

Time alignment

All sub-detectors are optimising readout as compromise between robustness and cost. OK, but.....

We must consider special scenarios where more information is required (eg more bits of BXID). For example,

time alignment within each sub-detector

time alignment of LHCb

(Remember we don't have the LO trigger !!!!)



	BXO	BX1	BX2	BX3	BX4	BX5	BX6	BX7	BX8	BX9	BX10	BX11	BX12	BX13	BX14	BX15
BXIDRst -SODIN	,															
	delayA	\longrightarrow		BXIDRs	tA											
BXIDA	3562	3563	0	1	2	3	4	5	6	7	8	9	10	11	12	13
	delayB			\longrightarrow		BXIDRs	tB									
BXIDB	3560	3561	3562	3563	0	1	2	3	4	5	6	7	8	9	10	11
'Beam' data i A and B	in							l								

Beams collide in only one BX (or a few well-spaced BXs)

Detector A sends a packet with data and BXID = 4 Detector A sends a packet with data and BXID = 2

Difference used to align BXIDResets

H3653	H0	H1
H2	H3	H4
Dat	H5	
H6	H7	

H3653	H0	H1		
H2	Data2			
H3	H4	H5		
H6	H7			



Example of a SPECIAL MODE: VELO data packets (30-bits):

Normal running	9-bit BXID	8-bit Supe	er-pixel Hit Map	13-bit Super-pixel address						
Time alignment running	12-bit BXID	2-bit ?	3-bit SP Hit Count	13-bit Super-pixel address						
Another example (in FE specs!): TFC-alignment mode: Replace data with TFC command received for each BX										
TFC alignment	12-bit BXID = N		TFC command	TFC command received at BXID = N						
Then compare to see if offsets are correct/consistent										
Ken Wyllie CERN		3		LHCb electronics. 12th December 201						



Test pulse injection (TFC triggered & phase adjustable) But is still sensitive to cable delays

Cosmics Gives absolute timing, but rare.....

Laser (or similar, TFC triggered & phase adjustable) Very useful, but not all detectors are sensitive

Beam

Ultimate tool, but quite expensive!



We still have time to put helpful features in the front-end designs, so.....

Next meeting in Feb 2014:

sub-detector ideas for time-alignment & commissioning, and how to implement them