



Flexible and portable XRF mapping solutions for Art and Conservation: Bruker's ELIO and CRONO spectrometers

**Dr. Henning Schroeder
Michele Gironda**

Bruker Nano Analytics

Art & Conservation Series – Part II

Questions and Answers



- If you have questions during this webinar, please **type your questions**, thoughts, or comments in the **Q&A box** and **press Send**.
- We ask for your understanding if we do not have time to discuss all comments and questions within the session.
- Any unanswered questions or comments will be answered and discussed by e-mail or in another Webex session.

A screenshot of a Webex interface. At the top, there is a "Participants" section with a search bar and a list of users: "Panelist: 2" (BNA moder... Host) and "Attendee: Henning Schröder Me". Below this is a "Q&A" section with a "Send" button. The "Q&A" section is currently empty, showing "All (0)". The "Ask:" dropdown menu is set to "Host & Presenter". A text box below the dropdown contains the instruction: "Select a panelist in the Ask menu first and then type your question".

Art & Conservation Series – Part II

Speakers



Dr. Henning Schröder
Product Manager Micro-XRF
Bruker Nano GmbH



Michele Gironda
Market Segment Manager Art & Conservation
Bruker Nano GmbH

Art & Conservation Series – Part II

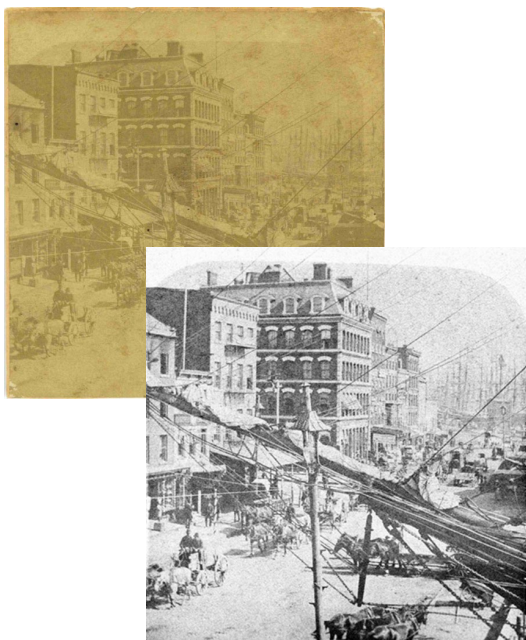
Overview



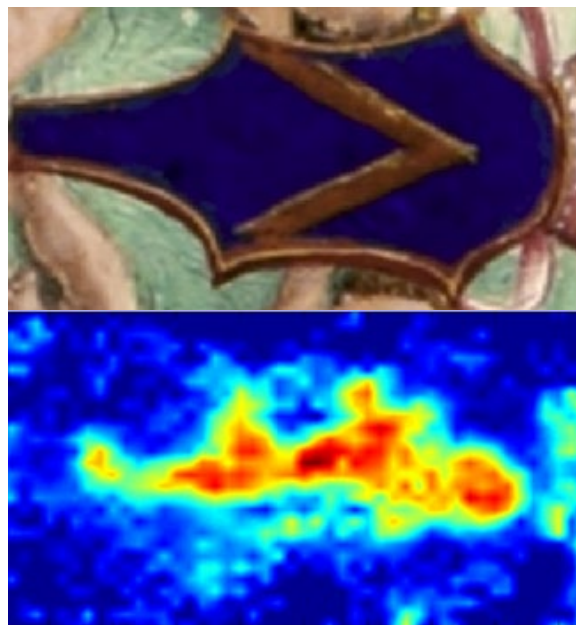
- Micro-XRF in Art
- The Bruker ELIO
- The Bruker CRONO
- Customer Feedback
- Live Demonstration
- Summary and Outlook
- Questions and Answers

