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Evaluation of a Hybrid Configuration for Active Space Radiation Bio-Shielding

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Abstract : One of the biggest obstacles to human space exploration of the solar system is the risk posed by prolonged exposure to space radiation. It is generally agreed that particles with energies around 1-2 GeV per nucleon are the most damaging to humans. Passive shielding techniques entail using solid material to create a shield that prevents particles from penetrating a given region by absorbing the energy of incident particles. Previous techniques resulted in adding 'dead mass' to spacecraft, which is not an economically viable solution. Additionally, collisions of the incoming ionized particles with traditional passive protective material lead to secondary radiation. This study develops an enhanced hybrid active space radiation bio-shielding concept, a combination of the electrostatic and magnetostatic shielding, by varying the size of the magnetic ring, and by having multiple current-carrying rings, to mitigate the biohazards of severe space radiation for the success of deep-space explorations. The simulation results show an unprecedented reduction of 1GeV GCR (Galactic Cosmic Rays) proton transmission to about 15%.

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