DPP08-2008-001084

Abstract for an Invited Paper
for the DPP08 Meeting of
the American Physical Society

Effects of ^{3}He Addition on Implosion of DT Capsules on OMEGA

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Glass capsules were imploded in direct drive on the OMEGA laser to look for anomalous degradation in DT yield (i.e., beyond what is predicted) and changes in reaction history with ^{3}He addition. Similar discrepancies had previously been reported for D/^{3}He plasmas, but had not yet been investigated for DT/^{3}He. Anomalies such as these provide fertile ground for furthering our physics understanding of ICF implosions. A relatively short laser pulse (600 ps) was used to provide some degree of temporal separation between shock and compression yield components for analysis. Anomalous degradation in the compression component of yield was observed, consistent with the "factor of two" degradation previously reported by MIT at a 50% 3He atom fraction in D2 [Rygg et al., Phys. Plasmas 13, 052702 (2006)]. However, clean calculations (assuming no fuel-shell mix) predict the shock component of yield quite well, contrary to the result reported by MIT, but consistent with LANL results in D_2/^{3}He [Wilson, *et al.*, Jrnl Phys: Conf Series 112, 022015 (2008)]. X-ray imaging suggests poor compression of capsules containing ^{3}He. Leading candidate explanations are poorly understood Equation-of-State (EOS) for gas mixtures, and nonthermal equilibrium between ions and electrons resulting in varying particle pressure with increasing ^{3}He addition. Results from upcoming experiments in which the D to T ratio will be varied as 3He is added in order to maintain hydro-equivalency will be also be reported on. Hydro-equivalency will allow better shot-to-shot comparisons rather than having to rely on shot-to-code, thus mitigating the effects of code uncertainties.