

# 3D painting distribution extracted by time domain spectroscopy

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The thickness of paint films is one of the most critical quality parameters in the aeronautics paint process. Numerous measurement techniques exist for quantifying coated film thickness but many are unsuited to deployment in industrial environments or non-metallic substrate. With the advent of robust, turnkey systems in recent years, time-resolved terahertz pulsed sensing has matured sufficiently to find application in providing quantitative analysis of physical properties to a range of industries, including semiconductor package inspection and non-destructive testing of larger scale composites. For many applications, layer thickness determination can be accomplished using a simple time-of-flight approach, whereby the thickness of individual layers can be estimated from the successive reflections from front and back interfaces of each layer. This may be applicable to thick paint layers where the interface reflections are well separated, as in marine paint systems, but modern paint systems such as aeronautics painting are comprised of many thin paint layers, making accurate identification of individual interface reflections difficult. Terahertz time-domain spectroscopy is a specifically appropriated technique to analyze layered structure composition and geometry and dimension. Inverse electromagnetic problems are commonly performed to extract, from a recorded reflection THz-signal, the distinctive layer dielectric properties and thicknesses deposited on a metallic substrate.

In this paper, we propose to investigate the possibility to retrieve the thickness of a stacked aerospace layers deposited on the composite material thanks to the resolution of a modified inverse electromagnetic problem. This solution consist on an iterative tree algorithm where the contribution of each pulse subdivision between the different layers and substrate can be evaluated [1]. We also reconstructed the deposited film in 2D or 3D see fig 1. and provide a mapping of the deposited thickness. Comparison of the thickness with optical and magnetic tools is in a very good agreement. These results will be applied to different multilayers material such as in Art science.

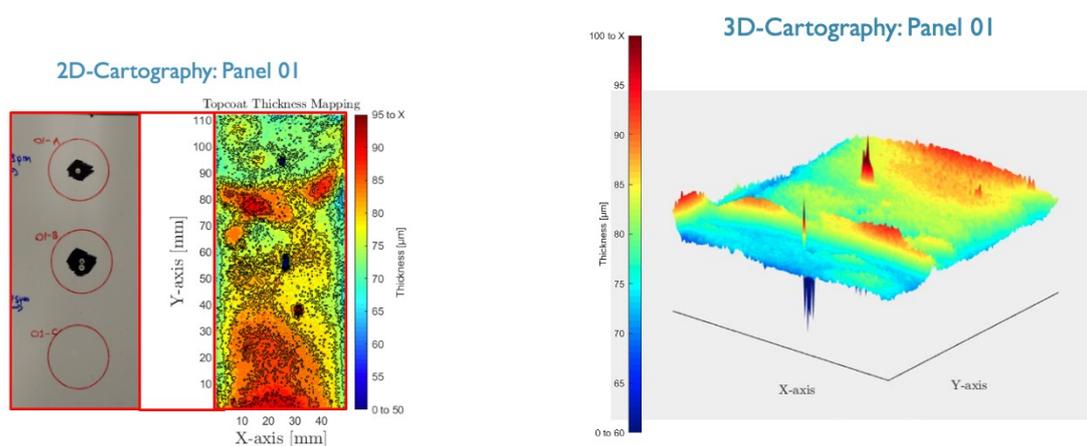


Fig.1: Paint sample, 2D Cartography and 3D representation of the thickness

## References

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