AWE NUCLEAR SECURITY TECHNOLOGIES

International Collaborations AWE UK FY25 & Look Ahead

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Non-Destructive Assay (NDA) / Radiation Detection Group (RDG) / Physics

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Appendix F International Collaborations AWE UK

- Criticality Incident Detection and Alarm System (IE12) **Simon Garbett, Graham Auld, Trevor Birkett**
- Neutron Time Correlation Measurement and Analysis of Radiometric Data from Bulk Nuclear Material **Nigel Kelsall**
- Criticality Incident Dosimetry, Inter-comparison **Phil Angus, Kirk Chapman**
- Hands-on Criticality Safety Training **Michael Varns**

AWE NUCLEAR SECURITY TECHNOLOGIES

IS820 Criticality Incident Detection System (CIDS) Program Updates

Simon Garbett

Radiological Instrumentation & Calibration

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GODIVA IV 2024 – CAAS Testing for AWE

Test Plan:

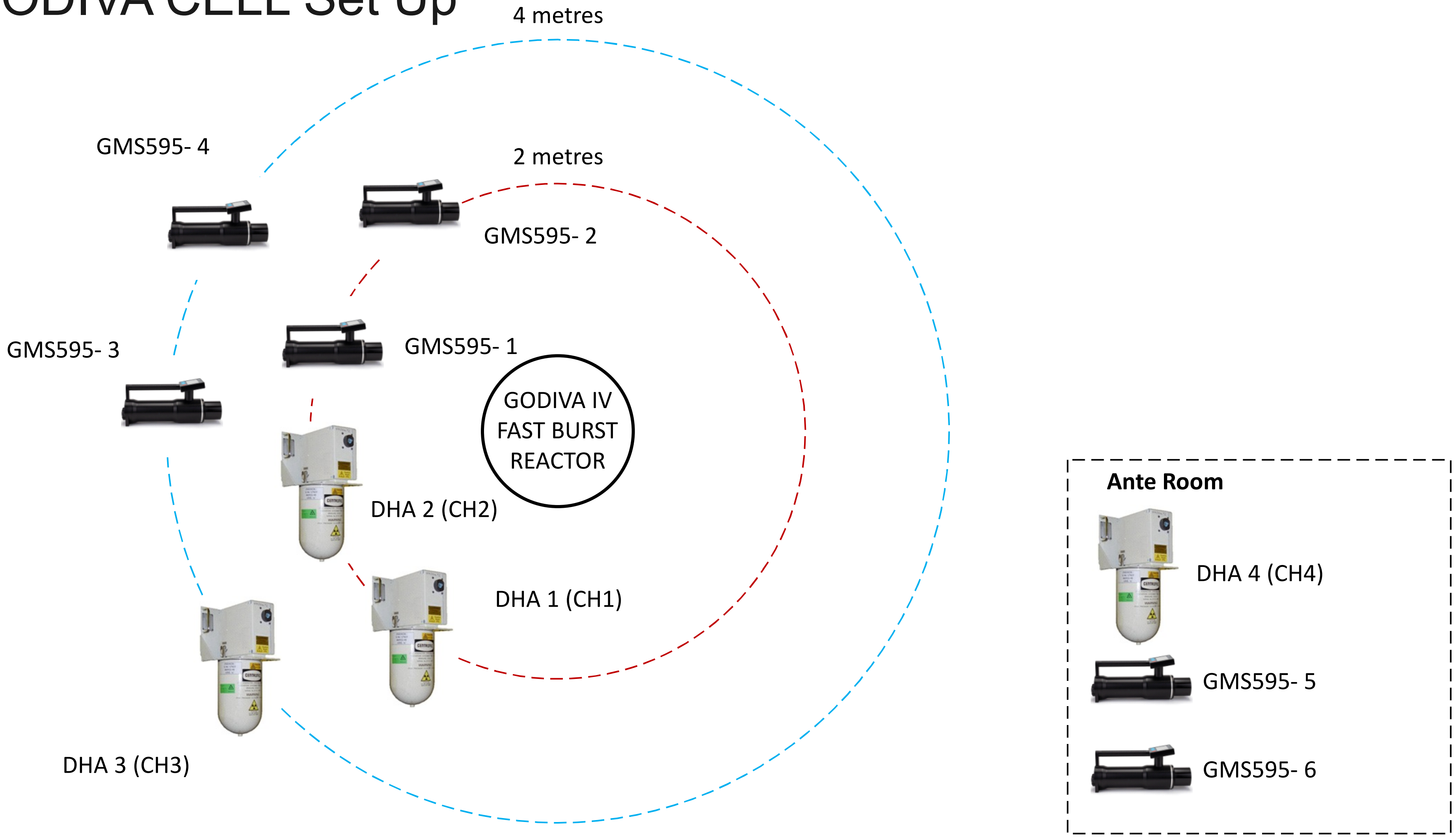
Three bursts over four days were carried out:

- Day 1 – Set up and verifying equipment configurations (Sub prompt burst).
- Day 2 – Low range burst (75°C ΔT) undertaken.
- Day 3 – High range burst (250°C ΔT) undertaken.
- Day 4 – Mid range burst (150°C ΔT) undertaken, and then pack up of equipment.

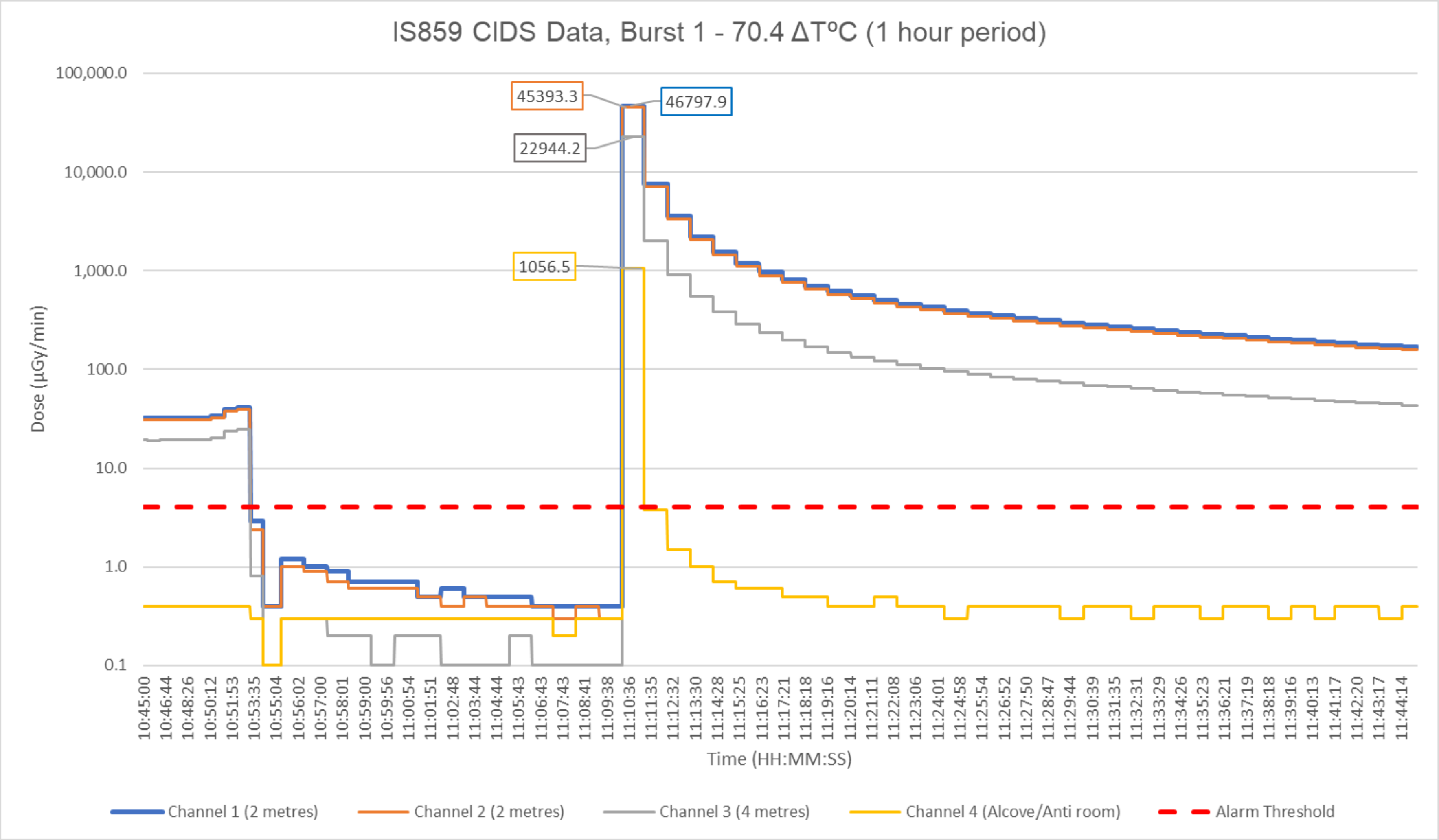
Objectives:

