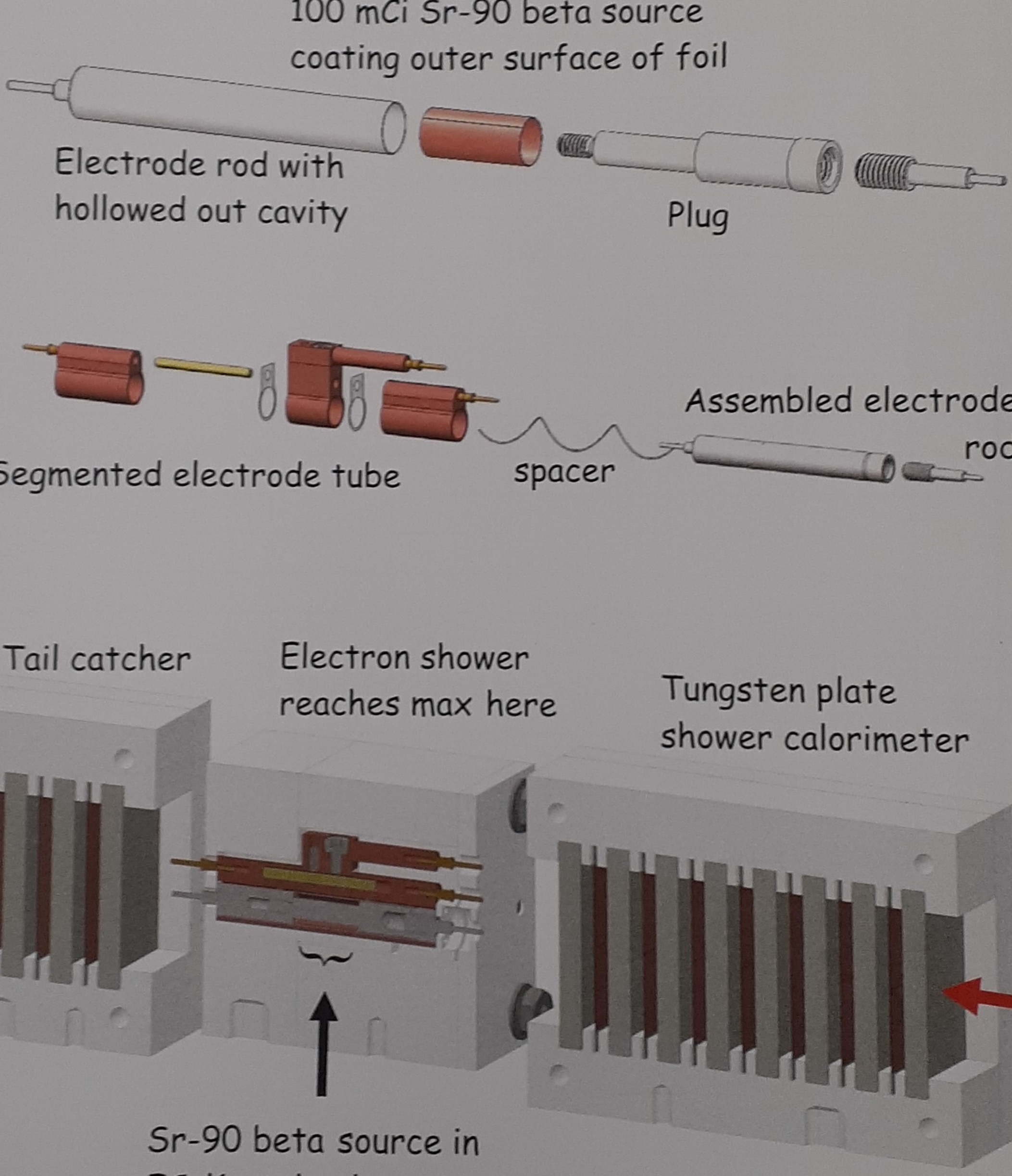
ATLAS Liquid Argon

FCalPulse Project



Cryostat / Ligaid Nitrogen Levels - when unable to use cryomonitor software

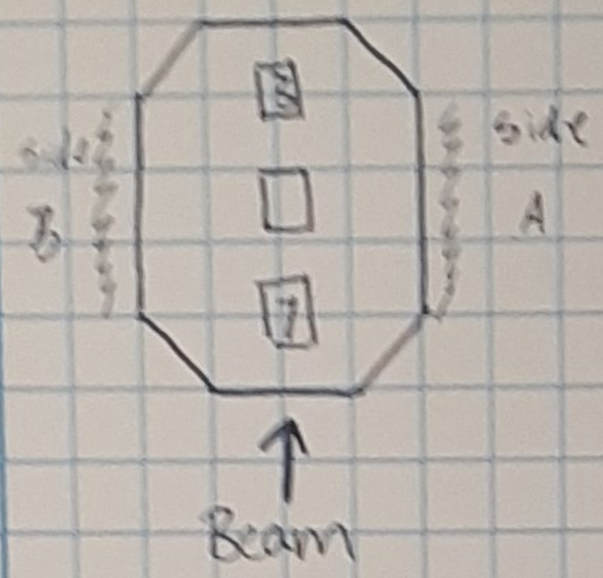
	Time	LN_2 %	Ar (kPa)	ΔF (ppm)	Illinois (ppm)	Cryostat Pressure (psi)
05/08	16:00	12.3	8400	0.36	2.61	2.0
→ N_2	18:00	63.5	8300	0.36	2.50	1.9
03/08	01:30	50.8	7500	0.36	2.37	?
04/08	08:30	39.6	6700	0.35	2.25	1.9
09/08	11:30	37.5	6200	0.33	2.17	2.1
	14:45	28.8	5900	0.33	2.08	2.0
N_2	17:29	73.4	5500	0.38	1.99	1.9
19/8	19:40	68.6	5500	0.38	1.89	2.0
10/08	05:00	53.6	4000	0.35	1.56	2.1
10/08	09:04	47.7	2900	0.32	1.47	1.9
	11:43	43.7	2600	0.32	1.44	2.1
10/08	15:30	37.1	1700	0.32	1.39	1.9
	23:21	25.3	off	0.34	1.35	2.0
de 27	23:42	—	—	0.63	1.63	—
11/09	03:15	19.4	off	1.1	1.82	2.0

Cryostat / Liquid Nitrogen Levels - when unable to use cryomonitor software.

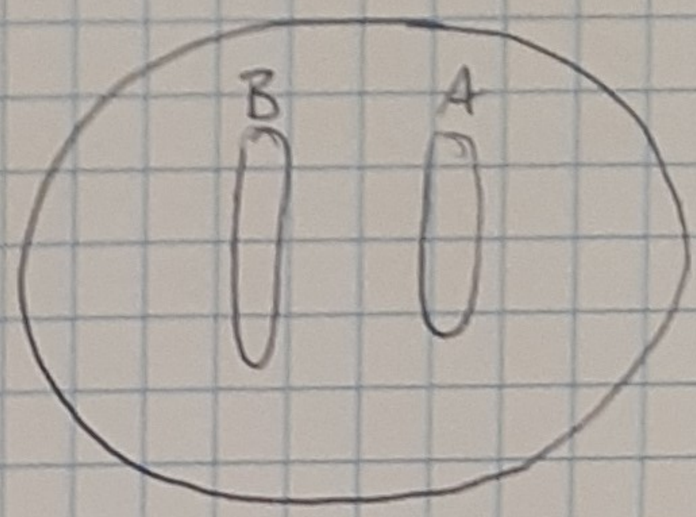
	Time	LN2 %	Ar (kPa)	ΔF (ppm)	[illegible] (ppm)	Cryostat Pressure (psi)
2021/08/08	16:00	12.3	8400	0.36	2.61	2.0
New → LN2	18:00	63.5	8300	0.36	2.50	1.9
2021/09/08	01:30	50.8	7500	0.36	2.37	?
2021/09/08	08:30	39.6	6700	0.35	2.25	1.29
2021/09/08	11:30	37.5	6200	0.33	2.17	2.1
	14:45	29.8	5900	0.33	2.08	2.0
New LN2	17:29	23.4	5500	0.32	1.99	1.9
2021/9/8	19:40	68.6	5500	0.32	1.89	2.0
2021/10/08	05:00	53.6	4000	0.35	1.56	2.1
2021/10/08	09:04	47.7	2900	0.32	1.47	1.9
	11:43	43.7	2600	0.32	1.44	2.1
2021/10/08	15:30	37.1	1700	0.32	1.39	1.9
	23:21	25.3	off	0.34	1.35	2.0
[illegible] 23:27	23:42	—	—	0.63	1.63	—
2021/10/09	03:15	14.4	off	1.1	1.82	2.0

