

D9.7 Final Public SHUTTLE Workshop

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Executive Summary

During the SHUTTLE project, three public events were planned to disseminate results to targeted audiences. The first public workshop, held at the Mediterranean Security Event on 30th October 2019, is described in D9.2. The second public workshop “Improving Forensic Trace Recovery”, held online on 1st, 2nd and 5th February 2021, is described in D9.6. This deliverable describes the final public workshop which took place from 30th May to 3rd June 2022 in Stockholm.

The final public workshop was organised as part of the European Academy of Forensic Science (EAFS) 2022 conference jointly organised by the European Network of Forensic Science Institutes (ENFSI) and the Swedish National Forensic Centre (NFC) in the Swedish capital. This five-day event gathered up to 1200 visitors, including practitioners, academics and industry stakeholders in the field of forensic science. SHUTTLE and its two contractors, the TRACES Consortium and AG SHUTTLE Toolkit Jena, participated all week. A SHUTTLE workshop was also organised on Thursday 2nd June.

This workshop and the participation to EAFS 2022 achieved the objective of increasing awareness of the SHUTTLE machine+toolkit among forensic laboratories, with a focus on the prototypes and the interest of their novel approach to forensic science, and in the uptake of the project’s results.

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Summary of contributions

Contributing Partners as defined in DoA	Brief Description of Contribution to the Deliverable
ARTTIC	Deliverable writing, workshop organisation– logistics and coordination
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NFI	Member of the Coordination team involved in the workshop organisation. Preparation of a publication and presentation.
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List of Acronyms / Abbreviations Used in this Document

Acronym / Abbreviation	Definition
EAFS	European Academy for Forensic Science
ENFSI	European Network of Forensic Science Institutes
PCP	Pre-Commercial Procurement

1 Introduction

The development of the SHUTTLE toolkit is realised through a pre-commercial procurement (PCP) action, which is coordinated and jointly carried out between forensic institutes across Europe.

More precisely, the forensic institutes organise and manage procurement of R&D services involving risk benefit sharing under market conditions, and competitive development in phases.

During the SHUTTLE project, three public events were planned to foster dissemination of results to target audiences.

The first public workshop objectives were to keep interested persons updated on SHUTTLE progress and future steps and to have an effective dialogue with the industry (Call for Tender, PCP process) and the End-users (future applications, path to standardisation).

This second public workshop enabled a general presentation of the project and a first presentation of the contractors' prototypes currently under development in PCP Phase 2 to a highly relevant audience of potential end-users and researchers concentrated in Europe.

The final public workshop aimed to present the contractors' prototypes to forensic scientists and technicians from across Europe and beyond as part of the European Academy of Forensic Science 2022 - "EAFS 2022" - conference sponsored by the European Network of Forensic Science Institutes (ENFSI) and attended by many of its members as well as international public authorities, and academic and industrial stakeholders in forensic science.

This report provides a summary of the workshop including its aims, preparations, the SHUTTLE activities during the week-long event, and its outcomes. The presentations are provided in Annexes.

2 Workshop Preparation

2.1 Workshop rationale

As described by Helena Trolläng, one of the organisers of EAFS 2022 on the event's homepage, the SHUTTLE project and the contractors' toolkits fit well with the conference's endeavour:

*The motto of the conference "Together for a Safer World" [...] has been chosen to emphasize the importance of **cooperation** in order to **meet future expectations on the forensic community**.*

*The event will focus on **transformation of forensic science due to new technical possibilities**, developments concerning the fundamentals of forensic science and new categories of crime. This means that we need to be **innovative in the forensic approaches** to generate results that will benefit a transparent judicial process.*

*This can be facilitated by **combining knowledge from different areas of expertise**. Since technology develops at an accelerating speed, it is essential to keep the issues of quality, competence, human factors and social responsibilities on top of mind.*

Additionally, EAFS organisers scheduled a "European Day" on Thursday 2nd June to promote "the work supported by **EU funding** over the last decade and at present, **disseminating results** and discussing future challenges for the forensic community and law enforcement."

Thanks to this close alignment of purpose between SHUTTLE and the EAFS 2022 conference, the timing of the conference close to the expected end of PCP Phase 3, and the expected audience, the SHUTTLE consortium chose to hold its final workshop at the EAFS 2022 conference.

2.2 Workshop objectives for SHUTTLE

As explained by Sophia Berkani, project technical coordinator from Ministère de l'Intérieur-IRCGN, during the SHUTTLE workshop on Thursday 2nd June, the SHUTTLE partners "[...] intend to continue the work of SHUTTLE in the future but hope more laboratories will be involved to deliver a powerful toolkit".

The focus of the final workshop was therefore on the uptake of the SHUTTLE results by demonstrating to a large audience of forensic laboratories and practitioners how the two SHUTTLE toolkits could support their work in the future, and thus demonstrating the relevance of pursuing the development of such toolkits beyond the end of the SHUTTLE project.

Consequently, the project arranged for both contractors to have a booth for the whole week to exhibit the toolkits and planned a live demonstration session as well.

2.3 Conference premises and program

The event took place at the Stockholm City Conference Centre in central Stockholm. Two buildings were used for the event: Norra Latin and Folkets Hus.



Figure 1: The EAFS 2022 conference venue: Outside view of the Folkets Hus (top) and inside view of Norra Latin (bottom)

SHUTTLE events took place in both buildings:

- The contractors' booths, the SHUTTLE workshop and all plenary sessions took place on the fourth floor of the Folkets Hus;
- The SHUTTLE presentation and European Day both took place in Norra Latin.

FLOORPLAN EXHIBITION AREAS - FOLKETS HUS

2nd and 4th Floor

Congress Hall

Plenary Sessions and Exhibition Areas

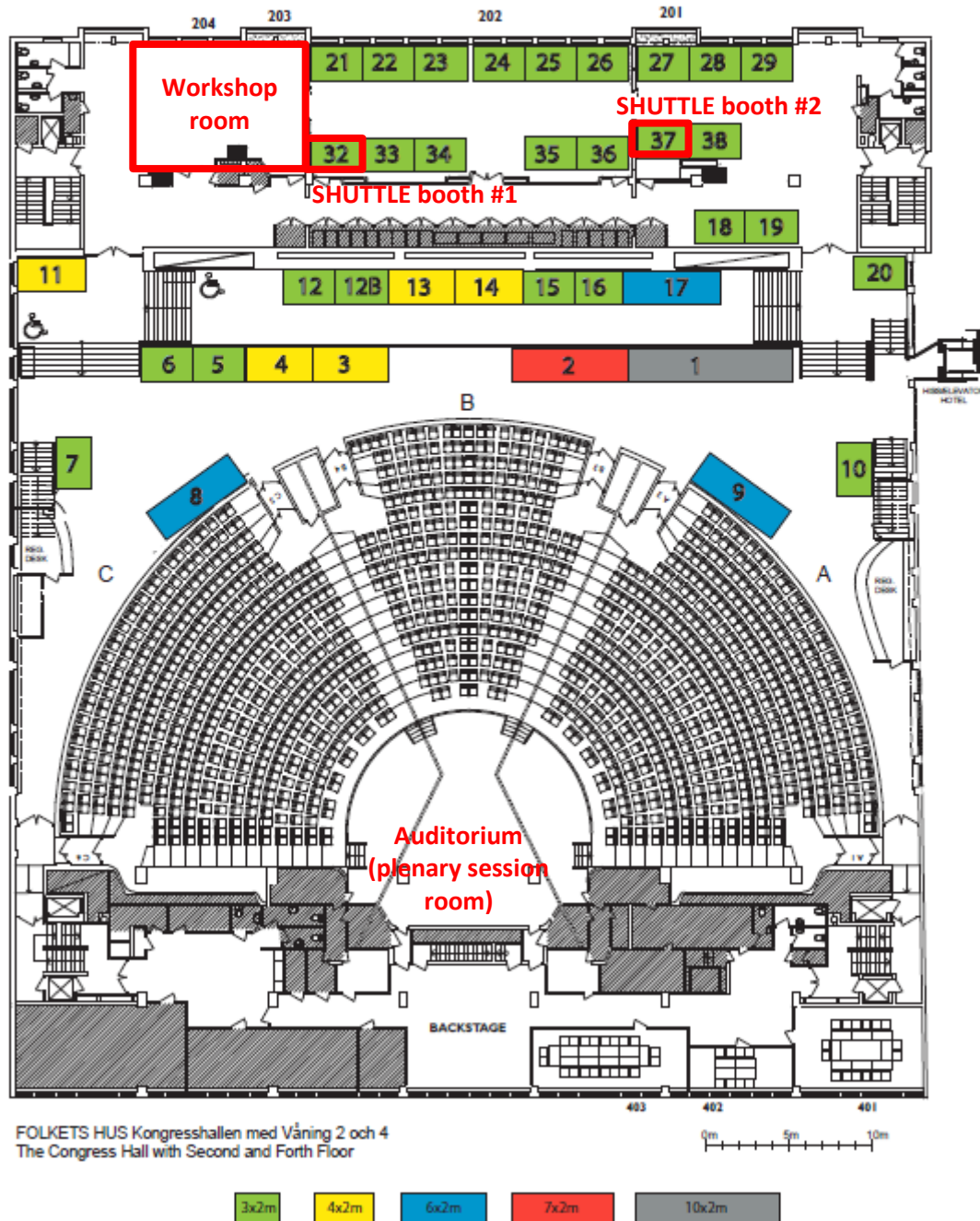


Figure 2: Layout on the fourth floor of Folkets hus

SHUTTLE's participation consisted in:

- A booth all week for each contractor in the exhibition area,
- A scientific presentation on Wednesday 1st June,
- A dedicated SHUTTLE workshop on Thursday 2nd June,
- A SHUTTLE project booth for European Day on Thursday 2nd June,
- Projection of the SHUTTLE video during the plenary panel discussion on 2nd June.

The conference program was as follows:



EAFS STOCKHOLM 2022 <small>THE EUROPEAN ACADEMY OF FORENSIC SCIENCE</small>				
Preliminary Program Overview Date of Issue: 2022-03-17				
May 30th Monday	May 31st Tuesday <i>Management Day</i>	June 1st Wednesday	June 2nd Thursday <i>European Day</i>	June 3rd Friday
WS	Plenary Speaker Presentations/WS	Plenary Speaker Keynote Speaker/ Presentations/WS	Introduction Plenary Speakers	Plenary Speaker/WS Keynote Speaker/ Presentations/WS
Coffee	Coffee	Coffee/ Poster Presentations	Coffee/ Poster Presentations	Coffee
WS	Keynote Speakers/ Presentations/WS	Presentations/WS	Keynote Speakers/ Presentations/WS	Keynote Speaker/ Presentations Closing Ceremony
Welcoming Lunch	Lunch	Lunch	Lunch	Lunch
Opening Ceremony Plenary Presentation	Keynote Speakers/ Presentations/WS	Keynote Speakers/ Presentations/WS	Keynote Speakers/ Presentations/WS	Meetings
Coffee	Coffee/ Poster Presentations	Coffee	Coffee	Coffee
Keynote/ Presentations/WS	Plenary Speaker/WS Panel Discussion/WS	Presentations/WS Plenary Speaker	Plenary Speaker Panel Discussion	Meetings
Reception at Stockholm City Hall	Exhibitors/ Partners Evening	Free Evening	Conference Dinner at the Vasa Museum	 

Figure 3: Overall program with, in red, events in which SHUTTLE was involved and/or showcased

2.4 Event organisation

The SHUTTLE project management team took charge of the organisation of the week-long event. Dissemination Work-package Leader ARTTIC acted as liaison for practical and organisational issues between the EAFS 2022 organisers, the SHUTTLE project management team, and the contractors.

Organising the shipping and installation of the toolkits proved to be very complicated due to the size of the toolkits compared to the available equipment and lifts in the venue and given the layout of the building.

2.5 Social media and communication

A visual was created and a social media campaign was organised to promote SHUTTLE's participation to EAFS 2022.



Figure 4: Social media posts (Twitter – top – and LinkedIn – bottom)

Posters were designed by ARTTIC, with a common section on SHUTTLE and a specific section on each contractor describing the prototypes' main features. These posters were used for the contractors' booths and the project's booth during European Day:



Figure 5: Contractors' posters

The SHUTTLE newsletter with a mailing list of over 250 stakeholders was also used to communicate and promote the final workshop.

What's New?



Project Events

SHUTTLE Final Workshop at the EAFS conference - May 30th to June 3rd in Stockholm

The SHUTTLE partners and contractors will be present in Stockholm from May 30th to June 3rd at the EAFS 2022 conference organised by the National Forensic Centre (NFC), under patronage of the European Network of Forensic Science Institutes (ENFSI).

SHUTTLE will also organise its **Final Workshop during European Day on June 2nd**. This 3-hour session will allow project partners and contractors to present the main results of the prototype development and to provide a hands-on demonstration of the two microtrace analysis toolkits.

Find out more on www.shuttle-pcp.eu/final-workshop/.

Register for EAFS and the SHUTTLE Workshop on <https://www.eafs2022.eu/registration/>. If you are already registered for EAFS, contact eafs2022@meetagain.se to request registration to the SHUTTLE Workshop.



Figure 6: SHUTTLE Newsletter #6

3 Description of events

3.1 Contractors' booths

Two separate booths were rented to protect the interest of each contractor. Each was equipped with chairs, tables, a screen and a poster, according to the needs expressed by the contractors.

3.1.1 TRACES Consortium exhibitor description

The TRACES consortium, consisting of Spectricon and Zanasi & Partners, has developed a prototype microtrace analysis toolkit within the European Horizon 2020 project SHUTTLE.

The Spectral Multimodal Microscope for the Automated Recognition of Traces (SMMART) forensics toolkit radically improves all aspects of trace collection and analysis:

- A novel thin recyclable lifting tape/backing system with special optical properties that does not influence collected samples.
- Automated high content screening corresponding to the surface of four A4 papers.
- Operation of multimodal image acquisition through a graphical user interface.
- Fully automated scanning requiring no human presence or intervention.
- Automated analysis and identification of traces using classification algorithms.
- Data storage and retrieval for remote locations as well as secure data handling.



Figure 7: The TRACES Consortium booth at EAFS 2022

3.1.2 AG SHUTTLE Toolkit Jena exhibitor description

The AG SHUTTLE Toolkit Jena consortium, consisting of aura optik, Optimal Systems, and AI-UI, has developed a prototype microtrace analysis toolkit within the European Horizon 2020 project SHUTTLE. The instrument can scan samples and process the acquired images simultaneously. It enables morphological and spectral imaging of the whole sample area, thereby fully digitalizing the sample. Its software automatically finds and annotates traces and classifies them with the help of AI. It also provides different result view options, zoom and navigate through the whole sample.

Innovations of the toolkit:

- A novel combination of optics/fine mechanics, a high-performance optical sensor, a new generation of tunable light sources, the AI and a content managed data base.
- Results in the form of A4-sized scan with the complete recording of all traces including optical and spectroscopic properties in less than 5 hours.
- Standalone use of toolkit in connection with other proven tools, or fusion of information from persons on different sites for optimal decision-making.



Figure 8: The AG SHUTTLE Toolkit Jena booth at EAFS 2022

3.1.3 Booth installation and visits

The booths were installed on Sunday 29th May and dismantled in the afternoon of Friday 3rd June. They were manned by the contractors themselves, with the support of SHUTTLE partners to answer any questions the visitors may have on the SHUTTLE project itself or on Pre-Commercial Procurement (PCP) projects in general. Visits lasted throughout the week, culminating on Tuesday and Wednesday. The toolkits were transferred to the workshop room for the SHUTTLE workshop demonstrations on Thursday.



Figure 9: Visitors at the contractors' booths

3.2 SHUTTLE scientific presentation –1st June

Sophia Berkani (MININT-IRCGN) and Alwin Knijnenberg (NFI) presented a scientific publication “SHUTTLE: A European Toolkit for Trace Analysis – Operational validation tests” as part of the schedule of lectures on Wednesday 1st June. This presentation focused on the operational validation tests underway with both toolkits.

As a result of the presentation, several attendees expressed an interest in joining the SHUTTLE workshop on the next day.

See also the abstract and presentation in annex section 5.1.



Figure 10: Sophia Berkani (MININT-IRCGN) and Alwin Knijnenberg (NFI) presenting the SHUTTLE operational validation tests

3.3 SHUTTLE workshop –2nd June

3.3.1 Workshop description for conference program

In this workshop, participants got experience with the micro-trace analysis toolkits that have been developed during the project and learn about the achievements of the SHUTTLE project.

During the workshop, the participants:

- Gained insight into SHUTTLE, an EU Horizon 2020 Pre-Commercial Procurement project. The consortium includes six forensic institutes which have contracted the design and prototyping of toolkits for micro-trace analysis according to their specifications.
- Had a detailed understanding of the various tools that constitute the toolkit, i.e. optimized tape lifts, an automated microscope, image processing software, and a searchable database with pattern recognition capabilities.
- Gained hands-on experience with the two toolkits, including the developed tapes, the instrumentation and the software tools. It is possible to bring own samples.
- Learned about the operational validation tests that have been carried out in the SHUTTLE partner forensic laboratories and had insight into the abilities and limitations of the toolkits.
- Learned from the contractors who developed the toolkits and how they can start implementing them in their own laboratories.
- Were able to evaluate the potential impact of implementing the developed toolkits in their own laboratories.

The workshop consisted of a lecture (11:00 - 12.30) and toolkit demonstrations (13.45 – 15.15).

