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**Designing a novel perforated diamond anvil for laser-driven shock wave experiments with pre-compressed samples** N. NISSIM, G. OREN, L. PERELMUTTER, M. WERDIGER, S. ELIEZER, N. SAPIR, Soreq NRC, Yavne, Isreal, M. GORMAN, S. ALI, R. SMITH, LLNL, Livermore, CA, USA, R. JEANLOZ, UC Berkeley, Berkeley, CA, USA — Performing laser-driven shock experiments with significantly increased static pre-compression provides access to far more compressed states than ever before. Specifically, using a new design we have developed for the diamond-anvil cell (DAC) that includes a partially perforated diamond anvil [1,2], allows us to generate 10-20 GPa pre-compression (vs. ˜5 GPa with current methods). This design will enable the study of the properties of matter at the thermodynamic conditions of planetary interiors to far greater densities and depths than possible with current methods. In this work we numerically study the effect that the designed geometry has on the plasma, and on the shock that is delivered to the sample. The simulation results were compared to experimental results of laser driven shock waves in partially perforated diamonds of different designs, performed at the Janus laser at LLNL. A qualitative correlation was found between the experiments and simulations, which allowed us to produce a scaling law for a desired laser spot diameter to hole diameter ratio. [1] N. Nissim, S. Eliezer, M. Werdiger, and L. Perelmutter, Laser Part. Beams 31, 73 (2013). [2] N. Nissim, S. Eliezer, and M. Werdiger, J. Appl. Phys. 115, 213503 (2014).

Noaz Nissim
Soreq NRC

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