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Supersonic Radiation Transport Experiments using large-scale Hohlraums on the NIF ALASTAIR MOORE, T. GUYMER, J. MORTON, M. STEVENSON, AWE plc, M. TACCETTI, N. LANIER, J. KLINE, R. PETERSON, K. MUSSACK, B. DEVOLDER, J. WORKMAN, Los Alamos National Laboratory — The National Ignition Facility (NIF) has made possible the exploration of fundamental radiation hydrodynamics in hitherto inaccessible regimes. Diffusive supersonic x-radiation transport, in which the radiative energy flux (σT^4) exceeds that of the material energy ($\varepsilon\rho cs$) producing a radiation-driven heat front that travels faster than the material sounds speed, is one such case. The understanding of such phenomena is of wide interest across a range of radiation-hydrodynamics.To study such phenomena, we have developed a high-temperature ∼350eV hohlraum platform that can, for the first-time, drive a supersonic radiative diffusion or Marshak wave through in excess of 50-100 cold material optical depths of 120mg/cc Si aerogel or chlorinated CH foam – approx. 10 mean free paths when heated to 200eV. To constrain radiation hydrodynamics models we measure the emitted radiation using multiple x-ray power and imaging diagnostics and in particular the structure of the soft x-ray thermal emission spectrum. We describe the hohlraum platform development and methodology to constrain the opacity and equation of state of the foam materials, together with initial measurements of the radiation transport demonstrating the diffusive and supersonic nature. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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