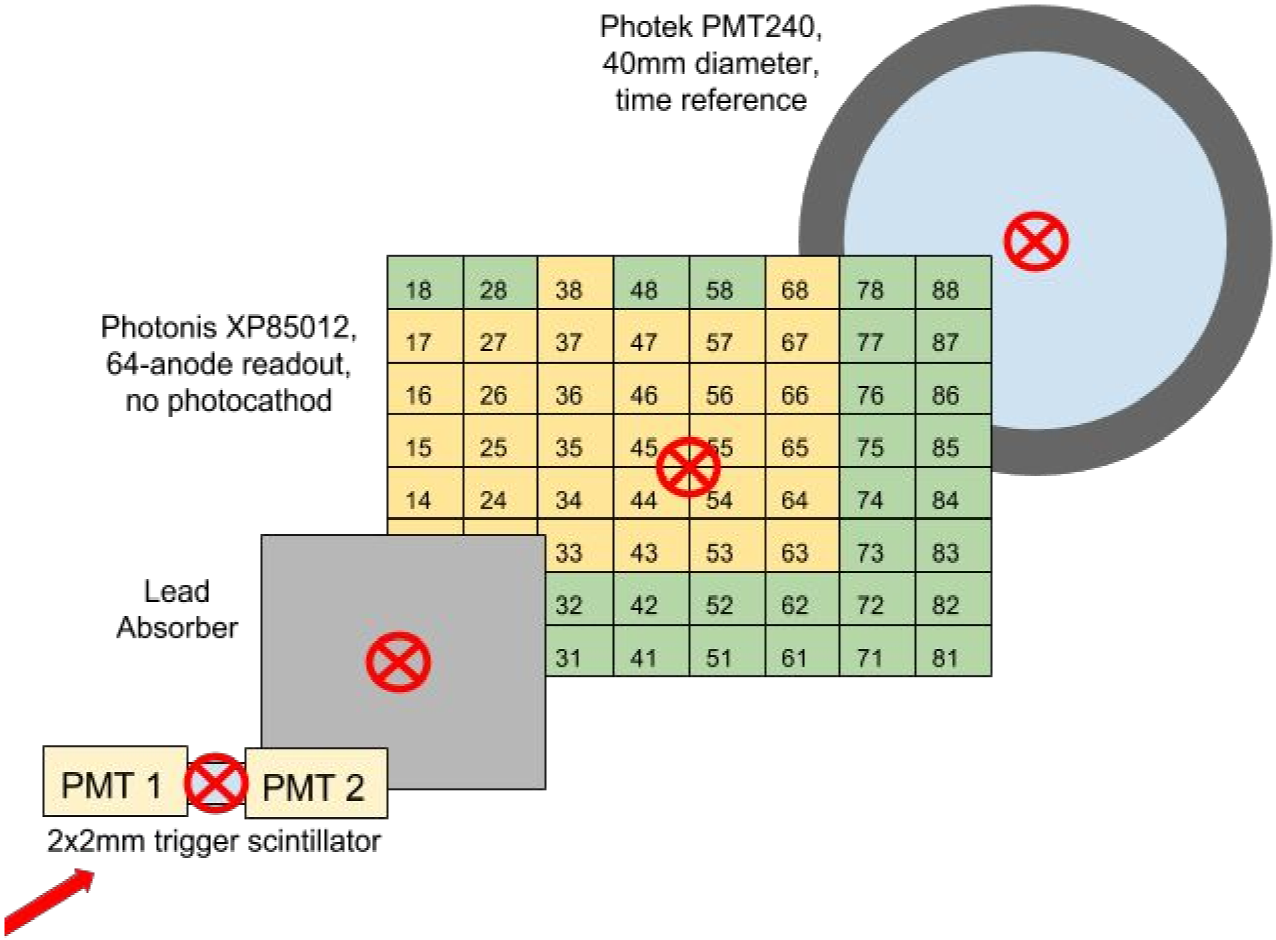
December 1, 2015
11:00

We moved equipment from SiDET to MTest.

December 2, 2015
7:00

HV and Signal Connections from the Test Area to Control Room

	Cable label	2B Panel	Source	Destination	Value
HV1	1	2B-106	MTRR03 **HV1**	Trigger PMT-1	-1550V
HV2	5	2B-107	MTRR03 **HV2**	Trigger PMT-2	-1550V
HV3	6	2B-108	MTRR02, left Bertan, **ch.A**	Photonis MC-PMT	<-2400V
HV4	7	2B-109	MTRR02 right Bertan, **ch.A**	Photek MC-PMT	<-4800V
HV5	8	2B-110	n/c		
Sig1	MT-121	2B-16	**T1 or T2**	Scaler in CR, ch.2	NIM
Sig2	MT-125	2B-17			
Sig3	MT-206	2B-18			
Sig4	MT-211	2B-19			
Sig5	MT-213	2B-20			



Experimental setup as viewed along the beam

2:10 PM : How to login to VME controller using ssh
IP: 131.225.179.67 (DHCP, can be changed)
User ID: daq, Passwd: sidetdaq
superuser password: 1065daq

Data acquisition programs are placed in a folder daq at home directory.

First, Go to 'daq' folder, and find shell scripts: run1.sh, run2.sh, and run-two.sh
To start DAQ, use of them. To readouot two V1742 boards, use run-two.sh
For example: 'run-two.sh run 1 1000'

After acquiring 1000 events, the program stops, and the data will be stored in two separate files: run-1-bd1.dat and run-1-bd2.dat

Second, Copy the data to your laptop or some area for data analysis.

Third, Enjoy the data analysis.

trigger delay parameter is an integer, corresponds to about 9ns

****

Analysis software:

compile:
make pro=<program name>

Programs:
test-11 : makes some example plots of pulseshapes
dat2root-11 : convert binary format to root Tree

dynamic range : 1V , corresponds to 4096 ADCs
1ADC is approx 0.25 mV

****

We try to do a test for the synchronization between the two DRS boards.

sync-test-10 : no variation of pulse generator
sync-test-11 : variation of pulse generator

sync-test-20 : no variation of pulse generator
sync-test-21 : vary pulse generator

sync-test-22 : vary pulse generator, but we got the 0 bytes for event 0 in this case
sync-test-23 : vary pulse generator, no 0 byte occurrence

from run 21 above, we find that the 2 boards apparently are not synchronized. eg. event 684 and 685, the amplitudes for the 2 different boards for the same event number is clearly not the same.

18:00 Cristian, Si, Adi, Sergey, AIR.

We passed ORC, waiting for all signature.

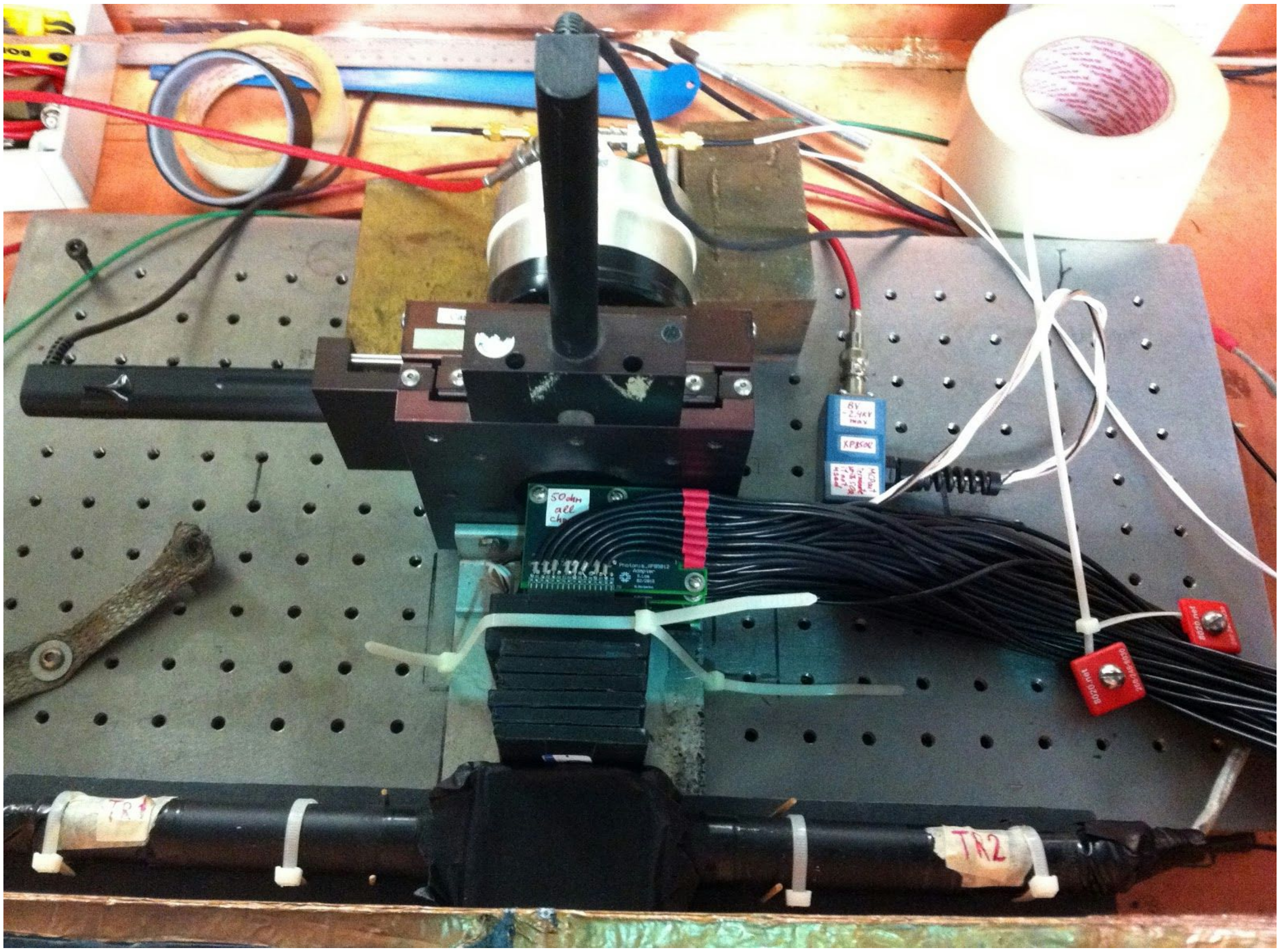
18:30

Sign done. Ordered search and rescue

19:00

Inspection done.

