

Martin Alcorta      Office: \*7419  
mailto:alcorta@triumf.ca      cell: 778-984-6402

//

07-08-14

Tested Si detectors with alpha source containing

Element	Energy	Percent
$^{239}\text{Pu}$	5.156 MeV	70%
	5.144 MeV	17%
$^{241}\text{Am}$	5.485 MeV	85%
	5.443 MeV	13%
$^{244}\text{Cm}$	5.805 MeV	76.9%
	5.763 MeV	23.1%

~~18:44~~ Si source Run file

file: alpha-source-004001.root

start: 18:44:34

stop: 18:51:59

//

07-09-14

file: alpha-source-005001.root

Bias for PC - 550V      P8: 8% Methane

Si - 44.6 V

92% Argon

Gas: P8 at 192 - ~~200~~ torr.

//

Bias for PC - 500 V

Si - 44.6 V

Gas: P8 at 146 torr

file: alpha-source-006001.root

start: 15:43:05

~~Serated~~ guard wire not biased!

file: alpha-source-007001.root

Pc Bias: 500V

Gas: P8 at 145 torr

Si Bias: 44.6V

Start: 16:10:52 (central time)

introduced pulsar at end. Restarted

// file: alpha-source-008001.root

start: 16:18:56

stop: 16:35:01

// changed Si bias from 44.6V to 120V  
(1.25mA)

on all last runs, threshold was too high  
to see 3rd peak in outside detectors.

noise level is not visible for ade. For fast channel  
it is 30% of alpha signal.

file: alpha-source-009001.root is bad.

// Added TDC times

file: alpha-source-010001.root

start: 18:04:16 (CT)

stop: 18:14:57

current is now 1.30mA in Si Bias

We have a trigger delay of -500ns and a  
window width of 4ns with a resolution of 250 ps.

// Pumped out and at full bias (120V)

Pressure is  $8 \times 10^{-2}$  torr

file: alpha-source-011001.root

~~Almost immediately~~

Closed shortly after starting to read  
"window". Handcoded in.



file: alpha-source\_012001.root

~~7/10/11~~

Taking a noise spectra with no beam

file: background-noise\_001001.root

Start: 21:53:47

Stop: 22:31:33

~~Testing Sync script~~

file: background-noise\_002001.root

~~7/10/11~~

Taking spectra with three continuous  
RF peaks

file: carbon-trunf\_001001.root

Start: 2:55:28

Stop: 3:00:34

After run, we setup to inhibit all  
RF peaks but first 700 after a  
trigger. Hopefully it will help  
filter

07/11/14

3:30 am: He (760 torr) + CH<sub>4</sub> (40 torr)

IC: Bias = 500V  
Guard gr. = 250V

PC: Bias = 450V - No correlations with IC or Si!

Guard: 150V - Bad mixture for PC!?

Breakdown at U > 450V

Starting run with these conditions

File: carbon-trunf-002001.root

Start: 04:08:48

Stop: 04:30:01

Proportional counter has no signal--  
gas mixture doesn't work.  
pumping out.

Pressure 500 torr

with original 760 He / 40 CH<sub>4</sub>

File: ~~st~~ carbon-trunf-003001.root

Start: 5:21:06

Stop: 5:26:04

Reattached inhibit of RF signal  
other than first after trigger  
running again

File: carbon-trunf-003001.root

Start: 5:30:28

Stop: 5:35:05

RF seems better. Pumping out  
and leaving

10:43 am

Pressure ~~controller~~ Gauge 782 torr }  
Controller 770 torr } CH<sub>4</sub>

Pressure Gauge: 785 torr

file: carbon-triumf-005001.root

start: 14:18:57

stop: 14:21:37

Increased beam intensity by 1000, beam count is  $10^6$ .

file: carbon-triumf-006001.root

start: 14:30:39

Stop: 15:34:21

Important run!  $^{12}\text{C}$ , 9 MeV/u

Run #7

Pressure Gauge: 785

(720 nominal)

~~starts~~

Increased beam intensity by 10, to  
about  $10^7$  pps.

Start: 15:42

Stop: 15:57

Gain on PC ~~not~~ charged somehow  
(All channels)

Run #8 JUNK!

Set PC Common Gain to 2.

Run #9

Start: 16:27:39

Stop: 16:39:20

Need to change default PC Common Gain to 2

Run #10 start: 16:39:14

Stop: 16:45:14

Run #11

start: 16:48:39

stop: 17:06:03

file: carbon\_triumf\_011001.root

PC: Bias : +1330V

Guard : +150V

17:06 - Stopped run at request of operators.  
Operators checking LINAC.

RUN #12

start: 17:28

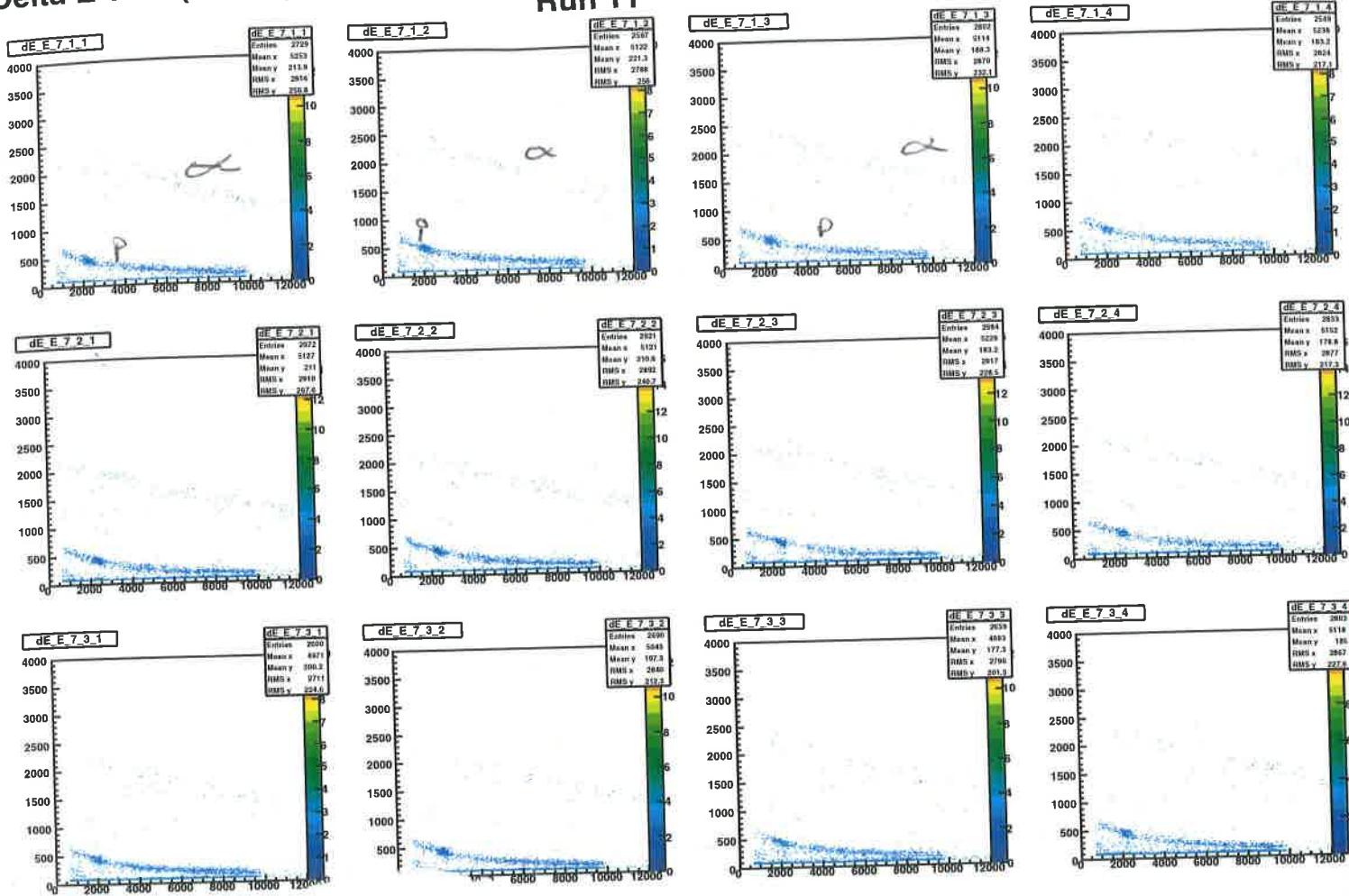
Stop: 17:59

DAC rate: 44 evt/sec

11-Jul-2014 15:02:22

## Delta E vs E (Wire 7)

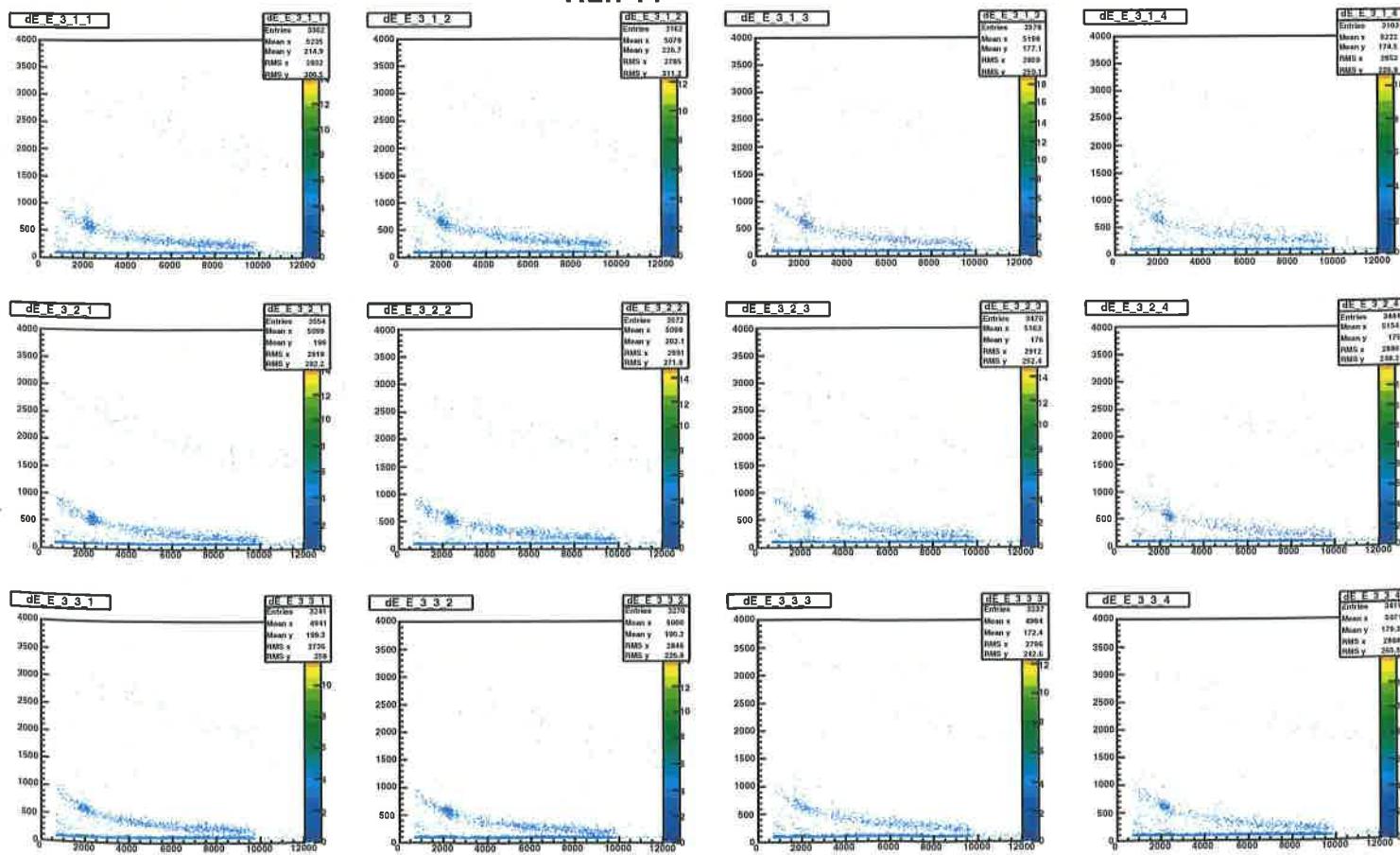
Run 11



## Delta E vs E (Wire 3)

Run 11

11-Jul-2014 15:24:



Changed Common Threshold on Prop Counter  
from 1 to 10 to get them to  
trigger less to improve timing.

Run 13 Start: 18:02

Daq rate: 45 events/sec

stop: 18:07

Change threshold from 10 to 20 in ~~gates~~  
of PC.

Run 14 \*, beam was stopped before  
run could begin

Shaper setting for previous runs

Proportional Counter

Gain: 2

Threshold: 1  $\rightarrow$  set to 10 for  
last run

Shaping: 2

Si Detectors

Threshold: 35 for chan 0

25 for chan 1-11

Threshold: 255 for other channels

Gain: 7 for S. Det  
15 for IC

Shaping: 3 for all channels

~~Set Gain~~ Set Gain for ch 4-7 of Si  
to 2.

Switched to He-8 beam  
pumped out chamber and we are  
stopping He-8 in the Si detectors

Run 14 (again?)

file: he8-trumf-014001.root  
start: 11:09:56

Tuned beam to 1e4 pps.

