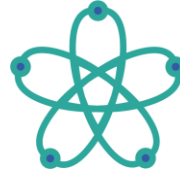


THE UNIVERSITY OF HONG KONG



Department of Physics
THE UNIVERSITY OF HONG KONG



HK Institute of
Quantum Science & Technology
香港量子研究院

Beyond Closed Wave Systems: Non-Hermiticity, Nonlinearity, and Casimir Effect

Prof. Kun DING

Fudan University

Abstract:

The classical wave system has demonstrated itself as an excellent platform to realize and investigate novel phenomena and physics. The bedrock principle is to utilize the macroscopic quantities obtained from the homogenization or mean-field treatment. However, it usually deals with Hermitian problems and averages out fluctuations. Therefore, the presentation will cover two topics: non-Hermitian physics and Casimir effect. The first part focuses on the impact of non-Hermitian ingredients on soliton formation and dynamics. By constructing a soliton phase diagram, two distinct soliton phases and their transitions are identified. A Wannier-function-based nonlinear Hamiltonian shows that soliton formation critically depends on how skin-mode localization and band nonreciprocity suppress or enhance wave dispersion. Both soliton phases have been demonstrated to be dynamically accessible from bulk and edge excitations. The second part discusses the influence of the metal's surface electrons on Casimir forces. A three-dimensional frame transformation method has been established by embedding mesoscopic boundary conditions of electromagnetic fields. We find that mesoscopic Casimir forces are sensitive to the surface electron behavior, including spill-in and spill-out, as verified by the multiple scattering method and proximity force approximation. The mechanism has finally been revealed as Casimir softening distances rooted in quantum surface responses of electrons.

Biography:

Dr. Kun Ding is an Associate Professor at the Department of Physics, Fudan University, starting in January 2021. He received his B.Sc. and Ph.D. in 2008 and 2013, respectively, from the Department of Physics at Fudan University. Before joining Fudan University as a faculty member, he worked as a Research Associate at Imperial College London from 2019 to 2020, under the supervision of Prof. Sir John Pendry, and at the Hong Kong University of Science and Technology from 2013 to 2018, where he served as a Postdoctoral Fellow and Research Assistant Professor in Prof. C. T. Chan's group. His research topics include non-Hermitian physics, plasmonics, and Casimir effects, among others.

ANYONE INTERESTED IS WELCOME TO ATTEND!

Wednesday, August 20, 2025, 11:00am

Room 522, 5/F, Chong Yuet Ming Physics Building, The University of Hong Kong

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Phone: 28592360 Fax: 25599152. *Anyone interested is welcome to attend.*