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12.29 Improved Ablator Areal Density Analysis by Investigating Background Gamma-Ray Signal

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Since the beginning of National Ignition Campaign, Gamma Reaction History (GRH) detector at the National Ignition Facility has been providing a fusion bang time, a burn width, as well as the areal density of the compressed carbon-based ablator. The emission of $^{12}\text{C}(n, n^{\prime})$ gamma rays from the carbon-based ablator is proportional to the ablator areal density. The gamma-ray based areal density measurement is unique because the gamma-ray emission is spatially isotropic, providing a shell-averaged areal density. A carbon-ablator areal density already helped to constrain a diagnostic simulation model for National Ignition Campaign. However, the current GRH-based carbon areal density measurement has a large uncertainty due to being convolved with both the carbon gammas and background gammas induced from the hohlraum and its thermo-mechanical package. By comparing campaigns that have non-carbon ablators, such as the Beryllium campaign, we can qualify the background gamma signal and validate our background subtraction model. We will apply the improved carbon-ablator areal density analysis to implosion campaigns including High-Foot, High-Density-Carbon and will compare implosion characteristics such as mic, between carbon-based capsule implosions.

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