| TPC_2019 | T1044-2018 | T1044-2018-Runs | EIC_FNAL | T1439 | PWO-FNAL | MVTX |

The MVTX Beam Test logbook (2019), all entries

New | Find | Select | Import | Config | Last day | Help

Full | Summary | Threaded | Hide attachments   **115 Entries**

Goto page 1, 2, 3, 4, 5, 6

ID	Date	Author	Subject
118	Sat Jun 22 15:07:36 2019	Zongze, Ming	2nd TB data transfered to RCF

done.

| 117 | Sat Jun 22 14:02:28 2019 | Zongze, Ming | VCLIP scan at Pulse_Dealy = 200 (5uS) |

RU1 = default;

stretched setting for RU2:

IBIAS = 44

ITHR = 21

Pulse_Delay = 200 (5.0uS)

Trigger dealy = 2.0 + 5.0 = 7uS

Beam intensity = 100K per spill for run 1245, 1246;

asked CAD to increase intensity to ~450K per spill from run 1247

Run #	VCLIP	nhit_C105 (RU2)	nhit_E103(RU1)	relative_eff (C105/E103)
1245	0	3.4		0.6
				5.7
1246	20	2.9		0.9
				3.2
1247	40	4.7		1.3
		3.6		
1248	60	4.5		1.4
		3.2		
1249	80	5.1		1.4
		3.6		
1250	100	5.6		1.4
		4.0		

Attachment 1: Run1250-last-run-06222019-IMG_2535.jpg

| 116 | Sat Jun 22 13:57:40 2019 | Zongze, Ming | all back to normal setting Run #1244, lasty short reference run |

250K, default settings after the long run, 53M, 13hr.

| 115 | Sat Jun 22 00:30:47 2019 | Zongze, Ming | long default run , #1243 |

a long reference run for default settings: --- a system stress test.

Pulse_Delay = 20 (0.5uS)

Beam trigger delay = 2.0uS

ITHR = 50 etc.

Started at 12:30AM, expect to run for 12hr, till noon on Saturday 6/22.

Stopped at 2PM, 53M triggers.

Attachment 1: RUn1243-53M-IMG_2529.jpg

Attachment 2: run1243_53M_IMG_2530.jpg

114	Fri Jun 21 23:51:40 2019	Zongze, Ming	all back to normal setting Run # 1242

a short reference run for default settings:

Pulse_Delay = 20 (0.5uS)

Beam trigger delay = 2.0uS

ITHR = 50 etc.

240K triggers.

113	Fri Jun 21 23:16:02 2019	Zongze, Ming	VCLIP scan at Pulse_Dealy = 280 (7uS)

RU1 = default;

stretched setting for RU2:

IBIAS = 44

ITHR = 21

Pulse_Delay = 280 (7.0uS)

Trigger dealy = 2.0 + 7.0 = 9uS

Run #	VCLIP	nhit_C105 (RU2)	nhit_C104(RU1)	relative_eff (C105/C104)
1236	0	4.9		1.5
3.3.				

```
1237          20                2.5                    0.8
3.1
1238          40 (00?)              2.9                      0.9
                          3.2
1239          00                2.9                    1.1
                        2.8
1240          80                7.5                    1.5
                        5.0
1241          40                3.1                    1.1
                       .3.0
```

| 112 | Fri Jun 21 22:38:35 2019 | Zongze, Ming | VCLIP scan at Pulse_Dealy = 200 (5uS) |

```
RU1 = default;

stretched setting for RU2:

IBIAS = 44

ITHR = 21

Pulse_Delay = 200 (5.0uS)

Trigger dealy  =  2.0 + 5.0 = 7uS


Run #        VCLIP        nhit_C105 (RU2)      nhit_C104(RU1)      relative_eff (C105/C104)
1230          0                2.9                    1.0
2.9 .
1231          20                5.1                    1.1
                        4.6
1232          40                3.4                    1.0
                        3.4
1233          60                5.8                    1.5
                        3.8
1234          80                3.6                    0.8
                        0.
1225          100               3.7                    0.8
                        0
```

| 111 | Fri Jun 21 21:47:13 2019 | Zongze, Ming | VCLIP scan at Pulse_Dealy = 160 (4uS) |

```
RU1 = default;

stretched setting for RU2:

IBIAS = 44

ITHR = 21

Pulse_Delay = 160 (4.0uS)

Trigger dealy  =  2.0 + 4.0 = 6uS


Run #        VCLIP        nhit_C105 (RU2)      nhit_C104(RU1)      relative_eff (C105/C104)
```

1224	0	2.8	0.8
3.5			
1225	20	2.9	0.9
3.2			
1226	40	3.0	1.0
3.0			
1227	60	3.7	1.0
3.7			
1228	80	3.4	0.8
4.3.			
1229	100	5.6	1.2
4.7			

| 110 | Fri Jun 21 20:58:22 2019 | Zongze, Ming | stretched setting - 5uS trigger delay Run # 1217 - |

RU1 = default;

stretched setting for RU2:

IBIAS = 44

ITHR = 21

Pulse_Delay = 120 (3.0uS)

Trigger dealy = 2.0 + 3.0 = 5uS

Run #	VCLIP	nhit_C105 (RU2)	nhit_C104(RU1)	relative_eff (C105/C104)
1218	0	2.7		0.7
0.				
1219	20	3.9		1.0
		3.9		
1220	40	3.2		0.9
		3.6		
1221	60	3.3		0.9
		3.7		
1217	80	3.5		0.8
		4.3		
1217	100	3.6		0.8
		4.5		

| 109 | Fri Jun 21 20:17:43 2019 | Zongze, Ming | VCLIP scan at Pulse_Dealy = 0 |

default settings:

IBIAS = 64

ITHR = 50

for RU2:

Pulse_Delay = 0 (0uS)

