UNIVERSITY OF LIVERPOOL

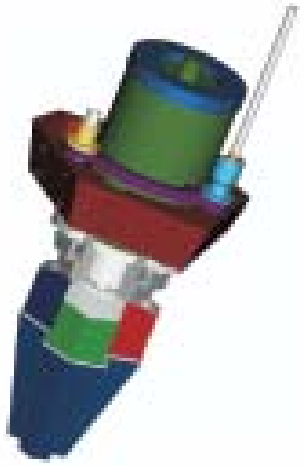
Science & Technology Facilities Council

Analysis of C001 Coincidence Data

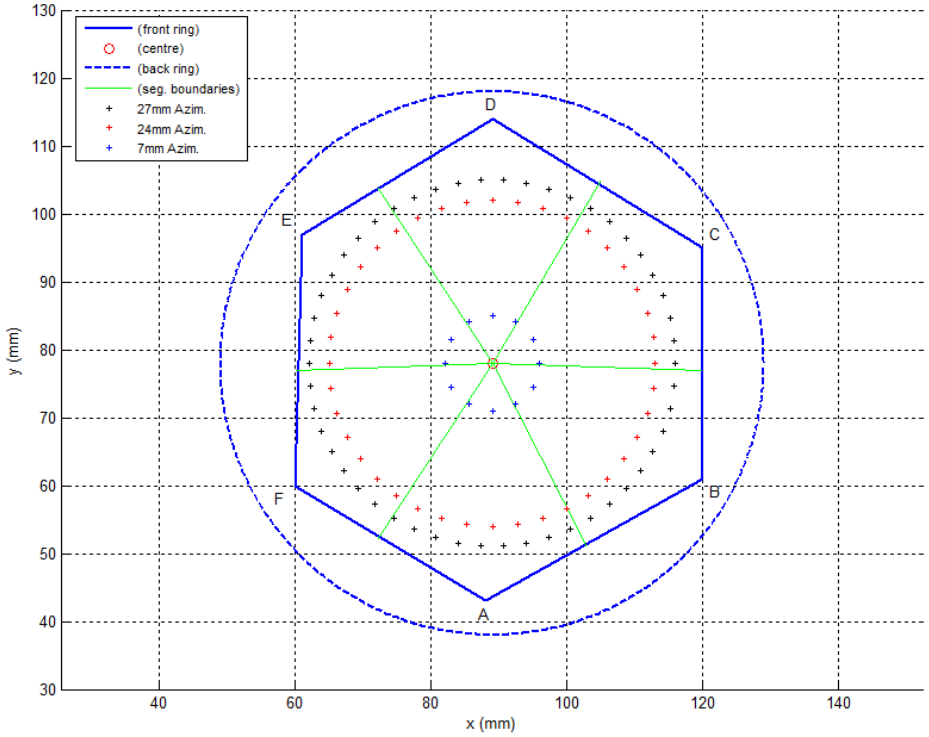
Carl Unsworth

AGATA week – INFN Legnaro, January 2010

AGATA
ADVANCED GAMMA TRACKING ARRAY

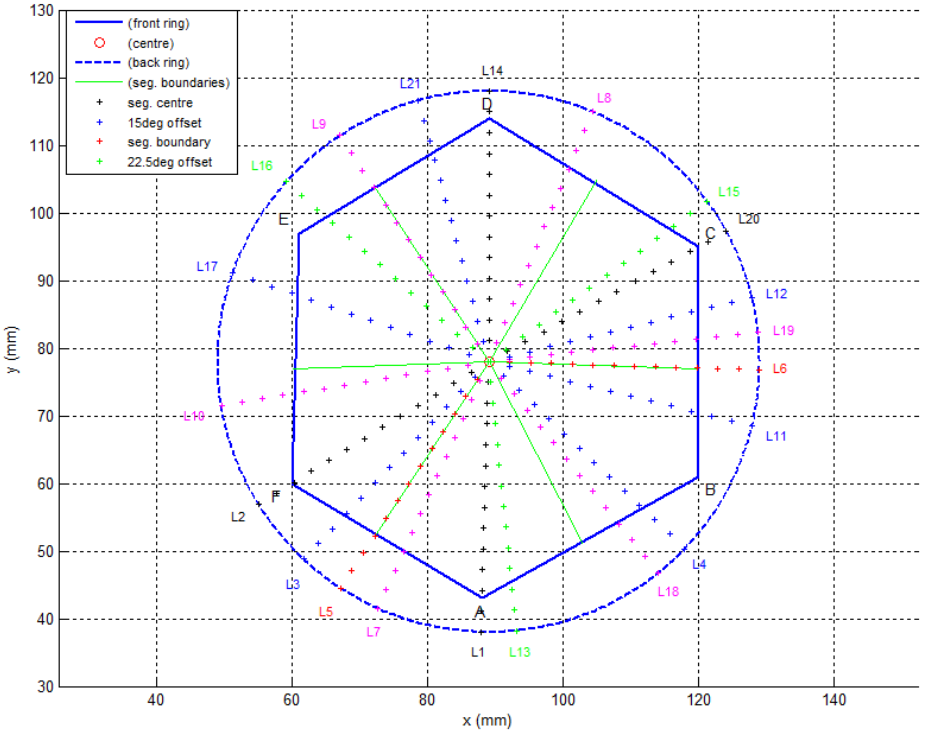


