



Contribution ID : 19

Type : not specified

THz wave for Cultural Heritage @ IREA-CNR

Tuesday, 20 February 2024 10:00 (20)

Nowadays, Terahertz (THz) waves are receiving huge attention in the frame of cultural heritage [1], [2]. THz imaging and spectroscopy are, indeed, useful tools for gathering high-resolution (of the order of mm) information about construction modality, preparing drawings and author's re-paintings, conservation state of artworks as well as to identify previous restoration actions, mainly of paintings and frescos. THz time-domain systems are part of the imaging/mapping technological tools of the Italian node of the European research infrastructure for heritage science (E-RIHS.it) [3]. Since 2014, research activities regarding the design of strategies for improving the imaging capabilities of THz waves and their application in artworks surveys are carried out at the Institute for Electromagnetic Sensing of the Environment, National Research Council of Italy (IREA-CNR) [4]. This communication aims at providing a critical overview of the THz potentialities and describing the main challenges for a reliable and accurate data interpretation; finally, some results mainly regarding majolica and ancient decorated mortar specimens will be presented, even with the aim to point out the developed strategies to solve issues in data acquisition and processing. [5], [6].

Acknowledge This study was partially funded by the European Research Infrastructure for Heritage Science (E-RIHS).

References 1. Fukunaga, Kaori. THz technology applied to cultural heritage in practice. Springer, 2016. 2. Cosentino, Antonino. "Terahertz and cultural heritage science: examination of art and archaeology." *Technologies* 4.1 (2016): 6. 3. <https://www.e-rihs.it/en/laboratori-mobili/> (last access Jenuary 2023). 4. Catapano, Ilaria, and Francesco Soldovieri. "THz imaging and data processing: State of the art and perspective." *Innovation in near-surface geophysics* (2019): 399-417. 5. Catapano, Ilaria, et al. "Majolica imaging with THz waves: preliminary results." *Applied Physics A* 122 (2016): 1-11. 6. Manca, Rosarosa, et al. "Non-Invasive Characterization of Maiolica Layer Structure by Terahertz Time-Domain Imaging." *Coatings* 13.7 (2023): 1268.

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Session Classification : IV session