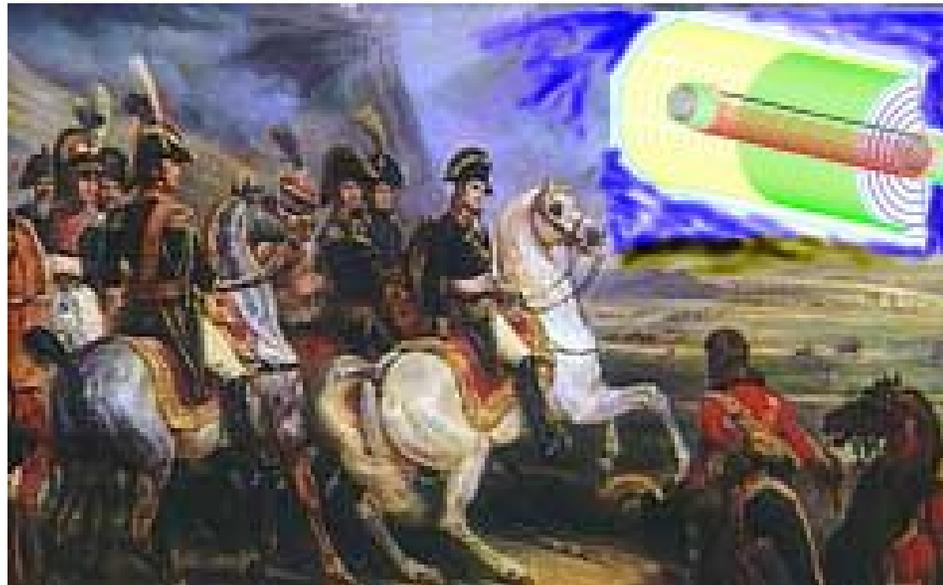
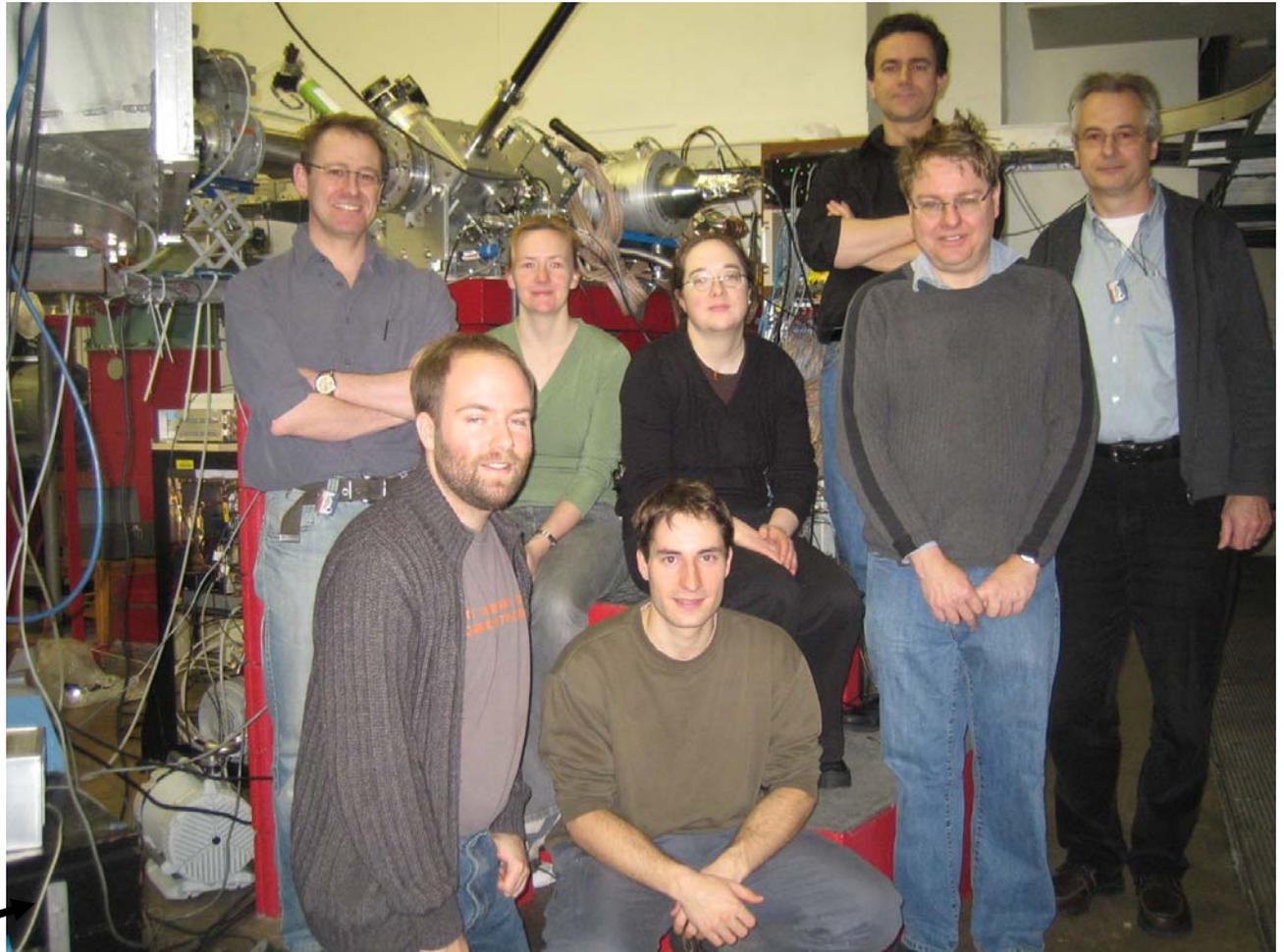


