Seminar

Institute for Plasma Research

Title : On the resonance absorption in laser-driven deuterium cluster

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Date : 19th April 2021 (Monday)

Time : 10:30 AM

Venue : Online- Join the talk:
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Abstract:

Resonance is a phenomenon that occurs in many driven oscillatory systems, when frequency of the driver matches the system's natural frequency and here maximum energy transfer from the driver to the oscillator happens. In a laser-irradiated atomic cluster linear resonance (LR) absorption occurs when Mie-plasma frequency (ω_M) matches the laser frequency (ω): and laser absorption is unconditionally presumed to be maximum here for the collisionless interaction. However, some earlier simulation works argued no role of LR during laser-cluster interaction due to absence of any absorption maximum while passing LR. To understand the condition for existence/non-existence of absorption maximum, we study interaction of laser of various intensity, polarization and pulse duration with deuterium cluster using an in-house developed molecular dynamics (MD) simulation code and MD results are further justified by a simple model. We have shown that for a given laser energy and pulse duration, absorption peak is red-shifted from the expected Mie-resonance condition $\omega = \omega_M$, irrespective of linear polarization (LP) and circular polarization (CP) of laser [1]. Increasing the intensity, red-shift of absorption peak increases; and above an intensity it disappears (sometimes followed by a growth in absorption) when outer ionization saturates at 100% which also holds true for fixed pulse energy and increasing pulse duration. Laser absorption and red-shift of the absorption peak for LP and CP are found to be almost equal. This work is expected to have large impact in laser heating of solid density plasmas as well as in future generation laser-plasma experiments where maximum energy is required to transfer from laser-fields to charge particles and/or radiations.