# Thin film characterization by picosecond ultrasonics on high curvature surfaces

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Since the discovery of picosecond ultrasonics by H. J. Maris and his team in 1984, this nondestructive technique continuously expanded and found numerous applications. Where the first application concerned thin film thickness measurement in the semiconductor industries with a complex setup, picosecond ultrasonics technique is now much more efficient, user-friendly and widespread. Indeed, thickness measurement is now easily reachable and this technique also allows the elastic properties measurement of thin films, multilayers and nanostructures, adhesion properties evaluation, etc. Thus, among all the fields that are potentially interested in this new technique are mainly surface engineering, microelectronics and biology. We will see how the photo-generation and the photo-detection of ultra-high frequency ultrasounds (of the order of THz) can accurately and rapidly measure the thickness of a gold coating on a Ti substrate. This measurement can be performed either locally with a high spatial resolution or by scanning the sample, hence giving a mapping of the thickness measurement on the whole surface. Up to now, the shape of the samples had to be very flat; in this presentation, we will demonstrate that we can also analyze even highly curved samples. Compared to concurrent techniques such as ellipsometry or the Calo tester, picosecond ultrasonics presents the unique advantages to be contactless, nondestructive and able to evaluate the properties of a complex shape sample. To illustrate this last point, results will be presented showing outstanding features such as an advanced 3D mapping of a hard coating thickness on a cylinder or a sphere.