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Comparison of plastic, high-density carbon, and beryllium as NIF ablators

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An effort is underway to compare the three principal ablators for National Ignition Facility (NIF) implosions: plastic (CH), High Density Carbon (HDC), and beryllium (Be). This presentation will summarize the comparison and discuss in more detail the issues pertaining to hohlraum performance and symmetry. Several aspects of the hohlraum design are affected by the ablator properties, as the ablator constrains the first shock and determines the overall pulse length. HDC targets can utilize shorter pulse lengths due to the thinner, higher density shell, and should be less susceptible to late time wall motion. However, HDC requires a larger picket energy to ensure adequate melt, leading to increased late time wall movement. Be is intermediate to CH and HDC in both these regards, and has more ablated material in the hohlraum. These tradeoffs as well as other design choices for currently fielded campaigns are assessed in this work. To assess consistently the radiation drive and symmetry, integrated postshot simulations of the hohlraum and capsule were done for each design using the same methodology. The simulation results are compared to experimental data. Using this post-shot model, we make a projection of the relative plausible performance that can be achieved, while maintaining adequate symmetry, using the full NIF laser, i.e. 1.8 MJ/500 TW Full NIF Equivalent (FNE). The hydrodynamic stability of the different ablators is also an important consideration and will be presented for the current platforms and projection to FNE. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.