Status Report

- Germanium Activities

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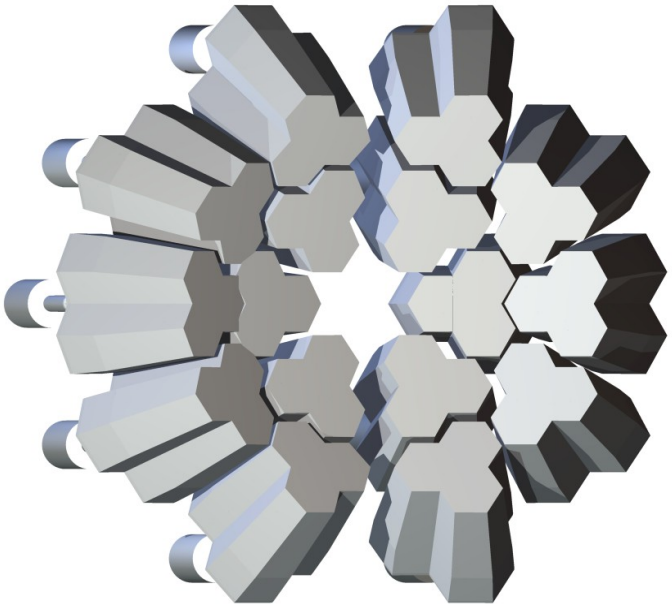
Panda LIII. Coll. Meeting, Uppsala, 06/09/15

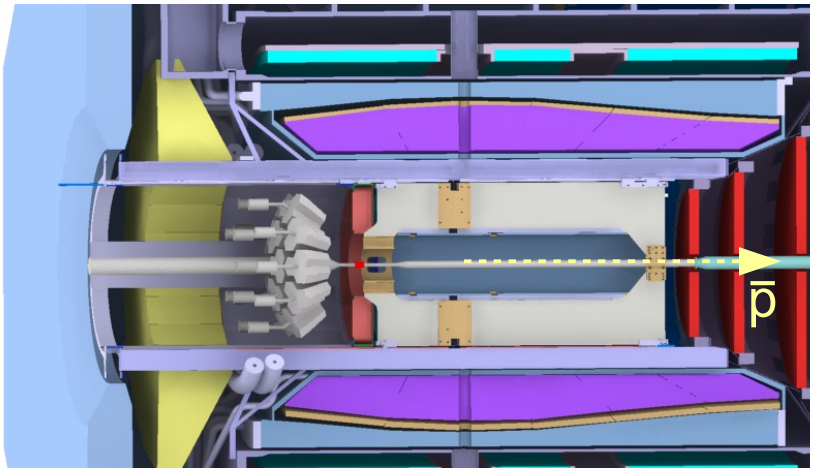
Outline

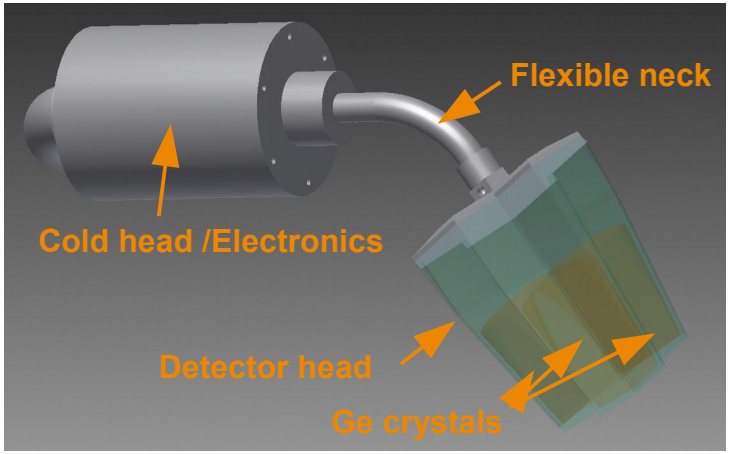
- Efficiency studies
- Beam time?!?

Germanium setup (reminder)

- 48 Euroball crystals
- 16 triple cryostats
- e.-m. cooled
- Backward angles

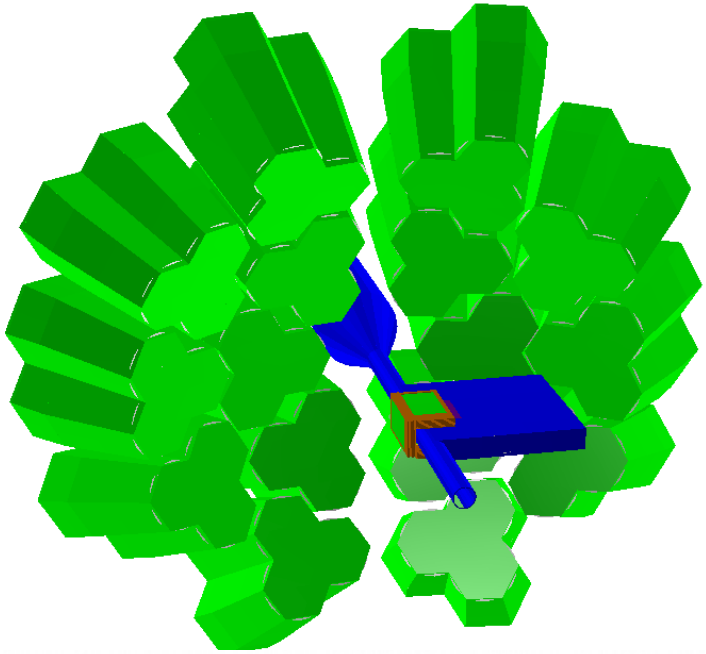


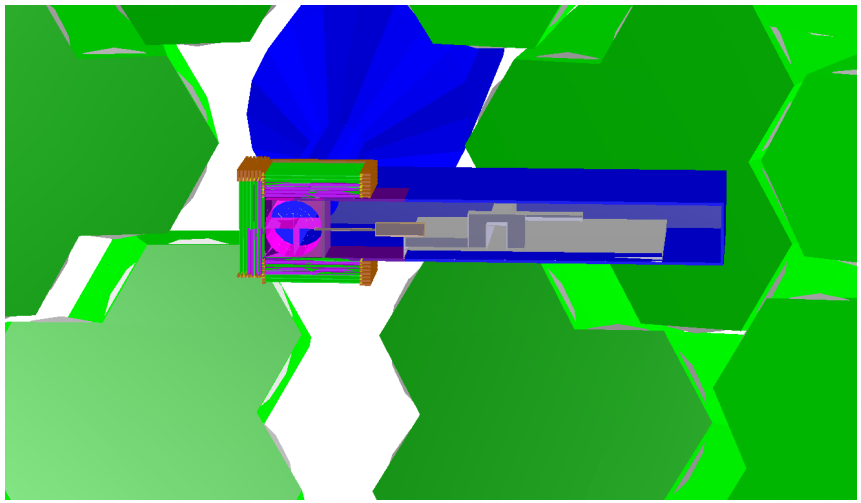


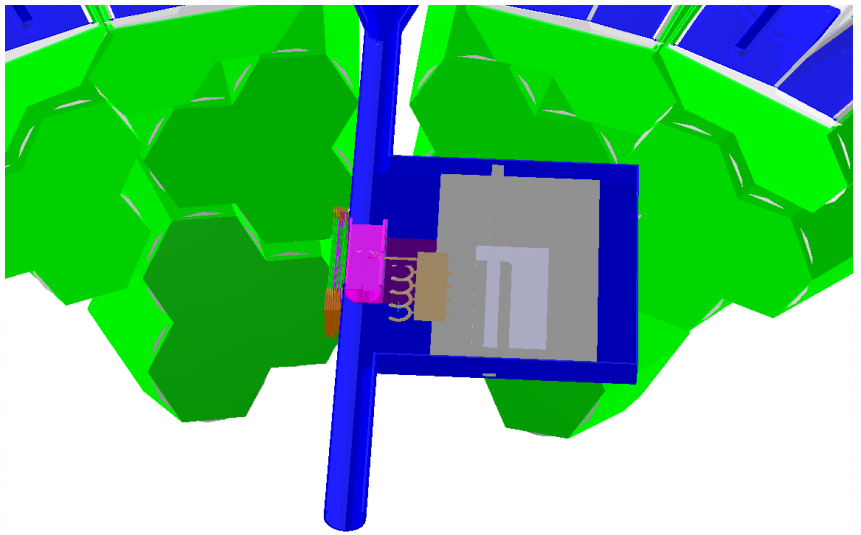


Efficiency studies

- Added more details to the target system geometry in PANDAroot
- Titanium beam pipe