Tactic in Notre-Dame II

TRIUMF Annular Chamber for Tracking and Identification of Charged particles



Lothar Buchmann



Peter Machule

Alan Shotter

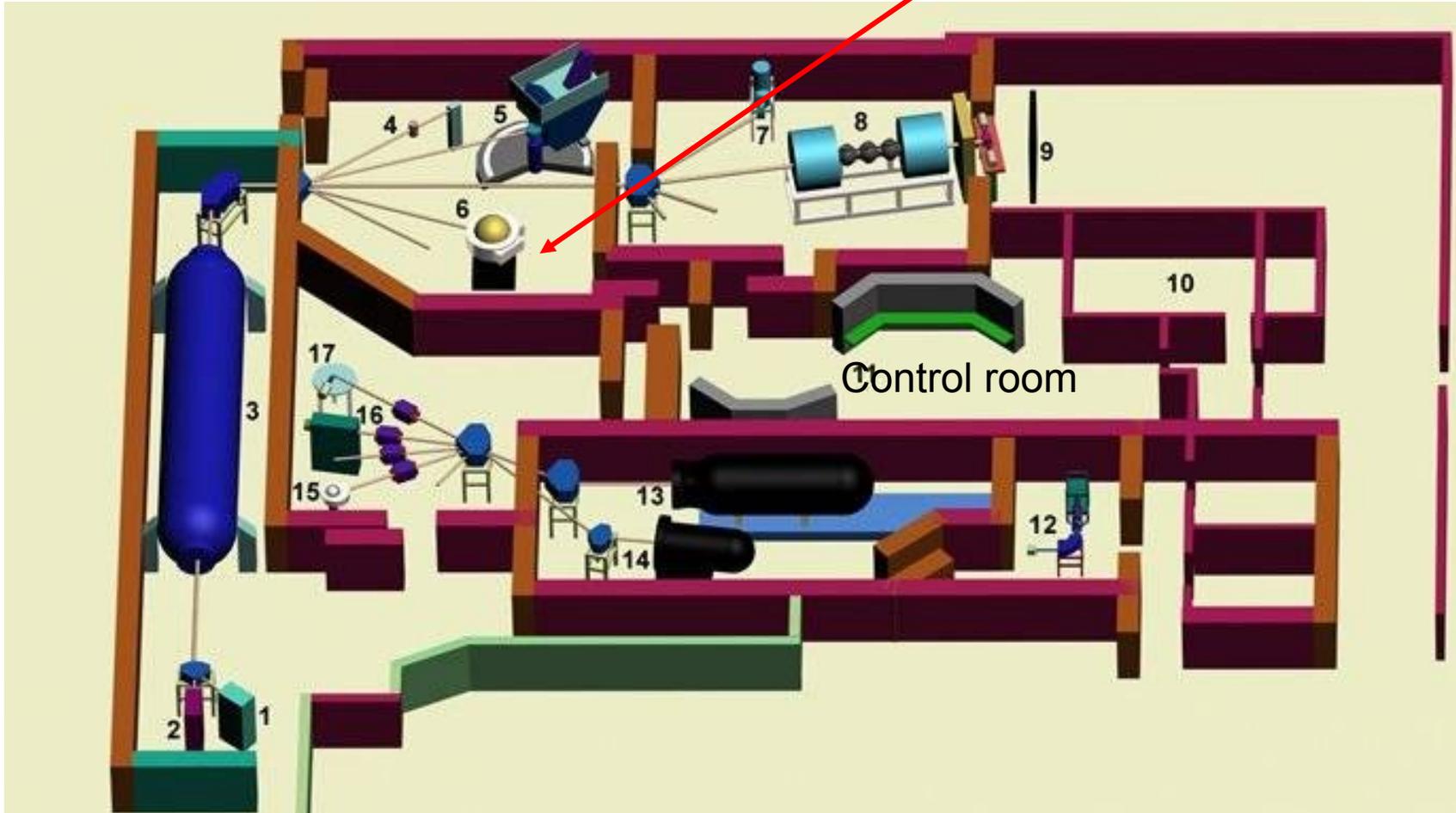
Geography



York

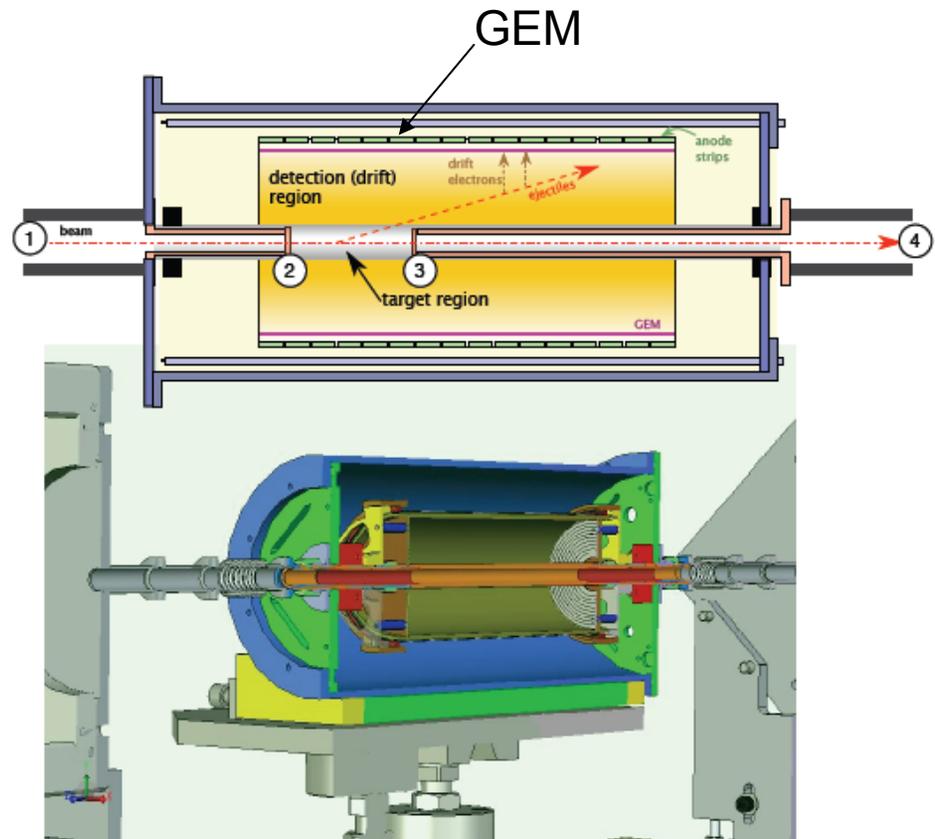
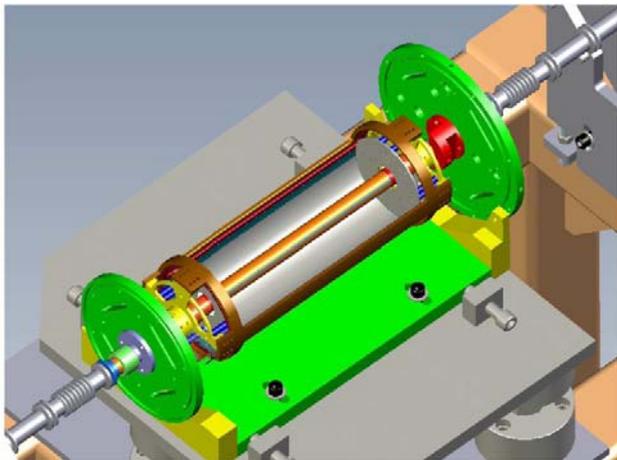
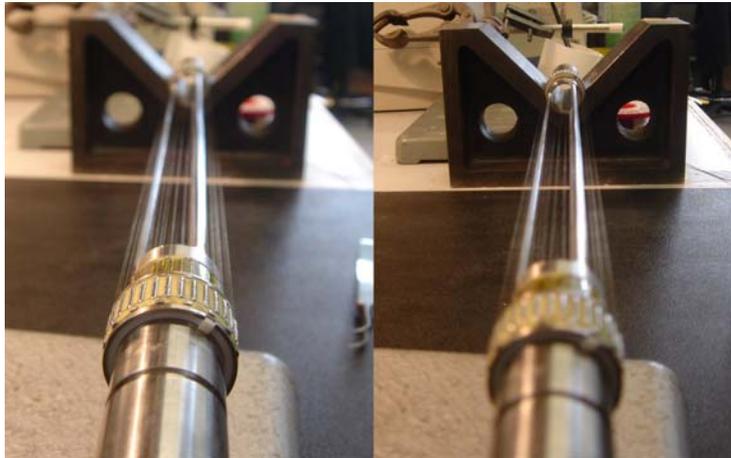
The ND laboratory

We run here.



There are focusing issues at our position, as quads are too far.
Beam was collimated down.

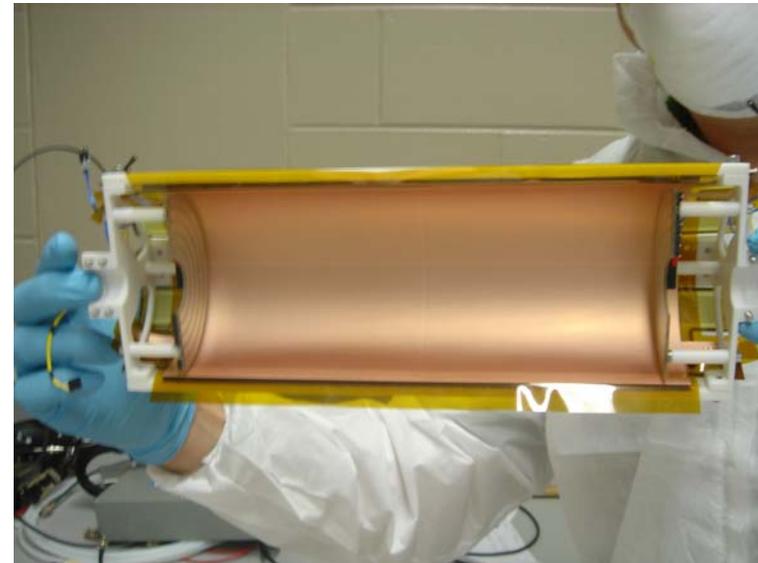
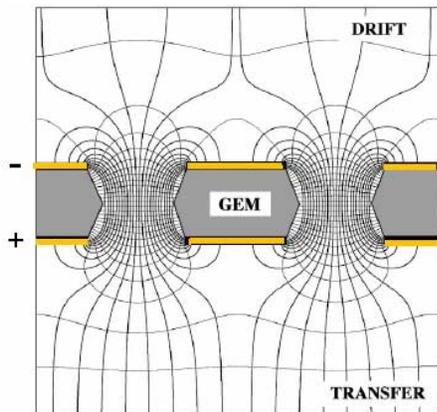
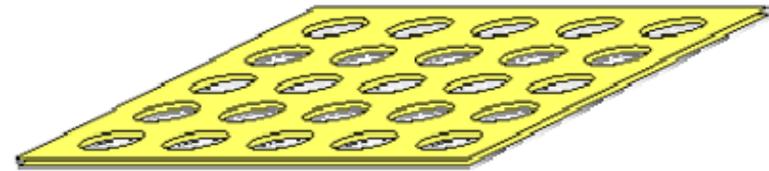
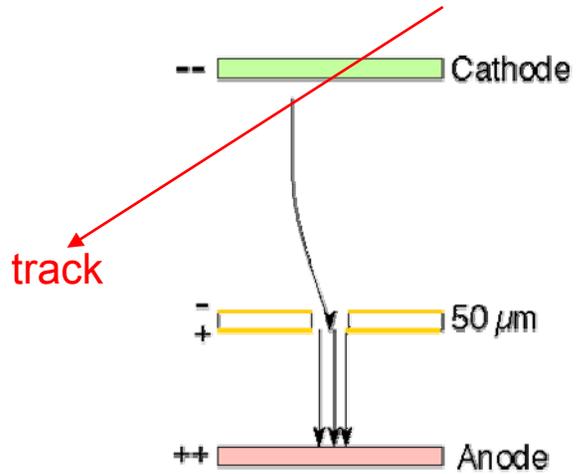
TACTIC-principle/images



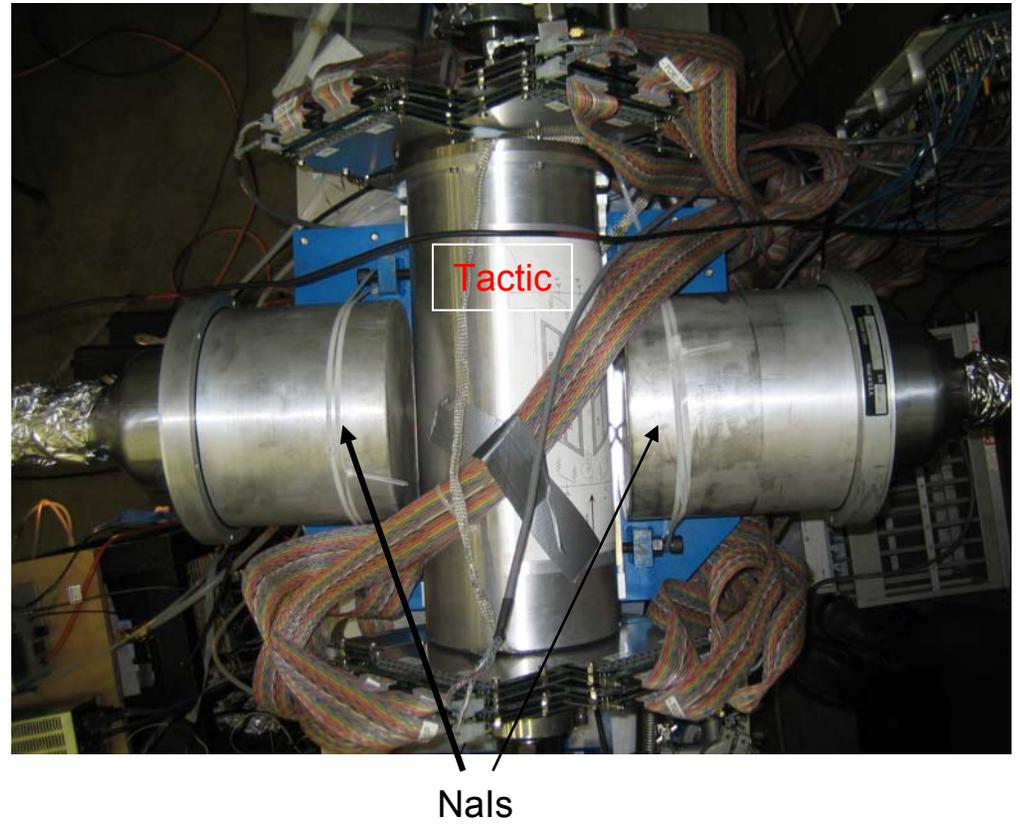
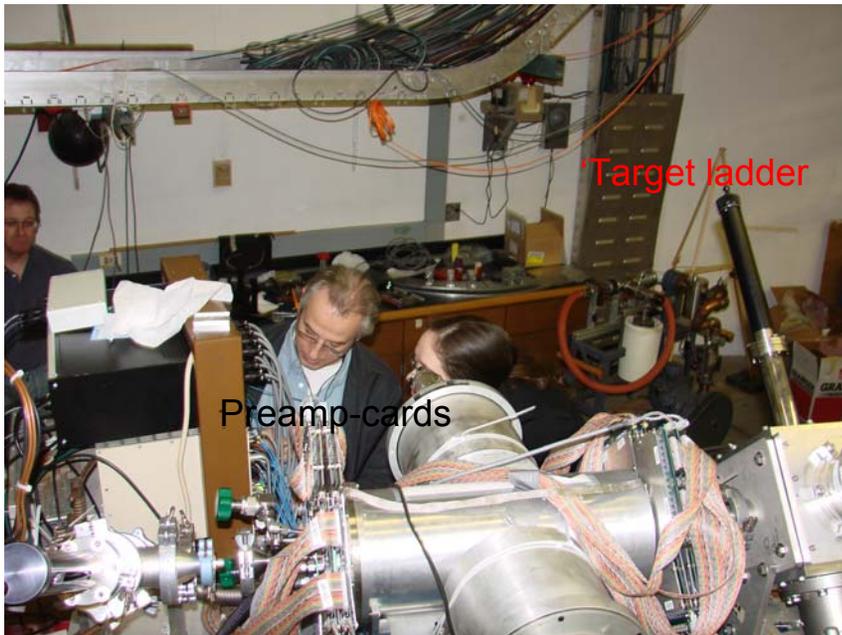
Active target: 90% He, 10% CO₂

