

MINEX

Performance and Interoperability of the INCITS 378 Fingerprint Template

Supplement No. 1: Native Matching

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POEBVA	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.1140	4	0.3106	4	0.3106	2	A	0.0000	2	0.0002	3	0.0001	2
B	0.2218	5	0.3570	5			B	0.0008	4	0.0017	4		
C	0.4049	7	0.4049	7			C	0.0027	5	0.0027	6		
D	0.0903	3	0.2772	3	0.2793	1	D	0.0000	2	0.0000	2	0.0000	1
E	0.7389	11	0.7538	12	0.7585	5	E	0.0030	6	0.0073	7	0.0071	4
F	0.9449	14	0.4016	6	0.4137	3	F	0.2123	12	0.0024	5	0.0016	3
G	0.0070	1	0.0053	1			G	0.0000	2	0.0000	1		
H	0.8115	12	0.5500	9			H	0.4479	13	0.4862	12		
I	0.4867	9	0.6316	10	0.4866	4	I	0.0120	7	0.0143	8	0.0137	5
J	0.9207	13	0.9207	13			J	0.6056	14	0.5670	13		
K	0.0196	2	0.9552	14	0.9552	6	K	0.0176	8	0.9285	14	0.9284	6
L	0.2266	6	0.2351	2			L	0.1632	11	0.0954	11		
M	0.4851	8	0.4852	8			M	0.0207	9	0.0212	9		
N	0.6742	10	0.7225	11			N	0.0363	10	0.0297	10		

Table 1: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POEBVA dataset. The values are false match rates at a false non-match rate of 0.005.

DHS2	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.9940	14	0.9940	14	0.9939	6	A	0.0890	6	0.1361	5	0.1361	2
B	0.5111	4	0.5888	2			B	0.0074	1	0.0119	2		
C	0.9939	12	0.9939	12			C	0.3993	7	0.3993	6		
D	0.5149	5	0.7410	3	0.7410	2	D	0.0106	2	0.0488	4	0.0488	1
E	0.7092	7	0.8191	6	0.8284	3	E	0.8963	11	0.9477	11	0.9516	5
F	0.9939	13	0.9939	12	0.9939	5	F	0.9905	14	0.4344	7	0.2687	3
G	0.0319	2	0.0059	1			G	0.0613	5	0.0118	1		
H	0.9599	11	0.9599	10			H	0.9797	13	0.9797	14		
I	0.2801	3	0.9136	7	0.2801	1	I	0.4431	8	0.9405	10	0.4431	4
J	0.9383	10	0.9383	9			J	0.7374	9	0.7233	8		
K	0.0205	1	0.9878	11	0.9878	4	K	0.0397	3	0.9760	13	0.9760	6
L	0.9206	9	0.9206	8			L	0.9494	12	0.9494	12		
M	0.7661	8	0.7661	4			M	0.8220	10	0.8220	9		
N	0.6901	6	0.8106	5			N	0.0583	4	0.0338	3		

Table 2: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DHS2 dataset. The values are false match rates at a false non-match rate of 0.005.

POE	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.2165	5	0.4267	8	0.4267	3	A	0.0000	2	0.0005	3	0.0001	2
B	0.2788	6	0.4016	5			B	0.0006	5	0.0016	4		
C	0.4203	9	0.4203	7			C	0.0017	7	0.0017	6		
D	0.1284	3	0.3340	3	0.3340	1	D	0.0000	2	0.0000	1	0.0000	1
E	0.7110	11	0.8324	12	0.8438	5	E	0.0027	8	0.0090	7	0.0074	4
F	0.8239	13	0.4112	6	0.4343	4	F	0.0002	4	0.0016	5	0.0008	3
G	0.0101	1	0.0055	1			G	0.0000	2	0.0000	2		
H	0.7948	12	0.6308	11			H	0.3760	13	0.3764	12		
I	0.3787	7	0.5302	9	0.3787	2	I	0.0100	9	0.0131	9	0.0102	5
J	0.9330	14	0.9330	13			J	0.6535	14	0.6338	13		
K	0.0158	2	0.9525	14	0.9525	6	K	0.0309	11	0.9239	14	0.9232	6
L	0.1639	4	0.1694	2			L	0.1061	12	0.0978	11		
M	0.3984	8	0.3986	4			M	0.0221	10	0.0220	10		
N	0.4490	10	0.5922	10			N	0.0015	6	0.0092	8		

Table 3: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POE dataset. The values are false match rates at a false non-match rate of 0.005.

DOS	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.2796	5	0.4896	4	0.4896	2	A	0.0002	2	0.0097	3	0.0082	2
B	0.4083	6	0.5983	8			B	0.0212	4	0.0458	4		
C	0.5768	9	0.5768	7			C	0.0601	7	0.0601	6		
D	0.2253	4	0.5242	5	0.5242	3	D	0.0004	3	0.0037	2	0.0037	1
E	0.7406	11	0.7884	11	0.7419	5	E	0.0263	6	0.0673	7	0.0423	3
F	0.9735	14	0.5712	6	0.6163	4	F	0.7895	14	0.0594	5	0.0602	4
G	0.0193	2	0.0047	1			G	0.0000	1	0.0019	1		
H	0.7940	12	0.8865	12			H	0.6365	13	0.7232	13		
I	0.4517	8	0.6150	9	0.4516	1	I	0.1039	9	0.1042	8	0.1098	5
J	0.8982	13	0.8989	13			J	0.5693	12	0.5976	12		
K	0.0141	1	0.9850	14	0.9850	6	K	0.0213	5	0.9743	14	0.9736	6
L	0.2164	3	0.2262	2			L	0.3746	11	0.2878	11		
M	0.4390	7	0.4391	3			M	0.2725	10	0.2697	10		
N	0.6653	10	0.7139	10			N	0.0715	8	0.1613	9		

Table 4: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DOS dataset. The values are false match rates at a false non-match rate of 0.005.

POEBVA	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.0013	2	0.0448	3	0.0448	2	A	0.0000	2	0.0000	2	0.0000	1
B	0.0535	5	0.1208	6			B	0.0001	4	0.0002	4		
C	0.1154	6	0.1154	5			C	0.0002	7	0.0002	6		
D	0.0060	3	0.0437	2	0.0441	1	D	0.0000	2	0.0000	2	0.0000	1
E	0.2389	8	0.3104	8	0.3165	4	E	0.0008	9	0.0017	9	0.0017	5
F	0.8368	14	0.1142	4	0.1021	3	F	0.0002	6	0.0002	5	0.0001	3
G	0.0005	1	0.0053	1			G	0.0000	2	0.0000	2		
H	0.6568	12	0.5500	12			H	0.1920	13	0.1722	12		
I	0.4053	10	0.3730	9	0.4151	5	I	0.0006	8	0.0014	7	0.0008	4
J	0.8046	13	0.8046	13			J	0.4668	14	0.3250	13		
K	0.0196	4	0.9552	14	0.9552	6	K	0.0001	5	0.9283	14	0.9283	6
L	0.2266	7	0.2351	7			L	0.0227	12	0.0151	11		
M	0.3874	9	0.3875	10			M	0.0016	10	0.0016	8		
N	0.4076	11	0.4584	11			N	0.0046	11	0.0039	10		

Table 5: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POEBVA dataset. The values are false match rates at a false non-match rate of 0.01.

DHS2	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.4936	6	0.5968	7	0.5968	4	A	0.0007	2	0.0017	2	0.0014	2
B	0.2313	4	0.3214	2			B	0.0010	3	0.0019	3		
C	0.5939	8	0.5939	6			C	0.0177	6	0.0177	6		
D	0.1574	3	0.3888	3	0.3888	2	D	0.0000	1	0.0004	1	0.0004	1
E	0.7092	9	0.8191	9	0.8284	5	E	0.8963	12	0.9477	11	0.9516	5
F	0.9617	14	0.5922	5	0.5600	3	F	0.8461	11	0.0181	7	0.0116	3
G	0.0319	2	0.0059	1			G	0.0066	4	0.0118	5		
H	0.9599	13	0.9599	13			H	0.9797	14	0.9797	14		
I	0.2801	5	0.9136	10	0.2801	1	I	0.4431	8	0.9405	10	0.4431	4
J	0.9383	12	0.9383	12			J	0.4452	9	0.5028	8		
K	0.0205	1	0.9878	14	0.9878	6	K	0.0267	7	0.9760	13	0.9760	6
L	0.9206	11	0.9206	11			L	0.9494	13	0.9494	12		
M	0.7661	10	0.7661	8			M	0.8220	10	0.8220	9		
N	0.5604	7	0.5658	4			N	0.0091	5	0.0057	4		

Table 6: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DHS2 dataset. The values are false match rates at a false non-match rate of 0.01.

POE	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.0262	4	0.0690	3	0.0690	2	A	0.0000	2	0.0000	3	0.0000	2
B	0.0738	5	0.1543	6			B	0.0000	6	0.0001	6		
C	0.1315	6	0.1315	5			C	0.0000	5	0.0000	4		
D	0.0112	2	0.0488	2	0.0488	1	D	0.0000	2	0.0000	1	0.0000	1
E	0.3424	9	0.3968	9	0.4072	5	E	0.0007	10	0.0017	9	0.0018	5
F	0.5998	12	0.1289	4	0.1058	3	F	0.0000	2	0.0001	5	0.0000	2
G	0.0006	1	0.0055	1			G	0.0000	2	0.0000	1		
H	0.6522	13	0.6308	12			H	0.1369	13	0.1274	12		
I	0.3787	10	0.4171	11	0.3787	4	I	0.0007	9	0.0012	8	0.0007	4
J	0.8154	14	0.8154	13			J	0.4770	14	0.3900	13		
K	0.0158	3	0.9525	14	0.9525	6	K	0.0001	7	0.9232	14	0.9232	6
L	0.1639	7	0.1694	7			L	0.0091	12	0.0094	11		
M	0.3984	11	0.3986	10			M	0.0022	11	0.0022	10		
N	0.1847	8	0.3339	8			N	0.0001	8	0.0007	7		

Table 7: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POE dataset. The values are false match rates at a false non-match rate of 0.01.

DOS	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.0567	4	0.1689	3	0.1689	2	A	0.0000	1	0.0015	3	0.0006	2
B	0.1822	5	0.3234	8			B	0.0035	6	0.0071	7		
C	0.2630	7	0.2630	7			C	0.0055	7	0.0055	6		
D	0.0446	3	0.1856	4	0.1856	3	D	0.0000	3	0.0001	1	0.0001	1
E	0.2763	8	0.3731	9	0.3334	5	E	0.0011	5	0.0041	4	0.0026	3
F	0.8973	14	0.2615	6	0.2550	4	F	0.3187	12	0.0051	5	0.0030	4
G	0.0028	1	0.0047	1			G	0.0000	1	0.0001	2		
H	0.7047	12	0.5586	13			H	0.3855	14	0.3094	12		
I	0.4164	10	0.4314	10	0.4151	6	I	0.0089	8	0.0146	8	0.0108	5
J	0.7758	13	0.7753	14			J	0.3664	13	0.3709	13		
K	0.0141	2	0.0217	2	0.0003	1	K	0.0004	4	0.9736	14	0.9736	6
L	0.2164	6	0.2262	5			L	0.1269	11	0.0842	11		
M	0.4390	11	0.4391	11			M	0.0606	10	0.0606	10		
N	0.4050	9	0.5467	12			N	0.0111	9	0.0223	9		

Table 8: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DOS dataset. The values are false match rates at a false non-match rate of 0.01.

POEBVA	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.0000	2	0.0006	1	0.0004	2	A	0.0000	3	0.0000	3	0.0000	2
B	0.0084	5	0.0192	6			B	0.0000	6	0.0000	6		
C	0.0143	6	0.0143	4			C	0.0000	3	0.0000	3		
D	0.0003	3	0.0016	3	0.0016	3	D	0.0000	3	0.0000	3	0.0000	2
E	0.0289	7	0.0507	8	0.0464	5	E	0.0003	10	0.0005	10	0.0006	5
F	0.5714	13	0.0146	5	0.0096	4	F	0.0000	7	0.0000	3	0.0000	2
G	0.0000	1	0.0008	2			G	0.0000	3	0.0000	3		
H	0.4643	12	0.2521	13			H	0.0484	13	0.0554	12		
I	0.1144	9	0.0897	9	0.1159	6	I	0.0000	7	0.0000	7	0.0000	4
J	0.6045	14	0.5923	14			J	0.3077	14	0.1418	13		
K	0.0069	4	0.0243	7	0.0004	1	K	0.0000	3	0.9283	14	0.9283	6
L	0.2266	11	0.2351	12			L	0.0016	12	0.0012	11		
M	0.1042	8	0.1042	10			M	0.0000	9	0.0000	8		
N	0.1573	10	0.1778	11			N	0.0004	11	0.0002	9		

Table 9: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POEBVA dataset. The values are false match rates at a false non-match rate of 0.02.

DHS2	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.0626	5	0.0904	4	0.0904	3	A	0.0000	2	0.0001	3	0.0000	2
B	0.0519	4	0.0956	5			B	0.0001	5	0.0001	2		
C	0.1738	6	0.1738	6			C	0.0008	7	0.0008	5		
D	0.0093	1	0.0452	3	0.0452	2	D	0.0000	2	0.0000	1	0.0000	1
E	0.7092	9	0.8191	11	0.8284	6	E	0.8963	12	0.9477	11	0.9516	5
F	0.8293	12	0.1747	7	0.1435	4	F	0.0047	8	0.0009	6	0.0006	3
G	0.0228	3	0.0059	1			G	0.0000	4	0.0118	7		
H	0.9599	14	0.9599	14			H	0.9777	14	0.9779	14		
I	0.2801	8	0.9136	12	0.2801	5	I	0.4431	10	0.9405	10	0.4431	4
J	0.8141	11	0.8136	10			J	0.2728	9	0.2695	8		
K	0.0205	2	0.0276	2	0.0005	1	K	0.0000	2	0.9760	13	0.9760	6
L	0.9206	13	0.9206	13			L	0.9494	13	0.9494	12		
M	0.7661	10	0.7661	9			M	0.8220	11	0.8220	9		
N	0.2416	7	0.2430	8			N	0.0006	6	0.0004	4		

Table 10: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DHS2 dataset. The values are false match rates at a false non-match rate of 0.02.

POE	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.0000	2	0.0015	1	0.0012	2	A	0.0000	4	0.0000	3	0.0000	2
B	0.0112	5	0.0266	7			B	0.0000	8	0.0000	6		
C	0.0122	6	0.0122	5			C	0.0000	4	0.0000	3		
D	0.0003	3	0.0017	3	0.0017	3	D	0.0000	4	0.0000	3	0.0000	2
E	0.0491	9	0.0877	8	0.0877	5	E	0.0002	11	0.0006	11	0.0006	5
F	0.0486	8	0.0122	4	0.0071	4	F	0.0000	4	0.0000	3	0.0000	2
G	0.0000	1	0.0016	2			G	0.0000	4	0.0000	3		
H	0.4052	13	0.3101	13			H	0.0306	13	0.0395	12		
I	0.1291	10	0.1219	10	0.1318	6	I	0.0000	9	0.0000	7	0.0000	4
J	0.6189	14	0.6021	14			J	0.3066	14	0.1573	13		
K	0.0076	4	0.0204	6	0.0002	1	K	0.0000	4	0.9232	14	0.9232	6
L	0.1639	12	0.1694	12			L	0.0004	12	0.0004	10		
M	0.1321	11	0.1321	11			M	0.0001	10	0.0001	9		
N	0.0409	7	0.0947	9			N	0.0000	4	0.0001	8		

Table 11: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POE dataset. The values are false match rates at a false non-match rate of 0.02.

DOS	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.0004	2	0.0469	5	0.0469	4	A	0.0000	2	0.0001	3	0.0000	2
B	0.0429	6	0.0892	8			B	0.0002	9	0.0006	7		
C	0.0480	7	0.0480	6			C	0.0001	5	0.0001	4		
D	0.0024	3	0.0150	2	0.0150	2	D	0.0000	2	0.0000	1	0.0000	1
E	0.0396	5	0.0809	7	0.0625	5	E	0.0002	6	0.0003	6	0.0002	4
F	0.7314	14	0.0466	4	0.0342	3	F	0.0002	7	0.0002	5	0.0001	3
G	0.0001	1	0.0047	1			G	0.0000	2	0.0000	1		
H	0.5447	12	0.5586	13			H	0.1284	13	0.1035	13		
I	0.1506	9	0.1377	9	0.1521	6	I	0.0002	8	0.0006	8	0.0003	5
J	0.5641	13	0.5647	14			J	0.2021	14	0.1638	14		
K	0.0117	4	0.0217	3	0.0003	1	K	0.0000	2	0.0416	12	0.0005	6
L	0.2164	10	0.2262	11			L	0.0109	12	0.0065	11		
M	0.2756	11	0.2756	12			M	0.0054	11	0.0054	10		
N	0.1174	8	0.2257	10			N	0.0006	10	0.0016	9		

Table 12: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DOS dataset. The values are false match rates at a false non-match rate of 0.02.

POEBVA	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FNMR	Rank	FNMR	Rank	FNMR	Rank		FNMR	Rank	FNMR	Rank	FNMR	Rank
A	0.0103	2	0.0187	1	0.0180	1	A	0.0007	2	0.0021	3	0.0015	1
B	0.0365	5	0.0462	6			B	0.0044	4	0.0059	4		
C	0.0403	6	0.0403	4			C	0.0069	6	0.0069	5		
D	0.0149	3	0.0218	3	0.0218	2	D	0.0013	3	0.0021	2	0.0021	2
E	0.0461	8	0.0600	9	0.0602	5	E	0.0089	8	0.0136	9	0.0143	5
F	0.0420	7	0.0407	5	0.0348	3	F	0.0076	7	0.0069	6	0.0057	3
G	0.0086	1	0.0190	2			G	0.0006	1	0.0018	1		
H	0.1618	13	0.1665	13			H	0.0737	13	0.0783	13		
I	0.0510	9	0.0575	8	0.0522	4	I	0.0093	9	0.0110	7	0.0094	4
J	0.2372	14	0.2372	14			J	0.1114	14	0.1192	14		
K	0.0294	4	0.0689	10	0.0634	6	K	0.0068	5	0.0345	12	0.0305	6
L	0.0844	12	0.0793	12			L	0.0224	12	0.0211	11		
M	0.0549	10	0.0550	7			M	0.0114	10	0.0114	8		
N	0.0837	11	0.0764	11			N	0.0159	11	0.0142	10		

Table 13: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POEBVA dataset. The values are false non-match rates at a false match rate of 0.001.

