Data Acquisition Systems

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Overview

During 1997, the Data Acquisition group continued to maintain the standard VMS VDACS/μSR data acquisition systems and the special RMC data acquisition system while the new MIDAS system became operational on CHAOS and TRINAT DAQ systems.

MIDAS software

In the first half of the year, the Midas data acquisition system was heavily tested on a variety of different computer platforms as well as used in small test labs. Based on this work, a list of improvements was established. In order to address them, Dr. Stefan Ritt, main author of MIDAS, was invited to spend some time at Triumf. The collaborative work was very fruitful, almost all of the desired improvements were implemented which gave birth to a first release and distribution of the Midas package. The improvements included in particular: a security option, front-end ring buffer, front-end interrupt handling and transfer speed increase.

Besides these main tasks, several aspects of the package were revisited in order to simplify its use like: package installation, monitoring tools and user code interface. Midas is currently distributed under version 1.03. The CHAOS group used Midas for their entire beam time without problem and several user specific applications were developed. Goals established last year regarding Midas operation under other operating systems have been reached i.e.: VMS and MS-DOS Midas front-ends, Midas + PAW under NT and Linux and stand-alone data acquisition with CAMAC under NT have been installed and successfully tested. Complete Midas documentation is currently under construction. Other projects have been carried out such as: a CAMAC driver for Linux systems using the DSP004, Kinetics 2926 and 2927 CAMAC PC interfaces, DMA studies under VxWorks, and Tcl/Tk run control application.

NOVA software

Various minor but significant improvements to the NOVA analysis system have been implemented during the past 12 months. The X-windows display package continues to evolve - color displays are now implemented for 2D histograms, which are particularly useful for TRINAT experiments. The hard copy printer drivers have been upgraded to directly support Postscript and data compression (resulting in a substantial decrease in the time required to generate a hard copy of a plot). In addition, a preliminary version of a TCL interface for NOVA has been implemented. An ASCII File input event driver has been implemented, allowing Monte Carlo generated data to be analyzed using NOVA.

All NOVA-based experiments at TRIUMF are now using Version 2.0 of the program. Because of various incompatibilities in (and rapid evolution of) the MIDAS system, the Parity experiment had been the single experiment which was still using the old version of NOVA. MIDAS has now stabilized to the point where it was possible to upgrade all of the Parity software to the latest version of NOVA.

μSR systems

A new 8 channels VME-based TDC V680 with a maximum resolution of 49 picoseconds and a jitter less than 200 ps plus timer base jitter was purchased from BIRA/Highland. Concerted efforts of μSR experts and DAS personnel made it possible to test successfully a prototype system on M20 last fall. The timing histograms are built in the memory of our standard MVME023 CPU running VxWorks. The CPU also controls the TDC. This type of TDC will replace the old Lecroy 4204 TDC's and CES HM21612 histogramming memories. Lecroy no longer produces or services this type of TDC. The intention is to equip M15, M20 and M9B with such TDC's in the coming year.

Since front ends of M15 and M20 had been moved last year to VME based CPU's connected via Ethernet, it became possible to use non-QBUS VMS machines as host. M15DAC and M20DAC were upgraded from VAX 3520s to 3100/76 Vax stations to double the CPU power. The change was relatively simple due to the similarity of the hardware. The 3520s were then available to upgrade M9BDAC and M13DAC from 3100s. This was done, but turned out to be very time consuming.

A driver for a new instrument (Lakeshore 450 Gaussmeter) was written and used by μSR, as were minor additions to an existing driver (for Group3 Digital Teslameter).

Support for FASTBUS

The software support for reading out Fastbus TDC1877 modules for E614 was completed and tested for the first time during the prototype chambers beam tests in August. The readout system used a Struck SFI Fastbus card with a MVME-162 CPU running VxWorks and Midas as the DAQ software.

Support for SNO

The TRIUMF DAQ group has provided considerable assistance to the SNO DAQ effort in preparation for turn on of the experiment. During the summer and fall of 1997, Peter Green implemented an Ethernet driver to connect a VME-based embedded CPU (located underground) to the main DAQ computer on

the surface. In addition, he provided considerable assistance in implementing and debugging the main Event Switchyard (dispatcher) which is responsible for distribution of raw event information to a homogeneous collection of analysis computers (Sun, DEC Alpha and Macintosh) which are primarily responsible for real-time analysis and monitoring of the SNO data stream. Both of these pieces of software have been implemented and demonstrated to operate reliably.

Custom Hardware

Andrew Daviel worked on the design and specification of a system to improve the signal/noise of UTC data for the Rare Kaon Decay experiment E787 at BNL. The system consists of a number of complex programmable logic elements implemented in Altera FPGA's and designed to interface with commercial Fastbus TDC units.