



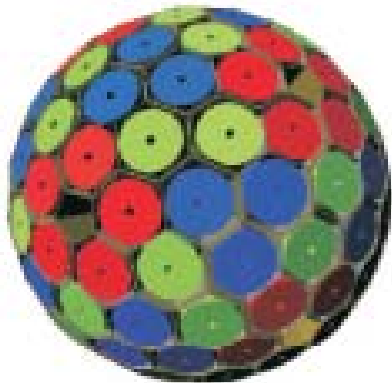
UNIVERSITY OF
LIVERPOOL



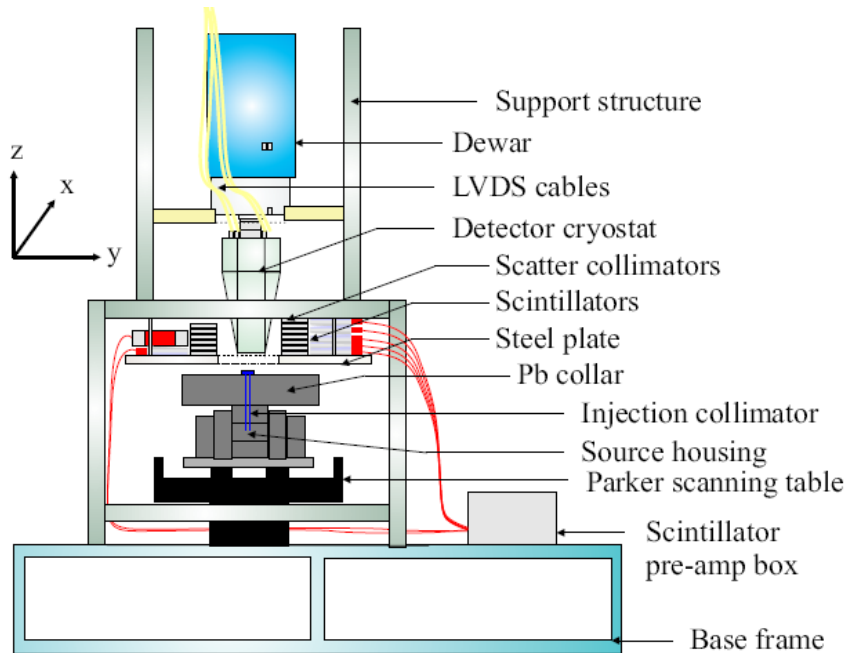
Science & Technology
Facilities Council

Status of the Liverpool Scanning System

Carl Unsworth
AGATA week – INFN Legnaro,
January 2010



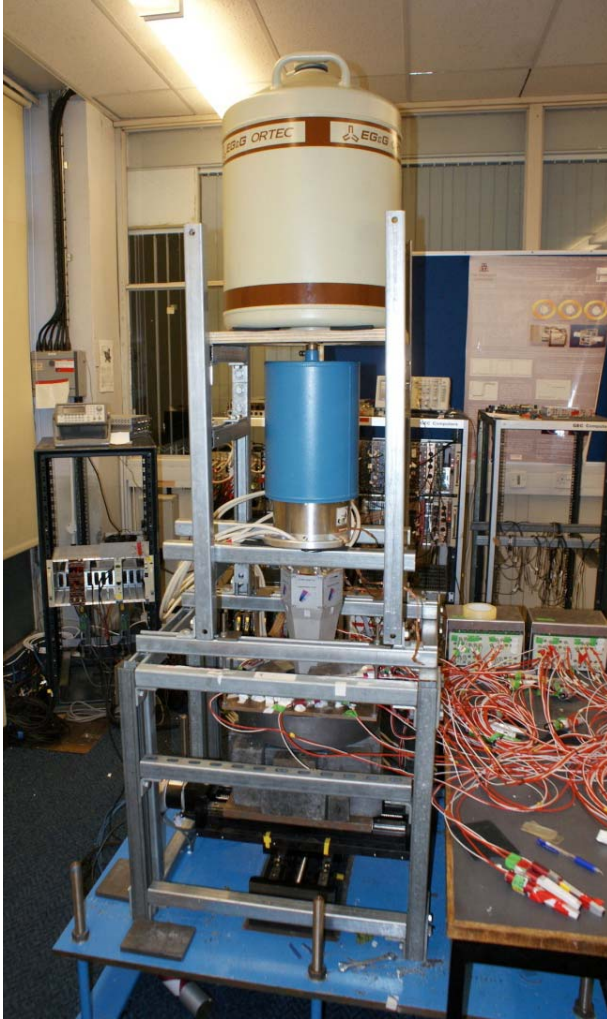
AGATA Scan Setup



- 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 $\sim 1.3\text{mm}$ at front face, $\sim 2.4\text{mm}$ 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:
 - > 300 keV on core for singles scan.
 - Core AND Scintillator within 100 ns for coincidence scan.

AGATA Scan Setup

- Storage Dewar provides 7 days LN₂ capacity.
- Filled every day to monitor rate of use.
- 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 ~3.8MB/s maximum data rate, equating to approximately 420 events per second.

