Test of the Silicon Detectors

- Silicon properties
- Leakage current
- Noise behavior
- Energy resolution with alpha source
- Summary and Outlook

E. Epple, R. Münzer

DETECTORS

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Detector Properties

CERBEROS (Central Beam tracker for pions)

Silicon detector

Micron Semiconductor Inc.

10x10 cm^2 - size

2x128 channels – double sided

300 µm thick

n^+-p junction type – radiation hardness

LECKEAGE CURRENT

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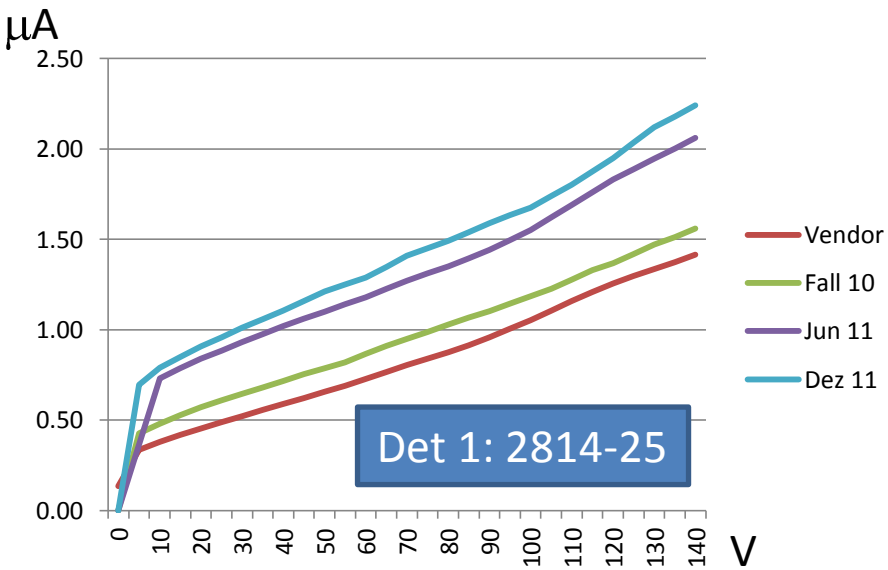
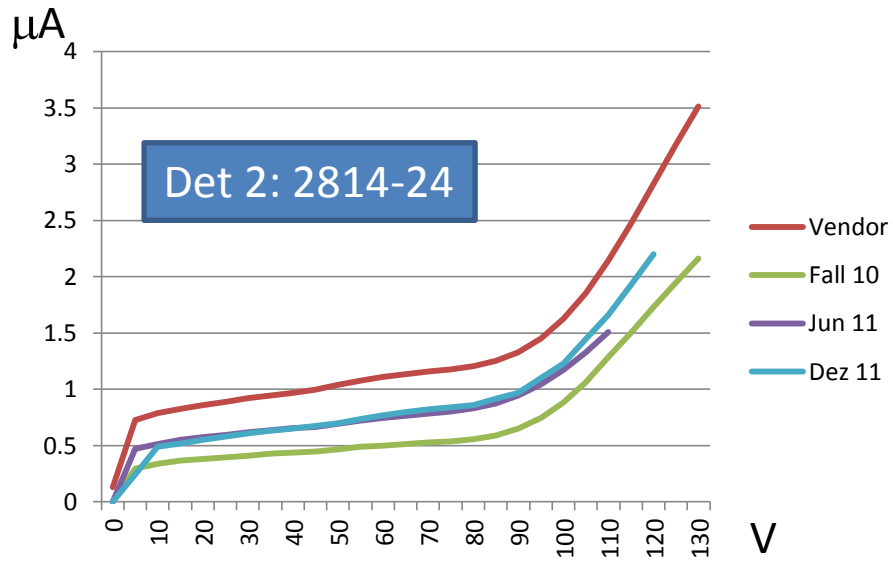
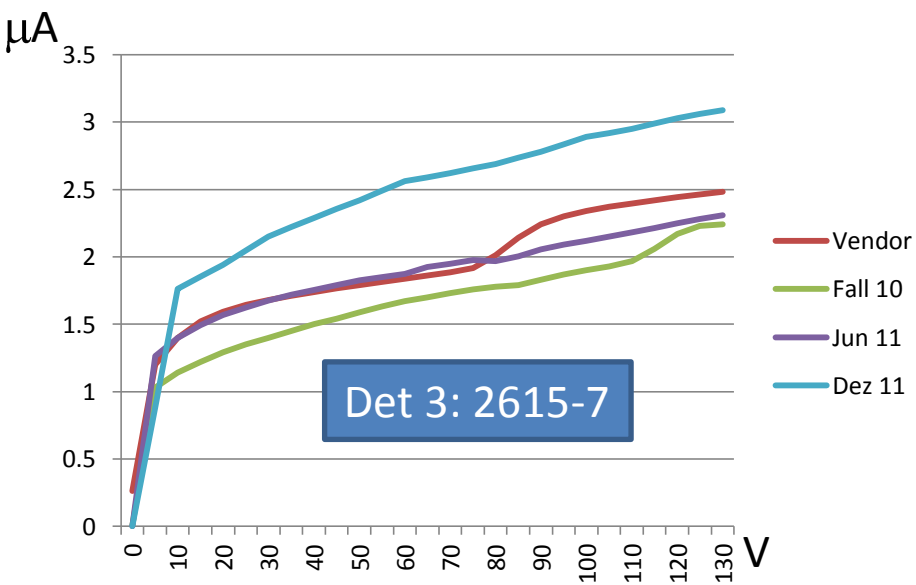
Leakage Current







Det 3: Used for Munich Beamtime (Jan11)
Det 2: Used for Julich Beamtime (Mar11)

Further checks of Det 3

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NOISE BEHAVIOUR

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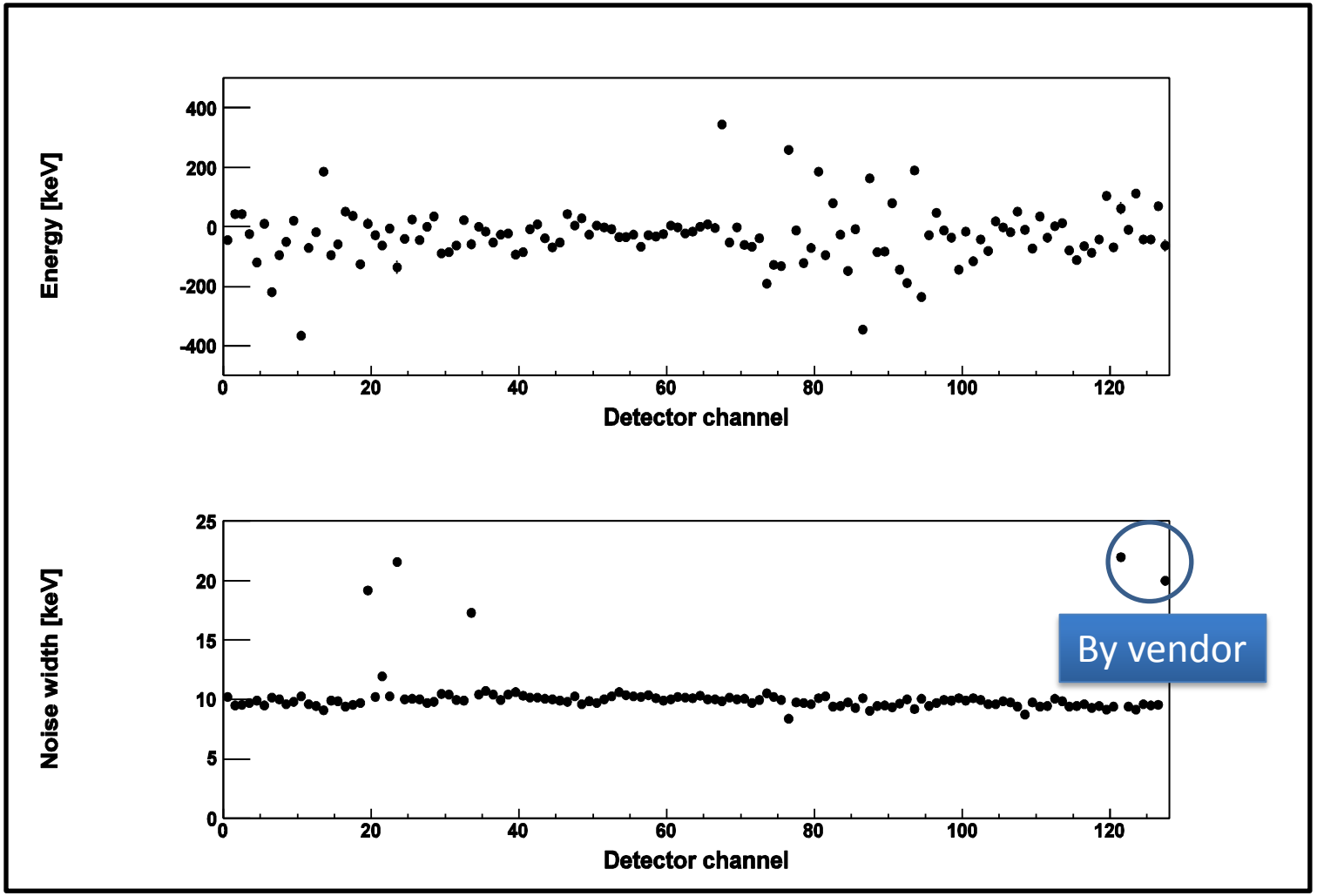
Detector 1 (2814-25) N-Side



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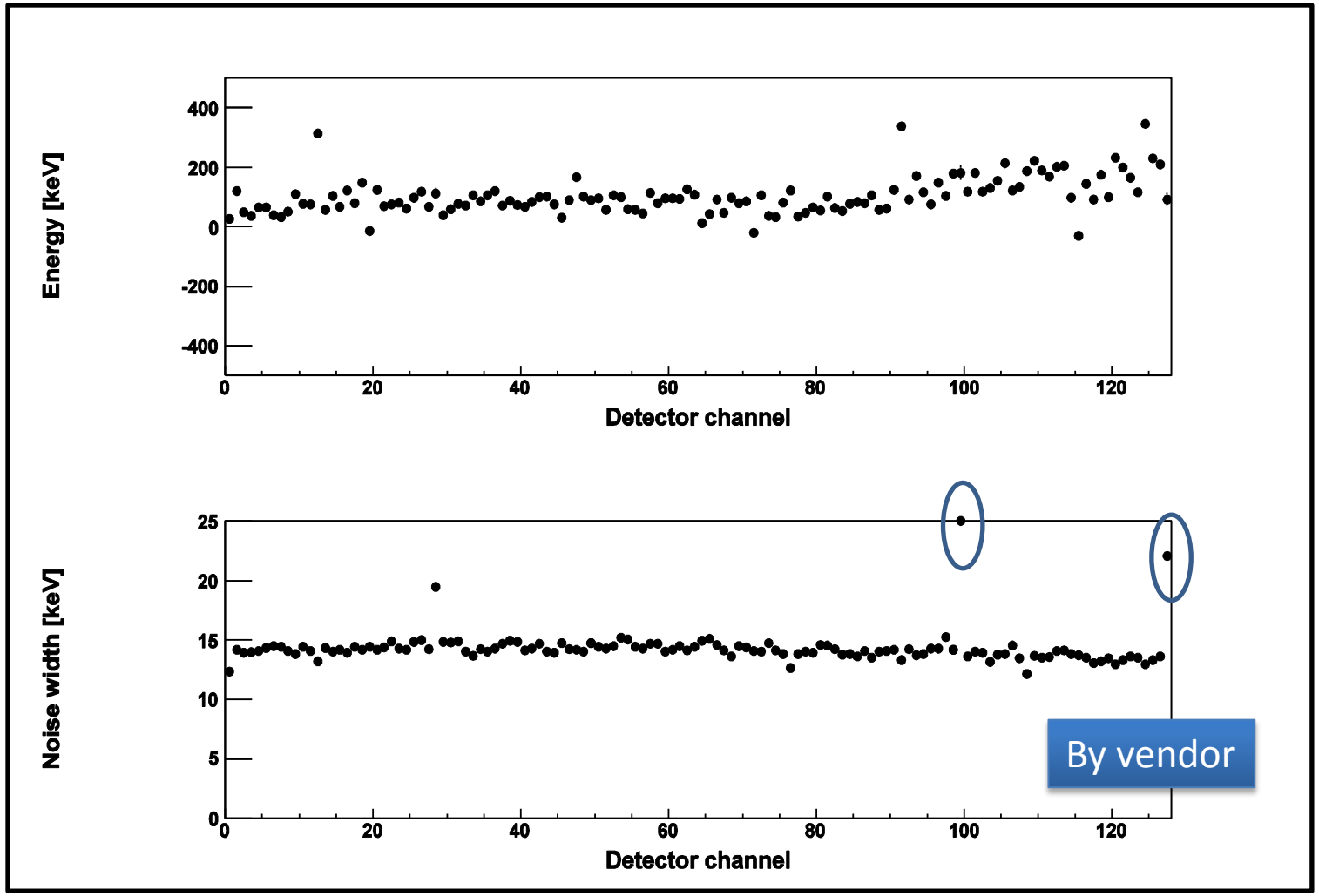
Detector 1 (2814-25) P-Side



