

Interaction Trigger

- Why an Interaction Trigger?
- What should it be based on?
- Get all involved in a room, and make some decisions.

Why?

From our EOI:

The following requirements for the new front-end electronics (FEE) have been established:

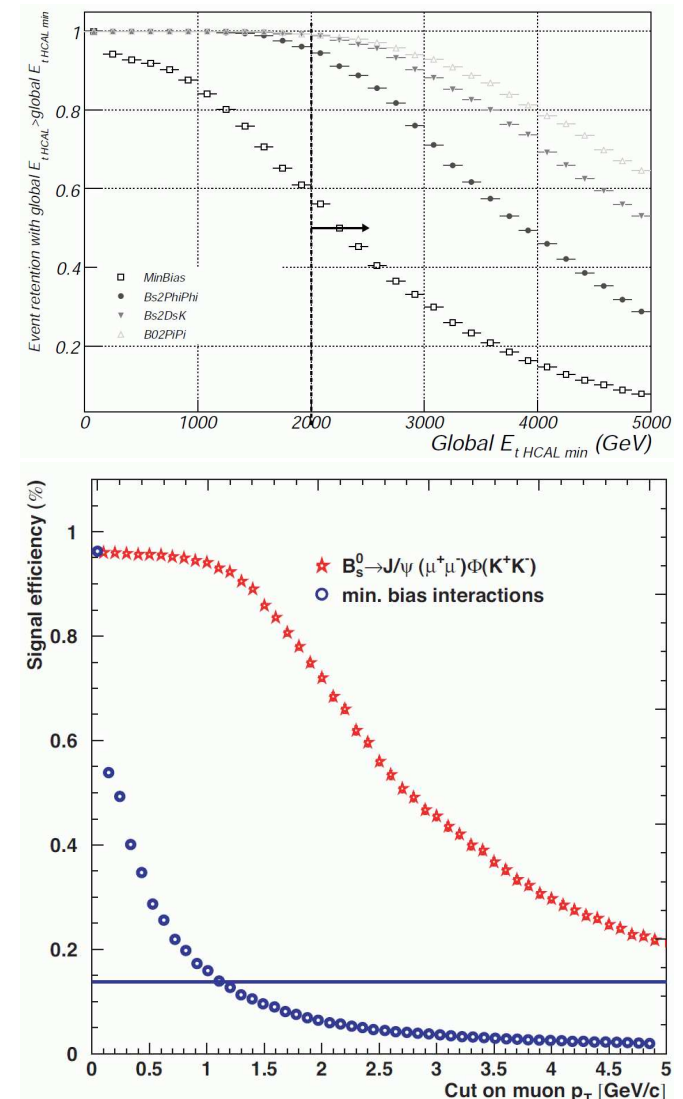
- A readout into the DAQ system at full interaction rate must be possible. This requires everything to be read out at 40 MHz, albeit 10 MHz of the bunches are actually empty.
- A rate-control trigger should cope with:
 - A staged DAQ system, which can not yet handle the full rate.
 - Unexpectedly high occupancies, which prevent the full readout.
 - Insufficient CPU power in the event-filter farm.
- This rate-control trigger should not just prescale but enrich the selected sample in good events. It corresponds closely to our current L0, however it can select rates up to 30 MHz.

Example Using Present L0

Present L0:

h Can keep efficiency $> 50\%$,
for rate reduction by factor 5.

μ Keep rate below ~ 1 MHz for good eff.



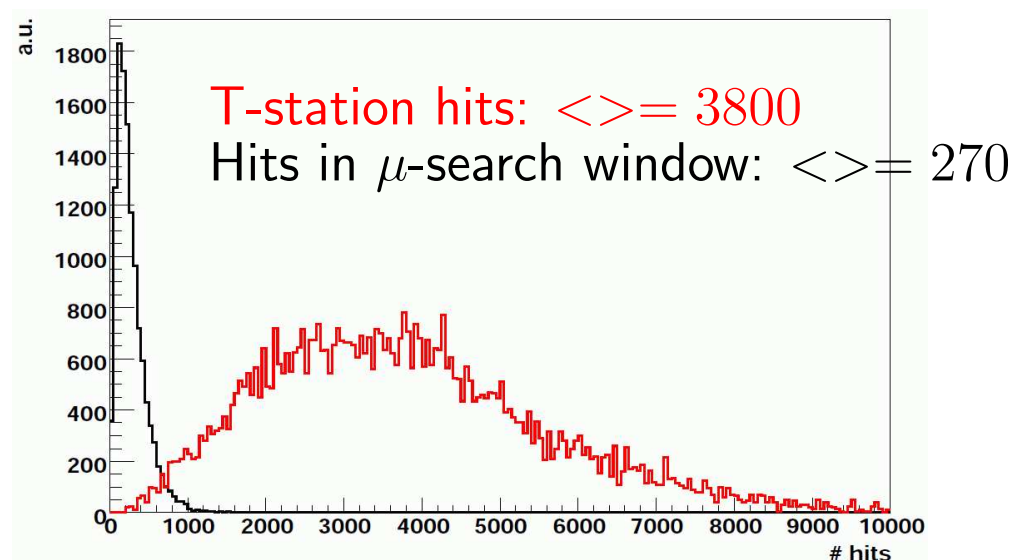
Additional Advantages

Assume present L0- μ , HCAL and ECAL triggers, then:

- could take all events with at least one muon, rate $< \text{MHz}$.
- and for the remaining BW, fill with photons, then electrons and hadrons.
- Should we foresee a jet-like trigger, or is this covered by E/HCAL already??