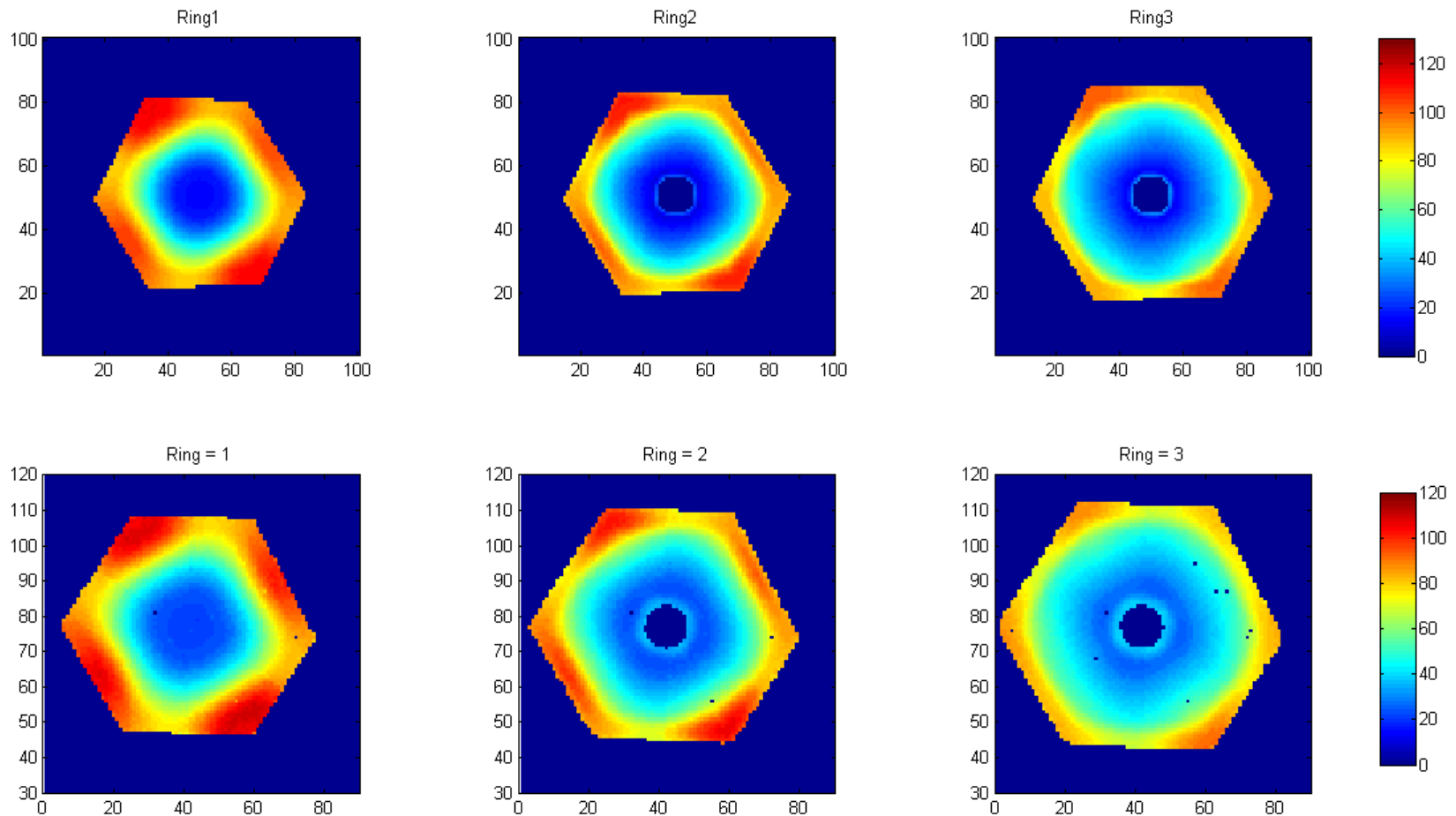


Timeline of C001 Measurements (Part 1)

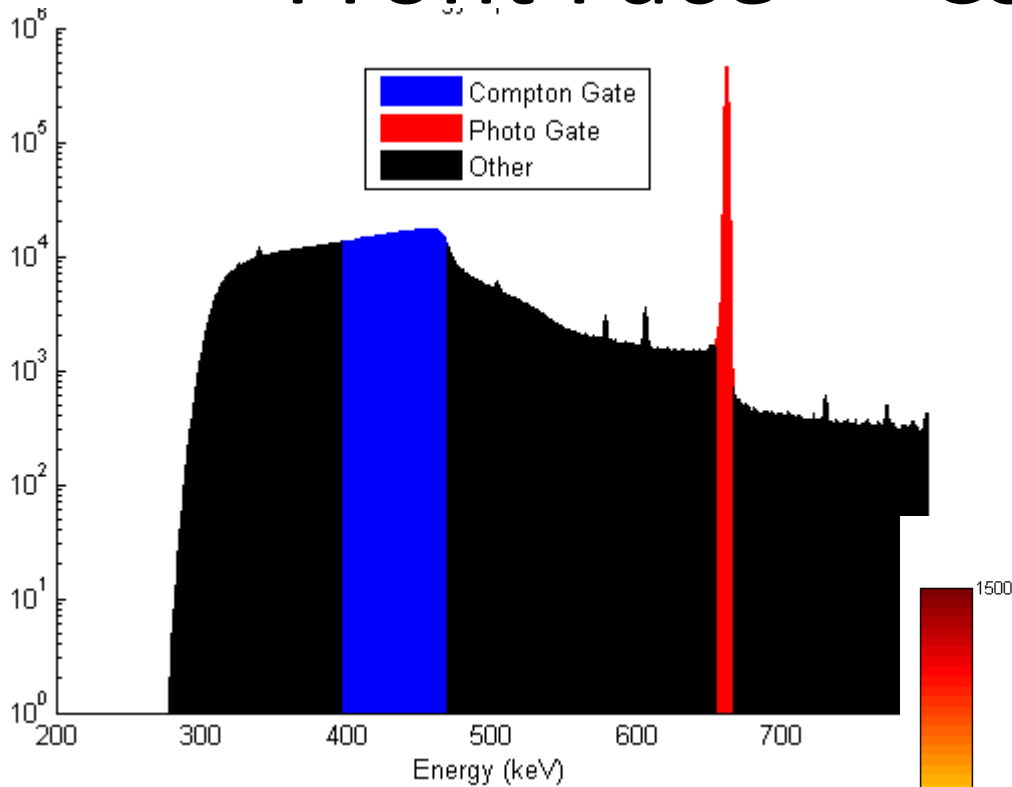
Measurement	Started	Finished
Post-repair Diagnostics		9/6/09
Energy Calibration on Digital System	11/6/09	12/6/09
⁶⁰ Co Proportional Crosstalk	12/6/09	14/6/09
Energy Calibration on Scan Table (CAEN HV)	15/6/09	17/6/09
Front Face Singles Alignment Scans	19/6/09	20/6/09
Front Face Singles Scans at 4000 – 2000 V Bias	23/6/09	26/6/09
Full Bias (4500V) Front Face Singles Scan	26/6/09	2/7/09
Coincidence Scan with CAEN HV Supply	3/7/09	2/9/09
Front Face Singles Scans at 50 – 1500 V Bias	3/9/09	8/9/09
No Trace Singles Scan For Alignment	10/9/09	11/9/09

Front Face ^{137}Cs Singles Scan

- Singles scan successfully completed.
- Generally good match between experimental and simulated risetime maps.
- Some difference in risetime near the back of the detector.

