Proceeds in infrared and thermal imaging – advantages of contactless latent print detection

FORENSIC SCIENCE ERROR MANAGEMENT
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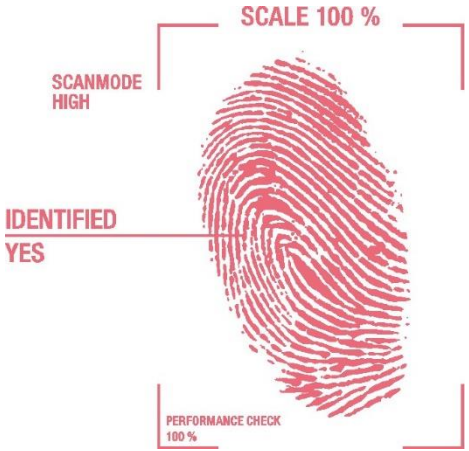
EVI SCAN

EVISCAN on a napkin



- Contactless detection of latent print evidence – and more
- Non-invasive and non-contaminative
- No prior treatment with chemicals or adhesives
- Immediate intelligent image processing

About the organisation

At German eForensics we aim to turn findings from science and technology into solutions for the forensic practice

Mission

Turn relevant findings from science and technology into innovative products, available to the forensic community.

Team

- Computer scientists
- Mathematicians
- Physicists
- Forensic Scientists
- Civil & mechanical engineering

Organization

- Private Company
- Partly owned by state and Federal Republic of Germany
- Both private and public funding
- Commercial interest

Current Objective

Establish future standard of contactless (latent print) evidence detection

Why bother?

We must not overlook the potential for error within the acquisition of latent print evidence „from item to image file“

„From item as found to digital image“

Reliability of latent print evidence under pressure

Analysis, comparison, evaluation & verification

Do we fully comply with basic rules of good scientific work?

- Results must be reproducable
- Results must be verifiable by a third party
- The observer should not manipulate (add, alter, subtract) the object of interest
- When analyzing information, one must preserve the original raw information, not only the results and conclusion
- When asking the same question different applicable methods should lead to similar answers

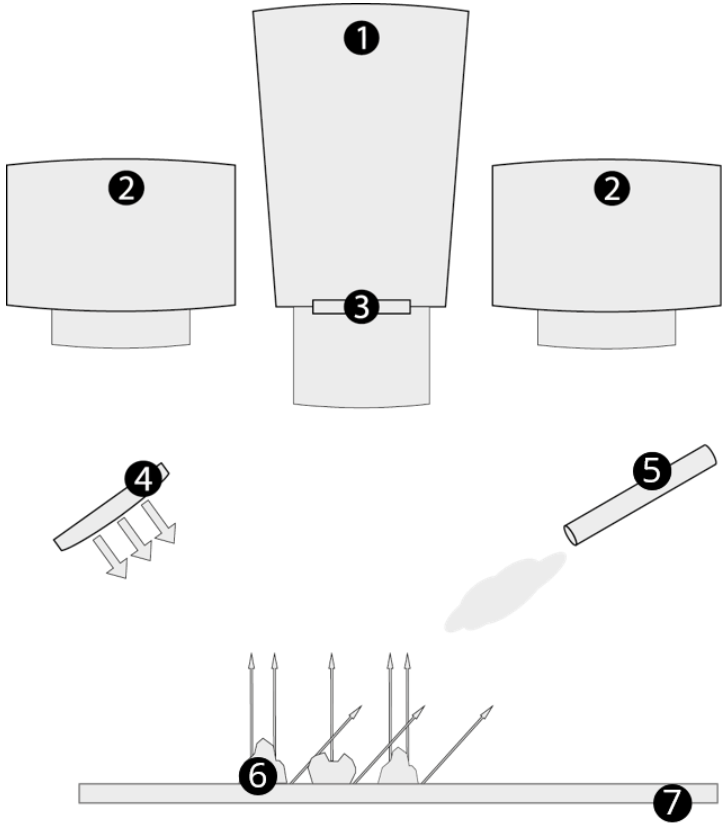
How does that go together with brush & powder, CA-fuming and aggressive chemicals/dyes typically used to visualize and preserve latent print evidence?

EVISCAN solution

The EVISCAN scanner helps forensic with a simplified, fastened and safe way to secure latent prints evidence

