Ageing Study Update and a Next Generation SuperB Ageing Chamber

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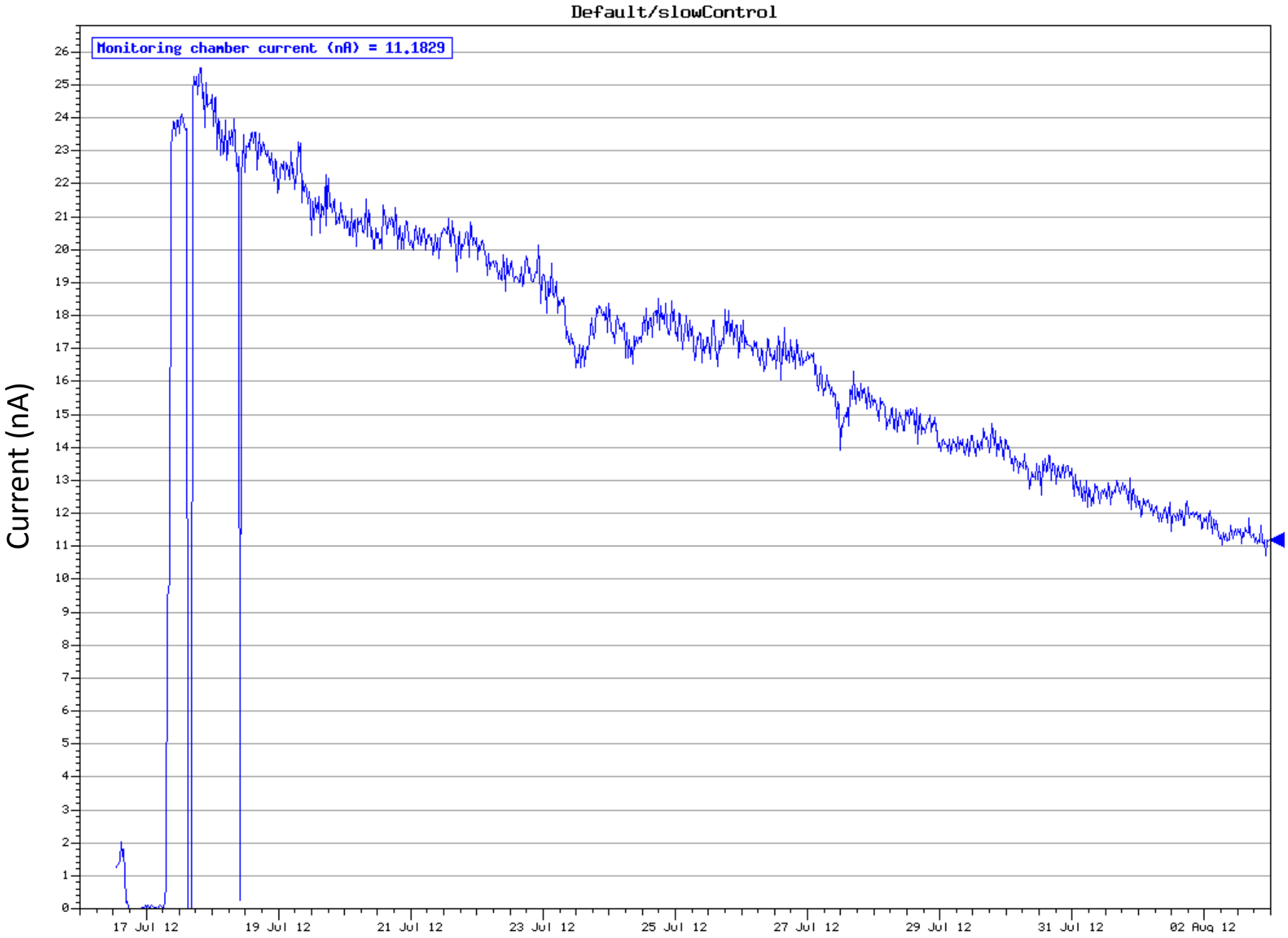
SuperB Collaboration Meeting, DCH II
Sept 20th, 2012