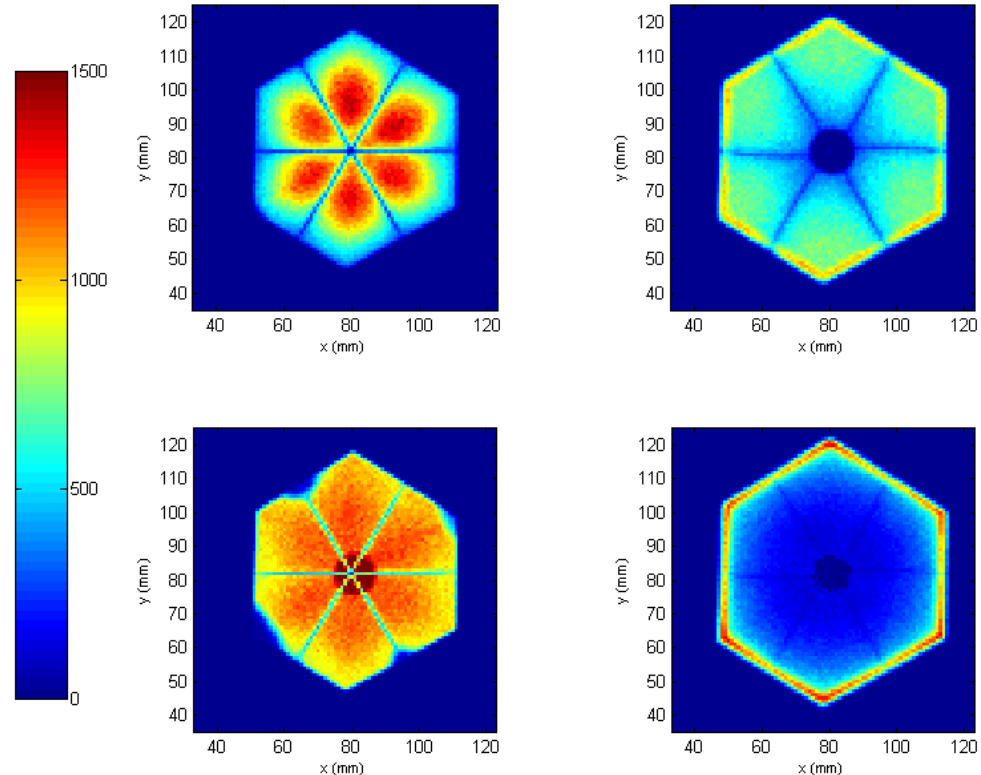


Front Face ^{137}Cs Singles Scan



- Several interesting features found when comparing Compton edge gated data with photopeak gated.

- Increased counts in front of core can possibly be attributed to reduced dead time.
- Reduced counts at segment boundaries and corners possibly due to CFD long risetime rejection.



Timeline of C001 Measurements (Part 1)

Measurement	Started	Finished
Post-repair Diagnostics		9/6/09
Energy Calibration on Digital System	11/6/09	12/6/09
⁶⁰ Co Proportional Crosstalk	12/6/09	14/6/09
Energy Calibration on Scan Table (CAEN HV)	15/6/09	17/6/09
Front Face Singles Alignment Scans	19/6/09	20/6/09
Front Face Singles Scans at 4000 – 2000 V Bias	23/6/09	26/6/09
Full Bias (4500V) Front Face Singles Scan	26/6/09	2/7/09
Coincidence Scan with CAEN HV Supply	3/7/09	2/9/09
Front Face Singles Scans at 50 – 1500 V Bias	3/9/09	8/9/09
No Trace Singles Scan For Alignment	10/9/09	11/9/09

Timeline of C001 Measurements (Part 2)

