

NEXT LITE-SEMINAR

Shaped wavefronts and speckle correlations: A window into opaque media.

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Gußhausstraße 27-29, 1040 Vienna,
Seminar room CBEG02, ground floor.

Host: S. Rotter

Abstract

In this colloquium talk I will give an accessible overview of the emerging field of wavefront shaping in strongly scattering media, highlighting the opportunities for new research.

Random scattering of light, which takes place in paper, paint and biological tissue is an obstacle to imaging and focusing of light and thus hampers many applications. At the same time scattering is a phenomenon of basic physical interest as it allows the study of fascinating interference effects such as open transport channels [1,2].

Propagation of laser light in scattering media can be controlled by shaping the incident wavefront using spatial light modulators. Wavefront shaping methods in scattering media have given rise to a new wave of fundamental studies of light propagation as well as new modalities of imaging and focusing with scattered light. Recently we demonstrated that speckle correlations enable non-invasive fluorescence imaging through strongly scattering layers [3]. Scattering “lenses” made of high-index materials, allowing wide-field speckle-illumination microscopy with a resolution approaching 110 nm [4].

In waveguides scattering can be exceptionally strong. We have very recently demonstrated dynamic control of resonant scattering using light, which allows interactive control of scattering [5], with the possibility to create a new class of adaptive nanophotonic circuits.

References

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- [2] I.M. Vellekoop and A.P. Mosk, Universal optimal transmission of light through disordered materials, *Phys. Rev. Lett.* 101, 120601 (2008).
- [3] J. Bertolotti, E. G. van Putten, C. Blum, A. Lagendijk, W. L. Vos, and A. P. Mosk, Non-invasive imaging through opaque scattering layers, *Nature*, 491, 232 (2012).
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