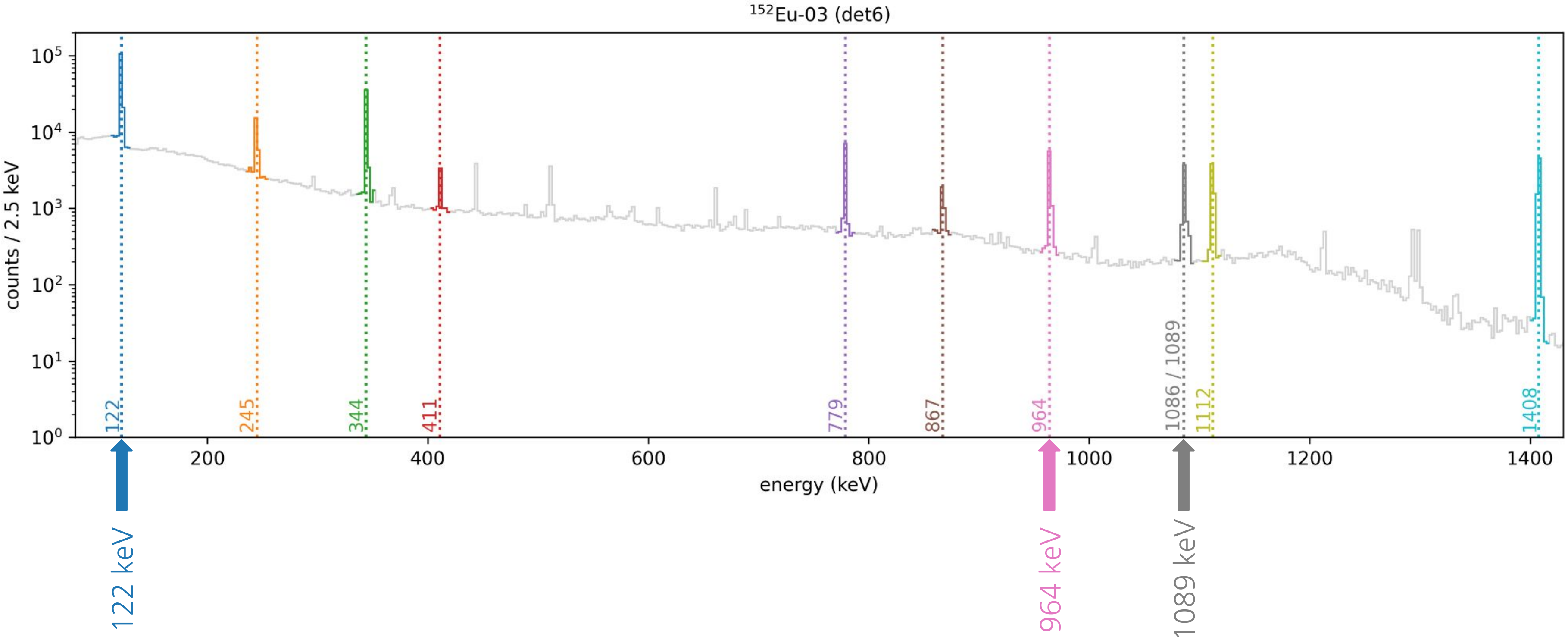
Towards partial capture rates of ^{76}Se with ALPACA data

Elizabeth Mondragón | TUM

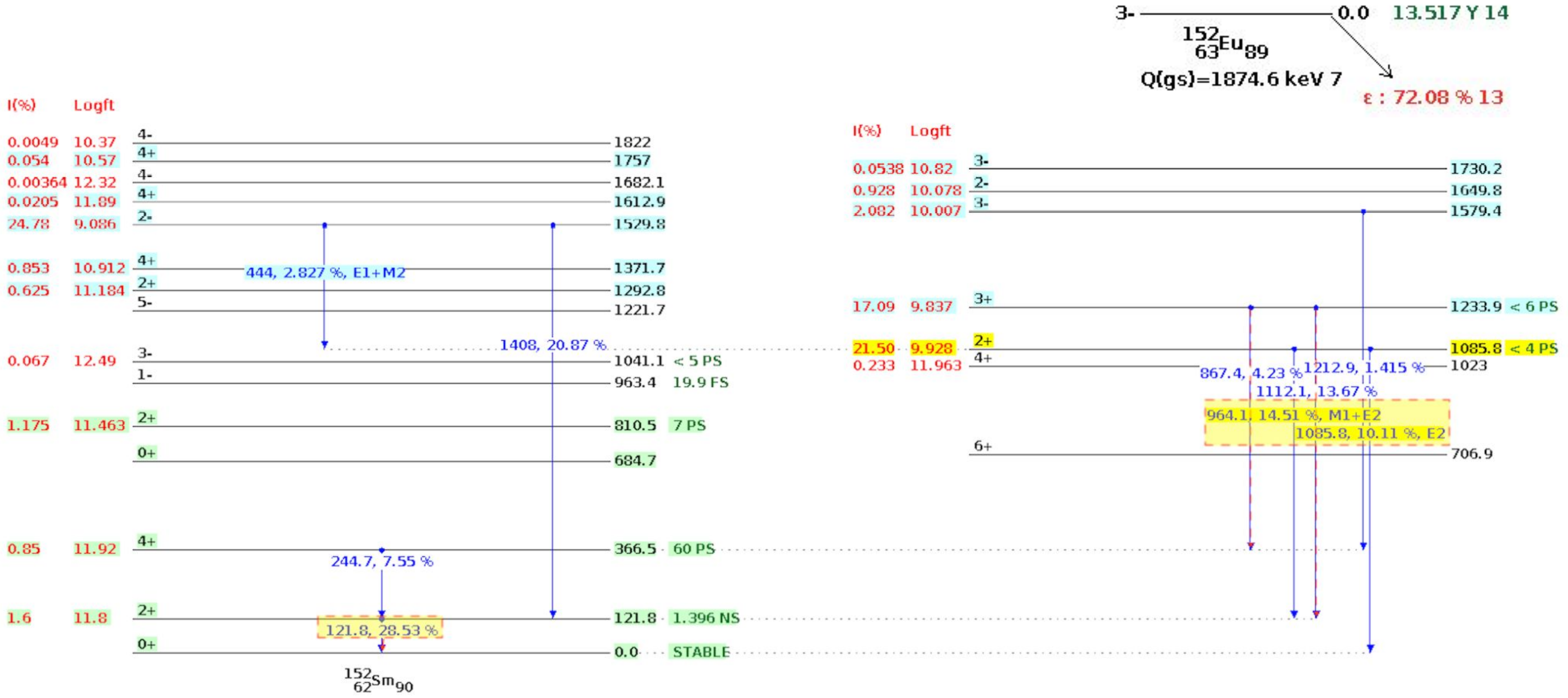
Steps

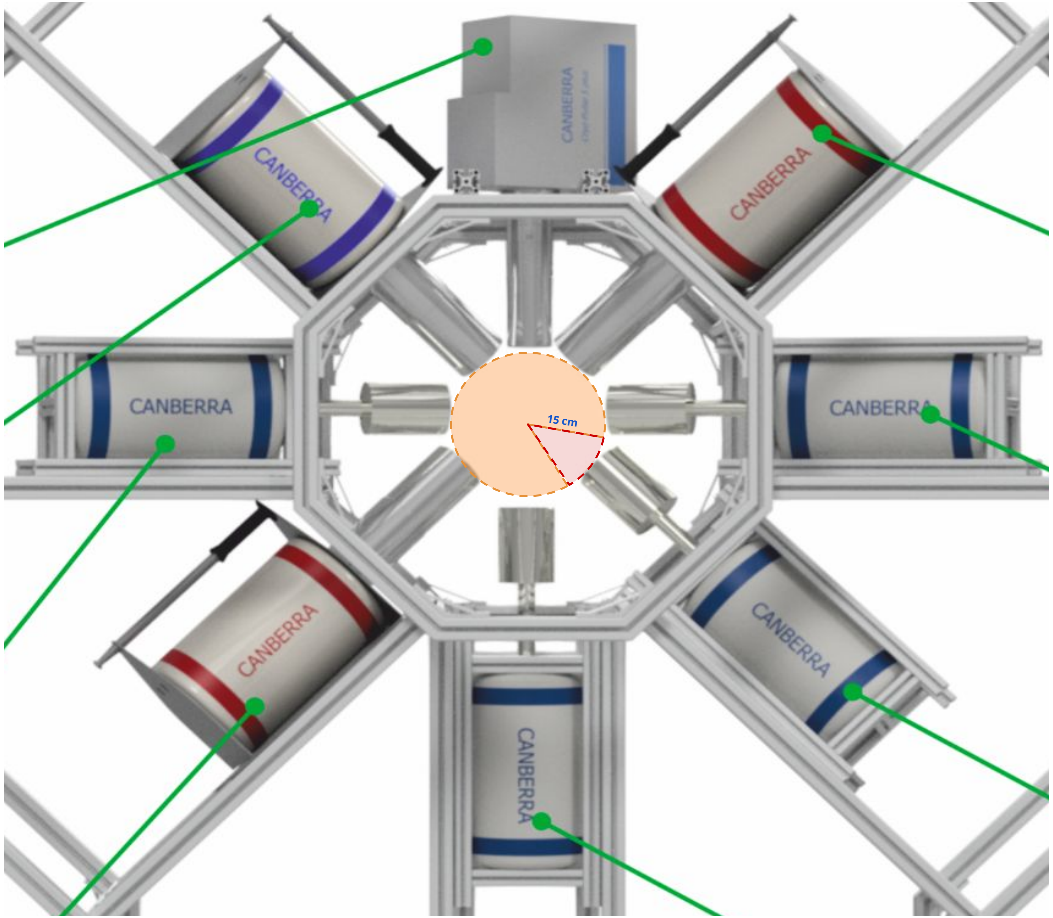
1. Test analysis chain
   - Select calibration data ---> Revise ^{152}Eu for summation peaks
   - Select detector
   - Fit calibration peaks
   - Produce relative efficiency curve
   - Select beam data
   - Fit peaks
   - Produce relative intensities
   - Derive partial yields
2. Apply to all 8 detectors
3. Perform multi-detector analysis