3.3.2 Presentations

The following presentations were given in the morning session (11:00 to 12:30):

- **Welcome keynote** by Nada Milisavljevic (European Commission)
- **Project Overview** by Sophia Berkani (IRCGN - Gendarmerie Nationale) and Nadine Merat (Police Scientifique)
- **AG SHUTTLE Toolkit Jena introduction** by the AG SHUTTLE Toolkit Jena consortium coordinator Dr. Roland Kilper (aura optik).
- **Traces Consortium introduction** by the Traces consortium coordinator Dr. Costas Balas (Professor at the Technical University of Crete and Founder & CEO of Spectricon)
- **Phase 3 preliminary results - Tests undertaken and test outcomes** by Christos Batis (Hellenic Police)
- **Panel discussion - Next steps to commercialisation** chaired by Iris Bijker (Amsterdam University of Applied Sciences) with the support of several SHUTTLE partners.

The panel discussion centred on the potential value of the toolkits to the forensic laboratories in their daily work. Costas Balas of the TRACES Consortium summarized the advantage that the SHUTTLE toolkit effectively “upgrades the role of investigators. The machine does the time-consuming work for investigators to focus on the difficult cases.”

João Fonseca of Polícia Judiciária noted that, with the toolkits, forensic investigators can bring back the value of traces that have been given relatively little attention in recent years, such as fibres.

Sophia Berkani explained that partner laboratories have also undertaken experiments beyond the scope of the original SHUTTLE specifications, such as the identification of diatoms.

Since the toolkits are programmable and trainable, laboratories can potentially adapt them to focus on particular interests, such as ballistic traces, for example, to determine the distance of a shooter.

Roland Kilper of the AG SHUTTLE Toolkit Consortium thanked the SHUTTLE partners and the European Union, noting that “without EU and lab support, no company would have tackled this challenge.”

In her concluding remarks, Sophia Berkani invited interested forensic laboratories to contact the SHUTTLE partners about potentially working together to continue the development and optimization of the SHUTTLE toolkits, whether in the form of a Public Procurement of Innovative solutions (PPI) or another funding instrument.



Figure 11: Series of photos of the workshop session: overview of the room (top left), Nada Milisavljevic (top right), Sophia Berkani and Christos Batis (bottom left), Iris Bijker and João Fonseca (bottom right)

3.3.3 Toolkit demonstrations

In the afternoon, each contractor was given 45 minutes to demonstrate their toolkit live. See also the presentations in section [Annex – SHUTTLE presentations at EAFS 2022](#).



Figure 12: Live demonstration by the TRACES consortium

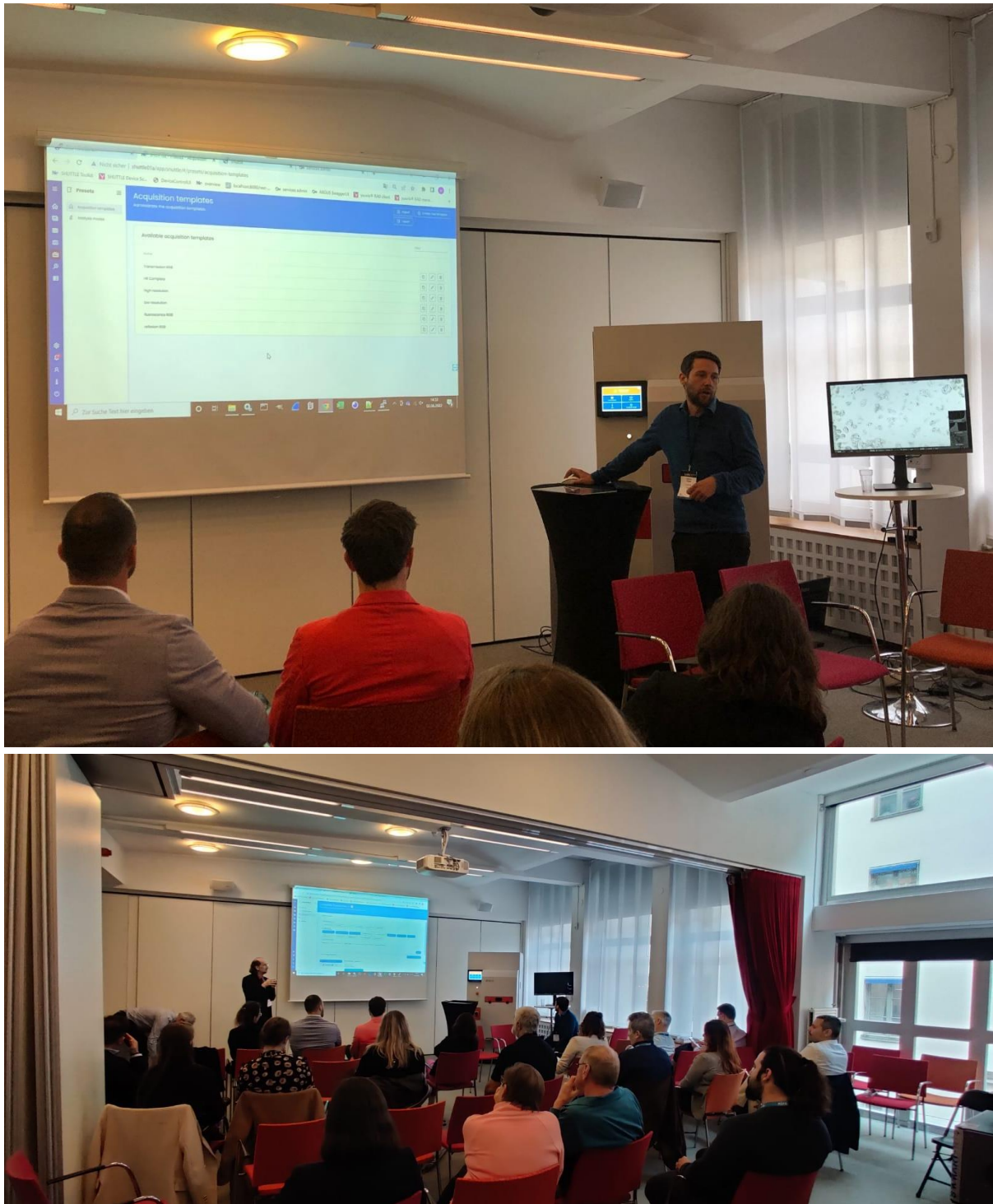


Figure 13: Live demonstration by the AG SHUTTLE Toolkit Jena consortium

3.3.4 Participants

Nearly 40 people registered to the workshop ahead of their participation to EAFS 2022, but several additional attendees later signed up and joined. The following organisations attended the workshop, including members of the SHUTTLE consortium and the Advisory Board:

Table 1: Participants from the following organisations attended the workshop

Organisations	
AI-UI GmbH (DE)	Institute of Criminalistics (CZ)
Amsterdam University of Applied Sciences (NL)	Israel Ministry of Public Security (IL)
ARTTIC (FR)	KEMEA (GR)
aura optik gmbh (DE)	Laboratório de Polícia Científica da Polícia Judiciária (PT)
Bayerisches Landeskriminalamt (DE)	National Public Prosecutors Office of the Netherlands (NL)
CLHC - Faculty of Science - University of Amsterdam (NL)	Netherlands Forensic Institute (NL)
Defence Science and Technology Laboratory - dstl (UK)	School of Criminal Justice / University of Lausanne (CH)
EUROPOL	Spectricon (GE)
Gendarmerie Nationale (FR)	State Forensic Police Office Berlin (DE)
FRENCH MINISTRY OF INTERIOR – IRCGN (FR)	Swedish Police (SE)
FRENCH MINISTRY OF INTERIOR – SNPS (FR)	Turkish Police Forensic Laboratories Department (TR)
Home Team Science and Technology Agency (SG)	University of Lausanne (CH)

3.4 European Day booth

The SHUTTLE project held a stand during the whole day on Thursday 2nd June as part of the European Day exhibition, which included the participation of more than 15 EU-funded projects.

The stand included a screen used to show the [SHUTTLE project video](#) and the posters of the two contractors.

3.5 SHUTTLE video at the final plenary panel debate

The SHUTTLE project video was showcased during the final plenary panel debate on innovation and innovation uptake, highlighting ways of developing innovative solutions for forensics through EU-funded Research & Innovation projects. SHUTTLE was presented by the speakers as a successful example of European cooperation in forensic science to an audience consisting of approximately 150 to 200 attendees. The debate focused on what follows after an EU project and the key elements to be successful with the innovation uptake. Panellists advised projects to get police practitioners and SMEs involved and to come to the Internal Security Fund (ISF) when the project results are mature enough.



Figure 14: The SHUTTLE video presented during EAFS's final plenary panel debate

3.6 Coverage of the events on social media

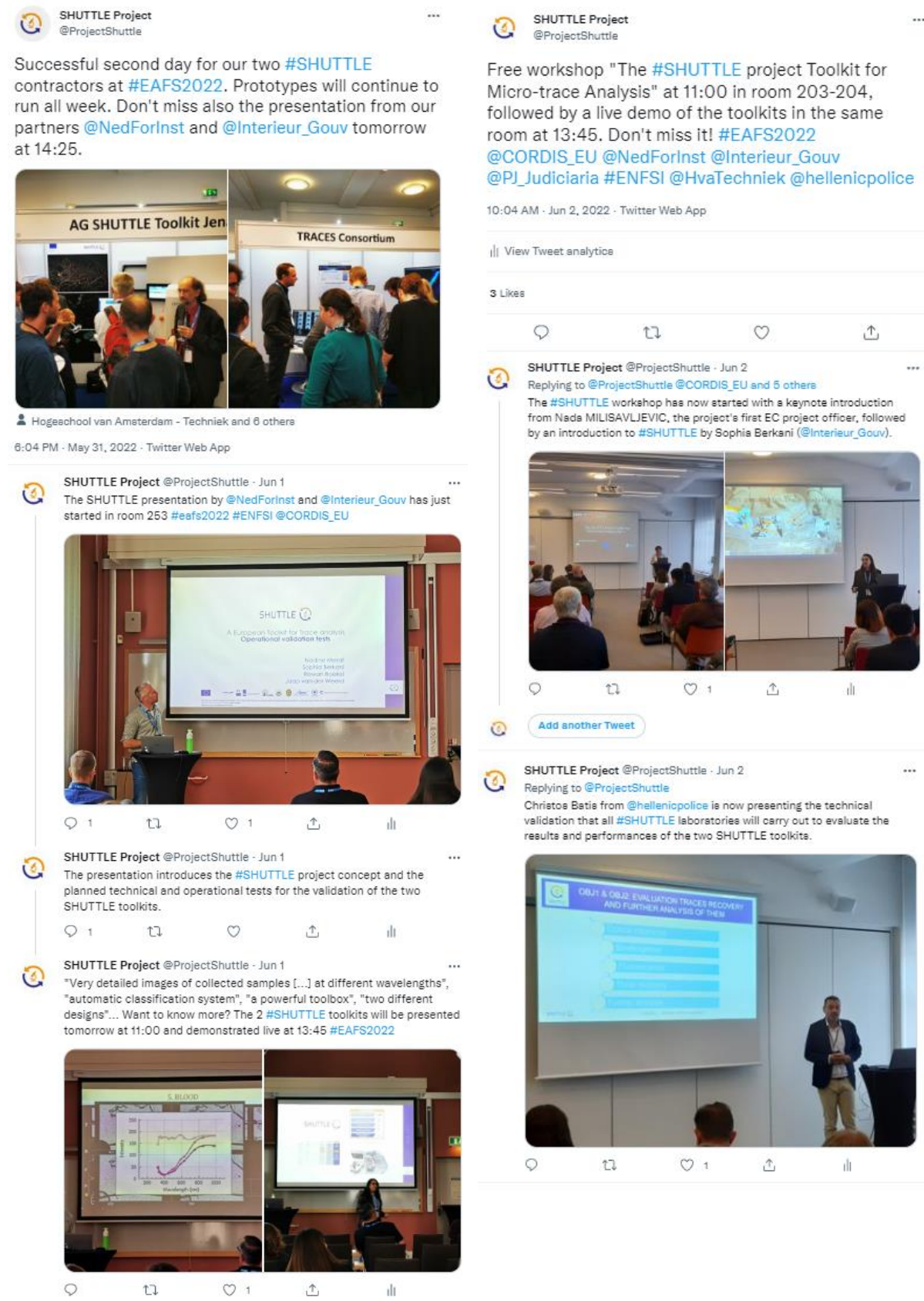


Figure 15: Twitter coverage of SHUTTLE events at EAFS 2022

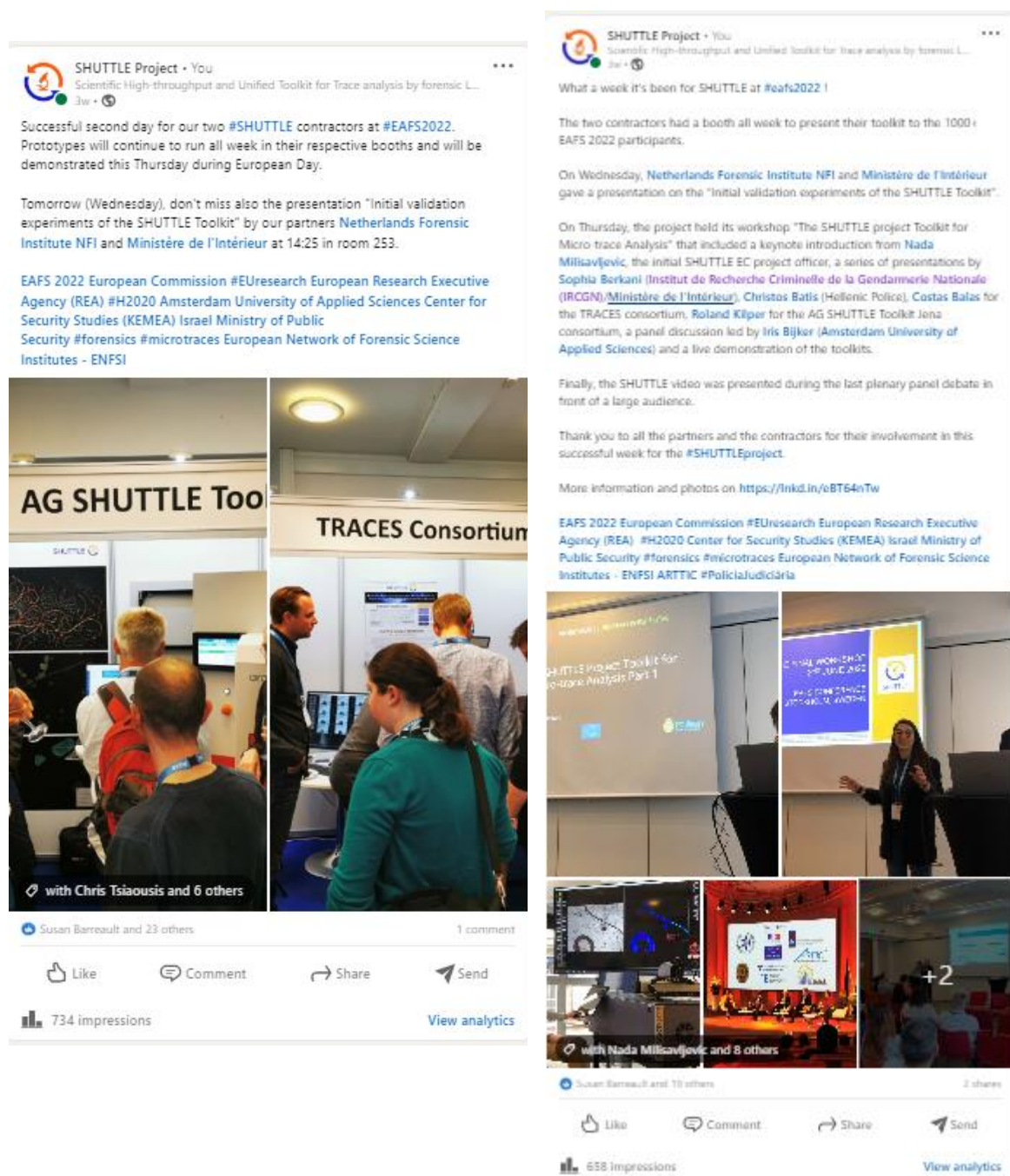


Figure 16: Event coverage on LinkedIn

The Twitter coverage reached an audience of about 400 persons and the LinkedIn posts reached an audience of about 700 persons within one month.

4 Workshop Outcomes

The EAFS 2022 conference aimed to paint a realistic picture of the current situation of forensic science, identify current challenges and opportunities, and determine how to address these in the future.

Within the conference, forensic investigators and experts in the field of forensic science from Europe and beyond had the opportunity to discover the innovative solutions for trace analysis developed by the two SHUTTLE contractors according to the specifications set by the SHUTTLE partner laboratories.

The conference also allowed the contractors to demonstrate their toolkits, receive feedback, and discuss practical aspects with expert stakeholders, future potential end-users, as a key contribution towards their objective of commercialising their prototypes.

In terms of the specific dissemination objectives of the SHUTTLE project, the participation to EAFS 2022 is considered successful as it contributed to both the promotion the SHUTTLE results and their future sustainability.

Building the SHUTTLE network and community of interested stakeholders and potential users

EAFS 2022 gathered forensic investigators and public authorities, as well as academics and industrial experts in the field of forensic science from around the world. All these participants (over 1200) attended EAFS to share knowledge and bridge the gap between forensic science and solution providers to identify potential future innovation pathways. As such, the participation of SHUTTLE and its contractors fit the event's objectives. The contacts gathered will increase the SHUTTLE network and community.

