

Seasonal Variation in Cosmic Muon Rate at the NOvA Experiment

The NOvA experiment, a long-baseline neutrino experiment, uses two detectors: one located at Fermilab and another at Ash River, Minnesota. The Near Detector, situated approximately 100 meters underground, observes cosmic muons at a rate of ~ 35 Hz, while the Far Detector, located on the surface, observes cosmic muons at a rate of ~ 150 kHz. The rate of cosmic muons exhibits seasonal variation due to the interplay between the decay and interaction of pions and kaons in cosmic showers, reaching a maximum in summer and a minimum in winter.

In 2015, the MINOS experiment published results on the variation of cosmic muon rates, distinguishing between single and multiple muons. Notably, the multiple muon rate demonstrated an opposite seasonal behavior compared to single muons, with a maximum in winter and a minimum in summer. This effect has also been observed in the NOvA experiment using both near and far detector data. In this presentation, I will show the observed variations in cosmic multiple muon rates and provide a possible explanation for the opposite behavior of single and multiple muons using CORSIKA simulation.

Working Group

WG 4: Muon Physics

Primary author: PAL, Amit (National Institute of Scientific Education and Research (NISER))

Co-authors: Prof. SWAIN, Sanjay (National Institute of Science Education and Research (NISER), Bhubaneswar, India); RAMSON, Bryan

Presenter: PAL, Amit (National Institute of Scientific Education and Research (NISER))

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