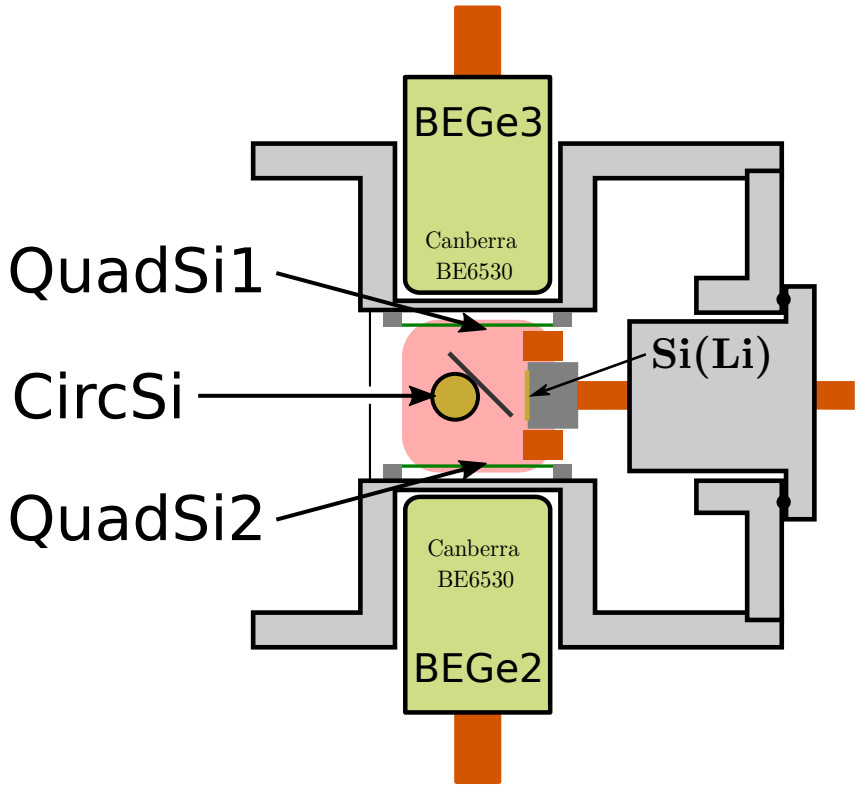
JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

I262 Setup Detection Efficiency

Detectors

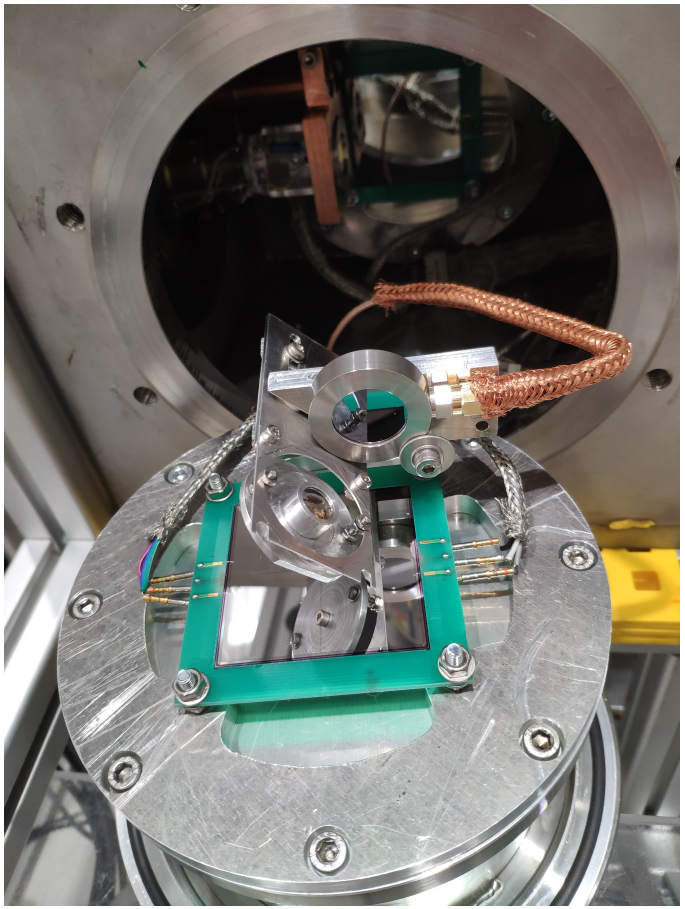
- **1**→ BEGE2020 (Ch. 1)
- **3**→ BEGE6530 (Ch. 2-4)
- **2**→ QuadSi (Ch. 5-12)
- **1**→ CircSi (Ch. 19)
- **1**→ Si(Li) (Ch. 17)

Total → 14 Ch.



