LIVERPOOL CHARACTERISATION UPDATE

Chris Everett, on behalf of the Liverpool characterisation group.

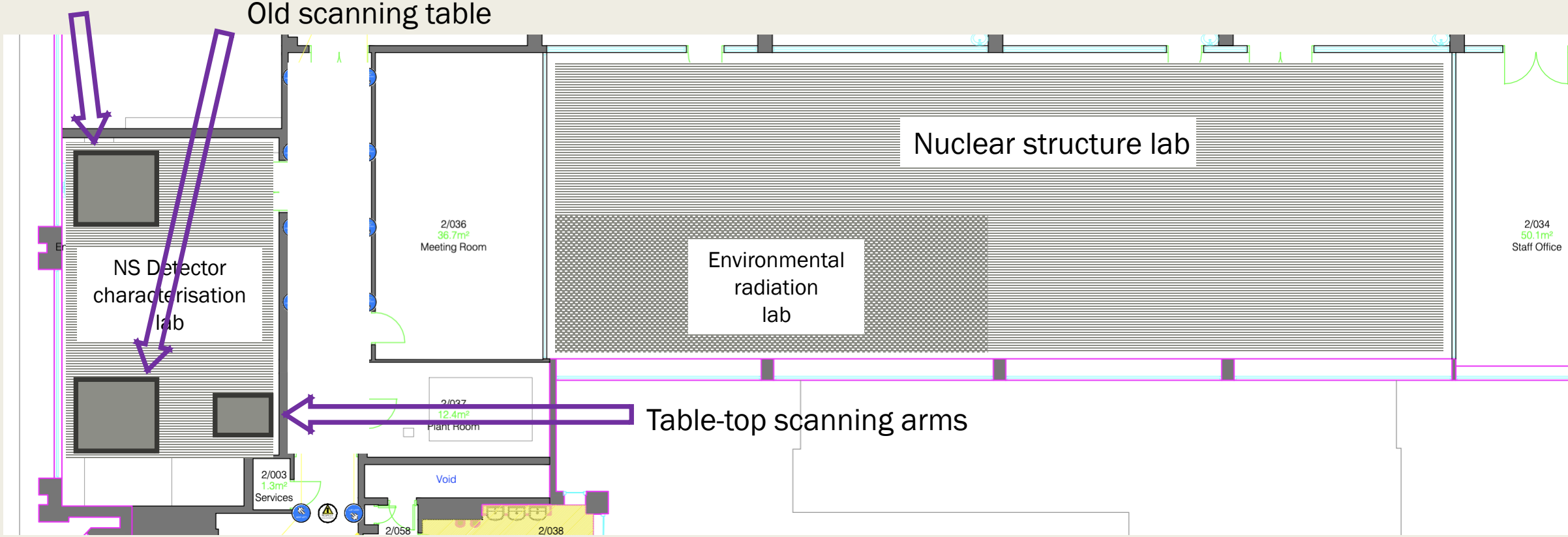
AGATA Week 2024, Milan

Layout of the new lab

We're (mostly) fully moved in.
The new high activity source has been delivered.

New scanning table

Old scanning table



Scanning tables at Liverpool

- The original high activity, highly collimated Cs-137 table is up and running, and a commissioning dataset is being collected on it currently with A601 –running well.
- The smaller, Velmex arm x-y scanning table has been used several times over summer with Co-57 and Tc-99m sources for student projects, and is also working well.
- The new scanning table & lead castle are fully assembled, and we are waiting on the final paperwork signed off before the 4 GBq Cs-137 source can be installed. A601 will then be used to commission this table.

