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TestBeamOct2017

This section will summarize the main documents, informations and results of the October 2017 testbeam. A fiber based telescope was installed in the testbeam area (Prévessins site).

- The layout is presented below .
- The data can be found on the LPHE cluster under /panfs/scifi_testbeam/Oct2017 --- TO BE CONFIRMED . The data files were renamed to correspond to the software standard.

This chapter focuses on the measurement planned and the status.

Open issues

- X1 (6 layer mat) has larger cluster size: 2.7ch for LY=33.3 PE. As a comparison, Y1 (6 layer mat) has cluster size: 2.45ch for LY 33.3 PE. Maybe due to an air gap between SiPM and fibre mat.
- btsoftware_analysis: we don't find where the result root files (for clusters and track) are written...

Over-voltage scan

Default z-position is: 268mm between Y2 and X3 (measured after all dV scans with the laser).

1) Fix telescope stations 1,2,4 and 5 to 3.5V and vary the over-voltage of station 3 from dV=1.5V to 7V every 0.5V

These measurements are finished (07.10 early morning). TO BE CONFIRMED by the analysis that the data is ok. Remarks:

- In runs 4, 5, 6, 11, 15, we detected with the event display of lect_sipm a desynchronisation (generally of boards 10 and/or 15). It seems that station 3 is one event in advance wrt the other stations.
- In all runs almost, Y1 has a lower gain.
- X1 has larger cluster size, maybe due to a gap between the SiPM and the mat.
- At high dV, the bts preAnalysis doesn't manage to compute correctly the ADC gain for X3.

Measurement	Status / LED + DATA	Run number	lect_sipm (clusters // synchronisation)	bts (gain // clusters // tracks)	Remark
Station 3 dV=1.5V 100k events	X	1	ok // ok	Y3 (not able to find gain) // ? // ?	
Station 3 dV=2.0V 100k events	X	2	ok // ok	Y3 (not able to find gain) // ? // ?	
Station 3 dV=2.5V 100k events	X	3	ok // ok	ok // ? // ?	
Station 3 dV=3.0V 100k events	X	4	ok // **desynchronisation from ~ev.86k**	ok // ? // ?	Y1 a bit lower gain
	X			ok // ? // ?	Y1 a bit lower gain

Station 3 dV=3.5V 100k events		5 (no use)	ok // **desynchronisation from ~ev.15k (X3 and Y3)**		
Station 3 dV=3.5V 1M events	X	6	ok // **Y3 desynchronisation from ~ev.654k**		Dark and LED same as Run 5 (Launch during the night 05.10.2017) Y1 shines a bit lower gain
Station 3 dV=4.0V 100k events	X	7	ok // ok	ok // ? // ?	Y1 a bit lower gain
Station 3 dV=4.5V 100k events	X	8	ok // ok	gains for X3 not computed correctly // ? // ?	
Station 3 dV=5.0V 100k events	X	9	ok // ok	ok // ? // ?	**noise peak at low cluster sum for station 3** (not so much present for higher dVs) low gain Y1
Station 3 dV=5.5V 100k events	X	10	ok // ok	gains for X3 not computed correctly // ? // ?	gain computed by bts for X3 is ~90 (expected ~160). But LED is fine.
Station 3 dV=6.0V 100k events	X	11 (no use)	ok // **desynchronisation from ~ev.35k**	gains for X3 not computed correctly // ? // ?	Y1 has lower gain gain computed by bts for X3 is ~90 (expected ~160). But LED is fine.
Station 3 dV=6.0V 100k events	X	13	ok // ok	gains for X3 not computed correctly // ? // ?	data taken again for dV=6V gain computed by bts for X3 is ~90 (expected ~160). But LED is fine.
Station 3 dV=6.5V ~20k events	X	12 (no use)	? // ok	gains for X3 not computed correctly // ? // ?	tracks with **large angles** gain computed by bts for X3 is ~90 (expected ~160). But LED is fine. Run stopped because desynchronization was detected in previous run.
Station 3 dV=6.5V 100k events	X	14	ok // ok	gains for X3 not computed correctly // ? // ?	gain computed by bts for X3 is ~90 (expected ~160). But LED is fine.
Station 3 dV=7.0V 100k events	X	15	ok // **Y3 desynchronisation from ev.65k**	gains for X3 not computed correctly // ? // ?	gain computed by bts for X3 is ~90 (expected ~160). But LED is fine.

