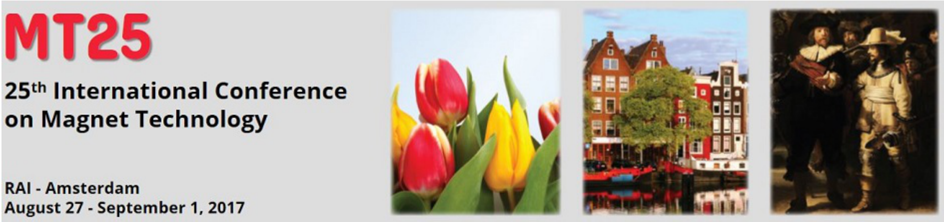

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The limits of space radiation magnetic shielding

Tuesday, 29 August 2017 09:30 (15 minutes)

A major problem of long duration manned missions in the deep space is the flow of high energy charged particles of solar (SPE) and galactic (GCR) origin. SPEs have short duration but can be extremely intense and can lead to acute, even lethal, effects. GCR flux is much less intense but is continuous, isotropic and more energetic; it increases the risk of carcinogenesis and can affect the nervous and cardiovascular systems, limiting missions duration to few months. It is commonly believed that the problem of space radiation can be solved by surrounding the spacecraft habitats with large superconducting magnets, even though a considerable technological effort would be required. However, magnetic shielding has several basic limitations which restrict the reduction of the radiation dose. As an example, particles in the high energy region of the GCR spectrum, that cannot be deflected out of the cabin by the magnetic shield, have a significant biological effect. Moreover, the interaction of cosmic rays with magnet and spacecraft materials generates secondary particles which have a major effect on the radiation dose. The physical and technological constraints of space radiation magnetic shields are discussed in the paper. Despite such limitations, a superconducting magnet could completely eliminate the risk due to SPE. Moreover, it could reduce the GCR adsorbed dose enough to make acceptable the risk of developing long term diseases after a return trip to Mars.

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