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**Emergence of the deterministic Green's function from thermal noise in inhomogeneous solids and fluid-solid structures**

Oleg Godin

NOAA/ESRL, 325 Broadway, Mail Code R/PSD99, Boulder, CO 80305-3328, USA

S. M. Rytov [ *A Theory of Electrical Fluctuations and Thermal Radiation* (USSR Academy of Sciences, Moscow, 1953)] was apparently the first to establish theoretically a simple relation between deterministic Green's function and cross-correlation of fluctuations of wave fields generated by random sources. He used reciprocity considerations to analyze fluctuations of electromagnetic fields. An acoustic counterpart of the Rytov's approach was applied in [O. A. Godin, Emergence of the acoustic Green's function from thermal noise, *J. Acoust. Soc. Am.* **121**, EL96-EL102 (2007)] to derive exact and asymptotic relations between acoustic Green's functions and cross-correlation of thermal noise in inhomogeneous moving or motionless fluids. In this paper, these results are extended to solid and fluid-solid media and compared to experimental and theoretical results previously reported in the literature. It is shown that, with the averaging time being sufficiently large, the two-point correlation function of thermal noise contains as much information about the environment as can be obtained acoustically by placing transceivers at the two points. A possibility of retrieving parameters of a fluid motion, such as a flow in a pipe or an oceanic current, from cross-correlations of diffuse noise fields is addressed.