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The resonant and nonresonant instability of Kinetic Alfven Waves driven by fast electron beams in the beam-return current system

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Kinetic Alfven Waves (KAWs) provide an alternative to energy transfer by the interaction of the electrons with the parallel electric field of KAWs in the impulsive phase of a solar flare and Earth's auroral electron acceleration. In this paper, based on analytic and numerical methods, we instigate the KAW instabilities driven by fast electron beam (FEB) in the beam-return current system with low plasma $\beta < Q$ (β is the kinetic-to-magnetic pressure ratio and $Q \equiv me/mi \ll 1$ is the electrons to ions mass ratio). Both the non-resonant and resonant instability characteristics of KAW have been discussed in the low-frequency (i.e., frequency lower than the ion cyclotron frequency) range. Also, the variations of the dispersion of KAW with perpendicular wavenumber, FEB velocity and plasma β have been shown. The possible applications to the electron beam-return current system in the solar flare loops and Earth's Aurora with low plasma β regions are briefly discussed.