Test of the Silicon Detectors

- Silicon properties
- Test setup
- Leakage current
- ADC values for Noise and triple α
- Calibration
- Results

E. Epple, R. Münzer

Detector Properties

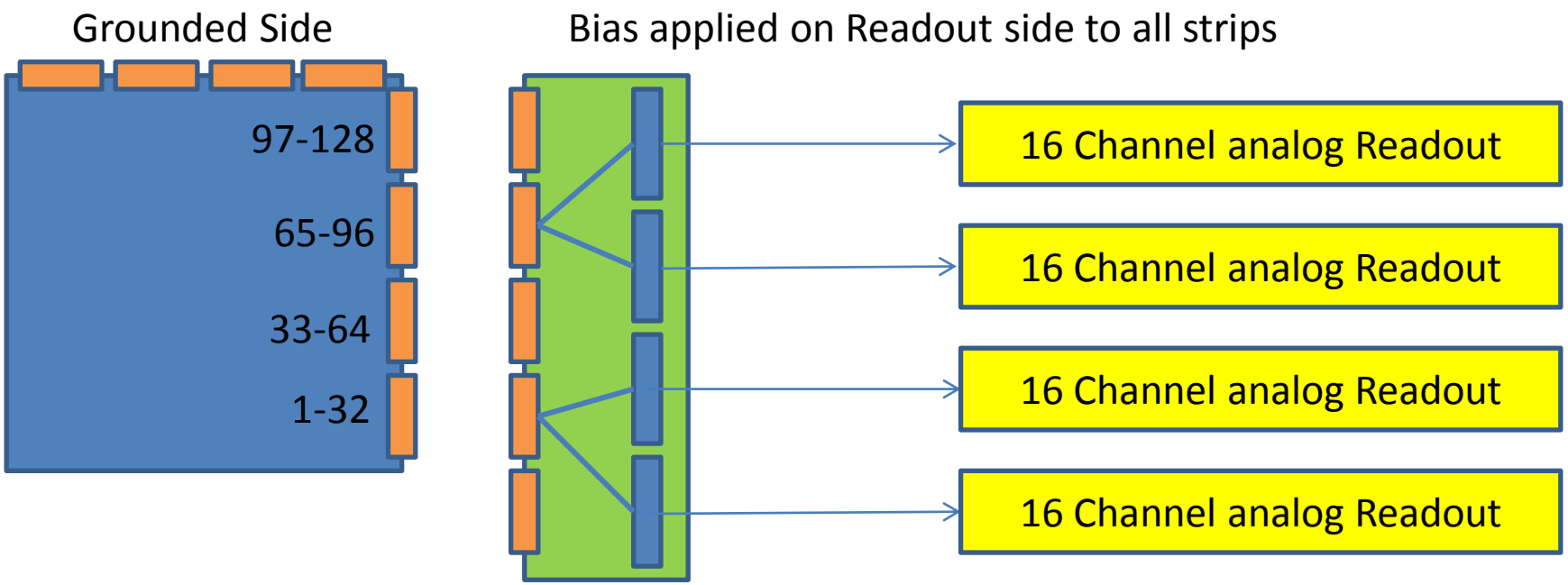
CERBEROS (Central Beam tracker for pions)

Silicon detector

Micron Semiconductor Inc.

10x10 cm^2 - size
2x128 channels – double sided
300 µm thick
n^+-p junction type – radiation hardness

