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A time- and wavelength-resolved optical pump-probe reflectivity study of the Metal-to-Insulator Transition in Sr_2IrO_4 TEJAS DESHPANDE, Division of Applied Physics, California Institute of Technology, DARIUS TORCHINSKY, LIUYAN ZHAO, Department of Physics, California Institute of Technology, XIAOYUE NI, Division of Materials Science, California Institute of Technology, TONGFEI QI, GANG CAO, Department of Physics and Astronomy, University of Kentucky, DAVID HSIEH, Department of Physics, California Institute of Technology, HSIEH GROUP TEAM, CAO GROUP TEAM — The iridates have been predicted to exhibit many exotic quantum phases due to a unique interplay of strong electron-electron correlations and spin-orbit coupling. The perovskite iridate Sr_2IrO_4 in particular has recently attracted a lot of attention owing to the possibility of high-temperature superconductivity upon doping and an unconventional phase transition between a metallic and spin-orbital entangled Mott Insulator ground state. Optical pump-probe reflectivity experiments using 1.5 eV pump and 1.5 eV probe light have demonstrated that the thermally induced metal-to-insulator transition in Sr_2IrO_4 exhibits both Mott- and Slater-type behavior [Phys. Rev. B 86, 035128 (2012)]. We extend these studies by performing optical pump-probe reflectivity experiments on Sr_2IrO_4 single crystals over a wide range of probe wavelengths in order to investigate the low energy electronic relaxation dynamics near the insulating gap. We will discuss the implications of our results on the nature of the metal-to-insulator transition. This work is supported by Army Research Office Grant Nos. W911NF-13-0059 and (ARO-DURIP) W911NF-13-1-0293.

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