

Title: Vortex mediated Josephson plasmon bound states in the Sine-Gordon model

Abstract: This talk focuses on the theoretical progress made in computing higher order correlation functions in the 3D anisotropic XY-model. Remarkably, this approach has uncovered the existence of a new vortex mediated Josephson plasmon bound state in the disorder phase created by the unbinding of vortex / anti-vortex pairs. Such a state appears as a pole in higher order correlation functions. At temperatures high above the transition, this new resonance has a universal ratio to the plasma resonance. The 3D anisotropic XY-model has been a candidate for many years for describing the superconducting transition of underdoped high temperature cuprate superconductors. So far it was not possible to experimentally distinguish between different competing theories. I will finish my talk by discussing how higher order correlation functions are now experimentally available through the advent of 2D THz spectroscopy, and can directly detect such a bound state. Confirming the existence of this bound state with the universal ratio computed for the anisotropic XY-model would provide strong evidence that this is the true physics of cuprates up to room temperature.