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An alternative method for high-precision calibration for dynamic pyrometry measurements above 2500 K ERIC DUTRA, Nevada National Security Site, MINTA AKIN, RYAN CRUM, Lawrence Livermore National Laboratory, HEMANG MEHTA, University of California, Irvine, YEKATERINA OPACHICH, ERIC SHI, Lawrence Livermore National Laboratory — Experiments in shock physics often use optical pyrometry to determine temperature of dynamically compressed materials. While tungsten ribbon lamp provides a known radiance at certain wavelengths, the calibration is made at temperatures T < 3000 K, while most of the experimental measurements are made at T > 3000 K, resulting in substantial extrapolation errors. This talk presents a concept and initial tests for the calibration of a streaked spectroscopy system used for optical pyrometry. The streaked spectroscopy system relies upon measuring the total system response (as counts $J^{-1} nm^{-1} sr^{-1}$) which aims to lower the uncertainty of temperature readings. The process uses a tunable monochromator, a NIST-traceable calibrated power meter, and a streaked spectrometer. Further, we have used the streaked spectroscopy system to measure the temperatures of a shocked z-cut quartz crystal at 93 and 99 GPa, and the results are found to agree with the literature. Sensitivities to various error sources are discussed. The combined uncertainties due to these errors are determined, the relative error from calibration and wavelength assignment, and estimated the overall uncertainty in the measurement is found to be about 1% at 5500 K, which is a substantial improvement over other methods that eliminates errors due to extrapolation from calibration at lower temperatures (e.g., tungsten lamps).

> Eric Dutra Nevada National Security Site

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