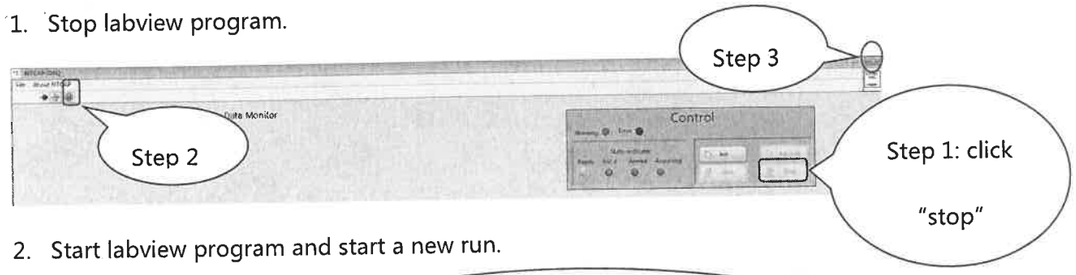
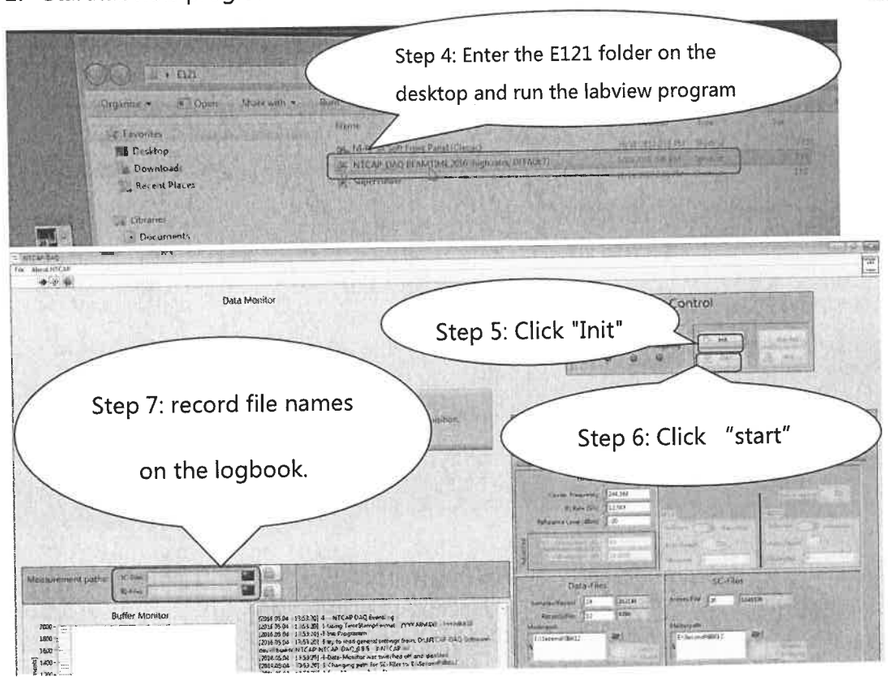
Instruction of NTCAP for shift person

To start a new run with NTCap, we need to retart NTCAP.

1. Stop labview program.



2. Start labview program and start a new run.



E121 EXPERIMENT

(Bound state beta decay in $^{205}Tl^{81+}$ ions)

Contacts

→ Ragandeep S. Sidhu, +49-15212937719 (whatsapp only)
2903 (office), r.s.sidhu@gsi.de

→ Ru Jiu Chen, +49-15217858831
2903 (office), r.chen@gsi.de

→ Uwe Spillmann, +49-16096229410, u.spillmann@gsi.de

→ Nikos, +49-16090245899, n.petridis@gsi.de, 3093 (office)

→ Yuri Litvinov, +49-152 56809091, y.litvinov@gsi.de, 1758 (office)

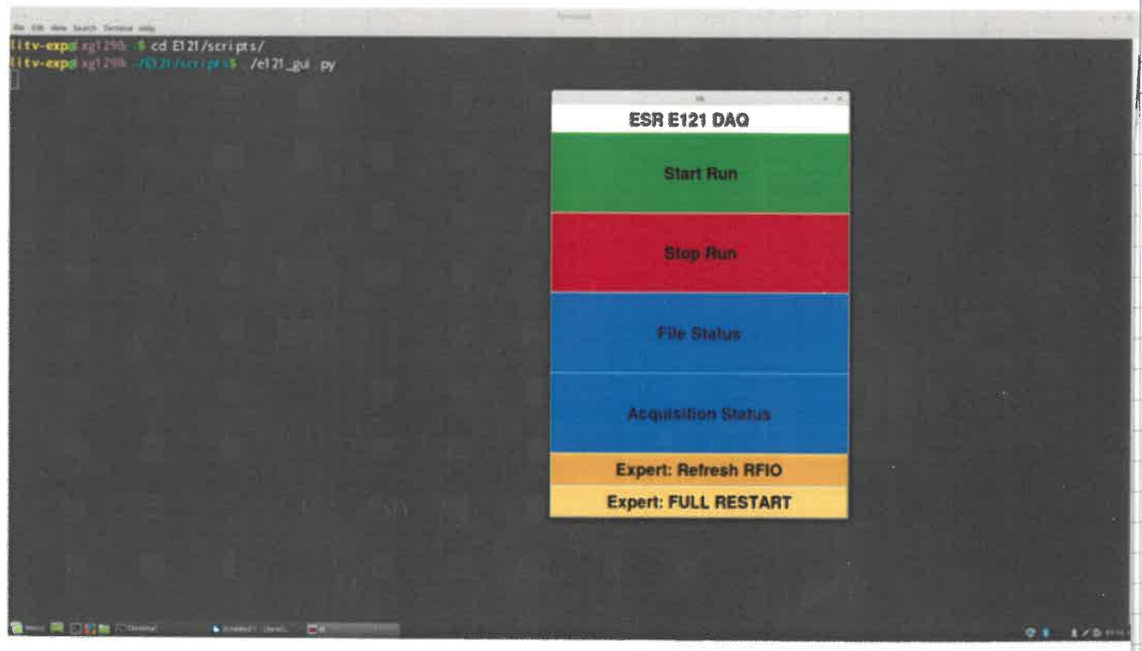
DAQ-GUI

To start DAQ-GUI

1) ssh litv-exp@lxg1298.gsi.de -Y
(password: ViValasVegas1964)

2) cd E121/scripts

3) ./e121_gui.py



Slow Control for DAQ

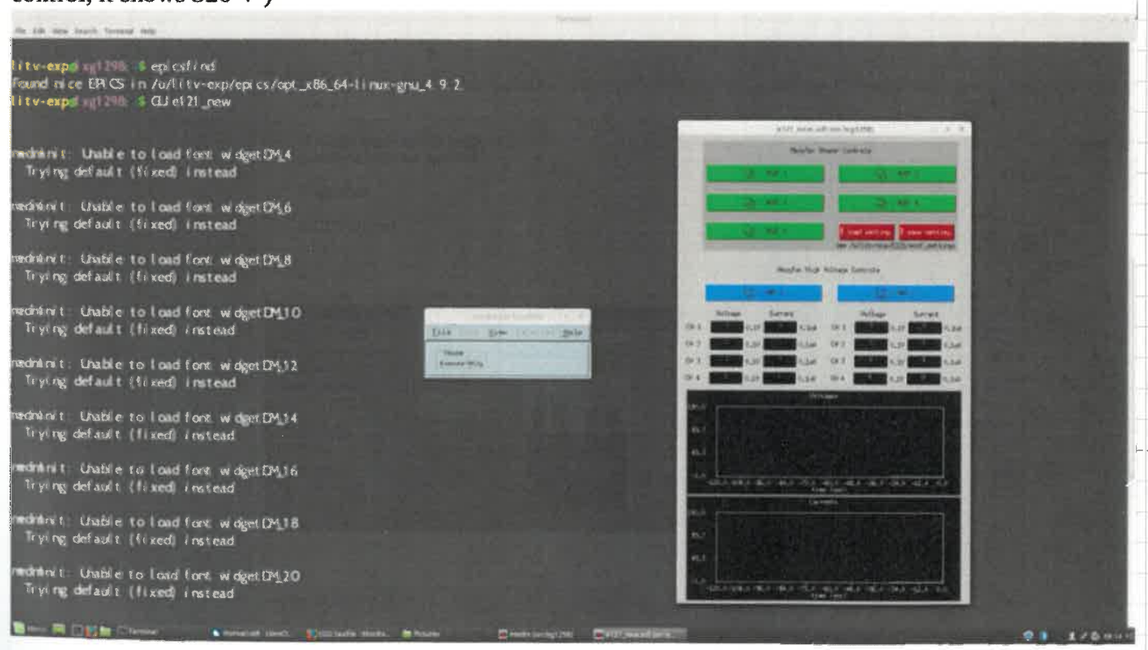
To start with the slow control of modules in DAQ:

1) ssh litv-exp@lxg1298.gsi.de -Y
(password: ViValasVegas1964)

2) epicsfind

3) GUIe121_new

(note: for HV slow control, there is an offset of x10 times i.e. if the real voltage is 32 V, on HV slow control, it shows 320 V)



Online Monitoring (Go4)

1) ssh litv-exp@lxg1298.gsi.de -Y
(password: ViValasVegas1964)

2) cd 2019Munich-Det/Go4-Muenchen-3V785AH-1V830-simple

3) g04 e121.hotstart

PICOSCOPE

Start a scope view

The online view of the shaper's energy signal and the shaper's trigger signals are done by using a Picoscope (digital oscilloscope).
To open a picoscope view one has to open a vnc viewer which connects to the "atpnuc004" NUC computer.

A) First, check if the vnc server is running on the **NUC (atpnuc004)**:

1) ssh litv-exp@atpnuc004.gsi.de -Y
(password: ViValasVegas1964)

2) vncserver -list
(by this we can know whether the vnc server is running or not)

→ if the vnc server is running, then the output should look like:
TigerVNC server sessions:

X DISPLAY #	RFB PORT #	PROCESS ID
:1	5901	1429

type "exit" to exit from the NUC

→ if the vnc server is not running, start a new by:
vncserver -localhost no :1

B) To attach to the vnc server on **litv-exp@lxg1298** computer:

1) ssh litv-exp@lxg1298.gsi.de -Y
(password: ViValasVegas1964)

2) E127_vnc
(password: ViValasVegas1964)

A window with two picoscope displays will be opened and if it doesn't open, within the window open a linux terminal (Applications → System → LXTerminal): and type picoscope

The channels of the picoscope currently:

	GQ856/0148 (Picoscope 1)	GX126/0070 (Picoscope 2)
Channel A:	Shaper 1 (MSCF1) E_{out}	Shaper 4 (MSCF4) E_{out}
Channel B:	Shaper 2 (MSCF2) E_{out}	Shaper 5 (MSCF5) E_{out}
Channel C:	Shaper 3 (MSCF3) E_{out}	Master_Trigger
Channel D:	ADC_Gate	ADC_Gate

26th March, 2020

17:17

- There is $^{208}Pb^{81+}$ (H-like primary beam) inside ESR @ 400 MeV/u
- The ESR team is now trying stochastic cooling with $^{208}Pb^{81+}$ @ 400 MeV/u.

18:47

- Beam from SIS-18 is $^{208}Pb^{67+}$ @ 401.17 MeV/u
- To get $^{208}Pb^{81+}$ beam, Seetram (SE01) is placed in FRS Target Area
- SEETRAM (SEondary Electron TRAnsmission Monitor) consists of Ti foils (~10 μm) to strip off the electrons from $^{208}Pb^{67+}$ and get $^{208}Pb^{81+}$.

27th March, 2020

12:00

- ESR team is successful with stochastic cooling of $^{208}Pb^{81+}$ beam in ESR @ 400 MeV/u.
- Now, they are trying with stacking

20:51

- Stacking in ESR with primary H-like $^{208}Pb^{81+}$ beam is achieved.
- NTCap is running since 26th March, 2:00 am

Start file: 1Q_2020-03-27-02-17-56
SC_2020-03-27-02-17-56

20:53: ~~Start~~ Stop NTCap and start a new run.

New data ~~are~~ saved in:
data1/205Te/29/1Q_2020-03-27-20-56-00.
data1/205Te/Sc/SC-2020-03-27-20-56-00.

21:03. Stop NTCap and start a new run; new datas are saved in:
data1/205Te/29/1Q-2020-03-27-21-03
data1/205Te/Sc/SC-2020-03-27-21-31

21:28. Stop copying data 1Q_2020-03-27-02-17-56 since it ~~is~~ is too huge. We need to ~~analyze~~ analyze new data tonight with this computer.

21:48. Yury is pushing detector. The HV of detector is on.

	MHV1 Voltage (V)	MHV1 Current (nA)	MHV2 Voltage	MHV2 Current
Ch1	32 V	60 nA	32	~~344~~
Ch2	32	82	32	123
Ch3	32	87	-50	34
Ch4	32	272	-160	2800

parameter gain,

	Gain	Shaping Time	Pole Zero	Threshold
MSCF 1	10	2 μs	100	150
MSCF 2	10	2 μs	100	150
MSCF 3	10	2 μs	100	150
MSCF 4	10	2 μs	100	150
MSCF 5	10	2 μs	100	150

22:04

· Trigger for NTCaI is 1 kHz.

2020-03-28

→ 01:57. start run e121-run-0143.lmd.

→ 2:04 stop run

MSCF 5 : gain changed to 5.

→ 2:18 start run e121_run_0144.lmd

Gain for CsI adjusted to 3 with same pole zero & threshold.

→ 2:48

Electron cooler current is increased to see nice beam spot on DSSD.

Electron cooler current now = 200 mA

→ 3:33

Stop Run : 0149.lmd

→ 3:34

HV for U7SiPMOS is turned off.

→ 3:45

Run start : 0150.lmd

→ 3:47 (Alex & Pierre-Michel)

MWPC

- HV of +1500 V is applied to Anode
- Signal on X_1 is weak compared to other signals

Now Alex and Pierre-Michel want to adjust the Threshold.

06:03. run = e121-run_0176.lmd

	MHV1	MHV2
Ch1	32V/802nA	32V/924nA
Ch2	32V/763nA	32V/871nA
Ch3	32/691nA	-50V/382nA
Ch4	32/963nA	-160V/3514nA.

NTCAP computer.

file = IQ2020-03-27-21-02-31/0000246.iq.tms

SC-2020-03-27-21-02-03/0000126.SC.tdms

I_{cool} = 178 mA.

I_{ESR} = 288 uA

07:54. Computer crush up again. Restart computer.

restart mbs.

start run e121_run_0198.lmd

9:15 run = 213

	MHV1		MHV2	
CH1	32 V	~~717~~ 835 nA	32 V	1041 nA
CH2	32 V	~~695~~ 928 nA	32 V	1035 nA
CH3	32 V	~~577~~ 879 nA	-50 V	486 nA
CH4	32 V	1057 nA	-160 V	3683 nA

NTCAP File = IQ_2020-03-27_21-02-31/0000330.iq.tdms

SC_2020-03-27_21-02-03/0000167.sc.tdms

I_{cool} = 176 mA I_{ESR} = 1.1E7

10:02 run = 223

	MHV1 U[V]	I[nA]	MHV2 U[V]	I[nA]
CH1	32	813	32	1007
CH2	32	887	32	1003
CH3	32	848	-50	425
CH4	32	1021	-160	3490

I_{cool} = 176 mA I_{ESR} = 1.1E7

NTCAP Files:

IQ_2020-03-27_21-03-31/0000348.iq.tdms

SC_ " - "/0000178.sc.tdms

28.03.2020

10:51 Move the silicon to +65 mm

The spot on DSSSD is changed by ~5 mm.

11:05
~~10:38~~ Detector is moved back to +60mm

11:03 Run stop 0235 and
Nikos is changing the gas jet target.

11:20
Intensity of beam in ESR is being reduced.

11:27
ESR is off now

12:30. Stop NT cap. Close file =
IQ
data1/205Tl/79/IQ-2020-03-27-21-02-31
data1/205Tl/81/IQ-2020-03-27-21-02-03

~~14:55~~
~~15:00~~ } ~~Garbage Run~~

15:00
15:10 } Garbage Run

SC_2020-03-28_14-58-46
VIQ_2020-03-28_15:00-12

I_{cooler} = 200 mA

ssh into [...]@ulp24.gsi.de > ssh -X @ulpc24.gsi.de
> gasjet_dichte

29th March, 2020

- 11:55

file : 0235.lmd

Some signals on MWPC & DSSSD

- 13:10

→ we inject the beam with (~20 stacking) & after that, we will switch on Ar gas jet for ~300 s.

Then, we will see the no. of contaminants on CATSiPHOS.

→ we will do it for different setting & then optimise it for minimum no. of contaminations

→ 13:17 (gas-Jet is on)

Ar density : 4.3E12 (13:17) ↓ 5 min (13:22)

→ we have

$I_{ESR} \sim 10^6$ (after stacking)

for Tl

13:29

a) $^{208}Pb^{81+}$ + Ar (@ 400 MeV/u)

Ionisation $1.40 \times 10^3 = 14 \times 10^2$

Capture $(5.57 + 1.34) \times 10^2$

$$\frac{\sigma_I}{\sigma_c} = \frac{140 \times 10^2}{6.91 \times 10^2} \sim \cancel{5.49}\ 2.02$$

b) $^{205}Tl^{81+}$ + Ar

13:48

- Two points on DSSSD are seen
- Inner detector put at 70 mm from 60 mm.

13:49

- Yuri - ~~close~~ open the slits at S6. in FRS.

— 10 mm open S6

14:06

- Detector (inner) moved to 50 mm.
- Gas jet will be on for 50 s.

14:29

S6 slit variation measurements
(Inner detector position: 60 mm)

Slit position	N_{α}/N_{p}
-10 mm	1460/91 = 16.04
-9 mm	1200/76 = 15.78
-8 mm	1491/91 = 16.38 (new)
-7 mm	1450/72 = 20.1
-6 mm	1454/80 = 18.175
-5 mm	1457/87 = 17.5
-4 mm	1397/87 = 16.05

-3 mm	1000/91 ≈ 10.98
-2 mm	1135/87 ≈ 13.04
-1 mm	1067/82 = 12.47
0 mm	

14:52

- Inner detector moved to 60 mm

* S6 Slit variation measurements were done to find out the optimum position.