Way forward to commercialisation

SHUTTLE's participation to EAFS 2022, in particular with the booths and live demonstrations organised, gave an opportunity to demonstrate to end-users how the time and financial investment in SHUTTLE could bring innovative solutions that could ease their work, and to encourage them to take part in the next step towards the commercialisation of a SHUTTLE-compliant toolkit.

SHUTTLE is now nearing its end, and the next step beyond SHUTTLE is the road to exploitation. The involvement of additional EU laboratories is therefore crucial to build on the work already done in SHUTTLE, to bring the solutions to maturity and commercialisation, and to ensure an EU-wide harmonisation by making the developments relevant to as many EU countries as possible.

5 Conclusion

The first SHUTTLE public workshop gave the opportunity for technology developers to get informed regarding the Call for Tender launched in September 2019.

The second public workshop served to build the SHUTTLE community of interested stakeholders, create greater awareness among potential end-users, and start to address some of the issues related to future implementation of new technology in the trace recovery processes.

The final public workshop and associated activities at EAFS 2022 allowed SHUTTLE to demonstrate its results to a wide, expert audience of over 1200 participants thus significantly increasing the network of forensic laboratories aware of the SHUTTLE toolkit capabilities and potentially able to support the next phase of optimisation and commercialisation of the SHUTTLE trace analysis toolkits.

Annex – SHUTTLE presentations at EAFS 2022

5.1 SHUTTLE operational validation tests by Sophia Berkani (MININT-IRCGN) and Alwin Knijnenberg (NFI)

5.1.1 Abstract

OP049 - Initial validation experiments of the SHUTTLE Toolkit

Theme: 1.8 Material 1. Chemistry

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2 Institut National de Police Scientifique (INPS), Toulouse, France

3 Netherlands Forensic Institute (NFI), The Hague, The Netherlands

SHUTTLE aims to solve two major issues in forensic trace evidence investigation. First, current microscopic analysis are subjective and require a high level of expertise and training of examiners. SHUTTLE will render analyses more objective and scientific by automation of microscopy. Second, trace evidence analyses are time consuming and hence expensive. This limits the number of cases in which analyses can be carried out by forensic laboratories to fight against crime. SHUTTLE can assist in reducing workload, but will not replace the forensic examiner. During the SHUTTLE project, complete automated microscopy systems have been developed (the 'toolkits'), consisting of high-throughput microscopic instrumentation, image processing and AI algorithms, and databases. After installation of the toolkits in laboratories all over Europe, the developed toolkits are evaluated. In the current presentation, we will detail a number of tests that have been carried out. These will include the search for glass fragments in dust samples, the search for target fibres in tape liftings, the search for blood on tape lifts of dark clothing and the use of the image processing and AI capabilities of the toolkits to automatically classify traces on tape lifts. The current contribution will focus on validation experiments. A more technical introduction to the toolkits will be provided during the workshop organised by the SHUTTLE consortium. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 786913.

5.1.2 Presentation



A European Toolkit for Trace analysis Operational validation tests

Nadine Merat
Sophia Berkani
Rowan Boekel
Jaap van der Weerd



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 786913. This document reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains.
<https://doi.org/10.2790/786913>



EAFS - June 2022

VALIDATION

Technical



Operational



SAMPLING



Tapes Lifts

Collect many traces (fiber, shard, blood...)



Tape System

Tape will be applied to a backing to preserve the traces



ROI definition

Definition of the region of interest

EXPERIMENT



Set parameters



Start an acquisition

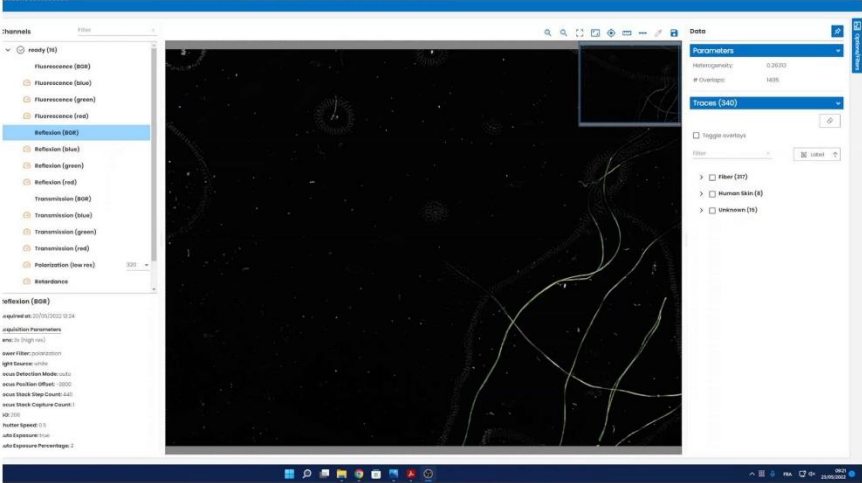


Analyse Result



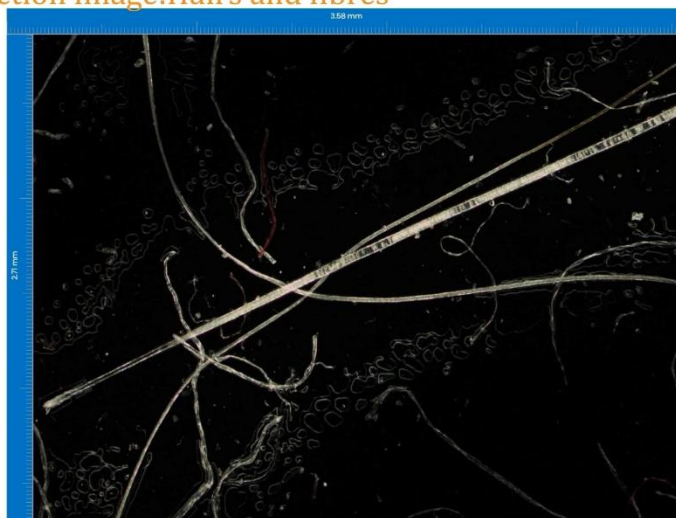
Insertion of the Tape system

ARGOS SOFTWARE





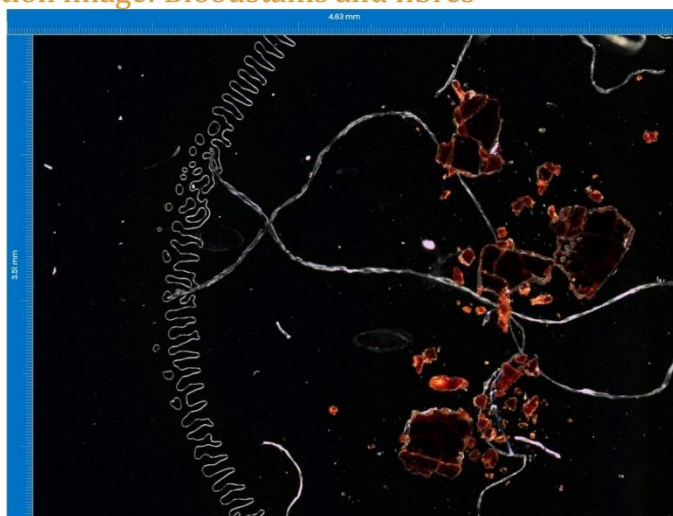
Reflection image:Hairs and fibres



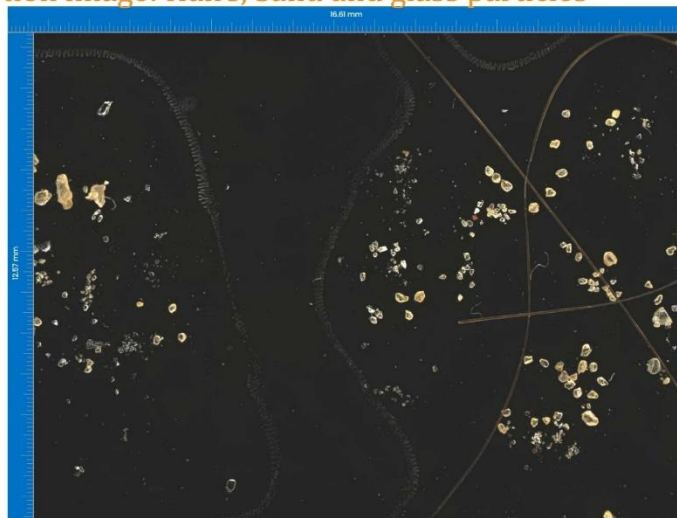
Reflection image: Whool



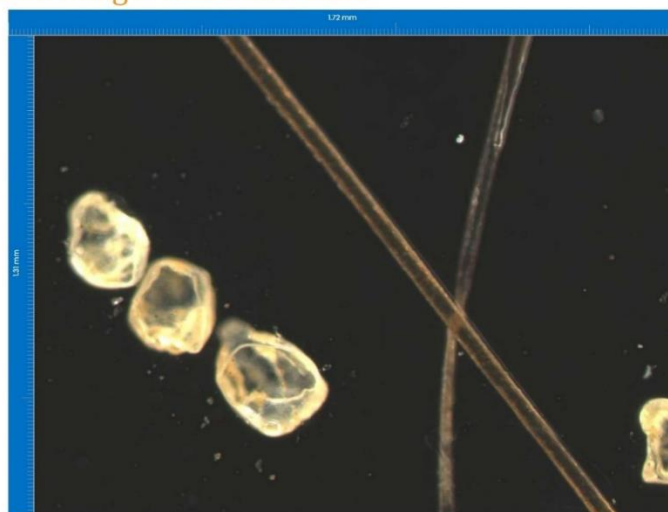
Reflection image: Bloodstains and fibres



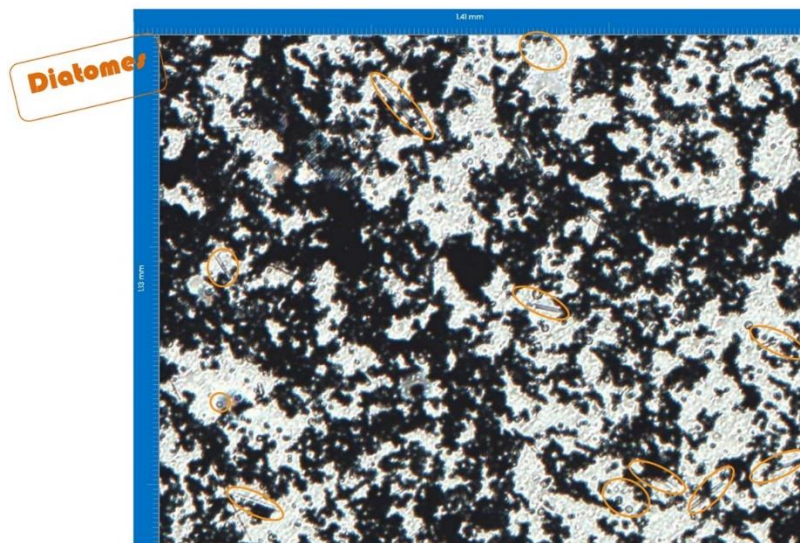
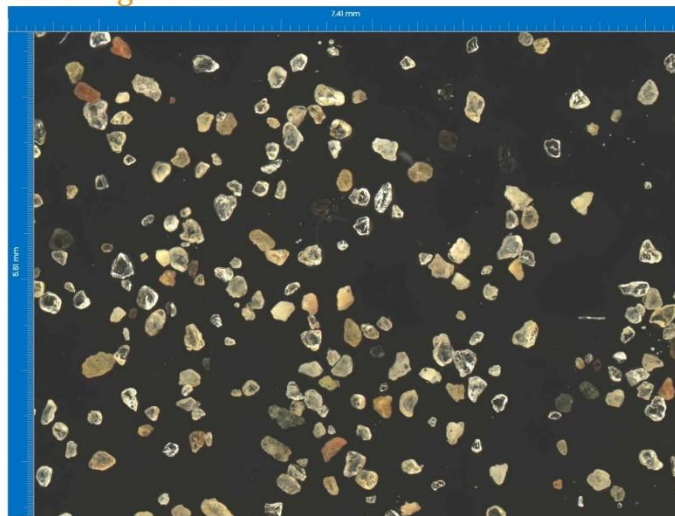
Reflection image: Hairs, Sand and glass particles



Reflection image: Hairs and Sand



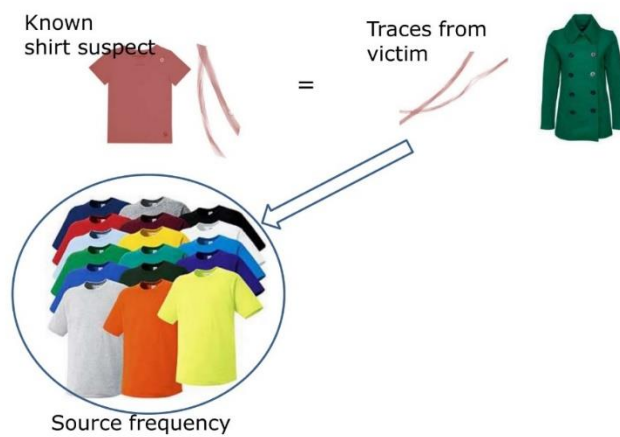
Reflection image: Sand

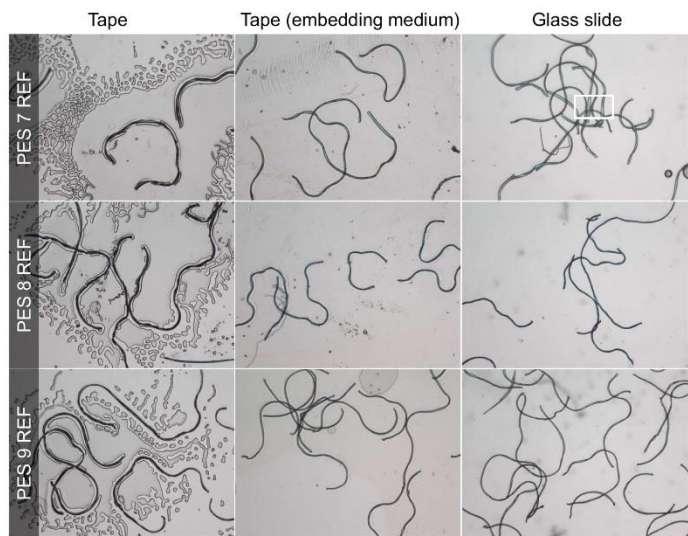


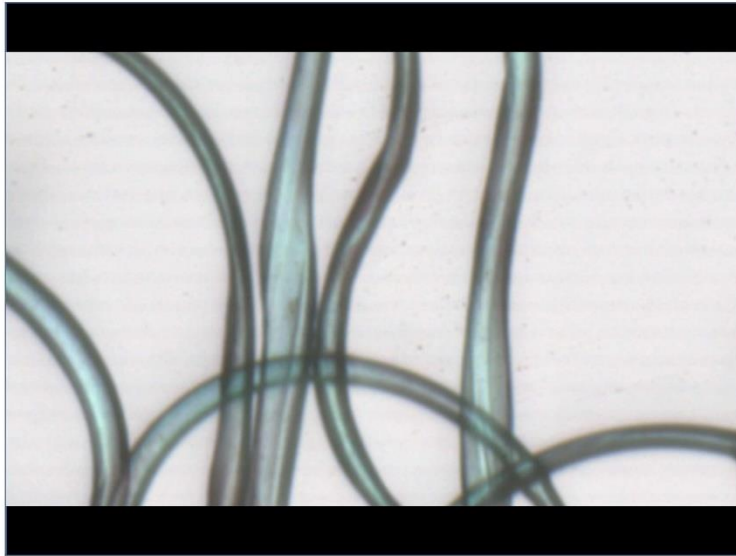
OPERATIONAL VALIDATION

- 1.Colour block study
- 2.Integration of target and population studies
- 3.Smothering study
- 4.Quantification of textile shedding
- 5.Samples taken without tape
- 6.Blood

