The SAGE Spectrometer

Status and first results

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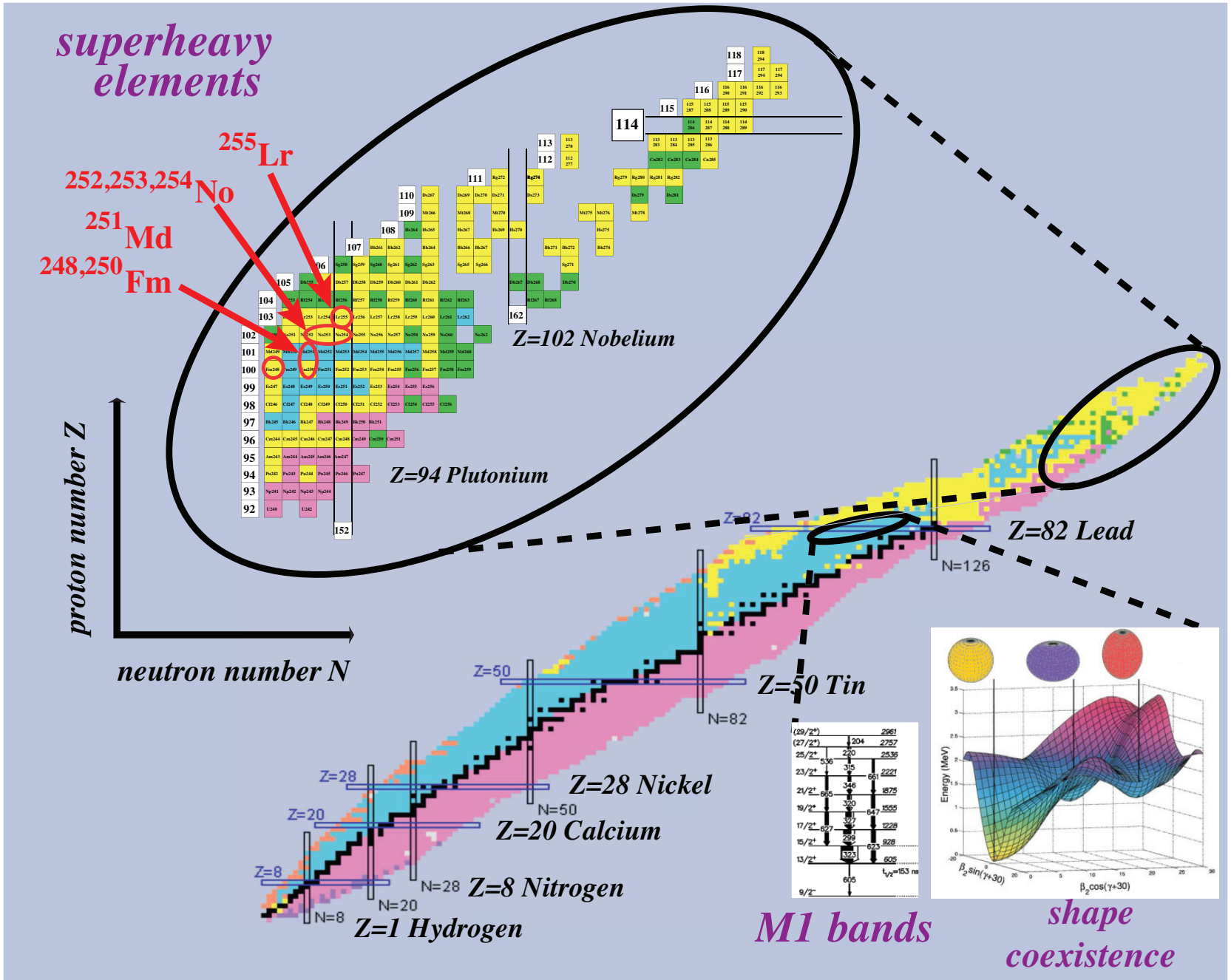
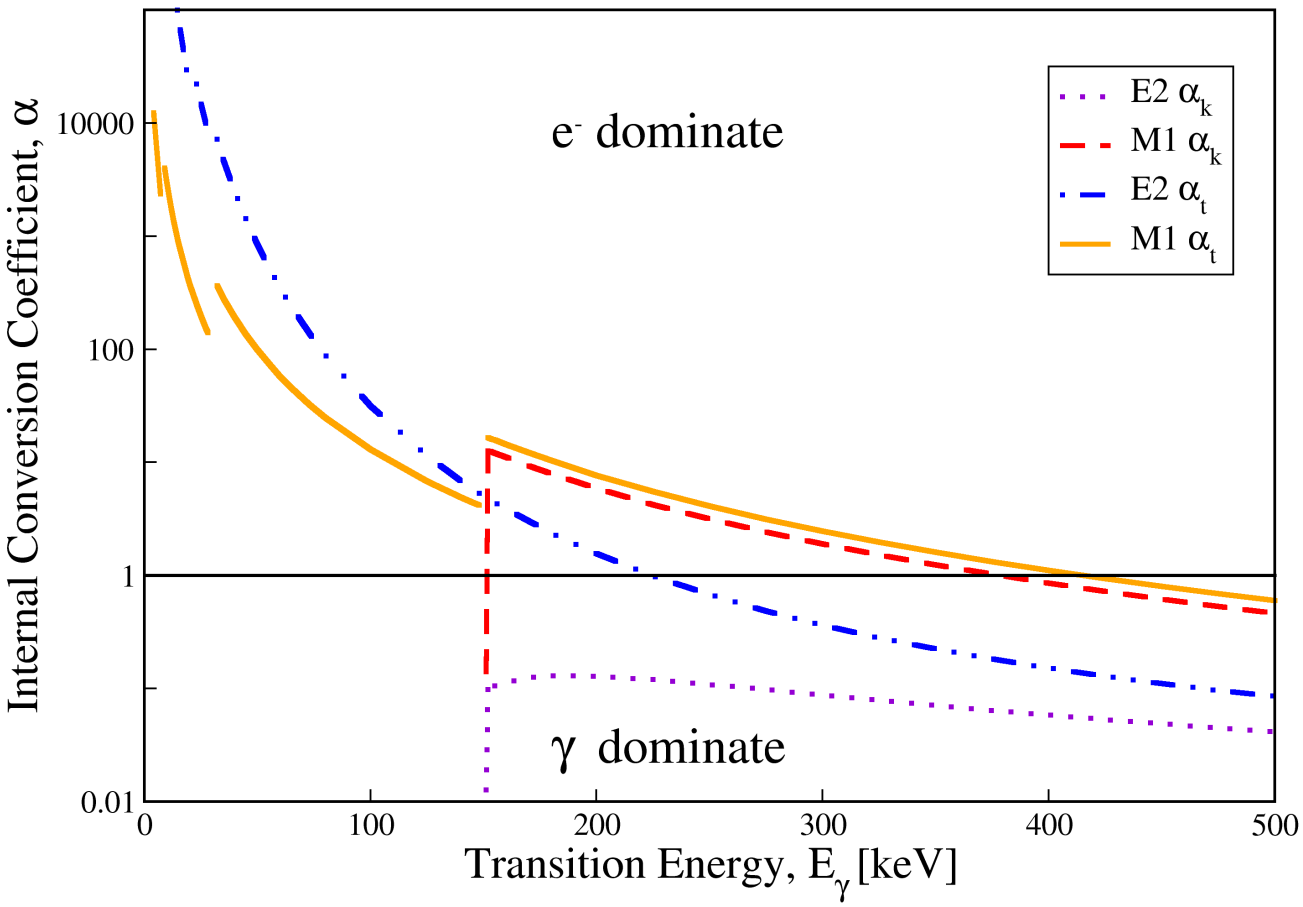
27 June 2011

UNIVERSITY OF LIVERPOOL

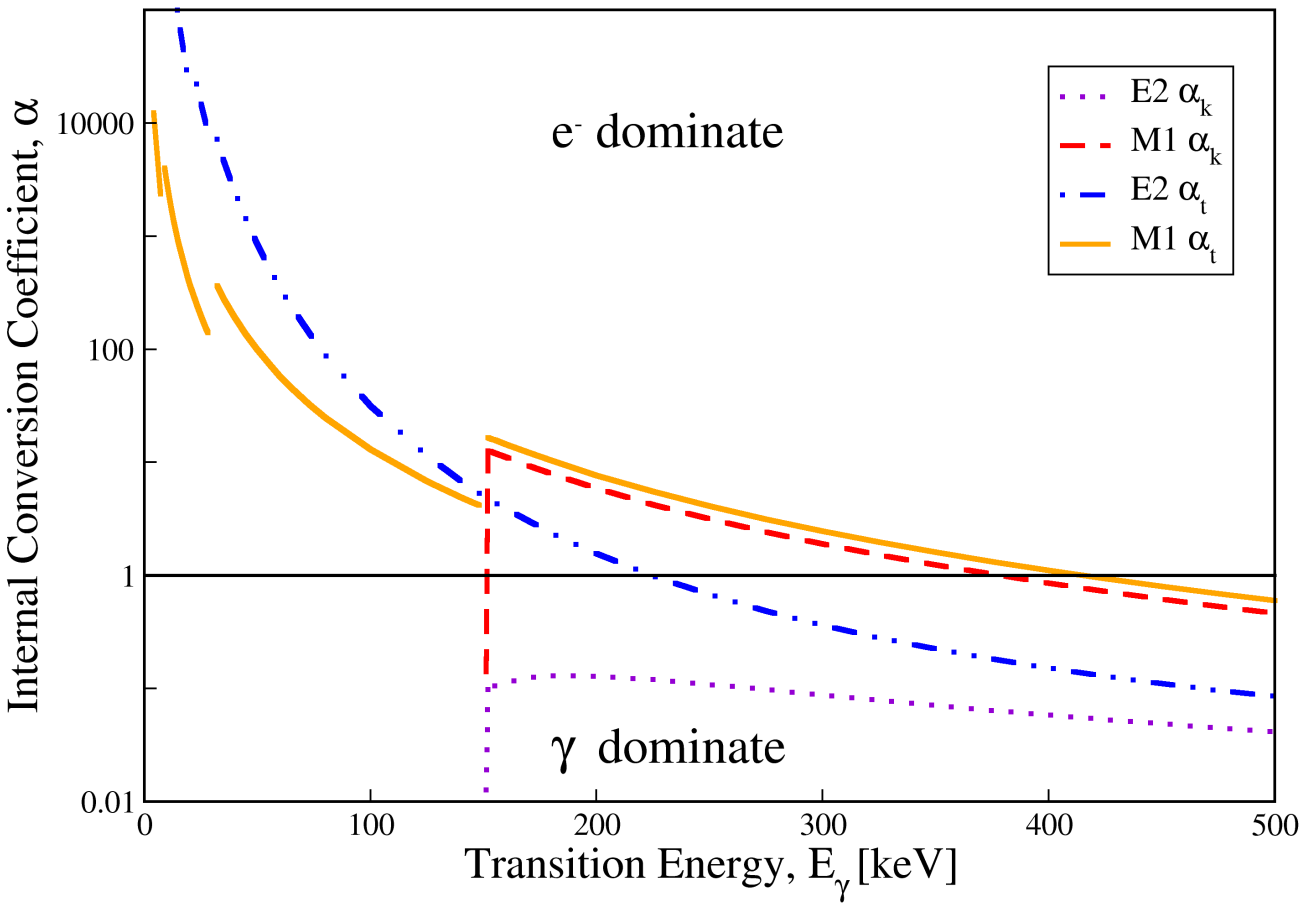
1. SAGE
2. Preliminary Results
3. Optimisation
4. Geant4 Simulation
5. Summary


superheavy elements
255Lr
252,253,254No
251Md
248,250Fm
Z=102 Nobelium
Z=94 Plutonium
proton number Z
neutron number N
Z=82
Z=82 Lead
N=126
Z=50
Z=50 Tin
N=82
Z=28
Z=28 Nickel
N=50
Z=20
Z=20 Calcium
Z=8
Z=8 Nitrogen
N=28
N=20
N=8
Z=1 Hydrogen
M1 bands
shape coexistence



Dependence of internal conversion coefficients on transition energy ($E\gamma$) for nobelium

Nucl. Instr. and Meth. A 589 (2008) 202-229



Dependence of internal conversion coefficients on transition energy ($E\gamma$) for nobelium

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$\Rightarrow$ Simultaneous measurement of γ rays and conversion electrons

