G. Reitz, Ph. D.
DLR Institute of Aerospace Medicine
Radiation Biology Section
Linder Höhe, 51147 Köln,
Germany

Dosimetric Mapping

Radiation constitutes one of the most impor tant hazards for man in long term space missions. Dosimetric data of the proposed expe riment will constitute essential information for the application of radia tion protection standards for manned space flight and for any radiation susceptibl e experiment in space. In addition, the measurement will contribute to the understanding of radiation transport through matter and for the radiation field characteristics, e. g. composition and anisotropy.

Due to the variety of particles and energi es in space, no single detector system is capable of providing sufficie nt information. Th erefore the proposed experiment is dosimetry package consisting of several nuclear track de tector packages (NTDP). And a detector telescope (DOSTEL). Usi ng two silicon detector, up to four small single silicon detector units (MDUs) and a TLD-R eader with eight bulb thermoluminescence dosimeters. The use of well known passive de tector systems in the NTDPs, thermoluminescence dosimeter s (TLDs), plastic detectors(cellulose nitrate, CR39, and polycarbonate), allows mission integrated measurements of the absorbed dose, neutron dose, the heavy ion fluences and its spectral composition with respect to charge, energ y and linear energy transfer (LET). In addition, target fragmentations for different absorber mate rials inside the detector stack will be studied to understand the fr agmentation systematics. Mounting of the stacks in different orientations allows the measurement of angular distributions of heavy ions and target fragments. DOSTEL and the MDUs provide the flux of charged particles and the corresponding dose rate as a functi on of time. In additio n, DOSTEL as a telescope is used for the measurement of time dependent LET spectra separately for galactic c osmic particles a nd trapped particles in differ ent directions at defined shielding locations. DOSTEL is used as reference instrument for the MDUs . The MDUs are designed as small lightweight pe rsonal dosimeters but may be used also at different locations inside the spacecraft. The meas urement set is complete d by a n onboard small compact TLD-Reader for the study of spatial distribution and time dependence of absorbed doses and for neutron dose measurements. The whole dosimetry set shall be used for routin e environmental, individual and EVA dosimetry. The single detector systems comp lement each other in their recording characteristics.

The diffe rent s ystems allow for in-flight cross-calibration of measurements at different shielding configurations. This is absolute necessary when recognizing that the comparison of available data is ofte n not possible due to not well known regular response of detector systems combin ed with unknown angular incidence o f radiations and only approx imate knowledge of shield ing distributions. On-ground cross-calibration of the equipment with we ll-known sources is an indispensable part of the work.