

# The BROADCASTER

**communication protocols  
and  
data encoding**

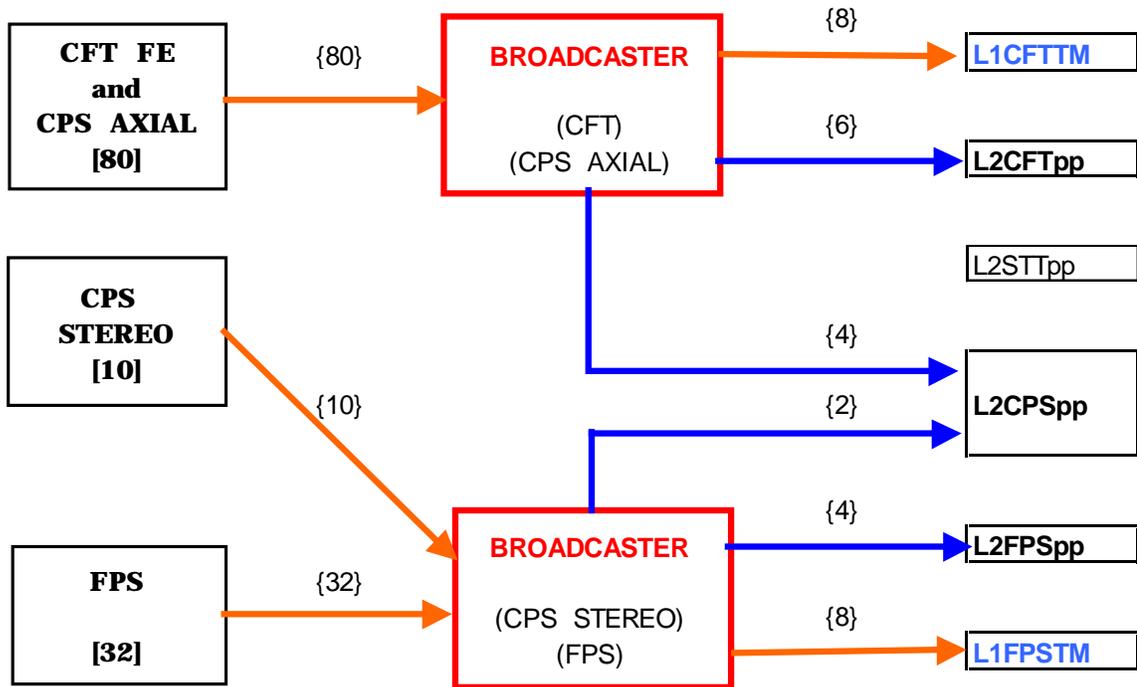
These ideas have evolved over a long period of time and are the result of many meetings as well as formal and informal conversations with many people. Specifically, the following people have contributed to the evolution of these ideas: F. Borcharding, P. Grannis, M. Johnson, J. Linnemann, A. Lucotte, D. Toback, M. Vaz.

