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Characterization of Saturn's Kilometric Radiation (SKR) from measurements inside its source region

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Abstract

The Saturnian Kilometric Radiation (SKR) is an intense, non-thermal free-space propagating radio emission, similar to the Auroral Kilometric Radiation (AKR) at Earth, generated by wave-electron resonance in auroral regions. SKR has been continuously observed, since mid 2003, by the Radio Plasma and Wave Science (RPWS) experiment, onboard Cassini.
So-called goniopolarimetric analysis of RPWS data provide the Poynting vector of each time-frequency measurement (intensity and direction of the k-vector) as well as its complete state of polarization. Investigation of many years of distant observations thus provide average SKR properties (spectrum, visibility of the emission, and polarization state).
However, previous studies at Earth investigated observations inside AKR sources (Viking, FAST...) and showed drastically different characteristics of the emission inside and outside the emitting region (found in density depleted cavities where part of the AKR is trapped).
Here, we investigate the recent (and yet only) crossing of an SKR source region by Cassini, and apply goniopolarimetric analysis to RPWS in situ measurements to derive SKR sources characteristics (polarization state, k-vector, modes of emission, and radiated power).