



# **Dstl Combined Photon, Beta and Neutron Dosemeter**

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# Primary customers

- Dosimetry provider for UK MOD.



# Aims

- Current services
- Requirements for next service
- New combined badge
- New track read system
- Current Status
- Technical aspects

# Current service



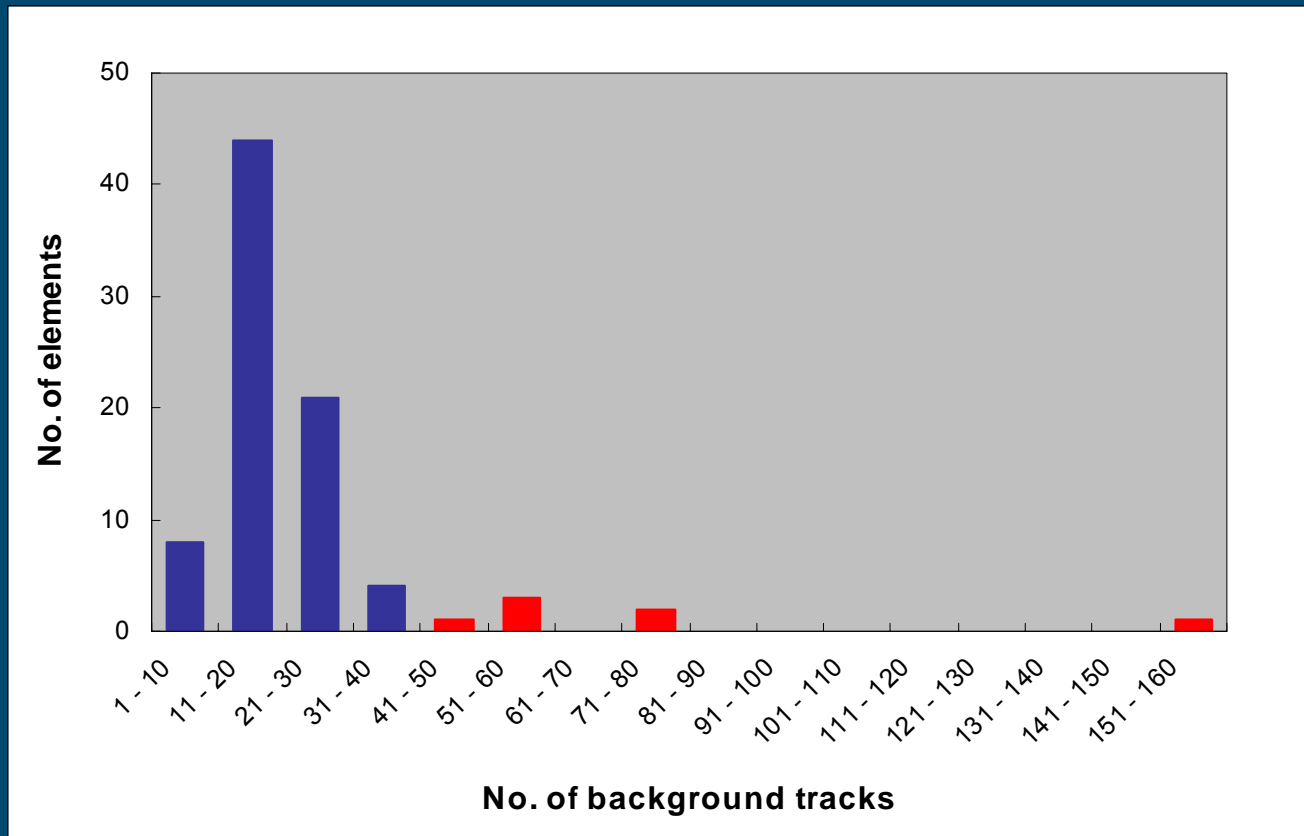


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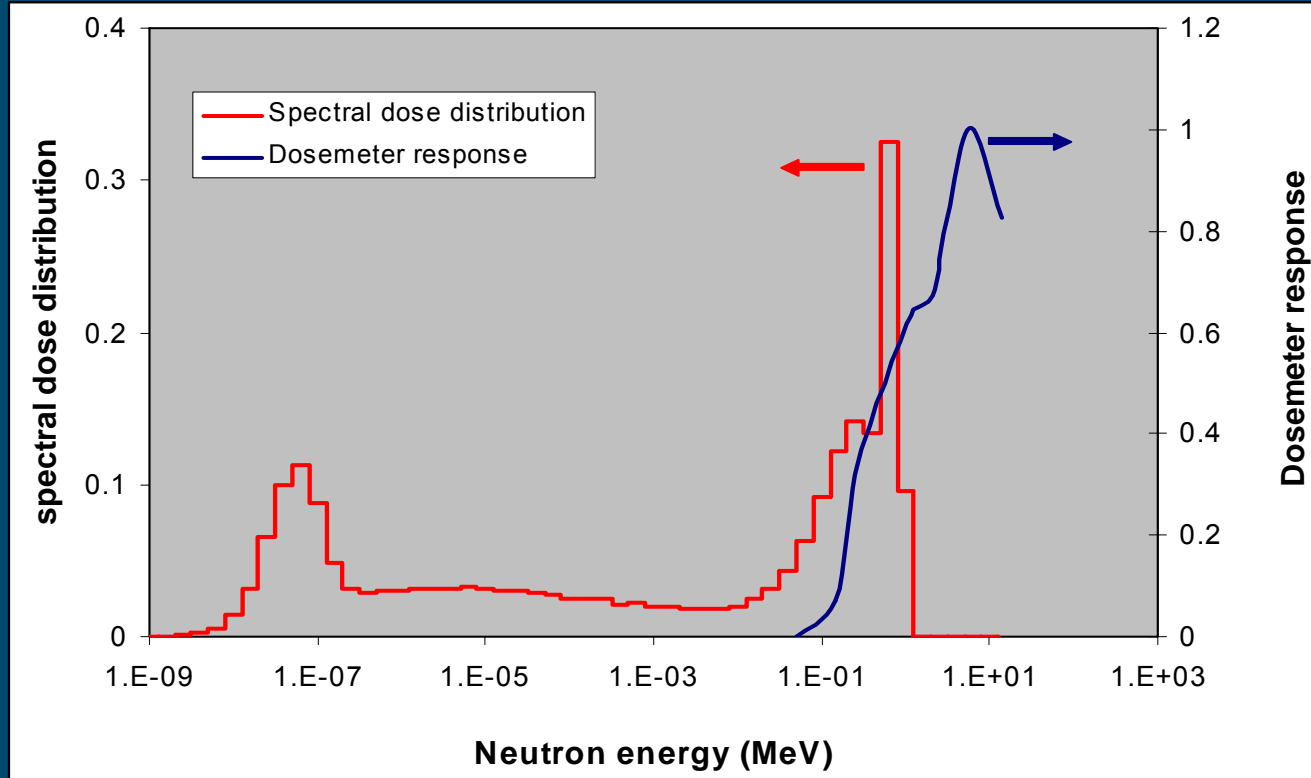


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# Current service



# Current service



# Requirements for next service

- Responds to low energies
- Fewer false positives
- Lower limit of detection
- Combined badge
- Decrease losses

