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A0 Lamb Mode Tracking to Monitor Crack Evolution in Thin Aluminum Plates Using Acoustic Emission Sensors

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Abstract: This paper presents a real time monitoring methodology to identify the location of acoustic emission (AE) sources generated by microcracks created within an aluminum plate when submitted to a tensile load. The real time detection of the AE hits was performed by means of a network of piezoelectric sensors distributed on the surface of the plate. The proposed localization approach is based on the combination of the time-frequency analysis of the detected AE hits with an extended Kalman filter (EKF). The spatial coordinates of the AE sources were determined by solving a set of nonlinear equations, where the extended Kalman filter is based on an iterative calculation. By considering the statistics related to the estimation of the coordinates' errors, results show that the proposed method is in agreement with the experimental observations related to the propagation of the crack when the aluminum plate is under load.

Keywords : Acoustic Emission (AE), AE events localization, Continuous Wavelet Transform (CWT), crack propagation, Extended Kalman Filter (EKF), Lamb waves, tensile test