2) Fix telescope station 3 to 3.5V and vary the over-voltage of station 1,2,4,5 from dV=2V to 6V every 0.5V

Measurement	Status / LED + DATA	Run number	lect_sipm (clusters // synchronisation)	bts (gain // clusters // tracks)	Remark
Stations 1,2,4,5	X	17	ok // ok	// //	

dV=2.0V 100k events					
Stations 1,2,4,5 dV=2.5V 100k events	X	18	ok // ok	// //	
Stations 1,2,4,5 dV=3.0V 100k events	X	19	ok // ok	// //	
Stations 1,2,4,5 dV=3.5V 100k events	X	16	ok // ok	// //	
Stations 1,2,4,5 dV=4.0V 100k events	X	20 (no use)	ok // **desynchronisation from ~ev.38k (X3 Y3)**	// //	
Stations 1,2,4,5 dV=4.0V 100k events	X	25	Noise cluster due to DCR // ok	// //	Rerun 20 due to desynchronisation. Use (pedestal, 24) and (LED,20)
Stations 1,2,4,5 dV=4.5V 83k events	X	21	ok // ok	// //	stopped at 83k because of access
Stations 1,2,4,5 dV=5.0V 100k events	X	22	Noise cluster due to DCR // ok	// //	
Stations 1,2,4,5 dV=5.5V 100k events	X	23	Noise cluster due to DCR // ok	// //	
Stations 1,2,4,5 dV=6.0V 100k events	X	24	Noise cluster due to DCR // ok	// //	

z position scan

Change z-position increased in 10cm steps for 5 points with all stations at dV=3.5V

Measurement	Distance Y2-X3 [mm]	Status / LED + DATA	Run number	lect_sipm (clusters // synchronisation)	bts (gain // clusters // tracks)	Remark
z=0cm (Default position) 100k events	268			//	// //	
z=5cm 100k events	316.9	X	26	ok // ok	// //	Take LED 2 times // photon peaks move during LED run // Event display a bit of strange cluster in Y1
z=10cm 30k events	369.4	X	27	//	// //	stopped at ~30k because of access
z=10cm 100k events	369.4	X	28	//	// //	The telescope is tilted and causes a disappearance of the beam in the second box
	369.4	X	29		// //	

z=10cm 100k events				2nd (S 3 4 5) box is a bit off angle // ok		Must move the telecope toward the computer 0.5 cm (push from the second box 3 4 5)
z=15cm 100k events	420.7	X	30	//	// //	High intensity beam // A lot of additional particles due to the high intensity beam
z=15cm 100k events	420.7	X	31	ok // ok	// //	
z=20cm 100k events	470.7	X	32	2nd (S 3 4 5) box is a bit off angle (acceptable) // ok	// //	
z=25cm 100k events	520.7	X	33	//	// //	

