Measurement of phase- and position- resolved optical reflection matrices

Niels Alferink*[1], Saipavan Vengaladas , Ad Lagendijk , Melissa Goodwin , and Willem Vos

[1]University of Twente – Netherlands

Abstract

Wave propagation in complex media is widely studied using scattering matrix consisting of the reflection and transmission matrices and Random Matrix Theory suggests the existence of dominant channels either on reflection or transmission side. The dominant channels can be found from reflection or transmission matrices. Reflection matrix can be obtained by recording the Green function between an array of sources and sensors in reflection (1). Reflection matrices allow us to manipulate the incident wavefront to achieve the desired output on the incident side. With Singular Value Decomposition, we can identify the dominant open channels that play a key role in reflecting the incident light. Here, we present complex optical reflection matrices of various samples like Au on Si wafers, 3D opals, 2D photonic crystals in a position-position basis. (1) A. Badon, D. Li, G. Lerosey, A. C. Boccara, M. Fink, and A. Aubry, "Smart optical coherence tomography for ultra-deep imaging through highly scattering media", Science Advances (2016).

*Speaker