



Unveiling the **rainbow**: how NIREOS' HERA IPERSPETTRALE makes artworks reveal their colourful secrets

Marta Ghirardello, Technical Sales Engineer
marta.ghirardello@nireos.com



NIREOS at glance



SPIN - OFF
COMPANY OF POLIMI

MAY 2018
INCORPORATION

FACILITIES
BOVISA AREA - MILAN

10 PEOPLE
EMPLOYED

> 80 YEARS
CUMULATIVE EXPERIENCE IN
PHOTONICS

We develop and manufacture novel devices for **SPECTROSCOPY**:
interferometers, spectrometers, multispectral & hyperspectral cameras

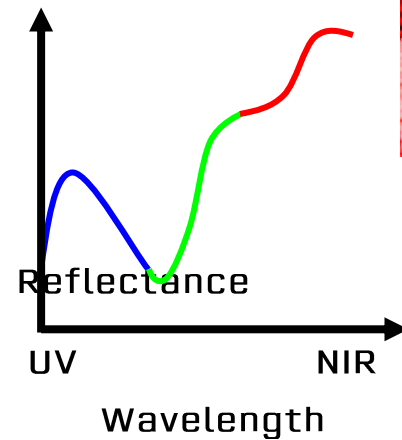
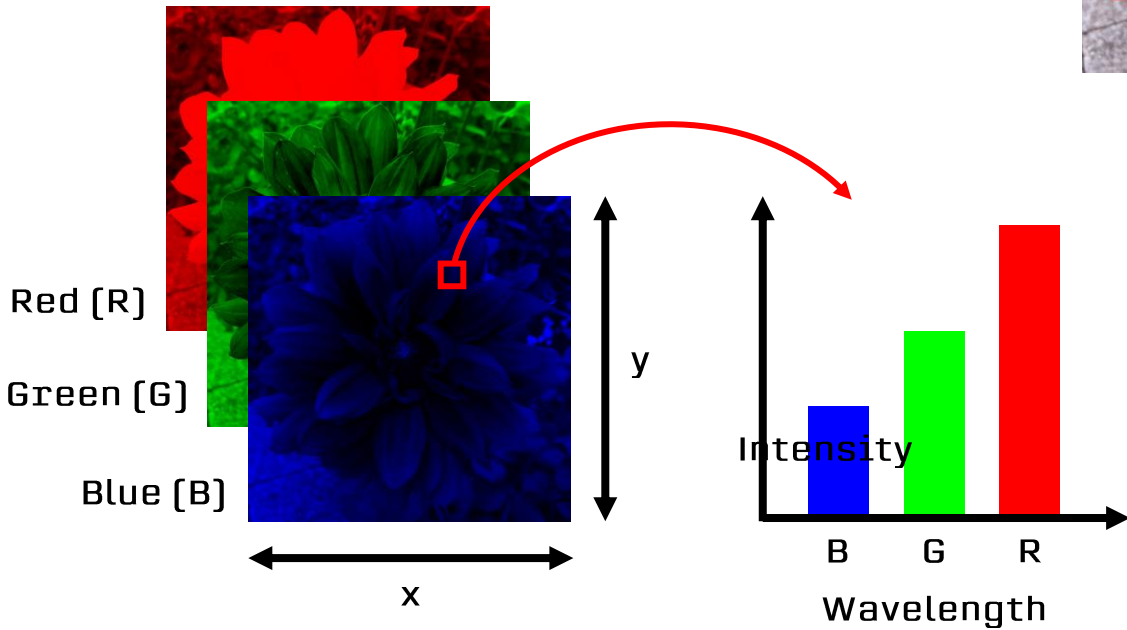
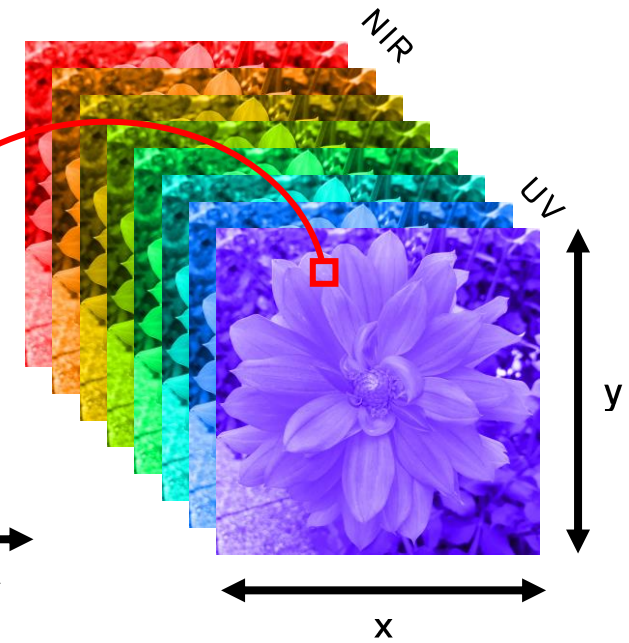


