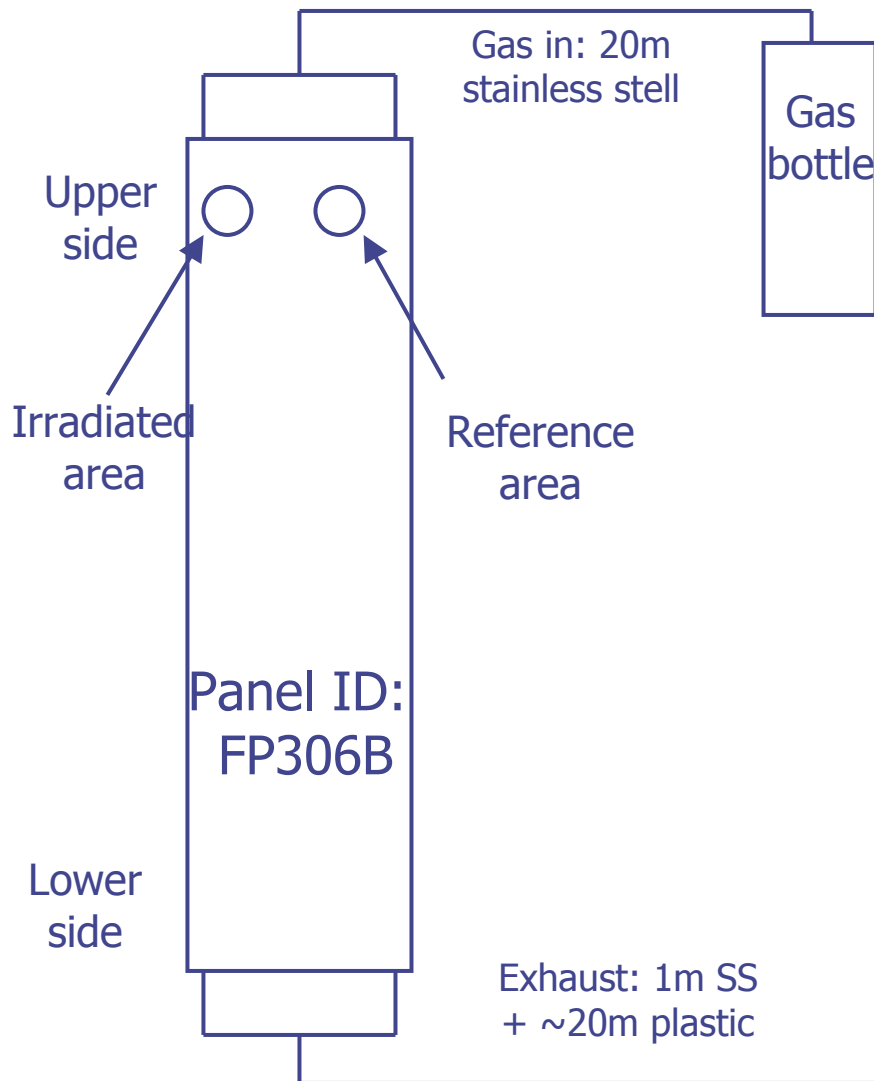


Set-up for testing module 123



Parameters:

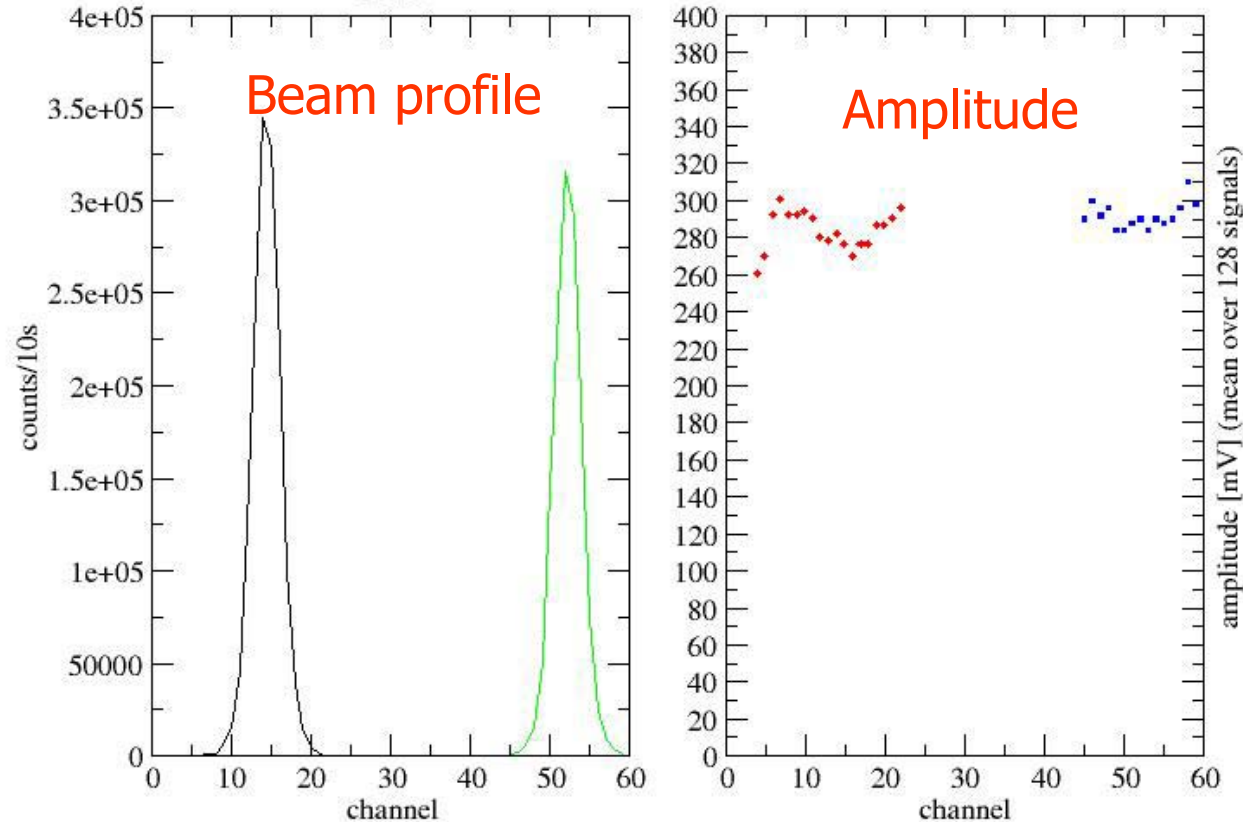
- Total irradiated area: $\sim 25\text{cm}^2$
- Source: ^{55}Fe
- Voltage 1600V
- Total current: $\sim 400\text{nA}$
- Current in hottest straw: $\sim 100\text{nA}$
- Total duration of irradiation: 144h
- Total integrated charge: $\sim 200\text{mC}$
- Integrated charge in hottest straw: $\sim 50\text{mC}$



Measurements before irradiation:

UpperSide 13.12.05

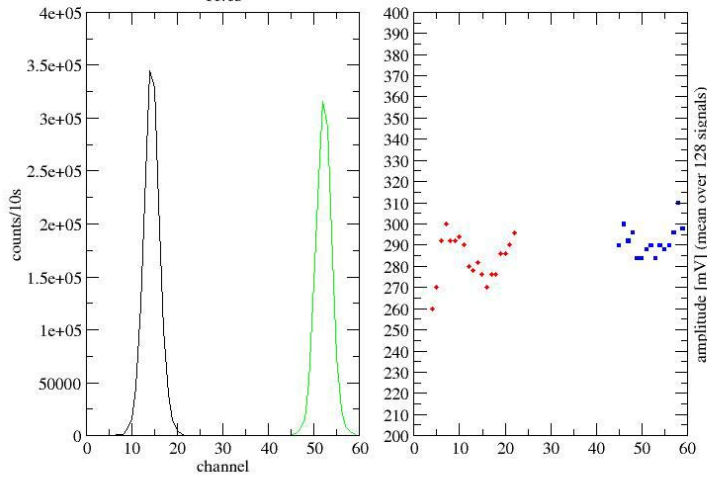
11:15



Evolution during irradiation

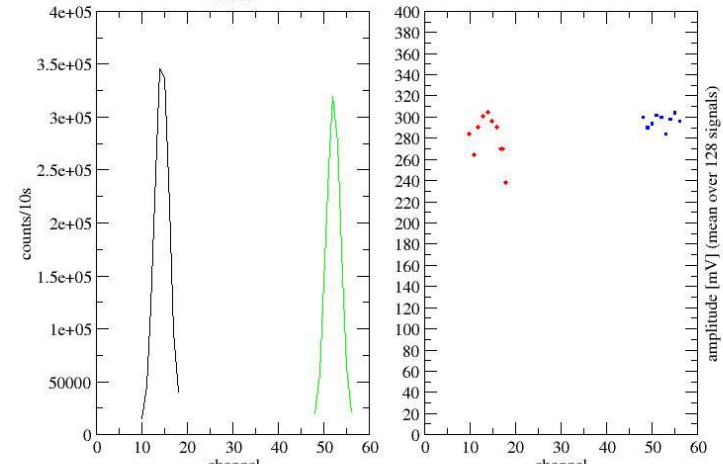
Test other side 13.12.05

11:15



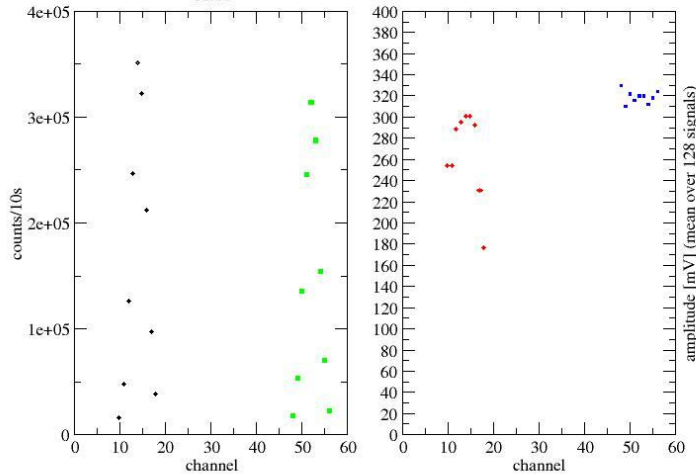
UpperSide 13.12.05

17:40



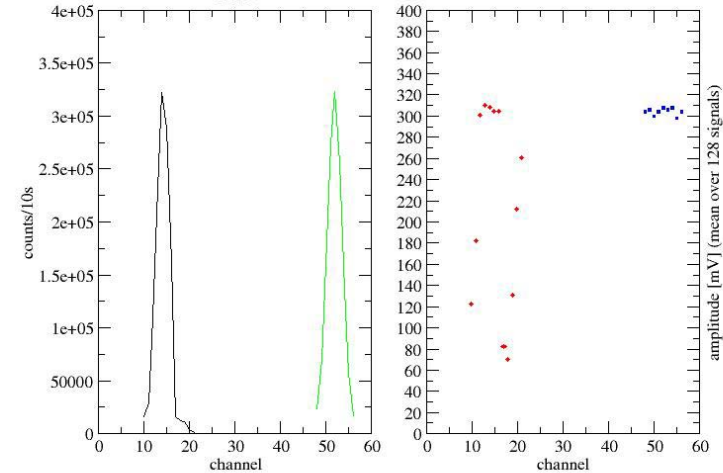
UpperSide 14.12.05

10:00

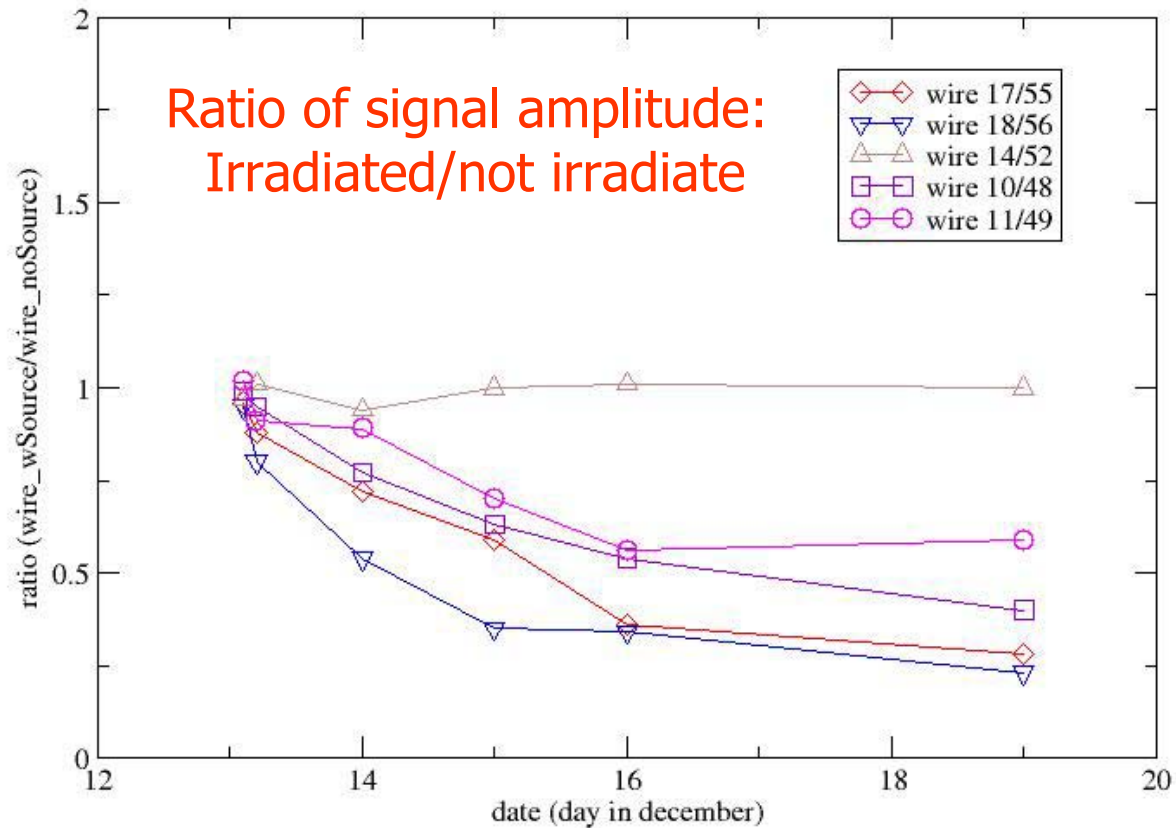


UpperSide 19.12.05

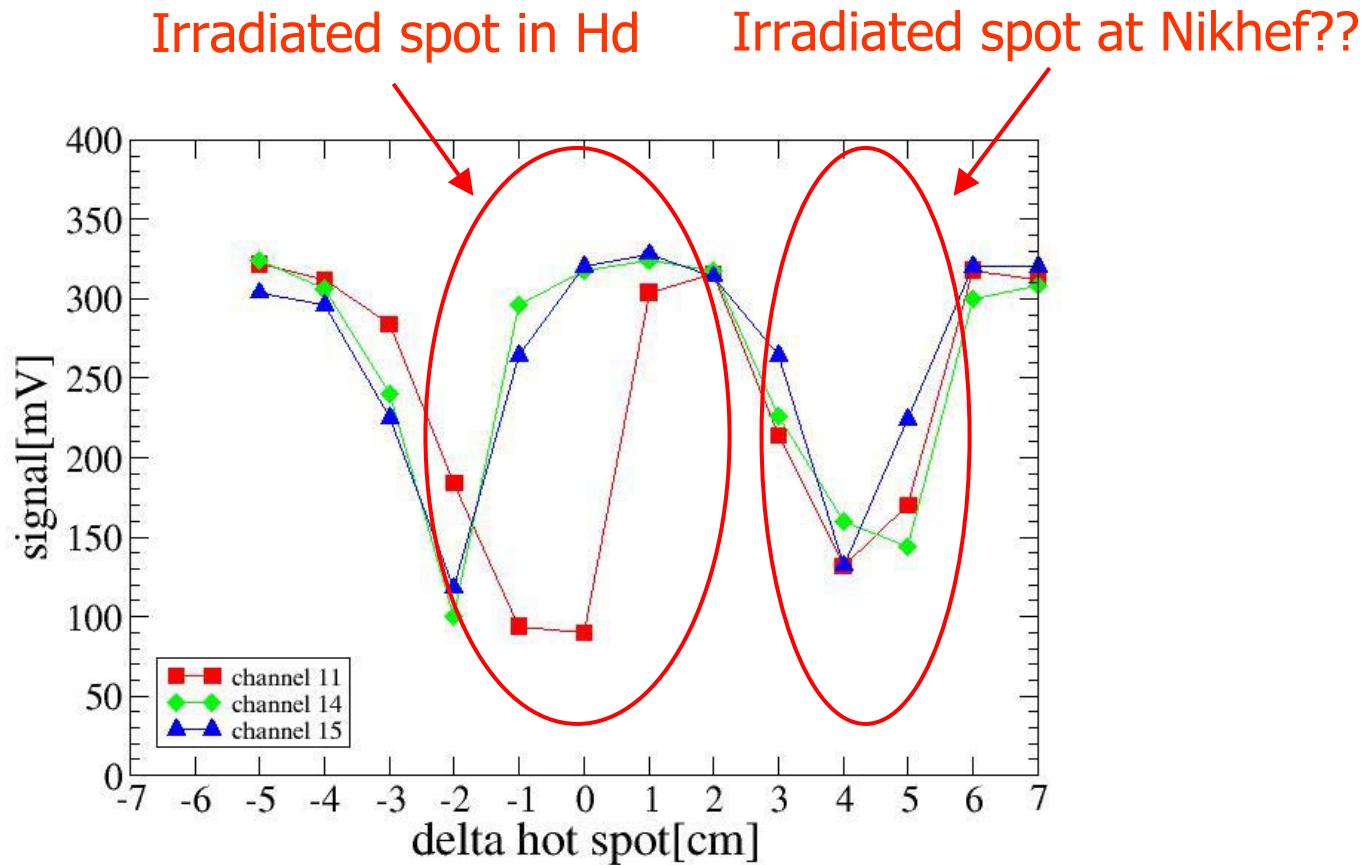
10:13



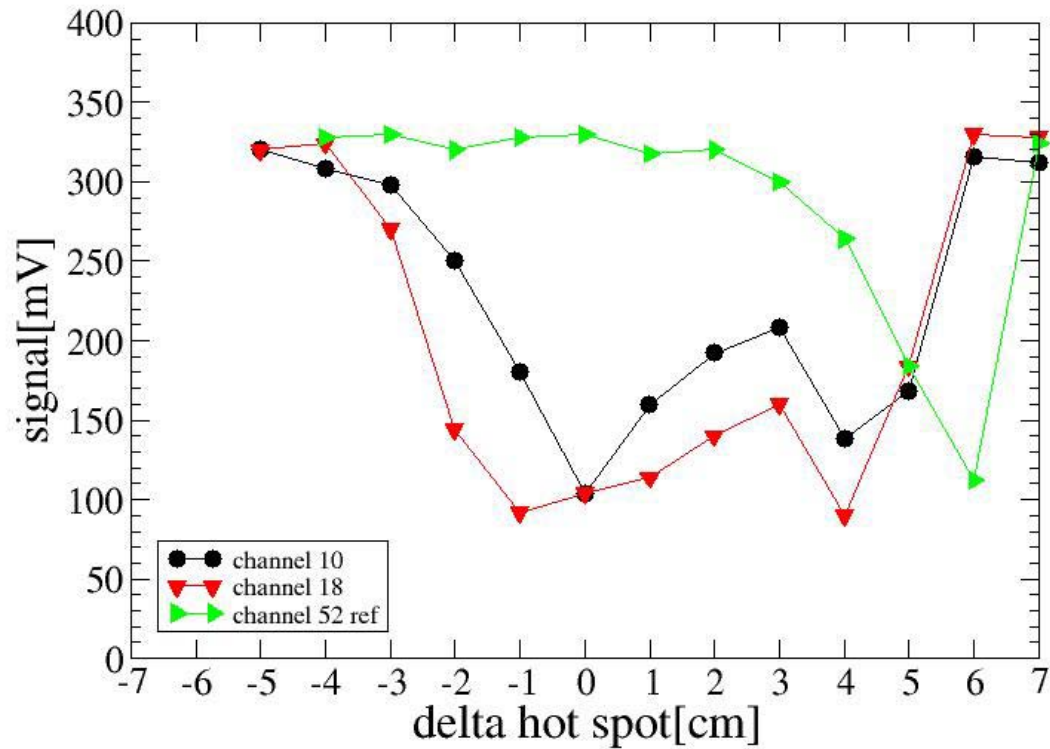
Evolution during irradiation



Wire scans after irradiation I:



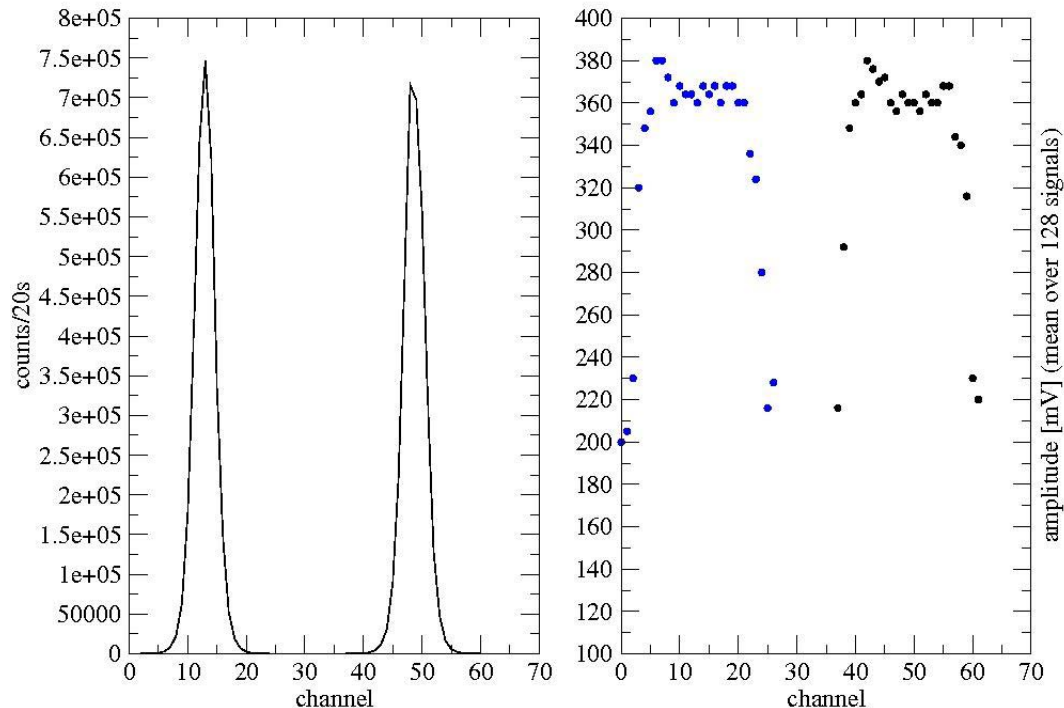
Wire scans after irradiation II:



Same measurement for lower side

No effect has been seen in the corresponding measurement for the lower module side:

Test 07.12.05

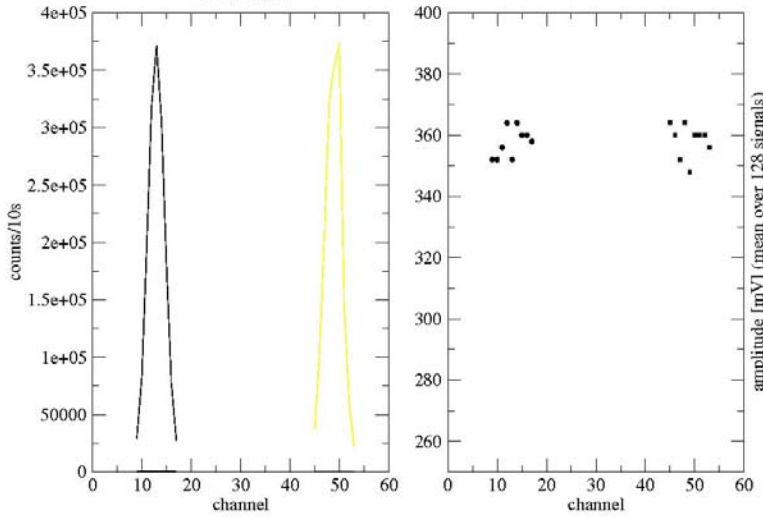


Pulseheight from ^{55}Fe
Before irradiation
(decrease of pulse height at the edge is understood. It is NOT due to decrease of gas gain. The reason is that in this region the rate from ^{55}Fe is comparable to cosmic. Therefore the smaller pulse height from cosmic dilutes the measurement).



