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New Imaging Geometry for Measuring Ion Temperatures with a Crystal Spectrometer on NIF P. BEIERSDORFER, E. WANG, A. GRAF, M. SCHNEIDER, R. SHEPHERD, LLNL, M. BITTER, K.W. HILL, PPPL — Measurements of the ion temperature utilizing very high-resolution crystal spectrometers to resolve the Doppler broadening of x-ray lines of high-Z dopants embedded in laser-heated plasma typically suffer from a lack of photons. This lack requires limiting (or even eliminating) time resolution or increasing the dopant amount to a non-perturbative level. Here we present a new measurement geometry that increases the photon density on the detector by at least two orders of magnitude over standard geometries. The increase in the photon flux per detector resolution element is achieved by using a spherically bent crystal and placing the source at the sagittal focus. A crystal spectrometer based on this geometry can, in principle, measure the ion temperature of a laser-heated capsule on NIF with picosecond temporal resolution and a low (¡0.01%) amount of dopant (Kr). The geometry also provides imaging, albeit with demagnification. Part of this work was performed under the auspices of the US DOE by LLNL under Contract DE-AC52-07NA-27344 and by PPPL under Contract DE-ACO2-76-CHO-3073.

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