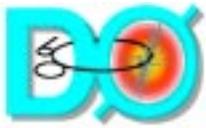




LINKS between  
FE and BROADCASTER  
BROADCASTER and TRIGGERS

— Fast Copper Serial Link  
— G Link

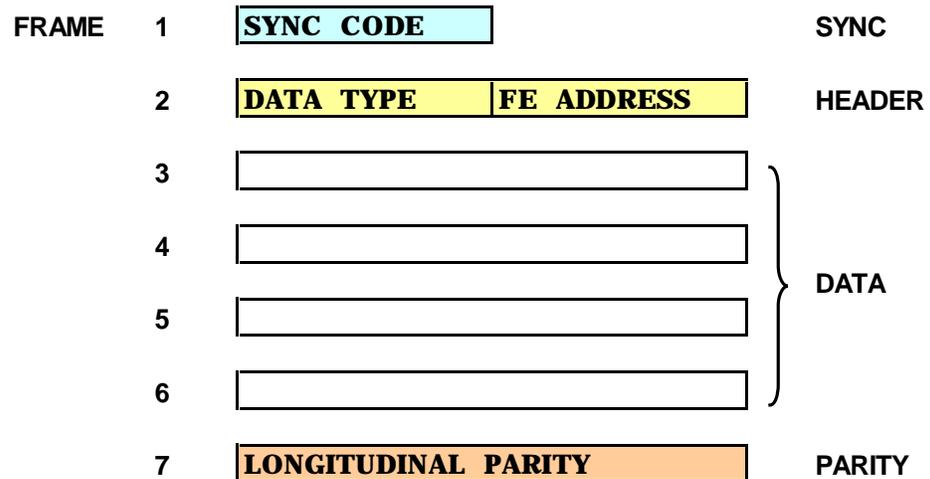




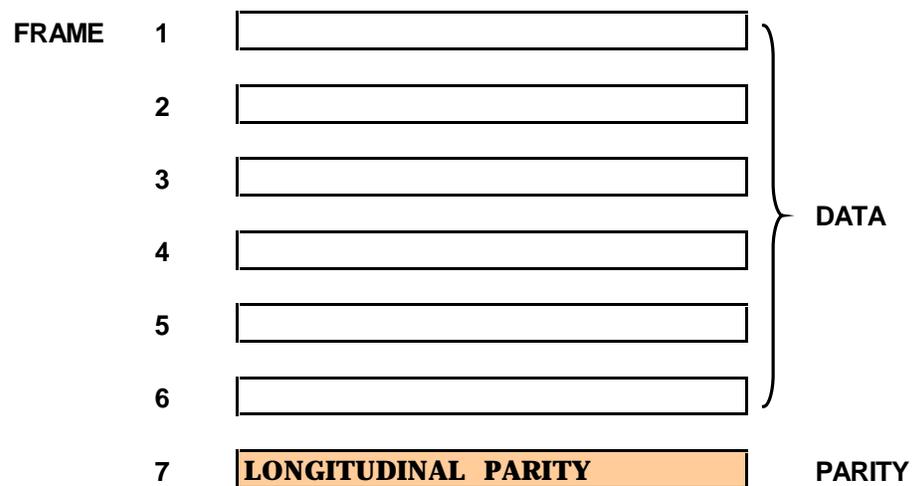
# L1

## PROTOCOLS for the FCSL

### FE to BROADCASTER



### BROADCASTER to TM (L1)

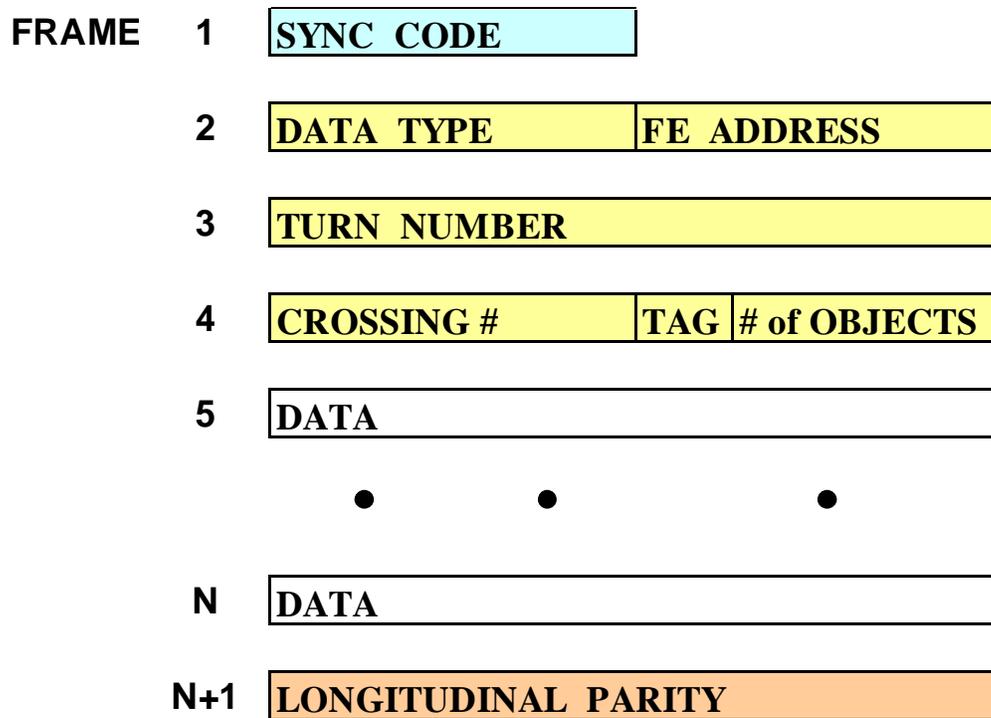


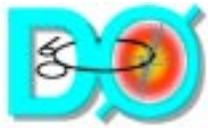


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## L2

### PROTOCOLS for the FCSL





# L1 DATA

## Assignment of Frames and Fields

### FCSL between CFT FE and BROADCASTER

Seven (L1) frames of 20 bits each. Use 16B/20B code.

