Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Geant4 Simulations for MRS Neutron Spectrometers on OMEGA and the NIF[1] BRYAN SPERRY, TIMOTHY JOHNSON, BRANDON LAHMANN, MARIA GATU JOHNSON, Massachusetts Institute of Technology MIT — In Inertial Confinement Fusion (ICF), a tiny pellet of fuel filled with a deuterium-tritium (D-T) mix is bombarded with high energy lasers to induce implosion. Neutrons generated in the D-T reactions are then measured to determine implosion conditions, such as yield, ion temperature, areal density, and asymmetries. The measurement of these neutrons is accomplished via a deuterated polyethylene (CD2) foil in the blast chamber, which has a well-studied conversion rate from incident neutrons to deuterons. A magnetic recoil spectrometer (MRS) measures these deuterons, from which we can infer the initial neutron spectrum using an instrument response function (IRF) calculated with Geant4. The primary focus of this project was to update the IRF simulations for the MRS's located at both OMEGA and the NIF. Previous measurements from the MRS at the NIF revealed a feature in the low energy tail of the measured deuteron spectrum. This could be a signature of inherent asymmetries in the implosion, but more rigorous simulations are needed to rule out an instrumental effect. To address this, we have worked on implementing the Ta-W blast shield and the Ta foil holder present at the NIF into the relevant Geant4 simulations to verify their impact on the response function.

[1]This work was supported in part by the U.S. DOE, the MIT/NNSA CoE, LLE, and LLNL.

Bryan Sperry
Massachusetts Institute of Technology MIT

Date submitted: 27 Jun 2020 Electronic form version 1.4