Black tape - reflectivity studies

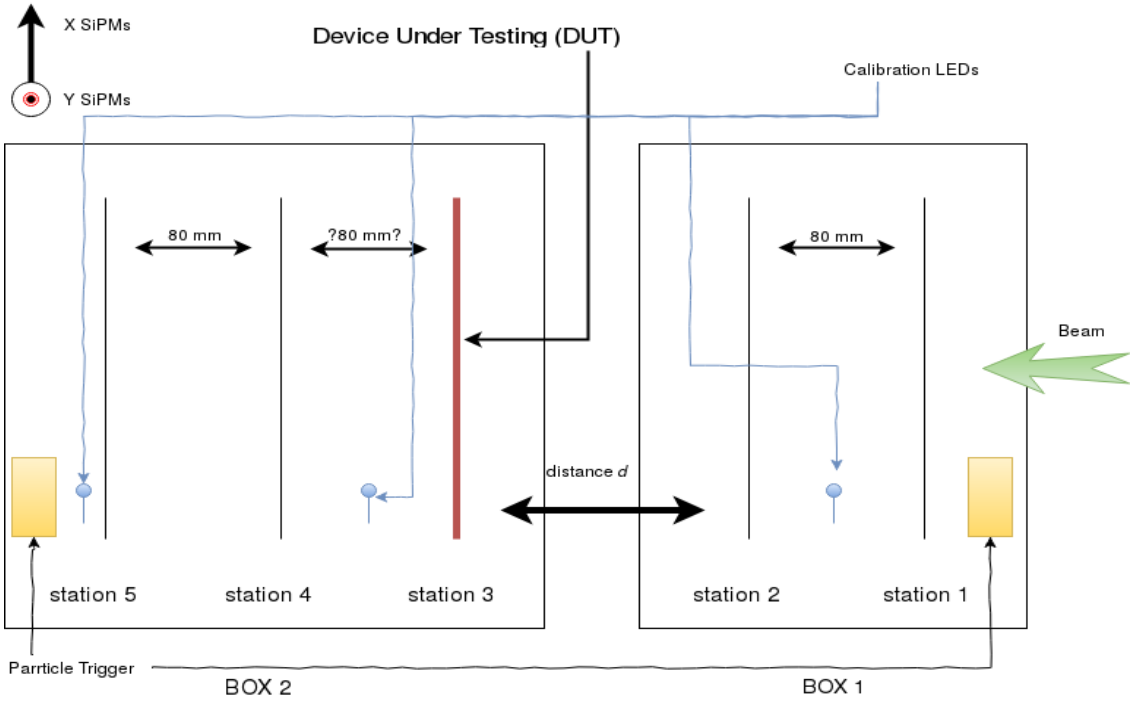
Add a black tape on the fibres at the mirror side. LY studies

Measurement	Status / LED + DATA	Controlled	Run number	Remark
Station 1,2,3,4,5 dV=3.5V 1M events				

Telescope layout

The telescope is based on scintillating fibers coupled to SiPMs. The fibers are 10cm long. The telescope is composed by 5 detection planes (called stations) each composed by two layers (x and y).

- Position of the stations (confirm the position of the DUT and the distance between the two boxes):



- A plan of the stations as set for Hamburg: TBea.pdf

SIPMs used

Station	SiPM X old name	SiPM Y old name	SiPM X new name	SiPM Y new name	Uplink X	Uplink Y	# layer X	# layer Y	Breakdown voltage [V] X//Y	# ch
1	X1=OF1030322-0014	Y1=OF1029927-0001	X1=9	Y1=19	100/101	102/103	6	6	52.54 // 52.67	0 /
2	X2=OF1029927-0017	Y2=OF1030322-0024	X2=15	Y2=14	104/105	106/107	5	6	51.93 // 51.36	0 /
3	X3=OF1029927-0014	Y3=OF1029927-0016	X3=13	Y3=20	150/151	152/153	5	5	52.48 // 52.41	0 /
4	X4=OF1029927-0019	Y4=OF1029927-0022	X4=16	Y4=6	120/121	122/123	5	5	52.16 // 51.54	0 /
5	X5=OF1030322-0021	Y5=OF1029927-0011	X5=1	Y5=2	124/125	126/127	5	6	52.58 // 52.57	0 /

A convention is used to shorten the old names of the SiPMs. OF1030322 stands for A whereas OF1029927 for B, the associated number are given after the hyphen. For example, OF1030322-0014 is called 14A.

The following graph shows the breakdown voltage for the SPMs:

- SiPM_BDVoltage_02102017.pdf

The data can be found at the following address: https://docs.google.com/spreadsheets/d/1-fBU3suWFYOL7Al4hKDNKX5qZZaz1qmdy5NHqZs_sbY/edit#gid=0

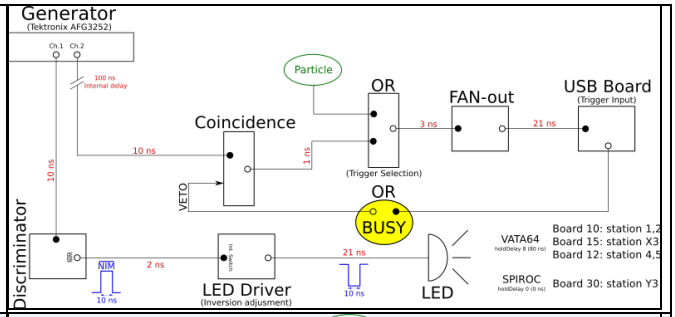
The applied overvoltage is of 3.5V.