Tactic-GEM

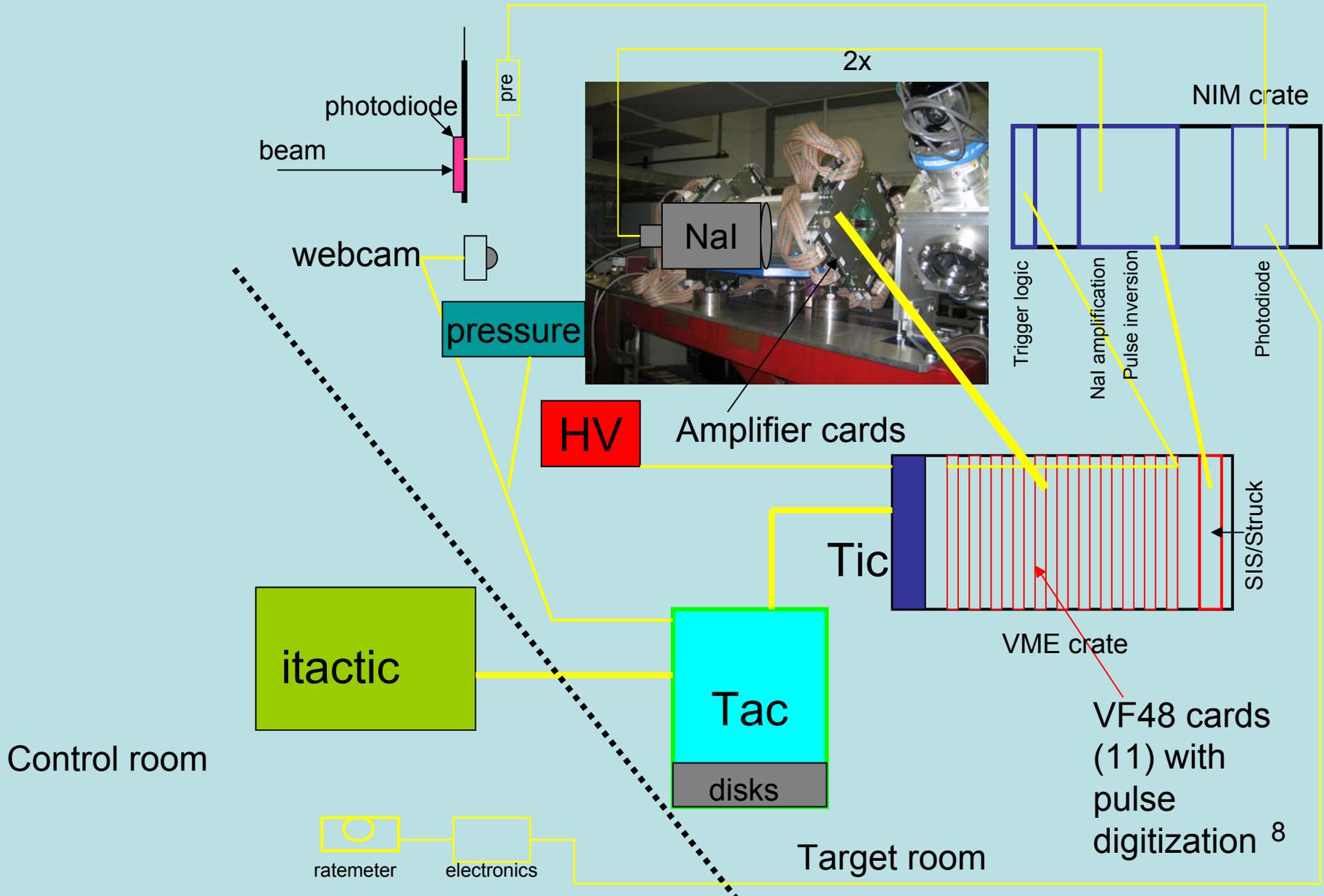
Gas Electron Multiplier



Set-up



Tactic-electronics



Things done in ND

1. Had to change one Gem again.
2. Set up trigger electronics, different possibilities.
3. Set up NaI and Struck module, search for γ -rays.
4. Test new analyzer and DMA mode.
5. Improve toast.
6. Put the inner wire cage on detection potential (outer on lower potential).
7. Shorten detection region.
8. Systematically step through energies (^{10}B).
9. Run different isotopes besides ^{10}B .

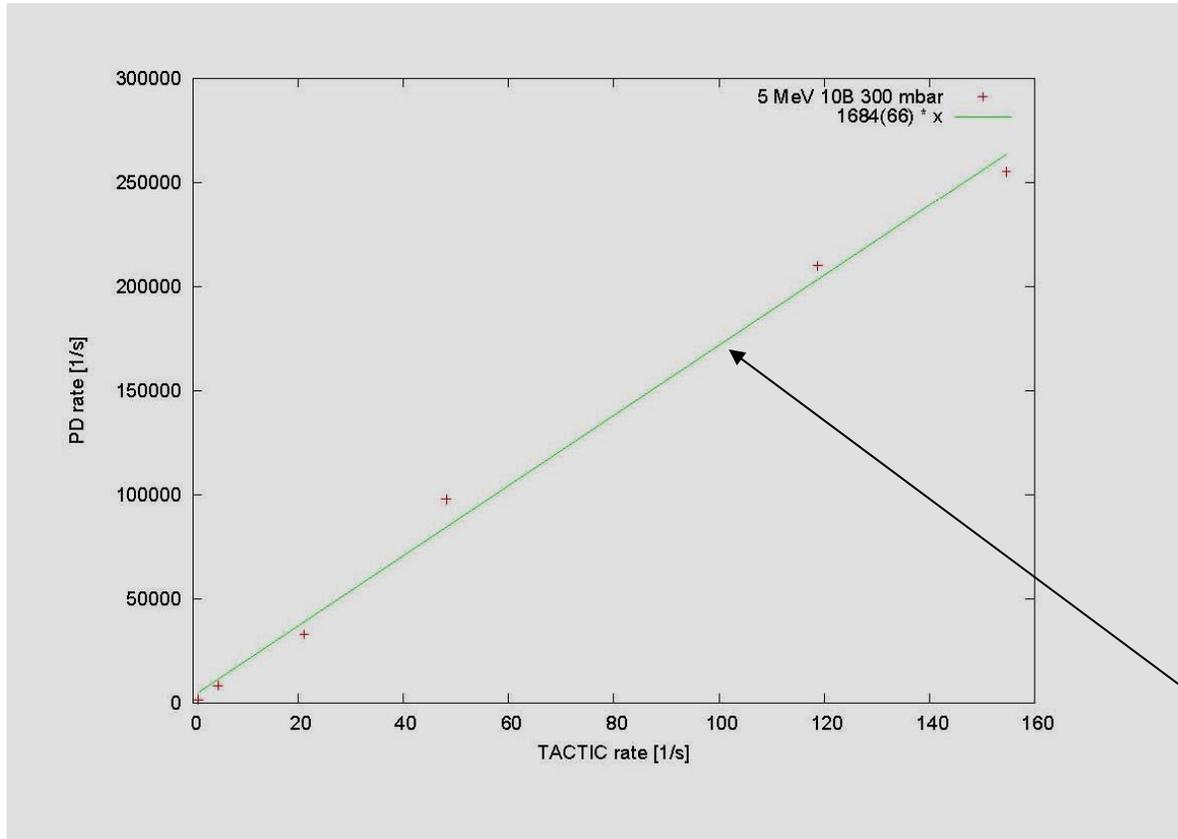
Equipment status

1. All equipment taken is back from Notre Dame including α -sources.
2. Data backed on two external disks taken to TRIUMF and York, now backed onto TRIUMF computers.
3. Tactic has been re-erected for α -tests.
4. BGO stand tables are in the workshop (June run).

Development (hang over from ND1)

- High voltage distribution box is being redeveloped to allow independent setting of drift and GEM (amplification) voltage.
- VF48 problem hopefully soon corrected.
- Development of DMA readout: Has been used in ND. Can be read.
- Computer hang ups in ND1 run seem to have been caused by VME crate.

Photo-diode tests



Tactic rate is energy, pressure, voltage, and ion dependent.

Typical currents in compressed data taking were about 10^6 s^{-1} .

linear

Tactic versus photodiode rate for 5 MeV, ^{10}B , 300 mb.