Taking run again w/  $^{8}\text{He}$  in Si.

Run 15

file: he8-trumf-015001.root  
start: 11:57:39  
stop: 12:12:50

Added 770 torr chamber pressure

Jul 12<sup>th</sup> of methane. Stopping  $^{8}\text{He}$  beam in  
Si still.

Run 16

file: he8-trumf-016001.root  
start: 1:39:55  
stop: 1:45:59

Set gain back to 7 for all S.

Run 17

file: he-trumf-017001.root  
start: ~~1:43:18~~ 1:47:19  
stop: ~~1:52:55~~ 1:53:38

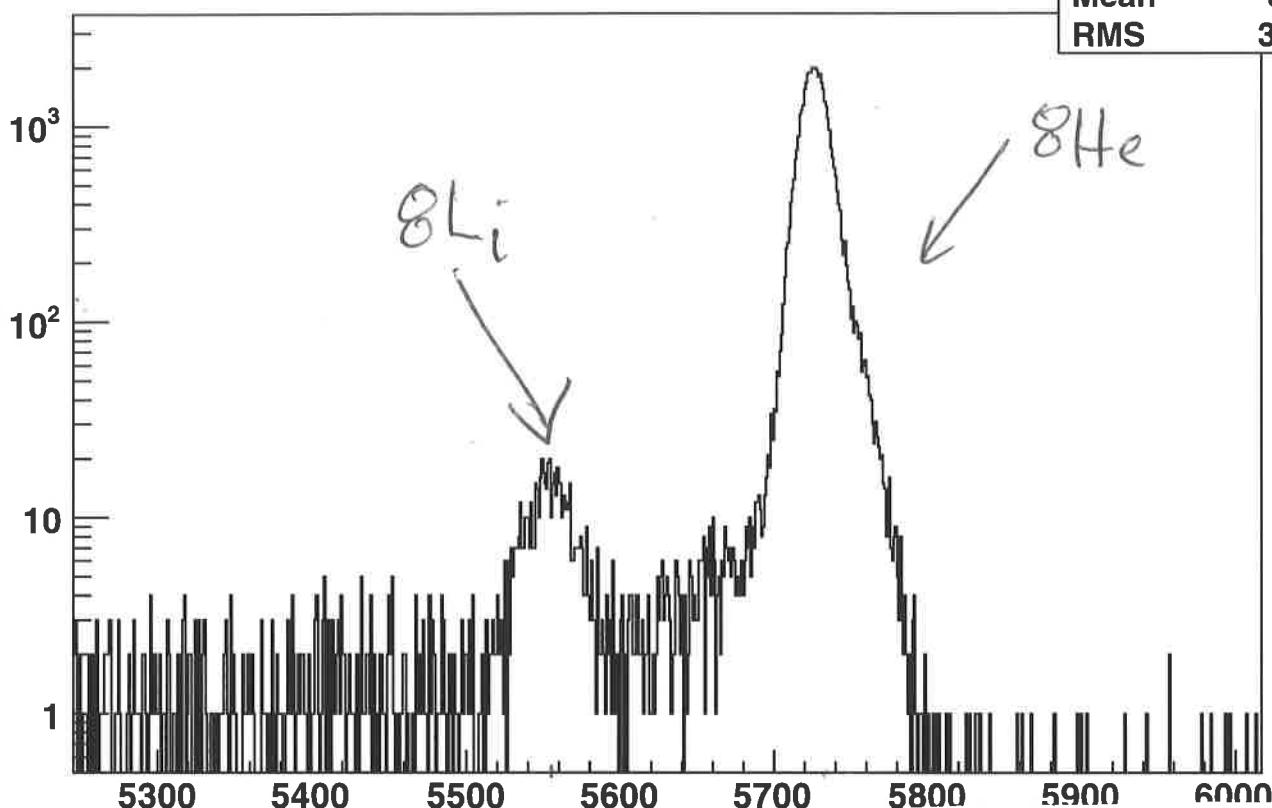
Si\_2\_3\_e

Run 14

11-Jul-2014 23:54:1

Si\_2\_3\_e

Si_2_3_e
Entries 99750
Mean 5722
RMS 38.73



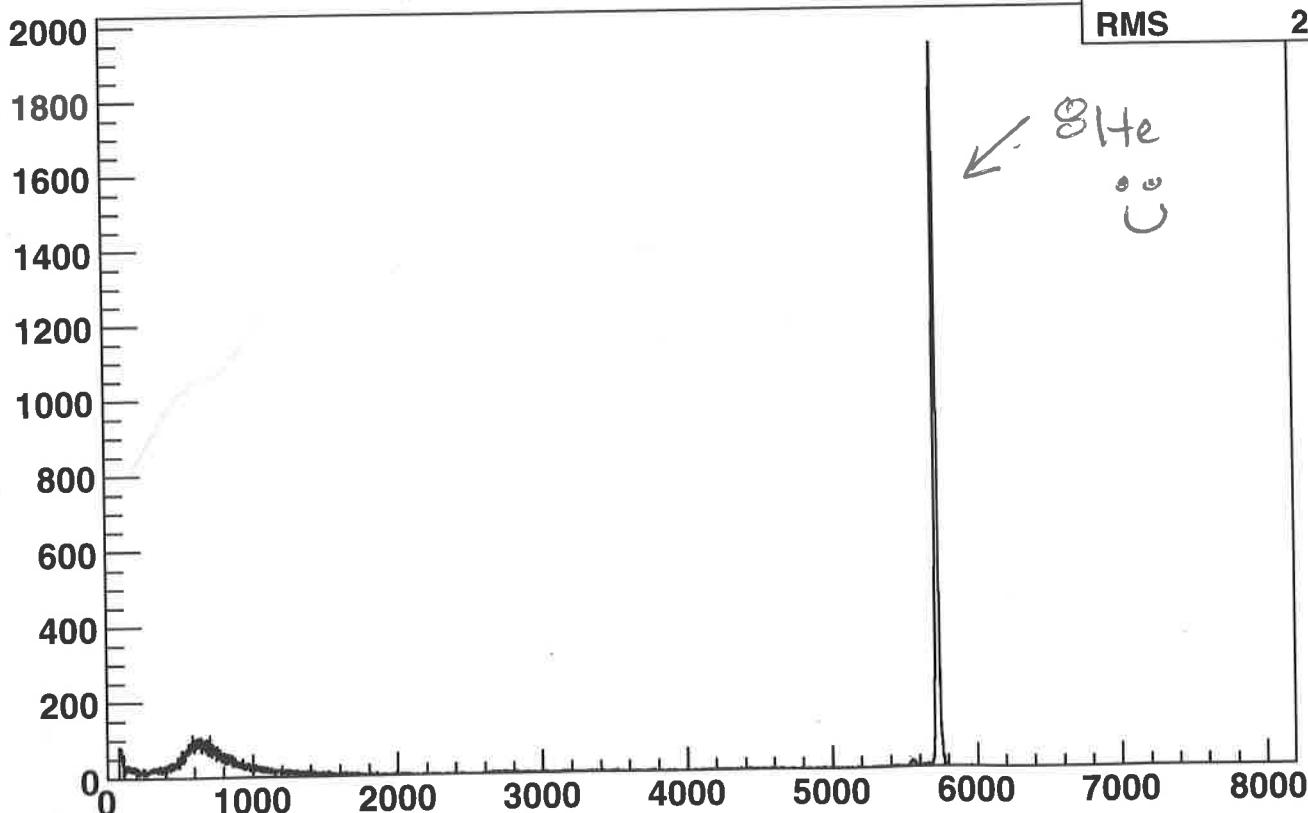
Si\_2\_3\_e

Run 14

11-Jul-2014 23:54:1

Si\_2\_3\_e

Si_2_3_e
Entries 97003
Mean 3092
RMS 2475



Jul 12 8h

Increase gas to move He  
incrementally out of Si, and PC

Run 18

Pressure set at 1030 torr

file: he8-triumf-018001.root

start:

3:00 am.

PC Bias: 1850 V  
Guard Ring: 150 ~~150~~ ?  
135

IC Bias: 1000 V  
FG: 475V

CH<sub>4</sub> Pressure:

Pressure / Flow controller: 995 torr

Vacuum / Pressure Gage: 1030 torr

Flow rate: ~150 sccm

Run 19

First "Production" run

file: he8-triumf-019001.root

Start 3:13:52

Stop: 4:12:36

Run 20

file: he8-triumf-020001.root

start: 4:13:57

stop: 5:14:02

s

### Run 21

File : he8-triumf\_021001.root

Start time : 5:15:53

Stop : 6:15:57

### Run 22

File : he8-triumf\_022001.root

Start : 6:16:38

Stop : 7:16:42

### Run 23

File : he8-triumf\_023001.root

Start : 7:17:11

Stop : 8:17:11

### Run 24

File : he8-triumf\_024001.root

Start : 8:17:39

Stop : 9:20:00

### Run 25

File : He8-Triumf\_025001.root

Start : 9:21:00

Stop : 10:26:55

Operator is going to peak the beam.

→ he8-triumf-background\_026001.root

RUN 26 Start: 10:33:41  
Stop: 10:35:27

Taking Background  
while the beam is  
being tuned.

"Noise" was ~1 c/sec, not important

RUN 27 Start: 10:36:02 DAQ rate: 75 c/sec  
stop: 10:44:03

File: he8-triumf-027001.root

\* Note: Operator says he had  $9 \times 10^3$  pps  $\pm 10\%$  when he peaked the  ${}^8\text{He}$  beam.

\* Stopped run.

Want to work on gains for wires 1-4.

Believe that gain for wires 1-4 needs to be reduced about  $\sim 3\times$ .

Next Page  $\rightarrow$  Wire 3 vs. 7  
for Runs 109 - 27.

Changed pressure down to ~770 - 778 torr to check beam rate

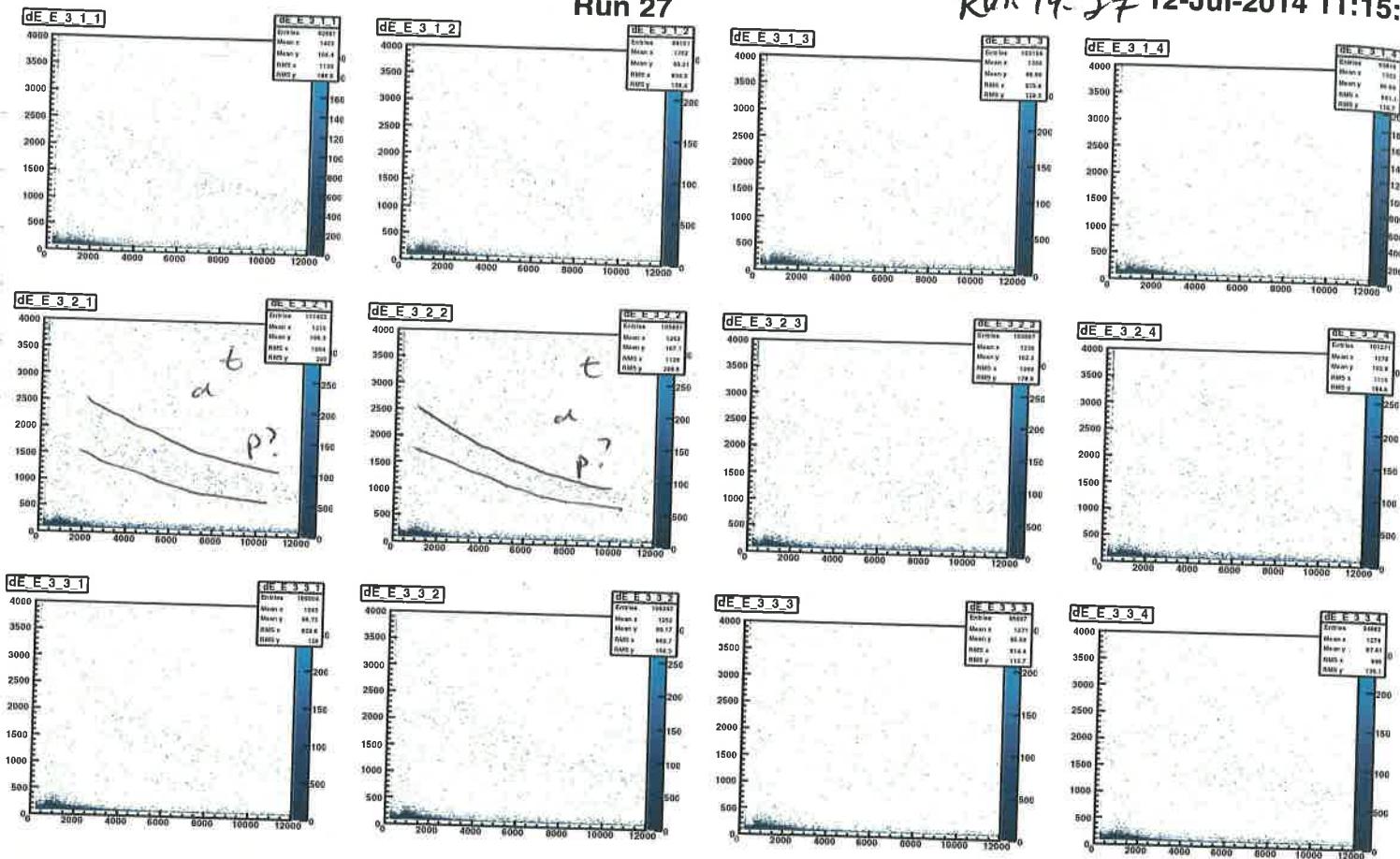
Seem we have a factor of two difference between Si and IC trigger.

