ELASTIC SCATTERING OF ^{9}Li AND ^{11}Li FROM ^{12}C AT 50 MeV PER NUCLEON

Abstract

by

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The elastic scattering of ^{9}Li + ^{12}C and ^{11}Li + ^{12}C has been measured with the S800 Spectrograph at Michigan State University at an energy of 50 MeV/A over the angular range of 2–15° in the center-of-mass frame. The energy resolution of the S800 provided the ability to separate true elastic from inelastic reaction channels, especially at forward angles. Dispersion-matched focusing was utilized to further improve the energy resolution. Ray-tracing techniques making use of measured field data were necessary to determine scattering angles.

A Monte Carlo code was developed to determine the acceptance of the spectrograph and to understand the interaction of the Li ions with the complex series of apertures, focusing elements, and fringe fields comprising the S800,. A successful technique for actively correcting gain shifts in the tracking detectors was developed. Techniques for correcting aberrations in the field maps used in the ray-tracing were explored with partially acceptable results.

An intrinsic energy resolution of < 1 MeV was obtained, which was negligible compared to straggling effects in the targets (2–6 MeV). An intrinsic angular resolution of 10 mr in the laboratory frame (1.1° c.m.) was achieved, limited both by uncertainties in ray tracing and poor performance of tracking detectors. The angular distributions obtained in this experiment appear to confirm prior ^{9}Li measurements.

The ^{11}Li results are also striking, as they show an absence of the near-side/far-side interference at forward angles as seen in prior measurements. This indicates a need for further refinement in the interaction models used to describe this exotic nucleus.