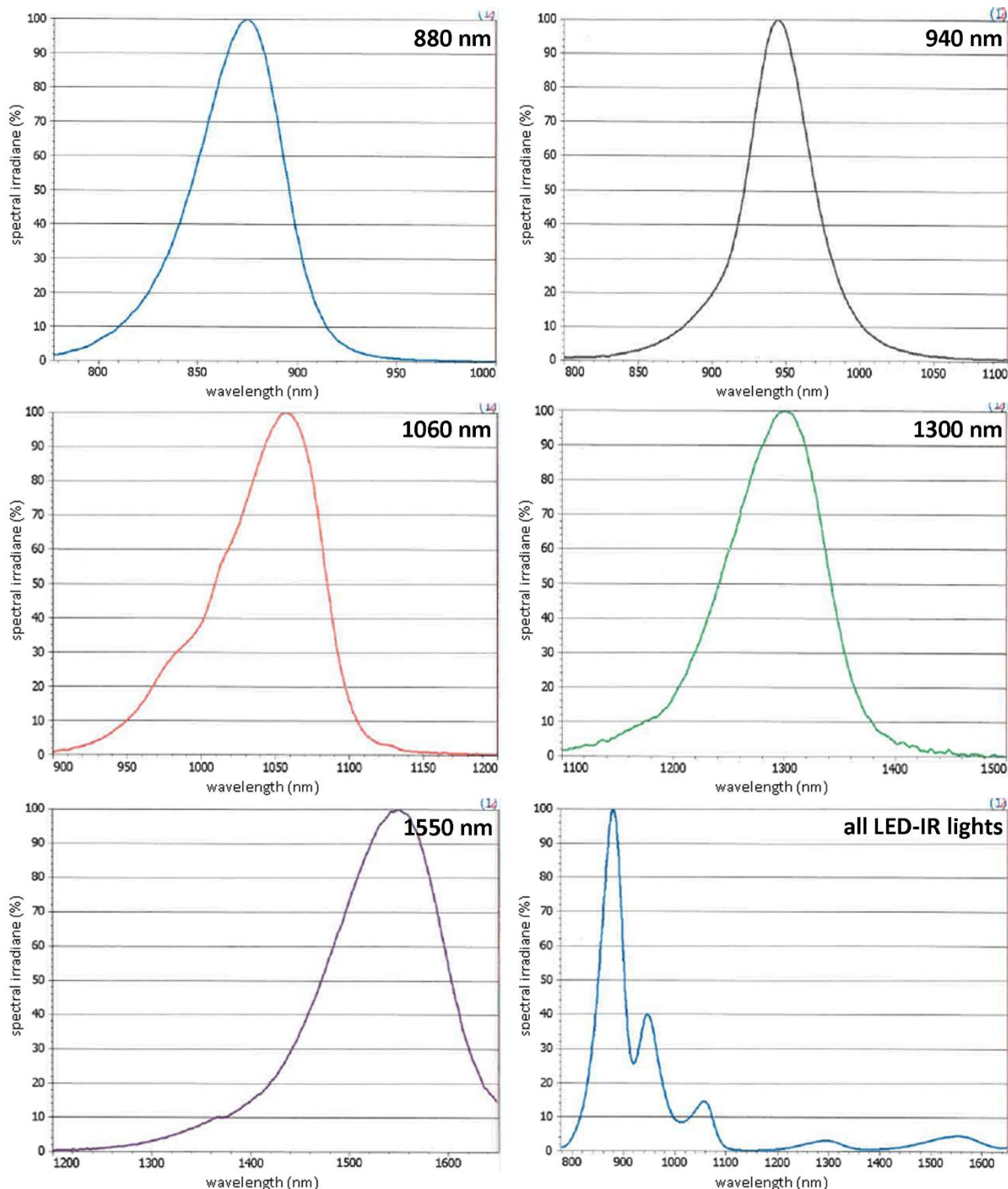
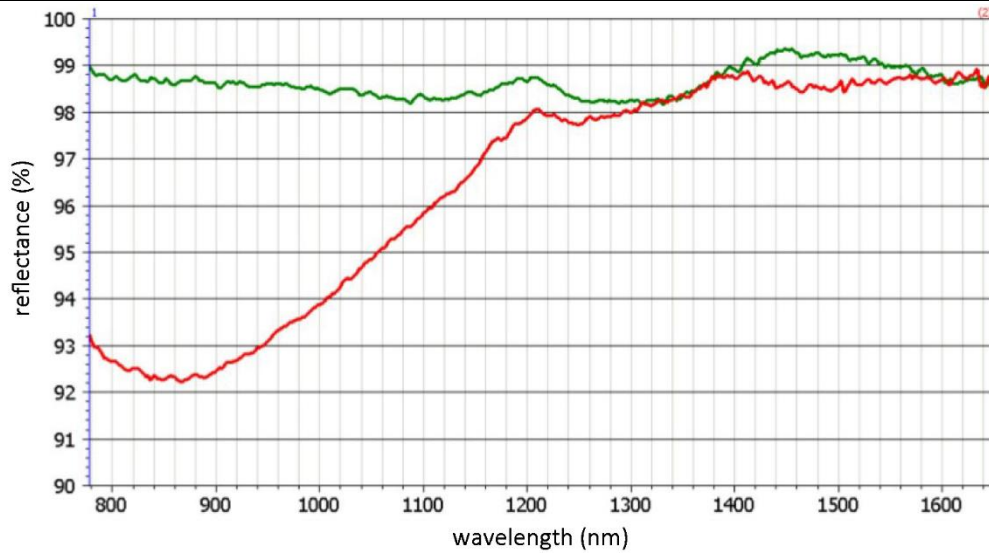


