Dynamics of Fast Wave Absorption With Multiple Damping Mechanisms*

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Recent DIII-D experiments on the absorption of fast waves (FWs) by moderate to high ion cyclotron harmonic damping [1] have motivated a substantial modeling effort within the RF SCiDAC community. Work using the AORSA full wave solver coupled to the CQL3D Fokker-Planck code has shown that the presence of a dilute hydrogen minority species in the nominally deuterium plasma can lead to significant cyclotron absorption on the hydrogen, but a high energy tail in the hydrogen velocity distribution is assumed to be the initial condition. In this work, a simple 0-D absorption and transport model is used to study the effect of multiple simultaneous absorption mechanisms, at least one of which has an important nonlinearity (as do all of the central absorption mechanisms for FWs), on the development of the partition between the absorption channels in time from the beginning of the FW pulse. It is found that both the steady-state solution and the time required to reach the final state can depend strongly on the initial conditions. We conclude that this effect should be taken into account in the full modeling, which to date has considered only a single damping mechanism at a time.

[1] R.I. Pinsker, *et al.*, Nucl. Fusion **46**, S416 (2006).

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