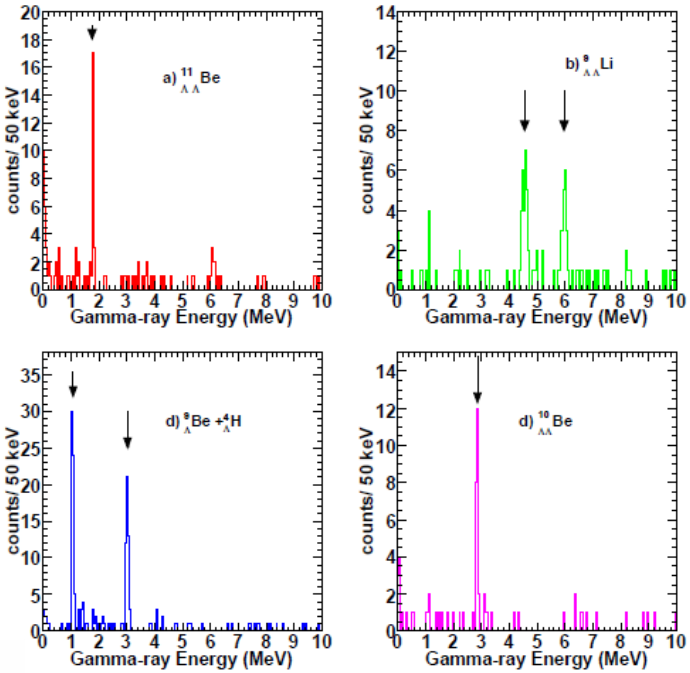


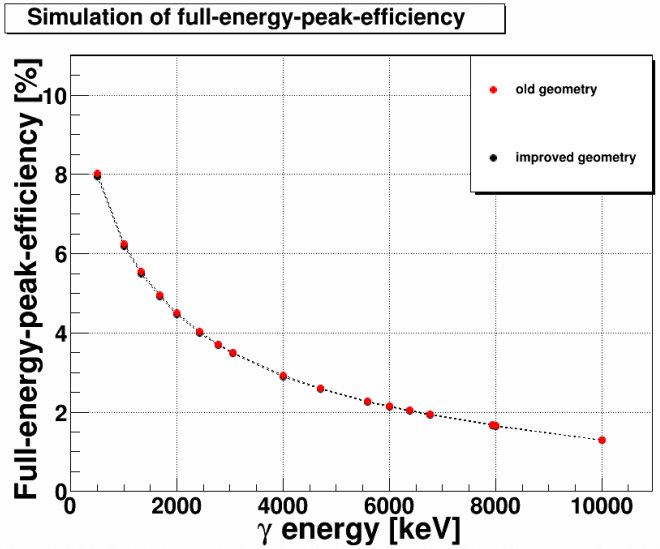




Efficiency studies

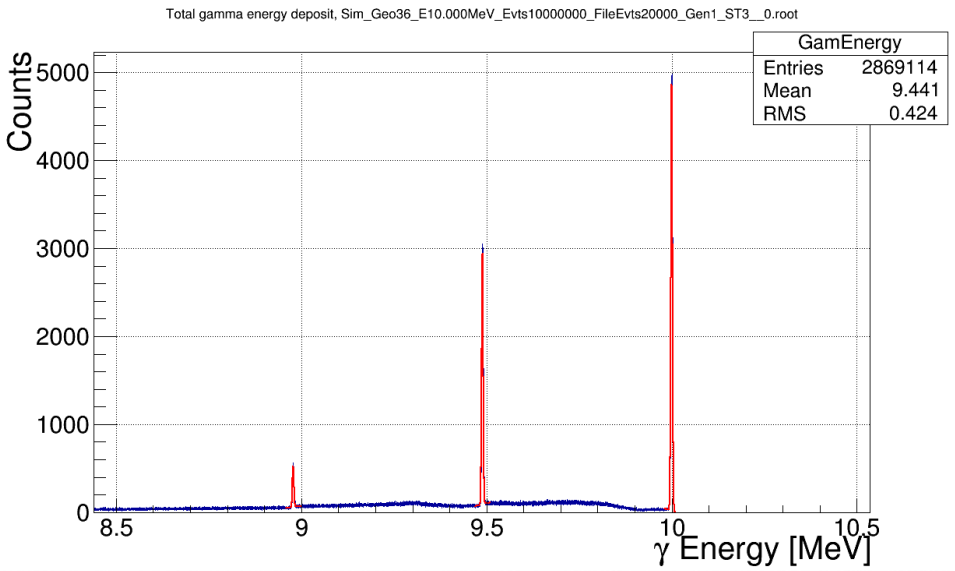
- Added more details to the target system geometry in PANDAroot
- Titanium beam pipe
- Added expected energies of $^{11}_{\Lambda\Lambda}$Be