Day triggers on ~~stop~~ decay of  
 ${}^8\text{He}$ !

## Delta E vs E (Wire 3)

Run 27

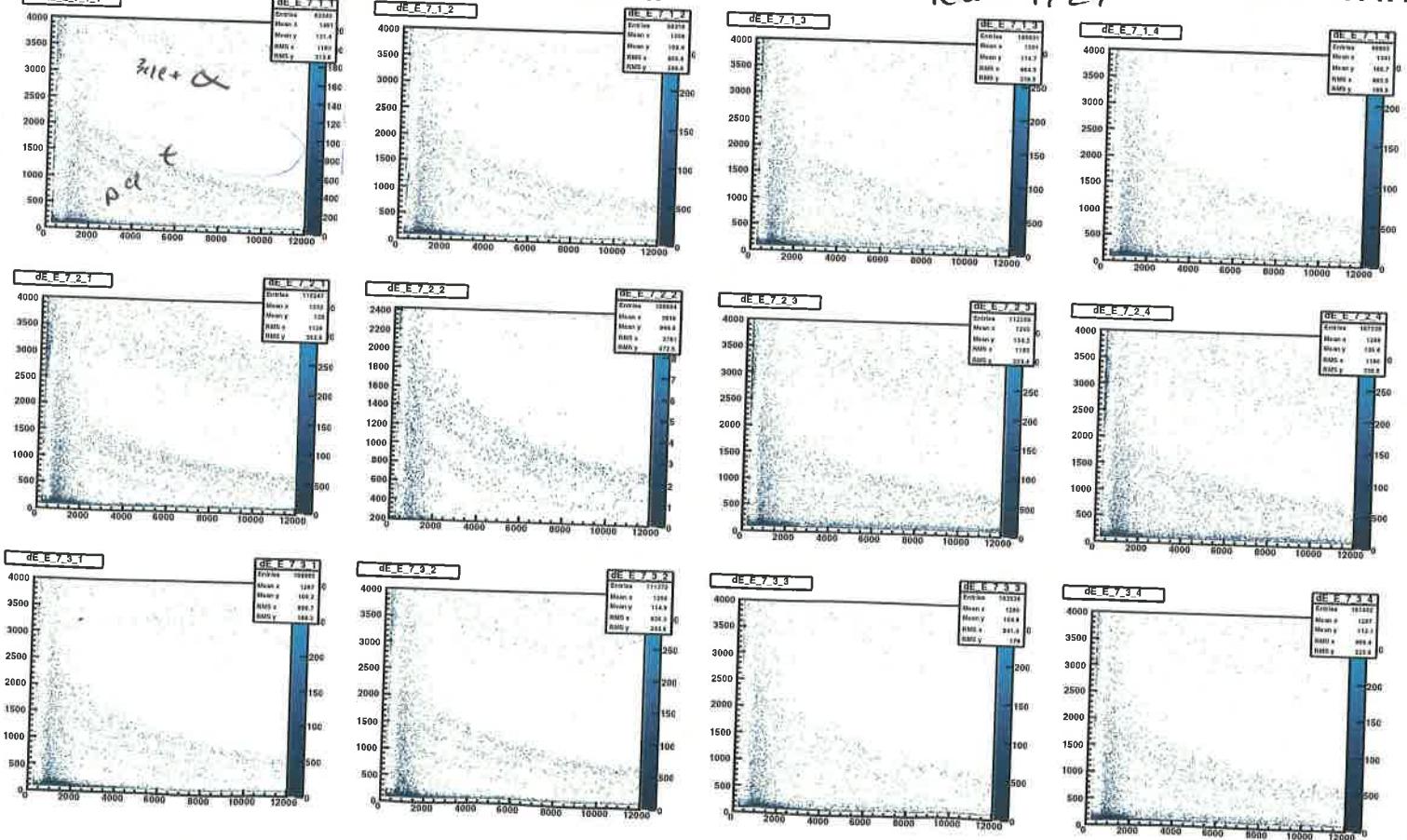
Run 19-27 12-Jul-2014 11:15:04



## Delta E vs E (Wire 7)

Run 27

Run 19-27 12-Jul-2014 11:14:41



We changed PC gain for waves  
1-4 to 0! \*

~~Verifying trigger~~

Si 1-1:  $2.05 \times 10^4$  counts  
 $3.089 \times 10^4$  counts  
 $1.523 \times 10^4$   
+  $2.302 \times 10^4$   
 $\underline{7.89124 \times 10^4}$  counts

Run 28

file: he8-triunf\_beam\_028001.root  
Start:  
Stop:

From the above run we verified  
that each Si has 1 beta in  
energy ~~loss~~, and that the IC count is  
most of the Si trigger rate,  
but equal to the peak integration  
in the energy spectrum.

Run 2a

Charged back to 1030 torr.

file: he8-triunf\_029001.root  
Start: 15:30:10  
Stop: 16:18:43  
Temp:

We still see tails of beam in  
coll #1 of PC

s

Charged to 1040 torr.

Run 32

Start: 16:26:13

file: he8-trufl-03001.root

Stop: 17:09:43

Tuning beam while running

Run 31

file: he8-trufl-031001.root

start: 17:10:27

DAC rate: 60eV/sec

Stop: 18:17:18

They are still tuning the beam while we run.

Run 32

file: he8-trufl-032001.root

start: 18:17:38

stop: 18:44:48

Rendering laptop, Strange behavior

Run 33

file: he8-trufl-033001.root

start: 18:50:20

stop: 19:36:33

Prior to run 33, stopped tuning with rates ~5k.

Run 34

file: he8-triumf-034001.root

Start: 19:37:43

Stop:

Run 35

file: he8-triumf-035001.root

Start: 20:38:07

Stop: 21:17:48

Stepping run to let operators  
take a cup reading.

Run 36

file: he8-triumf-036001.root

Start: ~~he8-triumf-036001.root~~

Start: 21: ?

Stop: 21:49:29

Change to another run while  
they tune again.

Run 37

file: he8-triumf-037001.root

Start: 21:50:54

Stop: 22:56:23

Run 38

file: he8-triumf-038001.root

Start: 22:56:54

Stop: 23:59:28

During run 38 cyclotron people  
stop the beam for tests

JUL 13 6h

Run 39

file: he8-truinf-039001.root  
Start: 00:00:16  
Stop: 00:20:46

Run 40

file: he8-truinf-040001.root  
Start: 00:01:27  
Stop: 00:02:30

~~Today~~ we still have beam  
in our proportional counter,  
which seems to be hurting  
the resolution of our  $\Delta E$  measurement

We are adding even more gas...

Gas pressure  $P =$

1130 on gauge and  
1025 on flow controller which  
is a larger difference  
than previously seen.

Estimate was 1140

Run 41

file: he8-truinf-041001.root  
Start: 00:31:12:51  
Stop: 01:25:13

Lam

\* problem back, last run junk \*

With the reduction in pressure,  
our IC rate dropped by 10%

Increased guard ring voltage to  
695 V, switched back to  
1040 torr.

Run 42

File: he8-triumf-042001.root

Start: 03:46:13

Stop: 04:48:24

Run 43

File: he8\_triumf\_043001.root

Start: 4:53:00

Stop: 5:58:35

1800

600

~~too~~ → elastic  ${}^8\text{He} + p$  events

in ~~too~~ min.

180

~~16,000~~  $\frac{16,000}{50,000}$

This would make  $50,000 \pm$   
 $(\text{He}(p,p))$  events  
total.

Run 44

File : he8\_triumf\_044001.root

Start: 05:59:28

Stop: 06:59:02

Run 45

File: he8\_triumf\_045001.root

Start: 07:03:33

Stop: 08:04:02

Run 46

File: he8\_triumf\_046001.root

Start: 08:06:41

Stop: 09:18:39

Run 47

File: he8\_triumf\_047001.root

Start: 09:19:56

Stop: 10:17:24

Stop the run to reduce the pressure. Guard one voltage increase on previous page seems to have cleaned up pfp-counter, but we are now stopping the beam too far back. Reduce pressure in steps of 10 torr to see beam in pfp-counter.

Saw  $\sim 10^4$  beam <sup>0"</sup> stop at  $\sim 992$  torr on gauge. Looks clean at 1010 torr on gauge. Stay here!  
Note: Agrees with GEANT4 and SRIM / TRIM calculations.

07/13 Sun.

Stay here!

Pressure is now 100 torr on Pressure gauge  
on pressure controller 975 torr

Run 48

File: he8-trumf-048001.root

\* Run 48 is good!

Start: 10:33

Stop: 11:46

DAQ: 140 evt/sec

IC-r = 7808/sec

Run 49

Start: 11:46

DAQ: 143 evt/sec

Stop: 12:03

IC-r = 7700/sec

In Run 49, event rate climbed to  $\sim 500$  evt/sec over 10 mins.  
Beam rate is the same, about 7000/sec.

Run 50

Start: 12:04

DAQ: 600 evt/sec

Stop: 12:16

\* Beam was off  
during this run.

file: he8-trumf-background\_050001.root

Found Si Det - 3-4 is triggering a lot in noise.

Call Ethan to increase threshold.

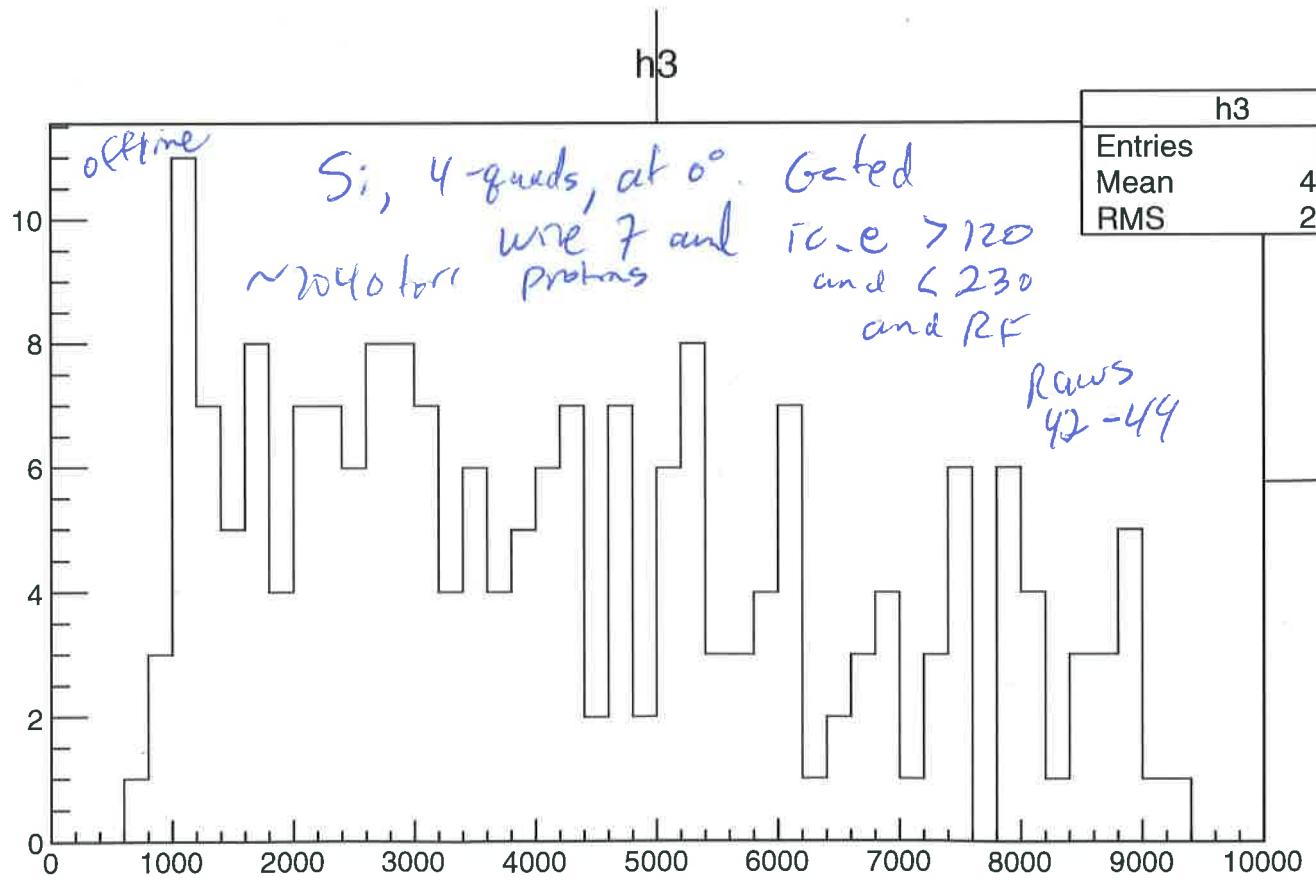
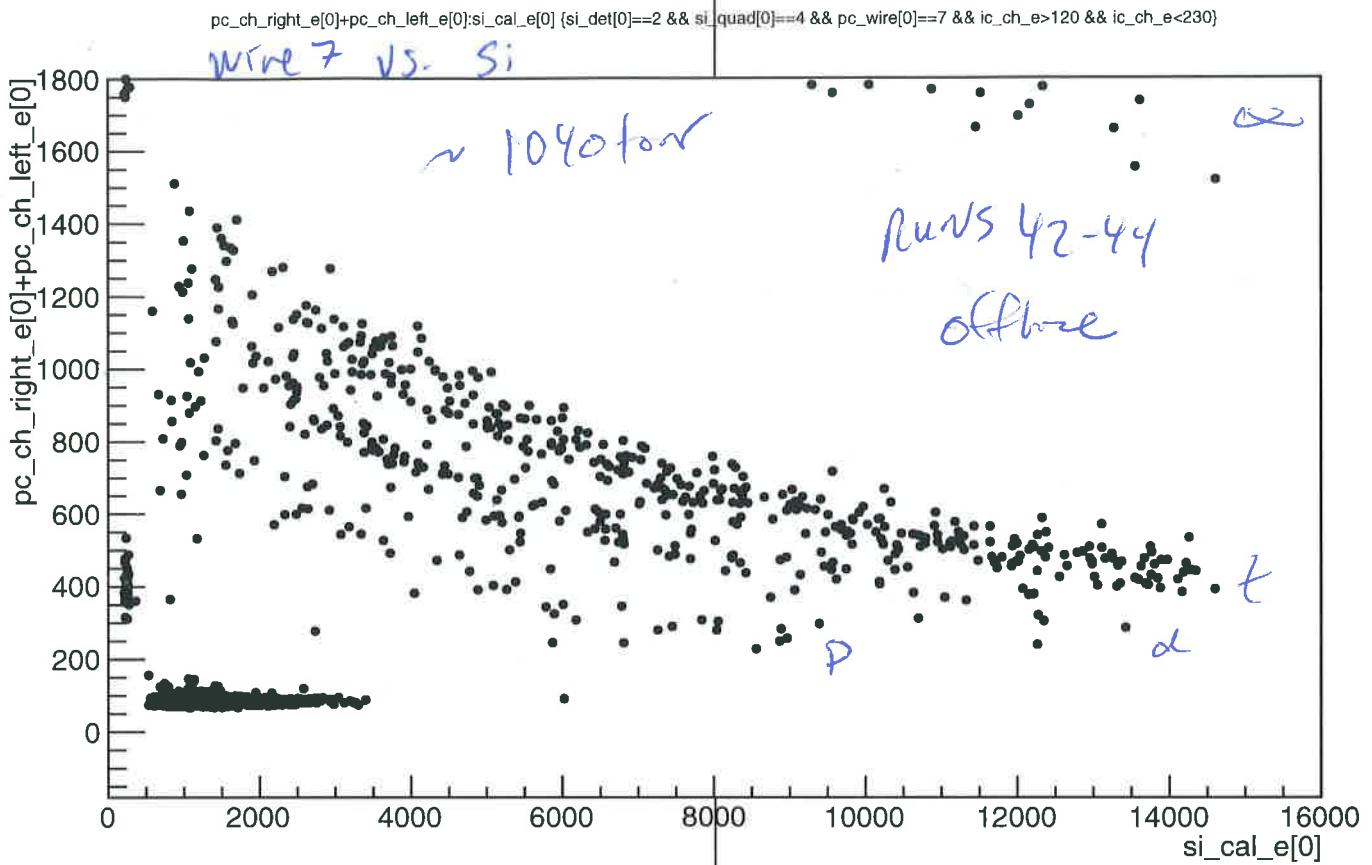
Threshold 10 and 11  $\Rightarrow$