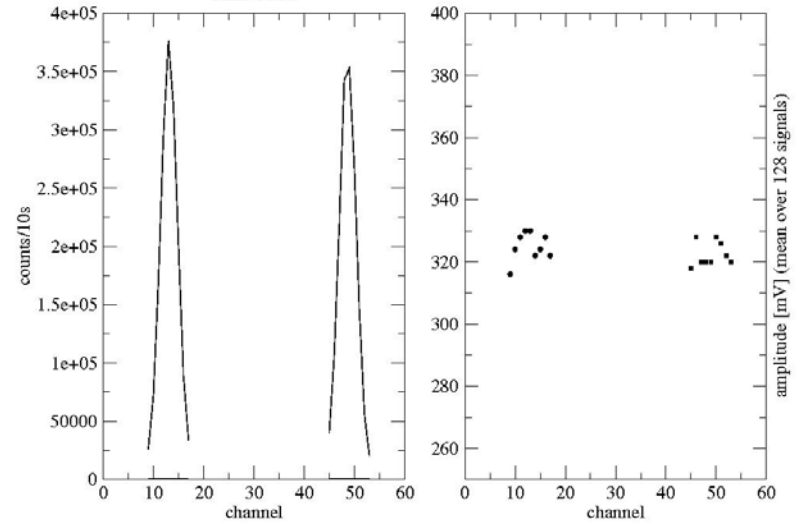
After 1 day of irradiation

Test 08.12.05
Time 16:50



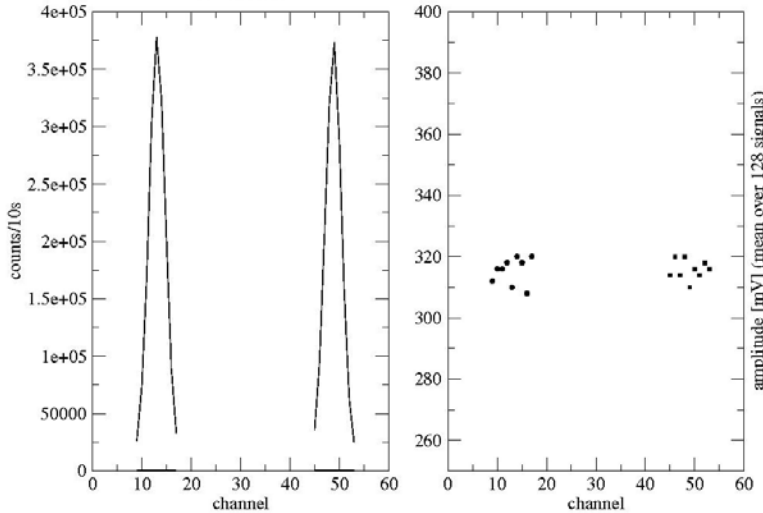
After 2 days of irradiation

Test 09.12.05
Time 10:58



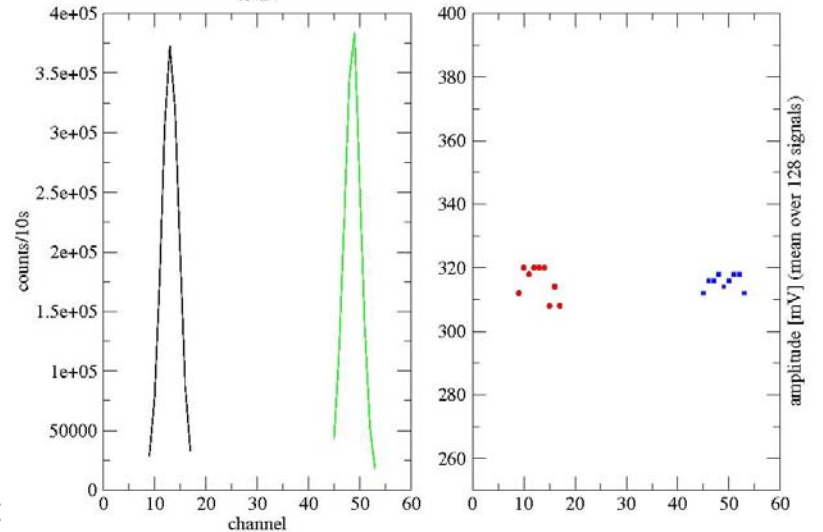
After 5 days of irradiation

Test 12.12.05
Time 10:16

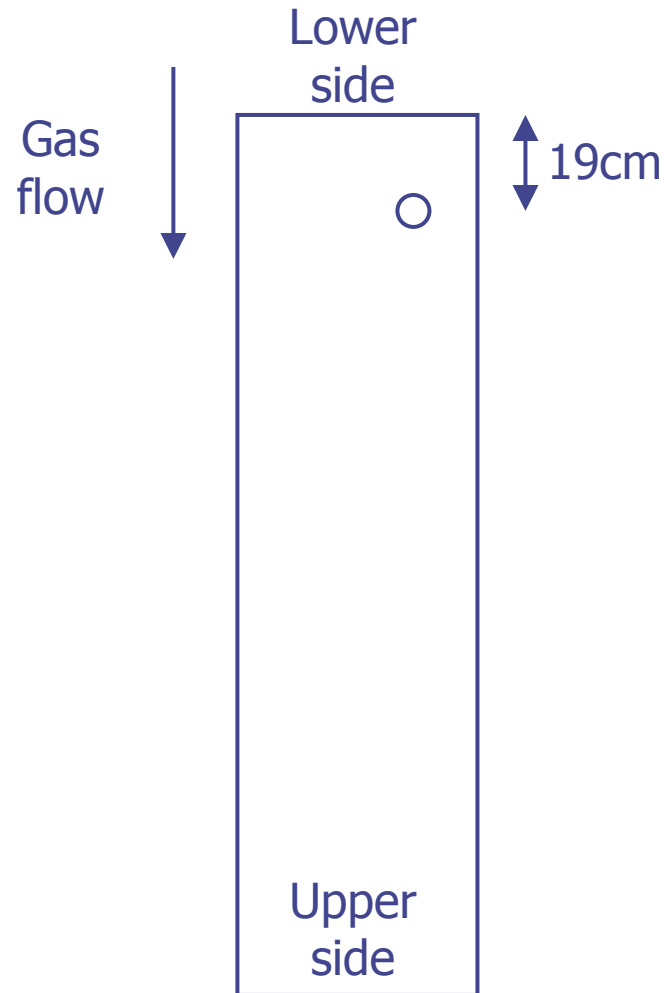


After 6 days of irradiation

Test 13.12.05
09:24



Measurement with HD-module 52:

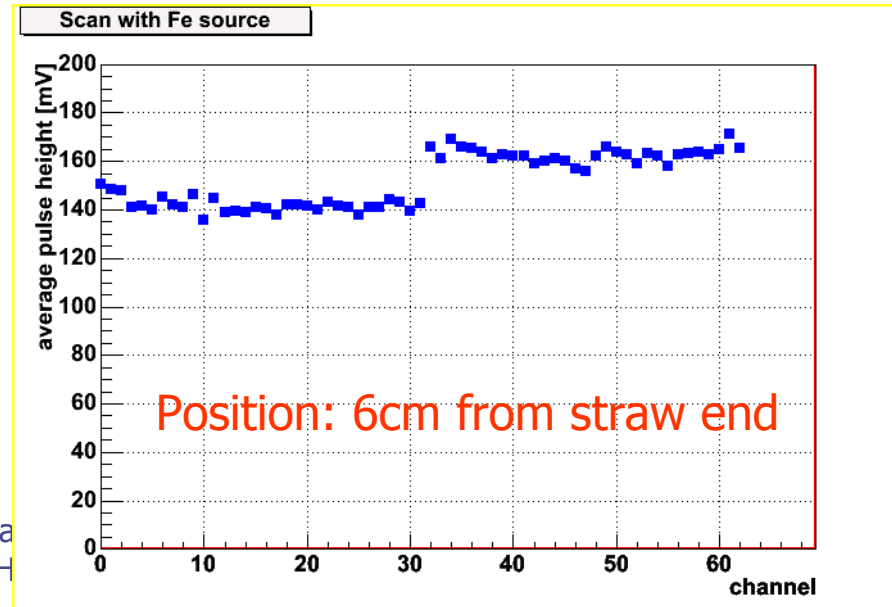
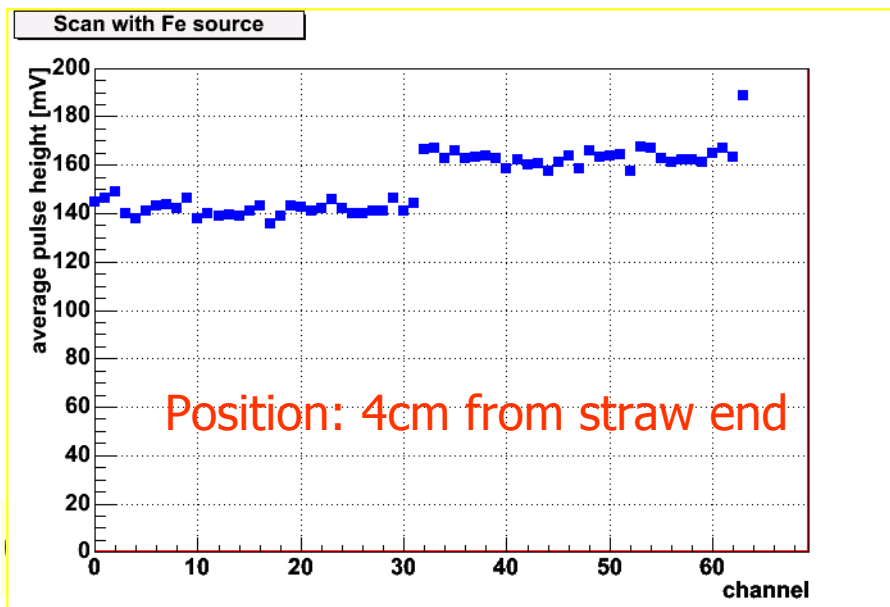
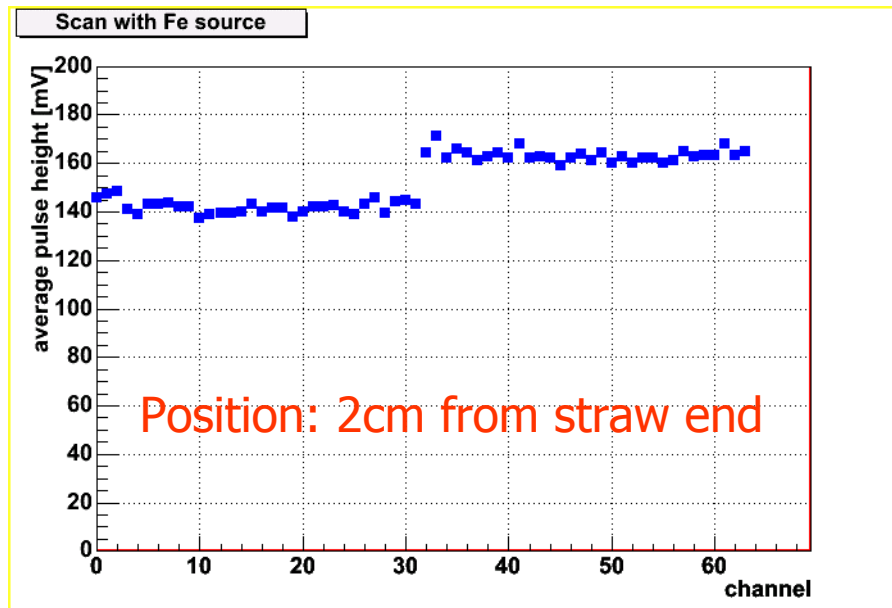
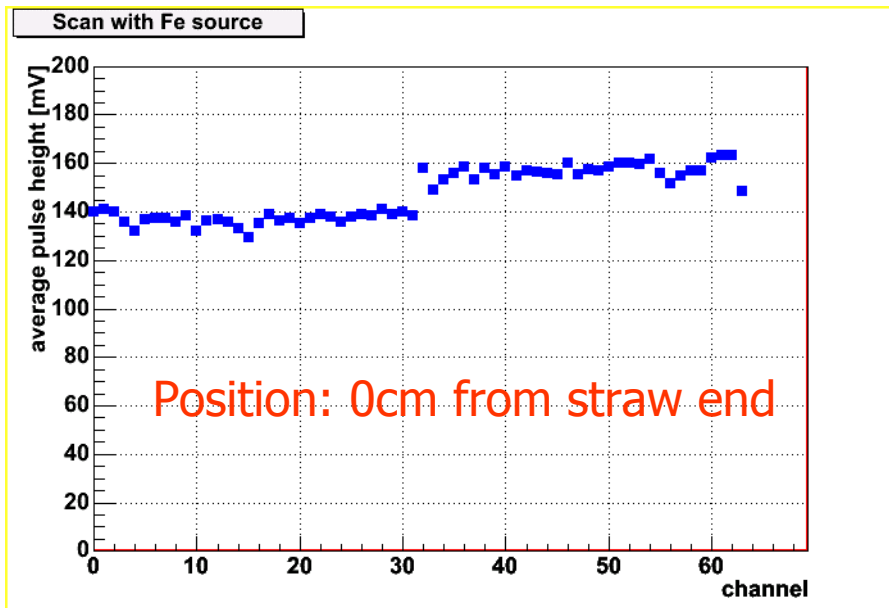


Parameters:

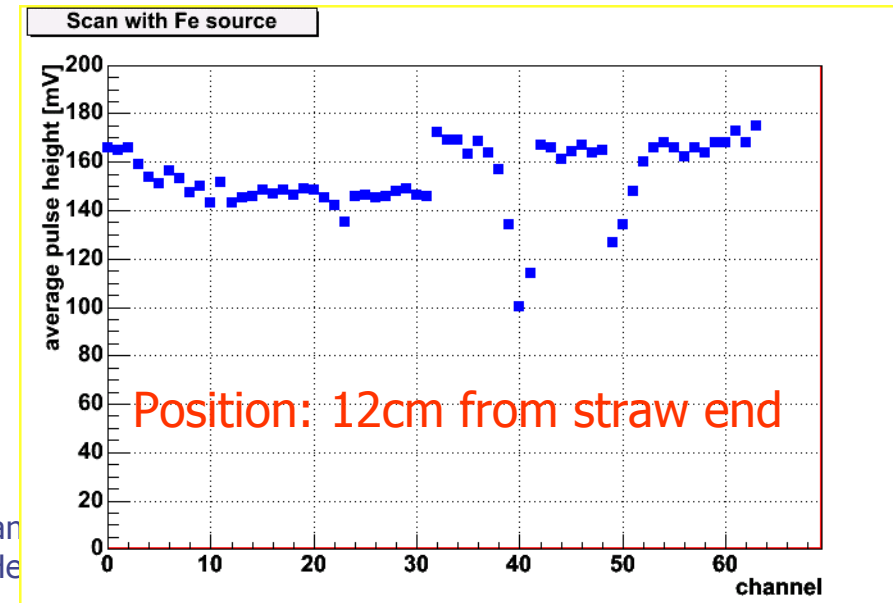
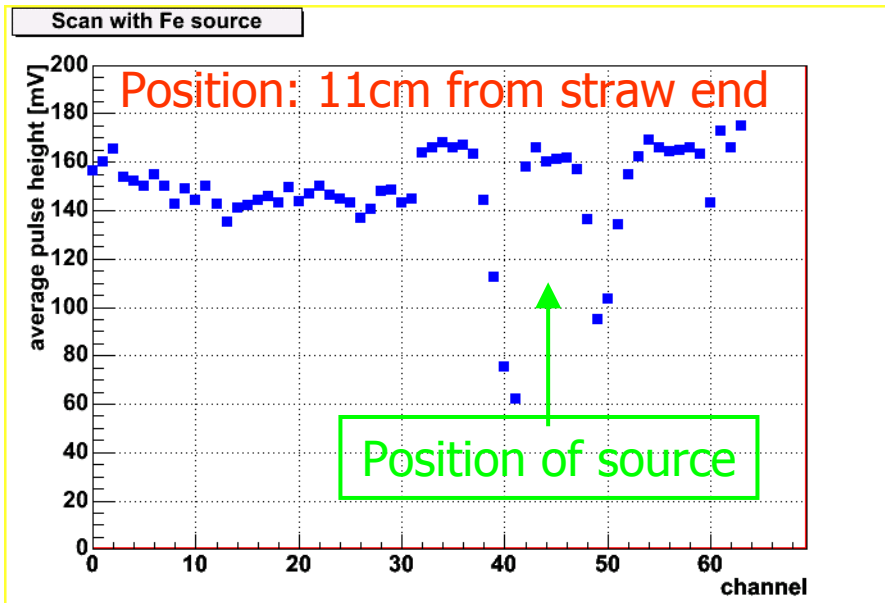
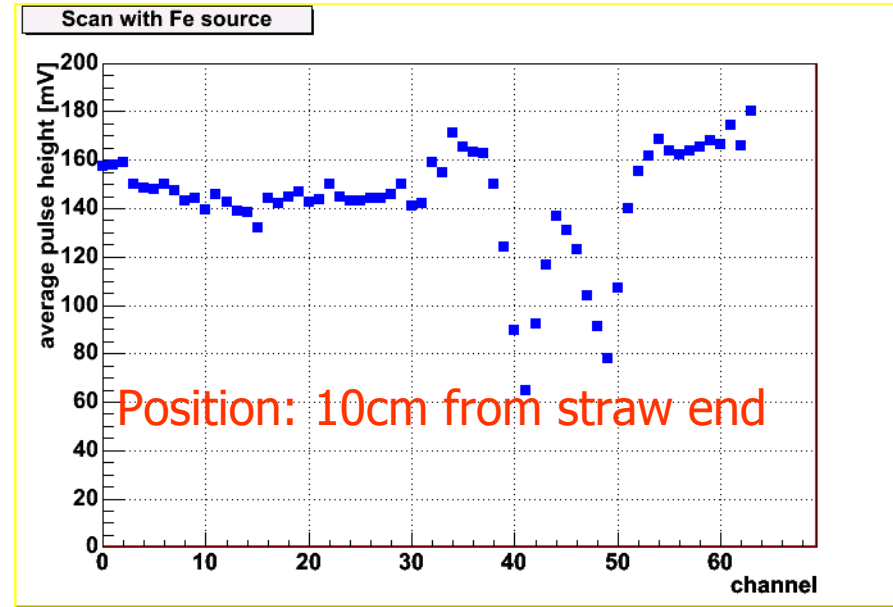
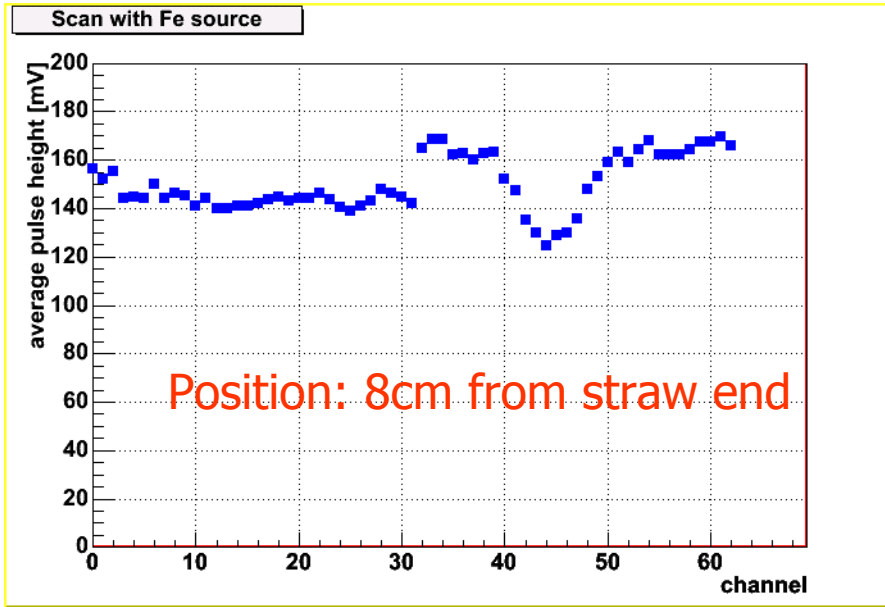
- Total irradiated area: $\sim 25\text{cm}^2$
- Source: ^{55}Fe
- Voltage 1600V
- Total duration of irradiation: 100h
- Position for source:
19cm from module, i.e. 13cm from beginning of active area
- Maximum flux: Channel 45 (35kHz)
- Flux for channel 40 and 50: $\sim 1\text{kHz}$
- Gas pipes: Plastic
- Gas flow: 18l/h ($\sim 1\text{Vol. exchange/hour}$)