High intensity (>1%) summation lines



High intensity (›1%) summation lines





Solid Angle

$$\Omega = A/r^2$$

r = 15 cm
A = πR^2
R : detector radius ~3 cm
$\Omega \simeq 0.15$ sr

$\Omega/4\pi$ **~1%**

→ Very unlikely to observe coincident gammas

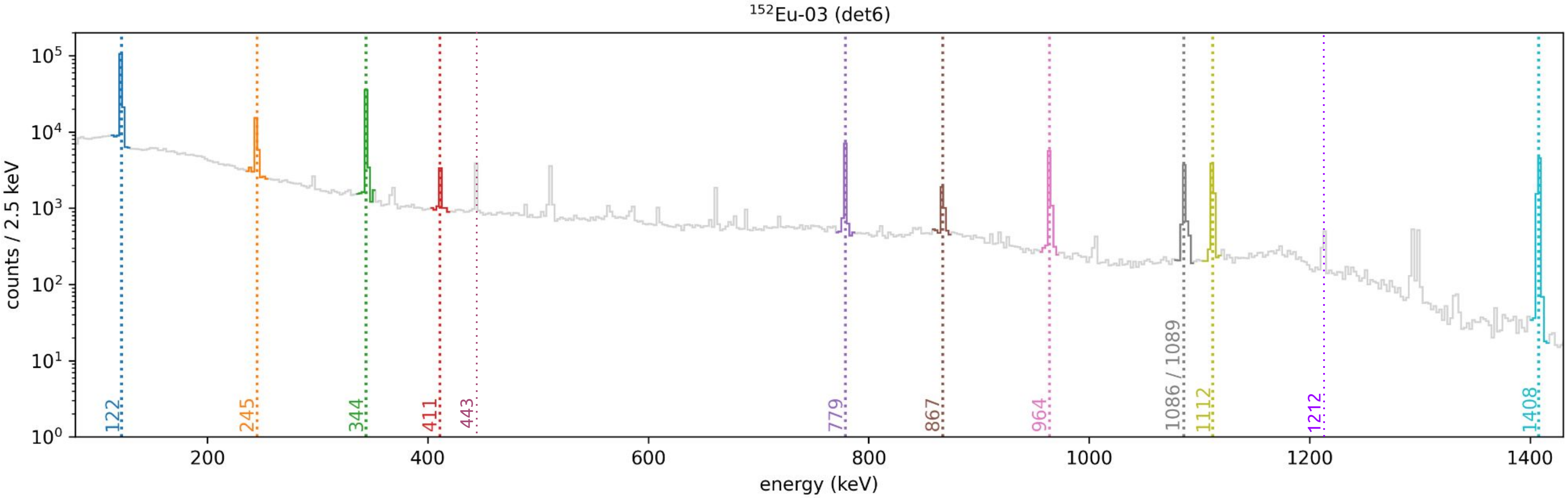
Steps

1. Test analysis chain
   - Select calibration data

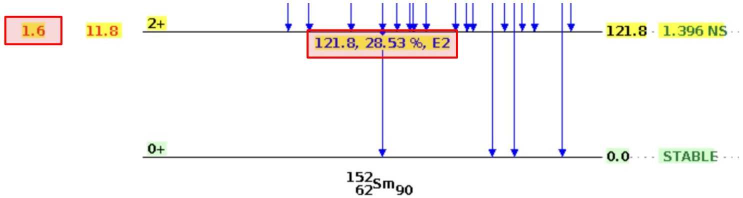
---> Revise ^{152}Eu for summation peaks

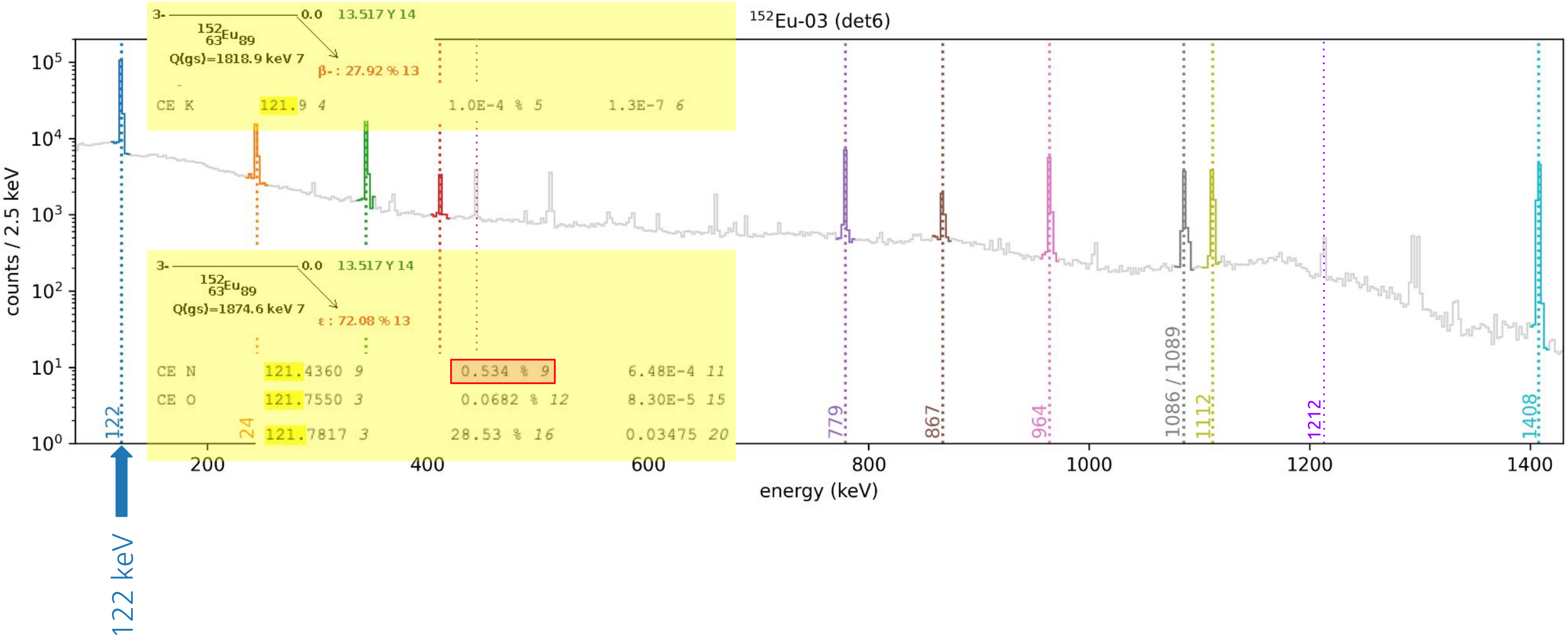
---> Intensity evaluation

Gamma-lines evaluation (intensity >1%)



