



CSC Track-Finder Update

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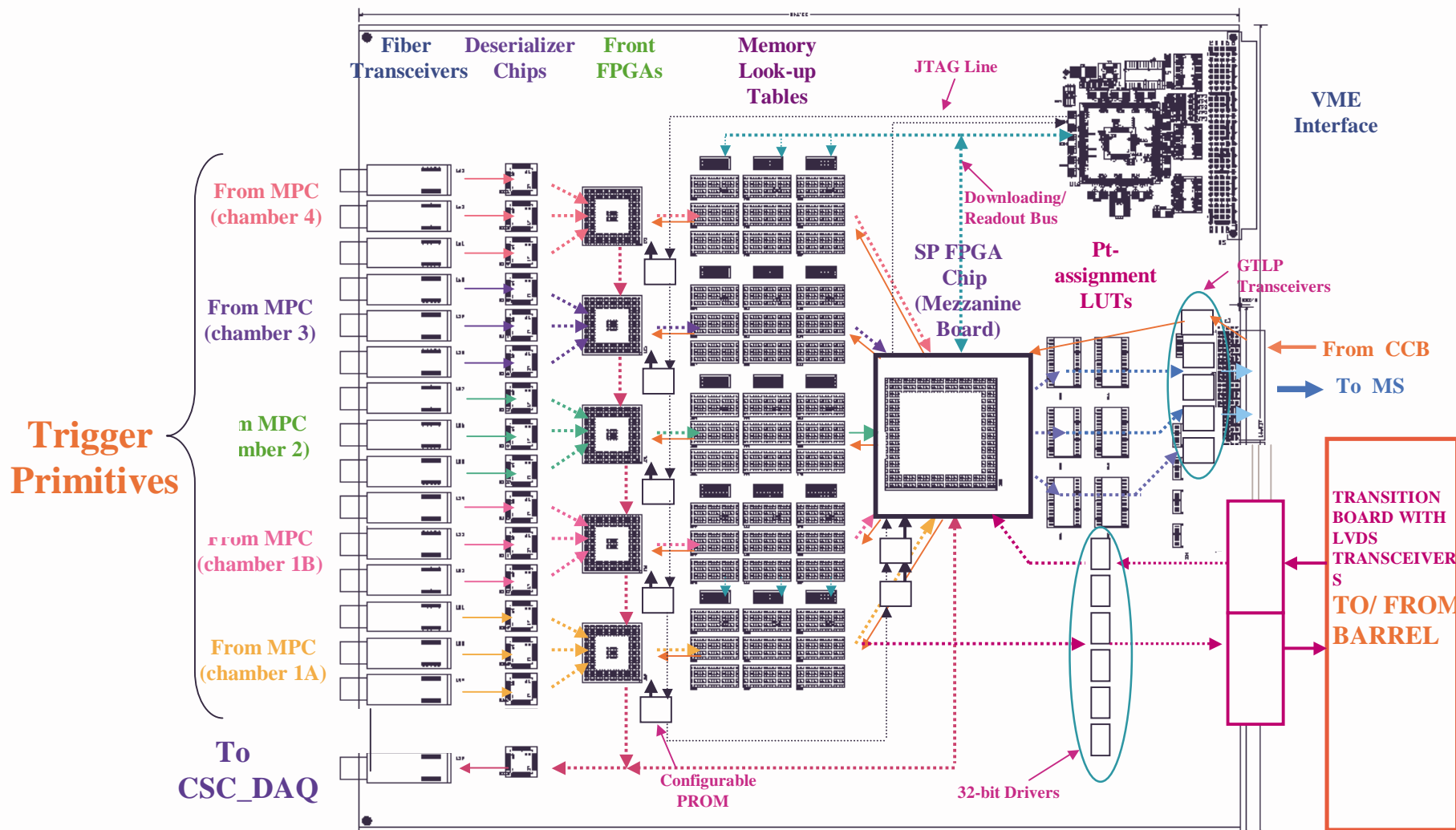
St. Petersburg Nuclear Physics Institute

Sector Processor
St. Petersburg Nuclear Physics Institute

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SR/SP Conceptual Layout



→ Currently specifying all interfaces



CSC TF Schedule

- Dec. 2001: **Specify backplane connections**
 - Mar. 2002: **Specify MPC, SR, SP designs**
 - Sep. 2002: **Finish construction of pre-production prototypes**
 - Mar. 2003: **Finish crate tests of CSC TF**
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- **Note: We hope to have a structured beam test of the CSC chambers and CSC Track-Finder in 2003**
 - **Chain test of entire system with 25 ns beam**



