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Role of the Jovian magnetic field on the occurrence probability of Io-controlled decameter emissions in a polar diagram

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Four zones of enhanced probability are found in the CML-Io phase diagram, where the occurrence of the Jovian decameter radio emissions 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 the northern hemisphere), and Io-C, Io-D (emitted from the south). In a recent work, we have studied the occurrence probability in a polar diagram linked to the local magnetic field, making the assumption that the magnetic field intensity gradient plays the role of an optical axis for the wave propagation. For a given Jovian magnetic field model, the four sources Io-A, Io-B, Io-C and Io-D are plotted as a function of the colatitude angle θ relative to the gradient of the magnetic field (radial coordinate) and an azimuth angle ψ linked to the direction of magnetic field vector. Our previous results revealed that the angle θ is not constant and that the Jovian decameter emission controlled by Io is radiated in a hollow cone which is not axi-symmetrical around the magnetic field gradient but flattened in the direction of the magnetic field vector. The relative directions of the magnetic field and its gradient within the radio source seem to play a crucial role in the angular distribution of the occurrence probability. Thus we analyze the effect of the choice of the magnetic field model (in particular the O6, VIP4, VIT4 and VIPAL models) on this distribution and the consequences for the emission cone. The use of elliptic coordinates in a frame linked to the local magnetic field is very relevant for such a study.