Scan of mod. 52 after irradiation:

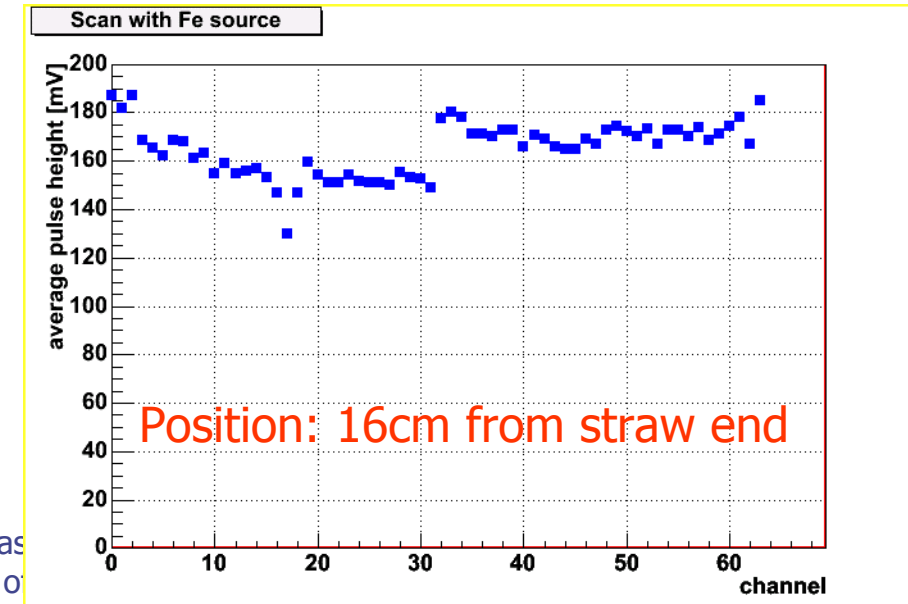
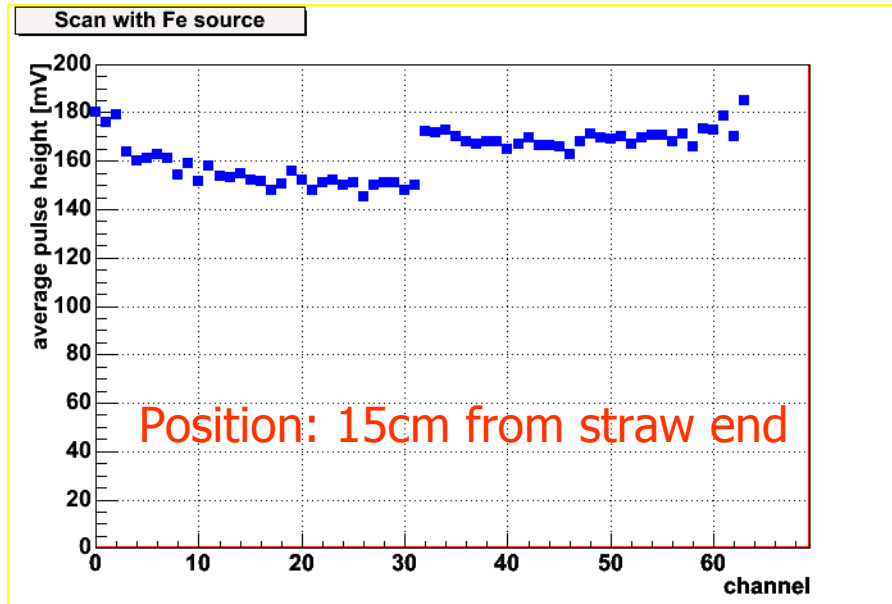
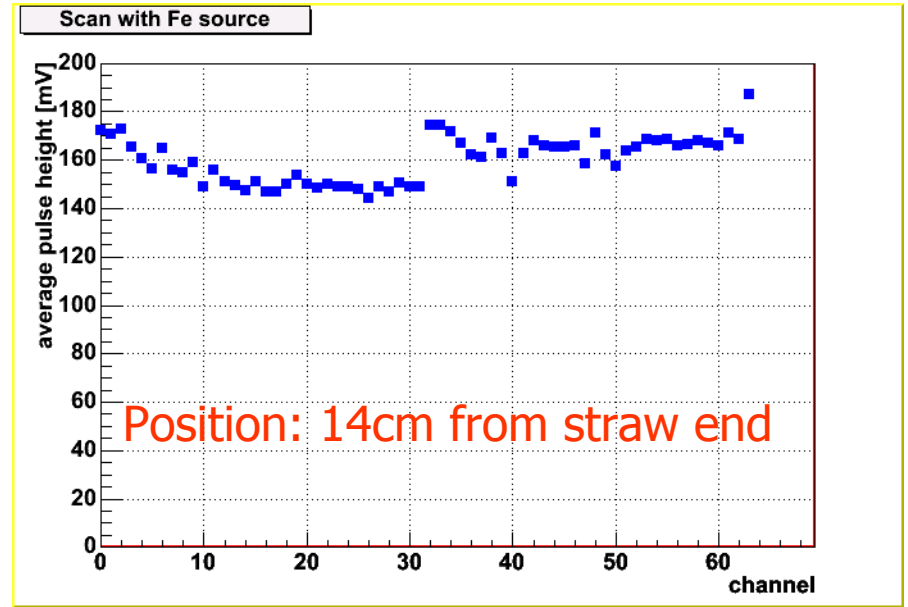
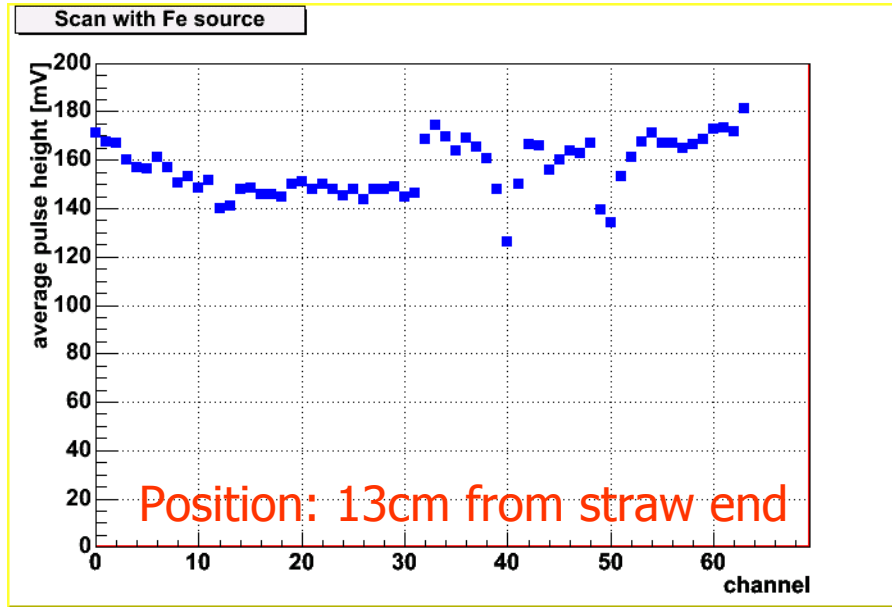


Scan of mod. 52 after irradiation 2:

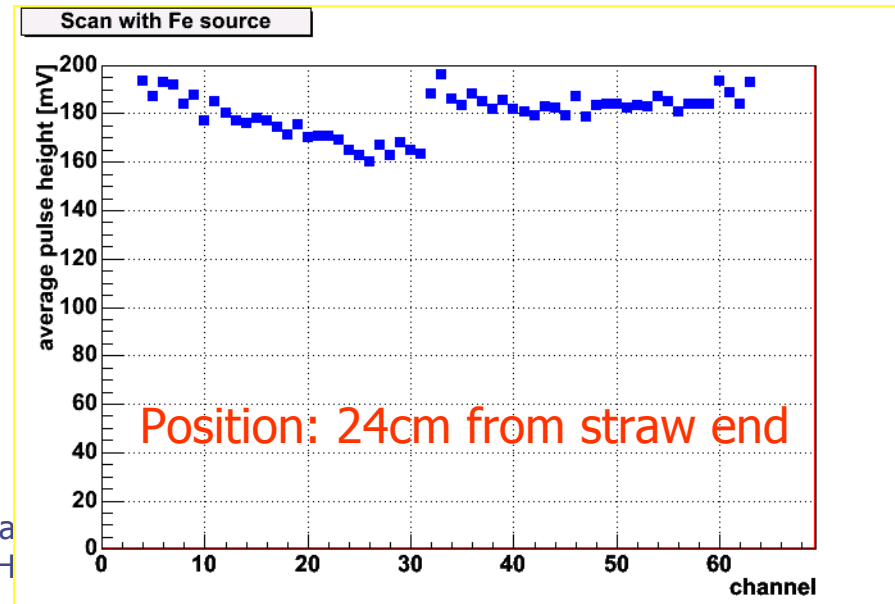
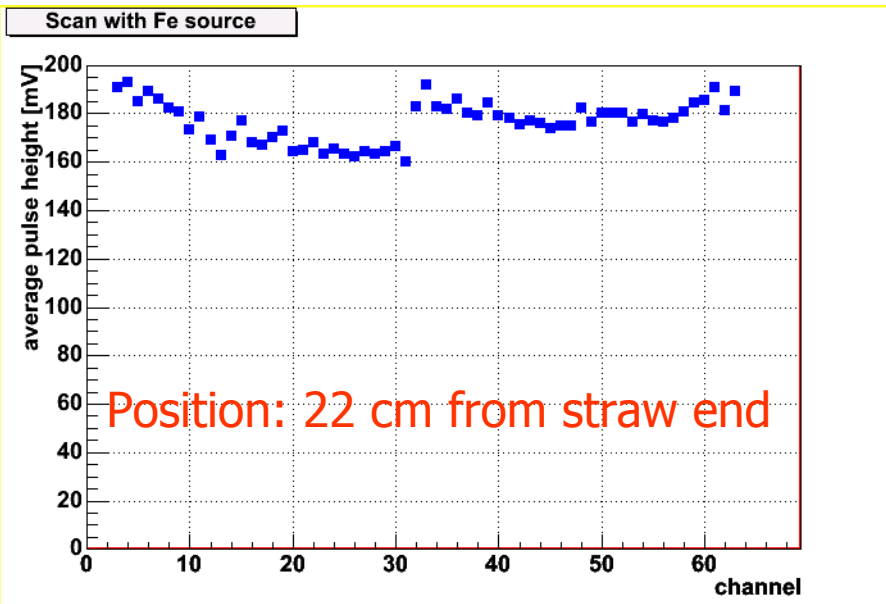
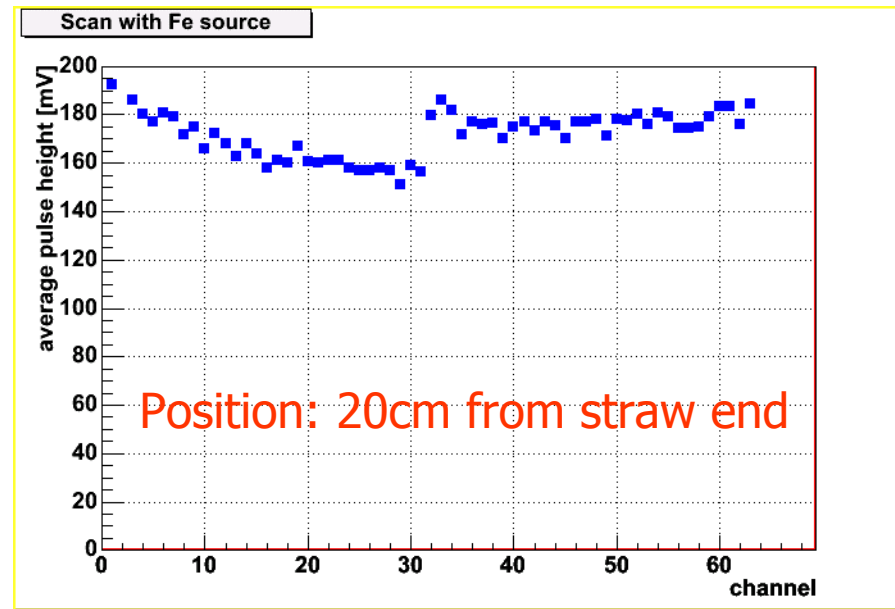
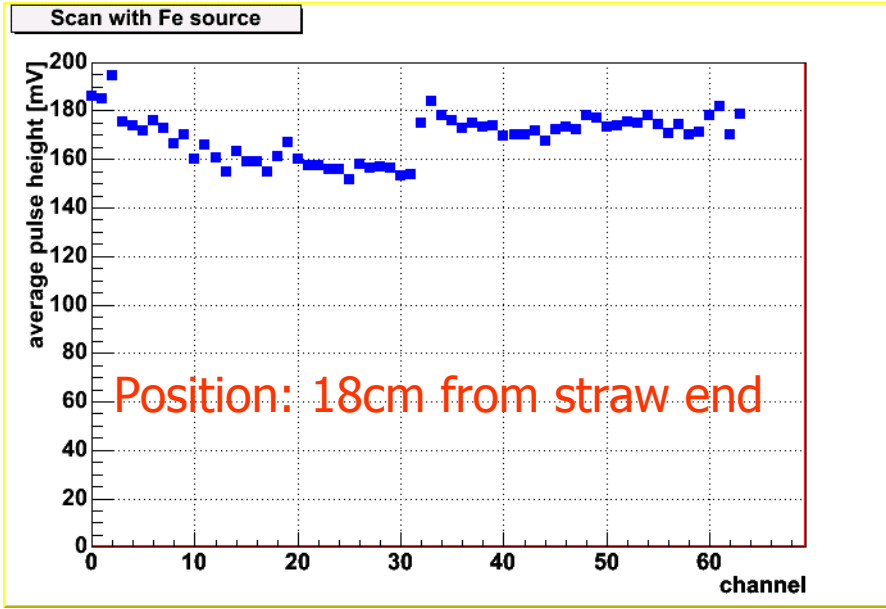


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f He

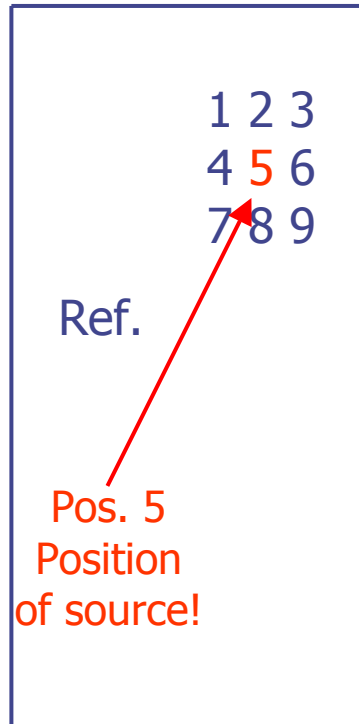
Scan of mod. 52 after irradiation 3:



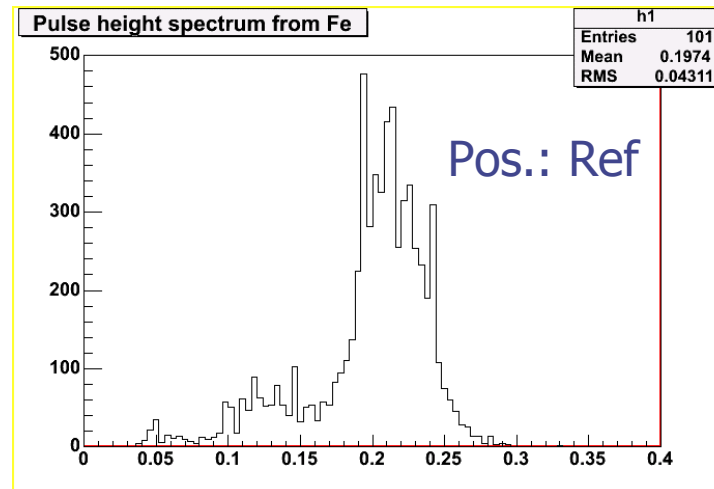
Scan of mod. 52 after irradiation 4:

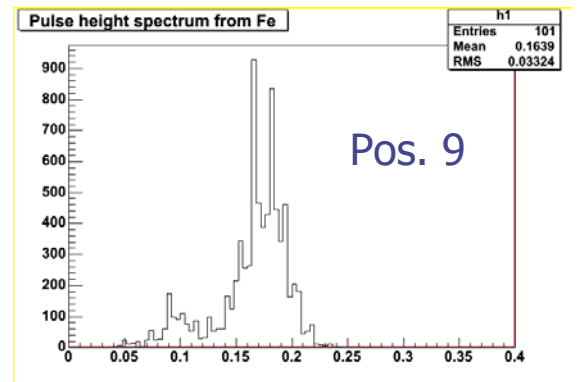
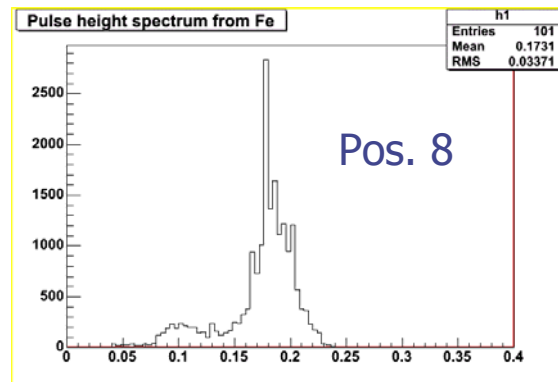
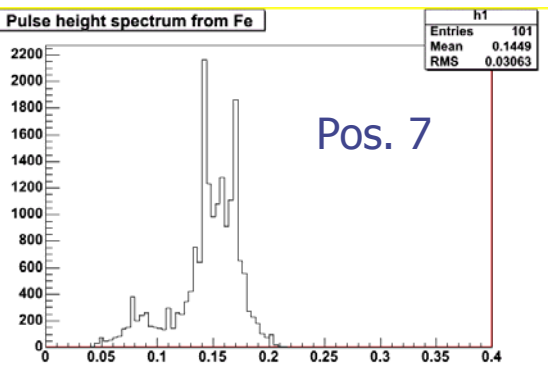
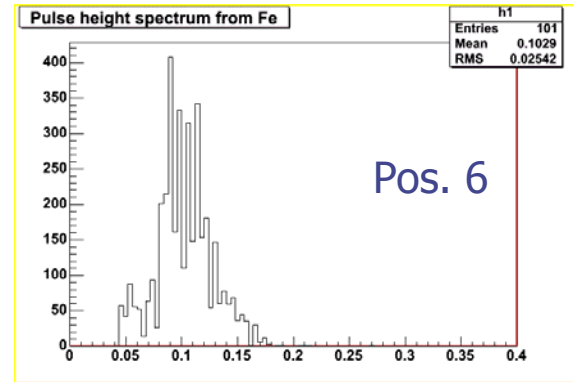
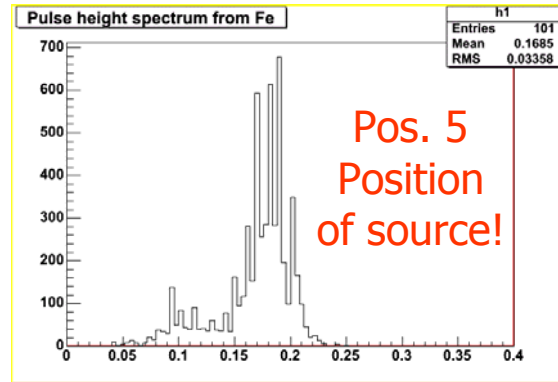
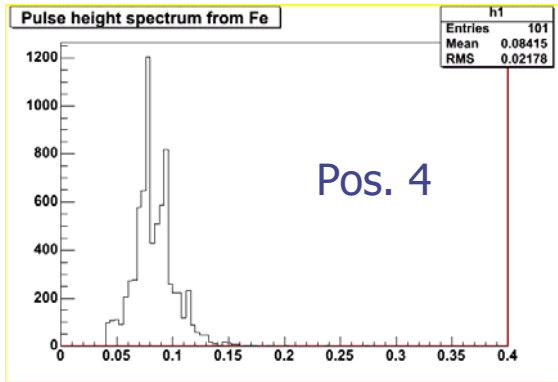
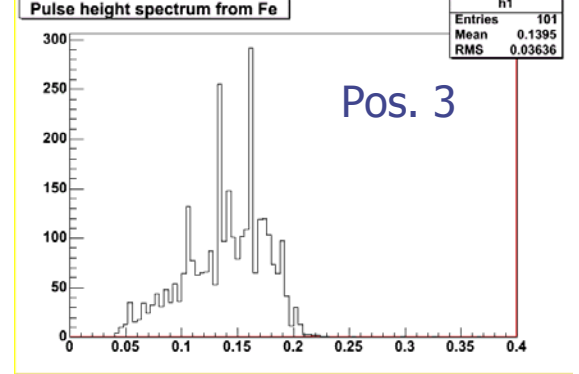
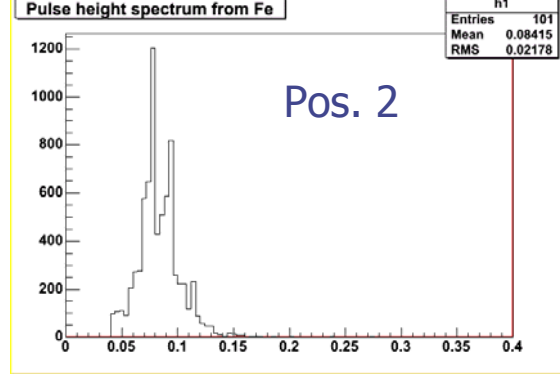