Sources

- **1→** 3-α source
  ^{239}Pu - ^{241}Am - ^{244}Cm
- **5→** γ sources
  ^{133}Ba - ^{210}Pb - ^{60}Co
  ^{137}Cs - ^{152}Eu
- **1→** α-recoil source
  ^{223}Ra



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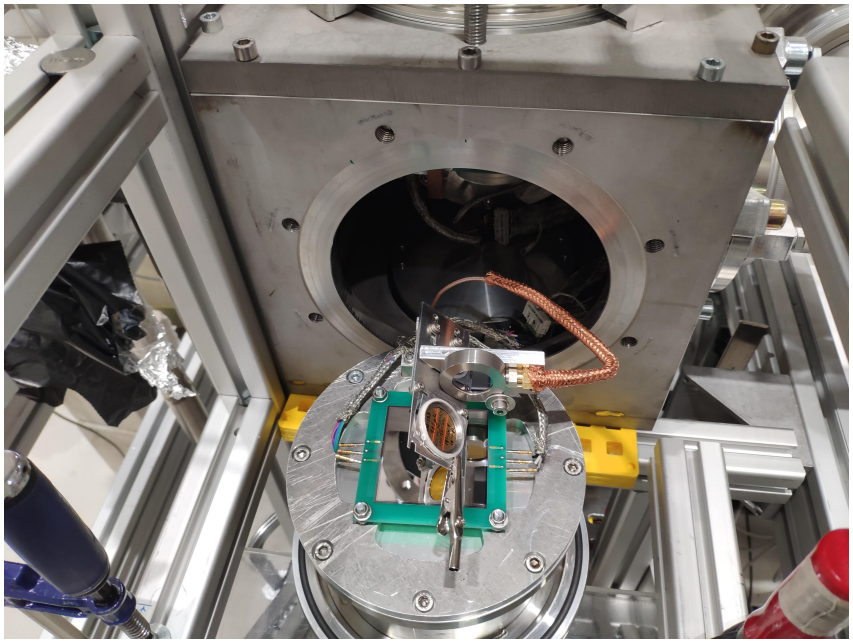

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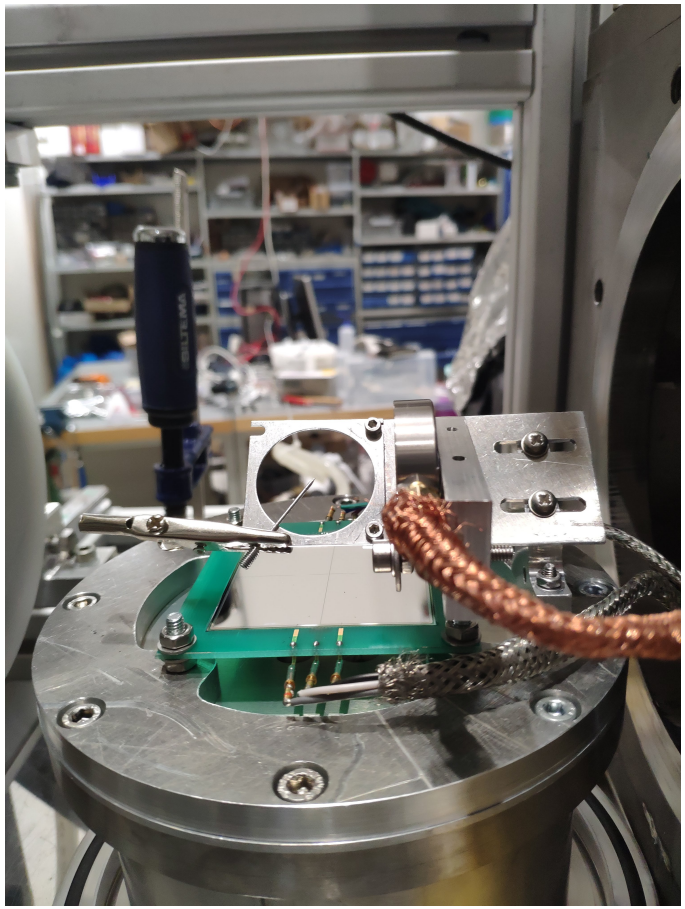