Gamma-lines evaluation





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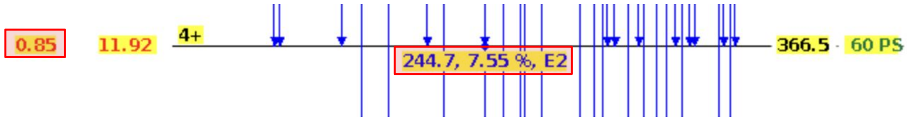
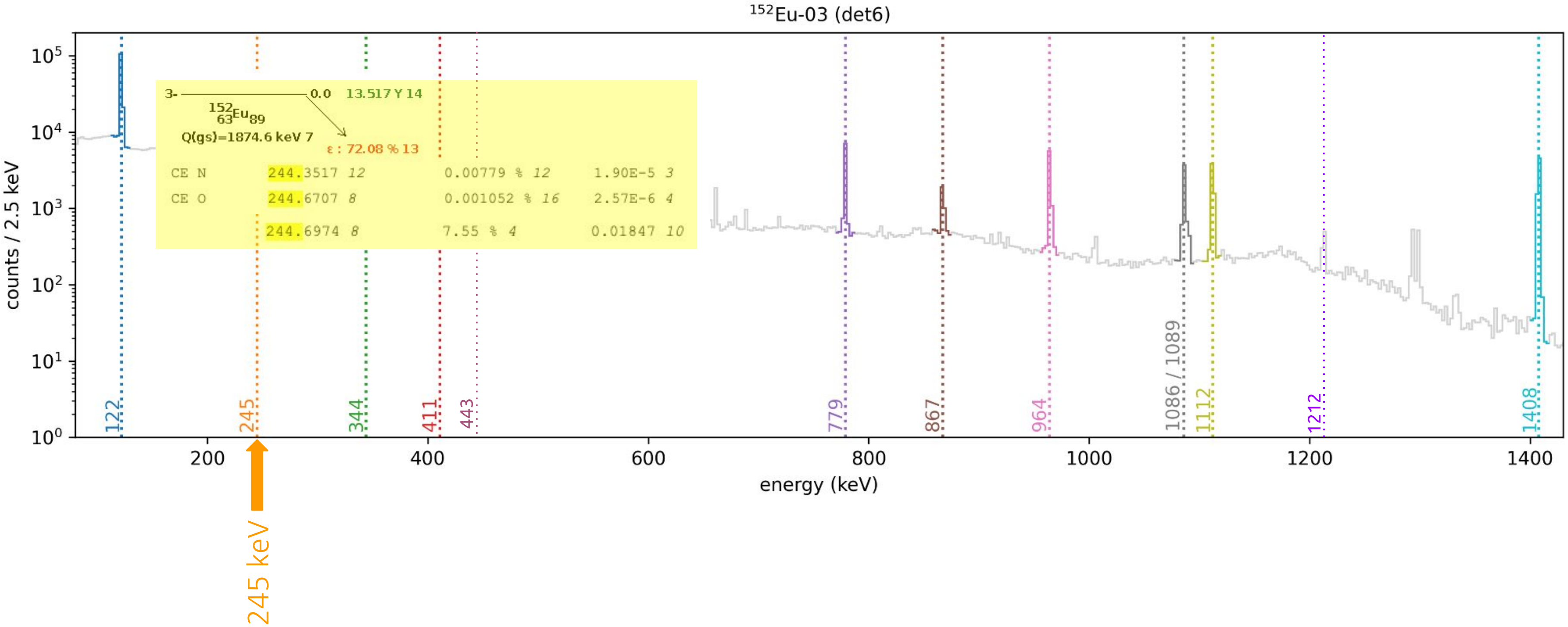
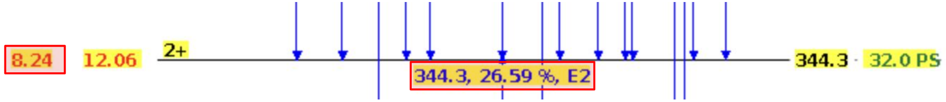
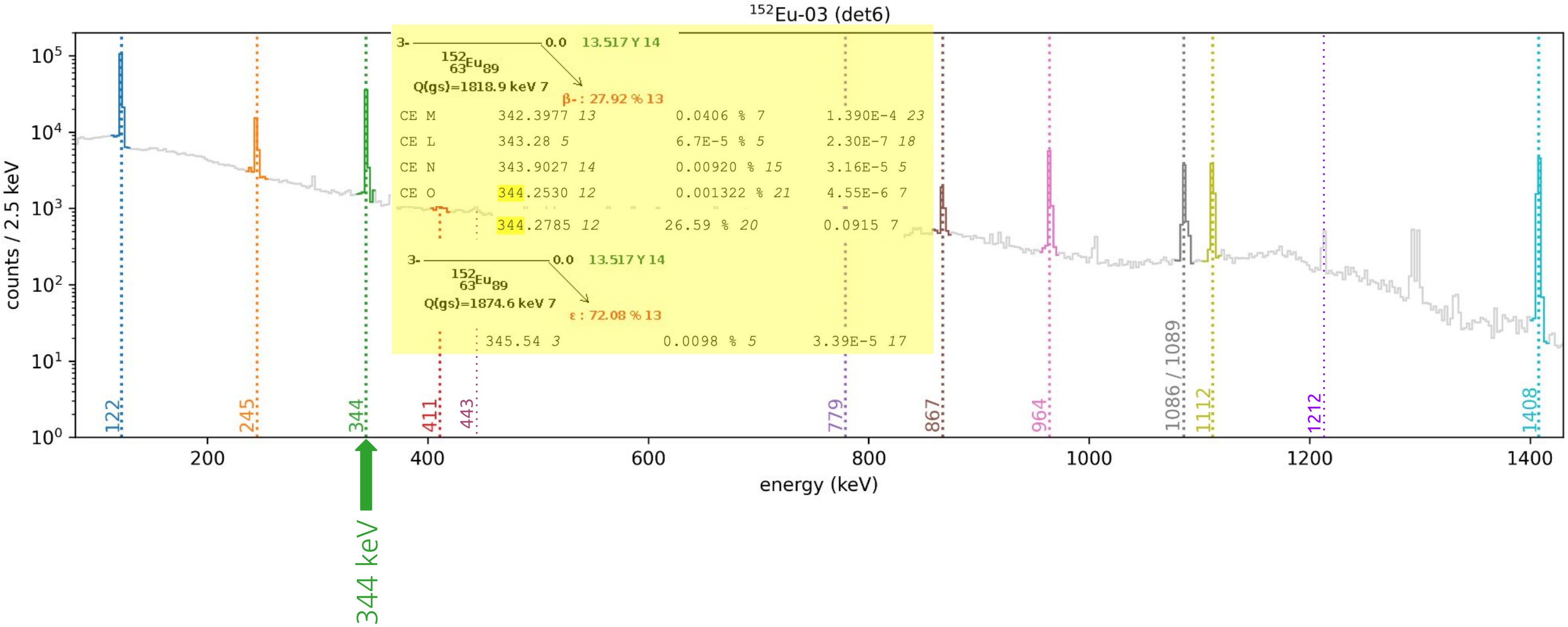




Gamma-lines evaluation





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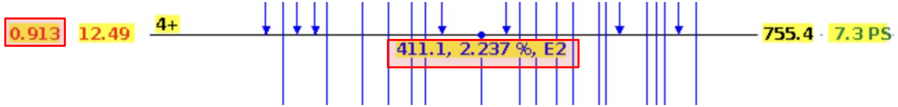