## Our requirements

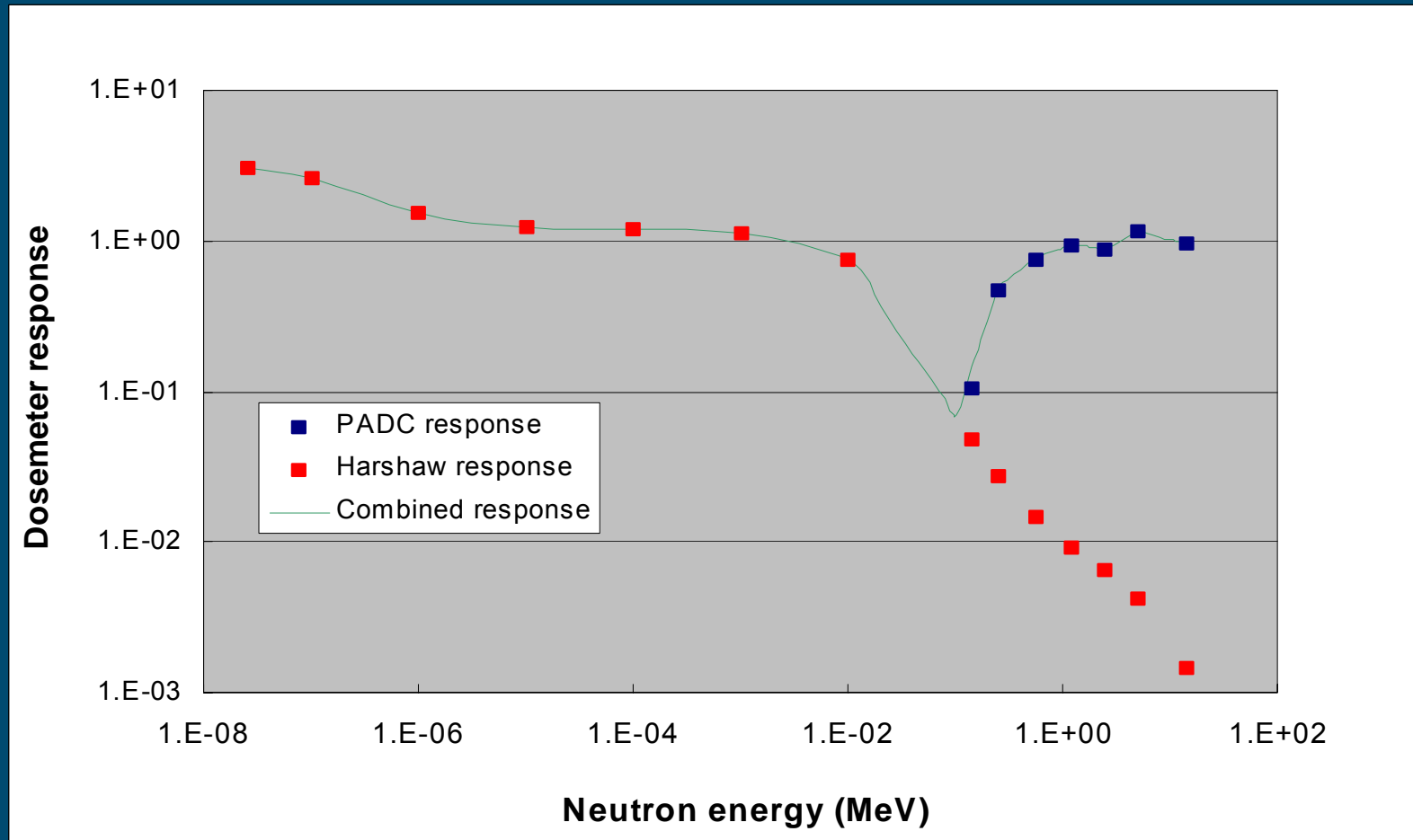
- Improved laboratory health and safety

# New combined badge

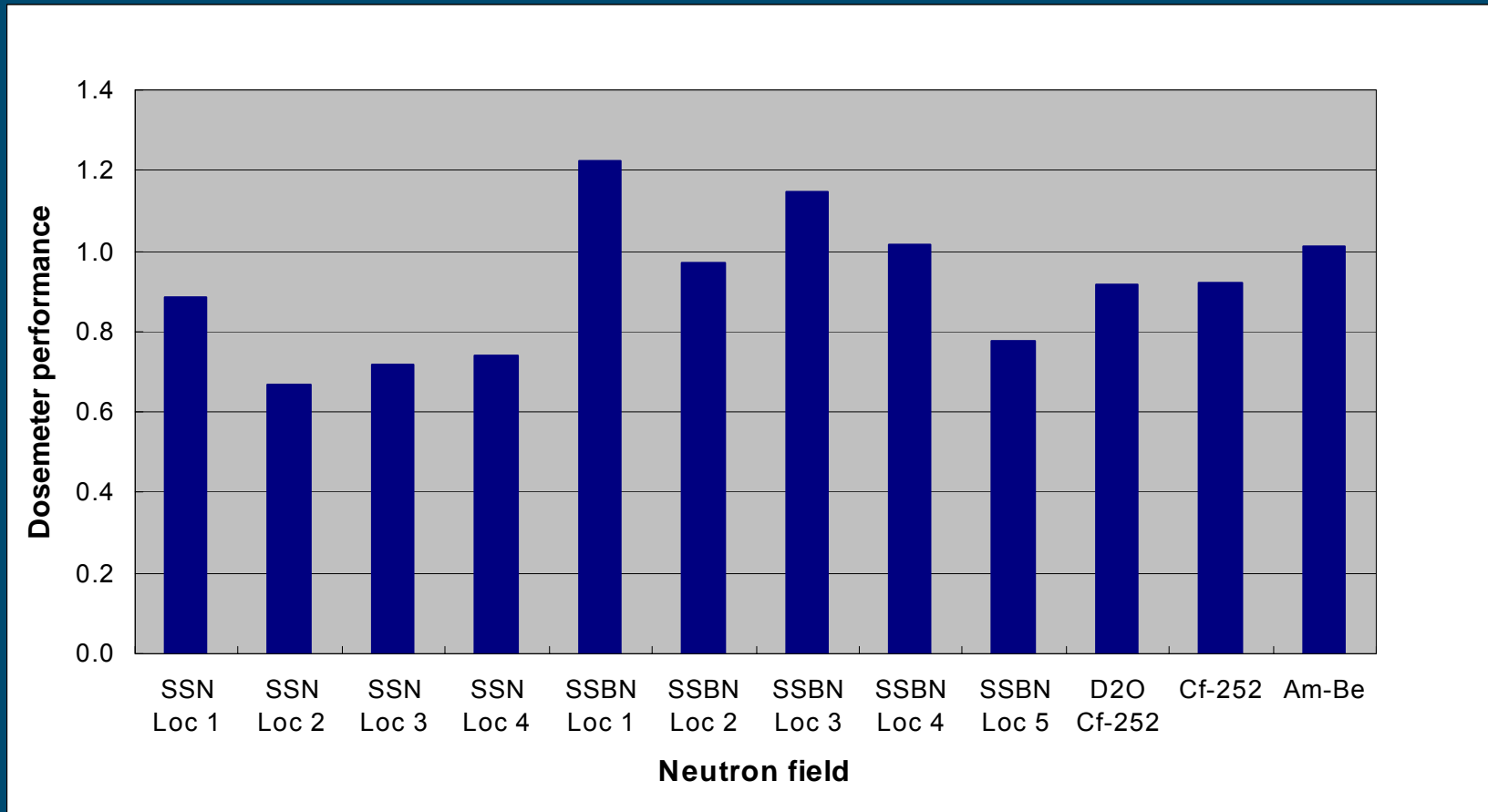
- Combine Harshaw and one PADC dosimeter element
- Photon, beta and neutron response
- Harshaw neutron sensitive chip acts as discriminator
- Harshaw element records low energy neutron dose; PADC records high energy neutron dose



