

emiT electronics/DAQ Update

February 7, 2002

The revised readout electronics

- replaces the 4 LeCroy 2228 TDCs (CAMAC) by a single, 32 channel CAEN V775 TDC (VME)
- replaces the 4 LeCroy 2249W ADCs (CAMAC) by a single, 32 channel CAEN V862 ADC (VME)
- replaces the Phillips 7186 Slow TDC (CAMAC) with a 2 channel latchable clock
- replaces the KS 3655 timing generators with the latchable clock module/1151N scalars
- replaces the MVME147 with a MVME 167 (allows single 32 bit reads)
- combines all VME hardware into a single VME crate
- eliminates the CAMAC to VME modules, VME to VME crate modules, and the CAMAC crate completely

Basic Operation

The system is significantly simpler, faster, and should allow us to actually simultaneously acquire singles data from the beta and proton detectors as well as coincidence data.

The basic idea is that when an event occurs in a beta or proton detector, a 100 MHz, 32 bit counter (there are two, one for the beta and one for proton detectors) will be latched that will tell us the time of the event (to within 10 ns). Beta and proton events will then be readout out in event mode and will be “tagged” with the 100 MHz clock. This tag will allow us to correlate beta and proton events, and hence replaces the slow TDC used in the earlier run. We will record raw events, but will also do building on-line so that one will have good diagnostics available.

the TDC and ADC modules take 6 μ s to digitize all 32 channels, so typical readout deadtime should be on the order of 7-8 μ s. These modules also have the feature of automatic suppression of zero channels, so typical readout size of a beta event will be ten 32 bit words (and max size would be 70 words). Typical proton event size will be three 32 bit words. We should be able to use the clock module to accurately track the livetime. The TDC and ADC modules have internal event counters, so that we will have a redundant check livetime.

The basic readout algorithm will be as follows

```
monitor loop {  
    check for beta event  
        on beta event go to beta readout  
    check for proton event  
        on proton event go to proton readout  
    return  
}
```

```
beta readout {  
    read beta 100 MHz clock register  
    read beta TDC  
    read beta ADC
```

```
    issue beta global clear  
    return to monitor loop  
}  
  
proton readout {  
    read proton 100 MHz clock register  
    read proton ADCs  
    issue proton global clear  
    return to monitor loop  
}
```

We will likely be a bit more sophisticated, and test for proton readout while in the beta readout routine, in order to maximize livetime.

Status

We expect to have the beta readout working by next Monday (we are missing the V862, the integrating ADC, so we are temporarily using a V265 module. Note from a VME register standpoint, the V862 module is nearly identical to the V775.). We will then proceed with the general eCPU readout program.

Mark is making good progress on adding diagnostics for the proton detectors.