GE DETECTOR CALIBRATION WITH TRAPEZOIDAL FILTER AND COMPARISON USING DIFFERENT FILTERS

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REVIEW

- We use a fit function with four components:
  - Gaussian part to model the peak
  - Tail portion restricted to some fraction of the peak for incomplete charge collection
  - Complimentary error and linear functions for Compton scattering and a flat background
- Data processing involved energy reconstruction using gaussian filter
- Some quality cuts were applied to the data
- Systematic errors from different fitting methods were included

UPDATE

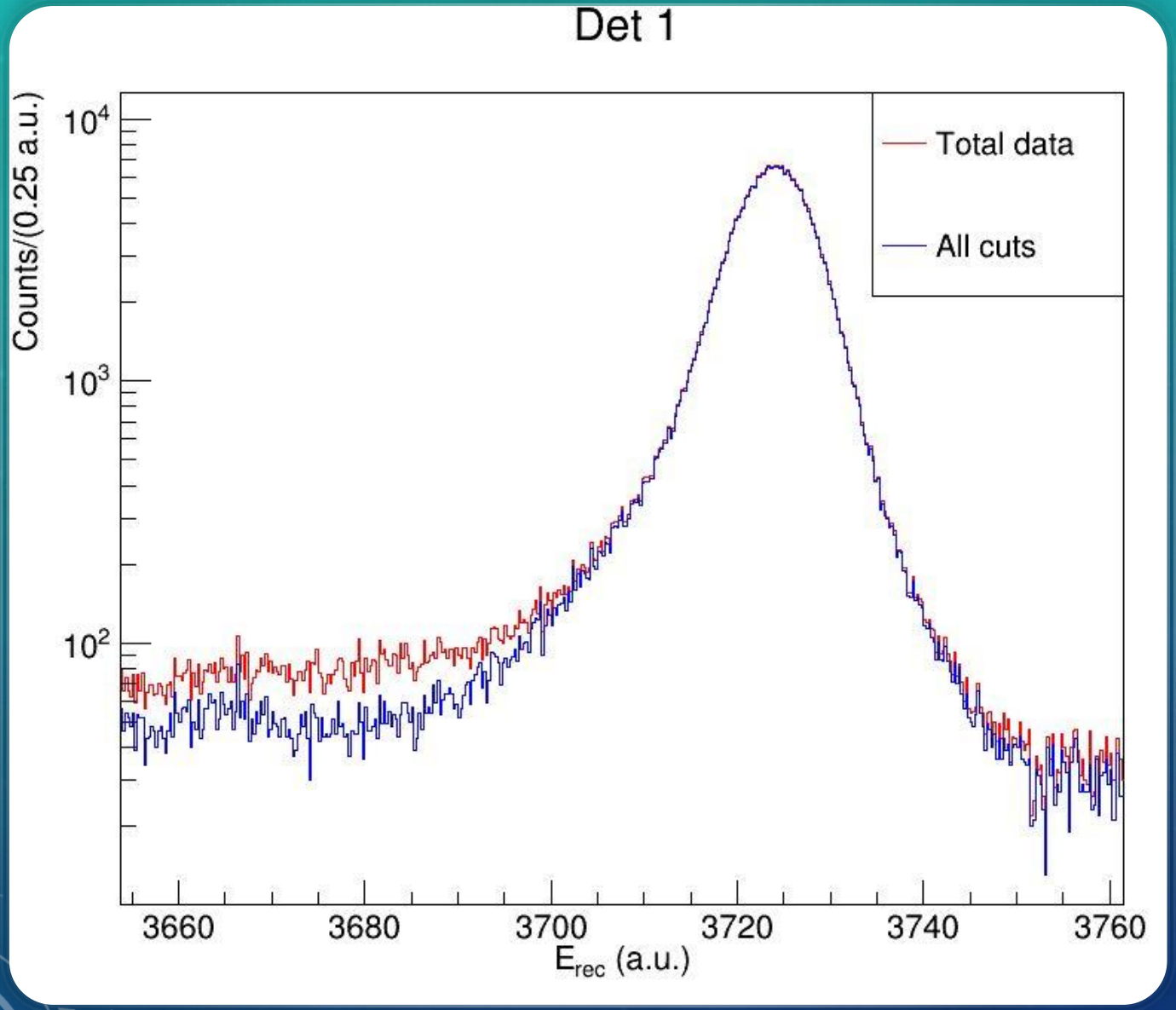
- Energy reconstruction using trapezoidal filter was done and tier2 files were produced
- Same fit function is used, and exact same procedure is repeated
- Quality cuts are applied after looking at Ba136 data (~5 hrs.)
- Discussion on detector 1 and 5 is done here along with comparison of results using different filters

QUALITY CUTS

- The variables used for cuts are:
  - Trigger position
  - Baseline slope
  - Baseline sigma
  - Number of fast trapezoidal triggers
  - Time of maximum amplitude

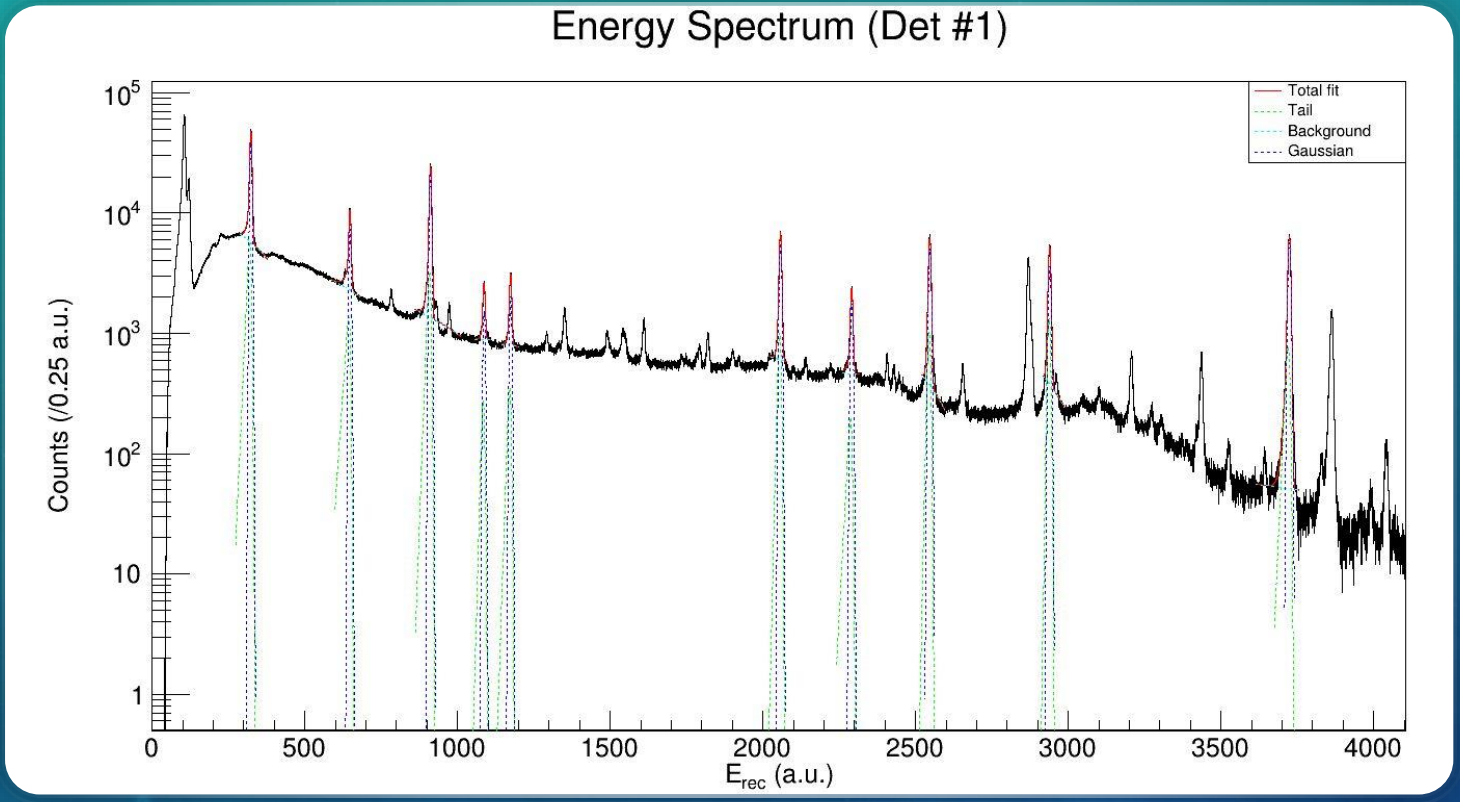
Variable	Det 1	Det 5
Trigger position (ns)	>10048,<11008	>10048,<11008
Baseline slope	<250	<200
Baseline sigma	<15	<20
# FT triggers	1	1
Max Amp time (ns)	<14080	<14080