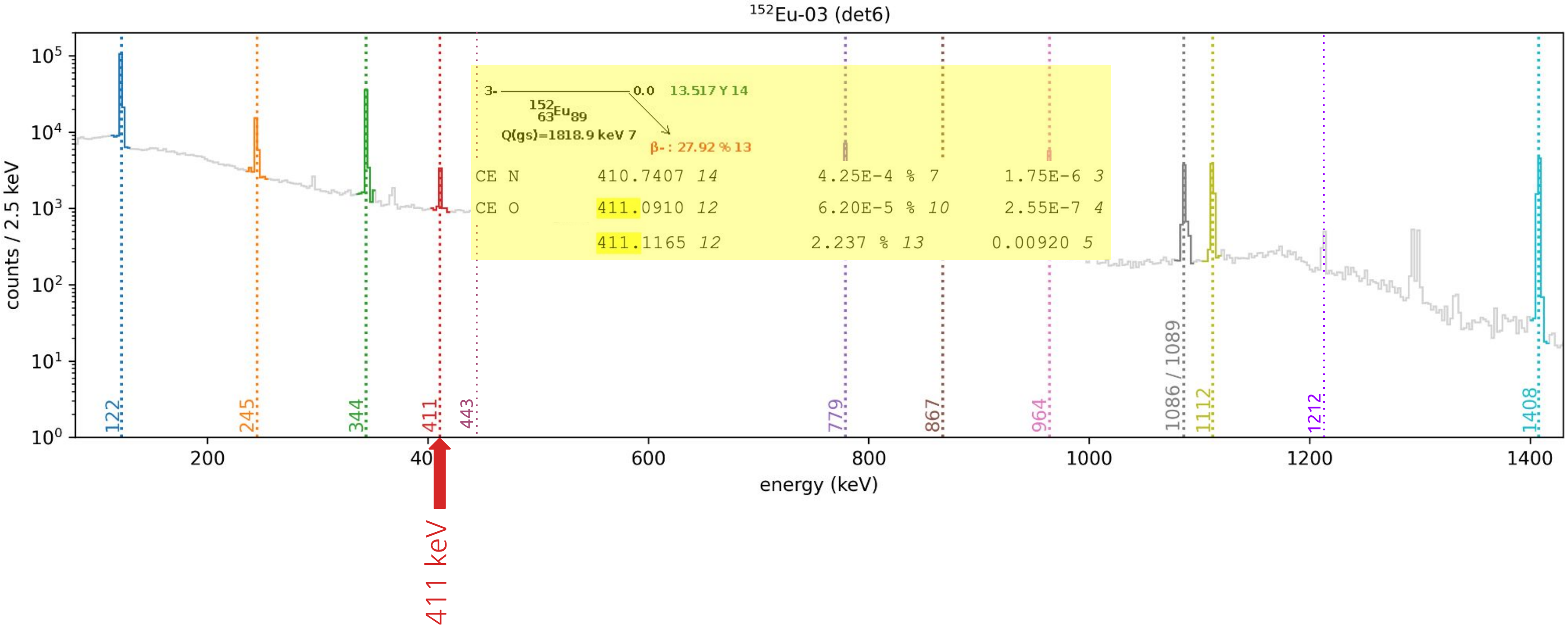

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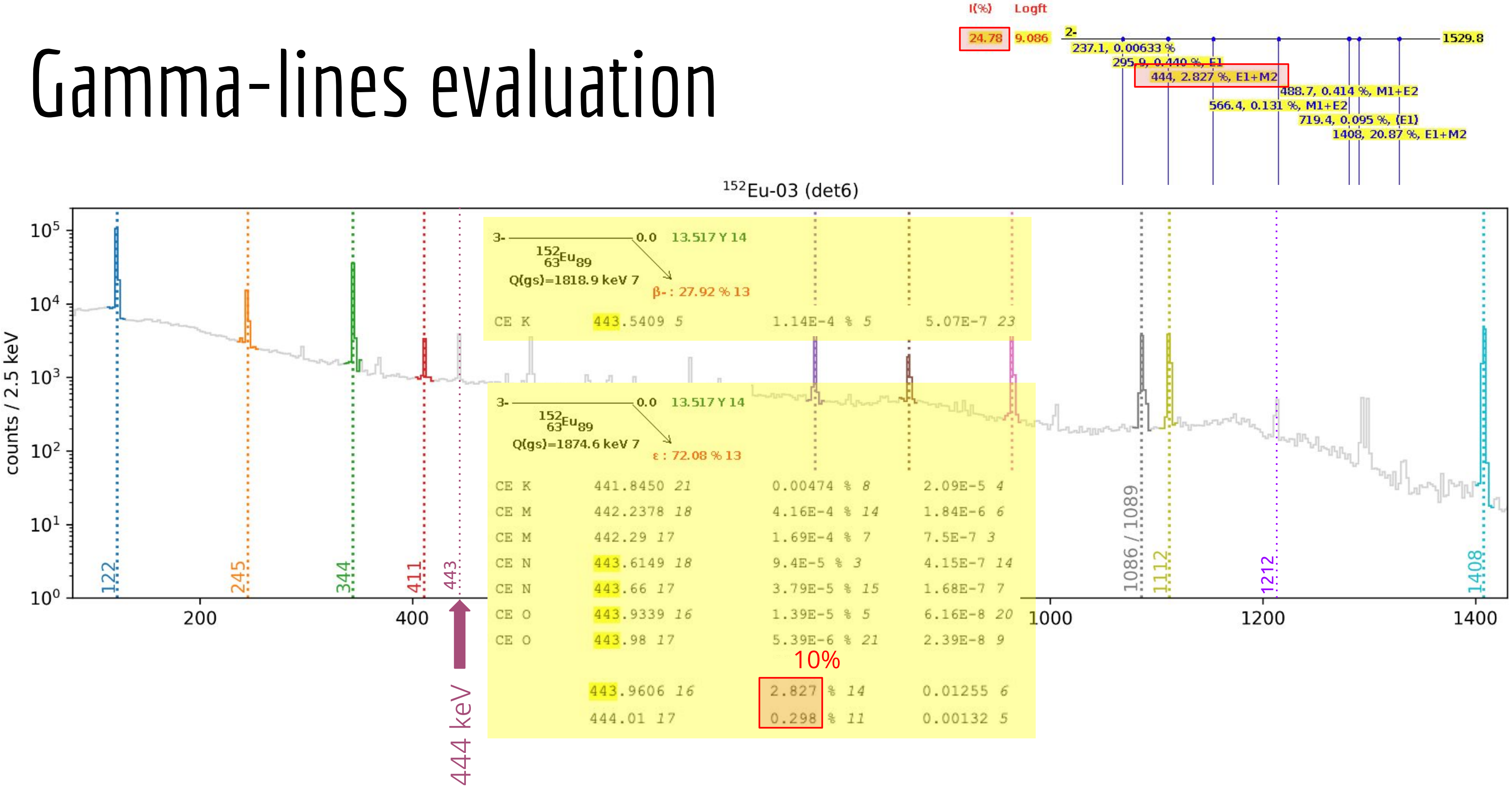

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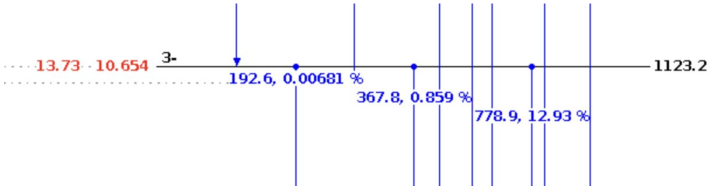

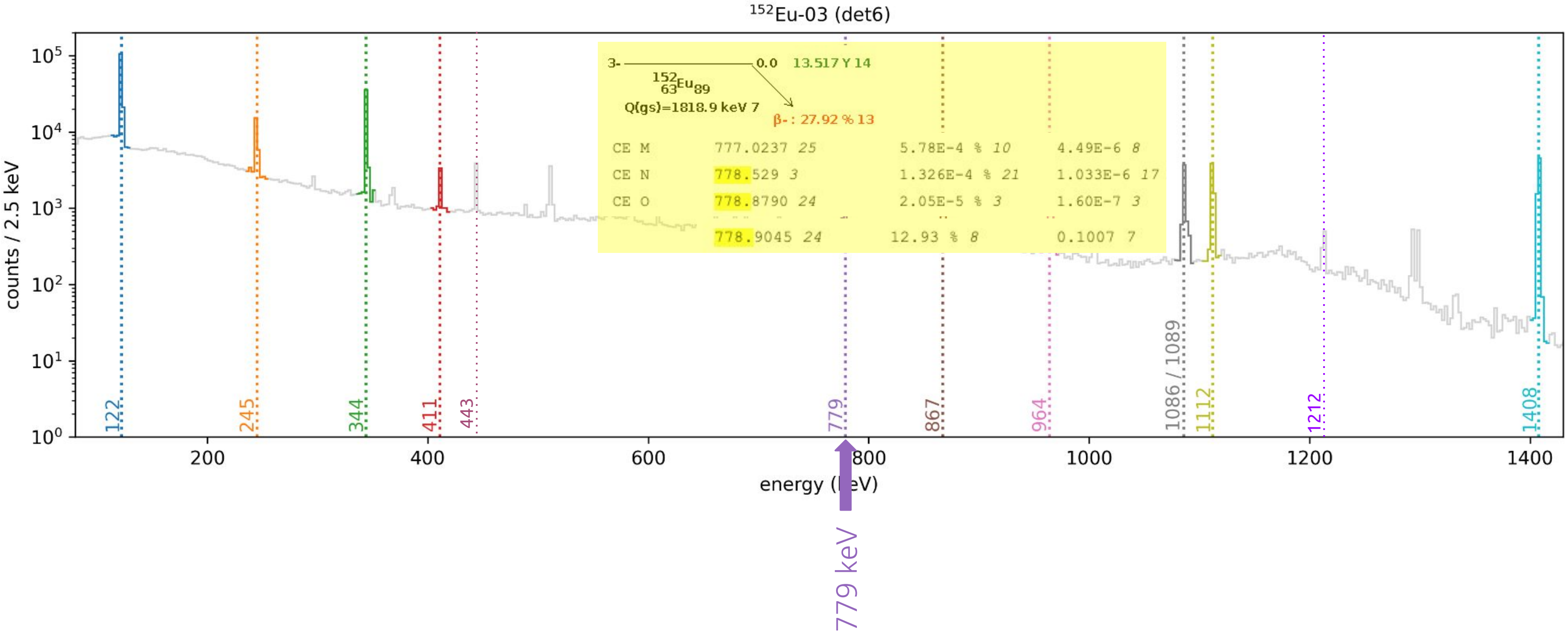

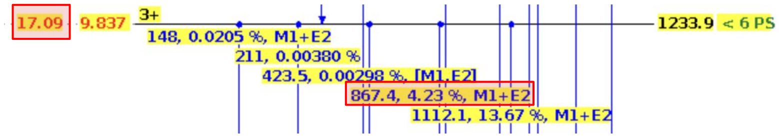

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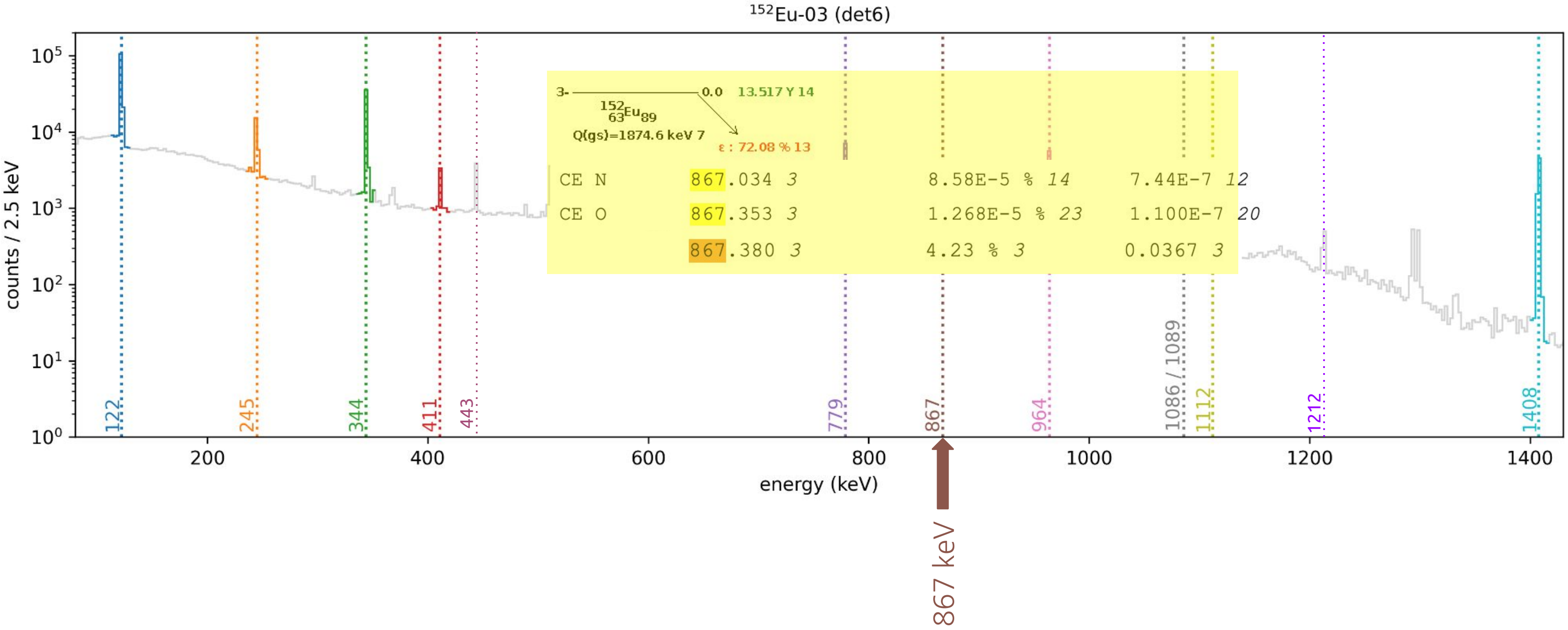

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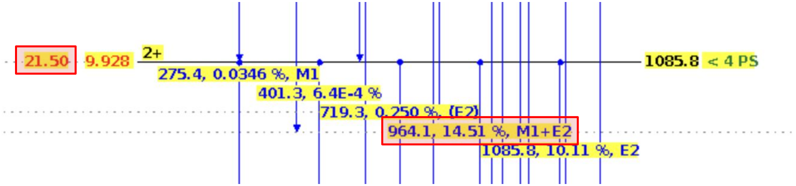

