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Interpreting Time-resolved X-ray Data on Igniting Fusion Experiments

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On Igniting DT fusion experiments at the National Ignition Facility, two diagnostics are currently capable of capturing usable time-resolved X-ray data: the SPIDER [1] and the DIXI [2]. However, the results from these diagnostics cannot be interpreted in the same way as traditional lower yield experiments. The signal is dominated by the emission from hot W-doped ablator material during and after the central DT core burn. Results from the SPIDER, the bang time and burn width, are not strictly from the central fusion process. Bang-time should now be interpreted from the rising edge of the signal and the burn-width needs to be interpreted in a way that considers the spectral range sampled. The DIXI captures pinhole X-ray images with 10ps time resolution in a broad energy band from the northern pole line of sight. The images are now interpreted as composed primarily of the emission from the outgoing shocked ablator as opposed to the central core where the drive symmetry could be directly inferred. However, these images can provide insight into other aspects of the experiment such as bulk hot spot motion, outgoing shock velocity (internal pressure), and drive non-uniformity.

References:

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