LABORATORIO: CNR-INO

NAME OF THE INSTRUMENT

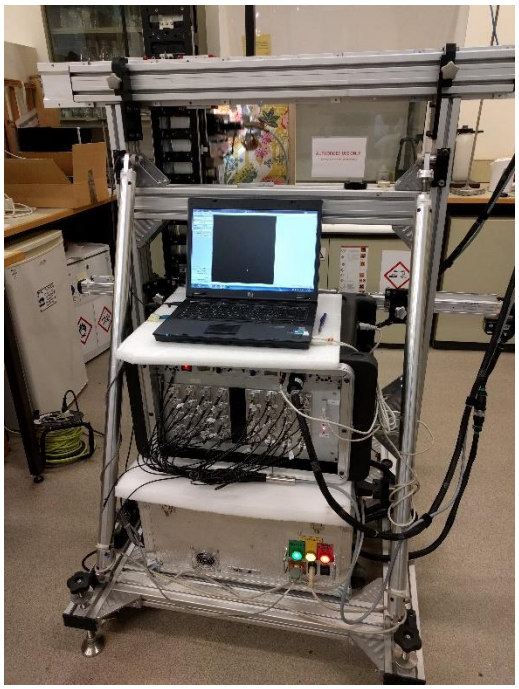
VIS-NIR Multispectral Scanner

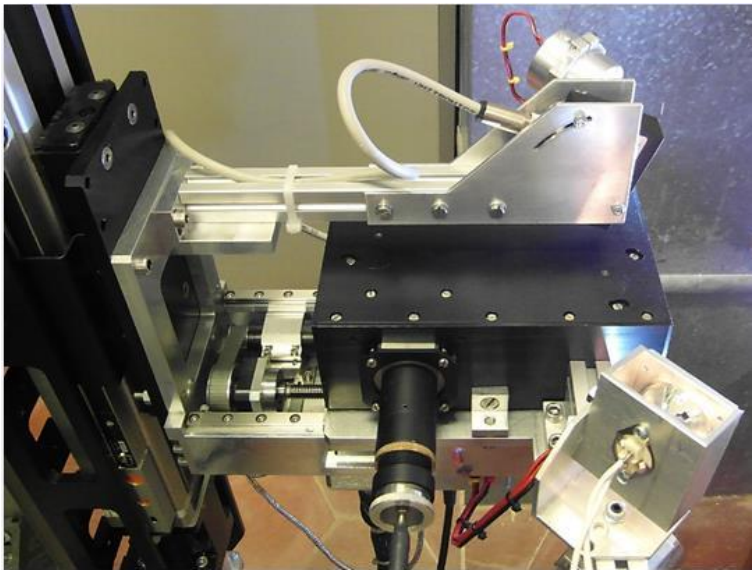
GENERAL DESCRIPTION:

Multispectral reflectography, providing a point-by-point spectrophotometric characterization of painted surfaces, is an extremely useful diagnostic tool for the study of works of art. Infrared reflectography, originally performed in a single spectral band in the near infrared (NIR) region, in recent decades has been implemented for image acquisition in several narrow spectral bands, enabling the disclosure of hidden details otherwise not visible, and thus providing valuable information on the phases of realization of the examined artwork. NIR analysis, thanks to the transparency of most of the pigments in this spectral region, makes it possible to visualize details beneath the painted surface, such as preparatory drawings, *pentimenti*, and retouching. The multispectral analysis in the visible (VIS), based on colorimetric calculation, allows monitoring the colour variations of the paint over time, which turns useful in conservation interventions, for example, to document the cleaning process.
The Multispectral Scanner is revolutionary in the field of VIS-NIR reflectography, as it provides a set of high-resolution images, acquired simultaneously at different wavelengths in a wide spectral region, ranging from 395 to 2500 nm. Images are self-registered and free of aberrations, facilitating the post-processing (multivariate analysis, false colour, difference/ratio between images, etc.).

TECHNICAL DESCRIPTION:

The multispectral scanner developed at CNR-INO is characterized by 32 spectral channels, 16 in the visible (395 - 765 nm, spectral resolution 20-30 nm) and 16 in the near infrared (750 - 2500 nm, spectral resolution 50-100 nm). The device is designed to ensure safe measurement conditions, avoiding any damage to the analysed object. The lighting system and collection optics are moved jointly by the XY scanning system, thus avoiding a prolonged exposure of the painting. The autofocus system, a laser distance meter positioned on the Z axis, maintains the working distance at about 12 cm during the entire scan. The boustrophedon movement allows measuring areas up to 1 m^2 in about 3 hours, with a spatial sampling step of 250 μm (4 points / mm). Each acquisition is calibrated by measuring the reflected radiation from a certified standard reference. The resulting set of images is completely free from chromatic and optical aberrations thanks to a catoptric system with unitary magnification factor, which focuses the back-scattered radiation onto a bundle of 36 optical fibres. The system is controlled via computer by a customized software that simultaneously regulates the movement of the axes, the autofocus, and the image acquisition. The instrument, approximately 1.5 m^3 in size, can be disassembled and transported for on-site measurements.





VIS-NIR Multispectral Scanner: the instrument during the MOLAB campaign at the V&A Museum – London, and detail of the optical head.

FURTHER INFORMATION:

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