Run2b Trigger Task Force

"Update, Plans, etc."

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Charge:

- Develop a plan for a Run2b Trigger System that will allow DØ to run at 5×10^{32} under the following constraints:
  - Operating Considerations:
    - L1 output rate = 5–6 kHz (limited by SMT readout)
    - L2 output rate = 1–1.5 kHz (limited by CAL readout)
    - L3 output rate = 50 Hz (limited by I/O)
  - Time Scale:
    - Must be ready in 2004
  - Reasonable Cost/Development/Resources
  - Reasonable Disruption to Existing Hardware

- Conclusions must be backed by Physics Simulations (Physics Case)

Conceptual Design Report Due to Jon by **September 17**

Membership:

Chairs: Mike Hildreth and Rich Partridge

Calorimeter

Chair: Mike Tuts
- Emmanuelle Perez
- Bob Kehoe
- Maris Abolins
- Patrick Le Du
- Pierre Petroff
- Drew Baden
- Vishnu Zutshi

Muon

Chair: Ken Johns
- John Butler

Tracking

Chair: George Ginther
- Drew Alton
- Brad Abbott
- Yuri Gerstein
- Frank Filthaut
- Sailesh Chopra
- Fred Borcherding

Technical Advisors:

Dean Schamberger, Jim Linnemann, Marvin Johnson, Dan Edmunds, Hal Evans

Many of the TrigSim Experts have also "volunteered" to help

Point of Departure

Previous Run2b Trigger Panel discussions identified potential upgrade paths consistent with constraints:

- "Engineering" Projects
  - replace L1CAL
  - potentially upgrade L1CTT

- Incremental Improvements
  - processor upgrades for L2, L3

- Outline of this program presented to PAC in April

⇒ Detailed plan required to move forward

Example Open Questions (a.k.a "Physics Case"):

- Does our current L1 Trigger die at $5x10^{32}$?
  - Upgrade Geant simulations showed High P_T trigger menu alone exceeded maximum L2 input rate

    $\rightarrow$ Needs to be shown with current simulation.

- What do we gain from improving L1CAL?
  - We think (U.G. Again) that jet triggers are ~80% of L1 rate

    $\rightarrow$ Needs to be shown with current simulation.

- Does an explosion of fake L1 Tracks hurt?
  - We think STT is bullet−proof
  - What about L1Muon?
  - What about the total L1 rate?

- How does L2 achieve 3−5x in rejection if we remove L2CAL?

Activities:

(• Panic)

- Large MC study underway:
  - "Standard" QCD menu, with 5 minimum bias events
    - will have ~300k events in various P_T bins
  - Various physics signals for efficiency studies (W's, Z's, ttbar, SUSY trileptons, taus...)
  - Processing through TrigSim is VERY slow
    - crashes every ~200 – 2000 events, depending on E_T
    - experts are helping

⇒ Will allow us to do a proper rate study for 5×10^{32}

- In parallel, implementation of new hardware in simulation
  - L1CAL: Saclay*/MSU
  - L1CTT: Brown/UO/UND/UM/FNAL

Track Triggers ($\rightarrow$reduce fake rate from L1CTT)

- "Finer Granularity" L1CTT
  - –Now, hit CFT fibers are grouped into pairs, whether or not the adjacent fiber is hit
  - –Current FPGA technology would allow us to put all 16 possible CFT axial hits into tracking matrix
    - –"Drop–in" replacement of DFEs
  - –being implemented in simulation

- Stereo L1CTT
  - –Axial L1CTT tracks can be used as seeds to which stereo hits can be added
  - –much more complicated project
  - –What use can we make use of η information?
  - –being implemented in simulation

Conclusions

- Rate studies beginning (painful start)
- L1CAL effort well underway
- L1CTT studies being coded/beginning
  - should start to get results in a week or two
- L2 under discussion
  - Ideas needed!

Assuming no one gets hit by a bus, we should have something useful for September 17.