

Report of Summer Student Work

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Introduction

I completed the projects discussed in this report between May 1 and August 29, 2003. They will be outlined in chronological order, with references to outside documentation that was created specifically for the project in question.

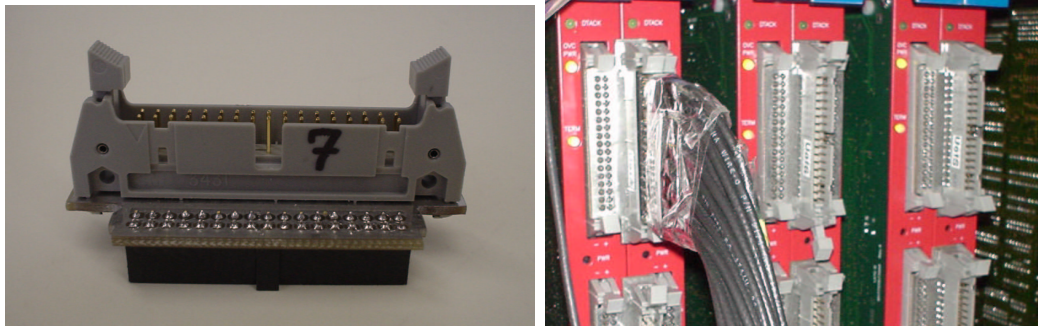
1 Oxygen Compton Scattering Analysis

This project involved the analysis of the nuclear Compton scattering cross sections from Saskatchewan Accelerator Laboratory (SAL) experiment 056. The electric and magnetic polarizabilities of the bound nucleons in an oxygen nucleus were extracted from the differential scattering cross sections, using a similar technique to the previous analysis on carbon nuclei. See Ref [Robb1] for details.

2 Splitters

This project involved passive analog splitters that were designed for use with CAEN 792AA VME QDC (See Ref [Igarashi] for details). The splitters will be used to equally split an incoming analog signal into two identical copies. The signals can then be measured using different gate lengths, providing pulse shape discrimination for neutron detection in scintillation counters.

Figure 1: Splitters



I constructed the splitters from bulk components (surface mount resistors, latched headers, and socket connectors) and special pre-printed circuit boards. Each step in the building process is described in Ref [RobbIgarashi].

The splitters were tested by Ward Wurtz and I, in conjunction with the specialized RG174 cable assemblies discussed in Ref [WurtzIgarashi]. Because these two components were designed primarily for combined use, it is the most meaningful (and feasible) to test them together. The testing was designed to examine cross-talk and attenuation in the cables and the splitters. The testing process can be found in Ref [RobbWurtz].

3 Radiation Dosage at HIGS

I designed and completed a study using computer simulations in GEANT 3 to examine radiation dosages received in the experimental counting area that exists in the HIGS (High Intensity Gamma Source) facility at the Duke University Free Electron Laboratory in Durham, North Carolina. HIGS is the facility where researchers and students from the University of Saskatchewan collaborate with other universities' staff and students on experiments involving the Blowfish neutron detector array. The study was initiated to determine whether those involved in the experiments are receiving/will receive unsafe dosages of ionizing radiation. The results and analysis of the simulations can be found in Ref [Robb2].

4 Detector Upgrades

Twenty-four of the eighty-eight detectors in the Blowfish neutron detector array were upgraded by Brian Bewer, Ward Wurtz and myself, during a trip to Duke University between July 28, 2003 and August 4, 2003. The upgrades included the replacement of photomultiplier tubes, the replacement of plastic detector housings, and the addition of components for a future gain monitoring system in the array. The details of these upgrades can be found in Ref [BRW].

Figure 2: Students Working on Upgrades



References

- [BRW] B. Bewer, J. Robb, & W. Wurtz. *Detector Upgrades Manual*. Internal Report SPIR-114, 2003.
- [Igarashi] R. Igarashi. *Design Considerations for Cable Adapters for CAEN V792AA QDC in the Blowfish Electronics*. Internal Report SPIR-109, 2003.
- [RobbIgarashi] J. Robb & R. Igarashi. *U of S Passive Analog Splitters for use with CAEN 792AA VME QDC*. Internal Report SPIR-111, 2003.
- [RobbWurtz] J. Robb & W. Wurtz. *Cross-talk and Attenuation Tests for Cables and Splitters used with CAEN 792AA VME QDC*. Internal Report SPIR-112, 2003.
- [Robb1] J. Robb. *Analysis of Oxygen Cross-Section Data*. Internal Report, 2003.
- [Robb2] J. Robb. *Radiation Issues for the Experimental Area at HIGS*. Internal Report, 2003.
- [WurtzIgarashi] W. Wurtz & R. Igarashi. *U of S RG174 Cable Assembly for CAEN 792AA QDC*. Internal Report SPIR-110, 2003.