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Monte Carlo simulation of the muon flux in DEAP-3600

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The DEAP experiment, set at SNOLAB, 2km underground (6.011 km.w.e.), is designed to search for Weakly Interacting Massive Particles (WIMPs), one of the most promising dark matter candidates. The experiment consists of a target of 3.3 tons of liquid Argon contained in an acrylic spherical vessel. The target is surrounded by a cylindric tank filled with ultra-pure water, which allows for the rejection of muons. In addition, the water tank can shield and discriminate neutrons from the environment that are created by the spallation of muons in the surrounding rocks. These are rejected thanks to the muon signals in the water.
The only measurement of the muon flux at SNOLAB was performed by the SNO experiment, down to 3.31e-10 mu/s/cmˆ2. The DEAP experiment is performing an independent measurement of the muon flux needed for the background evaluation of the upcoming dark matter searches.
A PyROOT-based Monte Carlo simulation was developed to evaluate the expected rate in the DEAP experiment starting from the Mei et Hime model, which describes the differential intensity of muons for underground experiments. The preliminary effective area of the DEAP muon veto is found to be A_eff = 63.5 +- 1.9m², which points to a rate of R_mu = 18.16 +0.59 -0.57 mu/day, assuming the SNO flux.

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