Radiation from Electron Phase Space Holes as a Possible Source of Jovian S-bursts

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Radio-frequency short burst emissions (10 - 40 MHz), known as Jovian S-bursts, have been observed from the Jovian aurora for over fifty years. These emissions, associated with Io's motion, have a rapidly declining frequency and an exceptionally narrow bandwidth. While it is widely believed that S-bursts are generated by the electron cyclotron maser instability, the mechanism responsible for the rapidly declining frequency and narrow bandwidth currently is not well established. We explore a hypothesis that electron phase space holes radiate or stimulate radiation in the Jovian aurora plasma environment as a possible source of S-burst emissions. Electron phase-space holes are ubiquitous in an auroral environment and travel at the implied speeds (~20,000 km/s) of the structures creating the Jovian S-bursts. Furthermore, electron phase-space holes have the proper physical size to create the observed bandwidth, have sufficient energy content, and can create an environment whereby X mode emissions can be excited. If verified, these findings imply that electron phase-space holes may be an important source of radiation from strongly magnetized or relativistic astrophysical plasmas.