EFFECT OF CUTS ON PEAKS



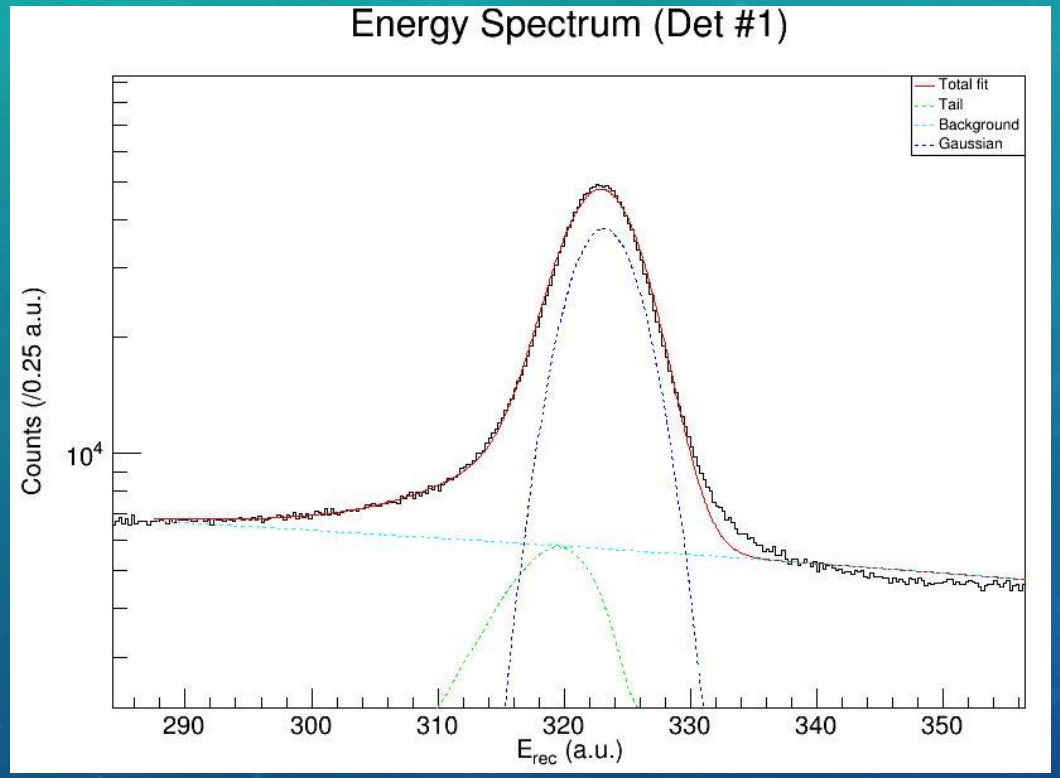
- After applying all the cuts, survival % of events for every peak is within 96-98%
- Peak at 1408 keV with and without cuts (red total, blue with cuts)

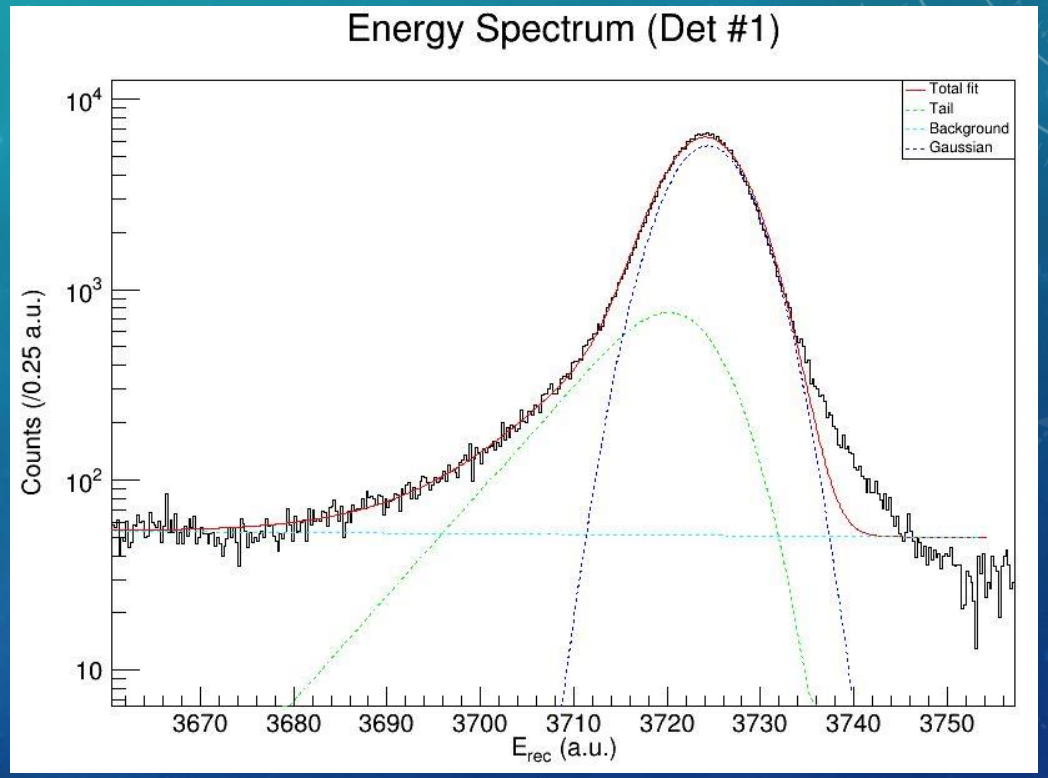
ENERGY SPECTRUM



- 10 peaks are fitted
- Using MIGRAD algorithm, status “converged” and Error Matrix was “accurate”

