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Zoom meeting B ：11/4 PM2 (15:45-17:30)
17:00-17:15

Electric Field Sensor Impedance in Magnetized Plasma by Particle-in-Cell Simulation

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A dipole antenna?has been commonly used as electric-field sensors to observe plasma waves in space plasma. To calibrate electric field measurements, we have been using the assumption that wavelengths are much longer than antenna lengths. However,?in the next generation of satellite projects,?it is possible that the wavelength is comparable to antenna length and?it?significantly?affects the interpretation of the observation results. Understanding of?the electric field sensor response to plasma waves with short wavelengths is significant in evaluating intensities and phases of targeted electrostatic waves. In this research, we simulated the antenna impedances of electric field sensors in magnetized plasmas over electromagnetic waves with short wavelengths. We conducted Particle-In-Cell simulations with electric field sensors as inner boundaries.
The results were evaluated considering the linear dispersion relations in magnetized plasmas.?According to the calculation results, when the wave number of the antenna resonance is large enough, it is estimated that the resonances are seen at the frequencies of the electron cyclotron harmonics, which are frequently observed in the magnetized plasmas. The results show in some situations that at near the UHR frequency, one or two peaks of?the antenna impedance was observed. When the wave number is small enough, the resonances frequencies are shifted to slightly high.
As results of the PIC simulations, the resonances were seen at harmonics of the electron cyclotron frequency when their wave numbers were large. When the wave number was small, no resonance was observed.
In the present paper, we discuss the characteristics of electric field sensors in plasmas over plasma waves with short wavelengths that are comparable with lengths of electric field sensors.