Trigger dealy = 2.0 + 0 = 2uS

Run #	VCLIP	nhit_C105 (RU2)	nhit_C104(RU1)	relative_eff (C105/C104)
1211	0	0.52	0.67	0.78
1212	20	0.52	0.67	
1213	40	0.52	0.67	
1214	60	0.52	0.67	0.78
1215	80	0.88	0.66	1.33
1216	100	0.88	0.67	1.33

108	Fri Jun 21 19:37:20 2019	Zongze	VCLIP scan at Pulse_Dealy = 120

Pulse_Delay = 120 (3.0uS)

Trigger dealy = 2.0 + 3.0 = 5uS

Run #	VCLIP	nhit_C105 (RU2)	nhit_C104(RU1)	relative_eff (C105/C104)
1205	0	0.2	0.80	
1206	20	0.48	0.7	
1207	40	0.62	0.75	
1208	60	0.64	0.74	
1209	80	1.1	0.65	
1210	100	1.1	0.7	

107	Fri Jun 21 18:51:29 2019	Zongze, Ming	VCLIP scan at Pulse_Dealy = 200

Pulse_Delay = 200 (5.0uS)

Trigger dealy = 2.0 + 5.0 = 7uS

Run #	VCLIP	nhit_C105 (RU2)	nhit_C104(RU1)	relative_eff (C105/C104)
1198	0	0.2	0.74	27%
1199	20	0.2	0.82	
1200	40	0.2	0.7	
1201	60	0.35	0.7	
1202	80	1	0.7	
1203	100	1.2	0.7	
1204	20	0.15	0.7	

106	Fri Jun 21 17:00:24 2019	Zongze, Ming	RU2 VCLIP= 0, deafult settings, delay scan , Run # 1

VCLIP = 0

Beam trigger delay = 2.0uS, for all, the following addtional delay relative to the beam hit =

```
(2.0 + XX ) uS;

Framduring = 80 x 25nS = 2 uS

Beam intensity =  50K per spill

For RU2 (stave C105)

Run #        PulseDelay (RU2)                      Evts            Eff

1181          20 (20x 25nS =500 nS )        200K              ==100% as a reference point
(1.6 hits/chip)

1182          20                             224K              100%

1183          80 (2.0 uS)                      200K            100%

1184          120 (3.0uS)                      200K            100%

1185          160 (4.0uS)                      200K            100%

----   all above are actually run with pulse deay = default (20) , python script was NOT
properly updated after previous FELIX firmware test ---

---- potential issues with RU2 setting in the following data sets  ----


average pixels/trigger   (beam rpofile seems not stable )

1186          300 (7.5uS)                      200K

1187          20 (0.5 uS)                      200K

1188          20 (0.5uS, default)           200K

1189          40 (1.0 uS)                      200K

1190          80 (2.0 uS)                      200K

1191          300 (7.5 uS)                     200K

1193          200 (5 uS)                        200K

1194        20 (0,5 uS)                         200K

1196        300 (7,5 uS)                        200K

1197        500 (12.5 uS)                       200K           0 hit/stave C105
```

105	Fri Jun 21 16:52:39 2019	Sho	system back to defaults

```
Starting with run 1179, the system is running with the previous FELIX firmware, default
testbench files, and the masklist that was used in the previous set of tests.
```

104	Fri Jun 21 16:24:23 2019	Sho, Zongze, Alex	test "plan B" bitstream

```
restore default testbench_base.py files

masklists are still empty

run 1171: 0x190 (10 us) delay, zero veto

1173: mask run with 0 delay

1174: pixels masked, 0 delay, 0 veto

1175: 0x190 delay

1176: 0x320 (20 us)
```

```
1177: 0x640 (40 us)
```

| 103 | Fri Jun 21 12:49:20 2019 | Ming Liu | 4-satve telecope mapping |

Beam coming from the bottom, hits A105 stave first.

C105 is the one connected to RU2

Attachment 1: MVTX-4-stave-Telescope-Mapping.png

| 102 | Fri Jun 21 12:25:18 2019 | Zongze, Ming | data transferred to RCF |

```
new MVTX TB data being transfered to RCF,  under "calib"

/gpfs/mnt/gpfs02/sphenix/data/data01/mvtx/tb-1441-052019/calib/


Will have access this afternoon at 2PM. can't program the RU baords, need to check the USB
cables.
```

| 101 | Thu Jun 20 23:37:26 2019 | Zongze, Gerd, Ming | stretched setting - ITHR2 50, Run # 1141 - |

```
beam trigger delay = 2uS;

ITHR1 = 50/defaultg

Strobe_delay to pulse  == 20;/default

IBIAS = 44 (streched setting)

VRESTD =147

VCASN = 50

VCASP = 86

VCLIP =0

VCASN2 = 57

IDB = 29

ITHR1 = 50

---  typical INTENSITY = 30K PROTONS PER 4-SEC SPILL ----

ITHR2/RU2    Run #      # of evts

50              1141        200K,  hit_eff == 100%

60              1142        200K, hit_eff ~90%

70              1143        200K,  hit_eff ~80%

80              1144        200K, hit_eff ~ 80%

90               1145        200K, hit_eff ~70%

100             1146        200K        . hit_eff ~70%

120              1147        200K, hir_eff ~ 50%
```

```
150                    1148          63K,  hit_eff ~40%
150                     1150         210K hit_eff ~40%
180                    1151          210K, hit_eff~30%
 200                    1152          240 K, Hit_eff~25%
40                      1153          218 K, hit_eff~120%
30                     1154           232K, hit_eff~205%
20                       1155         233K, hit_eff~400%
10                       1156           235K There is error on pixels
15                       1157          229K, hit_eff~750%
18                     1158           237K, hit_elf~500%
25                       1159         232K, hit_eff~300%
```