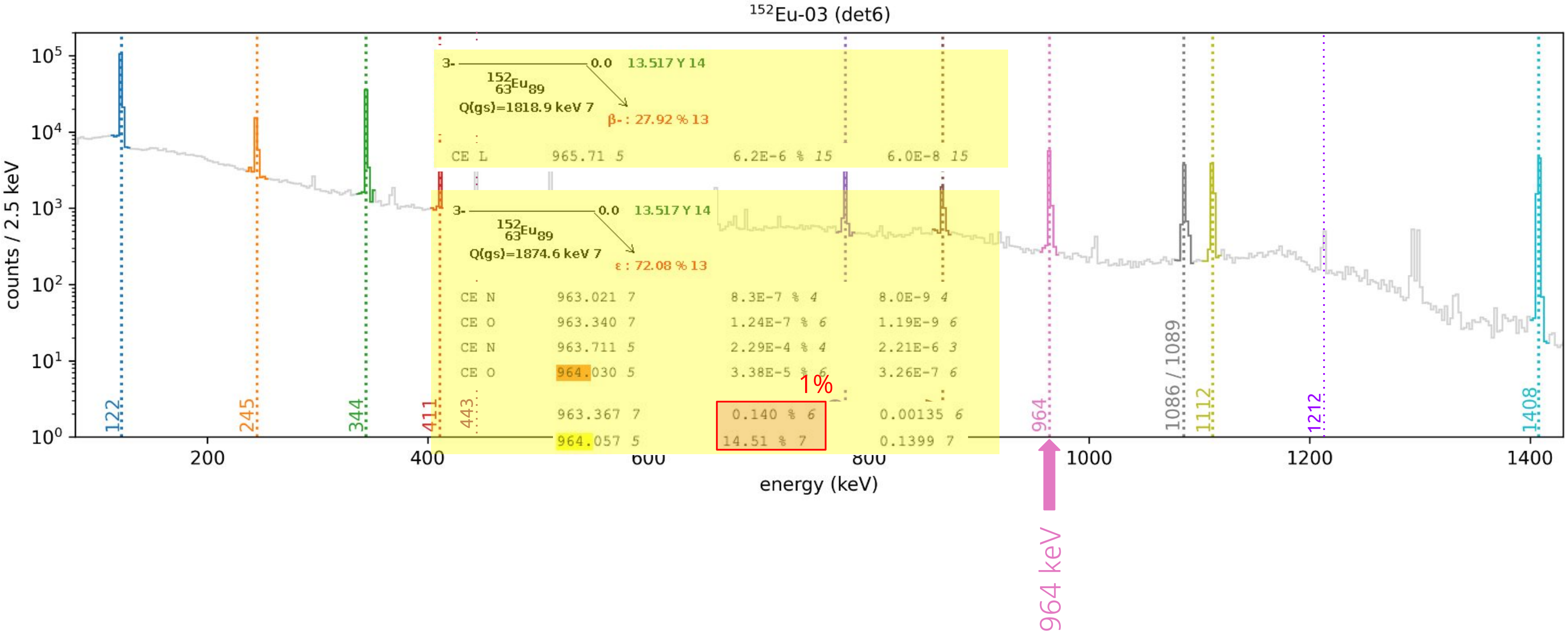

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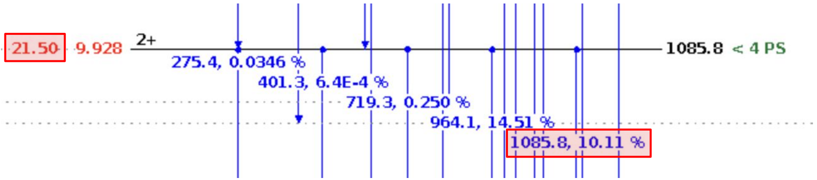

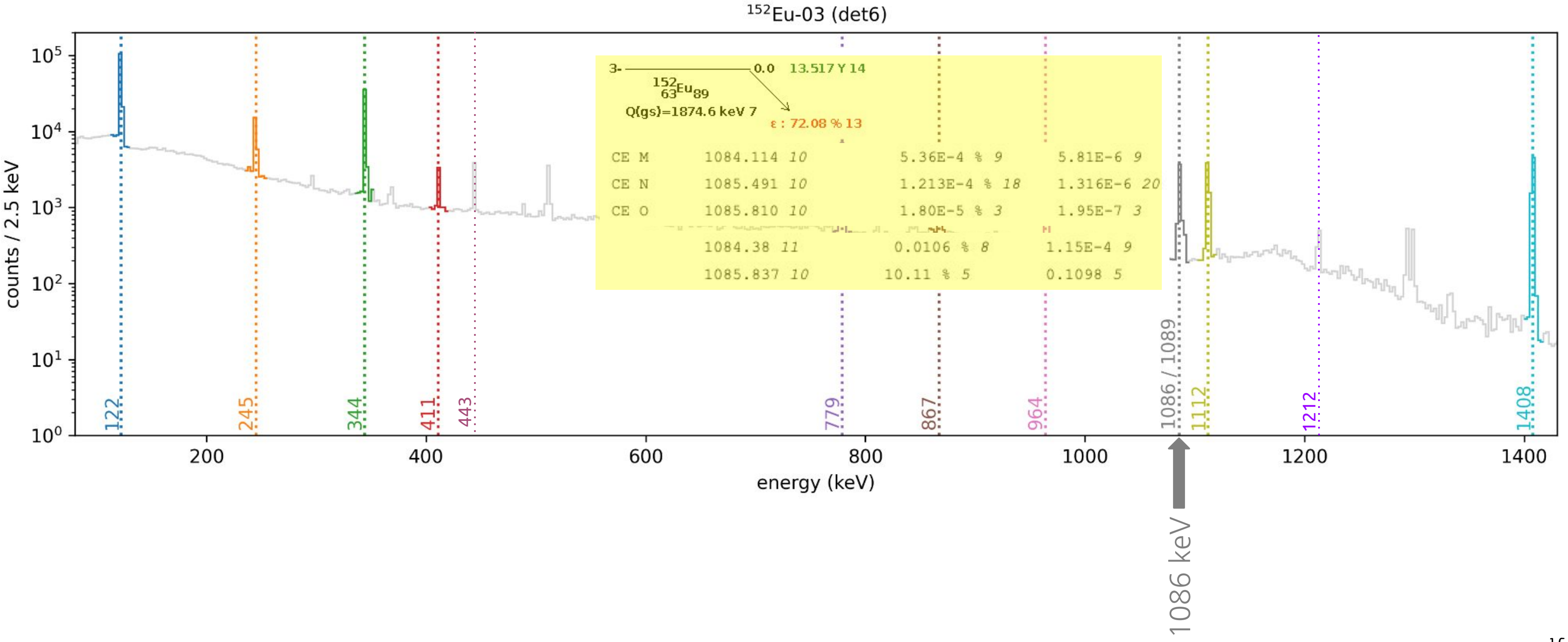

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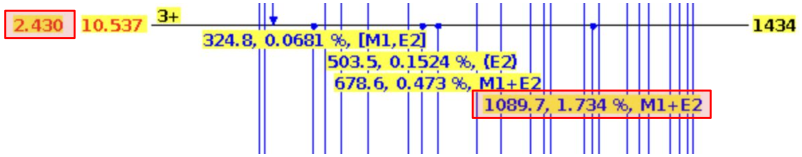