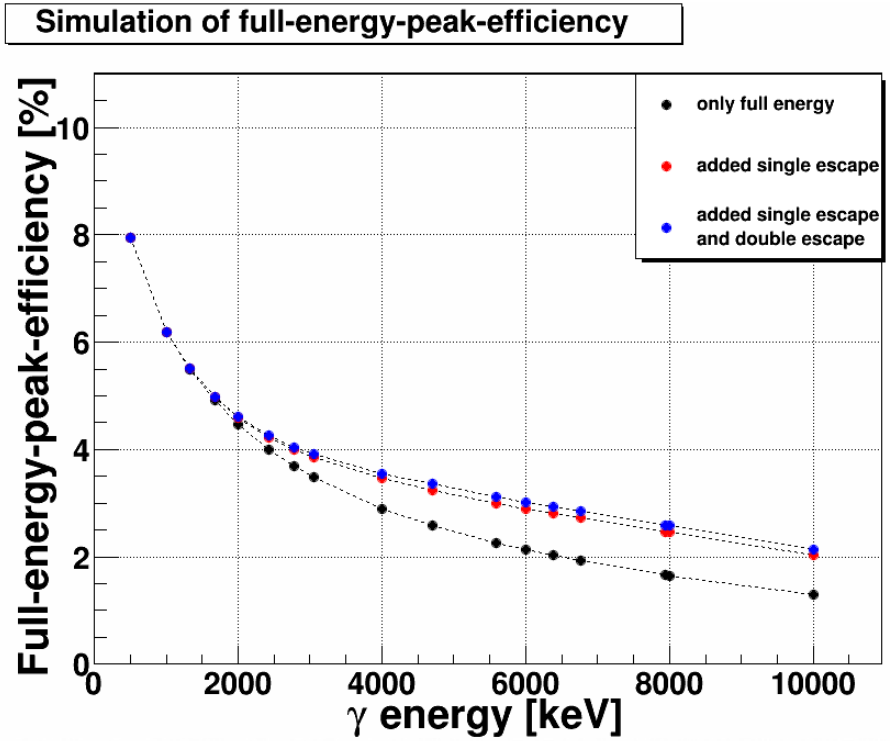




Efficiency studies

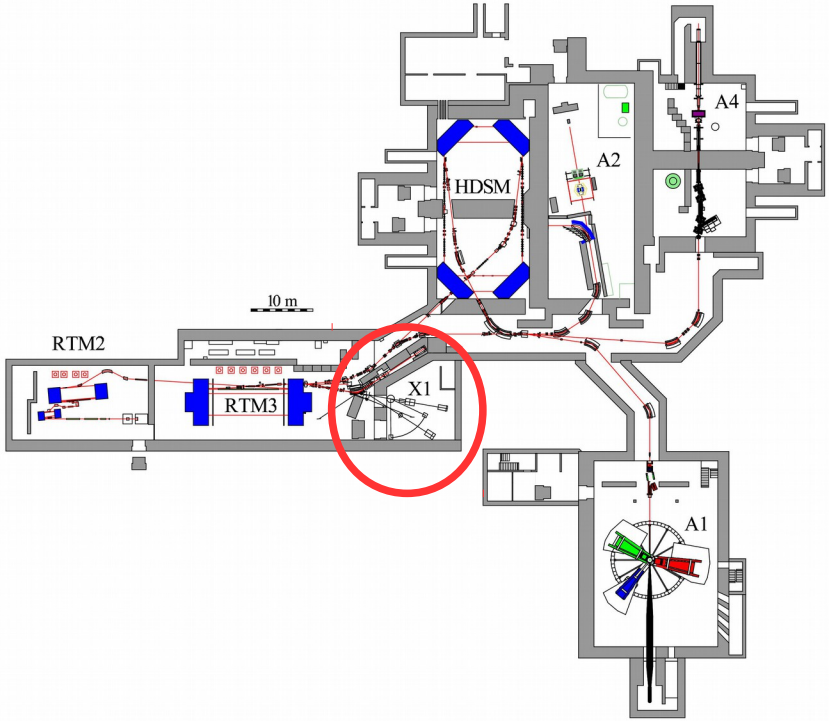
- Pair production important for higher energies
- Adding escape peaks back to photopeak





beam time!

- Problems should be fixed soon
- Test with electrons in Mainz in july
- Hopefully a short test in Jülich sometime in autumn



“beam time”

- Measurements with beam and active preamplifier at COSY in may
- beam time had to be canceled shortly!
- Active reset didn't work
- Vacuum leakage of the germanium

Summary / Outlook

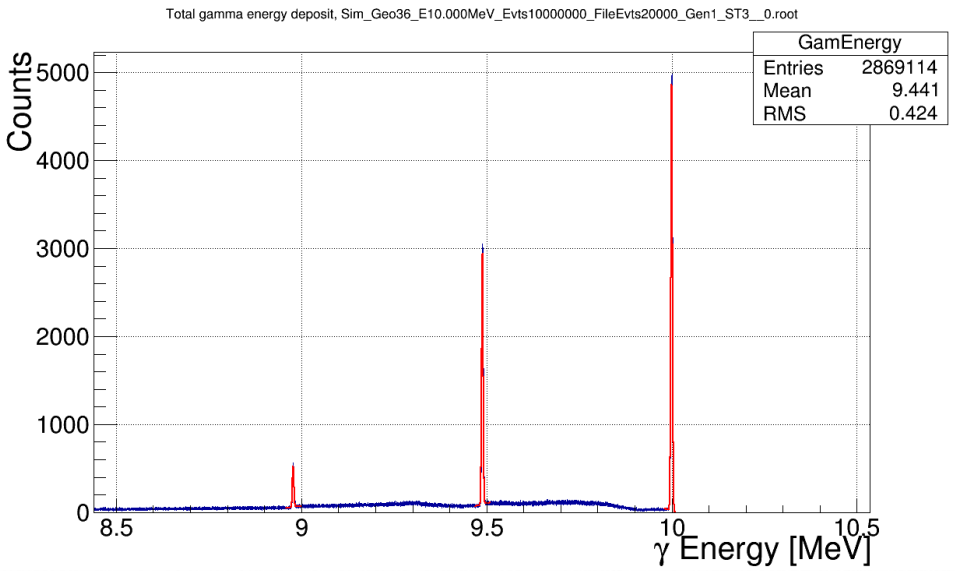
- Progress in efficiency studies, no big changes in results
- Adding escape peak result should improve the efficiency further
- New beam time tests foreseen in the near future
- Setup is ready, detector in repair

