Abstract Submitted
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Simulation studies on electron beam formation in high density plasmas in Laser Wake Field Acceleration[1] BHAVESH PATEL, CHANDRASHEKHAR JOSHI, UCLA — In recent experimental work based on Laser Wakefield Acceleration, Rao et al. [1] have demonstrated production of monoenergetic, 35 MeV electron bunch using 3 TW pulse and high density, 5.8x10cm^{-3} plasma. The electron beam formation in such scenario relies greatly on physical processes like relativistic self-focusing and modulation instability. Further, in view of the fact that the laser pulse has a pulse-length several times the plasma wavelength, it may be surmised that the beam electrons may gain energy by direct laser acceleration in addition to that from the longitudinal fields. In present work, laser wakefield acceleration and electron bunch formation for this relatively low intensity laser pulse and a high density plasma is studied using particle-in-cell code OSIRIS. The objective here is to decipher the role of various physical mechanisms responsible for production of the surprisingly narrow energy electron bunch.The electrons are trapped only after the laser pulse is longitudinally compressed such that there is little overlap between the trapped electrons and the laser field. Thus the acceleration of beam electrons is due to the wakefield.

[1] B.S. Rao. et al. High-quality stable electron beams from laser wakefield acceleration in high density plasma. Phys. Rev. ST Accel. Beams 17, 011301 (2014).

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