

The use of macro X-ray fluorescence scanning (MA-XRF) to study the decorative layers on a gilt leather altar frontal

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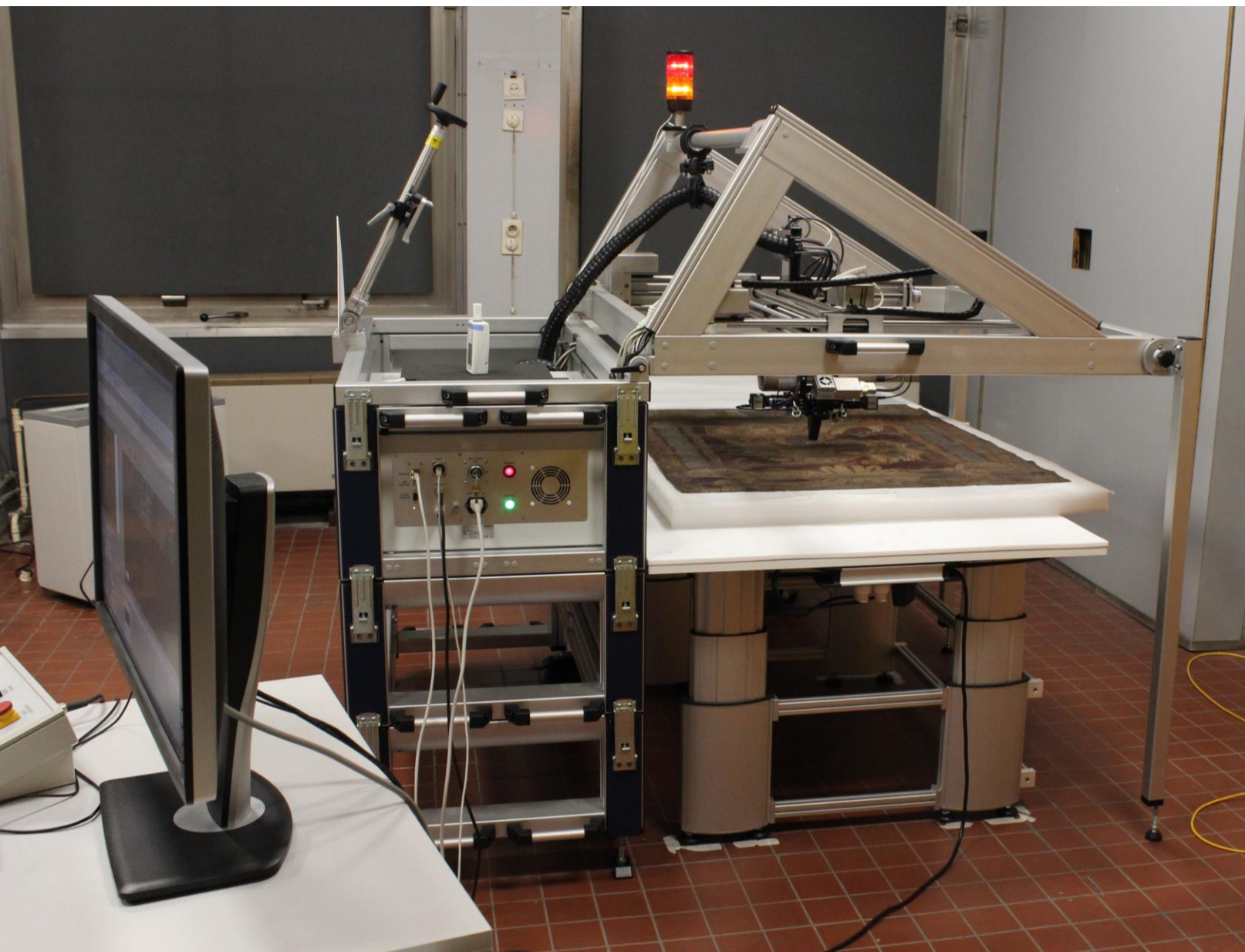
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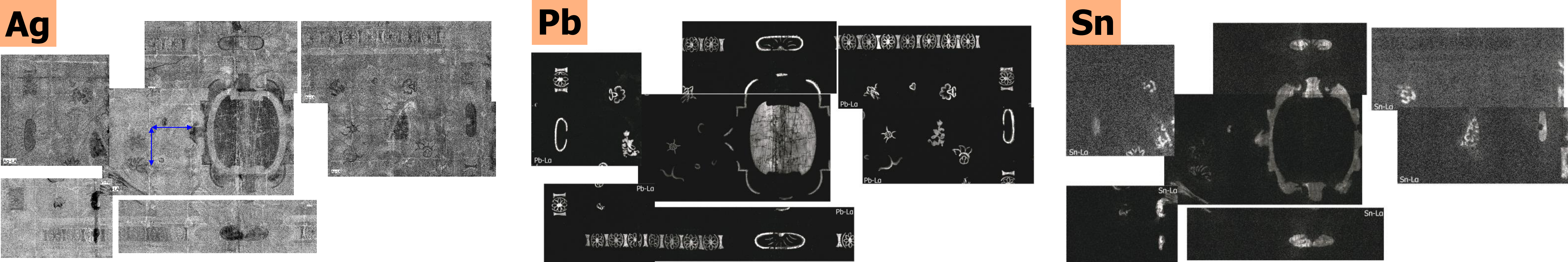
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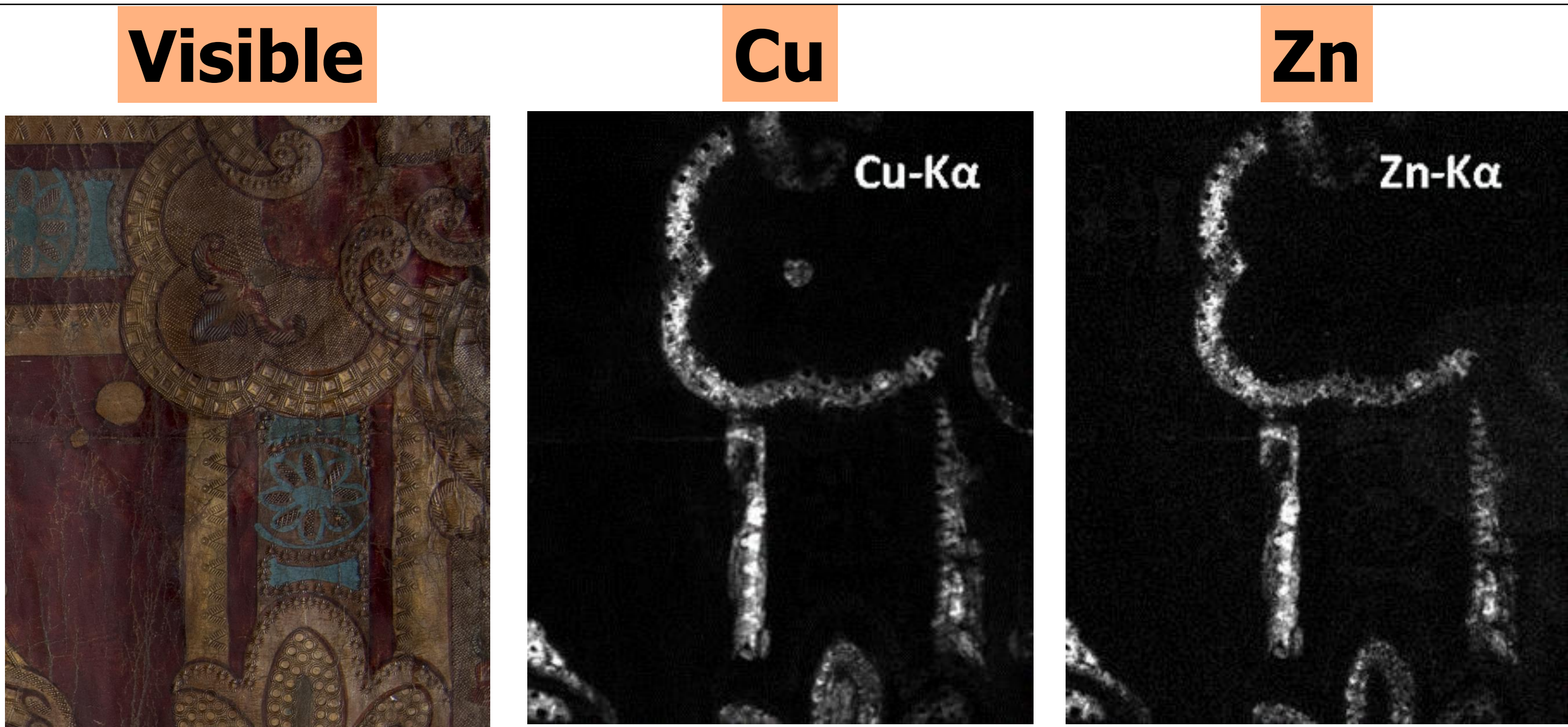
M6 Jetstream large area scanner (Bruker AXS)
Rh source, 50 kV, 600 μ A