Detectors at Liverpool

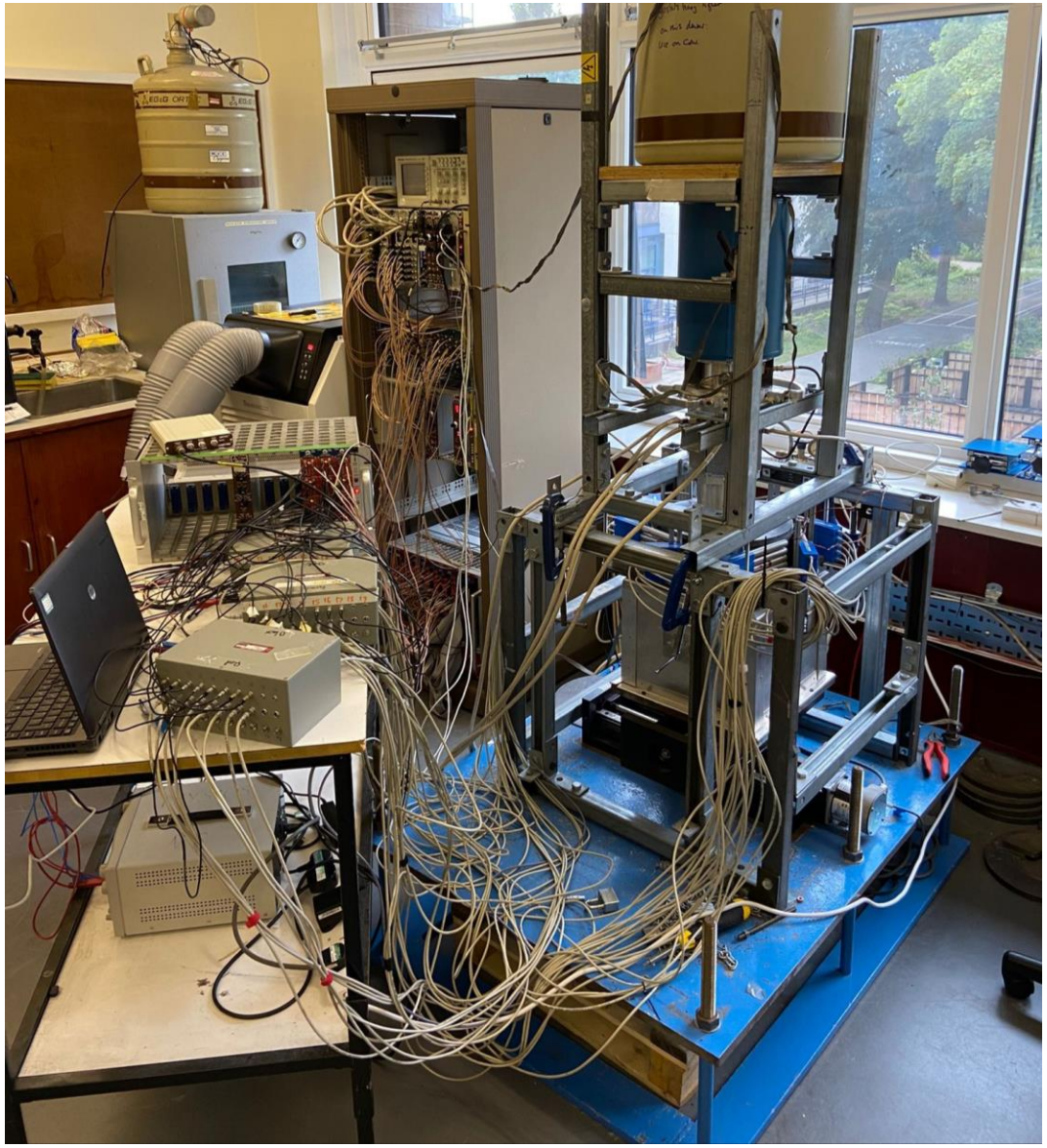
- This year we began the characterisation of the A601 detector, which will be used for neutron damage studies after table commissioning.
- We are still working with the inverted coaxial p-type HPGe detector SIGMA, which went to Mirion's Birchwood facility to collect imaging data at the beginning of summer.
- We also did a few scans of a new low background Mirion SageWell detector for our environmental radiation lab.

