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Bremsstrahlung Temperature Scaling in Ultra-Intense Laser-Plasma Interactions[1] C. ZULICK, B. HOU, J. NEES, A.G.R. THOMAS, K. KRUSHELNICK, University of Michigan — The absorption of laser energy during ultra-intense ($I > 10^{18}$ W/cm^2) laser-plasma interactions results in the production of a hot electron current, which can subsequently generate energetic protons, ions, and photons. The energetic photons are of particular interest in isomer excitation, positron production, and homeland security applications. Experiments were performed on the high repetition rate (500 Hz) Lambda Cubed laser ($I \approx 5 \cdot 10^{18}$, duration 30 fs) allowing high resolution ($\lambda/\Delta\lambda = 300$) spectroscopy of X-ray and γ-ray bremsstrahlung photons in the 20 keV to 3 MeV energy range. The effective bremsstrahlung temperature was measured over a range of laser energies, target materials, and detection angles. Additionally, simulations (MCNPX and GEANT4) were used to correlate experimental bremsstrahlung temperatures with hot electron temperatures, which were compared to existing electron temperature scaling laws.

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