In addition: it c(sh)ould provide the seeds for HLT trigger algorithms like:

- L0- μ is extrapolated to T-stations. Need to check without M1.
- Similar for HCAL/ECAL clusters with sufficient E_T .



Trigger Issues

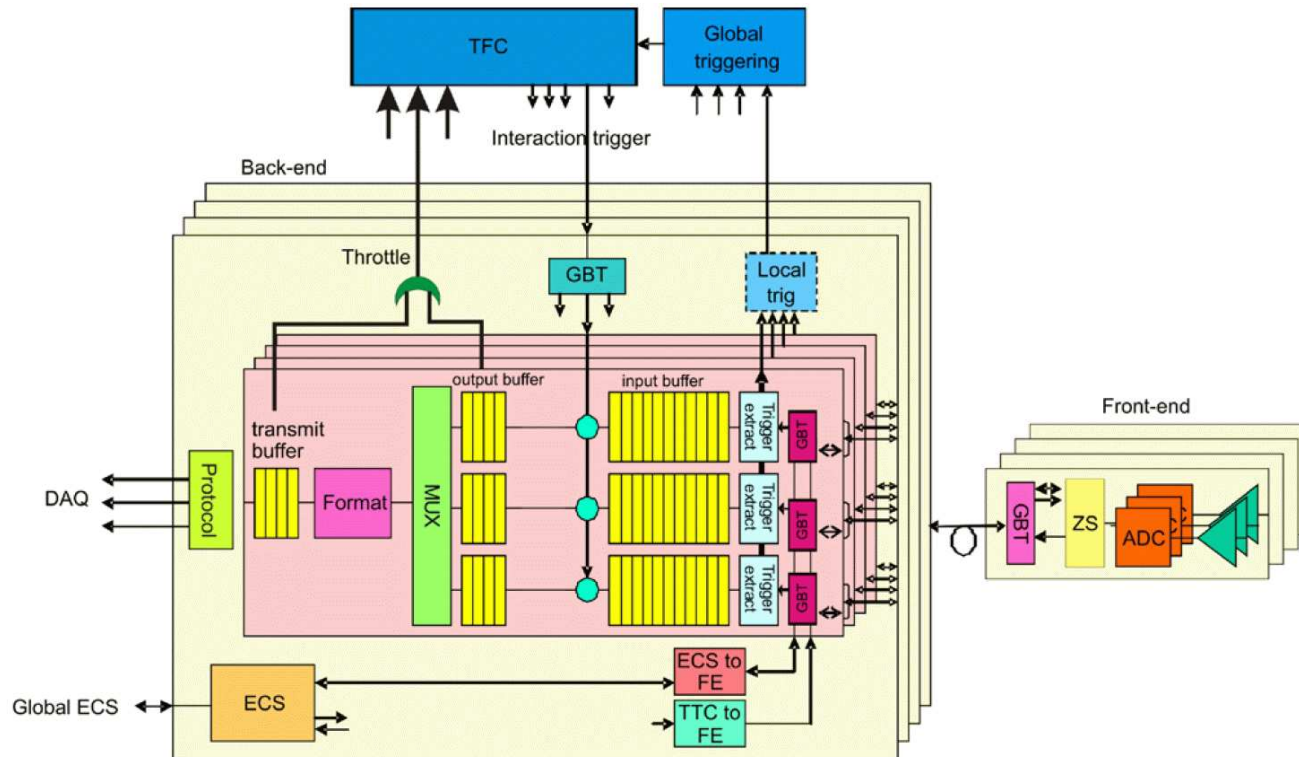
μ -Trigger:

- Present L0- μ runs at 40 MHz on special trigger boards, but cannot stay if chambers change their interface.
- Meeting(24/3/2010): investigate if TELL40 could do μ -trigger, hence could mu-trigger and muon-chamber read-out be combined?

E/HCAL-Triggers:

- Duplicate L0, but:
- SPD/PS: do we need it to distinguish between $e/\gamma/\pi$ at interaction trigger level?
Now we do:
 - require PS signal for e/γ , removing this would increase rate for same eff.
 - confirm electron (=SPD hit) in T-stations.
 - “Anti-” confirm only photons ignoring SPD info..
- Quote “Jacques/Frederic”: We still miss a solid pros and cons argumentation.
 - Proposal: do what is best for off-line, and try to mimic this in HLT. Watch extra FE-cost vs throwing CPU-power at the problem!

From Architecture Point of View



- Interaction Trigger is in addition to Throttle.
- Transmitted as bunch-crossing number of 12 bits (>3564).
- Directly to TFC, or to “Global Triggering”.
- Latency and Buffering the interaction triggers?

Summary

- Need an “Interaction Trigger” based on muons and E/HCAL info.
- Need to iron out how to get L0 like triggers in upgrade:
 - μ : discussion has started. Investigate TELL40?
 - Calo:
- Need fix where these triggers go, latency, buffering, etc.:
 - Have a meeting with all interested parties! Doodle or fix a date now.