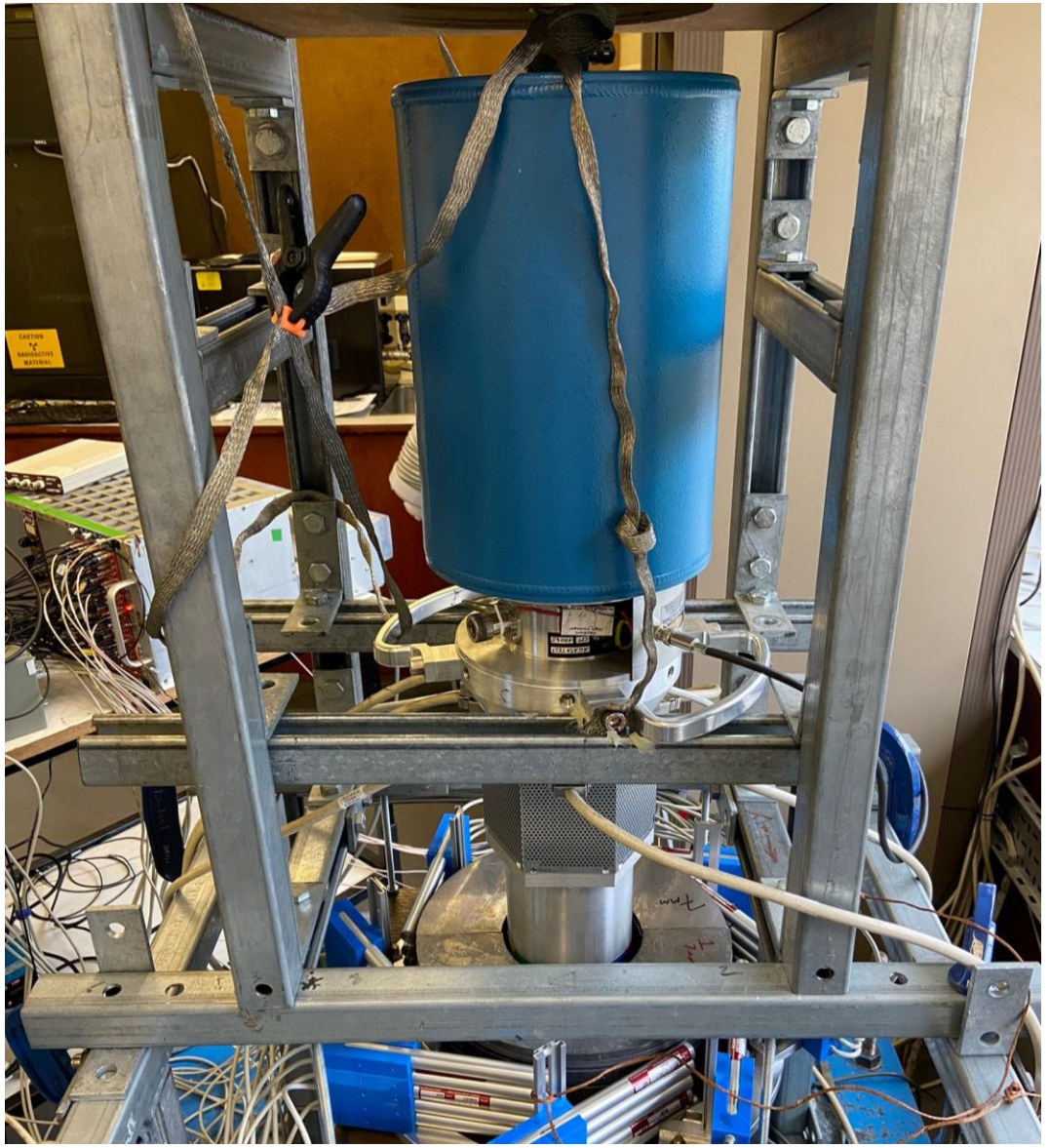
The new scanning table

- The new scanning system is a wholly new assembly, from top to bottom.
- A holding frame has been designed and constructed, which allows for far easier mounting and manipulation of the cryostat assembly in 4 axes, as well as allowing much quicker mounting for side scans.
- A new set of digital electronics has been purchased to read out detector signals.
- A new 48-channel BGO readout system has been built to allow for all 6 rings of an AGATA detector to be coincidence scanned in one run.

The new scanning table

- The new system is not yet fully commissioned, as the source is not installed. Instead, the x-y stage, electronics, BGOs and support frame have been tested independently.
- A601 was mounted on the new frame and supported over the old x-y stage and source – the scan results from my talk yesterday were from these tests.
- The new x-y stage was previously tested standalone to scan a BEGe as a test run. It has also been tested with the new 700 kg lead castle on it.
- The electronics and DAQ PC have been used with several detector systems since we bought them.