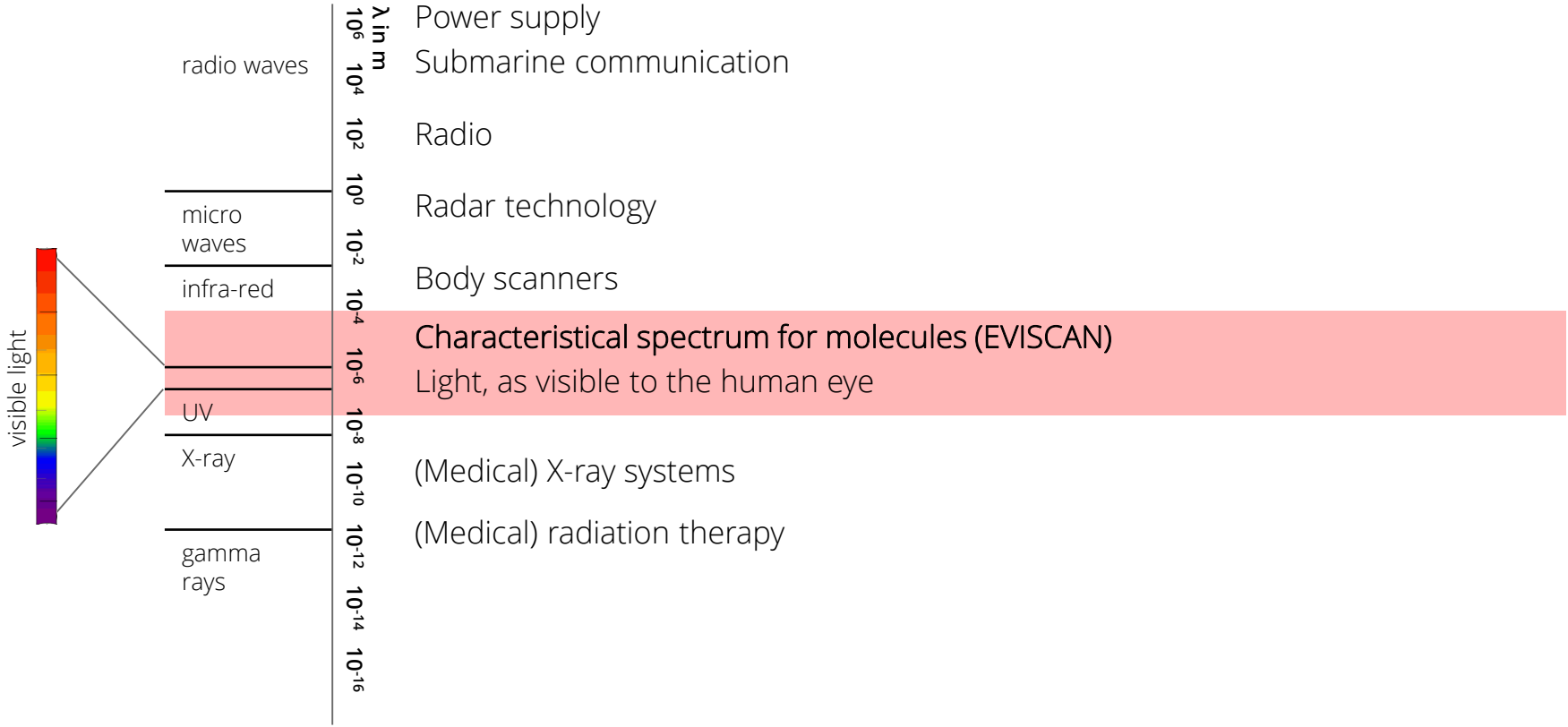
	Problem	Solution
Process Time	Time consuming techniques require up to 36 hours of processing time	Immediate output of AFIS-ready digital fingerprint image
Destruction	Brush, powder, foil and chemicals can affect or even destroy the trace or remove it from the exhibit permanently.	Contactless, chemical-free, purely optical inspection of the exhibit
Rivalry	Existing methods compete and sometimes exclude each other, e.g., chemicals vs. DNA	Exhibit remains 100% unaffected for further analysis (DNA, fibres, conventional methods)
Surfaces	Numerous aids for specific surfaces required but problems with background patterns persist	One device for most non-porous surfaces, mostly regardless of background patterns
Health	Inspections include respirable powders, aggressive chemicals and hazardous fumes	Clean technology protects user during inspection and further handling

Detect and preserve latent prints evidence with purely optical measures



1. non-VIS-camera
2. UV/VIS-camera
3. transmission filter
4. emitter
5. vaporizer
6. sebum and sweat
7. substrate

The scanner isolates specific signals representing latent prints from the electro-magnetical spectrum

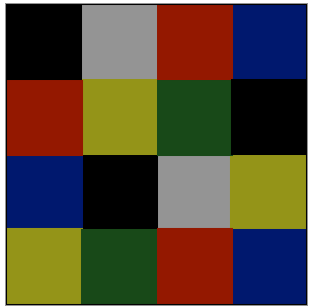


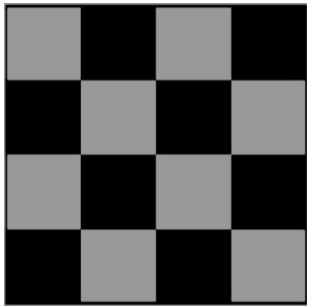
Differences between visible and non-visible radiation

Camera for visible light: **color and structure** contrasts

Detectors in the IR (UV): **intensity and structure** contrasts

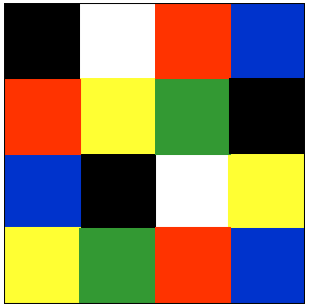
Color and structure contrast with **low light intensity**

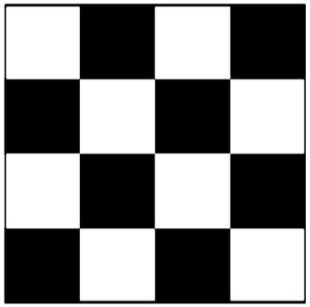




Low level contrast due to **low level IR intensity**

Color and structure contrast with **hight light intensity**





High level contrast due to **high level IR intensity**

Source: Tomshardware.com)

To sum it up...

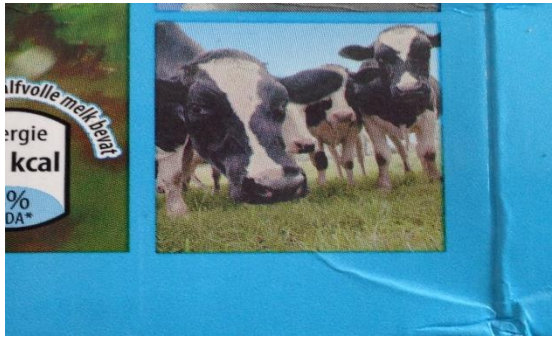
Conventional methods first add a dye or reagent to fingermark residue to make it visible for the human eye and then take a photo of the dye/reagent with a camera emulating the human eye.

The evidence scanner (EVISCAN) takes photos directly of the „invisible“ fingerprint residue.