100	Thu Jun 20 20:39:24 2019	Zongze, Gerd, Ming	RU2 ITHR= 30, 40, 50, 60, 70, 80, 90, 100, 120, Run # 1121 - #1140

```
beam trigger delay = 2uS;

ITHR1 = 50/defaultg

Strobe_delay to pulse  == 20;/default

IBIAS = 64

VRESTD =147

VCASN = 50

VCASP = 86

VCLIP =0

VCASN2 = 57

IDB = 29

ITHR1 = 50

---  typical INTENSITY = 30K PROTONS PER 4-SEC SPILL ----

ITHR2/RU2    Run #       # of evts

60                 1121          300K

50                 1122          115K

50                 1123          275K

50                 1124          200K       (cleared pixel masks, for the rest of runs below)

60                 1125          200K

70                 1126          200K

80                  1127          200K
```

```
90                    1128         200K

100                   1129         200K

120                   1130         200K

40                    1131          33K

40                    1132         200K

30                    1133          114K

30                     1134          200K

20                     1135          200K

10                     1136           200K , note - 20% fifo_gpio_full_error

150                   1137           200K,   hit_eff ~30%


180                   1138,        200K,    hit_eff ~15%

135                    1139         200K, hit_eff ~35%

15                      1140        200K,  No fifo-full errors
```

99	Thu Jun 20 20:37:45 2019	Zongze, Ming	RU2 delay = 400 x 25ns = 10us, run # 1120, long run, 2.9M triggers

```
long run , 2.9M triggeres
```

98	Thu Jun 20 17:54:06 2019	Zongze, Ming	RU2 delay = 800, 20uS, run 1118

```
RU2, delay =800,

almost no hits in RU2 stave;
```

Attachment 1: RU2_delay-800-IMG_2490.jpg

97	Thu Jun 20 17:47:28 2019	Zongze, Ming	RU2 delay = 400 x 25ns = 10us, run # 1117

```
set RU2 - delay = 400 (= 400 x 25ns = 10uS)

significant reduction seen for RU2 stave;


The software control is working! Nice job Sho!
```

Attachment 1: RU2-delay-400-IMG_2489.jpg

| 96 | Thu Jun 20 17:46:15 2019 | Zongze, Ming | back to normal ITHR2 = 50, run 1115 |

```
back to normal distributions

ithr1 = ithr2 = 50
```

Attachment 1: ITHR2-50-IMG_2487.jpg

| 95 | Thu Jun 20 17:22:25 2019 | Zongze, Ming | ITHR2 = 250, run 1114 |

```
ITHR1 = 50;

ITHR2 = 250
```

Attachment 1: ITHR2-250-IMG_2486.jpg

| 94 | Thu Jun 20 17:21:05 2019 | Zongze, Ming | ITHR2= 150, Run # 1113 |

```
ITHR1= 50;

ITHR2 = 150
```

Attachment 1: ITHR2-150-IMG_2485.jpg

| 93 | Thu Jun 20 17:12:33 2019 | Zongze, Ming | ITHR2_150, run #1112 |

```
ITHR1=50;

ITHR2 = 100
```

Attachment 1: ITHR2-100-IMG_2481.jpg

| 92 | Thu Jun 20 16:55:12 2019 | Zongze, Ming | testbench_base1,2 - test run 1111 |

```
all default values for testbench1 and testbench2.

ITHR = 50, default value;
```

Attachment 1: ITHR50_IMG_2480.jpg

| 91 | Thu Jun 20 16:52:57 2019 | Zongze, Ming | 120 GeV p beam with mask - Run # 1110 |

120 GeV proton beam data with noisy pixels masked.

Attachment 1: proton-120-with-mask-IMG_2479.jpg

| 90 | Thu Jun 20 01:23:28 2019 | Zongze, Gerd, Ming | 120 GeV p beam |

clearn beam profile, may need to move the dedetctor up a bit ~0.5cm to be on the center of the beam..

Attachment 1: 120_p_IMG_2473.jpg

| 89 | Thu Jun 20 00:32:54 2019 | Zongze, Gerd, Ming | first beam for the 2nd MVTX TB |

parasitic with TPC, INTT ... clear hits seen in MVTX sensors;

16Gev e- beam (some mix of pion-)

Attachment 1: IMG_2471.jpg

Attachment 2: IMG_2470.jpg

| 88 | Sat May 25 01:38:33 2019 | Matt & Ming | beam status |

MCR called, saying the situation is challenging and may take several hours to fix. given this is the last a few hours of scheduled beamtime, and the long weekend, we decide to end the TB for MVTX.

Launched data transfer to RCF.

| 87 | Sat May 25 01:31:11 2019 | Matt & Ming | RFQ anode trip, no estimate for beam |

it is 1:30AM and MCR is not sure about the beam schedule;

we will wait till 2AM, if still no new, we will end our TB.

86	Sat May 25 00:46:11 2019	Matt & Ming	5GeV e- Run 1040-xx

5GeV beam,

Run 1040: 1,205,852 event;

Run 1041: 81,805;

MCR lost beam.

85	Fri May 24 23:49:41 2019	Xuan & Cameron	New data with 5 GeV electron beam

Following the previous sets and start to take low energy electron beam tests.

Beam energy 5 GeV.

Beam intensity at 47k ppp.

Run 1039 calibration run.

84	Fri May 24 23:41:00 2019	Cameron, Xuan, Xiaochun, Zongze, Ming	what's going to happen with 5GeV e-?

we asked for 5GeV e- beam to scan MVTX stave material. It was shown for 5GeV e-, one expect 75% e- and 25% pi-.

83	Fri May 24 23:36:43 2019	Xuan & Cameron	Requested to start the low energy electron beams

Contacted teh MCR to start the 5 GeV electron beam.

Beam componets: ~ 75% electrons and ~ 25% pi-.