Hyperspectral imaging techniques

RGB image



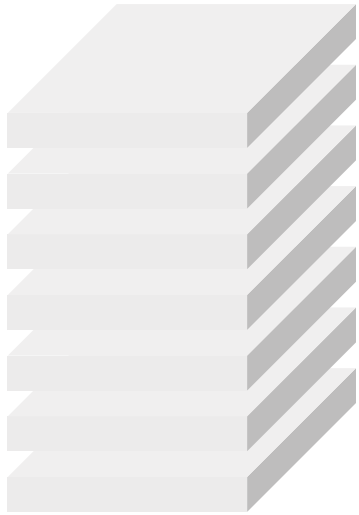
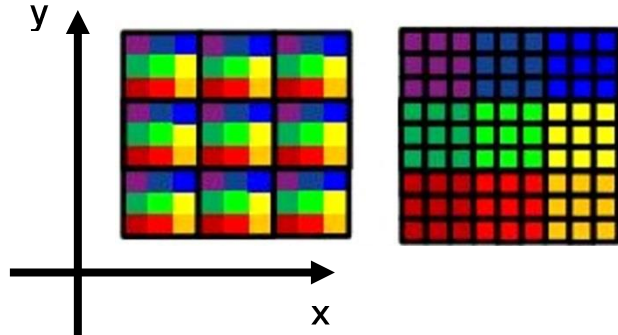
Hyperspectral Image





Hyperspectral imaging techniques

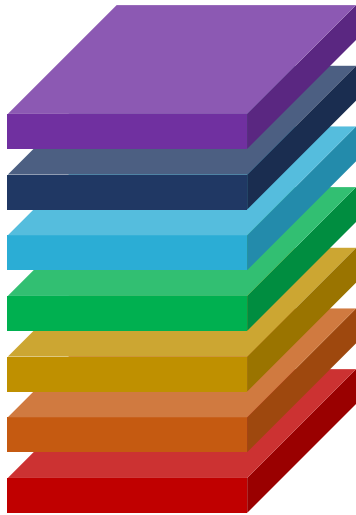
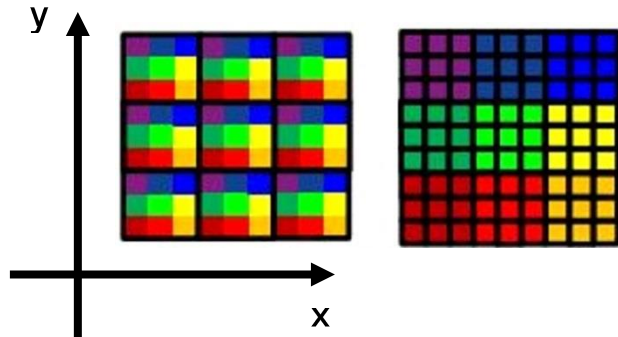
SNAPSHOT IMAGING





