

L1Calo Upgrade Phase 2

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- Phase 2 Functional Blocks?
 - Thoughts on L1 "refinement" of LO
- Simulation framework
- Phase 1 Online SW

"L1Calo" Functional Block Diagram?



"L1Calo" Functional Block Summary

- LOCalo
 - Big system (64 modules, 8 crates?), ~40Tbit/s
- LOTopo/Merger
 - One or few modules(?), ~2Tbit/s
 - May be fairly simple: do we need much more than merging for LO RoIs?
- L1Calo
 - One full crate system?, ~2Tbit/s, very complex FW
 - Limited rate reduction (π 0 rejection), may not be needed? Or phase 2.5?
- L1Topo
 - One or few modules(?), few Gbit/s
- ROD
 - Scattered system (1 module per crate?)
 - HW/FW/SW experts willing & able to travel to all test rigs!

Functional Blocks: Separate or Combine?

LOxxx and L1xxx

- Running at different rates (40 MHz vs 500 kHz)
- Easier to keep separate?
- Except LOCTP & L1CTP?
 - Combine to provide RODs & FEs with single LO/L1 interface?
 - But then single CTP needs sets of LO and L1 trigger inputs
- *Topo and *CTP?
 - CTP has detector interface and inputs from other triggers
 - Luminosity, forward, calibration triggers, etc
 - Keep CTP separate from topological triggers?
 - But *Topo would probably take over MuCTPI function?
 - Unless separate MuCTPI makes it easier for L1Calo group to provide the L*Topo systems?

L1Calo (phase 2) Functional Block (1)

- No need for LO RoIs?
 - Must have fibre(s) from each ROD/mezzanine anyway
 - Some RODs (FCAL?) may be hot: send data every LOA
 - Plenty of latency available: simplest to send everything?
 - Strips are 50% of the data, so everything is only factor 2 more
 - Rerun all algorithms at LOA rate, now with full granularity
- Input Data Volume
 - All calo cells preprocessed to give Et, time, quality flags
 - Say 20 bits/cell, 200k cells => 4 Mbit data (compressible?)
 - On LAr RODs, ~500 cells/mezzanine => 10 kbit per 0.4*0.2 eta*phi
 - Transmit in about 0.5μ s over one 20 Gbit/s fibre
 - Tile: one such fibre per ROD is more than enough
 - Average LOA rate 500 kHz (ie 1 per 2μ s)
 - Need some derandomising, limits on instantaneous LOA rate
 - Even with 2μ s transmission latency, still several μ s left for logic

L1Calo (phase 2) Functional Block (2)

- Total L1Calo Input and Output
 - Total ~512 * 1 fibre per mezzanine => 512 20 Gbit/s fibres
 - EM 432 mezzanines, LarHad 32 mezzanines, Tile ~64
 - Output: 8 fibres, one per 0.8*0.8 RoI map (as LOCalo)?
- Example Architecture
 - Single crate, eight modules
 - 64 * 20 Gbit/s fibres/module
 - Module covers 0.8 in eta and all phi
 - 100% fanout to neighbours

Phase 2 Simulation Framework

- Need new simulation toolkit for phase 2
 - New summing of cells to minitowers
 - New algorithms run on these minitowers
 - Would like several variants of them
 - Volunteers?

Phase 1 Module Services SW

- How to communicate with modules?
 - Existing: SW layer over VME driver to FW register model
- Proposed phase 1 TCM: ethernet to all modules
 - Keep vaguely similar SW model?
 - ATCA modules stay fairly dumb (as seen by SW!)
 - New protocols for SW to address registers/memories
 - SW running elsewhere loads data into modules
 - Or ATCA modules get smarter?
 - Use CPU cores in FPGA
 - SW runs in the module
 - Still need some model to interact with FW
 - Module fetches its data from external sources
 - Any idea how other ATLAS groups are thinking?