

Upgrade of the ^{37}K asymmetry measurement experiment

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It was reported last year that our efforts to upgrade the TRINAT apparatus had moved into the construction stage. Many of the critical components needed for the experiment have now been designed and fabricated and are currently being assembled in preparation for a short trial run of the experiment scheduled at TRIUMF in the fall of 2011. The purpose of this test run is to ensure that the new detector systems and acquisition software are all working as expected and to give us an idea of any unforeseen sources of systematic uncertainty that could be corrected or at least accounted for in the production run that will be scheduled early next year after the TRIUMF shutdown if all of the systems behave reasonably well in fall test run.

The main vacuum chamber is in the final stages of construction at the TRIUMF machine shop and will be completed and installed by the end of August. The completion and installation is a prerequisite for any changes required to the complicated optical setup. The reorganization of the optics should be very minimal and is not expected to take more than one week. These two tasks will be carried out by our collaborators in Vancouver. The main contribution from Texas A&M to the experimental upgrade is the construction and commissioning of two (identical) new beta telescopes that consist of a 40x40mm Micron BB1 silicon strip detector backed by large plastic BC408 scintillator; the telescopes will be encased within a re-entrant flange with a thin beryllium window on the front to allow the betas into the detectors while preserving the large pressure differential.

We have received the silicon strip detectors from Micron as well as the specially-designed preamps built at TRIUMF. We are currently in the process of building and testing an electronics setup to power the detectors and preamps and record the output using a CAEN V1740 digitizer. In order to facilitate testing we have built a test vacuum chamber here at the Cyclotron Institute with a precision source mount and collimator that will allow us to characterize the strip detector behavior with respect to the orientation of the incoming betas.

The plastic scintillators were built at the TRIUMF scintillator shop and have been tested in conjunction with their PMTs and lightguides. We performed tests to find the best wrappings for the light guides to maximize light collection and performed tests to find the ideal length of light guide to use in our experimental setup that would allow us room to include magnetic shielding around our PMTs. These tests allowed us to settle on the final design that will be used for the fall test run.

In the next few months we will be putting the strip detectors and scintillators together into the telescope assembly and write the software necessary to handle the pulses coming from the different detectors and devise a triggering scheme that will veto background events giving us the best results for the asymmetry experiment.