NCSP – AWE Collaboration

CIDAAS IS820 & IS859

Criticality Incident Neutron Dosimetry

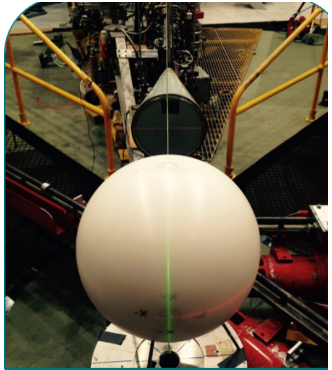
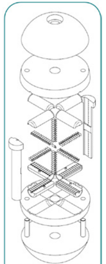


Image 1: PNS spectrometer (first generation) seen in a facility with neutron source (above the sphere) to expose the sphere and its detectors to neutron bombardment.



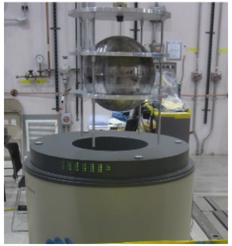
EXPLODED VIEW

Image 2: Exploded view of all components of the second generation sphere showing detector 'cartridges' and 'sword' arrayed along the three axis, nested into holder plates which in turn wit within the hemispheres

SPHERE ASSEMBLY

Image 3: Compiled sphere with all components shown in place.

Large Epithermal Multiplicity Counter



U.S. Nuclear Criticality Safety Program (NCSP) Technical Program Review (TPR), February 2023

Appendix F International Collaborations

AWE (UK) Collaborations Progress & Look Ahead

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

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 Bulk Nuclear Material **Nigel Kelsall**
- Criticality Incident Dosimetry; inter-comparison trials **Phil Angus**
- Hands-on Criticality Safety Training **Chris Hodkinson, Mark Roydhouse**

CIDAAS Testing (IE12) – Criticality Incident Detection System (CIDS) Update

MENSA Project at AWE

- One IS820 CIDS Rack – Currently at subsystem level testing. The next stage Factory Acceptance Testing (FAT) due April 2023.
- Three IS821 Detector Head Assemblies (DHA) – Due for FAT in February 2023.

AWE Project refurbishment project (multiple facilities)

- An order for a further eight IS820 CIDS Racks (with 140 IS821 DHA's) currently due for quotation by the manufacturer March 2023.

IS859 Mini CIDS

- Currently in the development stage, first prototype due April 2023.
- Intended to support the IS820 CIDS hot spares however, the system has been designed for a viable transition into a future portable CIDS.

CIDAAS Testing (IE12) – Additional News

Supply of IS820 CIDS to external entities

- AWE continue to work with Ploughshare (MOD) to explore licencing.
- For US Govt applications supply under MDA is also being investigated.

White Sands Missile Range Testing

- Survivability testing using multiple IS821 DHA design adaptations to safeguard against component obsolescence.
- Discussions ongoing for testing January 2024 onwards.

GODIVA IV Testing

- Further testing on the IS820 CIDS post event capabilities.
- Discussions with LANL for testing October 2023 onwards.

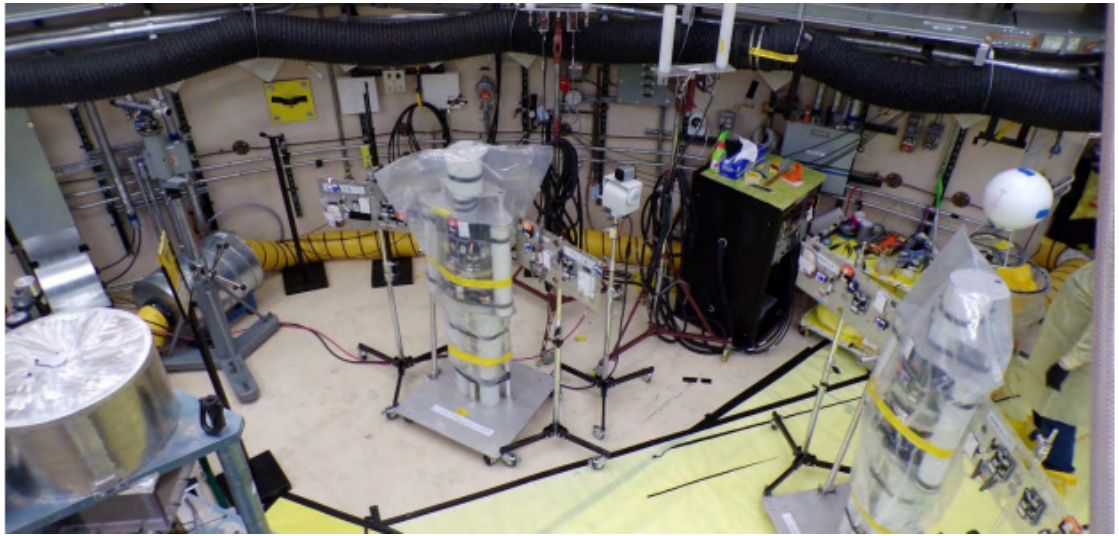
Criticality Audible Visual and Alarm System (CAVAS)

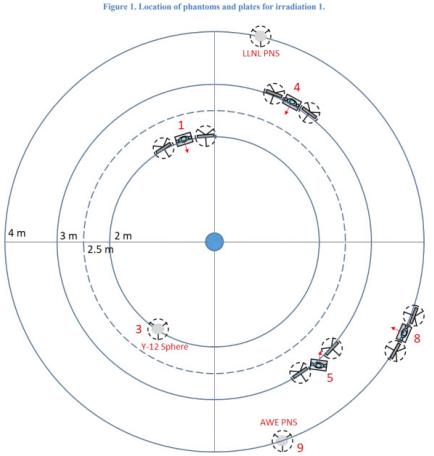
- A commercially available system providing audible and visual alarms when triggered by the IS820 CIDS.
- Three units have now undergone FAT, a fourth currently being manufactured.