Ageing study status

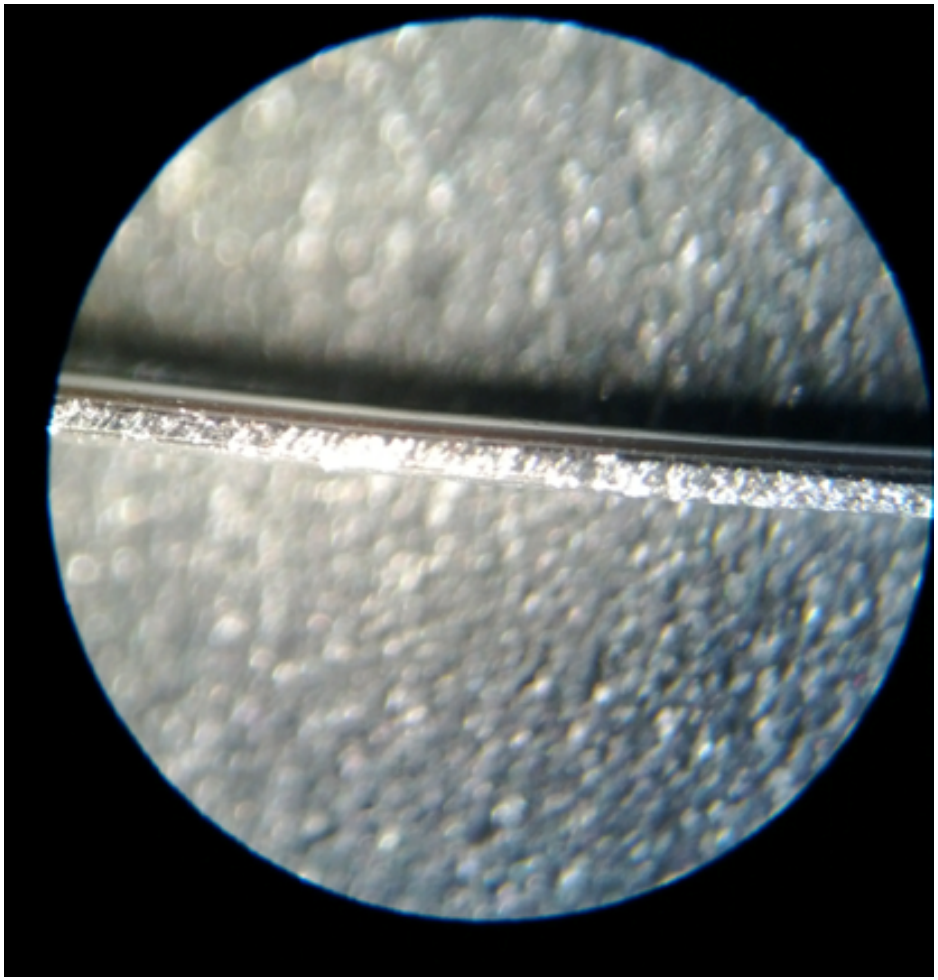
- Single hex cell Babar gas
- More than 300mC/cm
- Still seeing reasonable Fe55 pulses
  - no sign of loss of gas gain

