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Sub-megajoule high performance KrF direct-drive target designs¹ DENIS COLOMBANT, S.P. OBENSCHAIN, A.J. SCHMITT, S.T. ZALESAK, J. BATES, A. VELIKOVICH, Plasma Physics Division, Naval Research Laboratory, J.H. GARDNER, LCP&FD, NRL, B.B. AFEYAN, Polymath, Inc., W. MAN-HEIMER, RSI Inc. — In direct-drive ICF, the intensity on target has historically been kept lower than about $10^{15}/cm^2$ to avoid potential laser plasma instabilities. However, because of the $I\lambda^2$ scaling of most of the laser plasma instabilities, the KrF laser at 248 nm has a factor of 2 advantage over its closest competitor, the third harmonic of Nd glass laser light (351 nm). In addition, the smaller wavelength of KrF gives higher collisional absorption and the > 1 THz bandwidth is advantageous for both beam smoothing and instability suppression. The laser architecture makes it easy to zoom the focal spot to follow an imploding pellet and thereby increase absorption efficiency. The purpose of this paper is to investigate what can be gained in terms of performance and hydrodynamic stability by making use of the factor of 2 in laser intensity, as well as zooming. Our preliminary results indicate that KrF allows substantial reductions in the laser energy required for ignition while maintaining moderate gains. Target designs will be presented showing how the trade-off between gain and hydrodynamic stability is altered by using the advantages of KrF.

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