Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Numerical Simulation of Marshak Wave Propagation in Stochastic Media on the OMEGA-60[1] ANDY LIAO, SUZANNAH WOOD, CHRISTOPHER FRYER, CHRISTOPHER FONTES, PAWEL KOZLOWSKI, HEATHER JOHNS, TODD URBATSCH, Los Alamos National Laboratory — Radiation flows in stochastic media have direct and analogous applications in astrophysics and nuclear engineering. Advances in experimental techniques, meanwhile, have enabled the adoption of scaled platforms on HED facilities to recreate the Marshak wave physics underlying these radiation flows. In preparation for near-future experiments on the OMEGA-60 laser, we use the radiation-hydrodynamics code Cassio to model Marshak wave propagation in a ρ <100 g/cc, nanoporous silica aerogel foam medium. To break the homogeneity of this medium, thereby imposing stochasticity, we include a number of resolved microscale grains in regular or random distributions. These grains are either TiO_2 inclusions in a pure SiO_2 background, or vanadium inclusions in a $TiO_2(SiO_2)_5$ background as prepared for the COAX radiation temperature diagnostic. We find that, while the effect of grains on the bulk speed of the Marshak wave is below the COAX threshold of discrimination, the presence of grains themselves can be conspicuous in COAX spectra even in locations far downstream of the Marshak wavefront. Consequently, we are compelled by this analysis to reinterpret results from past COAX experiments that saw clumping of nominally nanoscale TiO_2 dopant grains into microscale plaques.

[1]Los Alamos National Laboratory is managed by Triad National Security, LLC, For the National Nuclear Security Administration of the U.S. Department of Energy under contract 89233218CNA000001.

Andy Liao
Los Alamos National Laboratory

Date submitted: 02 Jul 2019 Electronic form version 1.4