8/01/2021 Cold Test Wiring - Production ECal

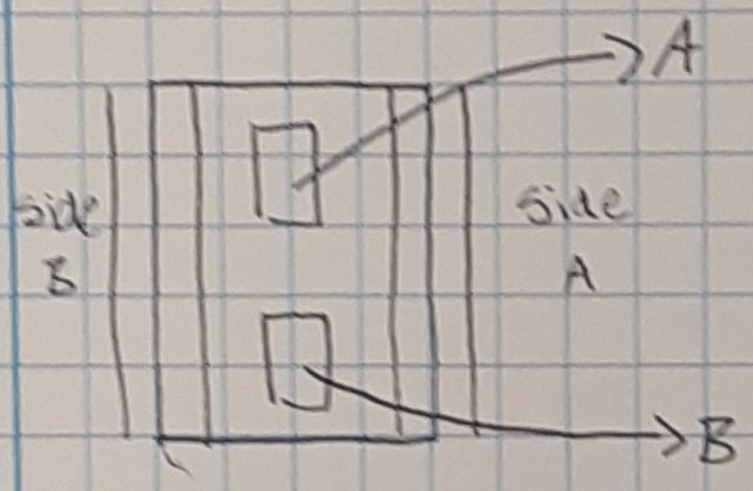
orientation



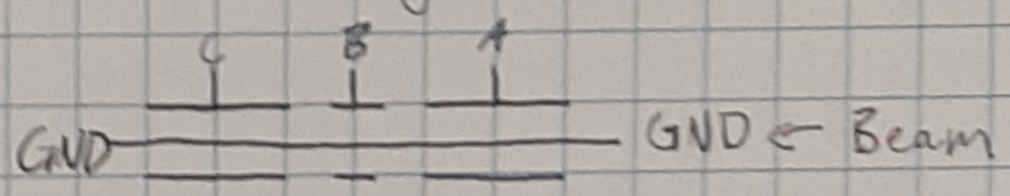
Signal Feedthrough



A = FAMP11-2
B = FAMP11-5

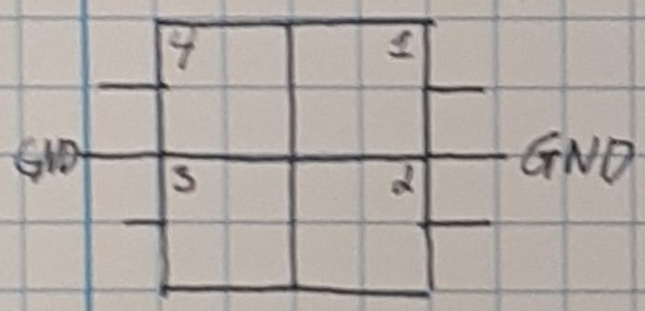


Fcal Wiring → Both the same



Upper (A) FCal - connected to cold Board B
Lower (B) Fcal - connected to cold Board A

ECal Wiring



Module	Quadrant	→	Cold Board-Ch.			
7A	-1	→	A-A	7B-1	→	A-E
7A	-2	→	A-B	7B-2	→	A-F
7A	-3	→	B-A	7B-5	→	B-E
7A	-4	→	B-B	7B-4	→	B-F
3A	-1	→	A-C	3B-1	→	A-G
3A	-2	→	A-D	3B-2	→	A-H
3A	-3	→	B-C	3B-5	→	B-G
3A	-4	→	B-D	3B-4	→	B-H

Wiring in Cryostat

HV1 - A
HV2 - B
HV3 - C
HV4 - D
} Both Cold Boards

Calibration

Cal-0 - ART
Cal-4 - AS
Cal-1 - BRT
Cal-8 - BO

FAMP II Channel Numbering differs from numbering used in the Cold side signal Board. The following are the conversions from Pam's numbering scheme to the new channels.

FAMP II Channel	Cold Board A - Feed Through A	Cold Board B - Feed Through B
1	Fcal - A	Fcal - A
2	Fcal - B	Fcal - B
3	Fcal - C	Fcal - C
4	Scal - A	Scal - A
5	Scal - B	Scal - B
6	Scal - C	Scal - C
7	Scal - P	Scal - D
8	Scal - E	Scal - E
9	Scal - F	Scal - F
10	Scal - G	Scal - G
11	Scal - H	Scal - H

FAMP A

Ch.	Digitizer Ch.
1	A2 0
2	A2 1
3	A2 2
4	A2 3
5	A2 4
6	A2 5
7	A2 6
8	A2 7
9	Triumf 0
10	Triumf 1
11	Triumf 2

FAMP B

1	Triumf 3
2	Triumf 4
3	Triumf 5
4	Triumf 6
5	Triumf 7
6	CERN 0
7	CERN 1
8	CERN 2
9	CERN 3
10	CERN 4
11	CERN 5

CERN 6 → Sudra
CERN 7

6

ALPHAGAZ™ Air Liquide

ALPHAGAZ™ 2 Ar

ARGON
verdichtet / comprimé

Reinheit/Pureté:	99,9999 %
Druck/Pression:	200 bar
Anschluss/Raccord:	W 21,8 x 1/14" r/d

MAX. VERUNREINIGUNG
IMPURETÉS MAX:

H_2O	< 0,5 ppm
O_2	< 0,1 ppm
H_2	< 0,1 ppm
CO_2	< 0,1 ppm
CO	< 0,1 ppm
C_nH_m	< 0,1 ppm

F91100269 09 19

Carbagas
Bern Basel Zürich Lausanne

FCalPulse Run program - Draft

- Taking data
  - Cycle thru O_2 contamination – Start at <0.1 ppm
    - Cycle thru HV settings (50 – 300 V) and polarity to the rod/tube electrode (SCal stays at +2 kV)
      - Cycle between up/down assemblies
  - Study x-talk between tube segments
    - Turn off HV to middle tube segment with 250 V on ends
    - Turn off HV to end tube segments with 250 V on middle

Testbeam 2021 Wiring Map v3.0
2021 July 30 Edited 2021 Aug 23
CERN

Digitizer	Digitizer Ch	FAMP FT	FAMP Ch	FAMP - ColdBoard Wire #	Cold Board	Cold Board Ch.	Module	Position**
AZ	0	A	1	20	A	FCal-A	FCal-B***	B
AZ	1	A	2	19	A	FCal-B	FCal-B***	A
AZ	2	A	3	18	A	FCal-C	FCal-B***	C
AZ	3	A	4	17	A	SCal-A	SCal-7A	1
AZ	4	A	5	16	A	SCal-B	SCal-7A	2
AZ	5	A	6	15	A	SCal-C	SCal-3A	1
AZ	6	A	7	14	A	SCal-D	SCal-3A	2
AZ	7	A	8	13	A	SCal-E	SCal-7B	1
Triumf	0	A	9	12	A	SCal-F	SCal-7B	2
Triumf	1	A	10	11	A	SCal-G	SCal-3B	2
Triumf	2	A	11	10	A	SCal-H	SCal-3B	1
Triumf	3	B	1	20	B	FCal-A	FCal-A	B
Triumf	4	B	2	19	B	FCal-B	FCal-A	A
Triumf	5	B	3	18	B	FCal-C	FCal-A	C
Triumf	6	B	4	17	B	SCal-A	SCal-7A	4
Triumf	7	B	5	16	B	SCal-B	SCal-7A	3
CERN	0	B	6	15	B	SCal-C	SCal-3A	3
CERN	1	B	7	14	B	SCal-D	SCal-3A	4
CERN	2	B	8	13	B	SCal-E	SCal-7B	4
CERN	3	B	9	12	B	SCal-F	SCal-7B	3
CERN	4	B	10	11	B	SCal-G	SCal-3B	4
CERN	5	B	11	10	B	SCal-H	SCal-3B	3^
CERN	6		--		--	--	--	Scintillator
CERN	7		--		--	--	--	Scintillator

Signal FT-A = FAMP 11-4
Signal FT-B = FAMP 11-3

Power Supply	Pwr Supply Ch	Readback - In	Readback - Out	HV Box - Input	HV- FT+	Cold Board Connection*+
Ortec	1	0	0	1		A
Ortec	2	1	1	2		B
Ortec	3	2	2	3		C
Petr - CAEN	23	--	--	4		S

Calibration Line	Cold Board	Cold Board Connection	Wire Label
2	A	RT	D2
4	A	S	D4
7	B	RT	D7
8	B	S	D

*Both Cold Board HV wired together
**Need to verify upon cryostat opening
***Source in FCal Module B
Red# = Mapping Change
^Shorted Channel

