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Magneto-optical measurements as tests for time-reversal symmetry breaking in the hidden order and superconducting phases of URu_2Si_2[1]

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It is now experimentally well established that the superconducting (SC) phase of URu_2Si_2 with T_c =1.5K emerges from the hidden order (HO) phase with T_{HO} = 17.5K. Thus, it is of great interest to discern the different symmetries of both phases. In particular, recent theoretical proposals for time-reversal symmetry breaking (TRSB) order parameters of either phases pose the question of whether the HO one drives the SC one, or TRSB appears in the SC phase independently. In this talk we report high resolution polar Kerr effect (PKE) measurements as a function of temperature for several high-quality single crystals of URu_2Si_2. We find an onset of PKE below the superconducting transition that is consistent with a TRS-breaking order parameter. This effect appears to be independent of an additional, possibly extrinsic, PKE generated in the hidden order phase, and contains structure below Tc suggestive of additional physics within the superconducting state.

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[2]Work done in collaboration with E. R. Schemm, R. E. Baumbach, P. H. Tobash, F. Ronning, and E. D. Bauer.