19:15 Ordered 8 GeV electrons, intensity 100,000/spill



20:00

We see beam now. trigger counts at about 90 per spill.

Run 1: MCP’s were off. triggers working

Run 2: MCP’s on now.
Photonis : 2.3 kV
Photek : 4.7 kV
Run 3: same as Run 2 (1000 events)

We see the cherenkov signal, but no other signals.

The “trigger” channel seems to have some offset with respect to all the other channels - we see this if we don’t apply the calibration.
Most likely the signals were outside our time sampling window, because they happen earlier than the trigger signal. We need to apply a negative delay.

looks like the trigger is happening even later than the cherenkov signal, which is typically separated with respect to the MCP signals by 150ns. So we need to apply a negative delay of ~200ns or so.

20:55

The DAQ got stuck, so we cannot take data anymore. Will need to power cycle.

21:05 HV is turned off, table is going down to 0, end of our day

Dec. 3, 2015

9:00 Heejong, Adi, Cristian, Sergey, AIR

HV, kV. TR=1.4, Photek240=4.7, Photonis XP85012/A1? =2.3 (NO PC).

Have a beam. 8 Gev electrons. X-Y scan of box, step 5mm.

Run 5: MCP’s on now. 200 events, delay -9 (~ -81 ns)
Run 6: MCP’s on now. 200 events, delay 0
Run 7: MCP’s on now. 200 events, delay -20 (~ -180 ns)
Run 8: MCP’s on now. 200 events, delay -15 (~ -135 ns)
Run 9: MCP’s on now. 1000 events, delay 0
Run 10: MCP’s on now. 1000 events, delay -9 (~ -81ns)
Control access: shorten cables for scintillator trigger
Run 11: MCP’s on now. 100 events, delay -9 (~ -81ns)

Run 12: MCP's on now. 100 events, delay 0
Run 13: MCP's on now. 100 events, delay -2
Run 14: MCP's on now. 100 events, delay -4
Run 15: MCP's on now. 100 events, delay -6
Run 16: MCP's on now. 200 events, delay -8
Run 17: MCP's on now. 200 events, delay -3
Run 18: MCP's on now. 200 events, delay 0
Run 19: MCP's on now. 200 events, delay 0 (sample rate 1Gs/s)

14:25 (Dec.03, 2015)

PMT Trigger efficiency scan (1.4E10 MTest counts, discriminator threshold is 40mV)

Voltage (V)	1400	1450	1500	1550	1600	1650
Count/spill	312	687	899	1234	1439	1775
						counts when no beam

X-Y Scan (nominal center 1645/350mm)

Trigger counter HV=-1550V, 1.3E10 MTest ppp count, X: West --- East

Y/X	1535	1555	1575	1595	1615	1635	1655
370	**123**	**288**	**556**	**628**	**398**	**218**	**79**
360	**186**	**554**	**1078**	**1219**	**570**	**293**	**204**
350	**205**	**593**	**1367**	**1434**	**724**	**456**	**299**
340	**179**	**623**	**1179**	**1306**	**632**	**388**	**225**
330	**130**	**336**	**759**	**757**	**405**	**231**	**141**
320		**149**	**307**	**330**	**191**		

15:40 - Dec.03 New suggested table position is at **1590/350** mm

Control Access 12.3.2015 #2 (13.08 pm):

Photek 240 is split into two channels only going into Board#1; channel 16, trigger channel on Group#0

run 21 : see Photek now
no Photonis yet

14:20 **Photonis HV to 2400 V**

Run 21: MCP's on now. 200 events, delay 0
Run 22: MCP's on now. 1000 events, delay 0 (sample rate 1Gs/s)
Run 23: MCP's on now. 1000 events, delay 0 (sample rate 5Gs/s)
Run 24: MCP's on now. 1000 events, delay 0 (sample rate 2.5Gs/s)
Run 25: MCP's on now. 200 events, delay 0 (sample rate 2.5Gs/s)
Run 26: MCP's on now. 1000 events, delay 0 (sample rate 2.5Gs/s)

16:00

- Remove lead
- global trigger is NIM from one PMT
- AND of the logic into channel 30

17:00

We remove the CAEN crate and try to work out the time delay in the control room. we replace it with the DRS evaluation board. We connect the 4x4 adaptor on the photonis, and read out the single channel.

CH1: Photonis

CH2: Photek
CH3: NIM trigger1
CH4: NIM trigger2
Ext Trigger: Trigger1 and Trigger2

Run 40:
Self trigger on photonis

Run 41:
Trigger on CH4 Trigger
CH4 trigger sees a lot of empty events. rate is about 400 per spill

Run42:
Trigger on CH3 Trigger. CH3 trigger has rate of about 40 per spill, most events have signals in photonis and photek.

Plan for Remaining time Tonight:

- do longitudinal shower depth scan for lead using opaque photonis MCP
- do longitudinal shower depth scan for tungsten using opaque photonis MCP

18:30 please, move down our box, before leaving, AIR

CH1: Photonis
CH2: Photek
CH3: NIM trigger1
CH4: Cherenkov Inner
Ext Trigger: Trigger1 and Trigger2

DRS4 scope data
t1065_dec_run40.dat

t1065_dec_run41.dat
t1065_dec_run42.dat
t1065_dec_run43.dat
t1065_dec_run44.dat

18:30 **Controlled Access, Cherenkov signal #1 (inner) was connected to DRS-4 channel #4, using a shorter cable (20' replacing 30")**

It was also noticed that the beam center has moved from X=1590 (80 triggers/spill), determined by the scan at 15:40 to approx. X=1645 (500 triggers/spill), why ???

8 Gev electrons, 500 triggers at table position 1645/350 mm
Trigger PMTs @ 1550V, Photonis@2.4kV, Photek@4.7kV
Absorber?

t1065_dec_run45.dat -->good run

20:00 **4 Gev electrons**, 350 triggers at table position 1645/350 mm
Trigger PMTs @ 1550V, Photonis@2.4kV, Photek@4.7kV
Absorber?

t1065_dec_run46.dat

21:06 Next energy point will be tomorrow, for now we are switching the HVs off and lowering the table.
HV is off, table is moving down. Good night!!!

CP: current situation is that we can take data on DRS4 eval board. Ran 8 and 4 GeV 5000 events. The proposed plan is to run 16 GeV tomorrow using the same setup so we finish the energy scan. Preliminary results show ~40 ps resolution between photonis and photek

Second proposal is to switch back to 8GeV electron and do the longitudinal scan with that particular energy beam. After that we believe we have a complete test and possibly a paper out of this data.

Third proposal, reproduce same results from DRS4 evaluation board using the CAEN VME board #1.

Dec 4, 2015

6:00, AIR
The plan above looks good.
Next.

1. What about the hadronic (120 GeV protons) shower study?
2. If not, the next should be silicon (I'm at SiDet to make it working, may be Sergey can come here to complete it?)
3. And eventually (if it will be enough time) the ANL 6x6 cm2 and may be MPPC, 4x4 matrix (each of the 16 pixels is 3x3 mm2) if it make sense.

PS. Looks like we need prop camera profiles, will contact Mandy about it today. I believe the plan depends on CAEN VME readiness to take data and can be corrected. Please, any comments and suggestions.

9:00, Heejong, Cristian, Sergey, AIR
BOX back to Y=350, asked 16 GeV electrons
HV, kV TR=1.55; Photek240=4.7; Photonis=2.4
Absorber 6 Xo of lead.

Begin Data Taken:

9:30 **16 Gev electrons**, 350 triggers at table position 1645/350 mm
Trigger PMTs @ 1550V, Photonis@2.4kV, Photek@4.7kV
Absorber: 6 Xo of lead

t1065_dec_run47.dat
Bad run--> Saturated Signal

10.00 Am: Control access add 10db att. for both MCPs
t1065_dec_run48.dat, take 5000 events.

10.43 Am: Control access add 10db att. for both MCPs
t1065_dec_run49.dat, take ~3700 events.

Decrease intensity of beam by a factor of 5. Stop run 49, begin a new one
11:00 asked to decrease beam intensity. We have TR/spill about 1500/spill now, before it was 8000/spill. The reason to decrease is to not study MCP rate effects. air.

11.01 Am: t1065_dec_run50.dat, take 5000 events.

11:23 Decrease Photek HV to -4.6kV
11.23 Am: t1065_dec_run51.dat, take 5000 events.

(Saturation of photek is gone, take another 500 events)

11.43 Am: t1065_dec_run52.dat, take 5000 events.

12:15, CA: Artur, Cristian, Heejong. Delivered CAEN VME back close to our beam setup, but w/o any changes of DAQ. DAQ is still DRS eval board (4 chs).
We have to check that X-Y stage (inside of our BOX) if it is working. AIR.