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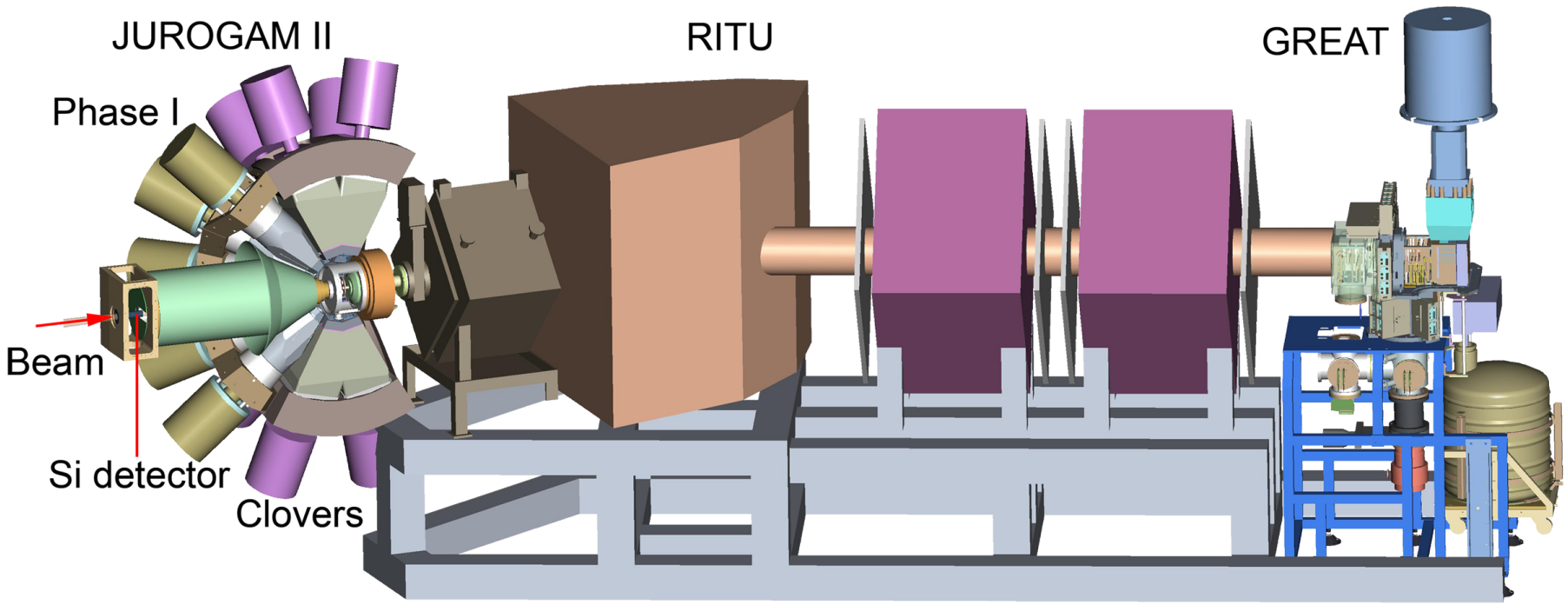
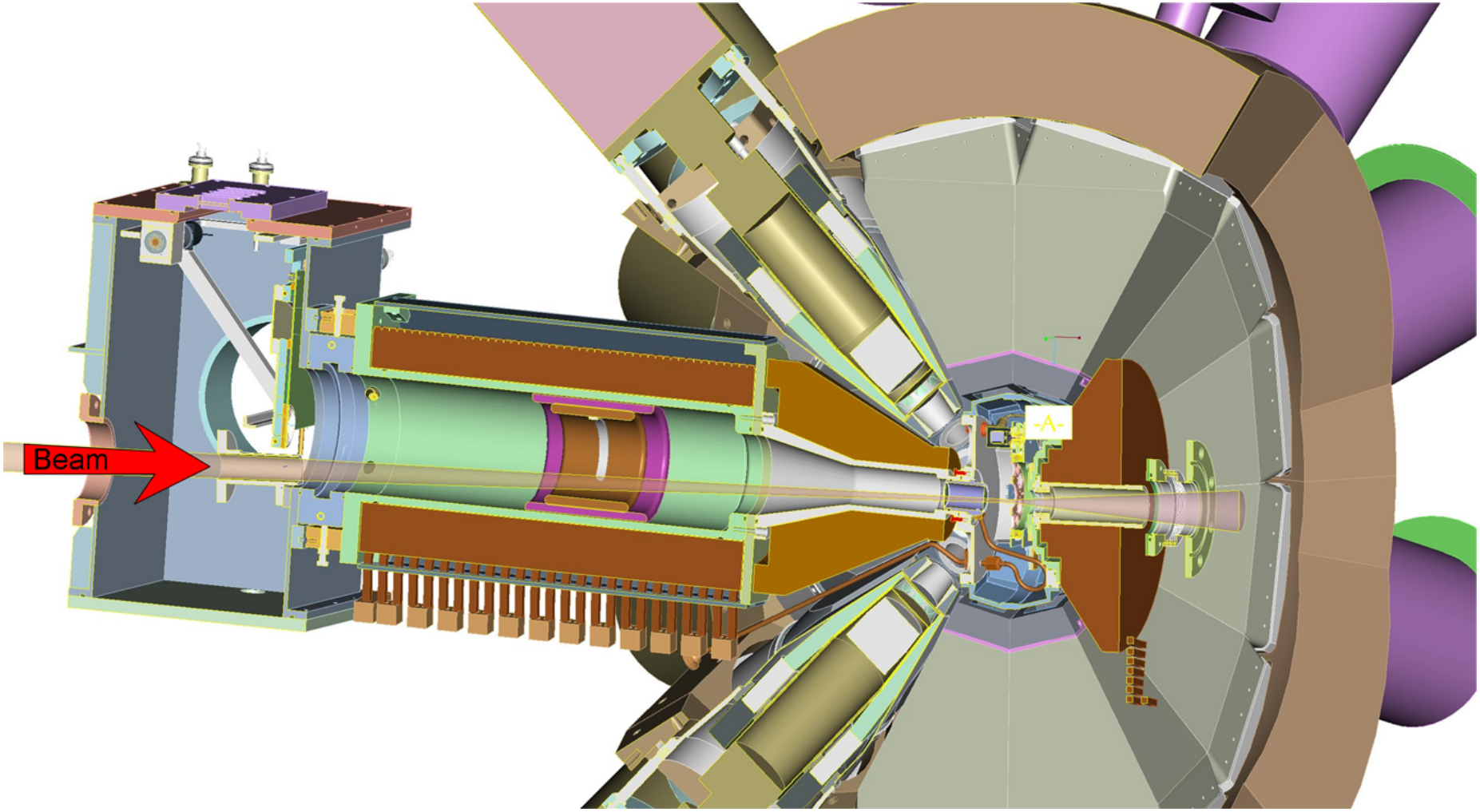
S(ilicon) A(nd) GE(rmanium) spectrometer



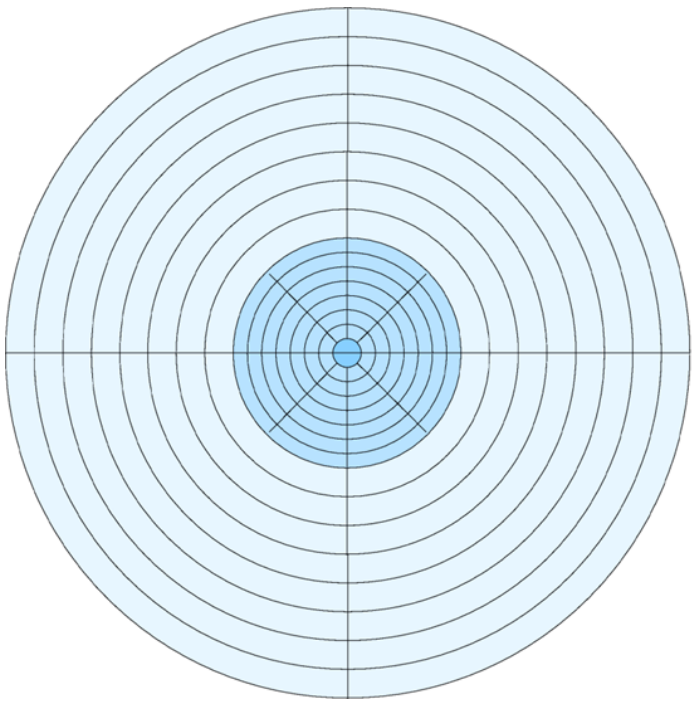
Employing **fully digital** front-end electronics

A closer look

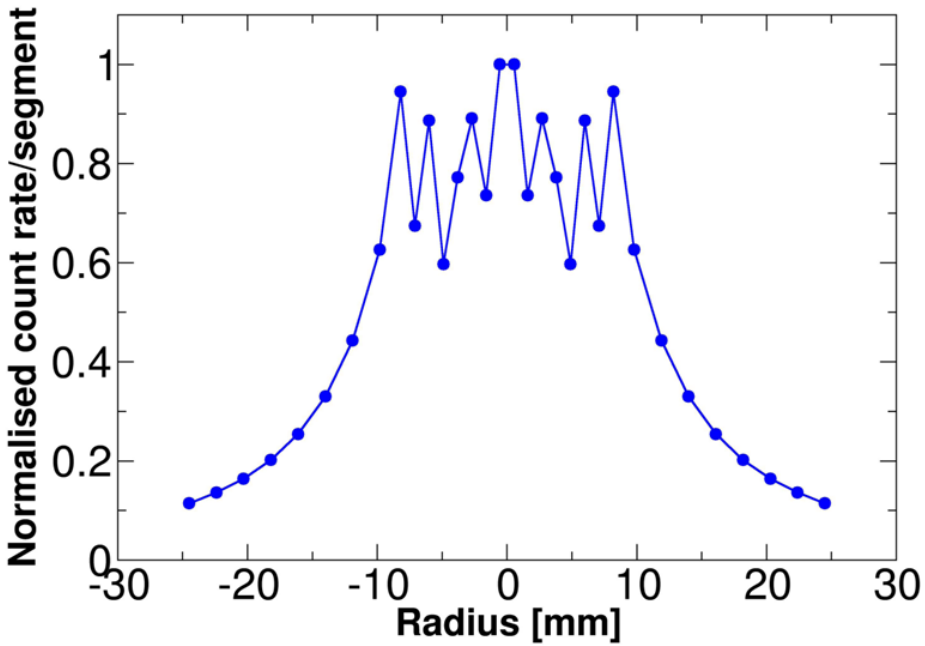


The Si detector

- 90 segments
- 50 mm diameter
- 1 mm thick



Simulated normalised count rate distribution using data from SACRED experiments



Detector geometry allowing higher count rates

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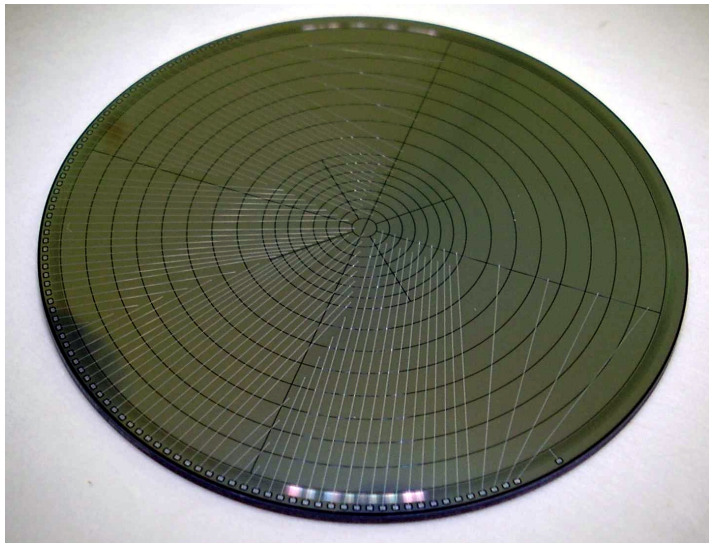

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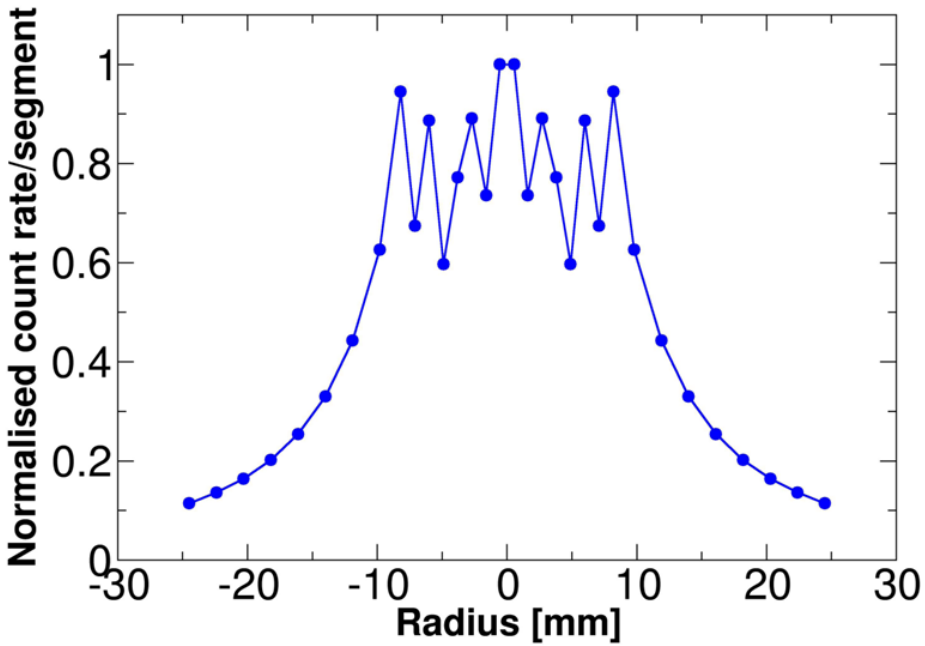
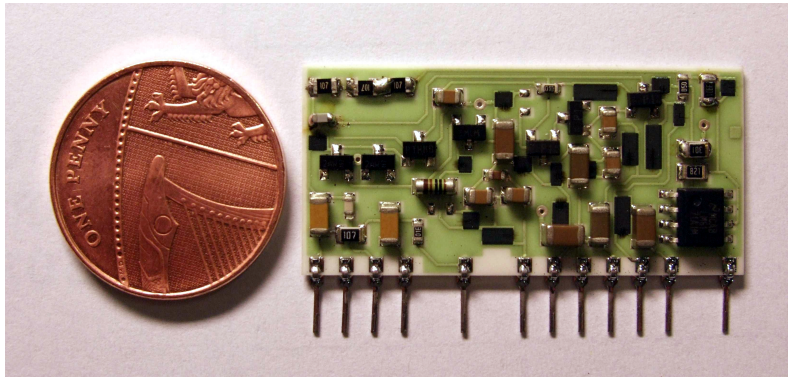


