# COMMISSIONING OF THE SILICON DETECTOR ARRAY (SIDAR)

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The SIlicon Detector Array (SIDAR) has been installed at the target position of the Daresbury Recoil Separator (DRS) for detection of charged particles from reactions of astrophysical importance with radioactive ion beams. The SIDAR is an annular array of single-sided silicon strip detectors similar to the LEDA array.[8] It is comprised of 128 segments with 16 radial (from 5 to 13 cm) and 8 azimuthal divisions. The array has the advantages of large solid angle coverage (subtends lab angles from 25° to 51°), excellent energy resolution, and high segmentation. The high segmentation allows for higher counting rates without pileup and extraction of angular distribution information. The signal processing is performed with a high-density preamplifier & amplifier electronics system produced by an Edinburgh University-RAL collaboration.[9] The analog to digital conversion is done with Lecroy 3351 peak sensing ADCs. The energy resolution of this system has been measured with a $^{241}$Am source and found to be 30 keV. An additional system of preamplifiers from Brookhaven National Lab are also being used.

The SIDAR has been tested with a measurement of the $^{1}$H($^{17}$O,p)$^{17}$O excitation function. An $^{17}$O beam was used to bombard a 50 $\mu$g/cm$^2$ polypropylene $(CH_2)_n$ target, and proton yields were measured for 19 beam energies between 9 and 13.5 MeV. A fit to this excitation function gave resonance parameters for two well-known states in $^{18}$F, in agreement with their accepted values. After the outstanding performance in this commissioning test, the SIDAR was then used for the successful $^{1}$H($^{17}$F,p)$^{17}$F experiment.

A reconfiguration of the SIDAR is required for measurement of the $^{1}$H($^{17}$F,$\alpha$)$^{14}$O cross section. In this case a thin (100 $\mu$m) layer of 128 strips will be placed in front of a thicker (500 $\mu$m) layer. This stacked configuration will detect the recoil alpha ions and provide $\Delta$E-E information for particle identification. A 'mini' annular array of 64 strips is placed behind the first two. It covers smaller angles ($3.2^\circ \leq \theta_{lab} \leq 6.5^\circ$) and detects the heavy recoil $^{14}$O ions in coincidence with the alpha particles. This arrangement has been tested with a $^{1}$H($^{17}$O,$\alpha$)$^{14}$N measurement and was found to work extremely well. With the stacked array, we were able to easily identify the alpha recoils as well as scattered protons, $^{17}$O ions, and $^{12}$C ions which were

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[8]R. Coszach *et al., Phys. Lett. B* 353, 184 (1995).
[9]S. L. Thomas *et al., Nucl. Inst. Meth. A* 288, 212 (1990).

knocked out of the target. Additionally, we were able to preferentially pick out the $^{14}N$ recoils from the mini detector singles spectrum by gating on alpha particles in the stacked array.