L-O1 AAPPS-DPP2020

4th Asia-Pacific Conference on Plasma Physics, 26-31Oct, 2020, Remote e-conference

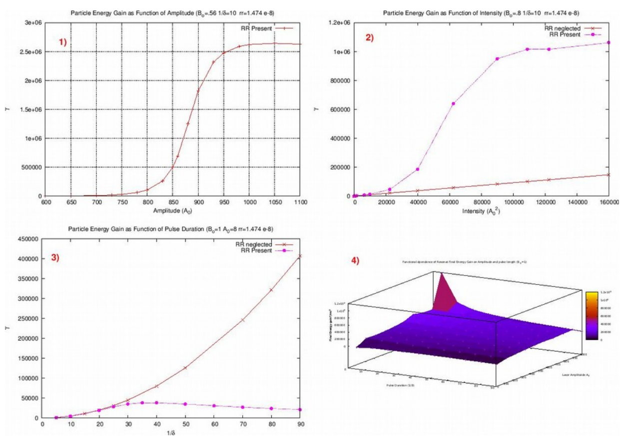
Radiation Reaction Effect on Particle Dynamics in Combined Field of Laser Pulse and Static Axial Magnetic Field

Vikram Sagar[1], Sudip Sengupta[2]

[1] Department of physics, Panjab University,Chandigarh 160014, India, [2] Institute For Plasma Research, Gandhinagar 382428, India

e-mail (speaker):narang.vikram@gmail.com

The acceleration of charged particles by intense electro-magnetic fields results in the emission of radiations. To conserve the momentum, these emitted radiations exert a recoil or back force on the charged particles which is referred to as radiation reaction force[1,2]. The inclusion of radiation reaction force (or radiative friction) can have significant affect on the motion of the charged particle. In the present work, the effect of radiation reaction force is studied on the dynamics of the charged particle in the combined field of relativistically intense laser pulse and static axial magnetic field using Landu-Lifshitz equation of motion. From the parametric study, it has been shown, that the radiation reaction force has significant affect on the dynamics of both initially resonant and non-resonant particles. In subplot-1, it is shown that the inclusion of radiation reaction force leads to resonance broadening [4], which in turn results in the acceleration of the initially non-resonant particles. It has been shown in subplot-2, that for the resonant case, the inclusion of radiation reaction force leads to one order increase in the final particle energy gain in comparison to the case when radiation reaction is not considered. In subplot-3, a parametric dependence on pulse duration is described for a resonant case in which the particle energy gain is maximum when recoil force is taken into account. It has been further shown in subplot-4, that for optimum choice of parameters, this scheme can be used for efficient acceleration of charged particles in vacuum.



References

1)F. V. Hartemann and A. K. Kerman, Phys. Rev. Lett. **76**, 624 (1996).

2) Y. Hadad, L. Labun, J. Rafelski, N. Elkina, C. Klier, and H. Ruhl, Phys. Rev. D **82**, 096012 (2010).

3)Blackburn, T.G. *Rev. Mod. Plasma Phys.* **4,** 5 (2020).

4) Sagar V, Sengupta S and Kaw P K, Phys. Plasmas 22,123102, (2015).

.