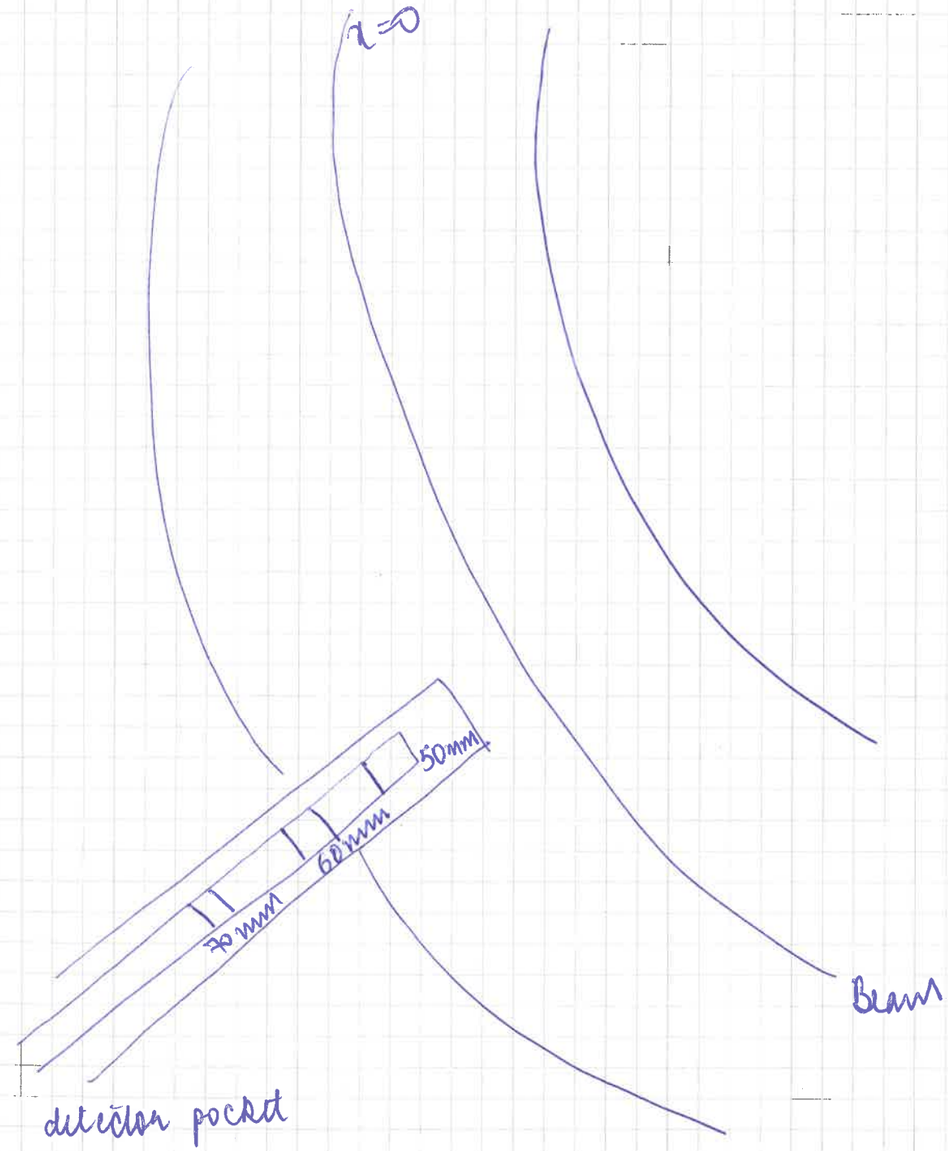
17:52
* To test whether its π beam.

→ The beam is stacked for 20 injections.
→ Then stored for ~15 mins.
→ Ar gas jet is switched on.

17:59
Gas jet is switched on

18:36
Inner detector is moved to +50 mm.

19:21
Inner detector is moved to +60 mm.



Measurements with $^{208}Pb^{81+}$

21:25 The beam in FRS is stripped by SEETRAM & we have no matter (target & degrader) in FRS.

I_{SIS} = 2E8

I_{ESR} = 4.5E6

No. of stacking = 1

I_{cooler} = 177 mA

Gas jet density = 4.34 E12

Gas jet on time = 5 min

Start Run : 0250. hrd (21:25)
Run Stop : 0250. hrd (21:31)
NTCal : SC_2020-03-29_21-27-57
\IQ_2020-03-29_21-27-57

21:31

Alex is here to help with MWPC and after he completes, we start with the measurements.

30th March, 2020

1) First Measurement of $^{208}Pb^{81+}$ for 1 hour

00:28

I_{SIS} = 3E8

I_{ESR} = 2.4 E6

No. of stacking = 1

I_{cooler} = 176 mA

Gas jet density = 4.45 E12

Gas jet on time = 5 min

Start Run : 0252. hrd (00:28)

Run Stop :

NTCal : SC_2020-03-30_00-28-45
\IQ_2020-03-30_00_28-45

(Saved in p drive)

Measurement purpose:

1) To find $\left(\frac{\sigma_c + \sigma_I}{\sigma_I}\right)_{Pb}$

2) detector efficiency of MWPC

1:00

I_{SIS} = 3.3 E8

I_{ESR} = 2.4 E6

No. of stacking = 1

I_{cooler} = 176 mA

Gas jet density = 4.49 E12

Gas jet on time = 5 min

Start Run:

Stop Run:

NTCal:

SC_2020-03-30_00-28-45

IQ_2020-03-30_00-28-45

Saved in p drive

1:06

There is problem with SIS

Run stop: 0257. lmd

1:17

Problem with SIS is solved

1:19

Run start: 0258. lmd

I_{SIS} = 1.5 E8

I_{ESR} = 2.8 E6

I_{cooler} = 176 mA

Gas jet density = 4.49 E12

Gas jet on time = 5 min

NTCal:

SC_2020-03-30_01-18-31

IQ_2020-03-30_01-22-52

Saved in p-drive

02:05

I_{SIS} = 3.3E8

I_{ESR} = 4E6

I_{corr} = 176 mA

Gas jet density = 4.53E12

Gas jet on time = 5 mins

Run stop: 0265. Und

NTCal:

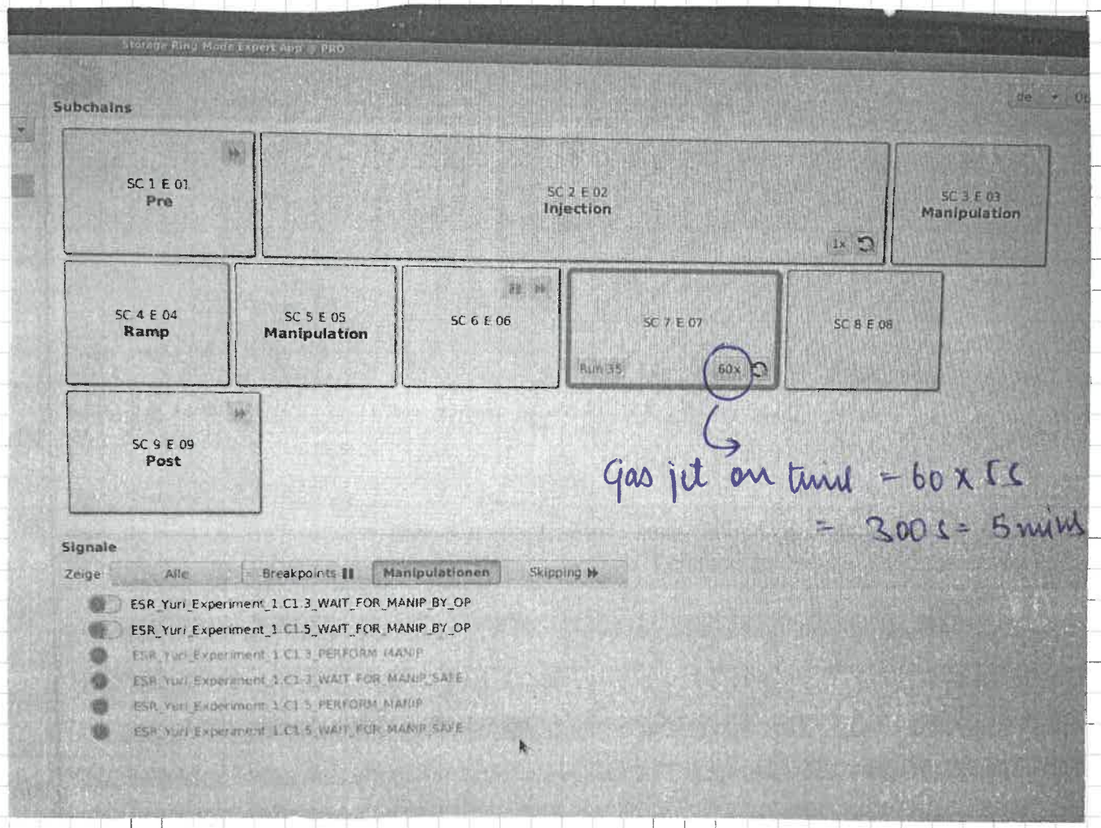
SC_2020-03-30_01-18-31

\IQ_2020-03-30_01-22-52

Saved in p drive

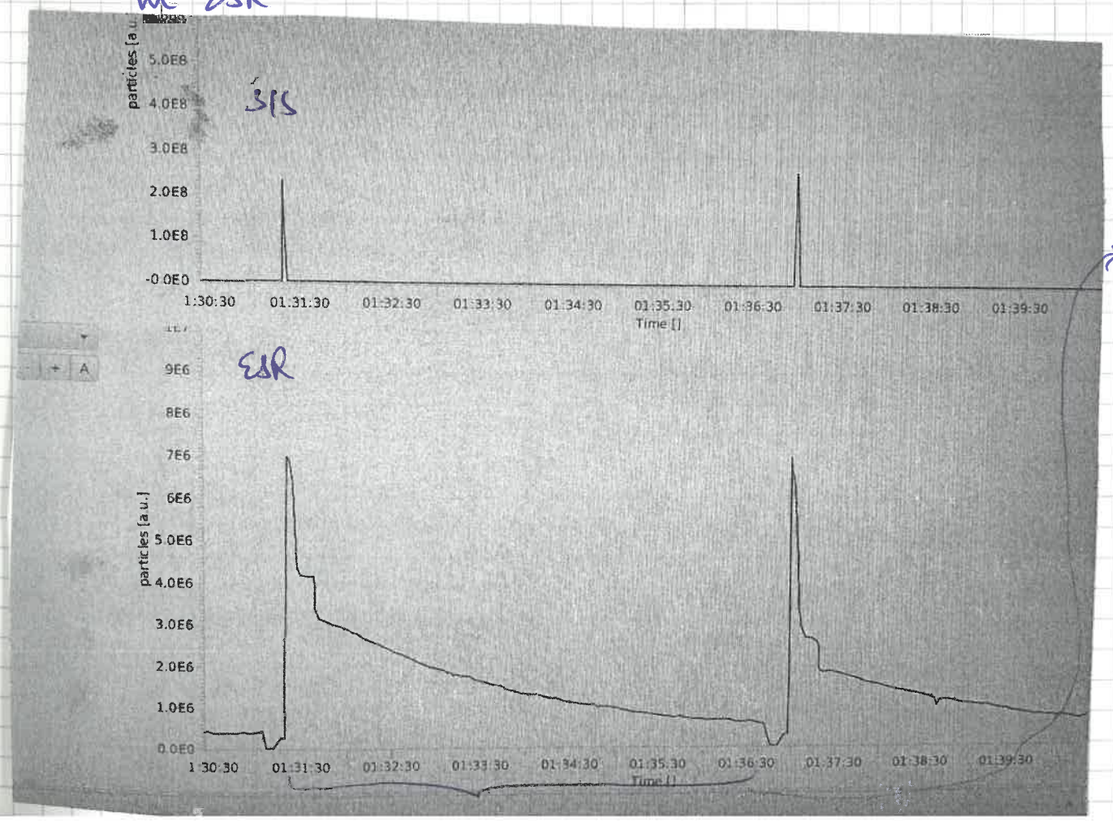
(ntcal stopped at 2:06)

First measurement steps:



Gas jet on time = 60 x 5s = 300s = 5 mins

The above is the pattern for first measurement in ESR.



one injection runs for ~6 mins

2) Measurements of λ_{cc}^{Pb} for different electron cooler currents

A) 200 mA

- Gas jet target was switched to local mode and then turned off

02:24

Start Run : 02 667

I_{SIS} = 2.5 E8

I_{ESR} = 4.9 E6 (at injection)

I_{cooler} = 176 mA

NTCap :

SC_2020-03-30_02-27-10

\ IQ_2020-03-30_02-27-10

(saved in p drive)

IQ Rate = 8 MS/s

02 66.lmd file is garbage file

3:00

File running : e121_run_0267.lmd

I_{ESR} = 4,2 · 10^6

I_{cooler} = 176 mA

NTCap :

SC_2020-03-30_02-27-10

\ IQ_2020-03-30_02-27-10

(saved in p drive)

IQ Rate = 8 MS/s

3:30

File running : e121_run_0267.lmd

I_{ESR} = 3,6 · 10^6

I_{cooler} = 176 mA

NTCap :

SC_2020-03-30_02-27-10

\ IQ_2020-03-30_02-27-10

(saved in p drive)

IQ Rate = 8 MS/s

4:00

File running: e121_run_0267.lmd

$I_{ESR} = 3.0 \cdot 10^6$

$I_{cooler} = 176$ mA.

NTCal:

SC_2020-03-30_02-27-10

\ IO_2020-03-30_02-27-10

(saved in p drive)

IO Rate = 8 MS/s

4:30

File running: e121_run_0267.lmd

$I_{ESR} = 2,5 \cdot 10^6$

$I_{cooler} = 176$ mA.

NTCal:

SC_2020-03-30-02-27-10

\ IO_2020-03-30-02-27-10

(saved in p drive)

IO Rate = 8 MS/s

4:31

Run stop: 0267.lmd

Measurement at 200 nA steps

B) 20 mA

· for reduction of the systematics.

04:58 – 05:22 5:31 – 5:34

Start Run: 0268.lmd & 0269.lmd

$I_{SIC} = 1.8E8$

$I_{ESR} = 3.7E6$

$I_{cooler} = -.01$ mA

NTCal:

04:58 – 05:22 { SC_2020-03-30_04-44-53

\ IO_2020-03-30_05-01-13

(saved in p drive)

IO Rate = 8 MS/s

Garbage run for 10 mA

5:31 – 5:34

SC_2020-03-30-05-34-13

IO_2020-03-30-05-34-13

05:08

Start File ~~running~~: 0270.lmd

$I_{ESR} = 3.01E6$

$I_{cooler} = -.01$ nA

$I_{SIS} = 2.5E8$

NTCal

SC_2020_03-30_06-11-08

\ IO_2020_03-30_06-11-16

(saved in p drive)

IO Rate = 8 MS/s

6:30

File running: 0270.lmd

I_{ESR} = 2.6 E5

I_{cooler} = −0.01 mA

NTCap

SC_2020-03-30_06-11-08

IQ_2020-03-30_06-11-16

(saved in p drive)

IQ Rate = 8 MS/s

7:00

File running: 270.lmd

I_{ESR} = 2.2 E5

I_{cooler} = −1 mA

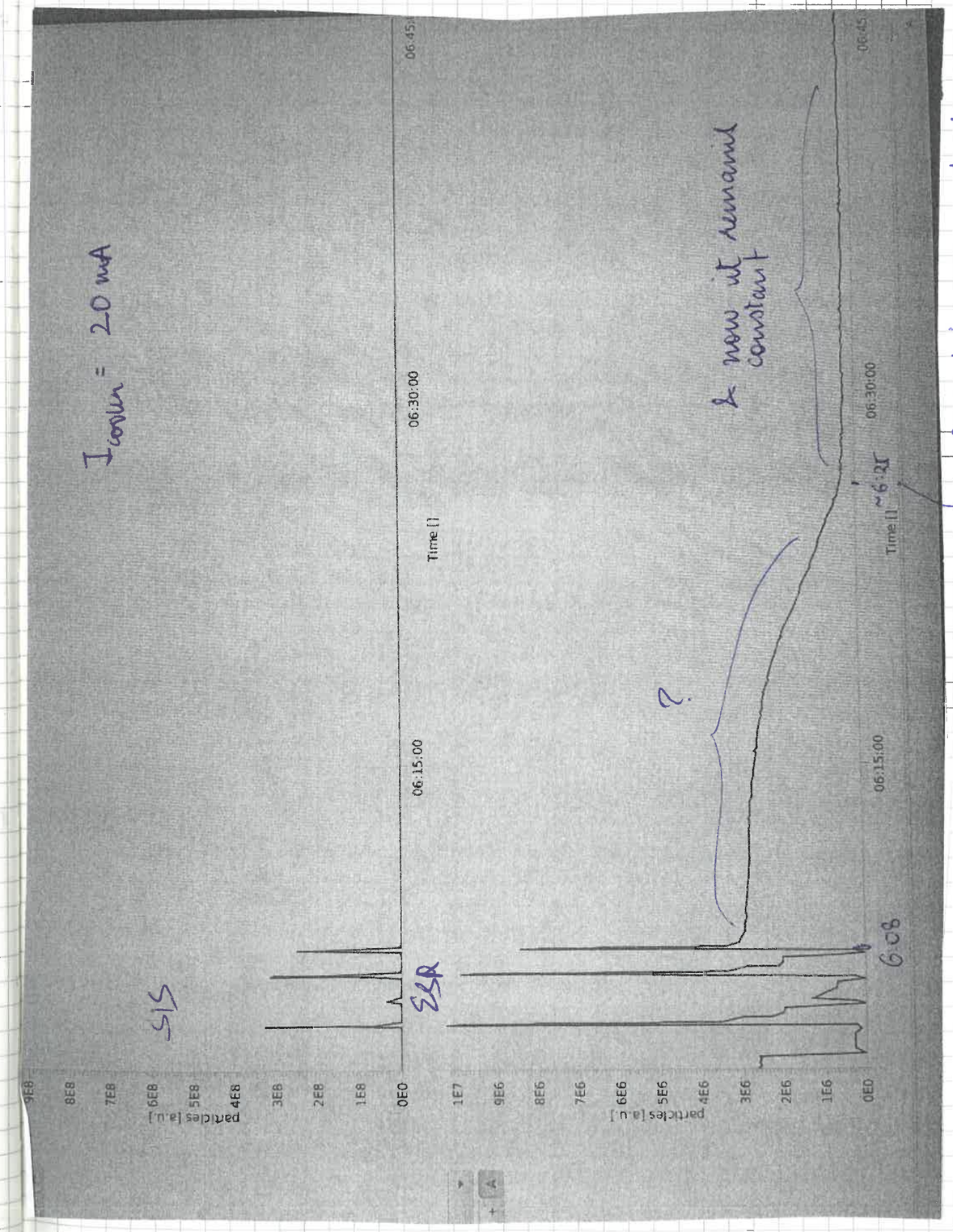
NTCap

SC_2020-03-30_06-11-08

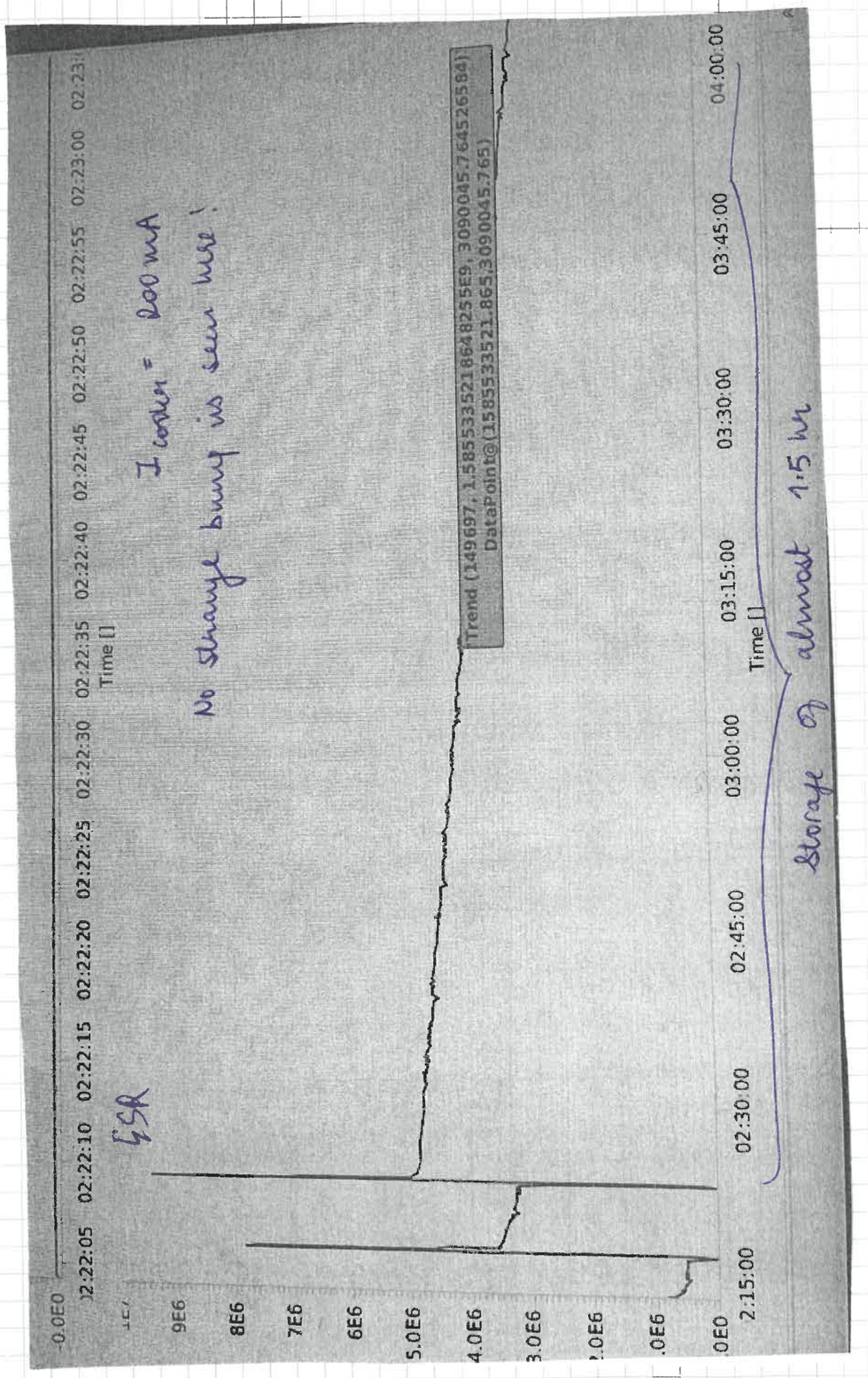
IQ_2020-03-30_06-11-16

(saved in p drive)

IQ Rate = 8 MS/s



Does this mean that our measurement started from ~6:25 - 8:30?