Detector geometry allowing higher count rates

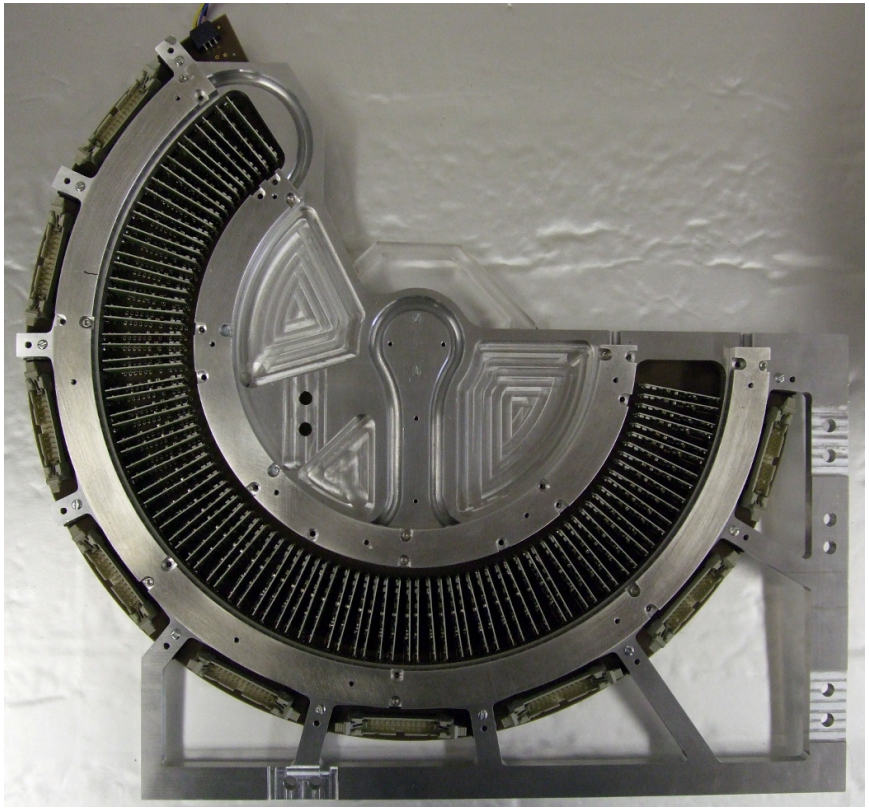
Preamplifiers

C.A.E.N. A1422 charge sensitive hybrid preamplifiers

- 400 mV/MeV
- Low noise



Detector PCB



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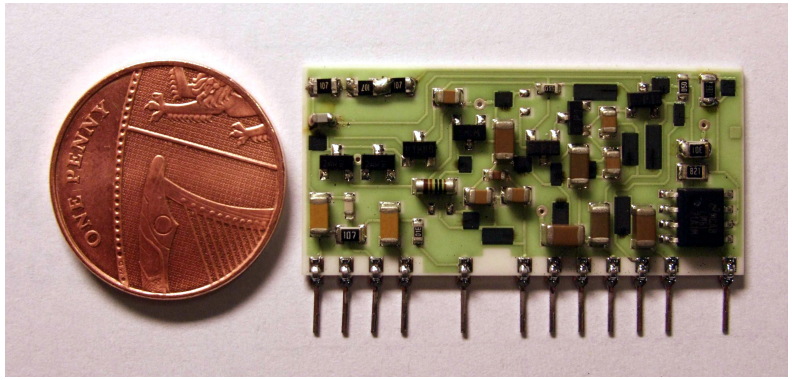

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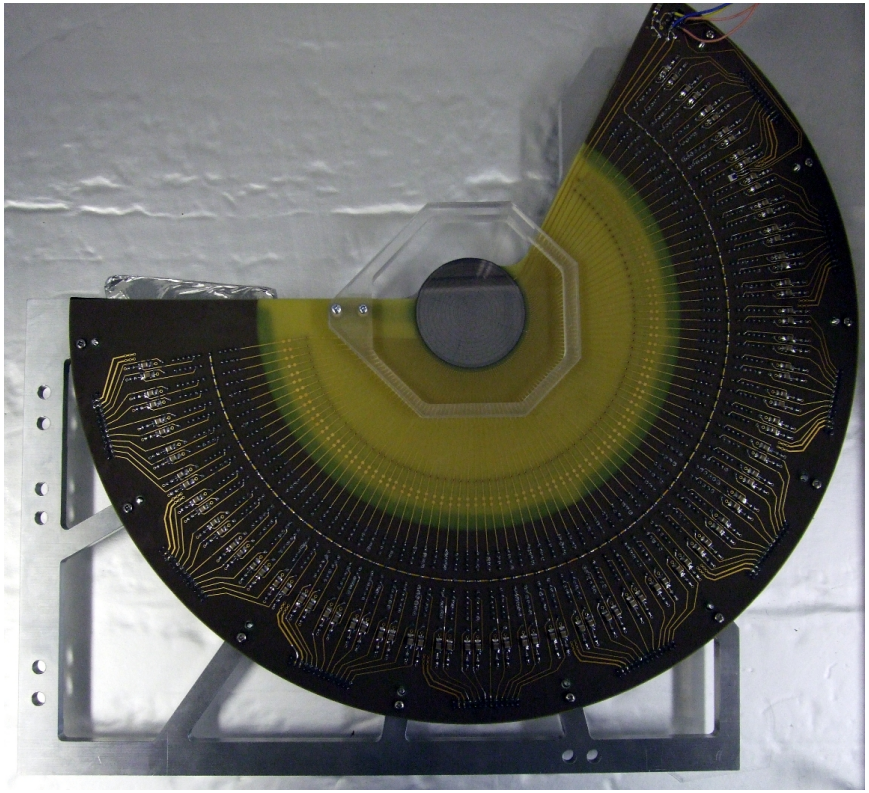
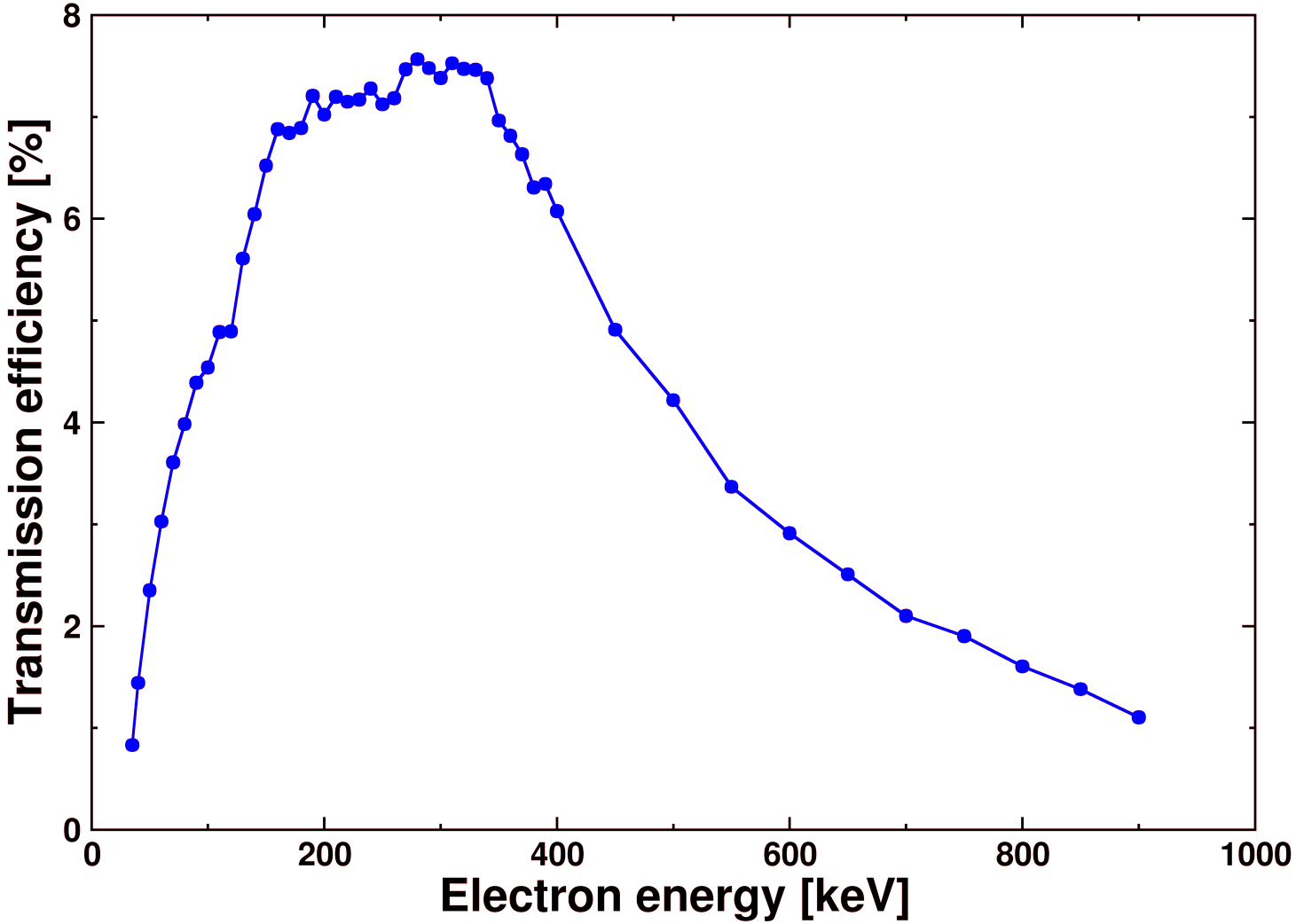


Simulated transmission efficiency



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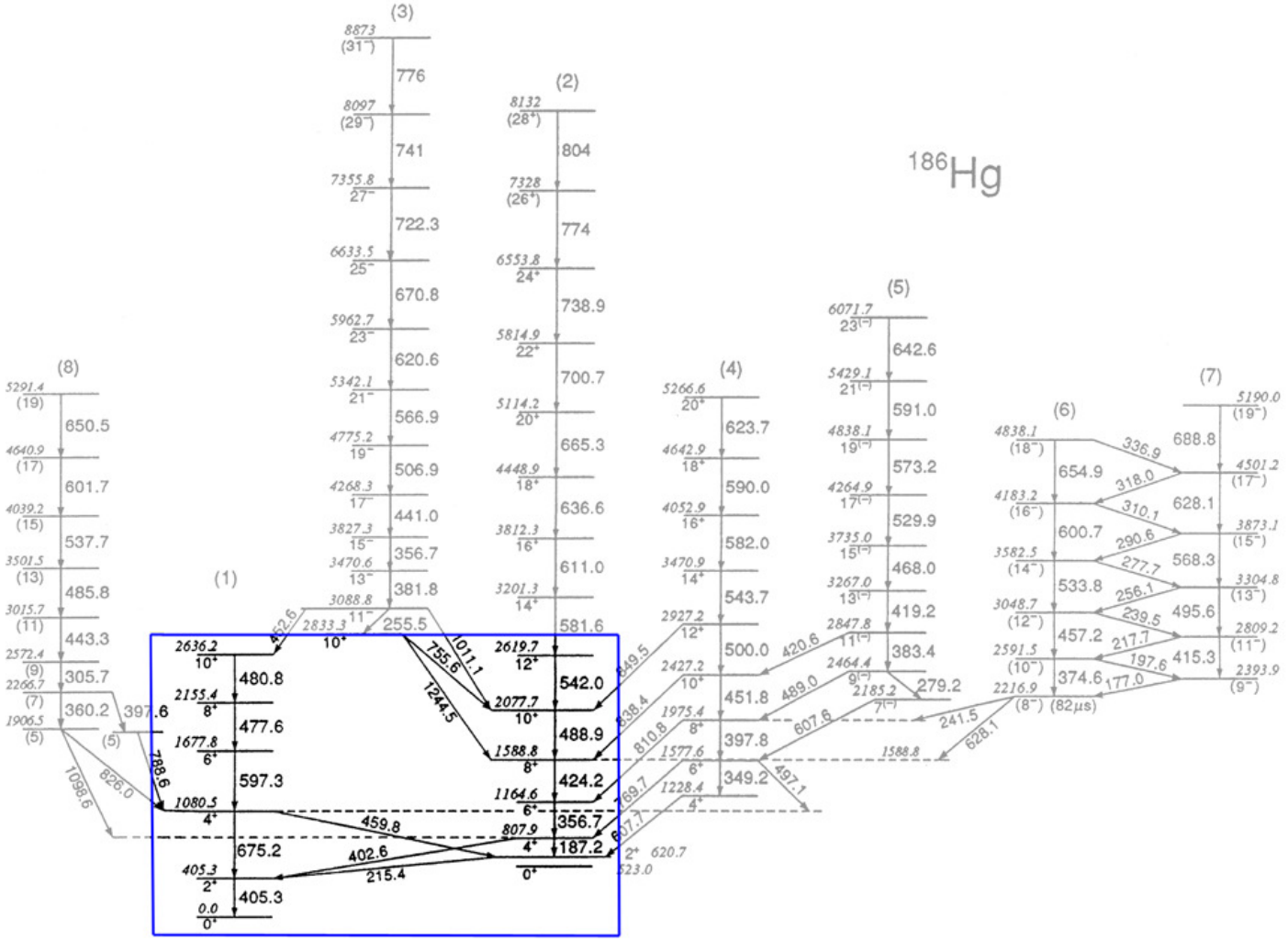
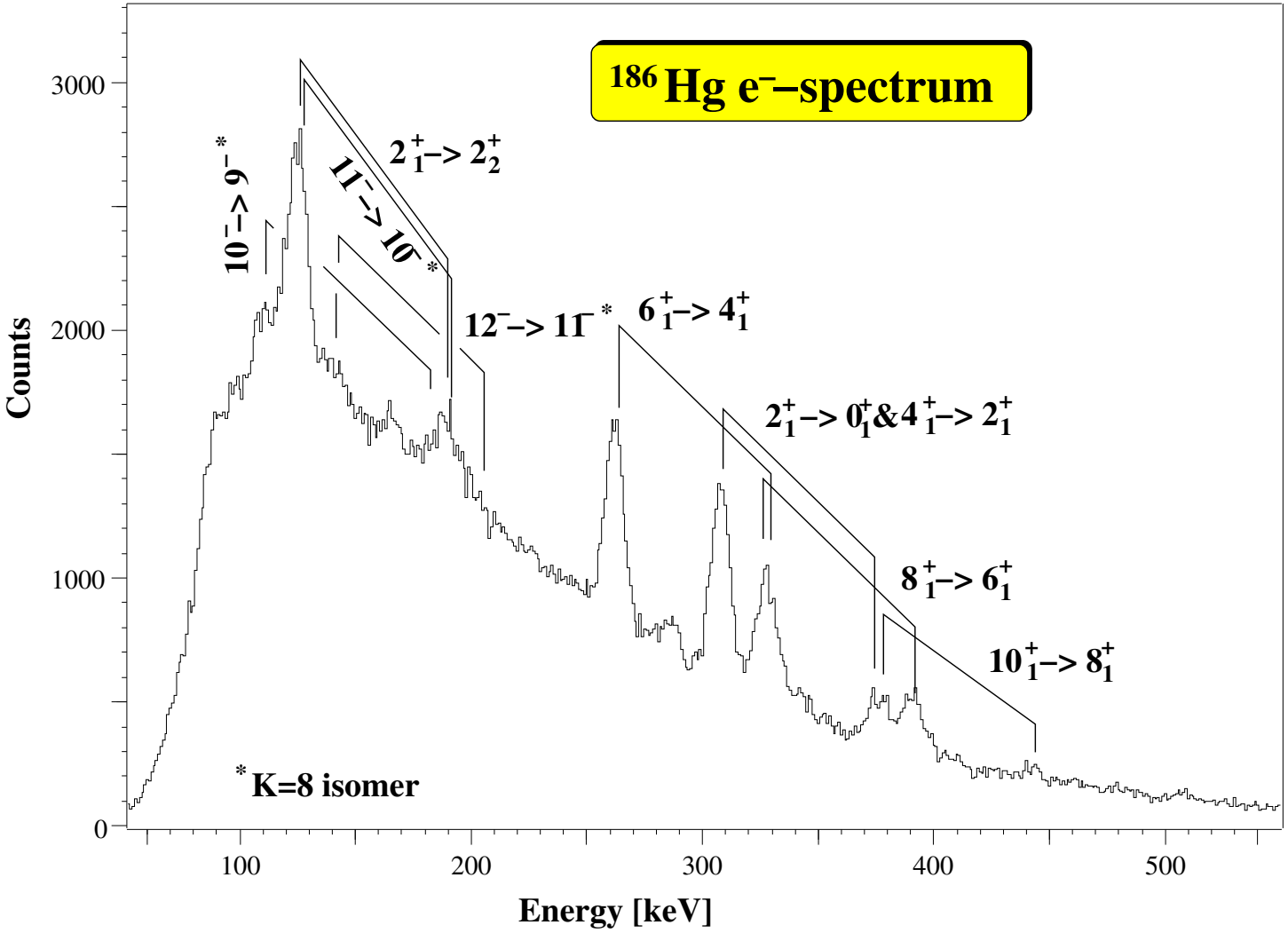
^{186}Hg SAGE experiment



