

Interpretation of Ultrasonic Backscatter of Linear FM Chirp Pulses from Targets Having Frequency-Dependent Scattering

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Abstract : Ultrasonic remote sensing is a useful tool for assessing the interior structure of complex targets. For these methods, significantly enhanced spatial resolution is obtained if the pulse is coded, for example using a linearly changing frequency during the pulse duration. Such pulses have a time-dependent spectral structure. Interpretation of the backscatter from targets is, therefore, complicated if the scattering is frequency-dependent. While analytic models are well established for steady sinusoidal excitations applied to simple shapes such as spheres, such models do not generally exist for temporally evolving excitations. Therefore, models are developed in the current paper for handling such signals so that the properties of the targets can be quantitatively evaluated while maintaining very high spatial resolution. Laboratory measurements on simple shapes are used to confirm the validity of the models.

Keywords : linear FM chirp, time-dependent acoustic scattering, ultrasonic remote sensing, ultrasonic scattering

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