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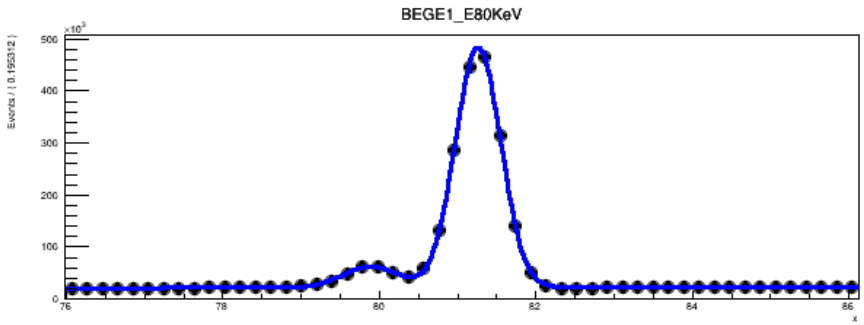
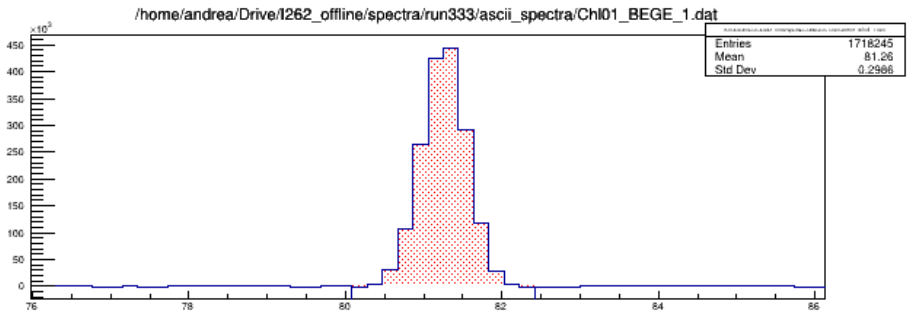
BEGE Efficiency

$$\mathcal{E}_{\text{ABS}} = \frac{\text{Peak Area}}{\text{Time} \times \text{Activity} \times \text{Intensity}}$$

- → Peak Area
- → Time
- → Activity
- → Intensity





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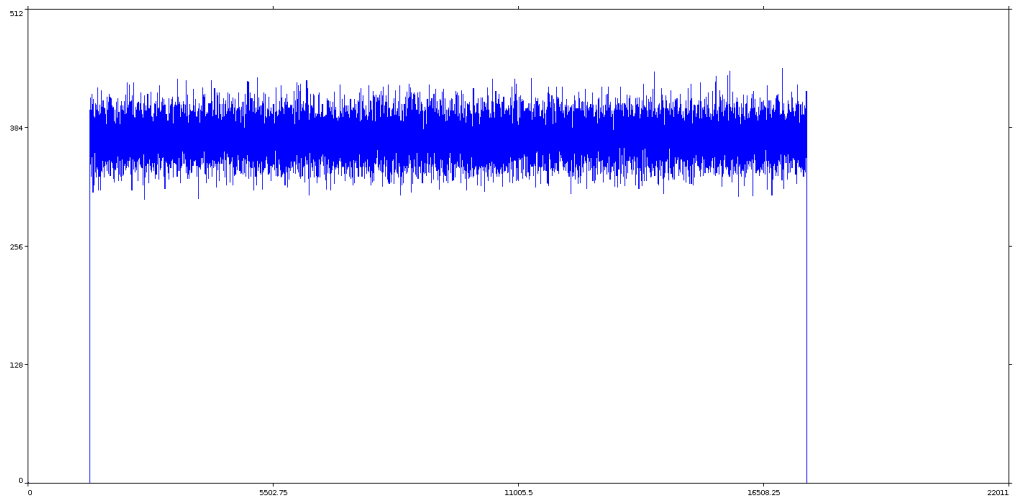