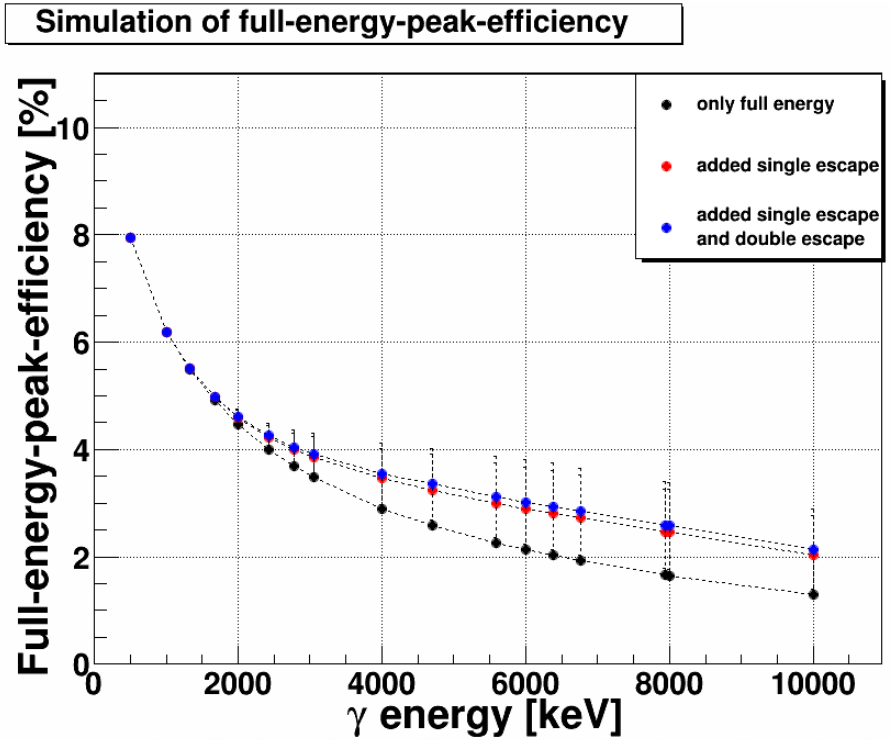
Thanks for your attention

Backup slides

Efficency studies

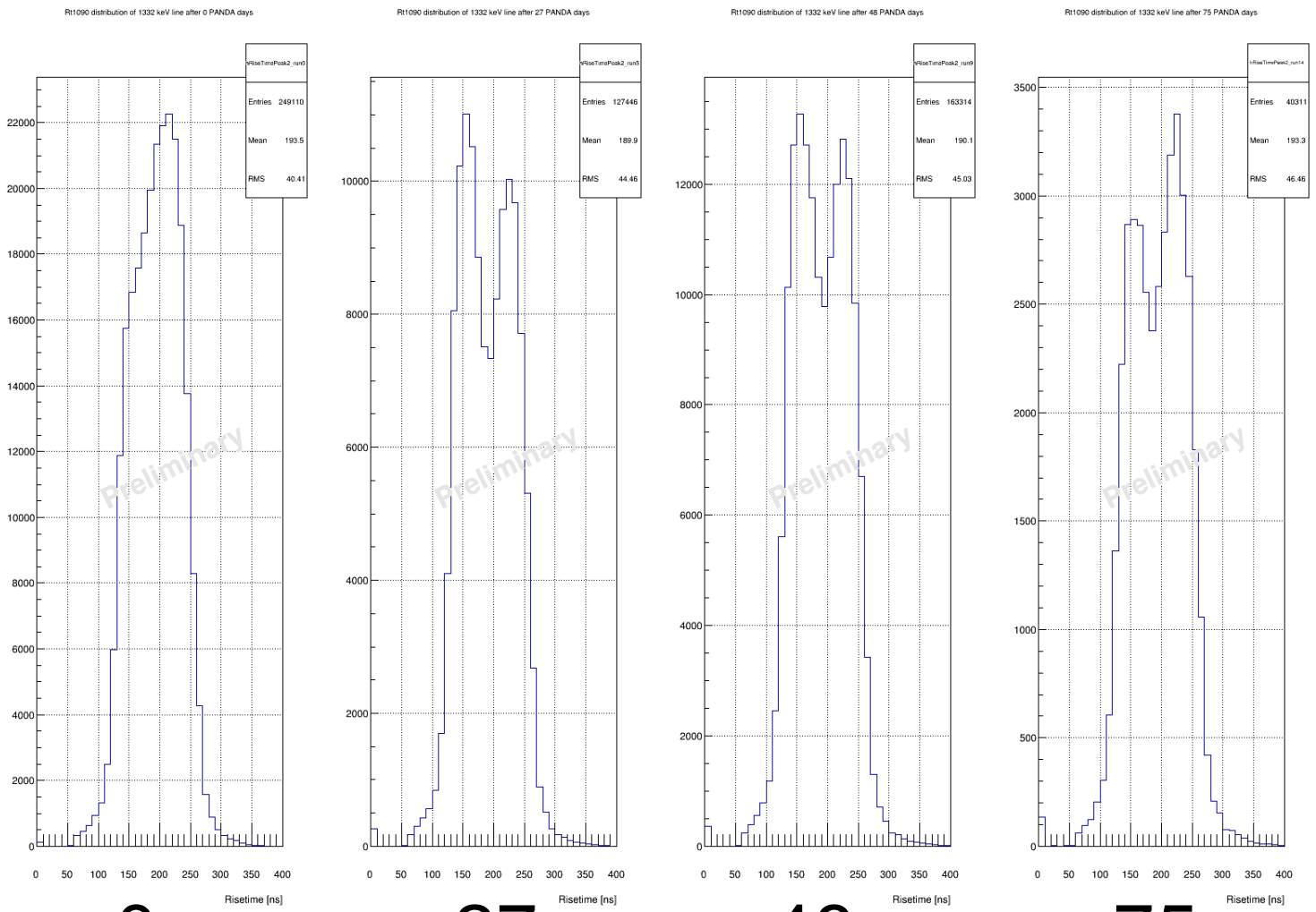
- Pair production important for higher energies
- Adding escape peaks back to photopeak





