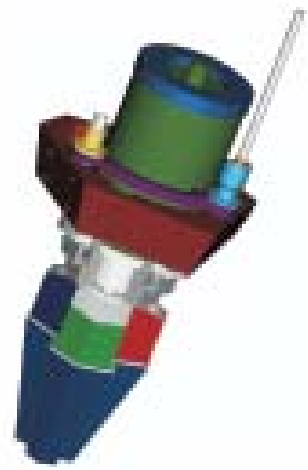
UNIVERSITY OF LIVERPOOL

Science & Technology Facilities Council

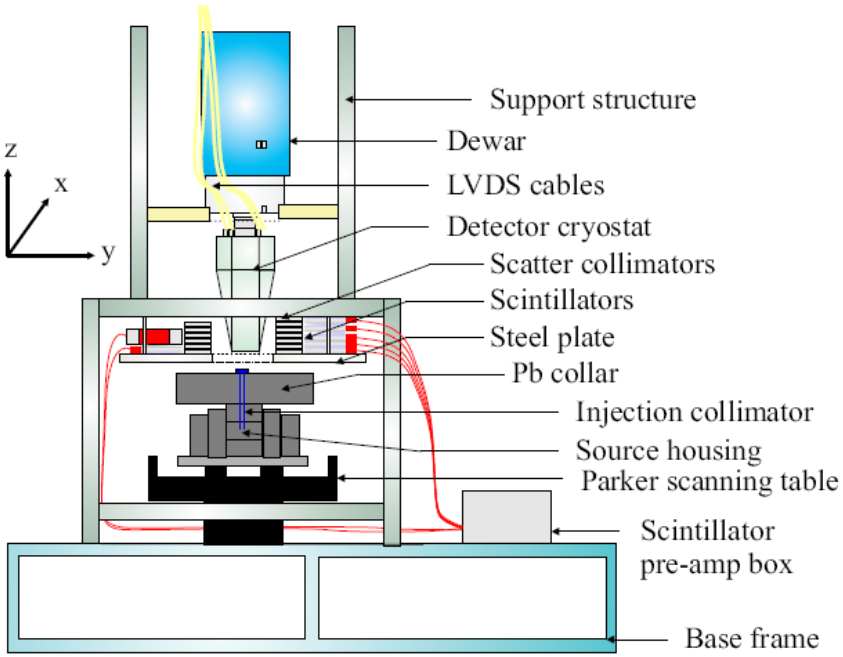
C001 Characterisation Measurements at Liverpool