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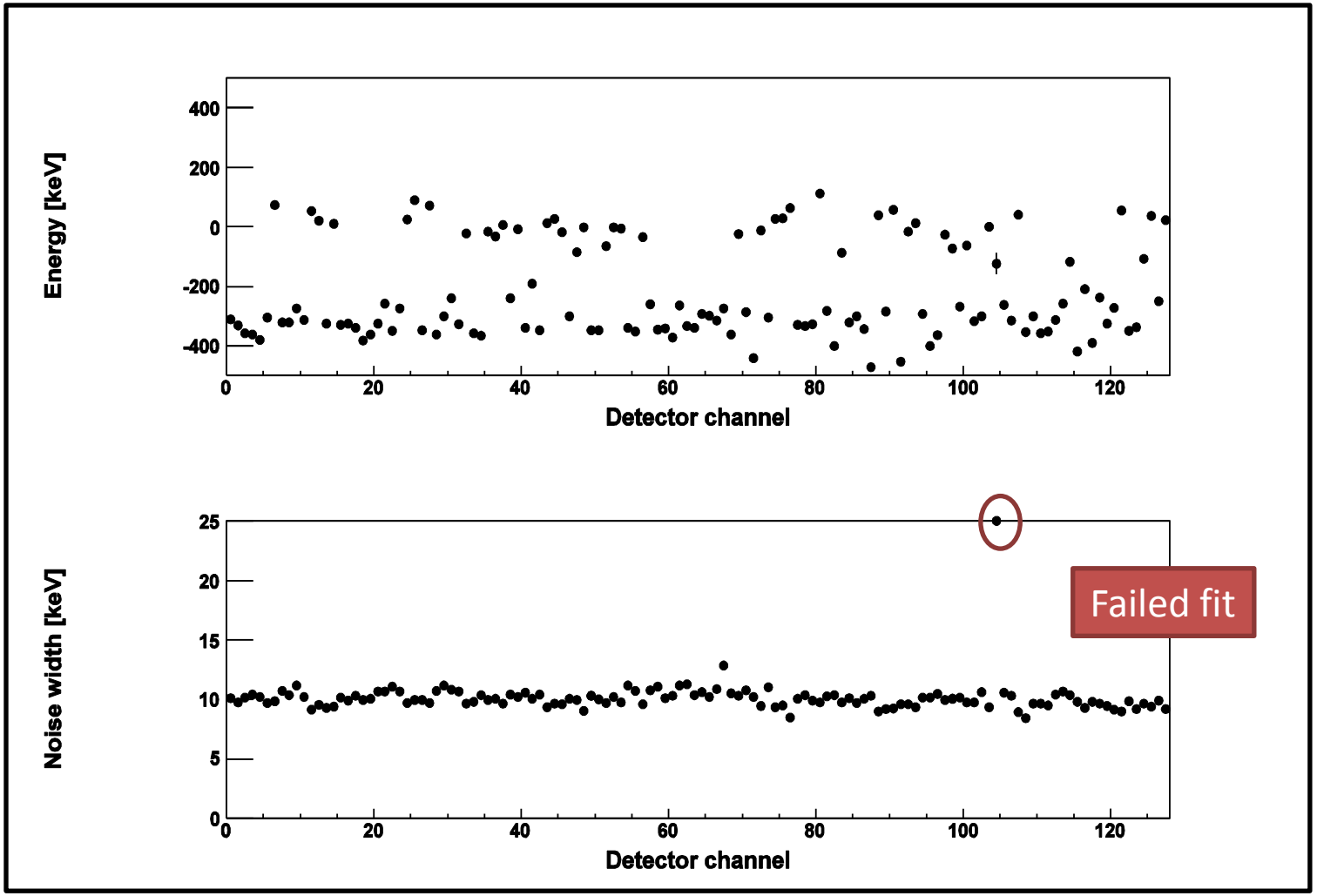
Detector 2 (2814-24) N-Side



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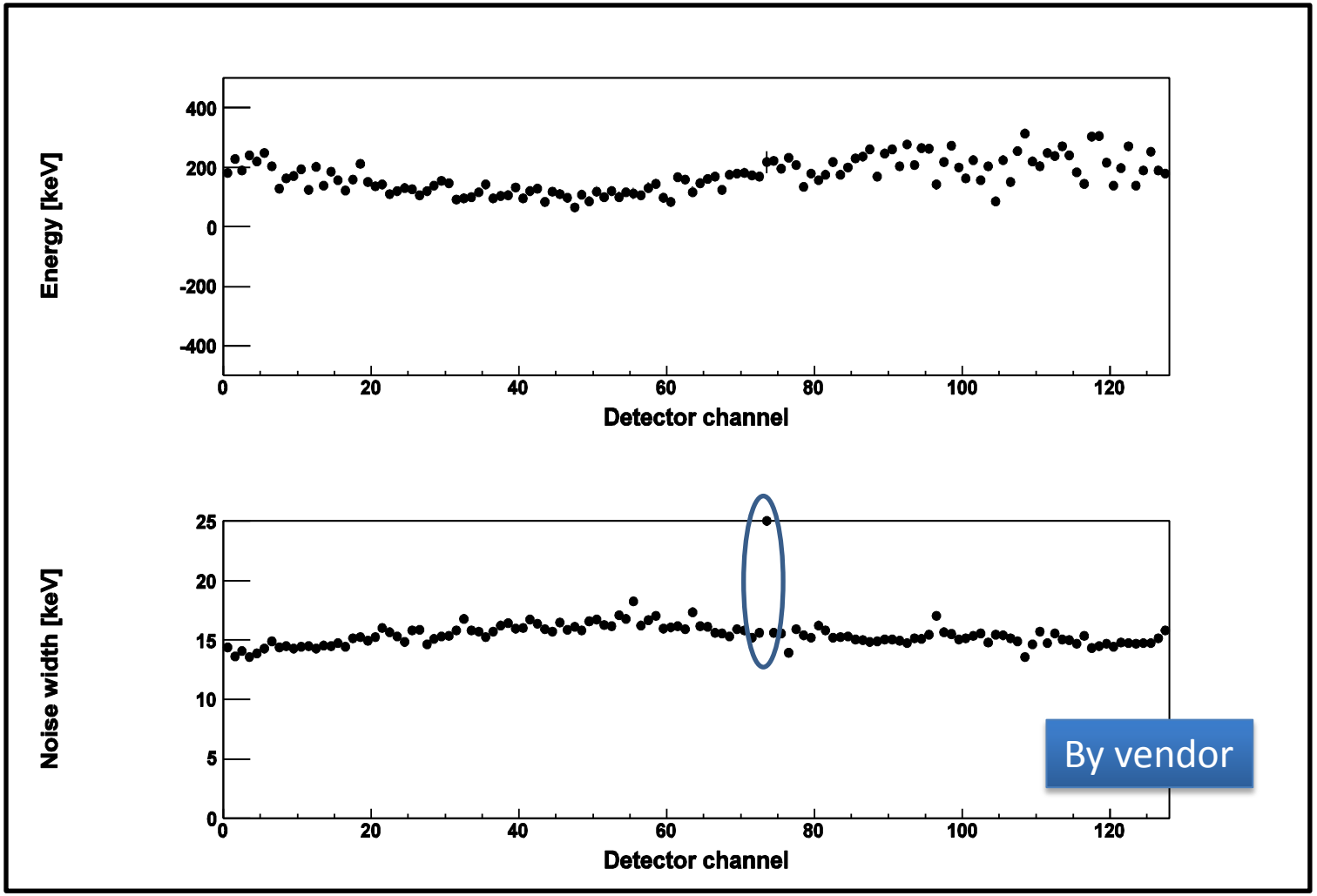
Detector 2 (2814-24) P-Side



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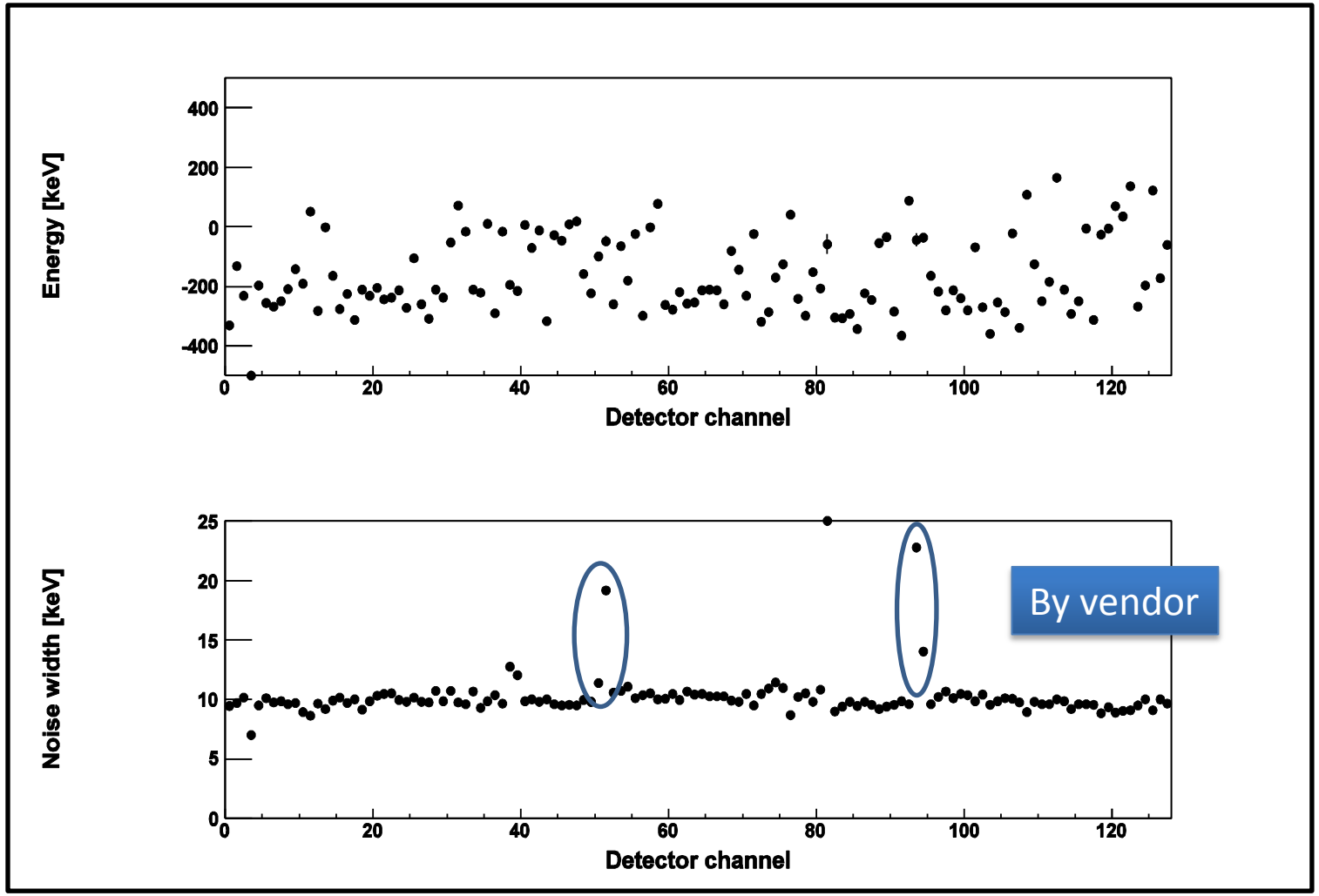
Detector 3 (2615-7) N-Side