1. COLOUR BLOCK STUDIES

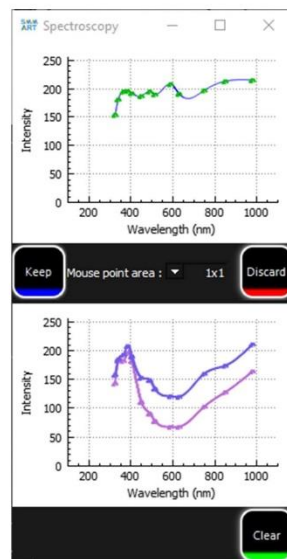




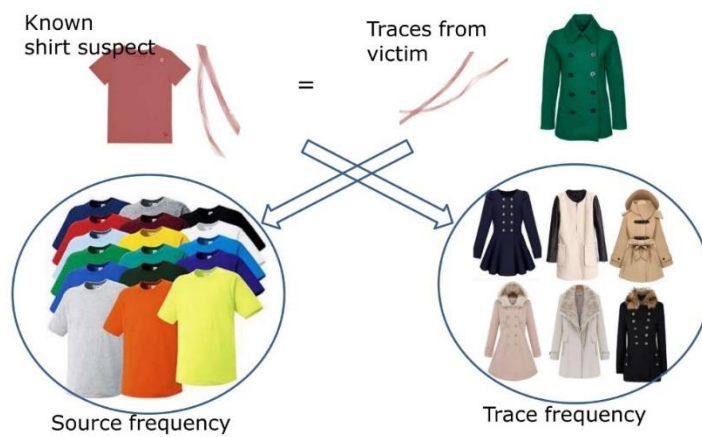


Results



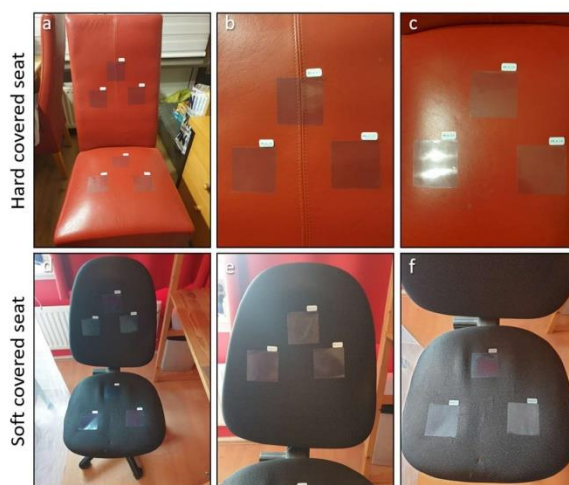


2. TARGET AND POPULATION STUDIES

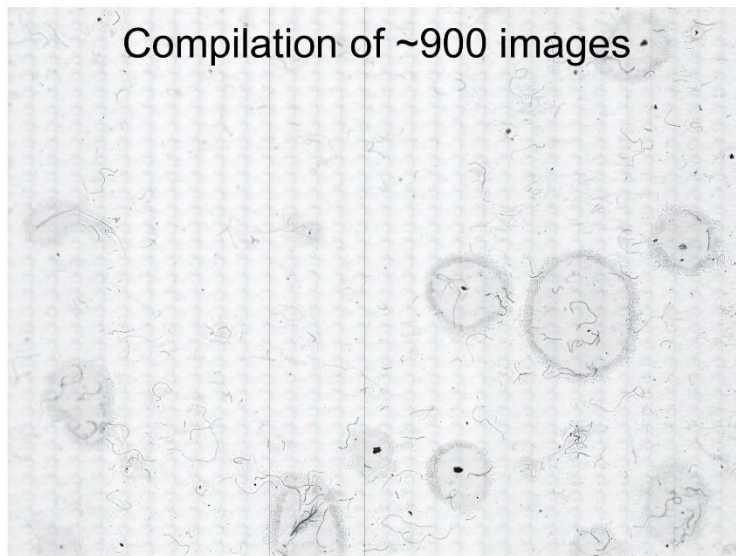
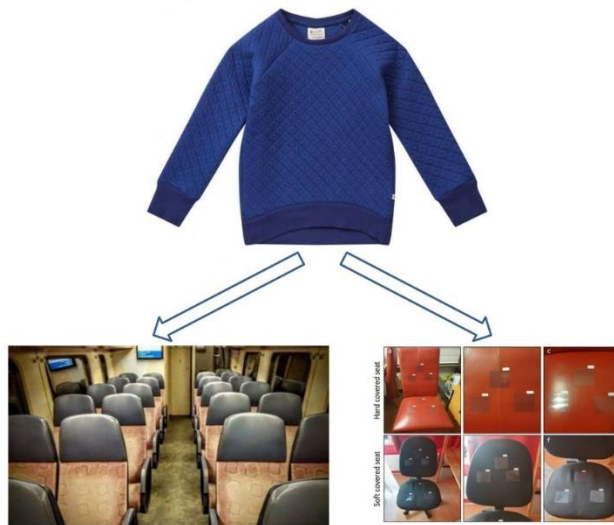




Public transport seats



Domestic seats



3. TRANSFER DURING SMOTHERING

Transfer tests



Background

Early morning

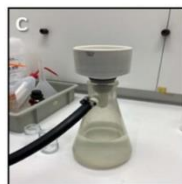


Daytime

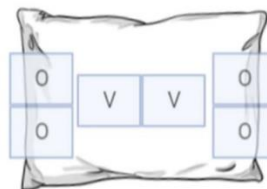


3. TRANSFER DURING SMOTHERING

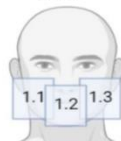
Mouth



Cushion

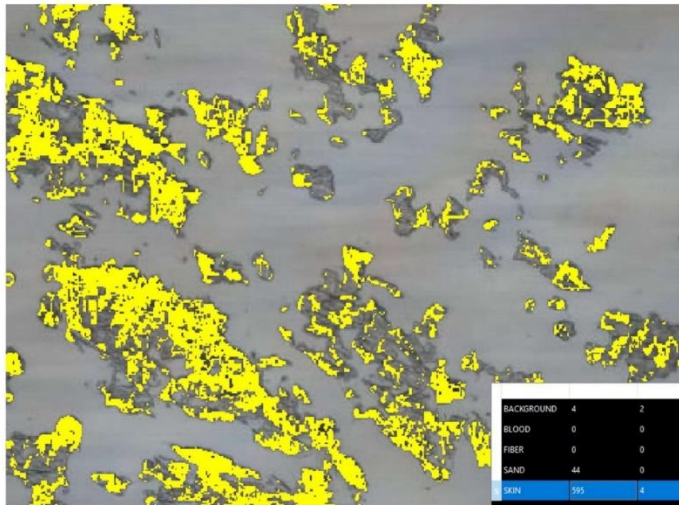


Face



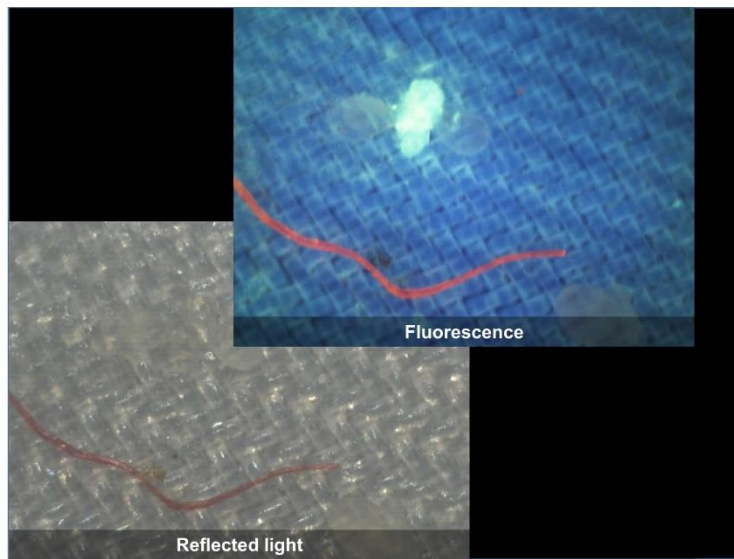
Schnegg M, Turchany M, Deviterne M, et al. A preliminary investigation of textile fibers in smothering scenarios and alternative legitimate activities. *Forensic Science International*. 2017 Oct;279:165-176. DOI: 10.1016/j.forsciint.2017.08.020. PMID: 28886411.

DETECT SKIN CELLS



Filter: ~900 images

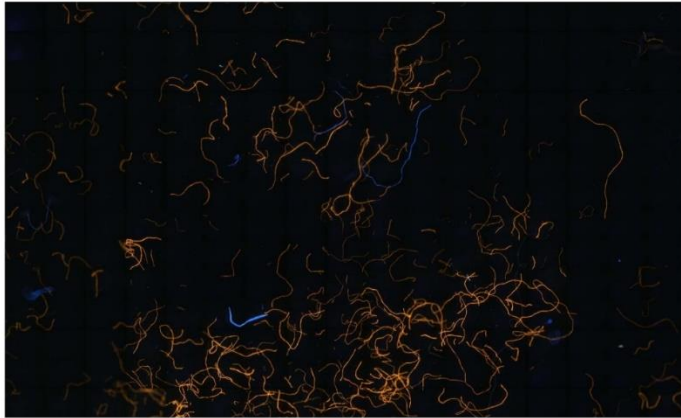




4. QUANTIFYING TEXTILE SHEDDING



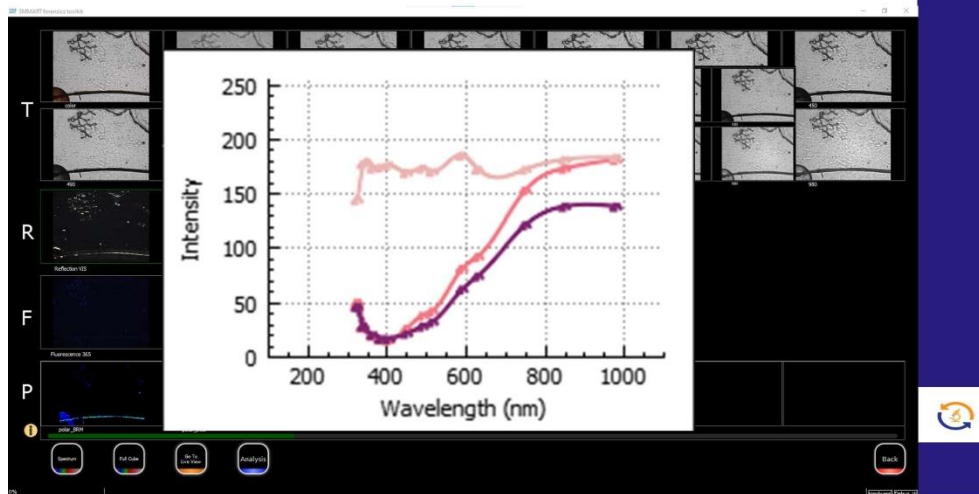
4. QUANTIFYING TEXTILE SHEDDING



5. BLOOD



5. BLOOD



6. SAMPLES TAKEN WITHOUT TAPE LIFT



Have a peek on the toolkit?

Go to Stand #32 & #37

More information on SHUTTLE PCP

Come to our workshop !

Project Management Office (ARTTIC)
shuttle-sec09-arttic@eurtd.com
SHUTTLE project website:
www.shuttle-pcp.eu



Thank you



Scientific High-throughput and Unified Toolkit for
Trace analysis by forensic Laboratories in Europe

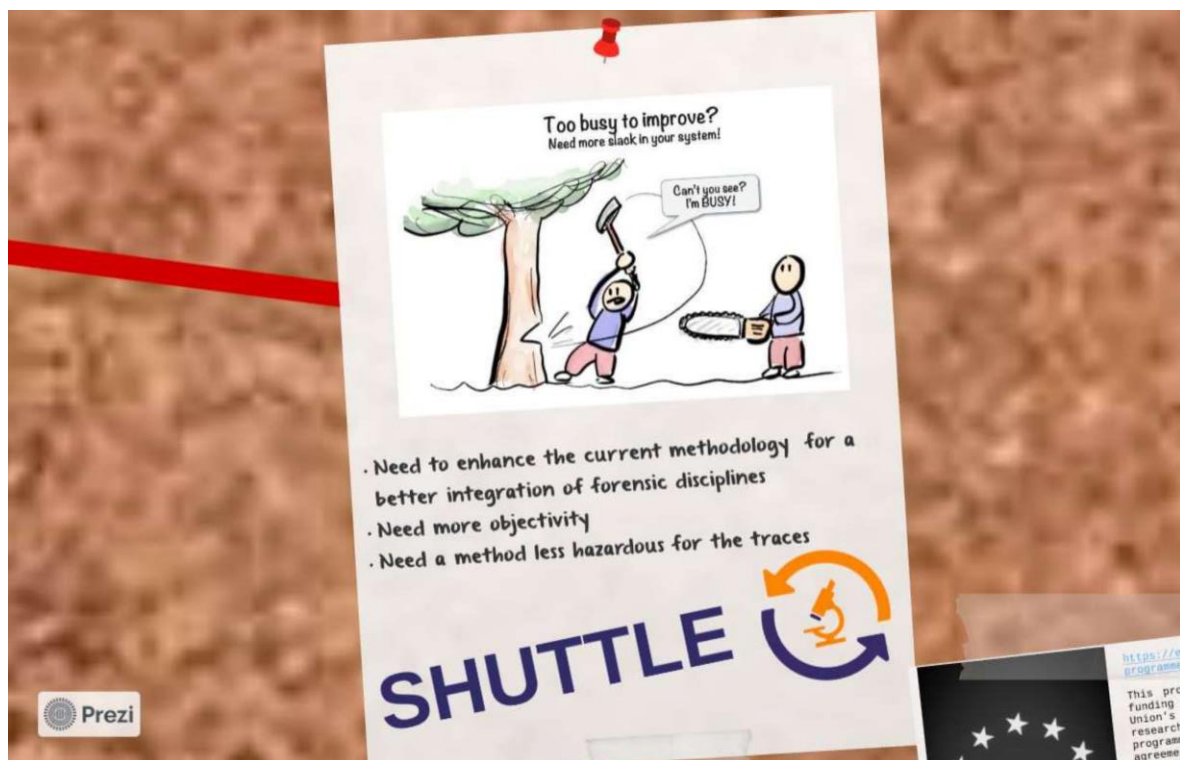
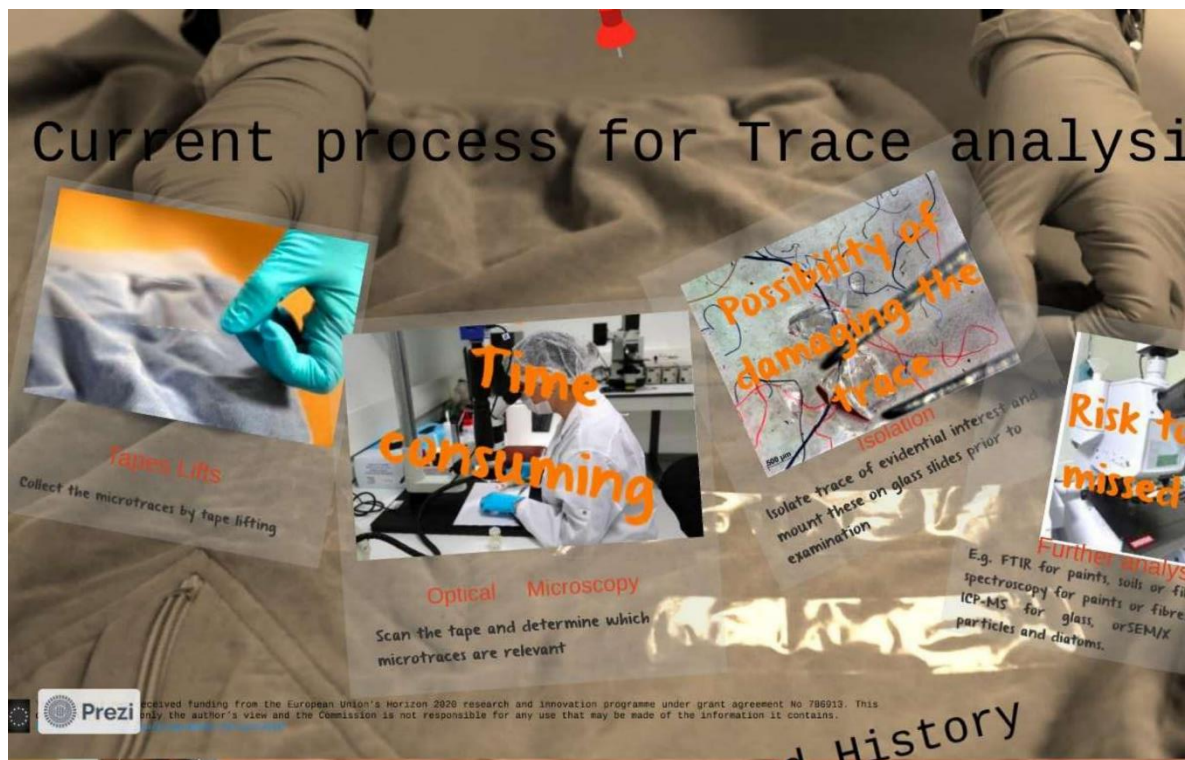


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<http://eur-lex.europa.eu/legal-content/en/legislation/horizon2020/>


5.2 Project overview by Sophia Berkani (MININT-IRCGN)

The image shows the title slide of a presentation. At the top, the word "SHUTTLE" is written in a large, bold, dark blue sans-serif font. To its right is a logo consisting of a stylized orange microscope with a blue circular arrow around it, indicating a cycle or process. Below this, the title "An European Toolkit for microtrace analysis" is written in a large, blue, sans-serif font. Underneath the title, the words "SHUTTLE CONSORTIUM" are written in a smaller, black, sans-serif font. At the bottom of the slide, there is a row of logos for the consortium partners: Horizon 2020, the French Ministry of Justice and Security, the Netherlands Forensic Institute, KeMiA, a stylized blue logo, a police badge, ARTIC, the European Union flag, and Hogeschool van Amsterdam. A small "Prezi" logo is visible in the bottom left corner of the slide.

[illegible]




SHUTTLE?




Scientific
High-throughput
Unified
Toolkit for
Trace analysis by forensic
Laboratories in
Europe


Financed by the H2020 program, eight European forensics laboratories and institutions have teamed up to develop a toolkit, which will render more objective and scientific the trace analysis.



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<https://ec.europa.eu/programmes/horizon2020>




Tapes Lifts




Optimized tape that can be directly use with the toolkit.

Automated microscope



Acquire images of traces, do spectrometric colour analysis as well as a number of illumination modes.


Image processing



Algorithms will process the image acquired and classify the different types of traces present.


Data acquired can be related to data acquired by other techniques.


Database and search algorithms



Search algorithms allow searches for similar samples in the database.

Pattern recognition procedures





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<https://ec.europa.eu/programmes/horizon2020>

SHUTTLE




- Make a powerful and versatile toolkit which solve the major issues in forensic sciences.
- Improve the information exchange and the synergy between different criminal research laboratories to fight against international crime.

