

NEXT LITE-SEMINAR

Engineering time-reversal symmetry in metamaterials

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Location: **TU Wien, Photonics Institute**
Gußhausstraße 27-29, 1040 Vienna,
Seminar room CBEG02, ground floor.

Host: S. Rotter

Abstract

Metamaterials are artificially structured materials capable of interacting with waves in anomalous ways, leading to new physical phenomena unavailable in natural materials, such as negative refraction or cloaking. These man-made structures have offered exciting potentials for several applications, spanning radio-frequency, infrared, optical and acoustic systems. Nevertheless, fundamental physical symmetries impose constraints on the ultimate functionalities of metamaterials. Relevant examples, at the core of the present talk, are the fundamental constraints of reciprocity and Hermiticity imposed by time-reversal (TR) symmetry.

Here, I will discuss the enhanced wave manipulation capabilities of non-reciprocal, topological and non-Hermitian wave devices obtained by judiciously engineering TR symmetry in acoustic and electromagnetic systems. In a first part, will discuss how TR symmetry breaking can lead to strong nonreciprocal effects at the sub wavelength scale, and used to induce classical analogs of Chern insulators. Designs of TR invariants topological insulators for electromagnetic and acoustic waves will be also discussed, based on adequate pseudo spin engineering strategies. In a second part, I will focus on the different case of non-Hermitian systems with broken TR symmetry, but preserved Parity-Time (PT) symmetry, demonstrating the possibility to induce negative refraction and cloaking with a PT pair of metasurfaces built with gain and loss.