



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

Katherine Goodrich, Robert Ergun, and Justin Holmes

Laboratory of Atmospheric and Space Physics, University of Colorado at Boulder, Boulder, USA

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 (EHs) are ubiquitous in an auroral environment and travel at the implied speeds ($\sim 20,000$ km/s) of the structures creating the Jovian S-bursts. Furthermore, EHs 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 EHs may be an important source of radiation from strongly magnetized or relativistic astrophysical plasmas.