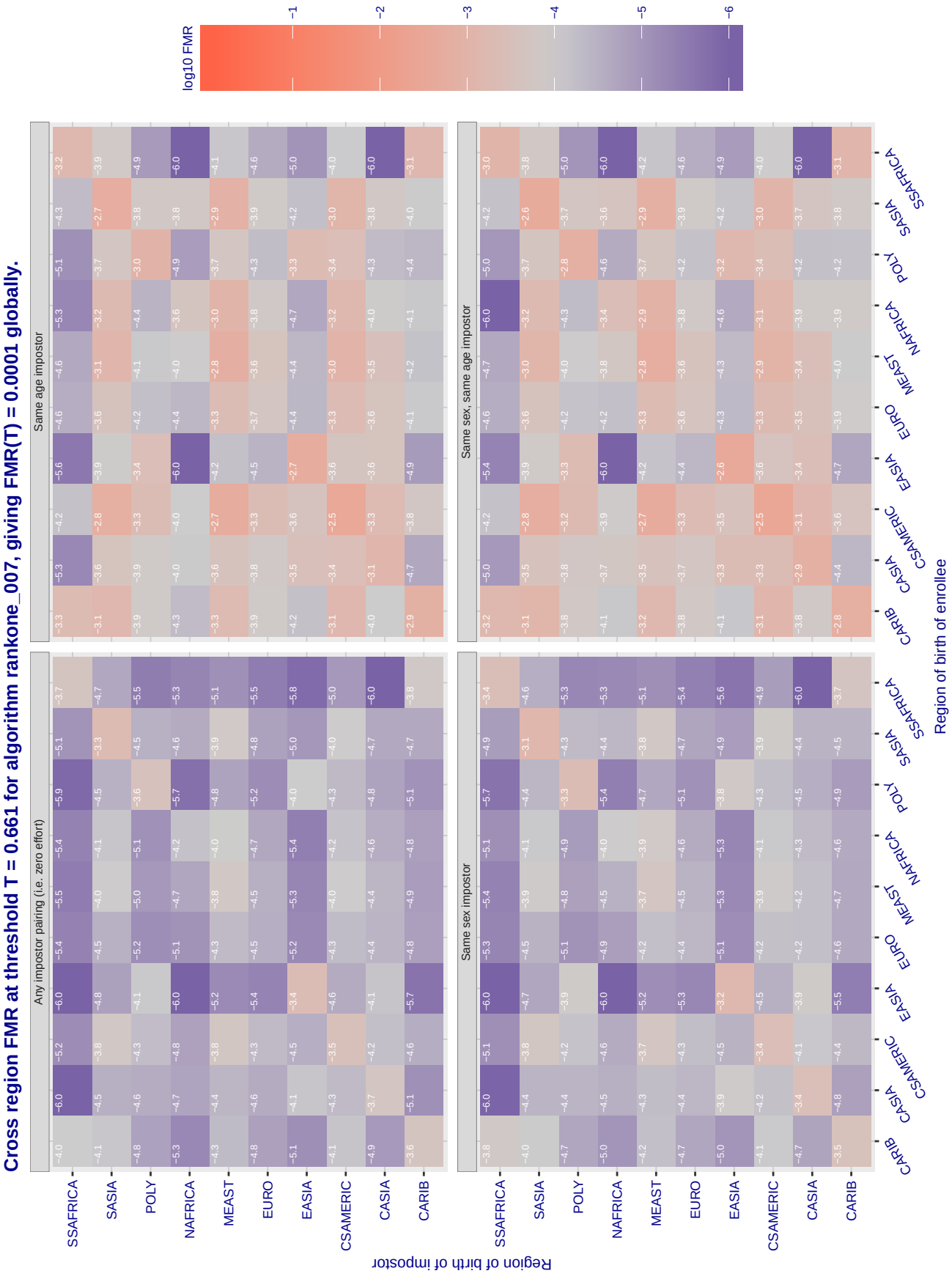


Figure 241: For algorithm rankone-007 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

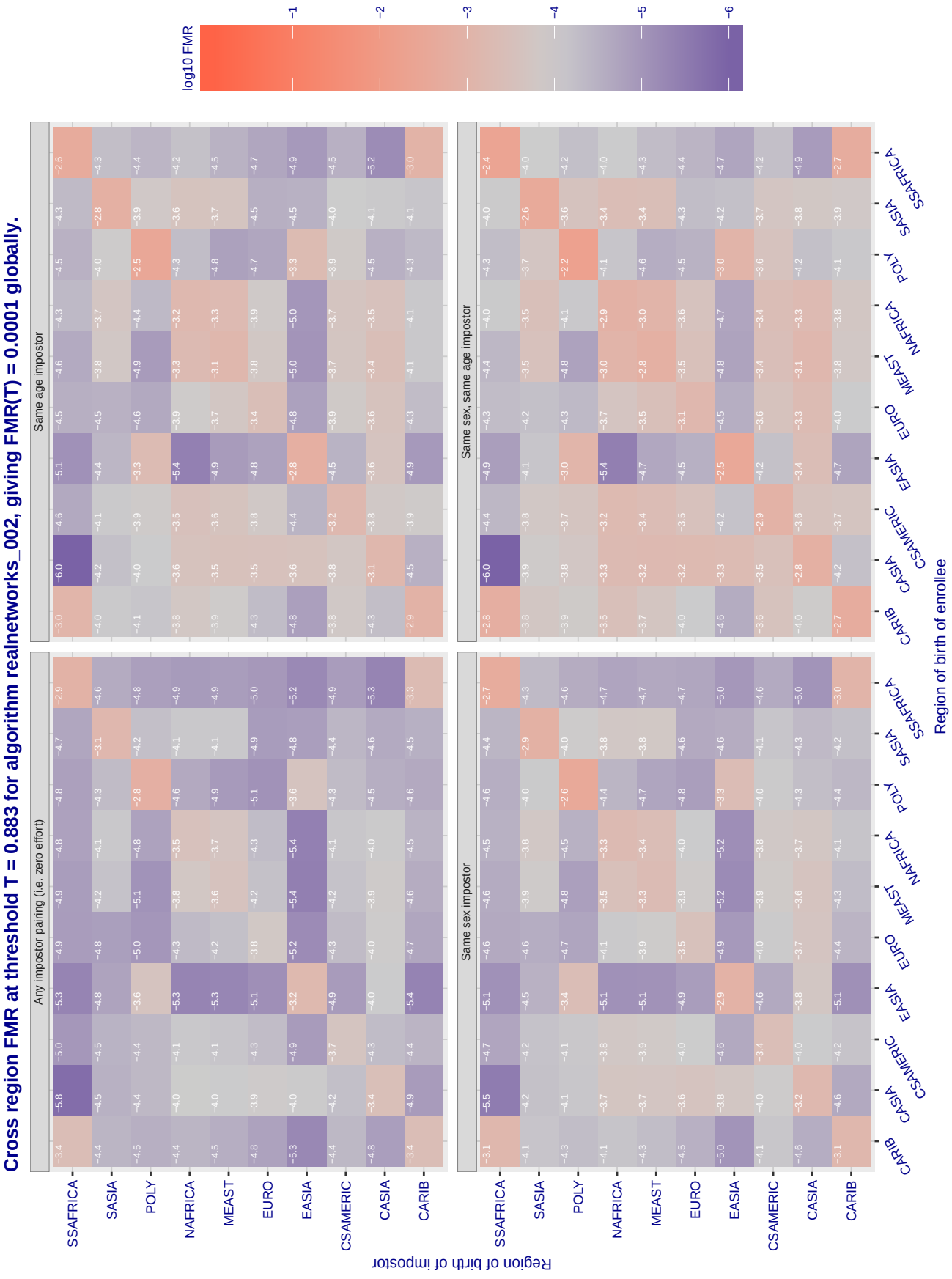


Figure 242: For algorithm realnetworks-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

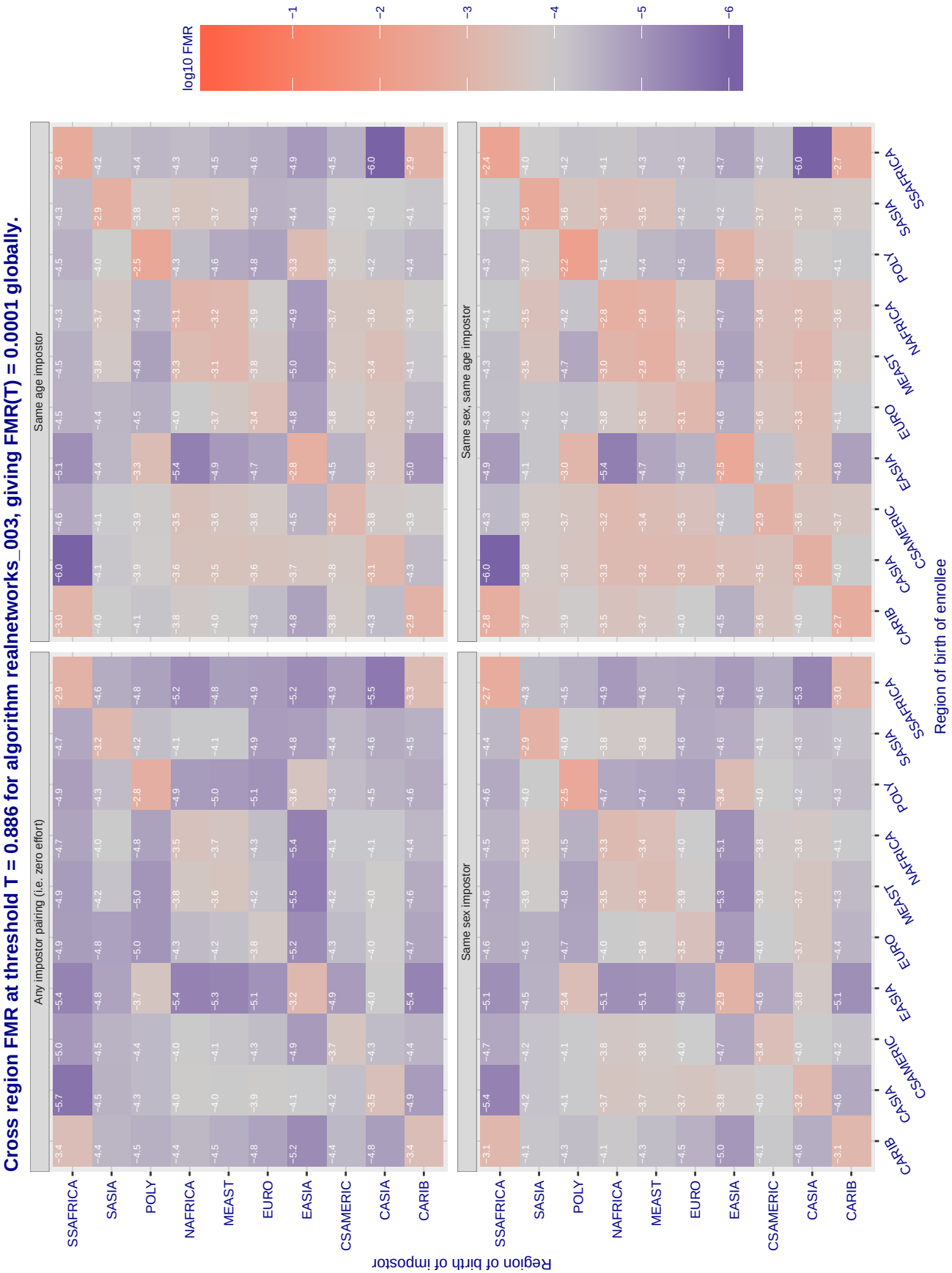


Figure 243: For algorithm realnetworks-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

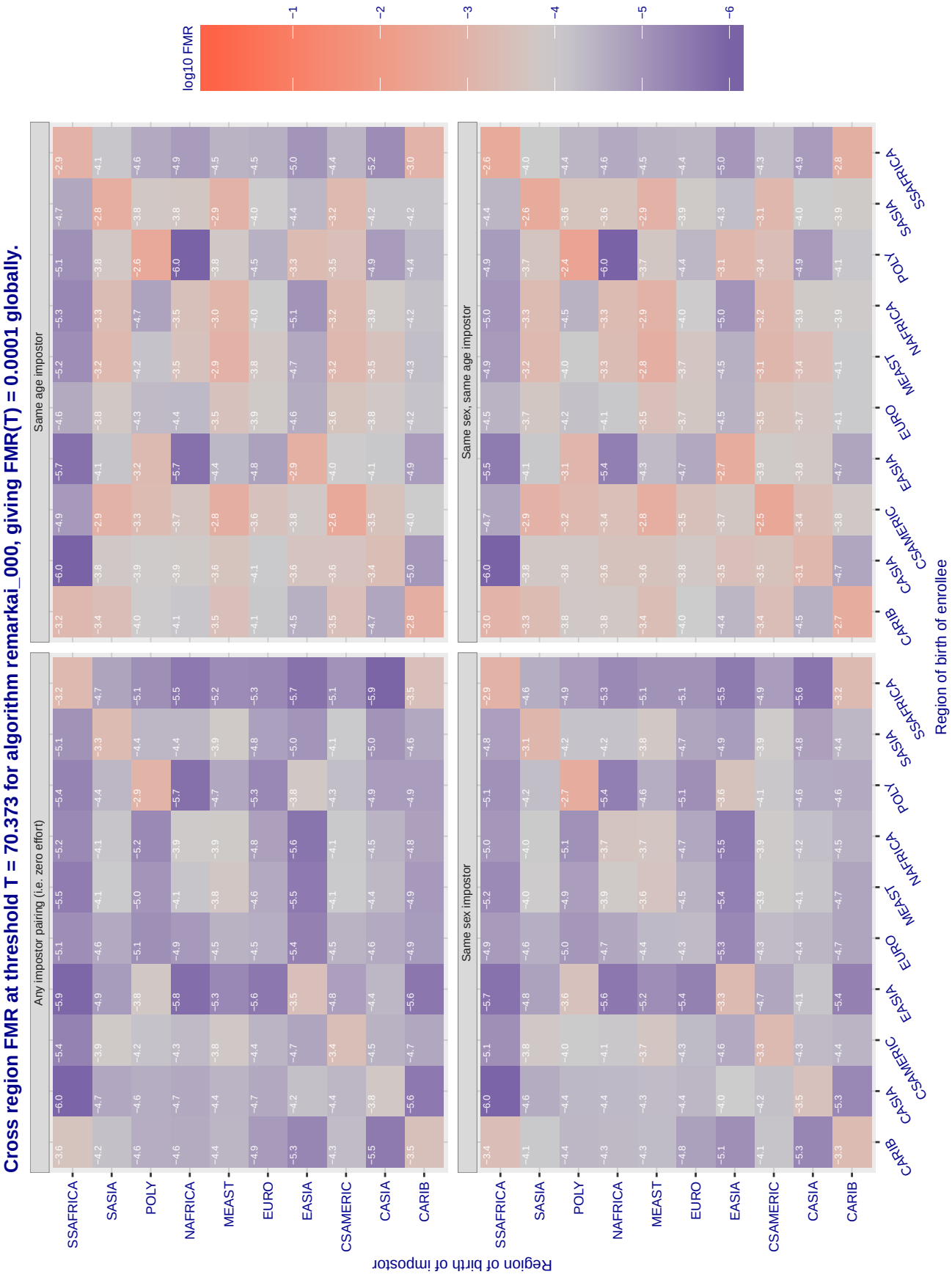


Figure 244: For algorithm remarkai-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

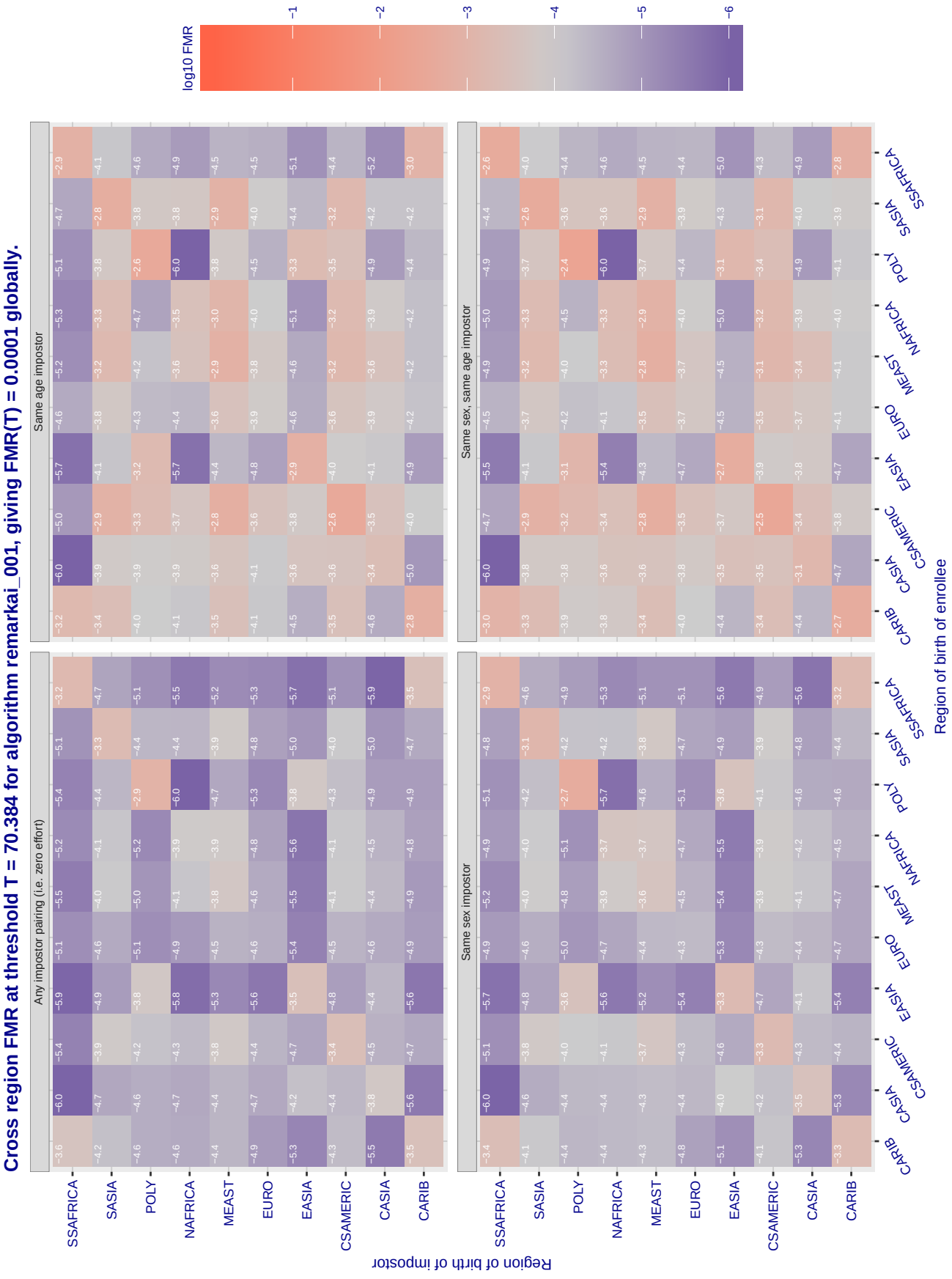


Figure 245: For algorithm remarkai-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

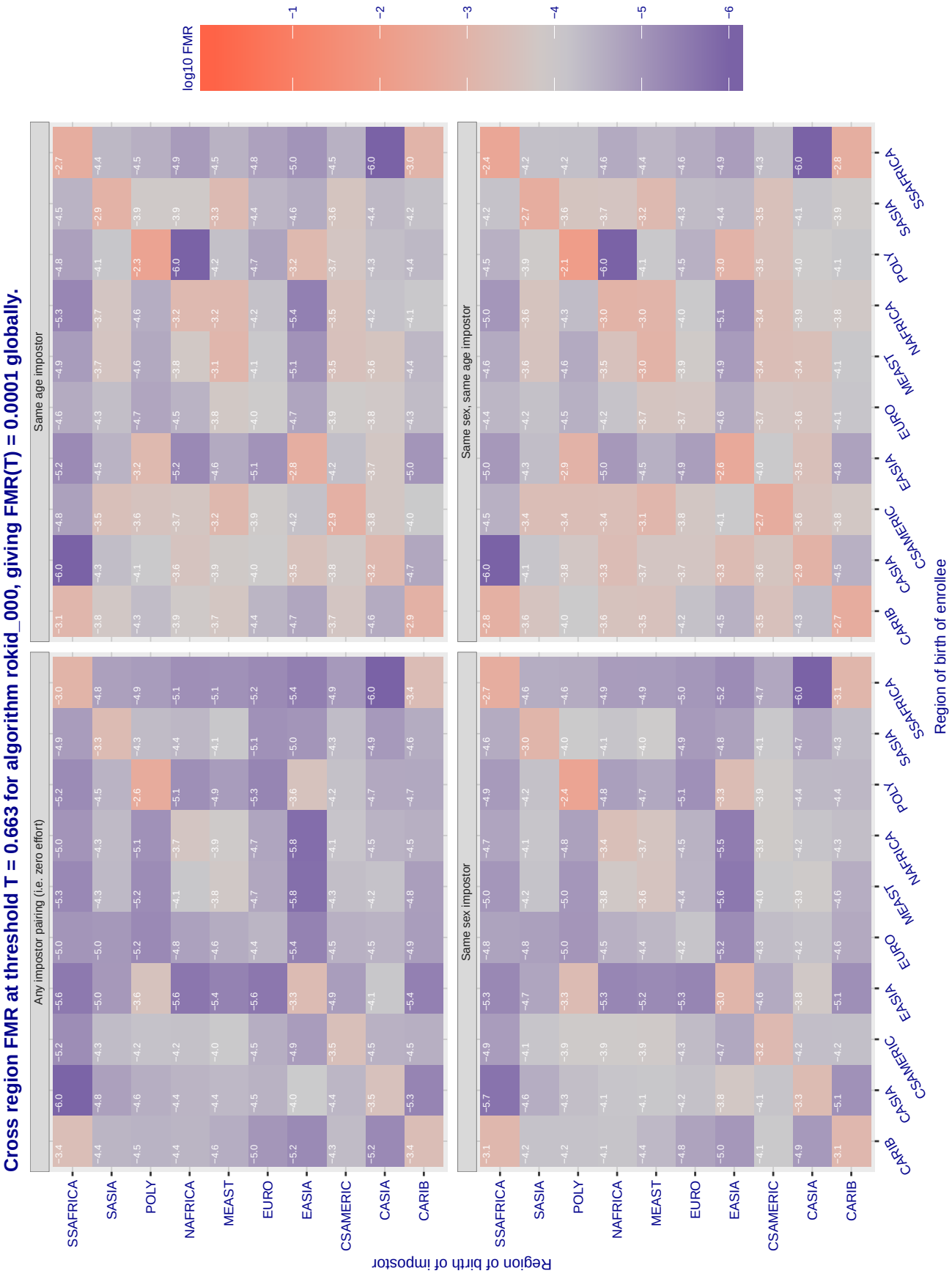


Figure 246: For algorithm rokid-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

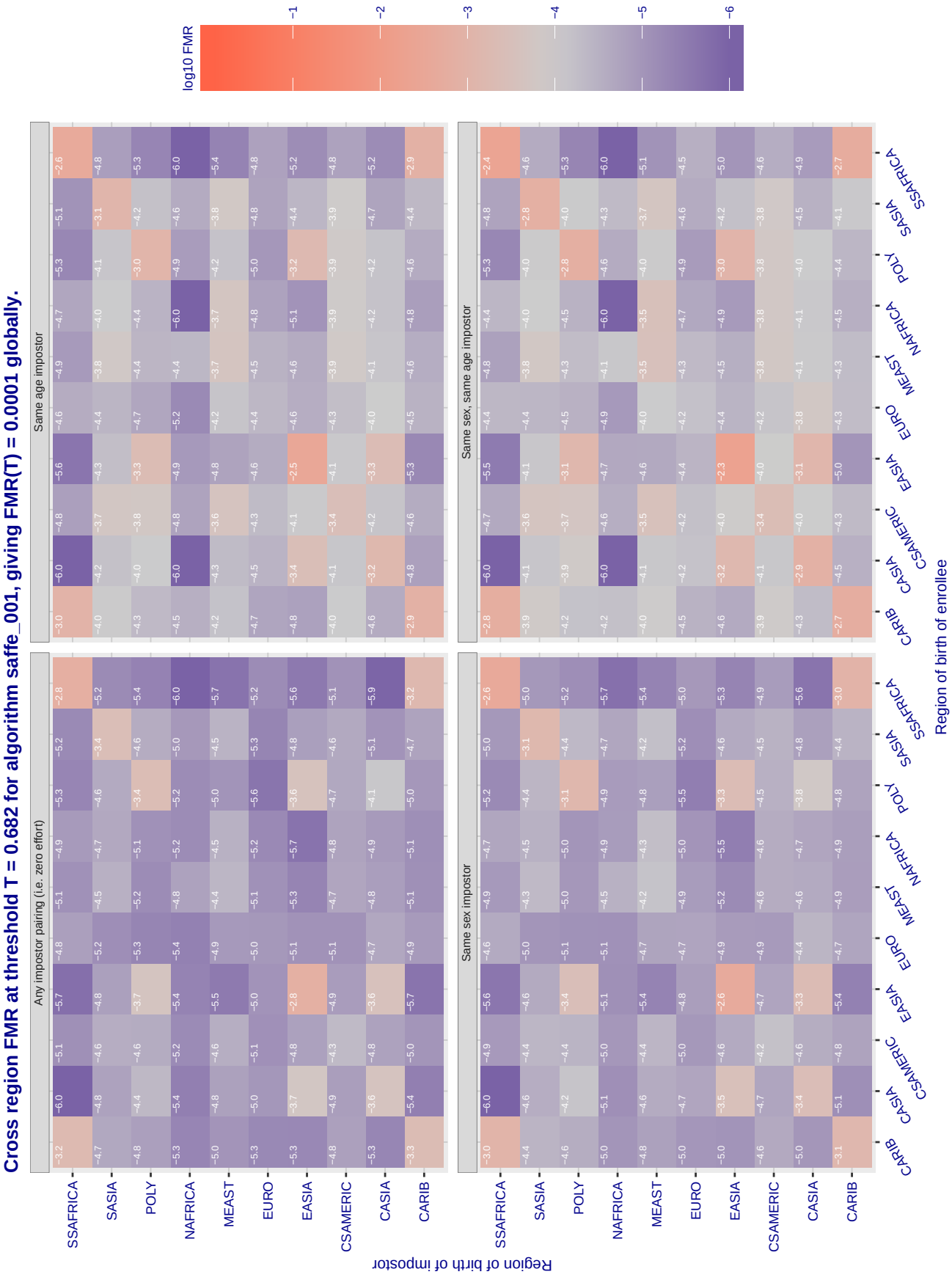


Figure 247: For algorithm saffe-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

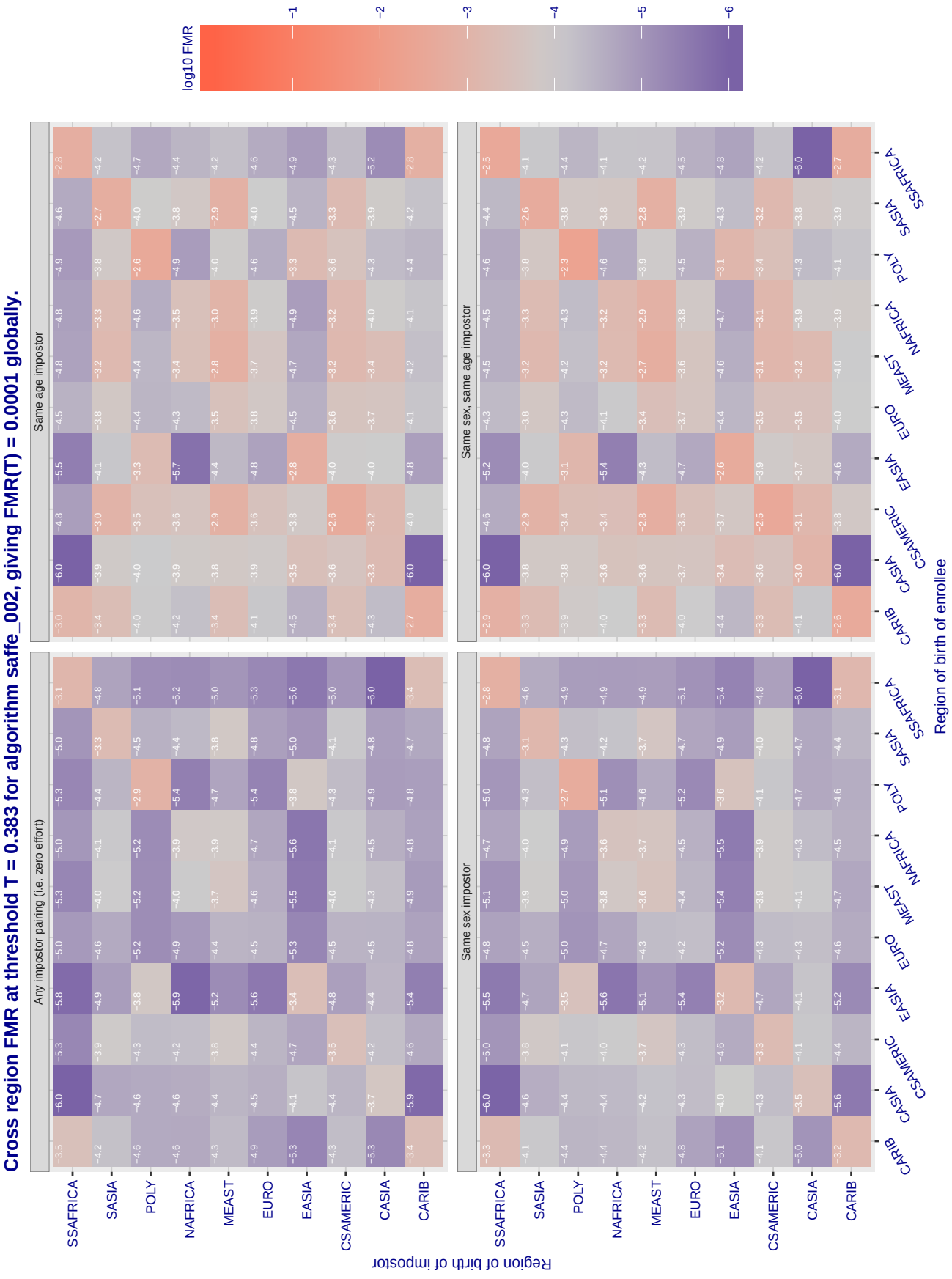


Figure 248: For algorithm saffe-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 249: For algorithm sensetime-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

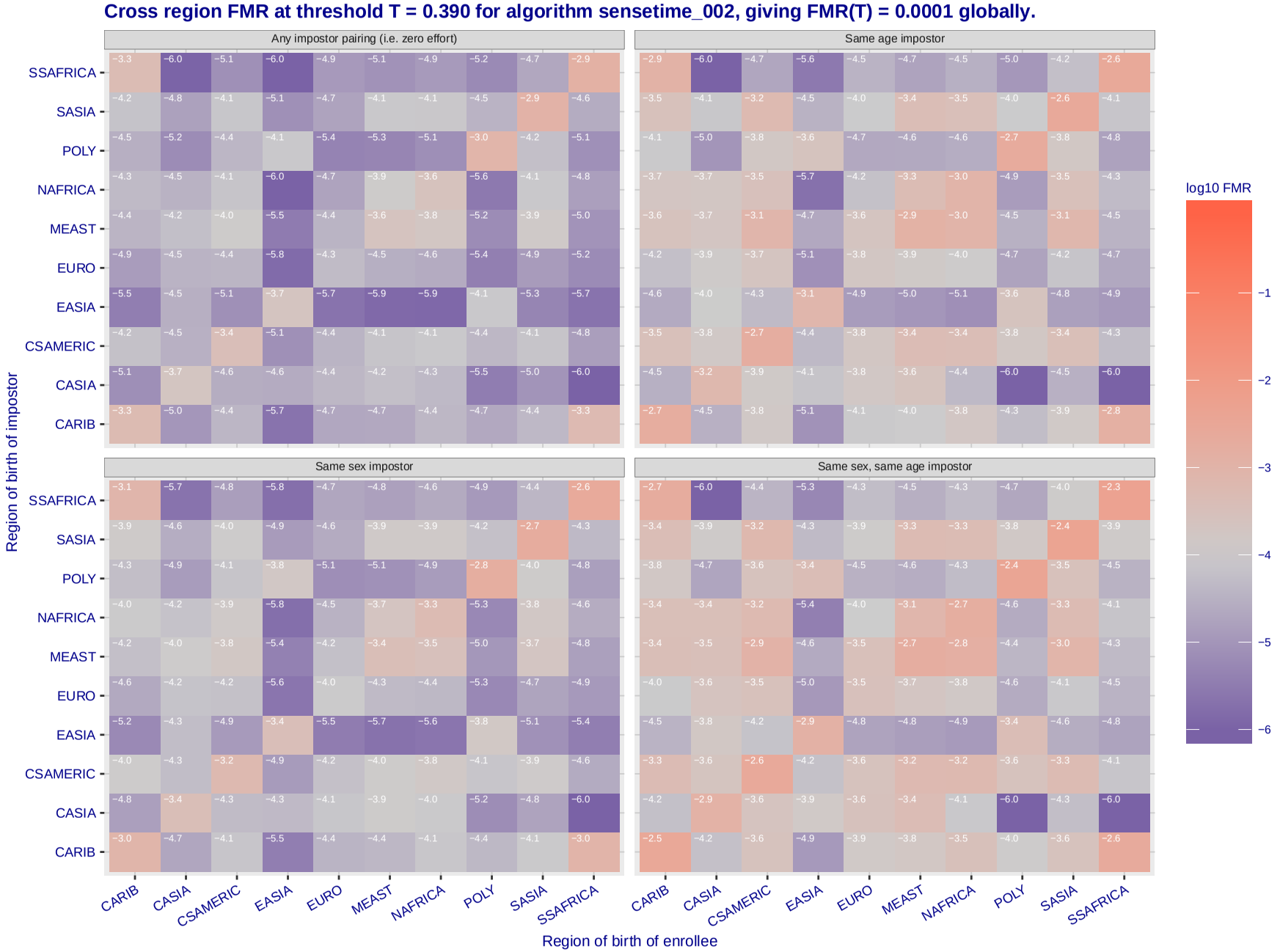


Figure 250: For algorithm sensetime-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

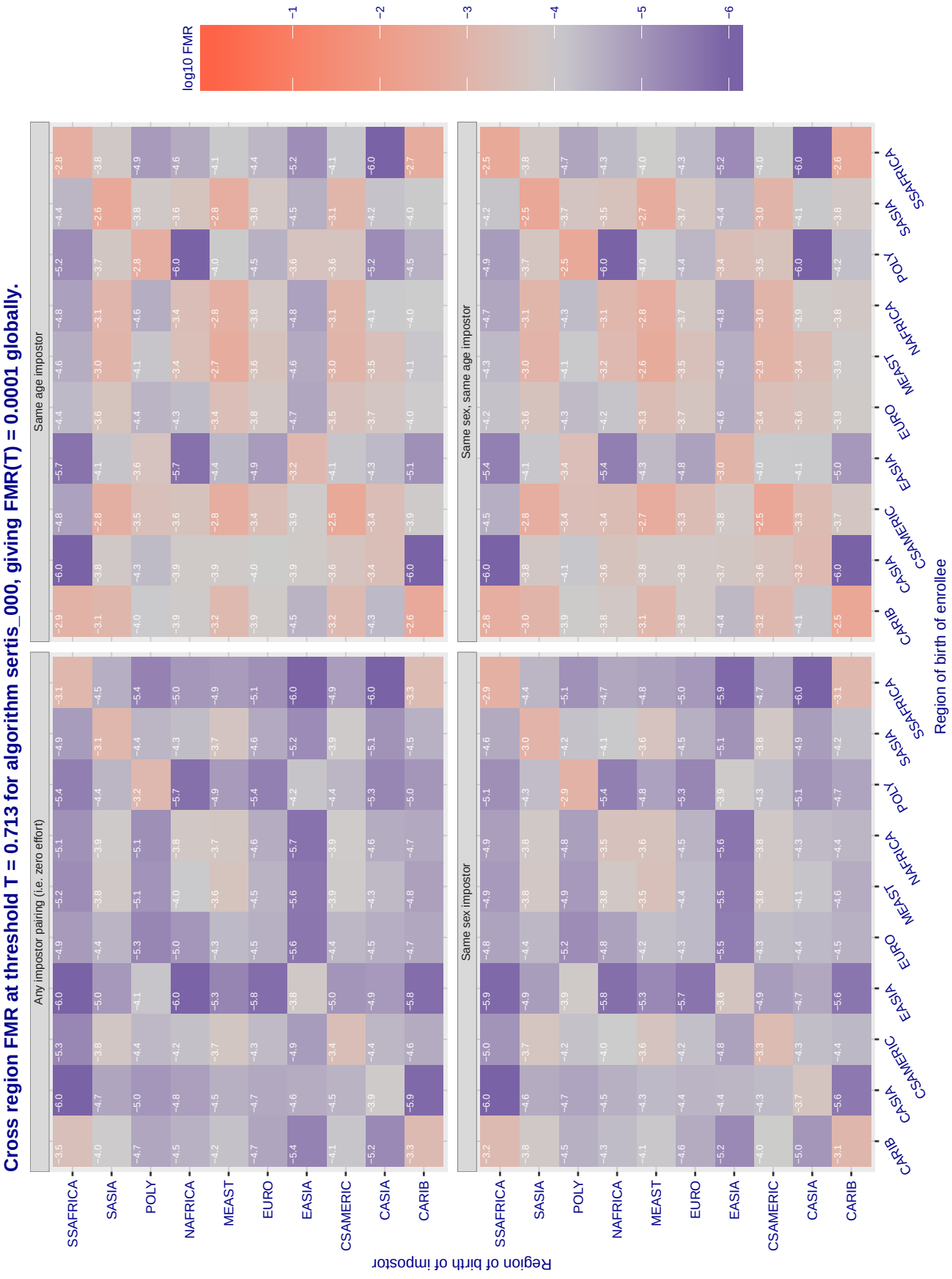


Figure 251: For algorithm sertis-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 252: For algorithm shaman-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

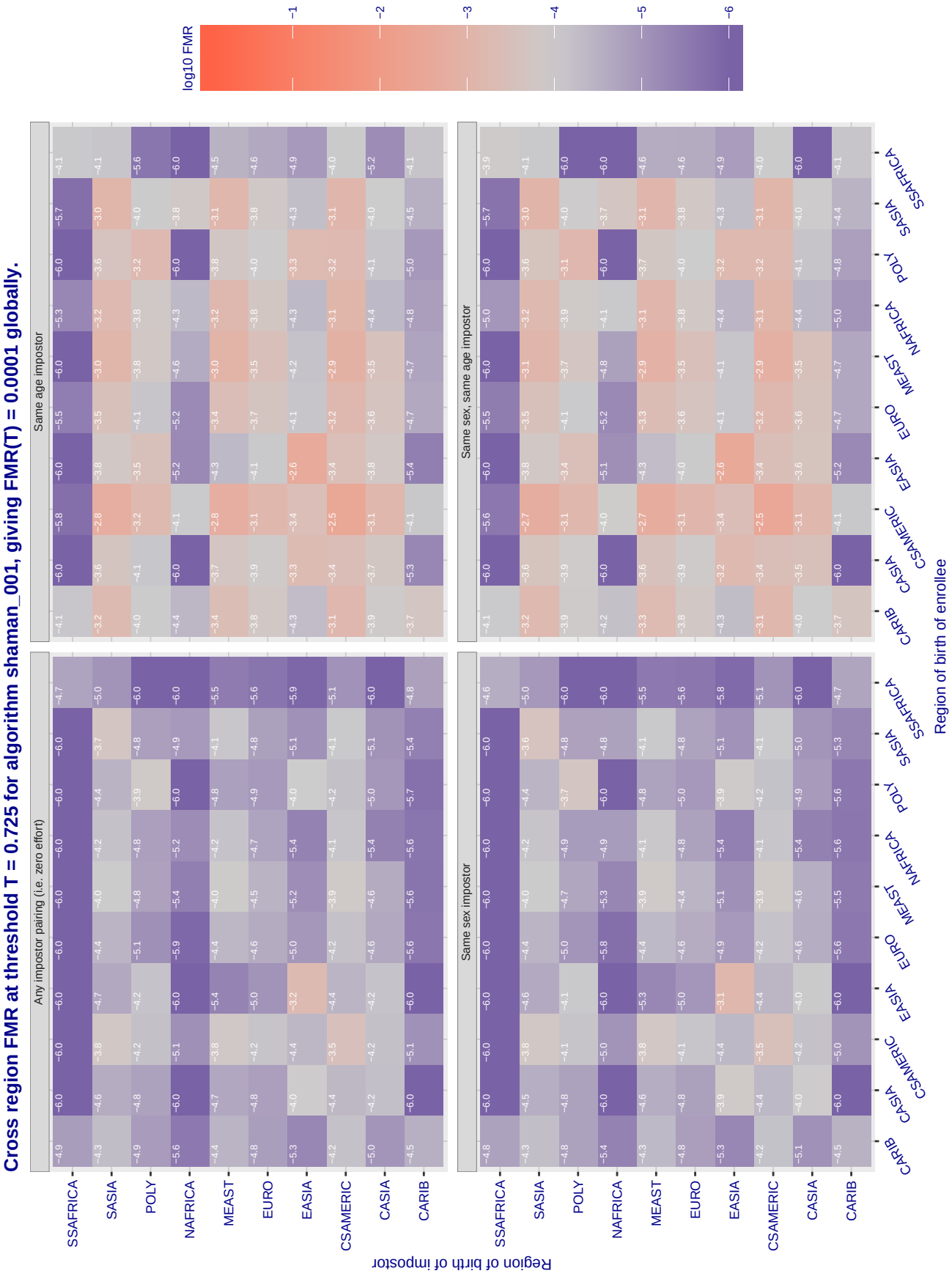


Figure 253: For algorithm shaman-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

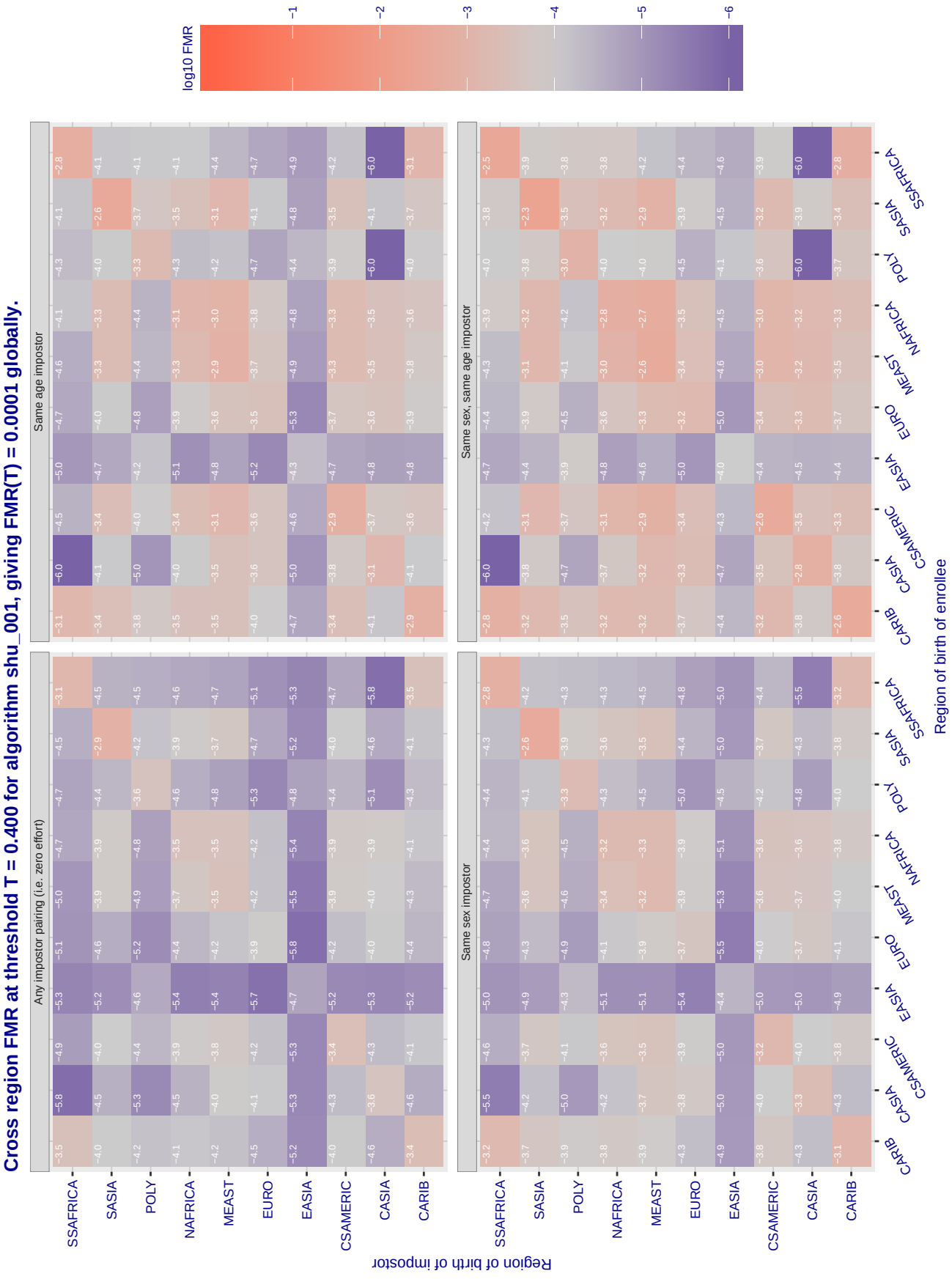


Figure 254: For algorithm shu-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

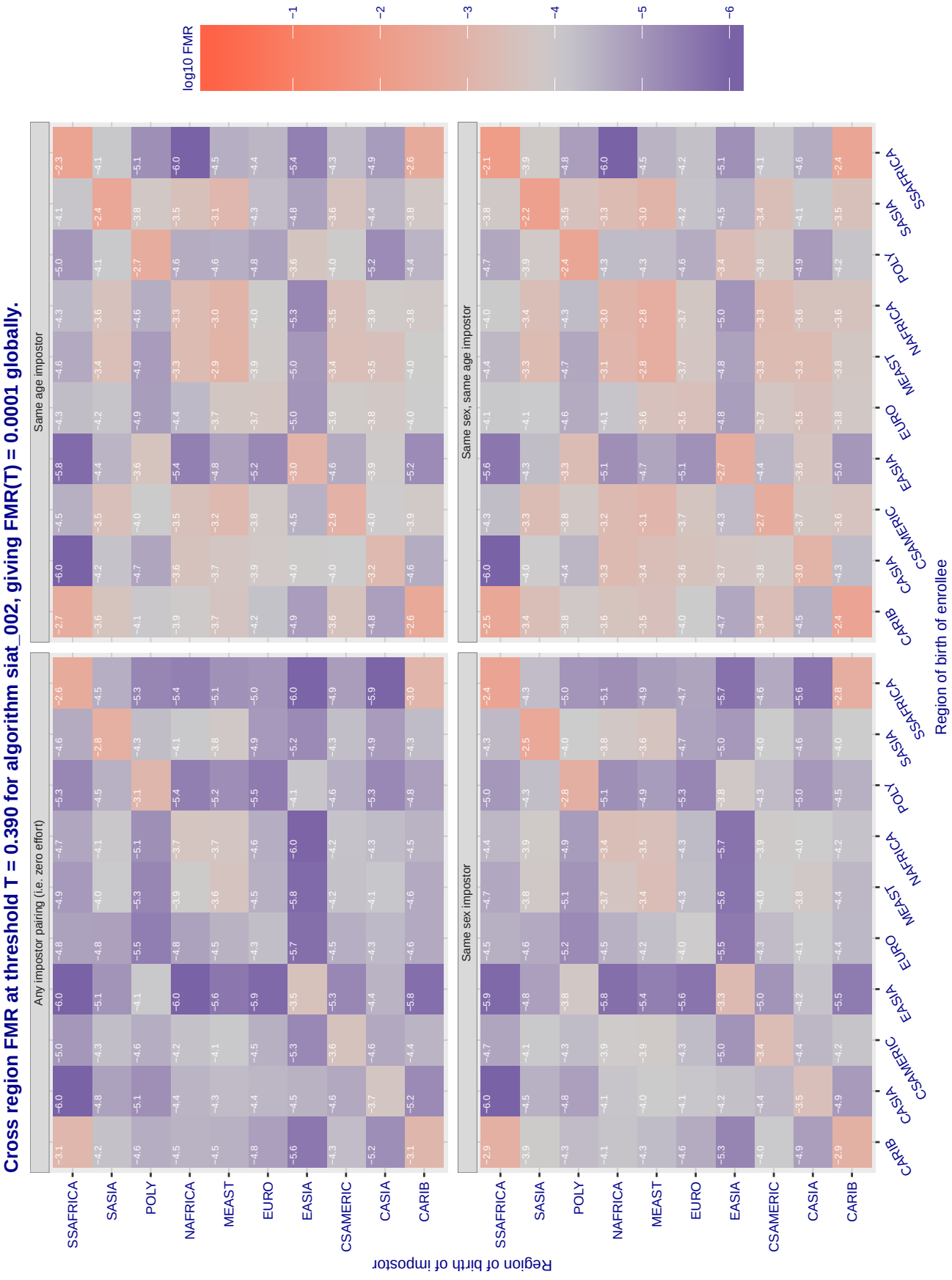


Figure 255: For algorithm siat-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

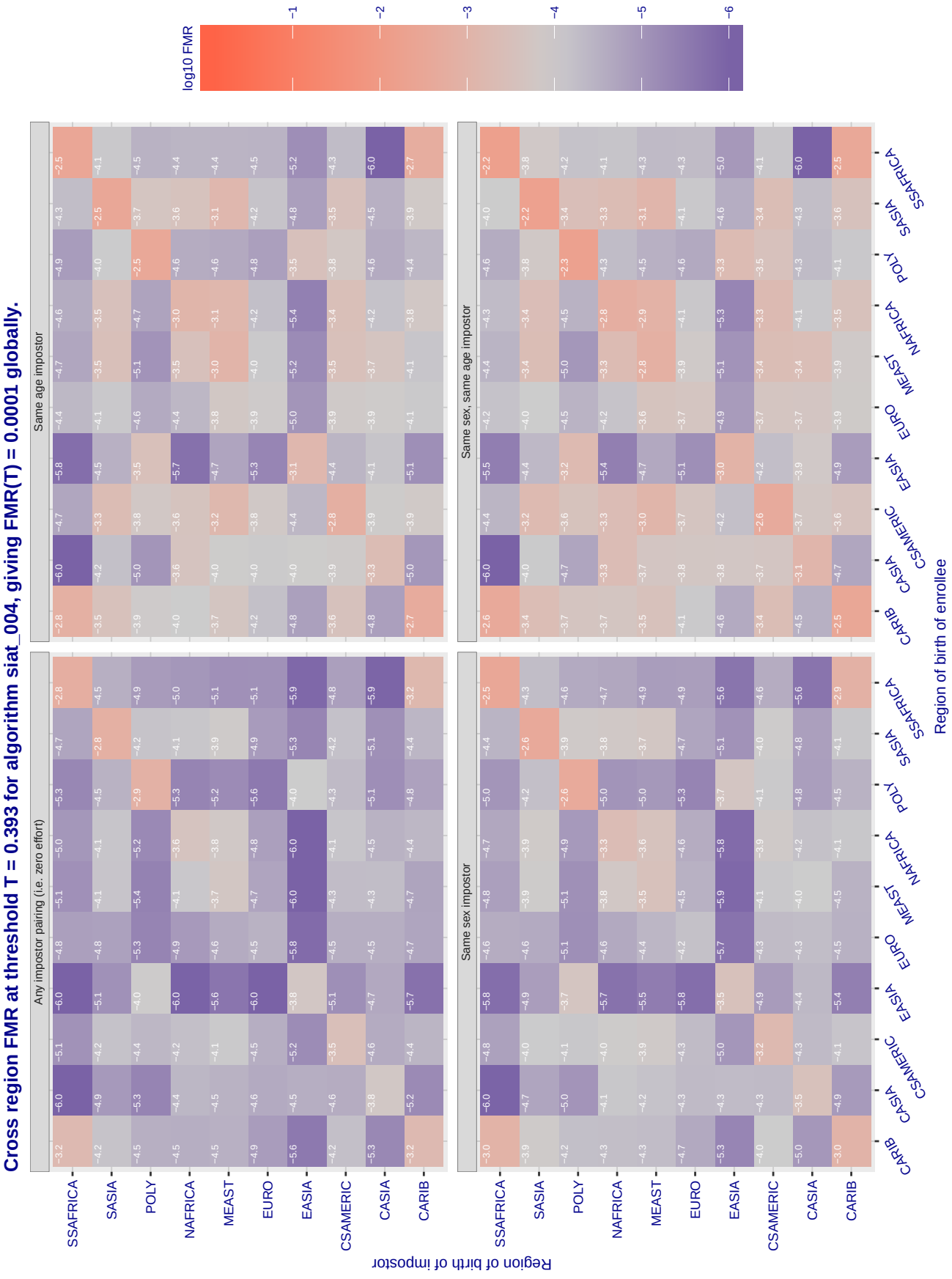


Figure 256: For algorithm siat-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

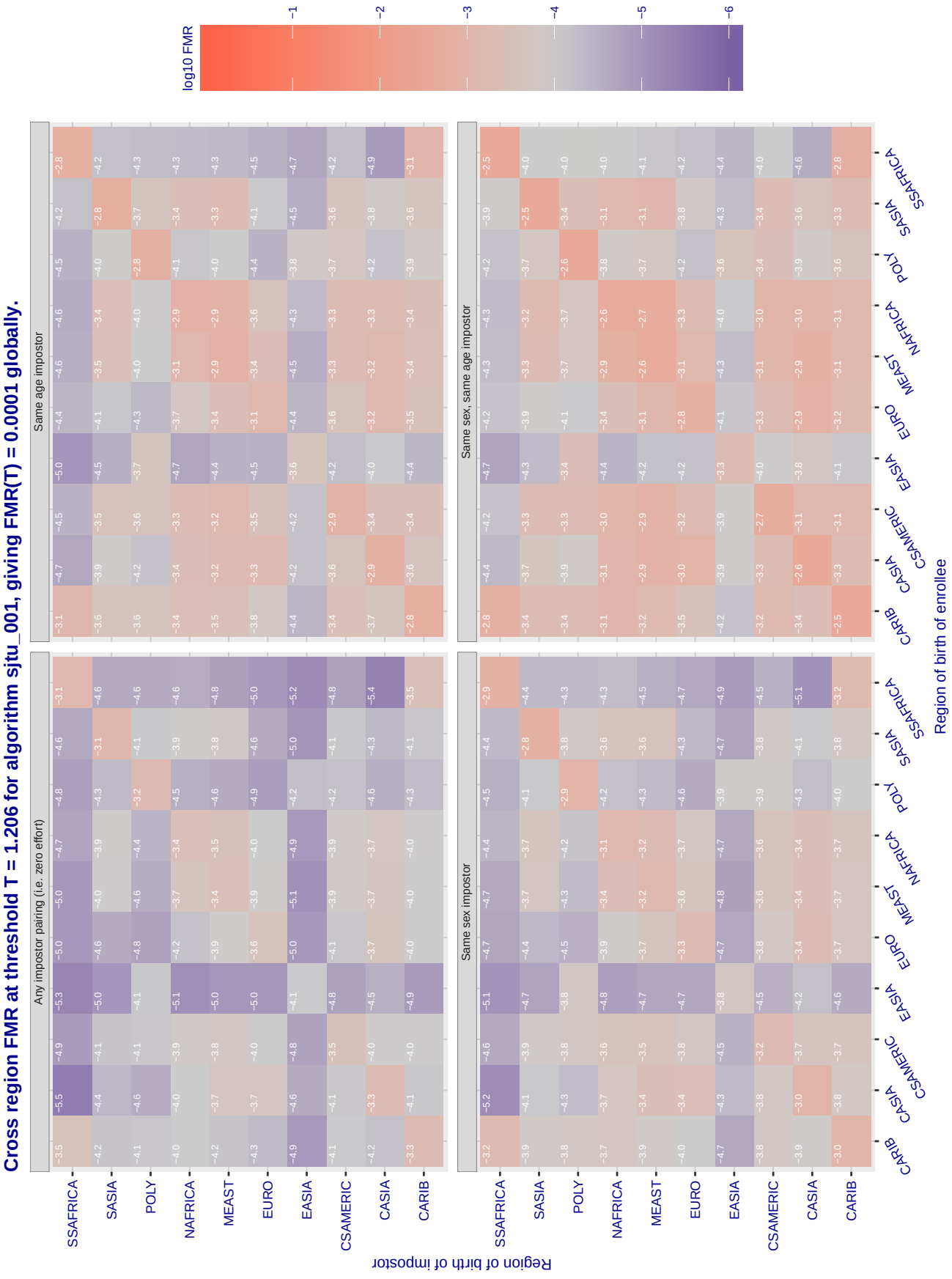


Figure 257: For algorithm sjtu-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 258: For algorithm smilart-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

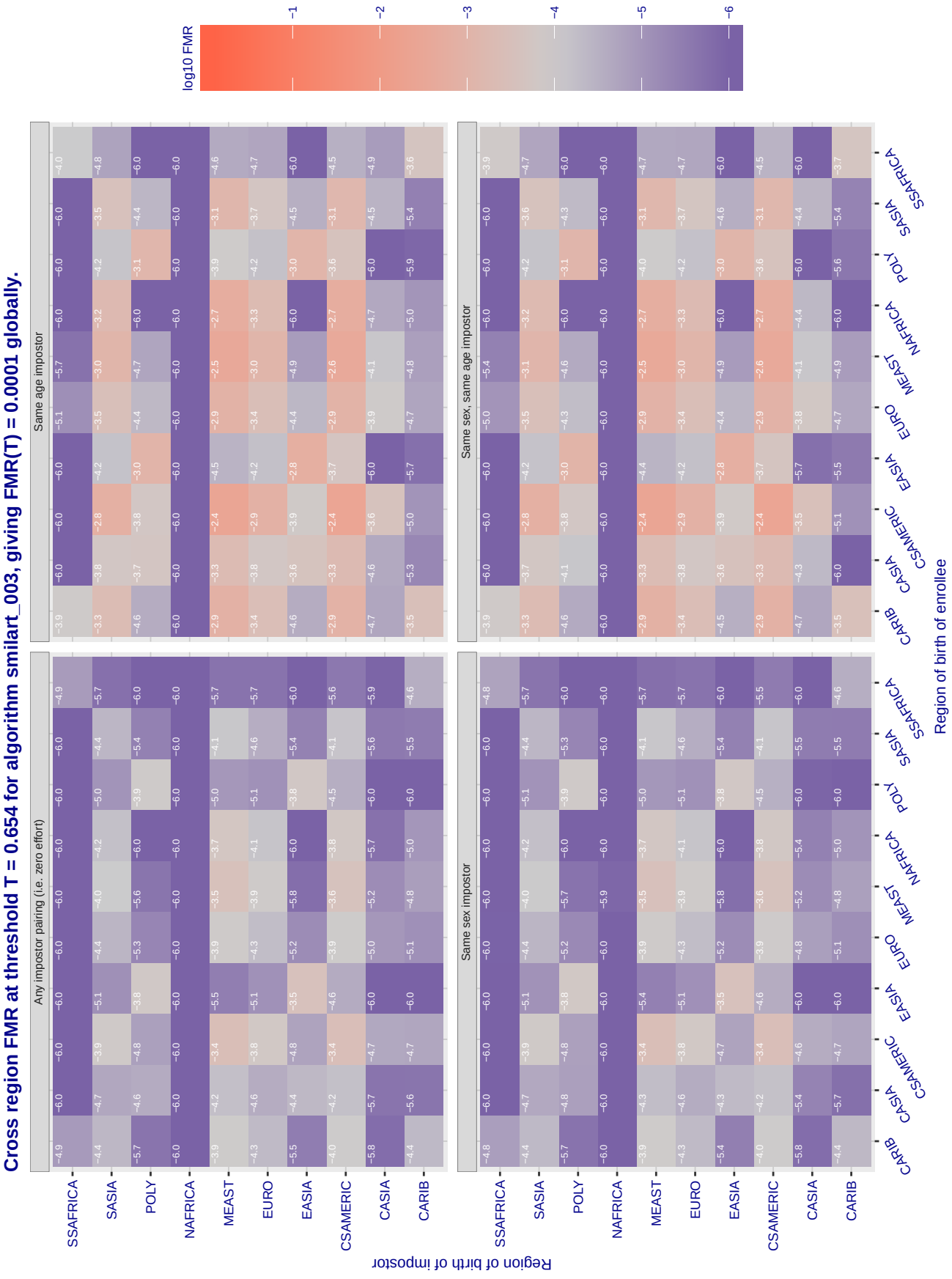


Figure 259: For algorithm smilart-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

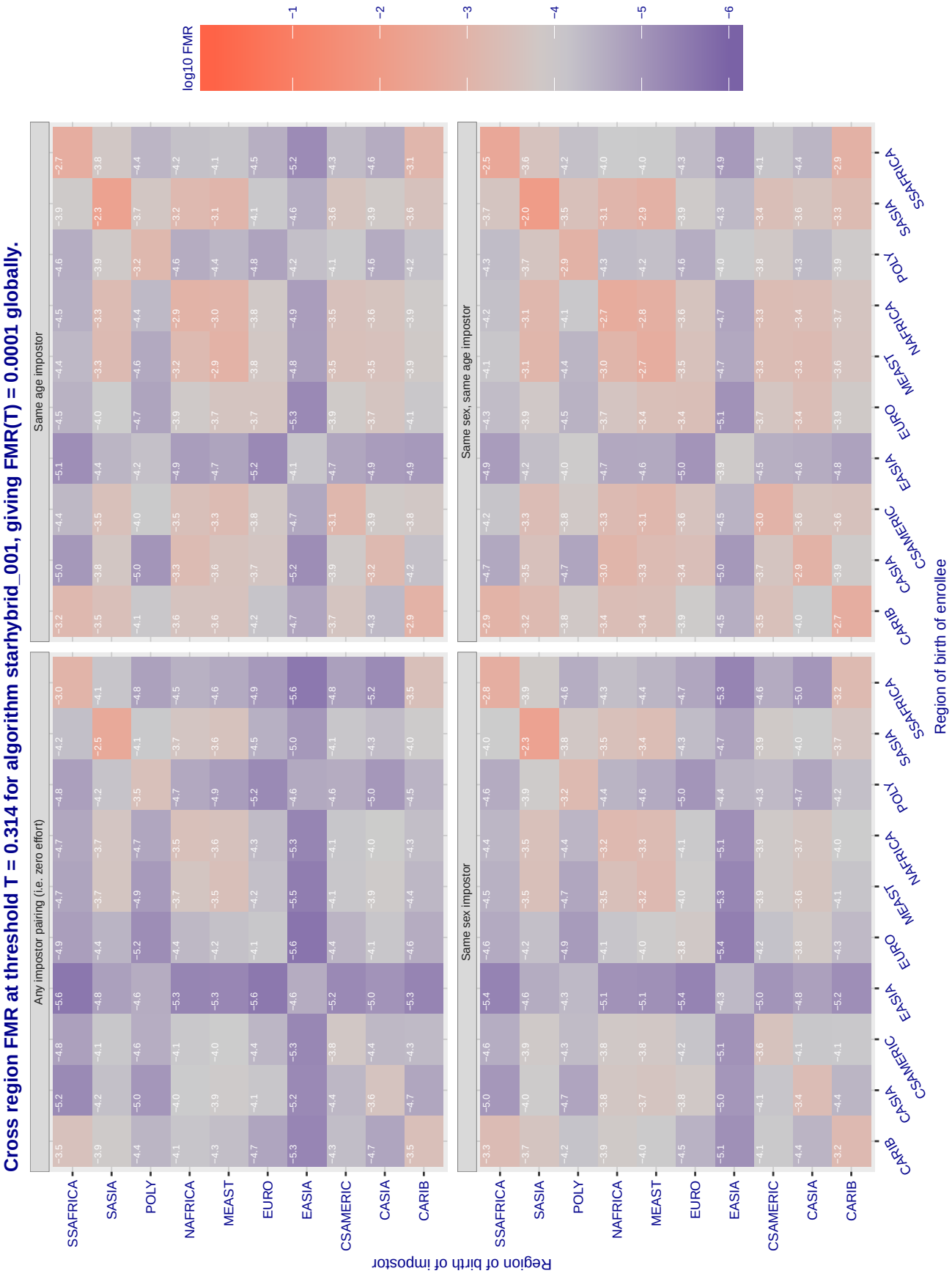


Figure 260: For algorithm starhybrid-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

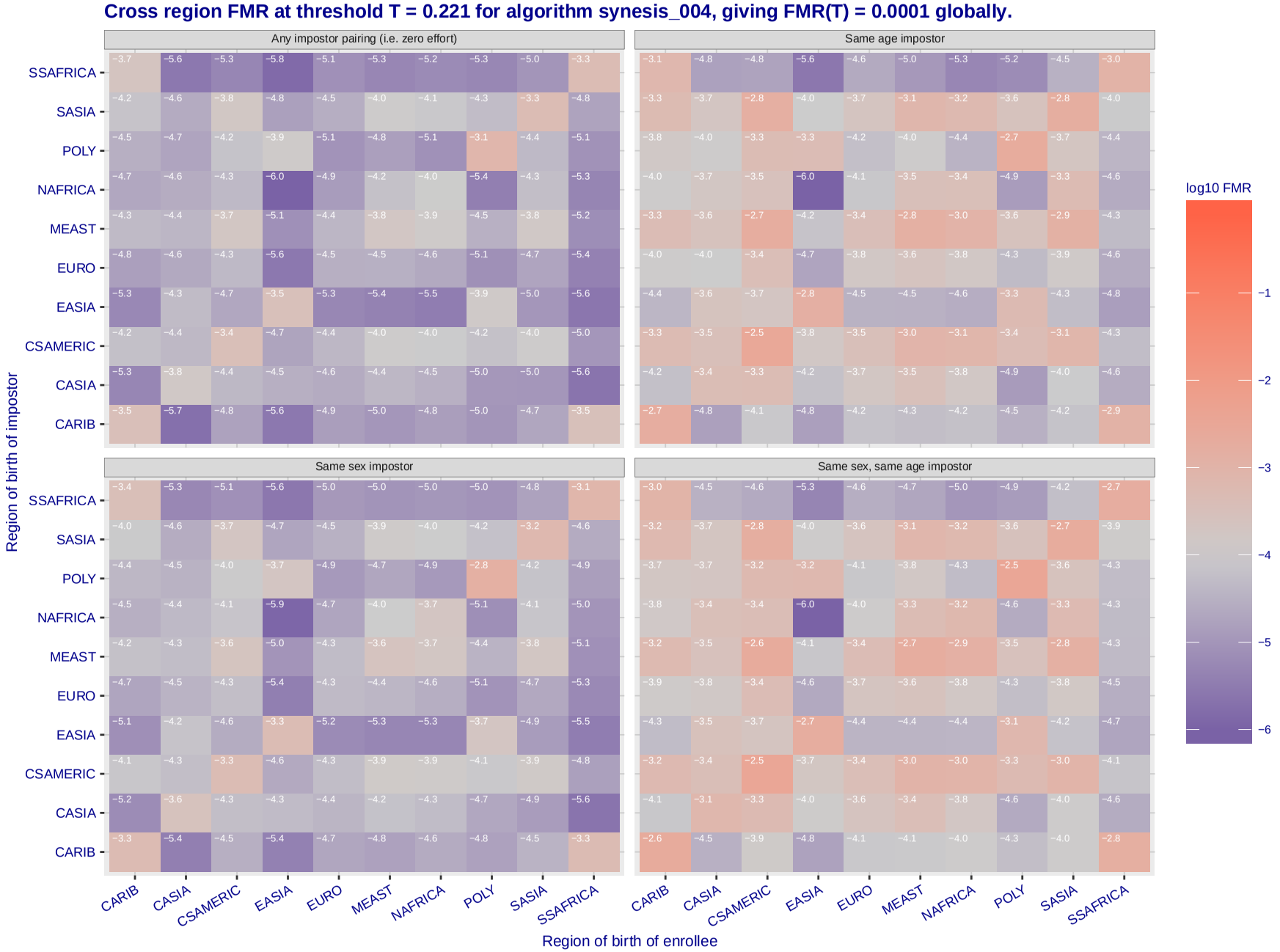


Figure 261: For algorithm synesis-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

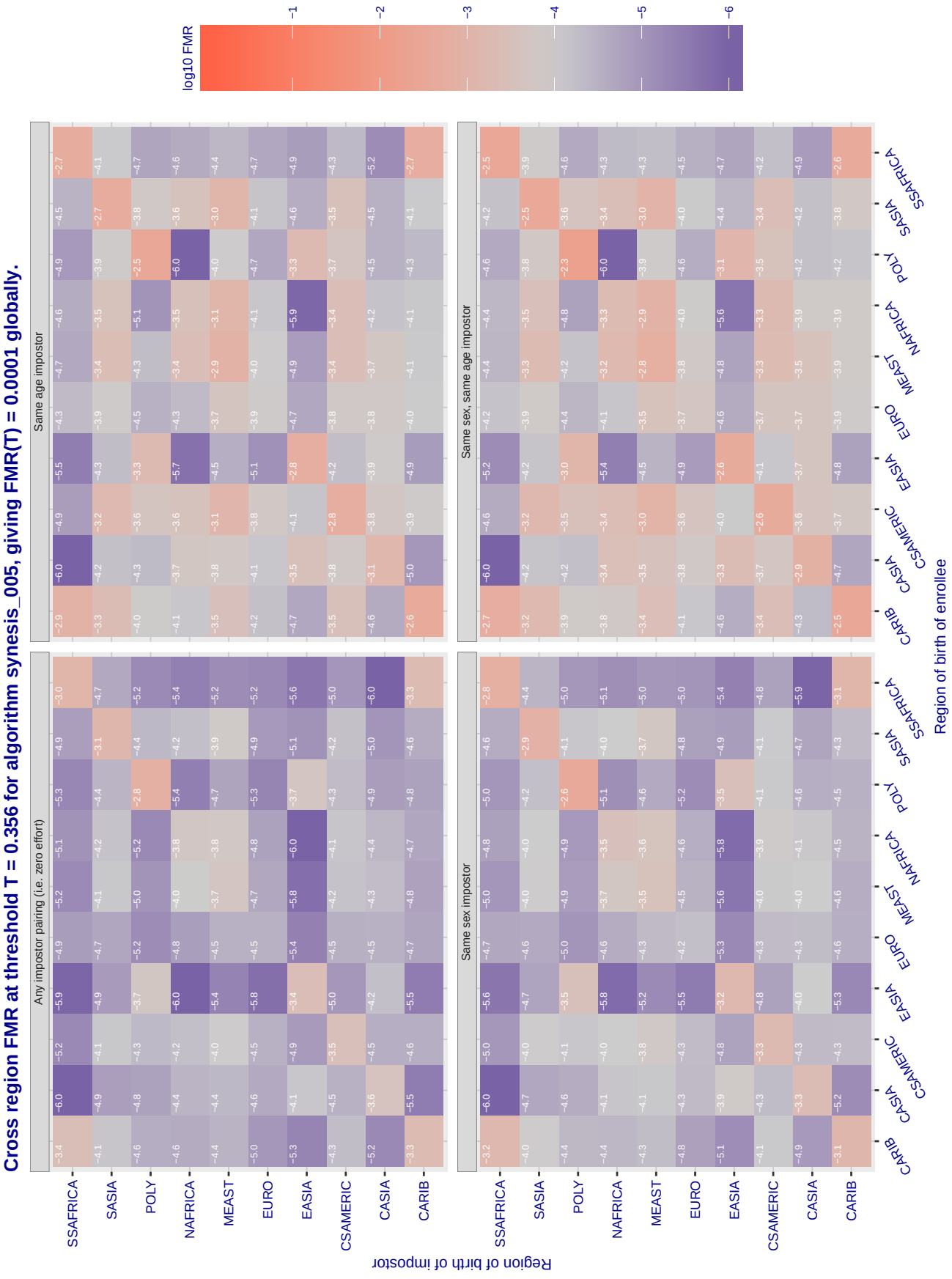


Figure 262: For algorithm synesis-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

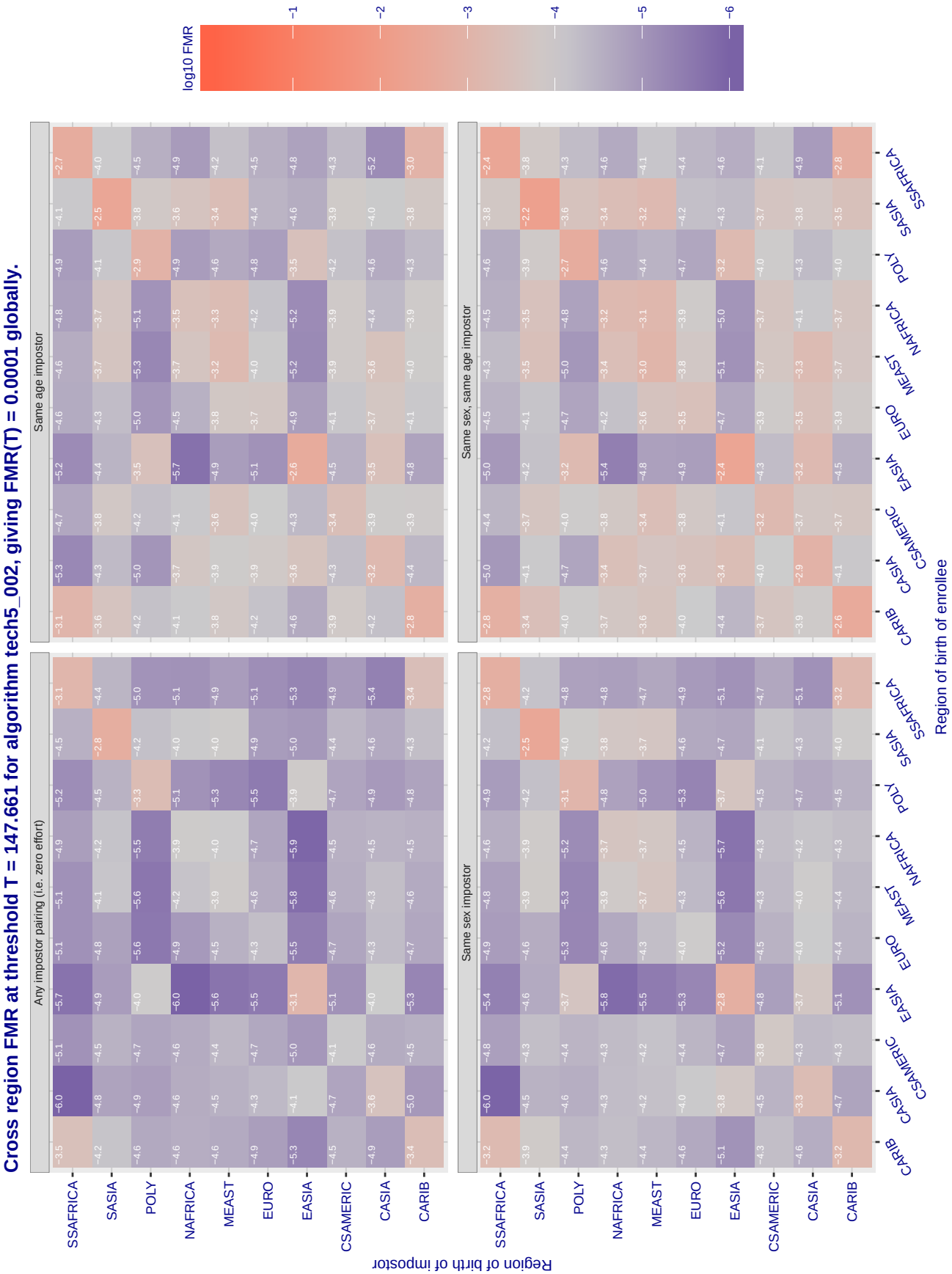


Figure 263: For algorithm tech5-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 264: For algorithm tech5-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

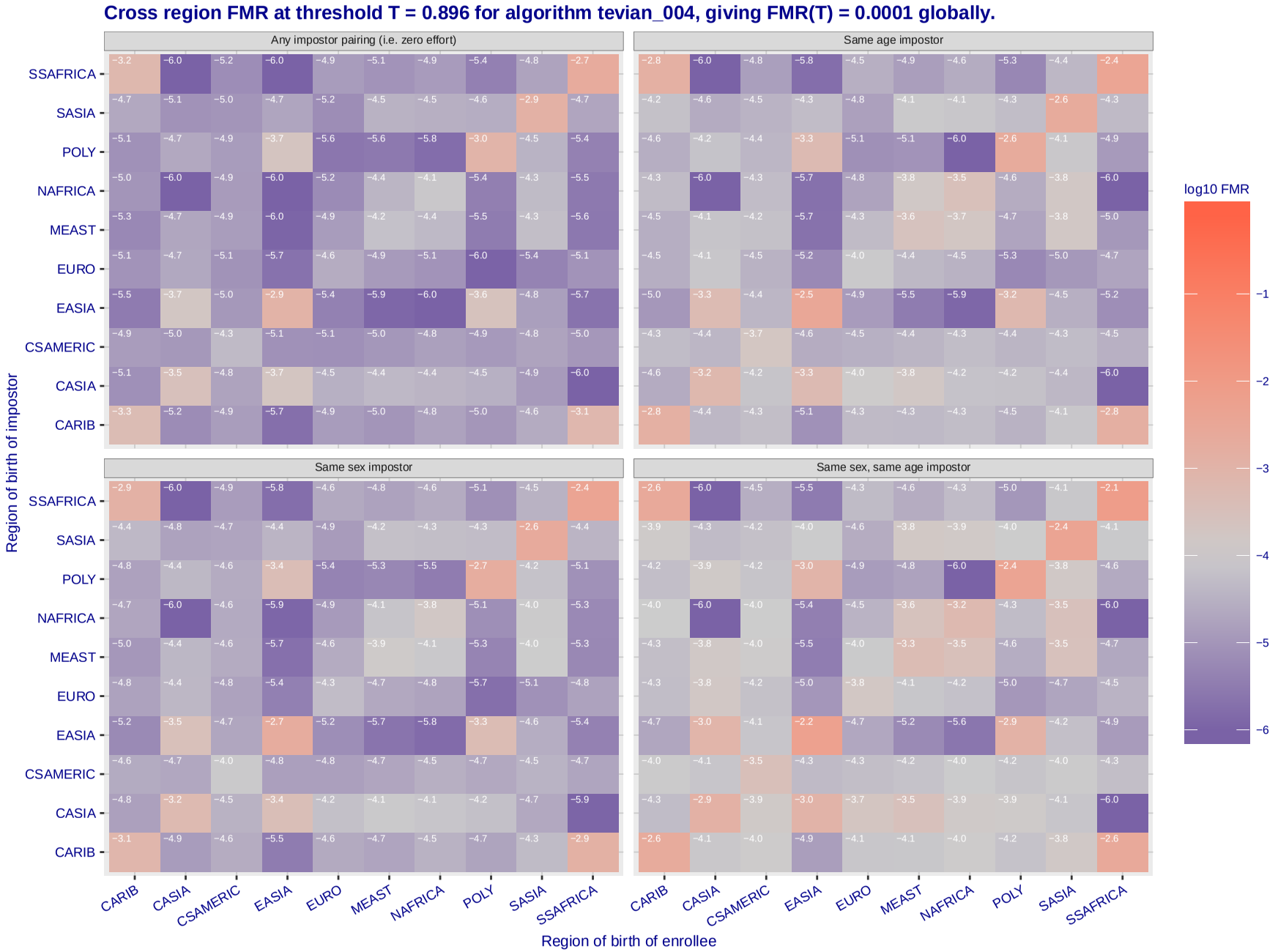


Figure 265: For algorithm tevian-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

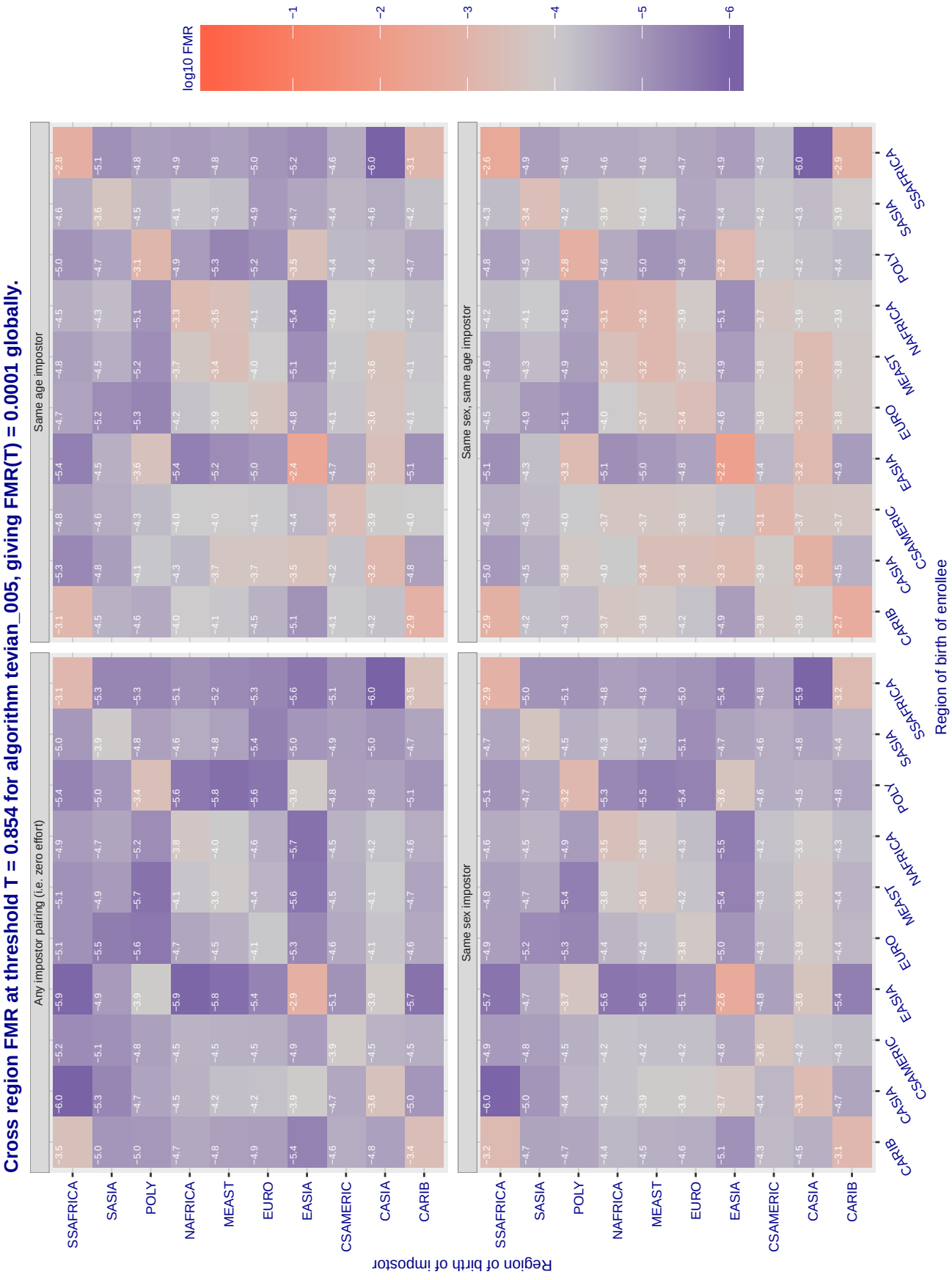


Figure 266: For algorithm tevian-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

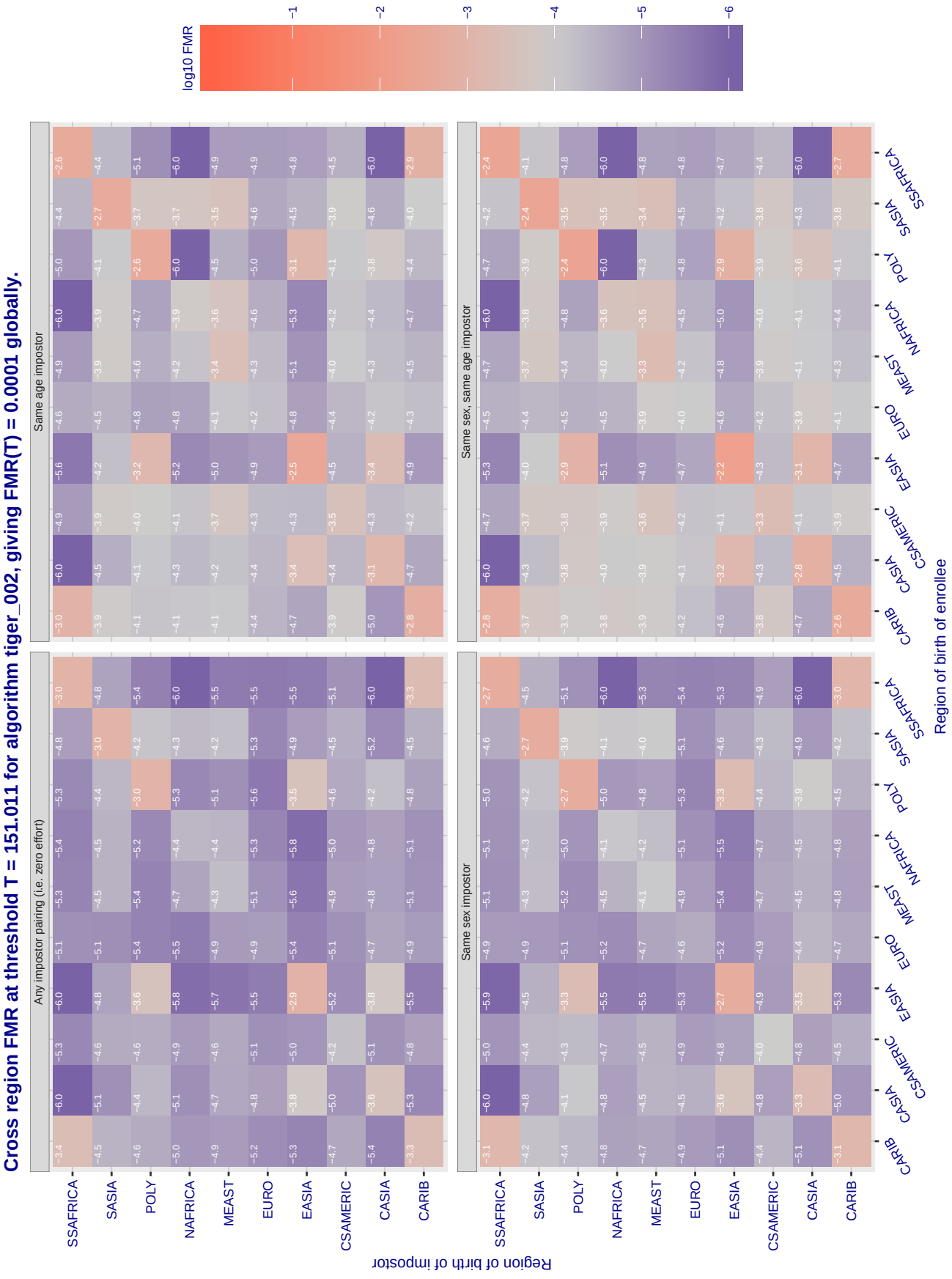


Figure 267: For algorithm tiger-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

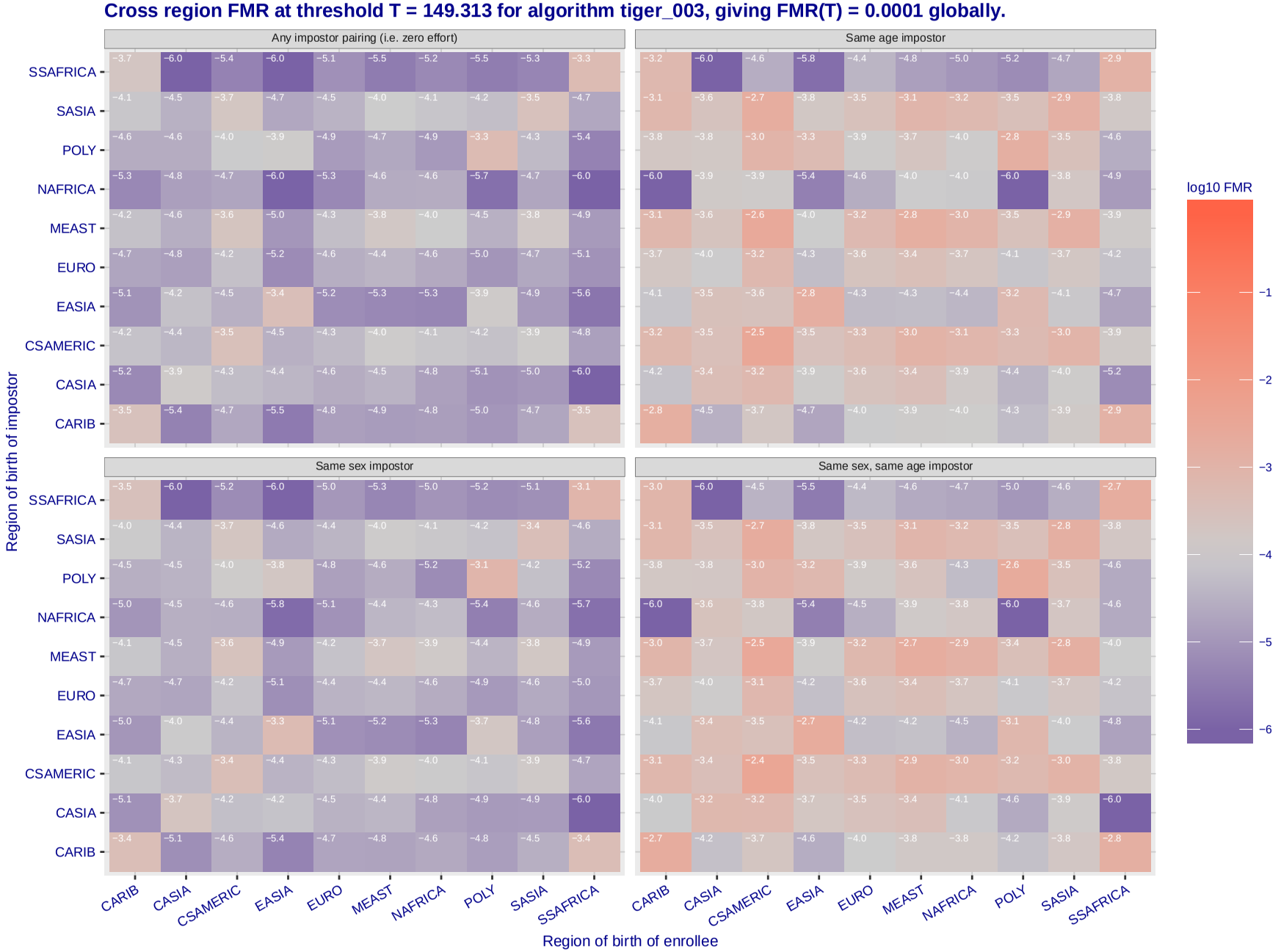


Figure 268: For algorithm tiger-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

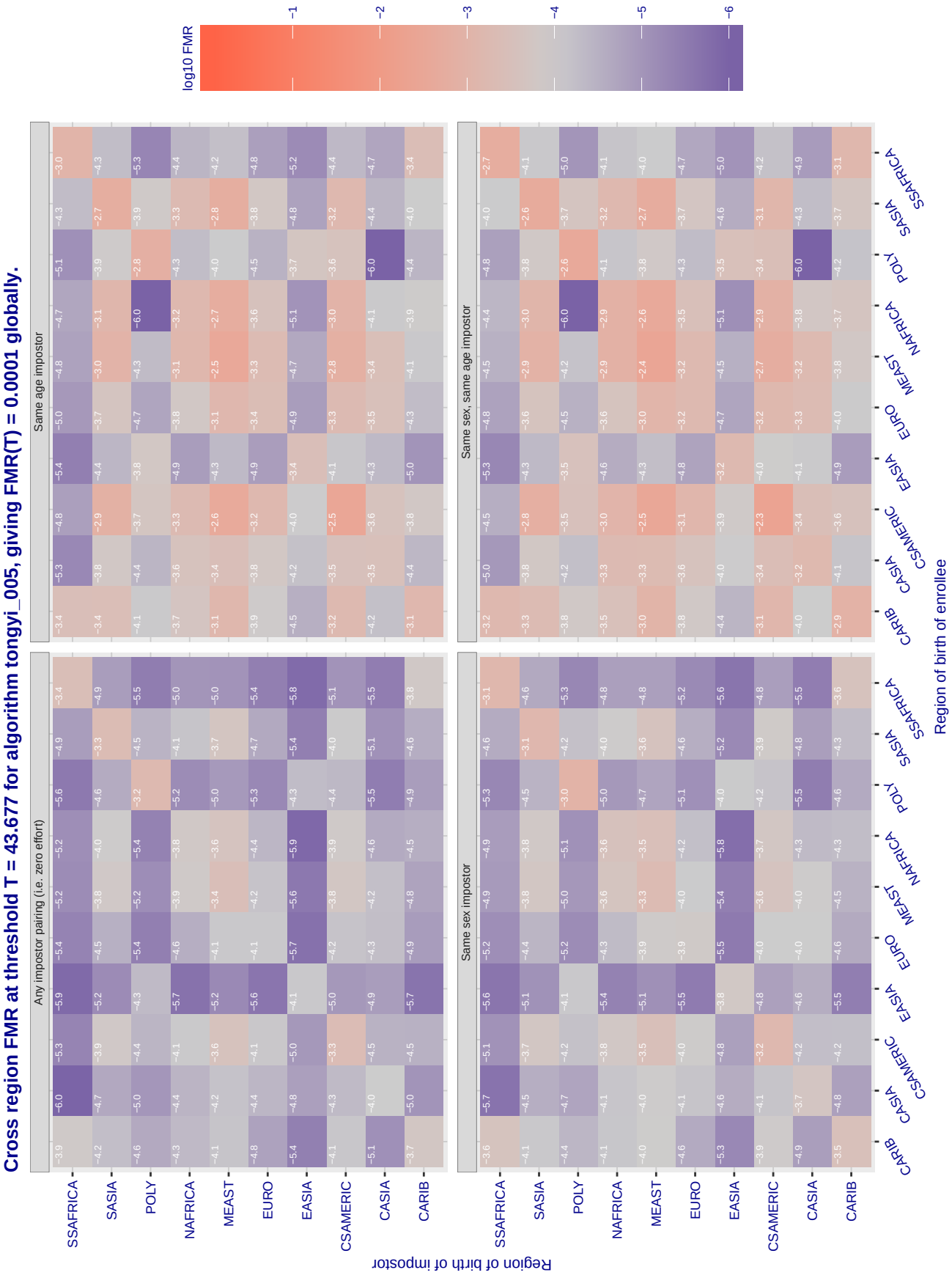


Figure 269: For algorithm tongyi-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

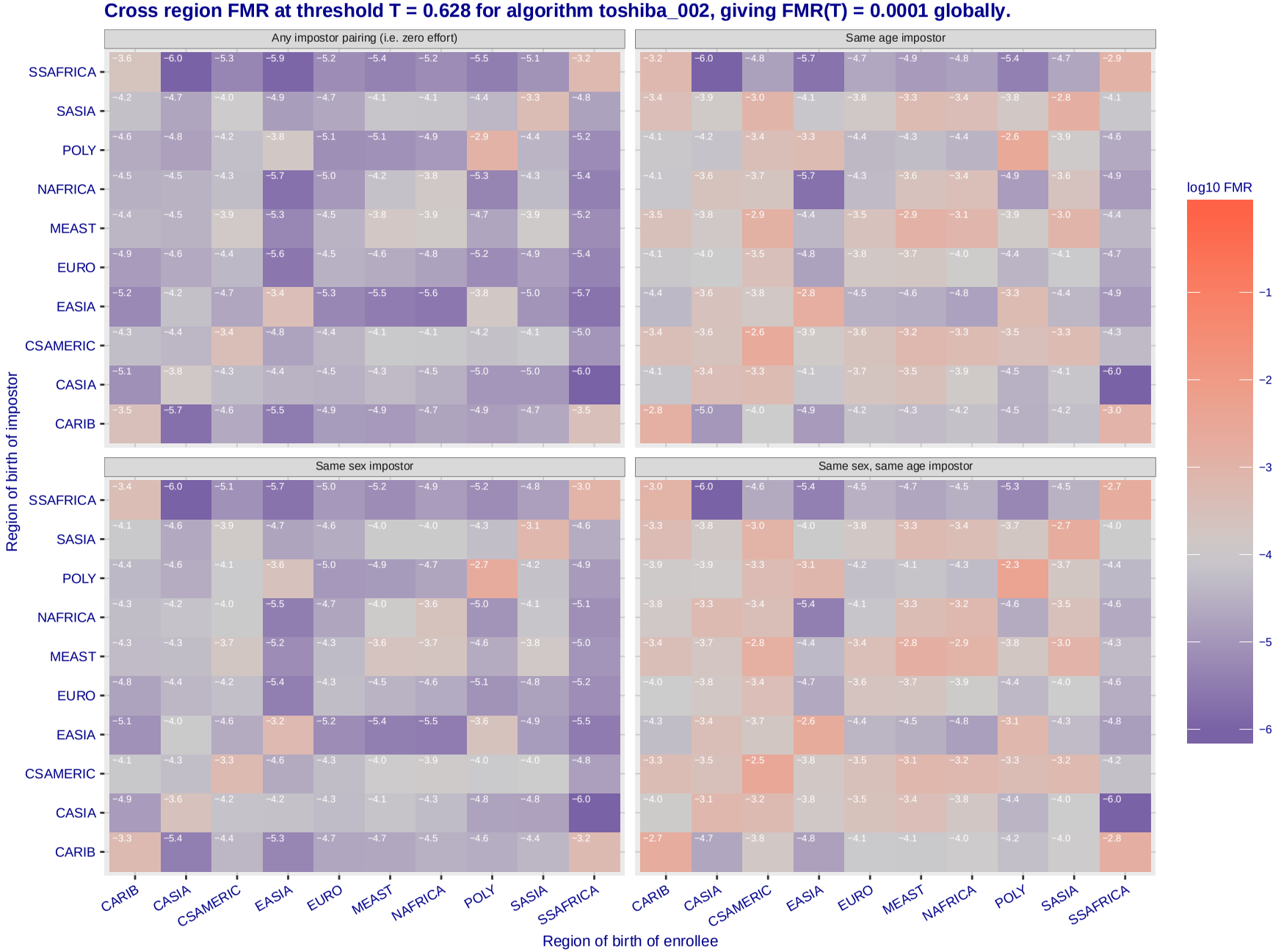


Figure 270: For algorithm toshiba-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

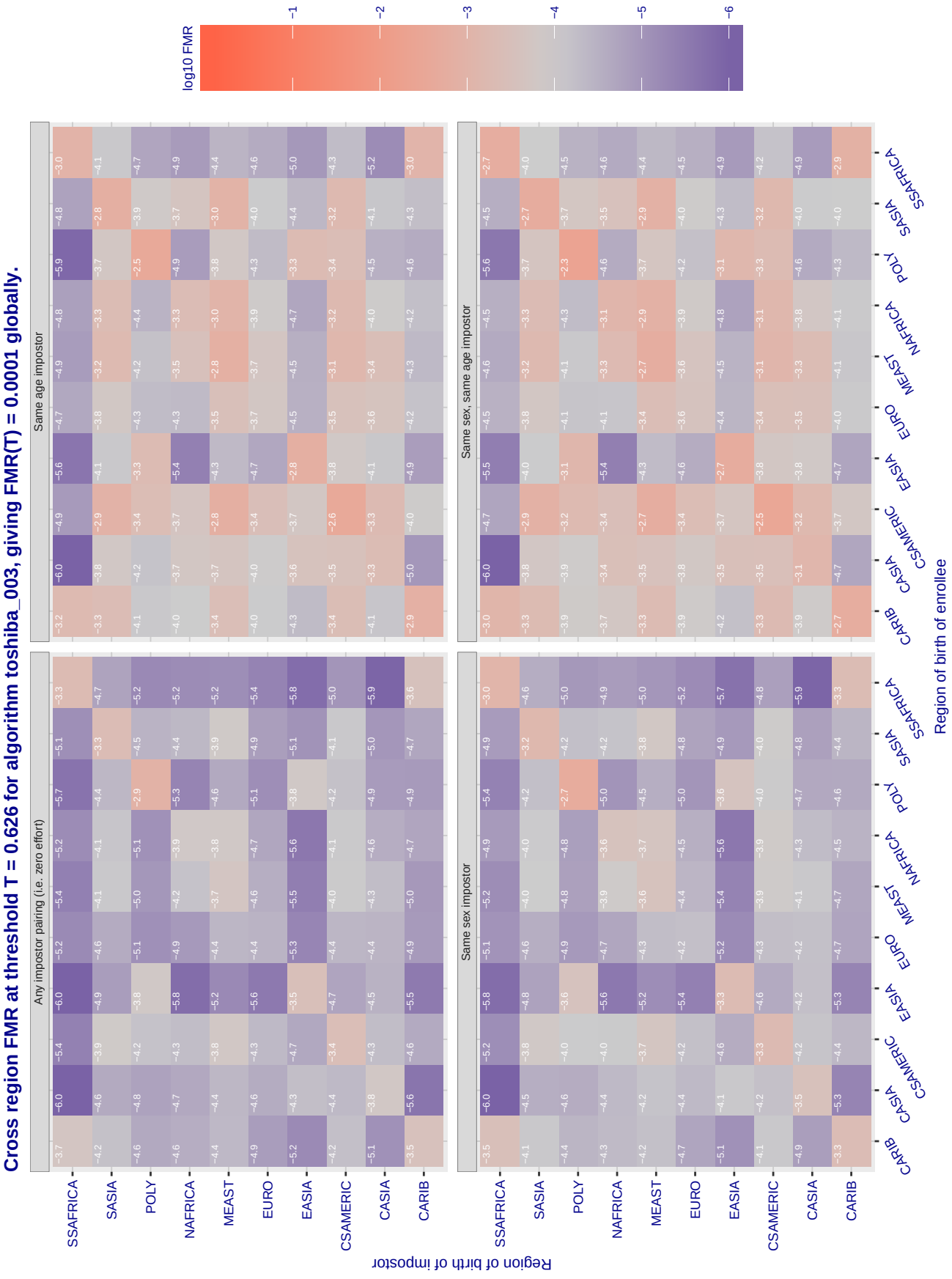


Figure 271: For algorithm toshiba-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

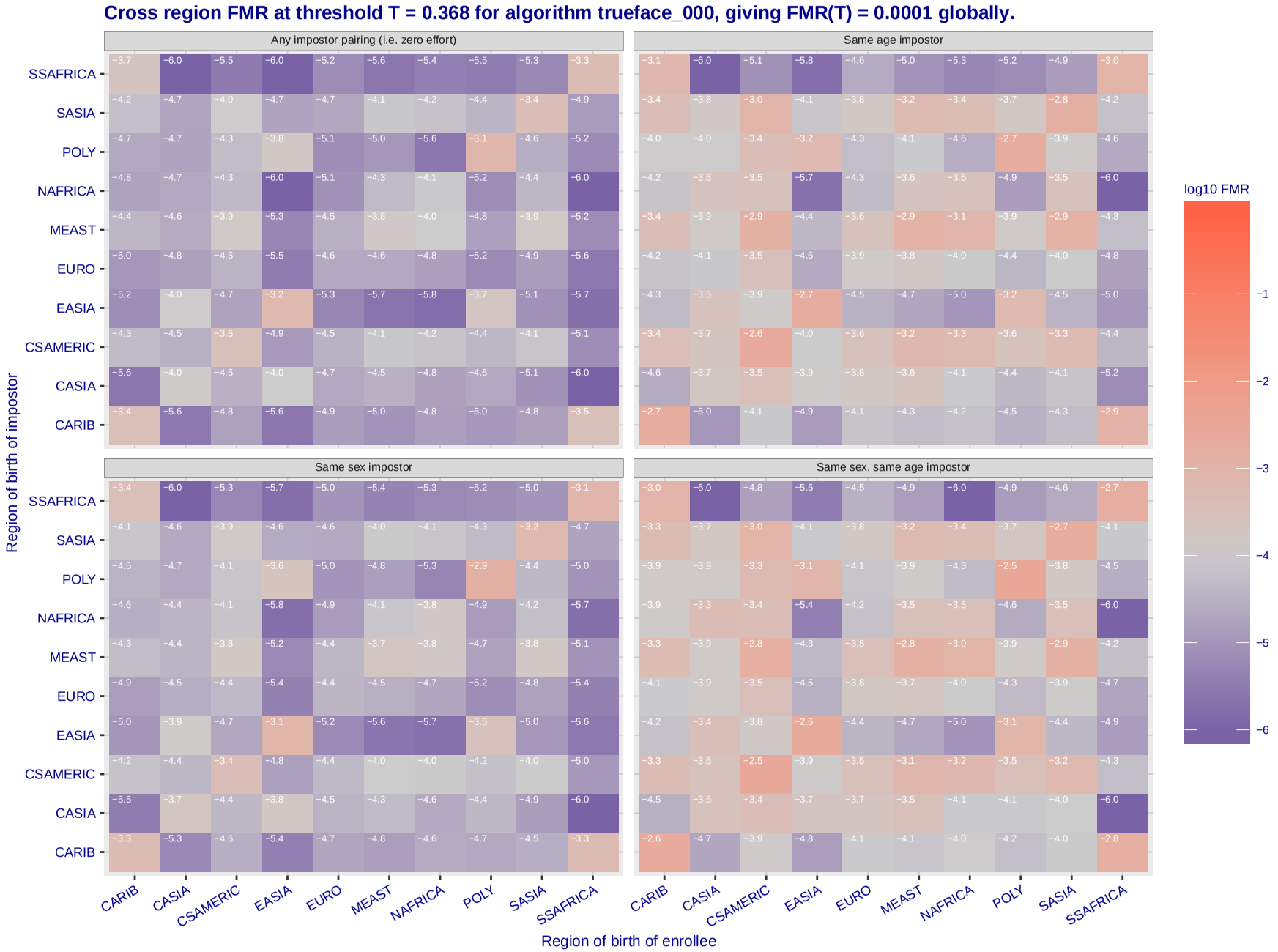


Figure 272: For algorithm trueface-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

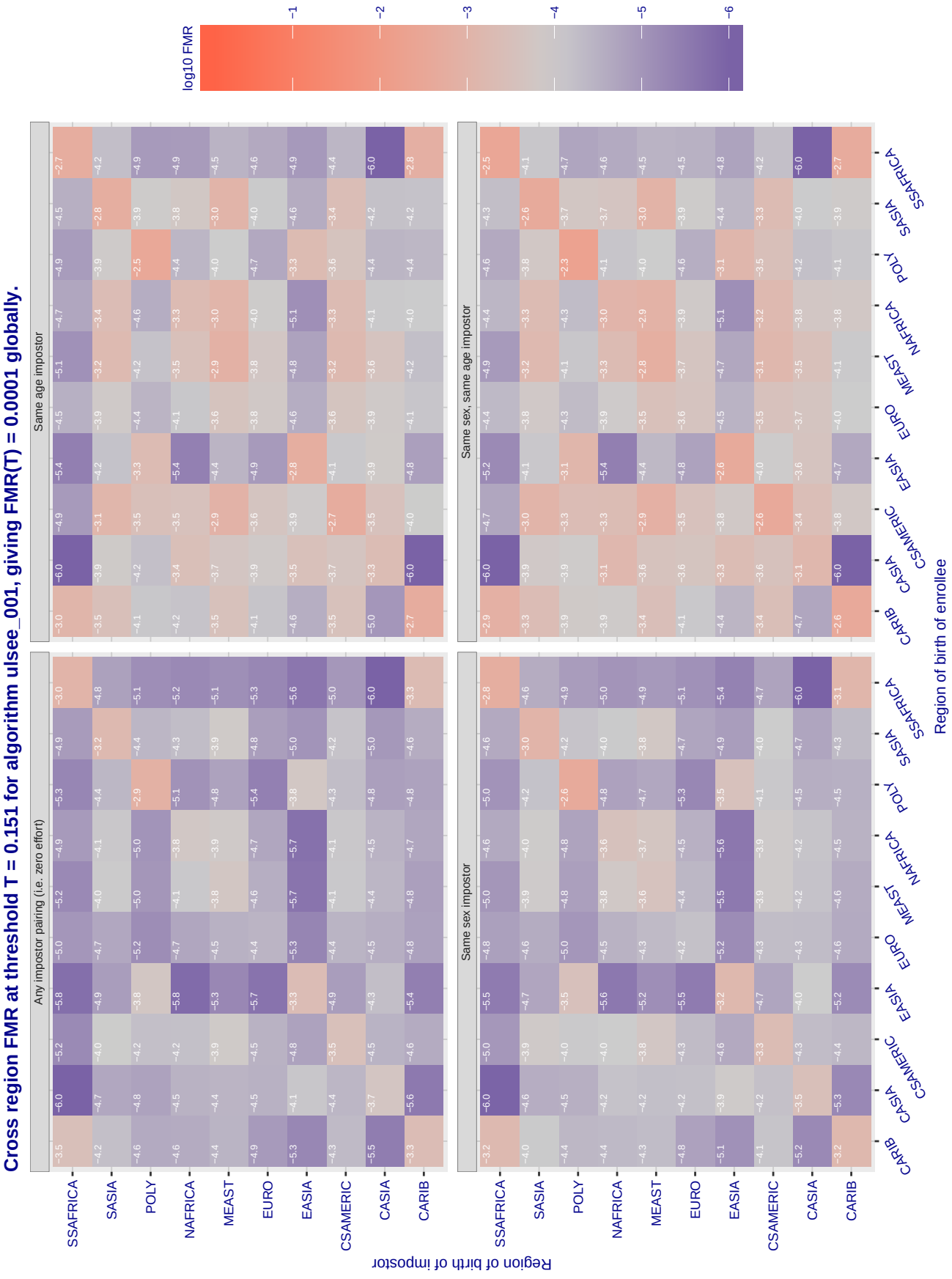


Figure 273: For algorithm ulsee-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

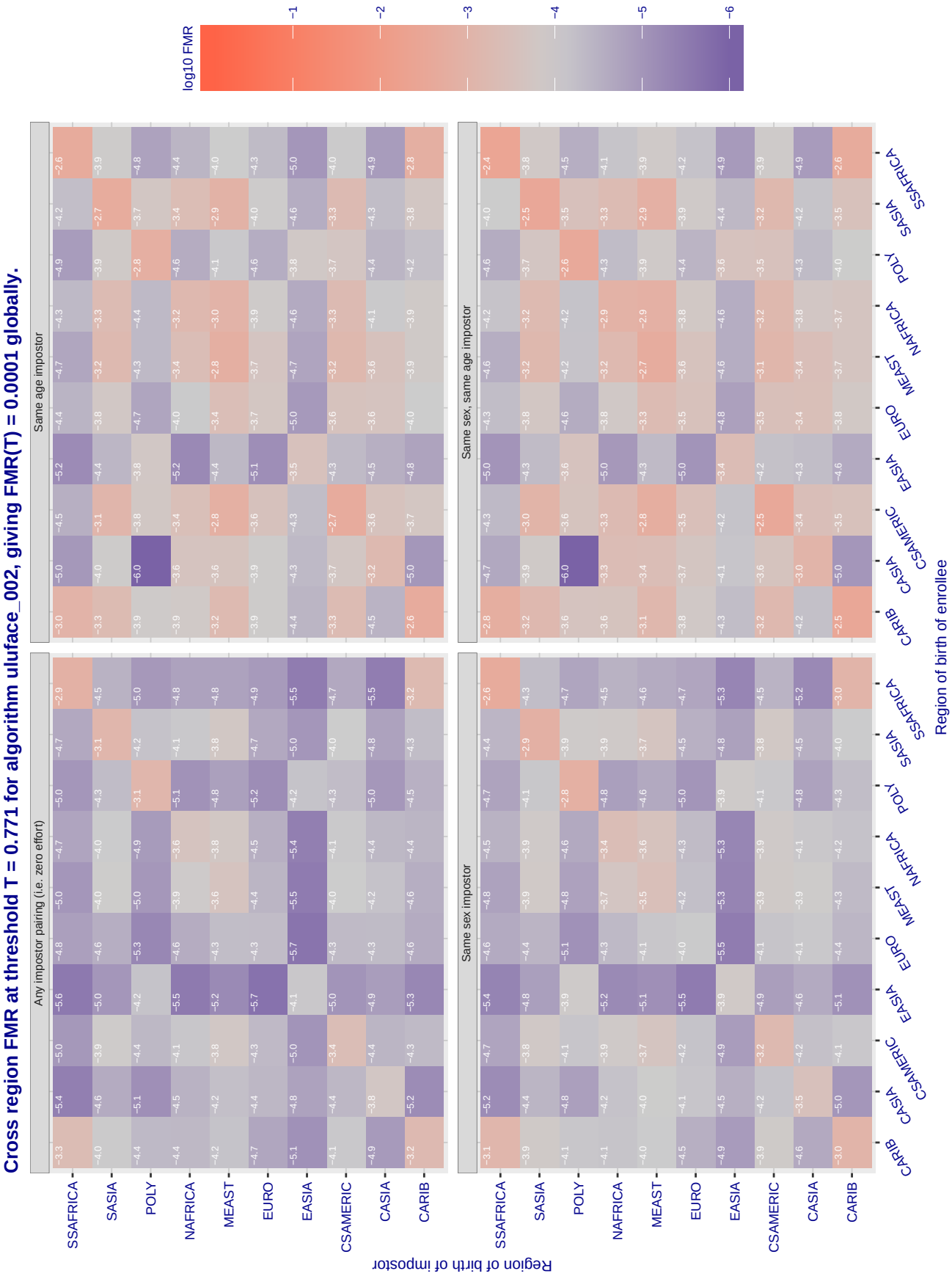


Figure 274: For algorithm uluface-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

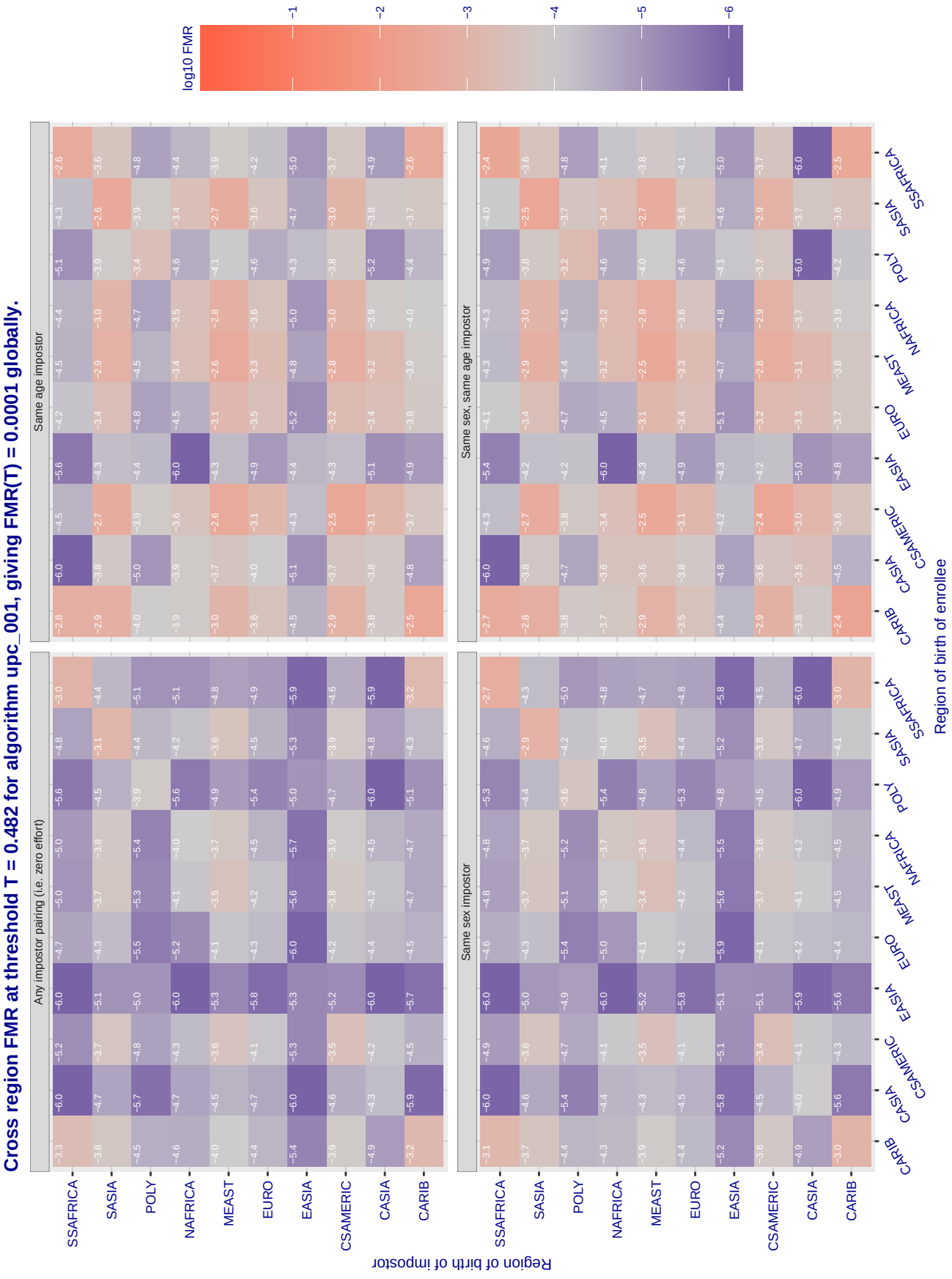


Figure 275: For algorithm upc-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

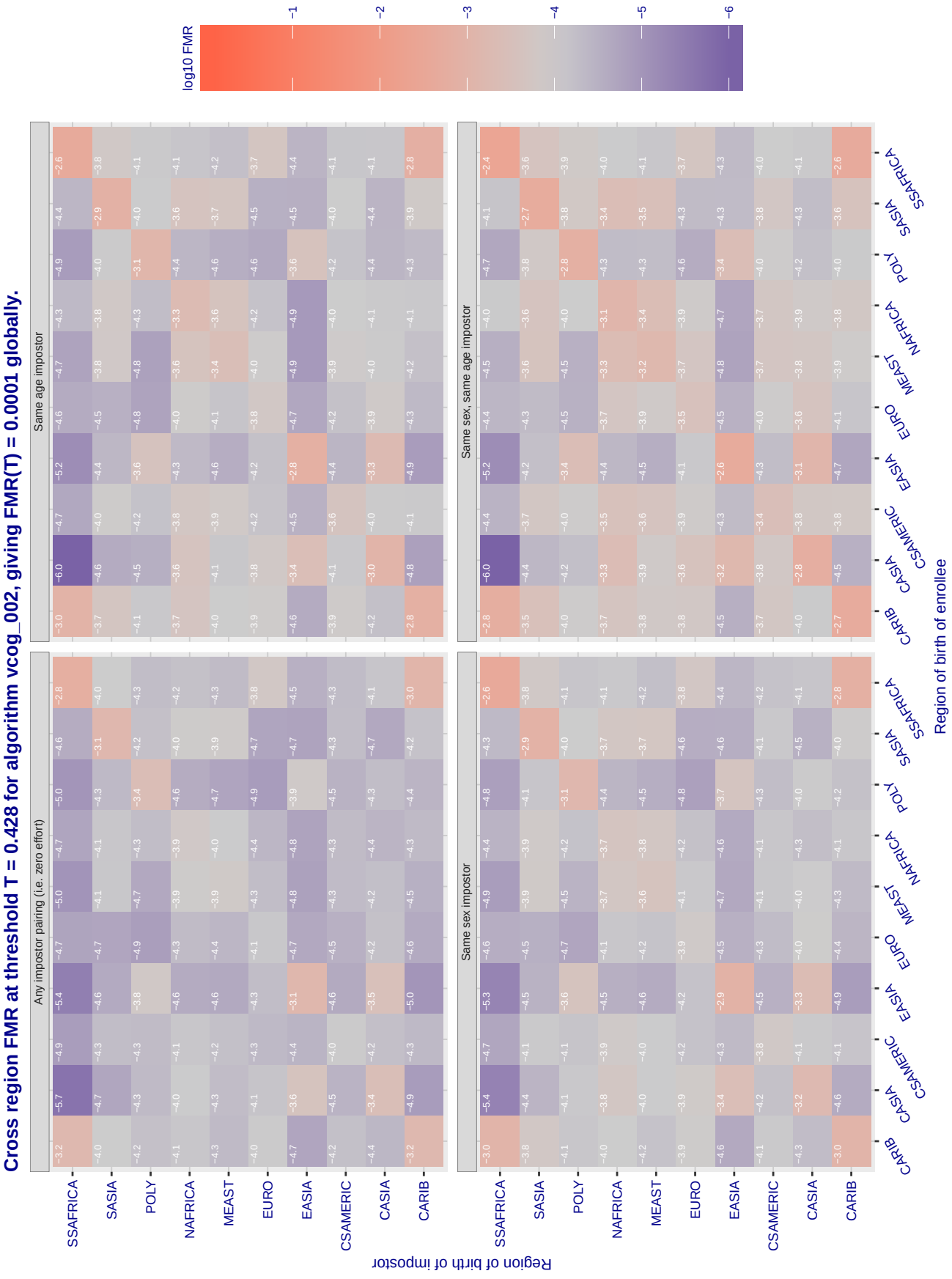


Figure 276: For algorithm vcog-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 277: For algorithm vd-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

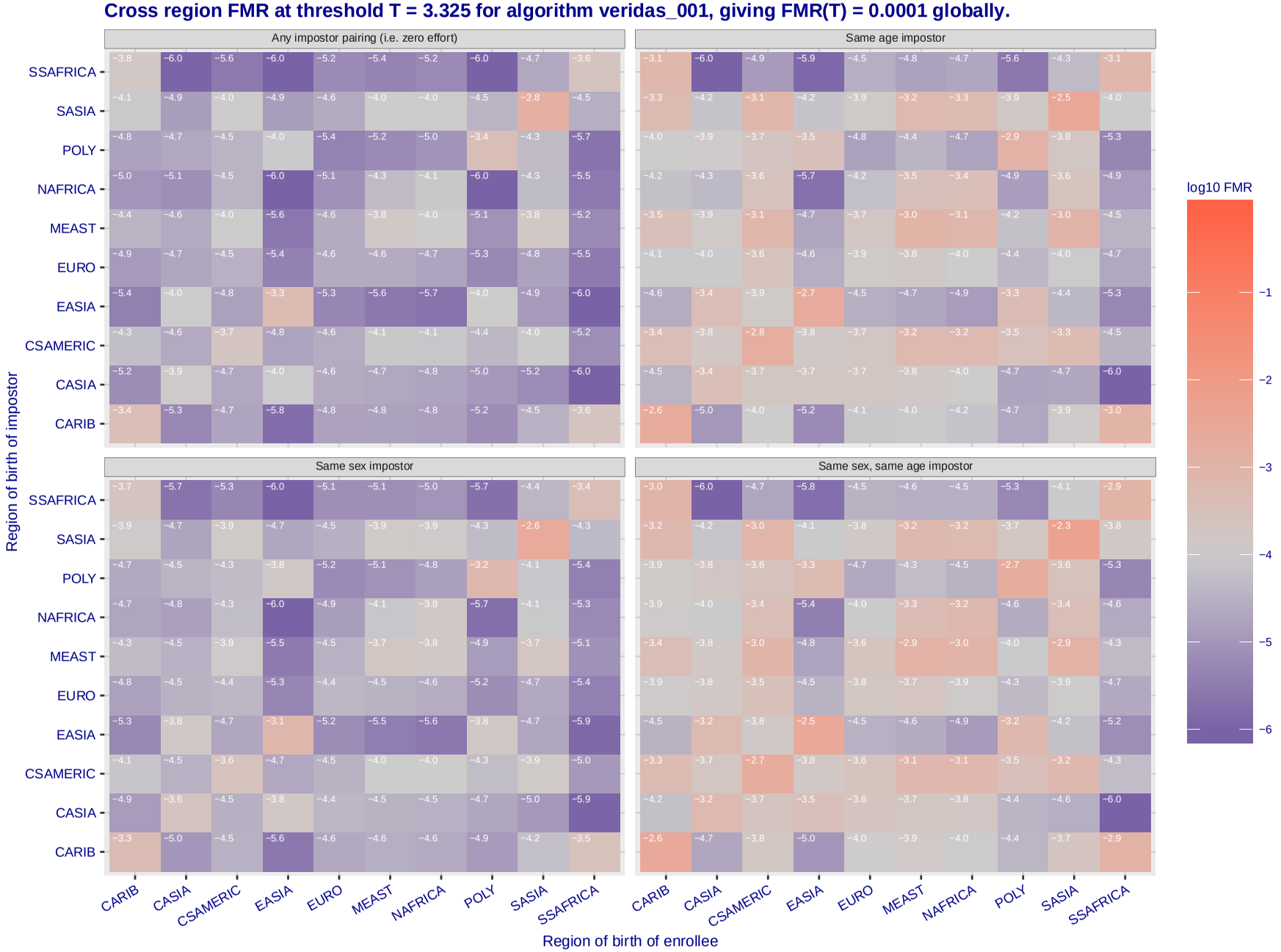


Figure 278: For algorithm veridas-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

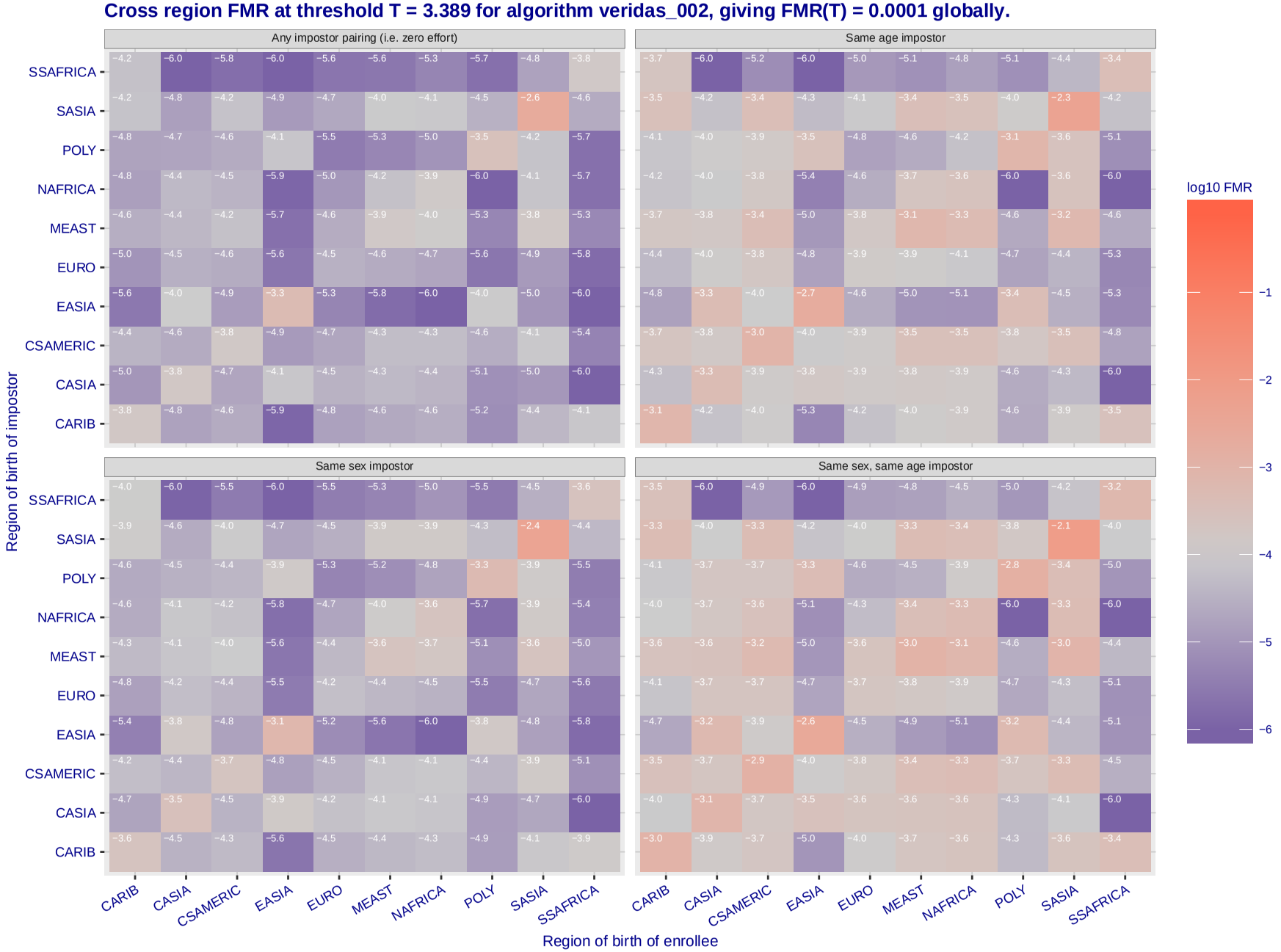


Figure 279: For algorithm veridas-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

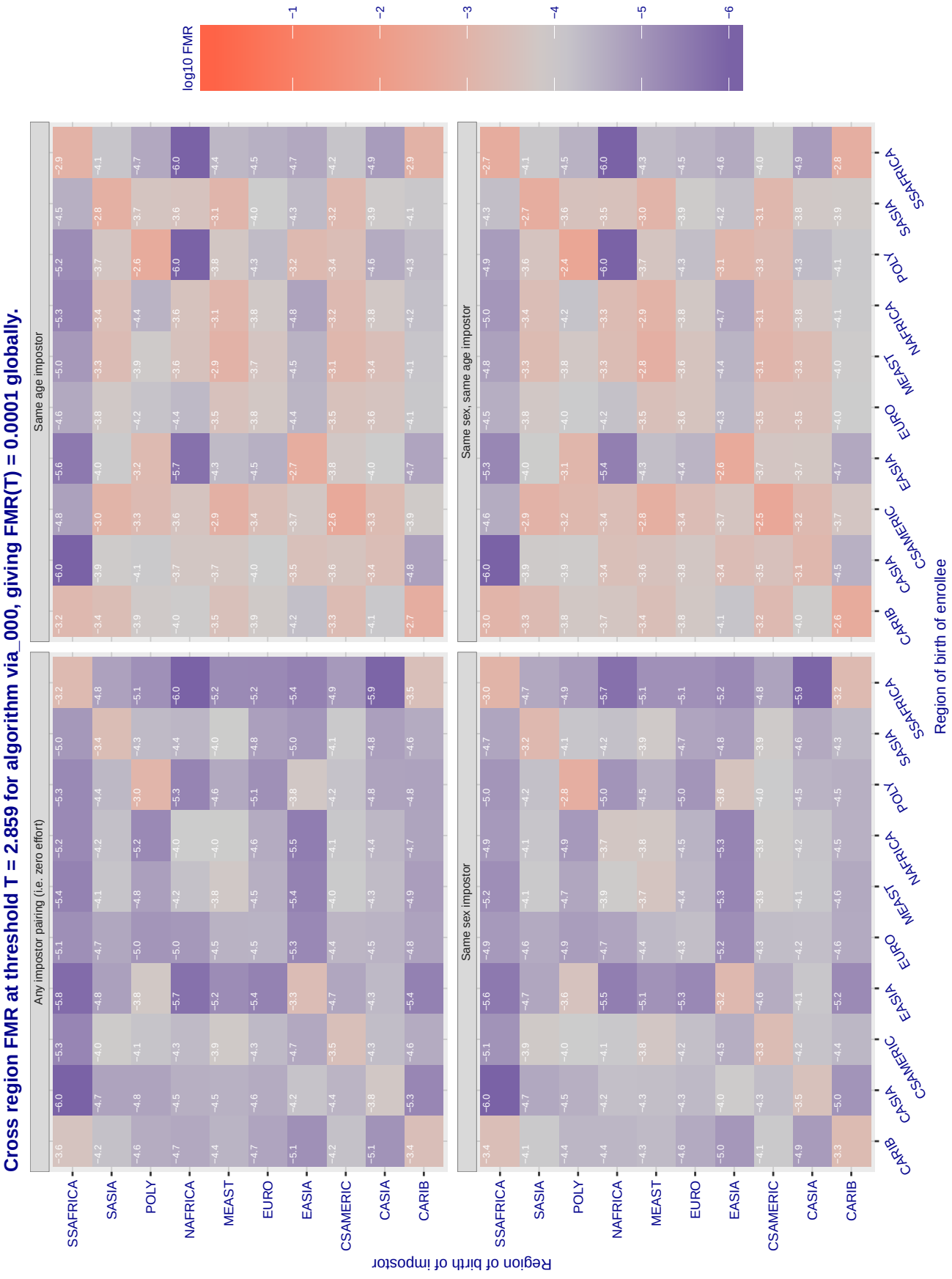


Figure 280: For algorithm via-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

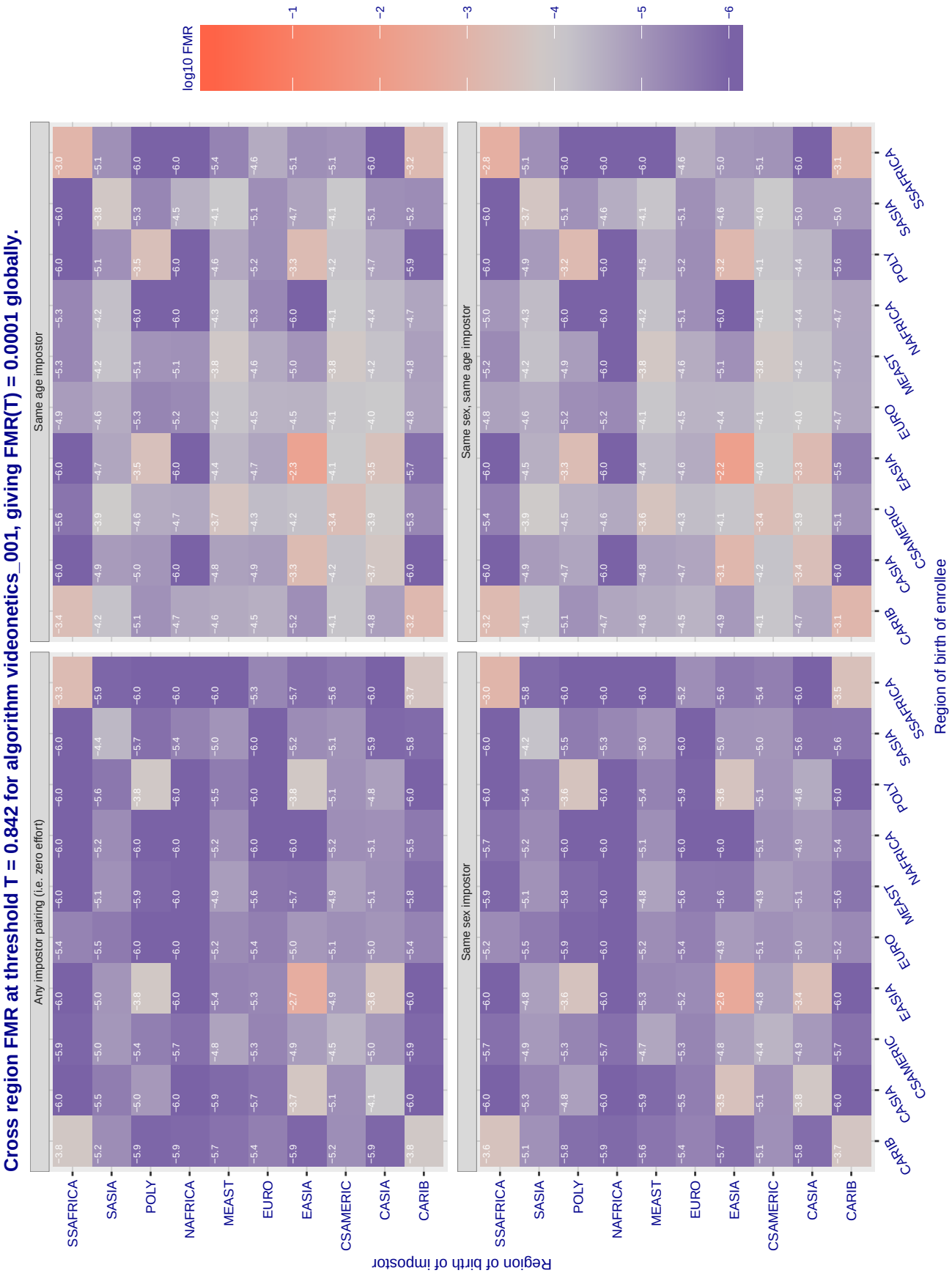


Figure 281: For algorithm videonetics-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

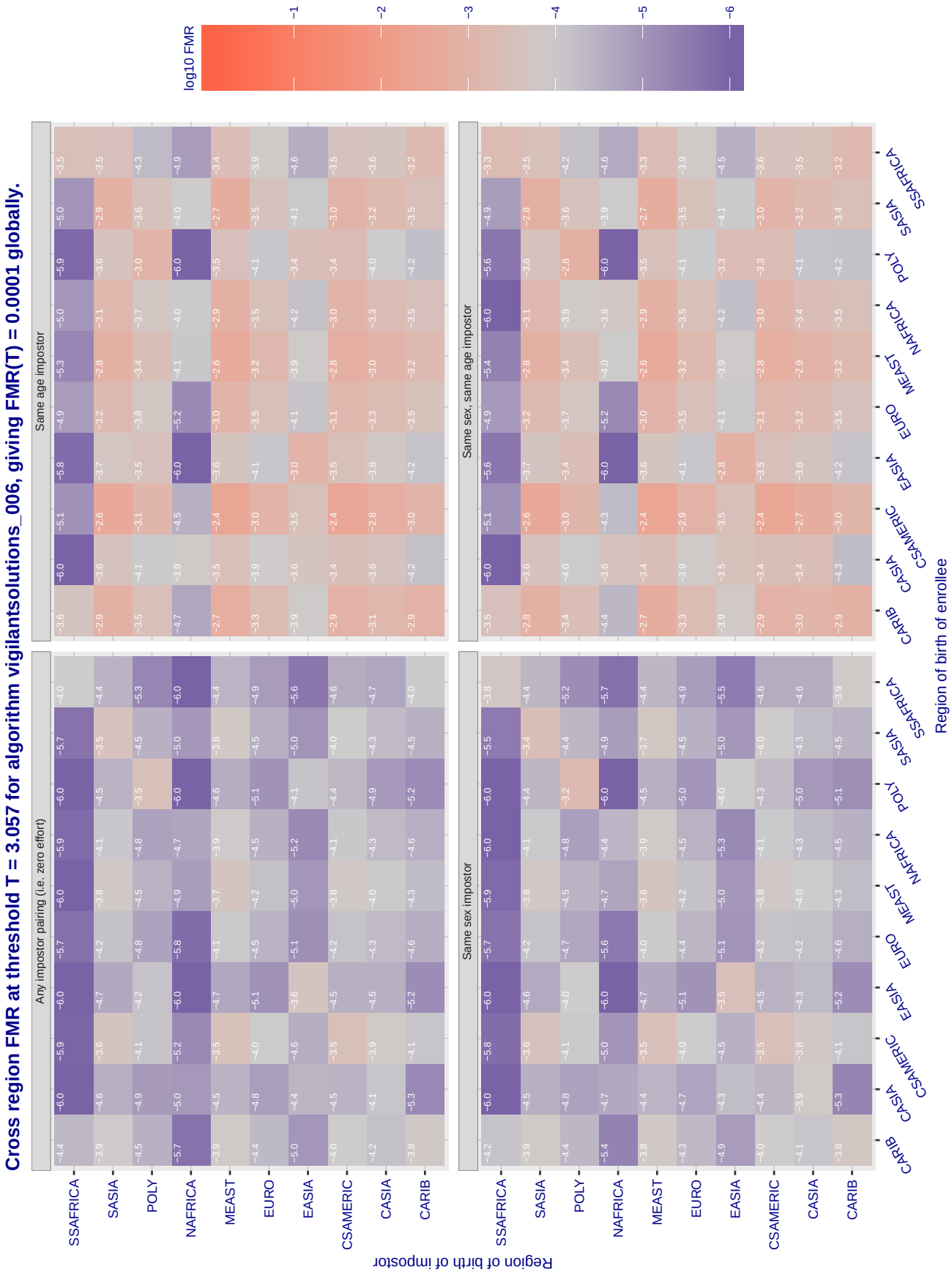


Figure 282: For algorithm vigilantsolutions-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

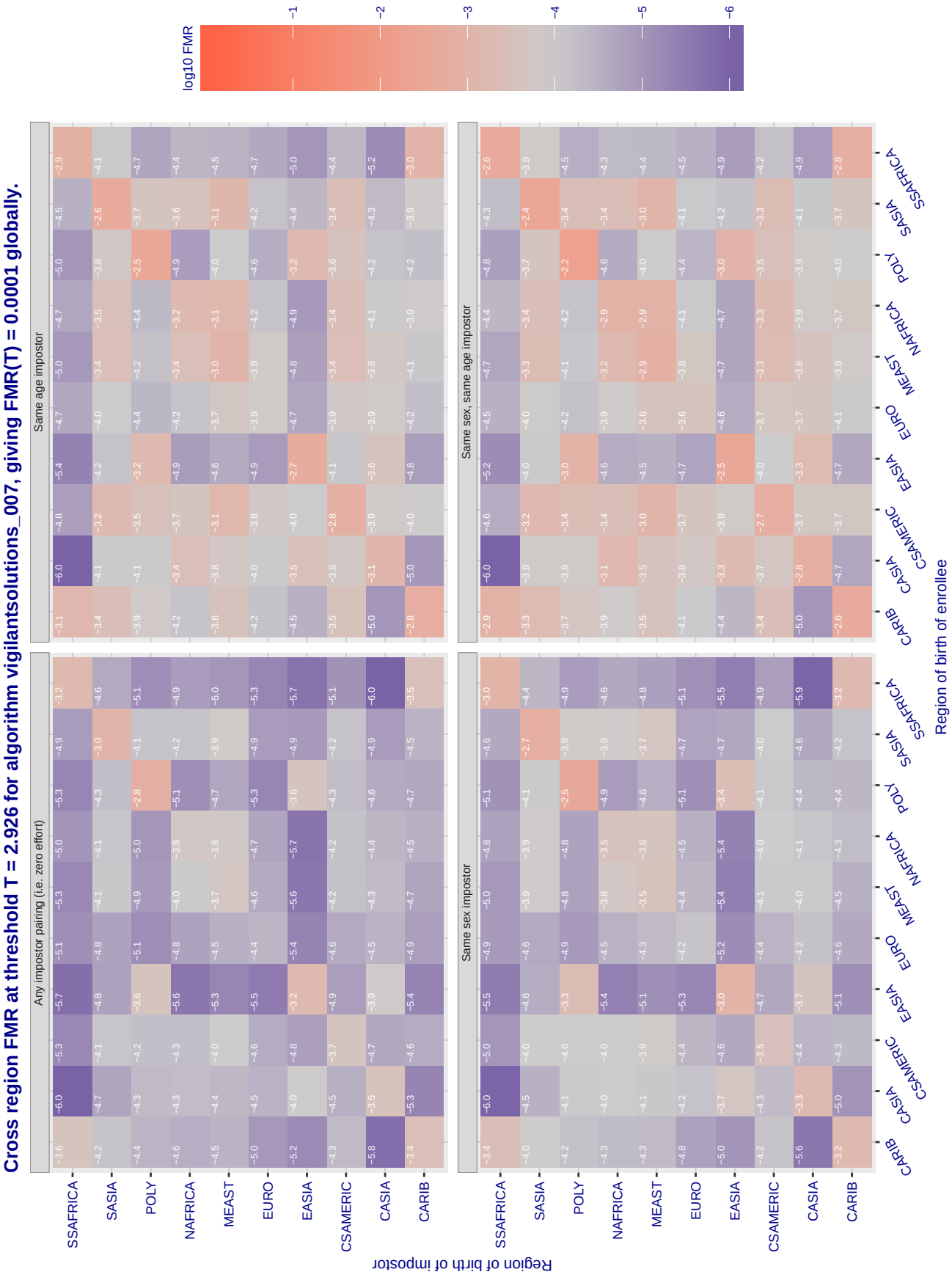


Figure 283: For algorithm vigilantsolutions-007 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 284: For algorithm vion-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

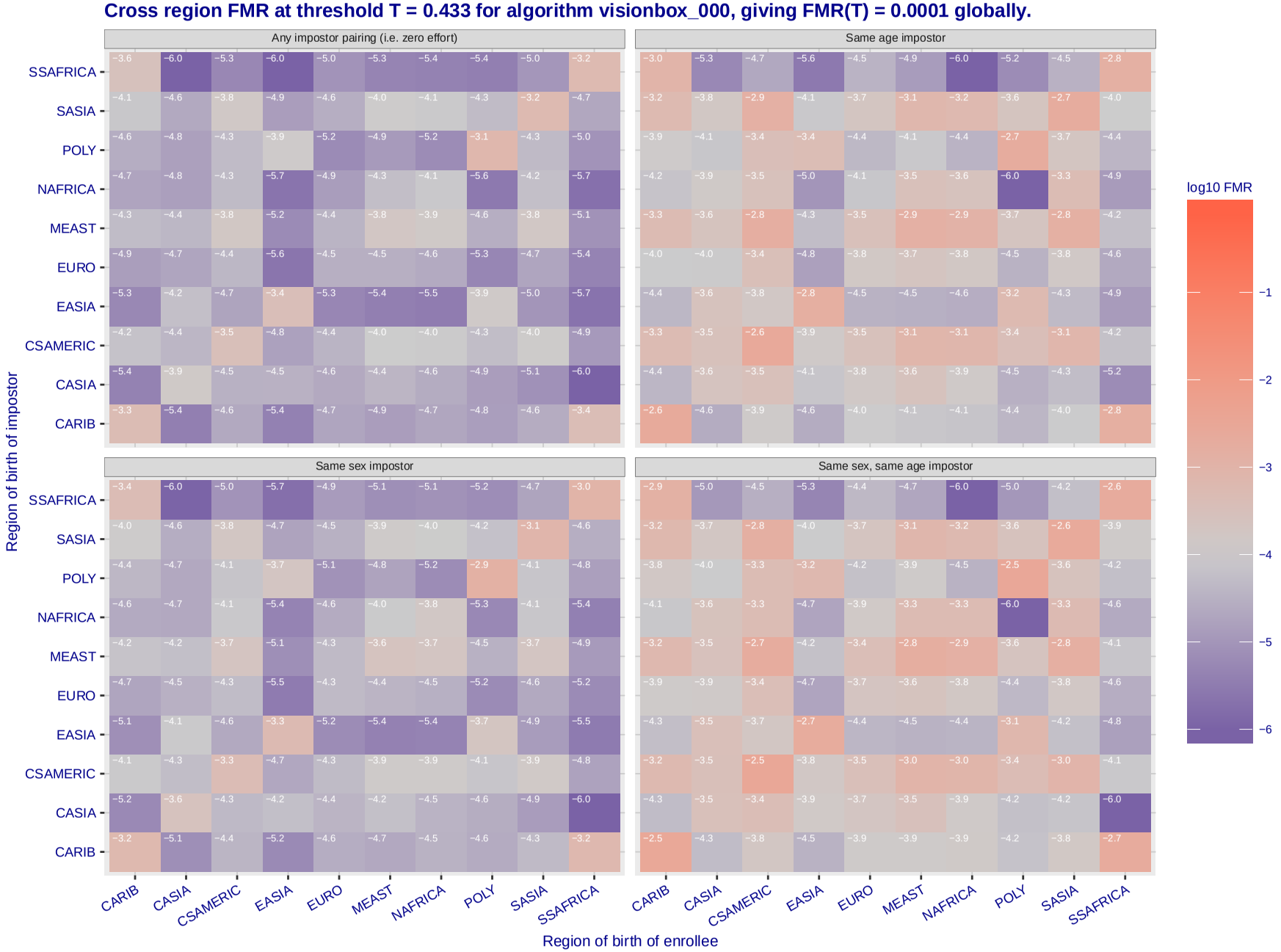


Figure 285: For algorithm visionbox-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

Figure 286: For algorithm visionbox-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

Figure 287: For algorithm visionlabs-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

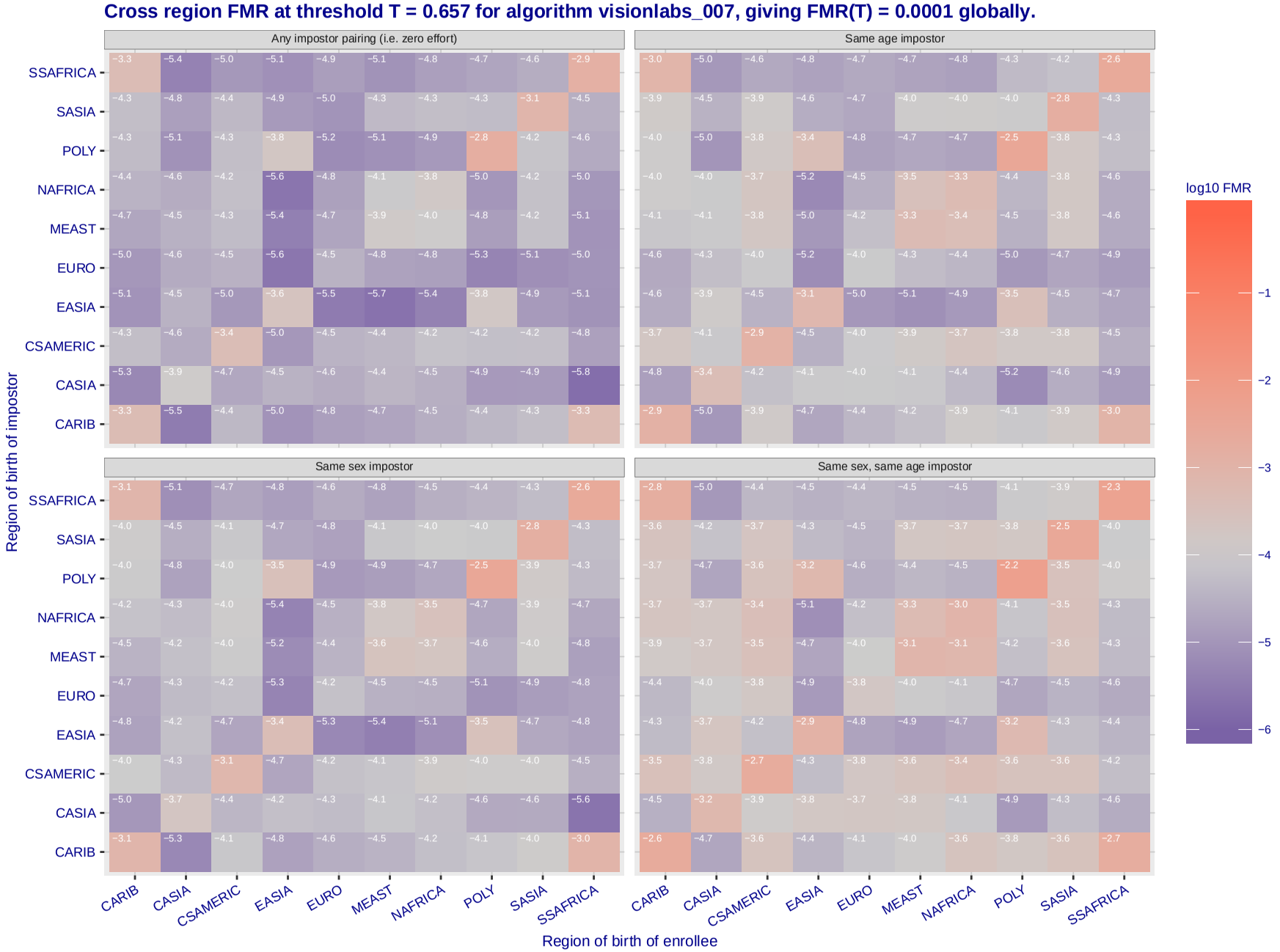


Figure 288: For algorithm visionlabs-007 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

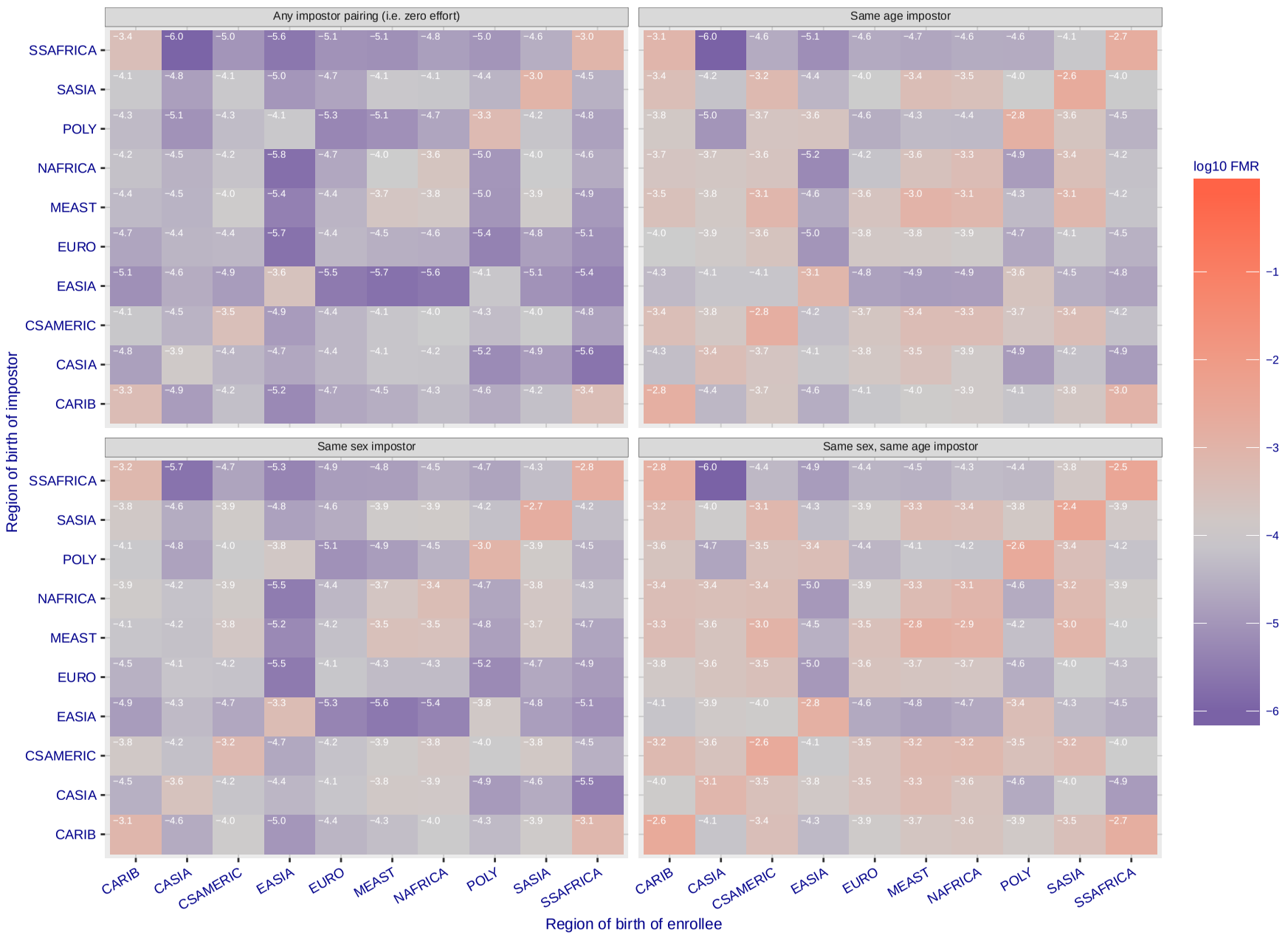


Figure 289: For algorithm vocord-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

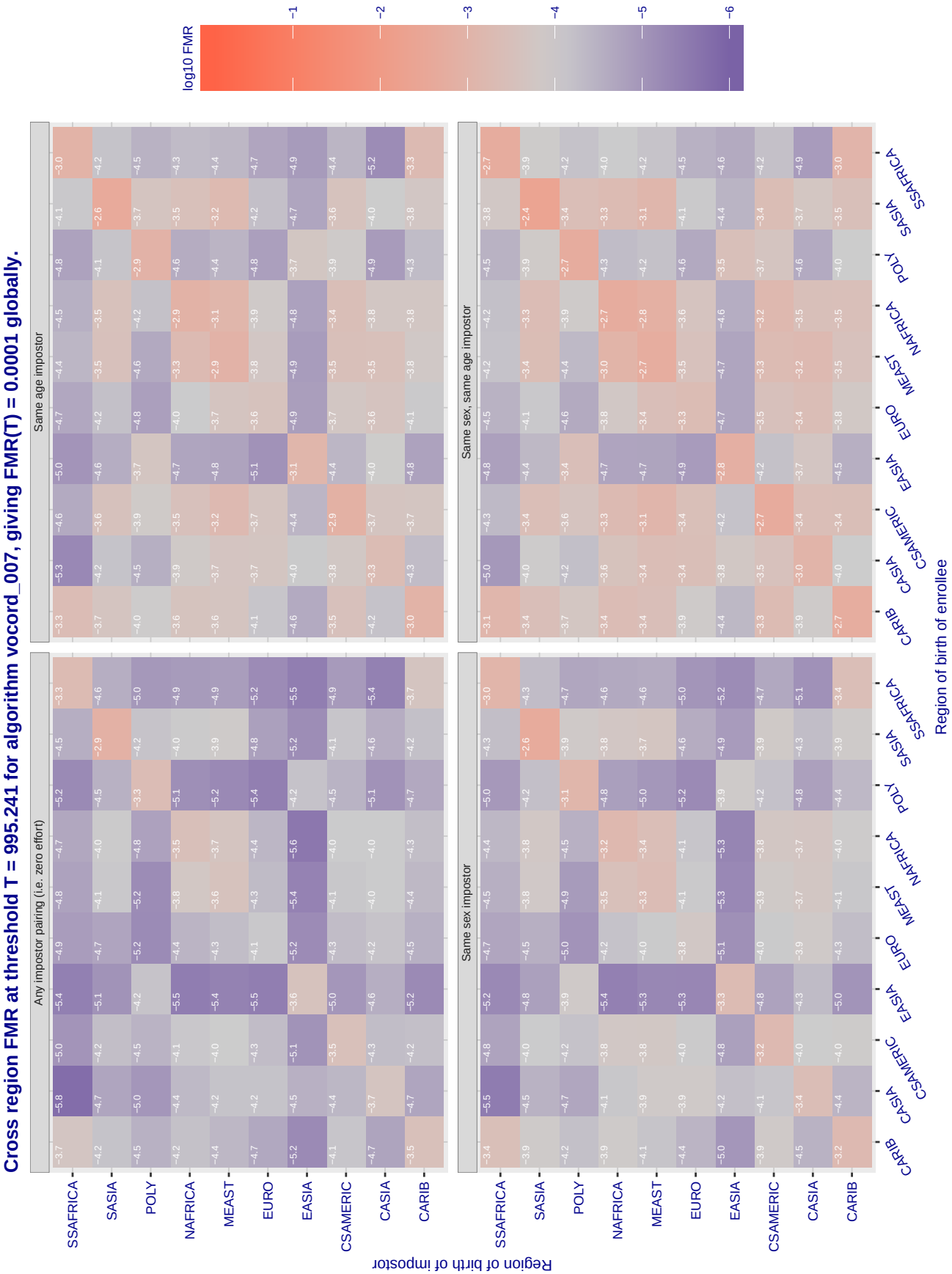


Figure 290: For algorithm vocord-007 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Figure 291: For algorithm winsense-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

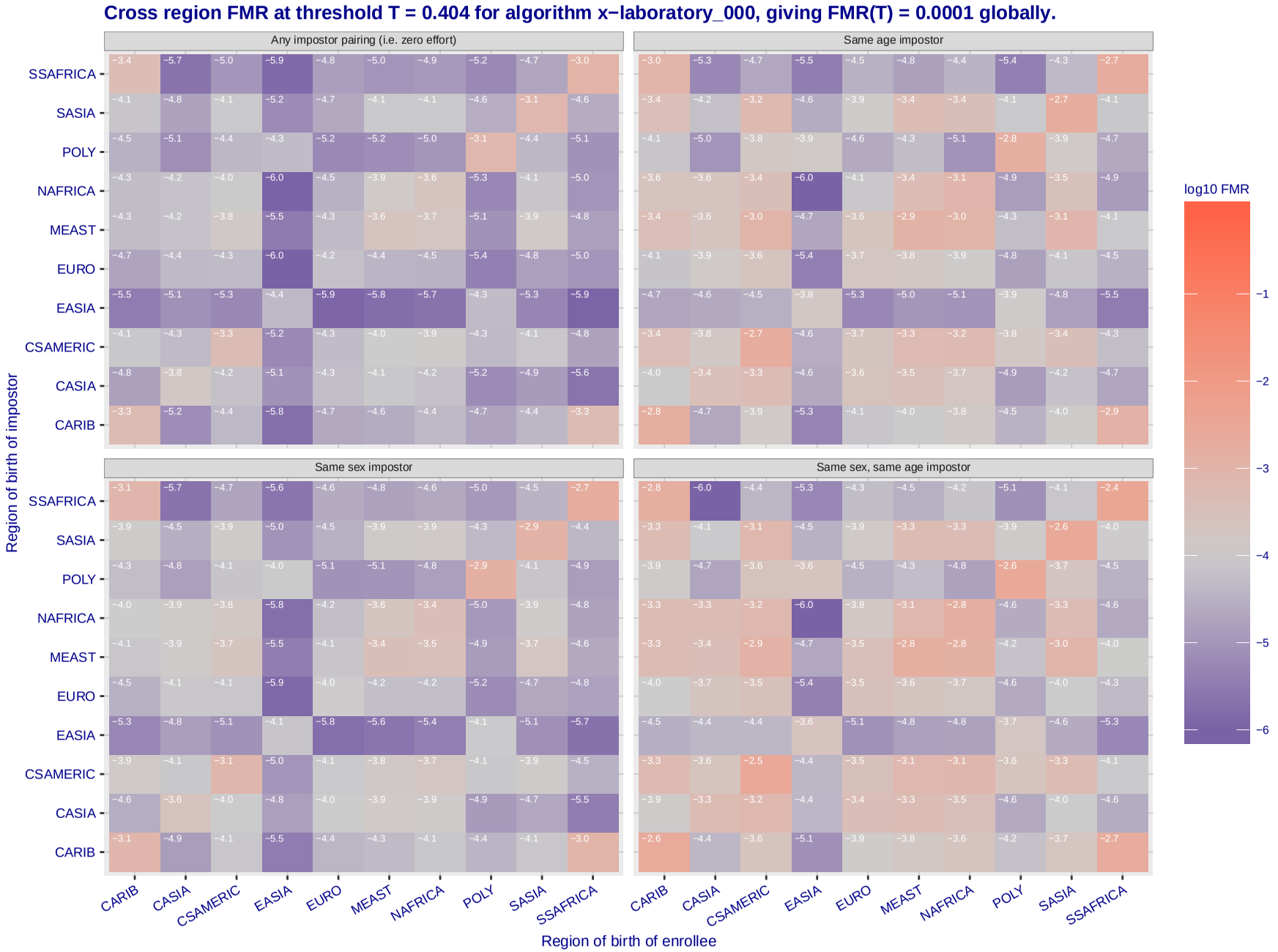


Figure 292: For algorithm x-laboratory-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

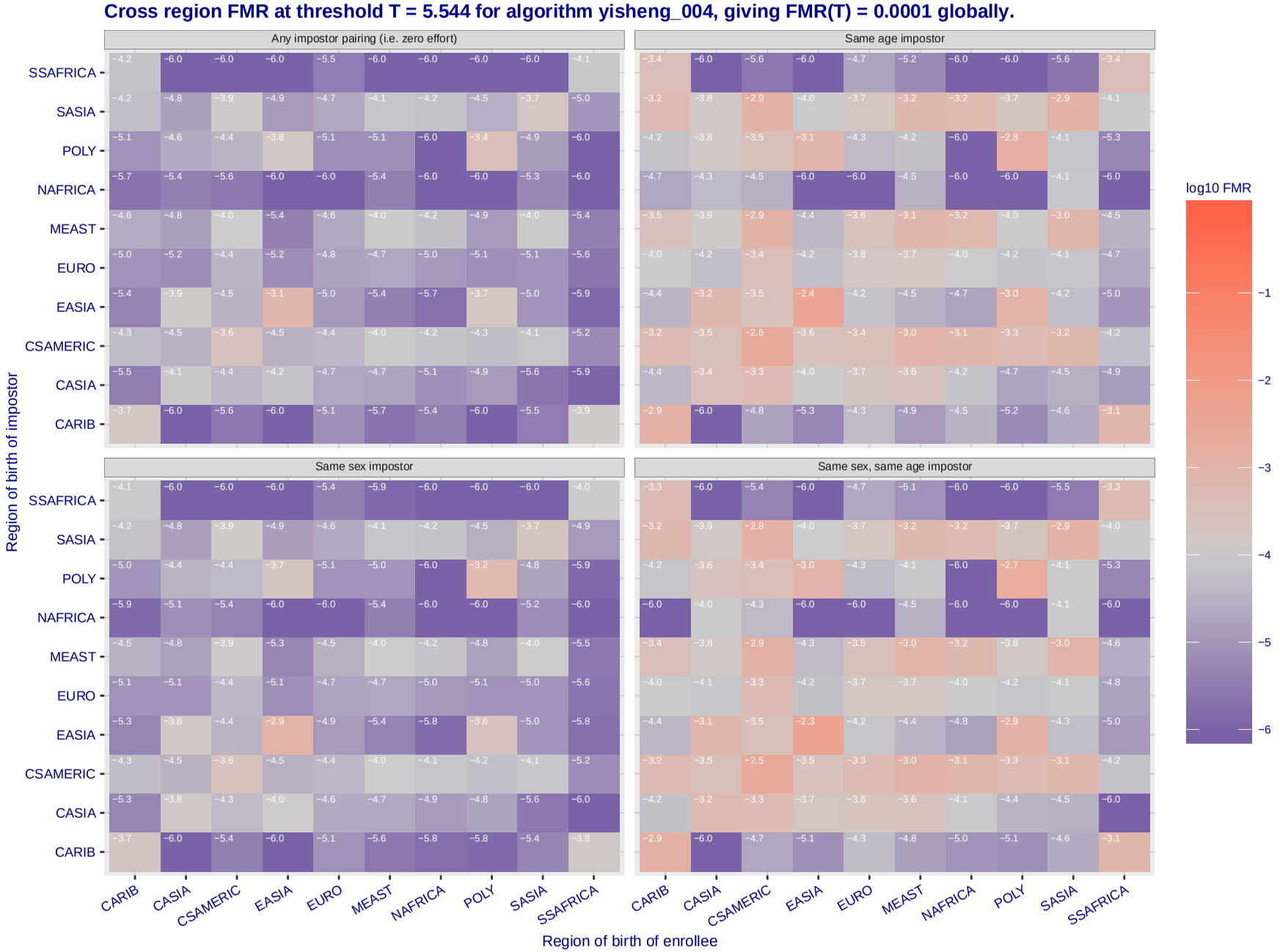


Figure 293: For algorithm yisheng-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

