Status of the Melbourne Experimental Particle Physics DAQ, silicon hodoscope and readout systems

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Introduction

This talk will present a brief review of the current status of the Melbourne Experimental Particle Physics group's primary data acquisition system (DAQ), the associated silicon hodoscope and trigger systems, and of the tests currently underway and foreseen. Simulations of the propagation of 106-Ru β particles through the system will also be shown.

The facility

The primary EPP DAQ consists of a Macintosh IIcf connected via VICbus (MAC7212) to a VME crate (VIC8251/F) and a CAMAC crate (VCC2117). The Macintosh runs LabVIEW 3.1 with several library sets from CERN, CES and in-house development. The VME crate contains a dataway display (VDIS8004), a 10 MHz, 12 bit ADC (Pentek 4261A), and an RD2 detector readout module (DHARP-32 Channels). The CAMAC crate contains several silicon readout modules (SIROCCO), a LeCroy TDC and several LeCroy ADCs. Associated NIM crates contain high and low voltage supplies, specialised timing units, and logic modules associated with trigger formation and distribution. The Macintosh is also provided with an IEEE-488 (GPIB) interface for control and readout of GPIB instruments, including a precision delay generator and a 1 GHz digital oscilloscope.

Detector hardware controlled and read from this DAQ includes several radioactive sources emitting β particles, a trigger system, a silicon hodoscope, and a number of devices under test (DUT). The trigger system includes two crossed scintillation counters of active area 50 x 50 mm and 3 mm and 6 mm thickness respectively, connected to fast photomultiplier tubes. These tubes are in turn connected to NIM output discriminators and a coincidence unit to generate a global trigger. The trigger signal is connected to the TDC (where it raises a LAM signal which in turns causes the Macintosh to start the readout cycle), and to the various hodoscope and DUT control and readout modules.

The silicon hodoscope consists of two pairs of crossed planes of 50 μm pitch silicon detectors each providing approximately 12 μm precision space points. The silicon detectors are connected to Viking readout chips, the multiplexed output signals from which are converted to hit data by the SIROCCO units. The detector devices under

test are controlled by their special purpose modules and read into the appropriate VME or CAMAC ADCs as required.

Currently all of these elements are operating under individual programs. An active integration program should permit commencement of serious test within the next few weeks. Test runs will thereafter be similar to beam tests in that the DAQ will control modules, readout detectors and assemble data packets for offline storage and analysis.

Tests underway and foreseen

Current tests are continuations of the work carried out at the CERN H8 test beam during 1995. Our primary interest is in the characterisation of the Digital (ADAM) family of readout chips in the form of the DHARP front-end, analogue memory and multiplexor. Modules populated with two versions of DHARP and with irradiated and non-irradiated silicon and GaAs detectors are being tested. DHARP modules with provision for the CAFE-A Bipolar front-end chip are of immediate concern. A program of single channel work on irradiated detectors will use the same facility.

Simulation work on the attenuation, energy loss and multiple scattering of β particles through the system is also progressing. This will allow improved understanding and calibration of the results obtained.

Outside the active DAQ system, the passive device characterisation facilities are being integrated through a system of network protocols and UNIX shell scripts allowing greatly improved data magagement and analysis.

Future developments

The EPP DAQ succussfully implements the requirements of bench testing detectors and readout systems. An important current deficiency is the ability to develop readout codes suitable for direct translation to the control and readout systems used at the accelerator laboratories where detector systems undergo beam tests. I regard it as vital that our DAQ be augmented with this option, preferably through the acquisition of a processor, connected directly or via an interface to the VME backplane, running a UNIX-like operating system with a C VME access library.