Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Continuous Multi-Cycle Terahertz Measurements of the Electrical Conductivity of Free-Electron Laser Irradiated Warm Dense Gold[1] Z. CHEN, C. CURRY, F. TREFFERT, M. GAUTHIER, M. MO, J. KIM, B. OFORI-OKAI, SLAC National Accelerator Laboratory, R. ZHANG, Y. TSUI, University of Alberta, N. STOJANOVIC, R. PAN, S. TOLEIKIS, E. ZAPOLNOVA, S. BAJT, S. USENKO, Deutsches Elektronen- Synchrotron, L. SEIPP, A. WEINMANN, J. SCHEIN, Universitat der Bundeswehr Munchen, B. WITTE, R. REDMER, Universitat Rostock, R. SOUFLI, T. PADINI, S. HAU-RIEGE, C. BURCKLEN, Lawrence Livermore National Laboratory, S. GLENZER, SLAC National Accelerator Laboratory — Recently, we developed the capability to directly measure the evolution of DC electrical conductivity of high intensity laser excited solid density plasmas using ultrafast terahertz radiation that overcomes the high frequency (>1PHz) electron shielding. Our measurements resolve the DC conductivity in free-electron laser-irradiated gold at lattice heating rate exceeding 10ˆ14K/s where melting occurs under superheating conditions that produce pressures of the order of 10 GPa [1]. The experimental results further allow us to determine the electron scattering between electron-electron and electron-ion. These unprecedented data will help to test and improve models of warm dense matter. [1] Z. Chen et al., PRL. 121, 075002 (2018)

[1]This work was supported by DOE Office of Science, Fusion Energy Science under FWP 100182.

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Date submitted: 10 Jul 2020 Electronic form version 1.4