The procedure to operate the X-Y.

1. go to rdp (this step should be Internet ---> KRDS instead)
2. connect with ncdflap45.dhcp.fnal.gov
3. use as username in KRDC - fermi\ppd-cap-ncdflap45
4. PWD: Ftbf_user01

after that should get the X-Y main window in:
rdp://fermi%5Cppd-cap-ncdflap45.dhcp.fnal.gov
Note: don't hit ENTER, when operating with the X-Y. To move X-Y hit right button in Jog instead.
So far it is look like working. We have got the window with X-Y operational stage. AIR.

Double checked absorber: 6Xo of Pb? Yes, 6Xo Pb! :)
Control Access 12:15-12:55PM :

- Absorber is now 2Xo Pb.
- Installed caen crate connected same trigger(Trigger group#0) as well as the output of the discriminator (channel #2) as the ones used in DRS4 evaluation board.
- Checked network connection; it works.

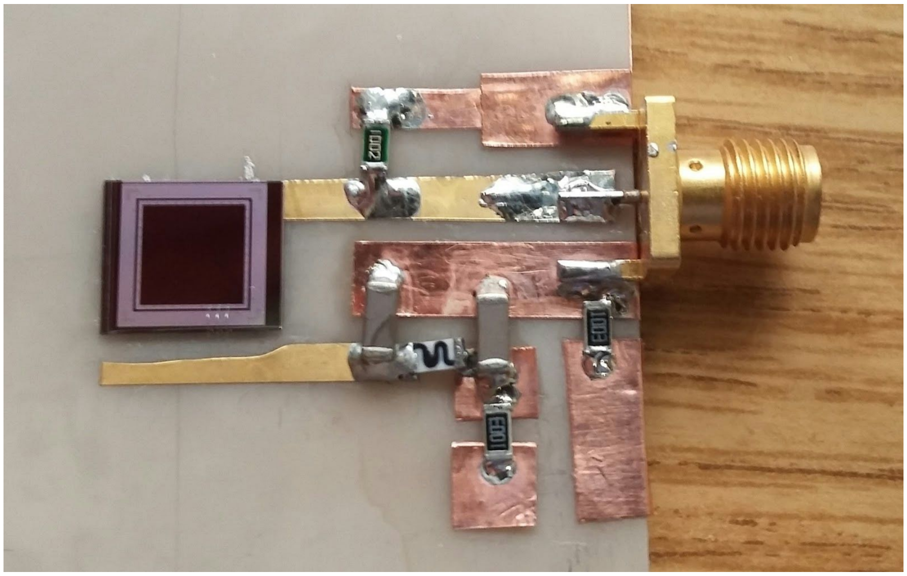
Photek@4.7kV, Photonis@2.4kV, and trigger counters@1550V

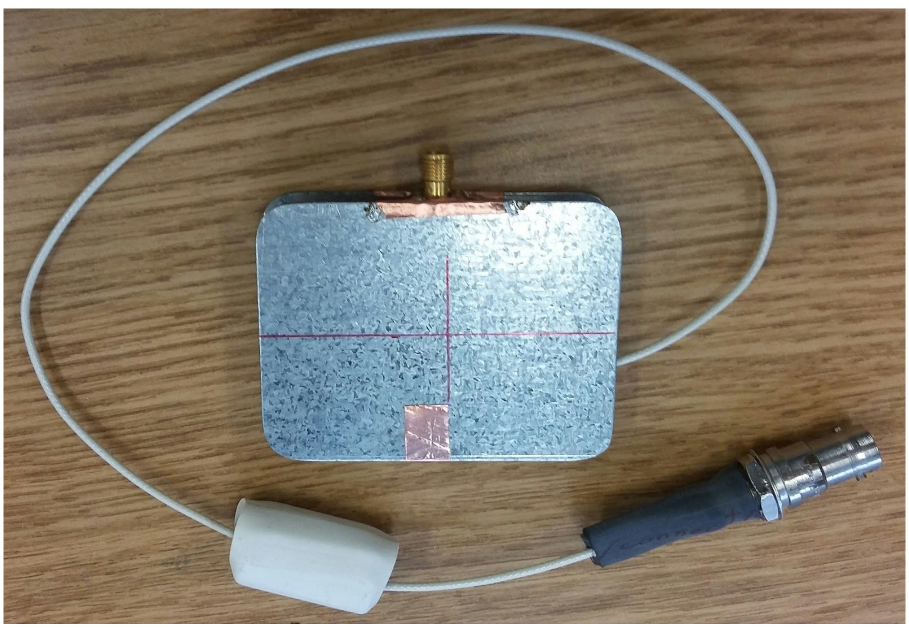
13:30 asking 8GeV electrons

t1065_dec_run53.dat

14:30 PM access: split the signals from Photek and Photonis, go into the DRS4 evaluation board and the CAEN board. Channel 1 is Photonis and Channel 2 is Photek, for both Eval Board and CAEN. We do not see Photek on Eval Board, but we see it on CAEN.

15:30 -Dec.04-2015
Silicon sensor is rewired and assembled for TB installation. Sergey





15:10 PM: access to fix the bad splitter for Eval Board. Changed the splitter and cables, checked with signal generator, looked like it works now. Beam of 8 GeV.

15:18 PM: we see now photek and photonis.
Will take data simultaneously using DRS4 and CAEN.

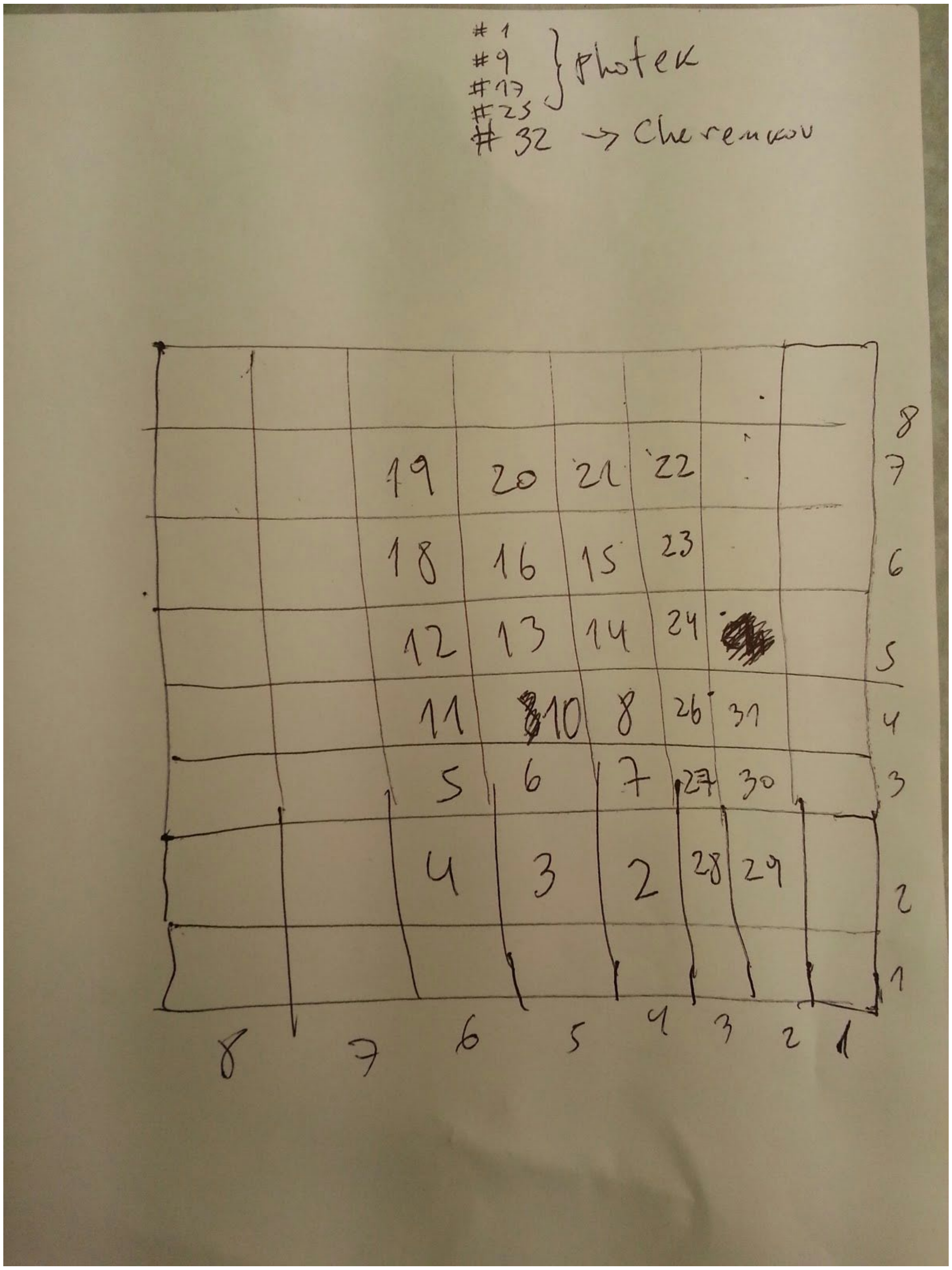
8 GeV electrons data. 2Xo Lead.
t1065_dec_run53.dat

16:00 PM: take more data
8 GeV electrons data. 2Xo Lead.
t1065_dec_run53.dat

17:46
Plan for access:

- Add another trigger to CAEN board group 2,3
- Photek split in 4, goes to channel 1 of each group (1, 9, 17, 25)
- add cherenkov to another channel (32)
- connect photonis

18:50 Si, Cristian, Adi
access completed
Channel map



Data taking: Caen 32 channels
t1065_dec2015_run57-57.dat
t1065_dec2015_run58-58.dat
t1065_dec2015_run59-59.dat

20:49 PM: access to change the splitter and remove the T on the output of Photek, since the signals on first pair of Photeks was much smaller than in the second pair. Also, we plugged the cables from the remaining 32 channels into the second CAEN board or with 50Ohm, to terminate them to avoid the reflections.