7:30

fill number: 270.1nd

I_{ESR} = 2.8 E 5

I_{cooler} = -1 mA

NTCal

SC_2020-03-30_06-11-08
IQ_2020-03-30_06-11-16
(saved in p drive)
IQ Rate = 8 MS/s

8:00

fill number: 270.1nd

I_{ESR} = 2.6 E 5

I_{cooler} = -1 mA

NTCal

SC_2020_03-30_06-11-08
IQ_2020-03-30-06-11-16
(saved in p drive)
IQ rate = 8 MS/s

8:30

File running: 270.lmd

I_{ESR} = 2.5E5

I_{cooler} = -1 mA

NTCal:

SC_2020-03-30_06-11-08

\IQ_2020-03-30_06-11-16

(saved in p drive)

IQ Rate = 8 MS/s

8:34 Run Stop: 0270.lmd

c) 10 mA

8:52 ~~[illegible]~~

Start Run: 0271.lmd

I_{SIS} = 3.4E8

I_{ESR} = 4.7E6

I_{cooler} = -1 mA

NTCal:

SC_2020_03-30-08-54-42

\IQ_2020-03-30-08-54-42

(saved in p drive)

IQ Rate = 8 MS/s

Garbage Run

9:29 Stopped file 0271

9:28 Started new Data recording again

File running: 0272.lmd

I_{SIS} = 3.1E8

I_{ESR} = 5.7E6

I_{cooler} = -1

NTCal:

SC_2020-03-30_09-28-14

\IQ_2020-03-30_09-28-14

(saved in p drive)

IQ Rate = 8 MS/s

10:00

File running: 0272.lmd

I_{ESR} = 2.8E5

I_{cooler} = -1 mA

NTCal:

SC_2020-03-30_09-28-14

\IQ_2020-03-30_09-28-14

(saved in p drive)

IQ Rate = 8 MS/s

10:30

File running: 0272.cmd

I_{ESA} = 2.7 E5

I_{code} = -1 mA

NTCap:

SC_2020_03-30_~~08-50-42~~ 09-28-14

\IQ_2020-03-30_~~08-50-42~~ 09-28-14

(saved in drive)

IQ Rate = 8 MS/s

~~10:00~~ 55

File running: 0272

I_{ESA} = 2.7 E5

I_{code} = -1 mA

NTCap:

SC_2020_03-30_~~08-50-42~~ 09-28-14

\IQ_2020-03-30_~~08-50-42~~ 09-28-14

(saved in drive)

IQ Rate = 8 MS/s

11:32 file running = 0272.cmd

I_{ESA} = 2.3 E5

I_{code} = -1 mA

NTCAP:

SC_2020-03-30_09-28-14

\IQ_2020-03-30_09-28-14

saved in p:\

IQ Rate = 8MS/s

12:00 file running = 0272.cmd

I_{ESA} = 2.3 E5

I_{code} = -1 mA

NTCAP

SC_2020-03-30_09-28-14

\IQ_2020-03-30_09-28-14

saved in p:\

IQ Rate = 8 MS/s

12:30 file running = 0272.cmd

I_{ESA} = 2.8 E5

I_{code} = -1 mA

NTCAP

SC_2020-03-30_09-28-14

\IQ_2020-03-30_09-28-14

saved in p:\

IQ Rate = 8 MS/s

13:00

running file = 0272.cnd

I_{ESR} = 4.5E5

I_{cole} = -1mA

NTCAP

SC_2020-03-30_09-28-19

IQ_2020-03-30_09-28-19

saved in p:\

IQ Rate = 8 MS/s

13:30

running file = 0272.cnd

I_{ESR} = 4.0E5

I_{cole} = -1mA

NTCAP

SC_2020-03-30_09-28-19

IQ_2020-03-30_09-28-19

saved in p:\

IQ Rate = 8 MS/s

14:00

running file = 0272.cnd

I_{ESR} = 4.0E5

I_{cole} = -1mA

NTCAP

SC_2020-03-30_09-28-19

IQ_2020-03-30_09-28-19

saved in p:\

IQ Rate = 8 MS/s

19:23 Run stopped : 0272.cnd

19:24 Optimising the Voltage for Si-Pads

To change the voltage for Si-Pads and see the leakage current trend.

Leakage current limit is changed from 1500 nA to 5000 nA (5 µA)

19:33

The voltage is not applied but still 4 nA of leakage current is seen for Si-Pad 1

19:35

Bias Voltage to whole detector is given for the different values.

Limit of leakage current for all Si-Pads changed to 5000 nA from 1500 nA

	I_{leak}@32 V	I_{leak}@35 V	I_{leak}@40 V	I_{leak}@ 45 V	I_{leak}@50 V
Si-Pad 1	1103 nA	1223 nA	1423 nA	1624 nA	1842 nA
Si-Pad 2	863 nA	967 nA	1143 nA	1321 nA	1499 nA
Si-Pad 3	1137 nA	1256 nA	1459 nA	1663 nA	1891 nA
Si-Pad 4	1004 nA	1126 nA	1334 nA	1546 nA	1761 nA
Si-Pad 5	1179 nA	1304 nA	1514 nA	1726 nA	1959 nA
Si-Pad 6	1090 nA	1210 nA	1414 nA	1619 nA	1837 nA

~~DSSD~~

GI & DSSD were kept at -150 V and -50 V respectively with leakage current 2919 nA and 248 nA respectively

	I_{leak} @ 55 V	I_{leak} @ 60 V
Si-Pad 1	2045 nA	2245 nA
Si-Pad 2	1677 nA	1877 nA
Si-Pad 3	2099 nA	2306 nA
Si-Pad 4	1975 nA	2190 nA
Si-Pad 5	2175 nA	2389 nA
Si-Pad 6	2042 nA	2246 nA

- Since I_leakage < 3 μA for 60 V for all Si-pads, its decided to apply 60 V bias voltage to all Si-Pads.

- Bias voltage for DSSD and CsI remained same i.e. −50 V and −160 V respectively.

10:52

0273.lmd (garbage file)

31st March, 2020

00:02

To check Tl/Pb ratio
Al Energy degrader : 700 mg/cm²

Run start : 0274.lmd

NTCap :

SC_2020-03-30_15-57-09
\IQ_2020-03-31_00-05-11

No. of injections : 20

No. of time for gas jet is on : 10 min

Gas jet density : 4.33 E12

S2 slits −10/+35 mm,

target bump +9 mm

00:46

New Run Start = 0276.lmd

NTCap :

left running

S2 slits 0/+35 mm, target bump +13 mm (1 injection)

target bump +5 mm (1 injection)

target bump +9 mm

01:45

Stop Run = 0277.lmd

NTCap :

SC_2020-03-30_15-57-09
\IQ_2020-03-31_00-05-11

Conclusion :

Even by changing the S2 slit distance, Tl/Pb ratio doesn't change much.

Al Energy degrader thickness : 700 mg/cm²

Plan for tomorrow:

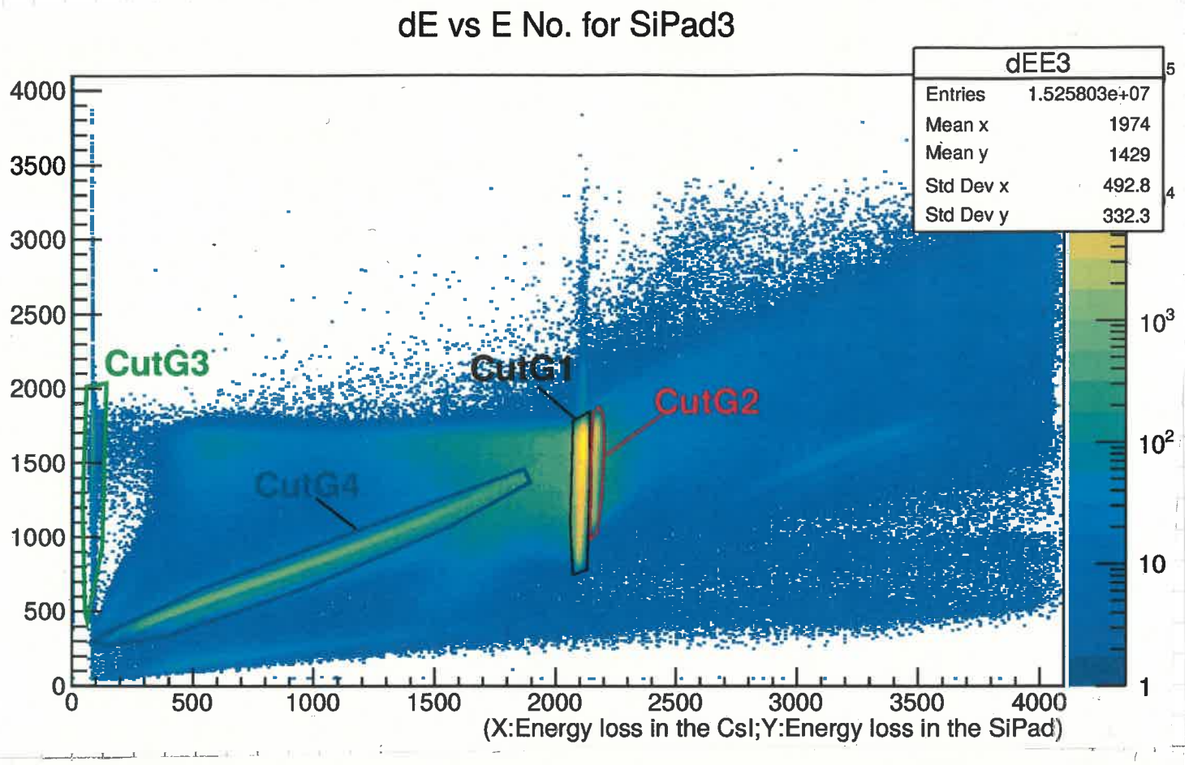
To change the degrader from 700 mg/cm^2 to ~ 2000 mg/cm^2 & see TL/PG ratio.

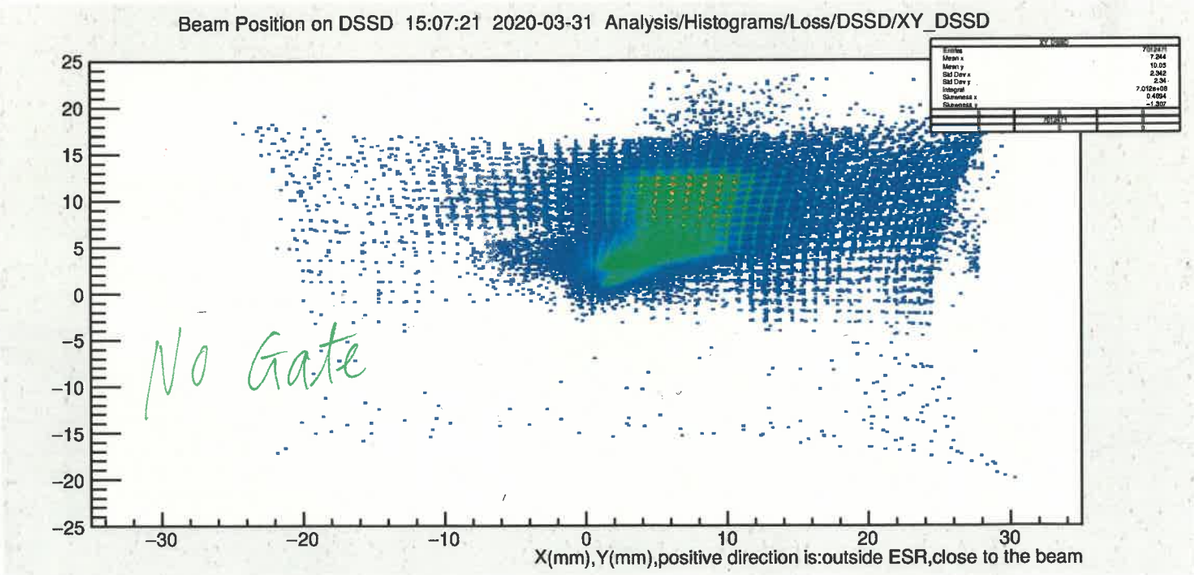
10:

2020-3-31

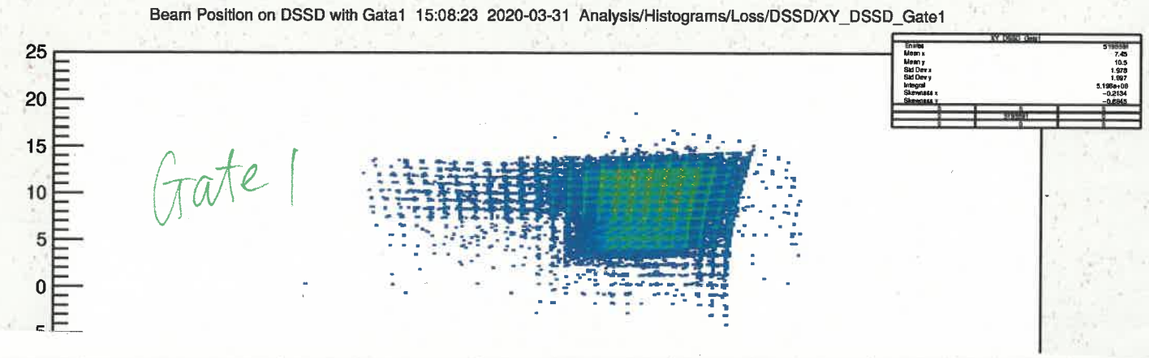
10:53. Copy data from NAT to portable HD "My book Duo".

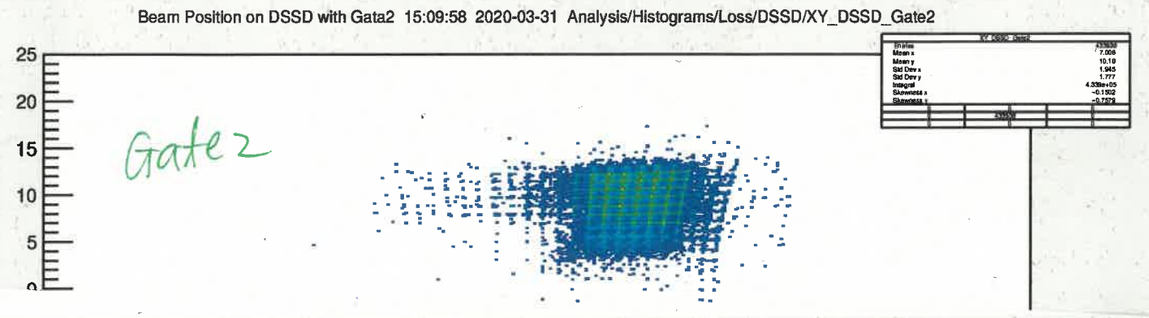
- Copy data2's data to portable HD
- change default directory for NTcap from "p" driver to "o" driver.
  "p" → data2. "o" → data1.
- Copying speed is 95.8 MB/s. Estimate time is 45 minutes.

