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Hot Electron and X-ray Production from Intense Laser Irradiation of Wavelength-scale Polystyrene Spheres T. DITMIRE, H.A. SUMERUK, S. KNEIP, D.R. SYMES, I.V. CHURINA, A.V. BELOLIPETSKI, G. DYER, A. BERNSTEIN, University of Texas, T.D. DONNELLY, Harvey Mudd College — In an attempt to control the electric fields at the surface of a high intensity solid target we have studied hot electron generation and x-ray production from targets coated with microspheres. This work is motivated by the possibility that spheres with size comparable to the wavelength of the incident laser radiation can result in electric field enhancements through well know Mie resonances. This local field enhancement can then lead to more efficient electron generation. We investigated hard x-ray (above 100 keV) generation from copper and fused silica targets coated with a monolayer covering of polystyrene microspheres. We performed the experiment using the 20 TW THOR laser system at the University of Texas. We frequency doubled the laser to improve temporal contrast and irradiated the spheres with 400 nm pulses at an intensity of 2 x 1017 W/cm2. Hard X-ray emission from the plasma was observed using filtered NaI scintillation detectors and K-alpha emission was measured with a Von Hamos spectrometer. We illuminated polystyrene spheres of diameters 0.1 -2.9 microns on a glass substrate, with the 400 nm 100fs pulse, and find that there is a clear Mie enhancement in the field and hot electron generation for a specific range of sphere sizes.

Todd Ditmire
University of Texas

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