CFT/CPS L1

b0	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	b15
----	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----

SYNC CODE

DATA TYPE CODE	FE SECTOR ADDRESS
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HEADER

TOTAL NUMBER OF HITS	# OF PHOTONS	ISOLATED TRACKS
----------------------	--------------	-----------------

# OF TRACKS PT1	# OF TRACKS PT2	# OF TRACKS PT3	# OF TRACKS PT4
-----------------	-----------------	-----------------	-----------------

NO PS

# OF TRACKS PT1	# OF TRACKS PT2	# OF TRACKS PT3	# OF TRACKS PT4
-----------------	-----------------	-----------------	-----------------

H PS

# OF TRACKS PT1	# OF TRACKS PT2	# OF TRACKS PT3	# OF TRACKS PT4
-----------------	-----------------	-----------------	-----------------

L PS

LONGITUDINAL PARITY

ISOLATED TRACKS

b12 ISO  
 b13 eISO  
 b14, b15 Pt of ISOLATED TRACK

Track information limited to: 6 tracks per Pt bin  
 24 maximum number of tracks



# L1 DATA

## Assignment of Frames and Fields

### FCSL between BROADCASTER and L1CFTTM

CFT/CPS L1

b0	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	b15
----	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----

TOTAL NUMBER OF FIBERS HIT														
----------------------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--

V	P	Pt BIN									
---	---	--------	---	---	--------	---	---	--------	---	---	--------

V	P	Pt BIN		# OF ELECTRON CANDIDATES											
---	---	--------	--	--------------------------	--	--	--	--	--	--	--	--	--	--	--

# OF TRACKS PT1	# OF TRACKS PT2	# OF TRACKS PT3	# OF TRACKS PT4	NO PS
-----------------	-----------------	-----------------	-----------------	-------

# OF TRACKS PT1	# OF TRACKS PT2	# OF TRACKS PT3	# OF TRACKS PT4	H PS
-----------------	-----------------	-----------------	-----------------	------

# OF TRACKS PT1	# OF TRACKS PT2	# OF TRACKS PT3	# OF TRACKS PT4	L PS
-----------------	-----------------	-----------------	-----------------	------

LONGITUDINAL PARITY	LONGITUDINAL PARITY
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ISOLATED TRACKS

V Valid  
P PS/ Not PS  
Pt BIN Pt of ISOLATED TRACK

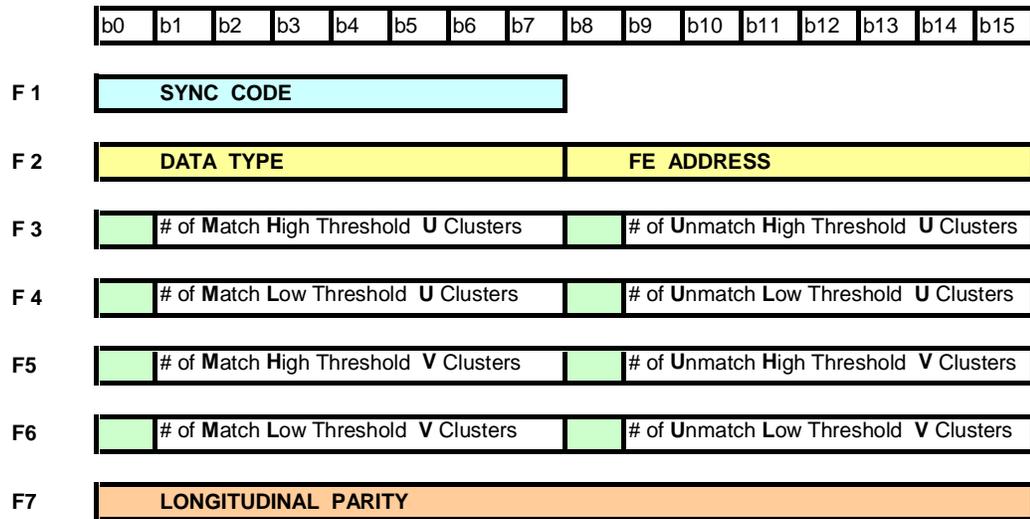
Track information limited to: 15 tracks per Pt bin  
48 maximum number of tracks