GET INVOLVED!

Project Management Office (ARTTIC)
shuttle-eu07-ar11x@eur-bl.eu

SHUTTLE project website:
www.shuttle-pg.eu





INVESTIGATION BOARD

Fictional Case
 October 10th, 2017, 11:40 pm
 Reptone Clonista's identity view

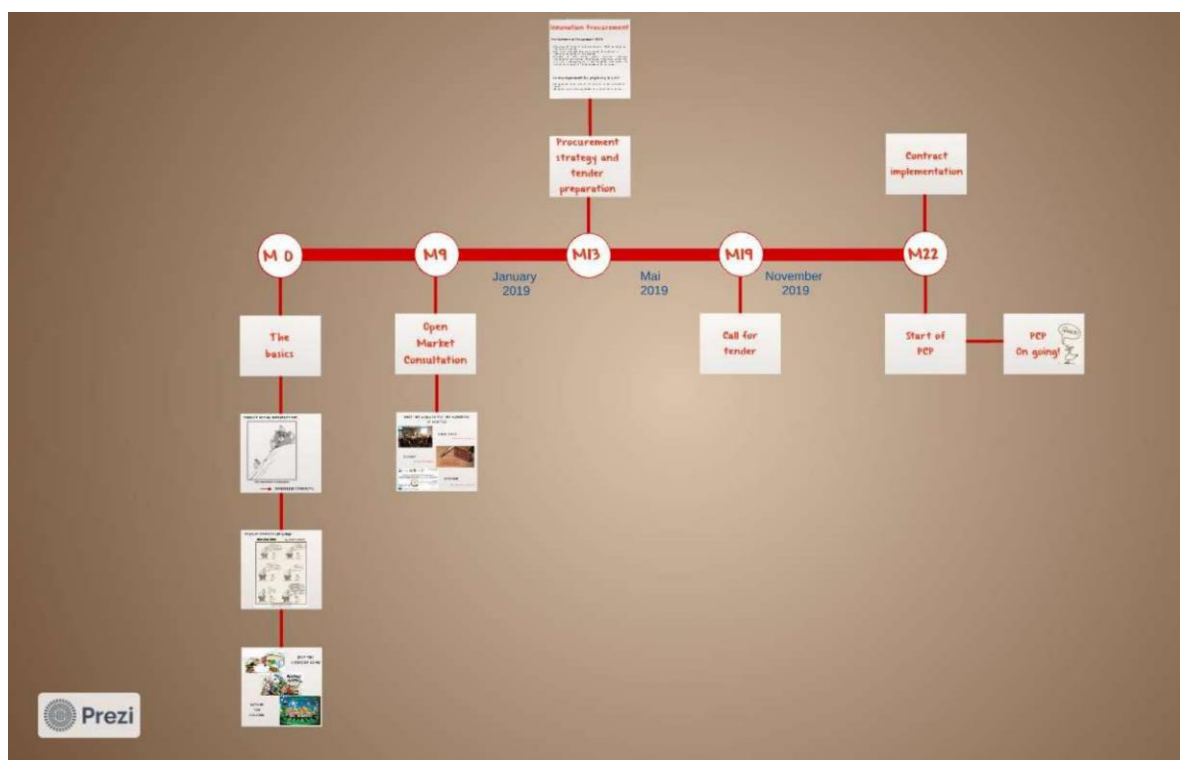
Collection of Trace Evidence
 - Tape Lifting -
 Efficient but non-selective!

Microtrace!
 It's useful with all the crime scenes of its ability to find all the traces of the crime scene. It's a powerful tool for forensic analysis. It's a powerful tool for forensic analysis. It's a powerful tool for forensic analysis.

SHUTTLE




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5.3 AG SHUTTLE Jena Toolkit presentation by the AG SHUTTLE Toolkit Jena consortium coordinator Dr. Roland Kilper (aura optik)



Scientific High-throughput and Unified Toolkit for Trace analysis by forensic Laboratories in Europe

Introduction to the solution of the AG SHUTTLE Toolkit Jena
A. Kleiber, R. Kilper, T. Bauer, M. Spitzer







This project was Funded by the European Union's Horizon 2020 research and innovation program under grant agreement No. 786913.

2th June 2022

EAFS, Stockholm

1

2th June 2022

EAFS, Stockholm

2

Optic concept
Mechanical design and assembly
Image processing





OPTIMAL SYSTEMS
A KYOCERA GROUP COMPANY

Web UI
Image Processing
Data Management
Database

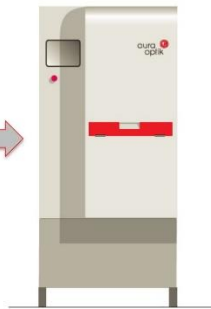
Image segmentation
Classification models
Artificial intelligence



Workflow approach



trace collection



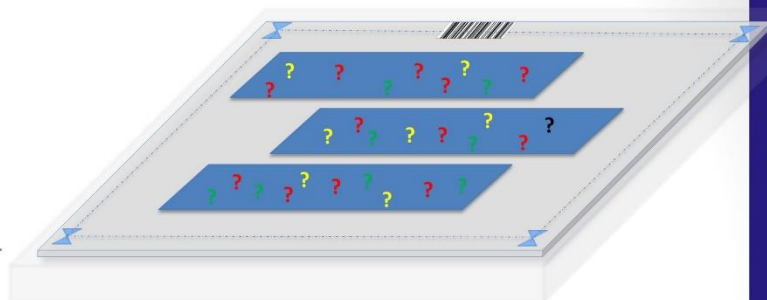
high-throughput
trace analysis



fine-structure
analysis

Challenges

- Large scanning area
 - Time issue
- Unknown traces
 - „One fits all“ parameter
- Multimode imaging
 - Reflection, Transmission, Fluoreszenz, Spectral, Polarisation
- Fully automated classification
 - Autofocus, Autoexposure, Image alignment, Depth of focus, AI
- Userinterface
 - Intuitive
- Content management



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3

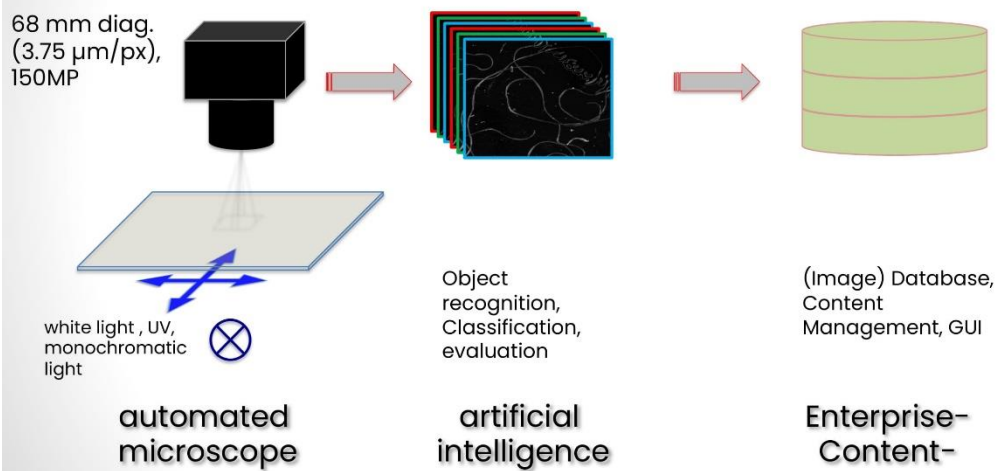
2th June 2022

EAFS, Stockholm

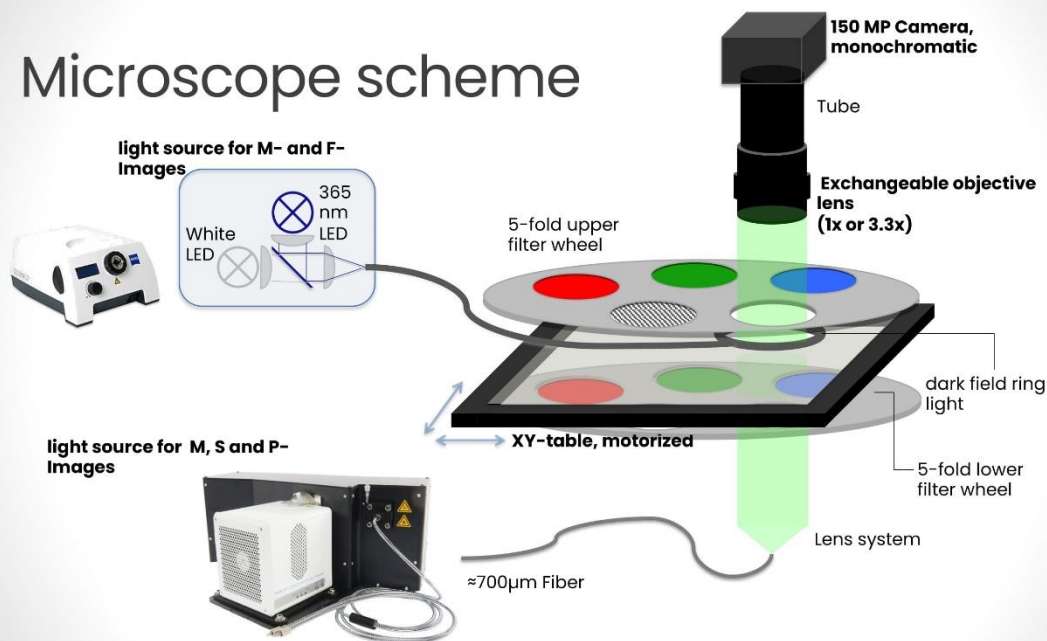


4

Image based approach



Microscope scheme

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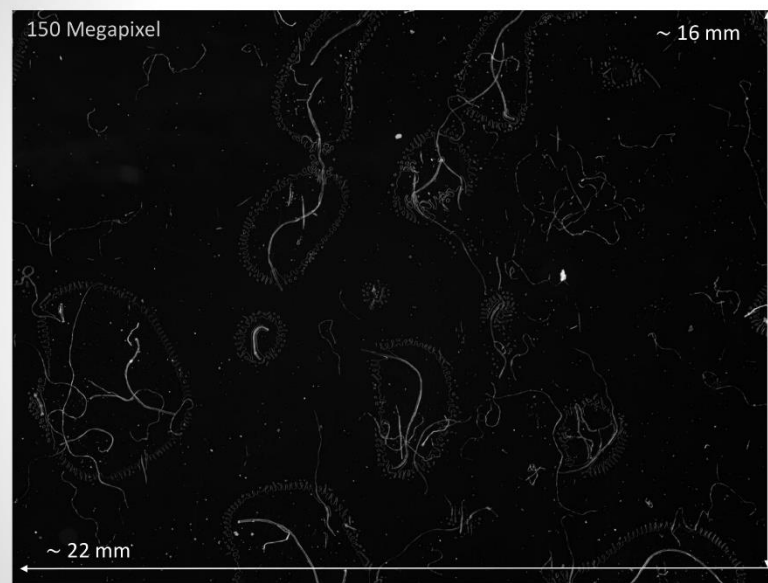
5

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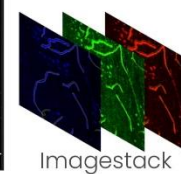
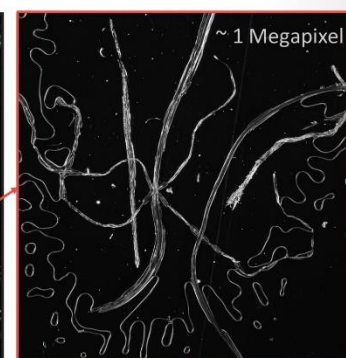
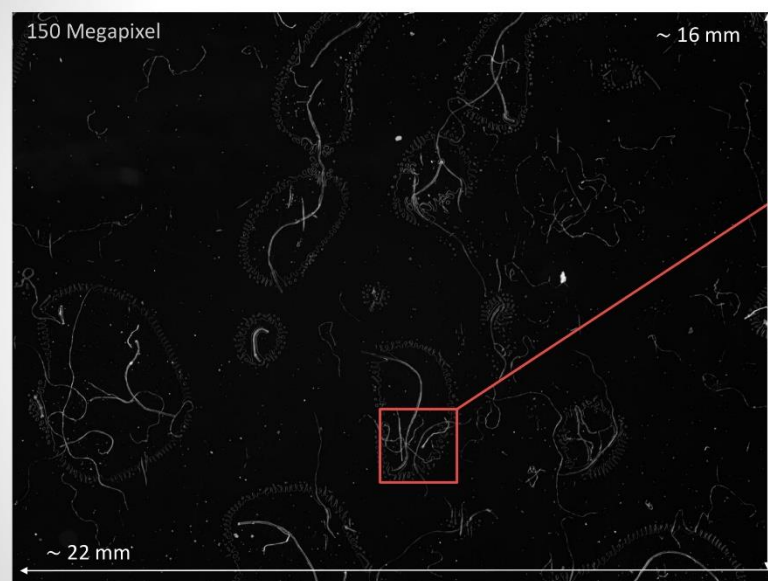
6

**Requirement :**

- Detail on 10 μm sized particles

Implementation:

- $\sim 2.5 \mu\text{m}$ opt. resolution
- 3.3x magnification
- Field of view approx. 22 x 16 mm
- Incident light / transmitted light / Dark field



Imagestack

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7

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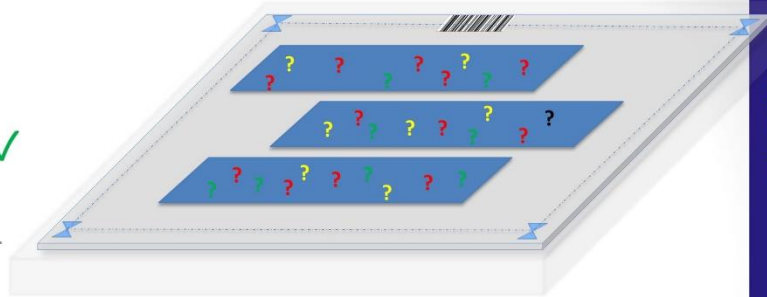
EAFS, Stockholm



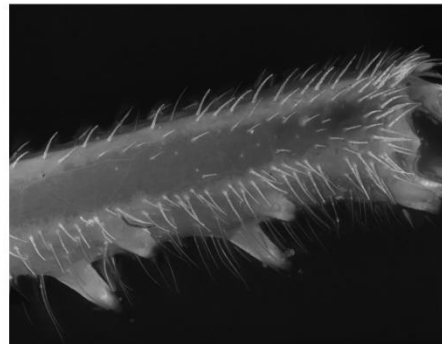
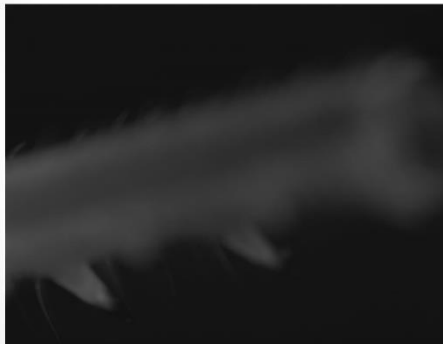
8

Challenges

- Large scanning area ✓
 - Time issue
- Unknown traces
 - „One fits all“ parameter
- Multimode imaging ✓
 - Reflection, Transmission, Fluoreszenz, Spectral, Retardance
- Fully automated classification
 - AUTOFOCUS, AUTOEXPOSURE, IMAGE ALIGNMENT, DEPTH OF FOCUS, AI
- Userinterface
 - Intuitive
- Content management



Extended depth of focus

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9

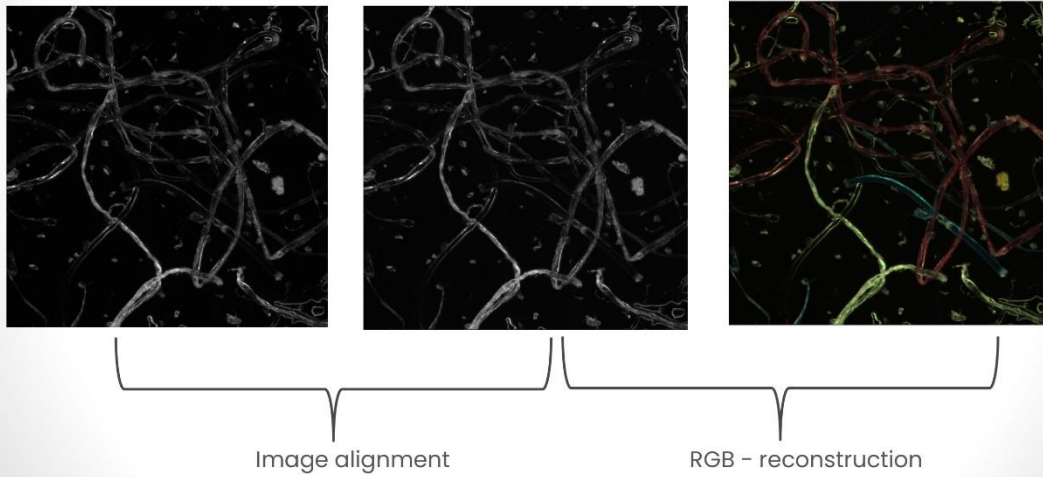
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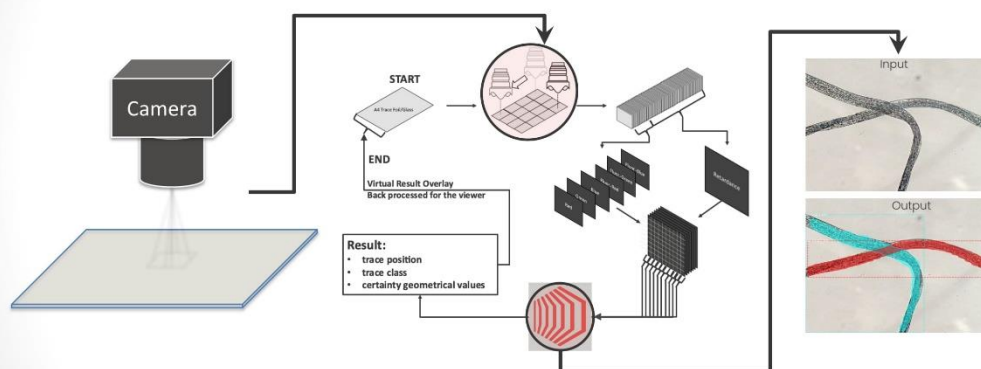