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$$A = A_0 \exp\left(-\ln(2)\frac{\Delta T}{T_{1/2}}\right)$$

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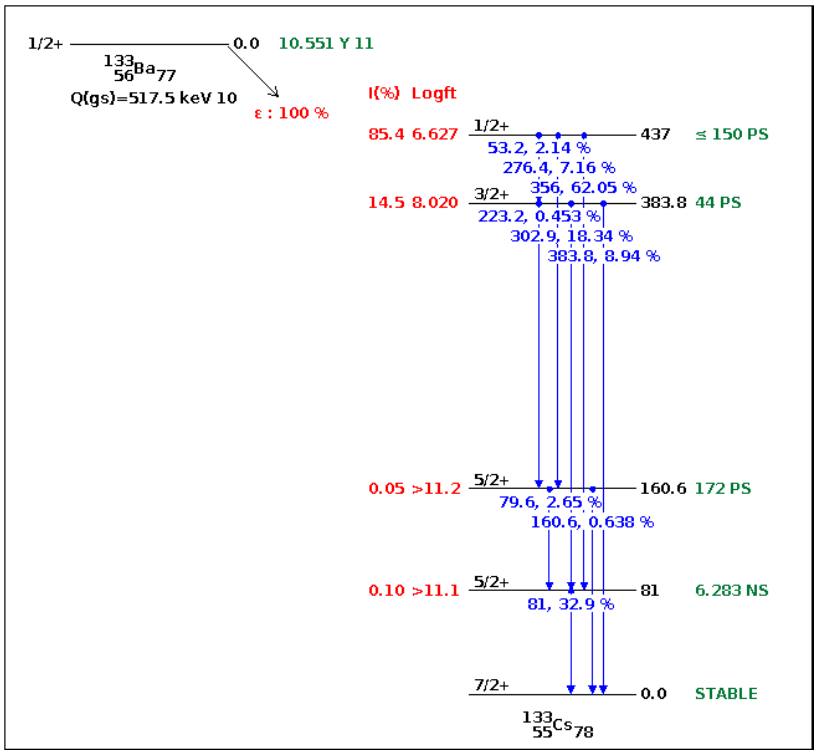
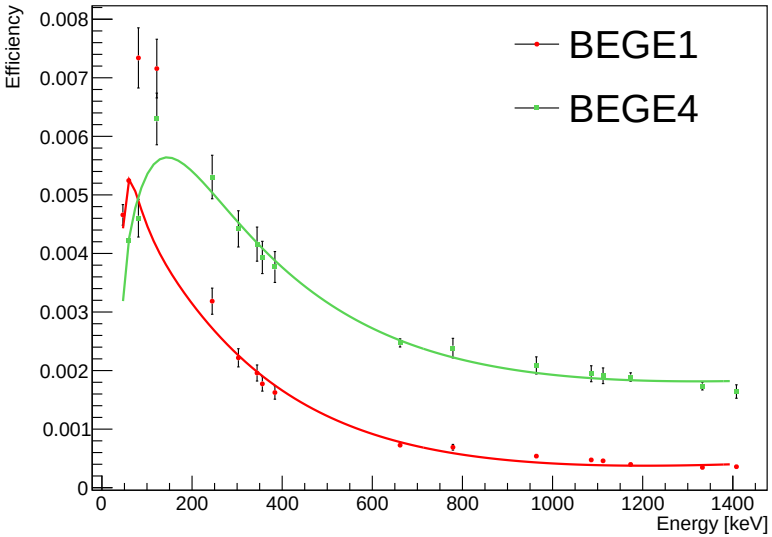
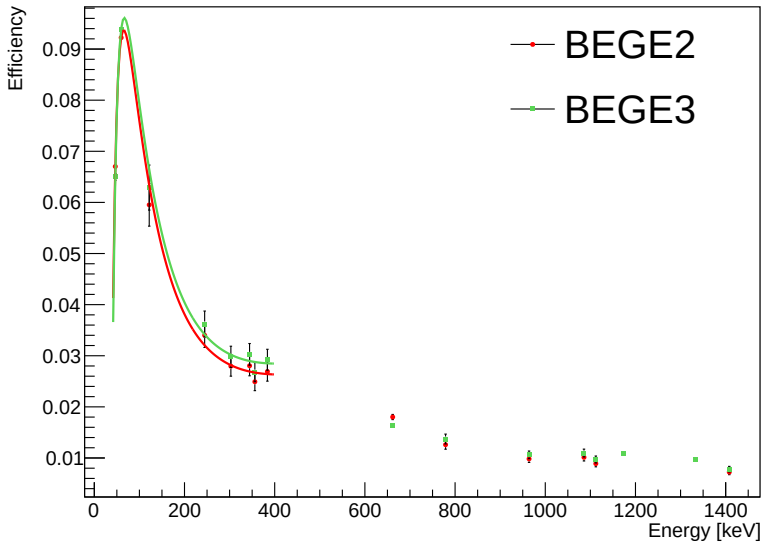