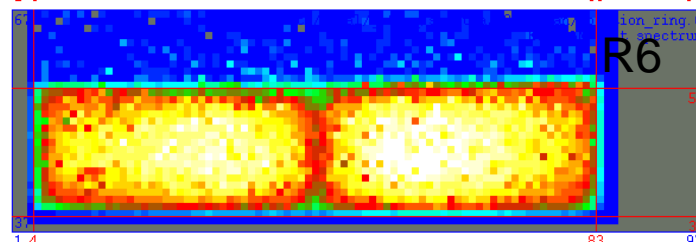
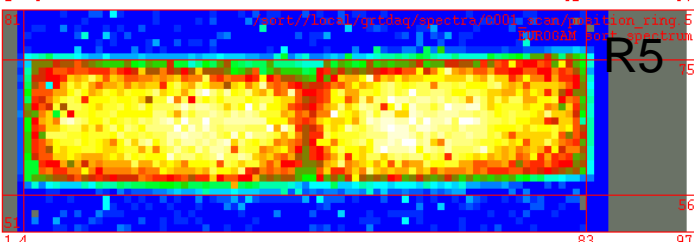
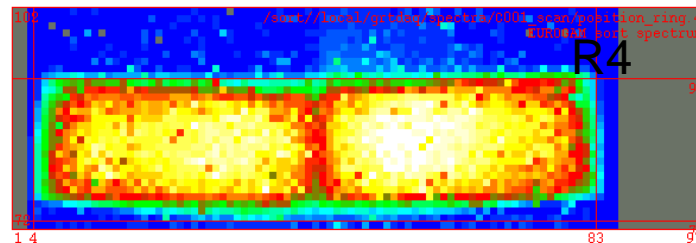
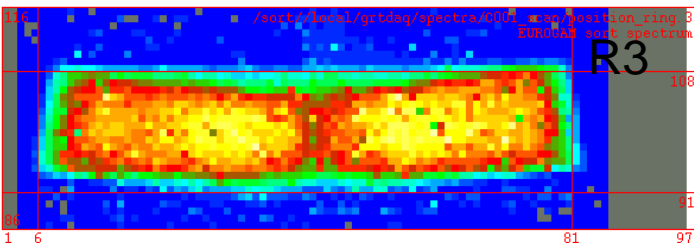
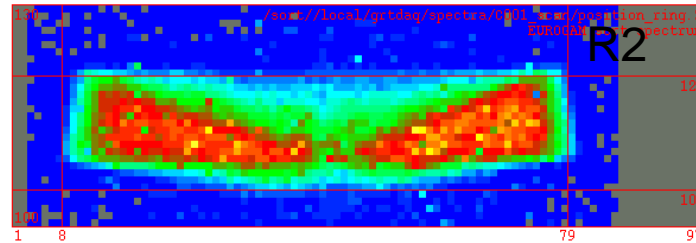
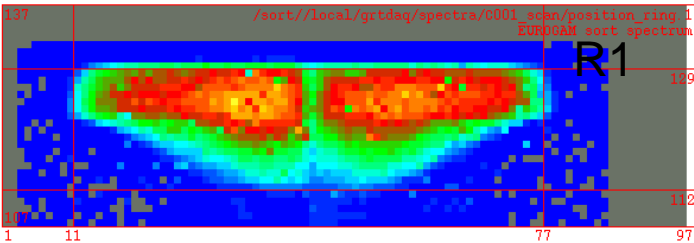
Measurement	Started	Finished
Gain Matching for Core with ORTEC supply	12/9/09	12/9/09
Coincidence Scan with ORTEC HV Supply	13/9/09	3/11/09
Alignment Tests	3/11/09	5/11/09
Plane Illuminated Data	6/11/09	9/11/09
^{137}Cs Side Singles Scan	11/11/09	19/11/09
^{241}Am Side Singles Scan	20/11/09	21/11/09
^{60}Co Flood Measurement for Prop & Diff Xtalk	21/11/09	23/11/09
^{60}Co and ^{241}Am Prop Xtalk Measurement (traces)	23/11/09	25/11/09
^{60}Co and ^{241}Am Prop Xtalk Measurement (no traces)	25/11/09	30/11/09
^{241}Am Front Face Singles Scan	30/11/09	1/12/09