USB Boards

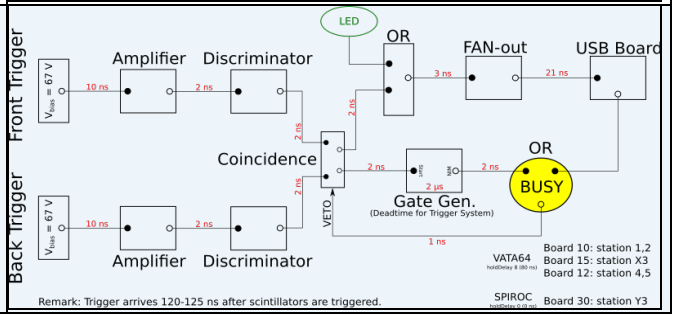
We use "old" USB boards for the VATA front-ends (all stations except Y3) and a new USB board for the spiroc front-end. The applied bias for the VATA front-ends is done with the CAEN whereas for the spiroc it is done with a Keithley source (which has a bias offset of 4.4V)

Trigger setup

LED trigger



Particle trigger



Tektronix Remote Control

Installation to control remotely with the Tektronix generator is explained in the README file. The actual acting script is TekControl.py.txt. Setup for LED injection are saved in internal memory "setup1". In case, they can be found here.

Machines and network

CAEN crate

IPv4[128.141.151.215] for interface LPHECAEN1 of device LPHECAEN1 connected on outlet 0887-R:4904/02.

The following setting may also need to be configured your IPv4 network connection:

- Default gateway: 128.141.151.1
- Subnet mask: 255.255.255.0
- Broadcast address: 128.141.151.255
- DNS servers: 137.138.16.5 and 137.138.17.5
- Time servers: 137.138.16.69, 137.138.17.69 and 137.138.18.69

TELL23

- From CERN network or lxplus, connect with: ssh -Y cc@lphe1tell23

DAQ machine

- MAC address is 00:21:5A:E9:B9:19
- From CERN network or lxplus, connect with: ssh -Y lphe-lphp@lphe1-daq-scifi-telescope (an Alias exists on lphe1tell23, just type: daq)

Taking data on lphe1-daq-scifi-telescope

To take data, source the file /home/lphe-lphp/sw/scifiusbboard/SetupUsbBoard.sh and go to /home/lphe-lphp/sw/scifiusbboard/Builds/

readoutTest

Launch readoutTest with: **./readoutTest < nevents > <path/to/config/files> <output.root>**

- <path/to/config/files> = /home/lphe-lphp/telescope_config_files/cfg_TestBeamOct2017_Dark
- <output.root> = /home/lphe-lphp/scifi-data/TestBeamDataOct2017/Testbeam_Telescope/"directory"/<name.root>
    - ♦ Run data must be stored in "directory" = Telescope_Rawdata and <name.root> must follow the convention (x = run number):
        - ◊ btsoftware_10000000xx_datarun.root for particle runs
        - ◊ btsoftware_100000000x_calib_dark.root for pedestal (or dark) runs
        - ◊ btsoftware_1000000xxx_calib_led.root for LED runs
    - ♦ Test data can be put in "directory" = test_data
- Example:
    - ♦ ./readoutTest 100000 /home/lphe-lphp/telescope_config_files/cfg_TestBeamOct2017_Dark /home/lphe-lphp/scifi-data/TestBeamDataOct2017/Testbeam_Telescope/Telescope_Rawdata/btsoftwa

Configuration files

The configuration files are:

- one "boardxx.cfg" for each board (xx = 10, 12, 15, 30):
  - pathToUsbBoardFirmware is /home/lphe-lphp/telescope_config_files/cfg_TestBeamOct2017_Dark/va32_readout_top_v28.rbf for old USBBoards (conntains the event timestamp) and /home/lphe-lphp/sw/scifiusbboard/firmware/USB_Board_TOP_v17.rbf for NewUSBBoard
  - eventsPerAccess must be set to 4 (maximum value for the new USBBoard)
  - TriggerType is external (selfTriggerEnable is 0), all triggers are given with an external system, even pedestal, dark and LED.
  - HoldDelayTime is 8 for OldUSBBoards with VATA64V2 and 0 for NewUSBBoard with Spiroc
  - executeFrondEndBoardConfiguration must be set to one for uplinks connnected to a VATA64V2
- VATA64V2_uplinkxxx.cfg for each uplink connecting a VATA64 chip:
  - slow shaper is set in low gain mode but not pre-amplifier (Lgs = 1, Lg = 0)
  - DACs are ON for stations 1, 2, 4, 5 (X and Y), DAC values were adjusted from ADC gain measurement and iterative process (described in other section)

Data visualization

Visualize the data with: **./lect_sipm_all -S < setup file > -p <pedestal.root> -s <signal.root> -options**

- < setup file > = ../cfgFiles/setup_lectsipmall.txt
  - In the setup file, you can comment out SiPMs you don't want to display. You can set their name, uplink IDs and ADC gain for basic clustering.
- options:
  - P : write the ADC distribution histograms for each channel in a root file (used for DAC computation)
  - C : basic clustering performed (set a correct value for the ADC gain in the setup file)
  - E : event display for one event. The program will keep asking you a new event number to display. To quit, type any other key than a number.
- Example:
  - ./lect_sipm_all -S ../cfgFiles/setup_lectsipmall.txt -p /home/lphe-lphp/scifi-data/TestBeamDataOct2017/Testbeam_Telescope/Telescope_Rawdata/btsoftwa -s /home/lphe-lphp/scifi-data/TestBeamDataOct2017/Testbeam_Telescope/Telescope_Rawdata/btsoftwa

Analysis

All of below can be done by run ./run_analysis.sh in /home/lphe-lphp/sw/scifibeamtest

1. Direct to /home/lphe-lphp/sw/scifibeamtest
2. $ source SetupScifiUsbboard.sh
3. Go to Builds
4. convert ./dataConversion_Telescope NoShifts TELSA btsoftware_1000000005_calib_dark.root ./dataConversion_Telescope NoShifts TELSA btsoftware_1000000555_calib_led.root ./dataConversion_Telescope NoShifts TELSA btsoftware_1000000055_datarun.root
5. compress ./preAnalysis_exec NoShifts TELSA 1000000005 1000000555 1000000055
6. analysis ./btsoftware_analysis TELSA 1000000055 +sltee log ---- can't save ---- get gain corrector; write in $BTSoftware_WORKDIR/gainCorrection.txt
7. compress again ./preAnalysis_exec NoShifts TELSA 1000000005 1000000555 1000000055

Data is in

/home/lphe-lphp/scifi-data/TestBeamDataOct2017/Testbeam_Telescope/Data_Compress/calibration_histos_ped10000

1. Alignment of the telescope

- settle the z position of the boxes
- the stations should be centered with respect to the beam
- alignment must be done
- measure the gap inefficiency of SiPMs

2. Fix stations 1,2, ,4,5 to 3.5V overvoltage and vary the overvoltage of station 3 from 1.5 V to 7.0 V with 0.5 V step

- Study the dependence on overvoltage
- Measure efficiency and resolution
- Exploring clustering algorithm (also add simulated noise to the data)

3. Vary stations 1,2, ,4,5 and fix station

- Similar measurement as point 2.

4. [To be discussed]

5. Change the beam position [in z-direction]

6. Use black sheet for measuring a reflectivity

Run

- Dark - LED OFF / Sci OFF
- LED - LED ON / Sci OFF
- Data - LED OFF / Sci ON

-- SurapatEkIn1 - 2017-10-03 (18:25) -- PhilippeAndrewWampler - 2017-10-03

This topic: LHCb > TestbeamOct2017
Topic revision: r51 - 2018-11-27 - BlakeLeverington