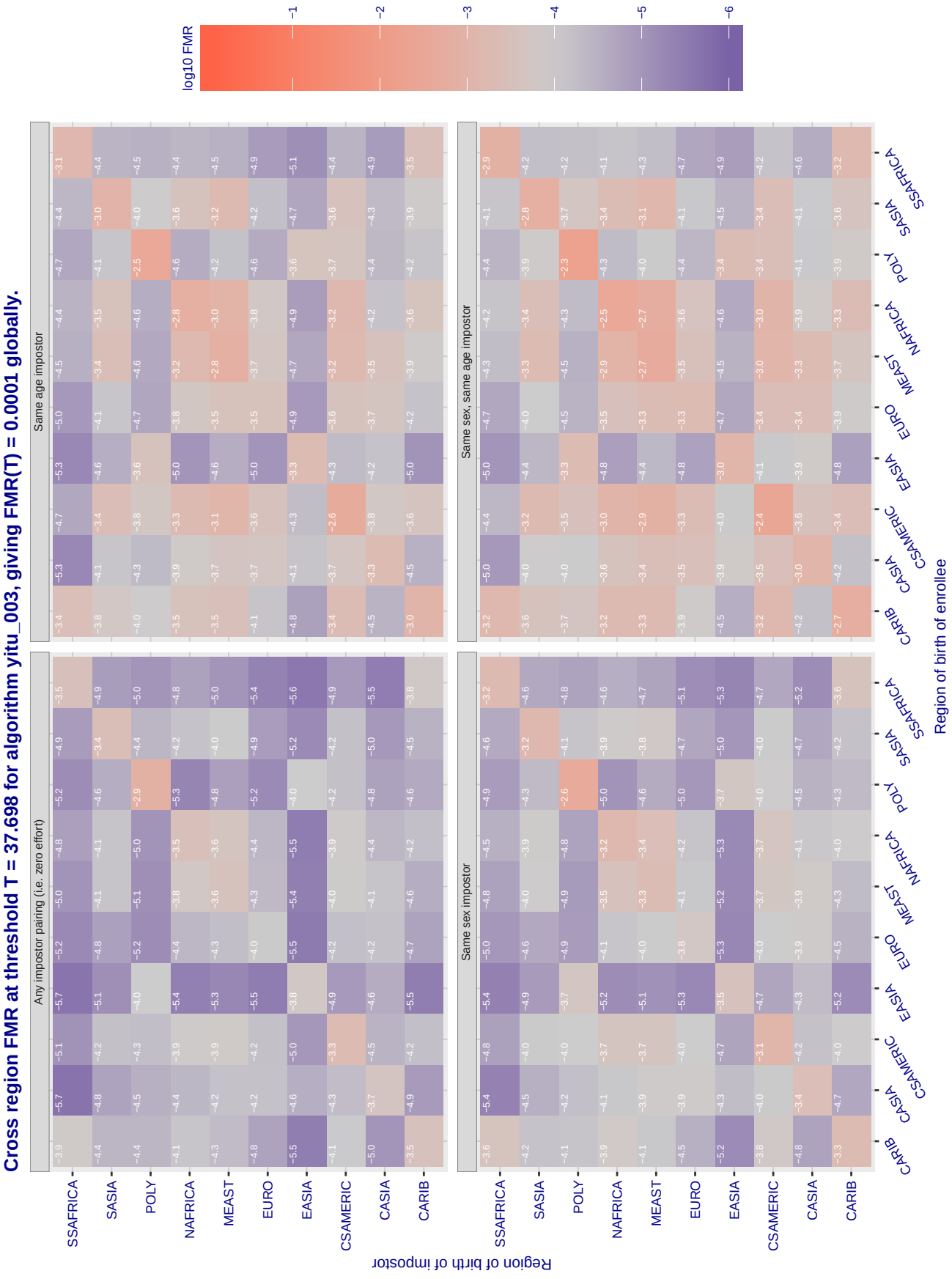


Figure 294: For algorithm yitu-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given region pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

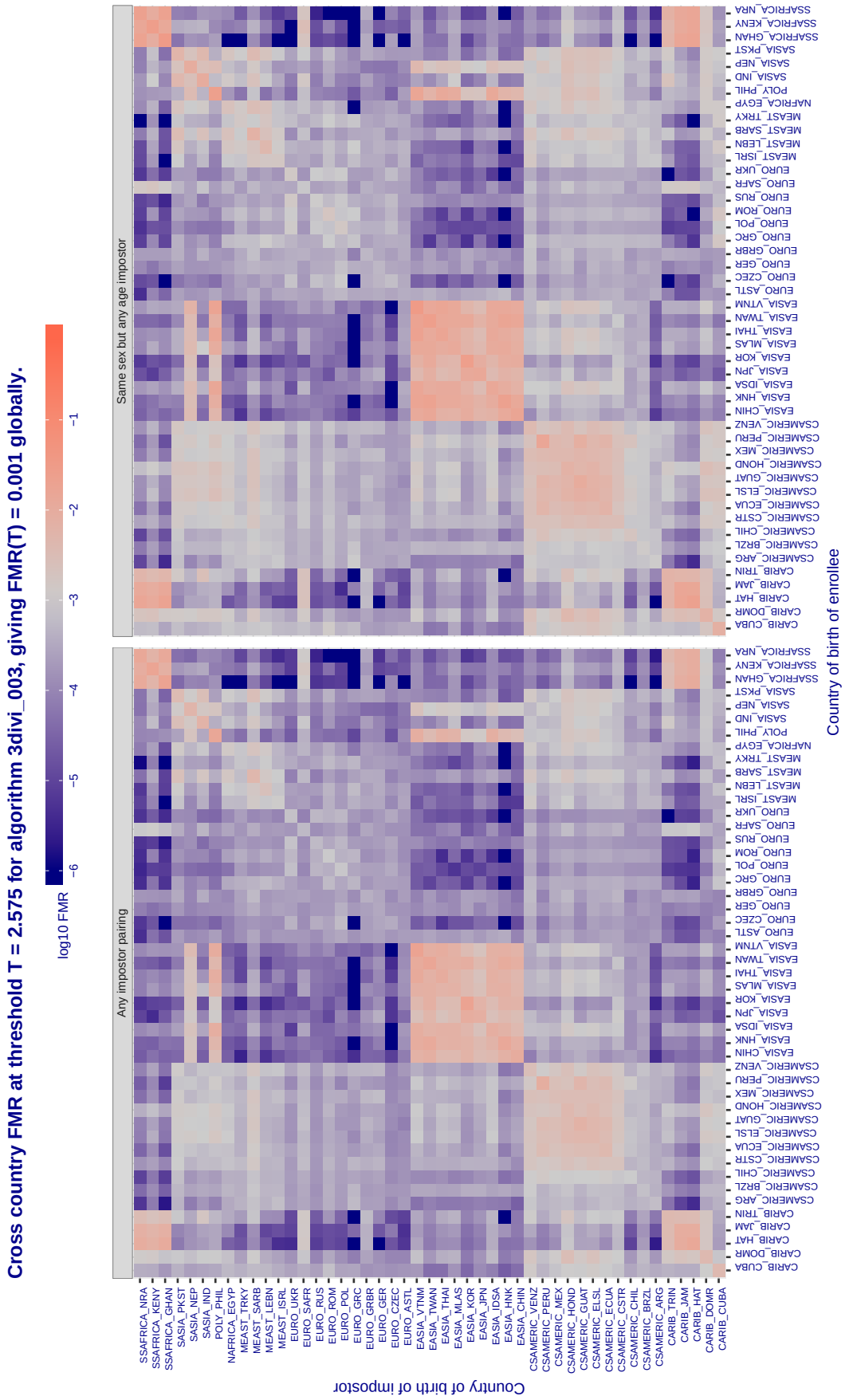


Figure 295: For algorithm 3divi-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

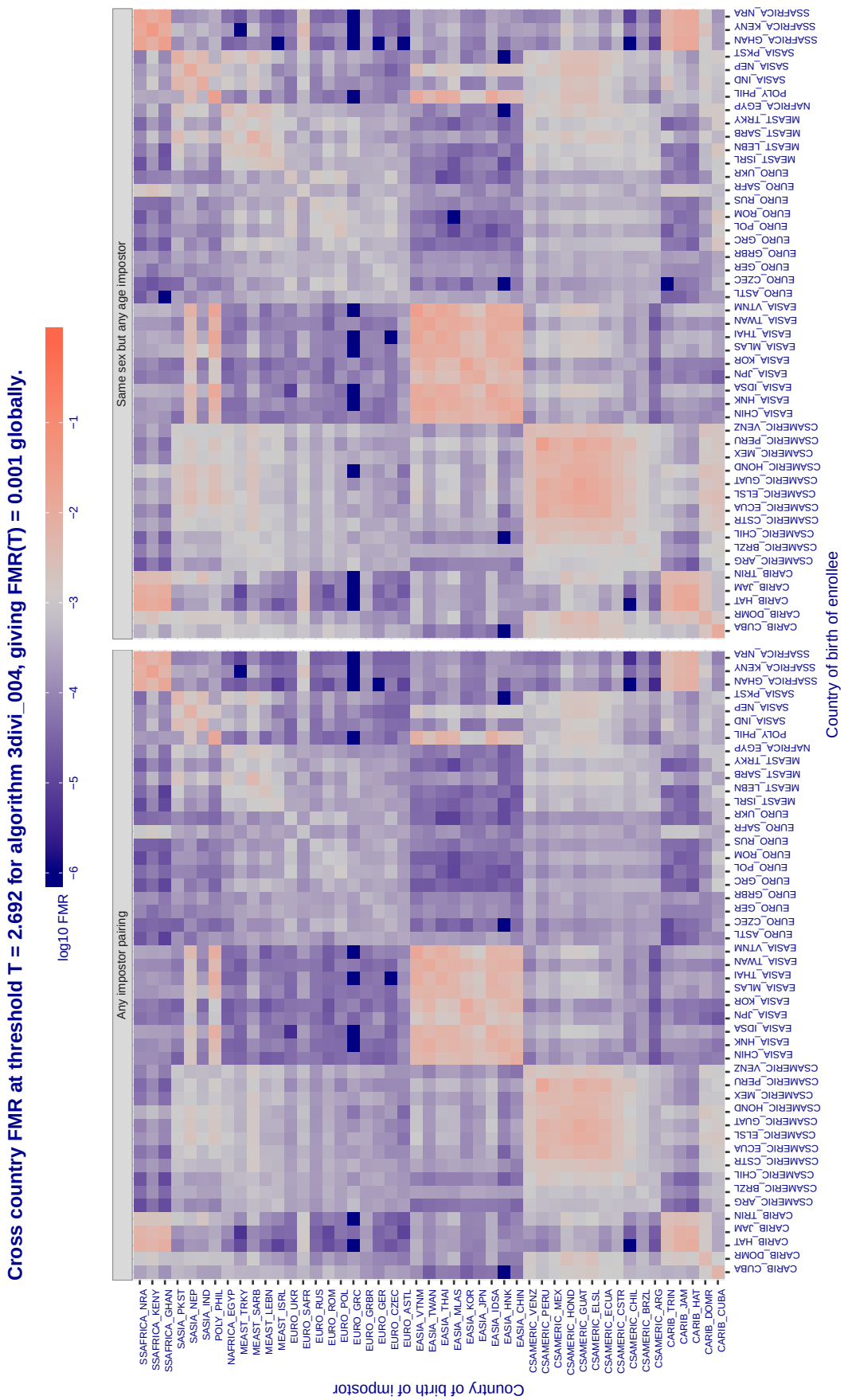


Figure 296: For algorithm 3divi-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

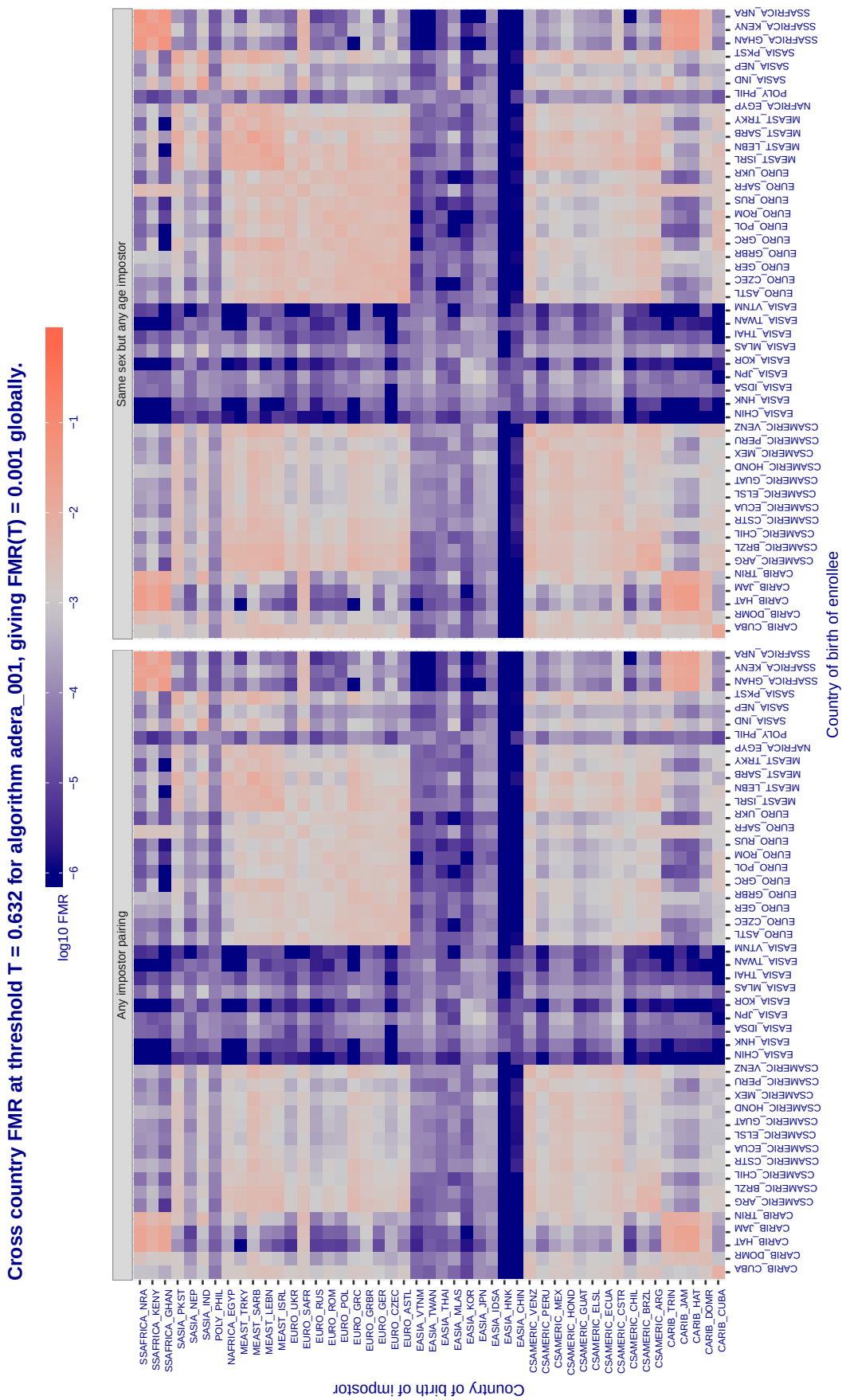


Figure 297: For algorithm adera-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

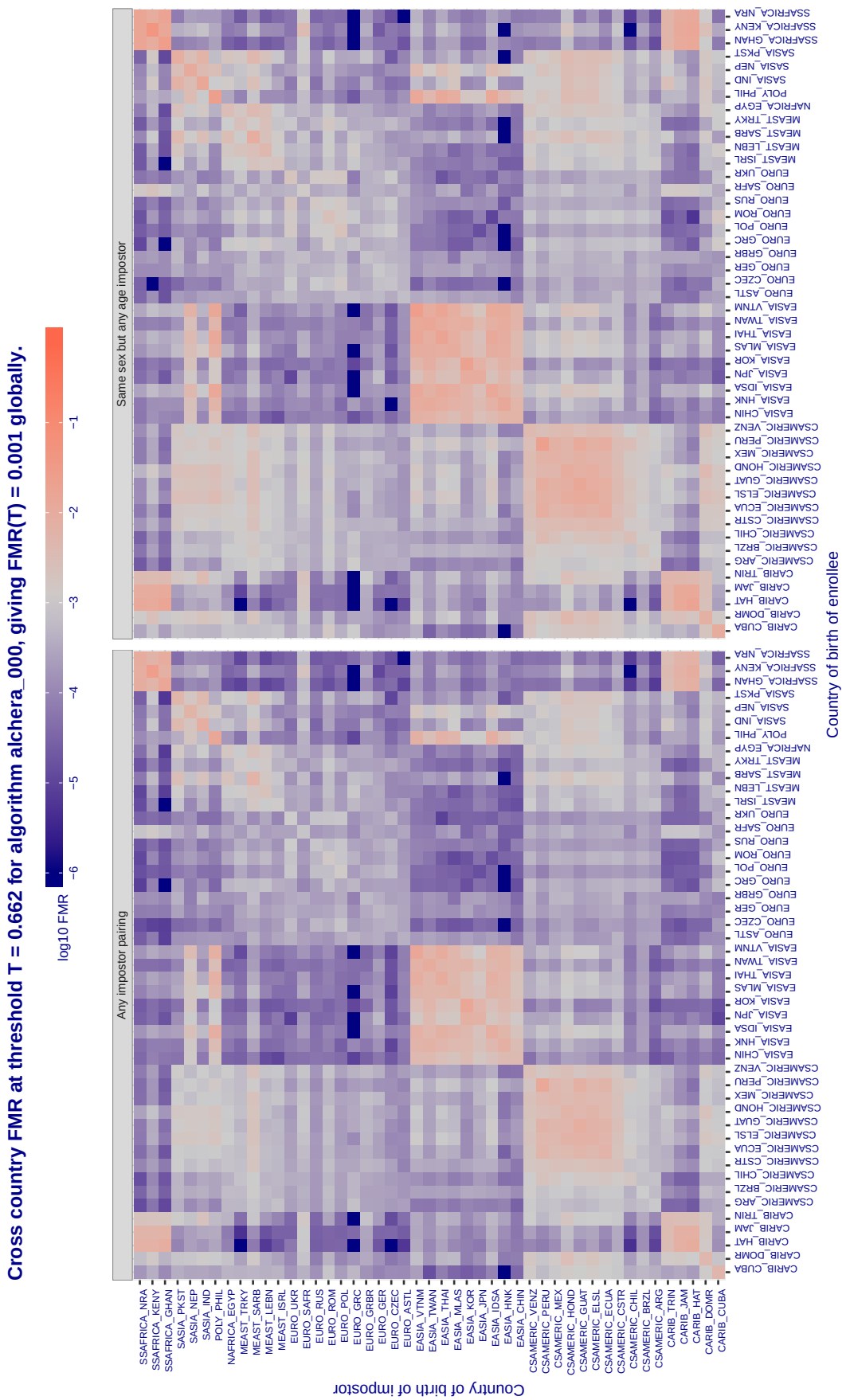


Figure 298: For algorithm alchera-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

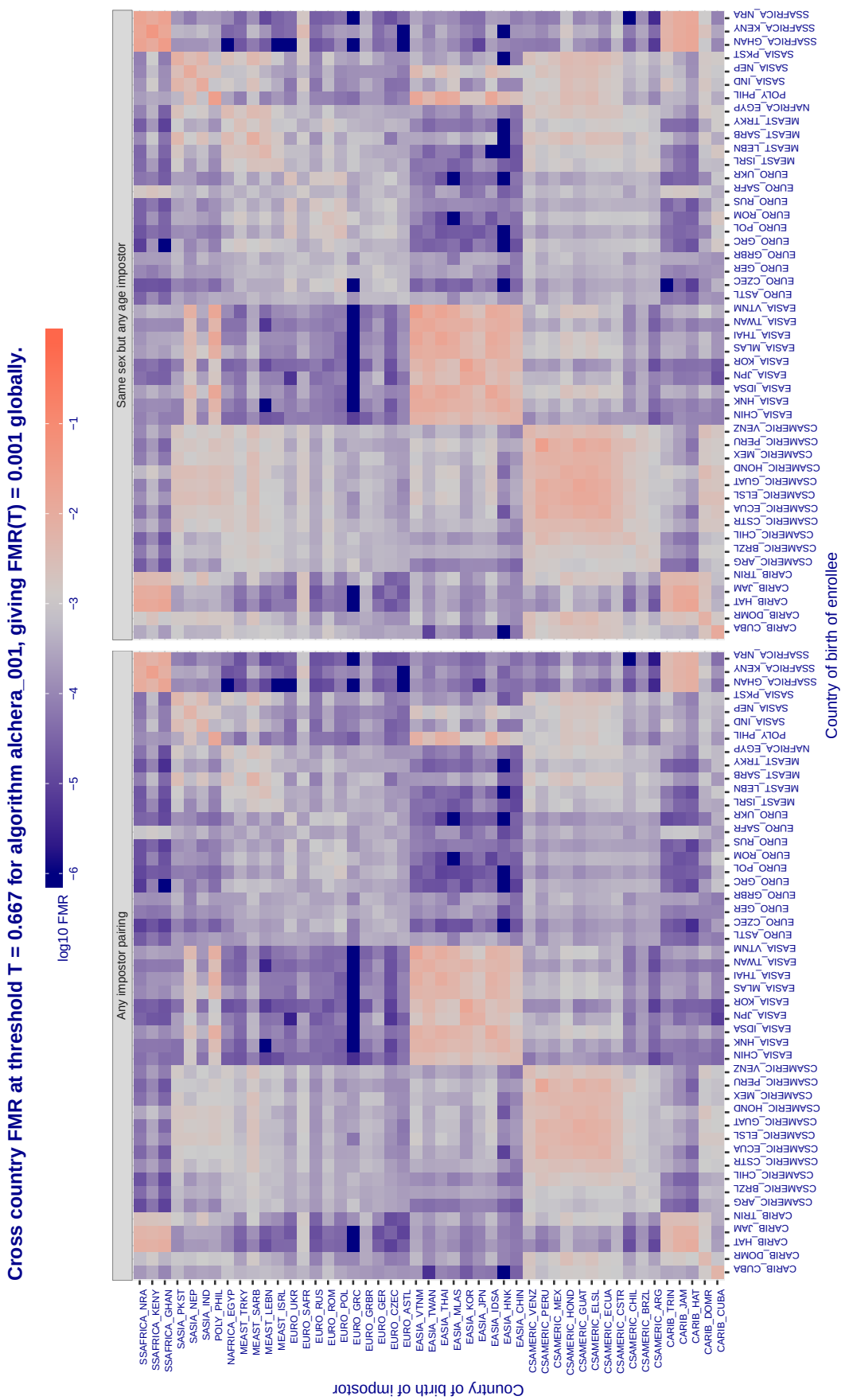


Figure 299: For algorithm alchera-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

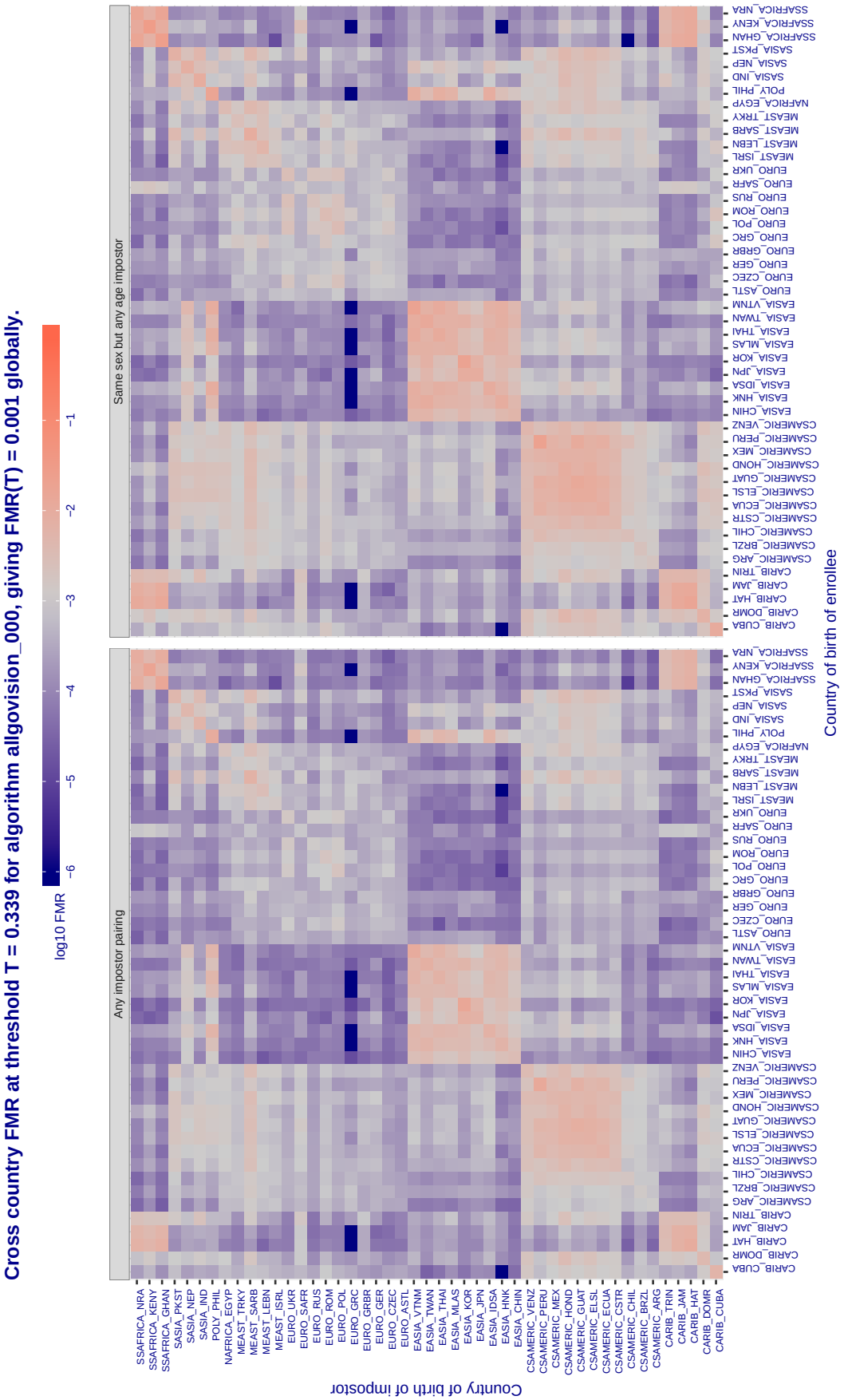


Figure 300: For algorithm allgovision-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

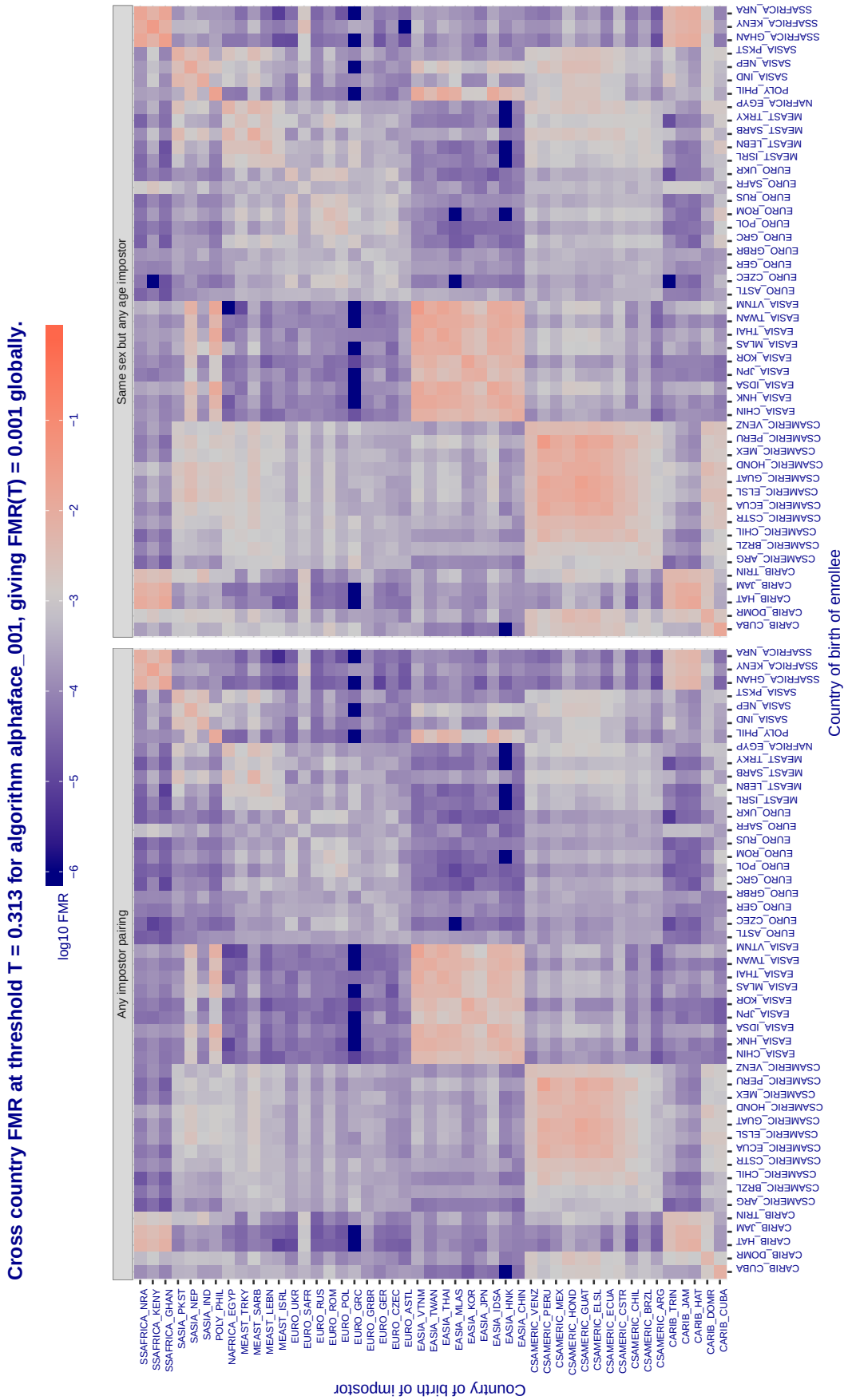


Figure 301: For algorithm alphaface-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

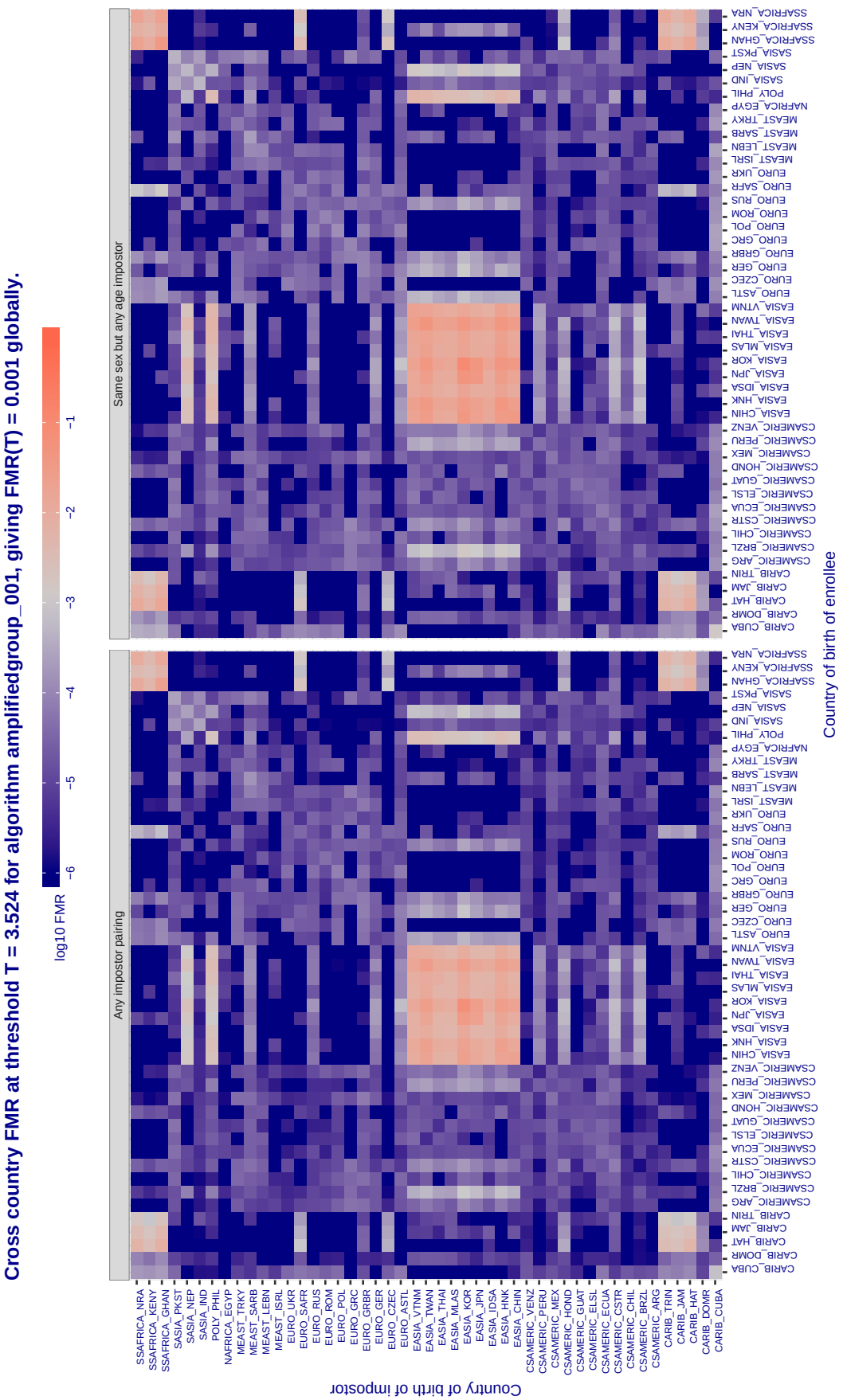


Figure 302: For algorithm amplifiedgroup-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

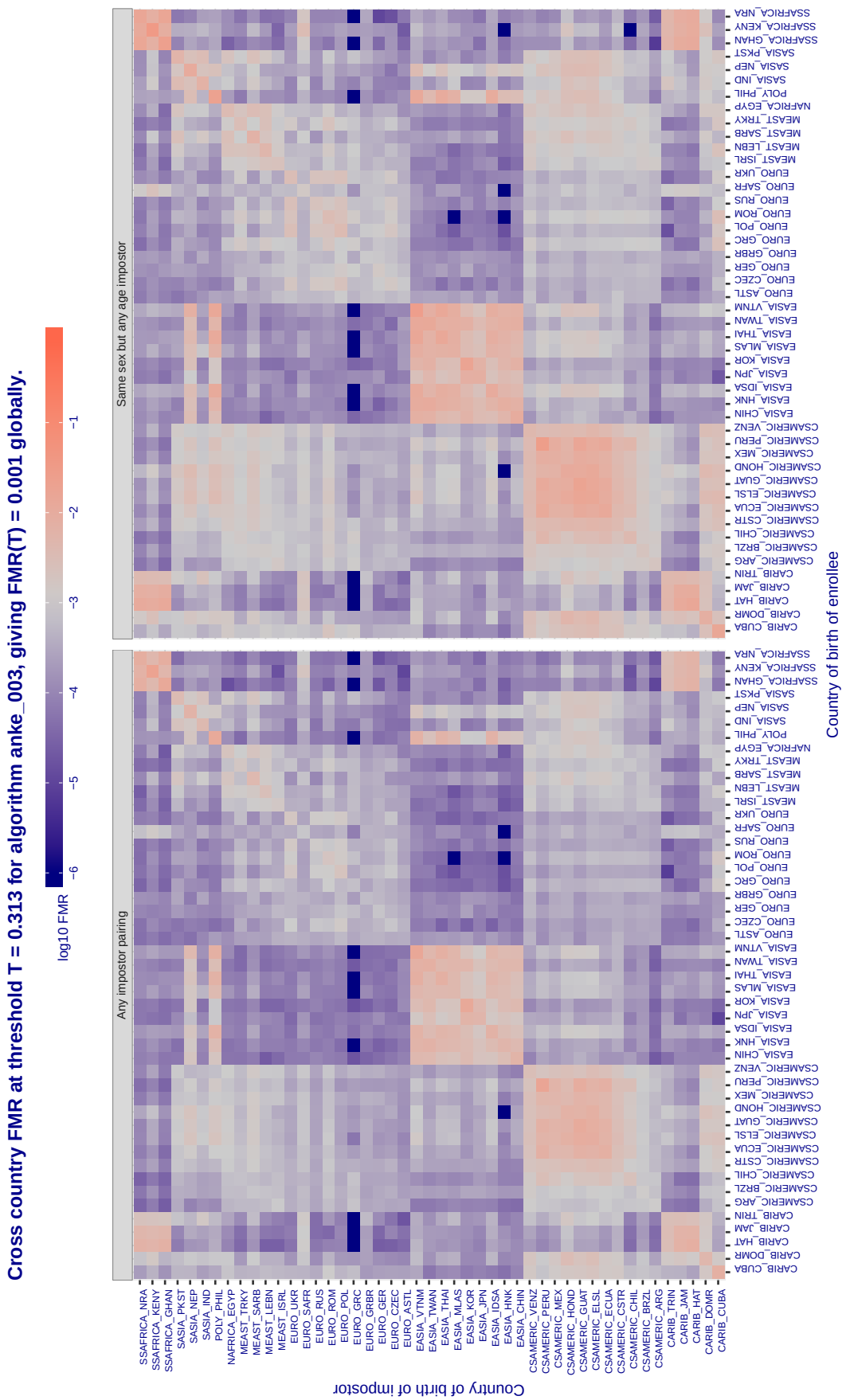


Figure 303: For algorithm anke-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

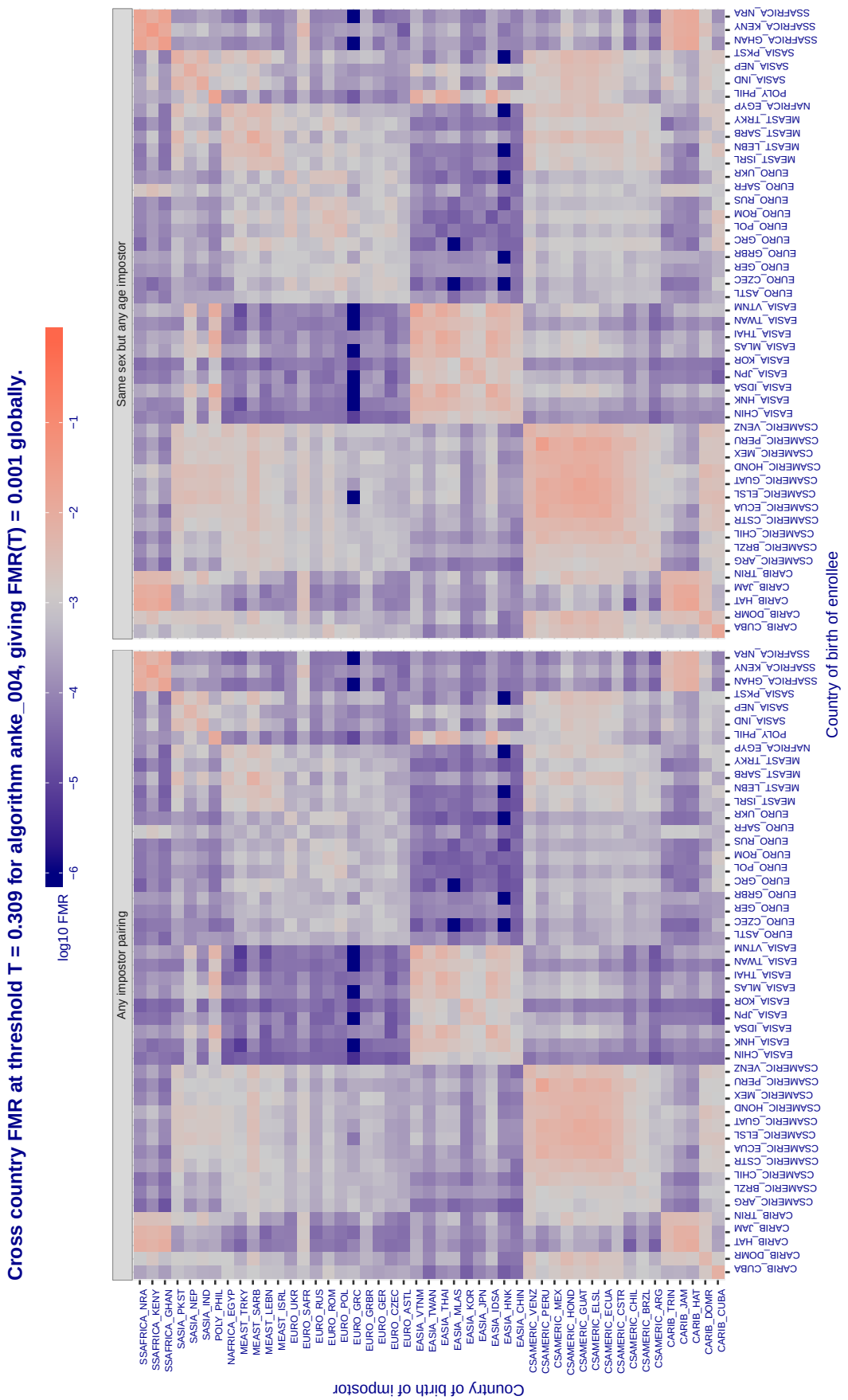


Figure 304: For algorithm anke-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

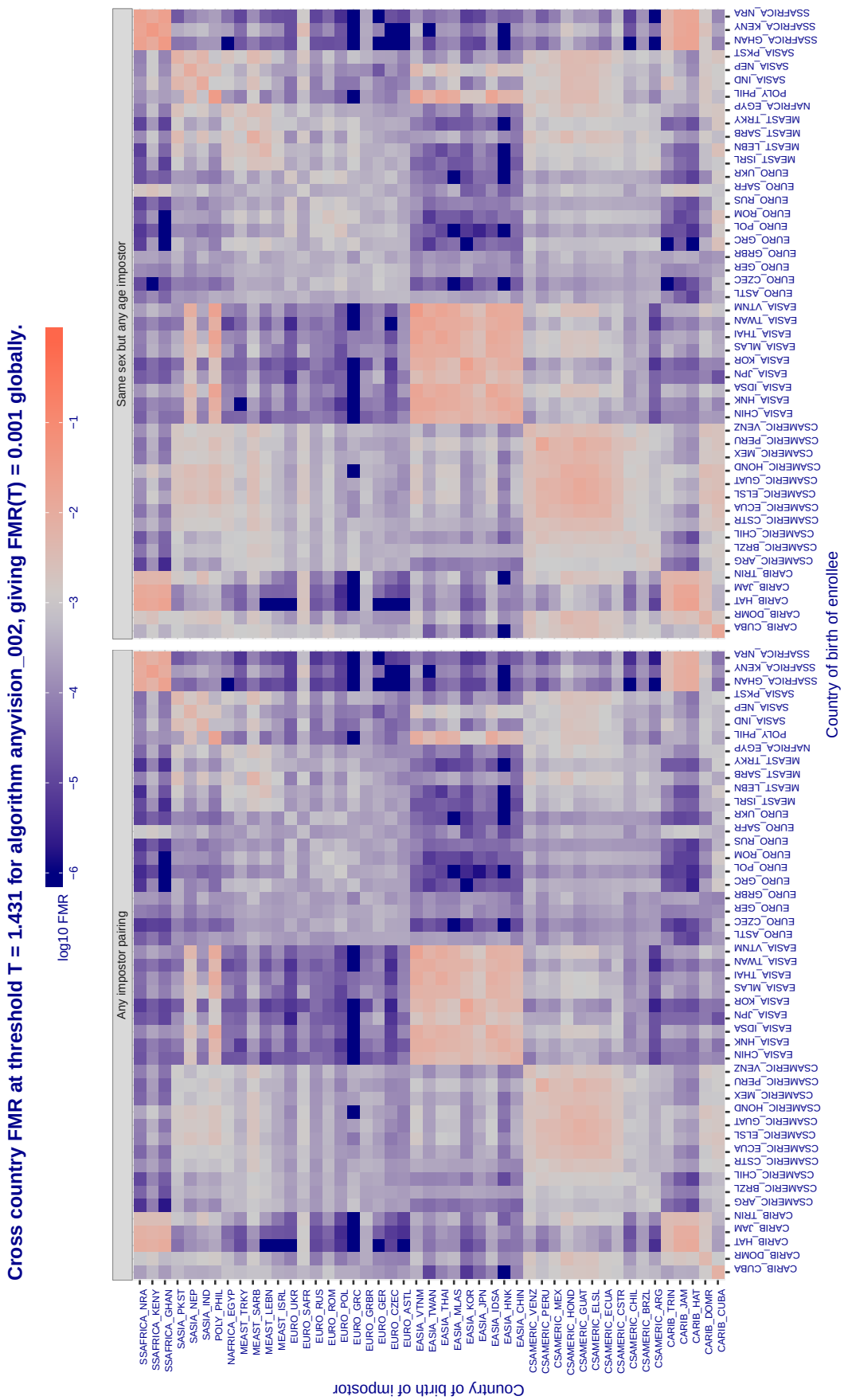


Figure 305: For algorithm anyvision-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

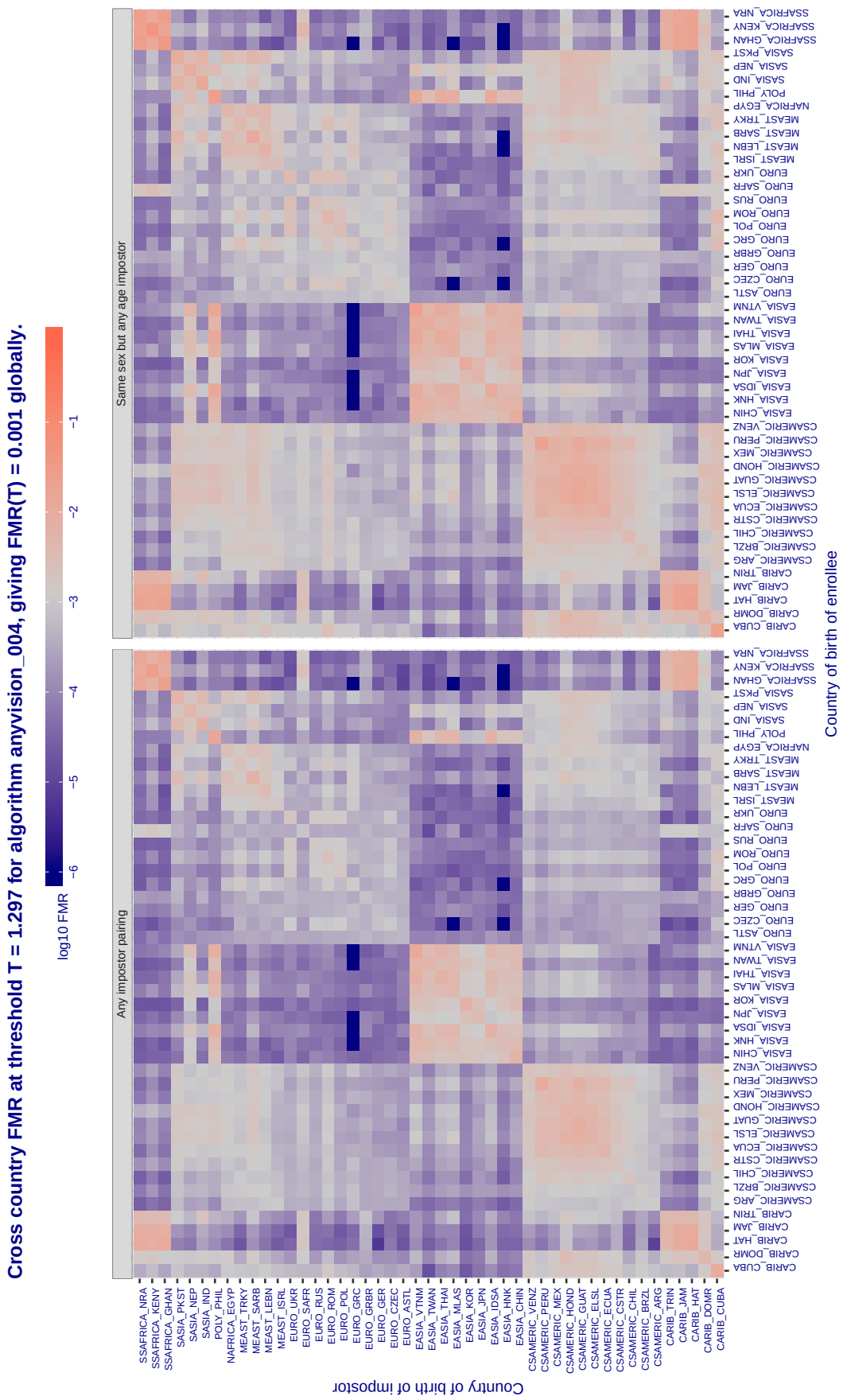


Figure 306: For algorithm anyvision-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

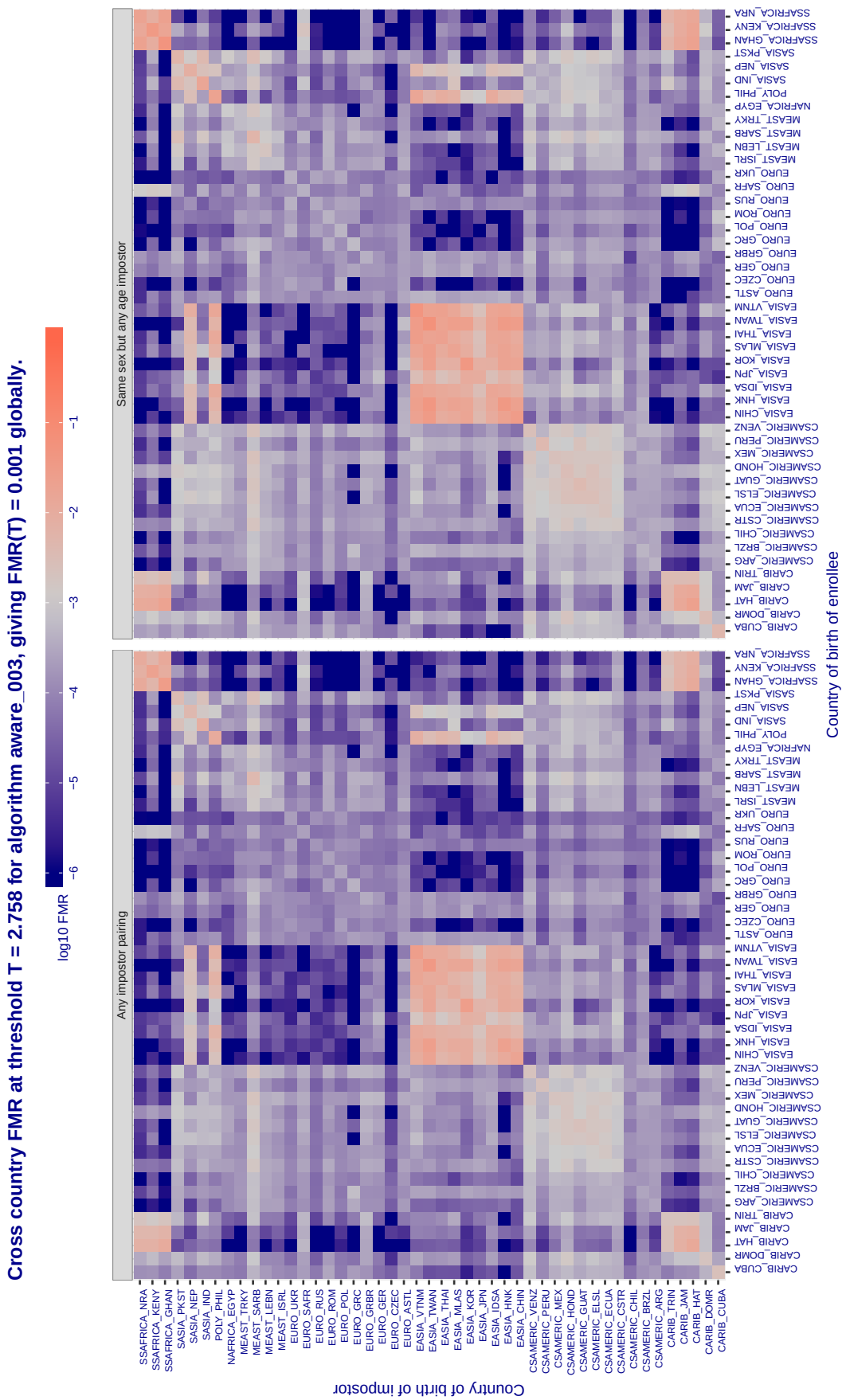


Figure 307: For algorithm aware-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

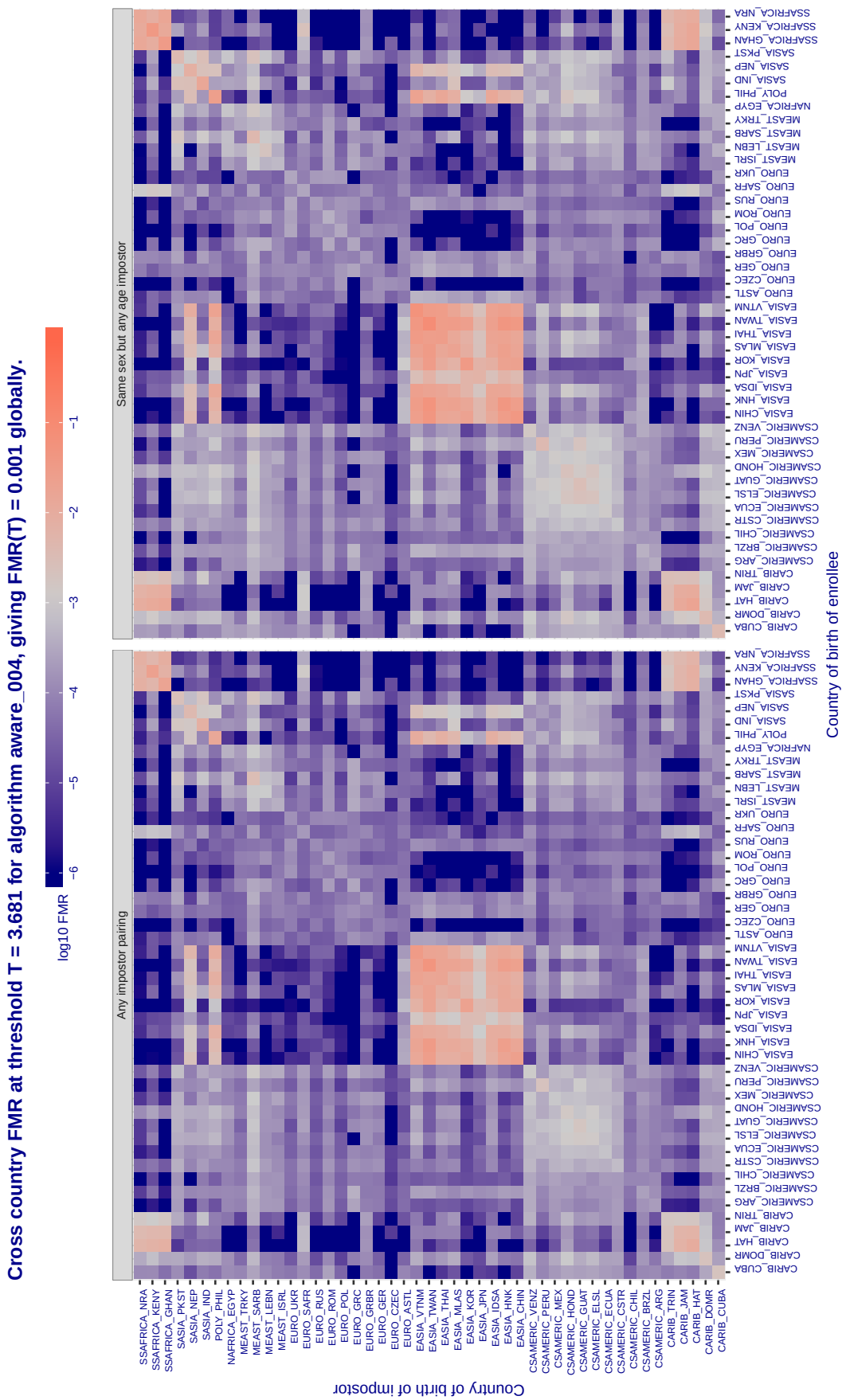


Figure 308: For algorithm aware-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

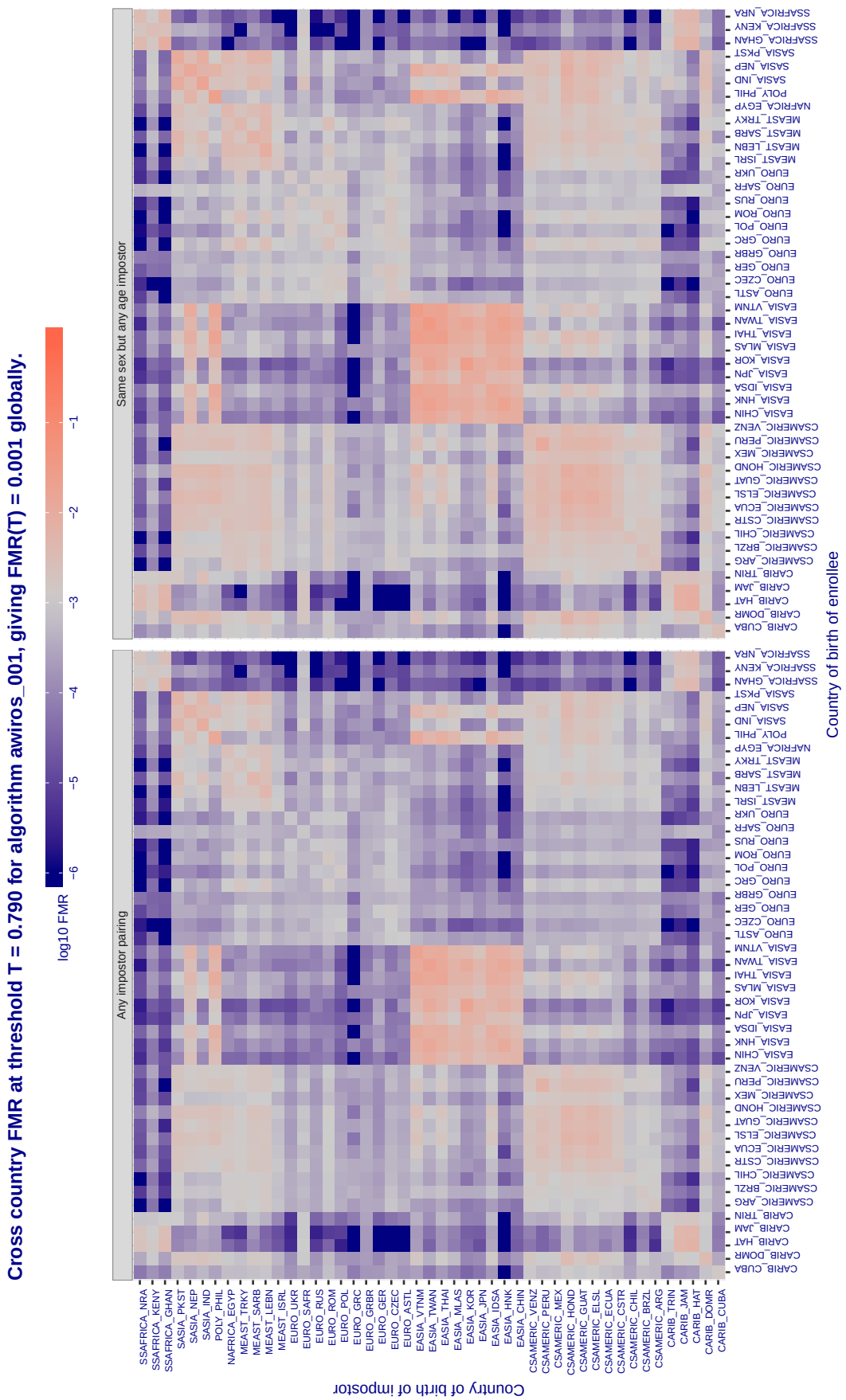


Figure 309: For algorithm awiros-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

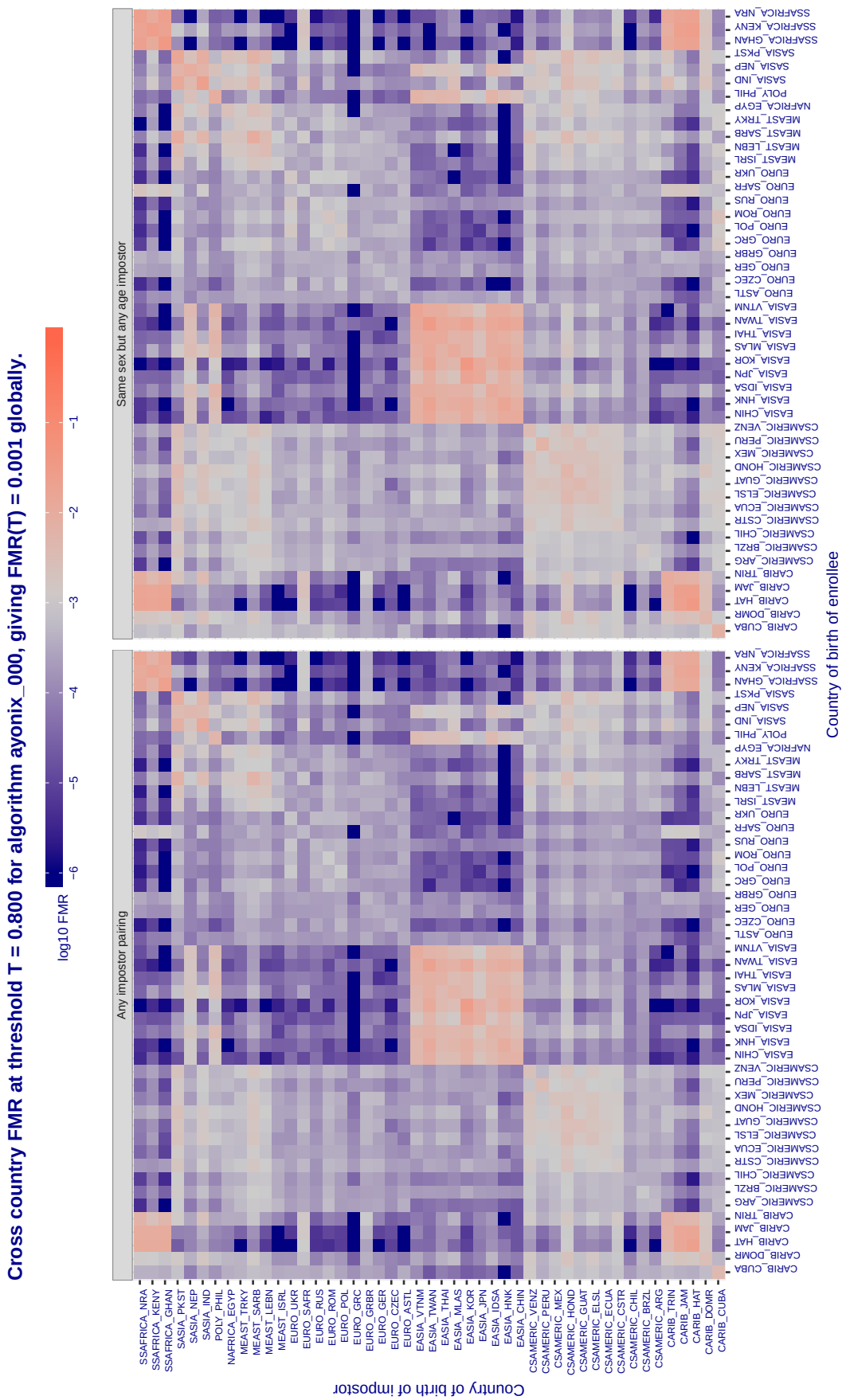


Figure 310: For algorithm ayonix-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

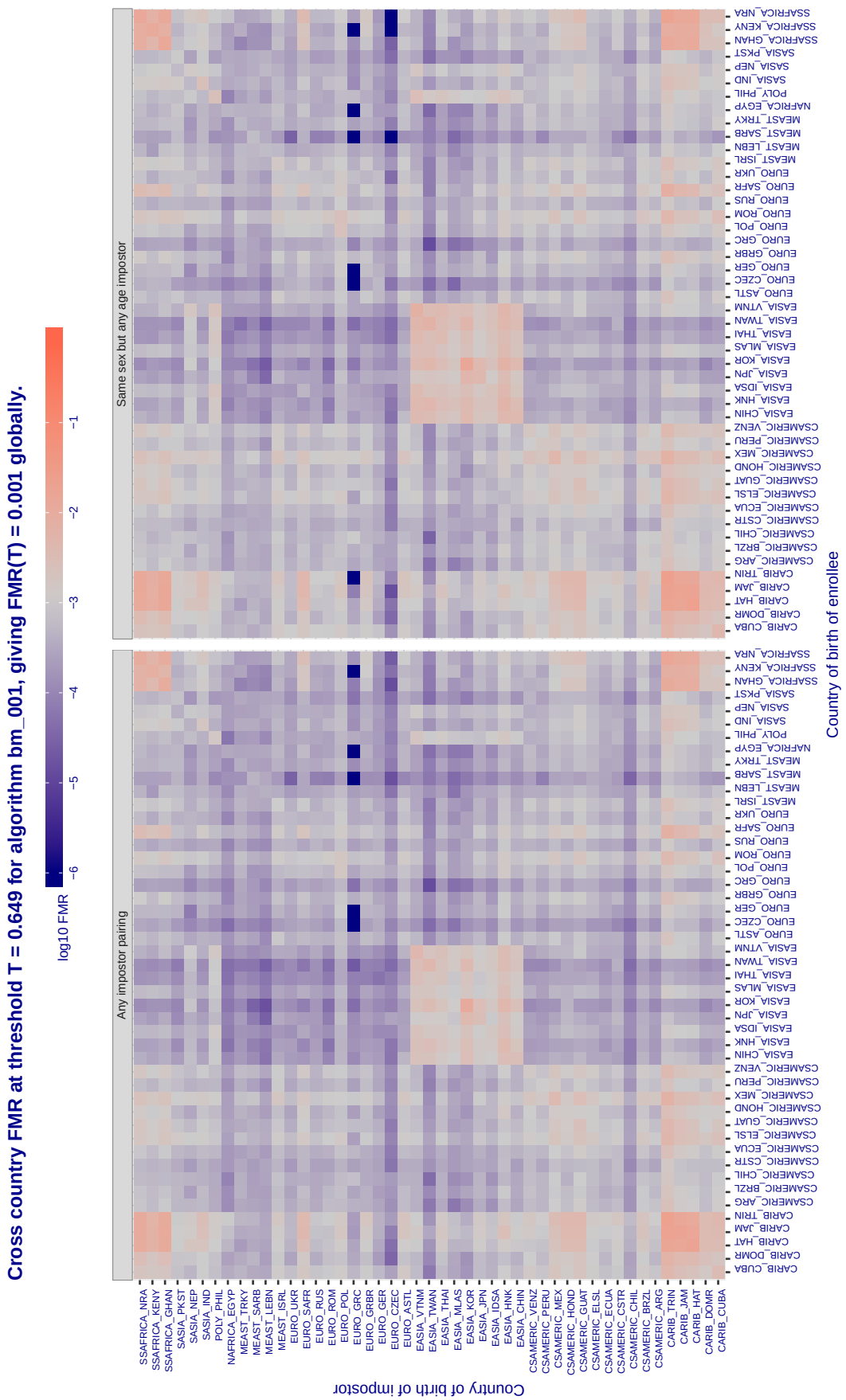


Figure 311: For algorithm bm-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

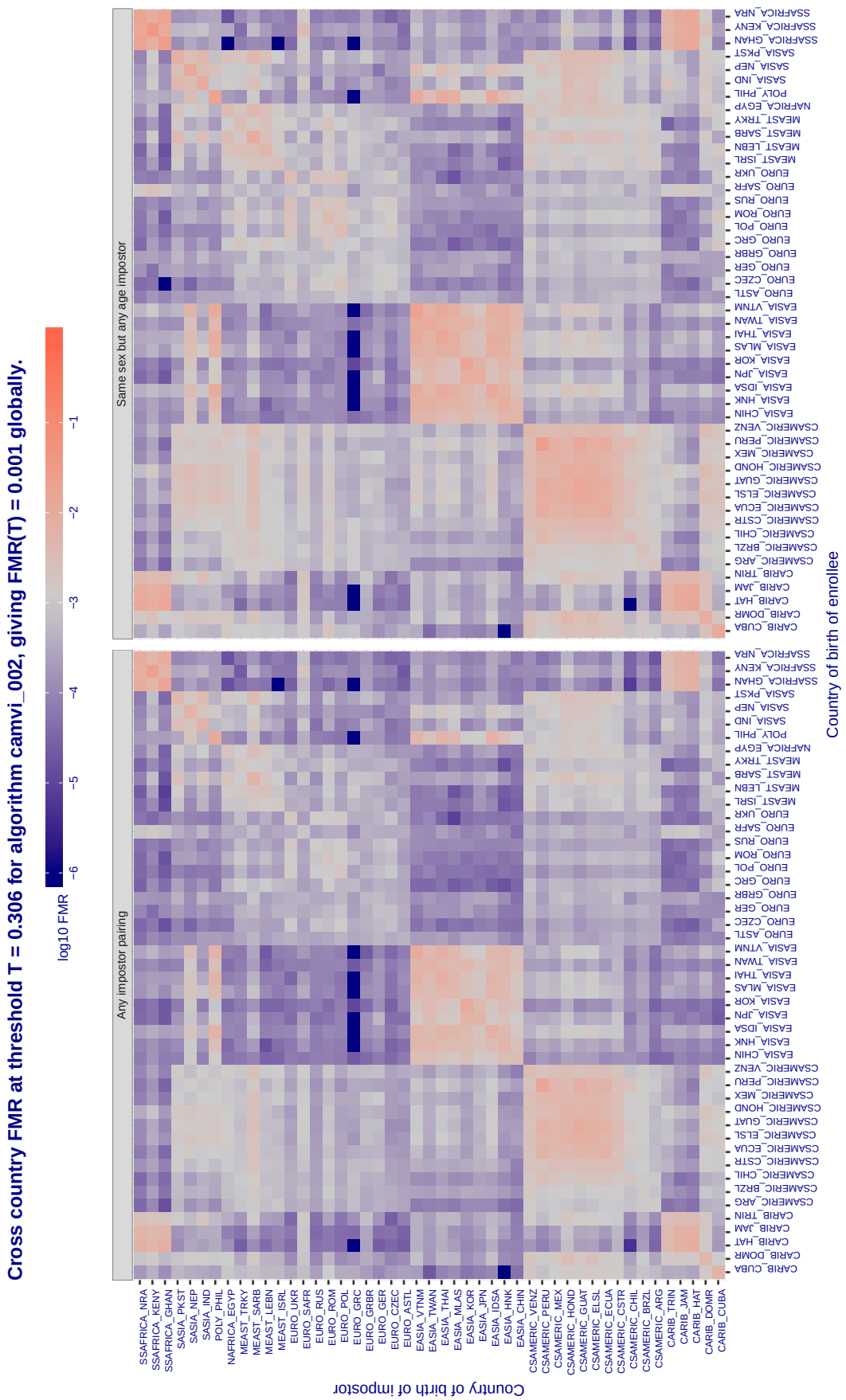


Figure 312: For algorithm camvi-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

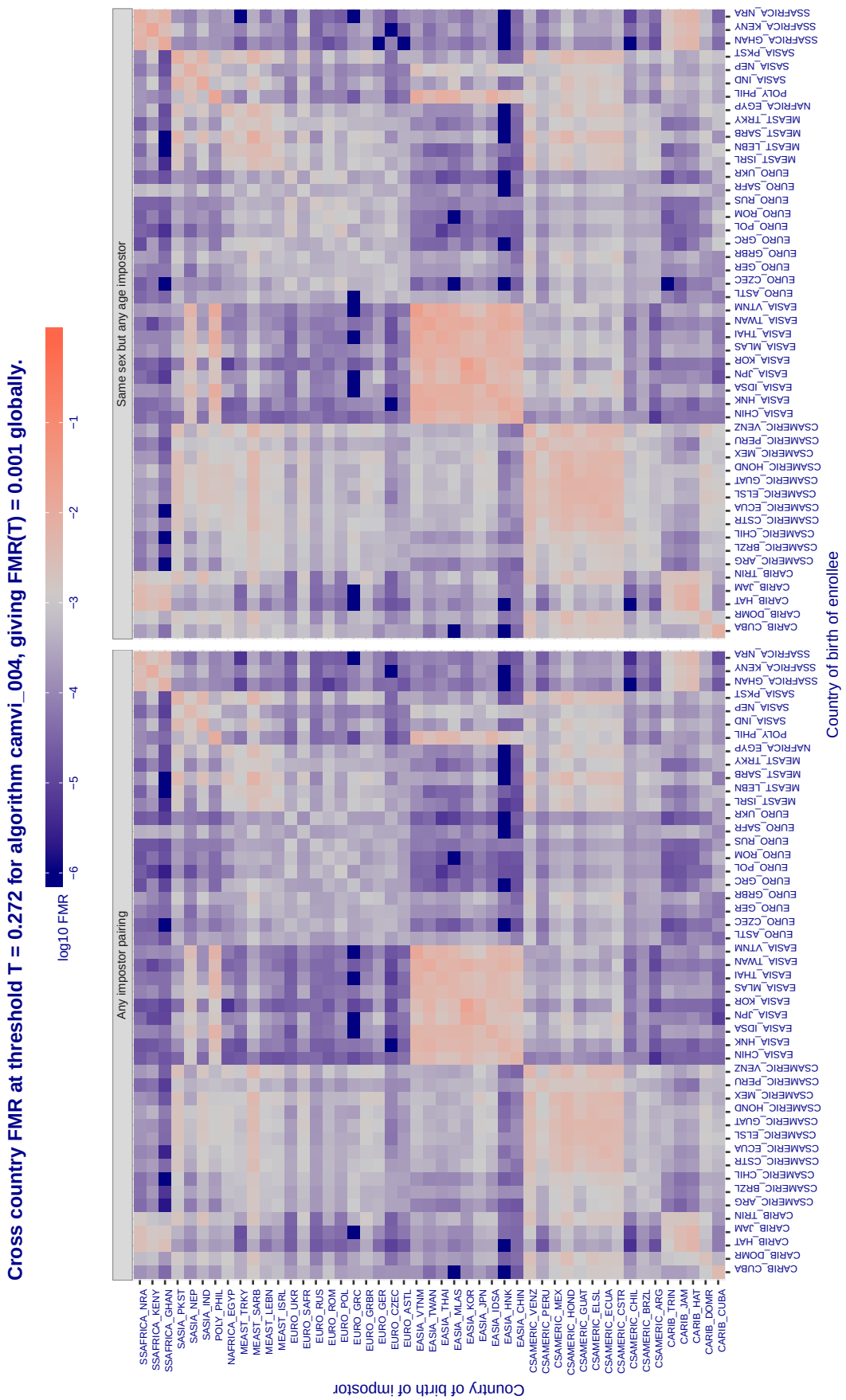


Figure 313: For algorithm camvi-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

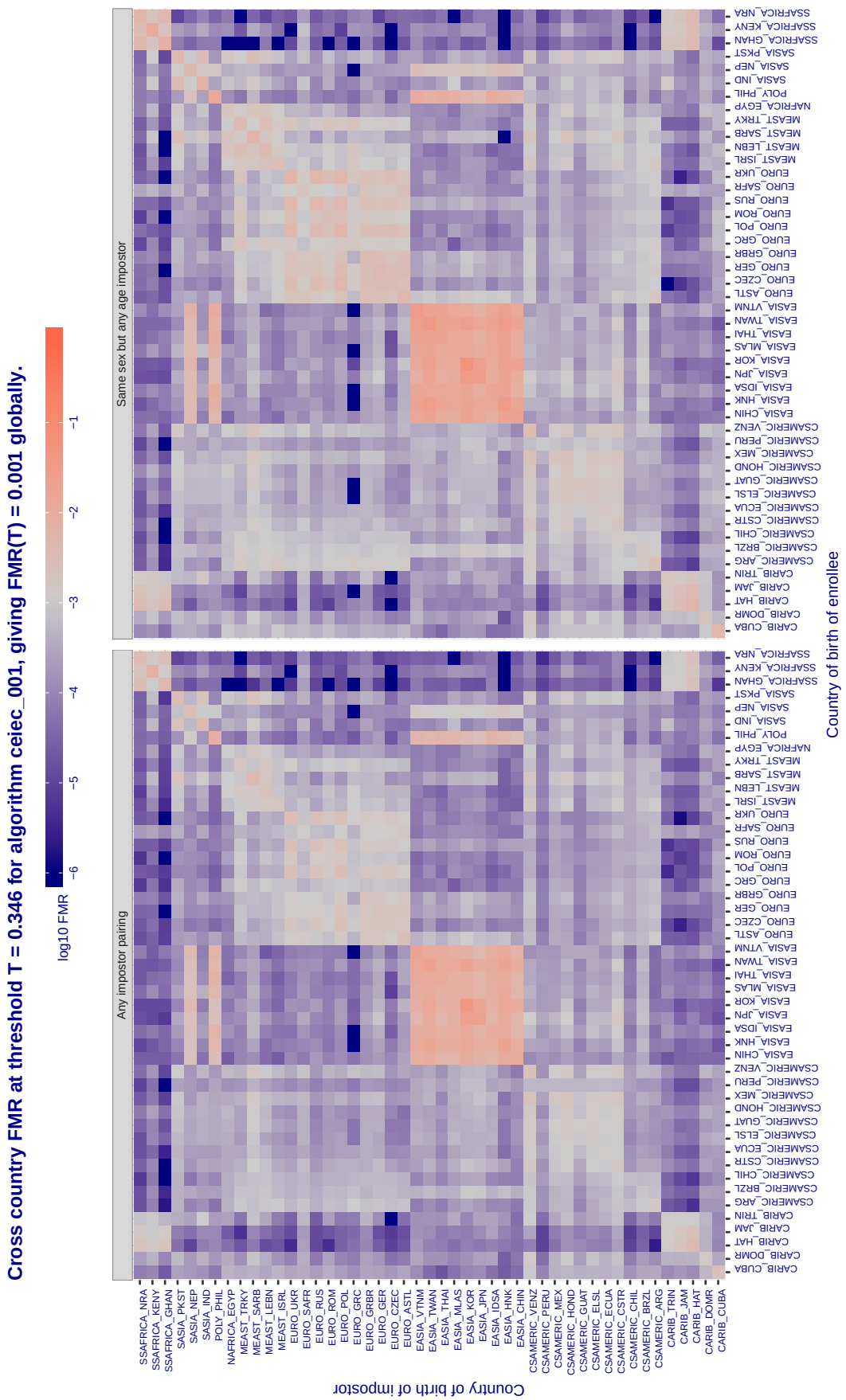


Figure 314: For algorithm ceiec-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

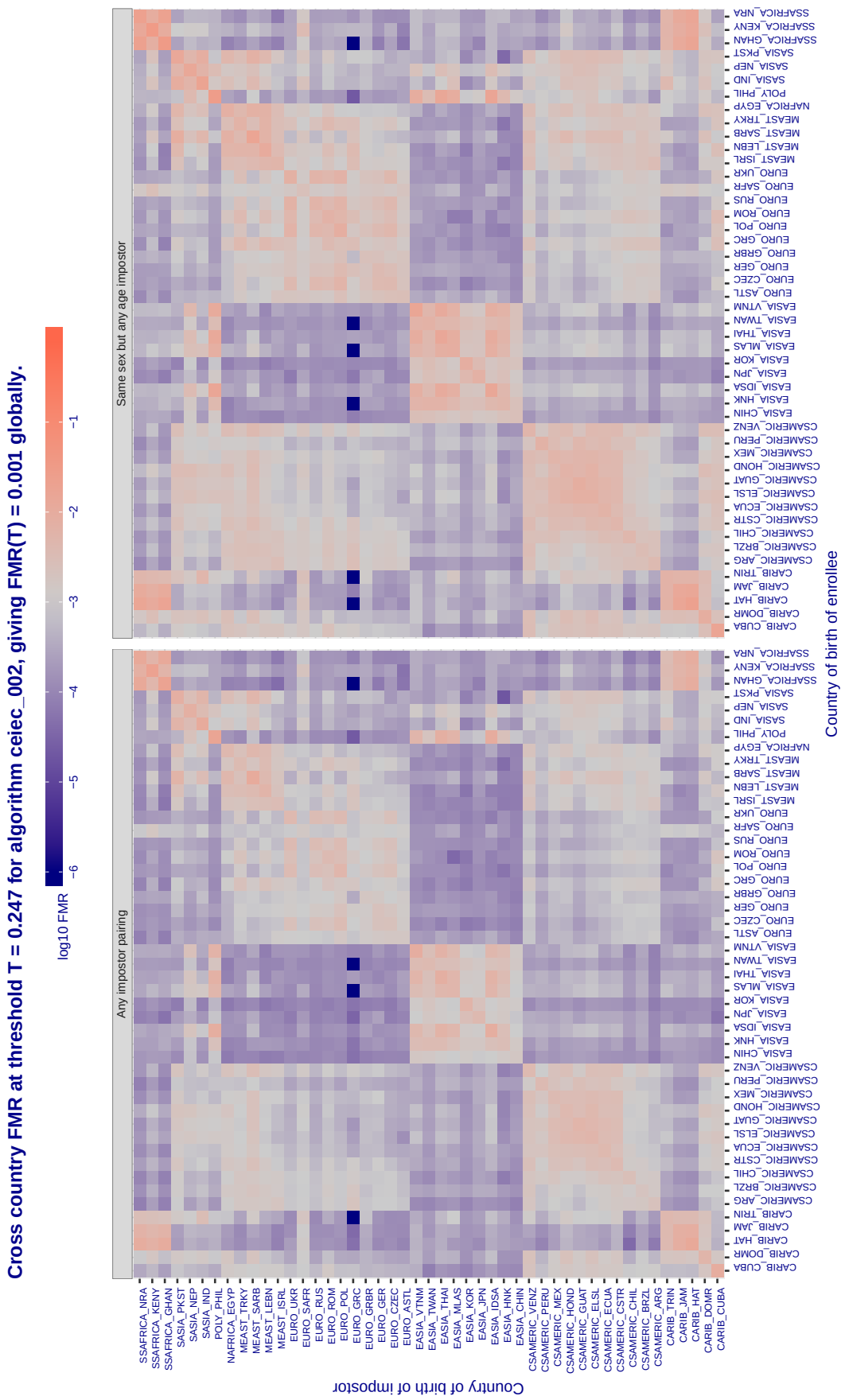


Figure 315: For algorithm ceiec-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

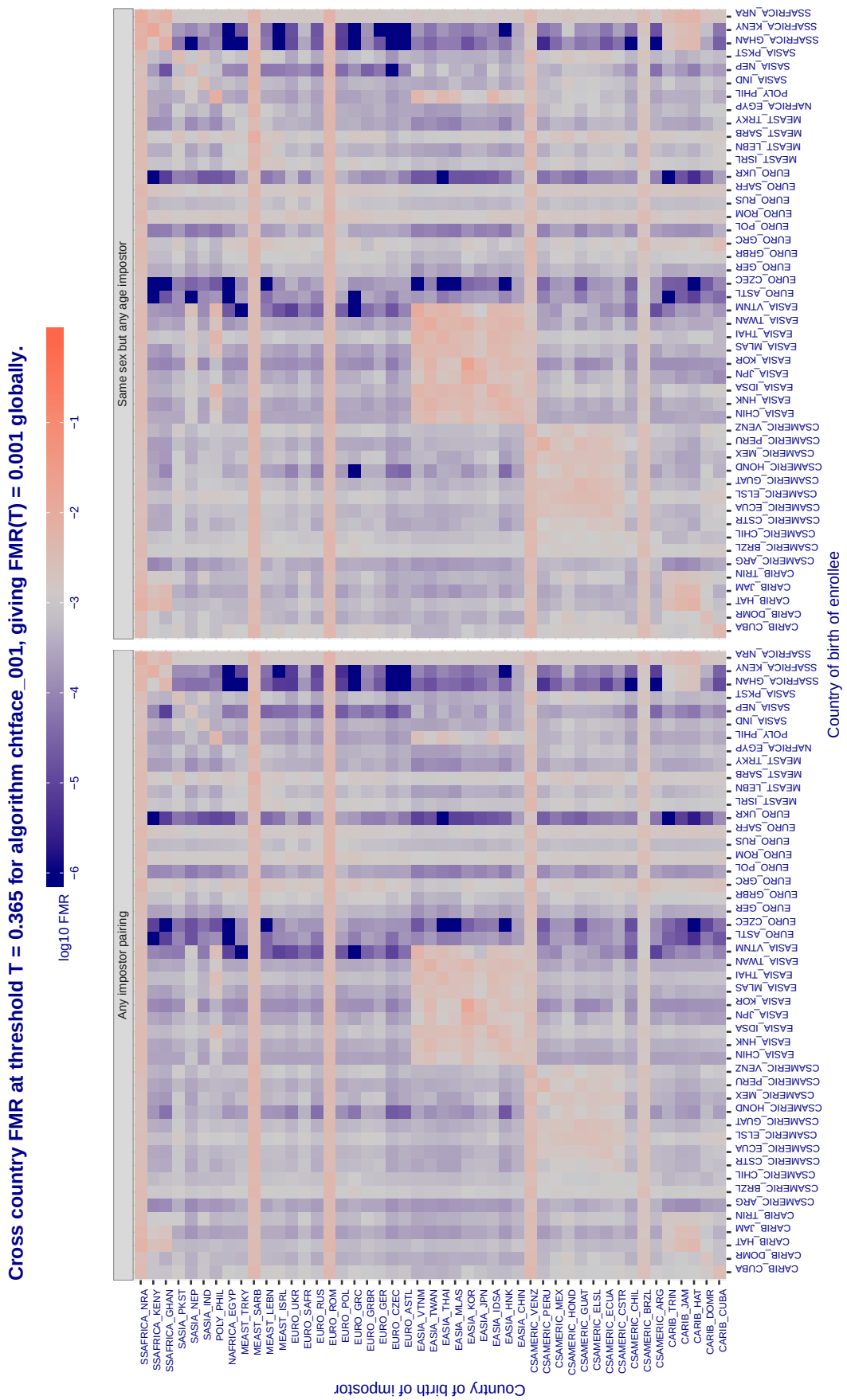


Figure 316: For algorithm chtface-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

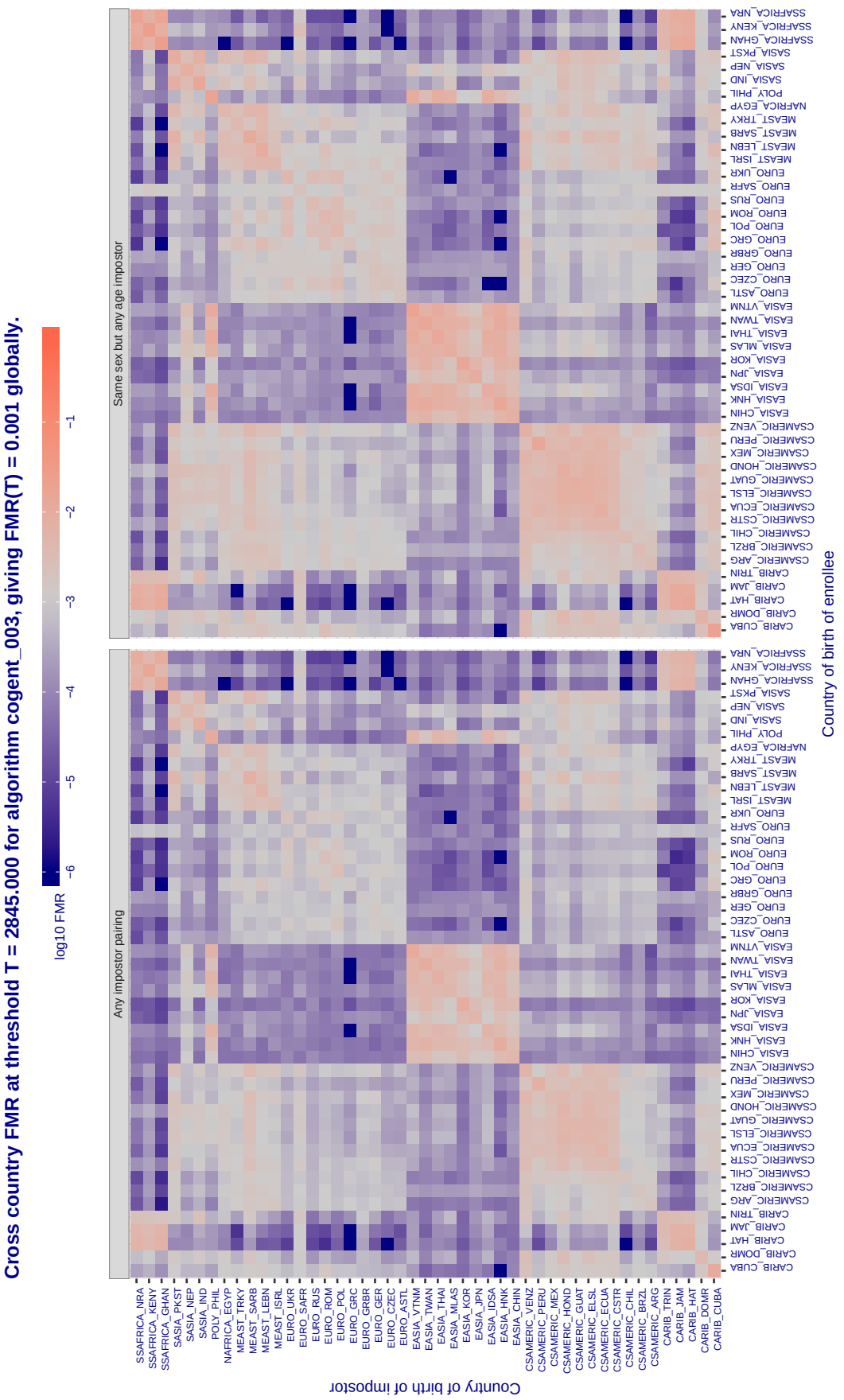


Figure 317: For algorithm cogent-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

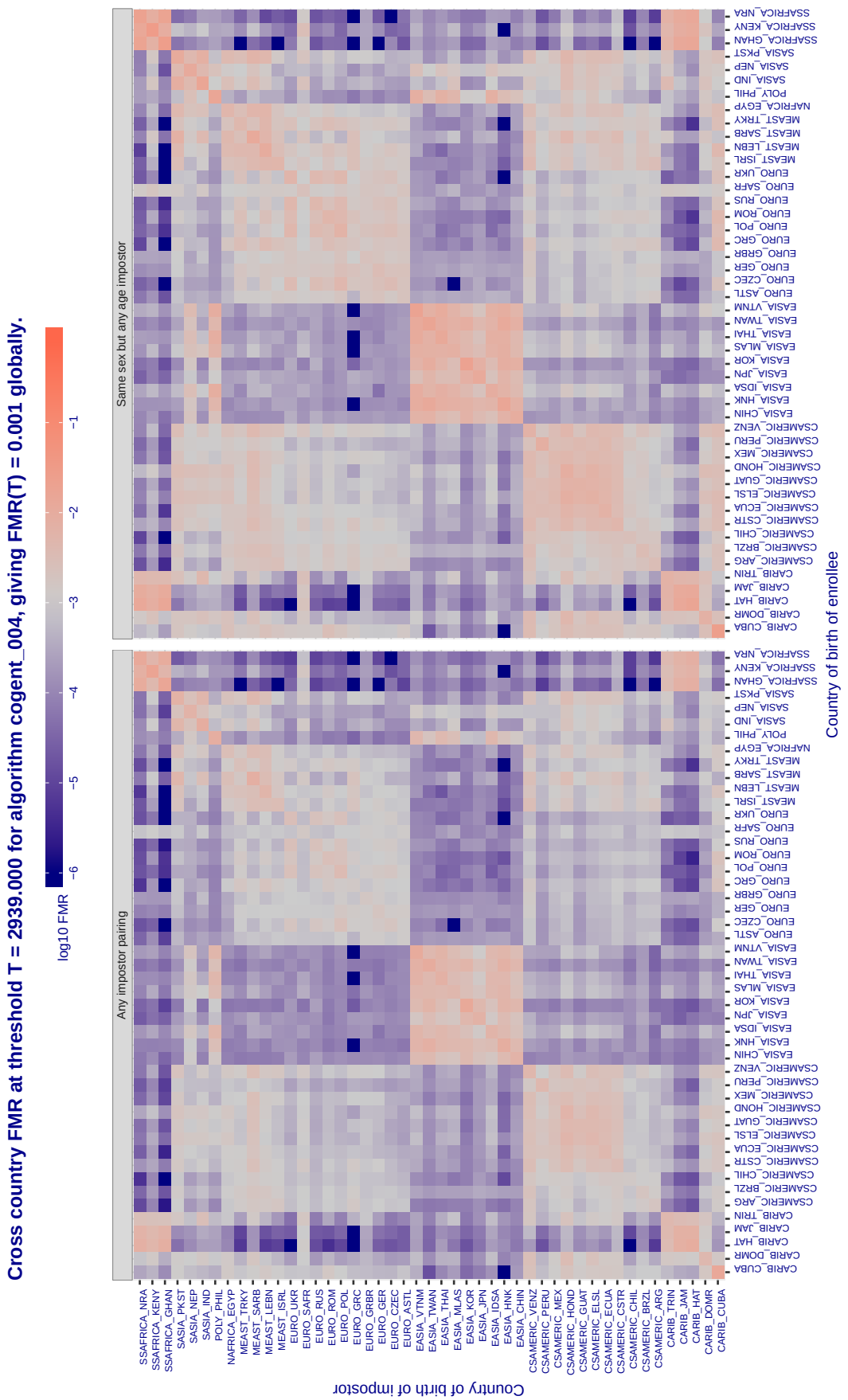


Figure 318: For algorithm cogent-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

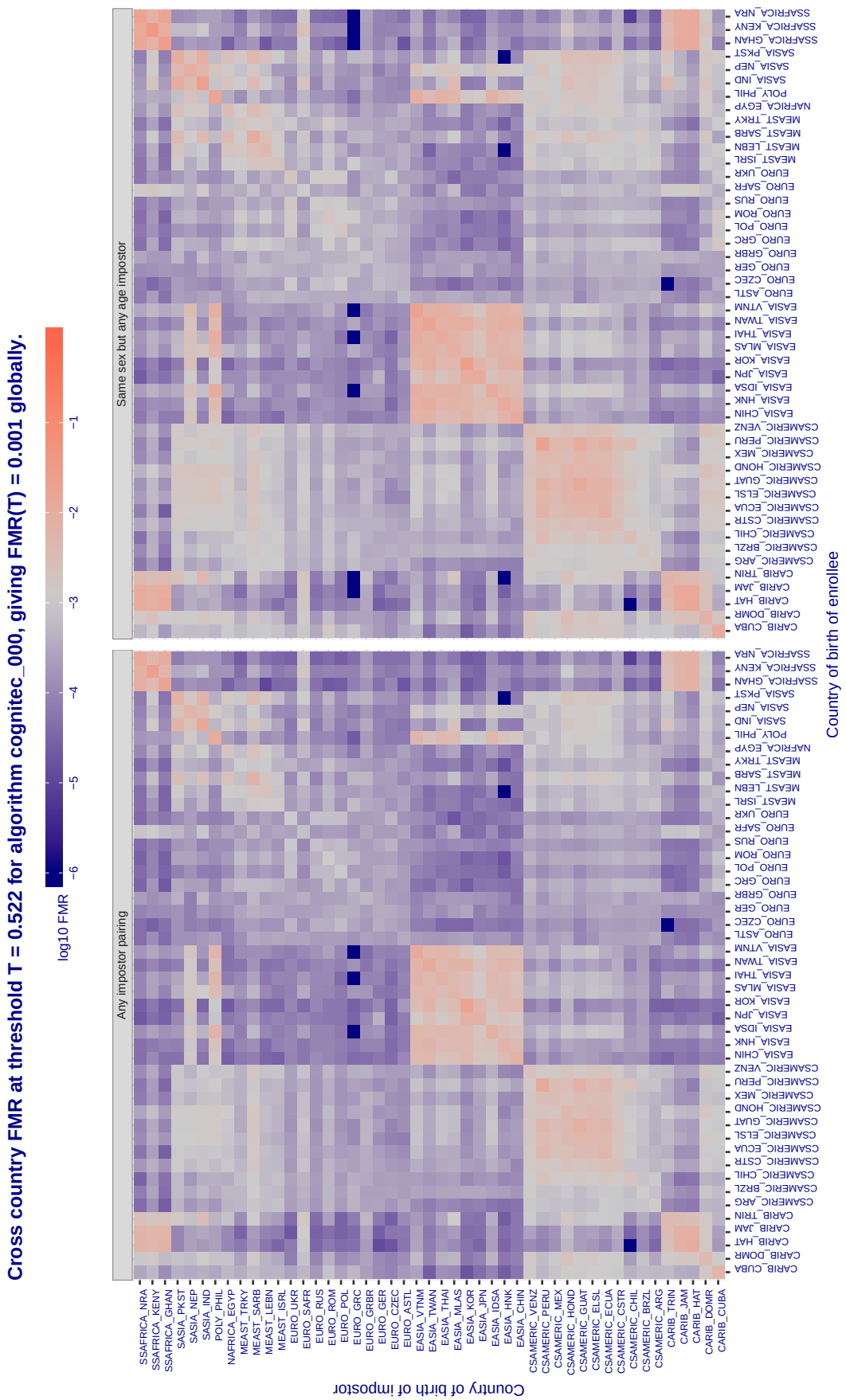


Figure 319: For algorithm cognitec-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

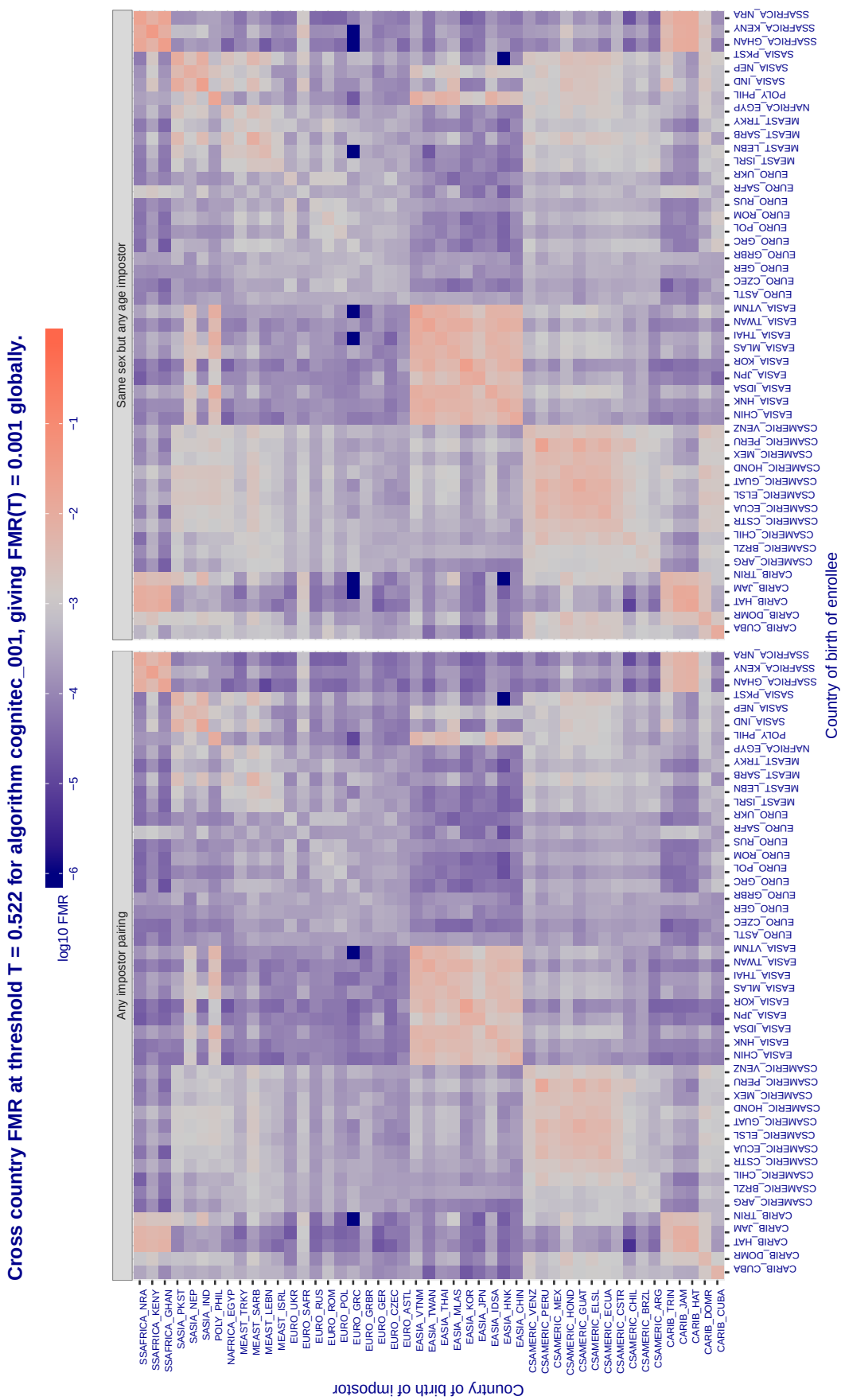


Figure 320: For algorithm cognitec-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

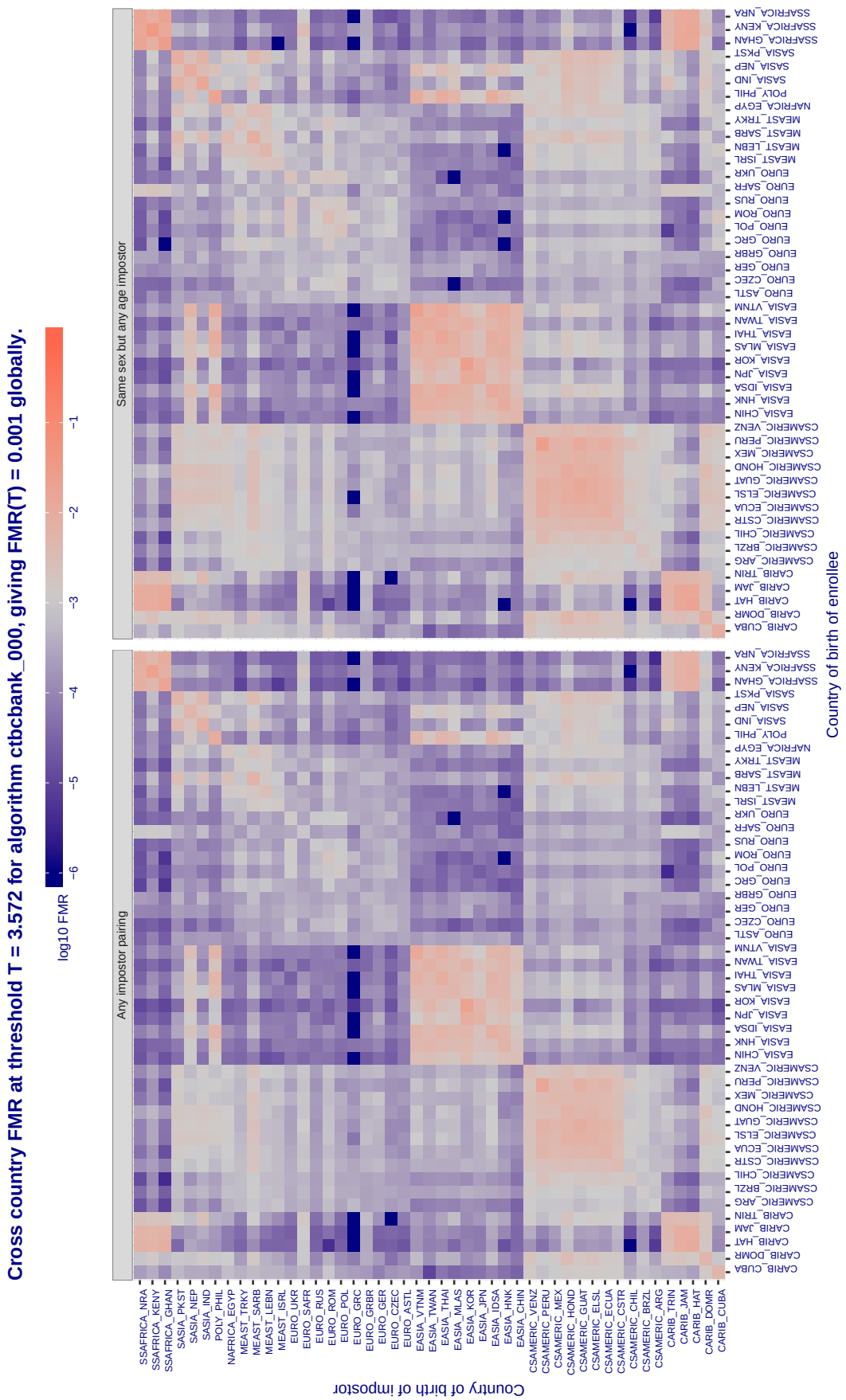


Figure 321: For algorithm ctbcbank-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

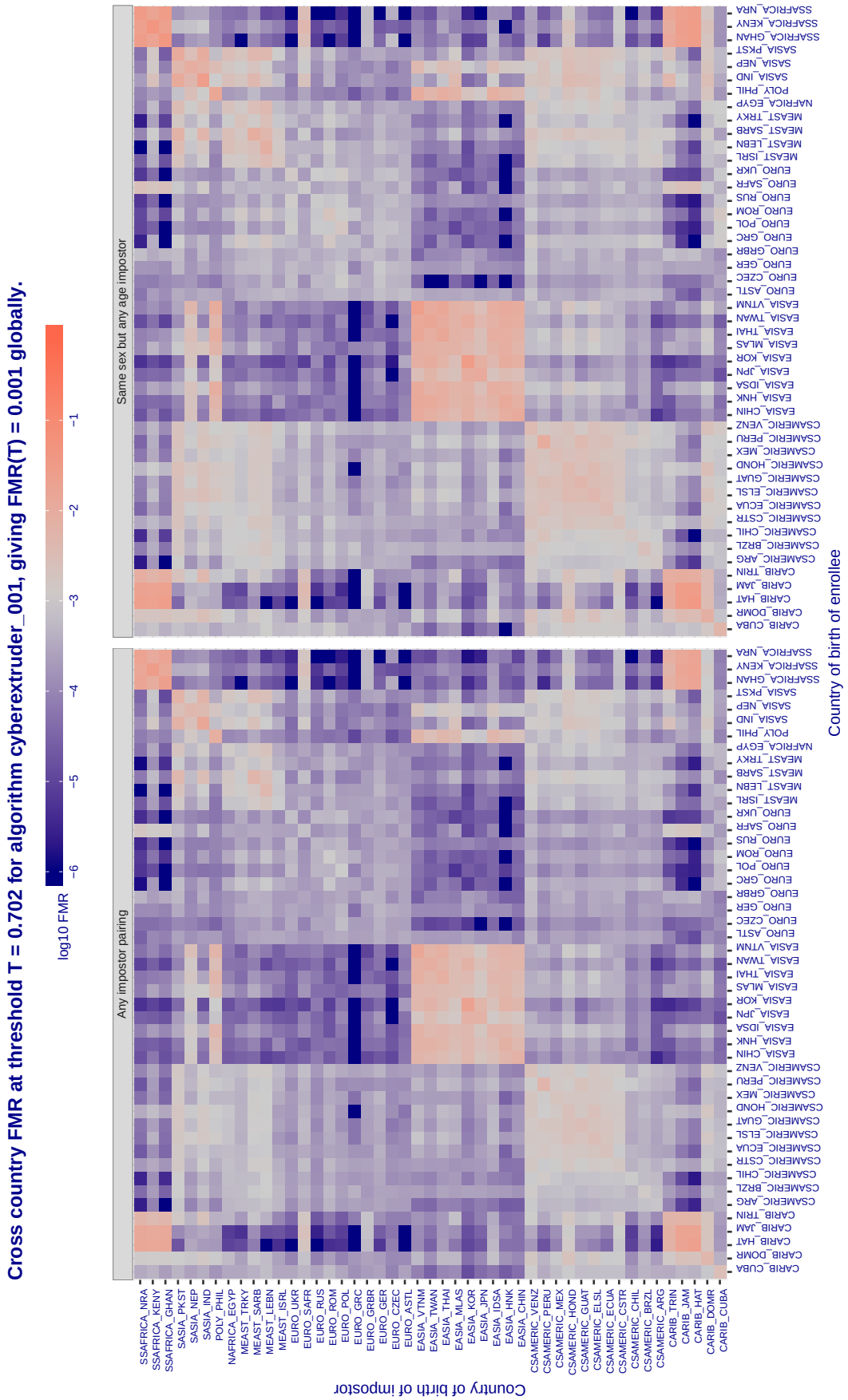


Figure 322: For algorithm cyberextruder-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

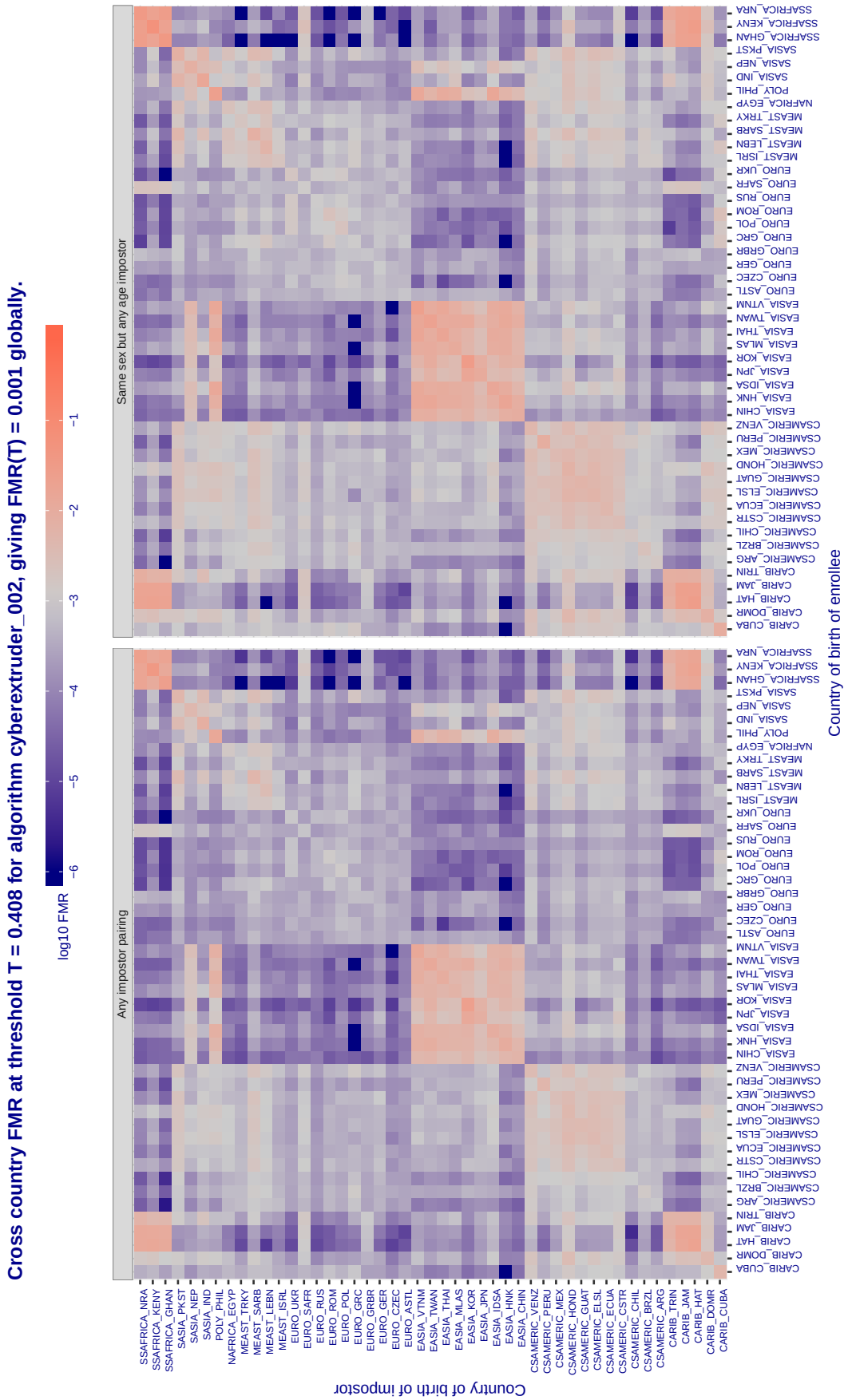


Figure 323: For algorithm cyberextruder-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

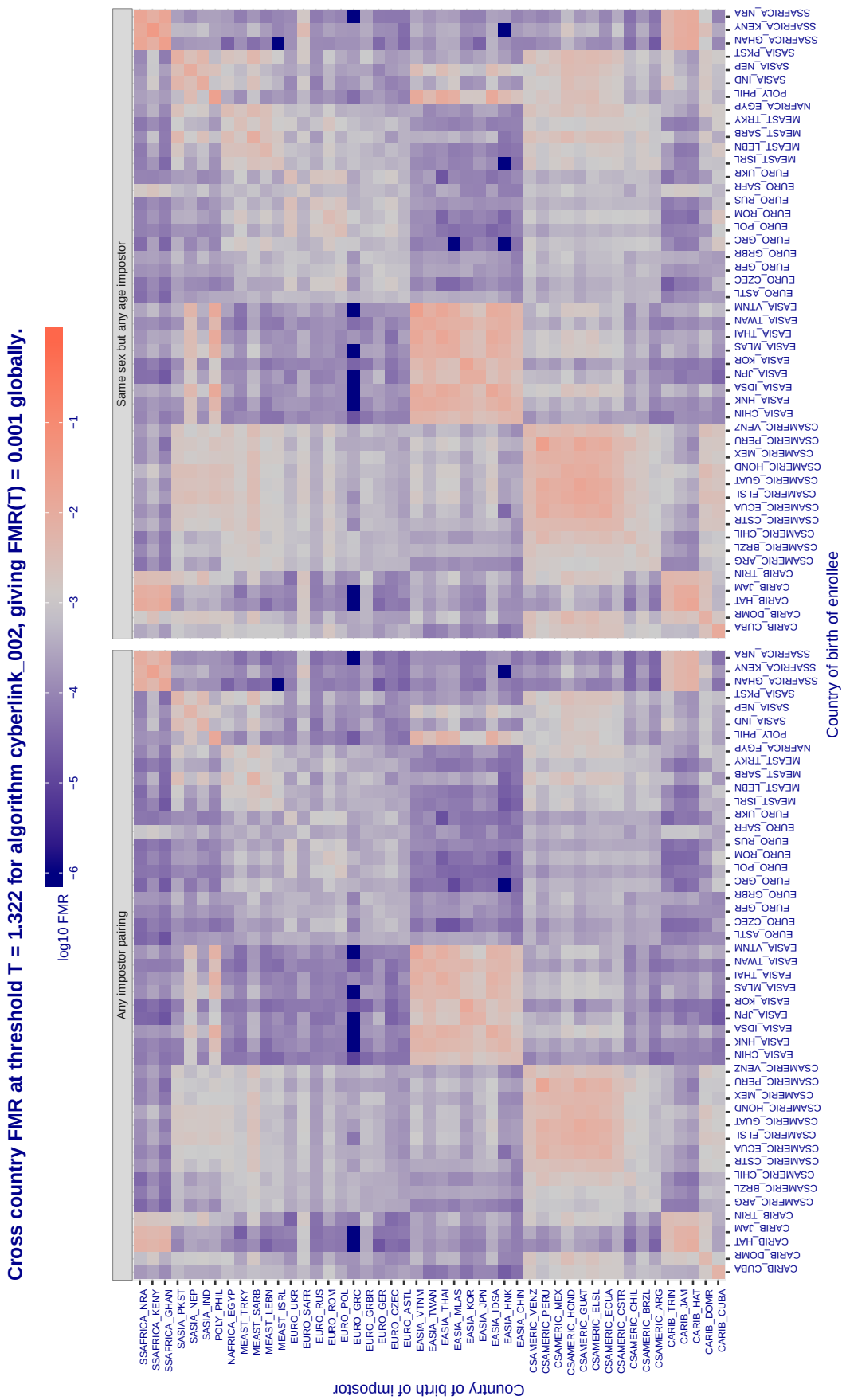


Figure 324: For algorithm cyberlink-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

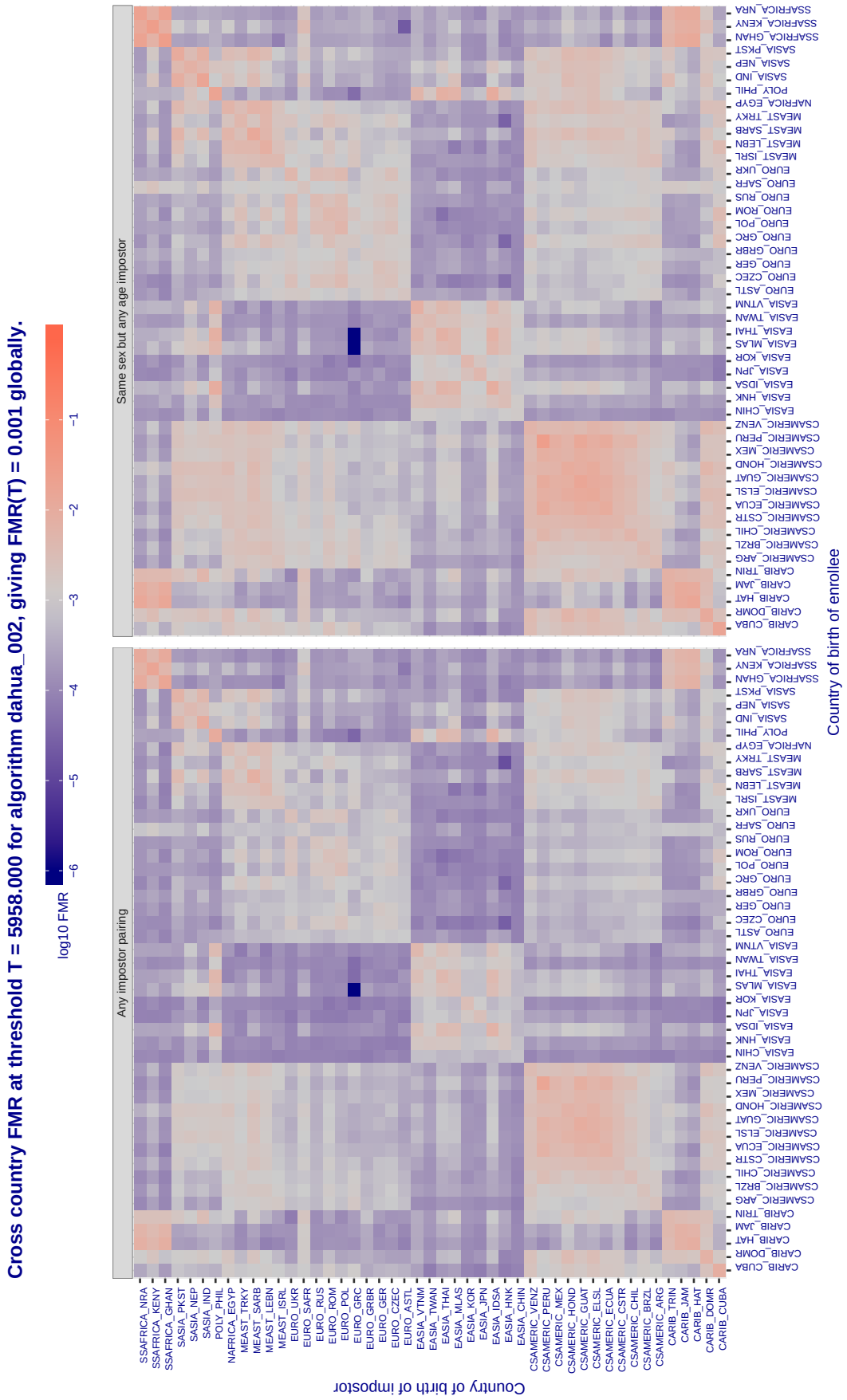


Figure 325: For algorithm dahua-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

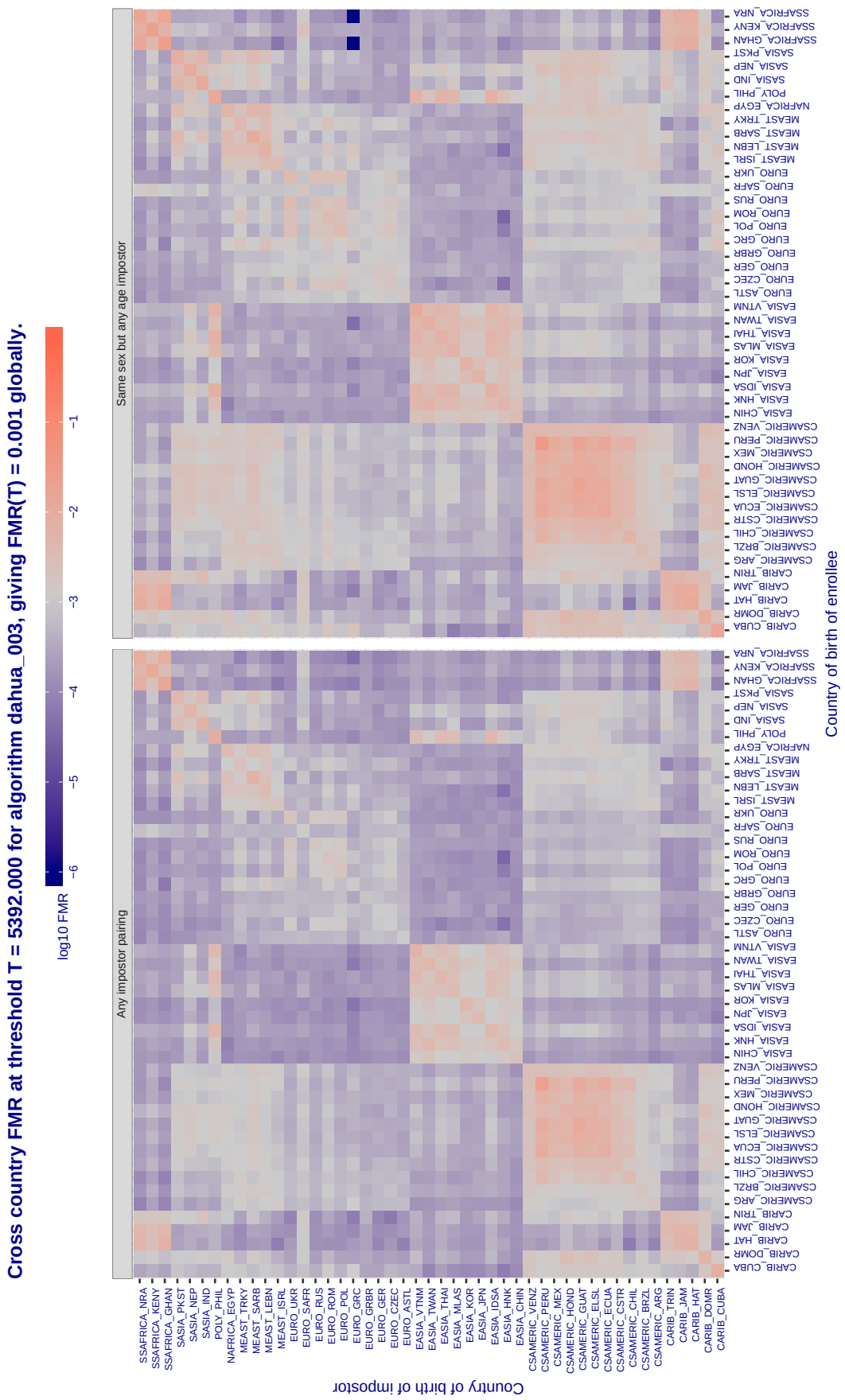


Figure 326: For algorithm dahua-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

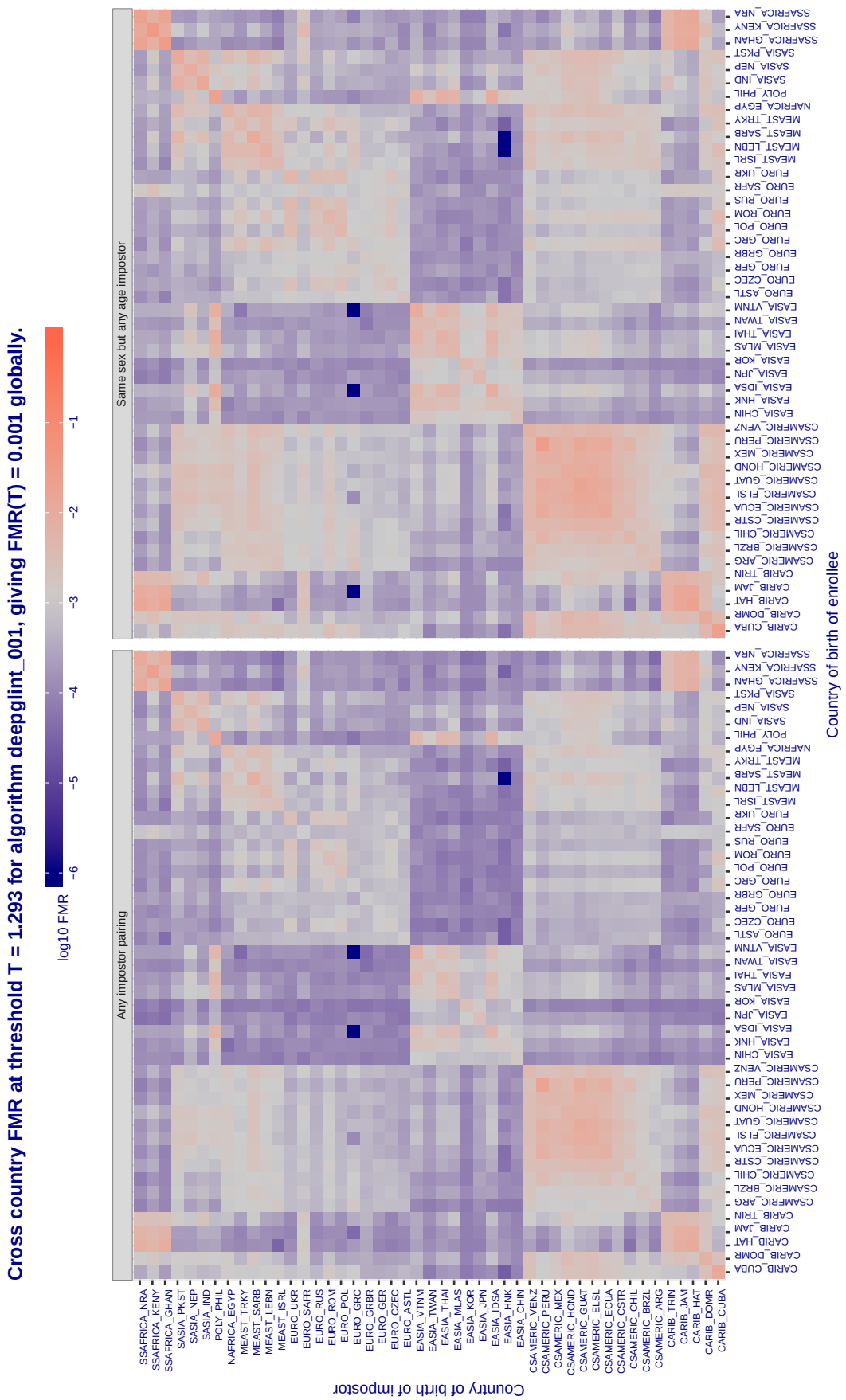


Figure 327: For algorithm deepglint-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

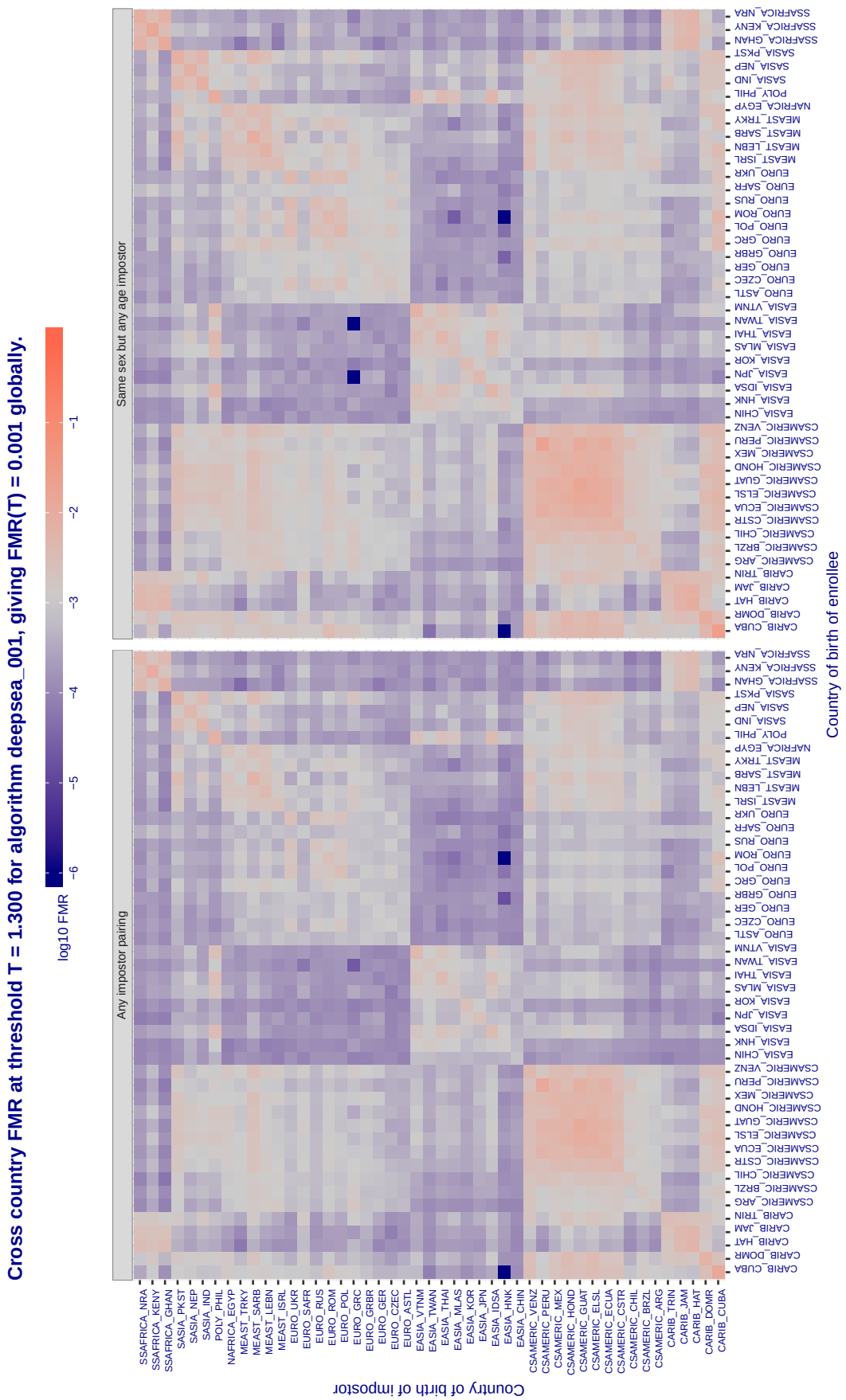


Figure 328: For algorithm deepsea-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

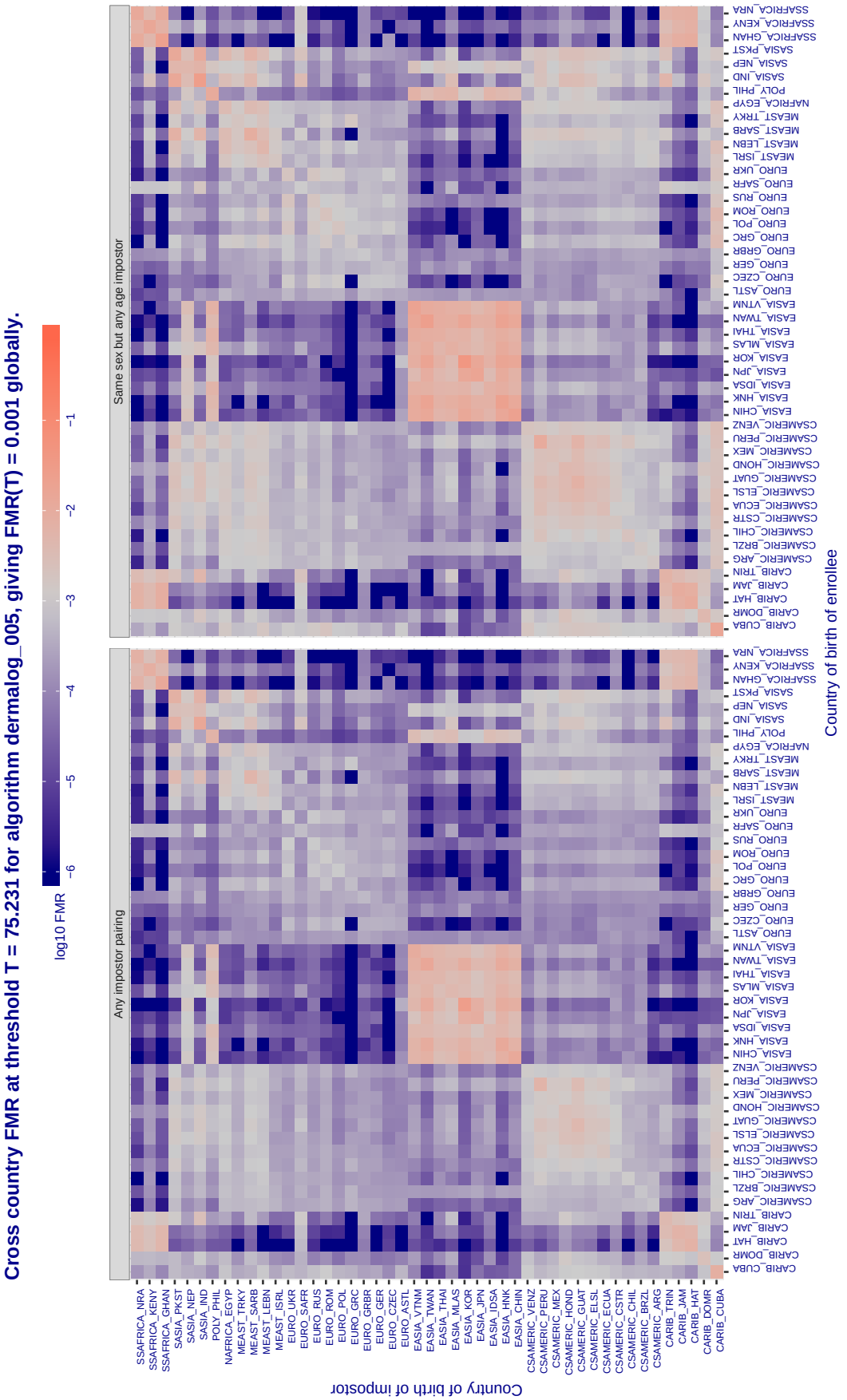


Figure 329: For algorithm dermalog-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

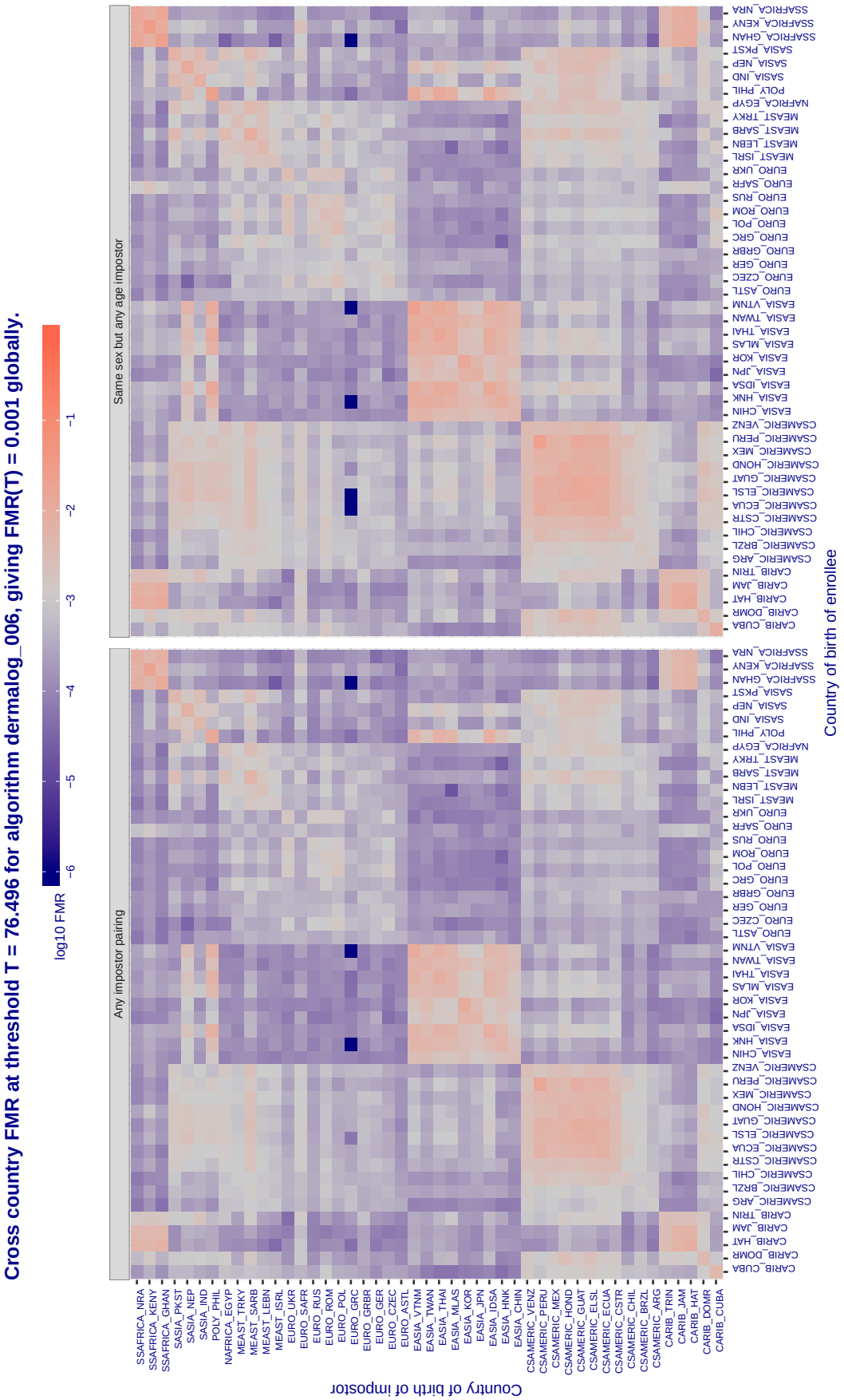


Figure 330: For algorithm dermalog-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

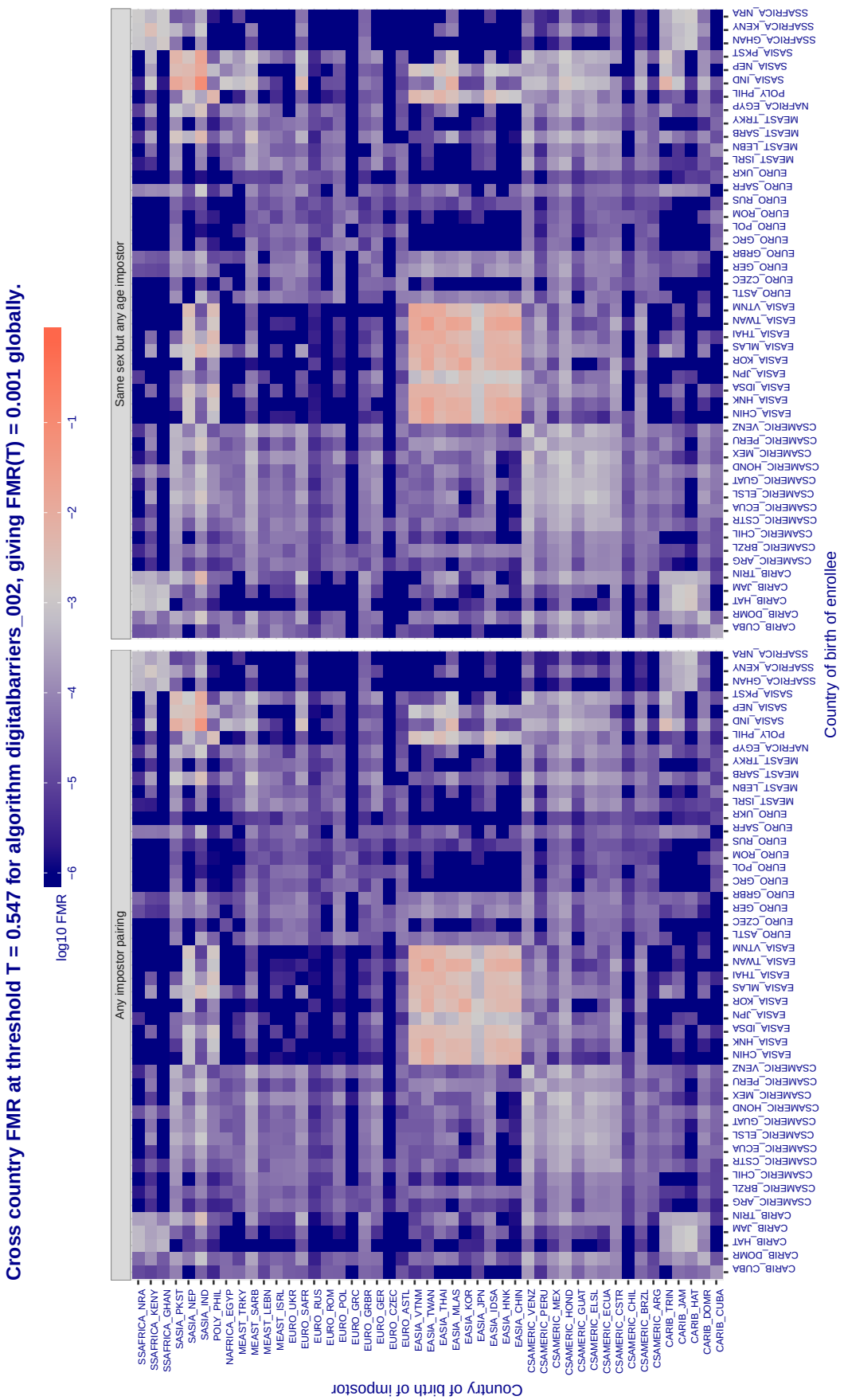


Figure 331: For algorithm digitalbarriers-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

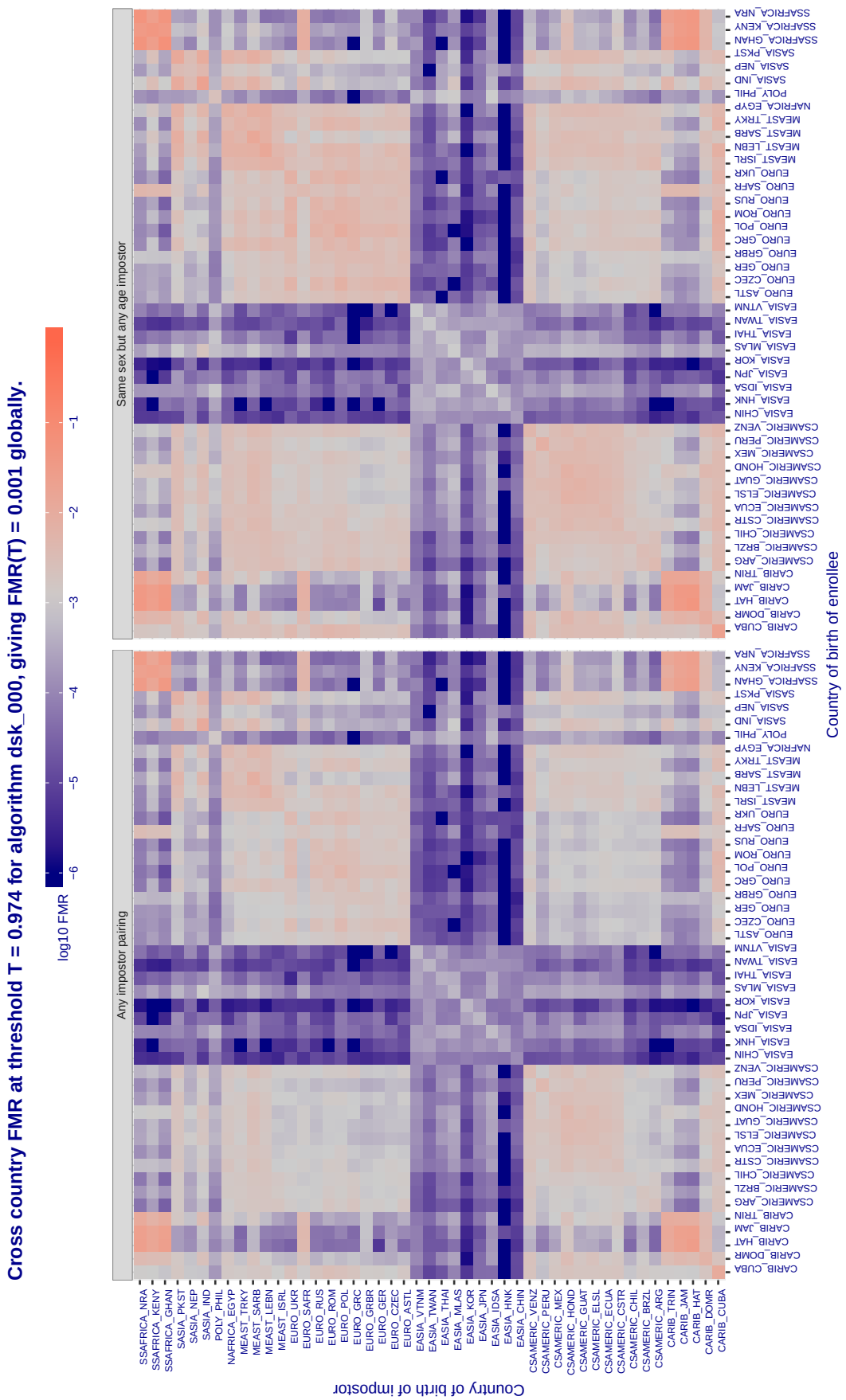


Figure 332: For algorithm dsk-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

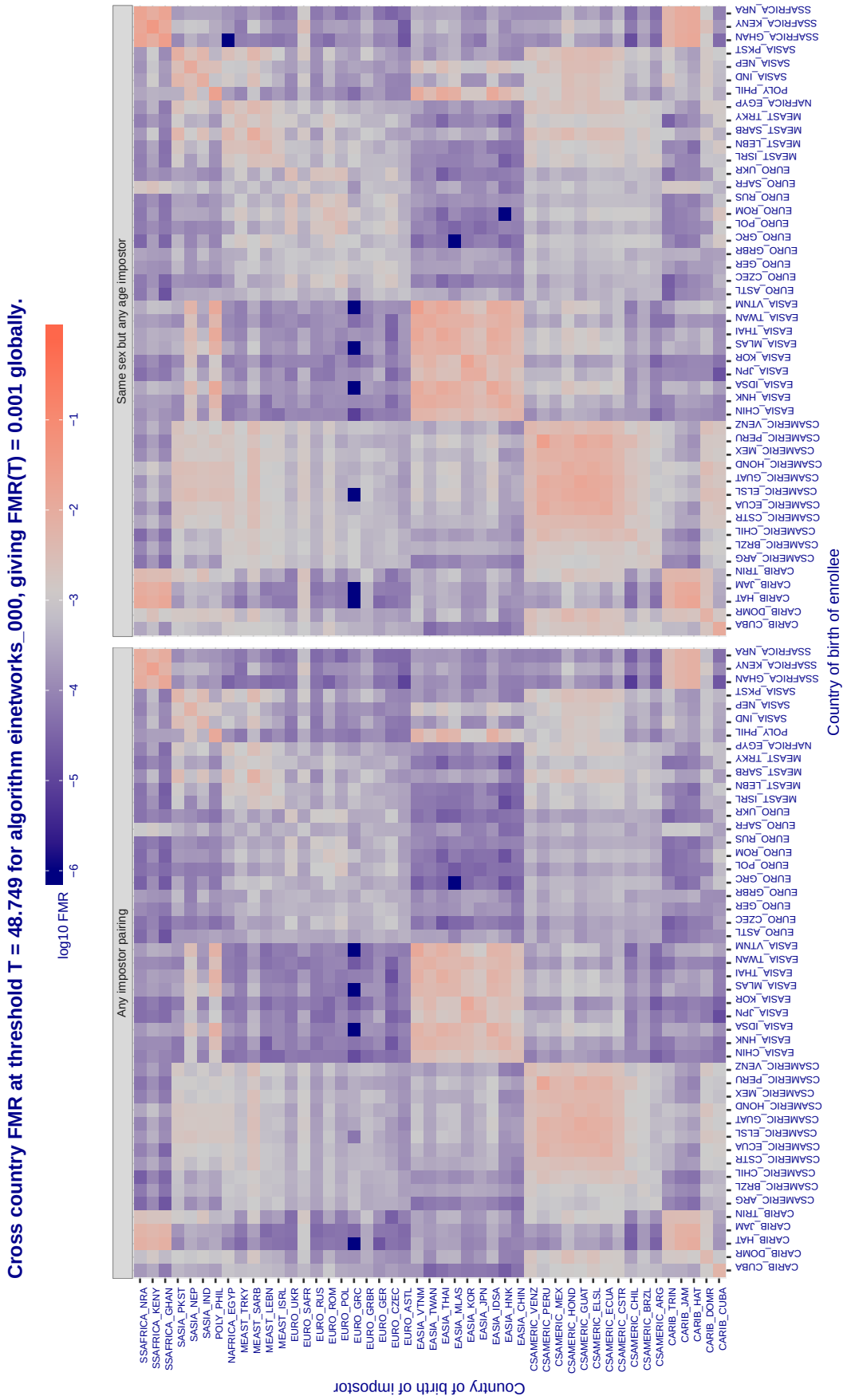


Figure 333: For algorithm einetworks-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

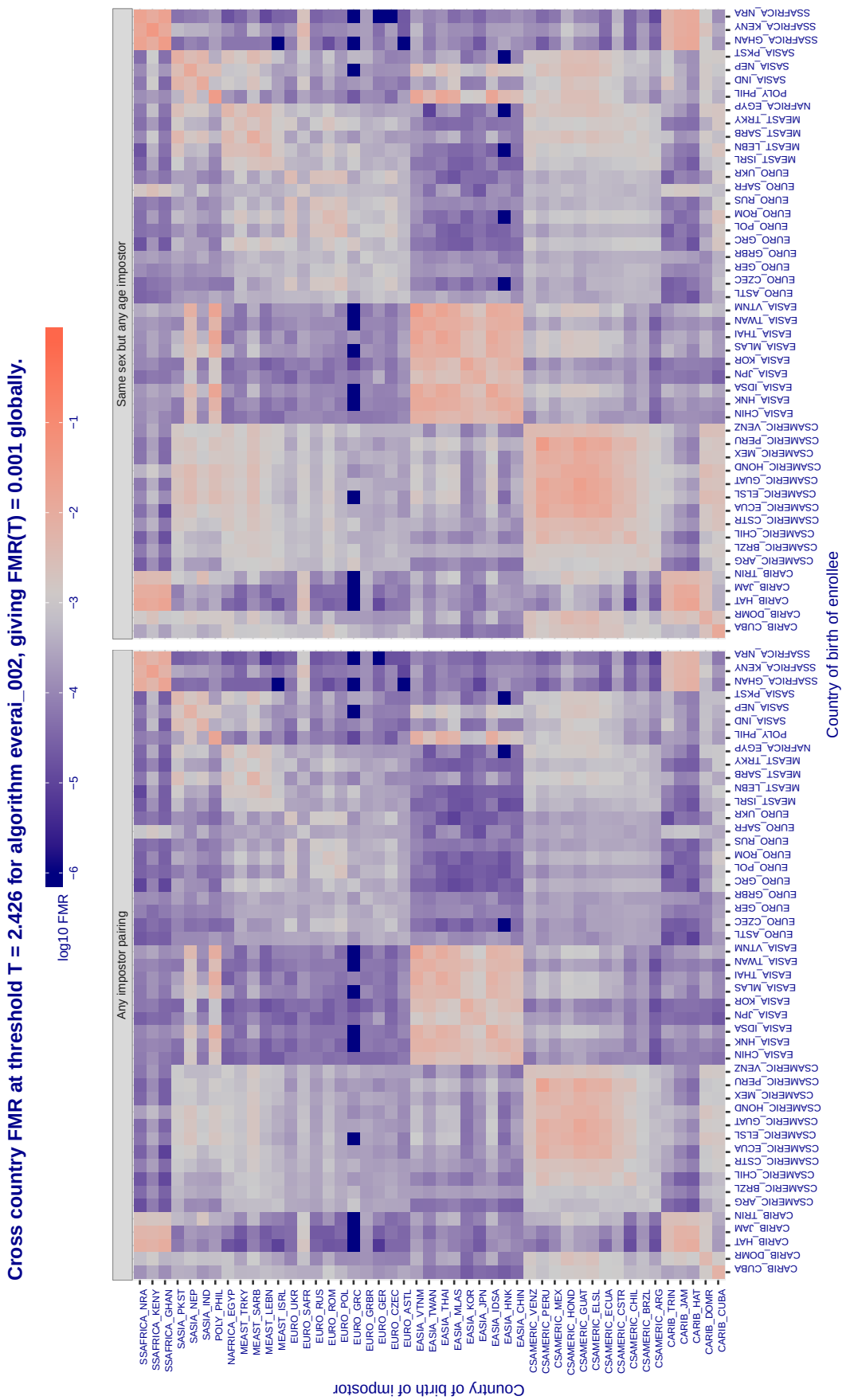


Figure 334: For algorithm everai-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

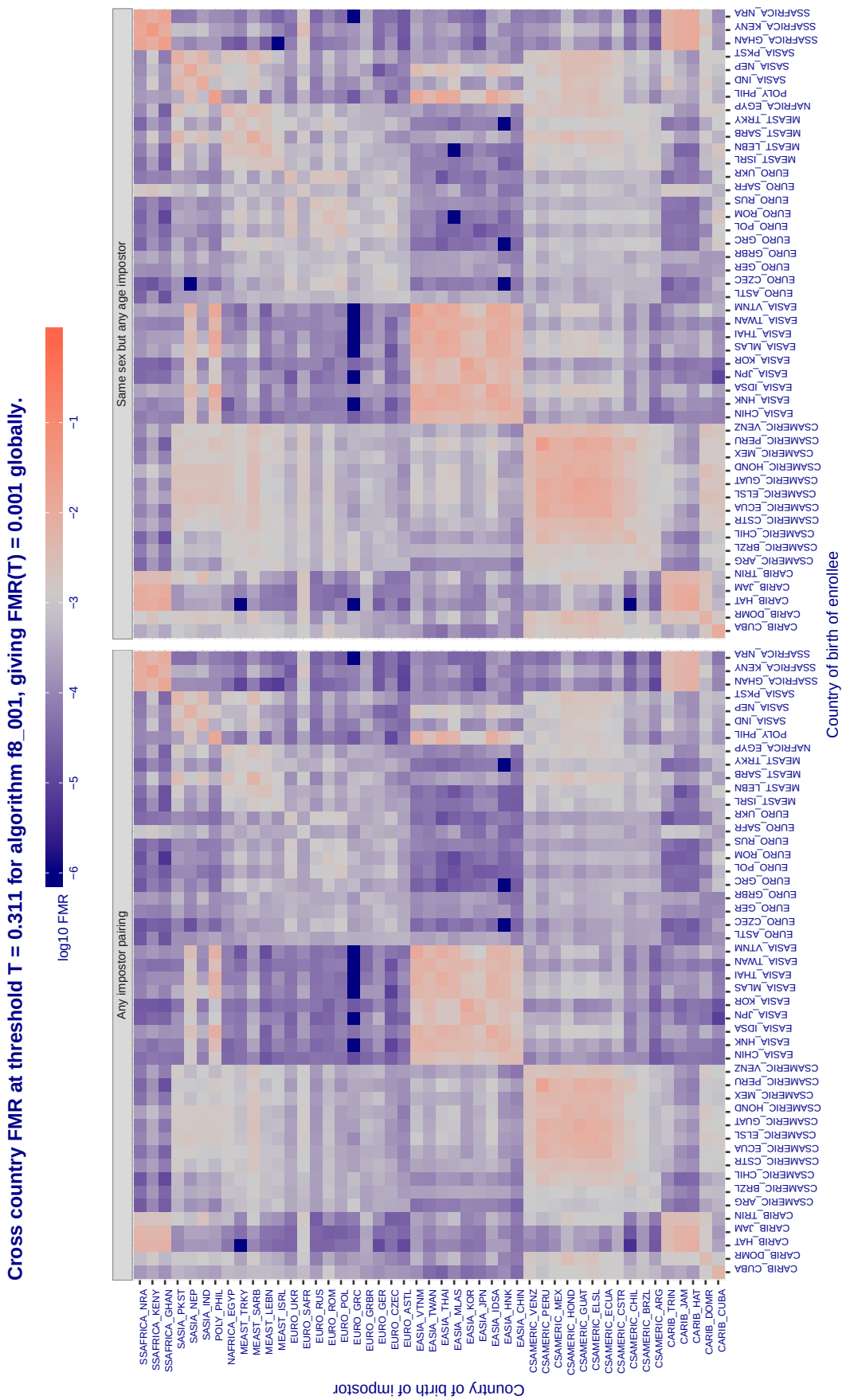


Figure 335: For algorithm f8-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

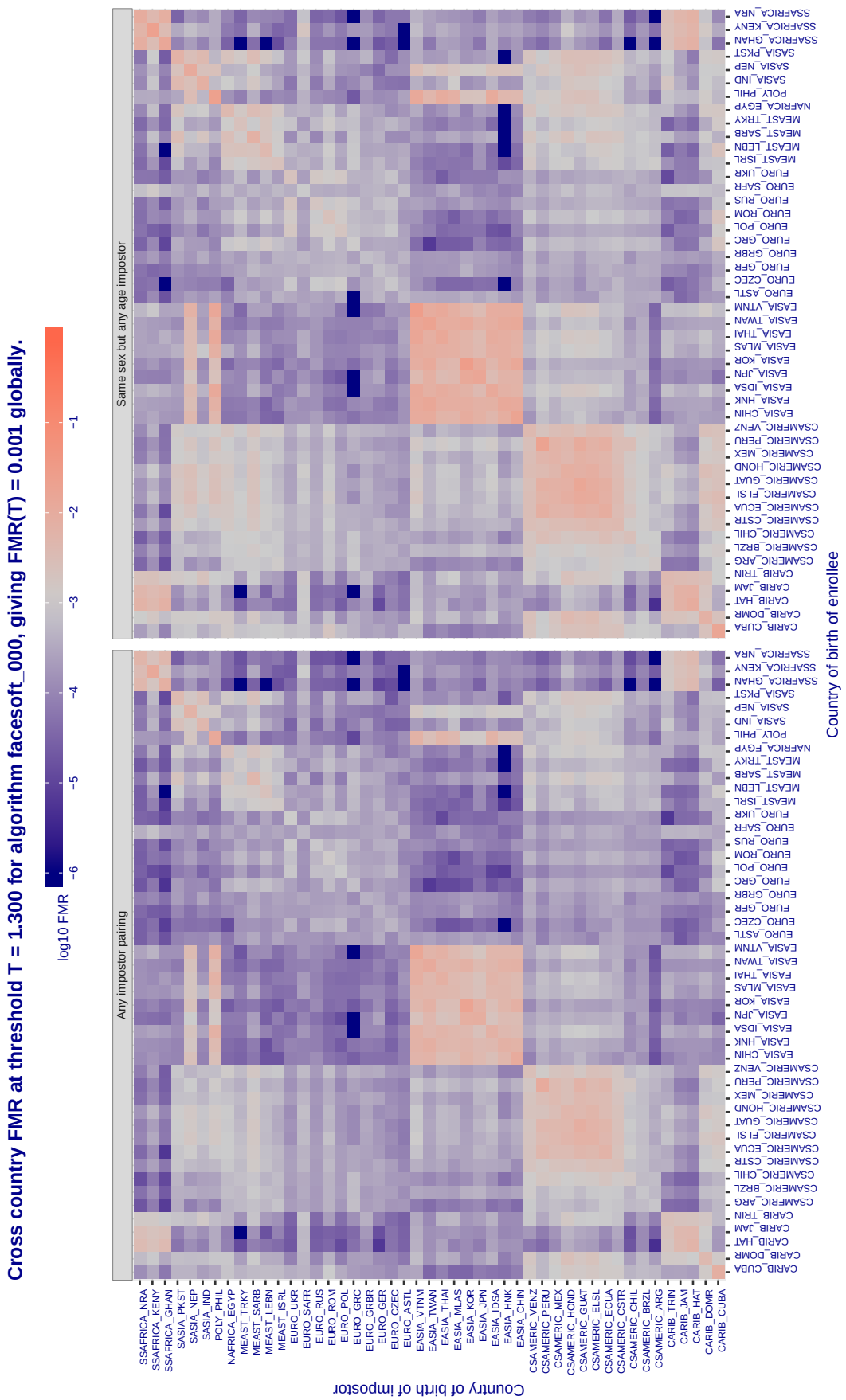


Figure 336: For algorithm facesoft-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

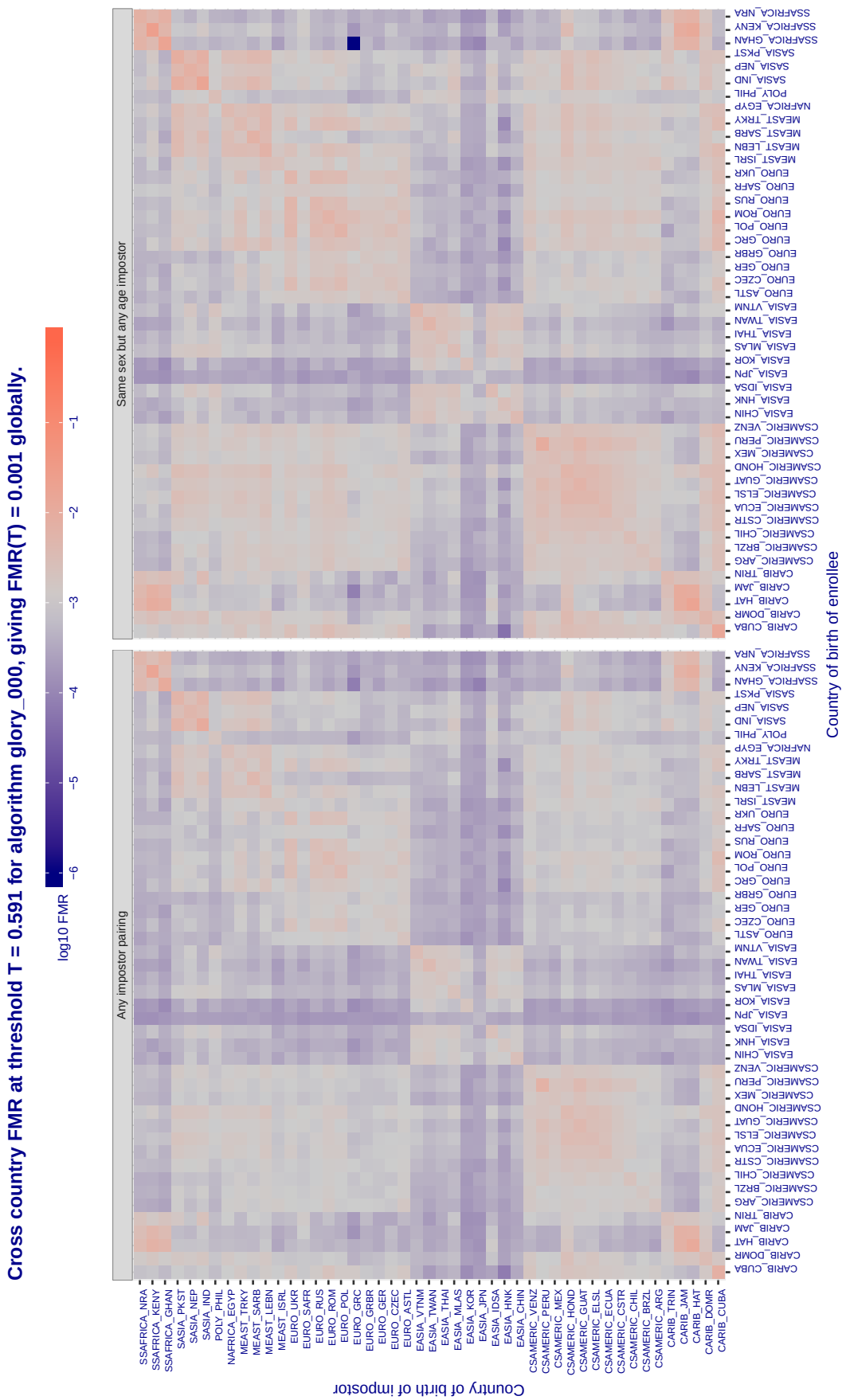


Figure 337: For algorithm glory-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

