Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Transport implications of hydrodynamic mix on hot-spot performance in inertial confinement fusion BHUVANA SRINIVASAN, Virginia Tech and Los Alamos National Laboratory, XIANZHU TANG, Los Alamos National Laboratory — In an inertial confinement fusion target, energy loss due to thermal conduction from the hot-spot will inevitably ablate fuel ice into the hot-spot, resulting in a more massive but cooler hot-spot, which negatively impacts fusion yield. Hydrodynamic mix due to the Rayleigh-Taylor instability at the gas-ice interface can aggravate the problem via an increased gas-ice interfacial area across which energy transfer from the hot-spot and ice can be enhanced. We quantify this mix-enhanced transport effect on hot-spot fusion-performance degradation using contrasting 1-D and 2-D hydrodynamic simulations, and identify its dependence on effective acceleration, Atwood number, and ablation speed. In the presence of magnetic fields, the thermal conduction is reduced which reduces the effect of ablative stabilization on mix mitigation while also reducing the amount of cold fuel being ablated into the hot-spot. A characterization of the transport enhanced mix characteristics with and without magnetic fields is performed to identify a regime where fusion-performance degradation is reduced by mix mitigation, through which the amount of cold fuel being ablated into the hot-spot is minimized.

Bhuvana Srinivasan
Virginia Tech and Los Alamos National Laboratory

Date submitted: 10 Jul 2014 Electronic form version 1.4