Run 60: 8 GeV electrons with 6X0 Lead.

Dec 5, 2015

9:00, Adi, Cristian, Si, AIR
Asked 8 GeV electrons.
CA: checked 32 cables which are hooked up to CAEN VME, they do not limit mechanically X-Y stage movement for +/- 15 mm. Moving BOX in vertical position to 355 mm. HV, kV: TR=1.55; Photonis=2.4; Photek240=4.6. TR counts 500-600/spill

t1065_dec2015_run59-59.dat

t1065_dec2015_run62-62.dat: good run, 8 GeV Electron, Photek at 4.6 V, Photonis at 2.4 V. Position not known. 6X0 lead.

11:50 AM:

t1065_dec2015_run63-63.dat: same condition as above, X-Y stage moved (0,+6) mm in positive units.

11:50 AM:

t1065_dec2015_run64-64.dat: same condition as above, X-Y stage moved (0,-6) mm.

t1065_dec2015_run65-65.dat: same condition as above, X-Y stage moved (-6,0) mm.

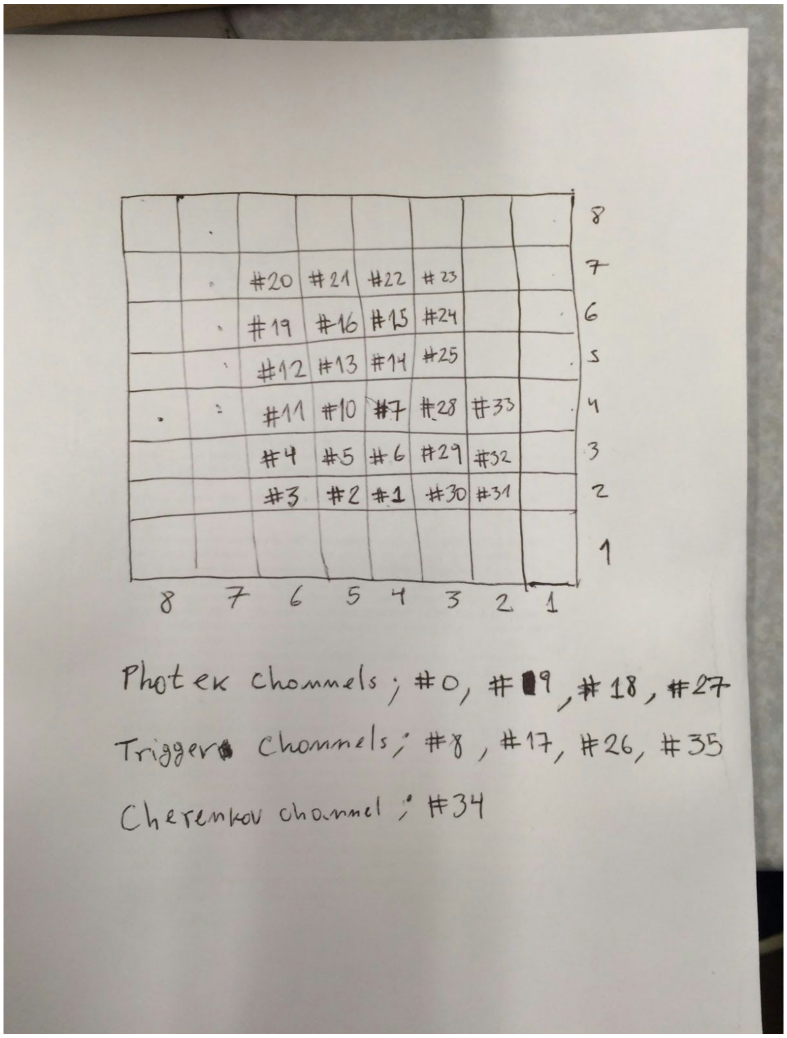
t1065_dec2015_run66-66.dat: same condition as above, X-Y stage moved (-6,-6) mm.

t1065_dec2015_run67-67.dat: same condition as above, X-Y stage moved (0,+12) mm in positive units.

t1065_dec2015_run68-68.dat: same condition as above, X-Y stage moved (0,+12) mm in positive units. Another 10,000 events in same position as run 67

t1065_dec2015_run69-69.dat: same condition as above, X-Y stage moved (-6,+14) mm in positive units.
t1065_dec2015_run70-70.dat: same condition as above, X-Y stage remains at (-6,+14) mm in positive units. Another 10, 000 events

Mapping of channels is shown below:



16:00
The DRS caen crate got corrupted. Needs a power cycle.
Access:

- Powercycled the CAEN crate
- Remove lead absorber and replaced it with 6X0 of Tungsten absorber

######TUNGSTEN(6X0)#######
t1065_dec2015_run71-71.dat: same condition as above, X-Y stage remains at (-6,+14) mm in positive units.

t1065_dec2015_run72-72.dat: same condition as above, X-Y stage remains at (-6,+14) mm in positive units. Another

t1065_dec2015_run73-73.dat: same condition as above, X-Y stage remains at (-3,+14) mm in positive units.

We observe some amplitude difference between photeks in different groups. It seems to happen more for later events within a run. We will test what happens by taking multiple short runs.

t1065_dec2015_run74-74.dat: same condition as above, X-Y stage remains at (-3,+14) mm in positive units. (1000 events)

t1065_dec2015_run75-75.dat: same condition as above, X-Y stage remains at (-3,+14) mm in positive units. (1000 events)

t1065_dec2015_run76-76.dat: same condition as above, X-Y stage remains at (-3,+14) mm in positive units. (2000 events)

t1065_dec2015_run77-77.dat: same condition as above, X-Y stage remains at (-3,+14) mm in positive units. (3000 events)

t1065_dec2015_run78-78.dat: same condition as above, X-Y stage remains at (-3,+14) mm in positive units. (1450 events)

t1065_dec2015_run79-79.dat: same condition as above, X-Y stage remains at (-3,+14) mm in positive units. (1000 events)

t1065_dec2015_run80-80.dat: same condition as above, X-Y stage remains at (-3,+14) mm in positive units. (1000 events)

t1065_dec2015_run81-81.dat: same condition as above, X-Y stage remains at (-3,+14) mm in positive units. (1000 events) t1065_dec2015_run82-82.dat: same condition as above, X-Y stage remains at (-3,+14) mm in positive units. (1000 events)

t1065_dec2015_run83-83.dat: same condition as above, X-Y stage remains at (-3,+14) mm in positive units. (1000 events)

based on the tests above, we conclude that taking short runs of 1000 events each increases the fraction of events that are synchronized. About 40-50% of events are synchronized. For events between 1000-2000, only 15% or so of events are synchronized. For the analysis, we need to make sure that we use events that are synchronized between group0,1 and group2,3

(0,+14) X-Y

Move to (0,+14) mm
t1065_dec2015_run84-84.dat: same condition as above, X-Y stage remains at (0,+14) mm in positive units. (1000 events)

to

t1065_dec2015_run93-93.dat: same condition as above, X-Y stage remains at (0,+14) mm in positive units. (1000 events)

10, 000 TOTAL.

We will change the file format to be t1065_dec2015_runNumber-i.dat where Number is the actual run number (t1065_dec2015_run94-i will be the first one with this format) and i is the subset of 1000 events, most run will have i in (0,9).

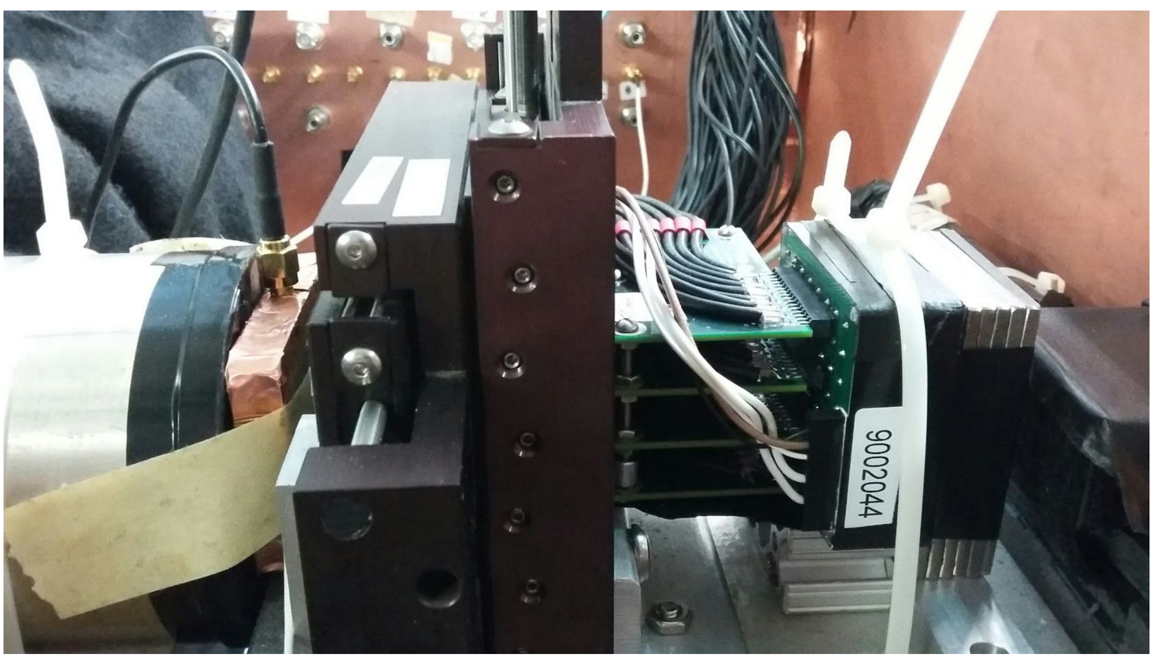
t1065_dec2015_run94-0.dat: same condition as above, X-Y stage moved to (-6,+14) mm. (1000 events)

19:20 please, move our box down before leaving.