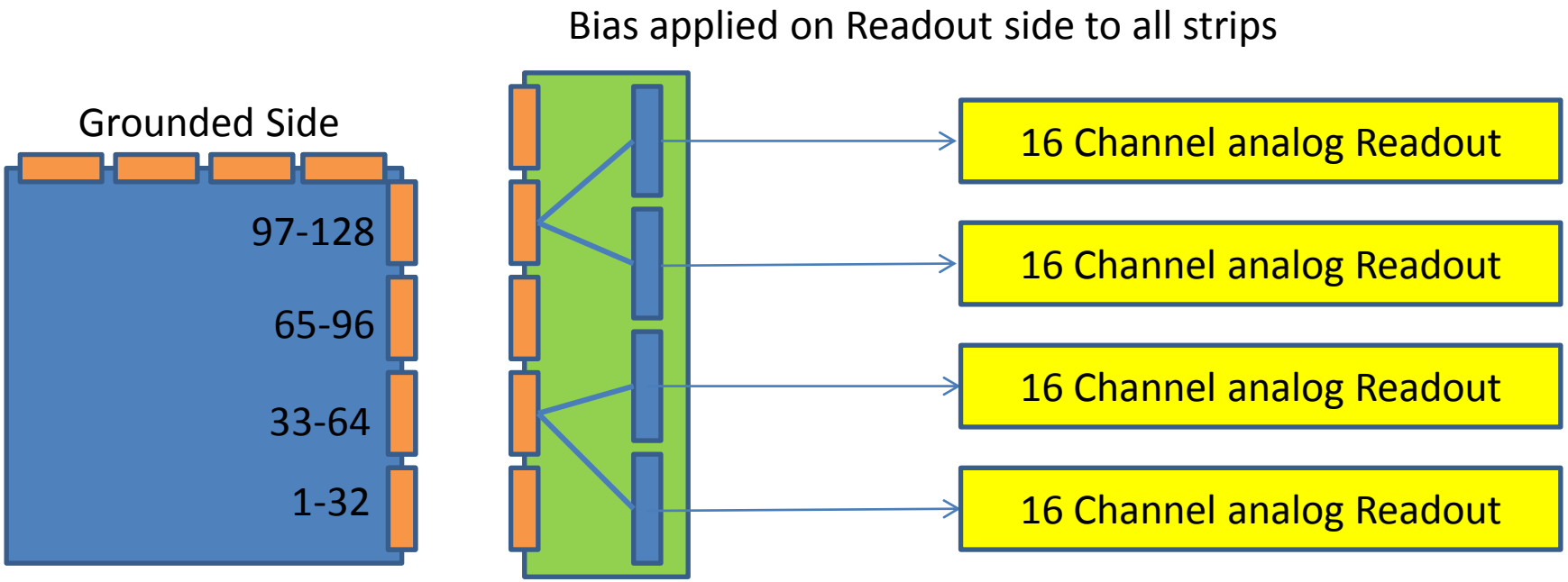
Test Setup



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

E. Epple, R. Münzer

Test Setup



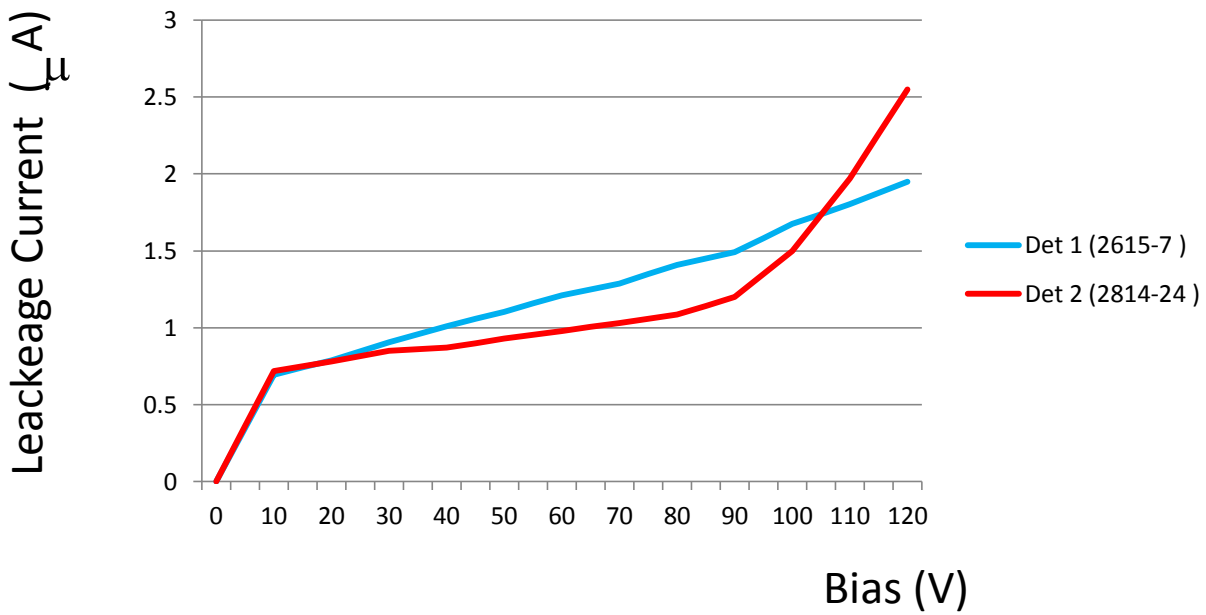
Setup 2: Readout Strip 33-64 / 65-128

Analog for backside of detector

E. Epple, R. Münzer

Leakage Current

Leckeage Current



- 2814 – 24 : used in Julich test - Beamtime

E. Epple, R. Münzer

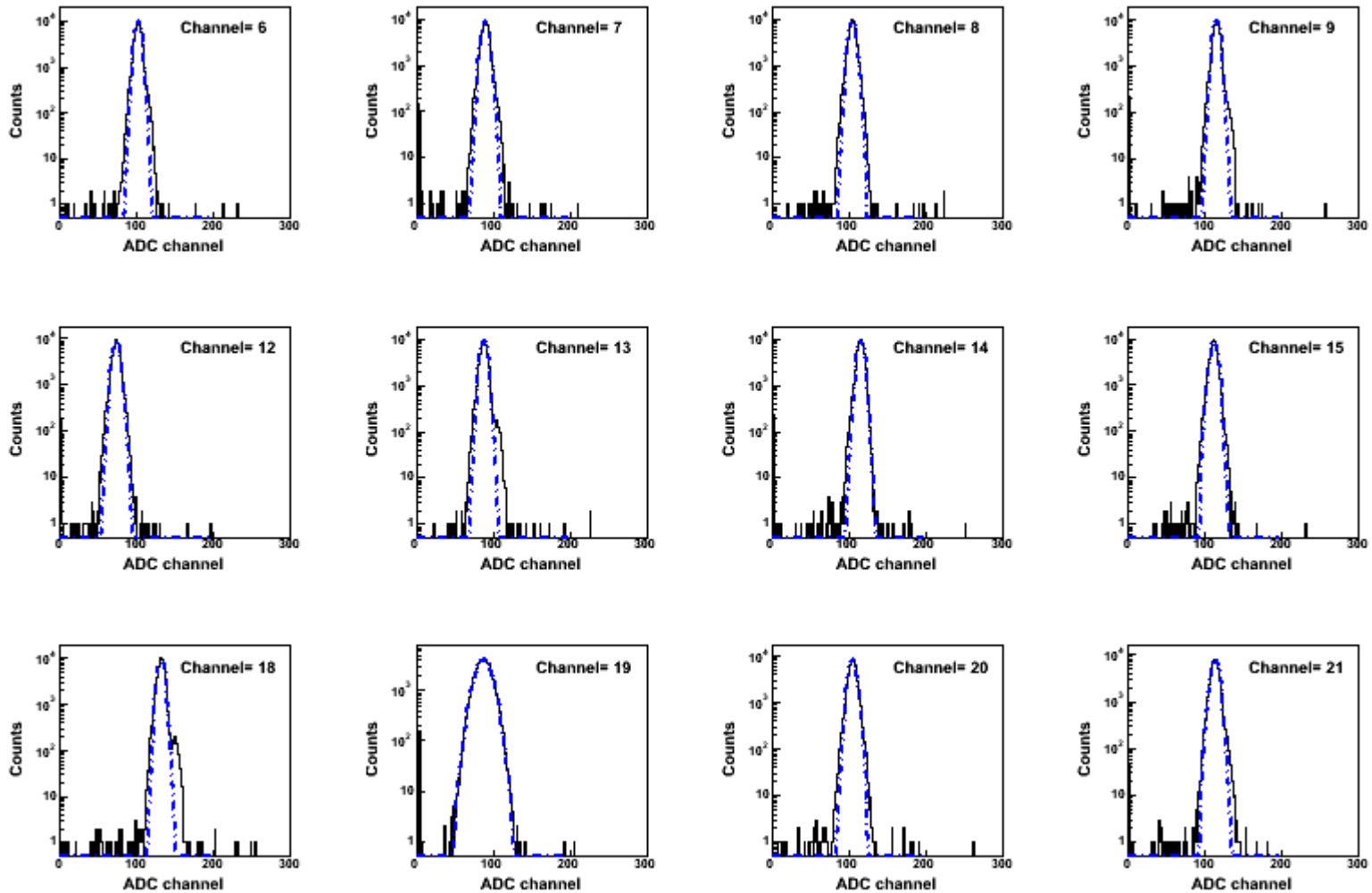
Calibration procedure

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

E. Epple, R. Münzer

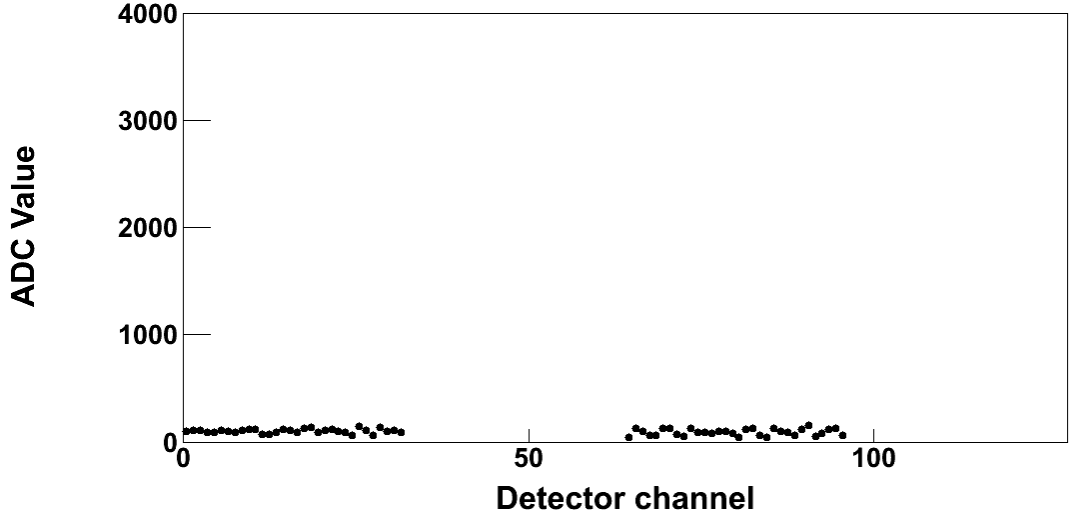
Noise Behavior

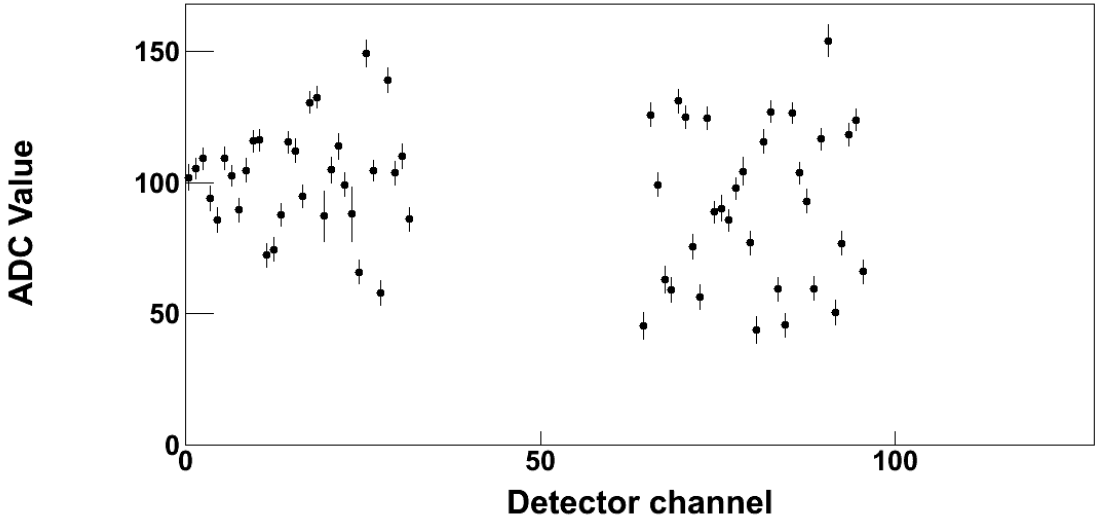
Fitted with a Gauss function



E. Epple, R. Münzer

Noise Behavior



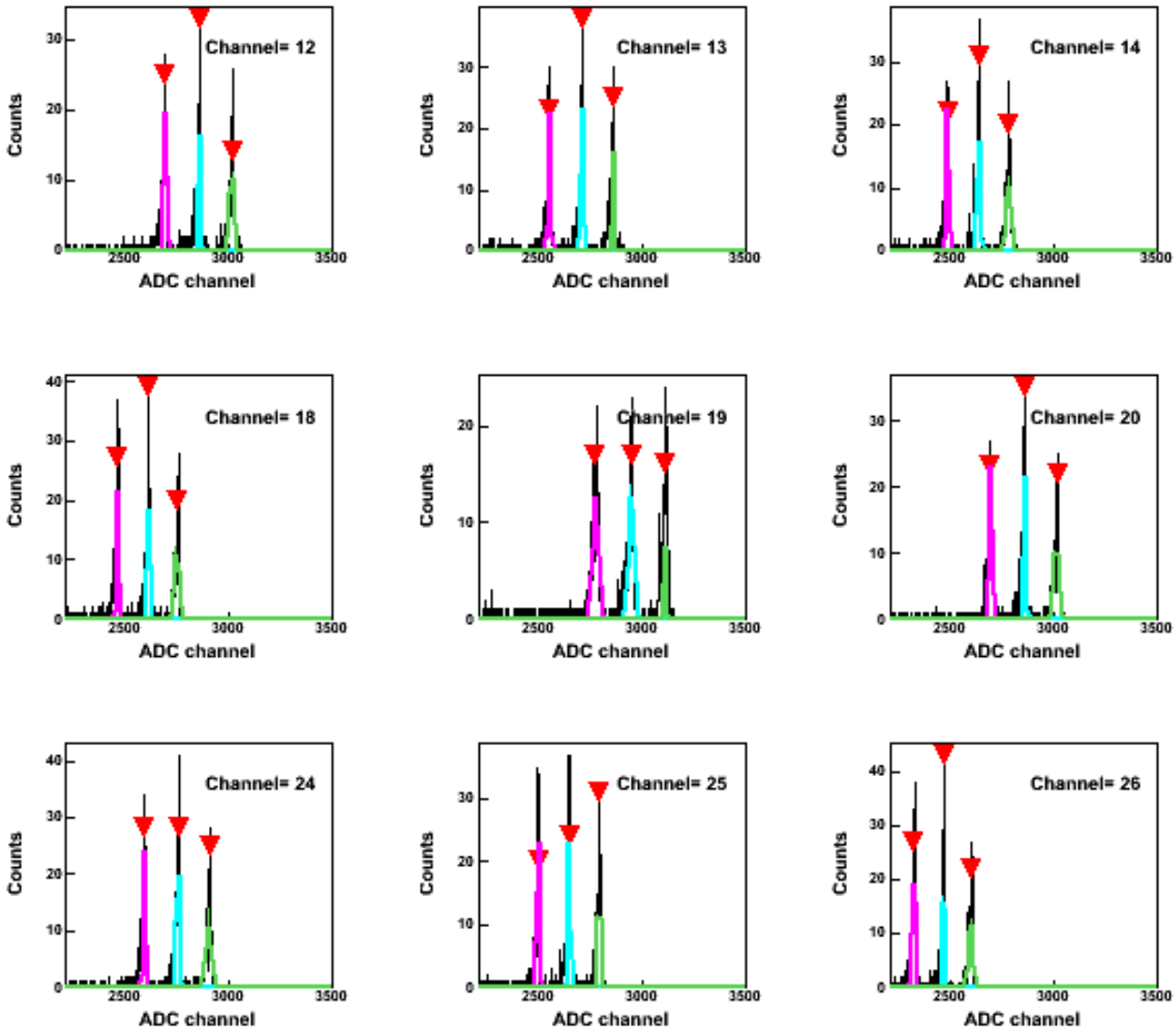


E. Epple, R. Münzer

Test with triple alpha source

Pu(239)
Am(241)
Cu(244)

