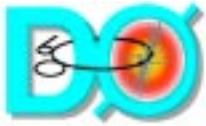


The BROADCASTER

**communication protocols
and
data encoding**

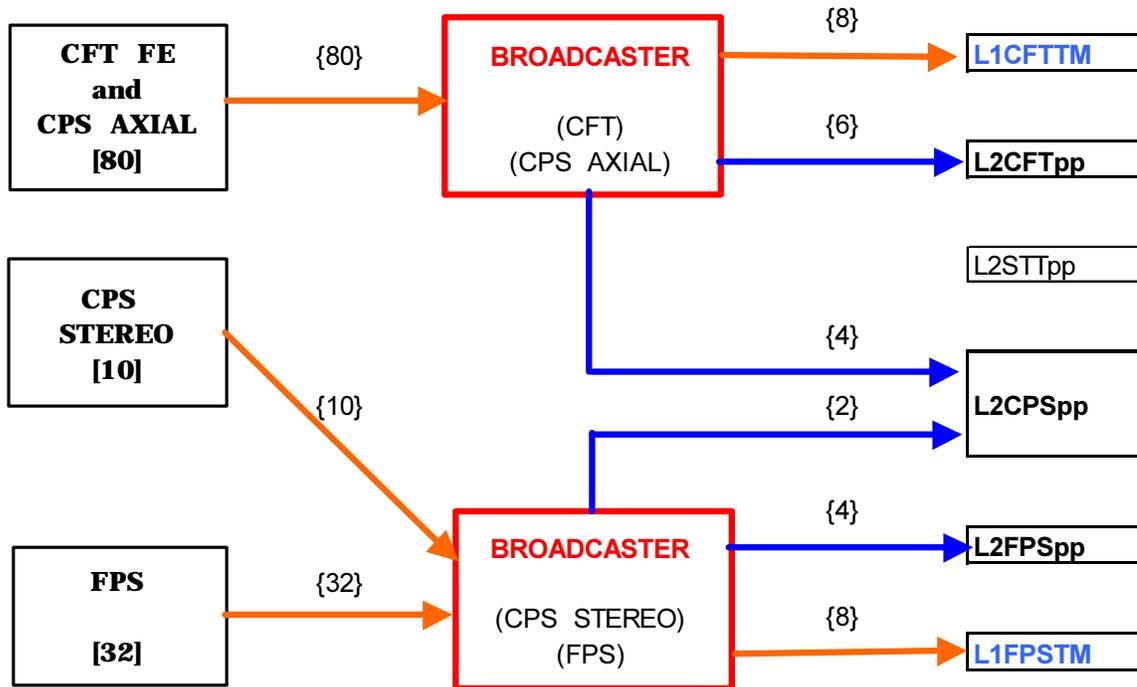
The ideas presented here were born long ago when I first start looking at the CFT (1996).

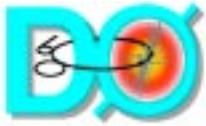
They evolved during the last months into a **PROPOSAL** made last **October**. Since then some improvements have being made.