Dec 6, 2015

8:30
The plan for today. Complete Opaque Phtonis XP85012/A study. Start silicon study. If problem with CAEN VME DAQ, use eval DRS (4 channels), because the silicon has only one signal out.
8:45
My guess for now. We have to continue 8 GeV electrons, (any recommends from yesterday?), elevate table, make HV ON, hook up Keithley 2410 for silicon HV, install Leader (+12 V) near MT6.2B for silicon amps, AIR.
Asked 8 GeV electrons.

9:15 CA: Cristian, Sergey, AIR
Sergey installed Si before Photek240 to check out its functionality. Silicon (Si) is hooked up to channel 1 of DRS-4 Module



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The Original Position from Saturday of the photonis in the motion table was accidentally moved in the morning of Sunday (First Control Access)

9:30 Adi, Artur, Si, Cristian, Sergey, AIR
X-Y table, X=1644 mm, Y=352 mm. X-Y table is about right position.
HV, kV: TR=1.55; Photonis=2.4; Photek240=4.7; Si=-0.5, I~60 mkA
8 GeV electrons. 6 Xo of W before Photonis.
X-Y stage. X=-6 mm, Y=14 mm.
Very good news: we see Silicon signal.

t1065_dec2015_run95-0.dat: 8 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events) beam intensity is less than yesterday. at 90K counts per spill.

t1065_dec2015_run95-1.dat: 8 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events)

t1065_dec2015_run95-2.dat: 8 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events)

t1065_dec2015_run95-3.dat: 8 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events)

10:33
We see that the rate of in-sync (between group0,1 and group2,3) for the low rate runs are about 80% for runs with 1000 events. Yesterday at 3 times the beam intensity, it was about 40%. So we want to check what happens in between.
We call MCR and ask for two times the current count (current count is about 90K counts).

t1065_dec2015_run96-0.dat: 8 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events) beam intensity is about 200K counts

t1065_dec2015_run96-1.dat: 8 GeV electron beam, X-Y stage at to (-6,+14) mm. (3000 events)

t1065_dec2015_run96-2.dat: 8 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events)

t1065_dec2015_run96-3.dat: 8 GeV electron beam, X-Y stage at to (-6,+14) mm. (4000 events)

Preliminary at this rate (180k counts) the sync events correspond to 65%

Change beam to 16 GeV electrons

t1065_dec2015_run97-0.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events) beam intensity is about 180K counts

t1065_dec2015_run97-1.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events) beam intensity is about 180K counts.

t1065_dec2015_run97-2.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events) beam intensity is about 180K counts.

t1065_dec2015_run97-3.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events) beam intensity is about 180K counts.

t1065_dec2015_run97-4.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events) beam intensity is about 180K counts.

t1065_dec2015_run97-5.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events) beam intensity is about 180K counts.

t1065_dec2015_run97-6.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events) beam intensity is about 180K counts.

t1065_dec2015_run97-7.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events) beam intensity is about 180K counts.

t1065_dec2015_run97-8.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events) beam intensity is about 180K counts.

Photek saturating, go to -4.6kV (from -4.7kV)

t1065_dec2015_run98-0.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (500 events) beam intensity is about 180K counts.

12:50 : Photek was saturating a lot at 16GeV. Went into access to put 6dB attenuators on the splitters for Photek. We also removed one of the amplifiers from Silicon.

Test RUN:
t1065_dec2015_run99-0.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (500 events) beam intensity is about 180K counts. photek 4.6 kV and 6db attenuator

t1065_dec2015_run99-2.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events) beam intensity is about 180K counts. photek 4.6 kV and 6db attenuator

Photek amplitude is not saturating, but the sync is lost! decrease the rate and check.

The sync loss above may be due to checksum being run simultaneously and using up the CPU.

t1065_dec2015_run99-2.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (500 events) beam intensity is about 180K counts. photek 4.6 kV and 6db attenuator -> Sync is working again!

t1065_dec2015_run99-3.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events) beam intensity is about 180K counts. photek 4.6 kV and 6db attenuator

t1065_dec2015_run99-4.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events) beam intensity is about 180K counts. photek 4.6 kV and 6db attenuator

We will increase the rate and check again.(170k)
t1065_dec2015_run99-5.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events) beam intensity is about 180K counts. photek 4.6 kV and 6db attenuator

t1065_dec2015_run99-6.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events) beam intensity is about 180K counts. photek 4.6 kV and 6db attenuator

t1065_dec2015_run99-7.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events) beam intensity is about 180K counts. photek 4.6 kV and 6db attenuator

t1065_dec2015_run99-8.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (1000 events) beam intensity is about 180K counts. photek 4.6 kV and 6db attenuator

Sync is lost again
So it is unrelated to the checksum.

So we go back to 100K rate.

t1065_dec2015_run100-0.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events) beam intensity is about 90K counts. photek 4.6 kV and 6db attenuator (Shower center seems to be in ch#14)

t1065_dec2015_run100-1.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events) beam intensity is about 90K counts. photek 4.6 kV and 6db attenuator (Shower center seems to be in ch#14)

t1065_dec2015_run100-2.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events)

t1065_dec2015_run100-3.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events)

t1065_dec2015_run100-4.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events)

t1065_dec2015_run100-5.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events)

t1065_dec2015_run100-6.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events)

t1065_dec2015_run100-7.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events)

t1065_dec2015_run100-8.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events)

t1065_dec2015_run100-9.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events)

t1065_dec2015_run100-10.dat: 16 GeV electron beam, X-Y stage at to (-6,+14) mm. (2000 events)

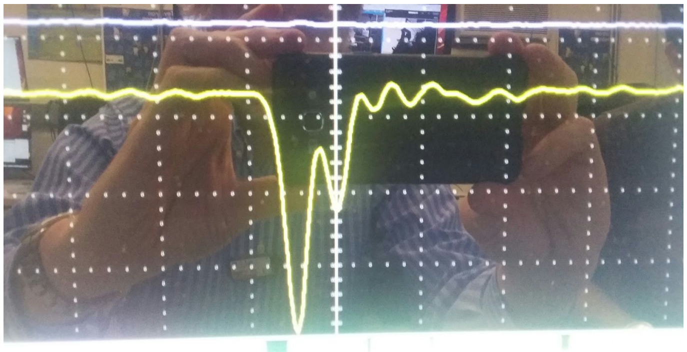
Control Access

5:00pm

Installed, in the order along the beam:

1. **Tungsten absorber, 6 blocks (6 Xo)**
2. **Silicon pad (6x6mm)**
3. **MPPC array**
4. **Photek**
5. **Argonne Strip MCP (3 strips connected: 5, 6, 7)**

	Cable label	**2B Panel**	**Source**	**Destination**	**Value**
HV1	1	2B-106	MTRR03 **HV1**	Trigger PMT-1	-1550V
HV2	5	2B-107	MTRR03 **HV2**	Trigger PMT-2	-1550V
HV3	6	2B-108	MTRR02, left Bertan, **ch.A**	Argonne MCP	<-2400V
HV4	7	2B-109	MTRR02 right Bertan, **ch.A**	Photek MC-PMT	-4700V
HV5	8	2B-110	Keithley 2410	Si Pad (6x6mm)	-500V
HV6	-100V DC	2B-10		MPPC Array	-70.3V (2.3uA)
Sig1	MT-121	2B-16	**T1 or T2**	Scaler in CR, ch.2	NIM
Sig2	MT-125	2B-17			
Sig3	MT-206	2B-18			



Silicon signal: 24ke/mip/300um, amp.gain x400, pulse width 5ns (base)
From capacitance (17pf) and area (36mm2) it looks like the effective diode thickness is 220um (Si dielectric constant is 11.7), so the charge should be about 18Ke/mip ??????????
Charge: 1.6pC/mip
Voltage: (1.6pC/5ns) * 50ohm * 2(triangular signal) = 32mV/mip

----

MPPC signal: 1.25Me/mip, pulse width 20ns
Charge: 200fC
Voltage: (200fC/20ns) * 50ohm * 2 = 1mV
With “clipping” circuitry the peak amplitude is another factor x3 smaller

----

We do a scan to try to find where the silicon pad is:

t1065_dec2015_run101-1.dat: 8 GeV electron beam, X-Y stage at to (0,0) mm.
very little counts. see some pulses with amplitude = 10 ADC counts = 2-3mV

t1065_dec2015_run101-2.dat: 8 GeV electron beam, X-Y stage at to (6,0) mm.

t1065_dec2015_run101-3.dat: 8 GeV electron beam, X-Y stage at to (6,6) mm.

t1065_dec2015_run101-4.dat: 8 GeV electron beam, X-Y stage at to (0,6) mm.

t1065_dec2015_run101-5.dat: 8 GeV electron beam, X-Y stage at to (-6,6) mm.