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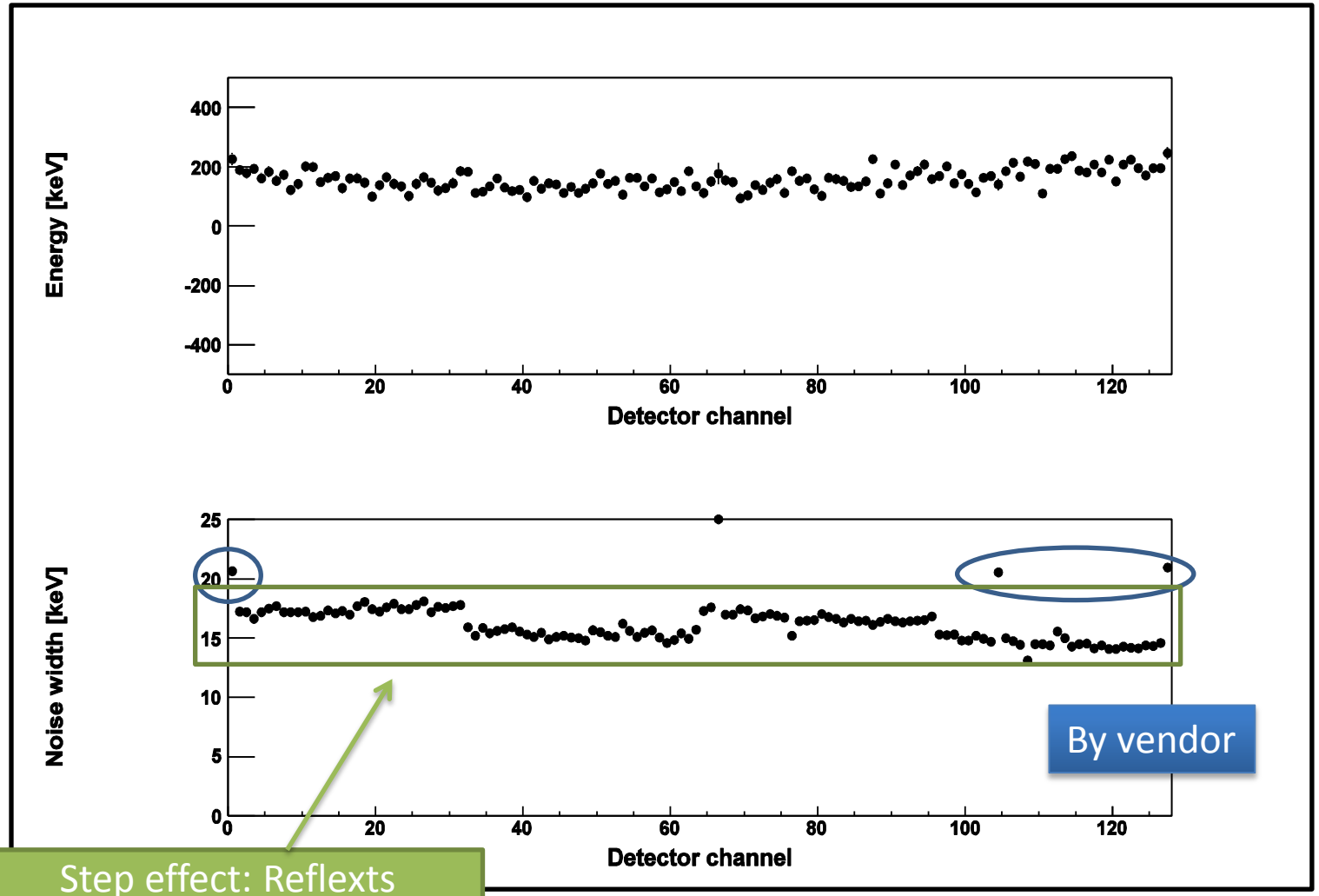
Detector 3 (2615-7) P-Side



Step effect: Reflexts readout adapter

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ENERGY RESOLUTION

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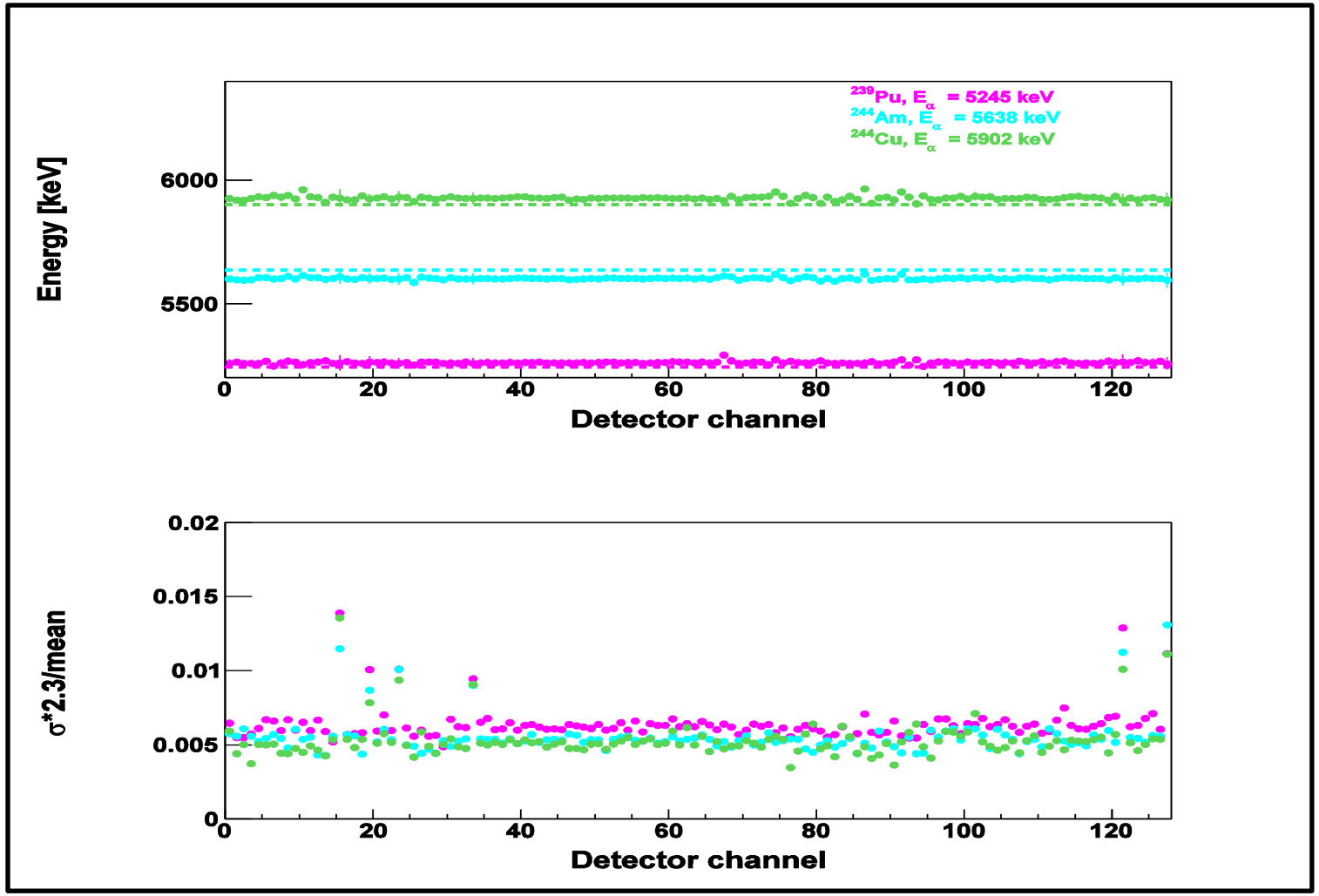
Detector 1 (2814-25) N-Side



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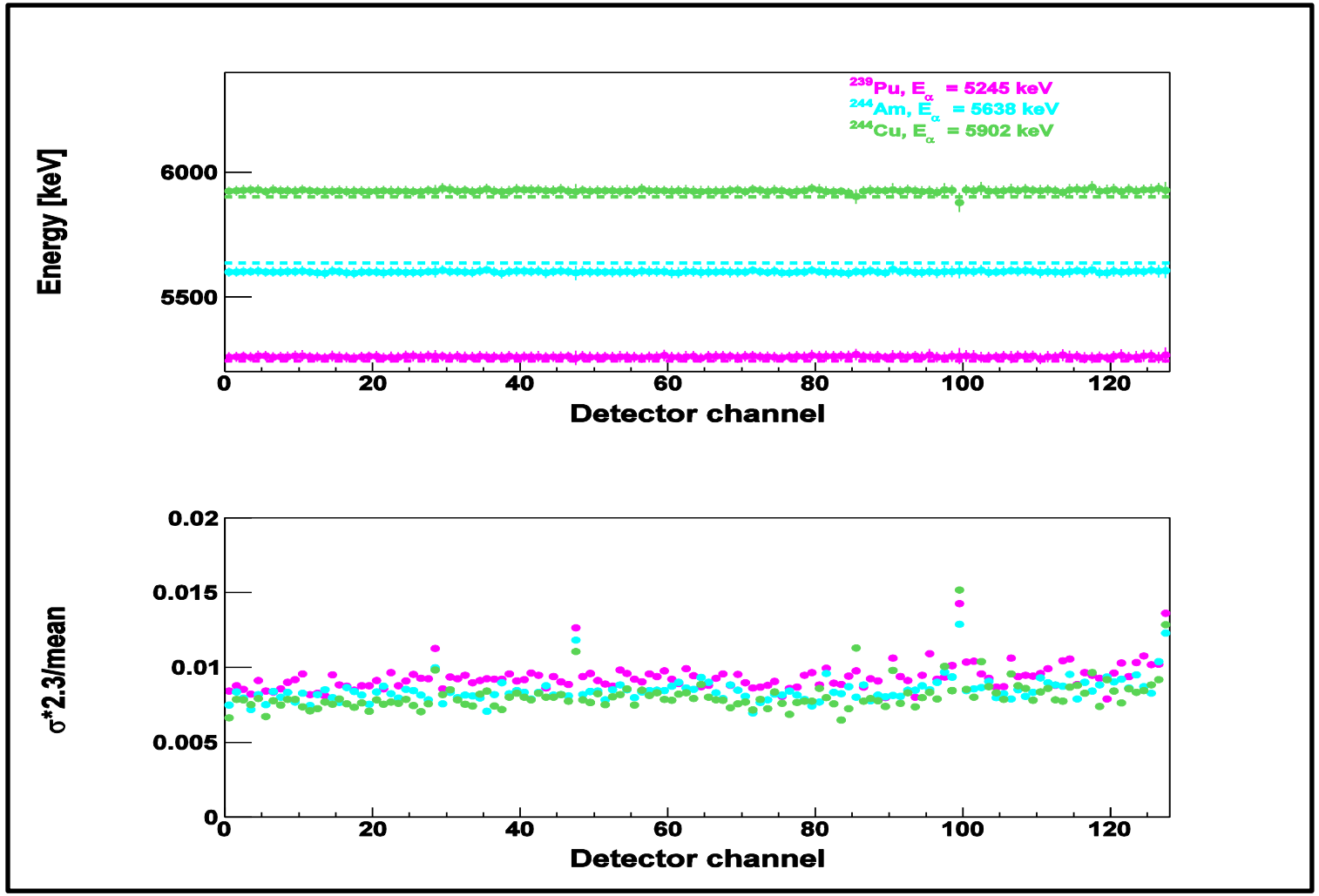
Detector 1 (2814-25) P-Side



