

Cassini/RPWS: A low frequency radio imager at Saturn

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Abstract

The High Frequency Receiver (HFR) of the Radio and Plasma Waves Science experiment (RPWS) on-board Cassini is a sensitive, and versatile radio instrument. Although the radio antenna connected to this instrument have no intrinsic directivity, the HFR measurements can provide instantaneous direction of arrival, flux density and polarization degree of the observed radio waves. Hence, the HFR can be described as an full-sky radio imager. As the instrument provides direction of arrival, radio sources can be located with some assumption on the propagation between the source and the observer. Hence, it is possible to produce radio source maps and correlate them with observations at other wavelengths, such as UV or IR observations of the auroral regions of Saturn. The flux and polarization measurements together with the time-frequency shape of the radio emissions can also be used to identify the radio emission processes.

We present a review of the results of the Cassini/RPWS/HFR observations since its arrival at Saturn in 2004: interpretation of the radio arc shapes and equatorial shadow zones; in-situ observations in the radio source region; comparison with other wavelengths and particle measurements; confirmation of the Cyclotron Maser Instability (CMI) as the main emission mechanism for auroral radio emissions; monitoring of the radio emission variability in time and location, etc.