17:40
The signals are too small and too close to noise floor to make a conclusive statement about whether we are in the beam or not.
We do an access and put back the 2nd ORTEC amplifier in series. Signals should be in the range of 40-60mV.

t1065_dec2015_run102-0.dat: 8 GeV electron beam, X-Y stage at to (6,0) mm.

t1065_dec2015_run102-1.dat: 8 GeV electron beam, X-Y stage at to (0,0) mm.

t1065_dec2015_run102-2.dat: 8 GeV electron beam, X-Y stage at to (6,6) mm.

t1065_dec2015_run102-3.dat: 8 GeV electron beam, X-Y stage at to (0,6) mm.

t1065_dec2015_run102-4.dat: 8 GeV electron beam, X-Y stage at to (-6,6) mm.

t1065_dec2015_run102-5.dat: 8 GeV electron beam, X-Y stage at to (-6,0) mm.

t1065_dec2015_run102-6.dat: 8 GeV electron beam, X-Y stage at to (12,12) mm.
t1065_dec2015_run102-7.dat: 8 GeV electron beam, X-Y stage at to (12,6) mm.
t1065_dec2015_run102-8.dat: 8 GeV electron beam, X-Y stage at to (6,12) mm.

At this point Argonne stripline MCP HV changed from 2.4kV to 2.5kV

t1065_dec2015_run102-9.dat: 8 GeV electron beam, X-Y stage at to (15,6) mm.

t1065_dec2015_run102-10.dat: 8 GeV electron beam, X-Y stage at to (15,0) mm.

t1065_dec2015_run102-11.dat: 8 GeV electron beam, X-Y stage at to (15,-6) mm.

t1065_dec2015_run102-12.dat: 8 GeV electron beam, X-Y stage at to (15,12) mm.

Counts above threshold (8mV) vs X-Y coordinate position (units are in mm)
Runs are 1000 events total

Coords	-15	-12	-9	-6	-3	0	3	6	9	12	15
12								177		181	185
9											
6				131		129		293		431	527
3											
0				121							472
-3											
-6											295

We conclude the the center of the beam is at least 15mm to the +X side. The X-Y motorized stage is at the maximum of +15mm

19:14

Go into access and manually move the silicon pad box WEST by 15mm.
Checked Properties of the motor stage:
Positive +X on motor stage moves to WEST
Negative -X on motor stage moves to EAST
+Y is UP
-Y is DOWN
-6mm in Y is the lower limit

light was on in enclosure

t1065_dec2015_run103-0.dat: 8 GeV electron beam, X-Y stage at to (0,6) mm.

t1065_dec2015_run103-1.dat: 8 GeV electron beam, X-Y stage at to (6,6) mm.

t1065_dec2015_run103-2.dat: 8 GeV electron beam, X-Y stage at to (12,6) mm.

t1065_dec2015_run103-4.dat: 8 GeV electron beam, X-Y stage at to (3,6) mm.

t1065_dec2015_run103-5.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm.

Best spot is (3,3)mm :

t1065_dec2015_run104-0.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm.

t1065_dec2015_run104-1.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm.

turned off light in enclosure

t1065_dec2015_run104-3.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm.

t1065_dec2015_run104-4.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm.

t1065_dec2015_run104-5.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm.

20:56

DAQ CAEN crate went into error.
We will end tonight.

We see a lot of high frequency noise (ringing) with the two ORTEC amplifiers in series. We propose to try the Hamamatsu amplifier tomorrow.

Some studies that could be done tomorrow:

- scan in longitudinal shower profile (vary absorber thickness)
- scan in energy (vary beam energy)
- take a run with muons (high stats MIP run)

21:00
HV off, table down, bye!

Dec 7, 2015

2:02
would be great to measure TR dependence on depletion voltage for the Si, say at -400, -300, -200 V (we have measurement with -500 V, the TR should be the best at the -500 V). Another request to make table with our current tb runs. Conditions should be there, like, energy, absorber material and thickness, channels hooked up to DAQ, etc. AIR.

8:55 Si, Artur, Cristian, Heejong, Sergey, AIR
started to elevate box to Y=355, X=1644 so far, asked 8 GeV electrons.

10:00AM: access to replace one of the Ortec Amplifiers out of Silicon Pad with Hamamatsu. Now we have the output of Silicon connected to Hamamatsu and second is Ortec. XY stage is at position (3,3), Silicon bias voltage is at 500V. The Hamamatsu amplifier was with 12V

t1065_dec2015_run105.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, 2000 events.

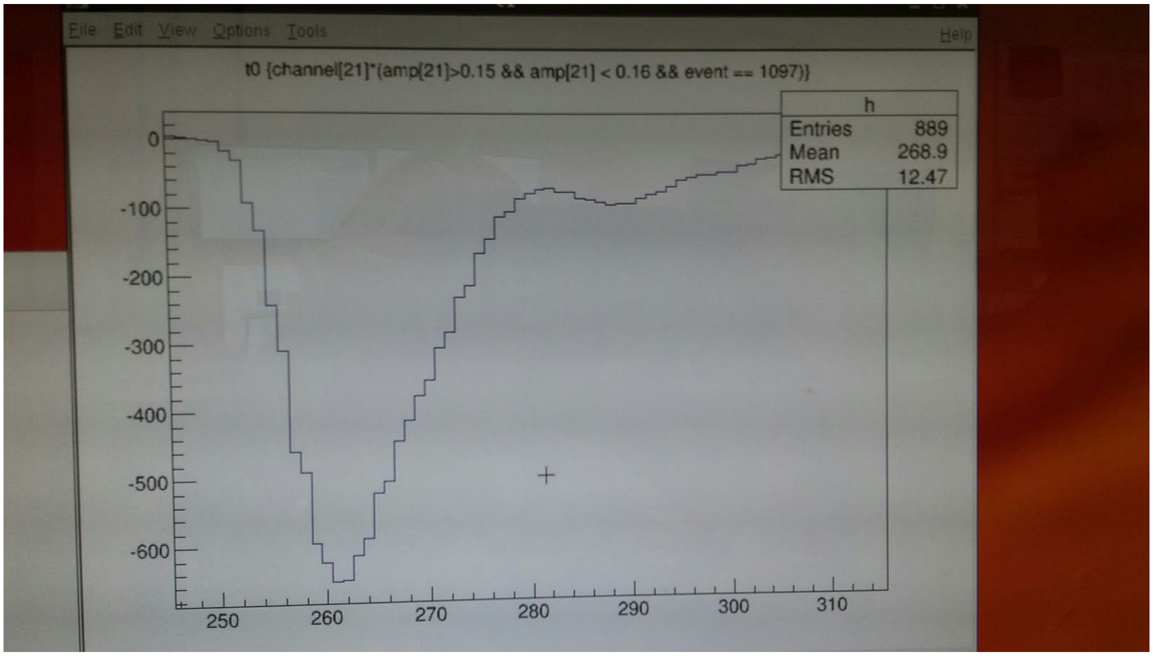
10:30am Controlled access: AA, SL
We have added a 10db attenuator to the Silicon Pad sensor.
Now it is: Silicon - Hamamatsu C5594 amp - Ortec VT120 amp - 10db atten.The Both amplifier power is 12V

t1065_dec2015_run106.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, 2000 events.

10:50am Controlled access: AA, SL
We have removed the 10db attenuator and Ortec amp from the Silicon Pad.
Now it is: Silicon - Hamamatsu C5594 amp - CAEN DRS TDC.The Hamamatsu amplifier power is 15V

t1065_dec2015_run107-0.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

Silicon pulse shape (rise time 1.5ns, width 5ns):



12:05pm: We went into access to change the setup in the following way. Now we have Ortec first, Hamamatsu second. There is a 10dB attn between Ortec and Hamamatsu, and 10dB on the output of Hamamatsu. 12V connected to the Hamamatsu amplifier. Tungsten is kept at the same distance.
SiPad-OrtecVT120-10db-HamamatsuC5594-10db-DRS (amps @12V/102mA)

t1065_dec2015_run108-0.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)
t1065_dec2015_run108-1.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

We observe the electron peak at about 50mV instead of 180mV as we expected
We suspect that maybe the attenuator we put in was not the same as expected. We do into access and change the attenuator to another one with better labeling of 10 dB. We also put in an alternative power supply for the hamamatsu amplifier and put it at 15V.

t1065_dec2015_run109-0.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)
t1065_dec2015_run109-1.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)
t1065_dec2015_run109-2.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)
t1065_dec2015_run109-3.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)
t1065_dec2015_run109-4.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)
t1065_dec2015_run109-5.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

14:45
Change beam to 16 GeV electrons

t1065_dec2015_run110-0.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

t1065_dec2015_run110-1.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

t1065_dec2015_run110-2.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

t1065_dec2015_run110-3.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

t1065_dec2015_run110-4.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

t1065_dec2015_run110-5.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events) t1065_dec2015_run110-6.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

t1065_dec2015_run110-7.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

t1065_dec2015_run110-8.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

t1065_dec2015_run110-9.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

t1065_dec2015_run110-10.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events)

t1065_dec2015_run110-11.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (4000 events)

t1065_dec2015_run110-12.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (4000 events)

t1065_dec2015_run110-13.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (4000 events)

DV @ -400V
t1065_dec2015_run111-0.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (5000 events). BV on Silicon changed to 400 V.