FITTED PEAKS

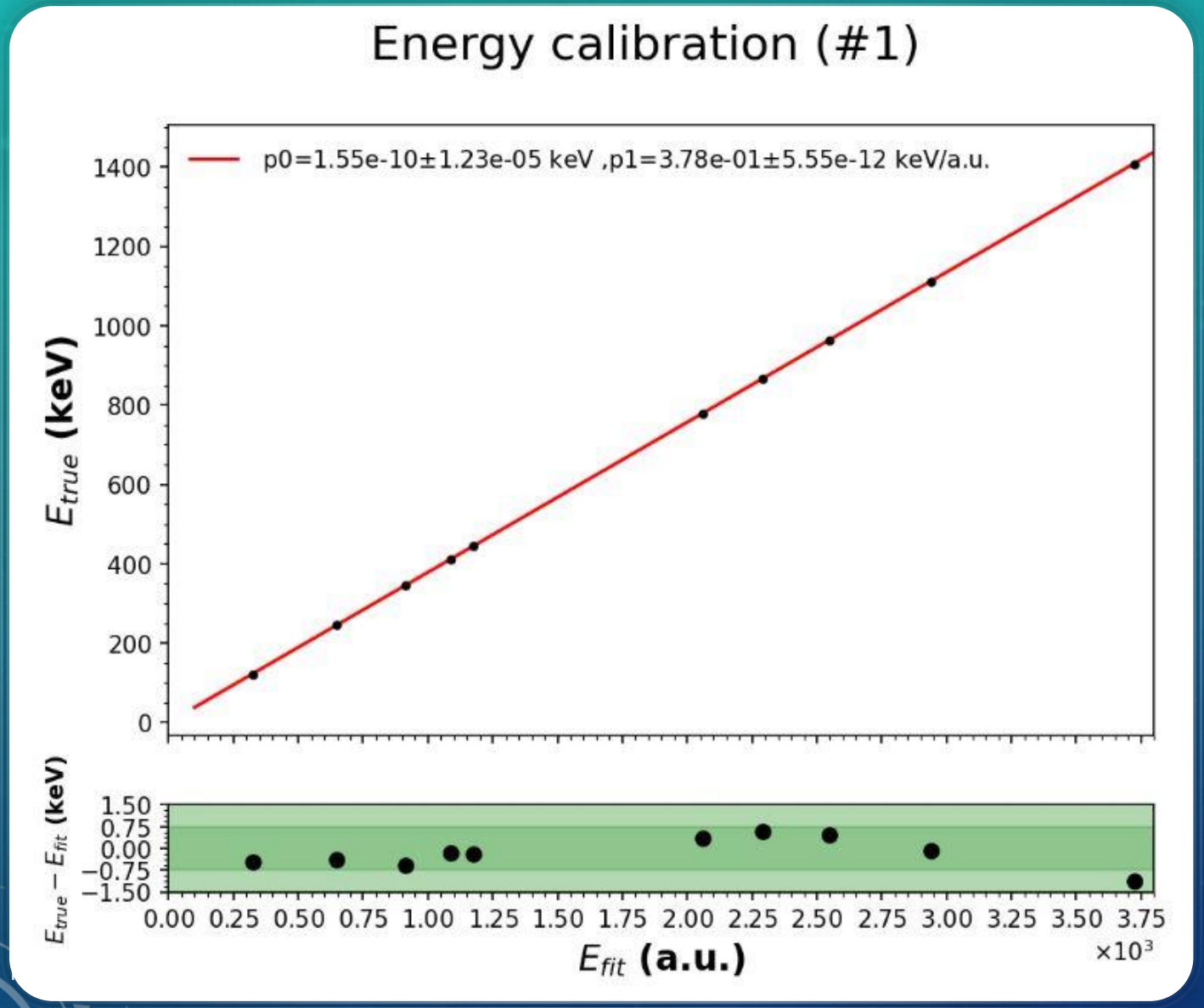




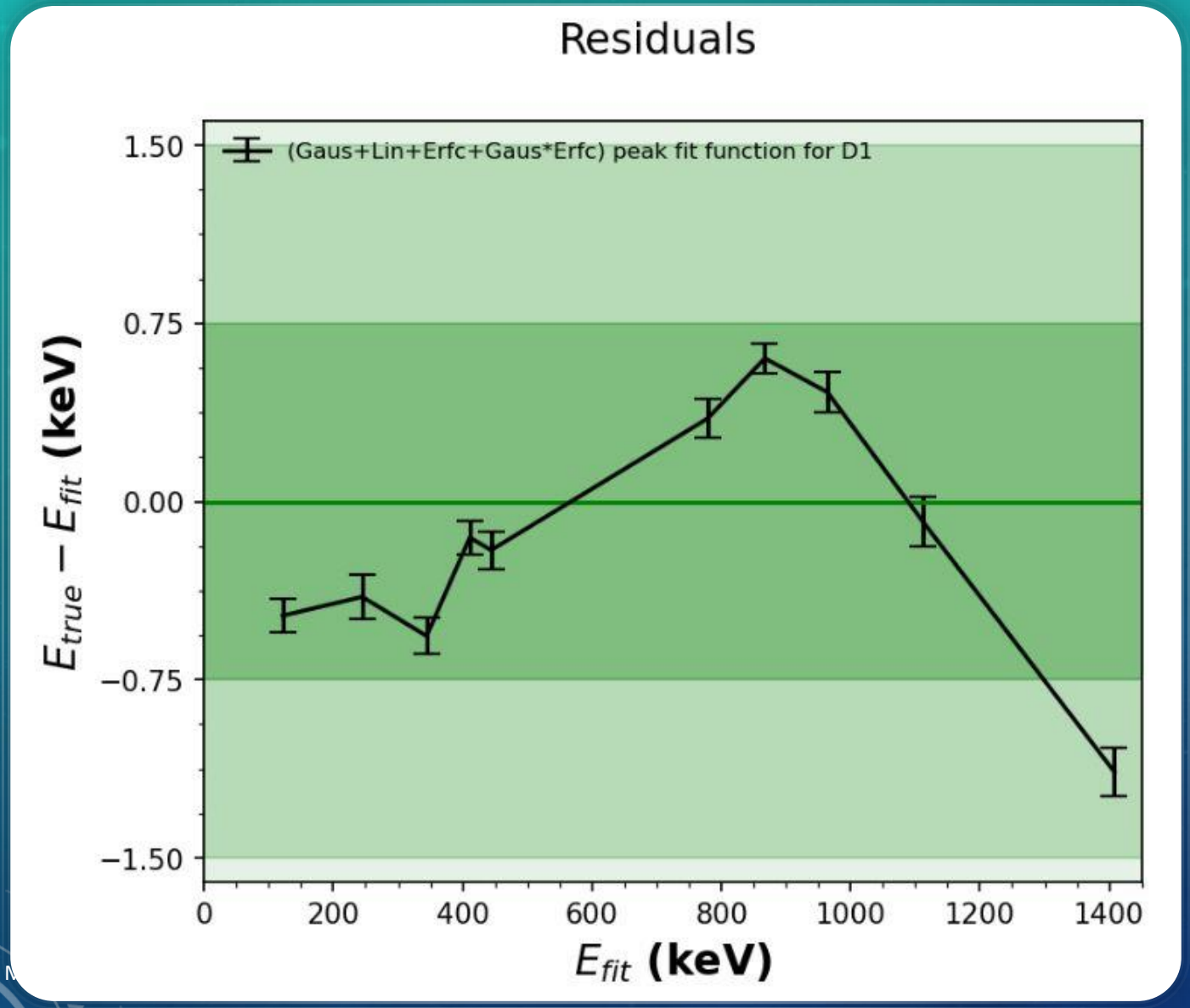
121 keV peak

1408 keV peak

ENERGY CALIBRATION

