7th Asia-Pacific Conference on Plasma Physics, 12-17 Nov, 2023 at Port Messe Nagoya

Diamagnetic drift induced laser energy absorption in hot magnetized plasma observed by Particle – In – Cell simulations

Laxman Prasad Goswami[a], Amita Das

Department of Physics, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016, India

[a]*Email address: goswami.laxman@gmail.com*

Recent technological advancements in low-frequency short pulse CO2 lasers and strong magnetic field production [1] have opened up possibilities for conducting experimental studies on the interaction between lasers and magnetized plasma in the near future. As a result, there has been a growing interest in theoretical and numerical simulation studies in this area [2 – 6]. These studies have unveiled various novel phenomena, including laser energy absorption and harmonic generation.

In this presentation, we delve into the manifestation of 2D and thermal effects in the context of lasers interacting with magnetized plasma. By considering a finite temperature for the target and introducing transverse density stratification, we observe the emergence of diamagnetic drift in the two plasma species. The difference of this drift between the species can contribute to an additional enhancement of laser energy absorption. To investigate these features, we employ Particle-in-Cell (PIC) simulations using the OSIRIS4.0 [7] platform.

This talk aims to explore the influence of 2D and thermal effects on the interaction between lasers and magnetized plasma, shedding light on their underlying dynamics and providing valuable insights into this intriguing field.

References

[1] Jha et al, *Physics of Plasmas*, 12(12):123104, 2005.
[1] Nakamura et al, Rev. Sci. Instrum., 89:095106, 2018.
[2] A Das, *Reviews of Modern Plasma Physics,* 4(1):1 – 16, 2020.
[3] Vashistha et al, *Nuclear Fusion,* 61(2): 026016 , 2021.
[4] Vashistha et al, *New Journal of Physics,* 22: 063023, 2020.
[5] Maity et al, *Journal of Plasma Physics,* 87(5), 2021.
[6] Goswami et al, *Plasma Physics and Controlled Fusion*, 63(11):115003, 2021.
[7] Fonseca et al, *Plasma Physics and Controlled Fusion*, 50 (12):124034, 2008.

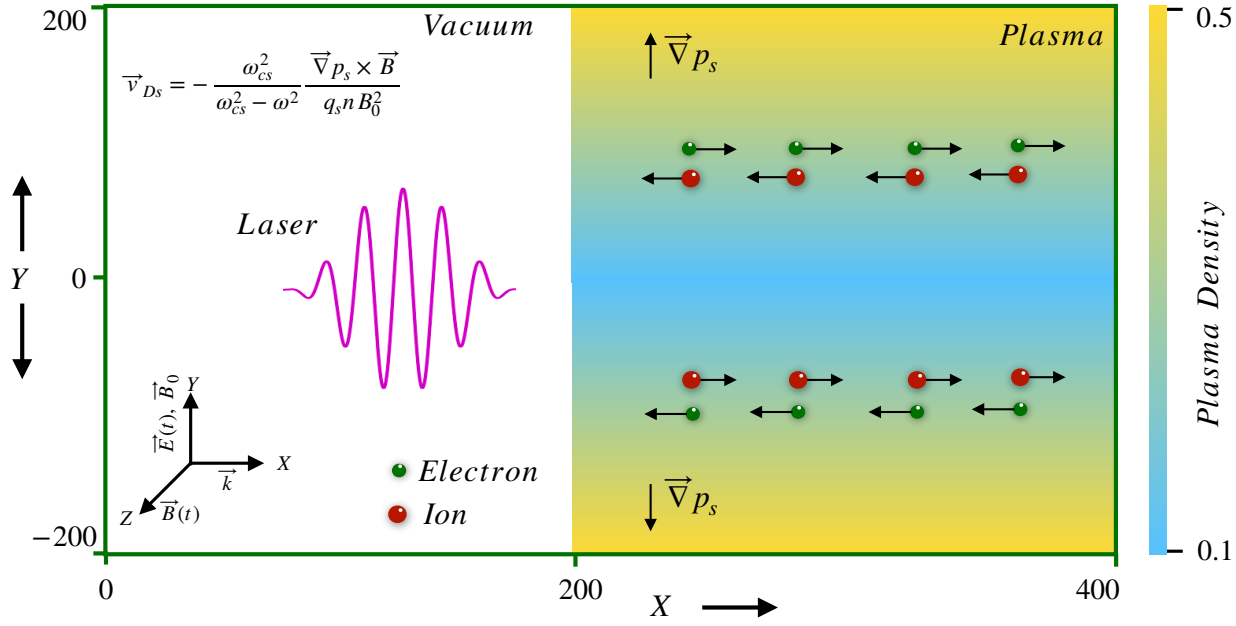

Figure: The figure shows the diamagnetic drift induced charge separation in magnetized hot plasma in Ordinary mode (O-mode) configuration.