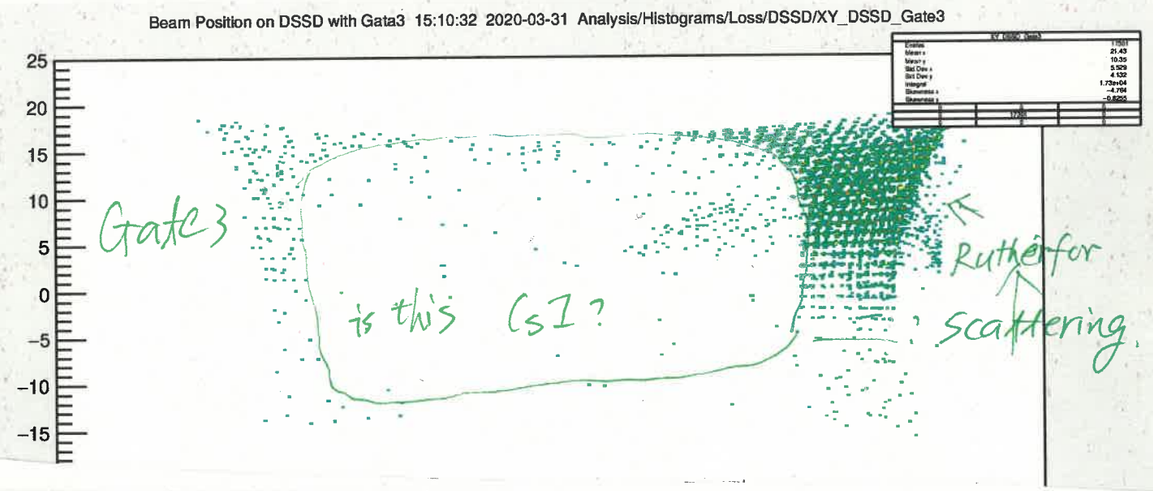


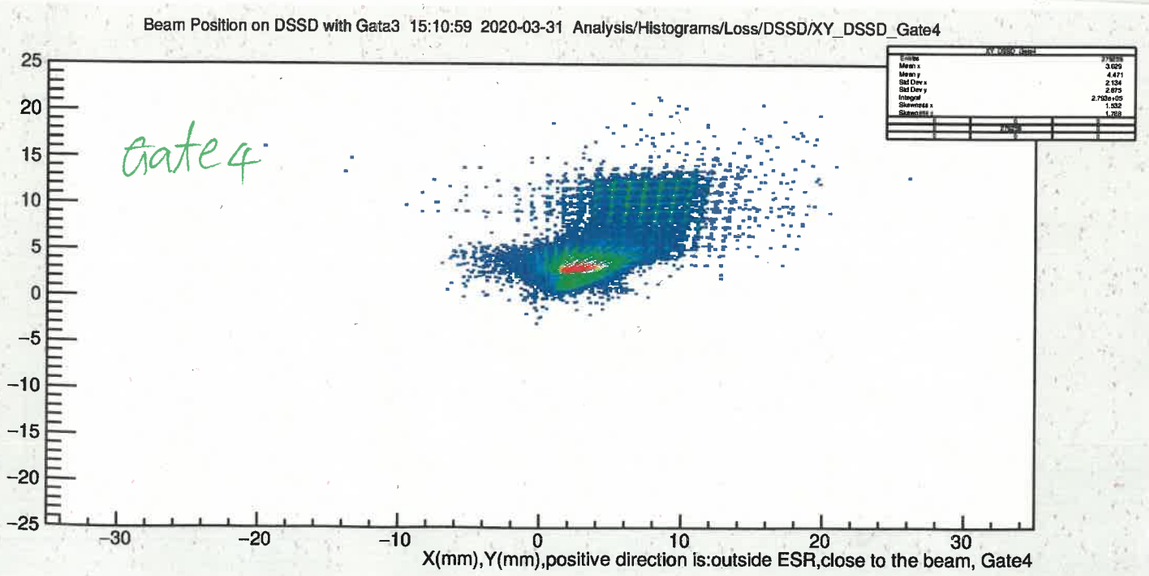


The beam position







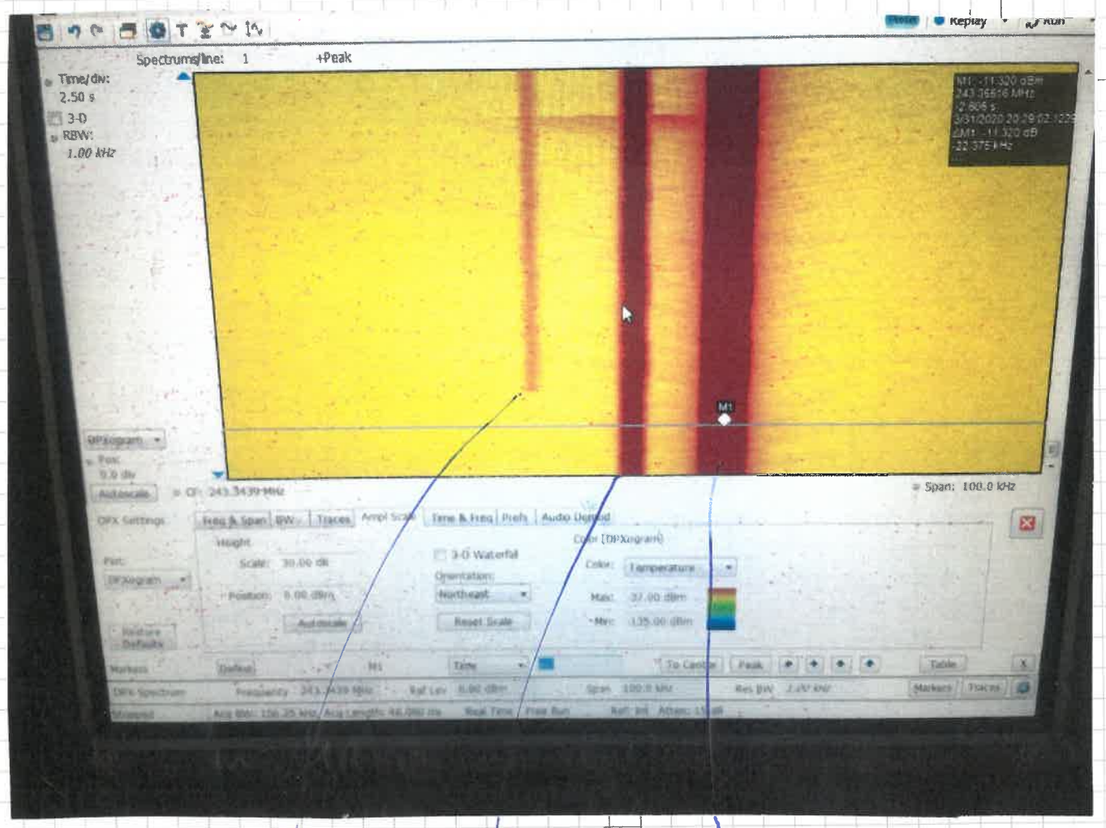


20:36

. NTCap is started

SC_2020-03-31_10-59-19

IQ_2020-03-31_20-39-41



203 Tl 80+

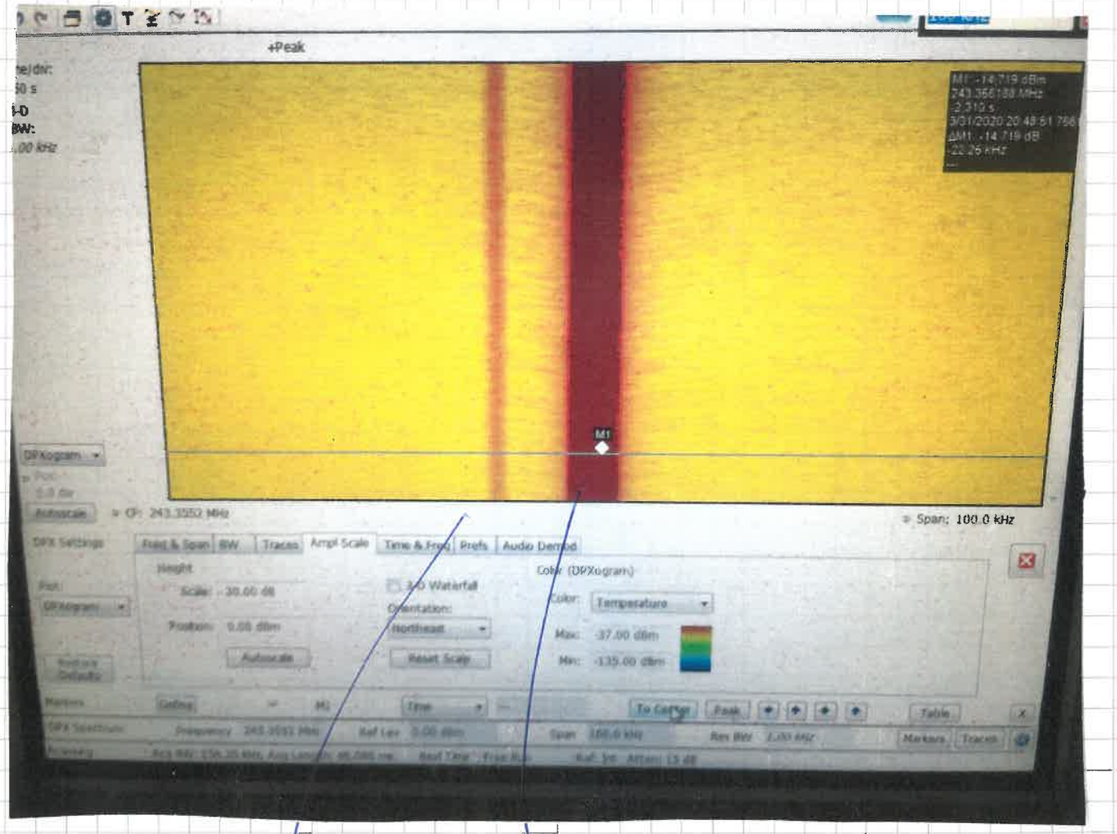
200 Hg 79+

205 Tl 81+

These contaminations are not seen on CSI Si PHOS but can be seen on Schottky

~ 20:50

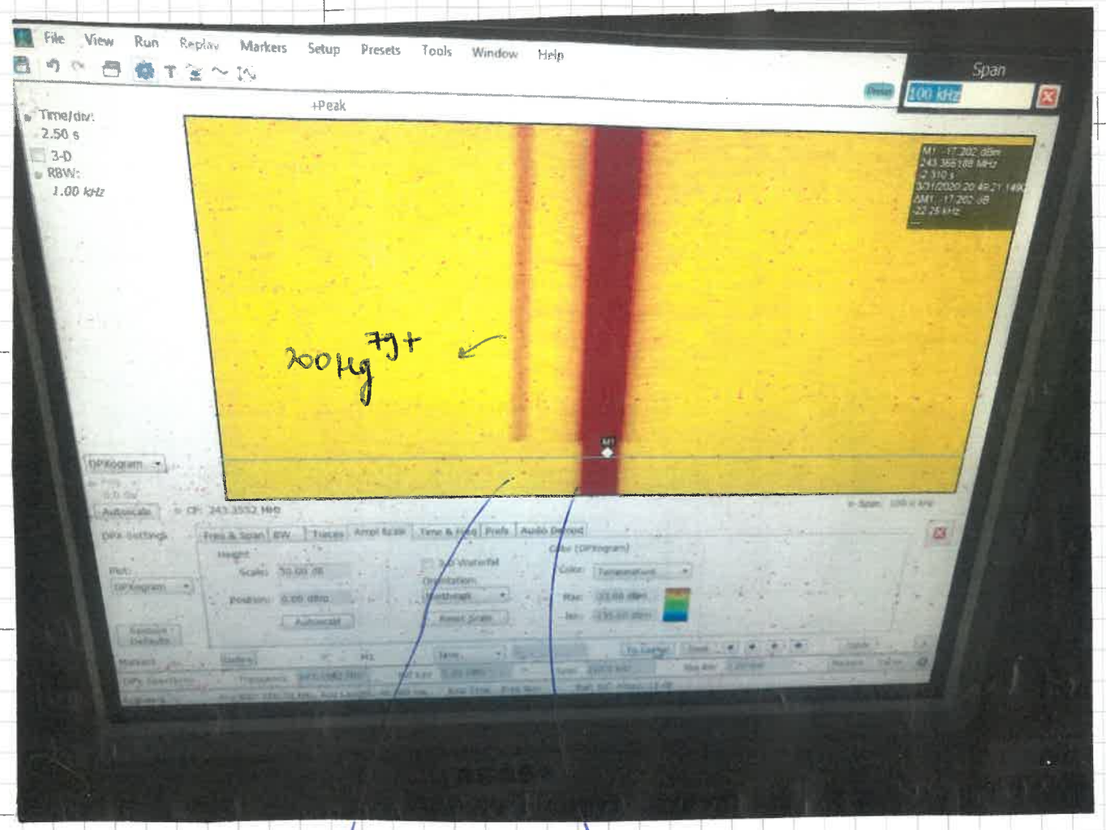
We get rid of 203 Tl 80+ by using scrapers in ERR



200 Hg 79+

205 Tl 81+

Now, we want to get rid of 200 Hg 79+



No $^{200}Hg^{79+}$ after putting the scraper in ESR.

- These contaminations cannot be seen in CSI SiPMOS can they sit almost on each other
- Scintillator is more sensitive to these.

21:11 – 21:12

0278.wmd (garbage)

21:13

Start file: 0279.wmd

22:19

Stop file: 0279.wmd

22:20

Zero leakage current was found for all Si Pads & CsI on turning on the HV.
But for DSSD, it was fine

23:40

The connection of the detector with the flange was loose which was connected again.
Leakage currents are good for all detector components now.

23:50

Problem with the Sextupole of ESR

1st April, 2020

00:30

Gain of MCP -1, 2, 3, 4 is changed from 12 to 11. Rest of the settings remains same.

- CSISIPHOS is fixed to 60 mm and will not be moved.

00:33 To see the amount of $^{205}Pb^{81+}$ under $^{205}Tl^{81+}$

Start Run : 0280.lmd

00:47

- The no. of counts on inner detector is found to be less.

Does that mean that we have less $^{205}Pb^{81+}$ impurity now ?

This is for S2 slits 0 / +35 mm position

00:58

To confirm, we are now doing mixed run with S2 slits -10 / +35 mm.

1:55 Start run : 0281.lmd

2:00 Stop run : 0281.lmd

2:09 Start new run : 0282.lmd

2:30 Stop run : 0282.lmd

→ Measurement with 2 hrs of storage time

- 2:35 Start run : 0283.lmd

2:51 Storage time starts
The beam is lost :(

3:14 Stop run : 0283.lmd
Start run : 0284.lmd

~3:30 Storage time starts

~3:33 Gas jet on for 10 min

~3:43 Gas jet off.

1) Twenty stacking
2) Ar gas jet is on for 20 s
3) Scrape away $^{200}Hg^{79+}$ with scraper in ESR
4) Store for 2 hrs
5) Gas jet on for 10 min
6) Measure the daughter ions

3:45 Stop run: 0284.lmd

Start run: 0285.lmd

New cycle

For all Si-pads, $I_{leak} < 3\,\mu A$ for $V_{bias} = 60V$

DSSD, $I_{leak} = 231\,nA$, $V_{bias} = -50V$

CsI, $I_{leak} = 2843\,nA$, $V_{bias} = -160V$

3:56 Storage time

4:30 Beam lost again

Run stop: 0285.lmd

NTCap is also closed:

SC_2020-03-31_10-59-19

IQ_2020-03-31_20-39-41

4:38 HV for inner detector is switched off.
We stop for today. Yuri will discuss with Machine & Surgery as beam goes lost. Also, how to switch off stochastic cooling after stacking is to be know!
I still believe in magical powers of God))

15:24

Beam from UNILAC is back & now, we can also switch off the stochastic cooling after stacking.

16:33 We are trying to shift the orbit of π beam

NTCap is started:

SC_2020-04-01_16-36-43

IQ_2020-04-01_16-36-43

Start Run: 0286.lmd

16:35

HV to detector is applied

For all Si-pads, $V_{bias} = 60V$, $I_{leak} < 3\,\mu A$

DSSD, $V_{bias} = -50V$, $I_{leak} = 230\,nA$

CsI, $V_{bias} = -160V$, $I_{leak} = 3091\,nA$

21:49

HV from detectors removed

Run stop: 0286.lmd

2nd April, 2020

1) First measurement with zero storage time (but with contaminants), Al degrader thickness ~ 770 mg/cm²

1:48 S2 : 0/35 mm

Start Run : 0287.lmd

NTCap :

SC_2020_04-01_16-36-43

IO_2020_04-01_16-36-43

IO Rate : 8MS/s , saved in drive 'D'

a) 20 injections for stacking : 01:48

b) no scraping

c) zero waiting time

d) Gas jet on for 10 min (local mode)

Start time : 01:54:34

Off time : 02:04:34

e) Now cooling the daughters

Peaks : 243,414304
243,41575
243,416482

2) measurement with 2 hrs storage time

S2 : 0/35 mm

a) Accumulation starts 2:08 (20 stackings)

b) no scraping

c) 2 hrs storage starts

Start time : 02:21

Stop time : 04:21

I_{cooler} during storage : 10 mA (SC8)

d) Gas jet on for 10 min (local mode)

Start time : 04:22:40

Off time : 04:32:40

target density : 3.9 E12

File running : 0287.lmd

I_{cooler} :

I_{ESR} :

3) Second measurement with 2 hours storage time

S2: 0|35 mm

I_{SIS}: 1.8E9

I_{ESR}:

a) Accumulation start: 04:45 (20 stackings)

b) no scraping

c) 2 hrs storage time starts

Start time: 04:55

Stop time: 06:55

I_{cooler} during storage: 10 mA (SC8)

d) Gas jet is on for 10 min (local mode)

Start time: 06:56:30

Stop time: 07:06:30

target density: 4E12

File running: 0287.lmd

Run stop: 0287.lmd (07:07)

NTCap stopped (07:07):

SC_2020_04-01_16-36-43

\ 70_2020_04-01_16-36-43

* Note: The beam after manipulation 9 for storage looks quite broad. Is it not electron cooled?

4) 1 hrs measurement → with cooler measurement doesn't make much sense.

I_{SIS}: 1.75E9

I_{ESR}: ~E5

a) Accumulation start (20 stackings): 07:29

b) no scraping

c) 1 hrs storage time

Start time: 07:29

Stop time: 08:29

I_{cooler} during storage:

d) gas jet is on for 10 min (local mode)

Start time: 08:30

Stop time: 08:33

target density: $3.8 \cdot 10^{12}$

File running: 0288.lmd

I_{cooler}: 0

Run start: 0288.lmd (07:08)

NTCap start:

SC_2020-04-02_07-10-40

\ 70_2020-04-02_07-11-48

Saved in 'p' drive

07:15 The cooler doesn't work, as it looks

Like some of the power supply may have failed at night.
We continue the meas until Markus comes to fix the cooler.

08:35 Indeed the anode power supply has failed at night (in order to see when exactly one has to look into the control system).
We stopped (08:40) the measurement, as Markus will tune the parameters of ESR & recover the cooler.

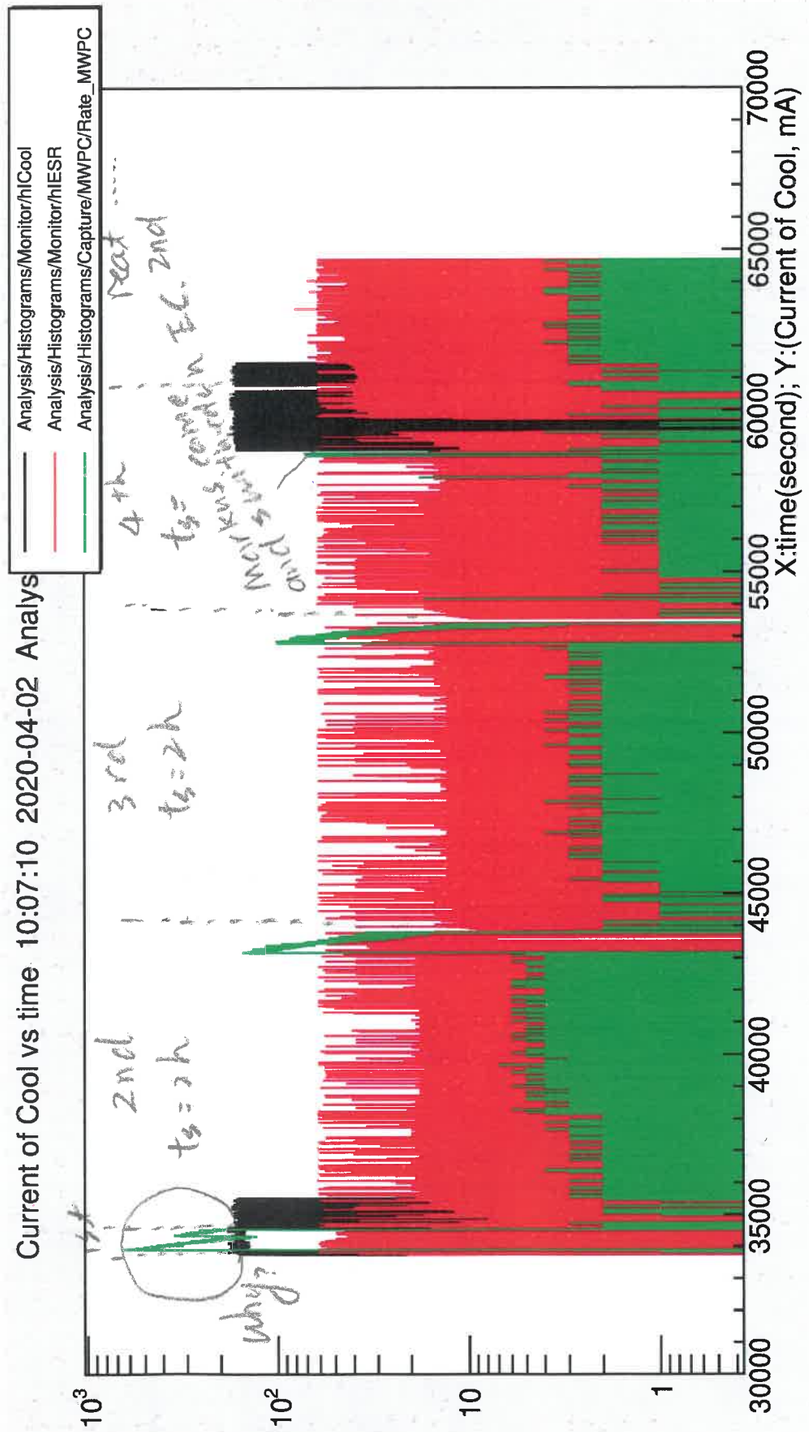
08:47 The cooler is back, we restart the measurement: e121_run_0289.lmd
Mean is still running.

(09:03: 2,3 ↓ 3,4)

$I_{SIS} = 1{,}79 \cdot 10^9$ /spill. $I_{ESR} = 5 \cdot 10^5$

09:03 Stopped the file: — " — 289.lmd
Restarting the cycle with the proper settings.
09:05 New file: e121_run_0290.lmd. Started injection studies.

