Abstract for IFSA 2017: Progress towards magnetized targets on NIF

B. Grant Logan [1], Darwin Ho[2], John Perkins[2], Mark Rhodes[2], David Strozzi[2], George Zimmerman[2]
1) BGLogan Scientific, USA
Email: grantlogan@aol.com
2) Lawrence Livermore National Laboratory, USA

A three-year study of magnetized ignition targets for NIF with applied Bz fields was completed September 30, 2016, using both 2D MHD simulations and analytic models, for hohlraums and capsules magnetized with 10 to 70 T applied Bz fields. In all cases studied, both gas capsules and cryo capsules, both CH and HDC ablators, and both high foot and low foot pulse shapes, applied Bz results in significant increases in yield in simulations, up to ~2X in gas capsules, ~5 X in sub-ignited cryo capsule simulations and ignition (200X-10MJ yield) in some cases. Thus, our simulations suggest applied Bz could bring NIF closer to ignition in capsules with large low mode and/or high mode perturbations that would otherwise fail. 2D hohlraum simulations show applied Bz improves inner beam propagation, enabling more round to even sausage-shaped stagnations and may also reduce stimulated Raman scattering. Both analytic and 2D simulations show improved yield with sausage shaped stagnations compared to round. Prototype single layer helix magnets (~ few gm mass) for NIF hohlraums were tested on a test stand at LLNL to reach 58 T. NIF engineering development began in March 2016 with a goal to field a magnet on NIF for room temperature targets (inertially-supported low mass helix magnets on cylindrical gas pipes for Sandia's MagLIF magnetized liner fusion program) by 2019 and for cryo hohlraum targets by 2020.

Acknowledgement: Part of this work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344, partly by LLNL Laboratory Directed Research and Development : LDRD 14-ER-028 and partly by SNL contract DEC-AC04-94AL85000