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Intense Laser Plasma interactions with kHz, mJ class lasers

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Mass-limited targets when impinged with moderate intensity (10^16 W/cm^2) femtosecond lasers offer a novel fundamental system for study of laser plasmas in the absence of the usual energy dissipation channels of bulk condensed media. When the targets are mesoscopic in nature with dimensions of the size similar to wavelength of the laser, coupling of laser energy is expected to be enhanced through linear and nonlinear Mie scattering type mechanisms [1].

In our lab we have engineered target delivery mechanisms to be able to study laser micro-plasma interactions. These targets are either 15 um liquid droplets in a jet or solid micro-particles injected into vacuum through a newly built particle jet generator [2]. In both cases the plasmas are seen to lead to spectacular asymmetric electron and photon emissions and in particular, electron emissions with temperatures of few hundreds of keV in the form of backward propagating jets. This talk will outline the results from our lab which illustrates the possibility of relativistic laser plasma physics with mJ class kHz laser systems, with focused intensities far lower than the relativistic intensity threshold (~2*10^18 W/cm^2).

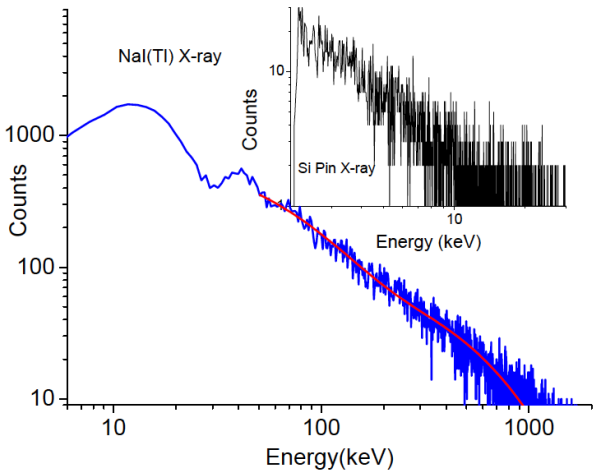

Figure 2. X-ray Spectrum obtained from the laser-microplasma at intensities of 3*10^16 W/cm^2.

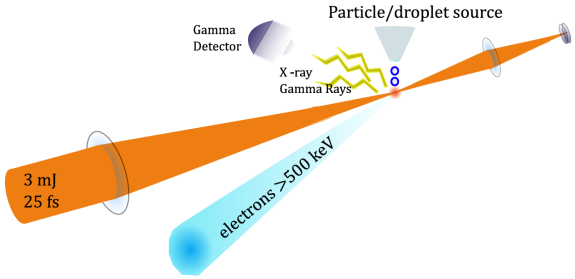

Figure 1. Experimental schematic for laser-micoplasma studies.

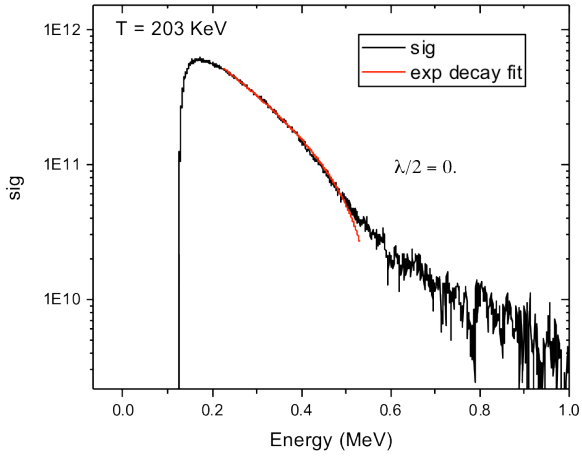

Figure 3. (top) Optical emission recorded from the Scintillator of a magnetic spectrometer for electrons. (bottom) The electron energy spectrum obtained thereof.

References

[1] T. V. Liseykina, D. Bauer, Phys. Rev. Lett., **110**, 145003 (2013).
[2] R. Gopal, et al, Review of Scientific Instruments **88**, 023301 (2017).