10

IMAGE ALIGNMENT



AI - Concept

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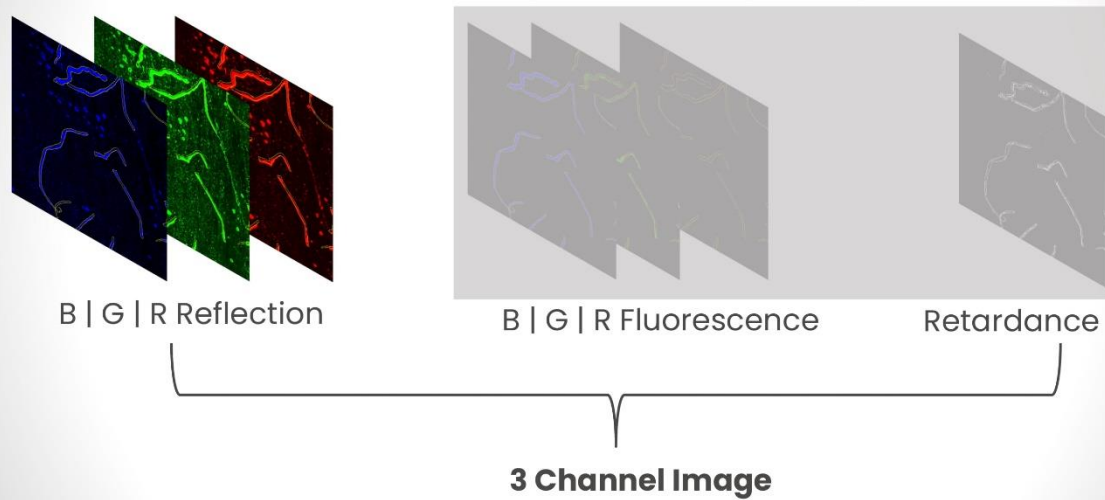
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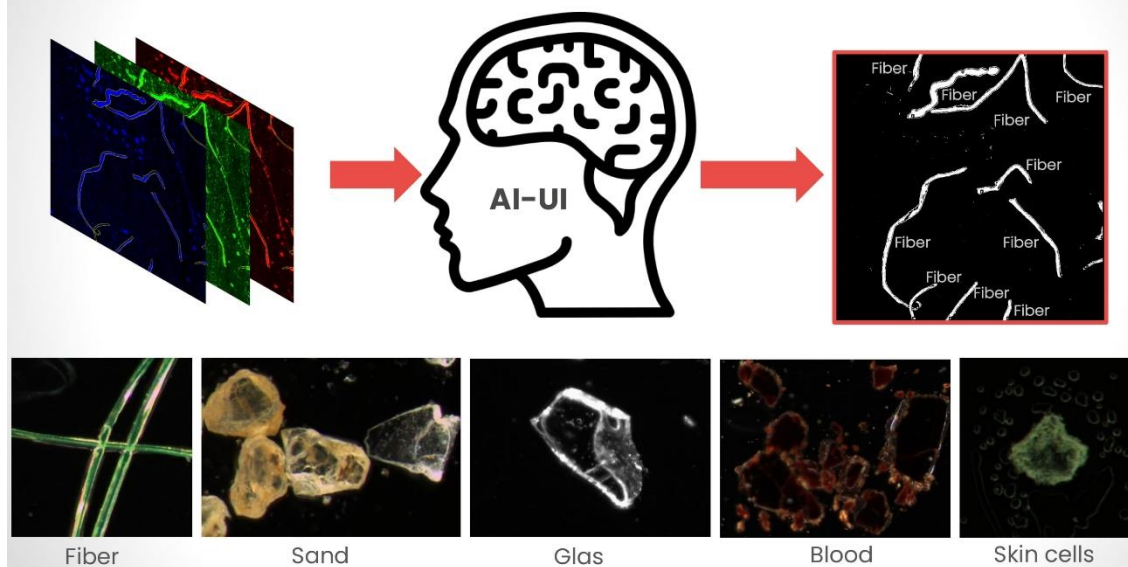


12

AI – Concept



AI – Concept

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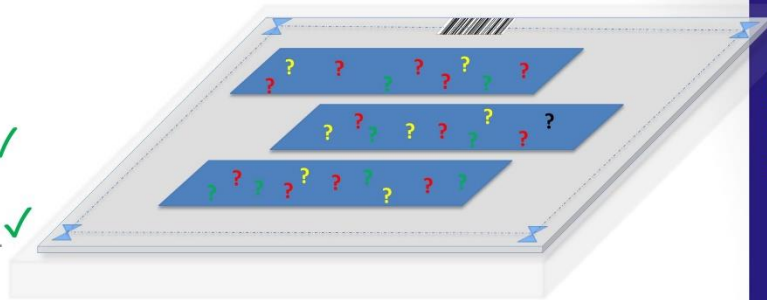
EAFS, Stockholm



14

Challenges

- Large scanning area ✓
 - Time issue
- Unknown traces ✓
 - „One fits all“ parameter
- Multimode imaging ✓
 - Reflection, Transmission, Fluorescence, Spectral, Retardance ✓
- Fully automated classification ✓
 - AUTOFOCUS, AUTOEXPOSURE, IMAGE ALIGNMENT, DEPTH OF FOCUS, AI ✓
- Userinterface
 - Intuitive
- Content management

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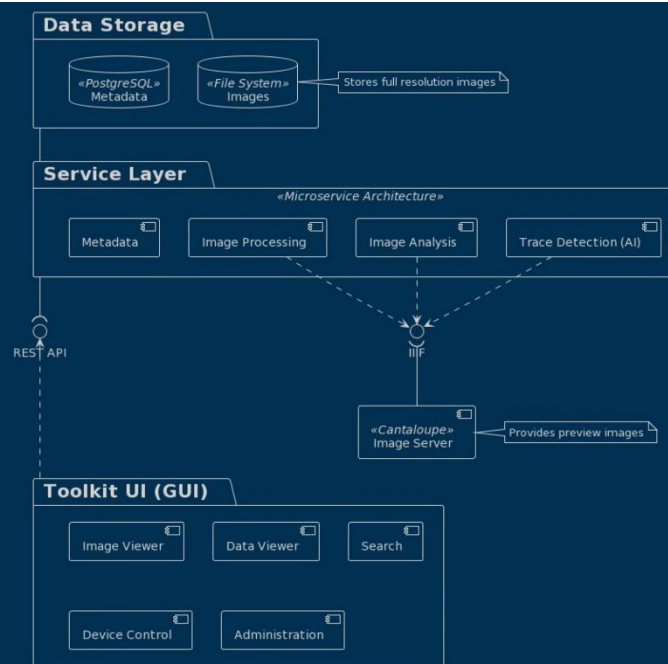
15

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Acquisition

Overview

Captured images

Configuration

Data

Settings

Multiplace-Demo

Status: finished, ran from 1.6.2022, 10:22:48 - 1.8.2022, 10:32:50, executed by admin

Back to acquisitions

Options

General data

Acquisition templates

Transmission ROE

HR Complete

high resolution

low resolution

fluorescence ROE

reflexion ROE

Analysis modes

Fluorescence (blue)

Fluorescence (green)

Fluorescence (red)

Polarization (high res)

Polarization (low res)

Reflexion (blue)

Reflexion (green)

Reflexion (red)

Spectral (high res)

Spectral (low res)

Transmission (blue)

Transmission (green)

Transmission (red)

Analysis mode order

Reflexion (red) > Fluorescence (red) > Reflexion (green) > Fluorescence (green) > Reflexion (blue) > Fluorescence (blue)

Clear all

List of trace carriers

Add loaded trace carriers

Add trace carrier

100000000014 - finished

Select used model

SGD_model_PSPnet5

Add region of interest to acquire

Coordinates: 79872, 81920 -> 93184, 92160 (6, 8)