Hyperspectral imaging techniques

SNAPSHOT IMAGING

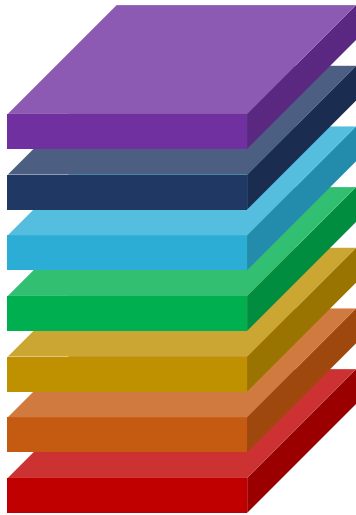
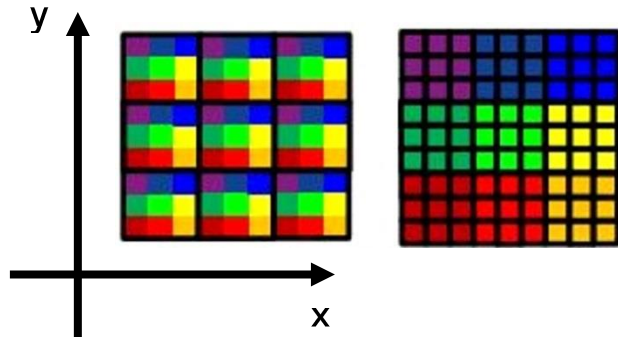


-  Fast
-  Limited number of bands and spatial resolution



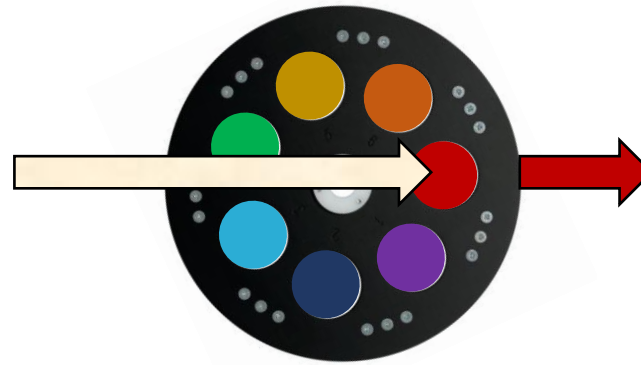
Hyperspectral imaging techniques



SNAPSHOT IMAGING



-  Fast
-  Limited number of bands and spatial resolution

STARING IMAGING

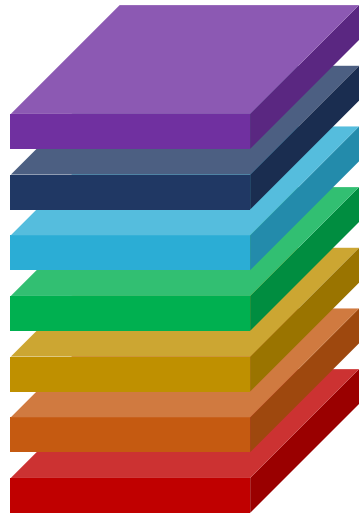
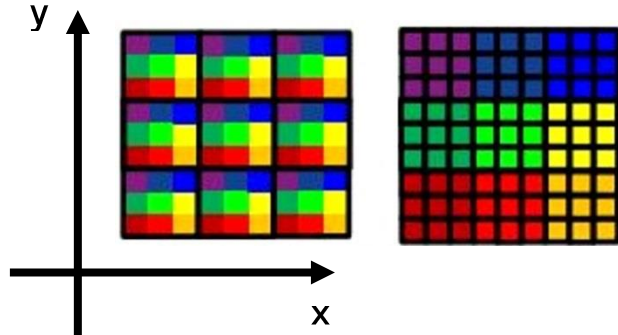