Monitoring Chamber Dead

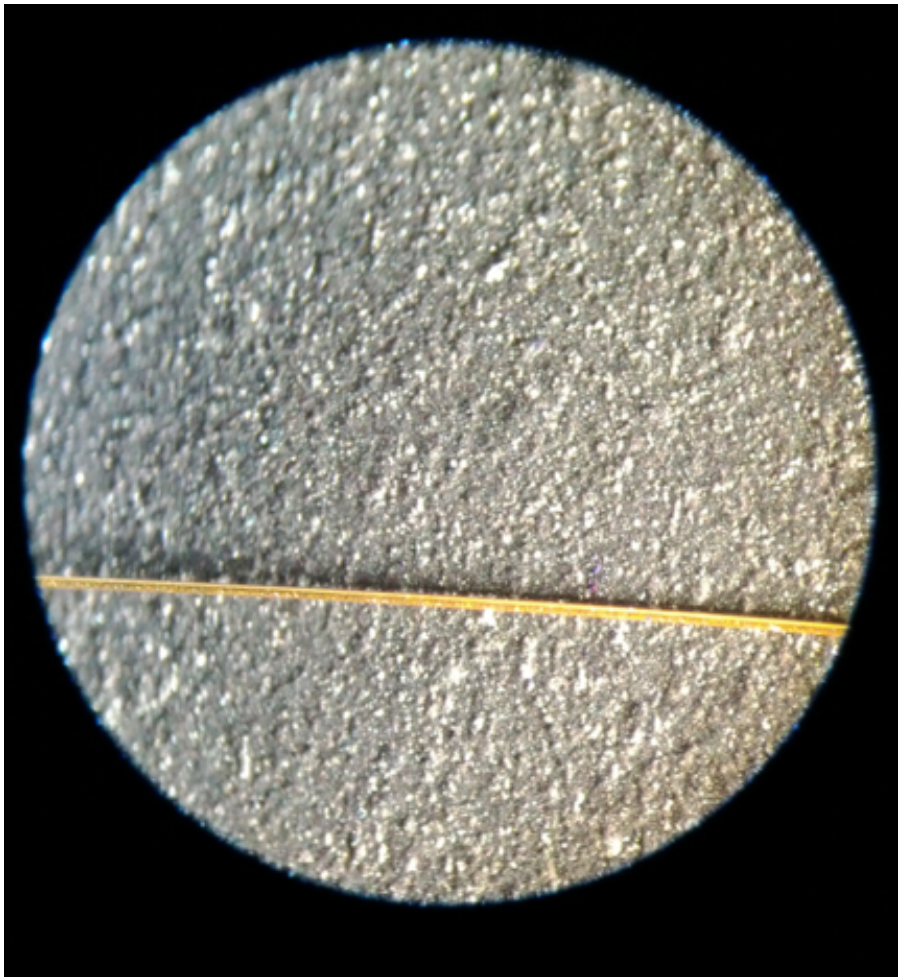
- Used a monitoring chamber as a control for the ageing chamber
- Borrowed it for August beam test to correct for density variation
- Lost >50% gain with ~2mC/cm
- Not sure what happened
- Ageing chamber used gold plated Al wires
- Monitoring chamber used bare Al wires

