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Flaw detection and thin materials thickness measurement using time frequency and high resolution algorithms

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Several techniques of signal processing were introduced in ultrasonics NDT field. In thin samples the reflected signals are overlapping thus making detection of defects in these samples and accurate measurements impossible. It is thus necessary to enhance the visibility of the defect echo by signal processing techniques. In this context, we develop signal processing tools allowing detecting and locating the imperfections present in these materials. In this paper, we contribute by the development of some signal processing techniques based on time frequency and high resolution algorithms in order to enhance the resolution of flaw detection and to measure thin materials thickness. 1- We propose to implement temporal versions of methods known as high resolution like MUSIC, Root MUSIC and Eigen vectors method. These methods allow frequencies extraction in the case of the complex signals drowned in noise. 2- We apply time-frequency algorithms based on STFT, Wigner-Ville, Gabor transform on thin materials thickness measurement. A comparative study is carried out between all of these algorithms and is applied in separation of closer flaw echoes and thin materials thickness measurement. Satisfactory results are obtained with Gabor transform in measurement of few tenth (0.1) mm.