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