Micro-XRF in Art

Introduction



Trace element sensitive



Information from depth in the sample



No sample preparation

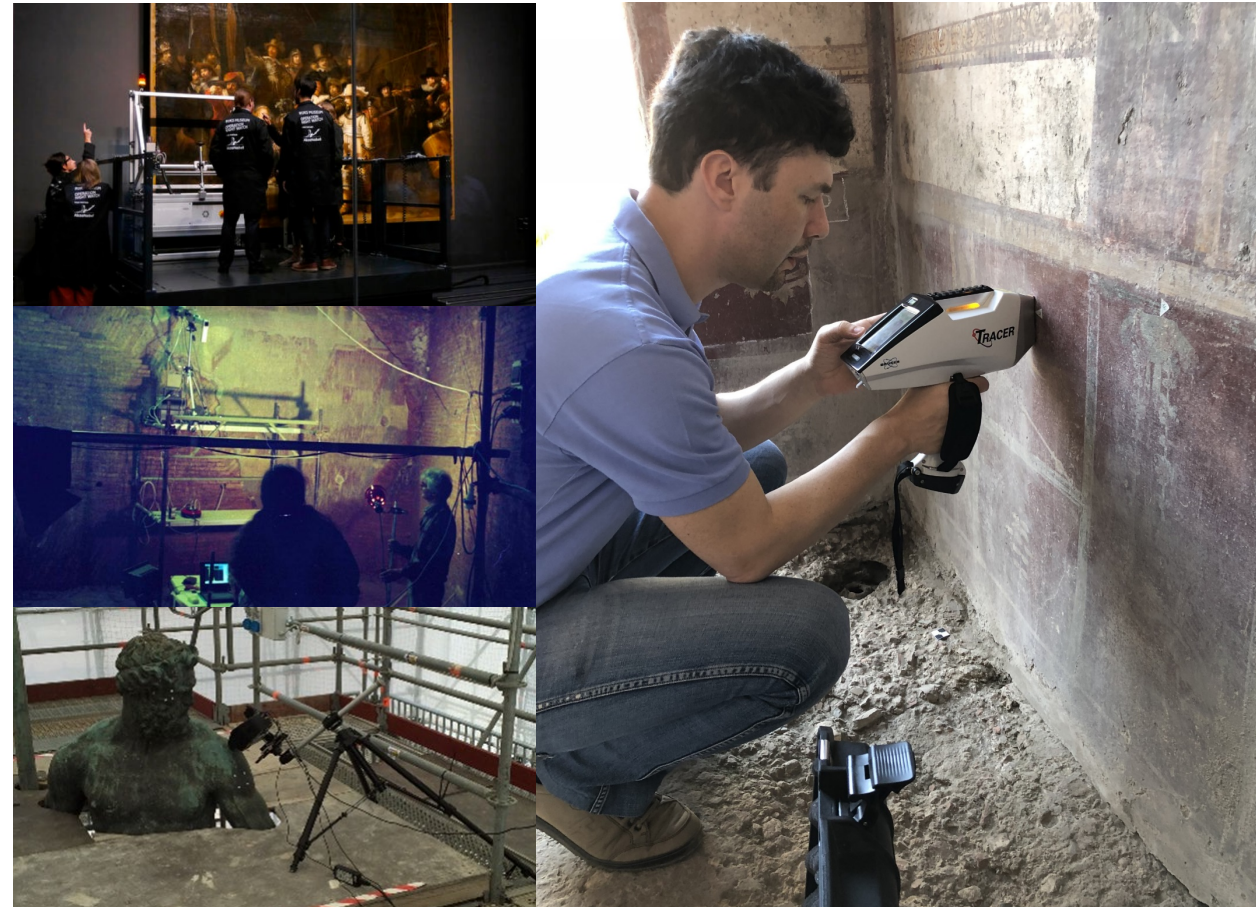
- XRF is an element specific technique as each element absorbs and emits fluorescence at its individual energy
- The element concentration can be determined from this data as XRF spectrometers analyze the fluorescence
- An XRF scanner records the fluorescence on multiple points to determine the element distribution
- In most cases X-rays can penetrate deeper into matter than visible light allowing identification of hidden paintings or faded colors

Micro-XRF in Art

XRF and Art – a Hand in Hand Partnership



- XRF has proven to be a **core analytical technique** in Cultural Heritage studies
- XRF provides key information on objects: **reliable, fast, and non-invasive**
- **But** application needs are not always the same. They differ in crucial ways with respect to the **what**, the **where**, and the **how**.
- Bruker offers several instruments for one analytical principle



Micro-XRF in Art

Our Portfolio for Art and Conservation



- Bruker offers the perfect instrument for your specific need with its unique micro-XRF instrument portfolio



