Interrelation between the "hidden order" phase and the large moment antiferromagnetic phase in URu_2Si_2

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(Invited)

Heavy fermion (HF) *f*-electron materials host novel ordered electronic ground states that emerge from hybridization between localized *d*- or *f*-orbitals and conduction electrons. The HF compound URu_2Si_2 hosts at low temperatures two competing staggered phases: a non-magnetic "hidden order" (HO) phase and a "large moment antiferromagnetic" (LMAF) phase. Both phases are largely due to special ordering of the uranium *5f* orbitals. The HO phase is the "chirality density wave" which breaks local chiral symmetry [1]. The LMAF phase is the orbital moment density wave which breaks local time reversal symmetry. The "Janus faces" nature of these almost degenerate HO and LMAF phases has been theorized before [2], but the experimental signature of the direct interrelation between them was lacking.

In this work we use high resolution polarization resolved Raman spectroscopy to study the interrelation between the "chirality density wave" HO phase and the LMAF phase. We drive and detect dynamic oscillations between HO and LMAF states by using polarized light, and as such provide direct experimental evidence for a unified order parameter describing the competing phases. The experiment is a realization of a similar 1961 proposal by A. Bardasis and J. R. Schrieffer to study unconventional sub-dominant pairing in the superconductors [3].

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