3-3  $\Rightarrow$  ~~38~~ 30

3-4  $\Rightarrow$  35

Seems to have fixed problem. Continue to monitor.

Event rate with no beam was  $\sim 30$  evt/sec.



~~Beam now back on.~~ Trigger rate much lower  
now.

Beam is off Run 51.

Run 51 was just background. We  
had no beam.

Operator B trying to fix the problem during  
Run 51.

Run 51, Event rate with no beams was  
50-70 evt/sec.

Still ok.

Run 51 file: he8-triumf\_051001.root

\* We have been down since about 10am Canada Time  
(12pm Texas time). LINAC control system and  
cryogenic issues. Operator B working on  
problems.

12pm: Cryogenics fixed.

\*\*\* Operator says mass analyzer magnet needed to be reset.  
checked Ion Chamber spectrum. looks ok (no 8Li).

12:20pm: Beam is back. Back to taking data.

Run 52

Start: 14:22

Stop: 15:24

DAQ rate: 200 evt/sec

IC-r = 8900 evt/sec

File: he8-triumf\_052001.root

Note: rate in Si-3-4-r = 104.6 with beam on.  
 $\approx 70$  with beam off.

\* Evgeniy added a fan on the pressure controller. 12:41pm  
Si leak age = 1.538 μA at 12:41 pm.

**Run 53** Start: 15:29 DAQ rate: 249 evt/sec  
Stop: 15:31 IC-r: 8340 /sec  
file: he8-triumf-053001.root

At end of Run 53, noted Si 3-3 and Si 3-4 rates are going up again. Si 3-3 ~ 200/sec Si 3-4 ~ 300/sec

Stopped run. Increased Si-3-3 Threshold to 35  
Increased Si-3-4 Threshold to 40

Rates after increase Si 3-3-r 20.8/sec  
Si 3-4-r 37.8/sec  
Total rate 158 evt/sec

} Beam ON

Back to data taking.

**Run 54** Start: 15:34 DAQ rate: 150 evt/sec  
Stop: 15:58 IC-r: 8250 evt/sec  
file: he8-triumf-054001.root

Lost Beam at the end of the run. Operator is getting it back.

**Run 55** Start: 16:01 DAQ rate: 170 evt/sec  
Stop: 16:53 IC-r: 8900 evt/sec  
file: he8-triumf-055001.root

**Run 56** Start: 16:53 DAQ rate: 150 evt/sec  
Stop: 18:02 IC-r: 8341 evt/sec

file: he8-triumf-056001.root

operator is checking the beam.  
Beam is down to  $\sim 7000$  evt/sec -  
operator will try to peak the beam while  
we run.

Run 57  $\Rightarrow$  operator is peaking the beam during run.

Start: 16:08

DAQ : 141 evt/sec

Stop: 18:39

IC-r: 7238 evt/sec

file: he8-triumf\_057001.root

Run 58  $\Rightarrow$  operator is done tuning the beam.

Start: 18:40

DAQ rate: 142 evt/sec

Stop: 19:03

IC-r : 7637 evt/sec

file: he8-triumf\_058001.root

cyclotron clamp about half-way through run.  
beam down for  $\sim 10$  mins. at end of run.  
stopped run due to beam loss.

Run 59 Start: 19:07

DAQ rate: 100 evt/sec

Stop: 20:08

IC-r : 6000 evt/sec

file: he8-triumf\_059001.root

Beam coming back  
during run.

Run 60

Start: 20:09

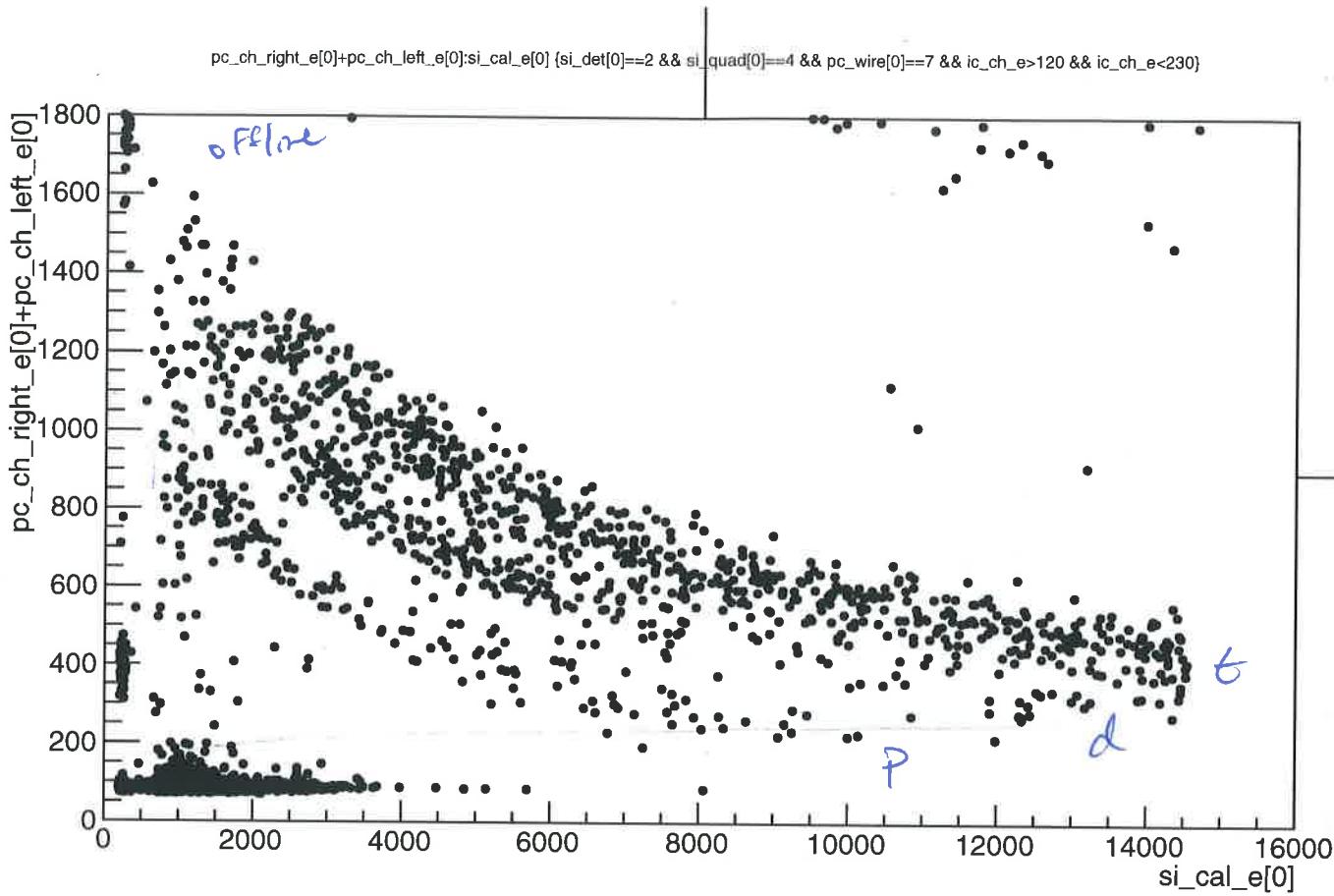
DAQ rate: ~~6300~~<sup>115</sup> evt/s

Stop: 21:04

IC-r : ~~115~~<sup>6300</sup> evt/s

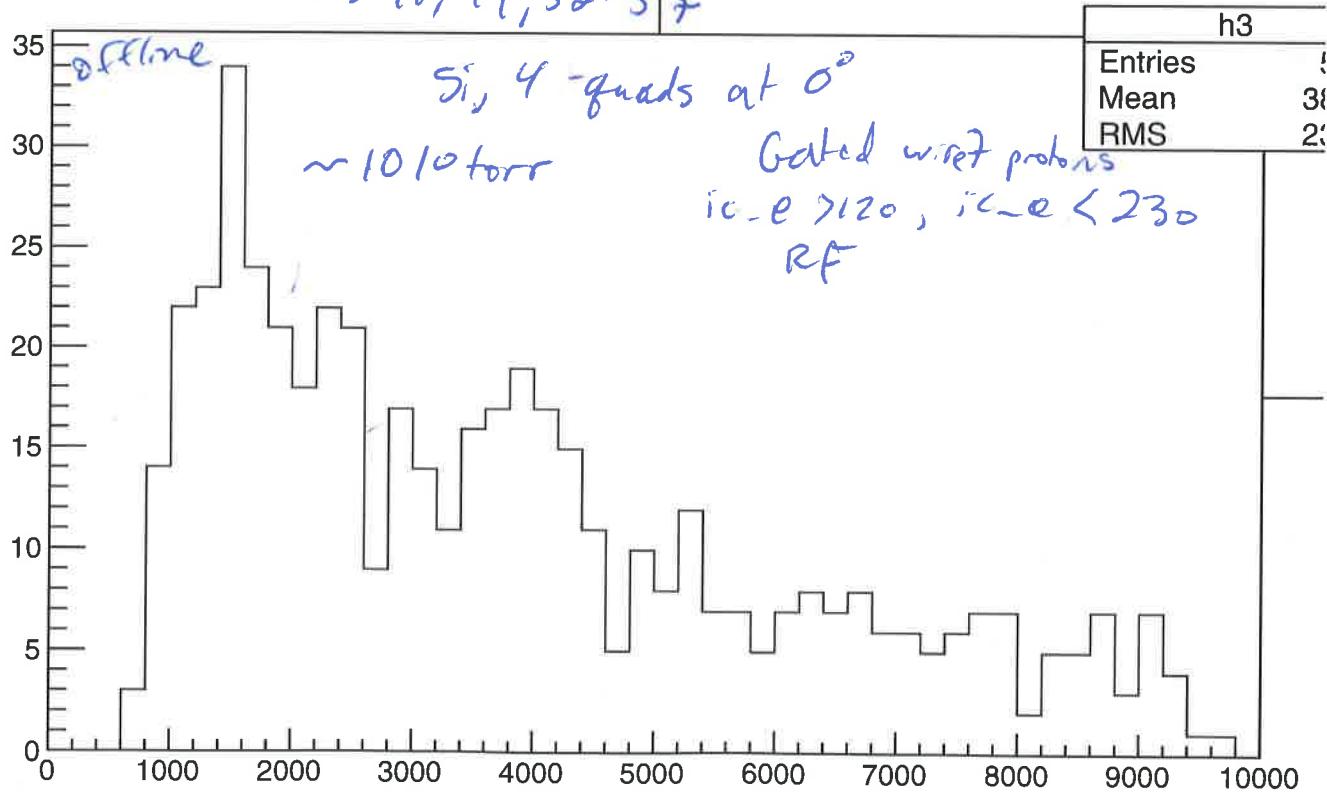
File: he8-triumf\_060001.root

# Runs 48, 49, 52-57



Runs 48, 49, 52-57

h3



Beam tuning during this run.

