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Pitch angle scattering of an anisotropic electron beam: linear theory and PIC simulations XIANGRONG FU, S. PETER GARY, MISA COWEE, DAN WINSKE, Los Alamos National Laboratory, KAIJUN LIU, Auburn Univerisity — An anisotropic electron beam ($T_{\perp b}/T_{\parallel b} > 1$) drifting along the background magnetic field through a cold background plasma is investigated by both linear theory and 2D PIC simulations. There are two possible instabilities in this scenario: the electron beam instability and the electromagnetic whistler instability. Linear analysis shows that the beam instability grows much faster than the whistler instability in our parameter regime. As a result of the beam instability, the beam is slowed down and heated in the parallel direction. In the 2D case, the electric field of obliquely propagating modes heats electrons in the perpendicular direction, and thus scatters some electrons outside the loss cone of an inhomogeneous magnetic field configuration. The linear theory also predicts that as the temperature anisotropy of the beam increases, the wave propagation aligns more with the background magnetic field, implying a reduction in the perpendicular heating. 2D PIC simulations confirm the prediction of the linear theory and show that fewer electrons are scattered outside a loss cone for for larger $T_{\perp b}/T_{\parallel b}$. We also investigate the parameter regime in which the whistler instability is comparable to the beam instability. LA-UR-13-25045.

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