Fiber Road Card

H.Evans **Columbia U.**

- Outline FRC Functions
- Information from L1CTT
  - Geometry
  - Truncation
  - Data Format
- Communications
  - Media
- To Do List

FRC Functions

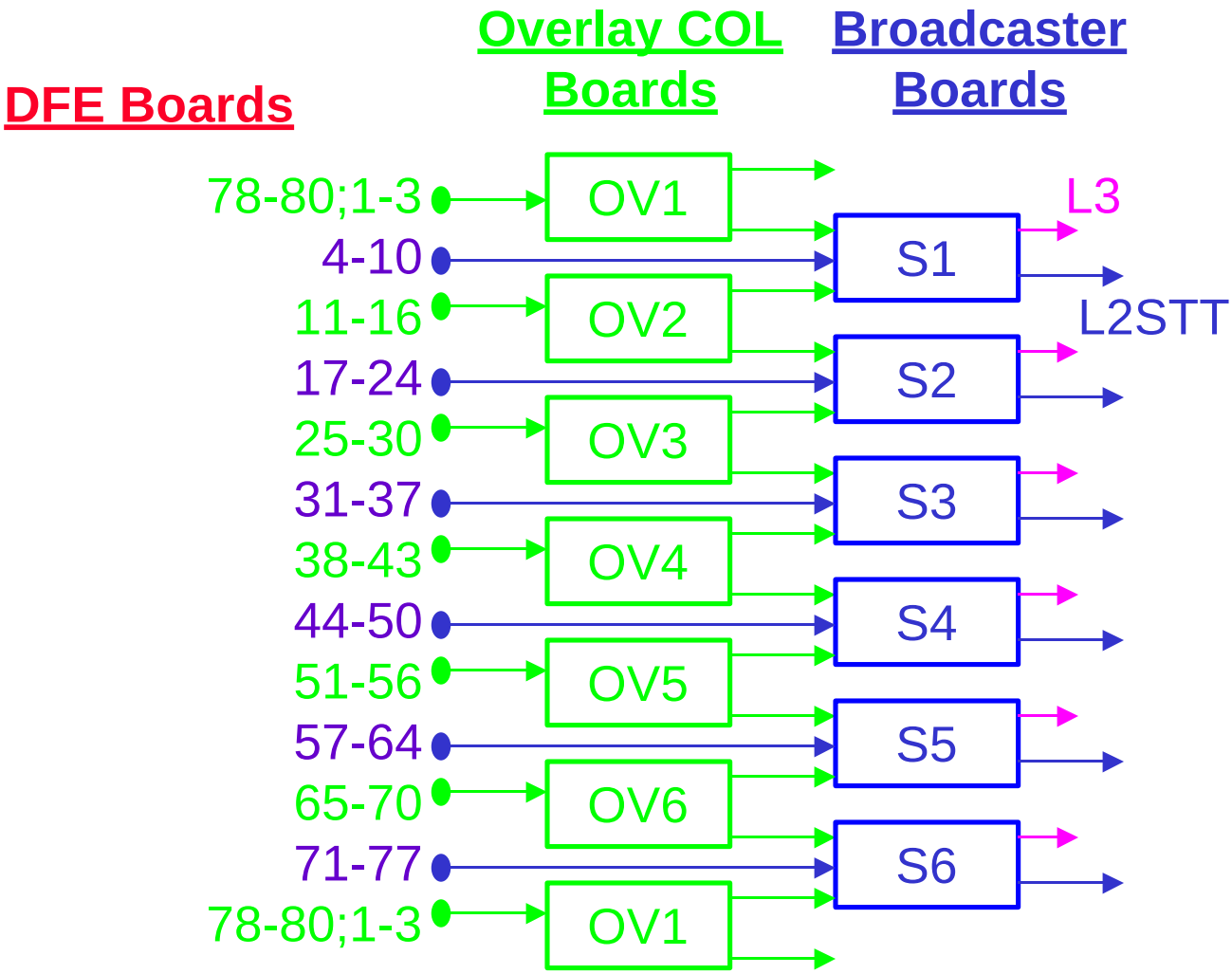
- L1CTT Receiver / Broadcaster
  - Receive L1CTT G-Link Fibers VTM/FIC
  - Generate Local (Global) Track #
  - Truncate Track List
  - Translate Data Format (?)
    - $H,P_t \Rightarrow H,A$
  - Broadcast Track List $\rightarrow$STCs
- SCL Receiver / Broadcaster
  - Receive SCL Information MBT
  - Generate STT-useful Subset
  - Broadcast $\rightarrow$ All(?) Cards
- L3 Buffer Management
  - Manage Buffer Pointers for STC/TFC/ZVC
  - Initiate VBD Transfers many examples
  - Broadcast Buffer Pointer Info $\rightarrow$ Cards
- Monitoring
  - Define Monitoring Tasks
  - Control for other Boards(?)