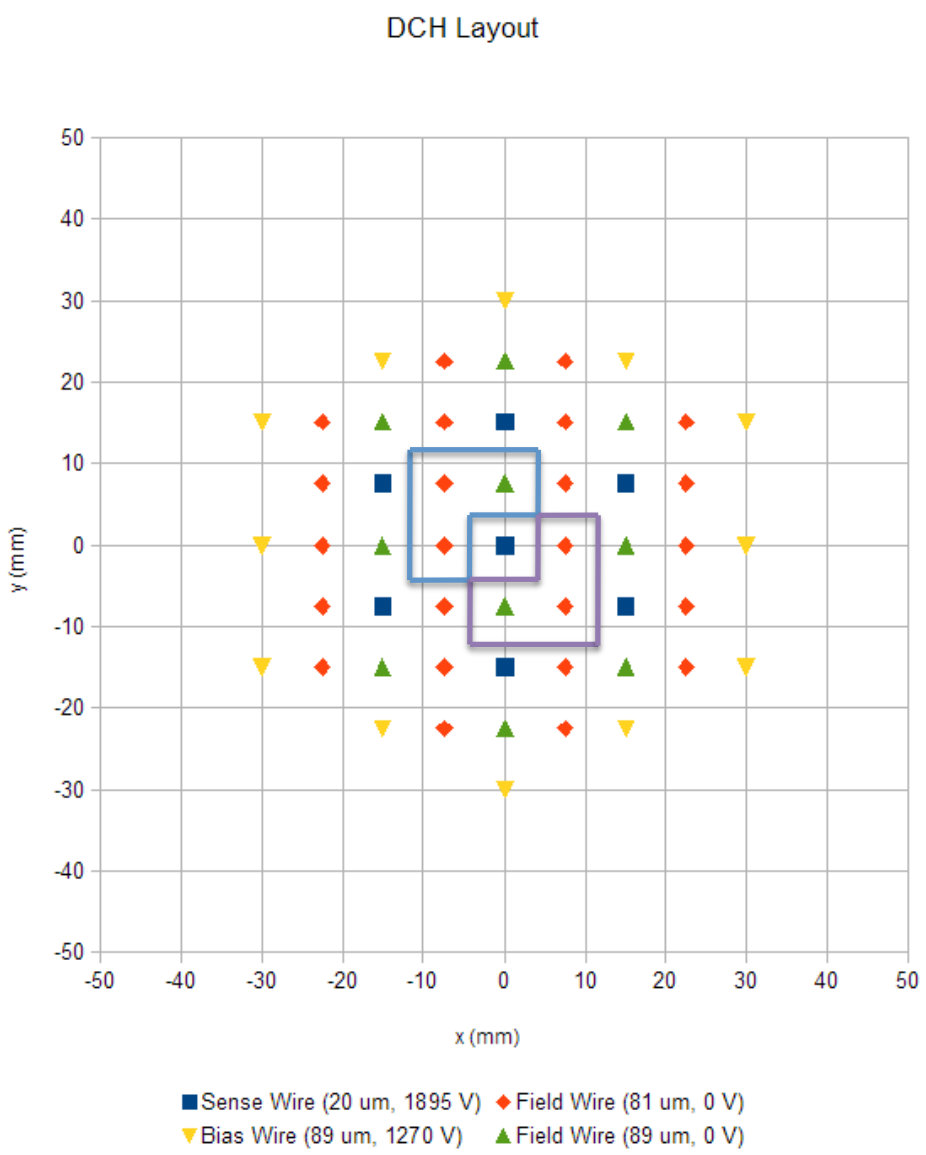

Default/slowControl
Monitoring chamber current (nA) = 11.1829
Current (nA)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
17 Jul 12
19 Jul 12
21 Jul 12
23 Jul 12
25 Jul 12
27 Jul 12
29 Jul 12
31 Jul 12
02 Aug 12