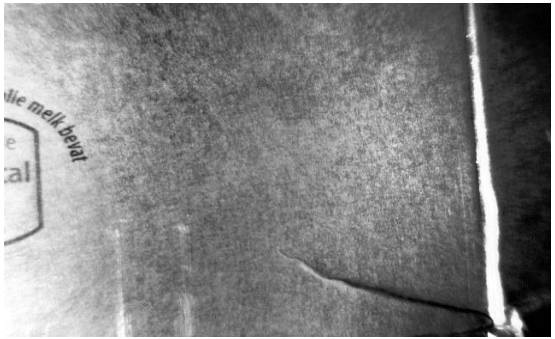
Features

The scanner provides high-quality images of latent prints on most non-porous surfaces

Milk box in visible light spectrum



...in non-visible light spectrum...



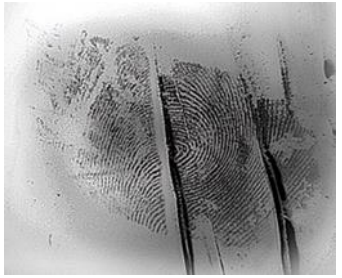
...and scanned with EVISCAN technology

Results collected from various surfaces (detailed images follow)

Porcelain

Plastic

Metal



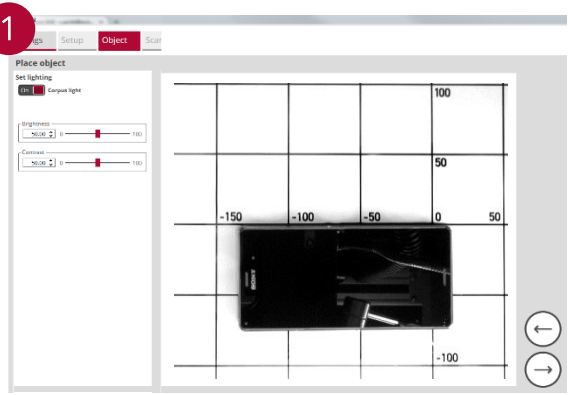
Duct Tape (sticky side)

Paper

Features

Analyze the surface of a cell phone and preserve the fingerprint evidence digitally within 10 minutes

1

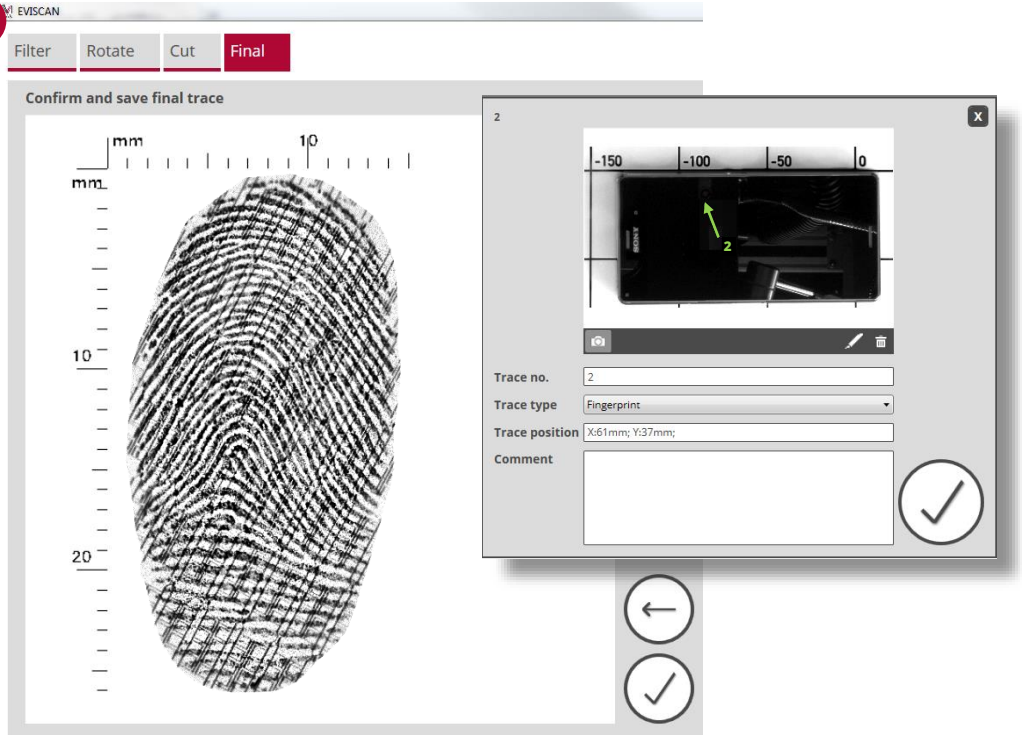


STEP 1: Capture VIS-overview image of a Nokia cell phone and define scan area (2 min.)

2

STEP 2: EVISCAN automatically scans scan area and detects fingerprint patterns on cell phone (3 min.)

3



STEP 3: Isolate relevant fingerprints from the scan, enhance image if necessary and secure high-quality, AFIS-ready images incl. protocol and project report (5 min.)

Features

Enhancement of raw images for subsequent analyses: intelligent, auto-logged, AFIS-friendly and simple

- Suppress interfering backgrounds
- Brightness and contrast optimization
- Invert image

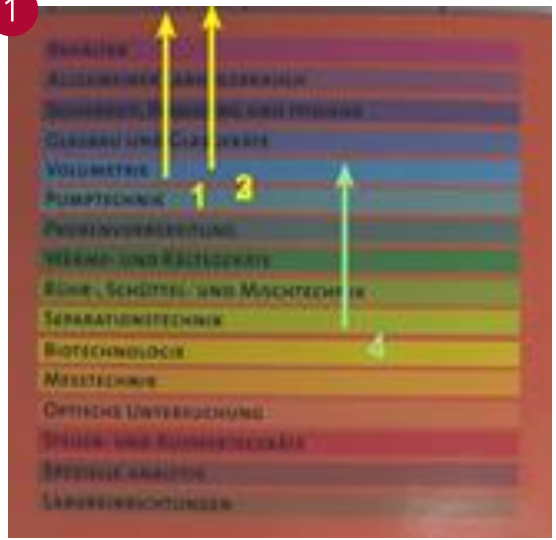
- Rotate image
- Isolate the fingerprint
- Add an automatic scale