DT / CSC Interface – Bits

From CSC to DT TF:

40 MHz LVDS both ways

Signal	Bits / stub	Bits / 2 stubs (ME1: 20°)	Bits / 6 stubs (ME1: 60°)	Description
f	12	24	72	Azimuth coordinate
h	1	2	6	DT/CSC region flag
Quality	3	6	18	Computed by TMB
BXN	–	2	6	2 LSB of BXN
Total:	16	34	102	

DT format

2 sets of 3 muons in 60° each BX

From DT to CSC TF:

Signal	Bits / stub	Bits / 2 stubs (MB1: 60°)	Description
f	12	24	Azimuth coordinate
f _b	5	10	φ bend angle
Quality	3	6	Computed by TMB
BXN	2	4	2 LSB of BXN
Synch/Calib	1	2	DT Special Mode
Muon Flag	1	2	2 nd muon of previous BX
Total:	24	48	

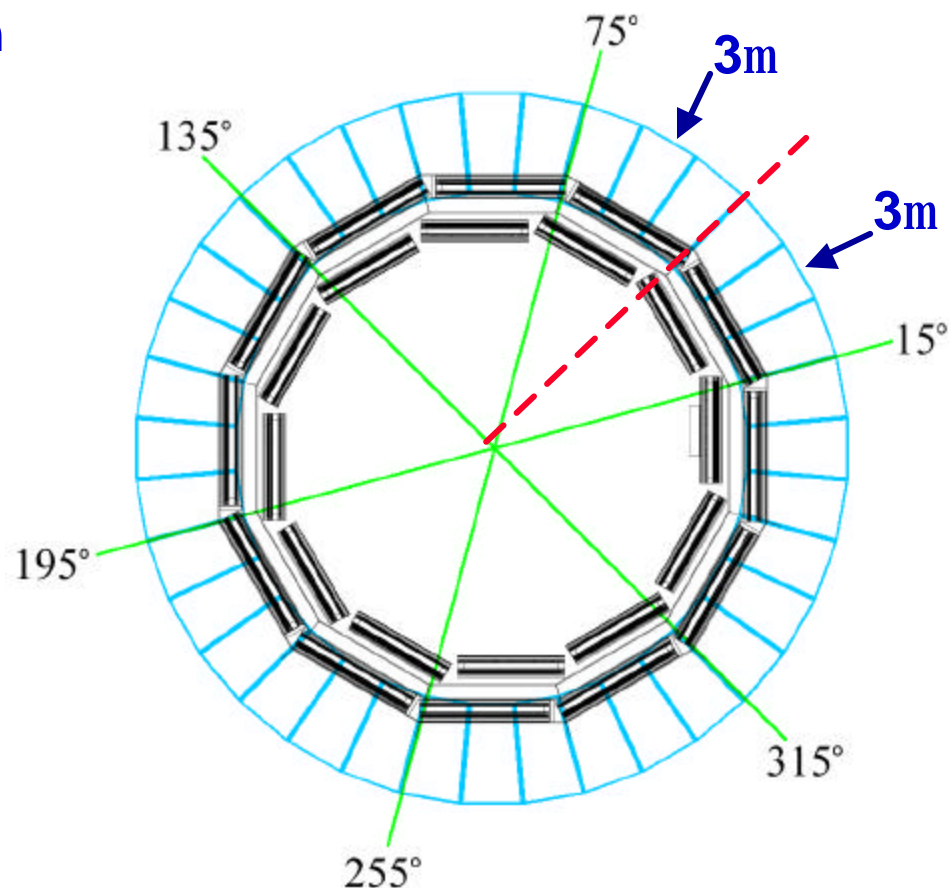
CSC format

2 sets of 2 muons in 60° serialized in 2 BX



DT / CSC Interface – Cables

- Need to decide cable map between DT and CSC TF
- Perturbed because ME 1/1a staging implies CSC trigger goes back to 3 muons per 30° rather than 2 per 20° (but still a total of 6)
- Can send 3 muons to each DT SP
- Old design sent 4 to each, and the center 2 were duplicated
- Can we accommodate either scheme ?
- Number of cables?