120 micron Al field wire



20 gold plated tungsten sense wire





Next Generation Ageing Chamber

Plot produced by
Philip Lu @ TRIUMF

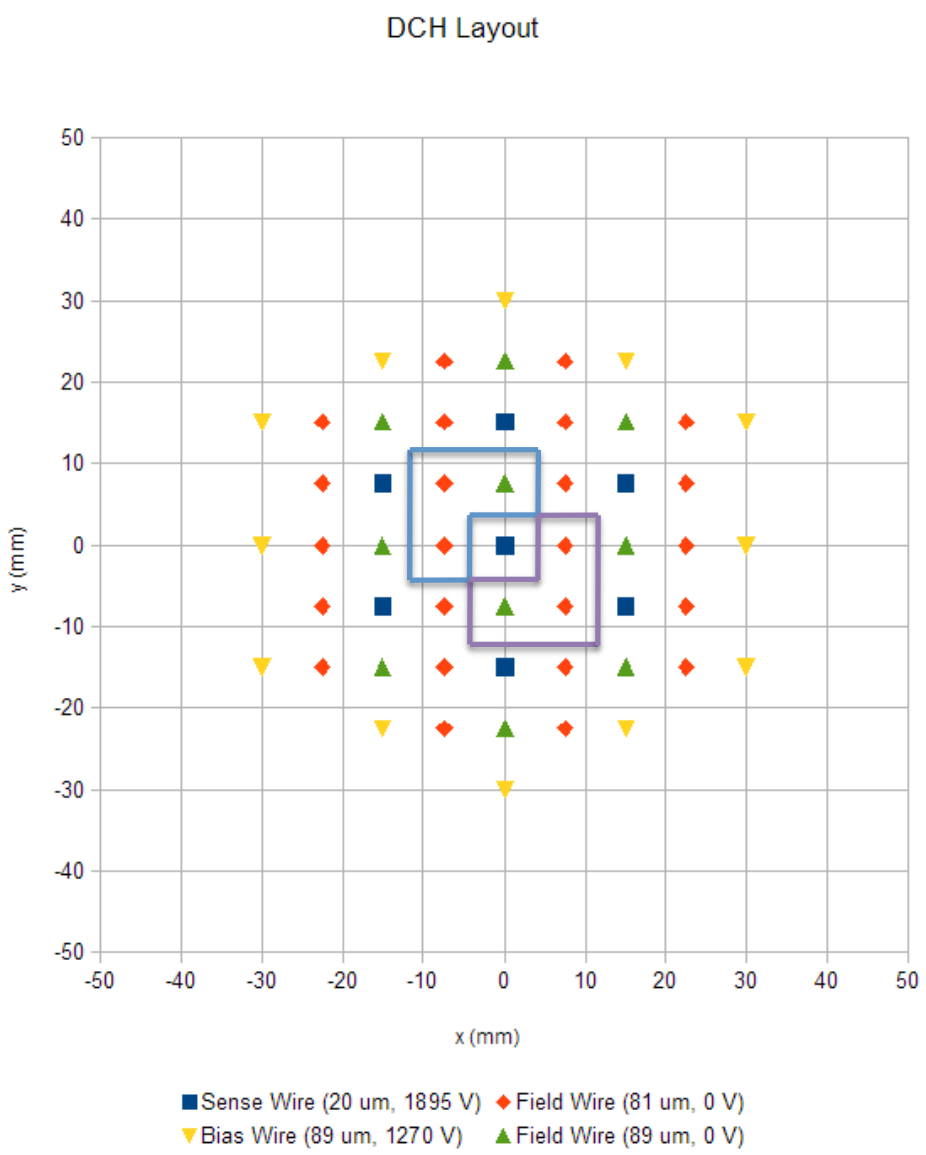
Voltages found using Garfield

Use different field wire diameters to get consistent fields

Measure current on 3 field wires because wire ratio is 1 sense : 3 field (Babar ageing chamber is 1:6)

Accumulated charge per field wire is more relevant than sense wire

Next Generation Ageing Chamber



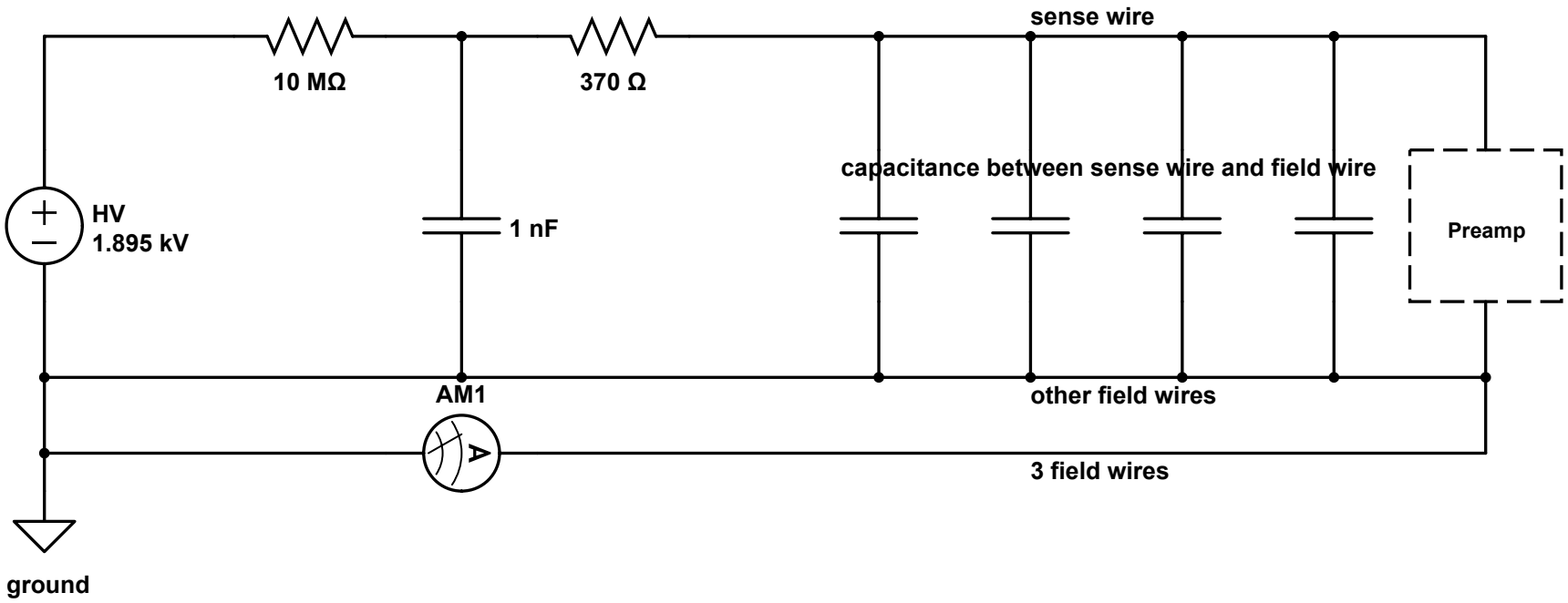
Adding an extra layer is a more realistic ageing environment