TRACER
Family



ELIO



CRONO



M4 TORNADO



M6 JETSTREAM

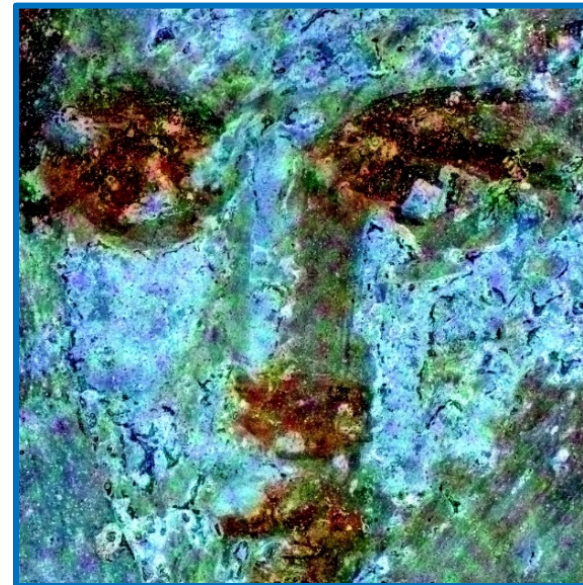
Performance and Features

Bruker ELIO

Mapping and Portability



The Bruker ELIO is a tripod-mounted, compact energy dispersive XRF system with a **1 mm spot size**. It offers the unique capability to perform **compositional mapping** of areas up to **10 cm x 10 cm** in a completely **non-contact** fashion.



K Cu Fe



Bruker ELIO

Mapping and Portability



ELIO is the only truly **portable XRF scanner** on the market

Designed for absolute portability and flexible positioning, this instrument allows in-situ scanning of any cultural heritage object.



light measurement head: **2.1 kg**

fully packed case (incl. head): **10 kg**

tripod: **4.3 kg**





Bruker ELIO

Key Campaigns – Frescos and Wall Paintings



Ercolano, Italy
Published



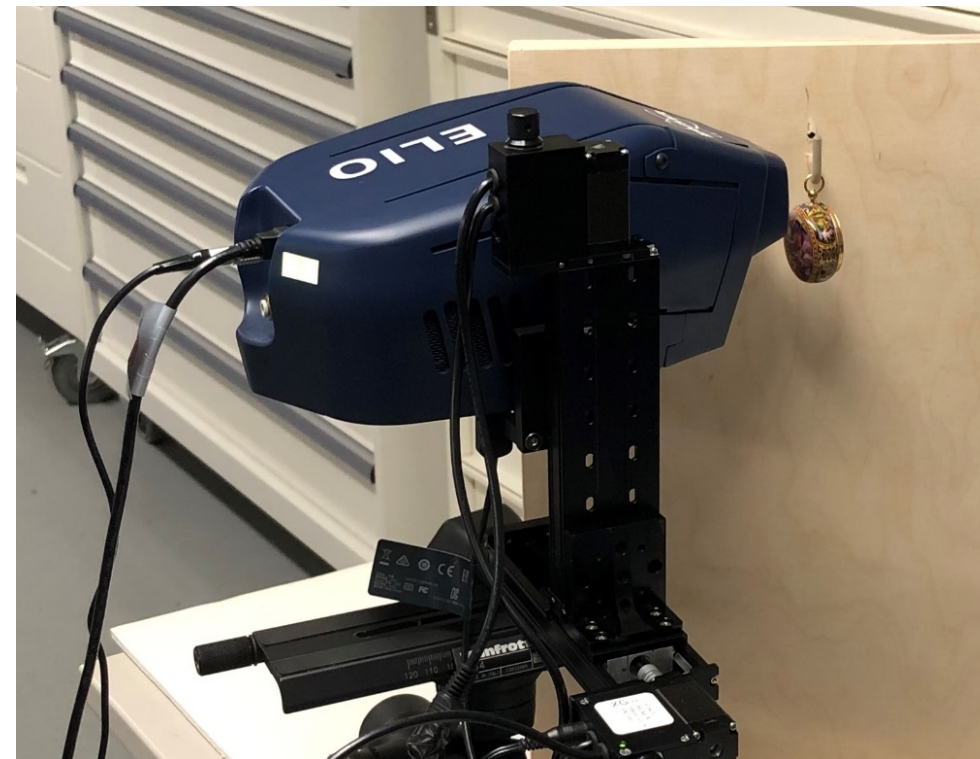
Sabz Burj, India
Publication in Progress

