

Recent Advances in Ultra Intense Laser Plasma Interactions

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In the field of ultra intense laser plasma interactions there have been many significant advances over the last few years. These advances are intimately linked to the growth and development of the drive lasers in terms of power, repetition rate and pulse fidelity. With many systems worldwide achieving on target intensities of $> 10^{20} \text{ Wcm}^{-2}$, pulse contrast has been one of the areas in which many new techniques have been tested and their influence on the plasma interaction will be reviewed.

In the fields of laser driven electron and ion acceleration, as well as increasing the maximum particle energy, experimenters have been working towards demonstrating control and stability of the beams. First experiments have been conducted where the electron and ion beams have been used as secondary sources to enable new experimental areas to be investigated. Examples where the laser driven particle beam produce secondary sources will be discussed, such as, Photon generation with electrons and plasma heating with ions to investigate warm dense matter. Secondary beams have also been used as probe sources, allowing ultra short measurements of the electric fields inside plasmas and high contrast imaging of low Z targets such as the core of a laser driven fusion capsule.

As the accessible intensity on target increases, new areas of experimental investigation are opening up. First experiments exploring the radiation pressure driven acceleration regime and the potential for testing QED are underway and the near term opportunities in this area will be discussed.