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Methodology of Real-Time Space Radiation Dose Estimates Using Onboard Vehicle Dosimeters

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Radiation exposure from solar energetic particle (SEP) events becomes a much greater concern as human exploration extends beyond low Earth orbit (LEO) and the protective environment of Earth's magnetic field. Free space SEP events have an increased impact on mission planning and operations, as countermeasures may be necessary to avoid exceeding astronaut permissible exposure limits (PELs) and acute radiation syndrome (ARS). Operational analysis tools are needed to assess acute radiation effects during SEP events in order to determine courses of action during the mission. A methodology has been developed to meet this need, which utilizes onboard vehicle dosimeter measurements to estimate dose quantities at astronaut crew locations. The estimated dose quantities provide the necessary inputs to acute biological response models that predict radiation induced performance decrement (RIPD) and other acute radiation effects. The active dosimeter-based crew dose estimate methodology is presented here, which will be tested on Exploration Mission 1 (or EM-1) of the Orion spacecraft.

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