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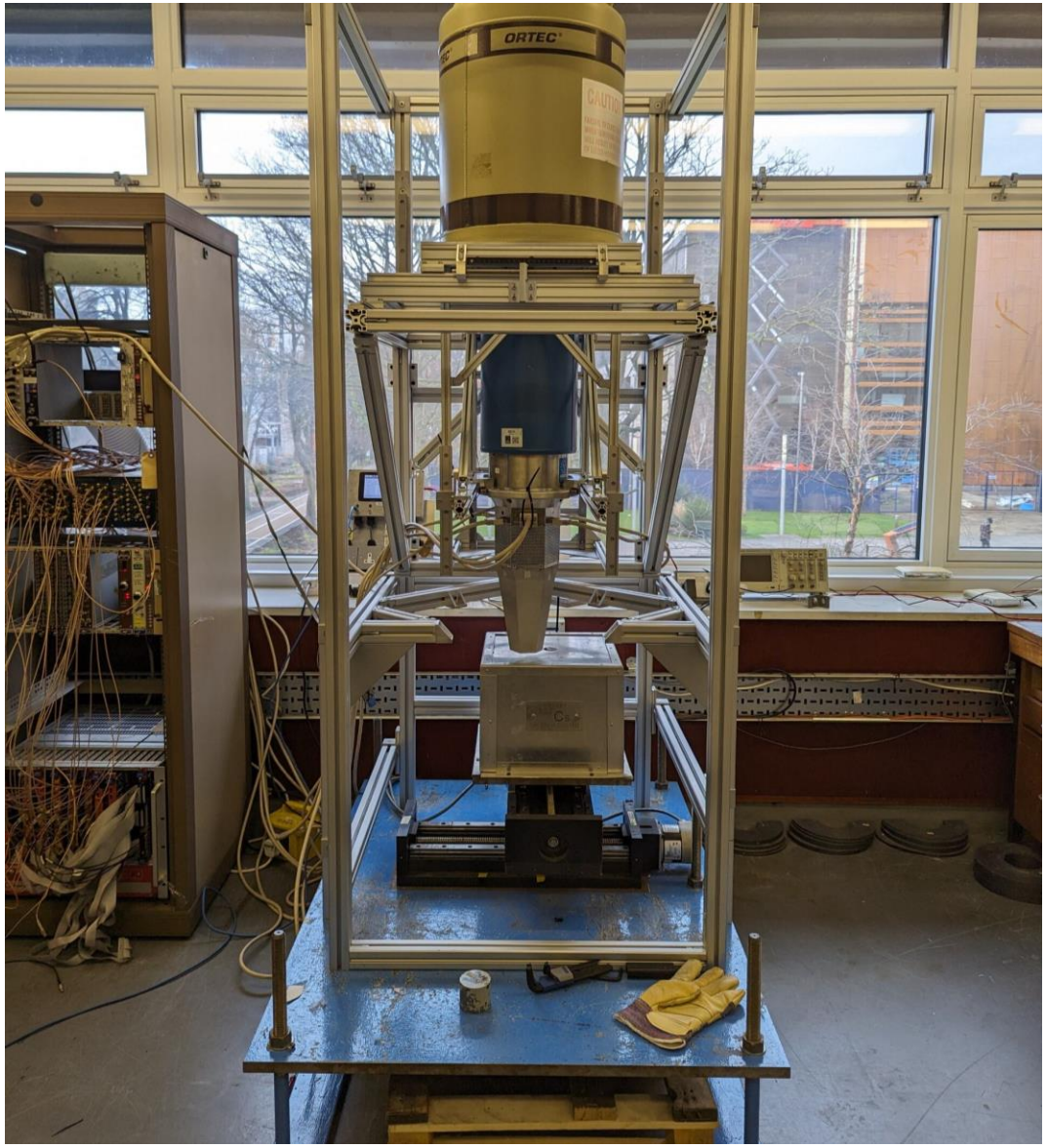
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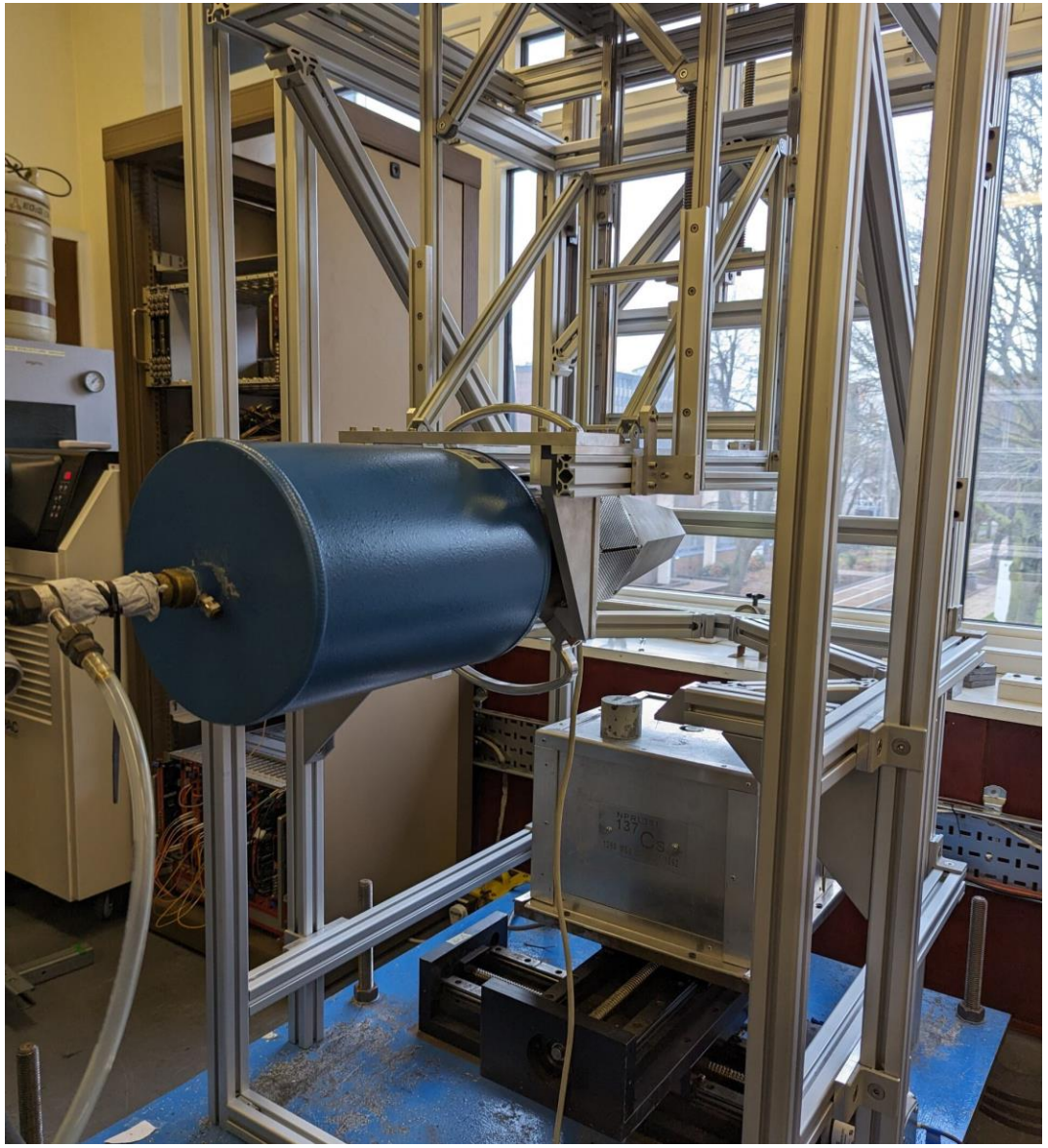

