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Insulator-metal transition in dense fluid deuterium[1] P.M. CELLIERS, M.A. MILLOT, LLNL, A.F. GONCHAROV, Carnegie Institution for Science, P. LOUBEYRE, S. BRYGOO, CEA France, R.S. MCWILLIAMS, University of Edinburgh, J.H. EGGERT, LLNL, J.R. RYGG, University of Rochester, S. LE PAPE, D.E. FRATANDUONO, S. HAMEL, J.L. PETERSON, N.B. MEEZAN, D.G. BRAUN, LLNL, G.W. COLLINS, University of Rochester, R. JEANLOZ, University of California, Berkeley, R.J. HEMLEY, Carnegie Institution for Science — Recent static and dynamic compression studies provide evidence for the insulator-metal transition in fluid hydrogen and deuterium at temperature T less than 2000 K but disagree on both the nature and pressure of the transition. There are also discrepancies in theoretical calculations with transition pressures spanning 120 GPa to 400 GPa at these temperatures. We present recent experiments using a reverberation compression scheme on the National Ignition Facility to compress cryogenic deuterium up to 600 GPa while keeping the temperature much lower than using single shock compression. Our optical measurements reveal a high index of refraction along with the onset of visible absorption, both arising from band gap closure ranging from 120 to 150 GPa (depending on temperature). Metallic reflectivity appears above 1000 K and 200 GPa. The results complement recent static and dynamic compression studies.

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