Toast improvements

38 38 32 46 28 31 43 23
38 38 32 47 28 31 43 23



Hits&Trac
Beachball
Total ene
Energy
Z origin
dE vs E
E vs Z en
R end vs
E vs Z ori
Angle
E vs Angl
Z origin v
E vs lengl
R end
dE vs Ang
Coincider

Ener
Tota
Orig
Angl
dE:

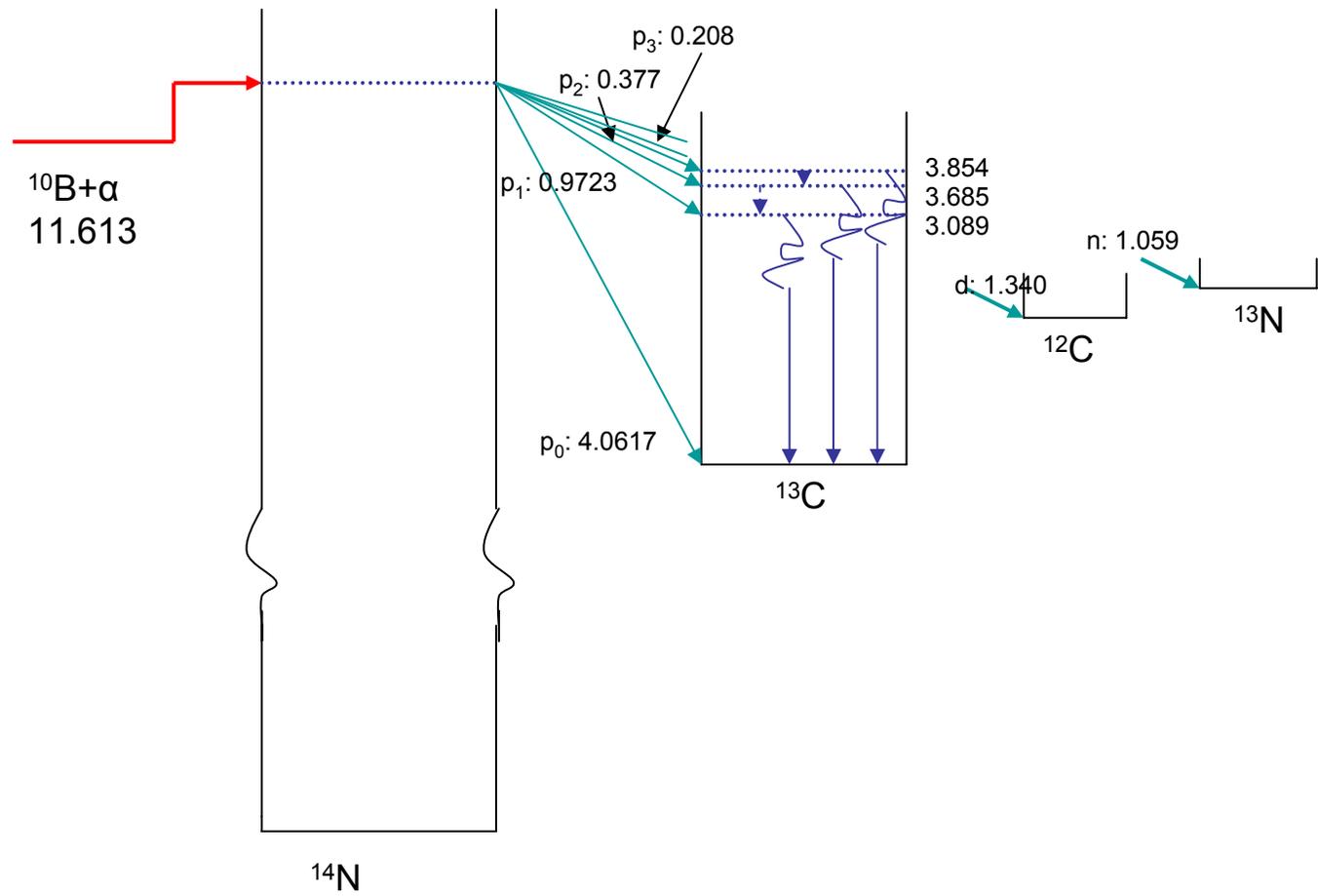
next

events: 4415
HW [V]: 858
Presented: 29905

tracks/event: 1.08
P [mbar]: 151
Accepted: 29904

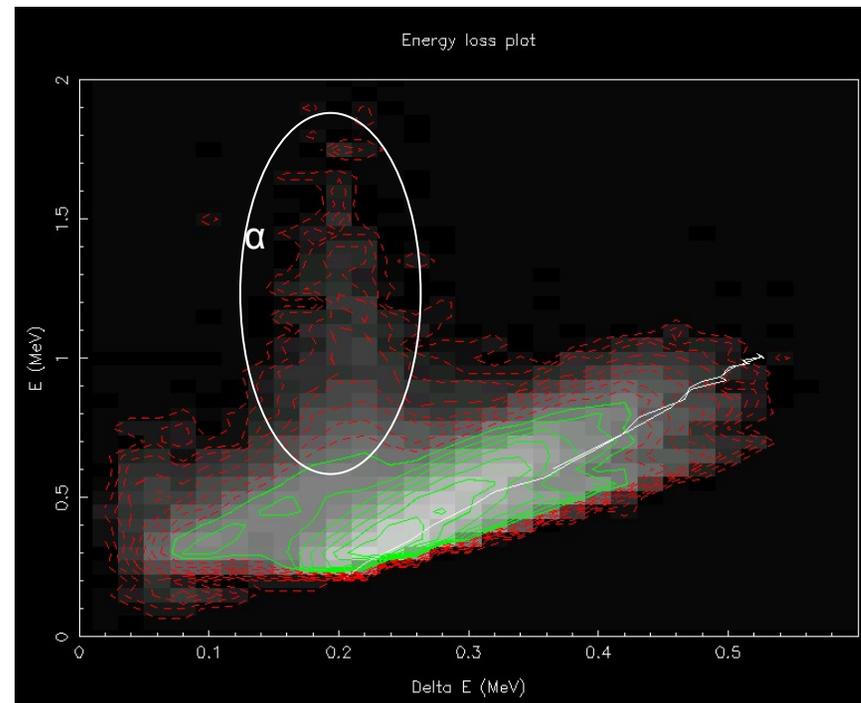
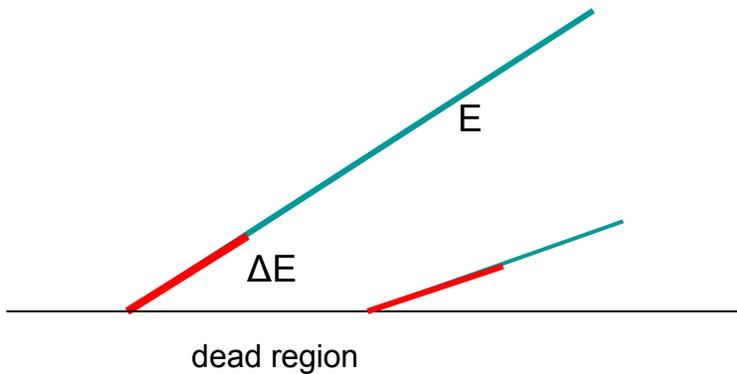
File: run05240.toast
flow [ccm]: 150
unknown strings: 0

$^{10}\text{B} + \alpha$



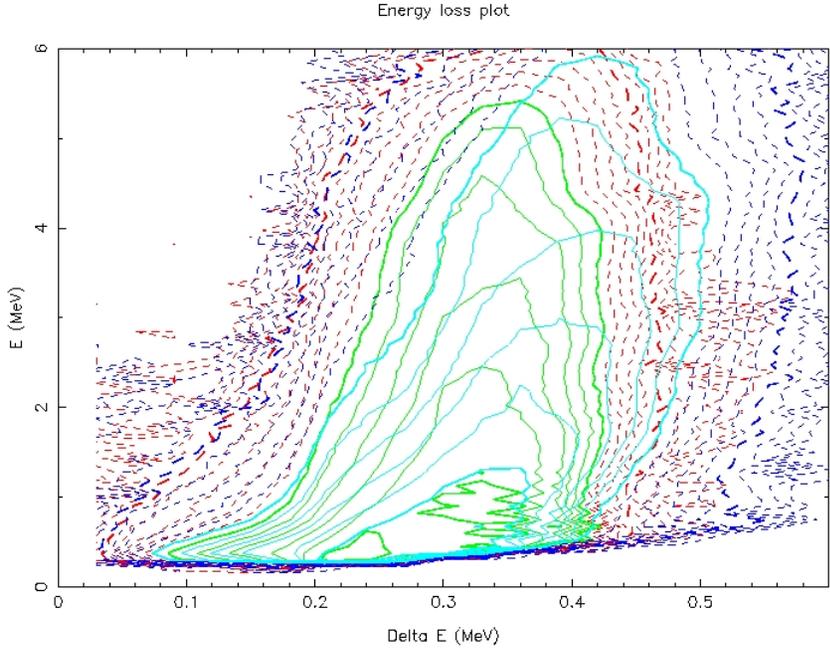
Analysis: $\Delta E/E$

The first way to distinguish different isotopes is to produce $\Delta E/E$ diagrams. However, We are dealing with continuous tracks of different lengths. Therefore the $\Delta E/E$ information forms a continuous locus in the $\Delta E/E$ plane. Many tracks are short and below the Bragg peak.



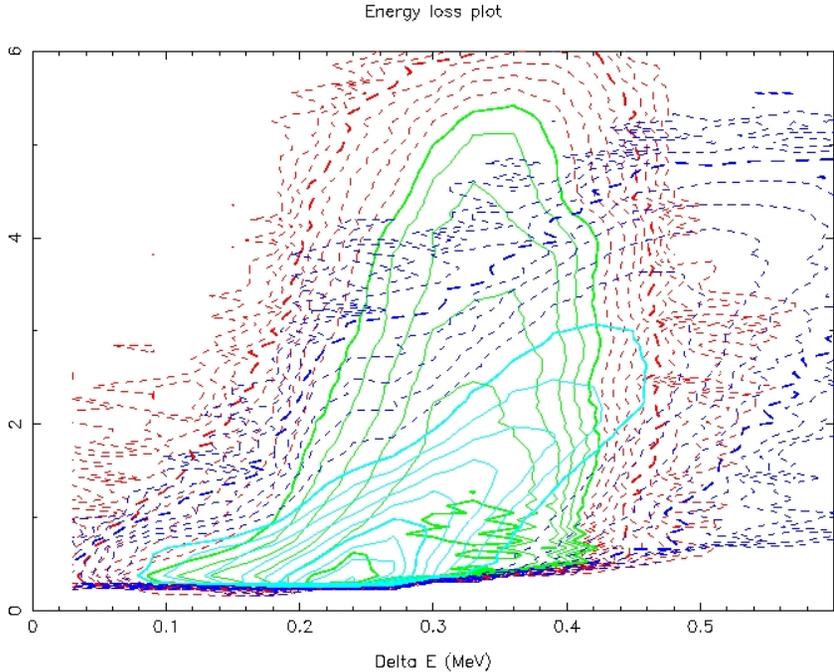
5 MeV run

Analysis: $\Delta E/E$



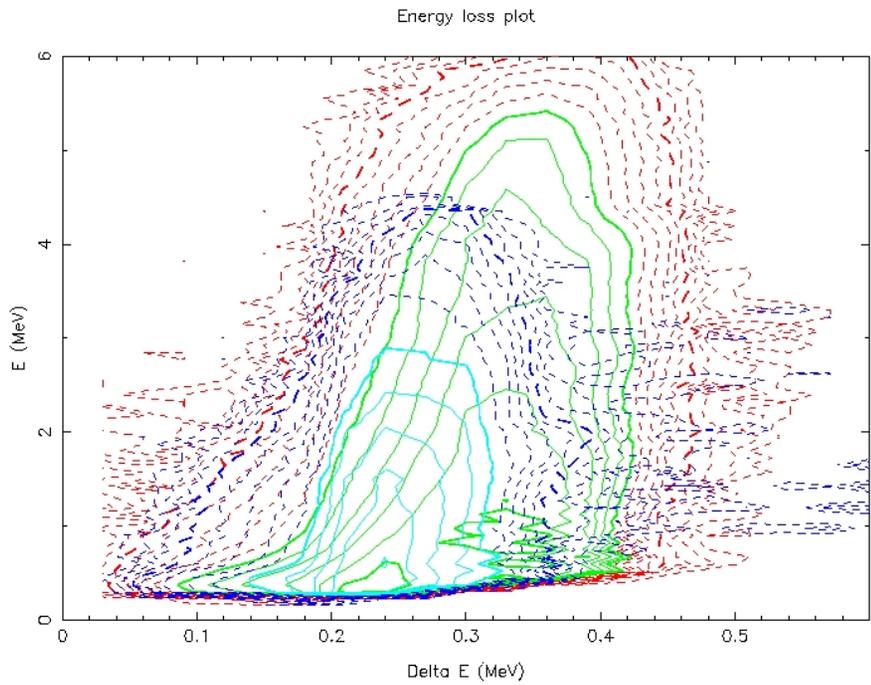
$^{10}\text{B} \leftrightarrow ^{13}\text{C}$

