

Neutrino absorption in the Earth and measurement of the neutrino-nucleon cross-section at multi-TeV energies with IceCube

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At the IceCube Neutrino Observatory, atmospheric and astrophysical neutrino fluxes become attenuated after passing through the Earth at energies above 40 TeV. This provides a unique method to measure the neutrino-nucleon cross section at energies significantly beyond previous accelerator-based approaches that reach 400 GeV. Here we report on the first measurement of neutrino absorption in the Earth, using a sample 10,784 energetic upward-going neutrino-induced muons observed in one year of IceCube data. From a fit to the two-dimensional distribution of muon energy and zenith angle, we measure the cross-section to be $1.30^{+0.21-0.19}$ (stat.) $+0.39-0.43$ (syst.) times the Standard Model expectation in an energy range from 6.3 TeV to 980 TeV.

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