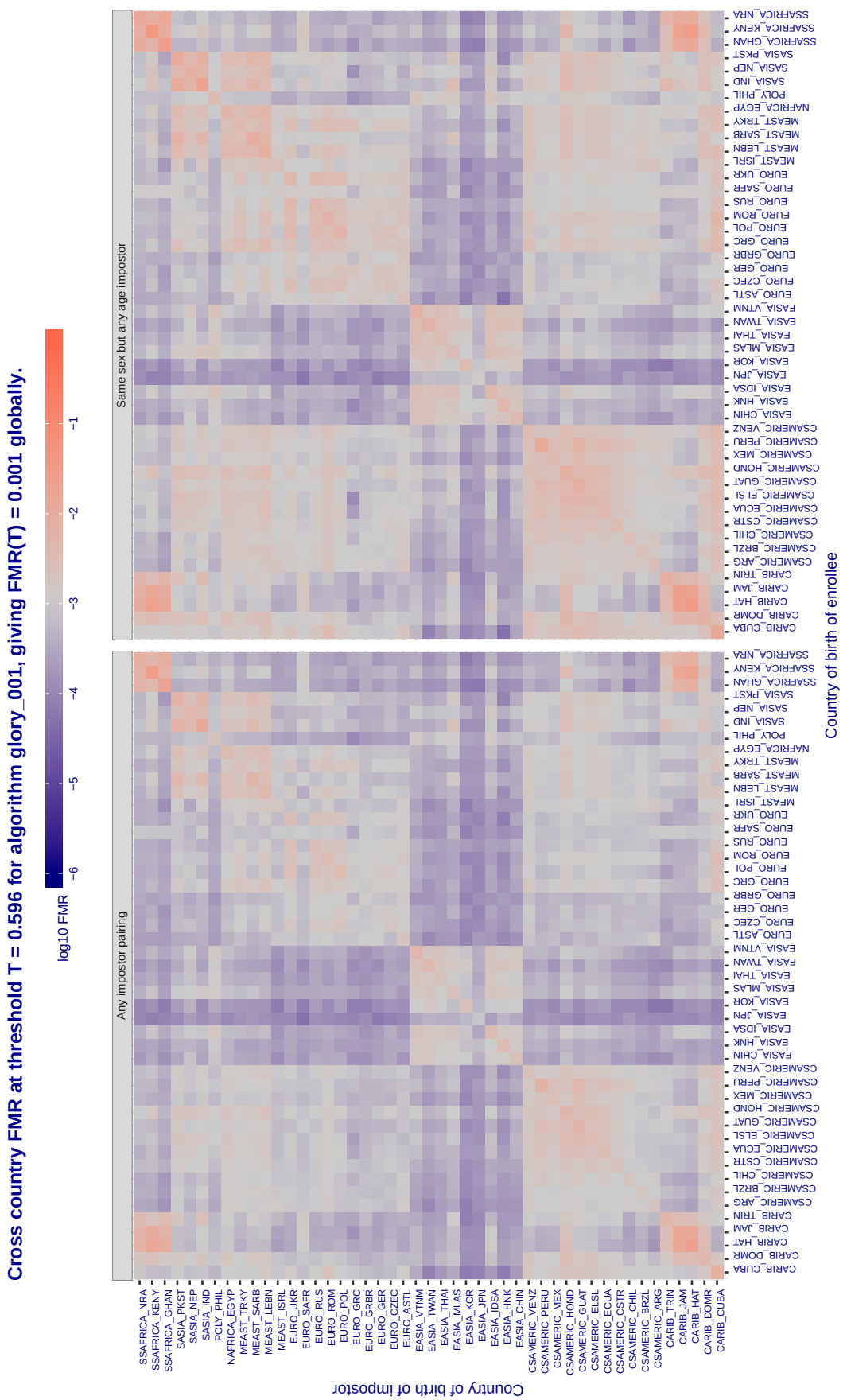


Figure 338: For algorithm glory-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

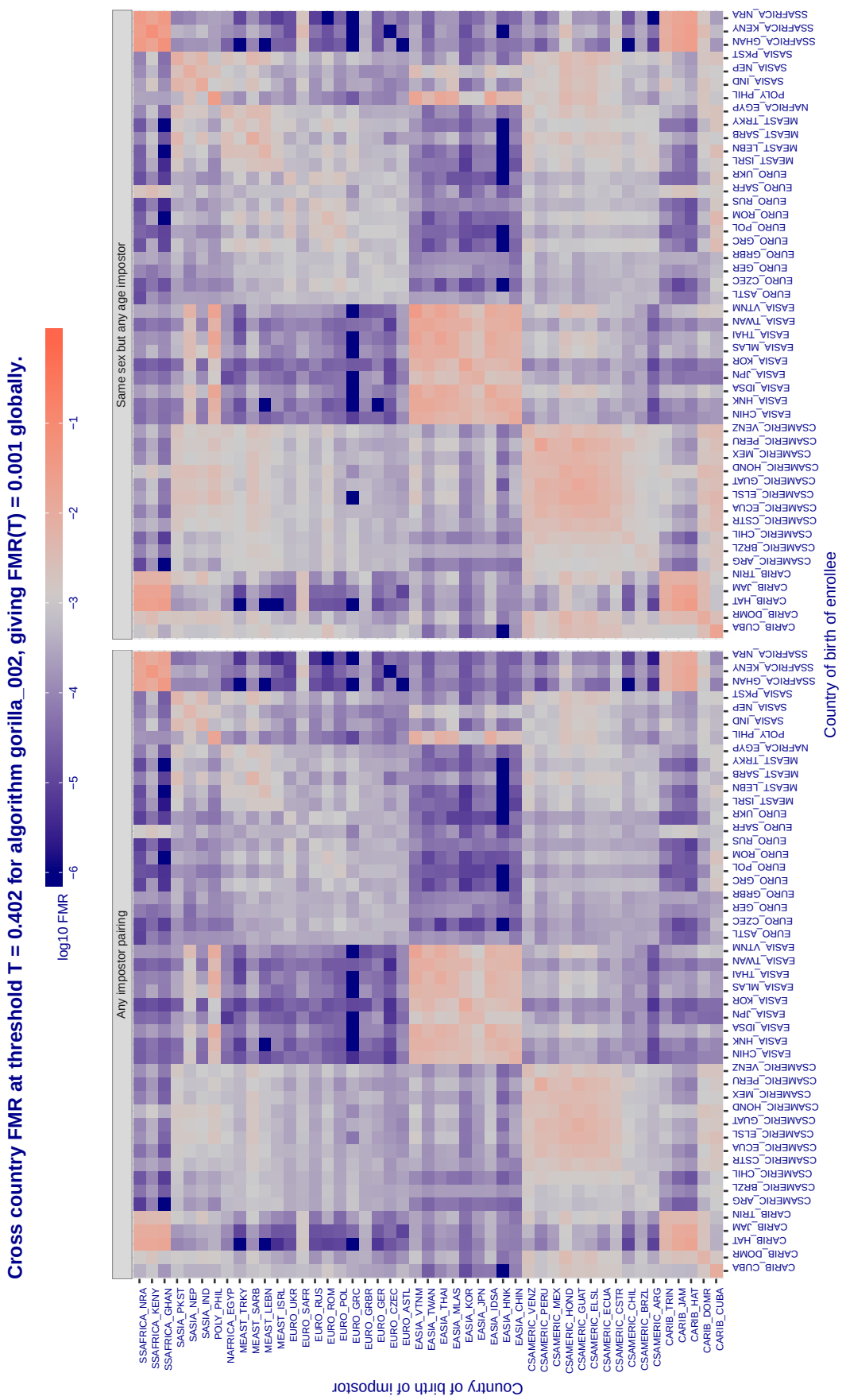


Figure 339: For algorithm gorilla-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

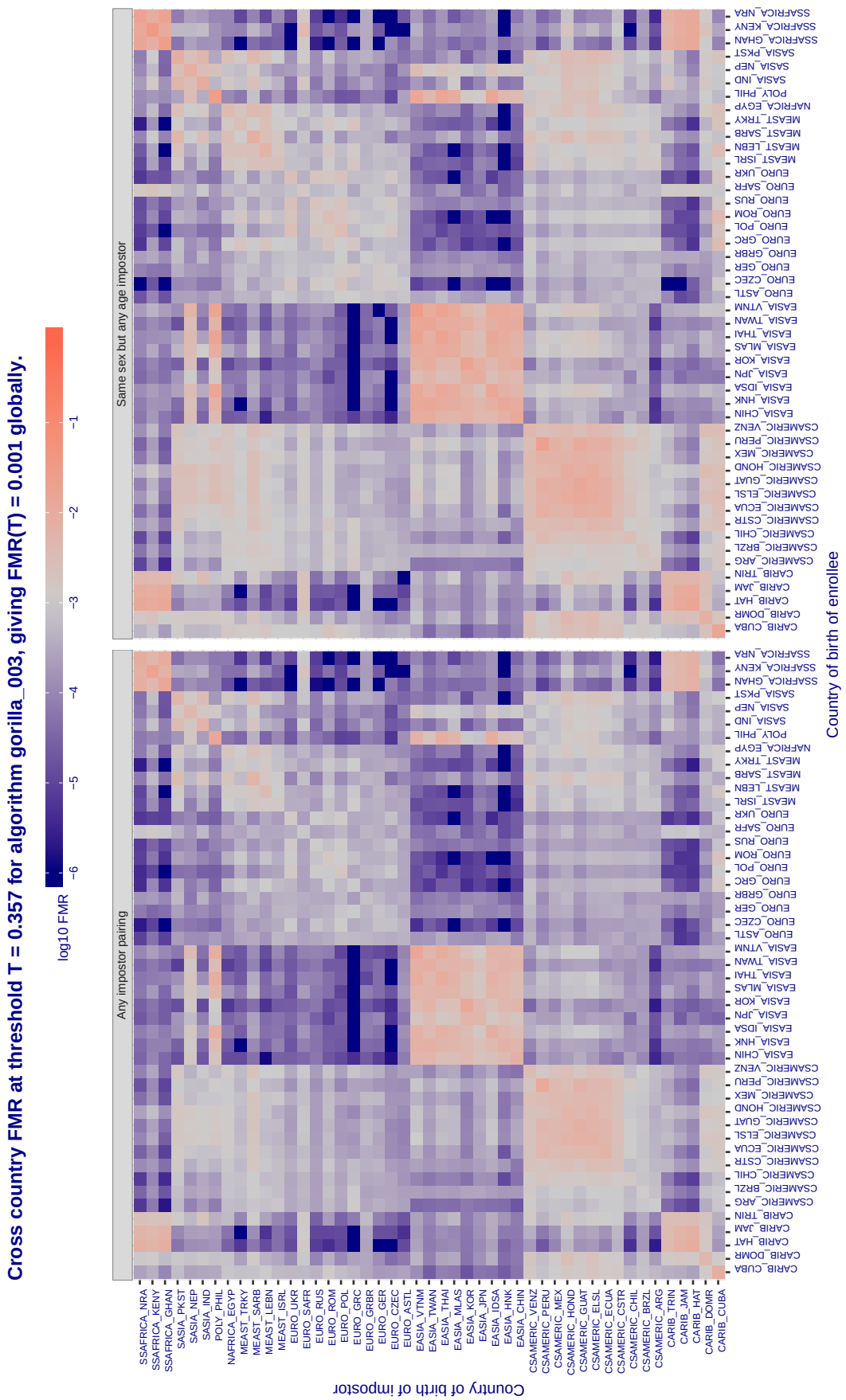


Figure 340: For algorithm gorilla-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

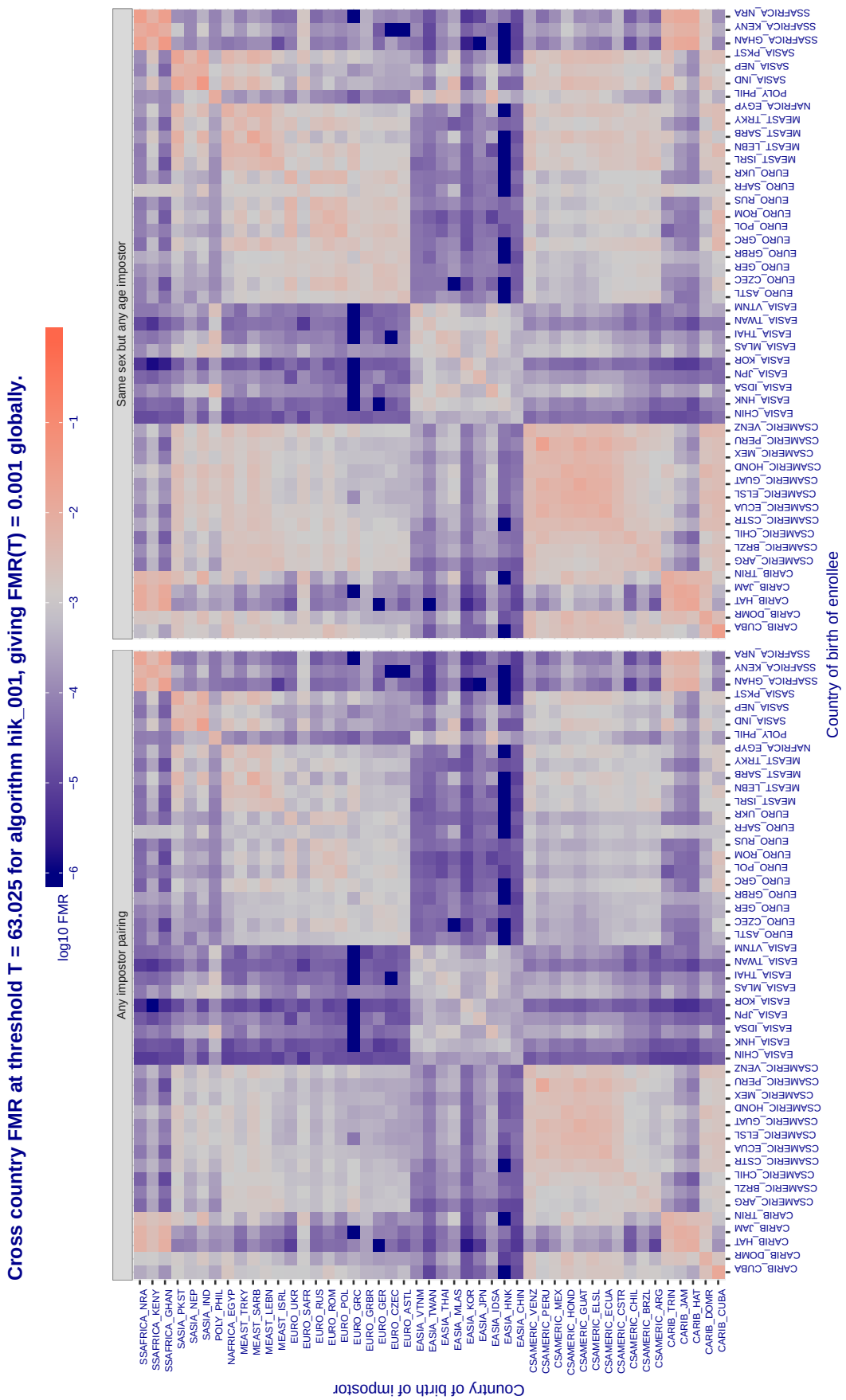


Figure 341: For algorithm hik-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

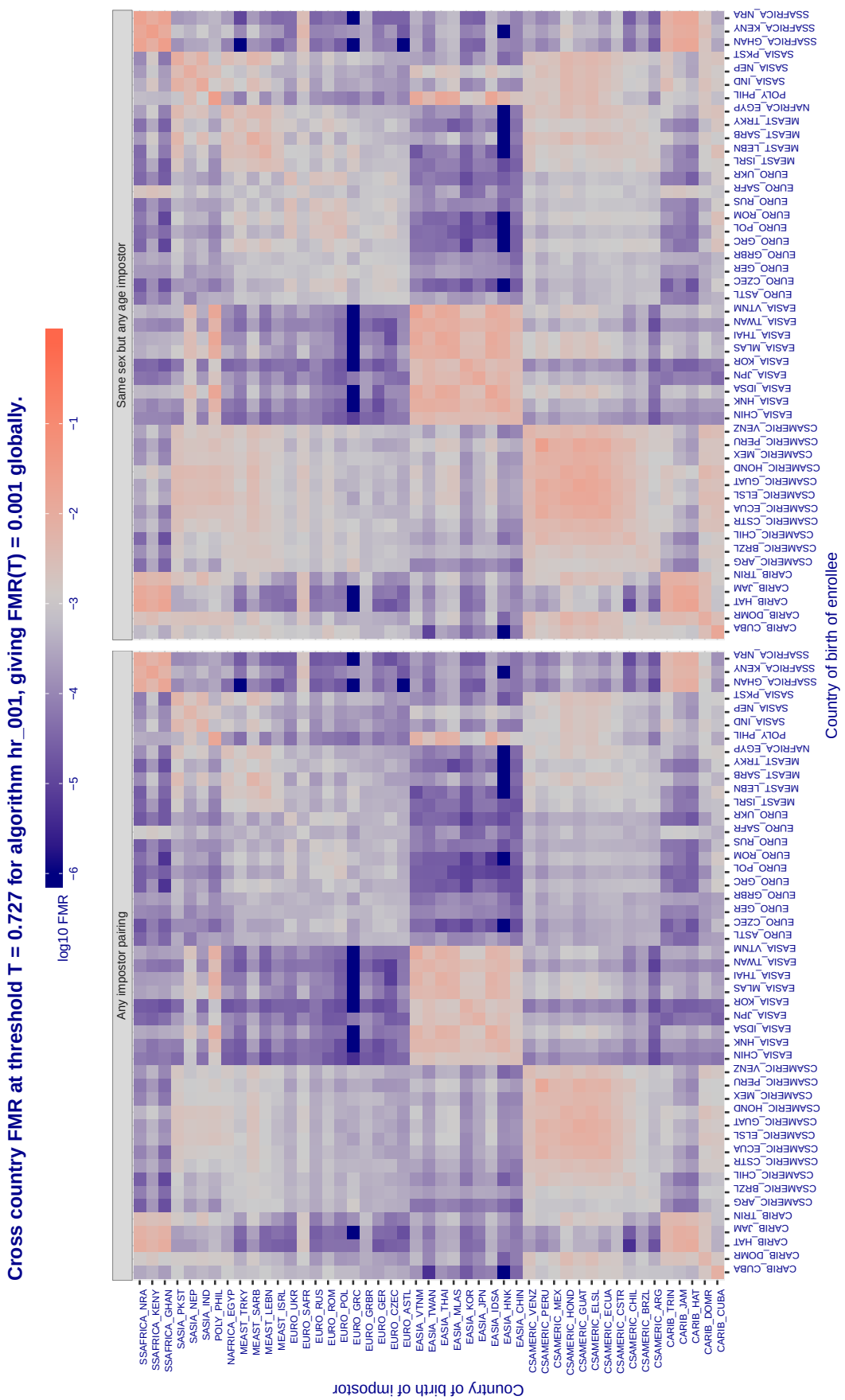


Figure 342: For algorithm hr-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

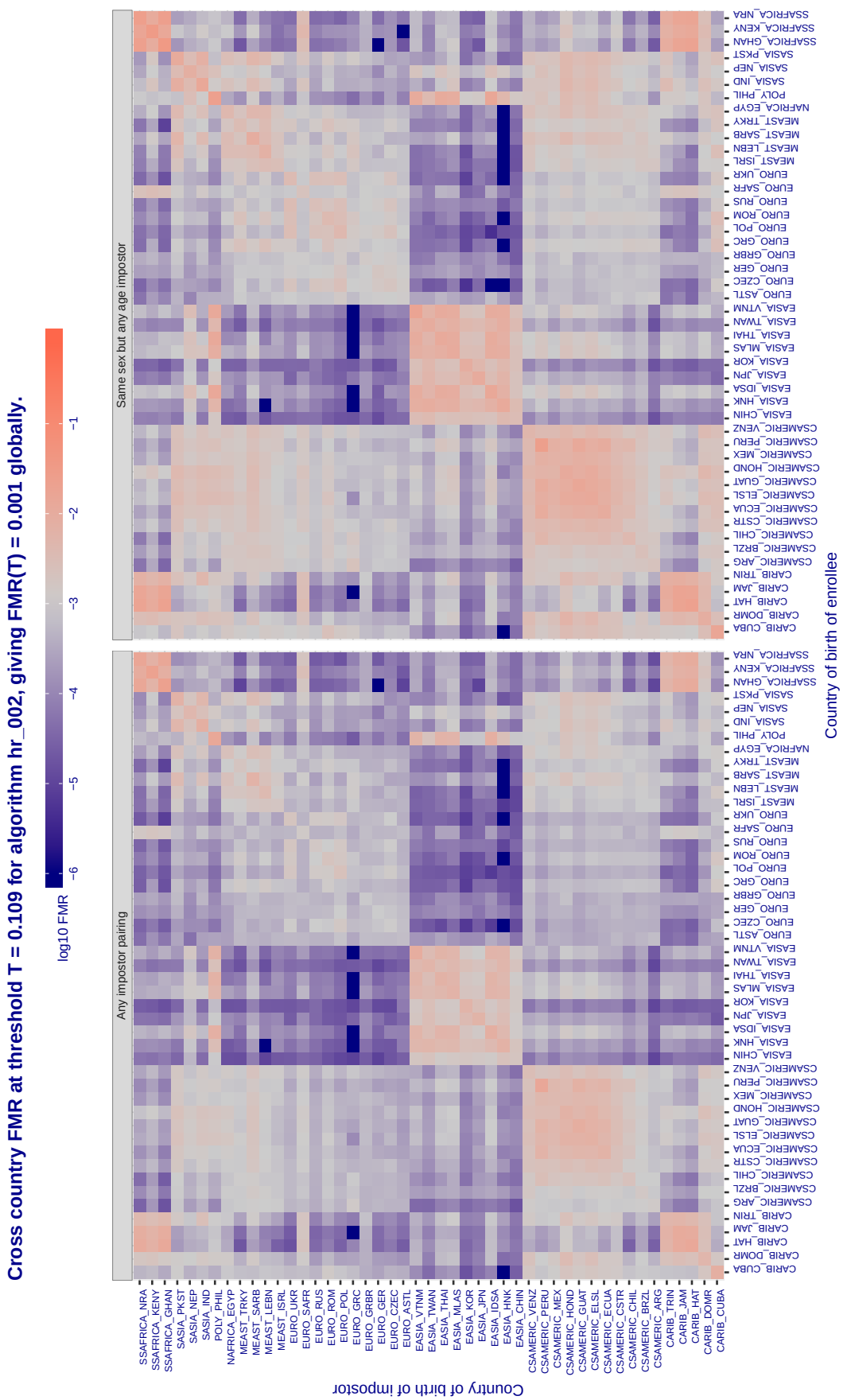


Figure 343: For algorithm hr-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

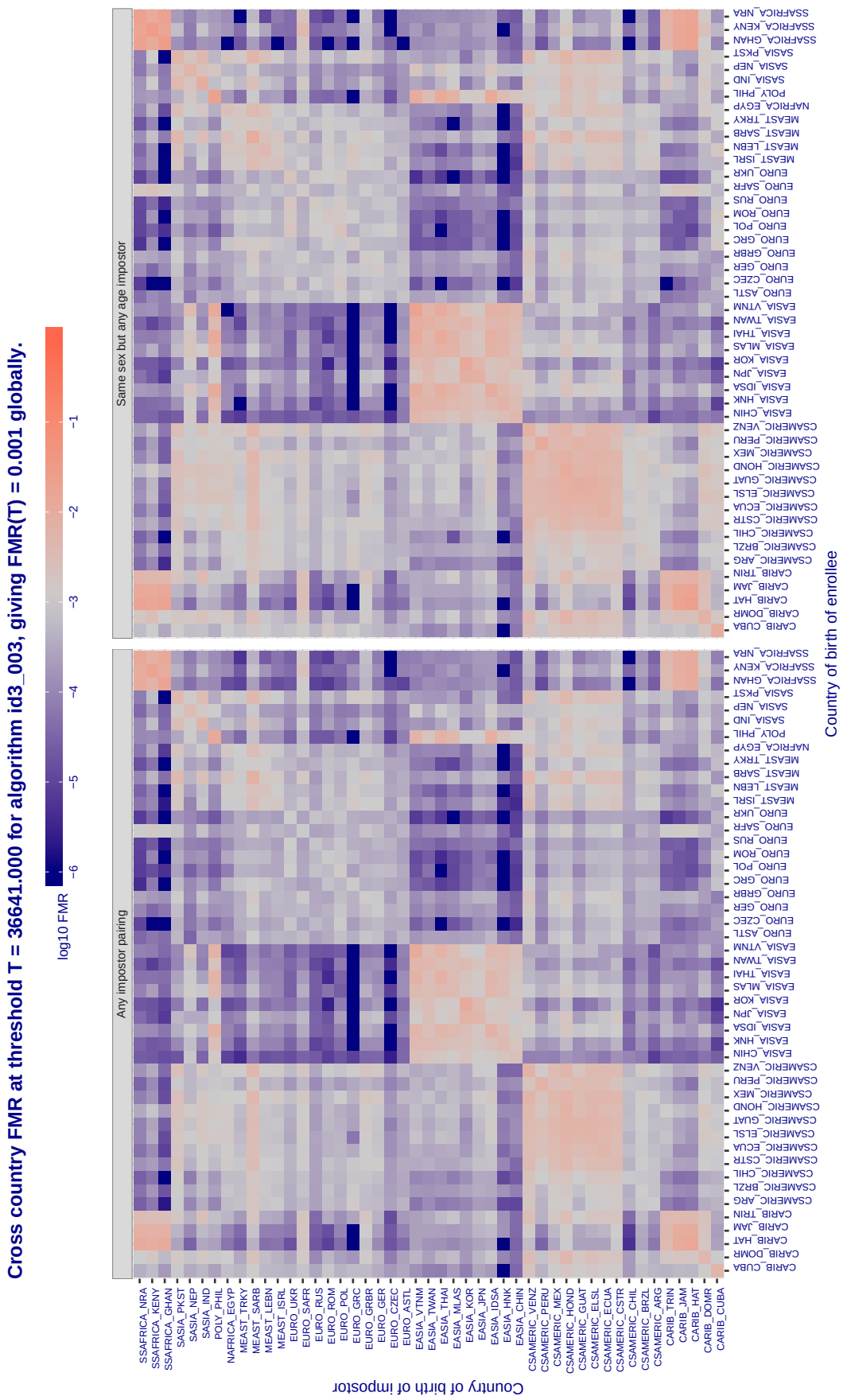


Figure 344: For algorithm id3-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

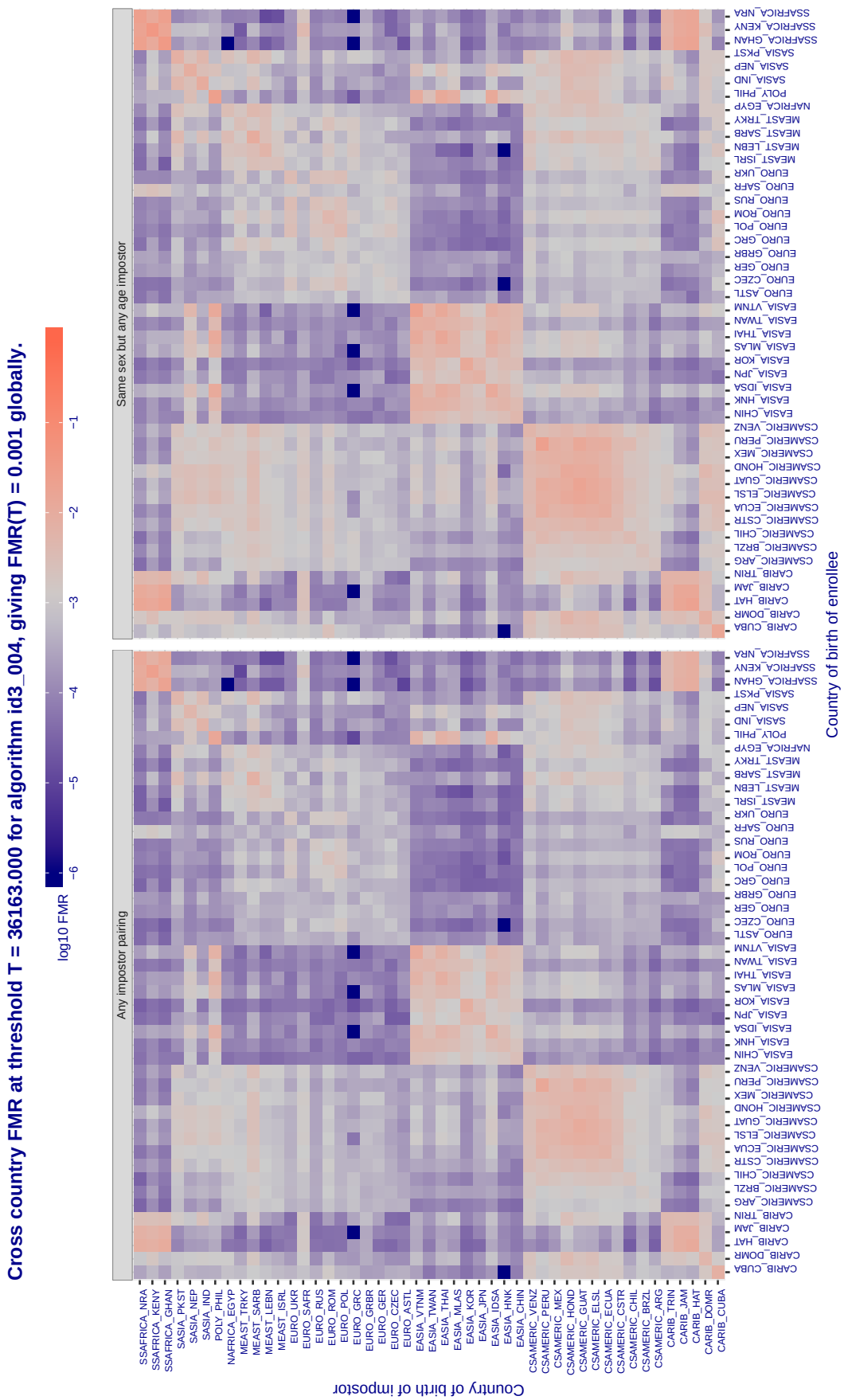


Figure 345: For algorithm id3-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

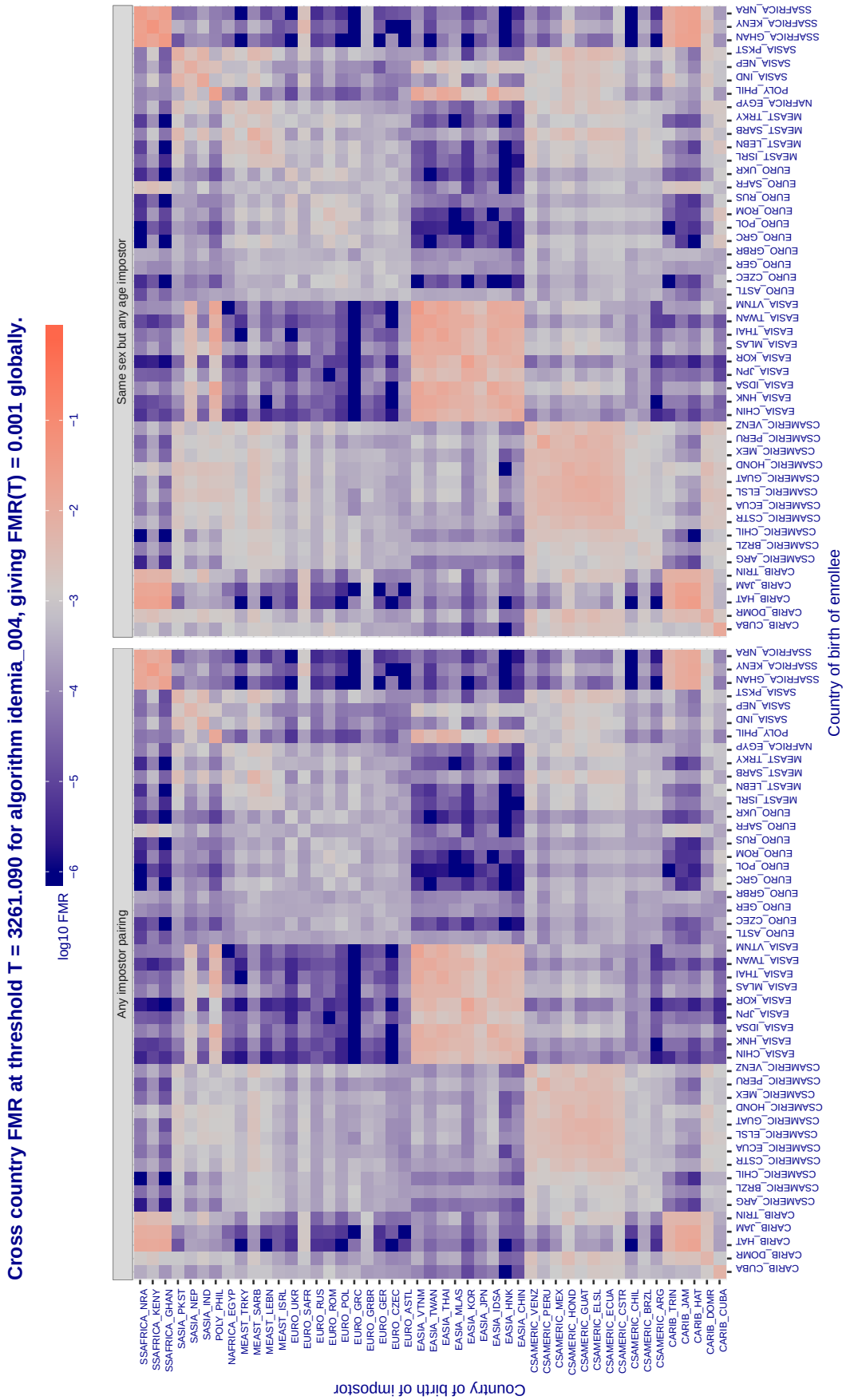


Figure 346: For algorithm idemia-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

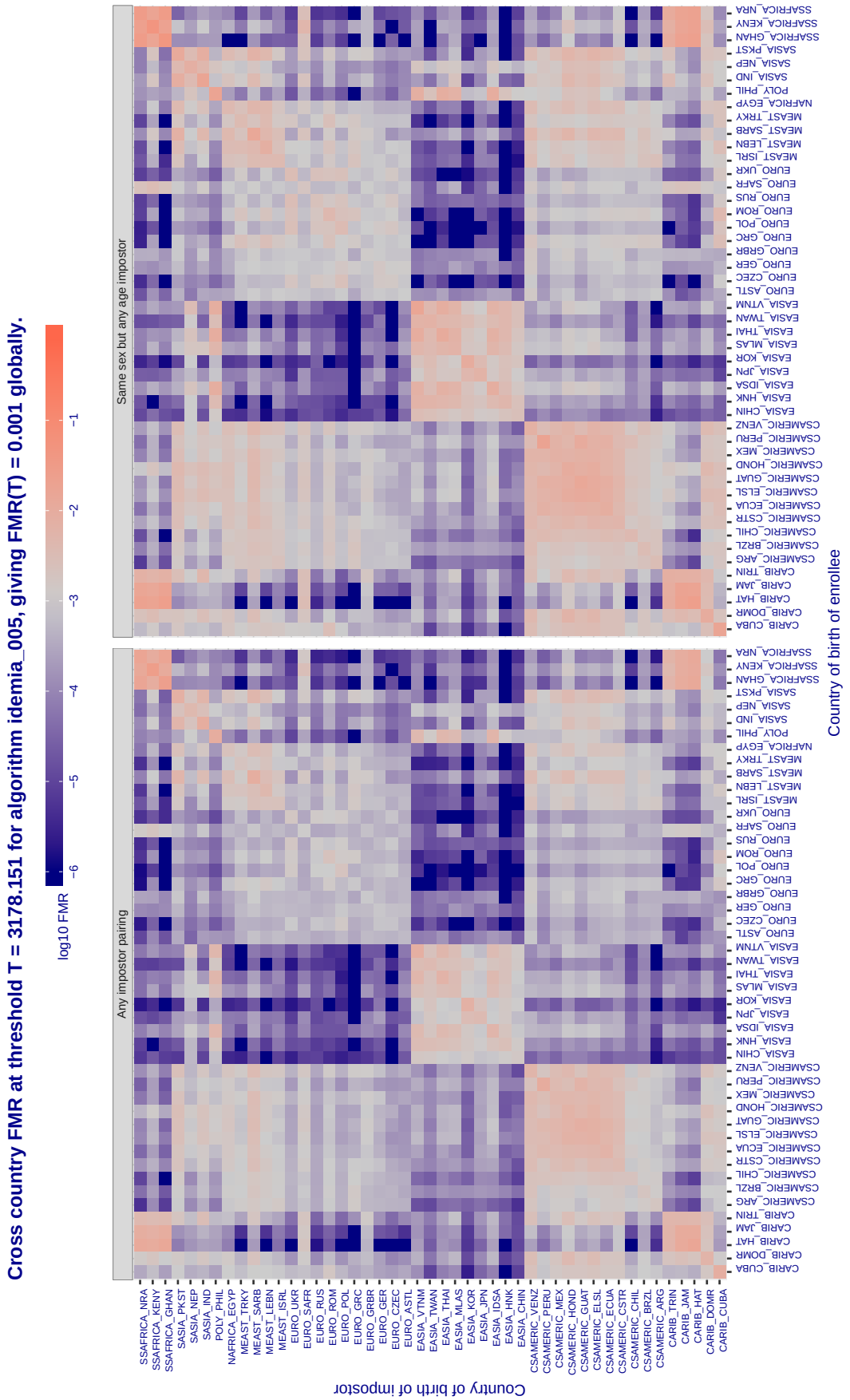


Figure 347: For algorithm idemia-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

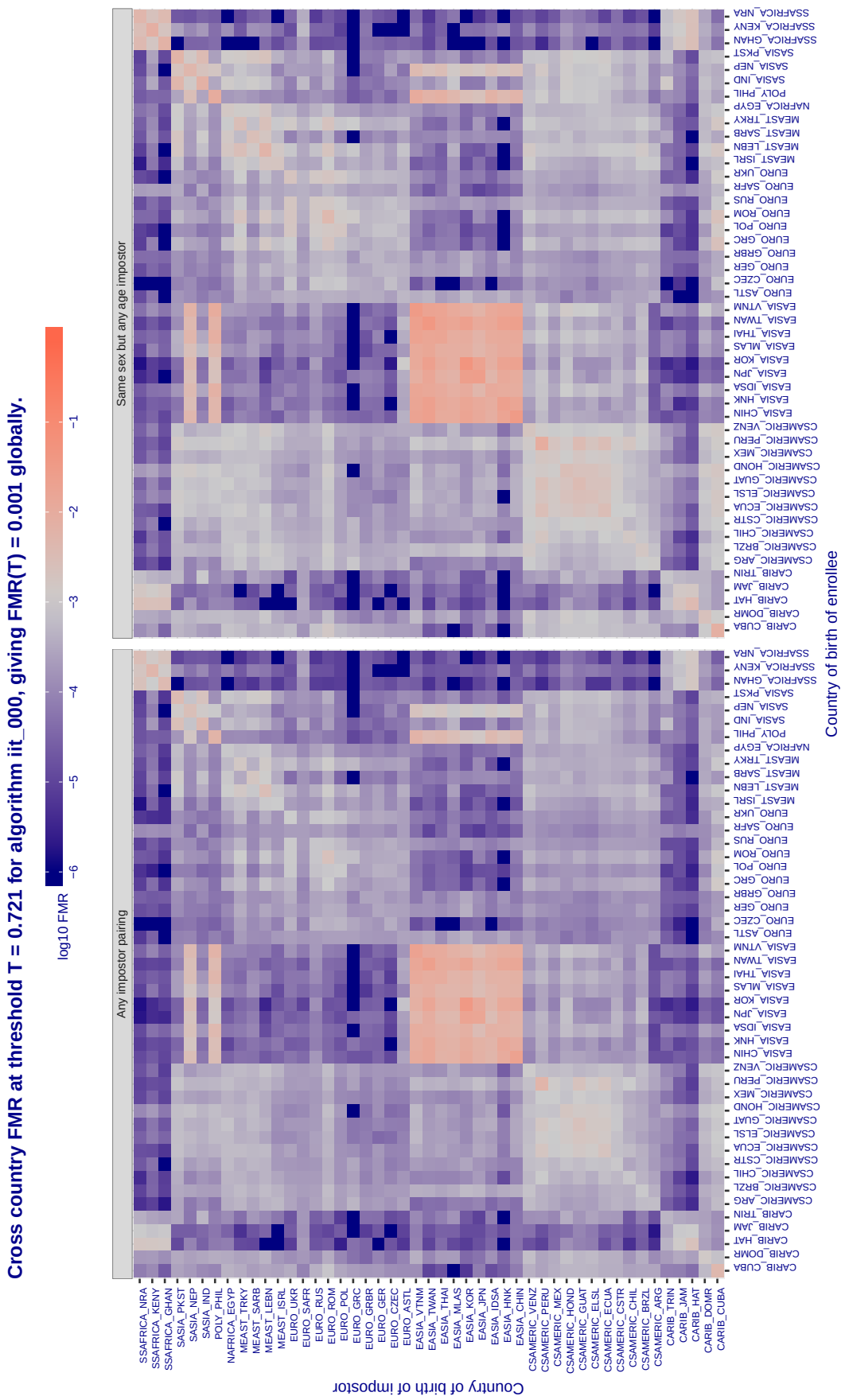


Figure 348: For algorithm iit-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

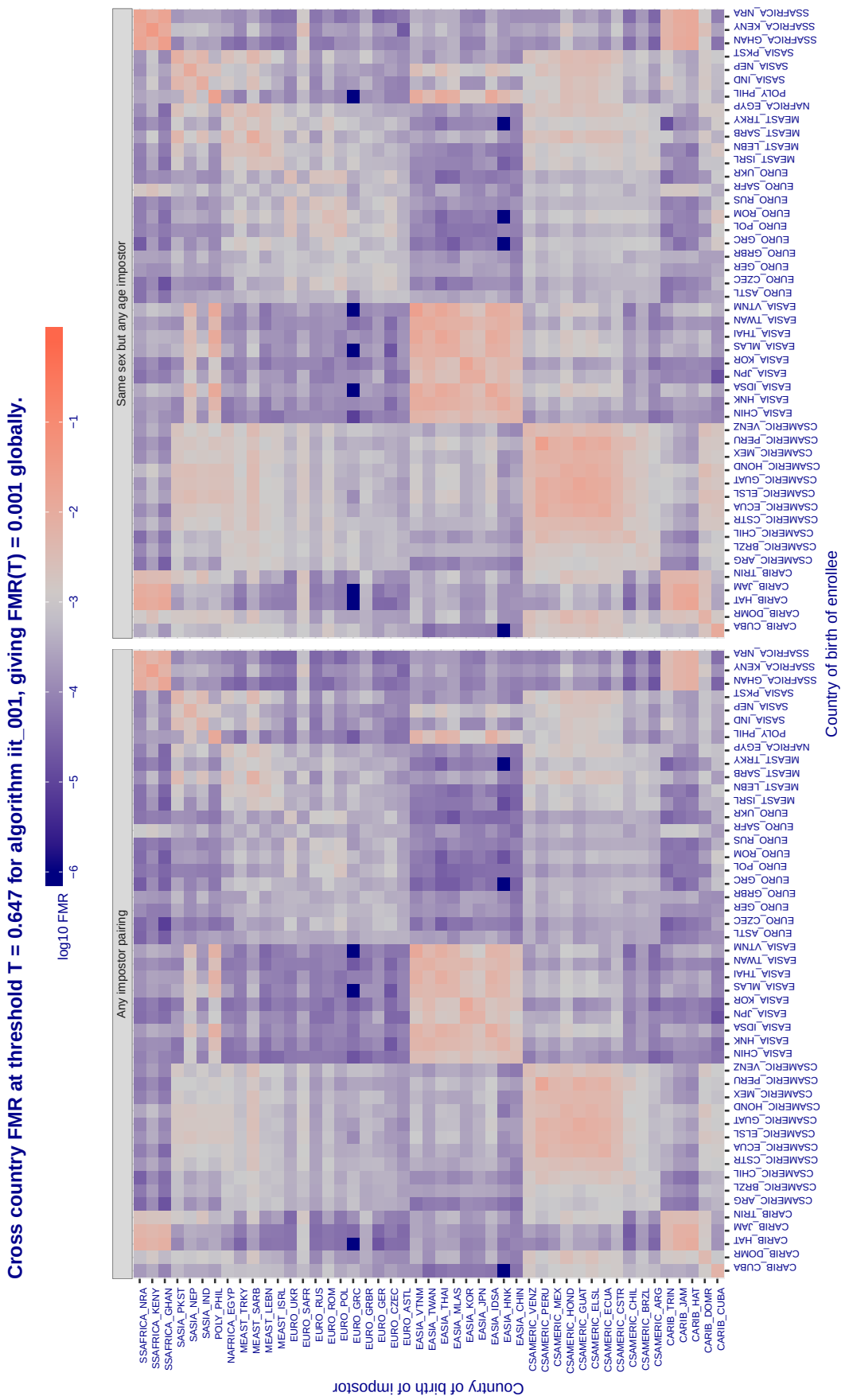


Figure 349: For algorithm iit-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

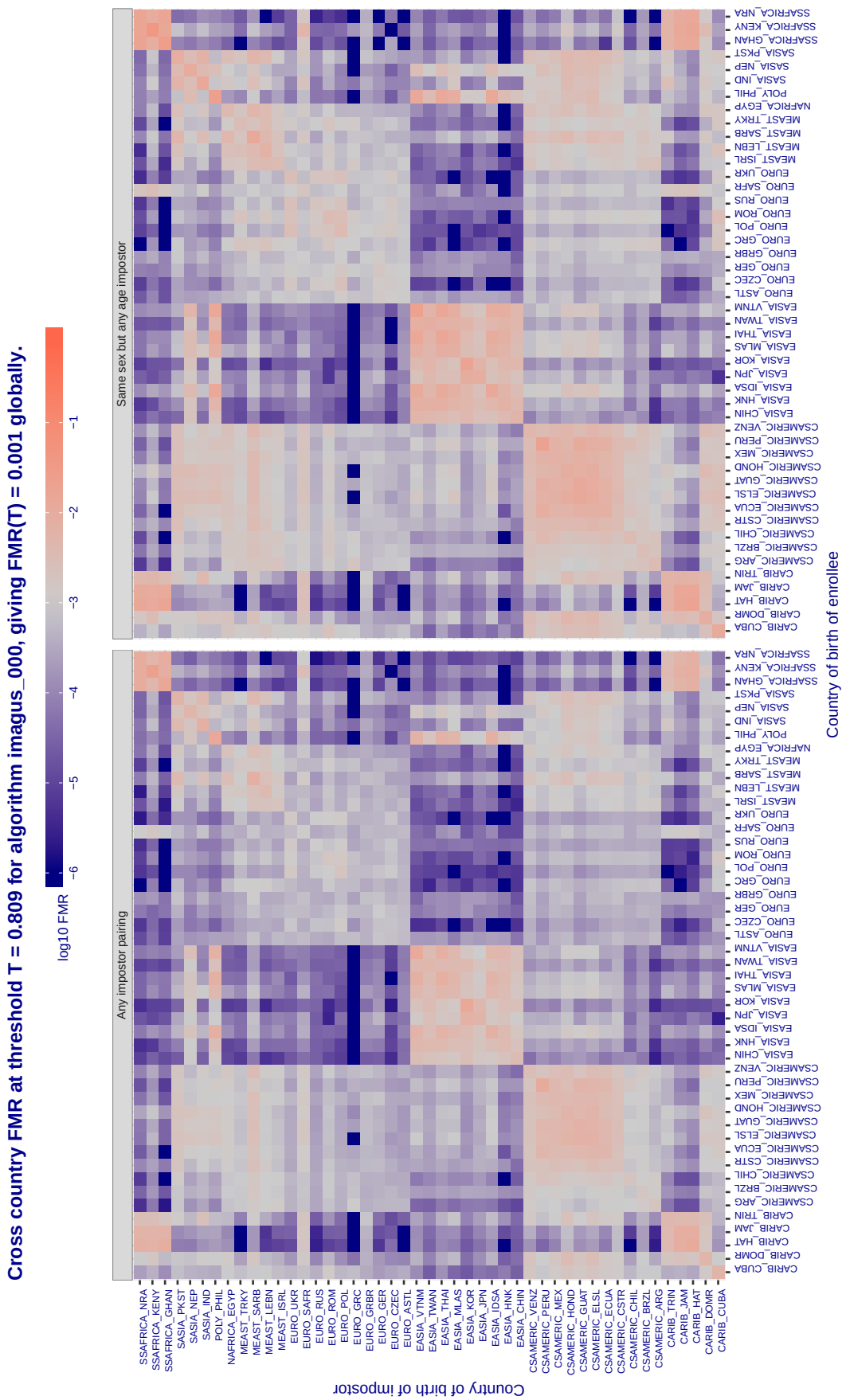


Figure 350: For algorithm imagus-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

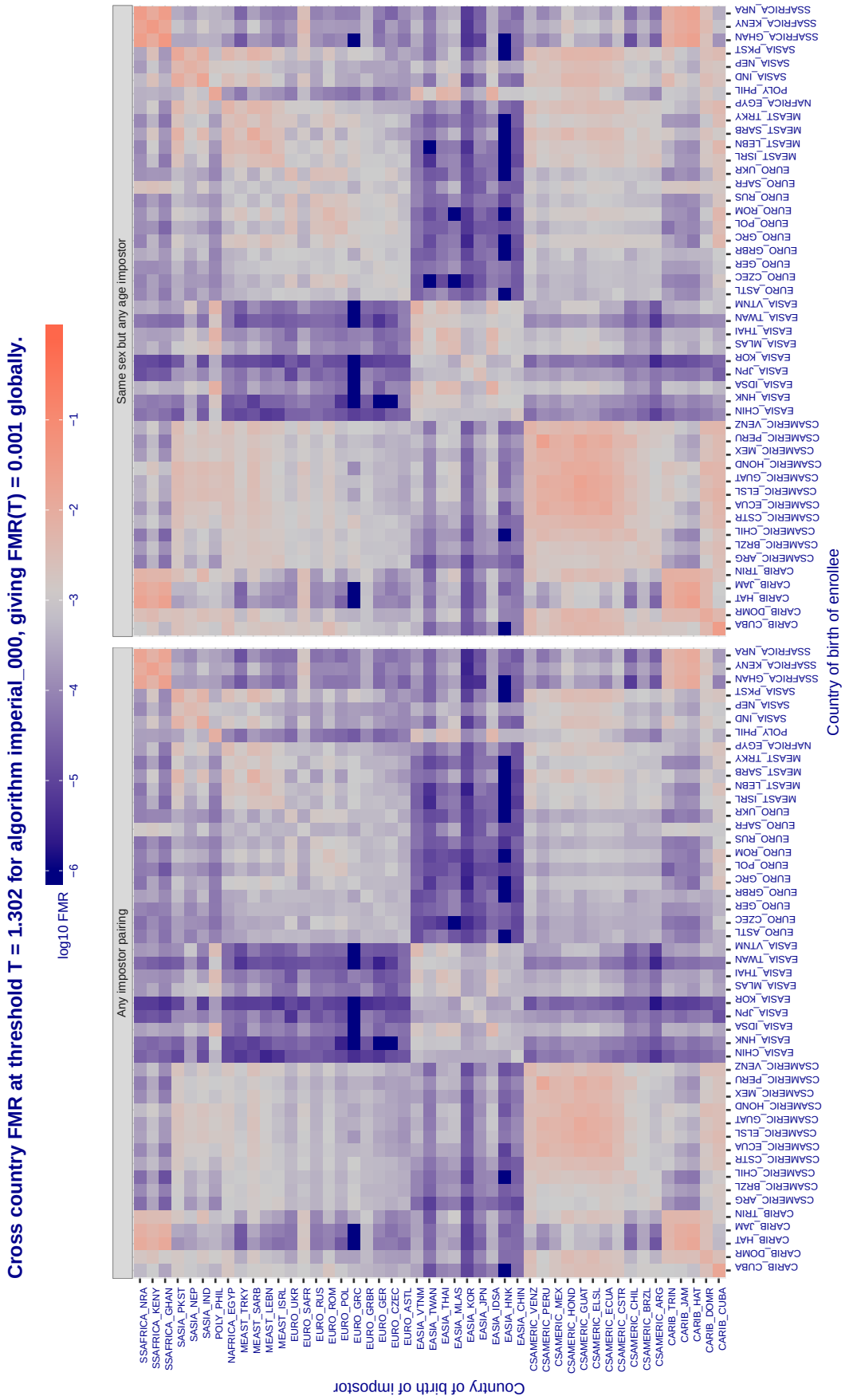


Figure 351: For algorithm imperial-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

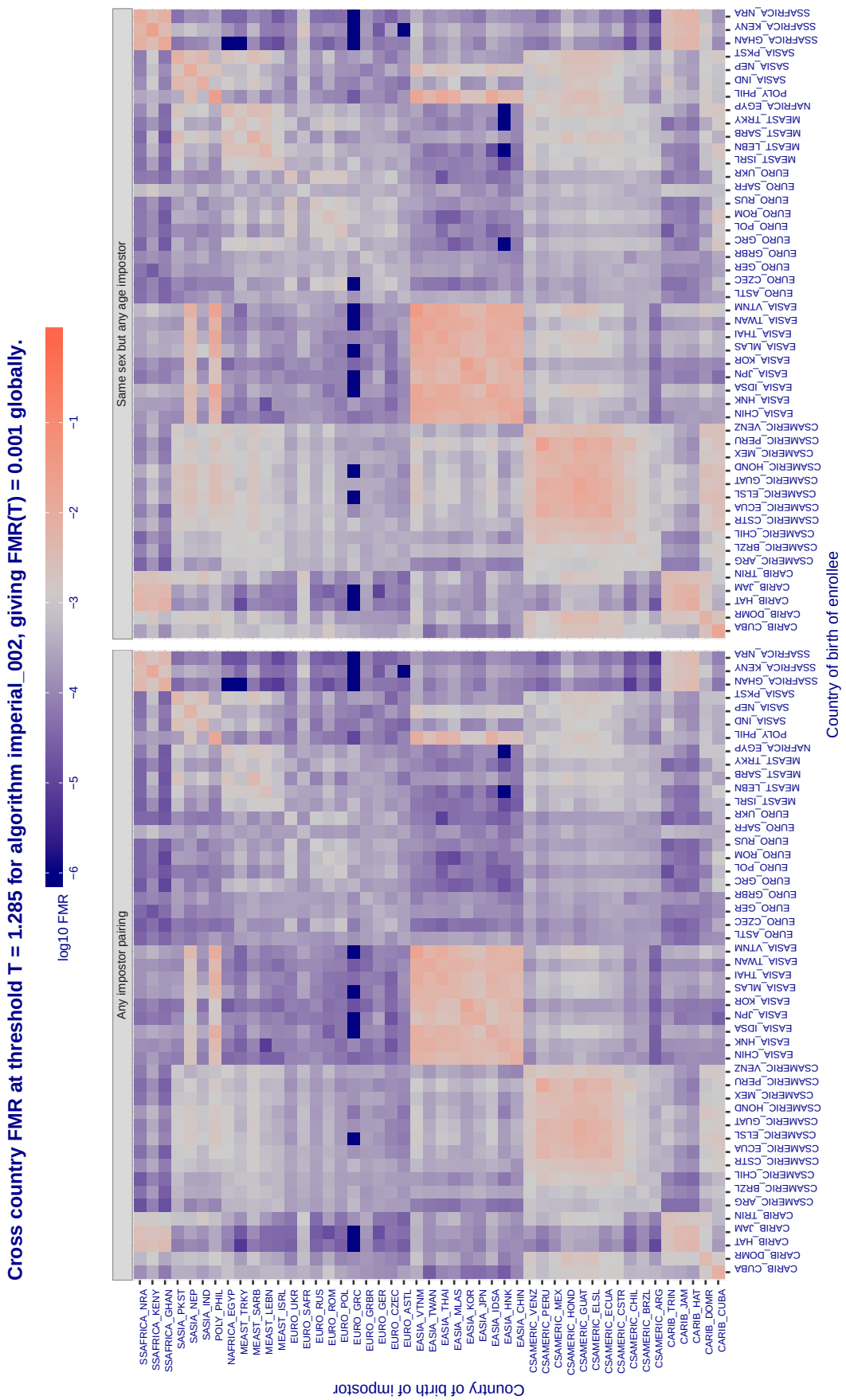


Figure 352: For algorithm imperial-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

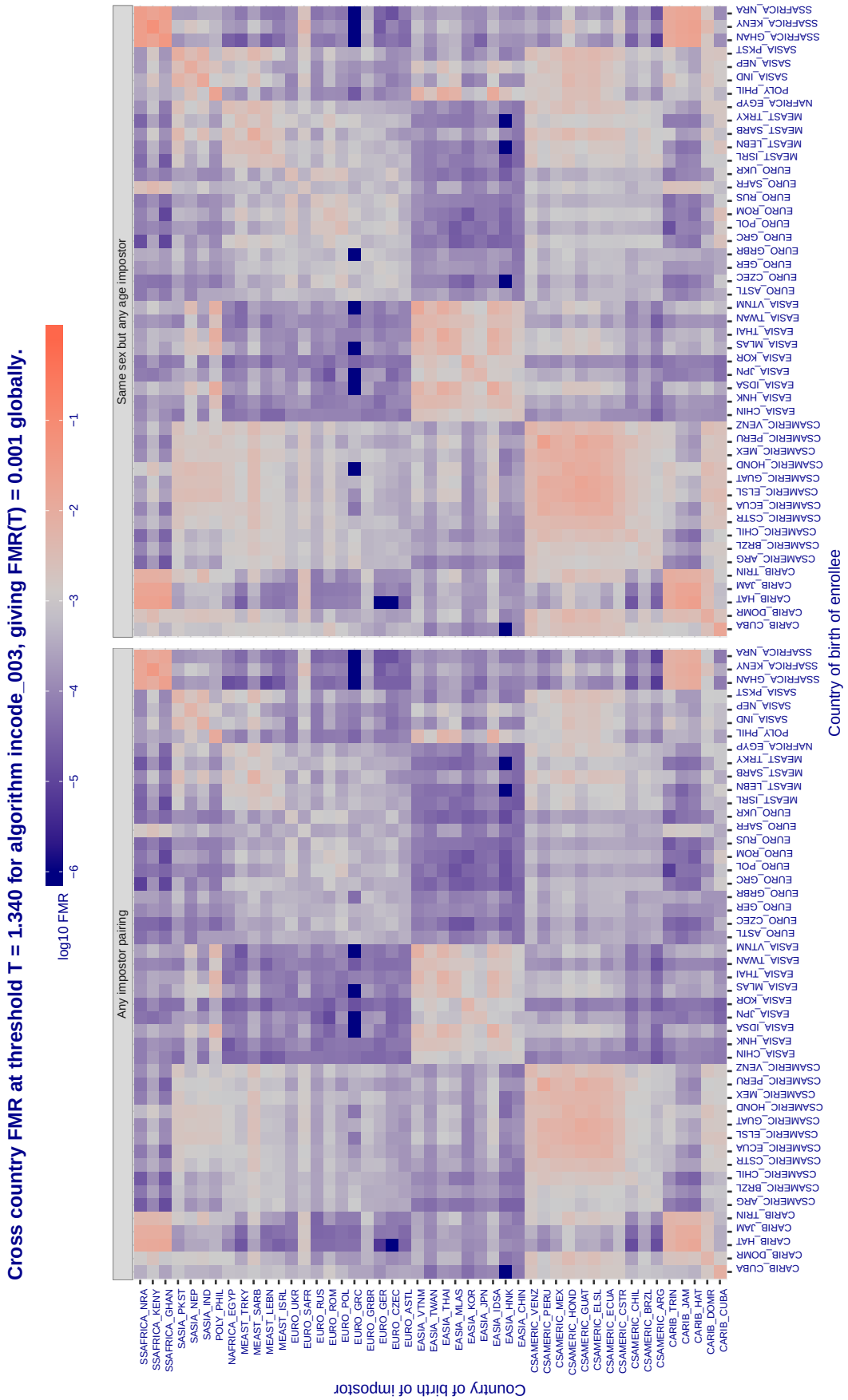


Figure 353: For algorithm incode-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

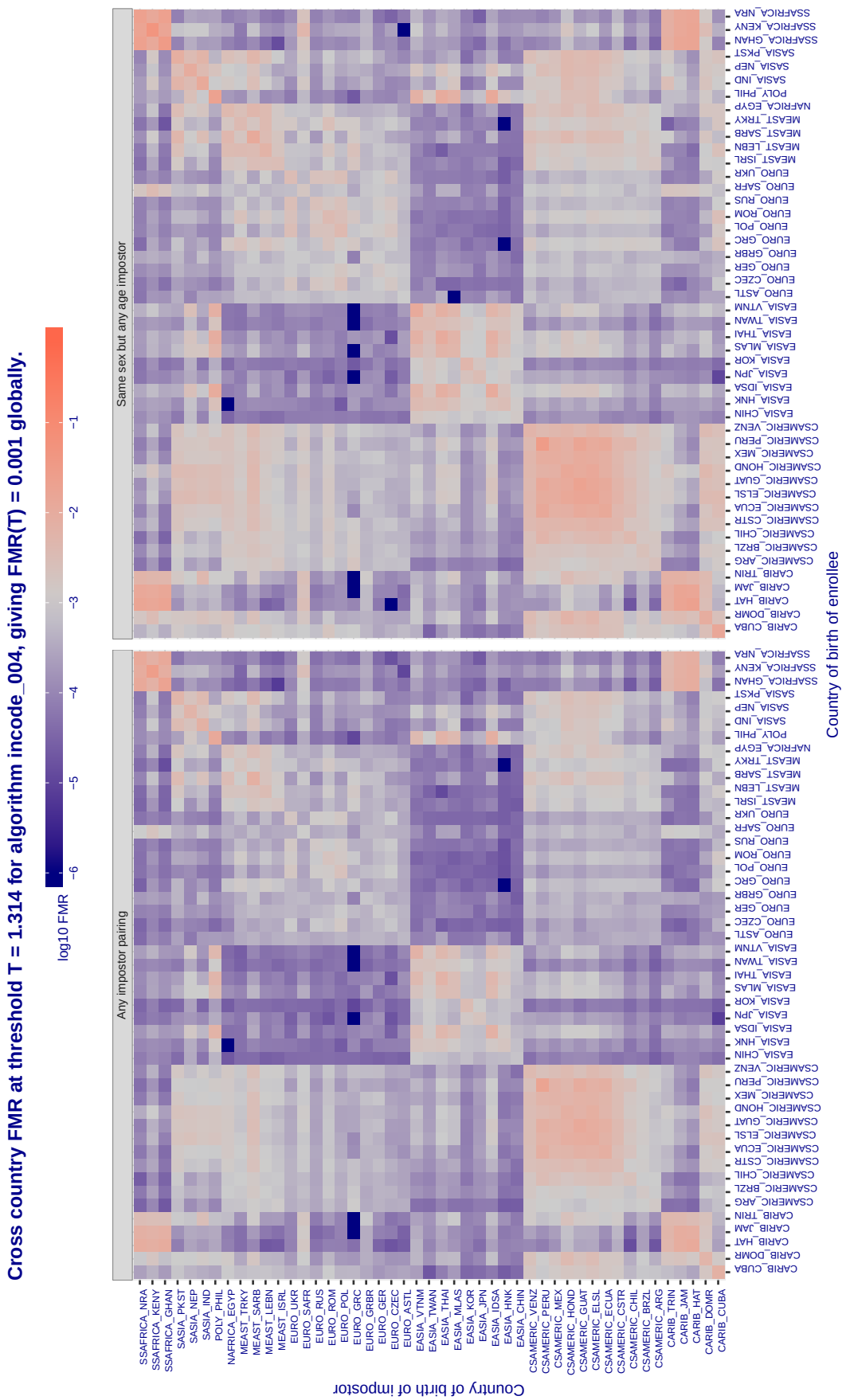


Figure 354: For algorithm incode-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

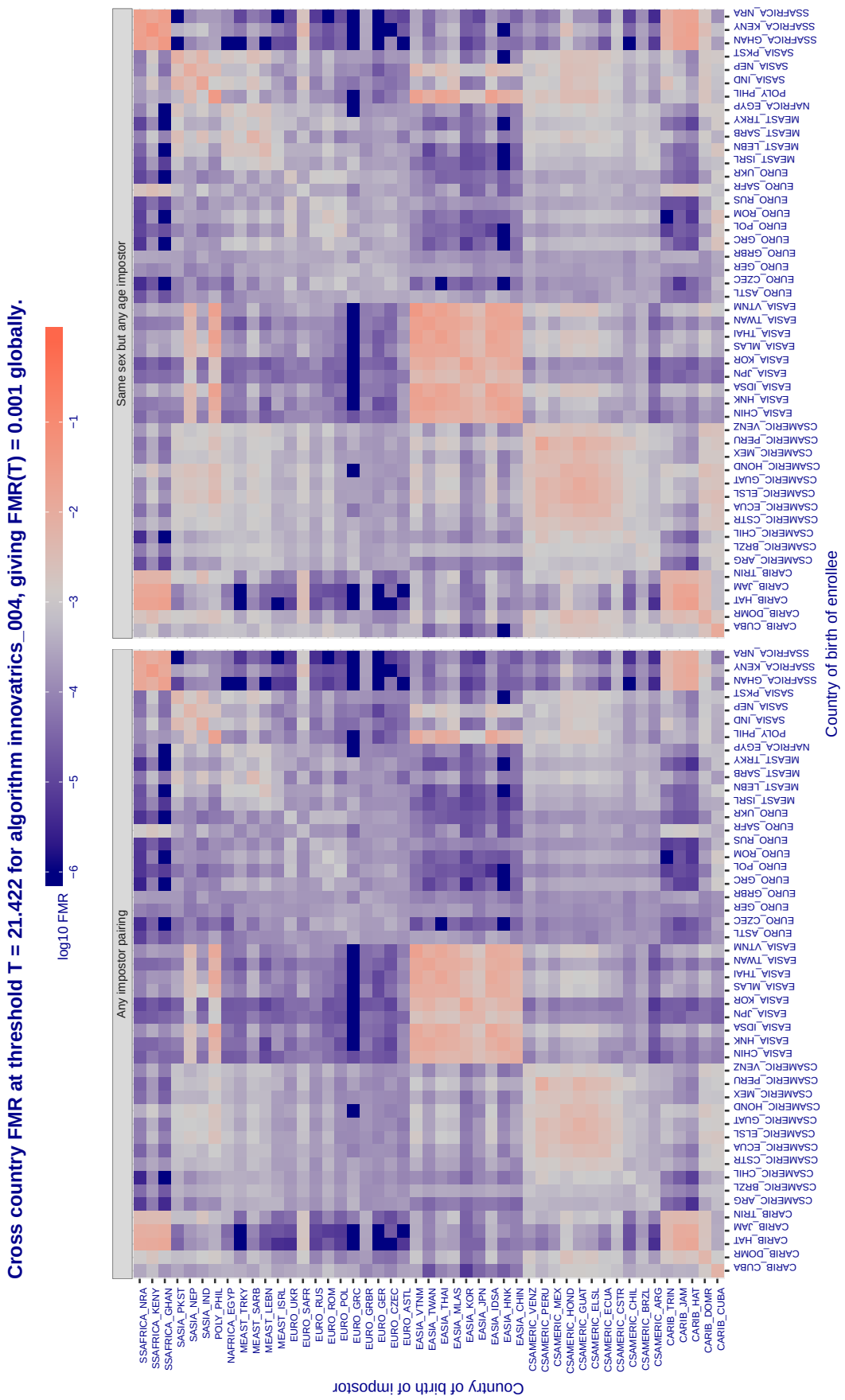


Figure 355: For algorithm innovatrics-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

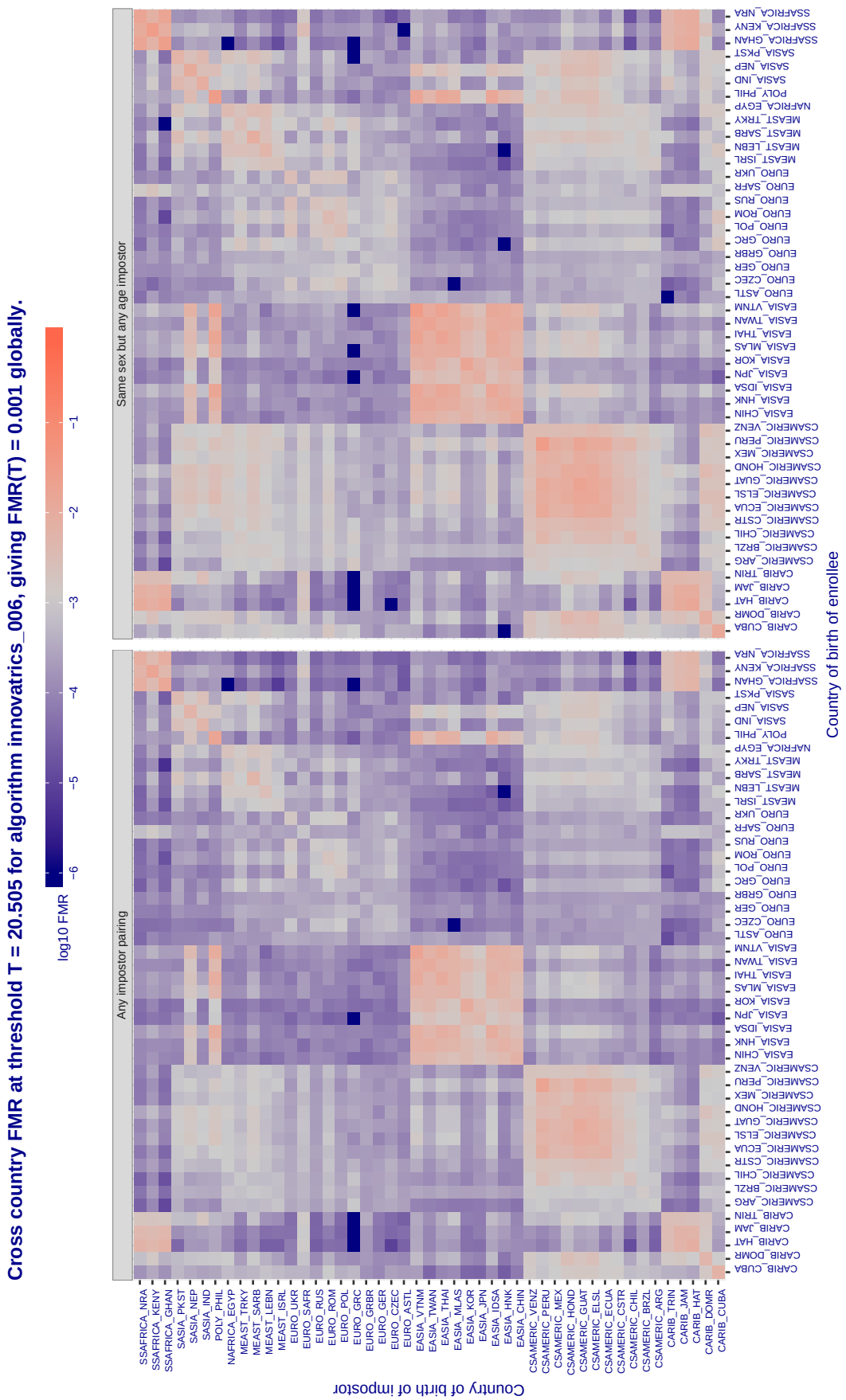


Figure 356: For algorithm innovatrics-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

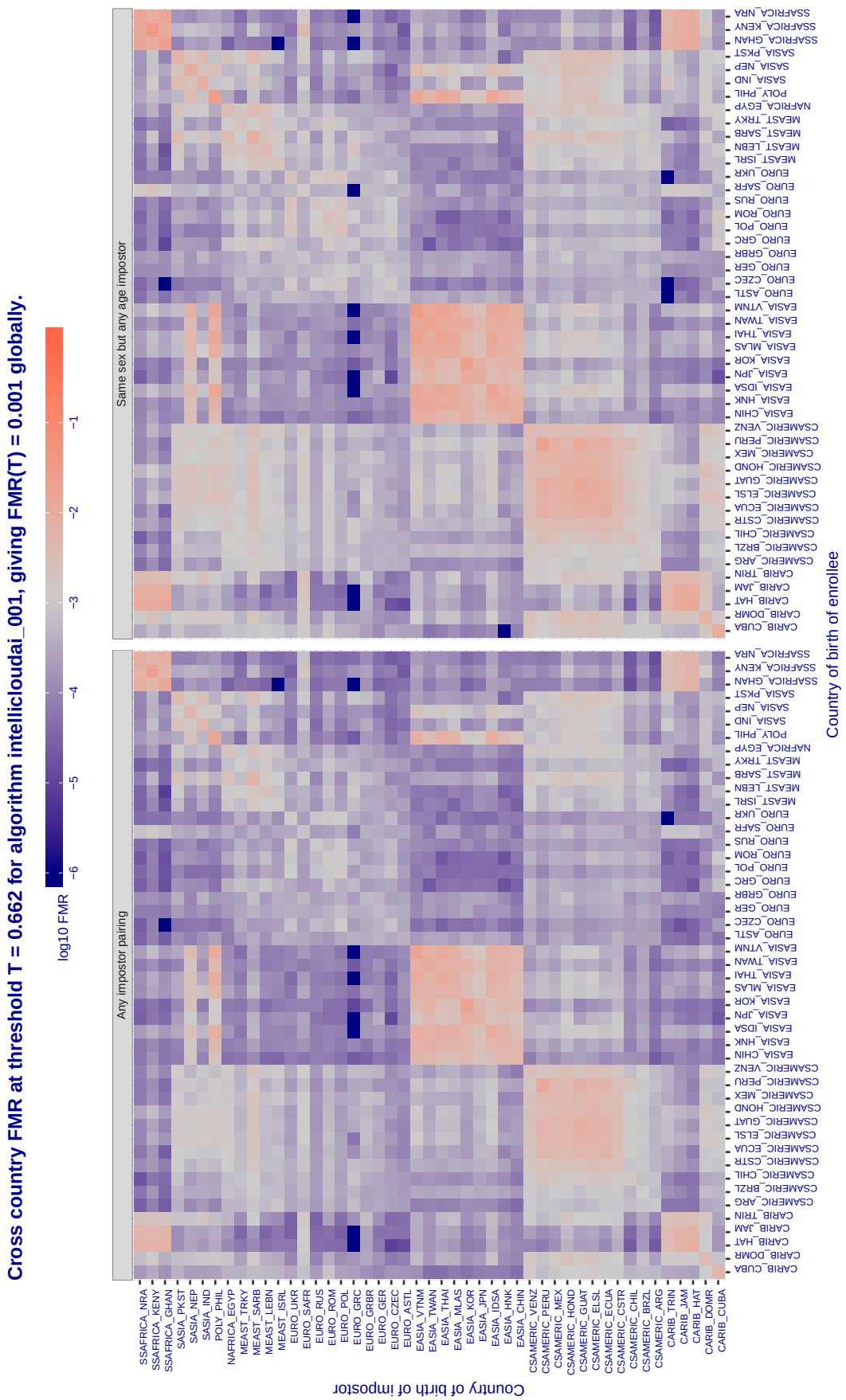


Figure 357: For algorithm intellicloudai-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

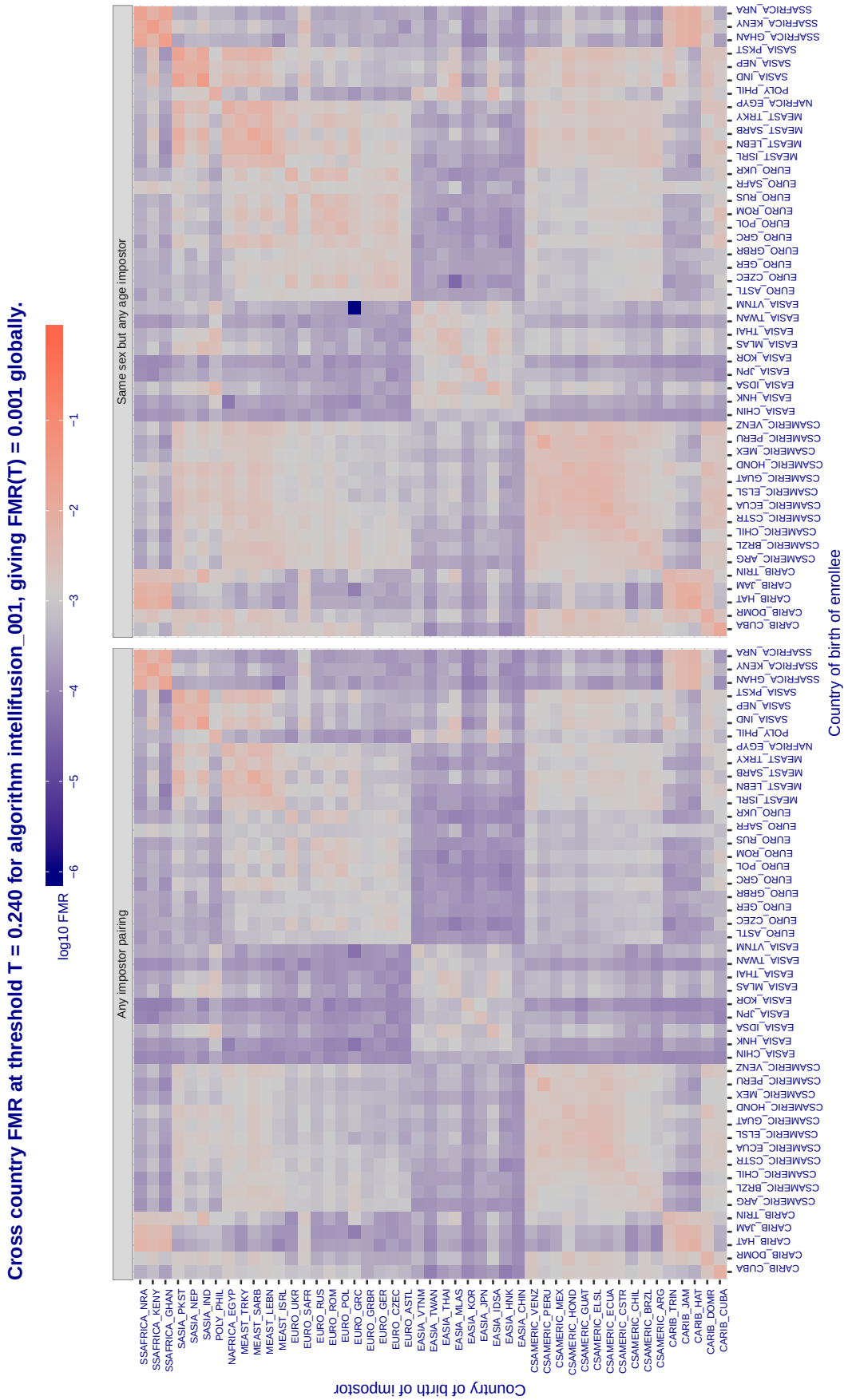


Figure 358: For algorithm intellifusion-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

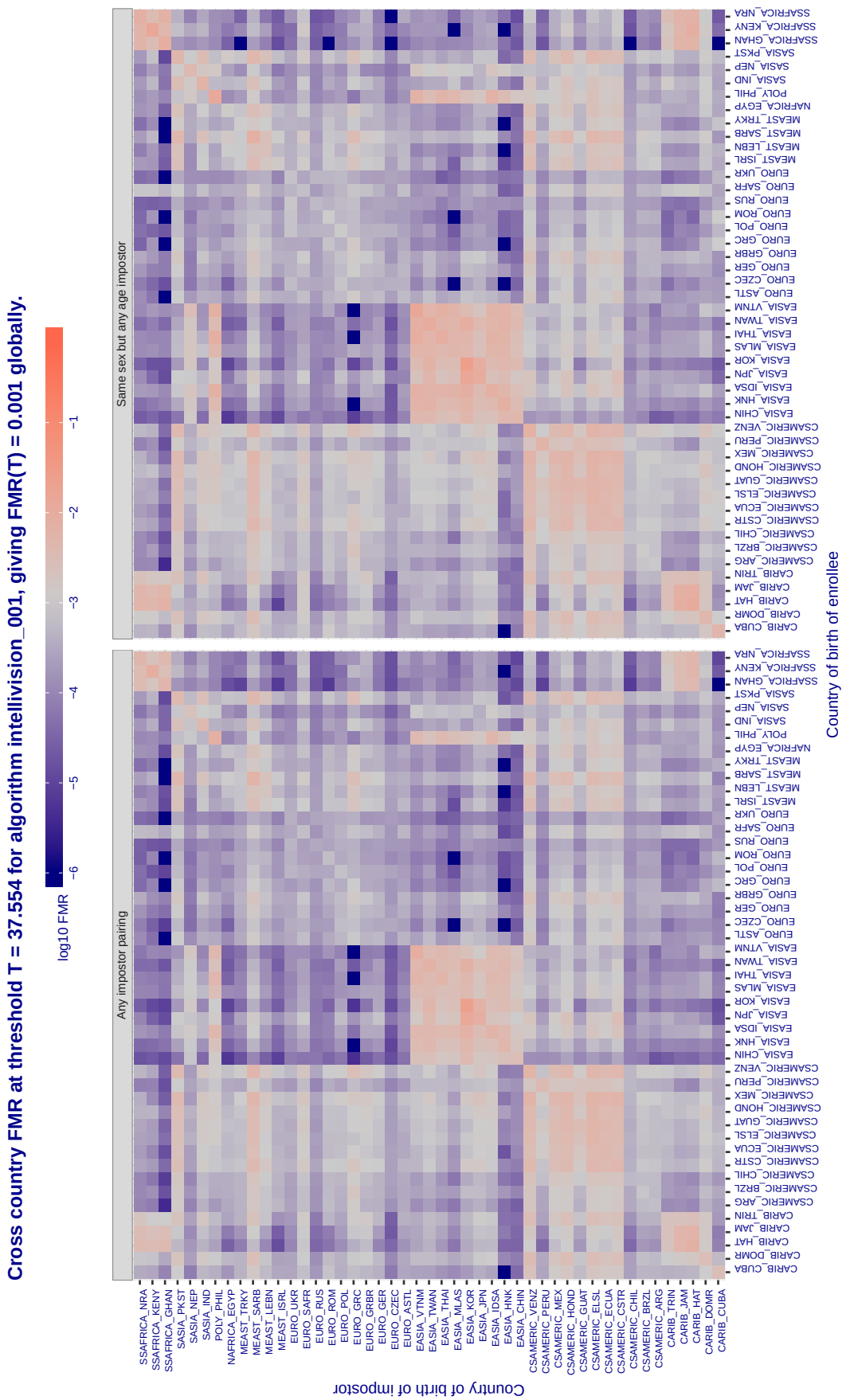


Figure 359: For algorithm intellivision-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

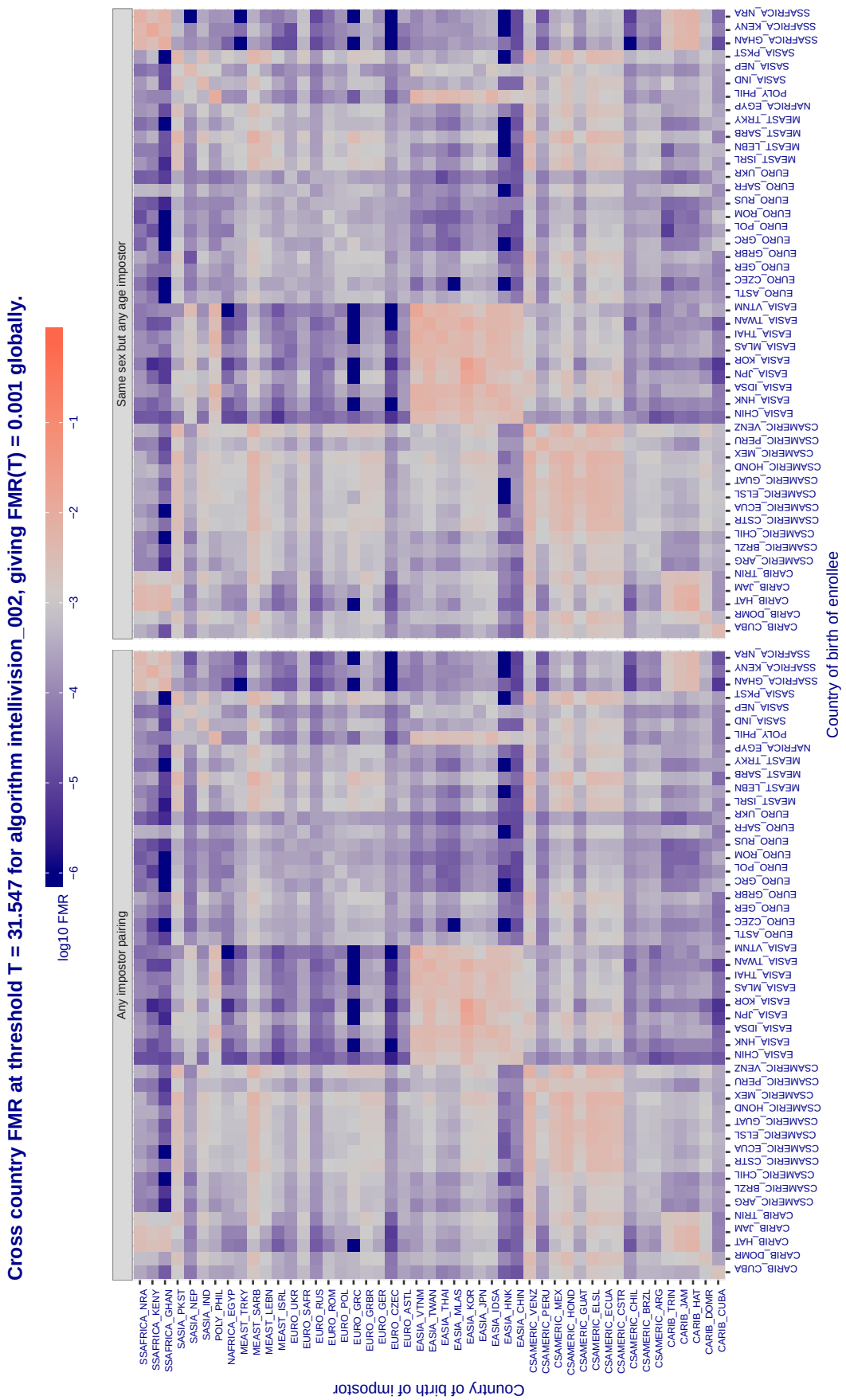


Figure 360: For algorithm intellivision-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

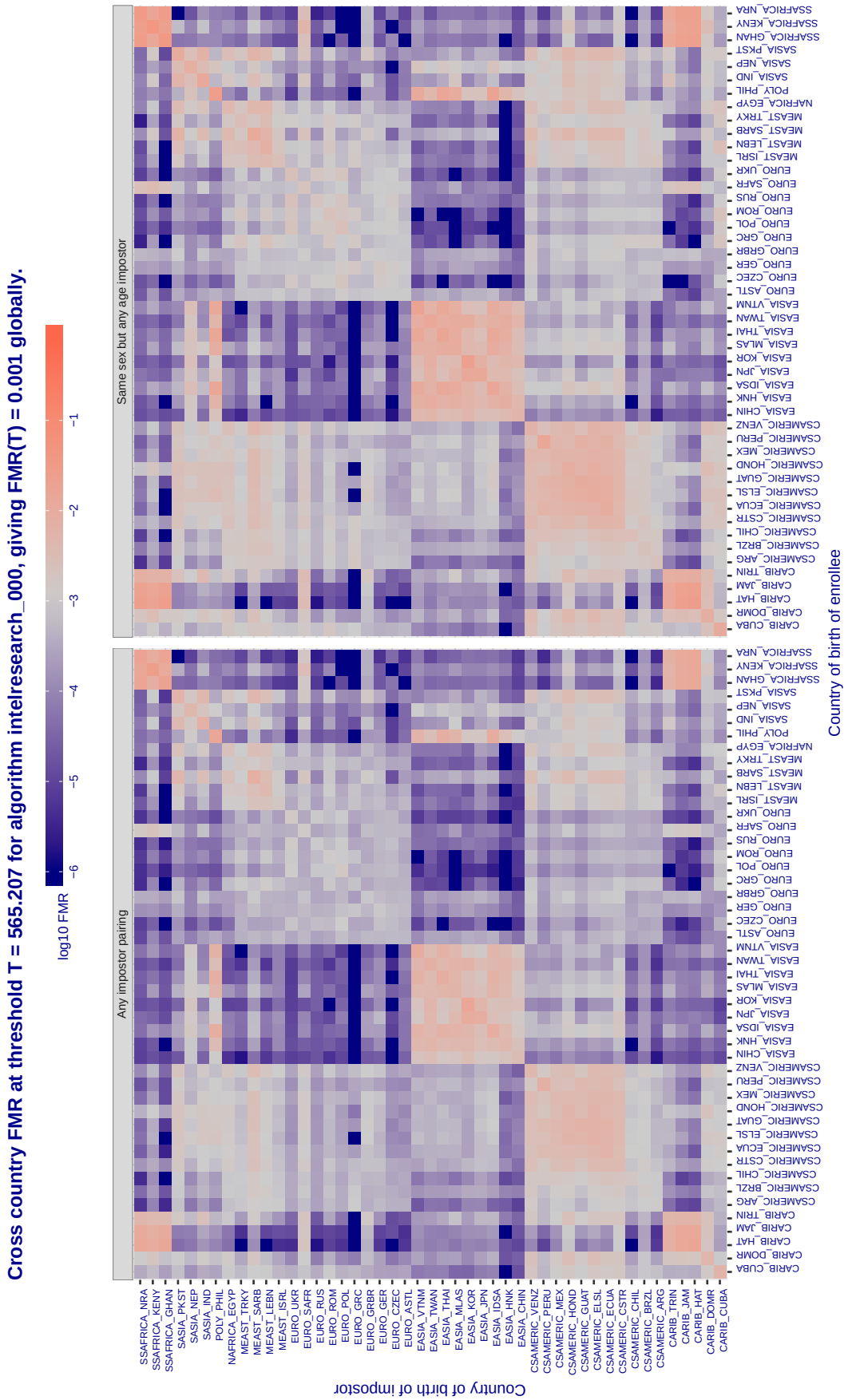


Figure 361: For algorithm intelresearch-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

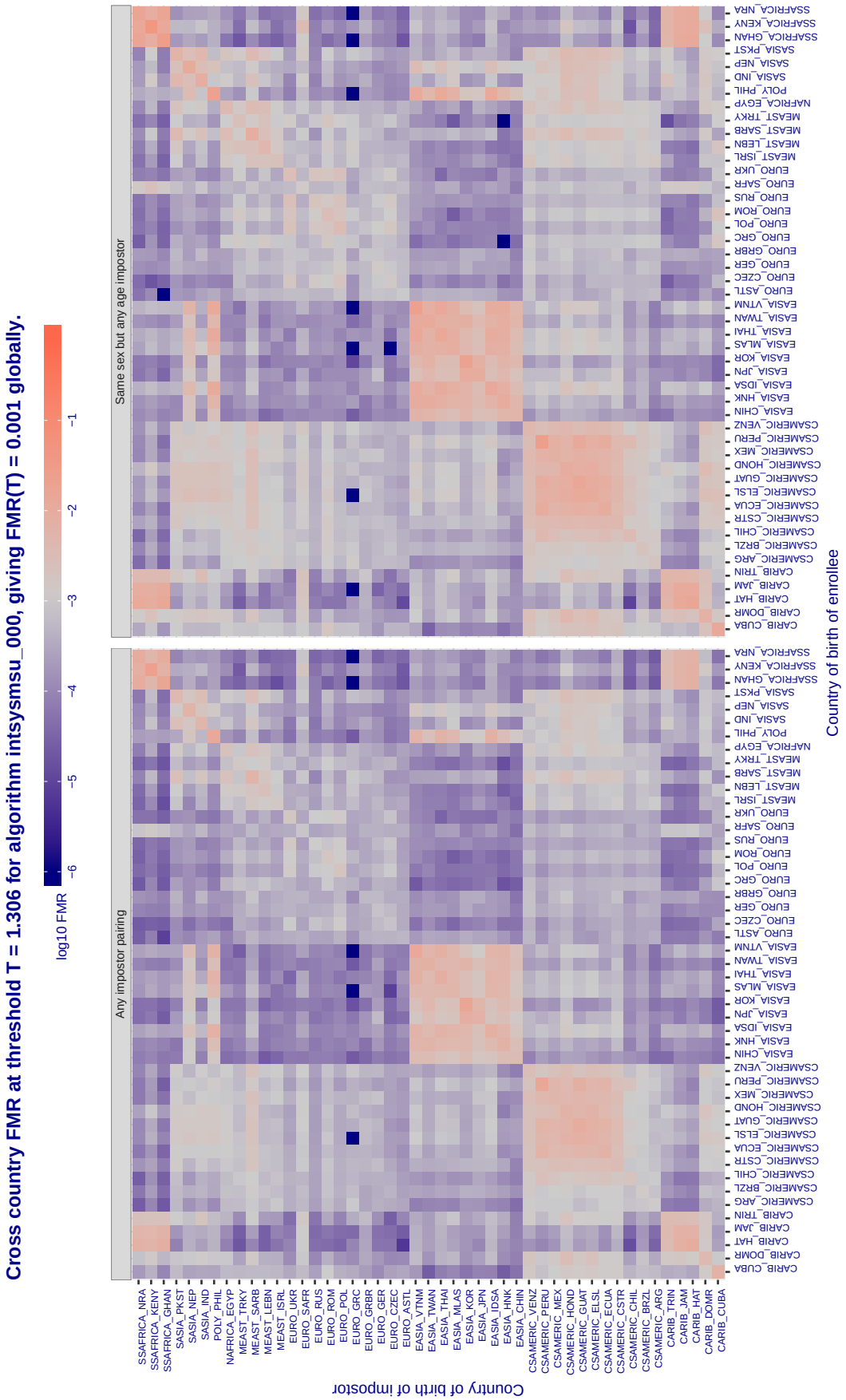


Figure 362: For algorithm intsysmsu-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

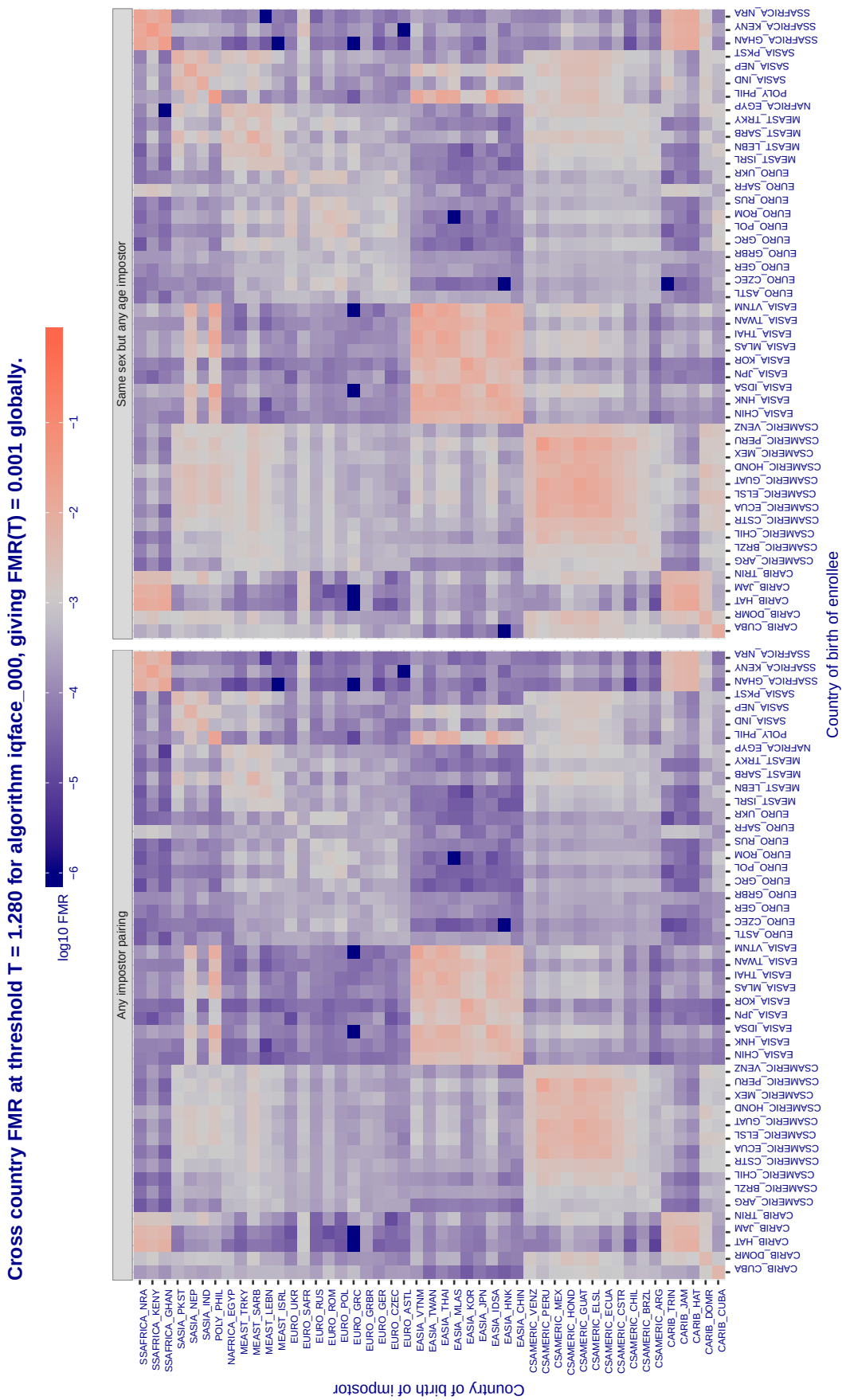


Figure 363: For algorithm iqface-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

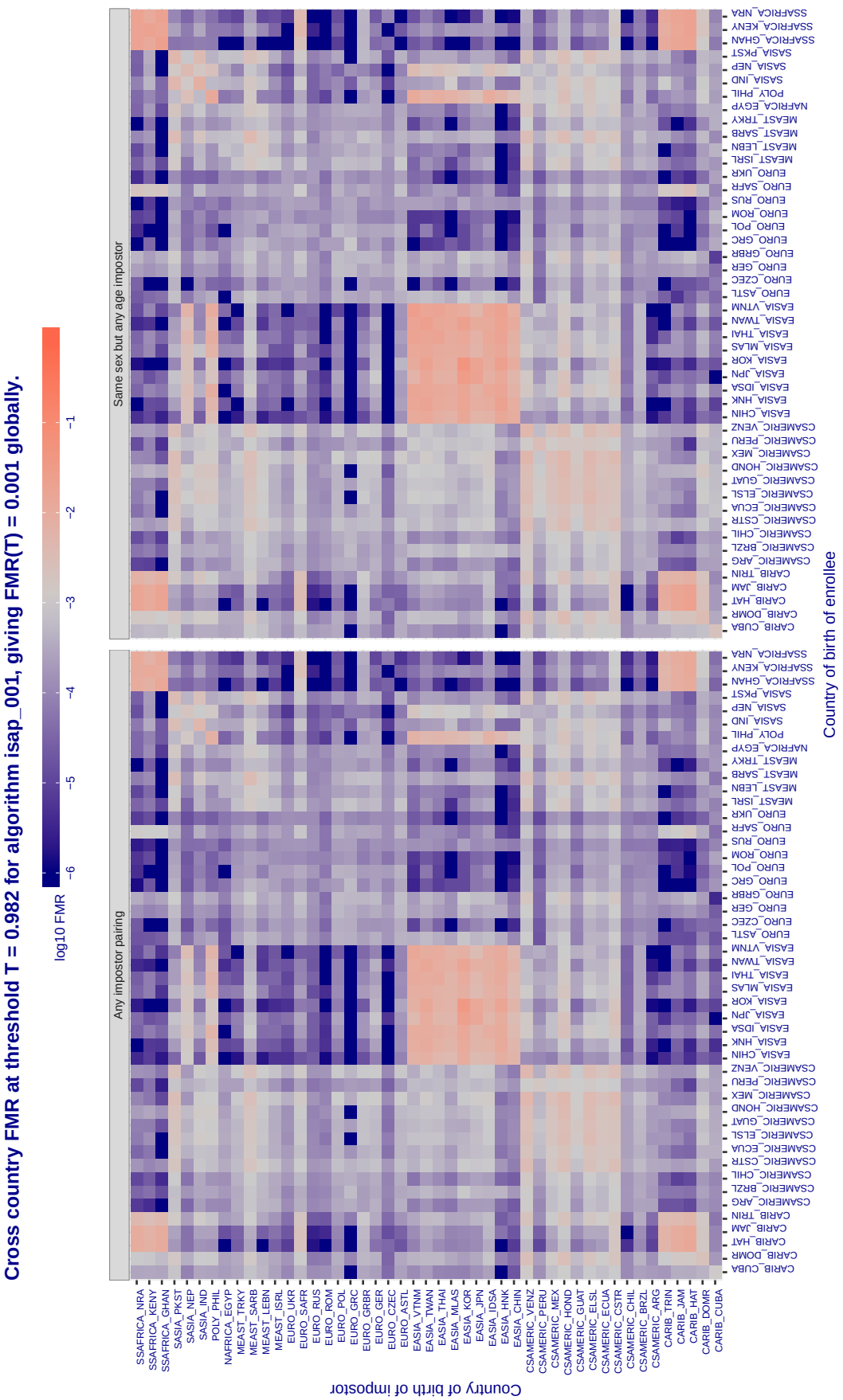


Figure 364: For algorithm isap-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

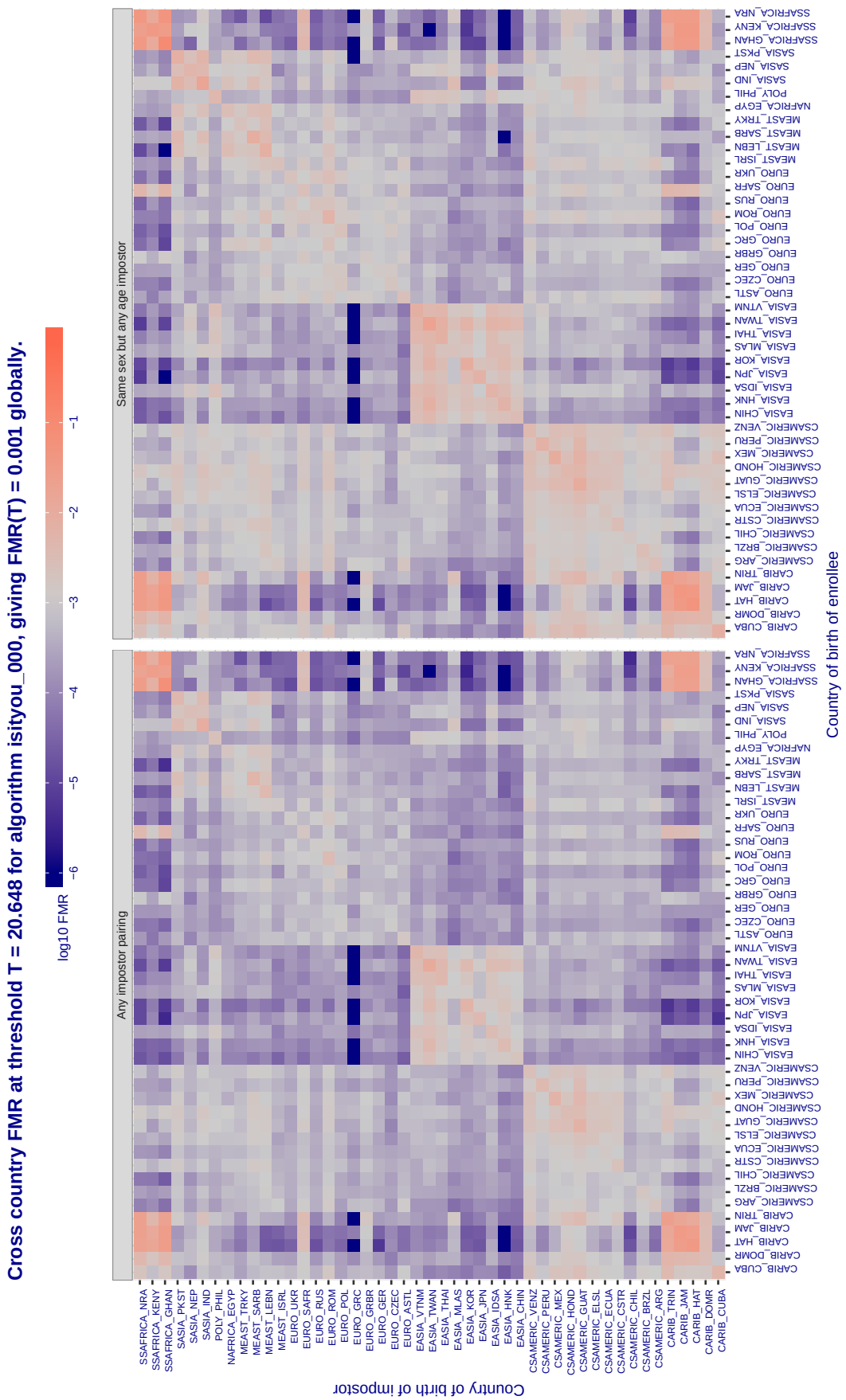


Figure 365: For algorithm isityou-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

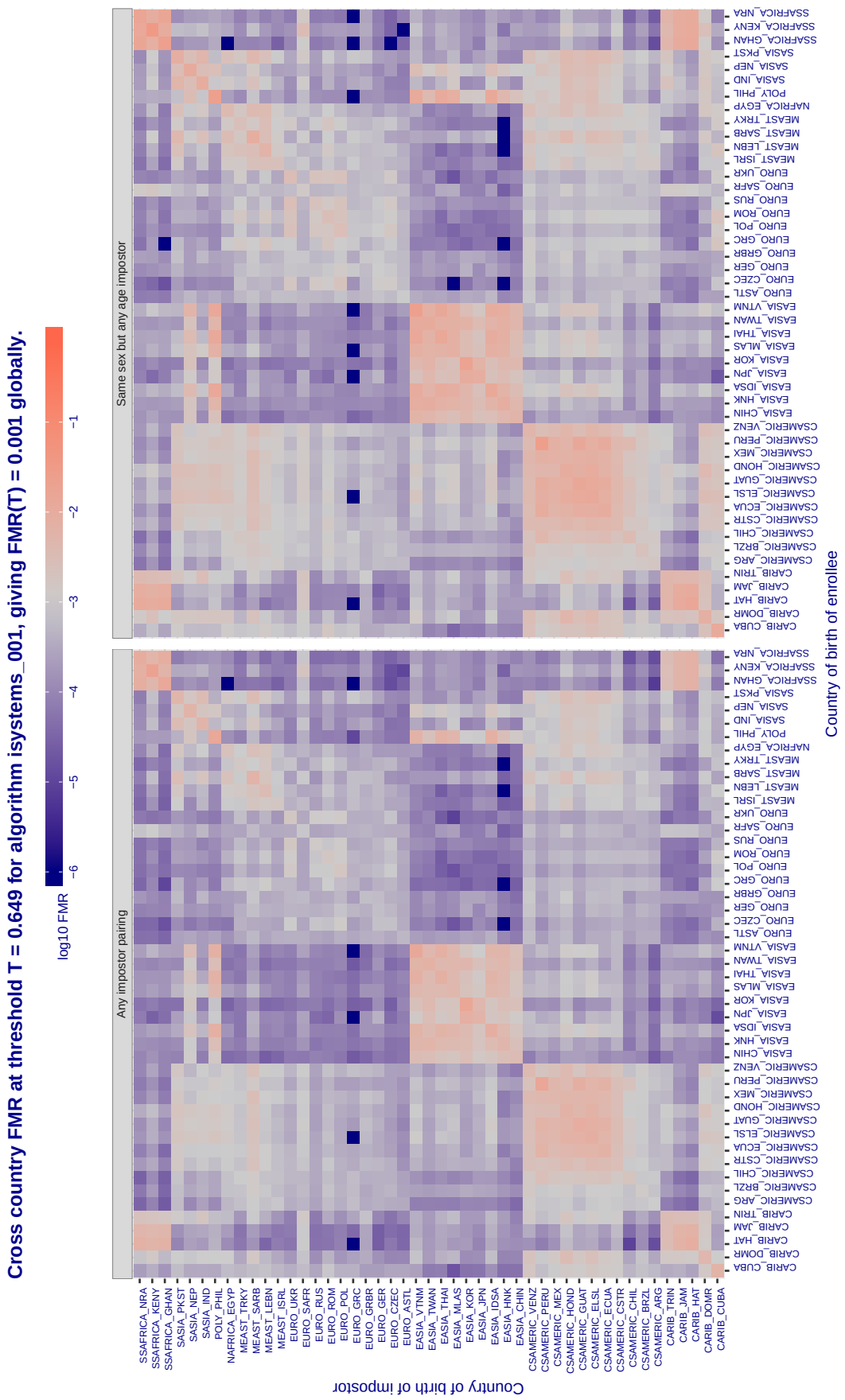


Figure 366: For algorithm isystems-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

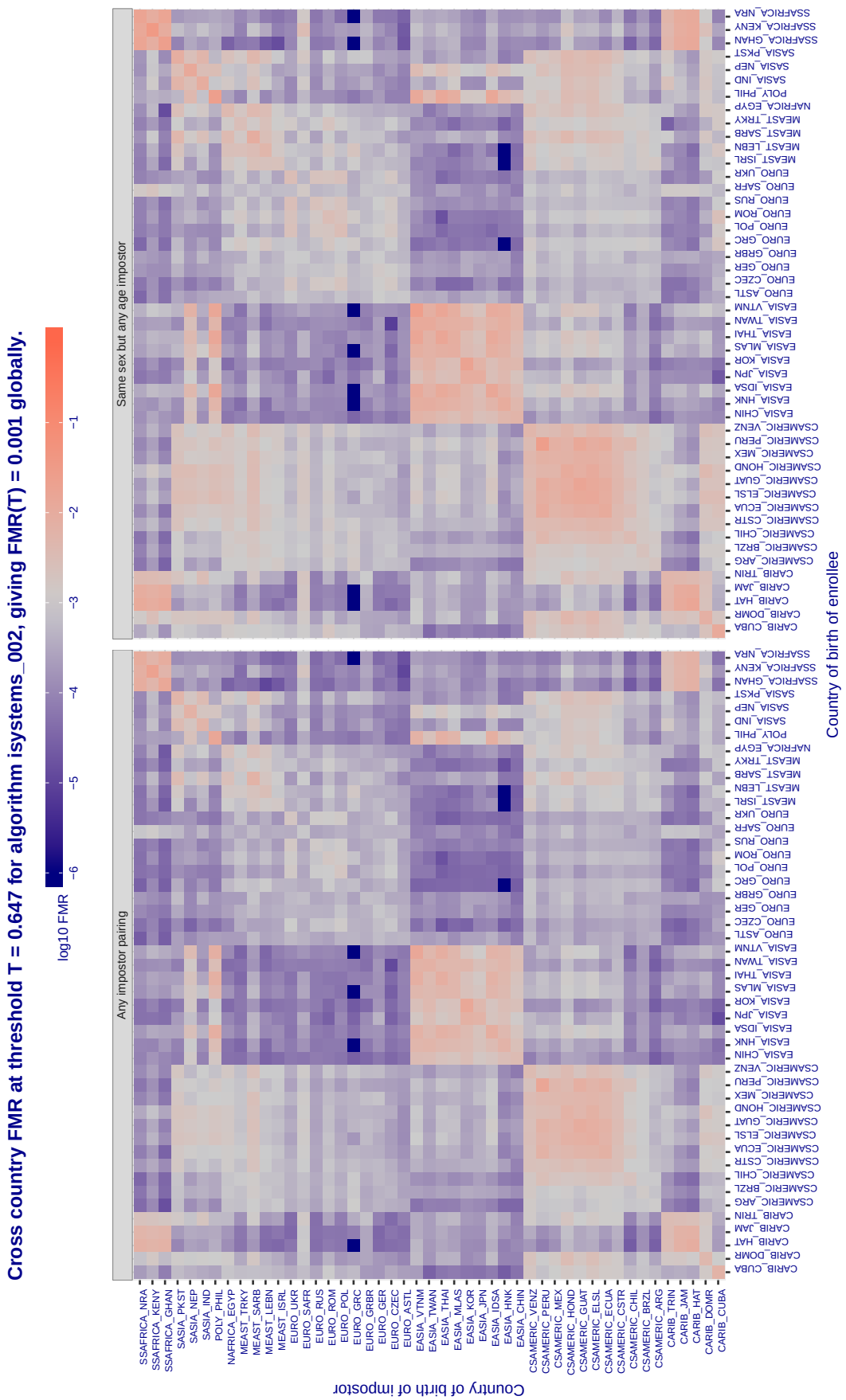


Figure 367: For algorithm isystems-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

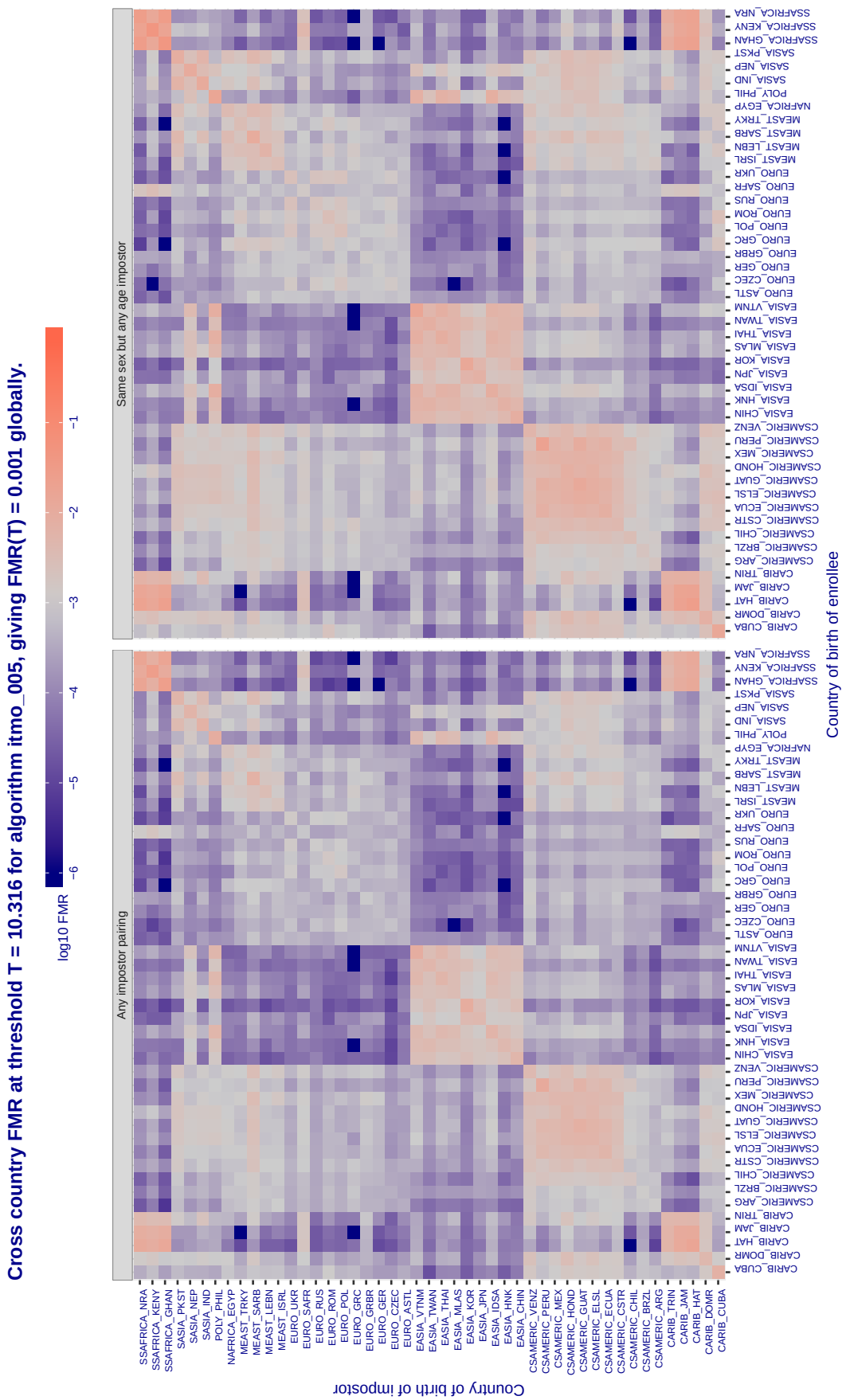


Figure 368: For algorithm itmo-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

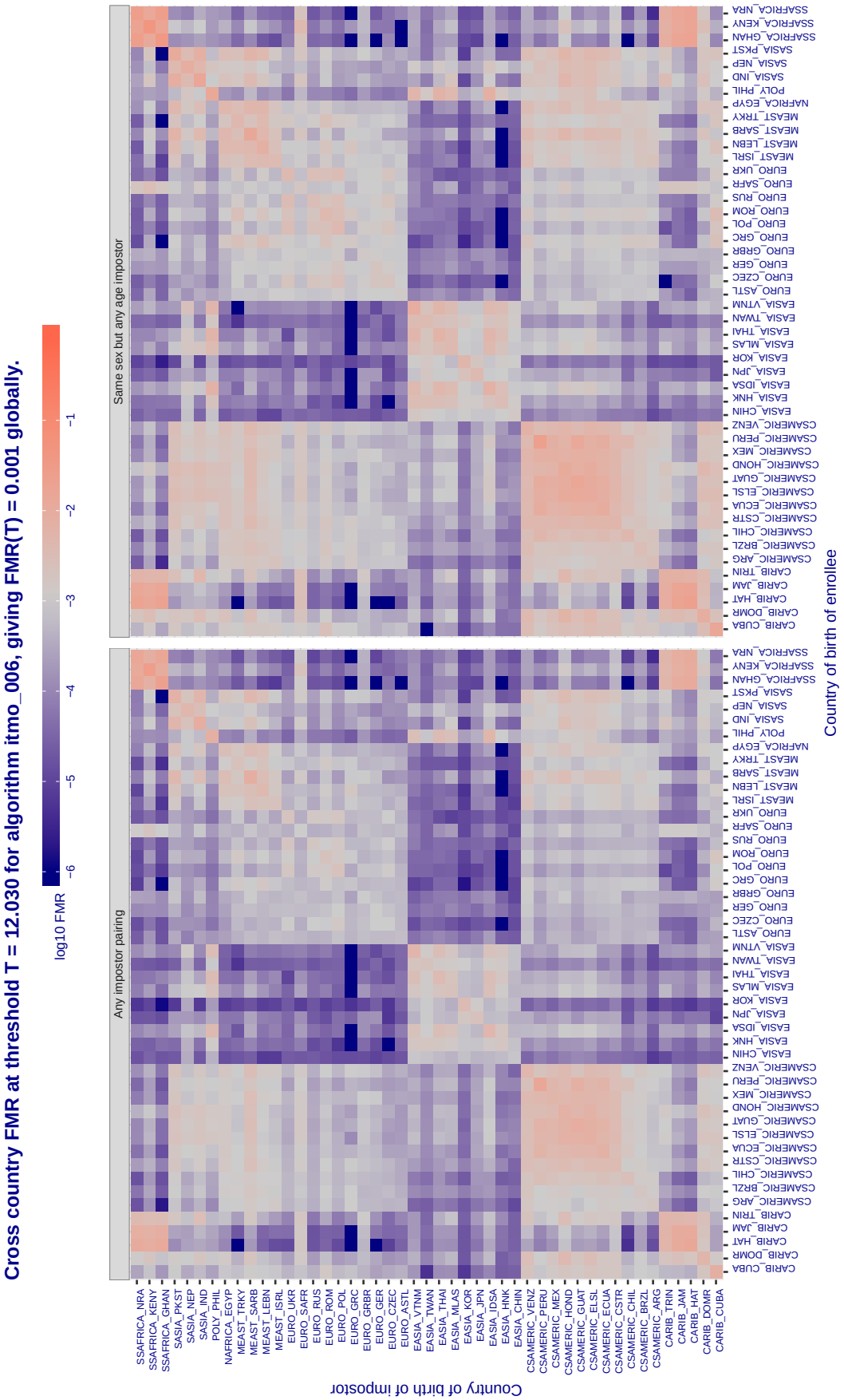


Figure 369: For algorithm itmo-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

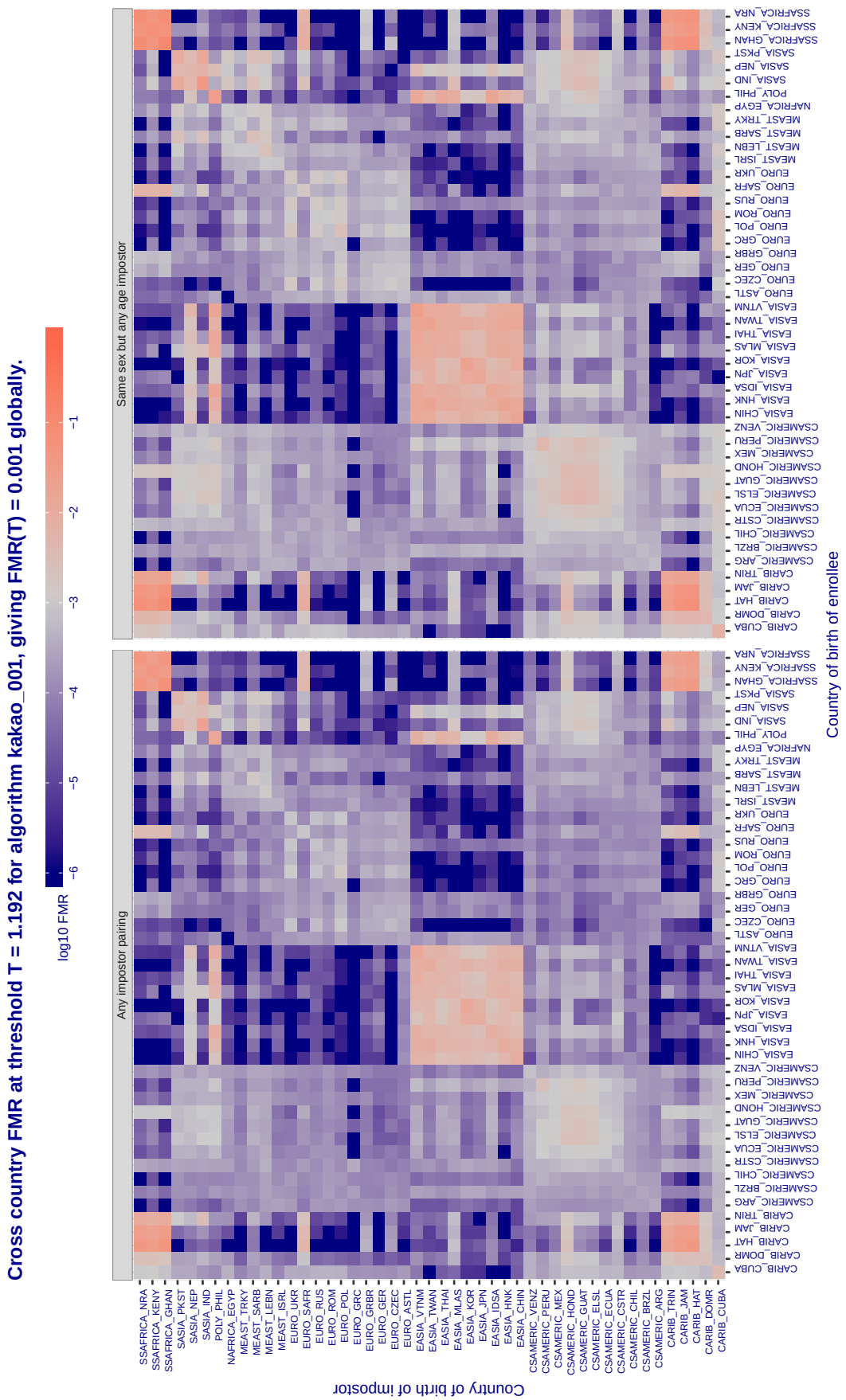


Figure 370: For algorithm kakao-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

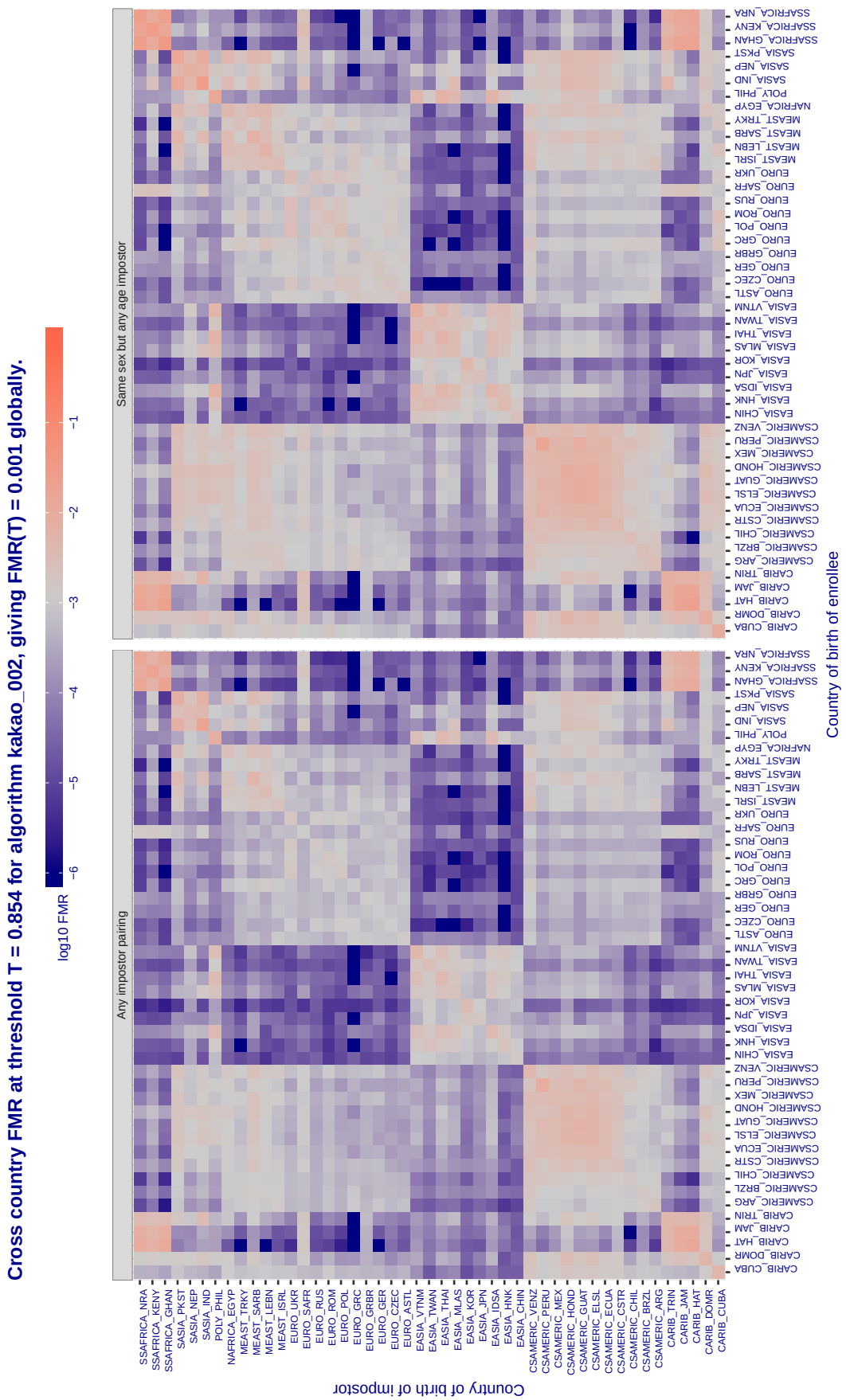


Figure 371: For algorithm kakao-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

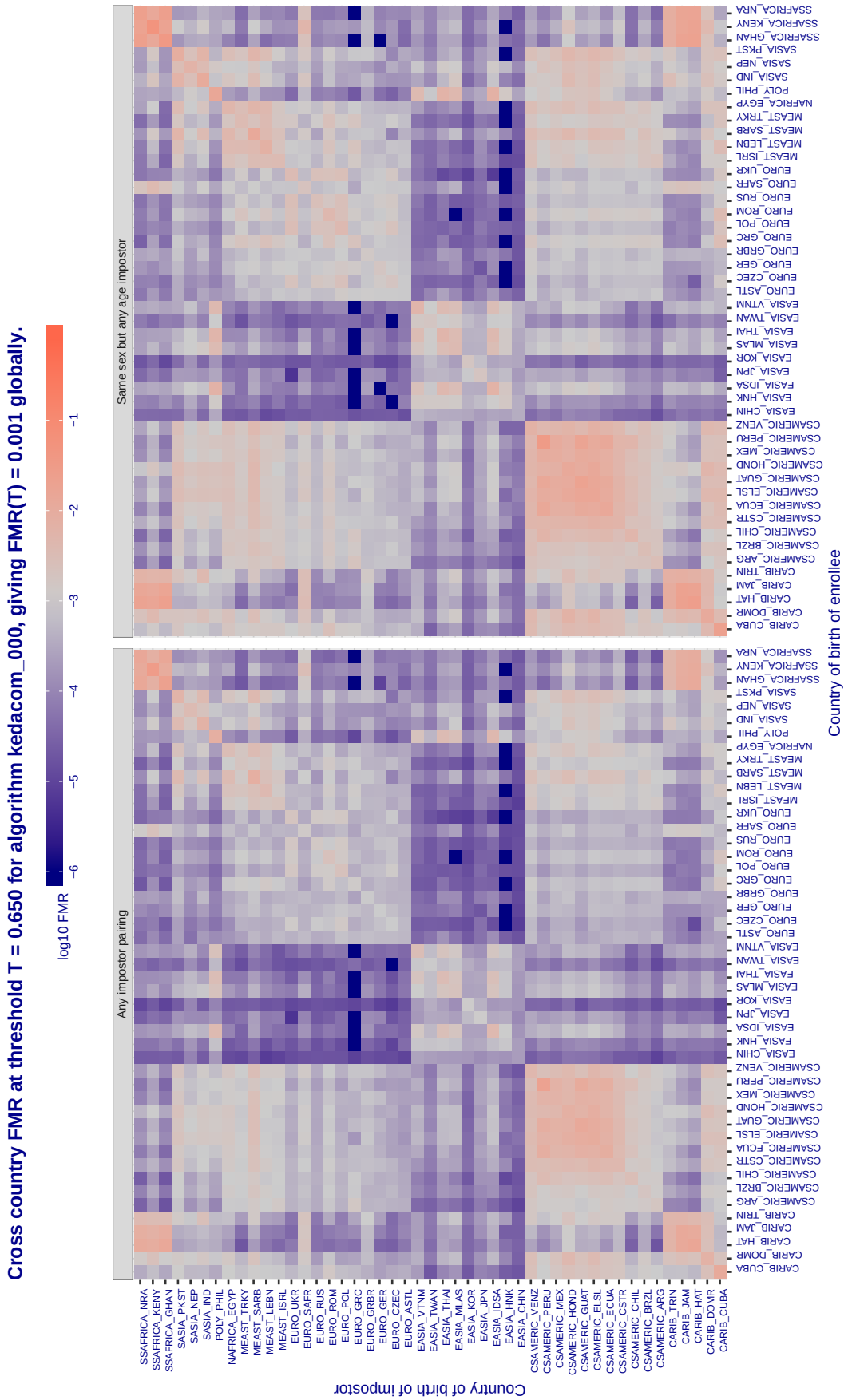


Figure 372: For algorithm kedacom-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

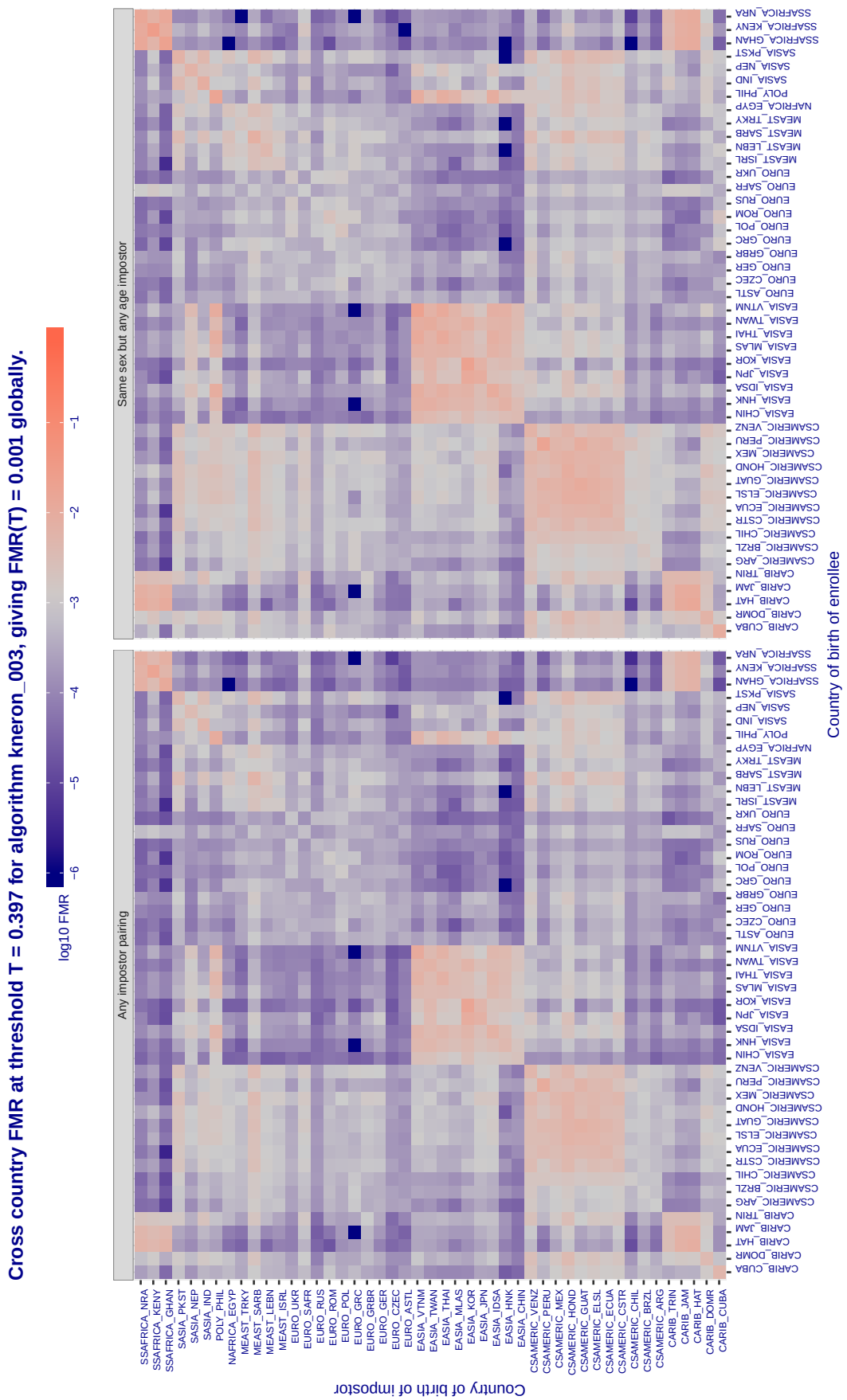


Figure 373: For algorithm kneron-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

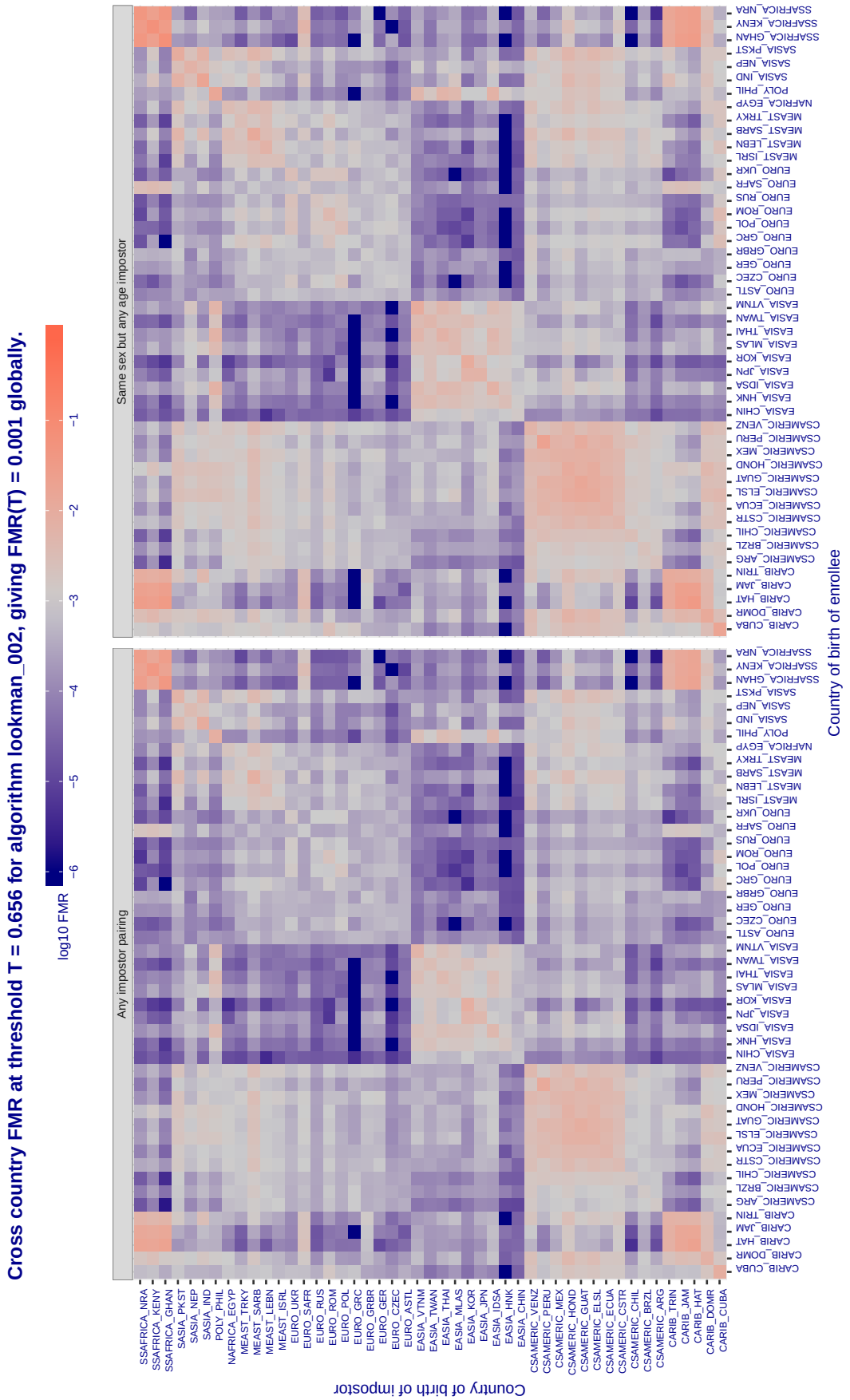


Figure 374: For algorithm lookman-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

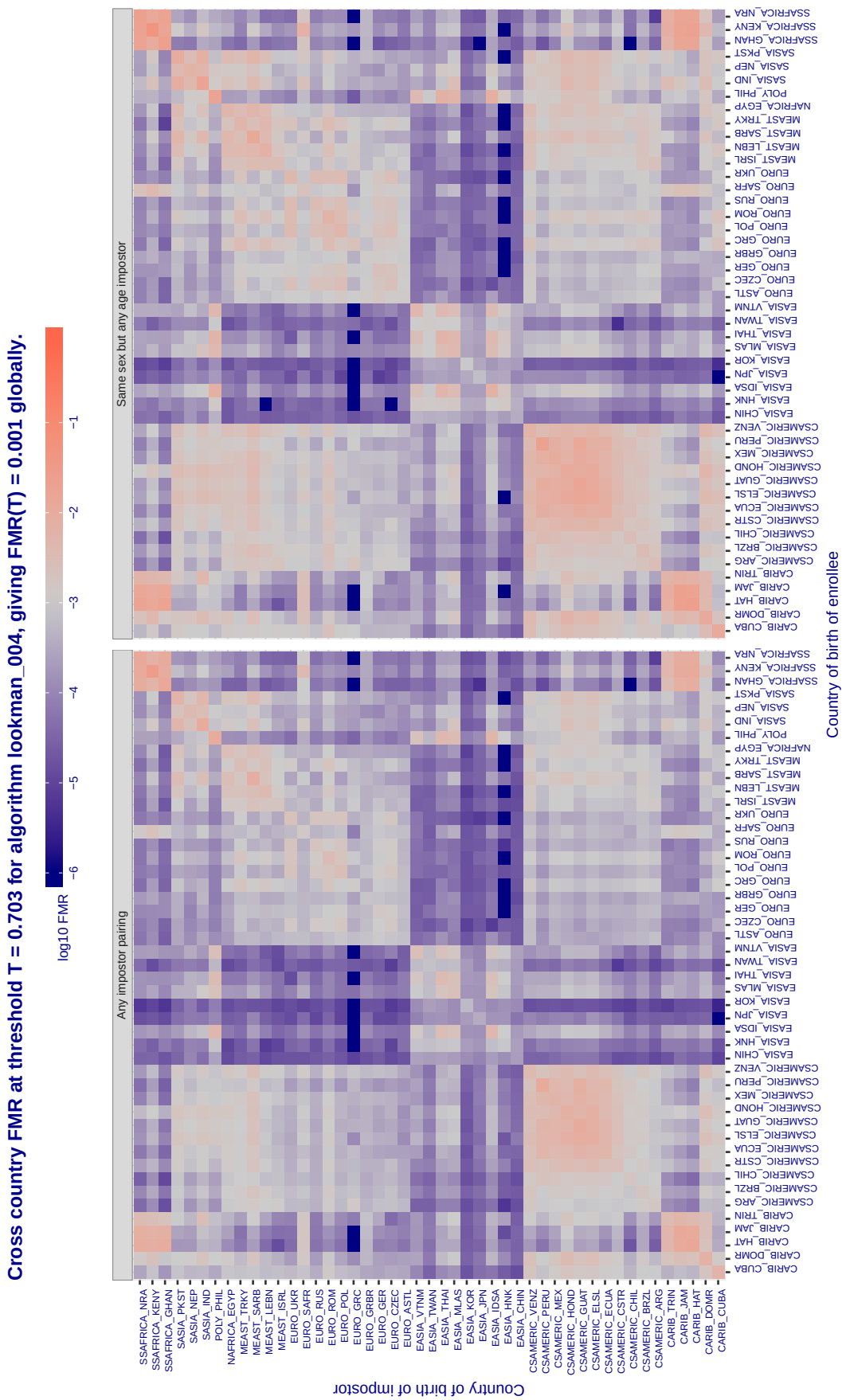


Figure 375: For algorithm lookman-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

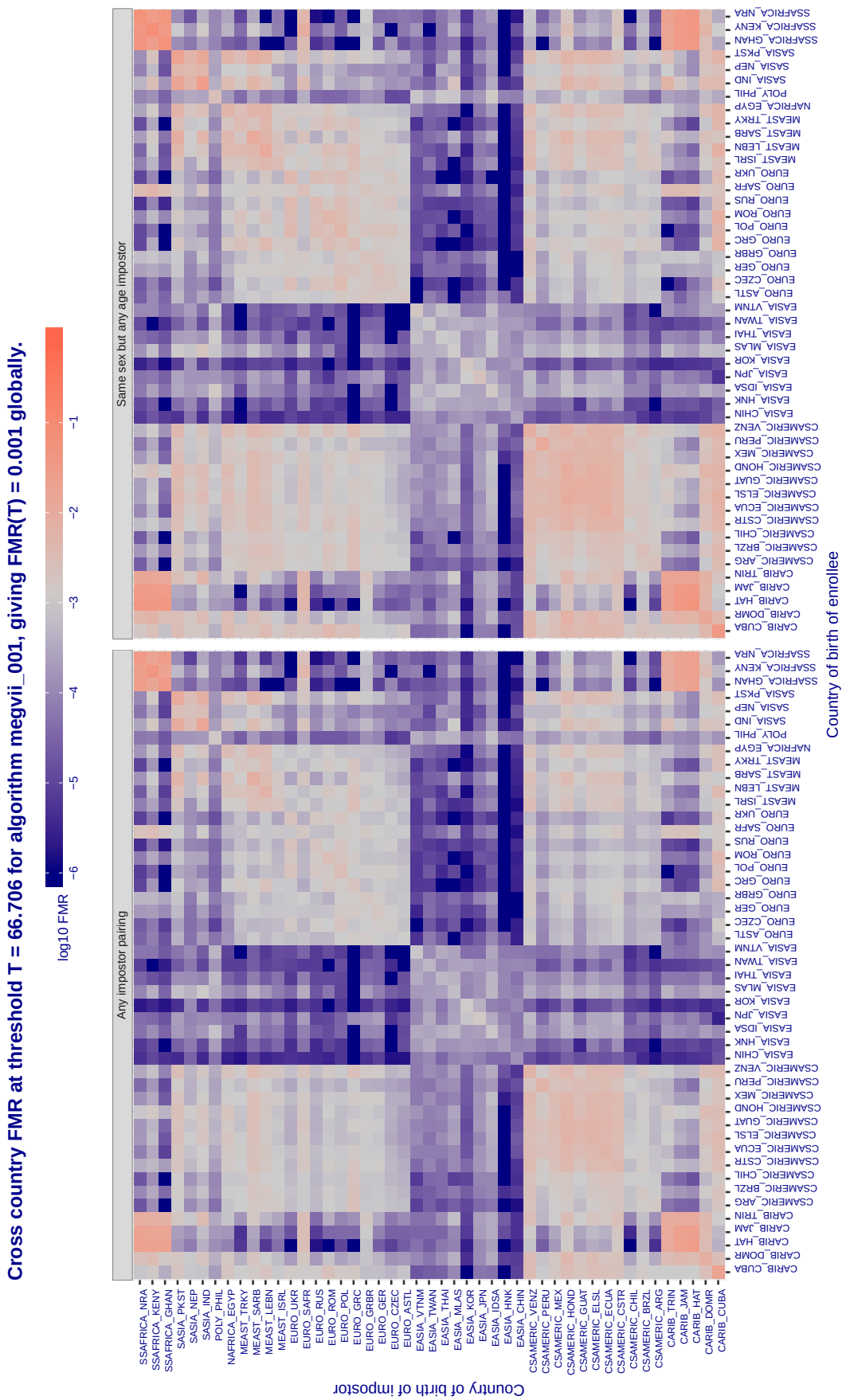


Figure 376: For algorithm megvii-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

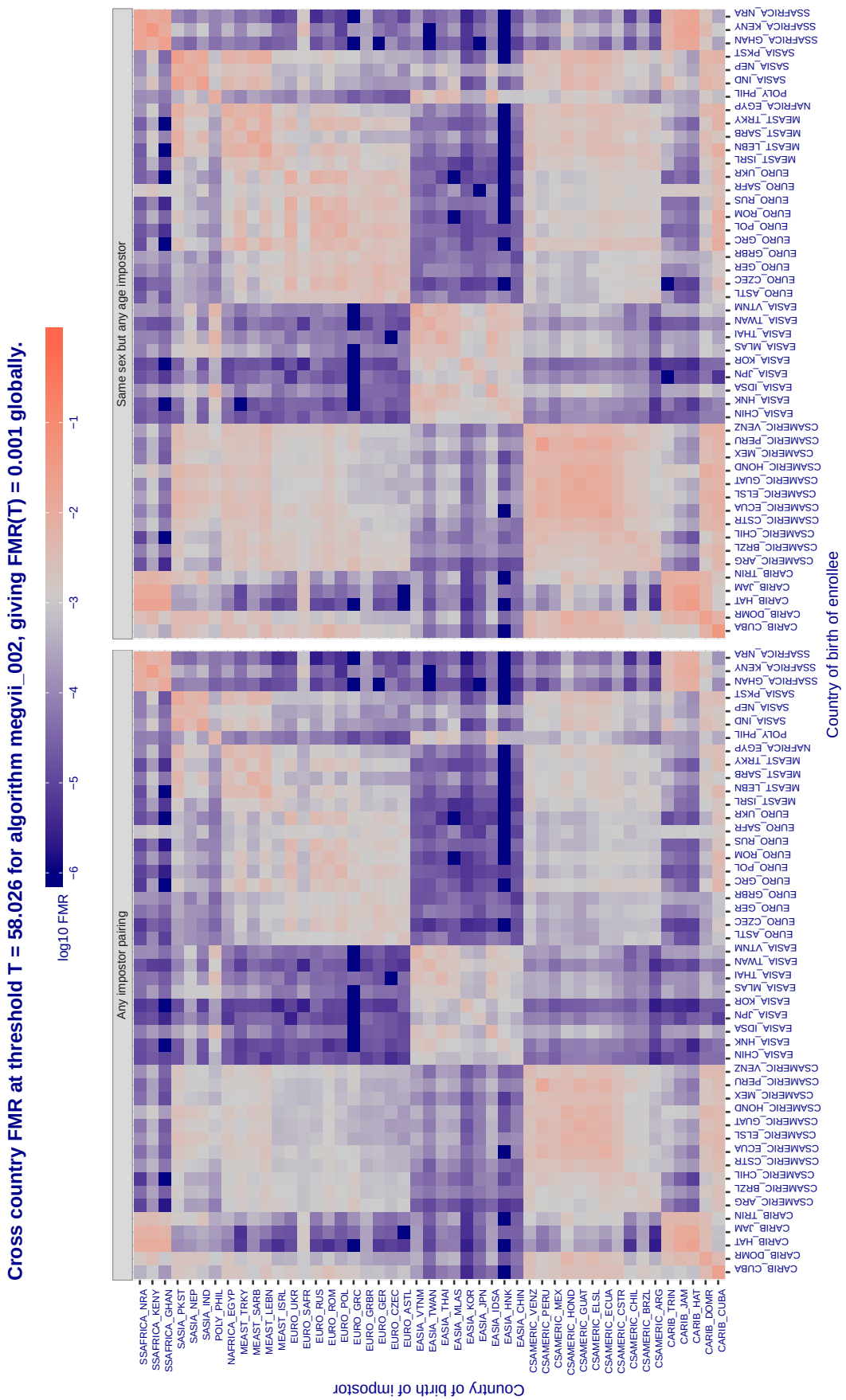


Figure 377: For algorithm megvii-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

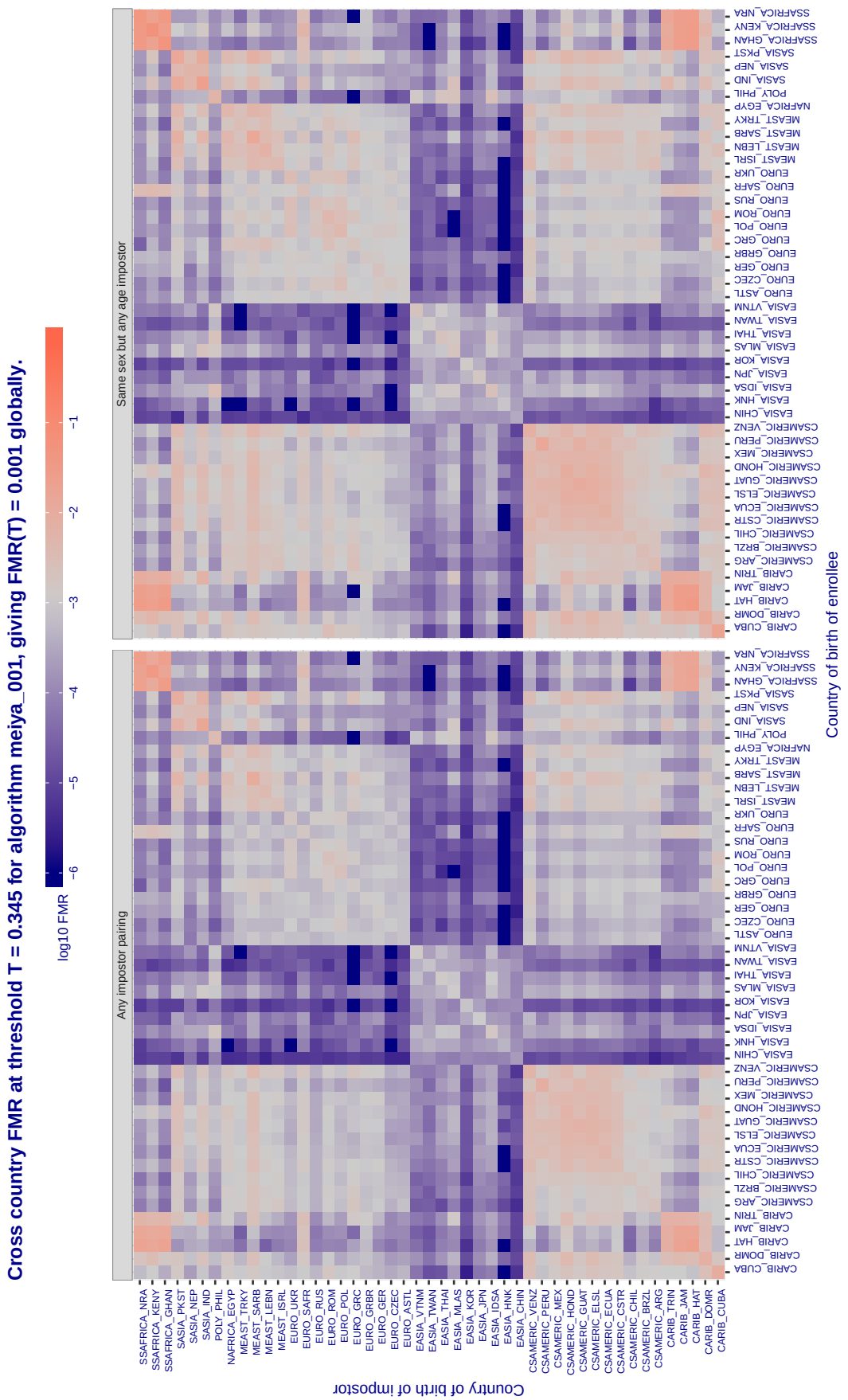


Figure 378: For algorithm meiya-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

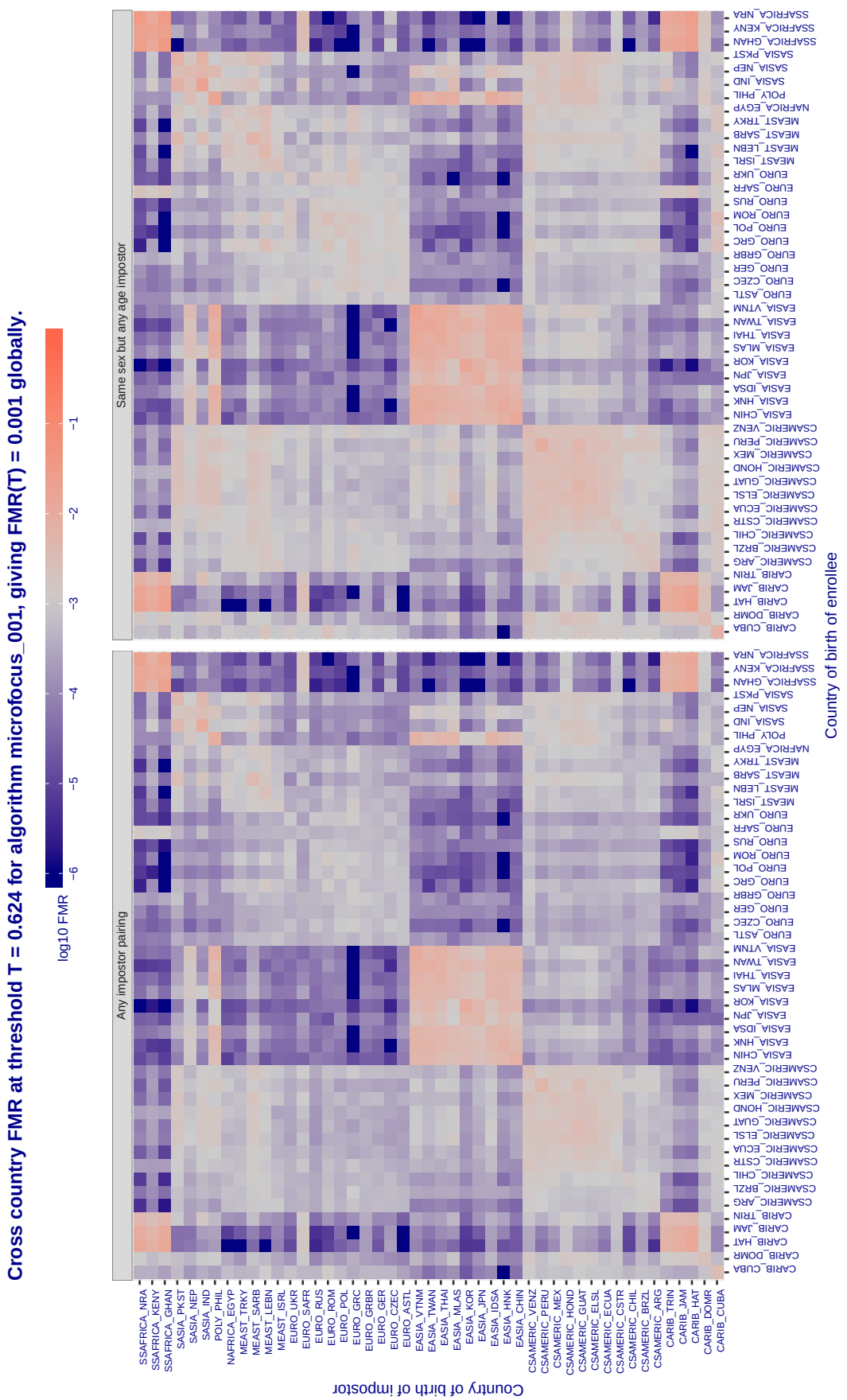


Figure 379: For algorithm microfocus-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

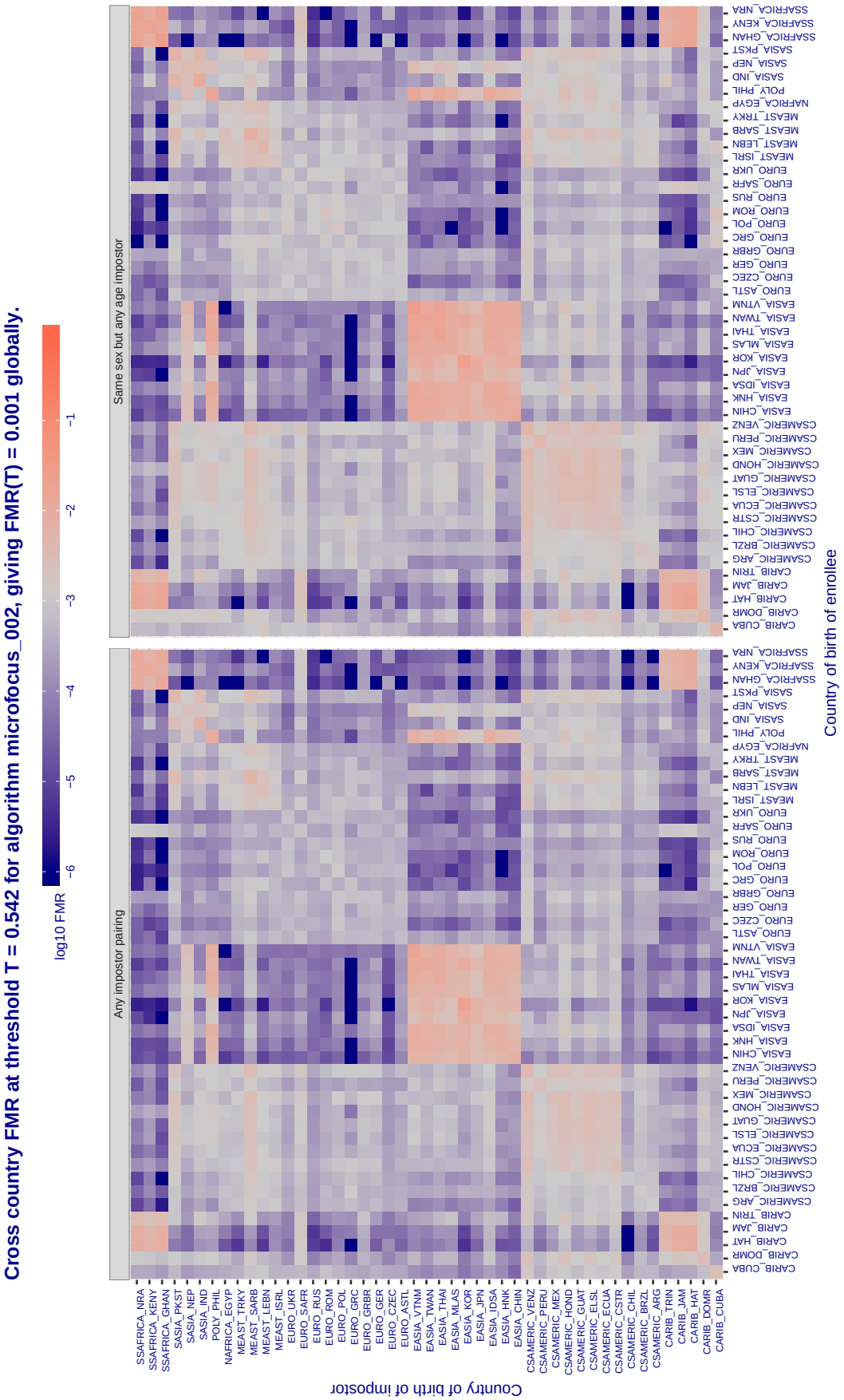


Figure 380: For algorithm microfocus-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

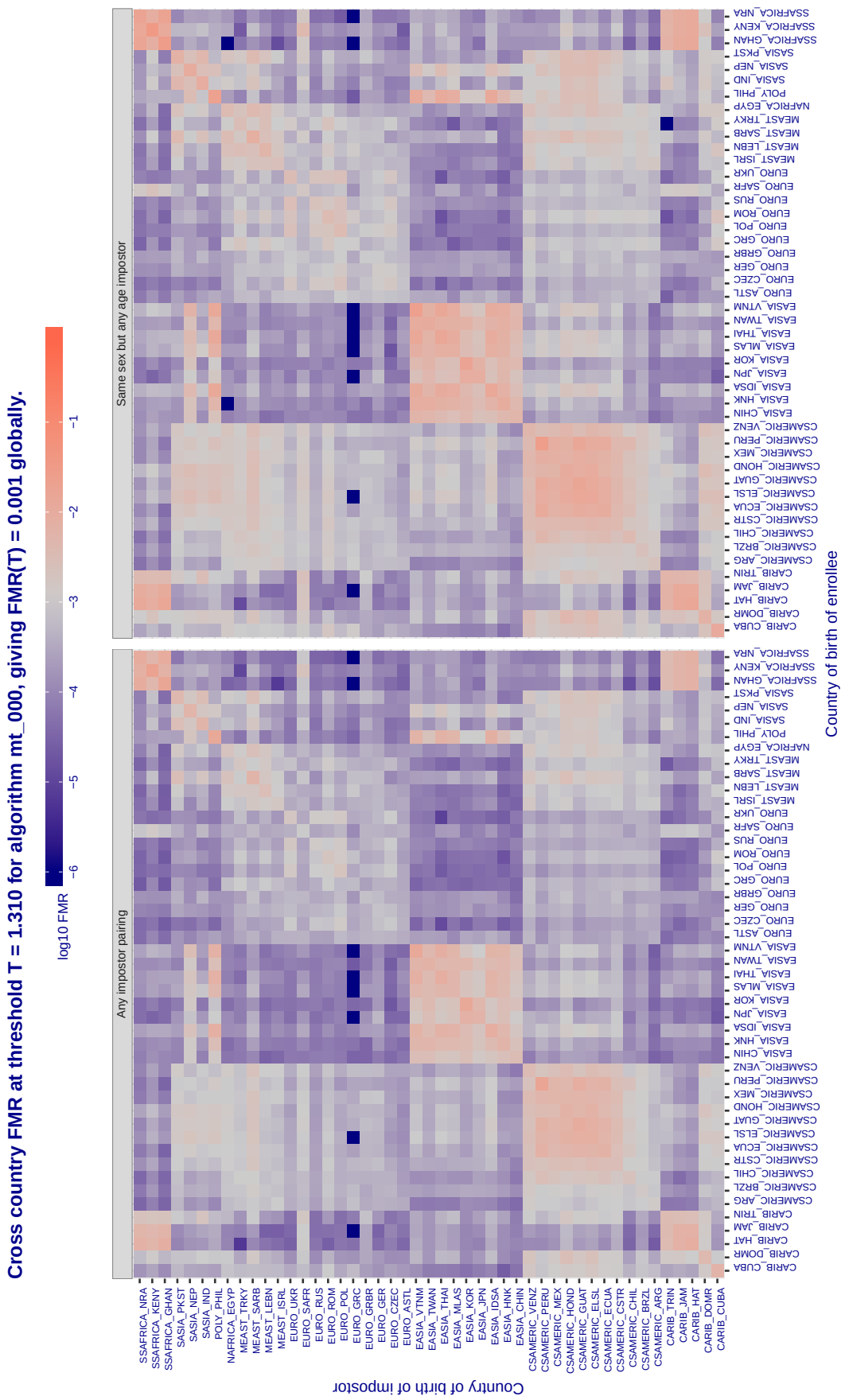


Figure 381: For algorithm mt-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

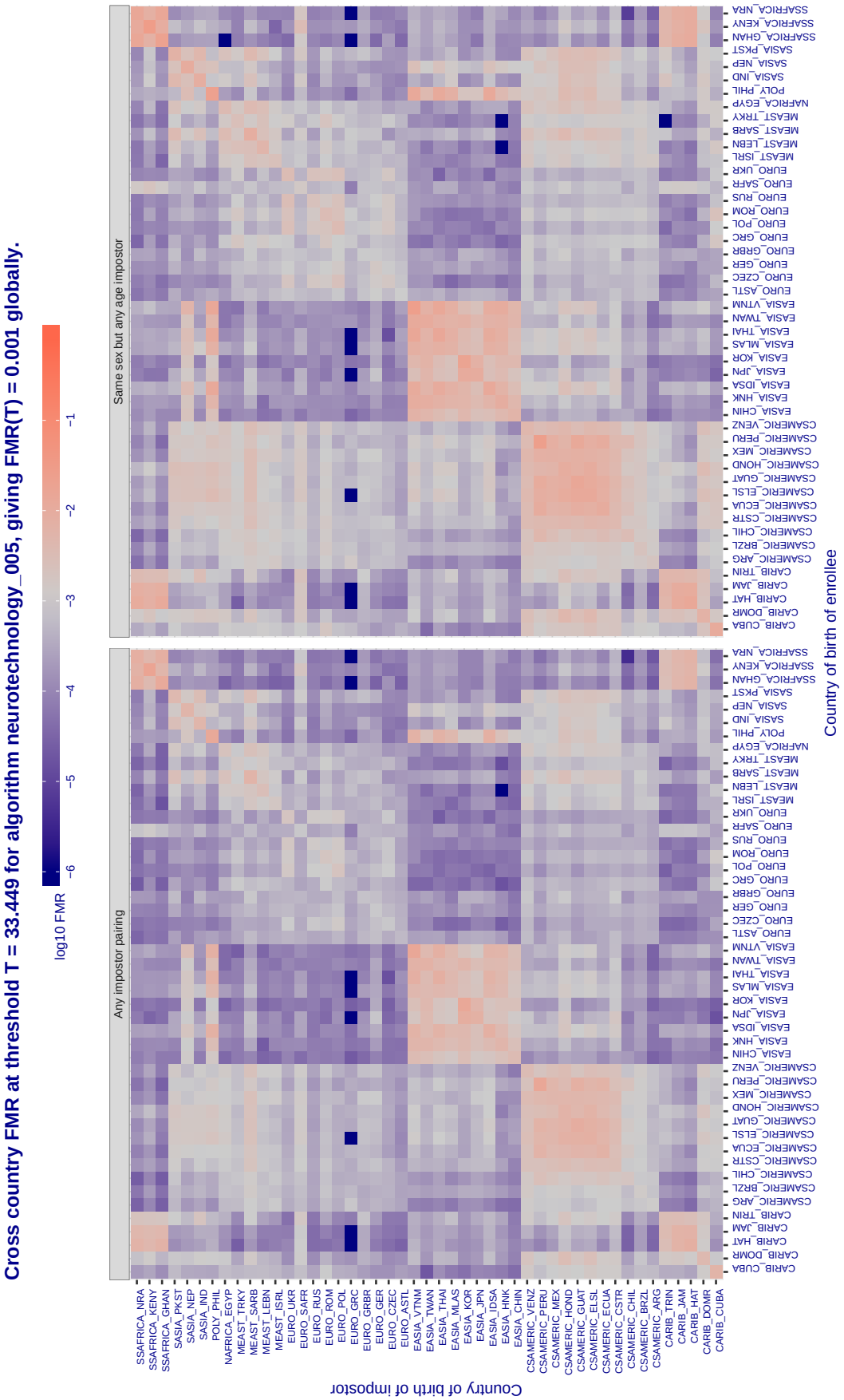


Figure 382: For algorithm neurotechnology-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