Pulse height spectra from ^{55}Fe



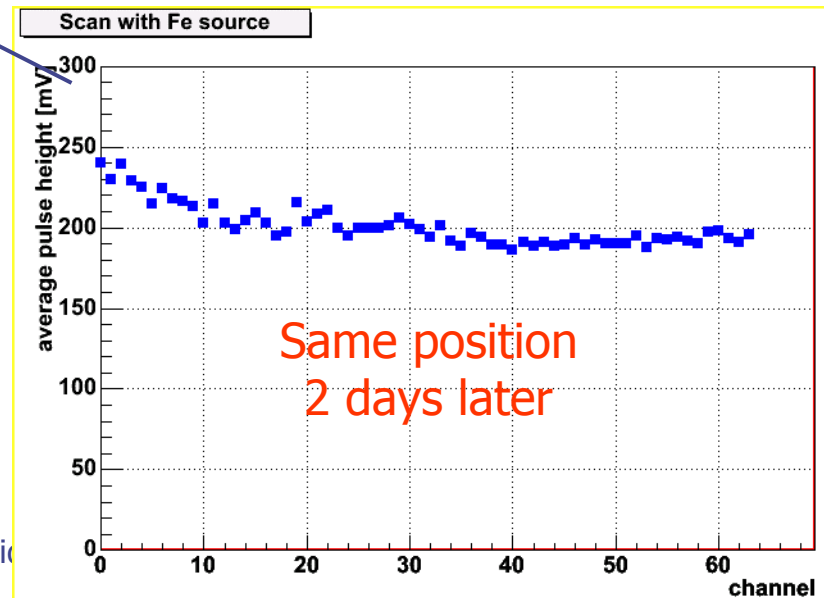
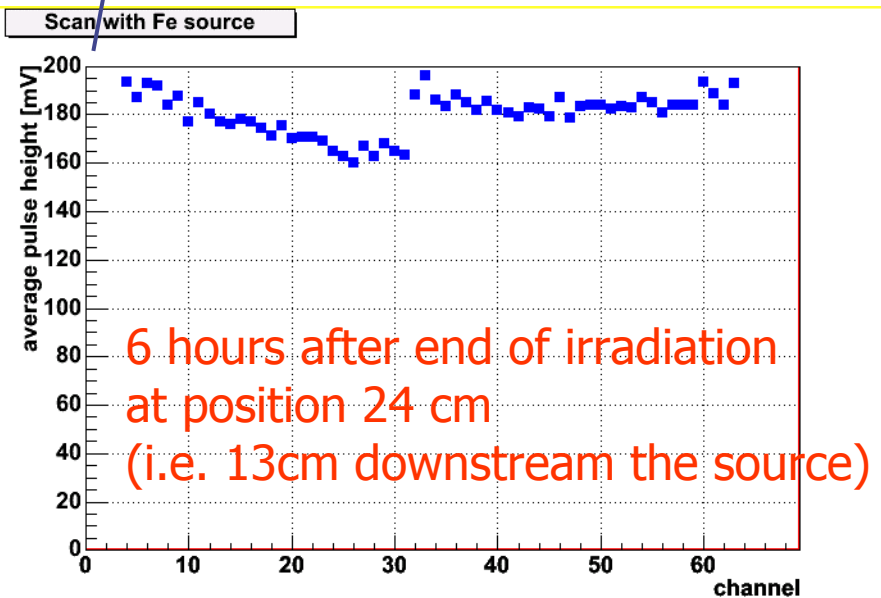
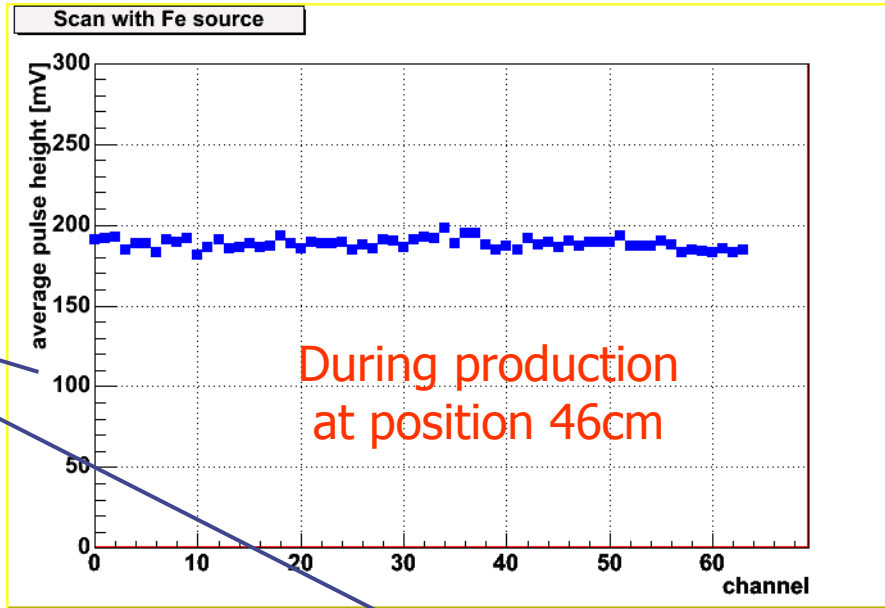
	Pos.	Channel
Ref.	30cm	10
1	8cm	40
2	8cm	45
3	8cm	50
4	11cm	40
5	11cm	45
6	11cm	50
7	14cm	40
8	14cm	45
9	14cm	50



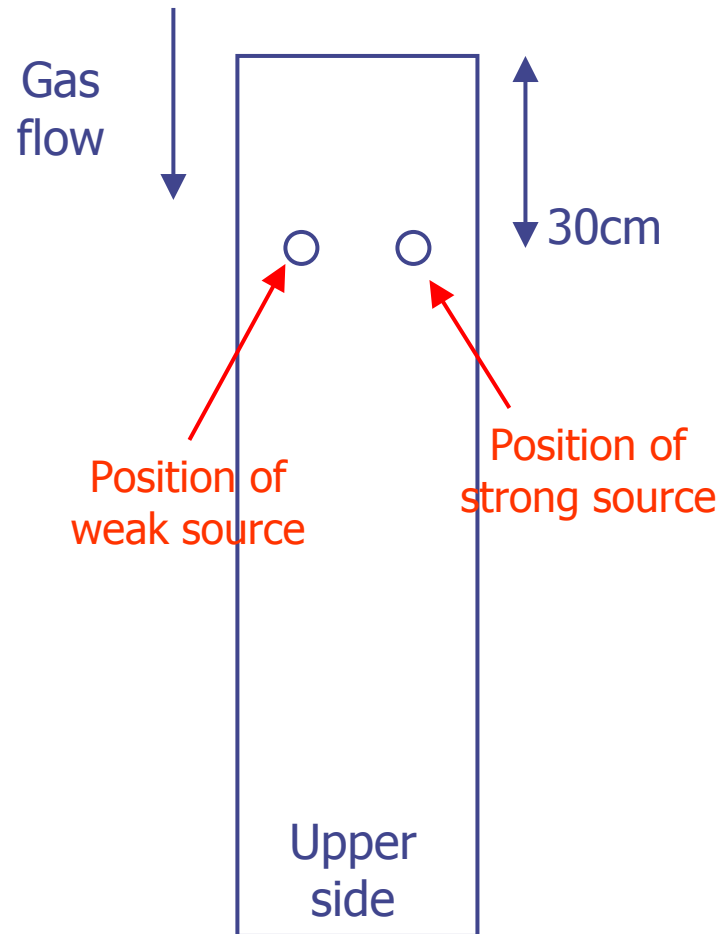


Is the effect permament?

Note different scales!



New irradiation



Parameters:

- Total irradiated area: $\sim 25\text{cm}^2$
- Source: ^{55}Fe
- Voltage 1600V
- Total duration of irradiation: 24h
- Gas pipes: Plastic
- Gas flow: 48l/h (2.7vol. Exchanges per hour)*
- Position for source:
30cm from module, i.e. 24cm from beginning of active area

1.) Strong source*:

Maximum flux: Channel 34: 35kHz

Flux for channel 29 and 39: $\sim 1\text{kHz}$

2.) Weak source*:

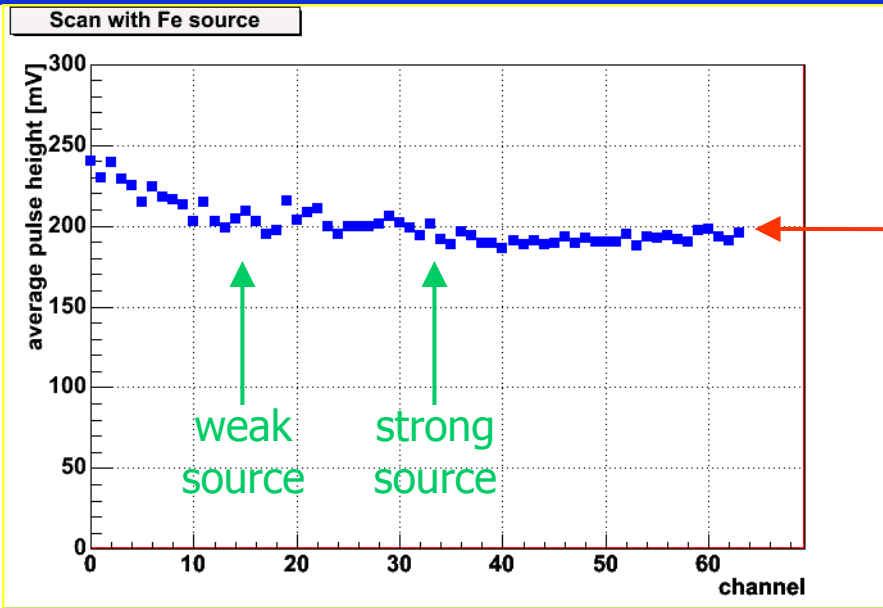
Maximum flux: Channel 14 6kHz

Flux for channel 9 and 19: $\sim 1,3\text{kHz}$

* changed!

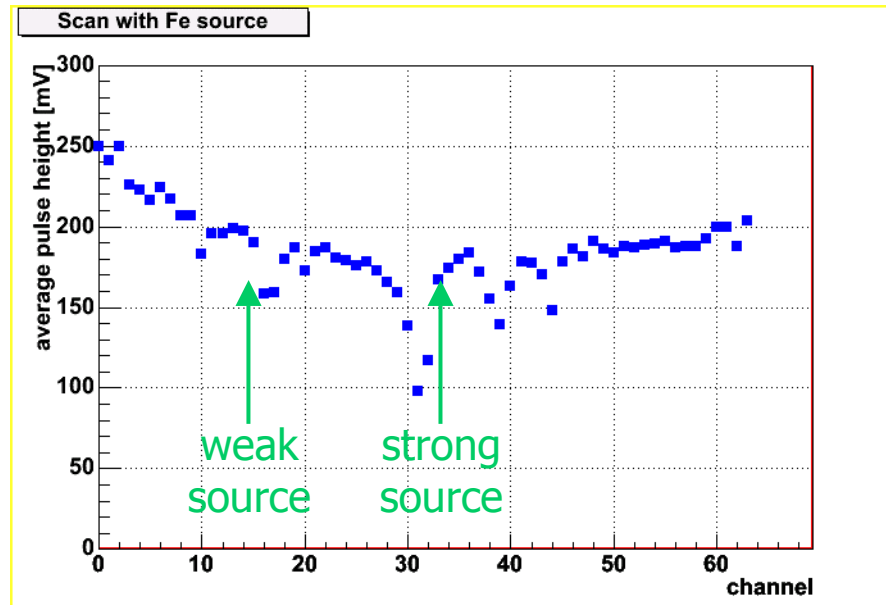


Scan with ^{55}Fe



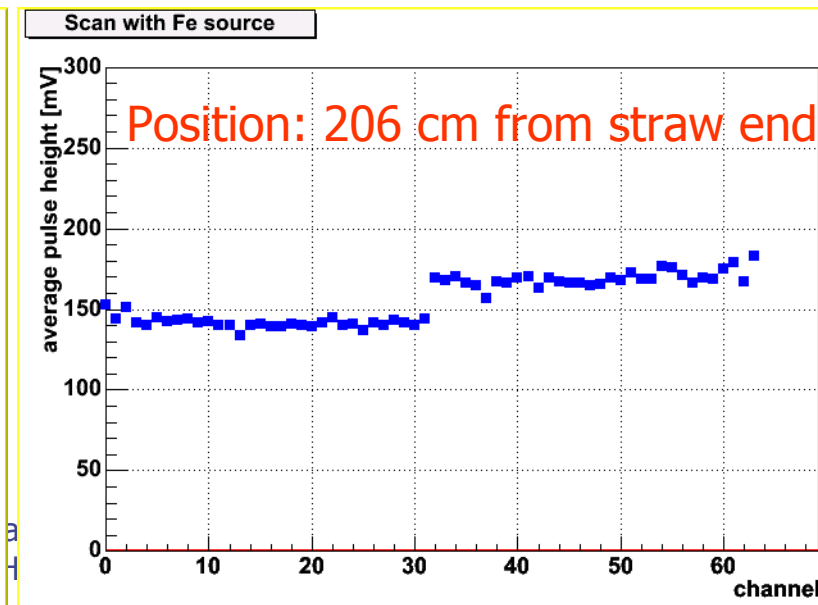
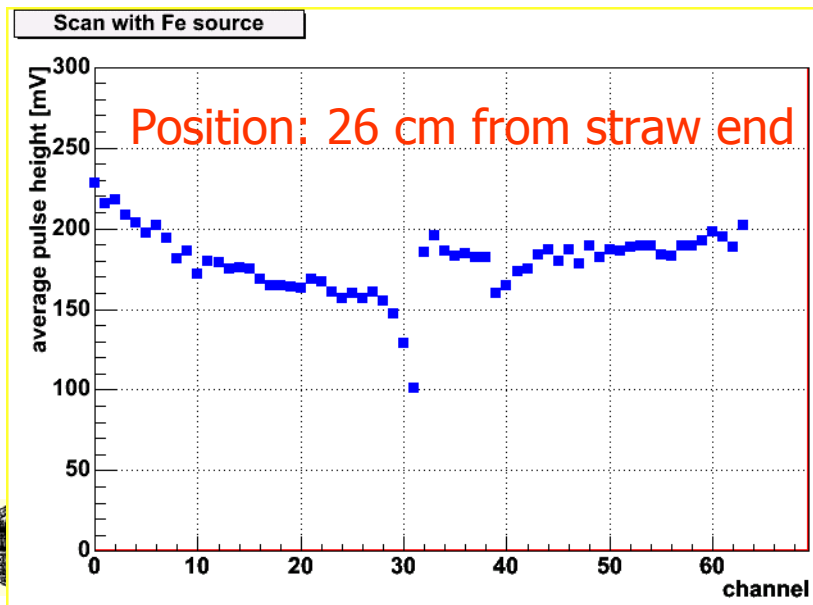
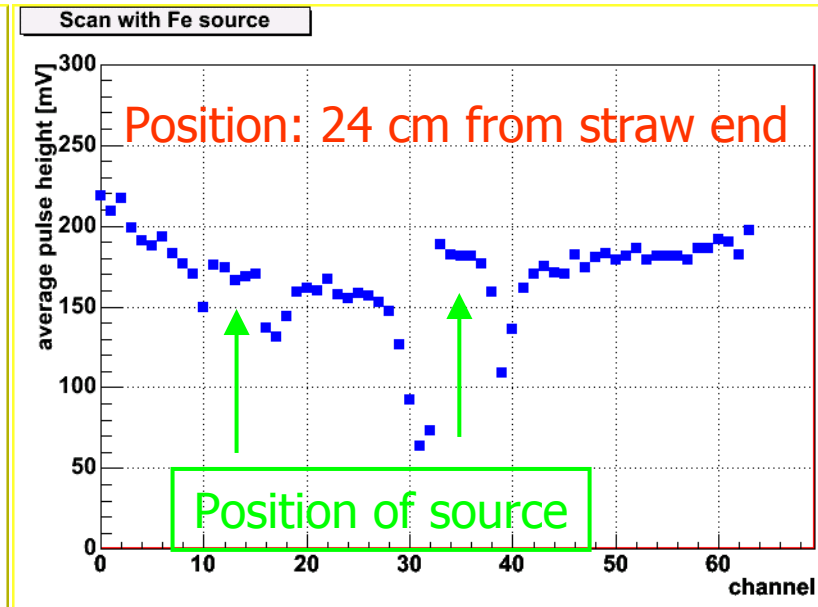
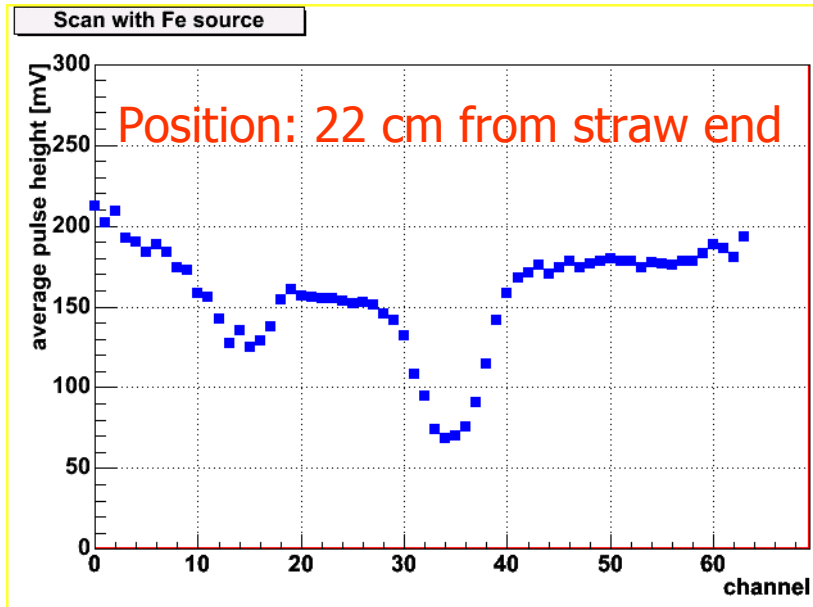
Before irradiation at position 24 cm (i.e. same position as source)