Features

Suppress distracting background patterns from any visible color range and clarify the latent fingerprint

Demonstration of EVISCAN image processing software capabilitites on a non-porous paper magazin

1



Visible photo with fingerprint locations

2

EVISCAN raw image before background removal through image processing

3

Final result, delivered within less than 10 minutes total processing time

Latent fingerprint acquired from coffee mug

Exhibit: Mug

Material:
Porcelain
non-porous
Ø 70 mm

Total processing time:
3 Minutes

Latent fingerprint acquired from steel blade

Exhibit: Steel blade

Material:
Steel
non-porous
25 x 180 mm

Total processing time:
3 Minutes

Latent fingerprint acquired from keycard

Exhibit: Electronic card key

Material:
Plastic
non-porous
85 x 54 mm

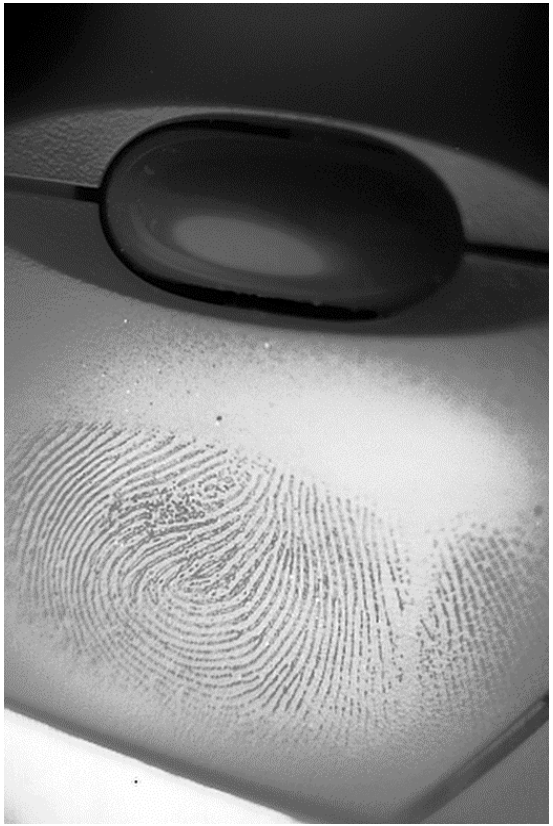
Total processing time:
5 Minutes

Latent fingerprint acquired from computer mouse

Exhibit: Computer mouse

Material:
Plastic, convex
non-porous
60 x 120 mm

Total processing time:
6 Minutes



Latent fingerprint acquired from shopping bag

Exhibit: Shopping bag

Material:
Polyethylene foil bag
non-porous
400 x 500 mm

Total processing time:
18 Minutes

Latent fingerprint acquired from PET bottle

Exhibit: Bottle

Material:
PET
non-porous
200 x 80 x 80 mm

Total processing time:
9 Minutes

Latent fingerprint acquired from CD

Exhibit: CD

Material:
Polycarbonate
non-porous
120 x 120 mm

Total processing time:
2 Minutes

Excellent results on exhibits made of metal

Exhibit: Metal cube

Material:
Aluminium
non-porous
50 x 50 x 50 mm

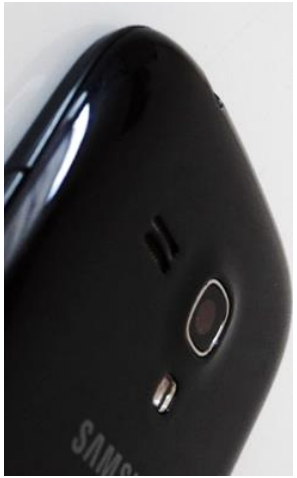
Total processing time:
2 Minutes

Latent fingerprint acquired from smartphone

Exhibit: Smartphone, back side

Material:
Smooth plastic
non-porous
70 x 115 mm

Total processing time:
2 Minutes



Latent fingerprint acquired from ducttape with rippled surface

Exhibit: Ducttape

Material:
Polyethylene, rippled surface
non-porous
51 x 200 mm

Total processing time:
3 Minutes

Silvery gray ducttape, for example removed from a drug parcel

Latent fingerprint acquired from plastic bag

Exhibit: Plastic bag

Material:
Polypropylene, embossed texture
non-porous
500 x 560 mm

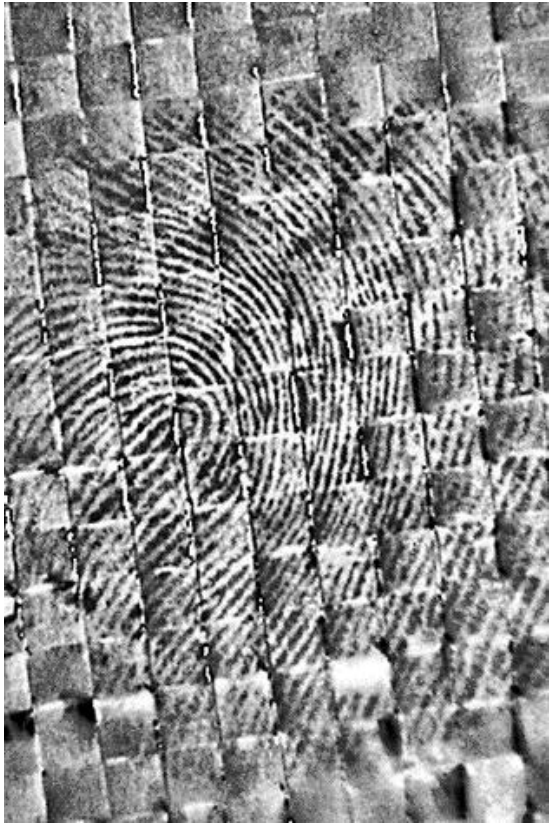
Total processing time:
6 Minutes

Latent fingerprint acquired from a plastic shopping bag

Exhibit: Shopping bag

Material:
Woven polypropylene
non-porous
550 x 350 mm

Total processing time:
6 Minutes



Latent fingerprint acquired from the dry side of a packing tape

Exhibit: Packing tape, dry side

Material:
Polypropylene
non-porous
60 x 100 mm

Total processing time:
3 Minutes

Latent fingerprint acquired from sticky side of packing tape

Exhibit: Packing tape, sticky side

Material:
Polypropylene, adhesive
non-porous
60 x 100 mm

Total processing time:
9 Minutes

Brown duct tape (sticky side up) as visible to the human eye and examined with EVISCAN.

Latent fingerprint acquired from a license plate

Exhibit: License plate

Material:
Aluminium, covered with reflective foil
non-porous
520 x 110 mm

Total processing time:
6 Minutes

Latent print is located on blue-white edge

Latents can also be acquired from the holograms of a 20 Euros banknote – almost impossible with standard photography

Exhibit: 20 EUR-Banknote

Material:

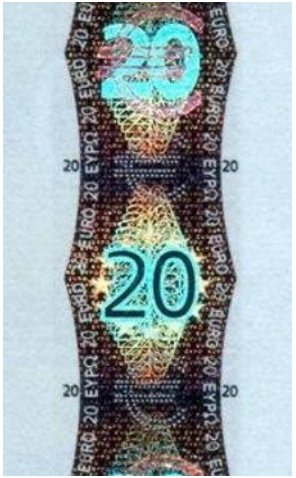
Banknote paper coated with hologram

Non-porous

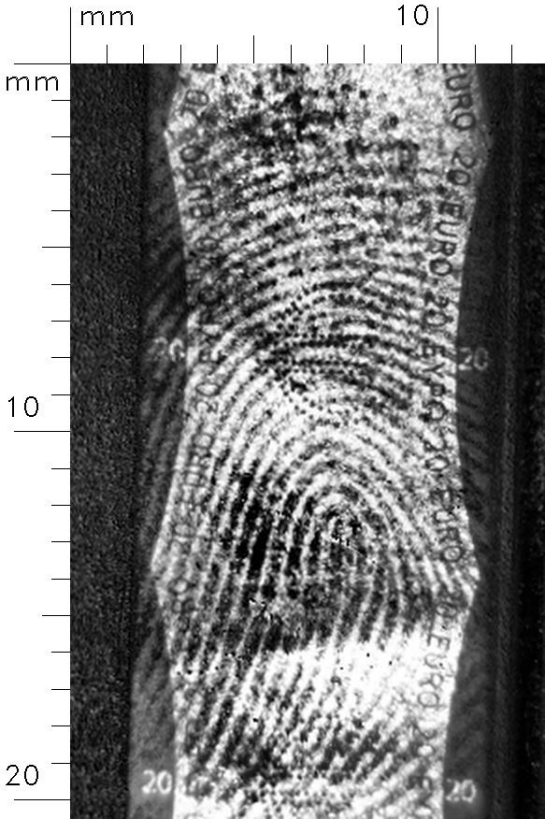
133 x 72 mm

Total processing time:

2 Minutes



The latent had been deposited on the hologram, not the paper itself.



Full palm prints from planar surfaces (35 MP)

Exhibit: Window glass panel

Material:
Glass
Non-porous
200 x 150 mm

Total processing time:
5 Minutes

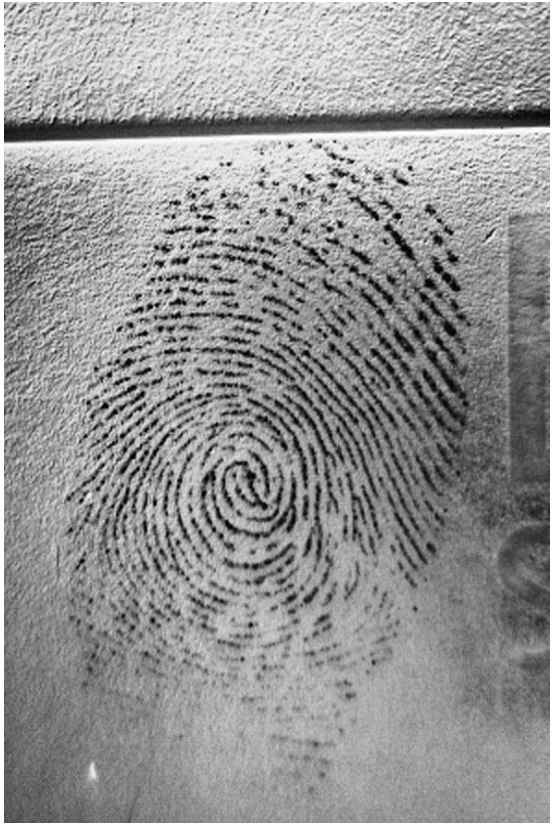
Fingerprint acquired from semi-porous cardboard material

Exhibit: Business Card

Material:
Cardboard / paper
semi-porous
55 x 85 mm

Total processing time:
3 Minutes

EVISCAN's business cards are made from a high-quality cardboard with a semi-porous surface. Quality depends on age of print



Latent fingerprint acquired from glass through a layer of soot

Exhibit: Glass panel covered with soot

Material:
Glass, sooted
non-porous
76 x 26 mm

Total processing time:
2 Minutes

Latent fingerprint secured on glass panel fully covered with soot without need to remove the soot.

