Fachgruppe
Physik und Astronomie
Universität Bonn

Physikalisches Kolloquium
Fachgruppe Physik/Astronomie der
Universität Bonn

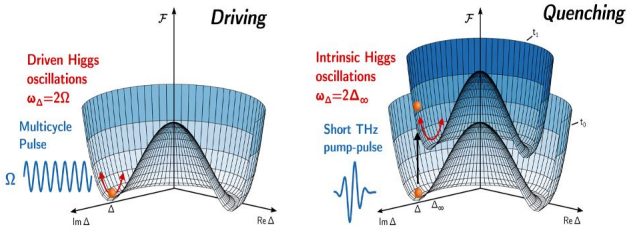
UNIVERSITÄT BONN

Friday, 27.10.2023, 1:15 p.m.
in Lecture Hall I of the Physics Institute

Dirk Manske

MPI for Solid State Research, Stuttgart

„Higgs Spectroscopy of superconductors: How to activate and detect the Higgs mode in superconductors“



Higgs spectroscopy is a new and emergent field that allows to classify and determine the superconducting order parameter by means of ultra-fast optical spectroscopy. There are two established ways to activate the Higgs mode in superconductors, namely a single-cycle ‘quench’ or an adiabatic, multicycle ‘drive’ pulse, both illustrated in Figure 1. In the talk I will review and report on the latest progress on Higgs spectroscopy, in particular on the role of the third-harmonic-generation (THG) and the possible IR-activation of the Higgs mode by impurities or external dc current. I also provide new predictions for time-resolved ARPES experiments in which, after a quench, a continuum of Higgs mode is observable and a phase information of the superconducting gap function would be possible to extract. Higgs spectroscopy can be extended to two-dimensional superconductivity and can shed some light on a 25-years-old A_{1g}-puzzle in equilibrium Raman scattering on high-Tc cuprates. Finally, I present a new prediction for Non-Equilibrium Anti-Stokes Raman Spectroscopy (NEARS) in order to see the Higgs mode directly. Recently this has been confirmed by experiment.

Fig. 1. *Two ways to activate the Higgs mode in superconductors: ‘Driving’ or ‘Quenching’.* ***(left)*** *A driven superconductor in steady-state non-equilibrium becomes resonant at the eigenfrequency of the Mexican hat and leads to third harmonic generation (THG).* ***(right)****In the non-adiabatic case, in which a single-cycle THz pulse shrinks suddenly the Mexican hat, one can observe Higgs oscillations directly in various quantities.*

Everybody is welcome, especially students of all semesters.

Coffee and tea will be available after the colloquium.

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