Blind ghost imaging through scattering media

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The propagation of coherent light through a scattering medium produces speckle patterns in reflection and transmission. Despite the apparent randomness of the speckle patterns, a spatial correlation between the reflected and transmitted intensities survives even in the multiple scattering regime [1]. The existence of mutual information between the two sides of a scattering medium opens up new possibilities for the control of light transmission, and for sensing and imaging [2]. Here we show that ghost imaging can be performed to image a target located behind an opaque scattering layer, without measuring the transmitted speckle [3].

References

[1] I. Starshynov, A.M. Panaguia-Diaz, N. Fayard, A. Goetschy, R. Pierrat, R. Carminati, J. Bertolotti, Phys. Rev. X **8** (2018) 021041.

[2] N. Fayard, A. Goetschy, R. Pierrat, R. Carminati, Phys. Rev. Lett. **120** (2018) 073901.

[3] A.M. Panaguia-Diaz, I. Starshynov, N. Fayard, A. Goetschy, R. Pierrat, R. Carminati, J. Bertolotti, Optica **6** (2019)460.

Figures

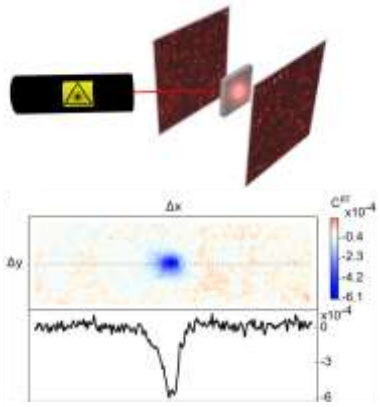

Figure 1: Top: reflected and transmitted speckle patterns measured on both sides of an opaque scattering layer. Bottom: reflection-transmission intensity correlation function. Adapted from [1].

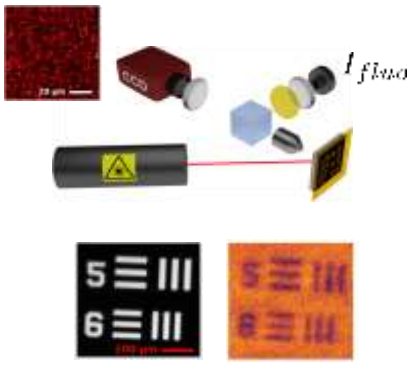

Figure 2: Top: scheme for blind ghost imaging. The object is placed behind an opaque scattering layer, and deposited on a fluorescent substrate. An image is reconstructed from the reflected speckle pattern measured on a CCD camera, and the backscattered fluorescent intensity. Bottom: object and reconstructed image. Adapted from [3].