

Signal processing for the detection of multiple imperfection echoes drowned in the structural noise

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Abstract: In this work, we propose to develop algorithms based on the split spectrum processing method associated with the multi-steps method based on “Group delay moving entropy” (GDME) allowing detecting and locating multiple imperfection echoes drowned in the structural noise of materials. In fact, GDME is based on the fact that defect echoes have a constant group delay while the noise has a random group delay. The investigation is performed with 4 known defect echoes with different characteristics (position, center frequency and bandwidth). The defect echo frequency is varied around the frequency of the input signal in order to evaluate, by signal to noise ratio calculation, the robustness of the detection method. The grain noise signal is generated first, by a simple clutter model which consider the noise, in the time domain, as the superimposed of signal coming from backscatterers in the medium and second, experimentally by a material with coarse grains.

Keywords : Ultrasonic NDE, split spectrum processing, Signal to noise ratio, Structure noise