- Primary Objective: *To further validate the IS820 CIDS post event monitoring capabilities.*
- Secondary Objective: *To better understand why dose collection effects within the IS821 DHA occur during the first stages of the burst (noticed on previous trial).*
- Third Objective: *To assess the scintillation-based detector used on the GMS595 Wide Range Gamma Detector for potential alternative for a criticality detector.*

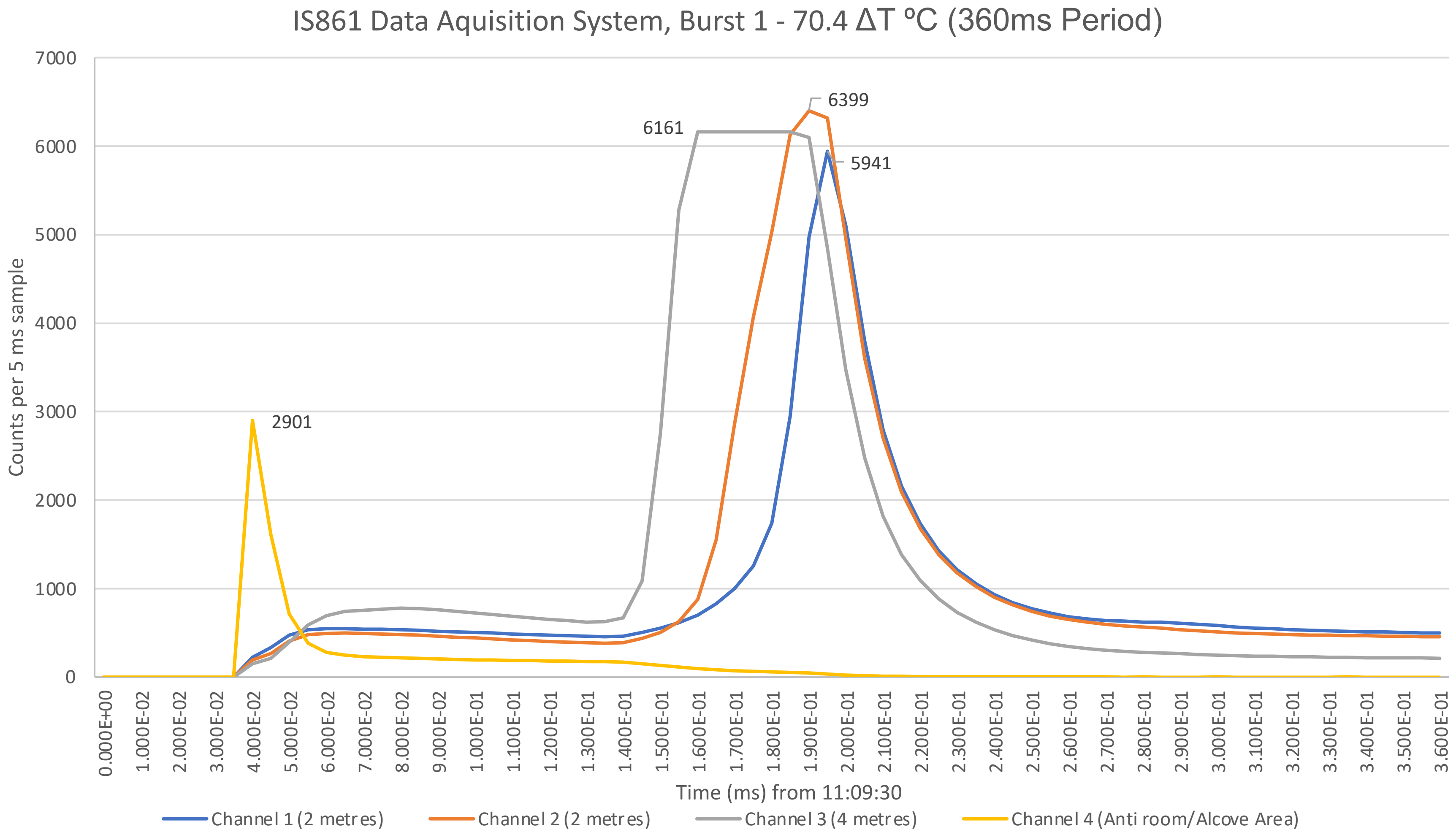
DAY 1- GODIVA CELL Set Up



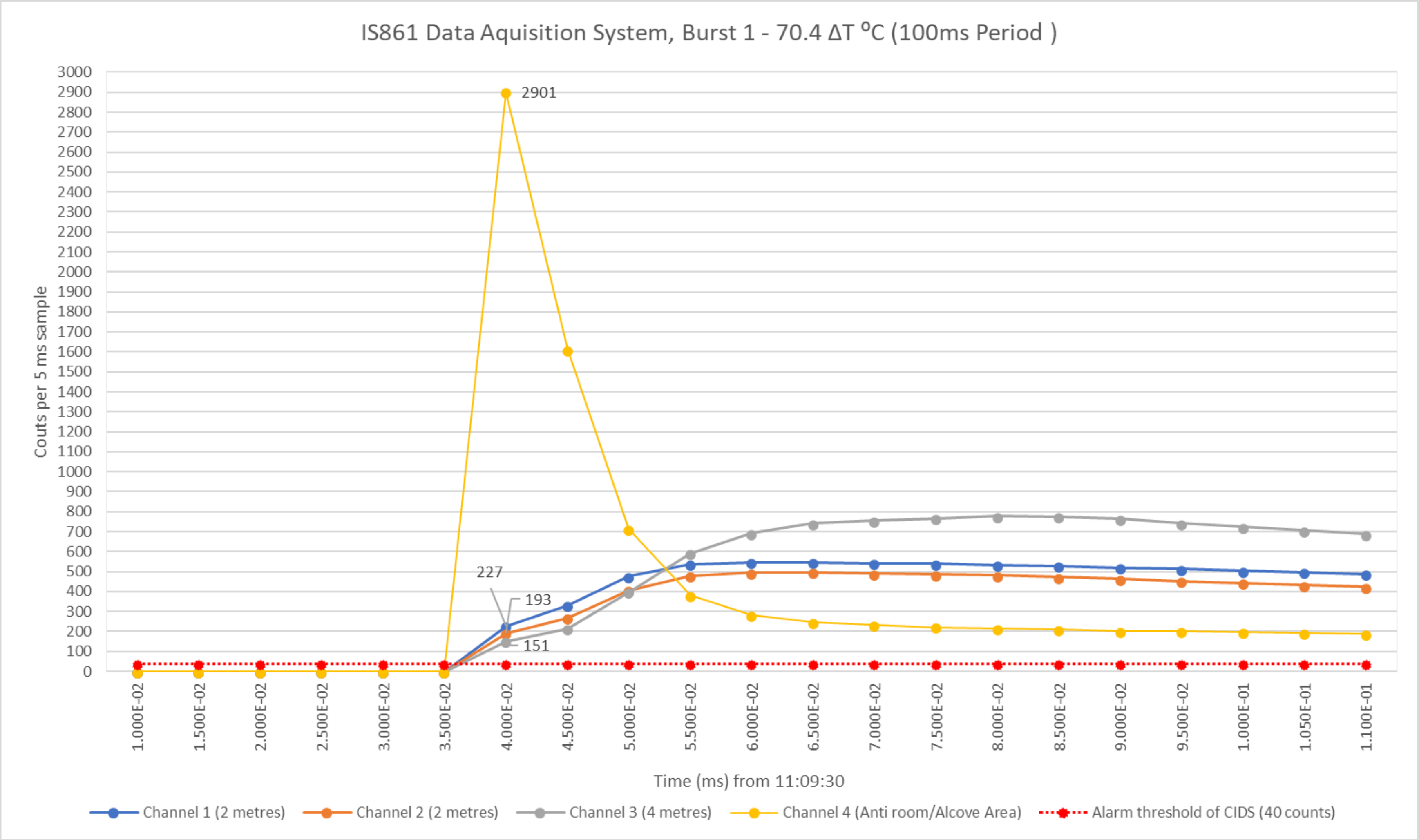
DAY 2 - Burst 1, 70.4°C ΔT (Low range) IS859 mini CIDS (1 minute logging) results



