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Poster

INTERPLANETARY LANGMUIR WAVES GENERATION DUE TO SOLAR ENERGETIC ELECTRONS

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Energetic electrons represent non-equilibrium distributions of particles that are produced on the Sun and in the heliosphere, notably by flares and the shocks driven by fast coronal mass ejections (CMS). Langmuir waves can be excited in a plasma by a number of mechanisms, but perhaps the best-studied mechanism is the propagation of a suprathermal electron beam with speed of $\sim 0.1 - 0.3\,c$ ($\sim 3 - 20$ keV) in a background plasma (the corona or the inter planetary medium). An electron beam will produce a "bump–on–the–tail" velocity distribution function and the positive gradient will be unstable to the production of a spectrum of Langmuir waves. Then, these electrostatic waves are converted via non-linear wave–wave interactions to transverse electromagnetic waves with a frequency near the electron plasma frequency f_p or its harmonic at $2f_p$ by the plasma radiation mechanism. These electromagnetic waves are responsible for solar radio bursts of type III with distinctive radio spectral signature observed in solar corona, earth and planetary bow shocks and interplanetary space by earth based radio telescopes and spacecraft. Signatures of coronal shock waves are radio type II bursts – a narrow-band radio emission excited at the local plasma frequency by a fast-mode MHD shock. As the shock propagates outwards through the corona, the emission drifts slowly towards lower frequencies due to decreasing ambient density.