Contours: natural logarithm



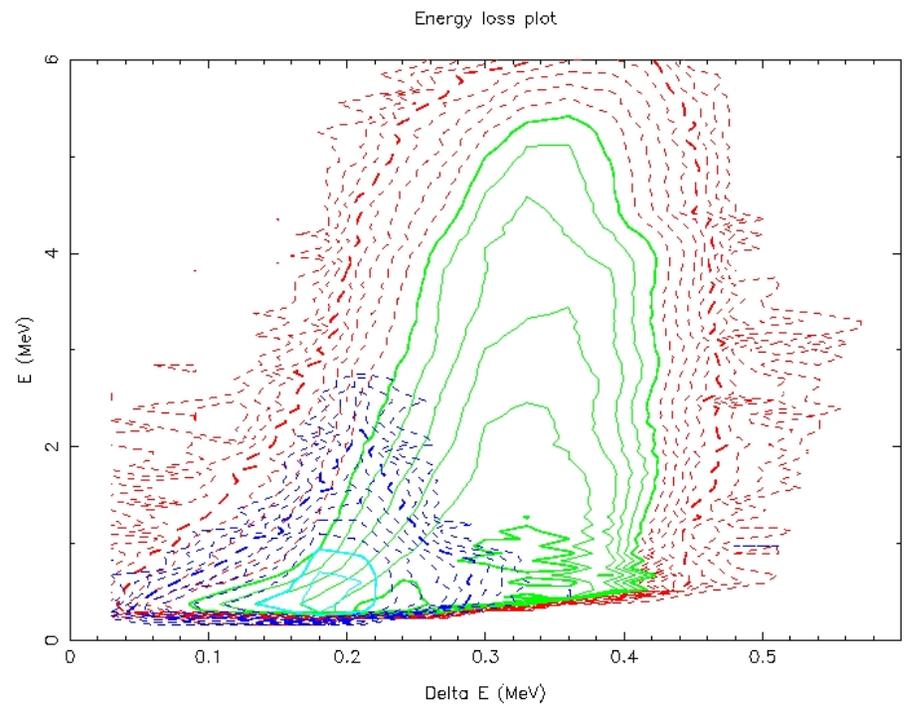
$^{10}\text{B} \leftrightarrow ^{16}\text{O}$

Analysis: $\Delta E/E$



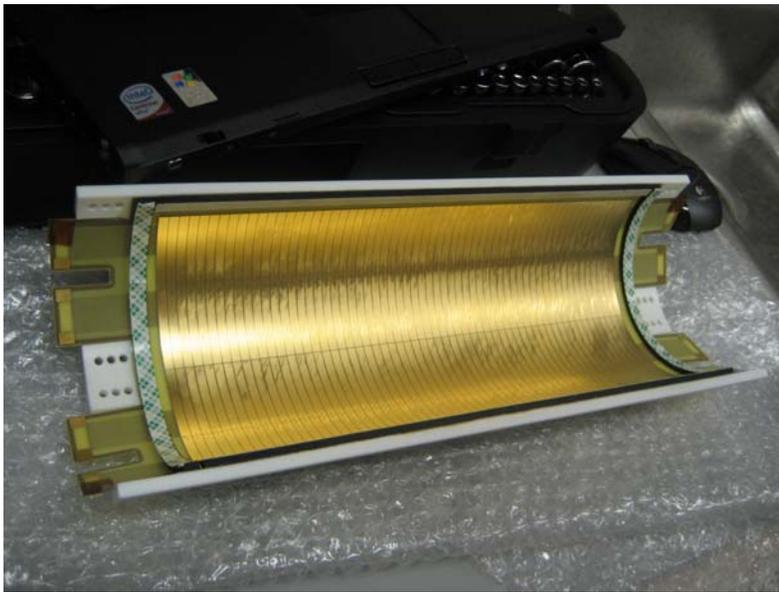
$^{10}\text{B} \leftrightarrow ^7\text{Li}$