82	Fri May 24 23:03:30 2019	Xuan & Cameron & Xiaochun	Physics runs at 120 GeV proton beam

Beam energy 120 GeV proton.

Beam intensity 50k ppp.

Run1038 with trigger delay 2 mu s, default setting.

1M events achieved.

81	Fri May 24 22:55:46 2019	Xuan & Cameron & Xiaochun	Shift the telescope box back to center the beam location within the first stave

Move the beam location back to 278 mm horizontally and 1078 mm vertically. The beam profile get narrowed.

Start to take physics runs to accumulate 1M events.

80	Fri May 24 22:45:53 2019	Xuan Li & Cameron & Xiaochun	Request to narrow the beam profile

The beam profile is wide spread along two chips, requested to narrow the beam profile.

Another suspect is in the day time the CMS group is testing their calorimetry system. The calorimeter system might be in front of us, which will spread the tracks from the beam as well.

Another suspect is the supporting frames are Al bars on the edge of the staves. When tilting

the telescope box, the beam could hit the supporting frames and generate multiple scattering.

| 79 | Fri May 24 22:21:11 2019 | Xuan & Cameron | Shifting the staves with 120 GeV proton beam |

Run 1036 beam location 299.9 mm vertically and 1062.7 mm horizontally.

Run 1037 is a tuning run, starting with beam location 299.9mm vertically and 1077.7 mm horizontally, later the beam location moves to 315.0 mm vertically and 1077.7 mm horizontally, then the beam location moves to 324.7 mm vertically and 1077.7 mm horizontally.

| 78 | Fri May 24 22:08:44 2019 | Cameron | Beam on titlted table |

We have placed a wedge under the side of the telescope furthest from the beam with a thickness of ~1.5cm
Will take data under nominal settings with 50k pps and a beam size of 0.5cm
Run 1036 – First run. Can see tilt in deltaRow

| 77 | Fri May 24 21:43:47 2019 | Xuan & Cameron | Trigger rate strentch tests |

Using Nominal Frame Duration (2us)
Run 1026 under 10 kHZ trigger rate without beam. 1M events no errors.

Run 1027 under 50kHZ trigger rate without beam. 47k overflows from RU2 out of 1M events.

Run 1028 under 50 kHZ trigger rate without beam. 17k overflows from RU1 and 47k overflows fron RU2 out of 1M events. 2 events lost.
Run 1029 under 100 kHZ trigger rate without beam. 39k overflows from RU1 and 15k overflows from RU2 out of 1M events. 9 events lost.

Run 1030 under 200 kHZ trigger rate without beam. 65k overflows from RU1 and 9.6k overflows from RU2 out of 1M events. 2 events lost.

Run 1031 under 500 kHZ trigger rate without beam. 13k overflows from RU1 and 55k overflows from RU2 out of 1M events. 3 events lost. 500kHz is a pulse every 2us. Probably have to change pulse length to 100ns again

Run 1032 under 1MHz trigger rate without beam. 32k overflows from RU1 and 6k overflows from RU2 out of 1M events. 2 events lost.

Changed Frame Duration to 100ns

Run 1033 under 500 kHZ trigger rate without beam. 31k overflows from RU1 and 35k overflows from RU2 out of 1M events. 9 events lost.

Run 1034 under 1MHz trigger rate without beam. 54k overflows from RU1 and 600 overflows from RU2 out of 1M events. 4 events lost.

Reverting settings back to default

| 76 | Fri May 24 21:28:36 2019 | Xiaochu & Ming | Telescope box offset, dY = 1.5cm |

Raised the backend of the telescope by 1.5cm;

slope = 1.5cm /12" = 0.05

Desired slope = 2mm / 4cm = 0.05

For material busget scanning with 5GeV e- beam later in the evening

| 75 | Fri May 24 19:00:30 2019 | Xuan Li | Evening shift starts and the beam profile is wide |

Evening shift starts. The beam profile is wide and beam intensity is high. Need to tune the
beam before take data.

| 74 | Fri May 24 07:08:40 2019 | Ming | upload data launched |

started data transfer

| 72 | Fri May 24 06:03:37 2019 | Ming Liu | extended run 1022 |

try to keep the current run 1022 as long as possible,

50k pps; ~ 10kHz trigger

started 5AM.

| 71 | Fri May 24 04:55:52 2019 | Cameron | |

Run 1022 – Frame length reverted to normal and taking 50k protons/spill again,

| 70 | Fri May 24 03:12:07 2019 | Cameron | |

Run 1015 – 100k protons/spill
Run 1016 – 200k protons/spill
Run 1017 – 400k protons/spill – Lost 2 events in 1055964 triggers
Run 1018 – 400k protons/spill – Lost 6 events in 1064299 triggers
Run 1019 – 800k protons/spill – Fifo overflow in RU1 was 56273, overflow in RU2 was 24107.
Lost 39 events in 1042583 triggers
Run 1020 – 1.2M protons/spill – Maxed out Fermilab, Fifo overflow in RU1 was 55914, overflow
in RU2 was 24469. Lost 110 events in 1025883 triggers
Run 1021 – 1.2M protons/spill, frame change to 100ns. Fifo overflow in RU1 was 57351,
overflow in RU2 was 50498. Lost 124 events in 1038680 triggers

| 69 | Fri May 24 02:51:10 2019 | zongze | Run 1014 |

Reference for high data rate 50K per spill.

| 68 | Thu May 23 23:37:27 2019 | Xuan Li & Cameron & Xiaochun | Run 1010 after remove the Pb bricks |

Run 1010 is to check the stave performance after removed the Pb bricks.