SP [®] CSC Muon Sorter Interface

80 MHz GTLP

Signal	Bits / m	Bits / 3 m (1 SP)	Bits / 36 m (12 SP)	Description
f	5	15	180	Azimuth coordinate
h	5	15	180	Pseudorapidity
Rank *	7	21	252	5 bits p_T + 2 bits quality
Special * Trigger	1	3	12	Extra quality bit (Halo muon trigger)
Sign *	1	3	36	
BXN *	–	2	24	2 LSB of BXN
Error *	–	1	12	
Total:	19	60	720	(360 bits at 80 MHz)

**Send on
1st frame**



GMT & GT Interface

We will implement special logic mode to trigger on accelerator muons during normal running

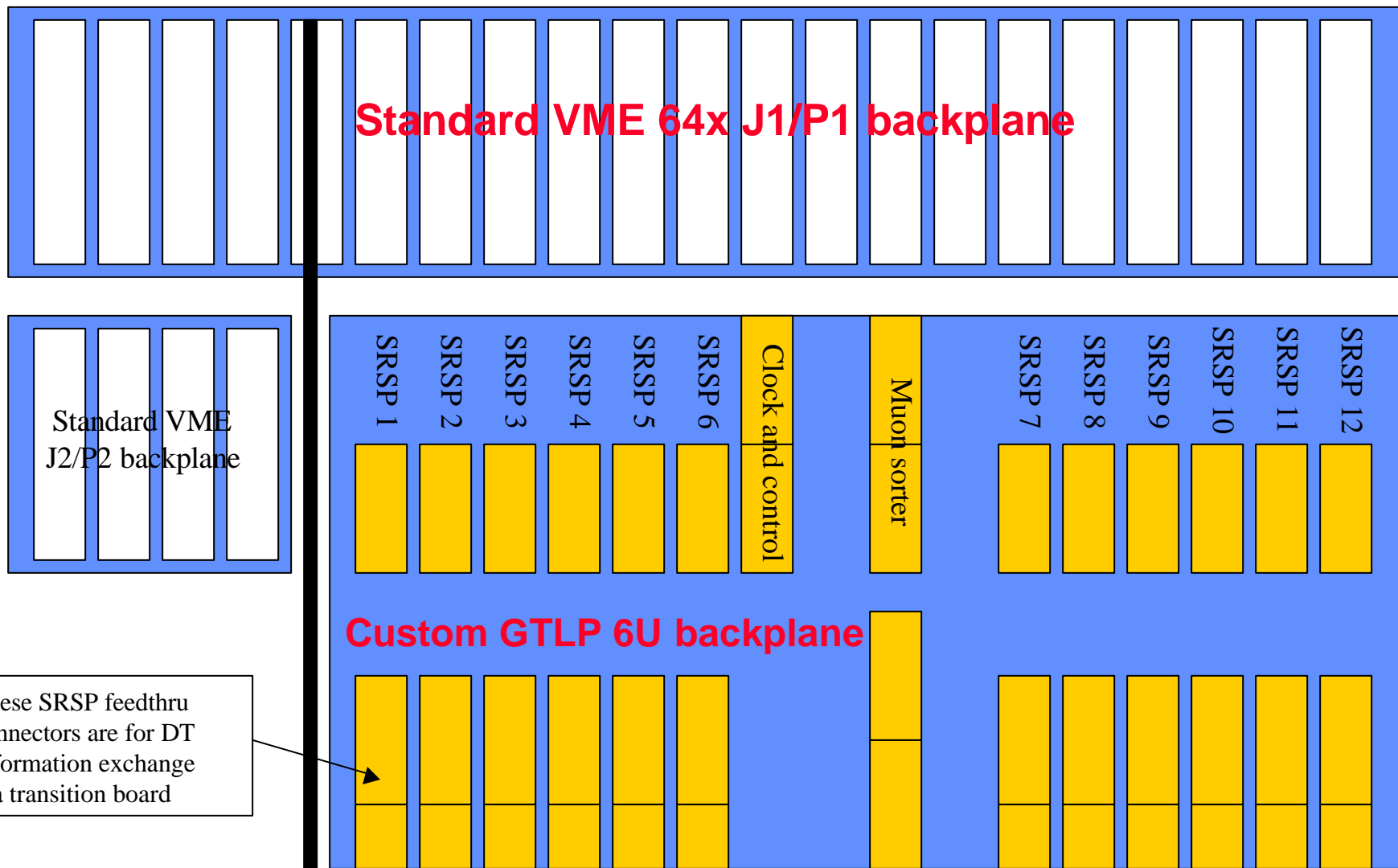
- Could also include a loose single station trigger**
- These trigger presumably can/will be prescaled**

Question: Do we include these special triggers with normal muons in the *same* BX ?

