



The Highly Miniaturised Radiation Monitor: Concept, Design and Space Weather Applications

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The high energy plasma population, i.e. inside the radiation belts and within solar energetic particle events, is extremely damaging to satellite electronics and human health. Therefore monitoring, understanding of the physics behind and prediction of space radiation strength is a crucial aspect of space weather research and applications.

In addition, the availability of good quality housekeeping data on the ionizing radiation environment in and around spacecraft systems is recognised as highly desirable for the efficient design and operation of spacecraft. Yet the engineering and economic costs of integrating such sensors into flight systems are a serious barrier to their widespread adoption.

In light of this, the Highly Miniaturised Radiation Monitor (HMRM) has been developed by the Science and Technology Facilities Council and Imperial College London within the framework of an ESA technology development contract. The device is significantly smaller and lighter than current space technology with modest power requirements (1W) meaning that it has negligible impact on the spacecraft's overall resources. Furthermore, its simple electrical and data interfaces result in minimal integration costs. The HMRM is designed as a real-time radiation monitor with provides additional scientific data sets, such as reconstructed particle spectra of high-energy plasma population. The instrument energy coverage of 35 keV – 6 MeV for electrons and 600 keV – 500 MeV for protons makes the HMRM an ideal instrument to monitor and study the radiation environment of near-Earth space and to be widely used for space weather monitoring and research.