DV @ -300V
t1065_dec2015_run111-1.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (5000 events). BV on Silicon changed to 300 V.

DV @ -200V

t1065_dec2015_run111-2.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events). BV on Silicon changed to 200 V.

t1065_dec2015_run111-3.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events). BV on Silicon changed to 200 V.

t1065_dec2015_run111-4.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events). BV on Silicon changed to 200 V.

t1065_dec2015_run111-5.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events). BV on Silicon changed to 600 V.

t1065_dec2015_run111-6.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events). BV on Silicon changed to 600 V.

t1065_dec2015_run111-7.dat: 16 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events). BV on Silicon changed to 600 V.

17:30
We ask for 4 GeV electron beam

t1065_dec2015_run112-0.dat: 4 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events). BV on Silicon changed to 600 V.

Set depletion voltage @ 500V

t1065_dec2015_run112-1.dat: 4 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events). BV on Silicon changed to 500 V.

t1065_dec2015_run112-2.dat: 4 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events). BV on Silicon changed to 500 V.

t1065_dec2015_run112-3.dat: 4 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events). BV on Silicon changed to 500 V.

19:20
we ask for 32 GeV electron beam

t1065_dec2015_run113-0.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (3000 events). BV on Silicon changed to 500 V.

t1065_dec2015_run113-1.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (3000 events). BV on Silicon changed to 500 V.

t1065_dec2015_run113-2.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (4000 events). BV on Silicon changed to 500 V.

t1065_dec2015_run113-3.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (4000 events). BV on Silicon changed to 500 V.

Photek was saturating.
We added 10db attenuator to the photek. it already had a 6db attenuator on it.
Now it has a 6db attenuator and a 10 db attenuator in series.

t1065_dec2015_run114-0.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (4000 events). BV on Silicon changed to 500 V.

DAQ system went into error.
We do an access to reboot it.

t1065_dec2015_run114-1.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (4000 events). BV on Silicon changed to 500 V.

t1065_dec2015_run114-2.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (4000 events). BV on Silicon changed to 500 V.

t1065_dec2015_run114-3.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (6000 events). BV on Silicon changed to 500 V.

t1065_dec2015_run114-4.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (6000 events). BV on Silicon changed to 500 V.

t1065_dec2015_run114-5.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (6000 events). BV on Silicon changed to 500 V.

t1065_dec2015_run114-6.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (1000 events). BV on Silicon changed to 500 V.

Dec 8, 2015

3:40
we have to estimate our "electronic" time resolution using the Photek240 signals time difference (1, 9, 17, 25?), AIR.

9:00 Cristian, Artur, Si, Jingbo, AIR
asking 32 GeV, 200k/spill, elevating table - done. X=1644, Y=353
HV, kV TR=1.55, 6x6=2.4, Photek=4.7, Si=-400V.

9:20

t1065_dec2015_run114-7.dat: 32 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (2000 events). BV on Silicon changed to 500 V.
For above run: Photek, Argonne MCP and Silicon PAD, Silicon MPPC's was off.
This is a DRS noise only run.

9:27

We call MCR and ask for 8 geV electrons

Current State of Devices:

Installed, in the order along the beam:

6. **Tungsten absorber, 6 blocks (6 Xo)**
7. **Silicon pad (6x6mm)**
8. **MPPC array**
9. **Photek**
10. **Argonne Strip MCP (3 strips connected: 5, 6, 7)**

	Cable label	**2B Panel**	**Source**	**Destination**	**Value**
HV1	1	2B-106	MTRR03 **HV1**	Trigger PMT-1	-1550V
HV2	5	2B-107	MTRR03 **HV2**	Trigger PMT-2	-1550V
HV3	6	2B-108	MTRR02, left Bertan, **ch.A**	Argonne MCP	-2400V
HV4	7	2B-109	MTRR02 right Bertan, **ch.A**	Photek MC-PMT	-4700V
HV5	8	2B-110	Keithley 2410	Si Pad (6x6mm)	-500V
HV6	-100V DC	2B-10		MPPC Array	OFF
Sig1	MT-121	2B-16	**T1 or T2**	Scaler in CR, ch.1 AND ch.2	NIM
Sig2	MT-125	2B-17			
Sig3	MT-206	2B-18			

t1065_dec2015_run115-0.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (1000 events).

t1065_dec2015_run115-1.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (4000 events).

t1065_dec2015_run116-0.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (4000 events).

10:15 AM: access to remove the 10db Attenuators from Photeks' signals,now they both have 6db attenuators only. We split the output of one Photek into two, and those two are sent into channels 19 and 20 to measure electrical resolution of the DRS4 chip. We removed the 10 db attenuators from amplifiers, now there is only one 10db on the amplifiers out of Silicon pad.

Configuration:

- Photek signal is split. each split signal have 6db attenuator. each is
- Silicon pad -> ORTEC amplifier -> 10 db attentuator -> Hamamatsu attenuator ->

10:20 Installed -70.3 V on 4x4 (each cell is 3x3 mm2) of the MPPC.

t1065_dec2015_run116-0.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (1000 events).

t1065_dec2015_run116-1.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, at 200K counts per spill (6000 events).

11:28 AM: Access to change absorber. Now we have **4X0 absorber**. We moved split Photek signal from channels 19 and 21 to channels 0 and 1 to measure the electronic resolution of the first DRS chip.

t1065_dec2015_run117-0.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, Absorber thickness is now 4X0 of tungsten.
at 200K counts per spill (1000 events).

t1065_dec2015_run117-1.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, Absorber thickness is now 4X0 of tungsten.
at 200K counts per spill (6000 events).

t1065_dec2015_run117-2.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, Absorber thickness is now 4X0 of tungsten.
at 200K counts per spill (3000 events).

12:15 : Access to change absorber. Now we have **2X0 absorber**. We moved split Photek signal from channels 0 and 1 into channels 9 and 10 to measure the electronic resolution of the first DRS chip.

t1065_dec2015_run118-0.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, Absorber thickness is now 2X0 of tungsten.
at 200K counts per spill (1000 events).

t1065_dec2015_run118-1.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, Absorber thickness is now 2X0 of tungsten.
at 200K counts per spill (6000 events).

t1065_dec2015_run118-2.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, Absorber thickness is now 2X0 of tungsten.

at 200K counts per spill (3000 events).

12:15 : Access to change absorber. Now we have **1X0 absorber**.
t1065_dec2015_run119-0.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, Absorber thickness is now 1X0 of tungsten.
at 200K counts per spill (1000 events).

t1065_dec2015_run119-1.dat: 8 GeV electron beam, X-Y stage at to (3,3) mm, Absorber thickness is now 1X0 of tungsten. (5000 events)

13:55 : Access to perform a pedestal run. We triggered on pulse generator to collect data without beam, collected data with two settings.

t1065_dec2015_run120-0.dat: **NO** beam, X-Y stage at to (3,3) mm. **PEDESTAL RUN** **10dB** attenuator on the Silicon Pad output to DRS. 5000 events

t1065_dec2015_run121-0.dat: **NO** beam, X-Y stage at to (3,3) mm. **PEDESTAL RUN** **NO** attenuator on the Silicon Pad output to DRS. 5000 events.

t1065_dec2015_run122-0.dat: Now we have **1X0 absorber**.
8 GeV beam, X-Y stage at to (3,3) mm. **No** attenuator on the Silicon Pad output to DRS. 6000 events

t1065_dec2015_run122-1.dat: Now we have **1X0 absorber**.
8 GeV beam, X-Y stage at to (3,3) mm. **No** attenuator on the Silicon Pad output to DRS. 6000 events

t1065_dec2015_run122-2.dat: Now we have **1X0 absorber**.
8 GeV beam, X-Y stage at to (3,3) mm. **No** attenuator on the Silicon Pad output to DRS. 4000 events

t1065_dec2015_run122-3.dat: Now we have **1X0 absorber**.
8 GeV beam, X-Y stage at to (3,3) mm. **No** attenuator on the Silicon Pad output to DRS. 6000 events

15:10 Access: **remove** tungsten, and plug Photek into the first and last channels of the last DRS chip. Adjust Argonne MCP to be better aligned with the beam. Move Argonne MCP to 2.5 kV.

t1065_dec2015_run123-0.dat: **8 GeV** beam, X-Y stage at to (3,3) mm. **No** Tungsten and **No** attenuator on the Silicon Pad output to DRS. 1000 events

t1065_dec2015_run123-1.dat: **8 GeV** beam, X-Y stage at to (3,3) mm. **No** Tungsten and **No** attenuator on the Silicon Pad output to DRS. 5000 events

t1065_dec2015_run123-2.dat: **8 GeV** beam, X-Y stage at to (3,3) mm. **No** Tungsten and **No** attenuator on the Silicon Pad output to DRS. 5000 events

Increase Argonne MCP to 2.6kV

t1065_dec2015_run124-0.dat: **8 GeV** beam, X-Y stage at to (3,3) mm. **No** Tungsten and **No** attenuator on the Silicon Pad output to DRS. 5000 events

t1065_dec2015_run124-1.dat: **8 GeV** beam, X-Y stage at to (3,3) mm. **No** Tungsten and **No** attenuator on the Silicon Pad output to DRS. 5000 events

16:40
Call MCR to get 120 GeV Proton beam

Argonne MCP HV is at 2400V

t1065_dec2015_run125-0.dat: 120 **GeV** proton beam @ 100K counts per spill, X-Y stage at to (3,3) mm. **No** Tungsten and **No** attenuator on the Silicon Pad output to DRS. 1000 events t1065_dec2015_run125-1.dat: 120 **GeV** proton beam @ 100K counts per spill, X-Y stage at to (3,3) mm. **No** Tungsten and **No** attenuator on the Silicon Pad output to DRS. 5000 events

Argonne MCP HV is at 2500V

t1065_dec2015_run125-2.dat: 120 **GeV** proton beam @ 100K counts per spill, X-Y stage at to (3,3) mm. **No** Tungsten and **No** attenuator on the Silicon Pad output to DRS. 5000 events

Argonne MCP HV at 2600V

DRS went into error.
Have to wait for Artur to come back to go into access and fix it.

