Optical emission as a key diagnostic of hot electrons

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Optic lights emitted from relativistic electrons generated in ultraintense laser plasma interaction have been proved to be powerful diagnostic tools for the hot electrons. Three kinds of optic emissions, i.e., transition radiation [1-3], Cherenkov radiation [4-6] and bremsstrahlung [7] are widely used to measure the characteristics of hot electrons such as temperature and energy flux. Transition radiation can be detected to give the temperature of hot electrons and the micro-bunch of the beams from which the mechanisms of hot electrons can be deduced. Cherenkov radiation is emitted from those energetic electrons in a transparent target. Since the emission angle of the lights depends on the electron energy, the measurement of the pattern of the Cherenkov lights can provide the energy distribution of hot electrons inside target which is a key parameters for fast ignition. When cold electrons are inject into bubble, and strongly accelerated, the acceleration of the electrons are so great that bremsstrahlung in optic region can be generated. Imaging the optical emission can give the position where the electrons are injected. I will review these unique features predicted and observed in various ultraintense laser plasma experiments.

Reference

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