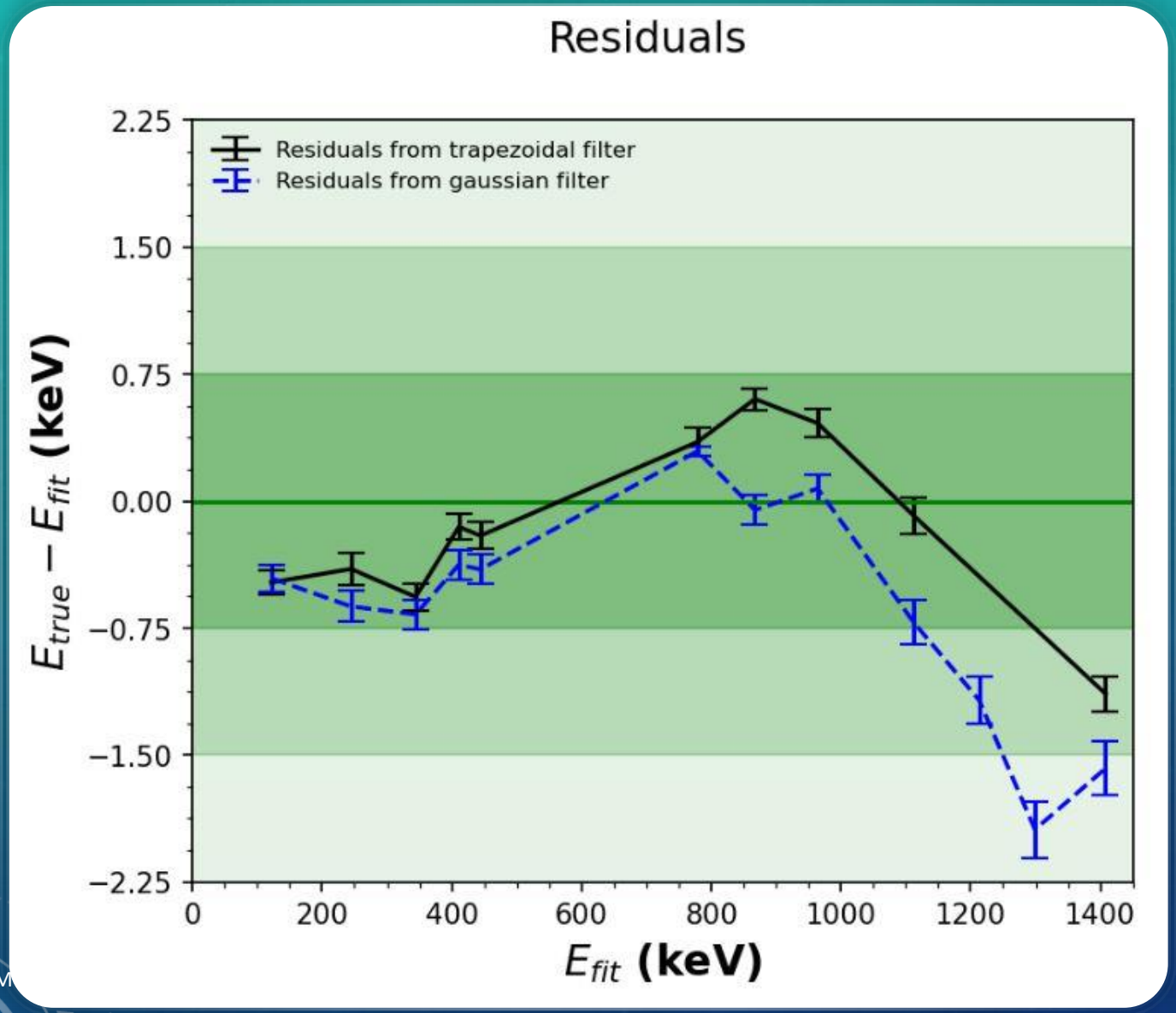


- Calibration constant:
  - 0.378 keV/a.u. with trapezoidal filter and
  - 0.797 keV/a.u. with gaussian filter