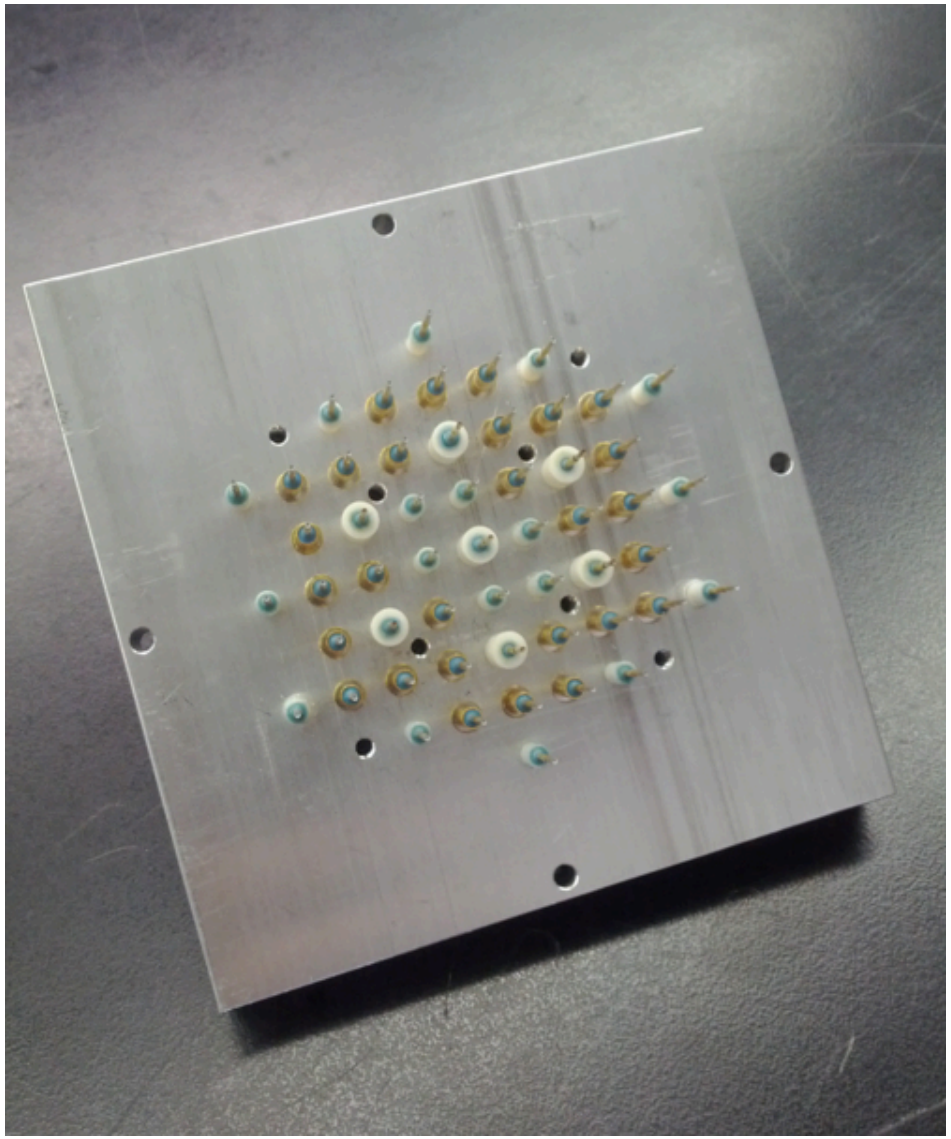
Positive ions drift to field wires in all directions instead of just from the centre

