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Optical PumpProbe Study of $URu_{2-x}Fe_xSi_2$ Single Crystals[1] PETER KISSIN, VERNER K. THORSMØLLE, SHENG RAN, M. BRIAN MAPLE, RICHARD D. AVERITT, Department of Physics, University of California, San Diego — We study ultrafast quasiparticle relaxation dynamics near the Fermi Energy E_F in $URu_{2-x}Fe_xSi_2$ single crystals using optical pump probe spectroscopy. $URu_{2-x}Fe_xSi_2$ is a heavy fermion compound that undergoes a low temperature first order phase transition between an enigmatic Hidden Order (HO) phase and a Large Moment Antiferromagnetic (LMAFM) phase with increasing Fe concentration, mimicking the effects of hydrostatic pressure. The quasiparticle relaxation dynamics depend strongly on temperature and excitation density, highlighting a marked sensitivity to gaps in the density of states. In agreement with previous measurements , a clear dependence of the dynamics on the hybridization gap and the HO gap is observed. Additionally, the quasiparticle dynamics evolve as the LMAFM phase is approached with Fe substitution. Furthermore, the onset of gapinfluenced dynamics occurs above the bulk transition temperatures for crystals on both sides of the HO/LMAFM phase boundary. In this presentation, we compare our findings to other experiments that exhibit HO/LMAFM physics above the transition temperature and provide a preliminary interpretation of our data.

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