→ Energy Resolution

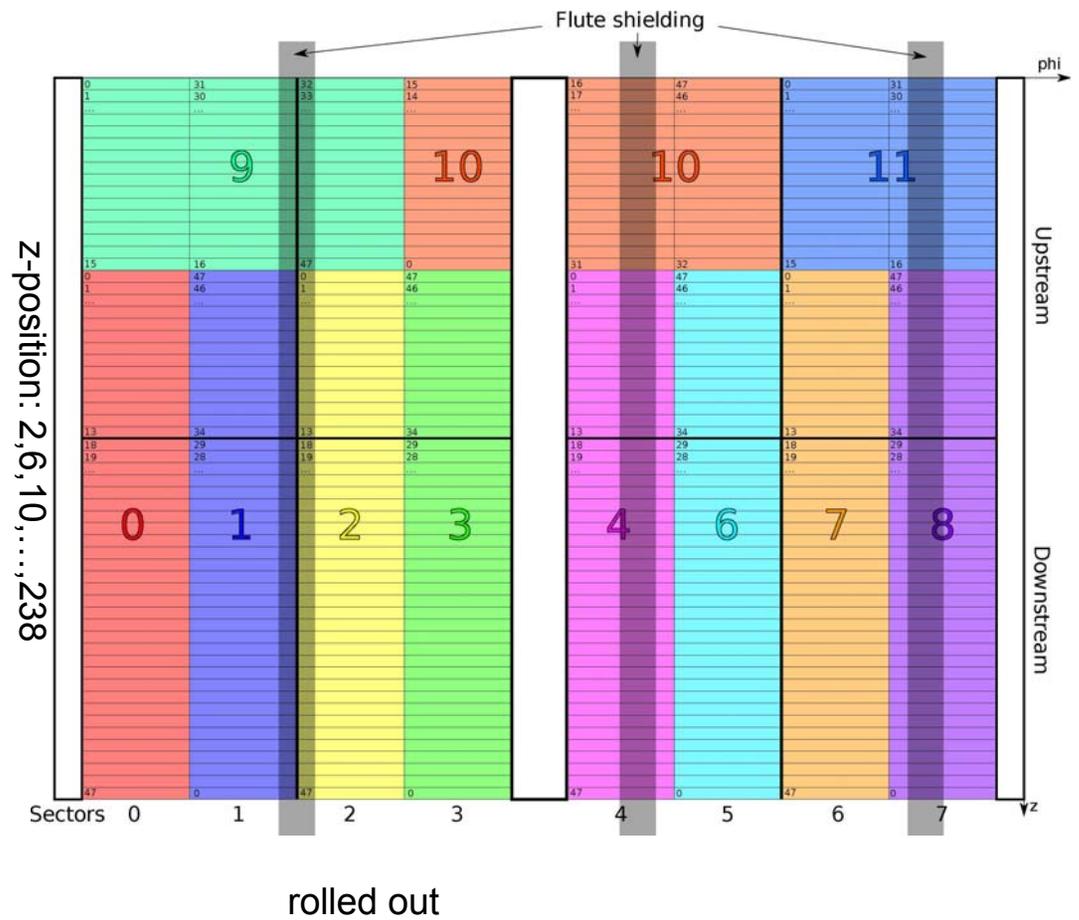


$^{10}\text{B} \leftrightarrow \text{p}$

Anode configuration

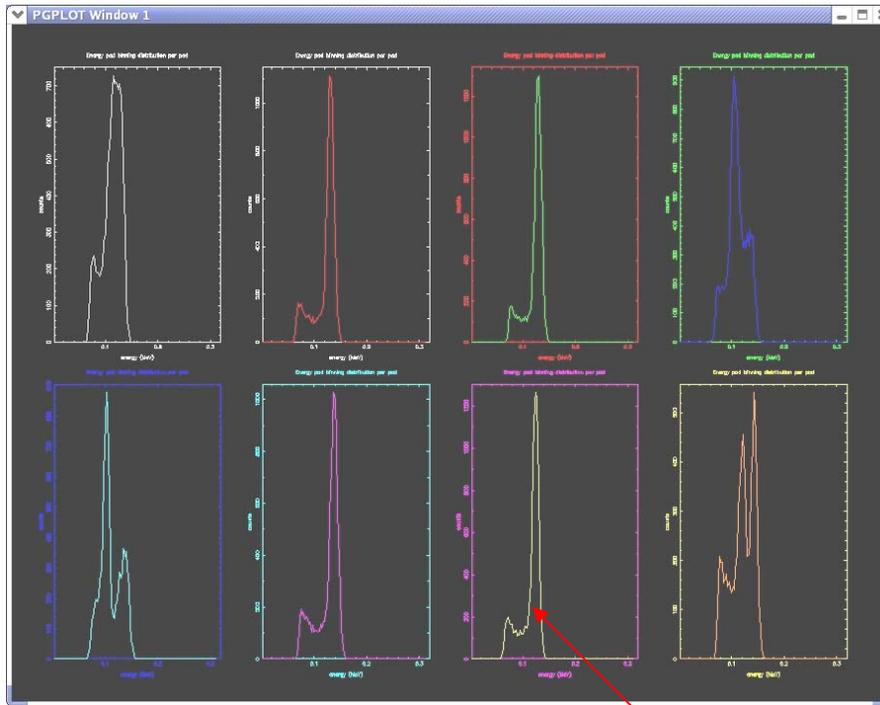


Physical anode pads



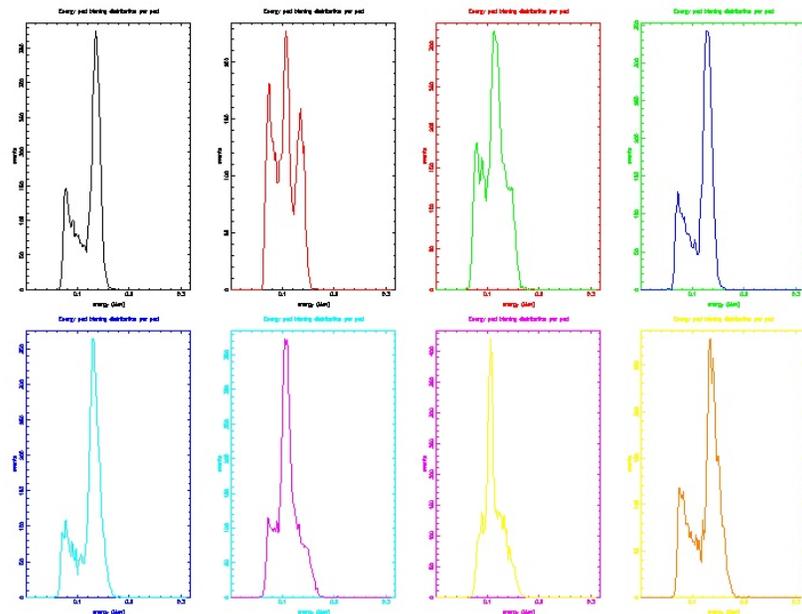
Resolution of individual pads

^{10}B , 9 MeV, 150 mb



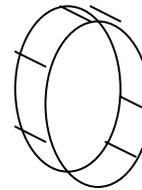
z=198

Presumed good resolution



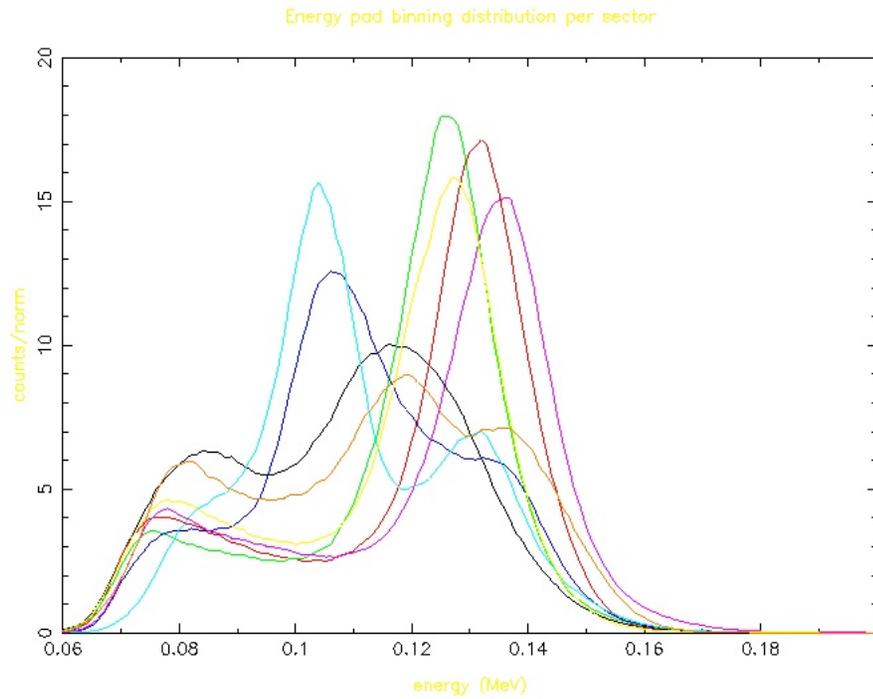
z=194

Rotational symmetry reasonable

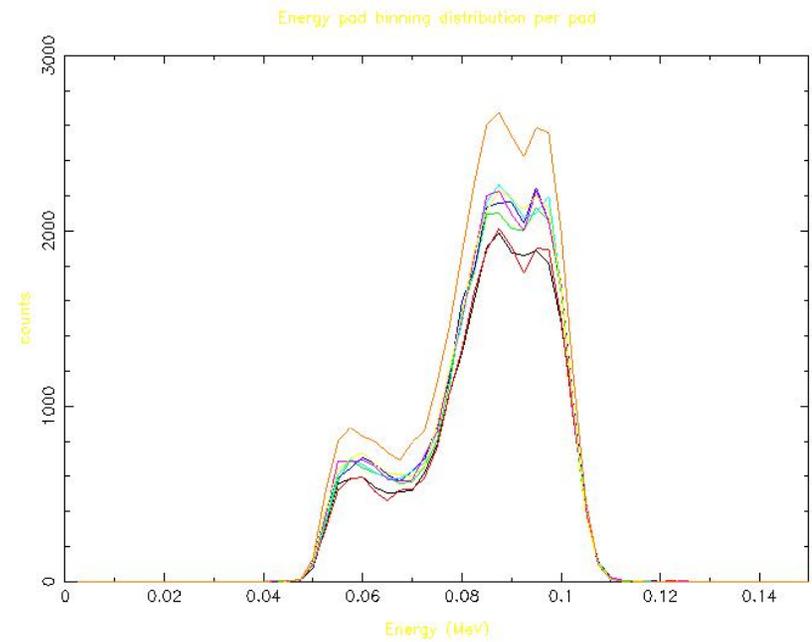


Resolution

^{10}B , 9 MeV, 150 mb



Eight sector integrated signal

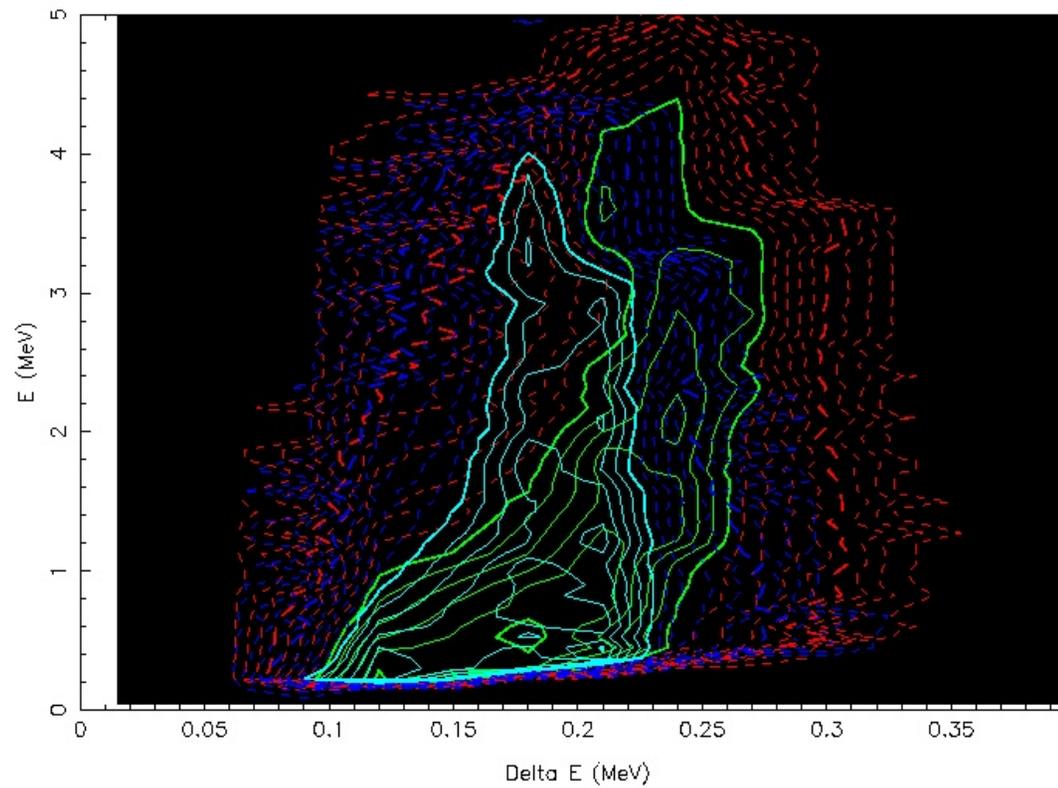


Time evolution: $z=198$, sector 0.
About equal time steps.

Resolution 1 sector

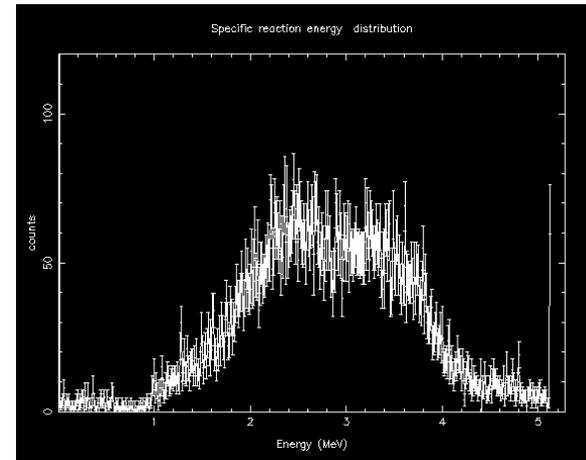
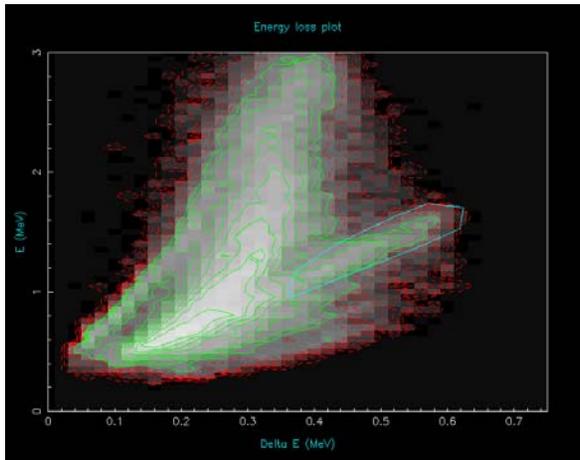
Energy loss plot

10B, 9 MeV, 150 mb



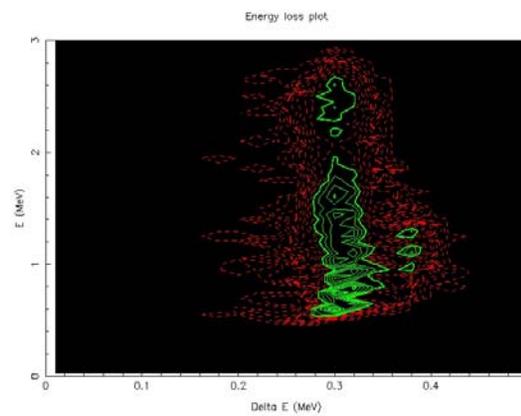
$^{10}\text{B} \leftrightarrow ^{13}\text{C}$

