

## GEOTAIL搭載電界観測アンテナの実効長の評価

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### Effective Lengths of Dipole Antennas Aboard GEOTAIL Spacecraft

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The plasma wave instruments (PWI) aboard the GEOTAIL spacecraft is observing various kind of plasma waves around the Earth.

To know absolutely accurate intensity of electric fields is important especially to compute Poynting vectors as well as to discuss nonlinear effects caused by large-amplitude plasma waves. Two components of electric fields are measured by the PWI with two pairs of dipole antennas, WANT (Wire dipole antenna) and PANT (Probe antenna).

The absolute intensity of the electric field at each dipole antenna is calculated from an induced voltage at the base of the antenna, which is a function of an antenna impedance in plasma and of its effective length.

The antenna impedance can be measured in situ[1]. However, the antenna effective lengths ( $heff$ ) have been assumed just simply as 50m, half of their tip-to-tip lengths ( $L/2$ ), and no attempt has been made so far to modify it.

According to past researches, the antenna effective lengths of dipole antennas aboard satellites seem longer than  $L/2$  [2].

In this study, we try to estimate accurate effective lengths of the dipole antennas aboard GEOTAIL. To estimate the effective lengths, we use the waveform data observed for chorus emissions. Chorus emission is an electro-magnetic wave whose electric and magnetic field polarization and propagation direction are well described by well-known

plasma dispersion[3].

Here we have intensity of electric field of chorus emissions by two methods: 1) estimate from the observed electric field with an assumption  $heff=L/2$ , and 2) estimate from the magnetic field with cold plasma dispersion using wave normal direction (evaluated with three magnetic field components) and the observed plasma and electron cyclotron frequencies.

A preliminary calculation shows that the result obtained by the two methods are slightly different, indicating that the effective lengths are  $0.89*L$  for WANT and  $1.05*L$  for PANT.

This result is consistent with the past researches.

We will show a statical result of the effective lengths and discuss characteristics of antenna impedance in the plasma.

#### References:

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