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Scaling of Liquid DT Layer Capsules to an ICF Burning Plasma[1]

R. E. OLSON, R. R. PETERSON, B. M. HAINES, S. A. YI, P. A. BRADLEY, A. B. ZYLSTRA, J. L. KLINE, R. J. LEEPER, S. H. BATHA, LANL — Recent experiments at the NIF demonstrated cryogenic liquid DT layer ICF implosions[1]. Unlike DT ice layer implosions, DT liquid layer designs can operate with low-to-moderate convergence ratio (12 <CR <25), with a hot spot formed mostly or entirely from DT mass originating within the central, spherical volume of DT vapor[2]. With reduced CR, hot spot formation is expected to have improved robustness to instabilities and asymmetries[3]. In addition, the hot spot pressure (Pr) required for self-heating is reduced if the hot spot radius (R_{hs}) is increased (Pr α R_{hs}^{-1}). With a reduction in the hot spot Pr requirement, the implosion velocity and fuel adiabat requirements are relaxed. On the other hand, with larger hot spot size, the hot spot energy requirement for self-heating (E_{hs}) is increased (E_{hs} α R_{hs}^2), and the required capsule-absorbed energy is increased. In this presentation, we will discuss the hot spot energy, hot spot pressure, cold fuel adiabat, and capsule-absorbed energy requirements for achieving self-heating and propagating burn with hot spot CR<20. [1]R. E. Olson *et al.*, Phys. Rev. Lett. **117**, 245001 (2016). [2]R. E. Olson and R. J. Leeper, Phys. Plasmas **20**, 092705 (2013). [3]B. M. Haines *et al.*, Phys. Plasmas **24** (2017).

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