$I_{SIS} = 1{,}75 \cdot 10^9$ / $I_{ESR} = 4 \cdot 10^5$



Message ID: **119** Entry time: **Thu Apr 2 09:21:19 2020**

Author:	ruijiu
Category:	Runs 2
Subject:	~~4th~~ measurement with ~~4~~ hrs storage time 2nd S2: 0/35 mm

Because the electron cooler was not
switched on during beam accumulation
in the previous measurement,
we repeat this measurent again.

beam: 205Tl81+ (no scraping)
energy: 400 MeV/u
storage time: ~~4~~ hrs 2

purpose: data with TARGET ON

Detector position (CsISiPHOS): out
of the ring
Detector position (MWPC): mm

run start at 08:46 , first file: run290.lmd
file running: 290.lmd

storage time 2hrs.

time when accumulation starts: 09:06
time when storage starts: 09:16
time when storage ends: 10:59
I_cooler during storage time: 10 mA

I_cooler = __ mA

I_SIS: 1.7e9
ESR particles after stacking: 1e6
Number of stackings: 20
Target ON density: 3.6·10^2
Target on time: 11:00
Target off time: 11:10
Target on time for measurement: 10
mins (by local mode)

NTCAp file:
SC_2020-04-02_07-10-40
\IQ_2020-04-02_07-11-48
IQ rate: 8 MS/s
(saved in drive : p)

copy and repeat the above (below the
line) for every storage time
measurement

11:13. Yuri and Markus try to turn electron cooler.
So we stop the measurement.

11:14 Stop file 290. (not useful ?)
Start file 291. Yuri and markus are turning
beam.

13:14. Yuri change the degrader from ~~19/cm²~~ to 29/cm².

Yuring is optimizing the ^{205}Tl beam intensity.

15:20 How to know whether e cooler is working?

18:25

Optimisation cannot be done / achieved for Al degrader thickness ~ 2 g/cm².
The plan is to switch back to thin Al degrader ~ 770 mg/cm².

1) The injection in ESR is in the outer orbit.
2) Then RF is on & it takes it to centre orbit
3) Then new injection at outer orbit & step 2) is repeated
4) This goes until we have 20 stackings.
5) From 1–4, e⁻ cooler & stochastic cooling is on.
6) After stacking, stochastic cooling is switched off

Now, the stacked beam is in inner orbit

7) With dipole magnet, the stacked beam is moved to outer orbit
8) It is aligned with the gas jet target
9) Target is switched on
10) daughters can be seen on outer orbit & captured via MWPC.

*1) Zero storage measurement (with contaminants & thin Al degrader)

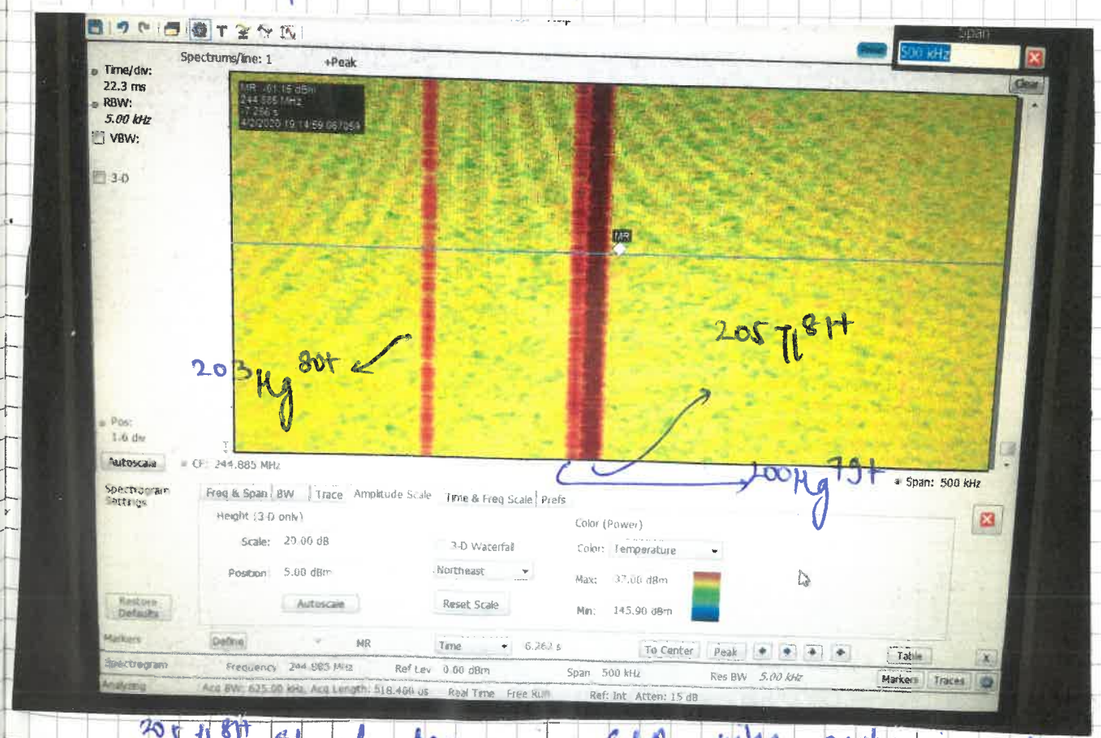
19:05 S2: ~10 mm / 35 mm ~700 mg/cm²
S8: open
Run file: 0292 bmd
Stacking ~ 40 (there were many)

19:07

SC - 2020-04-02-19-10-21
IC 2020-04-02-19-10-14
IC Rate = 8 MB/s
Saved in p drive

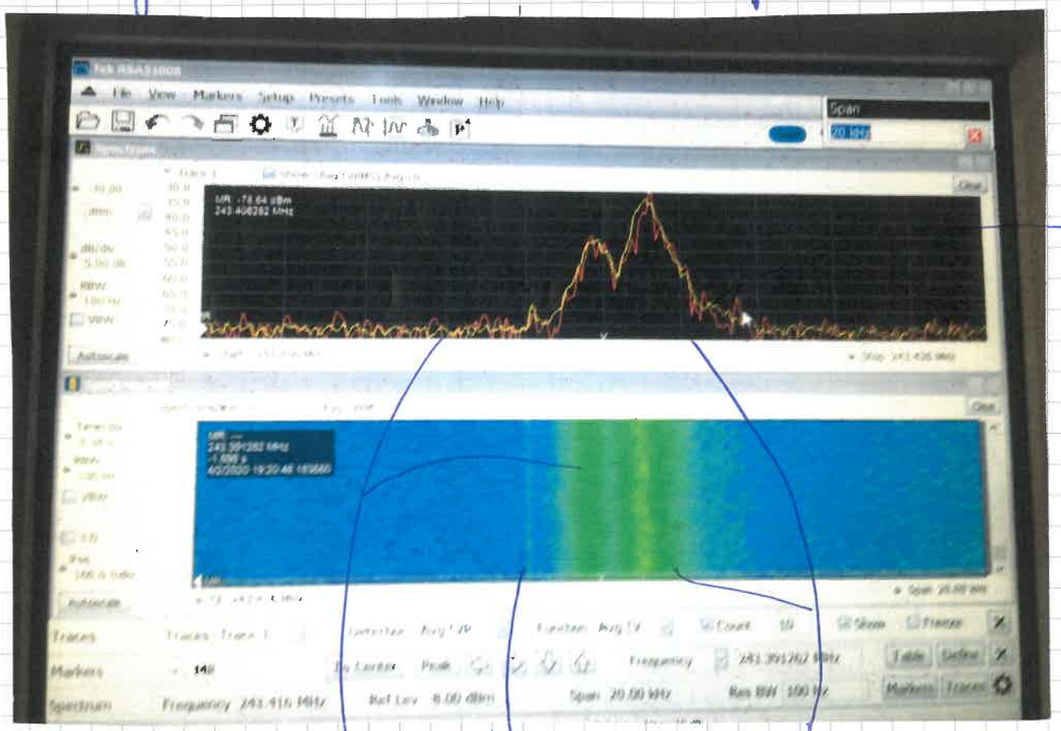
19:10 Gas jet is on for 10 min

I_{SIS} = 2.2 E9
I_{ESR} = 3.5 E9 (offset 1e5)
Gas jet density = 3.45 E12



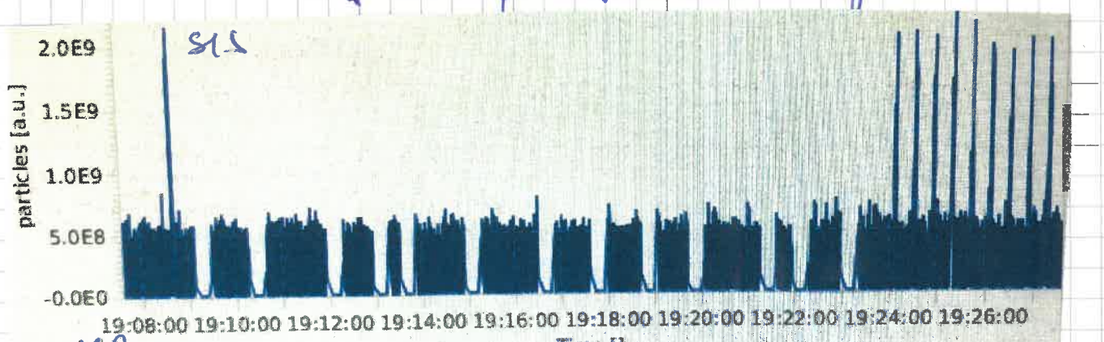
205 Tl 81+ Stored beam in ESR with contaminants

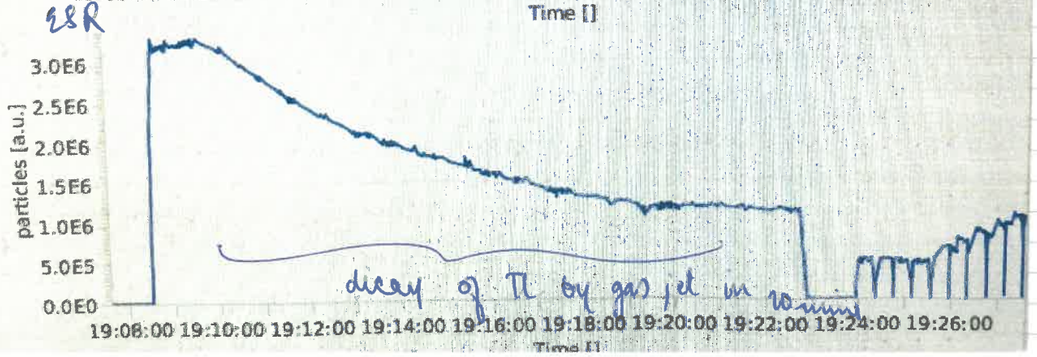
· After gas jet is switched off, e cooler is applied to see the 205 Pb 82+ & 200 Hg 80+ daughter ions via Schottky.



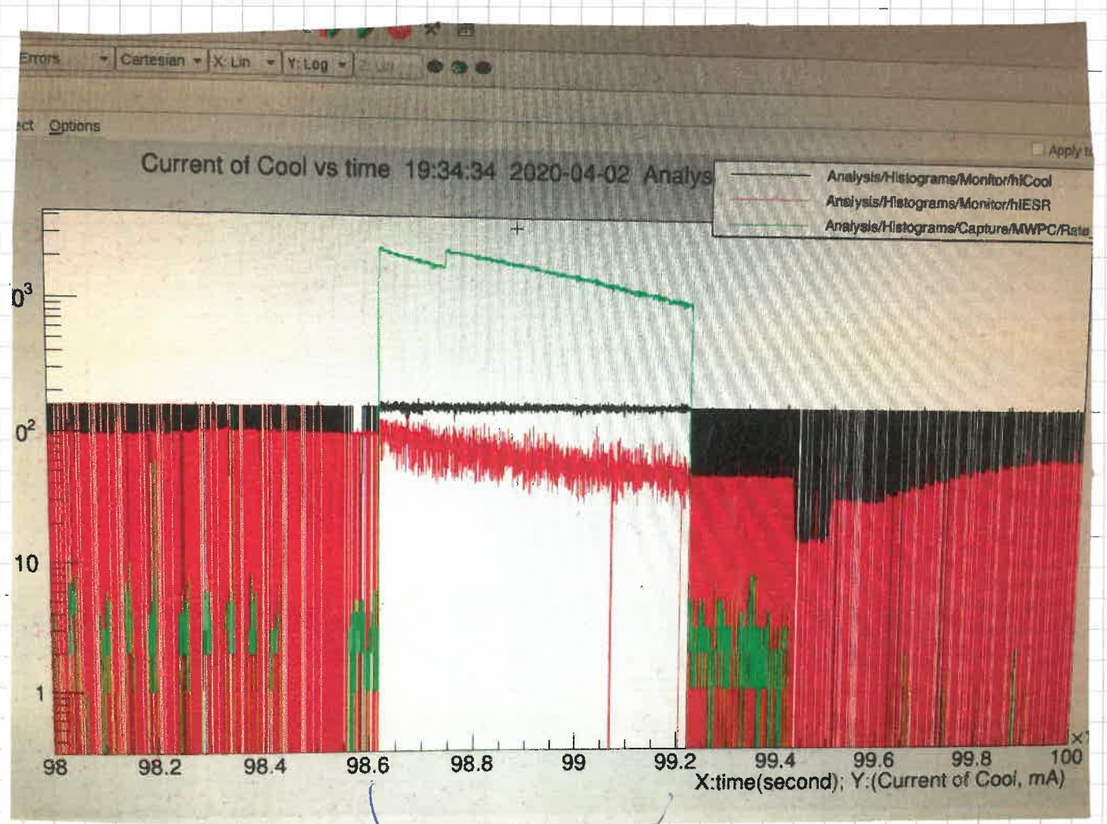
→ 195 Pt 78+

205 Pb 82+ artifact 200 Hg 80+

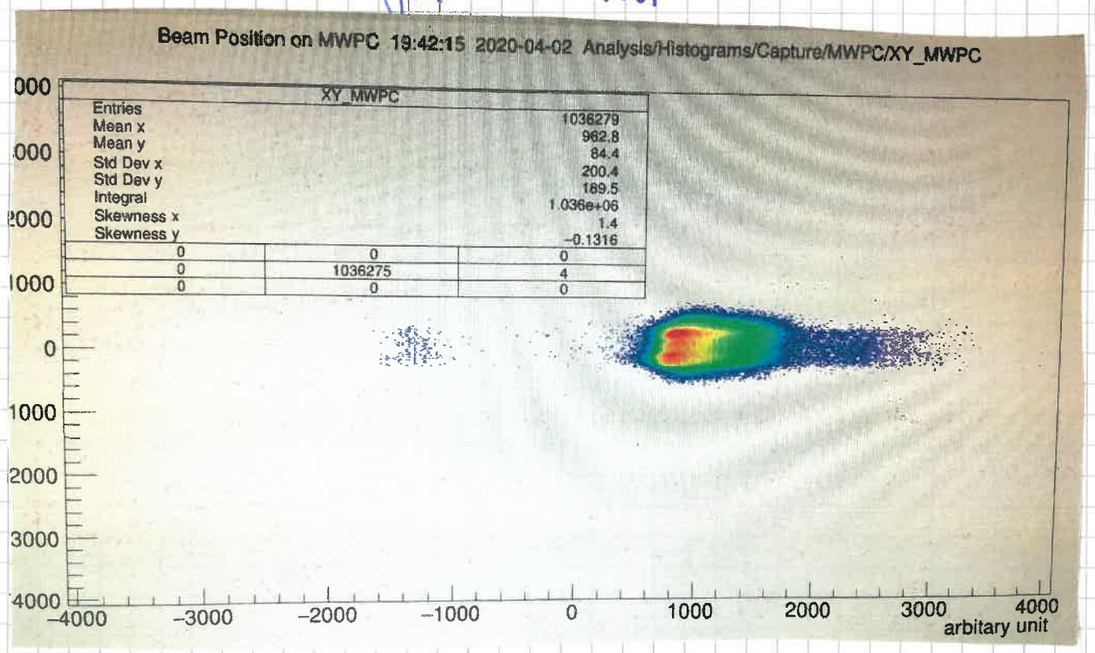




decay of Tl by gas jet in running



Rates on MWPC when gas jet is on for 10 min



* 2) 1 hr Storage Measurement

S2 = −10 mm / 35 mm
S6 : open

No. of stacking : 30

I_{SIS} : 2.2 E9

I_{ESR} : 2.6 E6 (offset 1e5)

→ Stacking starts at : 19:23

Storage start time : 19:36

Storage end time : 20:36

I_{cooler} for storage : 20 mA (−1 mA)

→ Gas jet is on for 10 mins

Gas jet on time :
Gas jet off time : } on event mode

Gas jet density : 3.44 E12

→ Cooler after gas jet on for : zero

File Running : 0293.lmd

I_{cooler} : 175 mA

⇒ In case of e⁻ - cooler malfunction:

GECE BG1E → Reset → Switch on

when green: (& Display shows ~21,2000 KEV again!)

GECE BG2T → Reset (maybe 2x) → switch on

---

* 3) 3 hr Storage Measurement

S2 : 0 / 35 mm
S6 : open

No. of stacking : 30

I_{SIS} : 1.75 E9

I_{ESR} : 2 E6 (offset 1e5)

→ Stacking starts at : 20:37

Storage start time : 20:51

Storage end time : 23:51

I_{cooler} for storage : 20 mA (−1 mA)

→ Gas jet is on for 10 mins (event mode)

Gas jet density : 3.48 e12

→ Cooler after gas jet is on for : 5 mins

File Running : 0295.lmd

I_{cooler} : 175 mA

3rd April, 2020

*4) 0.5 hr Storage measurement

S2 : 0/35 mm
S6 : open

No of stacking : ~~30~~ 9

I_{SIS} : ~ 2E9

I_{ESR} : 8.2 E5 (offset 1e5)

→ Stacking time starts at : 12:08
Storage start time : 12:25
Storage end time : 12:55

I_{cooler} during storage : -1 mA (90 mA)

→ Gas jet is on for 10 mins (current mode)
Gas jet density : 3.45E12

e⁻ cooler on at manipulation 13 for : 3 mins

File summary : 0295.lmd

I_{cooler} : 176 mA (200 mA)

*5) 1 hour Storage measurement

S2 : 0/35 mm
S6 : open

No of stackings : 30

I_{SIS} : 1.8 E9

I_{ESR} : 2.5 E6 (offset 1e5)

→ Stacking starts at 1:09
Storage start time : 1:20
Storage end time : 2:20

I_{cooler} during storage : -1 mA (90 mA)

→ Gas jet is on for 10 mins (current mode)
Gas jet density : 3.52 E12

e⁻ cooler on at manipulation 13 for : 5 mins

File summary : 0295.lmd

I_{cooler} : 174 mA (200 mA)

*6) Zero hour Storage time

S2: 0/35 mm
S6: open

No. of stackings: 30

I_{SIS}: 2 E9

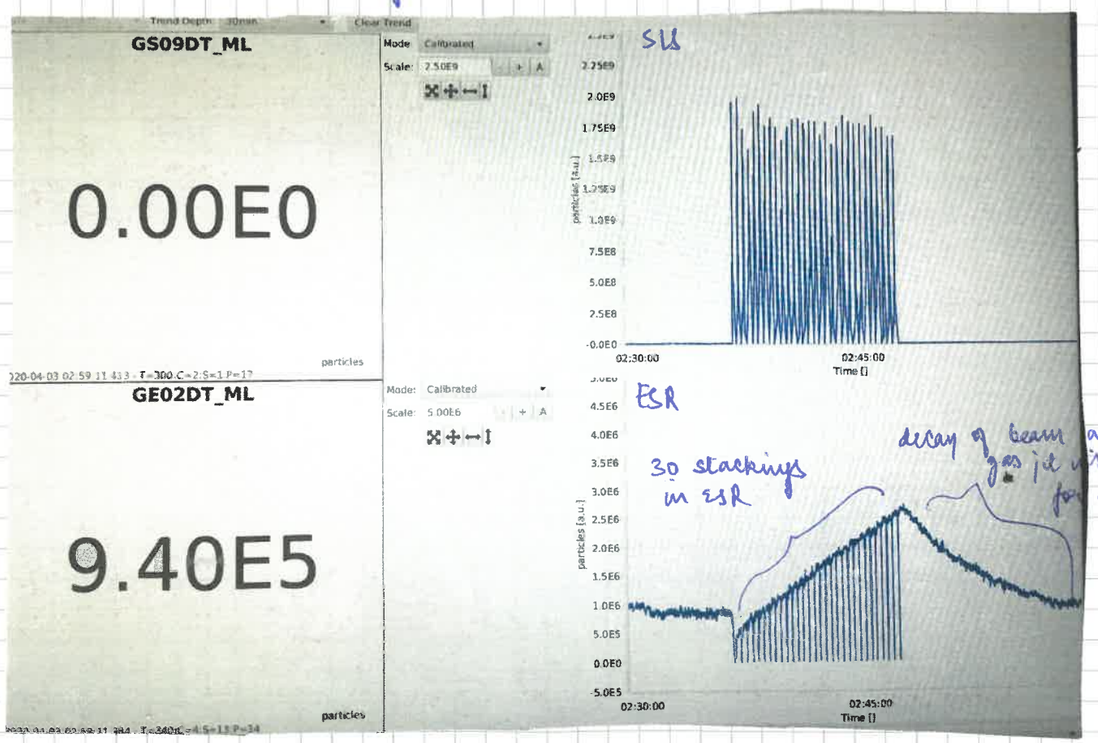
I_{ESR}: 2.7 E6 (offset 1e5)

→ Stacking start at 02:36

→ Gas jet is on for 10 mins (event mode)
Gas density: 3:49 E12
→ starts at 2:47
Storage start time: 02:47
Storage end time: 02:47

e⁻ cooler on at Manipulation 13 for: 3 mins

→ I_{cooler}: 175 mA (200 mA)
File running: 0298 hmd



*7) 0.5 hour Storage time

S2: 0/35 mm
S6: open

No. of stackings: 30

I_{SIS}: 1.8 E9

I_{ESR}: 2.4 E6 (offset 1e5)

→ Stacking time start at 03:00
Storage start time: 03:12
Storage end time: 03:42

I_{cooler} during storage: − 1 mA (20 mA)

→ Gas jet is on for 10 mins (event mode)
Gas jet density: 3.5 E12

e⁻ cooler on at Manipulation 13 for: 3 mins

I_{cooler}: 175 mA (200 mA)
File running: 0298 hmd

04:09 Electron cooler gun has some problem when we were stacking for 2 hrs storage measurement.

