Real Photon Collaboration Experiment Control and Data Acquisition Plans

Build on existing ESA Experiment Control and Data Acquisition System.

- PC running LABview for control of the Goniometer, target, and other movable elements.
- Solaris/Linux workstations for running HV control, LV monitoring, Magnet Control/Monitoring, and overall Experiment Control program.
- Distributed VME based Real Time Data Acquisition System for readout of detector data with local data staging and logging to SCS via a Solaris workstation.

All components communicate using a common ESA TCP based message structure to coordinate activities and combine environment data (target position, goniometer position, HV, magnets, etc.) with realtime data in the data stream.

The Real Time DAQ system is distributed between VME systems located close to data sources. A-line and ESA Alcove Beam monitoring/control data – "beam data" – collected by a VME system located in the ESA Counting House, and ESA floor and Beam Dump data – main "experiment data" – collected in a VME system located in a hut positioned near the main detector elements. This "experiment data" VME system is currently located in B420 just outside ESA, but is easily moved into a hut located near the proposed location of the E160 hodoscopes. This system would be moved as appropriate for E159 and E161. All VME systems are connected via fiber optic connected "reflective memory" boards. Event data is stored in buffers in these memory boards and extracted from the reflective memory by a different data logging computer located in the Counting House.

This system has been used successfully for many years in the ESA physics program. The current system has a maximum data throughput of approximately 750 Kbytes/sec (about 6000 bytes of data per event). This limit is largely due to the CAMAC based TDC system used by past experiments (CAMAC readout into the VME system being the bottleneck).

For the Real Photon Collaboration experiments, the VME DAQ system will be upgraded with faster CPUs and VME based TDCs to eliminate the CAMAC/VME bottleneck. Expect the new system to have a maximum data throughput to the local data staging of a few megabytes per second. The network connection between ESA and SCS also be upgraded to ensure that the logging of data to SCS based long term storage does not limit data rates. The current plan is to install a dedicated gigabit network connection and log experiment data to raid disk arrays.

RPC Technical Note #9 describes the expected data sources for the photon beamline monitoring and E160.

- Beamline Monitoring: ~250 channels of charge integrating ADC, one Toroid readout (using existing toroid electronics/ADC as in E158).
- E160: 1000 channels of TDC, 1000 channels of discriminator.
- Compton Polarimeter: 100 channels of charge integrating ADC, 300 channels of TDC, 100 channels of linear fanout, 300 channels of discriminators.

ESA electronics pool should have enough fanouts and discriminators for E160, spares/replacements can be purchased from CAEN.

TDCs will be upgraded CAEN V767 with 100 psec resolution, no deadtime 128 channels/unit.
ADCs will be CAEN V792 12bit 32 channels/unit.