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Influence of magnetic field on the beaming cone of Io-controlled Jovian decameter radiation

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Abstract

The Jovian decameter radiation, like the other auroral radio emissions of the magnetized planets, is known to be produced by the cyclotron maser instability (CMI). This mechanism allows the direct amplification of the waves through a resonant coupling between the electron population of the plasma and the electromagnetic waves with right circular polarization of the X mode. A previous study, based on different magnetic field models of Jupiter, revealed that the radio emission is beamed in a hollow cone presenting a flattening in a specific direction linked to the local magnetic field **B**. We investigate the angular distribution of the Jovian decameter radiation occurrence probability, relatively to the vector **B** and its gradient ∇B in the source region. In a plasma with axial symmetry, i.e., where **B** and ∇B are parallel, the maximum amplification of the waves is obtained for a particular value of the emergence angle relatively to the local magnetic field **B**. This angle is not constant anymore when **B** and ∇B are not parallel, so that the emission cone does not have any axial symmetry and then presents a flattening in a privileged direction. The topology of the magnetic field models developed for describing the Jovian magnetospheric environment seems to indicate that such a geometry exists. The new model of Jupiter's magnetic field based on Juno's first nine orbits, JRMP9, recently proposed by Connerney et al. [*Geophys. Res. Lett.*, *45*, 2590-2596, 2018] is used for this study, in order to analyze the geometry of the emission cone.