DHS2	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FNMR	Rank	FNMR	Rank	FNMR	Rank		FNMR	Rank	FNMR	Rank	FNMR	Rank
A	0.0323	2	0.0471	2	0.0455	2	A	0.0092	2	0.0130	3	0.0109	2
B	0.0657	5	0.0809	5			B	0.0099	3	0.0122	2		
C	0.0734	6	0.0734	4			C	0.0193	7	0.0193	6		
D	0.0300	1	0.0381	1	0.0381	1	D	0.0077	1	0.0093	1	0.0093	1
E	0.1394	9	0.1846	9	0.1857	5	E	0.0680	9	0.0965	9	0.0941	5
F	0.0885	7	0.0729	3	0.0648	3	F	0.0267	8	0.0192	5	0.0178	3
G	0.0339	3	0.0815	6			G	0.0130	4	0.0402	8		
H	0.2673	11	0.2759	11			H	0.1579	11	0.1687	12		
I	0.2708	12	0.2806	12	0.2735	6	I	0.1808	13	0.1892	13	0.1829	6
J	0.2892	13	0.2929	13			J	0.1774	12	0.1622	11		
K	0.0384	4	0.0909	7	0.0777	4	K	0.0141	5	0.0384	7	0.0356	4
L	0.2348	10	0.2172	10			L	0.1564	10	0.1516	10		
M	0.4132	14	0.4132	14			M	0.3495	14	0.3494	14		
N	0.0977	8	0.0999	8			N	0.0181	6	0.0185	4		

Table 14: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DHS2 dataset. The values are false non-match rates at a false match rate of 0.001.

POE	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FNMR	Rank	FNMR	Rank	FNMR	Rank		FNMR	Rank	FNMR	Rank	FNMR	Rank
A	0.0120	2	0.0213	1	0.0207	1	A	0.0007	2	0.0033	3	0.0020	1
B	0.0361	7	0.0450	6			B	0.0043	5	0.0056	6		
C	0.0351	6	0.0351	4			C	0.0055	6	0.0055	4		
D	0.0159	3	0.0222	2	0.0222	2	D	0.0012	3	0.0020	1	0.0020	2
E	0.0498	10	0.0662	10	0.0630	5	E	0.0080	9	0.0138	10	0.0139	5
F	0.0307	5	0.0353	5	0.0298	3	F	0.0035	4	0.0056	5	0.0046	3
G	0.0091	1	0.0223	3			G	0.0005	1	0.0021	2		
H	0.1528	13	0.1951	13			H	0.0588	13	0.0822	13		
I	0.0495	9	0.0564	7	0.0507	4	I	0.0088	10	0.0103	8	0.0090	4
J	0.2353	14	0.2353	14			J	0.1142	14	0.1227	14		
K	0.0272	4	0.0787	12	0.0746	6	K	0.0074	8	0.0399	12	0.0383	6
L	0.0719	12	0.0708	11			L	0.0170	12	0.0167	11		
M	0.0589	11	0.0589	8			M	0.0121	11	0.0121	9		
N	0.0466	8	0.0603	9			N	0.0061	7	0.0094	7		

Table 15: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POE dataset. The values are false non-match rates at a false match rate of 0.001.

DOS	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FNMR	Rank	FNMR	Rank	FNMR	Rank		FNMR	Rank	FNMR	Rank	FNMR	Rank
A	0.0187	2	0.0332	3	0.0314	1	A	0.0038	2	0.0122	3	0.0082	2
B	0.0578	9	0.0722	8			B	0.0144	6	0.0175	7		
C	0.0515	6	0.0515	5			C	0.0145	7	0.0145	6		
D	0.0238	3	0.0319	2	0.0319	2	D	0.0039	3	0.0066	2	0.0066	1
E	0.0397	5	0.0490	4	0.0453	4	E	0.0102	5	0.0144	4	0.0135	4
F	0.0569	7	0.0517	6	0.0434	3	F	0.0160	9	0.0144	4	0.0125	3
G	0.0132	1	0.0297	1			G	0.0016	1	0.0064	1		
H	0.1684	13	0.2062	13			H	0.0784	13	0.0941	13		
I	0.0570	8	0.0649	7	0.0585	5	I	0.0156	8	0.0182	8	0.0159	5
J	0.2183	14	0.2189	14			J	0.1211	14	0.1085	14		
K	0.0307	4	0.0740	9	0.0709	6	K	0.0092	4	0.0318	12	0.0287	6
L	0.0892	12	0.0814	12			L	0.0306	12	0.0285	11		
M	0.0795	11	0.0795	10			M	0.0272	11	0.0273	10		
N	0.0746	10	0.0811	11			N	0.0188	10	0.0230	9		

Table 16: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DOS dataset. The values are false non-match rates at a false match rate of 0.001.



POEBVA	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.0095	2	0.0158	2	0.0155	1	A	0.0006	2	0.0013	1	0.0013	1
B	0.0273	5	0.0353	6			B	0.0028	4	0.0043	4		
C	0.0311	6	0.0311	4			C	0.0048	5	0.0048	6		
D	0.0117	3	0.0175	3	0.0175	2	D	0.0010	3	0.0016	3	0.0016	2
E	0.0337	7	0.0413	7	0.0408	4	E	0.0051	6	0.0076	7	0.0074	5
F	0.0349	8	0.0313	5	0.0271	3	F	0.0064	8	0.0047	5	0.0041	3
G	0.0065	1	0.0147	1			G	0.0003	1	0.0014	2		
H	0.1295	13	0.1632	13			H	0.0544	13	0.0653	13		
I	0.0415	9	0.0456	9	0.0422	5	I	0.0069	9	0.0080	8	0.0070	4
J	0.1930	14	0.1930	14			J	0.0904	14	0.0913	14		
K	0.0233	4	0.0577	10	0.0634	6	K	0.0058	7	0.0302	12	0.0305	6
L	0.0703	12	0.0655	12			L	0.0170	12	0.0160	11		
M	0.0449	10	0.0449	8			M	0.0087	10	0.0086	9		
N	0.0661	11	0.0642	11			N	0.0123	11	0.0116	10		

Table 17: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POEBVA dataset. The values are false non-match rates at a false match rate of 0.003.

DHS2	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.0301	3	0.0408	2	0.0404	2	A	0.0073	3	0.0081	1	0.0084	2
B	0.0508	5	0.0621	5			B	0.0072	2	0.0084	3		
C	0.0592	6	0.0592	4			C	0.0150	7	0.0150	5		
D	0.0248	1	0.0322	1	0.0322	1	D	0.0066	1	0.0082	2	0.0082	1
E	0.1075	9	0.1214	9	0.1236	5	E	0.0485	9	0.0558	9	0.0584	5
F	0.0692	7	0.0592	3	0.0527	3	F	0.0216	8	0.0151	6	0.0138	3
G	0.0296	2	0.0723	6			G	0.0116	4	0.0371	8		
H	0.2255	11	0.2363	11			H	0.1294	10	0.1363	11		
I	0.2585	13	0.2645	13	0.2598	6	I	0.1738	13	0.1790	13	0.1746	6
J	0.2428	12	0.2458	12			J	0.1562	12	0.1294	10		
K	0.0325	4	0.0755	7	0.0777	4	K	0.0130	5	0.0332	7	0.0356	4
L	0.2175	10	0.2001	10			L	0.1482	11	0.1439	12		
M	0.3928	14	0.3929	14			M	0.3401	14	0.3401	14		
N	0.0784	8	0.0803	8			N	0.0140	6	0.0134	4		

Table 18: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DHS2 dataset. The values are false non-match rates at a false match rate of 0.003.

POE	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.0111	2	0.0182	3	0.0177	1	A	0.0006	2	0.0017	3	0.0014	1
B	0.0283	7	0.0353	6			B	0.0033	5	0.0042	4		
C	0.0278	6	0.0278	5			C	0.0042	6	0.0042	5		
D	0.0129	3	0.0180	2	0.0180	2	D	0.0010	3	0.0016	2	0.0016	2
E	0.0369	8	0.0475	8	0.0449	5	E	0.0048	8	0.0073	8	0.0075	5
F	0.0254	5	0.0278	4	0.0239	3	F	0.0026	4	0.0043	6	0.0037	3
G	0.0070	1	0.0172	1			G	0.0004	1	0.0014	1		
H	0.1224	13	0.1547	13			H	0.0437	13	0.0558	13		
I	0.0419	10	0.0449	7	0.0424	4	I	0.0067	10	0.0078	9	0.0067	4
J	0.1952	14	0.1952	14			J	0.0952	14	0.0933	14		
K	0.0242	4	0.0663	12	0.0746	6	K	0.0063	9	0.0379	12	0.0383	6
L	0.0595	12	0.0588	11			L	0.0133	12	0.0130	11		
M	0.0475	11	0.0476	9			M	0.0092	11	0.0091	10		
N	0.0388	9	0.0483	10			N	0.0044	7	0.0072	7		

Table 19: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POE dataset. The values are false non-match rates at a false match rate of 0.003.

DOS	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FMR	Rank	FMR	Rank	FMR	Rank		FMR	Rank	FMR	Rank	FMR	Rank
A	0.0173	2	0.0284	3	0.0272	2	A	0.0031	2	0.0073	3	0.0064	2
B	0.0458	7	0.0568	8			B	0.0105	6	0.0131	7		
C	0.0411	6	0.0411	6			C	0.0114	7	0.0114	6		
D	0.0192	3	0.0268	2	0.0268	1	D	0.0031	3	0.0052	2	0.0052	1
E	0.0328	5	0.0402	4	0.0374	4	E	0.0080	5	0.0108	4	0.0096	3
F	0.0509	9	0.0408	5	0.0352	3	F	0.0140	9	0.0114	5	0.0100	4
G	0.0099	1	0.0229	1			G	0.0011	1	0.0042	1		
H	0.1364	13	0.1670	13			H	0.0629	13	0.0702	13		
I	0.0466	8	0.0523	7	0.0475	5	I	0.0128	8	0.0147	8	0.0133	5
J	0.1794	14	0.1809	14			J	0.1027	14	0.0857	14		
K	0.0270	4	0.0631	9	0.0709	6	K	0.0071	4	0.0280	12	0.0287	6
L	0.0774	12	0.0704	12			L	0.0255	12	0.0232	11		
M	0.0669	11	0.0669	10			M	0.0224	11	0.0224	10		
N	0.0600	10	0.0681	11			N	0.0146	10	0.0177	9		

Table 20: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DOS dataset. The values are false non-match rates at a false match rate of 0.003.

POEBVA	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FNMR	Rank	FNMR	Rank	FNMR	Rank		FNMR	Rank	FNMR	Rank	FNMR	Rank
A	0.0089	2	0.0136	2	0.0135	1	A	0.0006	2	0.0011	2	0.0010	1
B	0.0189	5	0.0251	6			B	0.0018	4	0.0024	4		
C	0.0225	6	0.0225	5			C	0.0032	6	0.0032	6		
D	0.0089	3	0.0140	3	0.0140	2	D	0.0007	3	0.0013	3	0.0013	2
E	0.0251	7	0.0301	7	0.0296	4	E	0.0030	5	0.0045	7	0.0043	4
F	0.0337	9	0.0224	4	0.0199	3	F	0.0061	10	0.0031	5	0.0028	3
G	0.0047	1	0.0129	1			G	0.0002	1	0.0007	1		
H	0.1004	13	0.1027	13			H	0.0367	13	0.0422	13		
I	0.0329	8	0.0348	8	0.0336	5	I	0.0051	7	0.0056	8	0.0054	5
J	0.1503	14	0.1505	14			J	0.0704	14	0.0640	14		
K	0.0186	4	0.0461	10	0.0634	6	K	0.0054	8	0.0275	12	0.0305	6
L	0.0575	12	0.0524	12			L	0.0126	12	0.0113	11		
M	0.0358	10	0.0359	9			M	0.0060	9	0.0061	9		
N	0.0481	11	0.0486	11			N	0.0082	11	0.0081	10		

Table 21: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POEBVA dataset. The values are false non-match rates at a false match rate of 0.01.

DHS2	Single finger							Two fingers					
	Proprietary		MIN:A		MIN:B			Proprietary		MIN:A		MIN:B	
	FNMR	Rank	FNMR	Rank	FNMR	Rank		FNMR	Rank	FNMR	Rank	FNMR	Rank
A	0.0280	4	0.0359	2	0.0358	2	A	0.0057	3	0.0062	2	0.0069	2
B	0.0358	5	0.0442	3			B	0.0044	1	0.0055	1		
C	0.0456	6	0.0456	4			C	0.0114	7	0.0114	5		
D	0.0197	1	0.0263	1	0.0263	1	D	0.0051	2	0.0068	3	0.0068	1
E	0.0884	9	0.0949	9	0.0954	5	E	0.0404	9	0.0411	9	0.0436	5
F	0.0547	7	0.0458	5	0.0410	3	F	0.0178	8	0.0114	6	0.0103	3
G	0.0241	2	0.0677	8			G	0.0095	4	0.0336	8		
H	0.1793	10	0.1863	11			H	0.1043	10	0.1153	11		
I	0.2477	13	0.2482	13	0.2486	6	I	0.1672	13	0.1693	13	0.1678	6
J	0.1926	11	0.1967	12			J	0.1277	11	0.0950	10		
K	0.0266	3	0.0587	6	0.0777	4	K	0.0114	6	0.0295	7	0.0356	4
L	0.2022	12	0.1839	10			L	0.1403	12	0.1363	12		
M	0.3724	14	0.3724	14			M	0.3294	14	0.3294	14		
N	0.0602	8	0.0614	7			N	0.0105	5	0.0089	4		

Table 22: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DHS2 dataset. The values are false non-match rates at a false match rate of 0.01.

POE	Single finger						Two fingers						
	Proprietary		MIN:A		MIN:B		Proprietary		MIN:A		MIN:B		
	FNMR	Rank	FNMR	Rank	FNMR	Rank	FNMR	Rank	FNMR	Rank	FNMR	Rank	
A	0.0104	3	0.0159	3	0.0156	2	A	0.0005	2	0.0011	2	0.0011	1
B	0.0205	5	0.0262	6			B	0.0020	4	0.0029	4		
C	0.0212	7	0.0212	5			C	0.0032	7	0.0032	5		
D	0.0102	2	0.0142	1	0.0142	1	D	0.0009	3	0.0012	3	0.0012	2
E	0.0288	9	0.0352	7	0.0339	4	E	0.0031	6	0.0048	7	0.0046	4
F	0.0209	6	0.0212	4	0.0186	3	F	0.0021	5	0.0032	6	0.0027	3
G	0.0052	1	0.0149	2			G	0.0004	1	0.0007	1		
H	0.0908	13	0.1200	13			H	0.0299	13	0.0359	13		
I	0.0342	10	0.0353	8	0.0348	5	I	0.0050	9	0.0055	9	0.0051	5
J	0.1530	14	0.1532	14			J	0.0746	14	0.0671	14		
K	0.0191	4	0.0542	12	0.0746	6	K	0.0057	10	0.0351	12	0.0383	6
L	0.0479	12	0.0475	11			L	0.0098	12	0.0099	11		
M	0.0379	11	0.0378	10			M	0.0063	11	0.0063	10		
N	0.0286	8	0.0373	9			N	0.0032	8	0.0054	8		

Table 23: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the POE dataset. The values are false non-match rates at a false match rate of 0.01.

DOS	Single finger						Two fingers						
	Proprietary		MIN:A		MIN:B		Proprietary		MIN:A		MIN:B		
	FNMR	Rank	FNMR	Rank	FNMR	Rank	FNMR	Rank	FNMR	Rank	FNMR	Rank	
A	0.0163	3	0.0246	3	0.0238	2	A	0.0026	3	0.0050	3	0.0047	2
B	0.0328	7	0.0417	8			B	0.0070	6	0.0089	7		
C	0.0308	6	0.0308	4			C	0.0085	7	0.0085	6		
D	0.0147	2	0.0218	2	0.0218	1	D	0.0021	2	0.0040	2	0.0040	1
E	0.0269	5	0.0319	6	0.0299	4	E	0.0061	5	0.0084	4	0.0075	3
F	0.0501	10	0.0309	5	0.0268	3	F	0.0136	10	0.0084	5	0.0077	4
G	0.0068	1	0.0208	1			G	0.0005	1	0.0027	1		
H	0.1077	13	0.1334	13			H	0.0455	13	0.0502	13		
I	0.0370	8	0.0406	7	0.0377	5	I	0.0098	8	0.0111	8	0.0102	5
J	0.1428	14	0.1442	14			J	0.0840	14	0.0622	14		
K	0.0210	4	0.0507	9	0.0709	6	K	0.0059	4	0.0241	12	0.0287	6
L	0.0654	12	0.0580	12			L	0.0203	12	0.0187	11		
M	0.0542	11	0.0542	11			M	0.0169	11	0.0169	10		
N	0.0478	9	0.0524	10			N	0.0112	9	0.0130	9		

Table 24: Summary of native performance for suppliers' implementations using proprietary, MIN:A and MIN:B templates on the DOS dataset. The values are false non-match rates at a false match rate of 0.01.

