Trigger Primitive Studies at CERN Test Beam 2003 – Preliminary Conclusions

Jay Hauser
The *Most* Guilty Parties

- Martin von der Mey – TMB software
- Brian Mohr – setup and timing in at CERN
- Slava Valuev and Jason Mumford – decoding to ROOT and analysis feedback
- JK – TMB firmware and hardware
- Madorsky – ALCT firmware
- Jason Gilmore – test beam setup and coordination
- Plenty of others – Greg, Jay R, Ben B, Misha I, ...

CSC Track Finder meeting: July 17, 2003

J. Hauser UCLA
Chronology

- **Phase I – structured beam**
  - May 23 through June 1
  - ALCT timing tests
  - CLCT and TMB studies
  - High-rate tests

- **Phase II – unstructured beam**
  - June 13-28
  - CLCT and TMB studies
  - Low-rate and high-rate tests
Phase I Results

• Optimal timing found
• Fairly high efficiency (~98-99%) achieved
• Peripheral crate system basically working as desired
• Small CLCT efficiency loss at high rates, almost no ALCT efficiency loss
Structured Beam Timing

- Expect muons in 48 out of 924 bx due to beam structure
- Verified here by CLCT bxn from data
Scan over ALCT Delay Chip Settings

**BX Efficiency:**
1. Find number of events in maximum time bin
2. Divide by total number of events with ALCT
BX Distributions With Optimal Anode Delays

- **Cathodes (top):**
  - dBX (L1A – CLCT)

- **Anodes (bottom):**
  - dBX (L1A – ALCT)
CLCT Positions

- Relative position of key half strip from CLCTs from chamber 2 vs. Chamber 1
- Note: Chamber 1 is vertically higher than Chamber 2 (thus the offset in position).
Phase II Results

• **Very high efficiencies achieved**
  • Highest trigger efficiency (99.9% required low rate (few kHz))
  • 2-chamber “excellent event” (CFEB, CLCT, ALCT) efficiency limited to 99% due to CFEB timing problem

• **Improved scans taken:**
  • Angle scan
  • HV scan
  • Comparator threshold scan
  • Pattern requirements scan
  • Logic scope read out on most data

• **Some small problems:**
  • Some CLCT pattern requirements are inefficient
  • CFEB timing changes slightly with change of CLCT pre-trigger pattern requirements
CLCT Pattern Requirements

Example – “excellent event” (2xCFEB, 2xCLCT, 2xALCT) percentages:

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<tr>
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Bottom Line

- Peripheral crate system is nearly ready to go into production – no significant problems seen
  - Never had to attend to crate directly.
- Some tweaks highly desirable
  - Understand the CLCT pattern-finding better
  - Reduce the CLCT deadtime (Virtex-2 has better RAM structures)
  - Automate the ALCT-TMB and CFEB-TMB time-in procedure
  - Present CFEB_CONTROL software is somewhat clunky (but did this particular job well)
- Continuing analysis
  - Stan has track-finding working, getting good resolutions
  - Brian is working with UCLA undergraduates to understand data better.
  - Refer to http://www-collider.physics.ucla.edu/cms/trigger/testbeam2003/