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Beatwave acceleration in a plasma metamaterial[1] A. LOPES, E.P. ALVES, R.A. FONSECA, L.O. SILVA, GoLP/Instituto de Plasmas e Fusao Nuclear - Instituto Superior Tecnico, University of Lisbon — These media can be engineered to produce negative indices of refraction, which support the propagation of unusual light waves. In addition, the interaction of these unusual light waves with charged particles in the medium can lead to unusual features like negative radiation pressure. It is well known that two counter propagating chirped lasers in a positive response medium can lead to energy transfer from the waves to the particles leading to its acceleration. In this work, we explore the combination of two co-propagating EM pulses which, under the right conditions, achieve the same results as the previous scheme, but now in a plasma metamaterial. Depending on the chosen frequency, one of the pulses can experience a positive response medium (n>0) and the other a negative one (n<0), leading to anti-parallel phase velocities. This setup is capable of creating a beat wave which enables the acceleration of charged particles via the radiation tension. Our results are supported by numerical simulations using meta-OSIRIS, which combines a solver to deal with dielectric and magnetic materials with arbitrary EM linear properties with the standard PIC algorithm. Our simulations addressing this new setup provide results consistent with the theoretical predictions.

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