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Direct observation of an abrupt insulator-to-metal transition in dense liquid deuterium MARCUS KNUDSON, MICHAEL DESJARLAIS, Sandia National Laboratories, ANDEAS BECKER, University of Rostock, RAYMOND LEMKE, KYLE COCHRANE, MARK SAVAGE, DAVID BLISS, THOMAS MATTSSON, Sandia National Laboratories, RONALD REDMER, University of Rostock — Recently a so-called shock-ramp platform has been developed on the Sandia Z Accelerator to access off-Hugoniot states in liquids. The accelerator delivers a two-step current pulse; the first accelerates the electrode to a reasonably constant velocity, which upon impact with the sample cell creates a well-defined shock, the subsequent current rise produces ramp compression from the initially shocked state. This technique generates relatively cool (∼1-2 kK), high pressure (>300 GPa), high compression (∼10-15 fold compression) states, allowing experimental access to the region of phase space where hydrogen is predicted to undergo a first-order phase transition from an insulating molecular-like liquid to a conducting atomic-like liquid. In this talk we will discuss the experimental platform, survey the various theoretical predictions for the liquid-liquid, insulator-to-metal transition in hydrogen, and present the results of experiments that clearly show an abrupt transition to a metallic state. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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