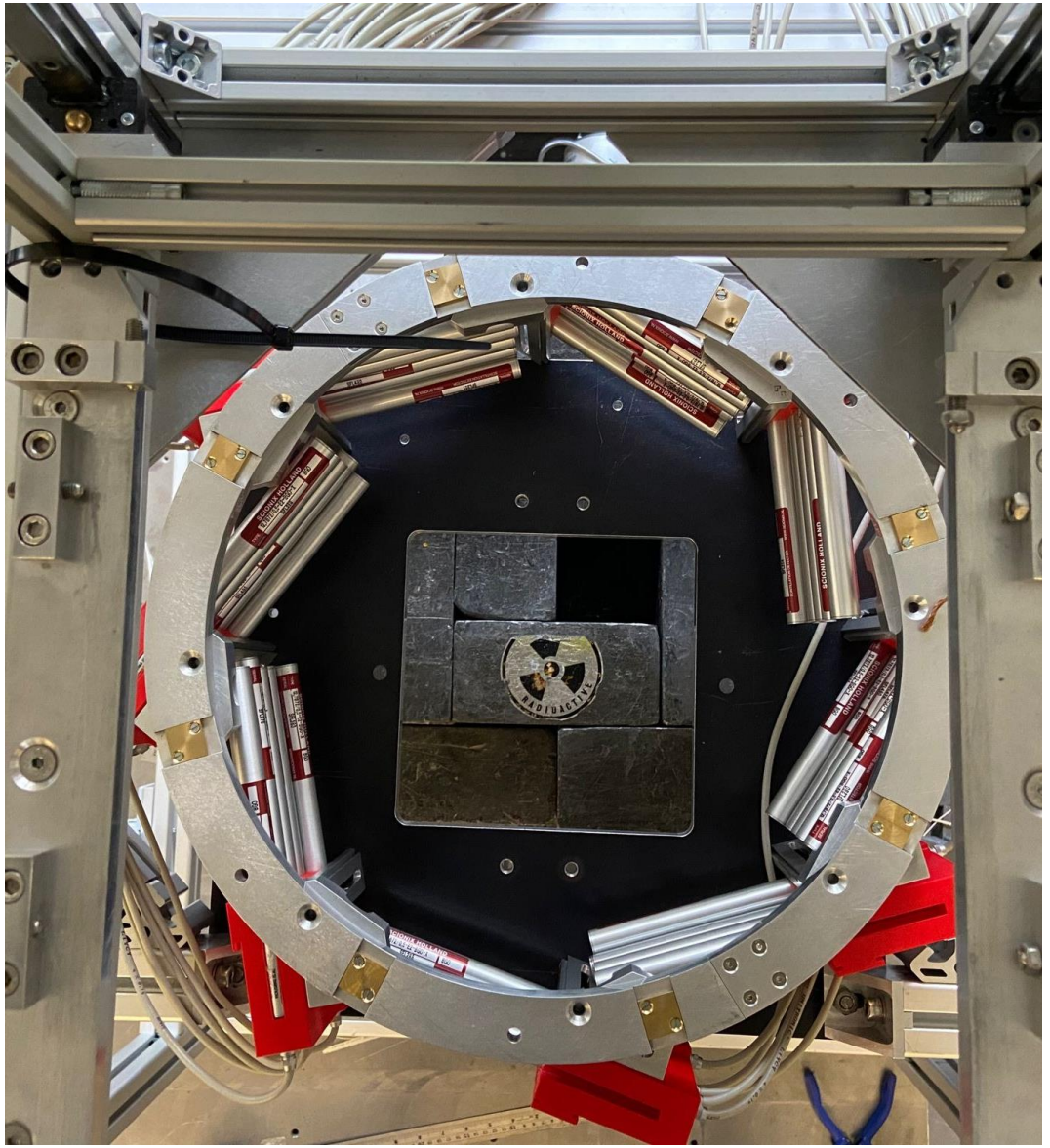
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