

Formation of Whistler Cavity by Nonlinear Scattering Resulting in Multi-Pass Gain

C. Crabtree⁽¹⁾, G. Ganguli⁽¹⁾, L. Rudakov⁽²⁾, and M. Mithaiwala⁽¹⁾

(1) Plasma Physics Division, Naval Research Laboratory, Washington, DC
20375-5346

(2) Icarus Research Inc., P.O. Box 30780, Bethesda, MD 20824-0780

Large amplitude magnetospherically reflected whistler waves (50-100 pT) can induce nonlinear scattering that can form a magnetospheric cavity filled with a nearly isotropic spectrum of wave vectors perpendicular to the magnetic field with low obliqueness. Formation of the cavity critically depends on evaluating the dissipation mechanism accurately. Recently, we have determined that collisional damping of whistler waves dominates over damping by suprathermal electrons. Formation of the cavity increases the wave-particle resonance time and maintains a large pitch angle scattering rate. With enhanced fluxes of anisotropic (e.g. loss cone) electrons, enhanced pitch angle scattering due to the cavity formation and the resulting precipitation of trapped electrons into the radiation belt loss cone provides a proportionate gain in the whistler energy, i.e. multi-pass amplification.