Use the Bertan HV to measure current draw on sense wire

Measure current on 2 sets of 3 field wires as a cross check

Circuit almost the same as long chambers used in TRIUMF beam test





Need a service board

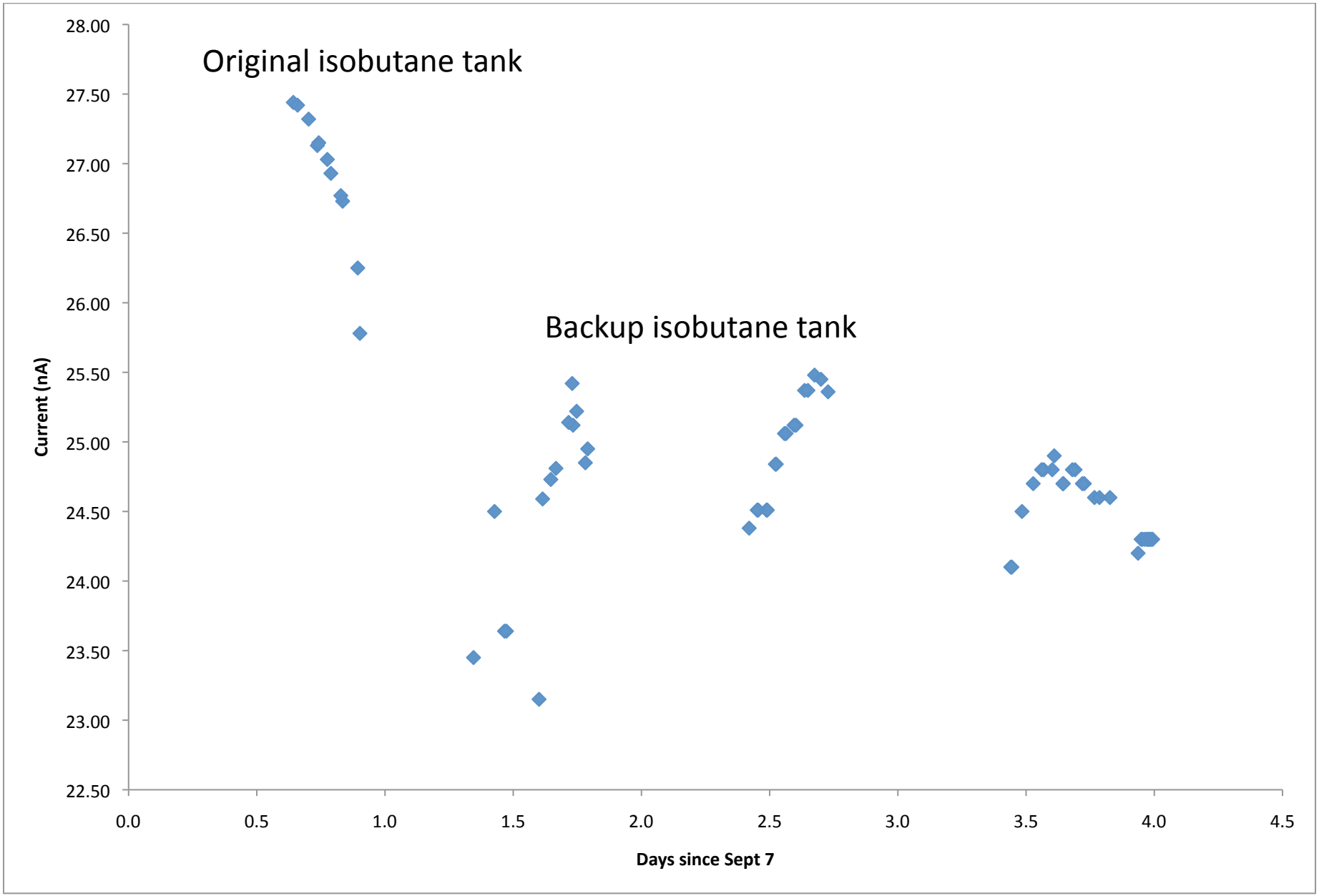
End plate prototype sent to Steven Robertson @ the University of McGill for designing service board