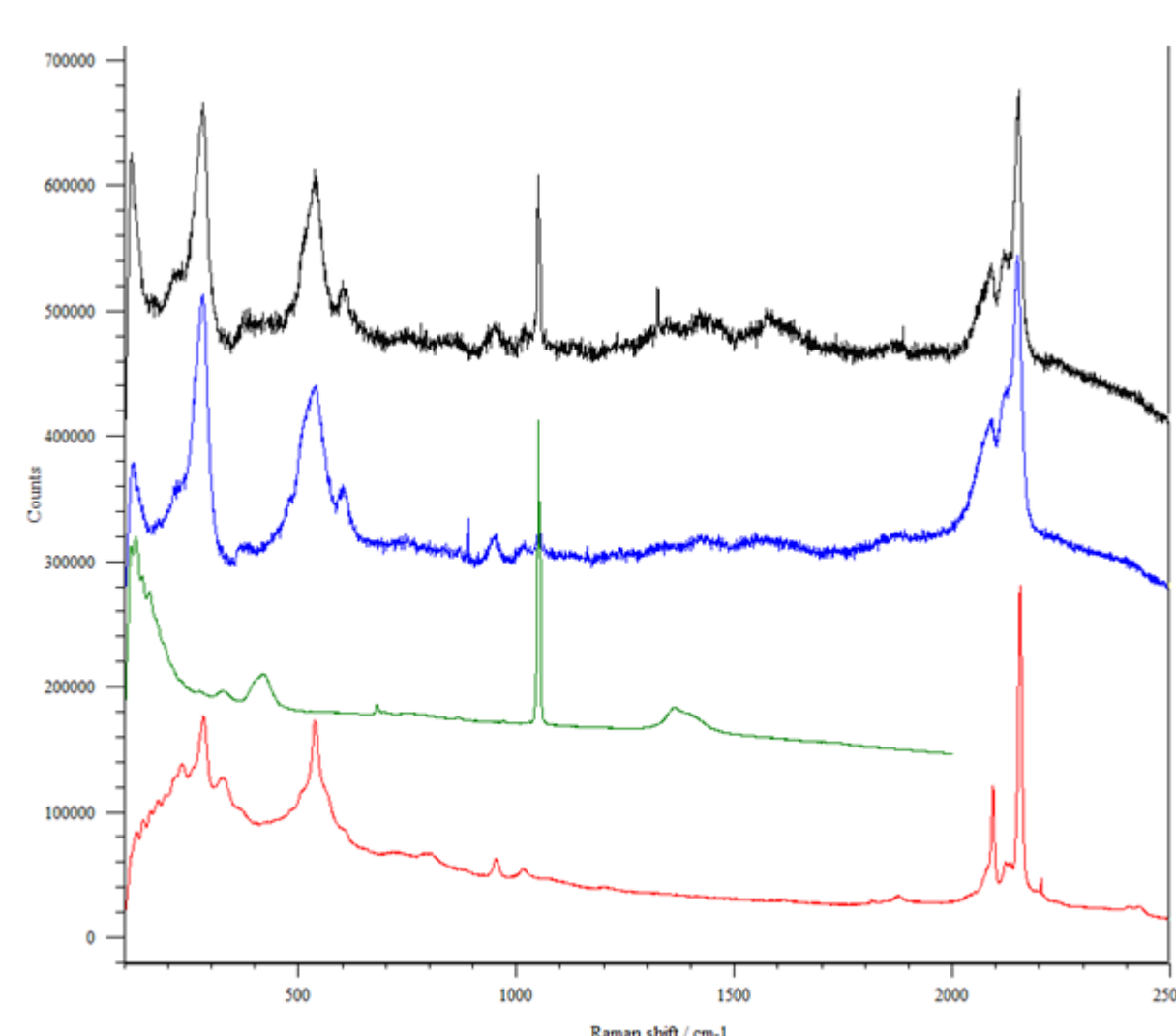
The Art & History Museum in Brussels has an altar frontal which is poorly documented. Its style indicates that it was probably produced in Italy during the 18th century or after. Within a Master project work, MA-XRF was used to study the materials and the execution technique and to propose suitable conservation-restoration treatments.



