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Theory of external geodesic acoustic mode excitation KLAUS HALLATSCHEK, Max-Planck-Institute for Plasma Physics, Garching, Germany, GEORGE R. MCKEE, University of Wisconsin-Madison, Madison, Wisconsin, USA
— It is extremely appealing to externally excite geodesic acoustic modes in a tokamak, either for diagnostic purposes, since the GAM frequency is dependent on the ion and electron temperature and the flux surface shapes, or, provided sufficiently large amplitude is achievable, to artificially reduce the turbulent transport due to the GAM shearing rate. As for symmetry, it should be possible to generate GAMs by applying an external magnetic field at the GAM frequency with a $(m, n) = (2, 0)$ component to the plasma column. (In principle, this could be done at present, e.g., in DIII-D with the RWM stabilization coils [I-coils]). The action of external currents on the flux surfaces of the plasma has been studied analytically and with a novel dynamic equilibrium code. The results exhibit several control knobs to influence the drive effectivity and aid in designing a GAM drive antenna. The magnetic drive is possible because a GAM localized at a flux surface exhibits a small ($O(\rho^*)$), intrinsically nonlocal magnetic perturbation of large radial range ($\sim$ minor radius) neglected in most turbulence codes. The response of the turbulent plasma to the external driving has been studied using nonlocal NLET code runs including scenarios of complete local turbulence suppression.

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