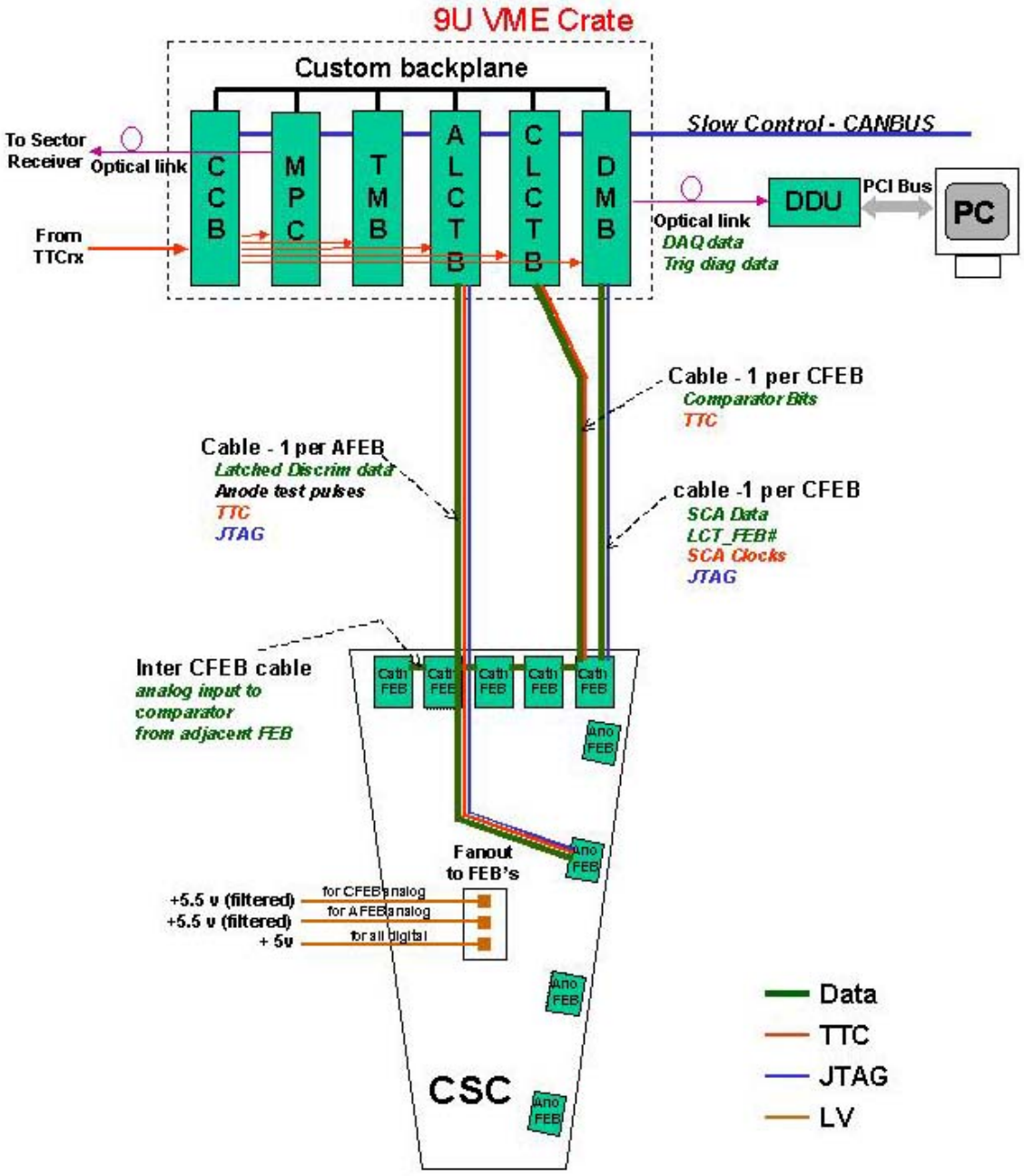
EndCap Muon CSC

Triggering, TTC, and Buffering Issues
15 June, 1999

P. Nylander
Ohio State University

Fundamentals

Electronics on CSC:



Buffering

CSC Buffering occurs in 2 places:

1. DAQ Motherboard (DMB)
   - 4 – 5 CFEB/DMB
   - 16-bit X 16k FIFO per CFEB
   - Typical CFEB event: ~800 Words

2. DDU
   - Single 16-bit X 64k FIFO
   - 8 time samples per event
   - Average event: ~1k Words
   - FIFOs have programmable "almost empty" and "almost full"
     - Trigger Throttle System?

Entire system holds ~85 Events
- With L1Acc & Local Charged Track

TTC Signals

Distribution

1. Clock & Control Board in VME crate: TTCRx to DMB, ALCT, CLCT, ...
2. DMB distributed TTC Signals to FEBs
3. DDU also needs signals for independant counters

Signals to be Used

- Global Reset
- BC0
- Clock

How much checking is enough?

- "Original" on CFEB
- Check on DDU! Also check on DMB?

Front End Rules

L1Acc with LCT Rate: 600 Hz/CFEB

- *L1Acc rate: 100 kHz*
- *LCT Rate: 60 kHz/CFEB, from "conservative" 300 kHz/chamber*
- *Estimate worst time slop: 100 ns*
- *100 KHz x 60 kHz X 100ns = 600 Hz*

Switched Capacitor Array (Buffer) Size

- *Preamp output is continiously sampled at 20 MHz*
- *96 time samples (SCA cells)/channel are grouped into 12 blocks of 8 cells*
- *2 blocks must be saved to sample any 8 consecutive time samples*
- *A block is released when*
  - *no LCT is found (400 ns)*
  - *LCT, but no L1Acc (3 μs)*
  - *sample is digitized (19.2 μs)*

Front End Rules

SCA Utilization:

- *From the LCT rate, OVER 99% of the time, only 4 SCA blocks are in use*
- *During digitization, 2 of the remaining 8 blocks are held for the 19.2 μs*
- *This leaves 6 blocks: room for 3 additional L1Acc with LCT*
- *Averageprobability of another L1Acc with LCT is*
  x = 600 Hz x 19.2 μs = 0.0115
- *Probability of 4 or more L1Acc+LCT is:*

$$P = 1 - \sum_{n=0}^{3} \frac{x^n e^{-x}}{n!} = 7.2 \times 10^{-10}$$

- *Equivalent to ~0.04 lost events per CFEB per 24 hours of running!*
- *IF it happens, just send an empty tagged error event*
- *No "almost full" warning available*