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Photon emission enhancement studies from the interaction of ultra-intense laser pulse with shaped targets

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We study the photon emission by Bremsstrahlung and Non-linear Compton Scattering (NCS) from the interaction of ultra-intense laser pulses with cone target and flat foil using particle-in-cell (PIC)simulations [1]. The simulations are performed for laser pulse interacting with Al and Au targets. The strength of the two mechanisms of photon emission from bremsstrahlung and nonlinear Compton scattering are compared [2-3]. When an ultra-intense ($I > 10^{22}$ Wcm^{-2}) laser interacts with a cone and a foil target, the photon emission by bremsstrahlung is comparable to that from nonlinear Compton scattering. The obtained electron energy and the energy and number of photons emitted were found to be higher in the case of the cone-shaped target compared to that of a foil target.

The enhanced photon emission from the cone-shaped target is attributed to the guiding or collimation of hot electrons towards the cone tip from the self-generated magnetic fields along the cone surface which pushes the hot electrons towards the tip. Fig.1& Fig.2 shows the corresponding magnetic field and photon energy.

References
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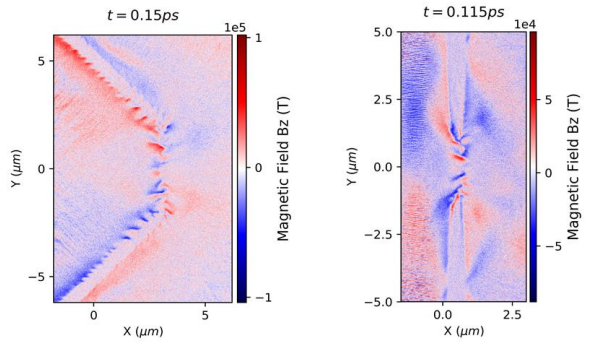

Figure 1. Magnetic field Bz for Cone shape (left), for the flat target (right)

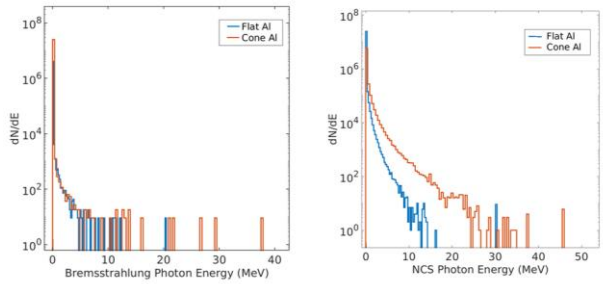

Figure 2. Energy spectrum for both BRE .and NCS mechanism in Cone and flat Al target.