Investigation of Kinetic Instabilities in Laser Plasma

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The interaction of intense laser pulses with matter is opening up new frontiers in physics via the production of extreme pressures, temperatures and intense electric and magnetic fields. This is leading to the use of high power laser radiation for exploring the properties of hot dense matter, the production of high-energy particles and radiation and the development of schemes for "*table top ion acceleration*". These advances are driven by rapid developments in ultrashort pulse laser technology, which have enabled new regimes in laser power and intensity to be reached.

Mechanisms leading to forward accelerated, high quality ion beams, operating at currently accessible laser intensities in laser-matter interactions, are mainly associated with large electric fields set up at the target rear interface by the laser-accelerated electrons leaving the target. The emitted ion pulses, and in particular, the proton pulses contain a large number of particles with

energies in excess of several MeV, having a pulse duration ps, and a source size of tens to hundreds of micrometer [1, 2]. Conversion efficiencies (laser energy to proton energy) up to 7 percent have been reported [3]. However, the emitted proton beam has a large divergence with filamentary structures, which restricts its applications [4, 5]. In this talk, we present our recent experimental results on investigating the instabilities in plasma created by relativistic short-pulse (45 fs) laser interaction with foil targets of varying thicknesses, structured / uniform targets (e.g. nano structures on thin metallic foils, sandwich targets, Foams). Evaluation of Mega gauss magnetic fields from filamentary structures and instabilities in plasmas using proton probing technique will be presented.

References

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