Bruker ELIO

Key Campaigns – Archeology and Iconic Objects



Museo Arqueológico Nacional, Spain
Published



Louvre Museum, France
Published

Bruker ELIO

Key Campaigns – Sculptures, Paintings, Written Documents



Villa Quintili, Italy
Published



Bergamo, Italy
Published



Bodleian Library Oxford
Published



Bruker CRONO

A Mobile Mapping Solution



- Boosts mapping capabilities
- Maintains mobility and flexibility in any location
- Fast acquisition on large surfaces
- Can quickly be packed
- Lightweight head and frame
- Ideal for on-site macro-XRF measurements in galleries or on temporary scaffolding in historic buildings

Bruker CRONO

Specifications



Rh-target microfocus-X-ray tube
up to 50 kV / 200 μ A, up to 10 W

Down to 140 eV energy
resolution at Mn $K\alpha$

50 mm² detector size

Up to 200 k cps

0.5 mm, 1 mm, and
2 mm collimator



Na (Z = 11) to U (Z = 92),
light elements with optional He purge

1D or 2D mapping
up to 600 mm x 450 mm

Integrated microscope camera

External camera

Bruker CRONO

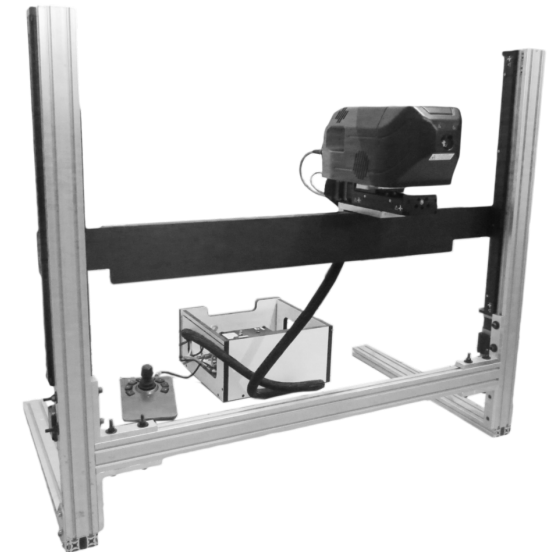
Flexibility and Mobility



Tripod mounting for point measurements



Full mounting with a 0° to 90° position option



Frame only for upside-down ceiling measurements

Bruker CRONO

Flexibility and Mobility



- CRONO can easily be transported



In a Fiat 500



Via boat through Venice, Italy

Bruker CRONO

Highlights



- CRONO is a **non-contact micro-XRF scanning spectrometer**



Non-contact



Fast scanning

up to 42 mm/s travel speed



Large area scanning

600 mm x 450 mm
mapping area

Bruker CRONO

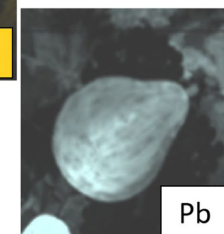
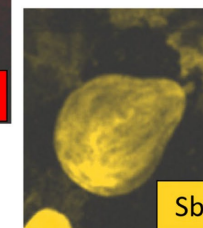
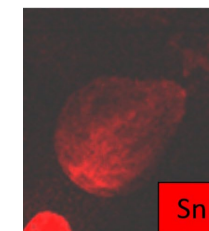
At Challenging Locations



Loggia di Amore e Psiche,
Villa Farnesina, Rome, Italy



Ceiling measurements



Bruker CRONO On-Site Measurements



Baglioni Altarpiece,
Raffaello Sanzio



Madonna Enthroned with
the Child and Two Angels,
Cimabue



Il quarto stato,
Giuseppe Pellizza da Volpedo

REALIZZATO CON IL SOSTEGNO DI
UNIONE EUROPEA
fondo europeo di sviluppo regionale
Regione Lombardia
POR FESR 2014-2020 / INNOVAZIONE E COMPETITIVITÀ