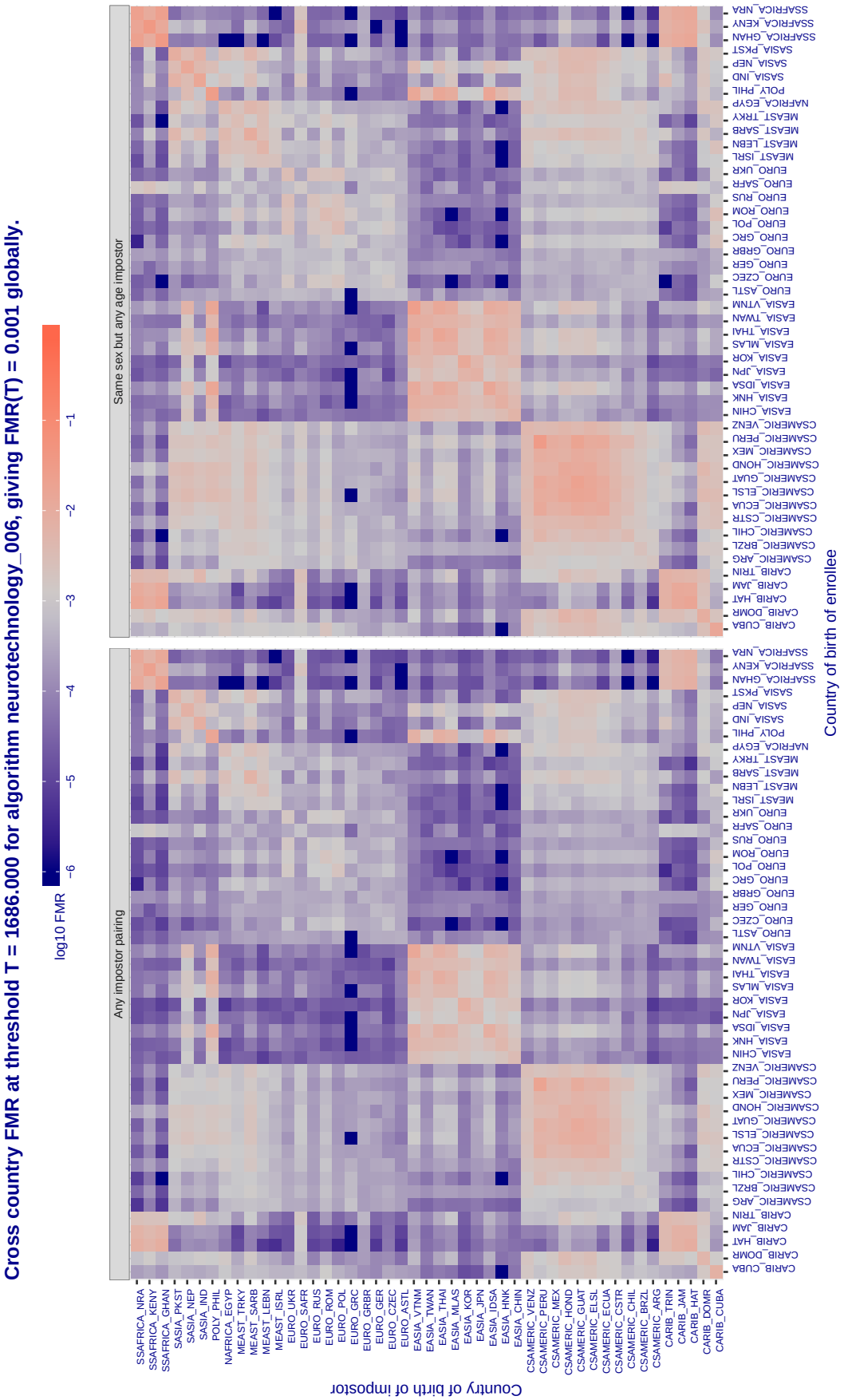


Figure 383: For algorithm neurotechnology-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

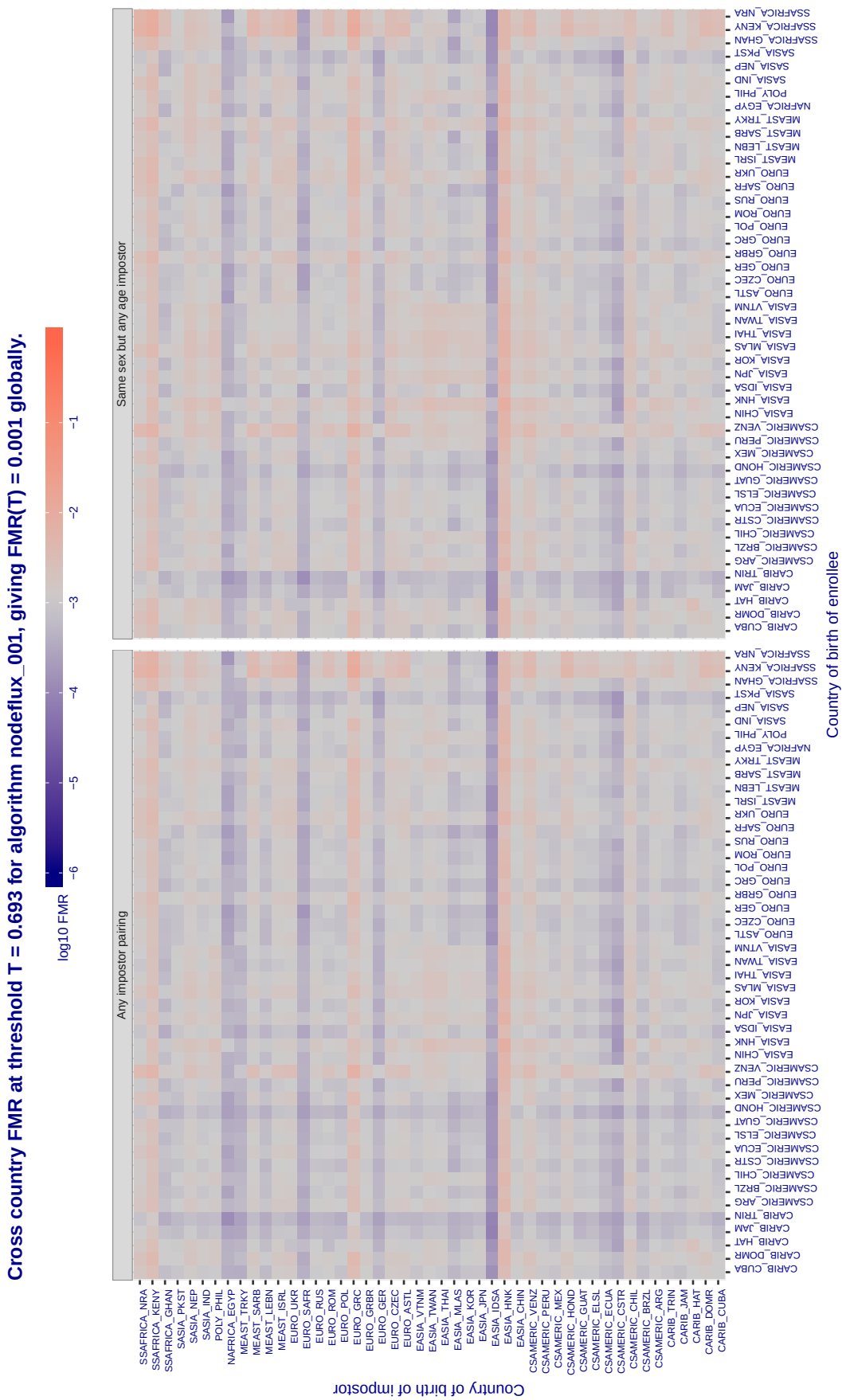


Figure 384: For algorithm nodeflux-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

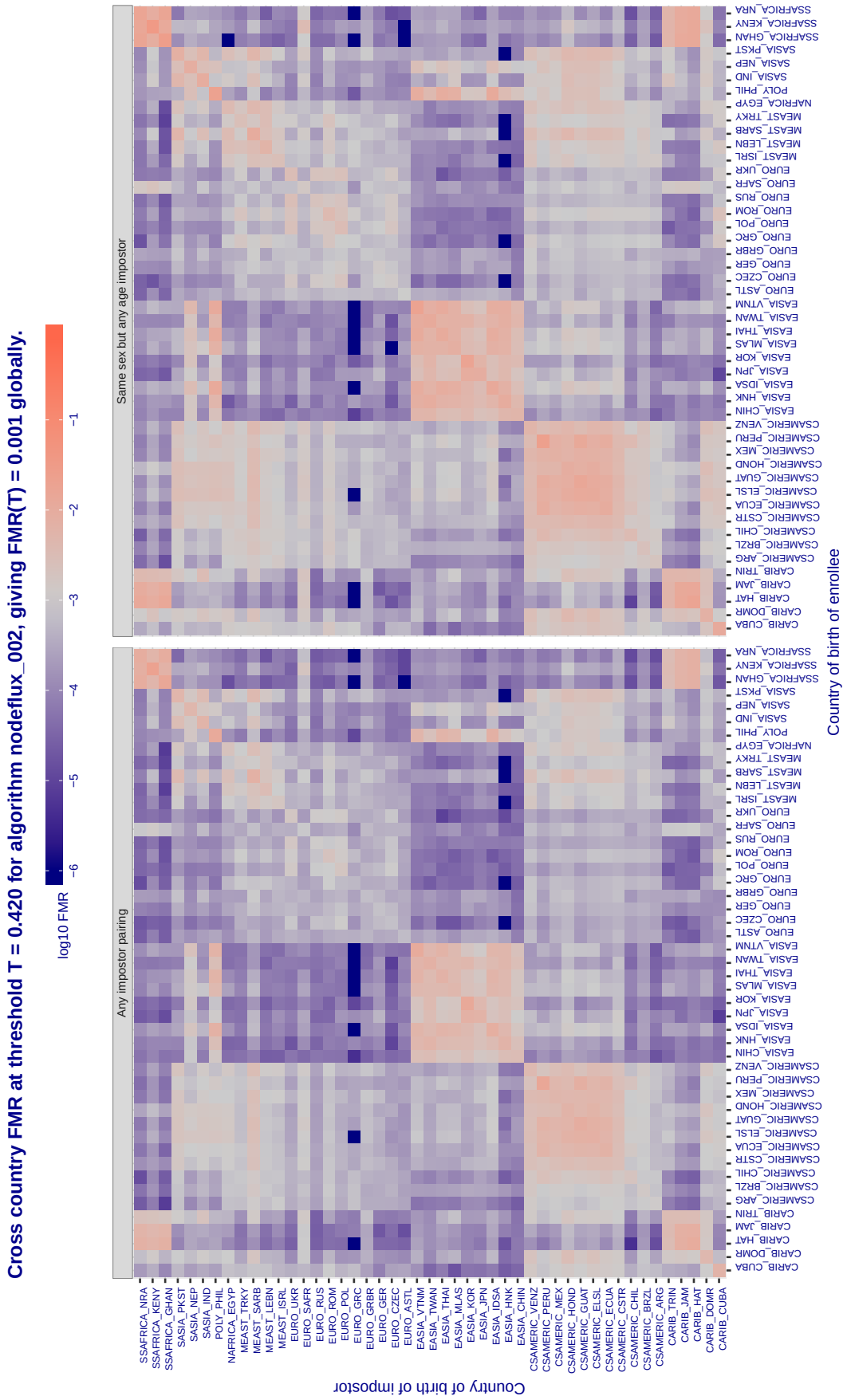


Figure 385: For algorithm nodeflux-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

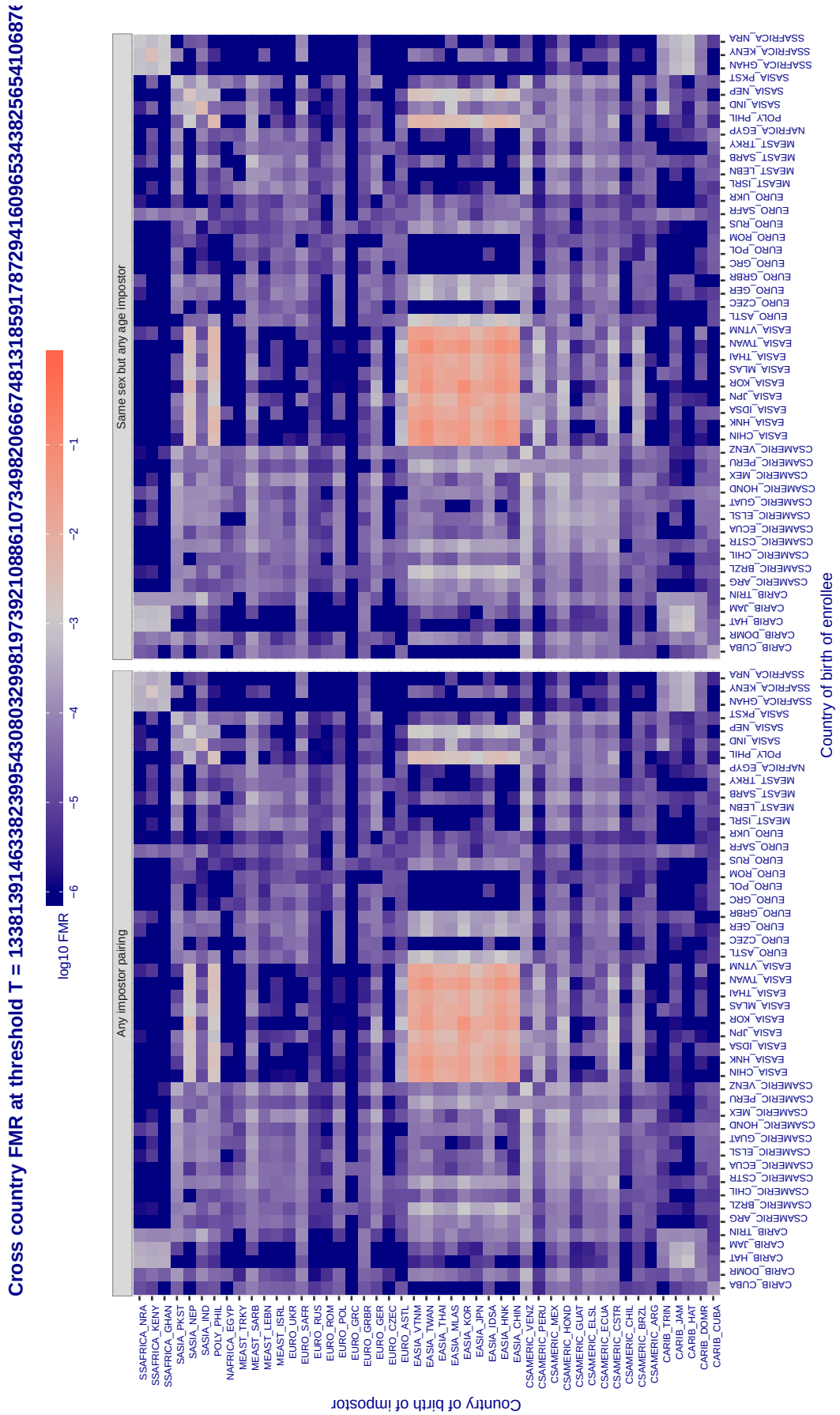


Figure 386: For algorithm notiontag-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

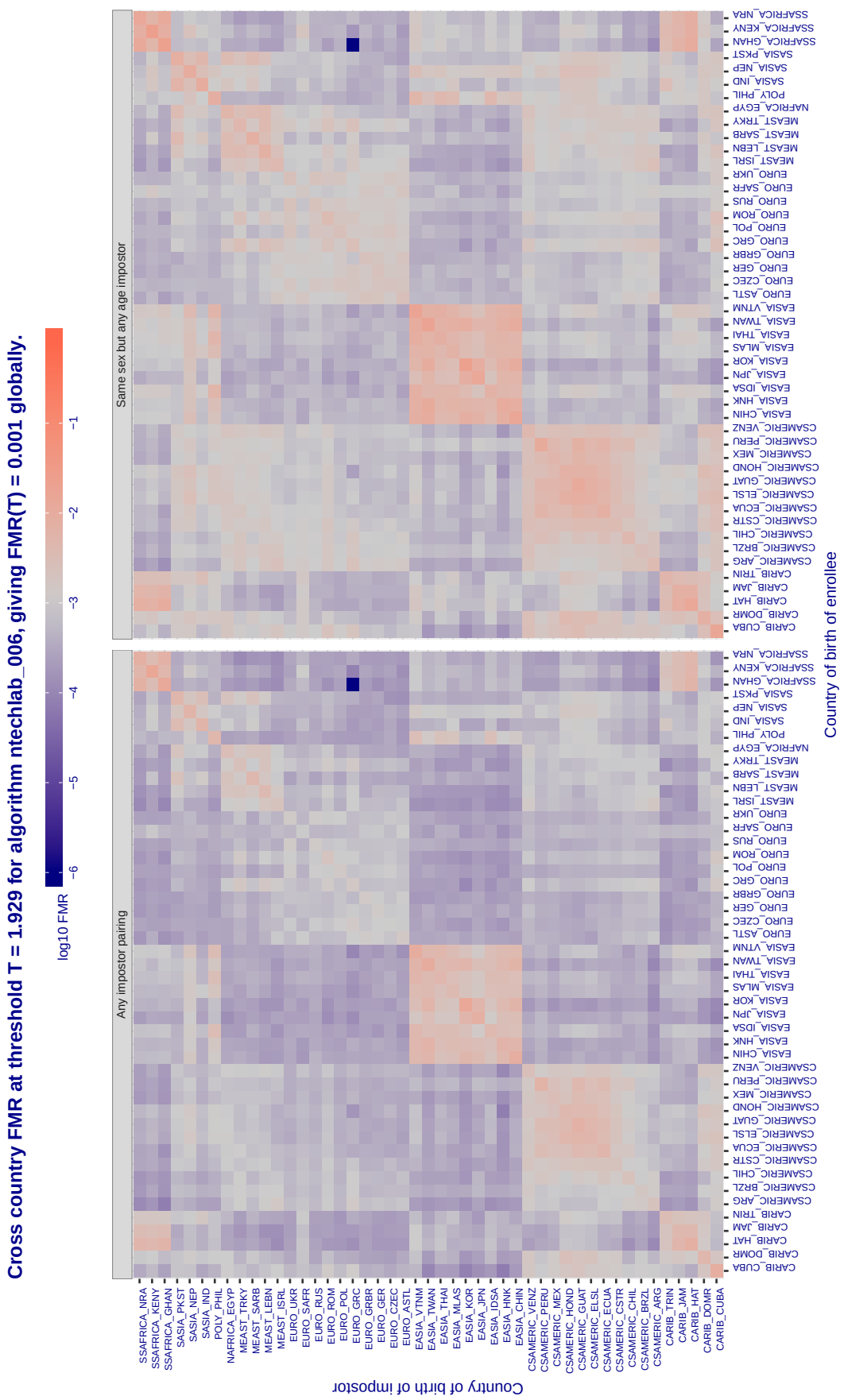


Figure 387: For algorithm ntechlab-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

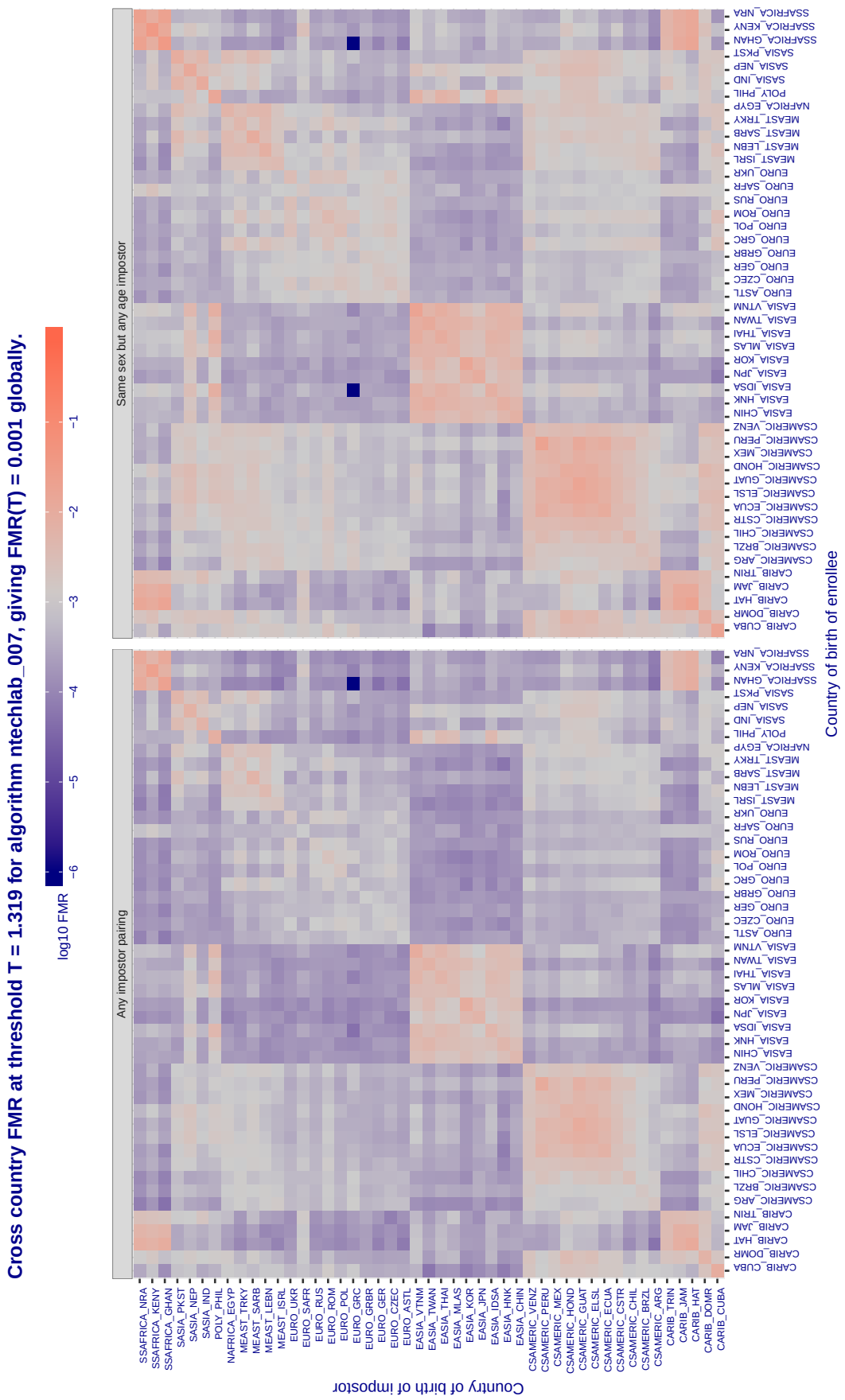


Figure 388: For algorithm ntechlab-007 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

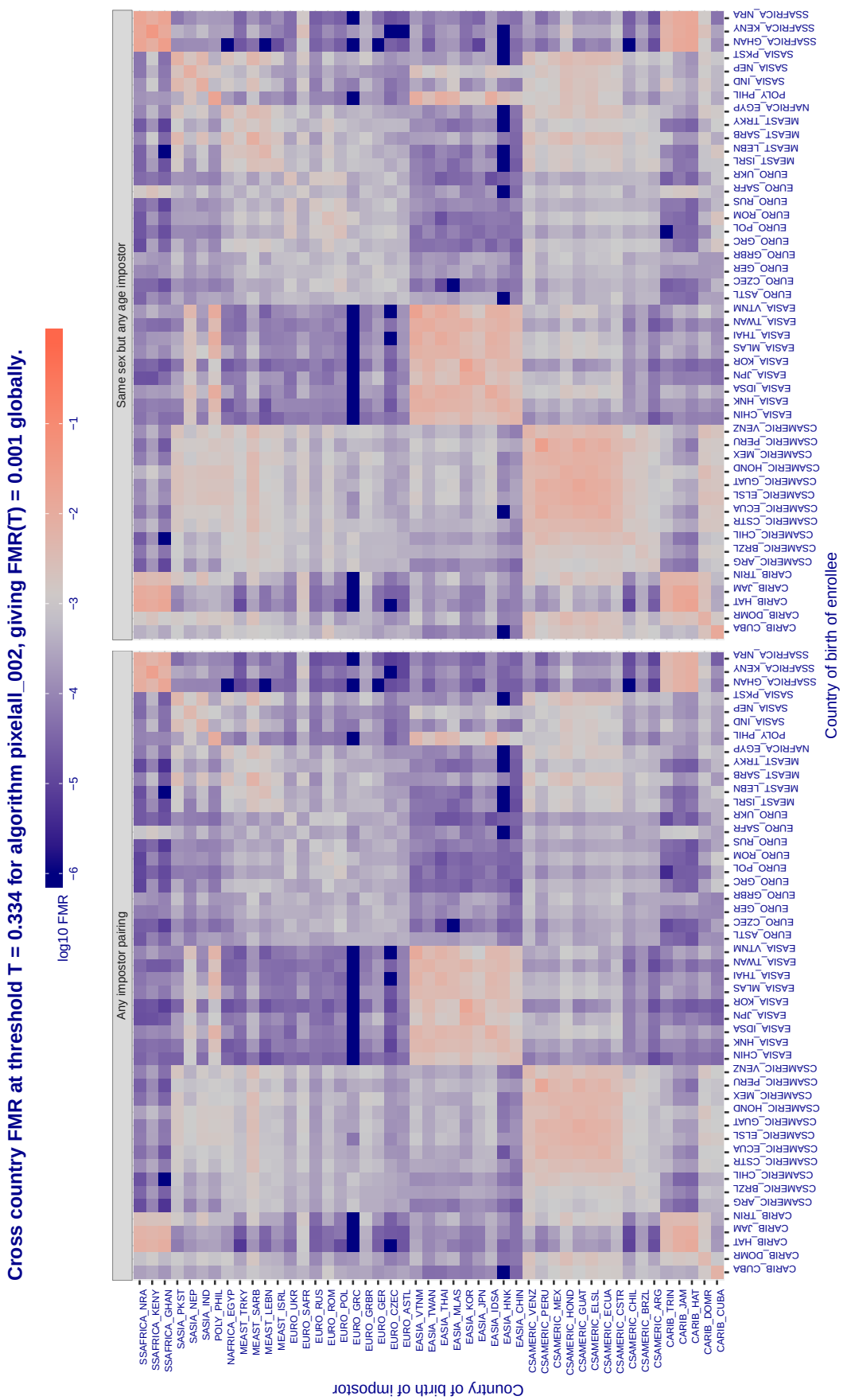


Figure 389: For algorithm pixelall-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

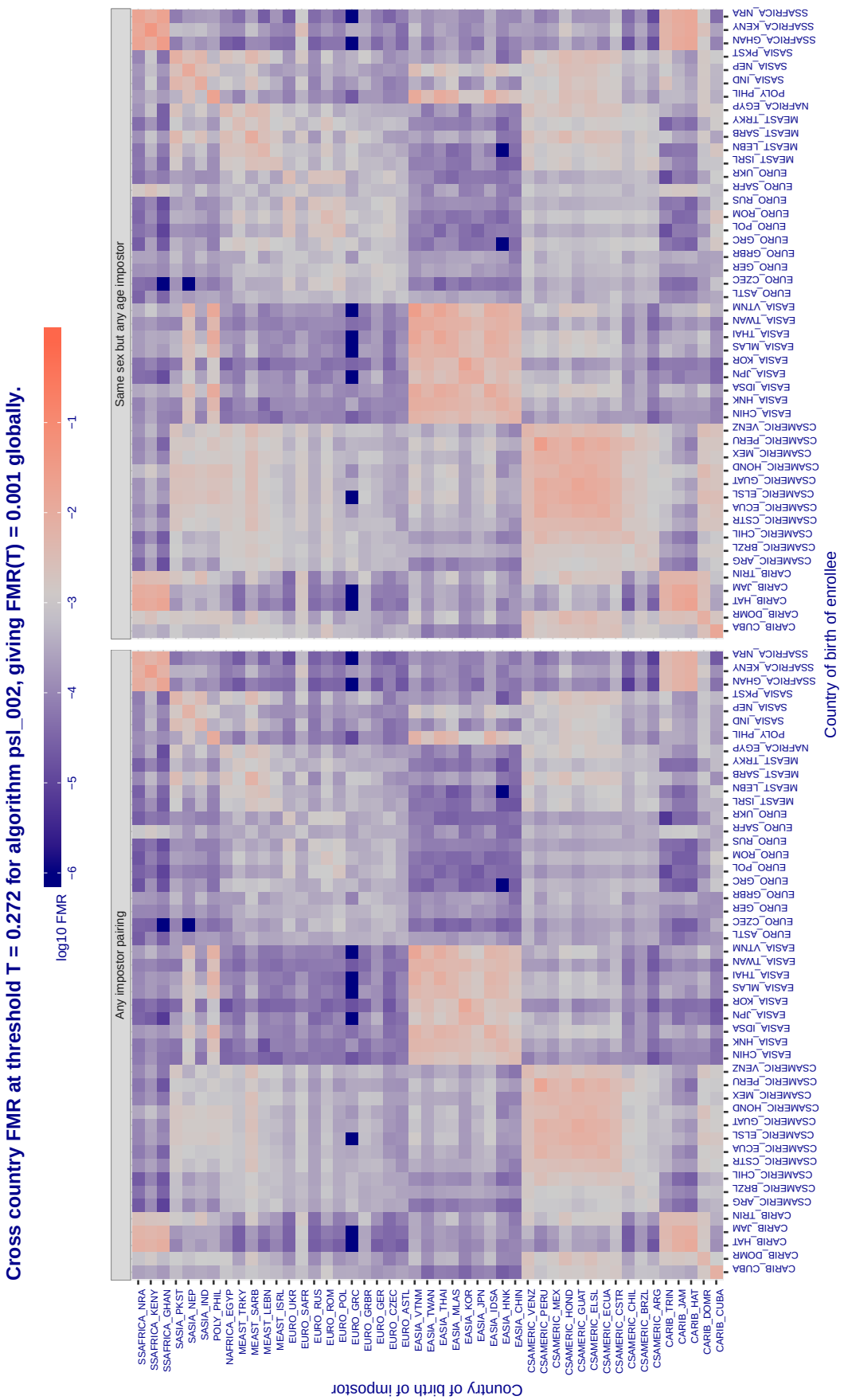


Figure 390: For algorithm psl-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

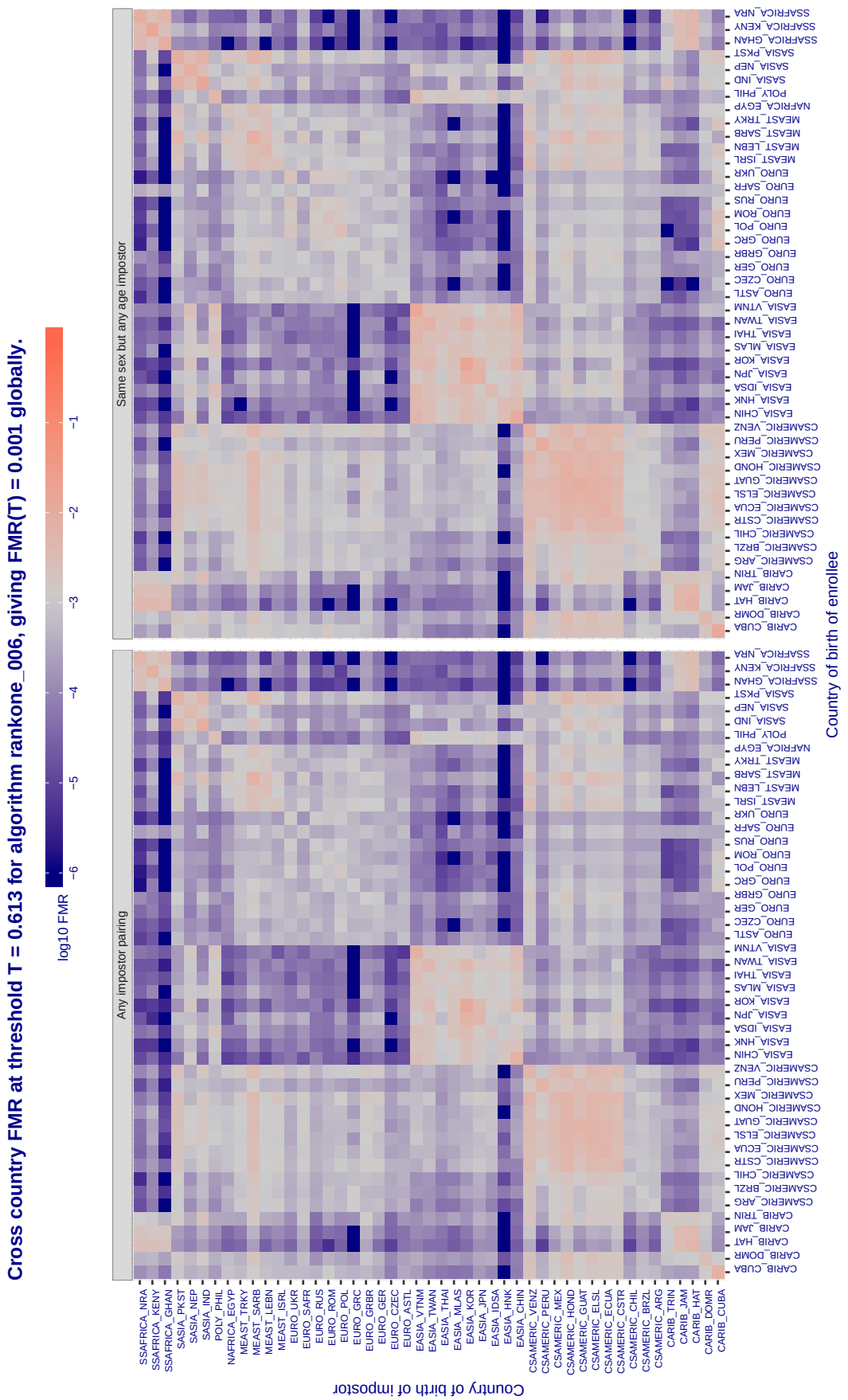


Figure 391: For algorithm rankone-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

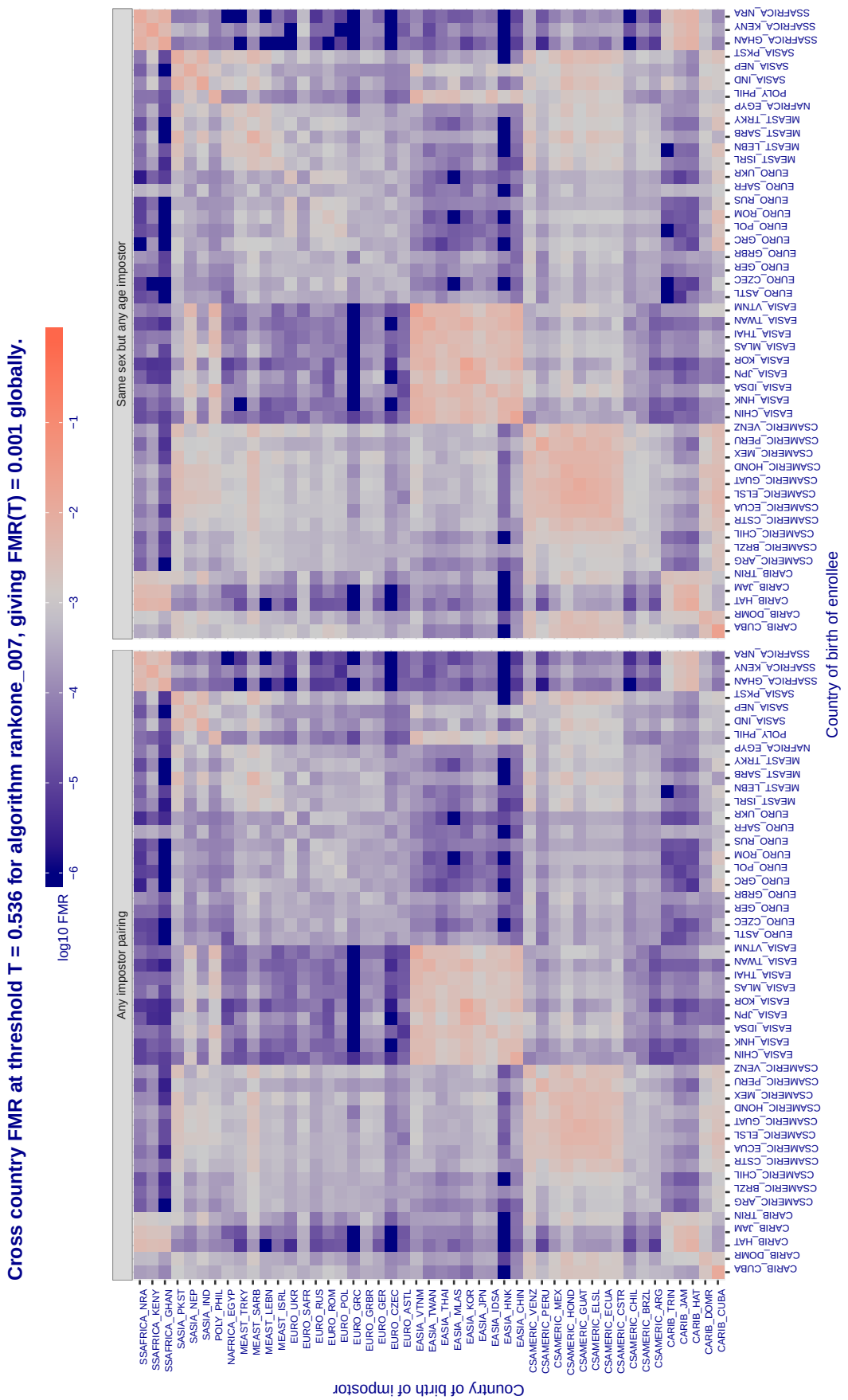


Figure 392: For algorithm rankone-007 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

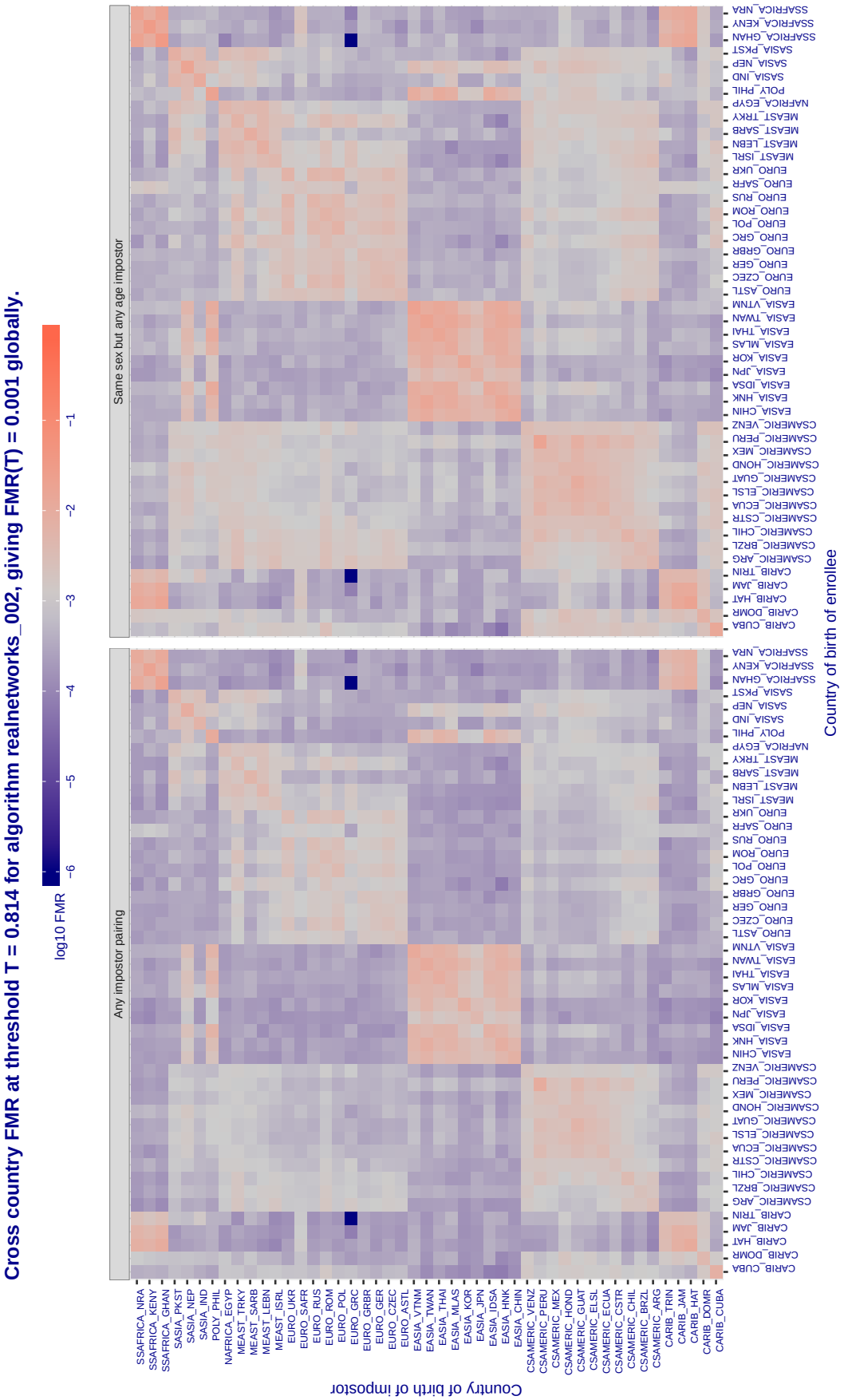


Figure 393: For algorithm realnetworks-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

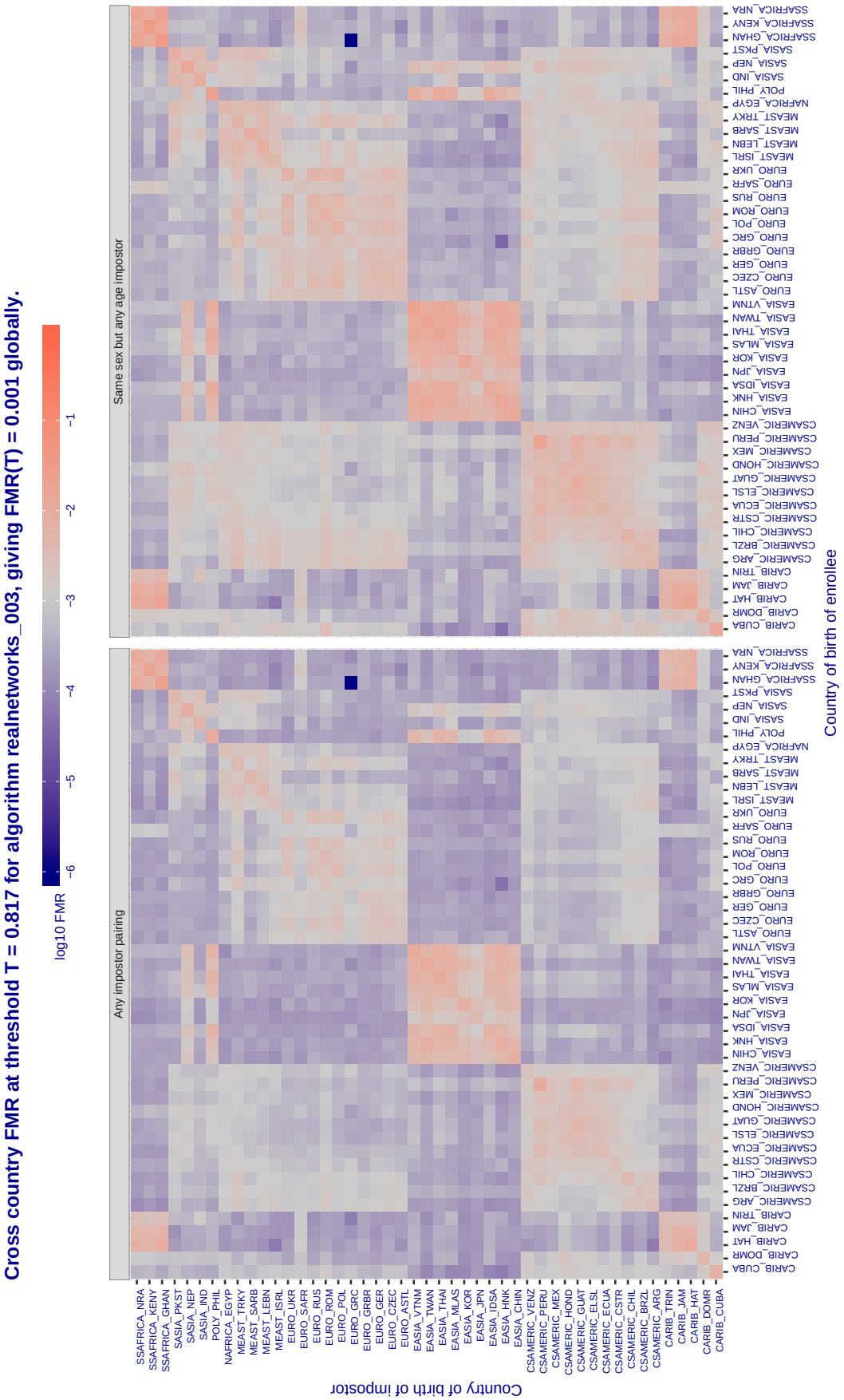


Figure 394: For algorithm realnetworks-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

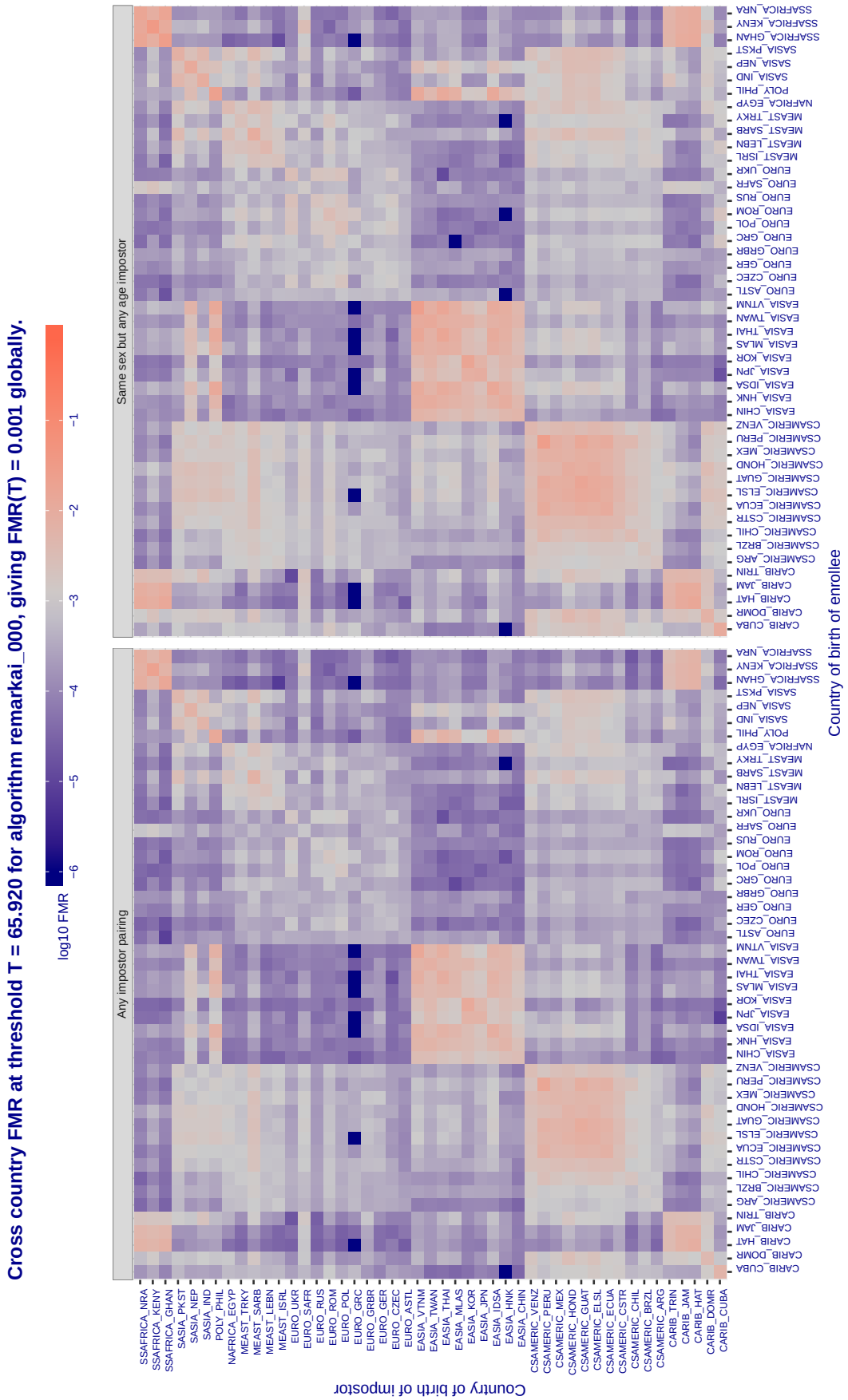


Figure 395: For algorithm remarkai-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

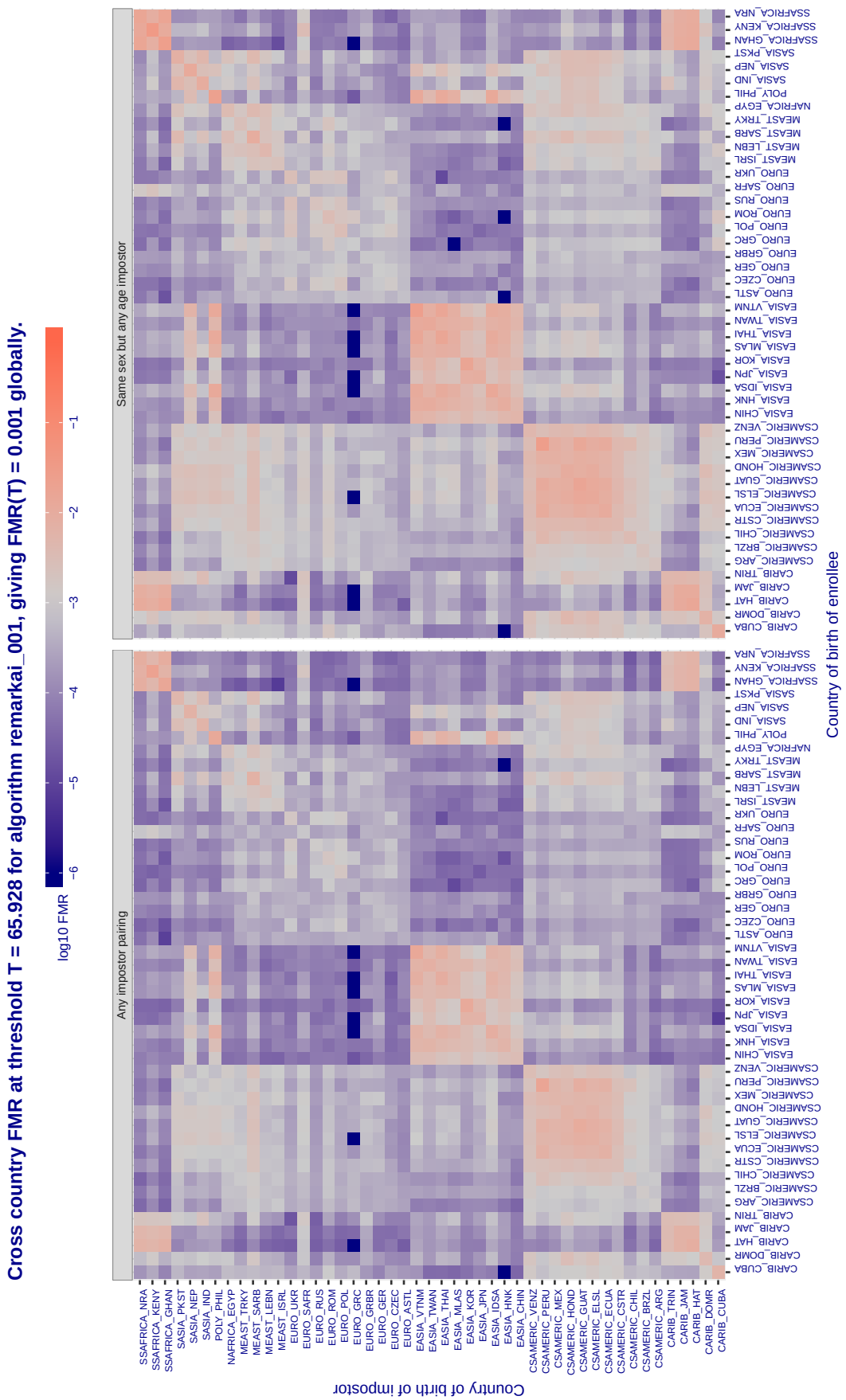


Figure 396: For algorithm remarkai-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

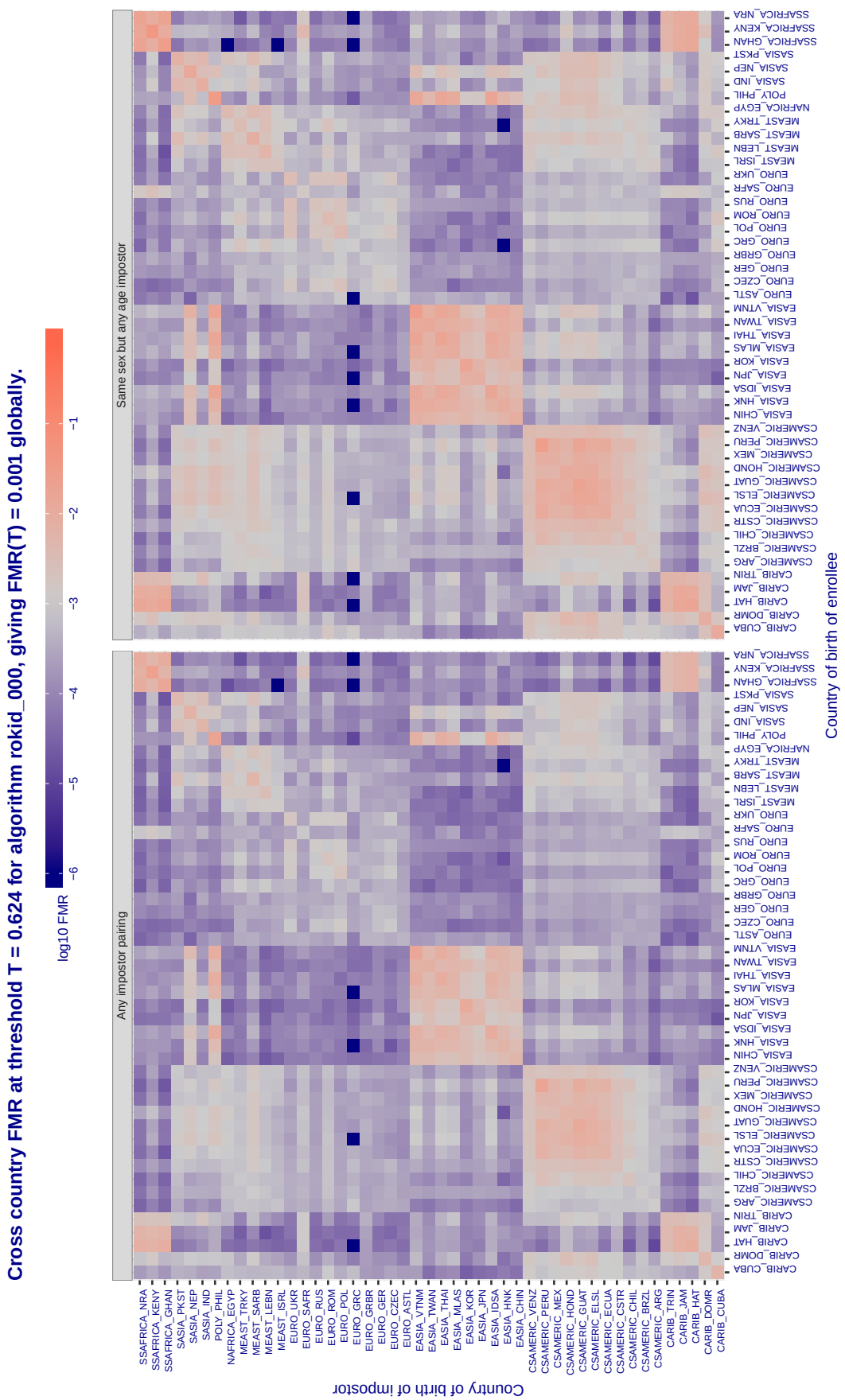


Figure 397: For algorithm rokid-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

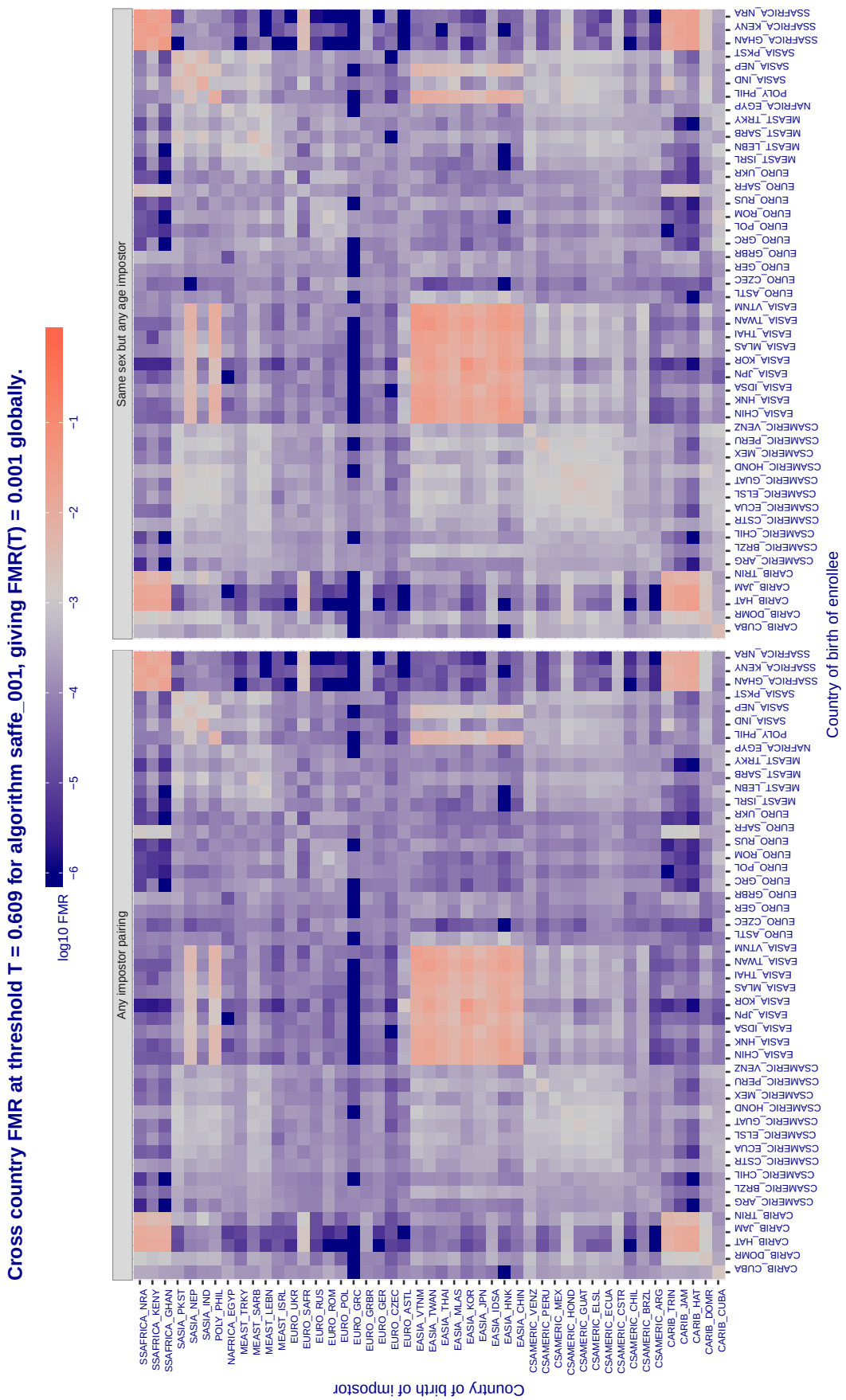


Figure 398: For algorithm saffe-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

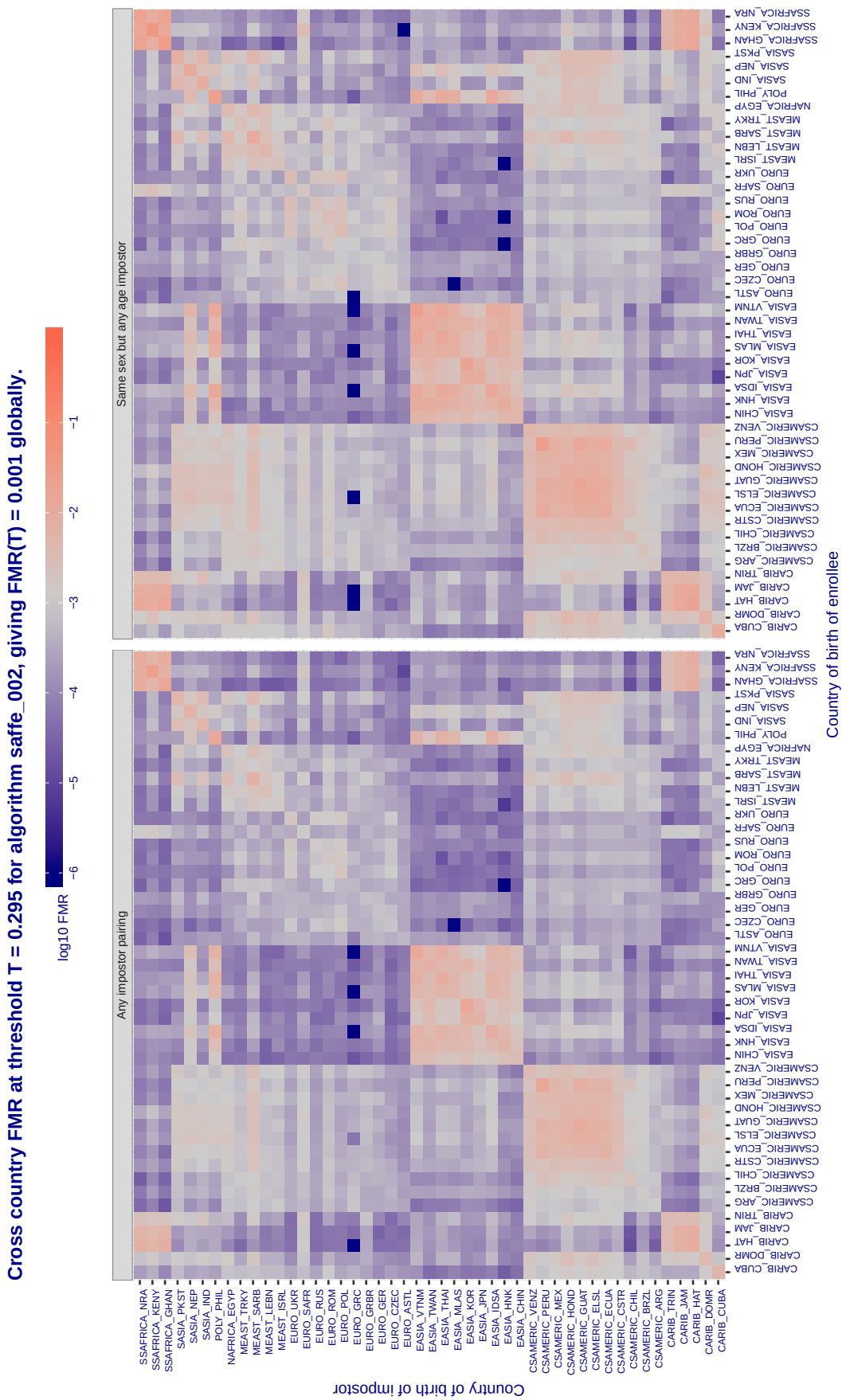


Figure 399: For algorithm saffe-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

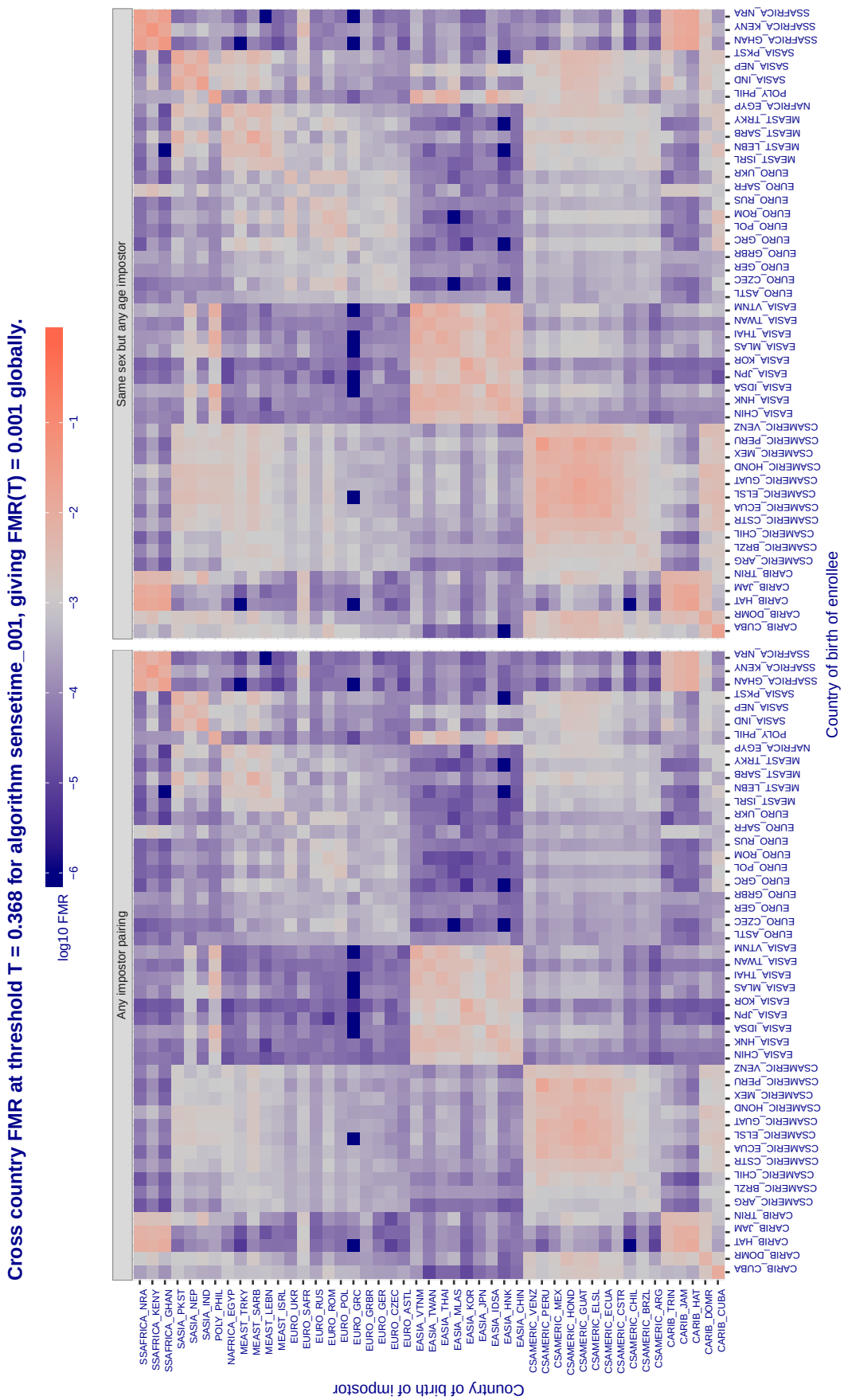


Figure 400: For algorithm sensetime-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

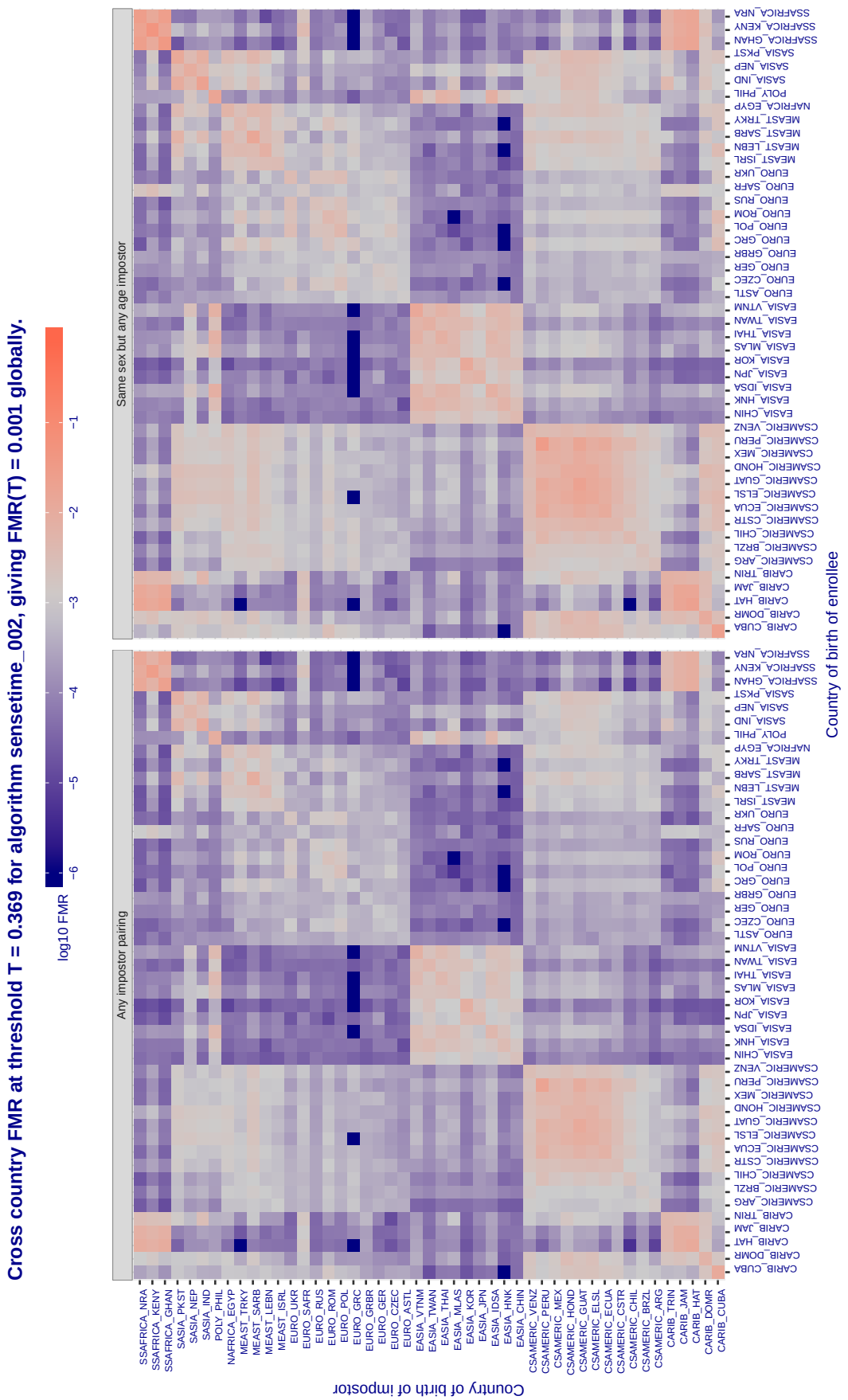


Figure 401: For algorithm sensetime-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

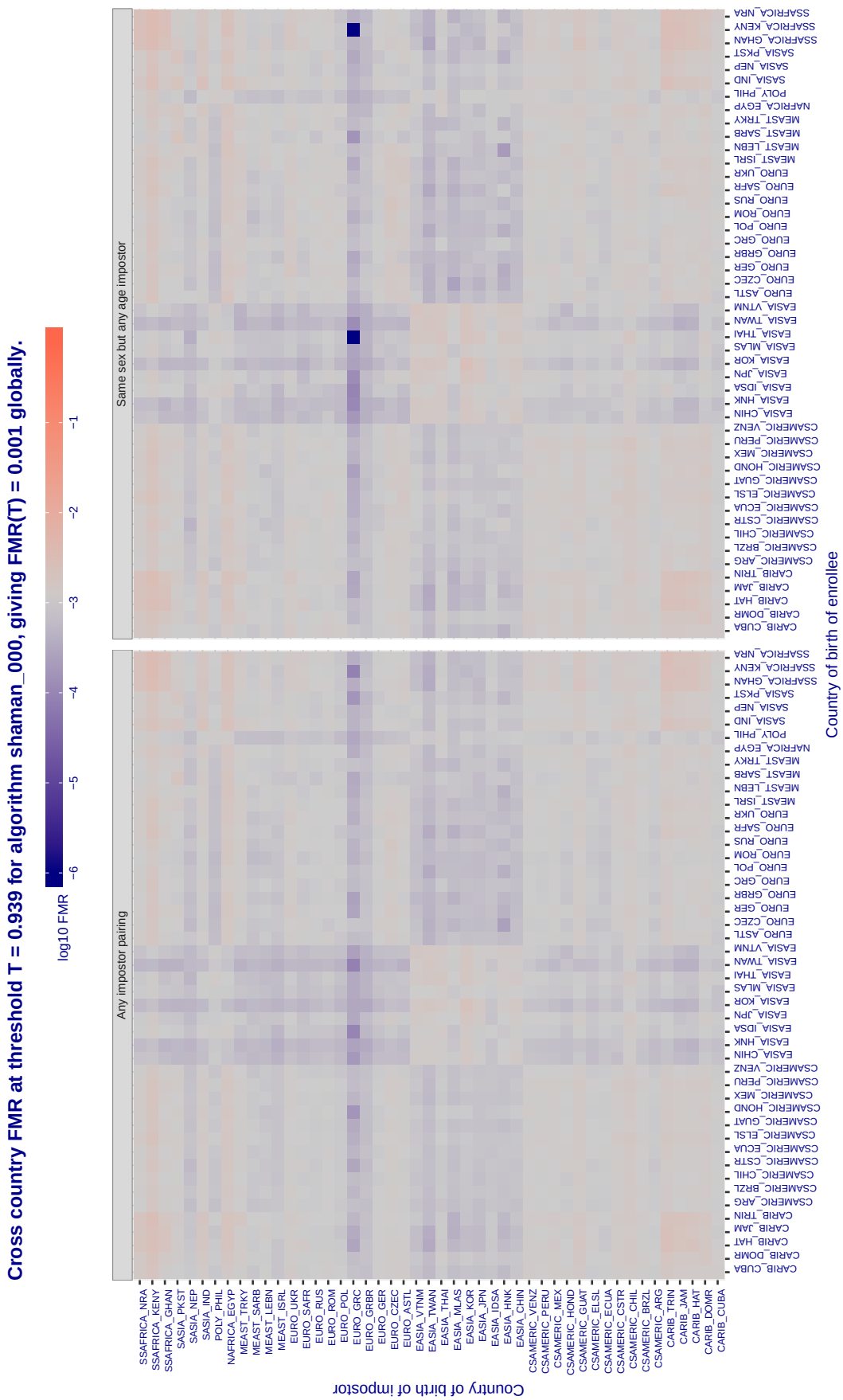


Figure 402: For algorithm shaman-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

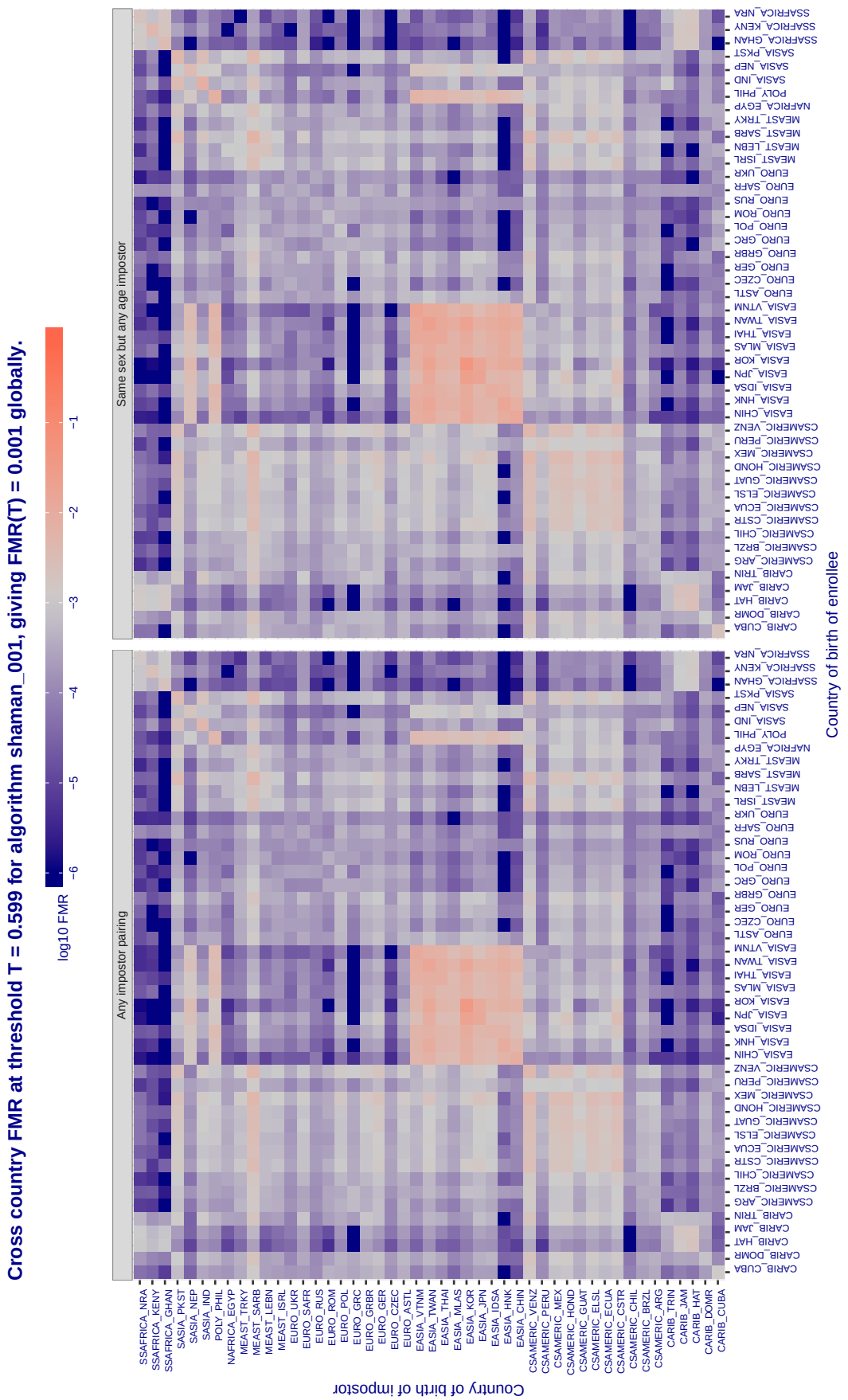


Figure 403: For algorithm shaman-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

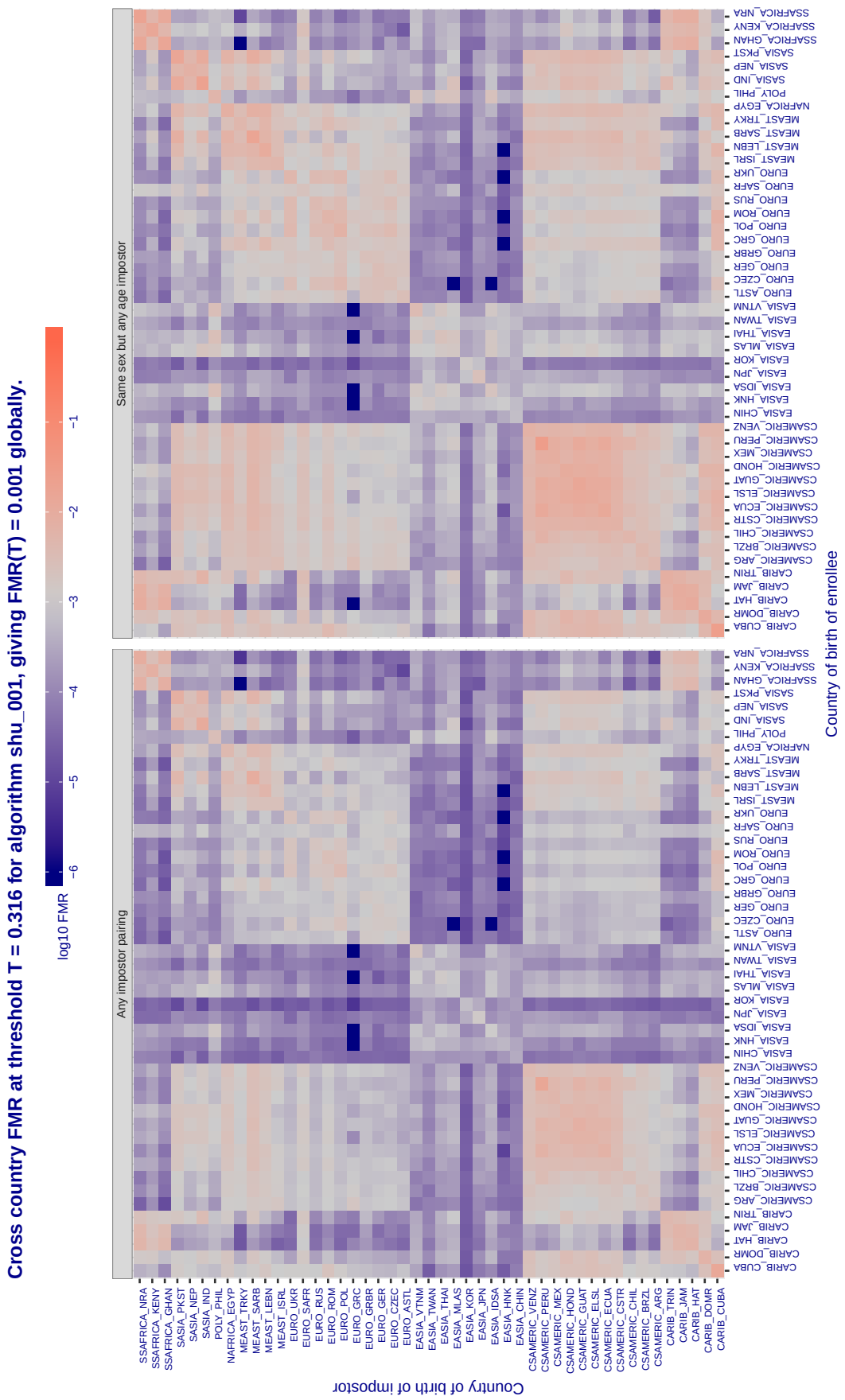


Figure 404: For algorithm shu-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

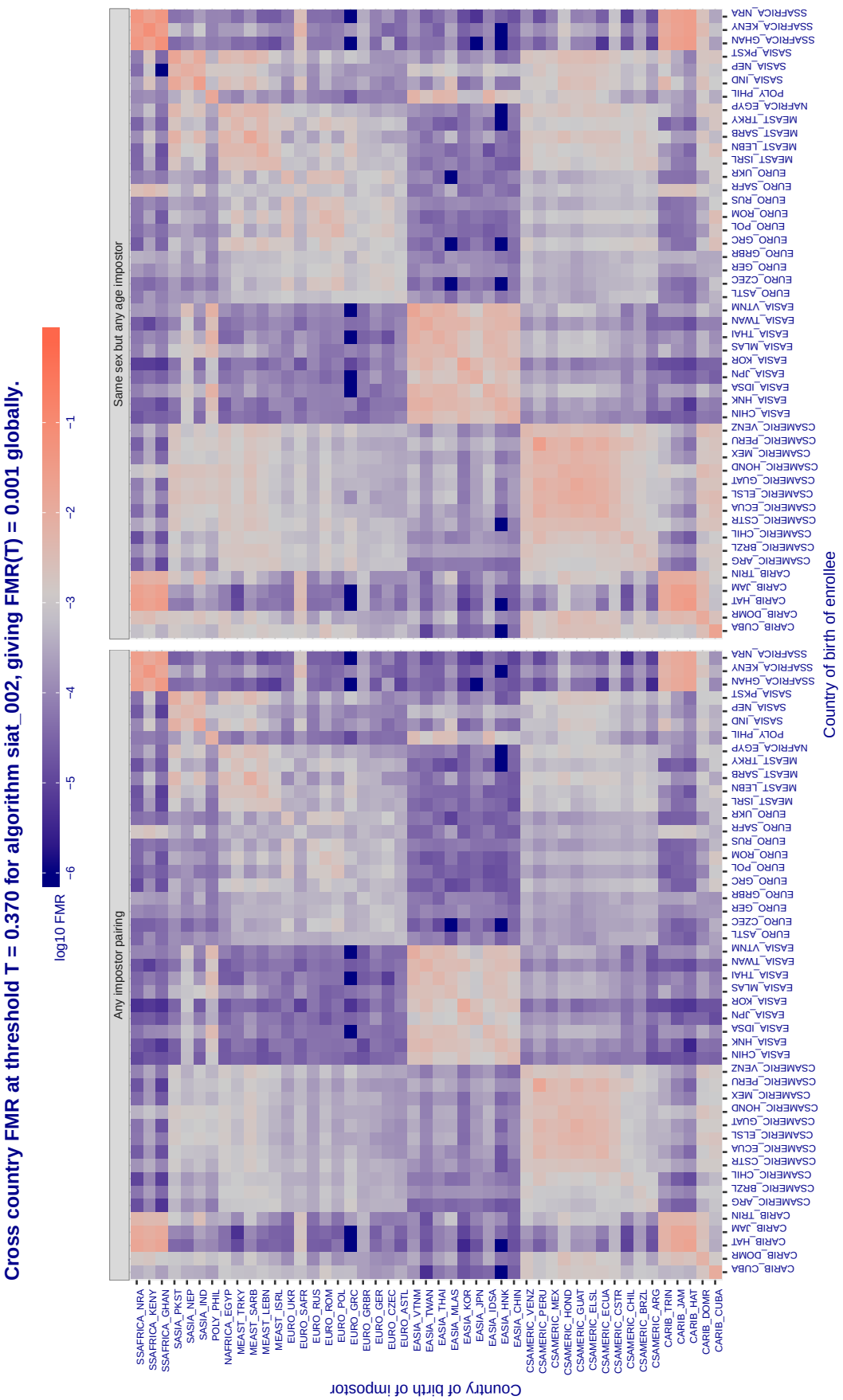


Figure 405: For algorithm siat-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

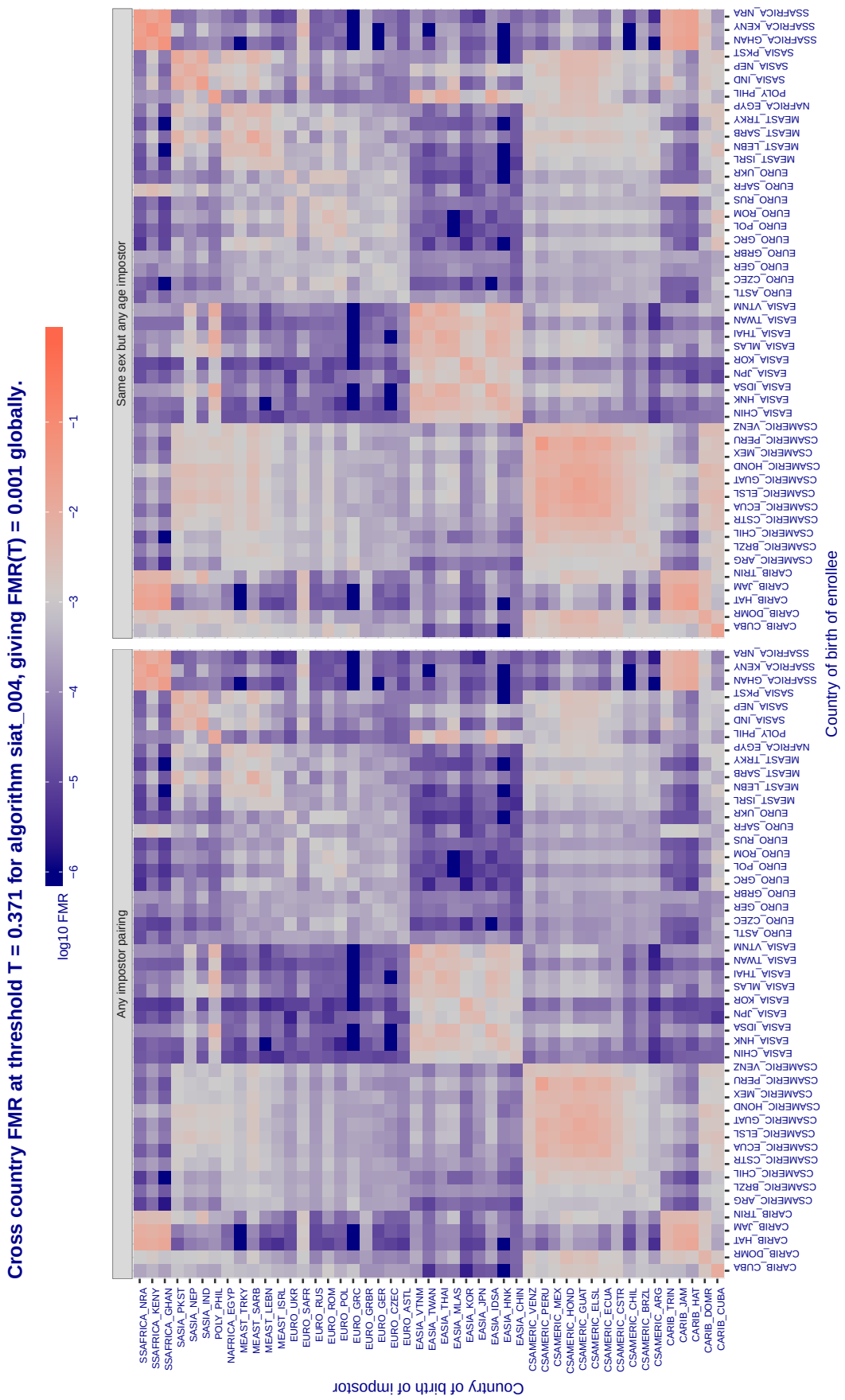


Figure 406: For algorithm siat-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

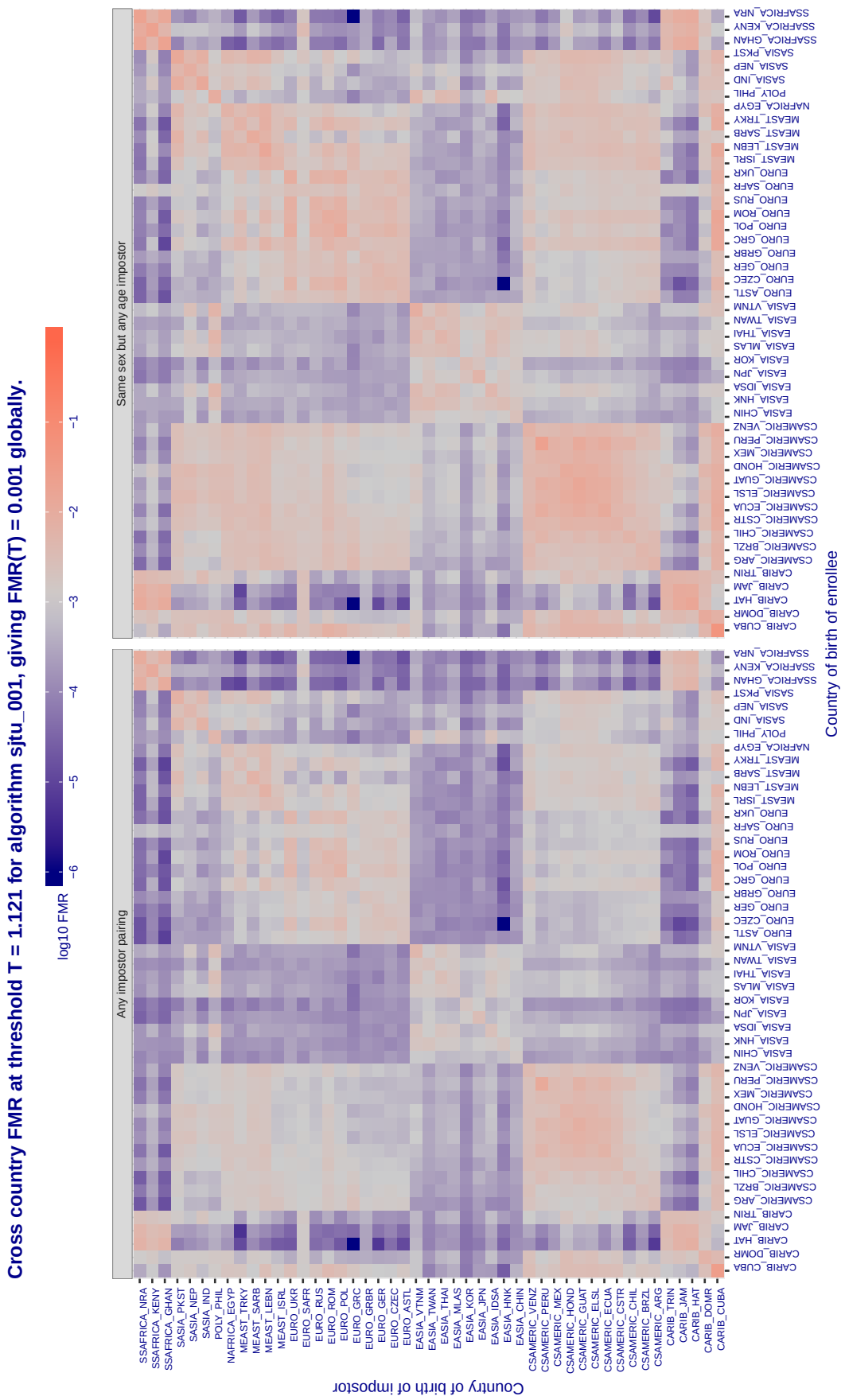


Figure 407: For algorithm sjtu-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

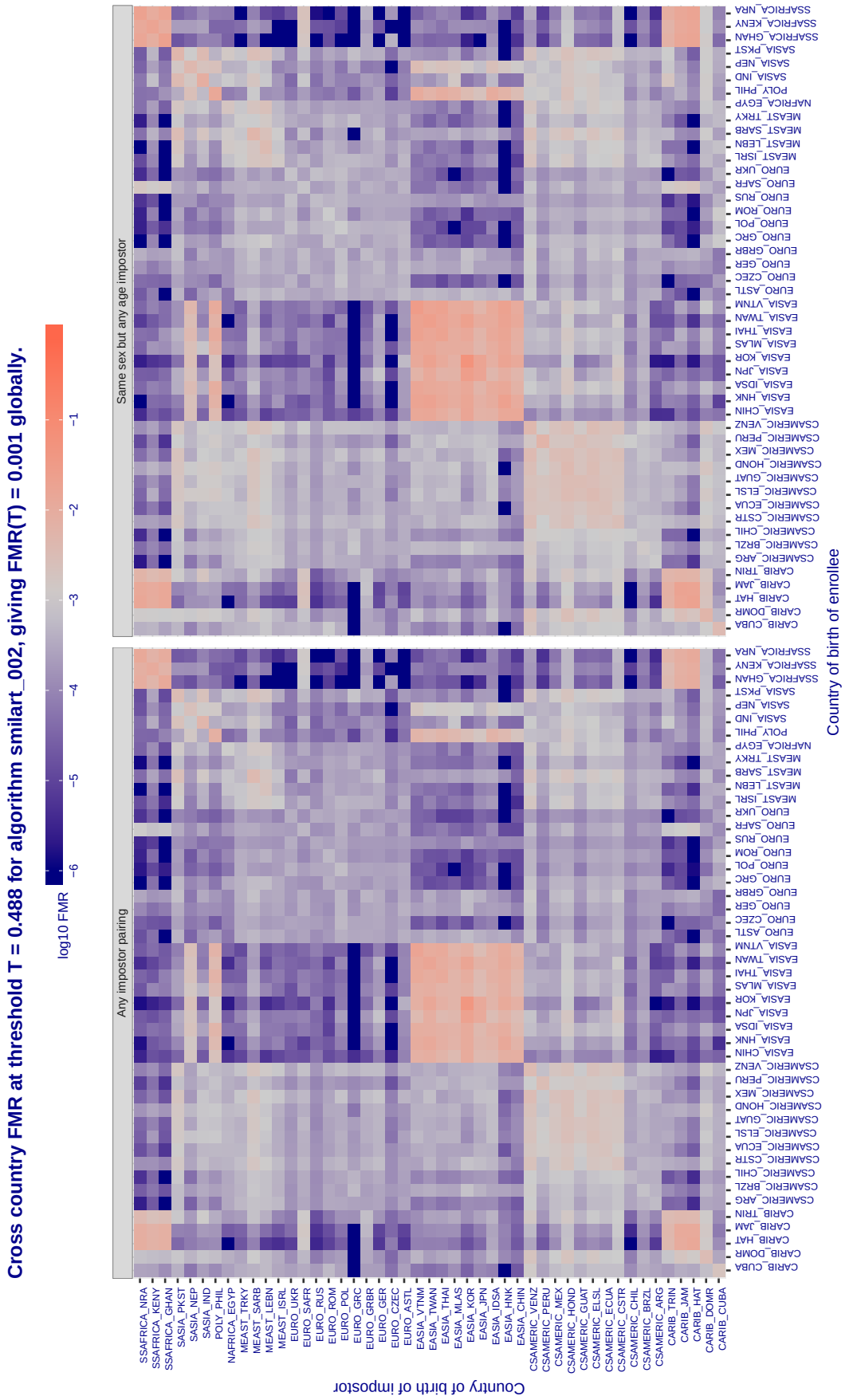


Figure 408: For algorithm smilart-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

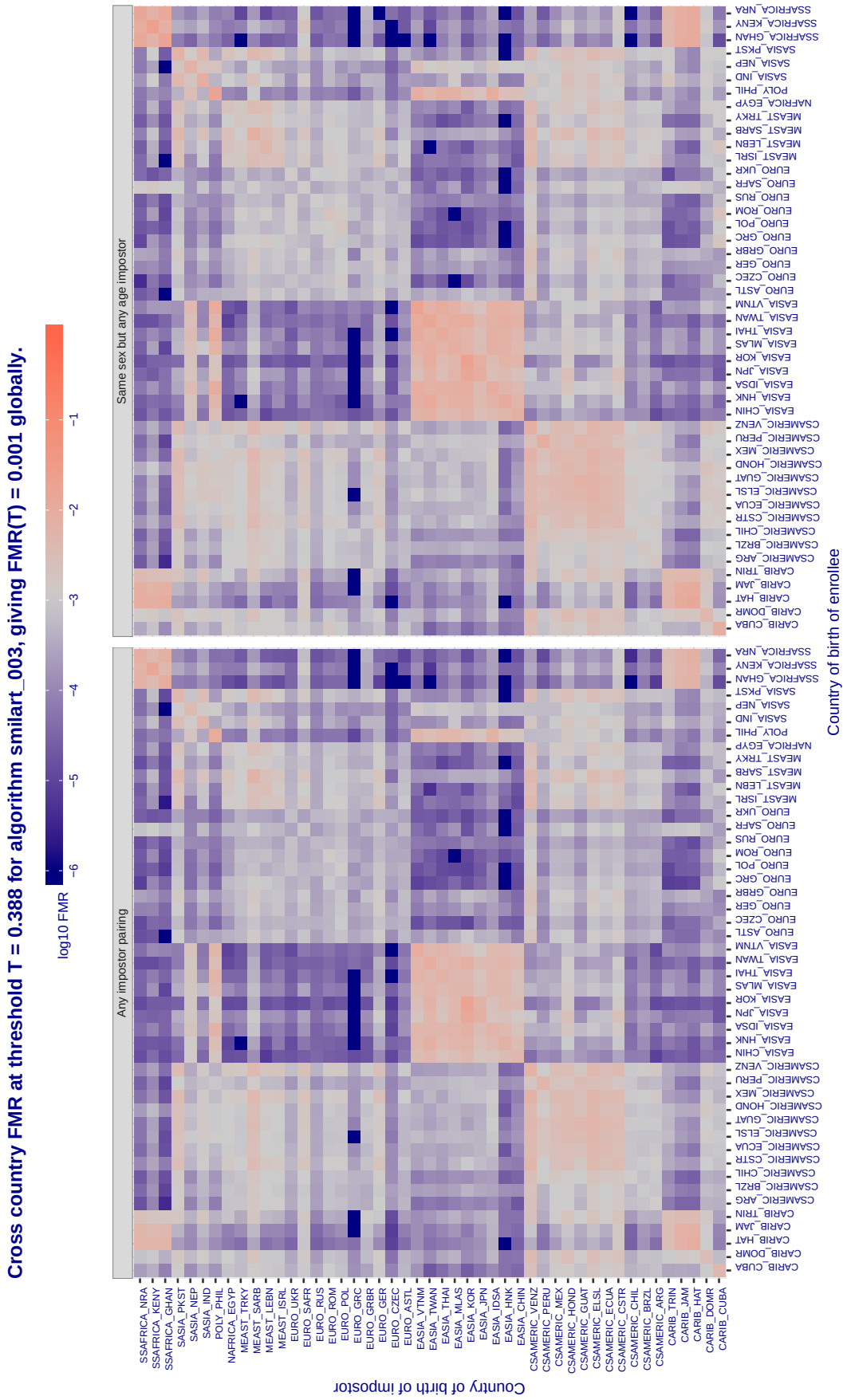


Figure 409: For algorithm smilart-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

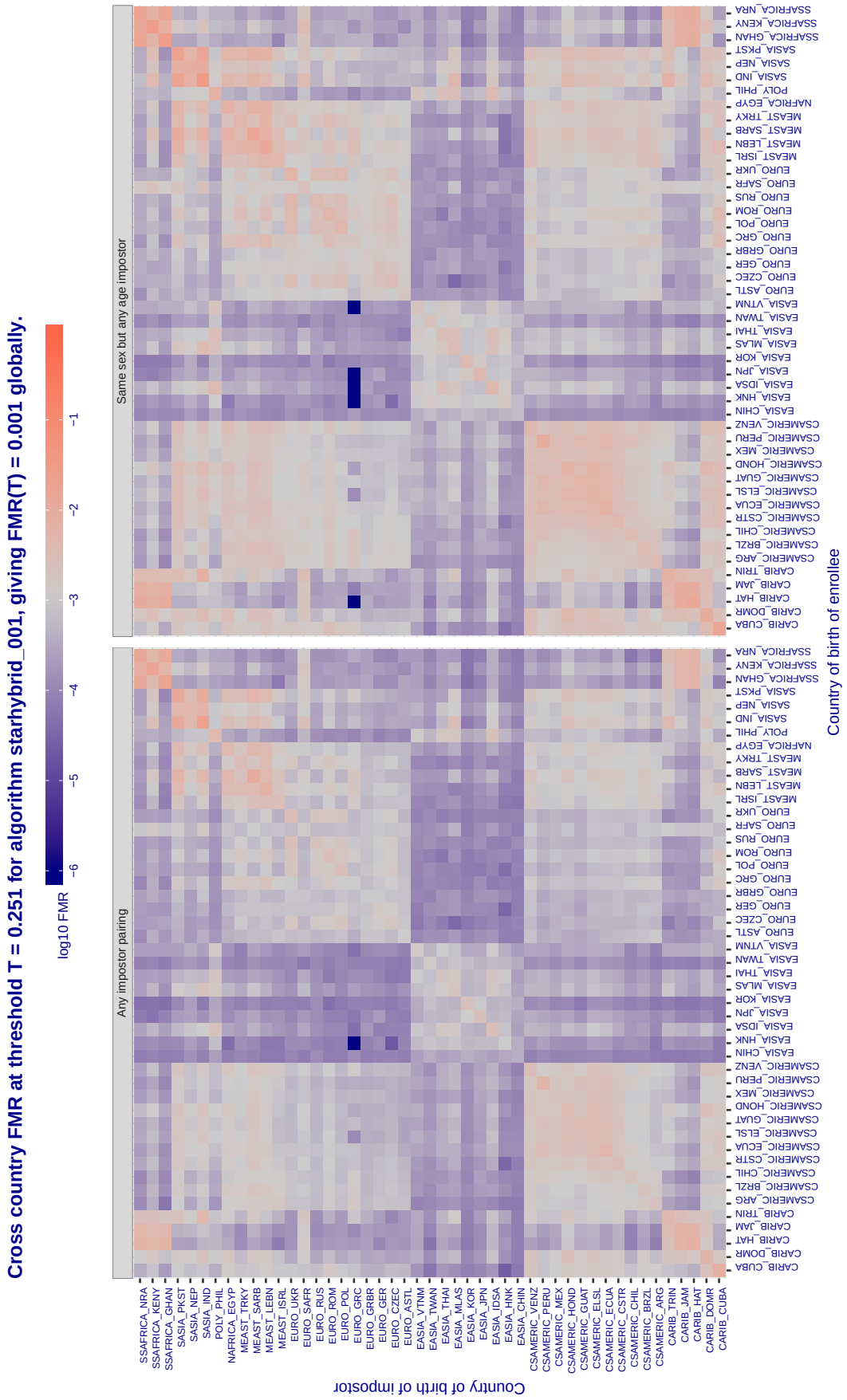


Figure 410: For algorithm starhybrid-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

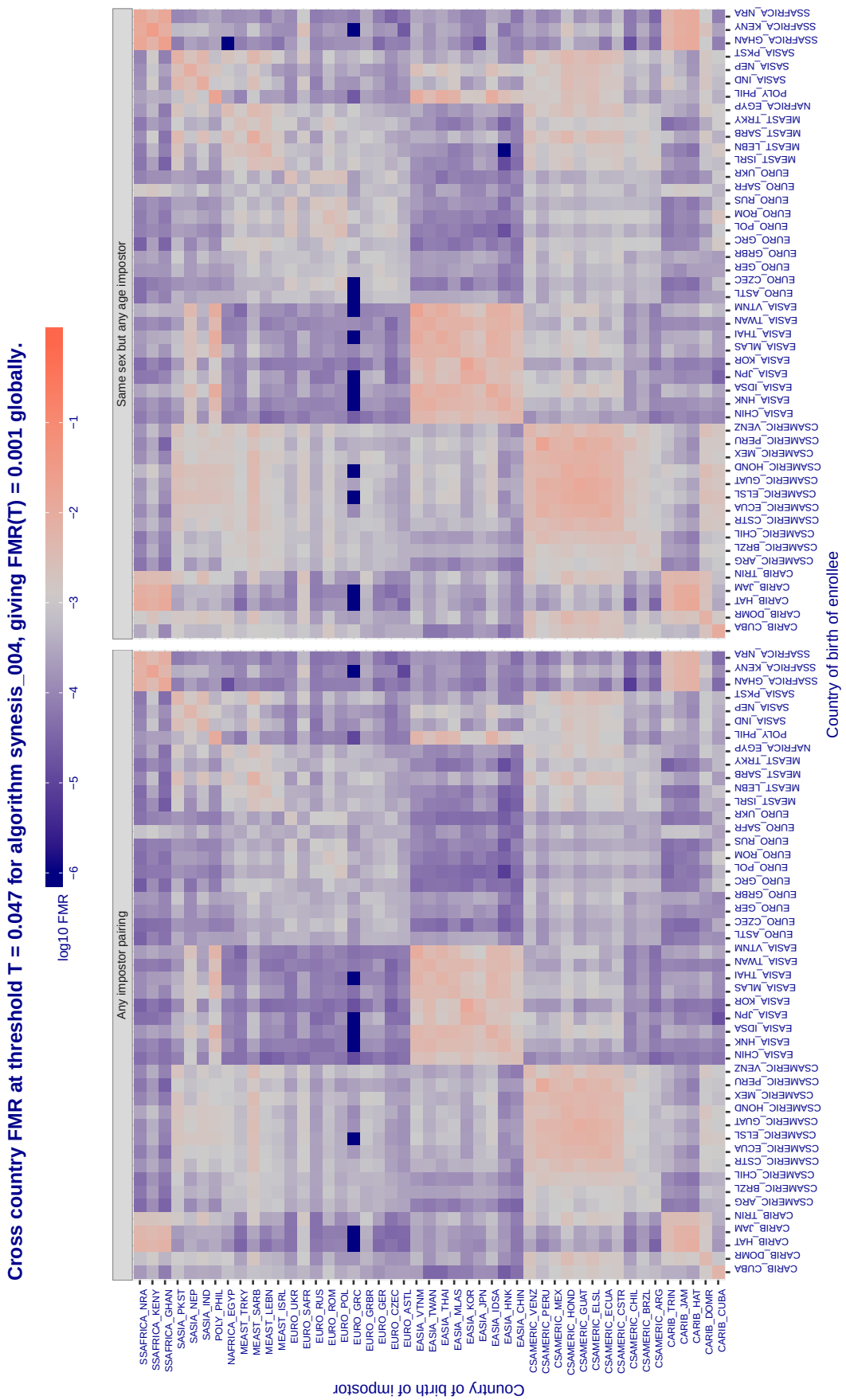


Figure 411: For algorithm synesis-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

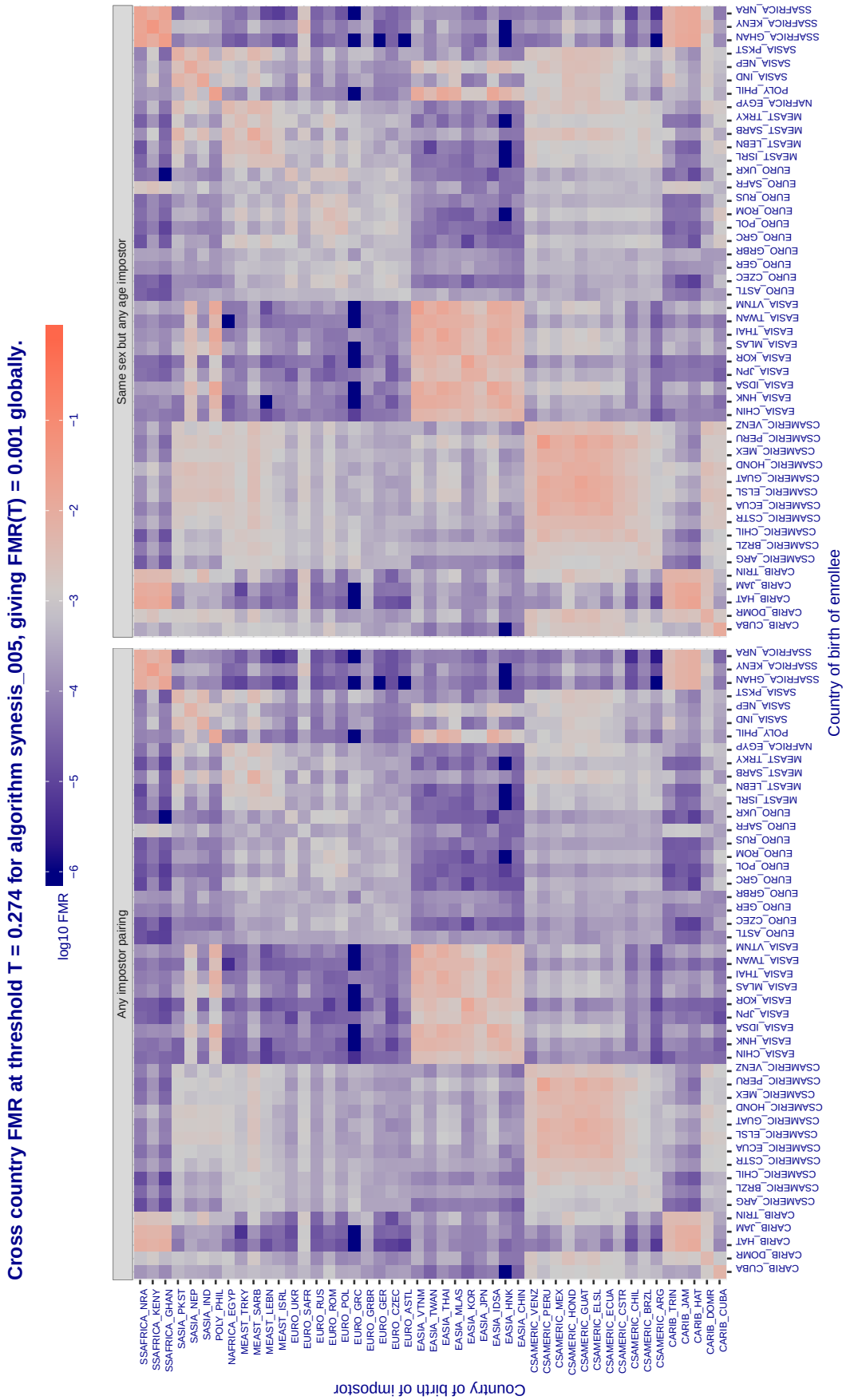


Figure 412: For algorithm synesis-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

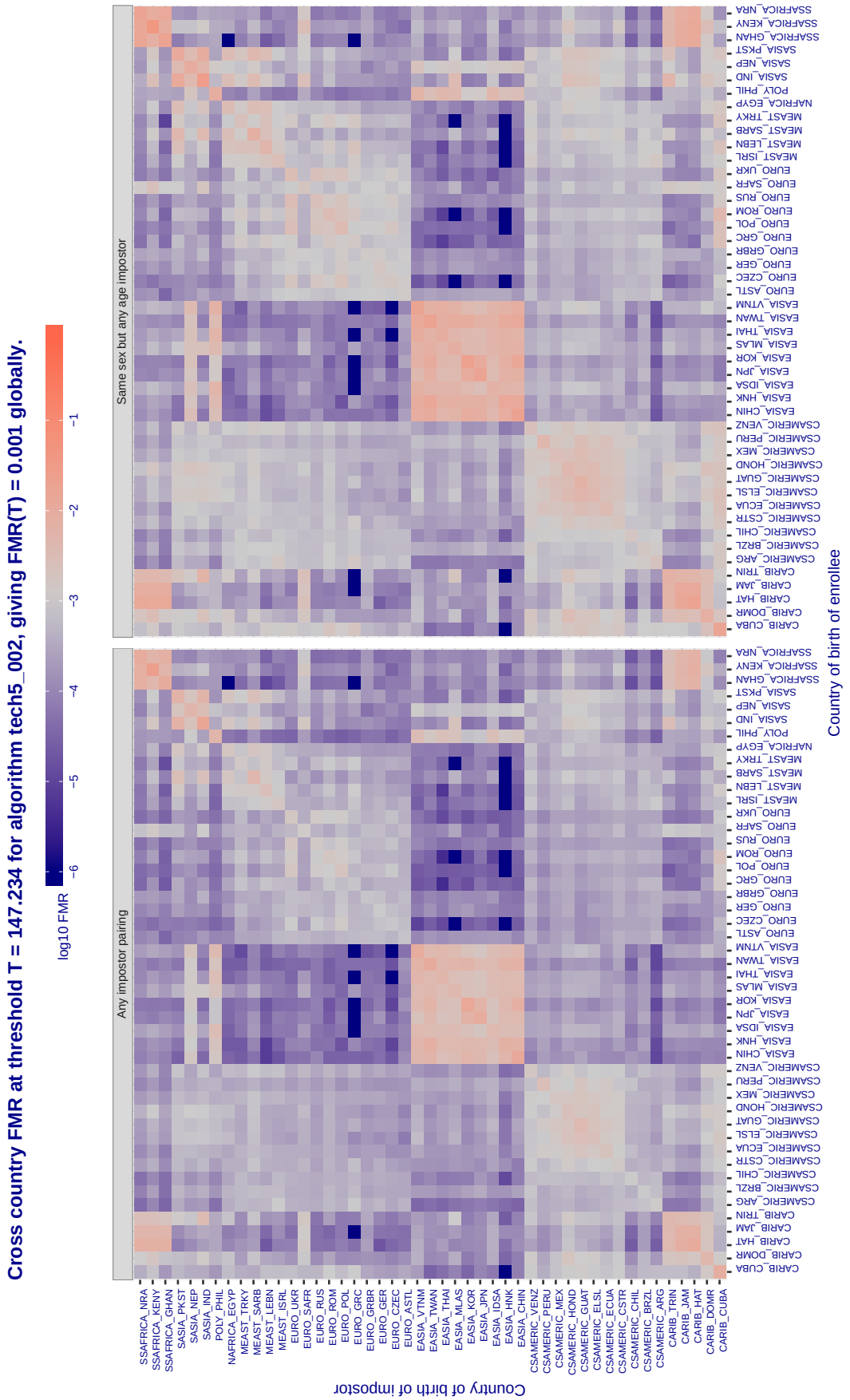


Figure 413: For algorithm tech5-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

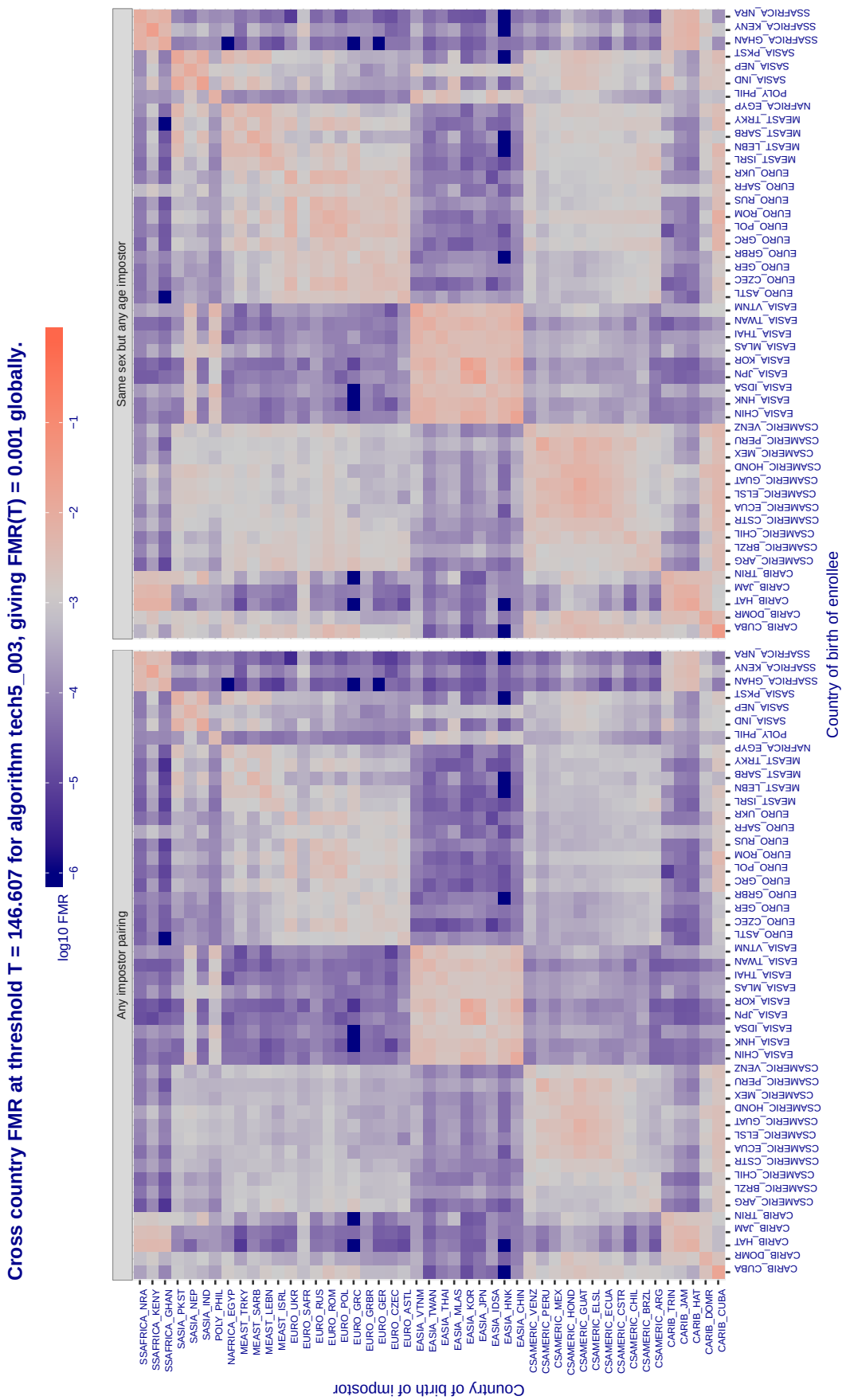


Figure 414: For algorithm tech5-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

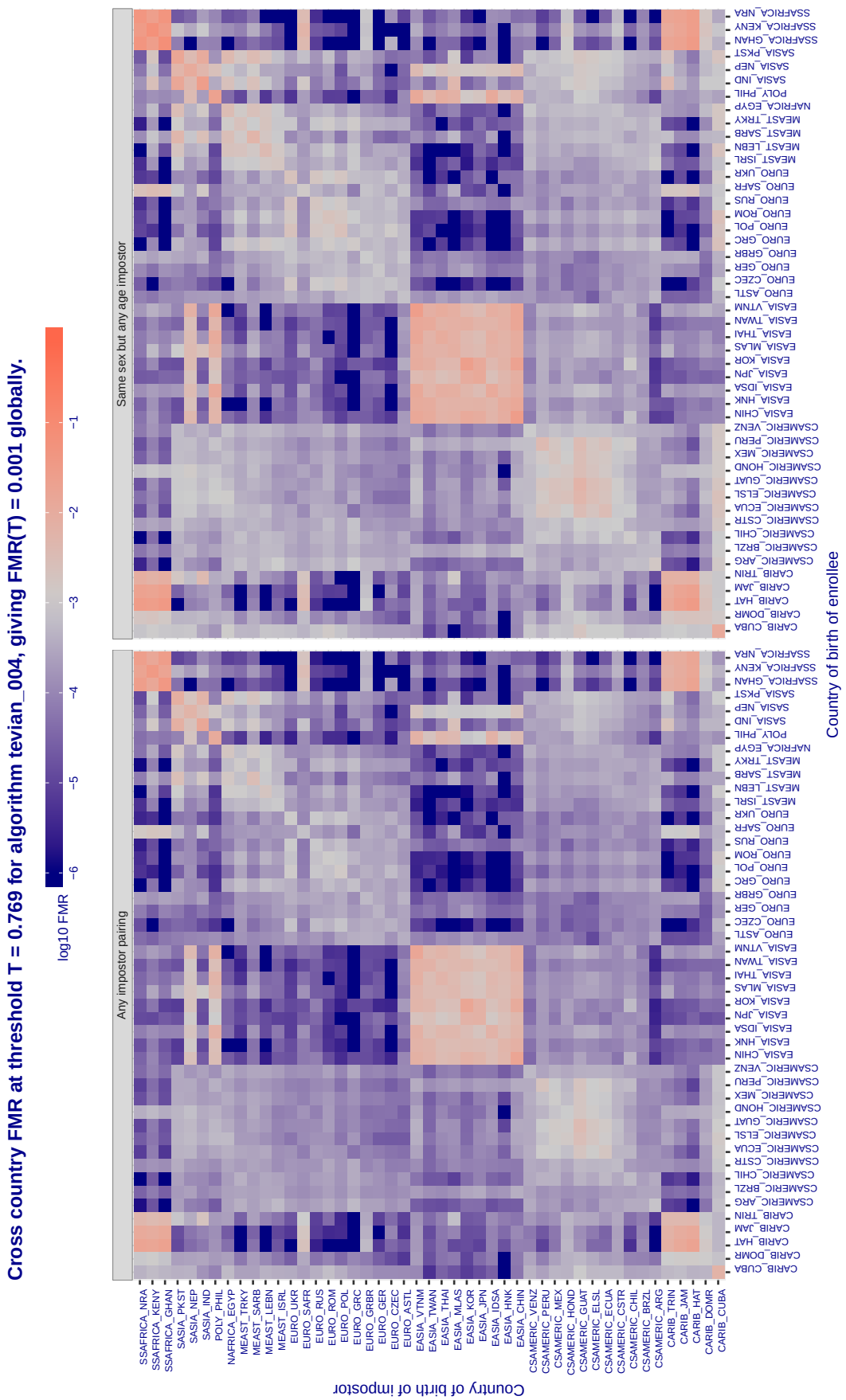


Figure 415: For algorithm tevian-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

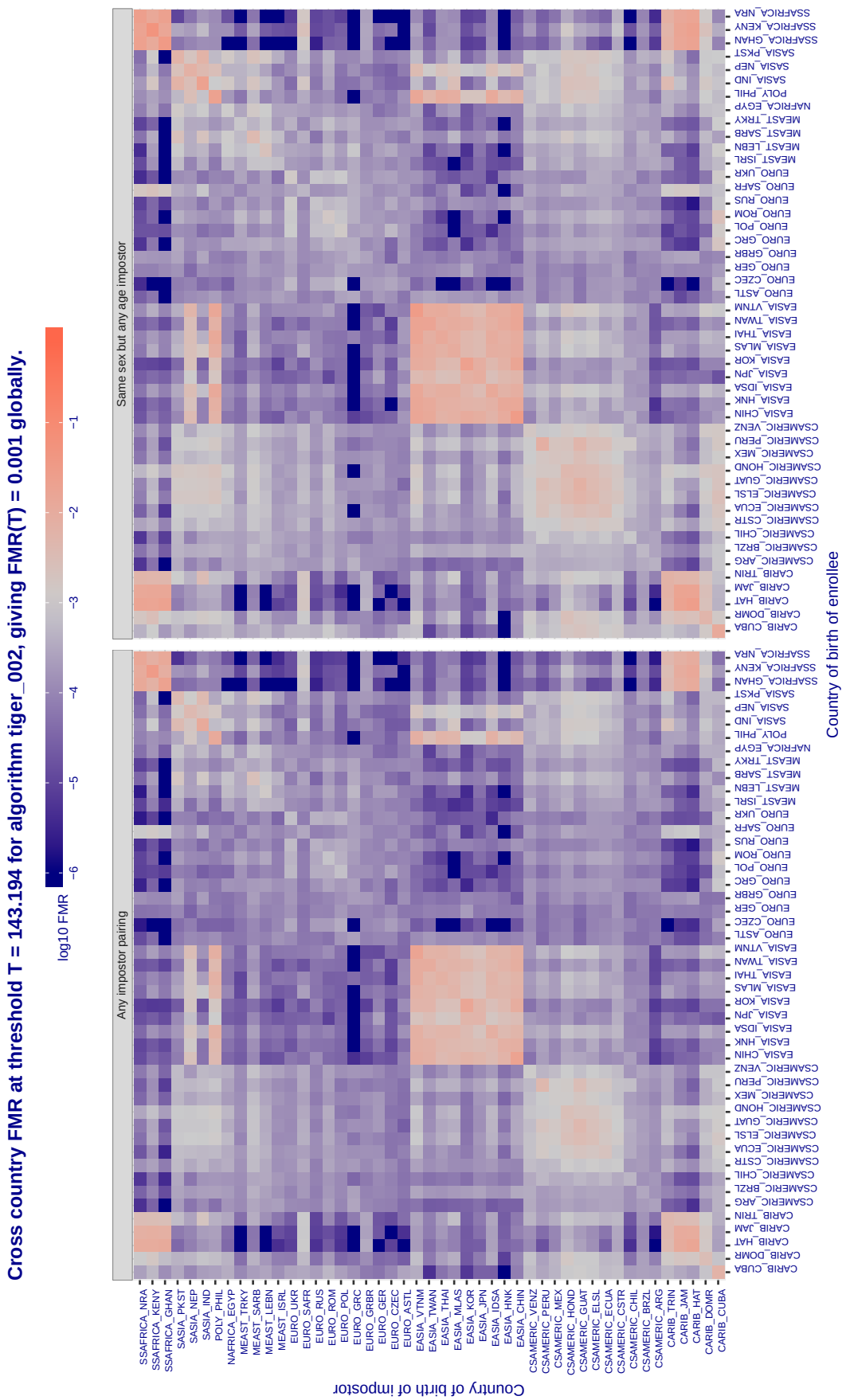


Figure 416: For algorithm tiger-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

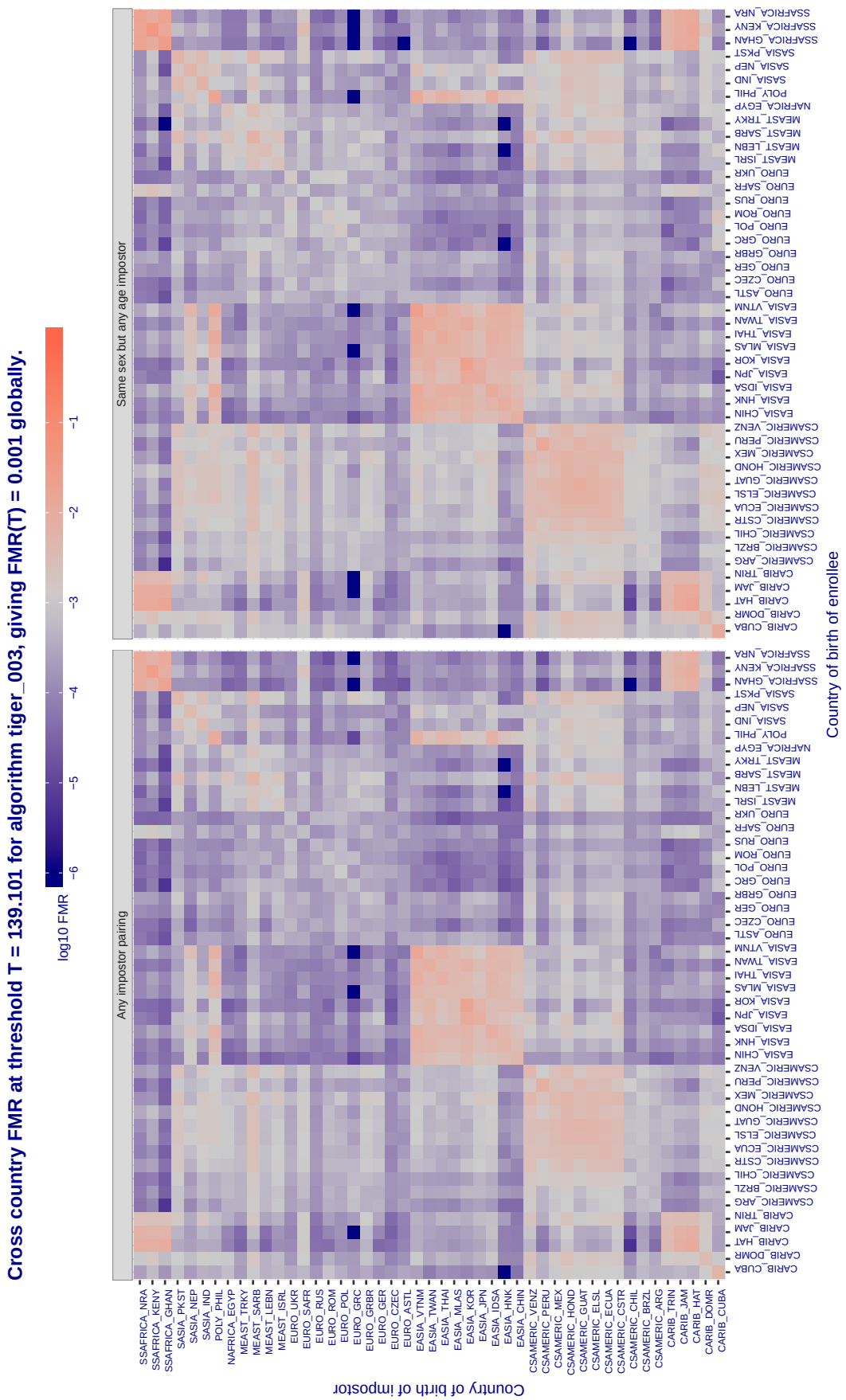


Figure 417: For algorithm tiger-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

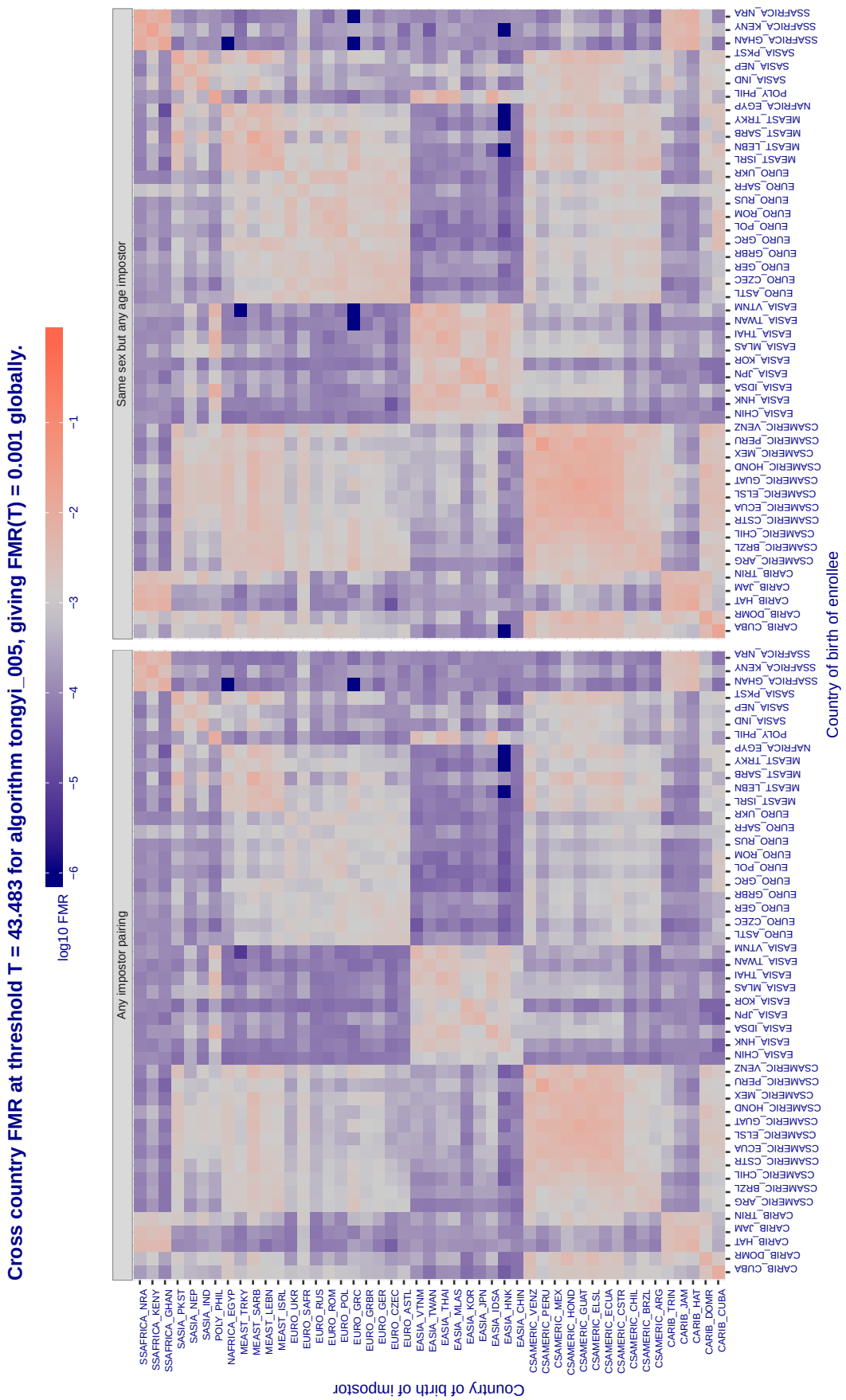


Figure 418: For algorithm tongyi-005 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

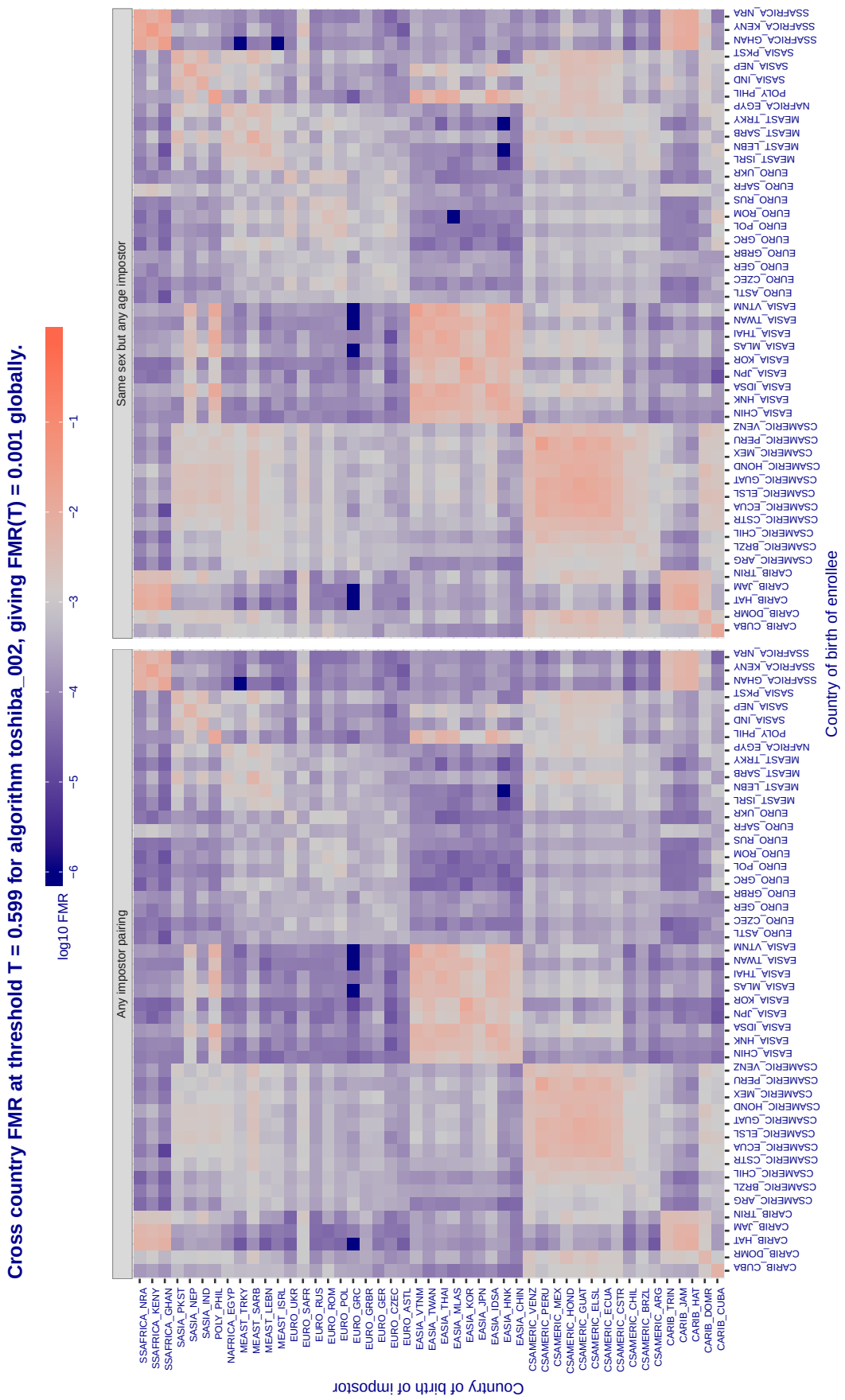


Figure 419: For algorithm toshiba-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

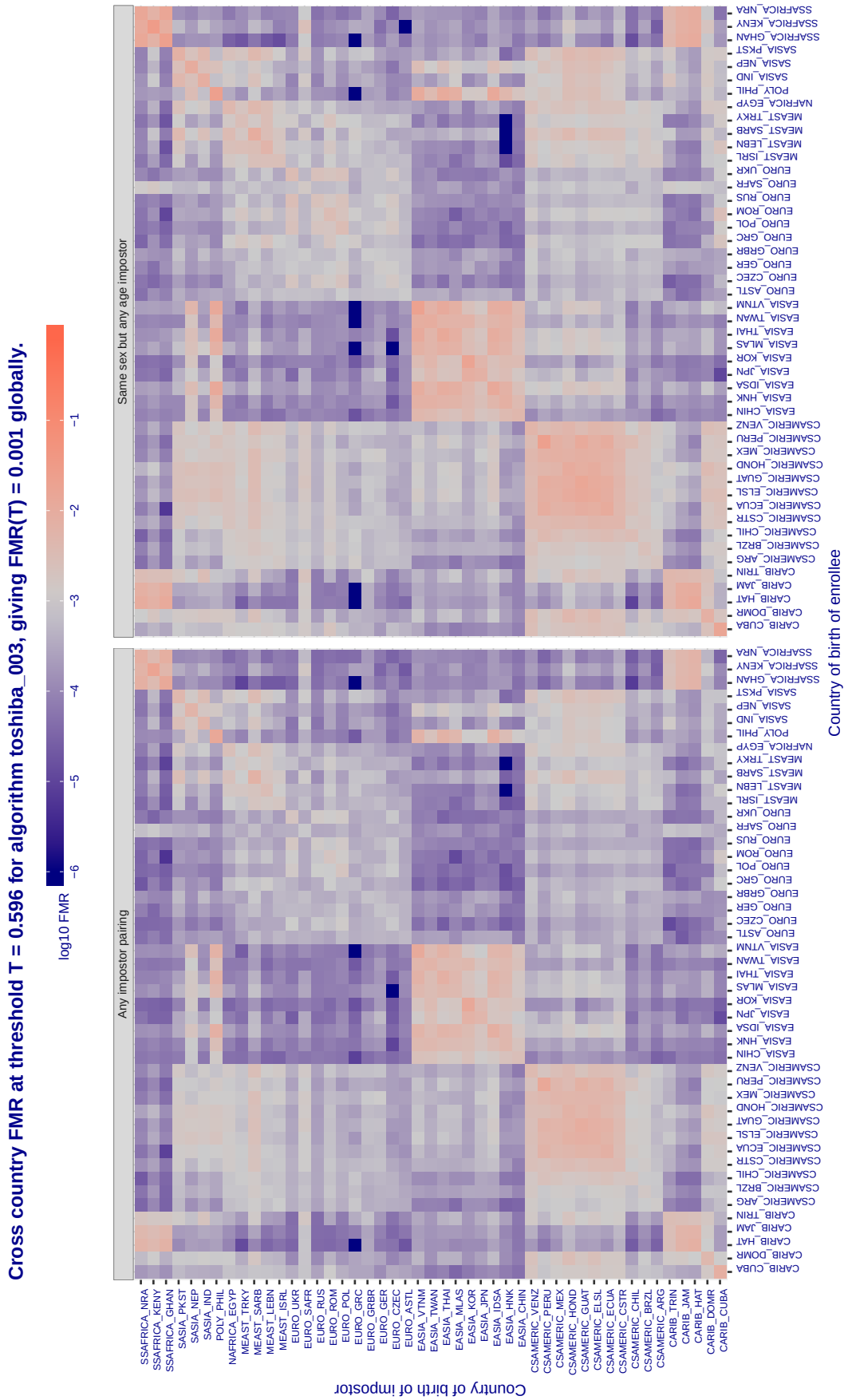


Figure 420: For algorithm toshiba-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

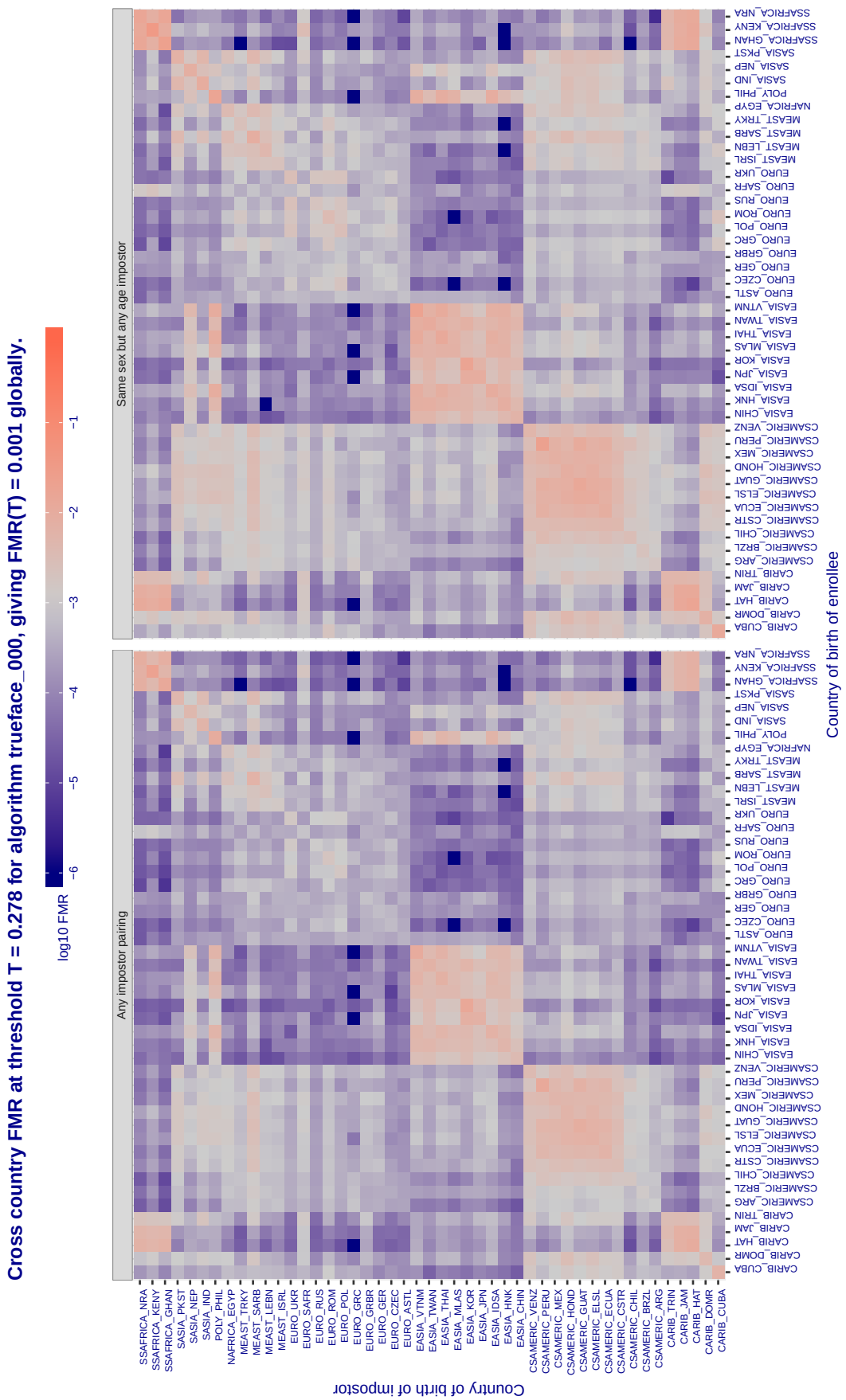


Figure 421: For algorithm trueface-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

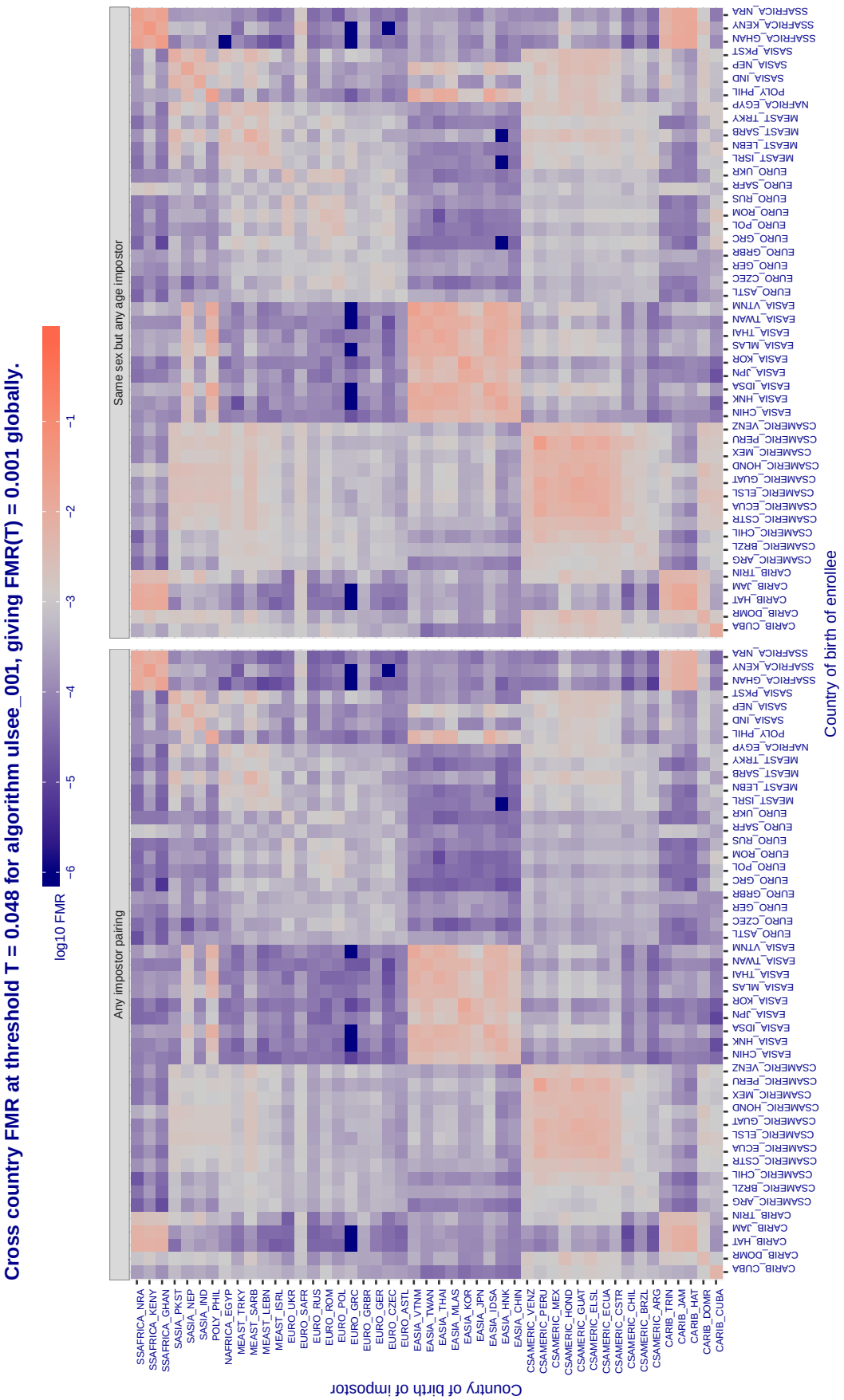


Figure 422: For algorithm ulsee-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

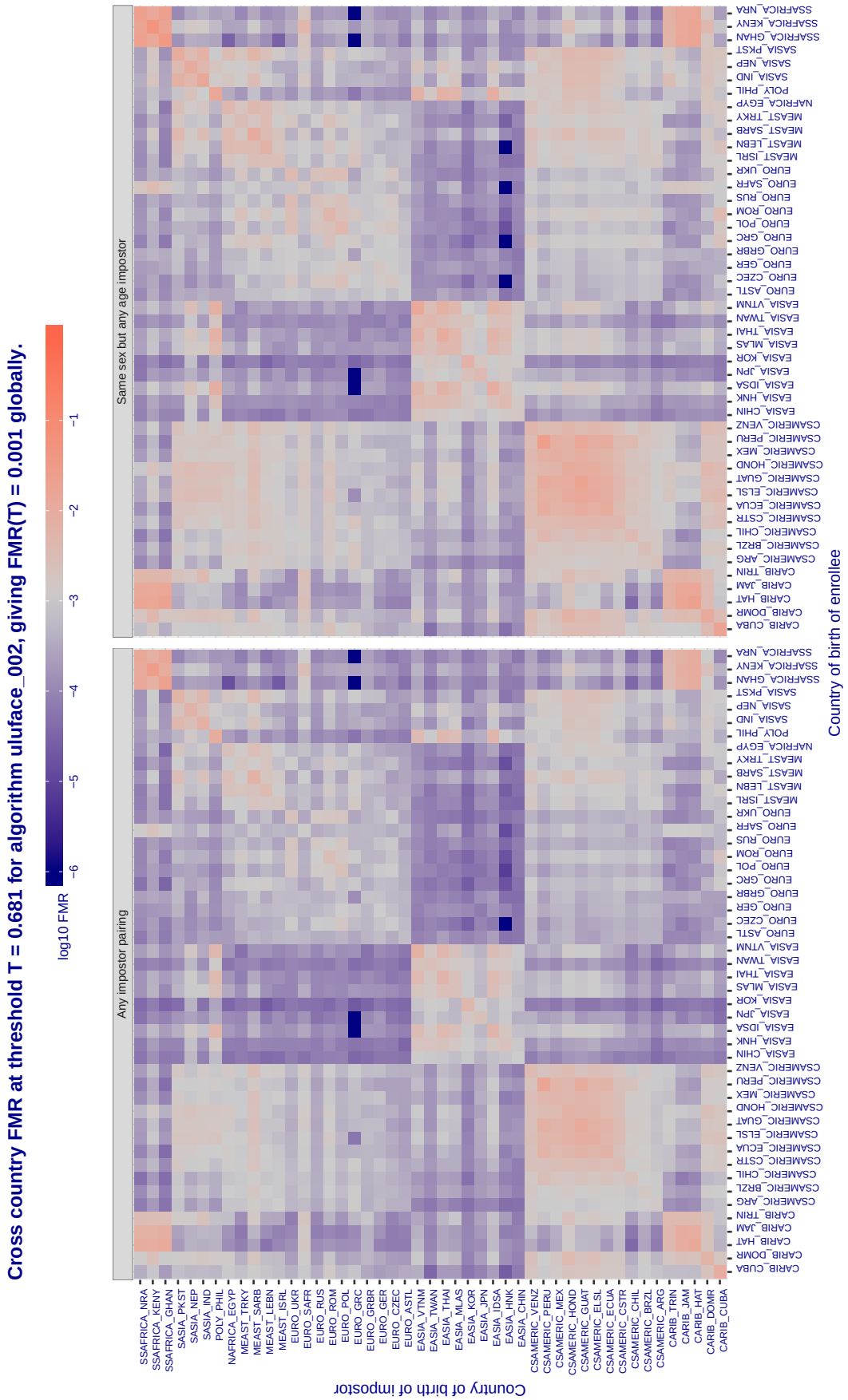


Figure 423: For algorithm uluface-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

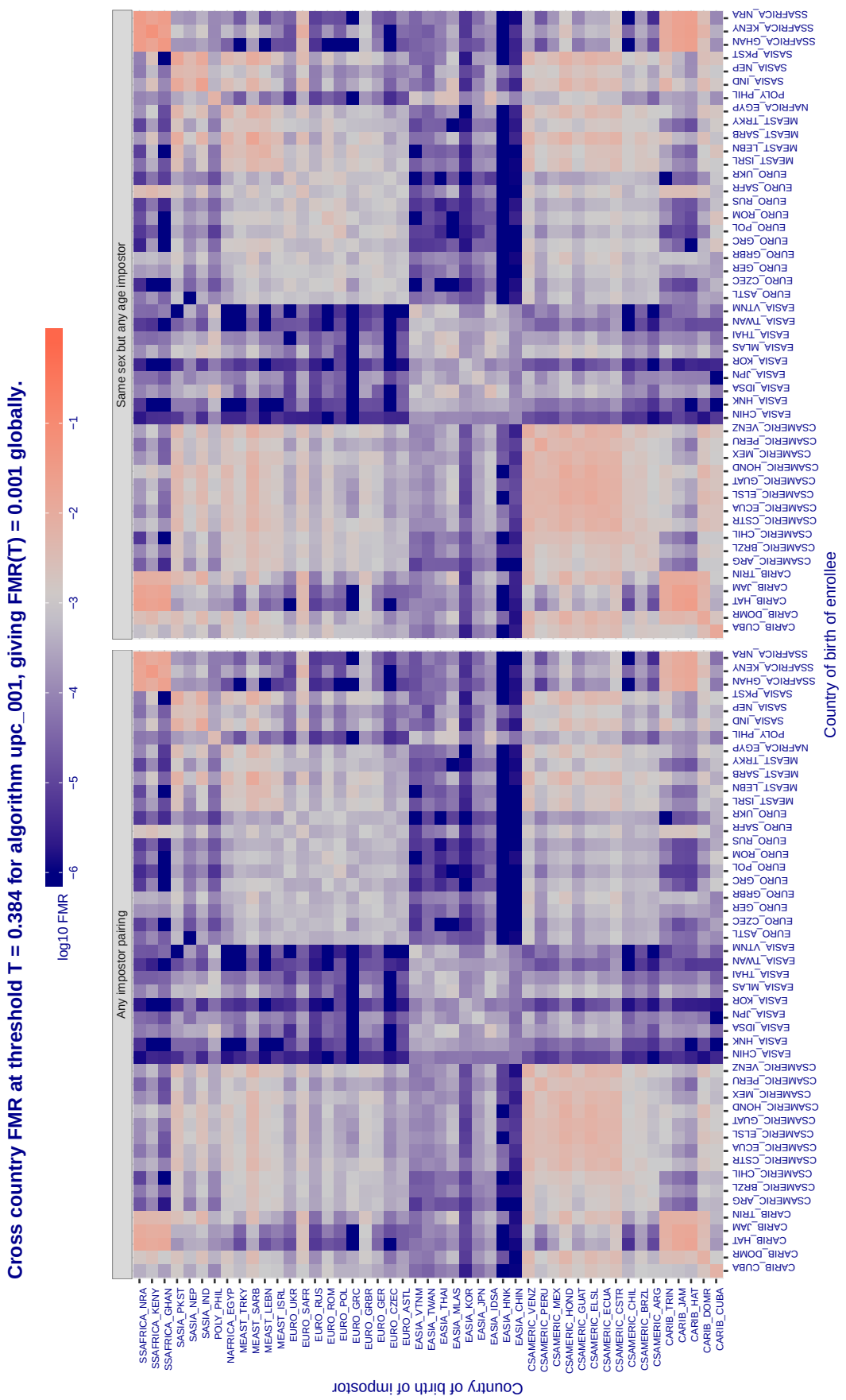


Figure 424: For algorithm upc-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

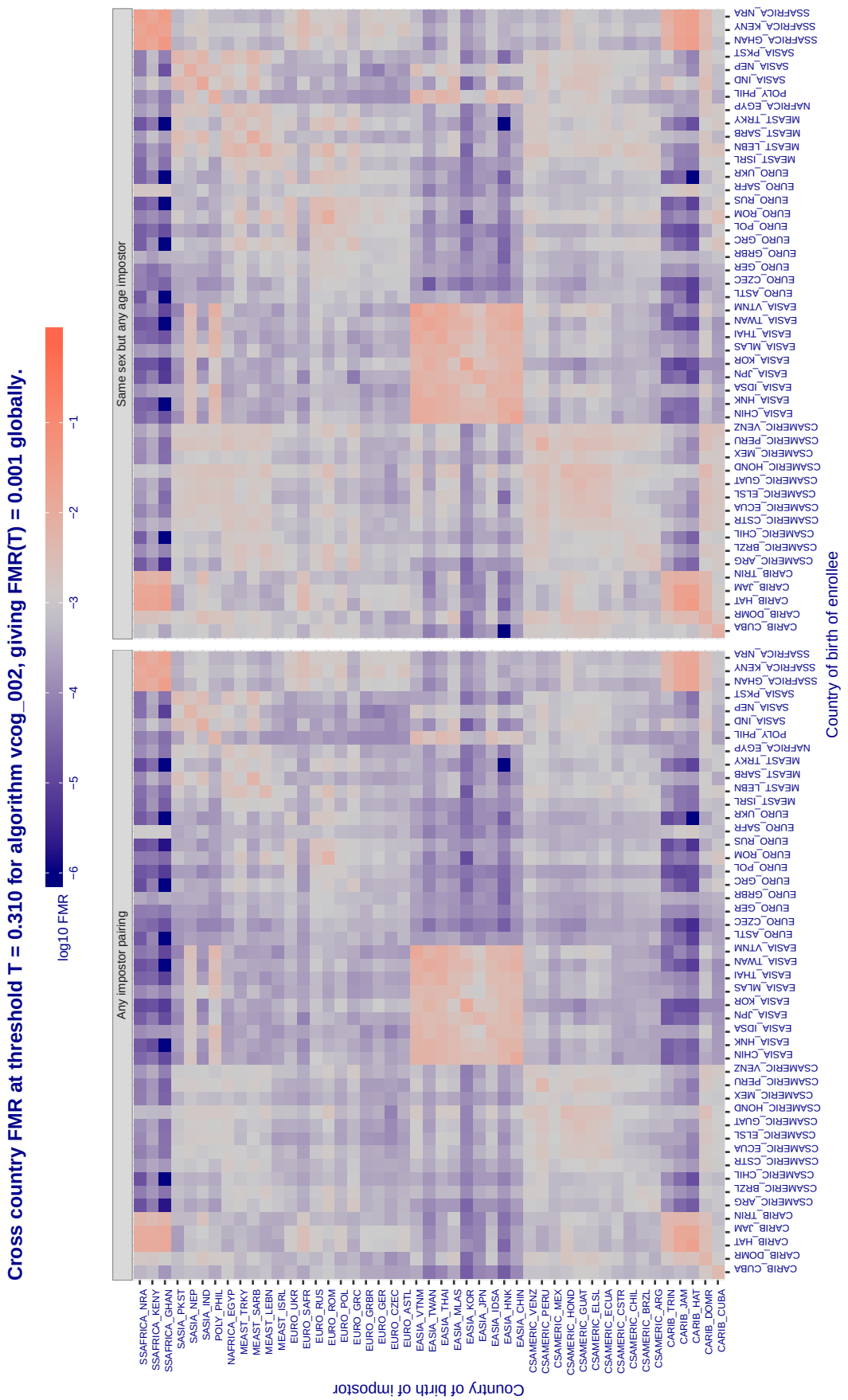


Figure 425: For algorithm vcog-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

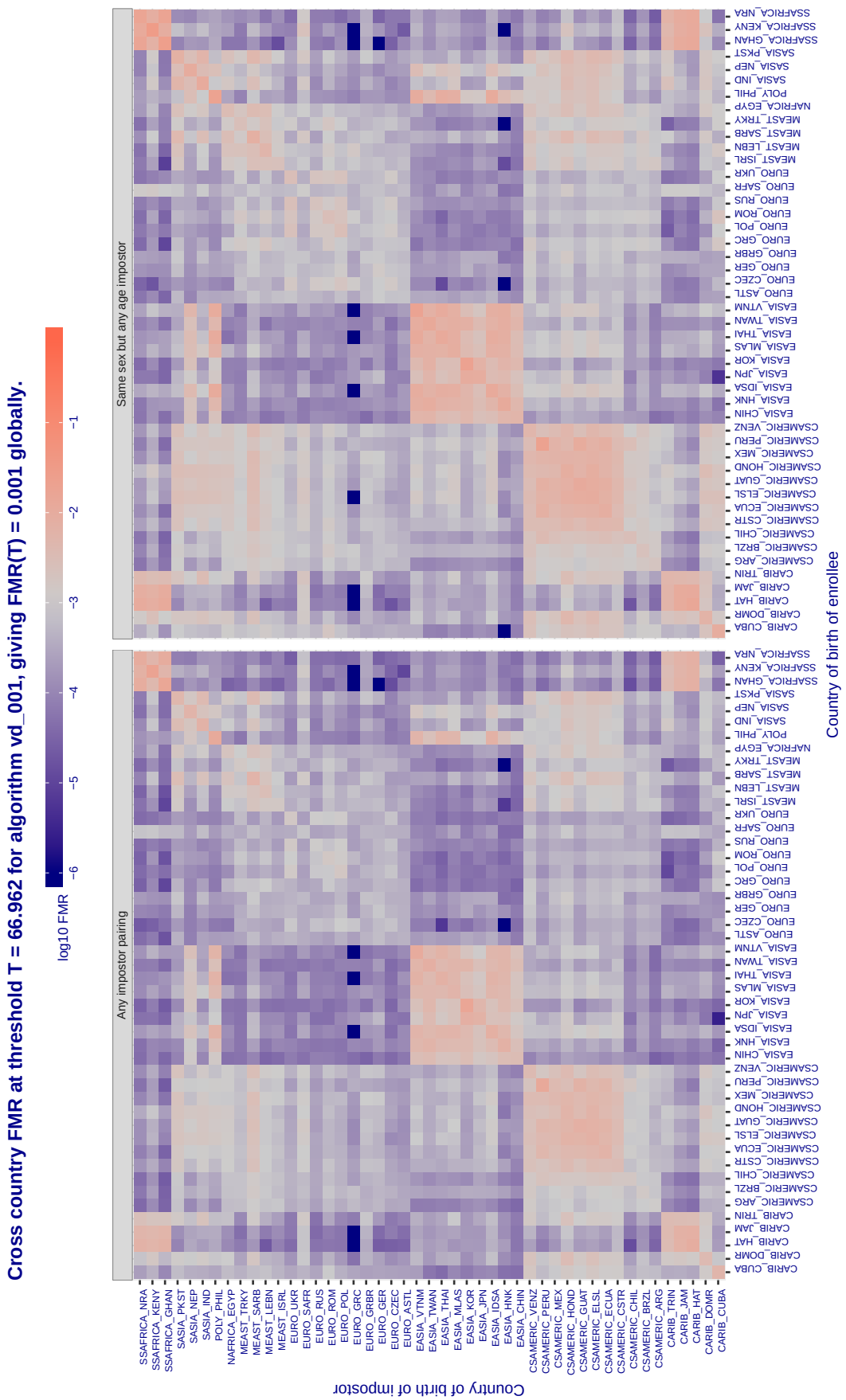


Figure 426: For algorithm vd-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