# L1 DATA

## Assignment of Frames and Fields

### FCSL between FE L1FPS and BROADCASTER



**Fig.7** Data Fields for L1 Transfers between the FPS and the BROADCASTER.  
Case requiring ONE Fast Cooper Serial Links per FE Board but more coding

U/V indicate the orientation of the fibers



# L1 DATA

## Assignment of Frames and Fields

### FCSL between BROADCASTER and L1FPSTM

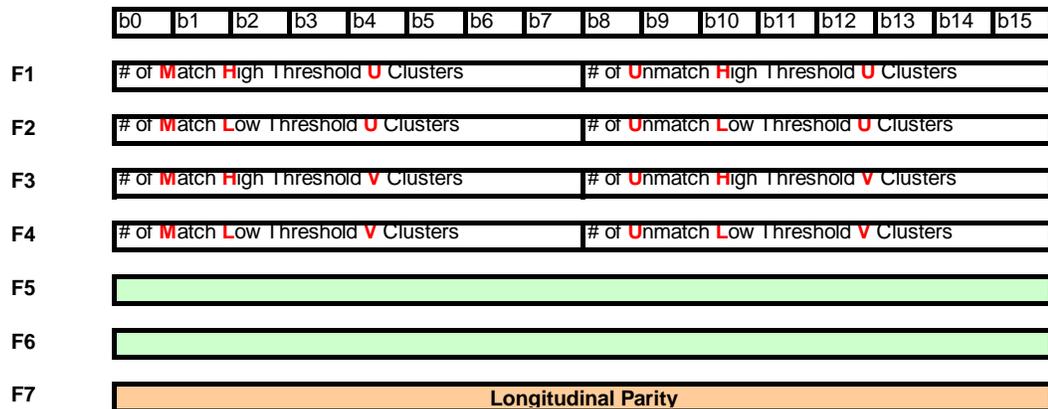
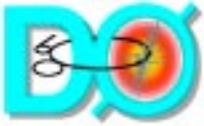