LINKS between FE and BROADCASTER BROADCASTER and TRIGGERS

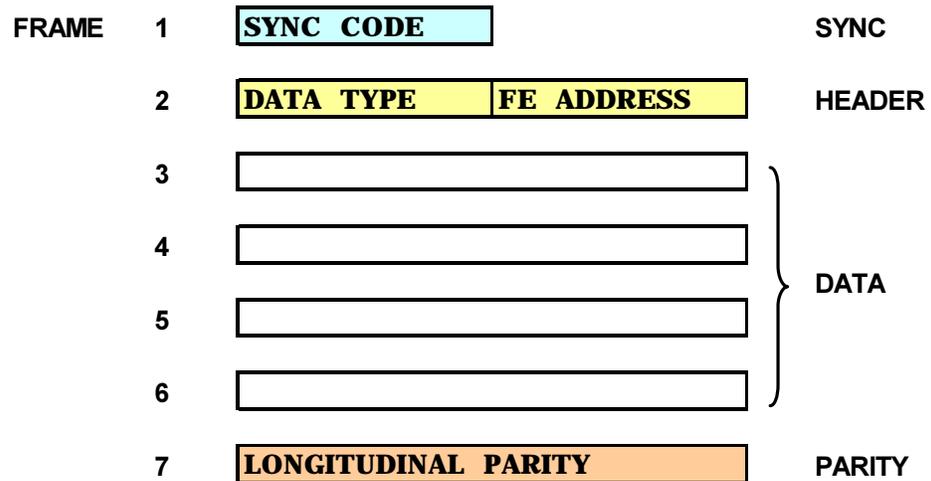
— Fast Copper Serial Link
— G Link



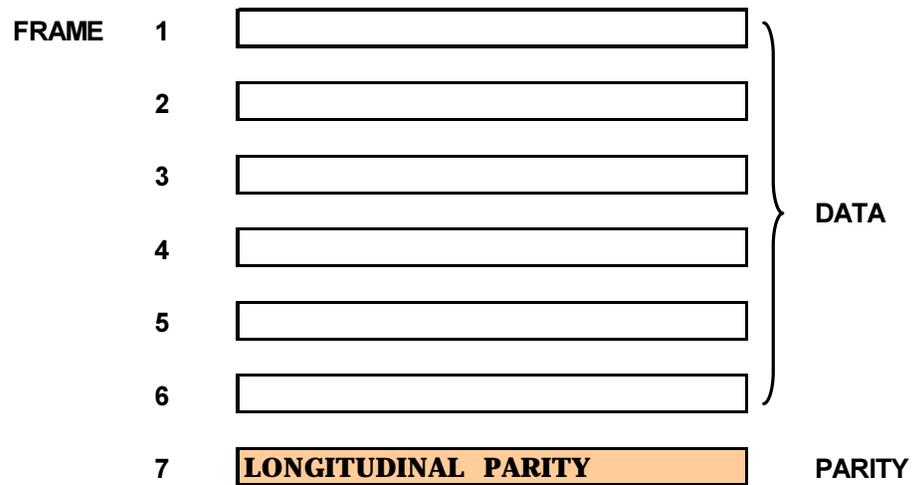


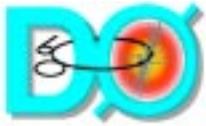
L1 PROTOCOLS for the FCSL

FE to BROADCASTER



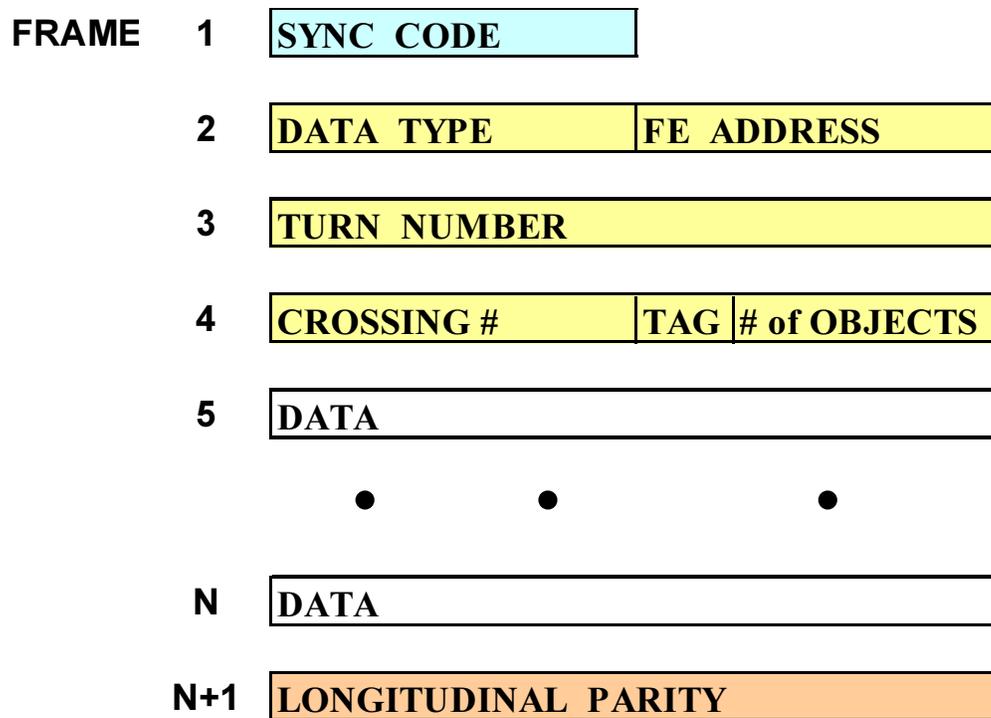
BROADCASTER to TM (L1)

