Project Details

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Project Title:
Next Generation Ion Detectors for Monitoring and Analysis of Solar Disturbances and Their Effect on the Geospace Environment

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Summary:
Conventional silicon-based solid state detectors (SSDs) offer many benefits for use as particle detectors for solar wind and magnetospheric measurements, but they are limited to measuring high energy particles (>20 keV for H+ and higher for heavier species). We propose to develop and test a new type of low energy ion detector, called a hybrid photomultiplier tube (HPMT), that provides energy resolution, intrinsic noise, and sensitivity levels that are far superior to SSDs at low energies. For magnetospheric measurements, the combination of an HPMT and an electrostatic energy analyzer will enable clear mass resolution of H+, O+ (tracer species of the ionosphere), and He2+ (tracer for the solar wind) within highly constrained resources. For solar wind composition measurements, the HPMT will allow significantly improved mass and charge resolution while reducing the resources by at least 2 kg and 2 W. In this study, we will assemble an HPMT detector for detection of low energy ions and will investigate the key parameters that govern the detector performance by measuring and modeling the HPMT response as a function of ion species and energy. These measurements will be used to characterize the HPMT detector as the key enabling technology for minimum resource mass spectrometry of the magnetospheric and the solar wind plasmas.

Publication References:

no references