Run 61

Start: 21:05

Stop: 21:58

DAQ: 135 → 170

IC-r: 6800 → 7000

File: he8-triumf\_061001.root

Run 62

Start: 21:59

Stop: 23:11

DAQ: 160 ert/s

IC-r: 7800 ert/s

File: he8-triumf\_062001.root

8:30pm:

Leak current on Si\_3\_1; Si\_3\_2, Si\_3\_3, Si\_3\_4  
increased up to 2.42mA (total)

Noise Rate: ~ 100 - 200 ert/sec

To fix it a fan was used to cool it down,  
a bay door opened → noise level went down  
to 7 ± 15 ert/sec

Run 63

08/14/14

Start: 23:19

Stop: 00:120

DAQ: 141 → 180

IC-r: 7000 → 8500

Set threshold at Si3\_3: 30

Si3\_4: 40

File: he8-triumf\_063001.root

Pressure (CH<sub>4</sub>):

925 torr at pi/PC

1010 torr at gage | 10:00 pm

flow rate:

170 sccm

Si detectors:

Leak current: 2,28 μA

Jul 14 85

Run 64

Start: 00:00  
Stop: 01:26

DAQ: 180 / sec  
IC\_r: 8700 a.u.

File: he8-triumf-064001.root

Run 65

Start: 01:28  
Stop: 01:57

DAQ: 170 / sec  
IC\_r: 7400 / sec

File: he8-triumf-065001.root

Run 66

Start: 02:02  
Stop: 02:37

DAQ: 120 / sec  
IC\_r: 6800 a.u.

File: he8-triumf-066001.root

Stopped protons due to high <sup>water</sup> temperature readings



BEAM OUT FOR: 2 hours and 50 minutes

Run 67

Start: 05:24

Stop: 06:29

DAQ: 90 / s

IC\_r: 5000 / s

file: he8-triumf-067001.root

Run 68

Start: 06:29

Stop: 07:30

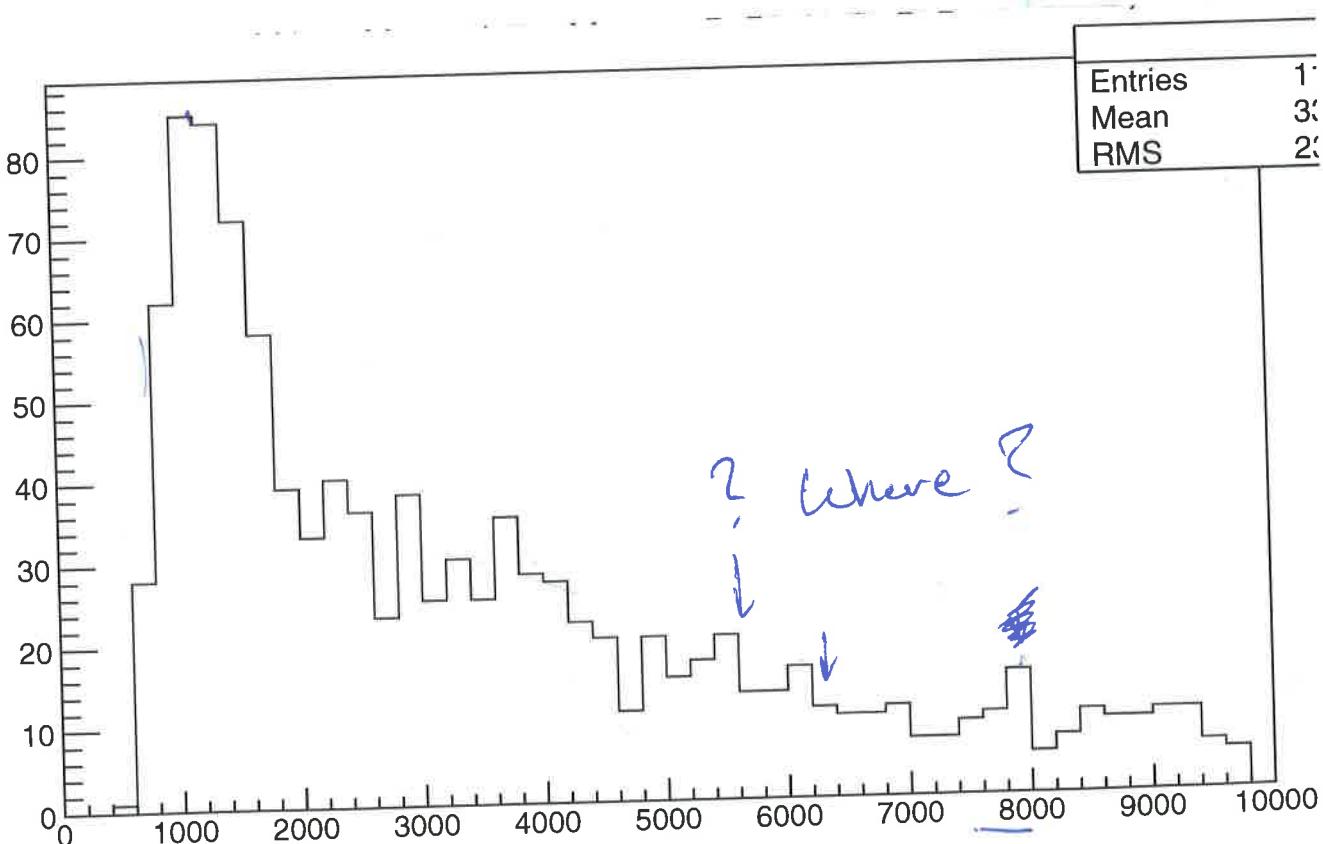
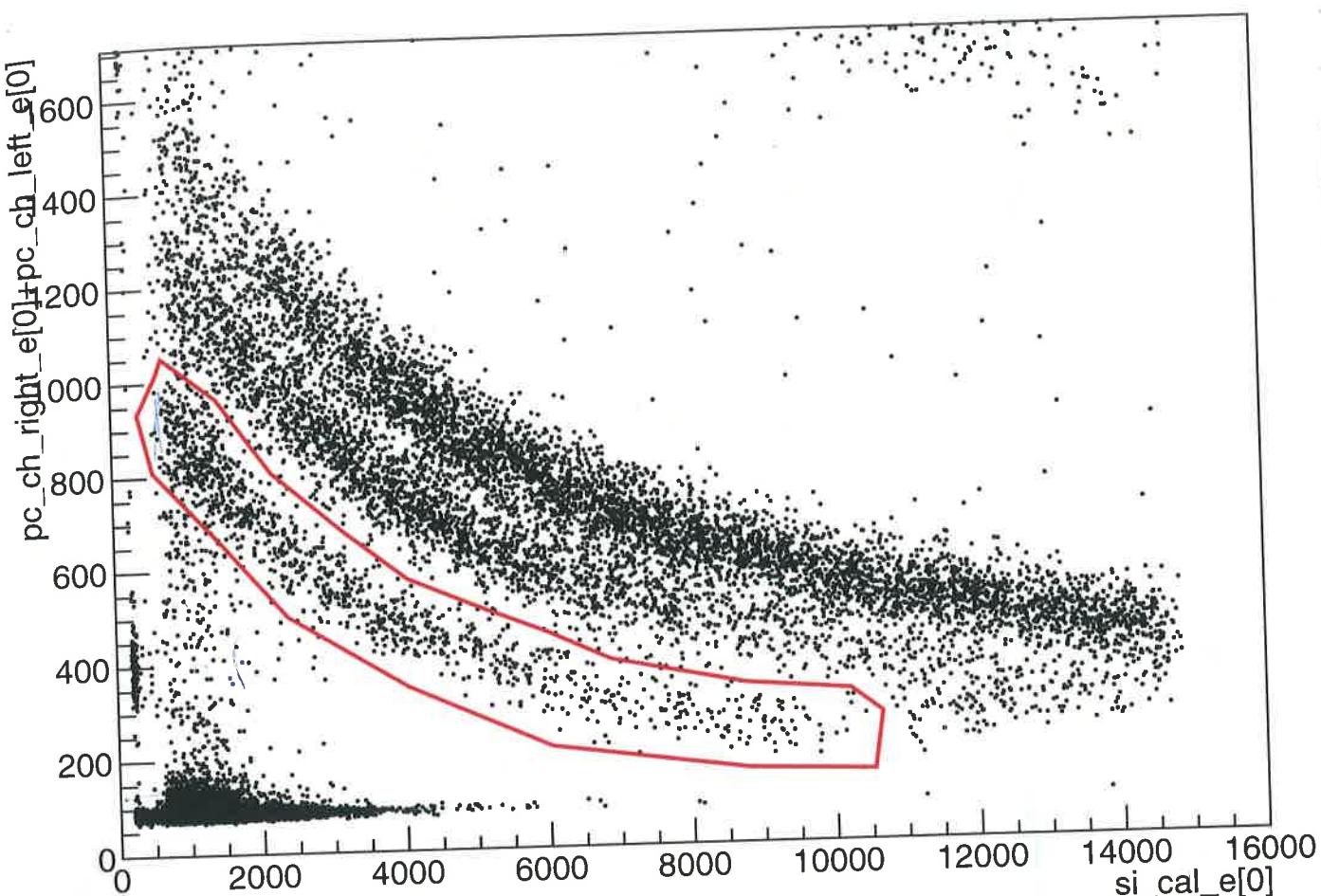
DAQ: 100 / s

IC\_r: 6600 / s

file: he8-triumf-068001.root

Run 48, 49, 52-57, 58-63

pc\_ch\_right\_e[0]+pc\_ch\_left\_e[0]:si\_cal\_e[0] {si\_det[0]==2 && pc\_wire[0]==7 && ic\_ch\_e>120 && ic\_ch\_e<230}



Run 69

Start: 07:31

DAQ: 110/s

Stop: 08:08

IC-r: 6900/s

file: he8-triumf-069001.root

Protons stopped. for about 15 minutes

Run 70

Start: 08:29

DAQ: 125/s

stop: 08:36

IC-r: 7000/s

file: he8-triumf-070001.root

Protons stopped again. Tripped. Out for 30 min.

Run 71

start: 09:03

DAQ: 140/s

stop: 10:02

IC-r: 8000/s

file: he8-triumf-071001.root

Run 72

start: 10:04

DAQ:

stop: 10:06

IC-r:

Better  
Temp  
Control

SCRATCH

Pressure Controller Froze  
\*\* Installed Air Conditioner in place  
of for.