MA-XRF maps of silver show that silver leaves cover the overall surface of the leather. Leaves measure approximately 16 cm per side (blue arrow in Ag map). Darker areas in Ag map correspond to areas rich in lead and/or tin (Pb and Sn maps), probably masking the weaker response for the lighter silver.



MA-XRF maps also facilitate the detection of two or more chemical elements in the same area. As shown in Cu and Zn maps, copper and zinc are present in areas with a golden aspect, suggesting a bronzine overpaint.



Blue paint cannot be characterized with MA-XRF (only detected Pb). Complementary Raman spectroscopy of blue paint's samples (black and blue spectra) clearly showed the presence of Prussian blue (red spectrum) and confirmed the use of lead white (green spectrum).

Results' summary

Area	Elements detected	Interpretation
Red background	- (MA-XRF detects elements with $Z > 15$)	Organic pigment as madder or carmine
Red (flowers' petals, Virgin's dress)	Hg	Vermilion (HgS)
Green leaves	Cu	No precise interpretation possible: Malachite or Verdigris or copper resinate?
Dark outlines around the painted motifs	Fe	Earth pigment containing ironoxide
Blue (floral frieze, flowers' petals, sky)	Pb	Lead white + Prussian Blue (identified by micro-Raman)
Some areas of the gold varnish	Cu, Zn	Bronzine overpaint (brass flakes mixed with a binder)
Silver areas	Sn	Tin flakes + binder overpaint

MA-XRF is an efficient method to study the chemical elements present in the different decorative layers of gilt leather and to visualize their repartition without having to take any sample.

This technique brings significant added value compared to other techniques of pigments and metal analysis. To refine the results' interpretation MA-XRF can be complemented with other instrumental analysis.