

Verification of Faraday-TEC accuracy during attitude ETS-VIII

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In Sugadaira Space Radio Observatory, we have been observing Total Electron Contents (TEC) with the Faraday rotation method using positioning signals transmitted from geostationary satellites, ETS-VIII and MTSAT-2. The TEC observation system obtains Faraday rotation angle of ellipse. The angle can be affected by the displacement of the satellite antenna as well as the receiving antenna because direction of polarization ellipse is sensitive to the offset direction of satellite and of the receiving antenna. The offset in the ATS-6 satellite was measured before the launch, but it does not the case in ETS-VIII and MTSAT-2 because they were already launched into orbit. It is difficult to estimate the offset angle of satellite in orbit. As recent positioning satellites are using circular polarized antennas in transmission, it can be assumed the depends on satellite antenna direction and position. The ETS-VIII satellite also uses right-handed circularly polarized antenna to transmission. The we have to estimate the orientation of polarization ellipse depend on the satellite antenna direction and on the satellite attitude.

The attitude control of plus and minus 1.5 degrees were conducted to measure the antenna pattern in Dec. 9, to 12, 2008; By considering the satellite antenna direction angle as the orientation of the transmission polarization ellipse Faraday-TEC offset is estimated with the attitude control data of ETS-VIII orientation of the polarization ellipse calculated by using the antenna direction toward the receiver. Taking the change of axial ratio with the satellite tilt angle into consideration, the

observation results shows good agreement with the estimated values, It is concluded that the initial orientation of the ETS-VIII antenna can be estimate by the angle difference between the beam direction and the receiver direction.