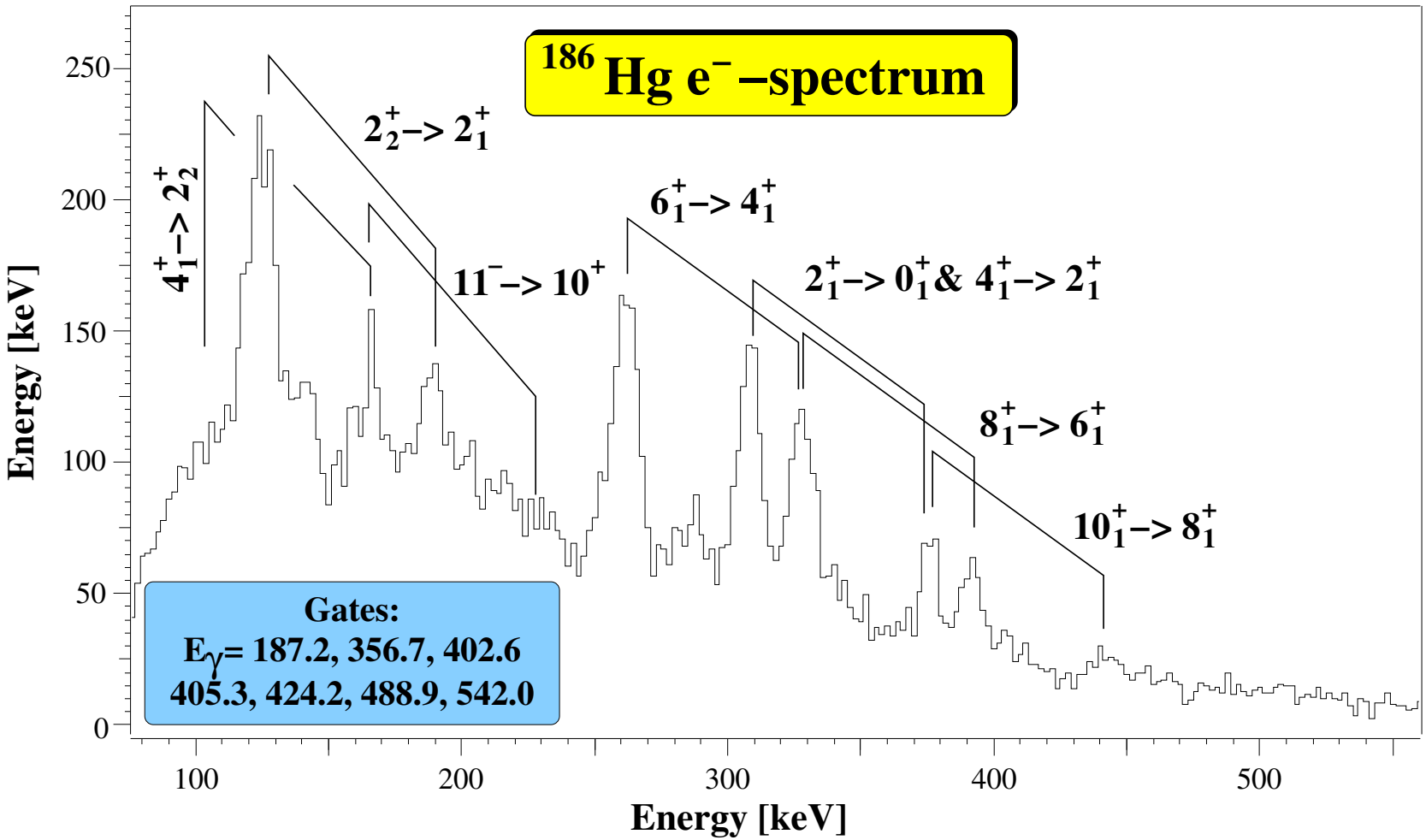
W.C. Ma *et al.*, Phys. Rev. C 47 (1993) 1

^{186}Hg - Raw electron spectrum



M. Scheck *et al.*, PRC **83**, 037303 (2011)

^{186}Hg - Gates on yrast transitions



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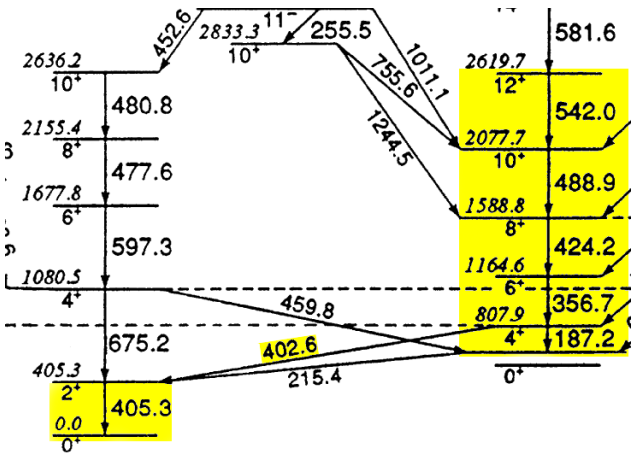
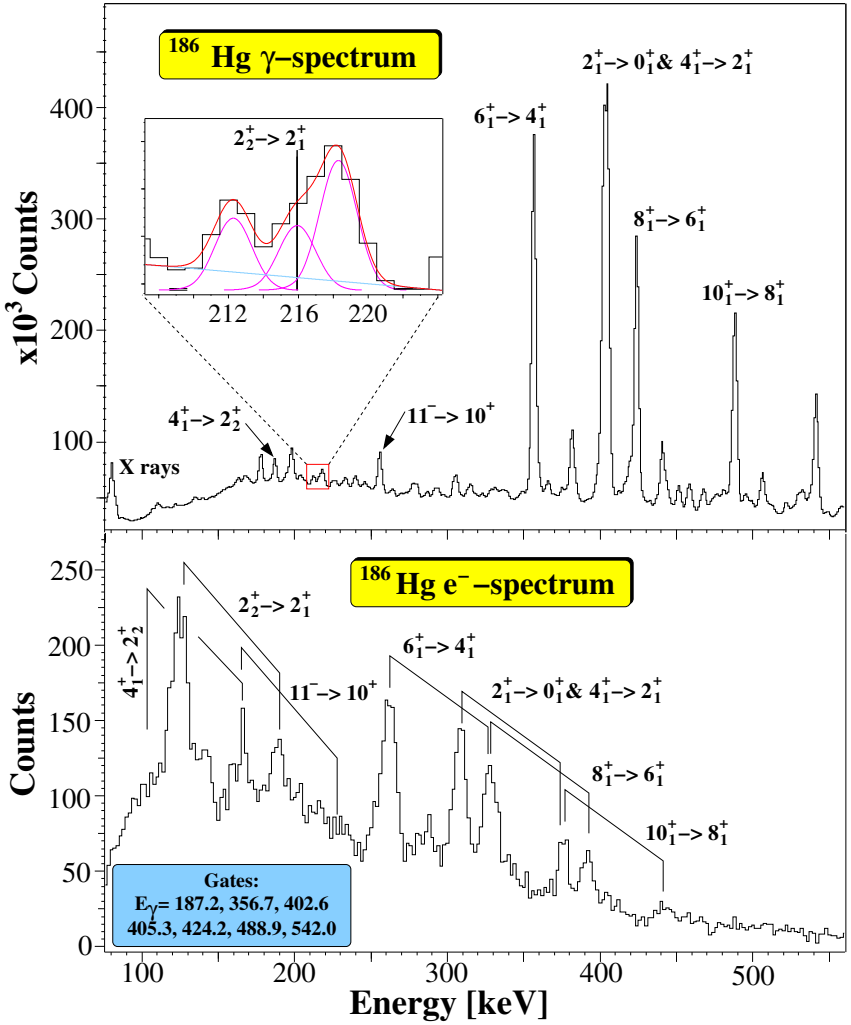
^{186}Hg - E0 detection





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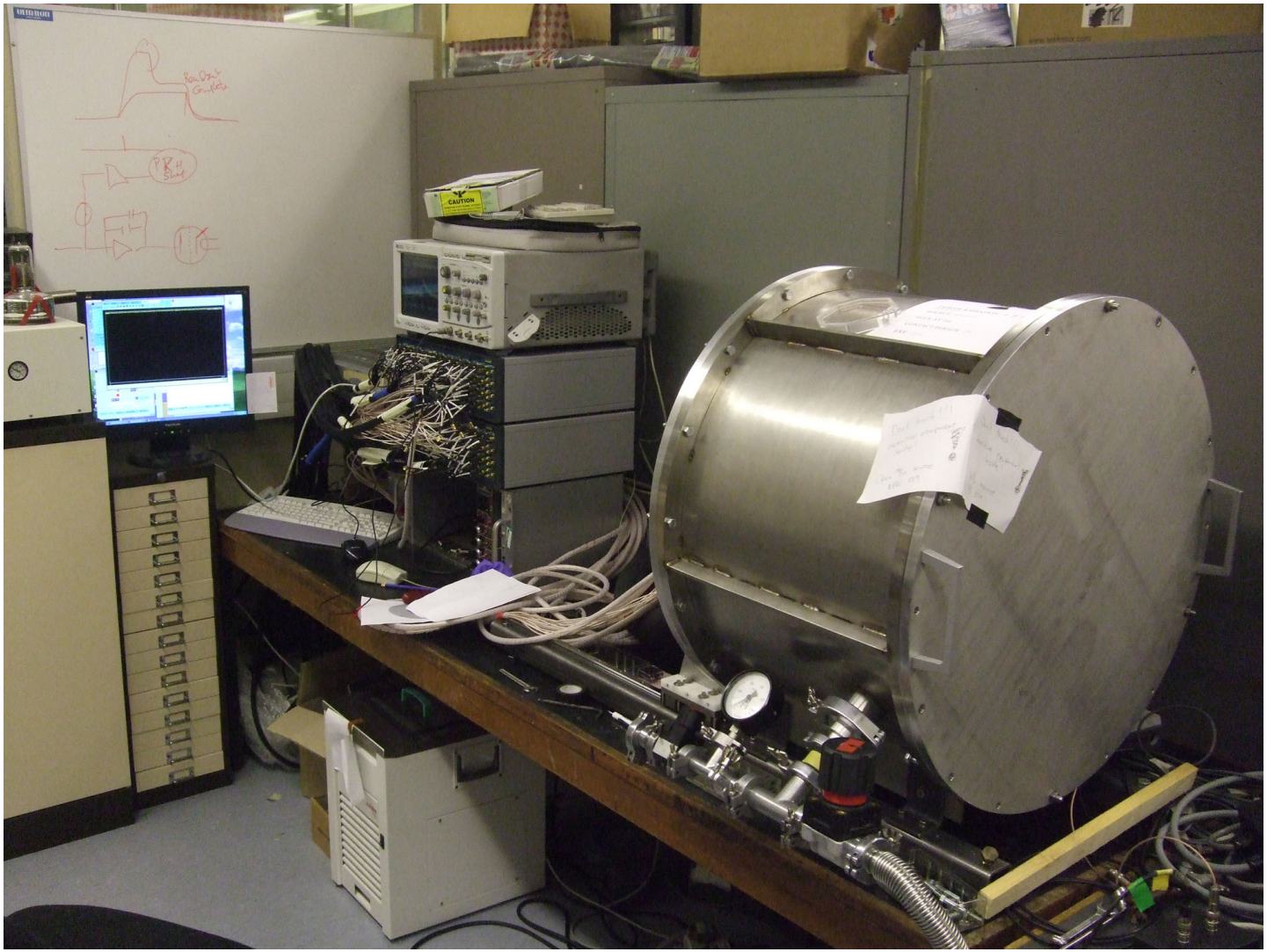
Test set-up in Liverpool