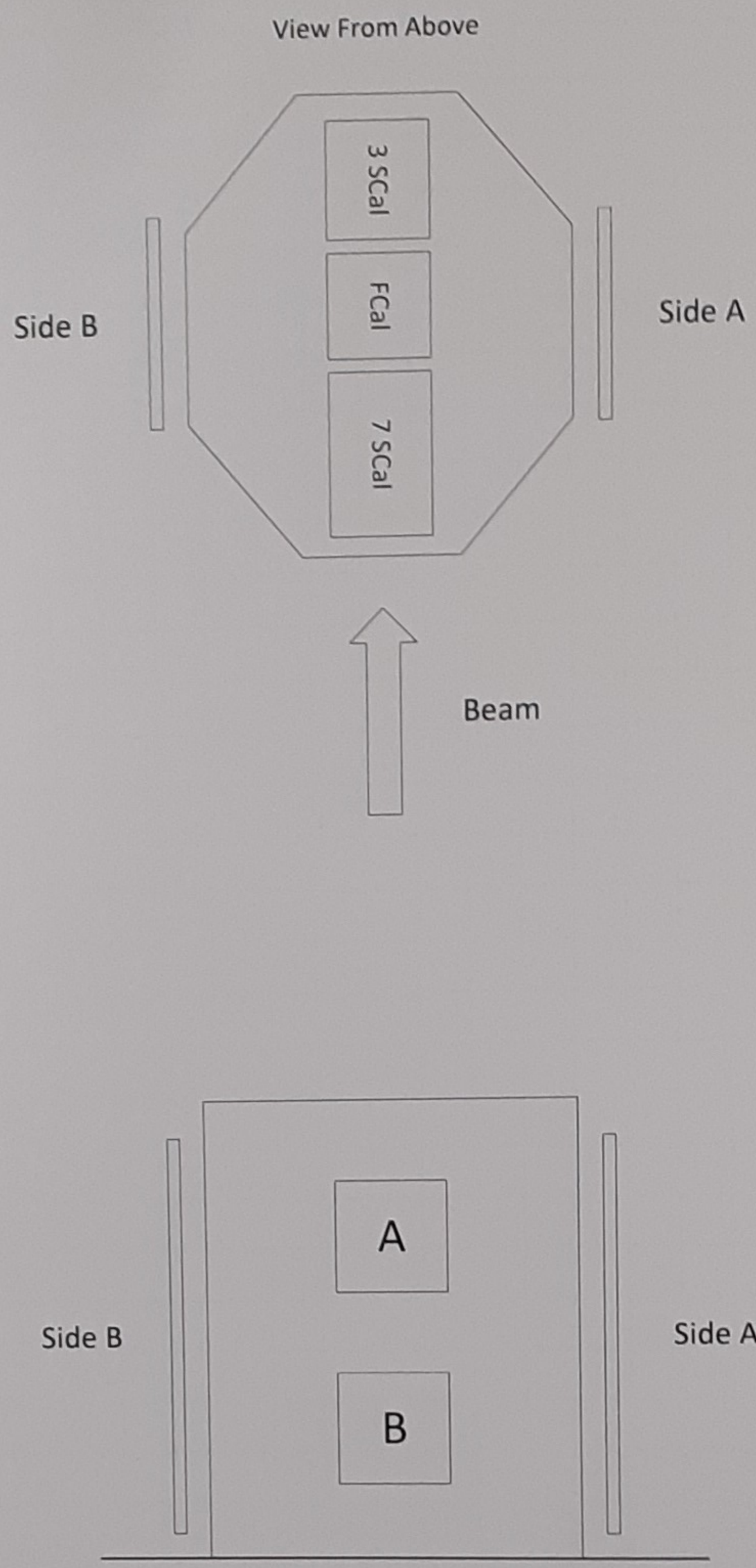
+Need to verify in AZ

SCal Grid: beam into page

4	1
3	2

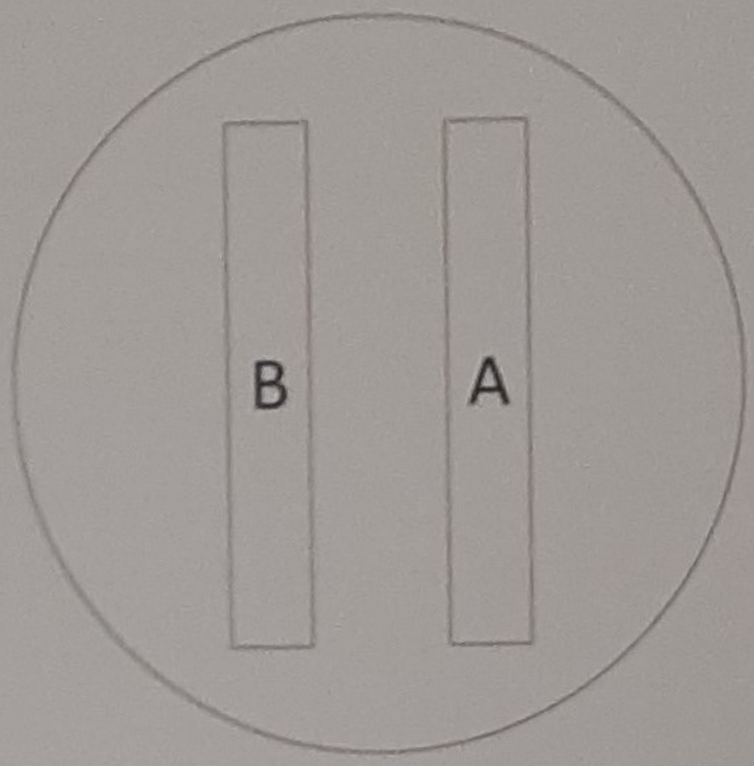
Test Beam 2021 - Wiring Map

CERN
2021/07/30
V2.0

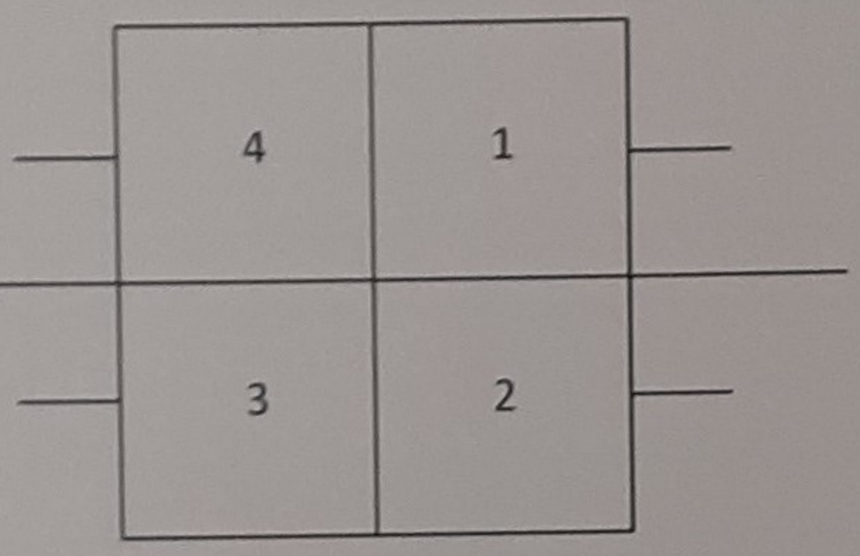


Wiring Map v2.0

Signal Feedthrough -
Air Side

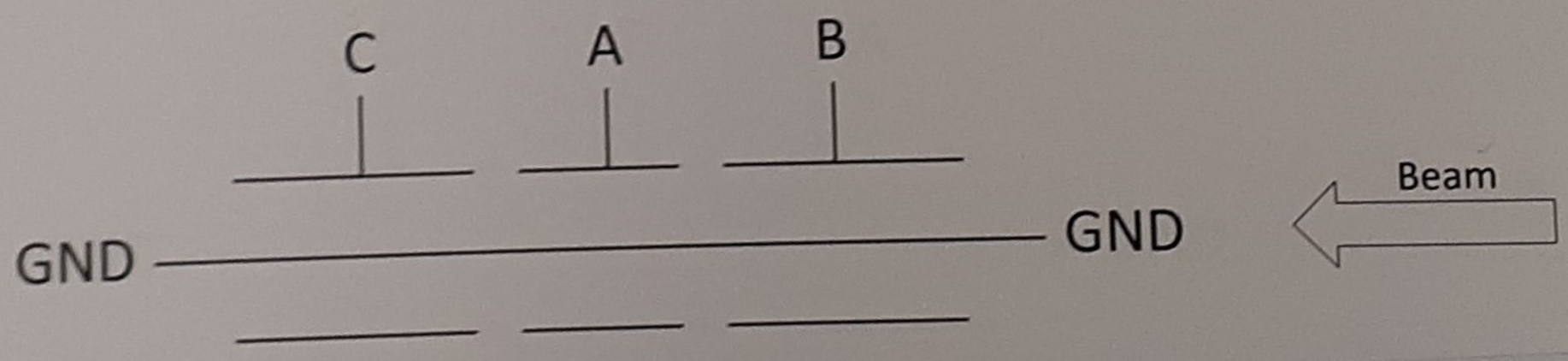


SCal Wiring – Front View



v3.1 - Reflects corrected wiring.

FCal Wiring



4 Aug 2021
17:57
JPR

The FCalPulse apparatus is largely installed but there's still a lot to hook up and then test

We are in the H2 beam line in zone PPE 172. Our control room is HNA 383 (aka 0887-1-B81)

A special 240V/32A service was installed in our zone last week but the circuit breaker in pad-locked. We are ready for that pad-lock to be removed. Our beam-line liason tells me to call 72201. I did and someone came out to look at it and then left, telling me he will talk with "electrical" and then call me on our barracks (control room) phone 79047.

Nikos Charitonidis, our beam line liason, will come at 19:00 to bring beam to our area.

19:55
JPR

Letizia di Giulio has given us Safety Clearance with ID 306

There's no beam in the SPS so Nikos hasn't come yet. No need to. But he believes we can get the power turned on.