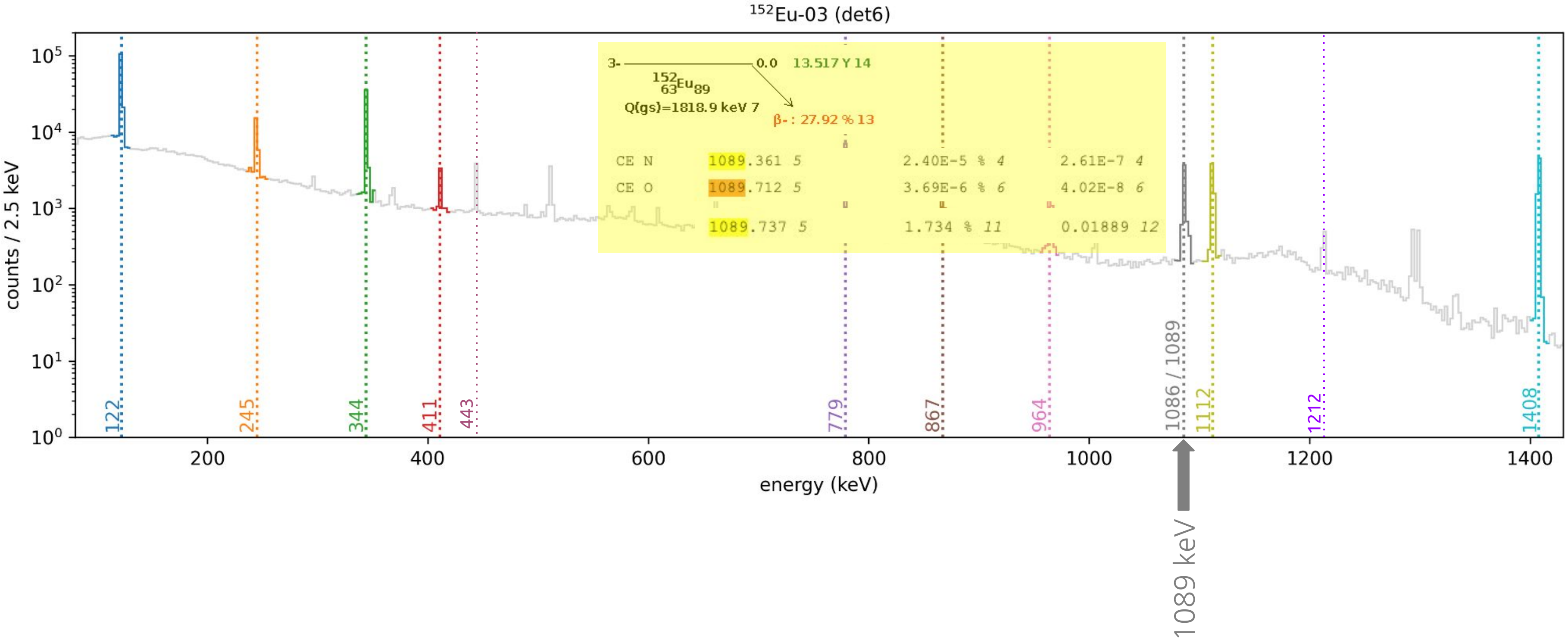

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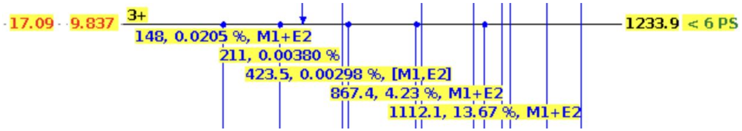
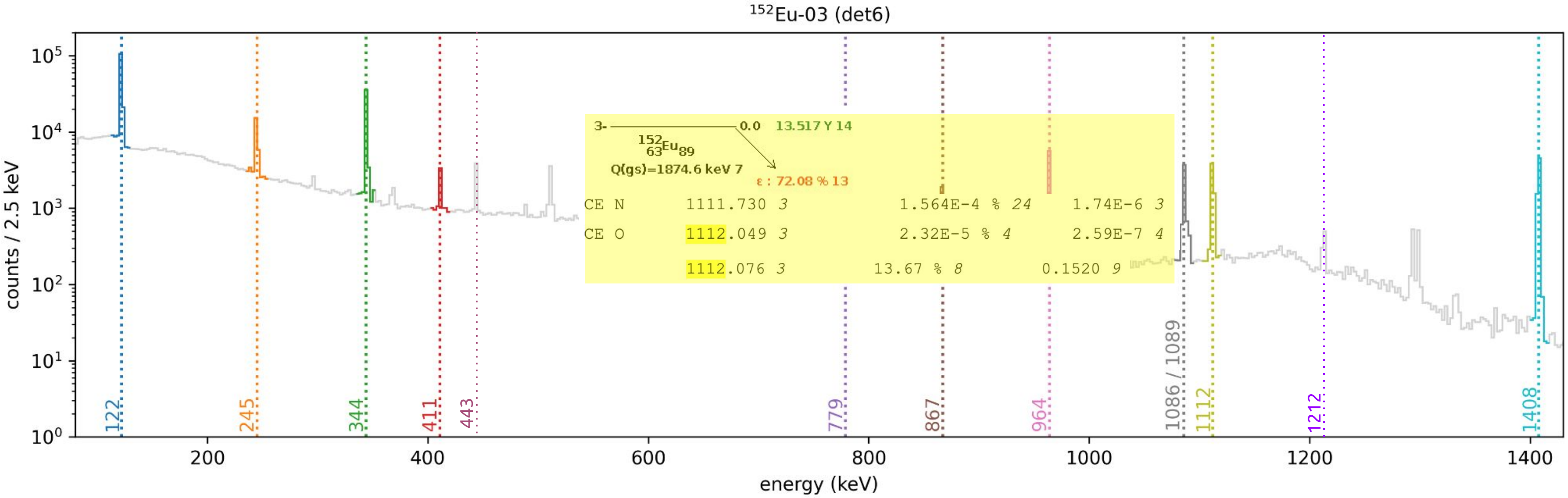
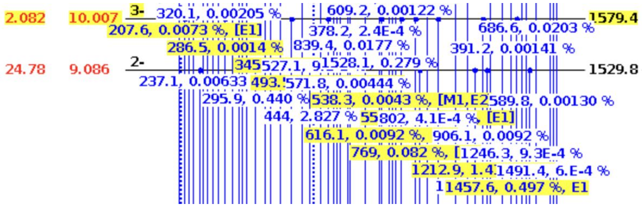
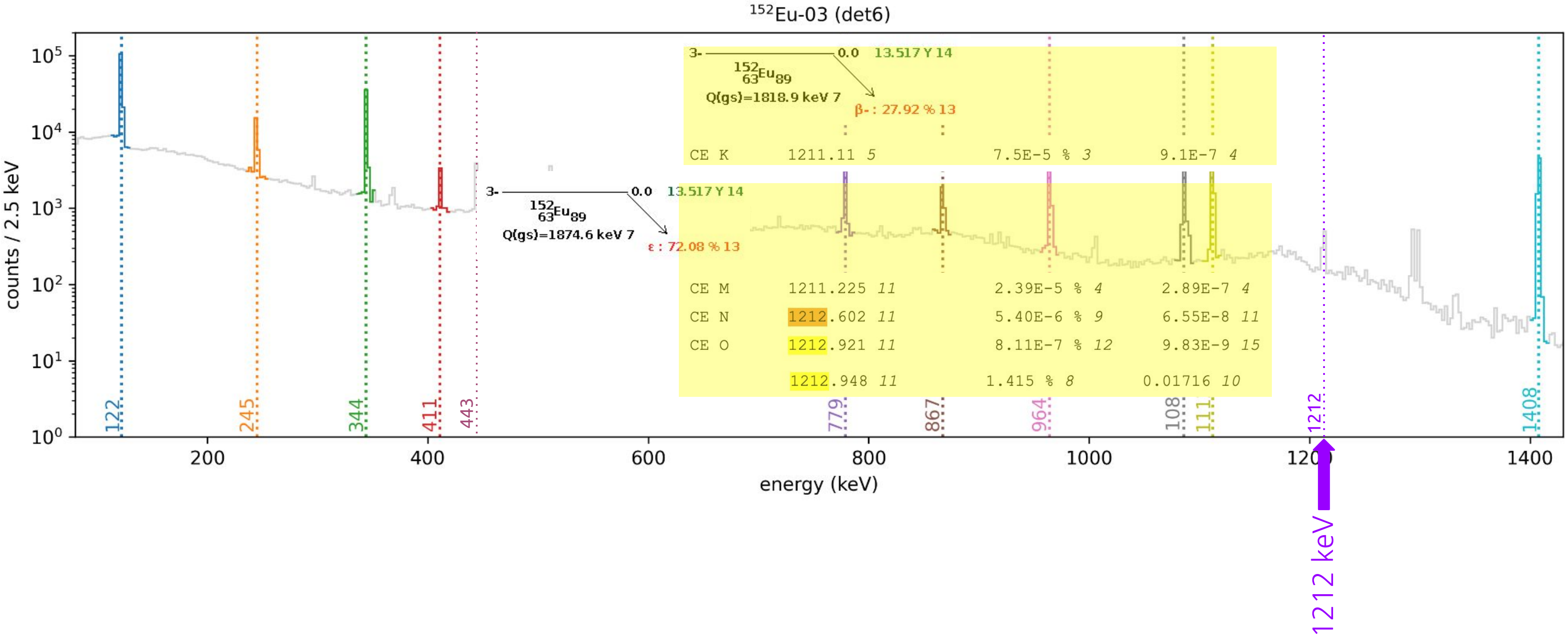




