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6.34 A Platform for X-Ray Thomson Scattering Measurements of Radiation Hydrodynamics Experiments on the NIF

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A recent experiment on the National Ignition Facility(NIF) radiographed the evolution of the Rayleigh-Taylor(RT) instability under high and low drive cases, where high drive means the radiation energy flux is comparable to the mass energy flux. This experiment showed that under a high drive the growth rate of the RT instability is reduced relative to the low drive case. It is believed the high drive launches a radiative shock, increases the temperature of the post-shock region, and ablates the spikes, which reduces the RT growth rate. The plasma parameters must be measured to validate this claim. We present a target platform for making X-Ray Thomson Scattering(XRTS) measurements on radiation hydrodynamics experiments on NIF to measure the electron temperature of the shocked region in the above cases. We show that a previously fielded NIF radiation hydrodynamics platform can be modified to allow for non-collective XRTS measurements. Photometrics and a noise estimation using synthetic scattering spectra are performed to demonstrate the measurement error. This work is funded by the NNSA-DS and SC-OFES Joint Program in High-Energy-Density Laboratory Plasmas, grant number DE-NA0002956 and the National Science Foundation through the Basic Plasma Science and Engineering program.

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