6 Aug 2021
20:17
RW

Filling the cryostat was a success except the oxygen levels were terrible. The ΔF Read 2.9 ppm Illinois read 13.7. The Illinois continued to increase. After discussing, we opted to dump the LAr and refill. We believe one line was not pumped on or purged.

Billie and I are staying tonight to complete the fill for the morning.

Dumping Began at 9:45 PM.

We will then start the vacuum on the system.
Check all connections while pumping.
Once an adequate vacuum has been reached we will fill again w/ Argon.
O_2 will be checked from the start. If bad gas, we will run through the purifier.

Started Vacuum @ 23:30
Checked All connections. Nothing loose.

7 Aug 2021
RW.

Started filling @ 02:30

7 Aug 2021
07:35 am
JPR

LAr level approaching top of brass shielding
Illinois O_2 meter has read zero for hours
ΔF O_2 analyzer reads 0.625 and dropping. (This one takes longer to stabilize)
We are filling with the 2nd (of 4) Ar gas cylinders. At 6:30 there was ~ 2/3 left in that cylinder. There's still some Ar left in the

first cylinder

To connect to Rob's Windows laptop in the area, run Remote Desktop and connect to 128.141.149.230 This only works if the MilSpec is plugged in.
Username: localuser
Passwd: Testbeam2021

09:45 JBR
Yesterday (6 Aug.) evening we completed a fill
Turn on HV to FCal tubes
HV current draw on Ortec channels 1,2,3 was 1.26, 0.43, 0.31 μA
Looks like we got the HV connections mixed up. We thought channel 2 was the middle tube segment but it looks like channel 1 is the middle tube segment. This current is way too low compared to what we expected.

Rob says: "Turn down flow rate to ~1.5 SCFH when level is between top two temp probes.

15:53 JBR
IL O2 analyzer has suddenly jumped to ~1.7 ppm and ΔF O2 analyzer now reads ~0.4 ppm and is no longer falling (or rising?)
Ar gas flow rate was lowered to ~1.5 SCFH when the top level temp probe went under the liquid.
Mechanical pressure gauge monitoring cryostat pressure is oscillating between 1.0 and 1.3 psi

17:39 JBR
Measure HV current draw on FCal rod/tube electrodes from Ortec HV supply
Ch1: 1.29 Ch2: 0.43 Ch3: 0.31 μA with 250 V on all
1.32 0.02 0.31 with 250V on 1 and 3 and 0 on 2
0.00 0.00 0.00 with 0 V on all channels
0.02 0.48 0.00 with 0V on 1 and 3 and 250 on 2
1.29 0.43 0.31 with 250 V on all

7:22pm A.S.
Beam back on

20:40 JBR
Run 111 Triggering on muons. Zone open so no beam in our area.
Eric sees several trggers per spill.
Sasha has the trgger going. No BPCs yet.
↳ DAQ not running
MilSpec and Pulser still connected and probably contributing to the noise.

21:00 TPR — Run 112 First run with BPC's. The BPCs are seeing far more triggers than ~~the~~ Eric's DAQ. Investigate.

1:33 PR — Run 115 First run with triggers going to both digitizers and BPCs and working properly.

2:20 A.S. — > Oxygen monitor moved to the platform with charger
> L1 Has ugly signal shape, bad cable or base damage; It is a veto, not very important.
> Still problems with pulse quality between trigger and BPC DAQ; Bad cable or Bad NIM module. Intermittent, hard to track.

0:29 BL — Run 136 Noise Studies
· ~~[illegible]~~, Initial run with everything connected
· Milspec, arduino connected
· No Cu tape ~~used~~ yet

0:52 BL — Run 138
· Everything connected, Removed unattached heat cable from top of milspec

00:55 BL — → Despite showing events in FCD-DAQ gui, spill 1 does not seem to be recording events (no events in spill file.)
* run 137

1:31 BL — ~~Run~~ Beam off: time estimate 1 hr minimum
· ~~Cu tape~~

2:16 BL — Beam still down. "Expert Investigating"
· Still says 1 hr minimum. (Is it a new one hour? We don't know)
· ~~But the magnets have turned back on~~ - Nevermind

6:16 BL — New update: "No beam from CPS. Kicker problem. Time estimation less than 1 hr."

8:09 — EW: run 140 taken with "Cu tape around FAMP cage" step done on the noise studies plan. Triggers were in ~~fact~~ flux, but spill 56 should be good (178 events)

8:29 BL — Run 143 spill 17
· FAmp Cu tape + ~~Pulser USB~~ Removed USB from pulser

8:34 — Run 145, spill 1
"remove pulser from feed through" step

8:43 — Run 146 spill 1
"Cu tape over pulser function" step

8:57 MNM — Run 147
"Cu tape around pulser cage" step

9:09 — Run 148
"Disconnect Milspec connection" step
-skipped "Cu tape milspec cage" step after run 147 and went right to "Disconnect milspec"

9:17 — Tried to run DAQ, got "can't open the digitizer" error. Power cycled the digitizers, and this fixed the issue.

9:~~28~~ — Run 150
"Cu tape over the milspec feed through" step

9:48 — Run 151
"move digitizer power" step
ended DAQ because of error, but spill 2 should be okay.

10:22 — Run 154
"Disconnect HV cables" step

10:25 — Run 155
"Disconnect the milspec ~~USB~~ USB power" step

10:30 Run 156
plugged HV MilSpec USB power back in

5 Aug 2021 SCal HV was tripping on 300V with the Bertan Supply. This appears to be due to A single short on one channel of the SCal. To operate at a higher voltage Pete Cushman has a power supply that trips at 1.2kV. We have connected the SCal HV to this supply and have chosen to run at 1.5kV.

Setup with beam

- Expect cryostat full by Friday (today) evening
- With beam on
  - Set up scintillators and beam trigger
  - Set up ITEP BPCs
  - Center the beam on the small (7.5 mm diameter) scintillator and on the shower calorimeters
  - Tune beam for small, centered spot
  - Final preparations of the DAQ, including the BPC summary hits
- Determine HV current draw from middle tube segment at 250 V
  - This tells us the source activity and determines the HV range
- When cryostat is stable
  - Disconnect mil-spec and calibration pulser
  - Measure noise levels
  - Optimize grounding to minimize the noise

FCalPulse Run program - Draft

- Taking data
  - Cycle thru O_2 contamination – Start at <0.1 ppm
    - Cycle thru HV settings (50 – 300 V) and polarity to the rod/tube electrode (SCal stays at +2 kV)
      - Cycle between up/down assemblies
  - Study x-talk between tube segments
    - Turn off HV to middle tube segment with 250 V on ends
    - Turn off HV to end tube segments with 250 V on middle

8 August 2021 RW — 2:10 PM (14:10)
Beam area patrolled & locked.
Test Beam testing to begin.

A.S. — Two cables in the barracks allow to remotely reconfigure Beam trigger.

1) ~~Veto~~ Leak C: plug it to $\overline{OUT}$ of a passive fan-out to have leakage Veto introduced. S1.52.5

~~2)~~ Halo C: plug to OUT to disable Leakage Veto; S1.

~~3)~~ plug to $\overline{OUT}$ of a passive Fan-out to add Halo(~~4)~~ counter to narrow Beam trigger; S1.52.54.$\overline{H}$

~~5)~~ Plug it to OUT to run on S1.52.54 coincidence

↳ controlled by selection @ Run Control

2:35 MM — First DAQ run with electron beam on. (Run 172) NO BPC data was recorded.

Run 173 has NO BPC as well.
↳ same for Runs 174-178

2:45 — Run 176 is the first one with BPC data recorded

2:50 pm AS — Scalers #3 and #4 on the right module are disconnected at the platform. Require more careful "decoupling" from trigger logics, ~~since double reflections~~ due to reflections

3:05 MM — Starting Run with Large scintillator.

3:19 — Run 182 appears to be with the Large scintillator selected, but it is unsure at this time if that is actually happening.

8 August 2021 RW — 2:10PM (14:10)
Beam area patrolled & locked.
Test Beam testing to begin.

A.S. — Two cables in the barracks allow to remotely reconfigure Beam trigger.

1) ~~Yanko~~ Leak C: plug it to $\overline{OUT}$ of a passive fan-out to have leakage Veto introduced. S1.S2.S3.$\overline{L}$

~~2)~~ Halo C: plug to OUT to disable Leakage Veto; S1.S2.S3

~~3)~~ plug to $\overline{OUT}$ of a passive Fan-out to add Halo(Hole) counter to narrow beam trigger; S1.S2.S4.$\overline{H}$

~~4)~~ Plug it to OUT to run on S1.S2.S4 coincidence

↳ controlled by selection @ Run Control

2:35 MM — First DAQ run with electron beam on. (Run 172) NO BPC data was recorded.

Run 173 has NO BPC as well.
↳ Same for Runs 174-175

2:45 — Run 176 is the first one with BPC data recorded.

2:50pm AS — Scalers #3 and #4 on the right module are disconnected at the platform. Require more careful "decoupling" from trigger logics, ~~since do to reflections~~ due to reflections

3:03 MM — Starting Run with Large scintillator.