Supplementary material



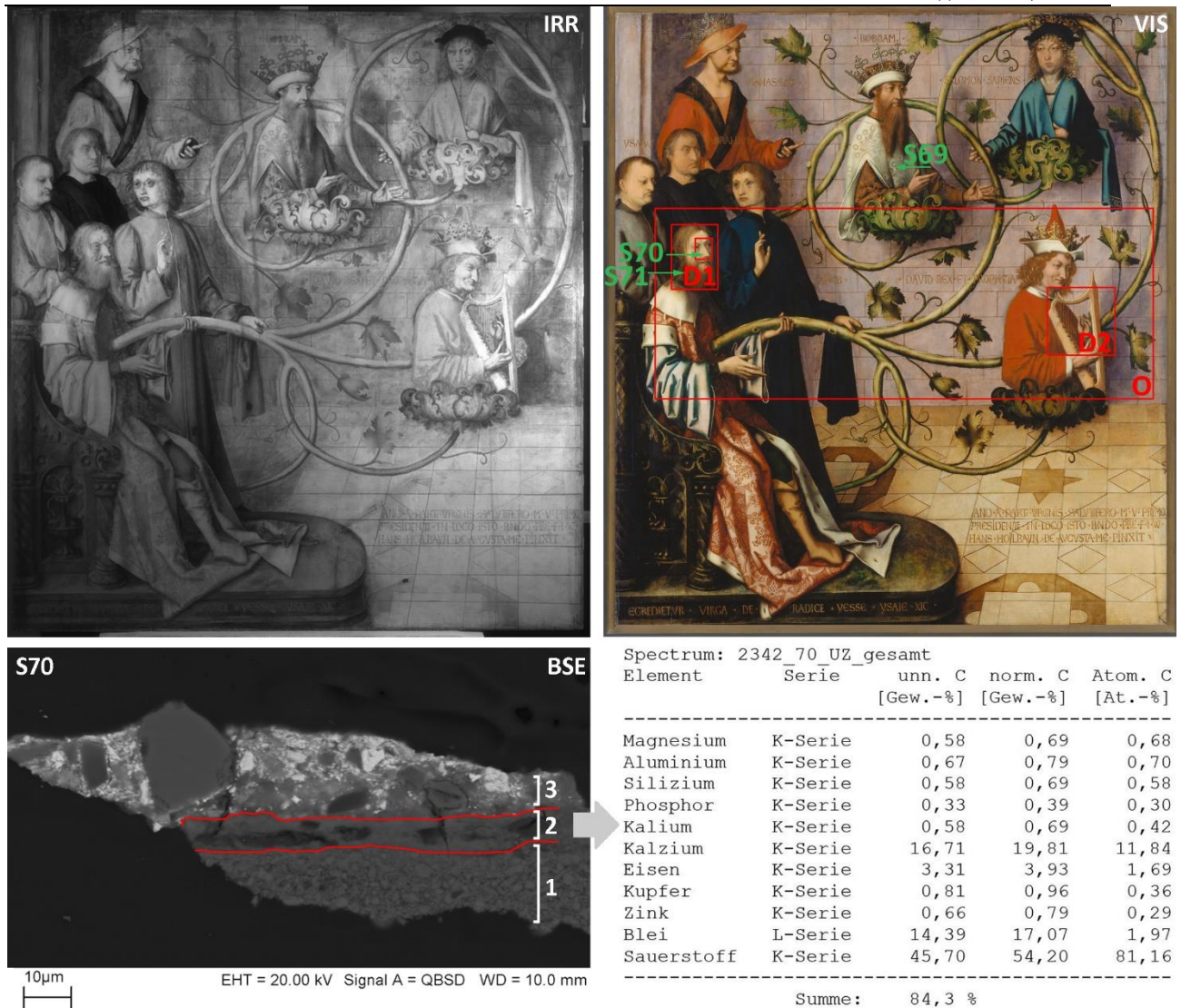
Suppl. 1 Spectral irradiance as a function of wavelength of IR-LED lights used for LEDE-IRR. The single LED lights (880 nm, 940 nm, 1060 nm, 1330 nm and 1550 nm) emit narrow IR bandwidths. The spectra displayed in the lower right corner shows the spectral irradiance, if all IR-LED lights are switched on simultaneously [36] (p. 11-14).