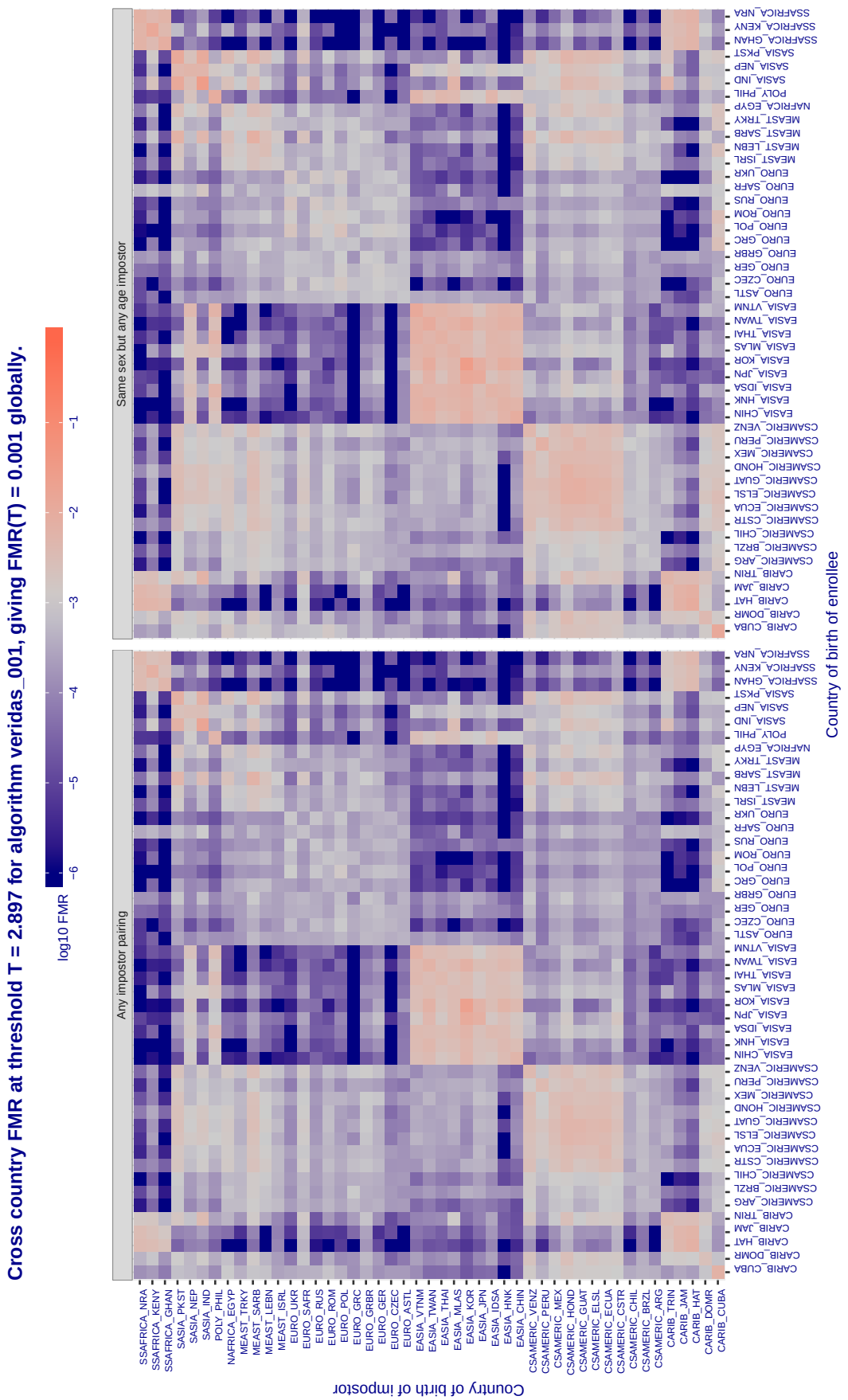


Figure 427: For algorithm veridas-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

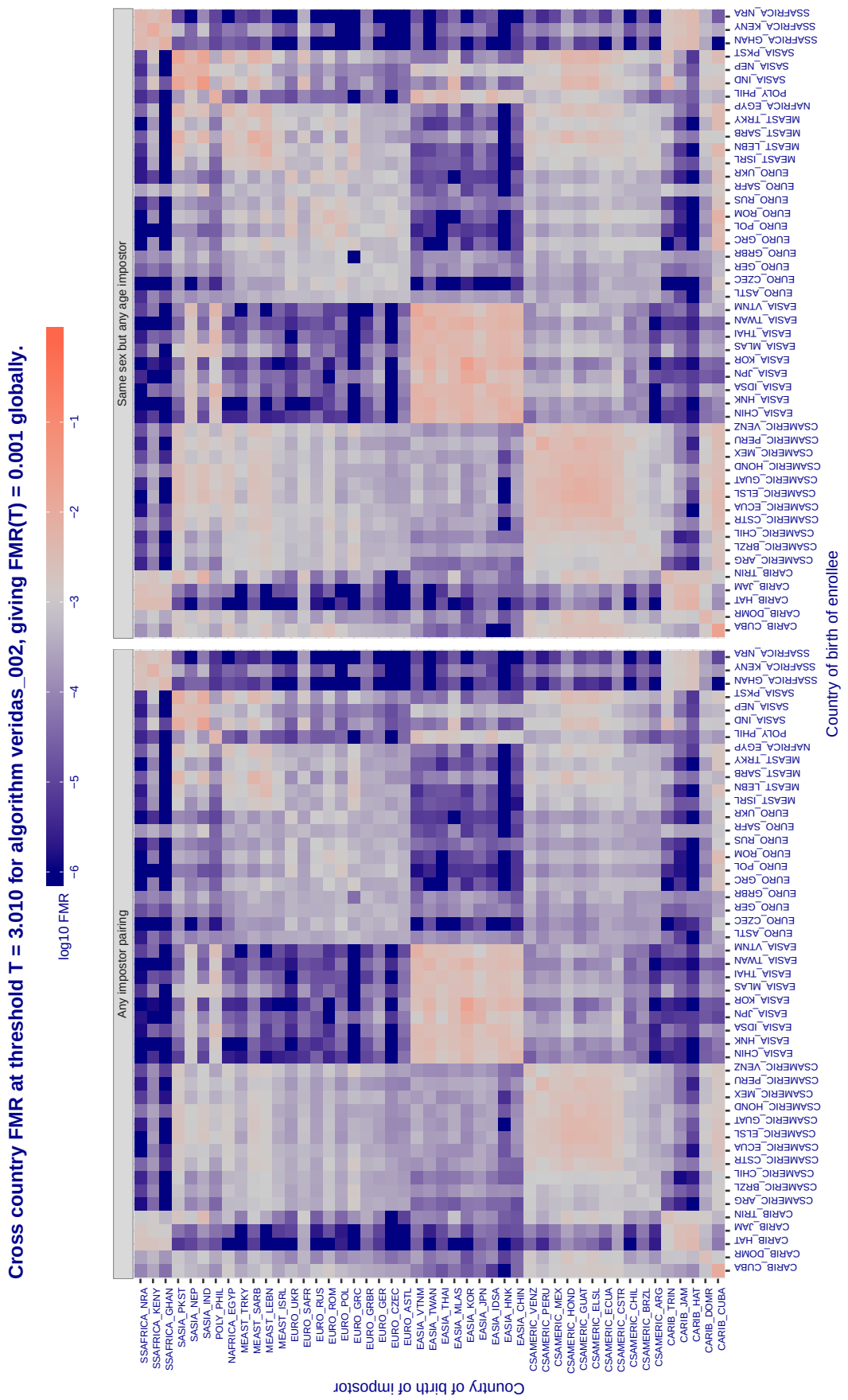


Figure 428: For algorithm veridas-002 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

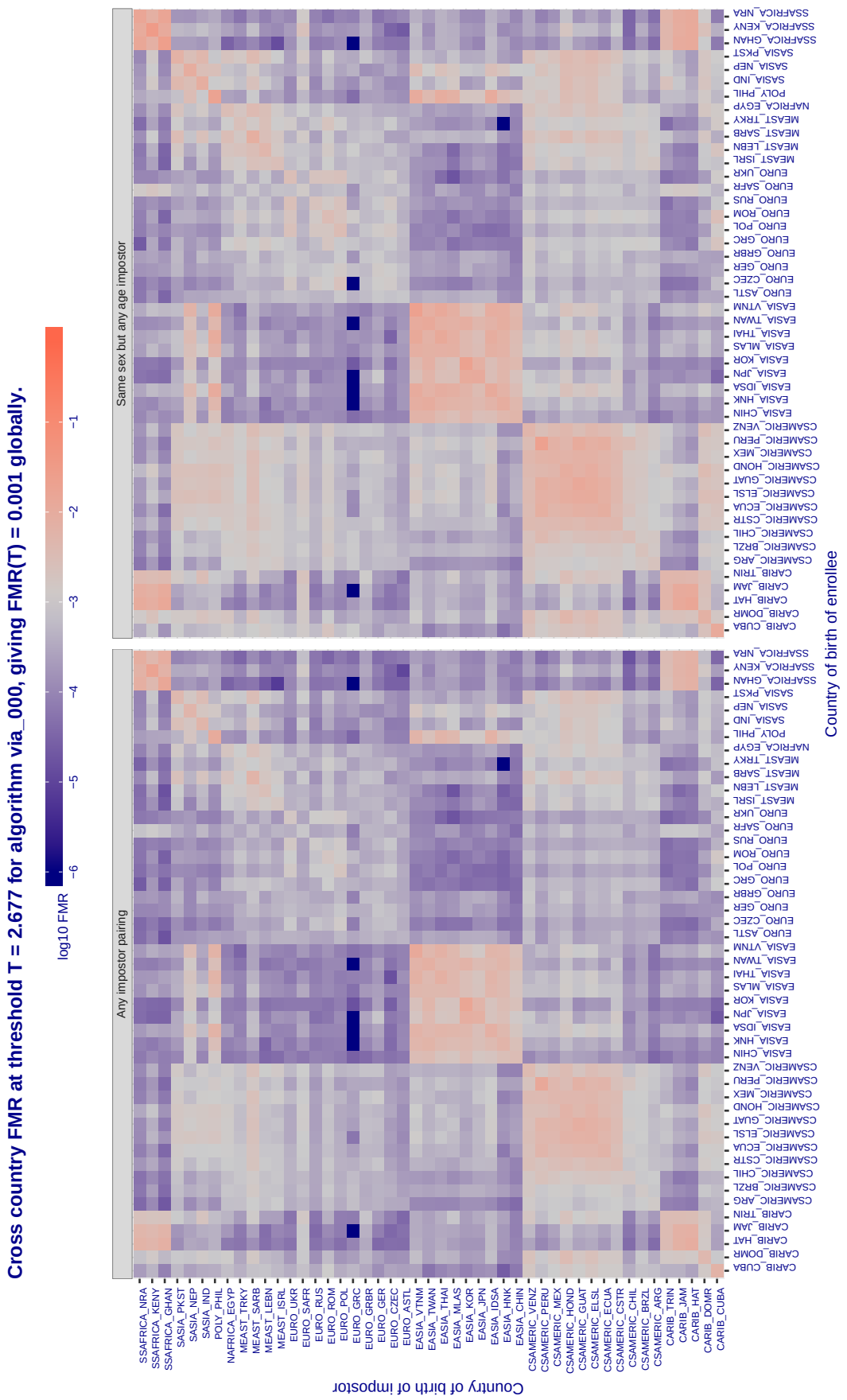


Figure 429: For algorithm via-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

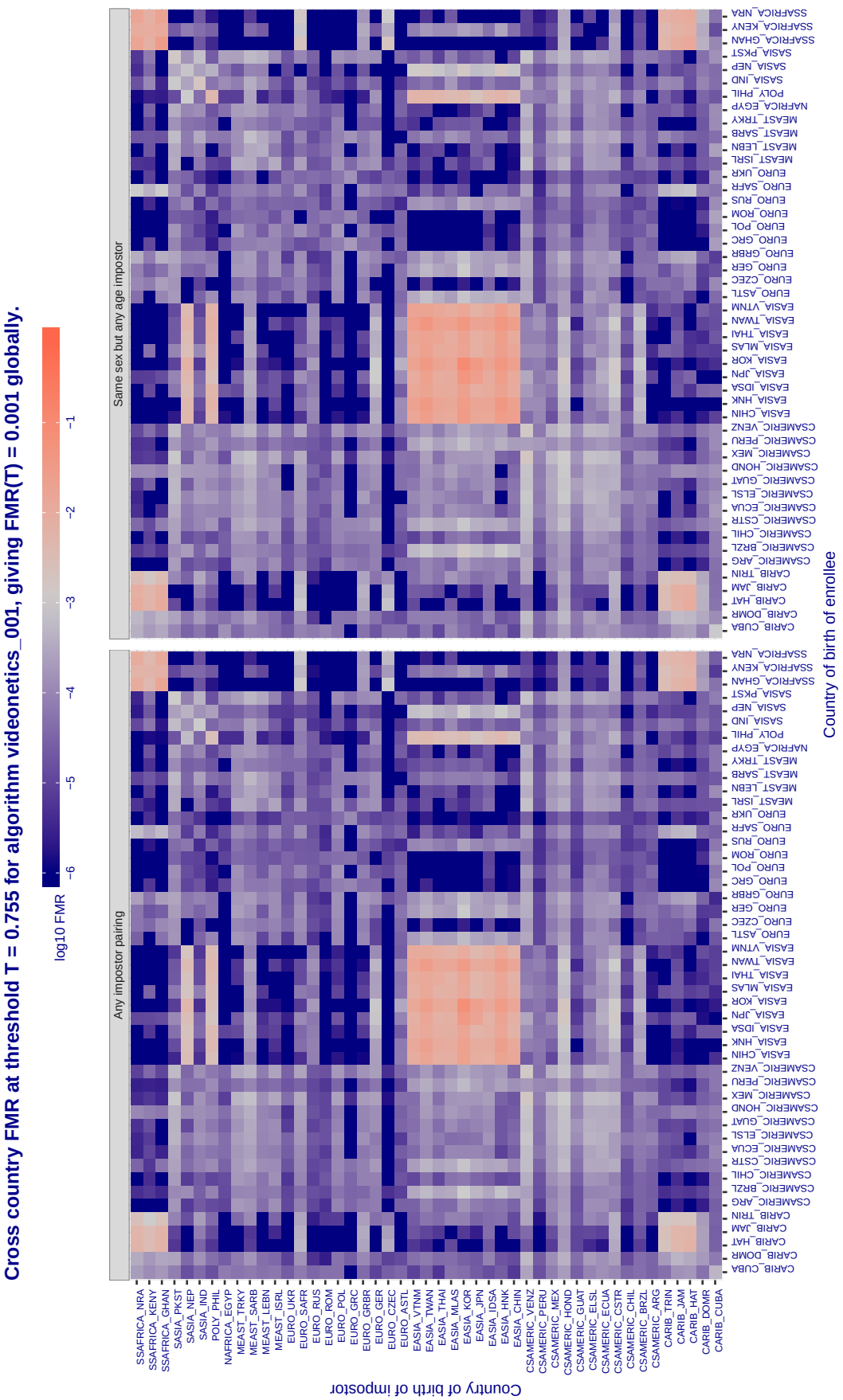


Figure 430: For algorithm videonetics-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

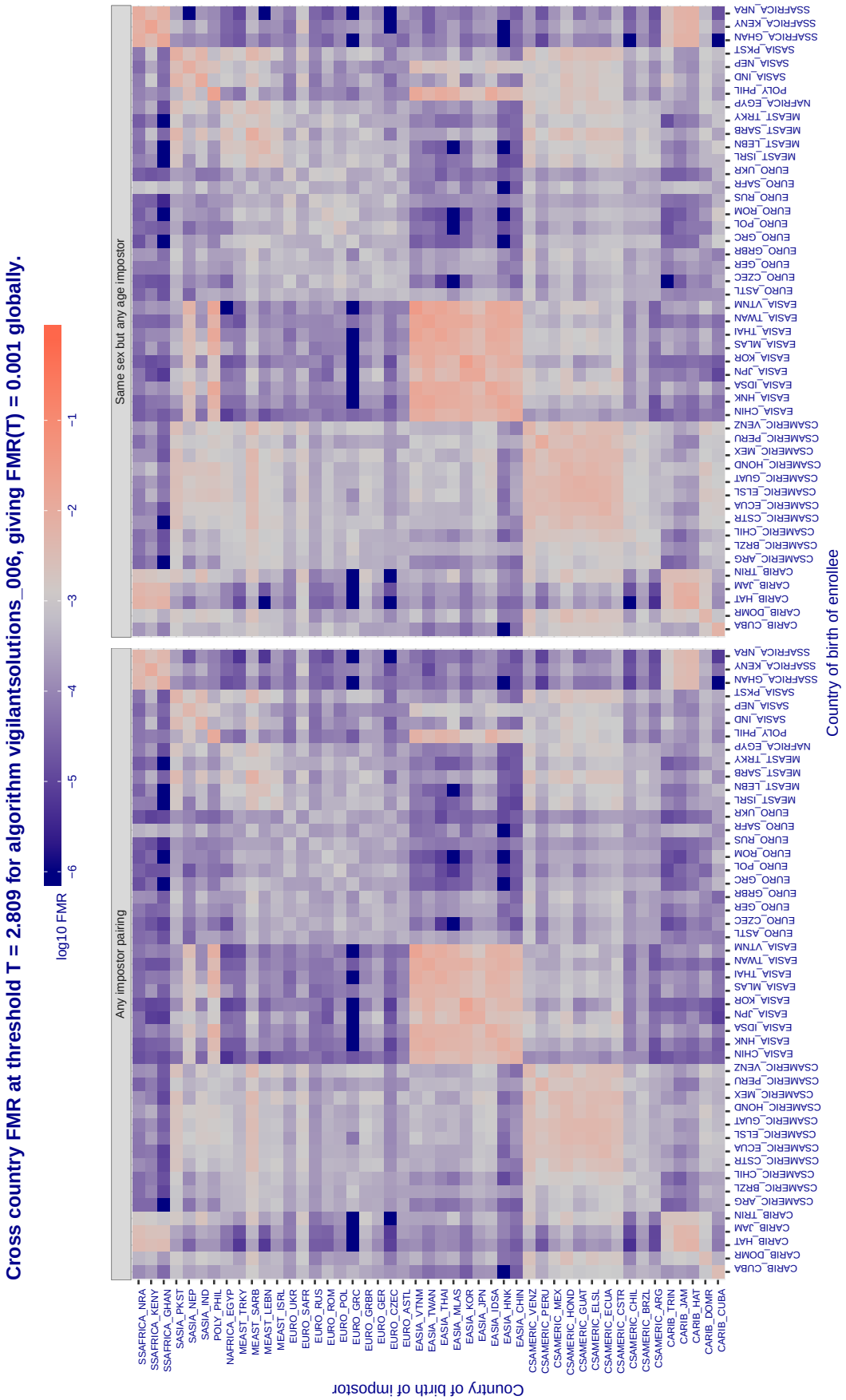


Figure 431: For algorithm vigilantsolutions-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

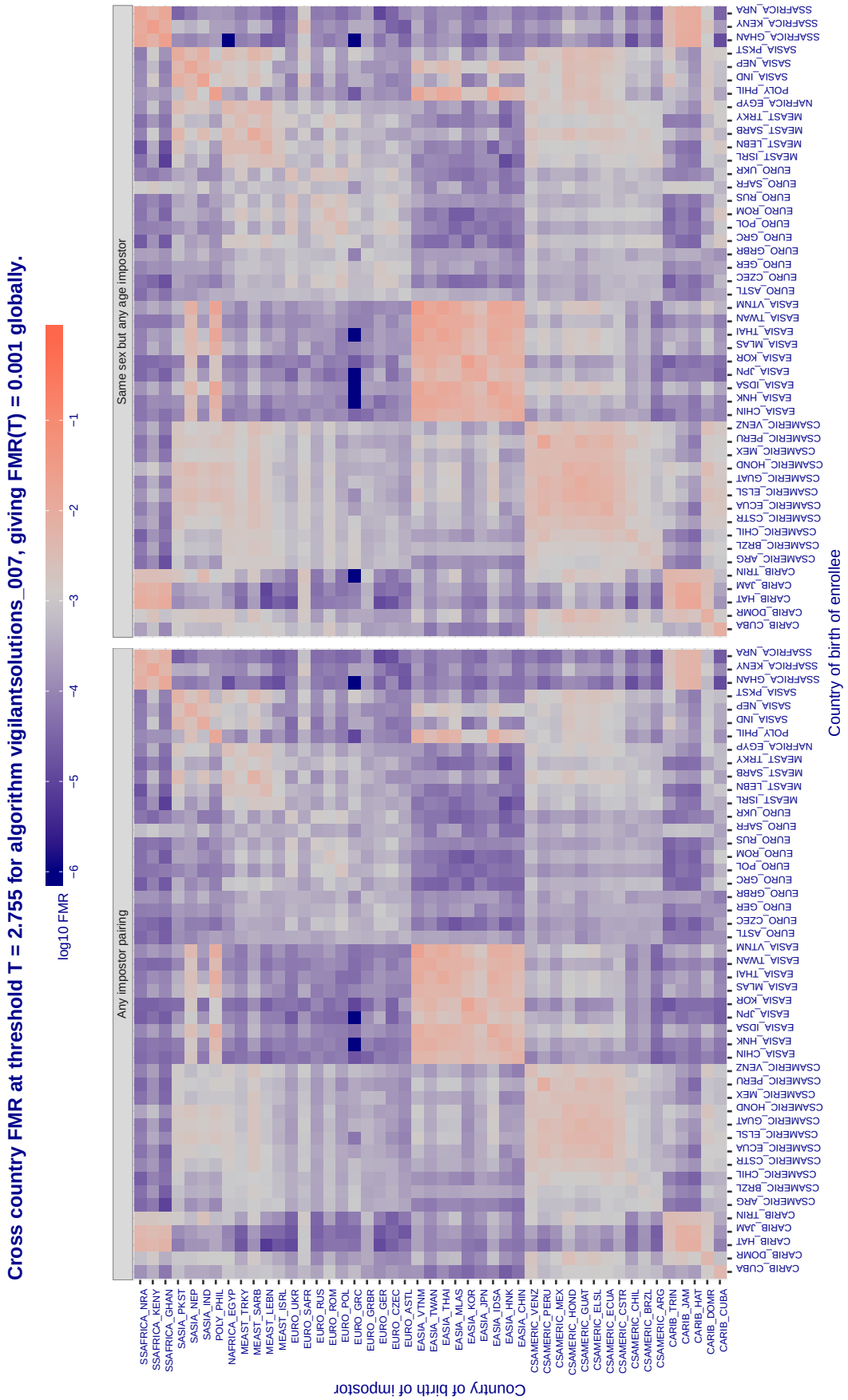


Figure 432: For algorithm vigilantsolutions-007 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

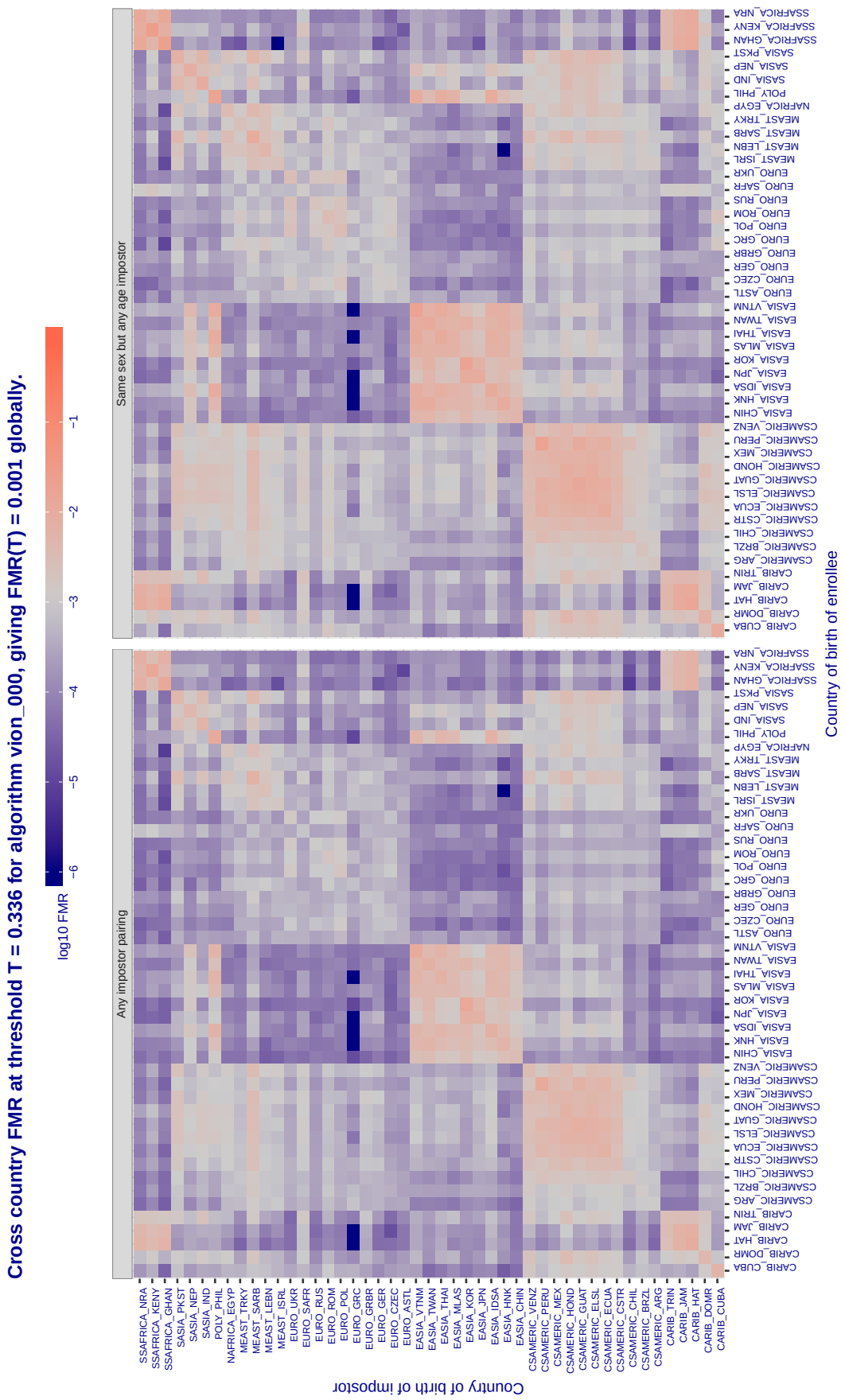


Figure 433: For algorithm vion-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

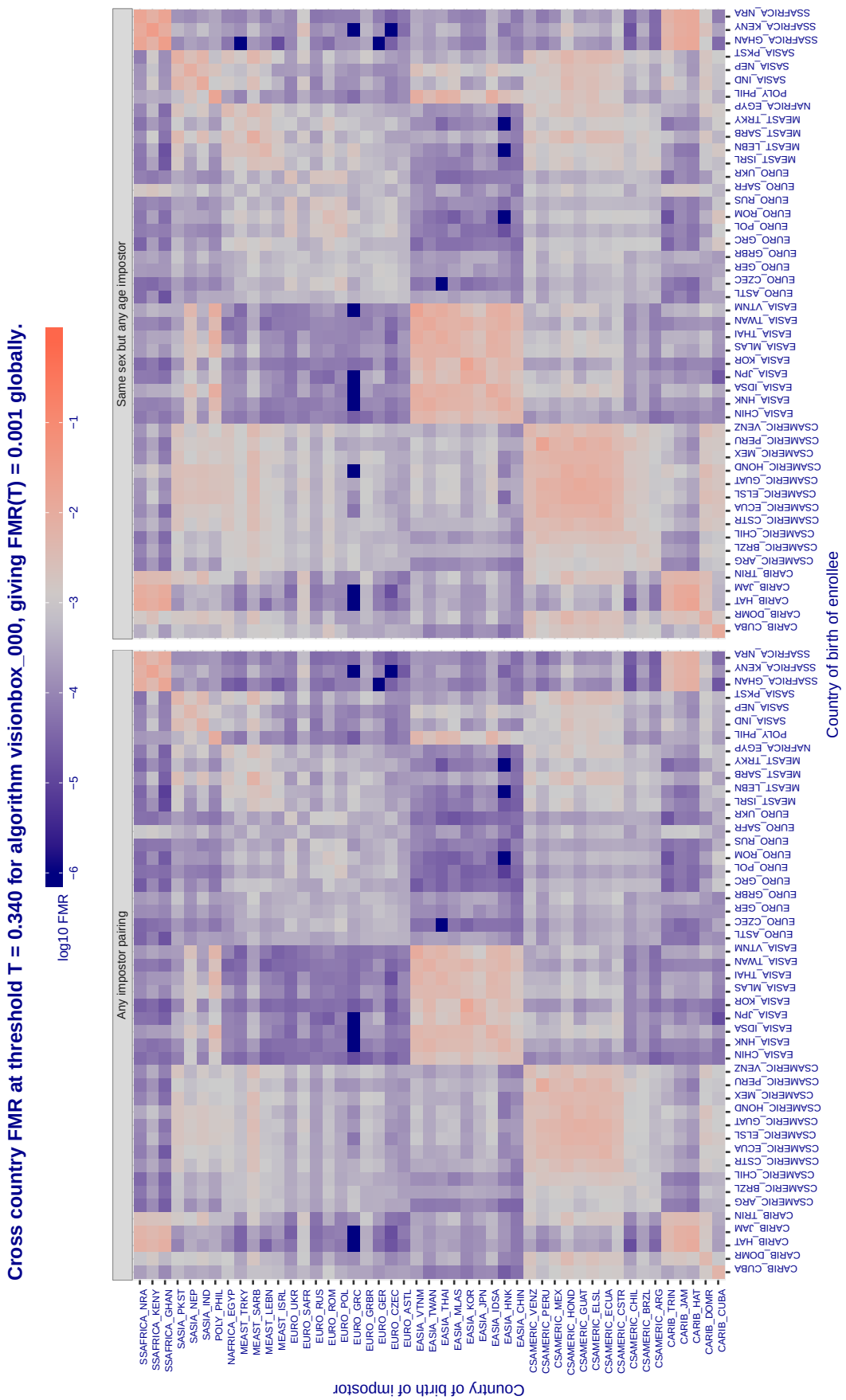


Figure 434: For algorithm visionbox-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

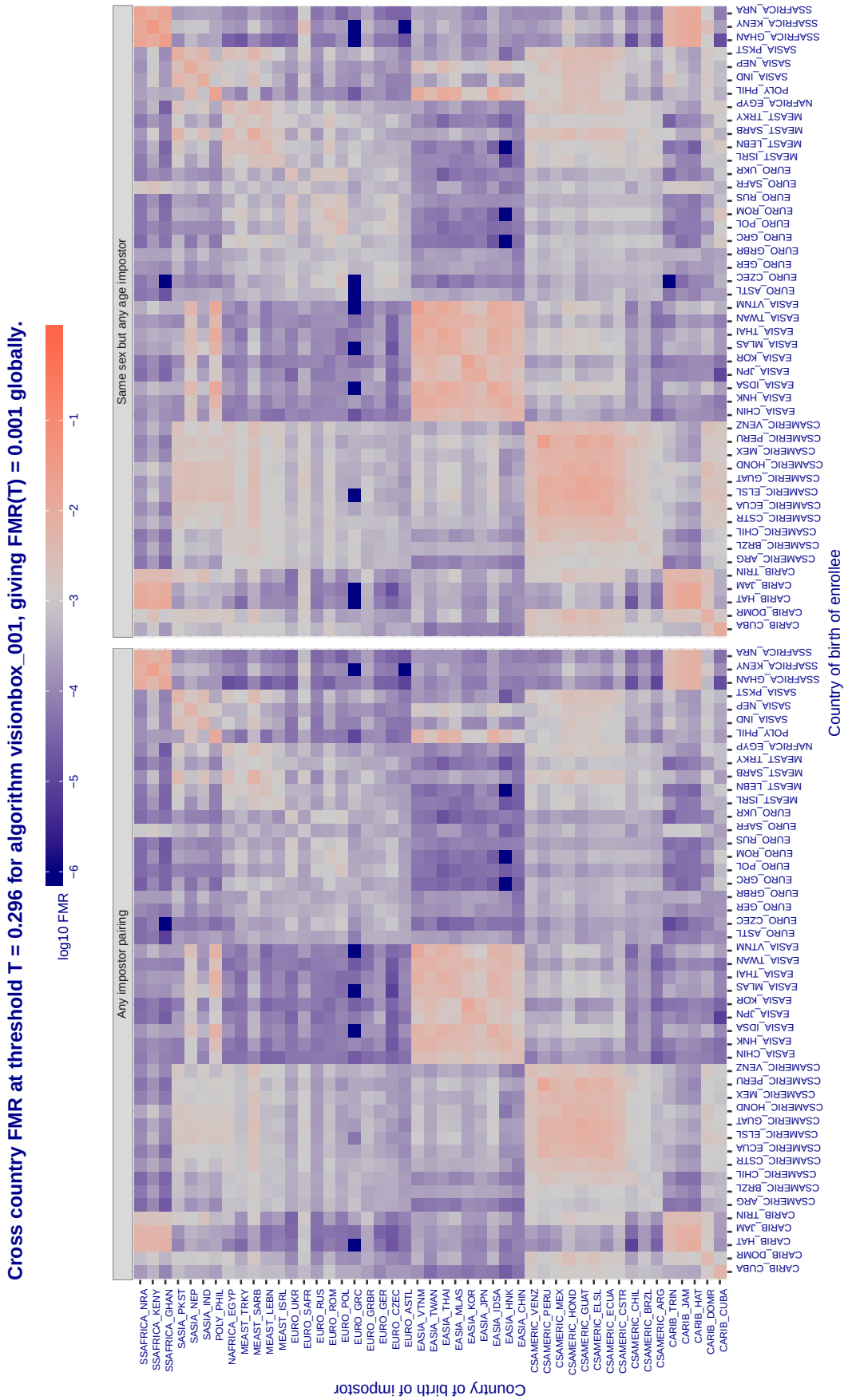


Figure 435: For algorithm visionbox-001 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

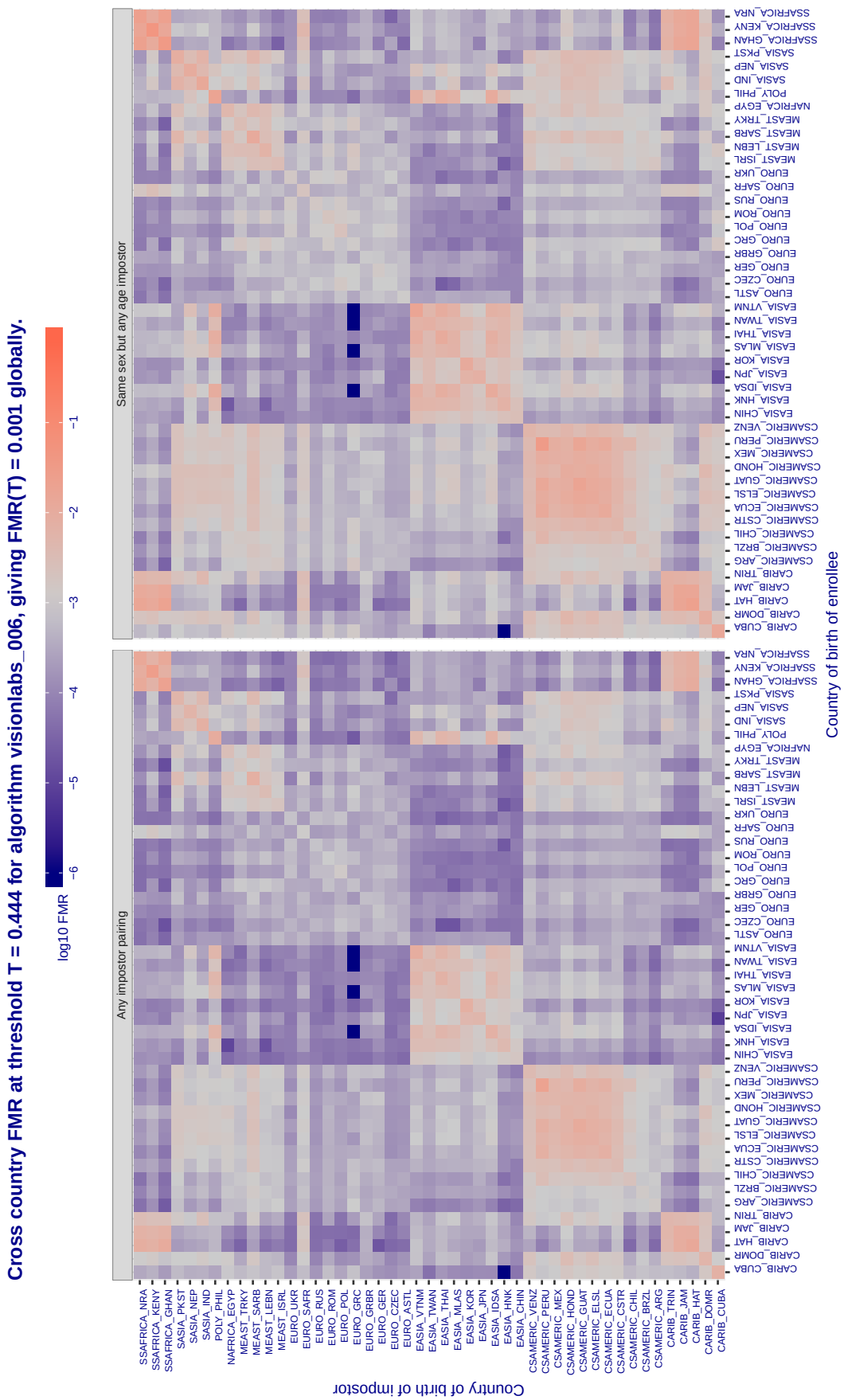


Figure 436: For algorithm visionlabs-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

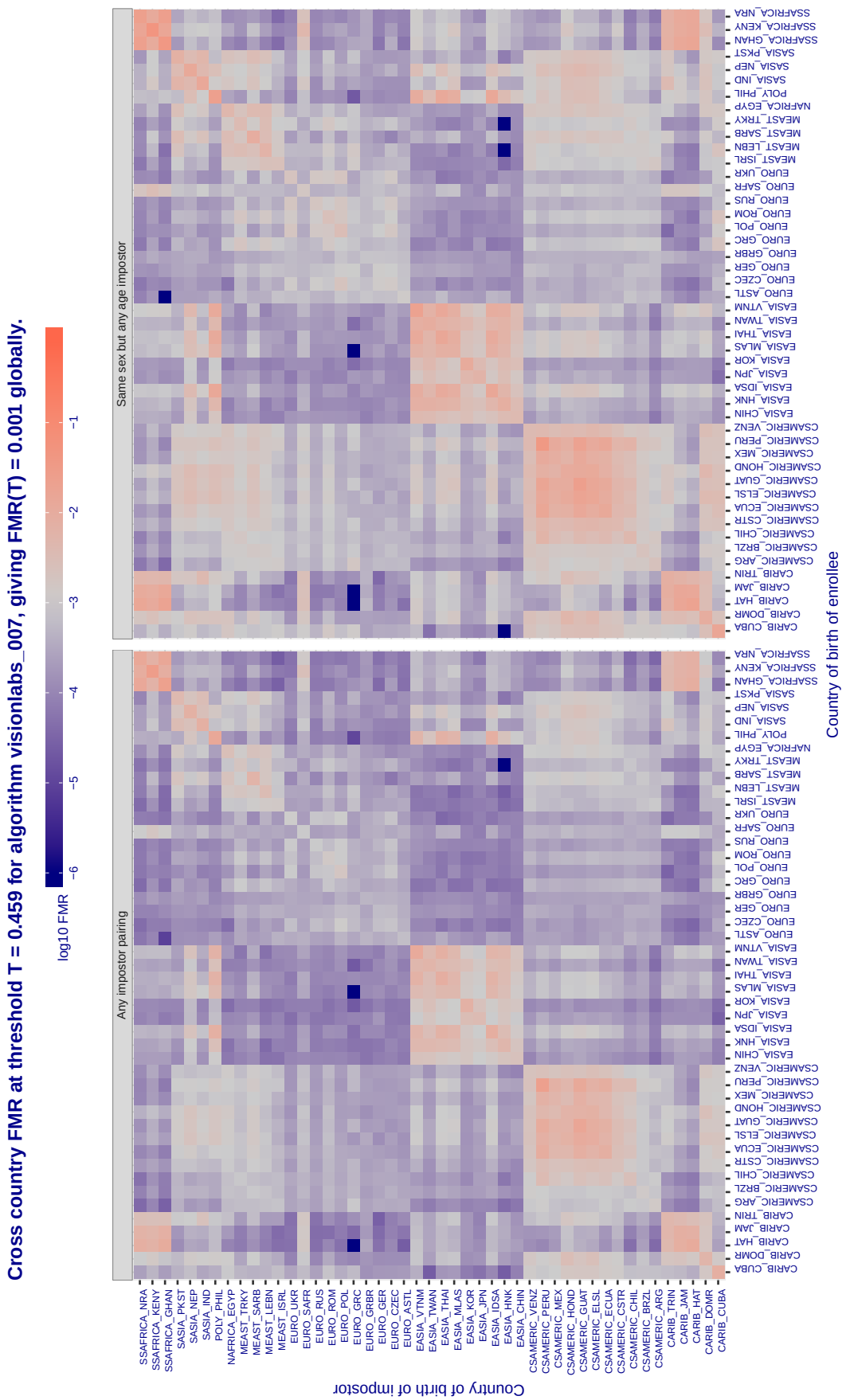


Figure 437: For algorithm visionlabs-007 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

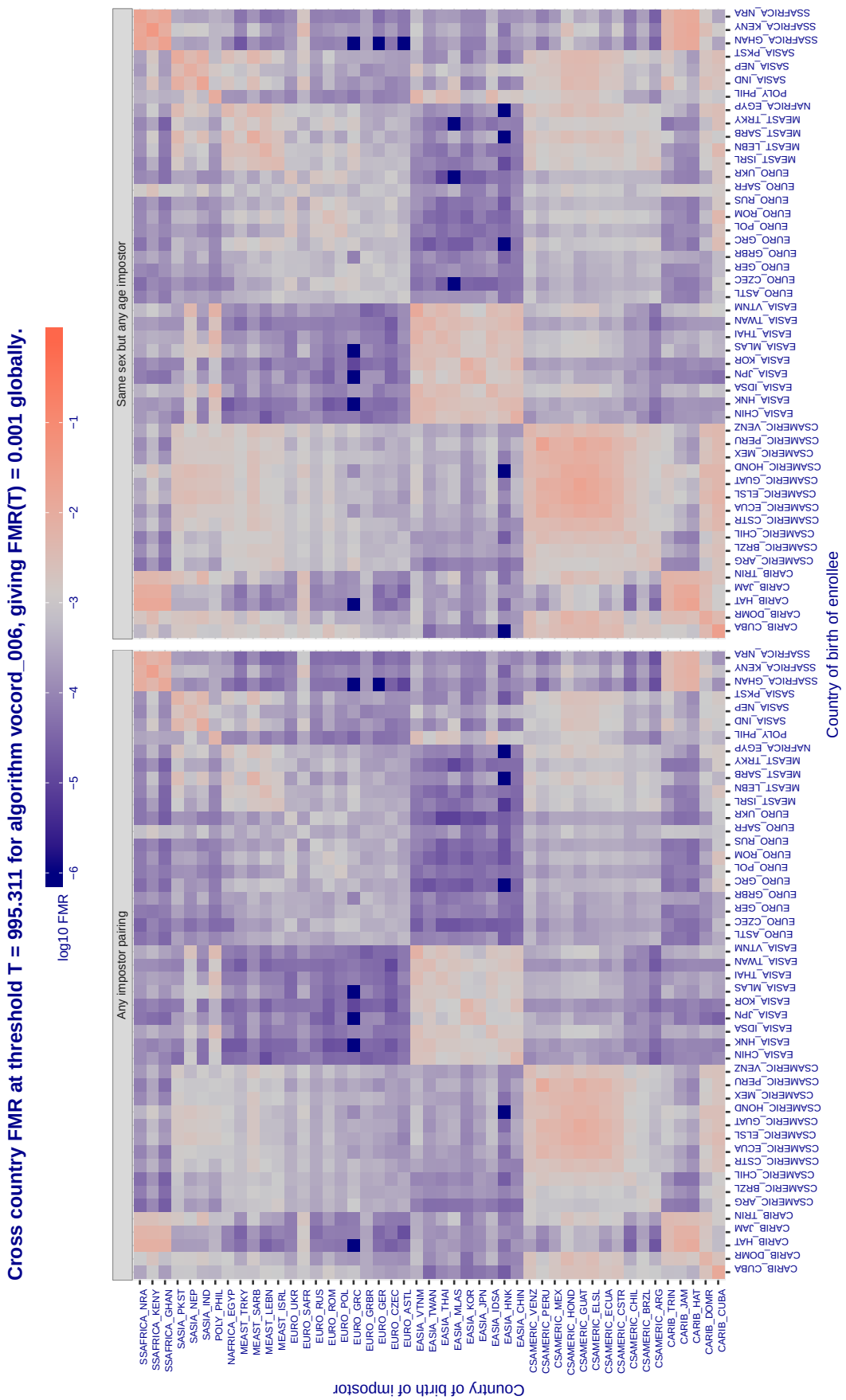


Figure 438: For algorithm vocord-006 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

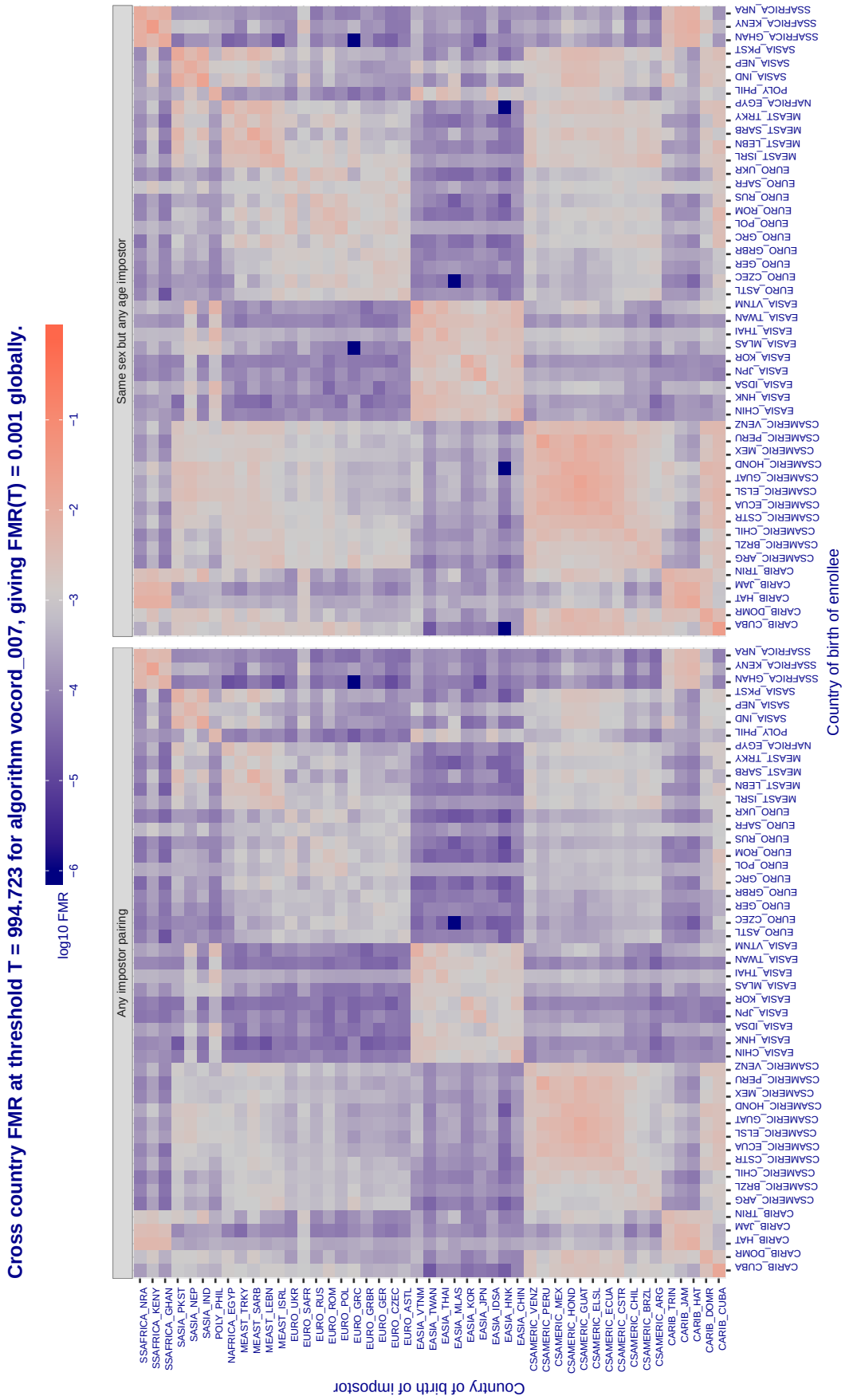


Figure 439: For algorithm vocord-007 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

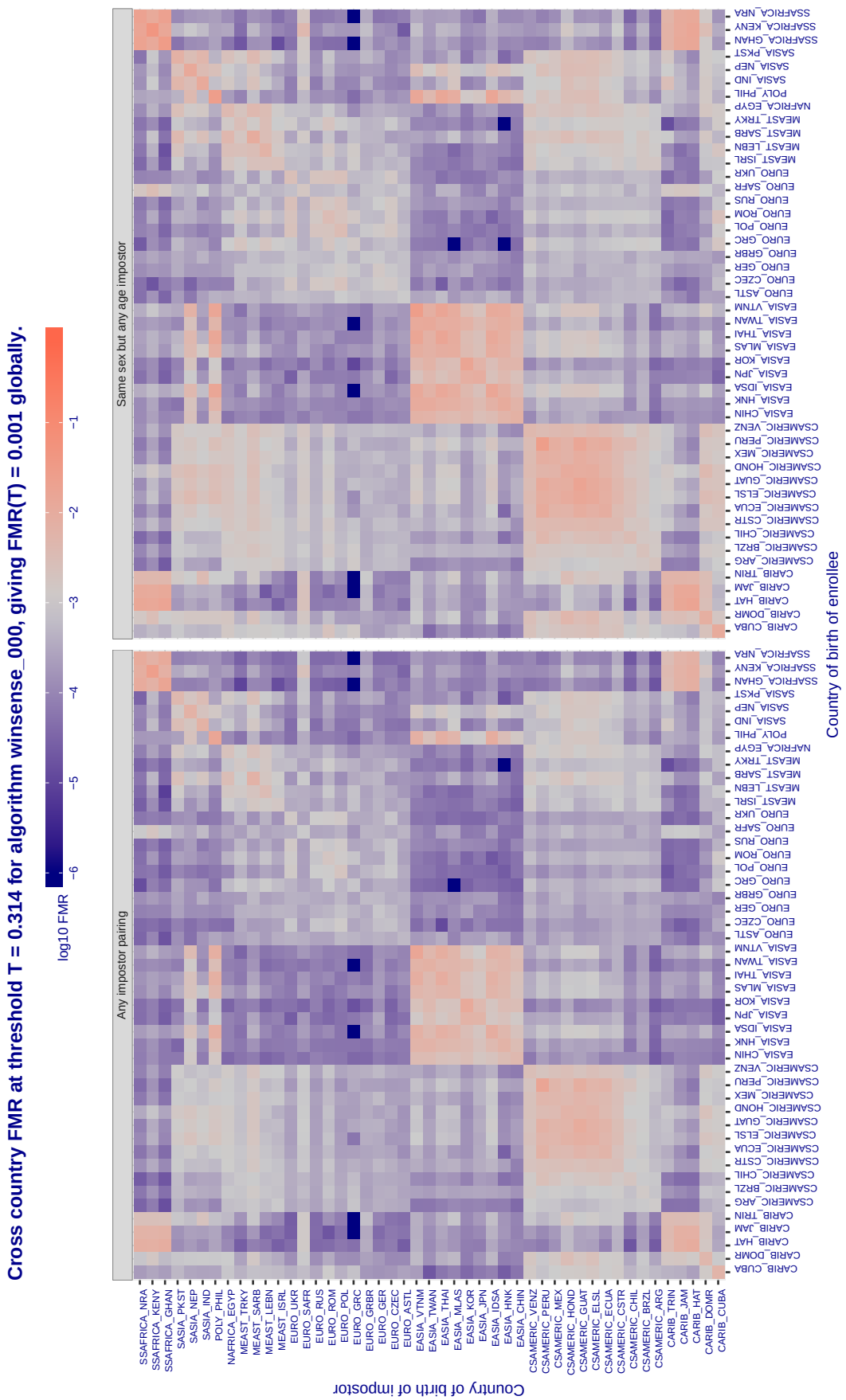


Figure 440: For algorithm winsense-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

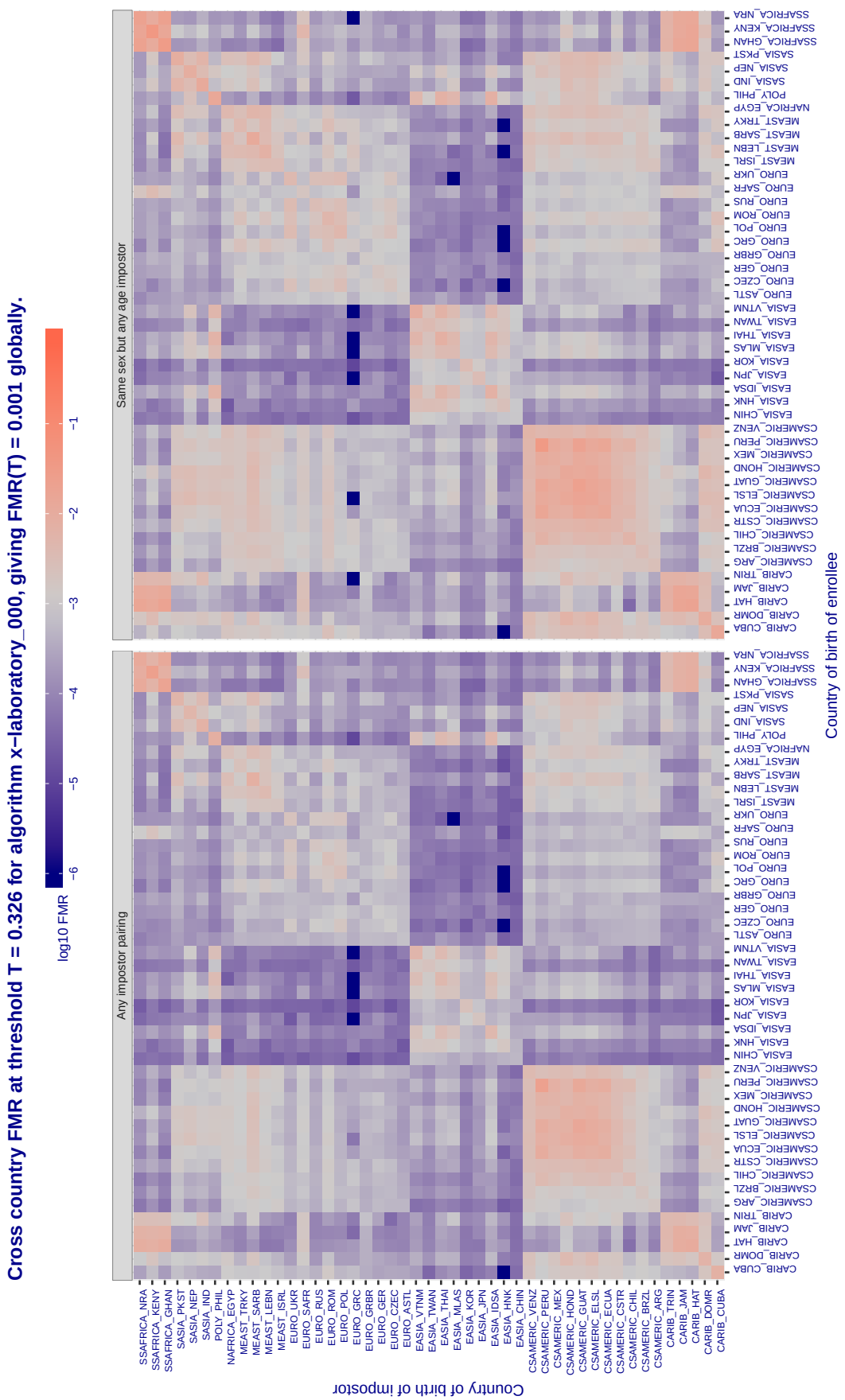


Figure 441: For algorithm x-laboratory-000 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

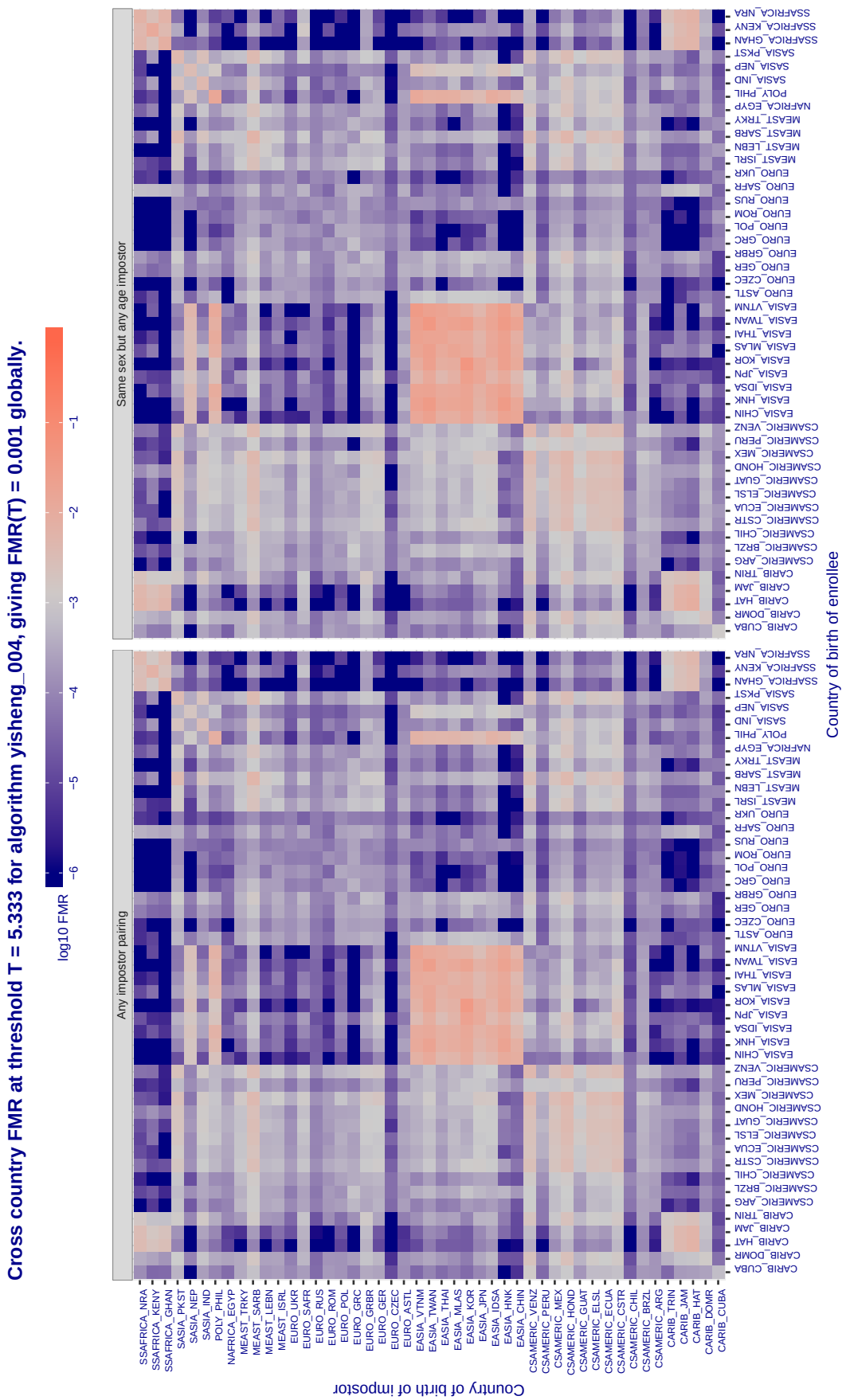


Figure 442: For algorithm yisheng-004 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

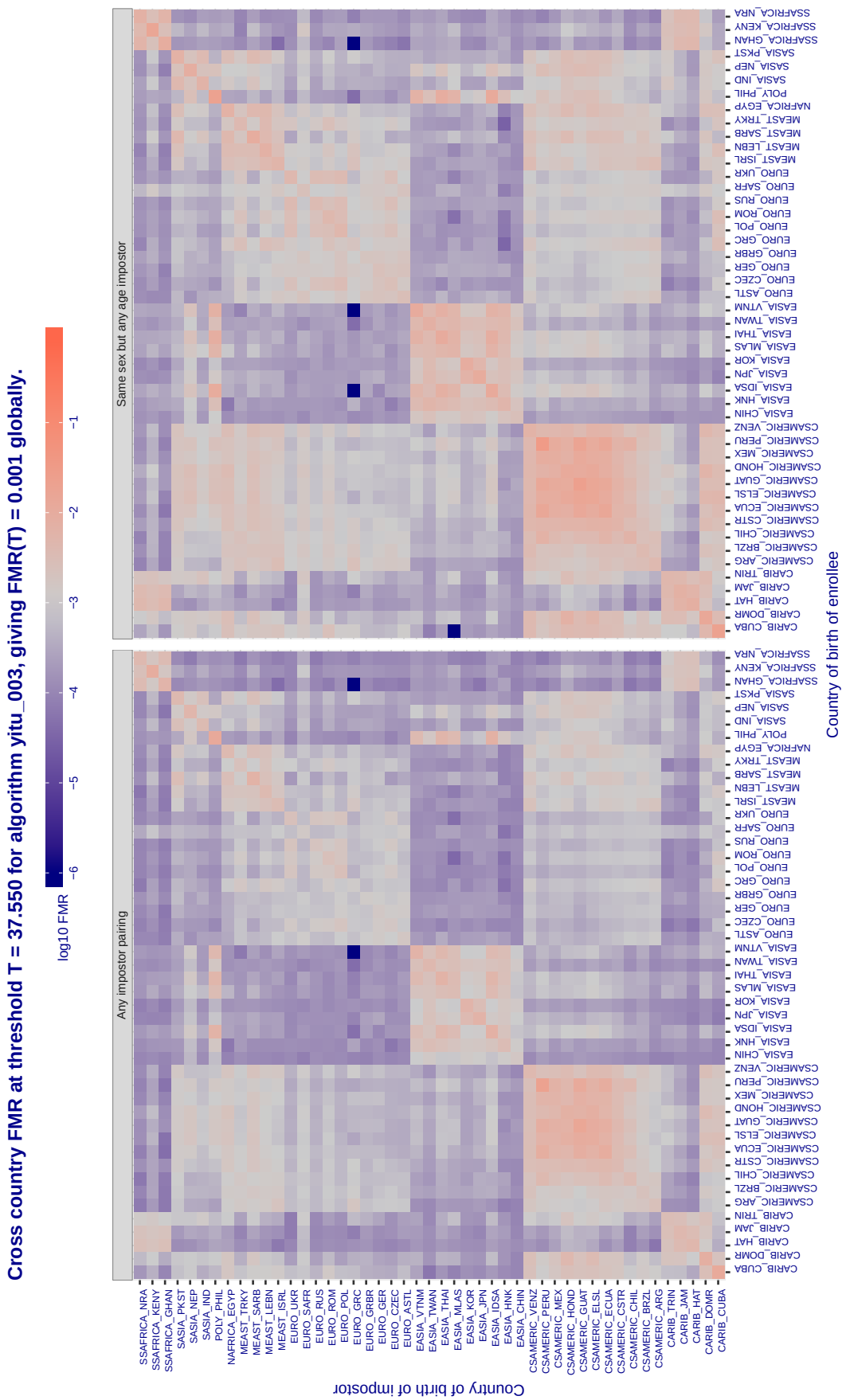


Figure 443: For algorithm yitu-003 operating on visa images, the heatmap shows false match rates observed over impostor comparisons of faces from different individuals who were born in the given country pair. False matches are counted against a recognition threshold fixed globally to give the target FMR in the plot title, computed over all on the order of 10^{10} impostor comparisons. If text appears in each box it give the same quantity as that coded by the color. Grey indicates FMR is at the intended FMR target level. Light red colors present a security vulnerability to, for example, a passport gate. Each +1 increase in log10 FMR corresponds to a factor of 10 increase in FMR. The matrix is not quite symmetric because images in the enrollment and verification sets are different.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

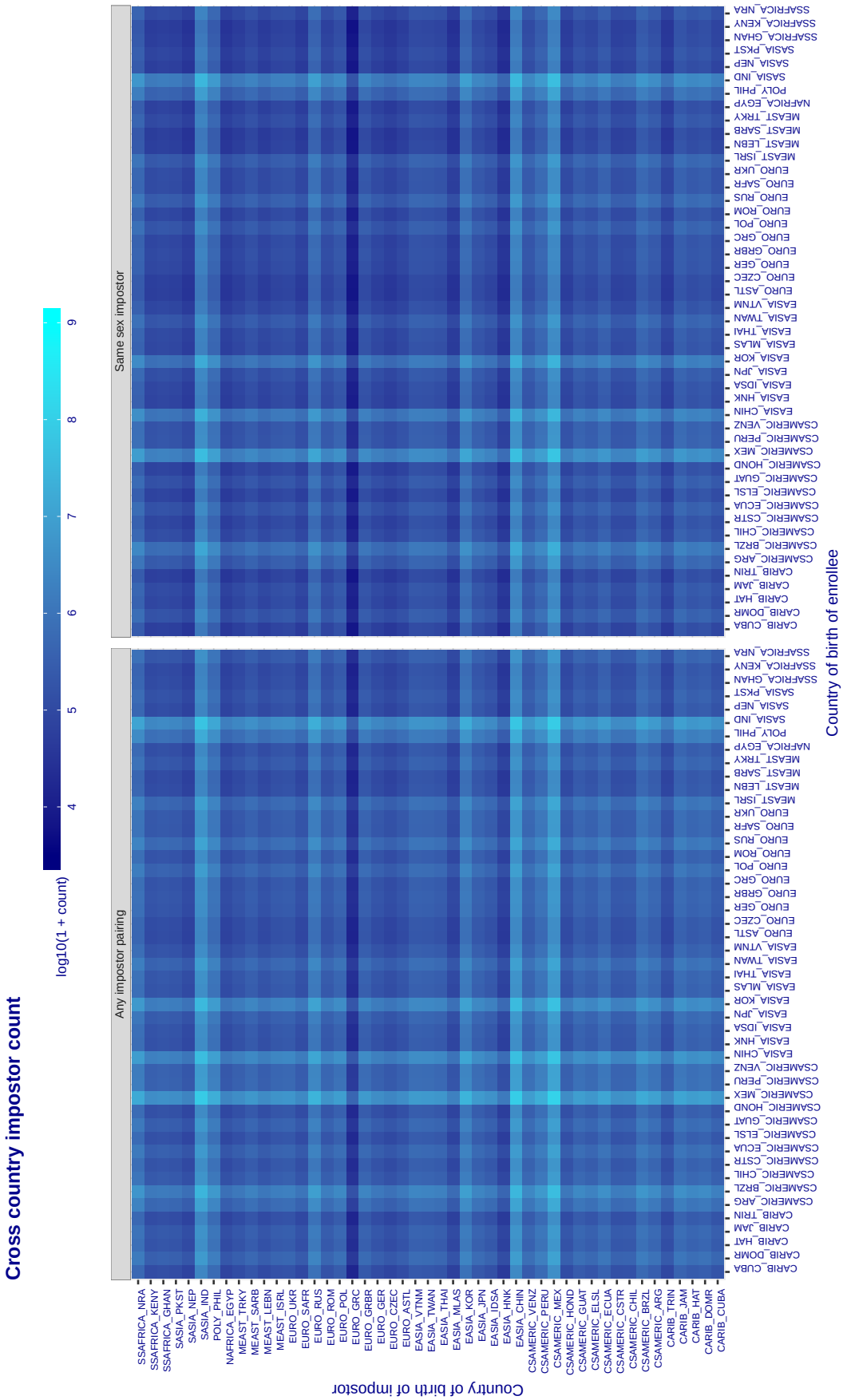


Figure 444: For visa images, the heatmap shows the count of impostor comparisons of faces from different individuals who were born in the given country pair.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

3.6.2 Effect of age on impostors

Background: This section shows the effect of age on the impostor distribution. The ideal behaviour is that the age of the enrollee and the impostor would not affect impostor scores. This would support FMR stability over sub-populations.

Goals:

- ▷ To show the effect of relative ages of the impostor and enrollee on false match rates.
- ▷ To determine whether some algorithms have better impostor distribution stability.

Methods:

- ▷ Define 14 age group bins, spanning 0 to over 100 years old.
- ▷ Compute FMR over all impostor comparisons for which the subjects in the enrollee and impostor images have ages in two bins.
- ▷ Compute FMR over all impostor comparisons for which the subjects are additionally of the same sex, and born in the same geographic region.

Results:

The notable aspects are:

- ▷ Diagonal dominance: Impostors are more likely to be matched against their same age group.
- ▷ Same sex and same region impostors are more successful. On the diagonal, an impostor is more likely to succeed by posing as someone of the same sex. If $\Delta \log_{10}$ FMR $= 0.2$, then same-sex same-region FMR exceeds the all-pairs FMR by factor of $10^{0.2} = 1.6$.
- ▷ Young children impostors give elevated FMR against young children. Older adult impostor give elevated FMR against older adults. These effects are quite large, for example if $\Delta \log_{10}$ FMR $= 1.0$ larger than a 32 year old, then these groups have higher FMR by a factor of $10^1 = 10$. This would imply an FMR above 0.01 for a nominal (global) FMR = 0.001.
- ▷ Algorithms vary.
- ▷ We computed the same quantities for a global FMR = 0.0001. The effects are similar.

Note the calculations in this section include impostors paired across all countries of birth.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

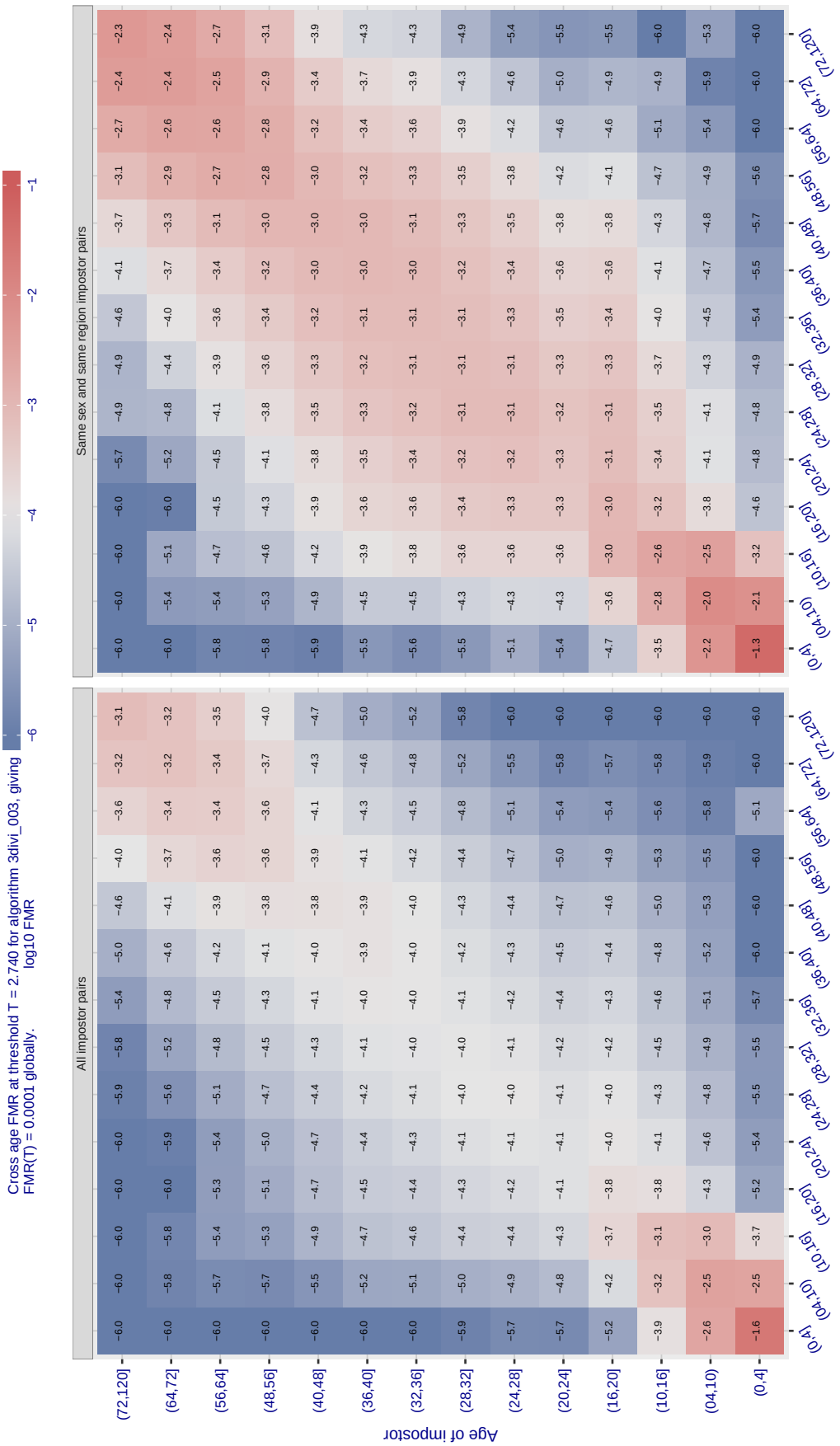


Figure 445: For algorithm 3divi-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

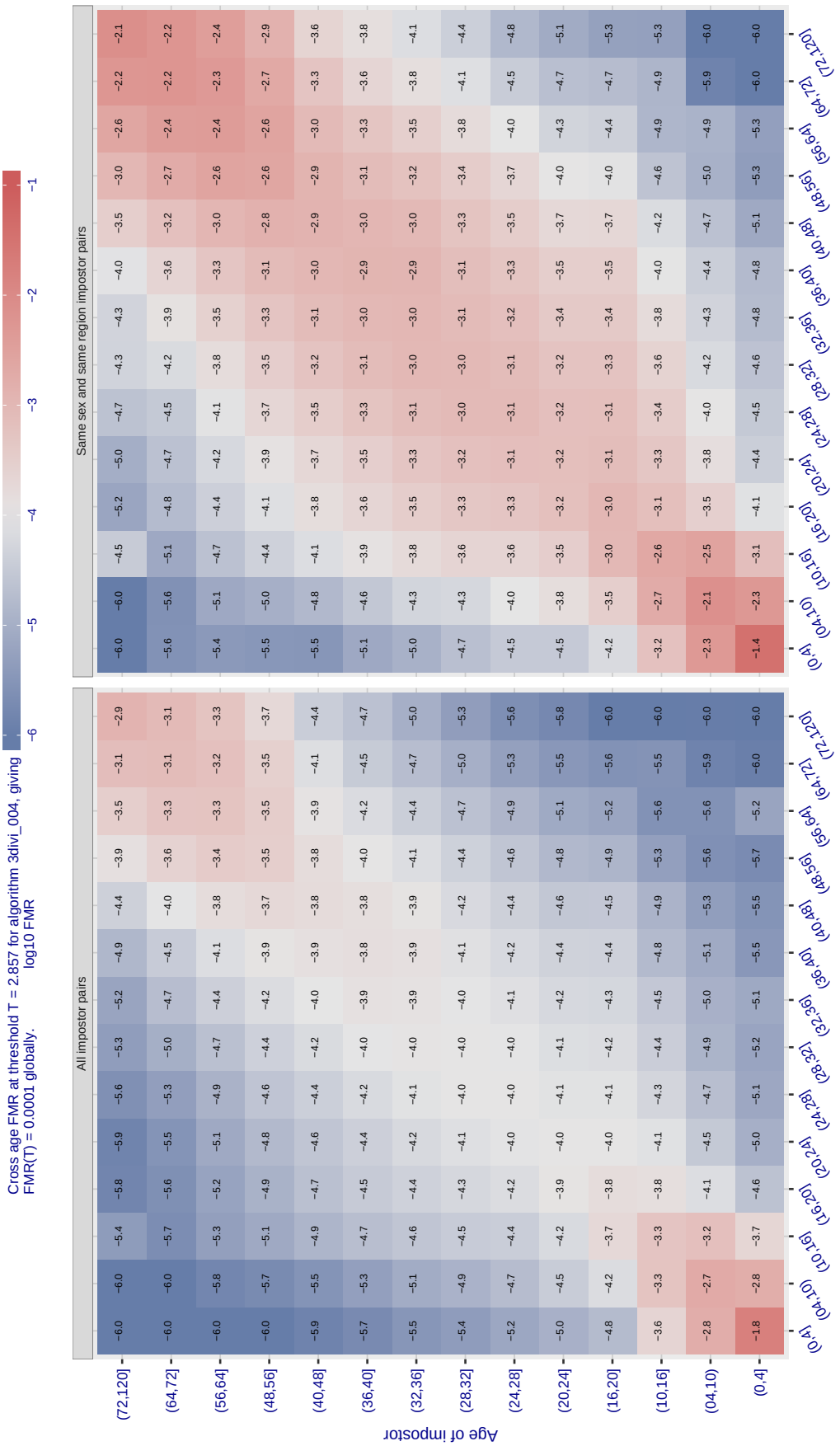


Figure 446: For algorithm 3divi-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

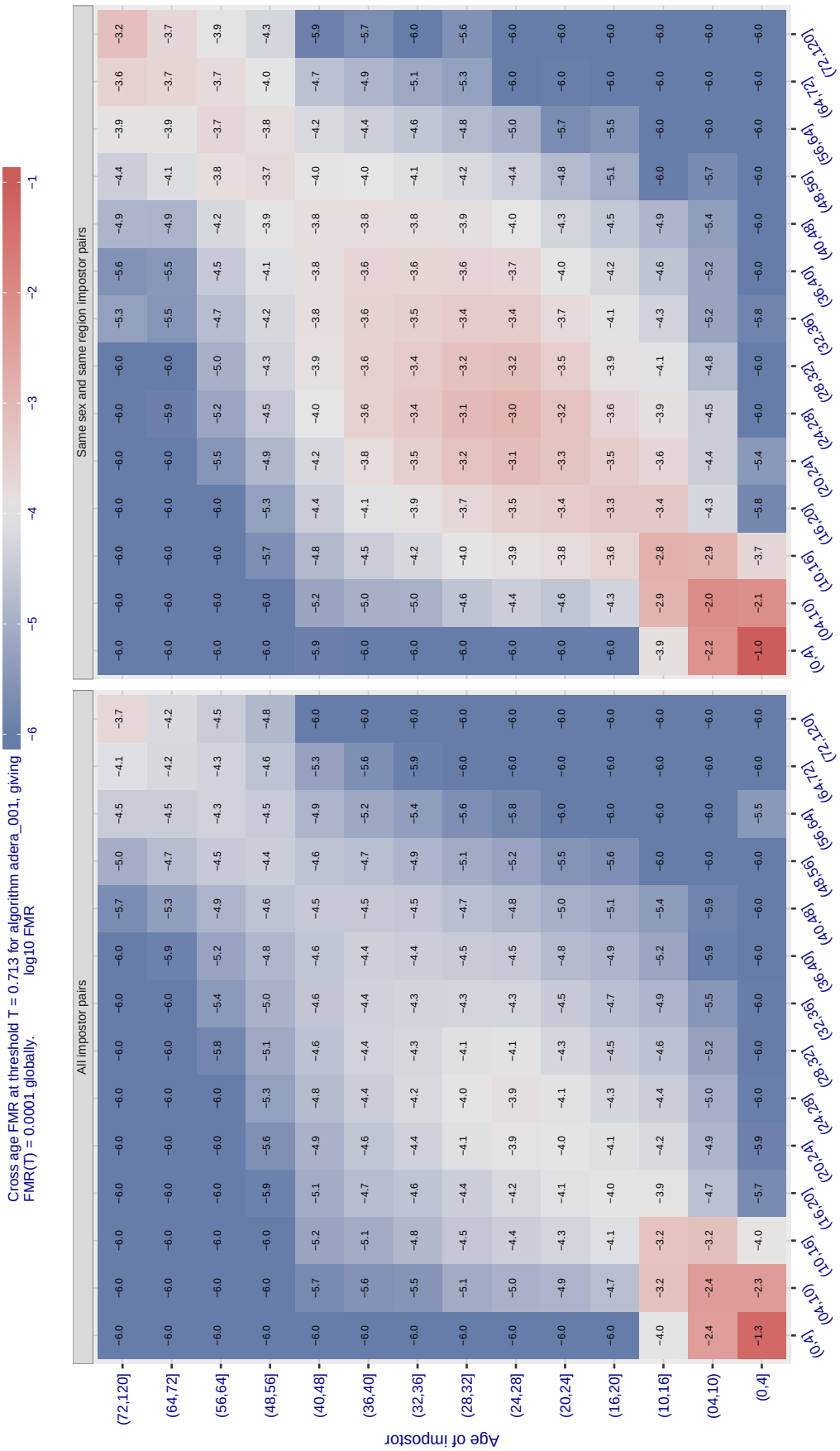


Figure 447: For algorithm adera-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

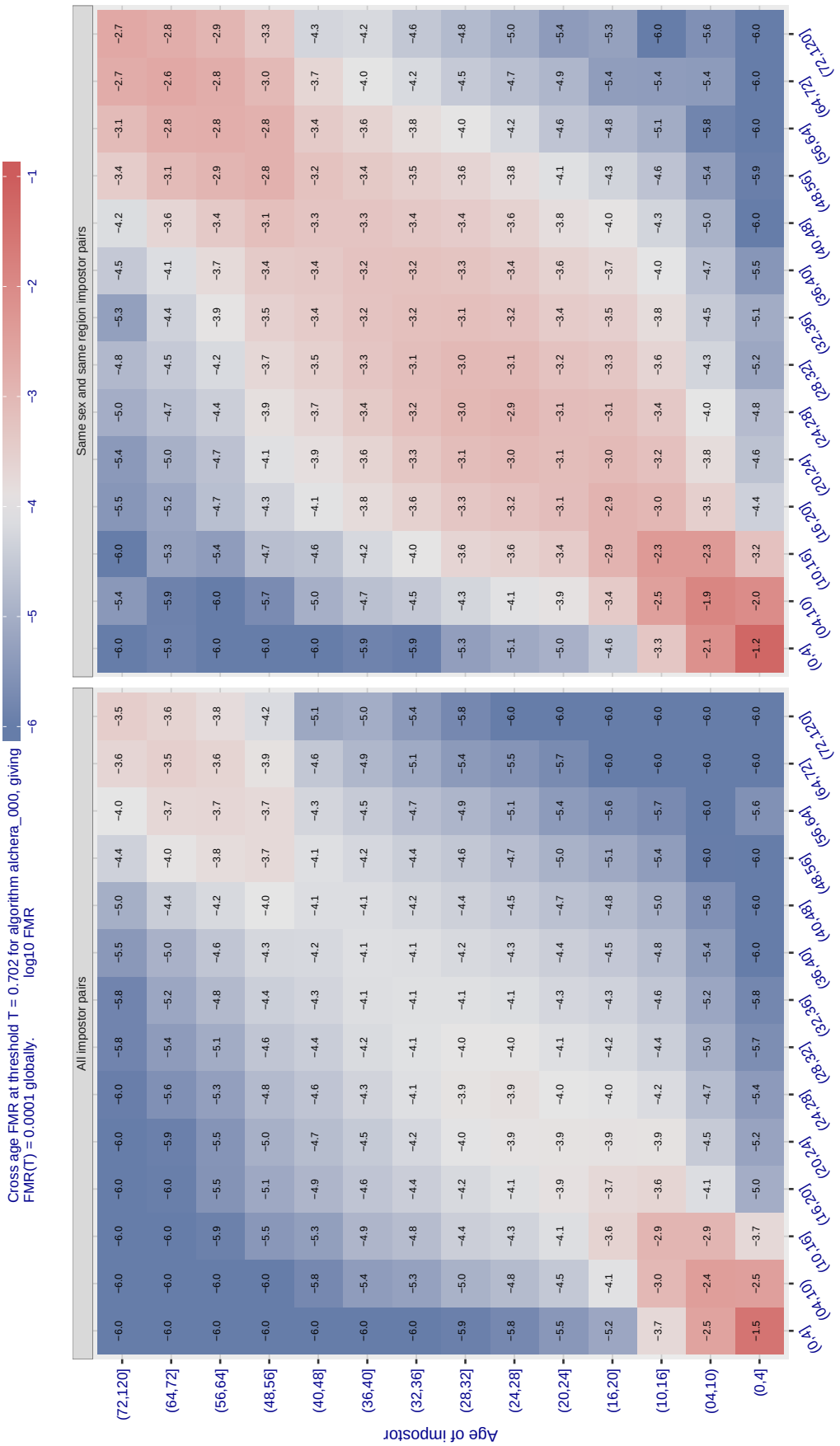


Figure 448: For algorithm alchera-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

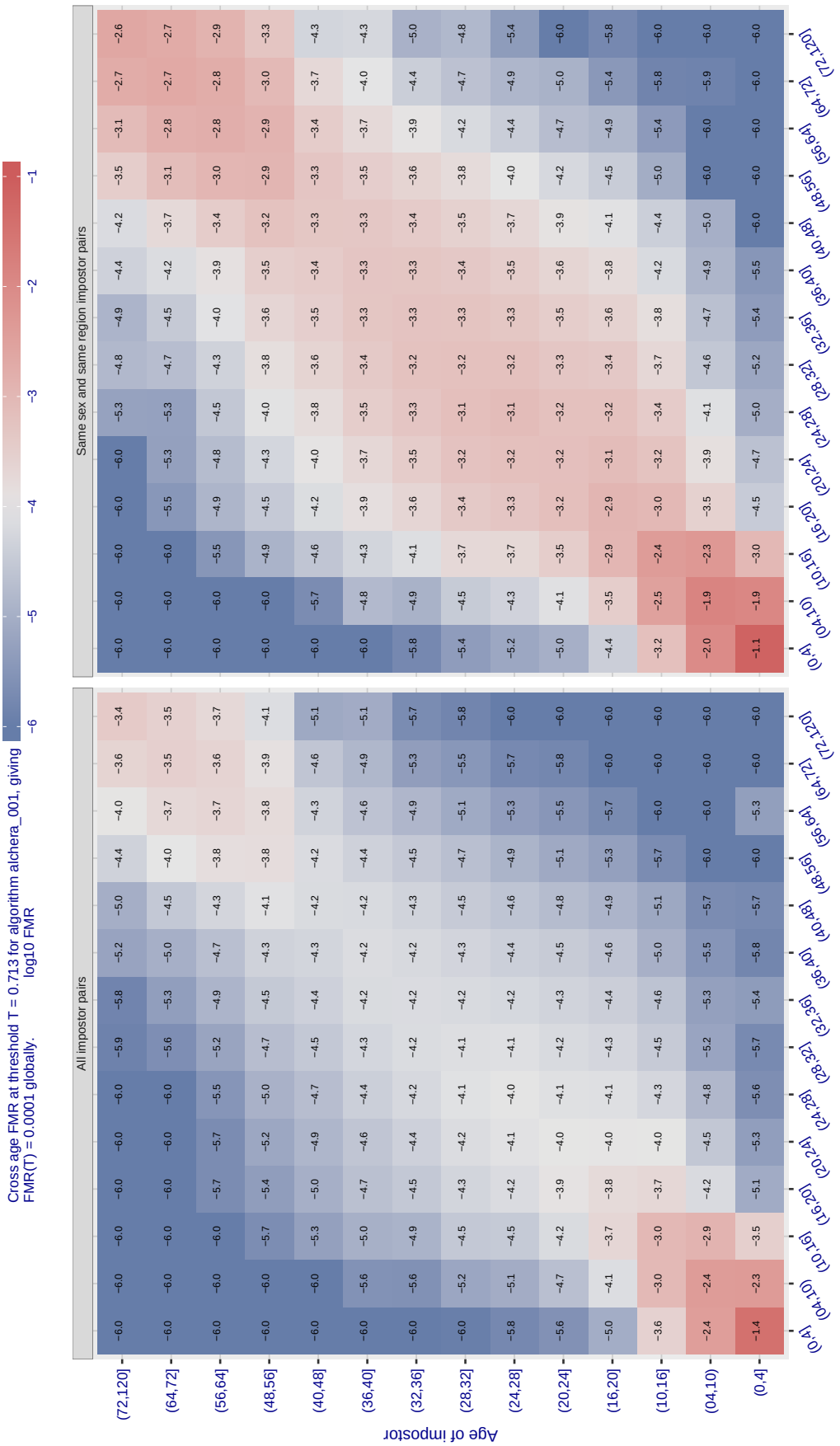


Figure 449: For algorithm alchera-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

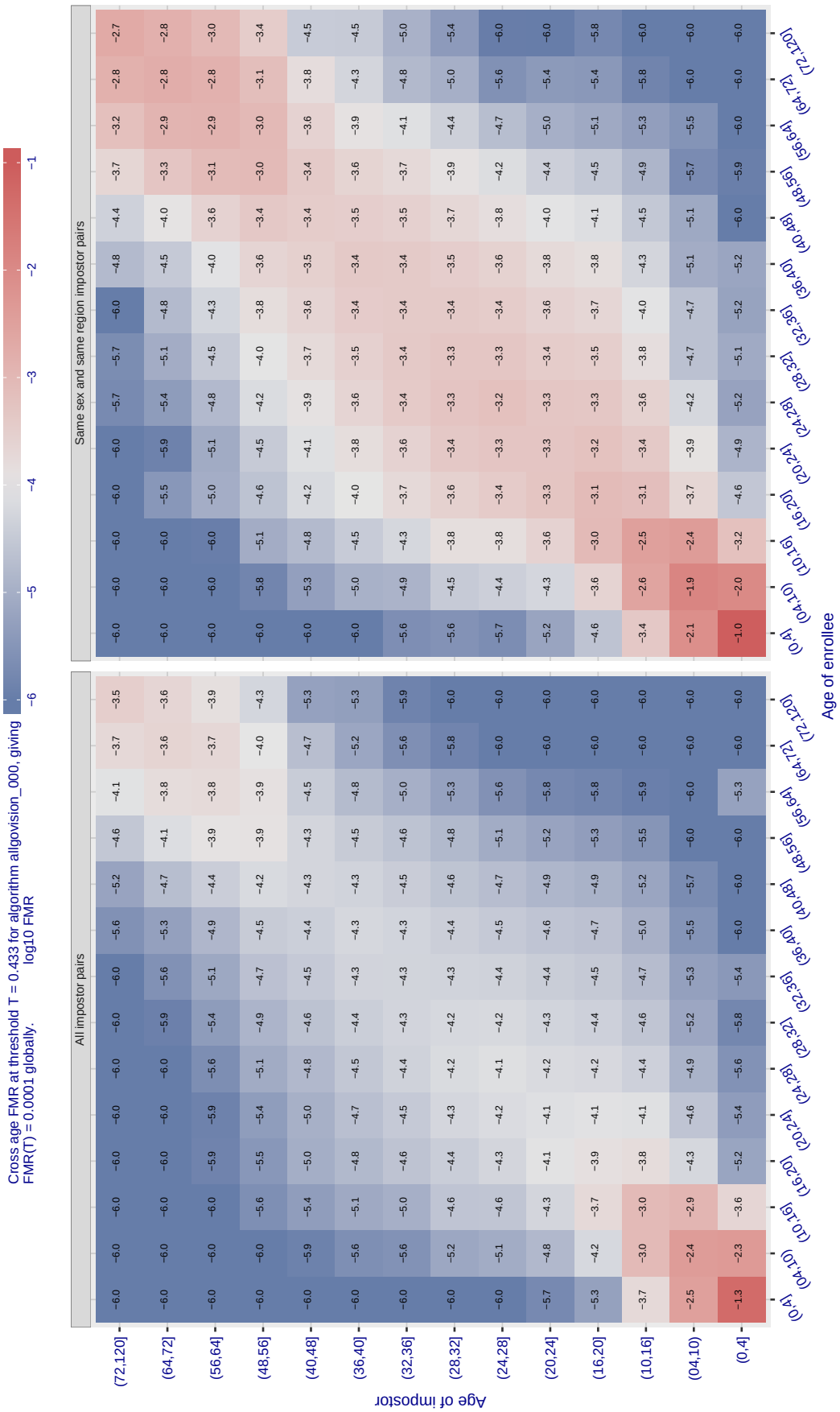


Figure 450: For algorithm allgovision-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

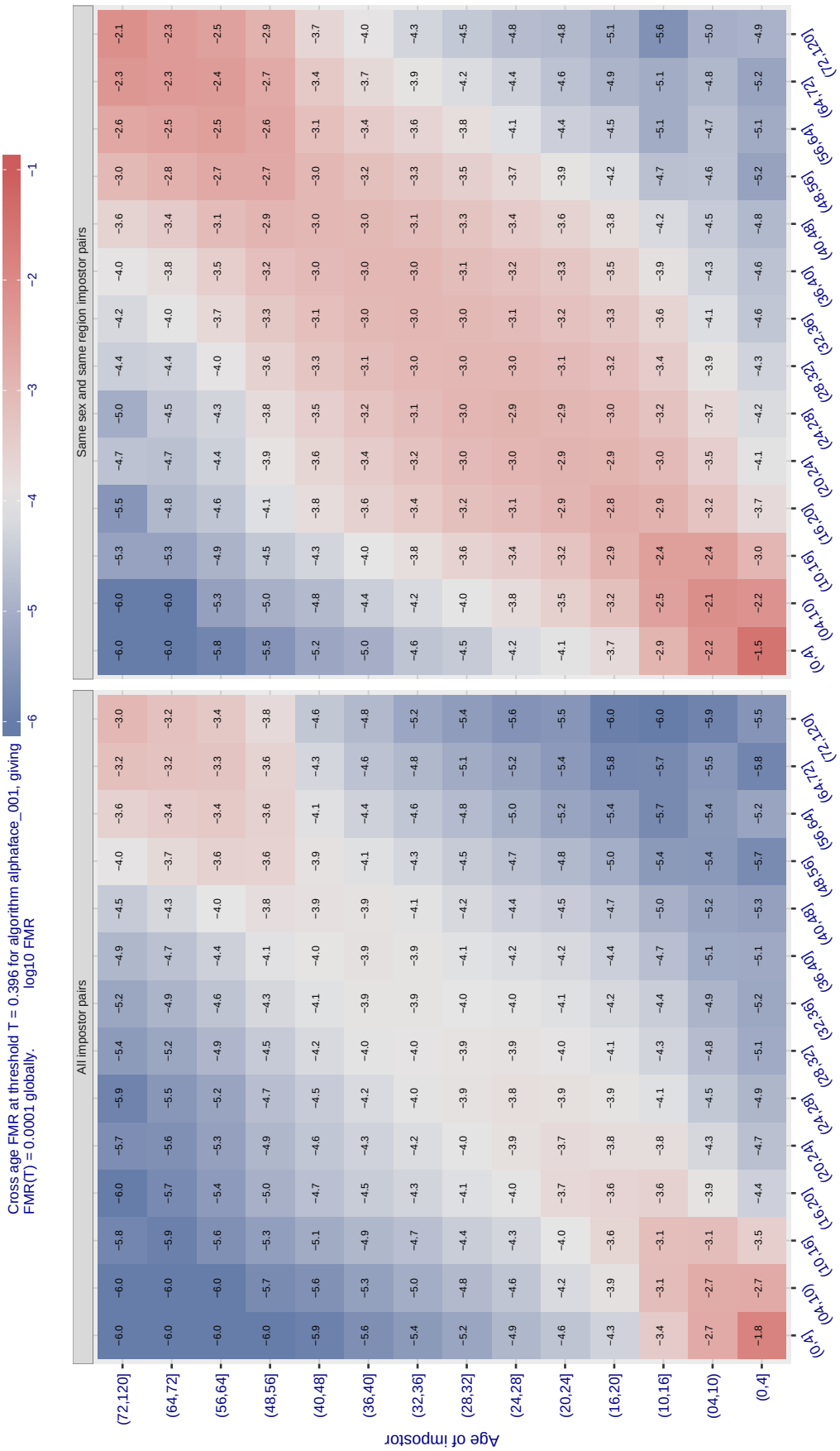


Figure 451: For algorithm alphaface-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

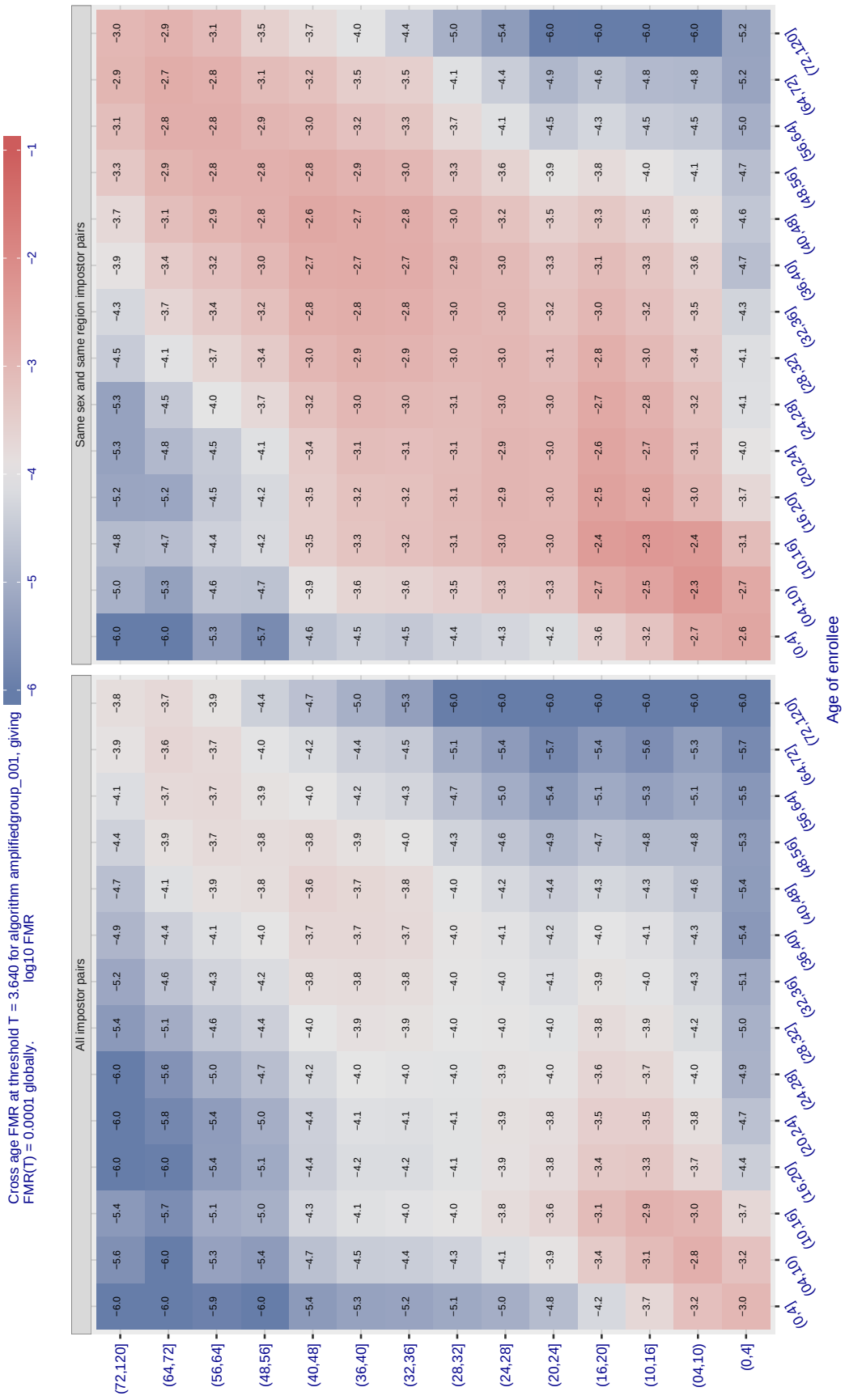


Figure 452: For algorithm amplifiedgroup-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

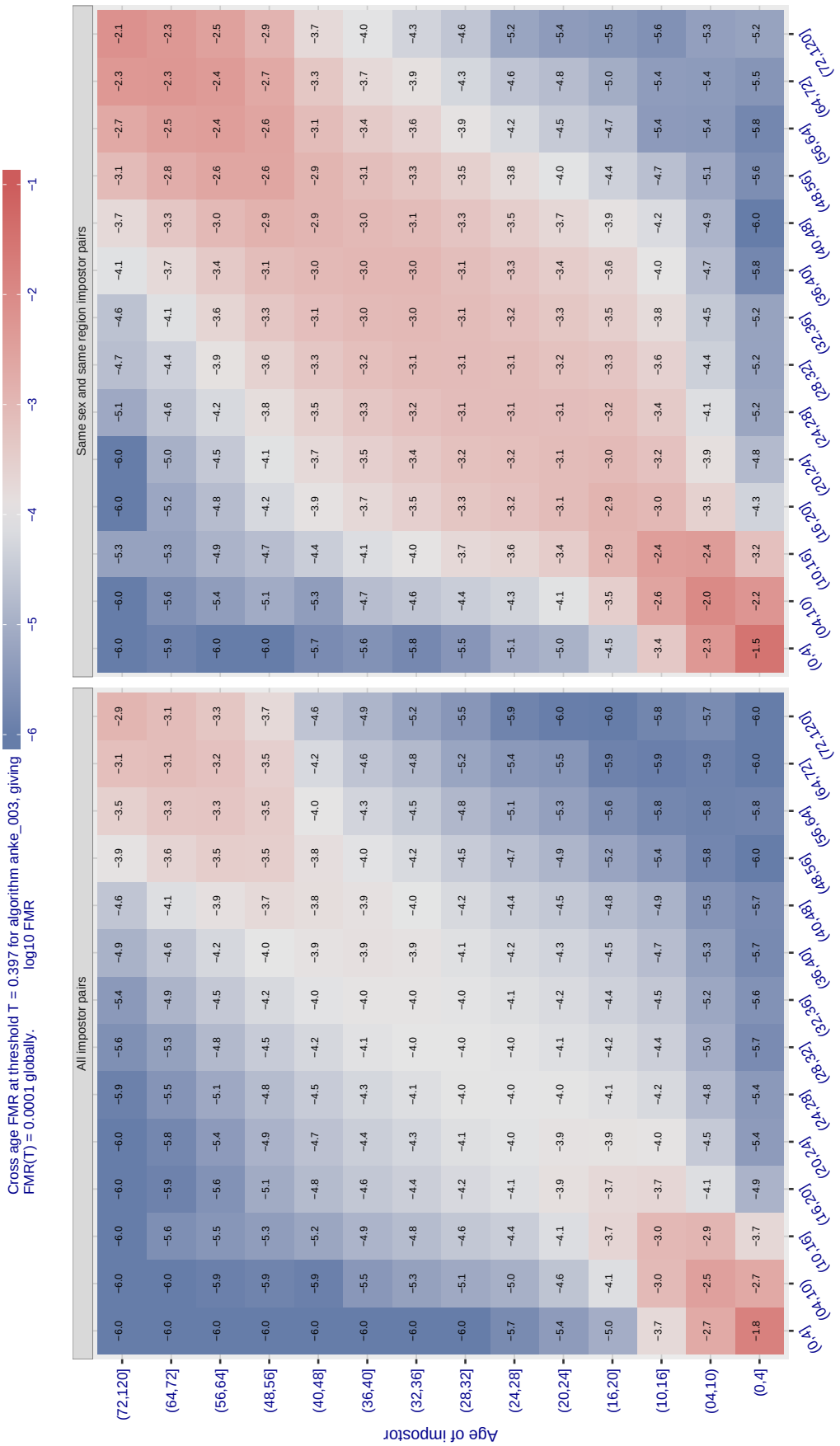


Figure 453: For algorithm anke-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

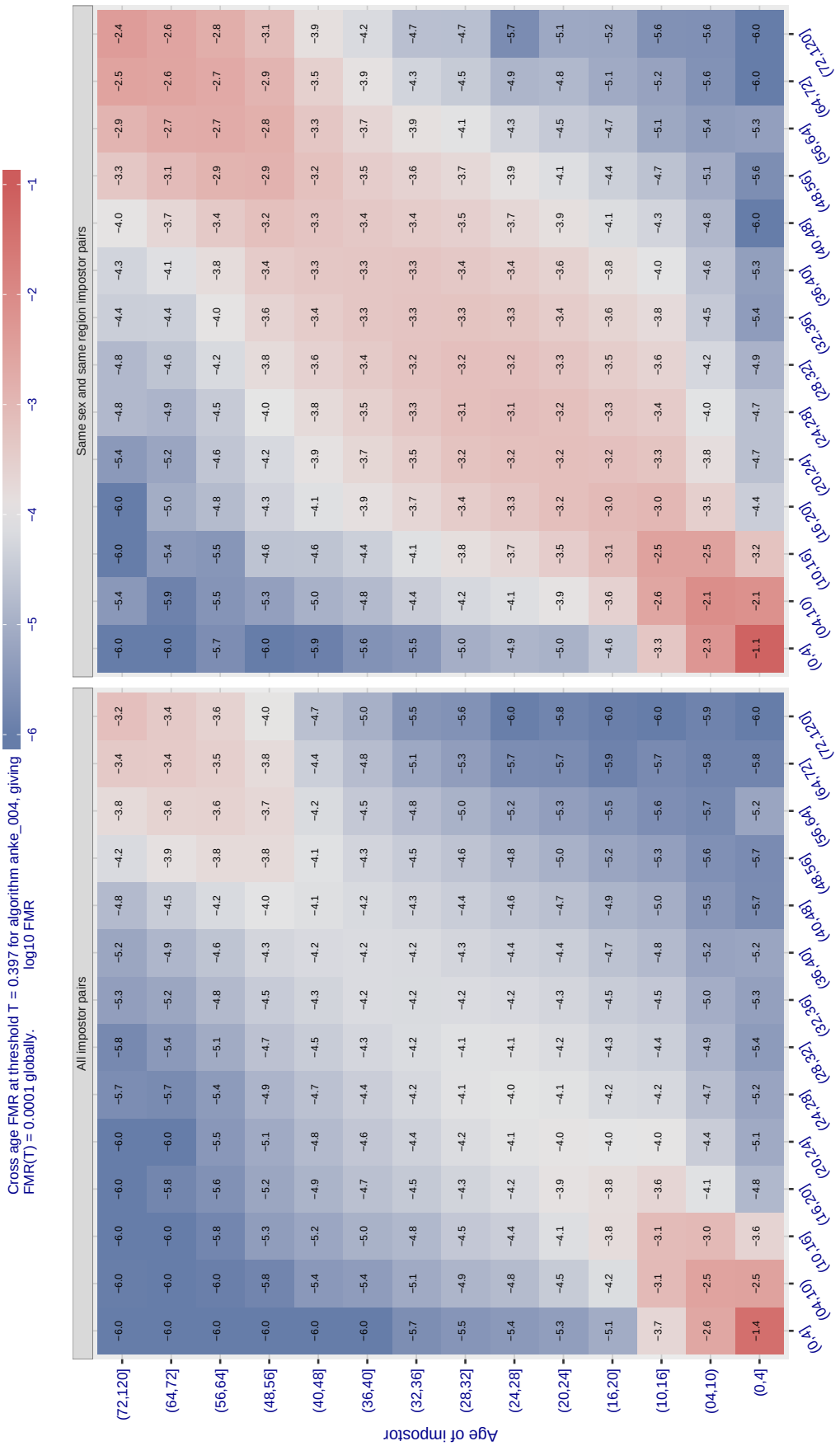


Figure 454: For algorithm anke-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

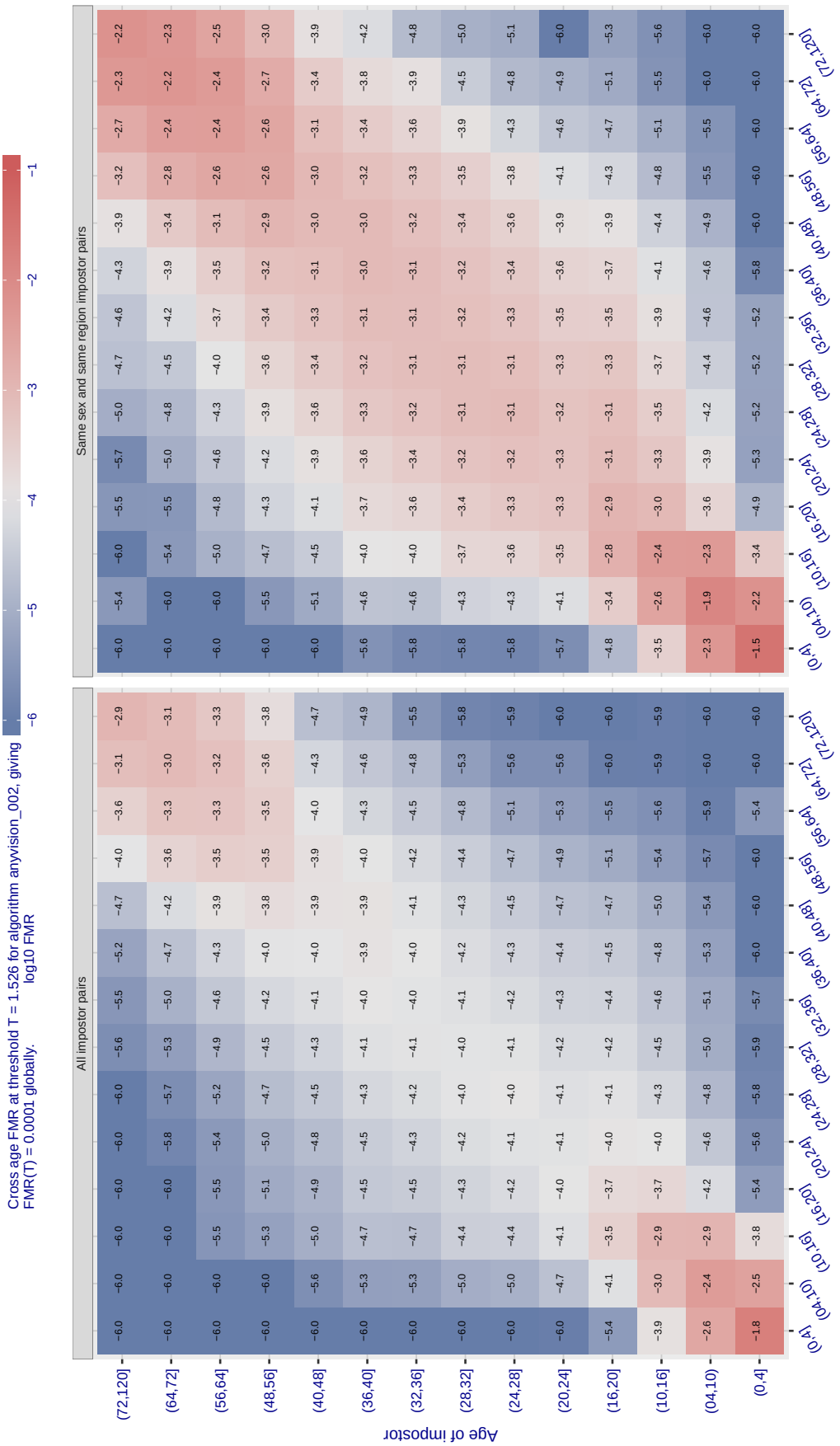


Figure 455: For algorithm anyvision-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

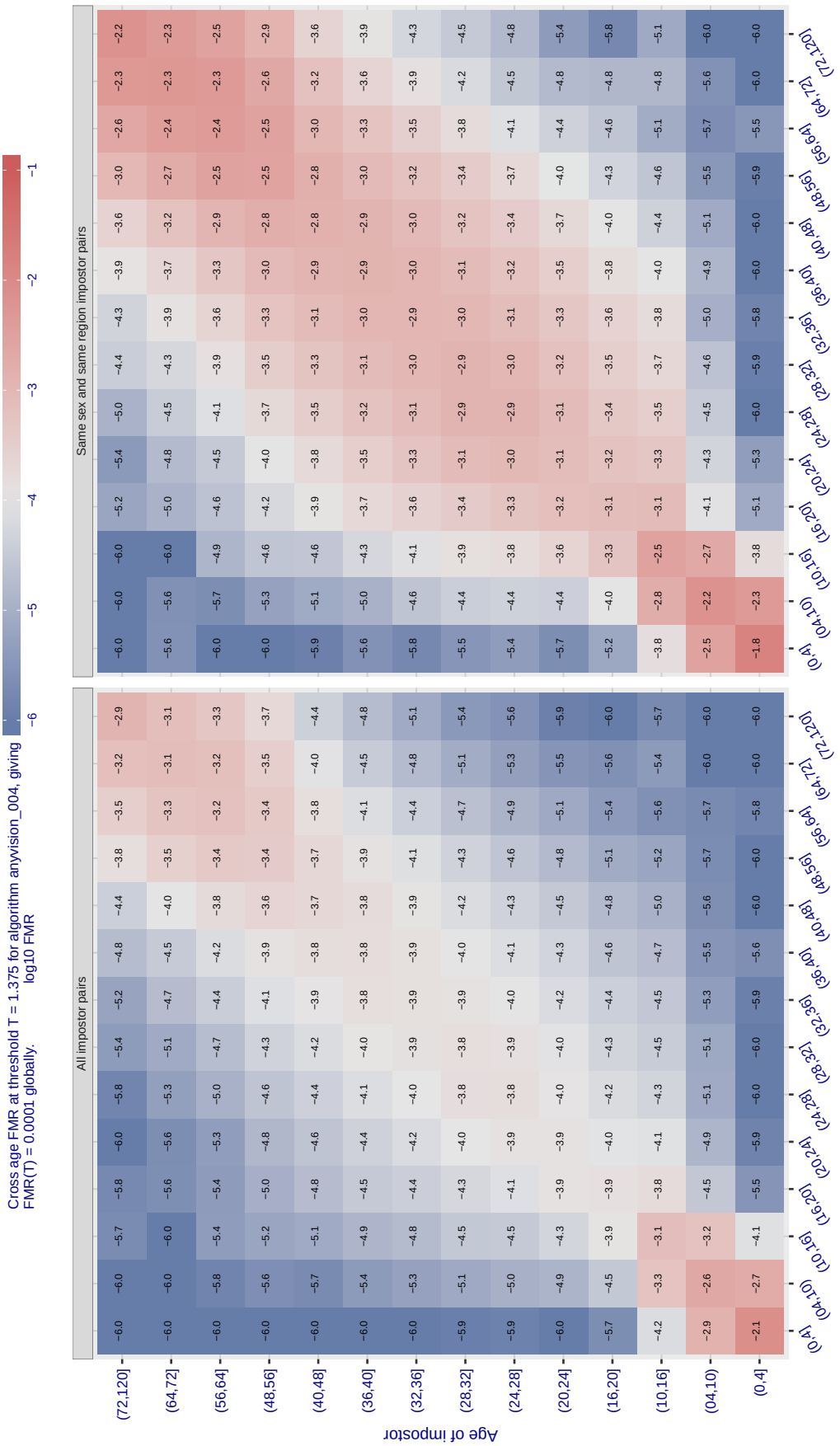


Figure 456: For algorithm anyvision-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

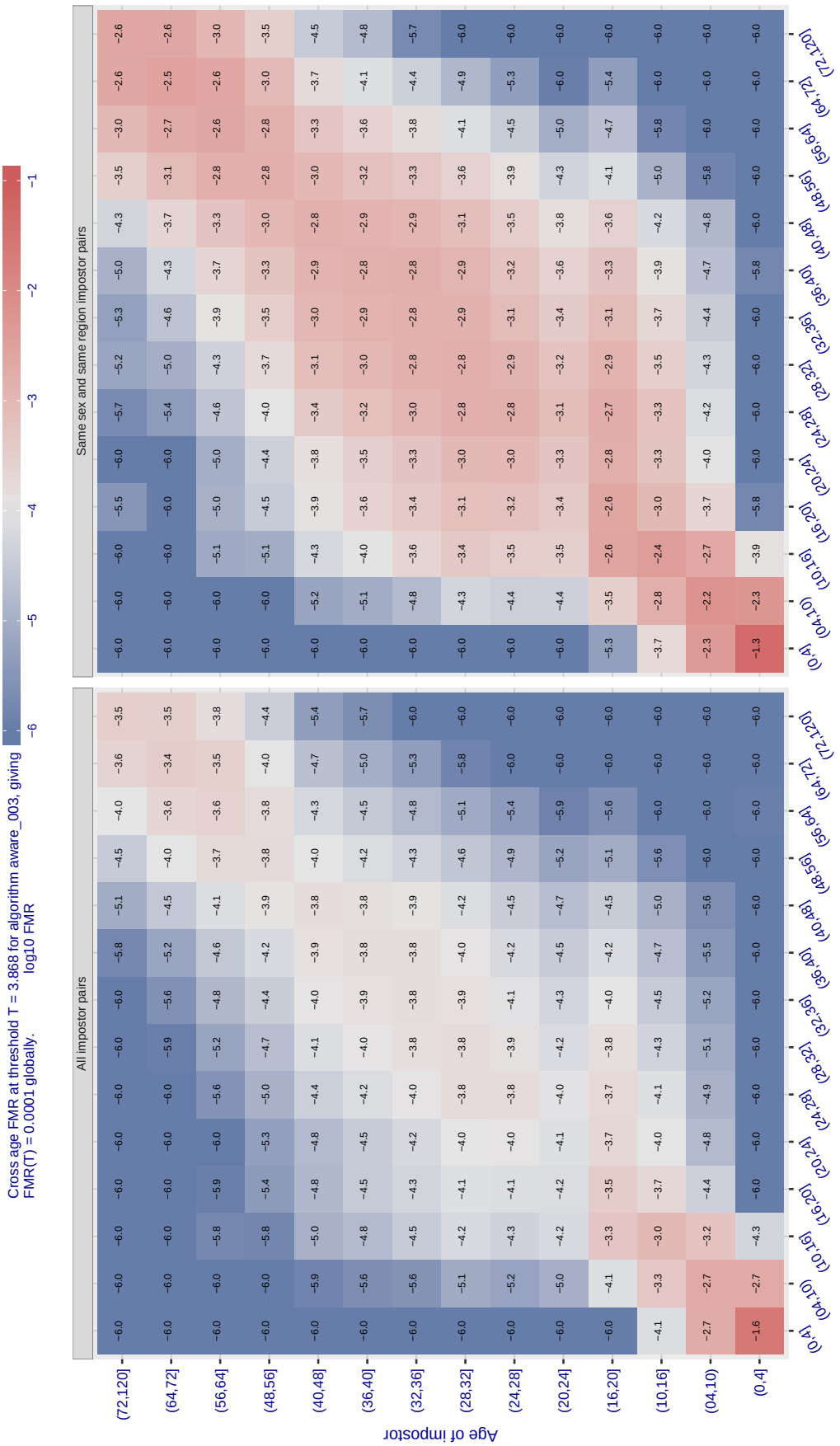


Figure 457: For algorithm aware-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

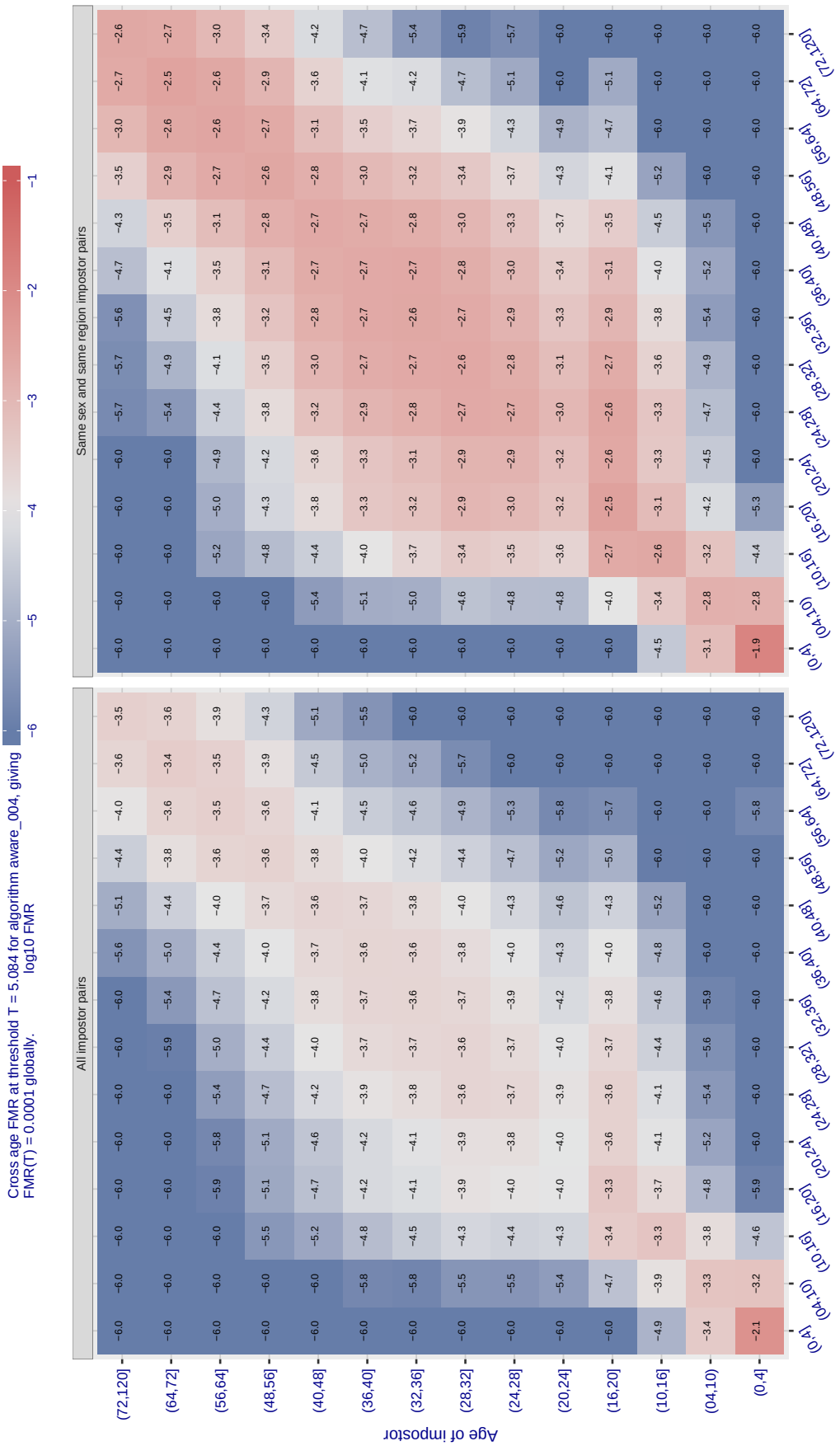


Figure 458: For algorithm aware-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

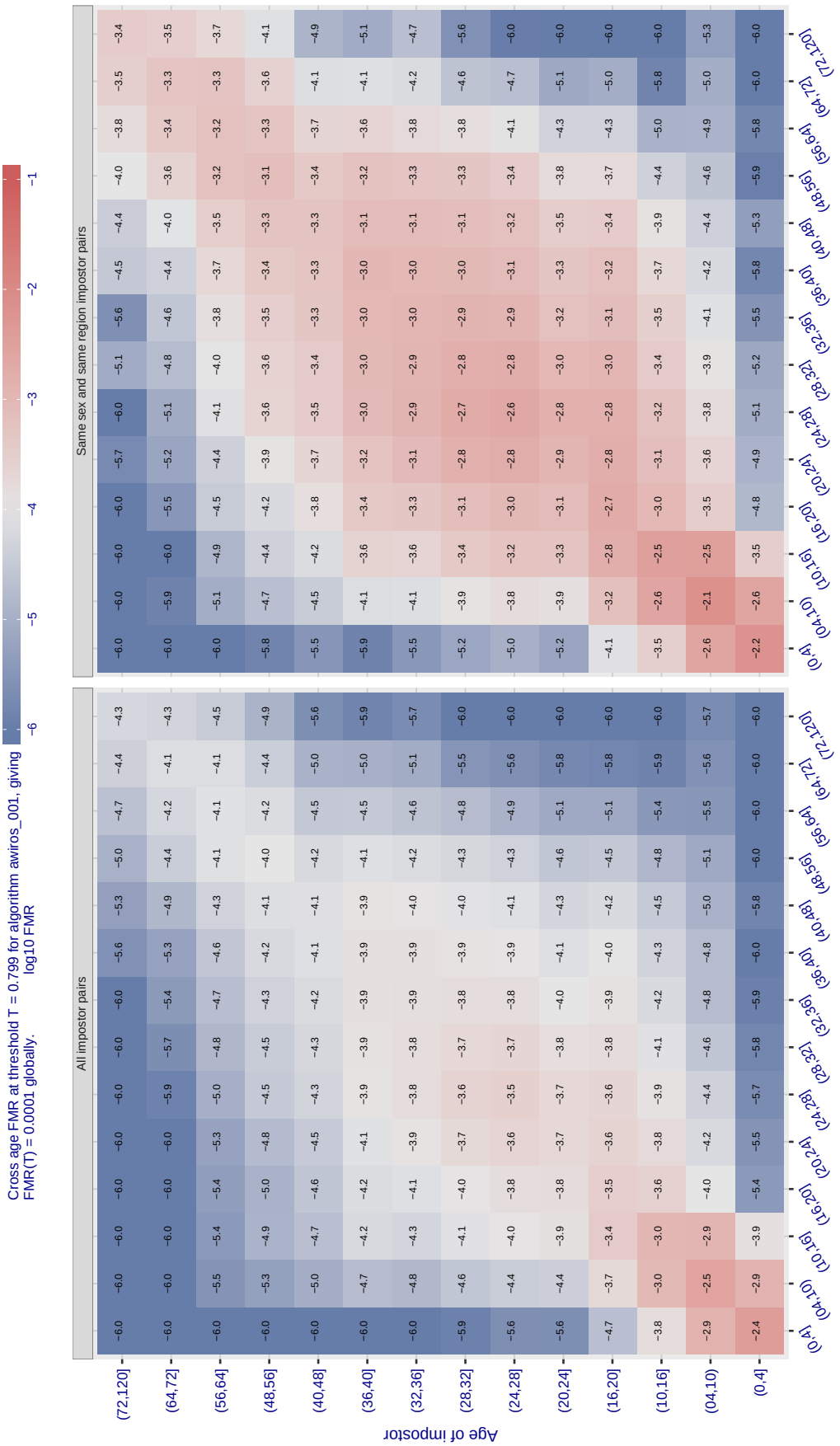


Figure 459: For algorithm awiros-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

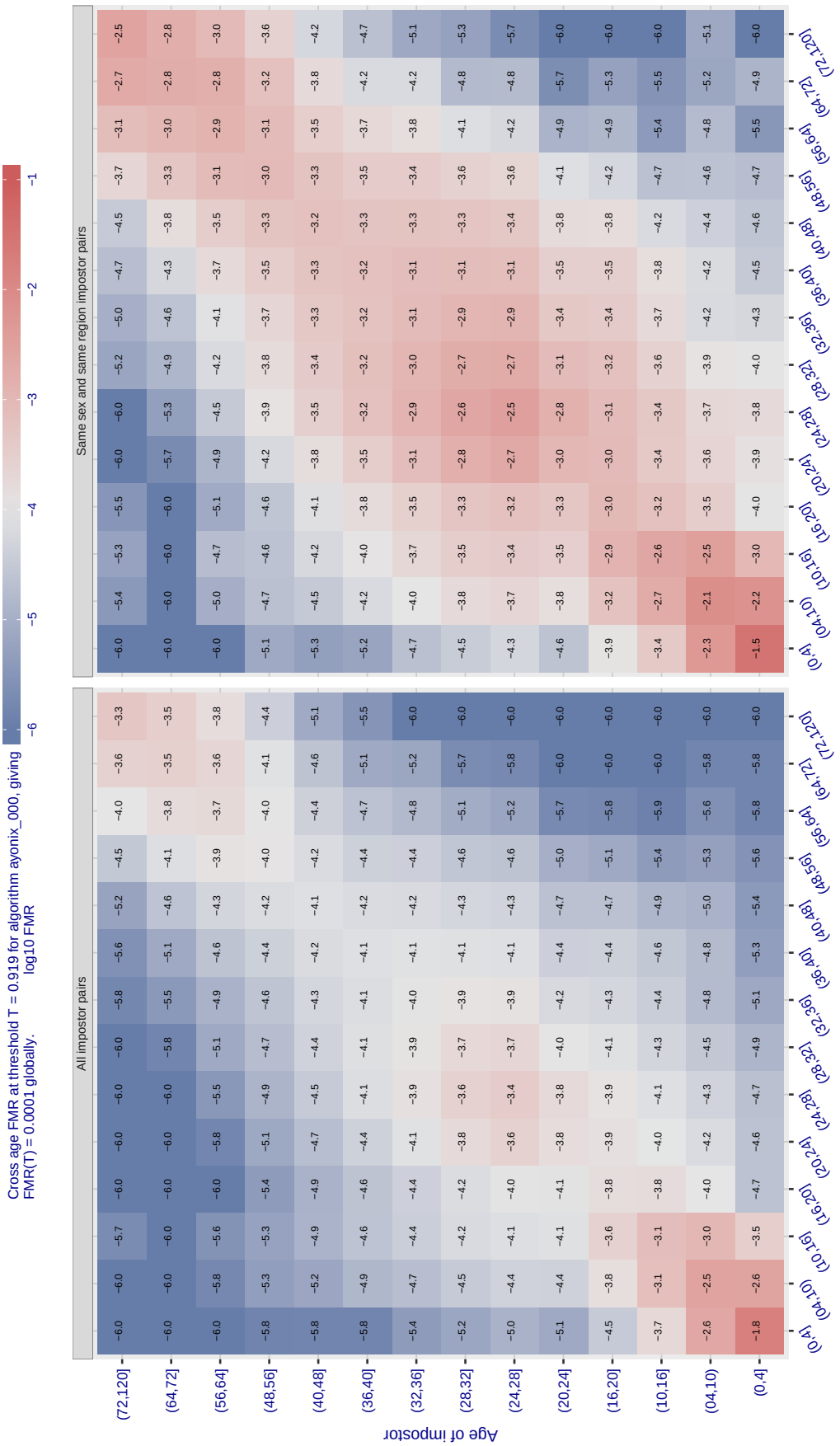


Figure 460: For algorithm ayonix-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

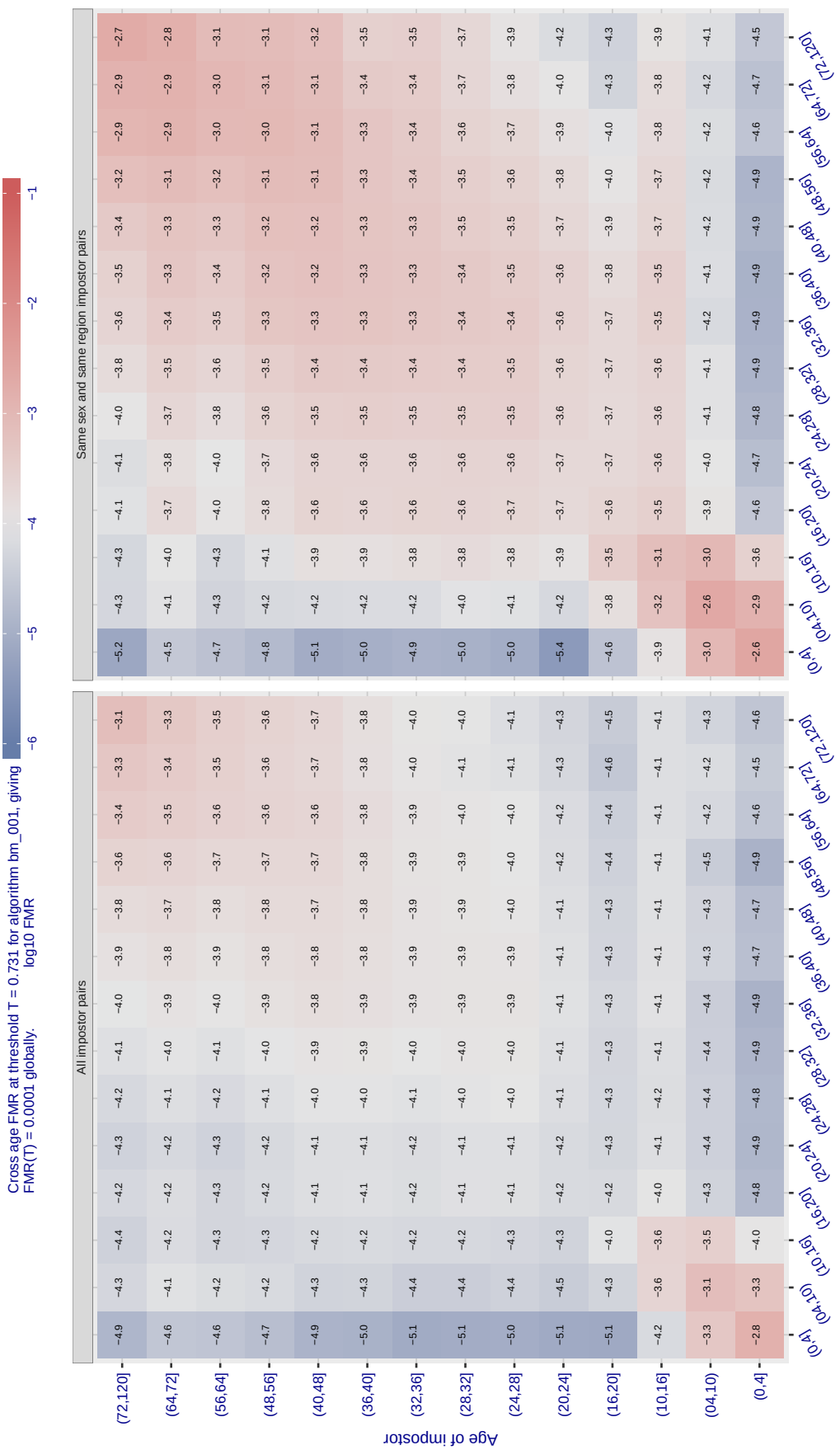


Figure 461: For algorithm bm-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

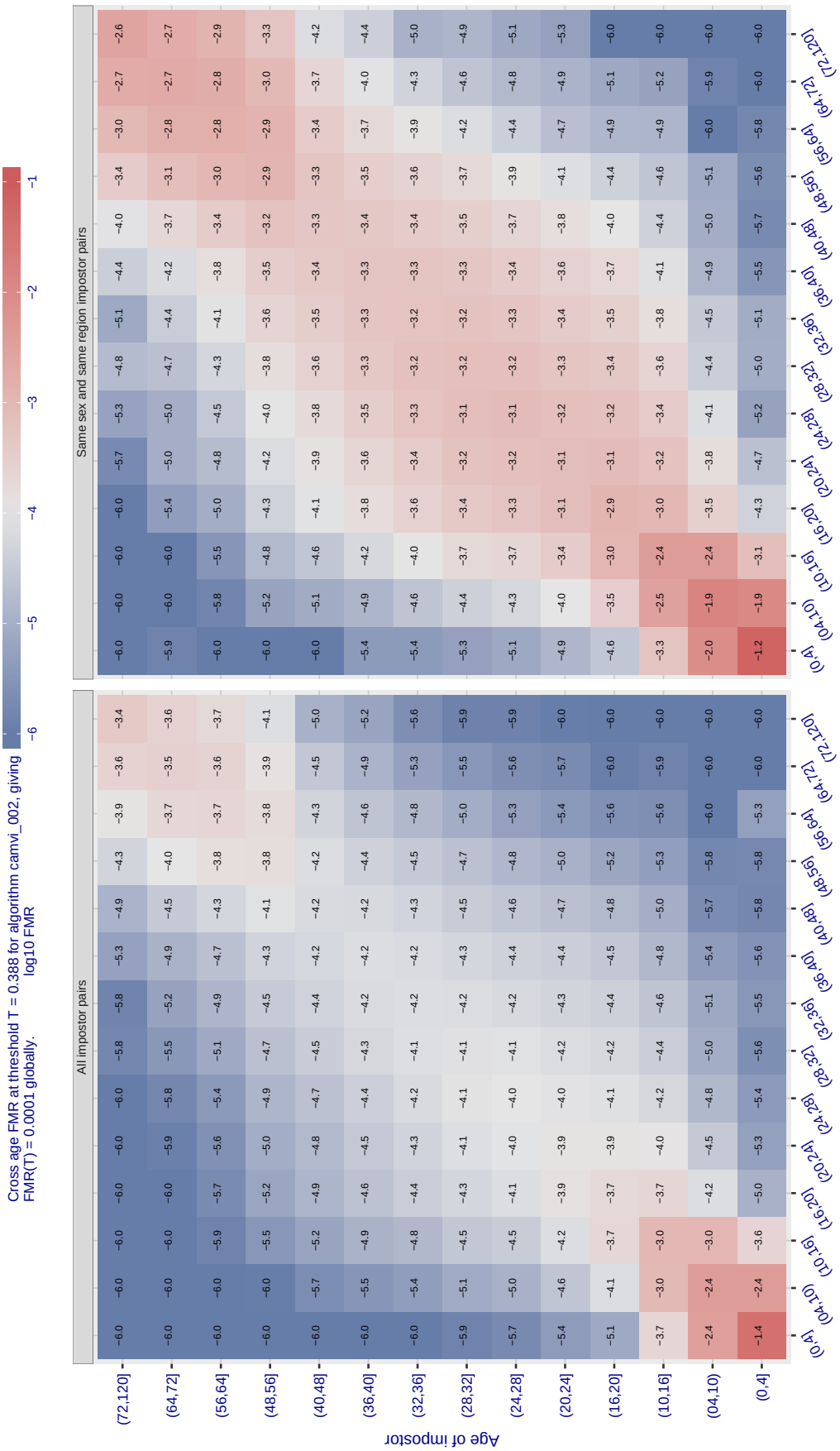


Figure 462: For algorithm camvi-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

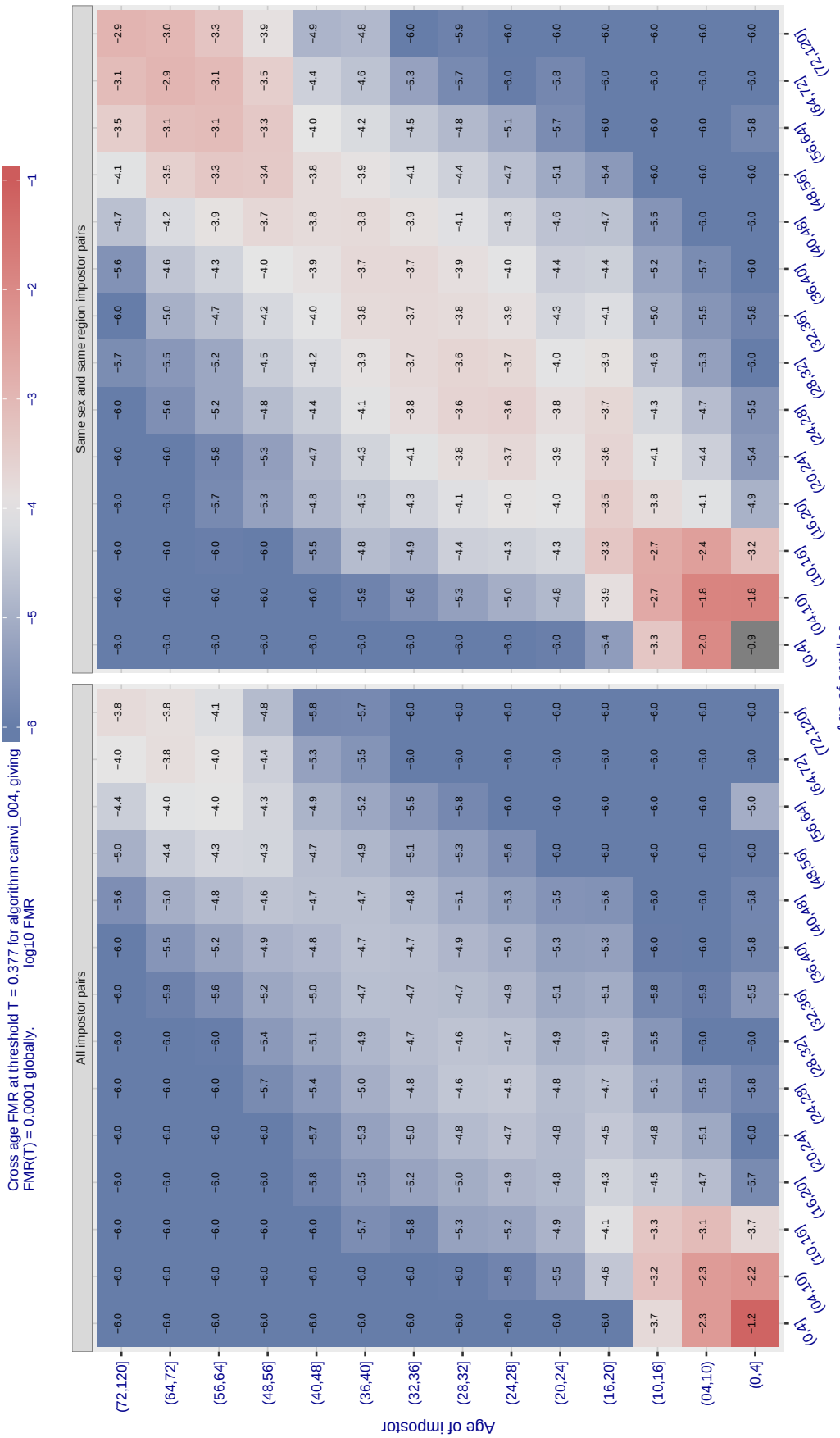


Figure 463: For algorithm camvi-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

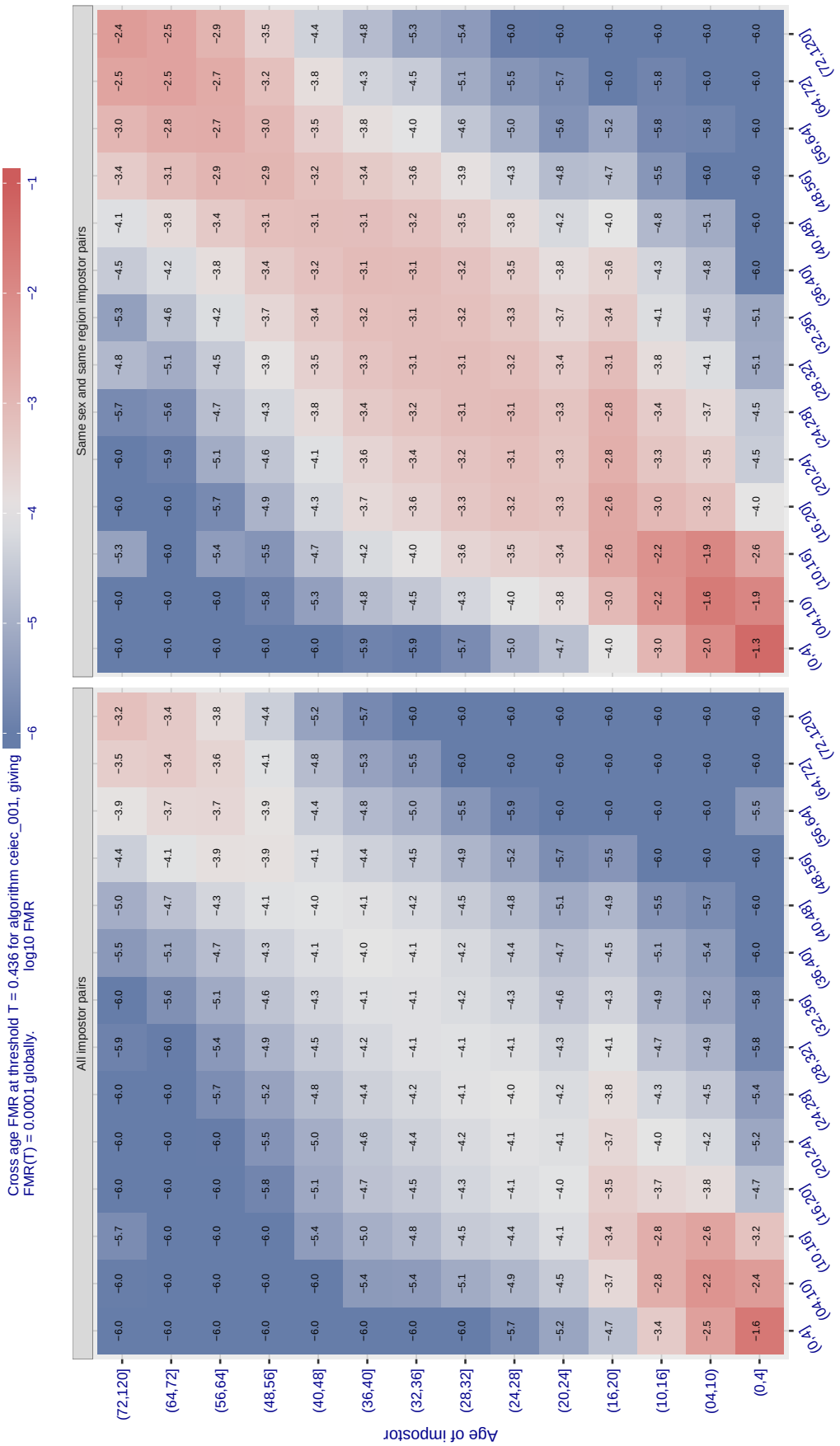


Figure 464: For algorithm celec-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

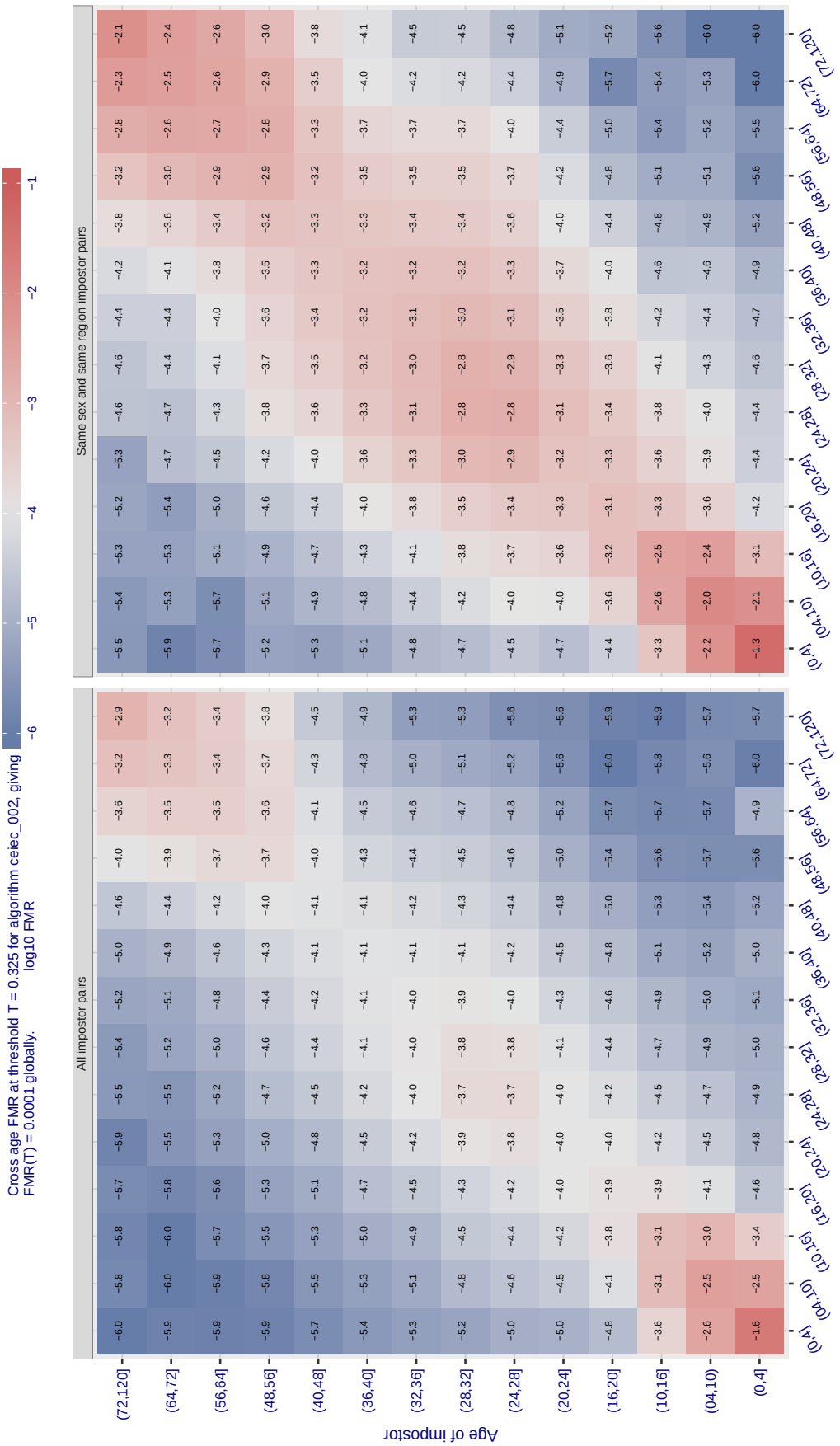


Figure 465: For algorithm ceiec-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

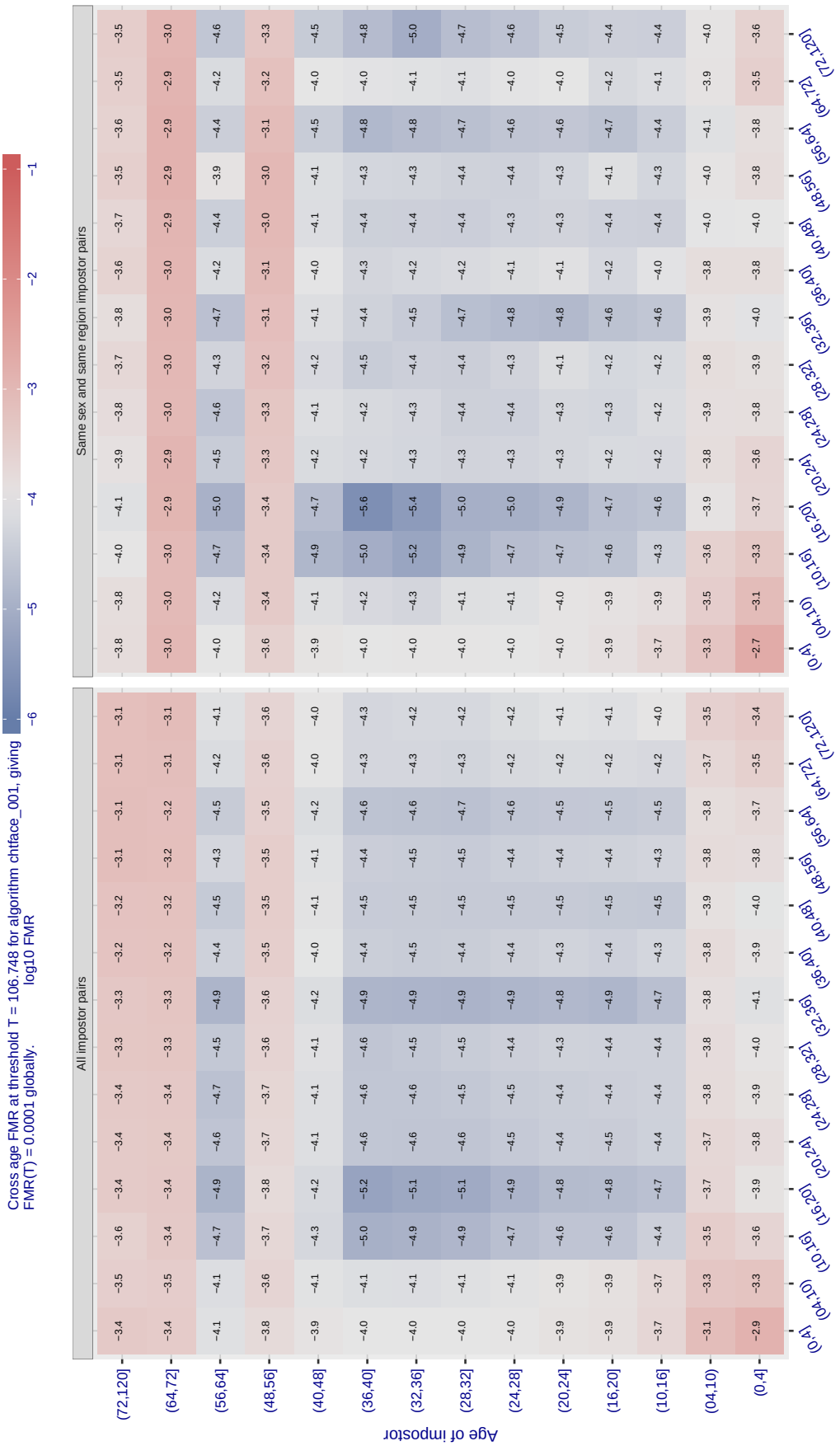


Figure 466: For algorithm chtface-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

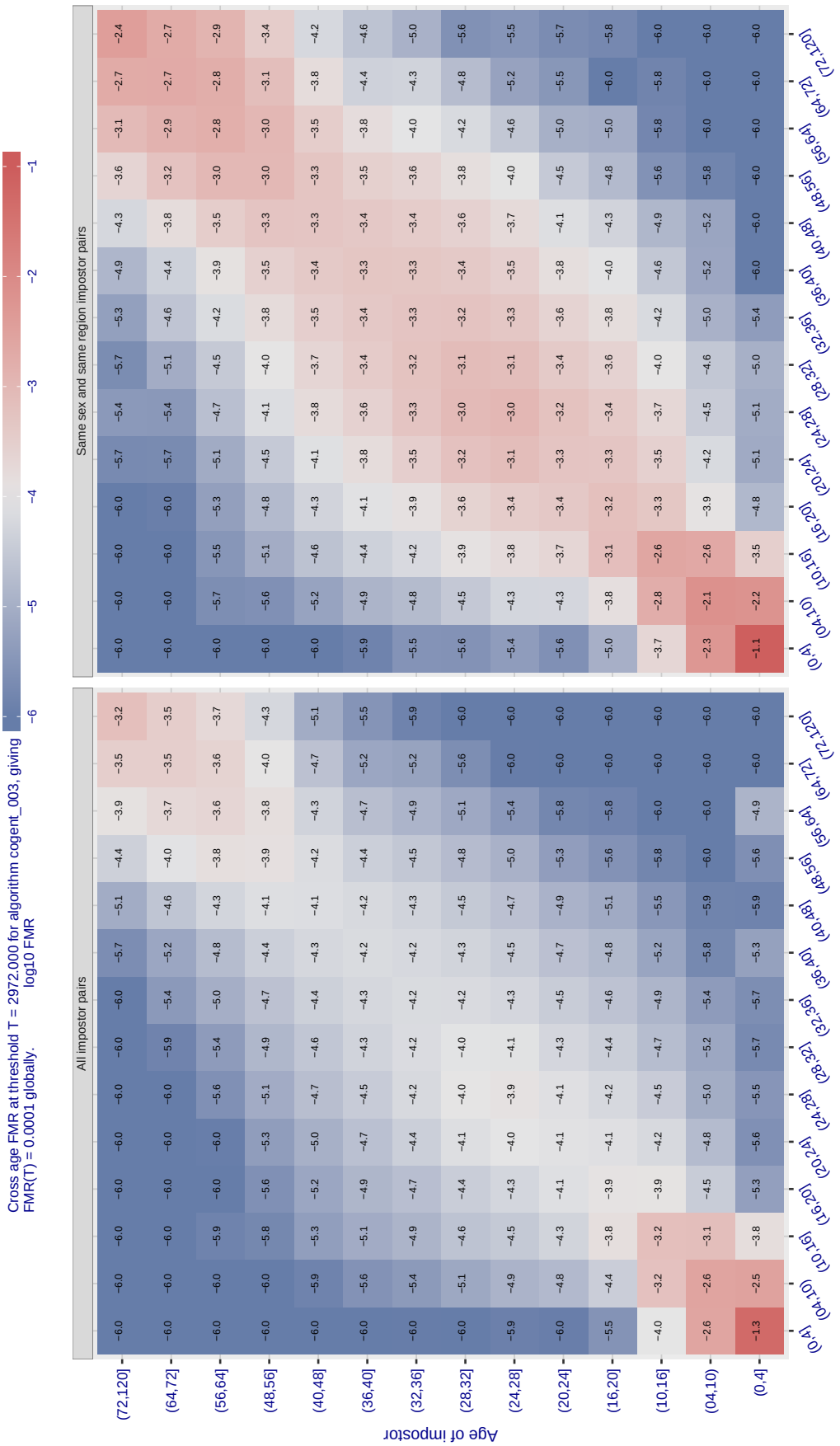


Figure 467: For algorithm cogent-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

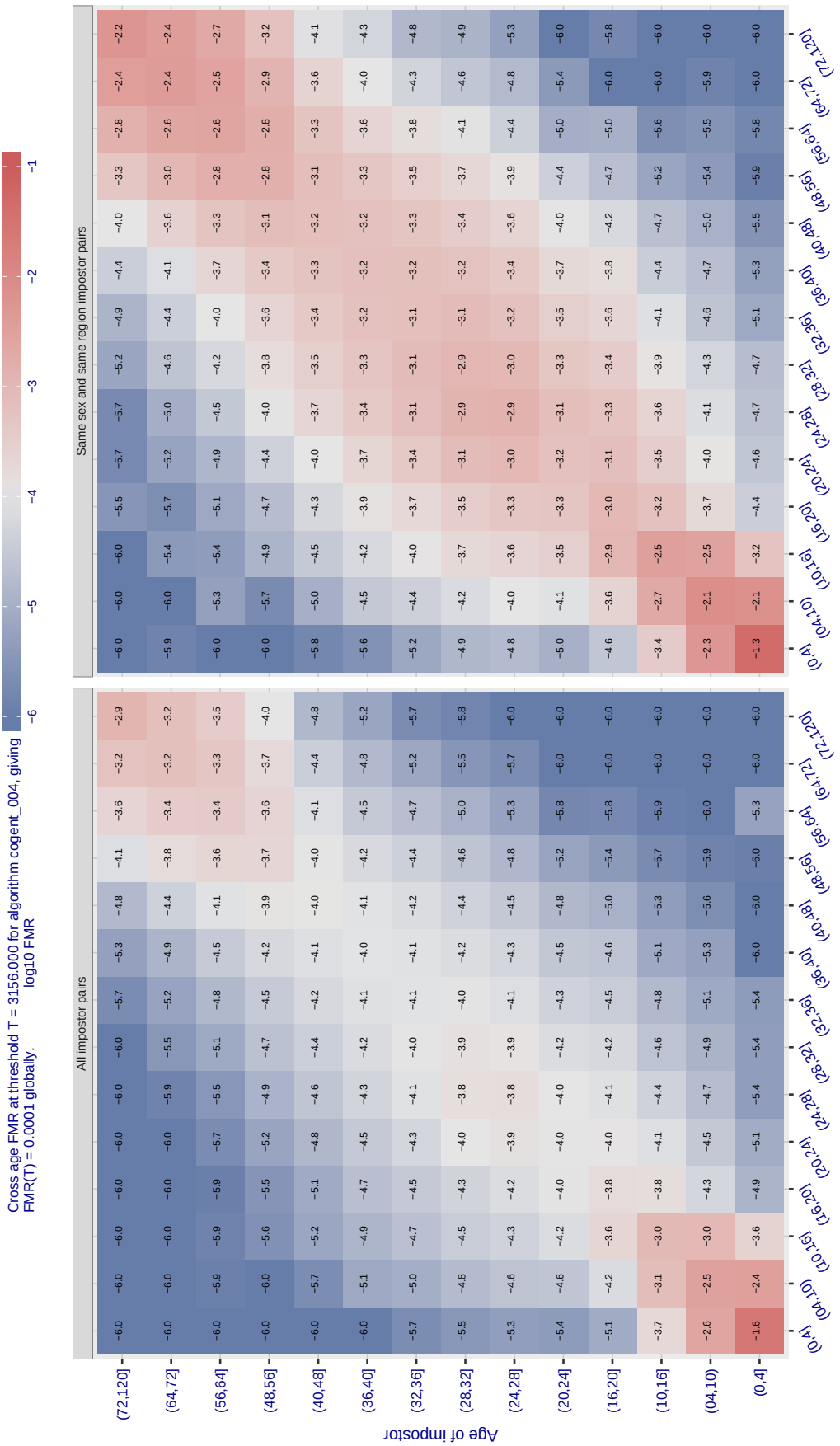


Figure 468: For algorithm cogent-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

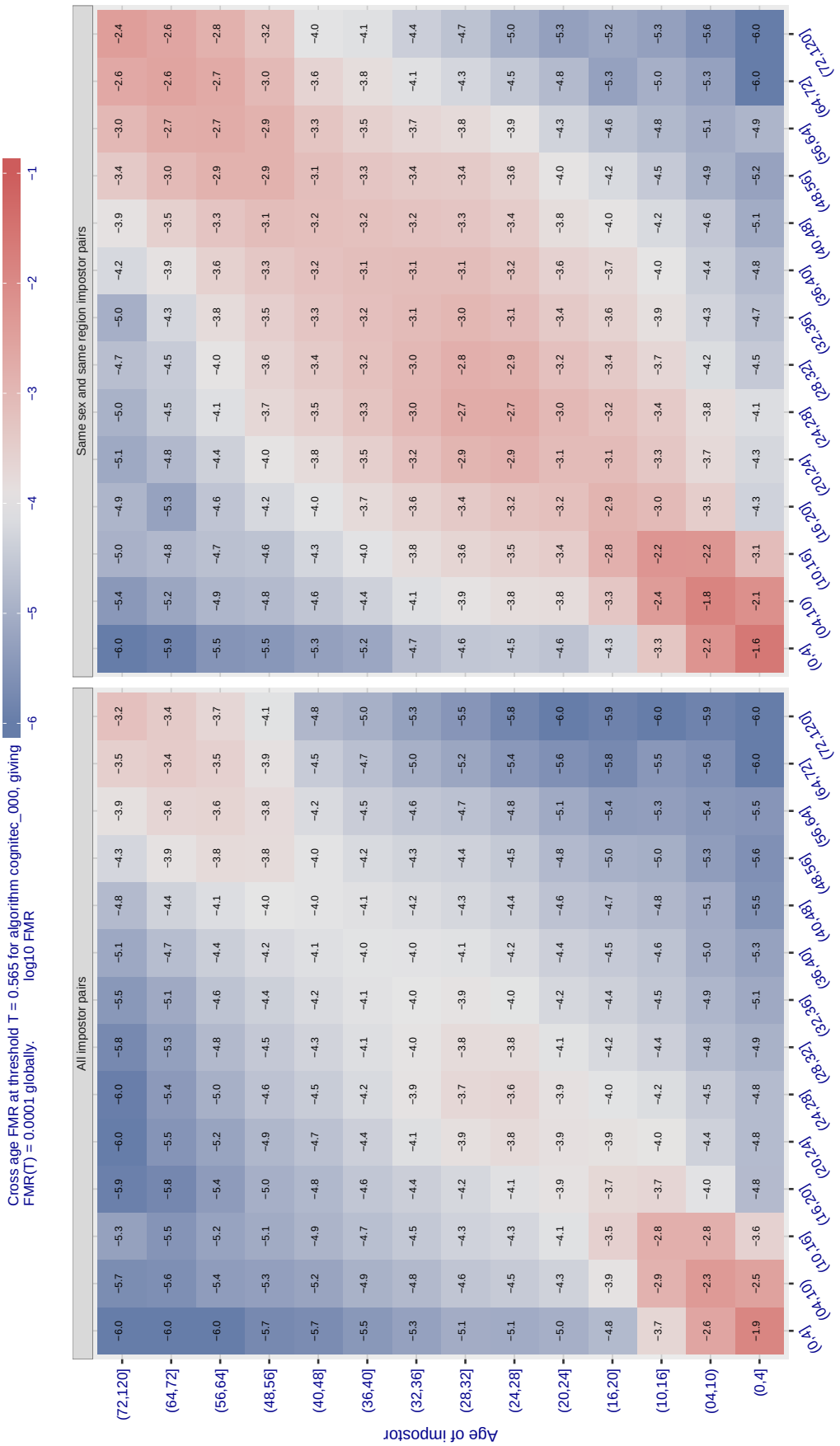


Figure 469: For algorithm cognitec-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

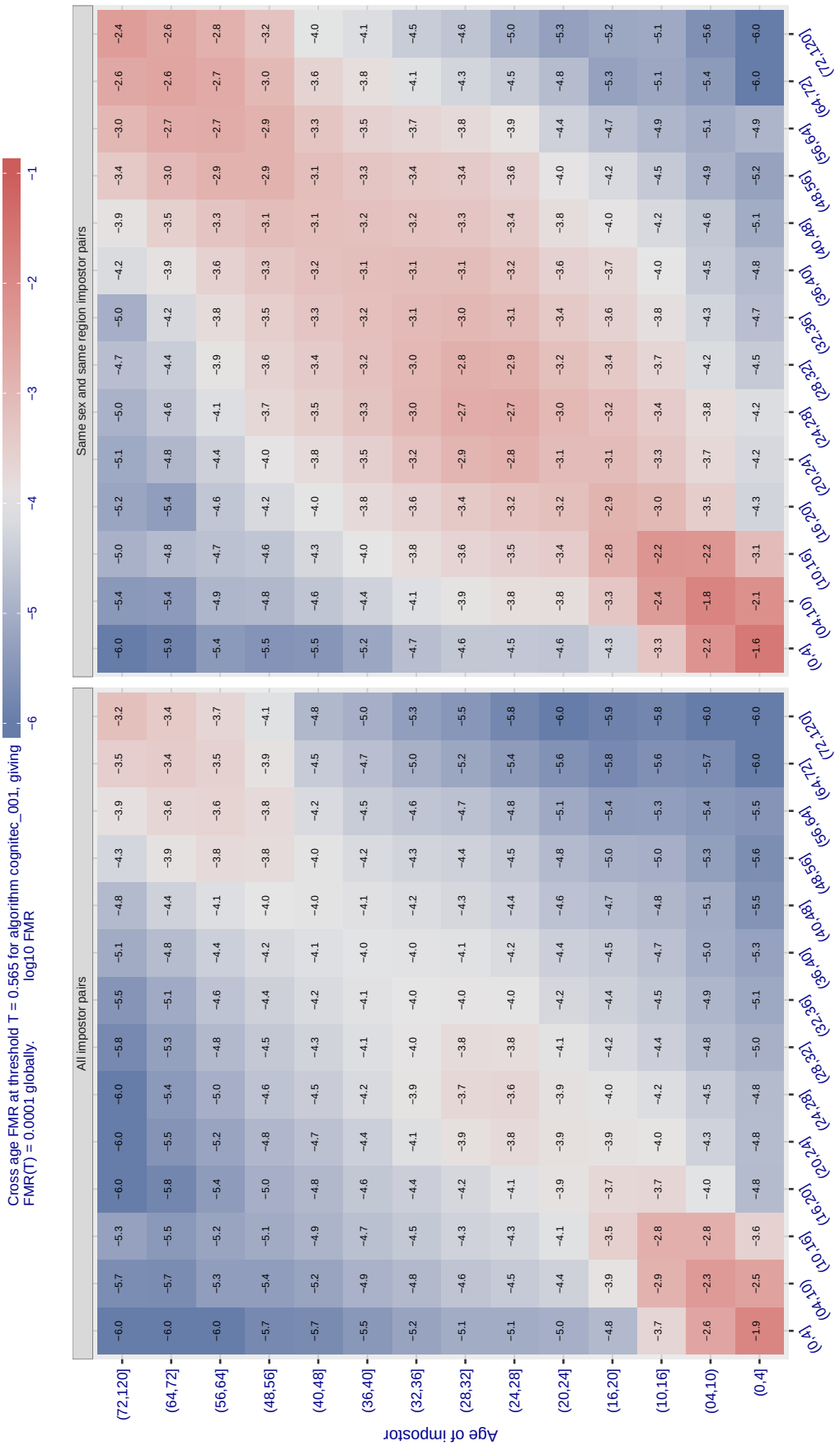


Figure 470: For algorithm cognitec-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