Insights from the Museum



Dr. Paola Ricciardi
Senior Research Scientist

Fitzwilliam Museum
University of Cambridge



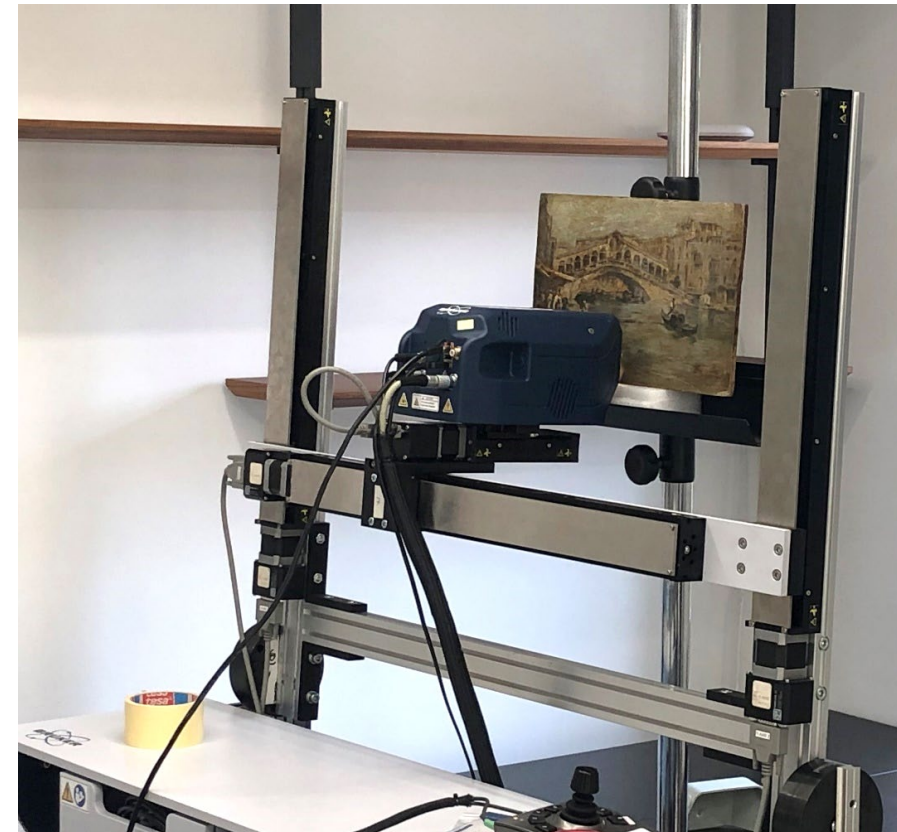
Unknown Lady,
Isaac Oliver



"Analyzing Historic Painted
Artworks with Micro-XRF at The
Fitzwilliam Museum, Cambridge"

Live Demonstration

The Bruker ELIO and CRONO

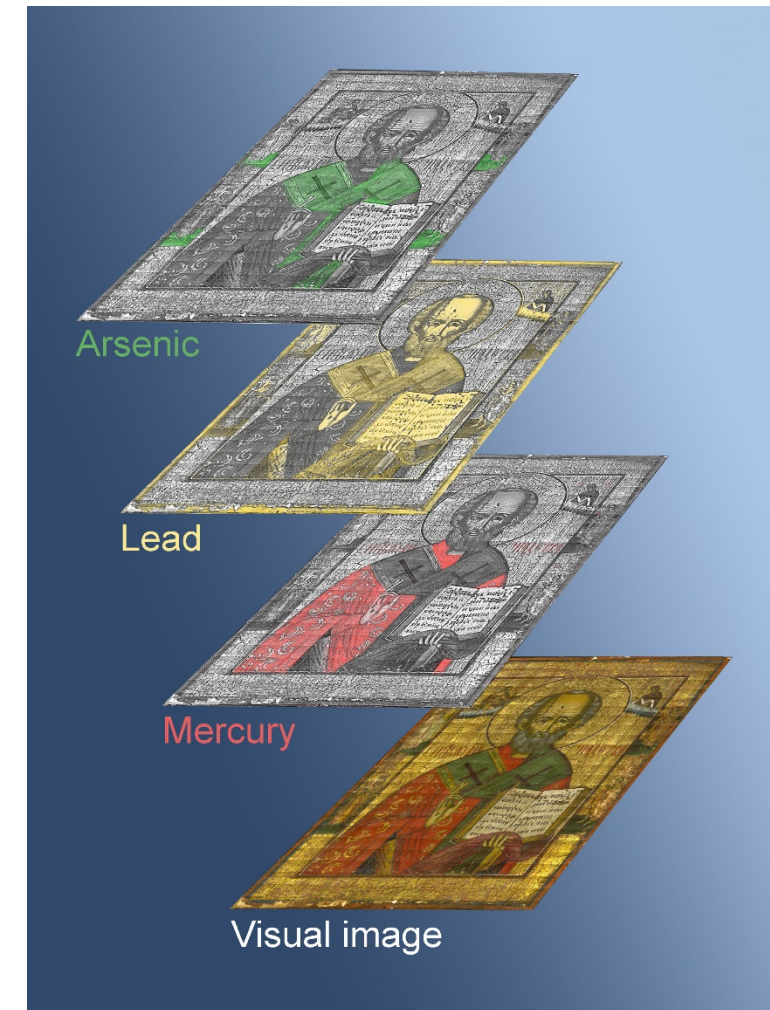


Outlook

ESPRIT Reveal - Introduction



- ESPRIT Reveal is an XRF data processing software
- It derives from the long experience Bruker developed in spatially resolved XRF, also known as MA-XRF, to provide an advanced analytical toolset
- Please note:
A dedicated webinar planned in September