18:44
Controlled Access to reset the DAQ crate.

Argonne MCP HV reading is 2550V

t1065_dec2015_run125-3.dat: 120 **GeV** proton beam @ 100K counts per spill, X-Y stage at to (3,3) mm. **No** Tungsten and **No** attenuator on the Silicon Pad output to DRS. 5000 events
Set Argonne MCP HV to 2600V after 1000 events in above run

Set Argonne MCP HV to 2700V
t1065_dec2015_run125-4.dat: 120 **GeV** proton beam @ 100K counts per spill, X-Y stage at to (3,3) mm. **No** Tungsten and **No** attenuator on the Silicon Pad output to DRS. 4000 events

20:00

We do controlled access and replace the ORTEC+Hamamatsu amplifier chain with Sergey's new amplifier, powered at 10 V. Gain is 190. Added 4X0 of tungsten in front of the silicon pad.

t1065_dec2015_run126-0.dat: Noise run with above amplifier settings. We find that the new amplifier has larger noise than the previous configuration, hence it does not make sense to continue taking data.

WE ARE ALL DONE.

BEAM IS DOWN, MAY TAKE SOME HOURS.

HUGE SUCCESS!!!

MERRY CHRISTMAS AND HAPPY NEW YEAR!

Dec 9, 2015

6:00
All equipment is taken out. AIR

Dec 17, 2015

We test linearity of the amplifiers that we used in the testbeam.
We first take data with ORTEC. Input pulse from pulse-generator, send into ORTEC amplifier, read out the amplitude from a scope.

Input square pulse width 10ns
ORTEC Amplifier powered at 12V

attentuator used exhibits some nonlinearity at level of 10% at low amplitude. cables (attenuator before or after cable) introduce some uncertainty at level less than 0.5%. scope application has error of 0.3%

pulse generator mV	amplitude after attn 1 mV	amp after attenuator 2 mv	output amplitude V	amplification
800	79.9 +- 0.7		1.5V	18.8
1000	99.0 +- 0.5		1.9V	19.2
1500	149.6 +- 1.5		2.9V	19.4
500	49.6 +- 0.4		0.925 +- 0.014	18.6
400	39.9 +- 0.4	37.6 +- 0.4	0.736 +- 0.017	18.4
300	30.0 +- 0.3	28.2 +- 0.4	0.538 +- 0.013	17.9
275	28.5 +- 0.3	26.4 +- 0.3		
250	26.0 +- 0.3	24.4 +- 0.3		
225	23.7 +- 0.3	22.3 +- 0.3		
200	21.3 +- 0.2	20.1 +- 0.3	0.313 +- 0.002	14.7
175	18.8 +- 0.3	17.8		
150	16.2 +- 0.3	15.4		

125	12.9 +- 0.2	12.3		
100	10.7 +- 0.2	10.2	0.135 +- 0.002	12.6
70	7.7mV +- 0.2	7.6	0.084 +- 0.001	10.9
50	5.7 +- 0.2	5.8	0.053 +- 0.001	9.3
20	2.8 +- 0.2	3.0 +- 0.2	0.0164 +- 0.0007	5.9
30	4.1 +- 0.2	3.9 +- 0.2	0.027+- 0.001	6.6
40	5.1 +- 0.2	4.8 +- 0.2	0.039 +- 0.001	7.6
25	3.6 +- 0.2	3.5 +- 0.3	0.022 +- 0.001	6.1
50	5.7	0.66 (in series)	0.0040 +- 0.0004	6.1

ORTEC+HAM in series

pulse generator mV	amplitude after attn 1 mV	amp after attenuator 2 mv	output amplitude mV	amplification
20	2.8	0.42	118 +- 9	281
25	3.6	0.504	133 +- 9	264
30	4.1	0.53	143 +- 12	270

40	5.1	0.61	178 +- 11	292
50	5.7	0.66	216 +- 8	327
70	7.7	0.836	305 +- 11	365
100	10.7	1.09	473 +- 11	434

amplitude peak for proton (MIP) run was ~30mV after amplification. Assuming amplification is the same as lowest measurement in table above, this corresponds to ~0.1mV raw non-amplified signal amplitude.

AmpCalib_run_1 :

Runs to measure weather time walk is caused by the amplifiers. Pulse generator output is split into 2: one output is fed into ORTEC+Hamamatsu+20 dB (CH1), the other output goes directly into the DRS scope (CH2).

t1065_timewalk_run001.dat: this run has no attenuators on Ortec+Hama.
t1065_timewalk_run002.dat:160 mV on pulse generator. Two 20 dB attenuators on the output of the pulse genertor, then goes into Ortec, then 10 dB, then Hamamatsu, then 10 dB into DRS, CH1. CH2 is directly out ot pulse generaotr.

t1065_timewalk_run003.dat:300 mV on pulse generator. Two 20 dB attenuators on the output of the pulse genertor, then goes into Ortec, then 10 dB, then Hamamatsu, then 10 dB into DRS, CH1. CH2 is directly out ot pulse generaotr.

t1065_timewalk_run004.dat:500 mV on pulse generator. Two 20 dB attenuators on the output of the pulse genertor, then goes into Ortec, then 10 dB, then Hamamatsu, then 10 dB into DRS, CH1. CH2 is directly out ot pulse generaotr.

t1065_timewalk_run005.dat:650 mV on pulse generator. Two 20 dB attenuators on the output of the pulse genertor, then goes into Ortec, then 10 dB, then Hamamatsu, then 10 dB into DRS, CH1. CH2 is directly out ot pulse generaotr.

t1065_timewalk_run006.dat:1000 mV on pulse generator. Two 20 dB attenuators on the output of the pulse genertor, then goes into Ortec, then 10 dB, then Hamamatsu, then 10 dB into DRS, CH1. CH2 is directly out ot pulse generator, with 10dB attenuator on it.

t1065_timewalk_run007.dat:100 mV on pulse generator. Two 20 dB attenuators on the output of the pulse genertor, then goes into Ortec, then 10 dB, then Hamamatsu, then 10 dB into DRS, CH1. CH2 is directly out ot pulse generator.

t1065_timewalk_run008.dat:20 mV on pulse generator. Two 20 dB attenuators on the output of the pulse genertor, then goes into Ortec then Hamamatsu into DRS, CH1. CH2 is directly out ot pulse generator.
t1065_timewalk_run009.dat:20 mV on pulse generator. Two 20 dB attenuators on the output of the pulse genertor, then goes into Ortec then Hamamatsu into DRS, CH1. CH2 is directly out ot pulse generator.

ORTEC+10db attenuator + HAM + 10db attenuator in series
red numbers below use the “extrapolation”, where we multiply the measured attenuation of both 20dB attentuators.
black numbers below directly use the measured value of the output out of the attenuators.

pulse generator mV	amplitude after attn 1 mV	amp after attenuator 2 mv	output amplitude mV	amplification
20	2.8	0.42	11.7 +- 0.8	27.9
25	3.6	0.504	13.5 +- 0.8	26.8
30	4.1	0.53	16.7 +- 1.0	31.6
40	5.1	0.61	20.7 +- 1.0	33.9
50	5.7	0.66	24.6 +- 1.0	37.3
70	7.7	0.836	33.6 +- 1.0	40.2
100	10.7	1.09 (extrap)	47.4+-1.2	43.5
125	12.9	1.37	59 +- 1.2	43.1
150	16.2	1.66	73 +- 1.4	44.0
175	18.8	1.91	87 +- 1.4	45.5
200	20.8	2.14 (extrap)	101 +- 2	47.2
225	23.7	2.35	116 +- 2	49.4
250	26.0	2.54	131 +- 2	51.6

275	28.5	2.74	144 +- 2	52.6
300	30.0	2.83	163 +- 2	57.6
200		3.0 +- 0.2	101 +- 2	34
225		3.26 +- 0.2	116 +- 2	35.6
250		3.5 +- 0.2	131 +- 2	37
275		3.71 +- 0.2	144 +- 2	40
300		3.9 +- 0.2	163 +- 2	42
350		4.4 +- 0.2	197 +- 2	45
400	39.9	4.9 +- 0.2	235 +- 2	48
500		5.8 +- 0.2	306 +- 2	53
600		6.7 +- 0.2	391 +- 4	58
700		7.7 +- 0.2	466 +- 5	61
800		8.6 +- 0.2	544 +- 5	63
1000		10.2 +- 0.2	669 +- 5	66
1250		12.3 +- 0.2	831 +- 7	68
1500		14.2 +- 0.2	937 +- 7	66
1750				
2000				
2500				
3000				

based on measurements at 200-300mV in the pulse generator, we see that the extrapolation of the two attenuators in series yields an amplitude that is 40% smaller than the actual measured amplitude. need to correct for this fact.