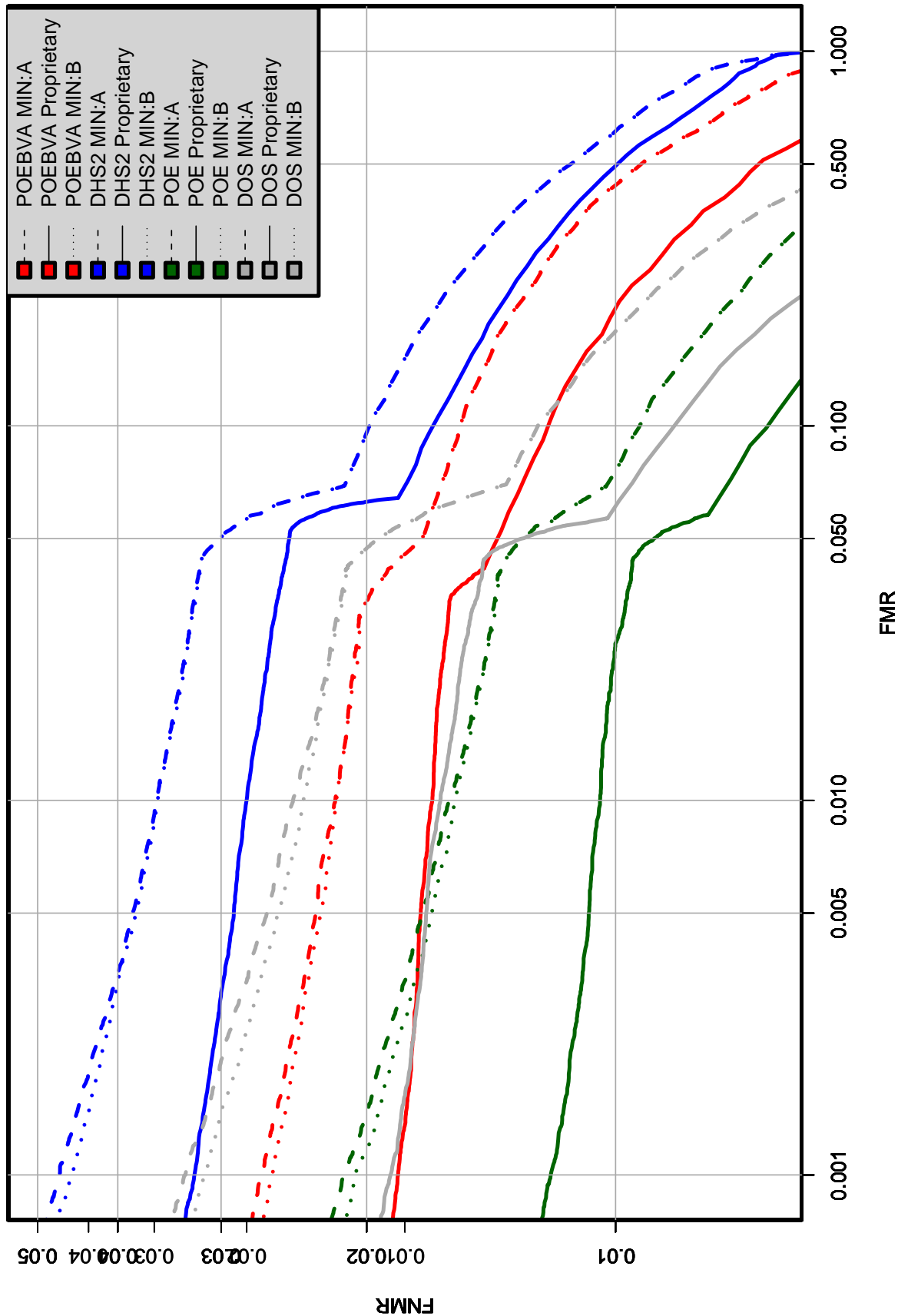


Table 25: Native, single-finger, DETs for vendor A on all four MINEX datasets.

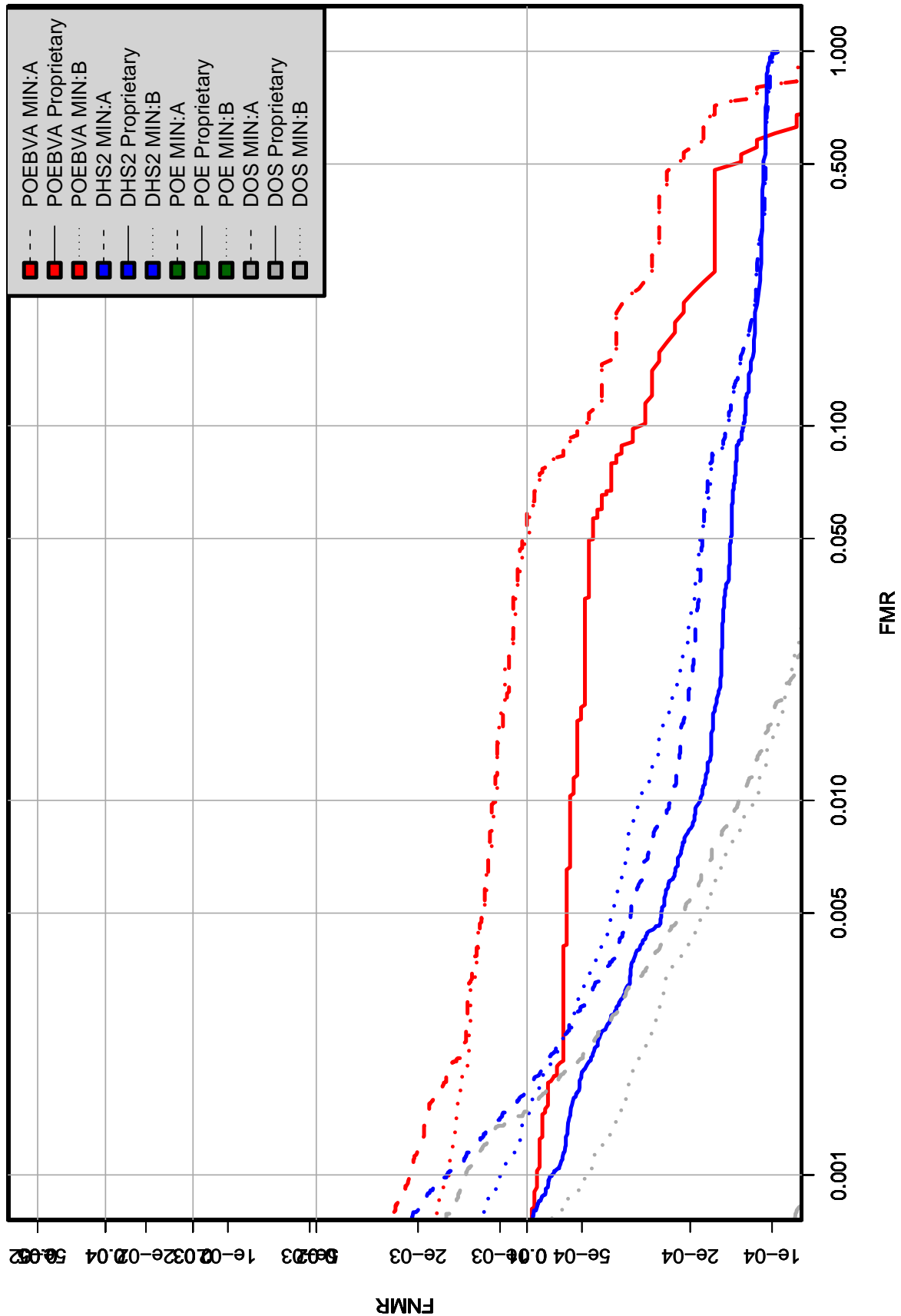


Table 26: Native, two-finger, DETs for vendor A on all four MINEX datasets.

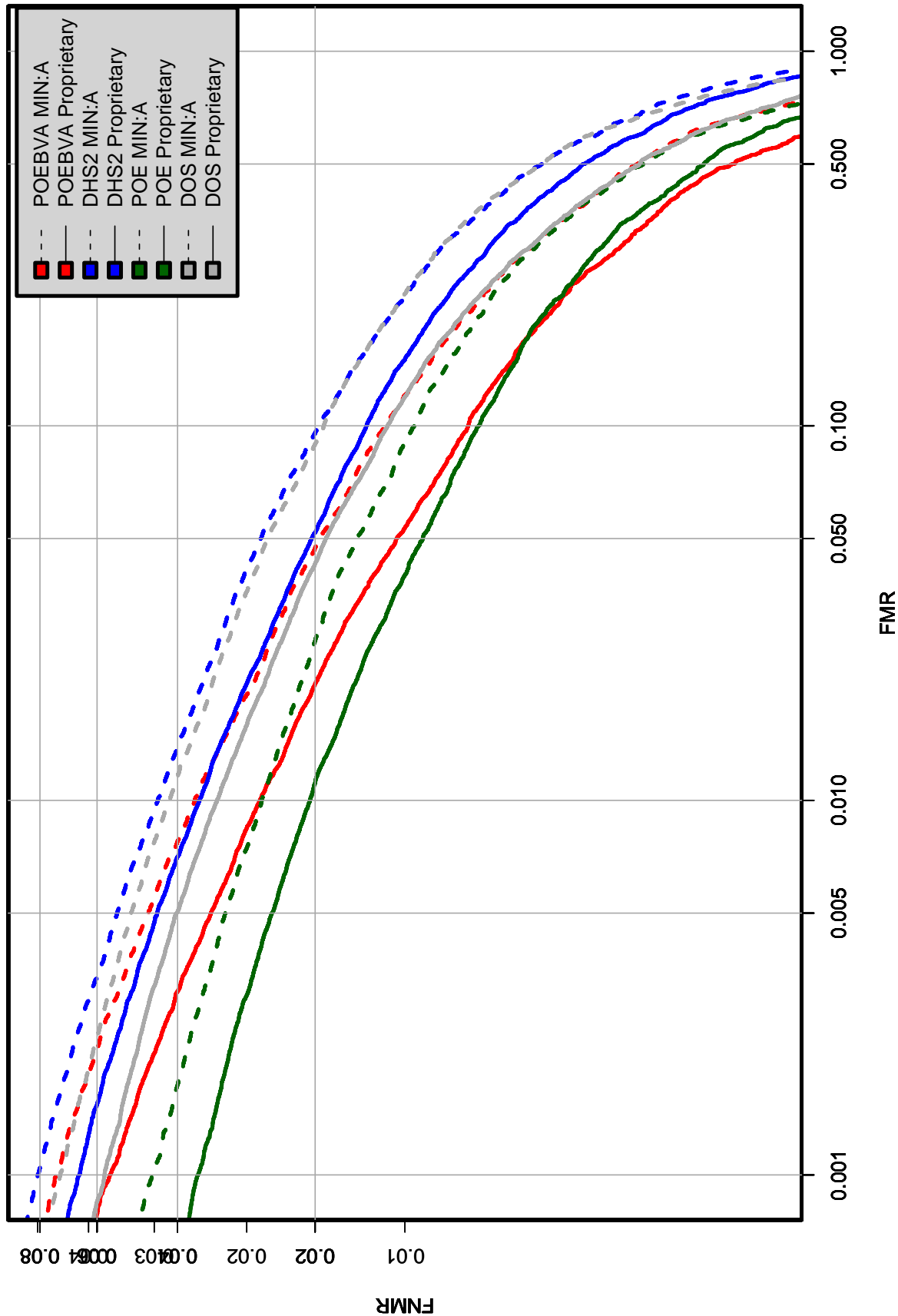


Table 27: Native, single-finger, DETs for vendor B on all four MINEX datasets.

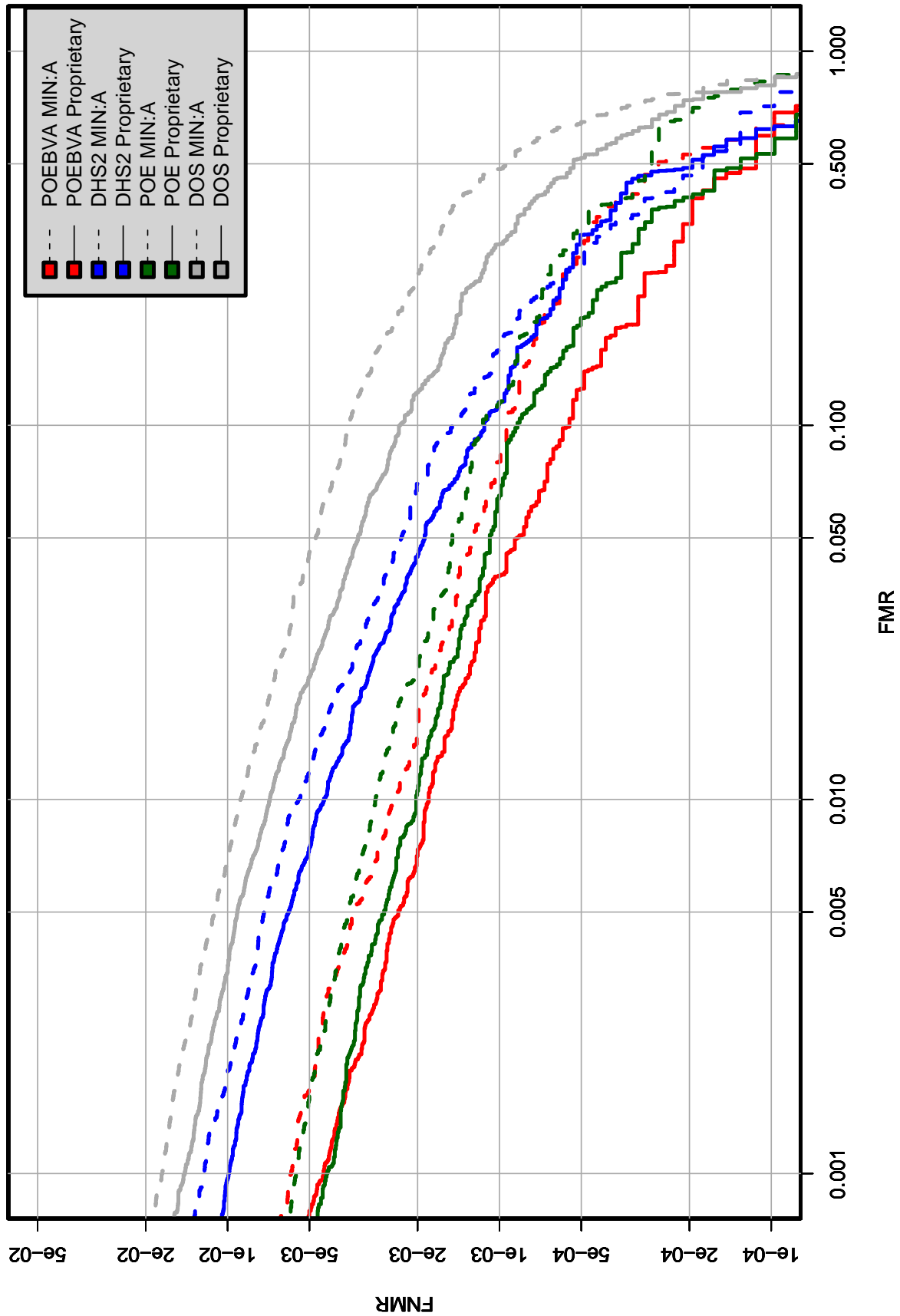


Table 28: Native, two-finger, DEIs for vendor B on all four MINEX datasets.



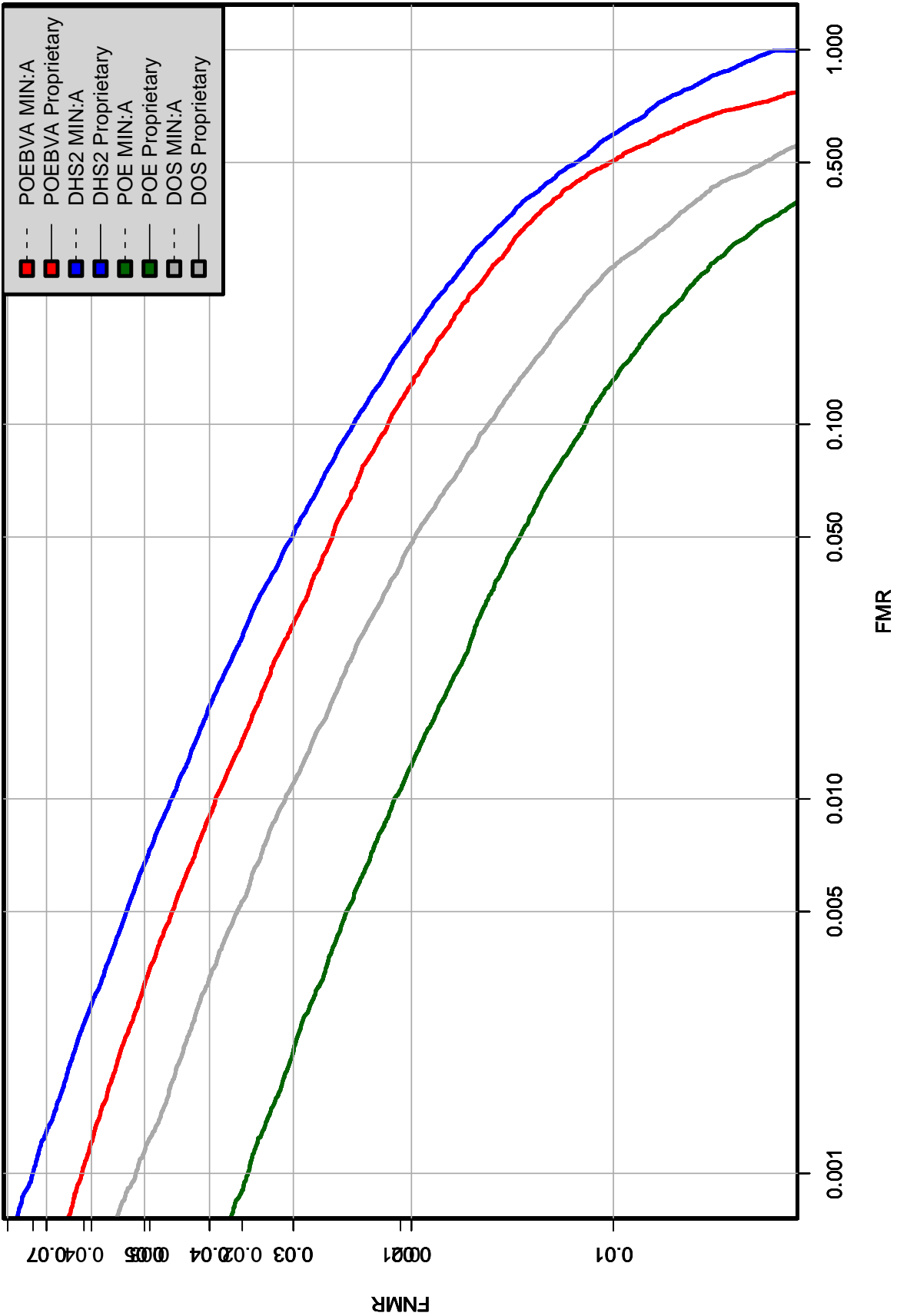


Table 29: Native, single-finger, DETs for vendor C on all four MINEX datasets.

