



Agyrotropic beam-plasma interactions near the electron diffusion region

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We study wave instabilities by agyrotropic electron beams or crescent electron distributions using a kinetic theory and a two-dimensional particle-in-cell (PIC) simulation for July 3, 2017 event in which MMS spacecraft observed high-frequency wave activities near the electron diffusion region (EDR). In this event, large amplitude upper-hybrid wave and its multiple harmonics are observed. The kinetic theory of stationary nongyrotropy plasma (SNG) applied to plasma parameters obtained from the observation shows the wave generation by the beam-plasma interaction between crescent electrons and the core electrons. PIC simulation results show nonlinear phenomena, especially nonlinear harmonics of upper hybrid waves. Moreover, we investigated various plasma parameters which determine wave branches of instabilities and growth rates. Depending on parameters, not only the beam modes but also electron Bernstein waves can be generated by agyrotropic beam near EDR. Comparing growth rates for various beam density and the background magnetic field, we discuss favorable conditions and locations for the generation of waves.