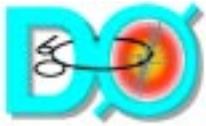




L2

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
----------------	-------------------

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
-----------------	-----------------	-----------------	-----------------

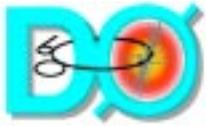
L PS

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
-----------------	-----------------	-----------------	-----------------	-------------

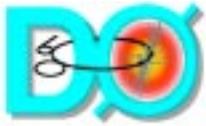
# OF TRACKS PT1	# OF TRACKS PT2	# OF TRACKS PT3	# OF TRACKS PT4	L PS
-----------------	-----------------	-----------------	-----------------	-------------

LONGITUDINAL PARITY	LONGITUDINAL PARITY
---------------------	---------------------

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

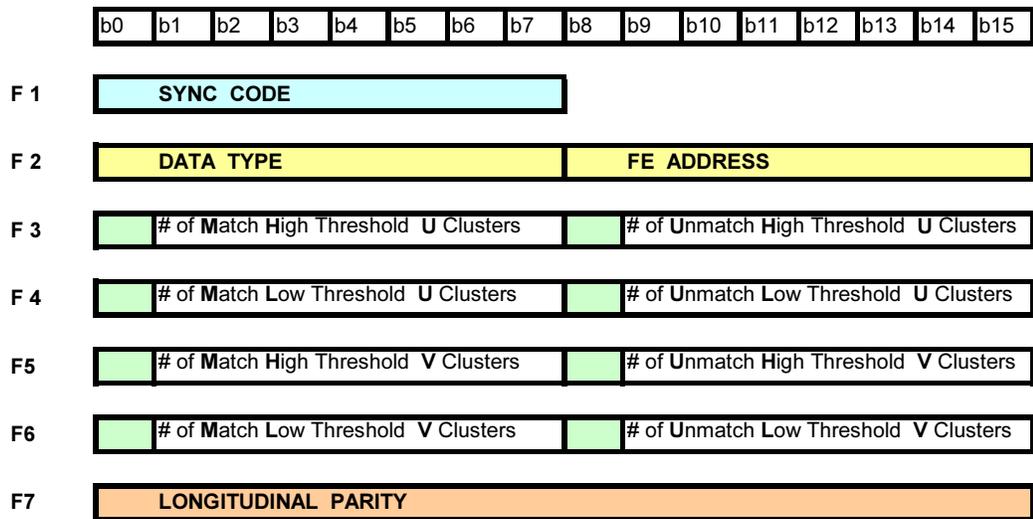
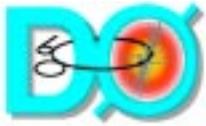


Fig.7 Data Fields for L1 Transfers between the FPS and the BROADCASTER.
Case requiring ONE Fast Cooper Serial Links per FE Board but more coding

