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Using Uncorrelated and Correlated χ^2 Fitting to Constrain Transfer Cross Sections[1] GARRETT KING, AMY LOVELL, FILOMENA NUNES, National Superconducting Cyclotron Laboratory and Department of Physics and Astronomy, Michigan State University, East Lansing, MI 48824, USA — Recently, theoretical uncertainties have begun to be explored in nuclear reaction theory. These uncertainties arise from a number of sectors, but in this work, we focus on parametric uncertainties in optical potentials. These are studied by fitting elastic scattering data then propagating the resulting uncertainties to predicted transfer cross sections. Optical model parameters were determined using a χ^2 minimization to find best fits to proton-, neutron-, and/or deuteron-target elastic scattering data. Regions of 95% confidence were then constructed around the minima of these fits. These potentials were subsequently used to predict 95% confidence regions for transfer cross sections using both the Adiabatic Wave Approximation (ADWA) and the Distorted Wave Born Approximation (DWBA). This procedure was compared to a correlated χ^2 fitting, intended to take into account angular correlations in these approximations. In total, we studied five reactions with target mass range $A = 48$ - 208 and energy range $E < 50$ MeV. Using the uncorrelated fitting procedure, ADWA had, on average, reduced uncertainties in the transfer cross section predictions when compared to DWBA. The correlated χ^2 function led to larger 95% confidence bands in the transfer predictions.

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