Scan Positions

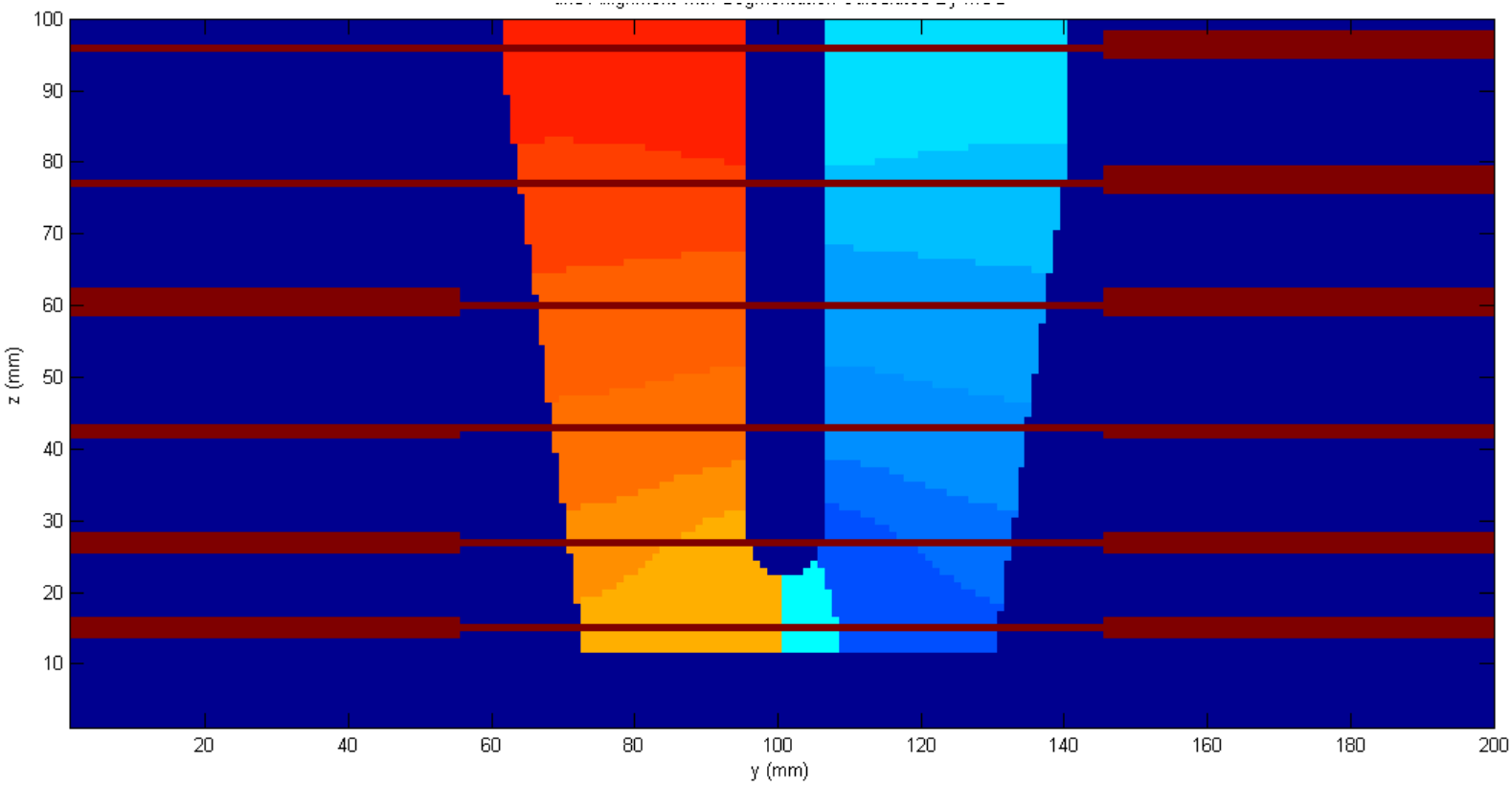


- 21 lines and 3 azimuths scanned.
- 3 – 5 hours of data collected per position.
- Coincident trigger requests ~ 50 cpm

- Due to high noise levels caused by the CAEN HV supply all points were repeated using an ORTEC supply.



