

COSPAR 2012 (F22 Space Radiation Risk Assessment and Counter Measures: Physics and
Biophysical Mechanisms, Modeling and Simulation)
**SPACE RADIATION CANCER RISKS AND UNCERTAINTIES FOR DIFFERENT
MISSION TIME PERIODS**

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ABSTRACT

Space radiation consists of solar particle events (SPEs), comprised largely of medium energy protons (less than several hundred MeV); and galactic cosmic ray (GCR), which includes high energy protons and high charge and energy (HZE) nuclei. For long duration missions, space radiation presents significant health risks including cancer mortality. Probabilistic risk assessment (PRA) is essential for radiation protection of crews on long term space missions outside of the protection of the Earth's magnetic field and for optimization of mission planning and costs. For the assessment of organ dosimetric quantities and cancer risks, the particle spectra at each critical body organs must be characterized. In implementing a PRA approach, a statistical model of SPE fluence was developed, because the individual SPE occurrences themselves are random in nature while the frequency distribution of SPEs depends strongly upon the phase within the solar activity cycle. Spectral variability of SPEs was also examined, because the detailed energy spectra of protons are important especially at high energy levels for assessing the cancer risk associated with energetic particles for large events. An overall cumulative probability of a GCR environment for a specified mission period was estimated for the temporal characterization of the GCR environment represented by the deceleration potential (ϕ). Finally, this probabilistic approach to space radiation cancer risk was coupled with a model of the radiobiological factors and uncertainties in projecting cancer risks. Probabilities of fatal cancer risk and 95% confidence intervals will be reported for various periods of space missions.