3:19 — Run 182 appears to be with the Large Scintillator selected, but it is unsure at this time if that is actually happening.

8 Aug

Found Mapping issue with FCals. Corrections made.
Program & Pg 7 have been Corrected.

Fixed in FCP_DAQ v1.0.2 (E. Varnes) never mind
first run with correction is 183 (~~version accidentally marked as 2.0.1 in run 183 root file~~)

4:10 MM — stopping beam in the test area to make adjustments to the scintillators

~~2~~16:35 AS — no spill RF LL lost. under investigation
Update: 19:00 - Estimate Beam 1hr.

17:00 RW — Decided to Change LN_2 Dewar. Found it pressurized to ~4bar (Needed operating ~1.7bar)
That high of pressure makes it almost impossible to control the flow for cryostat.
Vented N_2 gas off until it reached ~1.7 bar.
Connected to Cryostat ~18:30 and Monitored the Cryostat pressure.
- Data recorded via Labview.
Cryostat runs at a bit lower pressure with this LN_2 dewar.

Current LN_2 Dewar: 63.5%
Pressure (Gauge): 2psi
Ar Gas: 8400 kPa
ΔF: 0.36ppm
111: 2.50ppm
} Starting Data record on pg 3. Future Readings Should be completed/Entered there.

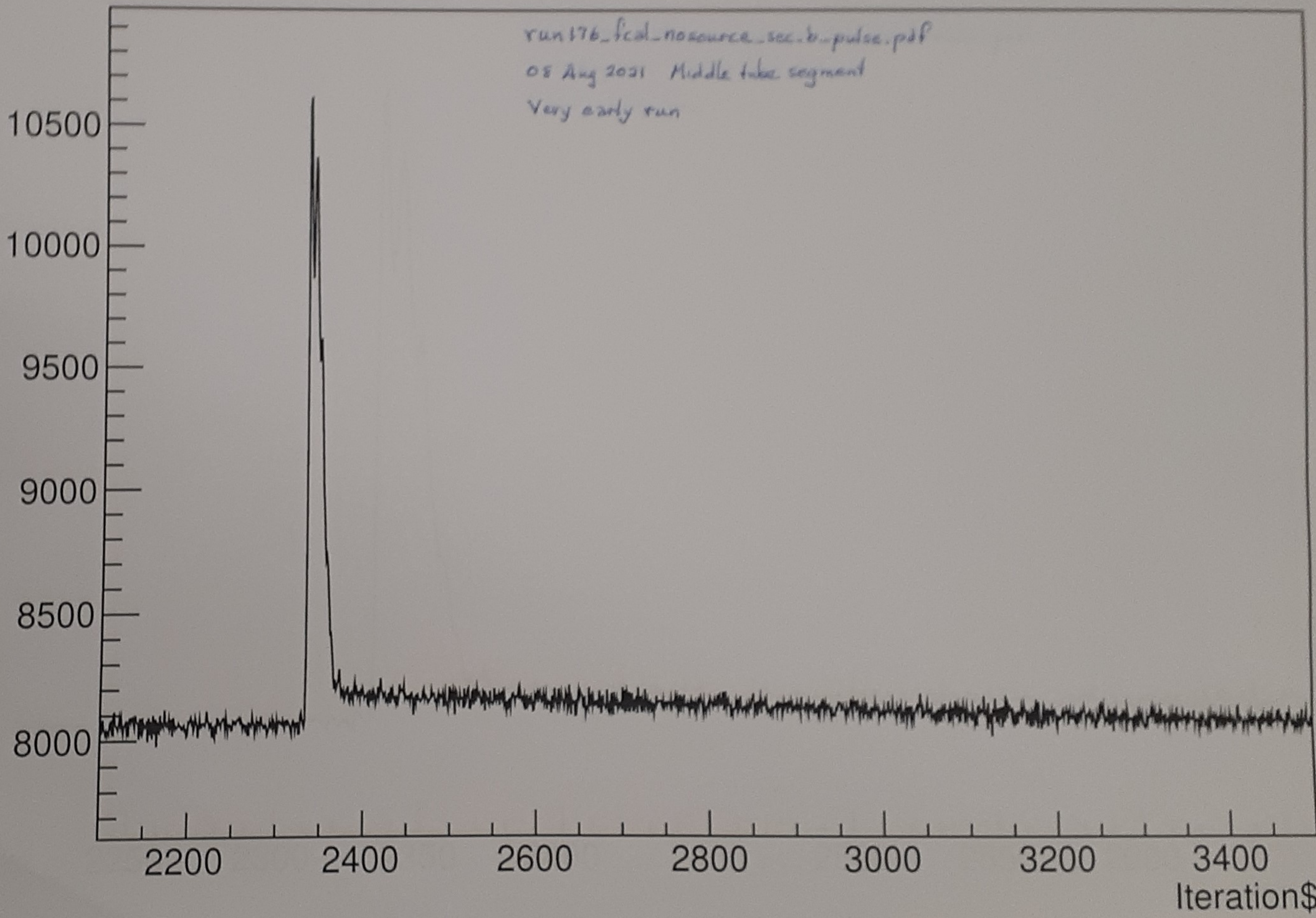
LN_2 -> Should Last ~60hrs. Old LN_2 Level: 11.5% ~11 hrs of reserve on platform if needed.

20:40 AS — no beam;

21:18 JPR — Present estimate "One hour" until beam returns.

21:58 E. Varnes — Run 186 - large scintillators partly [illegible]
Sr 90 in beam
HV = 250 V on all 3 segments
After a few spills digitizer and BPC went out of sync. (BPC getting more triggers) - our spills mis-aligned?

FCal_rod_source_section_b_data:Iteration$



8 Aug

Run 186, cont : trigger rate is ~150 / spill

Ended after 50 spills

For run roughly data appeared in Sr90 out directory

22:32 Run 187 Center fCal at 250V
outer at 0V
Large scintillators
Sr90 in beam

Again BPC and digitizers went out of sync. 1st 30 spills or so looked good

22:47 Run ended

22:54 Run ~~189~~ Center ← failed attempt

22:58 Run 191 Center fcal at 0
outer at 250
Large scintillators
Sr90 in beam

23:13 End run 191 BPCs and digitizers stayed in sync this time

23:20 Run 192 All 3 fCal HV at ~~200V~~
200V
Large scintillator
Sr90 in beam

23:35 End run 192. BPC and digitizers went out of sync almost immediately this time

23:54 Run 197 NO BPC, HV set to 150V
GW
Sr90 in Beam, Large Scintillator

9 Aug 2021

00:13 AS BPC/trigger issue; no SoB; Access by A.S and P.G. depending problem @ patch panel; trying to find good channel for pulse; Bad connection on patch panel → "replaced" by assigned different connection #65 for SoS

2:48 BL Run 206 100 V
FCal A 98.99
FCal B 100.248
FCal C 100.318
large scint., BPC on, Sr-90 in beam

3:13 BL Run 208 70 V
FCal A 69.27
FCal B 70.16
FCal C 70.17
large scint., BPC on, SR-90 in beam

3:35 BL Run 209 60 V
FCal A 59.39
FCal B 60.13
FCal C 60.16
large scint., BPC on, Sr-90 in beam

3:56 BL Run 210 50 V
FCal A 49.48
FCal B 50.11
FCal C 50.12
large scint., BPC on, Sr-90 in beam

4:16 BL Run 212 40 V
FCal A 39.597
FCal B 40.06
FCal C 40.08
large scint., BPC only, Sr-90 in beam

4:44 BL Run 214 170 V
FCal A 168.32
FCal B 170.38
FCal C 170.61
large scint., BPC on, Sr-90 in beam

20

9 Aug

5:07 BL — Run 216 — 120 V
FCal A 118.8
FCal B 120.28
FCal C 120.4
· large scint, BPCs on, Sr 90 in beam

5:27 BL — Run 217 — 90 V
FCal A 89.11
FCal B 90.22
FCal C 90.3
· large scint, BPCs on, Sr 90 in beam

5:52 BL — Run 219 — 80 V
FCal A 79.2
FCal B 80.19
FCal C 80.23
· large Scint, BPCs on, Sr 90 in beam

6:12 BL — Run 220 — 30 V
FCal A 29.67
FCal B 30.05
FCal C 30.02
· large Scint, BPCs on, Sr 90 in beam

7:12 BL — Run 222 — 20 V
FCal A 19.77
FCal B 20.03
FCal C 19.97
· large Scint, BPCs on, Sr 90 in beam

7:41 BL — Run 224 — 300 V
FCal A 297.06
FCal B 300.52
FCal C 301.17
· large scint, BPCs on, Sr 90 in beam

7:45 BL — We've observed that the H2 Profile Monitors say the beam is ~320/-303.67 GeV (so 320 GeV electrons). This was as of 2:40 am August 9th. We refreshed the tab at 7:40 am and it still shows the same.

4 Aug 2021
08:22
JPR

There was an apparent wiring mistake.

2021-08-09
9:50
A.S.