Fig. 8 Data tranfer from the BROADCASTER to the L1FPSTM

U/V indicate the orientation of the fibers



# L2 DATA

## Assignment of Frames and Fields FCSL between FE CFT and BROADCASTER

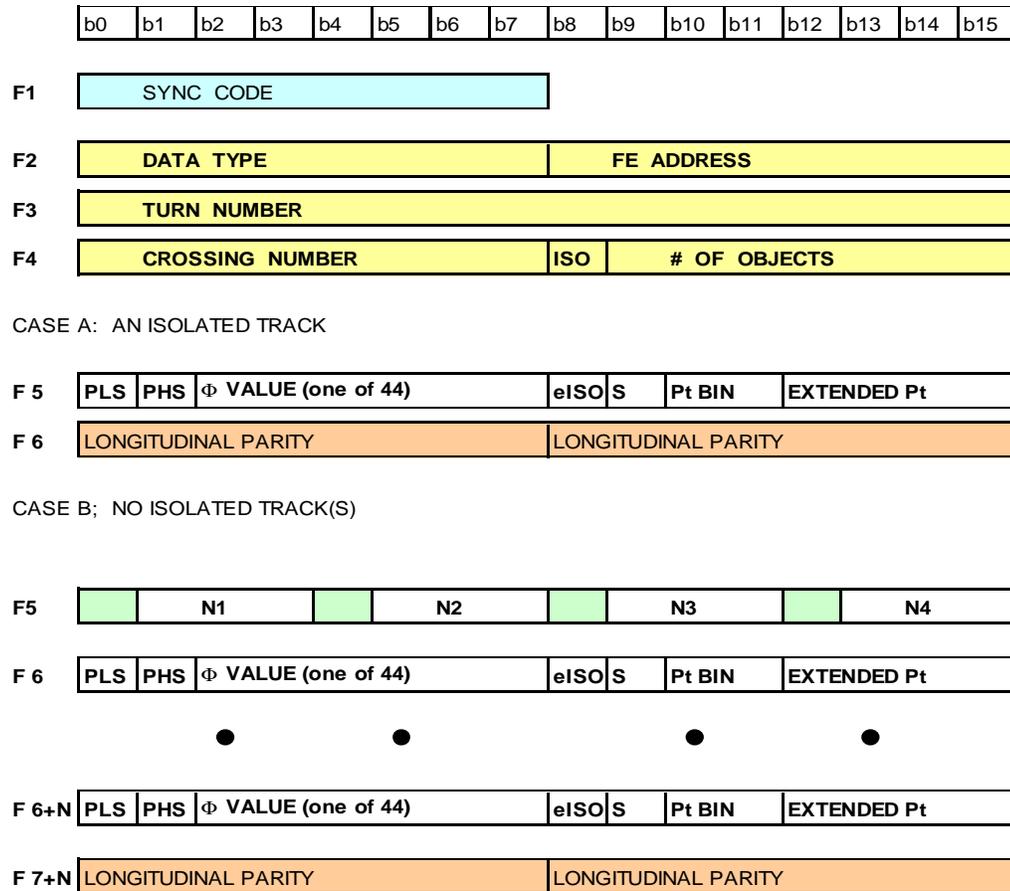


Fig. 11 Data Fields for L2 Transfers between the CFT FE and the BROADCASTER

<b>PSL</b>	If set, the track is associated with a Low Threshold PS cluster
<b>PSH</b>	If set, the track is associated with a High Threshold PS cluster
<b>eISO</b>	If set, this track corresponds to a candidate for an isolated electron
<b>S</b>	Sign of the Pt of the track
<b>Φ value</b>	Relative address of the fiber from layer H that belongs to the track.
<b>Pt BIN</b>	One of four Pt ranges to which the track belongs
<b>EXTENDED</b>	Information to give a finer Pt range within the one defined by the Pt BIN.

*Manuel J. Martin*

12/3/1998



# L2 DATA

## Assignment of Frames and Fields FCSL between FE CPS AXIAL and BROADCASTER

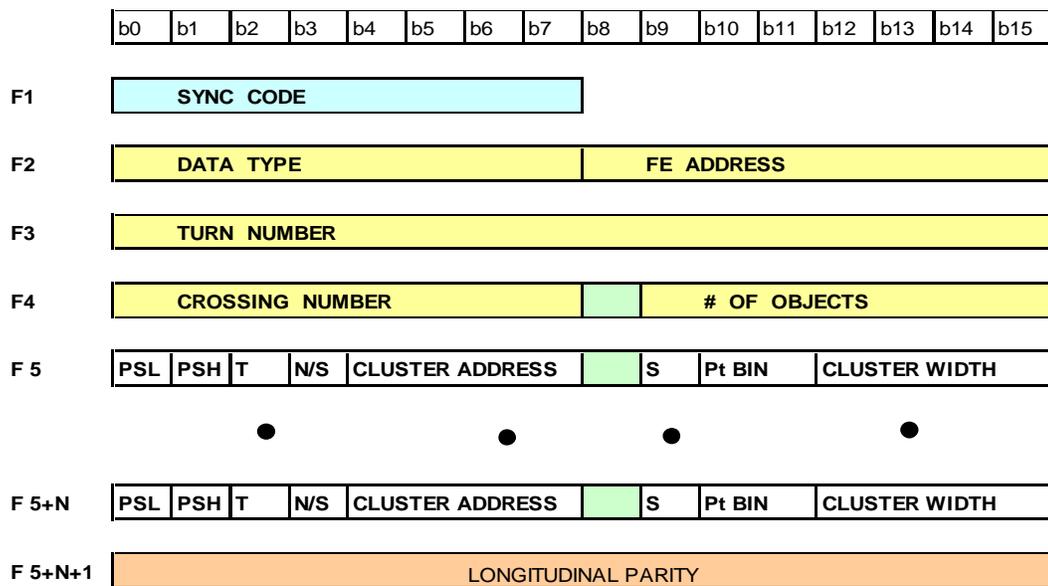
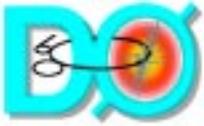