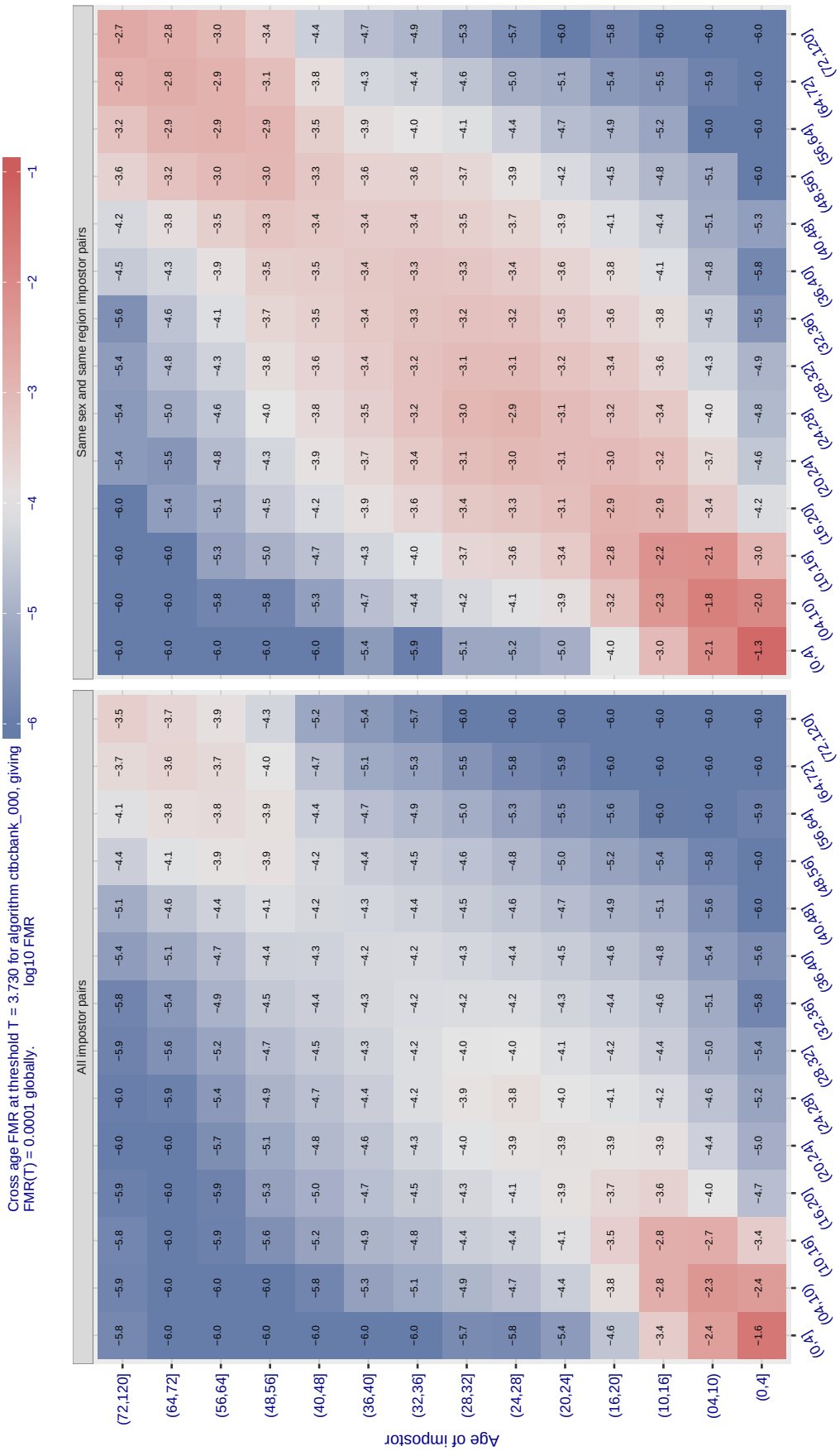


Figure 471: For algorithm ctbcbank-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

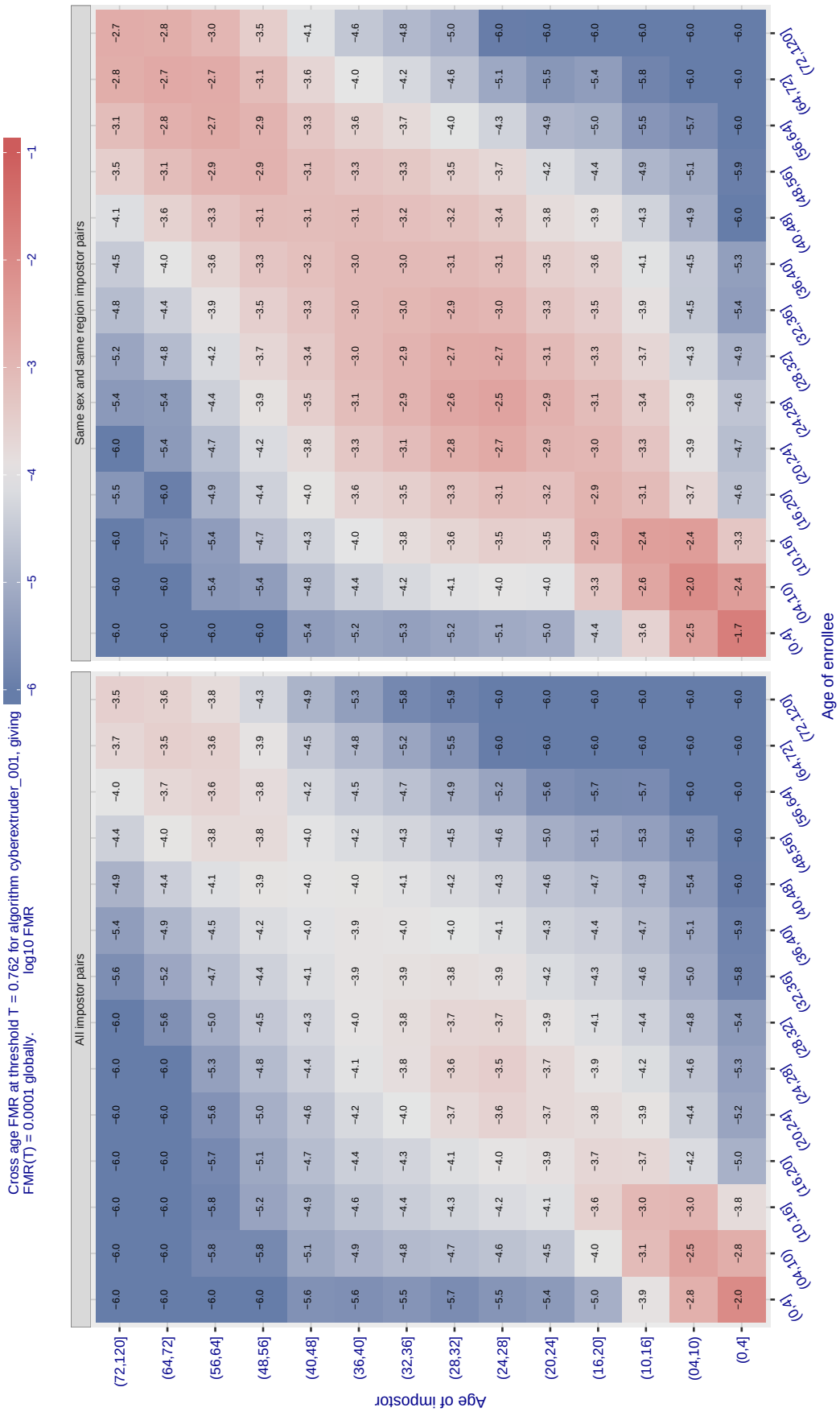


Figure 472: For algorithm cyberextruder-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

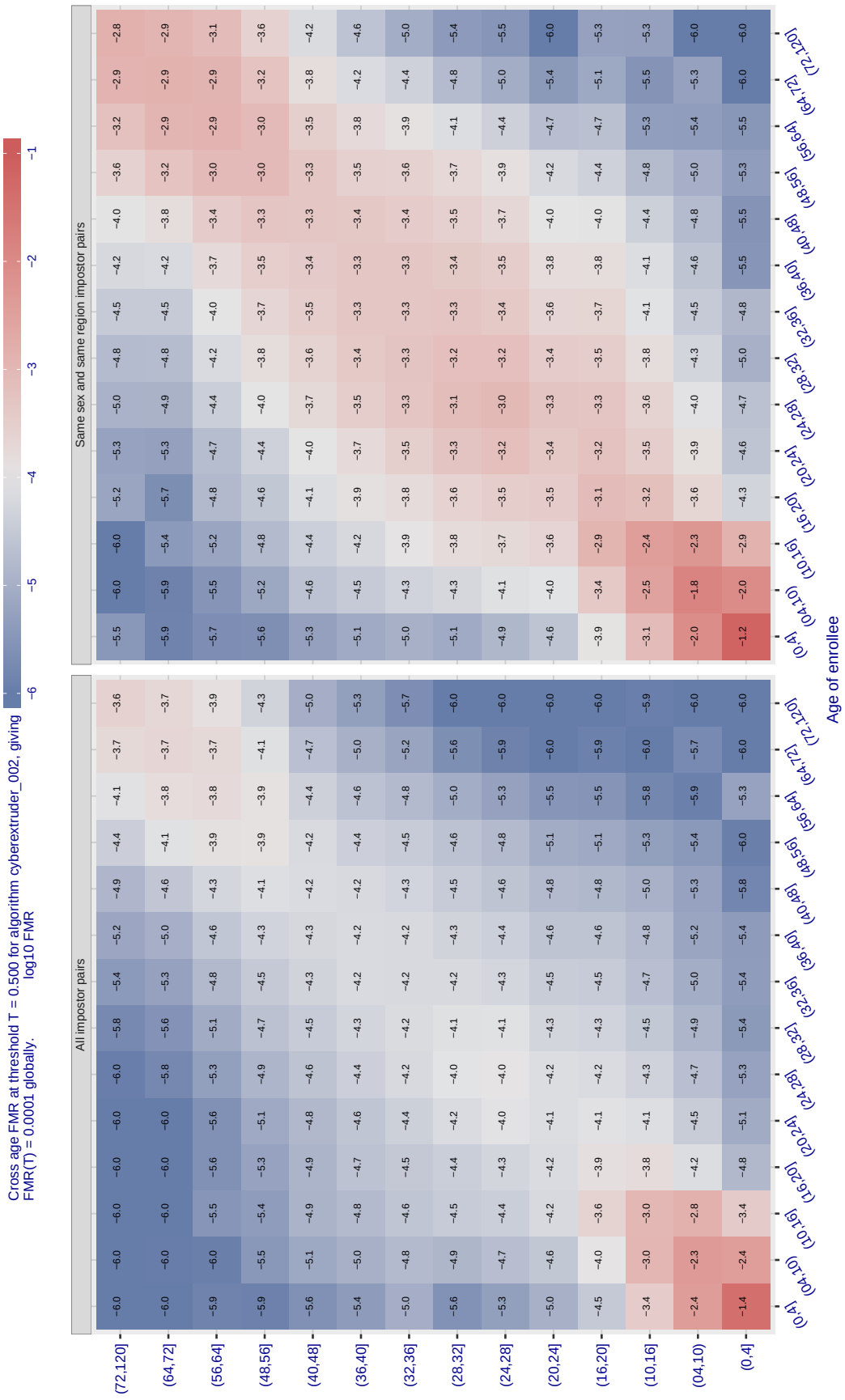


Figure 473: For algorithm cyberextruder-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

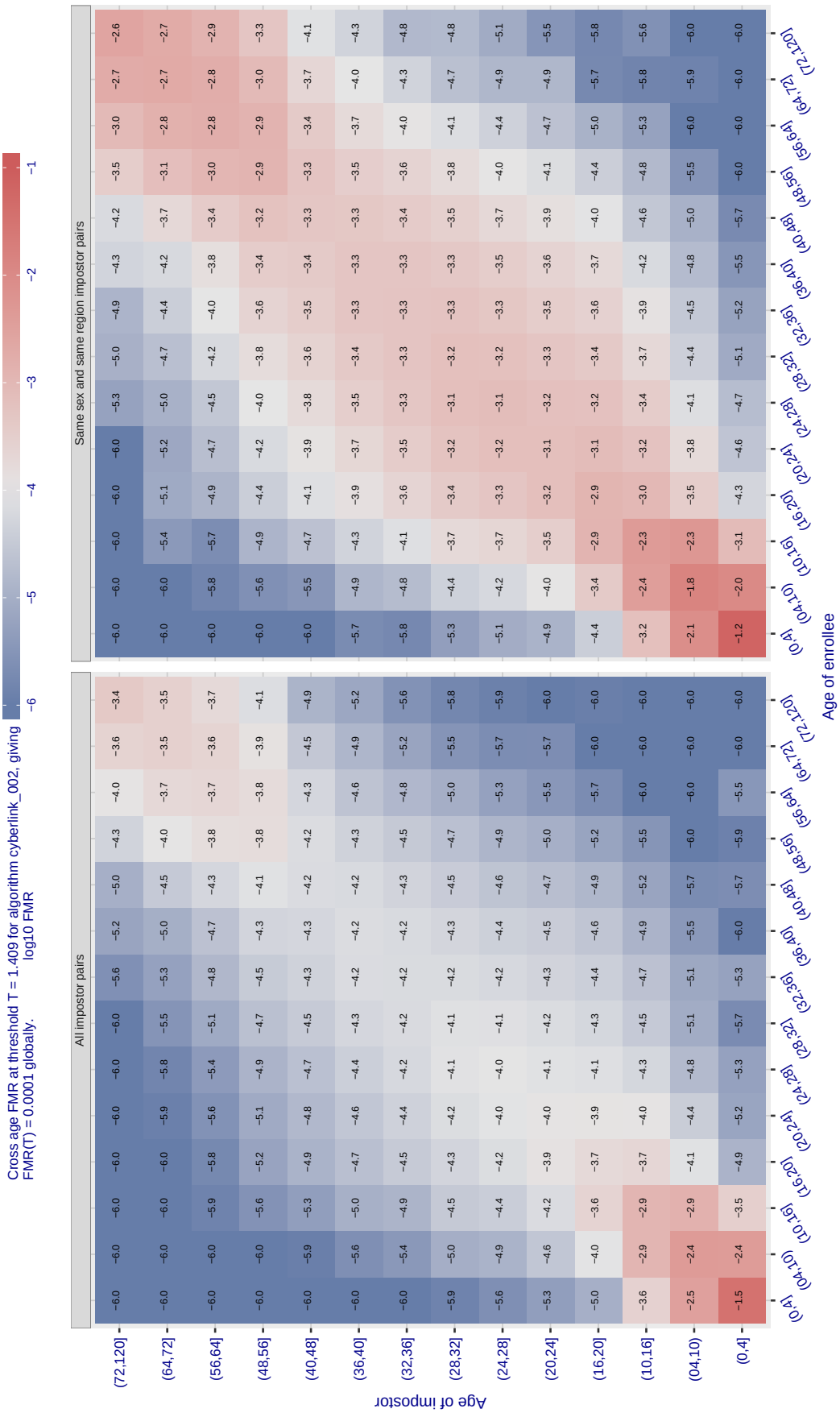


Figure 474: For algorithm cyberlink-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

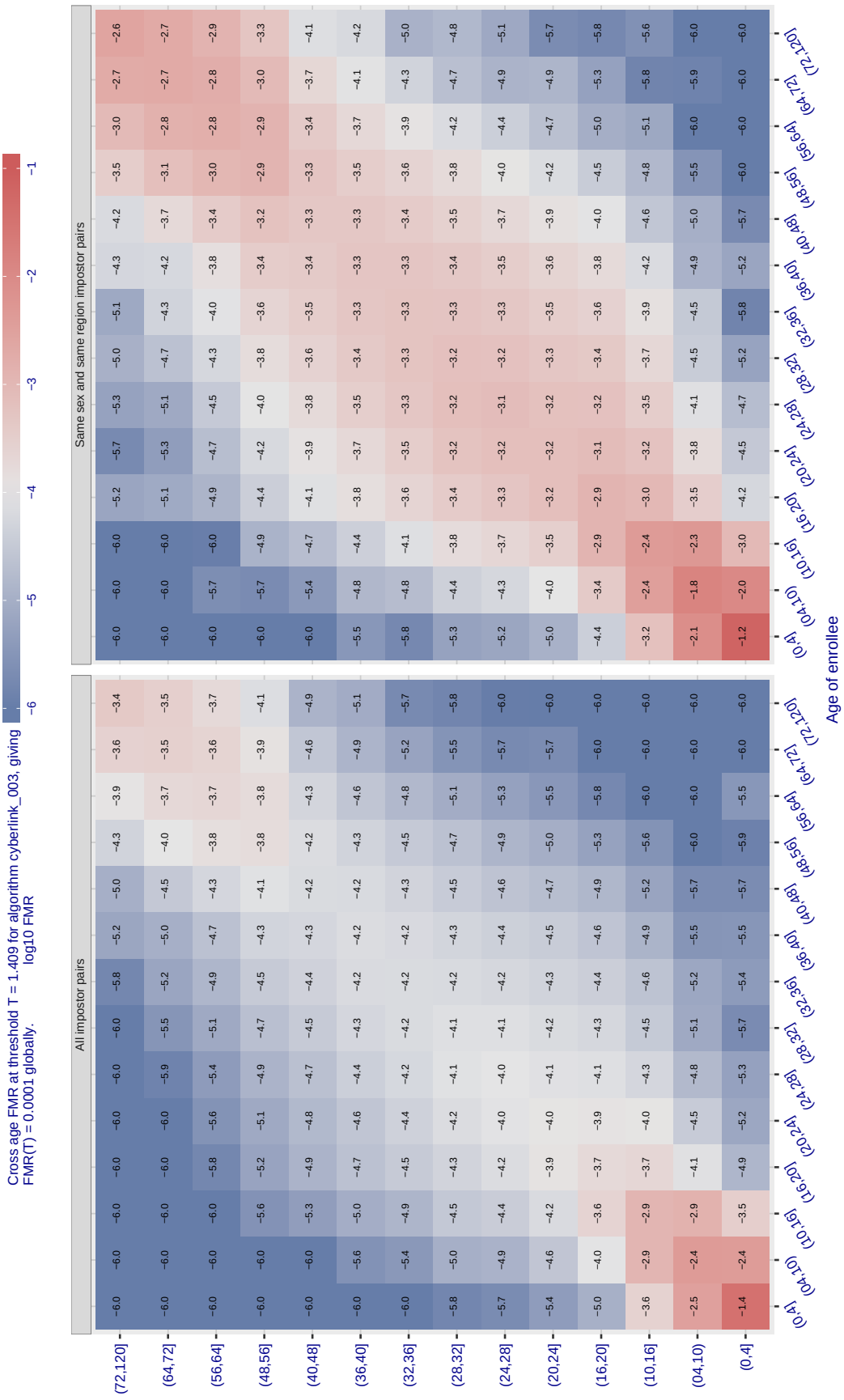


Figure 475: For algorithm cyberlink-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

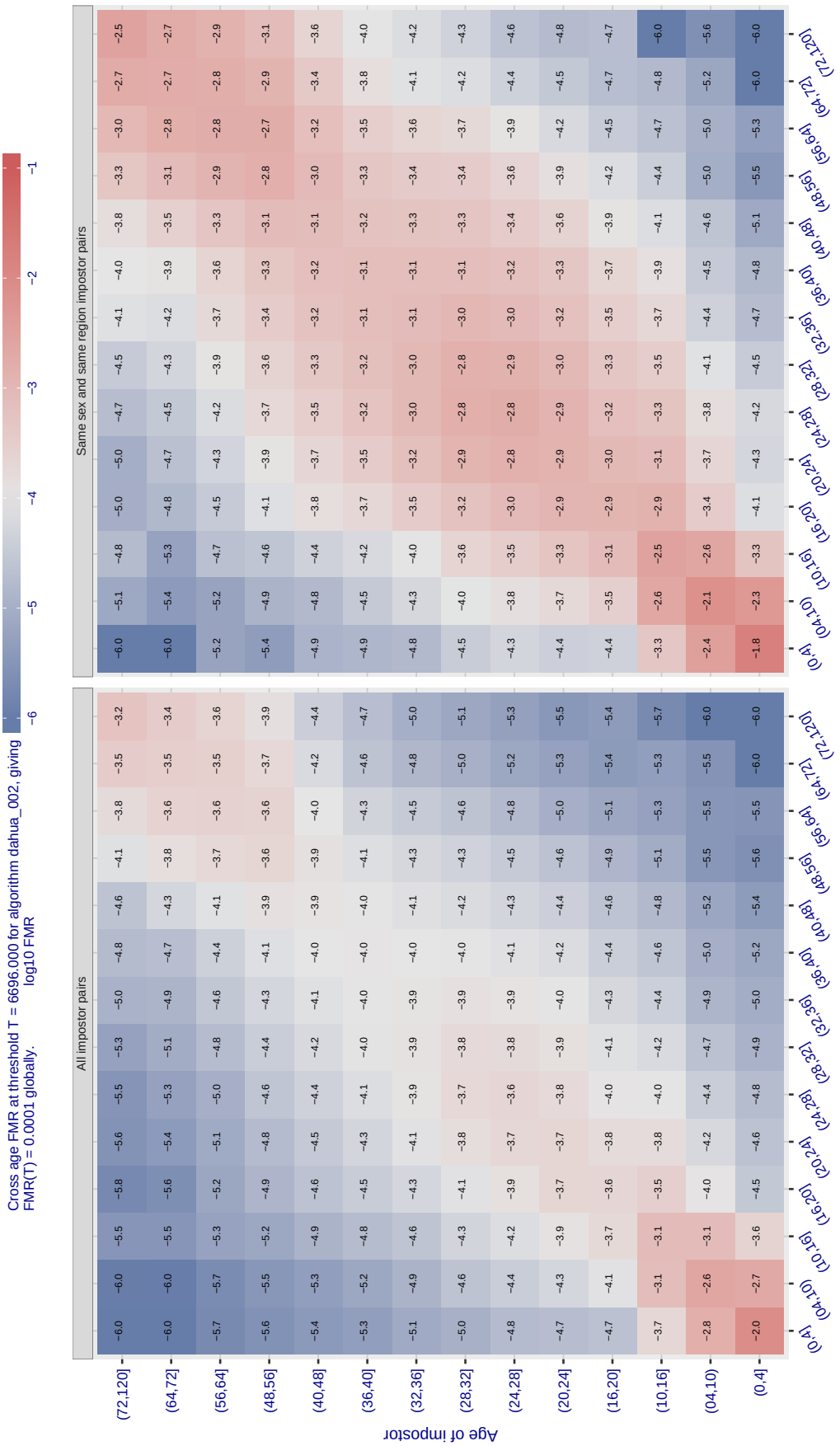


Figure 476: For algorithm dahua-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

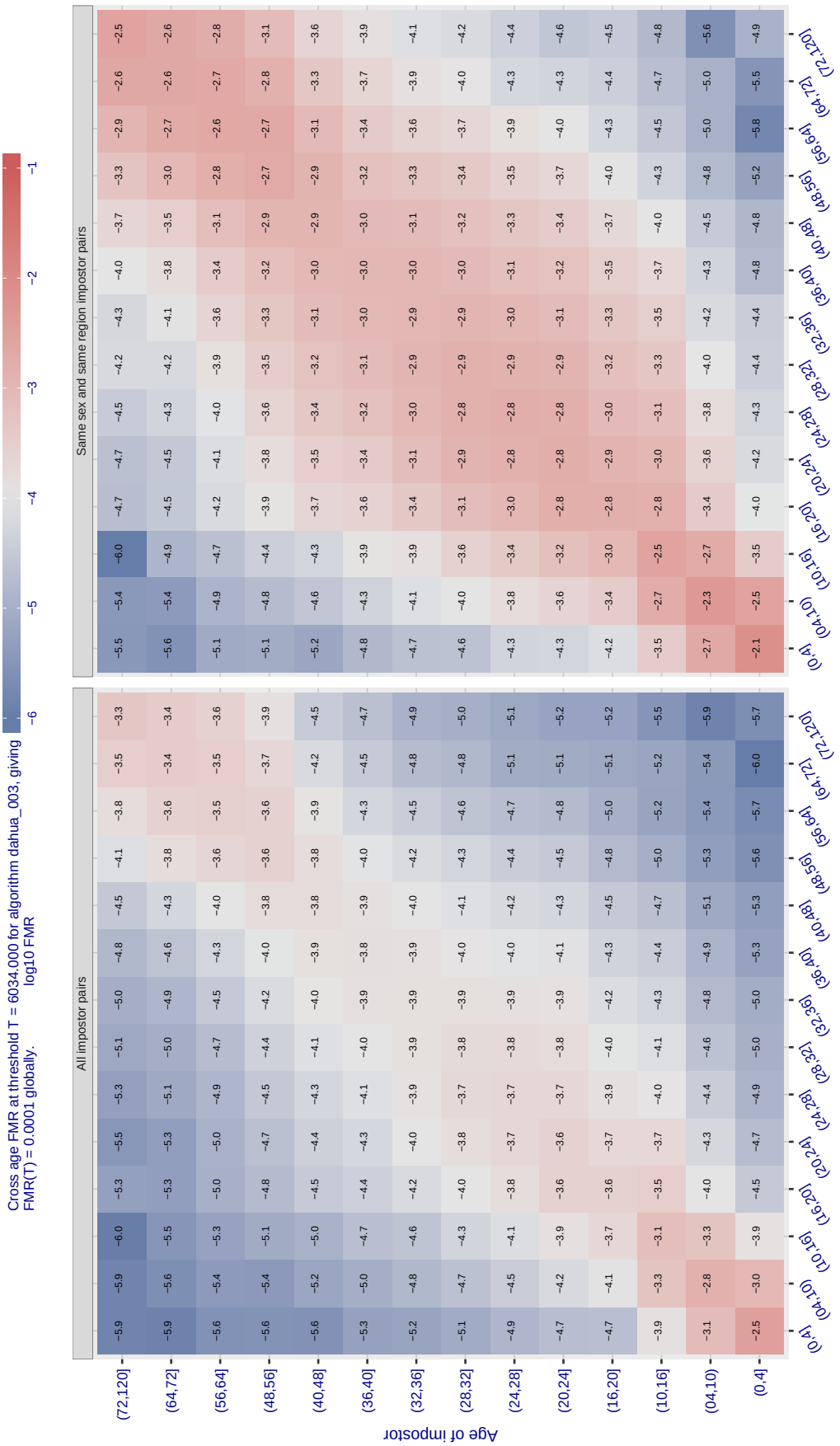


Figure 477: For algorithm dahua-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

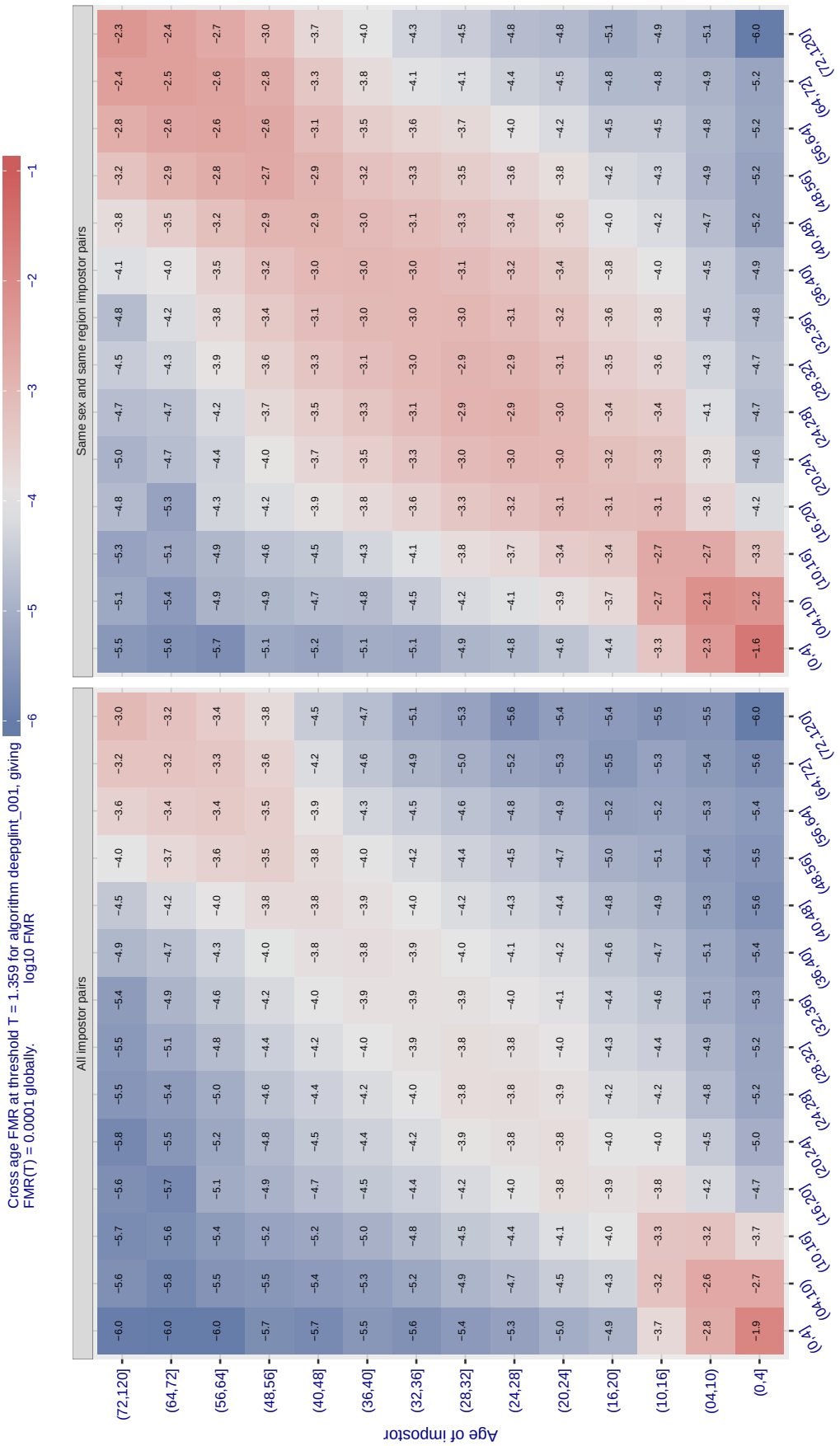


Figure 478: For algorithm deepglint-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

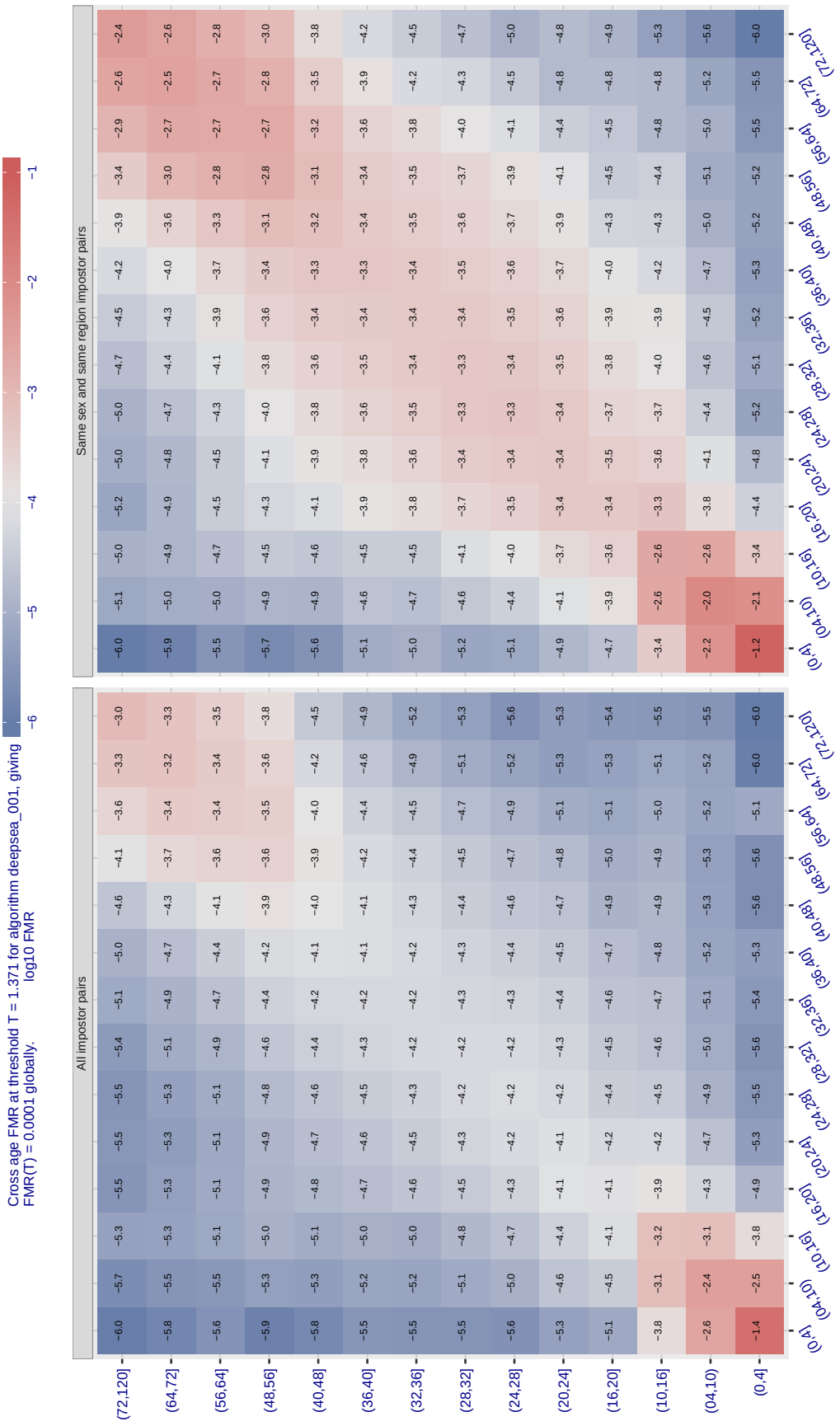


Figure 479: For algorithm deepsea-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

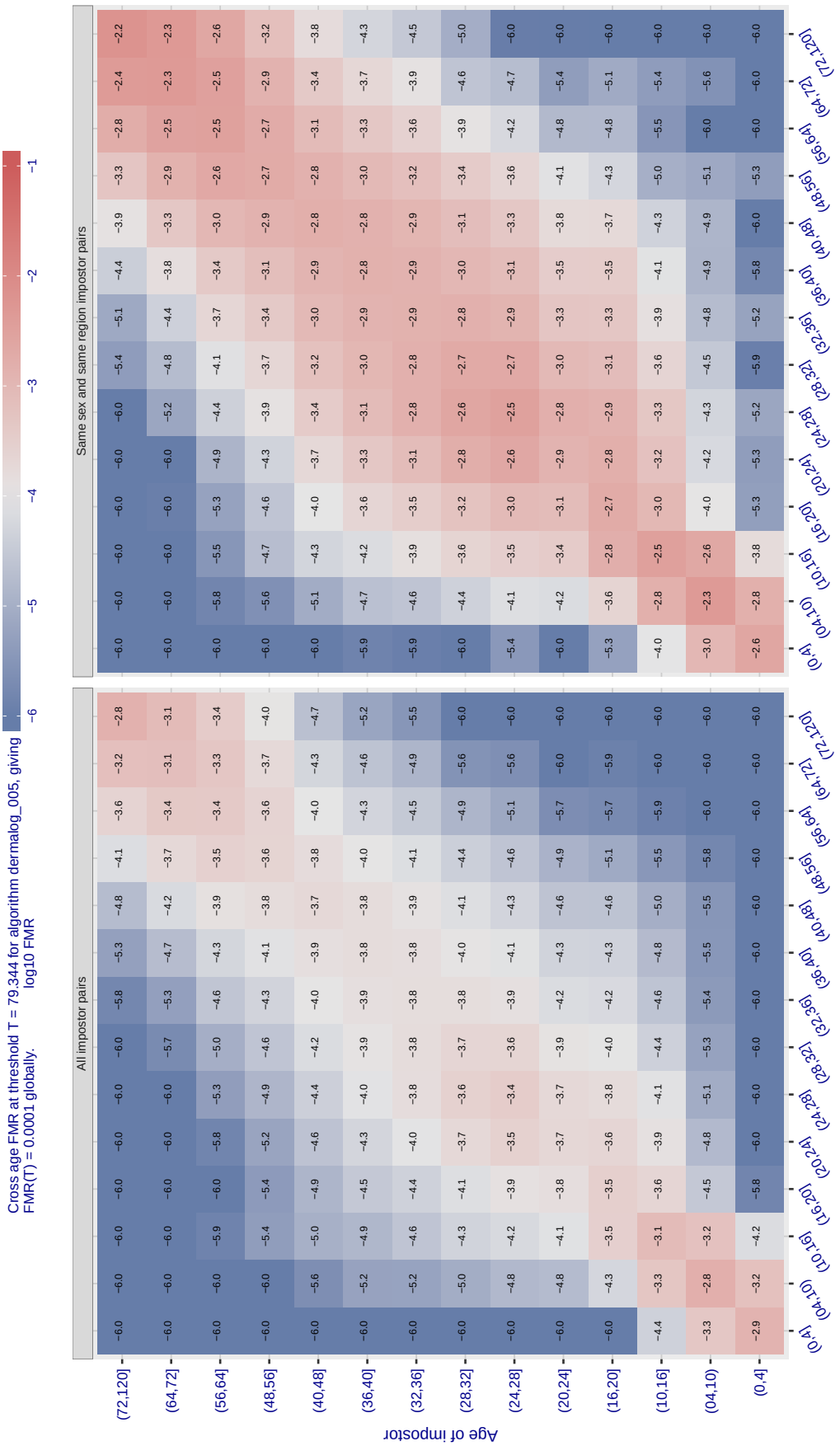


Figure 480: For algorithm dermalog-005 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

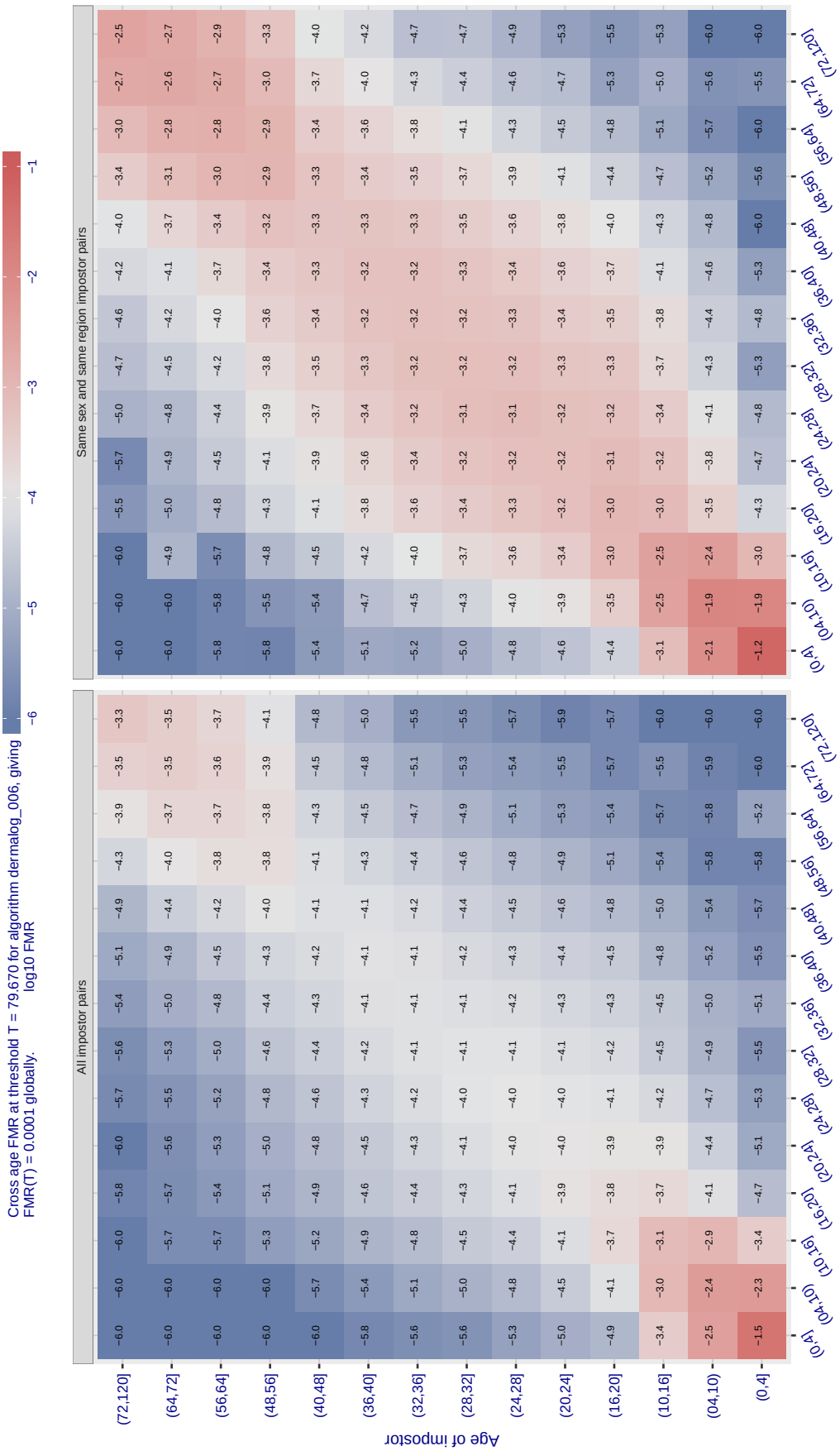


Figure 481: For algorithm dermalog-006 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

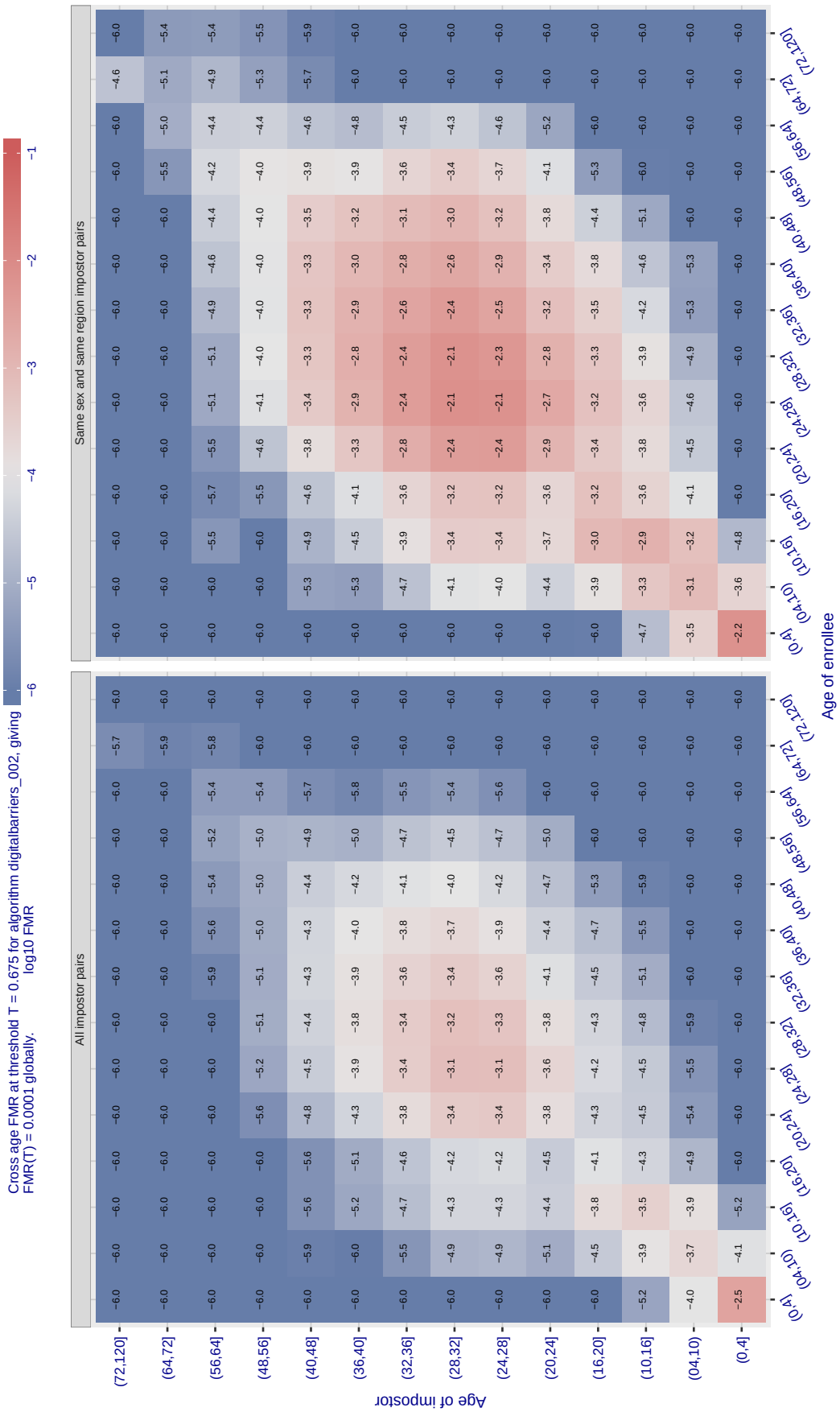


Figure 482: For algorithm digitalbarriers-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

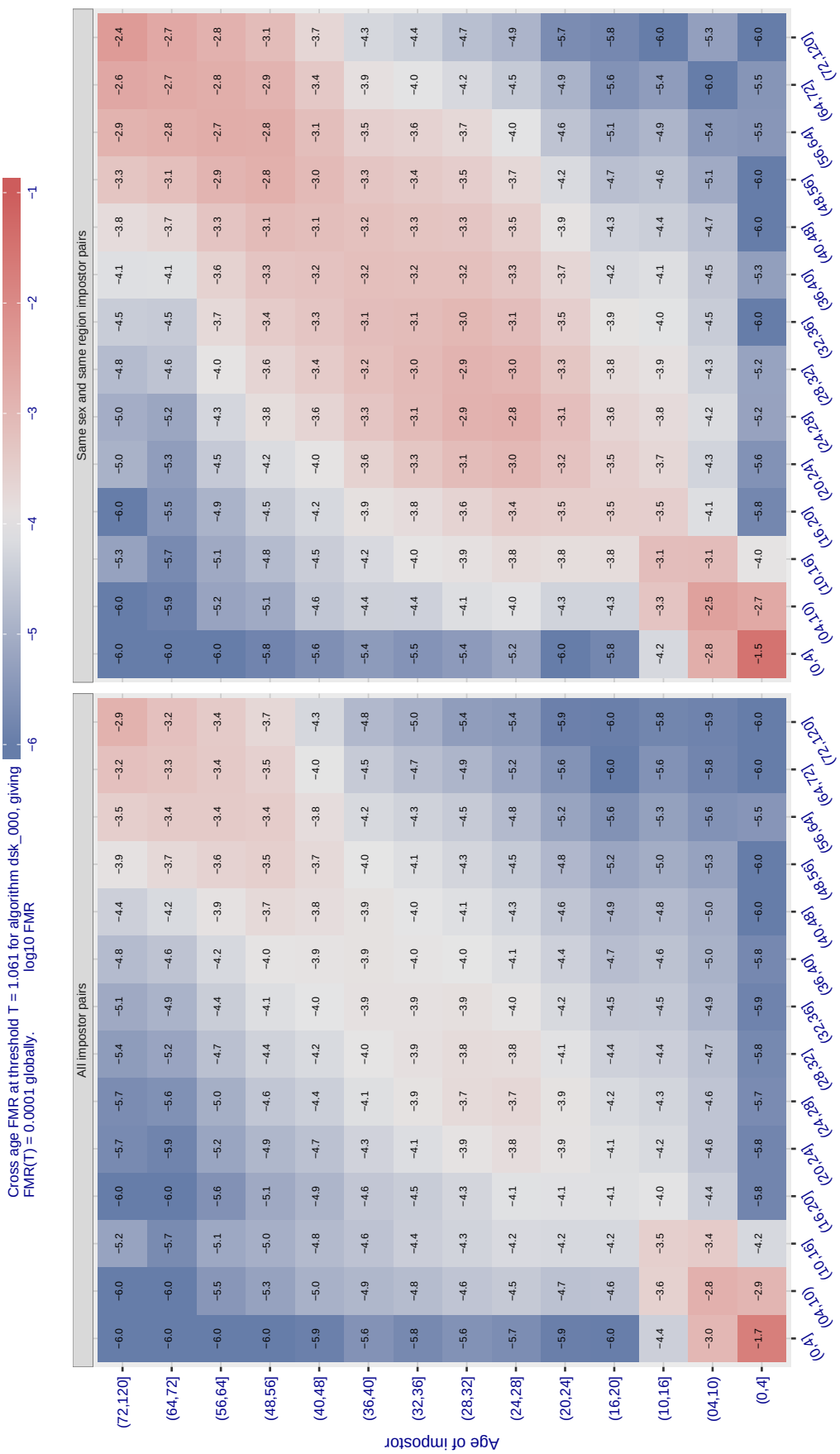


Figure 483: For algorithm dsk-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

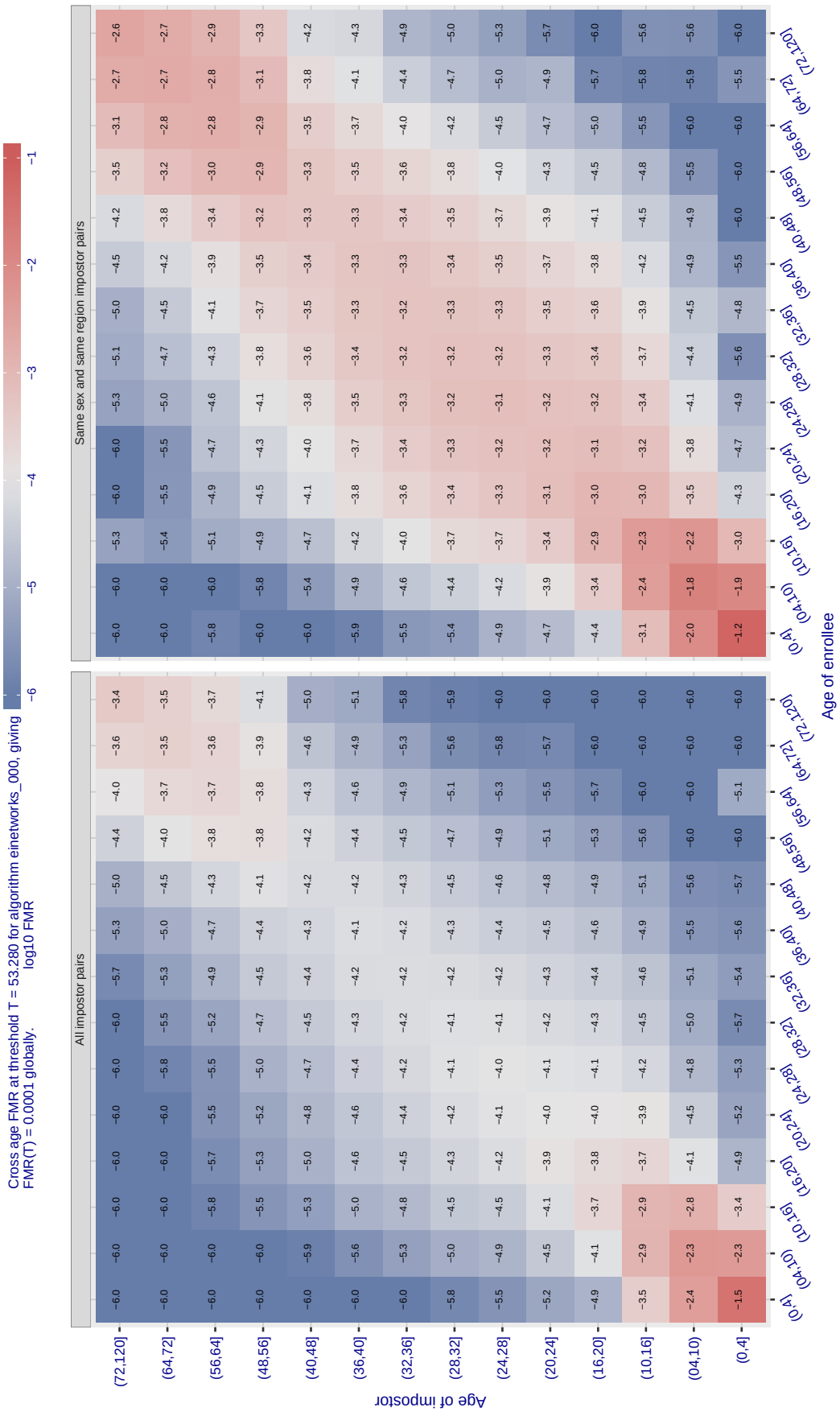


Figure 484: For algorithm einetworks-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

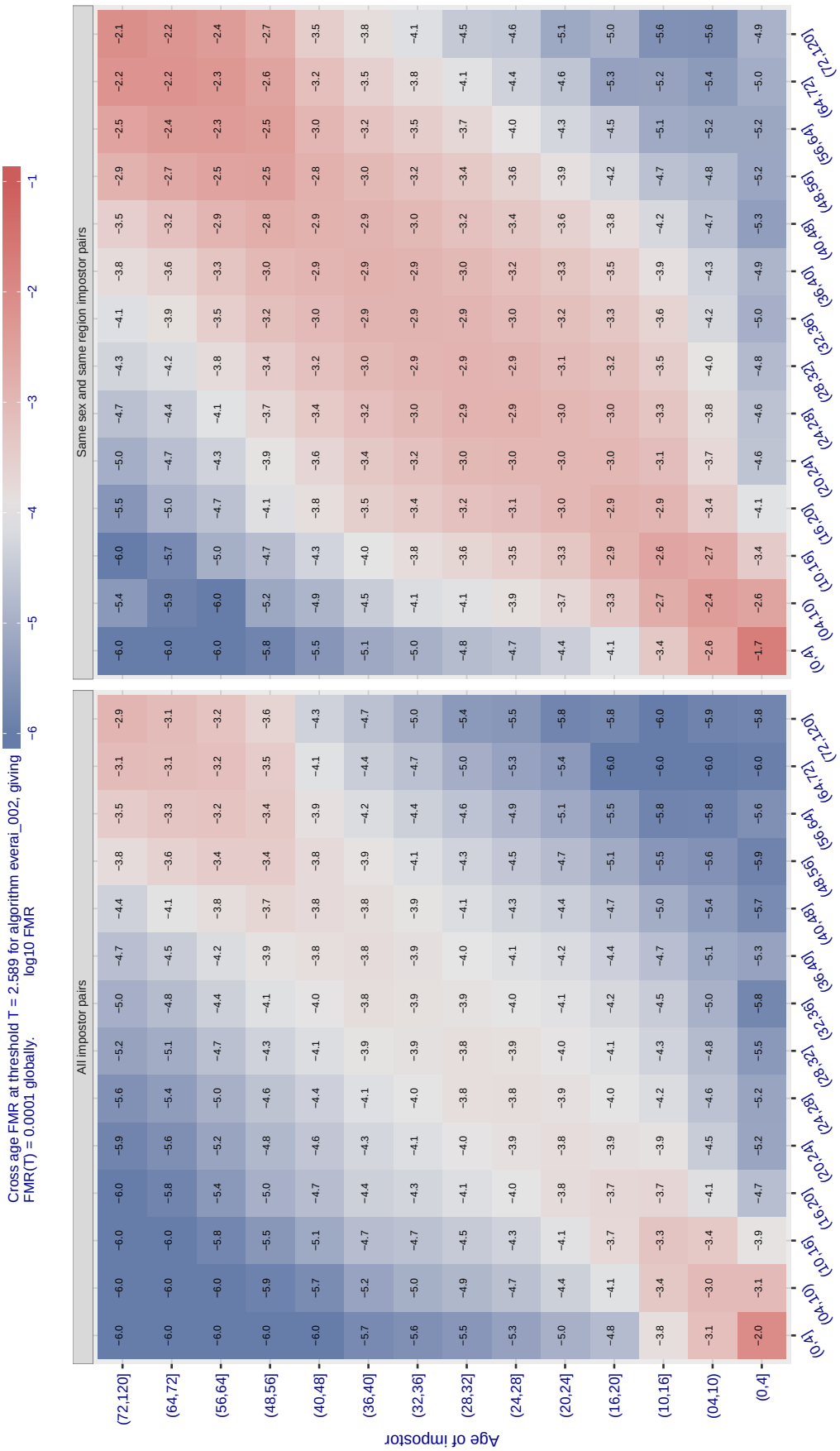


Figure 485: For algorithm everai-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

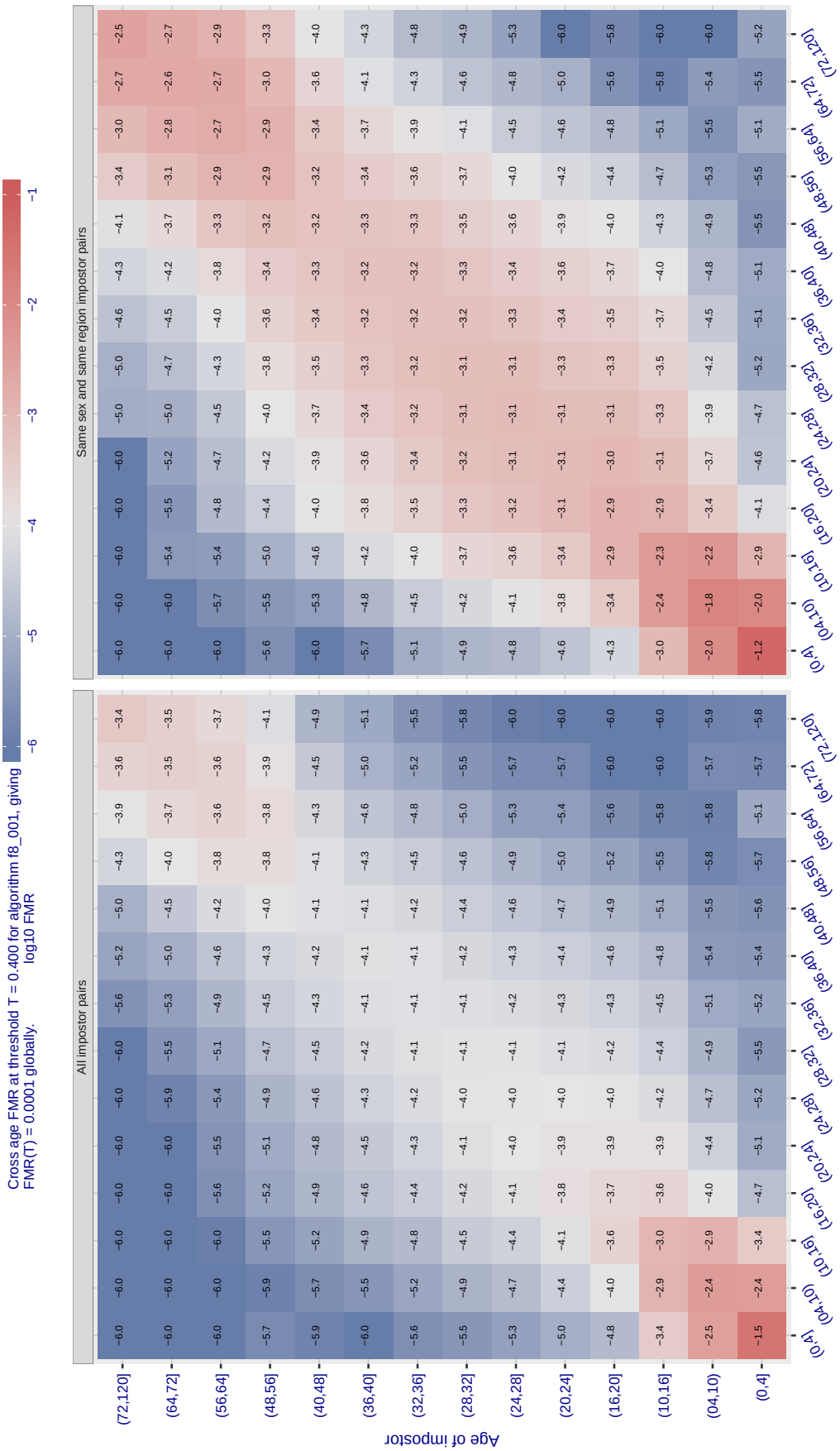


Figure 486: For algorithm f8-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

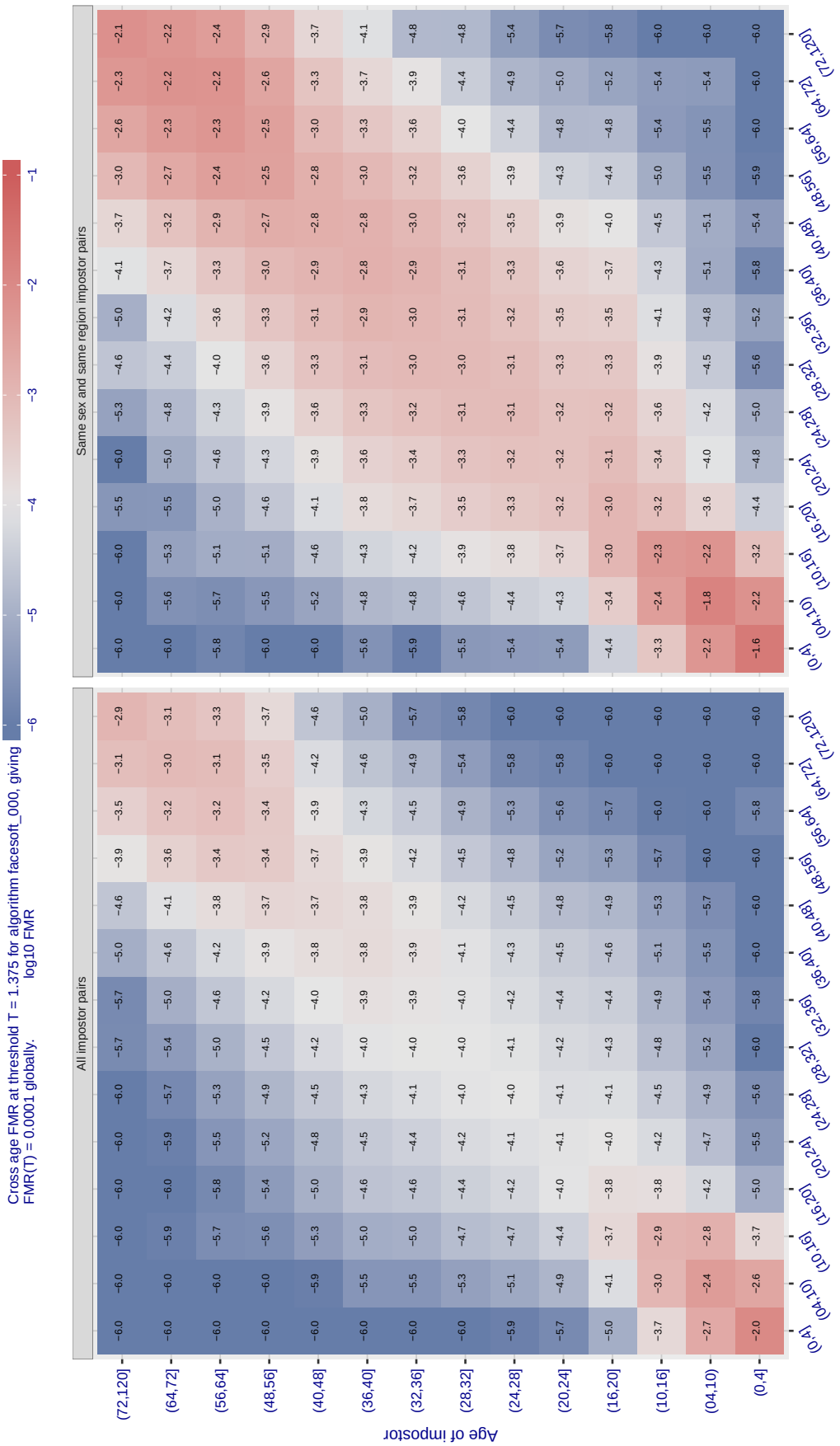


Figure 487: For algorithm facesoft-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

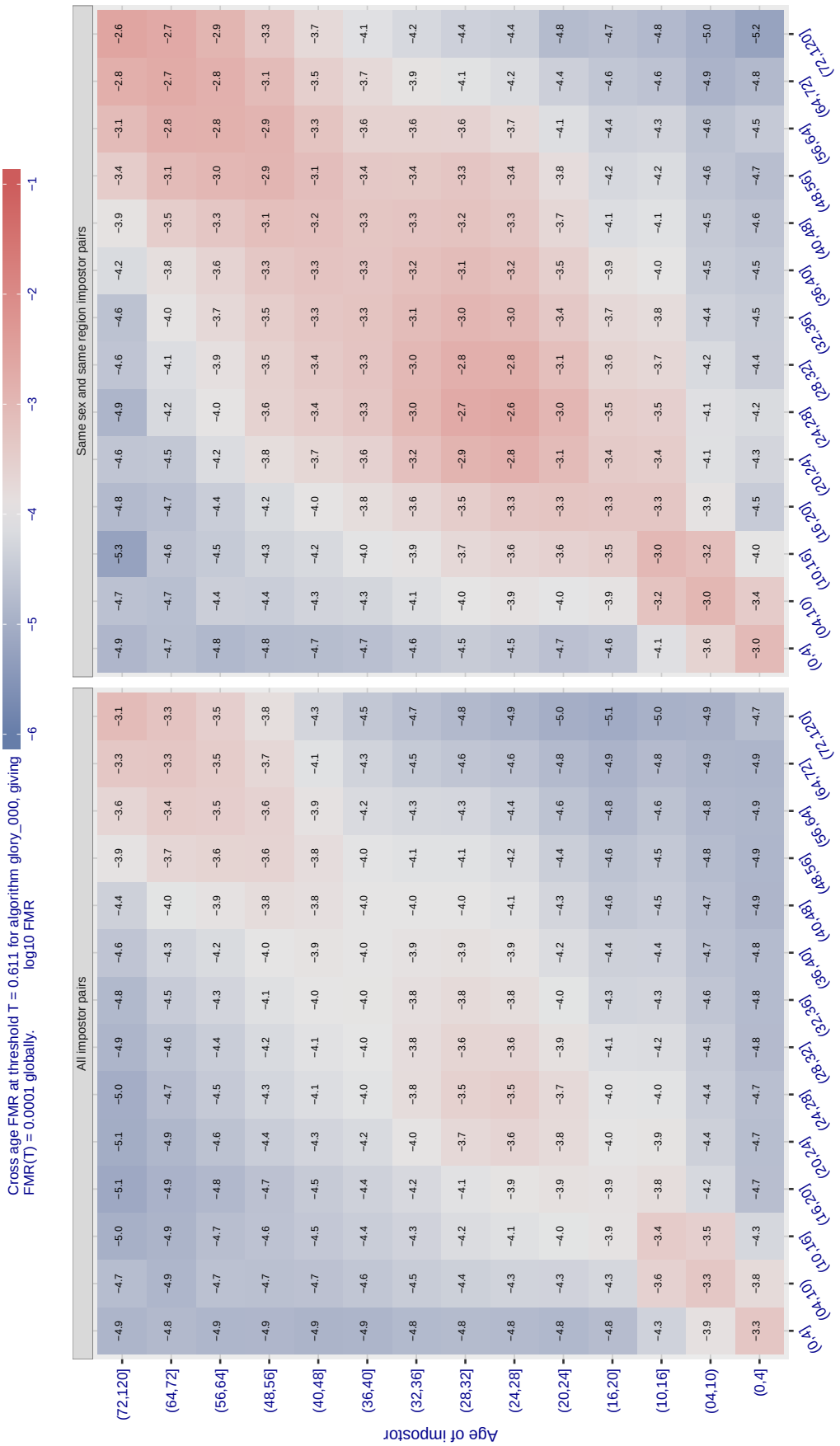


Figure 488: For algorithm glory-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

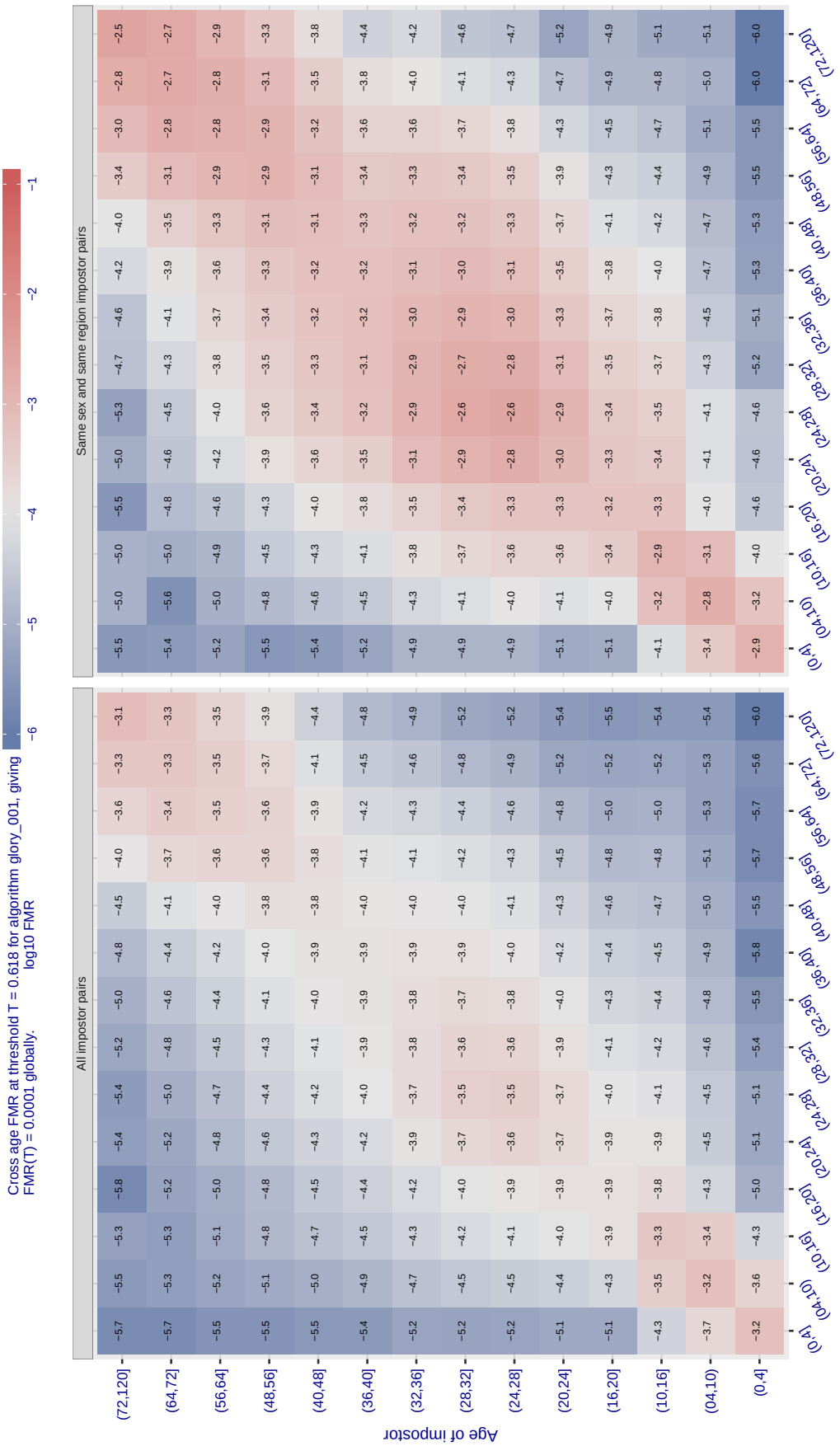


Figure 489: For algorithm glory-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

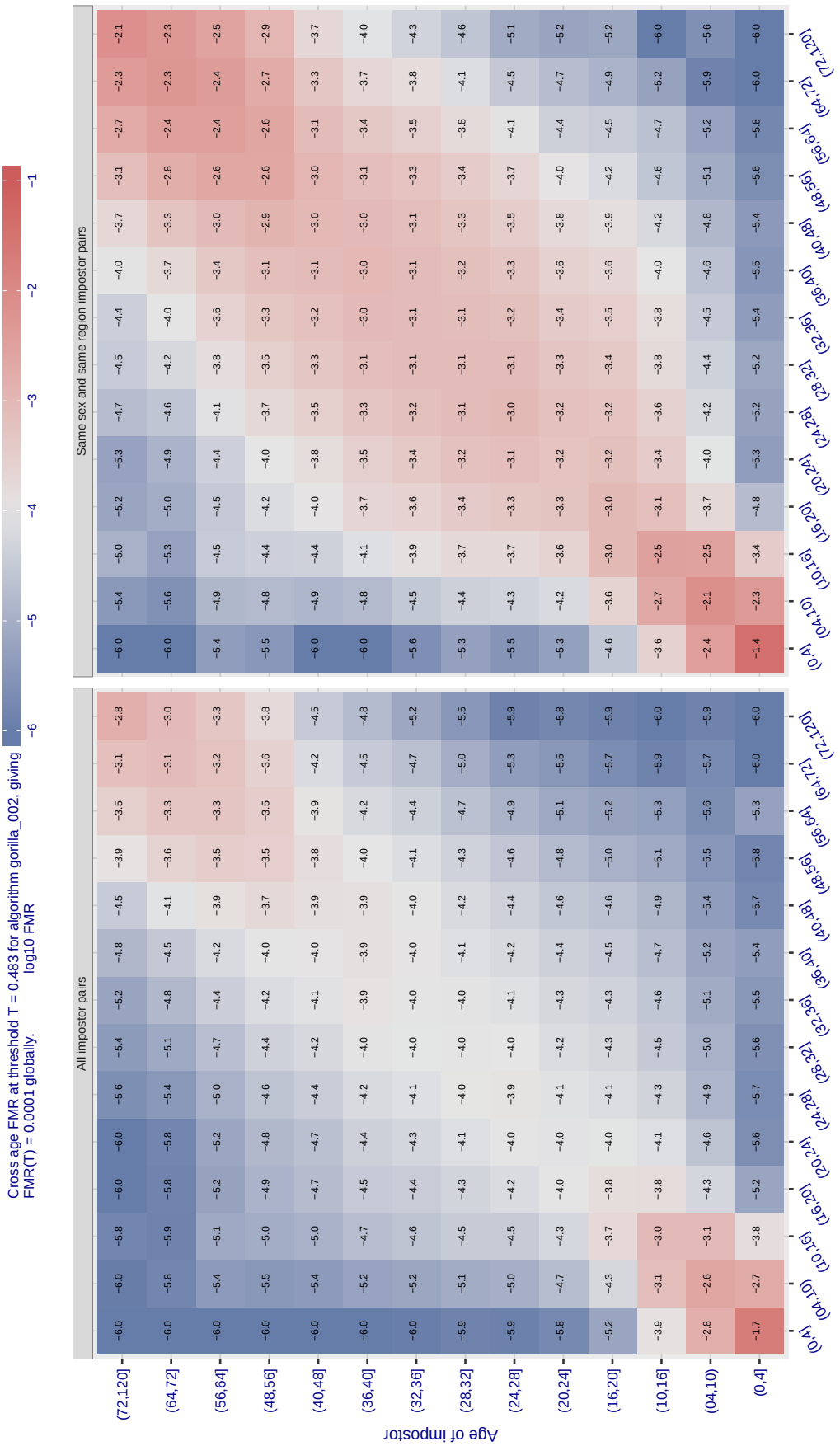


Figure 490: For algorithm gorilla-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

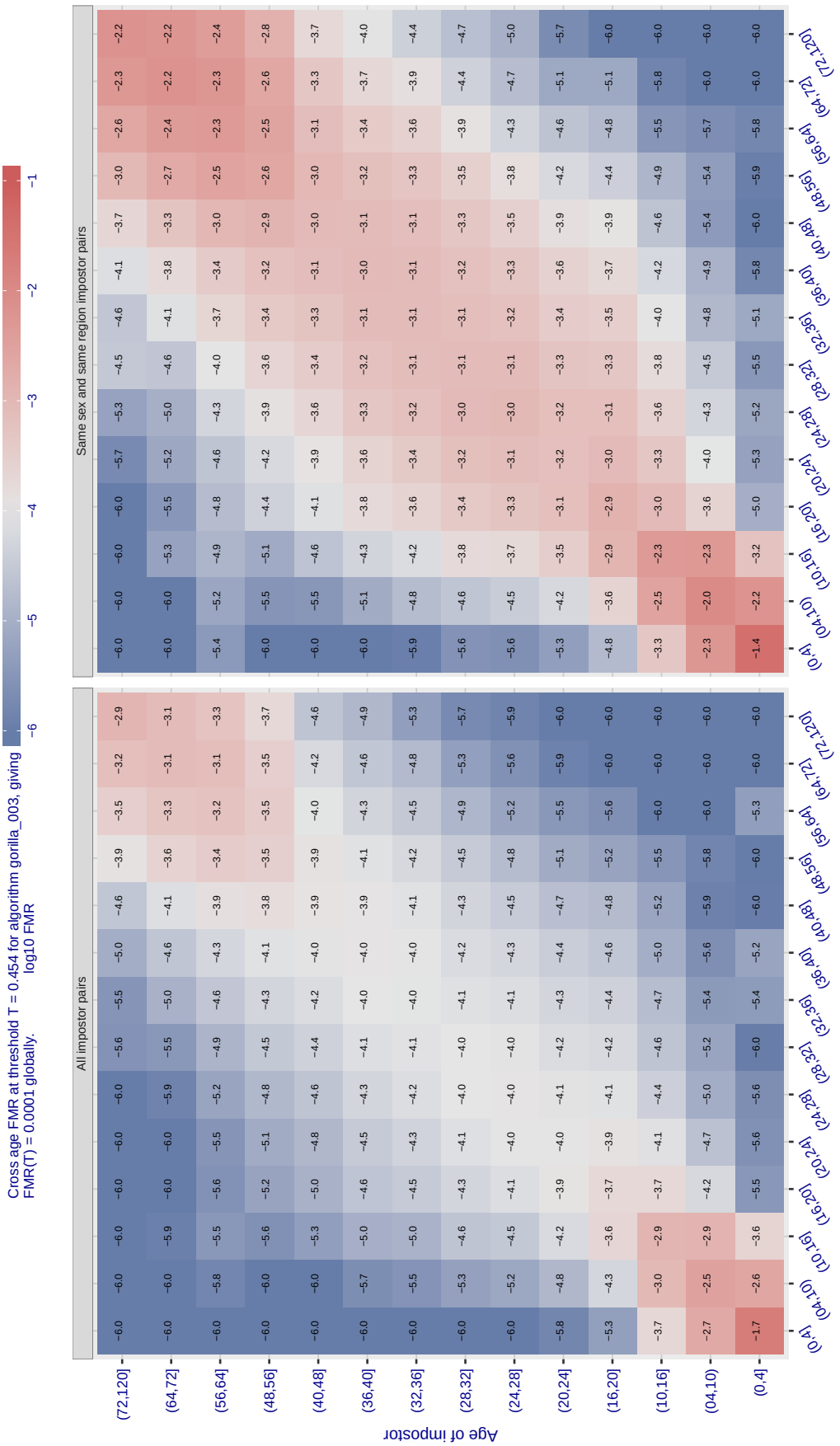


Figure 491: For algorithm gorilla-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

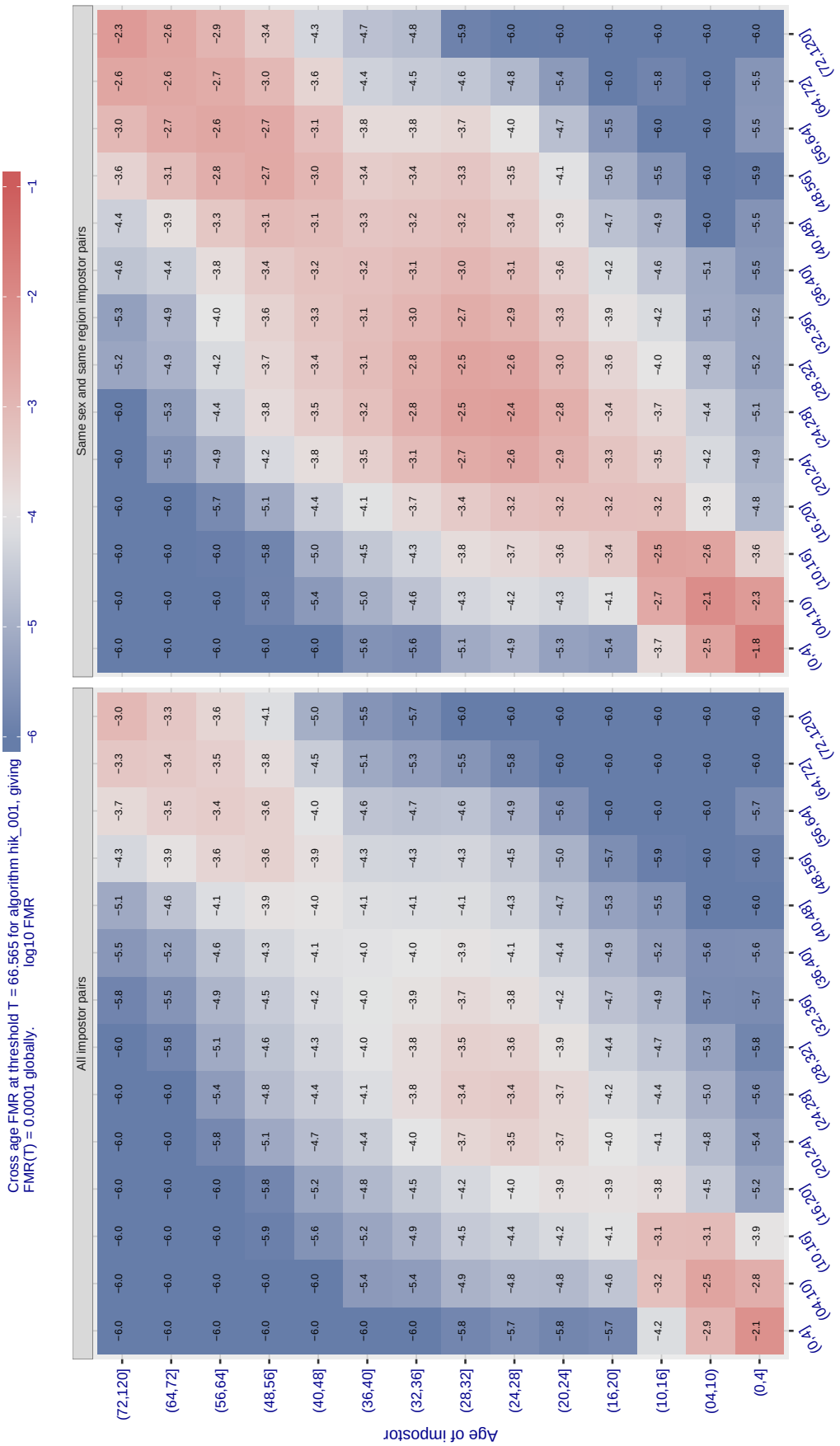


Figure 492: For algorithm hik-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

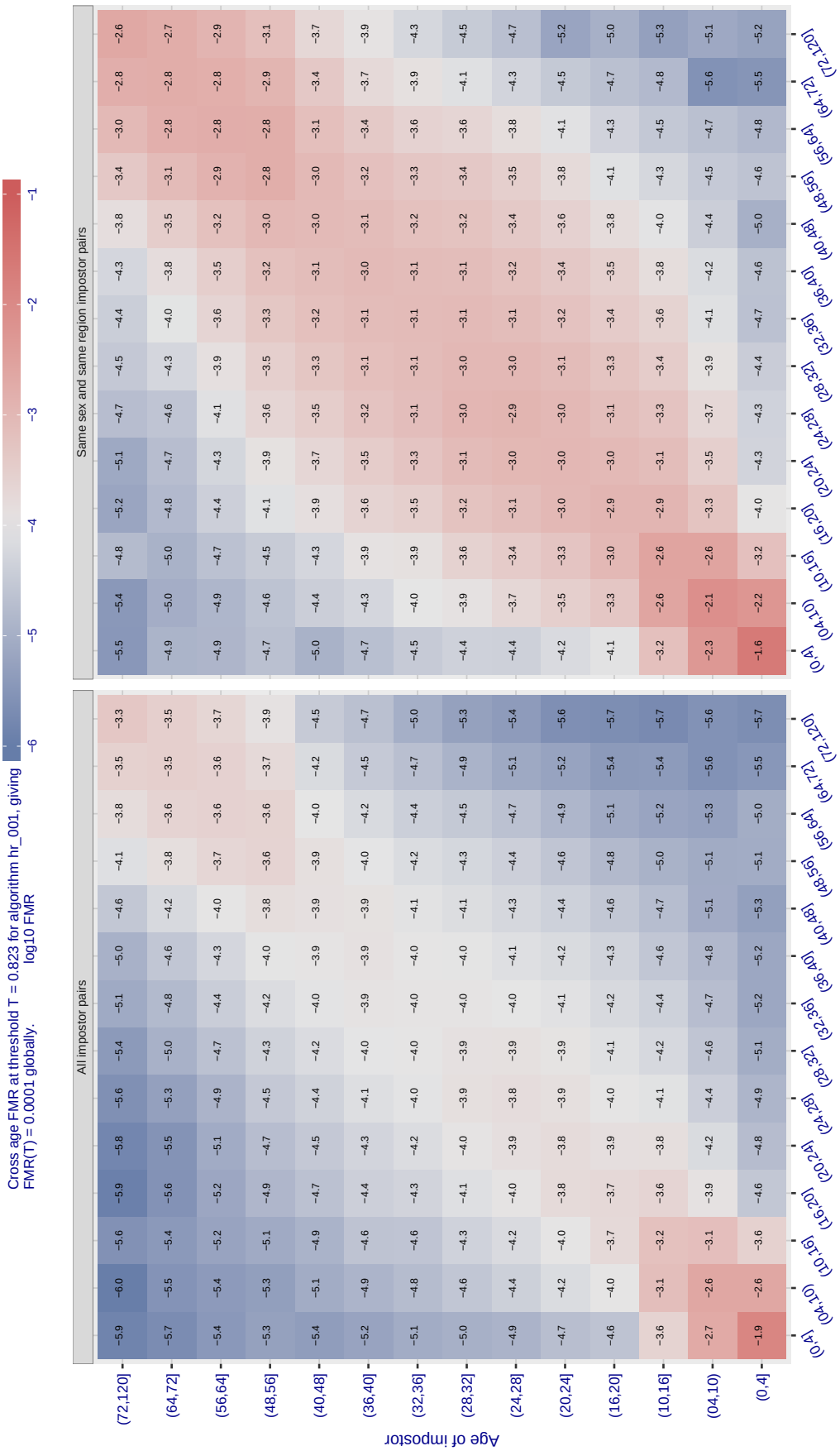


Figure 493: For algorithm hr-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

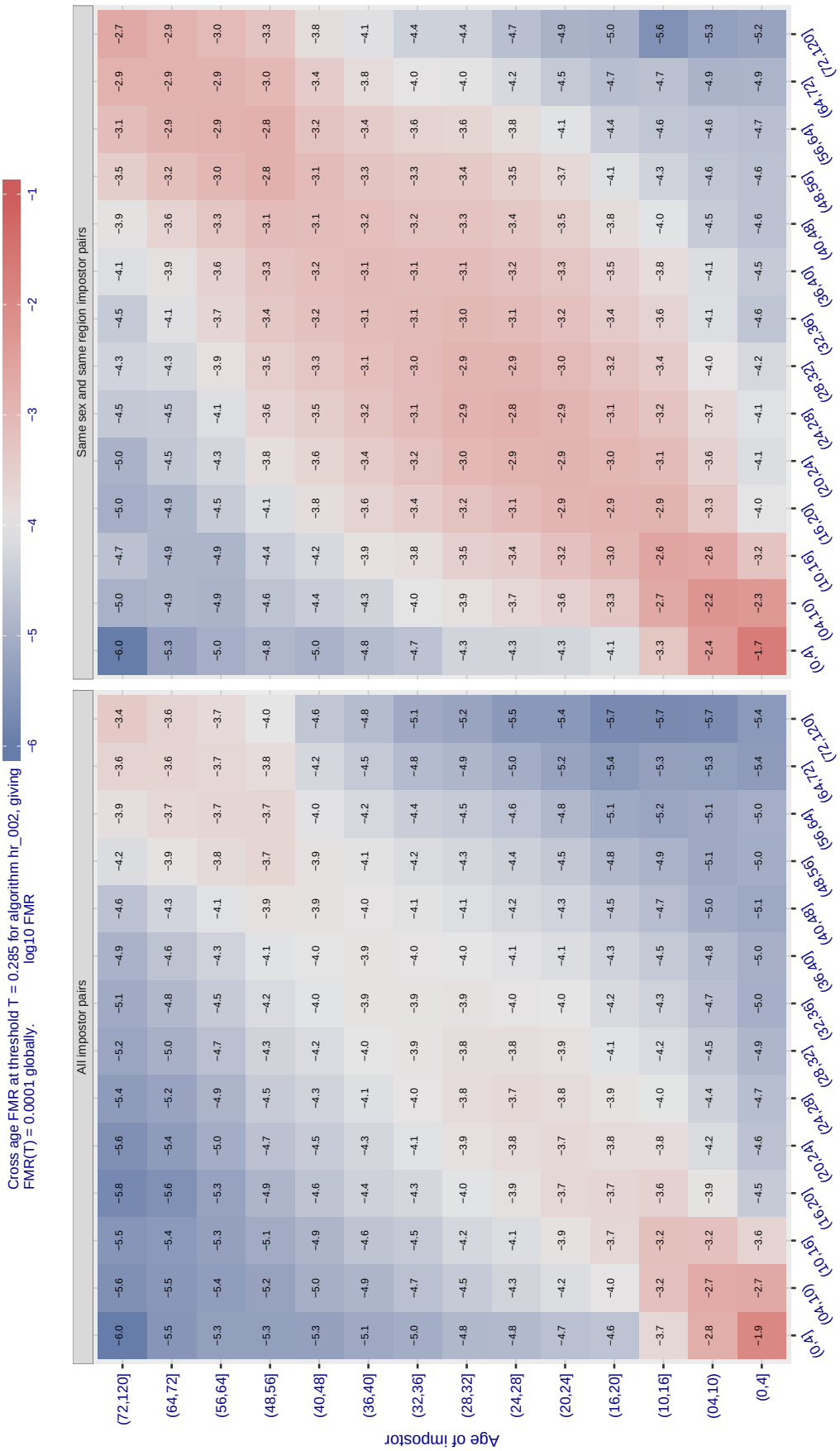


Figure 494: For algorithm hr-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

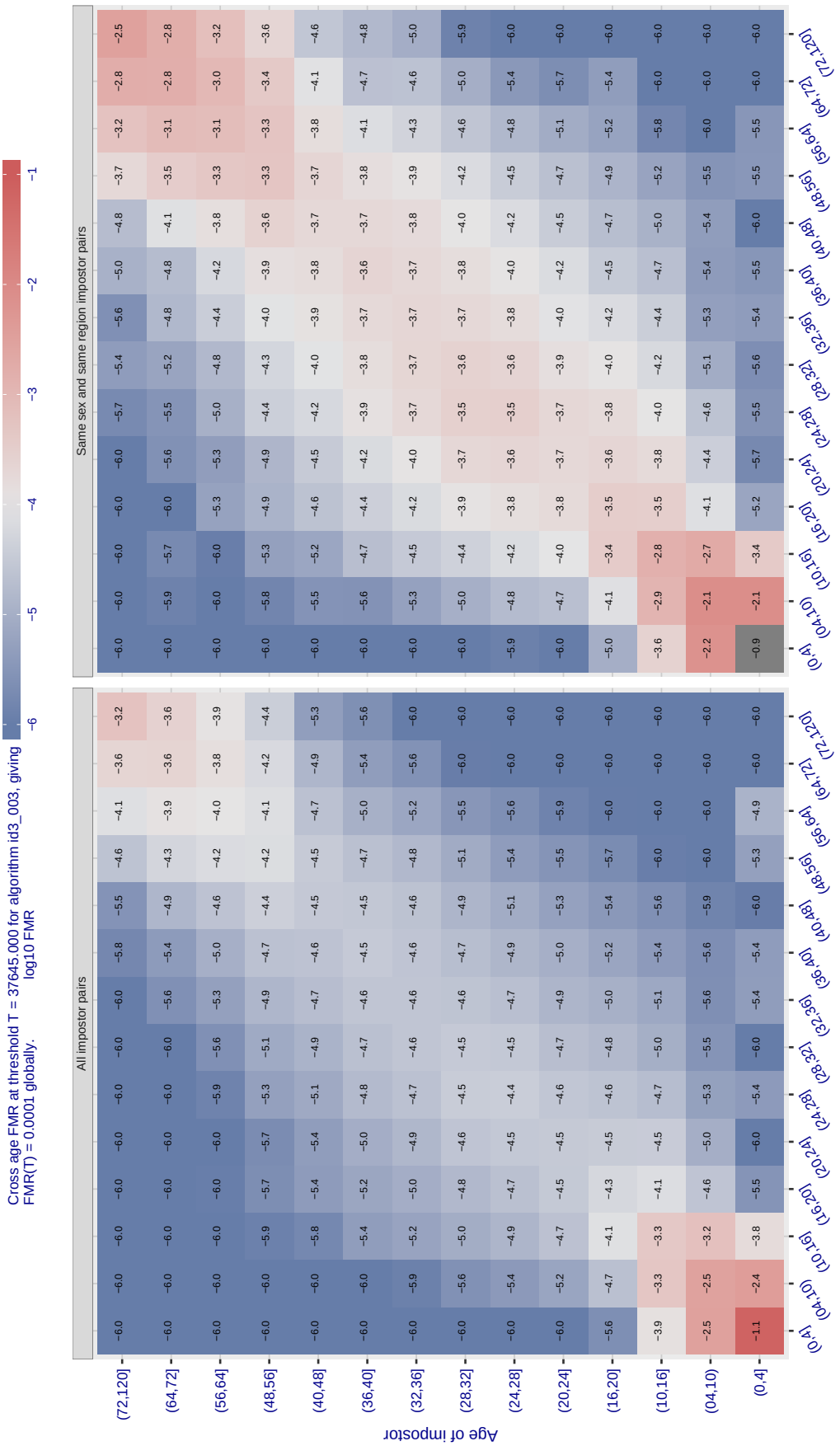


Figure 495: For algorithm id3-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

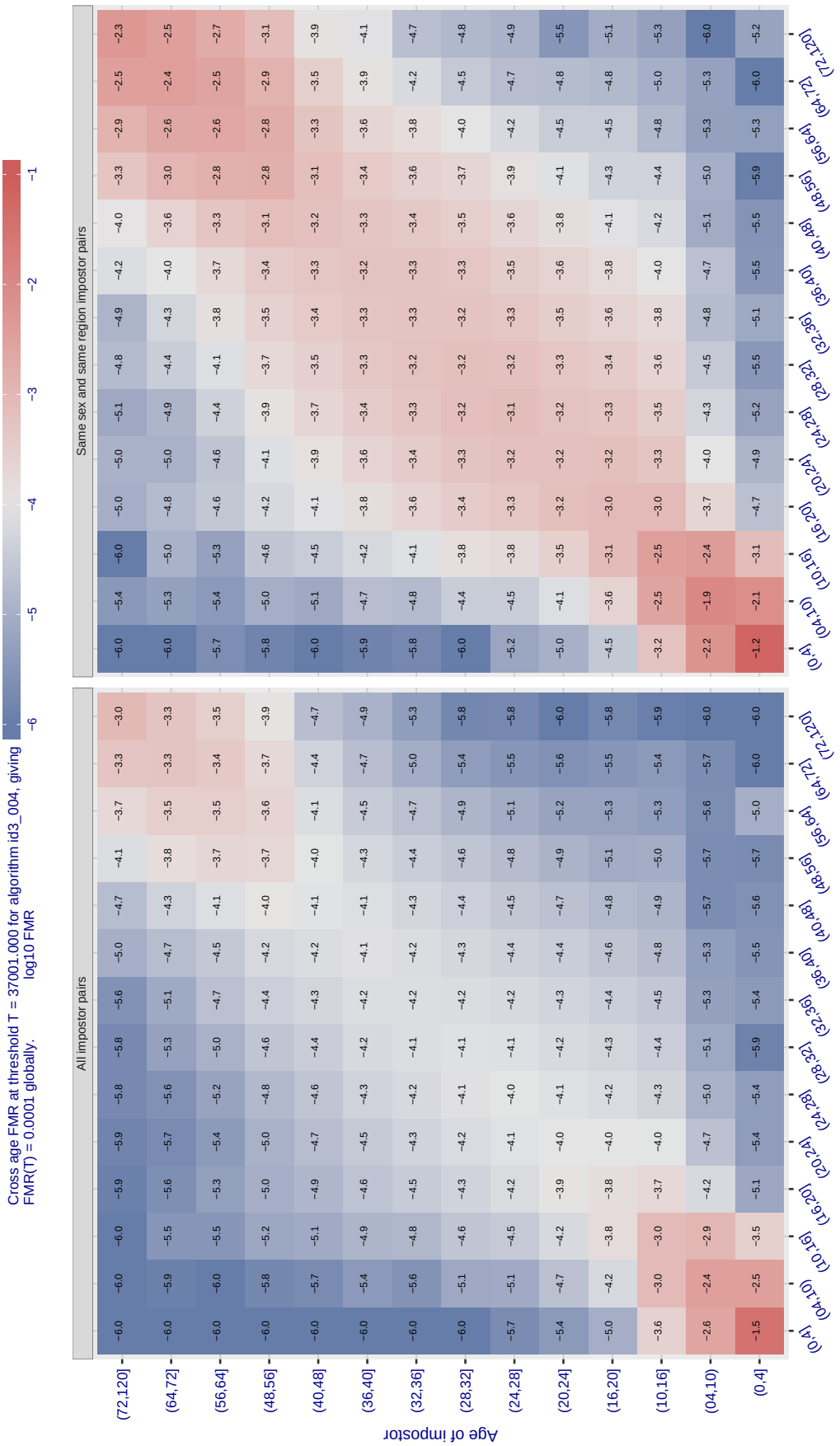


Figure 496: For algorithm id3-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

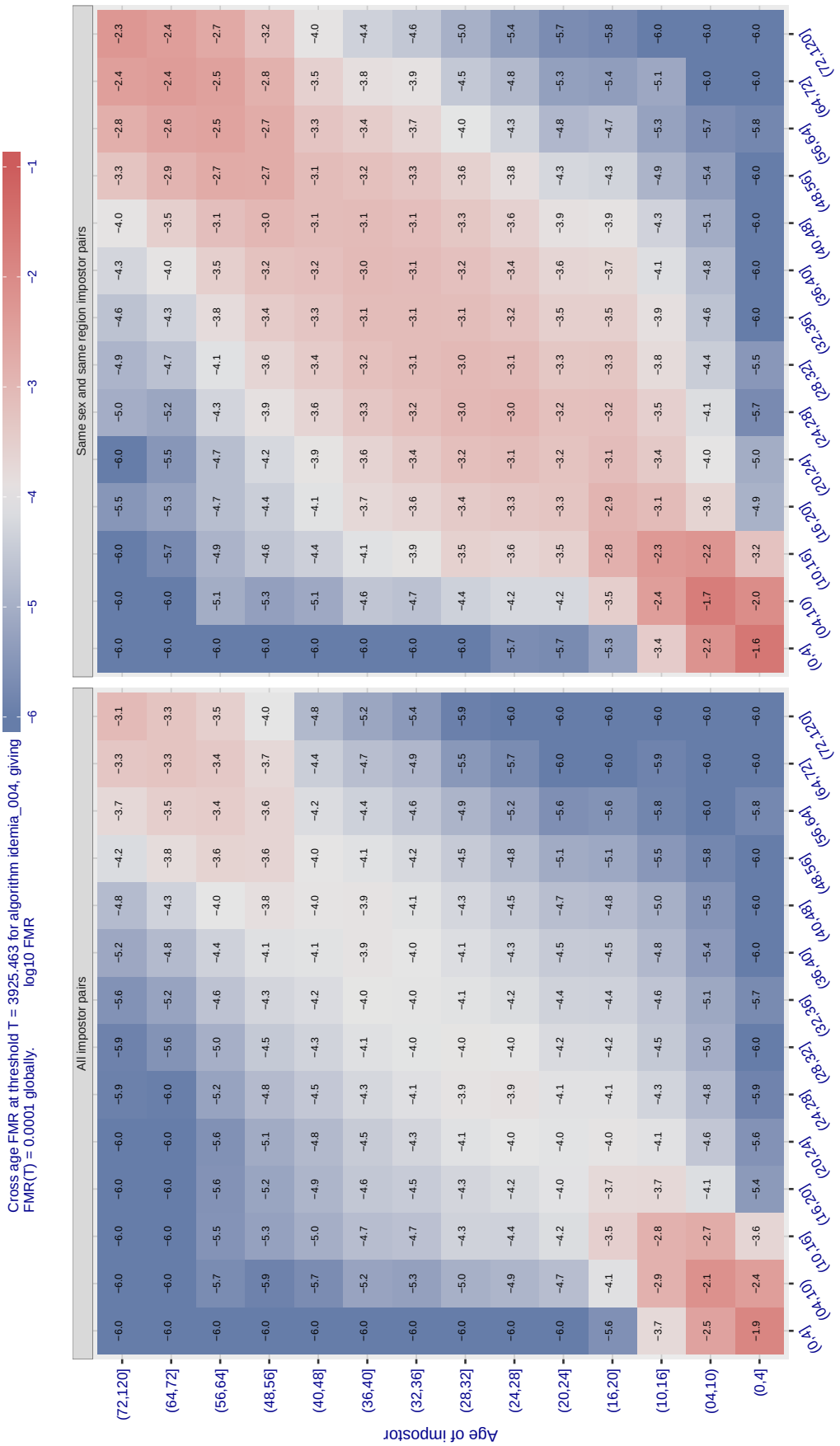


Figure 497: For algorithm idemia-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

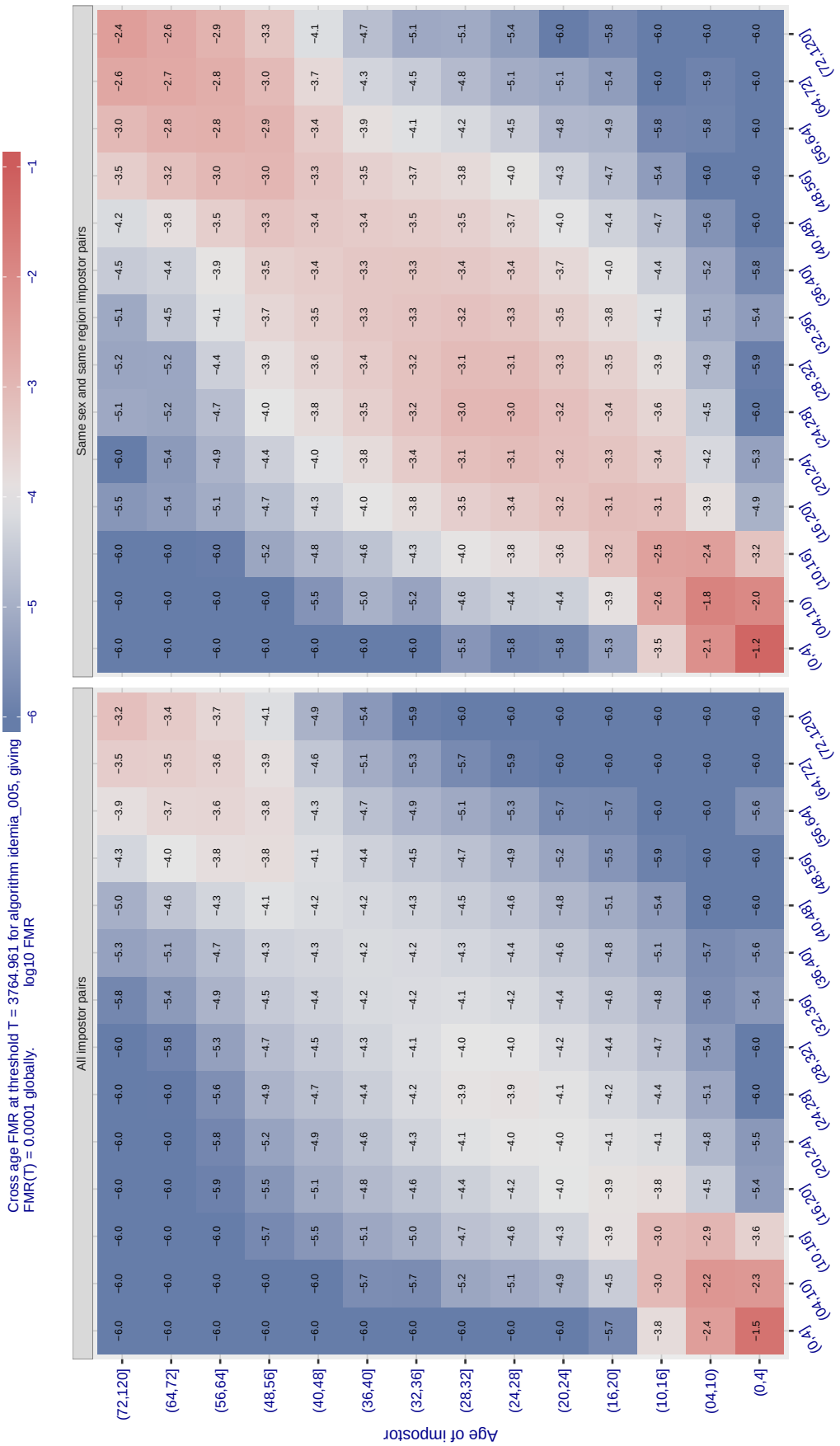


Figure 498: For algorithm idemia-005 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

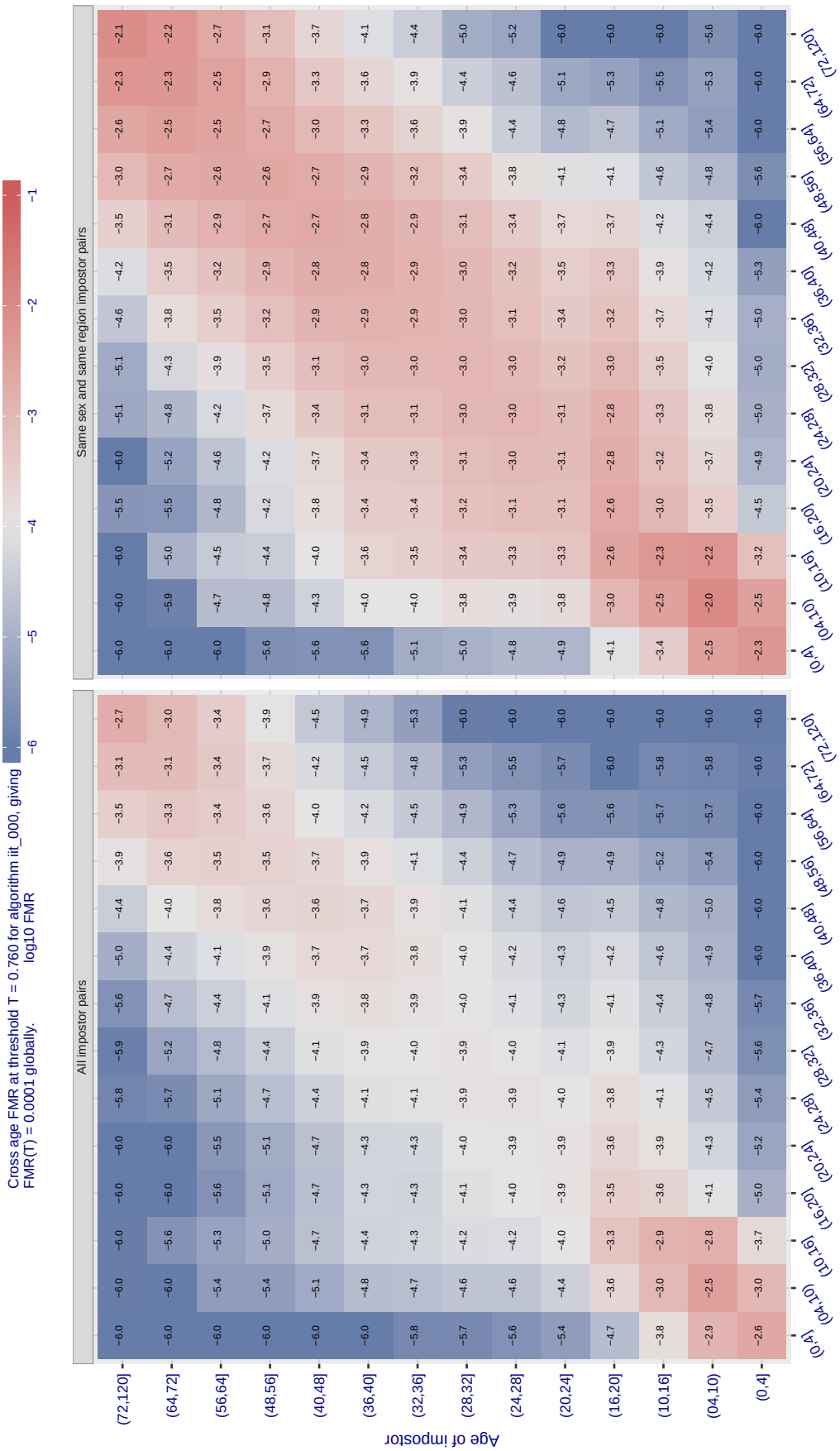


Figure 499: For algorithm iit-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

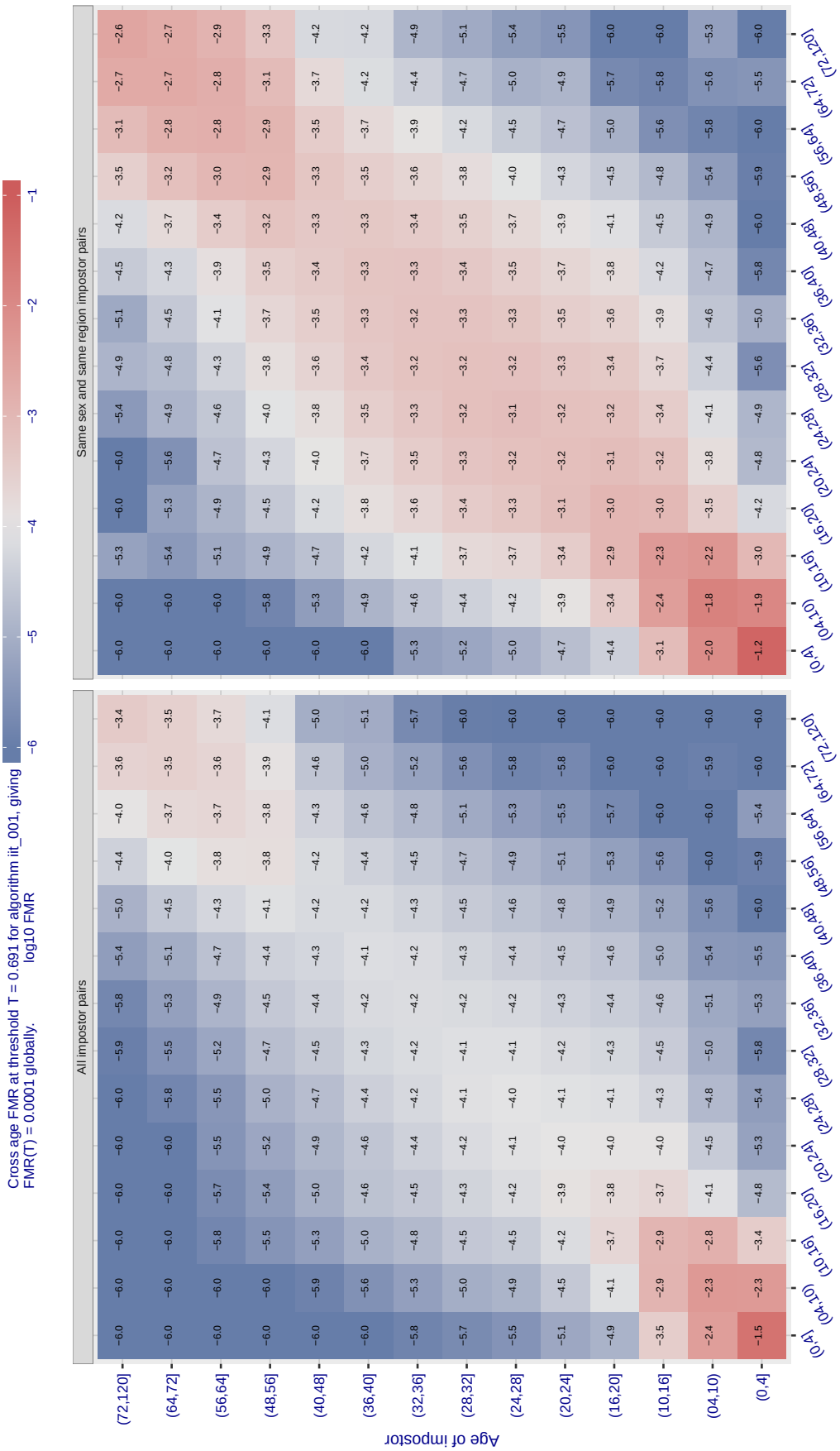


Figure 500: For algorithm iit-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

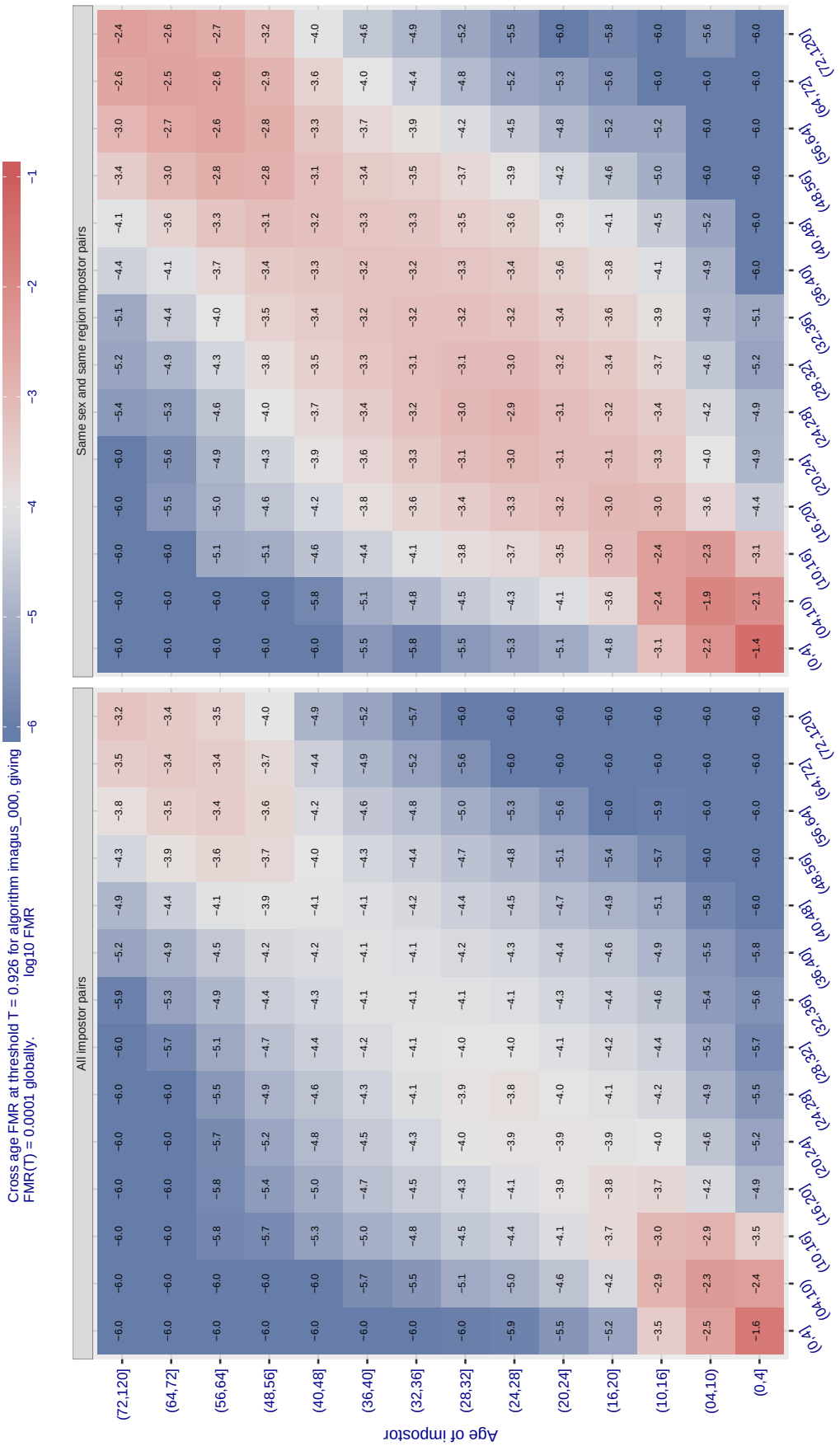


Figure 501: For algorithm imagus-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

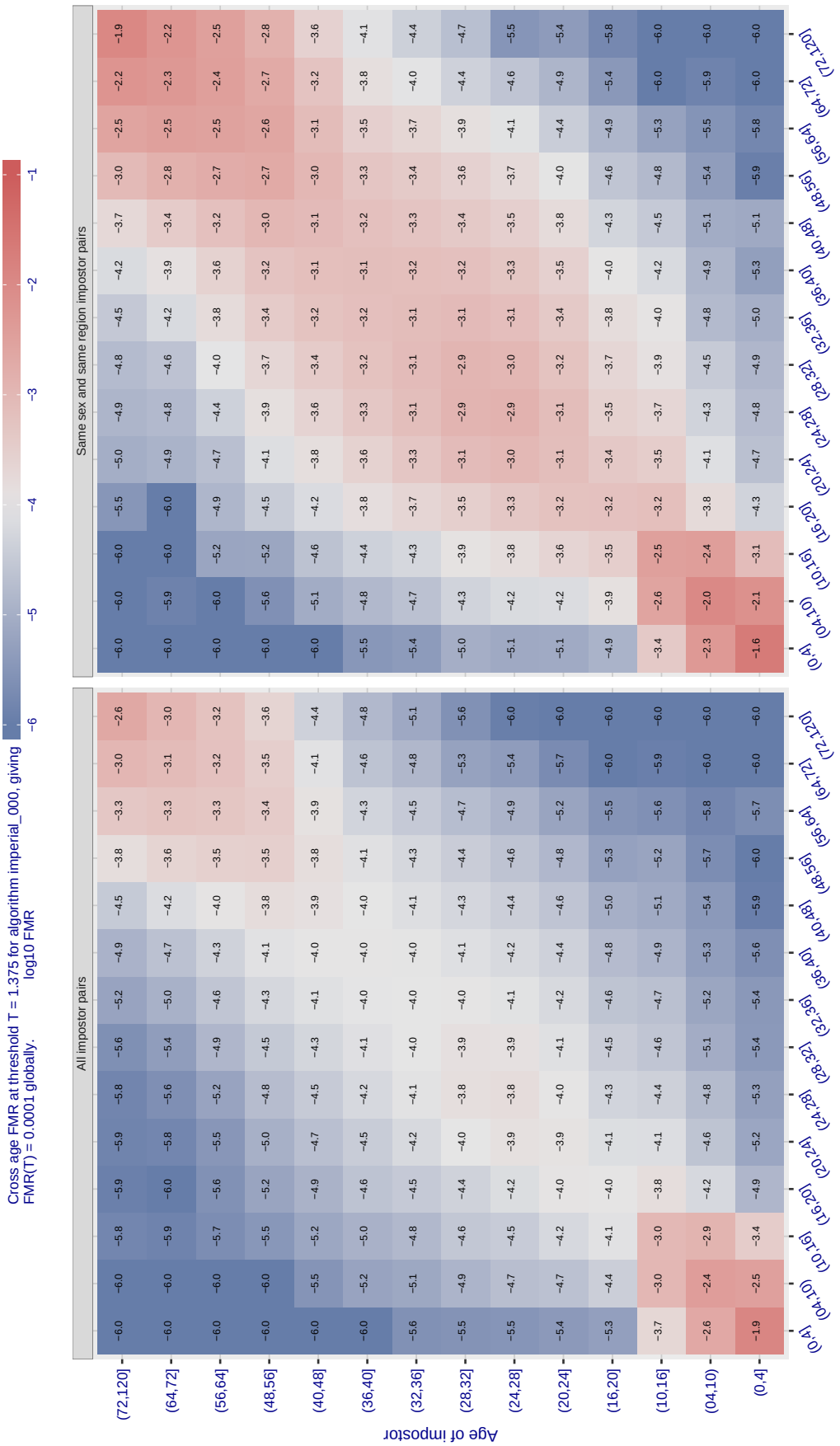


Figure 502: For algorithm imperial-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

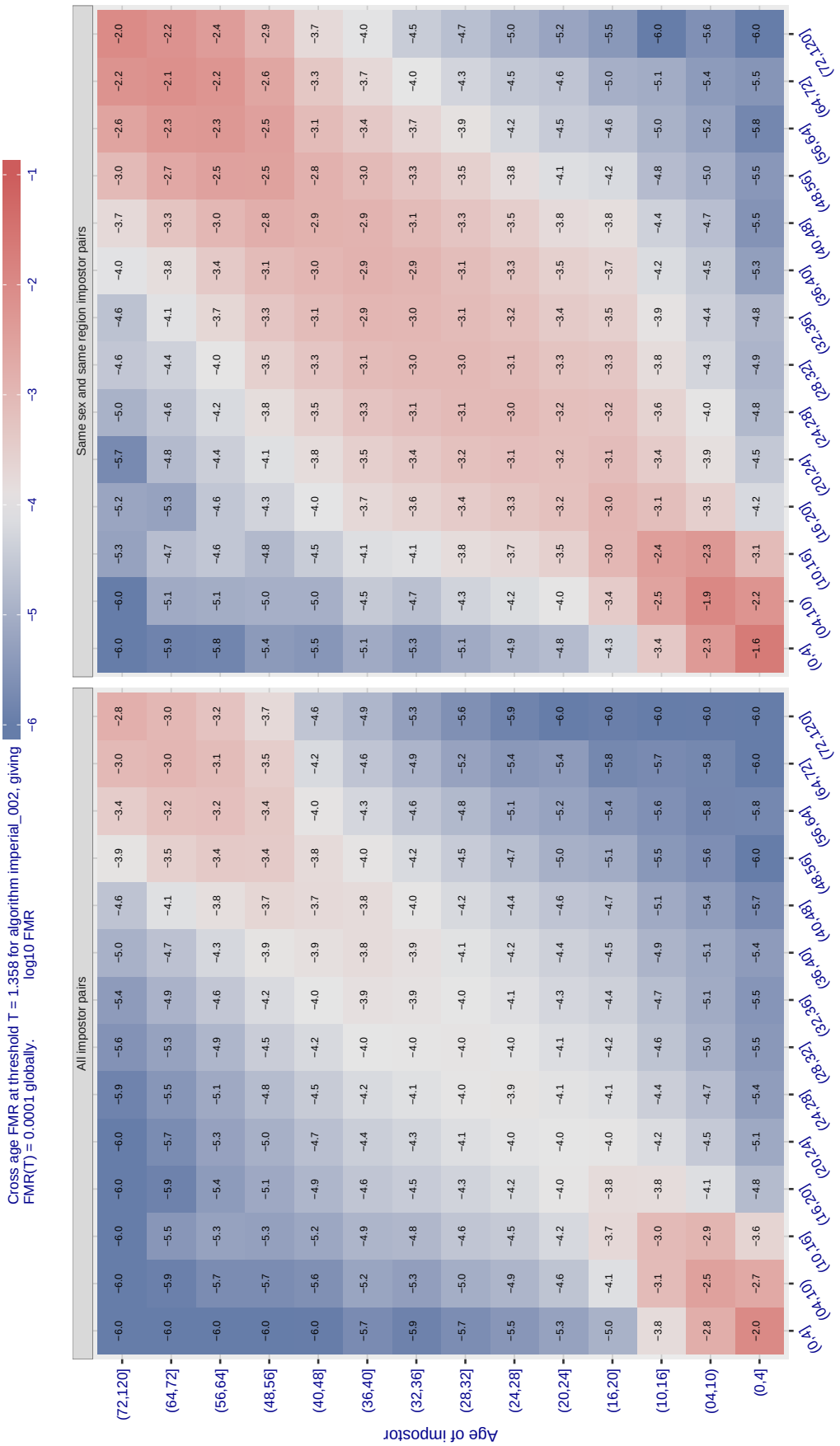


Figure 503: For algorithm imperial-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

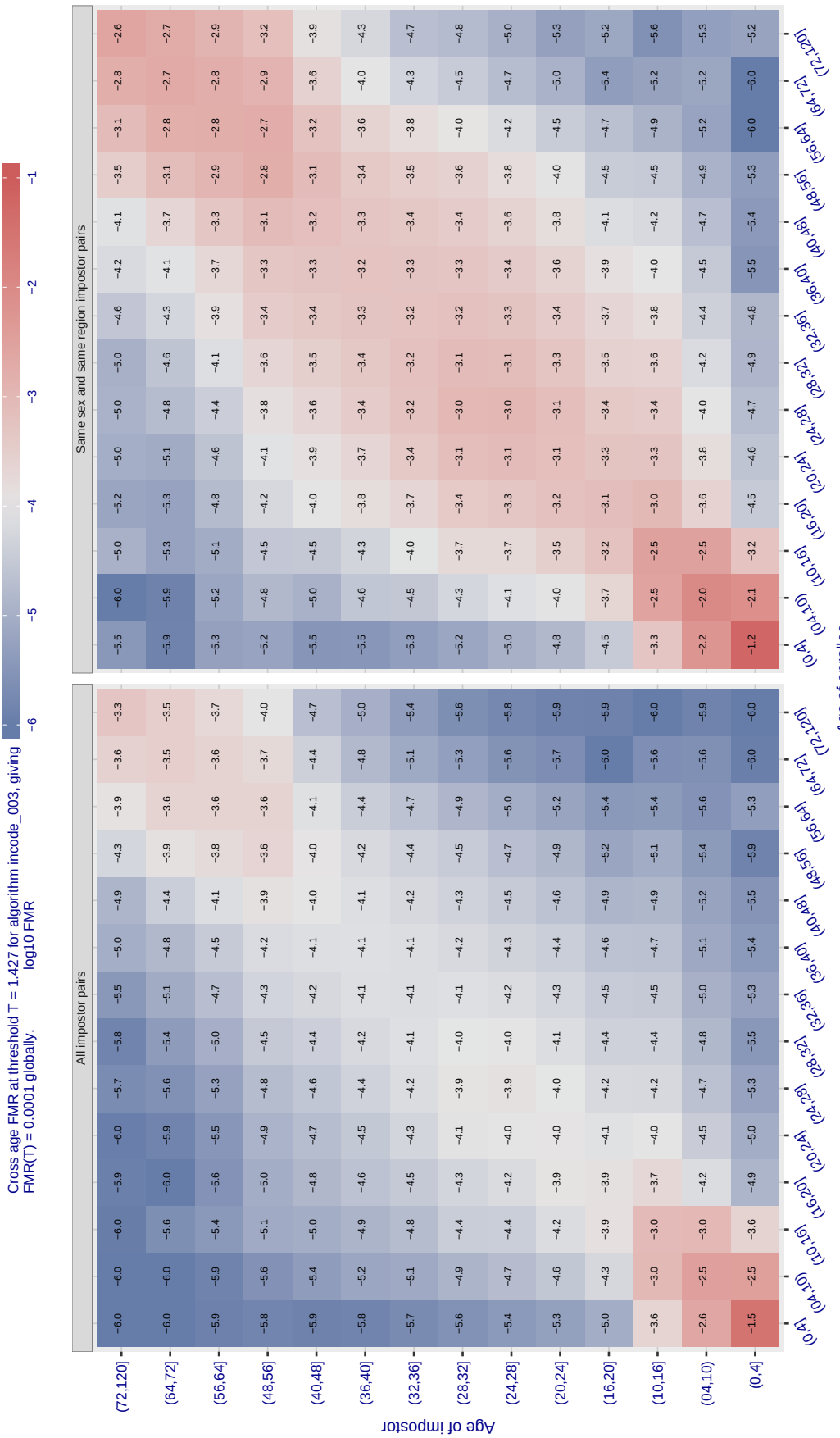


Figure 504: For algorithm incode-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

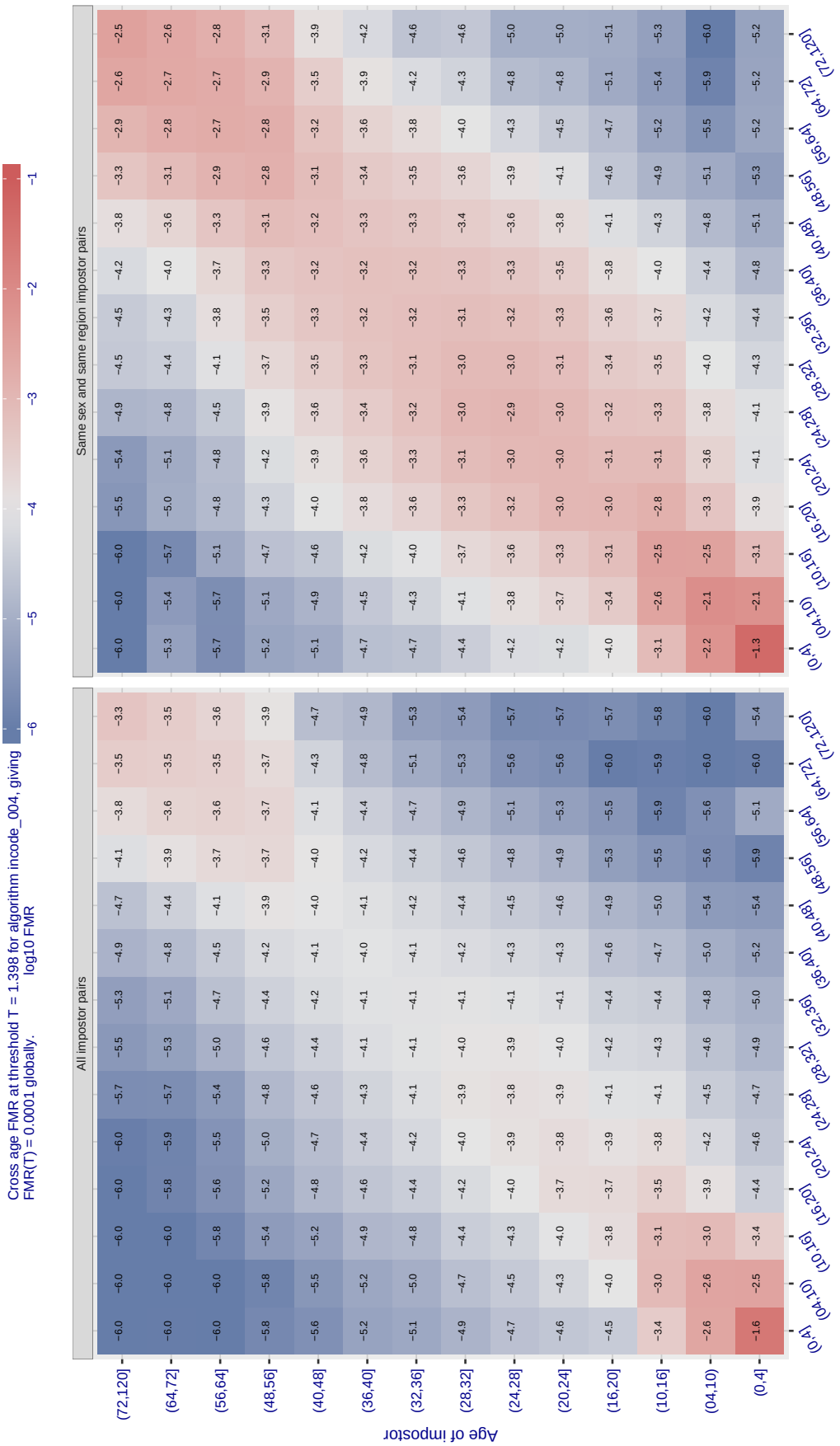


Figure 505: For algorithm incode-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

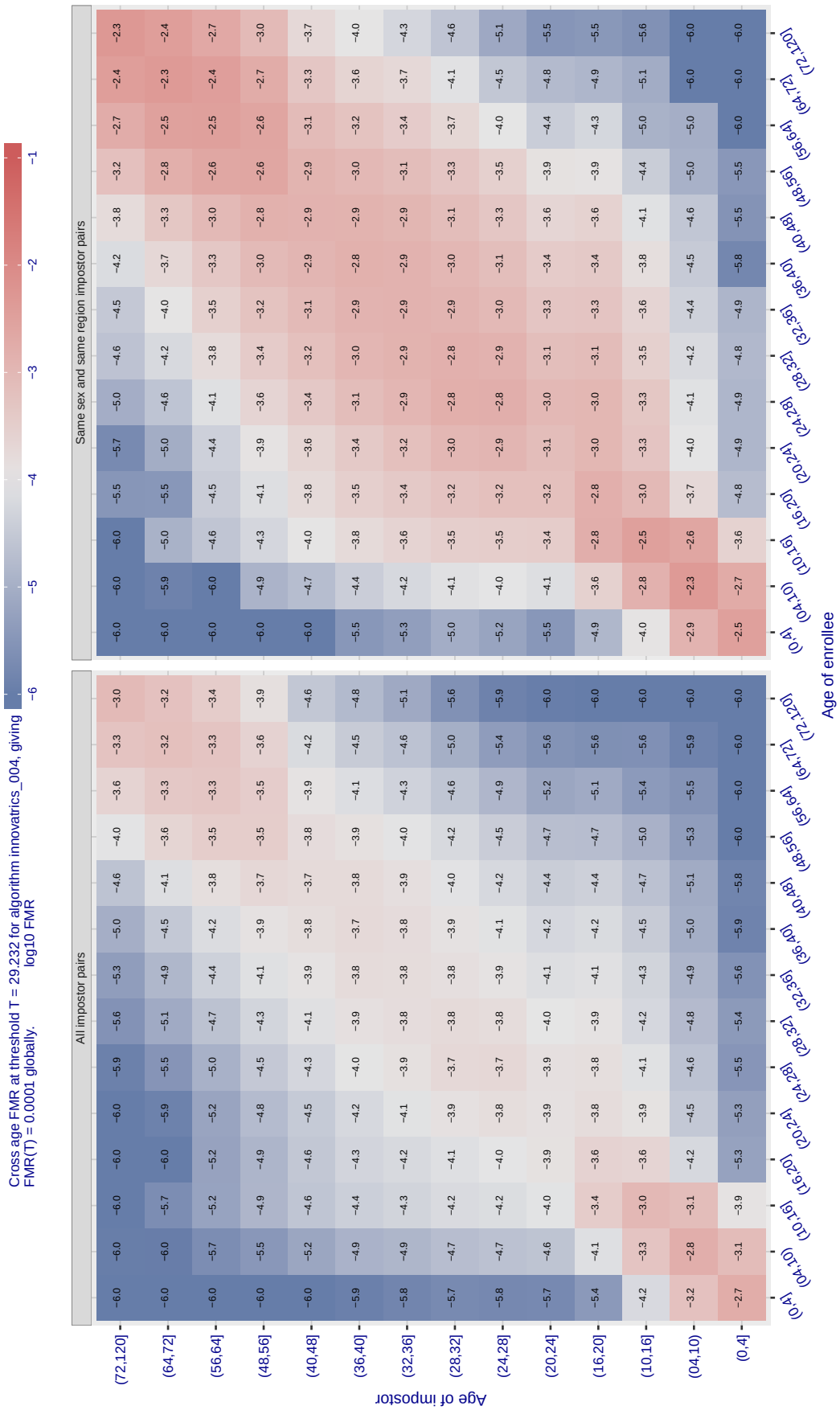


Figure 506: For algorithm innovatrics-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

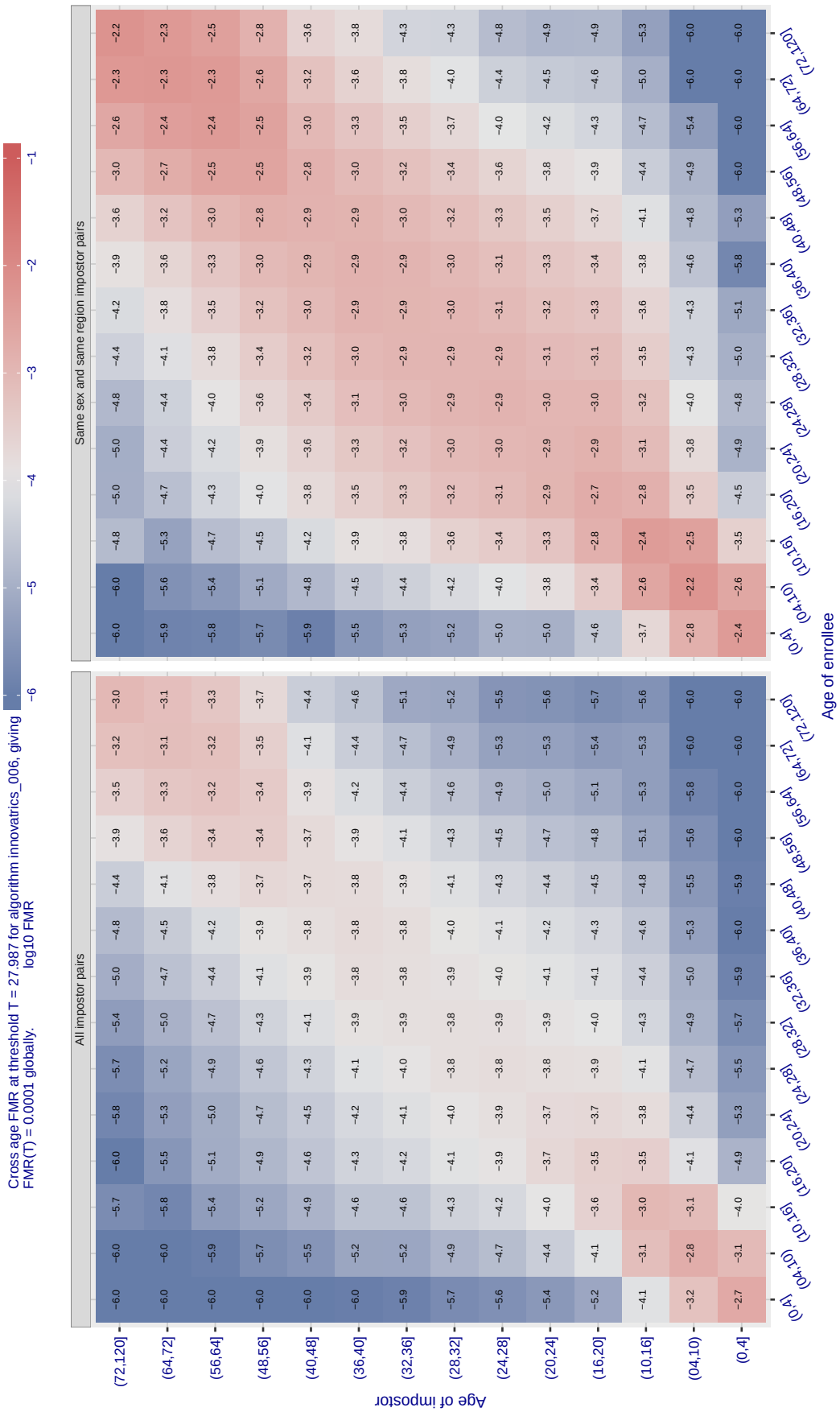


Figure 507: For algorithm innovatrics-006 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

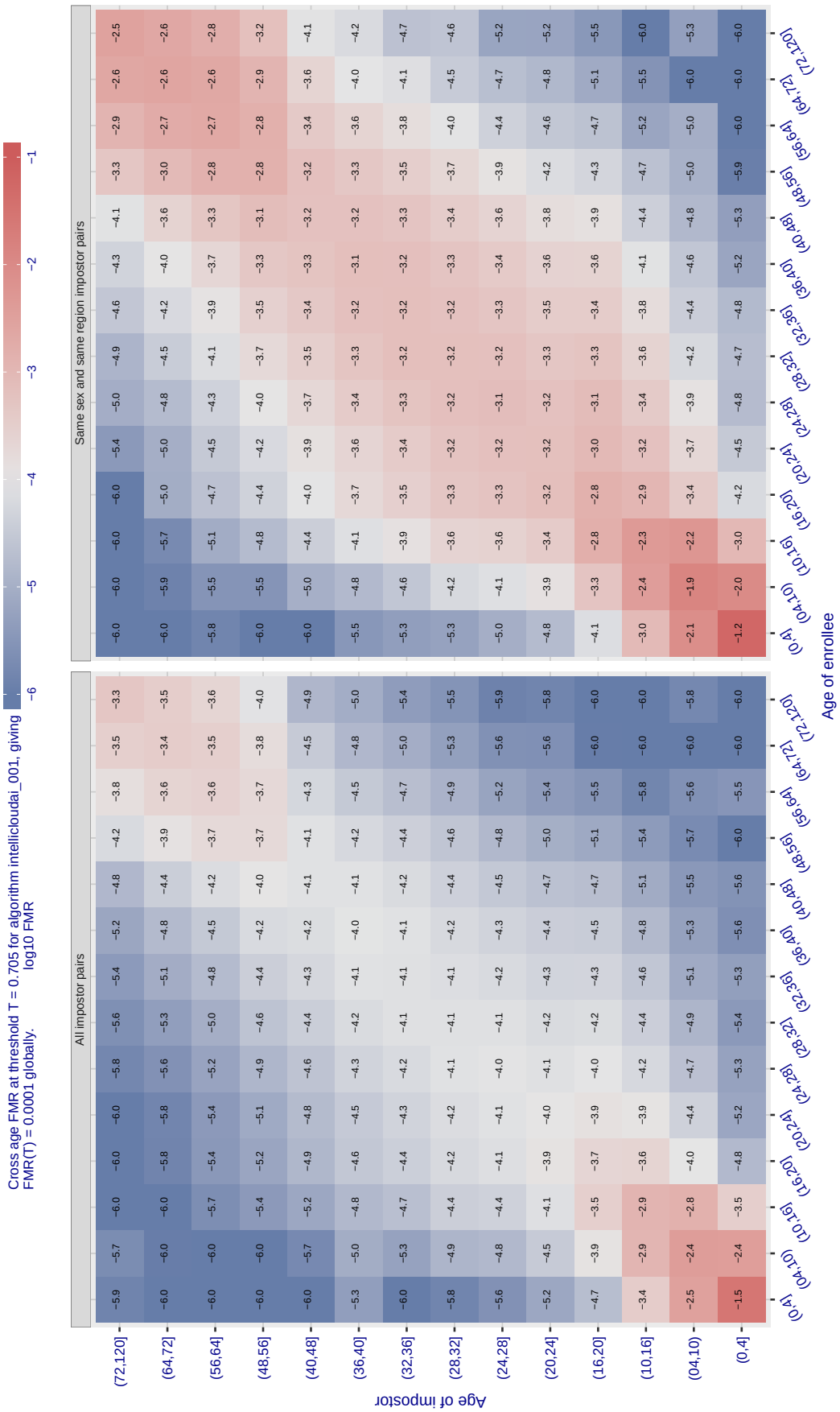


Figure 508: For algorithm intellicloudai-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

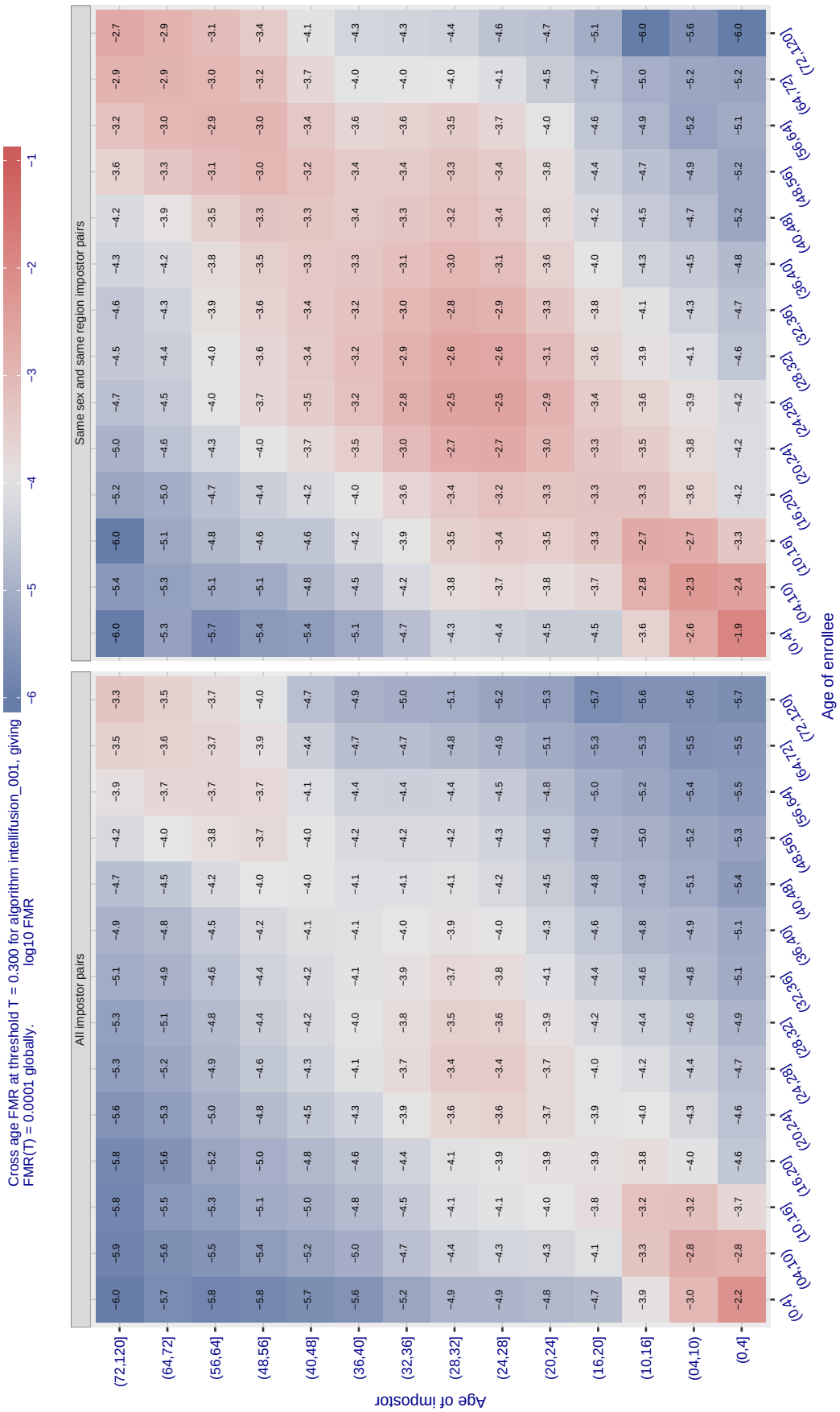


Figure 509: For algorithm intellifusion-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

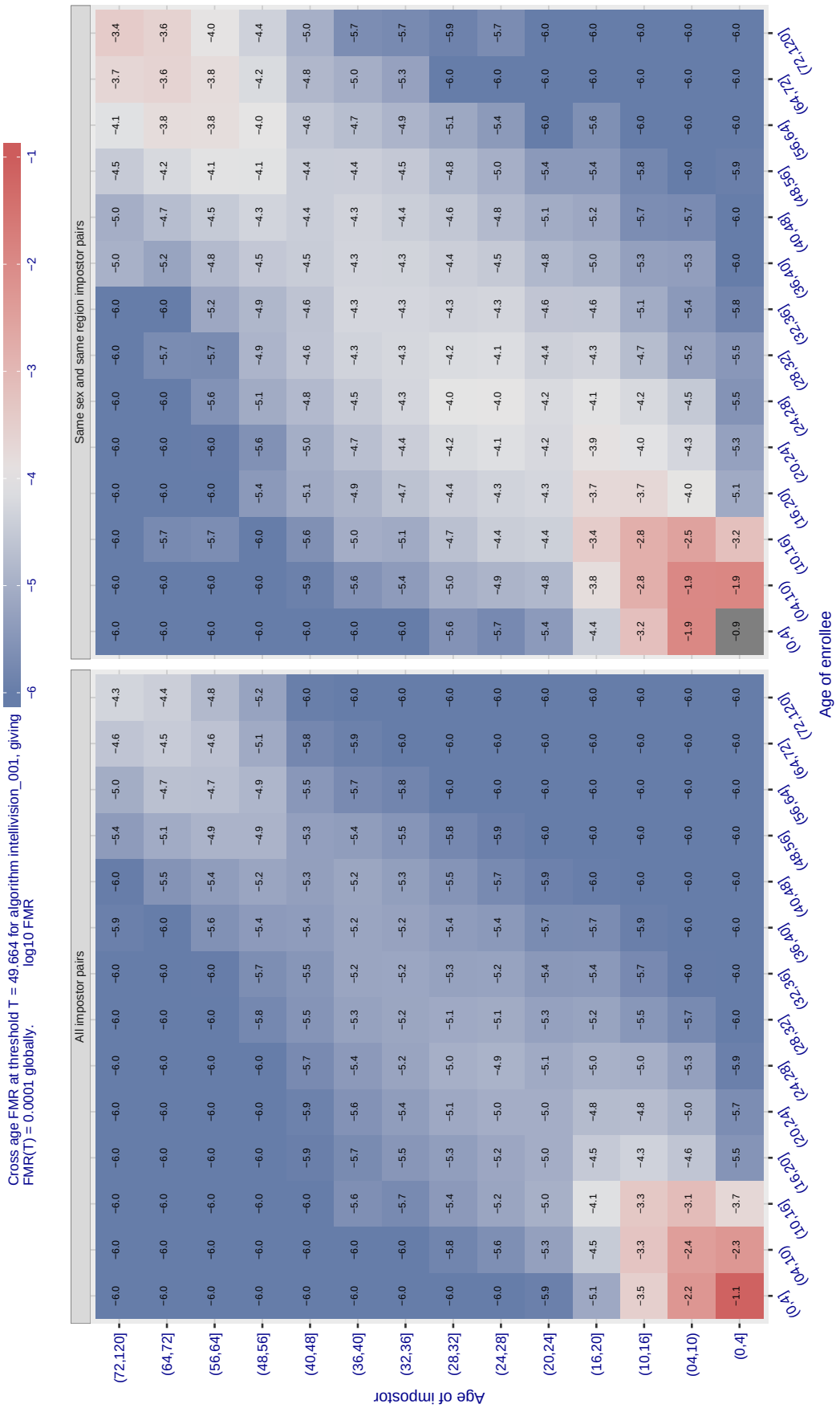


Figure 510: For algorithm intellivision-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

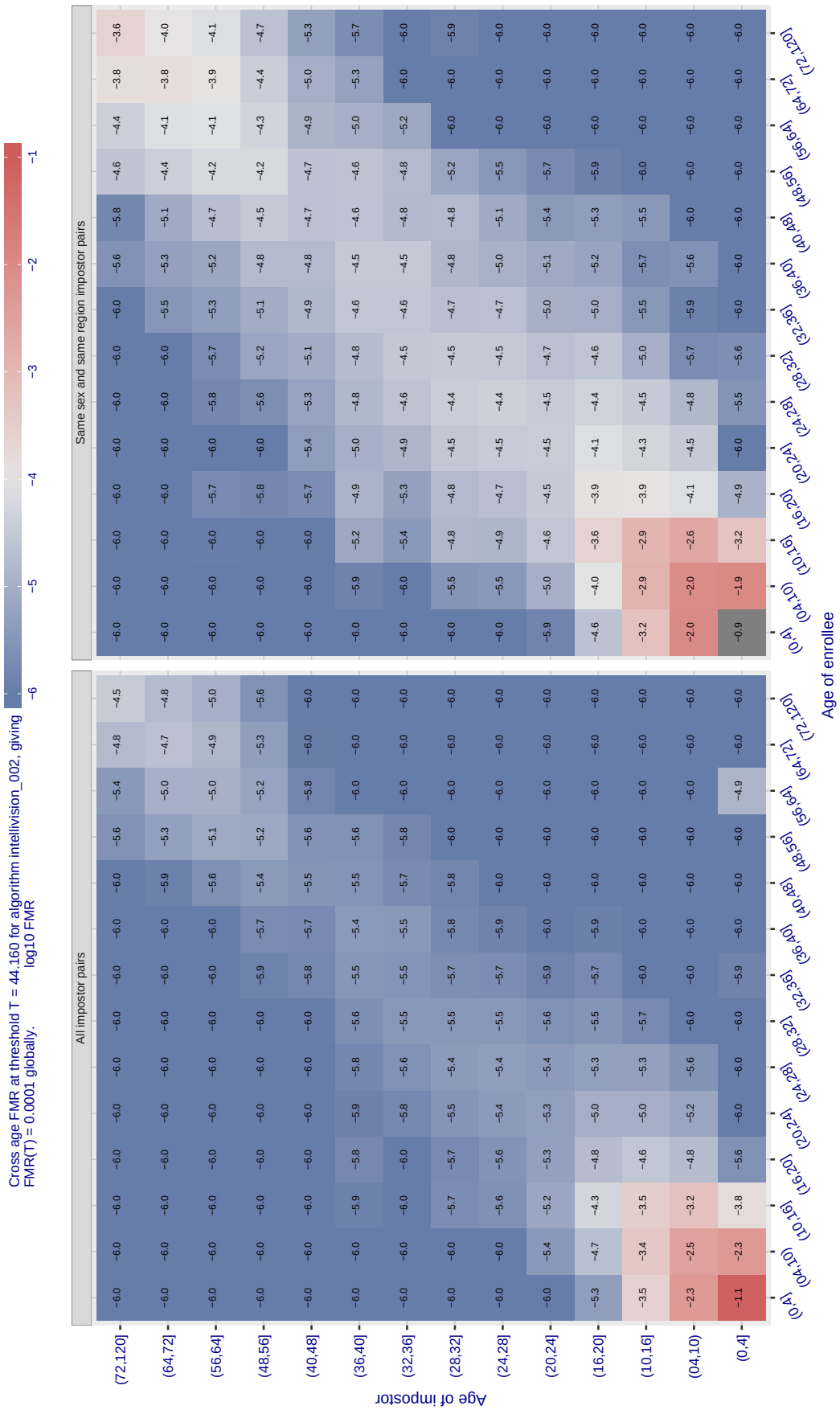


Figure 511: For algorithm intellivision-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

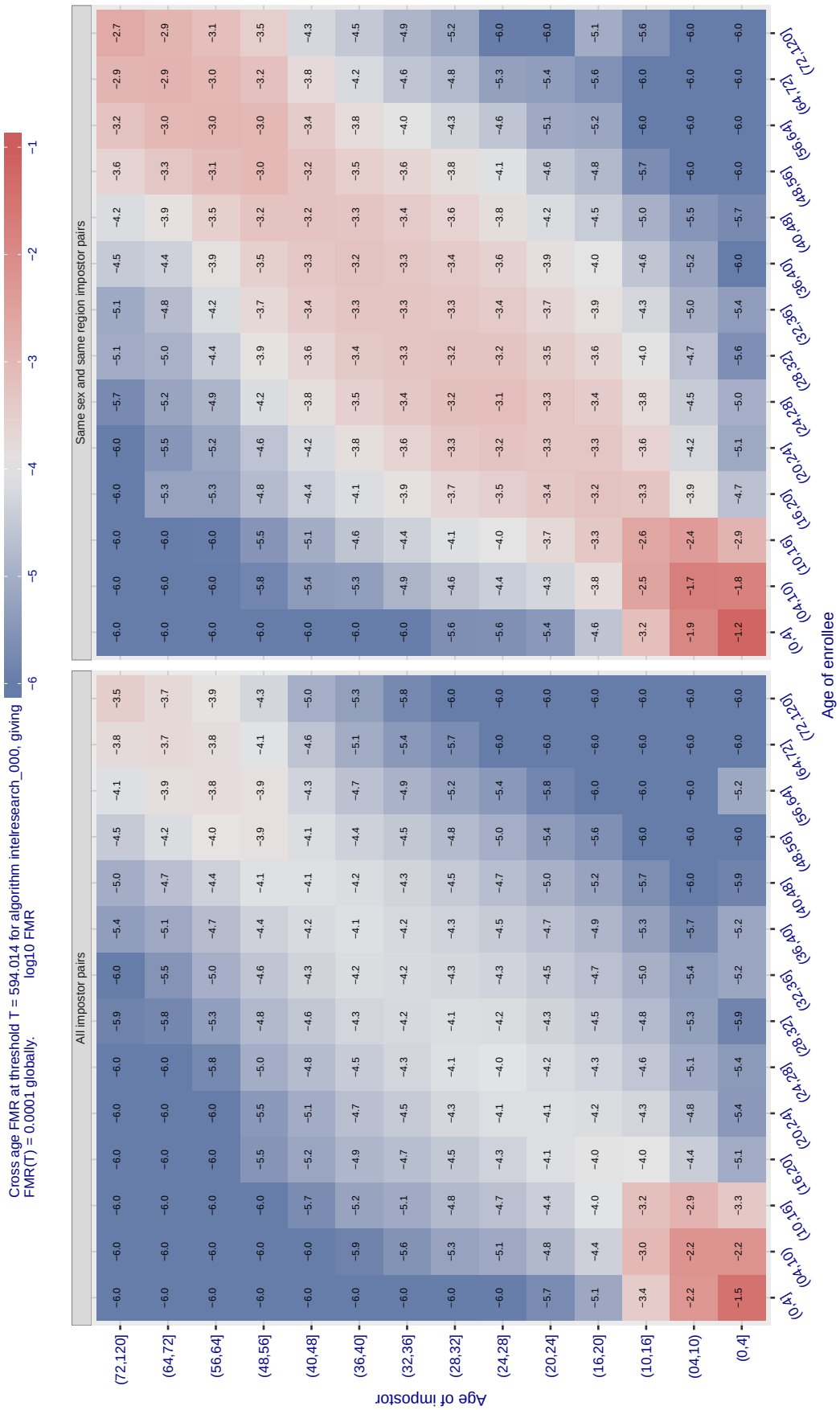


Figure 512: For algorithm intelresearch-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

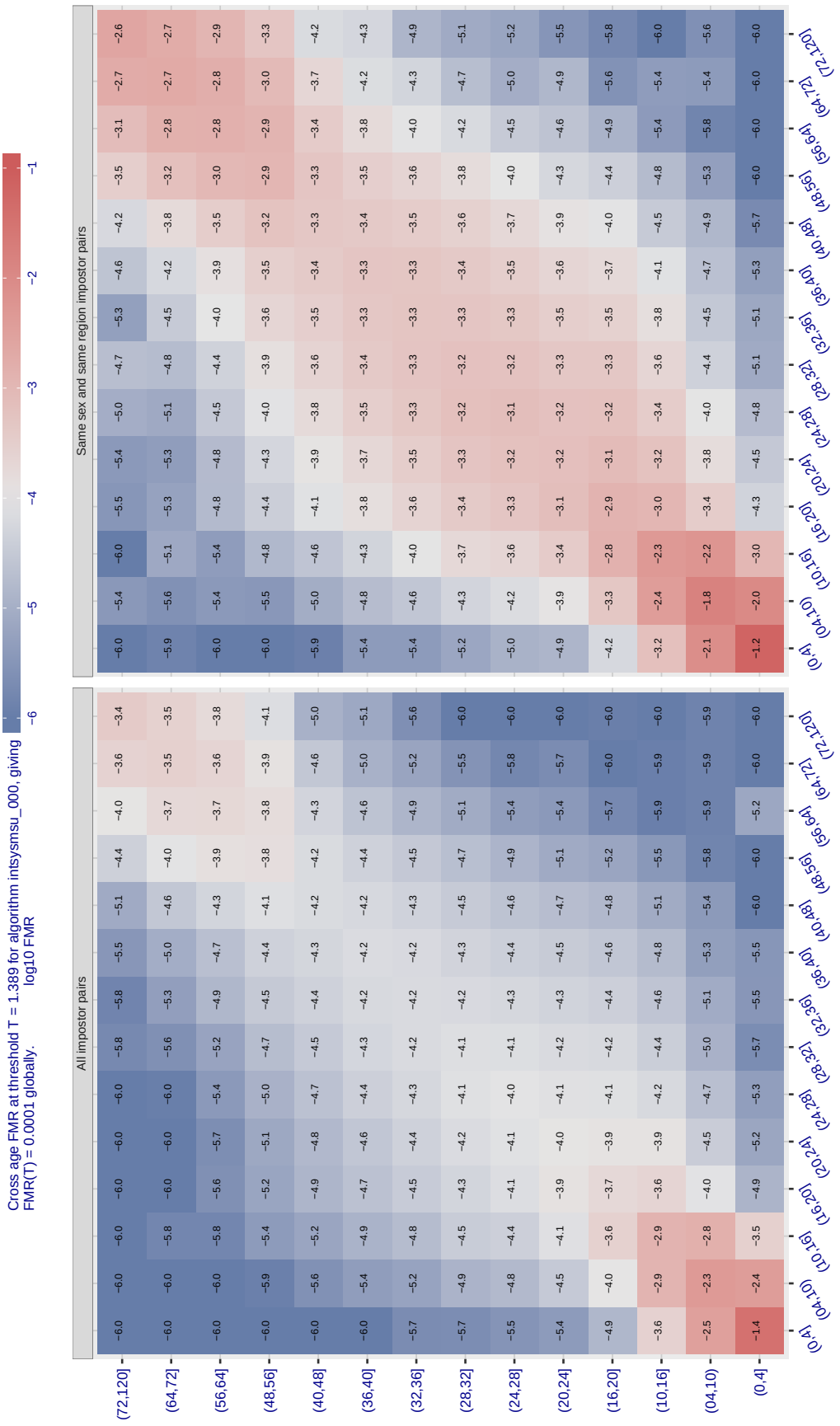


Figure 513: For algorithm intsysmsu-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

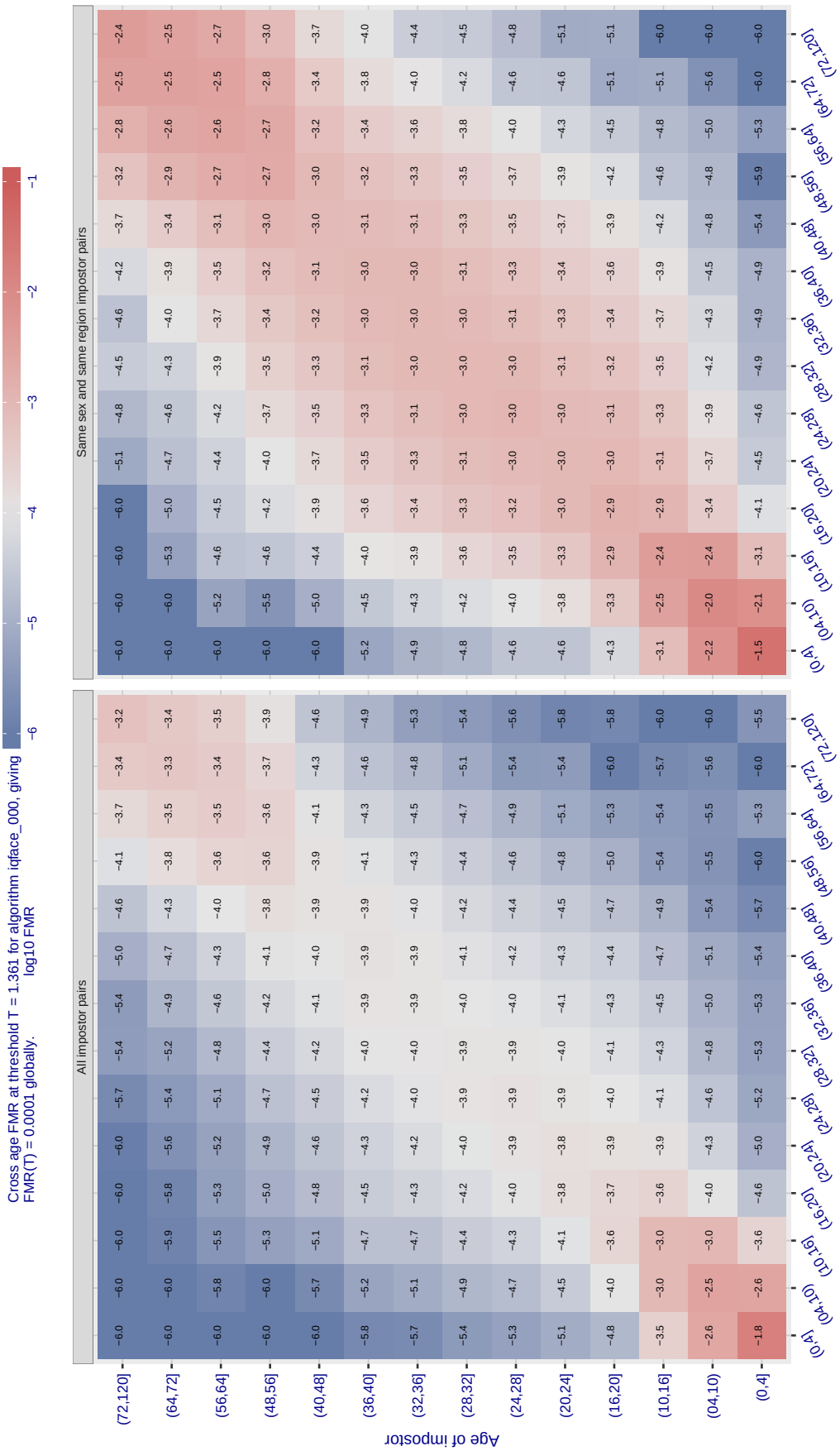


Figure 514: For algorithm iqface-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