-  Good spatial resolution
-  Spectral scan



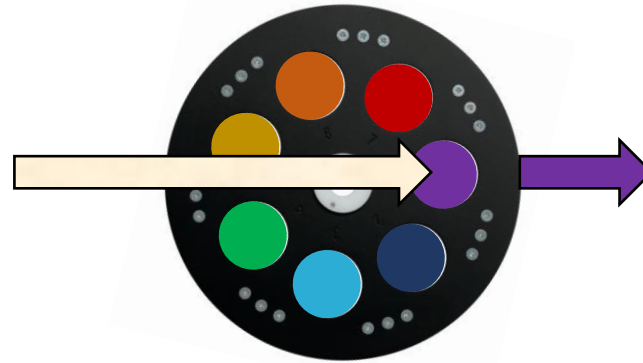
Hyperspectral imaging techniques

SNAPSHOT IMAGING



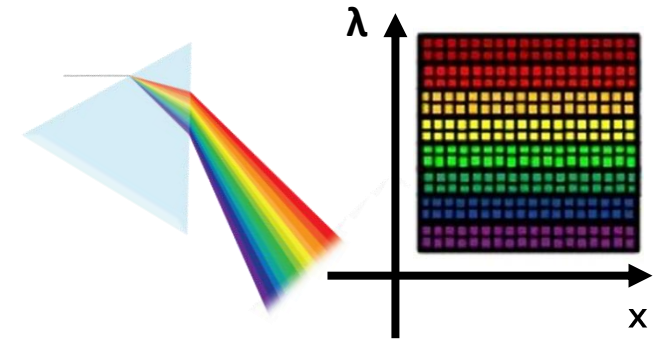
- Fast
- Limited number of bands and spatial resolution

STARING IMAGING



- Good spatial resolution
- Spectral scan

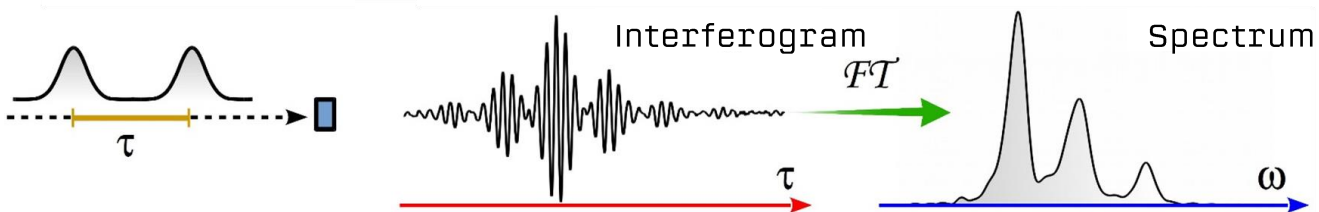
PUSHBROOM IMAGING



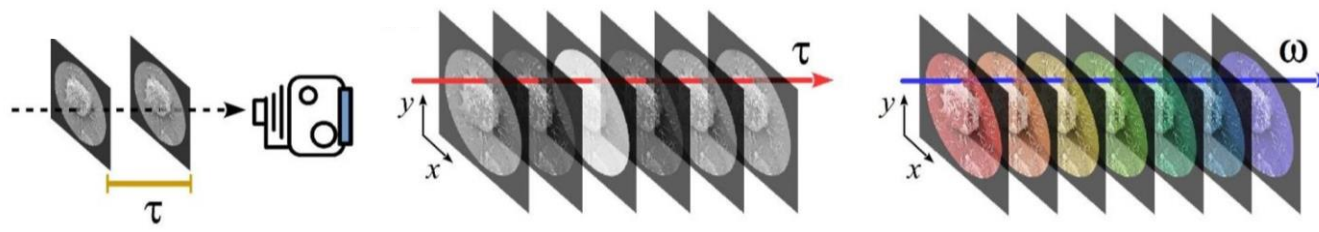
- Good spectral & spatial resolution
- Need for linearly moving the detector

Fourier Transform Hyperspectral Imaging

FT spectrometer
[single pixel detector]



FT Hyperspectral camera
[2D detector]



Advantages:

- **High throughput** (low light illumination conditions)
- **Stationary** (no additional moving system required)
- Remote, non-destructive
- **High spatial & adjustable spectral resolution – no compromise between spatial and spectral resolution**

HERA VIS-NIR (400–1000 nm) – CMOS sensor
HERA SWIR (900–1700 nm) – InGaAs sensor





Medieval Miniature - Castello Visconteo, Pavia (Italy)



RGB reconstruction



False Colour [IRFC]



