

Seminar

Institute for Plasma Research

Title: Particle-in-Cell Simulation of Interaction of Electromagnetic Waves with Inhomogeneous Plasmas

Speaker: Dr. Mamta
Institute for Plasma Research, Gandhinagar

Date: 15th February 2024 (Thursday)

Time: 11:00 a.m.

Venue: Seminar Hall, IPR

Abstract

Interaction of electromagnetic waves with underdense / overdense plasmas is a subject of intense current research worldwide, due to its wide ranging applications in the areas of laser driven fusion schemes, particle acceleration schemes, microwave plasma interaction, plasma diagnostics etc. With the aim of exploring the mechanism of absorption of a light pulse in short scale length inhomogeneous plasmas, in the present work, interaction of an intense light pulse with an inhomogeneous plasma is investigated using a 1D-3V particle-in-cell (PIC) simulation code LPIC++[1]. The code is first validated by comparing the propagation characteristics of a light wave in a plasma having a linear ramped density profile with the analytical results presented in Ref. [2, 3] for both normal and oblique incidence. Further to understand the absorption characteristics of the light pulse i.e. its dependence on the inhomogeneity scale length and the angle of incidence, a separate MATLAB code for directly solving the wave equations has been written following the procedure outlined in Ref. [4]. Comparison of the absorption results with the particle-in-cell code is presently in progress. In this talk, the above mentioned work along with the future direction will be presented in detail.

Reference:

- 1 R. E. W. Pfund, R. Lichters, and J. Meyer-ter-Vehn, LPIC++ a parallel one-dimensionalelectromagnetic particle-in-cell code for simulation of laser-plasma-interaction,” in Super Strong relativistic electromagnetic particle-in-cell code for simulation of laser-plasma-interaction,” in Super Strong Field in Plasmas, edited by M. Lontano et al., AIP Conf. Proc. Vol. 426 (American Institute of Physics, Melville, New York, 1998), p. 141.
- 2 W. L. Kruer, The Physics of Laser Plasma Interactions, (Redwood City, CA: Addison Wesley, 1988).
- 3 C. S. Liu, V. K. Tripathi, and B. Eliasson, High Power Laser-Plasma Interaction (Cambridge University Press, Cambridge, U.K., 2019).
- 4 H. M. Milchberg and R. R. Freeman, J. Opt. Soc. Am. B **6**, 1351-1355 (1989).