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[X] Theory [ ] Experiment

Transition From High Harmonic Fast Wave to Whistler/ Helicon Regime in Tokamaks,* S.P. Harris, *Carnegie Mellon University*; R.I. Pinsker, *General Atomics*; M. Porkolab, *MIT* – Experiments are being prepared[1] on DIII-D in which fast waves (FWs) at 0.5 GHz will be used to drive current noninductively in the mid-radius region. Previous DIII-D experiments used FWs at ~0.1 GHz to drive central current; in this work we examine the frequency dependence of wave propagation and damping in the 0.1–1.0 GHz range with the goal of identifying the optimum frequency range for a particular application. Strongly enhanced electron damping and reduced ion damping at higher frequencies must be weighed against increasing coupling difficulties at higher frequencies and more restrictive wave accessibility at low toroidal field. Wave propagation and accessibility is studied with ray tracing models in slab, cylindrical, and fully toroidal geometries. Analytic expressions for electron and ion damping will be derived with an emphasis on understanding the transition from the moderate-to-high ion cyclotron harmonic regime to the very high harmonic or "whistler"/ "helicon"/lower hybrid FW regime

[1] Prater *et al*., Nucl. Fusion **54**. 083024 (2014).

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