Contribution ID: **597** Type: **Poster**

High-multiplicity neutron events registered by NEMESIS experiment

Friday 16 July 2021 19:18 (12 minutes)

Neutron-induced interactions contribute to the signal-mimicking background in deep-underground searches for exotic phenomena such as Dark Matter, neutrino-less double beta decay, proton decay, etc. Apart from radioactive decay, the primary source of neutrons underground are high-energy muons from cosmic showers. While the maximum number of fission neutrons is around six and energies around one MeV, muon-induced interactions may generate hundreds of neutrons, also with high energies. Furthermore, these processes are not yet reproduced numerically with sufficient reliability. The main goal of the NEMESIS experiment is to improve our knowledge and understanding of cosmic muon-induced neutron production in high-Z targets. NEMESIS (New Emma MEasurement with neutronS In cosmic Showers) is taking data at a depth of 210 m.w.e. in Callio Lab at the Pyhäsalmi mine in Finland. The neutron setup consists of 14 ^3He counters in polyethylene blocks. Data from the helium counters and muon scintillation arrays are collected by proprietary electronics digitizing signal waveforms with adequate time overlap to detect delayed coincidences. The presented neutron spectra will include a 300-day run with a 565 kg Pb target, a 150-day run without the target, and the outcome of the relevant Geant4 simulations. The extracted neutron multiplicity spectrum shows a linear behaviour on a doubly logarithmic scale. The largest registered event had 36 neutrons. Correcting for a 10% detection efficiency, determined with Geant4, indicates the emission of 360 neutrons in this mega-event.

Keywords

Neutron; Dark Matter; Muons; neutron detection

Collaboration

other (fill field below)

other Collaboration

NEMESIS

Subcategory

Experimental Methods & Instrumentation

Primary authors: Dr KASZTELAN, Marcin (National Centre for Nuclear Research, Poland); ENQVIST, Timo (University of Jyväskylä); Dr SZABELSKI, Jacek (National Centre for Nuclear Research, Poland); TRZASKA, Wladyslaw Henryk (University of Jyvaskyla); Dr JĘDRZEJCZAK, Karol (National Centre for Nuclear Research, Poland); Dr KUUSINIEMI, Pasi (Muon Solutions); Ms PUPUTTI, Julia (University of Oulu); Ms PRZYBYLAK, Marika (Narodowe Centrum Badań Jądrowych); Mr JOUTSENVAARA, Jari (University of Oulu); Mr ORZECHOWSKI, Jerzy

Presenter: Dr KASZTELAN, Marcin (National Centre for Nuclear Research, Poland)

Session Classification: Discussion

Track Classification: Scientific Field: DM | Dark Matter