Run 73

start: 10:12:21

DAQ: 140/s

stop: 11:12:29

IC-r: 8500/s

Run 74

start: 11:16:47

DAQ: 168/s

stop: 12:24:34

IC-r: 8500/s

Run 75

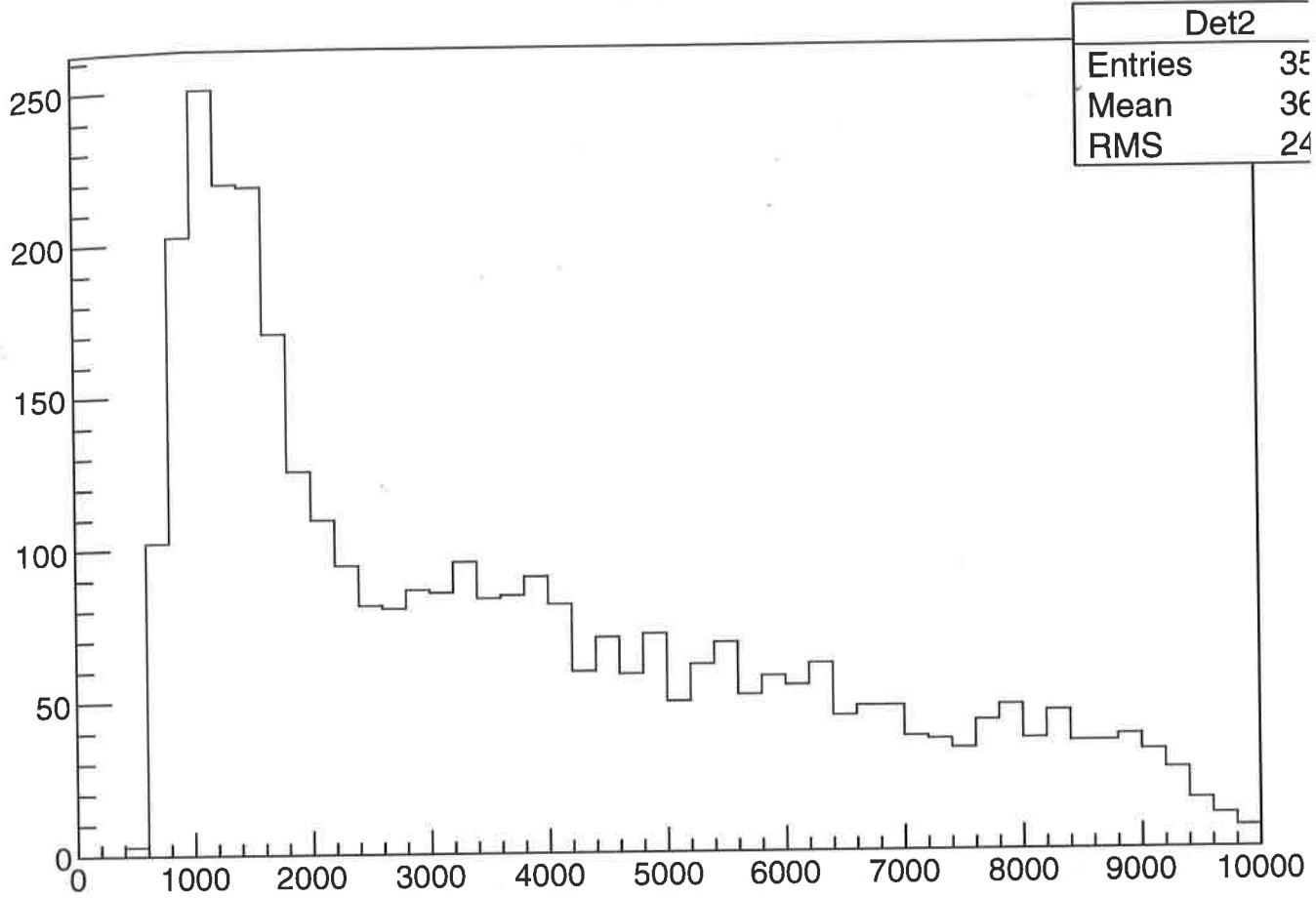
start: 12:25:03

DAQ: 203/s

stop: 13:45:31

IC-r: 8300/s

## Det2



Run 76

start 14:02:15 DAQ:140

$I_{e^-}$ : 856

stop 15:09

Run 77

start 15:04 DAQ:150

stop: 15:58  $I_{e^-}$ : 76

Stop the beam for LINAC transmission check.

Run 78

This is a background run with beam off.  
start: 16:06 DAQ: 7 evt/sec  
stop: 16:59

file: h8-triumf-background-078001.root

Beam is back on:

They increased heater on  $I_{sol}$   
Target source.  
Beam Current is now  
10K - 11K!

[Run 79]

Start: 16:10

DAQ: 150 evt/sec

Stop: 17:12:41

Ic-r: 9580

file: he8-triumf-079001.root

[Run 80]

Start: 17:12:56

DAQ: 218 evt/sec

Stop: 18:07:27

Ic-r: 11114

file: he8-triumf-080001.root

Lost beam at end of run,  
came back less--.

[Run 81]

Start: 18:08:02

18:35:02

Beam unstable. Ask operator to work on it.

[Run 82]

$\Rightarrow$

Operator  
Tuning with the beam on.

Start: 18:52

DAQ: 175 evt/sec

Stop: 19:05

Ic-r: 7897 /sec

Back to 9K-10K take data.

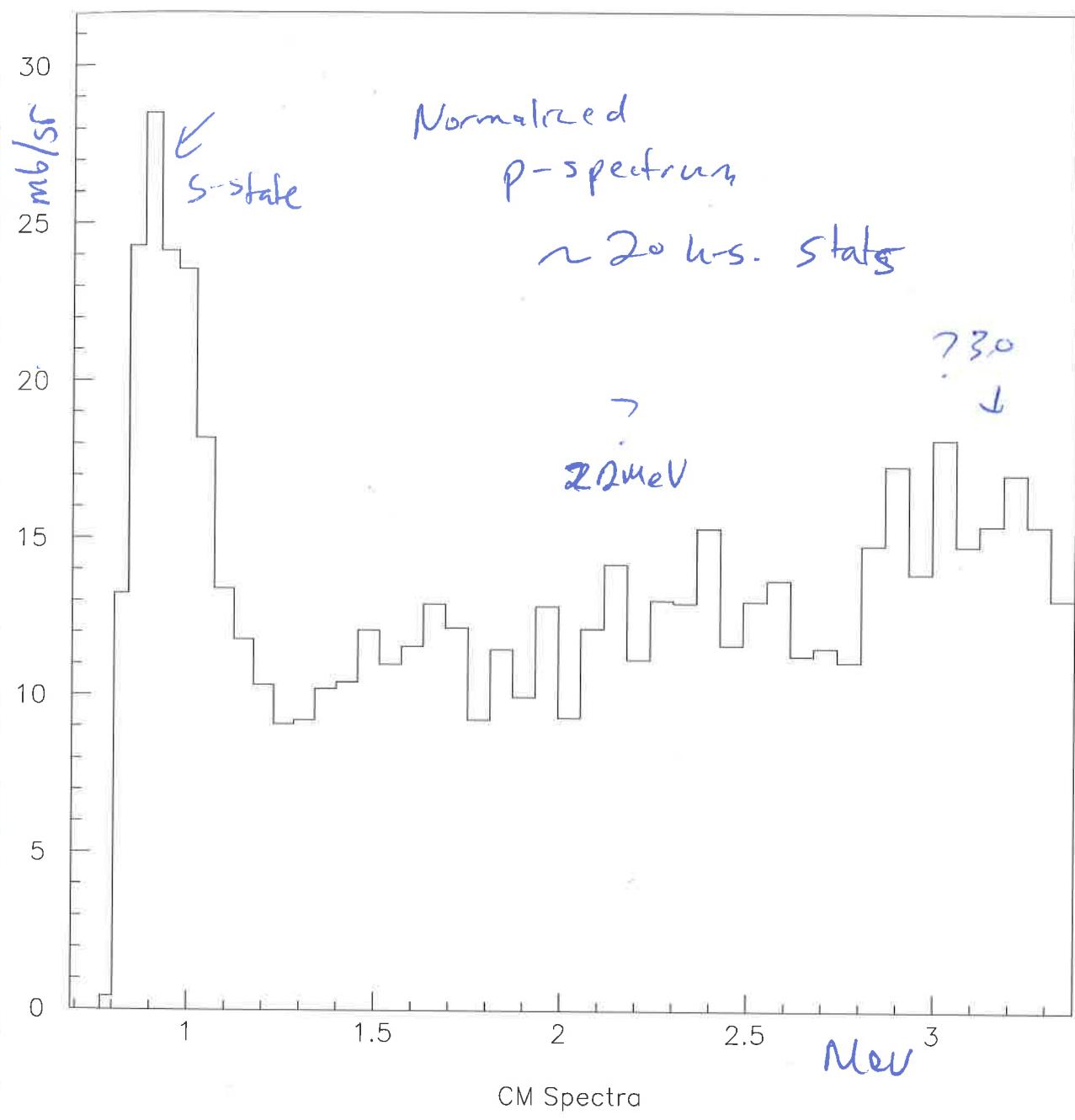
[Run 83]

Start: 19:05

DAQ: 170 evt/sec

Stop: 20:16

Ic-R: 9178 /sec



Run 84

Start: 20:17  
Stop: 21:16

DAQ: 150 e<sup>+</sup>/sec  
IC-r: 8700 /sec

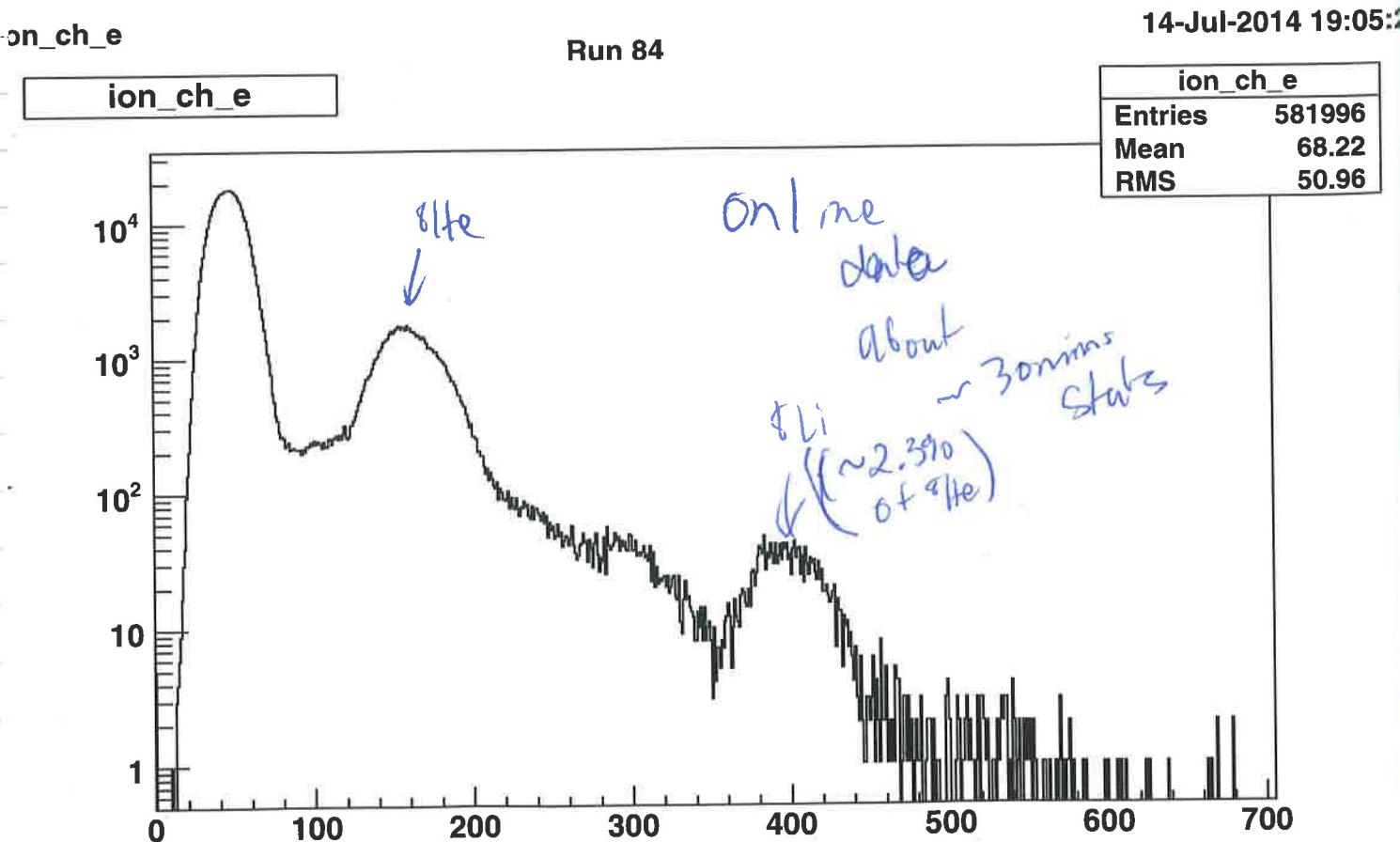
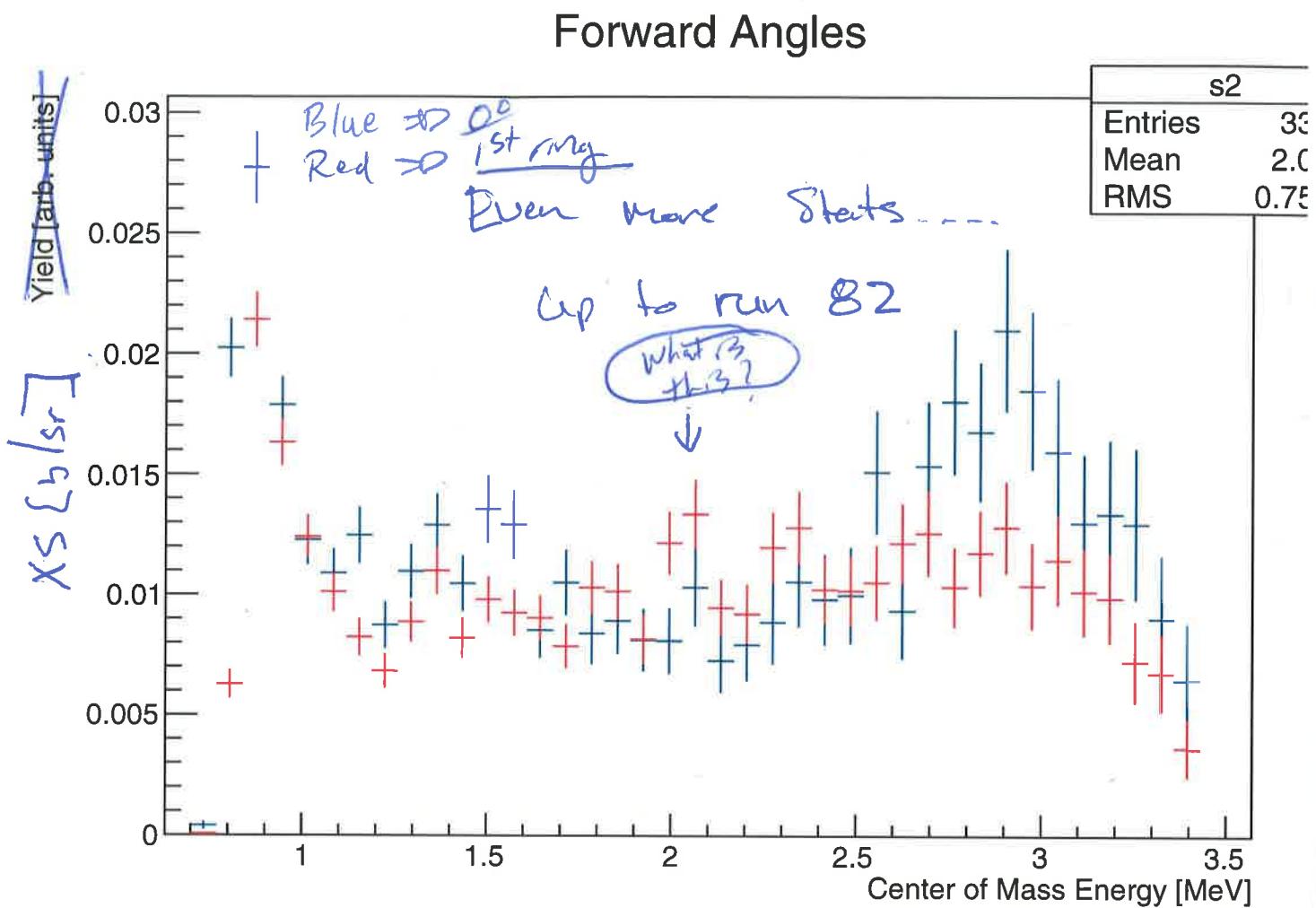
\* I have noted we now have about  $\sim 2\%$   ${}^8L$  in the beam based on ion chamber spectrum (around ch 400)

Run 85

Start @ 21:16  
Stop @ 22:20

DAQ: 170  
IC-r: 8400

Si-Leak current: 1.38 mA



RUN 86

Start: 22:21  
Stop: 22:31

DAQ: 150 eut/sec  
IC-r: 8518 /sec

Stopped run. LINAC operator is working on cavities. During RUN86, LINAC operator may have been tuning cavities, which may have affected beam energy.