BEGE Efficiency

Vertical Axis



Horizontal Axis



$$^{1}\mathcal{E}_{ABS}(E) = a_1 \left(\exp\left(-a_2 E^{a_3}\right) + \exp\left(-a_4 E^{a_5}\right)\right)\left(1 - \exp\left(a_6 E^{a_7}\right)\right)$$

$$^{2}\mathcal{E}_{ABS}(E) = \frac{1}{E}\sum_i a_i \left(\ln(E)\right)^{i-1}$$

[1] Hurtado Garcia-Lenon Nucl. Instr. and Meth. A 594 (2008) 362–367

[2] P.W. Gray, A. Ahmad, Nucl. Instr. and Meth. A 237 (1985) 577

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Error sources

- → Integral error ✓
- → acquisition time error (negligible ?)
- → Half Life time error (negligible ?)
- → Original Activity Error ✓
- → Intensity
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  - Coincidence summing γ
- → Geometrical error
  - Isotropic emission
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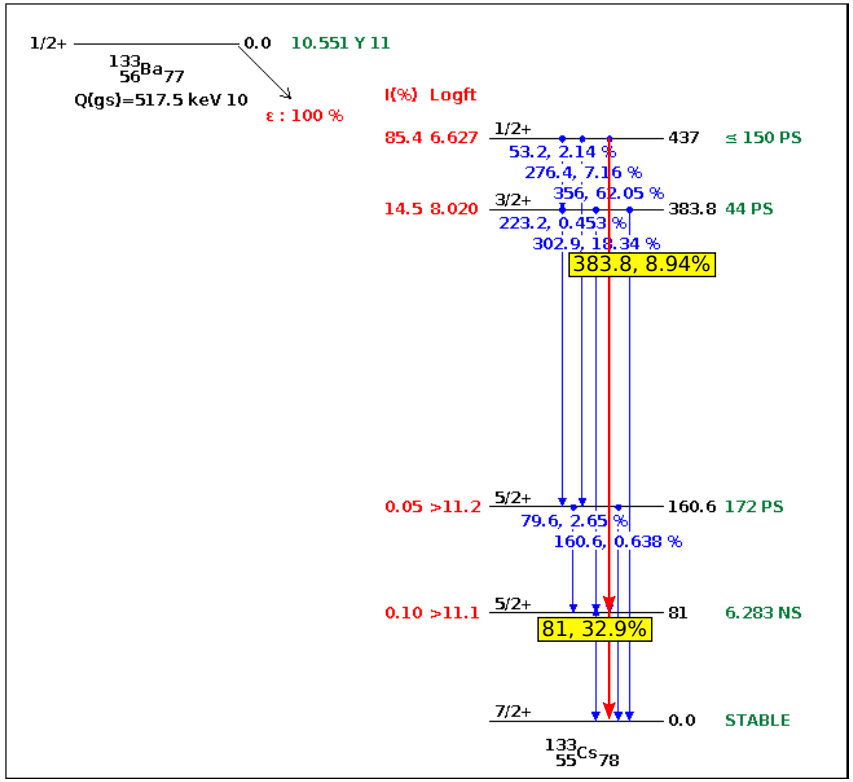

