SciFi Detector

Antonio Pellegrino, Wilco Vink,

December 12 2013

Front end

- Technology
  - Analog front end in PACIFIC asic (amp, shaper, ADC)
  - Data-compression algorithm (clustering) in FPGA

Data Format

- Header lenght, identical for all data types
  - 8 bits Bunch count ID
  - 3 bits info
  - 3 bits number-of-clusters
  - would like to add few detector-dependent header bits
- ZS data
  - 16 bits per cluster (e.g. 6 clusters in one GBT 112b frame)
- NZS data per SiPM
  - Header + 128 × 6b ADC = 7 × 112b GBT frames

Header

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Info			Spare		Length			BCID							

Header Synch command

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Info			Sp.	BCID											

ZS data

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Fraction		Cell							SiPM		Cluster Size		ADC Charge		

NZS data

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	ADC2					ADC1					ADC0				
.....															
ADC127						ADC126					ADC125				

Data Format

Synch data

- **80 bits GBT or 112 widebus GBT**
- **AMC40 specs: 16 bits header + SYNC pattern**
- **we request the "insertion" of a Link ID**
  - **mandatory: 9 bits geographical address according to convention in** http://www.nikhef.nl/pub/experiments/bfys/lhcb/outerTracker/NamingConventions/C-Frames/naming.html
  - **desirable: 9 bits FE Box serial number**

E.g. something like

Synch Data						
111:96	95:80	79:64	63:48	47:32	31:16	15:0
Link Id bits	Fixed Ptrn	Fixed Ptrn	Fixed Ptrn	Fixed Ptrn	Fixed Ptn	Header

Front end

- GBT width: we propose 112 bits ("widebus", no RS error correction)
- GBT emulation of widebus developed by F. Alessio, M. Feo and W. Vink
  - M. Feo studying receiver code optimization (should get in touch with Guillaume)
- Data ordering
  - High-occupancy section ordered (1 SiPM ⇒ 1 GBT frame)
  - Low-occupancy section too (but more SiPMs ⇒ 1 GBT frame)
- Variable latency depending on occupancy (output buffer with limited depth)
- Non valid data GBT frames, flagged by "idle" (Data valid)
- special running modes? Yet to be discussed
- Estimated bandwidth:
  - 24 GBT per AMC40 / 4 AMC40 per TELL40 / 96 GBT per TELL40
  - 28 TELL40's
  - For details https://indico.cern.ch/getFile.py/access?contribId=5&resId=1&materialId=slides&confId=285938
- Manpower estimates in progress (SciFi TDR in spring, NL and F involved)

Back end

- **Data processing, prefer generic**
  - **Histogramming highly desirable (even with "1 channel window")**
  - **Calibration modes (for commissioning)**
- **Manpower :**
  - **LPNHE Paris involved (O. Le Dortz)**
- **Need discussion on other items from questionaire**