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Whistler wave excitation from a dipole antenna in the NRL Space Physics Simulation Chamber[1] DAVID BLACKWELL, ERIK TEJERO, WILLIAM AMATUCCI, Plasma Physics Division, US Naval Research Laboratory, CHRISTOPHER COTHRAN, DAVID WALKER, Sotera Defense Solutions, Inc. —
A dipole has large radiation resistance at resonances associated with odd half integral wavelengths matching the overall antenna length. The first, and strongest resonance, is when $kl = \pi/2$, with k the wavenumber and l the length of one dipole arm. Half and quarter-wave dipoles and monopoles operate in such a manner to achieve good radio transmission and reception. At NRL's Space Physics Simulation Chamber, we have been investigating how this seemingly simple behavior is carried over, or not, when the antenna is immersed in a magnetized plasma. Short wavelength waves above the plasma frequency have been observed to have resonances with the driving antenna exactly as the half-wavelength dipole model predicts. However, the lower frequency short wavelength whistler mode resonance has not been observed, despite overlap of the measured wavelength with the resonance condition when whistler waves are excited. To address this inconsistency, we present a comparison between recent theoretical and experimental results with 2-D spectral analysis and measurements of the antenna impedance for different antenna geometries and plasma conditions. It is expected that these observations will provide insight into the design of a resonant antenna for generating large amplitude whistler waves.

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