

Radiation exposure from neutrons in spaceflight and aviation

Monday 7 July 2025 10:00 (15 minutes)

Secondary neutrons produced in the interactions of primary cosmic rays with matter are a relevant component of the radiation field in spaceflight and aviation and play a major role in radiation protection in these fields. On the International Space Station, the ORION spacecraft of the ARTEMIS program or any human-rated vehicle, neutrons are produced in the walls and other structures of the spacecraft. On planetary surfaces or at aviation altitudes, neutrons originate from the soil and regolith and from interactions with the constituents of the atmosphere. Energies of secondary neutrons from cosmic rays span many orders of magnitude from thermal energies up to tens of GeV and are relevant to the exposure in the range from approximately 100 keV to several GeV, depending on the shielding conditions and the primary particle spectra. Models predict that the build-up of the secondary neutron field leads to a maximum in the dose equivalent at altitudes in the Earth's atmosphere of approximately 20 km above ground and an increase in the dose equivalent for aluminum shielding above approximately 10 cm in space, but little experimental validation for these predictions exist. Model calculations and measurements of neutrons and neutron dose in aviation and space flight will be presented.

Author: MATTHIÄ, Daniel (Institute of Aerospace Medicine, German Aerospace Center (DLR), Linder Höhe, Köln, Germany)

Co-authors: Dr SCHENNETTEN, Kai (Institute of Aerospace Medicine, German Aerospace Center (DLR), Linder Höhe, Köln, Germany); Dr MEIER, Matthias (Institute of Aerospace Medicine, German Aerospace Center (DLR), Linder Höhe, Köln, Germany); Dr BERGER, Thomas (Institute of Aerospace Medicine, German Aerospace Center (DLR), Linder Höhe, Köln, Germany)

Presenter: MATTHIÄ, Daniel (Institute of Aerospace Medicine, German Aerospace Center (DLR), Linder Höhe, Köln, Germany)

Session Classification: Aviation, Space and Radiobiology

Track Classification: Day 1: Health and Radiation Protection; Science and Technology: Aviation, Space and Radiobiology