AGATA Bonding Meeting –
STFC Daresbury Laboratory Feb 09

AGATA
ADVANCED GAMMA TRACKING ARRAY

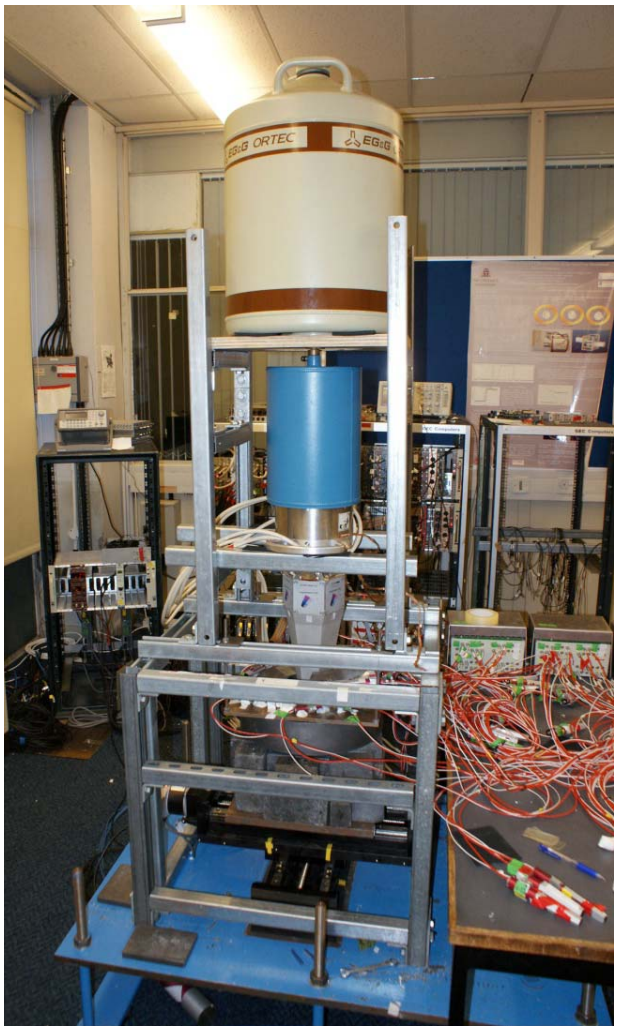


AGATA Scan Setup

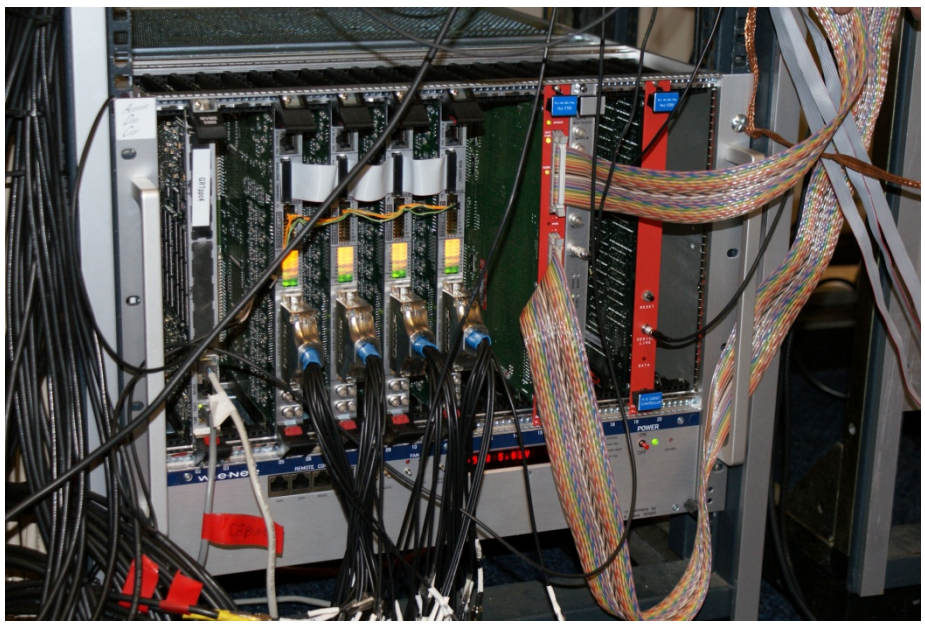


- 1 GBq ^{137}Cs source housed in lead assembly.
- Two stage Tungsten collimator parallel to z axis:
  - 8 cm x 5mm diameter
  - 8cm x 1mm diameter
- Spot size ~1.3mm at front face, ~2.4mm at back.
- Sources provides ~1000 cps with 450keV threshold.
- Collimator assembly movable in x-y plane.
- BGO and NaI scintillation detectors aligned with six depths of scatter collimation for coincidence scan.
- Trigger conditions:
  - > 450 keV on core for singles scan.
  - Core AND Scintillator within 100 ns for coincidence scan.

