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Development of new in-house detector facility at the University of the Western Cape

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The Physics academic community in South Africa is historically small with an increasing number of postgraduate students taking Masters and PhD. The University of the Western Cape (UWC) consist diverse student bodies, mainly supporting students from historically disadvantaged backgrounds in South Africa [1]. The nuclear physics group at UWC has research interests in nuclear physics which carries out research centered on the iThemba LABS facility in the Western Cape. The laboratory is well-resourced but the experimental apparatus at the laboratory is largely bought in commercially and comprises expensive items such as high-purity germanium detectors. The upcoming in-house detector facility aims at developing a strand of nuclear applications work at UWC and UniZulu in partnership with University of York (UoY), UK. UoK group lead by Prof. David Jenkins has its history in designing and building detectors with supporting instrumentation for the industry as well as leading research institutes. Transferring the knowledge from UoY on detector development will help to up-skill the young people. A team at UWC is working on developing a laboratory-based facility to facilitate detector development in their home institutions. The specific detector development activities have been devised in close consultation and are based on the existing strengths at UoY as well as interests of the SA team and the industrial connections in SA.

So far so, detectors such as NaI(Tl), have been tested using the conventional analog signal processing methodology. However in order to process the signals using the digital signal processing is underway to get the good timing information. Standardization of the digital parameter will help to get insight into the analog and digital pulse shape analysis. XIA's PIXIE-16 module has been employed for digital signal processing. Data acquisition (DAQ) has been developed to record the signal information. These detectors with the supporting electronics will be employed for the Coulomb excitation experiments at national and international laboratories. We also intend to develop an array of CsI(Tl) as well as gas detectors for such studies.

In future we plan to fabricate PET scanners using the plastic scintillator material interfaced to the fiber optical cables. To obtain the best timing resolution for tumor detection the DAQ modification is in process where we intend to detect the coincidence gamma-rays.

[1] http://nuclear.uwc.ac.za/

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