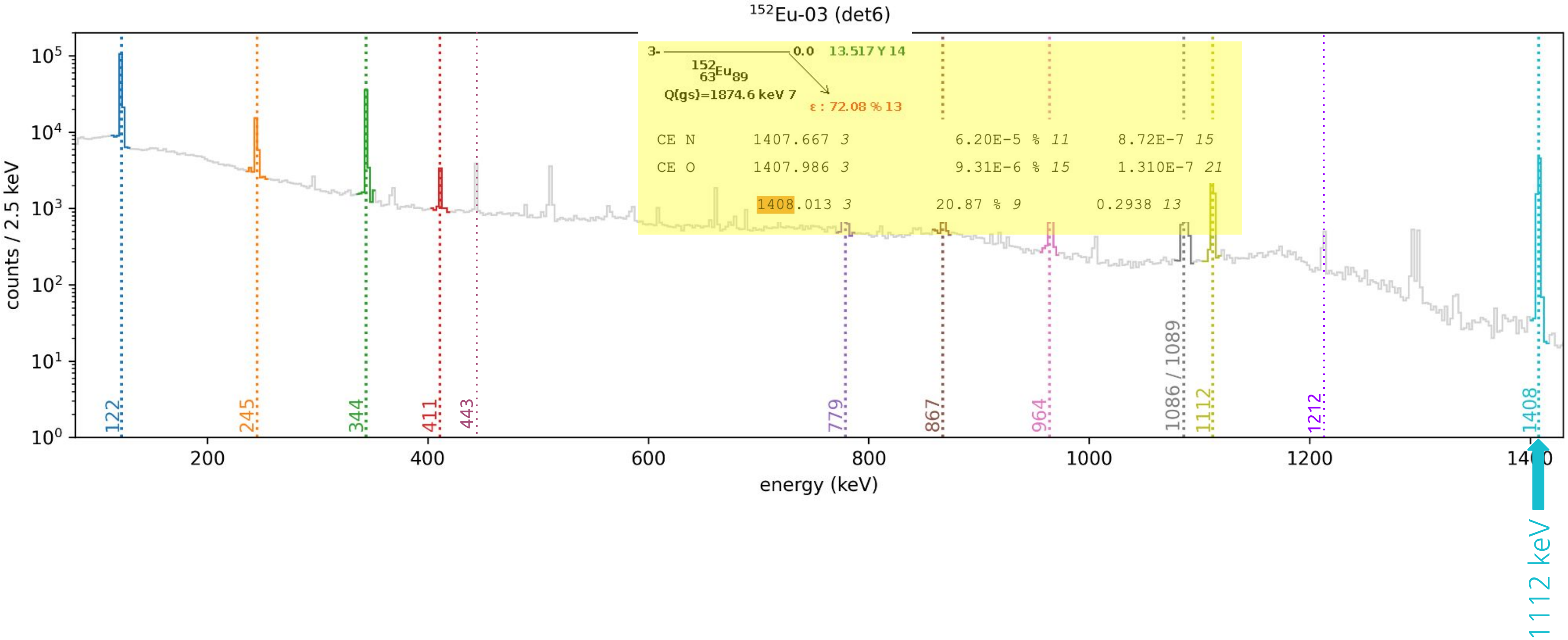
1112 keV

Gamma-lines evaluation

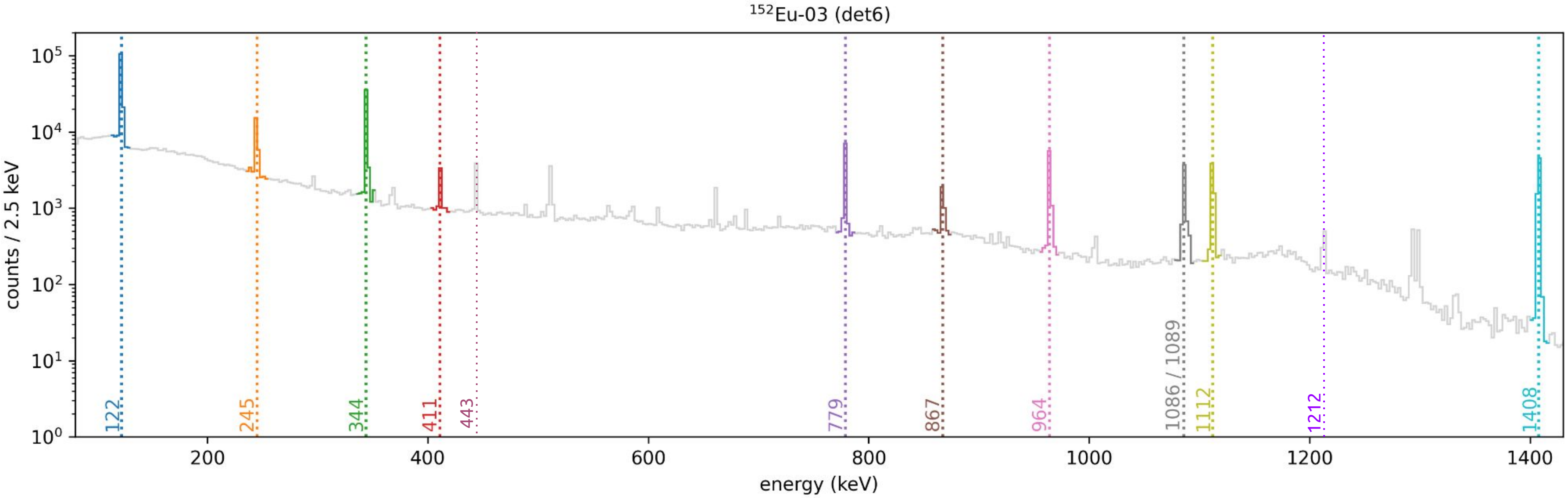




Gamma-lines evaluation



Final selection



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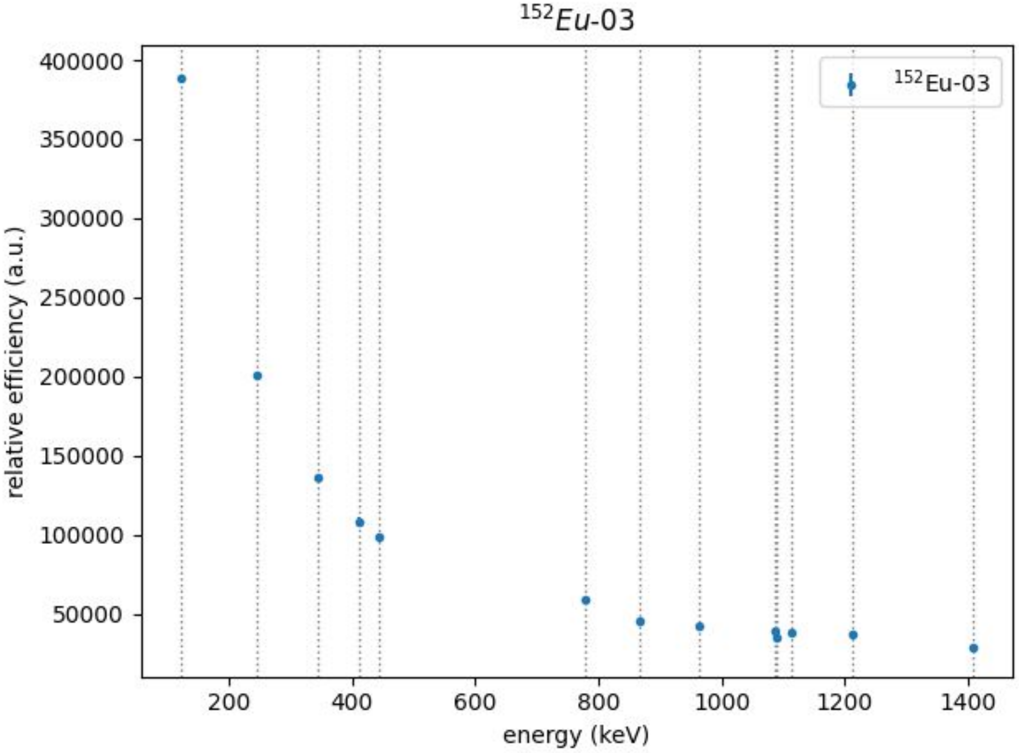

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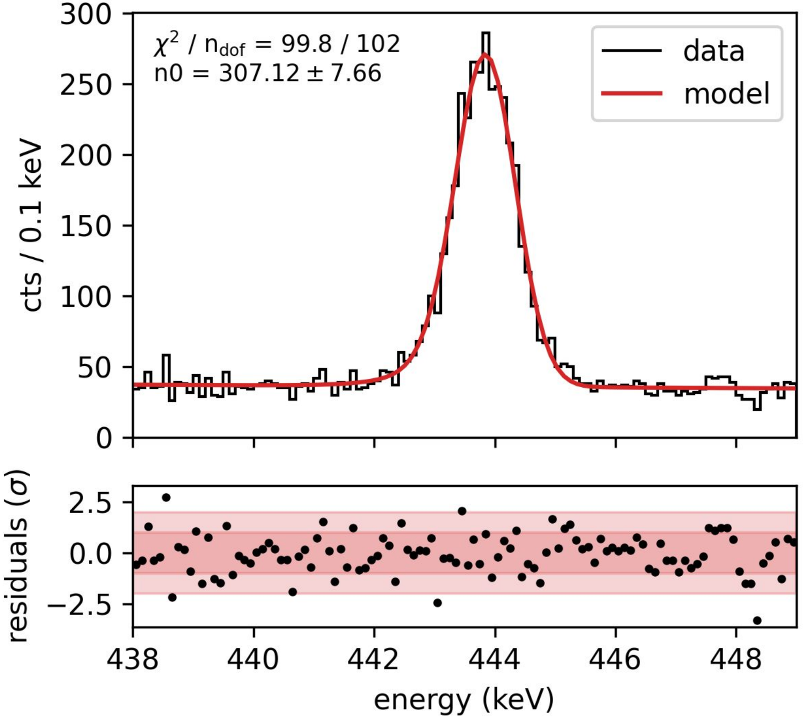
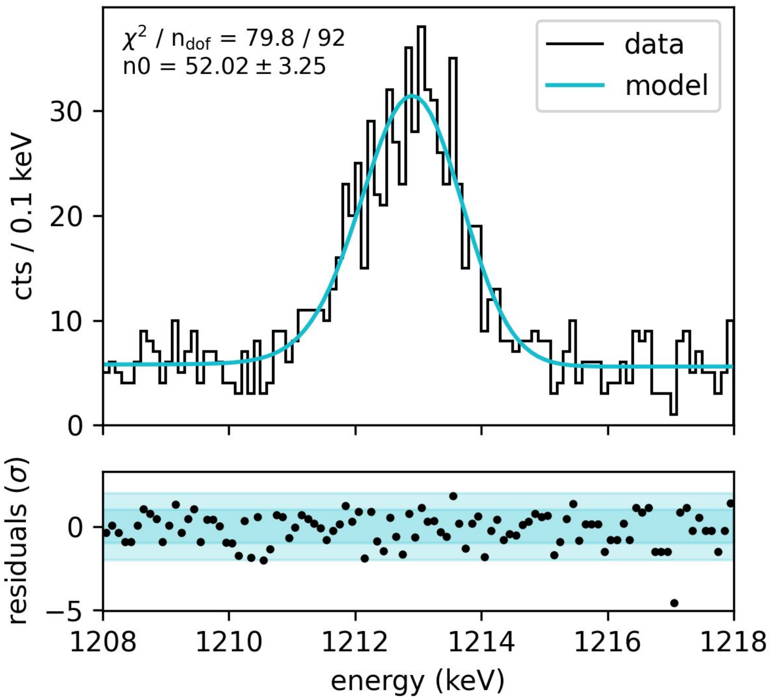




Steps

1. Test analysis chain
   - Select calibration data

---> Revise ^{152}Eu for summation peaks

---> Intensity evaluation

---> High energy data (**no-gamma lines above 1.5 MeV**)