Modifications Since Last Scan

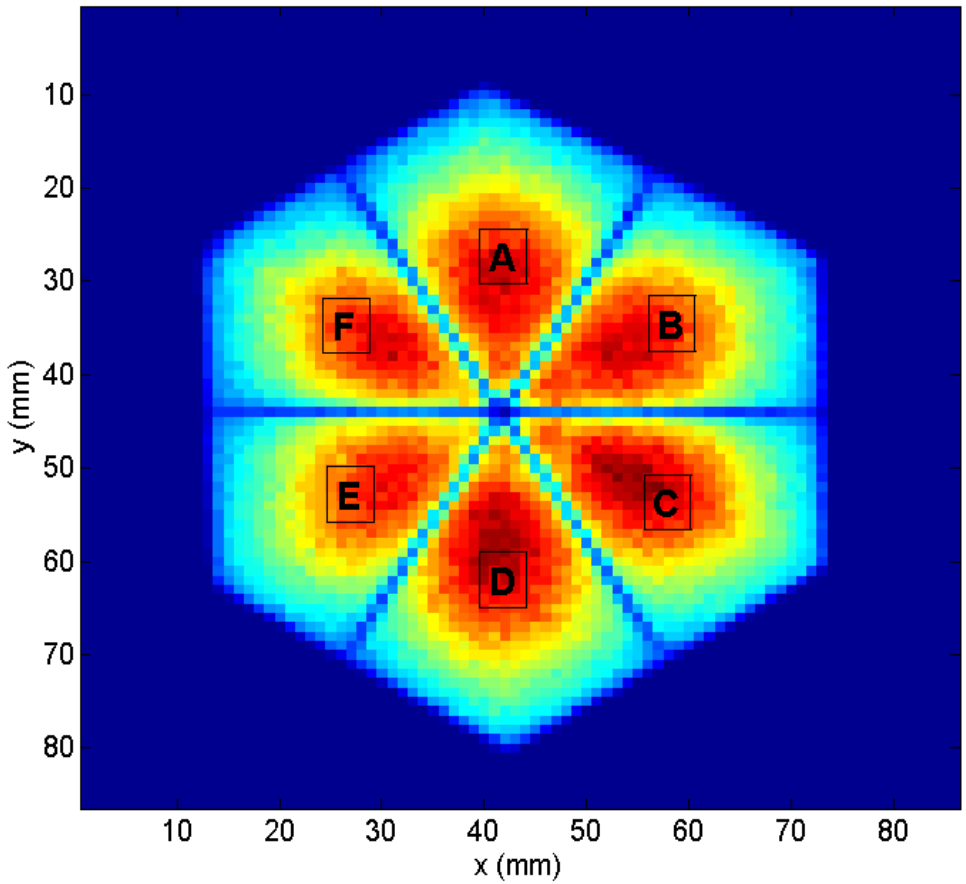


- Storage Dewar added to provide 7 days LN_2 capacity.
- TTL bias shutdown device provided by IKP Cologne.
- 4 x GRETINA digitiser cards providing 40 channels of 100MHz, 14 bit, time-aligned, FADCs.
- VME64x crate with XXXXX maximum data rate, equating to approximately 420 events per second.

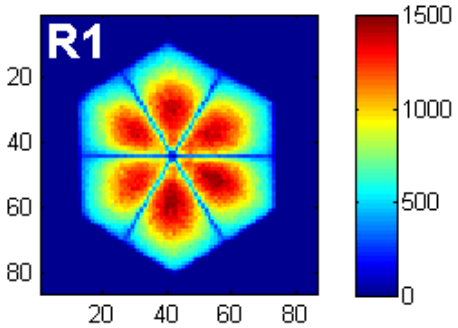


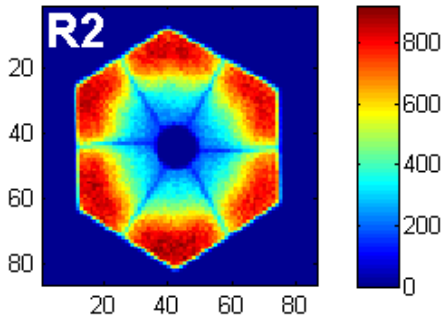
Segment Labelling

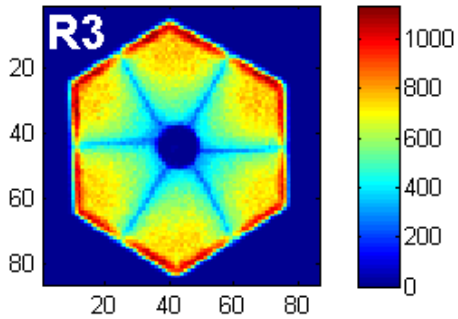
- Image shows intensity of single segment photopeak events for ring one.
- Sectors labelled A to F as shown on image.
- Rings labelled 1 to 6 from front to back.
- Singles scan conducted on 1mm Cartesian grid.
- This orientation will be used for all following images.

