NANOSCIENCE COLLOQUIUM

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

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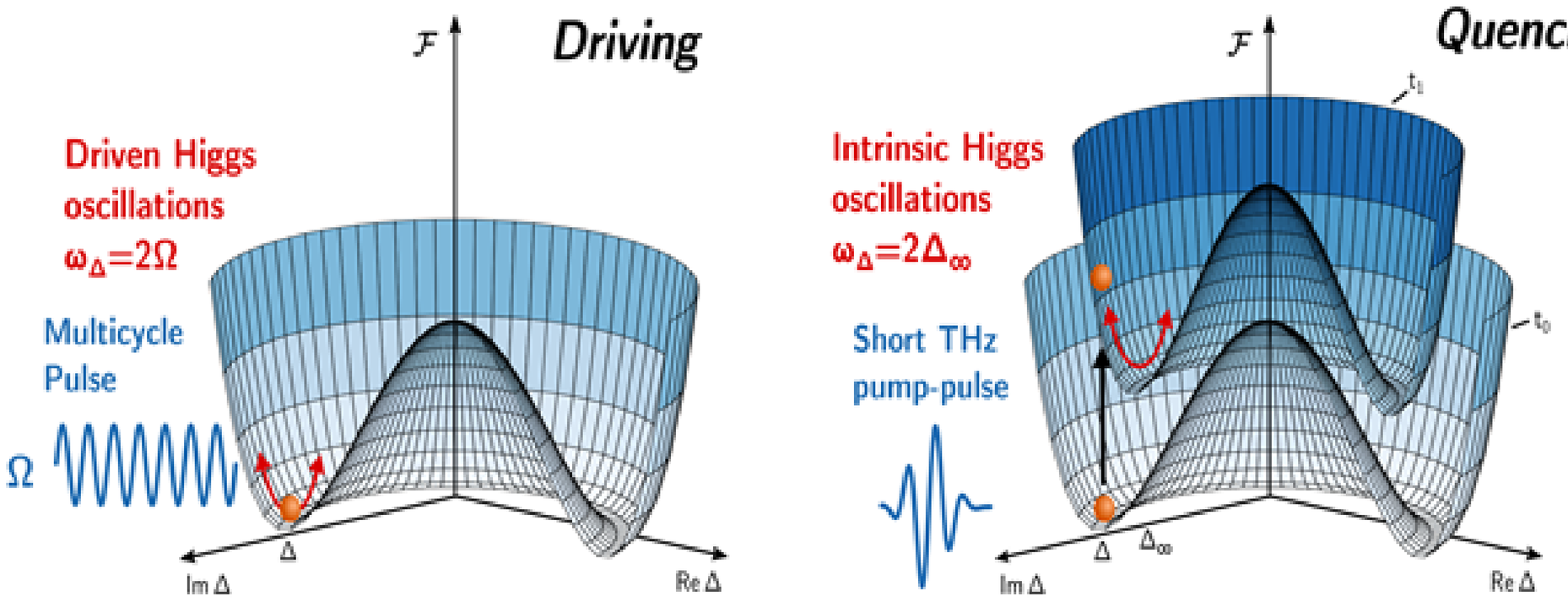
Abstract: Higgs spectroscopy is a new and emergent field [1-3] that allows to classify and determine the superconducting order parameter by means of ultra-fast optical spectroscopy. There are two established ways to activate the Higgs mode in superconductors, namely a single-cycle ‘quench’ or an adiabatic, 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) [4-6] and the possible IR-activation of the Higgs mode by impurities or external dc current [7,8]. 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 [9]. Higgs spectroscopy can be extended to two-dimensional superconductivity [10] and can shed some light on a 25-years-old A1g-puzzle in equilibrium Raman scattering on high-Tc cuprates [11]. 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 [12].



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