Future application in real-world case from German Federal Police: EVISCAN visualizes old bloody print on black plastic case

Exhibit: DVD-case

(experimental)

Material:

Plastic

non-porous

273 x 183 mm

Fingerprint impressed in dried blood

Total processing time:

3 Minutes

Future application in real-world case from Austrian Federal Police: EVISCAN reveals „invisible“ tyre mark on victim‘s jeans pants

Exhibit: Jeans

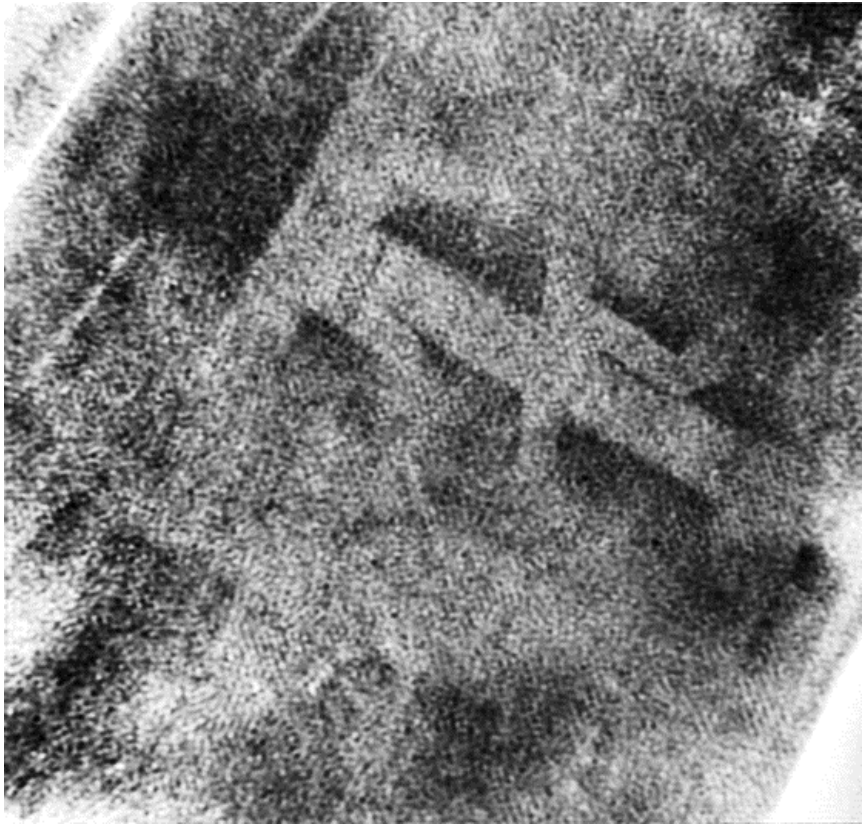
(experimental)

Material:

Cotton, jeans fabric
porous
1200 x 400 mm
Tyre mark caused by a scooter

Total processing time:

Preparation: 2 days, Analysis: 25 Minutes



Sometimes, it can also aquire better ridge detail from conventionally CA-fumed exhibits as suppplement to standard photography

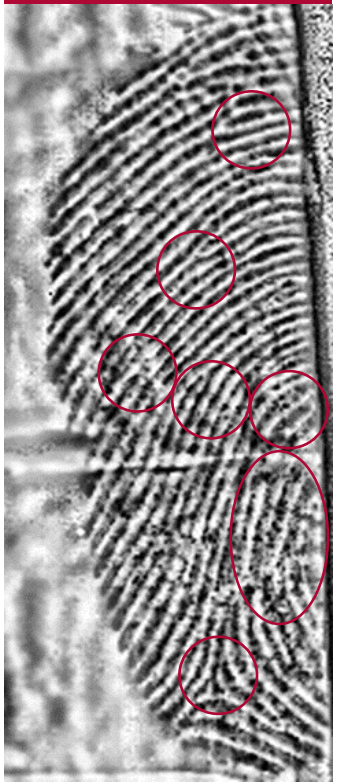
Exhibit: Packing tape, non-sticky side

Material:
Polypropylene
non-porous
60 x 100 mm

Total processing time:
9 Minutes

Lab photography

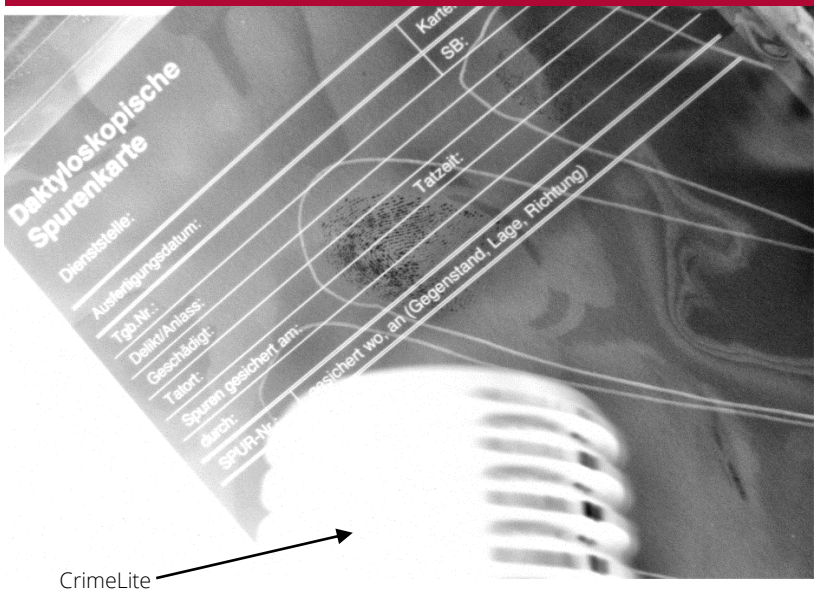
EVISCAN image



Optional Equipment

With optional equipment the scanner makes it easy to preserve and document conventionally pre-treated latents in highest image quality

CrimeLite reveals some ridge detail information



Indanedione pre-treated 4-fingers print on porous paper, excited with CrimeLite UV and photographed with conventional standard forensics lab photography (filter 529nm)