RESIDUALS

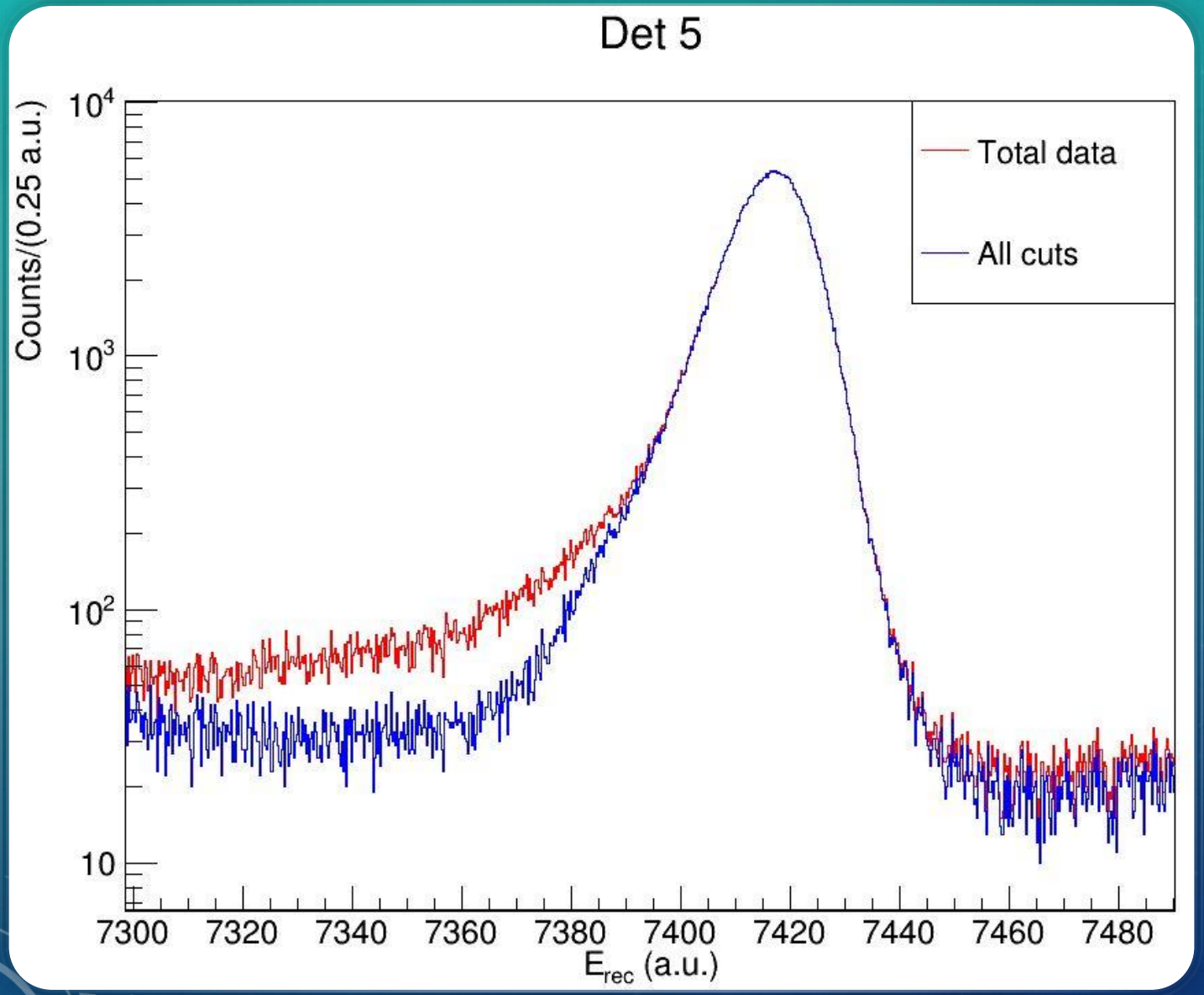
- Residuals are between -1.14 and 0.6 keV



COMPARISON OF RESIDUALS

- With trapezoidal filter, residuals are between -1.14 and 0.6 keV (black-solid)
- With gaussian filter, residuals are between -1.94 and 0.29 keV (blue-dashed)

EFFECT OF CUTS ON PEAKS



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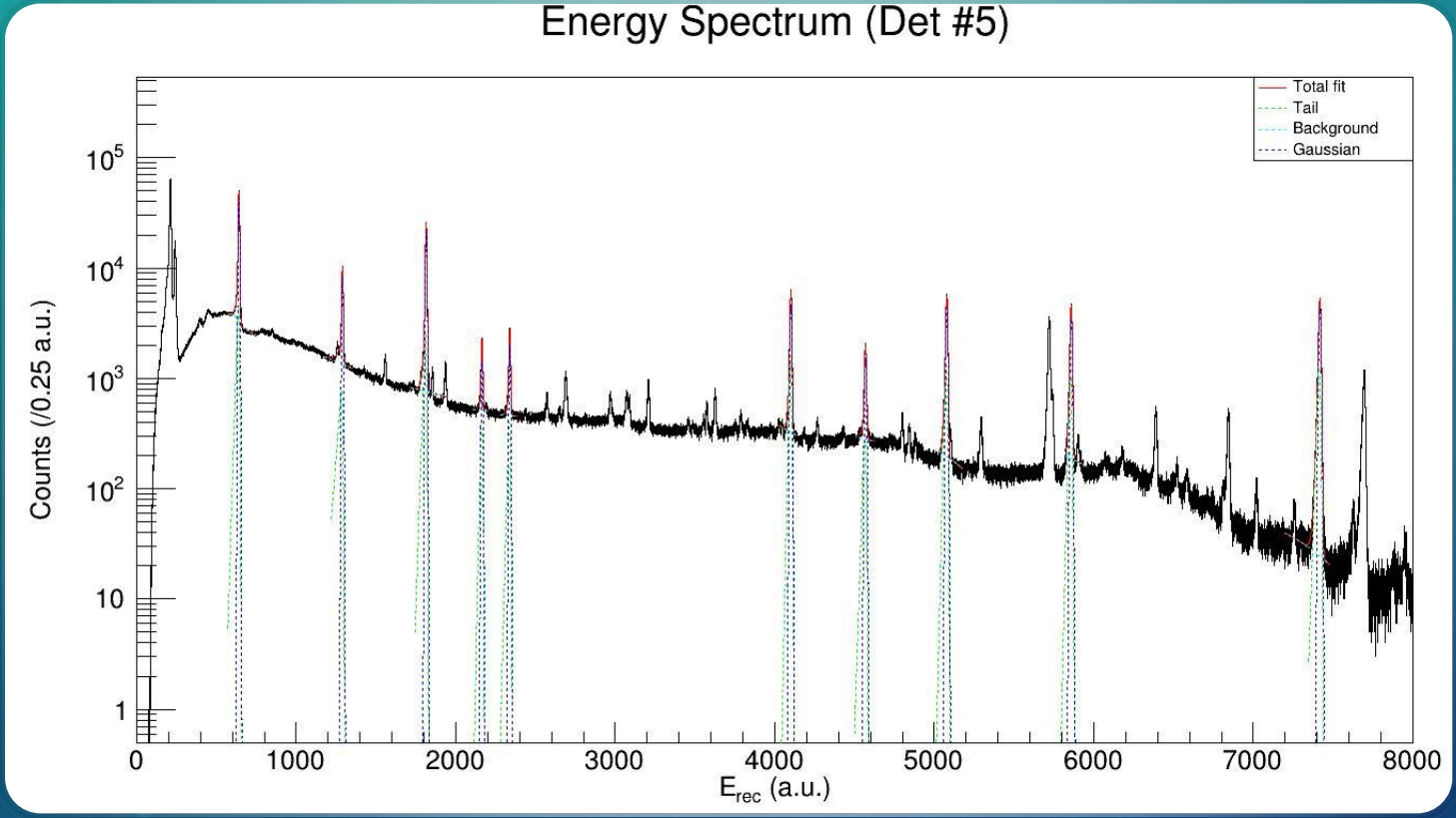
ENERGY SPECTRUM



