Rack Layouts

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- Overall latency
- Ergonomics, Maintainability, Flexibility
- Cable routing paths
- Holes in shielding wall
- Some possible layouts?

Latency

Current Critical Path (Jet/Et)

Component	Cable to next
Furthest (which?) FE electronics	60m→
Receivers (EM Barrel/Hadronic Sum)	1m?→
Receiver stations	10m→
PreProcessor Modules	7.5m→
Jet/Energy Modules	2.5m→
Energy Sum Merger Modules	2.5m→
Central Trigger Processor	)
TTC Distribution	) 8m→
Critical (eg LAr) TTC Crates	)
Longest TTC Fibres	80m→FE

Total latency in TDR was 82.2 BC. This is 2.2 BC, ie 11m cable over the target.

Less Critical Paths

- Muon Trigger (about 2 BC to spare, ie 10m of cable)
- Cluster Processor (about 4 BC to spare, ie 20m of cable)

Cable Routing

External Rules

- Route to/from detector is via four (small, slanted) holes in shielding wall The proposed layout is far from ideal, going to both sides of both floors. Try to renegotiate with safety group
- Meanwhile TC would like to increase the maximum cable length!
- The path from rack to rack is normally down and under the false floor...
- ...but front panel to front panel is OK
- (Almost) no cables between floors (except via long route)
- Layout of racks is also far from ideal with a large gap in the centre of the first row and only outlying racks in the second row

Internal Requirements

- Receiver crates will probably be split into +ve and -ve eta, barrel and endcap, EM and hadronic
- Summing across EM barrel/endcap transition connects pairs of EM receiver crates
- Each PPM crate spans all of eta and needs input from four receiver crates
- Each PPM crate feeds three CPM and three JEM crates
- Each CPM/JEM crate takes input from six PPM crates
- Cable runs from PPM to JEM/CPM may be limited to 10m (high speed digital signals)

Cable Routing

Front/Back Panels

Input and output connectors of the various trigger modules (along the trigger data path) are as follows:

Module	Input	Output	N.Crates
Receivers	Back	Front	8?
PPMs	Front	Back	8
CPMs	TBD	N/A	4
JEMs	Front	N/A	4
CMMs	Front?	Front?	) 0-2
SMMs	Front?	Front?	)
CTP	Front?	Front?	1
TTC	Front	Front	n

Front panel inputs are more easily disturbed, but might offer shorter cable runs.

Backplane inputs are preferable for maintenance and reliability.

Holes in Shielding Wall

- Proposed four holes are 300mm diameter, slanting away from central point in UX15 to left/right racks in niveaux 1 and 2.
- Expect about 500 prefabricated cables from calorimeters, maybe 20mm diameter with 20*80mm connectors.
- Naively require three 300mm holes to accommodate them. Or two 360mm holes.
- Expect about 1000 fibres from on-detector muon trigger electronics.
- Some number of TTC fibres back to FE electronics?

Ergonomics and Flexibility

Ergonomics

- Would like no more than two 9U crates per rack
- Centrally located for easy access and maintenance and to minimise accidental damage
- Other services (power supplies, 6U crates, bulk cabling, DCS, scopes, computers, monitors, network) above, between, below or in racks out of the critical path
- Quadrant architecture suggests a 2*2 layout is ideal...
- ...and doesnt take much extra cable path (because of the fanout to multiple crates)
- The (probably) eight crates of receiver modules are also likely to be naturally arranged in pairs rather than threes
- Separate racks for each system. Required(?) for receiver station grounding. Also to ease installation and commissioning phase

Flexibility

- Critical latency path might change
- Maybe more subdetectors will want TTC crates close to CTP
- We might need more nearby crates than we expect
- ...
- Aim for a layout which can accommodate some growth

Possible Layouts

Considerations

- Vertical cabling within/between racks fairly invariant
- Consider the horizontal path between racks. Try to avoid zigzags
- Obviously we always need to remember the longest required path among all the various fanouts

Examples

- Optimistic compact system: TDR -5m
- More realistic, flexible layouts: TDR +5m

Questions

- Larger/more holes in shielding wall
- Smaller gap between the racks
- Variation in input cable lengths
- Receiver station flexibility
- EM Barrel/Endcap sum latency
- CTP+TTC cable assumptions in TDR
- Muon trigger requirements