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Deuterium target data for precision neutrino-nucleus cross sections RICHARD HILL, TRIUMF, Perimeter Institute and U. Chicago, AARON MEYER, U. Chicago, MINERBA BETANCOURT, Fermilab, RICHARD GRAN, U. Minnesota, Duluth — Amplitudes derived from scattering data on elementary targets are basic inputs to neutrino-nucleus cross section predictions. A prominent example is the isovector axial nucleon form factor, $F_A(q^2)$, which controls charged current signal processes at accelerator-based neutrino oscillation experiments. Previous extractions of F_A from neutrino-deuteron scattering data rely on a dipole shape assumption that introduces an unquantified error. A new analysis of world data for neutrino-deuteron scattering is performed using a model-independent, and systematically improvable, representation of F_A. A complete error budget for the nucleon isovector axial radius leads to $r_A^2 = 0.46(22)\,\mathrm{fm}^2$, with a much larger uncertainty than determined in the original analyses. The quasielastic neutrino-neutron cross section is determined as $\sigma(\nu_\mu n \to \mu^- p)|_{E_\nu=1\,\mathrm{GeV}} = 10.1(0.9) \times 10^{-39}\mathrm{cm}^2$. The propagation of nucleon-level constraints and uncertainties to nuclear cross sections is illustrated using MINERvA data and the GENIE event generator. These techniques can be readily extended to other amplitudes and processes.

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