After 17 hours of irradiation, same position

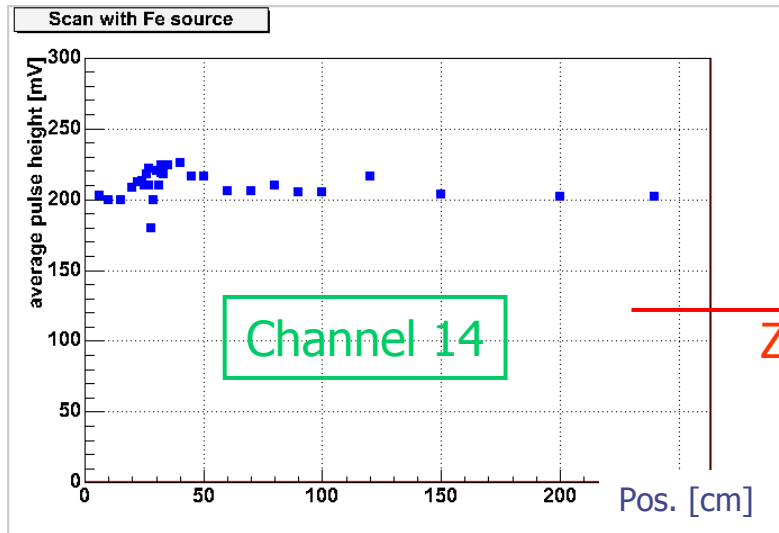


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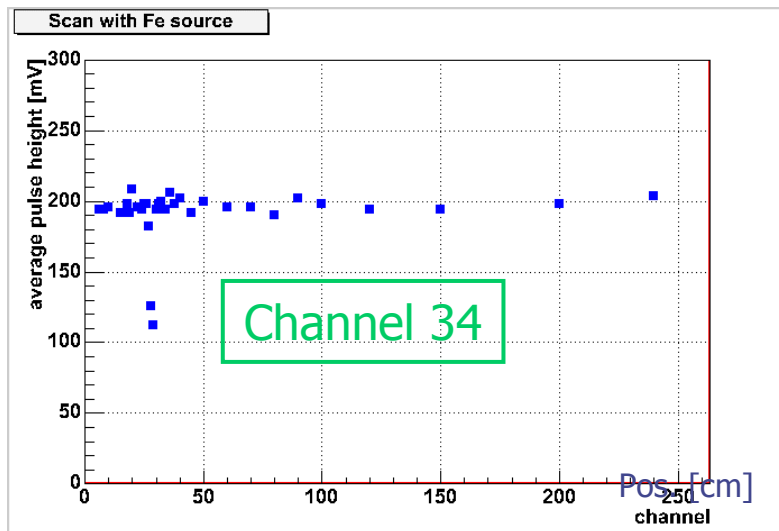
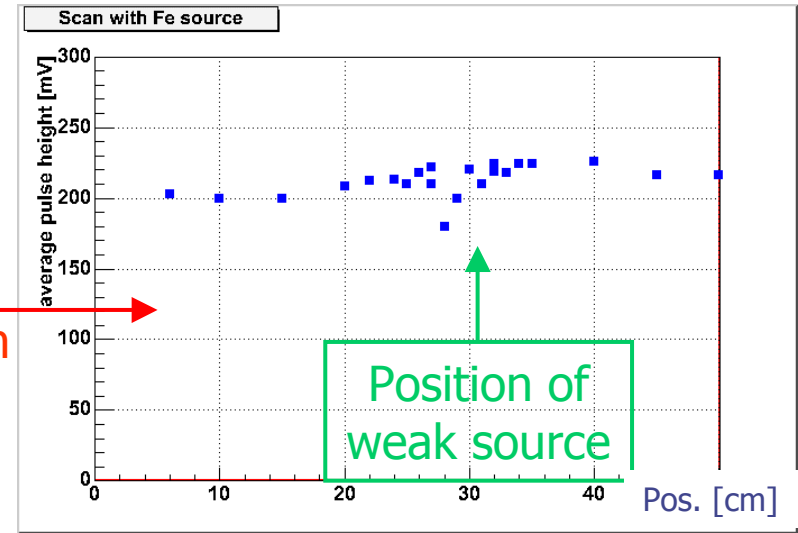
Scan after 50 hours of irradiation



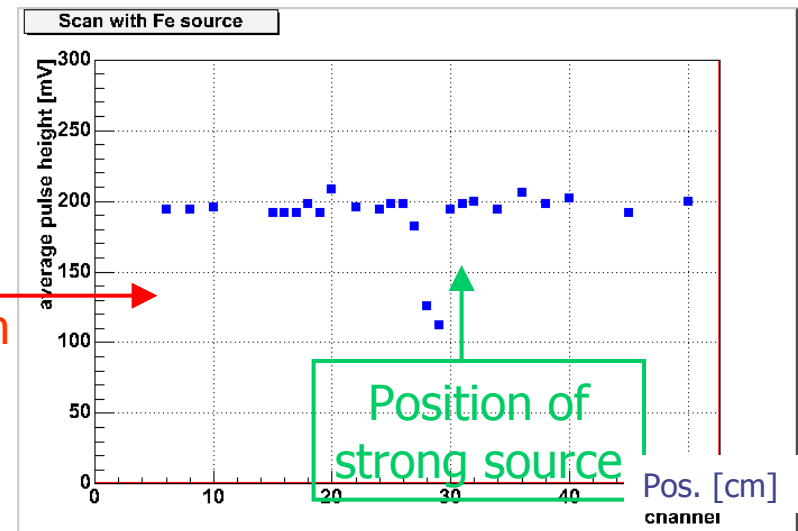
Scan along the irradiated wires



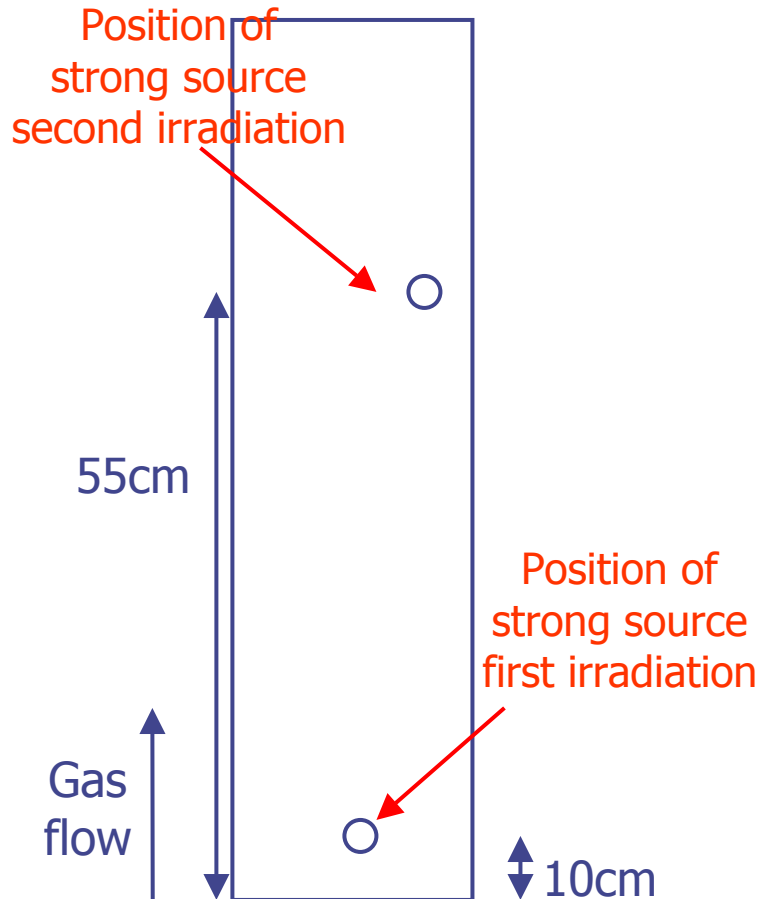
Zoom in



Zoom in



Irradiation of ageing test module



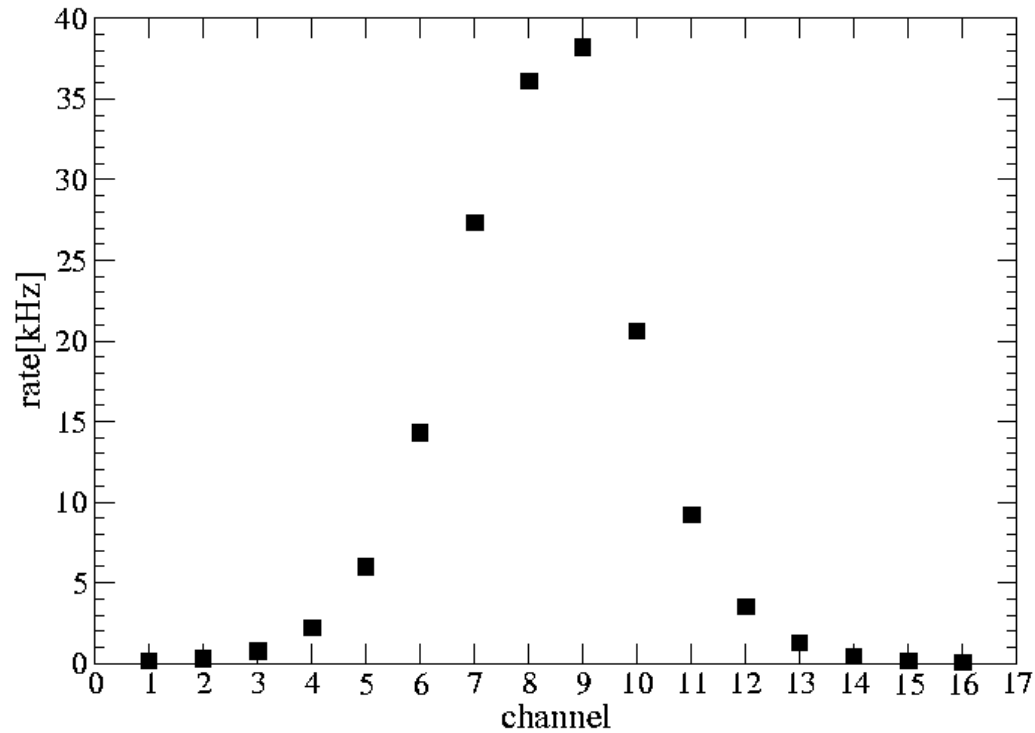
Parameters:

- 80cm ageing test module*
- vertical position*
- Total irradiated area: $\sim 25\text{cm}^2$
- Source: ^{55}Fe
- Voltage 1600V
- Total duration of irradiation: 42h
- Gas pipes: Plastic
- Gas flow:
 - 1st irr.: 1l/h (~ 1 volume exchange per hour)*
 - 2nd irr.: 6l/h (~ 1 volume exchange per hour)*
- Position for source:
10cm from straw end
- Strong source*:
 - Maximum flux: Channel 34: 35kHz
 - Flux for channel 29 and 39: $\sim 1\text{kHz}$

* changed!

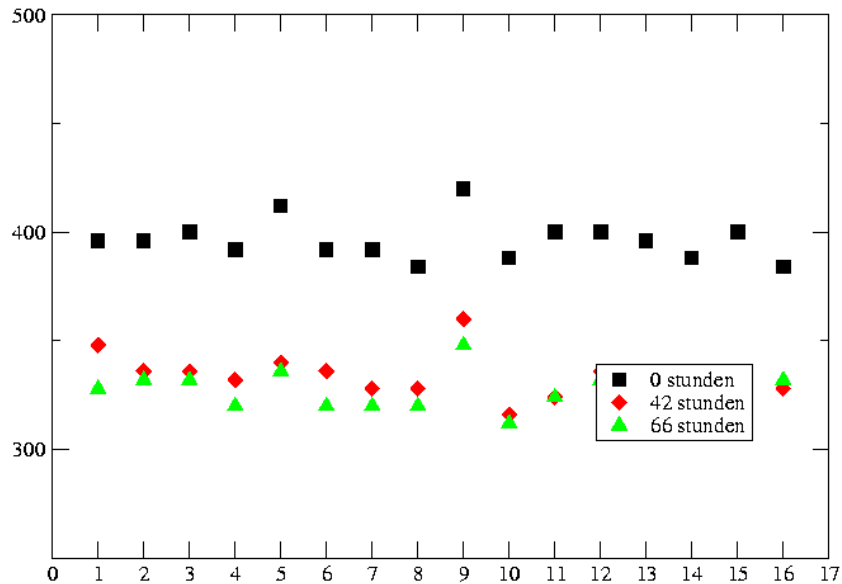


Beamprofile

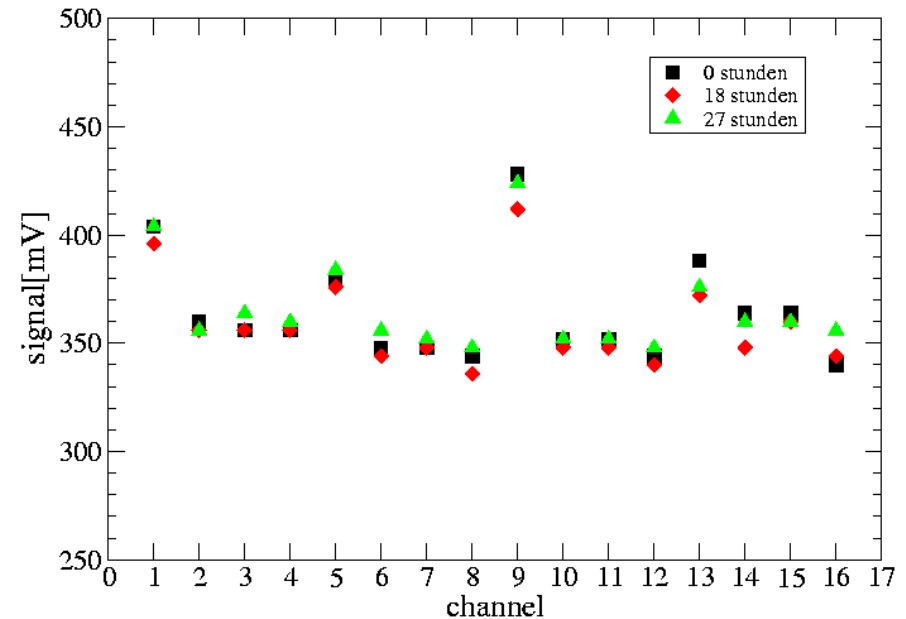


Scan for all channels in irr. region

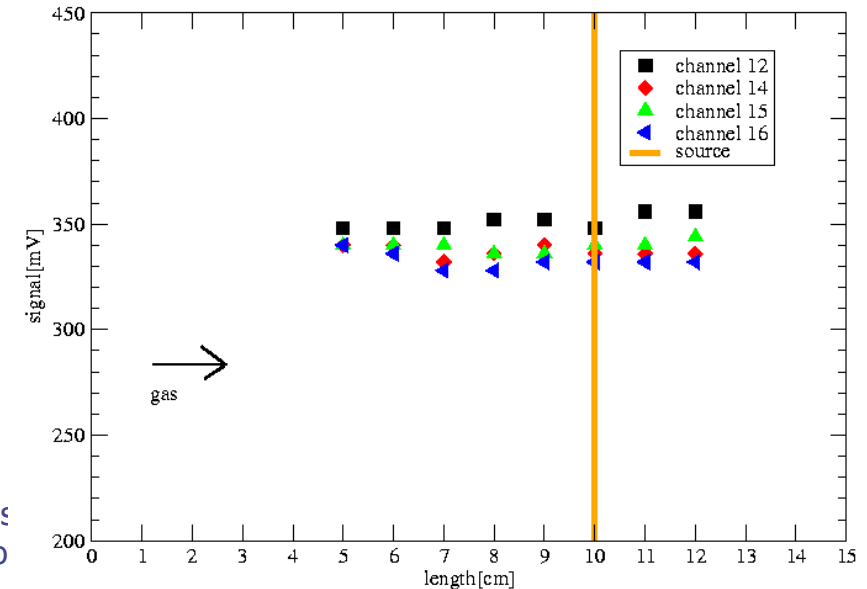
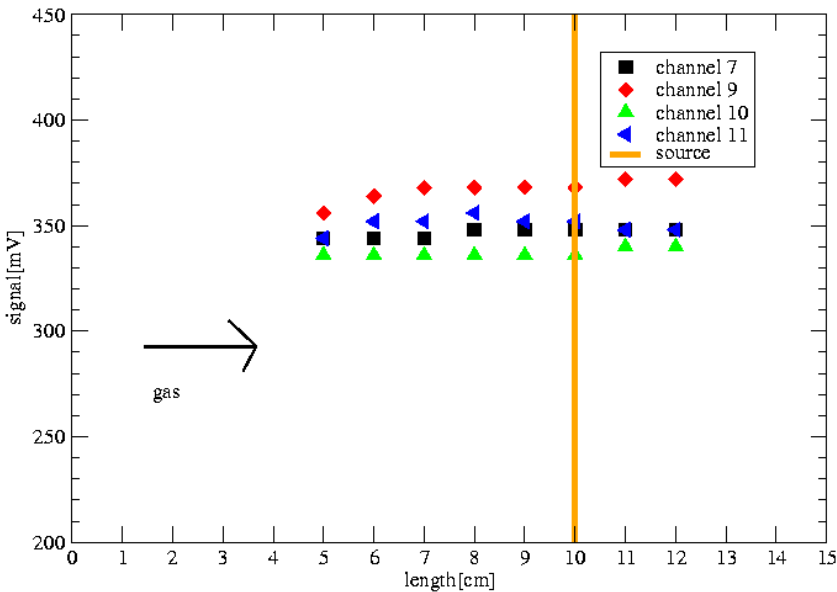
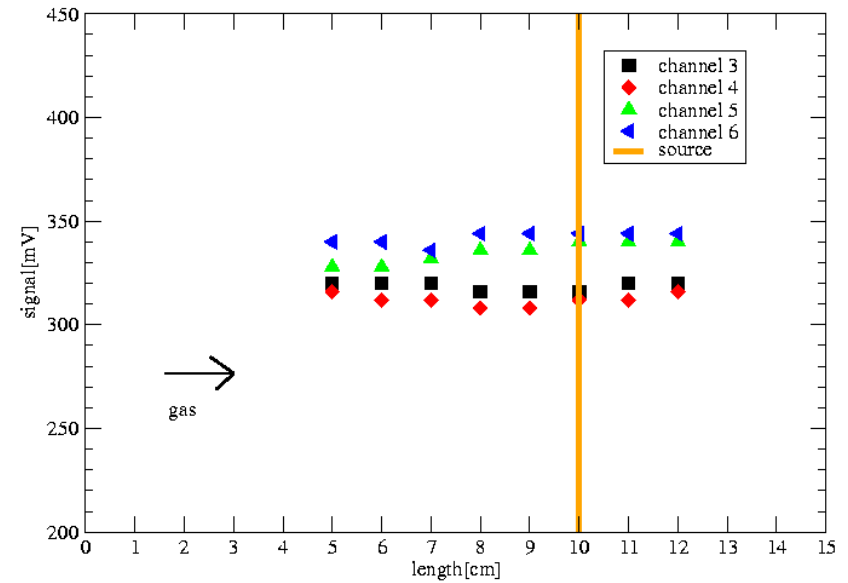
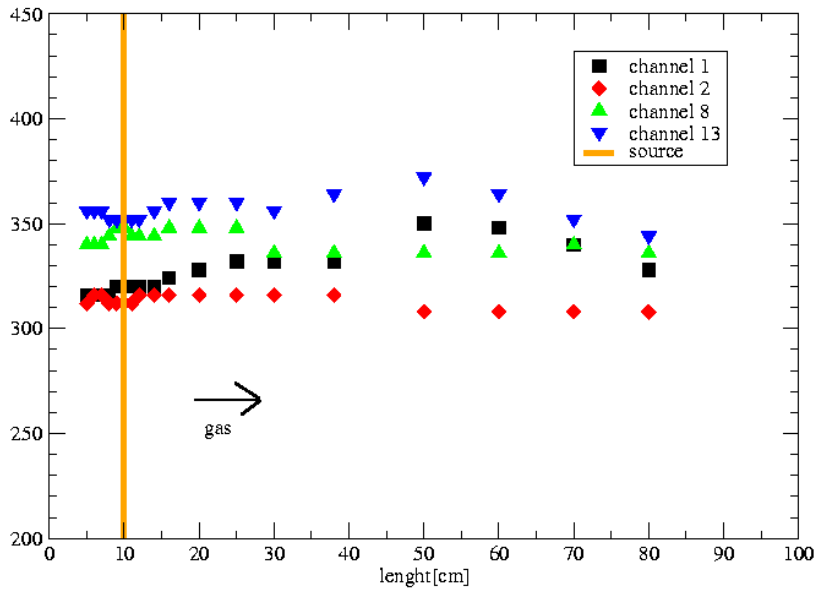
Before and after irradiation at
1 volume exchange per hour



