The Hidden Order Gap and In-Gap Excitation Mode in URu$_2$Si$_2$
Revealed by Electronic Raman Scattering

HSIANG-HSI KUNG, Rutgers University, RYAN BAUMBACH, ERIC BAUER, Los Alamos National Laboratory, JOHN A. MYDOSH, Kamerlingh Onnes Laboratory, WEILU ZHANG, VERNER K. THORSMØLLE, KRISTJAN HAULE, GIRSH BLUMBERG, Rutgers University — The heavy fermion compound URu$_2$Si$_2$ displays a phase transition into the so called “hidden order” state at $T_{HO} = 17.5$ K. Using polarized electronic Raman scattering, we show that the Raman response in the $A_{2g}$ symmetry channel ($D_{4h}$):
(1) at high temperatures can be described by a Drude-like continuum with the scattering rate decreasing from 46 cm$^{-1}$ at 300 K to 16 cm$^{-1}$ at 70 K; (2) develops a low energy peak due to spectral weight transfer through Fano interference in the temperature range of 70-20 K; (3) below $T_{HO}$ develops a gap of about 55 cm$^{-1}$ in the continuum, and a sharp in-gap mode centered at 14 cm$^{-1}$. In addition, we show that the real part of the static Raman susceptibility in the $A_{2g}$ symmetry is proportional to the $c$-axis static magnetic susceptibility above $T_{HO}$. The implication of these observations will be discussed in the talk.

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Hsiang-Hsi Kung
Rutgers University

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