In-flight calibration of the Cassini Radio and Plasma Wave Science (RPWS) antennas after the Huygens probe release

R. L. Karlsson (1), W. Macher (1), U. Taubenschuss (1), H. O. Rucker (1), and the Cassini/RPWS team

(1) Space Research Institute, Austrian Academy of Sciences, Graz, Austria

The RPWS instrument on board the Cassini spacecraft orbiting Saturn includes three 10 m long monopole antennas for studying dust, plasma and wave phenomena, including Saturnian radio emissions. Due to the presence of the spacecraft body, the electric antenna directions and lengths, represented by the effective length vectors, deviate from their physical directions and lengths. In order to provide accurate measurements, the antennas have to be calibrated to find these effective length vectors.

Antenna calibration has been done before launch using rheometry and wire-grid modeling with and without the Huygens probe attached. These methods cannot take into account the receiver characteristics and the magnitude of the effective length vectors must be determined by in-flight calibration. Such in-flight calibration has been performed, but only with the Huygens probe attached. For that calibration, Jovian radio emissions measured at a distance of 200–500 Jovian radii were used. At this distance, the radio emissions were sufficiently strong and Jupiter could be regarded as a point source. After the Huygens probe release, on December 25, 2004, Cassini is too close to Saturn to assume the source regions of Saturnian kilometric radiation (SKR) to be a point source. Consequently, SKR cannot be used for the antenna calibration. Would it be possible to use solar type III bursts and can suitable solar type III bursts be found? These bursts should be sufficiently strong with a signal-to-noise ratio >10 dB, and the influence from SKR should be low. Furthermore, they should have been measured in the direction-finding (DF) mode of the RPWS high frequency receiver. Unfortunately, no solar type III bursts has been found in the DF-data after the Huygens probe release. Only solar type III bursts measured in the dipole mode are available. It is not clear whether it will be possible to calibrate the antennas with data from the dipole mode, but an attempt will be made.