"Leak C" cable plugged to output "1" to ~~ex~~ exclude events with signal $L_1 + L_2$ from data on <u>hardware</u> level.
~~These events are~~
Excluded events are: 1) muons (~30/spill!)
2) hadrons (?/spill)
3) electrons "going around" the SCal and showering late

total rate drop ~50%

Aug 9
BL 9:55

Billie + Rob switched the polarity on the HV supply to the FCal from positive to negative.

10:02

FCP_DAQ v1.0.4 installed. Clears out BPC buffer at the start of each spill.

10:38
AS, JPR, RW

Platform was moved UP~5mm (BPC, Halo, S3)

10:~~40~~
MM

~~Run 229 (-250 V) Target Scint, BPCs on~~
~~FCal A~~
~~FCal B~~
~~FCal C~~
~~Sr 90 in Beam~~

10:54
MM

Beam was turned off

10:57
MM

Beam turned on, spill time is twice as long (1 spill per cycle)

Run 230 (-250 V) . Large Scint, BPCs on
FCal A -248.62 Sr 90 in Beam
FCal B -251.24
FCal C -251.81

11:13

run ended with 23 spills, keeping the run TO ~15 minutes.

11:48
A.S.

Based on BPC data, S1 was moved up 10mm, S2 was moved down 20mm

4 Aug 2021
08:22
JPR

There was an apparent wiring mistake.

2021-08-09
9:50
A.S.

"Leak C" cable plugged to output "1" to ~~ex~~ exclude events with signal $L_1 + L_2$ from data on <u>hardware</u> level.
~~These events are~~
Excluded events are: 1) muons (~30/spill!)
2) hadrons (?/spill)
3) electrons "going around" the SCal and showering late

total rate drop ~50%

Aug 9
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AS, JPR, RW

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10:~~40~~
MM

~~Run 229 (-250 V) Target Scint, BPCs on~~
~~FCal A~~
~~FCal B~~
~~FCal C~~
~~Sr 90 in Beam~~

10:54
MM

Beam was turned off

10:57
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Beam turned on, spill time is twice as long (1 spill per cycle)

Run 230 (-250 V) . Large Scint, BPCs on
FCal A -248.62 Sr 90 in Beam
FCal B -251.24
FCal C -251.81

11:13

run ended with 23 spills, keeping the run TO ~15 minutes.

11:48
A.S.

Based on BPC data, S1 was moved up 10mm, S2 was moved down 20mm

9 Aug

12:10 Run 236 (-200 V) · Large Trig Scint, BPCs on
MM Fcal A -199.9 Sr 90 in Beam
Fcal B -201.05
Fcal C -201.45

12:18 No events after spill 2 in run 236, stopped run

12:20 Tried to run the DAQ for run 237 and 238, but received a segmentation error.

12:25 Same issue as before with runs 239 & 240.

12:27 Beam turned off

12:30 Beam still off, tried to run the DAQ with Run 241 and it crashed at the start of the spill.

12:51 Run 242 HV -200V on all 3 sections,
Large scintillators
Sr 90 in beam

13:04 Beam off, ended run
RW

13:05 Run 243 HV -200V on all channel (Tube Sections)
RW Large Scintillator
Sr 90 in beam
Might have had one spill w/ data. Beam is off and on w/ no regularity. Stopped early.

13:14 HV set to -150V on all tub segments
RW FcalA - 149.2
FcalB - 150.8
FcalC - 151.1

9 Aug

13:19 RW — Run 244 HV -150 V on all 3 FCal Tubes
Large Scintillator
Sr90 in Beam.
End Run: 25 spills

13:41 RW — HV FCal Tubes set to -100 V
FCal A -99.97
FCal B -100.56
FCal C -100.75

13:43 RW — Run 245 HV -100V on all 3 FCal Tubes
Large Scintillator
Sr90 in Beam

13:58 MM — Run 245 ended 22 spills

14:01 — HV FCal Tubes set to -70 V
FCal A -69.61
FCal B -70.39
FCal C -70.55

14:02 — Run 246 HV -70 V on all FCal tubes
- Large Scint.
- Sr 90 in Beam

14:17 — Run 246 ended: 22 spills
HV FCal Tubes set to -60 V
FCal A -59.69
FCal B -60.32
FCal C -60.49

14:21 — Run 247 started - HV -60 V on all tubes
- Large Scint
- Sr 90 in Beam

14:36 — Run 247 ended: 20 spills
HV FCal Tubes set to -50 V
FCal A -49.74
FCal B -50.26
FCal C -50.41

1 Aug
13:19 Run 244 HV -100 V on all 3 FCal Tubes
RW Large Scintillator
Sr 90 in Beam.
End Run: 22 spills

13:41 HV FCal Tubes set to -100 V
RW FCal A -99.47
FCal B -100.56
FCal C -100.75

13:43 Run 245 HV -100V on all 3 FCal Tubes
RW Large Scintillator
Sr 90 in Beam

13:58
MM Run 245 ended 22 spills

14:01 HV FCal Tubes set to -70 V
FCal A -69.61
FCal B -70.39
FCal C -70.53

14:02 Run 246 HV -70 V on all FCal tubes
- Large Scint.
- Sr 90 in Beam

14:17 Run 246 ended: 22 spills
HV FCal Tubes set to -60 V
FCal A -59.69
FCal B -60.32
FCal C -60.49

14:21 Run 247 started - HV -60 V on all tubes
- Large Scint
- Sr 90 in Beam

14:36 Run 247 ended: 20 spills
HV FCal Tubes set to -50 V
FCal A -49.74
FCal B -50.26
FCal C -50.41

9 Aug

13:19 RW — Run 244 HV -150 V on all 3 FCal Tubes
Large Scintillater
Sr90 in Beam.

End Run: 25 spills

13:41 RW — HV FCal Tubes set to -100 V
FCal A -99.47
FCal B -100.56
FCal C -100.75

13:43 RW — Run 245 HV -100V on all 3 FCal Tubes
Large Scintillator
Sr90 in Beam

13:58 MM — Run 245 ended: 22 spills

14:01 HV FCal Tubes set to -70 V
FCal A -69.61
FCal B -70.39
FCal C -70.53

14:02 Run 246 HV -70 V on all FCal tubes
- Large Scint.
- Sr 90 in Beam

14:17 Run 246 ended: 22 spills
HV FCal Tubes set to -60 V
FCal A -59.69
FCal B -60.38
FCal C -60.49

14:21 Run 247 started - HV -60 V on all tubes
- Large Scint
- Sr 90 in Beam

14:36 Run 247 ended: 20 spills
HV FCal Tubes set to -50 V
FCal A -49.74
FCal B -50.26
FCal C -50.41

9 Aug

15:2[illegible] Run 248 HV -50V on FCal Tubes
Large Scintillator
Sc 90 in Beam

15.19 Run 248 ended. 24 spills (~2 spills were empty)
AA HV tubes set to -40 V
FCal A -39.79
FCal B -44.19
FCal C -48.35

15.2[illegible] Run 249 started - HV set to -40V on all tubes
- Large Scint
- Sc 90 in beam

15.5[illegible] Number of events per spill averaging
[illegible] 50

15.[illegible] Run 249 ended. 27 spills

15.[illegible] Lower number of events per spill
due to higher energy at 350 GeV
[illegible] GeV due to synchrotron radiation.

16.15 HV tubes set to -300 V
AA FCal A -298.30
FCal B -301.48
FCal C -302.16

16.25
AA no beam...

16.42 Run 250 with HV = -300V (reverse polarity)
Sc 90 in beam
spills 15/16 seemed to happen w/o a gap in between. HV/digitizer data not in sync for these spills

16.57 End run 250

9 Aug

16:58 Run 251 HV = ~~[illegible]~~ -500V, small scintillator,
Sr 90 in beam

Test of the small scintillator

Online analysis looked good, so will switch to this paddle for future runs (because rate will be lower)

17:59 Run 252 HV = -500V, small scintillator,
Sr 90 not in beam

18:15 End run 252

16:45 Lowered the cryostat into the A position (upper detectors)
Ed Craned in the 240L LN2 dewars And connected one to the cryostat. Starting % 73.42. Also increased the Argon flowrate into the cryostat to 3.5 SCFH

Once the Argon ~~[illegible]~~ is nearing empty, shutoff and close valve #7 (upper valve on transformer side). Leave in this state until I am back. Approximate level to shutoff at 1000 kPa.

New LN2 Dewar has lower operating pressure on the cryostat ~2psi

18:45 FCP_DAQ v1.0.5 checks for leftover BPC data at end of spill

18:51 ~~[illegible]~~ Run 253 HV = -250V, small scintillator,
Sr 90 not in beam

19:06 End run 253

19:12 Run 254 HV = -200V, small scintillators,
Sr 90 not in beam

DAQ crashed (cause hopefully fixed in v1.0.6)

9 Aug

19:19 Run 255 same conditions as 254

DAQ crashed, but enough data

Now deploy v1.0.6

19:48 Run 256 HV = -~~200~~ 150 V, small scintillators,
Sr90 not in beam

20:06 Beam lost reminded, 68 spill recorded
so that's OK

Note that file ended up in
"Sr90 in" directory. Need to
investigate → my logic was flipped,
All files are reversed in this way

20:13 Run 257 HV = -100 V, small scintillator,
Sr90 not in beam

20:27 End run 257

20:33 Run 258 HV = -~~80~~ 70 V, small scintillator,
Sr90 not in beam

20:48 End run 258

21:10
JPR
Take an access to move small scint to Jura side by 4 mm (Jura side is to the left when looking downstream. Start run 259. DAQ crashes. But we got enough data to see we moved the small scint in the wrong direction. Take another access to move the scint the other way

21:10 Start run 259. HV = -60, small scintillators,
Sr90 not in beam.