RGB reconstruction

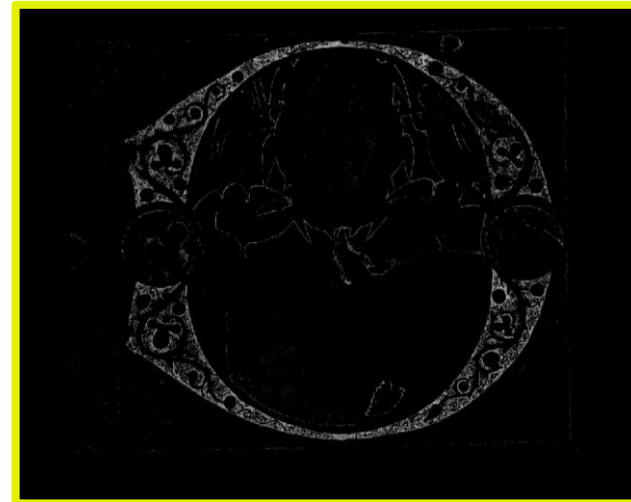
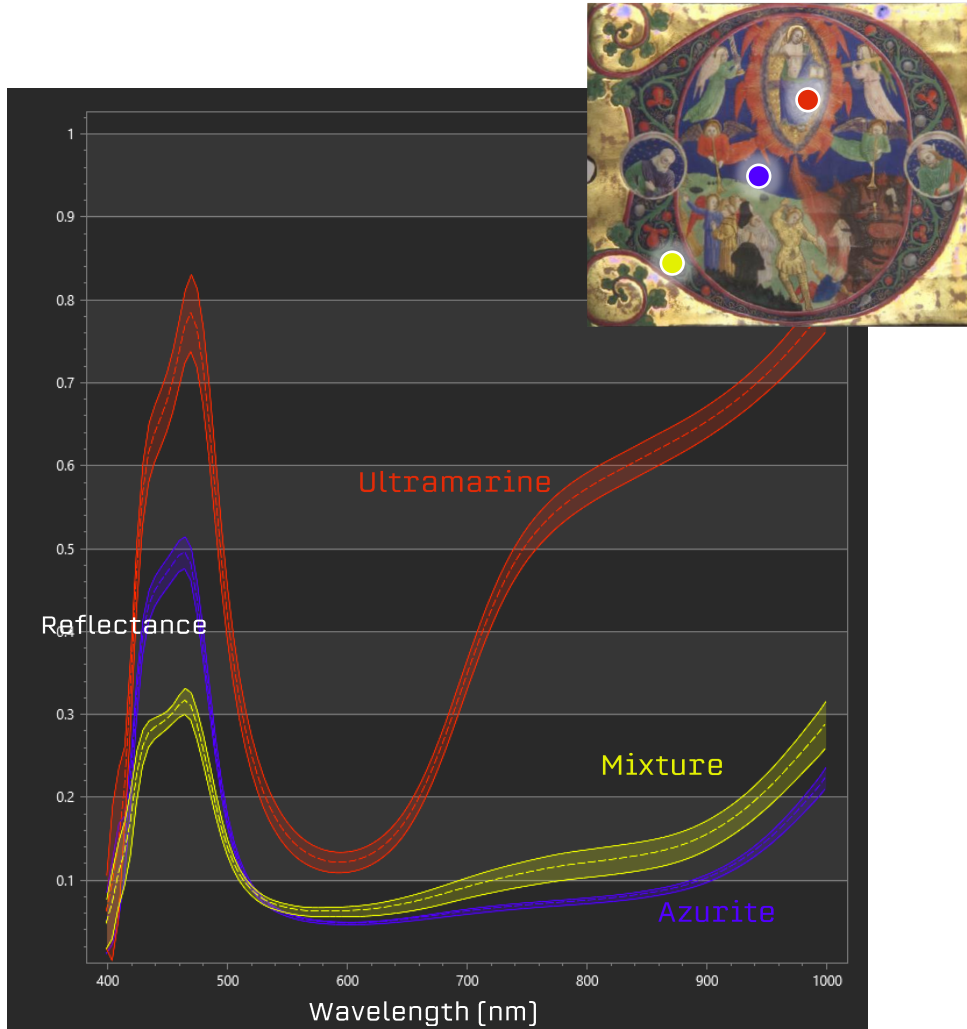


False Colour (IRFC)





Medieval Miniature - Castello Visconteo, Pavia (Italy)