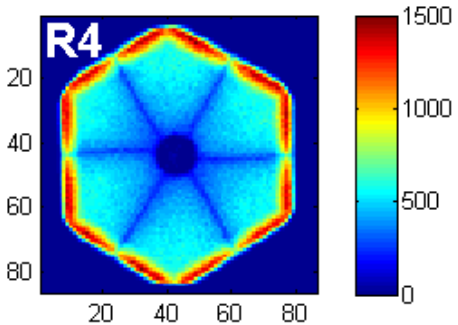


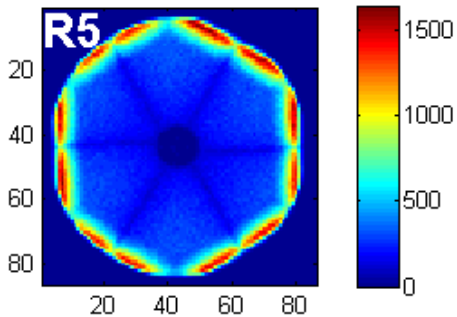
Fold-1 Photopeak Intensity Maps

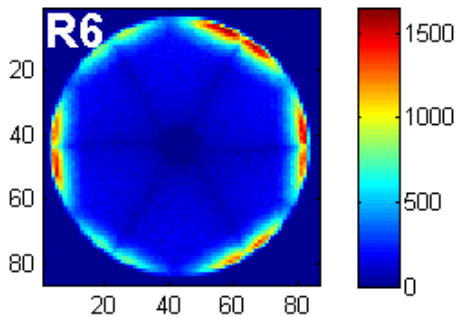






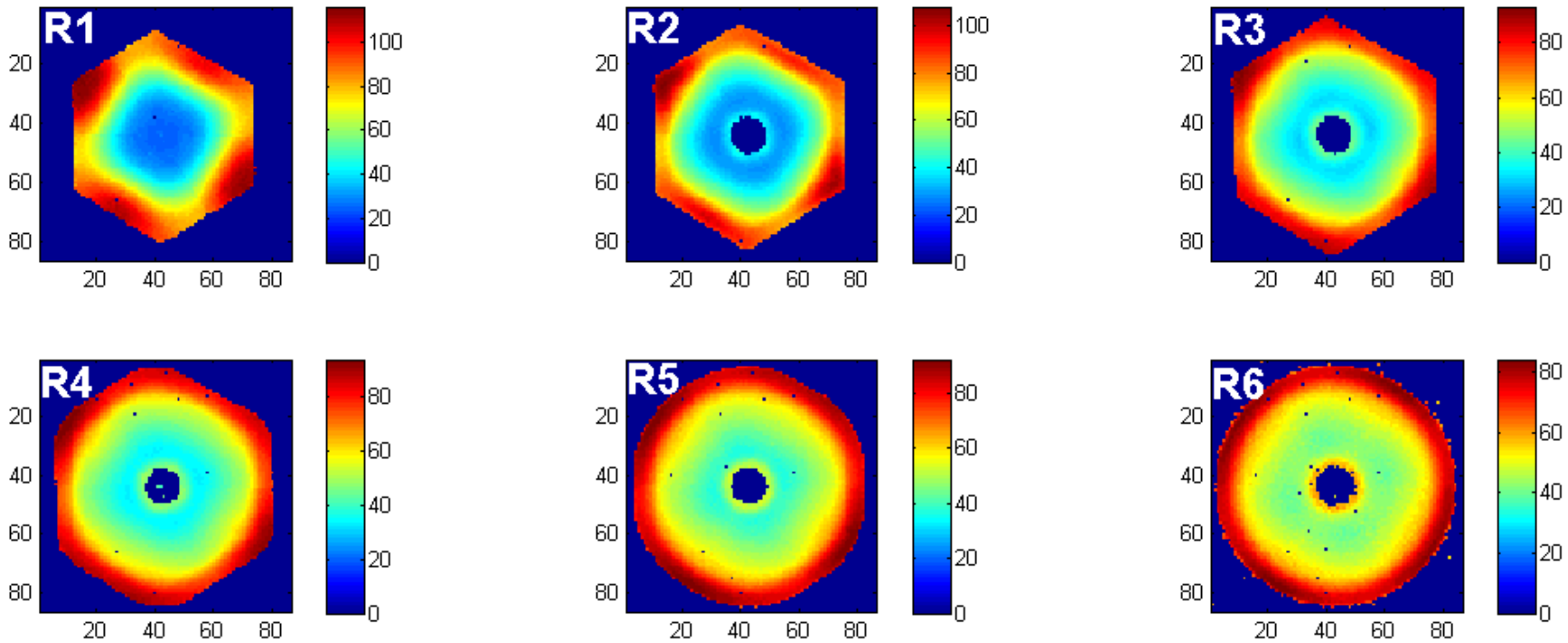