Outlook

Features of ESPRIT Reveal

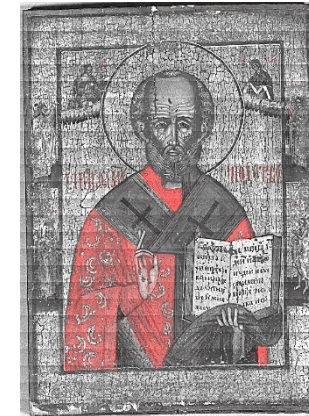


ESPRIT Reveal can

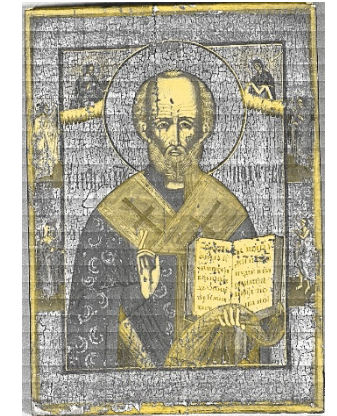
- identify elements automatically in spectra and maps
- visualize the distribution for each element or multiple elements as layer on top of a visual image of the sample
- separate elements with similar emission energies via deconvolution
- estimate the element quantification of the full sample or parts of it, or individual points, via the fundamental parameter based semi-quantitative analysis