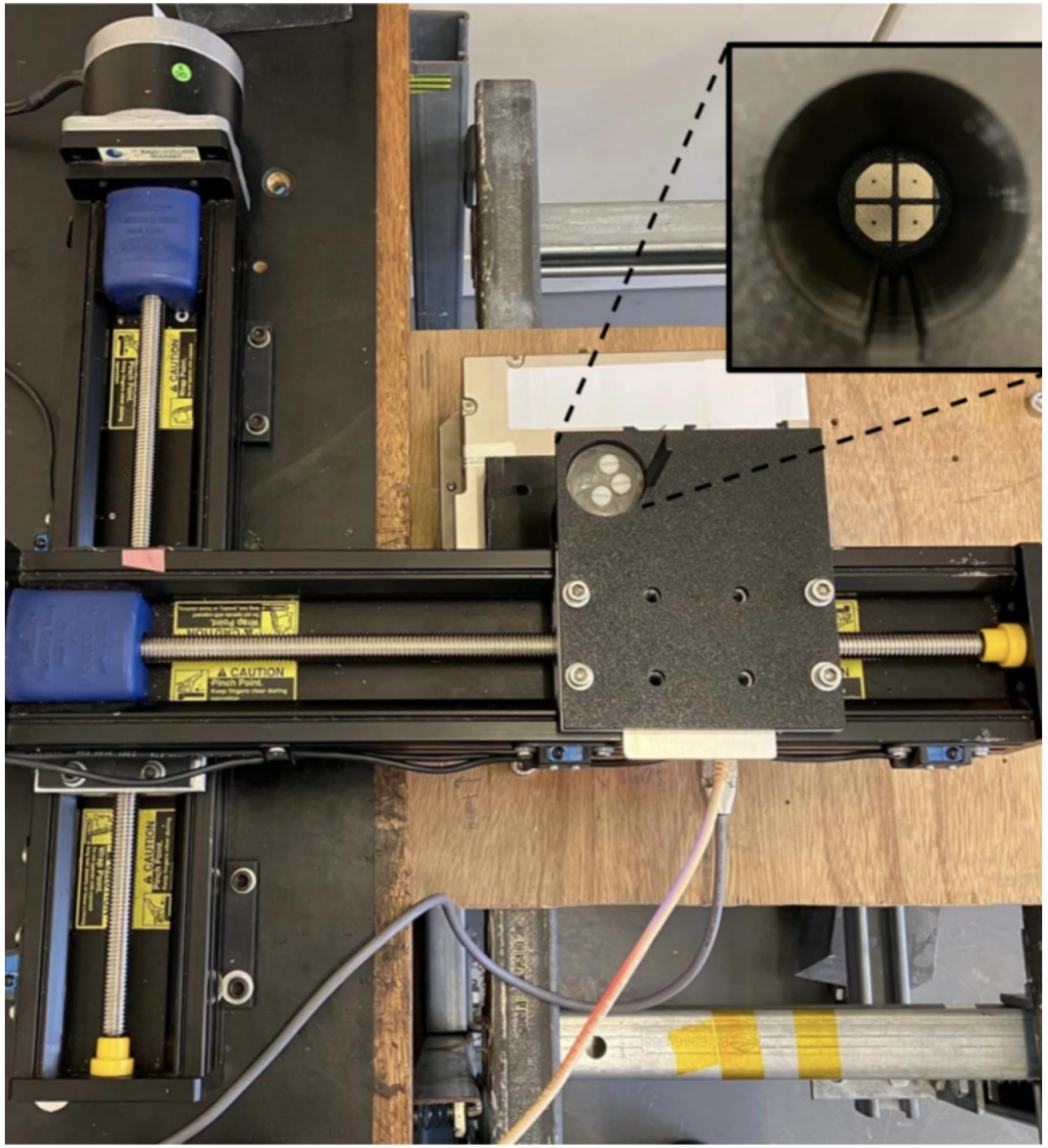
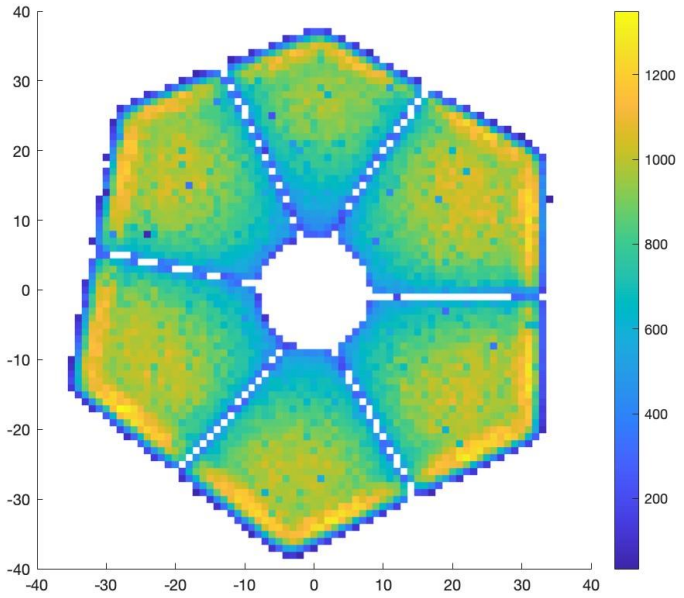
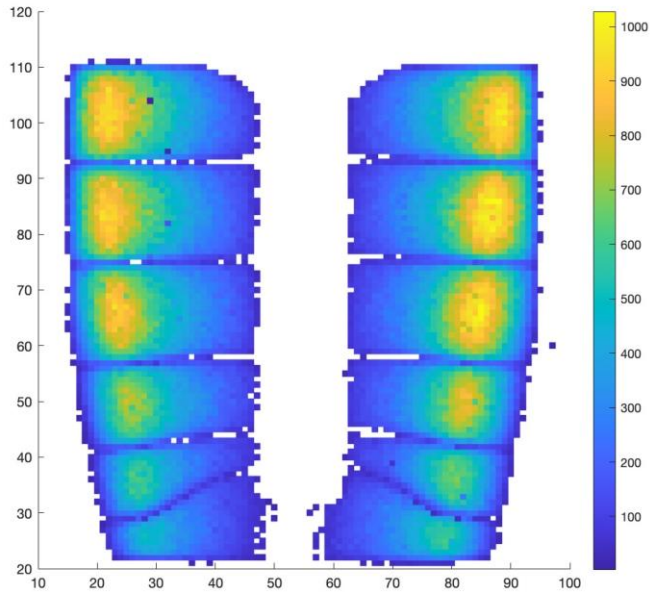