LINAC operator done. Starting to run again.

RUN 87

Start: 22:52  
Stop: 23:58

DAQ: 170 eut/sec  
IC-r: 8660 /sec

## SHIFT SCHEDULE ${}^9\text{He}$ experiment

SAT 7/12	SUN 7/13	MON 7/14	TUES 7/15	WED 7/16	7/16/14
12 AM Heshani	Josh Rogachev	Josh Heshani	Ethan Chungbo	Josh Heshani	
8 AM 4 PM Bryan	Chungbo Bryan	Brian Vlad	Rogachev Vlad	Brian Peter Bender	Beams Ends 8:30am
4 PM	DAN	Eugeniy	DAN	Eugeniy	
12 AM	Ethan	DAN	Brian		

Participants:

- Grisha Rogachev
- Vlad Goldberg
- Brian Roeder
- Eugeniy Koschobey
- Ethan Uberseder
- Dan Melkonian
- Greg Chubarian (setup)

Josh H.  
Heshani J.

From TRIUMF

- Martin Alcora
- Barry Davids
- Robert Openshaw
- Peter Bender (1-shift)

Jul 15<sup>th</sup>

Run 88

Start: 23:54

Stop: 00:43

DAQ: 140 eut/s

Ic-R: 7600 /sec  
(down to 7000 at start)

Operator is tuning during Run 88 to try to restore intensity.

OPERATOR is done tuning: Ic-R ~ 8000.

Run 89

Start: 00:43

Stop: 01:45

DAQ: 140 eut/sec

Ic-R: 7800 /sec

Run 90

Start: 01:45

Stop: 2:48

DAQ: 138 eut/sec

Ic-R: 7500 /sec

Run 91

Start: 2:49

Stop: 3:52

DAQ: 125 eut/sec

Ic-R: 6700 /s

Run 92

Start: 3:53

Stop: 4:56

DAQ: 138 /sec

Ic-R: 6877

Run 93

Start: 4:56

Stop: 6:00  
5:59

DAQ: 140 /sec

Ic-R: 6000

Run 94

Start: 5:59

Stop: 6:15

DAQ: 105 /sec

Ic-R: 6000

BB

The rate seems to have dropped significantly below GK, asked the operators to retune.

They will touch the magnet, so monitoring  ${}^8\text{Li}$  content as well.

Run 95

Start: 6:18

DAQ: 123

Stop: 7:13

IC-R: 5205

Run 96

Still tuning---

Start: 7:15

DAQ: 169

Stop: 8:18

IC-R: 7868

Finished tuning. Increased to 12 k/sec without any sign of  ${}^8\text{Li}$ .

Run 97

Start: 8:23:26

DAQ: 252

Stop: 9:31:57

IC-R: 12100

Run 98

Start: 9:32

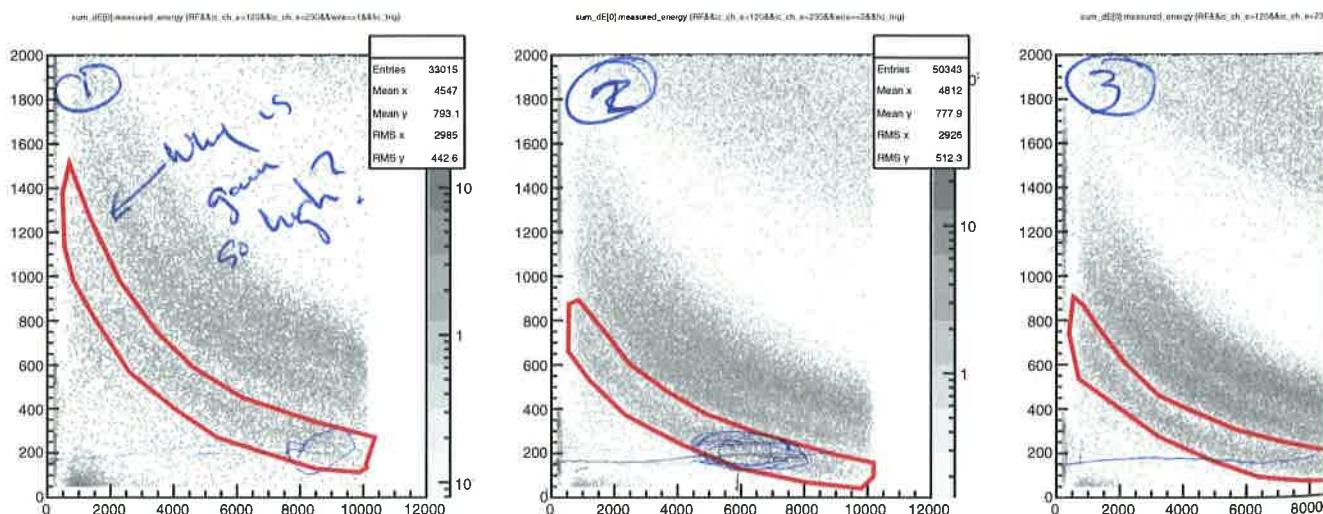
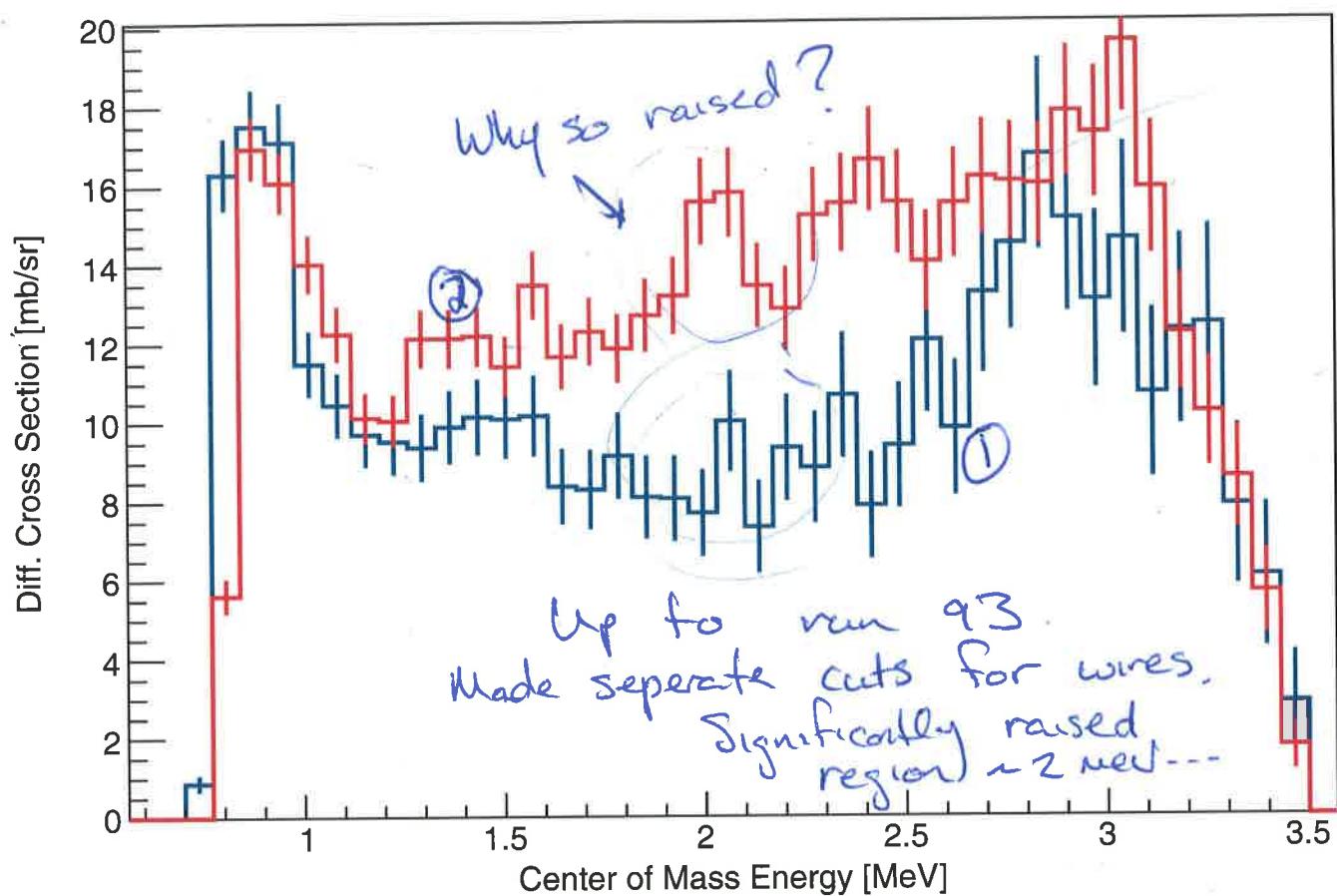
DAQ: 200

Stop: 9:54

IC-R 11800

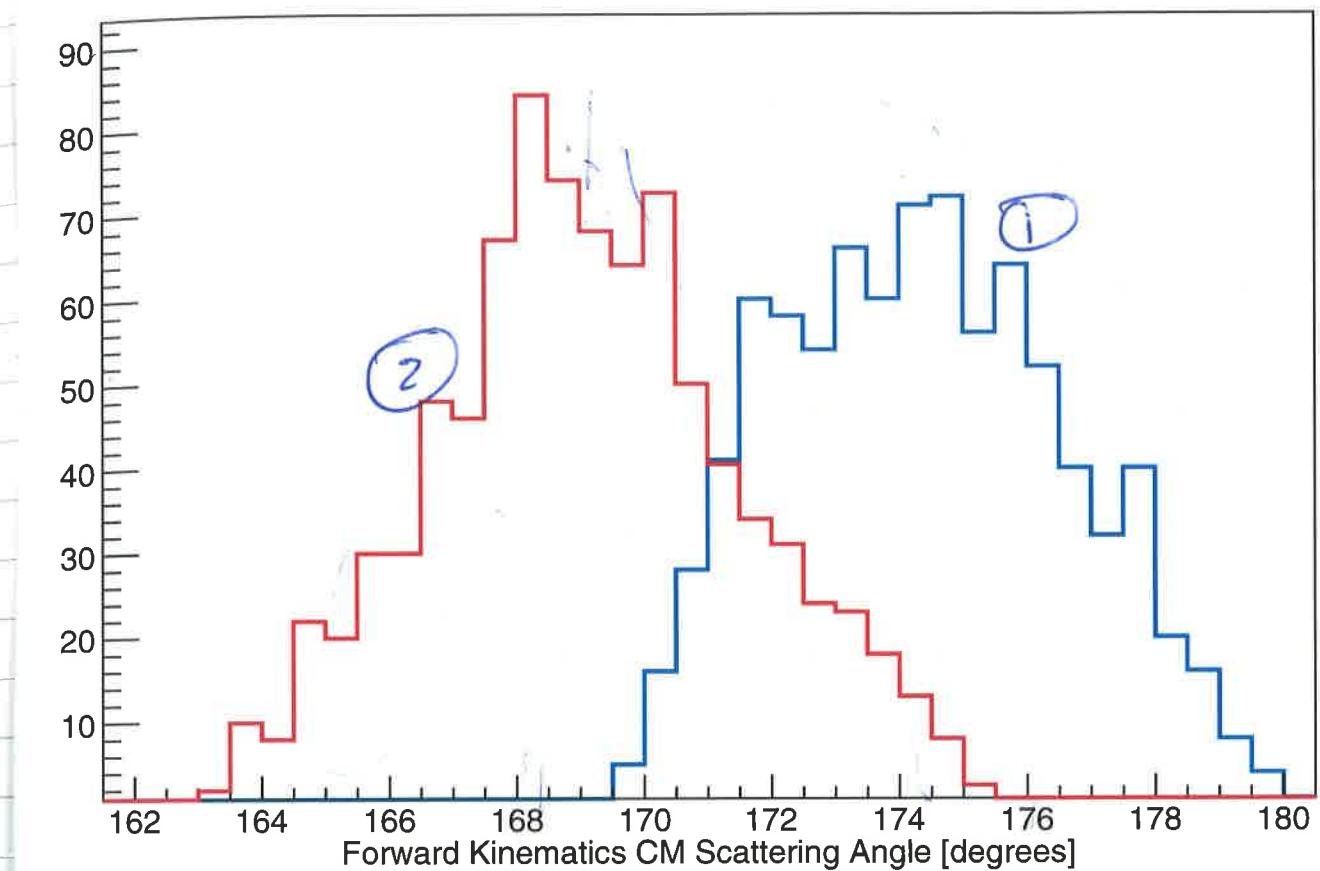
\* Lost cyclotron proton beam. Waiting for it to come back

## Forward Angles



Proton  
Cats  
for each  
wave

bin\_30\_cm\_fk



Mean of angle distributions only  
different by  $\sim 7^\circ$ , ~~possibly angle error~~  
Seems like too little for such a  
xs difference ... Maybe problem is  
fixed with better calibration of PC  
gain ...