Scan Depths



As with previous coincidence scans, collimators and scatter detectors were arranged at six z positions.

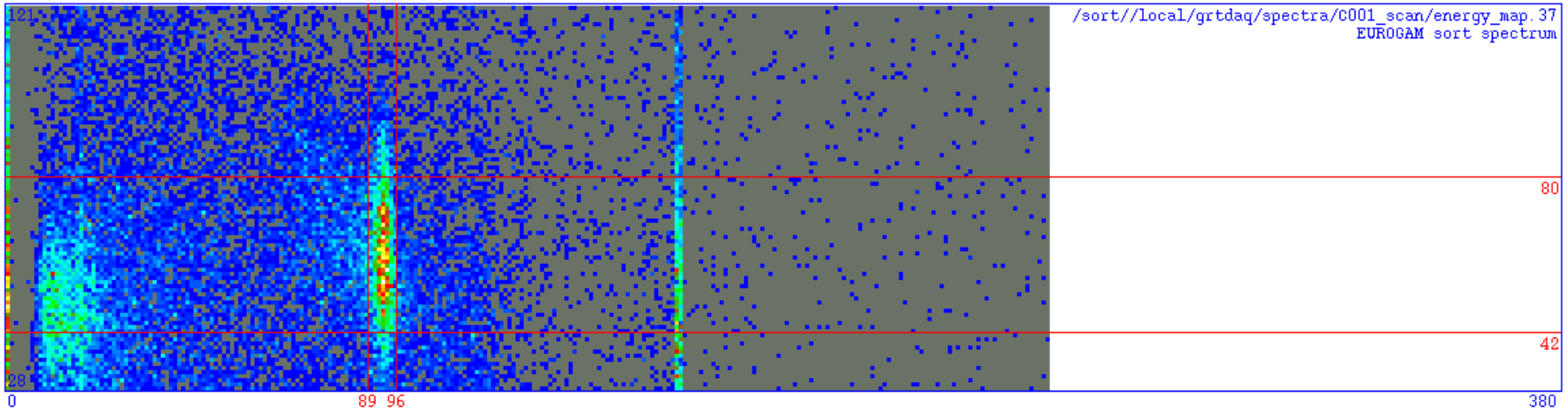
Depths 1,3,4,5,6 are aligned with rings 1,3,4,5,6. Depth 2 interactions may be in ring 1 or 2 depending on the x and y position.