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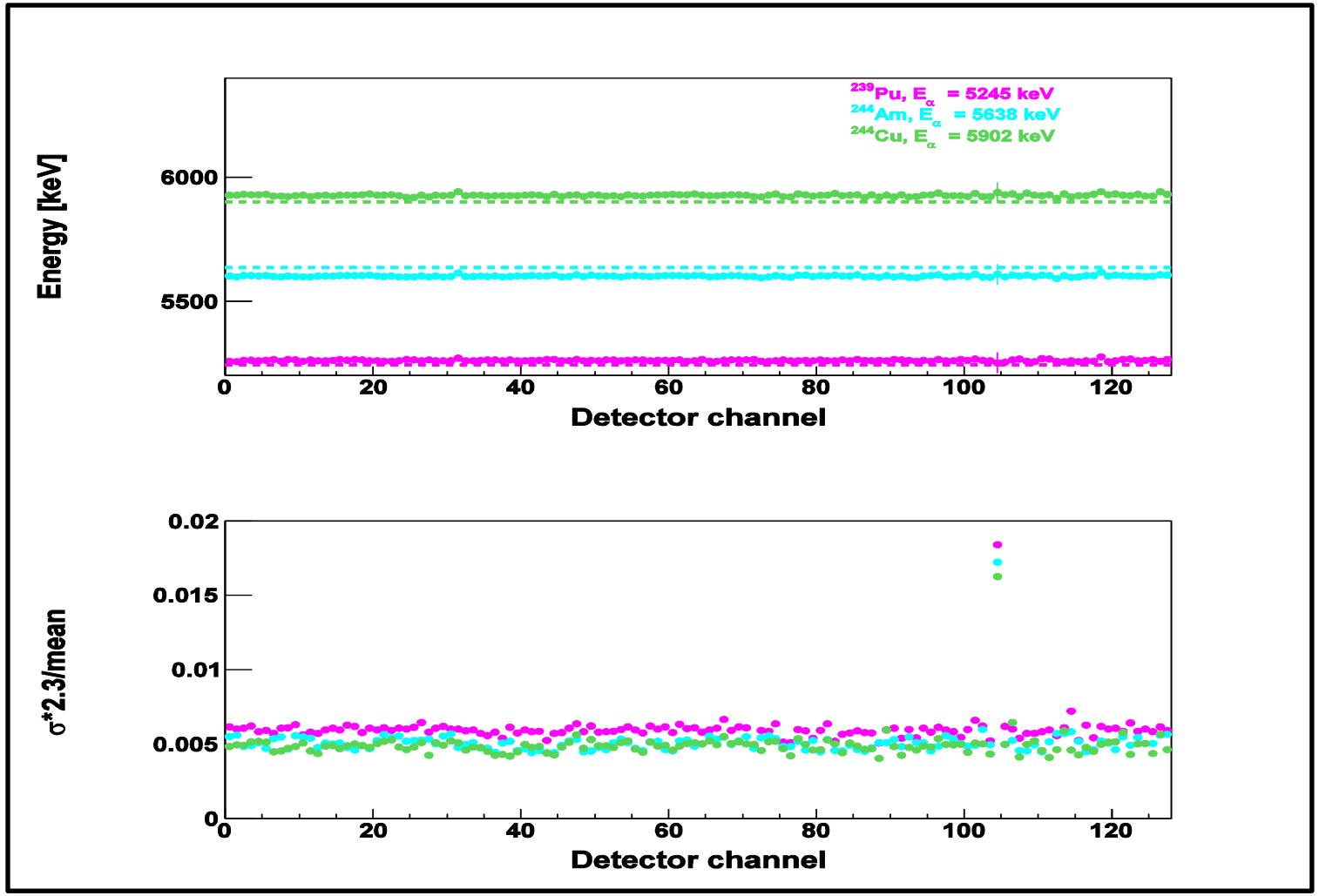
Detector 2 (2814-24) N-Side



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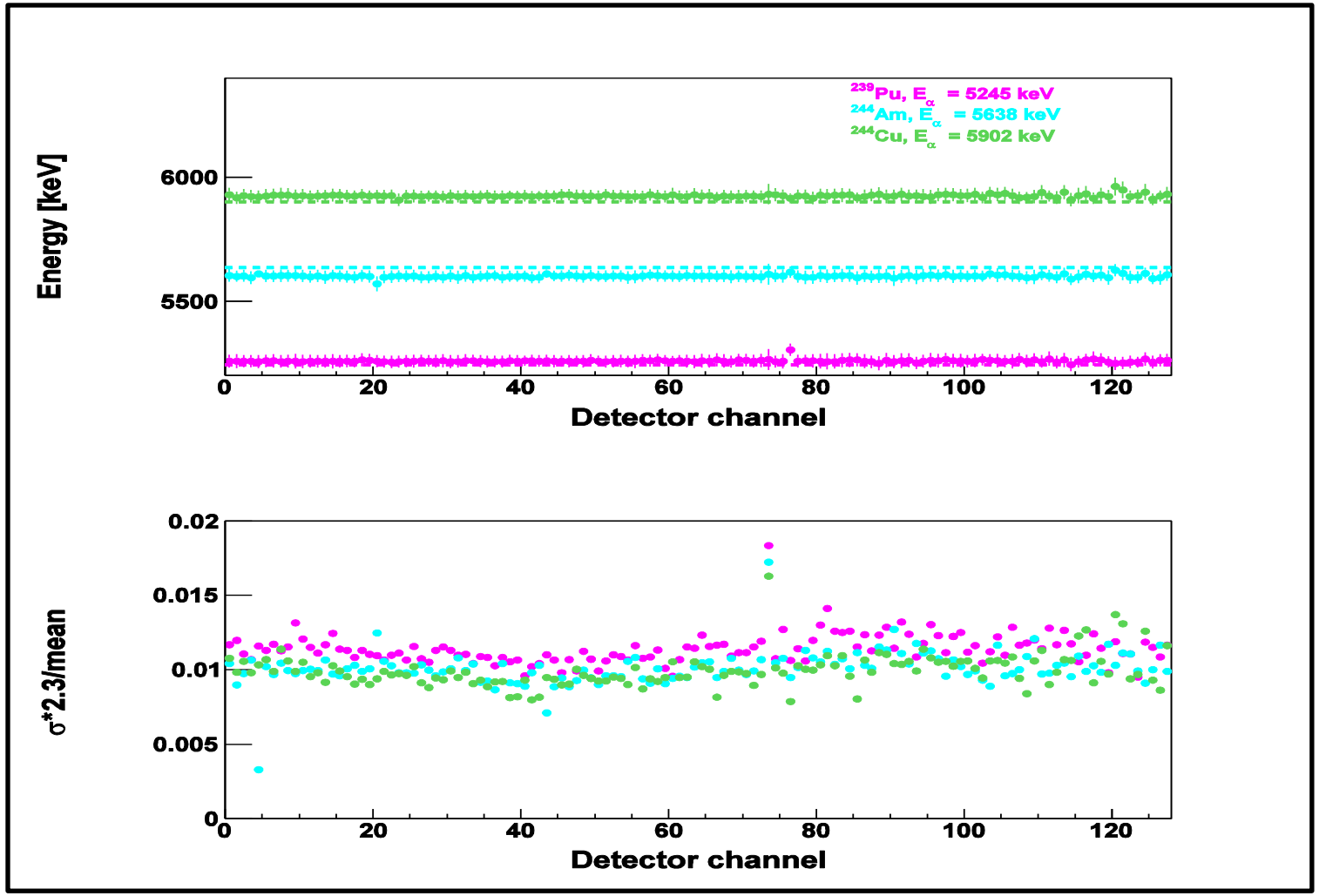
Detector 2 (2814-24) P-Side



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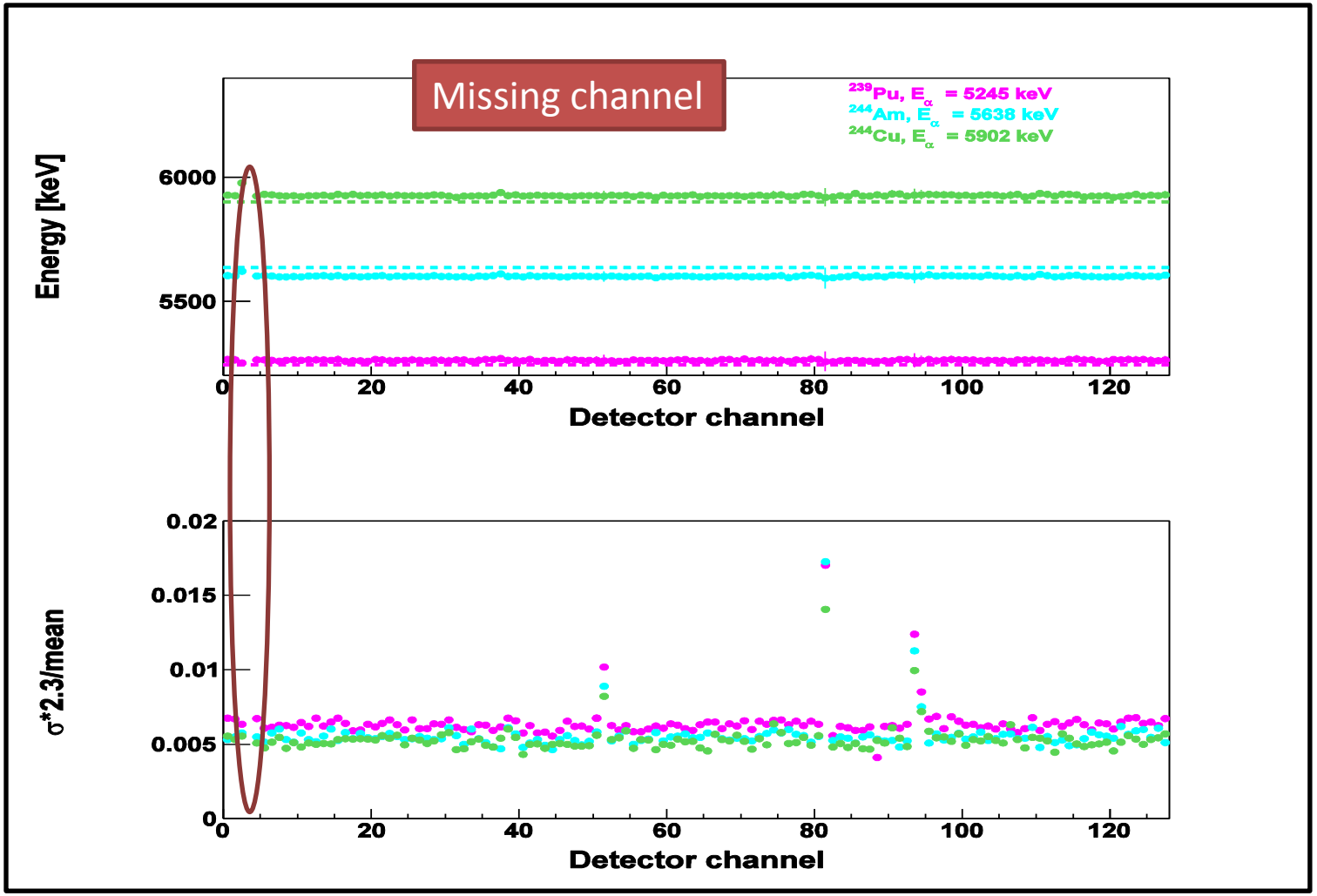
Detector 3 (2615-7) N-Side



