

Preliminary results on the improved Leake Detector (Design J)

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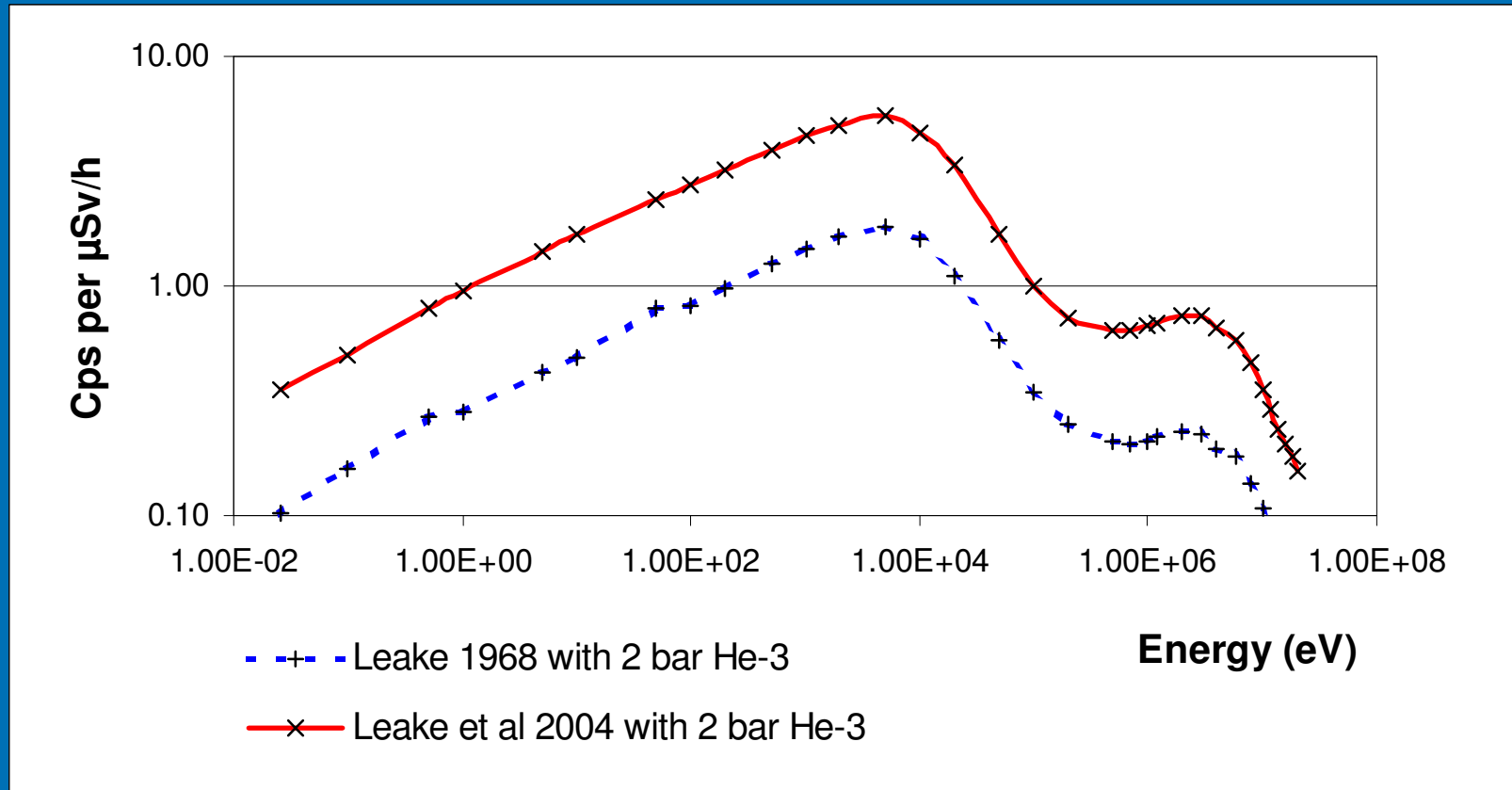


Next Generation REM

- At the Neutron Users' Club meeting in 2003 Dr John Leake reported Monte Carlo calculations on an improved Leake spherical REM detector
- This was detailed in a paper 'Improvements to the Leake Neutron Detector, J.W. Leake, T. Lowe & R.S. Mason' published in Nuclear Instruments and Methods in Physics Research A 519 (2004) 636 - 646
- The main improvements were to replace the cadmium shield with a boron loaded polyethylene and an average increase in sensitivity of 3.2 in realistic fields



Next Generation REM - Modelling



Next Generation REM - Design

- Two moderators have been manufactured to design J
- The diameter remains at 208mm and the original SP9 2 bar He-3 detector is retained
- Cadmium shell replaced by boron loaded polyethylene
- Moderator has relative density of 0.95
- The full assembly consisted of a separate inner sphere made to produce a solid moderator and the boron loaded shell to aid in testing design J



Next Generation REM - Testing

- Two solid spheres and NG REM's to design J were used for testing
- Calculation predicted a ratio of approximately 2.15 between the solid sphere and the NG REM for Am-Be neutron field
- The same SP9 detector was used to ensure that the results are independent of the He-3 content
- We have measured 2.20 ± 0.08 and 2.27 ± 0.08 for the two assemblies
- Testing at NPL next year will confirm the energy response

Next Generation REM – Further improvements

- Little more can be done with this new design
- The 5keV/10MeV ratio could be improved but at the expense of thermal response
- Holes in the boron loaded shell would not give an improved energy response in the 208mm sphere
- A Reference instrument is be modelled that utilises holes in the boron loaded shell that will provide a greatly improved energy response