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Retrieval of elastic Green's tensor near a cylindrical inhomogeneity from vector correlations

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It is now widely accepted that in reality multiple scattering makes that average field intensities or energy densities follow diffusive processes. In such regime the successive P to S energy conversions by distributed random inhomogeneities gives rise to equipartition which means that in the phase space the available elastic energy is distributed in average with equal amounts among the possible states of P and S waves. In such diffusive regime the P to S energy ratio equilibrates in a universal way *independent of the particular details* of the scattering. It has been demonstrated that averaging the cross correlations at two points subjected to diffuse elastic wavefields leads to the emergence of the Green function, which is the wave field that would be observed at one position if an impulsive load is applied at the other. The experimental results have demonstrated the role of long range correlation. In this work we study the canonical problem of the retrieval of the 2D elastodynamic Green function in an infinite elastic space containing a circular cylinder inclusion. We illuminate isotropically the elastic space with plane waves. In the antiplane *SH* case we assume uniform spectrum, while for the inplane *P-SV* case we assume the spectra for both P and *SV* uniform and such that the energy ratio $E_S/E_P = (\alpha/\beta)^2$, which is the one predicted by equipartition theory in two-dimensions. We then show that the Fourier transform of azimuthal average of the cross-correlation of motion between two points within an elastic medium is proportional to the imaginary part of the exact Green tensor function between these points. This result coincides with the canonical homogeneous elastic case in 2D and shows that both equipartition and isotropy of the field are necessary conditions to retrieve the *exact* 2D Green function from correlations of the elastic field.