Abstract Submitted
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**Weak Nonlinearity Effects in TG and EAW Modes**[1] ARASH ASHOURVAN, DANIEL H.E. DUBIN, UCSD — We have studied the nonlinear coupling of Trivelpiece-Gould modes as well as EAW modes, in a cylindrically symmetric plasma with average density $n_0$ and periodic boundary conditions at the axial ends of plasma. For Trivelpiece-Gould modes, the cold fluid formalism gives the slow time evolution of mode amplitudes due to nonlinear couplings. For EAW modes, the Vlasov-Poisson formalism is required. We analyze the coupling between mode $m_z = 2$ with frequency $\omega_2$ and mode $m_z = 1$ with frequency $\omega_1$, with initial density perturbations $n_2(0) \gg n_1(0)$. For small detuning $\Delta\omega \equiv 2\omega_1 - \omega_2 \ll \omega_1 n_2(0)/n_0$, mode amplitude $n_1$ grows exponentially in time due to resonant parametric interaction with mode $m_z = 2$, at a rate $\Gamma$ which is linearly propotional to $n_2(0)$. For $\Delta\omega \gg \omega_1 n_2(0)/n_0$, mode amplitude $n_1$ oscillates about its initial value, with frequency $\Delta\omega$ and amplitude $n_1^{(2)} \propto n_2(0)n_1(0)$. In both cases the theory is consistent with experiments.

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