An Ion Beam Tracking System based on a Parallel Plate Avalanche Counter

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Until recently most of our current understanding in nuclear collisions has come from reactions of stable targets and beams. Stable nuclei represent only a small fraction of the total nuclei that can exist, but do not exhibit many of the exotic proprieties seen in nuclei far from stability, such as neutron or proton halos [1]. The short lifetime of these isotopes makes most of them unsuitable as targets, but even short lived isotopes can be used as beams, known as radioactive isotope beams (RIBs) [2]. The reactions dynamics group at the Australian National University (ANU) have been working on achieving an Australian RIB capability [3].

The 6.5 T superconducting solenoidal RIB separator SOLEROO (solenoidal exotic rare isotope separator), recently developed at the ANU [3] can achieve RIB purities of about 60% [4]. This single solenoid separator does not have the separating power of the TwinSol and RIBRAS two-solenoid facilities [5, 6]. However, the SOLEROO separator uses a pair of position sensitive proportional avalanche counters (PPACs) as tracking detectors operated with C3 F8 gas [7]. These tracking detectors will electronically tag each secondary beam ion passing through the tracking detectors, before hitting the secondary target, allowing reconstruction of ion trajectories and the electronic removal of contaminant species. This will allow the practical use of RIBs with physical purities as low as 10%. Combined with an large solid angle Si detector system, the system permits the measurement of cross sections of interest in nuclear reactions of short lived radioactive light nuclei. A brief outline of this facility, and the performance of these PPAC gas detectors will be presented.

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