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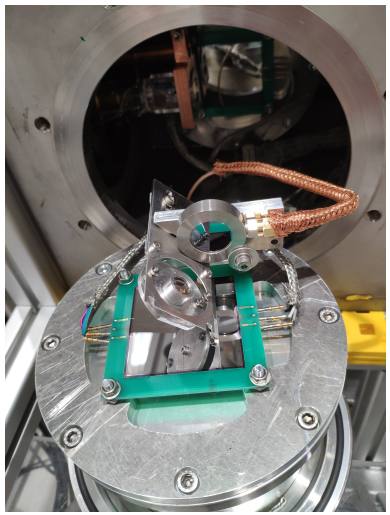

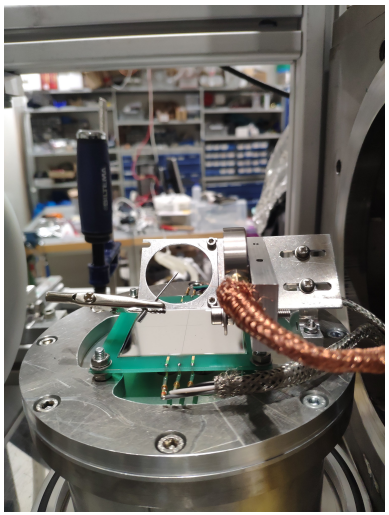

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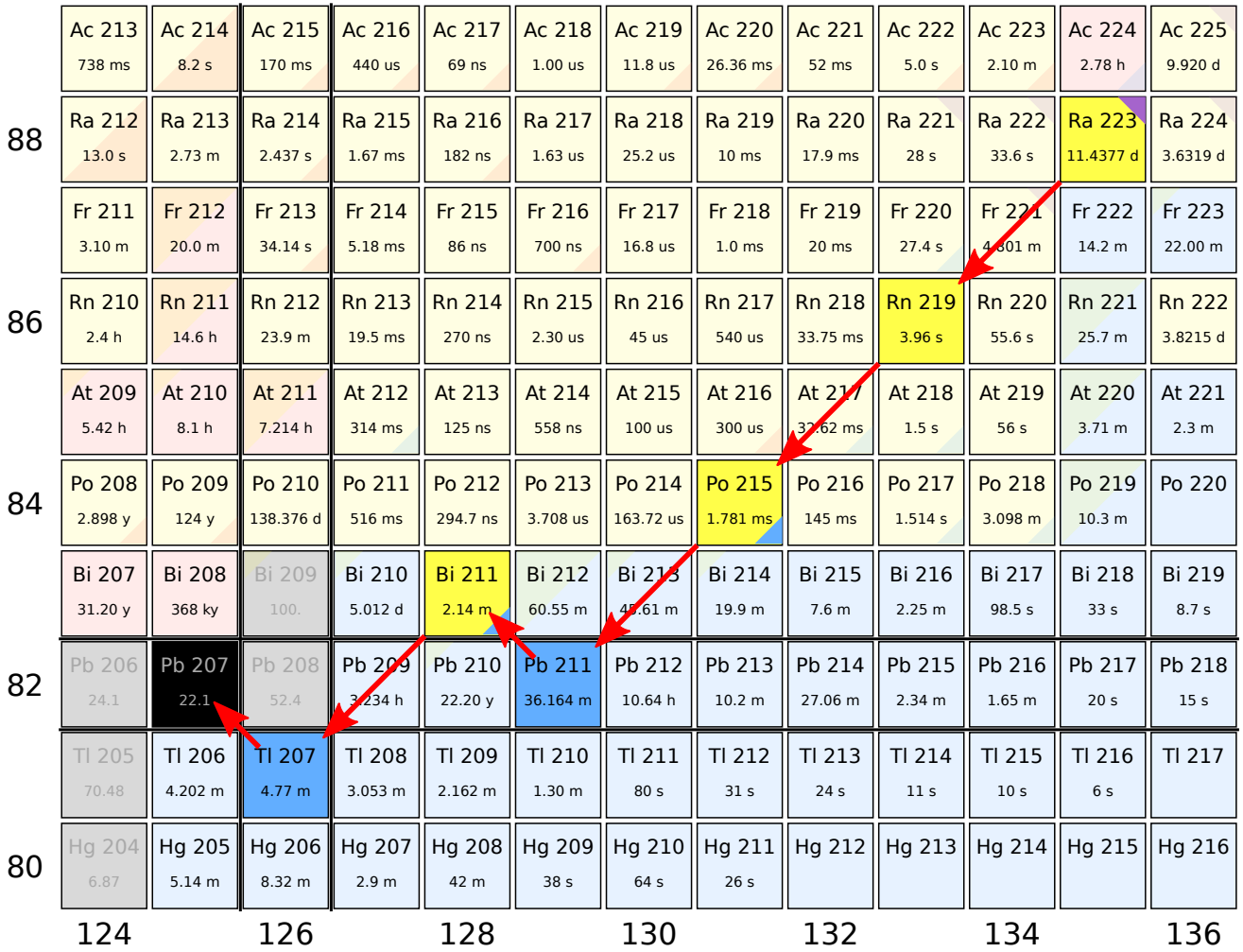
223Ra α-recoil source



