Contribution ID: **794** Type: **Poster**

Background measurements and detector response studies for ISMRAN experiment.

Friday, 8 July 2022 20:10 (20 minutes)

Indian Scintillator Matrix for Reactor Anti-Neutrinos (**ISMRAN**) is an above-ground antineutrino experiment at very short baselines located at **Dhruva** reactor facility in Bhabha Atomic Research Centre, Mumbai. ISMRAN detector setup consisting of an array of 9×10 optically separated 100 cm long with a cross-section of 10 × 10 cm^2 Gd-wrapped plastic scintillator bars(PSBs) and enclosed by a shielding made of 10 cm thick lead and 10 cm thick borated polyethylene, mounted on a movable base structure, situated at ~ 13 m away from the reactor core. Antineutrinos are detected via the inverse beta decay (**IBD**) process which provides a time correlated signal pair consisting of a positron energy deposition and a delayed neutron capture in the plastic scintillator, both of which are recorded by each double-ended PMT segment. This experiment's physics goals include searching for potential short-baseline oscillations by the existence of sterile neutrinos and precisely measuring the antineutrino energy spectrum from a natural uranium fuel based thermal reactor. The excess of antineutrino events in data compared to predictions particularly at 5–7 MeV in the measured positron energy spectrum will also be addressed using ISMRAN detector setup.

In this article, we will present the optical model, energy resolution model and energy non-linearity model of PSB. We will also discuss the natural radioactive and cosmogenic backgrounds, based on their energy deposition, number of bars hit as well as topological event selection criteria in position and time. Reconstructed sum energy spectrum and number of bar hits for different radioactive gamma sources such as ^{22}Na and ^{60}Co has been compared with Geant4 based Monte Carlo(MC) simulations. The sum energy, number of bar hits and energy ratios variables for the cascade gamma-rays from the n-Gd capture process are reconstructed using Am/Be neutron source and compared with the MC simulation in Geant4. These experimentally measured results will be useful for understanding the detector energy response and discriminating the correlated and uncorrelated background events from the true IBD events in reactor ON and OFF condition inside the reactor hall.

In-person participation

No

Primary author: DEY, Roni

Co-authors: Dr NETRAKANTI, P. K (Scientist(BARC)); Dr MISHRA, D. K (Scientist(BARC)); Dr BEHERA, S. P (Scientist(BARC)); Mr SEHGAL, R (Scientist(BARC)); Dr JHA, V (Scientist(BARC)); Dr PANT, L. M (Scientist(BARC))

Presenter: DEY, Roni

Session Classification: Poster Session

Track Classification: Neutrino Physics