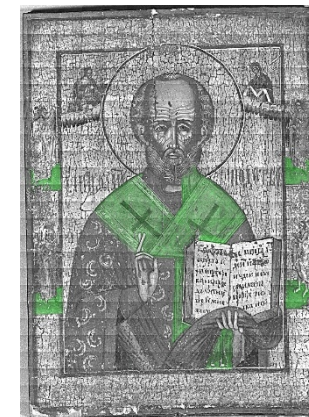
Visual Image



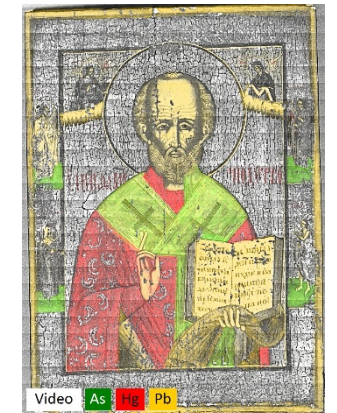
Mercury



Lead



Arsenic



Multi Element Overlay

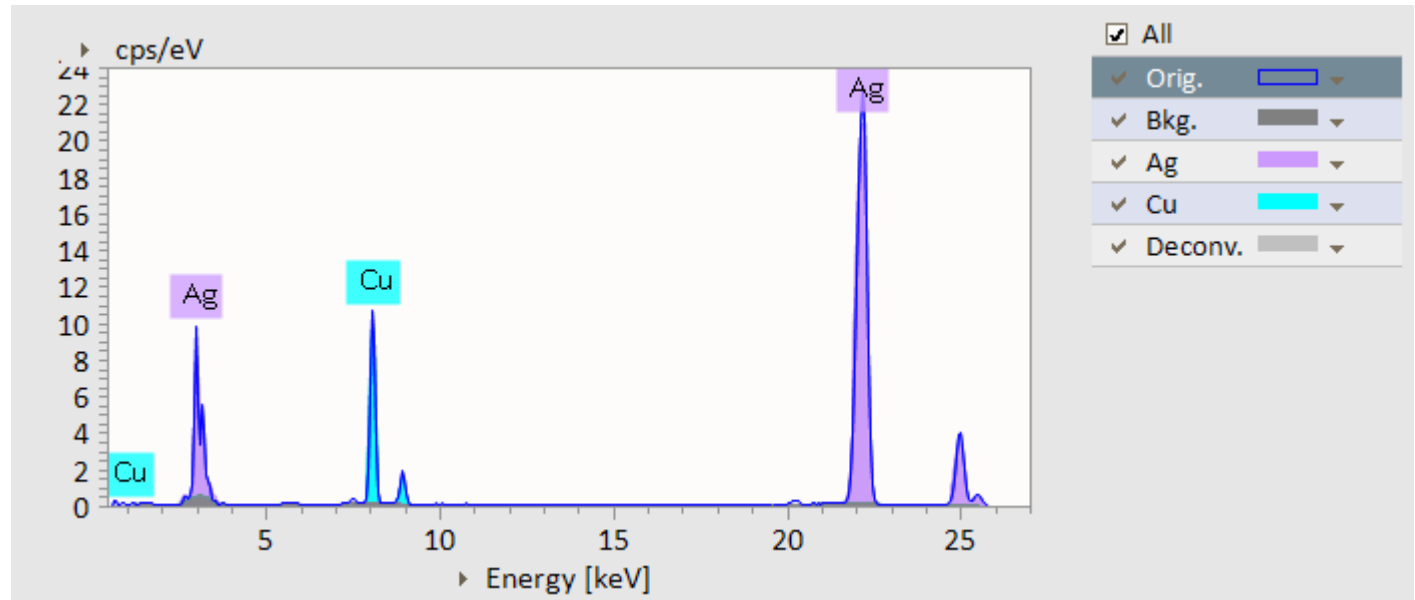
Outlook

Features of ESPRIT Reveal



ESPRIT Reveal can

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Element	At. No.	Netto	Mass [%]	Mass Norm. [%]	Atom [%]	abs. error [%] (1 sigma)	rel. error [%] (1 sigma)
Ag	47	503924	46,54	95,39	92,42	0,32	0,69
Cu	29	124498	2,25	4,61	7,58	0,00	0,04
		Sum	48,79	100,00	100,00		

