

A11

Non-destructive measurement of orthotropic elastic properties of wood samples by their modal impulse response

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- Wood represents a major class of versatile materials in mechanics, comparable to metals on various criteria such as annual tonnage produce worldwide or effective properties
- In general, only the longitudinal elastic modulus (E_L) of wood is available in **databases**

- CIRAD “xylotheque¹” in Montpellier: 34.935 samples of 8.385 tree species from 123 countries (Africa, Asia and America)

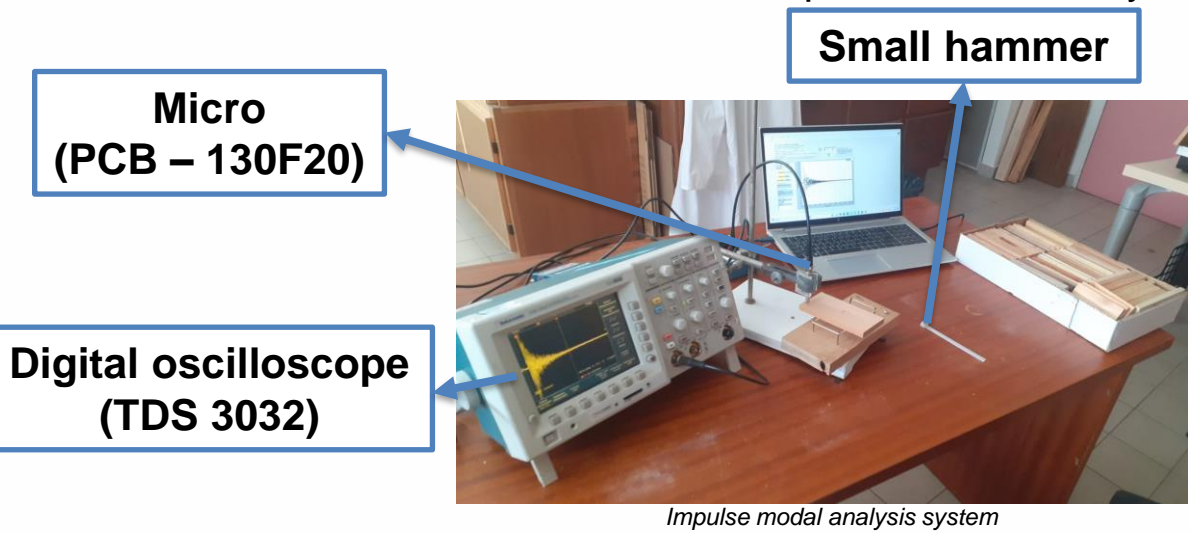
Problematic ?

The knowledge of the transverse (E_R and E_T) and shear (G_{RT} , G_{LT} and G_{LR}) elastic properties of this **orthotropic, heterogeneous, hygroscopic and variable** material is still limited due to a lack of **rapid and efficient** characterization tools and methods



Parallelepiped samples with fixed dimensions ~ 13 cm x 6 cm x 1 cm

- **Fast and non-destructive** method = impulse modal analysis:

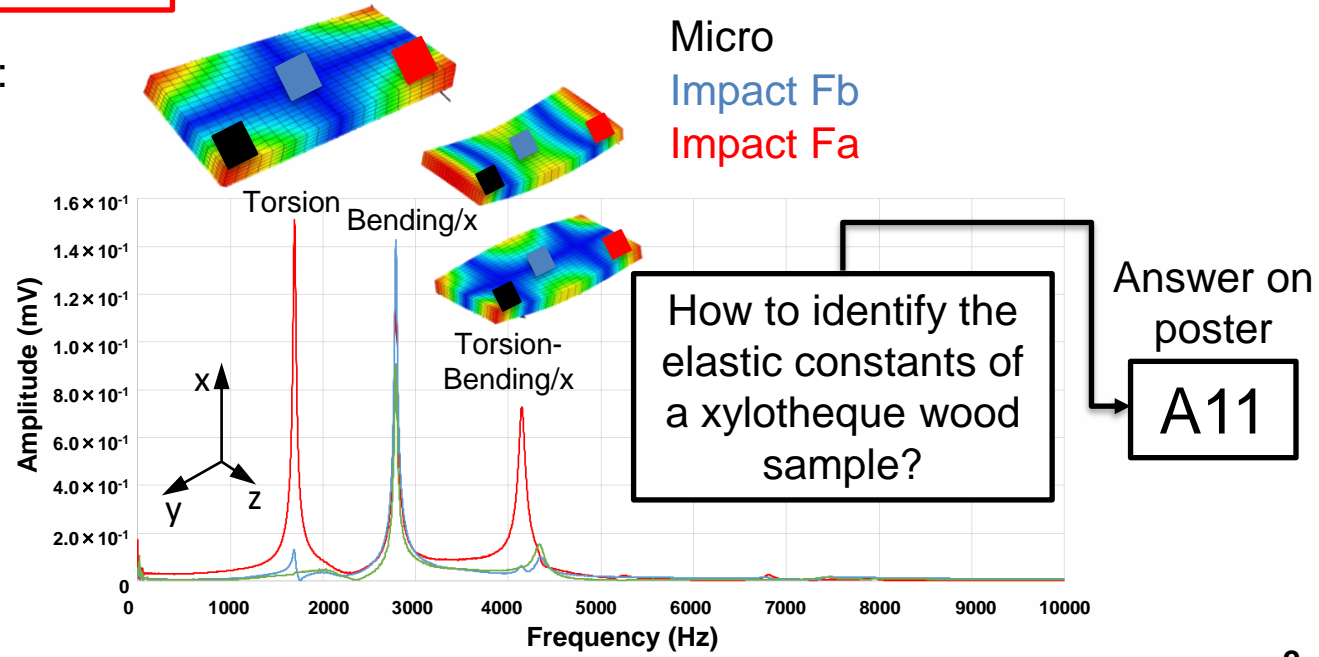


Micro
(PCB – 130F20)

Small hammer

Digital oscilloscope
(TDS 3032)

Impulse modal analysis system



Impulse response spectra for different configurations and mode matching: Beech quarter-sawn sample

¹ Langbour P. et al. (2019) Description of the Cirad wood collection in Montpellier, France, representing eight thousand identified species. *Tropical Woods and Forests*, 339:7-16. DOI: [10.19182/bft2019.339.a31709](https://doi.org/10.19182/bft2019.339.a31709)