HOT SPOT ELECTRON TEMPERATURE FROM X-RAY CONTINUUM MEASUREMENTS ON THE NIF

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We report on direct measurements of the electron temperature within the hot spot of inertially confined, layered, spherical implosions on the National Ignition Facility using a new differential filtering diagnostic. Measurements of the DT and DD ion temperatures using neutron time-of-flight detectors are complicated by the contribution of hot spot motion to the peak width, which may produce an apparent temperature higher than the thermal temperature. The electron temperature is not sensitive to this non-thermal velocity and is thus a valuable input to interpreting the stagnated hot spot conditions. Here we discuss a new electron temperature measurement using the high energy (> 15 keV) emitted continuum from the hotspot that can escape with minimal attenuation from the compressed fuel/shell. We will discuss the physics considerations for design of this new large-pinhole, hard x-ray imaging technique, and show preliminary data acquired from symcaps and DT-layered implosions. Validation of this technique against simulations and other diagnostics is performed to estimate the accuracy of the measurement.

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