^{137}Cs Singles Side Scan

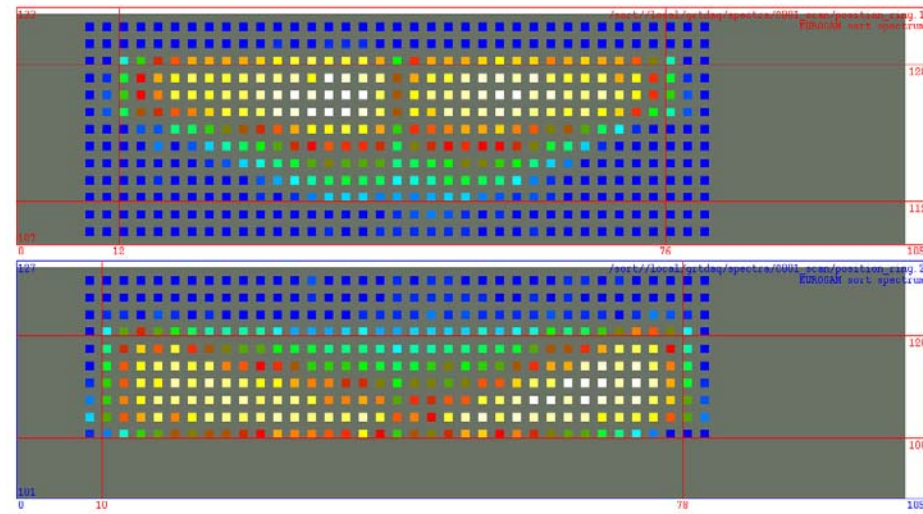
Detector scanned from side for 30s per position on a 1mm grid.

Triggered by >300keV on core.

Fold 1, Photopeak intensity matrix shown.



Front of detector scanned on 2mm basis for 150s per position to ensure sufficient statistics for PSCS method.



Timeline of Measurements (Part 2)

Measurement	Started	Finished
Gain Matching for Core with ORTEC supply	12/9/09	12/9/09
Coincidence Scan with ORTEC HV Supply	13/9/09	3/11/09
Alignment Tests	3/11/09	5/11/09
Plane Illuminated Data	6/11/09	9/11/09
^{137}Cs Side Singles Scan	11/11/09	19/11/09
^{241}Am Side Singles Scan	20/11/09	21/11/09
^{60}Co Flood Measurement for Prop & Diff Xtalk	21/11/09	23/11/09
^{60}Co and ^{241}Am Prop Xtalk Measurement (traces)	23/11/09	25/11/09
^{60}Co and ^{241}Am Prop Xtalk Measurement (no traces)	25/11/09	30/11/09
^{241}Am Front Face Singles Scan	30/11/09	1/12/09

Analysis of C001 data

Here in Liverpool:

- Produce quiver plots showing the best matching MGS pulses for each coincidence scan point. [C Unsworth]
- 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. [C Unsworth]
- Reproduce quiver plots with crosstalk corrections implemented. [C Unsworth]
- Analysis of scan data taken at a range of bias voltages [Ste Moon].

Elsewhere:

- PSCS method of producing pulse shape database from singles data [Fabio Crespi, Milan]

Timeline of A006 Measurements

Event	Date
A006 Capsule Arrives in Liverpool	10/12/09
Capsule Mounted in Cryostat	16/12/09
Damaged ribbon cables repaired	17/12/09
Cryostat attached to pumping system	17/12/09
Cooling Begins	18/12/09
Testing reveals segment C4 missing, warming begins	21/12/09
Repairs carried out to cold/warm feedthrough. Pumping	8/1/10
Cooling begins	11/1/10
Testing reveals segment C4 still missing, warming begins	12/1/09
Sector C ribbon replaced. Cryostat attached to pump.	19/1/09

Timeline of A004 Measurements

Event	Date
A004 arrives in Liverpool. Attached to pump.	10/12/09
Cooling.	11/12/09
Testing shows segment E6 missing. Warming begins.	14/12/09
Repairs to cold/warm feedthrough. Pumping begins.	18/12/09
Cooling.	22/12/09
Testing shows D6 missing. Warming starts.	23/12/09
Ribbon cable to D6 repaired. Pumping.	5/1/10
Cooling.	7/1/10
Testing shows all sector D channels missing. Warming.	8/1/10
Sector D feedthrough repaired.	12/1/10
Cooling.	13/1/10
All segments working. Acceptance tests begin.	14/1/10

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