AWE System management

- Project ongoing to develop a site wide monitoring capability for CIDS and other systems to provide system status and access to post incident data for relevant personnel on our corporate IT platform.

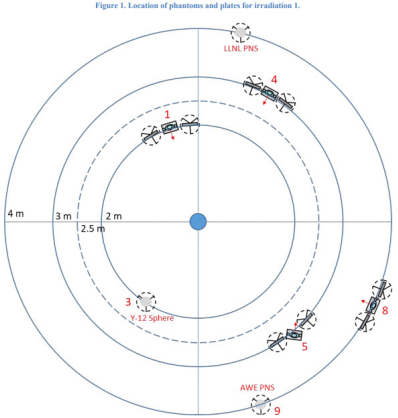
International Inter-comparison Exercise for Criticality Accident Dosimetry, August 2022

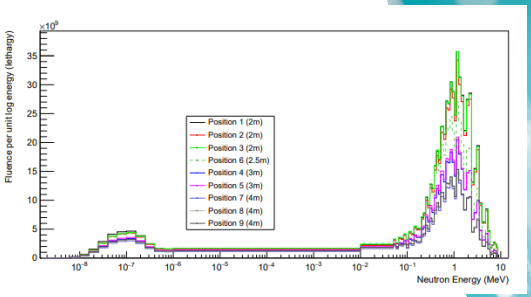




International Inter-comparison Exercise for Criticality Accident Dosimetry, August 2022

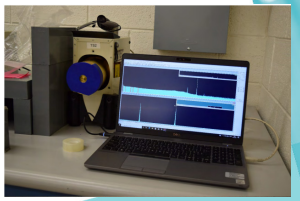
- Aug ‘22 Inter-comparison exercise a great success
- Welcome opportunity to deploy PNS alongside equivalent developments from LLNL and Y-12
- Phil & team pleased with the results
- Progress Li-6 TLD loading





Upcoming,

- Share Li-6 TLD progress
- TRIGA experiment sometime 2023
- Series of presentations between AWE and UKAEA showcasing neutron spectrum unfolding codes to U.S. colleagues

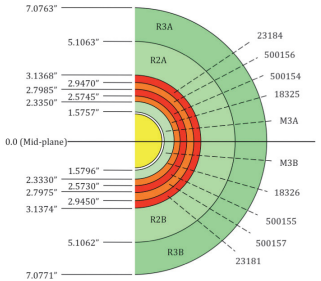


Nuclear Material Control & Nuclear Security

Neutron Time Correlation: Bulk Material

Nov ‘22 DAF Campaign a welcome return to experimental collaboration

- New 36 ZPPR plate holder
  - 36 ZPPR assembly inside smallest TACS shell
- All TACS inside lucite
  - LEMC unexpectedly high count rate
  - Cf252 & Cs137 investigation, outer ring sensitive to Cs137, γ ray breakthrough (?)
  - PTR-32 data allows selection inner & middle ring data only



Nuclear Material Control & Nuclear Security

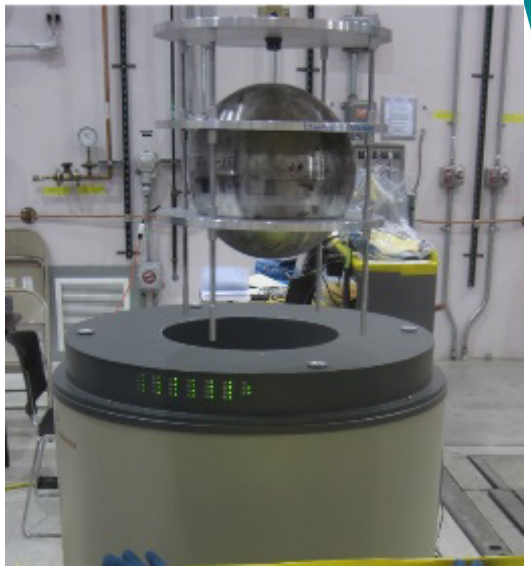
- Cosmic reaction rate experiments,

  overnight counting, LEMC

  - 10 steel shells
  - 16 x nominal 14kg lead (Pb) bricks

Look ahead,

- Data to benchmark computer models
- Better understand cosmic reaction rates in uranium
- Diagnose LEMC fault and repair



Hands-on Criticality Safety Training

- Four Criticality Safety Group team members immensely enjoyed a week of hands-on training at DAF following a 7year hiatus
- The 4 AWE attendees thoroughly enjoyed the hands-on training course describing it as informative, engaging and an invaluable opportunity to undertake hands-on training experiments. The course will support the training and development of each of the AWE attendees and we look forward to sending attendees to future courses
- Thank you NCSP and DAF 😊