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Dynamic compression experiments and first-principles simulations on liquid deuterium above the melt boundary to investigate the insulator-to-metal transition[1] T.R. MATTSSON, M.D. KNUDSON, M.P. DESJARLAIS, R.W. LEMKE, K.R. COCHRANE, M.E. SAVAGE, D.E. BLISS, Sandia National Laboratories, Albuquerque, NM, USA., A. BECKER, R. REDMER, Institute of Physics, University of Rostock, Germany. — Important phenomena at high pressure, for example in planetary science, occur at conditions that cannot be reached in shock impact experiments. Different techniques have therefore been developed at Sandia's Z-machine. One new approach is shock-ramp loading. The accelerator delivers a two-step current pulse that accelerates the electrode, creating a well-defined shock, and subsequently produces ramp compression from the shocked state. The technique makes it possible to achieve cool (1000-2000 K), high pressure (above 300 GPa), high compression states (10-15 fold) in hydrogen, thus allowing experimental access to the region of phase space where hydrogen is predicted to undergo a first-order phase transition from an insulating molecular liquid to a conducting atomic fluid. Knowing the behavior of hydrogen under these conditions is of pivotal importance to understanding the physics of giant planets. We will survey theoretical predictions for the liquid-liquid insulator-to-metal transition in hydrogen and present the results of experiments on Z.

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Thomas Mattsson
Sandia Natl Labs

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