

Proposed measurements of high energy particles in the Martian environment using Energetic Ion Spectrometer

A. Auknoor*, S. K. Goyal, P.Sharma, D. Chakrabarty, S. V. Vadawale, A. Sarda, N. K. Tiwari, S. Madhvi, N. Nagrani

Physical Research Laboratory, Navrangpura, Ahmedabad, Gujarat, India

*E-mail: (amogh@prl.res.in)

ABSTRACT

High-energy particles continuously bombard the Martian Ionosphere. These particles are believed to be an important factor for Mars' atmospheric loss. This in turn disrupts the state of Martian Ionosphere significantly. Sun or interplanetary medium is usually the source of these high-energy particles. In order to identify the nature and extent of the changes in the Martian Ionosphere to solar flare activity, ICMEs and CIR activity, it is necessary to know when the corresponding high-energy particles enter the Martian orbit. The Alpha-Proton ratio of Solar Energetic Particles (SEP) can be used to precisely determine the time of arrival of such particles. Such measurements of Alpha particles and Protons can also help us research the energetic particle environment of Mars.

With these objectives as its basis, the Energetic Ion Spectrometer is proposed for an Indian mission which will orbit around MARS, in the near future. The purpose of the EIS, thus, is to perform in-situ measurements of high-energy charged particles (viz., H^+ and He^{++}) in the range of 20 keV/n to 40 MeV/n. EIS uses customized Si-PIN detectors in the $\Delta E-E$ configuration mode for energy measurements and identification of H^+ and He^{++} particles. It uses a stack of 20 μm thick and 1.5 mm thick Si-PIN detectors to cover the energy range from 20 keV/n to 40 MeV/n. Third detector is placed behind the 1.5 mm Si-PIN detector to work in a flag mode. The detector and the Anti-Coincidence Shield (ACS) are designed using a plastic scintillator and Silicon Photomultiplier (SiPM) readout. Sm-Co magnet assembly, enclosed in a Mu-metal shield, was used to avoid electron measurements up to the energy of 400 keV.