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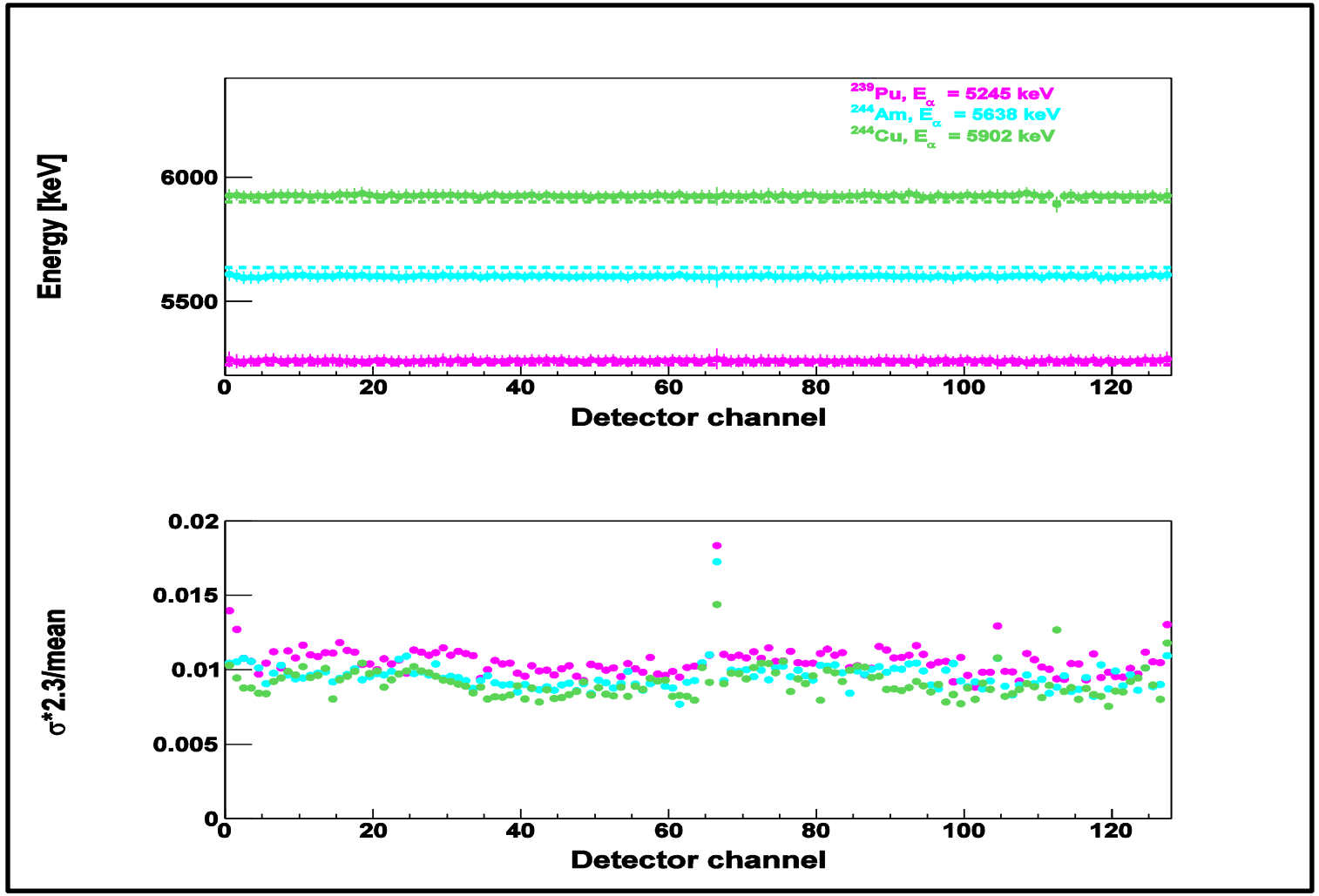
Detector 3 (2615-7) P-Side



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Summary

Detectors are working:

- 1 Channel missing : Brocken Bond Cable
- Energy Resolution: 0,5% - 1,0 % for all detectors
- 20 Noise Channel of 384 Channels (13 by Vendor)

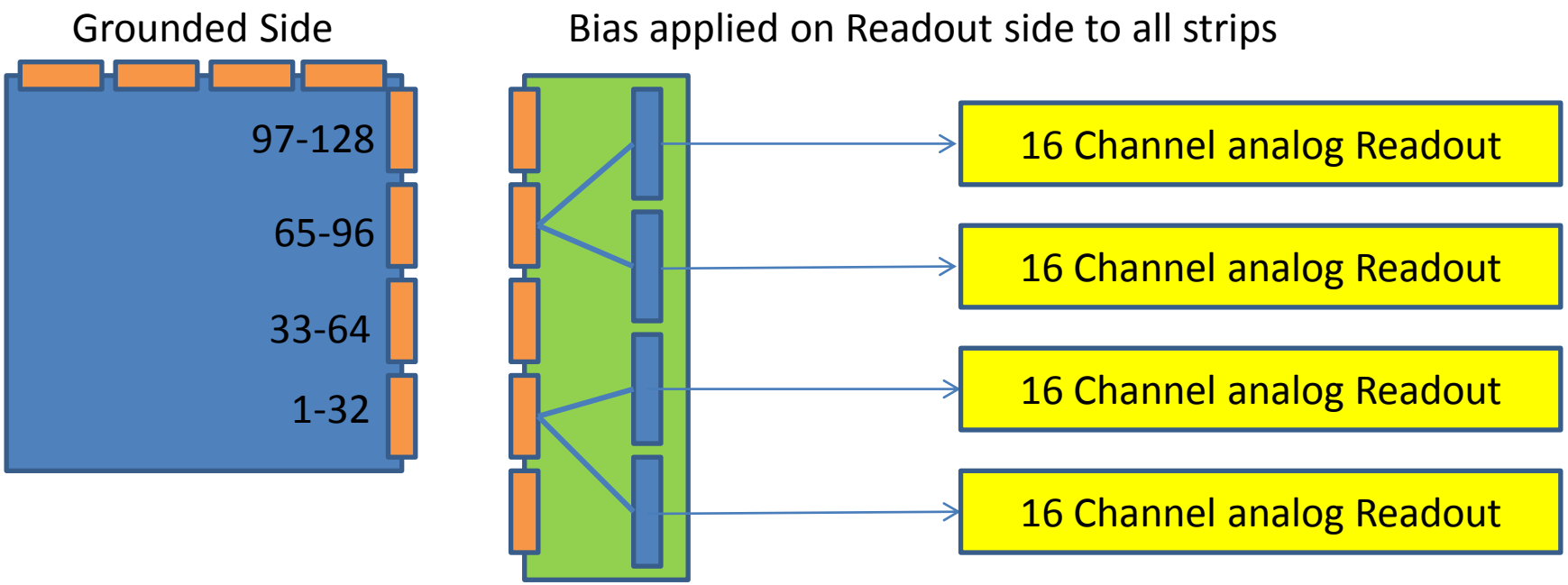
Det	Side	Mis. Chn	Hig. Noise	By vendor	Failed fit	Resolution	Leckeage Current
1	N	0	5	3	0	0,5 %	OK
1	P	0	3	2	0	0,8 %	
2	N	0	1	0	1	0,5 %	OK
2	P	0	1	1	0	1,0 %	
3	N	0	7	4	0	0,5 %	Higher then previous
3	P	1	4	3	0	1,0 %	

Outlook

- Repair Bond Cable
- Detector 3: Leakage Current => Clean Detector
- Check Resolution difference of detector sides (Tests with beta source)
- Step effect in Detector 3 P-Side Noise behavoir

BACKUP

Test Setup



Setup 1: Readout Strip 1-32 / 65-96

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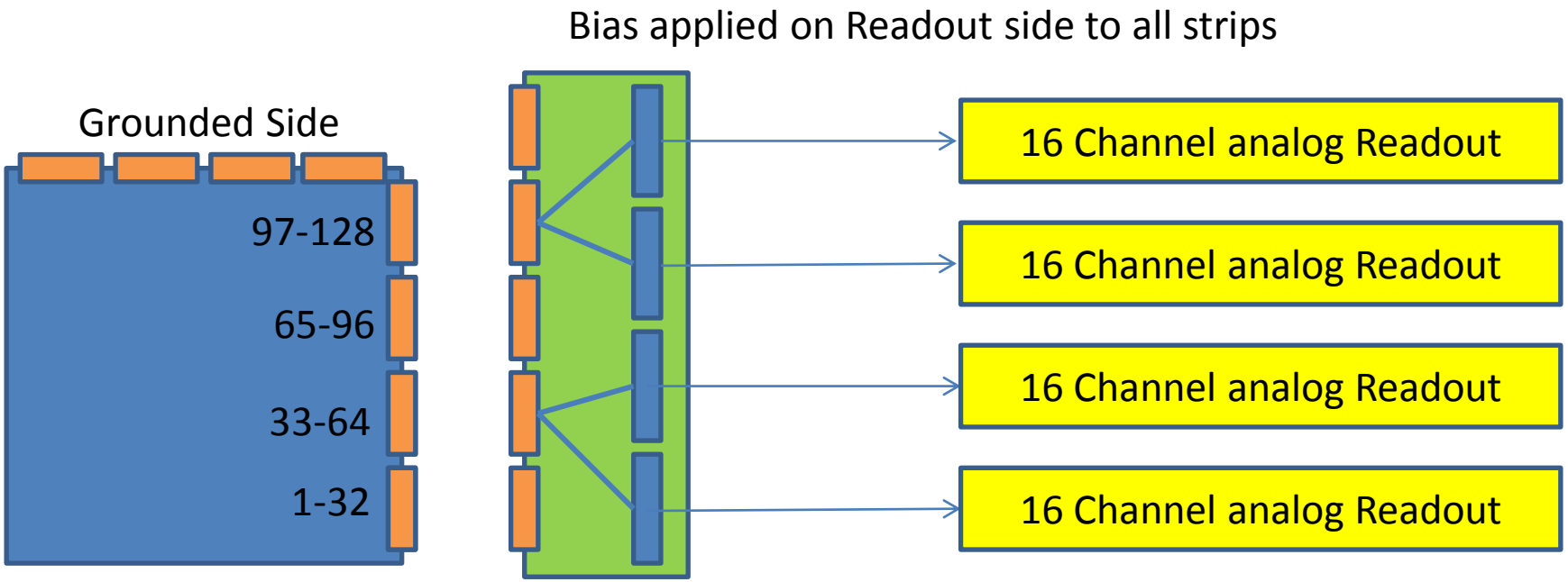
Test Setup