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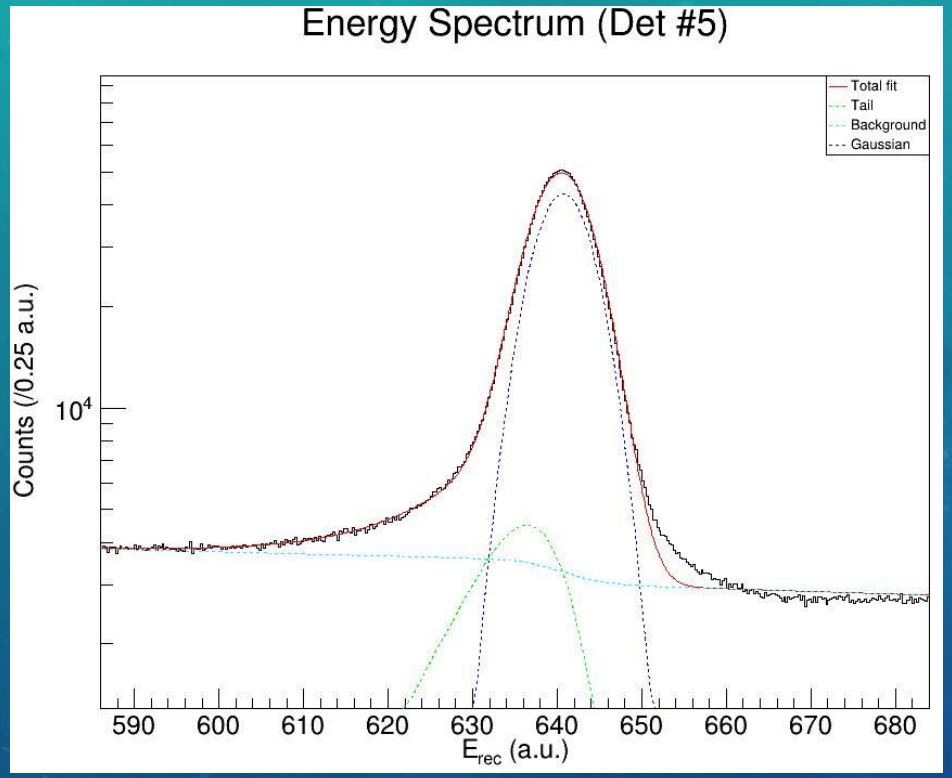
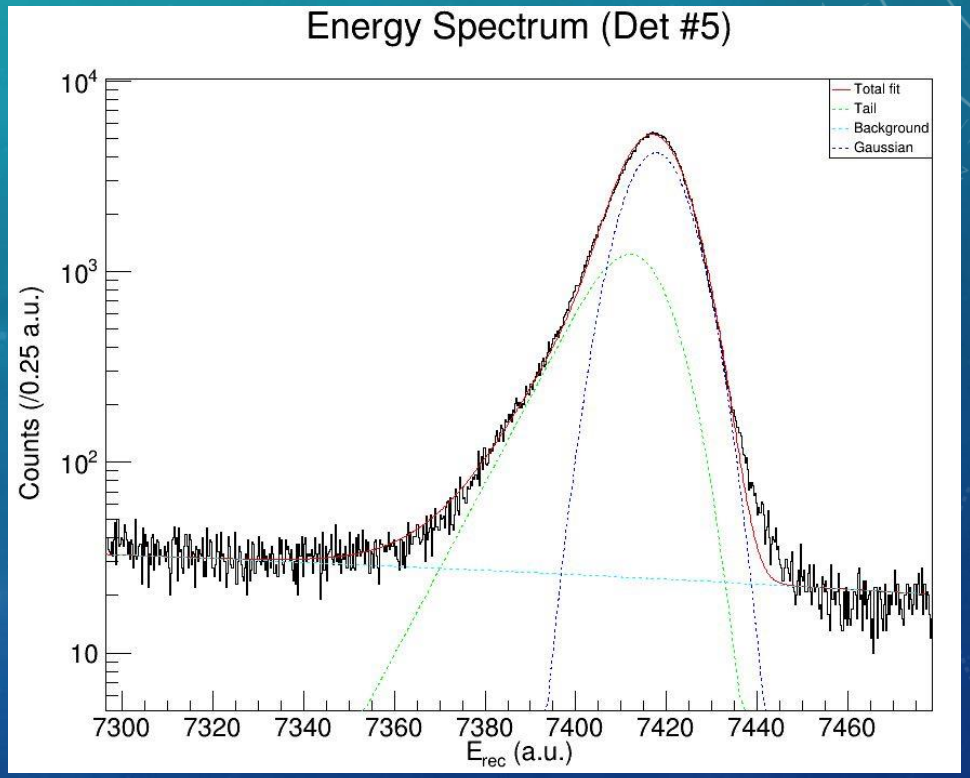
FITTED PEAKS

