Reconstruction of Rayleigh-Lamb dispersion spectrum based on noise obtained from an air-jet forcing

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The time-domain cross-correlation of incoherent and random noise recorded by a series of passive sensors contains the impulse response of the medium between these sensors. By using noise generated by a can of compressed air sprayed on the surface of a plexiglass plate, we are able to reconstruct not only the time of flight but the whole waveforms between the sensors. From the reconstruction of the direct A_0 and S_0 waves, we derive the dispersion curves of the flexural waves, thus estimating the mechanical properties of the material without a conventional electromechanical source. The dense array of receivers employed here allow a precise frequency-wavenumber study of flexural waves, along with a thorough evaluation of the rate of convergence of the correlation with respect to the record length, the frequency, and the distance between the receivers. The reconstruction of the actual amplitude and attenuation of the impulse response is also addressed in this paper [Larose et al, J. Acoust. Soc. Am 122(2007)].