

SEMINAR SERIES

PHOTONICS INITIATIVE

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Understanding light interaction at the nanoscale with quasinormal-mode theory

Abstract – Nanoresonators play a pivotal role in enhancing various light-matter interaction phenomena. These systems are open and exhibit resonances, often referred to as quasinormal modes or QNMs, which possess complex frequencies. The imaginary component of these frequencies encodes either an exponential decay ("damping") over time or an exponential growth ("amplification") in space. The physics of non-Hermitian systems offers a significantly more intricate landscape compared to their Hermitian counterparts; however, it is accompanied by the challenge of dealing with more intricate mathematical formulations.

Over the past decade, there has been notable advancement in the theory of electromagnetic QNMs. To the extent that there are now freely available software packages that aid in conducting modal analyses of the interaction between light and nanoresonators. In this context, we will provide an overview of the current state of the art in electromagnetic QNMs theory, encompassing aspects like their computation, regularization, and normalization. Additionally, we will explore several interesting applications of this theory in understanding fundamental properties of nanoresonators that arise due to their non-Hermitian nature.

Bio – Philippe Lalanne currently works as a CNRS Research Scientist. He is an expert in nanoscale electrodynamics, with a primary focus on modeling and theory. Over the course of his career, he has introduced novel modal theories, established general principles for designing high-Q microcavities, clarified the role of plasmons in the extraordinary optical transmissions, and demonstrated the first high-NA optical metalenses using high-index nanostructures during the late 1990s. Presently, his research interest focuses on the non-Hermitian interaction of light with nanoresonators and the characteristics of disordered optical metasurfaces. From 2018 to 2022, he held the role of Director for the GDR Ondes that gathers the French community working on electromagnetic waves. He received several distinctions, including the prestigious 2022 ERC Advanced grant. He is a fellow of IOP, SPIE and OPTICA.



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Date:

Thursday November 16, 2023

Time:

11:00am – 12:00pm

Location:

ASRC Auditorium
85 Saint Nicholas Terrace
New York, NY 10031

Host:

Andrea Alù, Director, Photonics Initiative, ASRC, CUNY GC

This is an in-person seminar. If you opt to join via Zoom use meeting ID: 854 7427 8616, Passcode: 249263

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