Fig. 12 Data Fields for L2 Transfers of CPS AXIAL data to the BROADCASTER

**PSL** If set the cluster is a Low Threshold PS cluster  
**PSH** If set the cluster is a High Threshold PS cluster  
**T** If set there is a track associated with this clu clSIN/S -1.14 TD 0 Tc 0 Tw (
   
**T**



## L2 DATA

### Assignment of Frames and Fields FCSL between FE CPS STEREO and BROADCASTER

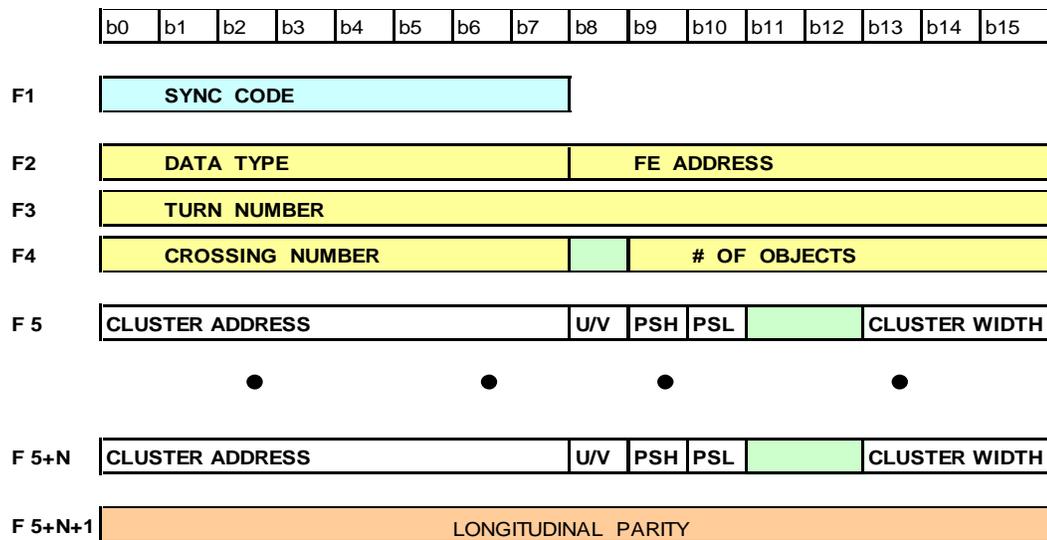


Fig. 12 Data Fields for L2 Transfers of CPS STEREO data to the BROADCASTER

**C. ADDRESS** Relative address of the "first" element of the cluster. One of 256

**C. WIDTH** Cluster width, the maximum width is 8 elements.

**U/V** Orientation of the PS strips.

**PSH** If set the cluster is a High Threshold cluster

**PSL** If set the cluster is a Low Threshold cluster



# L2 DATA

## Assignment of Frames and Fields

### FCSL between FE FPS and BROADCASTER

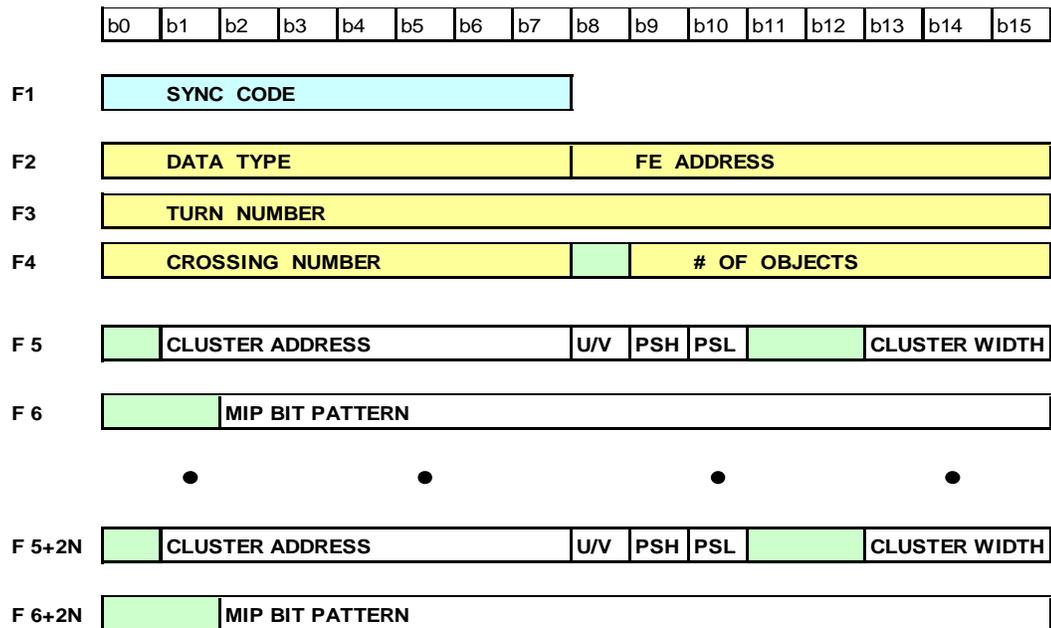
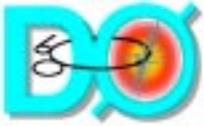


