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Parametric amplification of laser-driven electron acceleration in underdense plasma ALEXEY AREFIEV, BORIS BREIZMAN, Institute for Fusion Studies, The University of Texas at Austin, Austin, Texas 78712, USA, MARIUS SCHOLLMEIER, Sandia National Laboratories, Albuquerque, New Mexico 87185, USA, VLADIMIR KHUDIK, Institute for Fusion Studies, The University of Texas at Austin, Austin, Texas 78712, USA — Electron heating in laser-irradiated targets is crucial for production of energetic ions and other applications, including x-ray generation and fast ignition. Electron quiver energy in a laser beam is of the order of the ponderomotive potential, which is typically below the energy range of interest. This poster presents a new collisionless mechanism that allows electrons to gain energies significantly higher than the ponderomotive potential. The mechanism involves an under-dense preplasma in front of a target. The laser beam creates a positively charged channel in this preplasma, so that an electron accelerated by the laser performs betatron oscillations across the channel while moving along with the beam. The betatron frequency is strongly modulated by the laser field in the ultrarelativistic limit. It has been previously overlooked that such modulation makes the oscillations parametrically unstable. The resulting amplification of the oscillations decreases electron dephasing from the laser and thereby significantly enhances the electron energy gain [Phys. Rev. Lett. 108, 145004 (2012)]. This work was supported by Sandia National Laboratories, U.S. DoE, and NNSA.

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