Same configuration as run 1009.

| 67 | Thu May 23 23:36:36 2019 | Xuan & Cameron & Xiaochun | Removed the Pb bricks |

We accessed the experimental hall to remove Pb bricks.

| 66 | Thu May 23 23:13:25 2019 | Xuan Li & Cameron & Xiaochun | New runs with Pb bricks in front of the staves |

Run 1009 with the 8 inch Pb bricks in front of the staves. which is 9 feet and 8 inches
apart.

Using the default configuration as in run1008 and trigger delay 2 mu s.

Attachment 1: Pb_Block_Run1009_StartOfRun.pdf

| 65 | Thu May 23 22:50:23 2019 | Xuan Li & Cameron | Bring the Pb target back |

We access the experimental hall to bring back the Pb target.

Run 1009 - Pb Block in beam path. 8 inch thick and 9 ft 8 inch from start of lead block to start of telescope box

| 64 | Thu May 23 22:30:42 2019 | Xuan Li | run 1008 with wide beam profile |

The beam profile is much wider than before. horizontal width 0.5 cm and vertical width around 1.5 cm.

Run 1008 is a long run under this beam condition. The configure is the same as last night's shift. Trigger delay 2 mu s.

This is a reference run to compare with previous data.

average beam intensity 3.9 E09 ppp.

| 63 | Thu May 23 21:24:51 2019 | Cameron | Targets |

Run 1004 - Aluminum target on chip 4
Run 1005 - No target on chip 4 (reference)

Thickness of lead required to stop 120 GeV protons is

| 62 | Thu May 23 18:52:40 2019 | Xuan Li | Evening shift starts |

We have beam in.

| 61 | Thu May 23 03:36:45 2019 | ming liu | high rate 100k pps |

asked MCR to deliver 10x higher luminosity for 80-20 imaging .

Now intensity ~ 100K pps, Run # 1000

| 60 | Thu May 23 03:21:51 2019 | matt durham | 80/20 target |

1.5"x1.5" cross section

> **Quote:**
>
> Hubert and Xiaochun put in a piece of 80/20 100 inches in front of the MAPS sensors. Run 1000

| 59 | Thu May 23 03:21:02 2019 | ming liu | Reference run 999 hit distribution |

Run 999, reference system,

Signam_red (C105, the long cable) = 0.55 (pixle)

Run 1000, with Al 80-20 frame,

```
Sigma_red = 0.82 (pixel)
```

| 58 | Thu May 23 03:18:25 2019 | matt durham | 80/20 target |

```
Hubert and Xiaochun put in a piece of 80/20 100 inches in front of the MAPS sensors.  Run
1000
```

| 57 | Thu May 23 00:00:57 2019 | gjk | low intensity run |

```
center chip run 999 with 12,000 pps
```

| 56 | Wed May 22 22:55:09 2019 | gjk | high intensity center chip study |

```
run - 998 - 275.9 1094.4 with 80,000 pps
```

| 55 | Wed May 22 20:42:07 2019 | gjk cd | new pixel mask and scan all centers and borders |

```
run a new pixel mask with no beam, masked out 200 (zero threshold) which is less than before.

moved table to 972, all staves work.

asked for 50,000 pps

new beam hight 275

rightmost position

chip 8        - 977 - 275.8 972.6

middle 7/8 - 978 - 275.8 987.6

chip 7        - 979 - 275.8 1002.6

middle 6/7 - 980 - 275.8 1017.6

chip 6        - 981 - 275.9 1032.6

middle 5/6  - 982 - 275.9 1047.6

chip 5          - 983 - 275.9 1062.6

middle          - 984 - 275.9 1077.6

chip 4            - 985 - 275.9 1094.4     long because wire target is in place

middle          - 986 - 275.9 1108.6

chip 3            - 989  - 275.9 1123.6

middle          - 990  - 275.9 1138.6

chip 2            - 991  - 275.9 1154.6

middle          - 992   - 275.9 1169.4

chip 1              - 993   - 275.9 1184.4

middle          - 994   - 275.9 1200.4

chip 0              - 995   - 275.9 1215.4

edge                - 996   - 275.9 1230.4
```
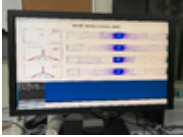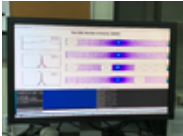
| 54 | Wed May 22 20:40:44 2019 | gjk cd | found box in the atlas beam with 600,000 pps |

power unit and readout unit were turned off.

| 53 | Wed May 22 06:50:31 2019 | Hubert | run with target wire |

run 968 has a ~300 um lead solder wire on the vertical laser line

| 52 | Wed May 22 06:10:42 2019 | Hubert, Matt, Xiaochun, Ming | 11.4m SamTec cable works! |

We are now taking data with the long 8.8m cable received today + 2.6m short one. total length = 11.4m.

Run # 967, trigger rate ~10kHz (58k ppp);

The long cable (red plot) seems working as good as others!

Pixel hits/trigger:

1/stave = 2.41

2/ = 2.75

3/ = 3.25

4/ = 2.50

Attachment 1: SamTec-2.6m-8.8m-IMG_2137.jpg

| 51 | Wed May 22 05:28:08 2019 | matt durham | data with 11.5m cable on RU2 |

switched cables on RU2. Same setup as previous long run 958 for comparison.

