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Nonlinear Amplification of the Whistler Wave in a Magnetized Relativistic Beam-Plasma Interaction[1] TOSHIHIRO TAGUCHI, Setsunan University, THOMAS ANTONSEN, University of Maryland, KUNIOKI MIMA, Graduate School for the Creation of New Photonics Industries — We have been investigating a relativistic electron beam–plasma interaction under a strong magnetic field using a hybrid simulation code. In an initial stage, the electron beam drives a return current in a background plasma and such a two beam state causes a longitudinal two stream instability and a transverse Weibel instability. The application of a strong magnetic field is proposed for the suppression of the beam instabilities. When a sufficiently strong magnetic field is applied along the beam propagation, the Weibel instability is well suppressed and electrons flow laminarly. When the magnetic field strength is not large enough, however, electrons stagnate and the total number of beam electrons is largely reduced. Our detailed analyses show that a strong whistler wave is excited during the interaction and the wave stops the beam electrons. Since the whistler wave is composed of transverse electromagnetic fields, there should be a mechanism to convert the transverse field to a longitudinal one. In order to investigate this problem, we have performed a lot of simulation runs for a simple geometry. Then we found the amplified transverse modulation of the background plasma due to the Weibel instability plays an important role for the amplification of the whistler wave.

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