

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Radiation Fields, Effects and Risks in Human Space Missions (5)

Author: Mr. Dionysios Gakis
University of Patras, Greece, dgakis@upnet.gr

Dr. Dimitra Atri
New York University Abu Dhabi, United Arab Emirates, atri@nyu.edu

RADIATION PROTECTION AND SHIELDING MATERIALS FOR CREWED MISSIONS ON THE
SURFACE OF MARS

Abstract

A potential crewed mission to Mars would require us to solve a number of problems, including how to protect astronauts against the devastating effects of charged particles from the Sun and Galactic sources. The radiation field on Mars is of particular interest, since maintaining optimal absorbed doses by astronauts is crucial to their survival. Here, we give an overview of the conditions on Mars, as determined by theoretical models and in-situ measurements, and present the main proposed strategies to mitigate radiation exposure while on Mars. Specifically, we focus on the passive shielding technique. Several widely used materials, along with some innovative ones and combinations of those, are studied for their behavior against Solar Particle Events and Galactic Cosmic Rays on the Martian environment. For that purpose, we implement the computational program Geant4, a Monte-Carlo numerical model developed by CERN, which is specifically applied to simulate interactions of radiation with matter. A description of our model will be given, followed by the computational outputs. We conclude that hydrogen-rich materials act as better attenuators, as expected, but other materials can be helpful against cosmic rays too.