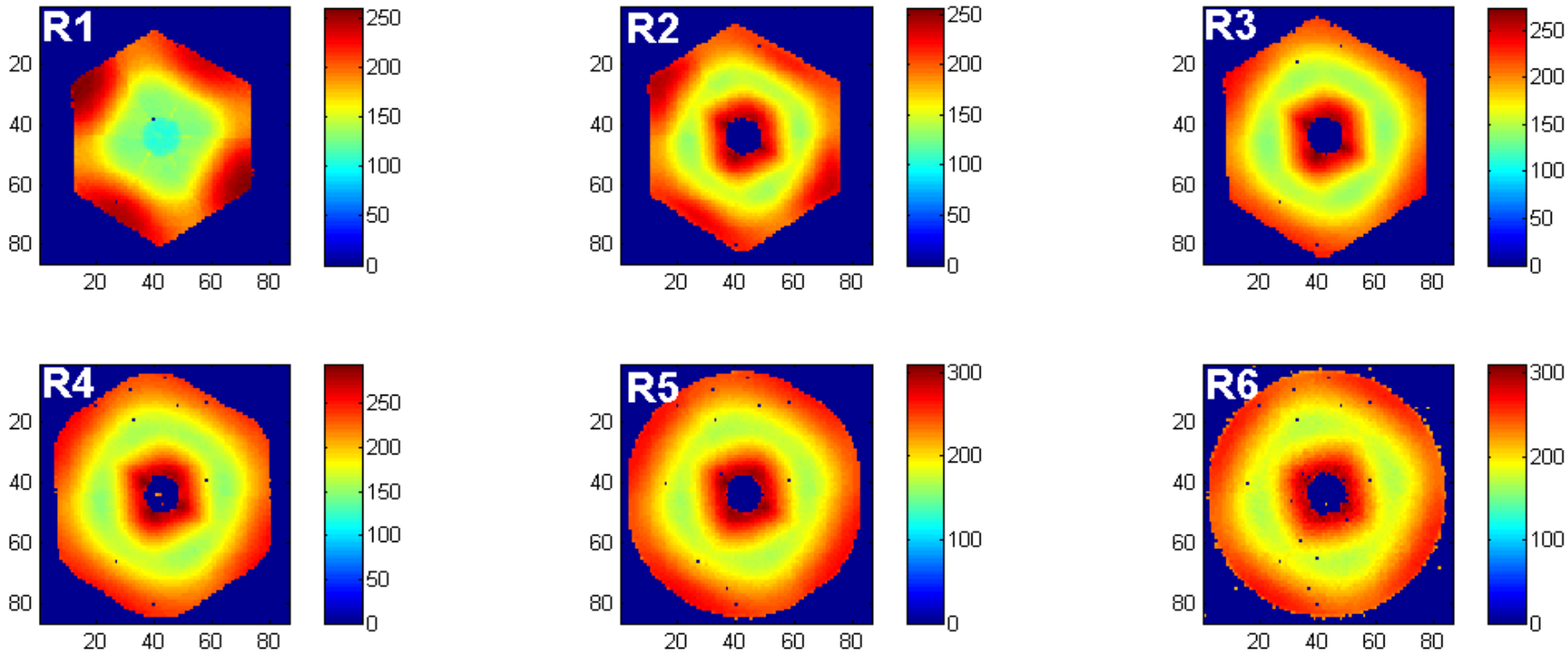
- Segmentation boundaries and attenuation of gamma flux through crystal depth can be seen.
- x-y crystal centre and rotation of crystal in x,y and z can also be obtained.

