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Coupled-Channels Calculations of Nucleon-Induced Reaction Observables¹ GUSTAVO NOBRE, IAN THOMPSON, JUTTA ESCHER, FRANK DIETRICH, Lawrence Livermore National Laboratory — A microscopic calculation of the reaction cross-section for nucleon-nucleus scattering has been performed by explicitly coupling the elastic channel to all particle-hole excitation states in the target and to all one-nucleon pickup channels. These states may be regarded as *doorway states* through which the flux flows to more complicated configurations, and subsequently to long-lived compound nucleus resonances. Target excitations for $^{40,48}\text{Ca}$, ^{58}Ni , ^{90}Zr and ^{144}Sm were described in a QRPA framework. Reaction cross sections calculated in this approach were compared to predictions of a fitted optical potential and to experimental data, reaching very good agreement. Couplings between inelastic states were found to be negligible, while the couplings to pickup channels contribute significantly. For the first time observed reaction cross-sections are completely accounted for by explicit channel coupling, for incident energies between 10 and 40 MeV. Elastic angular distributions were also obtained and compared to experimental data and results from optical model. The accuracy of the description of the observed cross sections was found to be sensitive to the nucleon-nucleon effective interaction, serving as a direct assessment of the structure models used.

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