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Optical evidence for a Weyl semimetal state in pyrochlore Eu2Ir2O7[1] ANDREI SUSHKOV, JOHANNES HOFMANN, GREGORY JENKINS, DENNIS DREW, Department of Physics, University of Maryland, USA, JUN ISHIKAWA, SATORU NAKATSUJI, Institute for Solid State Physics, University of Tokyo, Japan — Possible realization of a Weyl semimetallic state with the broken time-reversal symmetry in pyrochlore iridates is still under debate. In the absense of ARPES and neutron data, optical evidence become very important. We found that the THz optical conductivity and temperature dependence of the free carrier response in pyrochlore $Eu_2Ir_2O_7$ match the predictions for a Weyl semimetal and suggest novel Dirac liquid behavior. The interband optical conductivity vanishes continuously at low frequencies signifying a semimetal. The metal-semimetal transition at $T_N = 110$ K is manifested in the Drude spectral weight, which is independent of temperature in the metallic phase, and which decreases smoothly in the ordered phase. The temperature dependence of the free carrier weight below T_N is in good agreement with theoretical predictions for a Weyl semimetal. The fit of experimental Drude weight yields a Fermi velocity 4x10^7 cm/s, a logarithmic renormalization scale $\Lambda_L \approx 600$ K, and require a Fermi temperature of 100 K associated with residual unintentional doping to account for the low temperature optical response and dc resistivity.

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