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Measuring Q-Values and Elastic Nuclear Scattering Cross Sections for Protons on Lithium Fluoride KASSIE MARBLE, JAMES FLORENCE, DANIEL MARBLE, Tarleton State University — Elastically scattered protons and nuclear reaction products have been measured for MeV energy protons incident upon thick Lithium Fluoride targets. Spectra for protons on lithium fluoride show three separate interaction mechanisms: Rutherford scattering, nuclear elastic scattering, and nuclear reactions. Modeling of the elastic scattering portion of the spectra with RUMP for protons incident upon lithium fluoride supports incident beam energy of 1.29 MeV but, the ratio of the lithium to fluorine yields from the elastic scattering portion of the spectra deviates from the Rutherford Z^2 dependence indicating the presence of elastic nuclear scattering. In addition to nuclear scattering effects, the spectra also showed multiple peaks with energies greater than the incident ion beam energy due to nuclear reactions. Using these high energy peaks, Q-values are obtained that are within 7% of accepted values for the ^{6}Li (p,^{3}He) ^{4}He reaction, the ^{7}Li (p,^{4}He) ^{4}He reaction, and the ^{19}F (p,^{4}He) ^{16}O nuclear reaction. A discussion of our experimental results will be presented along with our work to improve measurements of elastic nuclear scattering cross sections as a function of incident energy for protons on lithium by using special enriched ultra-thin lithium targets deposited on a thin-layer of gold on carbon combined with Rutherford scattering of helium on lithium.

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