U/V indicate the orientation of the fibers



L1 DATA

Assignment of Frames and Fields

FCSL between BROADCASTER and L1FPSTM

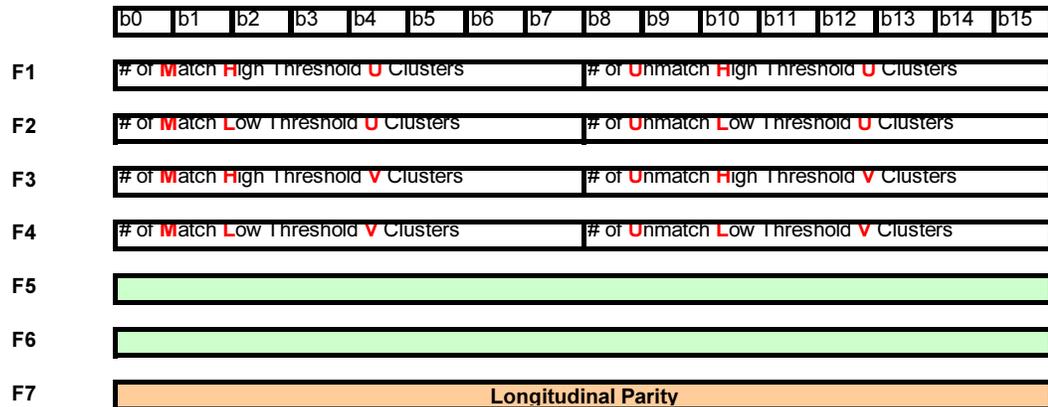
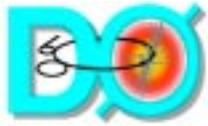


Fig. 8 Data tranfer from the BROADCASTER to the L1FPSTM

U/V indicate the orientation of the fibers



L2 DATA

Assignment of Frames and Fields FCSL between FE CFT and BROADCASTER

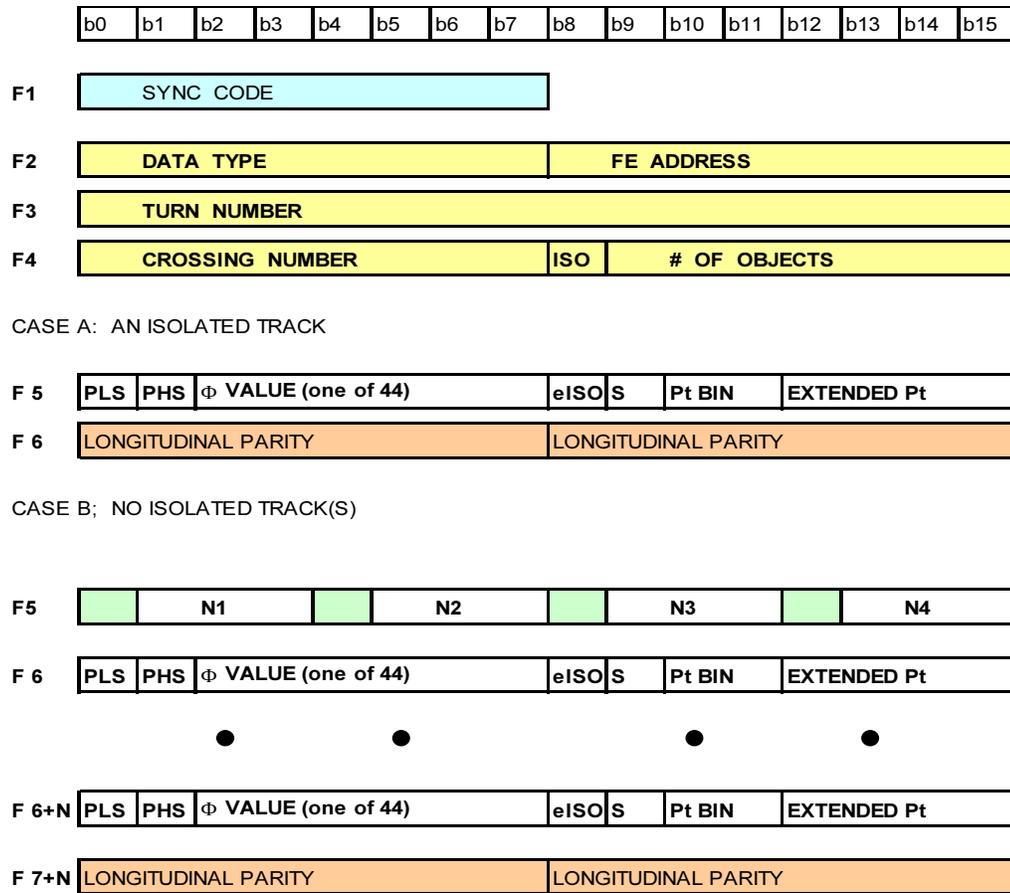
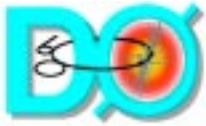


