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The Lunar Ionising Radiation Environment −A Benchmark Model

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Understanding the lunar radiation environment is critical for ensuring astronaut safety and mission success in upcoming ESA's lunar exploration programs such as Artemis and the Lunar Gateway. This study presents the development of the detailed Lunar Energetic Radiation Environment Model (dLEREM), a Geant4-based Monte Carlo simulation tool designed to assess radiation exposure on the Moon. dLEREM builds upon the detailed Mars Energetic Radiation Environment Model (dMEREM) by adapting its computational framework to the lunar surface, considering the absence of an atmosphere, unique regolith interactions, and exposure to Galactic Cosmic Rays (GCRs), Solar Energetic Particles (SEPs), and secondary radiation.

This presentation aims to outline the challenges of modeling the lunar radiation environment, including data limitations and the complexity of radiation interactions with the lunar surface. It will also describe the development of dLEREM, from adapting dMEREM's architecture to incorporating lunar-specific radiation sources and validating results with mission data from LRO, Artemis, past Apollo missions, and others. By addressing these challenges, dLEREM aims to provide a comprehensive and user-friendly tool for mission planning and radiation environment assessment.

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