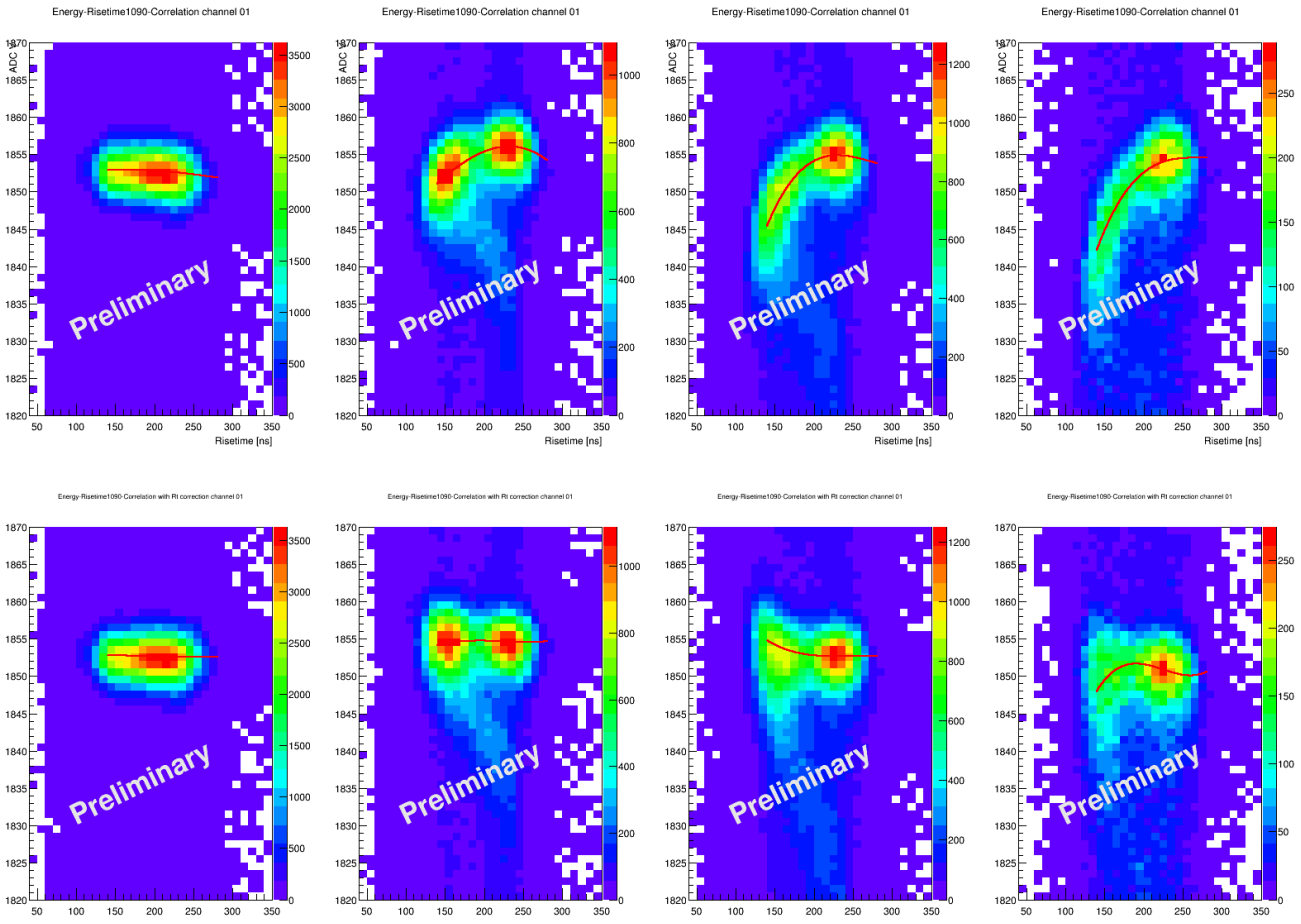
Progress in Analysis

- Risetime t_{1090}
- No change in mean value
- Shape changes

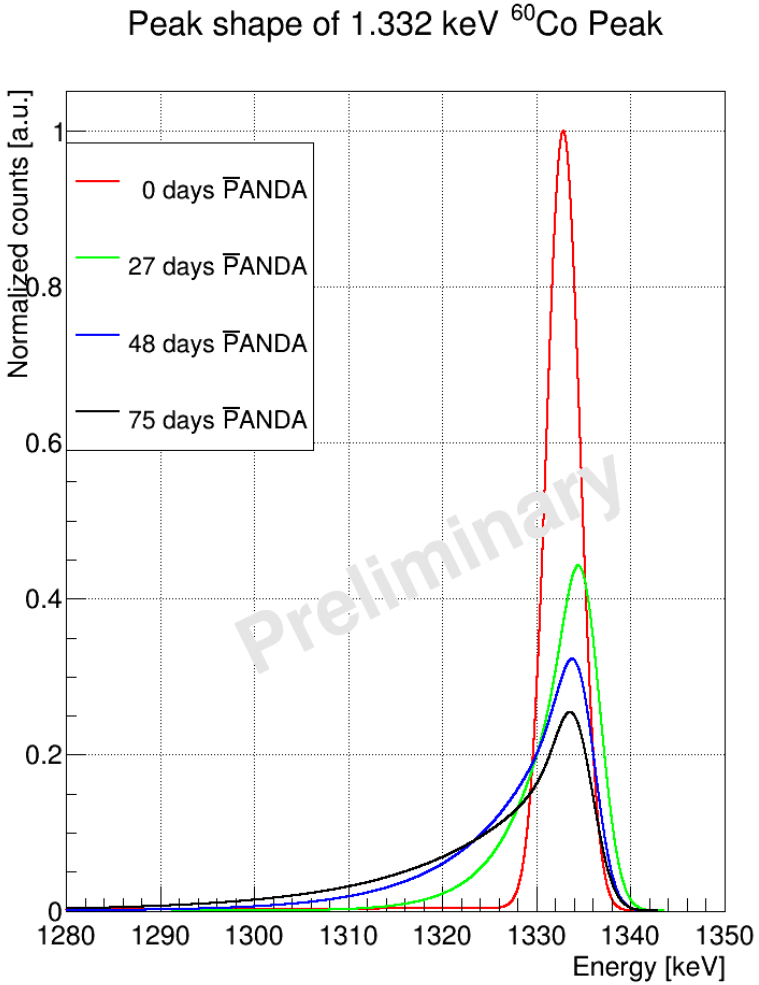


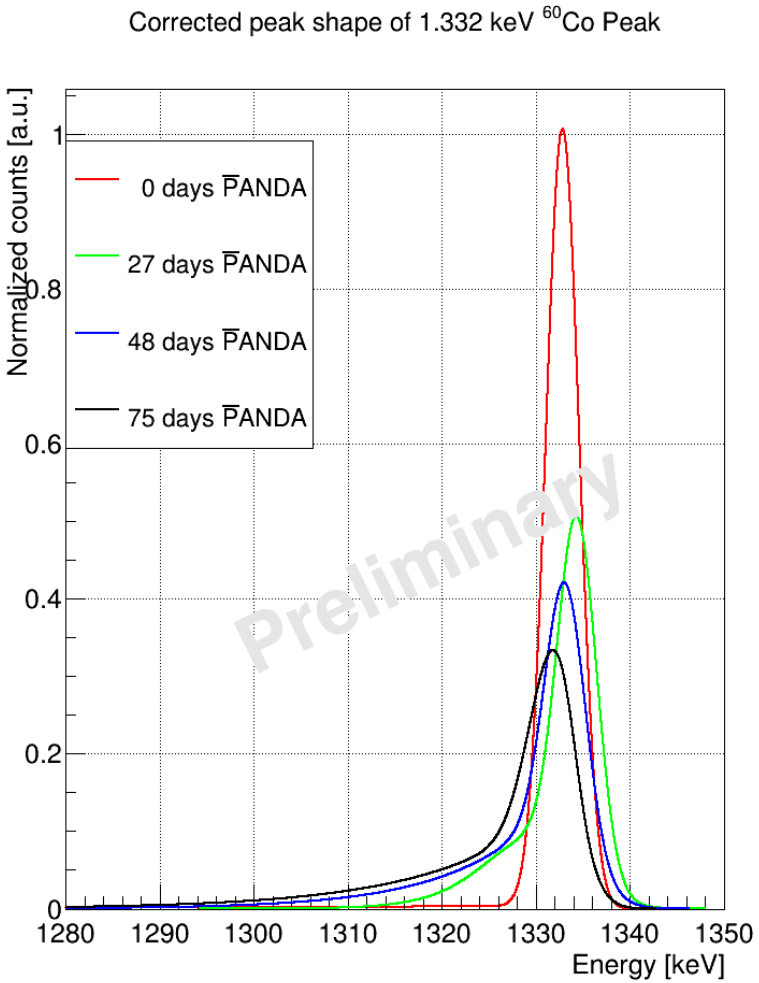
Progress in Analysis

- 2D correlation of t_{1090} and energy
- Drastic change visible
- Correction by fitting pol3 on 1332 keV peak and than event per event correction
- Not finally optimized
- Double peak structure of t_{1090} regognizable



