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Radiation Fields, Effects and Risks in Human Space Missions (4)

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ALTEA-SHIELD: A USLAB-ISS RADIATION SURVEY

Abstract

In general, radiation exposure represents one of the greatest risks to humans traveling on exploration missions beyond low Earth orbit (LEO). The structural complexity of the International Space Station together with the always changing configuration of racks and experiments make a difficult task to model the Station's shielding and to obtain a detailed simulation of the radiation environment. The ALTEA detector is used, within the ALTEA-Shield project, to measure the radiation environment in different places of the USLab. The ALTEA-Shield/Survey experiment, developed by the Italian Space Agency (ASI) and sponsored by ESA, uses the six particle detectors (SDUs, Silicon Detector Units) of ALTEA arranged on a 3D isotropic support. The detectors are capable to measure particle fluxes in an energy range between 3 and 900 keV/um and are able to discriminate ion species (charge Z) from Z¿4 and to measure the trajectory of each particle, so to be able to reconstruct the radiation flux in the three direction XYZ. The ALTEA-Shield/Survey experiment started on September 2010 and it was placed in four locations of the USLab, resulting in a total observation time of more than 290 days. We present here the particle fluxes measured in the four positions together with previous radiation measurements performed with ALTEA in other 2 positions of the USLab. The differences in the flux measured along the X Y and Z directions (the ISS main body and two transverse directions) are mostly due to the different amount and quality of shielding materials traversed by the incoming nuclei. Results of a preliminary analysis of the three sets of coupled SDUs, each realizing a telescope with a double number of silicon planes, increasing the nuclear discrimination capability, are also presented. Furthermore we use these data together with available information for the outside radiation environment [for example from Simpson (1983)] to study the consistency of the radiation field outside with our measurements inside taking into account current available modeling.