

Neutron Time of Flight Detector Array at Pelletron-Linac Facility at Mumbai

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One of the important channels in the study the nuclear reactions is the neutron decay channel. However, due to the poor detection efficiency and complexities associated with neutron detection, the measurements are more difficult.

One area where neutron measurements are very important is reactions involving neutron rich Radioactive Ion Beams (RIBs) of nuclei close to the neutron drip lines. As the radioactive ion beam current delivered on target is several orders of magnitude smaller than that for stable beams the detector systems in these setups need to be very efficient. These requirements led to the development of efficient large area neutron detector arrays in various laboratories all over the world.

In this talk I will discuss the characterization and use of a 1m² plastic detector array [1] for neutron time-of-flight measurements using stable heavy ion beams at the Mumbai Pelletron Linac Facility. I will show preliminary results from two experiments: gamma-ray multiplicity gated neutron spectra in the ¹²C+⁹³Nb reaction [2] at E(¹²C)=40 MeV and neutron spectra in coincidence with alpha particles in the ⁷Li+²⁰⁵Tl reaction [3] at E(⁷Li)=30 MeV.

I will also present the different setups we have developed at PLF, Mumbai to study nuclear reactions involving measurements of the neutrons, high energy gamma-rays [4] and charged particles [5] in coincidence with the gamma-rays detected in a BGO γ -multiplicity setup [6], and/or residues detected in a parallel plate avalanche counter placed in a very forward direction [7].

References

- [1] P. C. Rout et al., Nucl. Instr. Meth. A **598** (2008) 526.
- [2] P. C. Rout et al., DAE-BRNS Symp. on Nuclear Physics (Dec. 2007), Sambalpur University, Vol. **52** (2007) 325.
- [3] P. C. Rout et al., see contribution to this symposium.
- [4] D.R. Chakrabarty et al., Phys. Rev. C **77**, (2008) 051302(R); DAE-BRNS Symp. on Nuclear Physics (Dec. 2008), IIT (Roorkee), Vol. **53** (2008) 219.
- [5] A. Mitra et al., Nucl. Phys. A **765** (2006) 277; E.T. Mirgule et al., Pramana **67** (2006) 369.
- [6] V. Nanal et al., DAE-BRNS Symp. on Nucl. Phys., Mumbai, Vol. **46B** (2003) 472.
- [7] Suresh Kumar et al., DAE-BRNS Symp. on Nuclear Physics 2008, Roorkee, Vol. **53** (2008) 691.