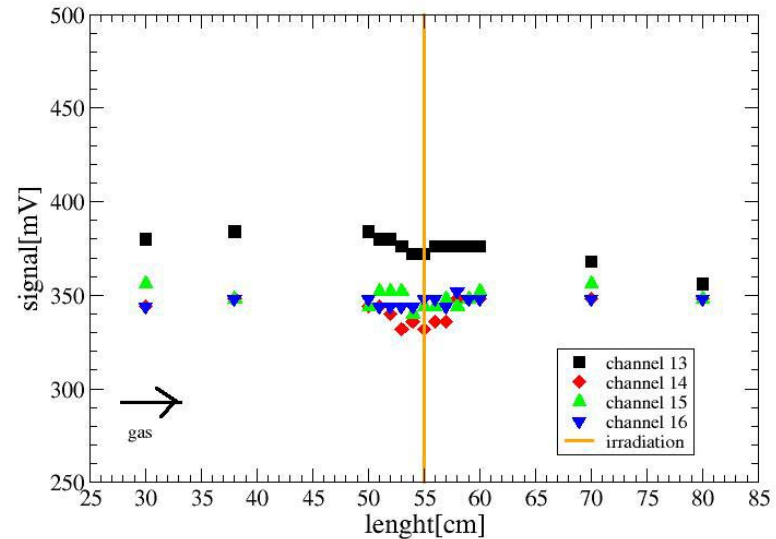
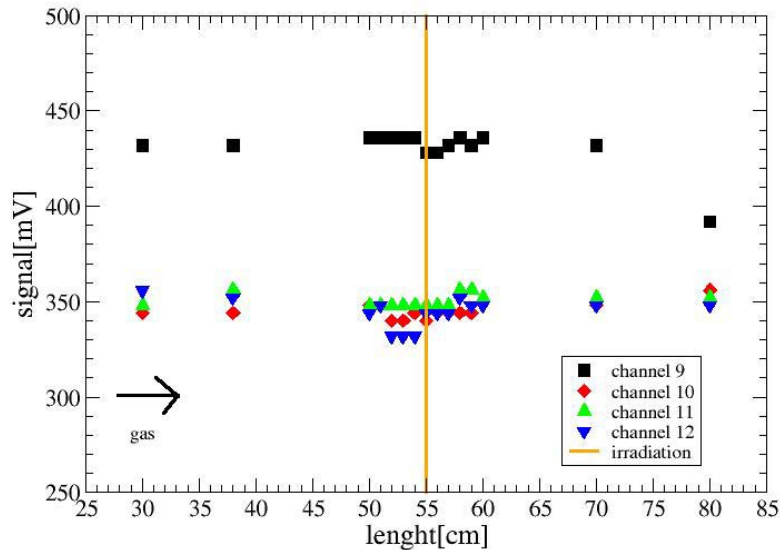
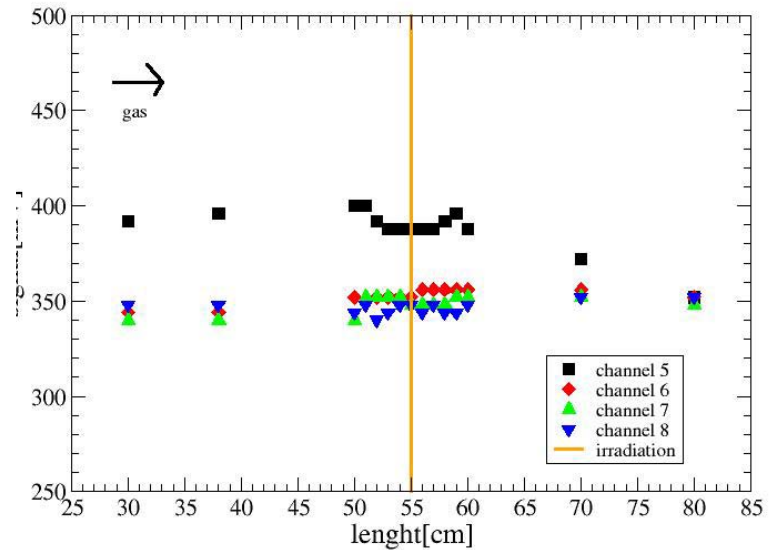
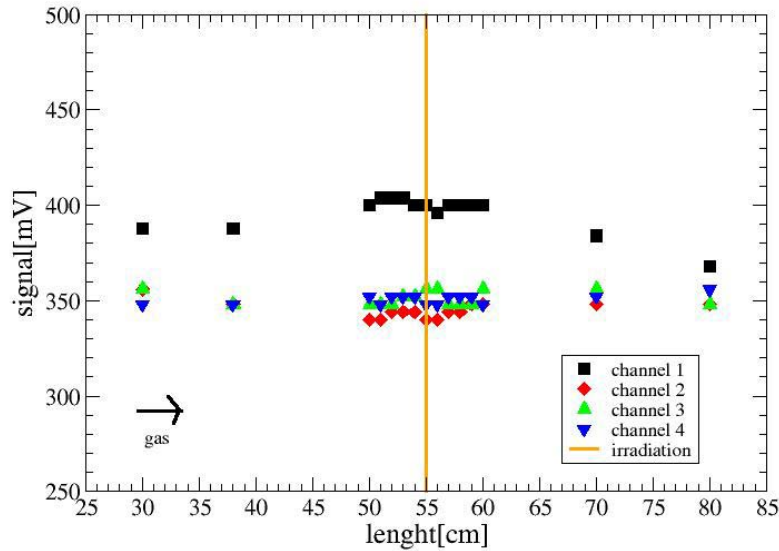
Before and after irradiation at
6 volume exchange per hour



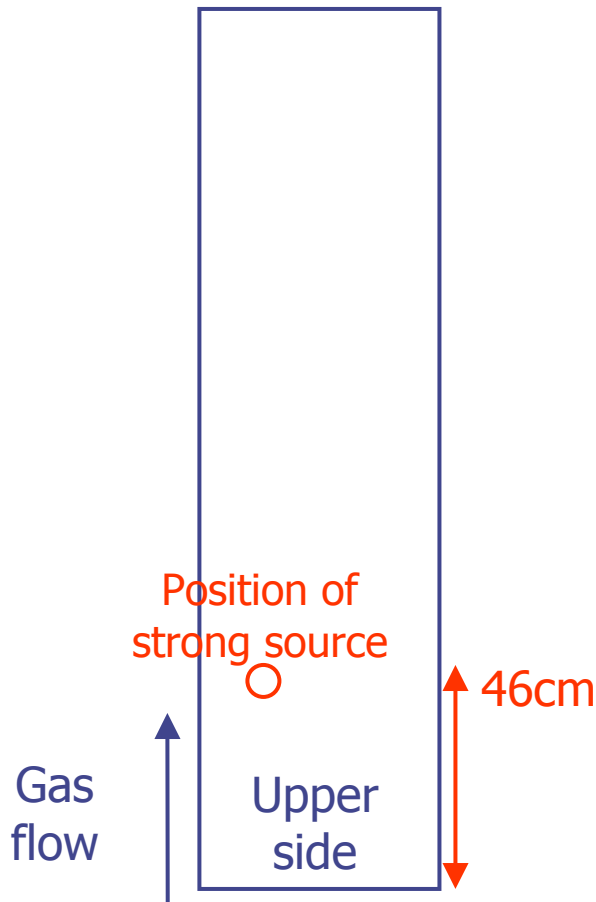
Scans along the wire (1st irr.)



Scans along the wire (2nd irr.)



New irradiation module 52



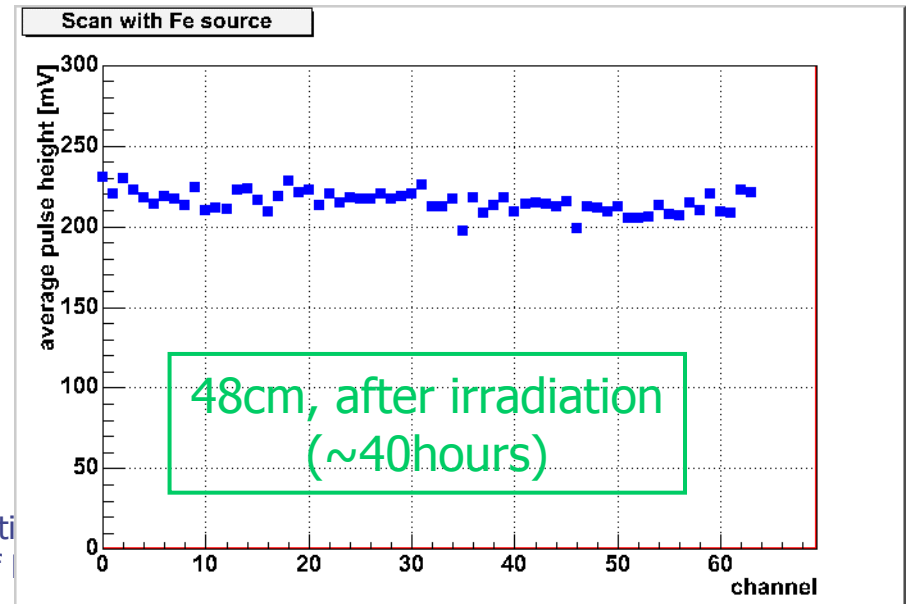
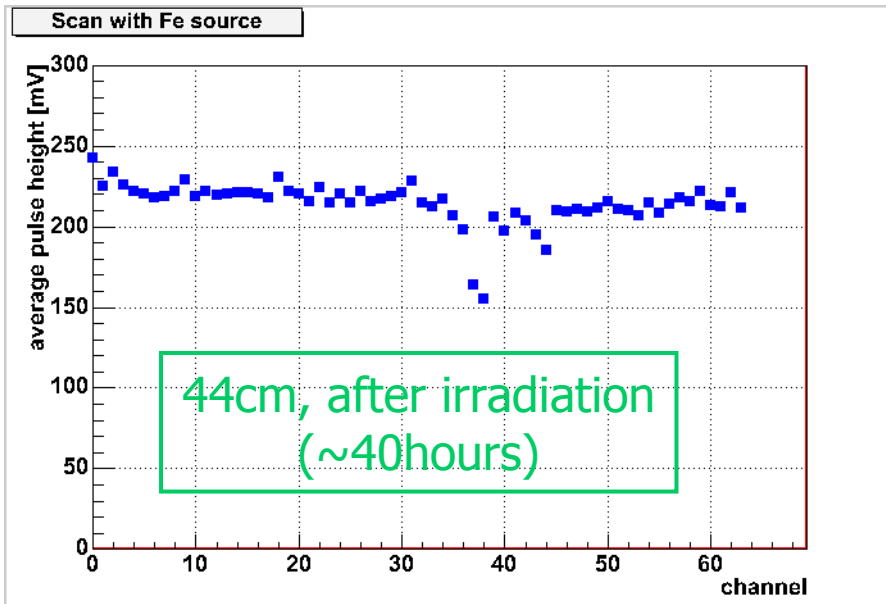
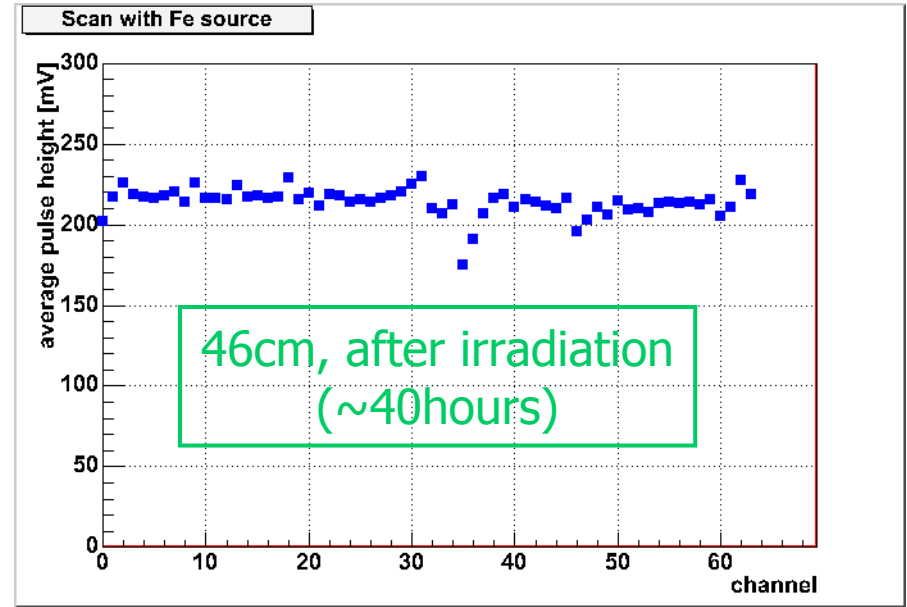
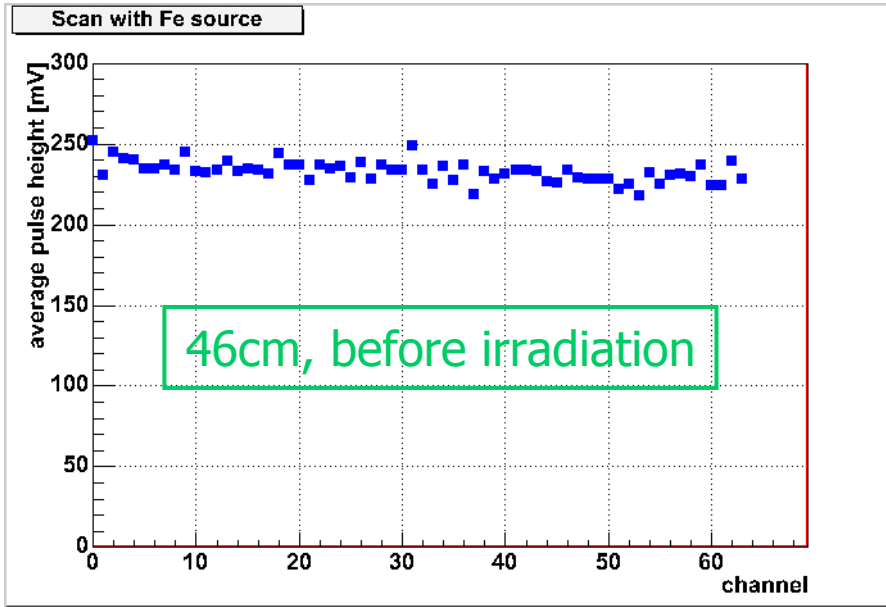
Parameters:

- Total irradiated area: $\sim 25\text{cm}^2$
- Source: ^{55}Fe
- Voltage 1600V
- Total duration of irradiation: 40h
- Gas pipes: Inlet SS + $\sim 30\text{cm}$ plastic for gas distribution
Outlet plastic
- Module operated in 45° position (to simulate vertical operation)
- Gas flow: 18l/h (1 vol. exchanges per hour)
- Position for source:
40cm from beginning of active area
- Strong source:
Maximum flux: Channel 40: 35kHz
Flux for channel 35 and 45: $\sim 1\text{kHz}$

* changed!



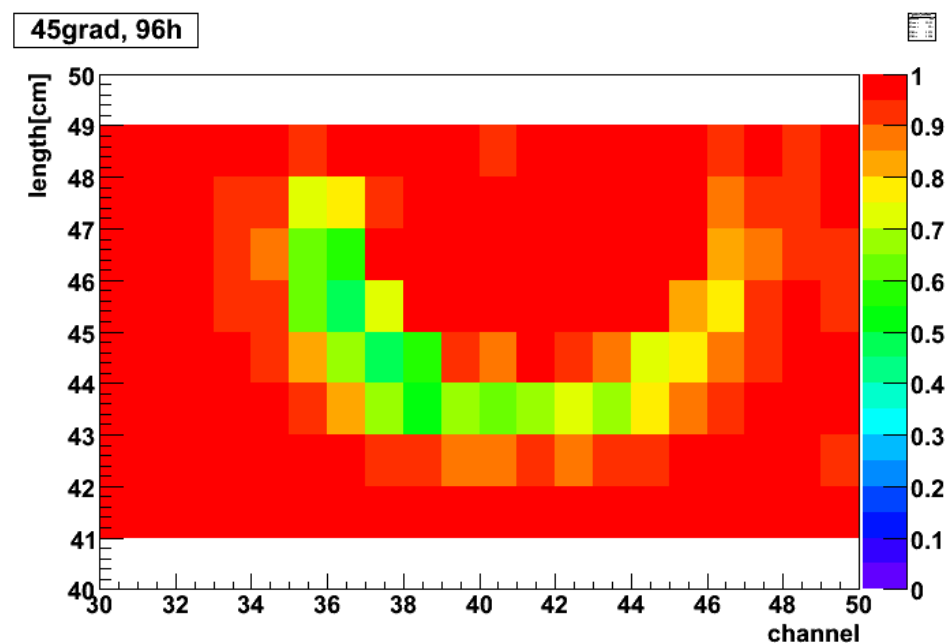
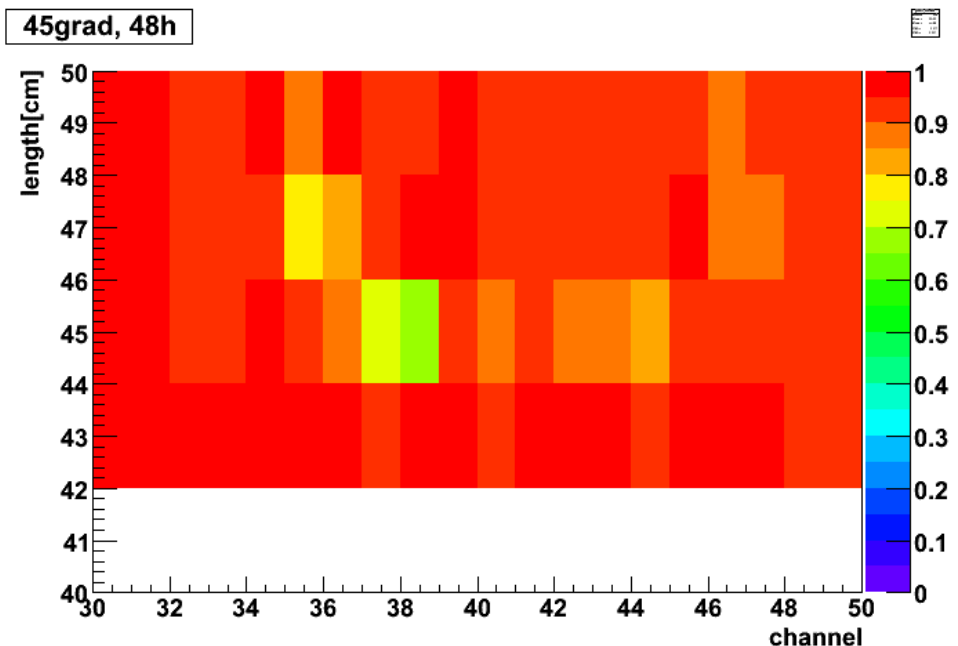
Scan at irradiated position



Scans after irradiating

After 48 hours:

After 96 hours:



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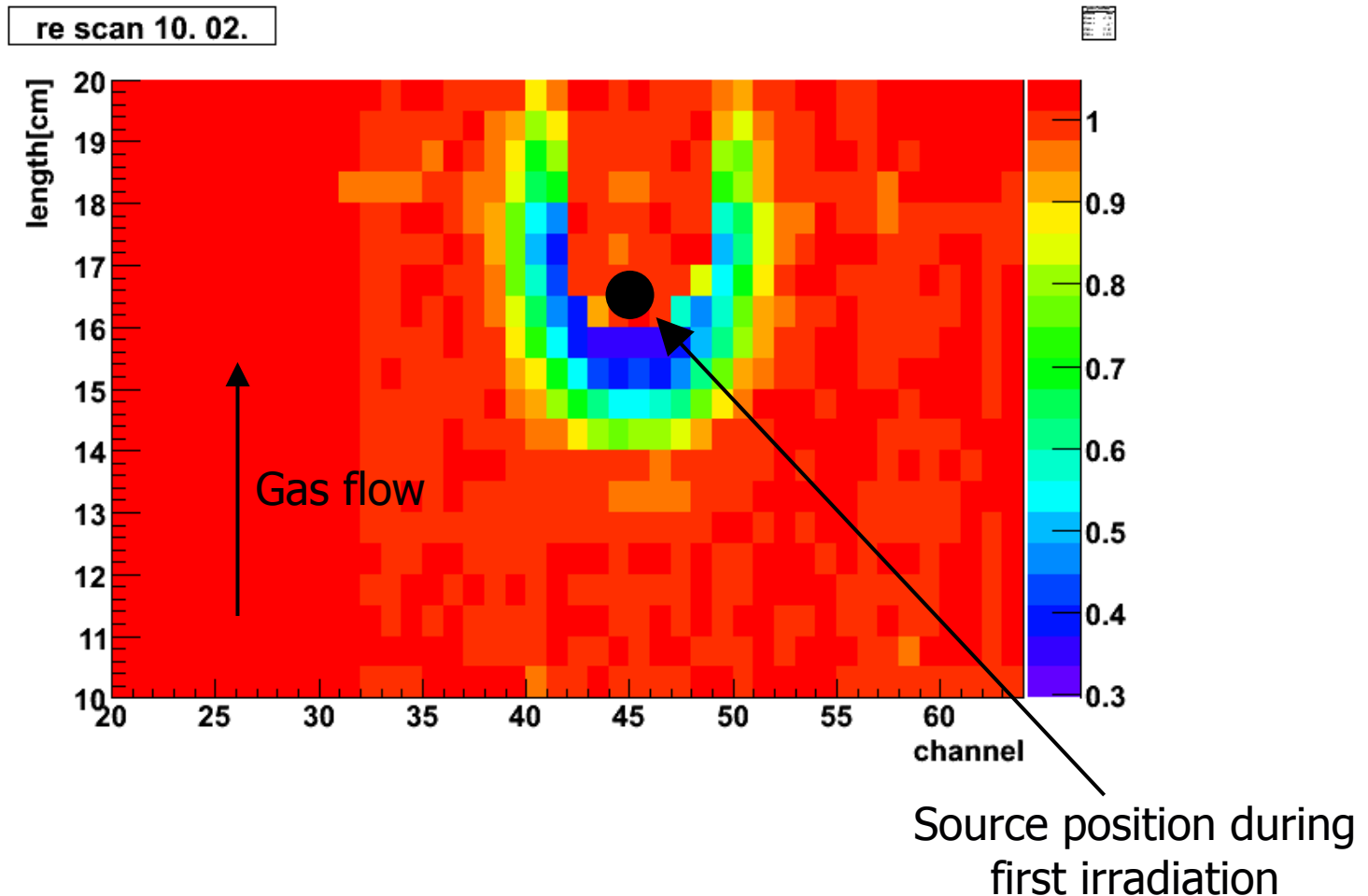
NSS2004 Sebastian Bachmann
University of Heidelberg

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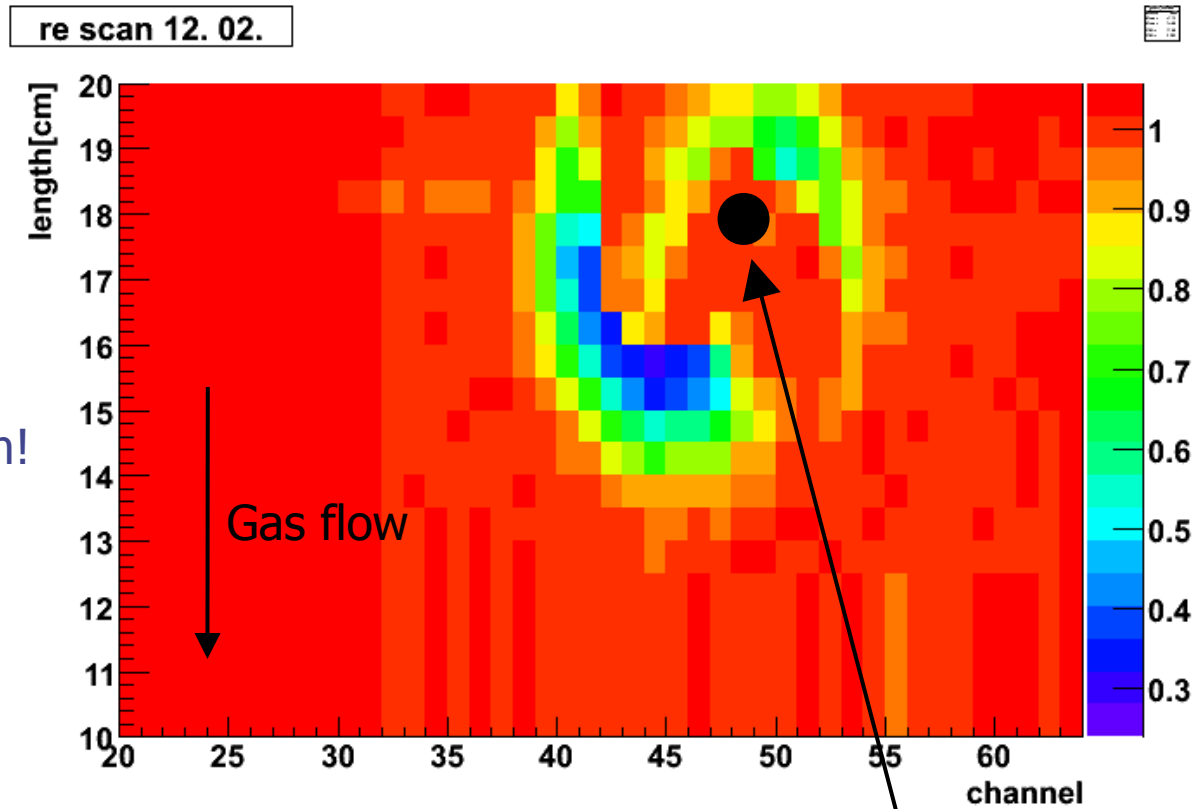
Reirradiate a damaged spot

Rescan of damaged spot from first irradiation of module 52:



Scan after second irradiation

Note:
Several trips
during irradiation!

