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**Ultrafast quasiparticle dynamics in the hidden order state of $URu_2Si_2$** MENGKUN LIU, Boston University, DZMITRY YAROTSKI, TOMASZ DURAKIEWICZ, STUART TRUGMAN, Los Alamos National Laboratory, RICHARD AVERITT, Boston University, ANTOINETTE TAYLOR, Los Alamos National Laboratory — The heavy-fermion compound $URu_2Si_2$ has attracted much interest in the past two decades due to appearance of the 'hidden order' (HO) state in this material below 17.5 K. Despite an extensive effort, the development of the theoretical description of the origin of HO has been hindered by the lack of adequate experimental evidence regarding low-energy electronic structure of this compound. We report on application of ultrafast optical spectroscopy to probe quasiparticle dynamics in the vicinity of $E_F$ in a single crystal $URu_2Si_2$ undergoing the HO phase transition. The relaxation dynamics of the photoexcited carriers exhibits a strong dependence on temperature and excitation intensity. Data analysis using the Rothwarf-Talyor model demonstrates an opening of a 5 meV energy gap as the temperature decreases below 20 K. This behavior is consistent with recent results obtained from angle-resolved photoemission spectroscopy, scanning tunneling microscopy and neutron scattering experiments.

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