A U S H A N G

FREIE UNIVERSITÄT BERLIN
Fachbereich Mathematik und Informatik

Promotionsbüro, Arnimallee 14, 14195 Berlin

D I S P U T A T I O N

Montag, 06. November 2023, 10:00 Uhr

Ort: Seminarraum 2006
(Zuse Institut Berlin, Takustr.7, 14195 Berlin)

Disputation über die Doktorarbeit von

Felix Binkowski

Thema der Dissertation:
Riesz-projection-based methods for the numerical simulation of resonance phenomena in nanophotonics

Thema der Disputation:
Exceptional points for enhancing the sensitivity of optical sensors

Die Arbeit wurde unter der Betreuung von **Prof. Dr. C. Schütte** durchgeführt.

Abstract: Optical sensors are often based on spectral degeneracies, where eigenvalues of the underlying physical systems coalesce. A small perturbation of the systems can result in a detectable frequency splitting of the eigenvalues. The frequency splitting is typically proportional to the perturbation. Exceptional points are spectral degeneracies where not only n eigenvalues but also the associated eigenvectors coincide, resulting in a frequency splitting which is proportional to the n-th root of the perturbation. This can yield an enhanced sensitivity of the sensors.

In this talk, we report on exceptional points occurring in optics and their meaning for sensing applications. We study an example from the literature, a microdisk resonator for single particle detection. The underlying eigenvalues and their frequency splittings are usually analyzed by considering non-Hermitian effective Hamiltonians. We compare the results of an optical two-mode approximation with results of numerical simulations based on solving the Helmholtz equation for the microdisk-particle system. An experimental realization of the system is also reported.

Die Disputation besteht aus dem o. g. Vortrag, danach der Vorstellung der Dissertation einschließlich jeweils anschließenden Aussprachen.

Interessierte werden hiermit herzlich eingeladen

Der Vorsitzende der Promotionskommission
Prof. Dr. C. Schütte