Resolution: α -source

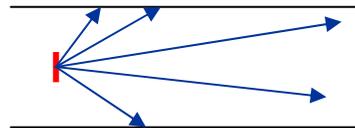
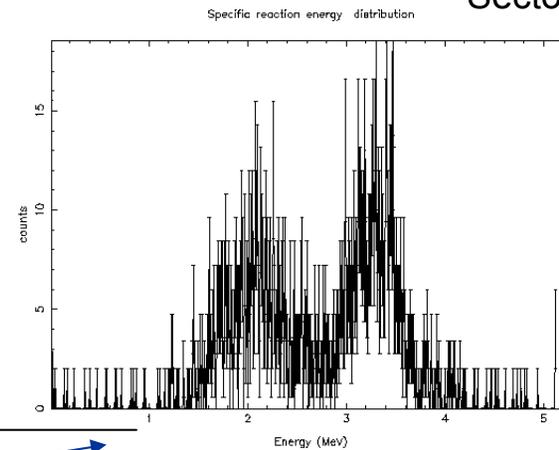


^{148}Gd

All sectors

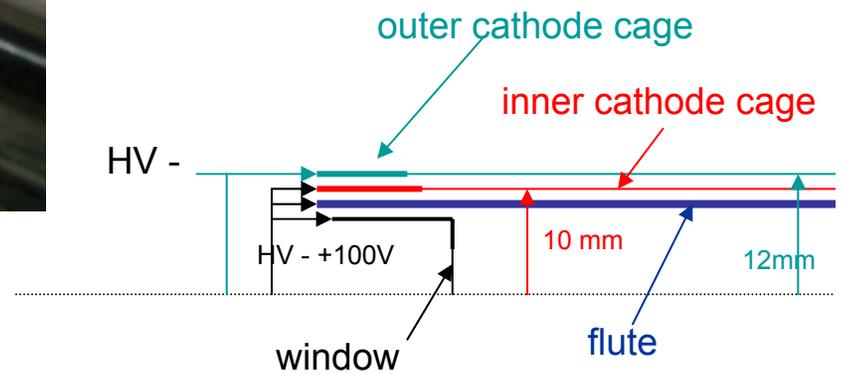
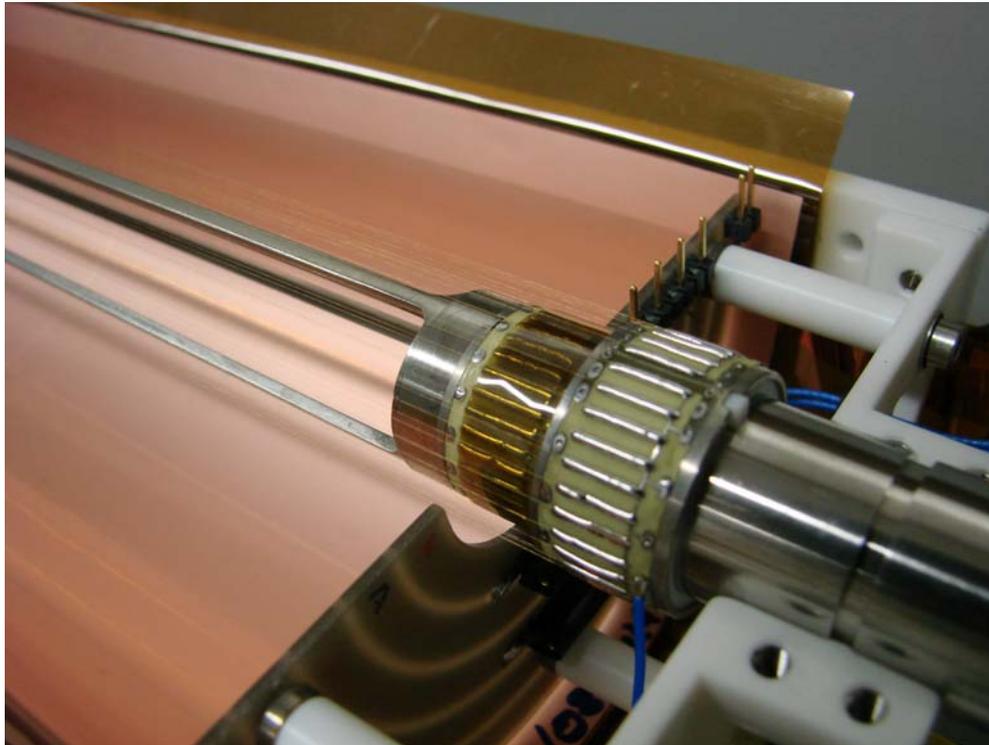


Sector 1 only

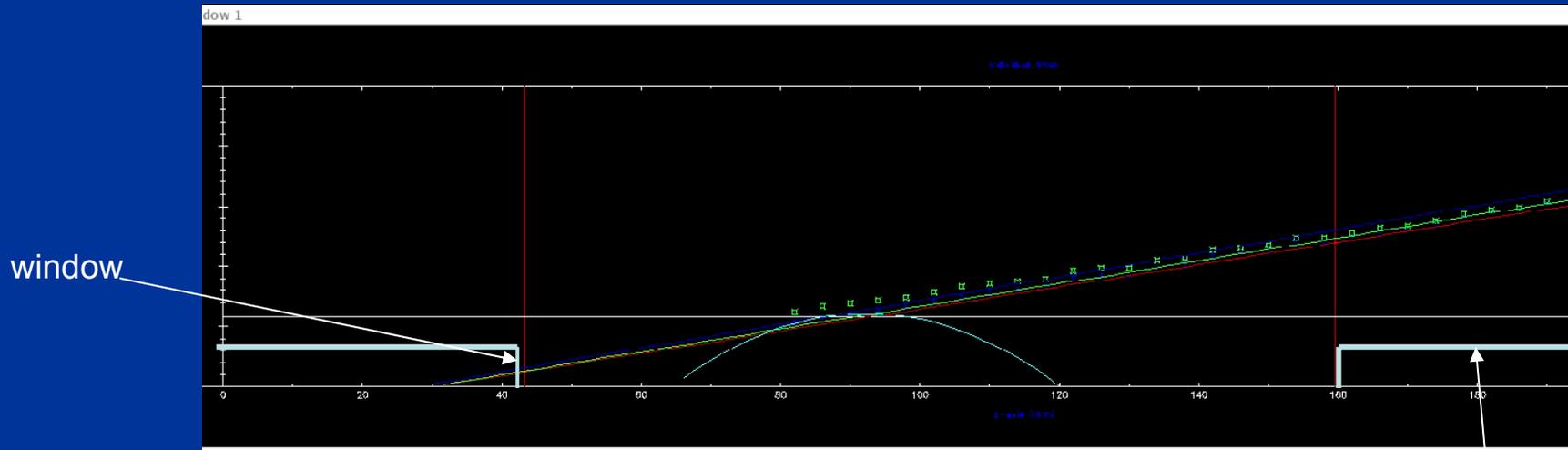


Most tracks hit the walls.

Cathode cage

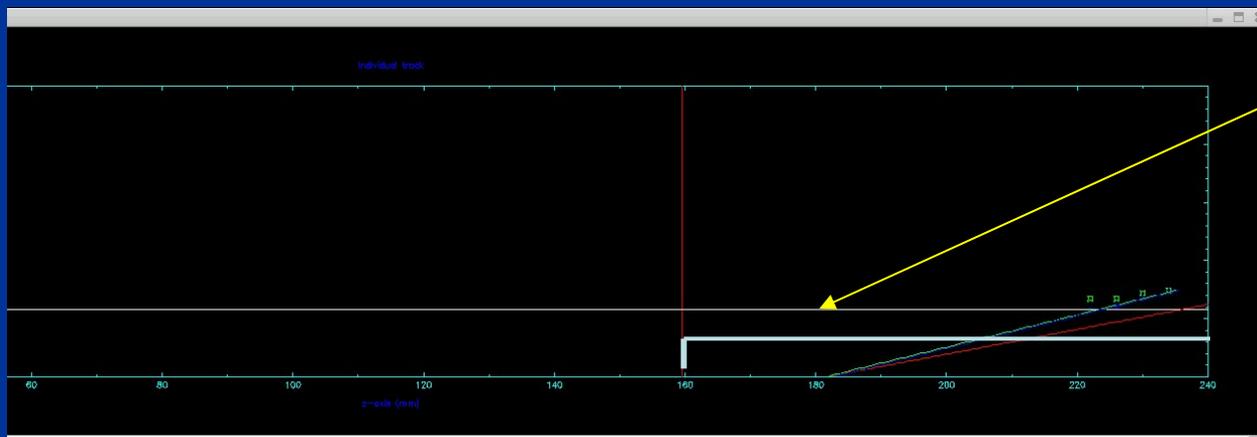


Tracks



z-info from pads, r info from timing, r correction applied.

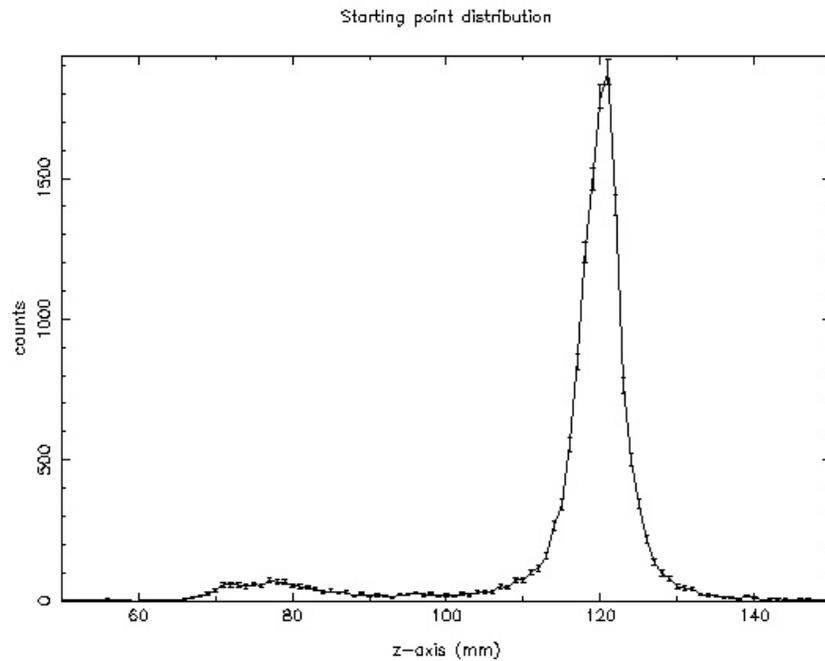
exit tube



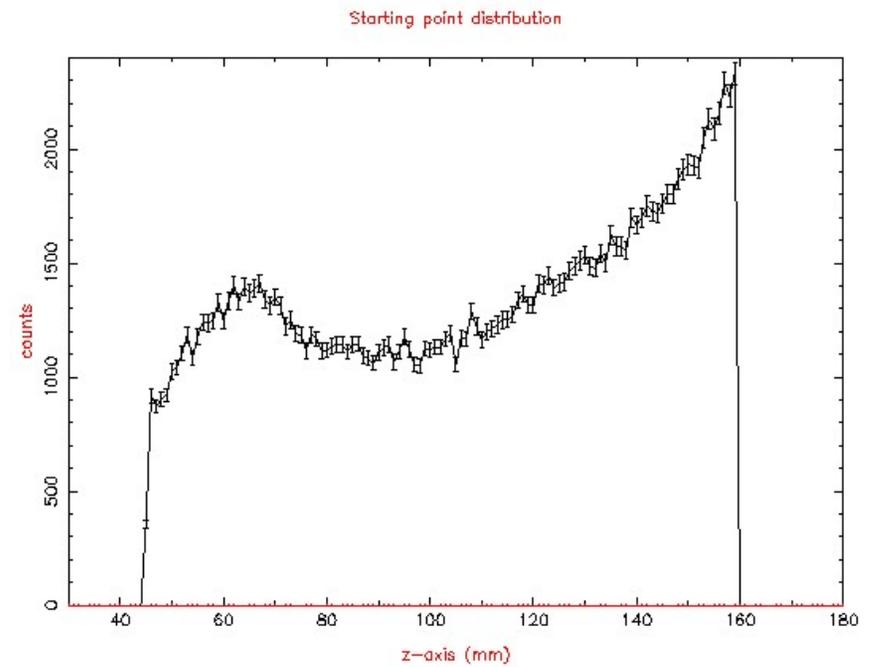
Outer cathode cage

Four methods of track reconstruction.