L1CTT Mapping Scheme

- **Need:** ±9º around each 60º sector to get all tracks w/ P_t>1.5GeV & |b|<2mm
- **Have:** Info from CTT DFEs in 4.5º Wedges
- **Solution:** (Manuel Martin) divide DFEs into ~30º regions. Send 3 regions to 1 STT Sector ⇒±15º Overlap
  - see http://d0server1.fnal.gov/www/protocols/

Sect	Boundaries		DFE		
	Desired	Possible	4.5º Wedges		
1	351º-69º	346.5º-72º	78-80; 1-3	4-10	11-16
2	51º-129º	45º-135º	11-16	17-24	25-30
3	111º-189º	108º-199.5º	25-30	31-37	38-43
4	171º-249º	166.5º-252º	38-43	44-50	51-56
5	231º-309º	225º-315º	51-56	57-64	65-70
6	291º-9º	288º-13.5º	65-70	71-77	78-80; 1-3

Track List Truncation

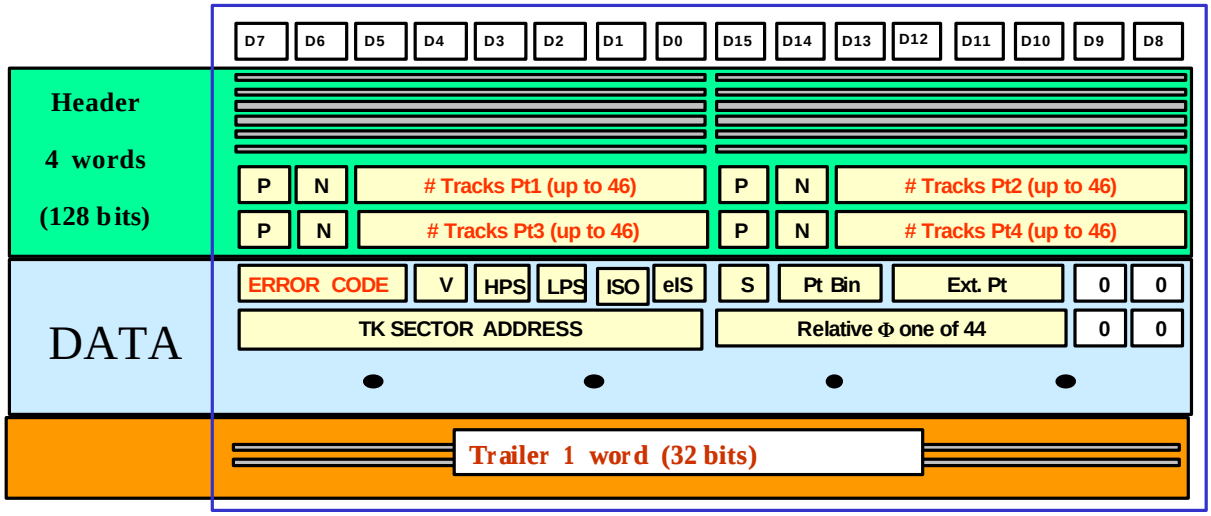


Truncation

Pt-1 Pt-2 Pt-3 Pt-4	All Pt	All Pt
≤6 ≤6 ≤6 ≤6	≤24	≤46
•Lowest ϕ	•Highest Pt	•Highest Pt
	•Lowest ϕ	•Lowest ϕ

