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

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

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

The Cassini RPWS antennas consist of three 10 m long monopoles. These antennas are influenced by the spacecraft body and in order to provide accurate measurements, the antennas have to be calibrated to obtain their effective length vectors. Only in-flight calibration can take into account the receiver characteristics and such a calibration has already been performed, but only with the Huygens probe attached to the spacecraft. In this case, Jovian radio emissions were measured at a distance from Jupiter where they were sufficiently strong and Jupiter still could be considered as a point source. When the Huygens probe was released on December 25, 2004, Cassini was already orbiting Saturn at a distance too close for assuming that Saturn is a point source for Saturnian kilometric radiation. Instead, solar type III burst have been used for the calibration. After the Huygens probe release, no bursts have been measured in the direction-finding mode of the RPWS instrument and only measurements in the dipole mode are available. As a consequence, the number of usable equations is only sufficient for calibrating one of the antennas. Since the result from the rheometry shows that the dipole, which is formed in the dipole mode by combining the u and v the antennas, does not change, the w antenna has been calibrated.