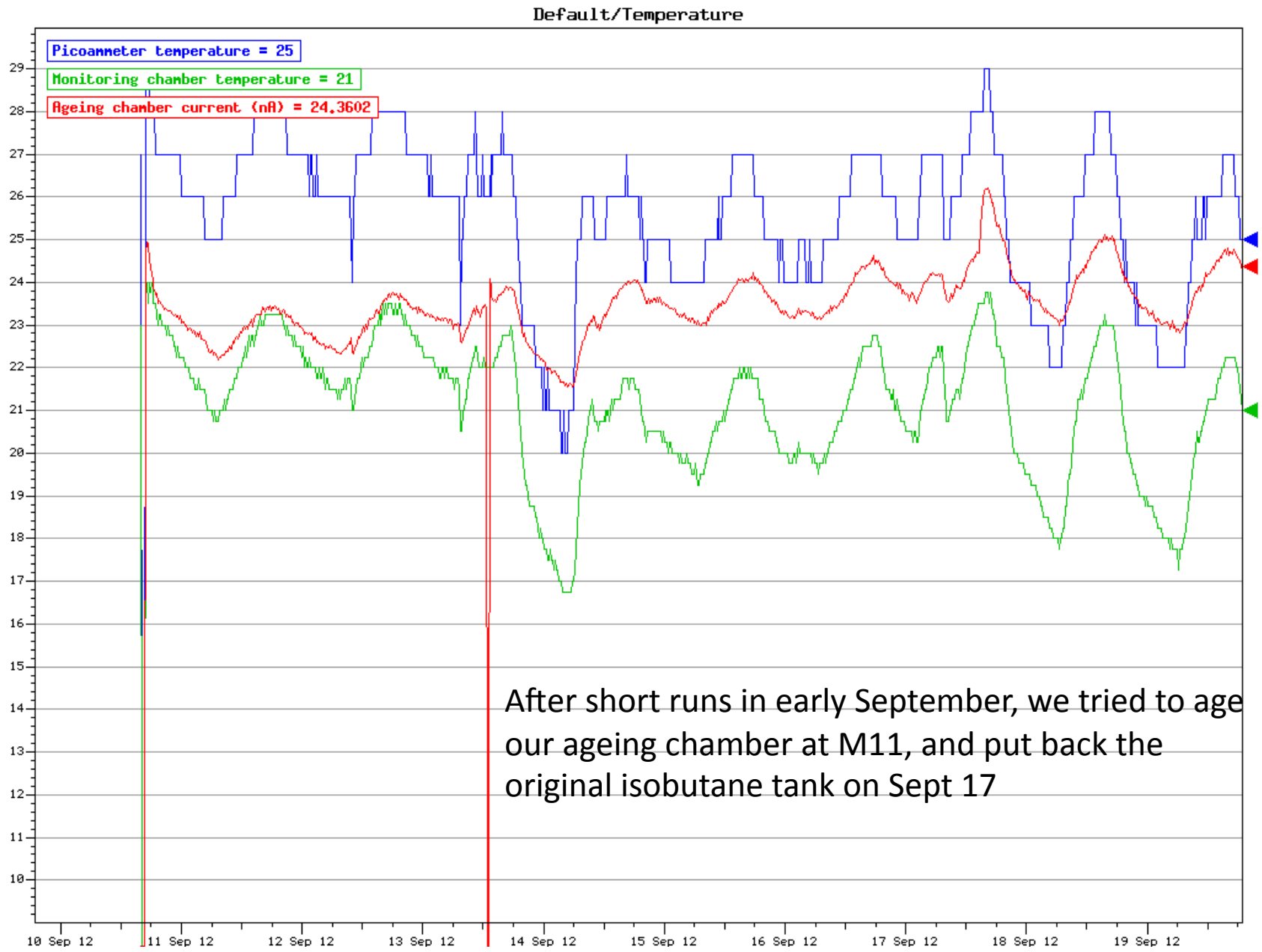
Field wires for current measurements use insulated feedthroughs

Other field wires use metal feedthroughs

September beam test

- We had to use the ageing chamber as a monitoring chamber
- Saw a loss of 10% drop in current in less than a day
- Switched isobutane tank and drop in current stopped
- Switched back isobutane on Monday, but the loss in gain is not reproducible


Original isobutane tank
Backup isobutane tank
Current (nA)
28.00
27.50
27.00
26.50
26.00
25.50
25.00
24.50
24.00
23.50
23.00
22.50
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
Days since Sept 7


Default/Temperature
Picoammeter temperature = 25
Monitoring chamber temperature = 21
Ageing chamber current (nA) = 24.3602
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
10 Sep 12
11 Sep 12
12 Sep 12
13 Sep 12
14 Sep 12
15 Sep 12
16 Sep 12
17 Sep 12
18 Sep 12
19 Sep 12
After short runs in early September, we tried to age our ageing chamber at M11, and put back the original isobutane tank on Sept 17

Outlook

- One day we will stop ageing the current ageing chamber
- Would be nice to have a carbon fibre end plate
- From beam test, 50ohm amplifier requires more gas gain compared to 370ohm amplifier
  - Difference of 60V required, about 2x gas gain
- Can always resort to adding water to slow down ageing