Geophysical Research Abstracts
Vol. 14, EGU2012-8728, 2012
EGU General Assembly 2012

The true properties of the Waves antennas onboard the Juno S/C

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Juno was successfully launched in August 2011 to its journey to the Jovian system. The Waves instrument onboard Juno consists of two boom antennas, and suitable receiver hardware, and is used to acquire electric field parameters. The instruments sensors (boom antennas) are extruded from the central body of the spacecraft and have a length of 2.73 m. The close proximity of the conducting spacecraft body inflicts significant changes to the properties of the antennas. In addition the antennas are rather short in comparison to the spacecraft body, which increases the distortion.

In order to acquire the true antenna parameters, we applied an experimental and a numerical method. The experimental method, called rheometry, is essentially an electrolytic tank measurement, using a scale model, which is immersed into an electrolytic medium (water), with corresponding measurements of voltages at the antennas. The numerical method consists of a numerical solution of the underlying field equations by means of computer programs, which are based on patch-grid models.

In this contribution the analysis of the reception properties of Juno's antennas is presented. The acquired results show that the effects of the antenna-spacecraft assembly alter the antenna properties significantly. The antenna directions and lengths, represented by the "effective length vector" are altered by up to 20 degrees in direction and approximately 50% in length, for the quasi-static range. High frequency analyses (up to 40 MHz) illustrate massive antenna pattern changes beyond the quasi-static frequency limit of approximately 4 MHz.