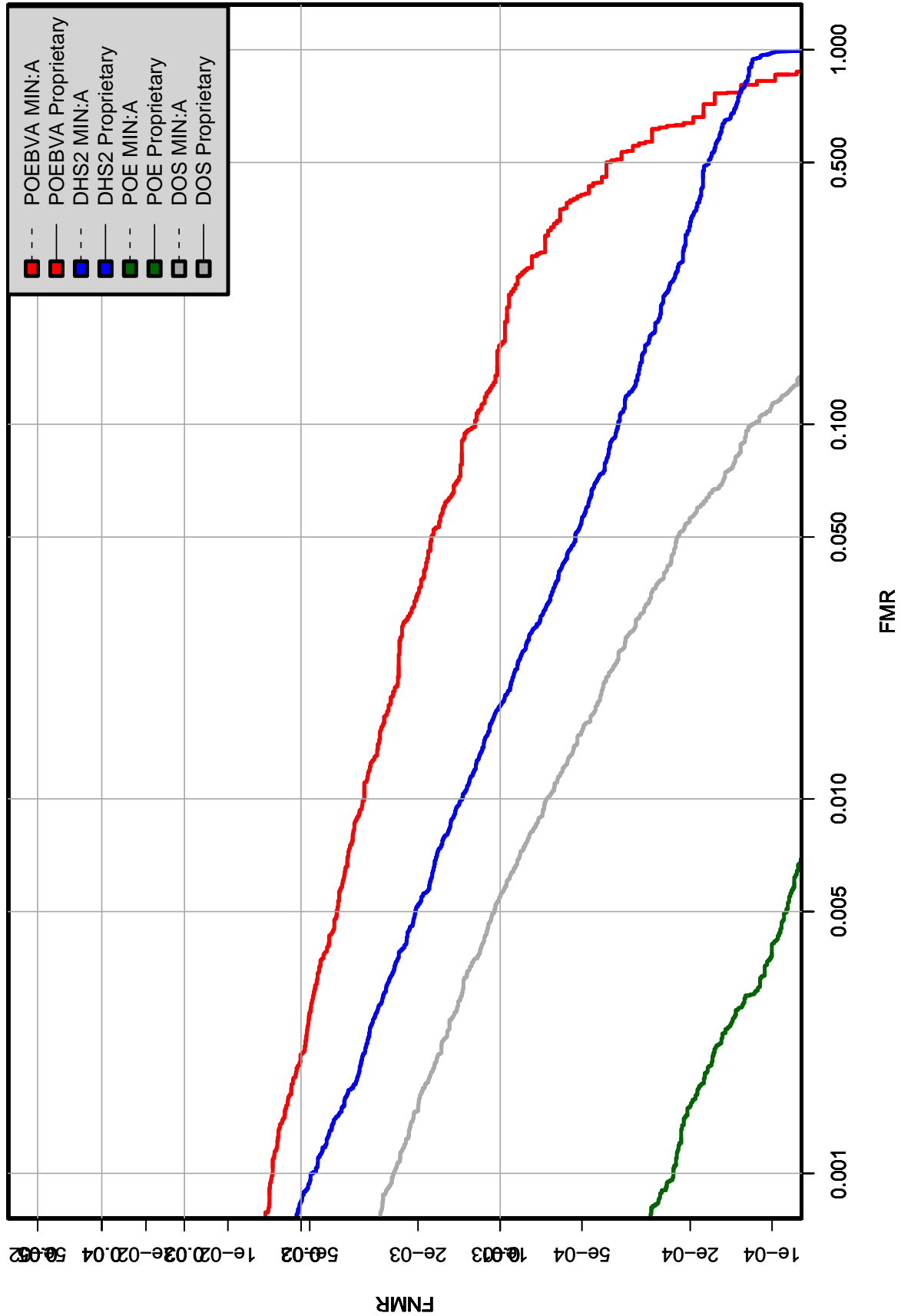


Table 30: Native, two-finger, DETs for vendor C on all four MINEX datasets.

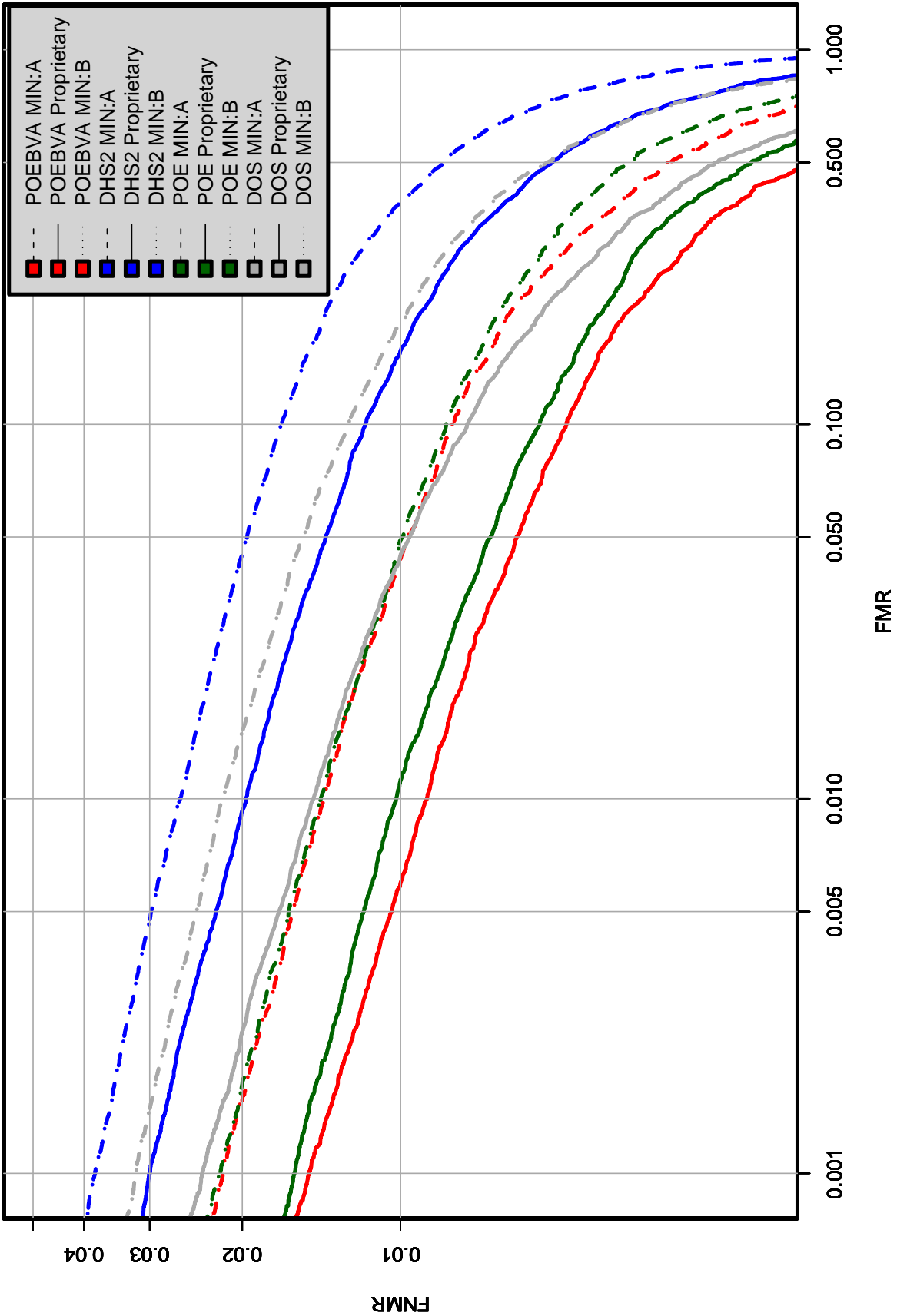


Table 31: Native, single-finger, DETs for vendor D on all four MINEX datasets.

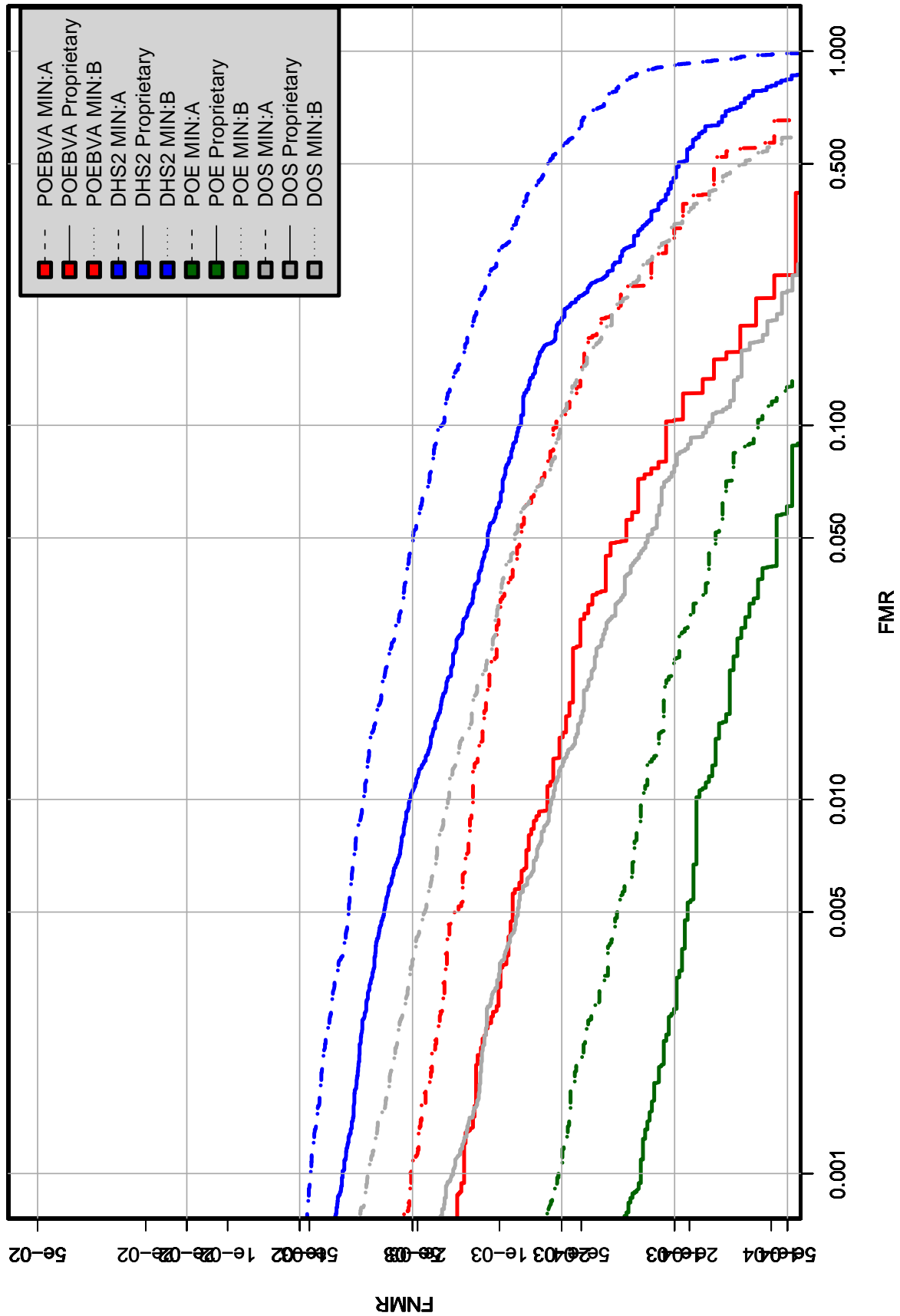


Table 32: Native, two-finger, DETs for vendor D on all four MINEX datasets.

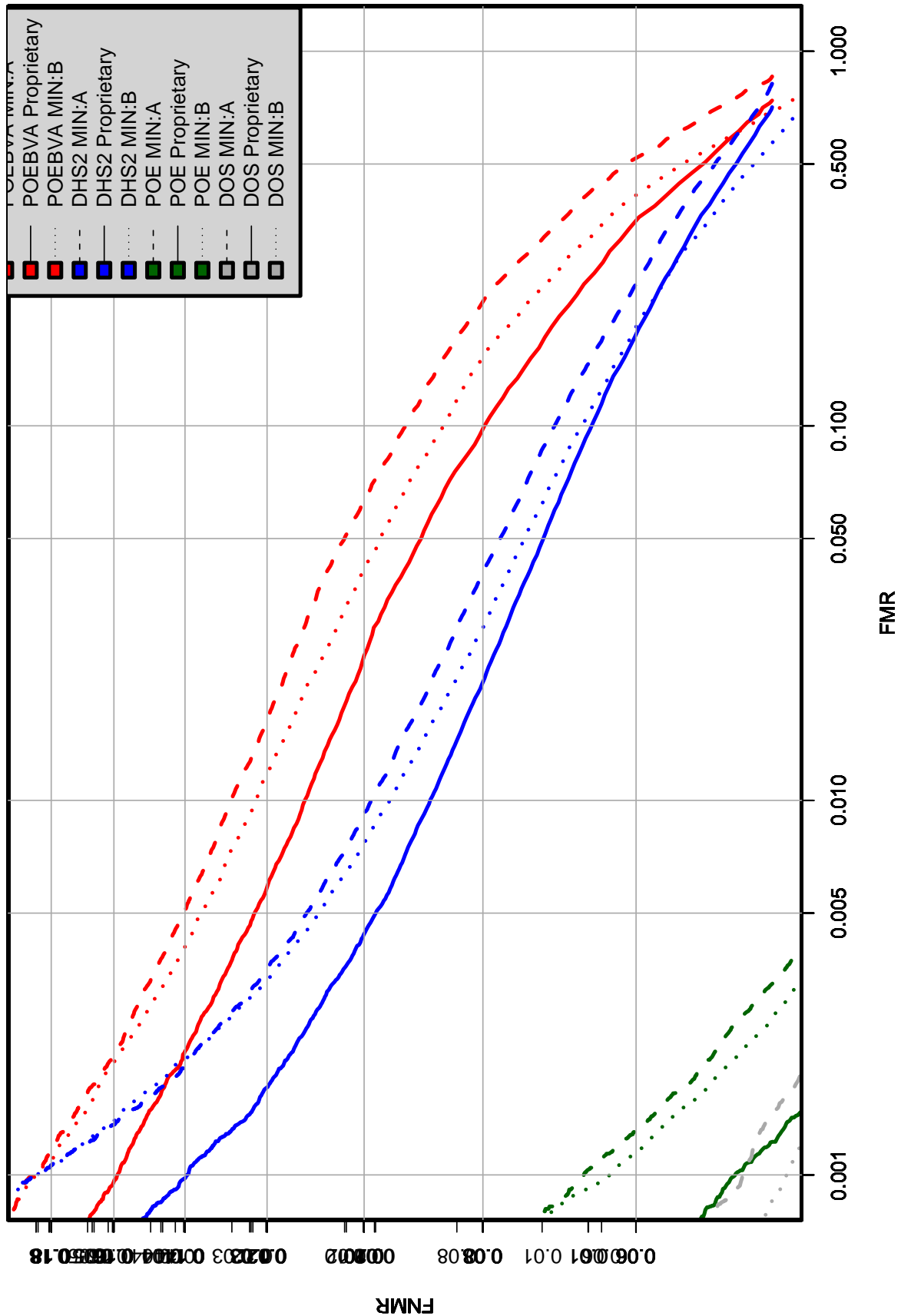


Table 33: Native, single-finger, DETs for vendor E on all four MINEX datasets.