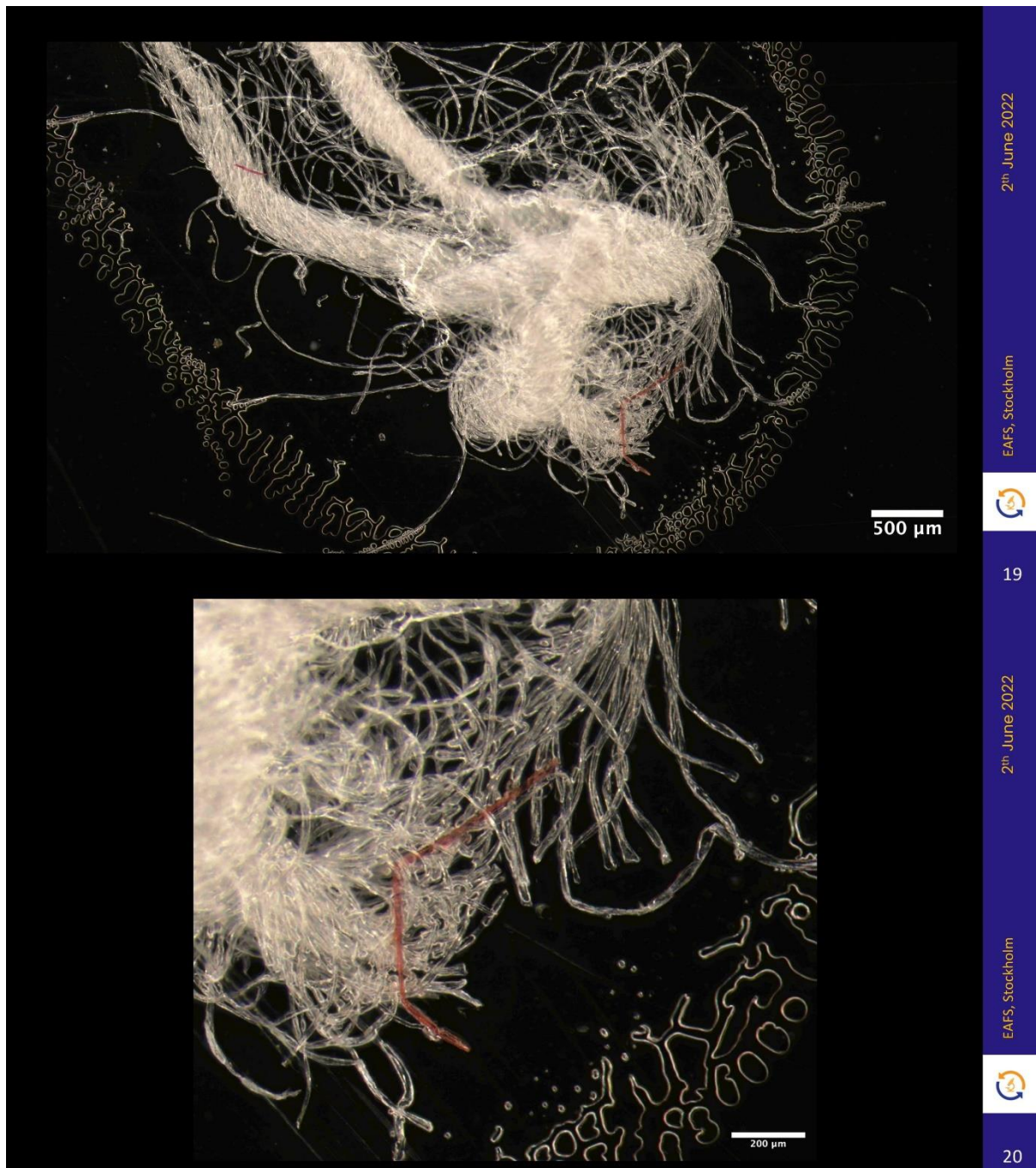
17

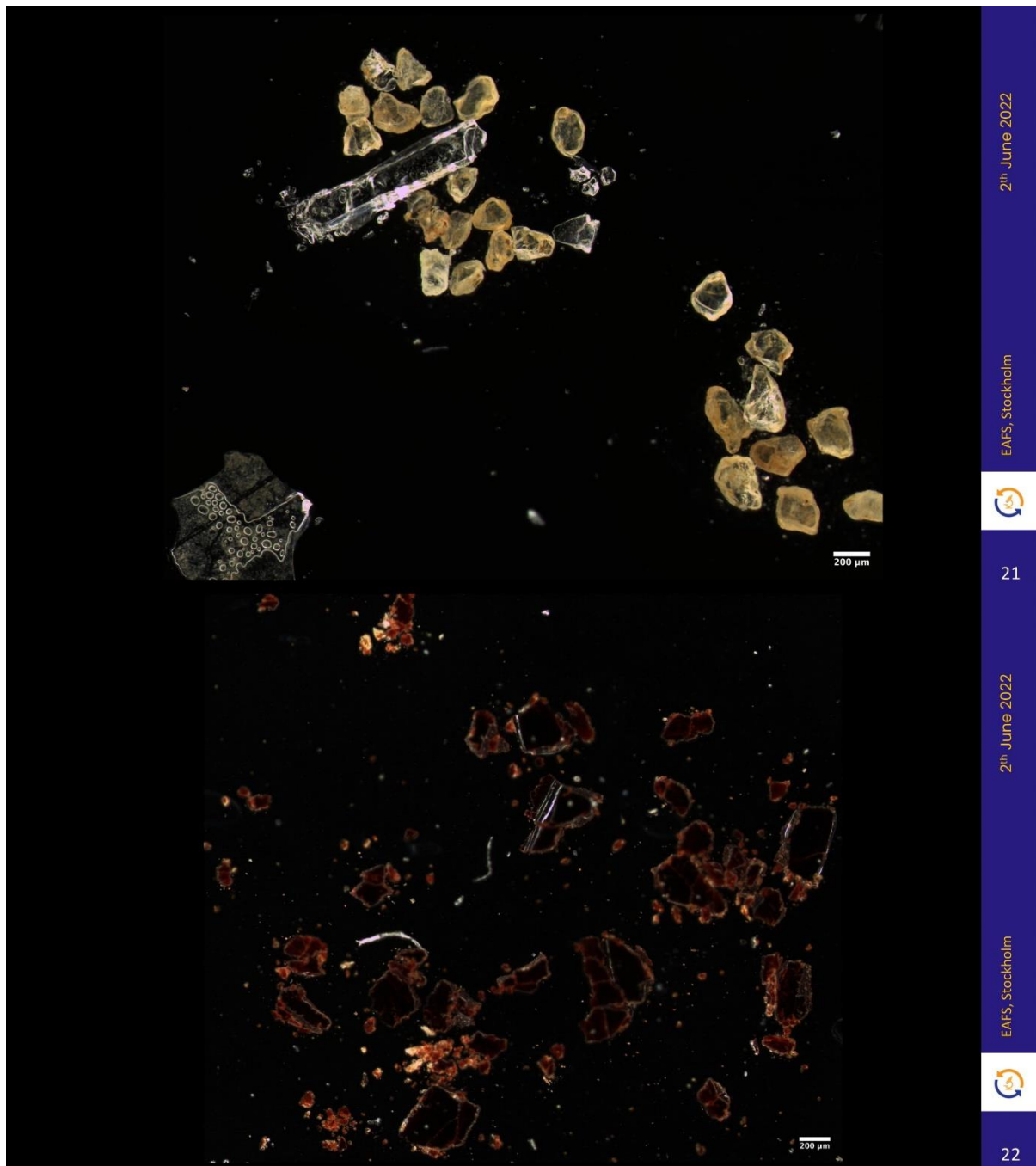
2th June 2022

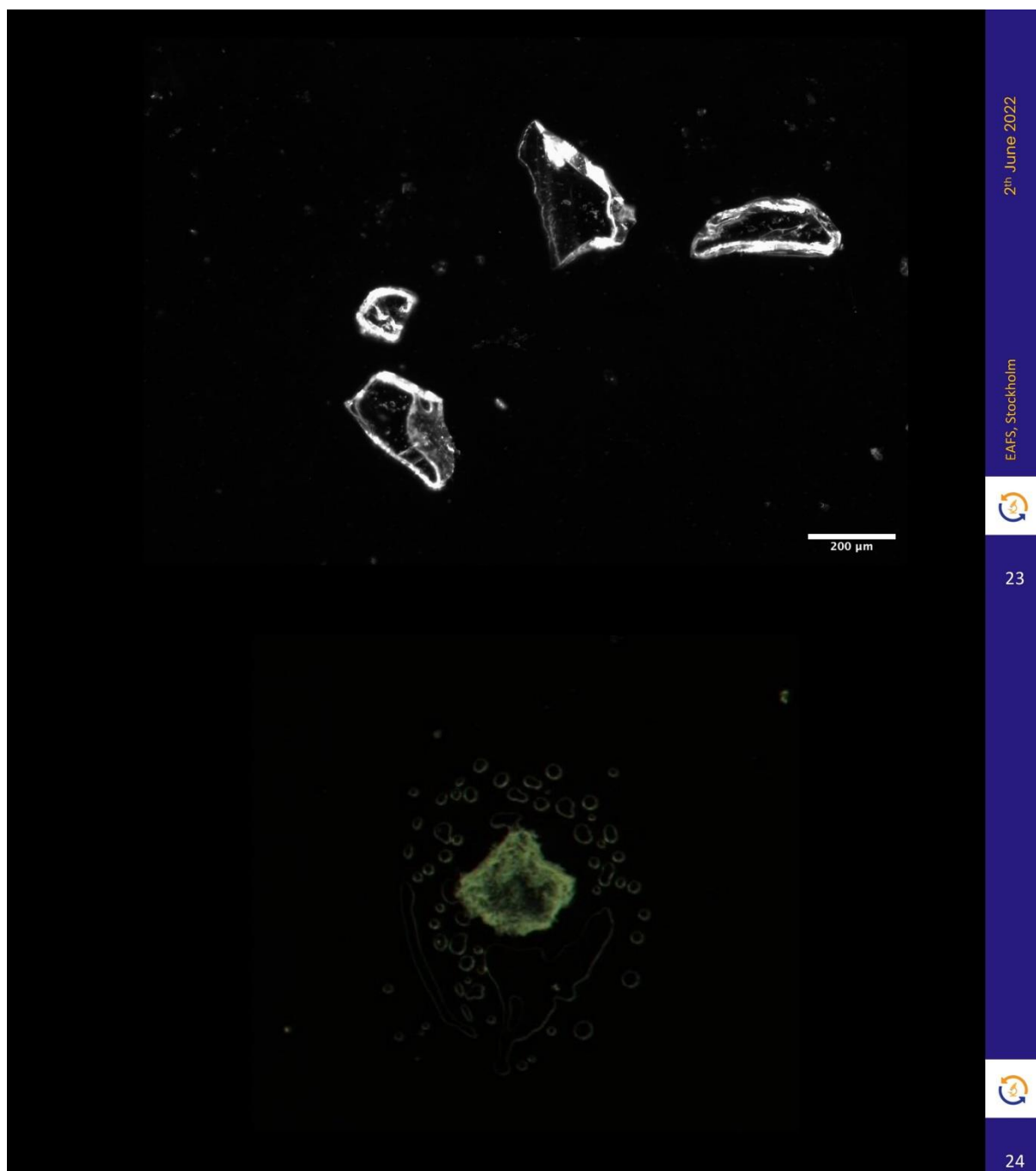
EAFS, Stockholm

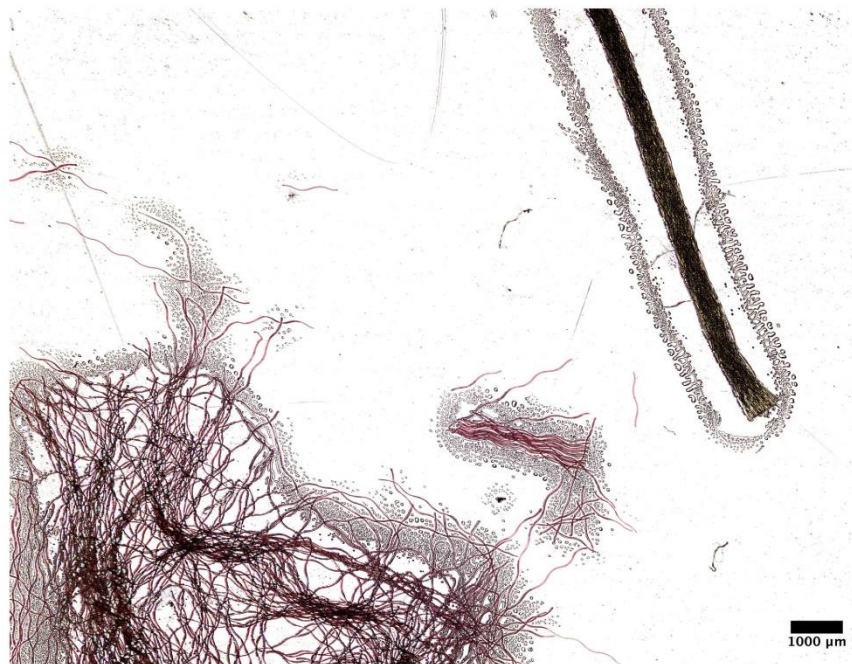
18



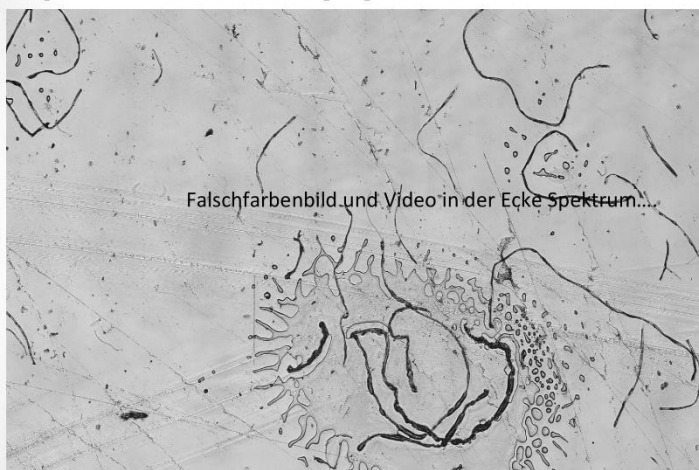








Spectroscopy



Baumwolle hellrot, Transmission bei 430 nm

Falschfarbenbild und Video in der Ecke Spektrum....

Requirement :

- Detection of 10μm particles

Implementation:

- ~ 7.5μm optical resolution;
- 1.0x magnification
- FoV ~ 67 mm
- Transmitted light brightfield
- in the range 320-720
- **41 images = 1 spectrum**

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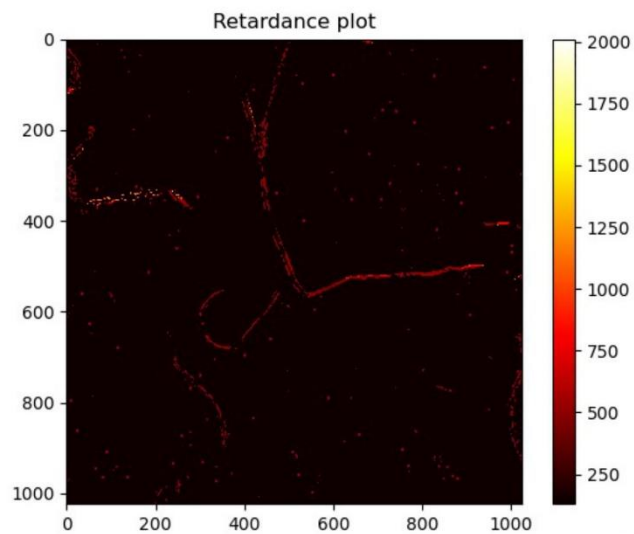
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Polarization

- Difference in birefringence can be determined for each pixel - i.e. also for the whole area



What's next?

- Address Issues learned from SAT
- Optimize concept for spectral and polarisation imaging
- Further AI improvement
- Provide dissection platform

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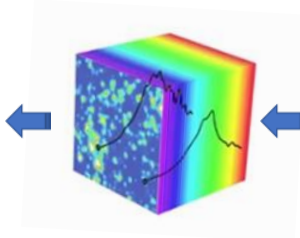
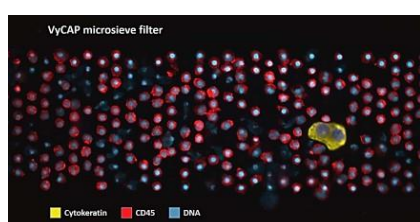


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5.4 TRACES consortium presentation: SMMART forensics toolkit by the Traces consortium coordinator Dr. Costas Balas (Professor at the Technical University of Crete and Founder & CEO of Spectricon)



2



Innovative hyperspectral cameras for high content screening and non destructive analysis
Detection of 5–6 circulating epithelial metastatic cells within billions of blood cells





1

Cybersecurity



Risk Assessment



Intelligence



< >

	Name	Organisation	
Project Leader	Prof. Costas Balas	Spectricon / TUC	
	Charalambos Boras	Spectricon	
	Daniele Cristofori	Zanasi & Partners	
	Davide Mauro Ferrario	Zanasi & Partners	
	Fabio Gilbertini	Zanasi & Partners	
	Graziano Giorgi	Zanasi & Partners	
	Prof. Claire Gwinnett	Spectricon / Staffordshire University	
	Christos Housos	Spectricon	
	Prof. Andrew Jackson	Spectricon / Staffordshire University	
Contributors An interdisciplinary team of 22 highly trained scientists and engineers 3 Professors 5 PhDs	Dr. Nikolaos Kaminakis	Spectricon	
	Dr. Nathanail Kortsalioudakis	Spectricon / TUC	
	Lorenzo Lodi	Zanasi & Partners	
	Dr. Emmanuel Raptakis	Spectricon	
	Christos Rossos	Spectricon	
	Gerasimos Stefatos	Spectricon	
	Panagiotis Takas	Spectricon	
	Athanasios Tsapras	Spectricon	
	Christos Tsiaousis	Spectricon	
	Dr. Panagiotis Tsopelas	Spectricon	
	Giovanni Vassalo	Zanasi & Partners	
	Giulia Venturi	Zanasi & Partners	
	Dr. Alessandro Zanasi	Zanasi & Partners	

The team

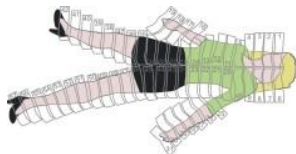
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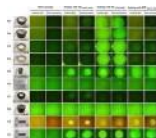
Forensics in Cross Roads

5

Taping bodies or crime scenes to lift traces and material for DNA analysis



+ Tapes collect invisible traces
- Their material is optically "active" interfering with trace optics



+ Large scale taping enriches evidence
- Analysis is subjective, multistep, labor intensive and long lasting



The solution

1. Integrate and overall advance a series of analytic and imaging techniques into a single instrument. Combine automation with machine learning to make large scale tape analysis realistic, transferring routine to machines and speeding up reaction time
2. Develop new, optically neutral trace lifting system

SMART forensics toolkit

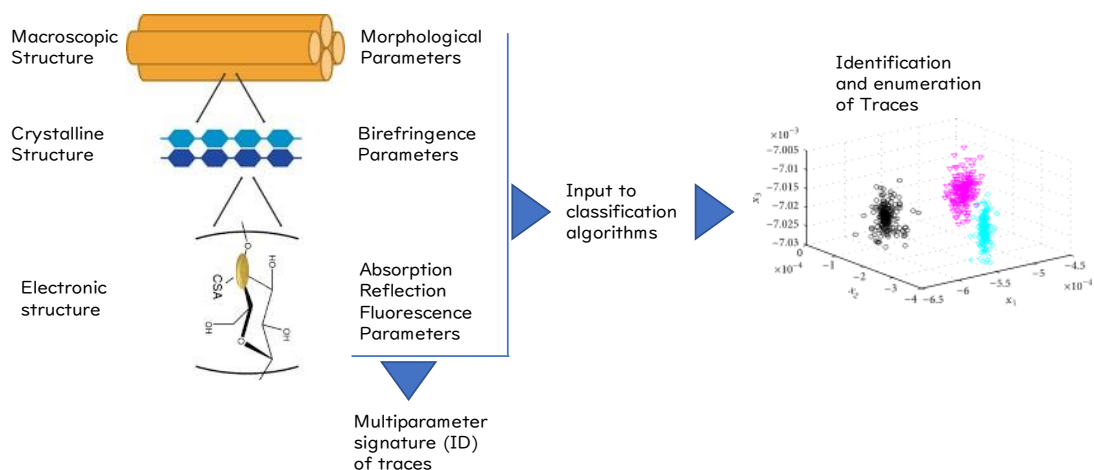
Funded by the European Union

SHUTTLE



Trace Identification Strategy: Multimodal Imaging and Spectroscopy

6



SMART forensics toolkit

Funded by the European Union

SHUTTLE



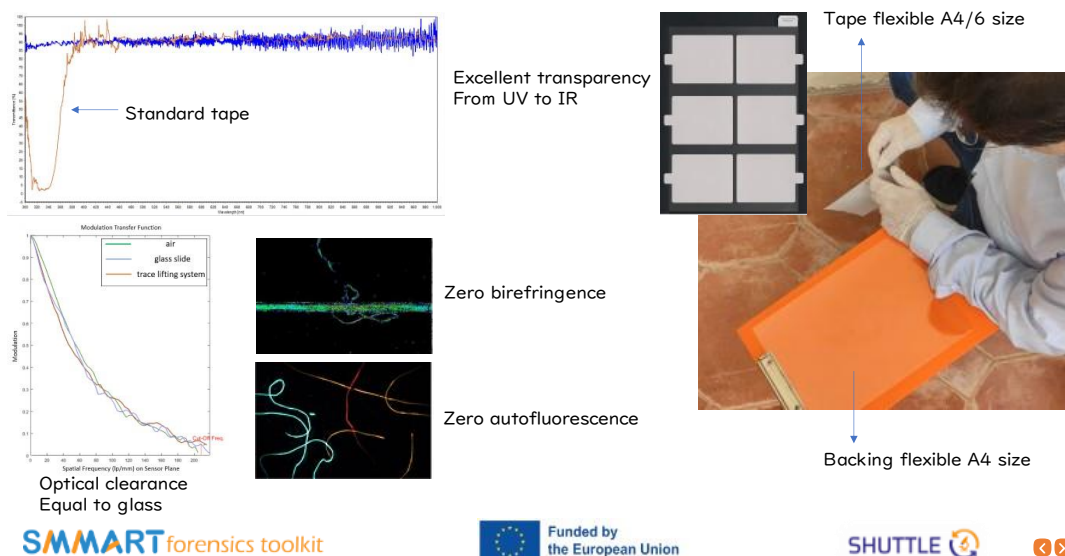
SMMART forensics toolkit

7



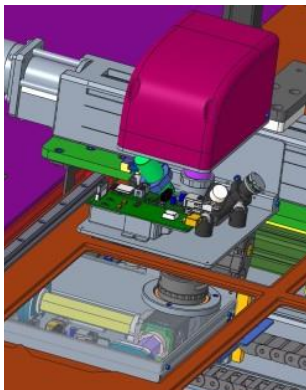
Tool-1: SMMART Trace Lifting Tape-Backing System

8



Tool-2: SMMART-HTS High Throughput Screening Microscope

9



- ▶ Spectral/polar camera
Sensitivity 320- 1100nm
- ▶ White LED, 365nm LED,
405 nm Laser, 450nm Laser
- ▶ Two branch multiplexed LED
source, emission 320- 1000nm



Scans (unsupervised) 4A4 backings or
60X45 cm in a single session

SMART forensics toolkit

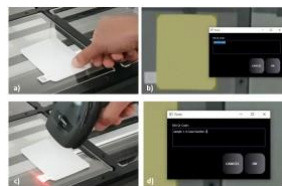


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Tool 2: SMMART-HTS High Throughput Screening Microscope

10



Barcode printing, tape labeling
and scanning before starting
image acquisition



Selecting areas or subareas for
scanning over the overview
image, through a graphical GUI



SMMART-HTS uses no sample feeder and accepts all kind of samples
(glass slides, tapes, raw traces etc.)