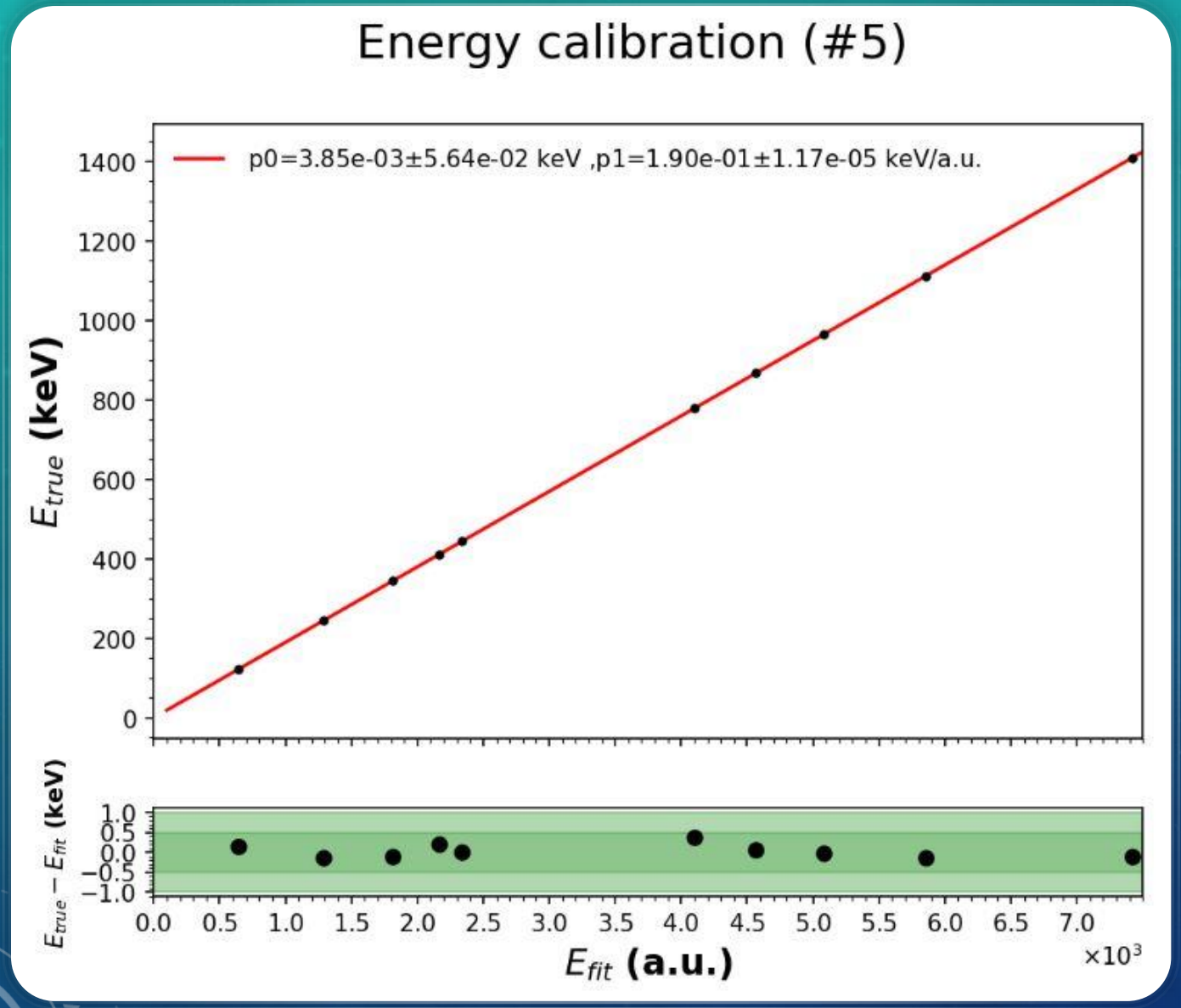




121 keV peak

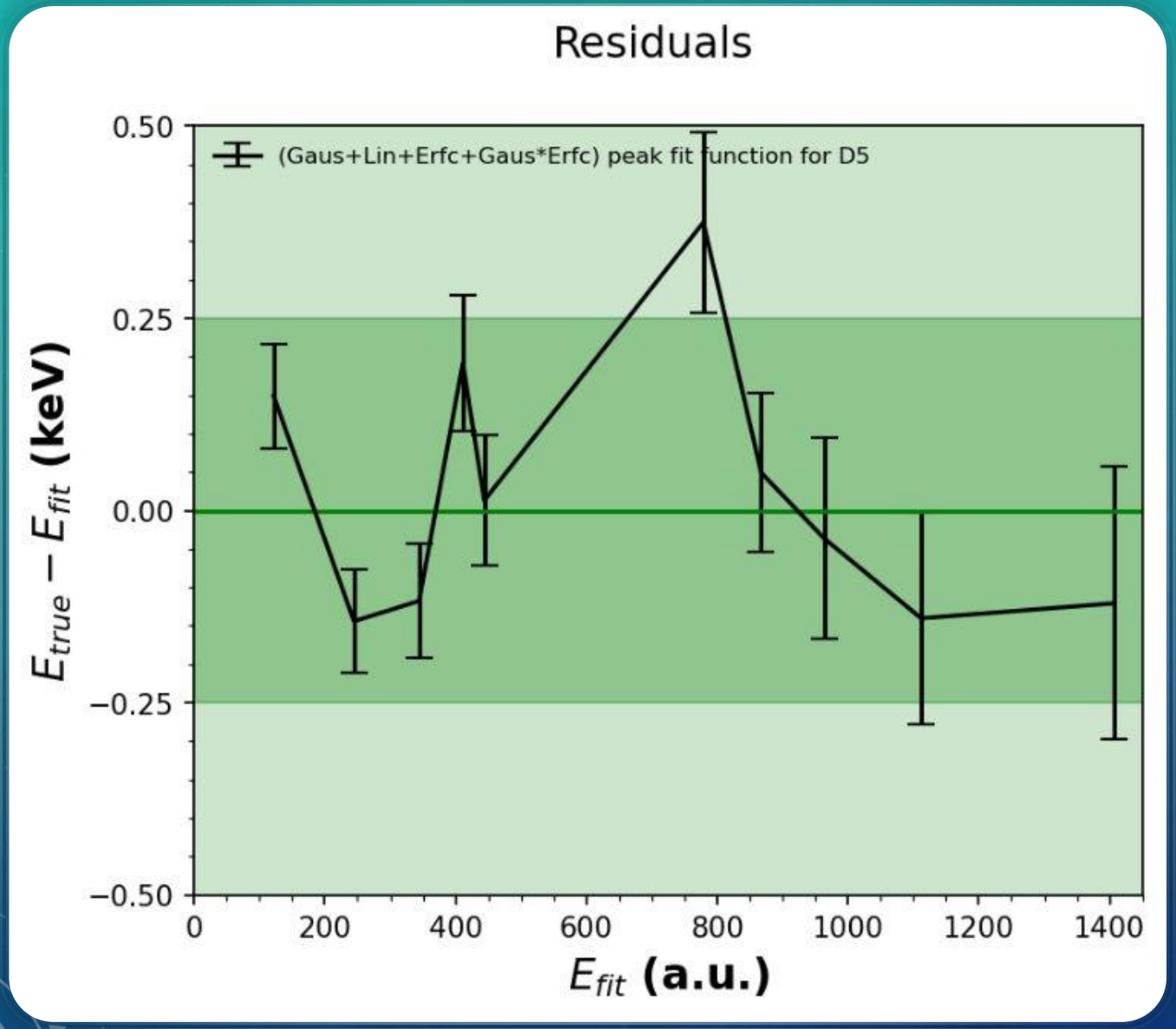
1408 keV peak

ENERGY CALIBRATION



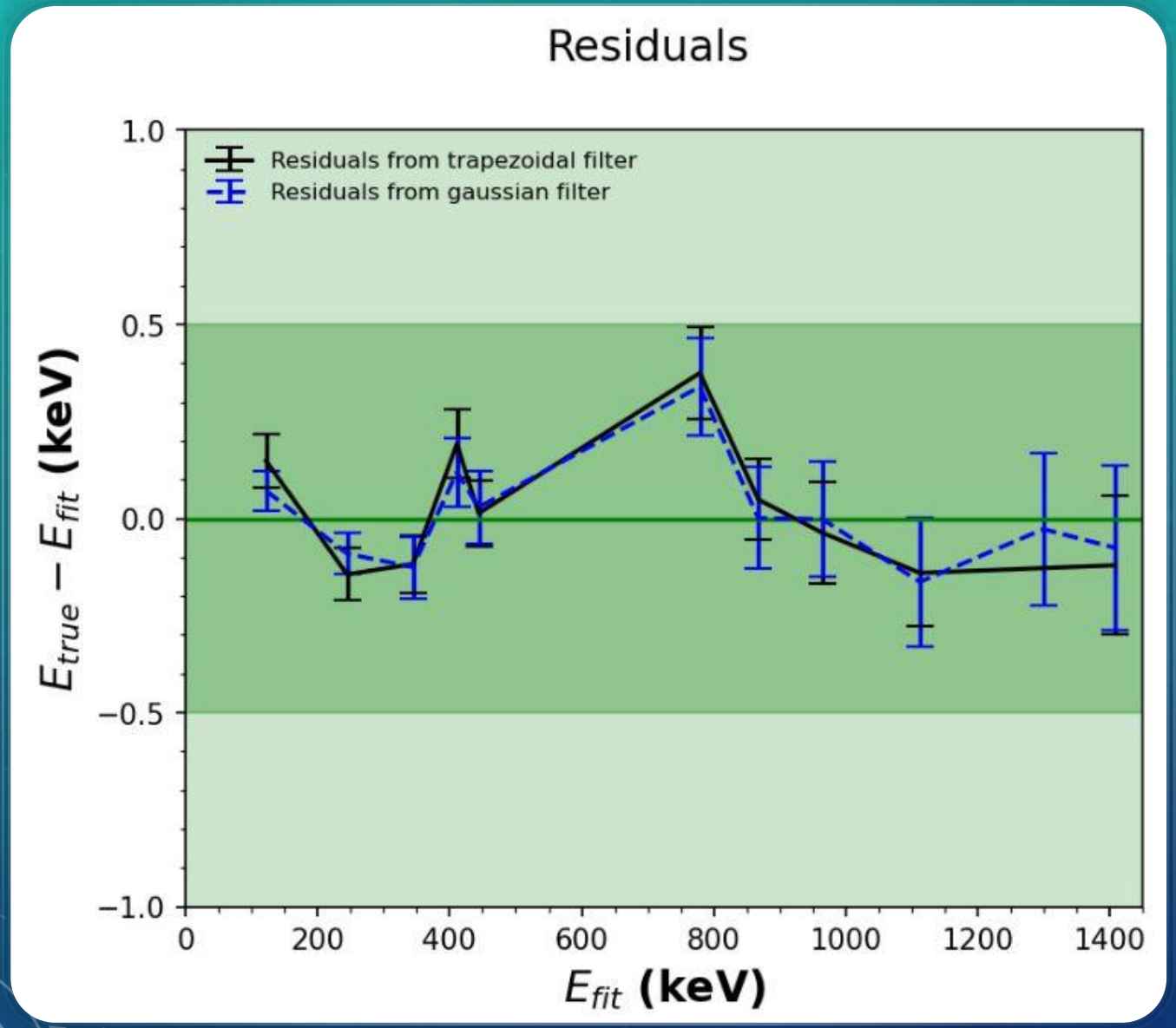
- Calibration constant:
  - 0.19 keV/a.u. with trapezoidal filter and
  - 0.4 keV/a.u. with gaussian filter

RESIDUALS



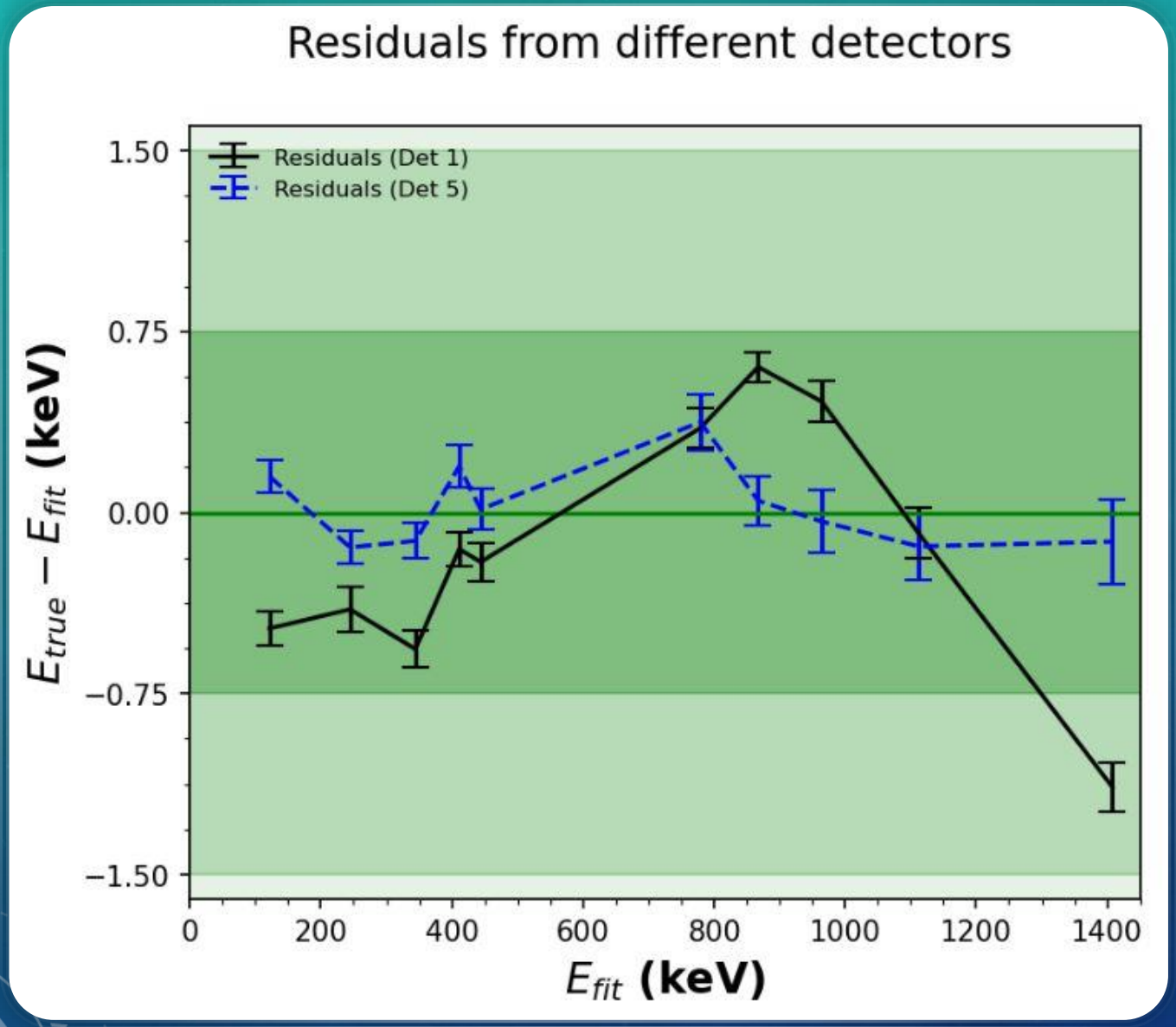
- Residuals are between -0.14 and 0.37 keV

COMPARISON OF RESIDUALS



- With trapezoidal filter, residuals are between -0.14 and 0.37 keV (black-solid)
- With gaussian filter, residuals are between -0.16 and 0.34 keV (blue dashed)

RESIDUALS FROM DIFFERENT DETECTORS



- Det 1: black-solid
- Det 5: blue dashed

SUMMARY

- Quality cuts applied to two detectors (1 and 5) from calibration of Oct 20-21
- After applying cuts, >96% events survive for every peak
- Calibration constants are obtained
- A comparison of residuals with two different filters

NEXT STEPS

- Quality cuts for other detectors need to be established for calibration from Oct 20-21 and other dates
- Address the issue of right tails in the fit
- Look for drift in the detectors
- Look into Ba136 data for isotope shifts