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14.32 High resolution, high signal-to-noise crystal spectrometer for measurements of line shifts in high-density plasmas

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The Orion high-resolution x-ray (OHREX) spectrometer has been a successful tool for measuring the shapes of density-broadened spectral lines produced in short-pulse heated plasmas on the Orion laser facility. We have recently outfitted the instrument with a charge-couple device (CCD) camera, which greatly increased the accuracy with which we can perform line-shift measurements. Because OHREX is located on the outside of the Orion target chamber, no provisions for the shielding of electromagnetic pulses were required. We obtained a higher signal-to-noise ratio than we previously obtained with an image-plate detector. This allowed us to observe structure in the image produced by the reflection from the two OHREX crystals, which was highly reproducible from shot to shot. This structure will ultimately limit the accuracy of our spectroscopic measurements. This work was performed under the auspices of the U.S. DOE by LLNL under Contract No. DE-AC52-07NA27344.

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