Take run 967

| 50 | Wed May 22 03:51:35 2019 | Ming Liu | new reference run with defaiult 8m cable |

plot for print

Attachment 1: Image-5.png

| 49 | Wed May 22 03:34:32 2019 | Ming Liu | MVTX Firmware and Software GitLab |

https://gitlab.cern.ch/sphenix-mvtx

one needs CERN account to access the MVTX readout firmware and software.

| 48 | Wed May 22 03:16:55 2019 | Hubert, MIng | SamTec custom cable mapping |

Hubert and I checked and marked the new SamTec mapping;

Chan-1 and Chan-2;

The current readout configuration for RU2:

Chan-1 cabels are connected to the stave C104 and RU2. (2.6m + 5.3m)

New cables: 1.2m + 8.8m;

Attachment 1: IMG_2124.jpg

Attachment 2: IMG_2125.jpg

| 47 | Wed May 22 02:59:13 2019 | matt durham | data back with working pixel mask |

Run 958, beam data is back to normal.

| 46 | Wed May 22 02:58:41 2019 | Ming Liu | new reference run with defaiult 8m cable |

Run # 958, reference run for SamTec cable test:

Intensity: ~55K pps, eq ~10kHz

Nominal position: low background with new pixel mask;

AVG # of pixle hits per trigger:

staves:

1/E102, chip 4 (central one) = 2.55

2/C105, chip4 = 2.86

3/C104, chip4 = 3.28. (custom 8m cable)

4/A105, chip4 = 2.53

Attachment 1: Run958-Ref-8mcable-Image-4.png

45	Wed May 22 02:40:48 2019	matt durham	another try at new pixel mask

Run 957. Now mask_pixels(0) gives us 372, a little more reasonable. I think 3 staves were out of the data stream last time but are back now. We will use this mask.

44	Wed May 22 02:08:21 2019	matt durham	data w new pixel mask

start run 951, only one stave has data. Pwer cycle RU and staves

Run 952: still out

Restart DAQ. sync triggers on 954 then take beam data on 955. Everything back.

43	Wed May 22 01:45:44 2019	matt durham	new pixel mask

making new pixel mask. Beam off, triggering on pulser, mask removed. Run 949. with setting of mask_pixels(0) got ~440 pixels masked.

Try again after power cycling RU and ALPIDES. Run 950. Got 134 masked. Push to Nuc and use this.

42	Wed May 22 00:49:58 2019	gjk cd	continues readout test

run 942 triggered by 125 khz pulser

we should gate the pulser with begin and end spill

41	Wed May 22 00:34:29 2019	gjk	filling in points in the graph

Run 939, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **8.5 us.** w/ 5.3 m cable

40	Tue May 21 22:50:09 2019	Xuan Li -gjk	New physics runs with new DAC values to extend shaping time

Run 923, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **1 us.** w/ 5.3 m cable.

Run 924, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **2 us** w/ 5.3 m cable.

Run 925, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **4 us** w/ 5.3 m cable.

Run 938, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **10 us** w/ 5.3 m cable.

Run 927, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **11 us** w/ 5.3 m cable

Run 928, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **12 us** w/ 5.3 m cable.

Run 929, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **13 us** w/ 5.3 m cable.

Run 930, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **9 us** w/ 5.3 m cable.

Run 931, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **8 u**s w/ 5.3 m cable.

Run 932, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **7.5 u**s w/ 5.3 m cable.

Run 933, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **7.0 u**s w/ 5.3 m cable.

Run 934, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **6.5 u**s w/ 5.3 m cable.

Run 935, with ITHR=21, IBIAS=44, IDB=29. Trigger delay = **6.0 us** w/ 5.3 m cable.

39	Tue May 21 22:18:49 2019	Xuan Li	Start the pedestal runs

Start the pedestal runs with different sets of IDB, ITHR and IBIAS to take the pixel mask maps for each individual runs.

Run 918, IBIAS: 59, IDB: 19, ITHR: 45

Run 920, IBIAS: 64, IDB: 19, ITHR: 45

Run 921, IBIAS: 44, IDB: 29, ITHR: 21

Run 922, IBIAS: 44, IDB: 29, ITHR: 21

38	Tue May 21 22:08:40 2019	Xuan Li	New run with new ITHR and IBIAS values

Set ITHR = 21, IBIAS = 44. w/ 5.3m cable.

beam in the center of staves (5th chip) and table rotation 1 degree.

Run 915 is noisy and need pedestal w/o beam.

37	Tue May 21 22:06:17 2019	Cameron	Changing strobe length

Altering value of IDB and ITHR to reproduce the Fig36 of the readout technique note.

36	Tue May 21 22:03:40 2019	Cameron	New 8.8m Cable Test

We were unable to get the new cable to work. We configured the readout units 4 times and got the same error when setting up RU2. Check gth is aligned gave false for chips 4 and 6.

Reverted back to older cable and everything worked again. Will check continuity of this cable and possibly use one of the others delivered by samtec in the next shift

35	Tue May 21 19:58:35 2019	Xuan Li	May 21 evening shift data taking

Run 908, beam in the center of staves (the 5th chip). rotate the table by 1 degree, beam location 1092.5 mm.
This is a 30 min run w/ 5.3m new cable. Will change to 8.8m new cable and repeat.
NHits/Event for Stave C104 = 2.67

Changed the 5.3 m cable with 8.8m cable, did not work.

Run 912 with beam in the center of staves (the 5th chip). rotate the table by 1 degree, beam location 1092.5 mm.

This is a 30 min run w/ 5.3m new cable.

Previous runs are under ITHR=50 and IDB=29, these two parameters can be tuned to study the pulse shape of the ALIPIDE.

To change this, in line 265 and 266 in testbench_base.py.

| 34 | Tue May 21 18:45:37 2019 | Ming Liu | To do's for tonight |

a few things for tonight:

1. test the new ling SamTec ables;

- only replace the 2nd half cables, keep the one connected to the stave, RU2

- take a good long reference run with the current setup (8m SamTec)

2. take high stat data

- some Millions event, no ronation

3. scan ALPIDE parameters

- threshold, shapping time etc.

4.

| 33 | Tue May 21 18:44:09 2019 | Ming Liu | asked reduce beam intensity to 50K per spill |

ATLAS group is done for today, beam is for us.

Asked MCR to reduced the beam intensity from 1M to 50K per spill

| 32 | Tue May 21 15:12:44 2019 | Cameron | Checking runs for out of sync staves |

There is a worry that some runs could have a stave out of sync. Checking the pixel deltas to see if anything looks odd.