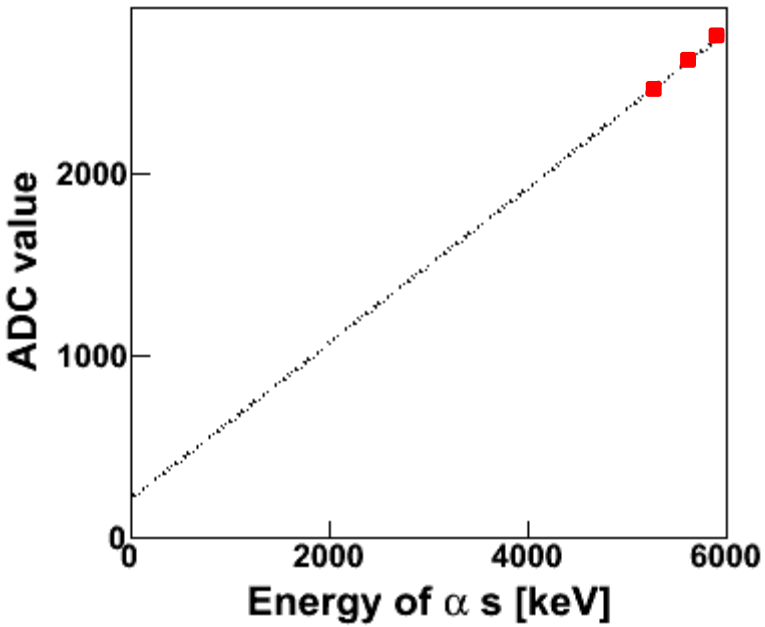
Fitted with 3 Gauss functions



E. Epple, R. Münzer

Calibration

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

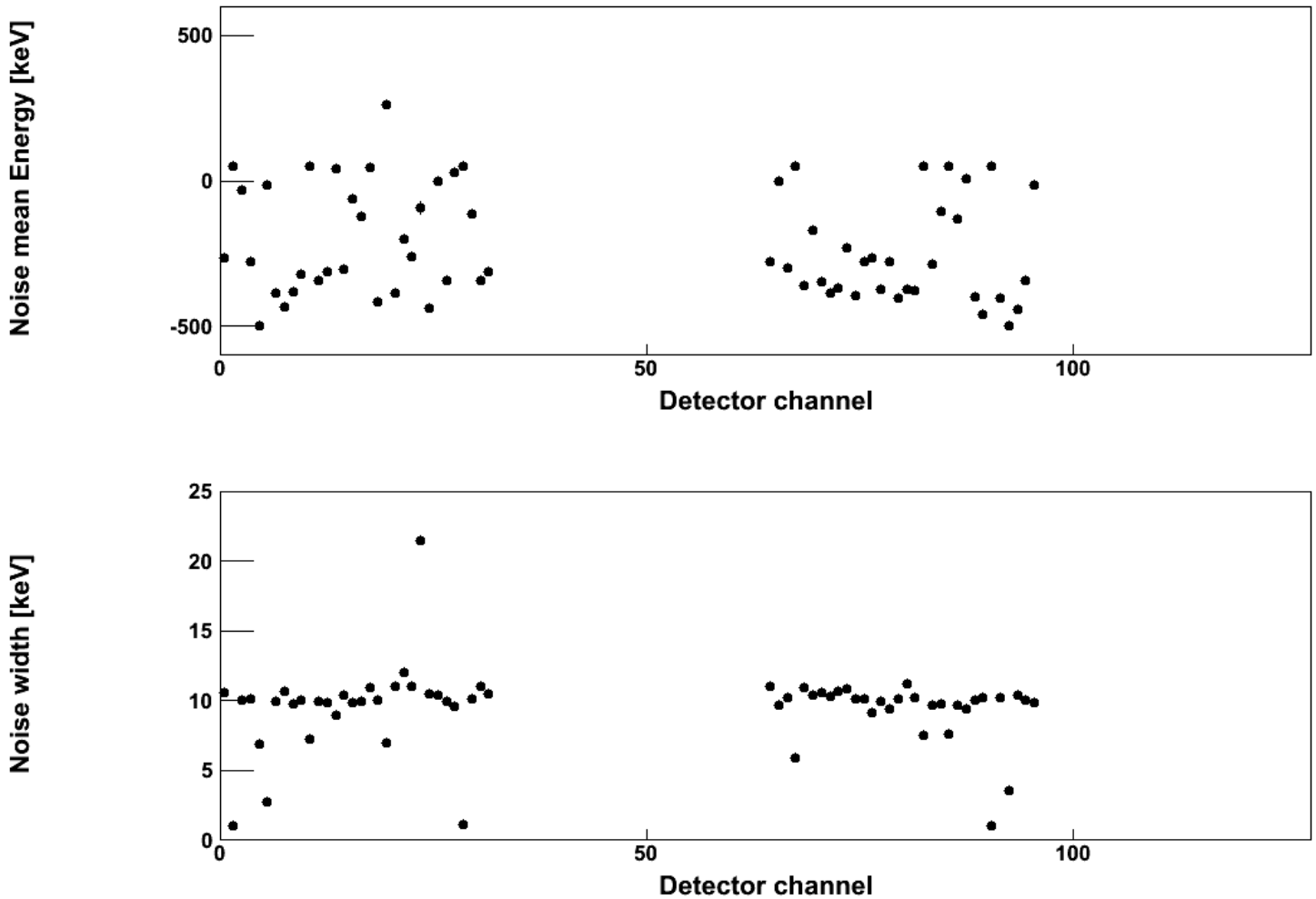


ADC value = ***A*** + ***B****Energy

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

E. Epple, R. Münzer

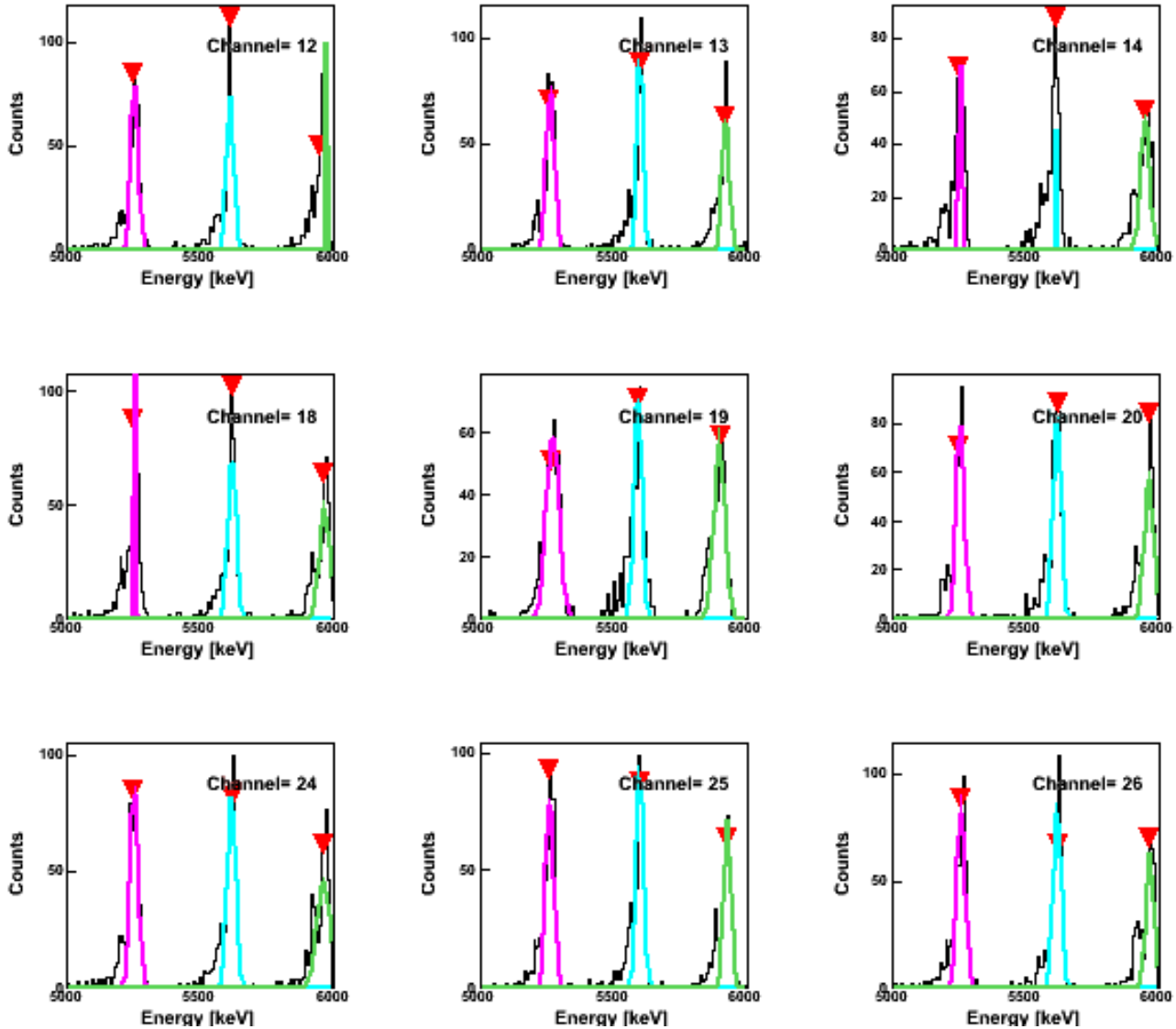
Noise calibrated



E. Epple, R. Münzer

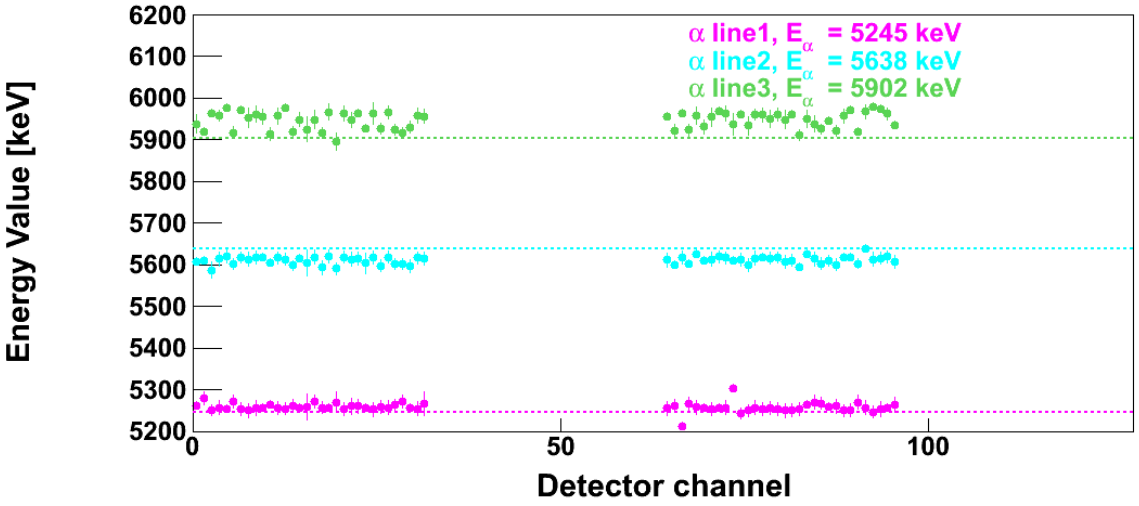
triple alpha calibrated

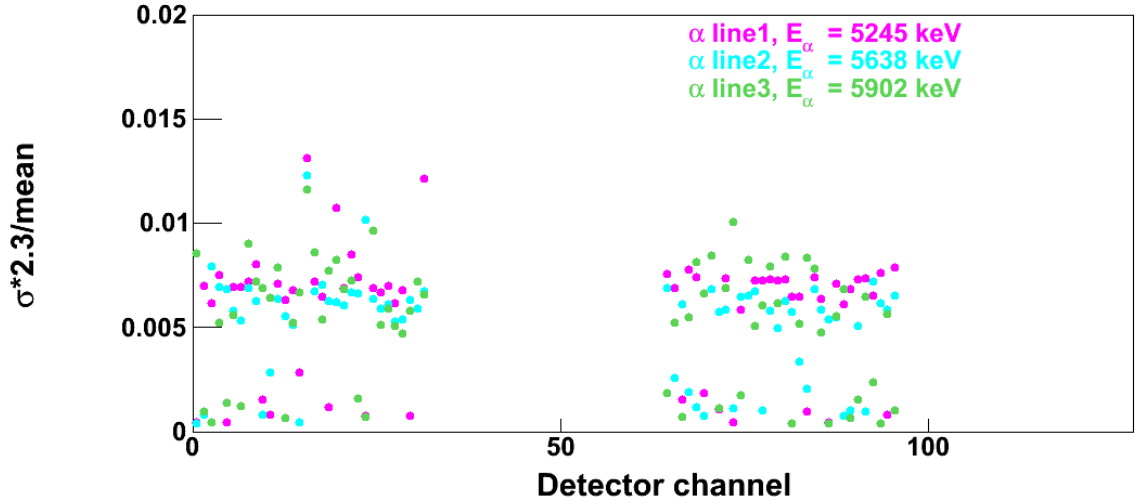
Fitted with 3 Gauss functions



E. Epple, R. Münzer

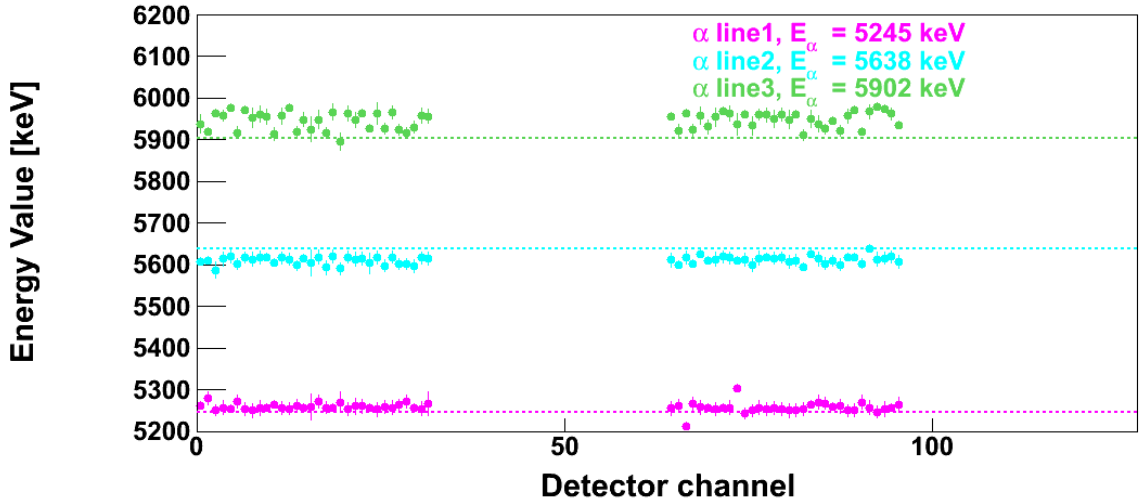
triple alpha calibrated

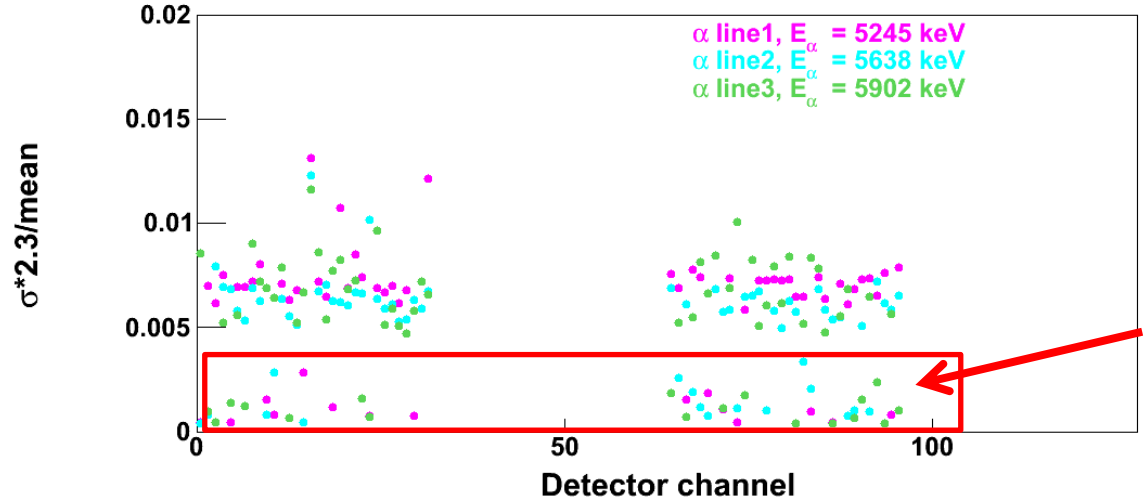




