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High Power Laser-Plasma Interaction under a Strong Magnetic Field TAKAYOSHI SANO, YUKI TANAKA, TOMOHITO YAMAGUCHI, MASAKATSU MURAKAMI, NATSUMI IWATA, MASAYASU HATA, ILE, Osaka Univ, KUNIOKI MIMA, GPI — We investigate laser-plasma interactions under a strong magnetic field by one-dimensional Particle-in-Cell (PIC) simulations. A simple setup is considered in our analysis, in which a thin foil is irradiated by a right-handed circularly polarized laser. A uniform magnetic field is assumed in the direction of the laser propagation. Then the whistler wave can penetrate the overdense plasma when the external field is larger than the critical field strength $B_c = m_e\omega_0/e$. In this situation, key parameters of the system are the plasma density and the size of the external field. We performed various models in the density-field strength diagram, which is actually the so-called CMA diagram, to evaluate the efficiency of the energy conversion from the laser to plasma and the reflectivity and transmittance of the laser. It is found that there are two important processes in the interaction between the whistler wave and overdense plasma, which are the cyclotron resonance of relativistic electrons and the parametric (Brillouin) instability. Because of the high temperature of electrons, ions can be accelerated dramatically by a large sheath field at the target surface.

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