An update to the dual-axis dual-lateral upgrade to the FAUST detector array

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In the last several years advances in silicon strip technology and continuous position sensitive detectors have allowed for more precise measurement of the emission angle of fragments from heavy-ion reactions. By achieving a greater understanding of the emission pattern of fragments from heavy-ion collisions, it is possible that the different modes of disassembly of excited nuclei can be differentiated [1]. Because of the success of FAUST due to its reconstruction capabilities it is a prime candidate for a move towards greater position sensitivity to allow for a greater understanding of multifragmentation processes.

We have continued work with the dual-axis dual-lateral position sensitive detector (DADL PSD) design in conjunction with Micron Semiconductor [2]. A second prototype was delivered with a resistivity of 3.5 kΩ on the front surface and 1.71 kΩ on the back surface of the detector. It was chosen to allow the resistivity of each side to be more equal and lower than the first prototype (with a front resistivity of 6.8 kΩ and a back resistivity of 22 kΩ) because it is believed that the higher resistivity back side gives an uneven implantation depth since the time of implantation is extremely small. An uneven implantation depth can describe the behavior that was observed with the first prototype of an increasing leakage current with increasing bias with independent fluctuations with the leakage current regardless of applied conditions.

In testing the second-prototype of the DADL PSD we have determined that there is a design flaw in the masking process during the manufacture of the detectors. This is observed during prolonged testing of the detectors as observed in Figure 1. Figure 1 shows the reconstructed energy off of the back side of the detector. We clearly see an energy spectrum that is expected from a normal silicon detector if it is being hit by particles of all energies. On top of this spectrum we can see a ^{228}Th source spectrum. This indicates that there is charge leakage occurring. In conjunction with this, when the back guard ring is monitored, it is observed that the back guard ring leakage current increases with increasing the bias on the detector itself. This behavior is seen whether the detector is biased from the front or the back side. The design of the detector allows for the surface and the guard ring to be isolated from each other and this clearly is not the case. It is believed that the back guard ring and the back surface of

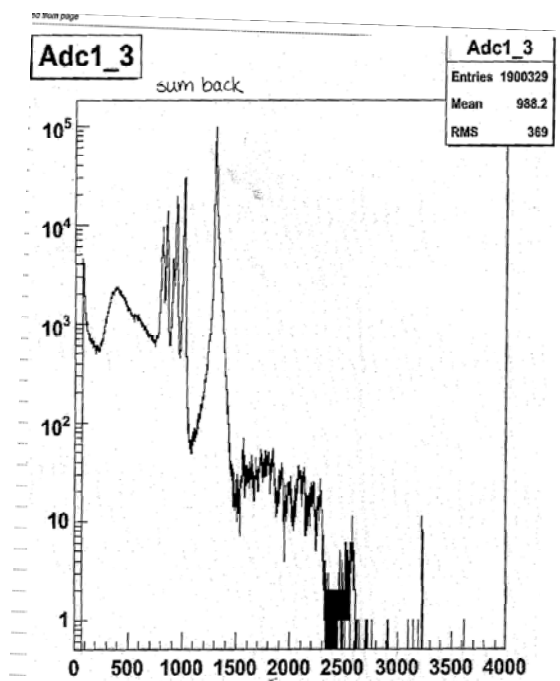

Figure 1. Summed energy spectra from the back surface

the detector are joined in some fashion that allows for some type of random charge to be detected in conjunction with a signal. Micron Semiconductor has delivered a third prototype that addresses this issue and further testing will begin shortly.

[1] R. J. Charity *et al.*, Phys. Rev. C **46**, 1951 (1992).
[2] S. N. Soisson *et al.*, *Progress in Research*, Cyclotron Institute, Texas A&M University (2005-2006), p. II-23