Emission Cone of Radio Waves Generated by Cyclotron Maser Instability in Nonaxisymmetrical Inhomogeneous Medium

Patrick H. M. Galopeau* [(1)], Mohammed Y. Boudjada[(2)], and Helmut O. Rucker[(3)]
(1) LATMOS-CNRS, Université Versailles Saint-Quentin-en-Yvelines, Guyancourt, France
(2) Space Research Institute, Austrian Academy of Sciences, Graz, Austria
(3) Astronomy Commission, Austrian Academy of Sciences, Graz, Austria

Four zones of enhanced probability appear in the CML-Io phase diagram, where the occurrence of the Jovian radio emissions at decameter wavelength is plotted versus the central meridian longitude (CML) and the orbital phase of Io. These zones are the so-called Io-controlled sources Io-A, Io-B (emitted from Jupiter's northern hemisphere), and Io-C, Io-D (emitted from the south). We have plotted the occurrence probability in a polar diagram linked to the local magnetic field, making the assumption that the magnetic field intensity gradient ∇B plays the role of an optical axis for the wave propagation, and introducing an azimuth angle measured relatively to the direction of the magnetic field vector **B**. The results of our study allow us to conclude that the Io-controlled decameter Jovian radiation is emitted in a hollow cone flattened in a particular direction. The existence of such an emission cone leads us to understand the location of the Io-controlled sources (Io-A, Io-B, Io-C, and Io-D) in the CML-Io phase diagram and to interpret their dependence on the longitude as the manifestation of a Jovian active longitude sector, where the emission mechanism is the most efficient. We study the origin of the flattening of the emission cone in the framework of a radio emission produced by the cyclotron maser instability in an inhomogeneous medium where the local magnetic field **B** and the gradient of its modulus ∇B are not parallel, i.e., in a geometry without axial symmetry. We consider that the radiation propagates in the source region in the X-mode near its cutoff frequency.