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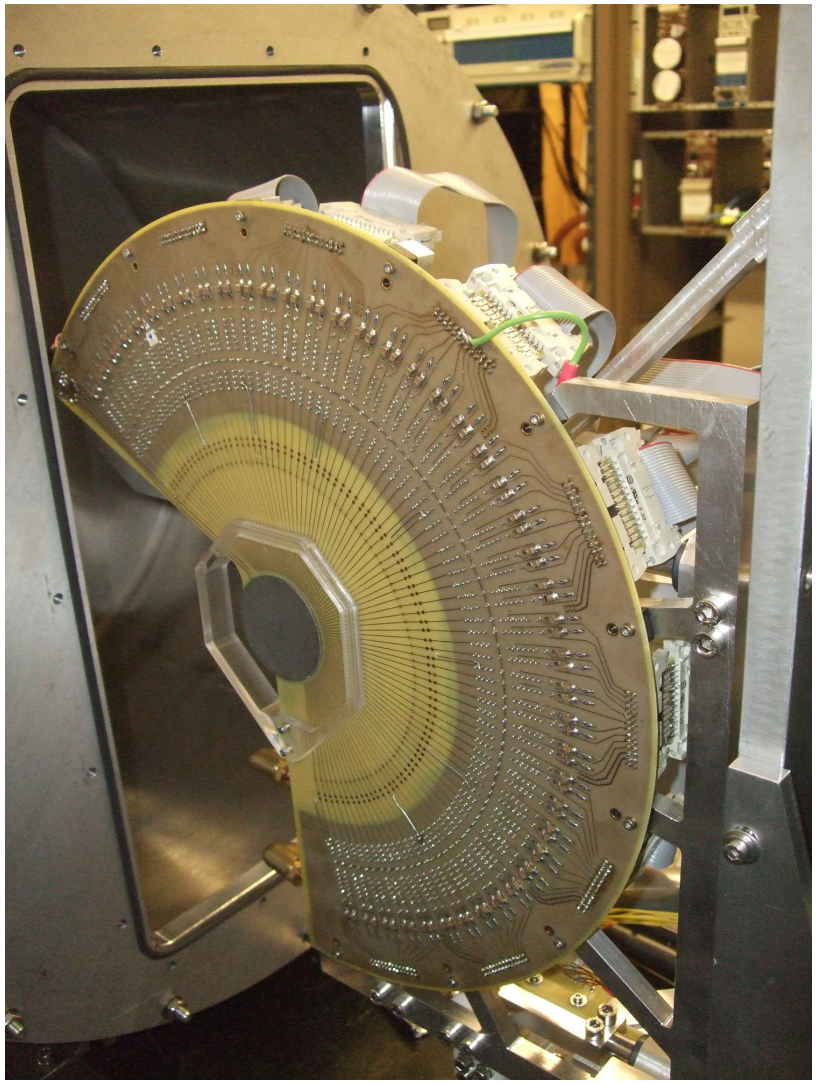

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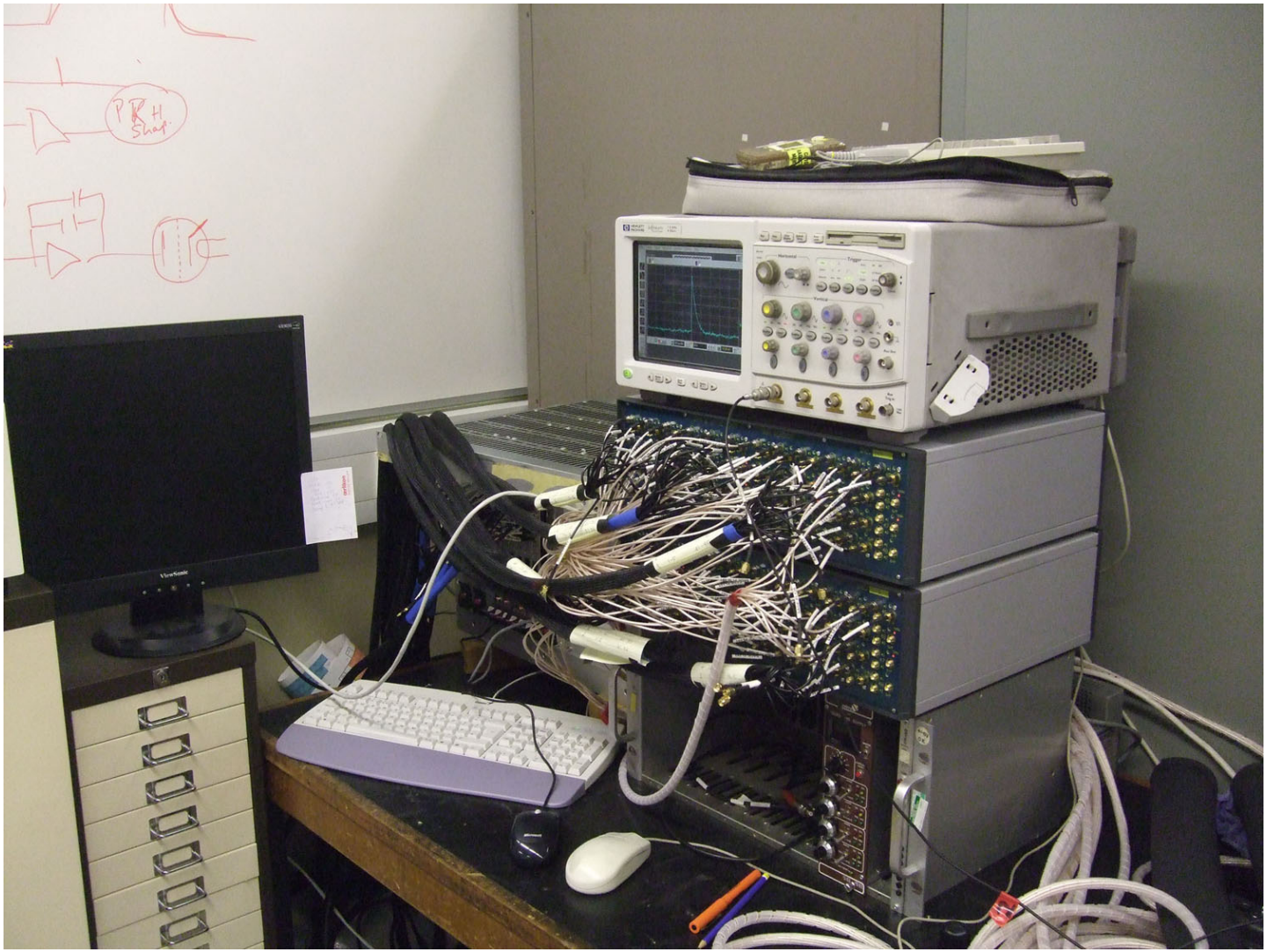
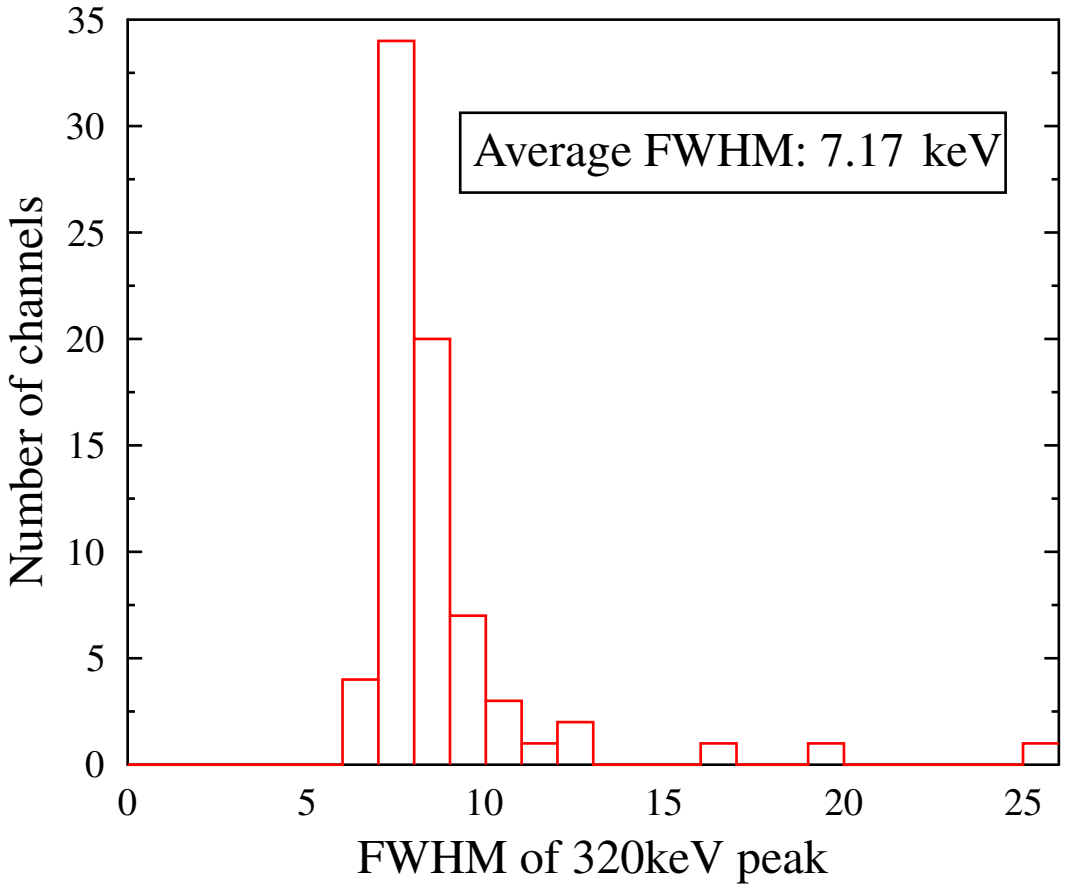
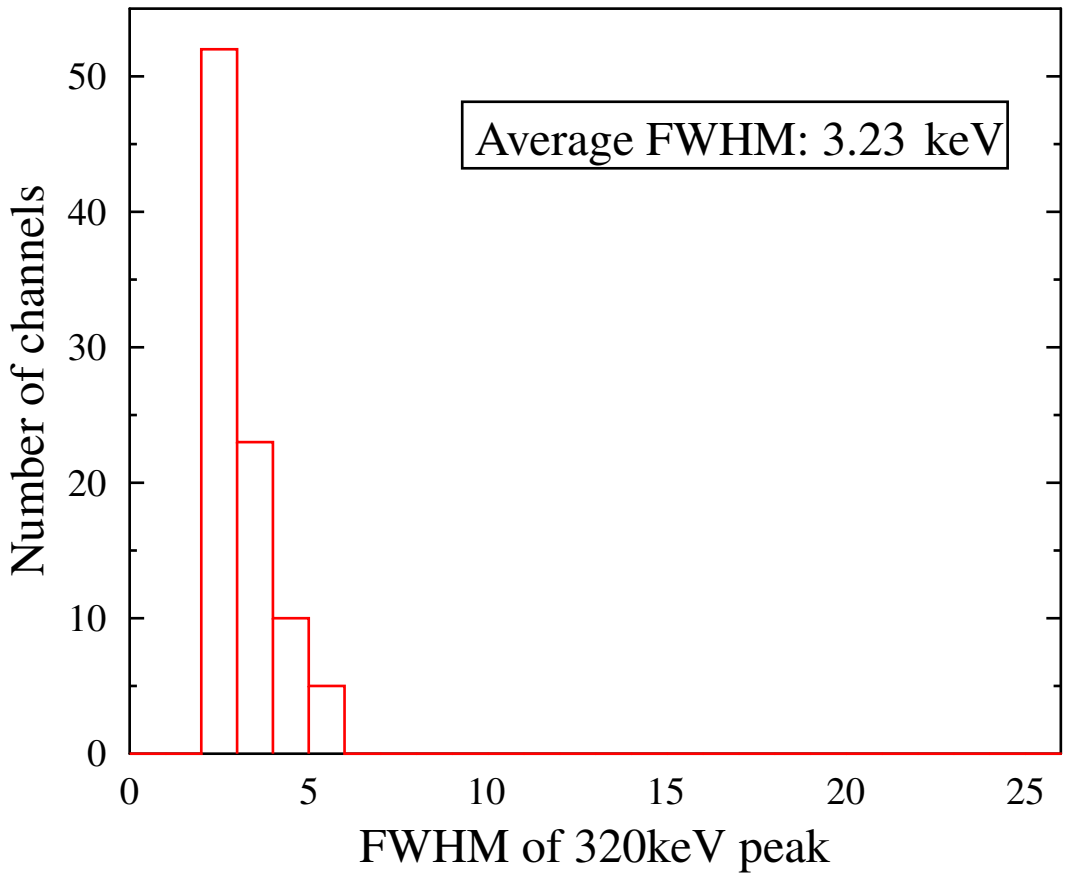


