Detector characterisation overview of the AGATA scanning tables

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AGATA collaboration Scanning tables

• Liverpool

- Conventional singles and Coincidence
- used to commission PSCS
- validate other tables in collaboration
- IPHC Strasbourg scanning table based on the PSCS technique
- Salamanca Scanning table (SALSA)
 - 511keV coincidence and PSCS
- Orsay
 - Singles and Coincidence
- GSI 511 keV coincidence upgrade plan defined (J. Gerl tomorrow)

Characterisation status & plans

Impact of electronics on signal shape

- Digitiser: AGATA v2 vs TNT2 vs Caen v1724 etc
- Preamplifier and grounding: single vs triple etc
- Validation of PSCS methodology
- ADL validation and questions (good progress), Peter Reiter or Lars Lewandowski tomorrow
- Acquire data from one detector with different DAQs
- Acquire data from one detector at two different scanning centres

Liverpool Detector characterisation



- Singles
- Coincidence scanning
- Very precise and accurate
- Can be very slow

Upgrade of system in progress

Existing scanning table status



- Existing scanning equipment has been upgraded significantly since the last Agata data was taken
 - Old scanning system based around Gretina digitisers + analogue trigger
 - Now uses Caen V1724 digitiser + V1495 digital trigger or software trigger
 - New custom designed BGO's
 - New detector support frame with easily adjustable height

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- New 3d printed secondary detector mountings
- New lead shielding around source
 - Easier to align source with collimator
- New 3d-printed 0.5 mm tungsten collimator
- Just finished commissioning with SIGMA detector

Existing scanning table status

- 'Prototype' 0.5 mm collimator manufactured
 - made by Department of Mechanical, Mate Aerospace Engineering at University of Live as a test of their technique
 - 'laser powder bed fusion scanning'
 - 99.9% pure W
 - Count rate ~ 15 cps





Resultant pinhole (~0.5mm)

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17/09/19

New scanning table

- Plans for a second scanning table to expand our capabilities and allow higher throughput of detectors
- Aim to use stronger ¹³⁷Cs / ²⁴¹Am sources than existing setup
- Project has been fully funded by University of Liverpool + STFC
- Acquiring new equipment DAQ, secondary collimation, detectors etc. is underway
- Hope to be operational early 2020



17/09/19

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Liverpool Characterisation Status

- Scan of SAGe Well detector (Q3 2017) TSLM readout (T0)
 - C. Unsworth et al., NIM A927 (2019) 293
- System shutdown (Q4 2017)
- Recommission system (Q2 2018)
- Scan SIGMA detector (Q4 2018) TSLM readout (DAQ system issues)
 - Laura H-B (Thursday)







Building + lab status

- Renovation work is still ongoing (over 2 years after it began)
- Scheduled to finish September 2019...
- Lab windows and roof work completed
- Still a lot of work ongoing around the building



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- Scan SIGMA detector (Q4 2018) TSLM readout (DAQ system issues)
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- Scan AGATA detector (Q4 2019)
 - A5 (cryostat from Salamanca)
 - **TSLM readout**
- ORTEC





The IPHC scanning table

Scanning Table upgrade

Principle of our scanning table

 \rightarrow PSCS method



To be more precise at the crossing point it was necessary to:

- Decrease in collimation diameter
- Increase in the number of steps in the rotation of the detector
- Improve the LabView programs correlating acquisition, positioning of the source and cooling.

https://agenda.infn.it/event/19438/timetable/

The IPHC scanning table



(1) LN2 pipes (2) test-cryostat Dewar (3) adjustment frame (4) holding plate for vertical positioning (5) holding plate for horizontal positioning (6) fixing studs (7) end cap of the detector (8) collimator (Ø 1.0mm 0.5mm 0.2mm) (9) scanning table motorized axes (10) alignment laser

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B. De Canditiis – 20th AGATA week – LNL, Legnaro – 16-20 September 2019

Scanning Table upgrade - 3 interchangeable collimators

Replacement of the fixed 1.5 mm diameter hole by removable collimation tubes of 1 mm, 0.5 mm and 0.2 mm



SALSA concept



The scanning set-up at Orsay

Agata detector : θ movement Xy movement

From simulations, the number of single interaction

400/h @front face, 100/h @front third and 10/h @the back of the detector

Compton scatter events at a given position :

Tohr : z movement Coincidences : 6 Nal detectors



Volume /scan point : 2 x 2 x 2-3 mm3 : 3D Scan of the whole detector

OPERATIONAL: AVAILABLE

Characterisation Summary

- 5 systems available (in principle)
- Three symmetric AGATA detectors
- Three asymmetric AGATA detectors have been coincident scanned and characterised
- The experimental measurements have informed the calculations
- ADL is used to generate a simulated basis (data from A6, C1)
- PSCS has been used to generate an experimental basis
- Generation of experimental single interaction data sets
- Availability of AGATA crystals
- Coordination of characterisation work

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THANKS