Setup 2: Readout Strip 33-64 / 65-128

Analog for backside of detector

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Calibration procedure

Shown for an example
Readout Position 0 = (0-31,64-95)
n- side of detector

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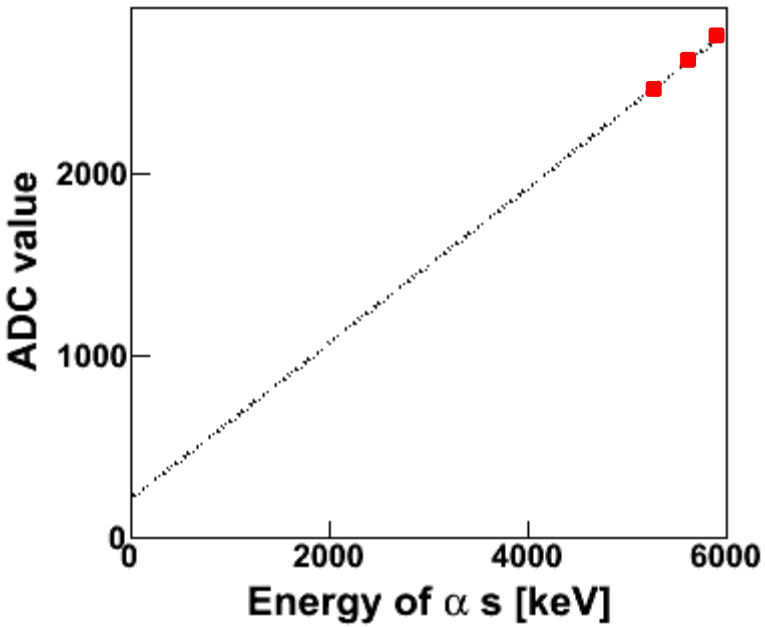
Calibration

E_α = 5245 keV
E_α = 5638 keV
E_α = 5902 keV



ADC value = ***A*** + ***B****Energy

<u>Calibration:</u>
Energy of Channel = (ADC value - ***A***)/ ***B***

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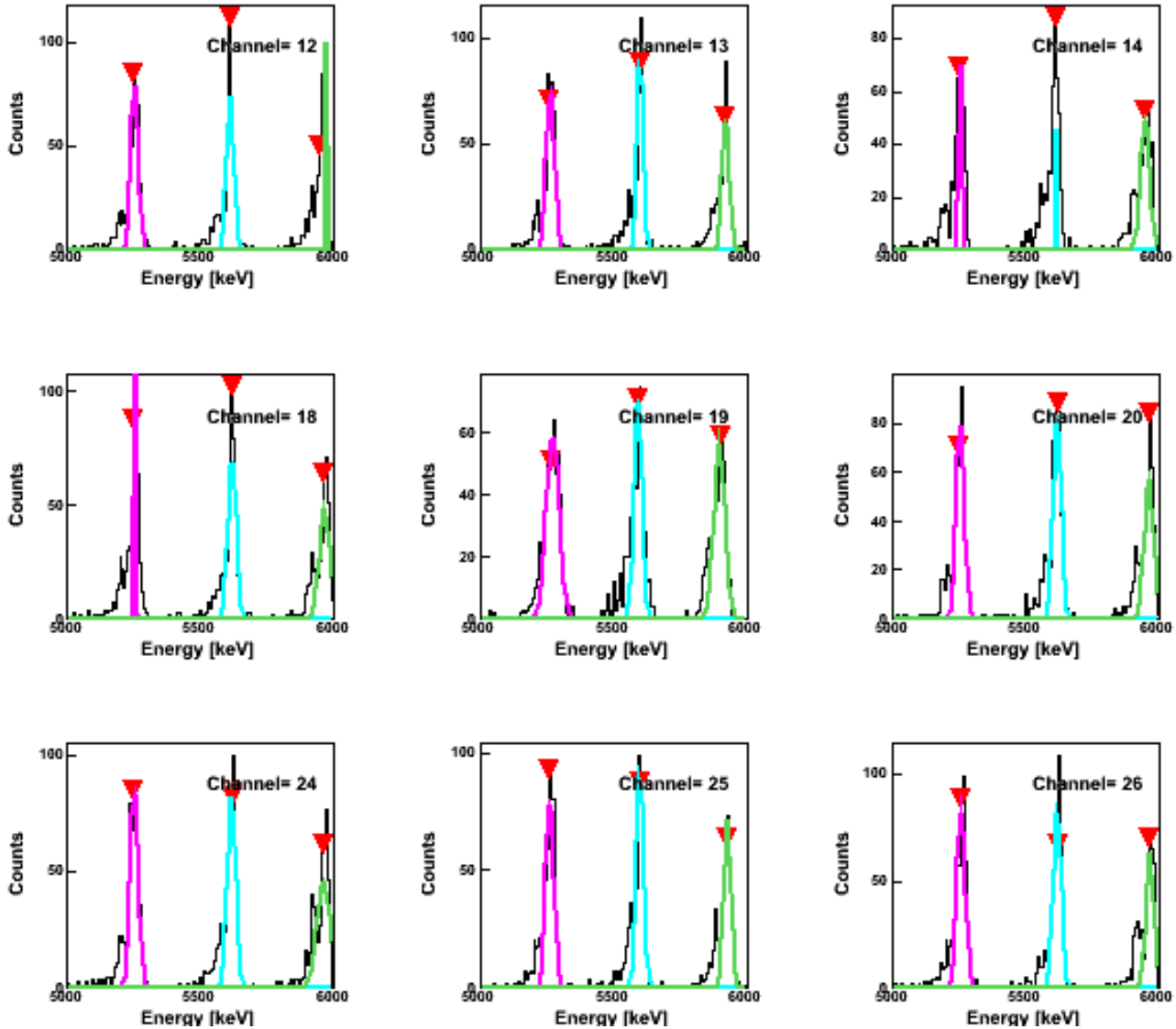
triple alpha calibrated

Fitted with 3 Gauss functions



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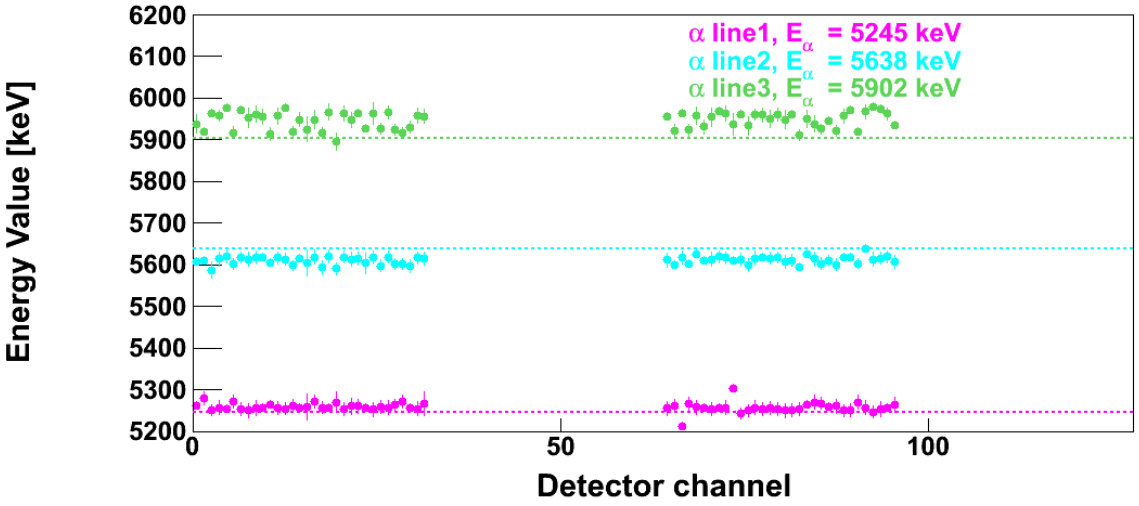
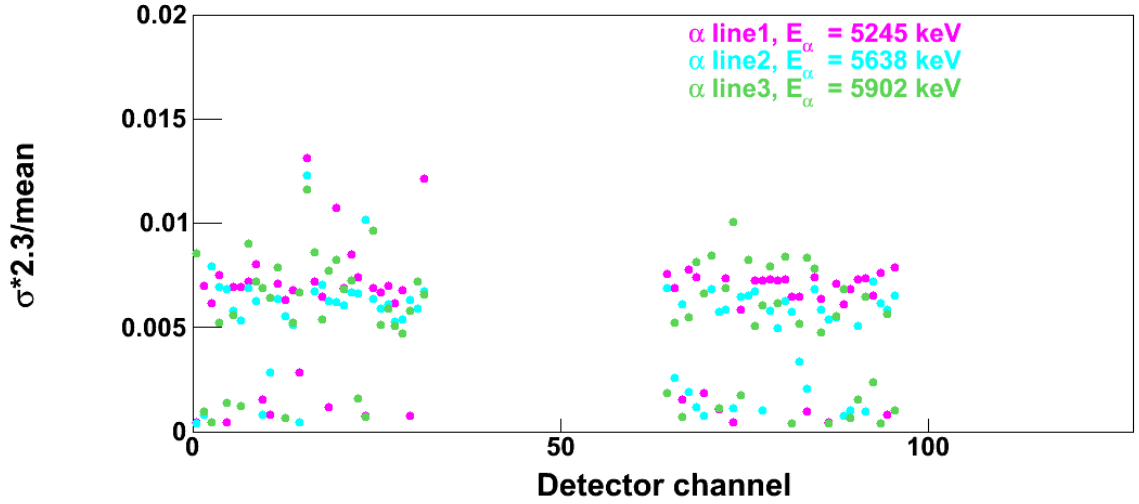
triple alpha calibrated





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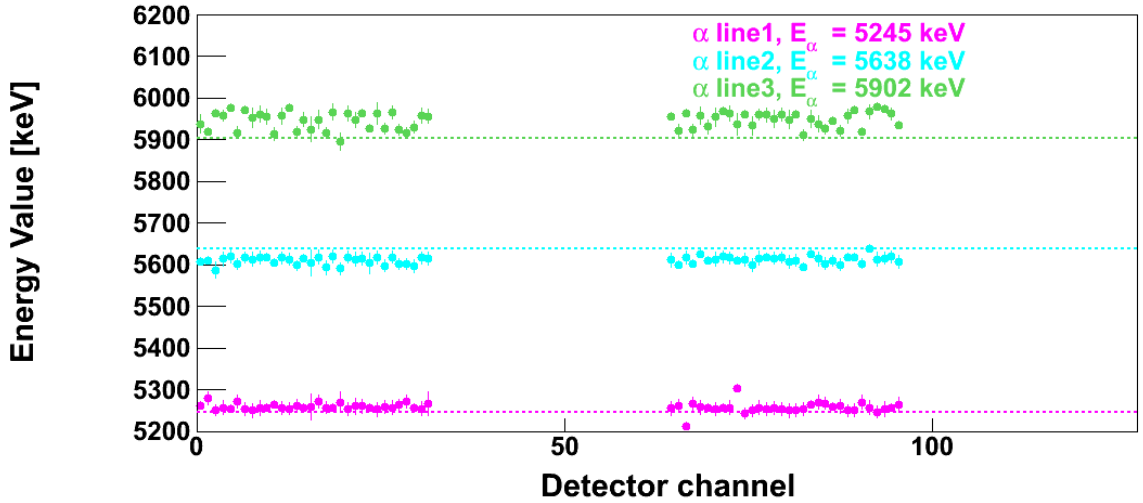
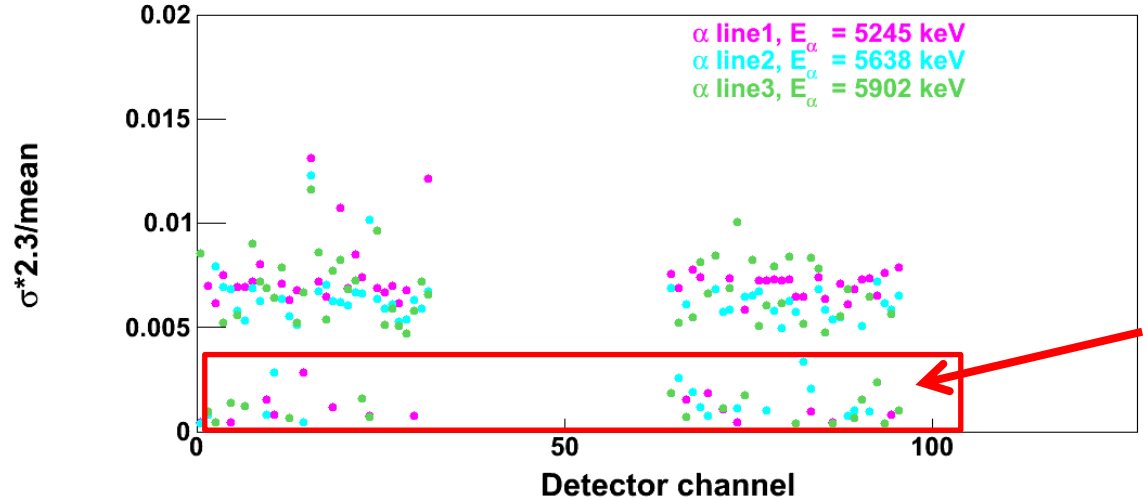
triple alpha calibrated





