Abstract Submitted for the DPP20 Meeting of The American Physical Society

Design of First Magnetized Hohlraum-Driven Implosions on NIF¹ D. J. STROZZI, J. D. MOODY, H. SIO, B. B. POLLOCK, D. D. HO, C. A. WALSH, G. B. ZIMMERMAN, S. O. KUCHEYEV, Lawrence Livermore Natl Lab — The first magnetized, hohlraum-driven implosions on NIF – or any facility – are planned for the end of 2020. The goal is to demonstrate field compression in the implosion, following the MHD frozen-in law, which will be diagnosed by improved capsule nuclear performance (higher yield and temperature). These will be deuterium gasfilled capsules based on the "BigFoot" campaign, and use about 900 kJ of laser energy (about half of NIF's maximum). To facilitate soak-through of the externallyimposed, predominantly axial field, especially against inward radial JxB motion, a hohlraum with much higher electrical resistivity than the typical gold or uranium is needed. A novel gold-tantalum alloy has been developed for this purpose, with the first shots using a 2:8 Au:Ta mixture (atomic). We present radiation-MHD modeling of this design with the Lasnex code. Based on this, we expect DD neutron yields $(2-4) \times 10^{13}$ and burn-weighted ion temperature of 3.5-4 keV, with an imposed 30 Tesla field. This should be 30-50% higher in yield, and 0.5 keV in T_{ion} , than an unmagnetized analog. The first two shots will vary the laser cone fraction (innerbeam vs. total power), to tune the implosion shape, and the third shot will be an unmagnetized repeat of one of these shots.

¹Prepared by LLNL under Contract DE-AC52-07NA27344 under the LDRD project SI-2020-002.

David Strozzi Lawrence Livermore Natl Lab

Date submitted: 26 Jun 2020 Electronic form version 1.4