EVISCAN acquires much more ridge detail information

Same exhibit, excited with optional EVISCAN UV Light Kit (here: 490nm), acquired with EVISCAN (same filter) and optimized with built-in image enhancement software (6 minutes)

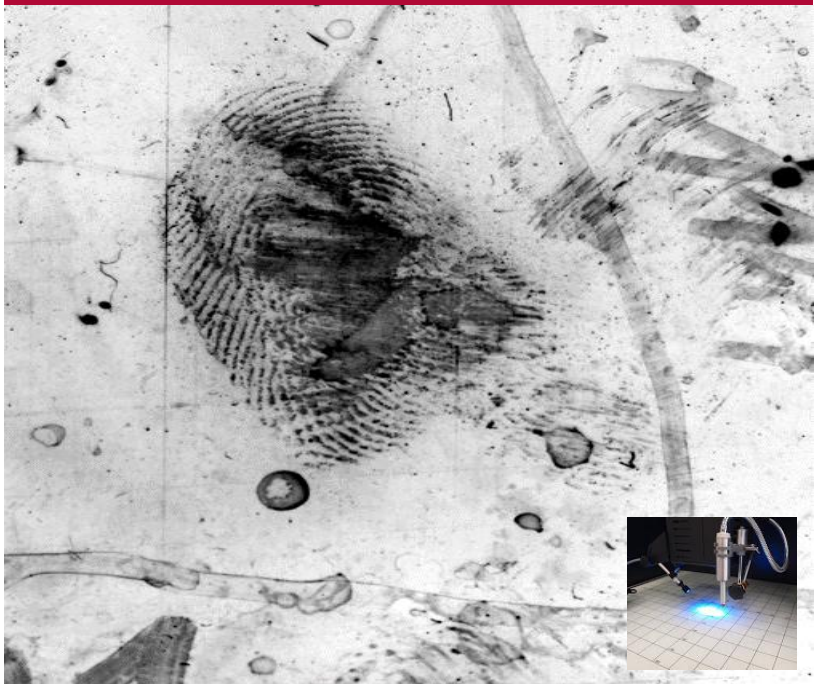
Results

Obtain high-resolution results even on pre-treaded surfaces with the additional UVLightKit and image processing

German Federal Police Forensic Lab Photography

Conventional DFO fluorescence image, excitation wavelength 460 nm, Nikon D 200 in macro mode 2,8/60 , Type 23 Filter

EVISCAN



DFO fluorescence image with EVISCAN, excitation wavelength 460 nm, NET C-IC 1500 BU, camera lense L-SV-5014 H, Type 23 Filter

Several awards and certificates for EVISCAN support the innovative approach for contactless, digital detection of crime scene evidence