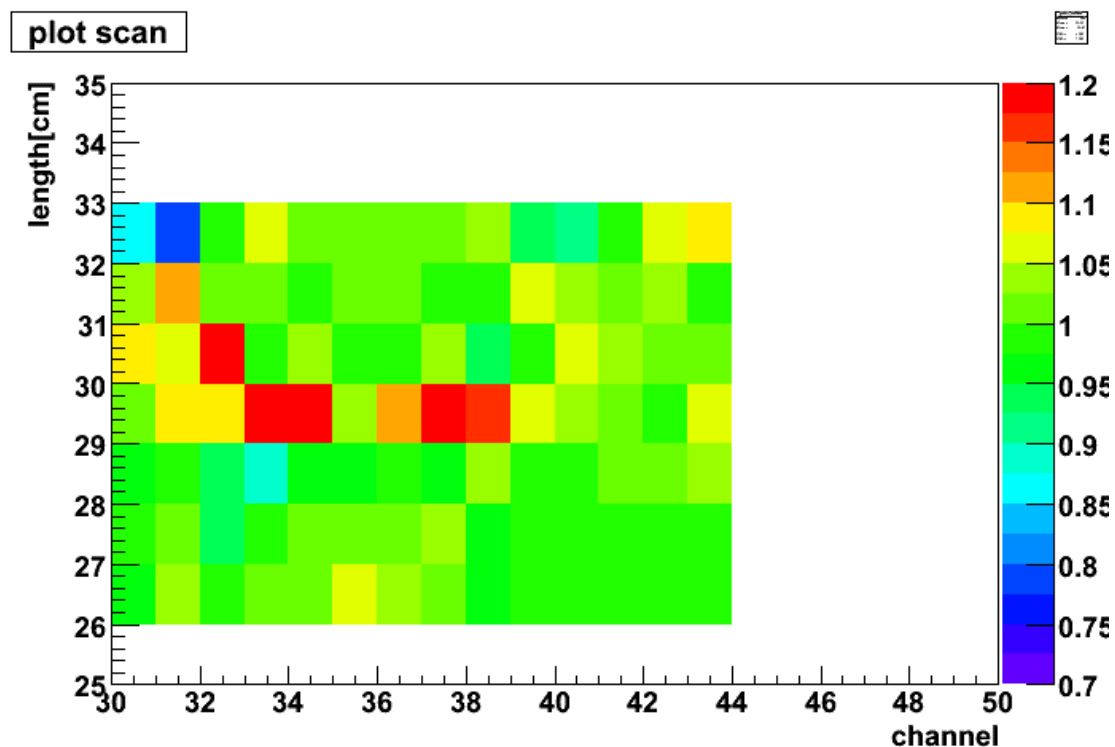


Apply reversed voltage

For ~ 12 hours a voltage of 1300V with inverted polarity was applied to Module 52.

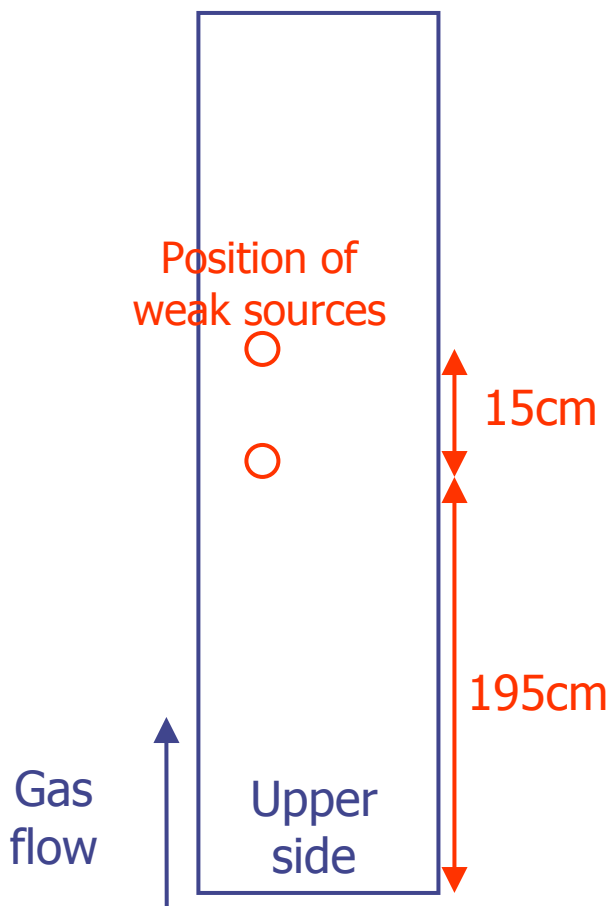
The plot shows the ratio of the pulse height before and after the irradiation.

The scanned spot has been irradiated before (see page 20):

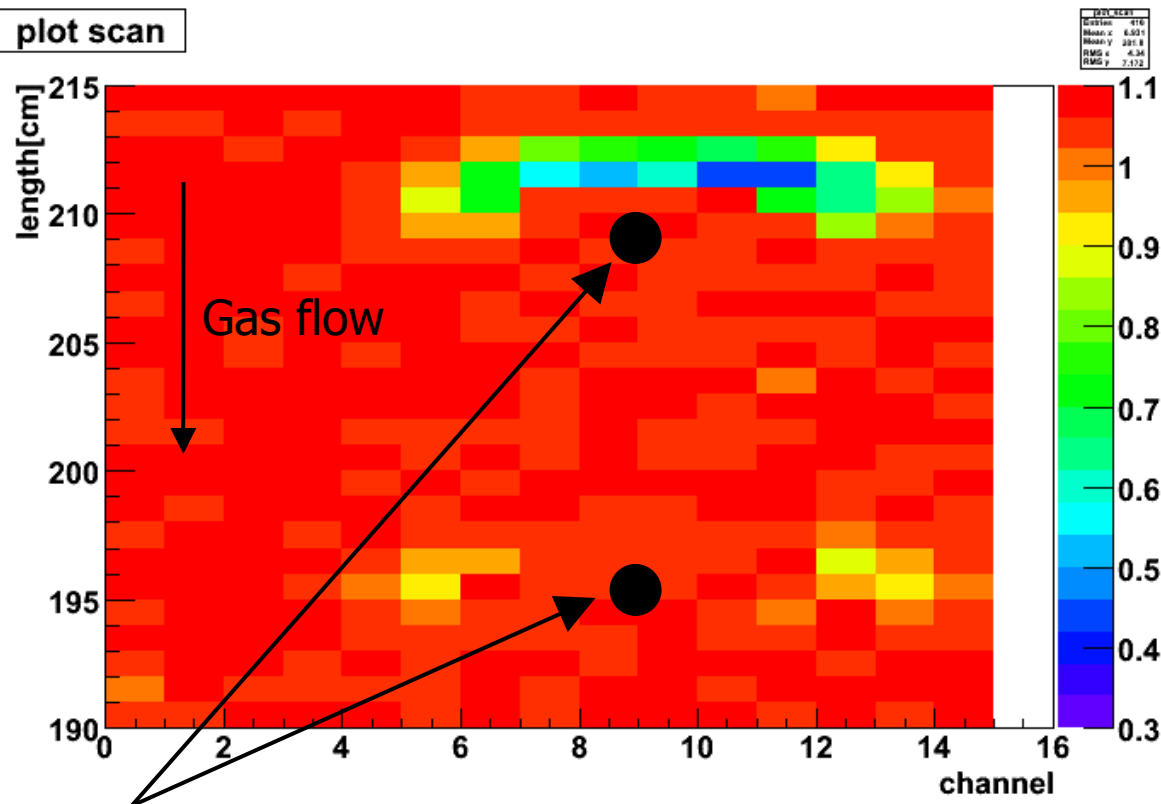


Irradiation with 2 sources in series

Irradiate same straw with two weak sources over 96 hours:



plot scan

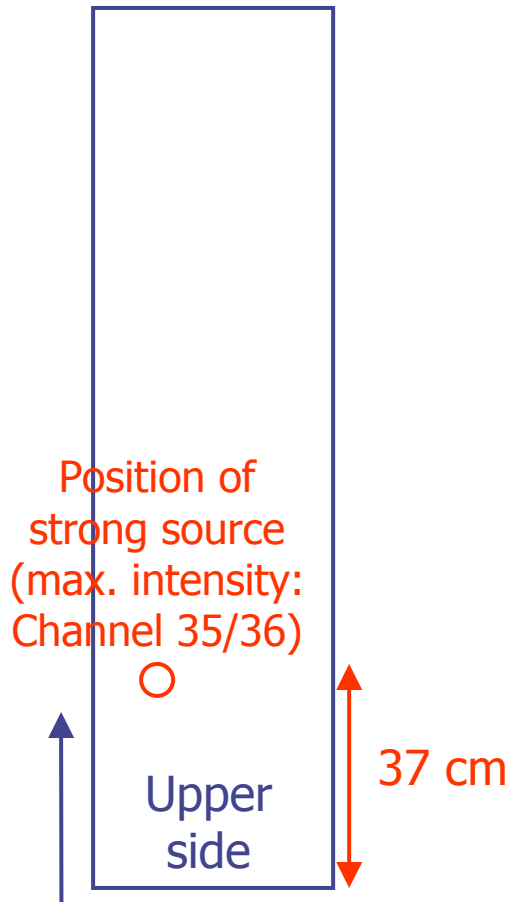


Source positions during second irradiation



Irradiation of module 12 in validated system

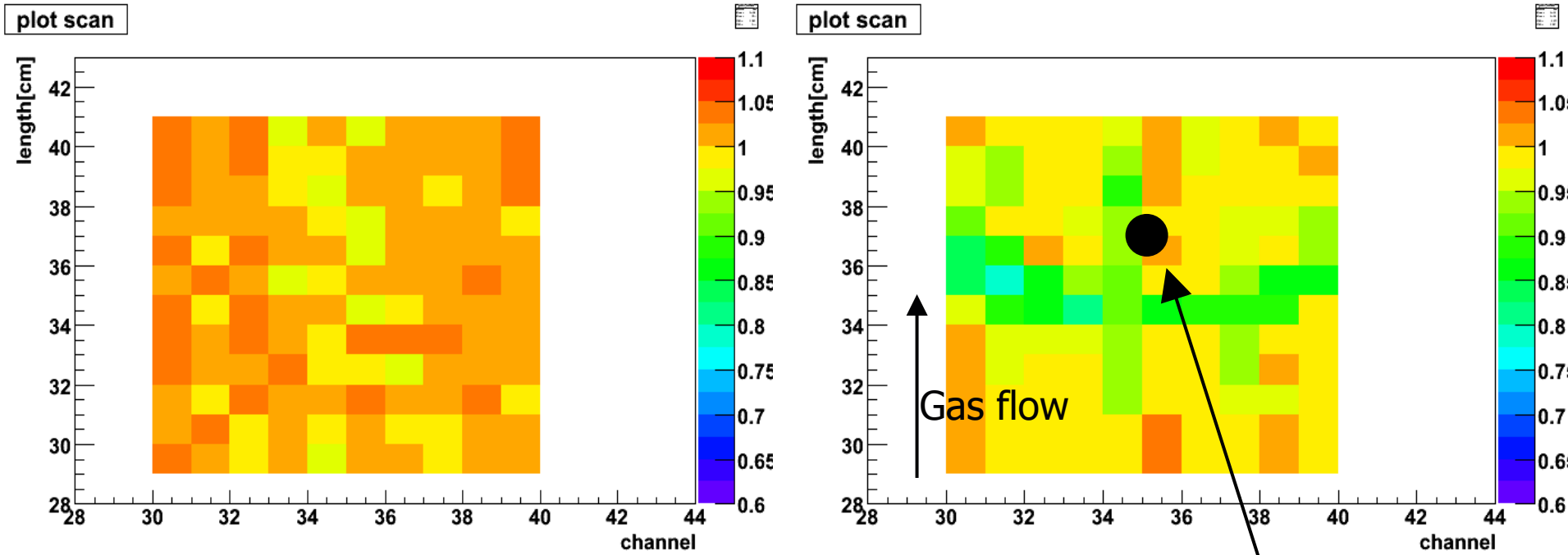
Same gas system used as for all ageing tests.
Gas flow is limited to $\sim 150\text{ml/min}$, i.e. 0.5vol./hour
Irradiation time 96hours.
All other parameters are the same as for tests with Module 52



Scans before and after irradiation:

Before irradiation:

After 96hours of irradiation:



Note: Effect is small but measurement has been done at a low gas flow (~ 0.5 vol. exchanges/hour).

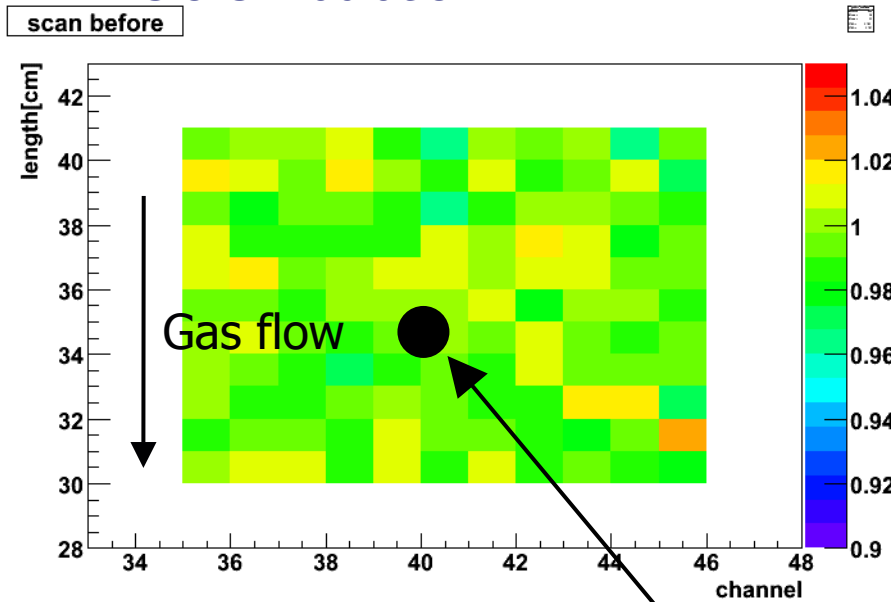
Source position during irradiation



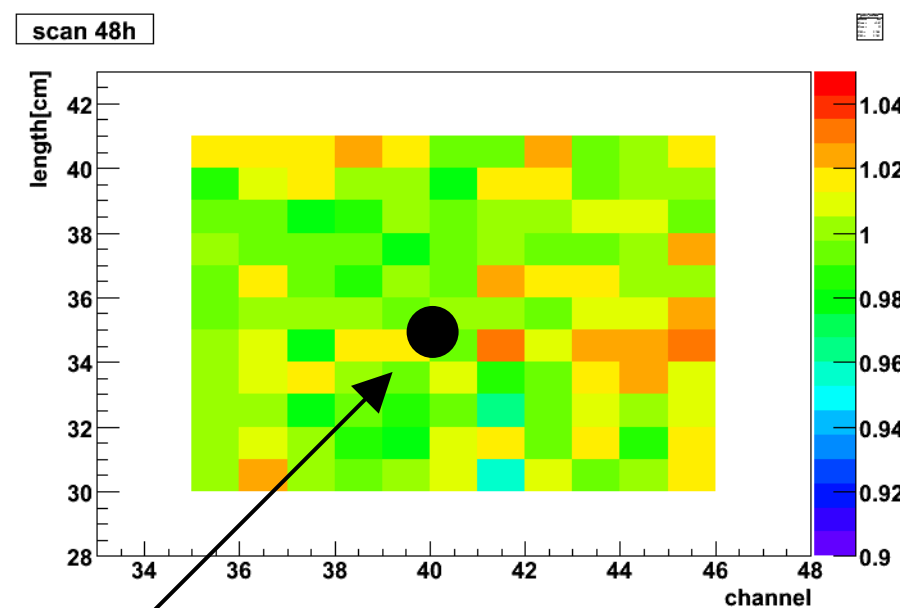
Irradiation of 1m module

1m from cosmic ray set-up is irradiated under default conditions using strong source.
Total irradiation time 48hours, first 24 hours at 3l/h, then 6l/h.

Before irradiation:



After 48hours of irradiation:



Source position

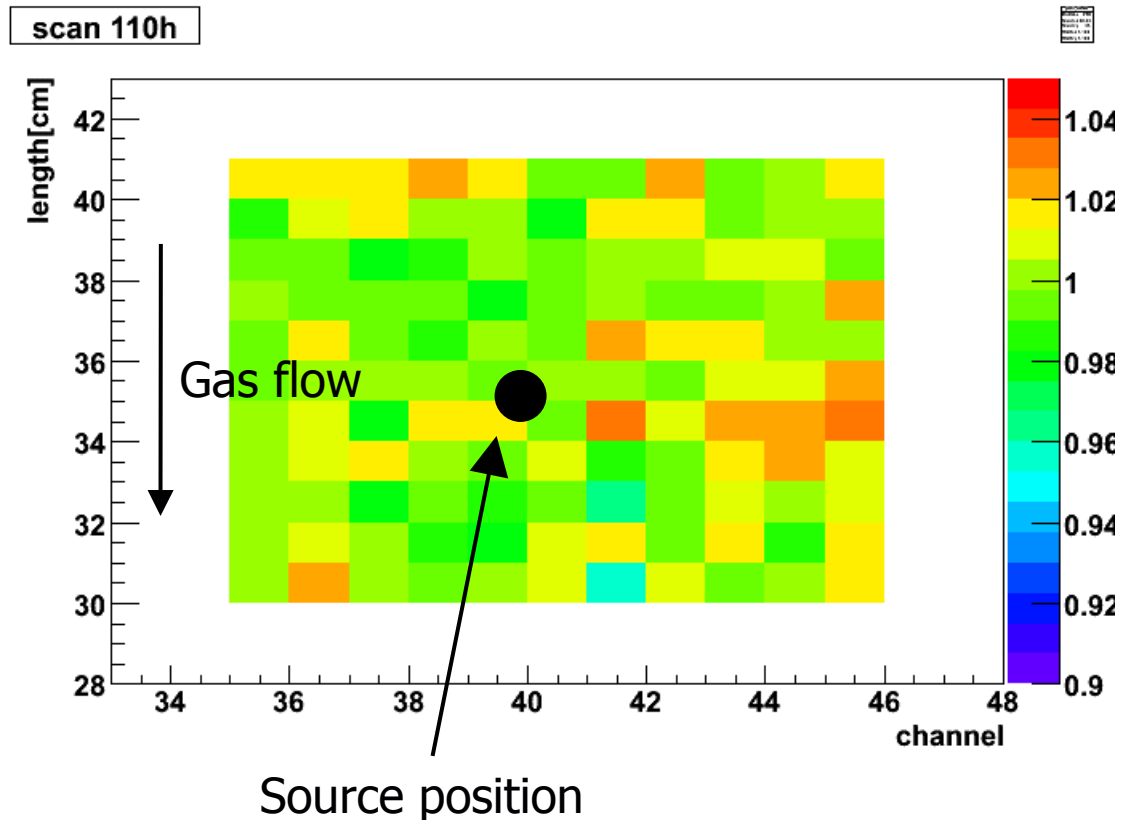


Try to force effect in 1m module

To enforce the effect in the module we:

- increased the gas flow to 12l/h
- added 4x3 gas pipes from the production at the gas inlet
- operated the module in the exhaust of a F-module

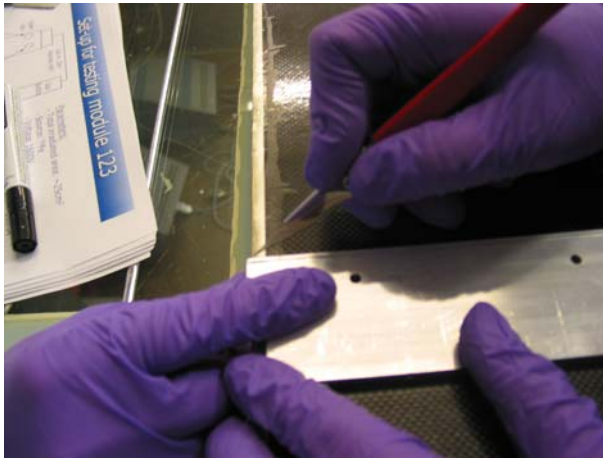
but after additional 68hours of irradiation we see no effect:



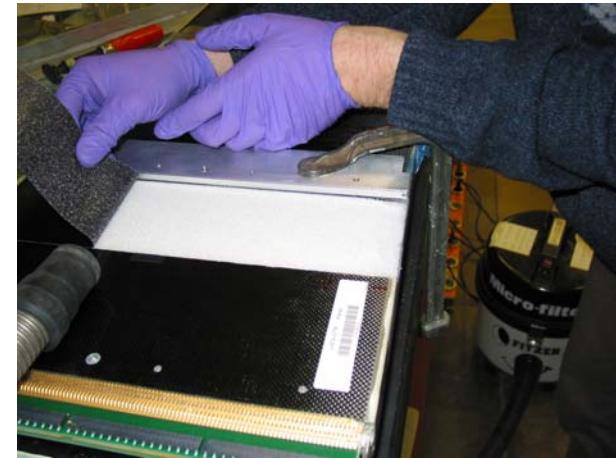
Open module 52

The irradiate module 52 has been opened. The following slides describe the procedure:

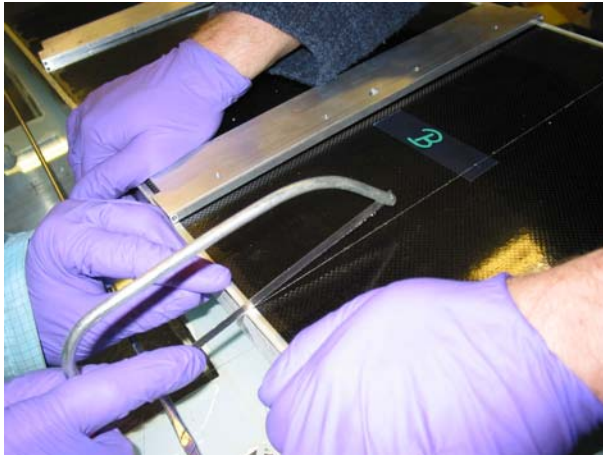
1. cut upper CF-layer of panel A (panel B was irradiated!)



