Panels (P)
Human Exploration on the Moon, Mars and NEOs (PEX.2)

SPACE RADIATION AND HUMAN EXPLORATION ON THE MOON, MARS AND NEOS DOSIMETRY, MODELS AND CHALLENGES

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Space programs are shifting towards planetary exploration and, in particular, towards missions by human beings to the Moon and to Mars. Radiation is considered to be one of the major hazards for human long-term missions beyond Low Earth Orbit (LEO). During transit to these far away destinations and during relevant extravehicular activities (EVA) on their surface, complete shielding of the highly energetic particles is impracticable. The two sources of radiation that can impact a mission outside the Earth's magnetic field are Solar Energetic Particles (SEP) and Galactic Cosmic Rays (GCR). The main goal for exploration missions is therefore the quantification and reduction of space radiation health hazards, with the goal of maximizing the number of days that may be spent in space. The research to be carried out has to support all phases of exploration including mission planning, component design, operation and post-flight studies. Having this in mind this calls for novel and improved radiation detector assemblies as well as extended calibrations, detector intercomparisons and analysis algorithms. New measurements are a prerequisite for reliable risk assessment, a crucial input for radiation source modelling, and are also needed for real-time calibration of the detectors thereby allowing for a detailed understanding of the radiation environment the astronauts are going to live in. For exploration missions, radiation risk assessment will predominately rely on simulation models. The reliability of these models needs to be optimized through a series of tests against a wide set of measurements at sites/conditions where instruments are available or can be made available. More and more radiation details are needed to correctly assess radiation risks, and this requires detailed model outputs to be tested against proper measurements. In the last years various radiation detector systems have been send either to the Moon (circulating in Moon orbit) or are already on the surface of Mars, providing thereby a tremendously needed data set for model validation and benchmarking and input data to face the challenges ahead of us.