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A study of the effect of overburden on cosmogenic backgrounds in the Fermilab Short-Baseline Neutrino Program Far Detector (ICARUS)[1]

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— When a cosmic ray muon collides with the upper atmosphere, it creates a shower of particles that transverse down to the Earth's surface. These cosmogenic particles provide a challenging background in neutrino experiments. The ICARUS detector is a Liquid Argon Time Projection Chamber (LArTPC) that is the far detector in the Short Baseline Neutrino (SBN) program, a program that is dedicated to resolve the sterile neutrino anomaly. As the ICARUS detector will operate at shallow depth, it is exposed to a high flux of these particles that could fake a neutrino interaction. The ICARUS detector is employing two techniques to mitigate this cosmogenic exposure: installing a 3-meter thick concrete overburden and a Cosmic Ray Tagging (CRT) System that will surround the detector medium and tag incoming particles. Using simulated data, one can study the effect of these two methods on rejecting the cosmogenic events. The effect of the concrete overburden is explored through simulation, where I study the effect the overburden has on stopping particles before they reach the cryostat.

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