

Shielding Design of Particle Dosimeter and Spectrometer for LVRad Mission using Monte Carlo Simulations

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For manned missions on the lunar surface, it is essential to assess radiation dose and its biological effects on the lunar surface. Seoul National University (SNU), Korea Astronomy and Space Science Institute (KASI), Kyungpook National University (KNU), and Cheongju University (CJU) are working together to develop lunar surface radiation dosimeter called LVRad (Lunar Vehicle Radiation Dosimeter) to detect radiation environment on the lunar surface. Particle Dosimeter and Spectrometer (PDS), which is a part of LVRad, is a silicon based detector to detect solar energetic particles (SEPs) from the Sun. LVRad mission is planned to detect lunar surface radiation environment in 2024, which is predicted as a solar maximum, which has extremely high fluxes of SEPs. For this reason, shielding design of PDS was tested to prevent pile-up effect and radiation hardness issue from high fluxes of SEPs using Monte Carlo simulations. ESP (Emission of Solar Protons) model in solar maximum with energy range of 0.1 to 500 MeV from SPENVIS (space environment information system) was used for SEP source in MCNP6 transport code. Aluminum and Tissue Equivalent Plastic (TEP) shield were tested in this simulations to reduce fluxes and doses from SEPs and consider practical biological effects such as extravehicular dose and tissue dose.

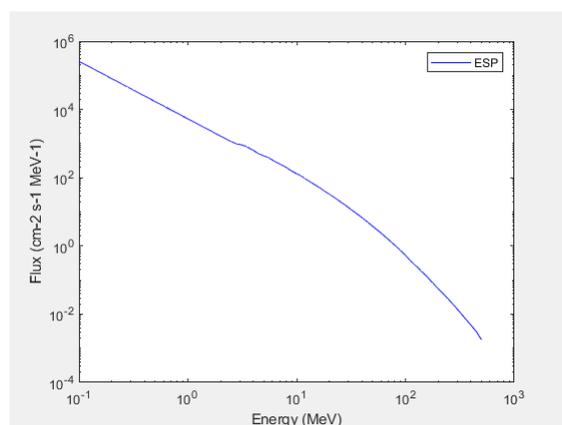


Fig. 1. ESP model solar energetic proton flux (SPENVIS).

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