COMPARISON BETWEEN SIMULATIONS AND INITIAL MAGLIF EXPERIMENTS

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The magnetized liner inertial fusion (MagLIF) concept has produced thermonuclear fusion yields [1, 2] using pre-magnetized cylindrical liner targets, a TW-/kJ-class laser to preheat the plasma fuel, and implosion of the solid metal liner using the Z facility. Integrated magneto-hydrodynamic simulations [3] provided the design for the first neutron-producing experiments using capabilities that presently exist: DD fuel, 2 kJ of 2ω laser energy, B_z=10 T, and peak current I_{max}~19 MA. The initial experiments measured stagnation radii r_{stag} < 75 μm, temperatures of 2-3 keV, inferred alpha-particle magnetization parameters of r_{stag}/r_{Larmor} ~ 1.7, convergence ratios in excess of ~ 40, low levels of beryllium liner mix (0-20%), and isotropic DD neutron yields up to $2*10^{12}$ from implosions reaching peak velocities of only 70 km/s over 60 ns. Focused laser-only experiments have revealed lower levels of energy coupled to the fuel than desired, and the low-preheat hypothesis is sufficient to explain the measured yields. Magnetic flux compression enables trapping of fusion-produced alpha particles and the reduction of the required stagnation pressure to reach ignition conditions from ~375 Gbar in traditional indirect drive to ~25 Gbar with B_z~50-250 MG (~1 Gbar and $\langle B_z \rangle$ ~ 91 MG have been inferred in experiments to-date). Quantitative comparison between experimental observables and post-shot simulations will be discussed.

[1] M. R. Gomez, et. al., *Phys. Rev. Lett.* **113**, 155003 (2014).
[2] M. R. Gomez, et. al., *Phys. Plasmas* **22**, 056306 (2015).
[3] A. B. Sefkow, et. al., *Phys. Plasmas* **21**, 072711 (2014).