failed gauss fit - preliminary

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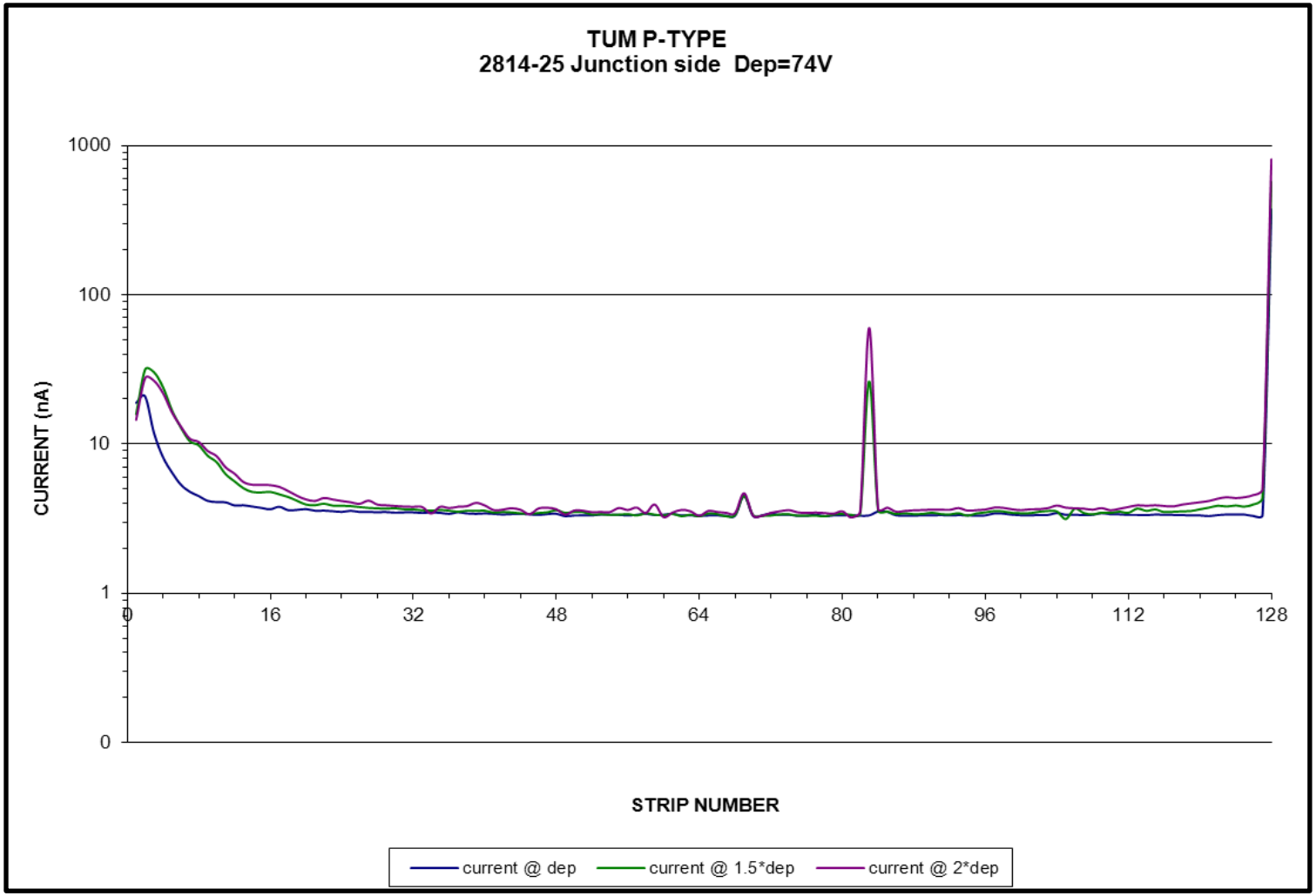

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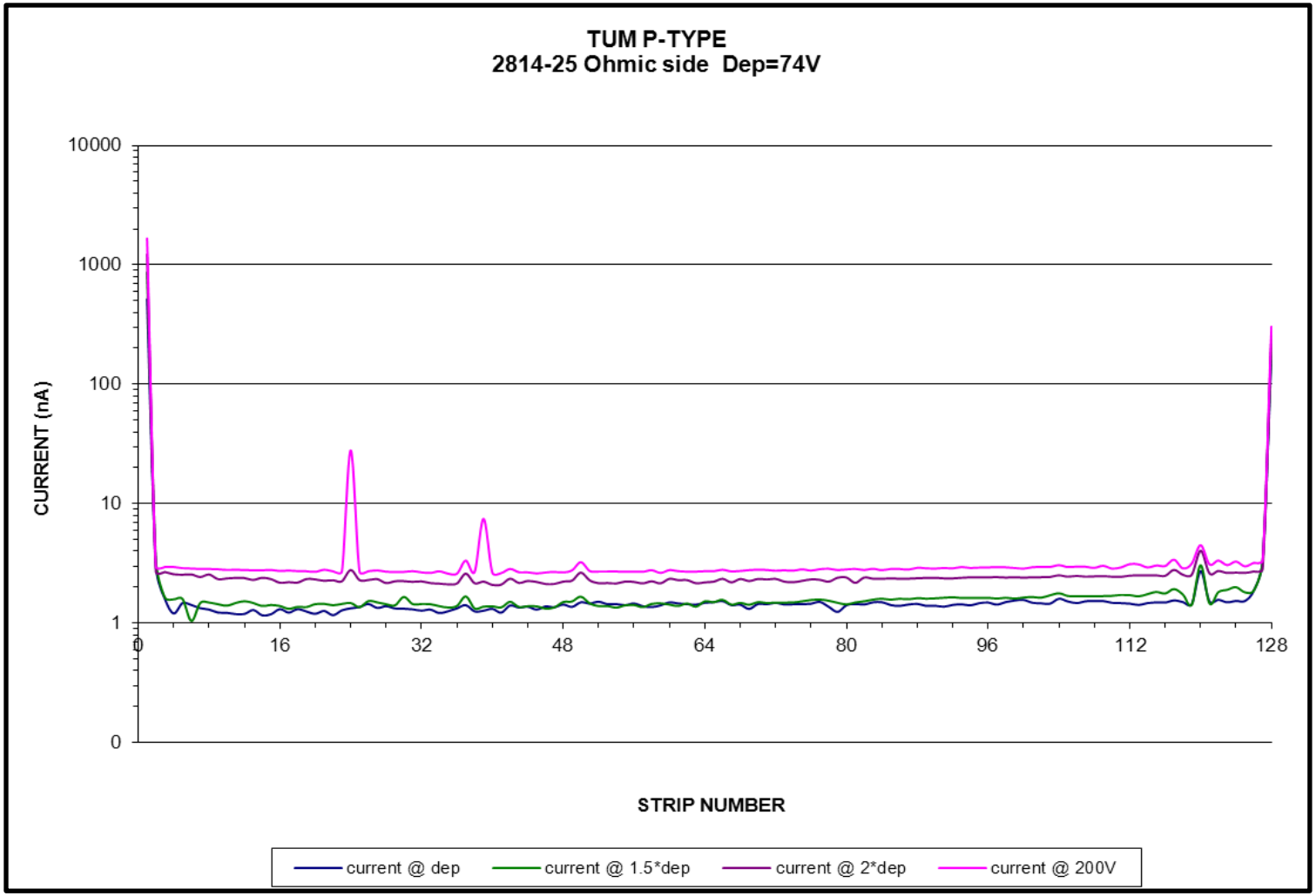

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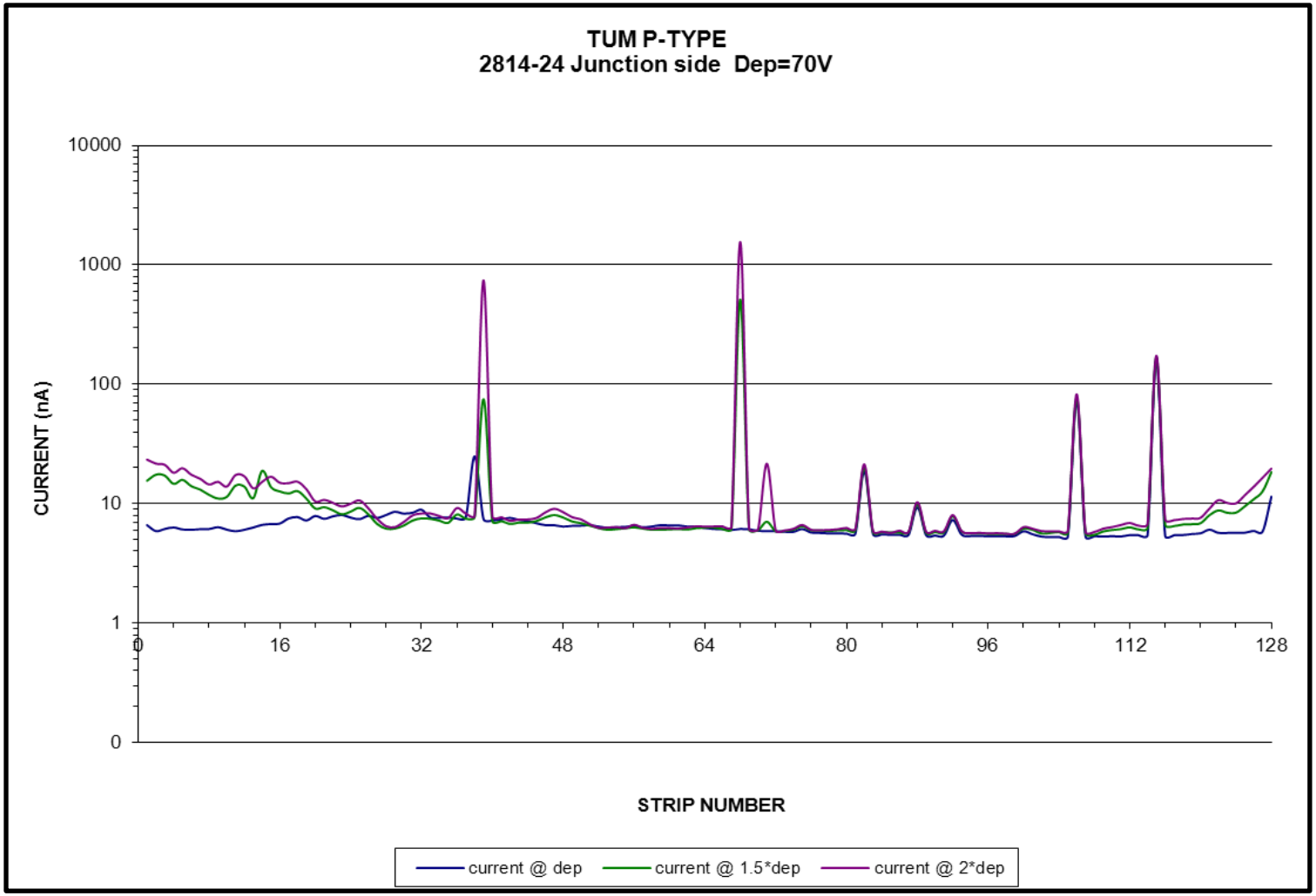