E. Epple, R. Münzer

triple alpha calibrated



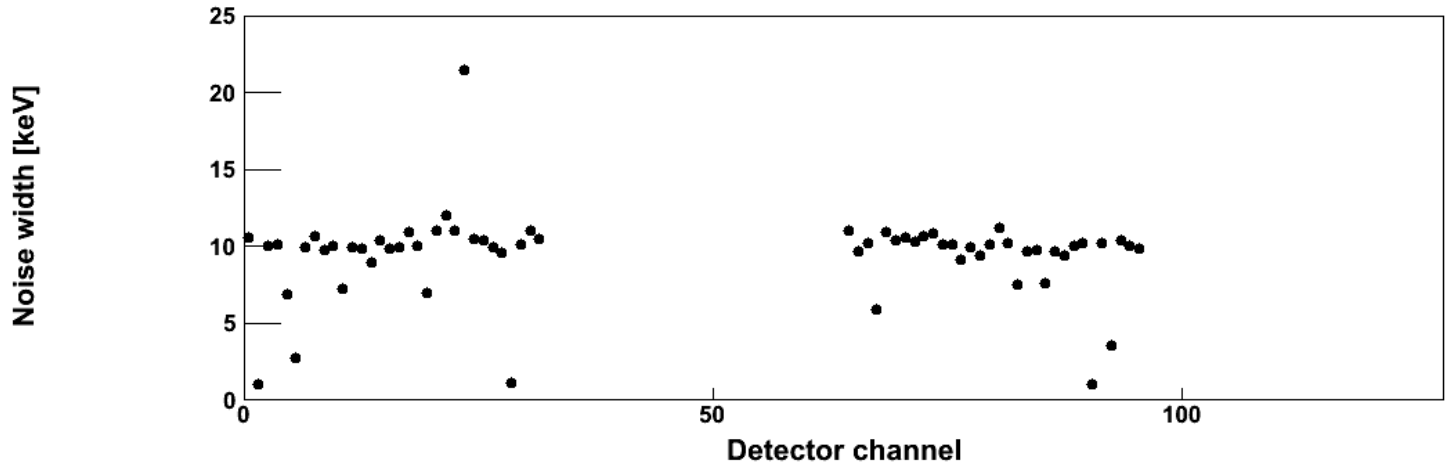


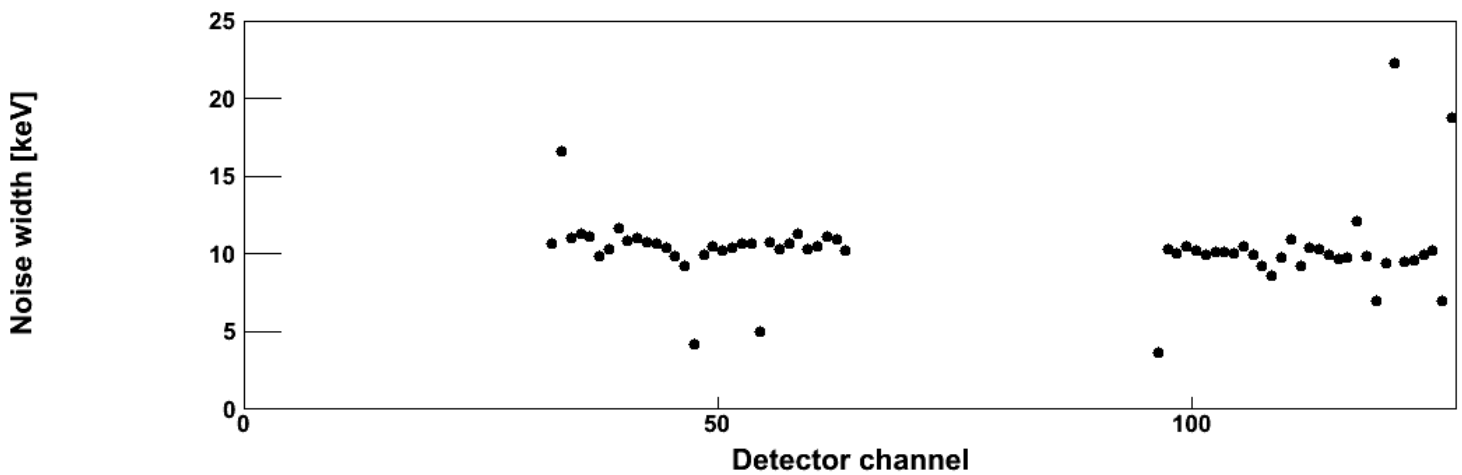
failed gauss fit - preliminary

E. Epple, R. Münzer

Result summary

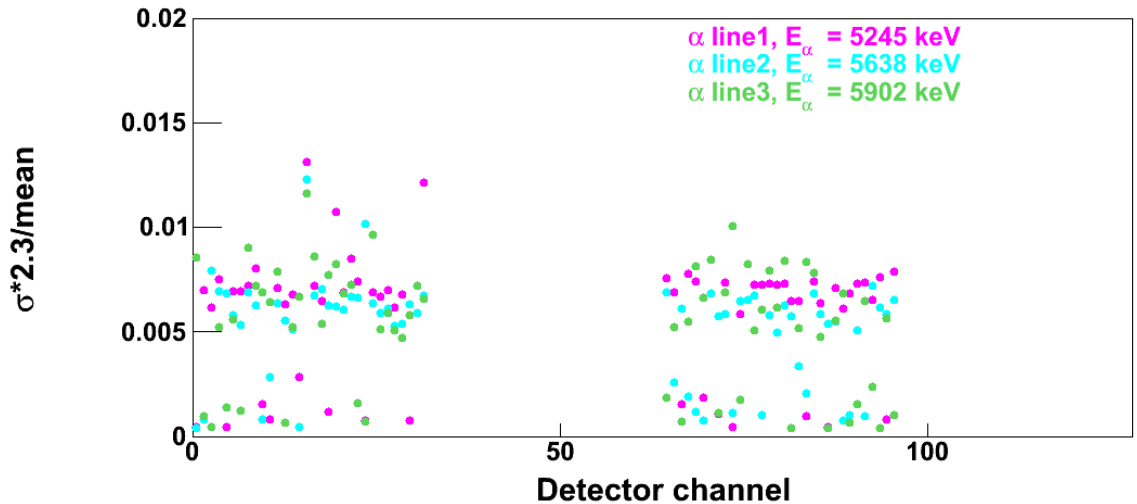
n-Side of Detector

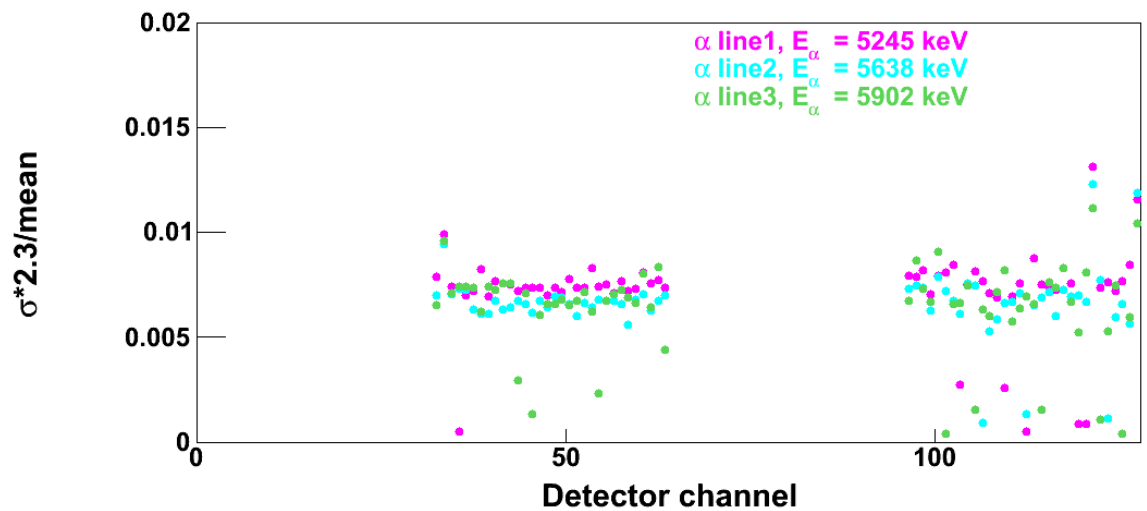




E. Epple, R. Münzer

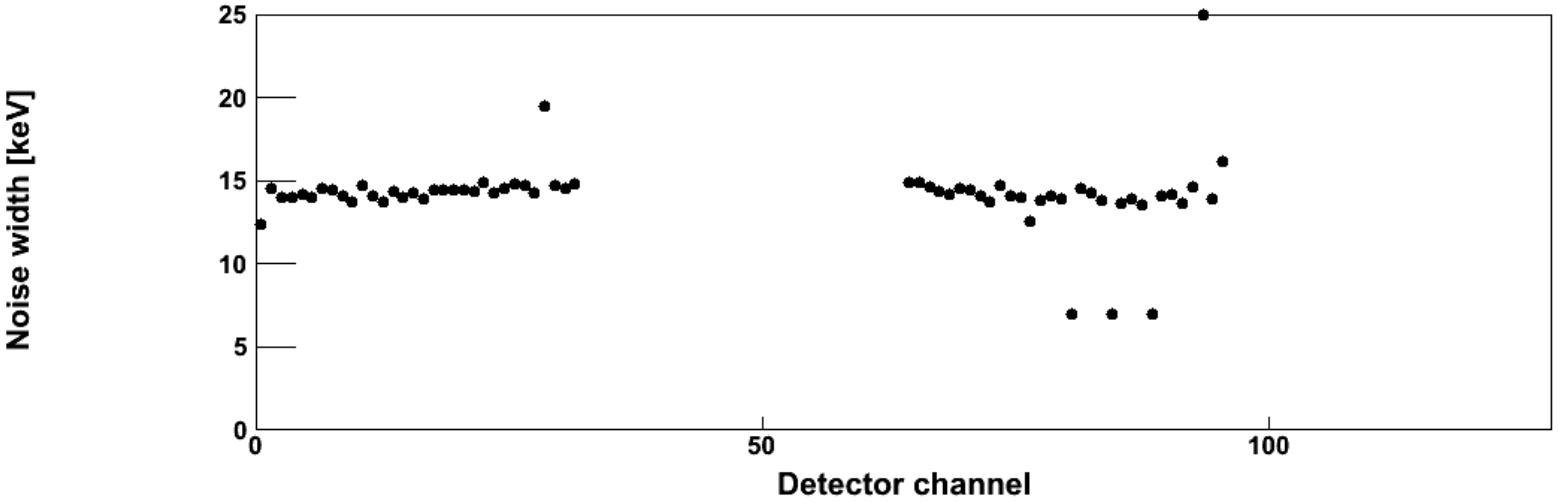
n-Side of Detector

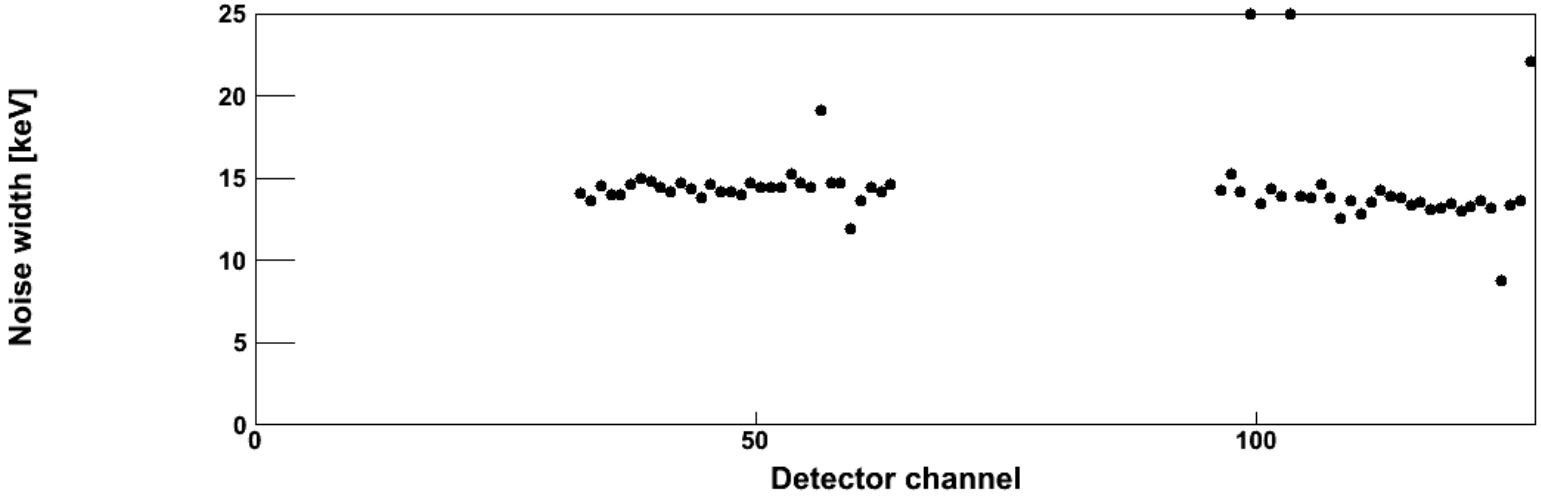




E. Epple, R. Münzer

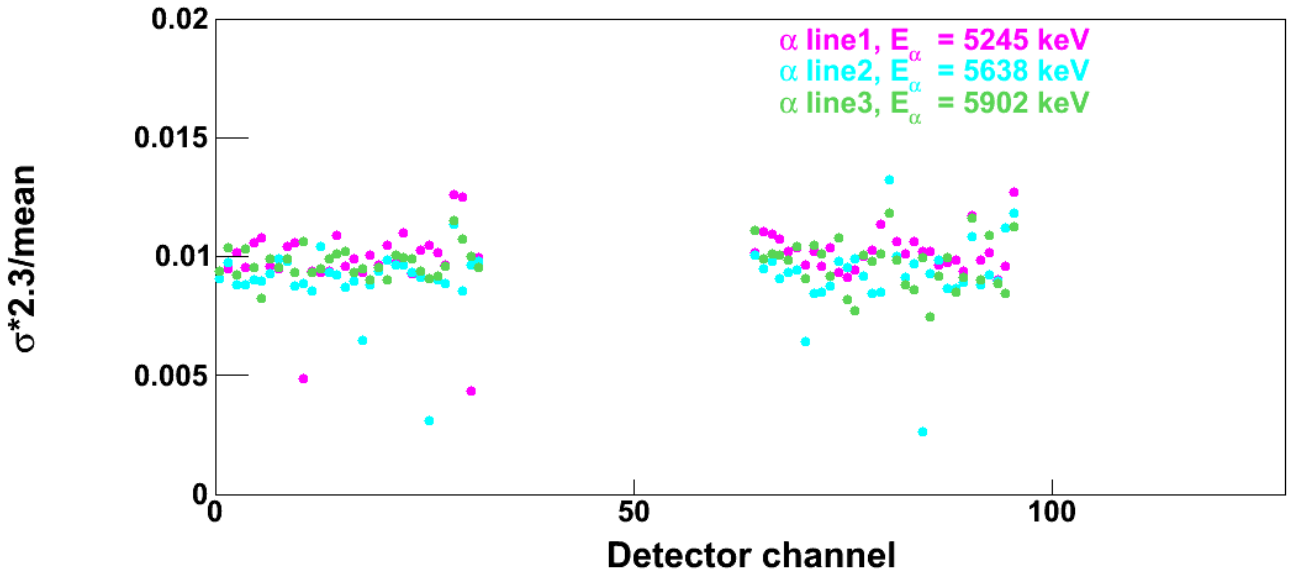
p-Side of Detector

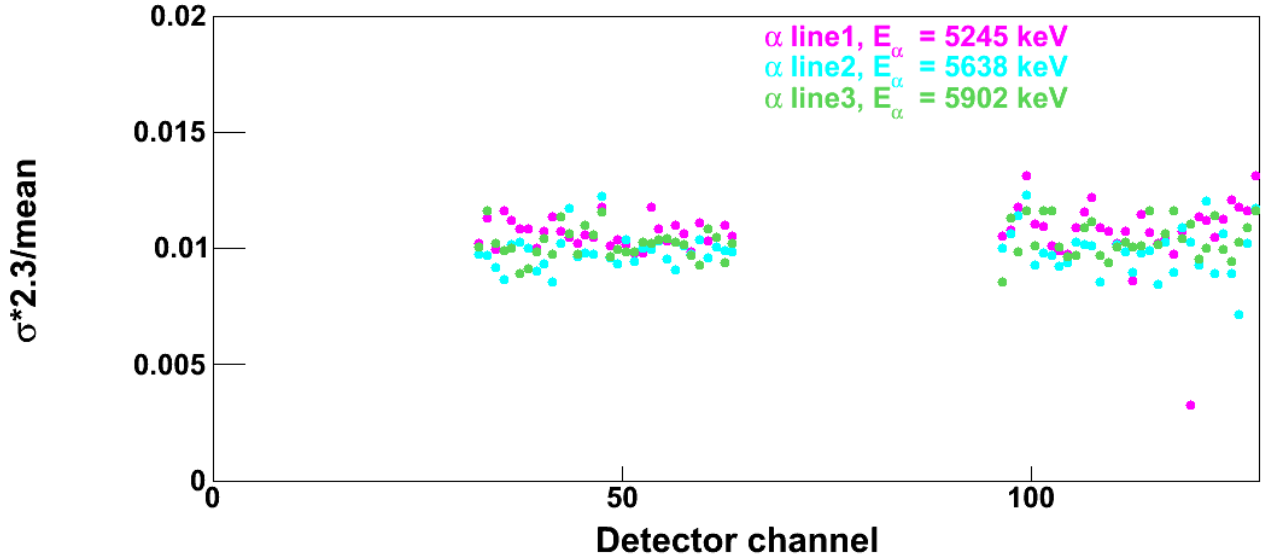




E. Epple, R. Münzer

p-Side of Detector





E. Epple, R. Münzer

Summary & Outlook

Test of Detector 1:

