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## 13.2 The new Pulse Dilation – PMT Gas Cherenkov Detector for gamma reaction history at NIF

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The Cherenkov mechanism used in Gas Cherenkov Detectors (GCD) is exceptionally fast. However, the temporal resolution of GCDs, such as the Gamma Reaction History diagnostics (GRH) at NIF, has been limited by the current state-of-the-art photomultiplier tube (PMT) technology to  $\sim 100$ ps. The recently deployed Pulse Dilation Photomultiplier Tube (PD-PMT) at NIF allows for temporal resolution comparable to that of the gas cell, or  $\sim 10$ ps. Enhanced resolution will contribute to the quest for ignition in a crucial way through precision measurements of reaction history and areal density ( $\rho R$ ) history, leading to better constrained models. Features such as onset of alpha heating, shock reverberations, and burn truncation due to dynamically evolving failure modes will become visible for the first time. PD-PMT is deployed on GCD-3 at NIF. Test measurements of the PD-PMT at AWE confirmed that design goals have been met. The PD-PMT provides dilation factors of 2 to 40x in 6 increments. A synthetic PD-PMT model provides fast and simple predictions for upcoming NIF shots, and allows optimal dilation factor choice for a given experiment. Initial data from PD-PMT fielded in NIF will be presented.

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