

IDM2008 - Identification of Dark Matter 2008

Contribution ID : 473

The LVD core facility: a study of LVD as muon veto and active shielding for dark matter experiments (10'+5')

Thursday 21 Aug 2008 at 14:10 (00h15')

Many experiments looking for dark matter are aiming to get the ton scale in the future.

However, it is well known that scaling dark matter detectors to higher mass is not a sufficient condition for sensitivity and that an equally important condition is to simultaneously keep the background low, in particular the ultimate background, namely the fast neutron background induced by muons.

In this presentation we study the possibility of using the existing structure of a running experiment, the LVD supernova observatory at the INFN Gran Sasso National Laboratory, as an active shield and veto for the muon-induced background.

In our vision LVD could become (without affecting in any way its main purpose of SN neutrino telescope) a 'host' for a relatively compact but massive experiment looking for rare events.

The LVD experiment consists of a 1000 ton liquid scintillator detector with a highly modular structure, being made of 3 identical towers, each one composed by 35 active modules.

The empty volume that can be obtained removing 2 modules from the most internal part of the detector is 2.1m x 6.2m x 2.8m; we will call it "LVD core facility" (LVD-CF).

We have evaluated the active vetoing and shielding power of LVD, with a detailed MC simulation (based on Geant4) of the detector and the rock that surrounds it. We have generated cosmic muons with energy spectrum and angular distribution sampled accordingly to what is expected in the LNGS underground laboratory ($E \approx 270$ GeV). The number and energy spectrum of the muon-induced neutrons that enter the LVD-CF has been calculated.

The results show that the flux of neutrons that are not associated with a visible muon in LVD is very low; it results equivalent to the one present in a much

deeper underground laboratory, i.e. Sudbury.

Moreover we will present the results of on-going measurements about the gamma contamination inside the LVD-CF: the gamma ray intensity inside the LVD-CF is reduced by a factor greater than 10 with respect to the one measured outside the LVD detector.

Primary authors : Dr. SELVI, Marco (INFN - Bologna)

Co-authors :

Presenter : Dr. SELVI, Marco (INFN - Bologna)

Session classification : Background studies and detector ideas for direct detection (joint with ILIAS meeting)

Track classification : Parallel A: Background studies for direct detection

Type : Talk