04:13 Run stop 0299, Run start 0300 hmd

04:15 NTCap stop: SC_2020-04-02-19-10-21
70_2020-04-02-19-10-14

04:15 NTCap start: SC_2020-04-03_04-17-44 \ JO_2020-04-03_04-17-51 (saved in p drive)

04:20 Electron cooler works again.

* 8) 2 hours Storage Measurement

S2: 0/35 mm
S6: open

No. of stackings: 30

I_{SIS}: ~ 1.75 E9

I_{ESR}: 2.1 E6 (offset 1e5)

I_{ESR} (after 2 hrs storage): 1.6 E6 (offset 1e5)

→ Stacking time start: 04:21

Storage start time: 04:32

Storage stop time: 06:32

I_{cooler} during storage: −1 mA (90 mA)

→ Gas jet is on for 10 min (current mode)

Gas jet density: 3.66 E 12

e⁻ cooler on at Manipulation 13 for: 7 min
(around 6:15 mins, trajectory changed a bit)

I_{cooler} = 179 mA (200 mA)

File running: 0300.lmd

GECEBG2T & GECEBG5T were Reset & then switched on at 04:20

* 9) 4 hours Storage Measurement

S2: 0/35 mm
S6: open

No. of stackings: 30

I_{SIS}: 1.75 E9

I_{ESR}: 2.3 E6 (offset 1e5)

I_{ESR} (after 4 hrs storage): 1.5 e6 (offset 1e5)

→ Stacking time start: 06:50

Storage start time: 07:01:20

Storage stop time: 11:01

I_{cooler} during storage: −1 mA (90 mA)

→ Gas jet is on for 10 min (current mode)

Gas jet density: 3.3 E 12

e⁻ cooler on at Manipulation 13 for: 5 min

I_{cooler} = 179 mA (200 mA)

File running: 0301.lmd

11:16 NTCap Close

SC_2020-04-03-04-17-44
\ JO_2020-04-03-04-17-51 (saved in p drive)

11:17 NTCap Open

SC_2020-04-03_11-20-14
\ JO_2020-04-03_11-20-05 (saved in p drive)

11:17 Run Stop: 0302.lmd

Run Start: 0303.lmd

* 10) 0.5 hour Storage time

S2 : 0/35 mm
S6 : open

No. Stacking : 54 (was set for 60 but we missed a few)

I_{SIS}: 2 E9

I_{ESR}: 3.2 E6 (offset : 5.e5)

Stacking time: Start : 11:19

Storage " start : 11:46

Storage stop time : 12:16

I current during storage : −1 mA (20 mA)

gas jet in on for 10 mins (current mode)

gas jet intensity : 3.66 E12

e-cooler @ manipulation 13 gas : 23 min

(more time here as shahat want to record data in 400 MHz Schottky)

I_{cooler} = 177 mA (200 mA)

File running =

(If we make 60 stacks, then we have to increase the cooler current from 20 mA to more. Thus, we reduce the stacks to 50 and keep I_{cooler} = 20 mA)

12:51 No injection in ESR from SIS
12:58 we stack with missed stacking & then we do other measurement

* 11) 0 hours Storage time

S2 : 0/35 mm
S6 : open

No. of Stackings : 38

I_{SIS} : 2 E9

I_{ESR} : 2.4 E6 (offset 5e5)

→ Stacking time start : 12:58
Storage start time : 13:16
Storage stop time : 13:16
I_{cooler} during storage : 0 – 1 mA (20 mA)

→ Gas jet is on for 10 mins (current mode)
Gas jet density : 3.54 E12
e⁻ cooler on at manipulation 13 for : 2 mins

I_{cooler} = 176 mA
File running : 0304-hmd

* 12) 8 Hour Storage Time

S2: 0/35 mm

S6: Open

No. of Stacking: 50

I_{SIC}: 2E9

I_{ESR}: 3E6 (offset 665)

I_{ESR} (after 8 hours storage):

→ Stacking time start: 13:32

Storage start time: 13:51

Storage stop time: 21:51

I_{cooler} during storage: −1 mA (20 mA)

→ Gas jet is on for 10 mins (event mode)

Gas jet density: 3.95 E12

e⁻ cooler on at Manipulation 13 for: 5 mins

I_{cooler}: 179 mA

File running: 0306.lmd

I_{ESR} (18:30) = 1.7 e6

I_{ESR} (19:00) = 1.6 e6

I_{ESR} (19:30) = 1.48 e6

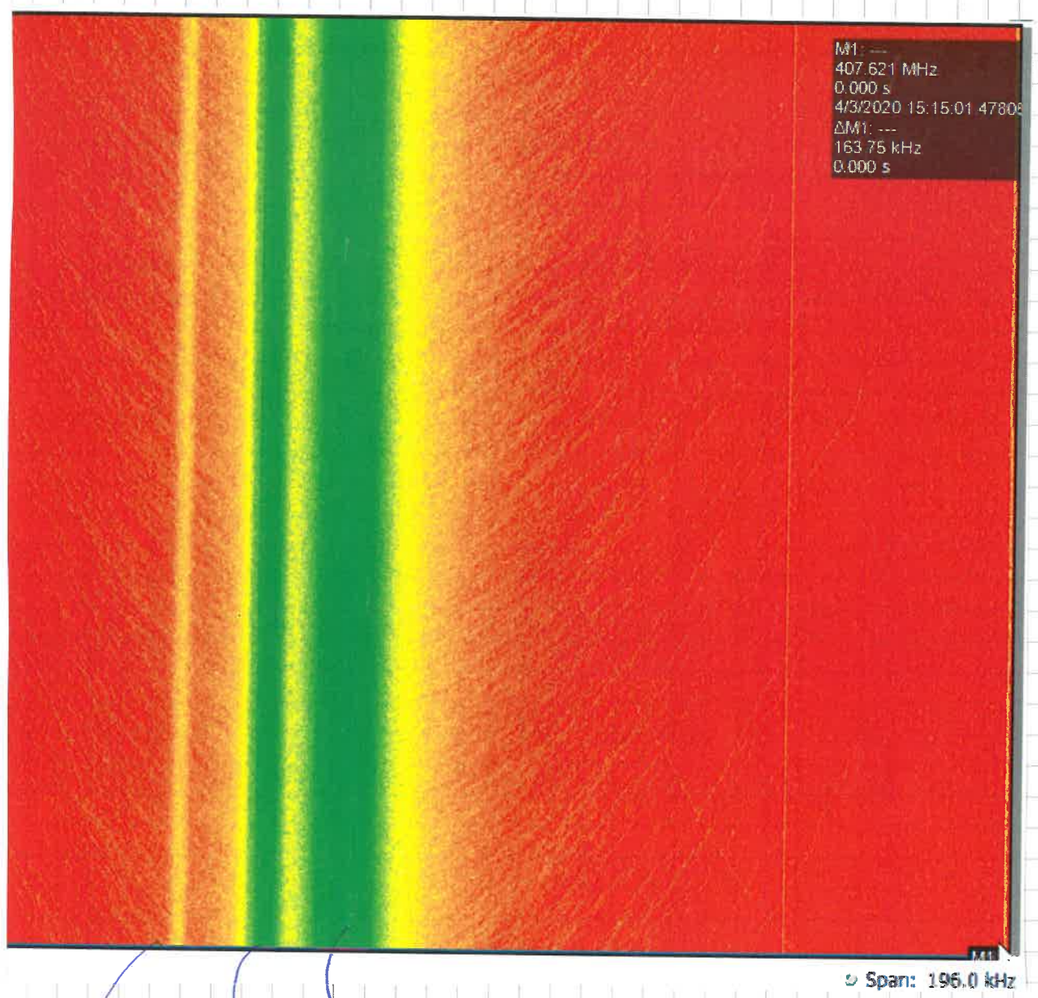
I_{ESR} (20:00) = 1.5 e6

I_{ESR} (20:30) = 1.4 e6

I_{ESR} (21:00) = 1.34 e6

I_{ESR} (21:30) = 1.34 e6

I_{ESR} (21:51) = 1.34 e6



$^{205}Tl^{81+}$

$^{200}Hg^{79+}$

$^{203}Hg^{80+}$

$^{195}Pt^{77+}$

22:07 Pattern stopped

22:09

NTCap Stop:

SC_2020-04-03_11-20-14
IQ_2020-04-03_11-20-05
(saved in p drive)
IQ Rate: 8 MS/s

22:10

Stop Run: 0307.lmd

22:11 NTCap Start.

SC_2020-04-03_22-12-50
IQ_2020-04-03_22-13-48
(saved in D drive)

22:11

Start Run: 0308.lmd

22:12

Yuri now wants to do some changes in S6 slit to reduce $^{205}Pb^{81+}$ from FRS.

22:14

Injection in ESR from SIS but Yuri is adjusting S6 & still not any storage measurement.

23:11 S6: was open — old
S6: -43.4/10 mm — New

No. of stackings: 20
I_{SIS}: 1.75 e9
I_{ESR}: (Ofset 5e5)

No storage
Gas jet is on for 5 s

In this setting, there should be zero $^{205}Pb^{81+}$ from FRS without cutting $^{205}Tl^{81+}$

just for setting

23:25

Before S6: open
Now S6: -20/7 mm
S2 slit remains the same: 0/35 mm

* 13) Zero Hour Measurement

S2: 0/35 mm
S6: -20/7 mm

23:29

No. of stackings: 60 (not all stacks, we get 53)

I_{SiR}: 1.75 e9

I_{ESR}: 2.9 e6 (offset 5e5)

→ Stacking time start: 23:29
Storage time start: 23:53
Storage time end: 23:53

→ Gas jet is on for 10 min (current mode)
Gas jet density: 4.0 e12
e^- cooler at Manipulation 13 on for: 2 min

I_{cooler}: 176 mA
File running: 0309.lmd

* 14) 0.5 Hour Storage Time

S2: 0/35 mm
S6: -20/7 mm

→ No. of stackings: 60
I_{SiR}: ~ 1.05 e9
I_{ESR}: 2.1 e6 (offset 5e5)

→ Stacking time starts: 23:53
Storage start time: 00:23 (4th April)
Storage stop time: 00:53 (4th April)
I_{cooler} during storage: -0.1 mA (20 mA)

→ Gas jet is on for 10 min (current mode)
Gas jet density: 4.03 e12
e^- cooler on at Manipulation 13 for: 3 min

I_{cooler}: 176 mA
File running: 0310.lmd

4th April, 2020

01:15

Electron cooler is broken during stacking

01:33

Pierre-Michel is over Electron Cooler Hero!
Electron cooler works again & we could do it in STORAGE TIME

GECEBG1E → Reset, → On
GECEBG8T → Reset, → On
GECEBG2T → Reset, → On

04:45

Accelerator operators switched on to a new 208 Pb electrode.

---

* What to do if Electron Cooler is Broken

1) In case of Electron cooler broken, GECEBG1E, GECEBG2T or/and GECEBG8T looks RED as shown in figure 1.

2) If the Long Storage Measurement is going on & we are on Step Manipulation 9, we can get them working

3) a) First click on GECEBG1E, then RESET it & then click on ON button

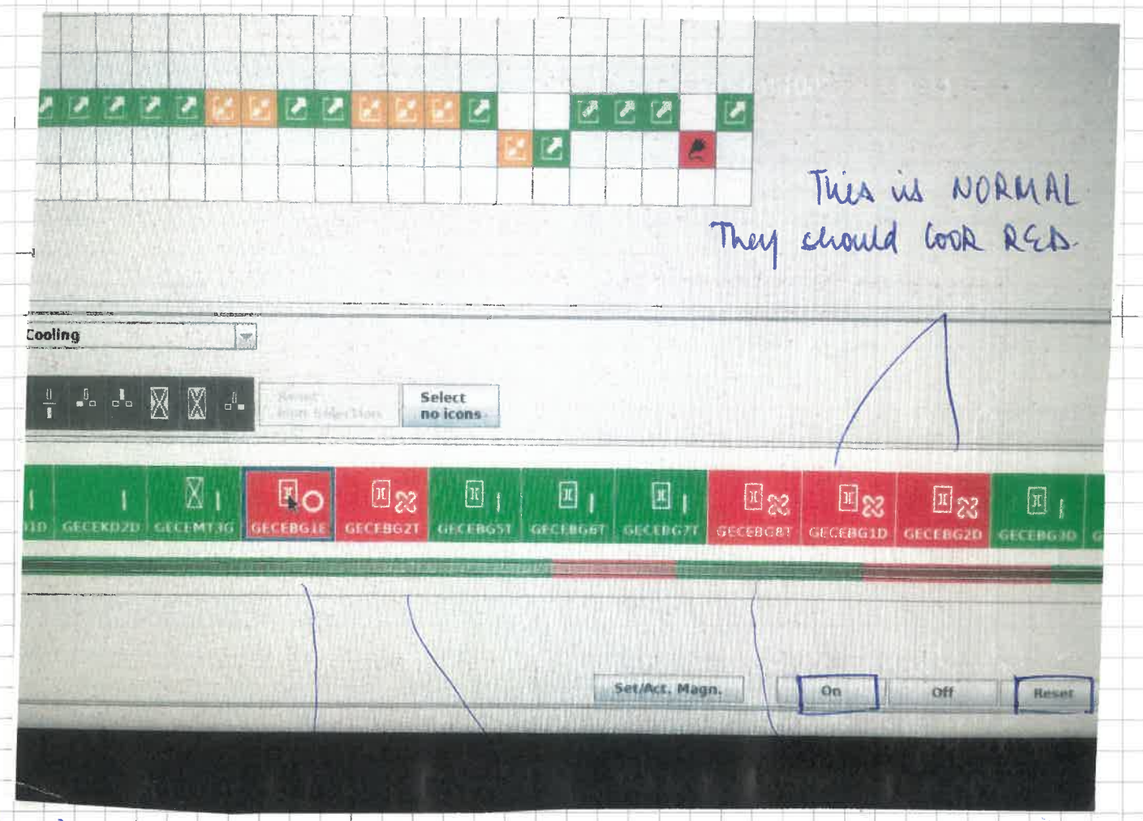
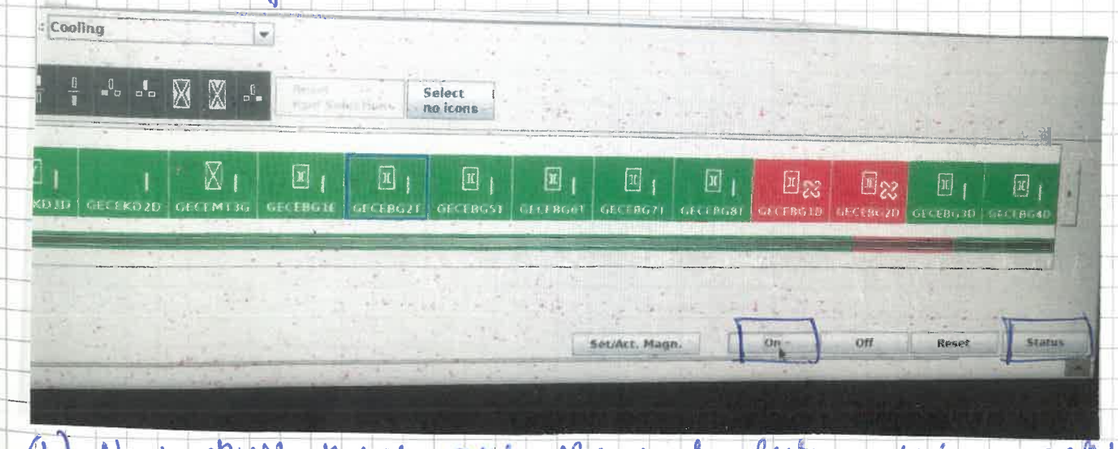


Fig 1) GECEBG1E, GECEBG2T & GECEBG8T are RED which means, electron cooler is BROKEN

b) Second click on GECEBG8T, then click on RESET button (on right bottom) & then click on ON button

c) Third click on GECEBG2T, then click on RESET button (on right bottom) & then click on ON button.



