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Kerr effect studies of the heavy fermion superconductor  $URu_2Si_2^{-1}$ ELIZABETH SCHEMM, Department of Physics, Stanford University, HOVNATAN KARAPETYAN, Department of Applied Physics, Stanford University, ERIC BAUER, Los Alamos National Laboratory, AHARON KAPITULNIK, Department of Physics and Department of Applied Physics, Stanford University — In the heavy fermion metal URu<sub>2</sub>Si<sub>2</sub>, the very large entropy carried by the 5f electrons is released at  $\sim 17.5$  K via a second-order phase transition to a "hidden order" state. Below  $\sim 1.5$  K superconductivity emerges with an as-yet unknown gap structure, adding to the mystery associated with this material. In this talk we present polar Kerr effect (PKE) measurements of URu<sub>2</sub>Si<sub>2</sub> crystals using a Sagnac interferometer. PKE is sensitive to time-reversal symmetry (TRS) breaking since it measures the existence of an antisymmetric contribution to the real and imaginary parts of the frequencydependent dielectric tensor. Such a contribution is necessarily absent if TRS is not broken in the material. We find a weak magnetic signal in the hidden order phase that seems to not influence superconductivity. The presence of a finite Kerr signal below  $T_c$  provides strong evidence that time reversal symmetry is broken in the superconducting state. The relationship between the magnetic response in the hidden order phase and superconductivity is also studied. We further compare our results to other unconventional superconductors.

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