



Saturnian narrowband radio emissions: In-situ studies of the source

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Narrowband radio emissions, or nonthermal continuum emissions, are present at all five radio planets of the solar system and Ganymede. At Saturn, narrowband radio emissions, mostly detected around 5 and 20 kHz, occur periodically for several days after intensifications of Saturn kilometric radiation. Model and direction finding results show that these emissions originate from the northern and southern edges of Saturn's plasma torus at $L=7\sim 10$. When passing through these regions at Saturn, Cassini RPWS observed intense electrostatic upper hybrid (ESUH) waves, suggesting that the narrowband emissions are generated at steep plasma density gradients by mode conversion from ESUH waves. So far there have been many passes through the source of the 20 kHz narrowband emissions, as indicated by electromagnetic waves connected to intense ESUH waves in the spectrograms. However, no convincing pass through the source of the 5 kHz narrowband emission has yet been recorded. Using a model of source locations of Saturnian narrowband emissions based on direction finding measurements, we predict upcoming possible passes through the source of these emissions. A series of in-situ studies, including wideband spectrum analyses and electron distribution function measurements, would significantly improve our knowledge of this universal radio phenomenon.