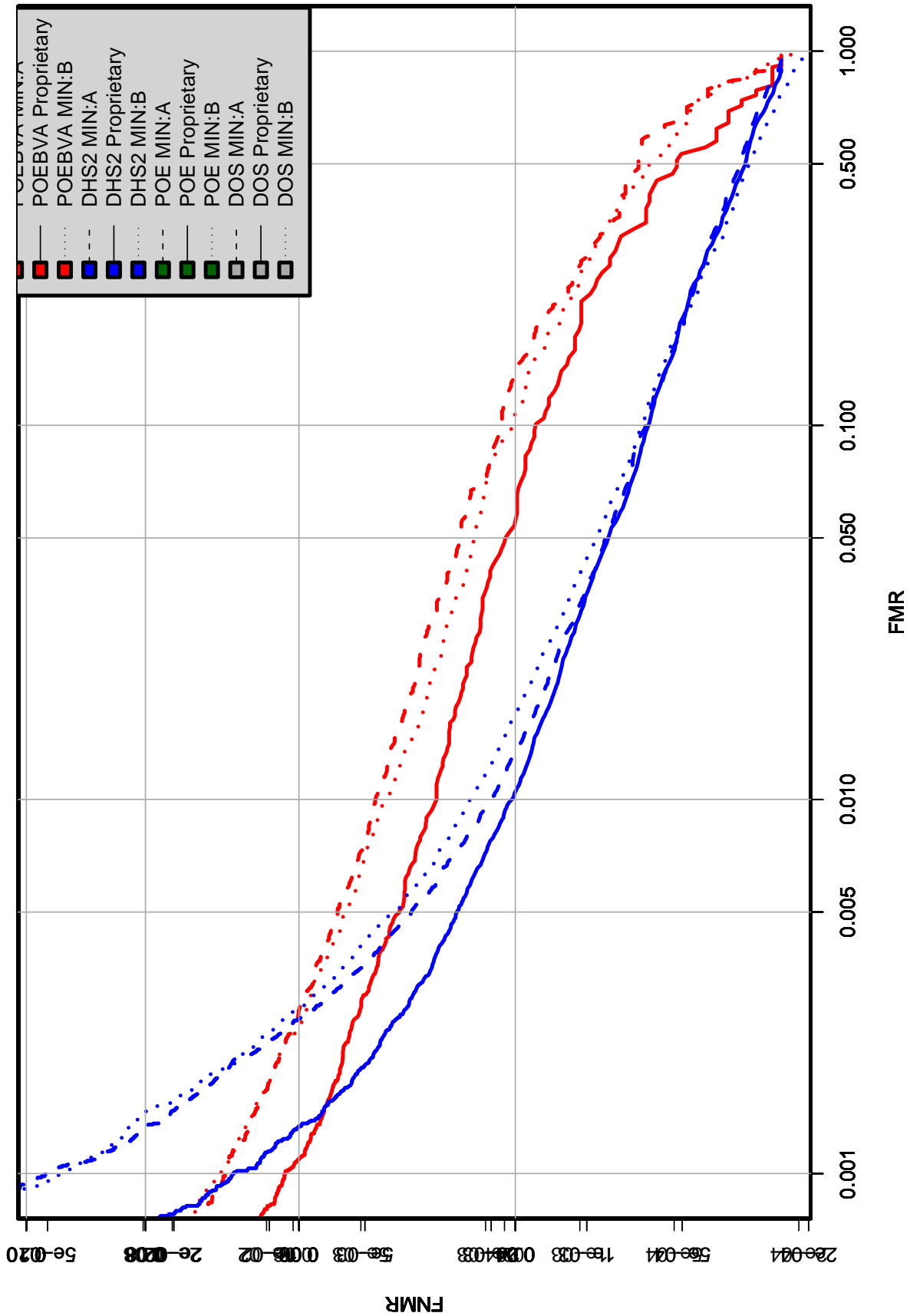


Table 34: Native, two-finger, DETs for vendor E on all four MINEX datasets.

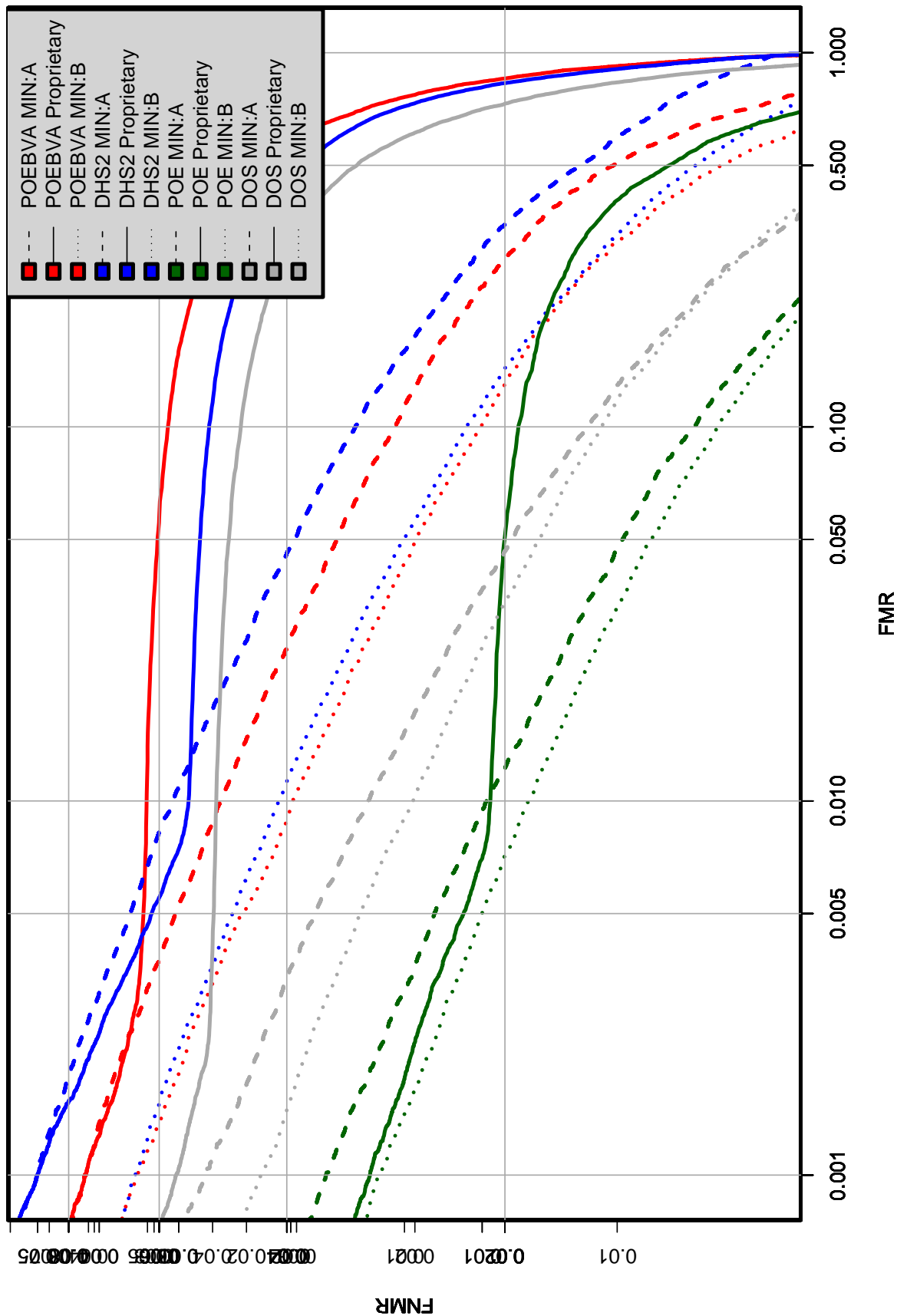


Table 35: Native, single-finger, DETs for vendor F on all four MINEX datasets.

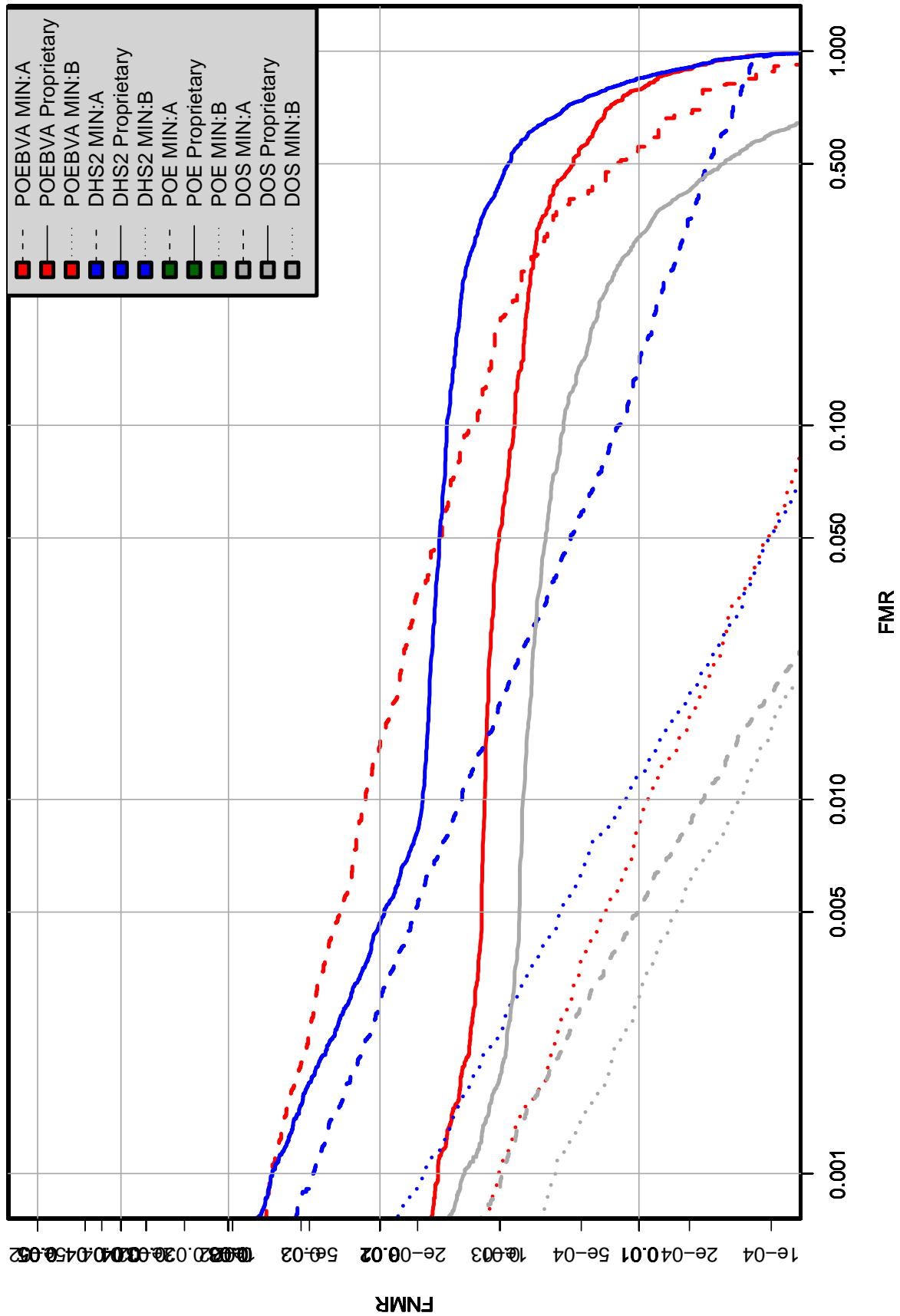


Table 36: Native, two-finger, DETs for vendor F on all four MINEX datasets.



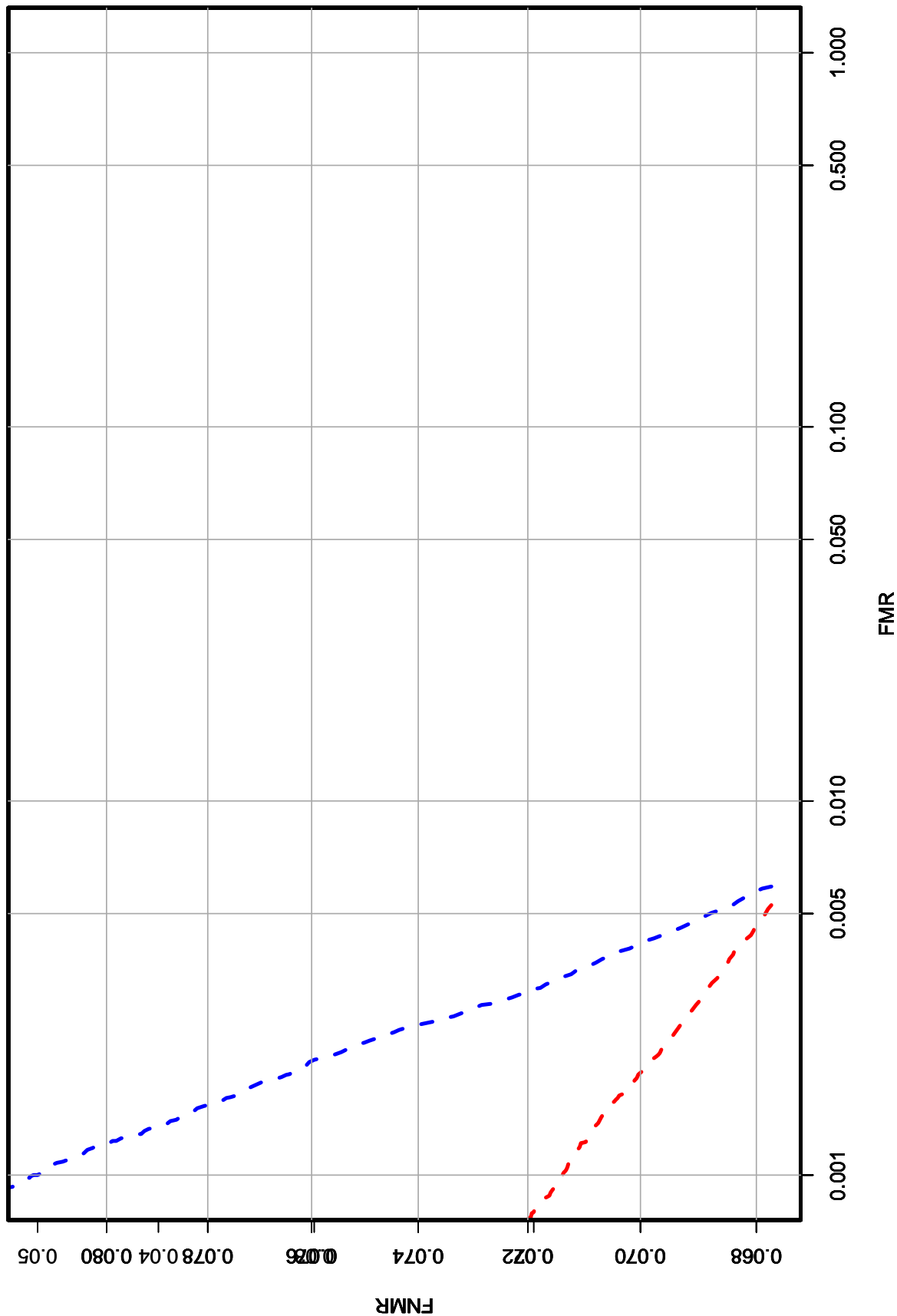


Table 37: Native, single-finger, DETs for vendor G on all four MINEX datasets.

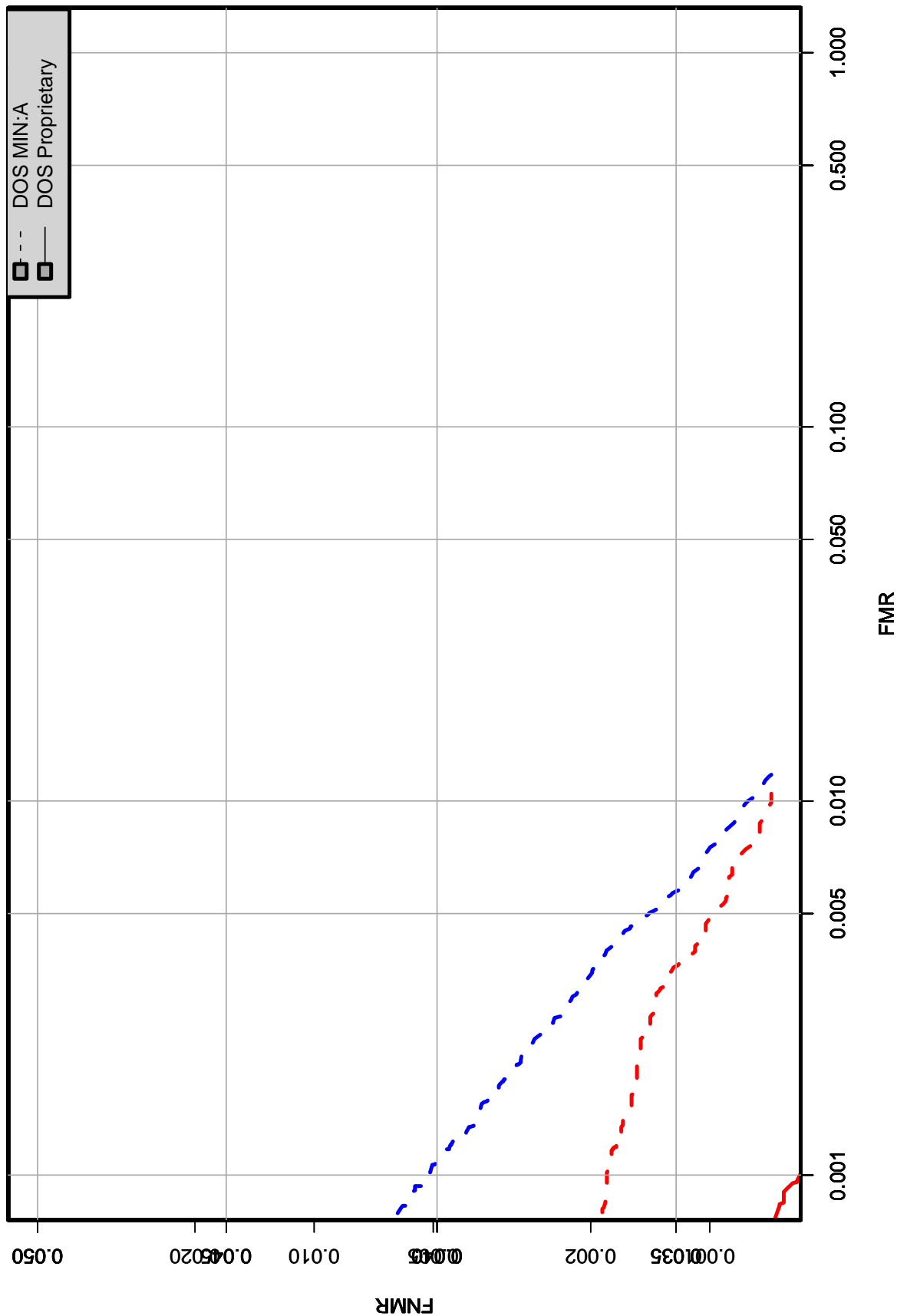


Table 38: Native, two-finger, DETs for vendor G on all four MINEX datasets.