Fig. 11 Data Fields for L2 Transfers between the CFT FE and the BROADCASTER

- PSL** If set, the track is associated with a Low Threshold PS cluster
- PSH** If set, the track is associated with a High Threshold PS cluster
- eISO** If set, this track corresponds to a candidate for an isolated electron
- S** Sign of the Pt of the track
- Φ value** Relative address of the fiber from layer H that belongs to the track.
- Pt BIN** One of four Pt ranges to which the track belongs
- EXTENDED** 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**

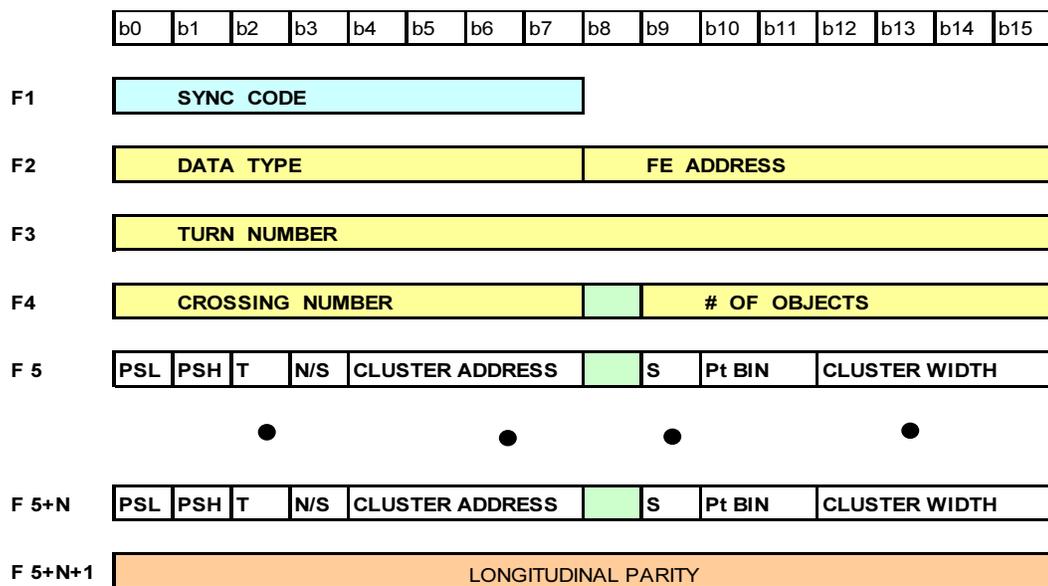
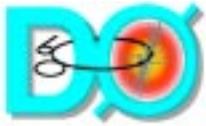


Fig. 12 Data Fields for L2 Transfers of CPS AXIAL data to the BROADCASTER

- 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 cluster
- N/S** Gives information about the Z position of the cluster
- C. ADDRESS** Relative address of the "first" element of the cluster. One of 16.
- S** Sign of the Pt of the track associated with the cluster
- Pt BIN** One of four Pt ranges to which the track associated with the cluster belongs
- C. WIDTH** Cluster width, the maximum width is 8 elements.