# New combined badge

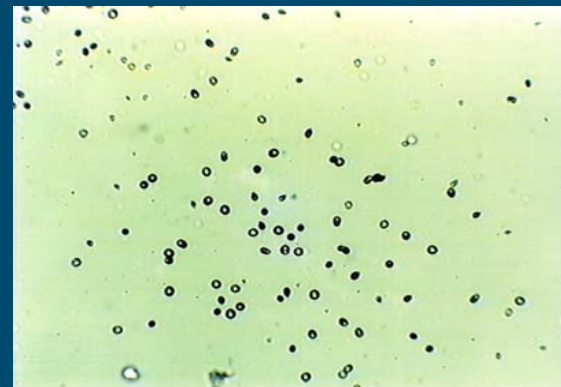
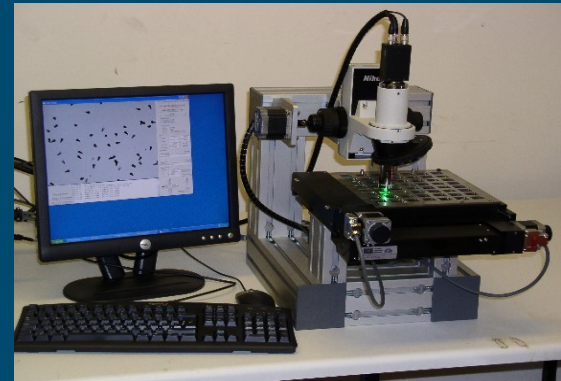


# New combined badge



# New track read system

- Track Analysis Systems Limited read system
- Automated microscope system
- Improved image recognition
  - Removes need for pre-etch?
  - Fewer false positives?
  - Lower limit of detection?



# Current status

- Photon type testing IEC 1066
- Neutron type testing ISO 21909
  - SSNT and TL type tests
  
- Remaining tests
  - Angular photon response to  $^{137}\text{Cs}$
  - Completion of neutron energy and angular response
  - Ageing and fading

# Technical aspects



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# Dose calculation

- Indicator dose = ( ${}^6\text{Li}$  signal –  ${}^7\text{Li}$  signal) \* establishment specific calibration value
- Establishment specific calibration value calculated so that TL chip LoD = 0.1mSv

# Dose calculation

- TLD dose = ( ${}^6\text{Li}$  signal –  ${}^7\text{Li}$  signal) \* calibration value
  - Calibration value is non establishment specific
- PADC dose = (Tracks – background)/Sheet sensitivity \* calibration value
  - Calibration value is non establishment specific
- Total dose = TLD dose + PADC dose