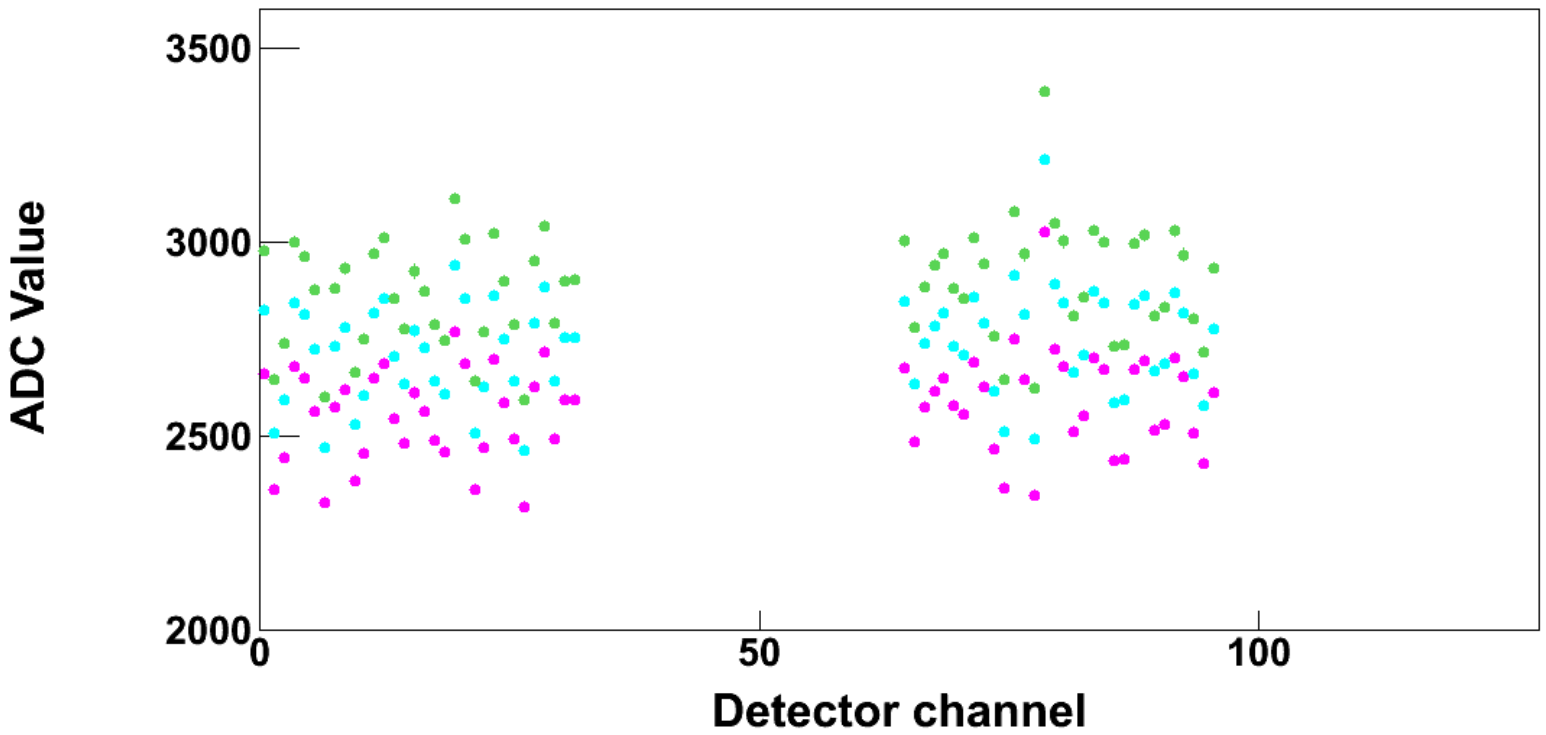
- Leakage Current Stable: Higher value due to different bias resistor
- 100% of strips are working well
- Energy resolution: <1 % @ 5 MeV
- Noise: ~2500 e- (Preamplifier)

Outlook

- Continue tests with detector 2 and 3
- Tests with beta-Source (Separation Noise/Signal)

Backup

Test with triple alpha source

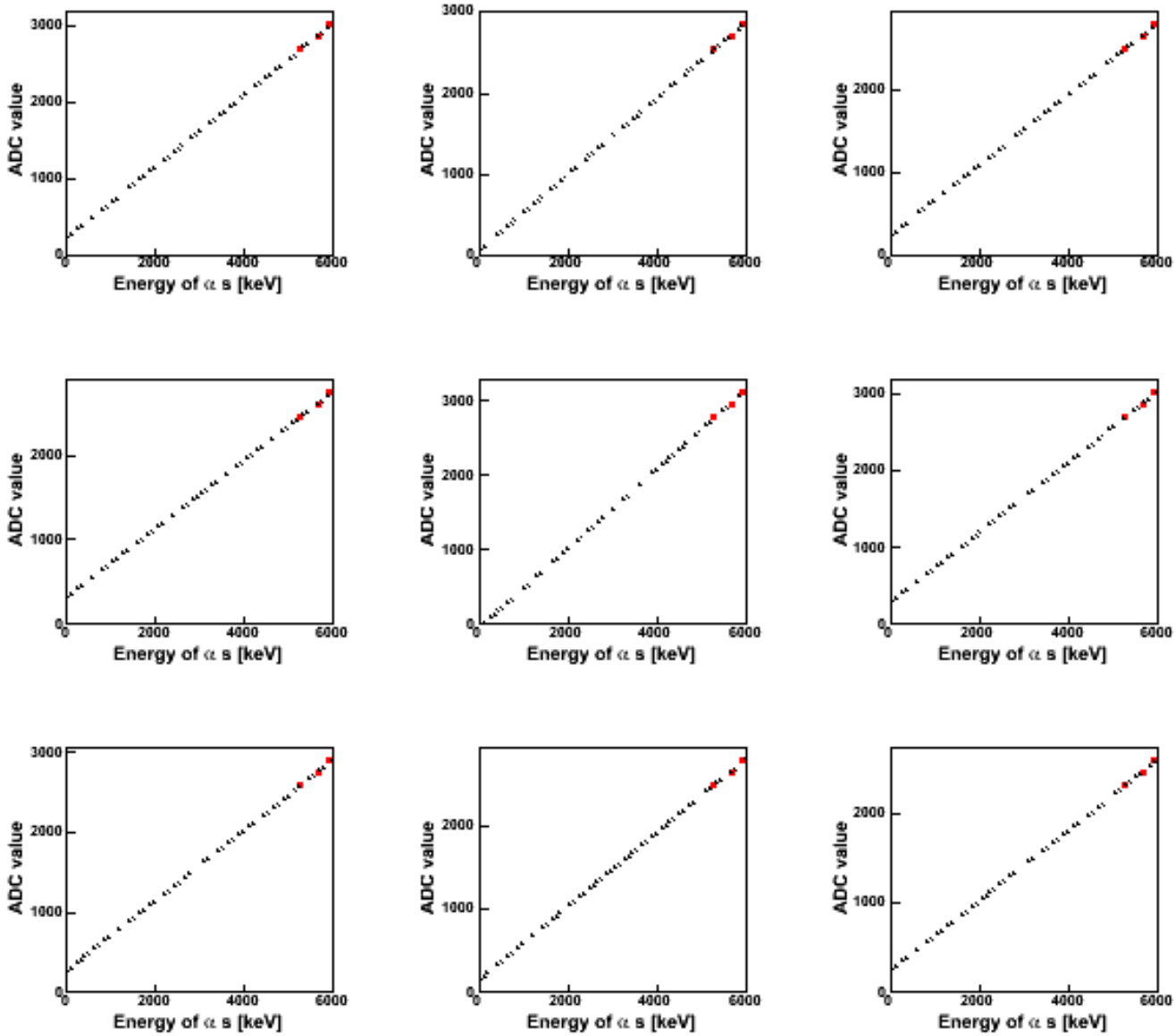


E. Epple, R. Münzer

Calibration

The 3 means of the fitted gauss is plotted against the 3 α Energies

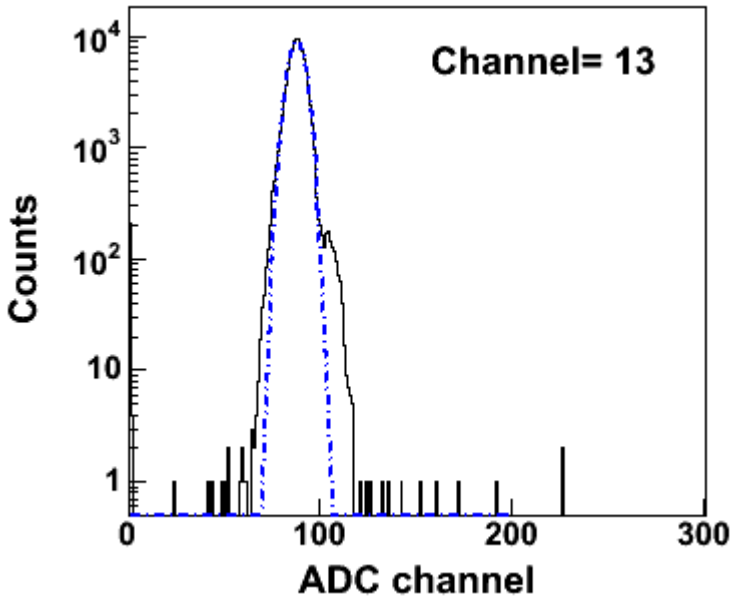
E_α = 5245 keV
E_α = 5638 keV
E_α = 5902 keV

