

Seminar

Institute for Plasma Research

Title : X-ray Irradiation of Finite Systems : Modeling the Nanoplasma Dynamics

Speaker : Dr. Vikrant Saxena
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Date : 30th December 2015 (Wednesday)

Time : 02.00 PM

Venue : Seminar Hall, IPR

Abstract:

Recently, a number of novel x-ray light sources have become available which boast of producing high intensity coherent x-ray beams. One can do ground breaking science with these state of the art experimental facilities, however, there is always a need of theoretical support to understand the experimental observations. We all are aware that computer simulations have almost replaced the analytical approach as one needs to solve the dynamics of increasingly complex systems which are intractable with analytical tools. The irradiation of matter with x-rays is one such field where we, as theoretical physicists, heavily depend upon computer simulations. The x-ray irradiation of a finite system, e.g., a sufficiently large noble gas cluster or a complex bio-molecule, turns it to a nanoplasma which then expands while undergoing a complex ionization-relaxation dynamics. On the other hand, a bulk solid target irradiated by high energy high intensity x-rays turns to a transient non-equilibrium warm dense matter phase before forming a plasma. In the seminar I will focus on our recent two step MD-Hydrodynamics approach to simulate the dynamics of an Ar cluster irradiated by a high intensity x-ray beam resulting in a nanoplasma. The effect of the cluster size on the expansion mechanism will be discussed and the efficiency of our approach in understanding the spectroscopic data involving clusters and complex bio-molecules will be outlined.

[1] R. Neutze et al., Nature 406, 752 (2000).

[2] T. Tachibana et al., Sci. Reports. 5, 10977 (2015).

[3] V. Saxena et al., High Energ. Dens. Phys. 15, 93-98 (2015).
