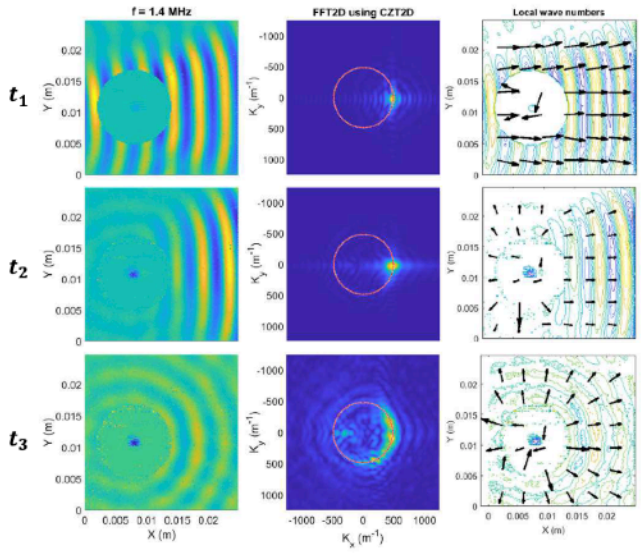
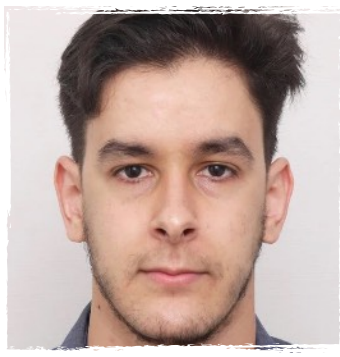
SEMINAR GREMAN

GREMAN | université de TOURS | INSA | cnrs

THURSDAY
6
NOVEMBER





Aziz BOUZZIT

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Acoustic ellipsometry for monitoring and characterizing complex materials

1:30pm - 2:30pm (T. Planiol room - A&P site)

Complex materials are now at the heart of major societal challenges in most key areas such as energy, transportation, the environment, heritage conservation/restoration, health, and safety. Indeed, due to the opportunities for innovation they offer in terms of functionality, these materials raise new issues of multi-physical and multi-scale analysis and understanding. The same applies to the instrumentation required for their characterization. Widely used in the field of non-destructive characterization of complex media, acoustic methods utilize the propagation properties of mechanical waves in these materials, which can be heterogeneous and anisotropic. In a multi-scale approach, the advantage of ultrasonic methods is that they are particularly sensitive to mechanical properties such as elasticity, stiffness, and viscosity. The heterogeneous and multiphase nature of a complex medium thus leads to the concept of a viscoelastic medium, characterized by complex generalized Lamé coefficients ($\lambda*$, $\mu*$) and their variation as a function of frequency. The objective of this work is to develop a method for characterizing these complex viscoelastic materials that allows the variation of both complex generalized Lamé coefficients ($\lambda*$, $\mu*$) as a function of frequency to be measured simultaneously. The proposed approach is to track the propagation of the Rayleigh wave in space and time and extract its ellipsometric parameters (ellipticity χ and orientation θ) in addition to the propagation parameters (k' and k'') that are traditionally determined. Based on wave detection by 3D laser vibrometry at the surface of the complex material, and using 2D Gabor analysis in Quaternion space, the estimation of all parameters—propagative and ellipsometric—provides access to the complete characterization of the medium with this single Rayleigh wave. The theoretical developments proposed in this work, as well as the experimental and simulation results, confirm the value of acoustic ellipsometry for characterizing these complex materials.

📅 **Upcoming GREMAN Seminars:**

- Tuesday, November 18, 2025 (11PM): *Louis LEFFRAY - Journal Club* (A&P site)
- Tuesday, December 9, 2025 (11AM): *Dragon DAMJANOVIC - Seminar (EMA site)*
- Thursday, December 18, 2025 (13:30PM): *Ayoub FAIHE - Journal Club* (A&P site)
- Tuesday, January 13, 2025 (11AM): *Mads WEBER - Seminar (EMA site)*