Outlook

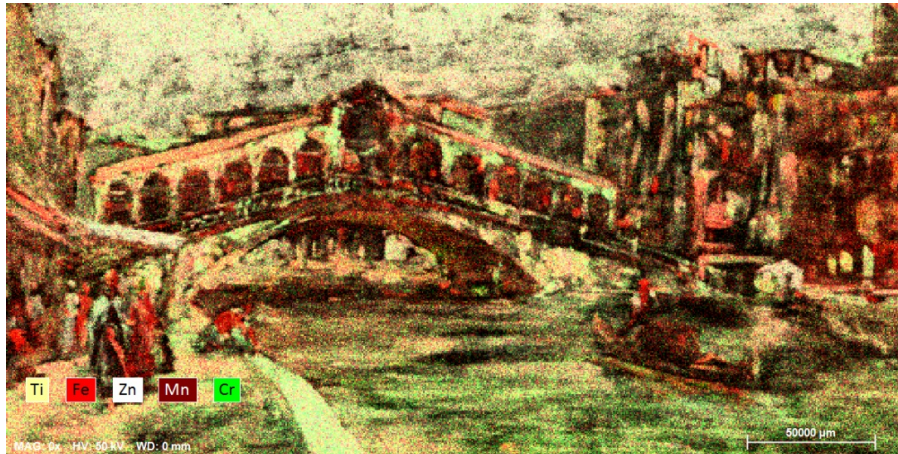
Features of ESPRIT Reveal – Demo Sample



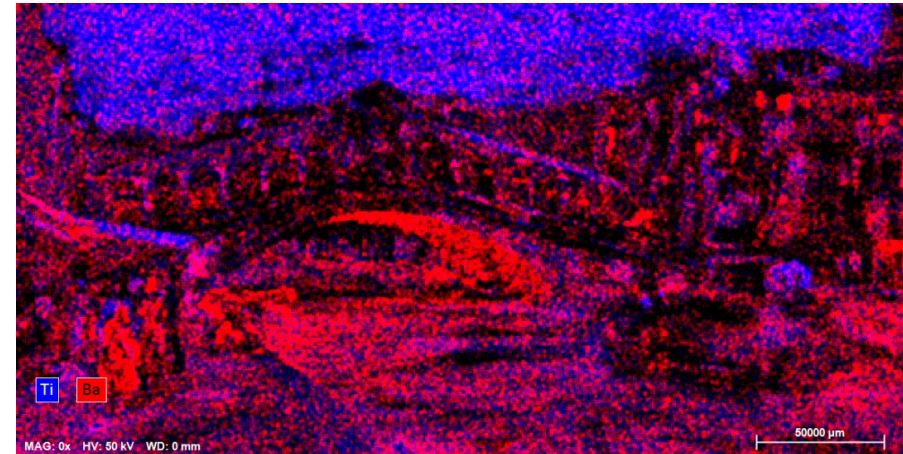
Visual image



Titanium and barium,
without deconvolution



Element overlay



Titanium and barium,
with deconvolution

Summary

ELIO, CRONO in Art & Conservation



- The Bruker ELIO and CRONO are micro XRF mapping solutions specifically designed for measuring works of art
- ELIO and CRONO are among the protagonists in the Bruker instrument portfolio for Art and Conservation with their unique features
- The targeted design has allowed these instruments to be used in key campaigns by our partners worldwide
- Latest software evolutions allow a complete integration into Bruker Instrument Software Suite



Art & Conservation Series – Part II

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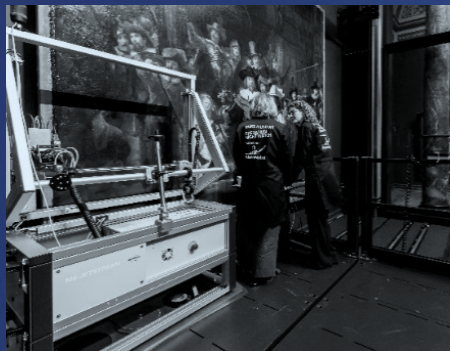
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Art & Conservation Webinar Series

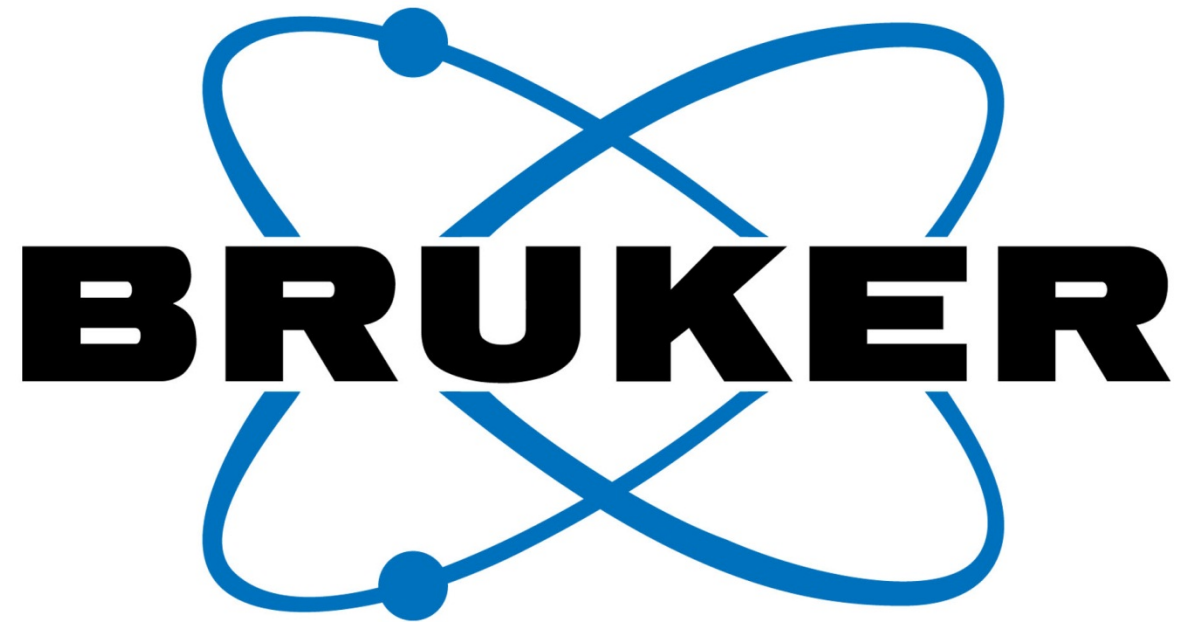
Overview



- Part I – May 6th New Horizons of micro-XRF
- Part II – May 27th Flexible and portable-XRF mapping solutions:
Bruker's ELIO and CRONO spectrometers
- Part III – June 16th TRACER: the benchmark in
handheld-XRF for cultural heritage
- Part IV – September ESPRIT Reveal: Micro-XRF Data Processing



Register on <https://www.bruker.com/events/webinars.html>



For more information please contact us
Michele.Gironda@bruker.com

