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MHD Modeling of Shock Physics Experiments with the PHELIX Portable High Magnetic Field Driver

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The PHELIX portable pulsed power driver has recently completed a set of experiments examining the response of granular material to convergent shock loading. Here a nearly 4 MA peak current is delivered to a Z-pinch load with a quarter wave cycle time of $\tilde{}$ us. This produces B $\tilde{}$ 0.30 MG field at the surface of a $\tilde{}$ cm diameter, 1 mm thick, 3 cm tall Al liner. The liner is accelerated to $\tilde{}$ 800 km/s before shock impacting a target cylinder filled with fine-grain CeO₂ powder. Design and analysis simulations are performed with 2D MHD Lagrangian/ALE code to predict the liner performance and material response. Computational results are compared to the PHELIX Faraday rotation measurements for load current as well as proton radiographic imaging of the evolution of the density profile in the CeO₂.

Author: ROUSCULP, Christopher (Los Alamos National Laboratory)

Co-authors: FREEMAN, M S; FREDENBURG, D A; FIERRO, F; GRIEGO, J R; MARIAM, F G; BRADLEY, J T; NEUKIRCH, L P; ORO, D M; PATTEN, A R; RANDOLPH, R B; REASS, W A; REINOVSKY, R E; SAUNDERS, A; TANG, Z; TURCHI, P J; DUNWOODY, J T; VOORHEES, T J

Presenter: ROUSCULP, Christopher (Los Alamos National Laboratory)

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