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2.48 High-Resolving-Power, Streaked X-Ray Spectroscopy on the OMEGA EP Laser System

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A high-resolving-power, streaked x-ray spectrometer is being developed and tested on the OMEGA EP Laser System to study temperature-equilibration dynamics in rapidly heated metal. The instrument is based on two diagnostic channels, each with a spherical Bragg crystal. Channel 1 couples a spherical Si220 crystal to an x-ray streak camera. Channel 2 couples a second, identical crystal to an x-ray charge-coupled device (CCD), allowing for photometric calibration of the time-resolved spectrum. The instrument covers the spectral range of 7.97 to 8.11 keV, centered on the Cu Ka1 line at 8.05 keV. The time-resolved spectrometer is designed to achieve a resolving power of 2000 and a temporal resolution of 2 ps. The instrument capabilities are demonstrated by resolving the Cu Ka1,2 doublet on high-power shots. Time-resolved Cu K α spectra for a wide range of high-power laser and target interactions, where heating and K α emission is generated by hot-electron-energy deposition, will be presented. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

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