Abstract Submitted
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Development of High Resolution X-Ray Crystal Spectrometry for HED Plasmas[1] K.W. HILL, PPPL, M. BITTER, Retired, L. DELGADO-APARICIO, N.A. PABLANT, PPPL, P. BEIERSDORFER, M. SCHNEIDER, K. WIDMANN, LLNL, M. SANCHEZ, ESRF — High resolution ($\lambda/\delta\lambda$ ~10,000) 1D spatially resolved x-ray spectroscopy using a spherically bent crystal and a 2D hybrid pixel array detector is used world wide for Doppler measurements of ion-temperature and plasma flow-velocity profiles in magnetic confinement fusion plasmas. Meter sized plasmas are diagnosed with cm spatial resolution and 10 ms time resolution. This concept can also be used as a diagnostic of small sources, such as high energy density plasmas (HEDP) and targets on x-ray light source beam lines, with spatial resolution of microns, as demonstrated by laboratory experiments using a 250-micron 55Fe source, and by ray-tracing calculations. Throughput calculations agree with measurements, and predict detector counts in the range 10-8 – 10-6 times source x rays, depending on crystal reflectivity and spectrometer geometry. Results of the lab demonstrations, application of the technique to HEDP facilities, and predictions of performance on these facilities will be presented.

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