TALENT Project Abstract

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My thesis project is analyzing 40 MeV ^{10}Be incident on ^{4}He. Currently, I have well separated angular correlations for elastic and inelastic scattering, and soon I will have cross sections for these reactions. Thus, I am interested in using FRESCO to model these cross sections. I have a three step plan for using FRESCO with my data for my TALENT project. First, I will try to produce a realistic optical model for the elastic scattering data in two ways. One way is to use a SPP for the real potential and a phenomenological potential, such as ^{12}C on ^{4}He, for the absorptive term. The second way would be to use a phenomenological potential for both real and imaginary terms. Once I am satisfied with how well the FRESCO elastic cross section reproduces my elastic data, I will move on to the second step, which is to perform a DWBA calculation with collective form factors. By considering the inelastic data of the 2^+ first excited state, I will consider a simple coupling potential that depends on the derivative of the potential I found in step one and a deformation parameter $\delta_2 = \beta_2 R$. Another, more involved option is to use a transition density to produce a microscopic potential. The final step is to perform a full CC calculation where I will refit the elastic as well as readjust the δ_2 as necessary to fit the data. By comparing the CC and DWBA, I will see how strongly, or weakly, coupled the 2^+ excited state is to the 0^+ ground state. As an extra step, I could eventually add higher excited states about 2^+ to see their effect as well. I believe this three step project outline is very relevant to my research and yet simple enough where I can perform the calculations myself. Since very little data exists on inelastic scattering of ^{10}Be, this work should have relevance to the field as well. A relevant paper that discusses CC calculations for channels of ^{10}Be and ^{4}He in ^{14}C is Y Sakuragi *et al* 2008 J. Phys.: Conf. Ser. **111** 012019. With the help of Antonio, I should be able to produce results shortly after I have my experimental cross sections.