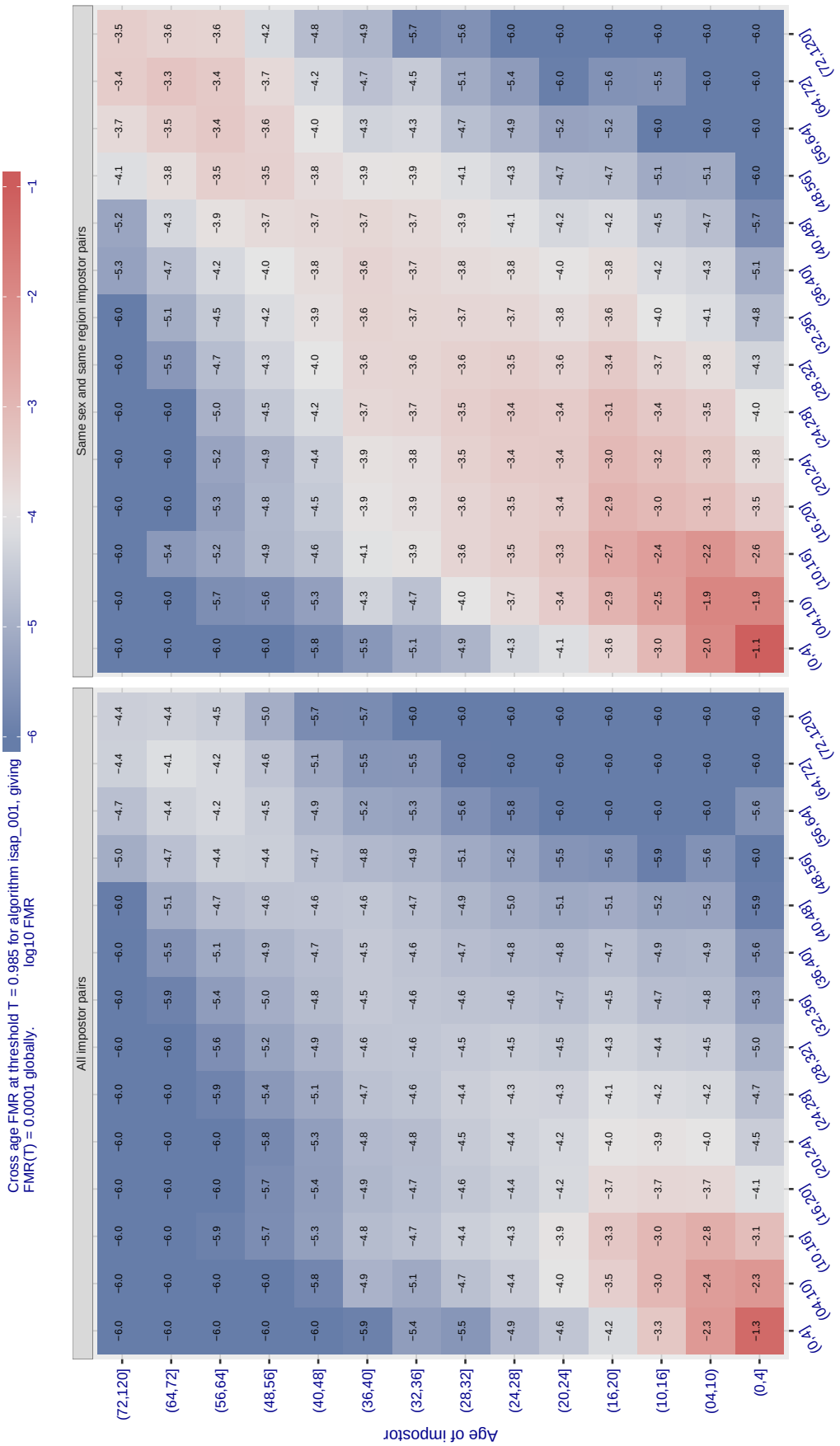


Figure 515: For algorithm isap-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

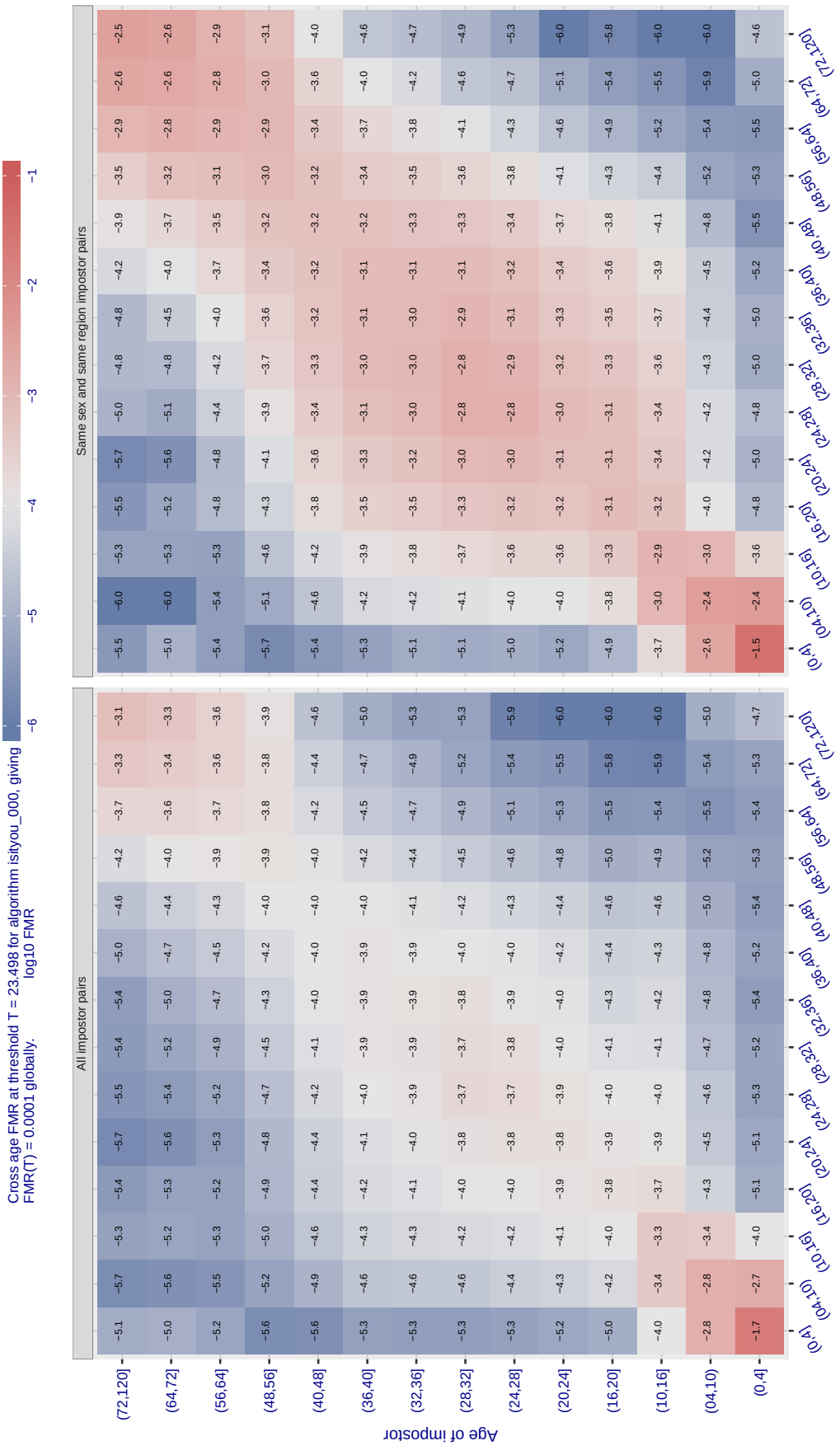


Figure 516: For algorithm isityou-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

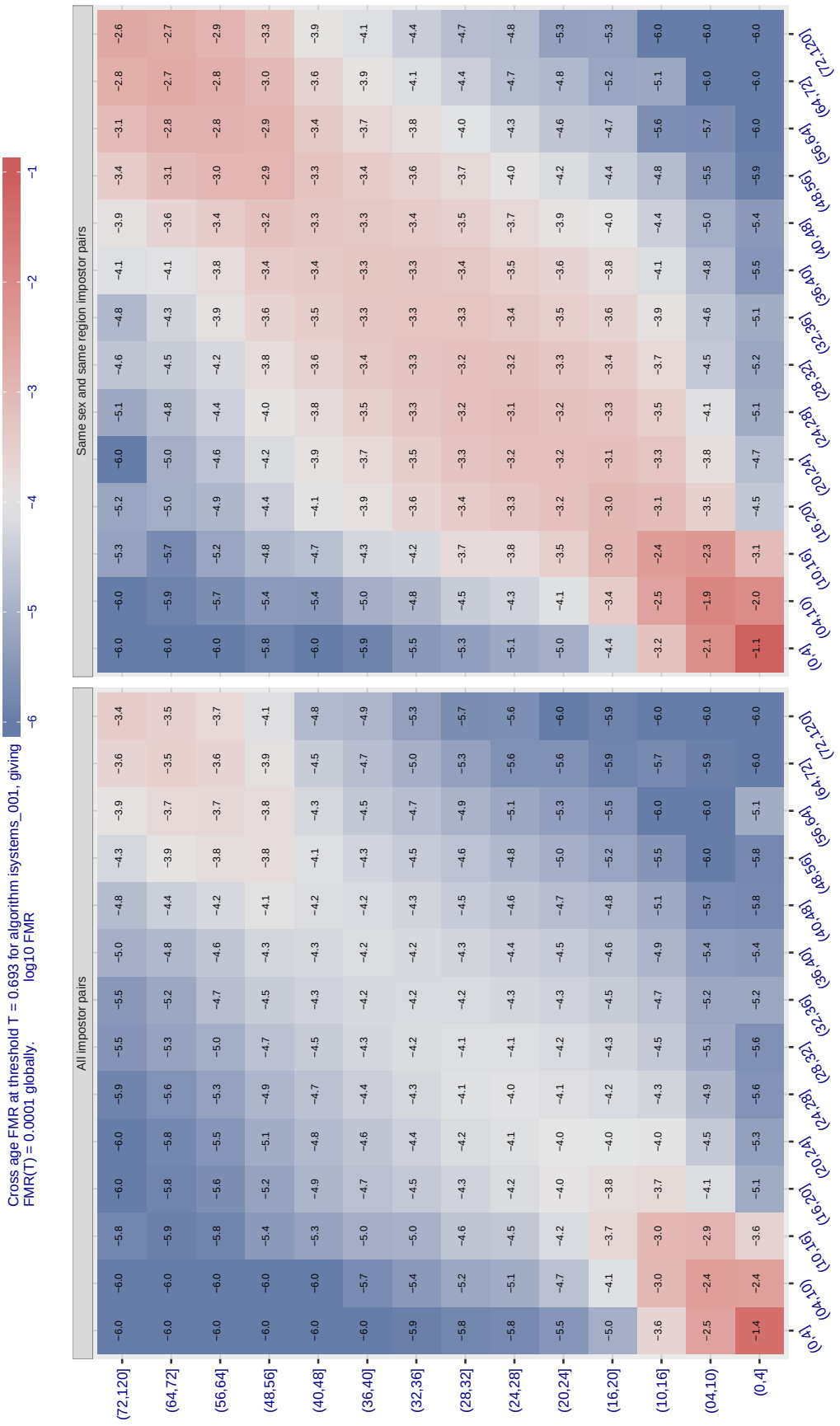


Figure 517: For algorithm isystems-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

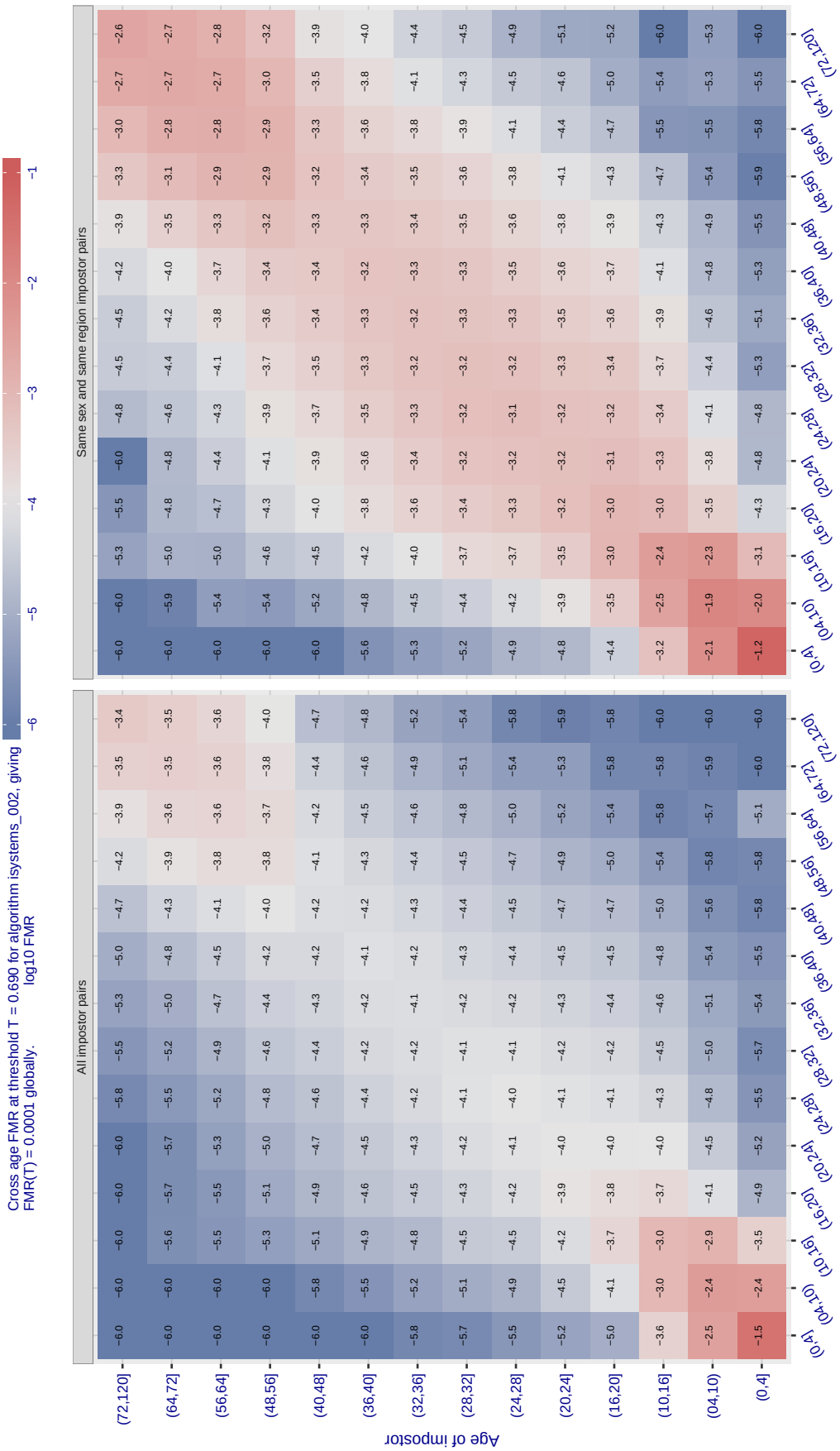


Figure 518: For algorithm isystems-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

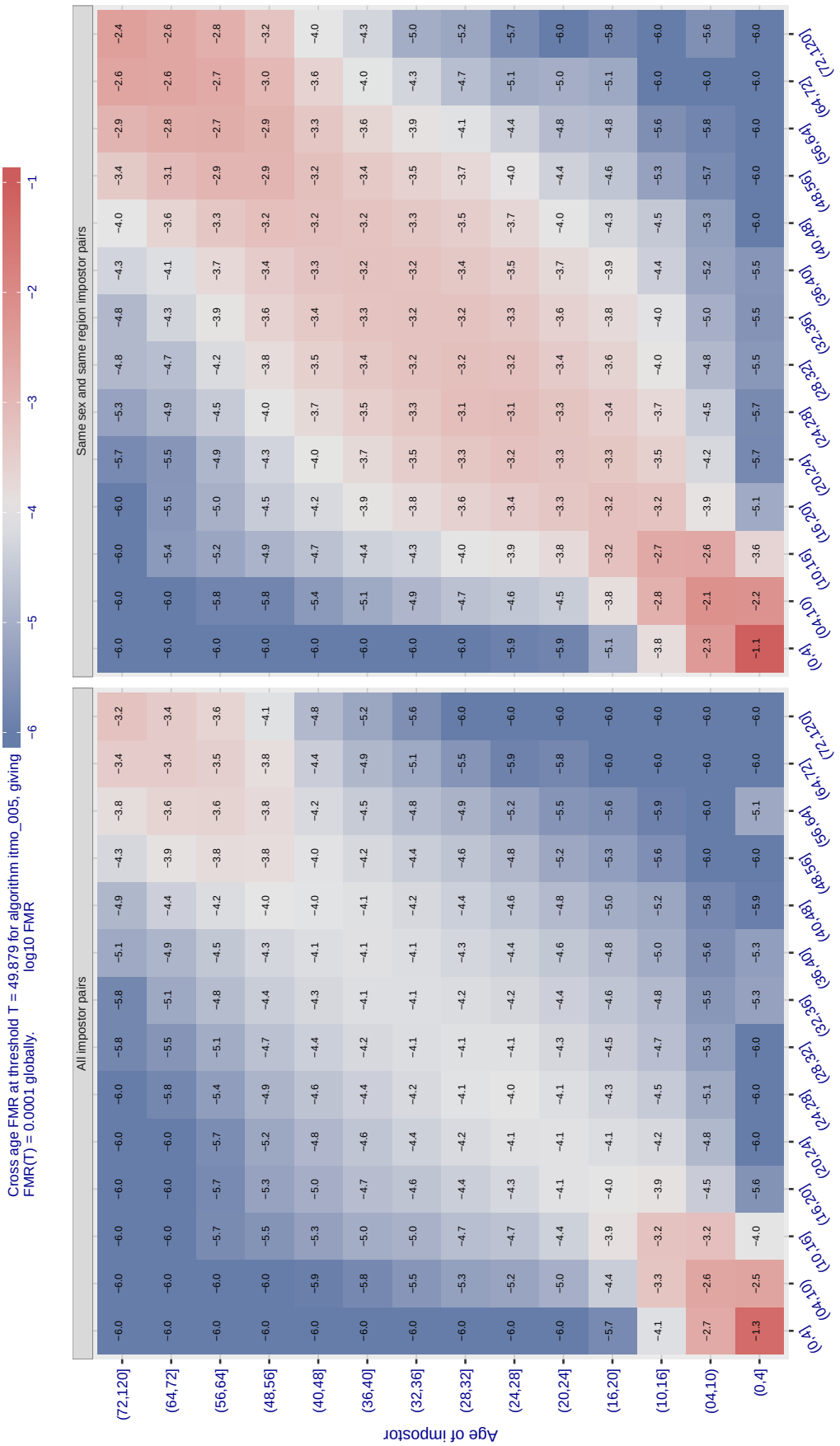


Figure 519: For algorithm itmo-005 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

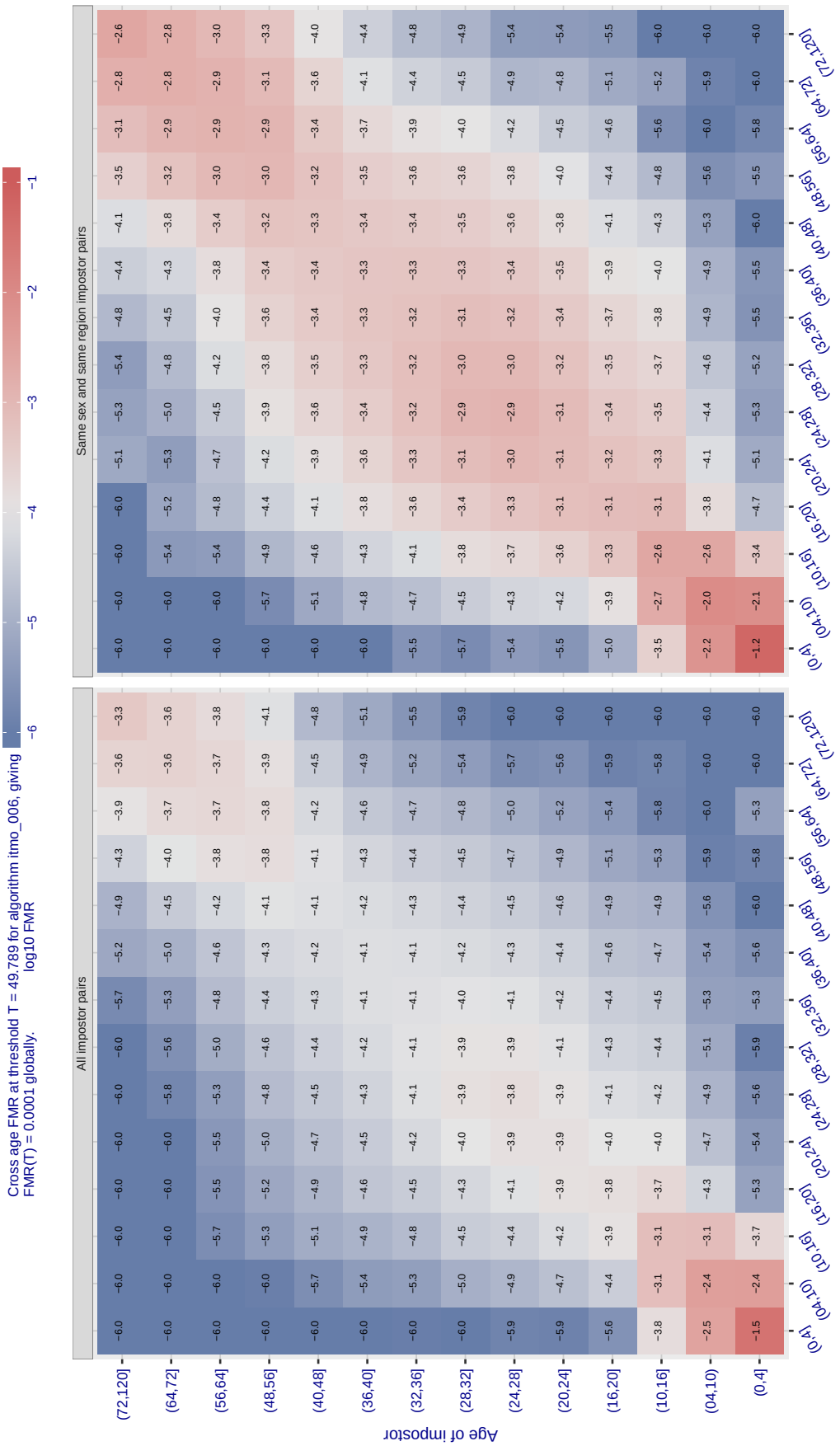


Figure 520: For algorithm itmo-006 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

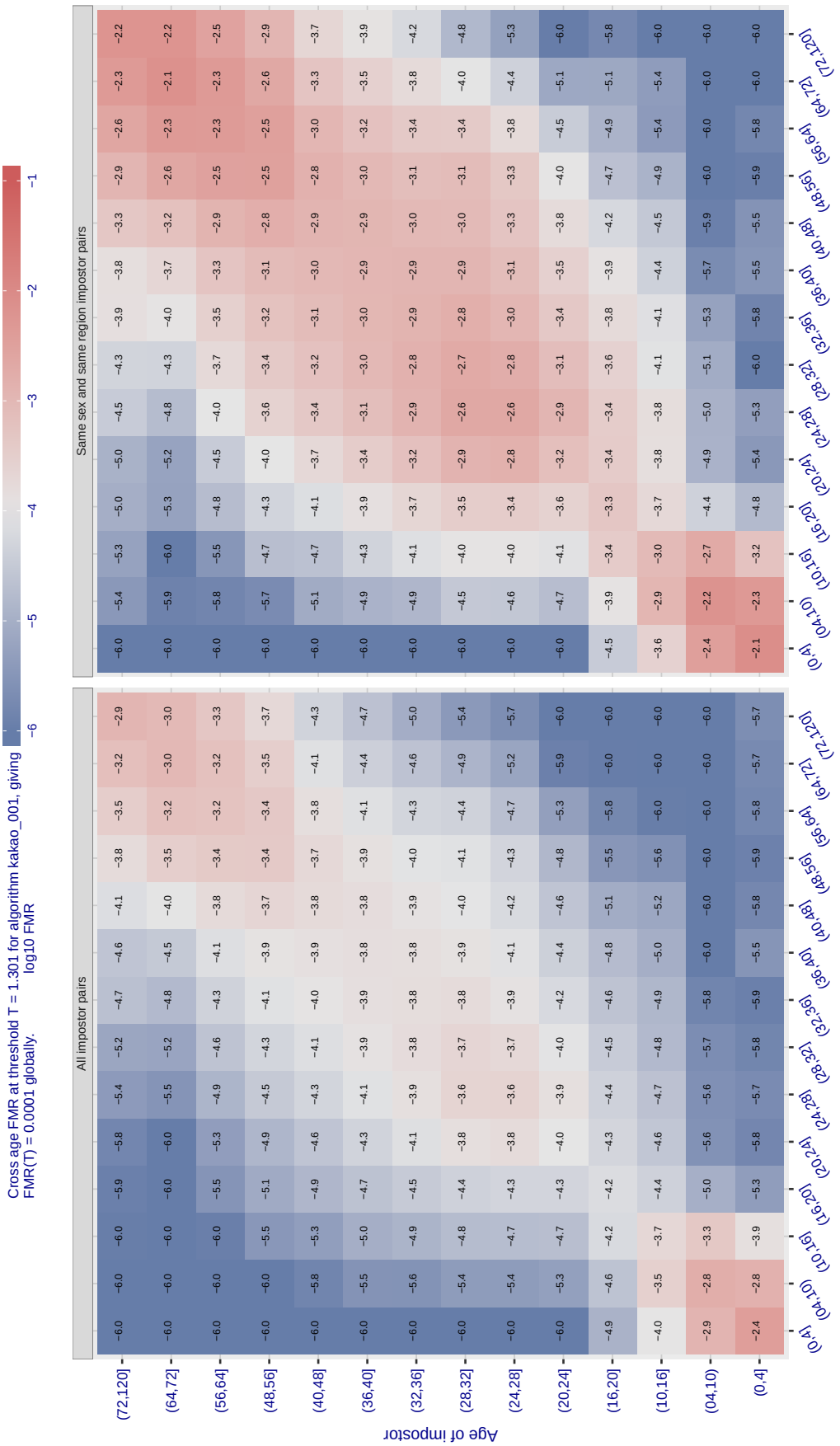


Figure 521: For algorithm kakao-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

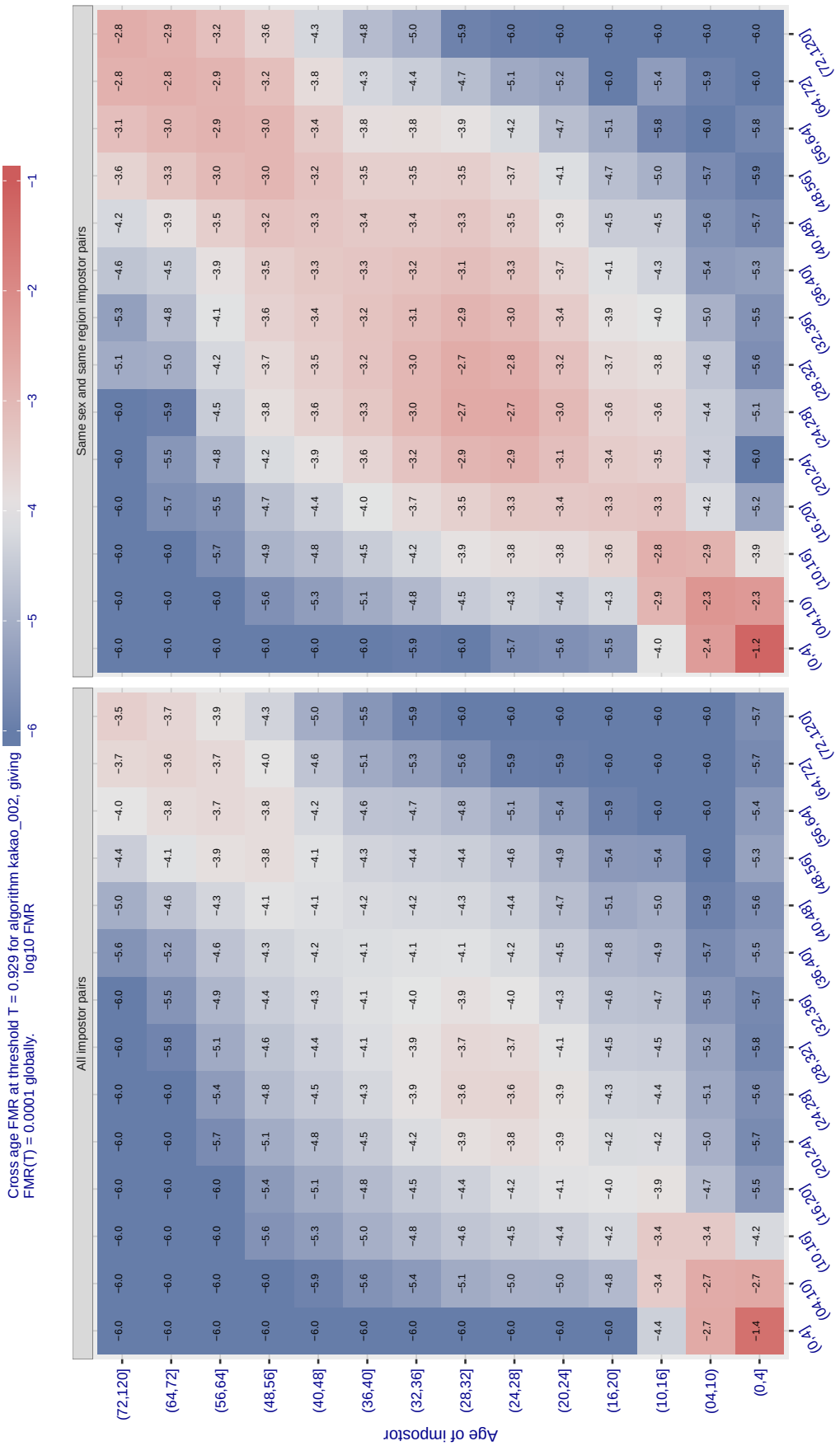


Figure 522: For algorithm kakao-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

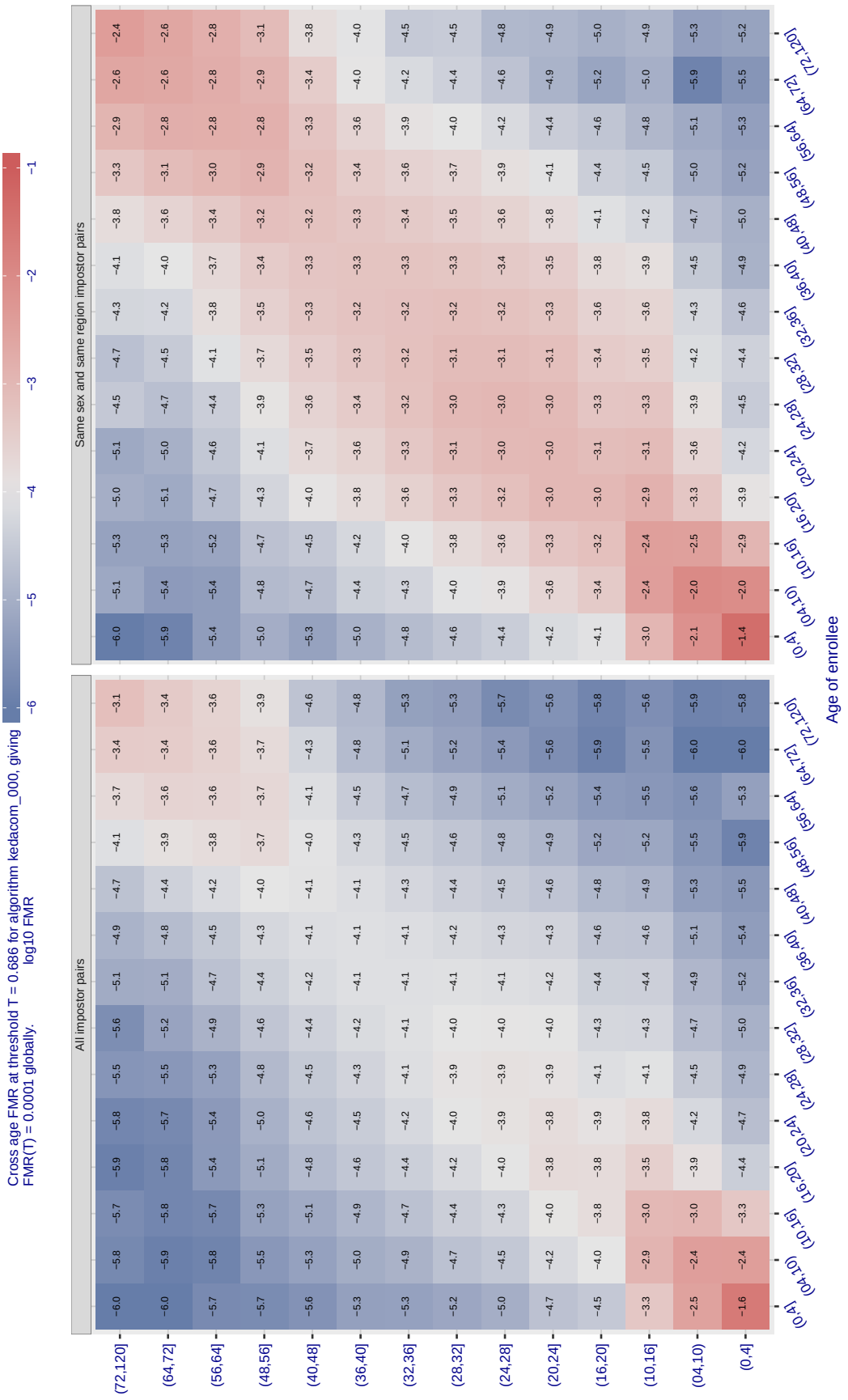


Figure 523: For algorithm kedacom-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

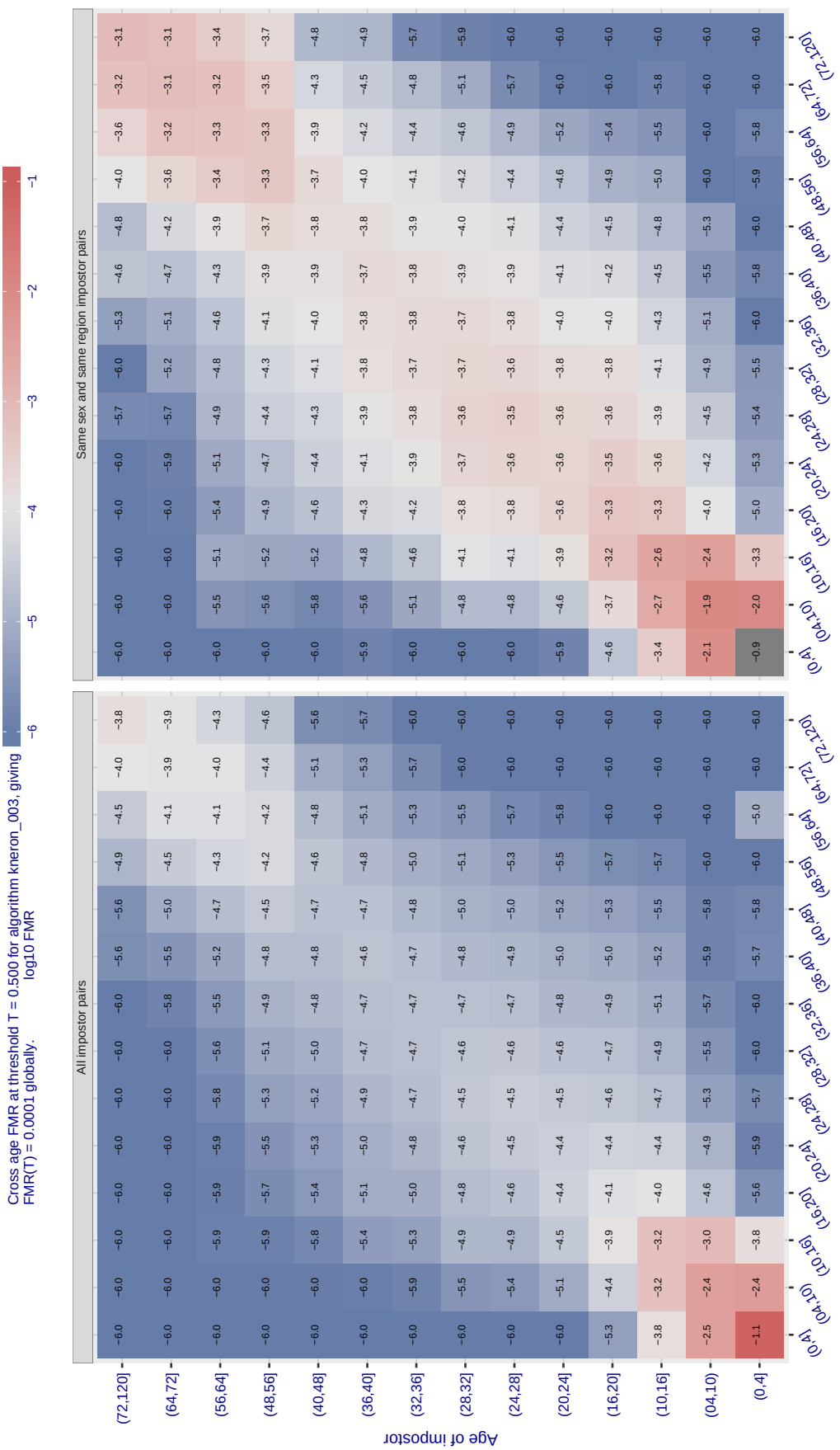


Figure 524: For algorithm kneron-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

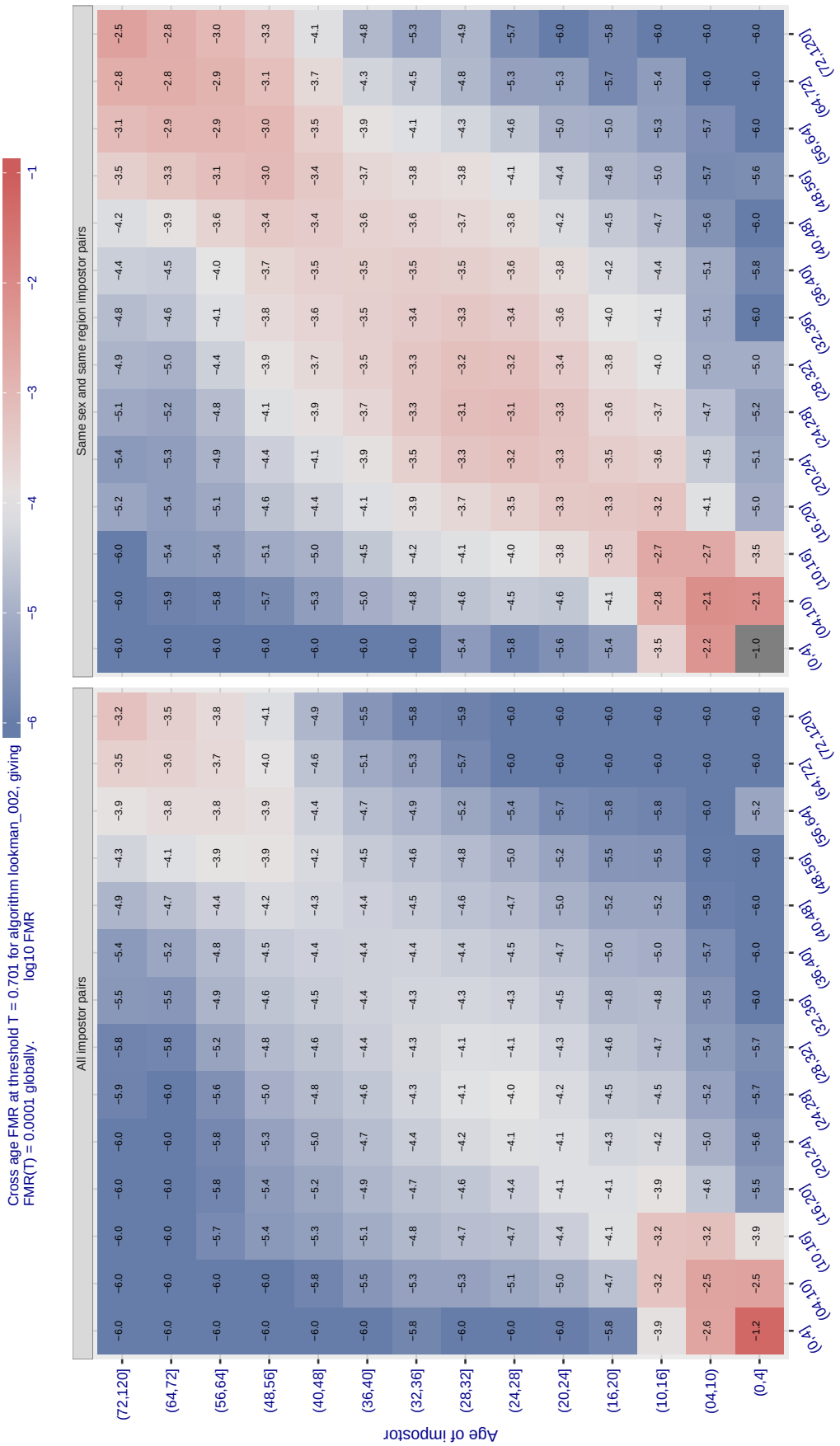


Figure 525: For algorithm lookman-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

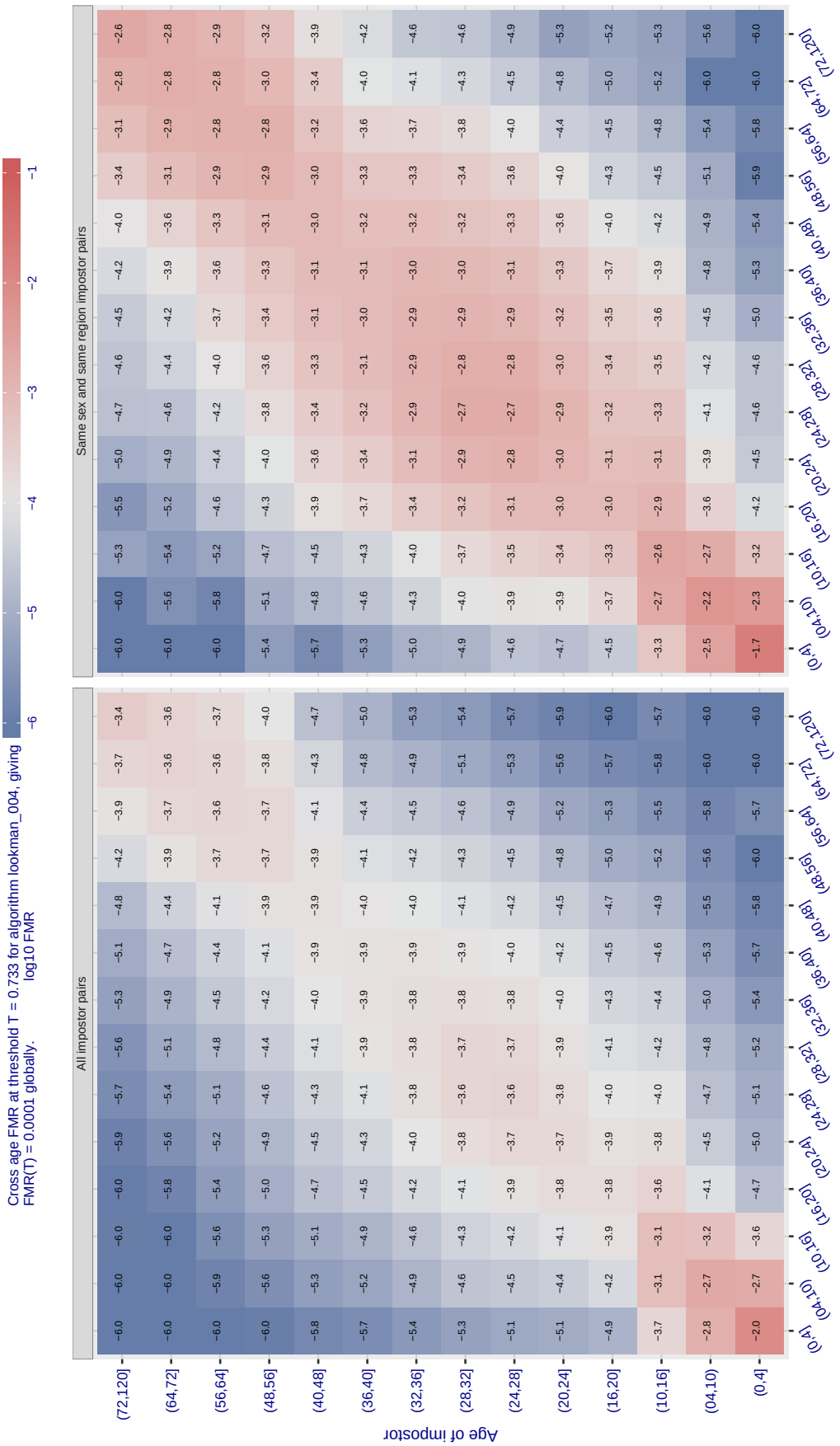


Figure 526: For algorithm lookman-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

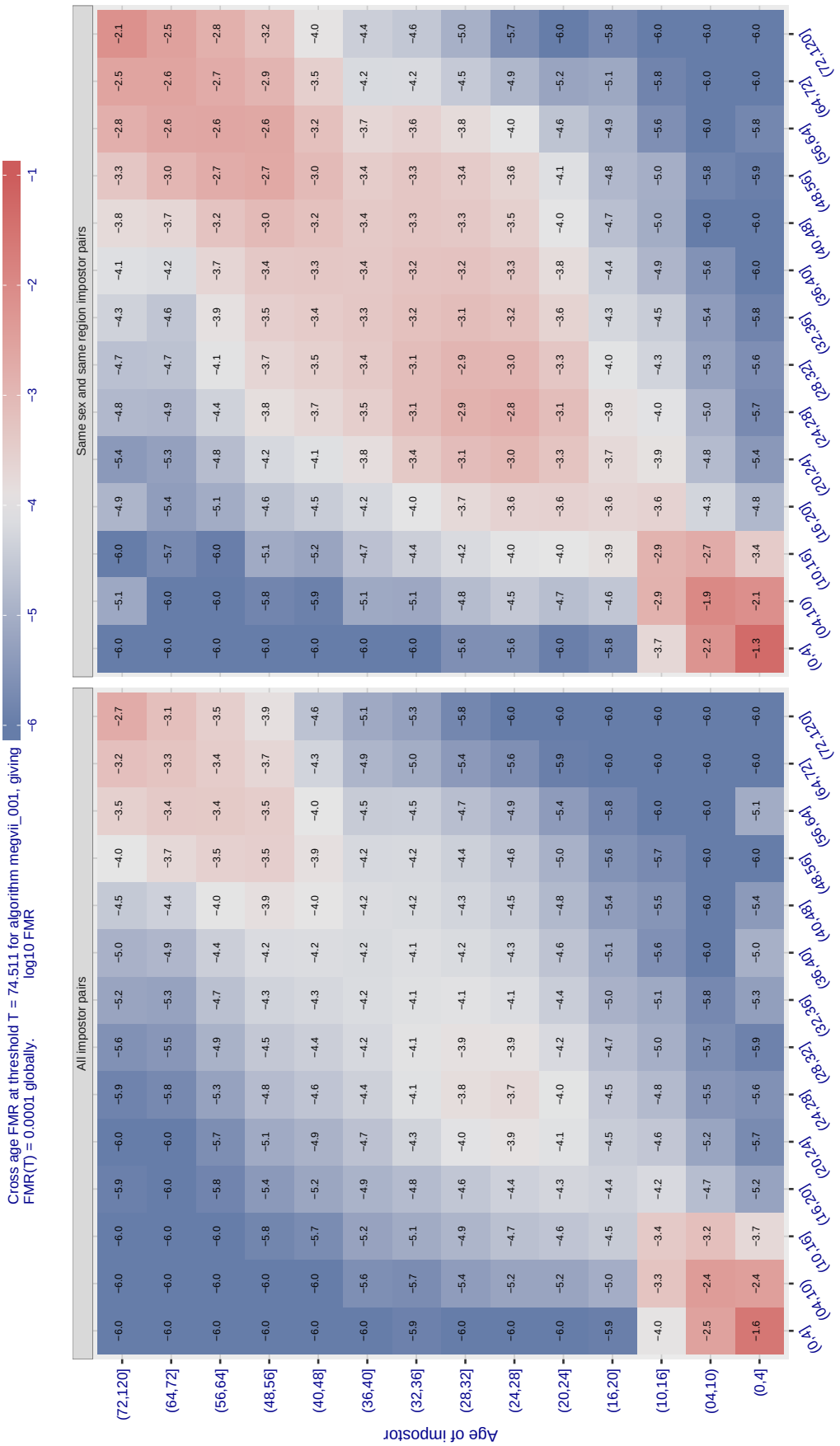


Figure 527: For algorithm megvii-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

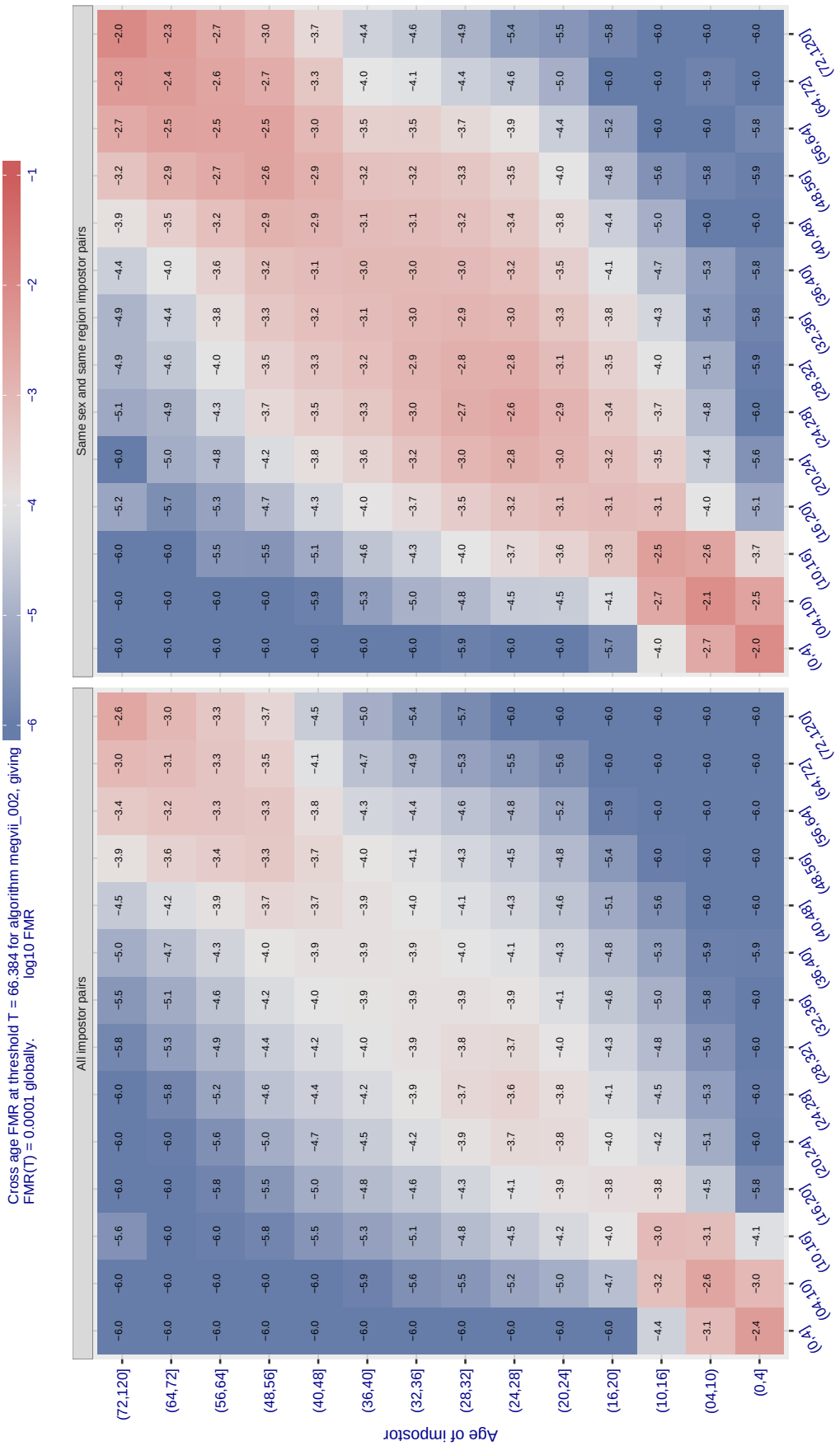


Figure 528: For algorithm megvii-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

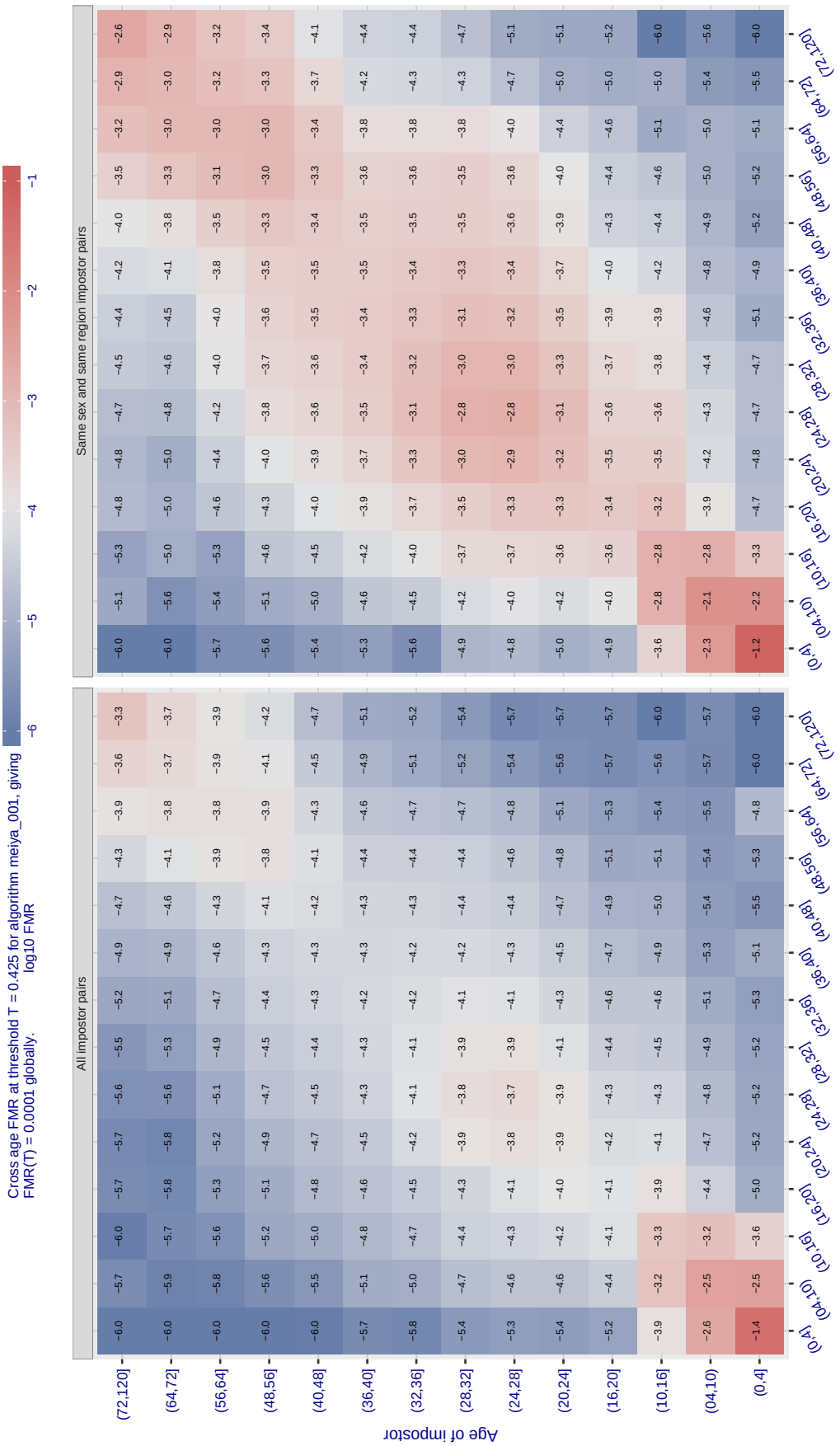


Figure 529: For algorithm meiya-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

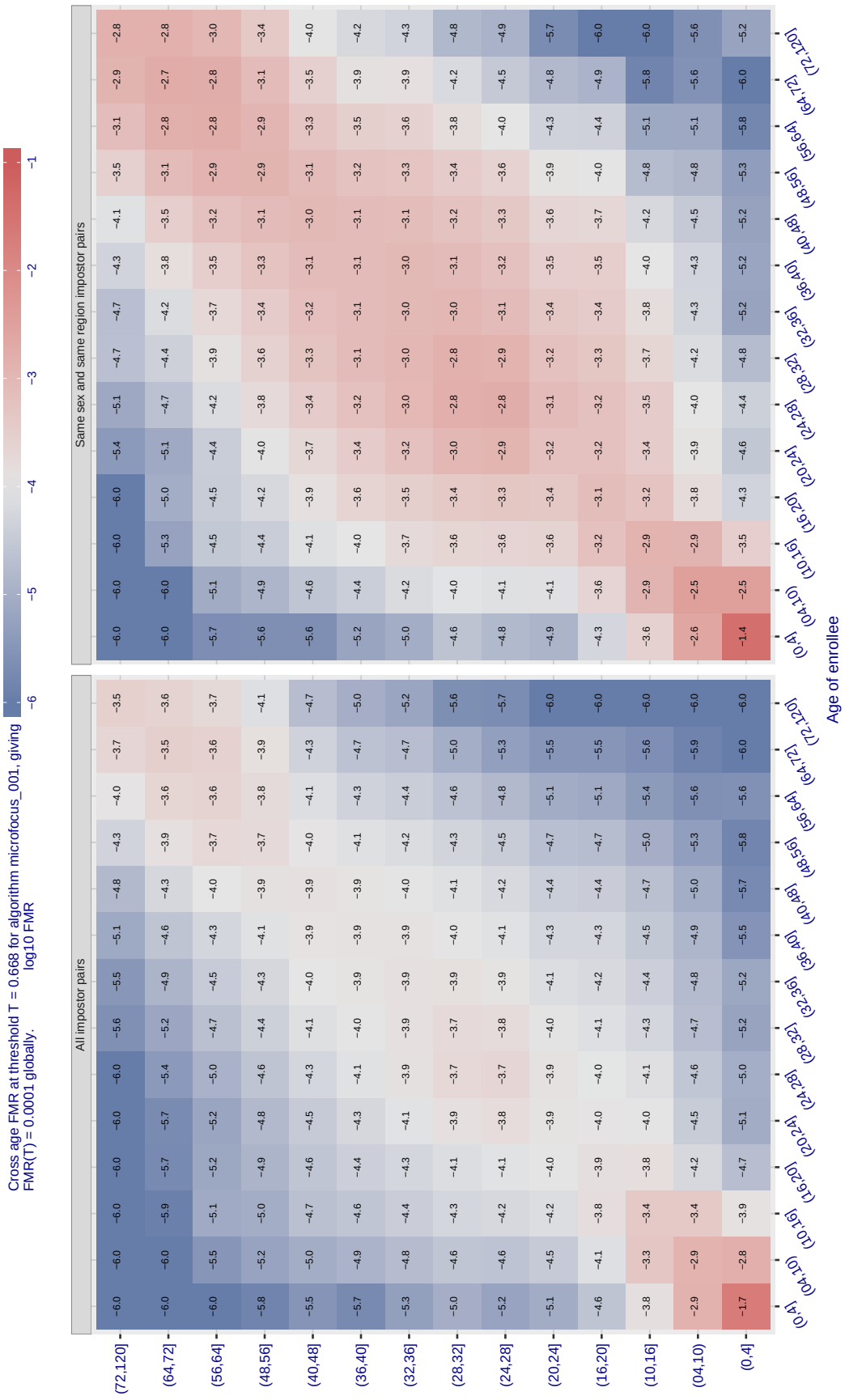


Figure 530: For algorithm microfocus-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

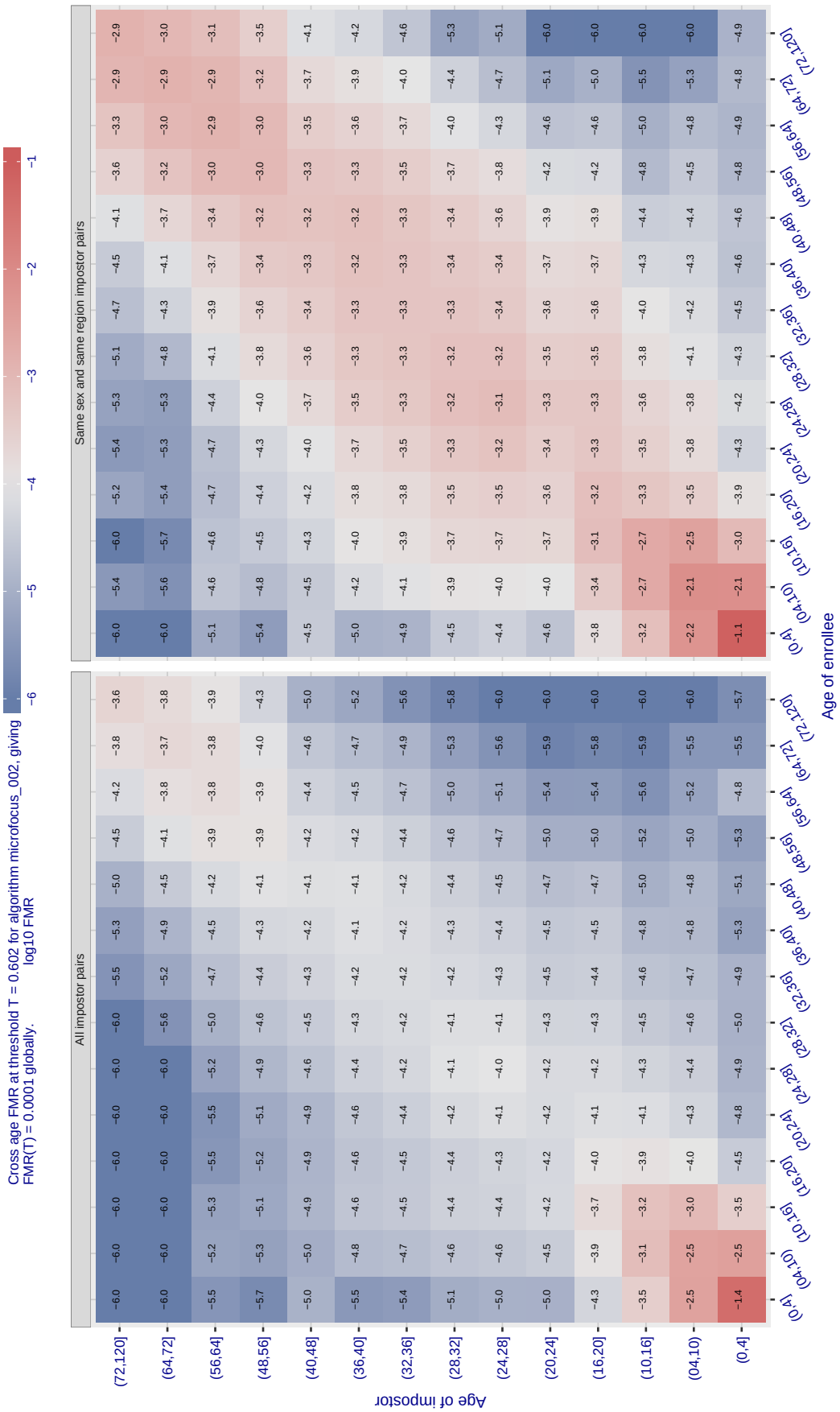


Figure 531: For algorithm microfocus-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

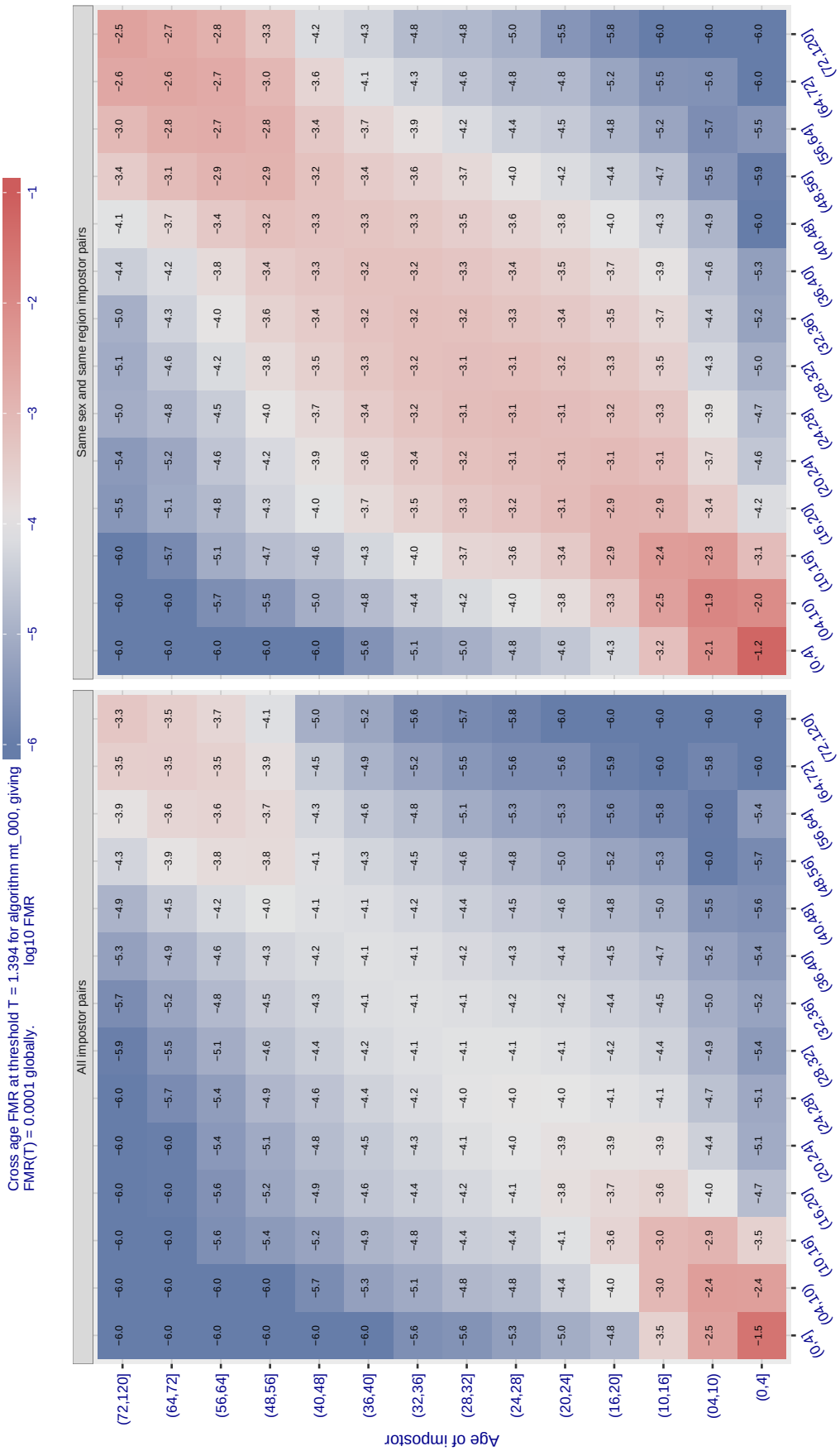


Figure 532: For algorithm mt-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

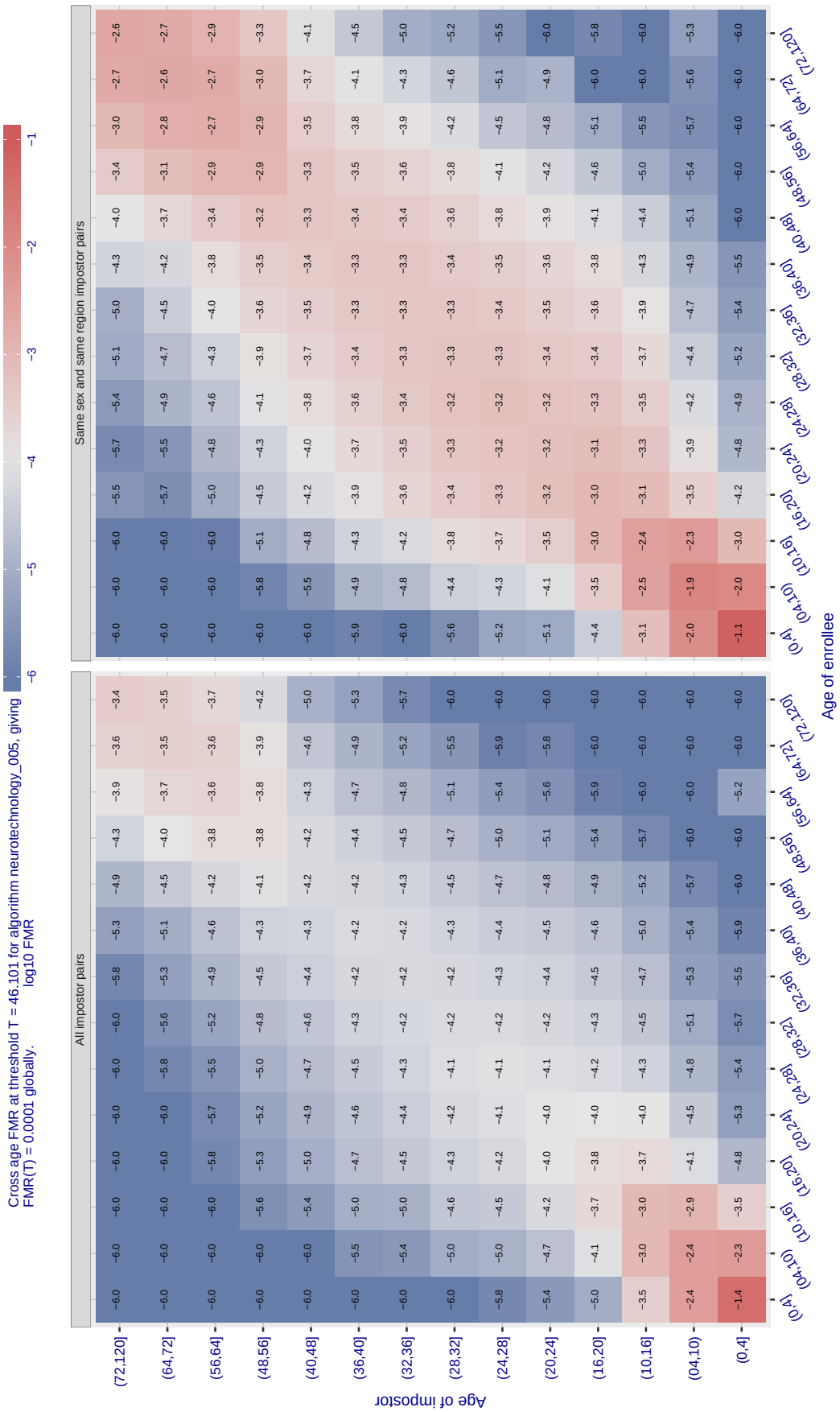


Figure 533: For algorithm neurotechnology-005 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

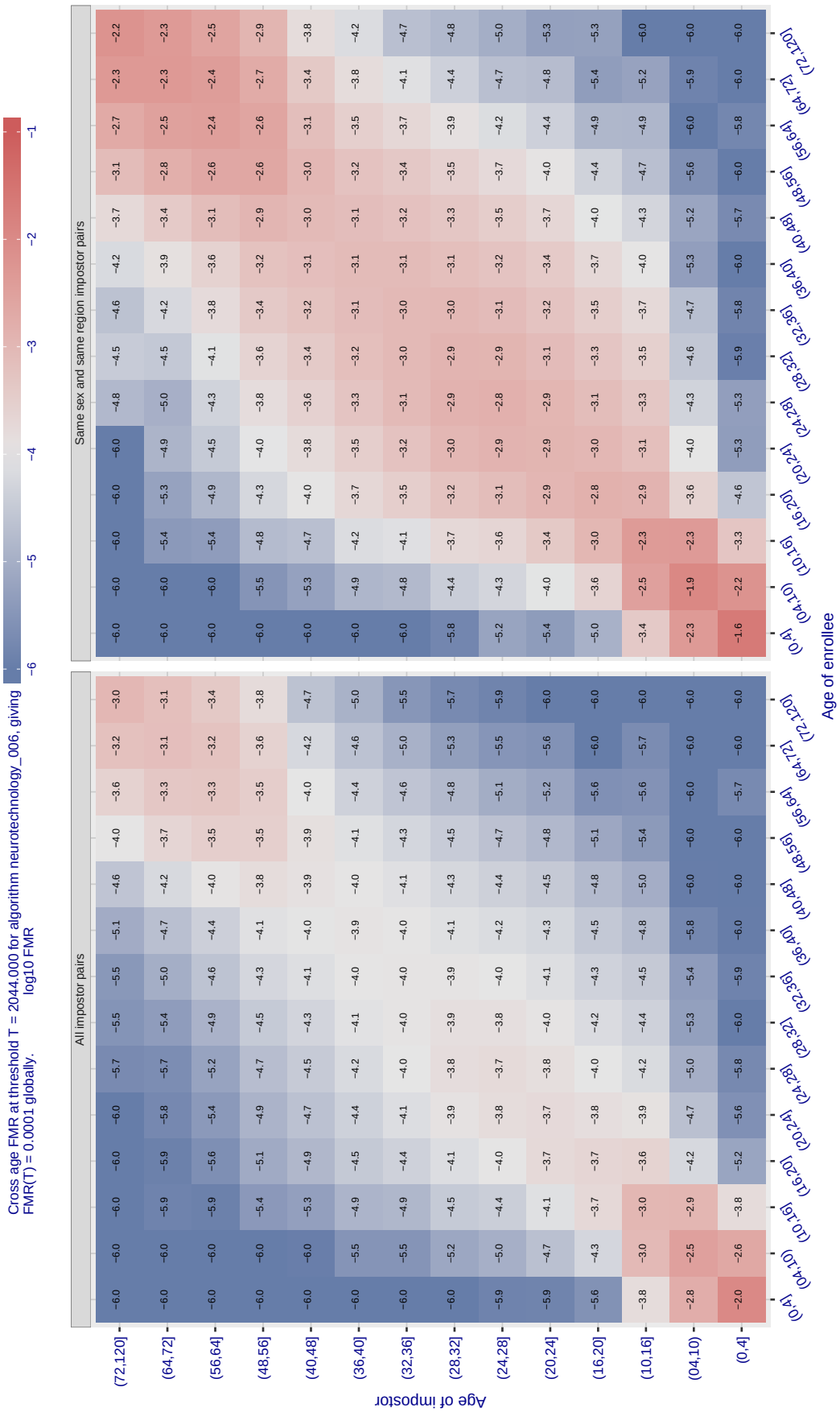


Figure 534: For algorithm neurotechnology-006 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

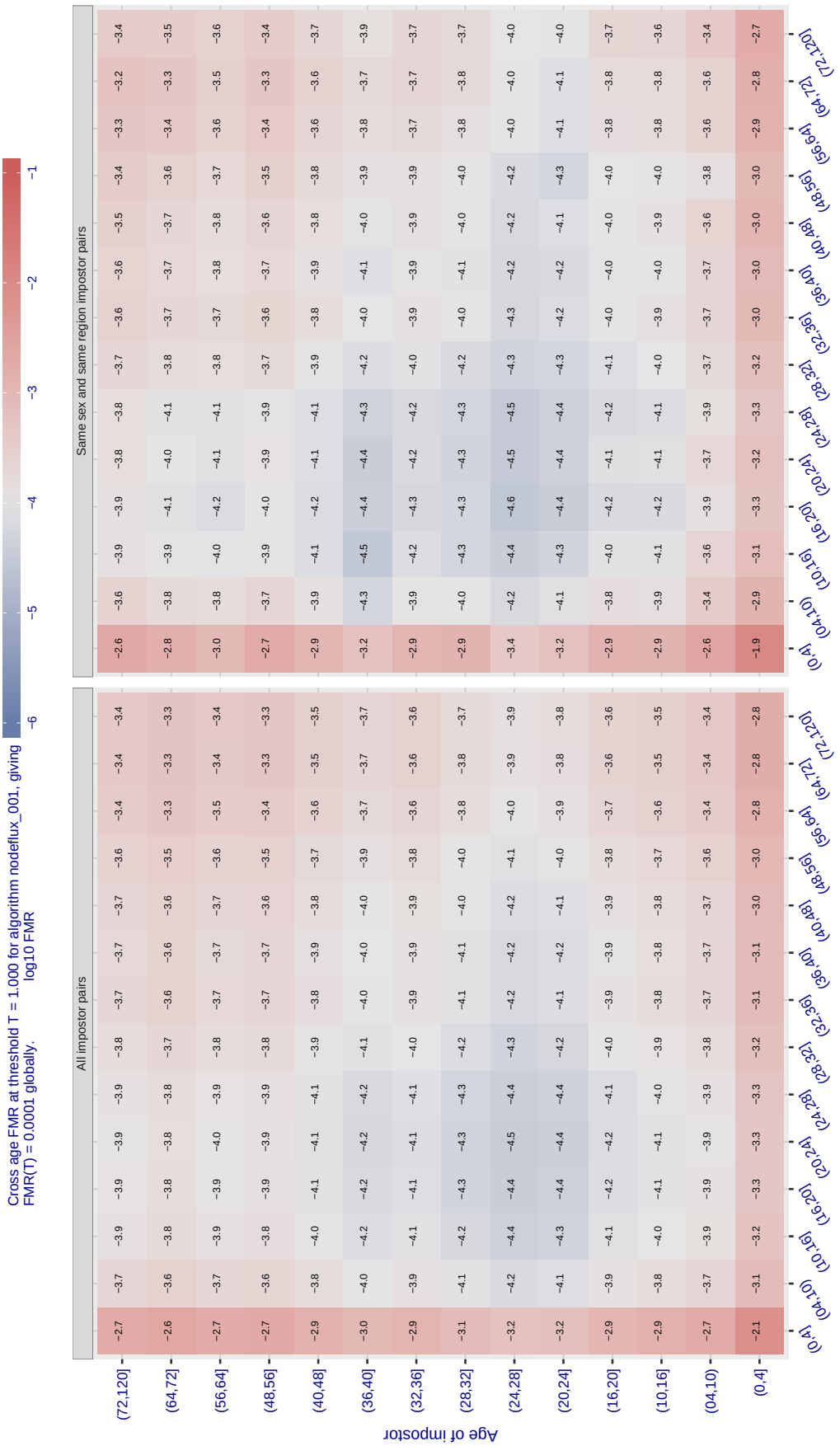


Figure 535: For algorithm nodeflux-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

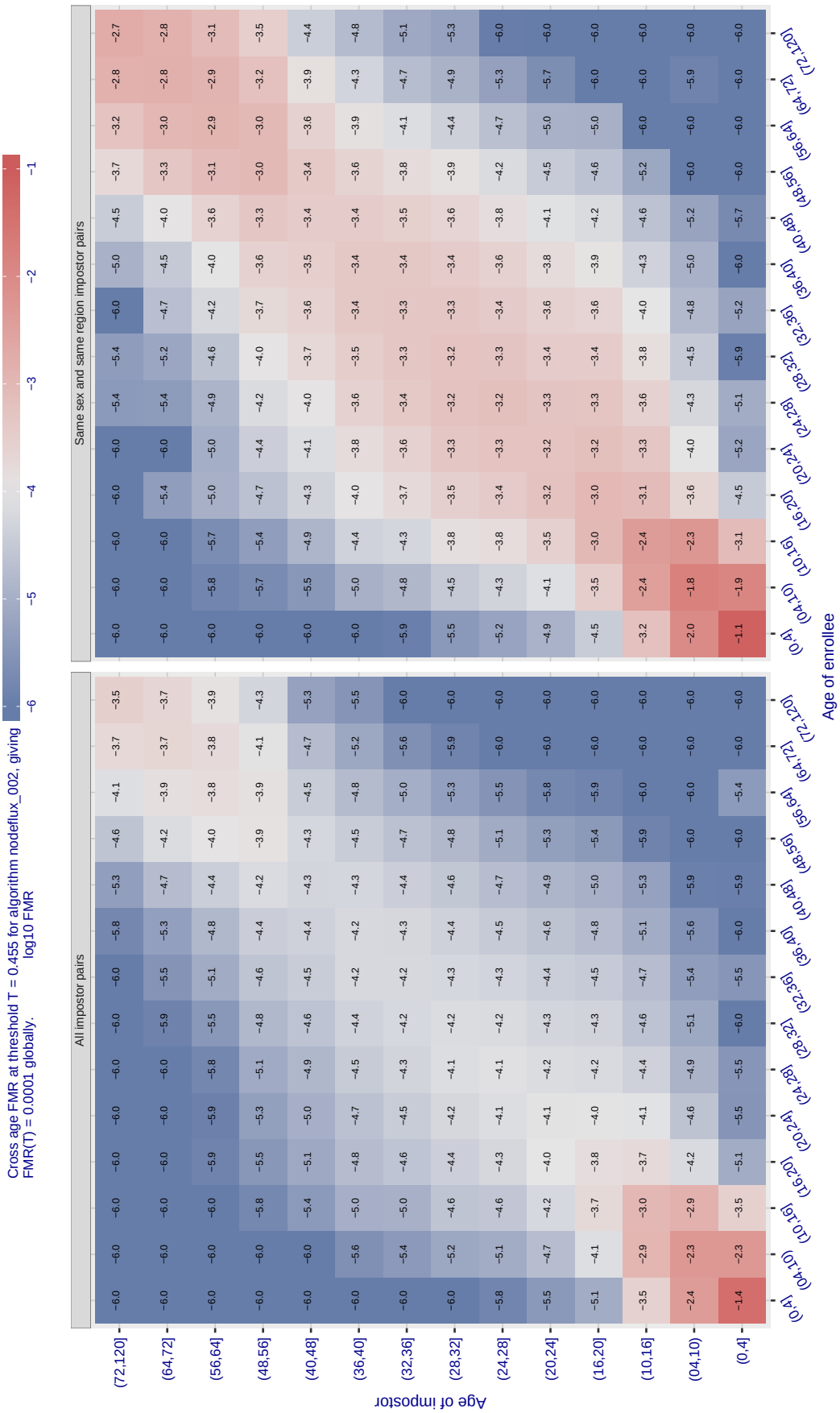


Figure 536: For algorithm nodeflux-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

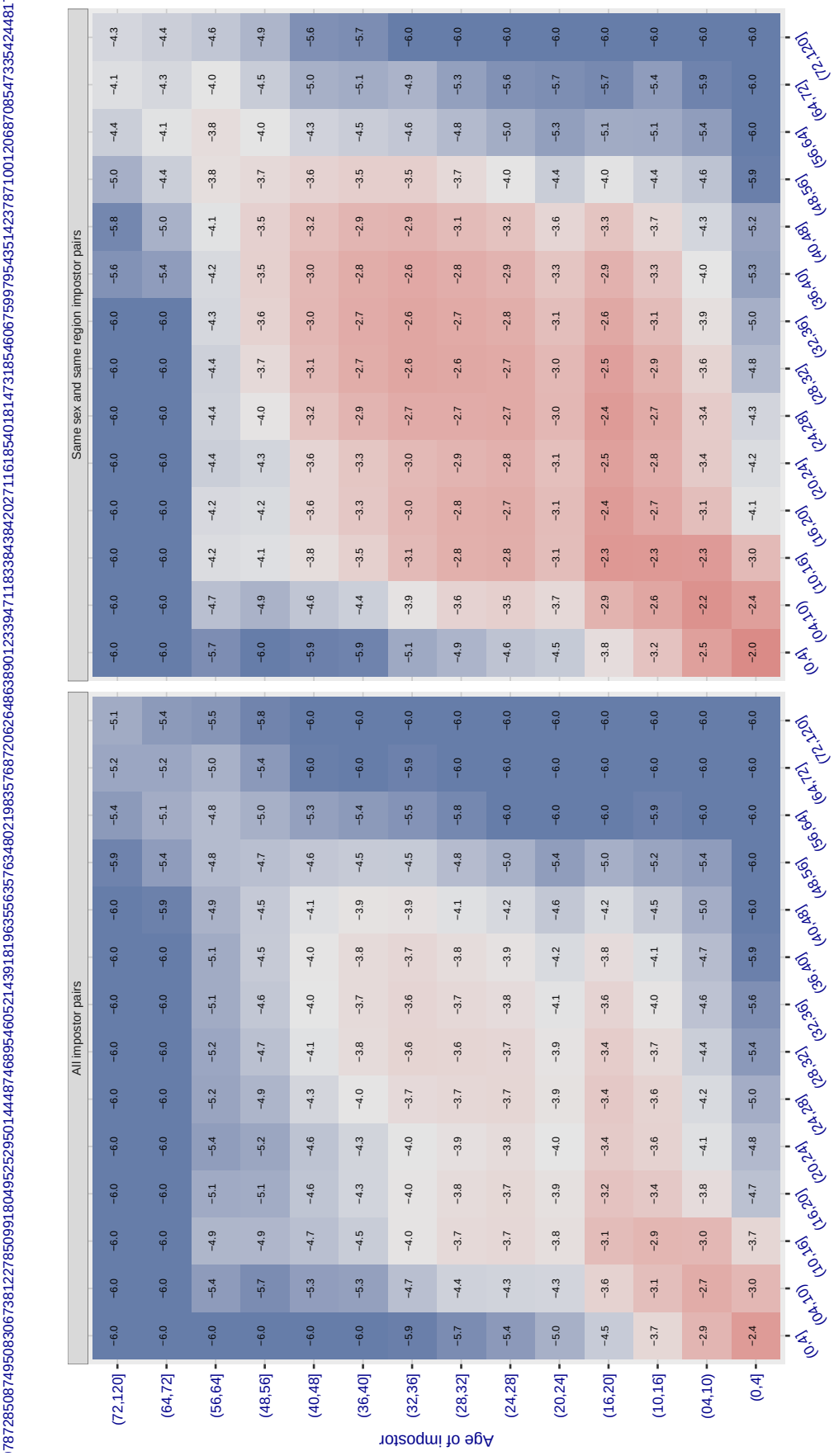


Figure 537: For algorithm notiontag-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

787285087495083067381227850991804952529501444874689546052143918196355635763480219835768720626486390123394711833843842027116185401814731854606759979543514237871001206870854733542448176 7

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

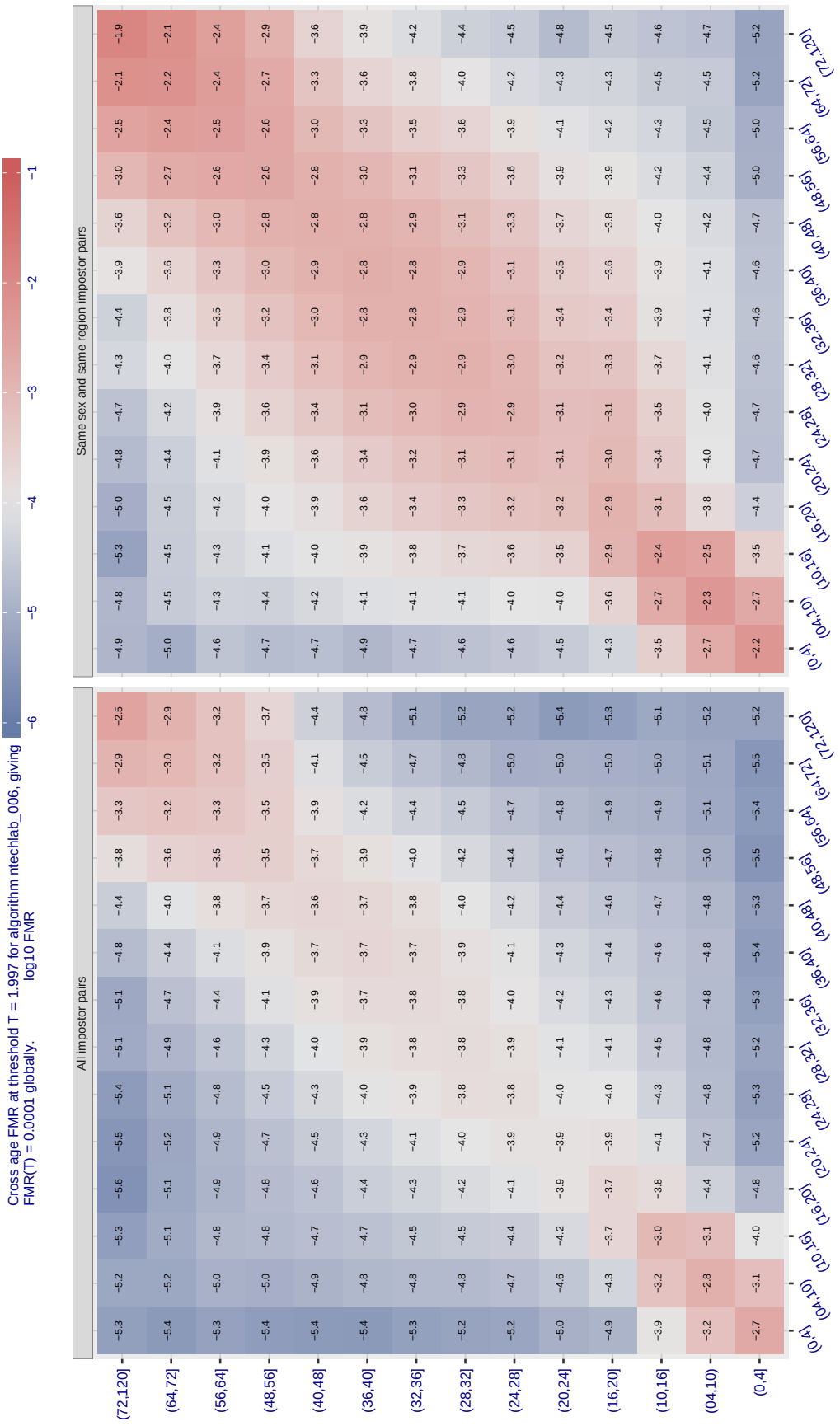


Figure 538: For algorithm ntechlab-006 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

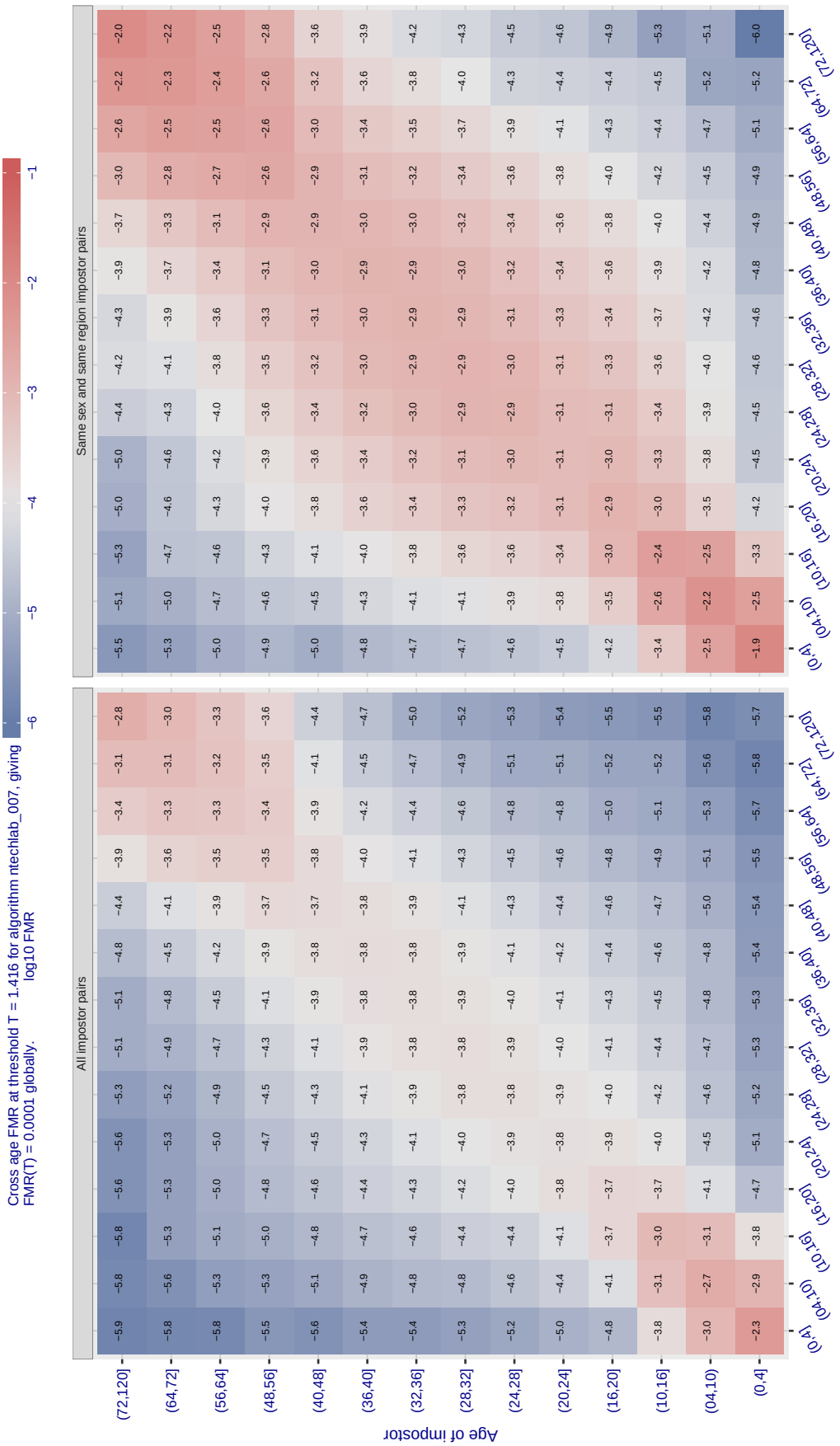


Figure 539: For algorithm ntechlab-007 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

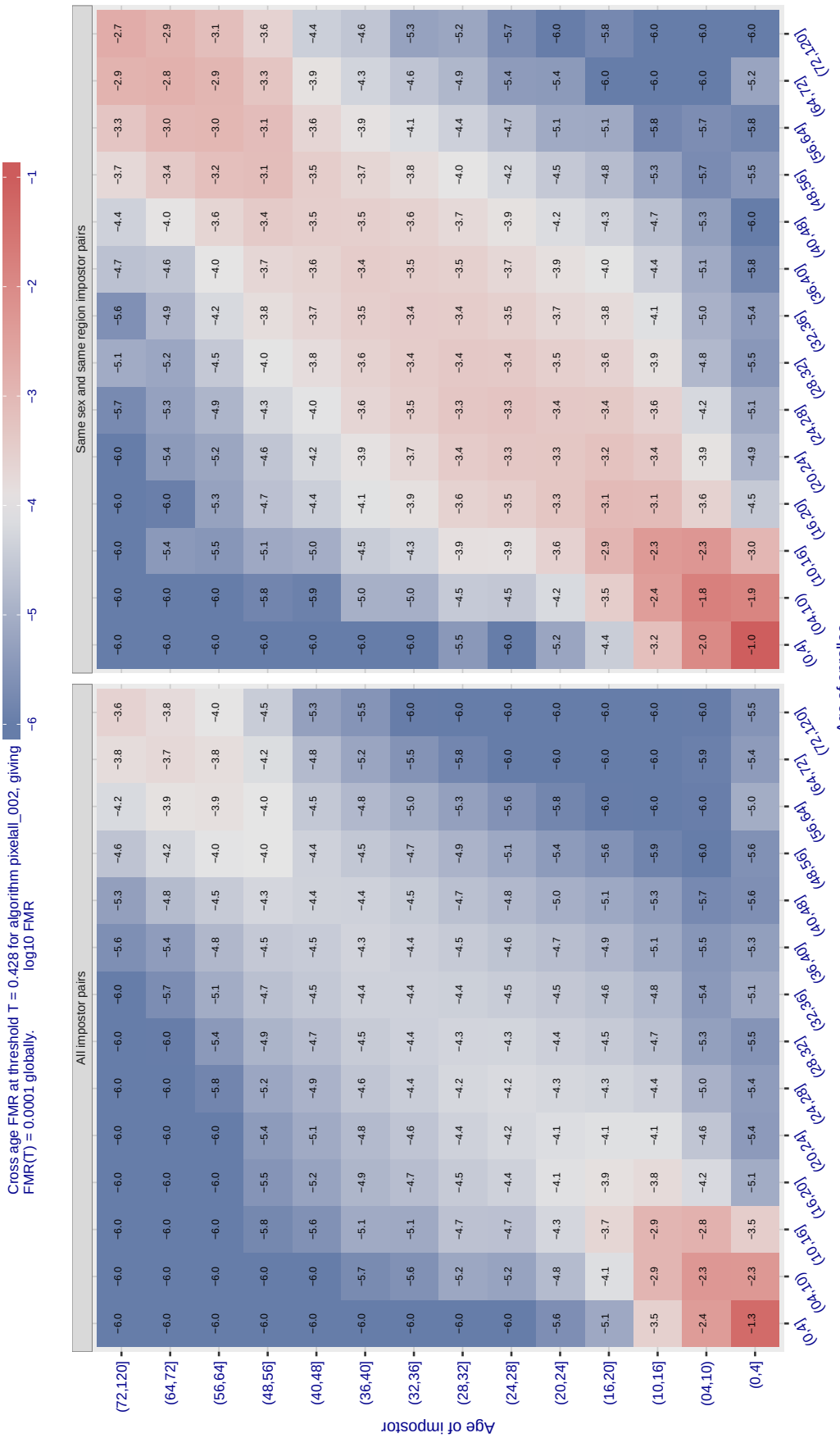


Figure 540: For algorithm pixelall-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

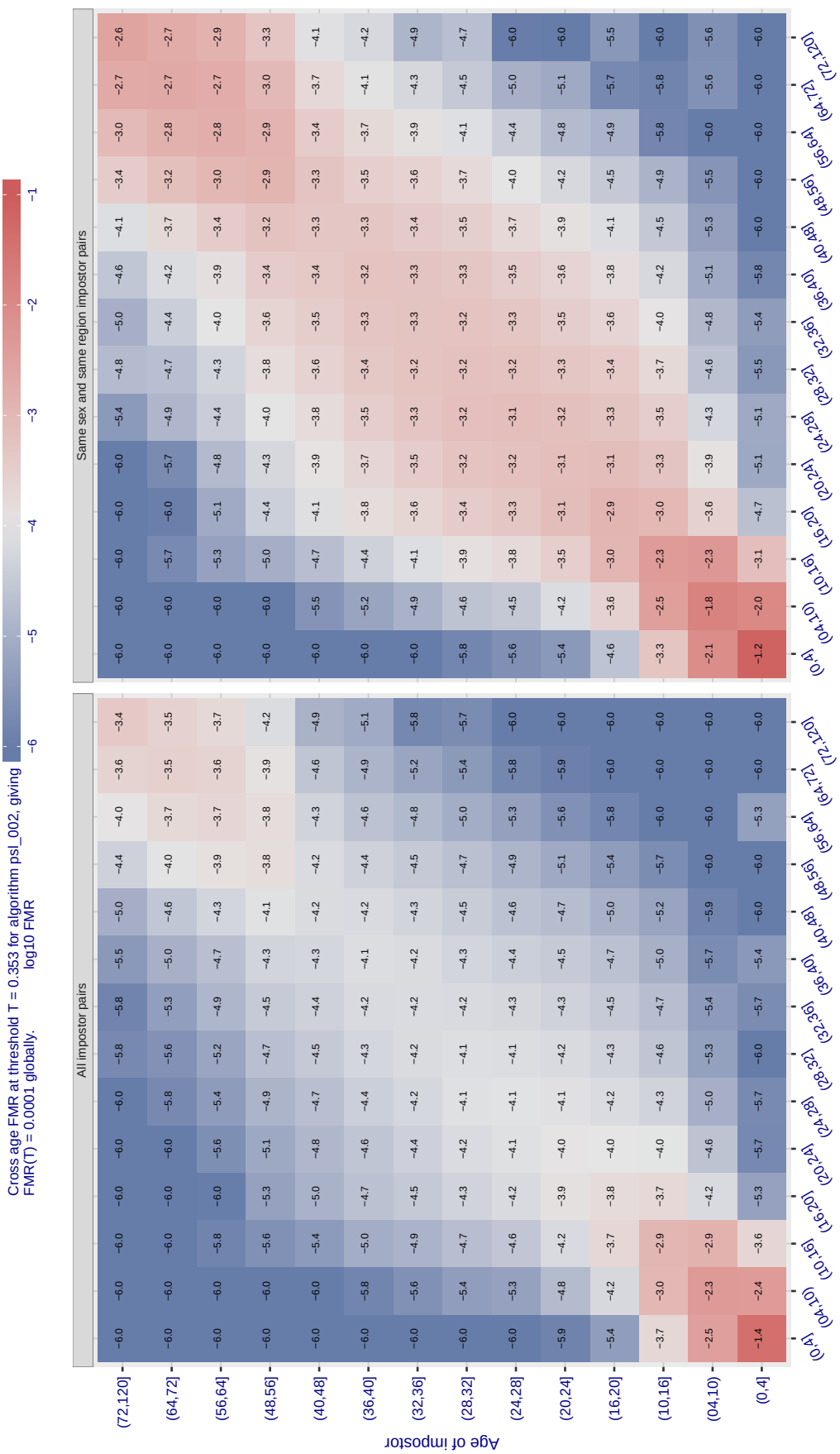


Figure 541: For algorithm psl-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

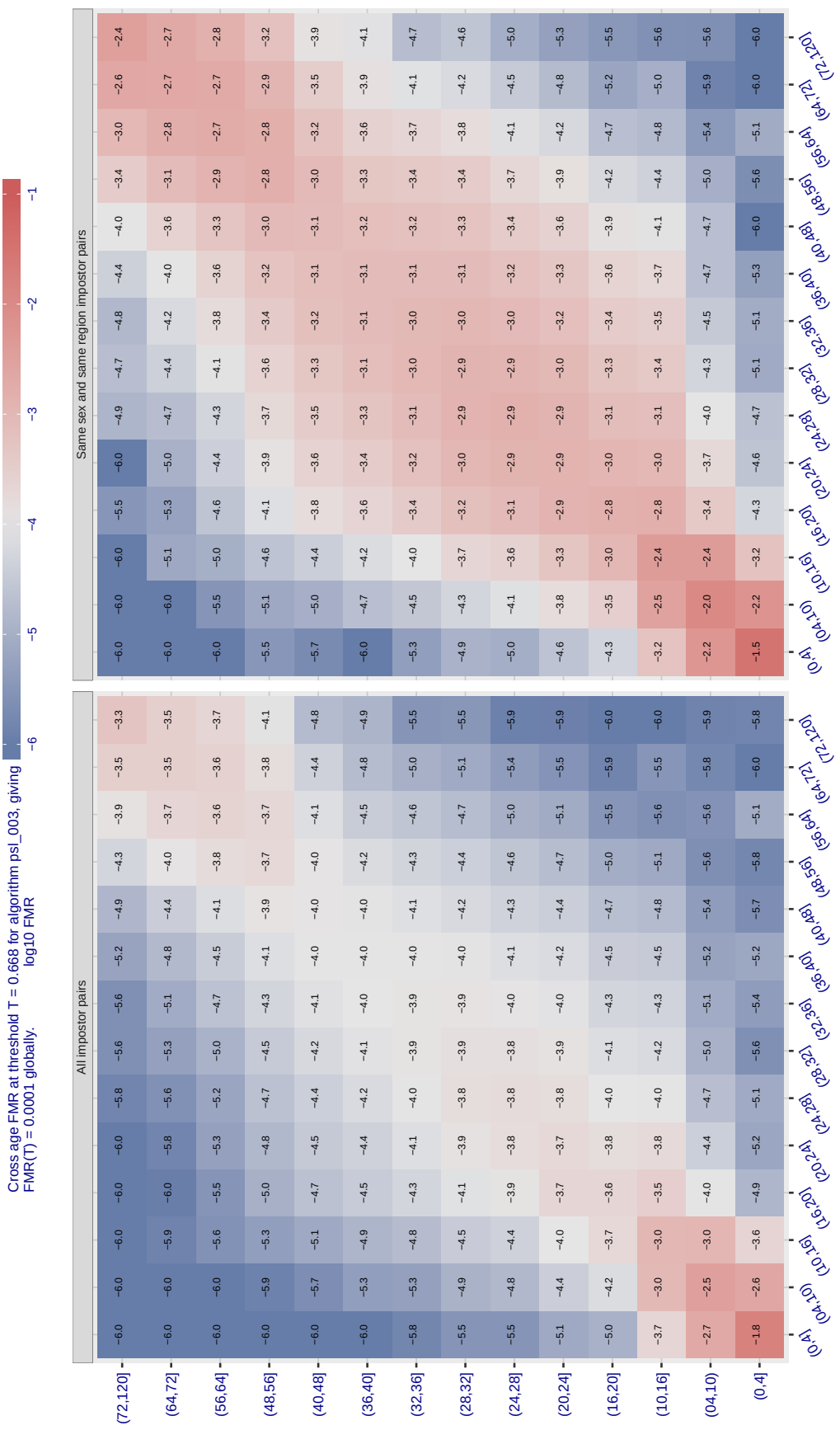


Figure 542: For algorithm psl-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

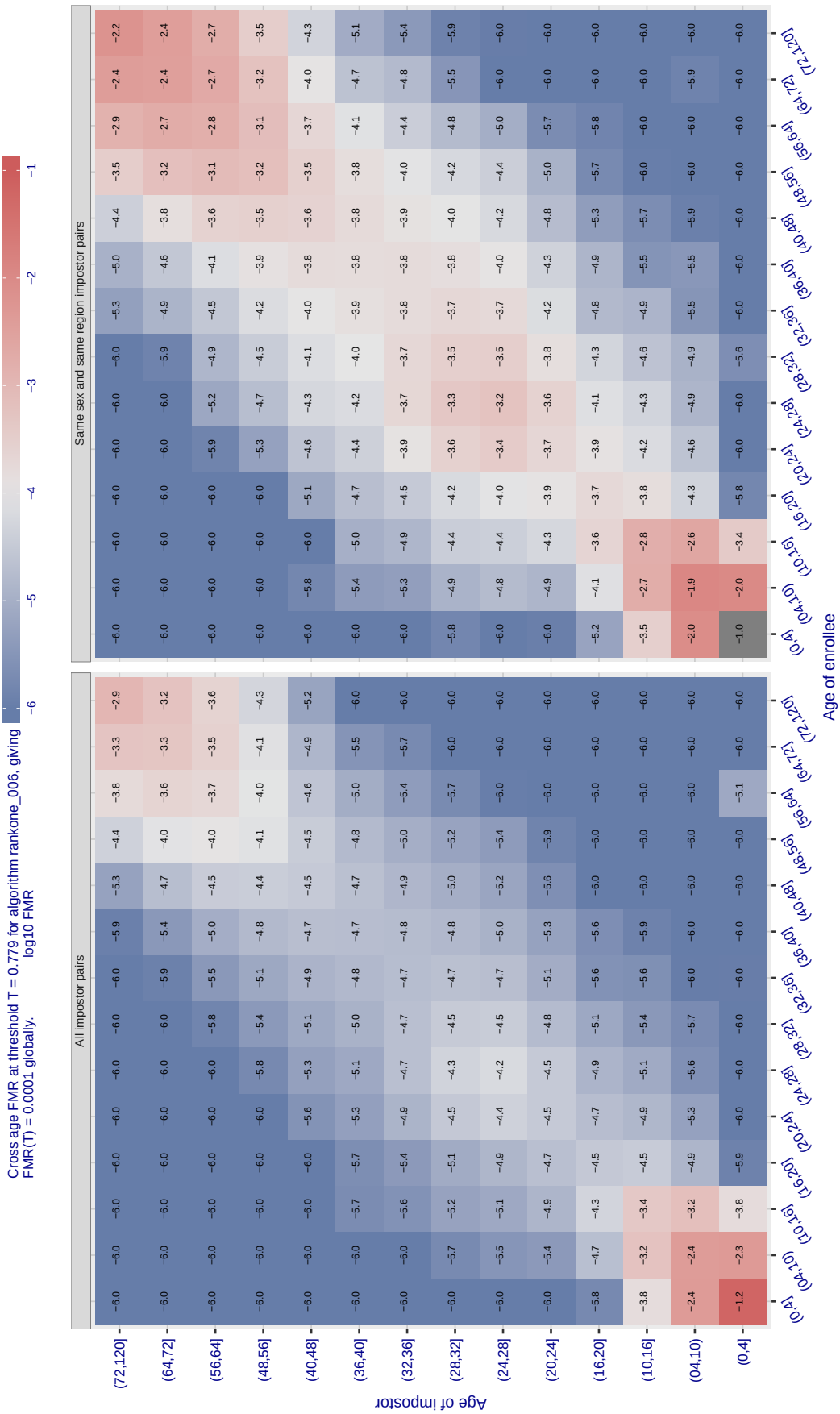


Figure 543: For algorithm rankone-006 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

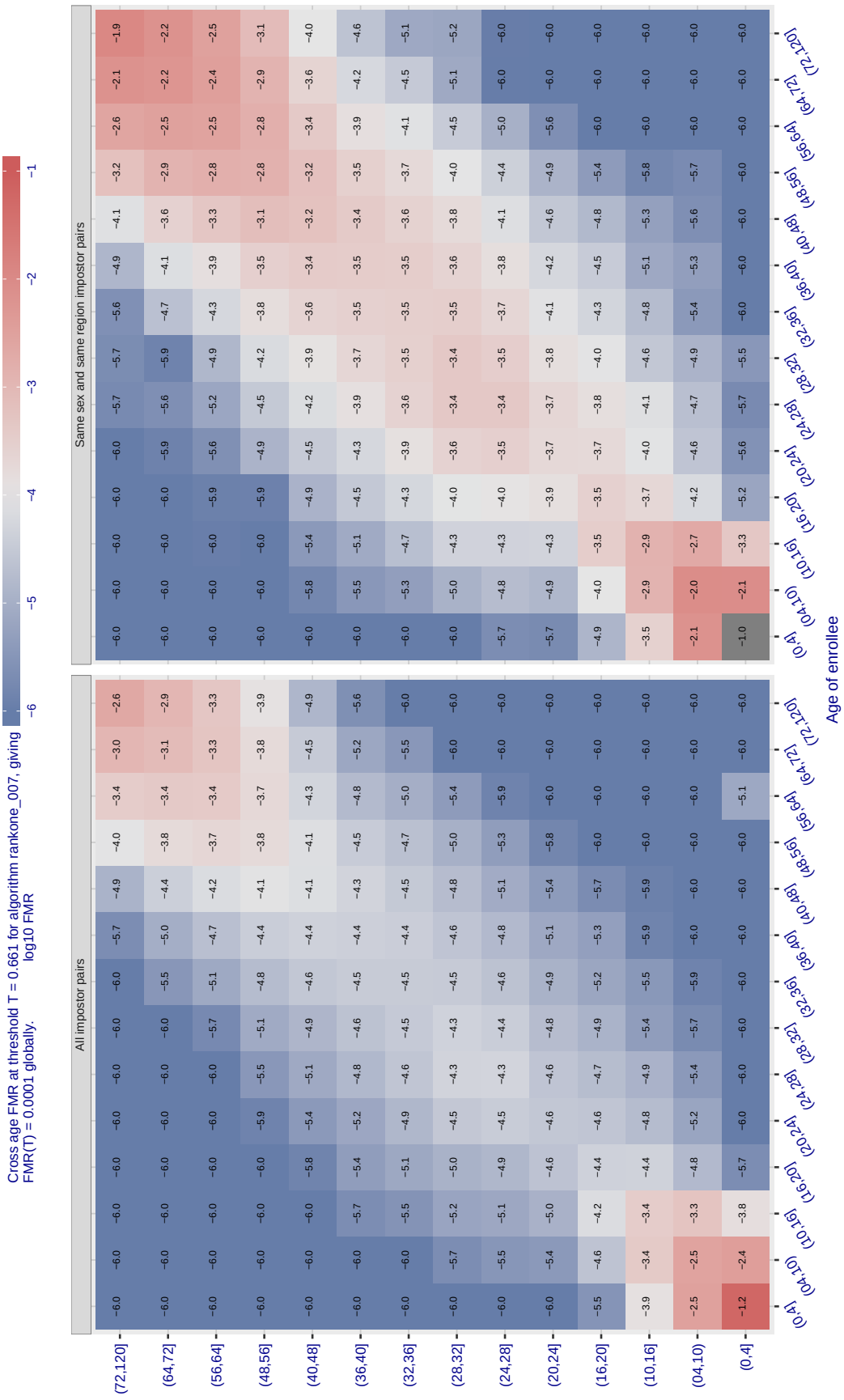


Figure 544: For algorithm rankone-007 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

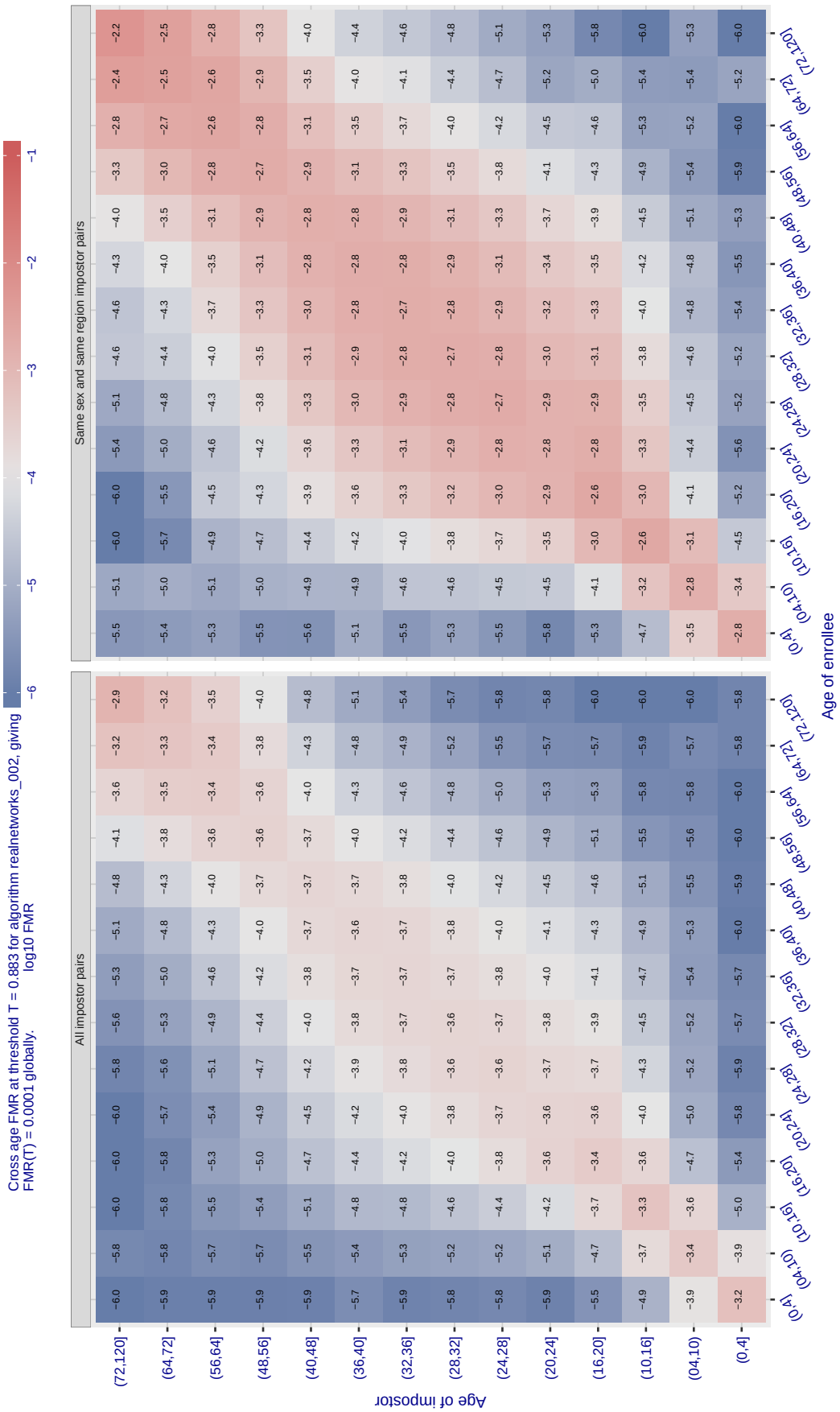


Figure 545: For algorithm realnetworks-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

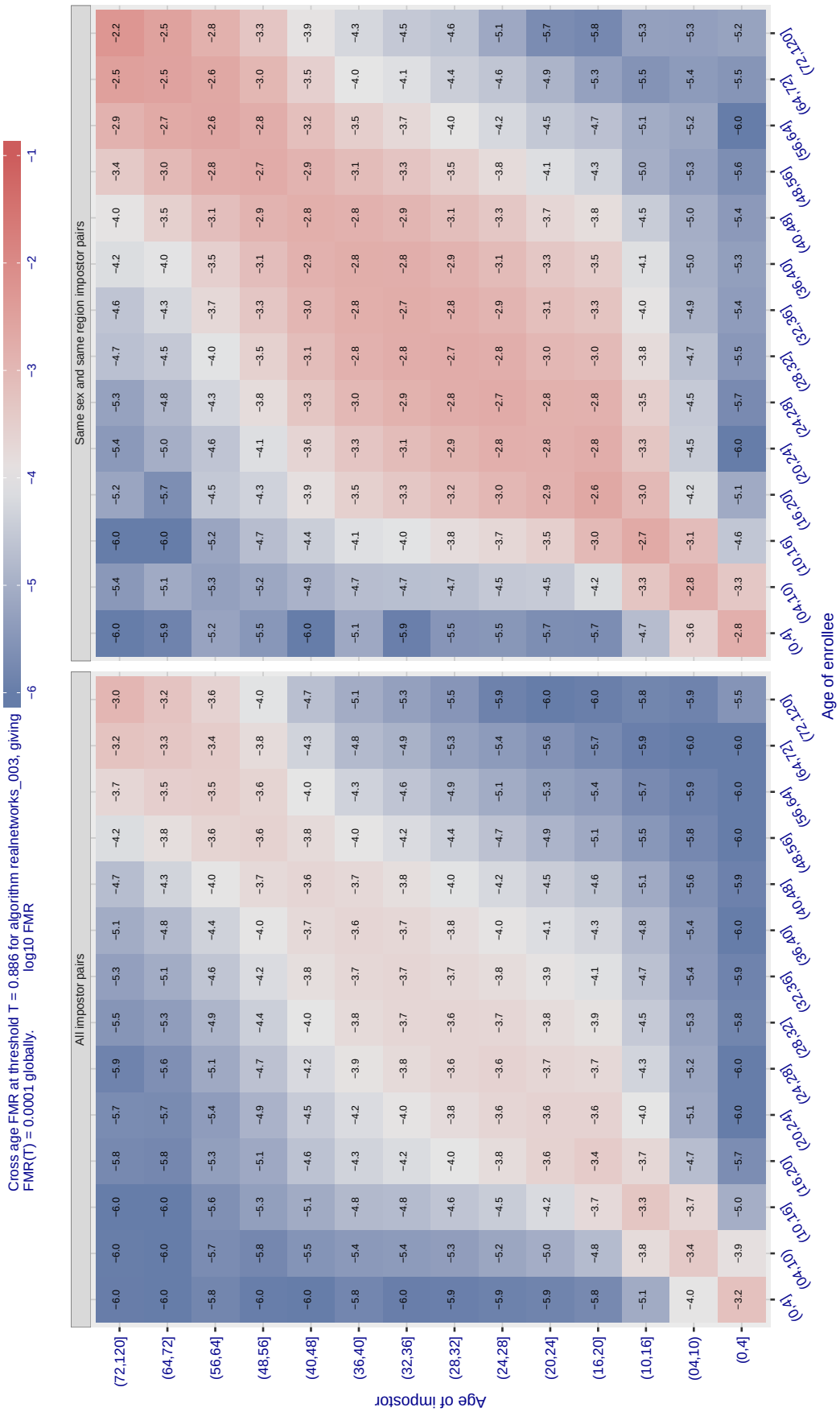


Figure 546: For algorithm realnetworks-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

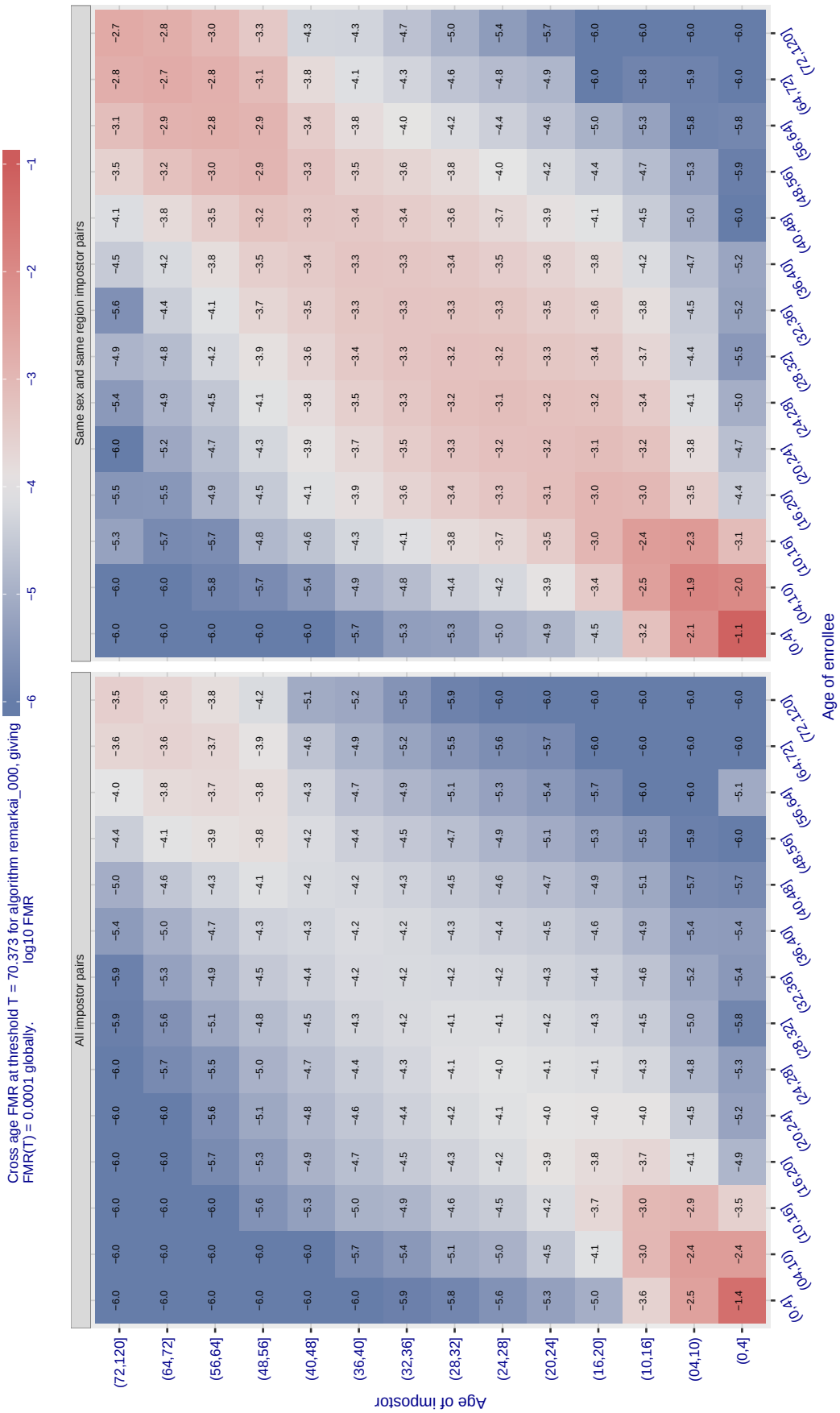


Figure 547: For algorithm remarkai-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

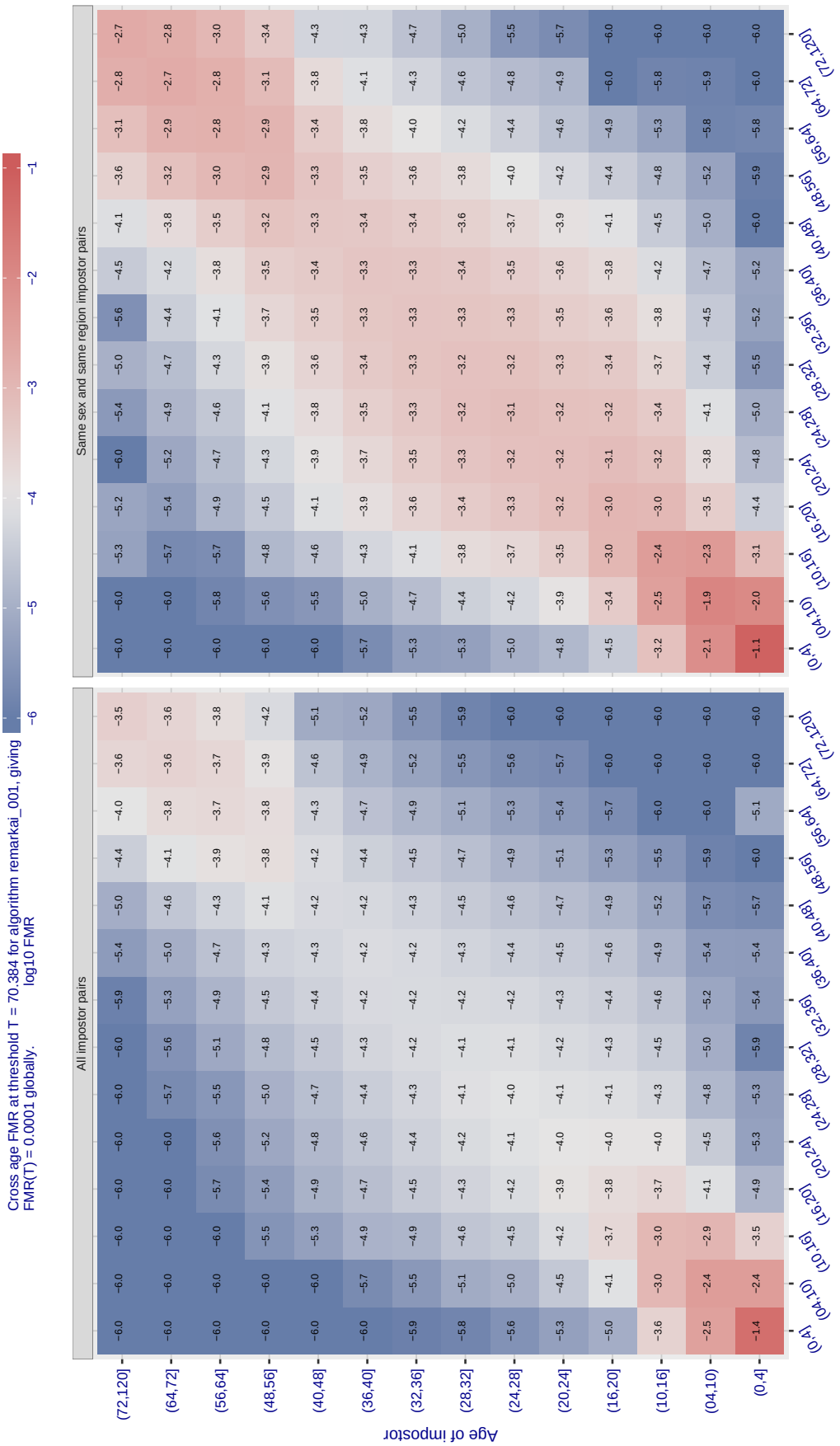


Figure 548: For algorithm remarkai-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

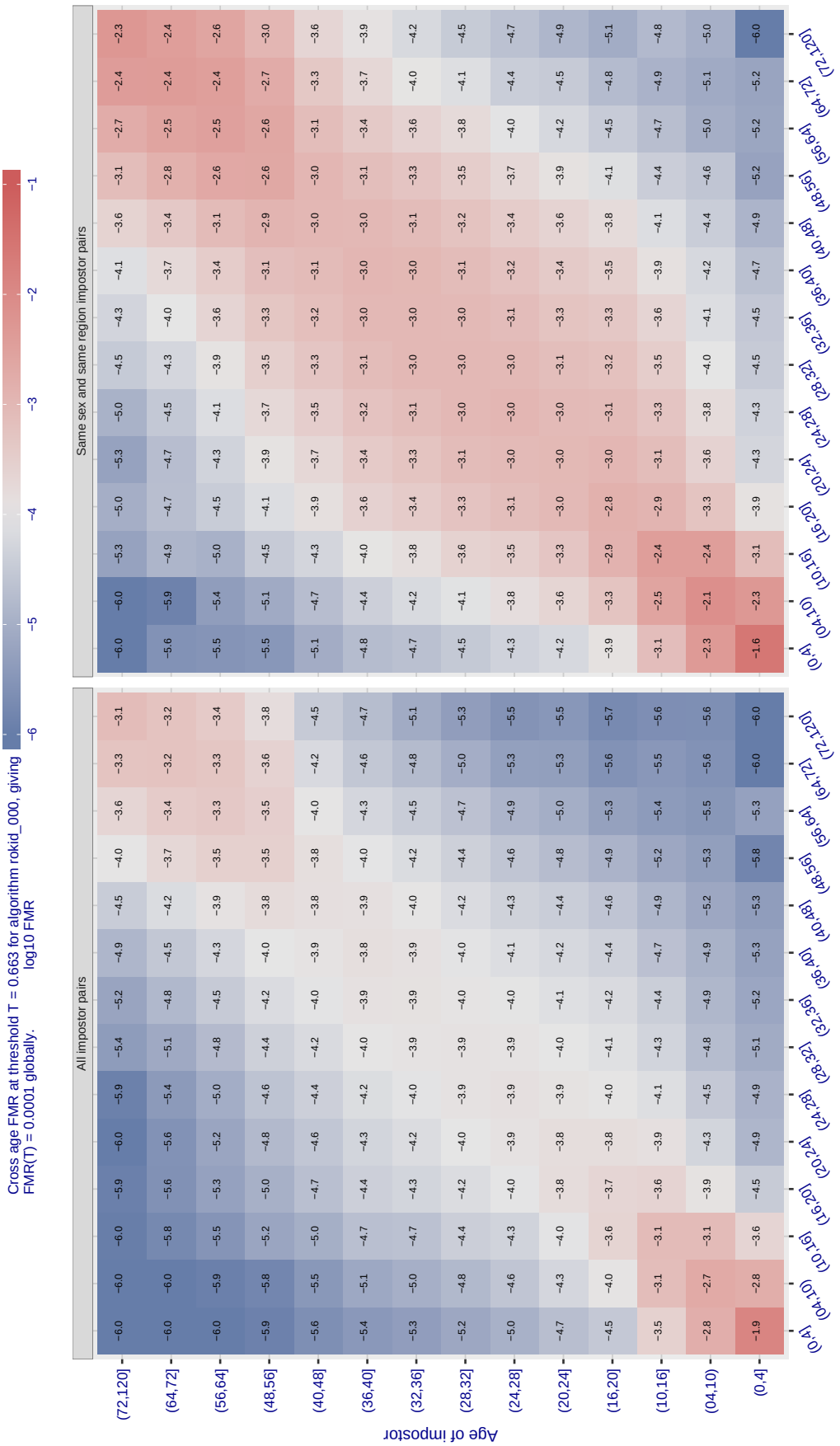


Figure 549: For algorithm rokid-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

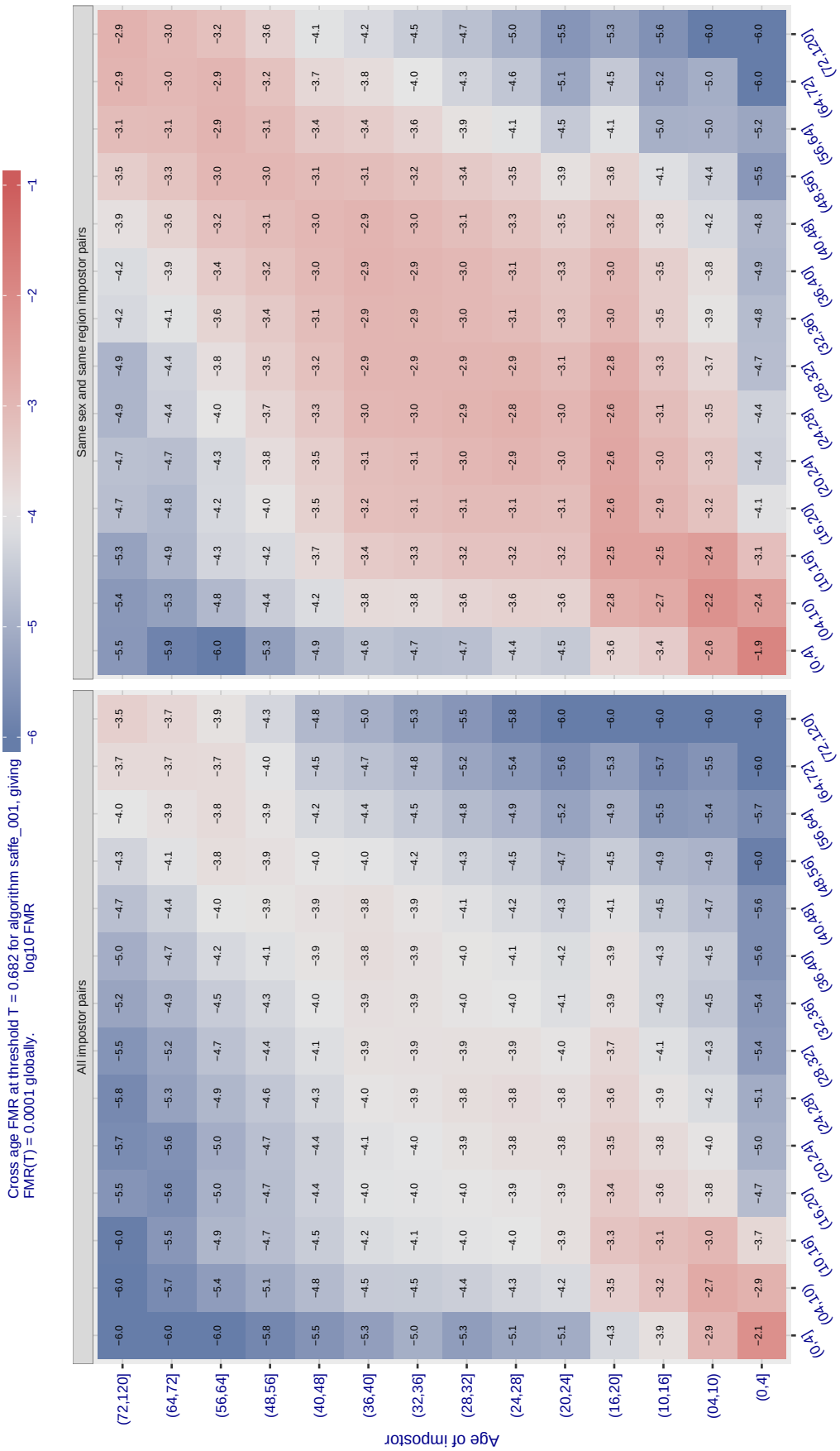


Figure 550: For algorithm saffe-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

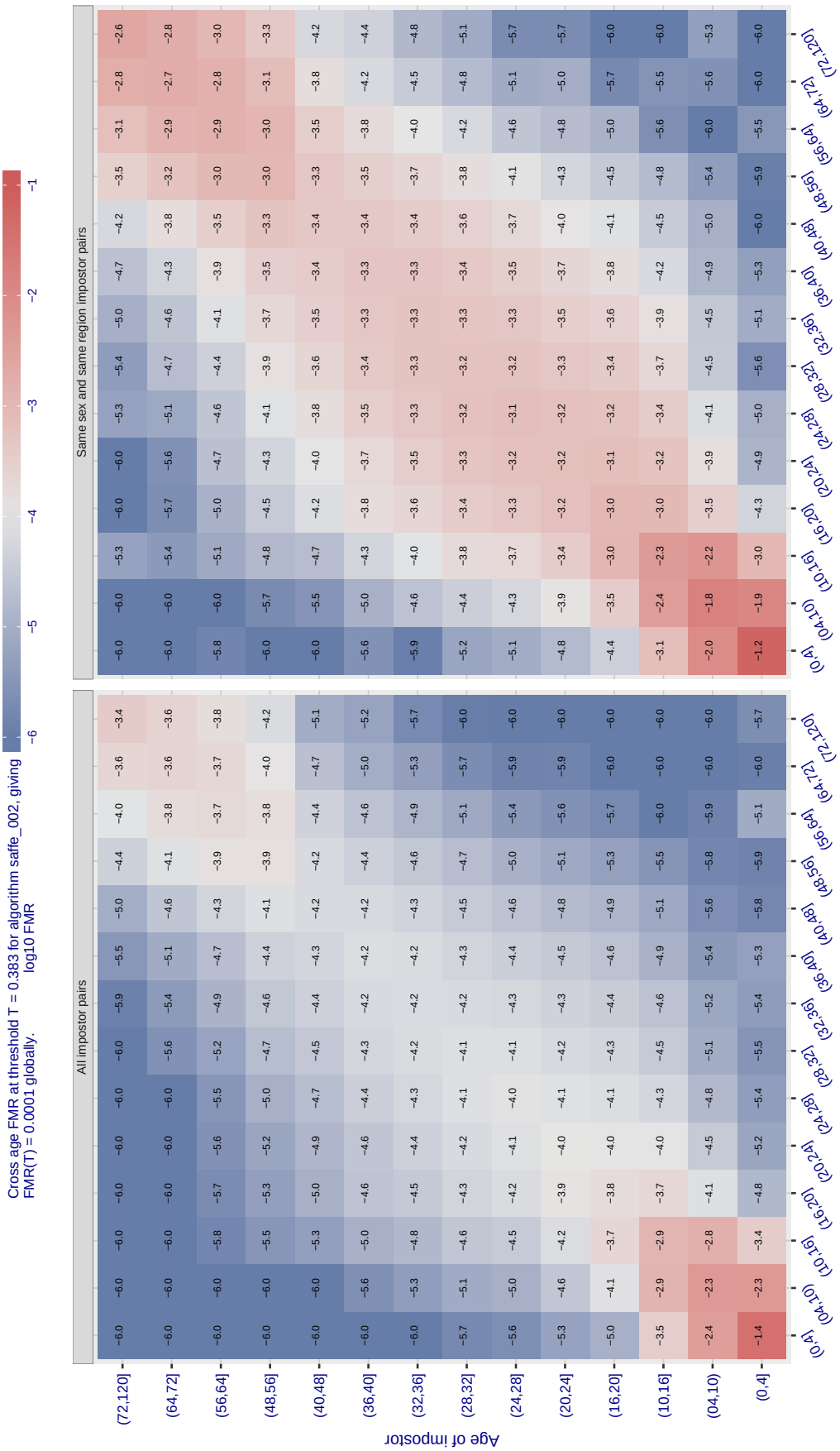


Figure 551: For algorithm saffe-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

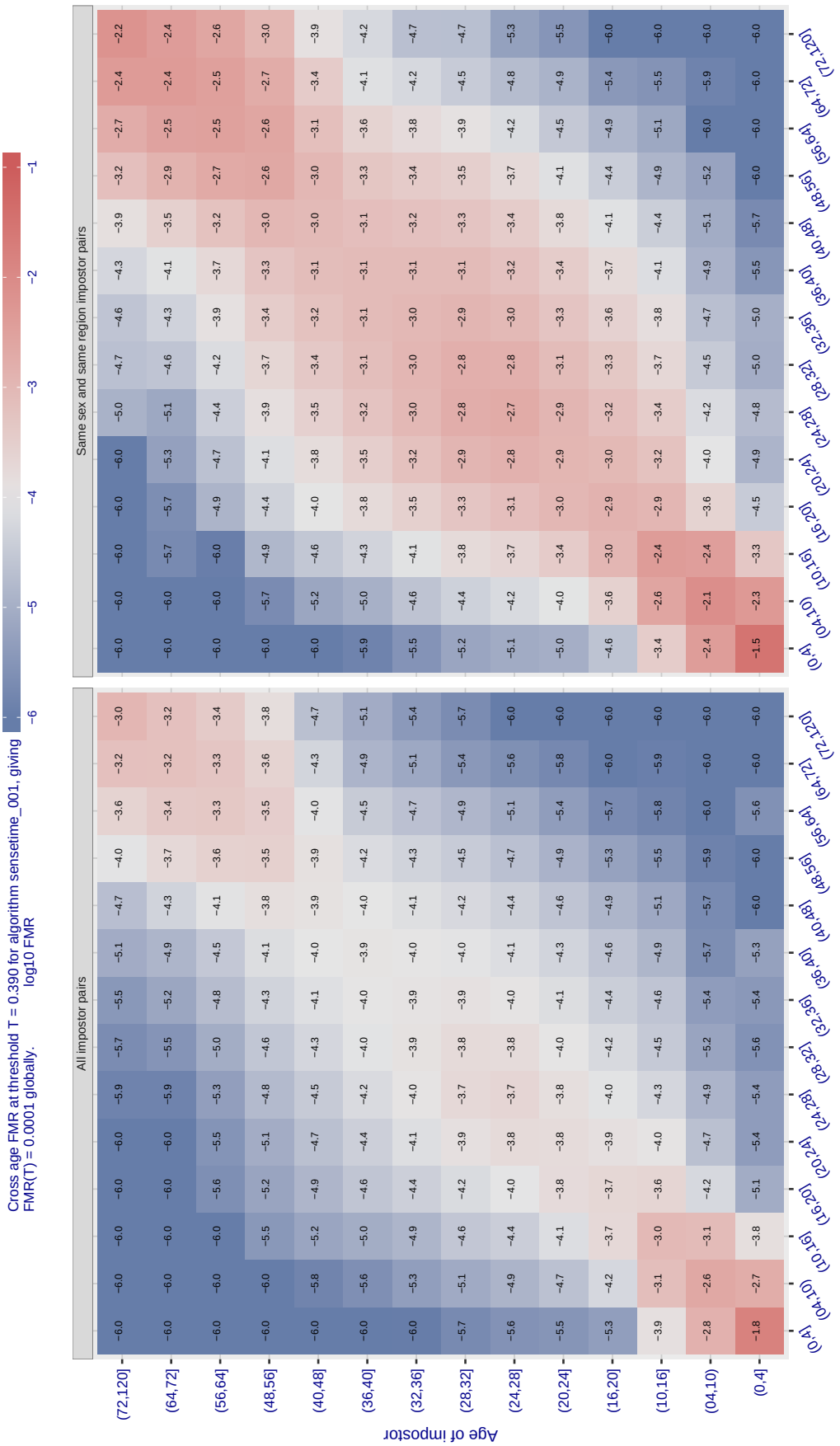


Figure 552: For algorithm sensetime-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

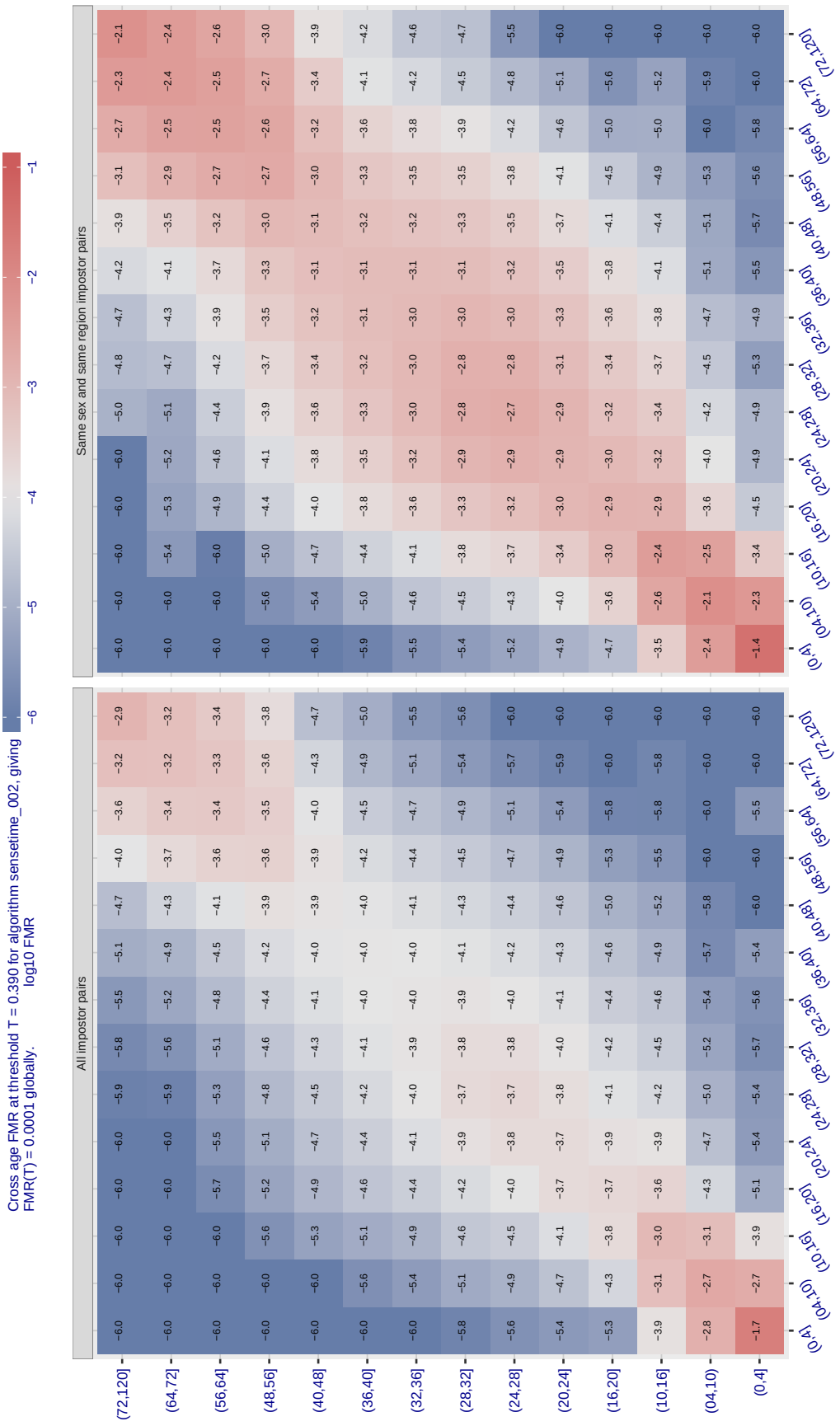


Figure 553: For algorithm sensetime-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

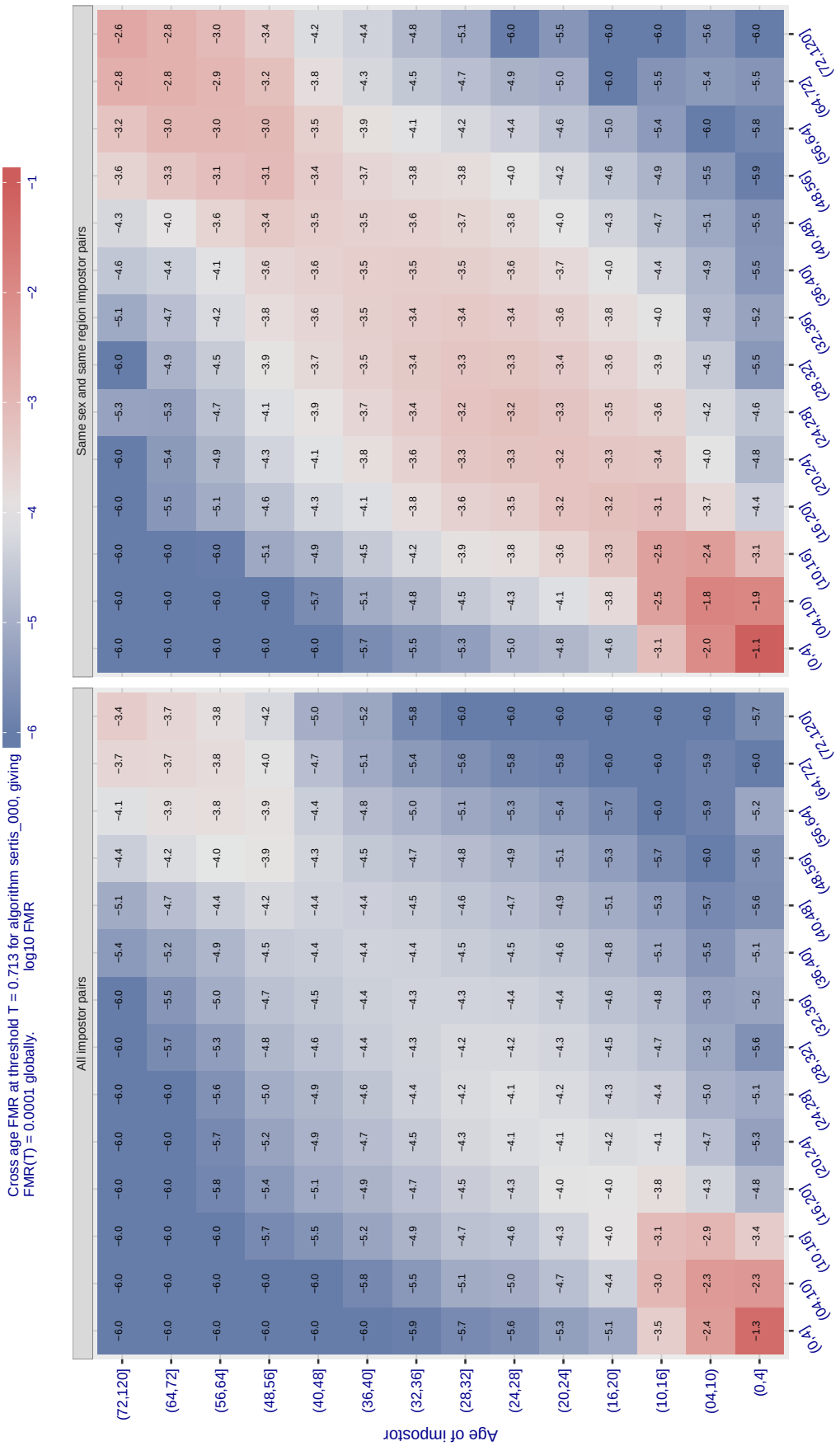


Figure 554: For algorithm sertis-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

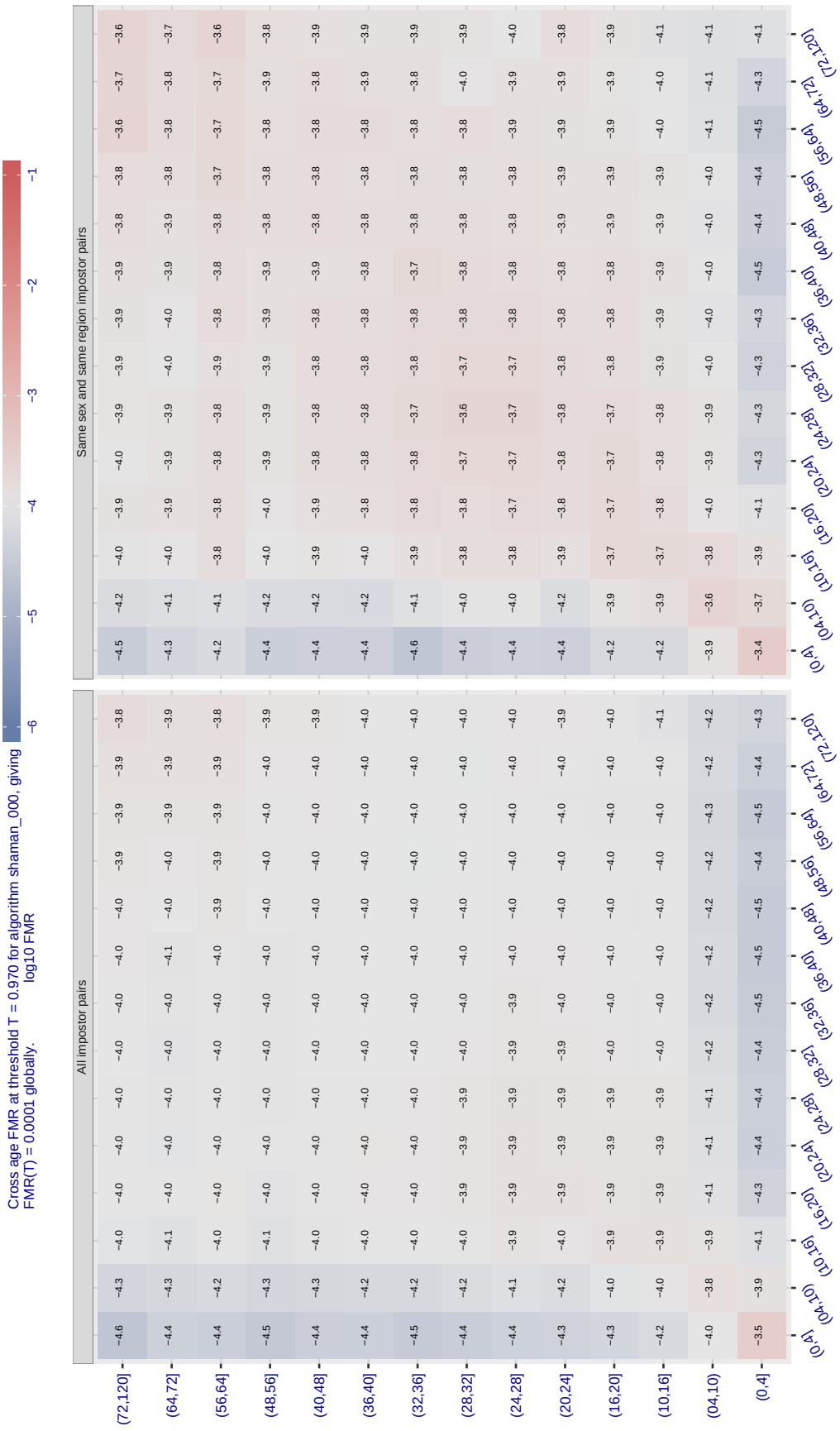


Figure 555: For algorithm shaman-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

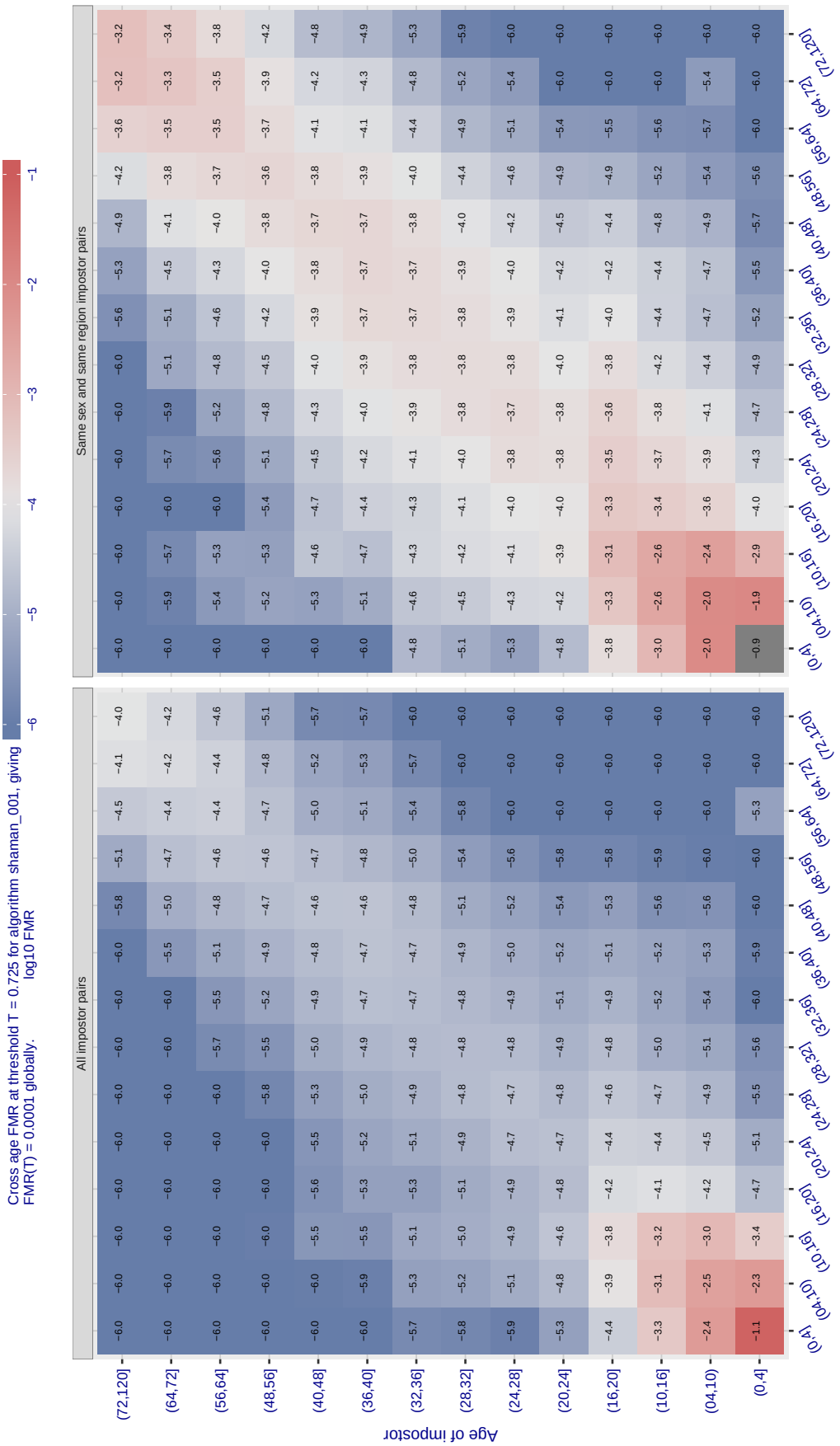


Figure 556: For algorithm shaman-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

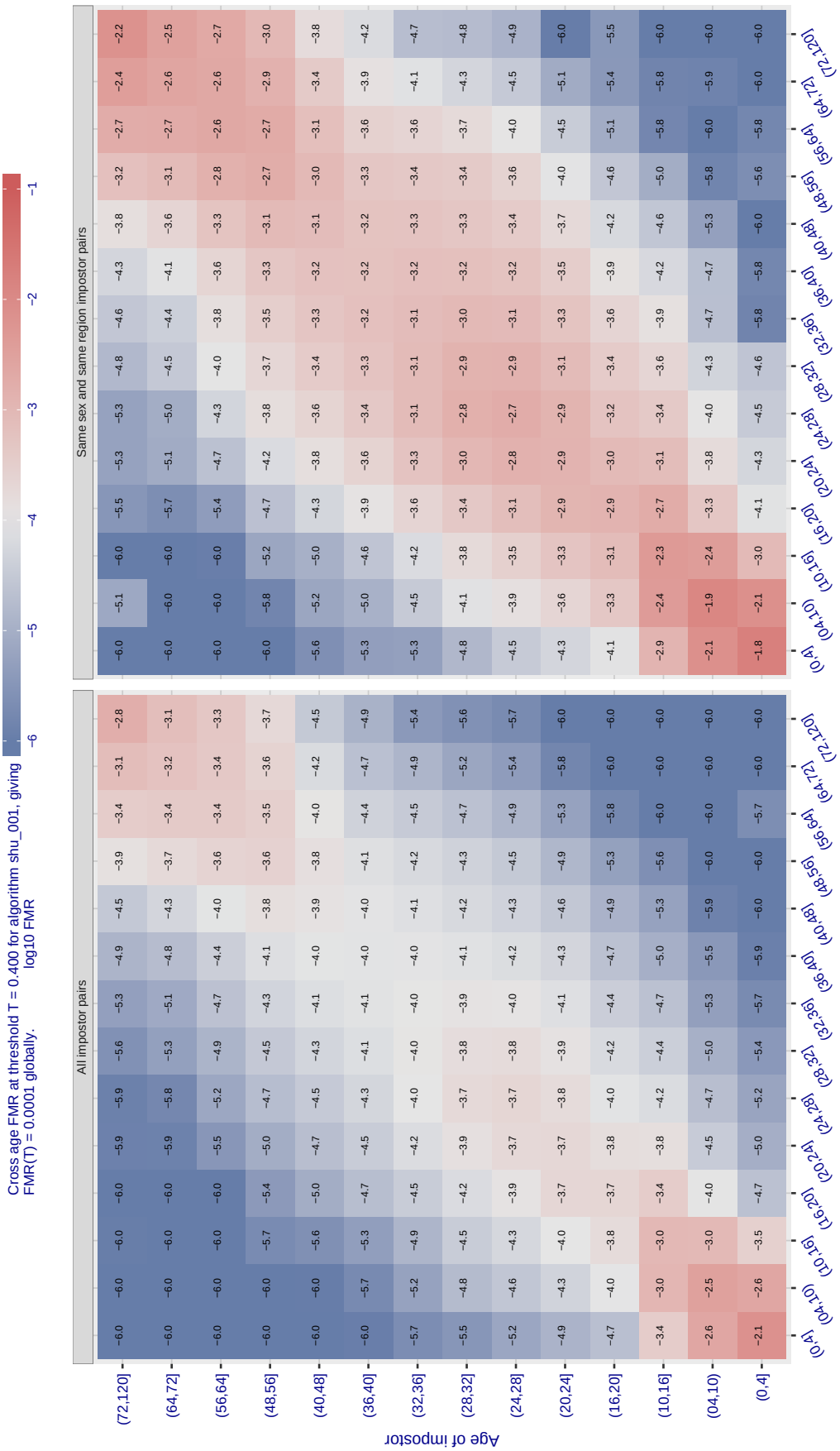


Figure 557: For algorithm shu-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

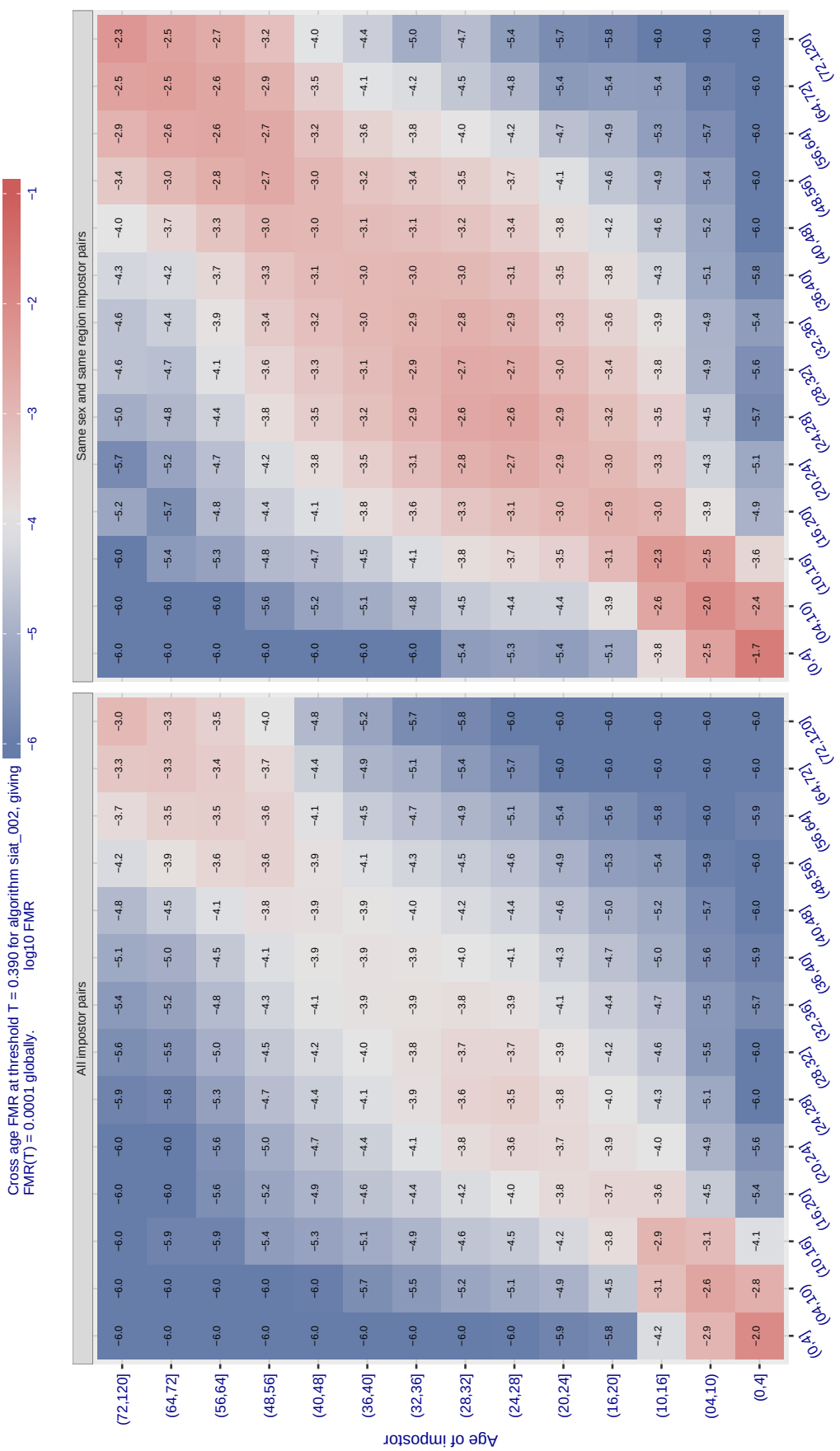


Figure 558: For algorithm siat-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

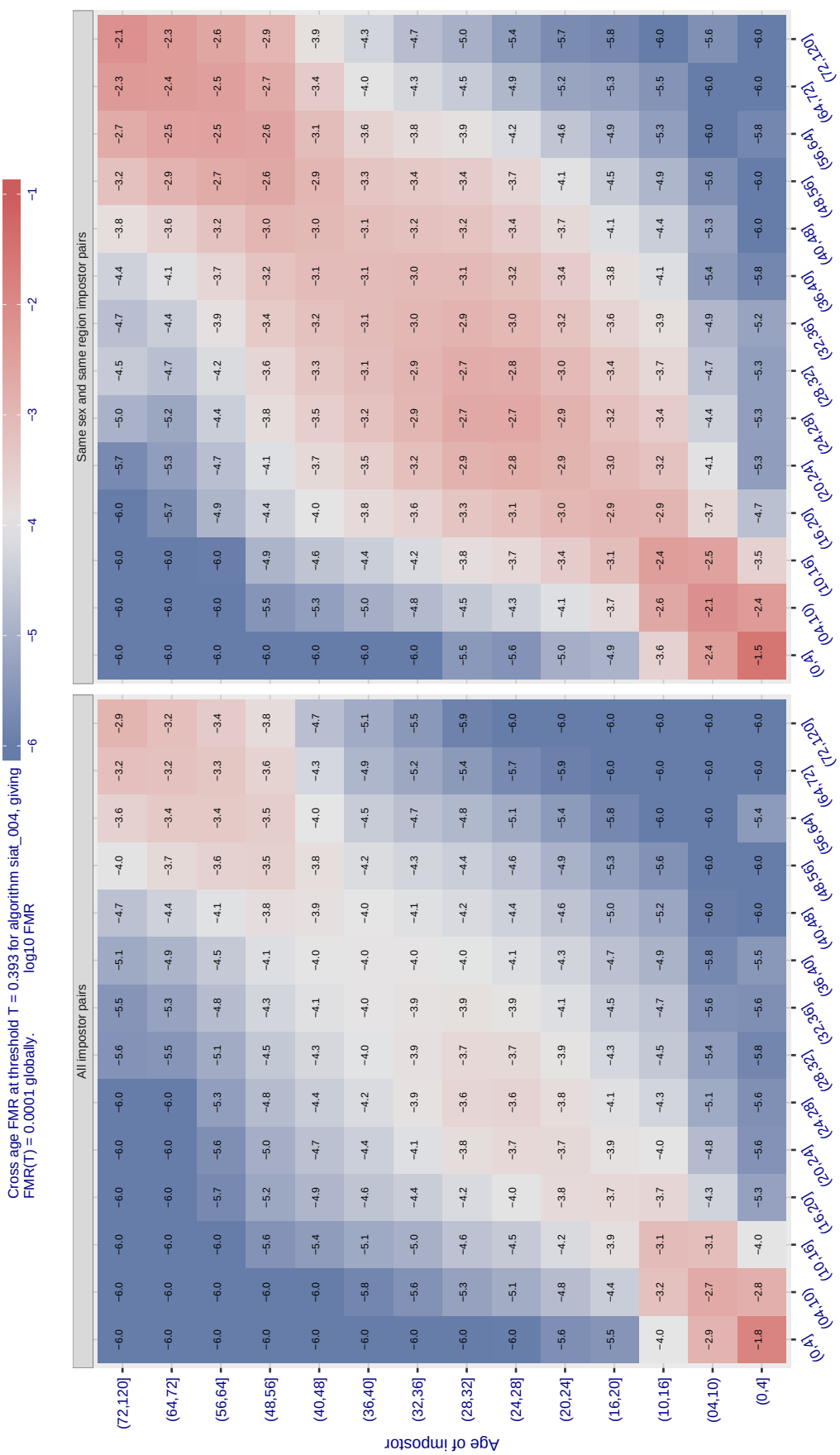


Figure 559: For algorithm siat-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