DAY 2 - Burst 1 IS861 Data Recorder (~5 milli second logging) results



DAY 2 - Burst 1, IS861 Data Recorder (100ms Period)



CONCLUSION FROM THE TESTING:

Primary Objective:

To further validate the IS820 CIDS post event monitoring capabilities.

- A number of bursts were repeated to provide supplementary evidence.
- In addition, a larger burst was undertaken (250°C ΔT) and successfully detected further widen its capability range of post event monitoring.

Secondary Objective:

To better understand why dose collection effects within the IS821 DHA occur during the first stages of the burst.

- The secondary unit called the IS861 Data Acquisition System (DAS) successfully sampled data around 5 milli seconds (ms) (previously 1 second) providing new data on the behaviours of the IS821 DHA during a burst.

Third Objective:

To assess the scintillation-based detector used on the GMS595 Wide Range Gamma Detector for potential alternative for a criticality detector.

- First trial, promising signs were shown on the dose data captured from the units located on the fringe of GODIVA IV's test cell area. Potential next stage is designing a 'radiation hardened' prototype.

Additional CIDS News!

MENSA Project at AWE

- One IS820 CIDS Rack – Factory Acceptance Testing (FAT) due November 2024.
- Three IS821 Detector Head Assemblies (DHA) – FAT completed last year.

AWE Refurbishment Project (multiple facilities)

- The manufacture of eight IS820 CIDS Racks is underway.
- The first batch of 80 (out of 150) IS821 DHAs have passed PCB level testing.

IS859 Hot Spares Rack/ Temporary CIDS Project

- Prototype has now received stakeholder approval.
- Stage 2 - Conformance testing is underway.

DAF Measurements in support of UK CT – Nigel Kelsall

- Measurement date 25th Feb to 7th March 2024
- Initial attempt to repair LEMC, unfortunately unsuccessful
- Measured a weapon component in varying stages of threat geometry.
- Assets used where extant UK response assets supplemented by LLNL equipment (Fission Meter and Detective X-8-N)
- Data was collected using standard response practices to provide a realistic data set
- Dataset is to be used as a training set for Material Assessors in an attempt to remove the need for synthetic data and provide enhanced realism.

Criticality Incident Dosimetry; International Inter-comparison

- Phil Angus and colleagues participated in the 2024 Criticality Incident Dosimetry International Inter-comparison exercise at AFRRI utilising the TRIGA reactor.
- Results were submitted on time
- At the time of writing, Phil and the team were awaiting receipt of the summary report
- Phil has had productive discussion with Paul Maggi (LLNL)
    - AWE will provide response functions and measurement data
    - LLNL will provide access to neutron spectrum unfolding code
- No official experiments next year, looking for measurement opportunity in 2025 where both U.S. and U.K. can deploy instrumentation

Hands-on Criticality Safety Training at the DAF

- The January-February visits have been re-arranged to December
- Next AWE attended Hands-on Criticality Safety Training at DAF, December ’25
- AWE Criticality Safety Group (CSG) plan to send 6 Assessors
- Hopefully similar numbers in follow-on years

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