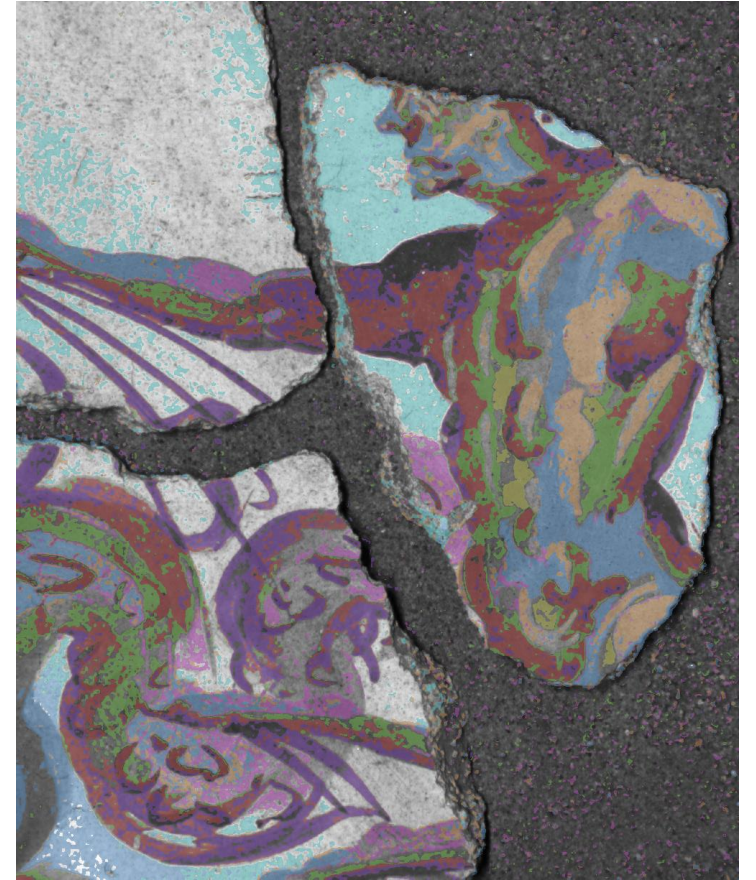
Fresco fragments - Parco Archeologico di Pompei (Italy)



Reconstructed RGB



Example of classified image



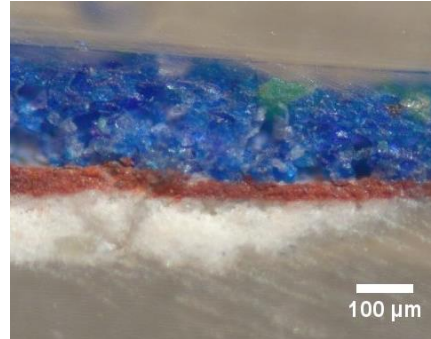
We thank Parco Archeologico di Pompei for granting us the access to the fresco fragments and the Centre for Cultural Heritage Technology of the Italian Institute of Technology [CCHT-IIT] for involving us in the hyperspectral imaging measurements campaign.