Ended with DAQ crash, should be
fixed in v1.0.7 (deployed now)

JPR
Now small scint is 4 mm to the Saleve from the position it was in when we started this exercise.

9 Aug

21:28 Run 260 HV = -60 V, small scintillator,
Sr 90 not in beam

~~4~~
21:33 Stopped run 260 to allow move of small
scintillator

21:44 Run 261 same conditions as 260 aside
from scintillator move

21:46 Small scint now 8 mm to Saleve compared to when we started.
IPR

21:52 Run 261 ended w/ DAQ crashe.
Was still running v1.0.6

21:53 Start run 262, same conditions as 261

22:08 End run 262

22:11 Start run 263 HV = -50 V, small scintillators,
Sr 90 not in beam

22:26 End run 263

22:30 Run 264 HV = -40 V, small scintillators,
Sr 90 not in beam

22:45 End run 264

23:27 Switched HV back to positive
Run 265 at HV = +300 V, small scintillators,
Sr 90 not in beam

23:43 End run 265

23:51 Start run 266 HV = +250, small scintillator
Sr 90 not in beam

10 Aug 2021
00:06 End run 266
BL

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00:19 BL — Start run 267
FCal A 198.08
FCal B 200.64
FCal C 200.72

HV = +200 V
· Small Scint, Sr 90 not in beam

00:34 BL — End run 267

00:22 BL — H2 Profile Monitors now say electrons are momentum
-350 GeV / -327.27 GeV
· Beam had way since the start of run shift, from 00:10

00:42 BL — Start run 268
FCal A 148.56
FCal B 150.46
FCal C 150.91

HV = +150 V
· Small Scint, Sr 90 not in beam

00:57 BL — End run 268

01:01 BL — Start run 269
FCal A 99.04
FCal B 100.33
FCal C 100.3

HV = +100 V
· Small Scint, Sr 90 not in beam

* Spill 64 + spill 65 had no beam off in between
DAQ did not record spill 65

01:16 BL — End run 269

01:21 BL — Start run 270
FCal A 69.31
FCal B 70.24
FCal C 70.18

HV = +70 V
· Small Scint, Sr 90 not in beam

01:36 BL — End run 270

01:38 BL — Start run 271
FCal A 59.41
FCal B 60.19
FCal C 60.16

HV = +60 V
· Small Scint, Sr 90 not in beam

01:53 BL — End run 271

10 Aug

01:55 BL — Start run 272
FCal A 49.5
FCal B 50.15
FCal C 50.1

HV = +50 V
• Small Scint, Sr 90 not in beam

02:10 BL — End run 272

02:12 BL — Start run 273
FCal A 39.59
FCal B 40.11
FCal C 40.08

HV = +40 V
• Small Scint, Sr 90 not in beam

02:27 BL — End run 273

02:29 BL — Start run 274
FCal A 29
FCal B 30
FCal C 30

HV = +30 V
• Small Scint, Sr 90 not in beam

02:44 BL — End run 274

02:46 BL — Start run 275
FCal A 19.76
FCal B 20.05
FCal C 19.97

HV = +20 V
• small scint, Sr-90 not in beam

03:01 BL — End run 275

03:04 BL — Start run 276
FCal A 79.22
FCal B 80.24
FCal C 80.21

HV = +80 V
• small scint, Sr 90 not in beam

03:19 BL — End run 276

03:24 BL — Start run 277
FCal A 89.14
FCal B 90.3
FCal C 90.29

HV = +90 V
- Small Scint, Sr-90 not in beam

03:39 BL — End run 277

10 Aug

03:45 BL	Start run 278 FCal A 118.9 FCal B 120.4 FCal C 120.4	HV = +120 V · Small Scint, Sr 90 not in beam
04:00 BL	End run 278	
04:01 BL	Start run 279 FCal A 118.85 FCal B 120.38 FCal C 120.39	HV = +120 V · Large Scint, Sr 90 not in beam
04:14 BL	End run 279	
04:20 BL	Start run 280 FCal A 247.65 FCal B 4.44 FCal C 247.0	* "Center" HV = 0 V, "Outer" HV = +250 V · Small Scint, Sr 90 not in beam * as designated in the Labview program
04:35 BL	End run 280	~~[illegible]~~
04:42 BL	Start run 281 FCal A 0.15 FCal B 246.6 FCal C 3.964	* "Center" HV = +250 V, "Outer" HV = 0 V · Small Scint, Sr-90 not in beam * as designated in the Labview program
04:57 BL	End run 281	
05:17 BL	Start run 282 FCal A 168.4 FCal B 170.5 FCal C 170.6	HV = +170 V · Small Scint, Sr 90 not in beam · this run is first run after I went downstairs and moved the string they used to align the small scintillator out of the beamline
05:33 BL	End run 282	
06:20 BL	Changed polarity of HV supply for the FCal from positive to negative	
06:31 BL	Start run 283 FCal A -29.9 FCal B -30.15 FCal C -30.27	HV = -30 V · Small Scint, Sr 90 not in beam

10 Aug

06:46 BL — End run 283

06:51 BL — Start run 284
FCal A -248.6
FCal B -4.97
FCal C -247.6

* "Center" HV = 0 V, "Outer" HV = -250 V
· small scint, Sr 90 not in beam
* as designated in the Labview program

07:06 BL — End run ~~284~~ 284

07:10 BL — Start run ~~285~~ 285
FCal A ~~-0.11~~ -0.11
FCal B -247.4
FCal C -3.98

* "Center" HV = -250 V, "Outer" HV = 0 V
· small scint, Sr 90 not in beam
* as designated in the Labview program

07:25 BL — End run 285

07:27 BL — Start run 286
FCal A -19.9
FCal B -20.1
FCal C -20.2

HV = -20 V
· Small scint, Sr 90 not in beam

07:42 BL — End run 286

07:45 BL — Start run 287
FCal A -79.6
FCal B -80.5
FCal C -80.6

HV = -80 V
· Small scint, Sr 90 not in beam

08:00 BL — End run 287

08:05 BL — Start run 288
FCal A -49.8
FCal B -50.3
FCal C -50.4

HV = -50 V
· large scint, Sr-90 not in beam

08:20 BL — End run 288

8:45 MM — Start Run 289 -> HV: -50 V. Large Scint, Sr 90 NOT in beam
FCal A -49.73
FCal B -50.29
FCal C -50.42

10 Aug

9:00 MM Run 289 ended: 68 spills
Turning the beam off to switch to positive polarities.

9:30 MM Setting HV Tubes to 250 V
FCal A 247.64
FCal B 250.6
FCal C 250.9

9:48 MM Started Run 290 HV 250 V
- ~~Large~~ small scint
- Sr 90 not in beam

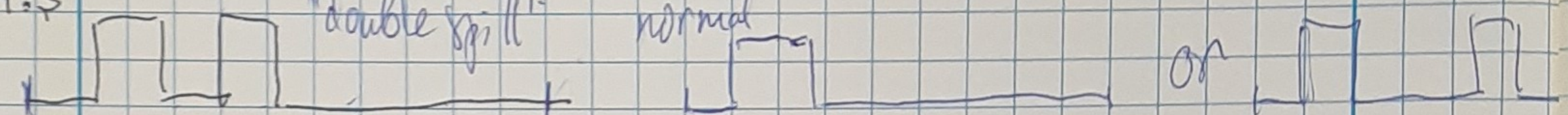
10:03 MM Run 290 ended: 65 ~~spills~~ spills

10:13 GW Run 291 Testing Tube BPC H,3X
Ended at 10:30

10:32 GW Run Testing Tube BPC H,3
Ended at 10:46

Odd spill structure from SPS

A.S



11:00 A.S.(?) no spill → dump kicker issue
Ended 11:24

11:44 MM Setting HV tubes to 250 V
Source has ~~been~~ been moved into the beam
FCal A 246.38
FCal B 250.66
FCal C 250.93

11:55 Started Run 294 -HV 250 V
- ~~Large~~ small scint
- Sr 90 IN beam

11:58 Run 294 stopped to switch to Large scint

10 Aug

11:58 MM Run 295 Started - HV 250 V
- Large Scint
- Sr 90 in source (in beam ??)
Yes ↗

New 2d plots from Graham: S4 position x = -9 .... -2
y = -1 ... 6

tube position x = -10 ... -5
y = 0 ... 6

12:49 RW Run 296 Started HV +50V FCalA + 49.5
Small Scintillator FCalB + 50.1
Sr90 in Beam FCalC + 50.1

