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The South African Space Neutron Initiative (SASNI)

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Cosmic radiation consisting of Galactic Cosmic Rays (GCRs) and Solar Energetic Particles (SEPs), and their associated secondary particles are a known radiation hazard for high altitude flights, satellites, and space operations. Solar energetic particles result from highly unpredictable space weather events, releasing a large number of high energy protons and alpha particles over short periods of time.

Cosmic ray interactions with matter produce a cascade of secondary particles, consisting of electrons, mesons, pions, protons, neutrons, alpha particles and higher mass fragments. At aviation altitudes around 40% of the total dose equivalent from this complex radiation field is attributed to neutrons with energies between 1 and 100 MeV, which poses the greatest challenge for dosimetric systems. Dosimetry at flight altitudes continues to grow in importance due to the increased awareness of the exposure of air crew personnel to cosmic radiation. This topic is of special importance because the accumulated effective dose of a significant number of air crew members will be between 1 mSv and 5 mSv per year, receiving the largest exposures of all occupationally exposed persons. The equivalent dose in the atmosphere strongly depends on geomagnetic latitude and altitude, and there have been few experimental measurements made in the Southern Hemisphere.

In general, there is a lack of experimental data for high-energy neutrons (> 20 MeV), and as such there is insufficient information regarding the biological effects and severity of neutron interactions to make accurate risk assessments. In order to improve understanding of radiobiological observations related to high-energy neutron irradiation, it is critical to fully characterize these mixed fields at the point of interest.

The South African Space Neutron Initiative (SASNI) is a new research collaboration between the Metrological and Applied Sciences University Research unit (MeASURe) at the University of Cape Town, the South African National Space Agency (SANSA) and the Radiation Biophysics division at iThemba LABS. The collaboration has a broad focus on the measurement of secondary neutrons produced by cosmic rays and the radiation protection consequences which follow, particularly regarding South African civil aviation and space missions.

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