3. remove upper CF-layer of panel A



2. cut side walls



3. after removal of CF-layer



Open Module 52

5. remove side walls



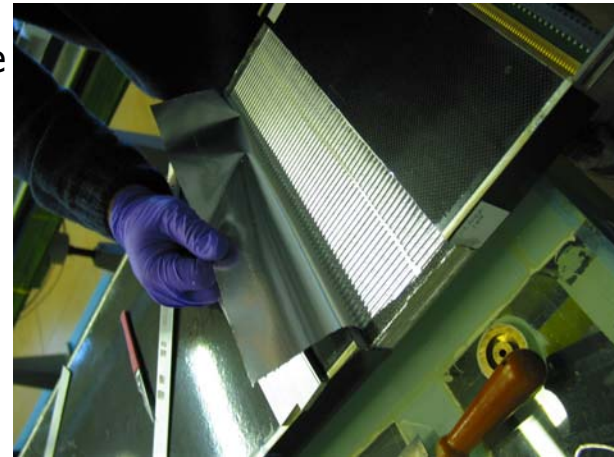
7. after removal of Rohacel



6. remove Rohacel from lower CF-layer by means of a sharp ruler



8. cut and remove lower CF-layer

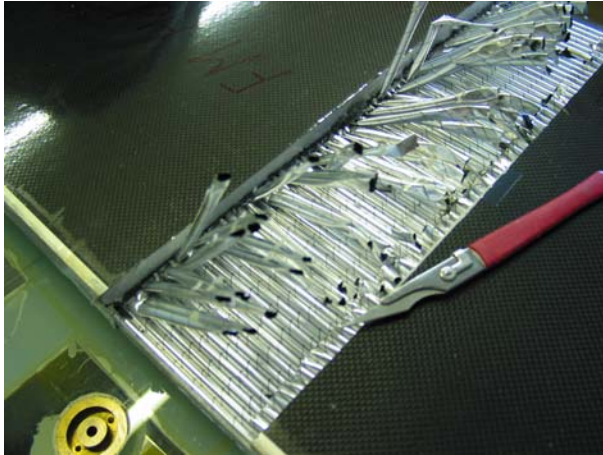


3/1/2006

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Open module 52

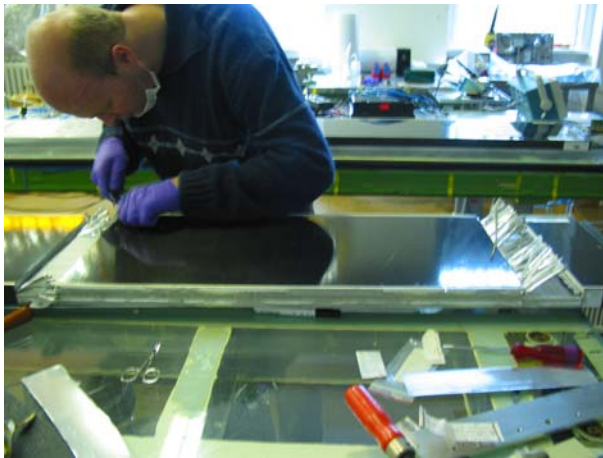
9. cut straws
(these are **not**
the irradiated
straws!).



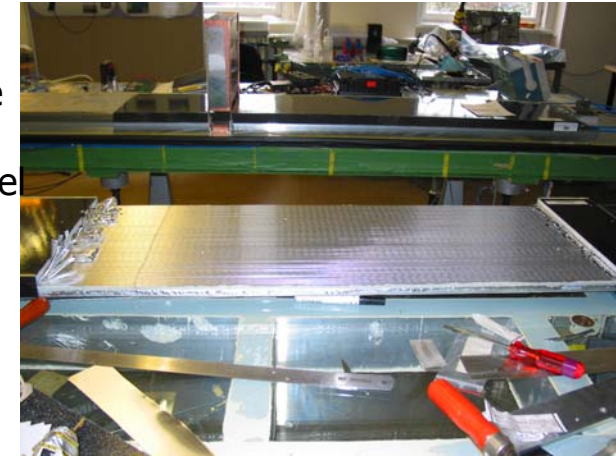
11. ...and remove
upper panel



10. Repeat proce-
dure in another
position...



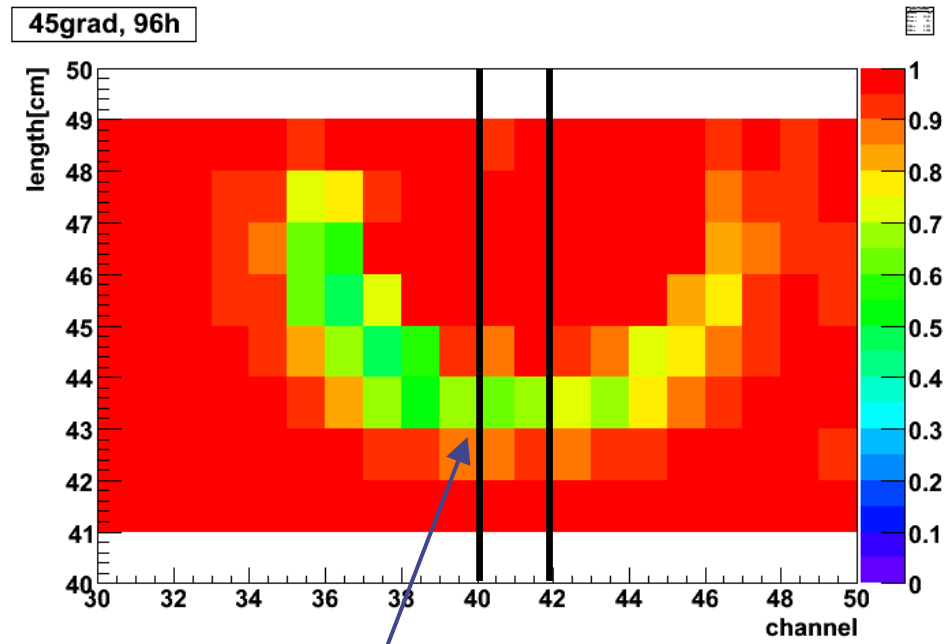
12. Now you have
access to the
straws of pane
B.



Module 52 has been opened

We opened module 52 and inspected wire from the irradiated region. Parameters for irradiation see page 28.

In this region the straw cathode is more dull. The effect is sharply bordered.



Pictures are shown from channels 40 and 42

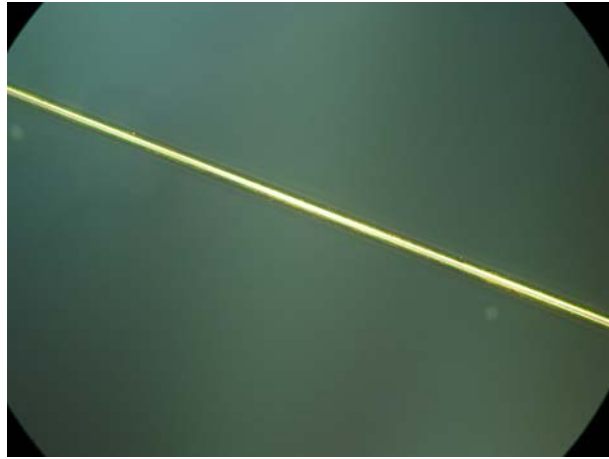


Some pictures from...

...a new wire:

Wire 63 (not irradiated!)

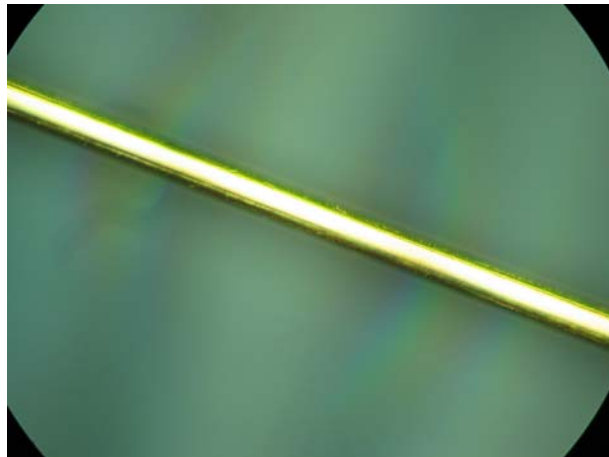
Magnif. 20:



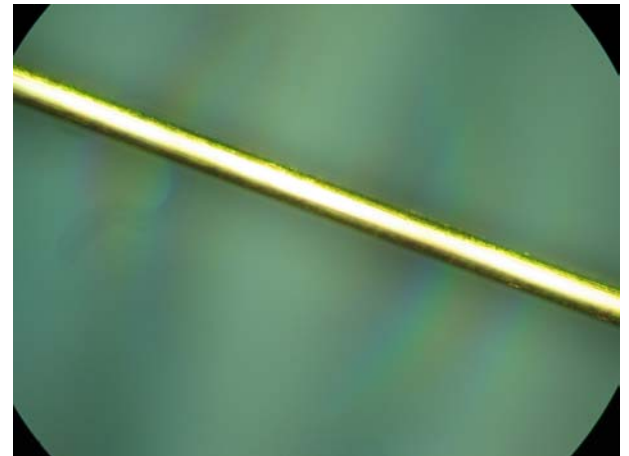
Magnif. 20:



Magnif. 50:



Magnif. 50:

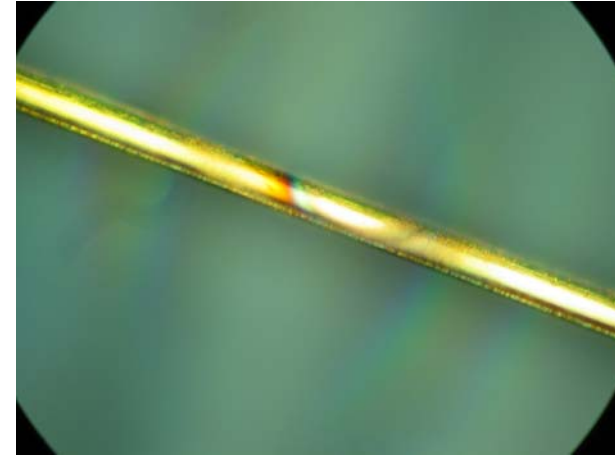


Wire 42:

Pos.: 44,3cm
Magnif. 20:



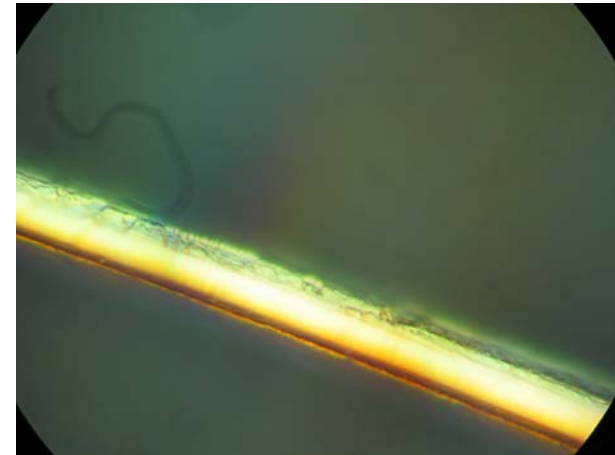
Pos.: 44,5cm
Magnif. 50:



Pos.: 44,3cm
Magnif. 50:

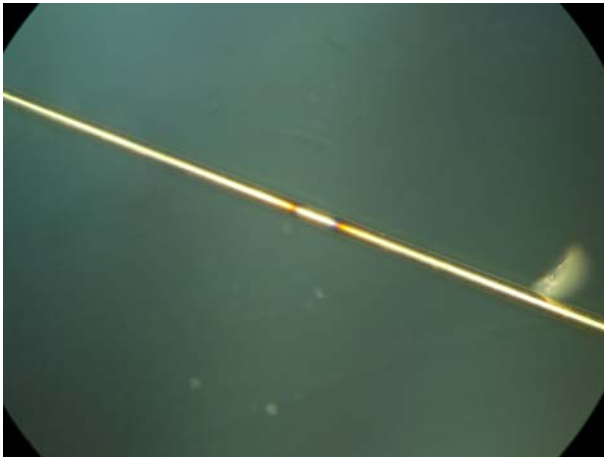


Pos.: 46,5cm
Magnif. 100:

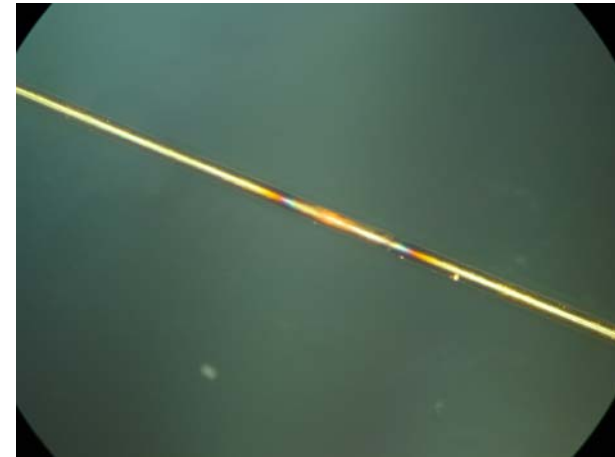


Wire 40

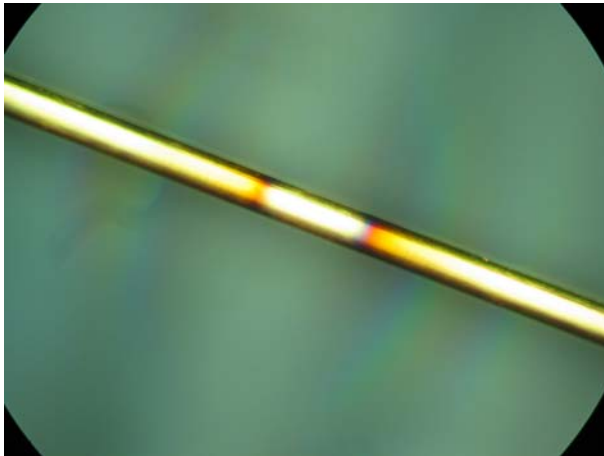
Pos.: 43,0cm
Magnif. 20:



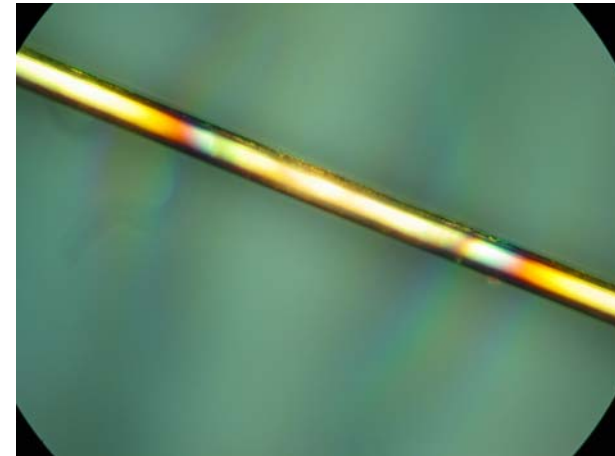
Pos.: 45,2cm
Magnif. 20:



Pos.: 43,0cm
Magnif. 50:



Pos.: 45,2cm
Magnif. 50:

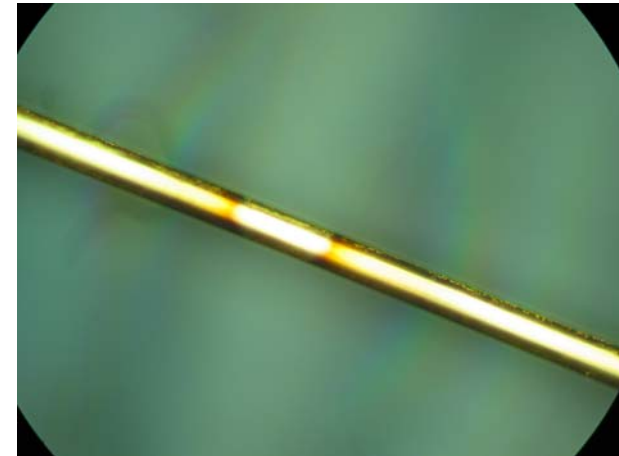


Wire 40

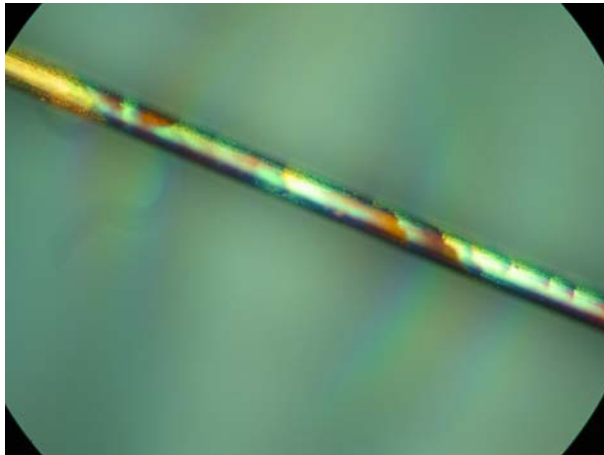
Pos.: 45,5cm
Magnif. 20:



Pos.: 46,0cm
Magnif. 50:



Pos.: 45,5cm
Magnif. 50:



Pos.: 47,0cm
Magnif. 20:

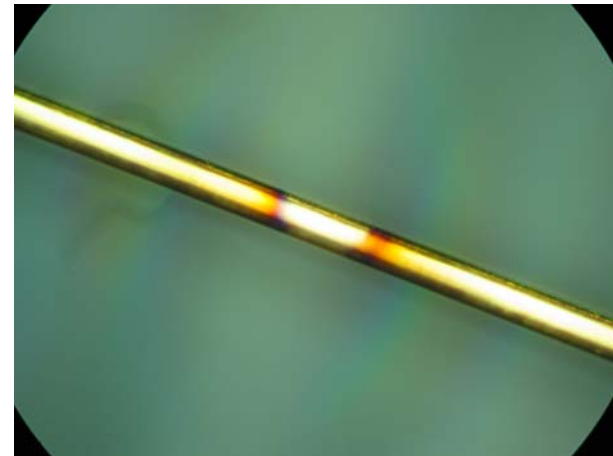


Wire 40

Pos.: 48,2cm
Magnif. 50:



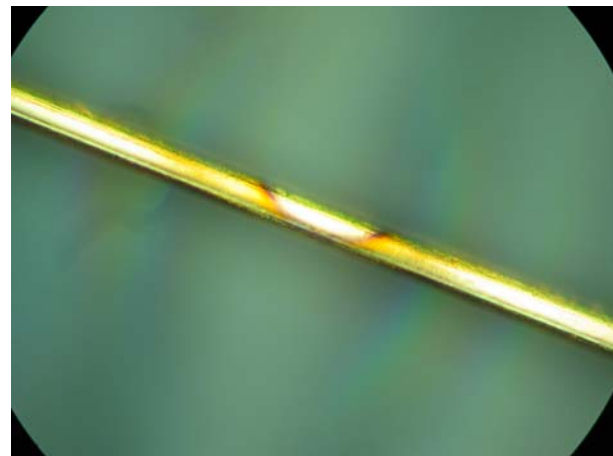
Pos.: 50,3cm
Magnif. 50:



Pos.: 48,5cm
Magnif. 50:



Pos.: 52,1cm
Magnif. 20:



Remark

For wire 40 and 41 the damage is very well localized in two spots.

For wire 42 there are two spots with major damages, but there are damaged spots regularly distributed over the entire wire.

The diagram shows the position of spots along the wire (Note the arbitrary Units for the ordinate).

