

Status of L1Calo in Phase 2

Murrough Landon 15 September 2011

- Reminder of current baseline concept
- Implications of recent ideas for phase 1?



Baseline Phase 2 L1Calo Architecture





Calorimeters

- All data digitised each BC and sent to RODs in USA15
- RODs do preprocessing and send minitowers to LOCalo
 - LAr RODs might process EM strips layer for $\pi 0$ rejection
 - Flexible definition of minitowers in FPGAs
 - Coherent scheme across LAr EM/HEC/FCAL and Tile
- L0 trigger
 - Sliding window algorithms with higher granularity than now
 - Also potentially much higher than new phase 1 TBB scheme
 - Aim for EM/Tau/Jet on same LOCalo module
 - Results to LO topological processor, LOA to track trigger
 - Minimum LO object thresholds defined by maximum LOA rate and quality of the objects found (ie available granularity at LO)



- New Tower Builder Boards (TBBs)
 - Only for LAr EM layer (ie not HEC, FCAL or Tile)
 - NB LAr propose using 10 Gbit/s links already from TBBs
 - Recent UK discussion => safer to stay with 6.4 Gbit/s for phase 1
 - New Digital PreProcessor (DPP) and Feature Extractor (FEX)
 - Combine EM FEX outputs with EM triggers from current system in expanded topological processor
- Proposals for new JEP system
 - Replace JEMs with optical transmission to new JEP system
- Hadronic layer in new FEX?
 - New JEM might be able to send hadronic layer to EM FEX
 - Or perhaps directly from some new PPM upgrade?



Implications for Phase 2





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- Recent ideas probably only impact on LO, not L1
- Is phase 1 EM-FEX a prototype for phase 2 LOCalo?
 - How different would signals be (speed, content, etc)
 - Will we really have any hadronic input to the phase 1 FEX
 - Would we still aim for single EM/Tau/Jet module?
 - Or would phase 2 really be a completely new trigger?
 - Two separate requests for funding...
- Should we use phase 1 LAr TBBs at phase 2?
 - New phase 1 TBBs would be a significant investment
 - LAr preference for us to still use them in phase 2
 - Minitowers from RODs no longer the LAr preferred option?
 - Use phase 1 TBB signals as EM layer inputs to phase 2 LOCalo



- Pro
 - Evolutionary, less intervention in phase 2
 - No need to route all fibres to L1Calo racks
 - Not sure of the fibre bulk (Marzio offered to provide more holes)
 - Nor of the relative latency via the longer route
- Con
 - TBB granularity fixed at limits imposed by phase 1
 - Little or no improvement in EM trigger possible at LO
 - No possibility of $\pi 0$ rejection from processing LAr strip layer
 - HEC and FCAL would need something different
 - Tile would be different again
 - Link speed 10 Gbit/s already at phase 1?
 - Or we would be stuck with 6.4 Gbit/s for phase 2



What Should L1Calo Preference Be?

• Physics case?

- Need simulation to tell us what improvement better phase 2
 EM granularity could give us over phase 1 TBB limit
- Could LO EM thresholds be low enough to satisfy Physics requirements at phase 2 with only the TBB granularity?

• Architecture?

- Baseline phase 2 scheme is fairly coherent
- Using TBBs for phase 2 is probably more messy
- Should we still press for minitowers from LAr RODs?
- Funding?
 - Can we get funding for two big rebuilds of the trigger?
- Other?



- Where to put all these wonderful new systems?
 - Presently about 1 free rack in USA15 in L1Calo area
 - 12U space above CP/JEP crates not enough for ATCA crates?
 - Need 12U for an ATCA crate, plus 1U additional heat exchanger :-(
 - Could fit two DPP plus 1 FEX crate in the free rack
 - Not sure where to fit possible new JEP crate(s)
 - Might be able to free a bit more space
 - Abandon Tile cosmic trigger (1 rack)
 - Relocate DCS and monitoring PCs somewhere (1 rack)
 - Replace receiver control crates by PCs (2 racks)
 - Relocate LUCID? (2 racks)
 - All those options are at the sides, ie 2-3 BC extra latency