SMART forensics toolkit

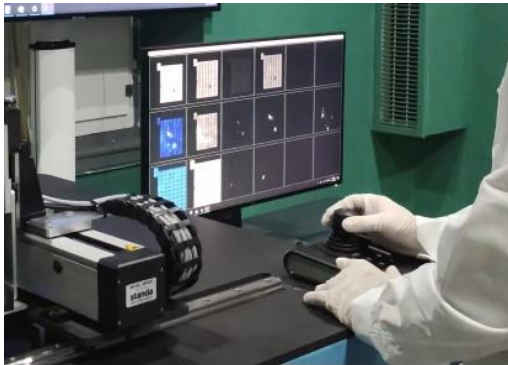


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Tool 2: SMMART-HTS High Throughput Screening Microscope 11

Live multimodal imaging in manual operation



- Joystick driven operation
- Real-time display of all imaging modes
- Random selection of fields for analysis
- Magnification 265X, plus digital zoom
- FOV 3.5 mm, 2448 pixels, 1,43µm/pixel

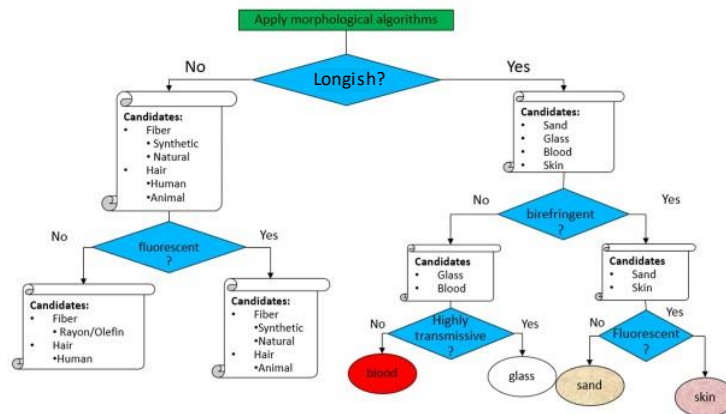


Tool 2: SMMART-HTS High Throughput Screening Microscope 12



Tool 3: SMMART-Analysis SW suite

13



SMMART forensics toolkit

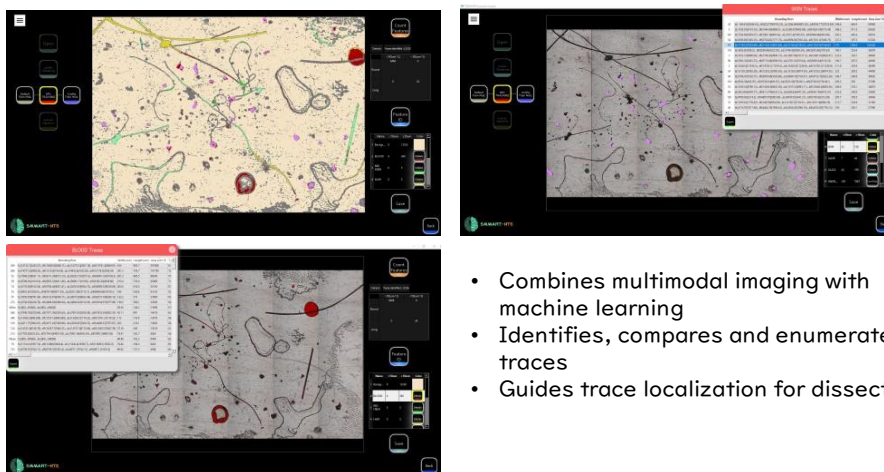
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Tool 3: SMMART-Analysis SW suite

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- Combines multimodal imaging with machine learning
- Identifies, compares and enumerates traces
- Guides trace localization for dissection

SMMART forensics toolkit

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Tool 4: SMMART -DATABASE

15



SMMART forensics toolkit

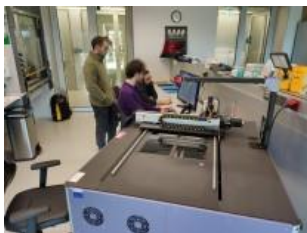
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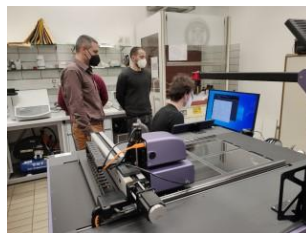


Installations

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NFI



Athens Police



LTEC Vilnius

SMMART forensics toolkit

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New installation in DASA -UK.GOV, UK (September 2022)



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SMMART: a Patented Innovation

- The SMMART forensics toolkit is a patented innovation (PCT/EP2020/082878)
- It stands ready to complement the analytical capital equipment of modern forensics labs
- It is a powerful research tool for developing new methods for increasing the evidential value of traces analysis.
- It collects and triage good quality material for DNA analysis
- It is an easy to use, one-stop and open to customization solution with great potential to make your practice to stand out.



5.5 Phase 3 preliminary results - Tests undertaken and test outcomes presented by Christos Batis (Hellenic Police)



SHUTTLE FINAL WORKSHOP
2ND JUNE 2022

EAFS CONFERENCE
STOCKHOLM, SWEDEN



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PHASE 3
PRELIMINARY RESULTS



TECHNICAL VALIDATION

PHASE III EVALUATION

- Verification of compliance with specifications
- 90 page document with testing protocol
- Samples distributed between partners
- Testing carried out in all six laboratories
- Independent verdict for both contractors

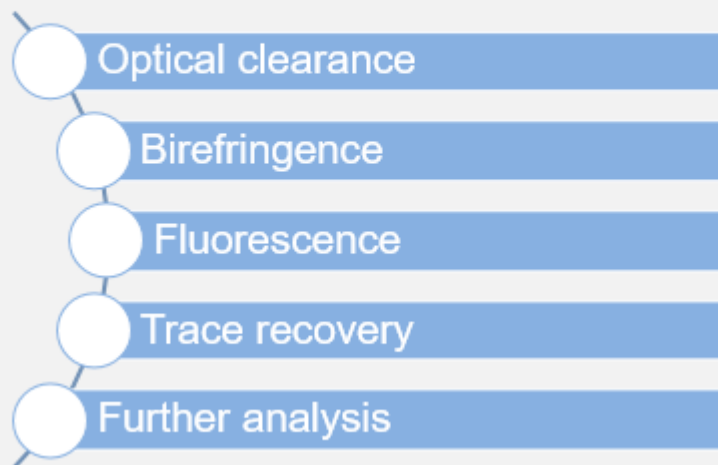


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OBJ1 & OBJ2: EVALUATION TRACES RECOVERY AND FURTHER ANALYSIS OF THEM




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 **OBJ1 & OBJ2: EVALUATION TRACES RECOVERY AND FURTHER ANALYSIS OF THEM**


RED POLYESTER FIBER ON GLASS SLIDE (MICROSCOPE)




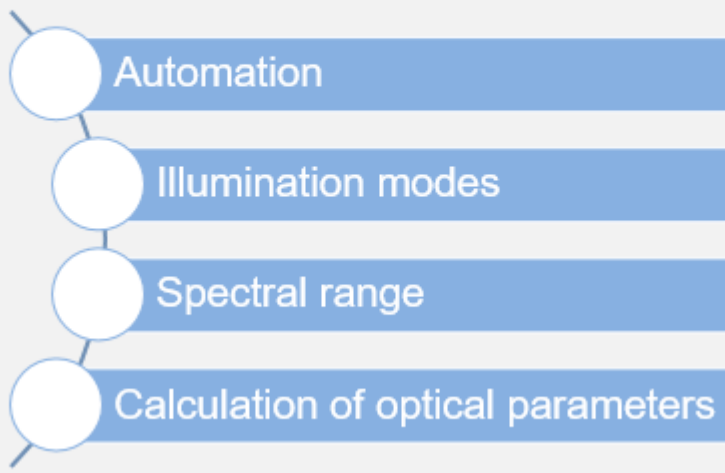
vs

RED POLYESTER FIBER ON TAPE SYSTEM (TOOLKIT)





 **BF** **FLUOR (365nm)** **PLM**

 **OBJ3: EVALUATION OF AUTOMATED MICROSCOPE**

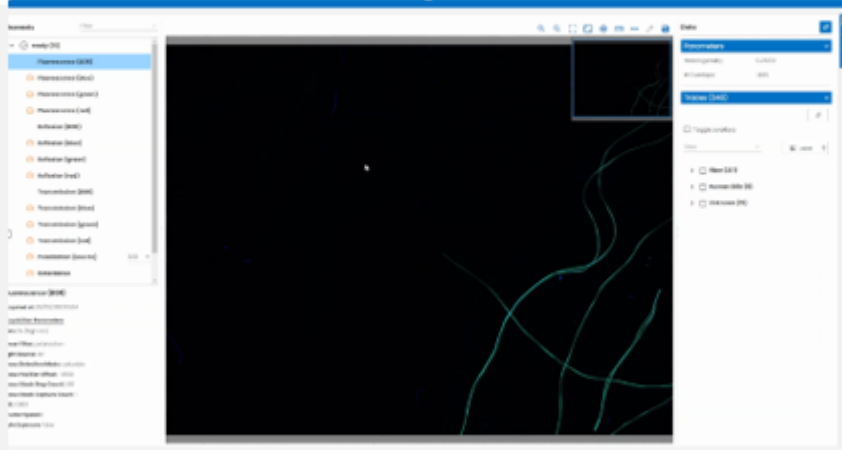



- Automation
- Illumination modes
- Spectral range
- Calculation of optical parameters






OBJ3: EVALUATION OF AUTOMATED MICROSCOPE



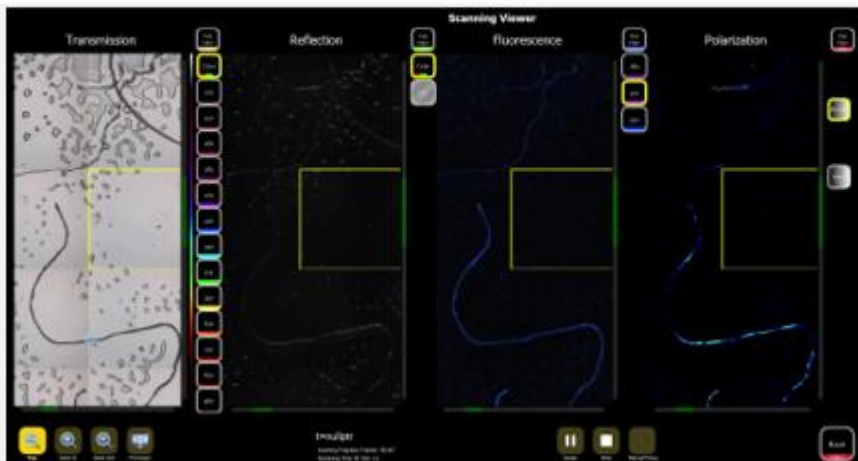



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OBJ3: EVALUATION OF AUTOMATED MICROSCOPE



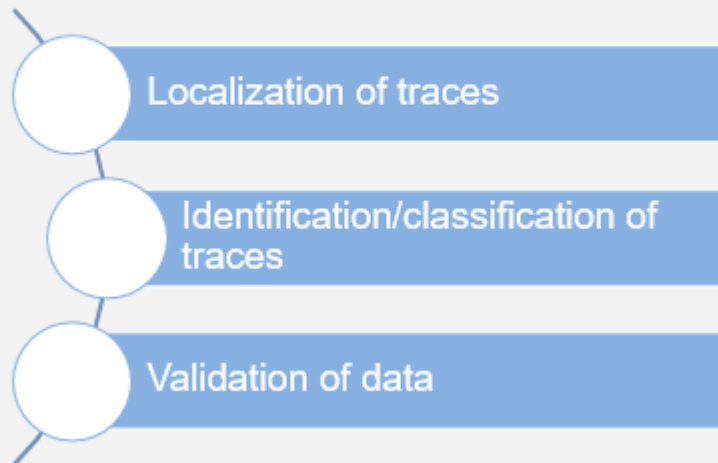


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OBJ4 & OBJ8: EVALUATION OF ALGORITHMS

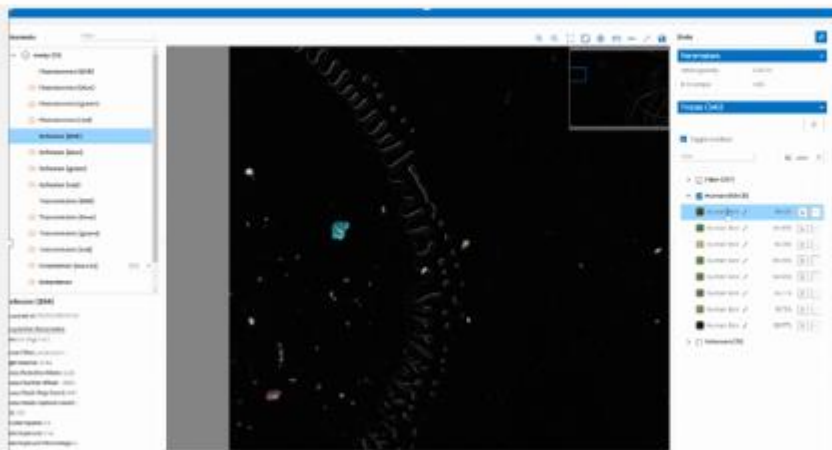


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OBJ4: EVALUATION OF ALGORITHMS

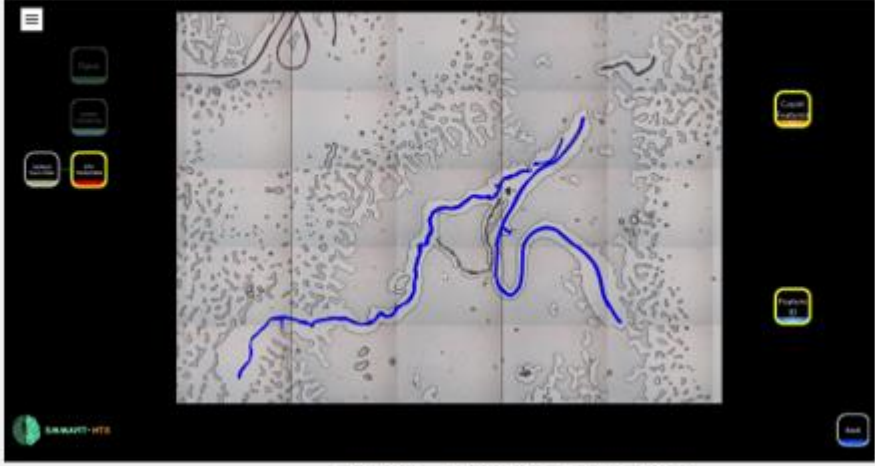


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OBJ4: EVALUATION OF ALGORITHMS

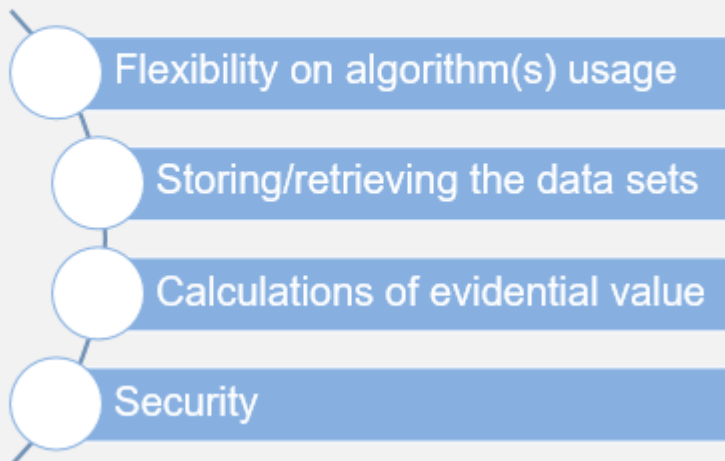


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OBJ5 & OBJ6: EVALUATION OF THE GUI & DATABASE



- Flexibility on algorithm(s) usage
- Storing/retrieving the data sets
- Calculations of evidential value
- Security

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EVALUATION NON-FUNCTIONAL OBJ



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JENA CONSORTIUM TOOLKIT



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TRACES CONSORTIUM TOOLKIT

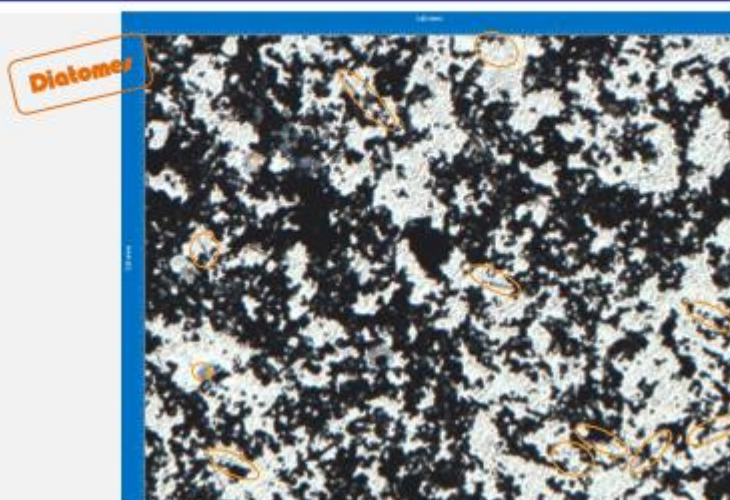


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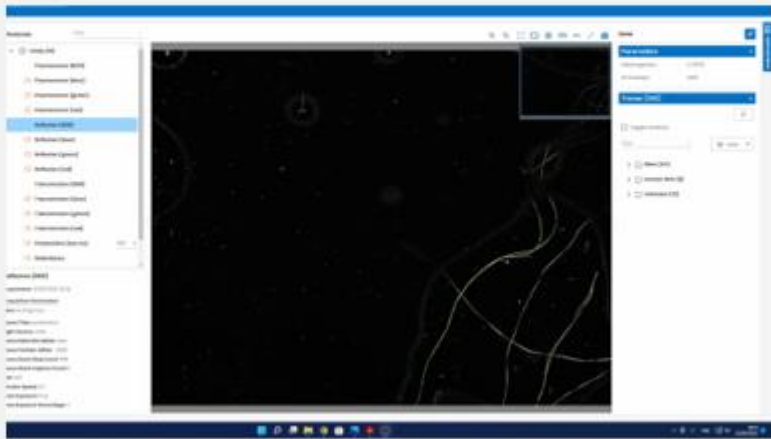
FOR MICROTRACES ONLY?



1




SHORT INTRODUCTION ON GUI

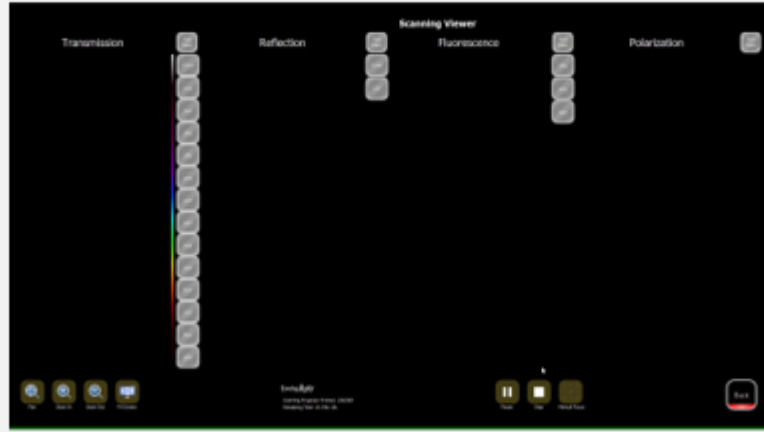


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SHORT INTRODUCTION ON GUI



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