4) Now, these three are green & electron cooler works :)

* 15) Zero Storage time measurement

Storage time

S2 : 0/35 mm

S6 : -20/7 mm

No. of stackings : 60 (missed ~5 stacks, thus, no. ~55)

I_{SIS} : 1.75 e 9

I_{ESR} : 1.5 e 6 (offset 5 e 5)

→ Stacking time starts : 02:35

Storage time starts : 02:39

Storage time ends : 02:39

→ Gas jet is on for 10 mins (current mode)

Gas jet density : 4 e 12

e^- cooler at Manipulation 13 on for:

I_{cooler} : 178 mA

File running:

02:42

Since, I_{ESR} doesn't increase much, we have decided to go for 80 stackings

* 16) Six Hour Storage time

S2 : 0/35 mm

S6 : -20/7 mm

No of Stackings : 80

I_{SIS} : ~1.75 e 9

I_{ESR} : 1.91 e 6 (offset 5 e 5)

→ Stacking time starts : 02:52

Storage time starts : 03:22

Storage time ends : 09:22

I_{cooler} during storage : -1 mA (20 mA)

→ Gas jet is on for 10 mins (current mode)

Gas jet density : 4.23 E 12

e^- cooler Manipulation 13 on for : 8 mins

I_{cooler} : 177 mA

File running : 0312.lmd

I_{ESR} (04:00) = 1,76 E6

I_{ESR} (04:30) = 1,62 E6

I_{ESR} (05:00) = 1,56 E6

I_{ESR} (05:30) = 1,42 E6

I_{ESR} (06:00) = 1,33 E6

I_{ESR} (06:30) = 1,27 E6

I_{ESR} (07:00) = 1,20 E6

I_{ESR} (7:30) = 1.12 e6

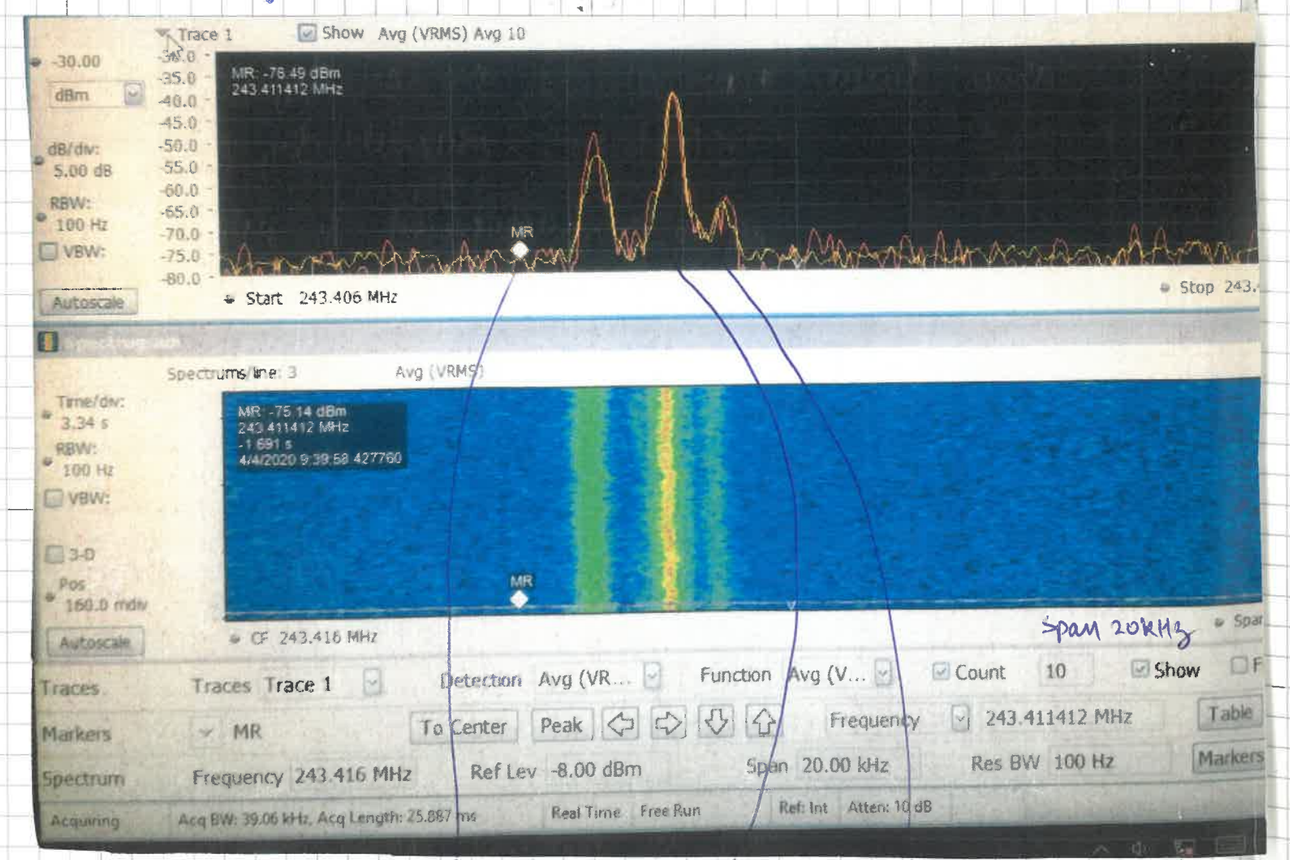
I_{ESR} (8:00) = –

I_{ESR} (8:30) = –

I_{ESR} (9:00) = 9.8 E5

I_{ESR} (9:32) : 9.85 e5

09:42 To heat up the source & get good SIS injections, empty 10 stacks are run for 10 times.



205 Pb 82+ 200 Hg 80+ 195 Pt 78+

* 17)

Fill Hours storage time

S2 : 0/35 mm
S6 : -20/7 mm

No. of stackings : ~ 70 (was set to 80 but we missed few shots)

I_{SIS} : 1.75 E9

I_{ESR} : 2E6 (offset 5e5)

→ Stacking time starts : 09:47
Storage time starts : 10:19
Storage time ends : 15:19
I_{cooler} during storage : – 1 nA (20 mA)

→ Gas jet is on for 10 mins (event mode)
Gas jet density : 3.91 E12
e cooler Manipulation 13 on for : 5 mins

I_{cooler} : 182 mA
File running : 0313.lmd

I_{ESR} (10:30) : 1.98 e6
I_{ESR} (11:00) : –
I_{ESR} (11:30) : 1.70 E6
I_{ESR} (12:00) : –
I_{ESR} (12:30) : –
I_{ESR} (13:07) : –

I_{ESR} (13:30) : 1.37 E6
I_{ESR} (14:00) : 1.28 E6
I_{ESR} (14:30) : 1.25 e6
I_{ESR} (15:00) :
I_{ESR} (15:19) :

* 18)

0.5 Hour Storage time

S2: 0|35 mm
S6: -20|7 mm

Number of stackings: 80
I_{SIS}: 1.25 e9
I_{ESR}: ~1.8 e6 (Offset 3.6 e5)

→ Stacking time starts 15:35
Storage time starts: 16:05
Storage time ends: 16:35

→ Gas jet is on for 10 mins (current mode)
Gas jet density: 4.08 e12

e⁻ cooler at Manipulation 13 on for:

I_{cooler}: 179 mA
All running: 0324 bmd

16:50 To heat up the Ion source, we started many cycles of 10 stacks with 5 s gas jet on.

~~16:~~
17:10 We ended these cycles & back to 80 stacks with 10 mins of gas jet on.

17:22 The beam in ESR is not coming!
17:41 Quadrupoll magnets are failed for ESR.
17:58 Beam is back in ESR.

* 19)

Zero Hour Storage time

S2: 0|35 mm
S6: -20|7 mm

Number of stackings: 80
I_{SIS}: 1.75 e9
I_{ESR}: 1.4 e6 (Offset ~ yes 5)

→ Stacking time starts: 17:58
Storage time starts: 18:28
Storage time ends: 18:28

→ Gas jet is on for 10 mins (current mode)
Gas jet density: 4.05 e12

e⁻ cooler Manipulation 13 on for: 2 mins

I_{cooler}: 177 mA
All running: 0339 bmd

18:42 The stacking stopped & I_{ESR} = 1.4 e6 even after 80 stacking. Now, we make a cycle of 10 injections & gas jet on for 5 secs.

19:00

NTCap Stop:

SC_2020-04-03_22-12-50
\ IQ_2020-04-03_22-13-48
(saved in drive: 0)

Run Stop: 0342.lmd

19:02

NTCap Start:

SC_2020-04-04_19-04-52
\ IQ_2020-04-04_19-04-52

(saved in drive: 0)
IQ Rate: 8 MS/s
Carrier Freq: 245 MHz

Start Run: 0343.lmd

19:11
Problem is solved.
There was HV power problem with the source.

*20)

Ten Hour Storage time (Missed Storage Measurement)

S2: 0/35 mm
S6: -20/7 mm

Number of stacking: 100
I_{ESR}: 1.8e-9
I_{esr}: ~2.5e-6 (offset 3e-5)

→ Stacking time starts: 19:17
Storage time starts: 19:55
Storage time ends: 05:55
Iconler during storage: -1 mA (20 mA)
→ Gas jet is on for 10 min (event mode)
Gas jet density:
e cooler manipulation 13 on for:

Icooler:
File running:

I_{ESR} (20:30): 2.25e6
I_{ESR} (21:00): 2.1e6
I_{ESR} (21:30): 2.0e6
I_{ESR} (22:00): 1.8e6
I_{ESR} (22:30):
I_{ESR} (23:00):

I_{ESR} (23:30) :

I_{ESR} (00:00) :

I_{ESR} (00:30) :

I_{ESR} (01:00) :

I_{ESR} (01:30) :

I_{ESR} (02:00) :

I_{ESR} (02:30) :

I_{ESR} (03:00) :

I_{ESR} (03:30) :

I_{ESR} (04:00) :

I_{ESR} (04:30) :

I_{ESR} (05:00) :

I_{ESR} (05:30) :

I_{ESR} (05:55) :

*21) Ten Hour Storage time

S2 : 0/35 mm

S6 : -20/7 mm

Number of stackings 100

I_{BIS} : ~ 1.8 E9

I_{ESR} : ~ 2.2 e6 (offset 5e5)

→ Stacking time start : 22:43

Storage time start : 23:23 (4th April)

Storage time end : 09:23 (5th April)

I cooler during storage : -1 mA (20 mA)

→ Gas jet is on for 10 min (event mode)

Gas jet density : 4.24 e 12

e cooler at Manipulation 13 on for : 6 min

I_{cooler} : 180 mA

File running : 0446.bmd

I_{ESR} (00:06) = 1,98 e6

2020 - 4 - 5

00:40 I(ESR) = 48 uA, I(cool) = 20 mA
01:00 I(ESR) = 45 uA, I(cool) = 20 mA
01:30 I(ESR) = 45 uA, I(cool) = 20 mA
02:00 I(ESR) = 41 uA, I(cool) = 20 mA
02:30 I(ESR) = 38 uA, I(cool) = 20 mA
03:30 I(ESR) = 34 nA, I(cool) = 20 mA
04:00 I(ESR) = 31 uA, I(cool) = 20 mA
04:30 I(ESR) = 29 uA, I(cool) = 20 mA
05:30 I(ESR) = 27 uA, I(cool) = 20 mA
06:15 I(ESR) = 25 uA I(cool) = 20 mA
06:57 I(ESR) = 22 uA I(cool) = 20 mA
07:30 ~ = 8E5 part.
8:37 I(ESR) ~ 7.4 e5
9:00 I(ESR): 7.06 e5
9:23 I(ESR): 6.9 e5

5th April, 2020

09:41 To wait up the ion source, we run few cycles of 10 injections & 5 l gas jet.

*227)

Two Hours Storage time
S2 : 0/35 mm
S6 : -20/7 mm

Number of stackings: 100
I_{SIS}: ~ 1.8 e9
I_{ESR}: ~ 2.2 e6

→ Stacking time starts: 09:52
Storage time starts: 10:30
Storage time ends: 12:30
I cooler during storage: - 1 mA (20 mA)

→ Gas jet is on for 10 mins (current mode).
Gas jet density: 4.16 e12
e⁻ cooler at Manipulation 13 on for: 3 mins

I_{cooler}: 182 mA
File running: 0499.lmd

I_{ESR}(11:00): 2.02 e6
I_{ESR}(11:30): -
I_{ESR}(12:10): 1.7 e6
I_{ESR}(12:30): 1.62 e6

12:44 stopped the pattern as Yuri wants to come.

23)

Zero Hour Storage Time
S2 : 0/35 mm
S6 : -20/7 mm

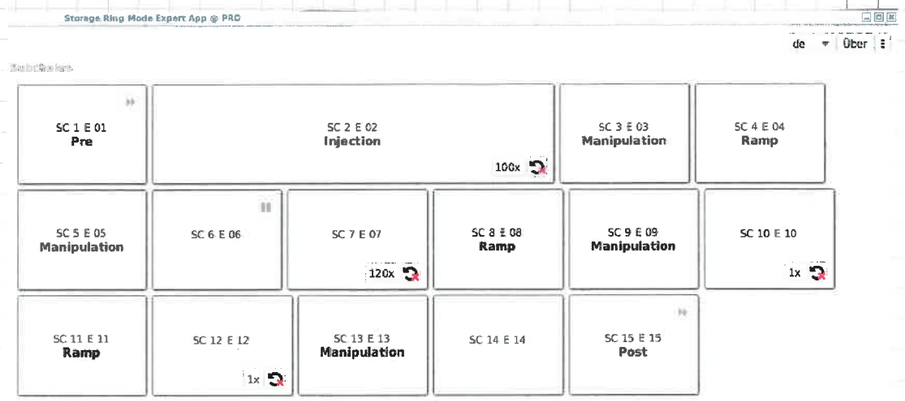
We have now gas jet on for 10 mins at SC7 E07 after stacking & we wait for ~1 hour at SC 9 E09 Manipulation step & then for ~5 mins at SC 13 E13 Manipulation step

Number of stackings : 100
I_{SIS} : ~2.2e9
I_{ESR} : ~2.1e6

→ Stacking time starts at : 12:59
Storage at Manipulation Step 9 starts at : 13:55
Storage at Manipulation Step 9 stops at : 14:55
I cooler at storage at Manipulation : -1 mA (20mA)
Storage at Manipulation Step 13 for : 5 mins
I cooler at storage at Manipulation 13 : 178 mA
I_{cooler} : 179 mA
File running:

→ Gas jet density when at SC7 E07 used for 10 mins : 4.11e12

→ Gas jet density when at SC 12 E12 used for 5 secs :



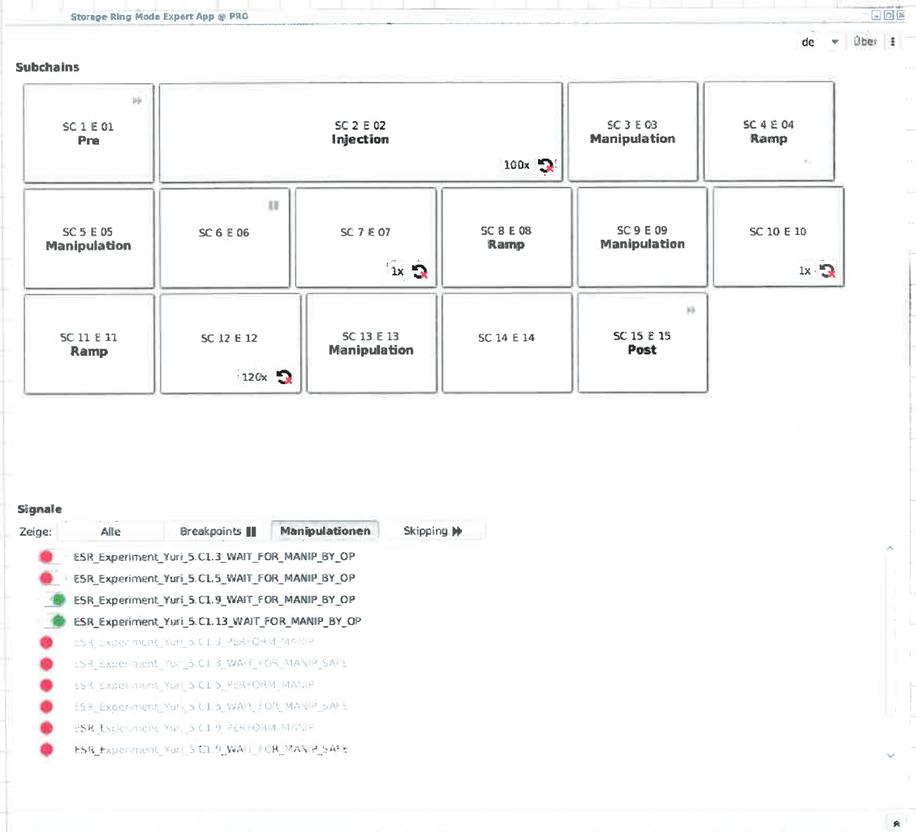
Now, at SC7 E07 gas jet is on for 10 mins
at SC 12 E12 gas jet is on for 5 secs.

14:05 The Trigger rate was ~5000 (so high) even without using CsI SiPMOS & MWPC.
The gain of all MSCF's was put to 0 & threshold to 244 (maximum) in order to get no trigger from CsI SiPMOS (inner detector)

15:02 Run ~~two~~ few cycles of 5 stacks & 1 gas jet of 5 s to heat the ion source.

15:10 Operators changed the cathode to the last one. I asked HTD to stop so that we can take maximum beam intensity from SEB.

15:27 Back to the previous Pattern



Gas jet is on at SC 12 E12 for 10 mins.

*24)

Four Hour Storage Time

S2: 0/35 mm
S6: -20/7 mm

Number of stackings: 100
I_{SIS}: ~ 2E9
I_{ESR}: ~ 2E6
→ Stacking time starts: 15:27
Storage time starts: 16:05
Storage time ends: 20:05
I cooler during storage: ~1 mA (20 mA)

→ Gas jet is on for 10 mins (current mode)
Gas jet density: 3.92 e 12
e^- cooler at Manipulation 13 on for: 5 mins

I_{cooler} = 180 mA
File running: 0539.lmd

16:10 Cooler power supply failure (GECEBG2T).
→ Reset successfull

I_{ESR} (16:30): 1.9 e6
I_{ESR} (17:00): 1.75 e6
I_{ESR} (17:30): 1.6e6
I_{ESR} (18:00): 1.55e6
I_{ESR} (18:30): 1.45e6
I_{ESR} (19:00): 1.3 e6
I_{ESR} (19:30): 1.25 e6
I_{ESR} (20:00): 1.2e6

20:21 Close run : 0539 . lmd
Start run : 0540 . lmd

*25) Half Hour Storage Time

S2 : 0/35 mm
S6 : -20/7 mm

Number of stackings : 100
I_{SIS} : ~ 2e9
I_{ESR} : ~ 2.2e6 (offset ~ 2.5e5)
→ Stacking time starts : 20:21
Storage time starts : 20:59
Storage time ends : 21:29
I cooler during storage : -1 mA (20 mA)
→ Gas jet is on for 10 mins (current mode)
Gas jet density : 4.14e12
e^- cooler at Manipulation 13 on for : 3 mins

I_{cooler} : 179 mA
File running : 0540 . lmd

21:56 we started with stacking of beam in ESR at 21:43, but at 21:56, the beam from SIS was lost after 23 injections

21:58 beam is back from SIS but we are still in the pattern with 100 stackings & 10 min gas jet on.

