

Breakup and transfer reactions with radioactive beams for nuclear astrophysics

L. Trache

Cyclotron Institute, Texas A& M University, College Station, Texas 77843

I will discuss the use of one-nucleon breakup reactions at intermediate energies and of one-nucleon transfer reactions with radioactive beams as indirect methods in nuclear astrophysics [1,2,3]. These reactions that can give spectroscopic information about the single particle structure of the loosely bound nuclei, each with its own advantages. Both types are peripheral processes from which we can extract spectroscopic factors or, more precisely, asymptotic normalization coefficients (ANC) from which reaction rates of astrophysical interest can be determined.

Examples of use of proton and neutron breakup data at intermediate energies (^8B , ^9C , ^{15}C , ^{23}Al) to obtain proton and neutron radiative capture cross sections for nuclear astrophysics will be reviewed. Results from one-proton transfer reactions with radioactive beams at TAMU will be briefly shown, with emphasis on a newer one with ^{12}N beam.

Comparison with other methods to obtain spectroscopic information useful for nuclear astrophysics, like the investigation of mirror nuclei or beta-decay studies, will be made using ^8Li and ^{23}Al as examples .

Work was done with colleagues from the MARS group at the Cyclotron Institute, Texas A&M University, and from NIPNE Bucharest, Romania.

References

- [1] L. Trache, F. Carstoiu, C. A Gagliardi, R. E. Tribble, Phys. Rev. Lett. **87**, 271102 (2001); Phys. Rev. C **69**, 032802(R) (2004).
- [2] L. Trache, F. Carstoiu, A. M. Mukhamedzhanov and R. E. Tribble, EuroPhys. J. A direct (2006). DOI: 101140/epja/i2006-08-037-2.
- [3] See for example A. Azhari et al., Phys. Rev. C 63, 055803 (2001) and references therein.