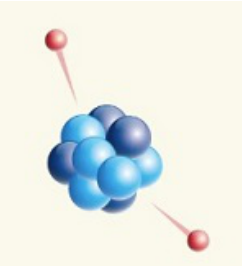

Contribution ID : **59** Type : **not specified**

Shielding and Outer Detectors

Wednesday, 12 November 2025 16:30 (14)

Cosmogenic muons are a major background source in rare event search experiments. To mitigate this background, neutrinoless double beta decay ($0\nu\beta\beta$) and direct detection dark matter experiments prefer to operate in deep underground laboratories, where they can receive adequate shielding from cosmic rays. However, high energy muons can still reach underground and create backgrounds for these experiments. To reduce such cosmogenic muon backgrounds, the rare-event search experiments deploy an outer detector to tag the muons. The outer detector can act as a muon veto. An active muon veto detects light produced either via Cherenkov radiation (if the detector is filled with the water) or scintillation light (if the detector is filled with the scintillation medium). The outer detector is instrumented with photon detection modules, such as photomultiplier tubes (PMTs) or silicon photo multipliers (SiPM). In addition, the outer detector can also serve as passive shielding, moderating secondary neutrons produced by muon interactions. In this talk, I will discuss about requirements of the deep underground laboratories, and the specifications of the outer detectors for the current and future rare event search experiments.

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Session Classification : Blue Sky Session