*26) Half Hour Storage Time

S2 : 0/35 mm
S6 : -20/7 mm

Number of stackings : ~90 (was set to 100 but ~10 stacks were missed)
I_{SIS} : ~ 1.75 e9
I_{ESR} : ~ 2.2 e6 (offset ~ 3e5)

→ Stacking time starts : 21:43
Storage time starts : 22:21
Storage time ends : 22:51
I cooler during storage : -1 mA (20 mA)

→ Gas jet is on for 10 mins (current mode)
Gas jet density : 4.2 e12
e^- cooler at Manipulation 13 on for : 3 mins

I_{cooler} : 179 mA
File running : 0546 . lmd

* 27)

One Hour Measurement

S2: 0/35 mm
S6: -20/7 mm

Number of stackings: 100
I_{SIS}: ~ 1.8 e9
I_{ESR}: ~ 2.2 e6 (offset ~ 3e5)

→ Stacking time starts: 23:04
Storage time starts: 23:42
Storage time ends: 00:42 (6th April, 2020)
I cooler during storage: -2 mA (20 mA)

→ Gas jet is on for 10 mins (current mode)
Gas jet density: 4.24 e12
e⁻ cooler at Manipulation 13 on for: 3 mins

I_{cooler} = 180 mA

File running: 0549.lmd

6th April, 2020

00:56 NTCal Start

SC_2020-04-04_19-04-52
\IQ_2020-04-04_19-04-52
(saved in 0 drive)

00:56 NTCal Start:

SC_2020-04-06_00-59-46
\IQ_2020-04-06_00-59-38
(saved in drive)

* 28)

Three Hour Measurement

S2: 0/35 mm
S6: ~~-20/7 mm~~

Number of stackings: 100
I_{SIS}: ~ 1.8 e9
I_{ESR}: ~ 2.4 e6 (offset ~ 3e5)

→ Stacking time starts: 00:57
Storage time starts: 01:35
Storage time ends: 04:35
I cooler during storage: -1 mA (20 mA)

→ Gas jet is on for 10 mins (current mode)
Gas jet density: 4.3 e12
e⁻ cooler at Manipulation 13 on for: 5 mins

I_{cooler} = 179 mA

File running: 0555.lmd

I_{ESR} (02:00): 2.25 e6
I_{ESR} (02:30): 2.04 e6
I_{ESR} (03:00): 1.96 e6
I_{ESR} (03:30): 1.87 e6
I_{ESR} (04:00): 1.56 e6
I_{ESR} (04:35):

*29)

Zero Hour Measurement

S2: 0/35 mm
S6: -20/7 mm

Number of stackings: 100
I_{SIS}: ~ 1.75e9
I_{ESR}: 2.2e6 (offset 5e5)

→ Stacking time starts: 04:51
Storage time starts: 05:28
Storage time ends: 05:28
I cooler during storage: (20 mA)

→ Gas jet is on for 10 mins (current mode)
Gas jet density: 4.45e12
e^- cooler at Manipulation 13 on for: 2 mins
I_{cooler}: 178 mA
File running: 0555.lmd

*30)

1.5 Hour Measurement

S2: 0/35 mm
S6: -20/7 mm

Number of stackings: 100
I_{SIS}: ~ 1.75e9
I_{ESR}: 2.36e6 (offset 3e5)

→ Stacking time starts: 05:41
Storage time starts: 06:19
Storage time ends: 07:49
I cooler during storage: -1 mA (20 mA)

→ Gas jet is on for 10 mins (current mode)
Gas jet density: 4.36e12
e^- cooler at Manipulation 13 on for: 3 mins
I_{cooler}: 179 mA
File running: 0558.lmd

I_{ESR} (7:20) = 2.05e6
I_{ESR} (7:49) = 2.0e6

08:02 Pattern is stopped & we are about to start the final long measurement.

*31)

Tell tale measurement

S2: 0/35 mm
S6: -20/7 mm

Number of stackings: 200
I_{SIS}: ~ 1.8 e9
I_{ESR}: ~3.1 e6 (offset 4e5)

→ Stacking time start: 08:12
Storage time start: 09:27
Storage time end: 19:27
I cooler during storage: -1 mA (20 mA)

→ Gas jet is on for 10 min (current mode)
Gas jet density: 4.15e12

e⁻ cooler at Manipulation 13 on for: 10 mins

I_{cooler}: 180 mA
File running:

I_{ESR} (10:34): 2.78 E6
I_{ESR} (11:07): 2.53 E6
I_{ESR} (12:07): 2.2 E6
I_{ESR} (13:43): 1.7 E6
I_{ESR} (14:00): 1.6 E6
I_{ESR} (15:24): 1.43 E6
I_{ESR} (16:19): 1.3 e6
I_{ESR} (17:03): 1.3 e6
~ (18:20): 1.15 E6
~ 18:50: 9.5 E6
~ 19:27: 8.5 e6

14:17 We saw reduction in ESR beam life. It turned out that FRS has opened valves & venting caused us reduction of the quality of vacuum.

14:57 Cooler component GECEB2T was off again which was Reset

19:49 Last measurement is finished !! :) :)

19:51 we ask the operators to ramp down the magnet

19:52 NICap Step

SC_2020-04-06_00-59-46
IQ_2020-04-06_00-59-38
(saved in 0 drive)

19:53 Run Stop : 0588 lmd

19:54 NICap details

RFSA
Carrier Freq : 245 M
IQ Rate : 8 M
Reference level (dBm) : -30
RF Attenuation (dB) : 40
IF Attenuation (dB) : 19.9288

Data Files
Samples/Record : 18 262144
Record/File 12 4096

SC Files
Entries/File : 18 262144

21:30 CeISiPHOS has been taken out from the detector pocket

S2: -10/35 mm

S6: open

Storage time	Measurements done		
0 hr	X (40 stacks)		
0.5 hr			
1 hr	X (30 stacks)		
1.5 hr			
2 hr			
3 hr			
3.5 hr			
4 hr			
5 hr			
6 hr			
7 hr			
8 hr			
10 hr			
More hr			

S2: 0/35 mm

S6: open

Storage time	Measurements done			
0 hr	X (20 stacks)	X(30 stacks)	X (38 stacks)	
0.5 hr	X (9 stacks)	X(30 stacks)	X (54 stacks)	
1 hr	X (20 stacks)	X(30 stacks)		
1.5 hr				
2 hr	X (20 stacks)	X (20 stacks)	X(20 stacks)	X(30 stacks)
3 hr	X (30 stacks)			
3.5 hr				
4 hr	X (30 stacks)			
5 hr				
6 hr				
7 hr				
8 hr	X (50 stacks)			
10 hr				
More hr				

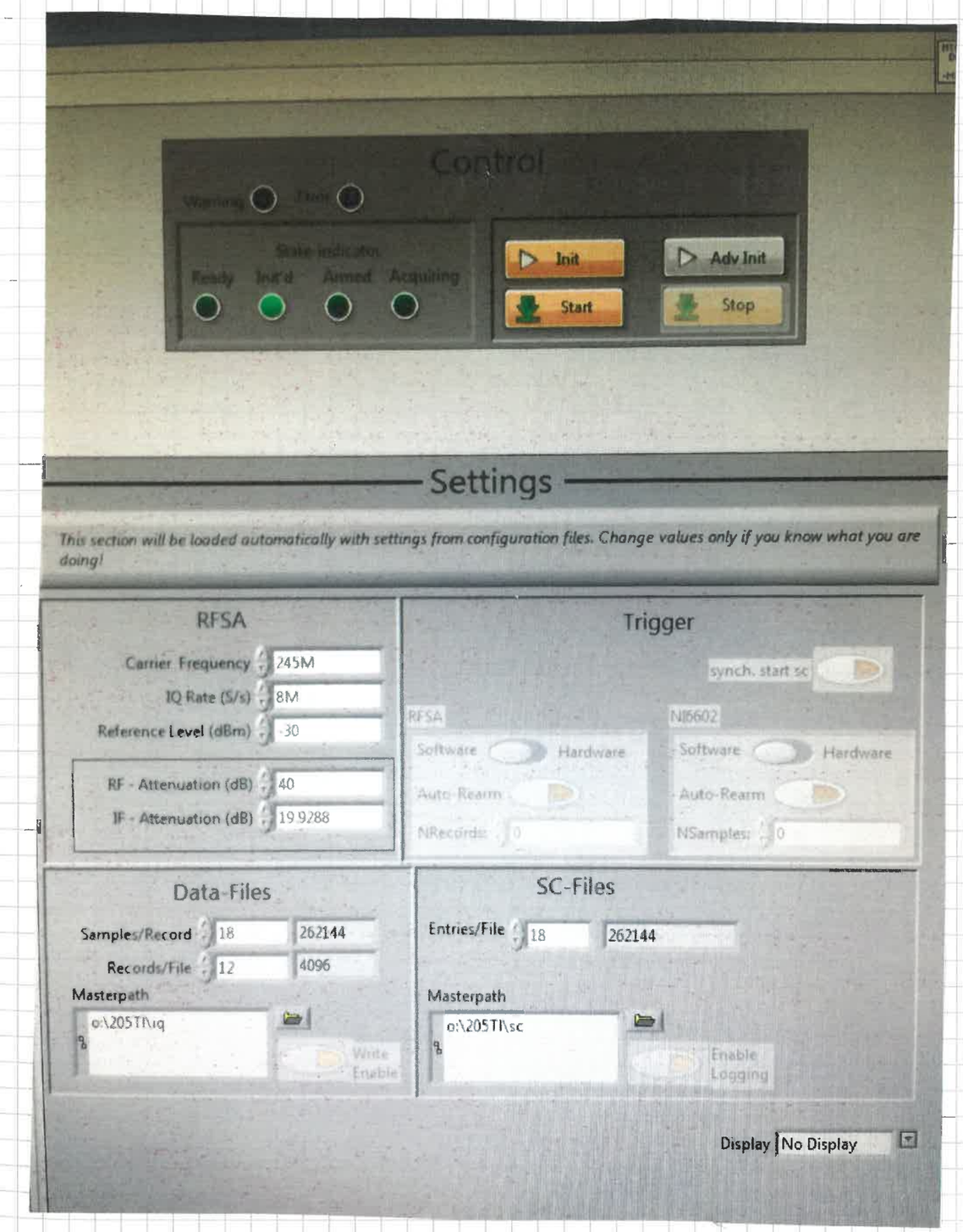
S2: 0/35 mm

S6: -20/7 mm

Storage time	Measurements done				
0 hr	X (60 stacks)	X(60 stacks)	X(~65 stacks)	X(100 stacks)	X(100 stacks)
0.5 hr	X (60 stacks)	X(80 stacks)	X(100 stacks)	X(90 stacks)	
1 hr	X(100 stacks)				
1.5 hr	X(100 stacks)				
2 hr	X(100 stacks)				
3 hr	X(100 stacks)				
3.5 hr					
4 hr	X(100 stacks)				
5 hr	X (70 stacks)				
6 hr	X (80 stacks)				
7 hr					
8 hr					
10 hr	X(100 stacks)	X(200 stacks)			
More hr					

Shift Plan for E121

	Wed 25.03.	Thurs 26.03.	Fri 27.03.	Sat 28.03.	Sun 29.03.	Mon 30.03.	Tue 31.03.	Wed 1.04.	Thurs 2.04	Fri 3.04	Sat 4.04	Sun 5.04	Mon 6.04
7:00 - 15:00 Morg	Ragan/Ruijiu	Ragan/Ruijiu	cancelled	Mei Bai, Tino	Oliver	Mei Bai, Tino	cancelled	cancelled	Serge	Mei Bai, Shahab	Shahab	Shahab	Shahab
15:00 - 23:00 Afternoon	Ragan/Ruijiu	Ragan/Ruijiu	cancelled	Alex, Esther	Shahab	cancelled	cancelled	cancelled	Nikos	Laszlo	Alex, Esther	Alex, Esther	Pierre-M.
23:00 - 9:00 Night	Ragan/Ruijiu	Ragan/Ruijiu	Pierre-M.	cancelled	Serge, Dima	Pierre-M., Dima	Oliver, Tino	Oliver, Esther	Pierre-M., Dima	Pierre-M., Dima	Ruijiu, Laszlo	Nikos, Laszlo	



NTCaq Settings

* The offset between the NTCap computer time and the real time is ~ 2 minutes.

e.g.

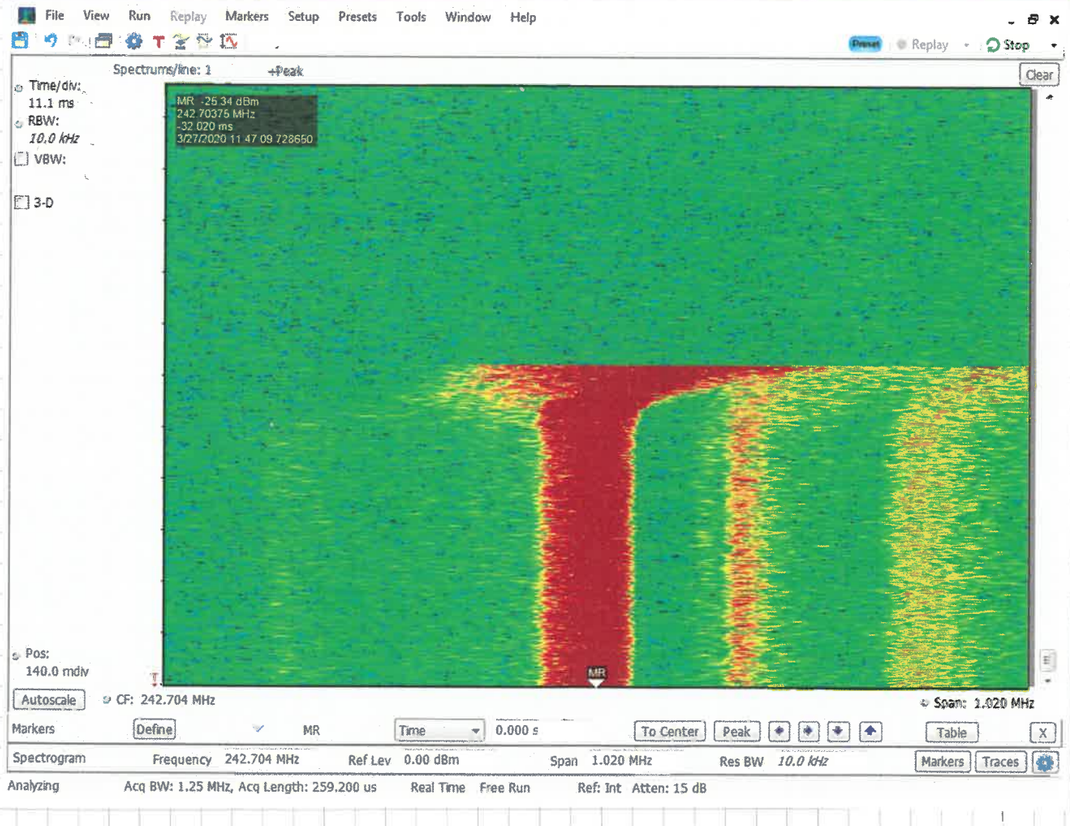
Real time : 10:02
NTCap time : 10:04

Logbook from ESR team

Message ID: **264**	Entry time: **Thu Mar 26 22:34:22 2020**
Author:	Sergey
Category:	Setup
Type:	machine
Subject:	ESR parameters

The ESR injection tune changed from 2.33 to 2.35 which corresponds to the previous experiment (pgamma) with stochastic cooling. The injection intensity was not changed. The RF setting is prepared for the stacking, as well as Frequency shift. For the example, one can look in the our old pattern with stacking: "ENGRUN2019 only accumulation" The Beam is given to the FRS (Yuri and Helmut)

Message ID: **265**	Entry time: **Fri Mar 27 12:30:33 2020**
Author:	BL, RJ, SW
Category:	
Type:	
Subject:	Stochastic Cooling,Pb 81+
Attachment 1:	sc1.PNG 825 kB | Hide | Hide all



Message ID: **266** Entry time: **Fri Mar 27 17:16:28 2020**

Author:	BL, MS
Category:	Tuning
Type:	machine
Subject:	improved momentum acceptance

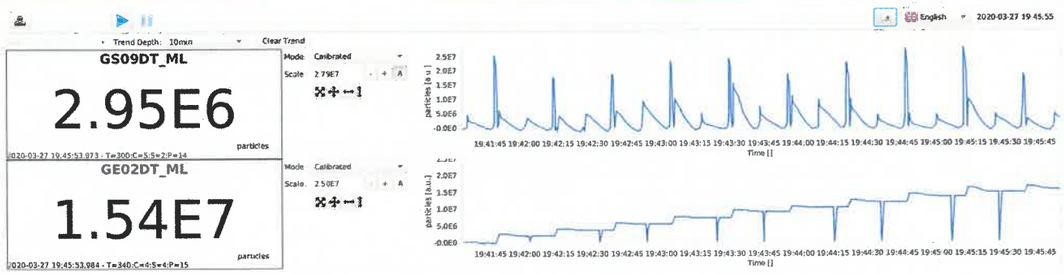
By changing the tune to Qx=2.33, Qy=2.36 the momentum acceptance was significantly improved. A variation of the cooler voltage of 10300 V was possible without beam loss. That corresponds to a momentum acceptance of 2.7 %. That should provide good conditions for longitudinal stacking.

Message ID: **267** Entry time: **Fri Mar 27 19:56:54 2020**

Author:	Mst;SL
Category:	Setup
Type:	machine
Subject:	beam stacking established

The stacking of the primary beam was established. There is continuous cooling on the injection orbit by stochastic cooling and by electron cooling on the stack orbit. (Time controlled operation of stochastic cooling could not be achieved due to controls issues). After stchastic cooling on the injection orbit the rf system decelerates the beam by 1.5 % in momentum and at the lower momentum electron cooling keeps the beam. The DC trafo shows accumulation of 10 injections of primary low intensity Pb81+ beam. Losses during the accumulation seems to be small.

Attachment 1:	stacking1-2020-03-27_19-45-56_tcl1032_lassie-monitor.png 133 kB | Hide | Hide all

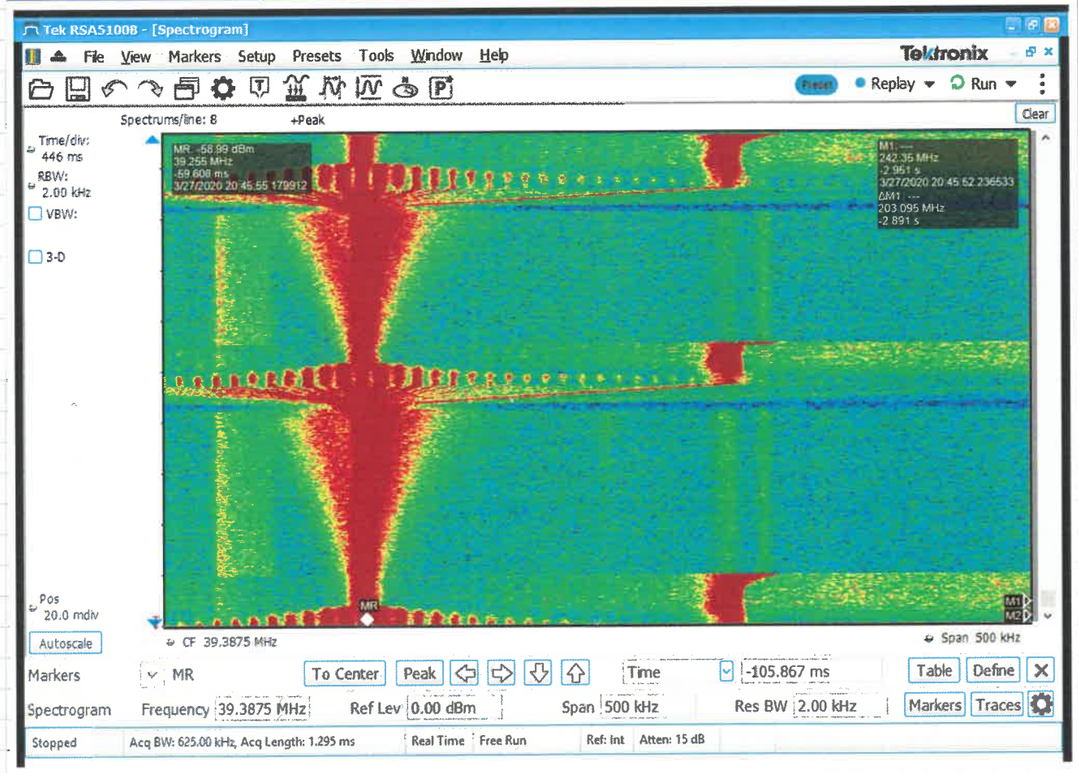


Message ID: **269** Entry time: **Sat Mar 28 10:12:20 2020**

Author:	M.Steck
Category:	Documentations
Type:	machine
Subject:	Stacking process in frequency domain

Spectrum analyser picture shows the repeated stacking of Pb81+ in the ESR. After stochastic cooling on the injection orbit (higher) frequency) the beam is decelerated with the rf (h=1) and kept at the lower momentum by electron cooling. The application of rf at the injection orbit results in a modulation of the stacked beam and corresponding side bands which disappears when the rf amplitude is decreased.

Attachment 1:	stacking-Pb81-demo.PNG 731 kB | Hide | Hide all



Message ID: **271** Entry time: **Thu Apr 2 01:44:26 2020**

Author:	Sergey
Category:	Failure
Type:	LSA
Subject:	Horizontal correctors KX

Horizontal correctors do right bumps in reality, but in Paramodi they show wrong target bumps. The values cannot be changed, the paramodi calculates overcurrent. I keep them like this, in order to start experiment