Status of detector during Hg run



After optimisation



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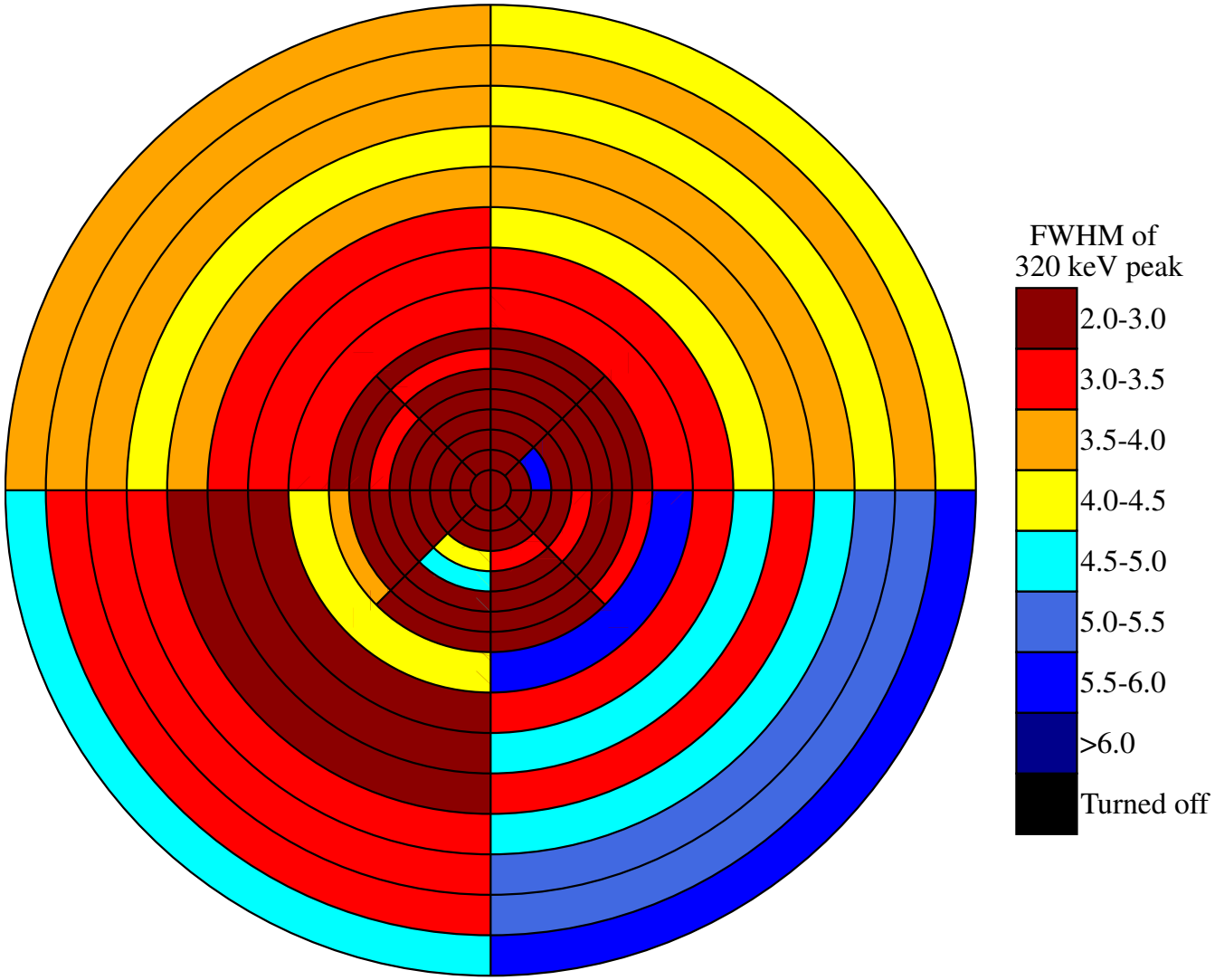
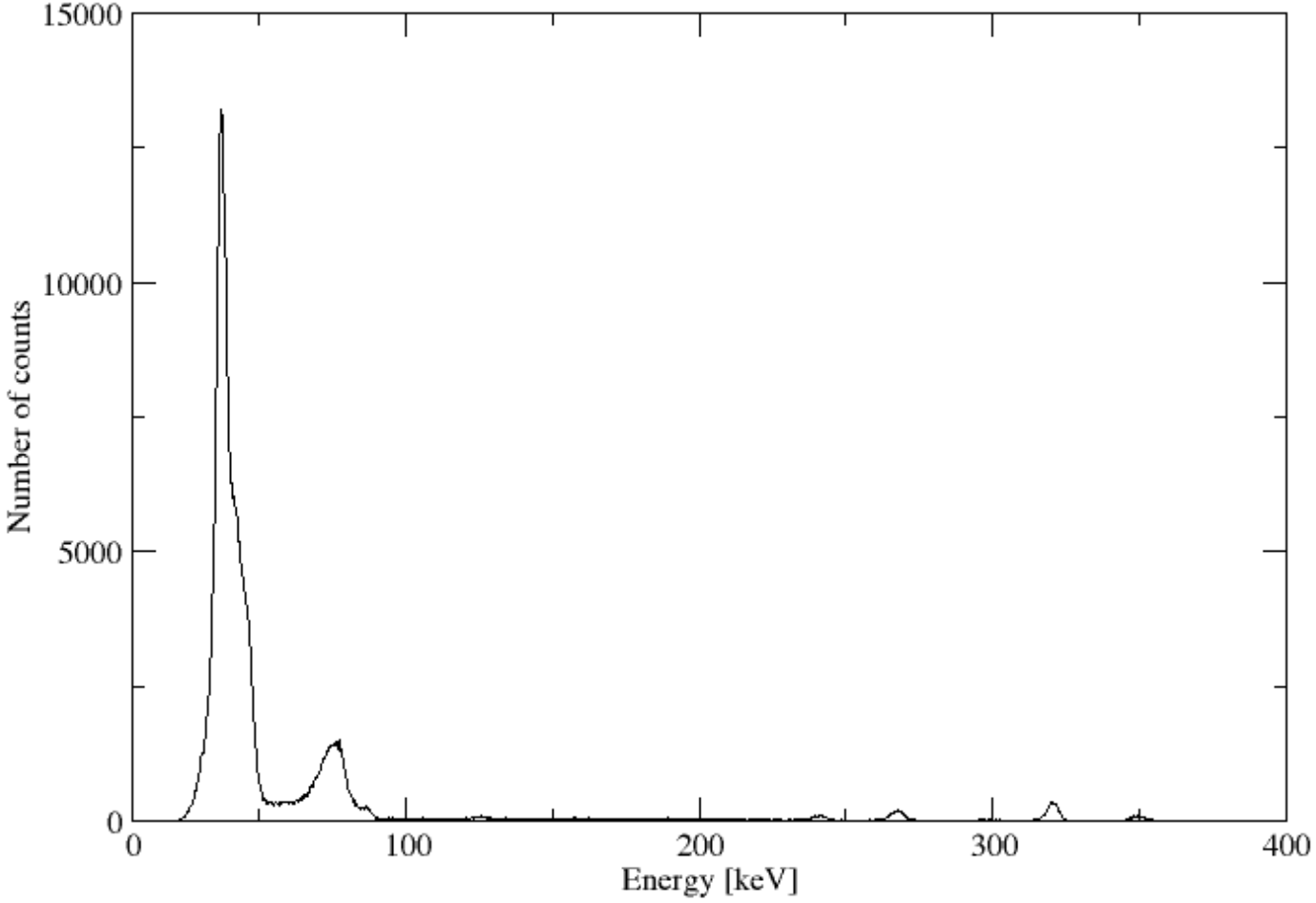


Example of a spectrum



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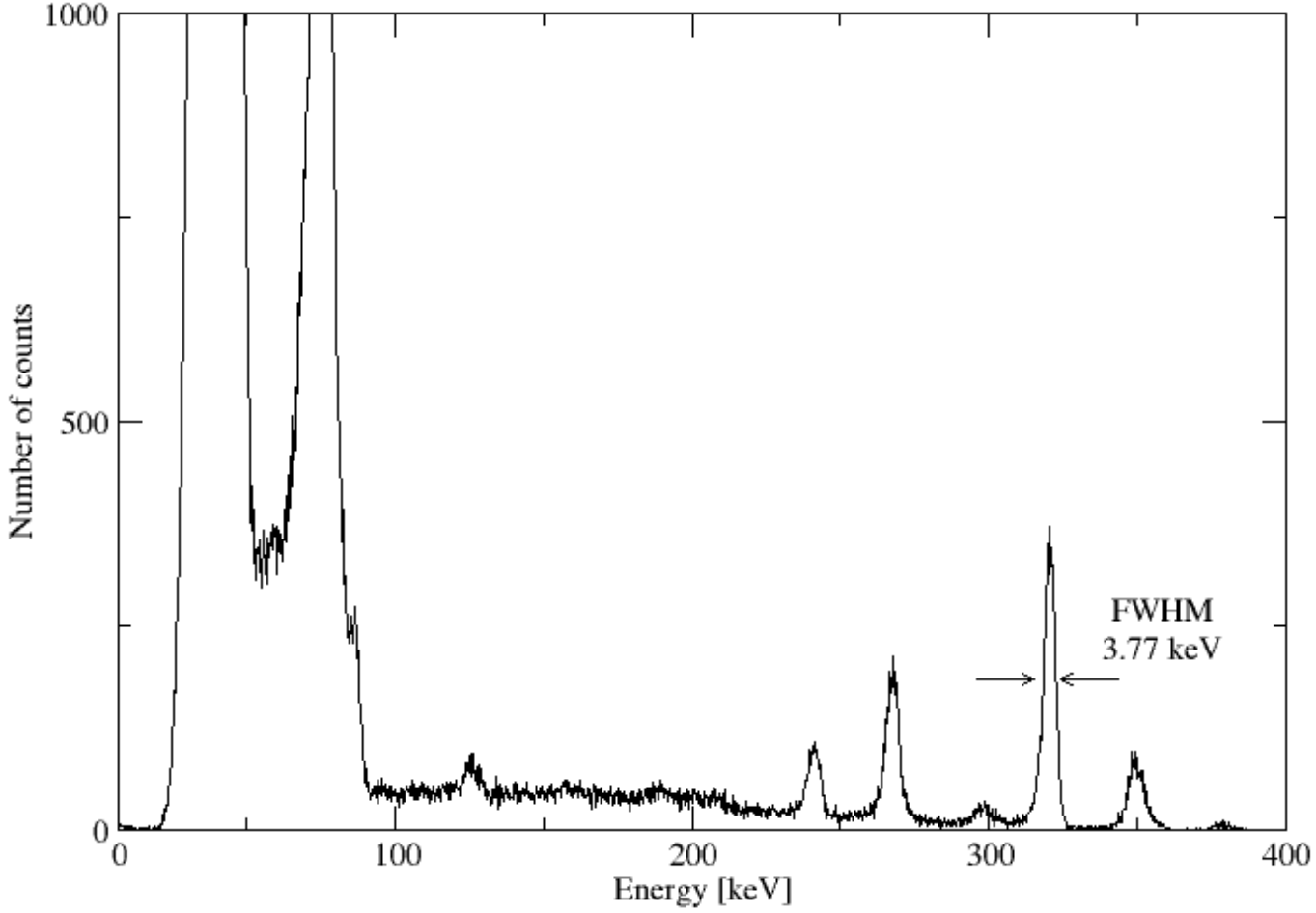

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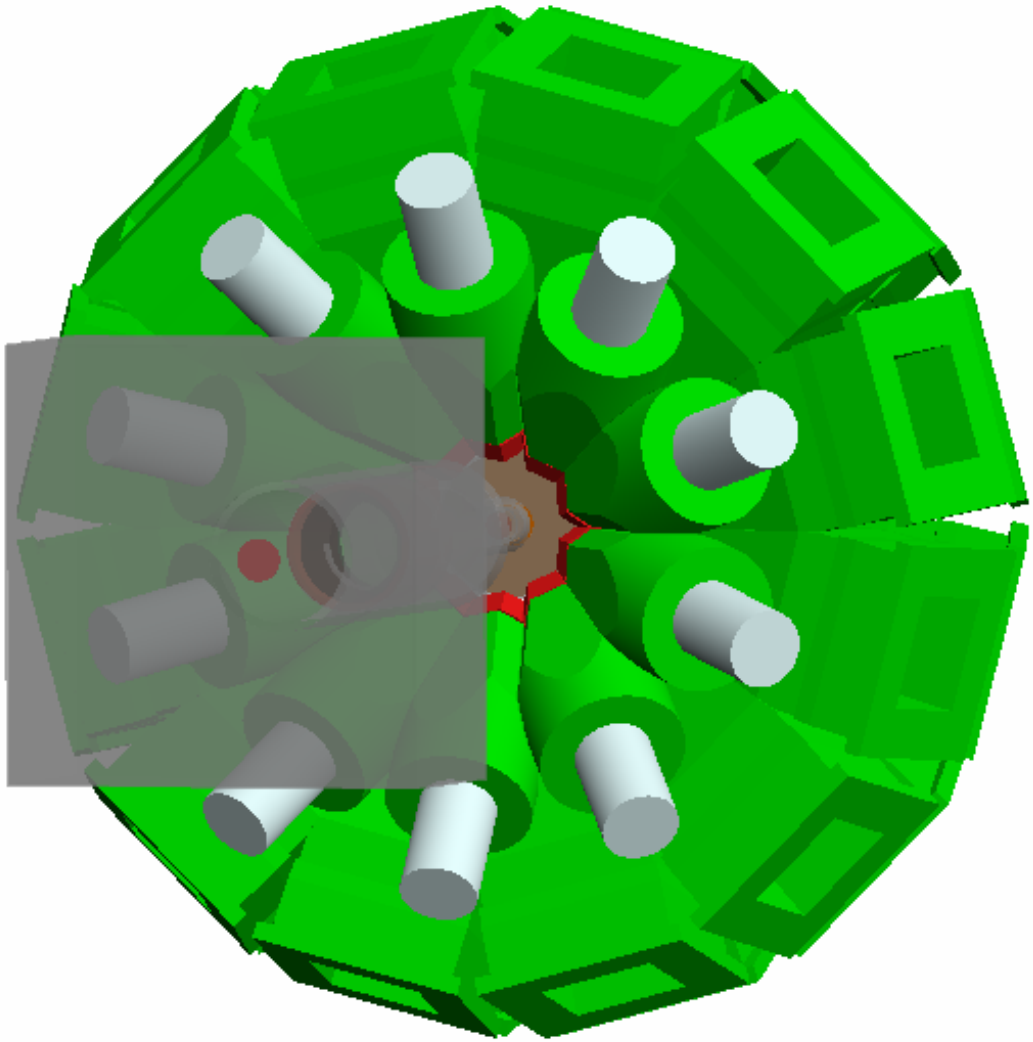
Geant4 simulation