Coincidence Analysis Process

1. All events with more than one segment or scintillator hit are discarded.

2. Pulses and energies are gain matched.

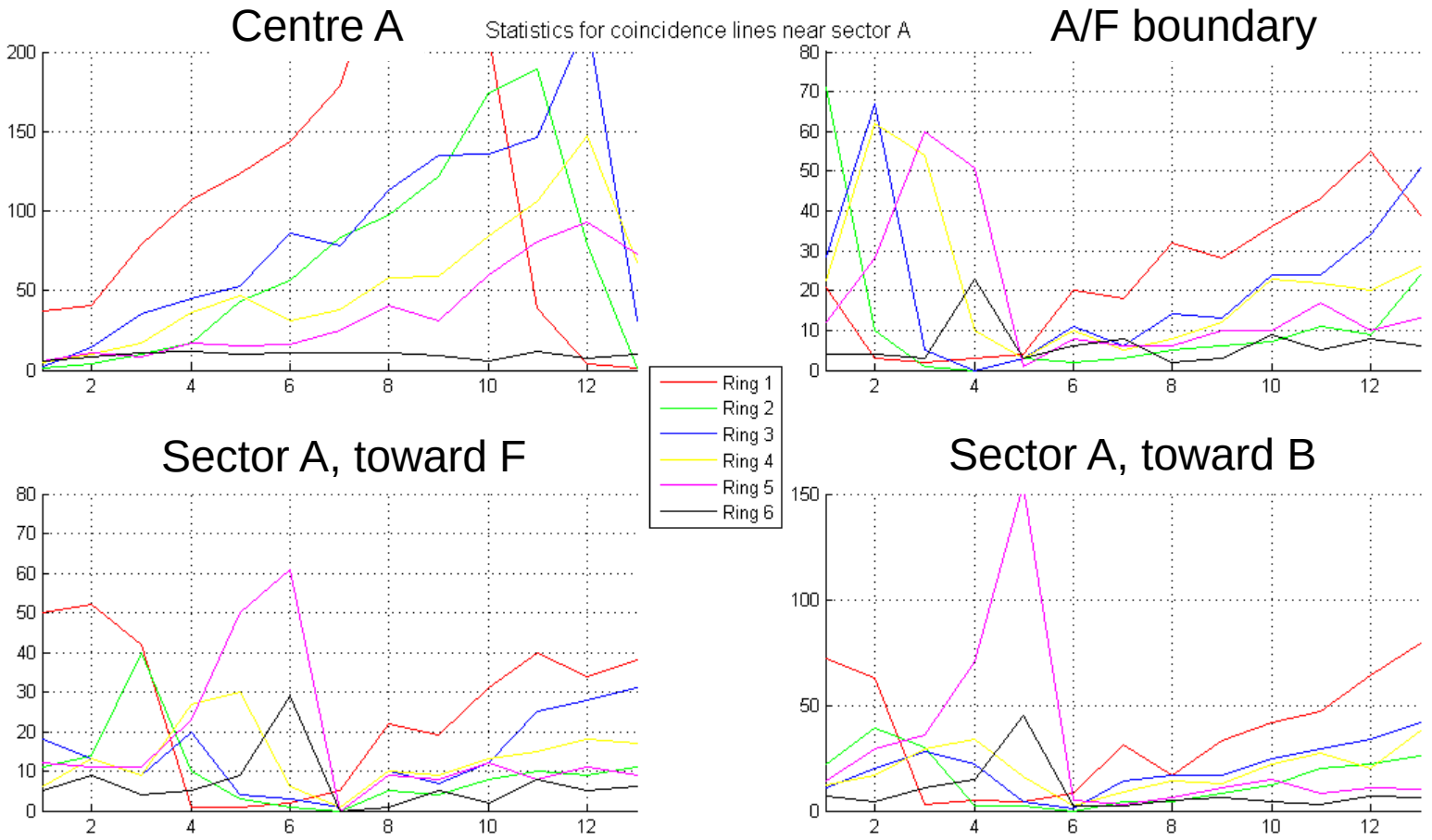
3. Energy gate applied to Ge-BGO energy matrix.