Core T30 Maps



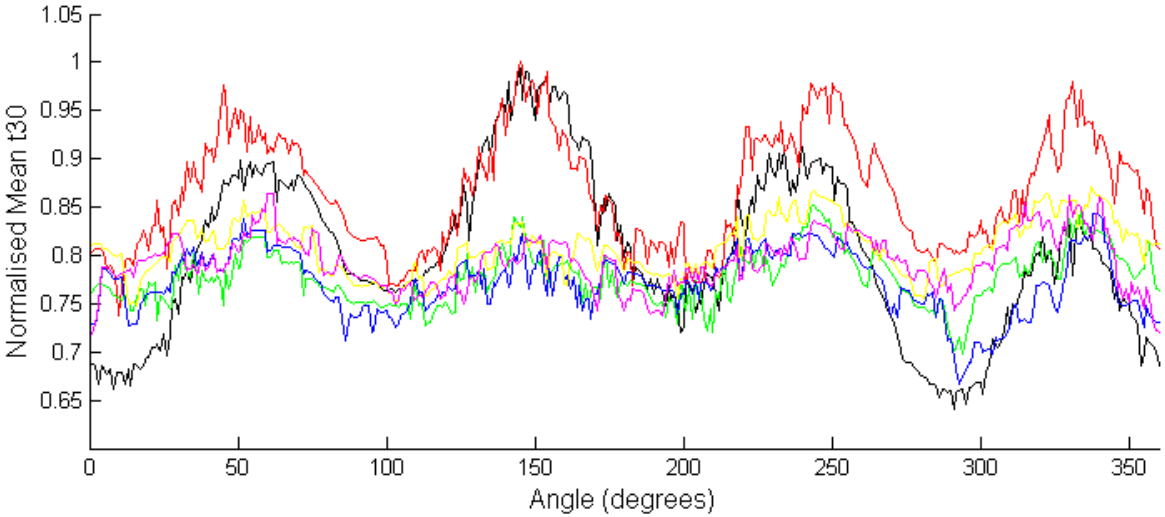
- Time in ns for charge pulse to rise from 10% to 30% of its maximum height.
- Fourfold symmetry of crystal can be seen.
- [1 0 0] axis produces fastest risetime.
- Long charge collection times can be seen in regions of weak field at crystal corners.

Core T90 Maps



- Time in ns for charge pulse to rise from 10% to 90% of its maximum height.
- Longest risetimes seen in corners of ring 1 and near core in rings 2-6.
- Shortest risetimes seen in front of core in ring 1.