Geant4 is a toolkit developed to simulate the passage of particles through matter.
Reasons for Simulation

- Deeper understanding of instrument
- Simulation beforehand to optimise set-up

Geant4 simulation



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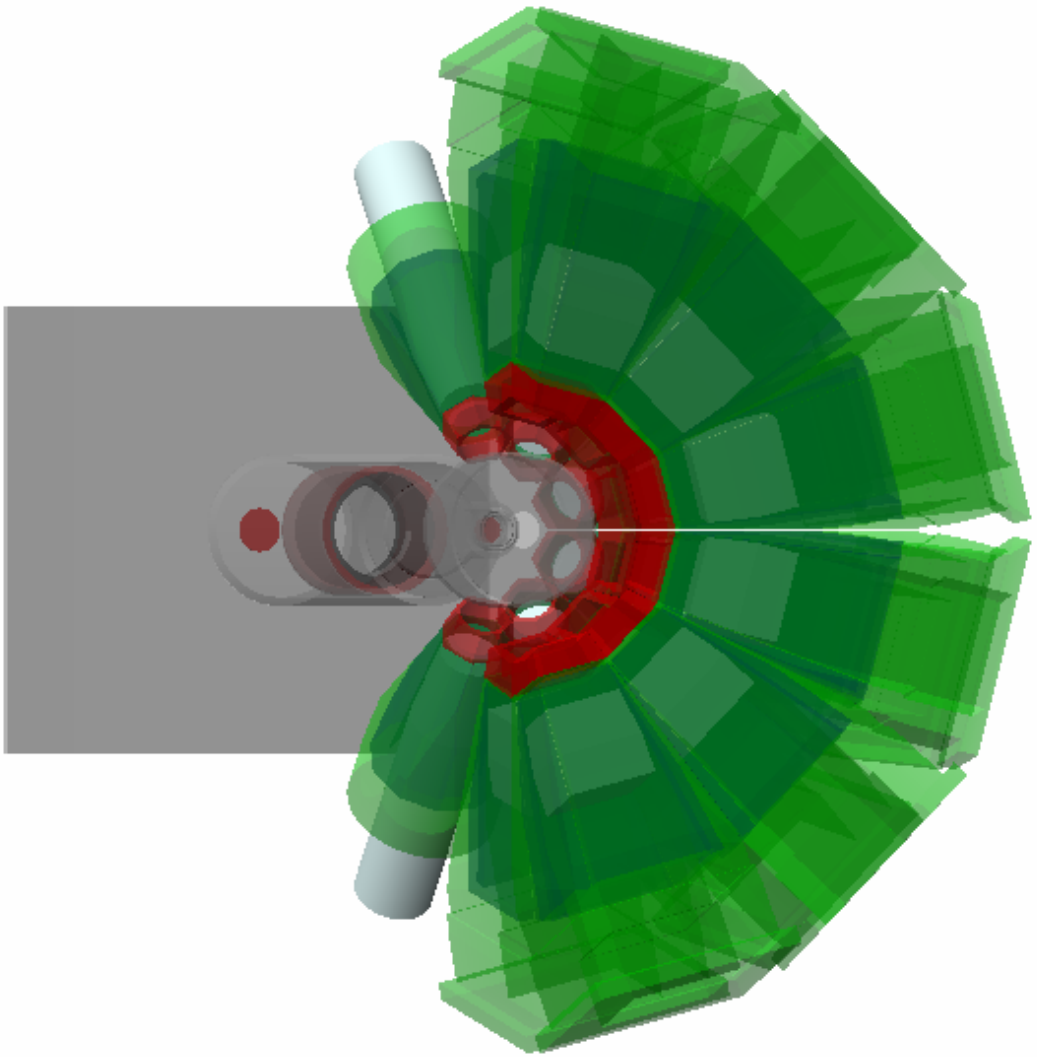

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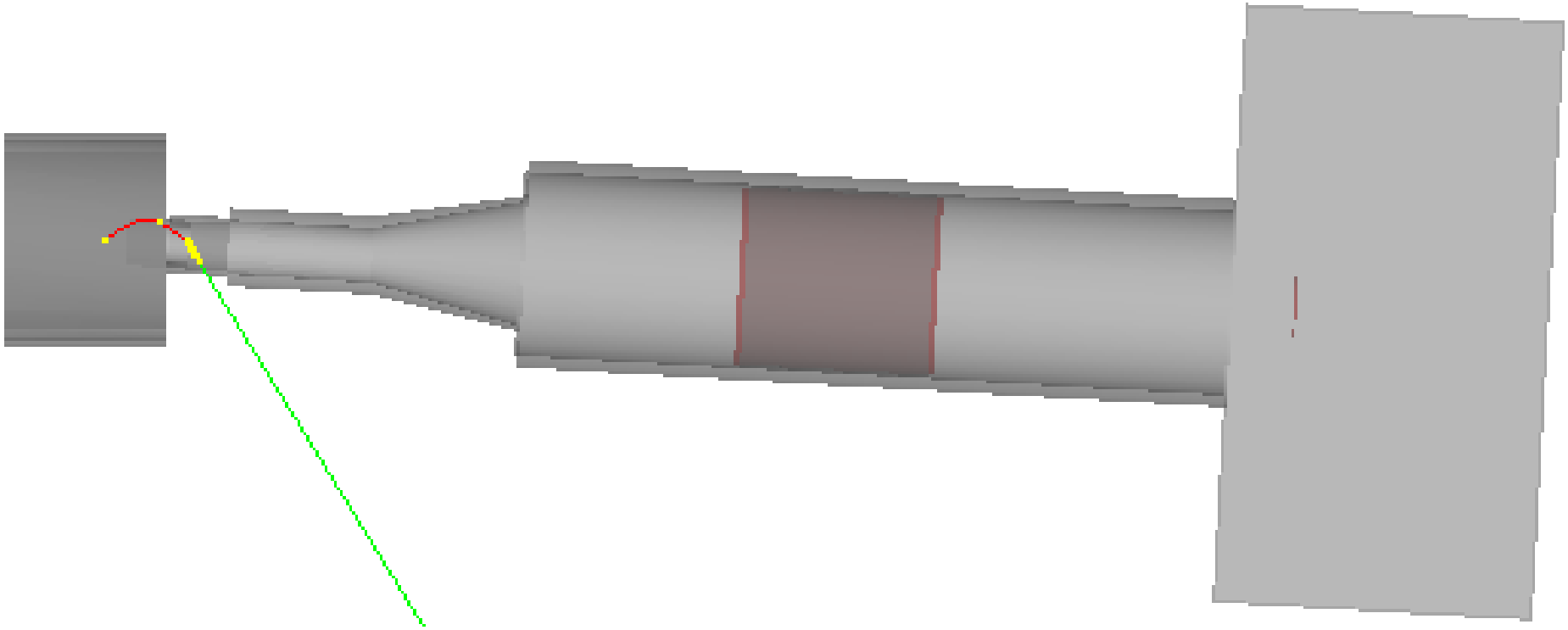

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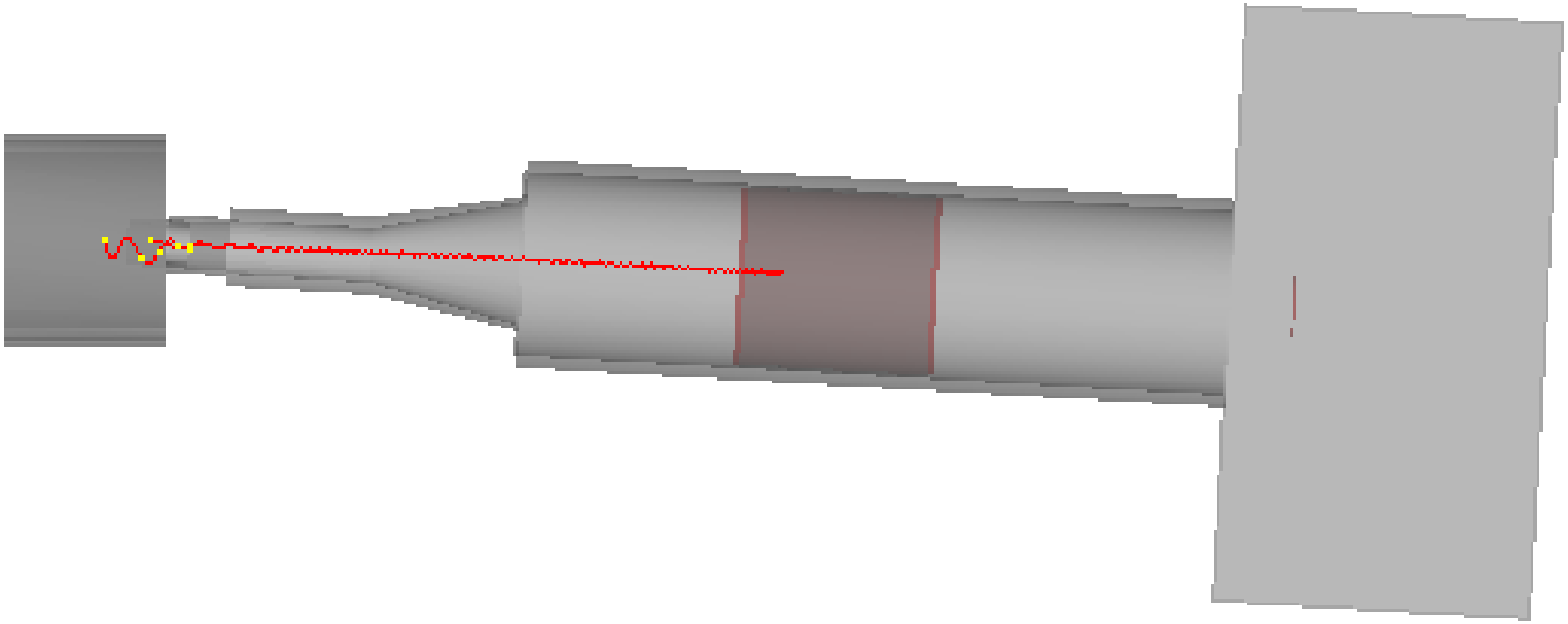

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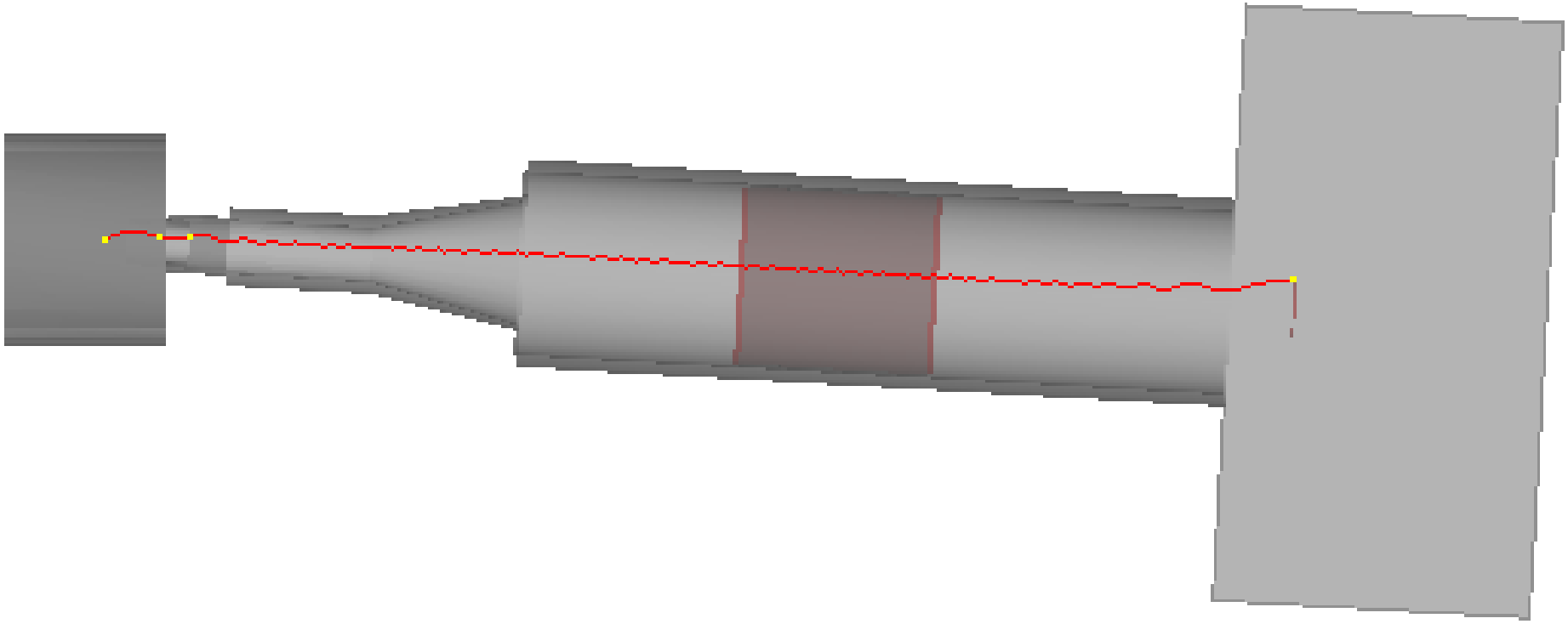