Runs Continue  
next page →

# Background Run

Run 99

Start: 10:06  
Stop:

DAQ: 53 evt/sec

No Beam in Run 99

Beam is back. Back to running

Run 100

Start: 10:22  
Stop: 11:00

DAQ: 200 evt/sec  
IC-R = 12000 evt/sec

11am - Cyclotron operators tuning proton beam.  
The beam ok, but at reduced rate.

Run 101

Start: 11:00  
Stop: 11:11

DAQ: 200 evt/sec  
IC-R: 11000 evt/sec.

Run 102

Start: 11:11  
Stop: 12:34

DAQ: 250 evt/sec  
IC-R: 12000 evt/sec

Back to SOUT protons from cyclotron.

Run 102.3  
good data

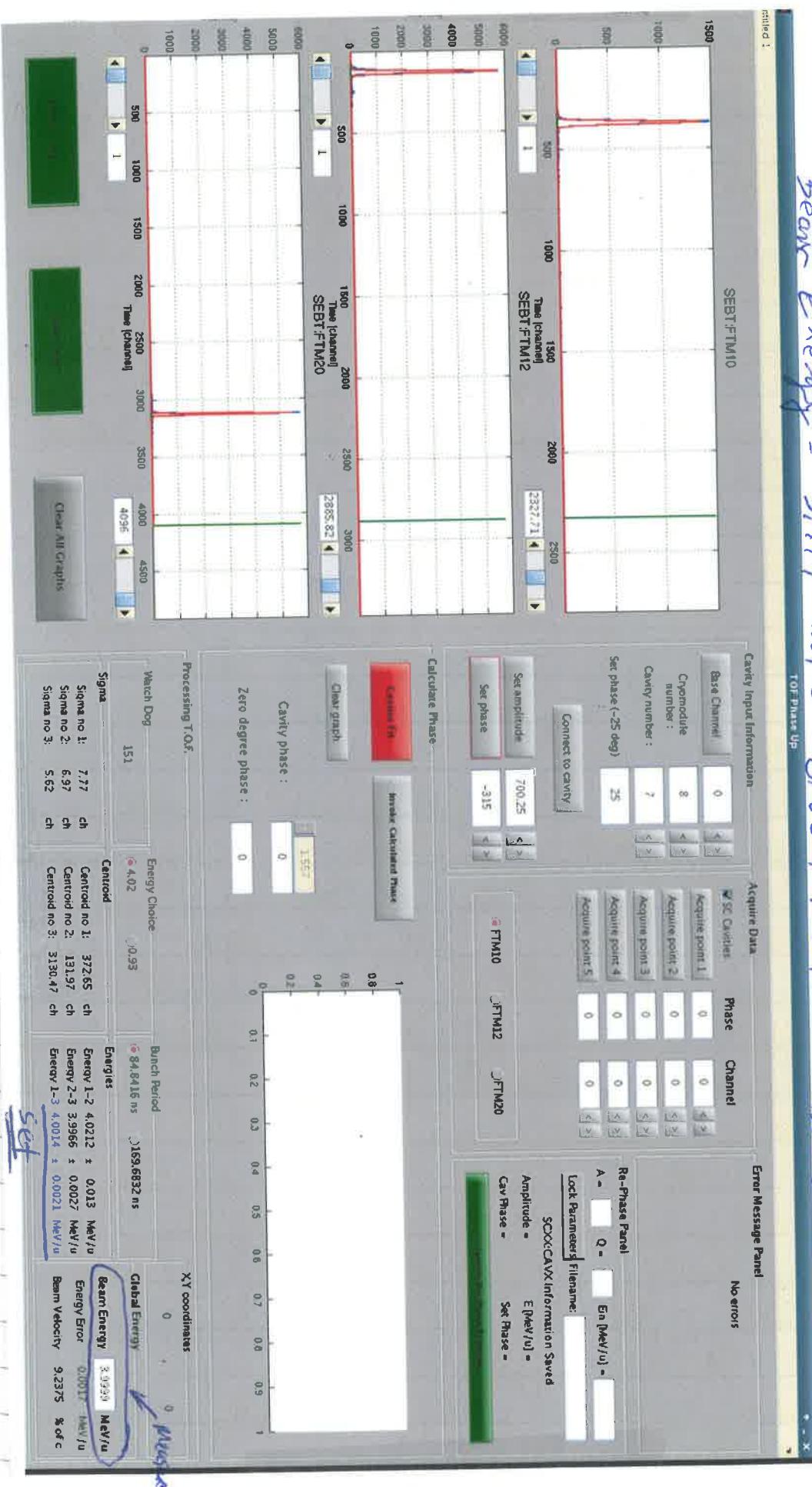
Si Leakage: 0.87 nA in morning.

Pressure Gauge Temp: 28°C

After

~~the end of Run 102, Cyclotron operators take beam for a while to check RF tune. Down for ~10mns~~  
~ 30 mns

Copy of Pre-Run TOT Beam Energy Measurement from 7/11/2014.  
 Beam Energy = 3.999 MeV/u  $\pm$  0.017 MeV/u. Measured with  $^{12}\text{C}$  beam.



Run 103

Start: 13:15

Stop: 14:19

DAQ: 225 evt/sec

IC-r: 12000 evt/sec

Run 104

Start: 14:19

Stop: 15:19

DAQ: 225 evt/sec

IC-r: 11000 evt/sec

lost beam for ~2mins. at the end of Run 104.

Cyclotron proton beam decay over ~10 mins.

Run 105

Start: 15:32

Stop: 15:53

DAQ: 187 evt/sec

IC-r: 9610 /sec

Operator B tuning during Run 105

Run 106

Start: 15:54

Stop: 16:32

DAQ: 143 evt/sec

IC-r: 8000 evt/sec

OPERATOR finished tuning, up to ~ 9500 /sec

Run 107

Start: 16:32

Stop: 18:16

DAQ: 175 evt/sec

IC-r: 10000 ev/sec

Note: 2 files  
for this  
run

he8-triumf-107001.root

he8-triumf-107002.root

Run 108

Start: 18:16

Stop: 18:28

DAQ: 175 evt/sec

IC-r: 9405

File: he8-triumf-108001.root

The End of 1010 for 1

Changed pressure to ~~778~~ torr.

$^{3\text{He}}$  Beam on Si detectors.  
70X attenuator is on.

Run 109 Start: 19:36  
Stop: 20:06

DAQ: 243 euf/sec  
IC-r: ?69

No calculated with SRIM/PRISM Density of  
 $\text{CH}_4$  to be  $0.697 \text{ g/cm}^3$  (approx.)  
with GEANT4 we get  $0.692 \text{ g/cm}^3$

such that we de posit  $3.45 \text{ MeV}$  in the silicon  
at 778 torr. with  $^{3\text{He}}$

∴ we calculate Temp to be  $16.5^\circ\text{C}$  with chiller on.

Run 110 Start: 20:14  
Stop: 20:29

DAQ: 243 euf/sec  
IC-r:

Temperature Pressure for RUN 110 is 800 torr.

(even though file says last-trial-780torr,  $780$ )

Strange result for run 110. No  $^{3\text{He}}(?)$

Go to 768 torr.  $\downarrow\downarrow\downarrow$

Run 111 Start: 20:35  
Stop: 20:43

DAQ: 328 euf/sec  
IC-r:

766 torr

~~$^{3\text{He}}: 4.136 \text{ MeV}$~~  Peak at  
4 MeV is  
 $2 \times 2 (^{8}\text{Be})$

Run 112

Start: 20:46  
Stop: 20:50

DAQ: 300 eV/sec  
IC-r:

Pressure is now: 778 torr 2  $\alpha$ 's

~~${}^8\text{He}$  in S-det 2-2  $\Rightarrow$  3.66 MeV~~

Run 113

Start: 6 mins  
Stop: data

DAQ:  
IC-r:

~~Not flowing~~

Pressure is now: 790 torr

${}^8\text{He}$  in S-det 2-2  $\Rightarrow$  6.16 MeV (in S1,2,2)

We verified in this run that we see  ${}^8\text{He}$ .

In previous runs at lower pressure, we were seeing 2 $\alpha$  peak around 4 MeV.  
Peak moved at lower pressure

Run 114

Start: 21:17:36  
Stop: 21:42:22

DAQ: 273 eV/sec

*Not flowing  
was reduced  
pressure* (785 torr)

In Vire 3 vs. S1,2,3  
 ${}^8\text{He} \Rightarrow$  6.4 MeV

Run 115

Start: 21:47  
Stop: 21:52

DAQ:

*Reduced  
pressure* (778 torr)

*Not  
flowing  
gas*

Run 116

Start: 21:56  
Stop: 22:05

DAQ: 239 eut/sec

767 torr

We have a problem with gauge meter. He has different energy for some setting of pressure in vacuum gauge (on the chamber).

Now stopping the just before "wire 3" as seen on oscilloscope. Beam is hitting wire 7.

Pressure [920 torr on pressure controller  
948 torr on gauge]

\* file names are now: he8\_triumf\_948torr etc.

Run 117

Start: 22:55

DAQ: 239 eut/sec

Stop: 23:54

IC\_r: 8000 eut/sec

Pulser was "off" for part time of this run

#80e in 10sec 2.74x10<sup>8</sup> (scd) 2.82x10<sup>8</sup> (sp)

Run 118

Start: 23:55

DAQ: 239

Stop: 00:21

IC\_r: 8000

Pressure controller failed.  
Rebooted!

Jul 16<sup>th</sup>

Run 119

Start: 00:09  
Stop: 01:49

DAQ: 185  
IC-r: 8500

Run 120

Start: 01:50  
Stop: 02:51

DAQ: 270  
IC-r: 9500

Pressure: 920 torr at PC93 (948 on press. gauge)  
Si leakage current: 1.0  $\mu$ A

Run 121

Start : 02:53  
Stop : 03:35.

DAQ : 336  
IC-r : 9500

Protos Died. Down for 30 minutes.  
Low count rate

Cyclotron having trouble sparking source

Run 122

Start : 03:59  
Stop : 04:30

DAQ : 280  
IC-r : 9500

Pressure controller froze. Rebooted. 920 torr on Controller  
948 torr on Gauge

Run 123

Start : 04:56  
Stop : 05:03

Pressure (After reset) : 948 torr on Gauge  
920 torr on Controller

948 Torr on Gauge

$\star \equiv$  IC scalar all over the place???

Run 124

Start : 05:05      DAQ = 270  
Stop : 06:06      IC-r : 9500

\* Run 125

Start : 06:06      DAQ : 280  
Stop : 06:46      IC-r : 9500

Scaler going upto 22000. Operators stopped the beam but the scaler was still counting. After restarting analysis, scaler is still high. They put a cup in front of the beam, but the intensity is similarly high.

\* Run 126

Start : 06:47      DAQ : 270  
Stop : 07:49      IC-r : All over the place

Run 127

Start : 07:50      DAQ : 250  
Stop : 08:53      IC-r : 8500

Run 128

Start : 08:54      DAQ : 270  
Stop : 10:00      IC-r : 9500

Run 129

Start : 10:01      DAQ : 260 is  
Stop : 10:30      IC-r : 9500

The END of He Beam

# Pulser calibrations.

Run 130

PC Pulser test (ramp:  
0.0 ÷ 4V; 0.5Hz 500 Hz)

Run 131

PC Ramp calibration  
0.0 ÷ 0.5V; 500 Hz

Run 132:

PC calibration  
Pulser: 0.05V; 100 Hz  
2 minute run

Run 133,

Pulser: 0.045V; 100 Hz  
2 min. Run

Run 135

Pulser: 0.0475 , 100 Hz  
2 min run

Run 136

Pulser: 0.08 V 100 Hz [2"]  
0.1  
± 0.2

Run 138

0.2V, 0.5V, 0.25V,  
1.0V, 1.25V

Alpha-calibration

Run 139

Start: 14:44

Stop:

file: alpha-source\_triumf\_139001.root