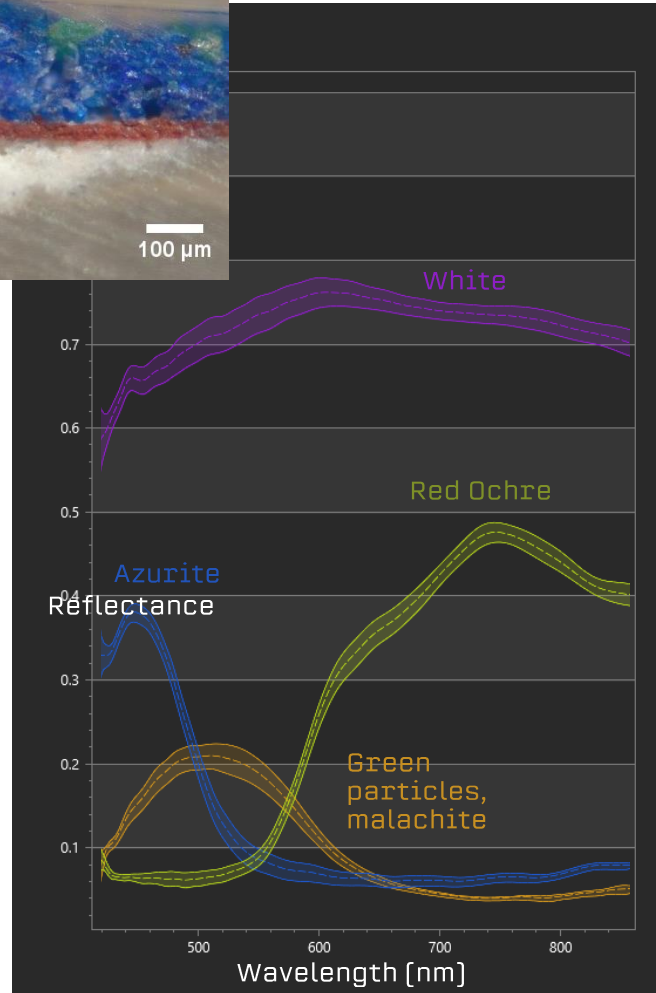
Microscopy application



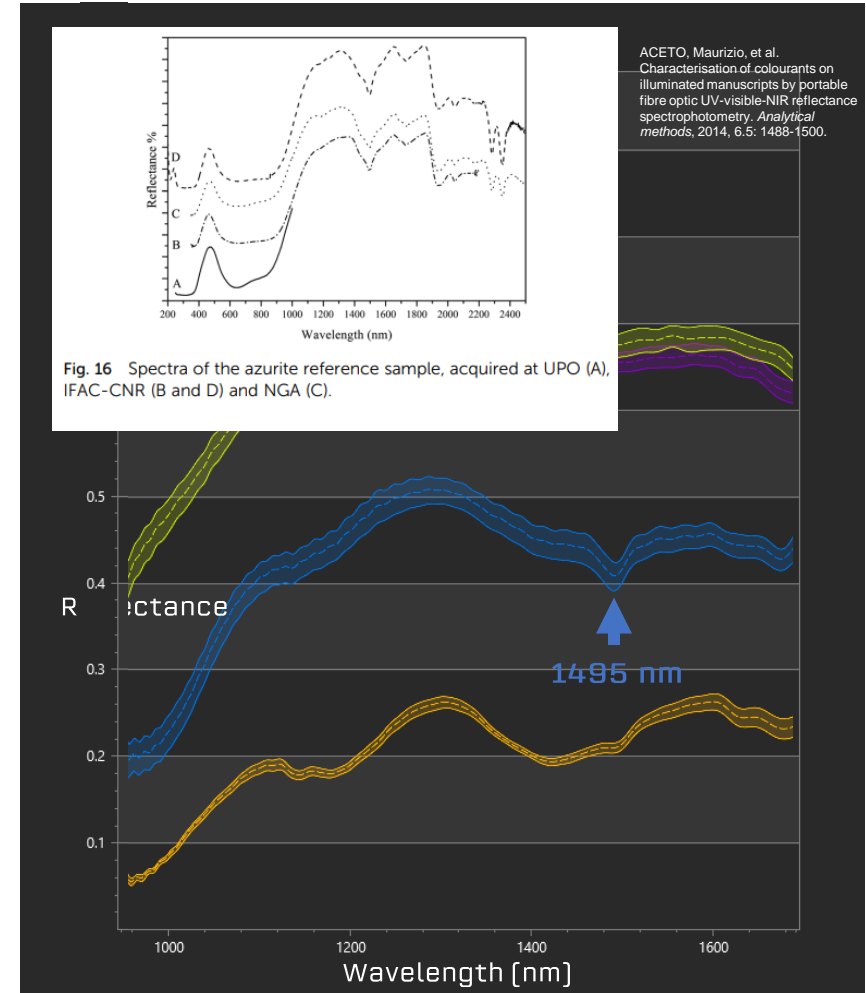
Reconstructed RGB



VIS-NIR



SWIR



Thank you for your attention!



www.nireos.com

marta.ghirardello@nireos.com



Via G. Durando 39, 20158 Milan, Italy



NIREOS SRL – Follow us!