Laser Beat Excitation of an Upper Hybrid Wave in a Rippled Density Plasma and Acceleration of Electrons

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Abstract

The excitation of an upper hybrid wave (UHW) is a topic of current research interest in many areas such as particle acceleration, thermonuclear preheating and various aspects of space plasma physics [1-6.The excited upper hybrid wave after Landau damping transfers its energy to the plasma particles and leads to enhanced heating of the plasma. Another method for exciting UHW is the beating of two laser beams in the presence of an external magnetic field [7].

The amplitude of UHW can be enhanced by introducing a density ripple into the interaction region. The ripple provides an additional momentum required for phase matching [8]. The excitation of high and low phase velocity upper hybrid waves by beating two lasers in a plasma, in the presence of a transverse magnetic field and a density ripple, is investigated.. The upper hybrid wave has a phase velocity comparable to the velocity of light and can effectively accelerate electrons to a high energy. The advantage of the transverse magnetic field is to localize the electrons in the region of large amplitude. The finite spot size of the laser beam can strongly influence the amplitude of the excited wave and hence the energy of the accelerated electrons

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