Image from Rachil Dogolazky's MSc Thesis

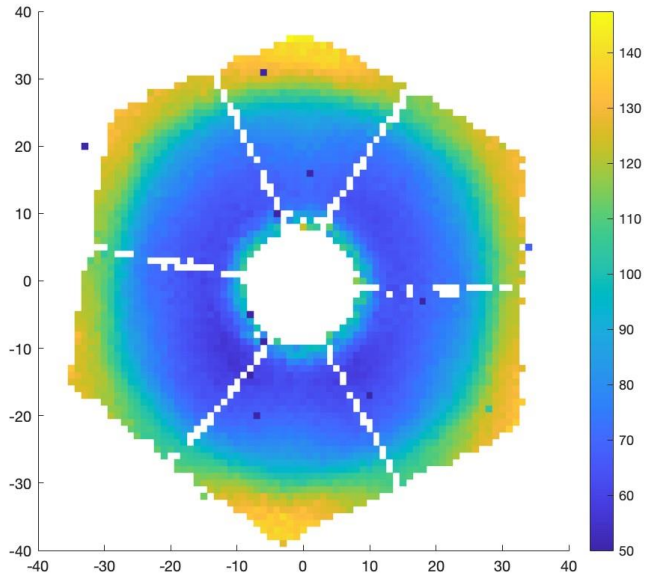


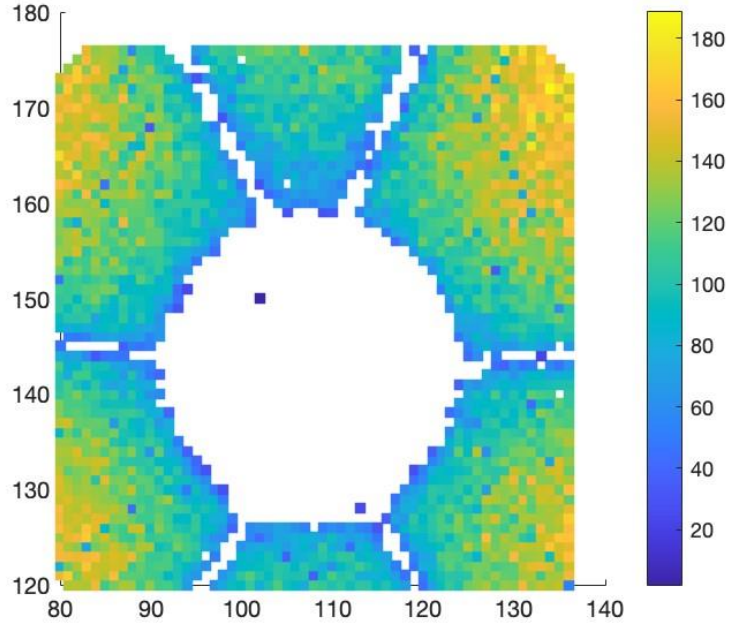


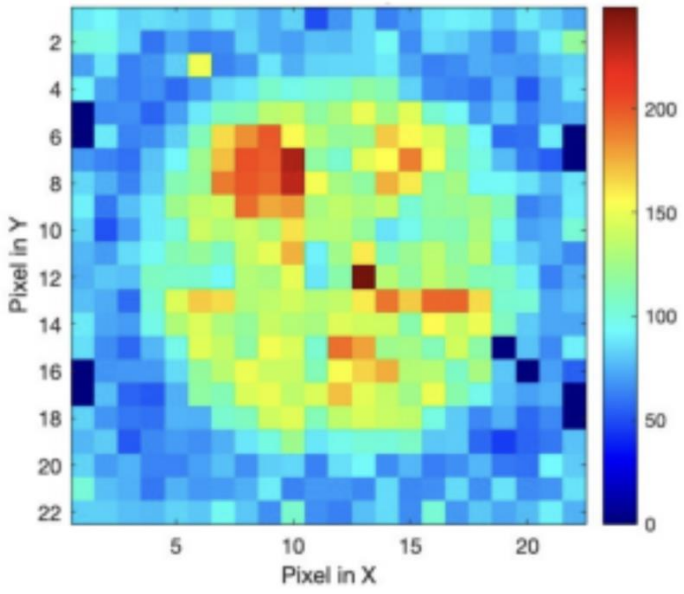
A601 measurements

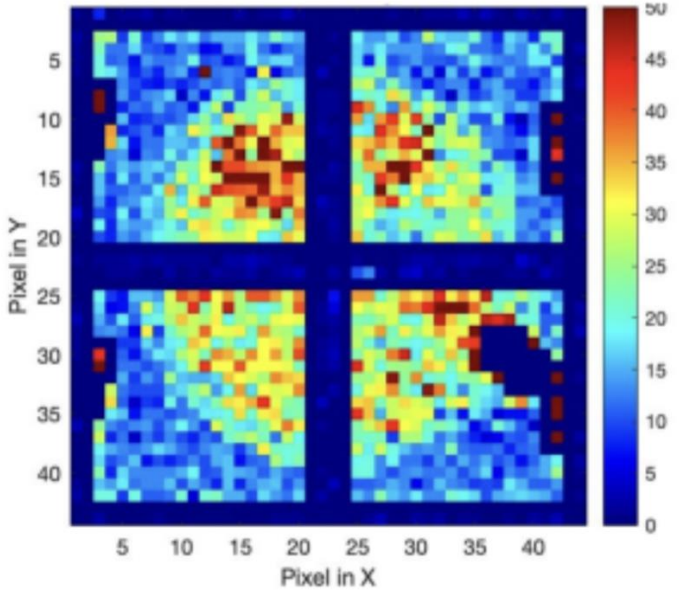
Top: A601 gated Cs-137 counts, front and side scan.

Bottom, A601 @ 2350V, Core t50 rise times, A601 @ 5kV borehole scan.





