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Radiation-driven hydrodynamics of long pulse hohlraums on the National Ignition Facility*,** EDUARD DEWALD, Lawrence Livermore National Laboratory

The first hohlraum experiments have been performed at the National Ignition Facility (NIF) in support of indirect drive Inertial Confinement Fusion (ICF) and High Energy Density Physics. Vacuum hohlraums have been irradiated with laser powers up to 8 TW, 1-9 ns pulse lengths and energies up to 17 kJ to activate several hohlraum drive diagnostics, to study the radiation temperature scaling with the laser power and hohlraum size, and to make contact with hohlraum experiments performed at the NOVA and Omega laser facilities. The vacuum hohlraums yield low laser backscattering and hot electron fractions, and the hohlraum radiation temperature measured with a newly activated 18 channel Dante soft x-ray power diagnostic agrees well with two-dimensional LASNEX calculations. Using the unique feature of NIF to deliver long steady laser drives, these hohlraum experiments have also validated analytical models and LASNEX calculations of hohlraum plasma filling as evidenced by time-resolved hard x-ray imaging and coronal hohlraum radiation production measured by Dante. Analytical modeling used to estimate hohlraum radiation limits due to plasma filling is in agreement with measurements and predicts for full NIF system with peak powers up to 500 TW peak radiation temperatures that are considerably higher than required in ICF designs.

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