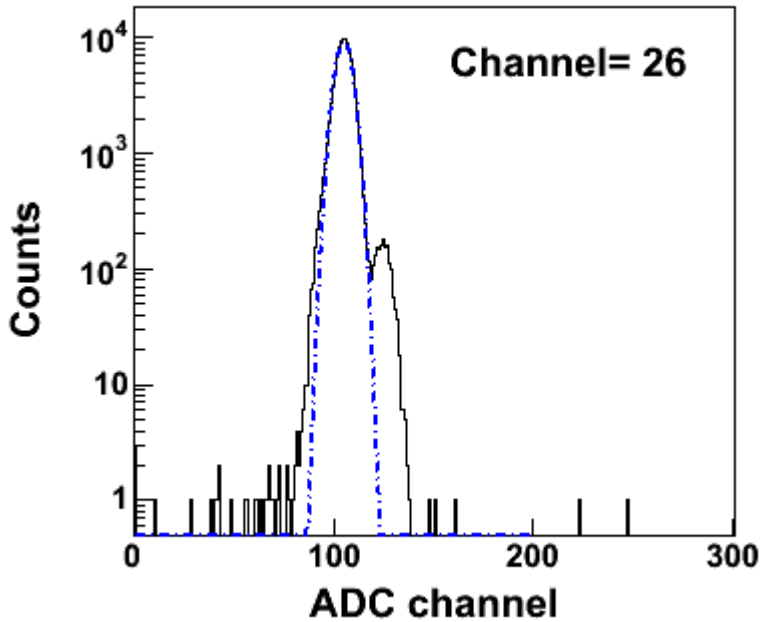


E. Epple, R. Münzer

Noise Behavior

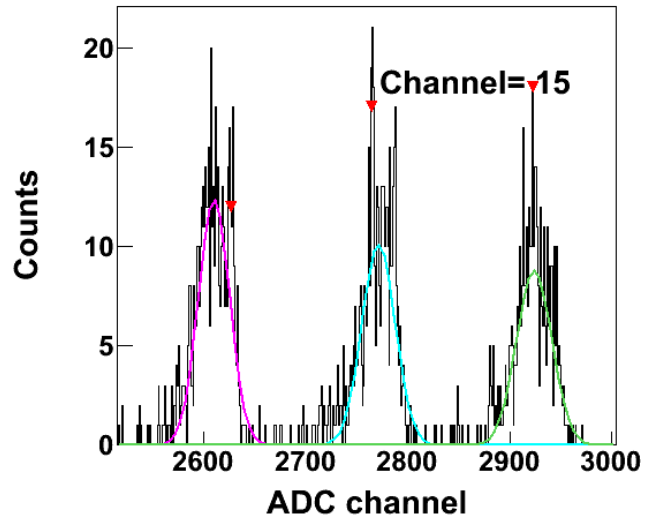
Fitted with a Gauss function

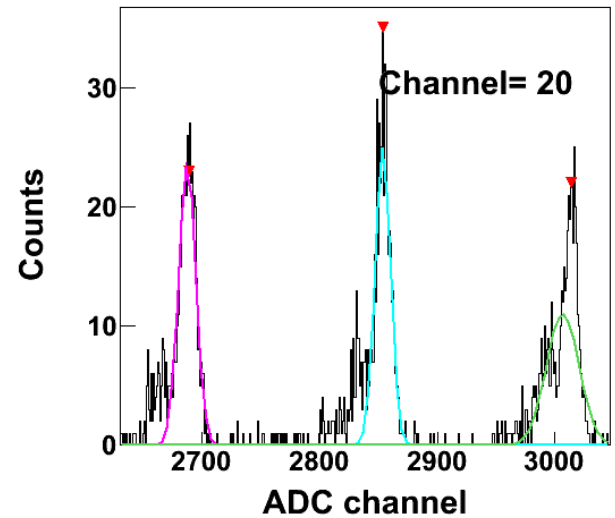


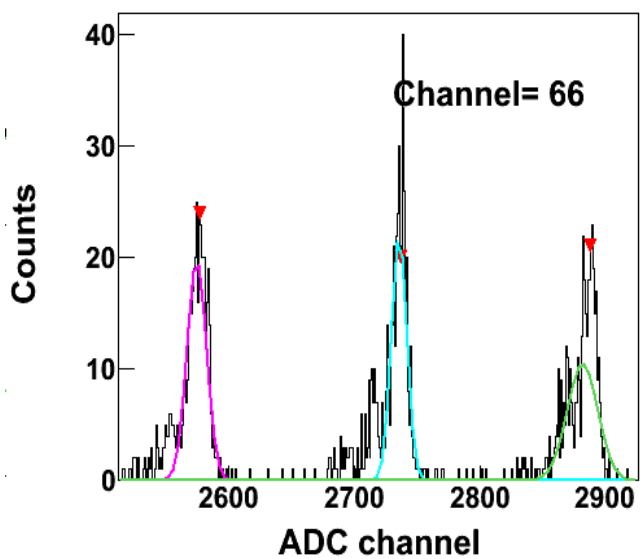


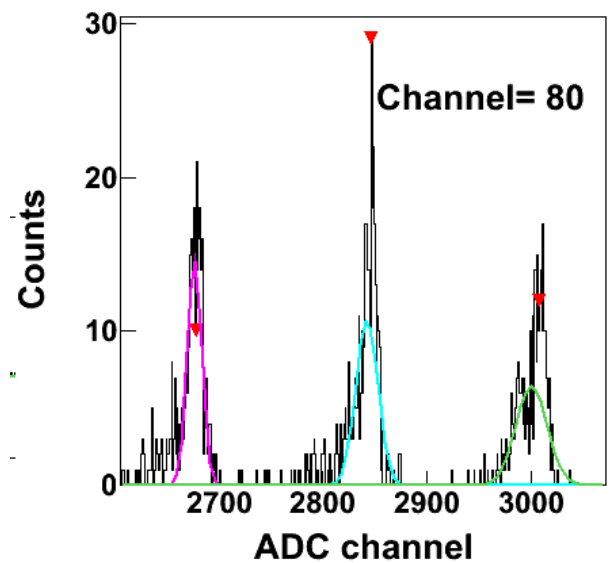
E. Epple, R. Münzer

Test with triple alpha source





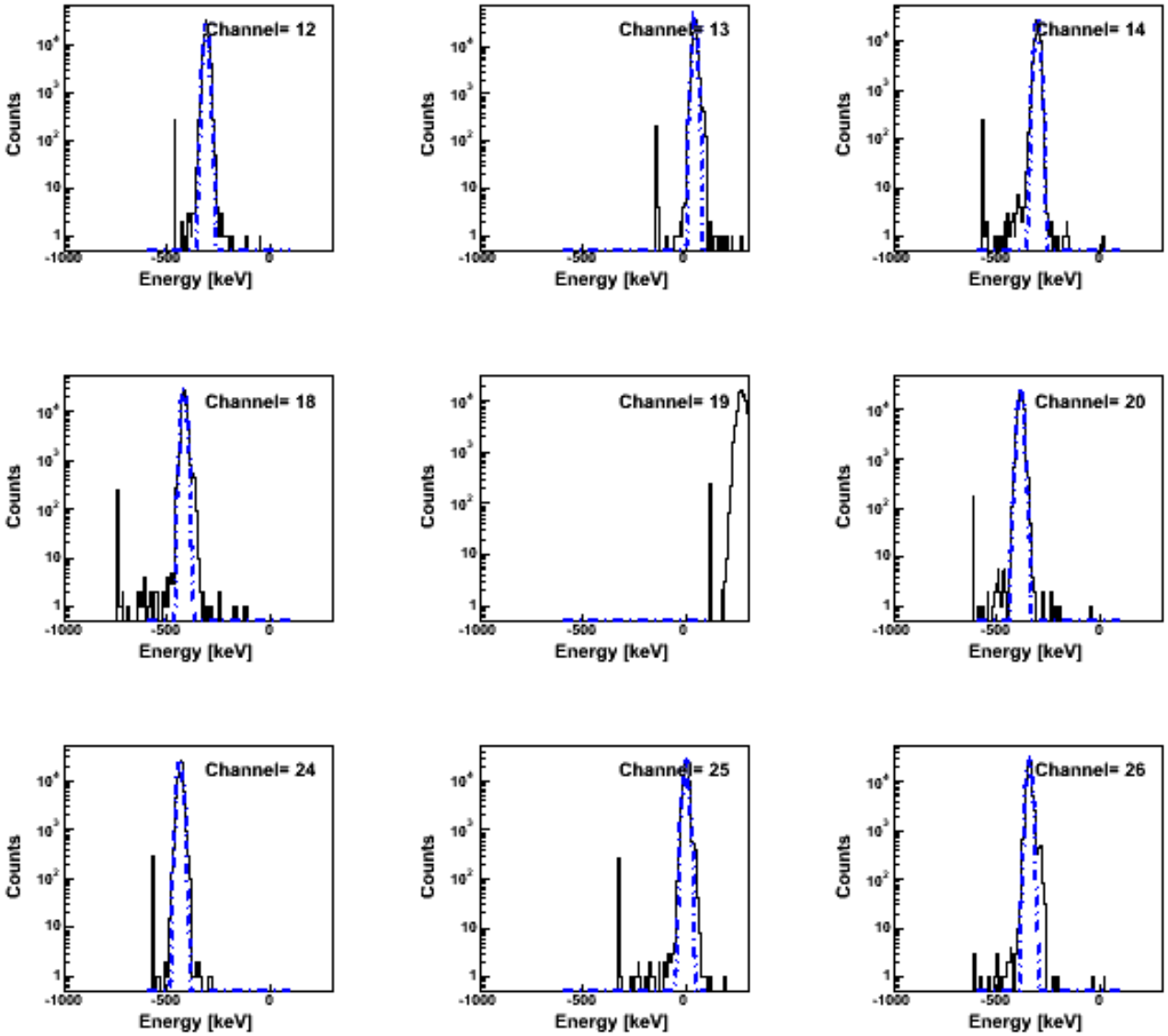




E. Epple, R. Münzer

Noise calibrated

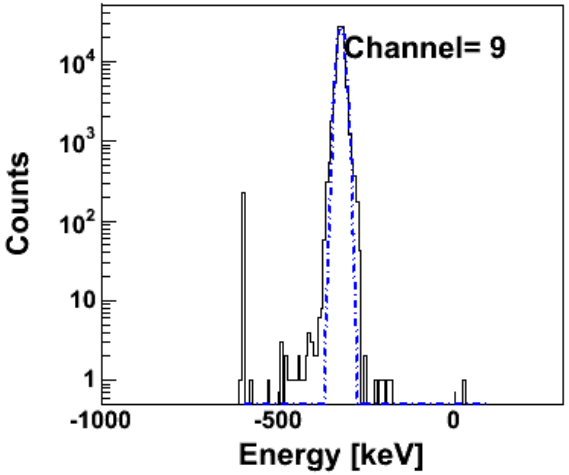
Fitted with a Gauss function

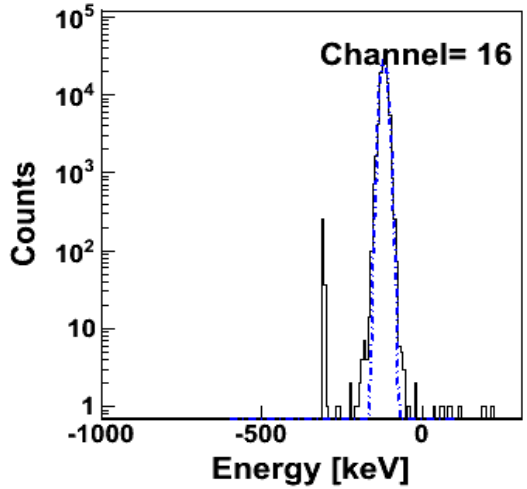


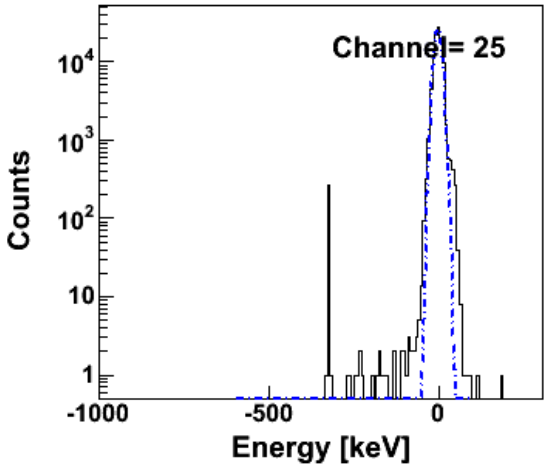
E. Epple, R. Münzer

Noise calibrated

Fitted with a Gauss function







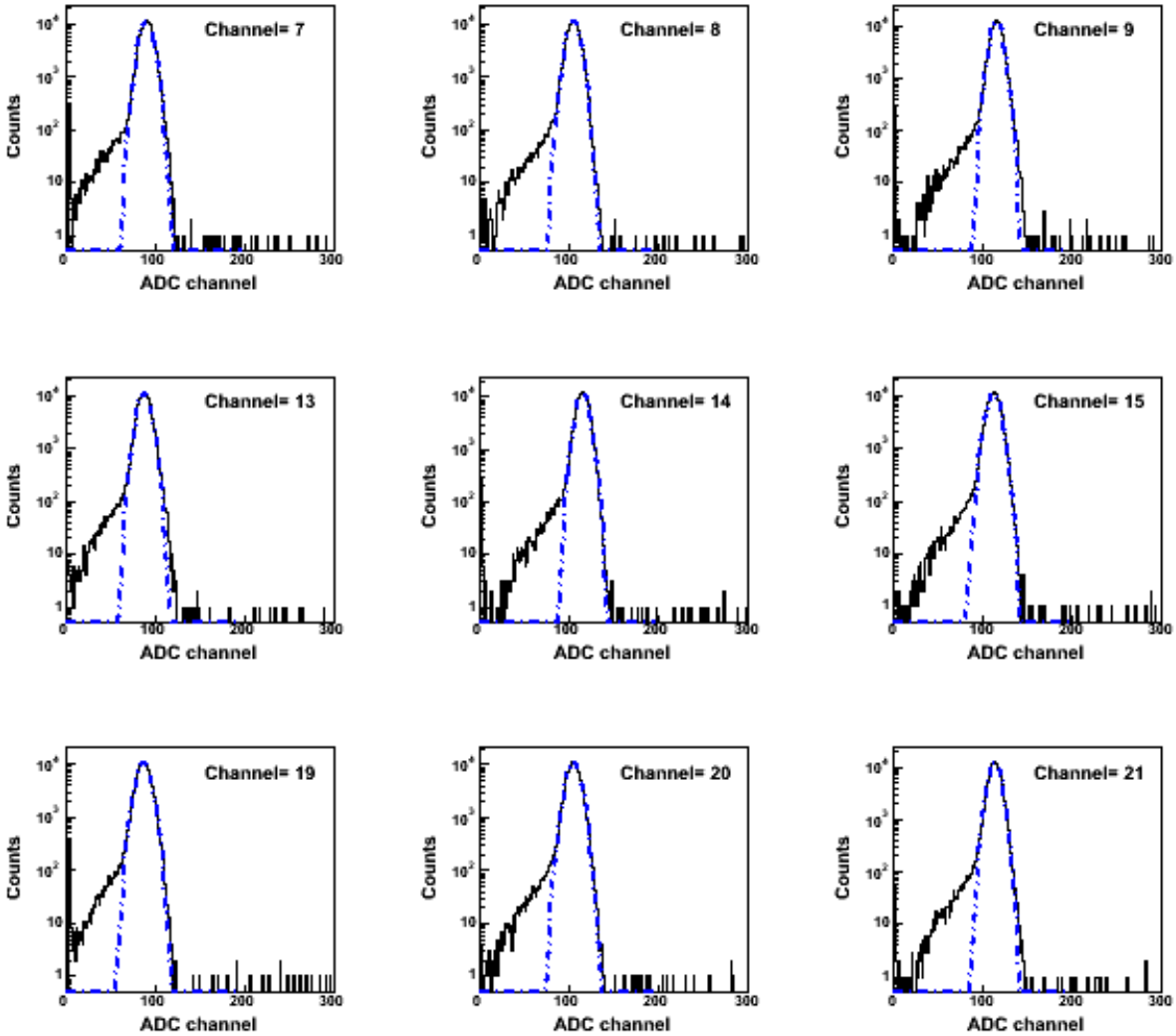
Noise peak not at 0 after calibration
still preliminary