German Design Award NOMINEE 2013

ISO 9001 QUALITY ASSURANCE

INNOVATIONSPREIS-IT BEST OF 2012 innovative mittelstand HARDWARE

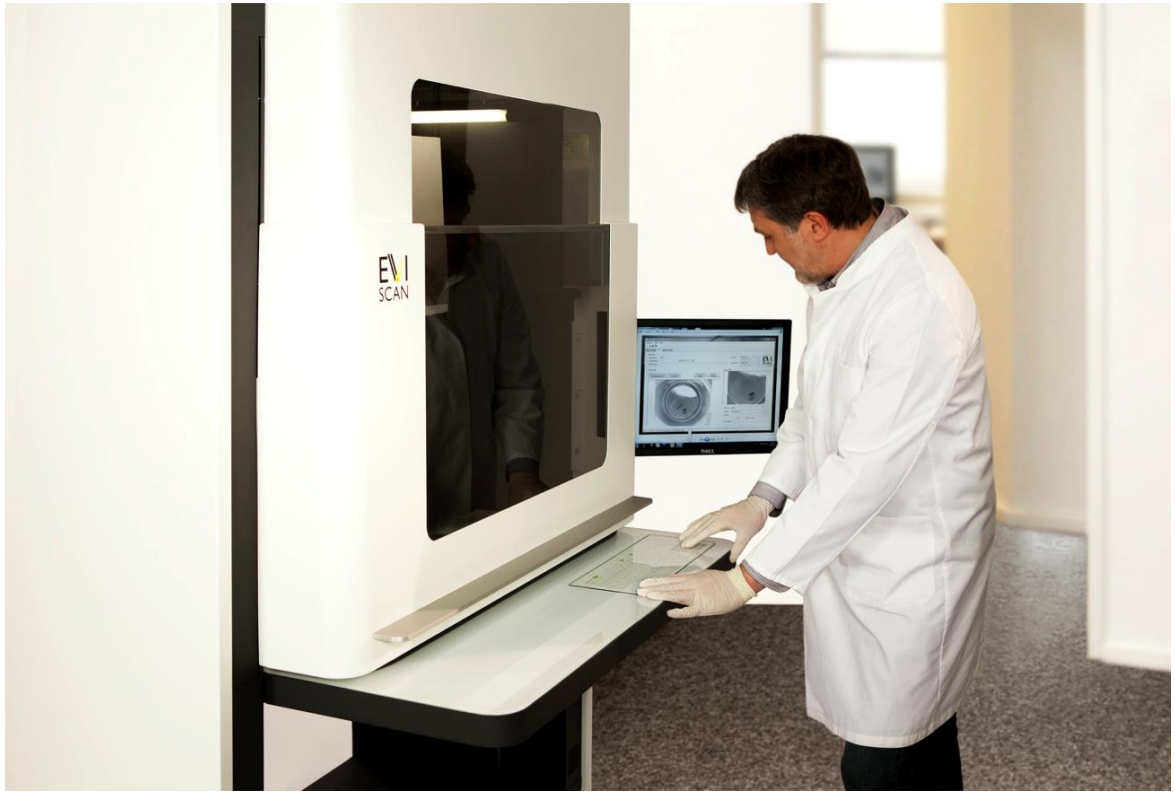
reddot design award winner

GERMAN SILICON VALLEY ACCELERATOR

Nationaler IT Gipfel München 2011

Hauptpreisträger GRÜNDERWETTBEWERB IKT INNOVATIV

Build around user needs: ergonomic clean design



Adaptive interface
for stand-up
and sit-down
environments

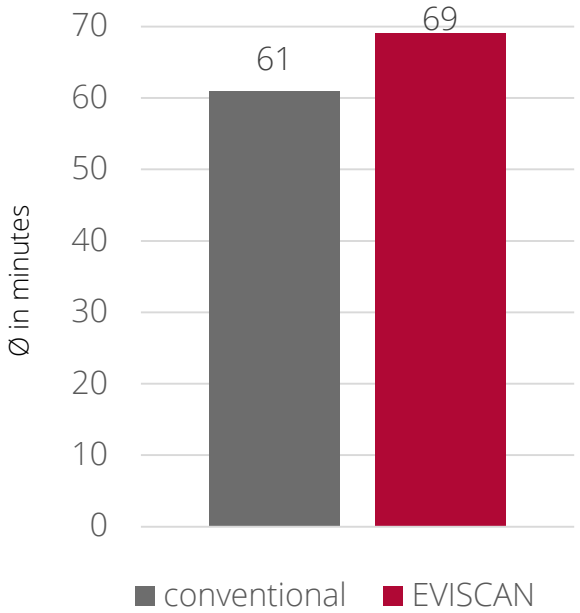
Large and robust: capable of analyzing various object sizes, like chip cards, trolleys, long arms and many more

Friendly, large, easy to clean workspace and user interface

Likewise manpower but tremendously faster results

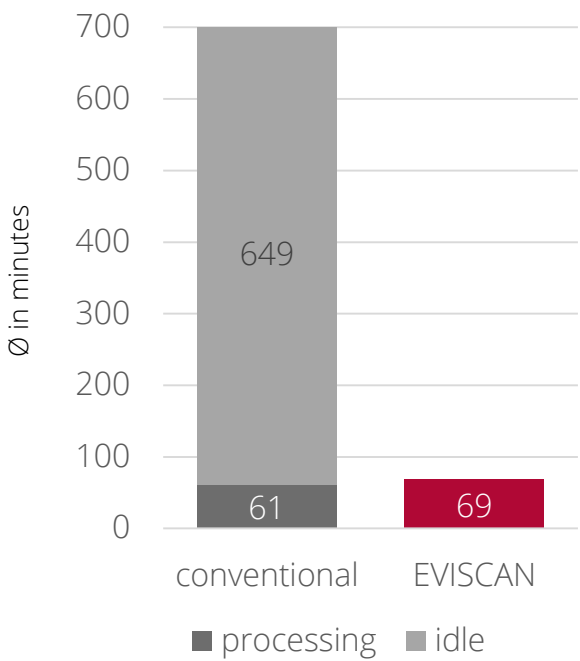
Active processing time (no waiting etc.)

„How much time do I need to spend on an item?“



Total throughput time

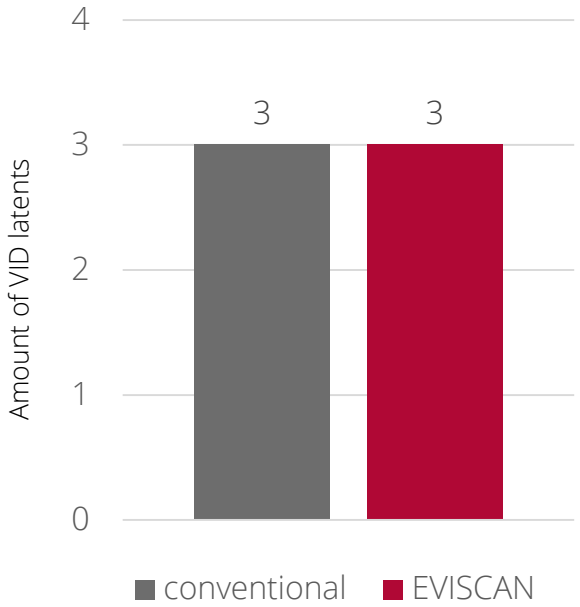
„How long until I have the image ready for analysis?“



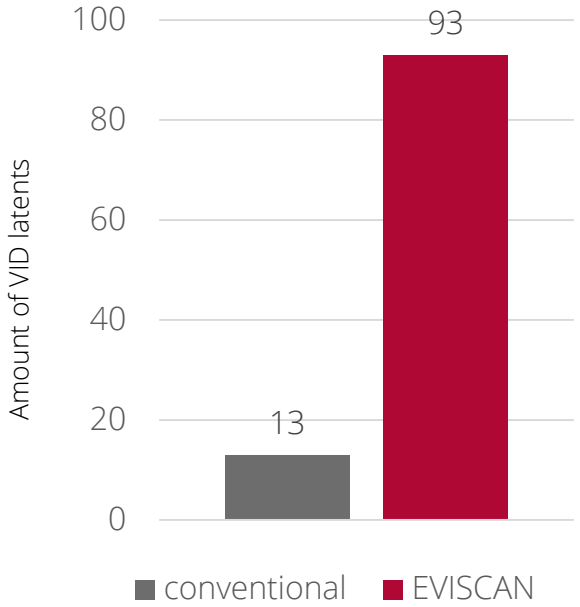
Results from early tests

Same amount of VID latents and much more NOV latents from a total of 90 items

Amount of VID latents acquired



Amount of NOV latents acquired



Good acceptance of new technological approach in first field test

„I am convinced this is the future for latent print detection.“

-W. Hertinger, President of the State Criminal Police Office

Contact

German eForensics wants to establish relationships with US police, justice and certification teams to better understand US requirements

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