Fig. 13 Data Fields for L2 Transfers from FE FPS to BROADCASTER

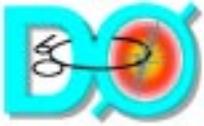


# PROPOSAL

Protocol for

**BROADCASTER to FIC Transfers**

a0	a1	a2	a3	a4 through a19					
c0	c1	c2	c3	b0	b1	•	•	•	b15
1	0	0	0	BEGINNING of RECORD FIRST FRAME of HEADER					
0	1	0	0	HEADER FRAME					
0	0	1	0	DATA FRAME					
0	0	0	1	END of RECORD LONGITUDINAL PARITY					



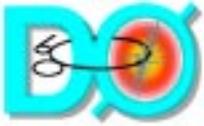
# PROPOSAL

Protocol for

**BROADCASTER to FIC Transfers**

## Field Assignments in the Header

Frame # 1	<b>Word Count</b>		Number of long words in the record not including the 3 header words
Frame # 2	<b>Module Id</b>	<b>First byte</b>	Processor ID as in [3]
		<b>Second byte</b>	Not defined
Frame # 3	<b>Crossing #</b>	<b>First byte</b>	Not defined
		<b>Second byte</b>	Bunch # as in [3]
Frame # 4	<b>Turn #</b>		Turn #
Frame # 5	<b>Event Status</b>	<b>First byte</b>	Processing Format
		<b>Second byte</b>	Global Error Code
Frame # 6	<b>Event Status</b>		Source of Errors ?

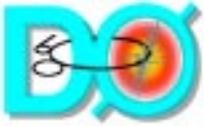


# PROPOSAL

## BROADCASTER to FIC Transfers

### ERROR CODES

BIT	ERROR	G	L
7	Fatal Error. Ignore Data.	✓	
6	Maximum number of consecutive <b>parity</b> errors reached	✓	
5	Maximum number of consecutive <b>Frame Sync</b> errors reached	✓	
4	Maximum number of consecutive <b>Bit Sync</b> errors reached	✓	
3	<b>Parity</b> Error detected	✓	✓
2	<b>Frame Sync</b> Error detected	✓	✓
1	<b>Bit Sync</b> Error detected	✓	✓
0	Test Data (no real data)	✓	



# L2 DATA

## Assignment of Frames and Fields

### GLink between BROADCASTER and L2CFTpp (FIC)

F #	LW#	b0	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	b15
1	1	WORD COUNT															
2	1	MODULE ID (data type?)															
3	2									CROSSING NUMBER							
4	2	TURN NUMBER															
5	3	PROCESSING FORMAT								GLOBAL ERROR CODE							
6	3																
7	4					# of Tracks in Pt bin 1								# of Tracks in Pt bin 2			
8	4					# of Tracks in Pt bin 3								# of Tracks in Pt bin 4			
9	5	ERROR CODE				HPS	LPS	ISO	eISO	S	Pt BIN		EXTENDED Pt VALUE				
10	5	FE BOARD # (address)								Φ ADDRESS							
		● ● ● ● ●															
n-1	n/2																
n	n/2	LONGITUDINAL PARITY								LONGITUDINAL PARITY							

Fig. 18 Fields assignments for data transfers from the BROADCASTER to

Number of Tracks is limited to: a MAXIMUM of 48 per Pt Bin  
a TOTAL MAXIMUM of 48



