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Nonlinear heating of ions by electron cyclotron frequency waves[1]

P.A. ZESTANAKIS, K. HIZANIDIS, NTUA, Greece, A.K. RAM, PSFC, MIT, Y. KOMINIS, NTUA, Greece — We study the nonlinear interaction of ions with electron cyclotron (EC) wave packets in a magnetized plasma. Previous studies have shown that such interactions with high frequency electrostatic lower hybrid waves can lead to coherent energization of ions. It requires the frequency bandwidth of the wave packet to be broader than the ion cyclotron frequency [1,2]. For the electromagnetic high frequency EC waves we have developed a more general theory, based on the Lie transform canonical perturbation method [3,4]. We apply the theory to the case of two overlapping EC beams. The wave frequency of each beam is assumed to be frequency modulated with a modulation bandwidth comparable to the ion cyclotron frequency. We present results for both X-mode and O-mode and illustrate the conditions for ion energization.

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