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(oral presentation)

Acceleration of a high-Z foil by hydrodynamic pressure of radiatively heated matter*

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The radiation field from a laser-heated hohlraum can drive a supersonic Marshak wave through low-density material such as a foam buffer placed between the radiation source and the foil sample. When the radiation wavefront arrives at the foil/foam interface, pressure is applied to the foil by the radiatively heated and ionized buffer material. Because the opacity of the high-Z foil impedes the flow of radiation, the foil is not volumetrically heated and hence does not develop a back-pressure. The foil is accelerated by the resulting pressure imbalance. A rarefaction wave propagates behind the radiation wavefront, and the material pressure applied to the sample drops when the rarefaction wave reaches it.

Using laser facilities such as the proposed NIF (National Ignition Facility) and HU (Helen Upgrade), and perhaps Nova, pressures of order tens (HU) to hundreds (NIF) of Mbar can be generated and sustained for several nanoseconds. For the same radiation drive, this method generates typically double the pressure that would be generated if the sample were ablatively accelerated, at the expense of requiring additional energy to heat the buffer material.

The design parameters that can be varied to tailor the pressure pulse include the applied radiation field intensity and pulse length, the density and opacity of the buffer material, the thickness of the buffer material, and the density and opacity of the foil. We will present Lasnex simulations of experimental designs that could be fielded on HU, NIF, and maybe Nova.

***This technique was first described to us by researchers from AWE, Aldermaston, UK.**

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