L2 DATA

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

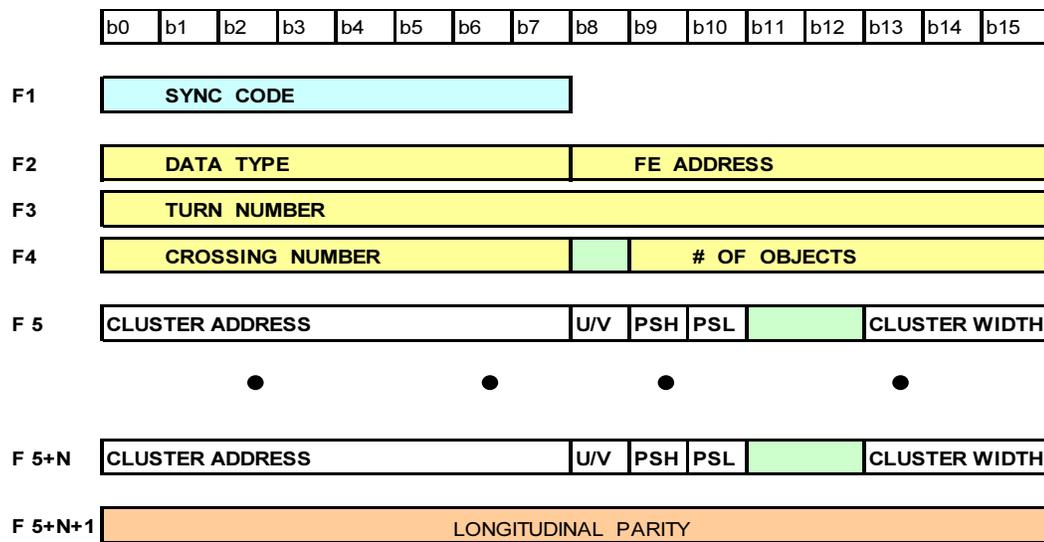


Fig. 12 Data Fields for L2 Transfers of CPS STEREO data to the BROADCASTER

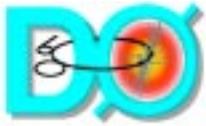
C. ADDRESS Relative address of the "first" element of the cluster. One of 256

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

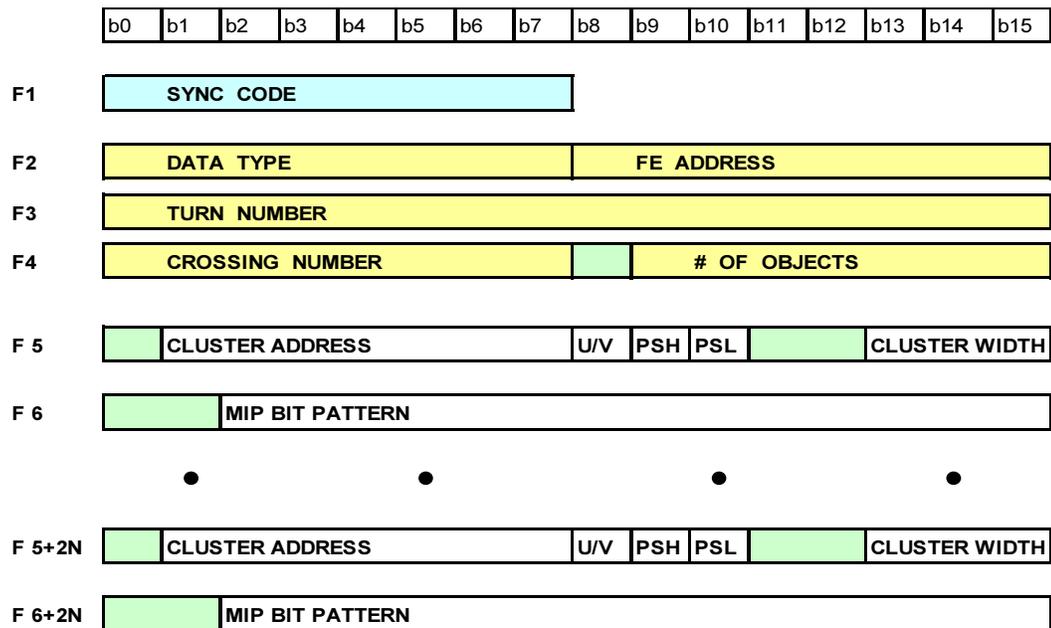
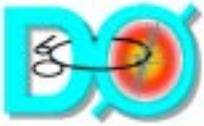