Progress in Analysis

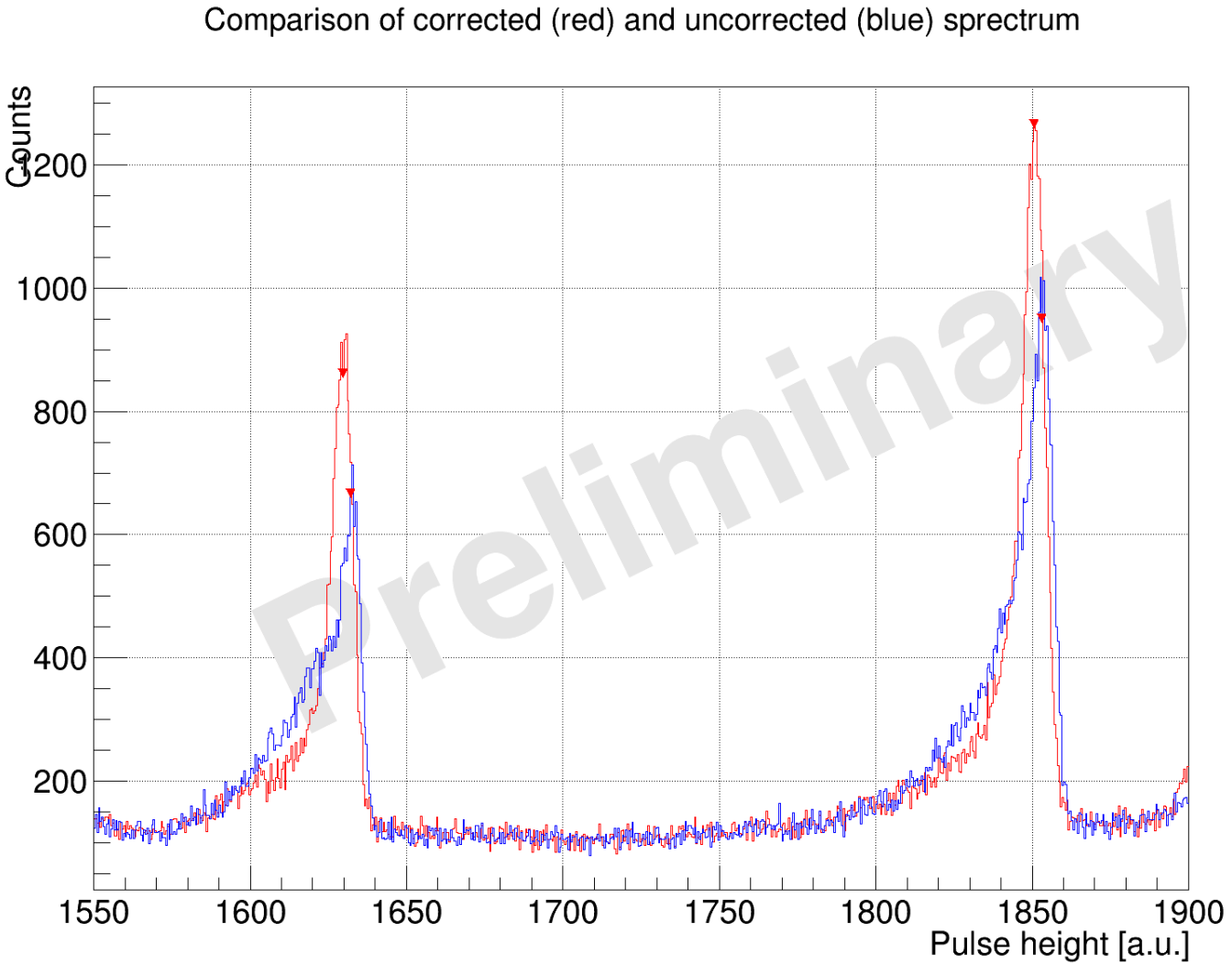




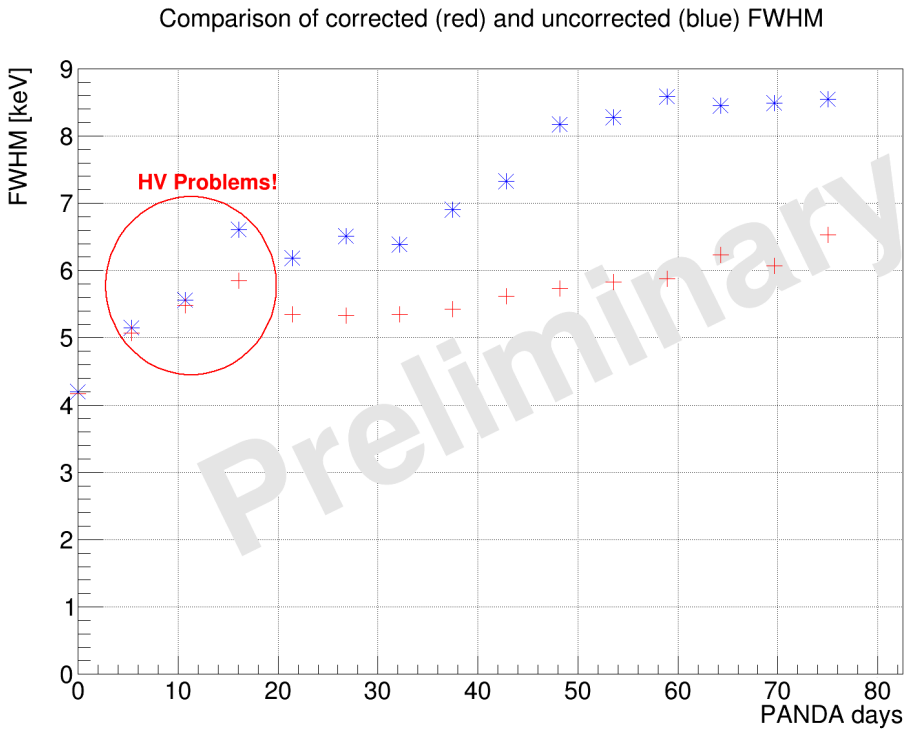
- Visible improvement of peak shape due to risetime correction

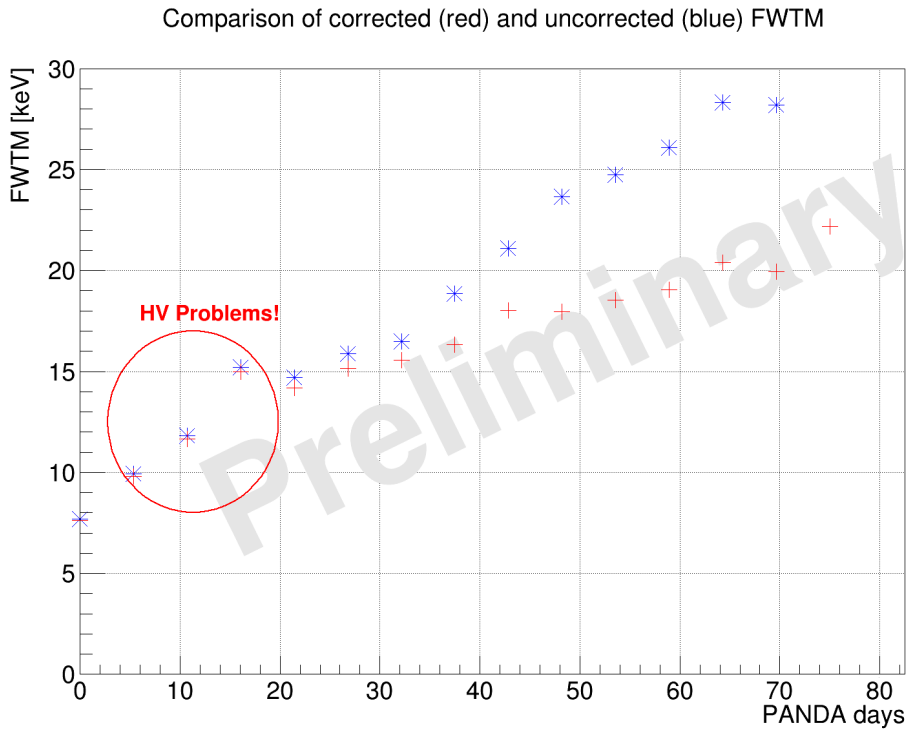
Progress in Analysis

- Correction seems also feasible for other peaks
- 1172 keV line as example
- 75 days spectrum as example



Progress in Analysis



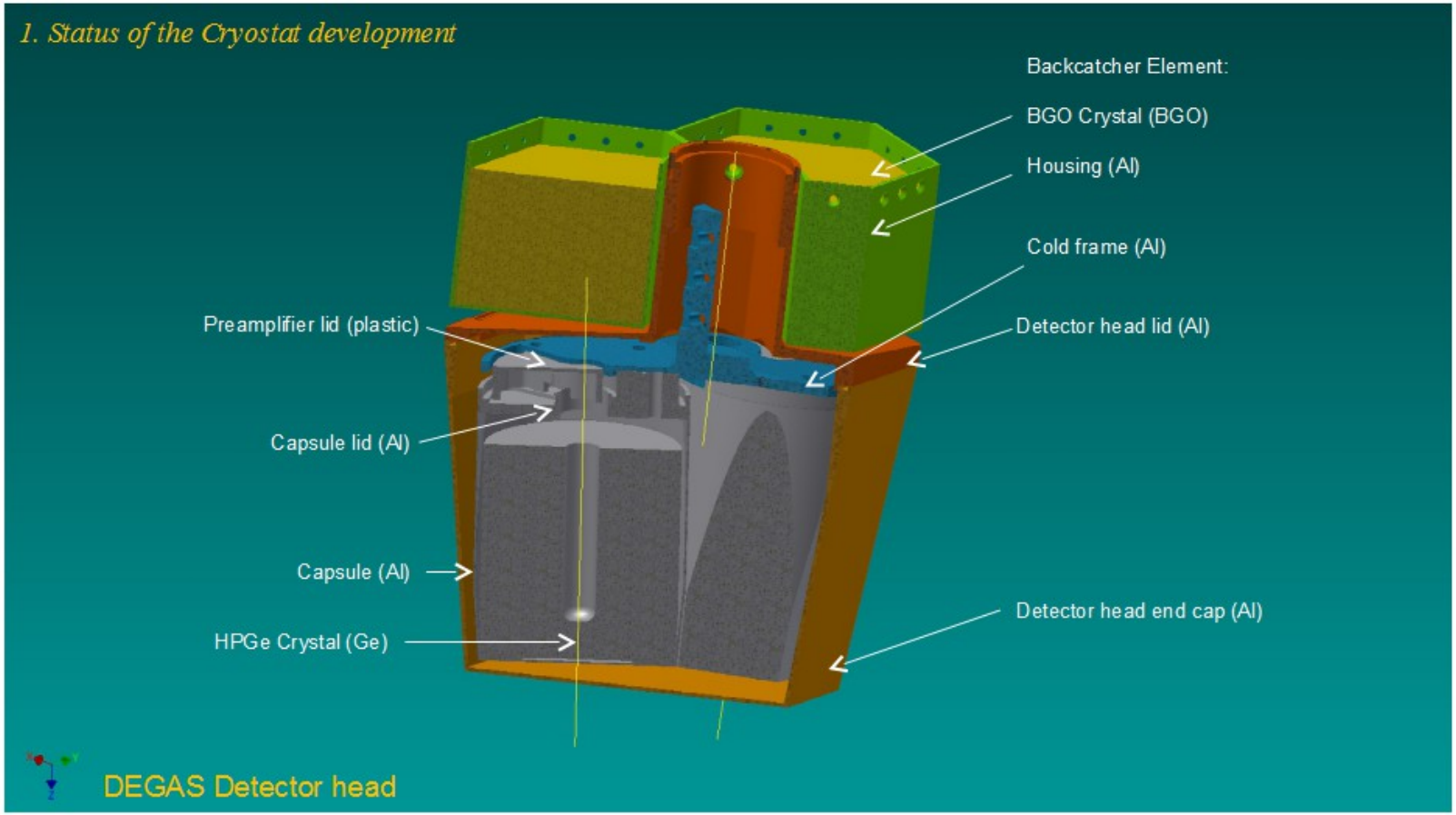


- Overview of data during irradiation
- Better correction for FWHM than FWTM
- Still room for improvements