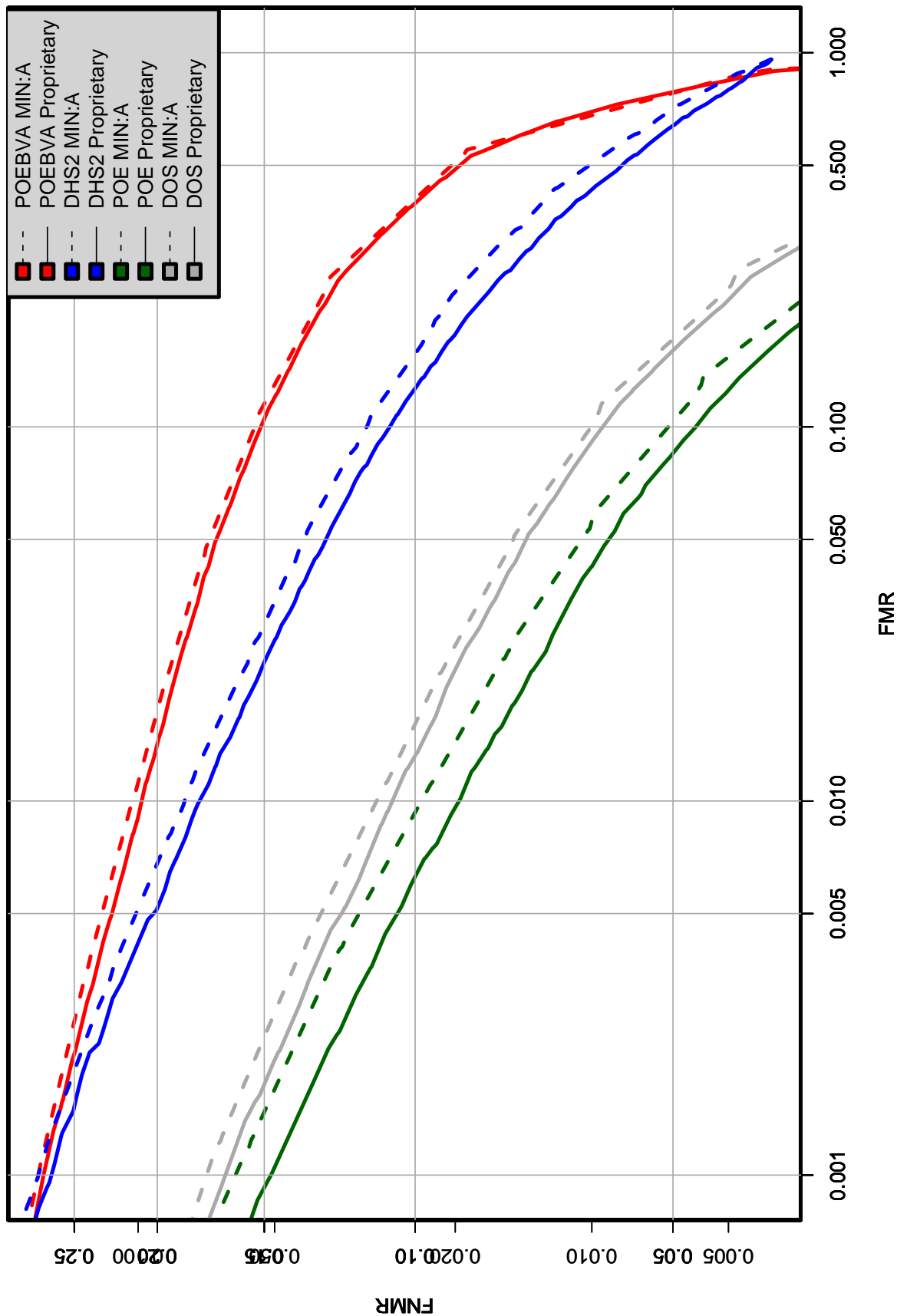


Table 39: Native, single-finger, DETs for vendor H on all four MINEX datasets.

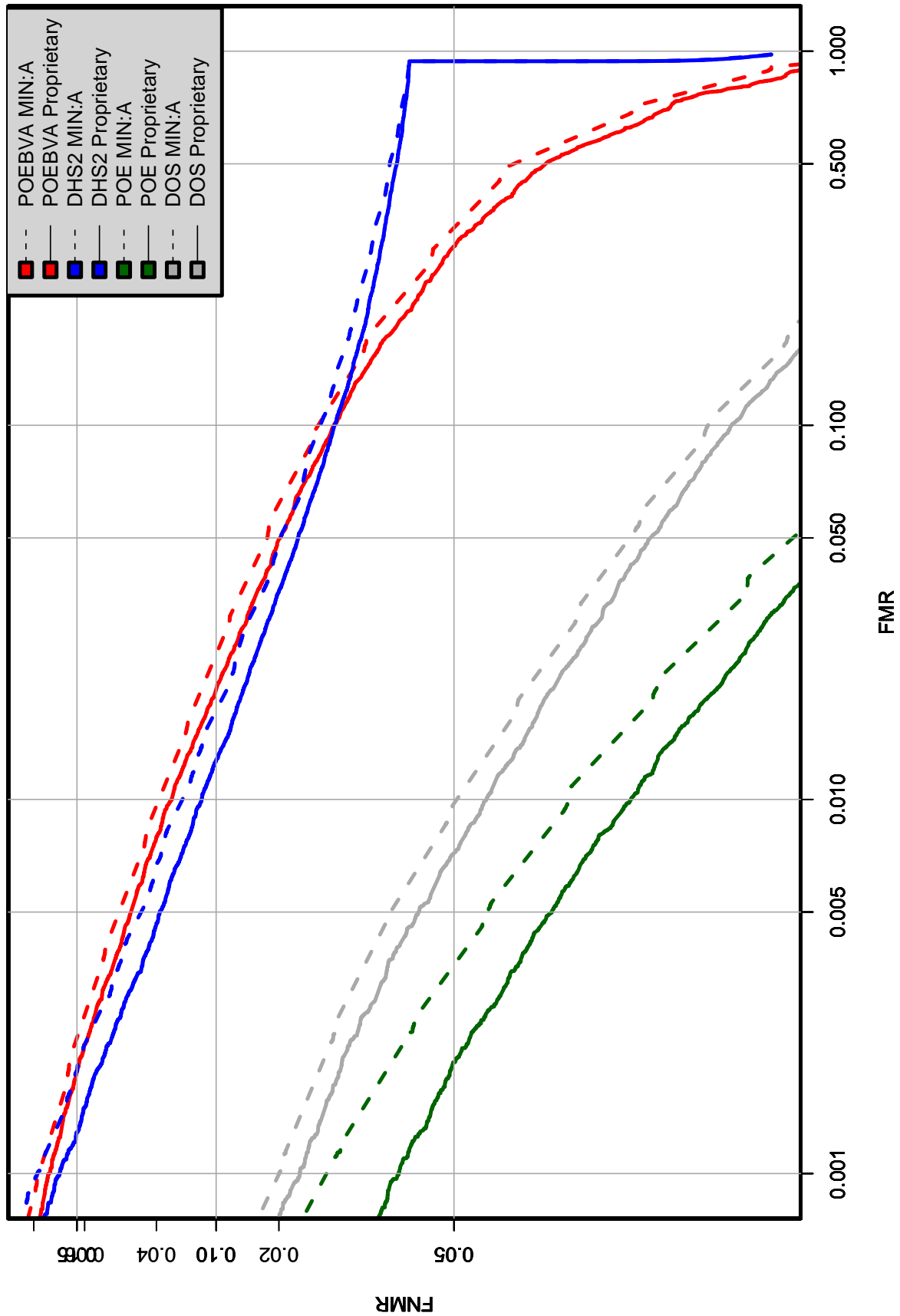


Table 40: Native, two-finger, DETs for vendor H on all four MINEX datasets.

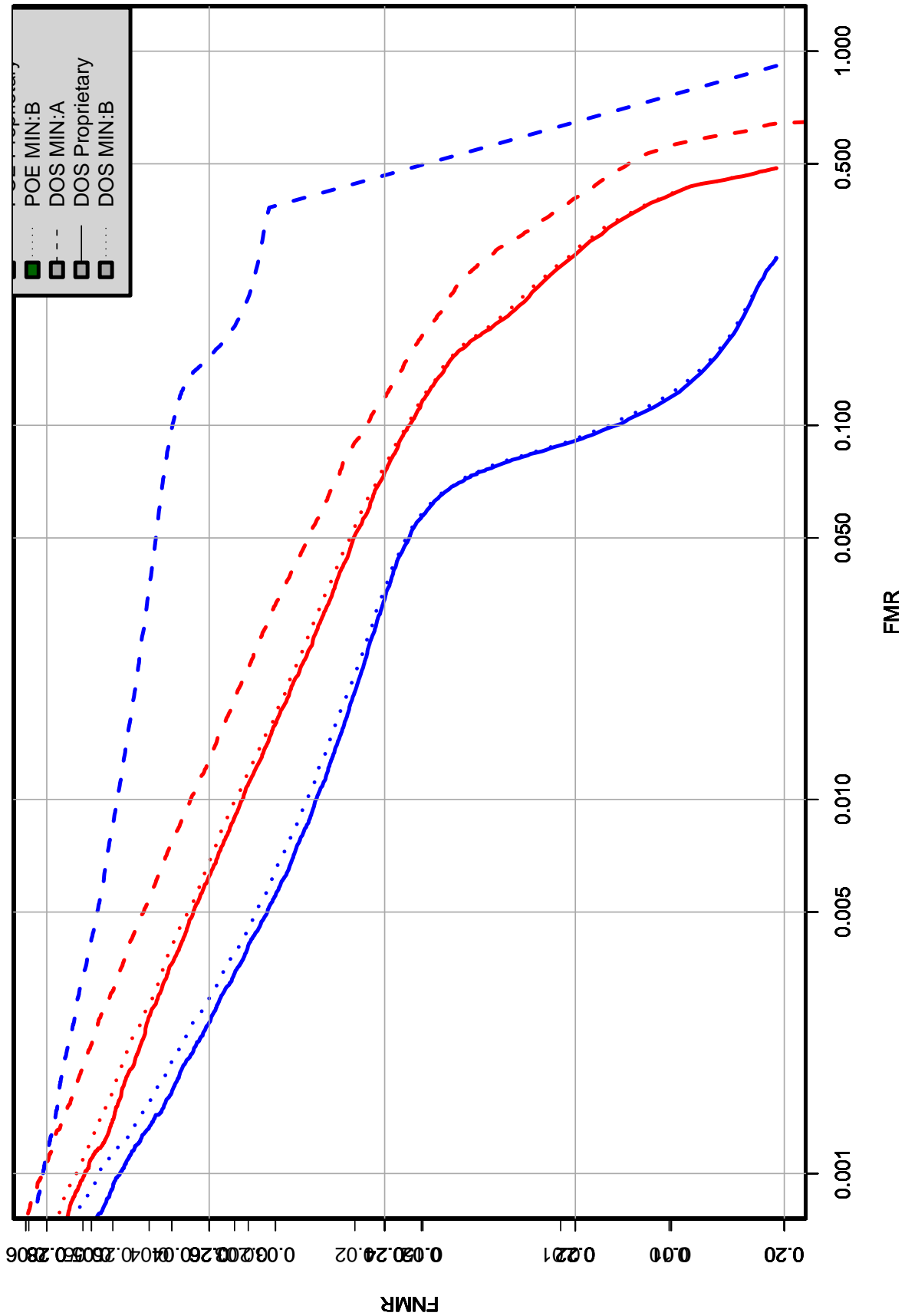


Table 41: Native, single-finger, DETs for vendor I on all four MINEX datasets.

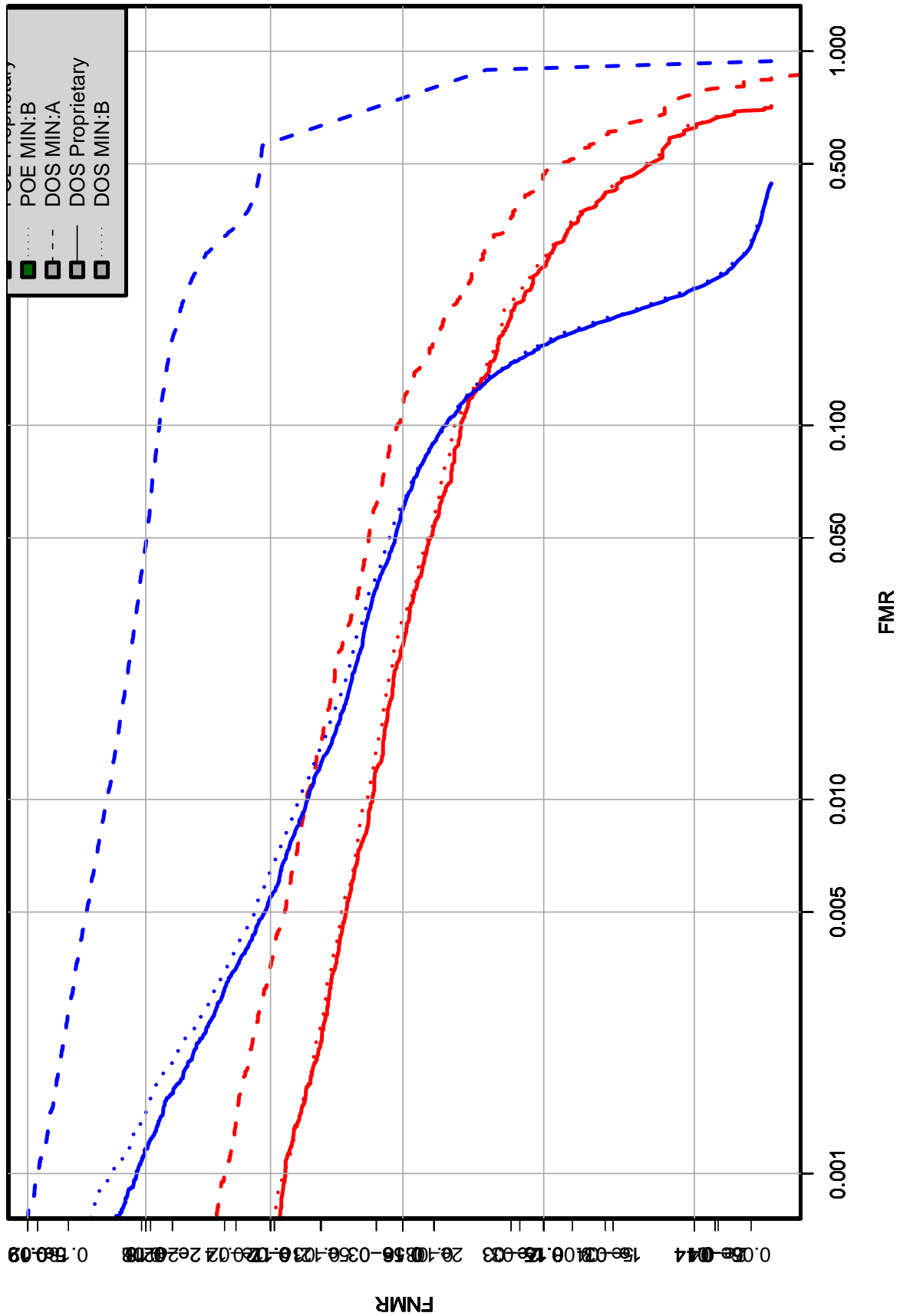


Table 42: Native, two-finger, DETs for vendor I on all four MINEX datasets.

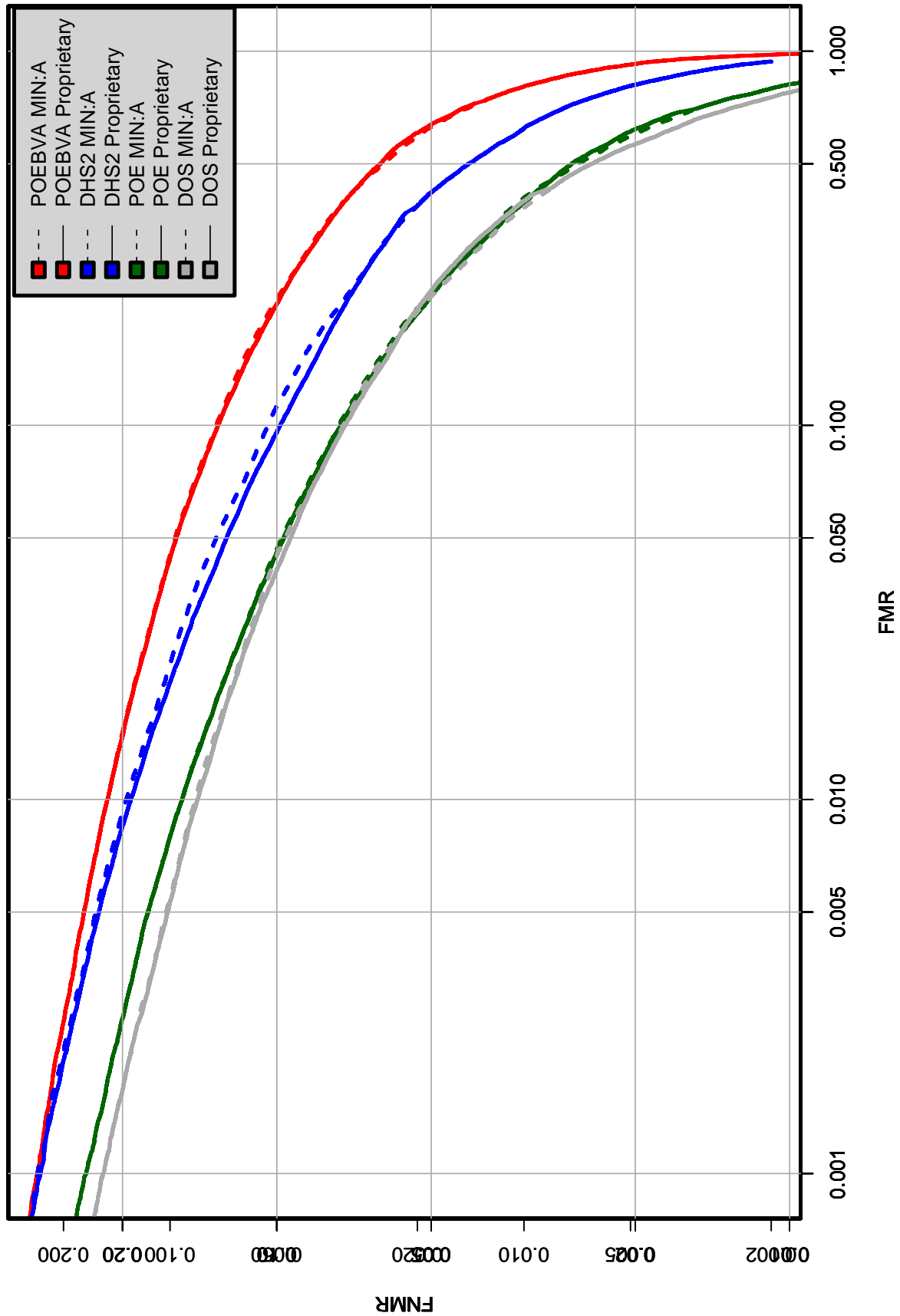


Table 43: Native, single-finger, DETs for vendor J on all four MINEX datasets.