Fig. 13 Data Fields for L2 Transfers from FE FPS to BROADCASTER

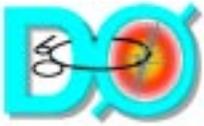


PROPOSAL

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					



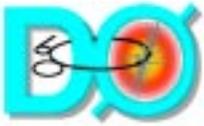
PROPOSAL

Protocol for

BROADCASTER to FIC Transfers

Field Assignments in the Header

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

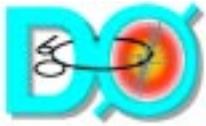


PROPOSAL

BROADCASTER to FIC Transfers

ERROR CODES

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



L2 DATA

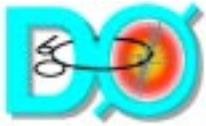
Assignment of Frames and Fields

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]

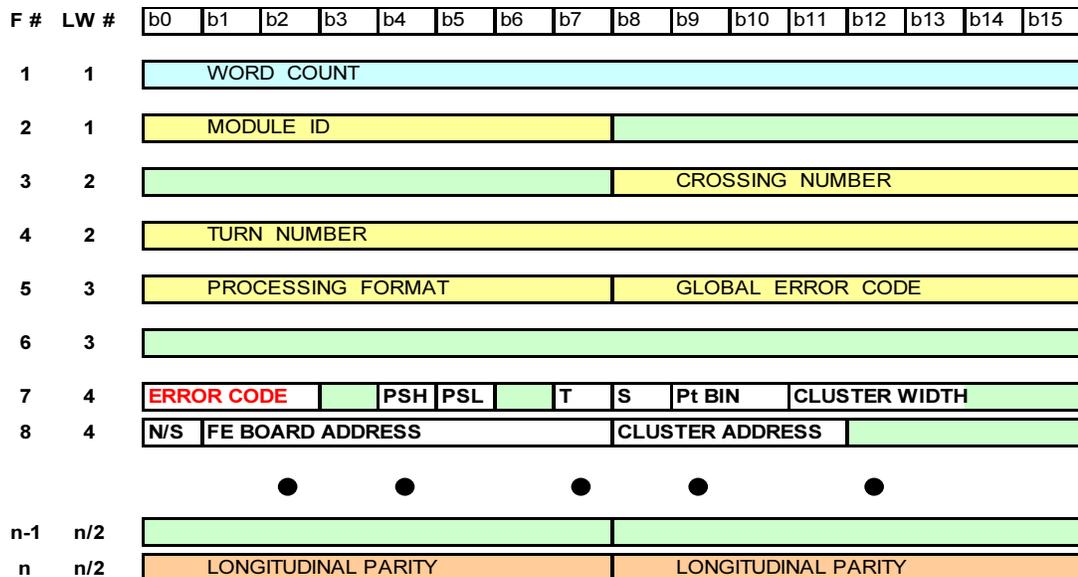
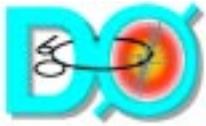


Fig. 19. Data Fields for CPS AXIAL BROADCASTER to L2CPS Transfers.



L2 DATA

Assignment of Frames and Fields

GLink between BROADCASTER and L2CPSpp (FIC)

[STEREO]