4. Check is made to ensure a match between hit ring and scintillator.

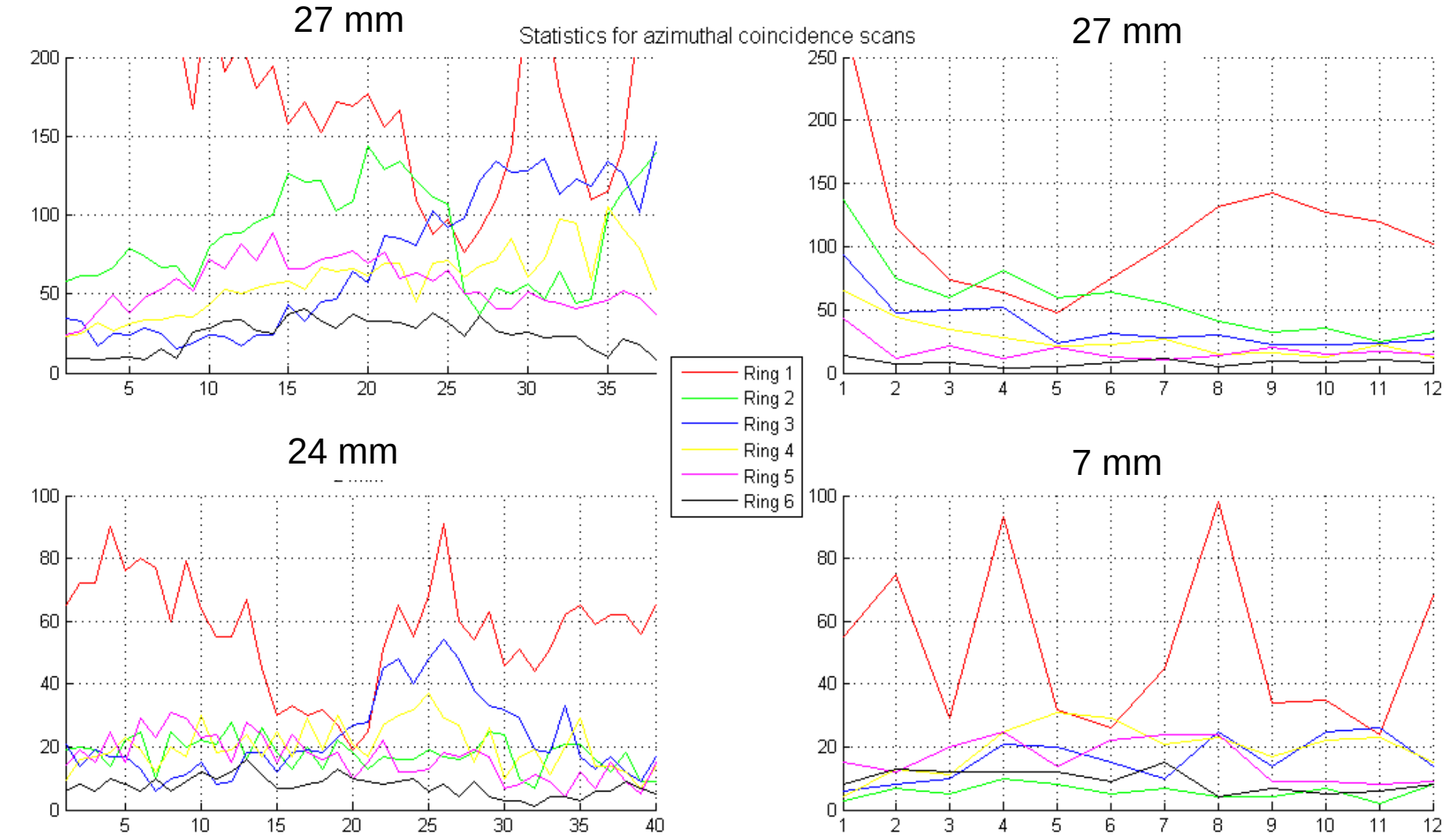
5. All of the events passing these conditions are output in the pre-sort, converted to ROOT format and distributed to the collaboration.

Coincidence Scan Statistics



• Plots show remaining events after gating on core energy, scintillator energy, segment fold, scintillator fold and segment-scintillator matching.

Coincidence Scan Statistics



Coincidence Analysis Process cont...

Pre-sorted data is then processed further.

1. Core and hit segment are normalised to 1. Other segments are normalised by the same factor as the hit segment.

2. Traces are interpolated to 2ns and a five point smoothing function is applied. Linear interpolation is used for now but cubic and fft methods are available.