Track origin reconstruction

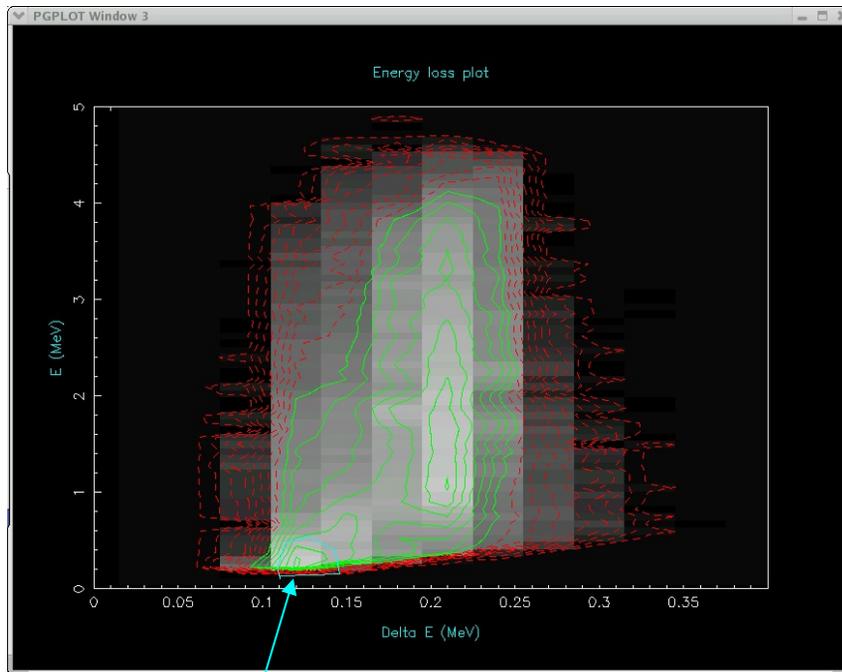


α -source

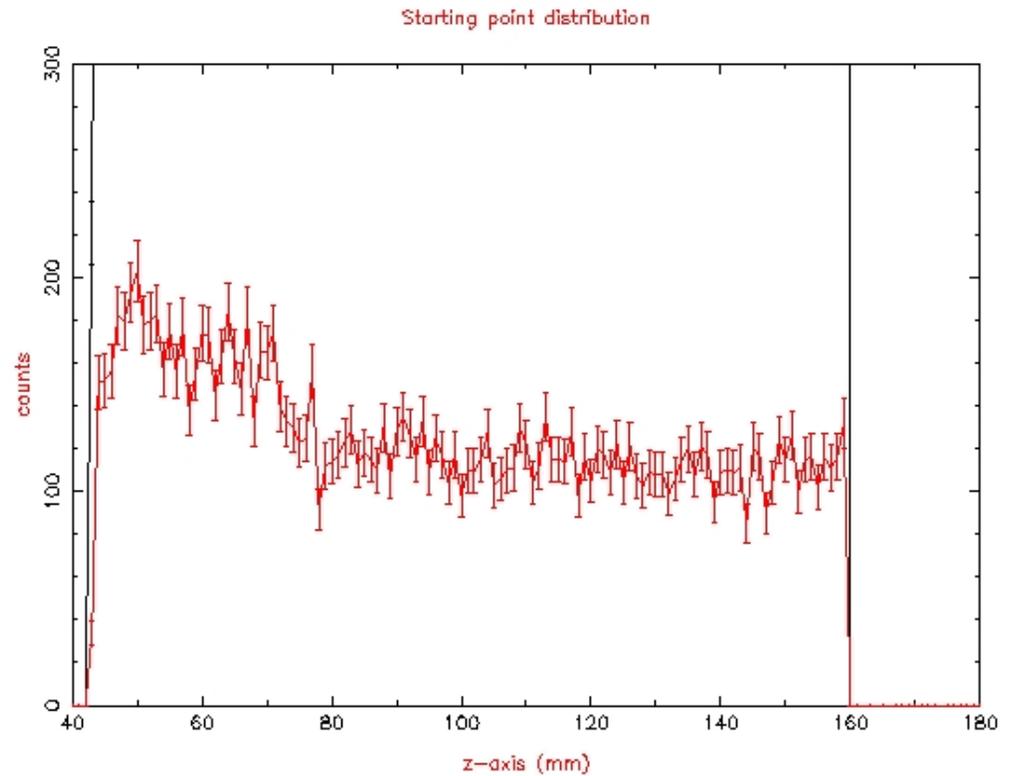


^{10}B , 9 MeV, 150 mb
Sector 6

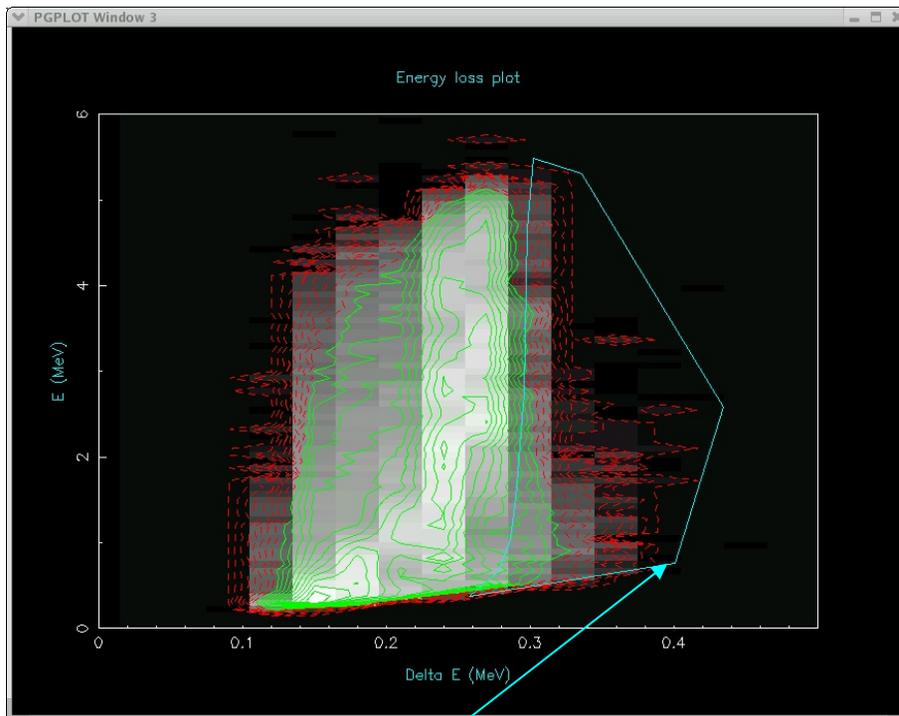
Proton cut (s6)



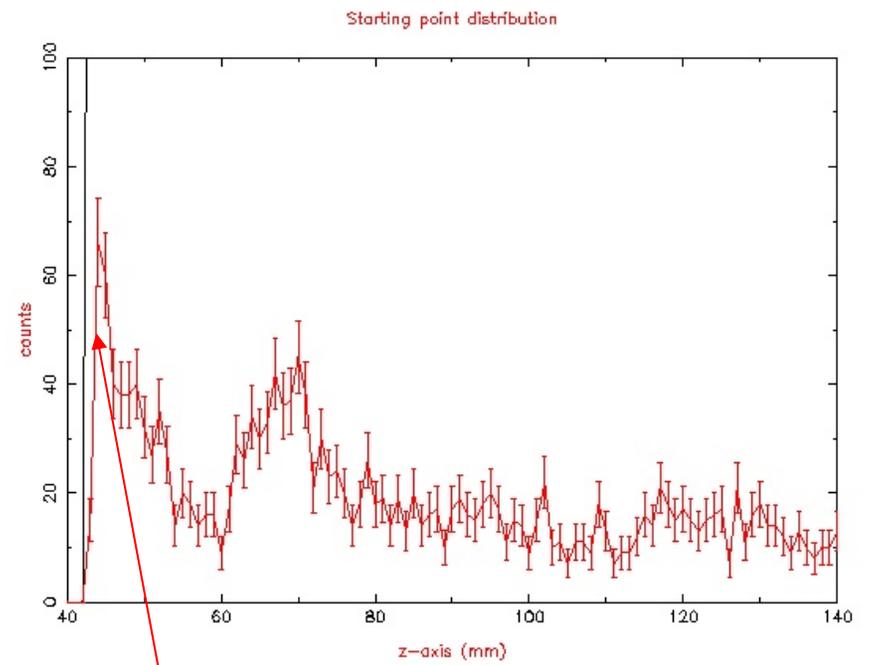
Proton cut



' ^{13}C '-cut (s6)



cut



Window?

Future short term development

Analysis: (i) Develop tool to match energy response of individual pads in one sector (preferably automatic).
(ii) Develop sliding z_0 endpoint selection.
(iii) revisit coincidence conditions
(iii) Look into raw data runs.

α -source: (i) Confirm previous results.
(ii) Tackle bad resolution sectors.
(iii) Correct for not straight tracks.
(iv) Try other gases.

Hardware: (i) HV box improvement.
(ii) No flute, smaller diameter wire cages.
(iii) BGO stands.

Firmware: Still debugging necessary.

Long term

^8Li run in June. Full run in fall?

Write a technical paper.

UK, York group received major grant for Tactic development. Outside detectors for light particles are considered.