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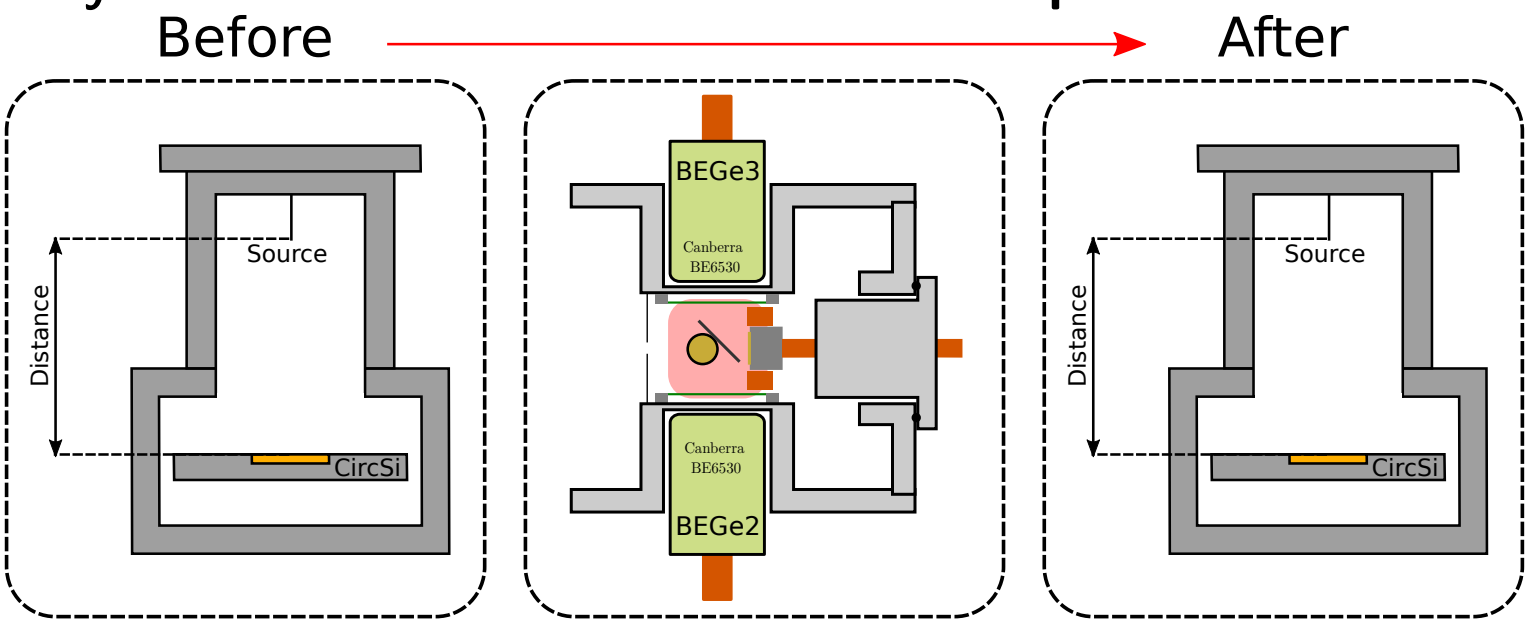
223Ra α-recoil source

