

Validation of Monte Carlo Yield Function of a Semi-Leaded Neutron Monitor using Latitude Survey Data in 2019 and 2020

Friday 16 July 2021 19:18 (12 minutes)

A neutron monitor (NM) is a ground- (or sea-) based detector of the flux of cosmic ray particles in space. The high-energy cosmic rays in the GeV primary range interact in the upper atmosphere, producing a cascade of subatomic particles, some of which reach Earth's surface. A neutron monitor is mostly sensitive to the neutron component of the atmospheric cascade. The standard-design neutron monitor (NM64) contains lead, the nuclei of which fragment when struck by a high-energy particle. Some of the fragments are neutrons, moderated and trapped by polyethylene, acting as a reflector and moderator. These neutrons can then be detected by induced nuclear fission of ^{10}B in a $^{10}\text{BF}_3$ gas proportional counter. The Changvan neutron monitor is a portable neutron monitor assembled in Thailand and housed in a standard insulated shipping container to conduct long-term research in polar regions. There are three proportional counters housed in the insulated shipping container, but the central counter lacks the lead producer. Since the detector has a non-standard semi-leaded design, we examine the response functions of the Changvan for neutrons and other atmospheric secondary particles with varying angles of beam generating particles. Deadtime, the specific time after each event during which the electronics cannot record another event, is also applied to the responses. This will allow us to find the yield function from the simulation. We can validate the Monte Carlo model using the latitude survey data, as a step toward using the unleaded/leaded count rate ratio from a single detector at a fixed location to study spectral variations.

Keywords

Collaboration

other Collaboration

Subcategory

Experimental Methods & Instrumentation

Primary author: SERIPIENLERT, Achara (National Astronomical Research Institute of Thailand (NARIT), Chiang Mai 50180, Thailand)

Co-authors: NUNTIYAKUL, Waraporn (Chiang Mai University); RUFFOLO, David (Mahidol University); MANGEARD, Pierre-Simon (University of Delaware); Dr SÁIZ, Alejandro (Mahidol University); Ms KHAMPHAKDEE, Sidarat (Department of Physics and Materials Science, Faculty of Science, Chiang Mai University); FONGSAMUT, Kanokkarn (Chiang Mai University); JIANG, Peng (Polar Research Institute of China); CHUANRAKSASAT, Pongpichit (National Astronomical Research Institute of Thailand); EVENSON, Paul (University of Delaware); MUNAKATA, KAZUOKI; Prof. MADSEN, James; SOONTHORNTHUM, Boonrucksar (National Astronomical Research Institute of Thailand); KOMONJINDA, Siramas (Chiang Mai University)

Presenter: SERIPIENLERT, Achara (National Astronomical Research Institute of Thailand (NARIT), Chiang Mai 50180, Thailand)

Session Classification: Discussion

Track Classification: Scientific Field: SH | Solar & Heliospheric