

## AHCAL preparations for test beam

## The online monitor

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- A new online display for the AHCAL technical prototype
- Online monitor ADC
- Online monitor TDC
- Summary and outlook



- AHCAL technical prototype in test beam at CERN in November
- Only one layer (4 HBU)
- Completely different readout than physical prototype (Spiroc2b + USB Readout)
- New TDC capabilities of Spiroc2b  $\rightarrow$  shower timing studies
- $\rightarrow$  Need of a new online monitor to cope with:
  - TDC monitoring
  - Completely new output data format

## The DAQ



- Labview DAQ for
  - Slow control
  - Chip settings
  - USB readout
- Data saved with new data format in a text file

- max 20Hz

Ch 14 102 ON Ch 26 181 9 OK ch 2 0 ch 14 0 ch 26 0 ch 2 (123 ON Ch 15 0 77 O ON Ch 27 142 9 ON ch 3 0 ch 15 0 ch 27 0 ch 2 🕀 137 🔾 ON Ch 28 182 9 0N ch 4 0 ch 16 0 ch 28 0 2) 120 ON Ch 16 88 9 ON 114 🔾 ON Ch 17 174 9 ON Ch 29 2155 9 ON ch 5 0 ch 17 0 ch 29 0 Ch 30 🕀 0 ch 6 140 0 0h ch 7 (137 🔾 ON 0 Ch 31 Slow control Ch 8 () 172 O ON 0 Ch 32 Ch 9 119 ON Ch 21 160 ON Ch 33 126 OF Ch 9 7 0 Ch 21 7 0 Ch 33 7 0 ch 10 (116 ON ch 22 (125 ON ch 34 (102 ON ch 10 0 ch 22 0 ch 34 0 Ch 11 (142 ON Ch 23 (130 ON Ch 35 (136 ON Ch 11 0 Ch 23 0 Ch 35 0 Discriminator Mask Enable Internal Test Capacitor Enable Discriminator Mas All Channel Mark Enabled Individual Ch. Control esult data file wo extension 2 \CC\1D\00\01\C8\01 C:\testbeam2012\Beam 04o09o12 HBUVI\Run 0041.dat estbeam2012\Beam\_04o09o12\_HBUVI\Run\_004 Choose Chip I or online disp Validation \CC\1D\00\01\C8\0 no. cycles 2 InfoCycle ChipIDs\_inSlab2 1500 100 OFF 129 ChIDO 400 current cycle 2 infoCycle no\_trig Poll\_Cycle Set ChID1 2 130 1Layer  $\rightarrow$  4 HBU  $\rightarrow$  16 Spiroc  $\rightarrow$  576 channels DAQ and run monitor 200 250 300 350 400 450 500 (1..36) / events (1..16) [left to right] 550 600 ò 10 15 channels (1..36) / events (1..16) [left to right] - limited by the on board USB readout chip 1024 2415 3706

100 150 200 250 300 350 400 450 500

hannels (1.,36) / events (1.,16) [left to right]

Discri 4-bit DAC Threshold Adjust

ch 0 0 Ch 12 0 Ch 24 0

ch 1 0 Ch 13 0 Ch 25 0

- Size:

- Rate:

Input 8-bit DAC

Ch 0 () 182 🔾 ON

Ch 1 143 9 ON

ch 12 0 ON ch 24 85 ON

Ch 25

Ch 13 0 ON

Ĕ 1350 ·

1300

15

channels (1...36) / events (1...16) [left to right

3561



 $\rightarrow$  all are events



Readout: chip memories are read out one after another if readout is triggered (readout cycle):

- max. of 16 memory cells per chip
- only triggered memory cells in one chip (all channels) are read
  - $\rightarrow$  different amount of data per chip
- $\rightarrow$  No time order in readout data (in one readout cycle)
- → Need event builder (rudimentary)

p <del>-</del>						
nnel	Bxid	TDC	Events	(unique BXi	d:Reado	)
1	200	345	EvontNr		Dvid	
1	1500	654	Eventini	Channel	BXIU	
1	2500	245	0	1	200	
-	2000	2.0	1	1	1500	
chip 2			-	1	1500	
Channel	Bxid	TDC	2	2	1900	
1	1500	665	3	1	2500	
1	1900	433				

#### chip 1

## The Online Monitor



#### New online monitor

ADC Single Channel Options

ADC TDC RATE

RATE

counts

Speed

400

300

200

100

0<u>`</u>

- → Reads the text file during readout
- → Runs on a network connected computer
- → Flexible to be used with single or multiple HBUs
- → Standard functionality used now more histograms for CERN can easily be added

50

Event #

6500

→ Easy to use code: C++ and ROOT

Not so Simple Examp

100

Reset Rate

Average

500 🖨



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- Look at MIP spectra from single channels



 $\rightarrow$  ADC online monitor well understood and used extensively

### Testbeam at DESY







- Need of a TDC zero per event
- $\rightarrow$  Must be in the same ramp
- → DESY test beam: middle of the shower
- $\rightarrow$  No option for hadron showers (0.5 – 8 hits per event in the last layer)



## TDC – Timing Plot



# - Online analysis of showers in <u>one</u> chip at DESY: (in preparation for CERN)



Cuts applied:

- Center of shower triggered (channel 18)
- More than one channel triggered
- Energy cut over 1/2 MIP (roughly)
- TDC only usable are

After noise cut: RMS ~50 TDCbins

No corrections applied (only for online monitor):

- Channel wise TDC offset
- Time walk effect



- Preparations for test beam are ongoing
- Online monitor and tools for test beam 2012 at CERN are ready and being extended
- Timing measurement with Spiroc2b is challenging but is developed in DESY test beam to be ready for CERN





## Thank You!

For your attention