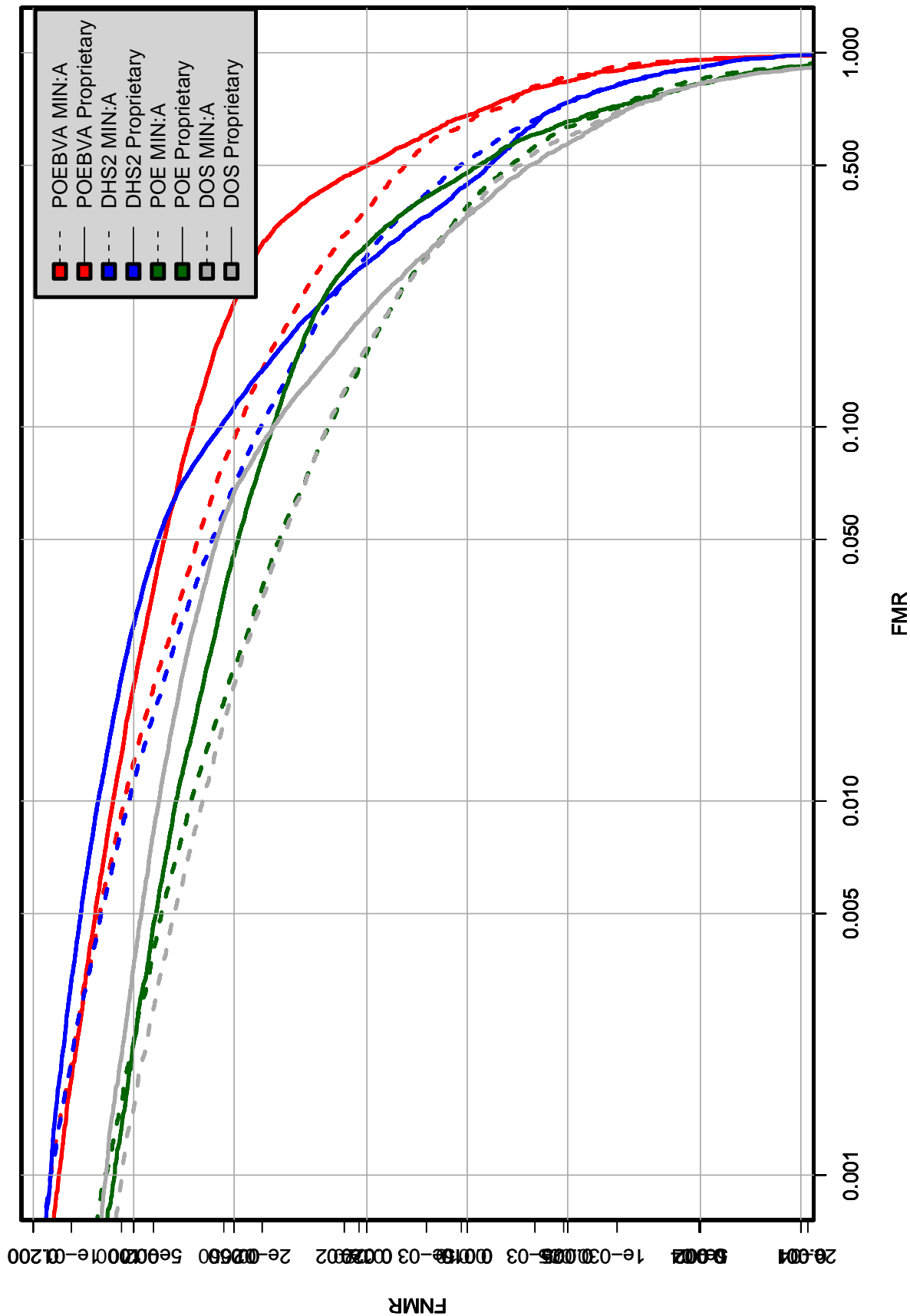


Table 44: Native, two-finger, DETs for vendor J on all four MINEX datasets.



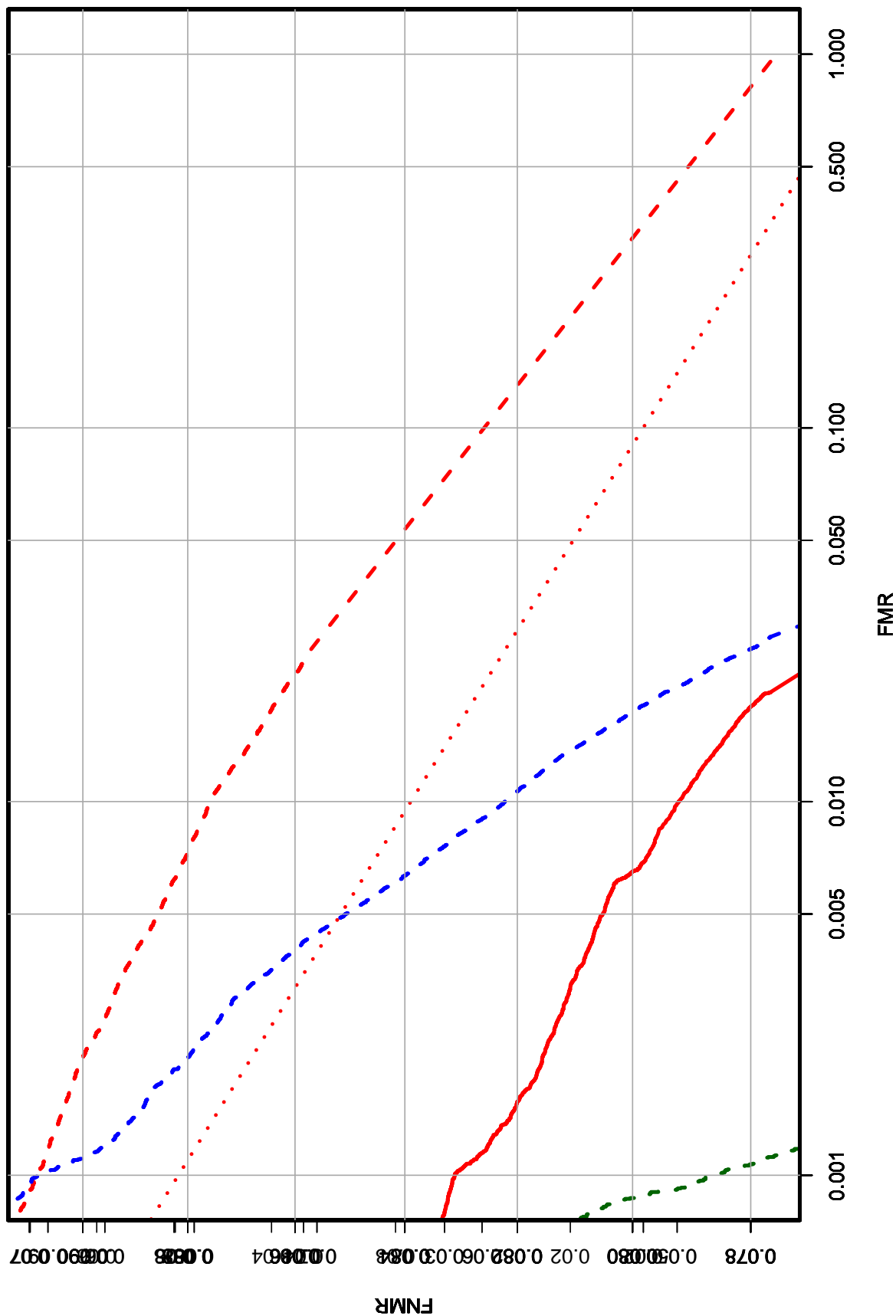


Table 45: Native, single-finger, DETs for vendor K on all four MINEX datasets.

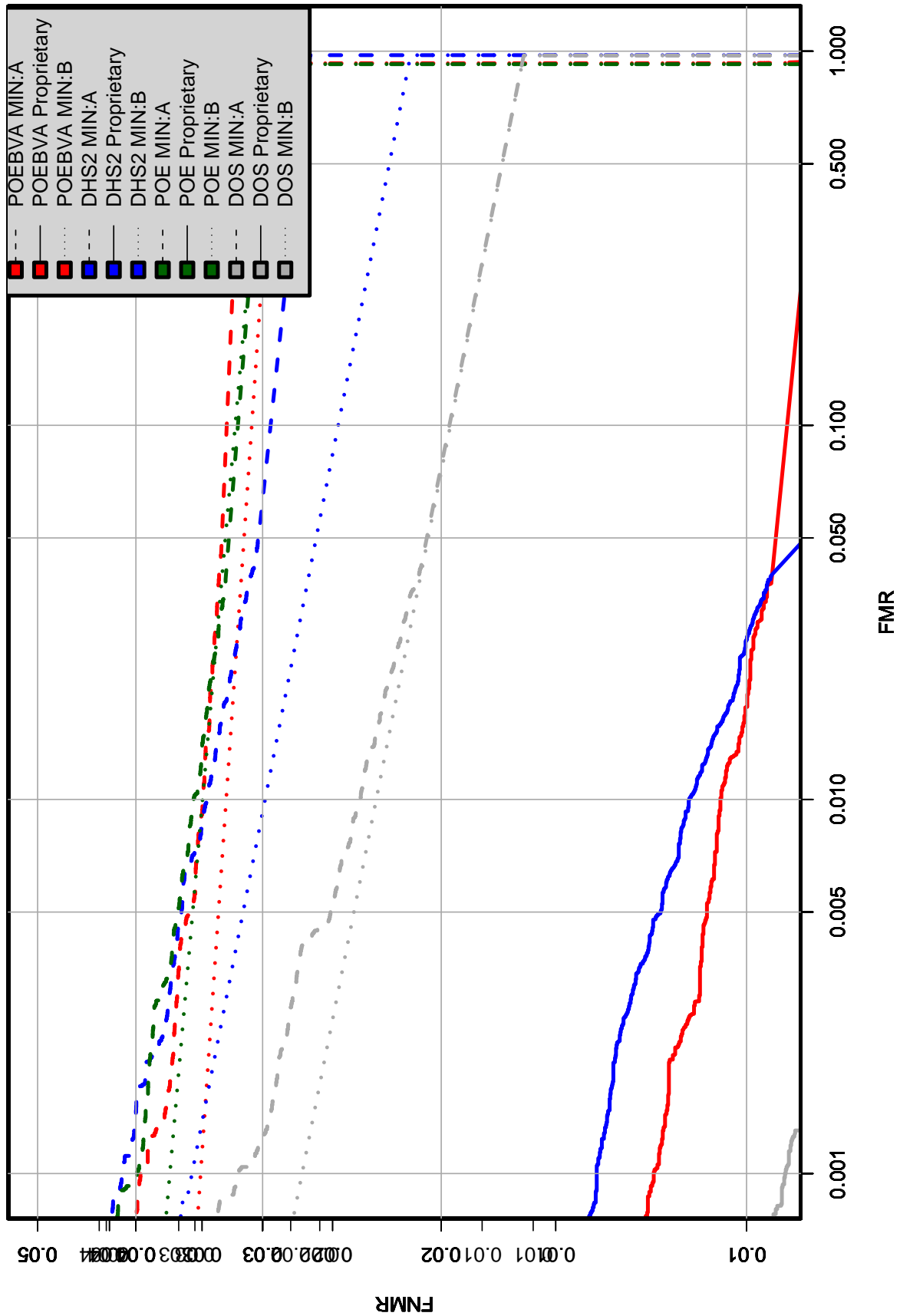


Table 46: Native, two-finger, DETs for vendor K on all four MINEX datasets.

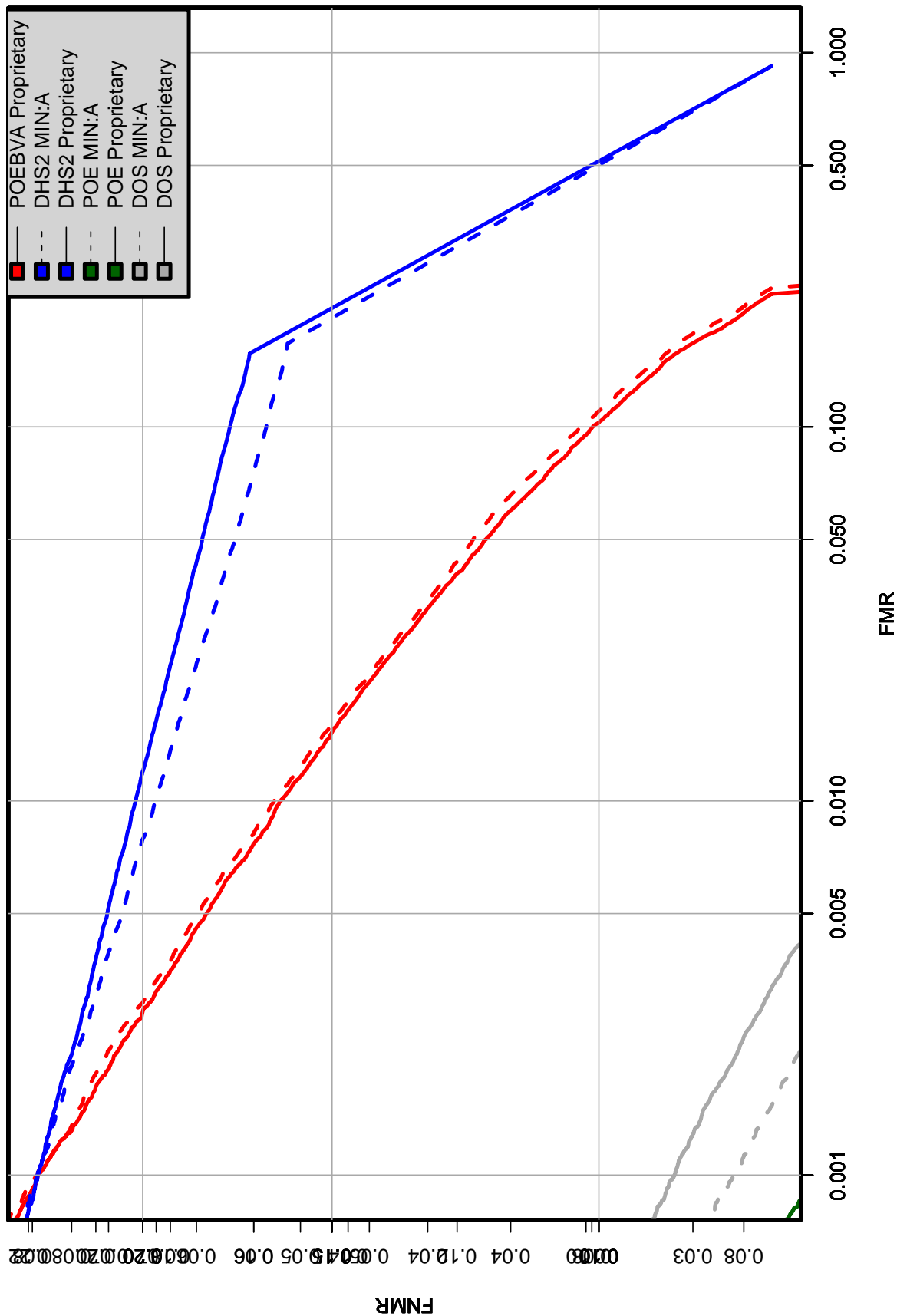


Table 47: Native, single-finger, DETs for vendor L on all four MINEX datasets.