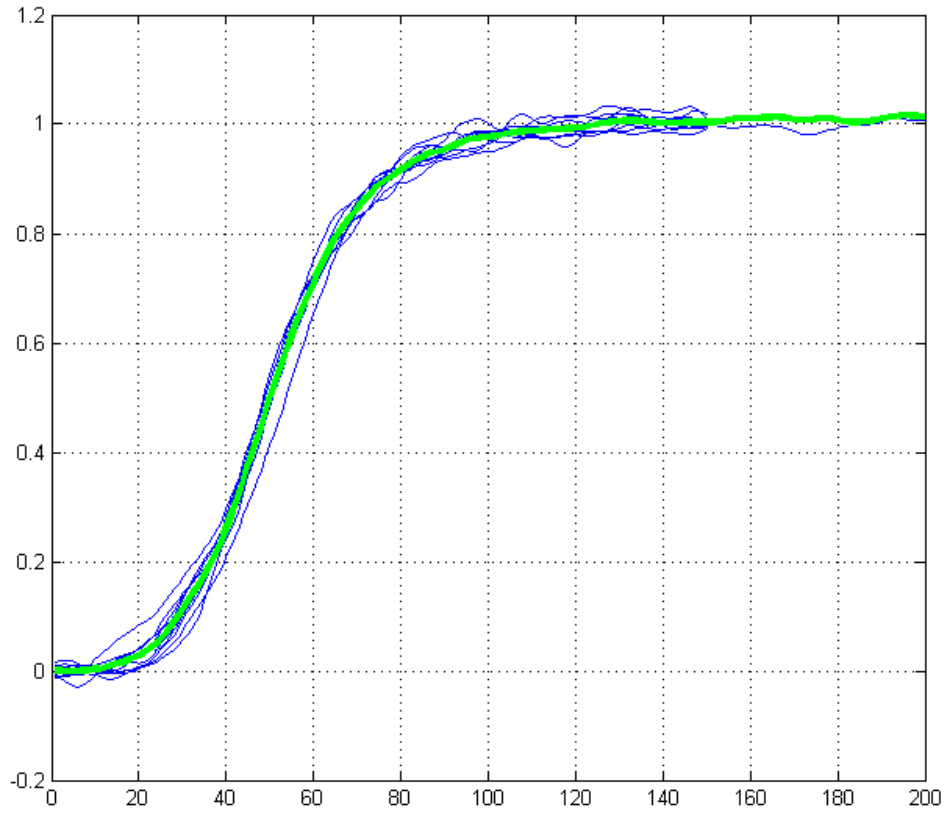
3. First pulse is added to mean.

4. Remaining pulses are time aligned with mean pulse by measuring RMS difference for range of offsets. Each pulse is shifted to position giving minimum difference. If the RMS difference is less than a fixed value the pulse is added to the mean.

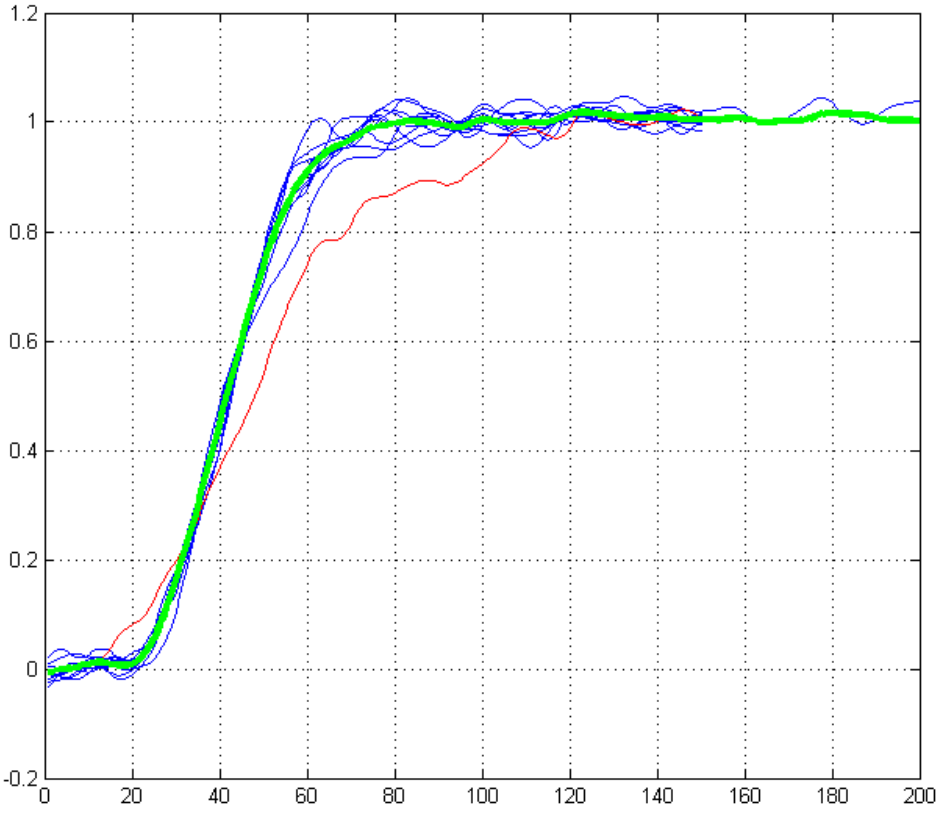
5. Mean pulse is renormalised, weighting factor updated to ensure equal value to all events.