- Mixed list of muons from CSC Sorter, or just one or the other?**
- Also, what if we get several accelerator muons in one BX ?**

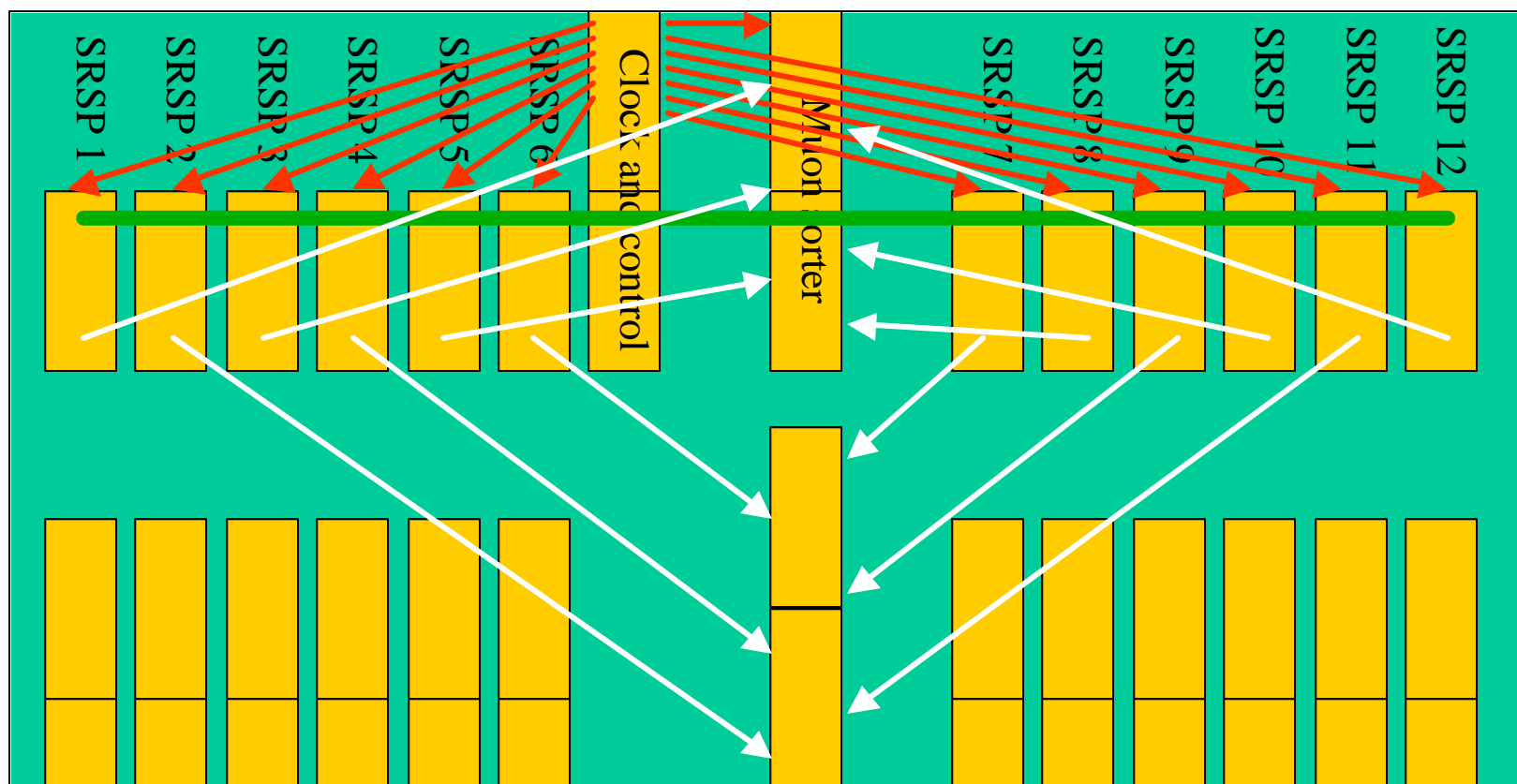




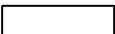
CSC Track Finder Backplane





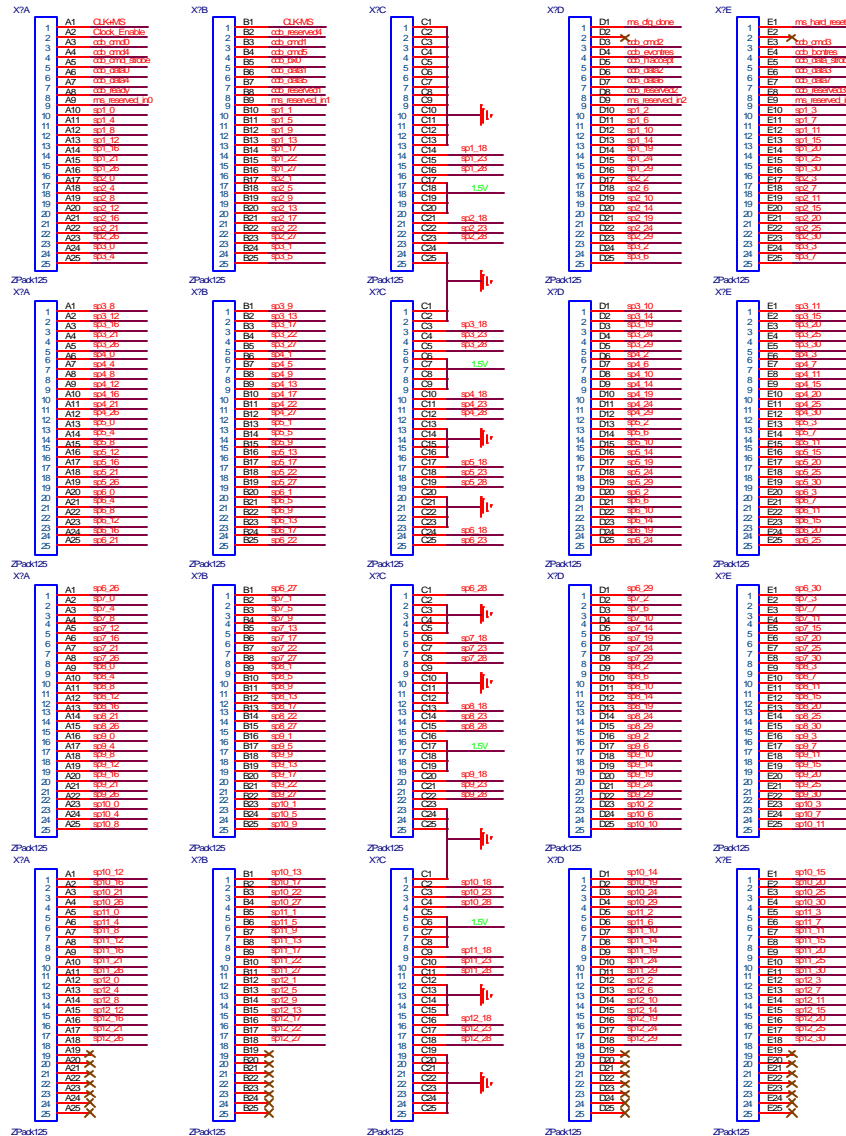
Custom Backplane Connections



-  Point-to-point LVDS clock 40 MHz
-  Fast control bus, GTLP 40 MHz
-  Point-to-point data from SRSP to MS, GTLP 80 MHz



CSC Muon Sorter Connector



370 signals on AMP 100145-1 connector

Similar specification written for SP connection, but only 31 signals



Ghost-Busting in CSC Muon Sorter

CSC TF does not share information across sector boundaries

- Efficiency loss is negligible
- Ghost tracks are created and pose a problem for the di-muon trigger

Most ghosts stem from duplicate LCTs from overlapping chambers

- This can be solved in principle by suppressing the LCT trigger for one of the chambers in the 5-strip overlap
- But not done currently in ORCA simulation, PRS rate studies

However, ghosts also can be cancelled in the CSC Muon Sorter, which receives all CSC information

