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Elastic and interfacial contributions to SAS images of tilted metal cylinders: Laboratory experiments

Jon La Follett, Kyungmin Baik and Philip L. Marston
Washington State University, Physics and Astronomy Department, Pullman, WA 99164-2814, USA

Laboratory experiments were carried out to explore interfacial and elastic contributions to synthetic aperture sonar (SAS) images of a solid aluminum circular cylinder having flat ends. Some of the elastic responses for free field backscattering as a function of tilt angle could be interpreted using prior ray-based theory of generalized Rayleigh wave contributions [K. Gipson and P.L. Marston, *J. Acoust. Soc. Am.* 106, 1673-1680 (1999); 107, 112-117 (2000)]. Simplified acoustic holography was also used to interpret aspects of the free field bistatic response. To study the effects of proximity to a flat reflecting surface, the cylinder was hung through the free surface of a water tank and monostatic SAS images were acquired by scanning the transducer location along a horizontal line. This arrangement partially simulates SAS images of cylinders on the ocean bottom at grazing incidence. There were bright contributions to the SAS images of tilted cylinders associated with direct elastic rays as well as with indirect elastic rays due to acoustic reflections from the free surface of the water tank. [Research supported by ONR.]