Mean Pulse Formation

Core:

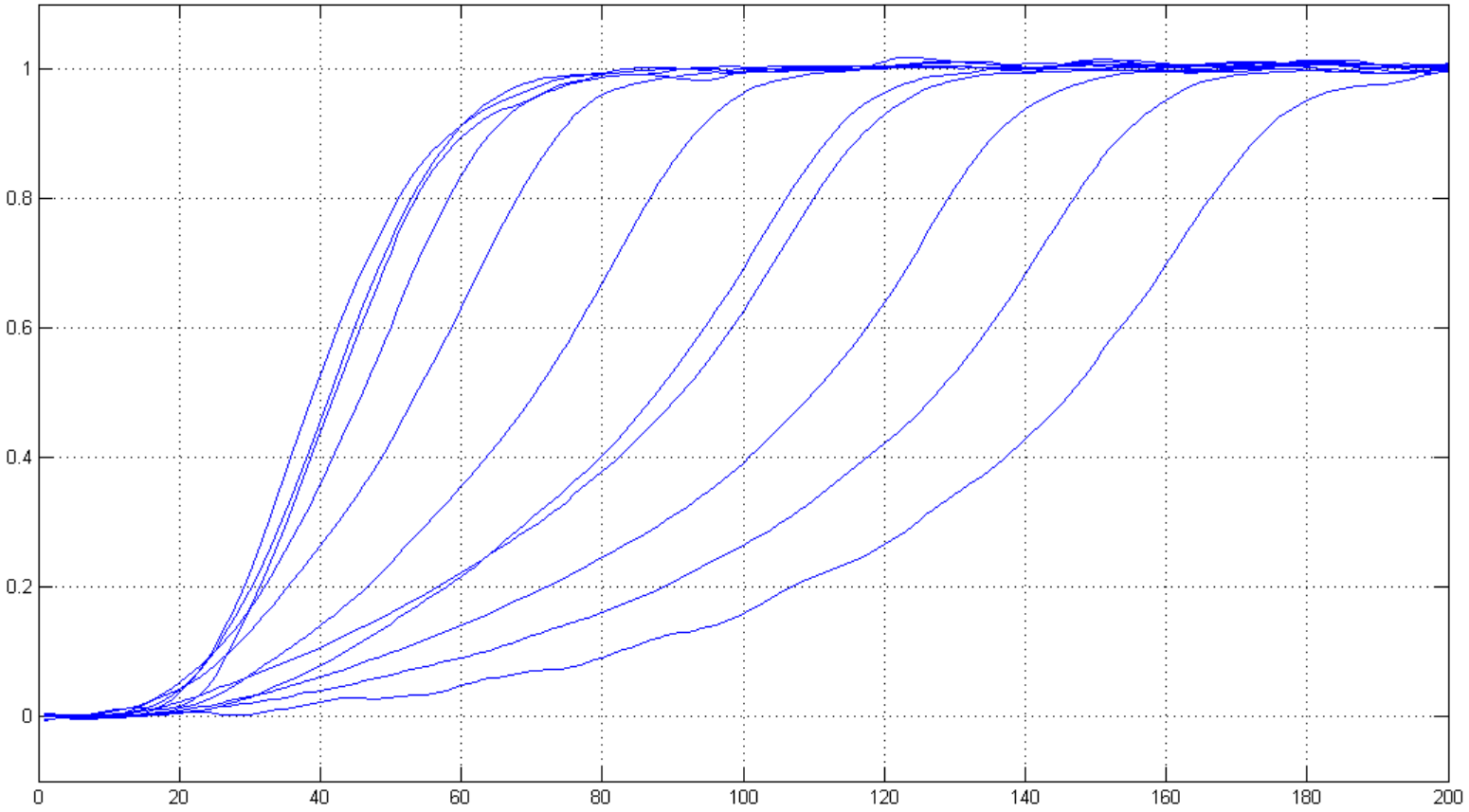


Segment:



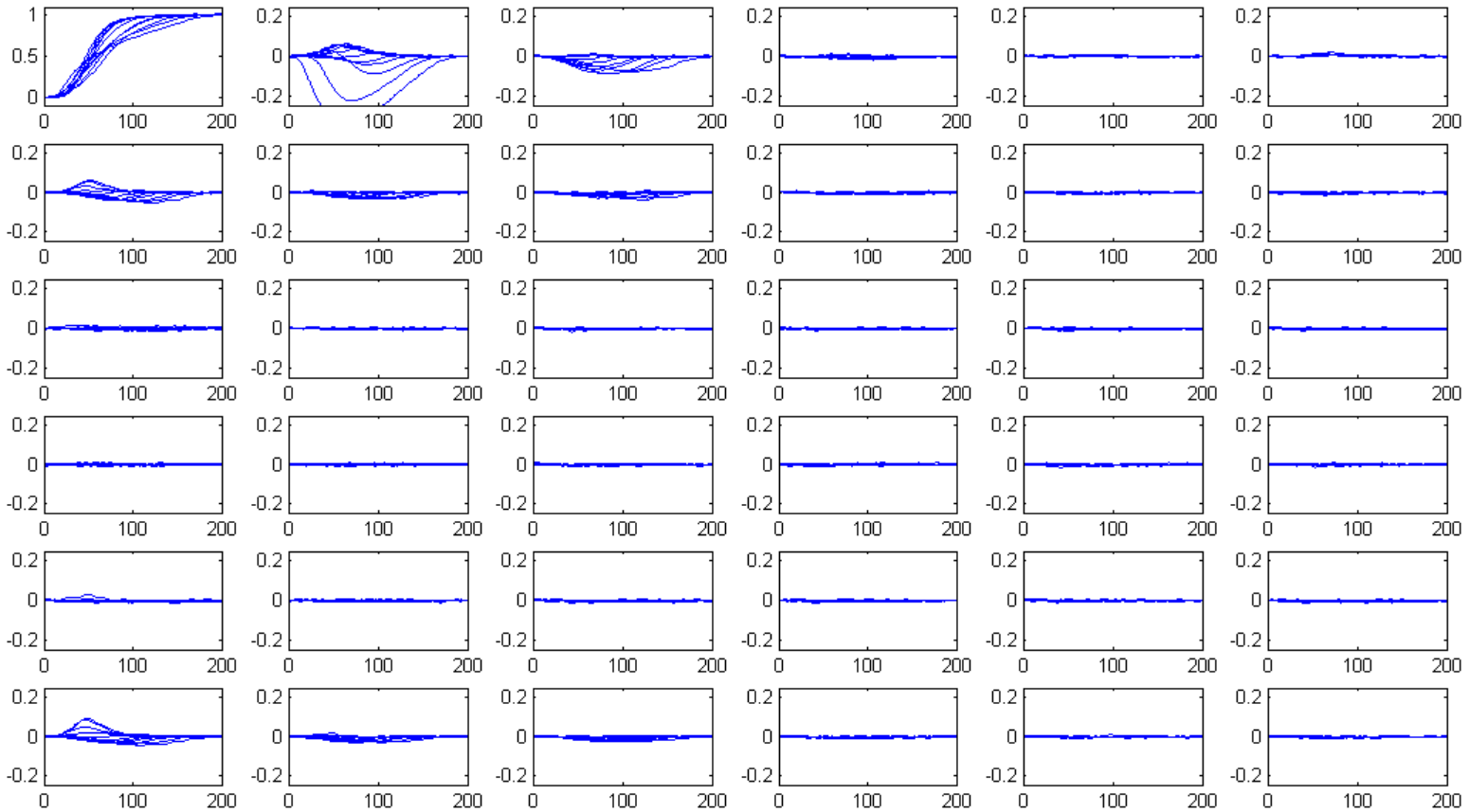
Individual events are shown in blue if accepted and red if rejected. Mean pulse formed is shown in green.

Core and Segment Pulses



This image shows the mean core signal for 12 positions on a line through the centre of sector A.

Core and Segment Pulses



This image shows the mean segment signals for 12 positions on a line through the centre of sector A.

Further Analysis of Coincidence Data

- Produce quiver plots showing the best matching MGS pulses for each coincidence scan point.

- Correct MGS pulses for effect of preamp.

- Calculate coefficients for proportional and differential crosstalk, delays and preamp bandwidths. This will be done using Dave Radford's method of minimising the difference between experimental, segment fold 1, data and GEANT4/MGS simulations.

- Reproduce quiver plots with crosstalk corrections implemented.

Thank You

Carl Unsworth, D. Barrientos, A.J. Boston, H.C. Boston, S.J Colosimo,
J. Cresswell, M.R. Dimmock, F. Filmer, D. Judson,
S. Moon, P.J. Nolan, M.J. Norman, D. Oxley, M. Slee, the AGATA collaboration.

UNIVERSITY OF
LIVERPOOL