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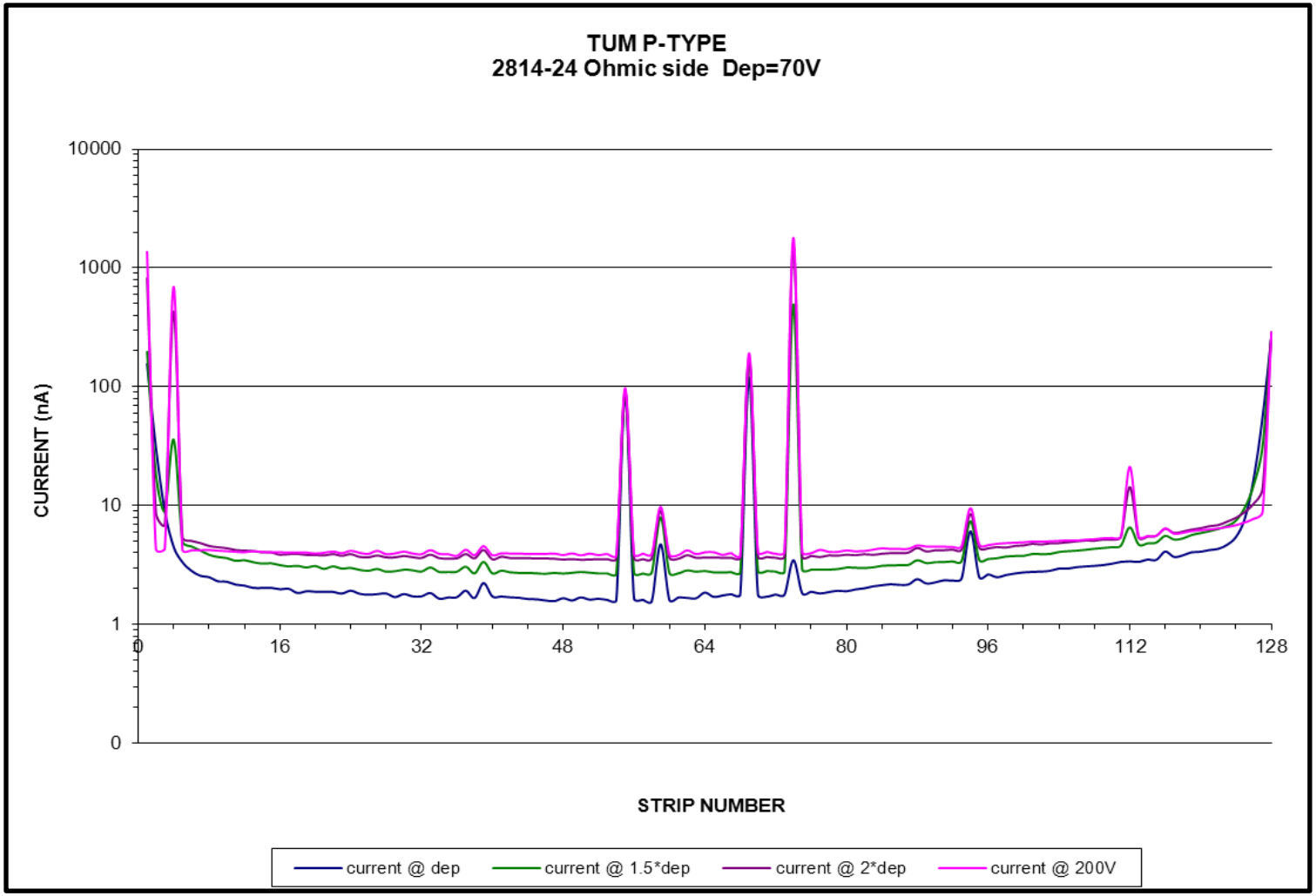

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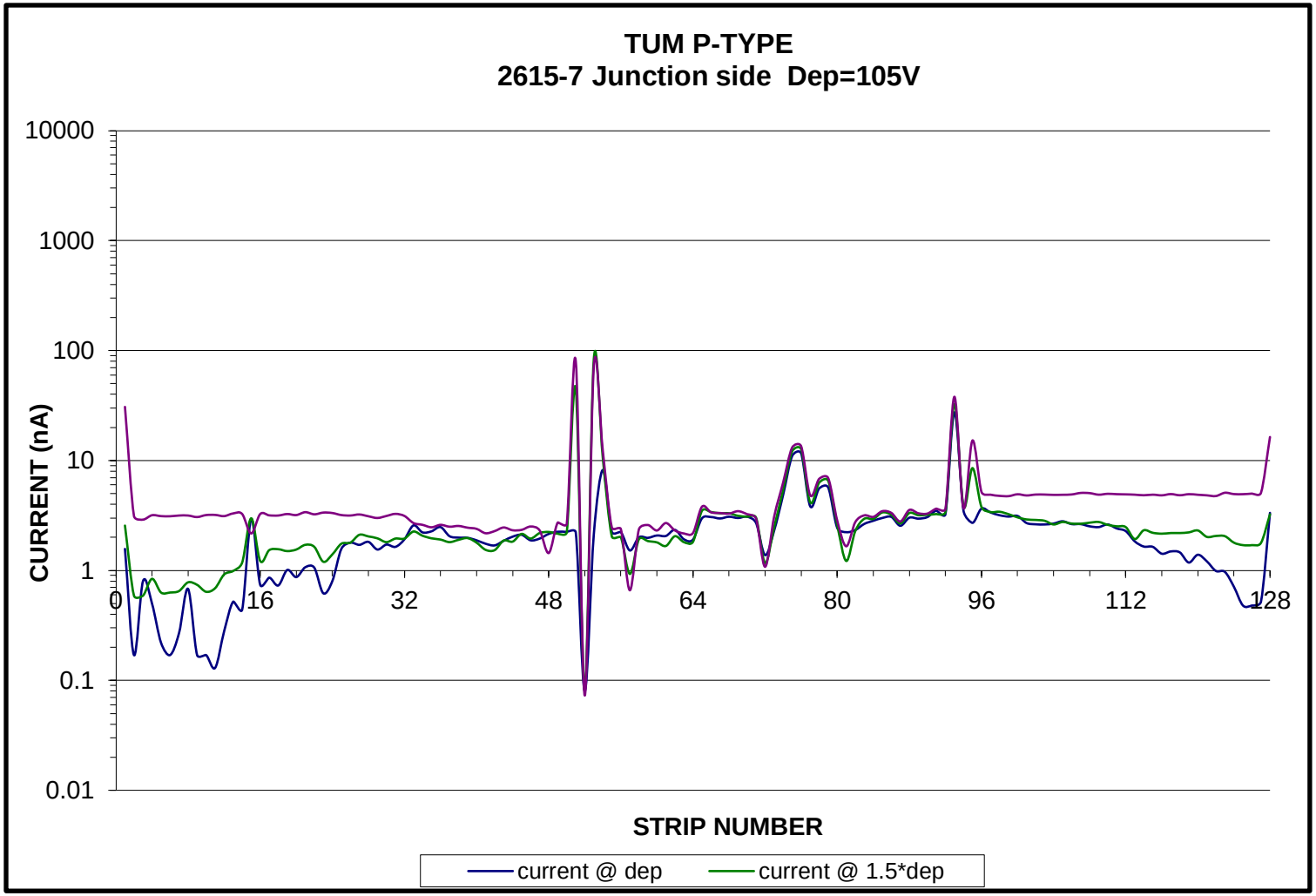

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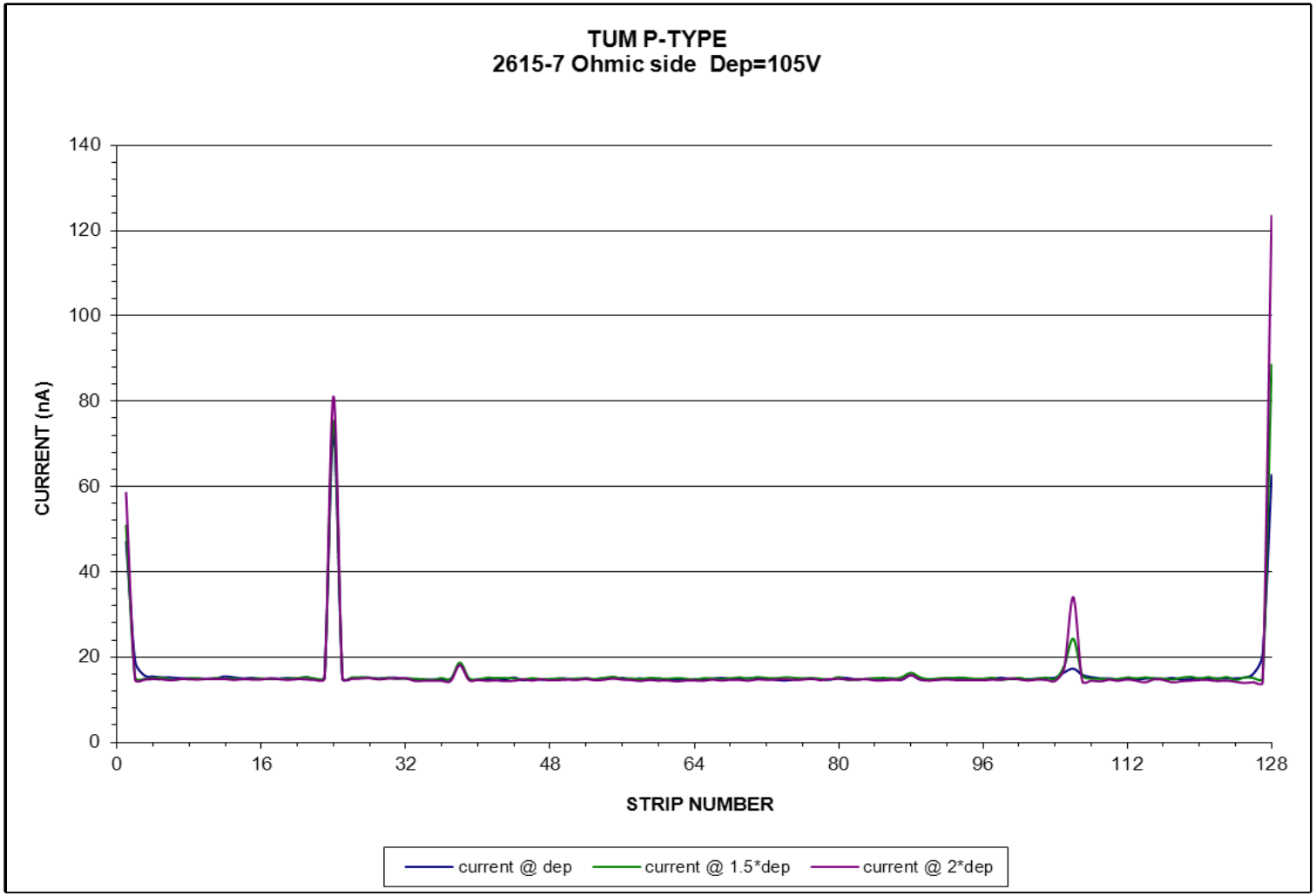

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