865 - This is fine. Beam going through excluded chip

868 - As above

871 - As above (2 chips)

877 - This is the original suspicious one for an out of sync stave (C105)

879 til 883 - Bad connections in setup

884 - Excluded chip and table was in rotation. May still be an issue though

890 - Bad connections in setup

894 - Stave C104 had half a chip hit

| 31 | Tue May 21 14:21:50 2019 | matt durham | higher intensity running - 25kHz |

Run 898 - x=scan, y=270, phi = -40 degrees. started at 0626 end 0640

moving in x 5mm per spill

turn back to phi=0

Run 899 - x=scan, y=270, phi = 0 degrees. started at 0642 end 0715

moving in x 5mm per spill

stop at x=1175

30	Tue May 21 06:28:20 2019	Ming Liu	high intensity bean 25kHz

started high intensity beam , 100K ppp,

~25kHz trigger rate

29	Tue May 21 06:26:19 2019	matt durham	higher intensity running - 25kHz

Run 898 - x=scan, y=270, phi = -40 degrees. started at 0626 end 0640

moving in x 5mm per spill

turn back to phi=0

Run 899 - x=scan, y=270, phi = 0 degrees. started at 0642 end 0715

moving in x 5mm per spill

stop at x=1175

28	Tue May 21 05:24:16 2019	matt durham	translated into live areas

realign and now all beam spots on live areas

Run 893 - x=1075, y=270, phi = -40 degrees. started at 0523, end 0530

Run 894 - x=1045, y=270, phi = -40 degrees. started at 0532 end 0539

Run 895 - x=1085, y=270, phi = -40 degrees. started at 0540 end 0548

Run 896 - x scan 1165 and 1135 , y=270, phi = -40 degrees. started at 0550 end 0559

Run 897 - x=scan, y=270, phi = -40 degrees. started at 0600 end 0625

27	Tue May 21 05:05:56 2019	Ming Liu	disconnected LV connectors at stave end

found a disconnected LV (Digital) for the 1st stave;

had a controlled access to resit this cable and the whole system runs again.

Attachment 1: LV-connector-issues-IMG_2110.jpg

26	Tue May 21 04:57:42 2019	matt durham	data at -30 deg run 891

Ming, Hubert, Xiaochun fixed cables.

Run 891 - x=1090, y=270, phi = -30 degrees. started at 0503 (wait a few minutes for beam to come in), end at 0512

Run 892 - x=1090, y=270, phi = -40 degrees. started at 0514, end at 0521

25	Tue May 21 04:16:09 2019	matt d	data at -10 deg run 888, -20 deg run 889

Run 888 - x=1090, y=270, phi = -10 degrees. started at 0415, end at 0433

Run 889 - x=1090, y=270, phi = -20 degrees. started at 0434, end at 0442

Run 890 - x=1090, y=270, phi = -30 degrees. started at 0443, end at

Cables came unplugged!!! Lost the data.

24	Tue May 21 03:46:45 2019	matt d	back to data w run 885, but onlmon problem

Run 885 - x=1090, y=270, phi = -10 degrees. started at 0347. stop at 0353, online monitoring not working.

Run 886, still not working.

Restart DAQ, run 887 short junk run to align trigger. Run 88 start to take data

23	Tue May 21 03:05:47 2019	matt d	fixed Assertion Error in RU

Ming found a couple USB connections that were loose. Seemed to fix the issue. Thanks Cameron for waking up and talking us though it.

If you see dead staves check the RU currents (middle terminal on Nuc).

Run 884: straight on. Doing some translation and rotation to line up chips.

22	Tue May 21 02:19:14 2019	Ming Liu	Default PS readings

2 RUs + PU operation:

1. FAN = 12V. 2.3A

2. 4 staves: 3.3V, 3.5A; -5V, 0.01A

3. RUs: 5.0V, 5.1A

Attachment 1: MVTX-PS-readings-IMG_1792.jpg

21	Tue May 21 02:02:52 2019	matt durham	fixing staves

Ming and Hubert make an access to re-seat cables that may have come unplugged during rotation.

Run 884: junk data on pulser trigger to see if staves are reconnected

| 20 | Tue May 21 01:51:59 2019 | hvh | staves disconnected? |

after rotation from -30 to -45, staves 1,2 missing.

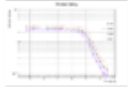Rotate back to -30, staves 1,2,4 missing

Rotate to 0, staves 1,2,4 missing.

Disk full warning

| 19 | Tue May 21 00:40:25 2019 | ming liu | strobe delay scan plot |

Completed strobe delay scan;

operation point: delay = 2.0uS

Attachment 1: strobe_delay.pdf

| 18 | Tue May 21 00:33:26 2019 | Ming Liu | controlled access to move stop-block |

we found the right most chips ("chip -8", look down stream) can't be accessed in the current motion table setting;

had a controlled access to moved the limiting block further out by ~5cm.