E. Epple, R. Münzer

Besonderheiten

p-Side of Detector

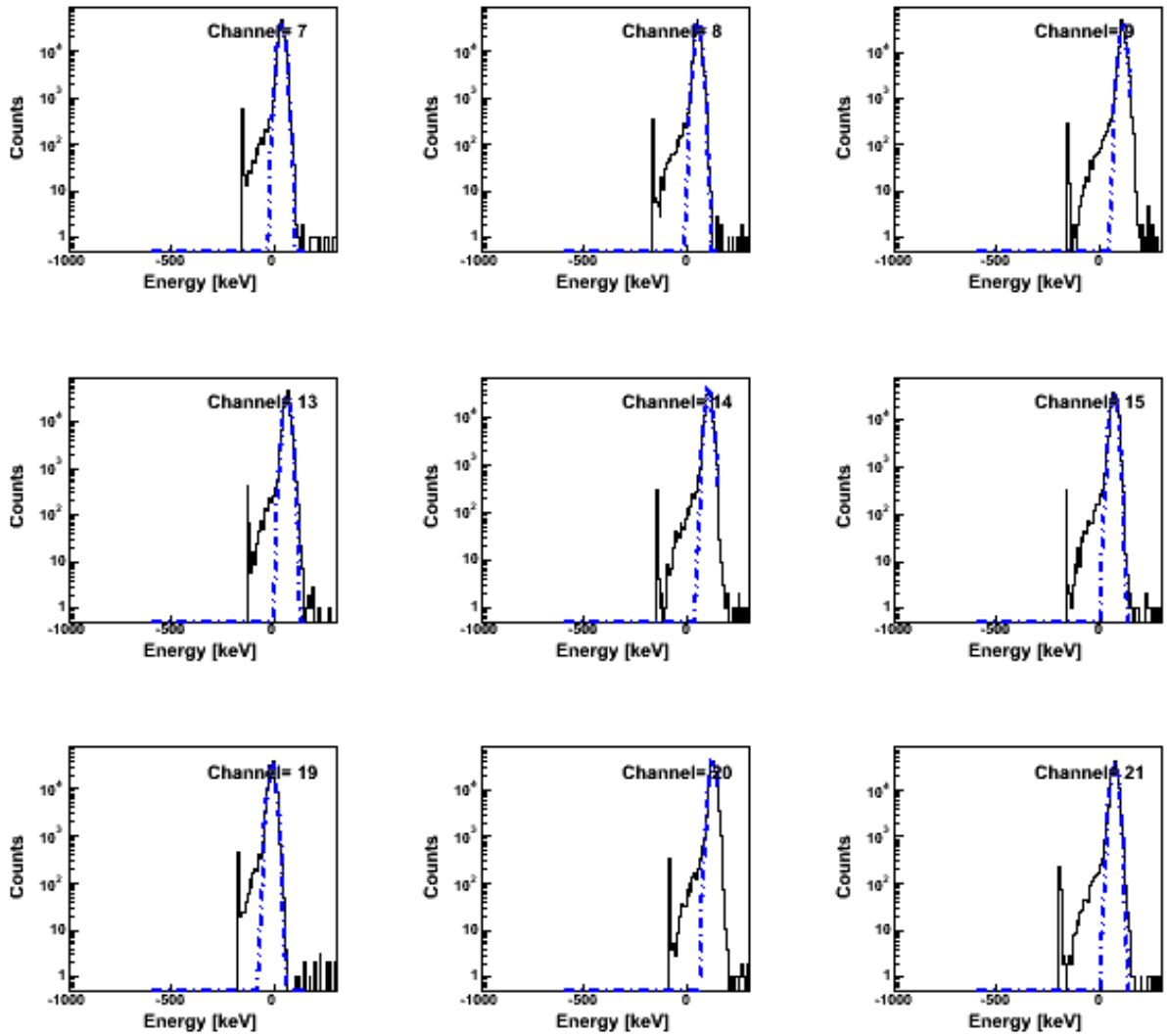
"raw"



E. Epple, R. Münzer

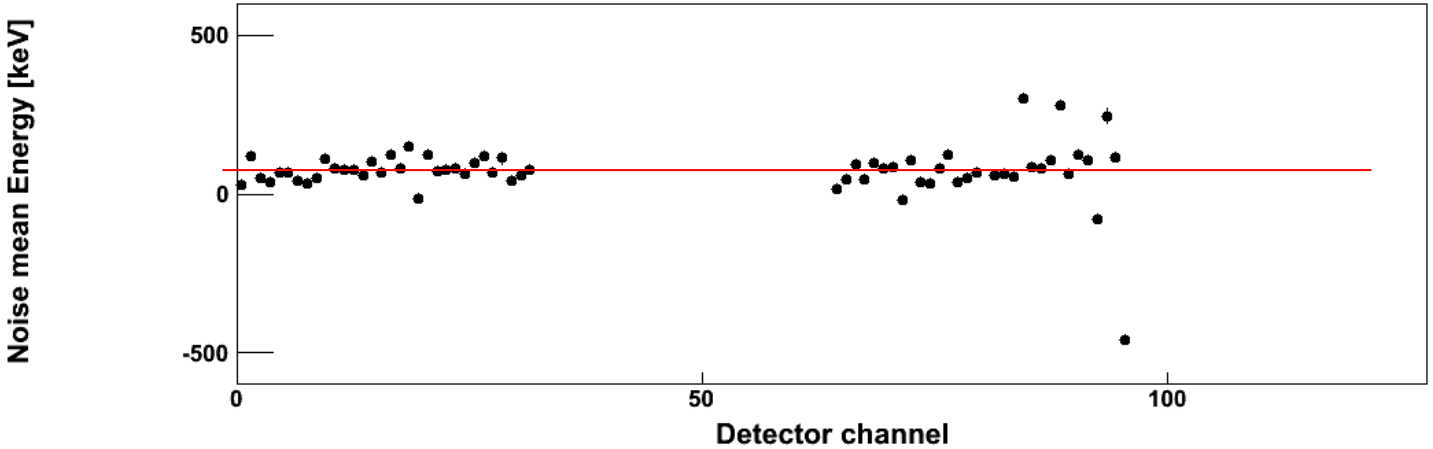
p-Side of Detector

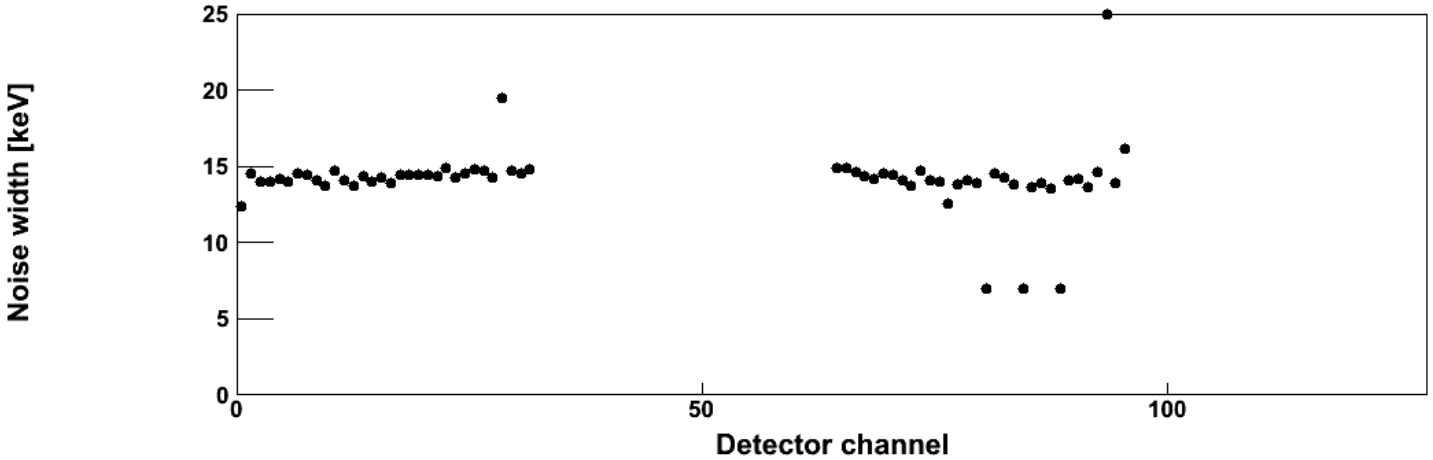
"calibrated"



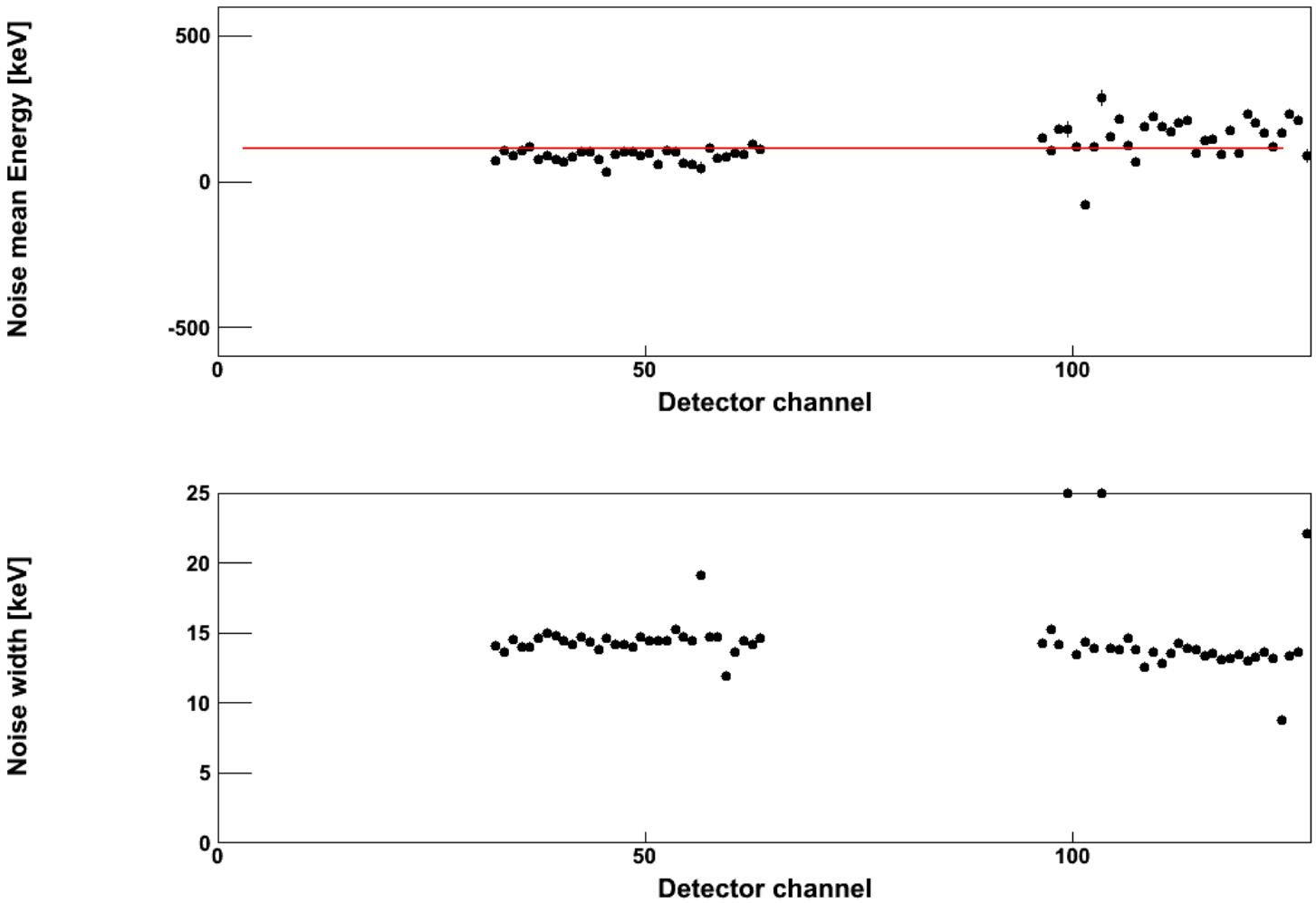
E. Epple, R. Münzer

Kalibration funktioniert hier viel besser !!



