Laser Seminar
Monday, May 15, 2017

Time **13.15**

Location ETH Zurich, Hönggerberg, HPF G6

Speaker Romolo Savo, Laboratoire Kastler Brossel, Ecole Normale Supérieure, Paris

Title **Transport and invariants in disordered photonics**

Abstract Improving optical investigations capability to extract information from complex media, such as disordered and heterogenous media, has become of primary importance in a wide range of disciplines, from atmospheric physics to medicine and cultural heritage preservation. The accurate characterization of the light transport process and the connection to the parameters describing single and multiple scattering of light is of great importance, both for understanding of the physical process and for practical use.

Disordered photonics represents a versatile platform to investigate light propagation in complex structures from a fundamental perspective [1]. On the one hand it focuses on controlling the optical properties of the investigated system and on the other hand it uses high-precision optical experiments to study the effects. This approach makes possible to look more clearly into the connection between measurable quantities and scattering parameters, so as to improve the modeling and the comprehension of the transport phenomena.

In this talk I will consider several models of disordered structures, namely heterogeneous fractal-like materials (Lèvy Glasses), thin opaque layers and liquid Mie solutions. I will show how accurate time- and space-time-resolved experiments allow detecting previously inaccessible features of the transport process, which expand the diagnostic capability of optical experiments and enrich the physics of multiple light scattering, requiring to go beyond the mainstream diffusion modeling [2,3].

Complementary to previously introduced results, which highlights the role of the medium's structure on the light transport process, I will present very recent results on a surprising invariance property of wave physics. By means of photon correlation experiments I will show that the mean length of light trajectories inside a scattering medium is independent of its microstructure and that only its overall shape counts [4].

[1] D.S. Wiersma, Nature Photonics 7.3 :188-196 (2013).
[2] R. Savo et al., Physical Review A, 90 (2):023839, (2014).
[3] L. Pattelli, R. Savo et al., Light: Science & Applications 5 (5), e16090, (2016).
[4] R. Savo et al. arXiv:1703.07114 (2017).

Host Rachel Grange, Optical Nanomaterial Group, IQE

More Info http://www.fastlab.ethz.ch/laser-seminar.html

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