



Contribution ID: 113

Type: **Poster Presentation**

A compact neutron spectrometer for neutrons produced by cosmic rays

Cosmic rays are comprised largely of high energy protons and alpha particles which create large amounts of secondary particles through spallation when they interact with our atmosphere. At aviation altitudes the radiation field is made up predominantly of neutrons in the energy range 1 - 100 MeV [1]. During space weather events, such as solar flares, the number of energetic particles entering the atmosphere can increase drastically resulting in higher radiation doses to aircrew, and an increased risk of electronics malfunction on board aircraft [2]. As these events are unpredictable and short-lived, very little observational data exist.

The development and characterisation of a detector to measure cosmic ray induced neutrons with energies up to 100 MeV on board aircraft is presented. Due to the measurement environment, the detector needed to be compact and safe to operate during commercial flights. Building upon previous research at UCT [3,4,5], the prototype detector comprised of a 6 mm x 6 mm x 50 mm slab of EJ-276 plastic scintillator, a SensL C-series silicon photomultiplier, and digital data acquisition. Results from the first measurement campaign at the n-lab, UCT, are presented, utilising mixed gamma ray and neutron fields with energies up to 4.4 MeV and 14.1 MeV respectively. Overall, the detector system performed well and showed promise of being suitable for the measurement of neutrons with energies up to 100 MeV. Further development of the device is ongoing in collaboration with SANSA and iThemba LABS, with the aim to improve the design and characterise the response up to 100 MeV.

[1] P. Goldhagen, et al., Rad. Prot. Dos., vol.110, p.387 (2004)

[2] W. Tobiska, et al., Space Weather, 13, 202–210 (2015).

[3] A. Buffler, et al., Int. Jour. Mod. Phys. 44, 1660228 (2016).

[4] A. Comrie, et al., Nucl. Instr. Meth. A, 772, 43–49 (2015).

[5] E. Jarvie, A new pocket-sized neutron detector, Hons. Thesis, Dept. Physics, UCT, 2020

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

Hons

Primary author: JARVIE, Erin (University of Cape Town)

Co-authors: Dr HUTTON, Tanya (University of Cape Town); Prof. BUFFLER, Andy (University of Cape Town); Dr NNDANGANENI, Rendani (South African National Space Agency (SANSA)); Dr VANDEVOORDE, Charlot (iThemba LABS, Radiation biophysics)

Presenter: JARVIE, Erin (University of Cape Town)

Session Classification: Poster Session

Track Classification: Track B - Nuclear, Particle and Radiation Physics