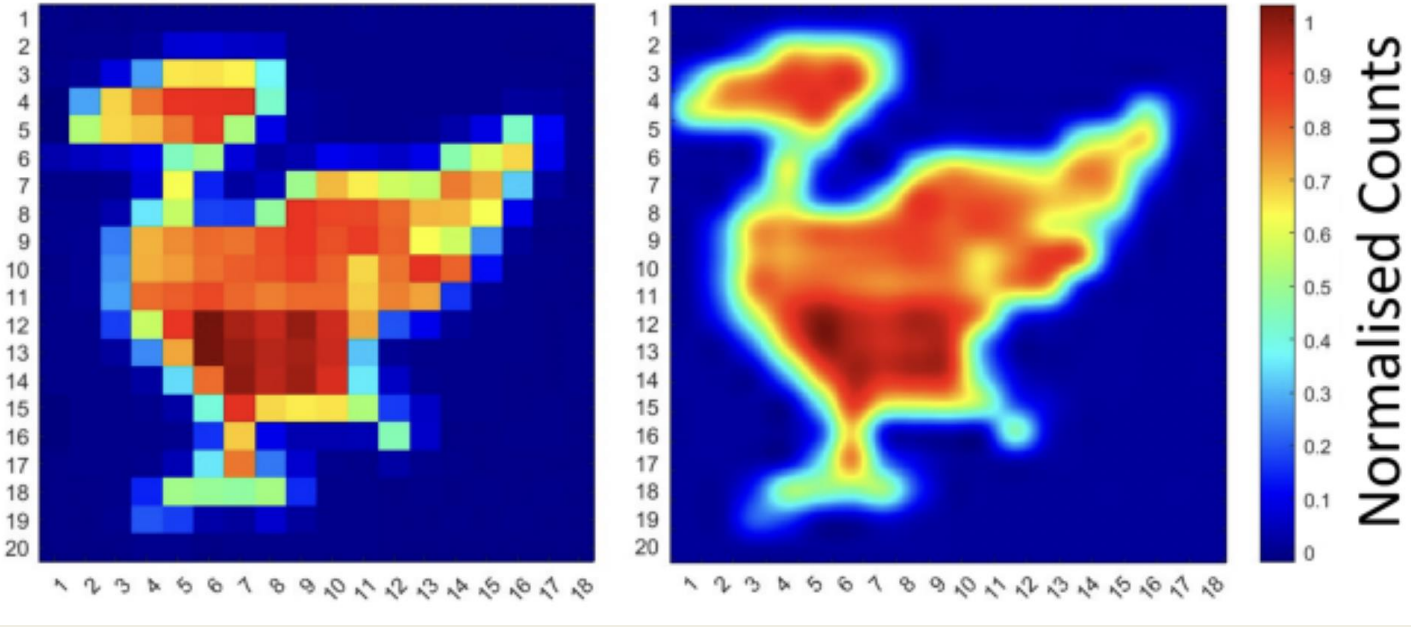




CZT measurements

Top: Tc-99m measurements using a hot-rod phantom.

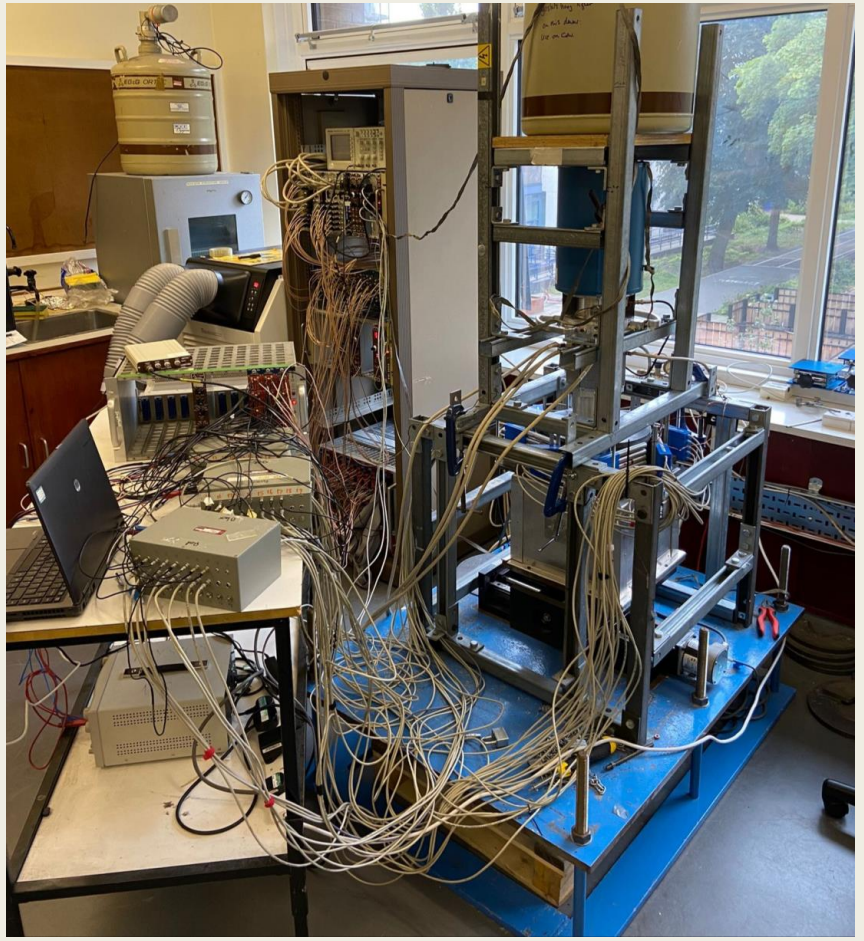
Bottom: ”Source painting” Co-57 used to draw the Liver bird logo from the UoL crest onto the CZT.



Results from Rachil Dogolazky’s MSc Thesis

The old BGO readout system

- The current BGO readout system uses 20-channel boxes to provide externally sourced LV and HV to the detector, and read out the signal.
- Those signals then go into NIM unit fan-in/fan-out boxes, to sum the signals in 4s.
- The summed signals then go into the CAEN digitisers.
- Lots of wires, lots of floor space.



The new BGO readout system

- A single rack mounted unit contains the LV and HV supplies, as well as the fan-in/fan-out circuitry.
- The box has 48 BGO inputs, and 48 single/12 summed signal outputs.
- The summed outputs then go to the digitisers as before.
- More permanent solution, far less wiring.
- Designed and built in-house.

The future

- Priority is getting the final red tape out of the way and getting the new 137-Cs source into the new table.
- Possibility of getting a second scanning frame made to replace the older frame of the original table.
- Looking into ordering new, non Cs-137 collimated sources for scanning.
- Ideally, get more detectors to scan…

Thank you for listening.

Thank you to Dan Judson, Ellis Rintoul, Kieran Green and Rachil Dogolazky for their contributions to this presentation.