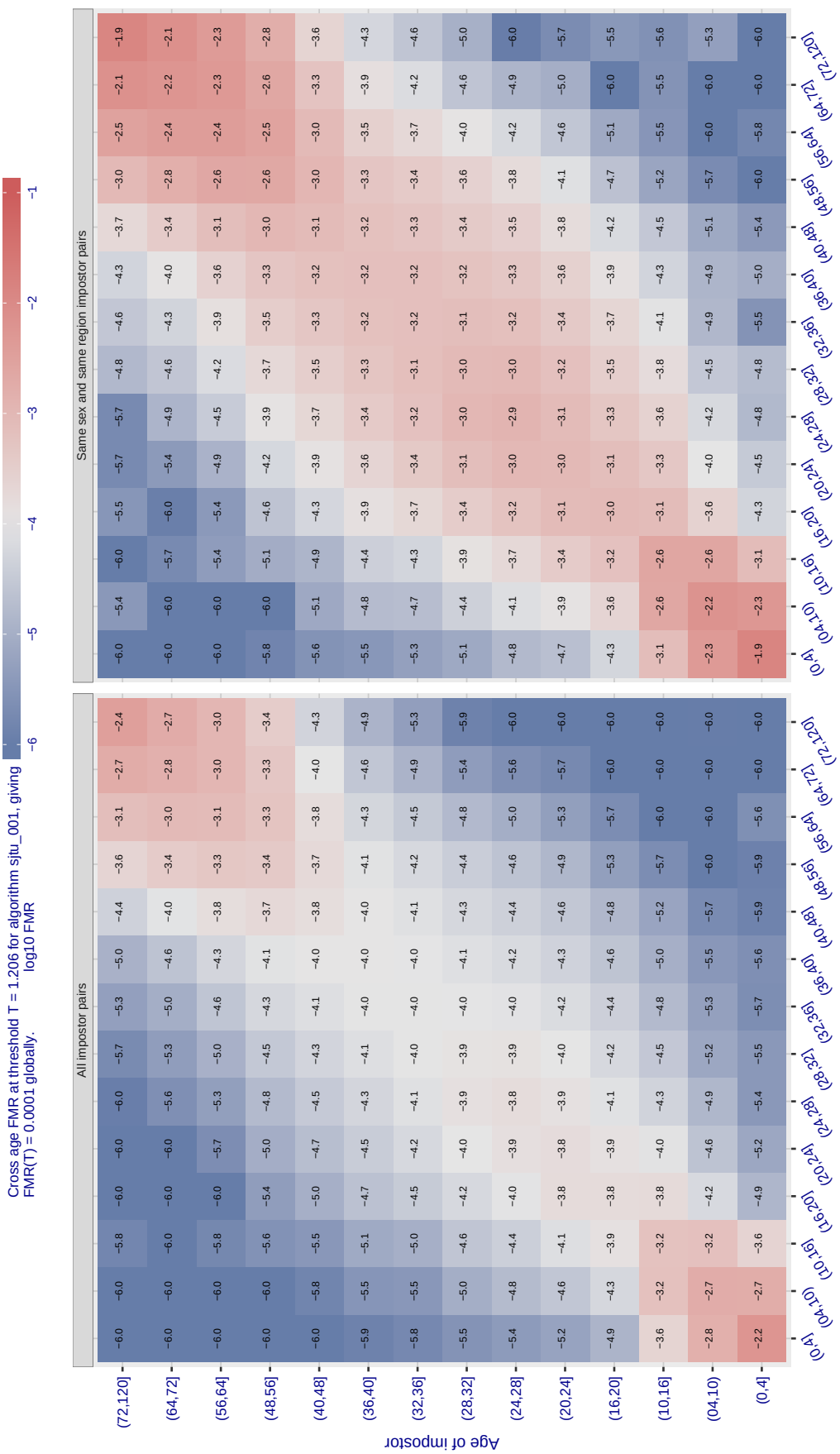


Figure 560: For algorithm sjtu-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

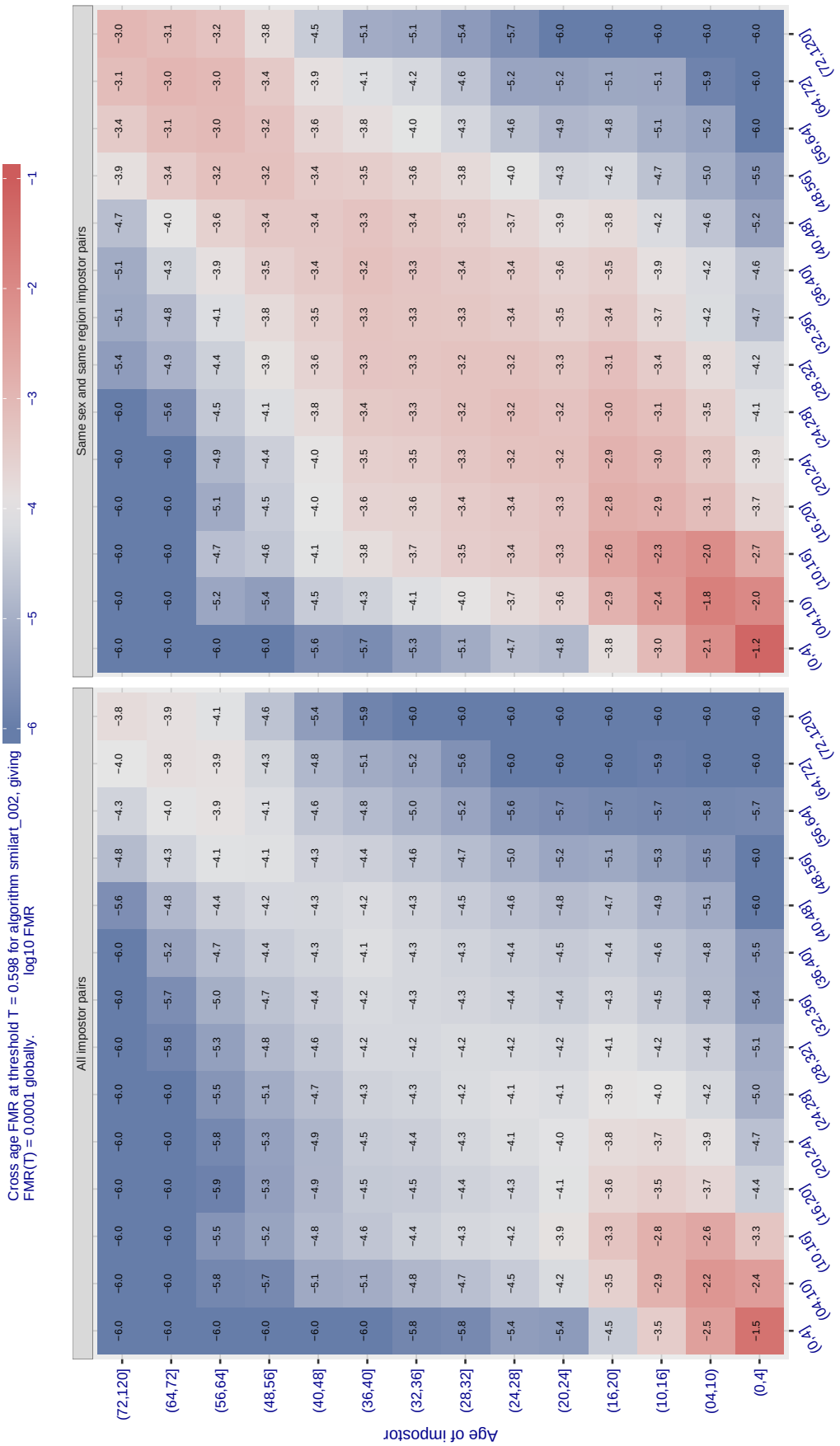


Figure 561: For algorithm smilart-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

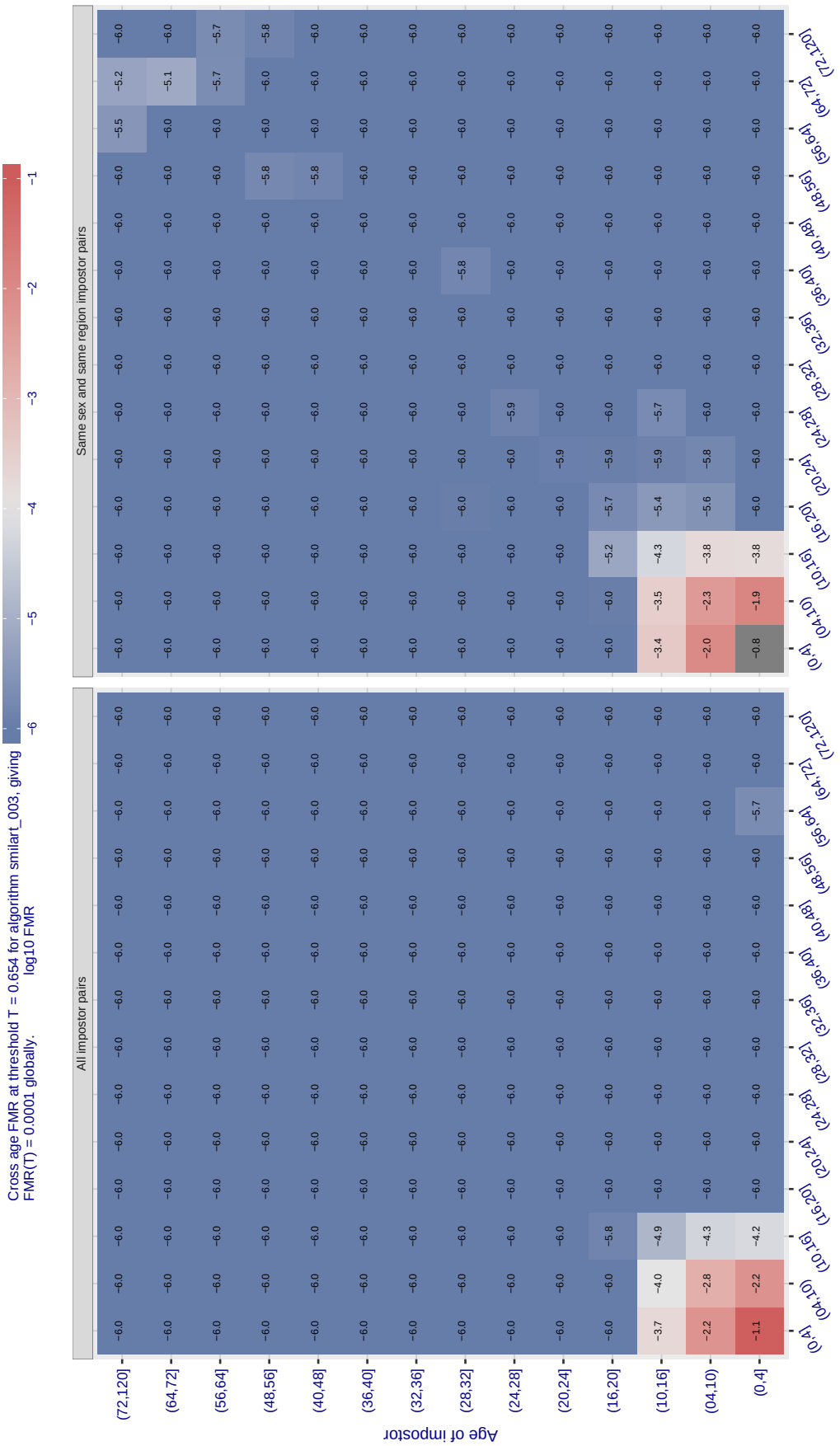


Figure 562: For algorithm smilart-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

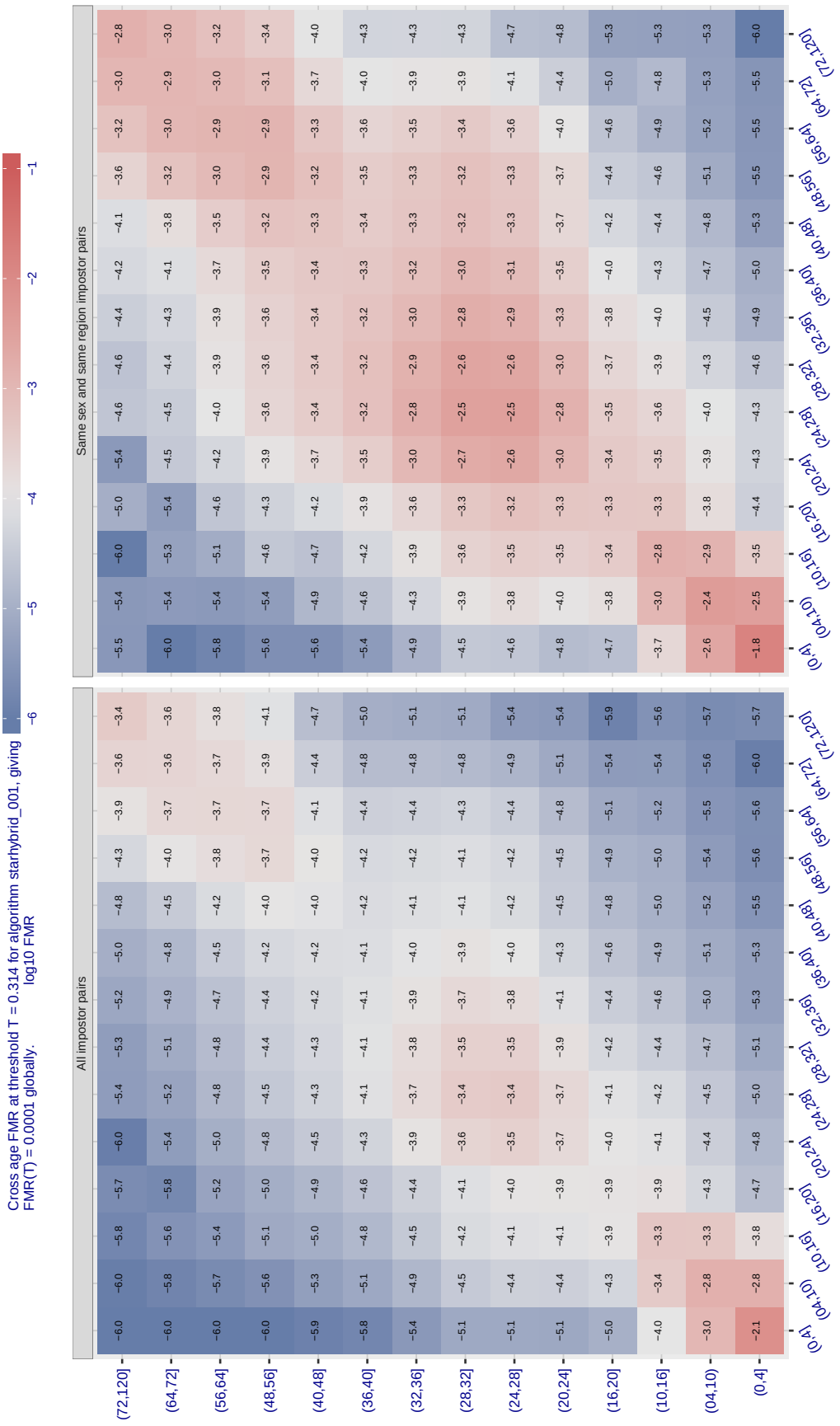


Figure 563: For algorithm starhybrid-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

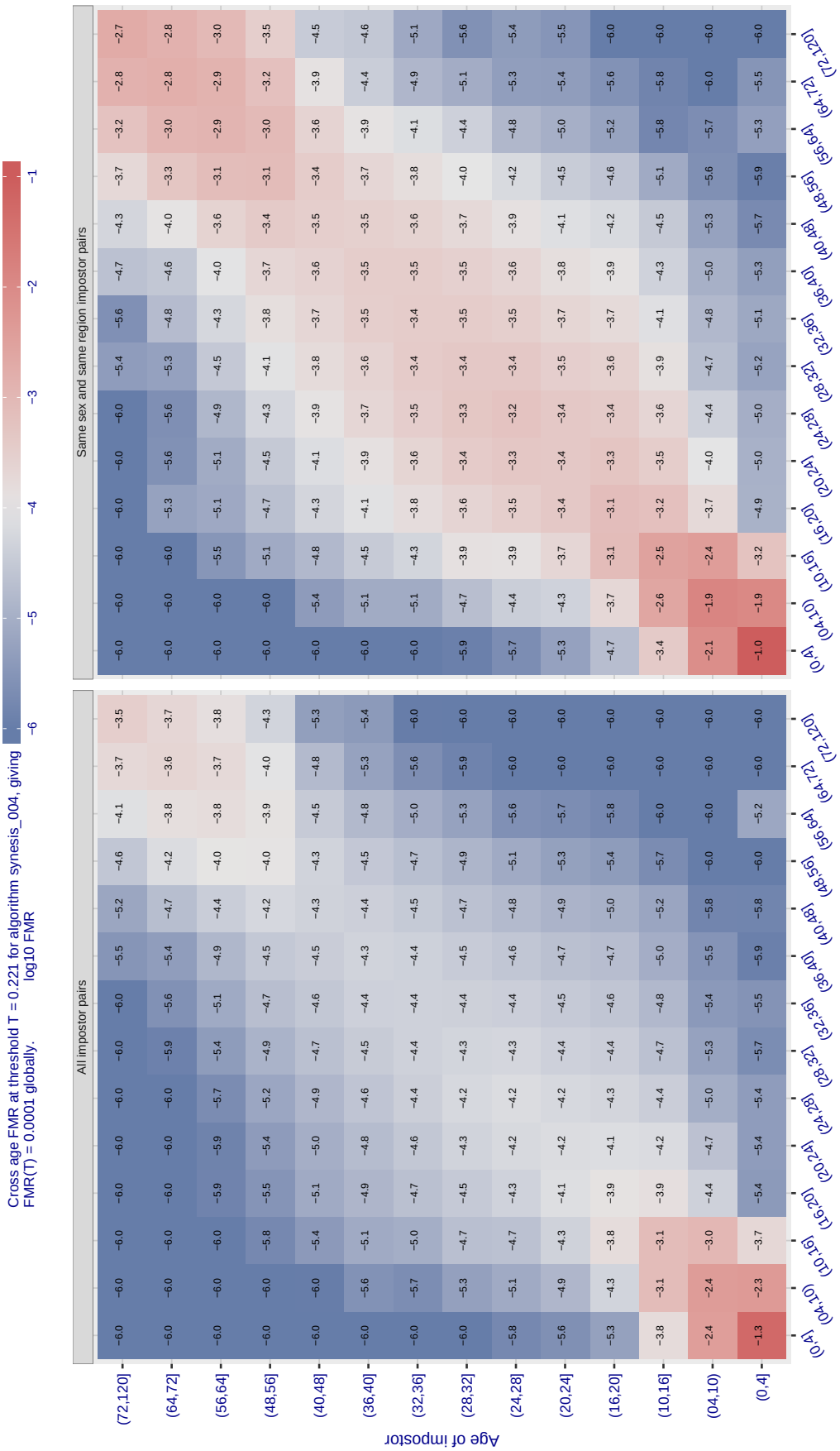


Figure 564: For algorithm synesis-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

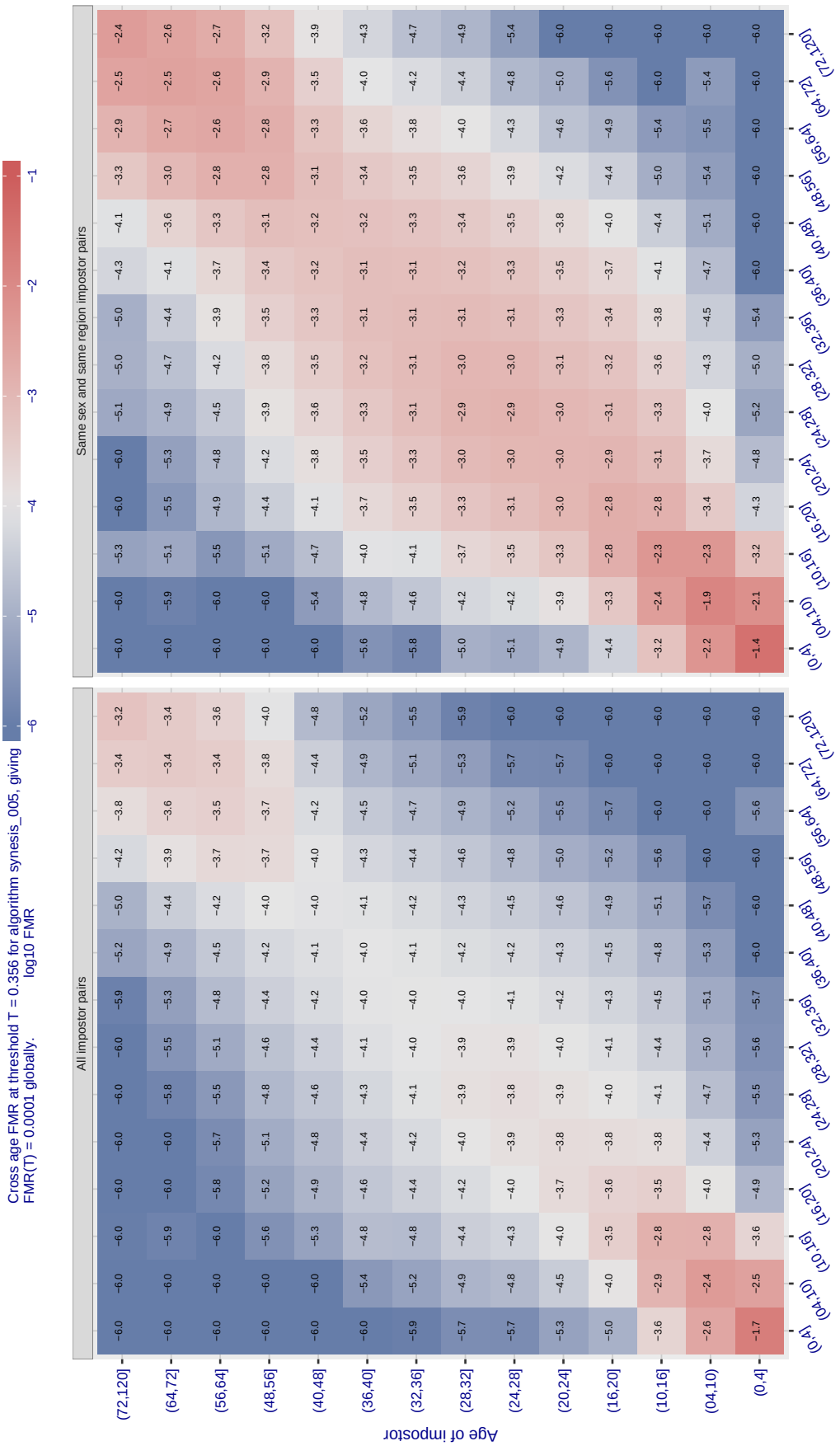


Figure 565: For algorithm synesis-005 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

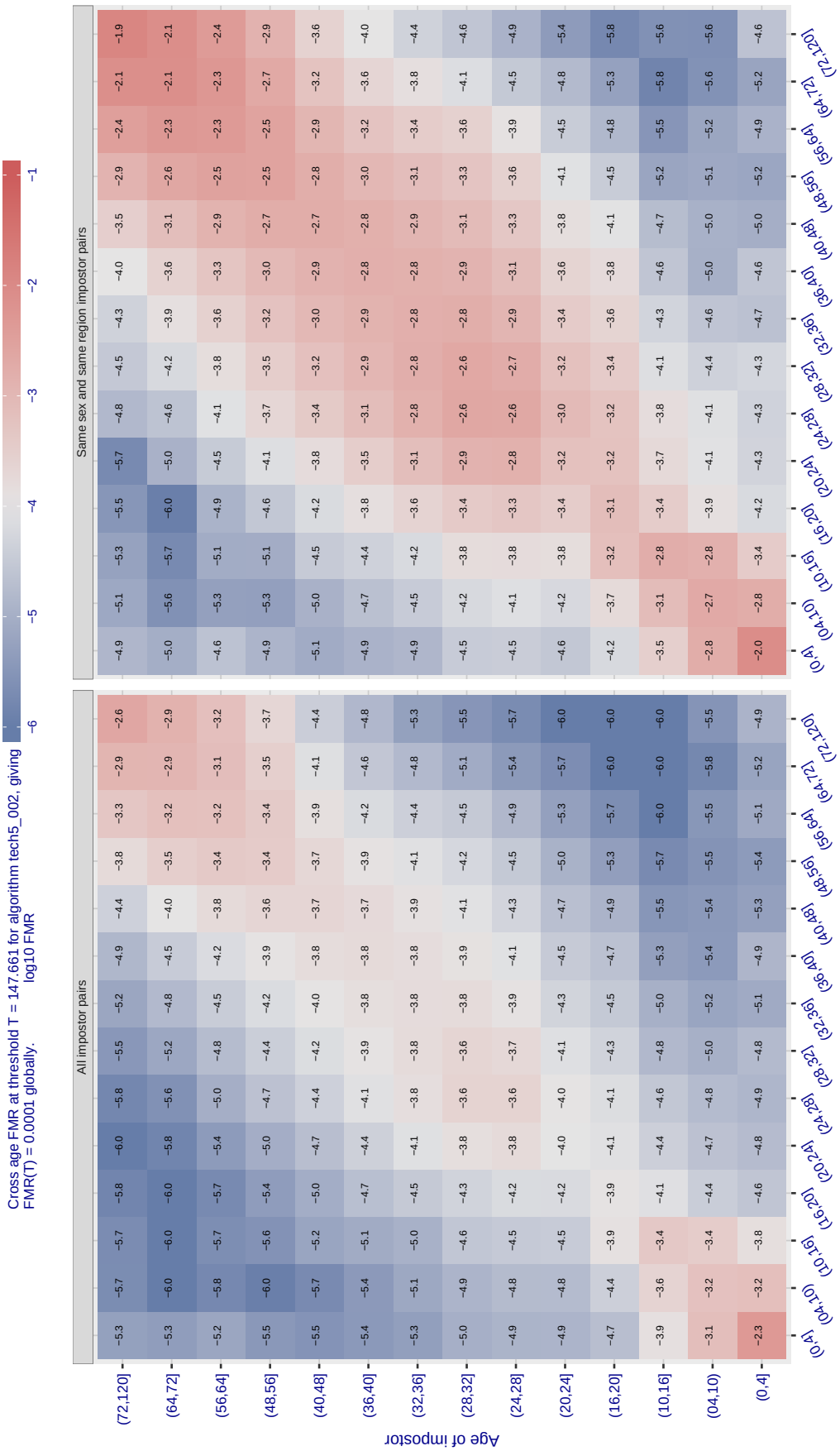


Figure 566: For algorithm tech5-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

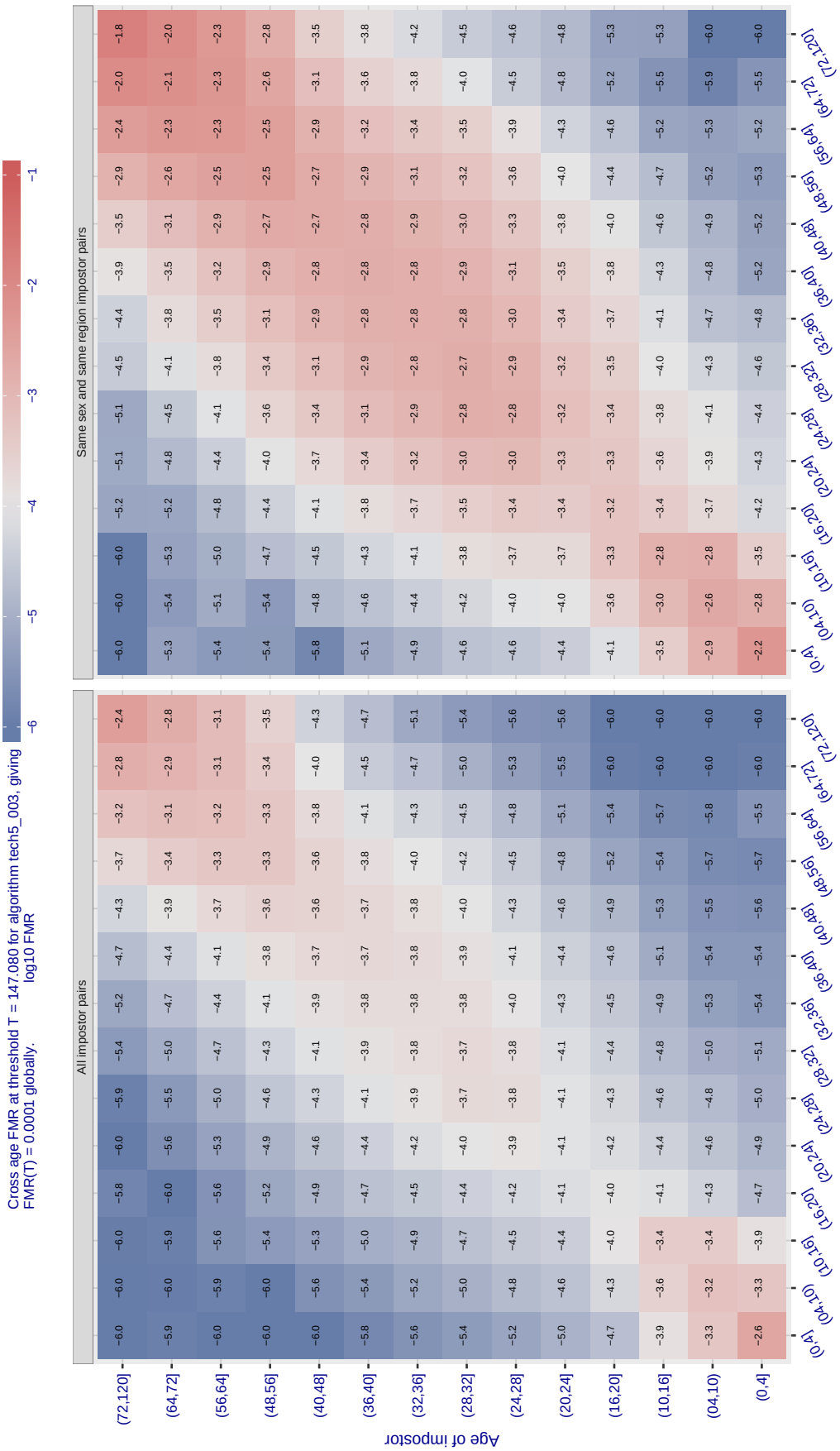


Figure 567: For algorithm tech5-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

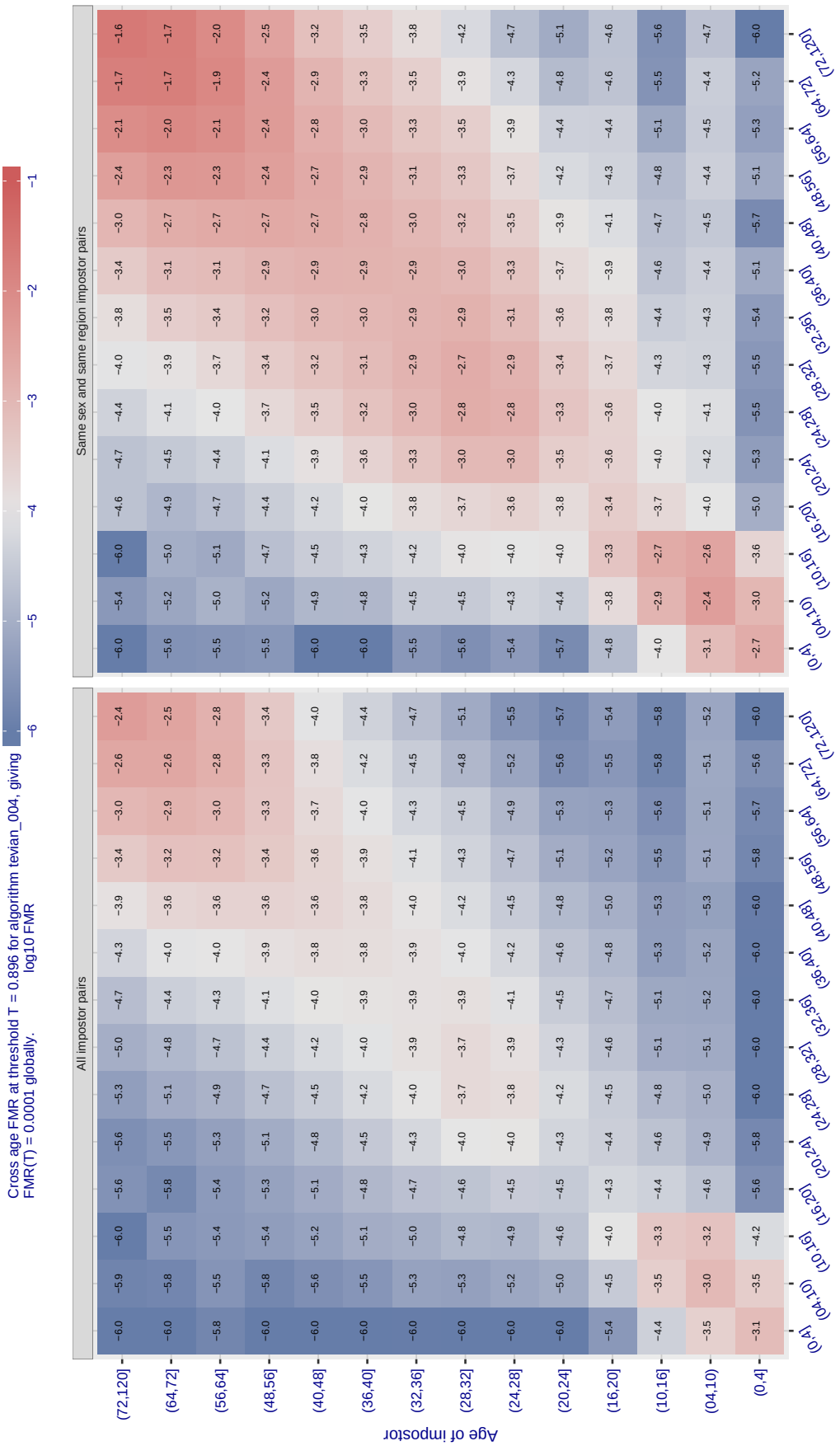


Figure 568: For algorithm tevian-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

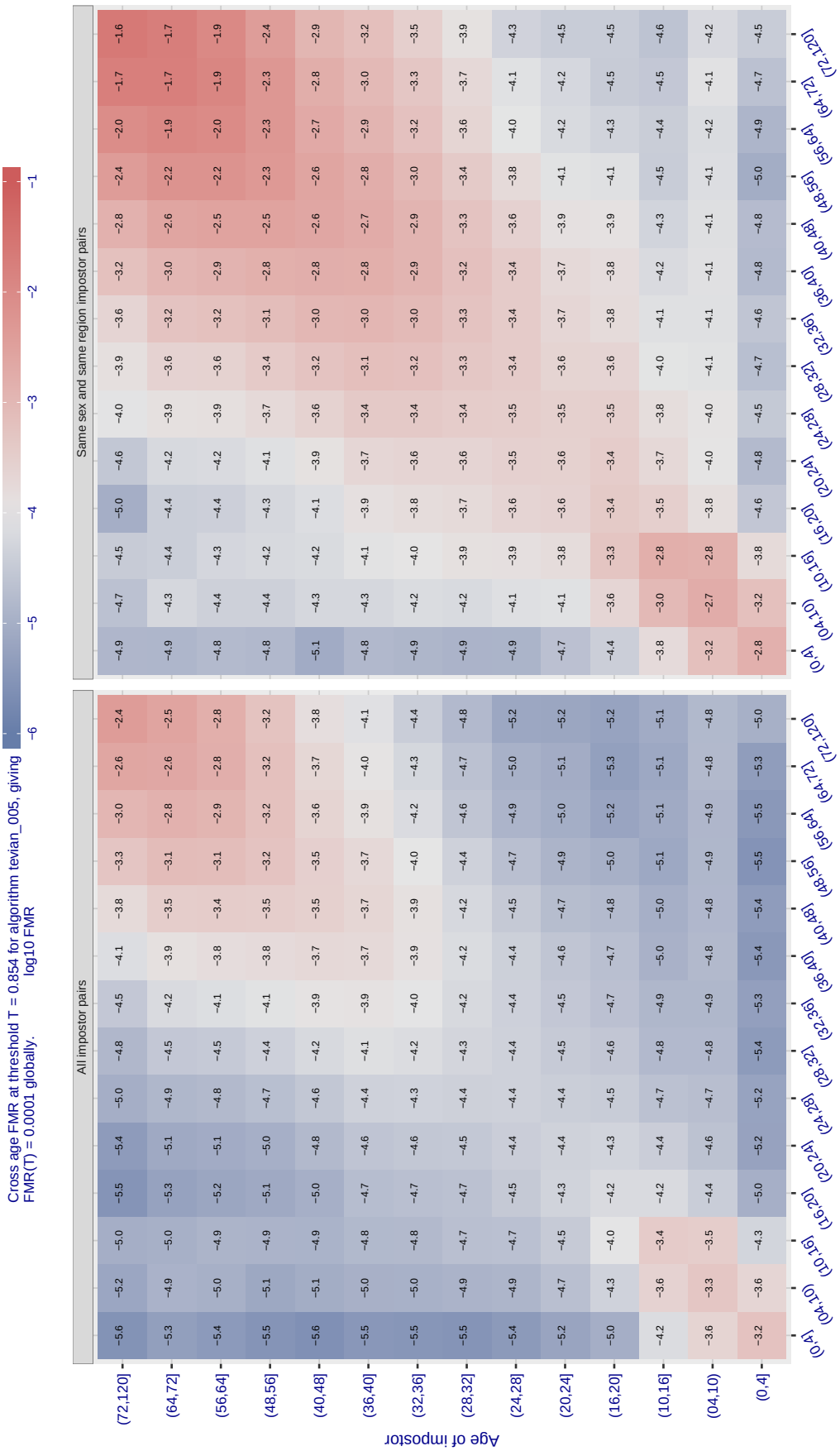


Figure 569: For algorithm tevian-005 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

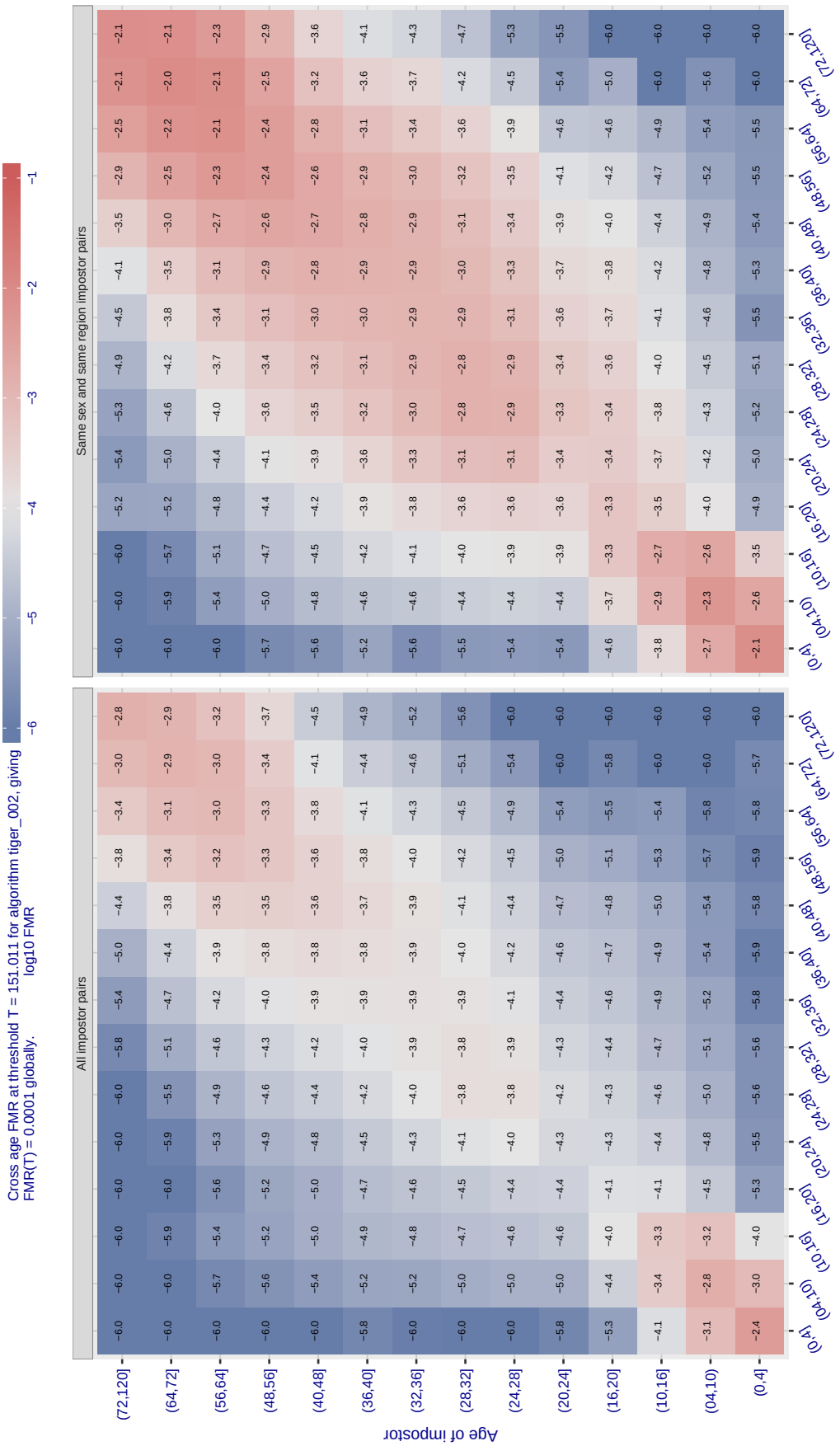


Figure 570: For algorithm tiger-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

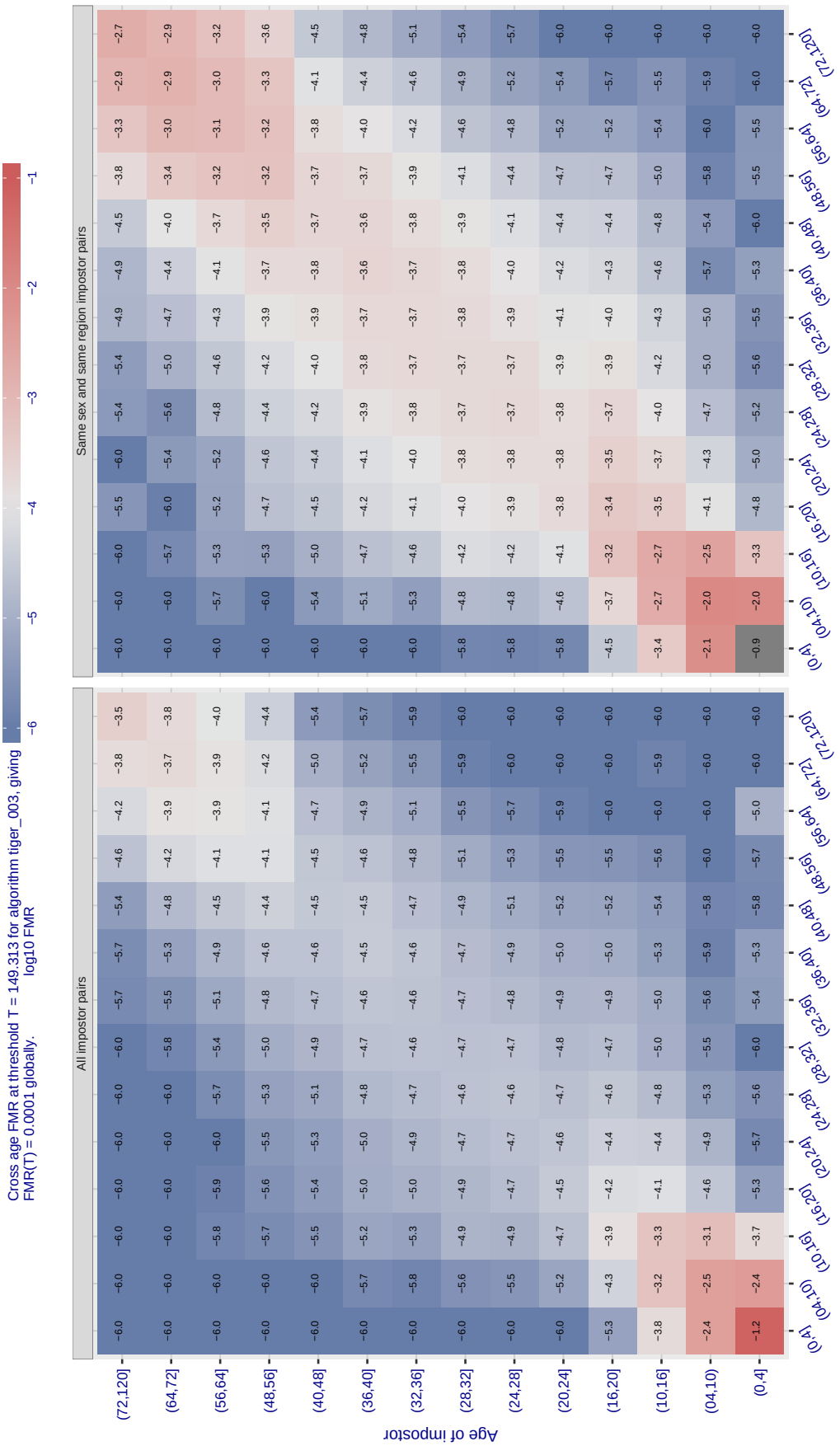


Figure 571: For algorithm tiger-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

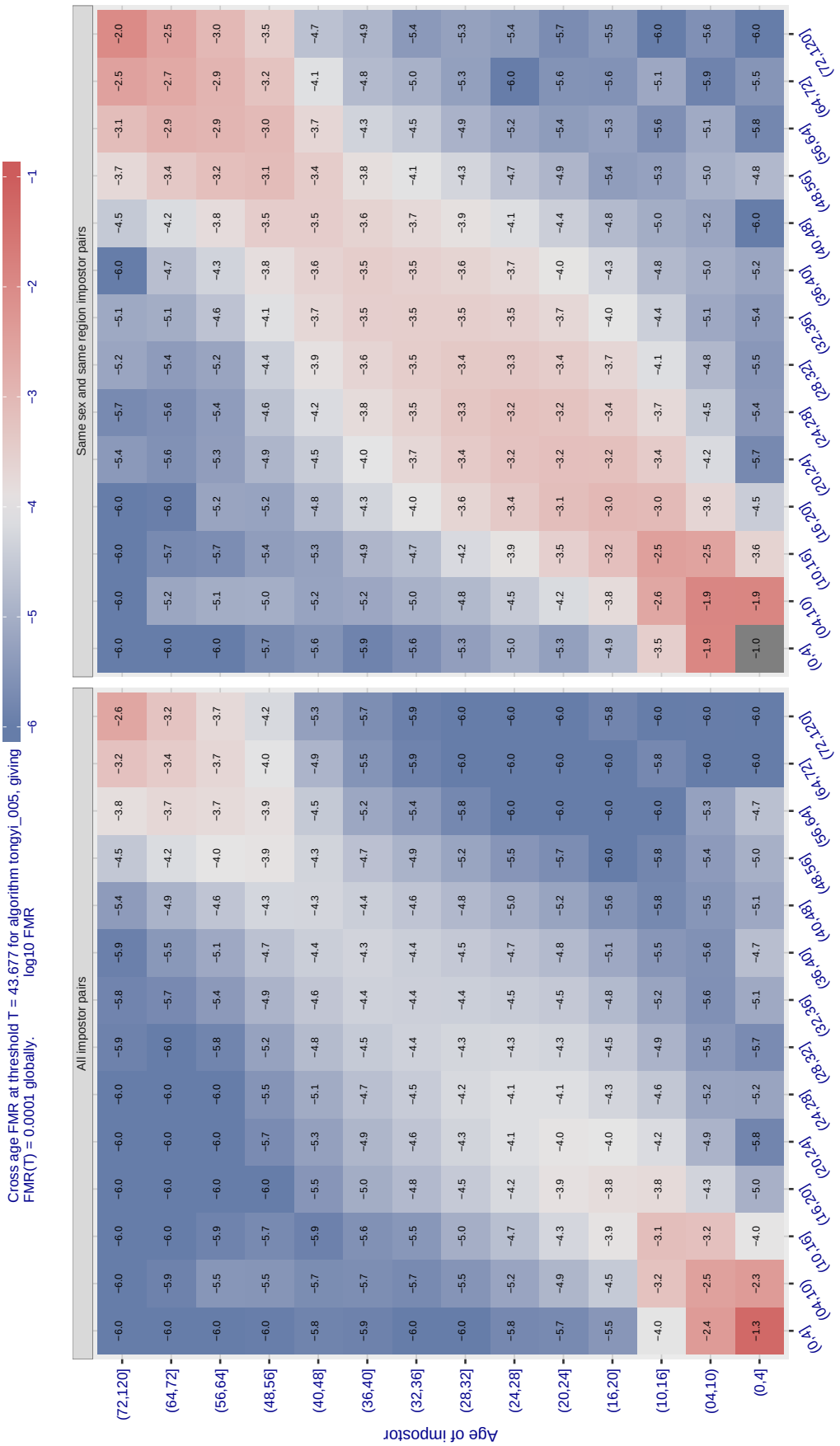


Figure 572: For algorithm tongyi-005 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

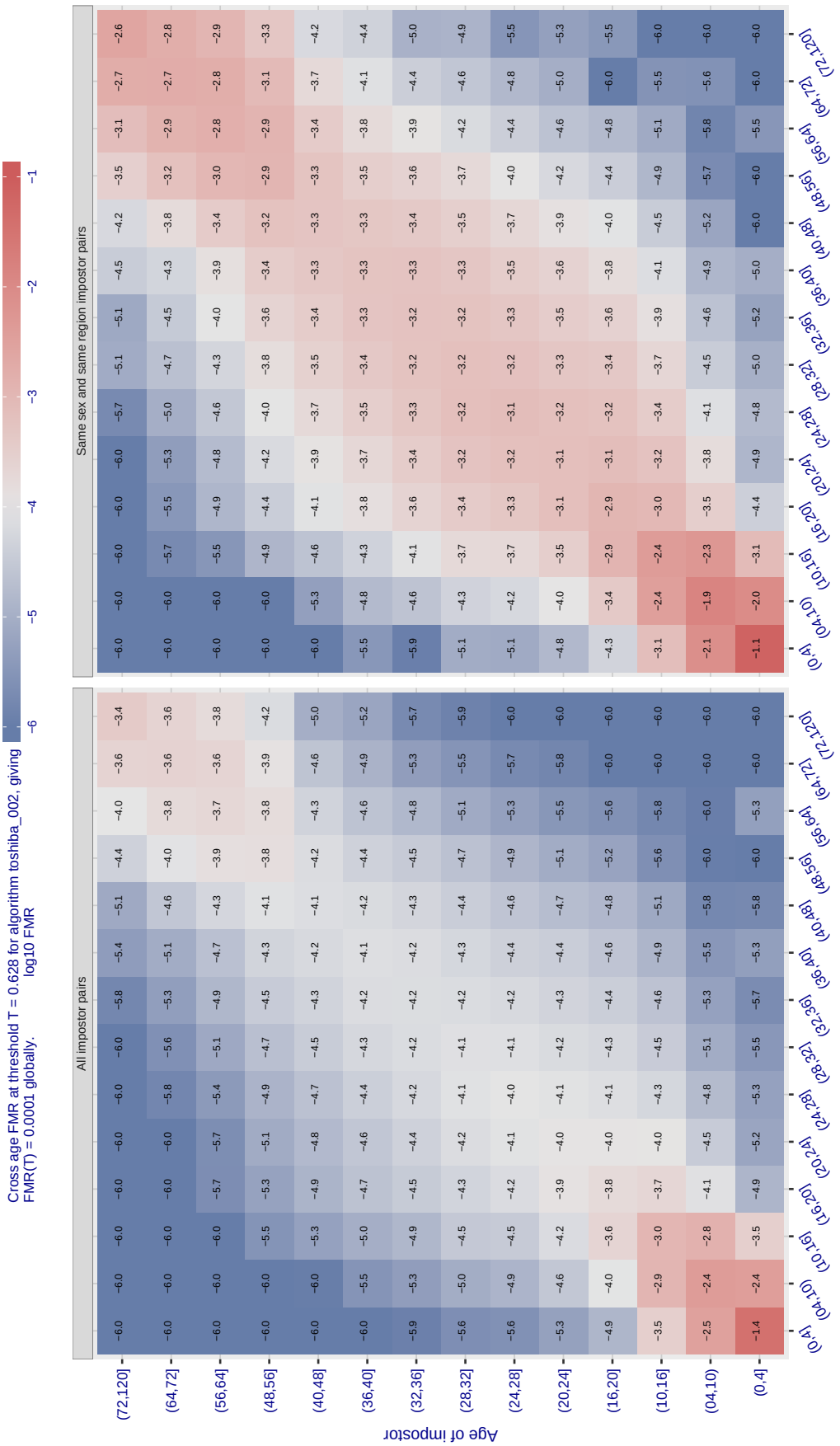


Figure 573: For algorithm toshiba-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

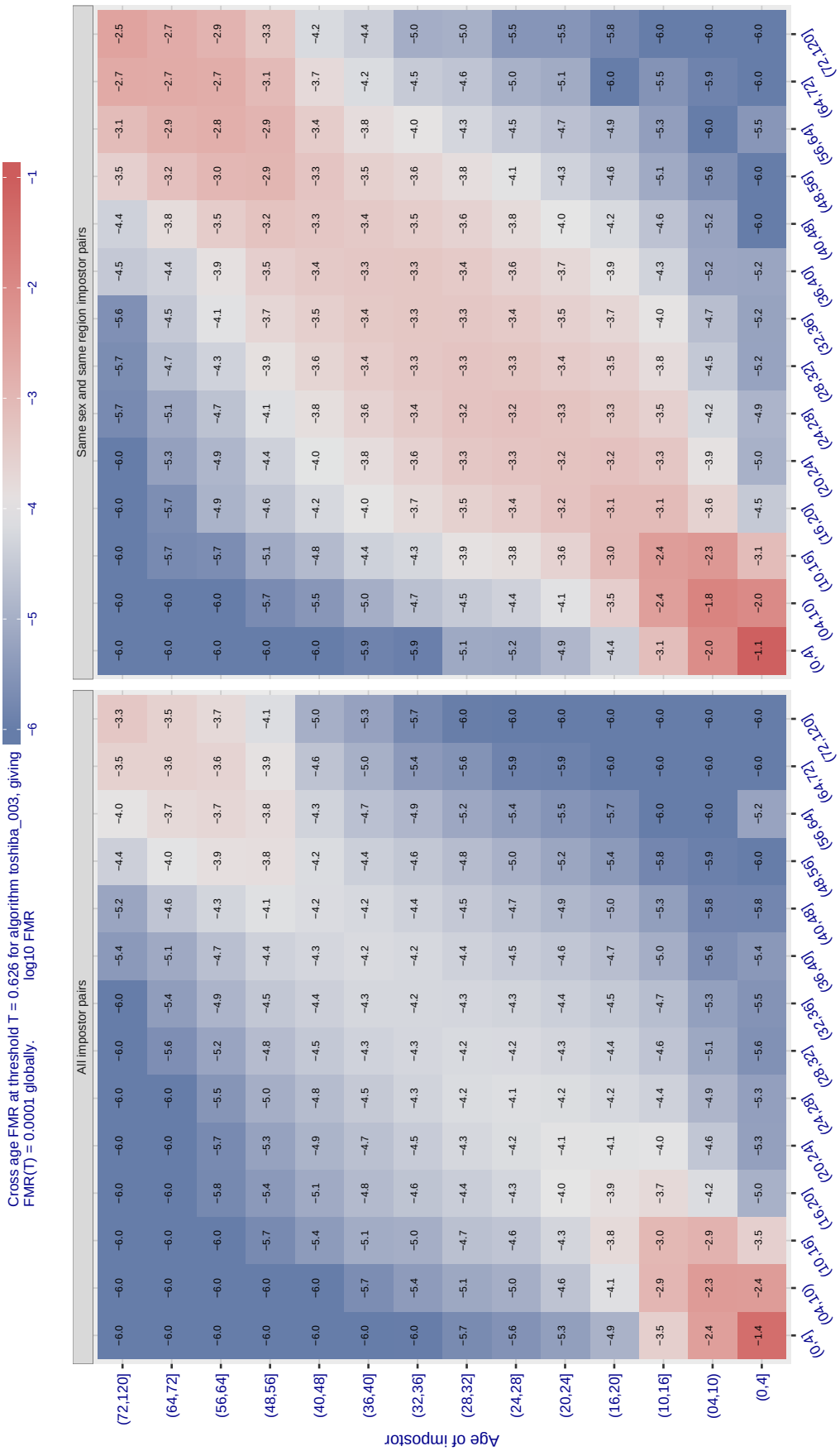


Figure 574: For algorithm toshiba-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

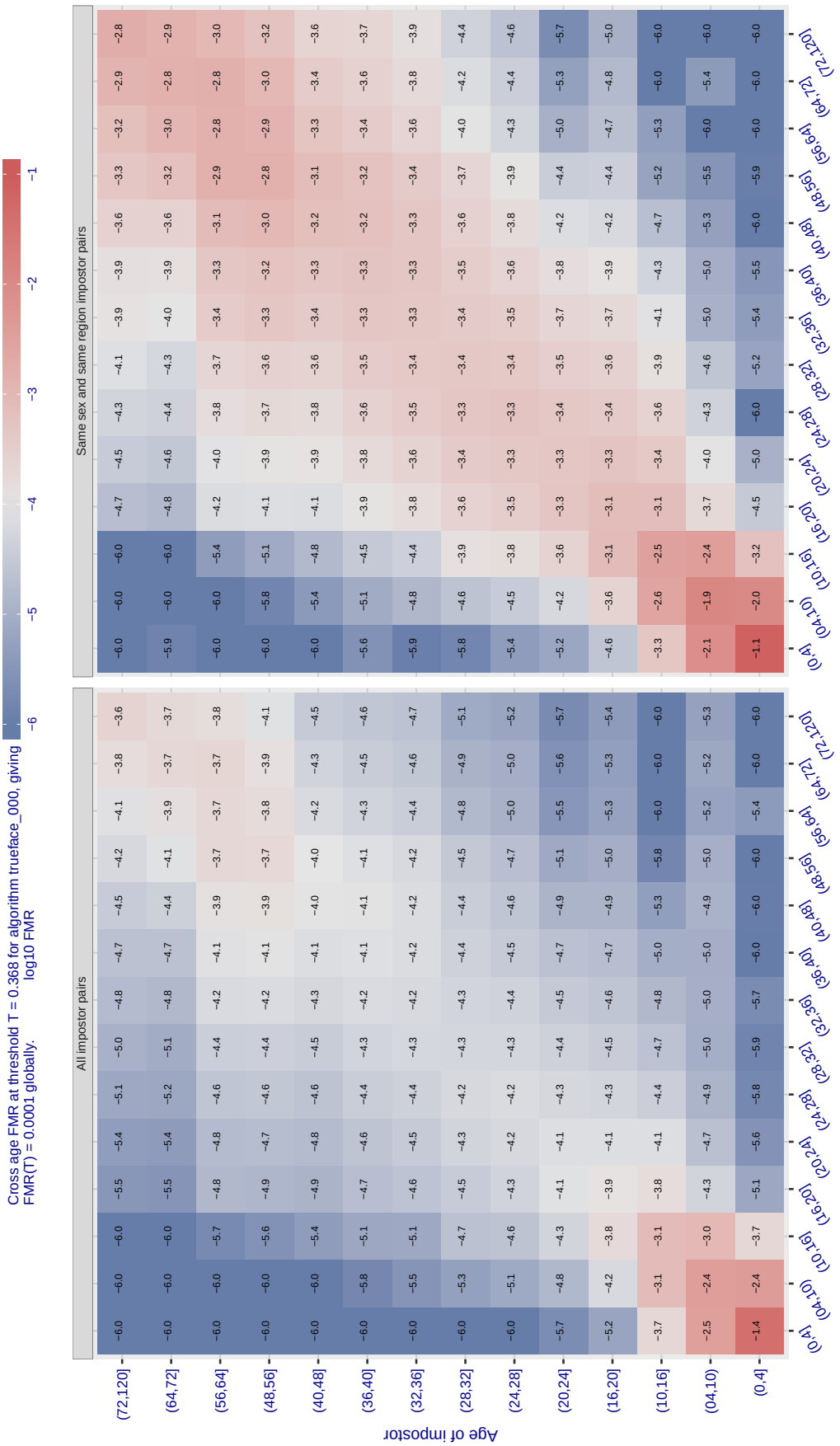


Figure 575: For algorithm trueface-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

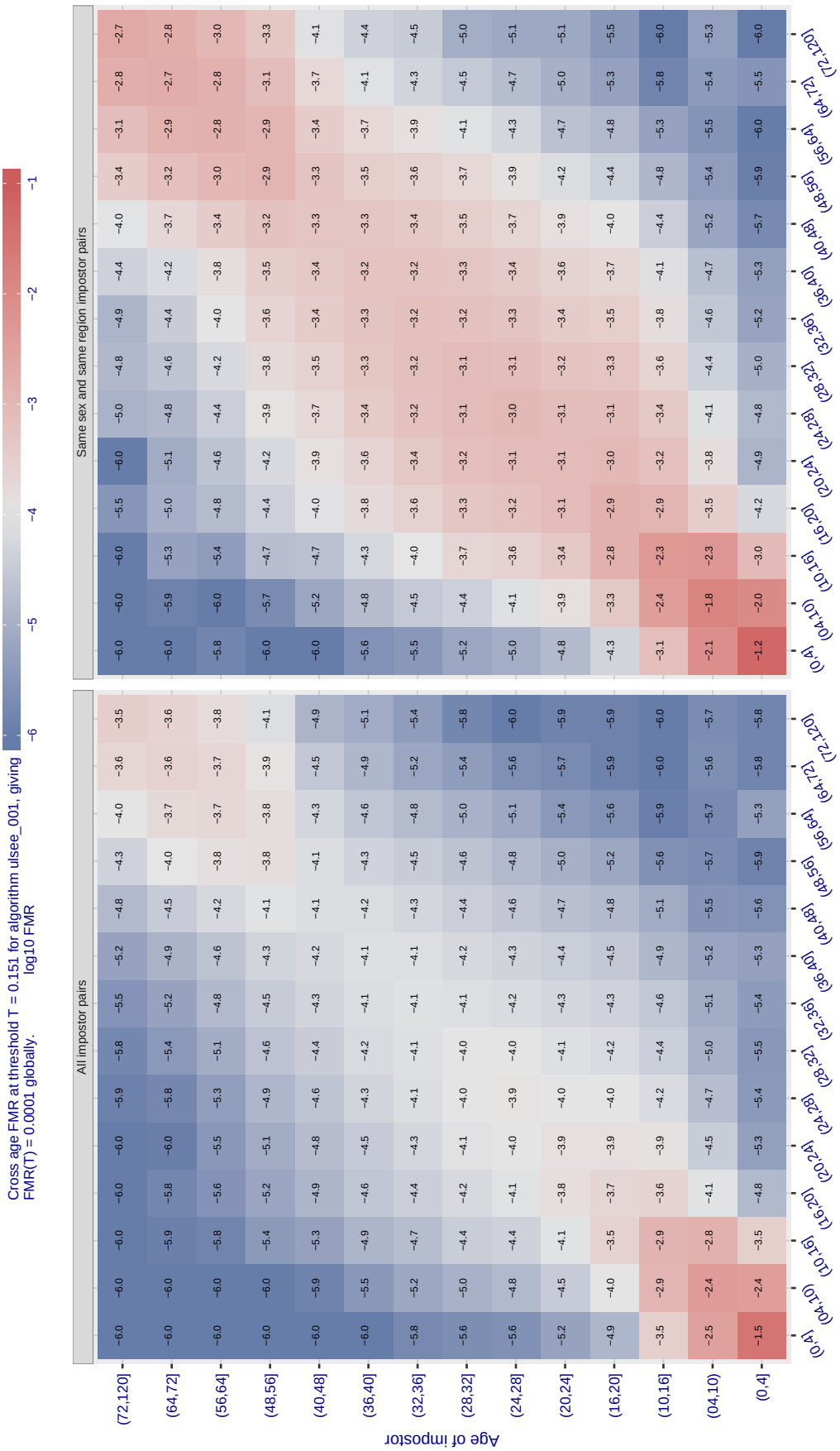


Figure 576: For algorithm ulsee-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

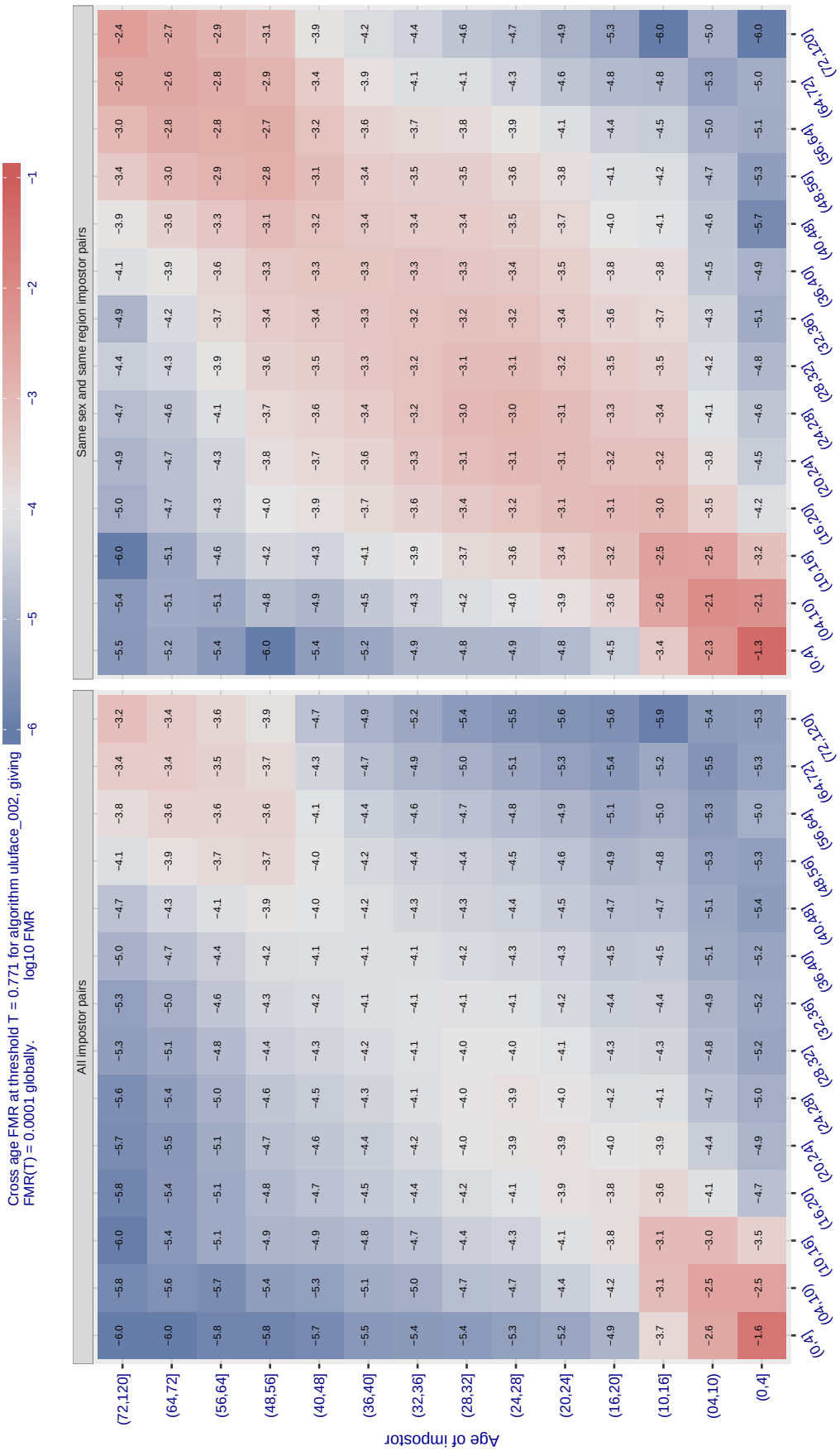


Figure 577: For algorithm uluface-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

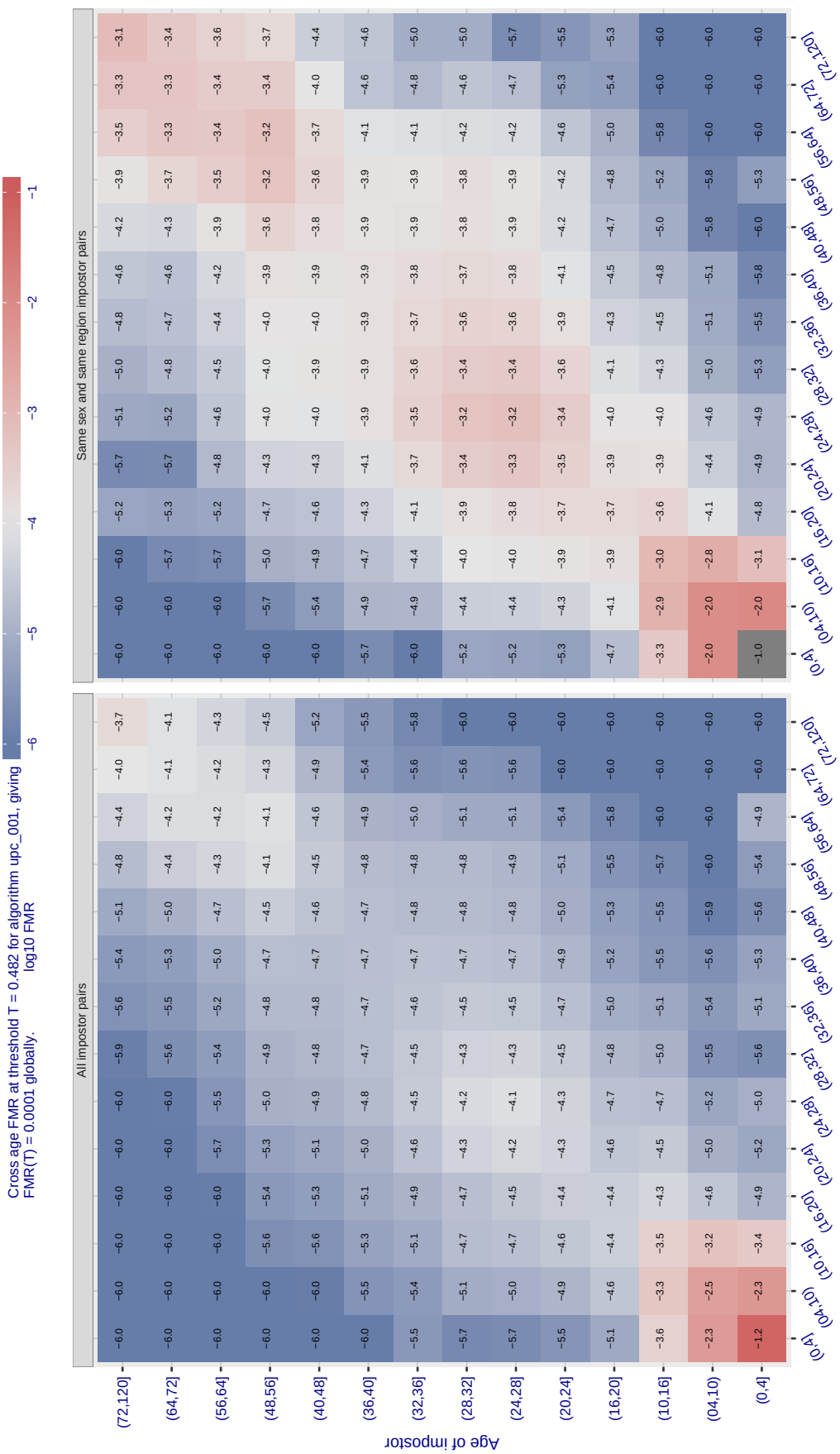


Figure 578: For algorithm upc-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

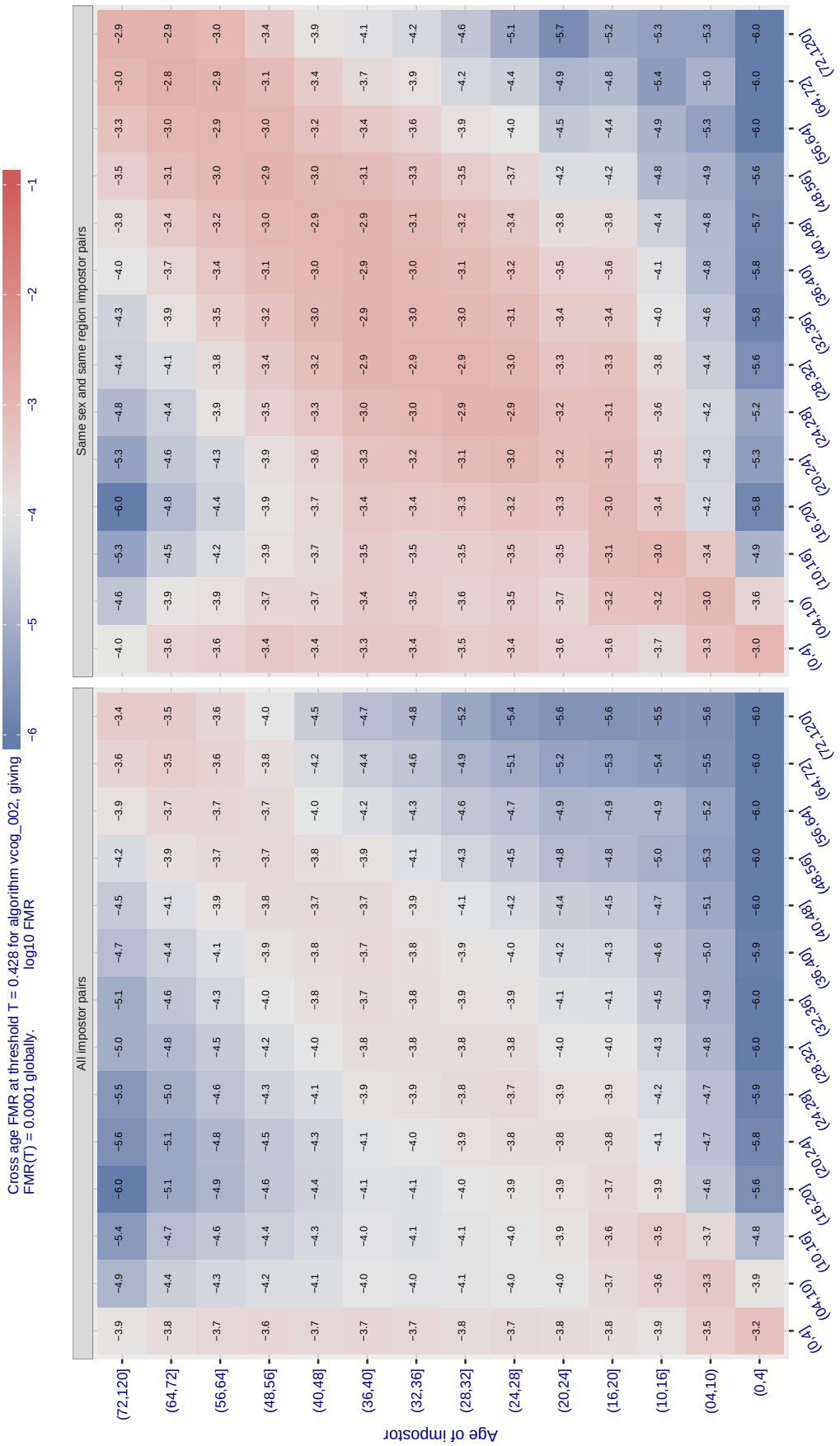


Figure 579: For algorithm vcog-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

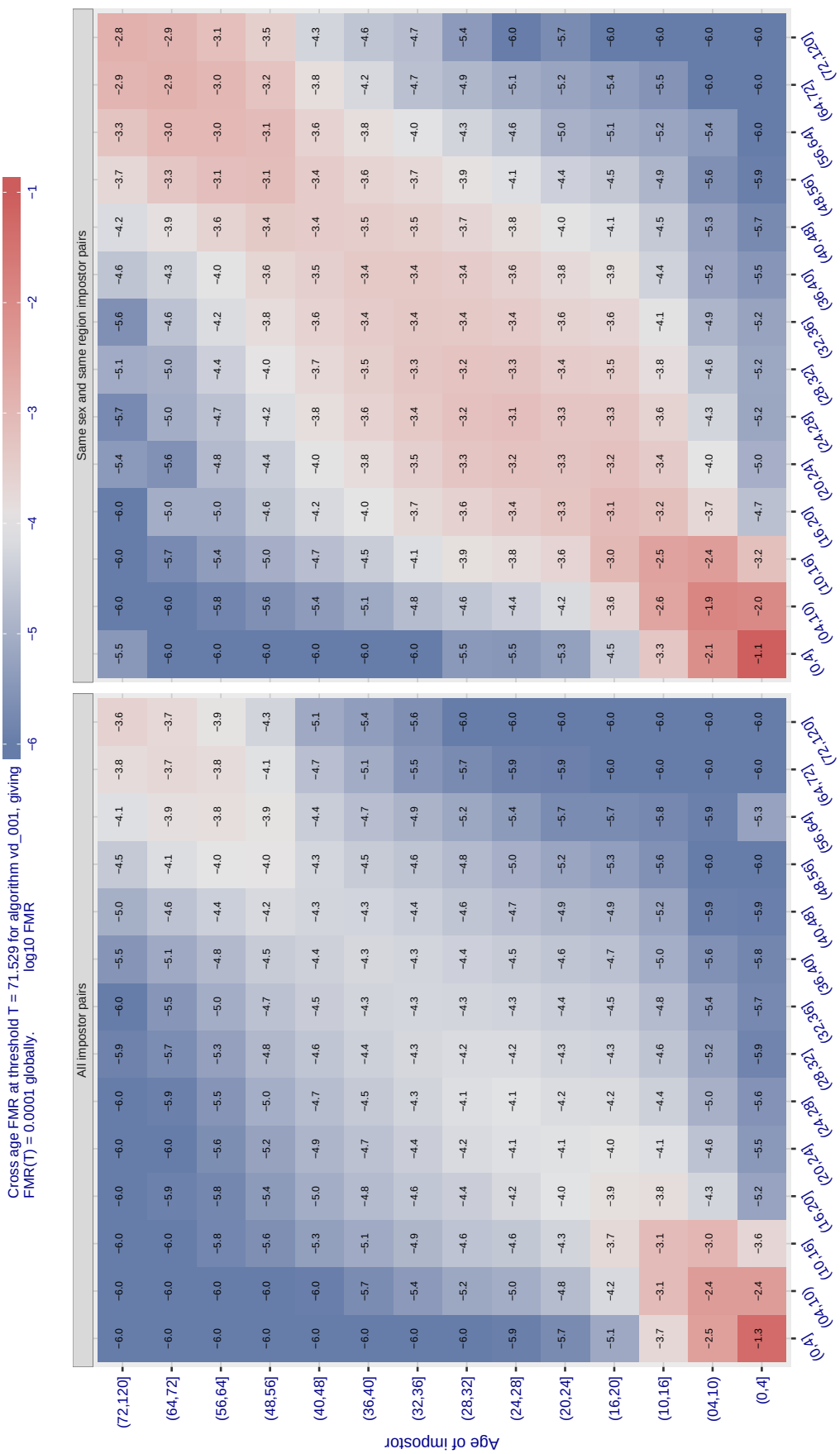


Figure 580: For algorithm vd-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

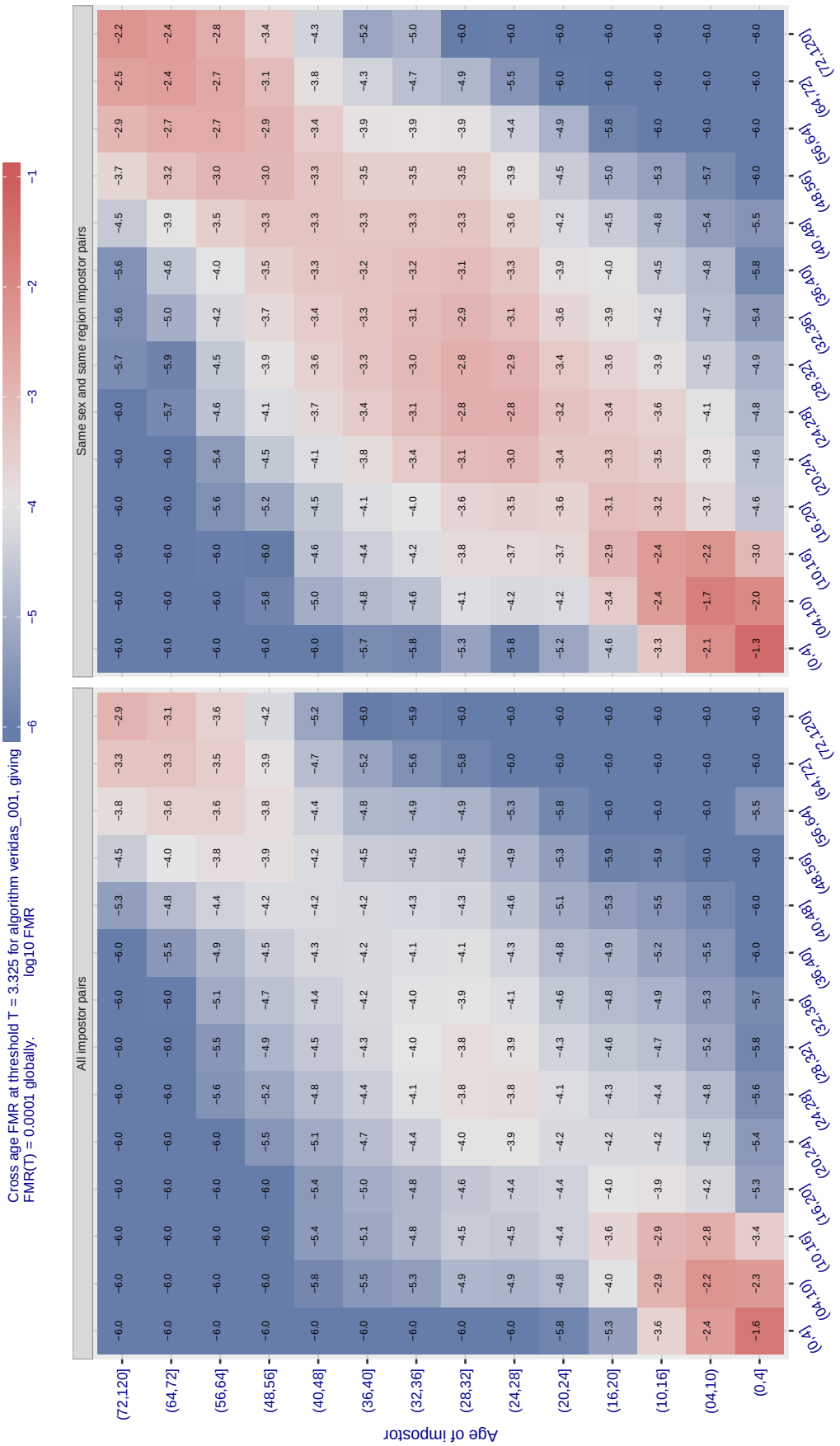


Figure 581: For algorithm veridas-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

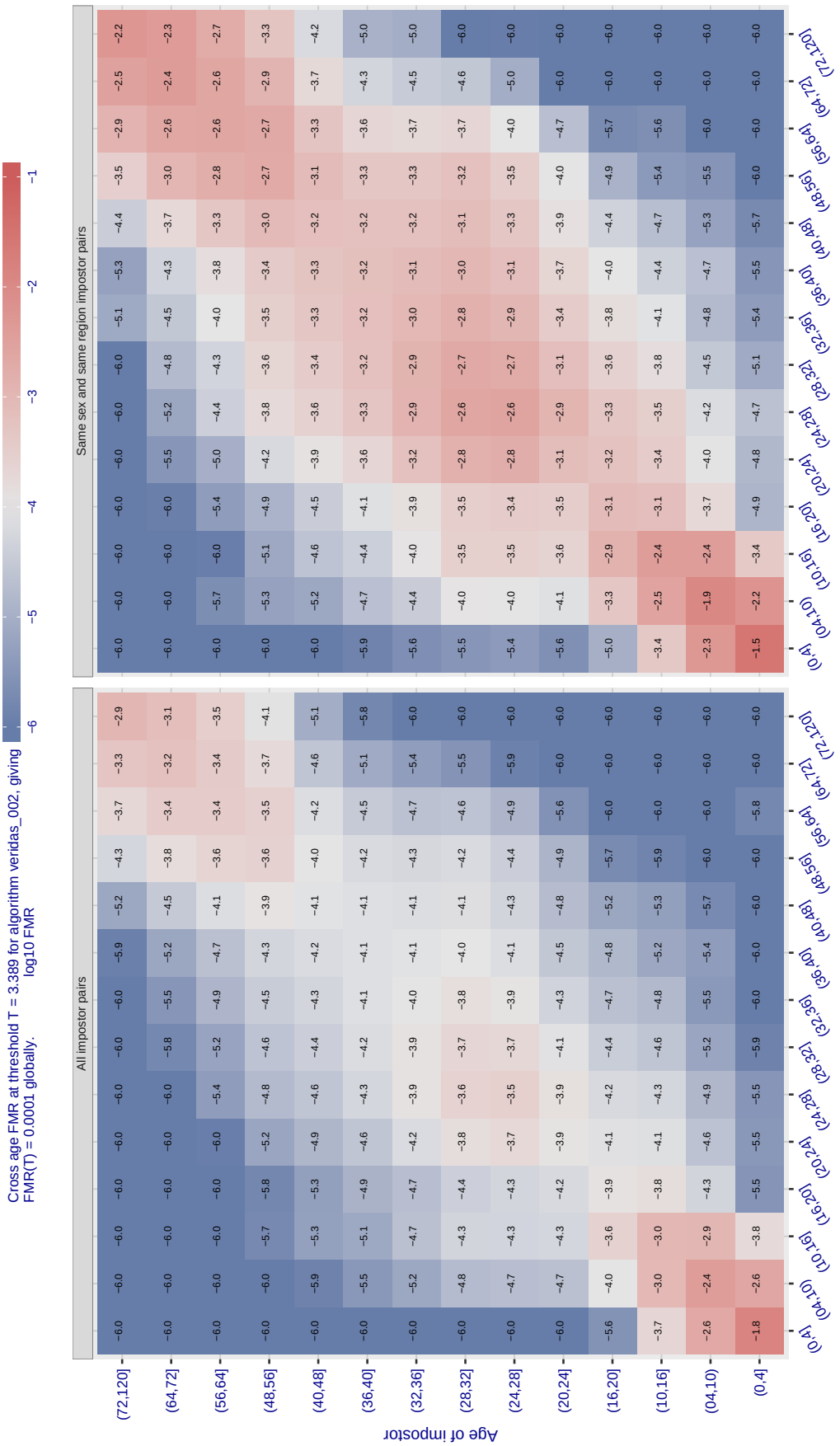


Figure 582: For algorithm veridas-002 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

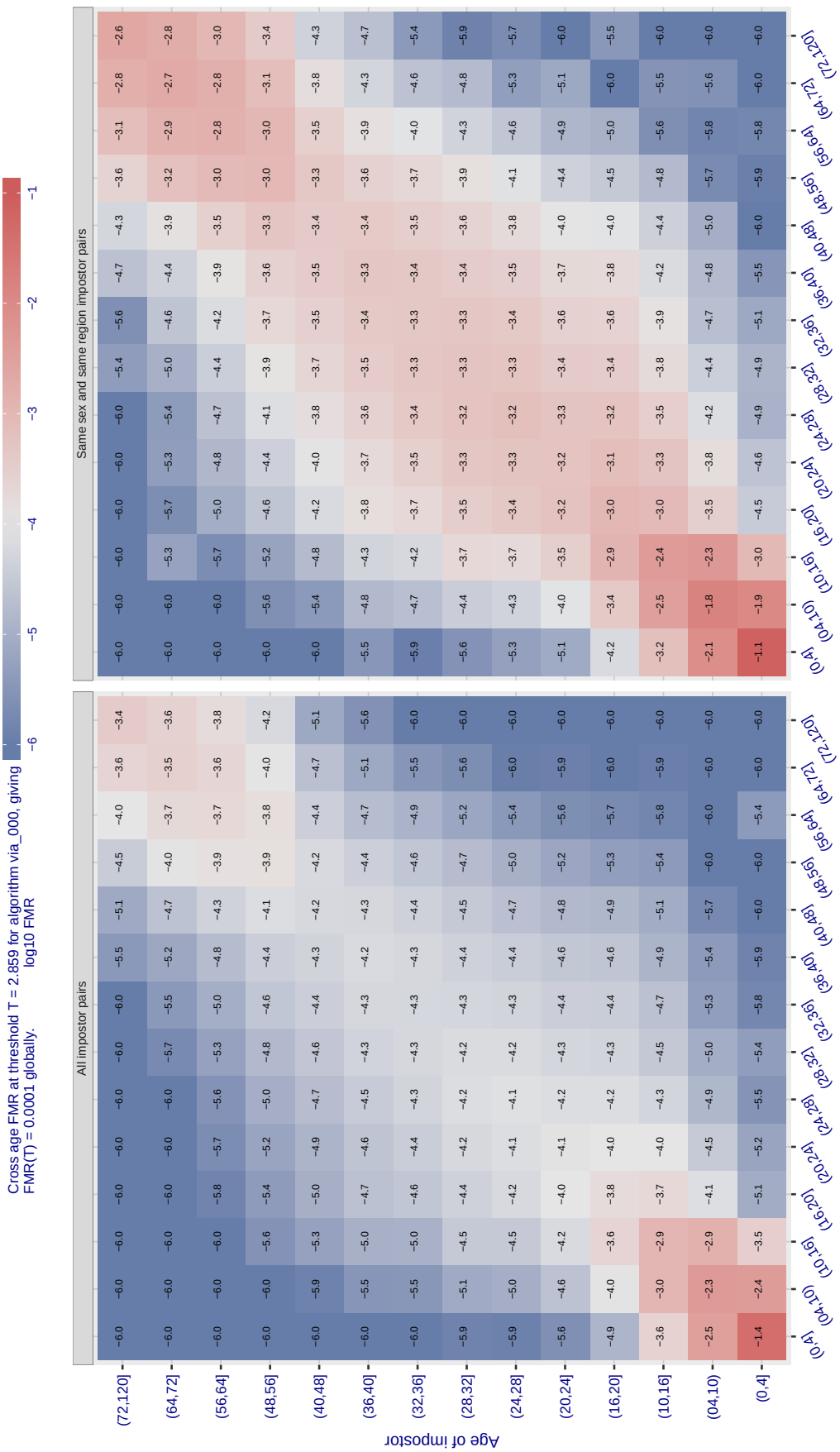


Figure 583: For algorithm via-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

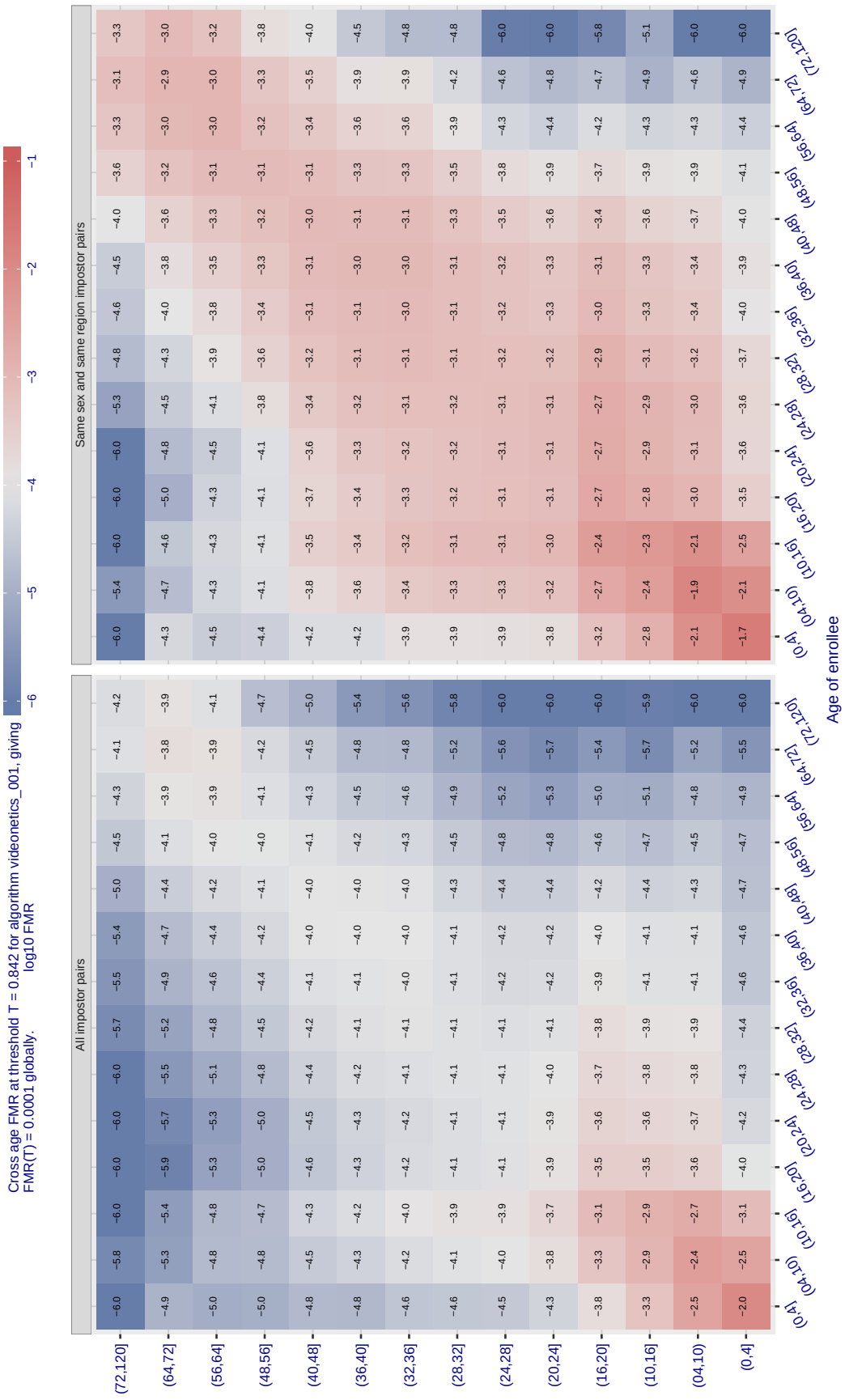


Figure 584: For algorithm videonetics-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

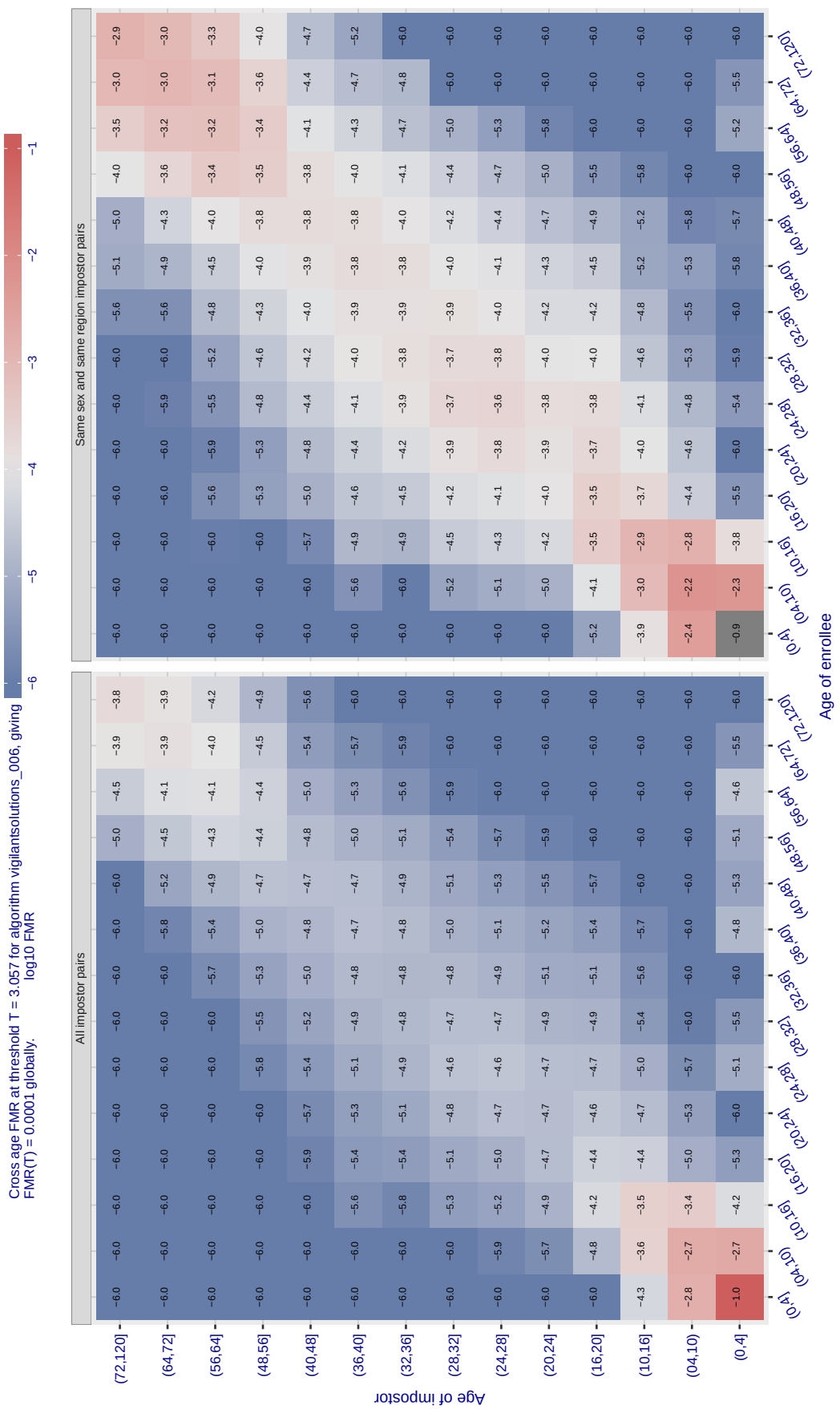


Figure 585: For algorithm vigilantsolutions-006 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

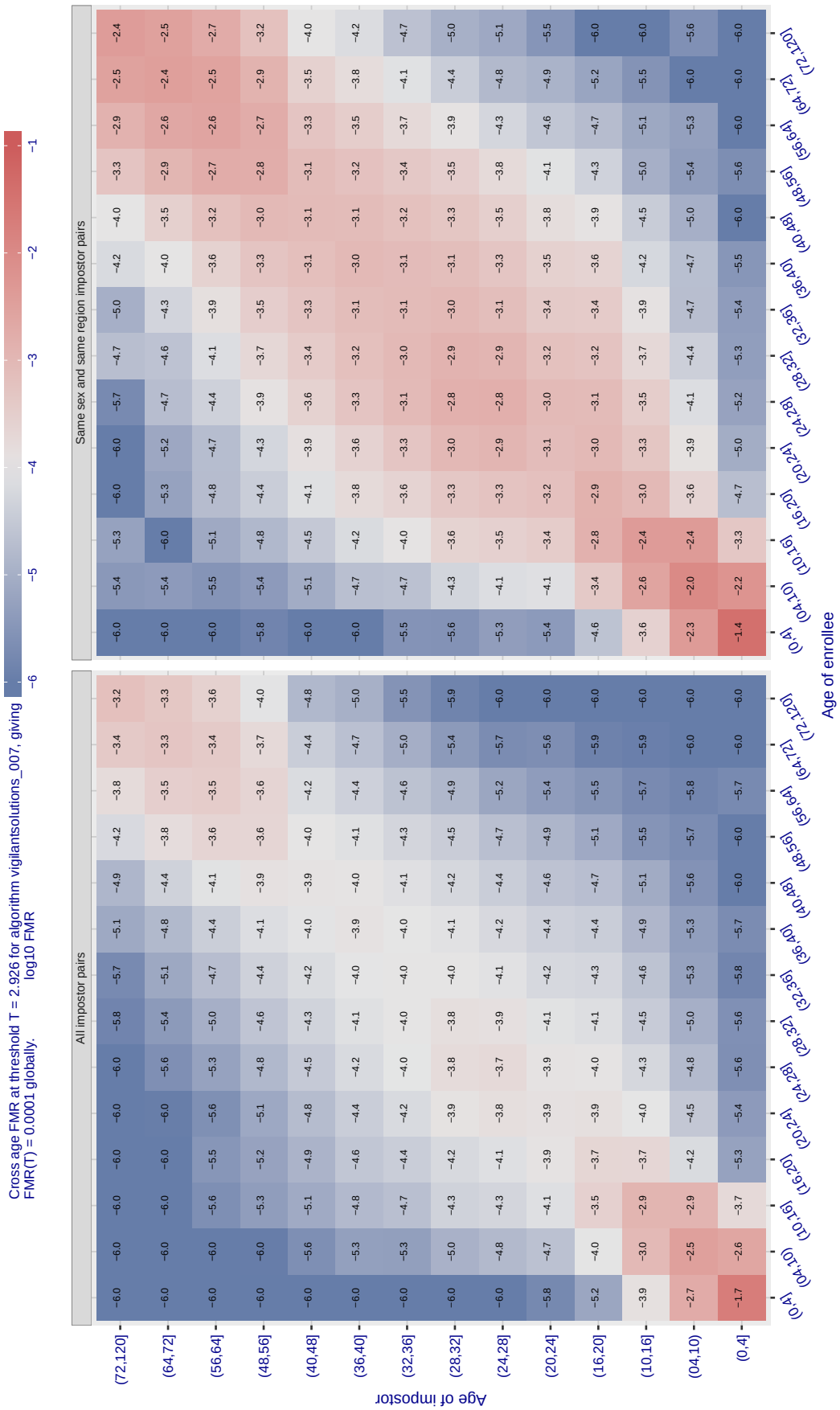


Figure 586: For algorithm vigilantsolutions-007 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

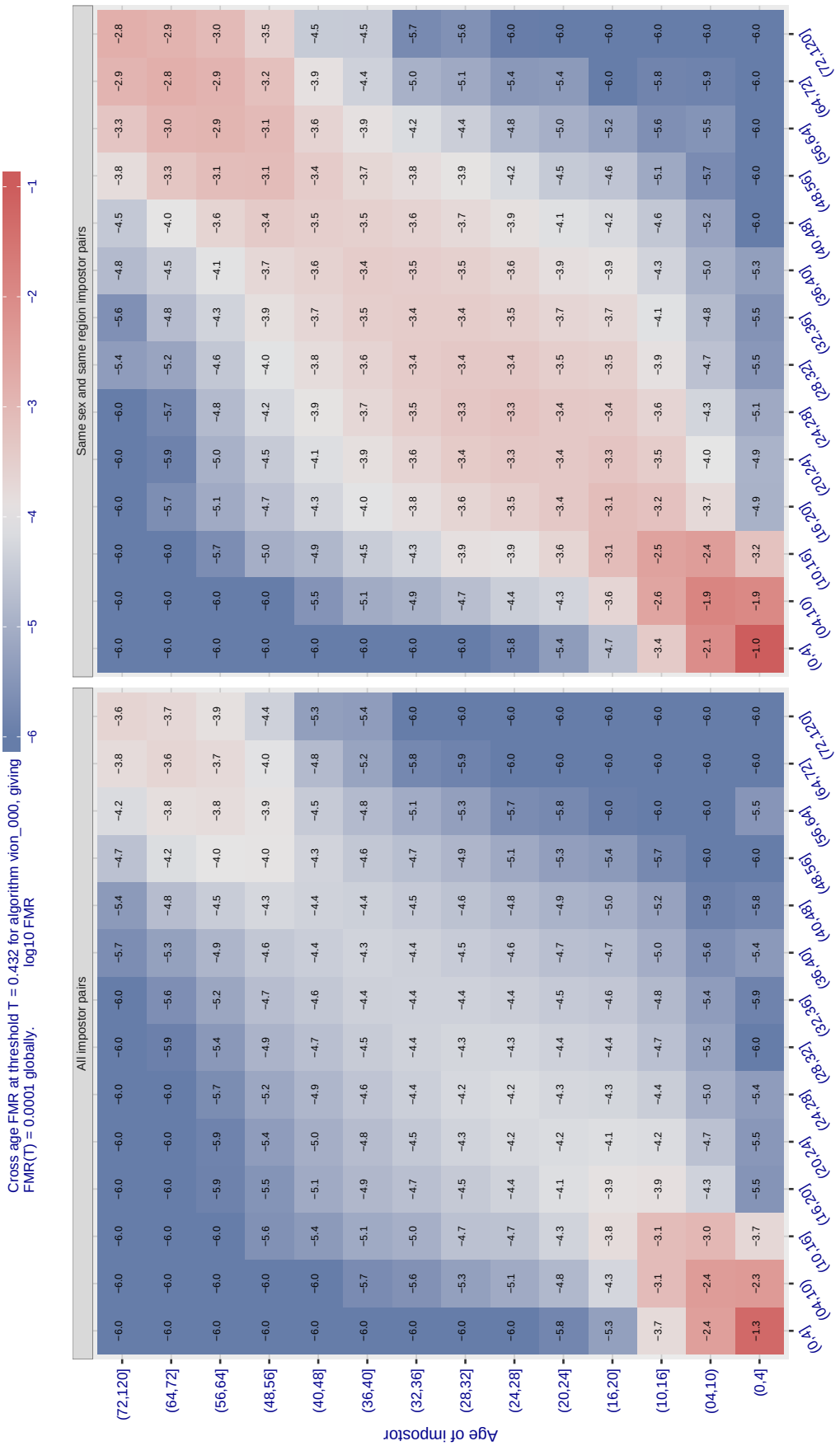


Figure 587: For algorithm vion-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

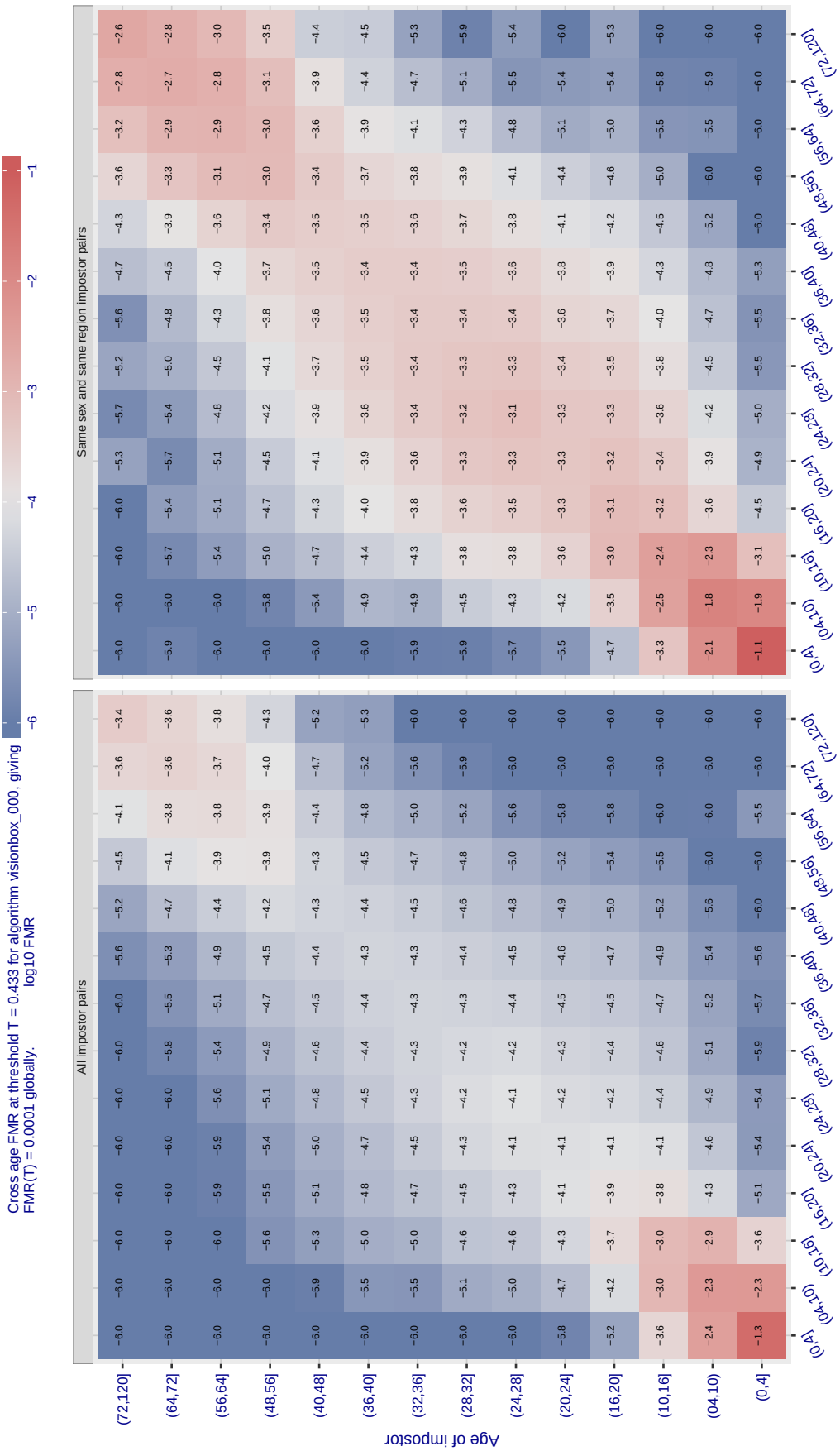


Figure 588: For algorithm visionbox-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

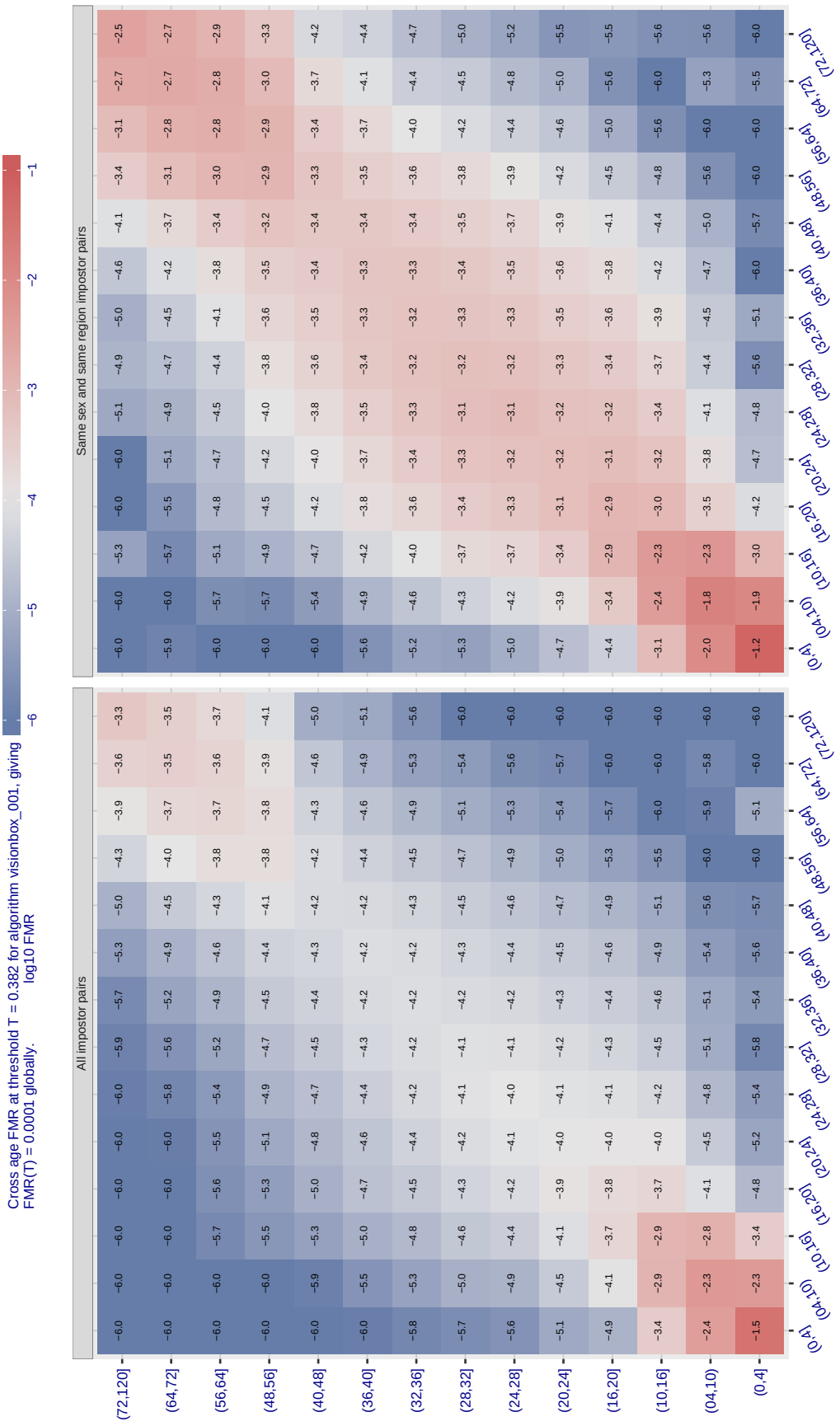


Figure 589: For algorithm visionbox-001 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

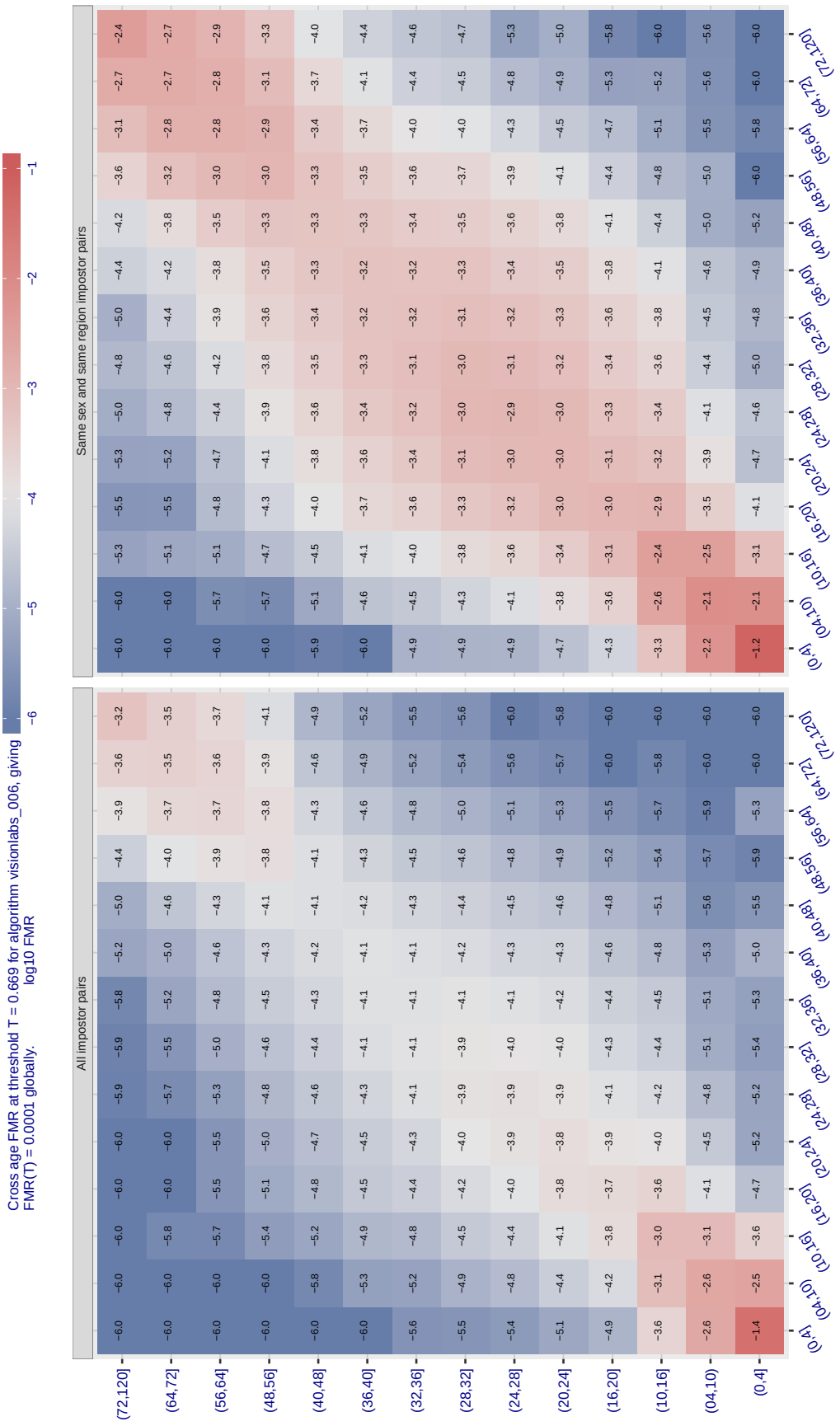


Figure 590: For algorithm visionlabs-006 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

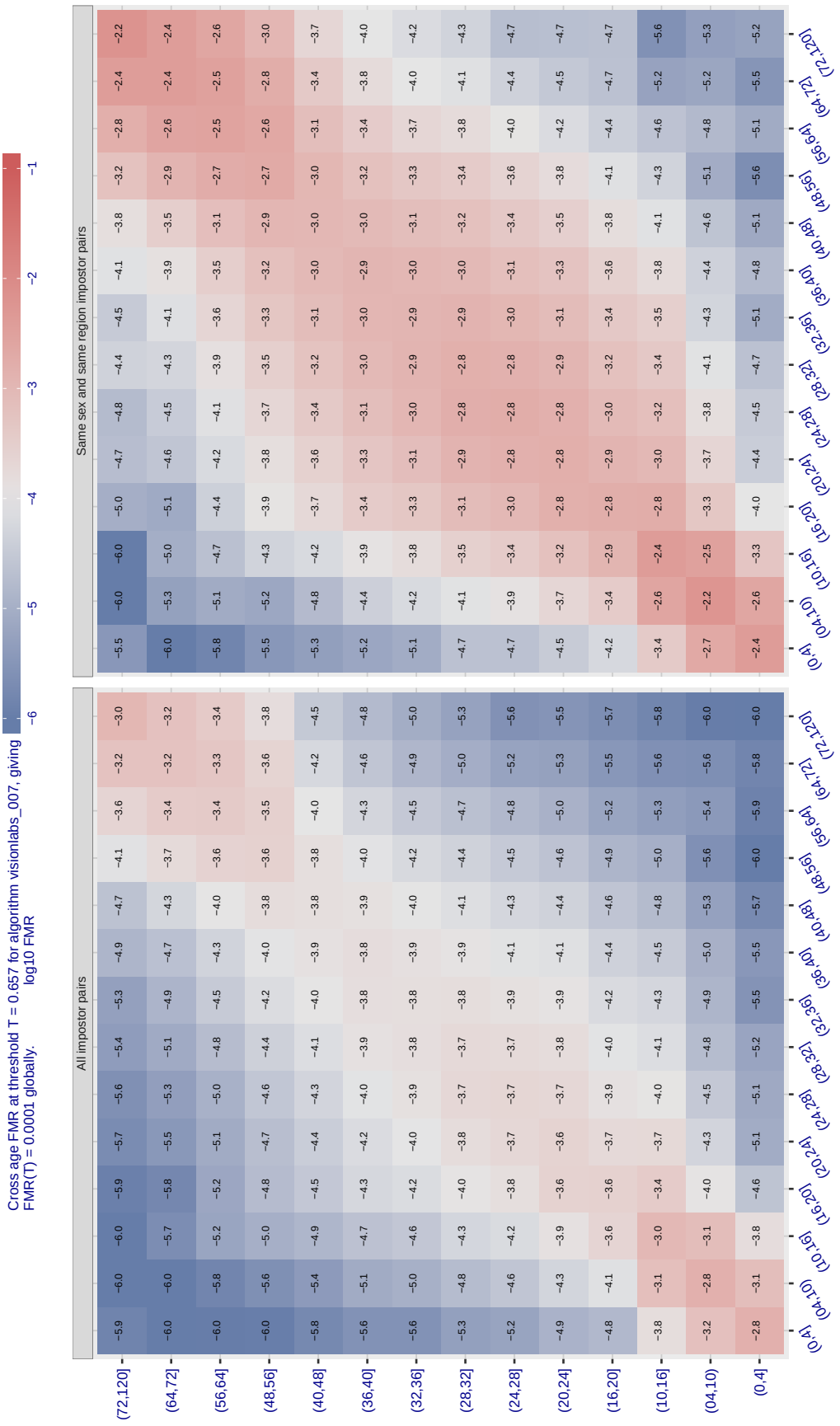


Figure 591: For algorithm visionlabs-007 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

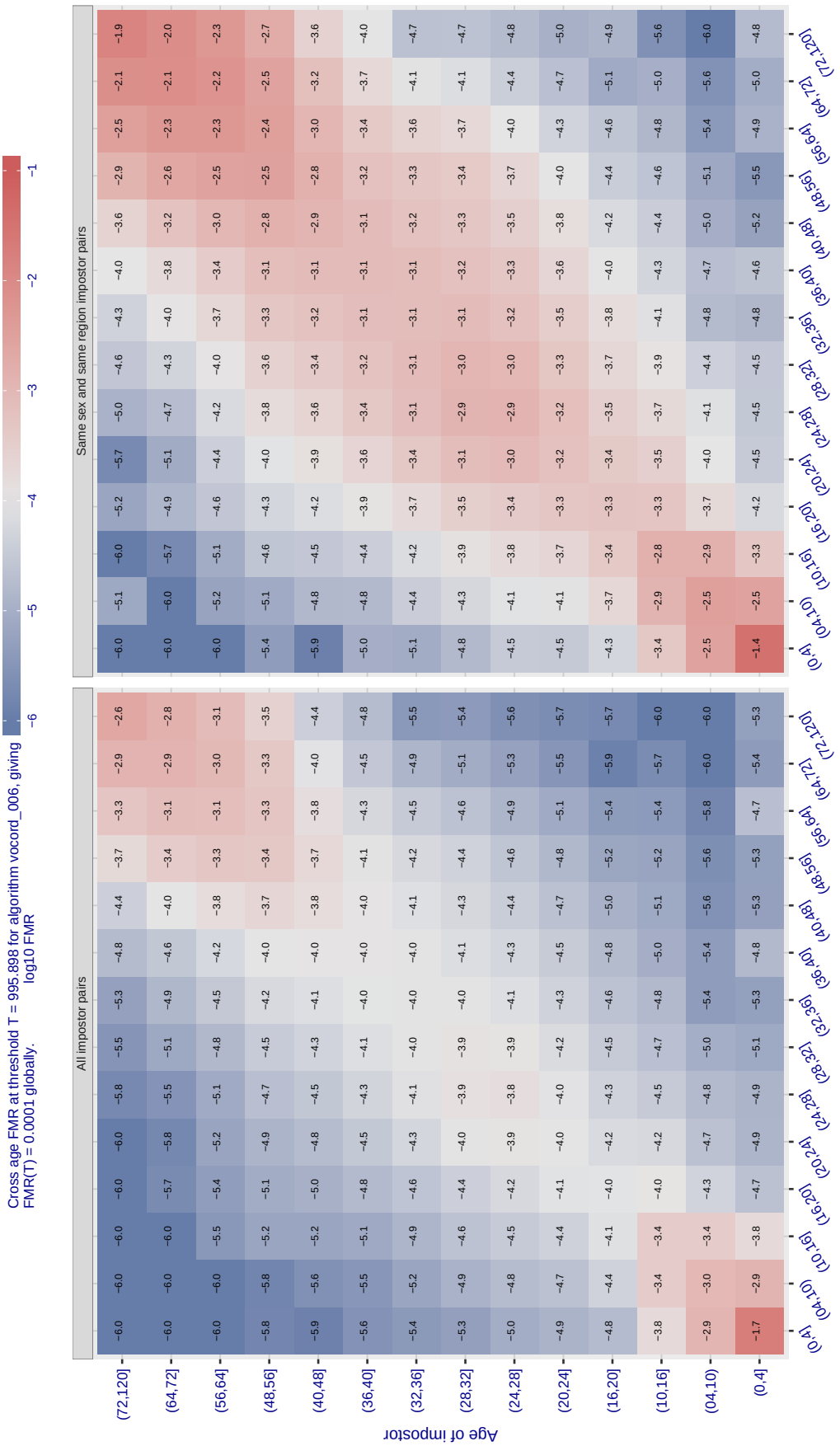


Figure 592: For algorithm vocord-006 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

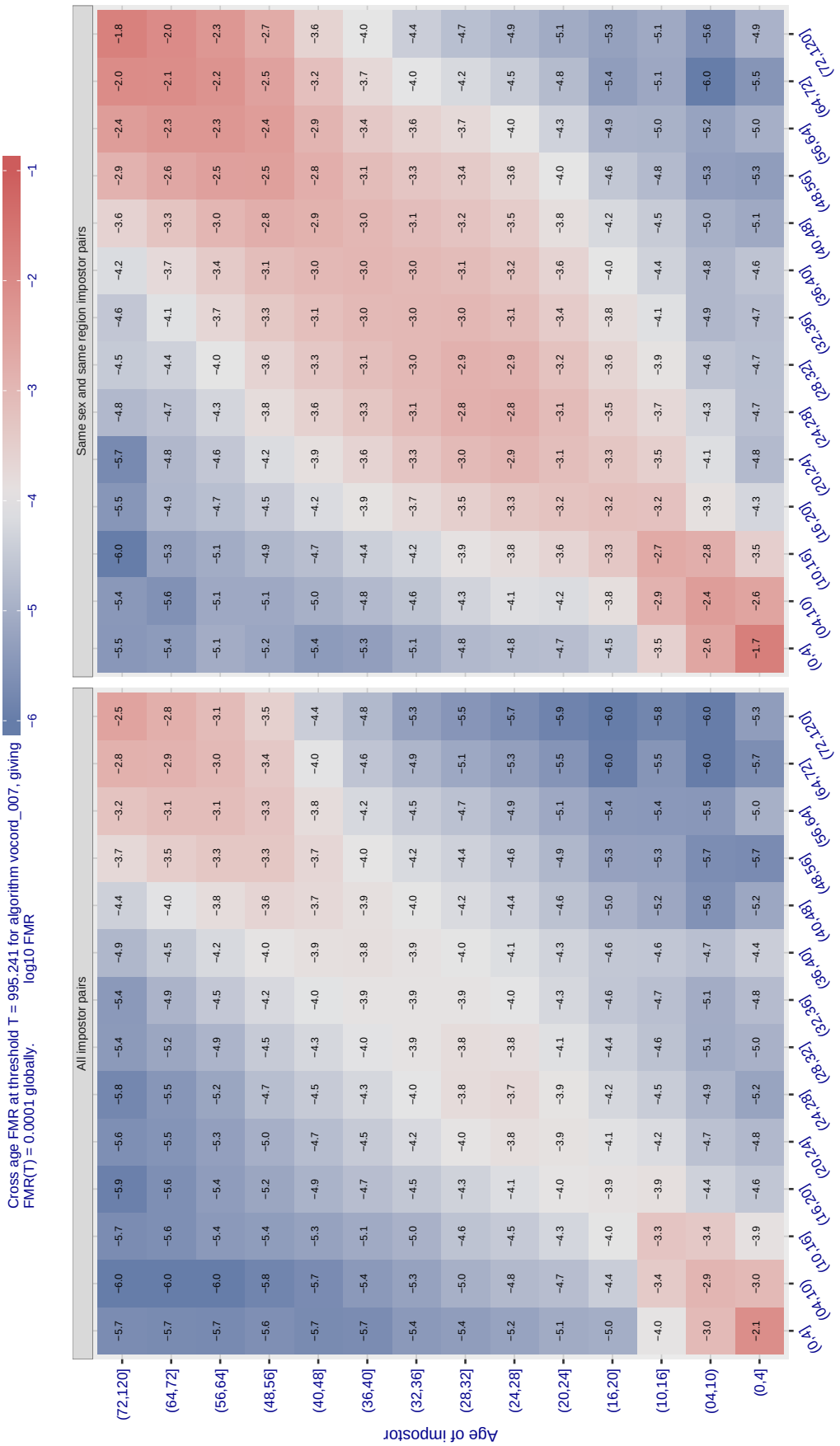


Figure 593: For algorithm vocord-007 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

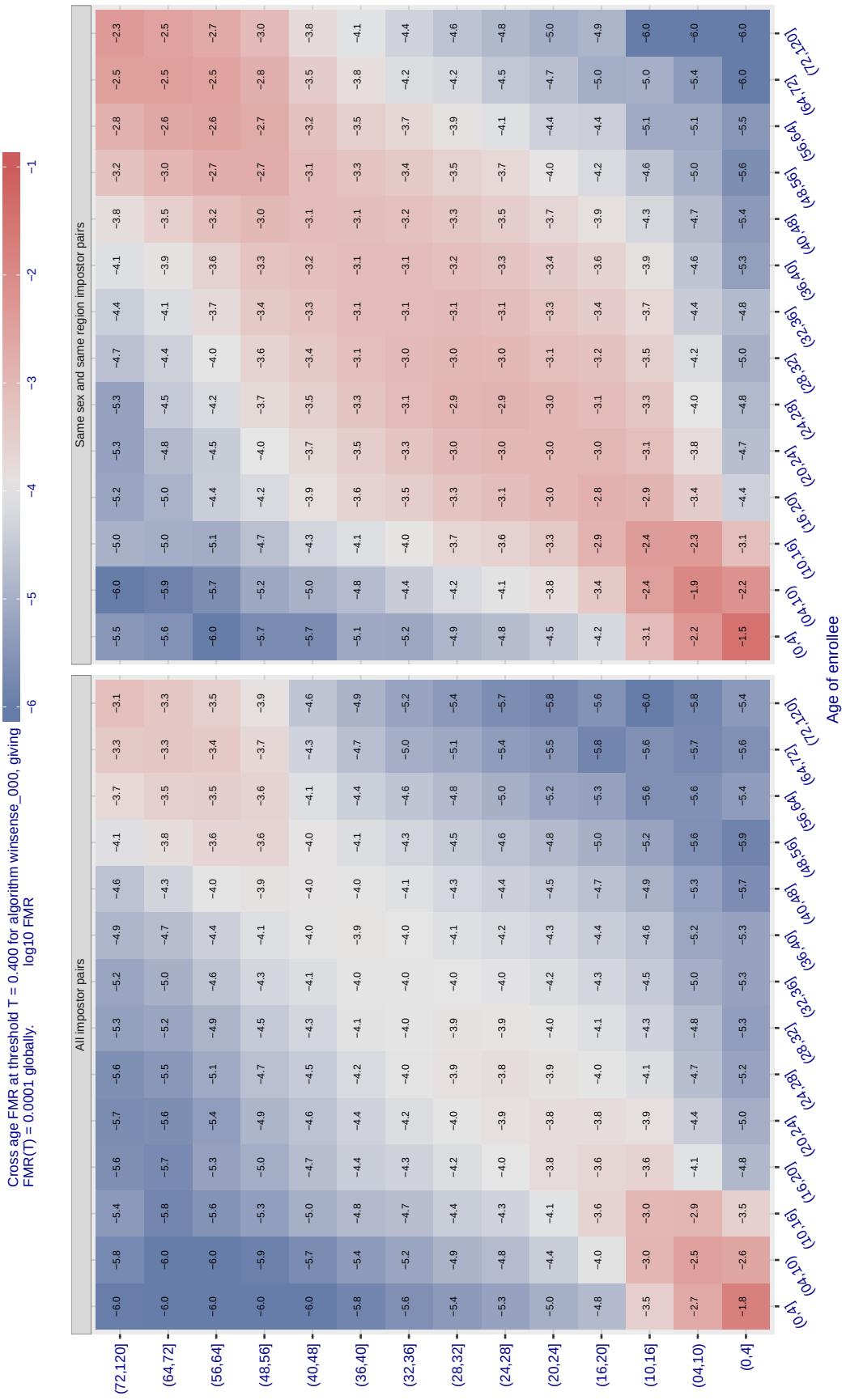


Figure 594: For algorithm winsense-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

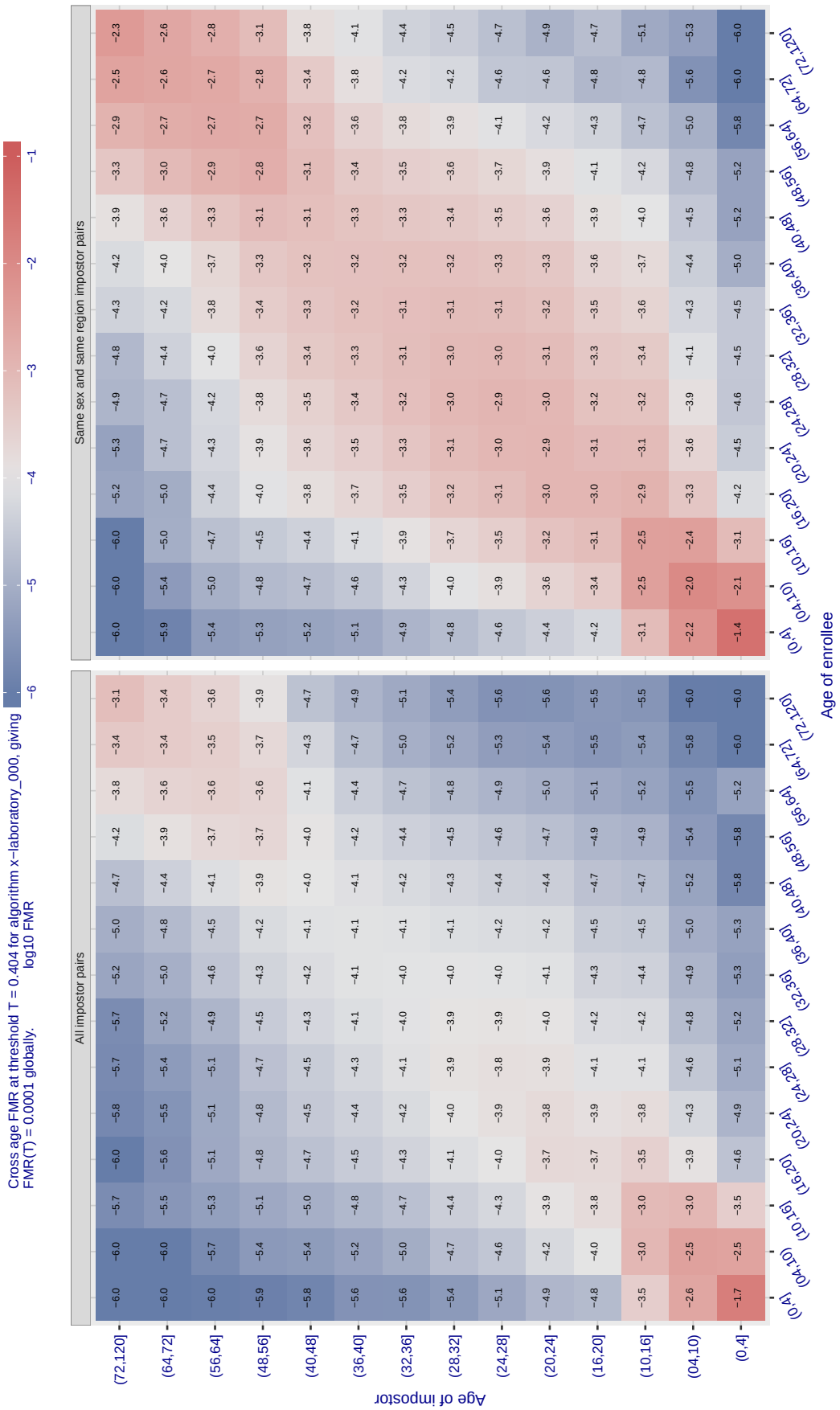


Figure 595: For algorithm x-laboratory-000 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

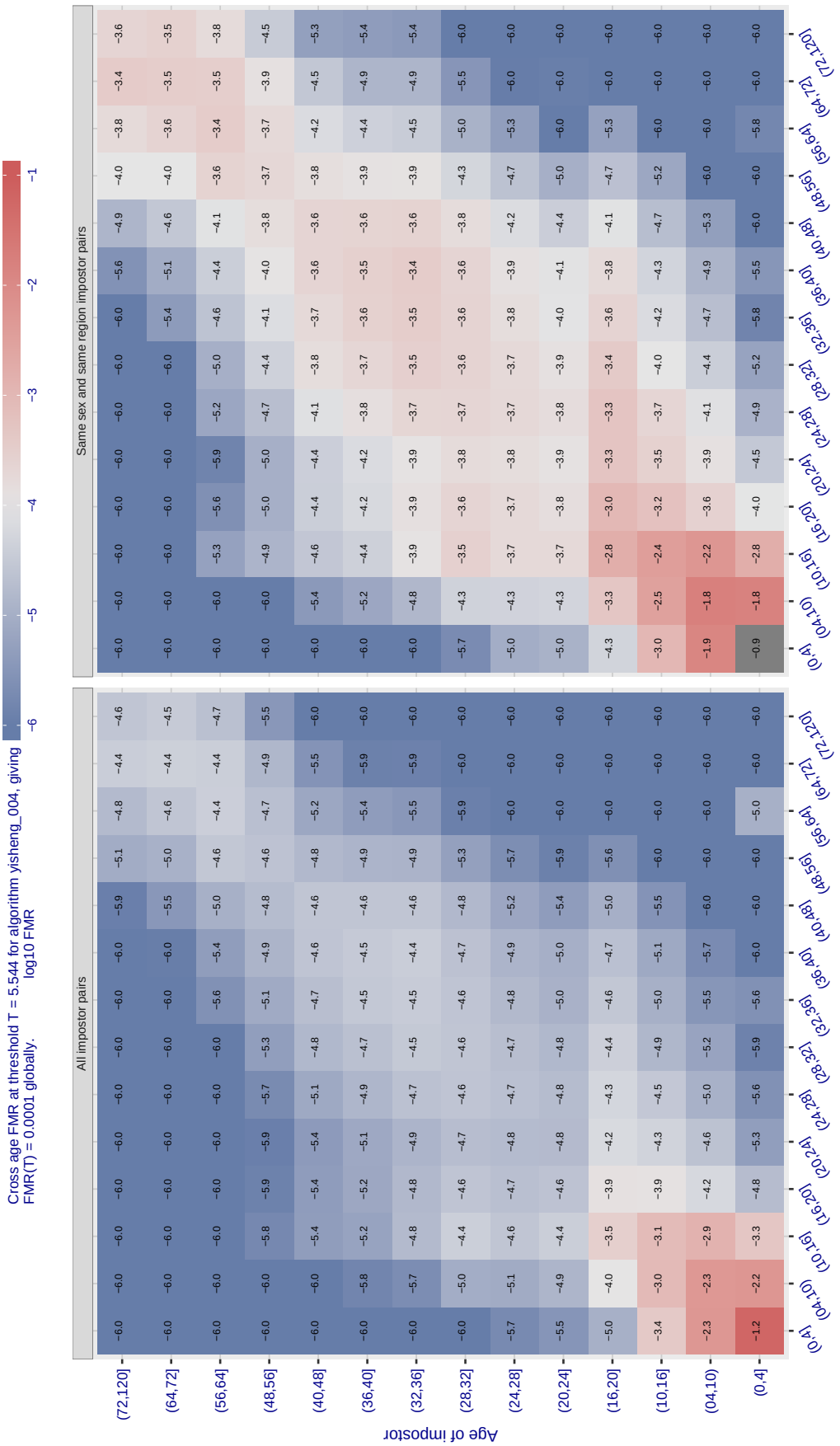


Figure 596: For algorithm yisheng-004 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

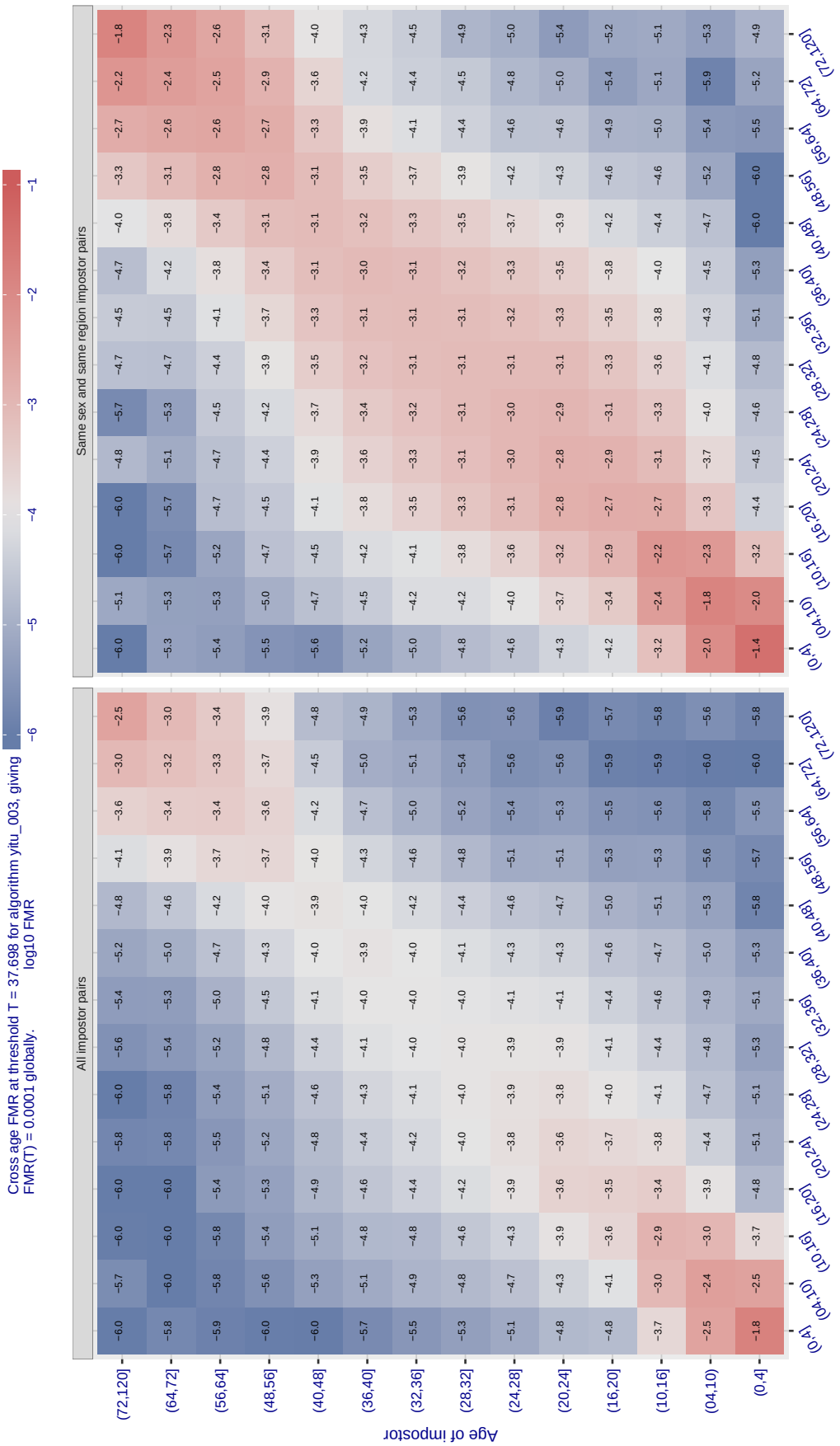


Figure 597: For algorithm yitu-003 operating on visa images, the heatmap shows false match observed over impostor comparisons of faces from different individuals who have the given age pair. False matches are counted against a recognition threshold fixed globally to give FMR = 0.0001 over all on the order of 10^{10} impostor comparisons. The text in each box gives the same quantity as that coded by the color. Light colors present a security vulnerability to, for example, a passport gate.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"

Accuracy Terms + Definitions

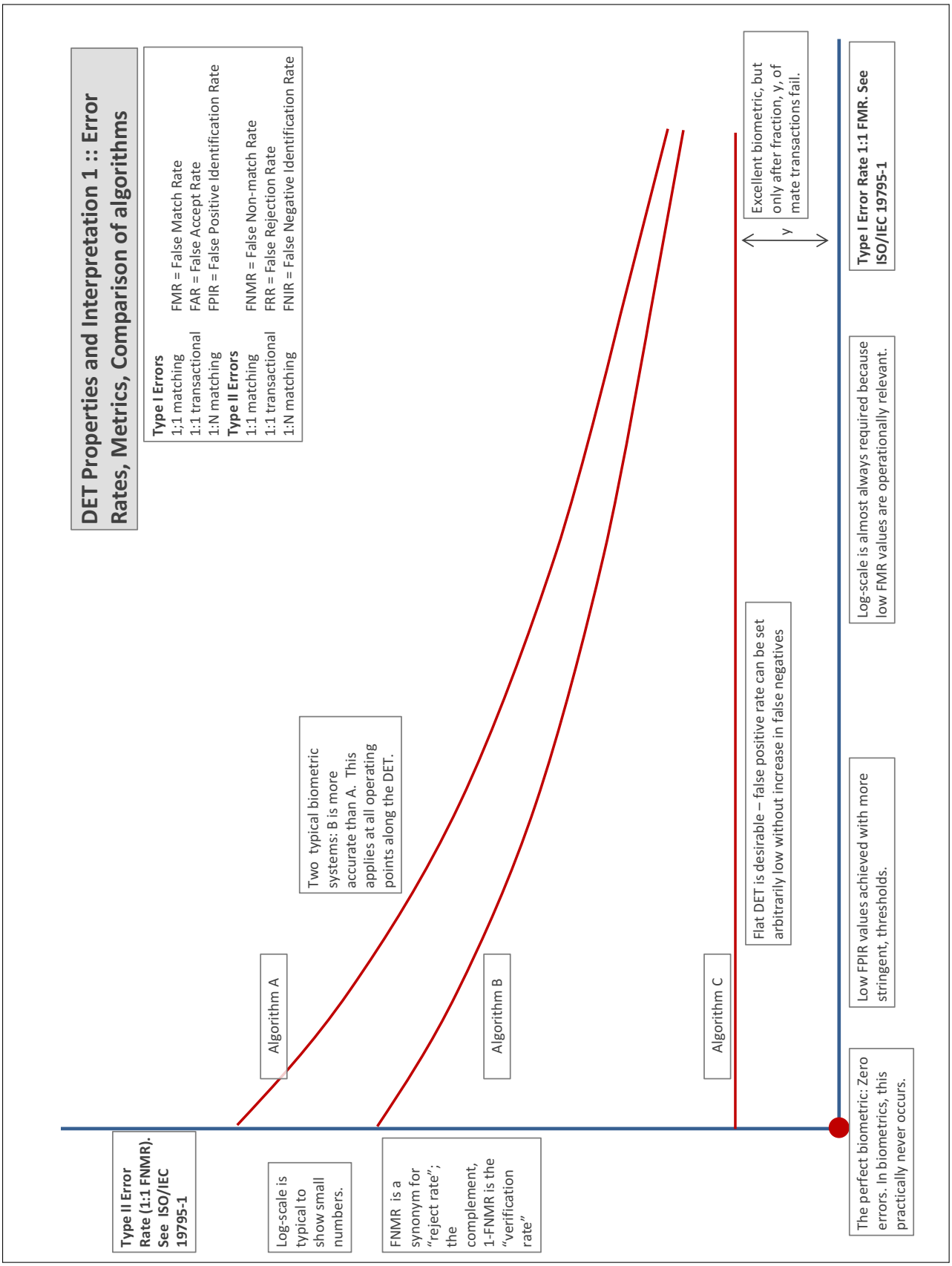
In biometrics, Type II errors occur when two samples of one person do not match – this is called a **false negative**. Correspondingly, Type I errors occur when samples from two persons do match – this is called a **false positive**. Matches are declared by a biometric system when the native comparison score from the recognition algorithm meets some **threshold**. Comparison scores can be either **similarity scores**, in which case higher values indicate that the samples are more likely to come from the same person, or **dissimilarity scores**, in which case higher values indicate different people. Similarity scores are traditionally computed by **fingerprint** and **face** recognition algorithms, while dissimilarities are used in **iris recognition**. In some cases, the dissimilarity score is a distance; this applies only when **metric** properties are obeyed. In any case, scores can be either **mate** scores, coming from a comparison of one person's samples, or **nonmate** scores, coming from comparison of different persons' samples. The words **genuine** or **authentic** are synonyms for mate, and the word **impostor** is used a synonym for nonmate. The words mate and nonmate are traditionally used in identification applications (such as law enforcement search, or background checks) while genuine and impostor are used in verification applications (such as access control).

A **error tradeoff** characteristic represents the tradeoff between Type II and Type I classification errors. For verification this plots false non-match rate (FNMR) vs. false match rate (FMR) parametrically with T.

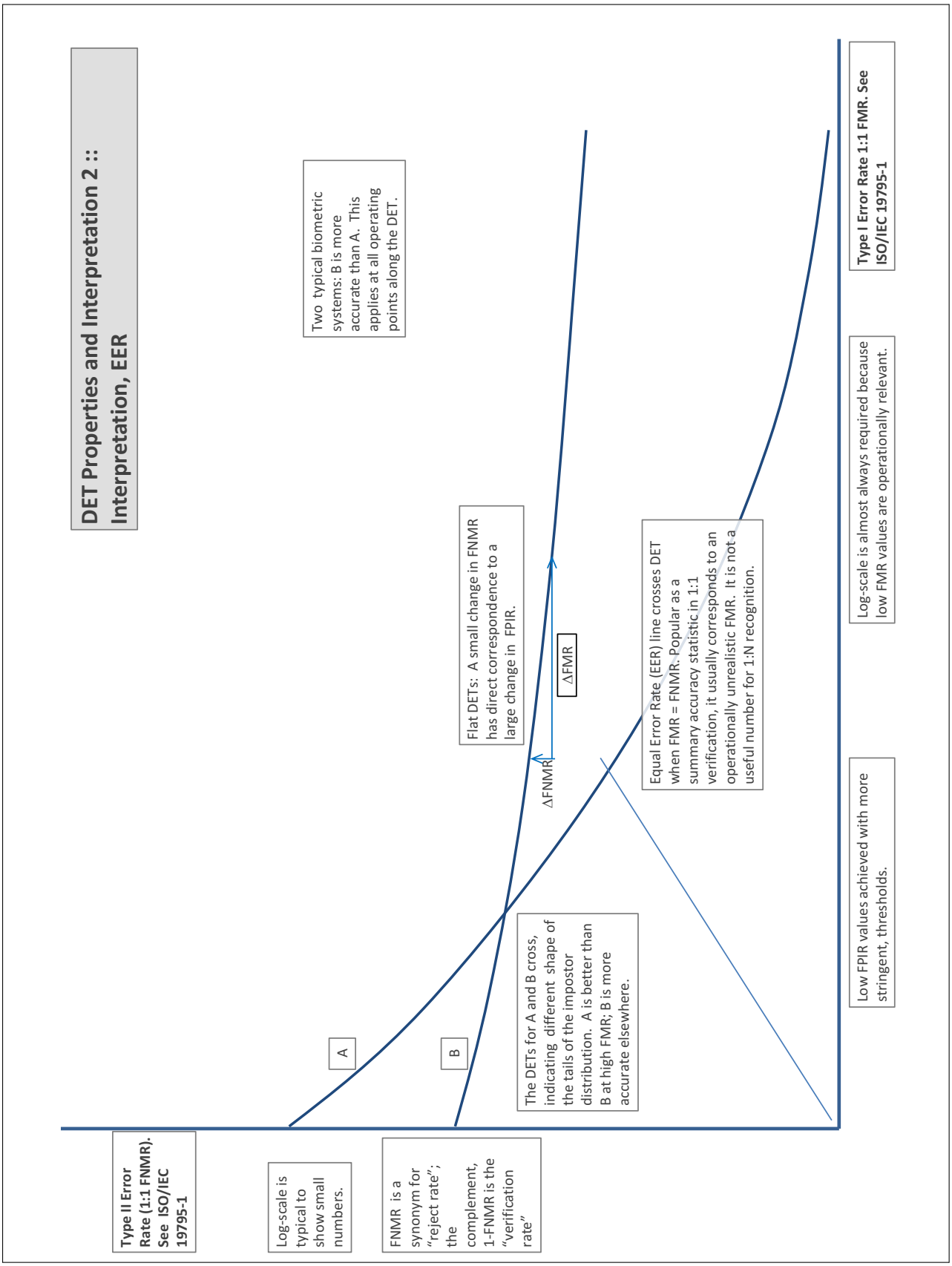
The error tradeoff plots are often called **detection error tradeoff (DET)** characteristics or **receiver operating characteristic** (ROC). These serve the same function but differ, for example, in plotting the complement of an error rate (e.g. TMR = 1 – FNMR) and in transforming the axes most commonly using logarithms, to show multiple decades of FMR. More rarely, the function might be the inverse Gaussian function.

More detail and generality is provided in formal biometrics testing standards, see the various parts of ISO/IEC 19795 Biometrics Testing and Reporting. More terms, including and beyond those to do with accuracy, see ISO/IEC 2382-37 Information technology -- Vocabulary -- Part 37: Harmonized biometric vocabulary

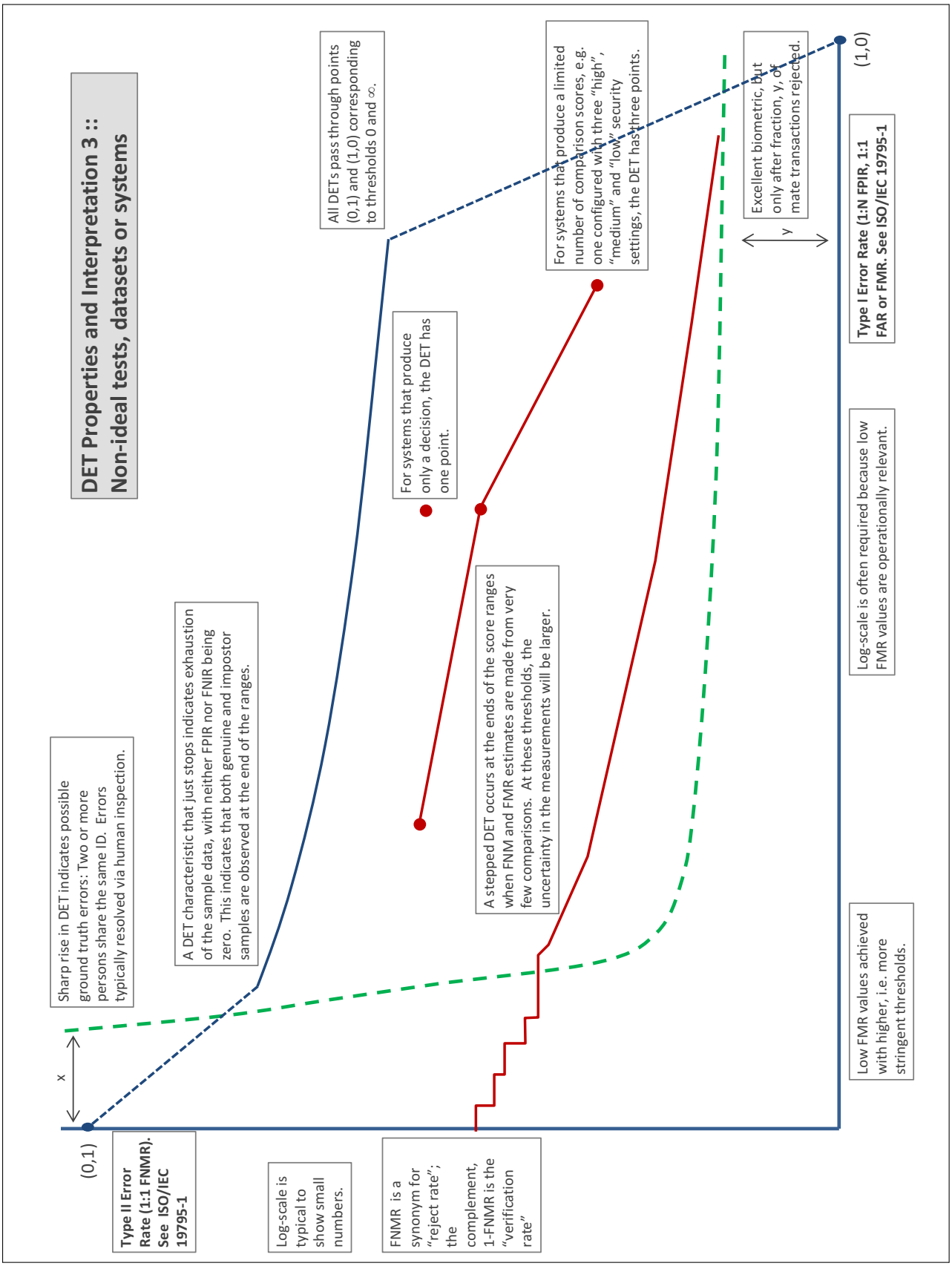
FNMR(T) "False non-match rate"
FMR(T) "False match rate"



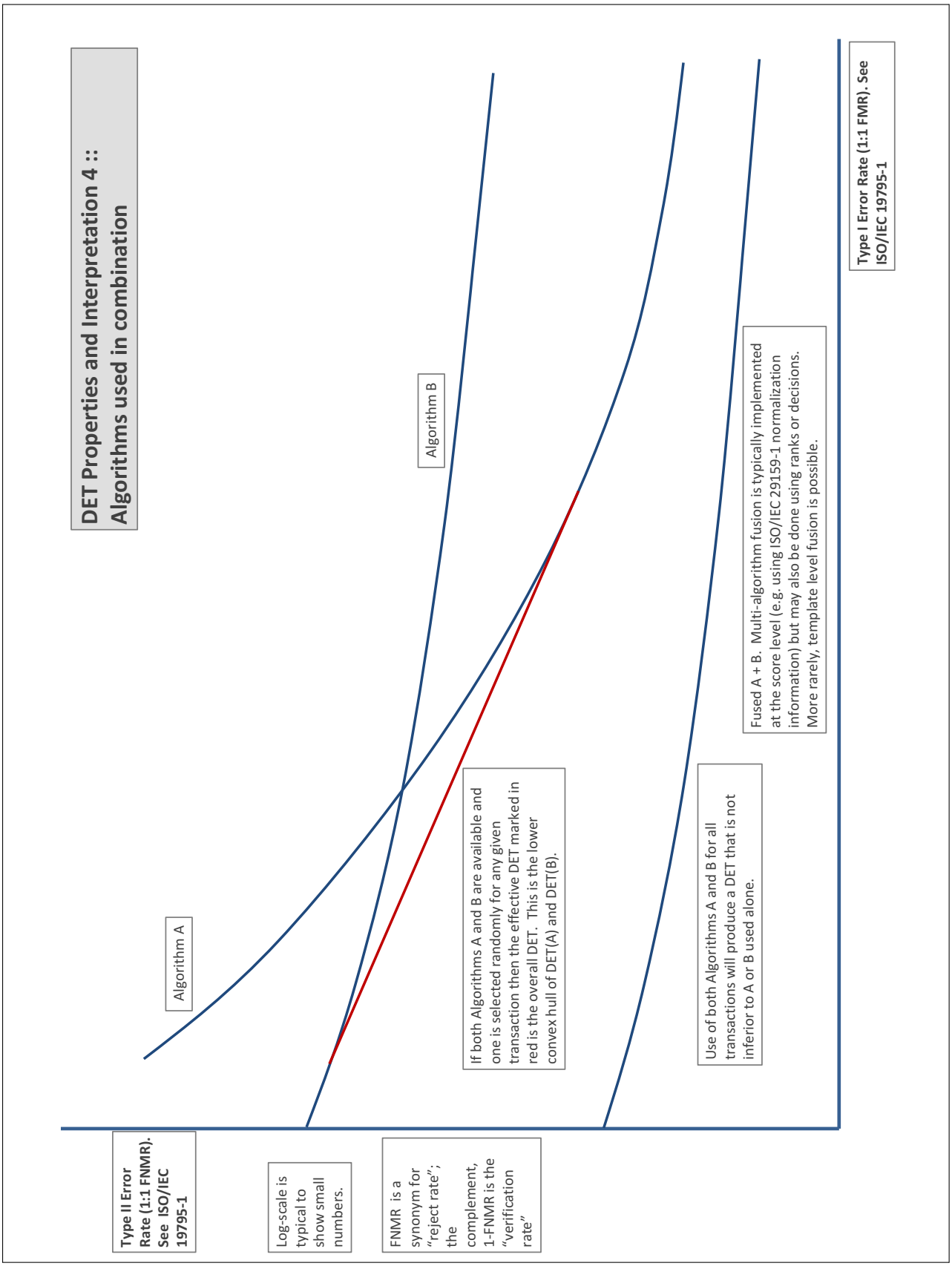
FNMR(T) "False non-match rate"
FMR(T) "False match rate"



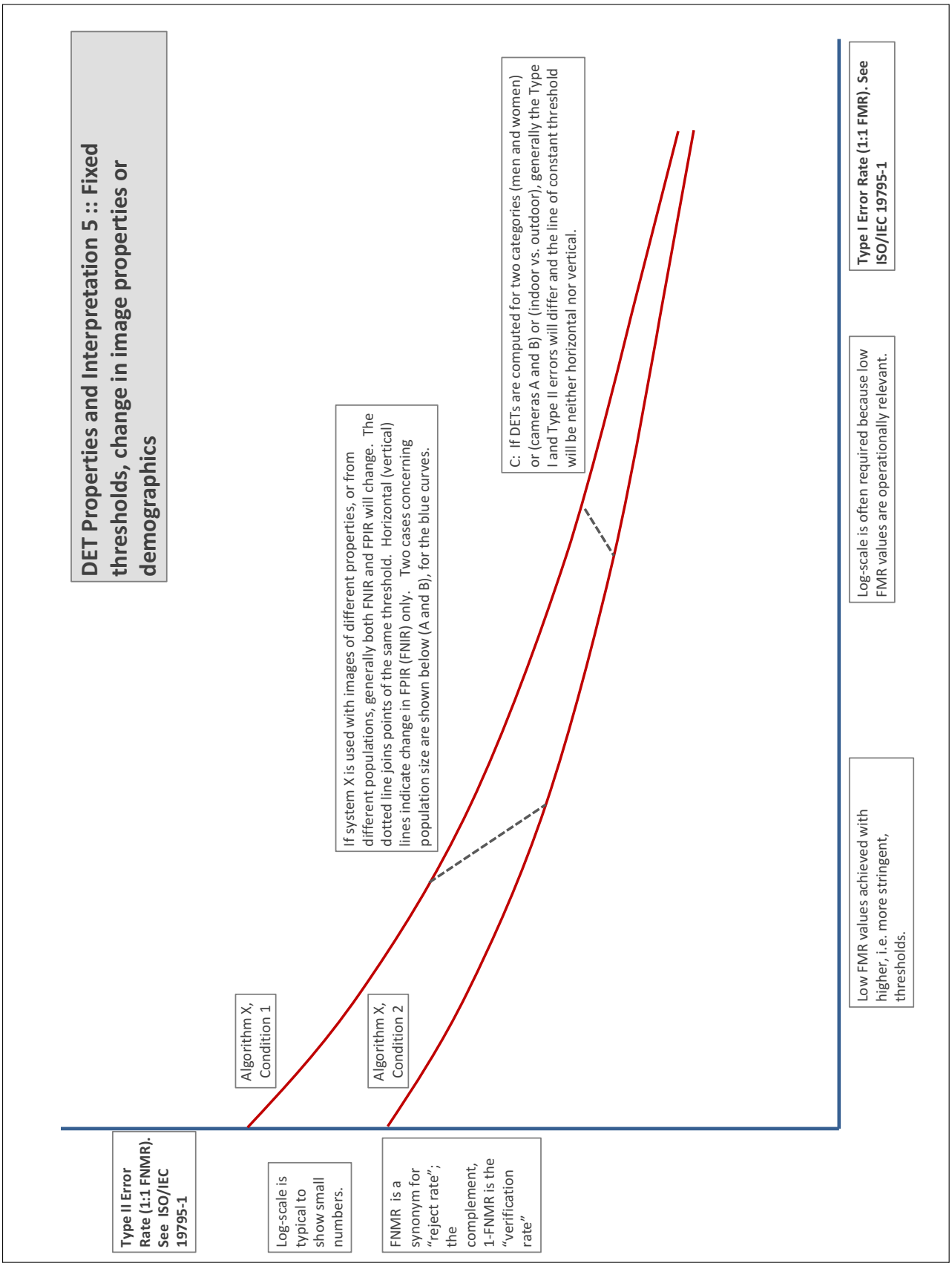
FNMR(T) "False non-match rate"
FMR(T) "False match rate"



FNMR(T) "False non-match rate"
FMR(T) "False match rate"



FNMR(T) "False non-match rate"
FMR(T) "False match rate"



FNMR(T) "False non-match rate"
FMR(T) "False match rate"

References

[1] P. Jonathon Phillips, Amy N. Yates, Ying Hu, Carina A. Hahn, Eilidh Noyes, Kelsey Jackson, Jacqueline G. Cavazos, Géraldine Jeckeln, Rajeev Ranjan, Swami Sankaranarayanan, Jun-Cheng Chen, Carlos D. Castillo, Rama Chellappa, David White, and Alice J. O'Toole. Face recognition accuracy of forensic examiners, superrecognizers, and face recognition algorithms. *Proceedings of the National Academy of Sciences*, 115(24):6171–6176, 2018.

FNMR(T) "False non-match rate"
FMR(T) "False match rate"