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Ion heating by high frequency RF waves[1] P.A. ZESTANAKIS, K. HIZANIDIS, Y. KOMINIS, NTUA, Athens, Greece, A.K. RAM, PSFC, MIT — In ionospheric plasmas, high frequency lower hybrid waves are observed to heat ions through nonlinear wave-particle interactions [1]. Using a similar approach, we consider the nonlinear heating of ions in magnetized fusion plasmas by high frequency waves propagating across the magnetic field. The nonlinear interaction is a result of two waves whose beat frequency is equal to the cyclotron frequency of the ions in the spatial region where the two waves overlap. The energy transfer from the waves to the ions occurs through a second order (in wave amplitude) resonance between the beat frequency and the ion cyclotron frequency. The low energy ions can be coherently accelerated into a dynamically chaotic phase space where the ions can gain substantial energy. The ratio of the group velocity to the phase velocity of the waves plays a crucial role in the energy transfer. The optimal energy transfer occurs when the ratio is near unity. Along with the theoretical nonlinear analysis, we will present numerical results illustrating the heating of ions by quasi-electrostatic and electromagnetic waves. Possible application of ion heating by electron cyclotron waves will be discussed.

[1] A.K. Ram, A. Bers, and D. Bénisti, *J. Geophys. Res.* **103**, 9431 (1998).

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