Suppl. 2 IR reflectance properties of iron gall ink (red) beneath a cadmium yellow paint layer [23] (p. 57). The ink was produced according to recipe 208 and 211 from the *Liber illuministarum* [24]. The green graph shows IR reflectance properties of bistre, which can be neglected in the context of this study.



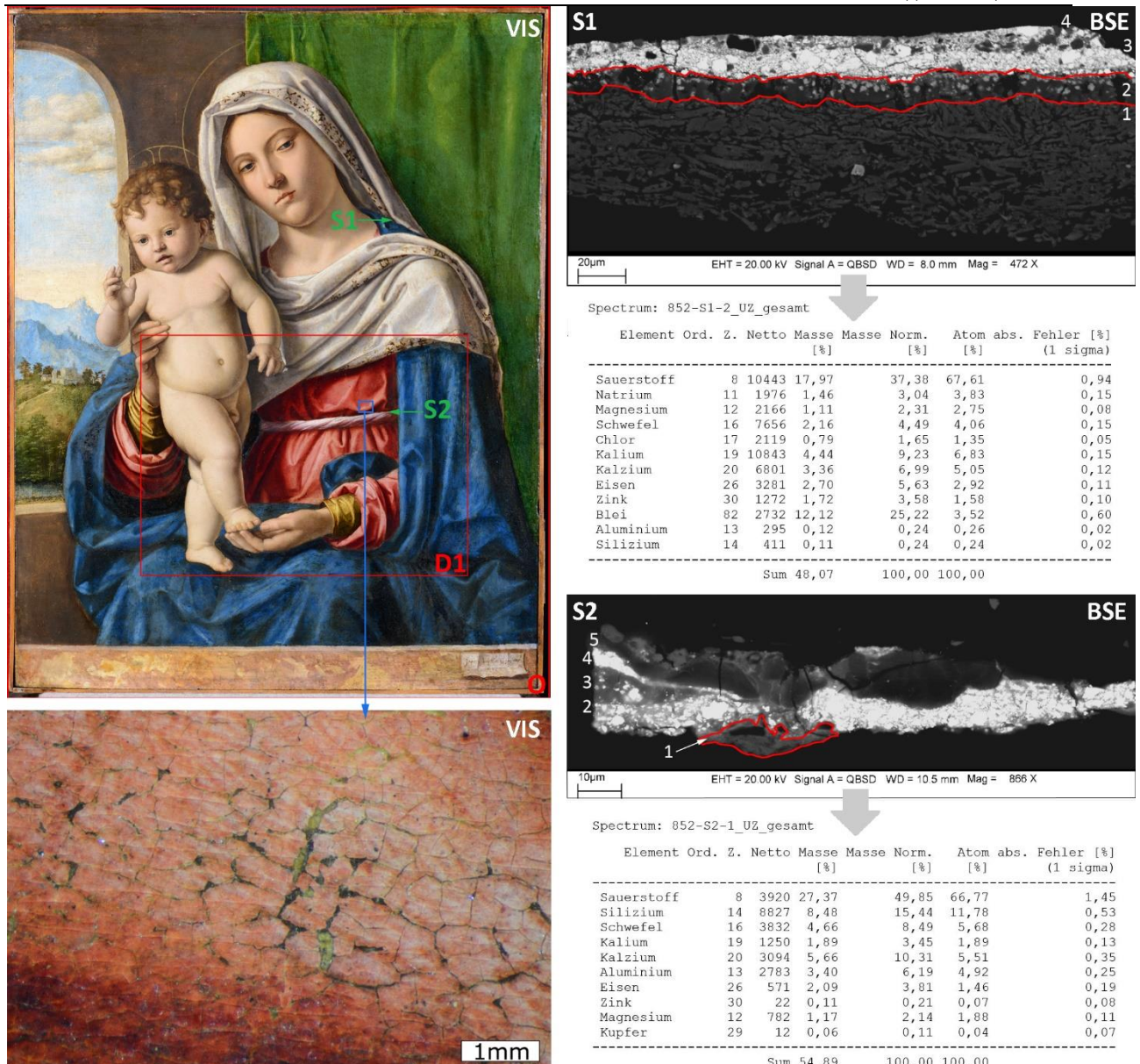
Suppl. 3 H. Holbein the Elder, High Altarpiece of the Dominican Church, Städel Museum Frankfurt (Inv. No. HM 6-HM 20 and LG 1).



Suppl. 4 H. Holbein the Elder, “Tree of Jesse” (Inv. No. HM 6), exterior wings, High Altarpiece of the Dominican Church. Top row, left to right: conventional IRR image (900–1700 nm) and visible light image (VIS) with mapping of performed MA-XRF scans and location of samples S69–S71. Bottom row, left to right: backscattered electron (BSE) image of S70 with mapping of the underdrawing layer (red) and related EDX results [4].



Suppl. 5 H. Holbein the Elder, “Bearing of the Cross” (Inv. No. HM 15), inside of the outer wings, High Altarpiece of the Dominican Church. Top row, left to right: Conventional IRR image (900–1700 nm) and visible light image (VIS) with mapping of MA-XRF scans performed and samples S12–S15 and S18. Bottom rows: MA-XRF elemental maps of Fe-K, Cu-K, Mn-K and Zn-K.



Suppl. 6 G. B. Cima da Conegliano "Virgin and Child" (Inv. No. 852). Left, top down: Visible light image (VIS) of the painting with a mapping of MA-XRF scans (red), cross-section sampling (green) and microscopic image (blue) displayed beneath, showing small damages of the red paint layer of the Virgin's dress in areas covering the underdrawing. Right, top down: SEM/EDX results of S1 and S2 with a mapping of the underdrawing layer in backscattered electron (BSE) image (red) and related EDX results.

Images

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Suppl. 2: © Katharina Geffken, [23] (p. 57).

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Suppl. 4 BSE image and EDX results: © Stephanie Dietz.

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Suppl. 5 MA-XRF maps (Fe-K, Cu-K, Mn-K, Zn-K), Suppl. 6 VIS microscopic image, BSE image and EDX results: © Städel Museum, Frankfurt am Main – Department for Art-Technology and Conservation of Paintings and Modern Sculpture, M. Gerken.

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