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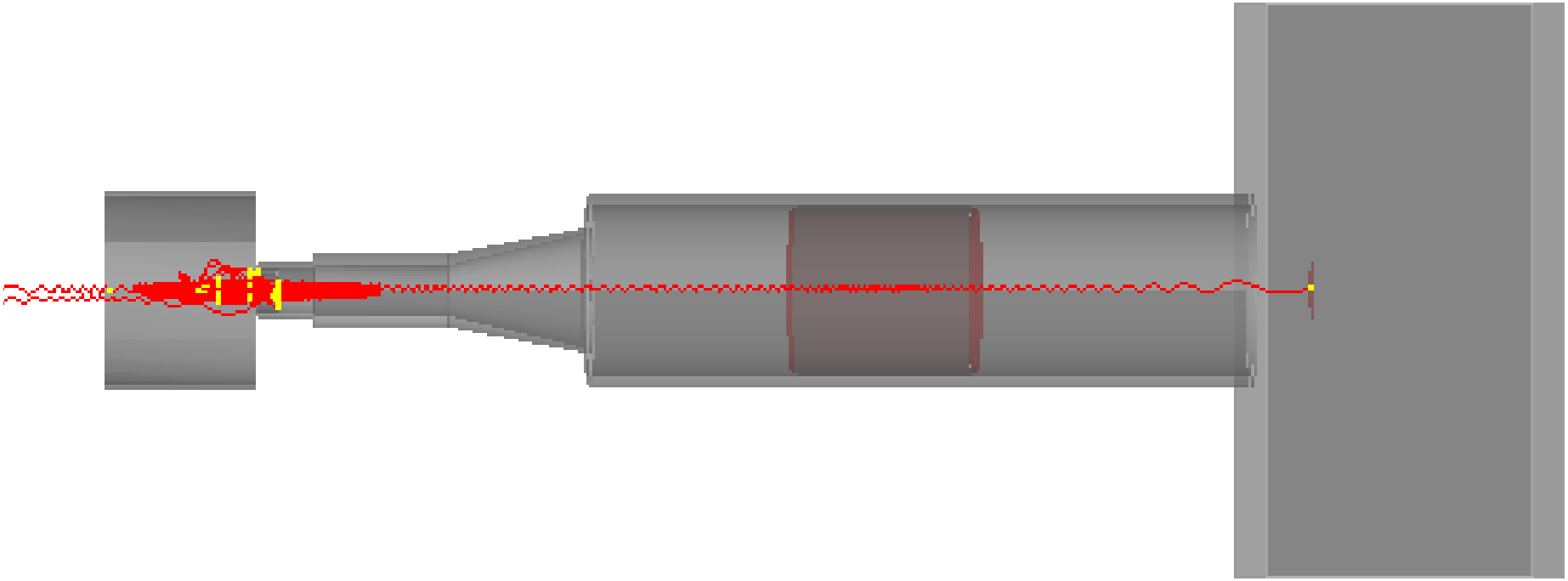

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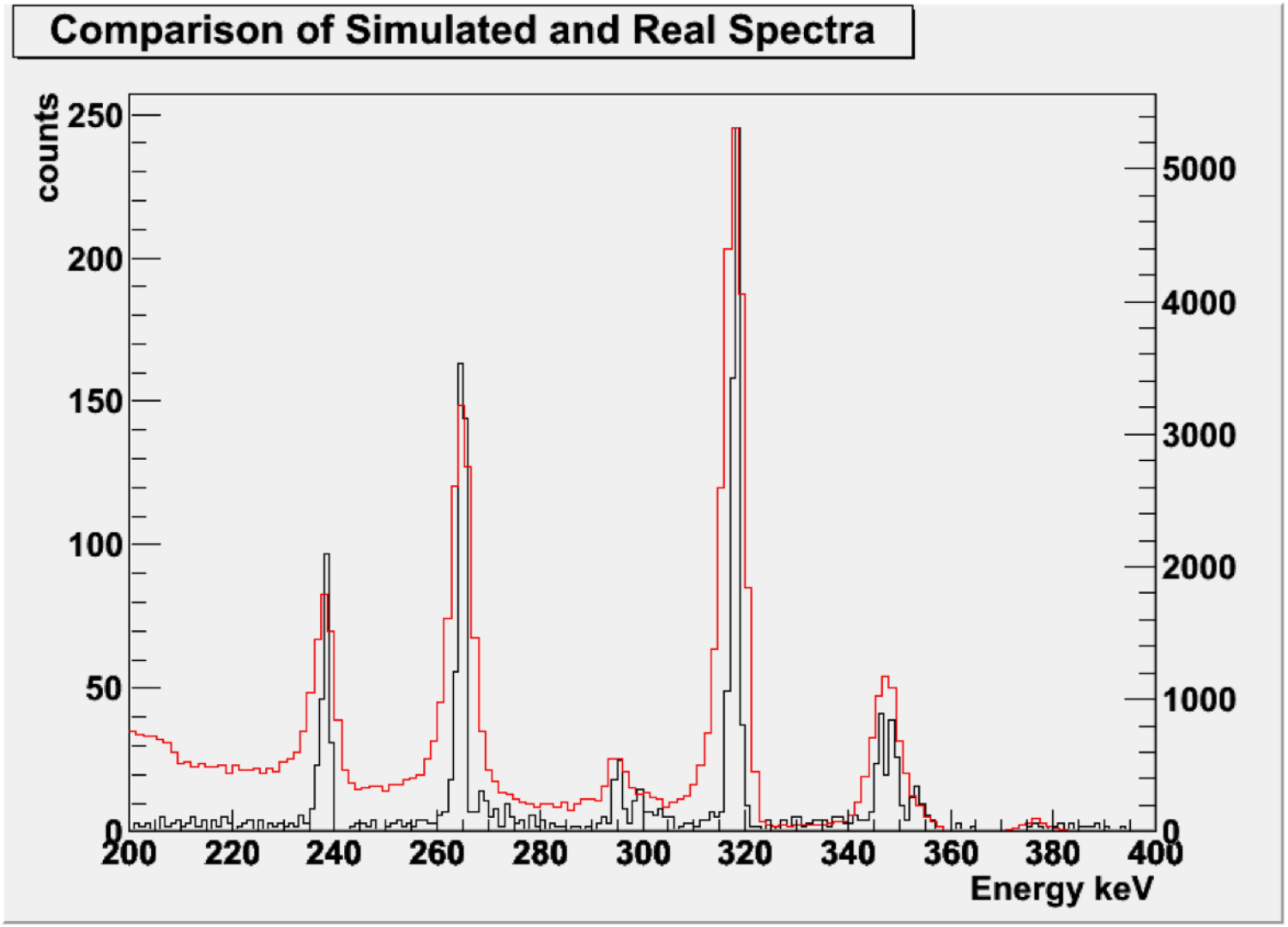

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- Experimental campaign scheduled for later on in the year

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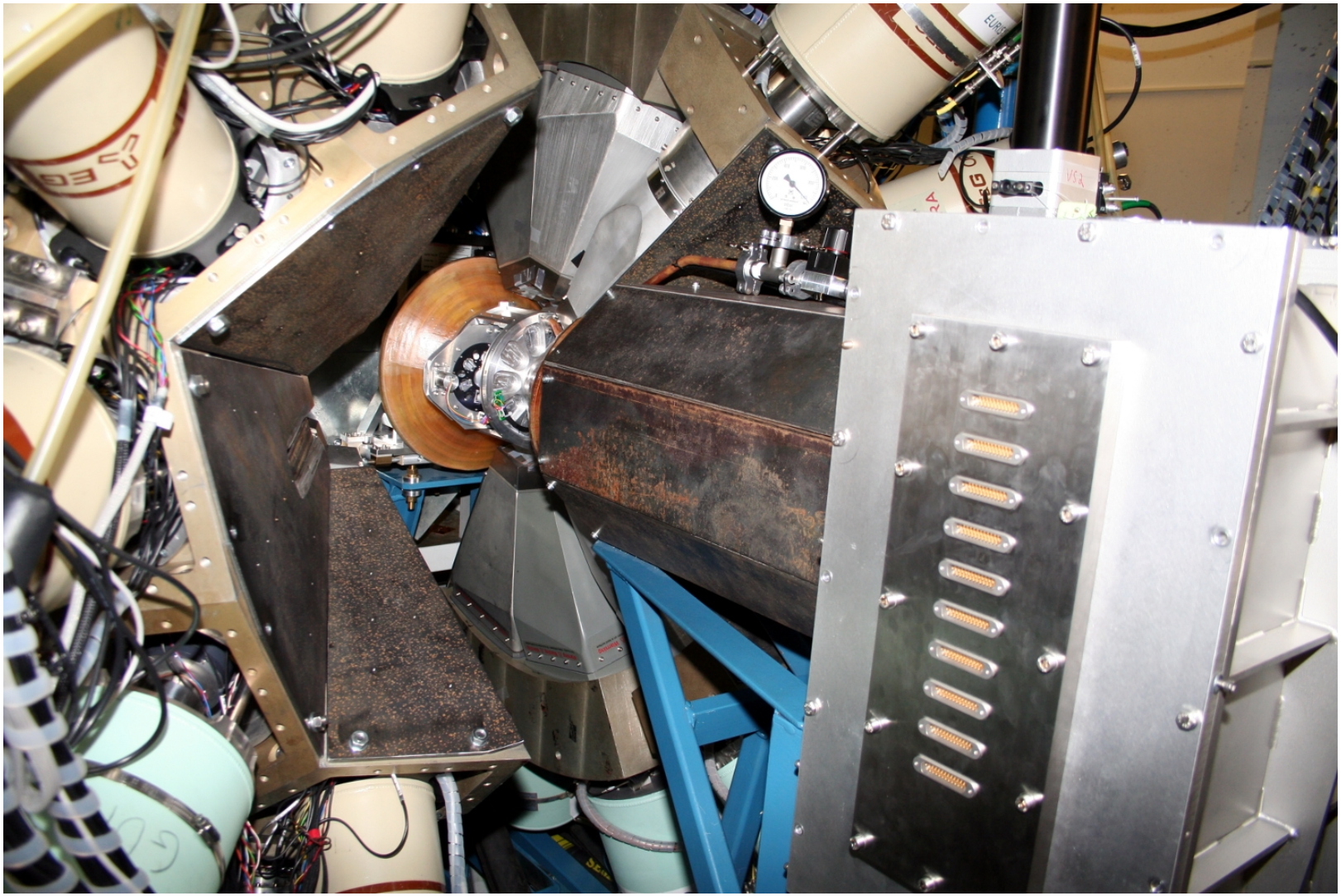

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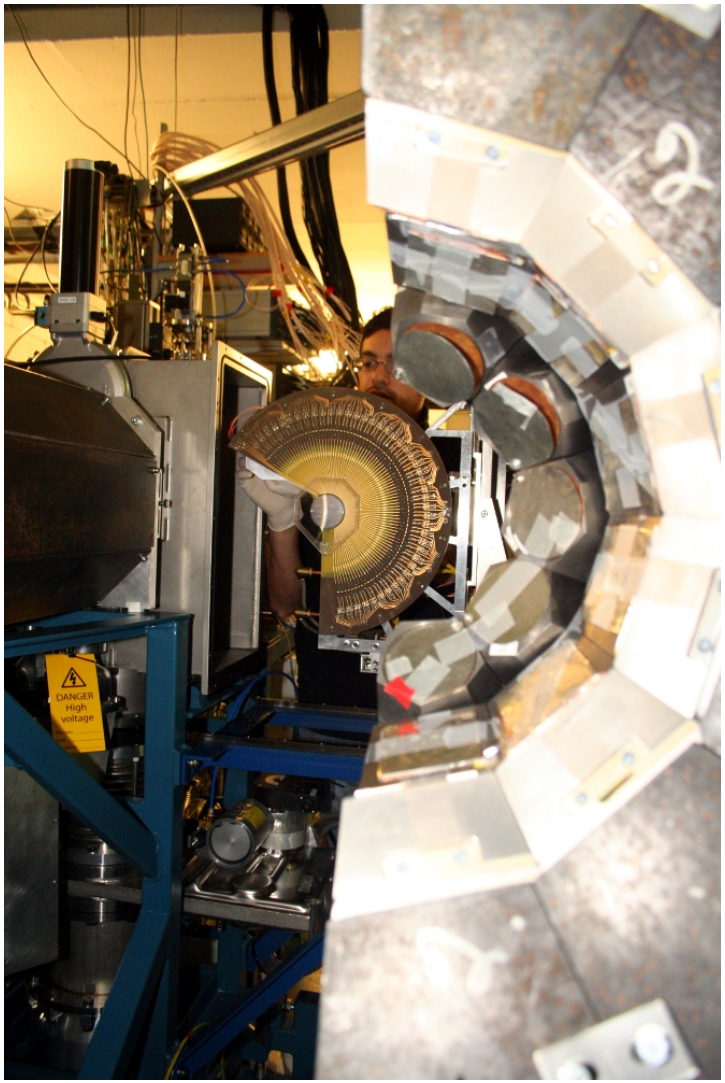

Summary

Collaboration

University of Liverpool, UK
R.-D. Herzberg, P. Papadakis,
J. Pakarinen, P.A. Butler, D. Cox,
J.R. Cresswell, E. Parr, J. Sampson,
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P. Jones, R. Julin, P. Peura,
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