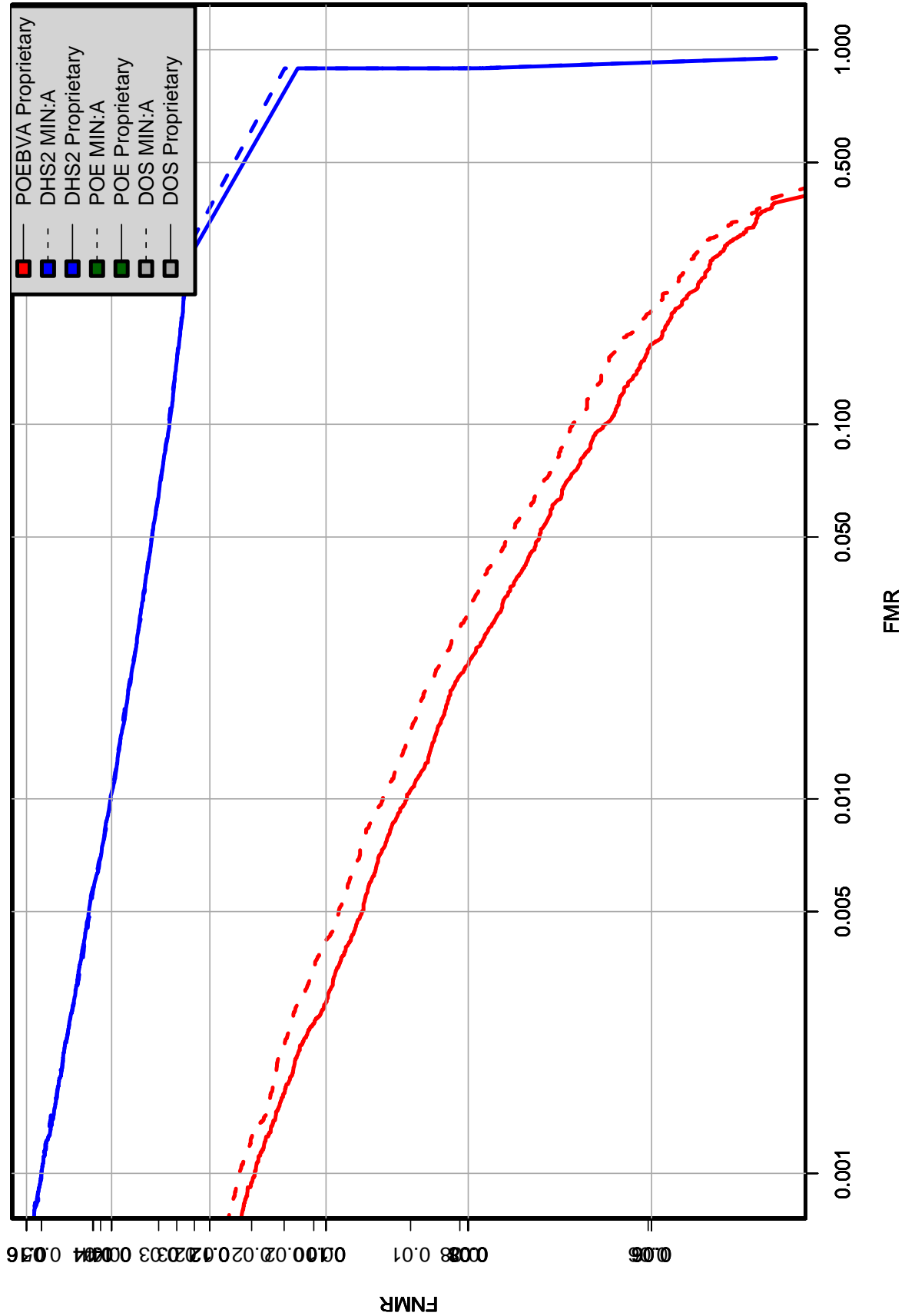


Table 48: Native, two-finger, DETs for vendor L on all four MINEX datasets.

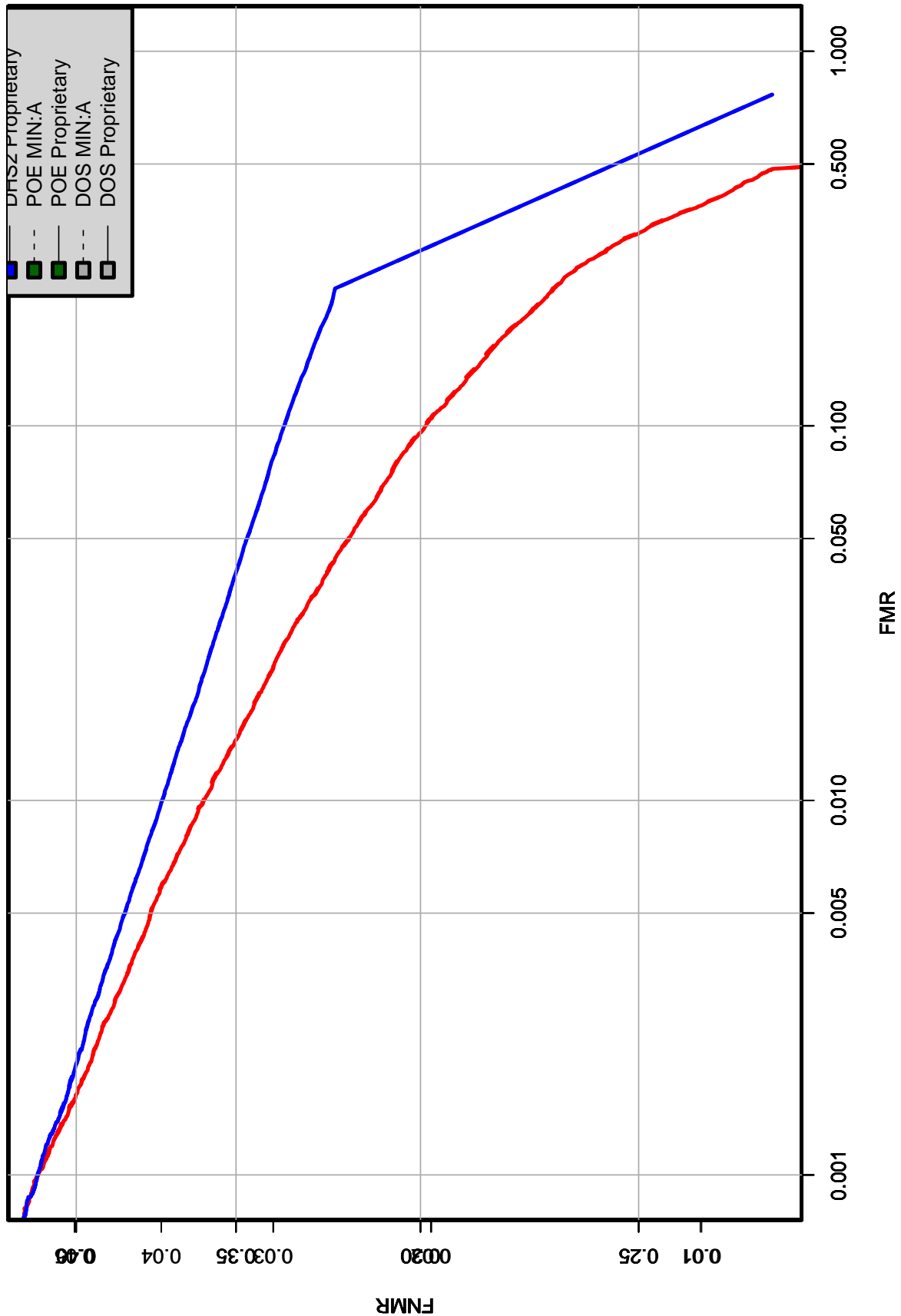


Table 49: Native, single-finger, DETs for vendor M on all four MINEX datasets.

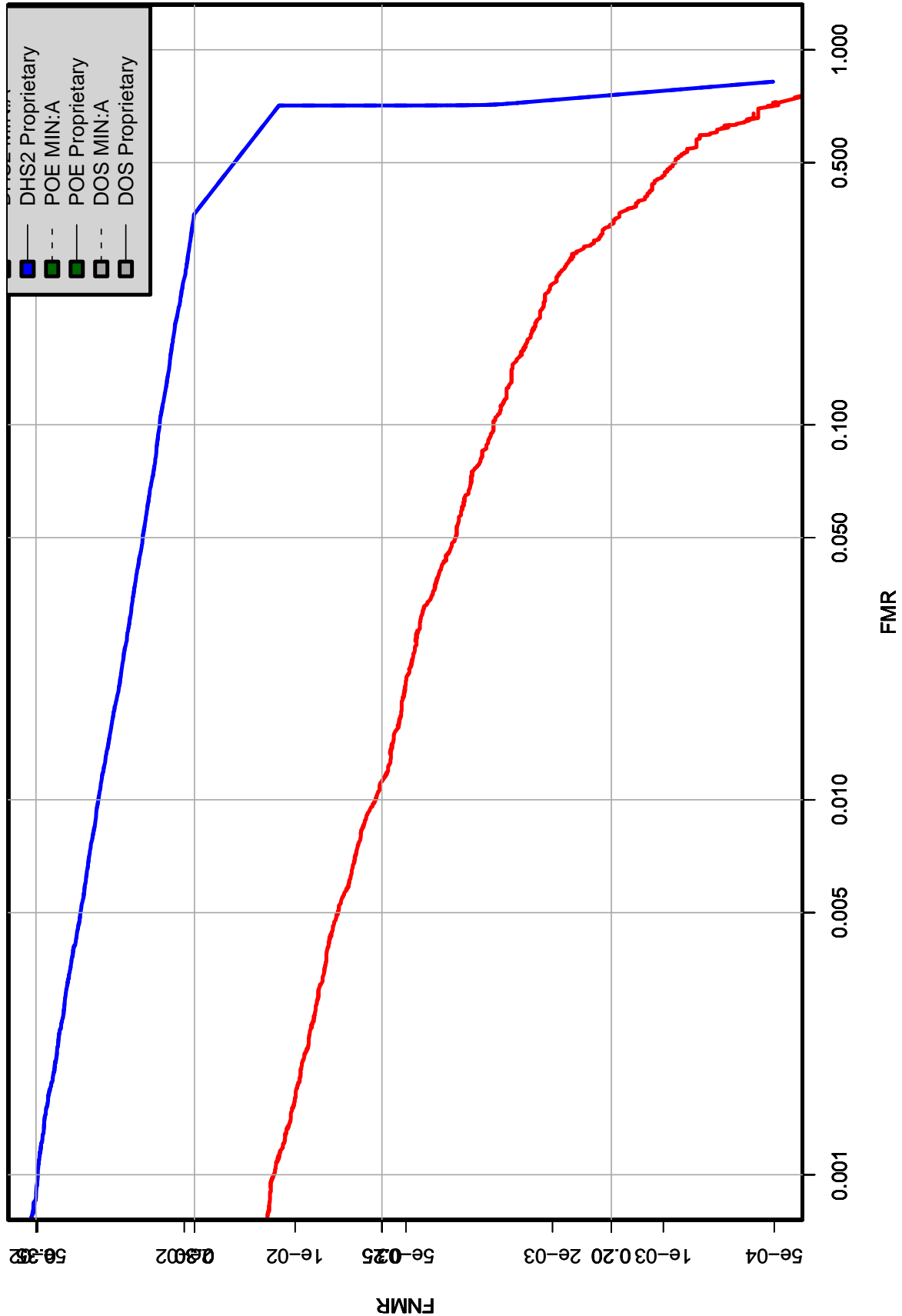


Table 50: Native, two-finger, DETs for vendor M on all four MINEX datasets.

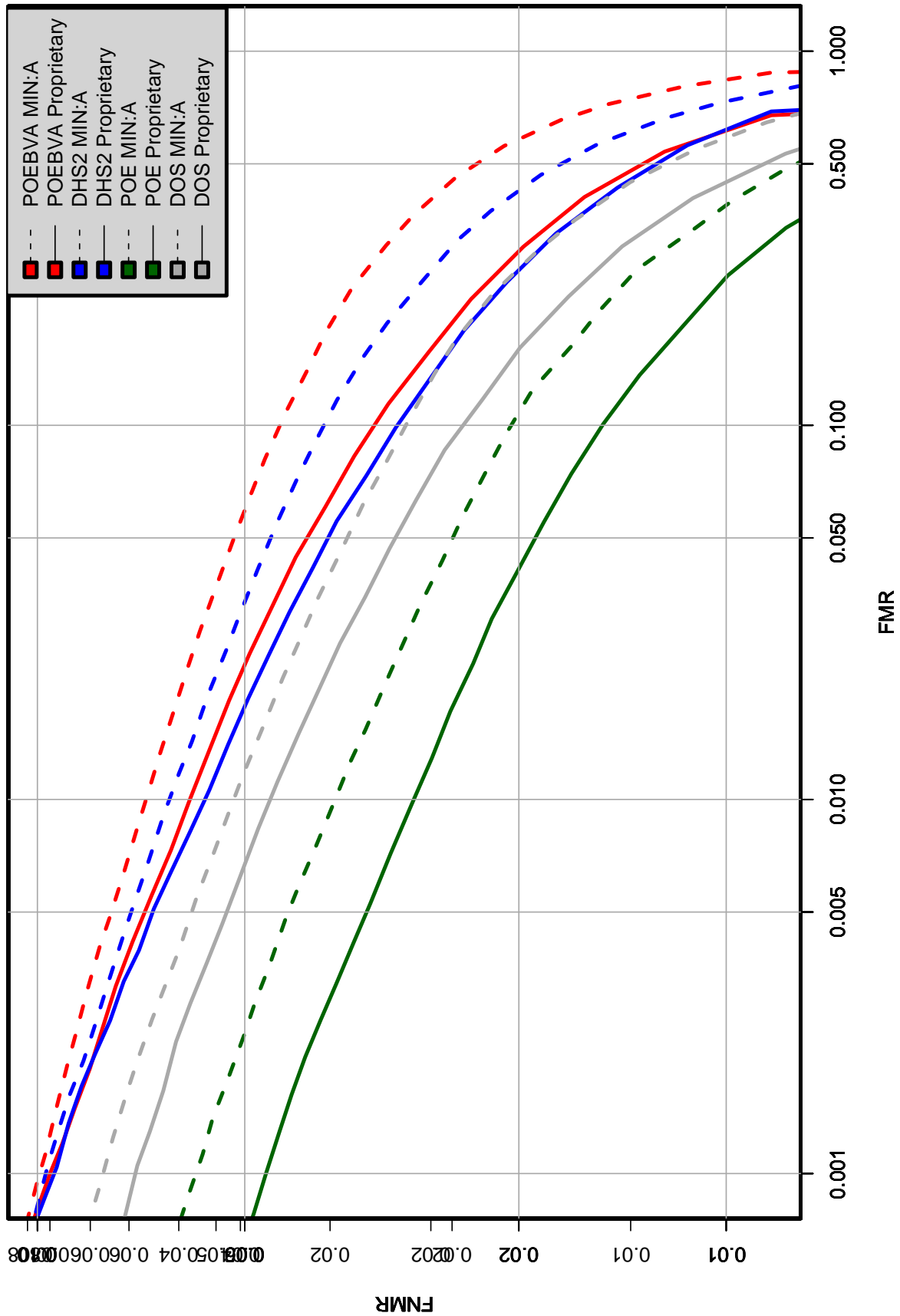


Table 51: Native, single-finger, DETs for vendor N on all four MINEX datasets.

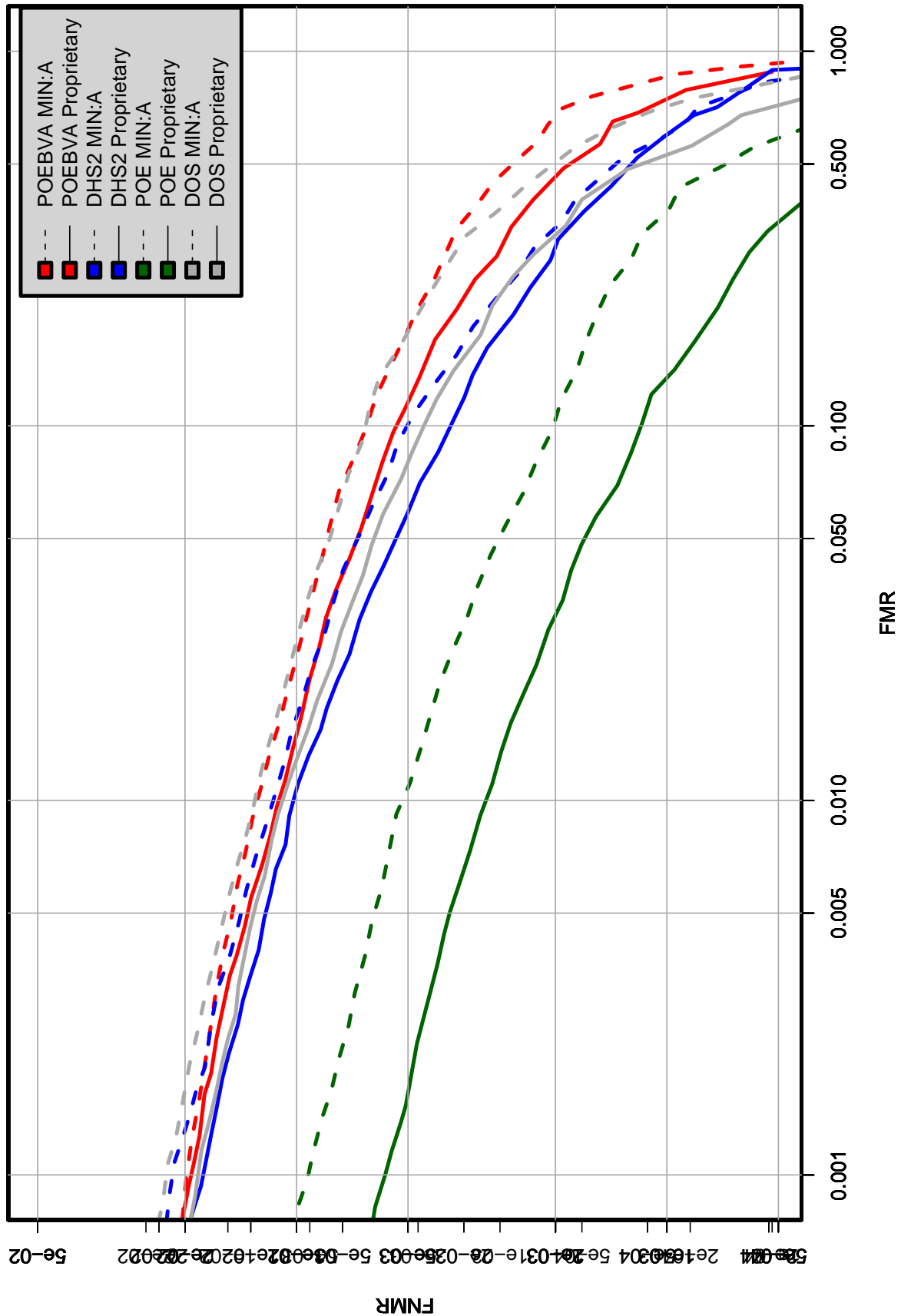


Table 52: Native, two-finger, DETs for vendor N on all four MINEX datasets.