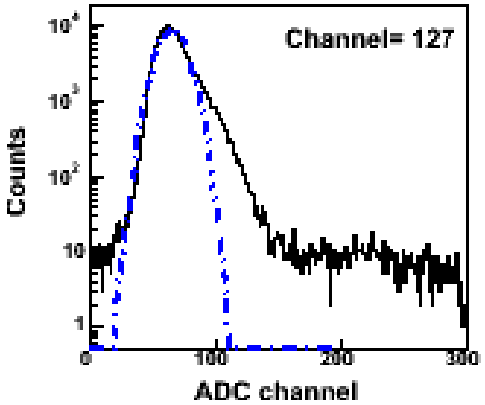


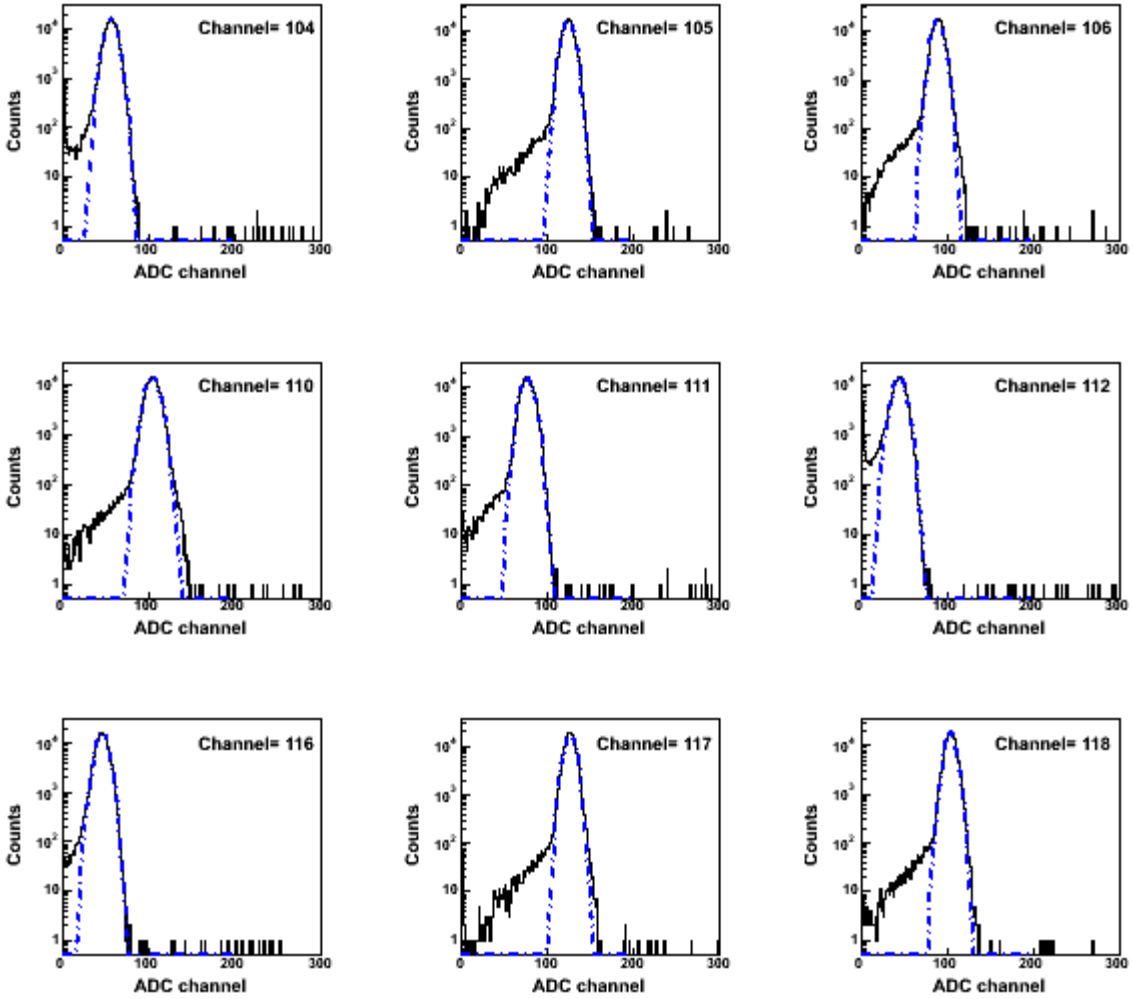
E. Epple, R. Münzer



E. Epple, R. Münzer

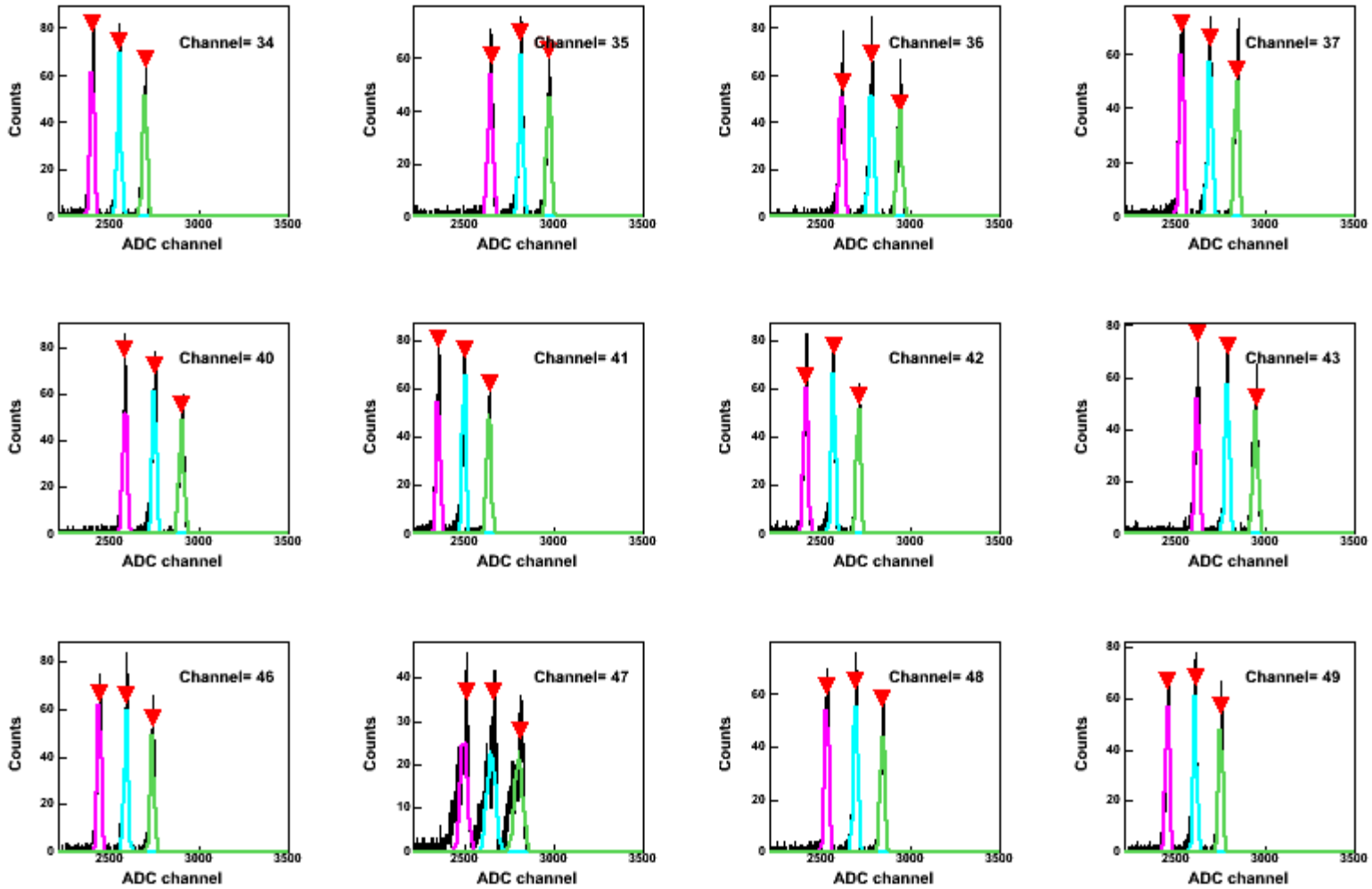
auch bei p-seite problem mit Kanal 127



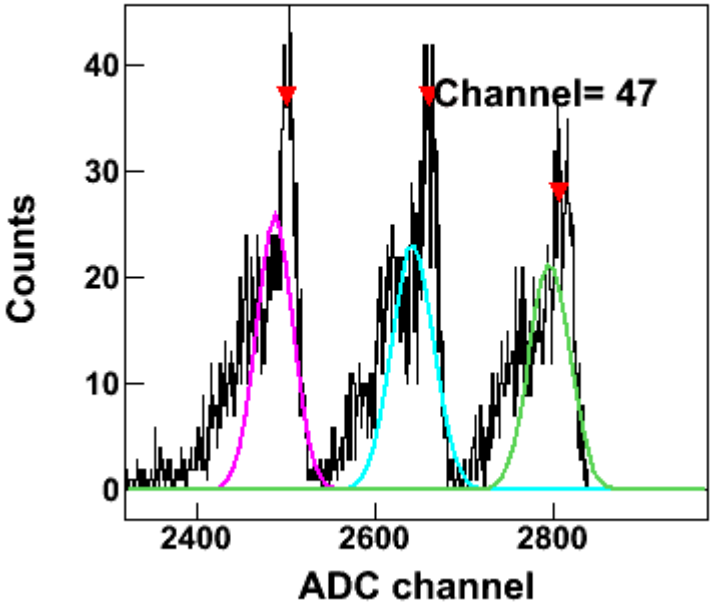


E. Epple, R. Münzer

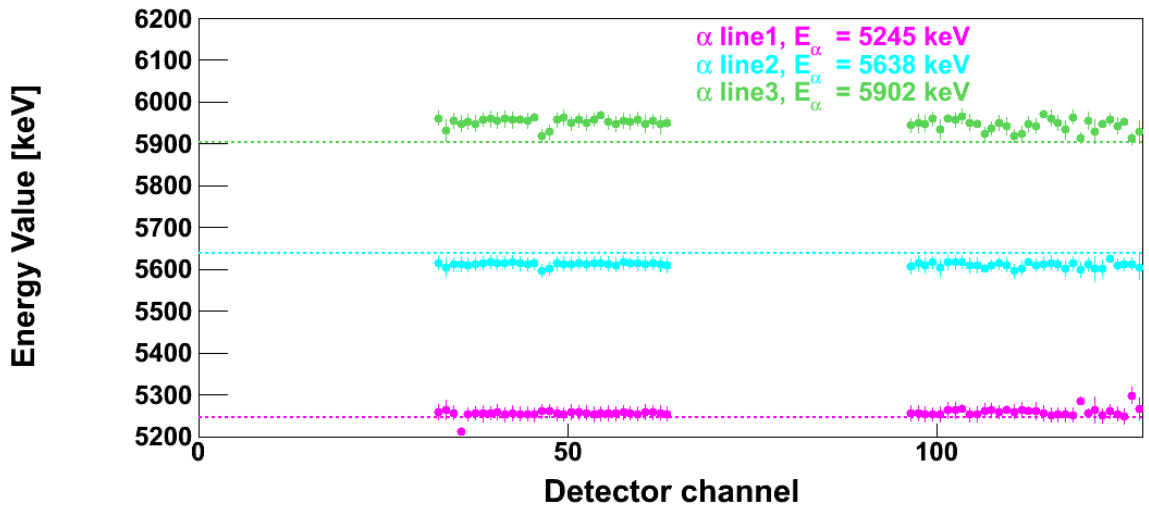
Alpha peaks sehen alle ganz gut aus bis auf Kanal 47!

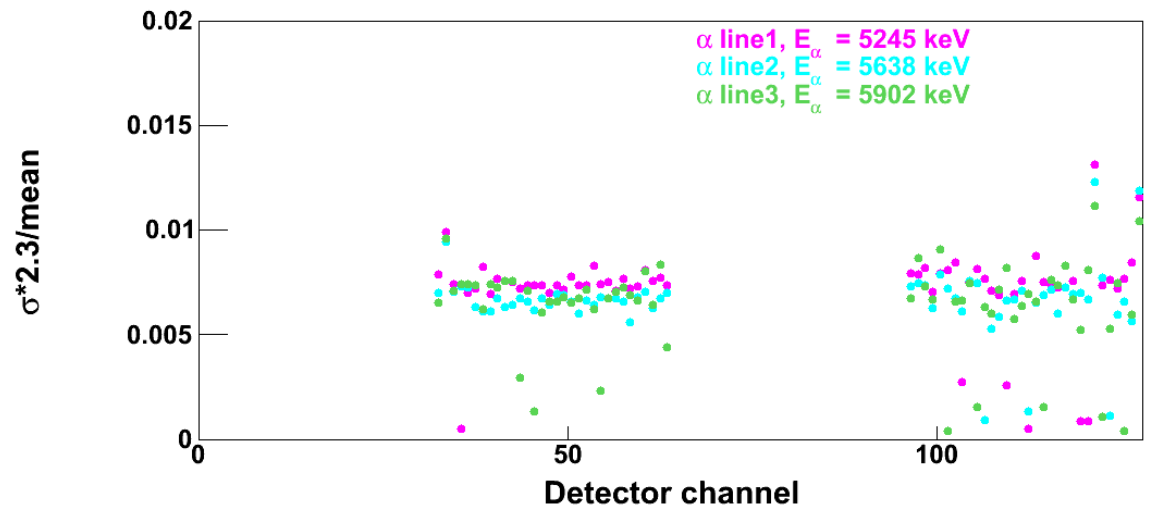


E. Epple, R. Münzer



E. Epple, R. Münzer





E. Epple, R. Münzer