Fast Neutron Dosimeter for the Space Environment

Radiation Monitoring Devices, Inc.

Technical Abstract
Model calculations and risk assessment estimates indicate that secondary neutrons, with energies ranging between 0.5 to >150 MeV, make a significant contribution to the total absorbed dose received by space crews during long duration space missions [1-3]. Advanced scintillation materials, which exhibit radiation type and mass dependent emission times, coupled to SSPM detectors, provide the optimum volume to payload performance and the ability to easily discriminate between the fraction of dose, which results from secondary neutrons, and that which results from exposure to energetic charged particles and background gamma-rays. The Phase-1 effort successfully characterized the critical components of the proposed dosimeter, specifically, the response of the scintillation material to irradiation by gamma-rays, protons, and neutrons, as well as the performance of the SSPM detector. The Phase-1 modeling studies provide a critical foundation for assessing the anticipated signals in the space radiation environment. The proposed dosimeter would overcome many of the limitations in the current generation of neutron dosimeters, and would provide baseline information on the physics, needed with the information from biological studies, to assess risk in future human-space-exploration missions to the moon and Mars.

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2009 Phase II
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High Efficiency, High Output Plastic Melt Waste Compactor (HEHO-PMWC)

Orbital Technologies Corporation

Technical Abstract
The innovative High Efficiency, High Output Plastic Melt Waste Compactor (HEHO-PMWC) is a trash dewatering and volume reduction system that uses heat melt compaction to remove nearly 100% of water from trash and reduce the volume by up to 11 times. The HEHO-PMWC system incorporates novel methods to compress the trash, recover water, and remove the resultant plastic tiles. This system requires access to power, data, and cooling interfaces. The system is suitable for recovering water and compacting all trash sources on the ISS. The system has also been designed to recover water from brine solutions produced by primary wastewater processing systems. The HEHO-PMWC works by heating and compressing trash simultaneously to first remove water and then to melt plastic in the trash. The melted plastic encapsulates the trash into a 16 inch square tile, approximately ½ inch thick. The square tile is easier to store than a round tile and is a more effective radiation shield. Variables such as transport vehicle availability, ISS mass, power and space availability, and ISS cooling capabilities were considered. The resulting HEHO-PWMC system, proposed here, was sized to process 3-4 kg of trash per batch while operating three times per day.

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