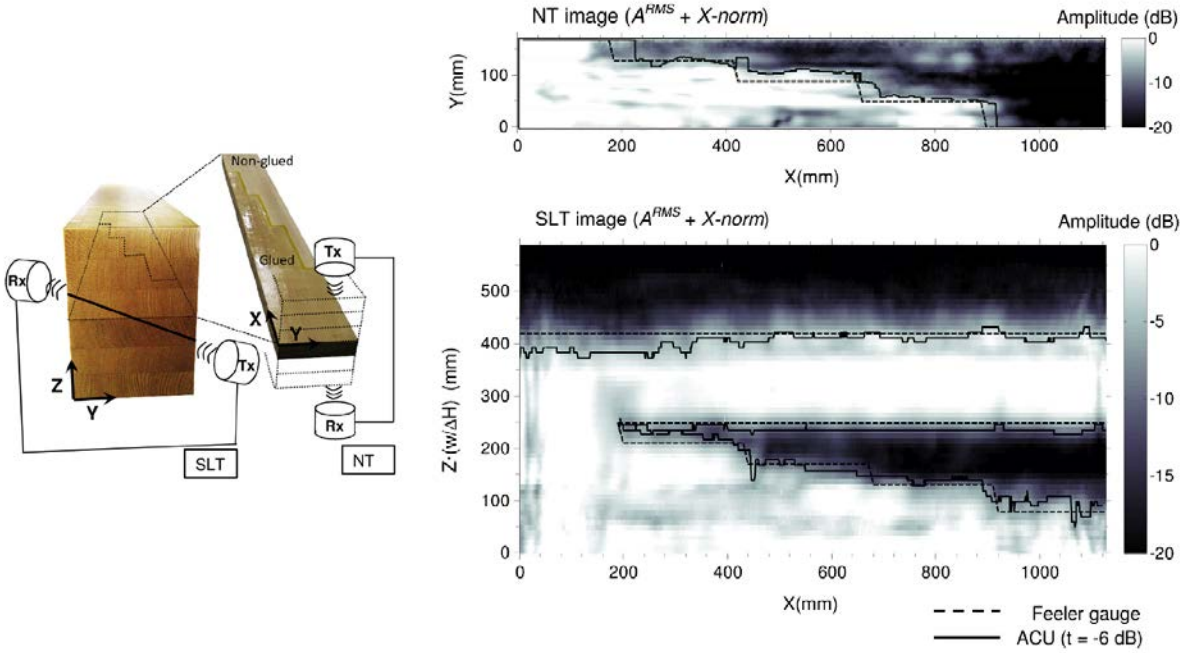
Ultrasonic diagnostics of glued timber components

Glued laminated timber, solid wood panels and prefabricated wood components currently experience a strong increase of use in timber constructions. Quality monitoring is imperatively necessary during fabrication and whole life time. Ultrasonic diagnostics today is indispensible in medicine as well as in quality control of technical products. However, for glued timber structural monitoring ultrasonics still has a high potential for developments. Problems to be solved are, e.g., the coupling to wood and the high attenuation in it, the elastic anisotropy and the difficulty to differentiate between defects and natural variability.

The objective of this project was to investigate the fundamentals of the interaction of ultrasonic waves with glued timber interfaces and defects and to develop and validate ultrasonics as a diagnostic tool for monitoring the integrity of timber structures. Characteristic features of different glue joint defects were be detected by varying transmission frequency and pulse coding combined with dedicated signal analysis. Main emphasis was placed on the application of air-coupled ultrasonics which has the great advantage of constant and reproducible coupling conditions without deteriorating the surface. Ultrasonic imaging developed in the project enabled the detection and characterisation of flaws as well as the monitoring of changes with time. The project included numerical simulations of the propagation path of ultrasonic waves, dedicated hard- and software developments as well as advanced signal and image processing.



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