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Radio emissions from planetary magnetospheres

DONALD A. GURNETT, University of Iowa

Since the discovery of intense radio emissions from Jupiter by Burke and Franklin in 1955, it is now known that the magnetospheres of all the strongly magnetized planets emit intense non-thermal radio emissions. This talk will review the progress that has been made in understanding these radio emissions during the more than fifty years since their discovery. It is now known that two basic radio emission processes are involved: cyclotron maser radiation from precipitating auroral electrons, and mode conversion from electrostatic waves driven by the anisotropy of magnetically trapped magnetospheric electrons. Of these, the cyclotron maser radiation is by far the most intense. Since the gaseous outer planets have no visible surface and since the magnetic field which controls the motion of the electrons is linked to the deep interior, the rotational modulation of cyclotron maser radiation provides the primary method of determining the rotation rates of these planets. Cyclotron maser radiation has also been detected from certain strongly magnetized stars, and serious efforts are now underway to try to detect cyclotron maser radiation from extra-solar system planets.