# L2 DATA

## Assignment of Frames and Fields

### GLink between BROADCASTER and L2CPSpp (FIC)

[AXIAL]

F #	LW #	b0	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	b15				
1	1	WORD COUNT																			
2	1	MODULE ID																			
3	2									CROSSING NUMBER											
4	2	TURN NUMBER																			
5	3	PROCESSING FORMAT								GLOBAL ERROR CODE											
6	3																				
7	4	ERROR CODE				PSH		PSL		T		S		Pt BIN		CLUSTER WIDTH					
8	4	N/S								FE BOARD ADDRESS								CLUSTER ADDRESS			
		●            ●            ●            ●            ●																			
n-1	n/2																				
n	n/2	LONGITUDINAL PARITY								LONGITUDINAL PARITY											

Fig. 19. Data Fields for CPS AXIAL BROADCASTER to L2CPS Transfers.



# L2 DATA

## Assignment of Frames and Fields

### GLink between BROADCASTER and L2CPSpp (FIC)

[STEREO]

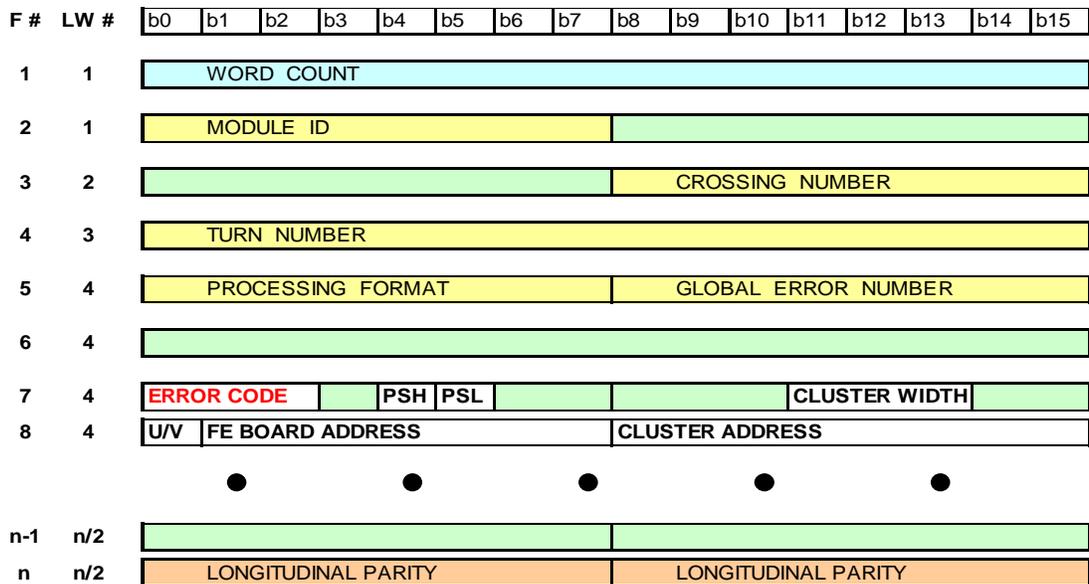
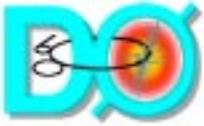


Fig. 20. Data Fields for CPS STEREO BROADCASTER to L2CPS Transfers.



## L2 DATA

### Assignment of Frames and Fields

### GLink between BROADCASTER and L2FPSpp (FIC)

F #	LW #	b0	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	b15
1	1	WORD COUNT															
2	1	PROCESSOR ID															
3	2									CROSSING NUMBER							
4	2	TURN NUMBER															
5	3	PROCESSING FORMAT								GLOBAL ERROR CODE							
6	3																
7	4	ERROR CODE				PSH				PSL				CLUSTER WIDTH			
8	4	N/S		U/V		FE BOARD ADDRESS						CLUSTER ADDRESS					
9	5	MIP BIT PATTERN															
10	5																
		●                      ●                      ●                      ●                      ●															
n-1	n/4																
n	n/4	LONGITUDINAL PARITY								LONGITUDINAL PARITY							

Fig. 21. Data Fields for FPS: BROADCASTER to L2FPS Transfers.

Note that each cluster requires three (3) full frames to carry the desired information. Following the rule of data being always transferred by long words, this implies that each cluster information is encoded into four (4) frames.