News from Ivan

DEGAS Detector

I. Kojouharov, *GSI, Darmstadt*



News from Ivan

DEGAS Detector

I. Kojouharov, *GSI, Darmstadt*

1. Status of the Cryostat development

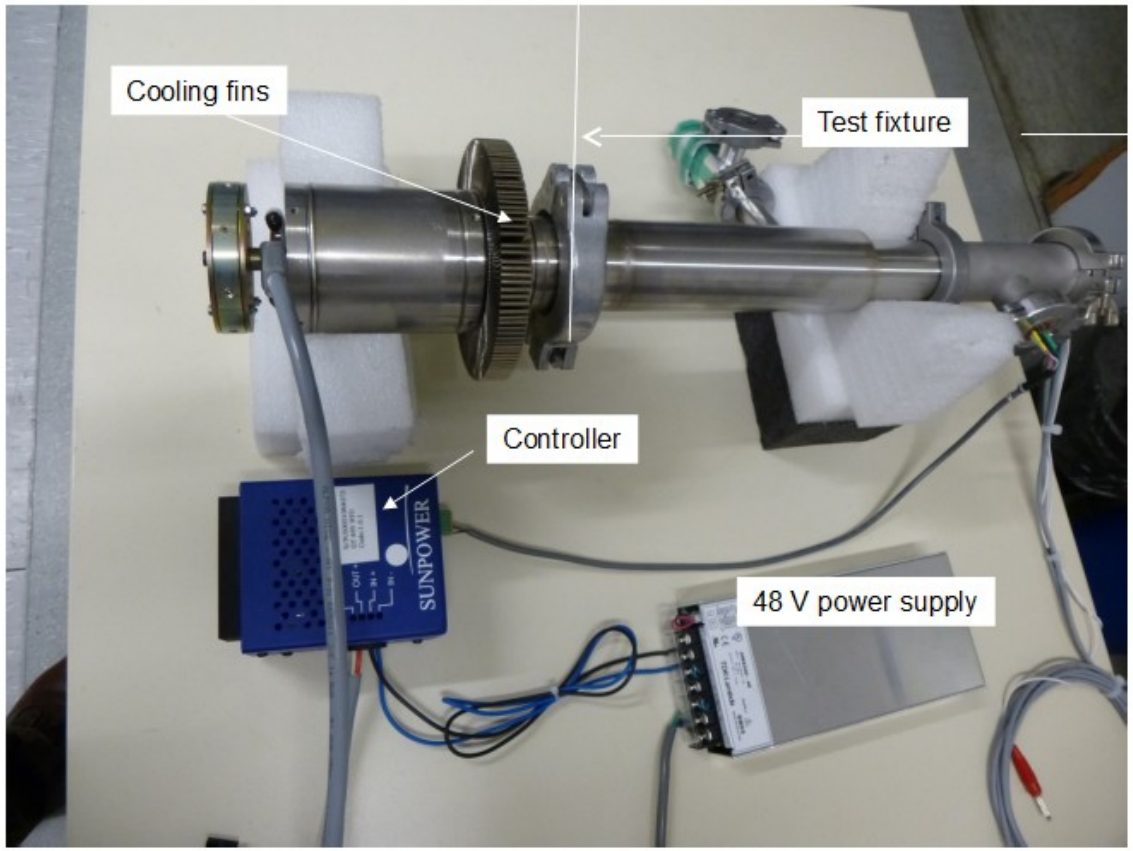
DEGAS capsules cold frame

News from Ivan

DEGAS Detector

I. Kojouharov, *GSI, Darmstadt*

2. Cooling engine



Sunpower cooling engine Type GT:
- 16 W cooling power
- 240 W electrical

Under test:
- strong cooling power
- heavy energy dissipation – need air cooling with a defined flow. An option – cooling jacket.
- strong vibrations. There is a vibration reductor and this option is to be investigated. The detector construction has to consider vibration strong reduction if not an elimination.

Conclusion: the use of SP GT or CT cooling engines needs further R&D, therefore initially the MMR X-Cooler has to be considered and an interface for easy transition to SP CT-cooler to be provided.

GSI

NUSTAR week, 2015 , March 02-06, GSI

News from Ivan

DEGAS Detector

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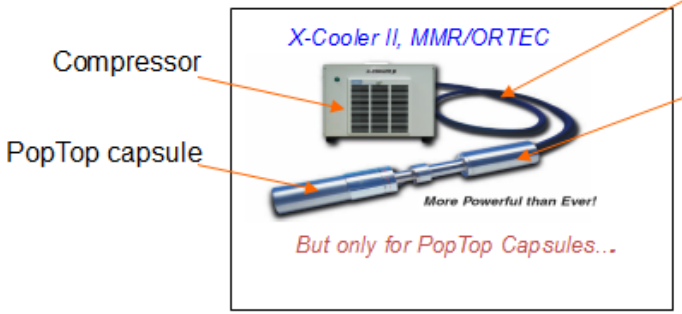
2. Cooling engine



X-Cooler II or III, MMR/ORTEC approx. 11 W cooling power, 240 VAC/500 VA Power

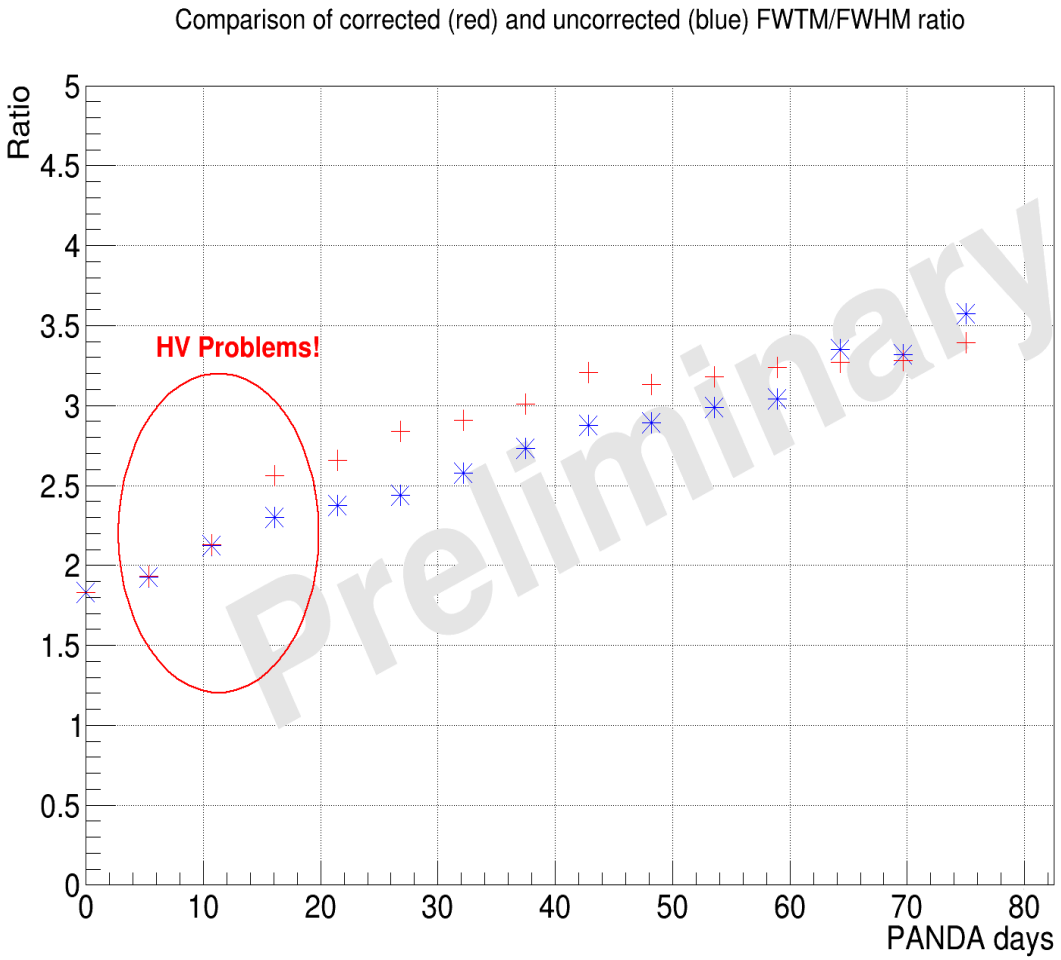
Conclusion: the use of SP GT or CT cooling engines needs further R&D, therefore initially the MMR X-Cooler has to be considered and an interface for easy transition to SP CT-cooler to be provided.