Activity measurment before and after the acquistion with the setup



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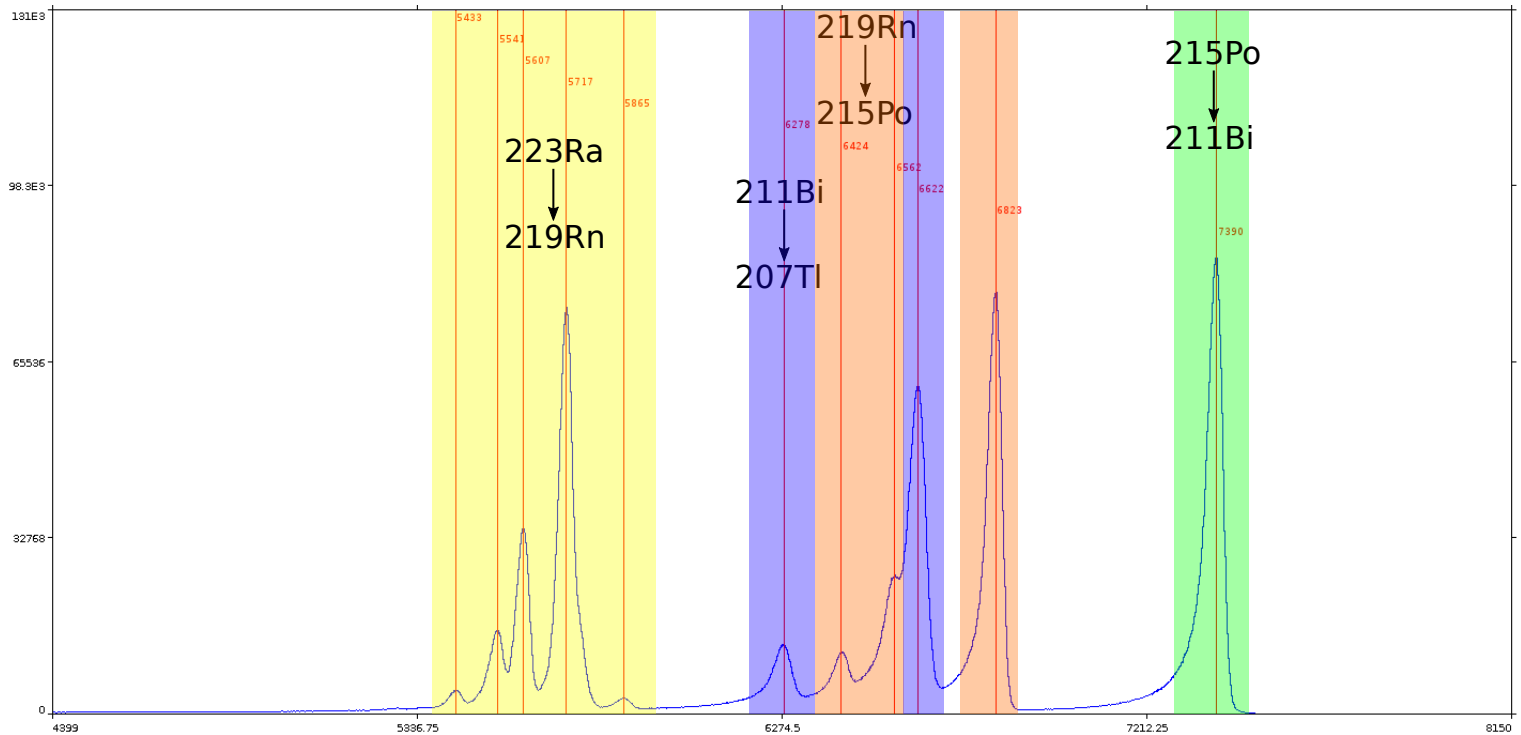

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To Do List

- Efficiency curves fitting
- Include 3-α source ^{241}Am low energy γ
- Include correction coefficients for coincident summing
- Compute geometrical error contribution
- Compute Si detectors efficiency from ^{223}Ra source spectra.