

REVIEW OF RADIO EMISSIONS FROM CORONAL AND INTERPLANETARY SHOCK WAVES

IVER H. CAIRNS

School of Physics, University of Sydney, NSW 2006, Australia

Shock waves are observed to produce several classes of radio emission within the heliosphere: coronal type II bursts, interplanetary type II bursts, ``foreshock'' emissions from upstream of Earth's bow shock, and various emissions whose names, nature, and detailed origins are unclear (e.g., ``stripeys''). Analogous emissions are also predicted, but not yet observed, from mini-magnetospheres on the Moon and moons like Ganymede, and also from the foreshocks of other planets, particularly Mercury and Jupiter. In each case the theoretical interpretation requires coupling of multiple physical processes from micro-scales to macroscales. Micro-scale physics includes the time-varying magnetic overshoots of reforming shocks, electron reflection and acceleration at shocks, growth of Langmuir waves in the upstream foreshock, and the linear or nonlinear conversion of Langmuir energy into radio emission at multiples of the electron plasma frequency f_p . Intermediate scale physics includes the creation of ripples on the shock on distances of order the decorrelation length of the magnetic field, as well as scattering of the radiation by density irregularities. Macroscale physics includes 3D spatiotemporal variations of the plasma and the shock motion, as well as integration of emission from individual shock ripples over the entire shock. Existing observations and theoretical models are briefly reviewed here, including detailed comparisons between theory and data which indicate reasonable agreement, and a recent attempt to combine the Sydney group's theory with a global MHD simulation of a coronal shock. Outstanding issues and current research activities will be identified.

radio emissions, shocks, electron acceleration, plasma waves

Iver H. Cairns, School of Physics, University of Sydney, NSW 2006, Australia. Ph +61-2-9351-3961, Fax +61-2-9351-7726, Email i.cairns@physics.usyd.edu.au .