

Abstract Submitted
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Evaluation of cosmogenic production of chlorine-40 for an argon-based long baseline neutrino experiment¹ DONGMING MEI, D'ANN BARKER, CHAO ZHANG, University of South Dakota — We evaluate the cosmogenic production rates of chlorine-40 that are a potential source of background for an argon-based long baseline neutrino experiment at Sanford Underground Research Facility (SURF). Using the measured muon fluxes at different levels of the Homestake mine, we use GEANT4 to investigate the cosmogenic production of chlorine-40 by muons through the stopping muon capture and by the muon-induced neutrons via (n,p) reaction. We find that the simulated production rates agree closely with the analytic model prediction. The formalism is provided that describes the ratio of the stopping muons to through-going muons as a function of depth and as a function of the thickness of the detector. The production rate of chlorine-40 as a function of depth and the mass of detector will also be discussed. We conclude that the cosmogenic chlorine-40 produced inside the detector can result in large backgrounds for an argon-based long baseline neutrino experiment at a depth of less than 4000 mwe.

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