

IFMP Seminar

Date: Tuesday, February 01, 2022, at 14:50

BigBlueButton:

<https://selfservice.zih.tu-dresden.de/link.php?m=157295&p=94027b15> (TUD)

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Speaker: **Peter Abbamonte**
University of Illinois Urbana-Champaign

Title: **Evidence for Pines' Demon in Sr_2RuO_4 from Momentum-Resolved EELS**

Abstract: The characteristic excitation of a metal is its plasmon, which is a quantized collective oscillation of its electron density. In 1965, David Pines predicted that a distinct type of plasmon, dubbed a "demon", could exist in multiband metals containing more than one species of charge carrier. A demon corresponds to an out-of-phase oscillation of electrons in different bands, *i.e.*, a modulation in the band occupancy. Demons have proven difficult to detect because they are neutral, meaning they do not couple to light, and are gapless so their excitation energy vanishes in the long-wavelength limit. In this talk I will present evidence for a demon in the multiband metal Sr_2RuO_4 from momentum-resolved electron energy-loss spectroscopy (M-EELS). The excitation is formed from electrons in the beta and gamma bands, is gapless with a velocity $v = 0.5 \text{ eV} \cdot \text{Å}$, and exhibits a critical energy of 60 meV. I will discuss how this excitation violates low-energy sum rules in Sr_2RuO_4 , which is a defining property of a demon, as well as its Landau damping into the strongly interacting continuum in this material.