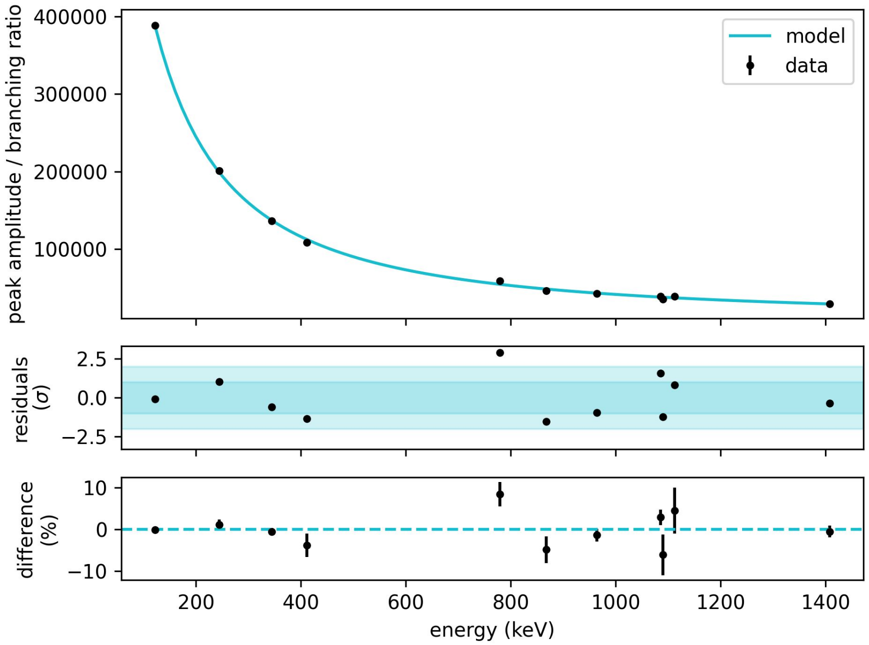
Steps

1. Test analysis chain
   - Select calibration data
   - Select detector
   - Fit calibration peaks
   - Produce relative efficiency curve ---> Try different efficiency curves
   - Select beam data
   - Fit peaks
   - Produce relative intensities
   - Derive partial yields
2. Apply to all 8 detectors
3. Perform multi-detector analysis

Efficiency fit

$$p(E) = \frac{1}{E} \cdot \sum_i C_i \ln(E)^i \; ^*$$

- χ^2 fit (Neyman) using iminuit
- model under study



AIP Conference Proceedings 1584, 38–44 (2014)

Efficiency fit

- Model 1* $\longrightarrow$ $p(E) = \frac{1}{E} \cdot \sum_i C_i \ln(E)^i$
- Model 2** $\longrightarrow$ $ln(E) = \sum_i a_i \cdot ln(\frac{c}{E})^i$
- Model 3** $\longrightarrow$ $ln(E) = \sum_i a_i \cdot ln(E)^i$
- Model 4** $\longrightarrow$ $ln(E) = a_1 \cdot E + a_2 + a_3 \cdot E^{-1} + \ldots + a_4 \cdot E^{-4}$
- Model 5** $\longrightarrow$ $e(E) = \frac{c}{a \cdot E^{-x} + b \cdot E^{y}}$

*AIP Conference Proceedings 1584, 38–44 (2014)
**Practical Gamma Spectroscopy, G.Gilmore & J. Hemingway

Efficiency fit

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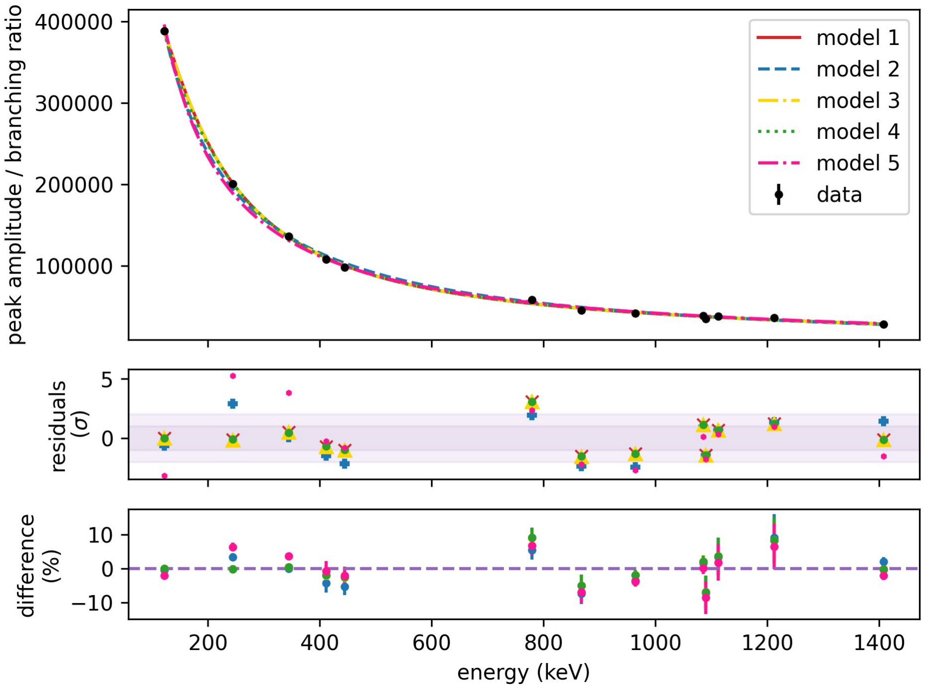

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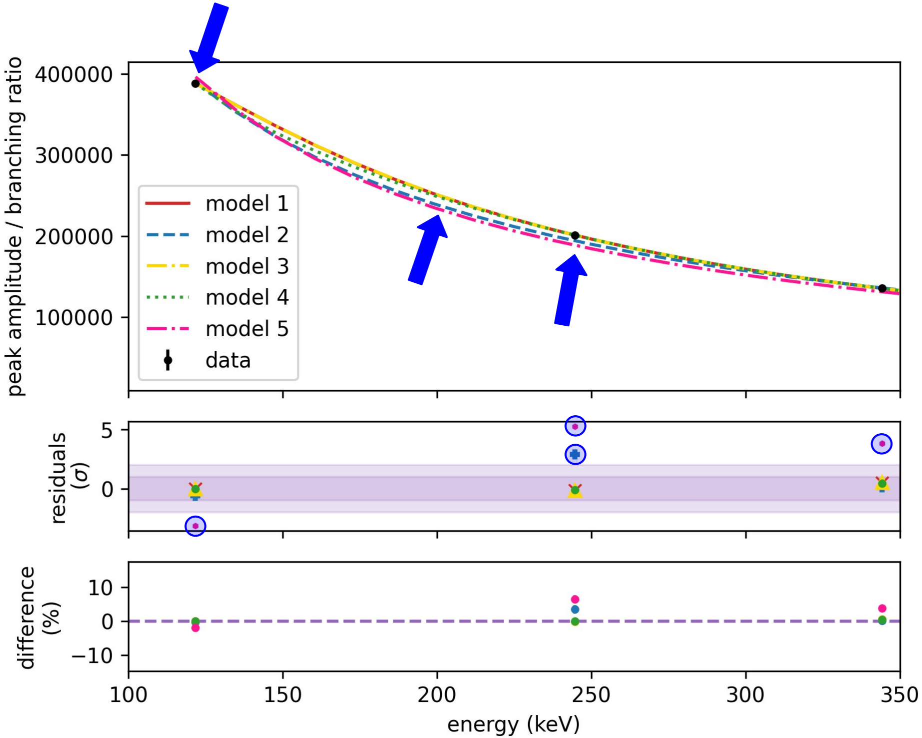

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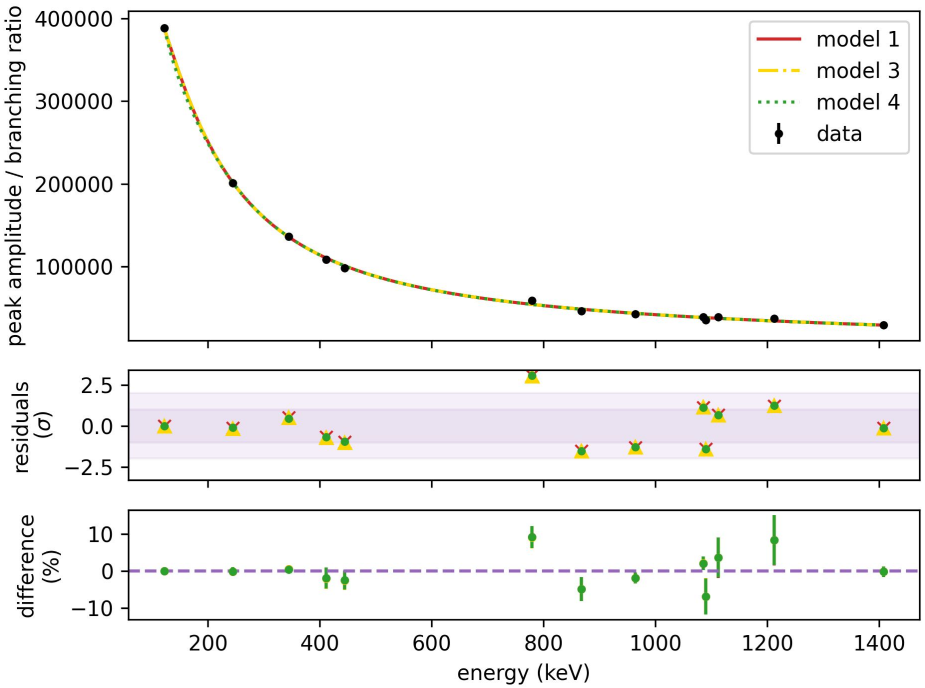

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Steps

1. Test analysis chain

    ○ Produce relative efficiency curve ---> Try different efficiency curves

    ---> Test with combine fit