

Radar detection of interplanetary shocks: scattering by Langmuir turbulence at foreshock

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Earth-directed interplanetary shocks associated with Coronal Mass Ejections (CMEs) are known to have a severe impact on the magnetosphere, causing strong geomagnetic storms and substorms, and thus early detection of such shocks is important. We study the feasibility of radar detection of interplanetary shocks and consider a reflection mechanism based on the induced scattering of a radar beam by Langmuir turbulence of the foreshock. We obtain and analyse analytical expressions for the optical depth of scattering process, and angular characteristics of the scattered signal, for various possible shock configurations.