Panels inspection behind gilded finishes through Terahertz Time-Domain Imaging (THz-TDI)

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Abstract

Pulsed Terahertz Time-Domain Imaging (THz-TDI) in reflection mode has been applied to the investigation of gilded tempera panels, for the study of their internal structure and as an aid to understand the applied execution techniques. The knowledge of the inner structure, stratigraphy and condition of the subsurface layers of multi-layer objects is highly relevant in conservation when stability problems such as delamination, internal cracking or defects are considered. Unlike infrared reflectography and X-ray radiography, THz-TDI provides not only 2-D images but also subsurface 3-D images. Furthermore, unlike cross-sectional samples it provides stratigraphic images (b-scans) contactless and non-invasively.

THz reflectometric imaging of the gilded panel replica n. 1

Defects inside the buried plaster layer behind the gilding have been imaged through B-SCANS (fig. c) and d). Single interfaces have been imaged through Time-of-Flight plots (fig. e)).

THz reflectometric imaging of the gilded panel replica n. 2

A cloth piece was applied on the wooden support of the second panel replica, and then covered by the primer layer. A golden finish (gold leafs on a red bole layer), frames the pictorial scene. The terahertz reflection images show the grain of the wood located behind the primer layer and partially under the gilding. The part of the canvas hidden by the primer has been also localized through terahertz time parametric images.

Gilded XIV C. tempera panel - the Virgin with Child and Saint

In the terahertz reflection image (fig. b)), the details of the figure made by gold are much more clearer. It is possible to see the borders of the gold leafs covered by the paint layers, especially in coincidence with the faces of the characters.

The investigated gilded tempera panel (fig. a)), has been provided by the conservator Angelo Cristaudo (Acireale, Sicily, Italy). It is a unique example of gilded icons of the XIV C. .

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