International Nuclear Physics Conference INPC2013: 2-7 June 2013, Firenze, Italy

Non-locality in the adiabatic model of (d,p) reactions

N.K. Timofeyuk[1], R.C. Johnson[1]

[1] *Department of Physics, University of Surrey, Guildford GU2 7XH, United Kingdom*

Contact email: *N.Timofeyuk@surrey.ac.uk*

It is long known that the experimental cross sections of (d,p) reactions are best reproduced by theoretical calculations if deuteron breakup is accounted for. Such calculations, performed usually in the adiabatic model, use local neutron and proton optical potentials taken at half the deuteron energy in order to calculate the distortion in the incident channel. However, it is also known that nucleon optical potentials are non-local due to the complex nature of the target. What has been an open question until now is how the adiabatic model should be modified to include these non-localities. We propose a model in which all the complexity of the continuum n + p + A effects and the non-localities in the p-A and n-A interactions is reduced to a simple two-body equation with an effective deuteron potential which is easy to construct. Such a potential can be read in by existing transfer reaction codes thus giving our approach the opportunity to being widely used. We demonstrate that in our new approach the effective deuteron potential is reduced with respect to the traditional adiabatic potential and quantify the influence of this effect on (d,p) cross sections.