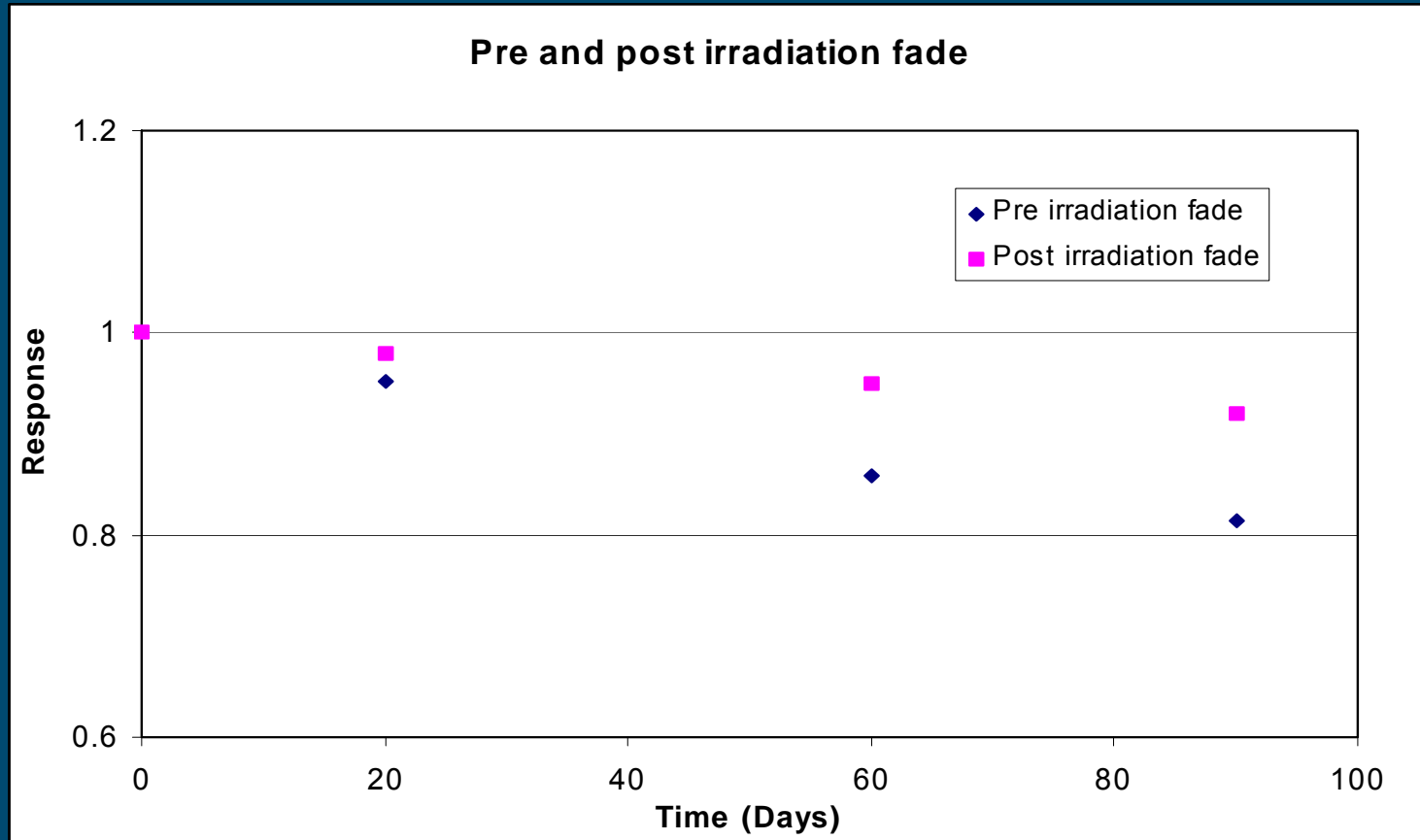
# False positives

- Neutron dose calculated by TLD chip
  - Based on worst case scenario
  - Based on dose distributions across boat (BAE)

# Limit of detection

- LOD calculated to  $4\sigma$
- LOD calculated using element specific calibration values
- PADC  $\approx 0.1\text{mSv}$
- TLD  $\approx 0.05\text{mSv}$
- Overall LOD based on both elements
- Dosemeter LOD = PADC LOD + TLD LOD ??

# PADC calibration



# Summary

- Dosemeter system being developed to increase accuracy and reliability
- Potential new read system
- Problems determining LOD and methodology to account for false positives