Hubert, Gerd, Xiaochun and Ming

| 17 | Mon May 20 23:39:26 2019 | gjk | rotation |

run 873
run 874 - lost beam before events

run 875 - junk

run 877 - angular track (-30deg, x = 1079.3 up, y = 270.1)

run 878 - angular track (-30deg, x = 1060 up, y = 270.1) - stop at 0130

run 879 - angular track (-45deg, x =1060 up, y = 270.1) - start at 0131, stop at 0134: one stave had no hits, maybe came unplugged?

run 880 - angular track (-30deg, x =1060 up, y = 270.1) - start at 0135, stop at 138, 3 staves wtith no data.

run 881, back t ozero degress to see effect, three still dead

run 882 test w/pulser trigger, junk data

| 16 | Mon May 20 23:13:15 2019 | gjk | scan other side |

remember there is a 2 mm hysteresis

```
run 868        1125.4 270.1 (coming from the right)

run 869         1156.1 270.1

run 870          1186.3 270.1

run  871          1216.7 270.1

run 873           1095.9  270.1 back to center - maybe slight tilt
```

15	Mon May 20 22:52:53 2019	gjk	Chip Scan

```
beam back at 22:50

2 us delay

center run 862  plus (some moving)

1st move left 1063.6 270.1 run 863

2st move left 1033.3 270.1 run 864

3rd move left 1002.4 270.1 run 865

4th move left - failed because of hard limit for horizontal.
```
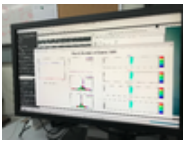
14	Mon May 20 19:34:37 2019	gjk	trigger delay study

```
beam back - hor sigma 6 mm - vert sigma 3.5 mm - requested 40,000 counts - got them at 7:39

centered beam in the middle of the stave with down 7 mm, right 5 mm ie. 270.1 - 1095.5

sdb died - cannot mount - superblock failure - switched to external disk at 8:05

trigger delay scan:

delay 750 ns - run 848

delay 1.25 us - run 849

delay 2.25 us - run 850

delay 3.25 us - run 851

delay 4.25 us - run 852

delay 5.25 us - run 853      stave 2 = 1.7/ev

delay 5.5 us   - run 854

delay 5.75 us - run 855       stave 2 = 0.6/ev

delay 6.00 us  - run 856      stave 2 = 0.33/ev

delay 6.25 us  - run 857      stave 2 = 0.21/ev

delay 6.50 us  - run 858      stave 2 = 0.165/ev

delay 5.00 us  - run 859

delay 4.75 us  - run 860      stave 2 = 2.8/ev

delay 4.50 us  - run  861
```

| 13 | Mon May 20 10:40:59 2019 | Cameron | Runs |

```
Run 831 - First beam

Run 834 - Noise run for pixel mask. 10kHz from signal generator
```

| 12 | Mon May 20 10:01:35 2019 | cameron, hubert, matt, ming | stopped data taking |

```
ATLAS asked for high intensity beam for their detector tunning;

Stopped data taking and moved the detector down by 15cm, Y0 =136mm
```

| 11 | Mon May 20 09:28:31 2019 | Cameron, Huber and MIng | We got data! |

```
first events display showingh we are getting proper tracks!
```

Attachment 1: first_beam_IMG_2075.jpg

| 10 | Mon May 20 08:43:49 2019 | Cameron and Ming | first beam after a long shutdown! |

```
MCR is deliverinbg beam at intensity ~10K per spill ; we are moving the telescope to the
normal position now;

X0 = 1085 mm;

Y0 = 278 mm; (was 130mm, 15cm below the beam)



For some reasons, the FELIC server restarted itself, in the process of restarting
```

Attachment 1: Screen_Shot_2019-05-20_at_9.04.15_AM.png

| 9 | Sat May 18 18:11:14 2019 | Ming Liu | Default MVTX table locations |

```
X = 1085 mm;

Y = 278 mm;

Phi =0;

https://www.phenix.bnl.gov/WWW/publish/mxliu/sPHENIX/LDRD/Telescope/photos/Normal-
locations.jpg
```

| 8 | Sat May 18 17:24:40 2019 | Ming Liu | ORC review response |

ORC reviewed on May 16 (Thur), and approved on May 17 (Fri), 2019.

attached is our response to ORC recommendations.

Attachment 1: sPHENIX-MVTX-ORC-05162019-Responses.pdf

| 7 | Sat May 18 16:29:54 2019 | Ming Liu | MVTX Test Beam Data localtion - TB1441 |

all MVTX testbeam data from May 2019 are located at,

/gpfs/mnt/gpfs02/sphenix/data/data01/mvtx/tb-1441-052019
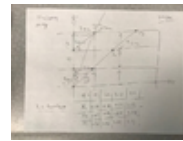
- calib

- junk

- beam

- longrun

| 6 | Sat May 18 16:02:19 2019 | Ming Liu | Rotation angle and Chip Crossing - TB 1441 |

Telescope rotation angle and chip crossing distance.

| 5 | Sat May 18 15:12:56 2019 | Ming Liu | MVTX Test Beam Data Taking Plan |

Plan for telescope data taking:

Trigger: SC1 + SC2 + SC3 + Spill (F:MTSCL5)

Delay adjusted through local NIM modules (delay + TTL)

Day-1: geometry mapping, trigger delay study etc.

1. 120GeV proton beam at norminal intensity, ~15kHz (= 15k x 4Sec = 60k protons), ~10M events (~10min);

  - check relative hit distributions from online monitoring; (dX,dY)

  - adjust trigger delay to get maximum # of hits per trigger (trigger delay = 0 ~ 7uS, possible default ~ 1.5uS)

  - move the motion table +/- 30mm each time to scan all sensors

2. Horizontal scan for each sensor group (4 chips), offset in Y to map the physics geometry

  - check hit distributions for all sensors from online monitoring; 4 corners; map the sensor geometric location (x,y) vs (Col. Row)

3. Detector alignment study

```
 - preliminary alignment in (X,Y)

Day-2:

1. High stat. data at several beam angles, 10, 20, 30 degrees;

Day-3:

1. some other fun stuff...

2. low energy beam? 5GeV?


more ...  TBD
```

| 2 | Sat May 18 09:53:15 2019 | Ming Liu | MVTX TB entry |

```
this is a test, the telescope photo is attacehd.
```

Attachment 1: Telescope-system-IMG_2017.jpg

| 1 | Fri May 17 19:13:06 2019 | Martin | test entry |

```
just to see if we can make entries...
```

Goto page 1, 2, 3, 4, 5, 6

ELOG V3.1.3-