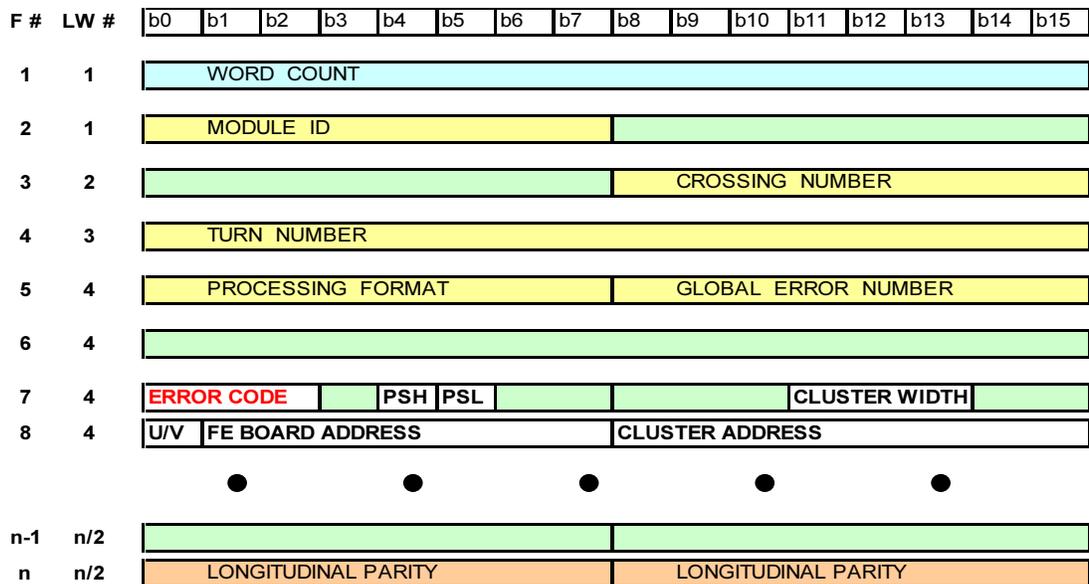
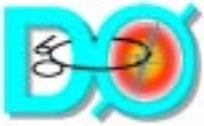


Fig. 20. Data Fields for CPS STEREO BROADCASTER to L2CPS Transfers.



L2 DATA

Assignment of Frames and Fields

GLink between BROADCASTER and L2FPSpp (FIC)

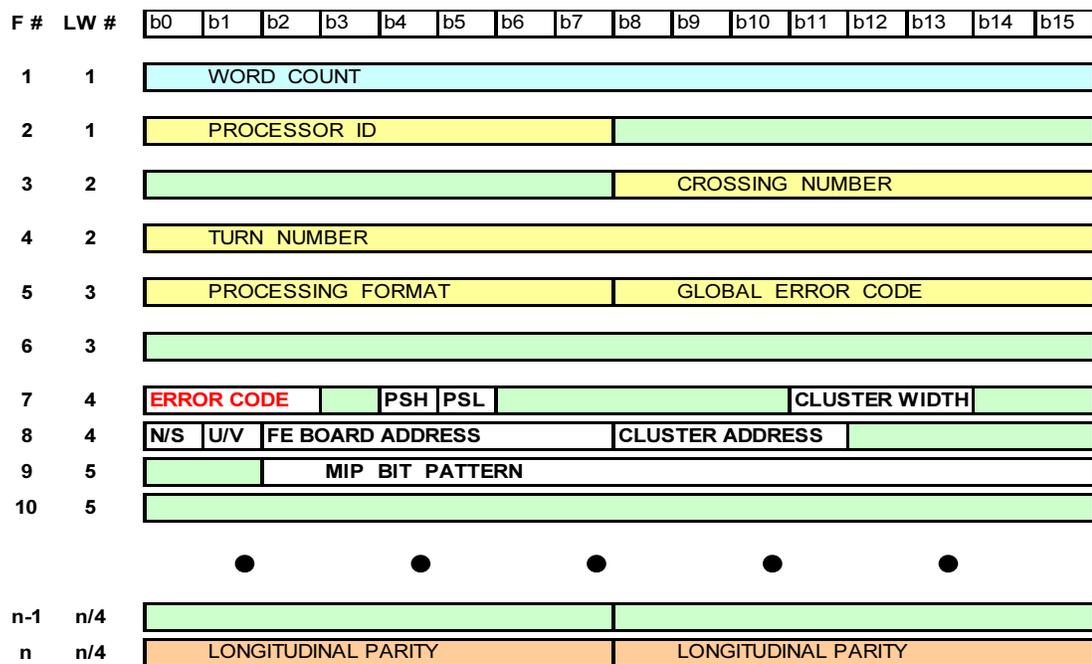


Fig. 21. Data Fields for FPS: BROADCASTER to L2FPS Transfers.

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.