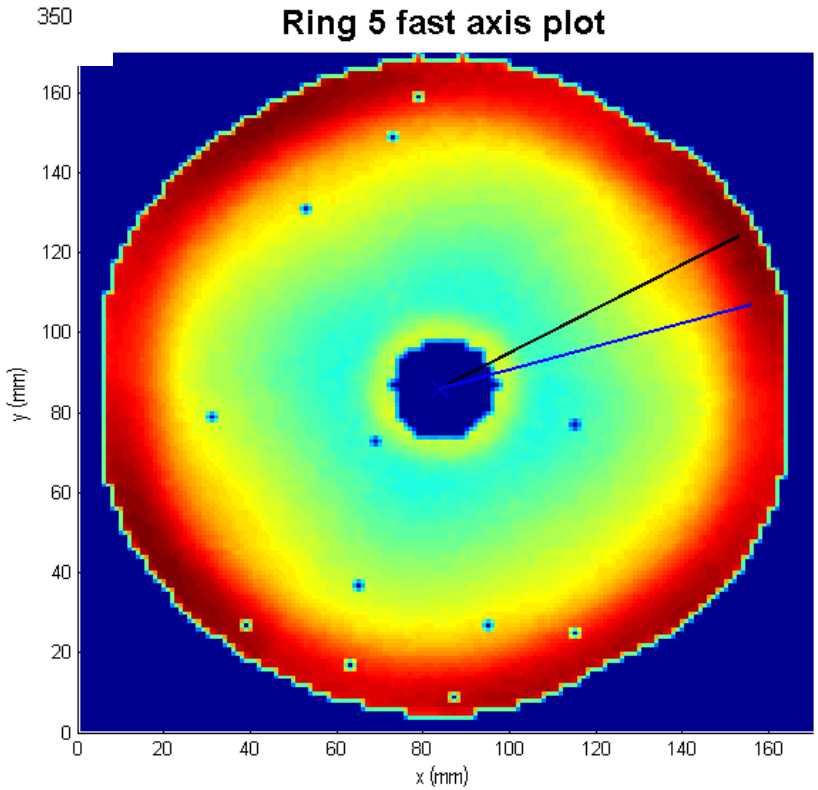
Identification of Fast Axis



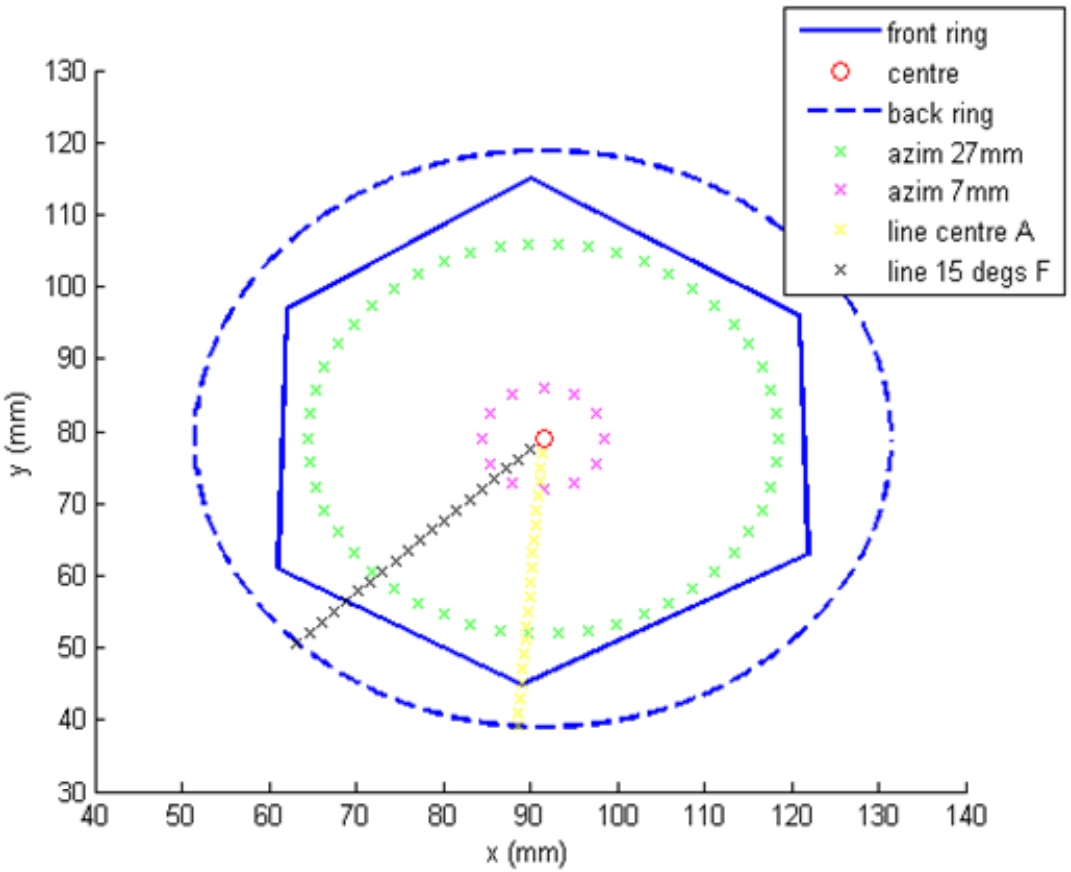
Ring 1
Ring 2
Ring 3
Ring 4
Ring 5
Ring 6

Canberra [100]
Scan [100]

- Mean T30 found along 360 radial lines.
- Results normalised by drift distance.
- Preliminary results measurements show 12˚ offset toward segment B.
- ^{241}Am scan will allow more precise measurement.



Ongoing Coincidence Scan



- Series of Radial and Azimuthal coincidence scans currently underway.
- Scanning for 3 hours per position.
- Ideally 100 events per position required to effectively cancel noise.
- This can easily be achieved in front rings and at large radi in back rings.
- Fewer events recorded at smaller radi in back rings.

Further Plans For C001

Time allowing:

- Completion of coincidence scan.
- ^{137}Cs singles scan from side.
- ^{241}Am surface scan.
- Compton imaging to gauge performance of PSA (Fay and Mike).
- Collaboration with Fabio Crespi (Milan) to produce single site interaction pulses from front and side singles scans using χ^2 minimisation.
- Singles scan with varying bias to study depletion behaviour.

Thank You

Collaborators:

A.J. Boston, H. Boston, S.J Colosimo,

J. Cresswell, M.R. Dimmock, D. Oxley, F. Filmer, D. Judson , P.J. Nolan, M. Slee

Any Questions?