Data Acquisition and Electronics

January 24, 2000

– Typeset by FoilTEX –

Issues

- "Buffered Mode" for Data Acquisition to keep computer deadtime low
- "Open Trigger": Readout of neutron detector whenever the HMS sees an electron
- Oversampling of Scaler reads
- Omit the huge rate that results from a master OR of all neutron bars
- Control of electronics deadtime
- Impact on Hall C standard equipment

Event Rate, Open Trigger and Buffered Mode

- GeN98 was measured in unbuffered mode
  - Event rate (q^2=0.5, 100 nA): 400 Hz with HMS singles prescaled by 6 $\longrightarrow$ dead time: 13%
- GeN01 will be measured in buffered mode (<12% dead time for 1kHz event rate)
  - HMS Singles (q^2=0.5, 100 nA): 900 Hz
  - HMS Singles (q^2=1, 100 nA): 400 Hz
  - No prescaling of HMS singles necessary
  - "Open Trigger" possible
- The last two experiments in 1999 (E97-006 and E91-016) were run in buffered mode and showed few synchronization problems.
- There exists code for the analyzer which filters periods of sync problems out of the data

Scaler Readout and Synchronization

- For polarized running: Sync points and scaler reads during helicity change (blank period)
- New Trigger Supervisor with external "scheduled trigger" input capabilities:
  - "Scheduled Trigger" always accepted
  - Can be programmed as sync point
  - Ideal for triggering the scaler readout during helicity change
- Oversampling of Scaler reads
- New Struck Scaler STR7201:
  - Onboard FIFO allows "deadtime" free oversampling.
  - Several scaler reads (triggered by external signal) during helicity state are stored in FIFO.
  - Readout of FIFO during helicity change (triggered via "scheduled trigger").
  - 3 units plus spare needed to keep redundancy as we had it during Gen98.
  - requires time tag for each event (STR7201 would be ideal)

Bar rates, e$\star$B Coincidence, Electronics Deadtime

- Gen98 used e$\star$B coincidence as main trigger
  - B (OR of all bars) showed huge rates
  - Rate dependent electronics dead time induced (contribution to the systematic error $< 2\%$)
- Gen01 will use "Open Trigger"
- Measurement of electronics deadtime with pulser
- e$\star$B for diagnostics and as backup
  - Several coincidences between subsets of bars and the HMS instead of just one
  - requires additional delay for scintillators (+100ns for the cables from the detector to the patch panel)

Impact on Hall C standard equipment

- Gen98 cannibalized SOS electronics for the neutron detector, which worked fine for the experiment but it was a pain to restore SOS configuration after the experiment.
  - Signal lines up to the counting house
  - Signal lines from the patch to the fastbus modules
  - Fastbus Crate and ADCs and TDCs
  - VME crate and Scalers
  - Trigger Logic and Retiming

- For GeN01 (and GeN Madey) different possibilities
  - same as GeN98
  - Own Fastbus Crate and modules (requires own signal cables from splitter to fastbus)
  - Own VME crate with scalers
  - Generic trigger logic that includes a third arm
  - Adjust hodoscope delays