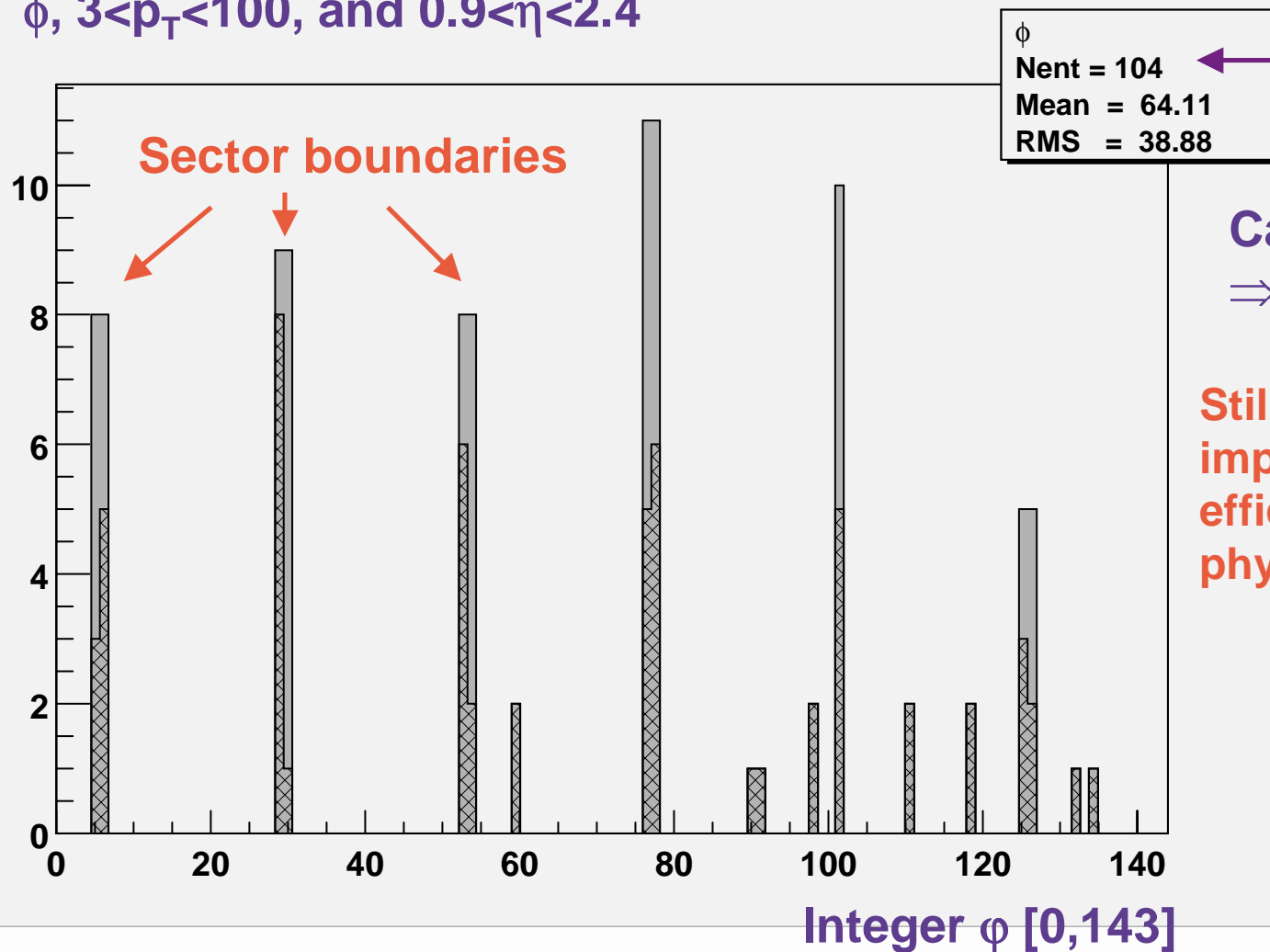
- Less challenging technically than trying to share information between Sector Processors
- “Small” additional logic to Sorter chip, and hopefully minimal impact on latency
- Compare h, j between muons from neighboring sectors and cancel lower quality candidate
 - Current resolution is 2.5° in f and 0.05 in h



Ghost Cancellation

Study of 25K single muons generate flat in ϕ , $3 < p_T < 100$, and $0.9 < \eta < 2.4$

B.Scurlock



ghosts

Can cancel 92
⇒ 10X reduction

Still need to assess
impact on di-muon
efficiency from real
physics (J/Psi)