13:08 RW Run 297 Started HV +60V FCalA +59.4
Small Scintillator FCalB +60.2
Sr90 in Beam FCalC +60.2

Ended Run due to Lost Beam 8-9 empty spills

13:26 RW Run 298 Started HV +40V FCalA +39.6
Small Scintillator FCalB +40.1
Sr90 in Beam FCalC +40.1

~~300~~

13:45 MM Run 298 ended: 38 spills
Setting HV to +30V
FCal A +29.55
FCal B + 30.08
FCal C + 30.02

13:47 Run 299 Started - HV set to +30V
- small scint.
- Sr 90 in beam

14:02 Run 299 ended: 35 spills
Setting HV to +20V
FCal A +19.49
FCal B + 20.03
FCal C + 19.61

10 Aug

N/C Run 300 Started - HV set to +20V
- Small Scint.
- Sr 90 in beam

14.27 Run 300 ended: 89 Spills
Setting HV to +300V
FCal 1 295.69
FCal 8 300.34
FCal 0 301.15

14.52 Run 301 started - HV set to +300V
- Small Scint.
- Sr 90 in beam

14.54 Run 301 stopped to set Center HV to +250
FCal A 0.24 Outer HV to +0V
FCal B +246.6
FCal C +3.45

14.59 Run 302 Started - HV → Outer: +0V Center +250V
- Small Scint
- Sr 90 in beam

15.25 Run 302 ended
Setting HV to 0V & Outer HV to +250V
Center
FCal A 247.6
FCal B 4.6
FCal C 247.0

15.26 Run 303 Started - ~~Outer~~ HV +250V / ~~Center~~ HV +0V
- Small Scint
- Sr 90 in beam

15.29 Run 303 ended because the HV shorted resulting in 0V on all channels.

15.56 All channels tripped including the FCal. They have been reset.

15.34 Run 304 started with the same specs as Run 303

10 Aug
15.42 Run 304 ended for same trip seen in run 303

16.14 Run 305 Started with same specs as Runs 303 and 304
FCal A 247.6
FCal B 4.5
FCal C 247.0

· argon flow stopped. Valves 7 closed.

16:34 Run 305 stopped: 45 spills

16.48 Setting HV to +300V
FCal A
FCal B
FCal C

17:05 Reset Ortec yet again. Two steps
JPR
Step 1 Turn on HV channel 2 — ch1 0V 0.02 μA, ch2 300V 0.54 μA, 0V 0.01 μA
Step 2 Turn on HV channel 1 & 3 — ch1 300V 1.35 μA, ch2 300V 0.49 μA, 300V, 0.38 μA

17:12 [illegible] Start run 306
small scintillator, HV: +300 V
Sr90 in beam

Petr's Power Supply (SCal) - if tripped.
RW
pico com window
~~to~~ press keyboard keys: 1 = top menu
B = single ch
N = Supply [on] ← Switch from off to on
1 - Top menu
Check that front display is increasing to 1500V

17:42 End run 306

10 Aug

17:44 Rob and Sasha key access to go over HV reset procedure

17:50 No beam "PSB problems". Find quality

18:02 Run 307 HV +250 small scintillators, Sr 90 in beam

Sasha and Erich discuss possible reasons for variation in pulse shape (Cal, tail vs no tail):

- possible non-uniformity in Sr 90 around the tube. Shows that hit region of high activity show more space-charge effect, others don't
- possible non-concentricity of rod in tube. Region where gap is wider show more space-charge effect.

18:42 End run 307

18:43 Start run 308 HV = +60 V, small scintillators, Sr 90 in beam

19:23 End run 308

19:24 Start run 309 HV = +50 V, small scintillators, Sr 90 in beam

18:40 JPR Erich changed the digitizer offset for SCal channels to 13000 to give room for the larger negative signals. Actually he set the DAC to 0x0000 DAQ version 1.0.8

10 Aug

20:23 End run 309

20:24 Run 310 HV = +40V small scintillators,
Sr 90 in beam
Uses FCP_DAQ v1.0.8
Broken - accidental moved the wrong way!

20:27 Run 311 HV = +40V, small scintillators,
Sr 90 in beam
v1.0.9 of FCP_DAQ

20:38 BPC/digitizers out of sync. End run 311
and refresh everything → symptom consistent w/digitizers
missing some triggers

20:39 Start run 312 HV = +40V, small scintillators,
Sr 90 in beam
BPC/digitizers seem back in sync
(restarted DAQ, which resets
digitizers)

21:39 End run 312

21:42 Run 313 HV = +200V, small scintillators,
Sr 90 in beam

22:04 End run 313

22:04 Run 314 HV = +150 small scintillators,
Sr 90 in beam

22:24 End run 314

22:26 Run 315 HV = +100, small scintillators,
Sr 90 in beam

22:46 End run 315

22:47 Run 316 HV = 150 small scintillator
Sr90 in beam

23:17 End run 316

23:27 Added Oxygen to the system. System volume between valves, the volume will be calculated once back in AB
RW Added 4 "fills" of oxygen. 1st fill vacuum on space, remaining 3 fills had argon gas at ~~oxygen~~ ~2psi.
Each fill ~~[illegible]~~ pressurized the ~~system~~ volume to 1 bar.
Argon gas from cylinder was used to push oxygen into the system. Flow for about 30 seconds then wait
And fill again repeating flush. Total fill time for all 4 about 10 minutes. Oxygen content was double at ~20min from start.

23:55 Run 317 HV +250V on all channels
RW Sr90 in beam
Small Scintillator

11 Aug 2021
00:25 End run 317
BW

00:27 Start run 318 HV = +60 V ~~[illegible]~~
BW
PCal A 59.39
PCal B 60.22
PCal C 60.18
· Small scint, Sr 90 in beam, O_2 present

00:57 End run 318
BW

00:58 Start run 319 HV = +50 V
BW
PCal A 49.48
PCal B 50.2
PCal C 50.1
· Small scint, Sr 90 in beam, O_2 present

· There were a few stretches of about a minute each where there were no spills occurring. This happened probably
~~[illegible]~~ ~~[illegible]~~ 3-5 times.
There are some empty spills with no events - these should be
~~[illegible]~~ obvious to distinguish based on the file size.

01:58 End run 319
BW

01:59 BL — Start run 320
FCal A 39.6
FCal B 40.1
FCal C 40.1

HV = + 40 V

· Small scint, Sr 90 in beam, O_2 present

· Same notes as for run 319

02:29 BL — End run 320

02:31 BL — Start run 321
FCal A 148.5
FCal B 150.6
FCal C 150.5

HV = + 150 V

· Small scint, Sr 90 in beam, O_2 present

· Same notes as for previous 2 runs

02:50 BL — End run 321

02:52 BL — Start run 322
FCal A 99.0
FCal B 100.4
FCal C 100.3

HV = +100 V

· Small scint, Sr 90 in beam, O_2 present

· Same notes as for previous 3 runs

03:12 BL — End run 322

Sorry :(

03:15 BL — Final settings taken
· LN2 19.4%
· O_2 Levels → Illinois: 1.82 (flow rate around 0.5)
Delta F: 1.1 (flow rate around 1.5)

· We took these readings, then turned off nitrogen, started pumping oxygen and warming up.

22:47 Run 316 HV = +80 small scint.
Sr90 in beam

23:17 End run 316

23:27 RW Added Oxygen to the system ~4cm volume between valves, the volume will be calculated once back in AZ.
Added 4 "fills" of oxygen. 1st fill, vacuum on spec. remaining 3 fills had argon gas at ~~40psi~~ ~2psi.
Each fill ~~~~ pressurized the ~~system~~ volume to 1 bar. Argon gas from cylinder was used to push oxygen into the system. Flow for about 30 seconds then wait and fill again repeating flush. Total fill time for all 4 about 10 minutes. Oxygen content was double at ~20min from start.

23:55 RW Run 317 HV +250V on all channels
Sr90 in beam
Small Scintillator

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00:25 BL End run 317

00:27 BL Start run 318 HV = +60 V
FCal A 59.39
FCal B 60.22
FCal C 60.15
· Small scint, Sr 90 in beam, O2 present

00:57 BL End run 318

00:58 BL Start run 319 HV = +50 V
FCal A 49.48
FCal B 50.2
FCal C 50.1
· Small scint, Sr 90 in beam, O2 present

· There were a few streaks of about a minute each where there were no spills occuring. This happened probably 3-5 times.
· There are some empty spills with no events - these should be obvious to distinguish based on the file size.

01:58 BL End run 319

Aug 2024
RW

Due to the short in SCal 3A electrode the current draw exceeded the Bertan's limit when approaching 1kV. The Bertan supply is designed to trip at 80% the current meter setting w/ 1mA being the lowest current setting available.
80% of 1mA = 0.8mA → 800V max available

We wanted more voltage on the SCal's if possible. Pete's power supply used to power the beam chambers had a higher trip current (2.5mA?) We opted to use this supply, sacrificing the ability to automatically record the SCal voltages into the settings/readback files.

In setting up the power supply we found the setup (SCal's) would still trip at ~2kV. We opted to run them at 1.5kV for the duration of the test beam.