L1CTT Data Format

Bit Fields allocation for L2 CFTpp data transfers between the Broadcaster Boards and the L2 Pre Processors (via FIC) using G Links



Number of Tracks per Pt bin — 4*8 bits for a maximum of 46 tracks
List of tracks with tagging and address — n*32 bits for a maximum of 46 tracks
If truncation of data is necessary the reporting is done moving counter clock wise, this will result in a possible Φ dependence.

Manuel I. Martin June 2, 1999

See http://d0server1.fnal.gov/www/protocols/

Track Info from L1CTT

Data	Bits	Range		
Trk Wedge Addr	8	0-79		
H-Layer Offset	6	0-43		
P_t-Bin	2	0-3		
Sign	1	0-1		
Extended P_t	3	0-7	P_t < 3GeV	A-Offset
		0-3	3<P_t<5GeV	A-Offset
		0-7	P_t > 5GeV	P_t Info
Local Trk #	6	0-45	$\Rightarrow$ **26 Bits Total**	

Pt-Bin	Min Pt (GeV)	Max Pt (GeV)
1	1.5	3
2	3	5
3	5	10
4	10	∞

Extended Pt Information

Pt-Bin		Ext. Pt	Ptmin	Ptmax	Ptave	A-Off
1(11)	1.5-3	111				14
		110				13
		101				12
		100				11
		011				10
		010				9
		001				8
		000				7
2(10)	3-5	011	3.0	3.3	3.2	6
		010	3.3	3.8	3.5	5
		001	3.8	4.3	4.0	4
		000	4.3	5.0	4.6	3
3(01)	5-10	011	5.0	5.7	5.3	
		010	5.7	6.7	6.2	
		001	6.7	8.0	7.3	
		000	8.0	10.0	8.9	
4(00)	10-∞	011	10.0	13.3	11.4	
		010	13.3	20.0	16.0	
		001	20.0	40.0	26.7	
		000	40.0	∞	80.0	

Communications

Things to Keep In Mind:

- Number of Cards May Change
  - **Flexible # of Outputs**
- Data Transmission Error Rates
  - **Study Effect of Faults**

	# of Dest's	Bits / Word	Wd/Evt Av	Wd/Evt Mx	Transf Time (μs) Av	Transf Time (μs) Mx	Transf Media
SCL*	12+3	<32	1		0.25		Hotlink
Buffer*	12+3	a few	1		<0.1		
L1CTT	9+3	26	2	46	0.1	1.8	VME
		(32)			0.5	11.5	Hotlink

*Includes 1 ZFC / Crate 3 = 8 Barrel SMT

Comm. Options

1) VME Bus
   - \+ easily expandable
   - \+ fast
   - – error rate
   - – pin availability

2) Hotlink
   - \+ point-to-point
   - – speed
   - – daisy-chain for expandability

3) LVDS
   - \+ faster than hotlink
   - – complicated error correction
   - – complicated daisy-chain

4) G-Link
   - – complicated driver
   - – expensive

5) Other Options ???

FRC To Do List

- Check for Truncation Scheme Biases
- Define Road Info Data Format
- Decide Where Reformatting of L1CTT Info will be Done
- Decide on Communications Medium
- Identify SCL Info Needed
- Define Data to L3
- Define Buffer Control Protocol
- Define Monitoring Data / Monitoring Control

\+ Long List of Internal FRC Decisions...