

Multipurpose single shot, offline and online, gamma calorimeters for ultra-high intensity laser-plasma experiments

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Highly intense gamma ray bursts ($>10^6$ gamma/shot) are associated with the interaction of ultra-intense lasers with solid targets. In the case of underdense plasmas, burst of gamma rays can be generated via inverse Compton processes between the laser and the accelerated electrons. In both cases, a suitable diagnostic is required.

In this talk, we present a multipurpose gamma calorimeter based on absorber materials and image plates that provides a single shot measurement of the gamma spectrum. Furthermore, measurement results from an online-readout calorimeter based on scintillators will also be presented.

Both detectors have been successfully fielded at the high power laser facility DRACO at Helmholtz-Zentrum Dresden – Rossendorf. We report the results of bremsstrahlung measurements at ion acceleration with solid targets as well as inverse Compton measurements at laser wakefield acceleration in which the calorimeters have recorded data over more than a thousand shots.