

Seminar

Institute for Plasma Research

Title : Particle-in-Cell Simulations of Fast Electron Time Scale Phenomena

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Date : 16 November 2016 (Wednesday)

Time : 03.30 PM

Venue : Committee Room 3, (New Building), IPR

Abstract:

In Fast Ignition scheme of laser Fusion depends crucially on the transport of energy in the dense core region for ignition on energetic electrons produced in intense laser-plasma interactions. Thus an efficient laser energy absorption for the creation of highly energetic electrons and their unhindered propagation in dense plasma region are two issues of primary importance. Hence, new ideas which could increase the efficiency of laser absorption and can also suitably guide the propagation of energetic electrons are of great significance. This is the primary focus of the thesis. We utilize relativistic electromagnetic code based on the Particle-in-Cell method to describe the interaction of laser with a target plasma. A comparison of laser energy absorption in the case of a homogeneous target and when the target is structured by nanowires (along the laser propagation direction) has been made. The results show that there is a significant improvement in the laser absorption in the case of structured targets. This has been understood on the basis of a novel vacuum heating like mechanism which occurs in the case of structured targets within the skin depth of the target. The plasma density inhomogeneity at the nanowire surface acts like a vacuum plasma interface prompting a vacuum heating like absorption. The subsequent propagation of the energetic electrons is also observed to be collimated over much longer distances in the case of structured targets in simulations. The instabilities related to propagation of the relativistic electron beam in plasma have been studied in detail.