	MMR XC	SP CT
Cooling (total) power	11 W (240V/500W)	11W (24V/120W)
End temperature	-187 °C	-220 °C
Vibrations	very low	high
Life	unknown, 3-7 Years	unknown, >200 000 h
Compactness	low	high
Functionality	medium	medium

NUSTAR week, 2015 , March 02-06, GSI

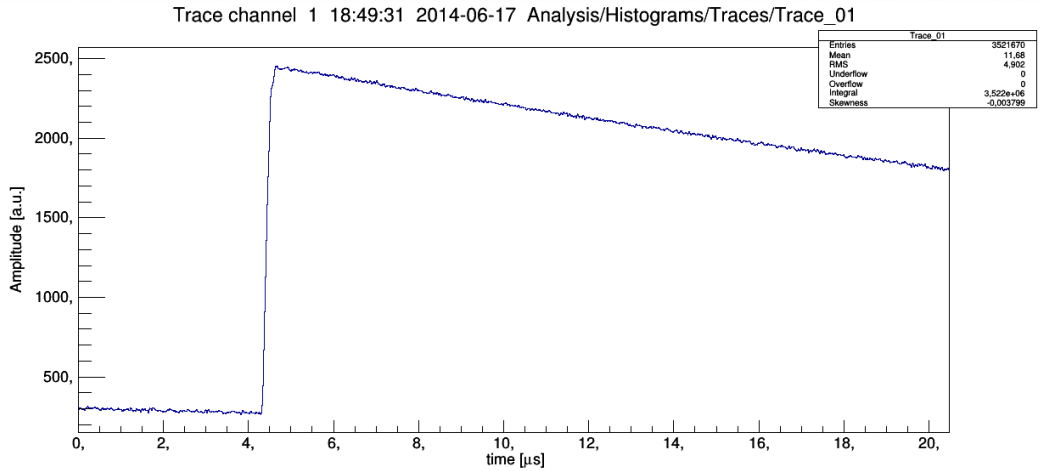
Progress in Analysis

- Ratio confirms that correction is better for FWHM

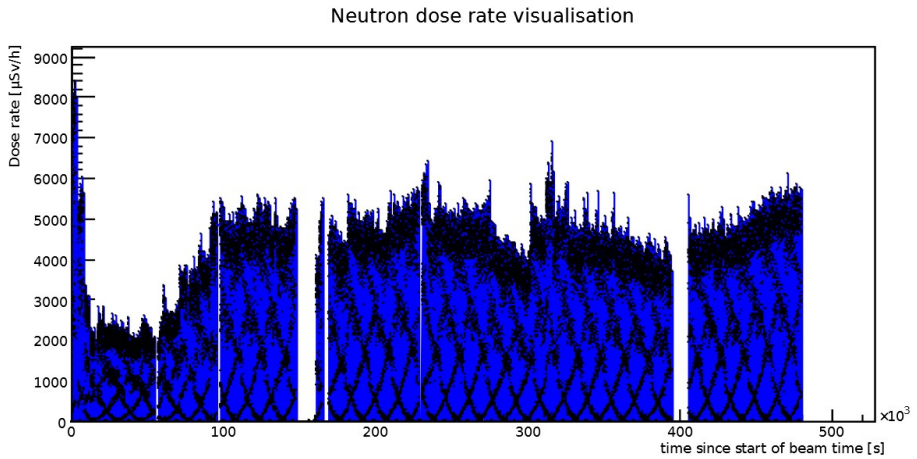


Irradiation test @ COSY in Jülich

- Better noise conditions due to improved grounding of the setup



- 4 *10^{13} protons accumulated
  ~50 days $\bar{P}$ANDA
- Limitation by radiation protection and beam time

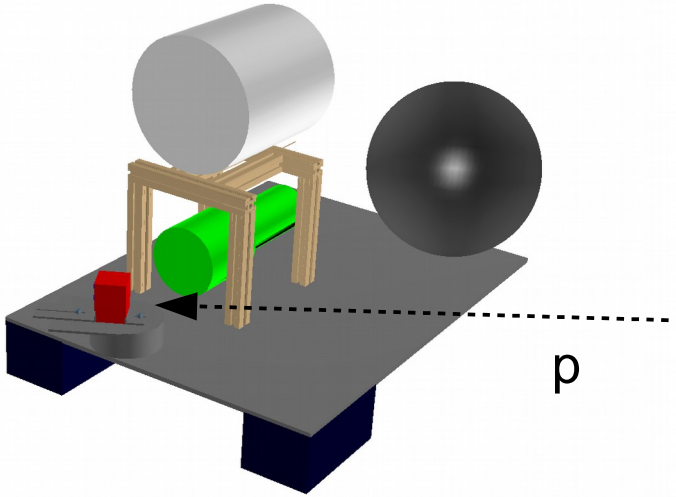


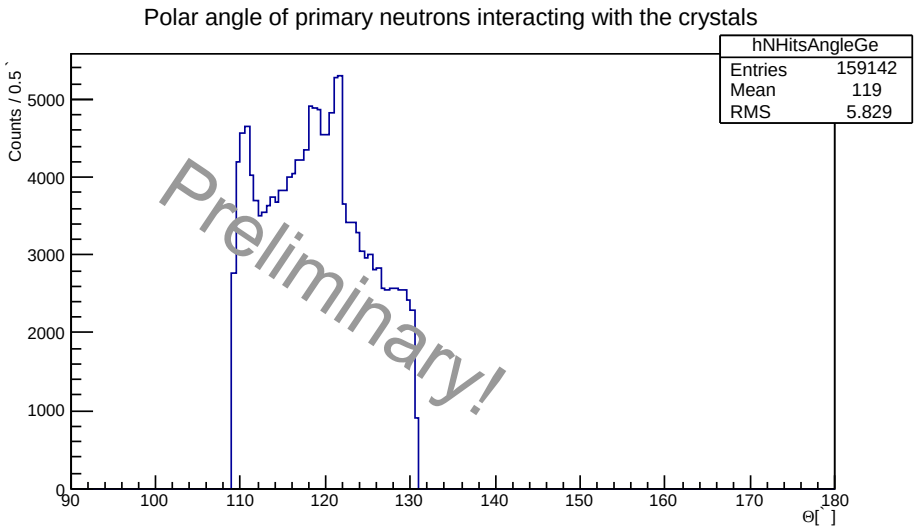
Irradiation test: Simulation

- Geometry of test setup build in PandaRoot
- 10^8 events, 1.6 *10^5 n

  → 2.1*10^9 n/cm^2 total

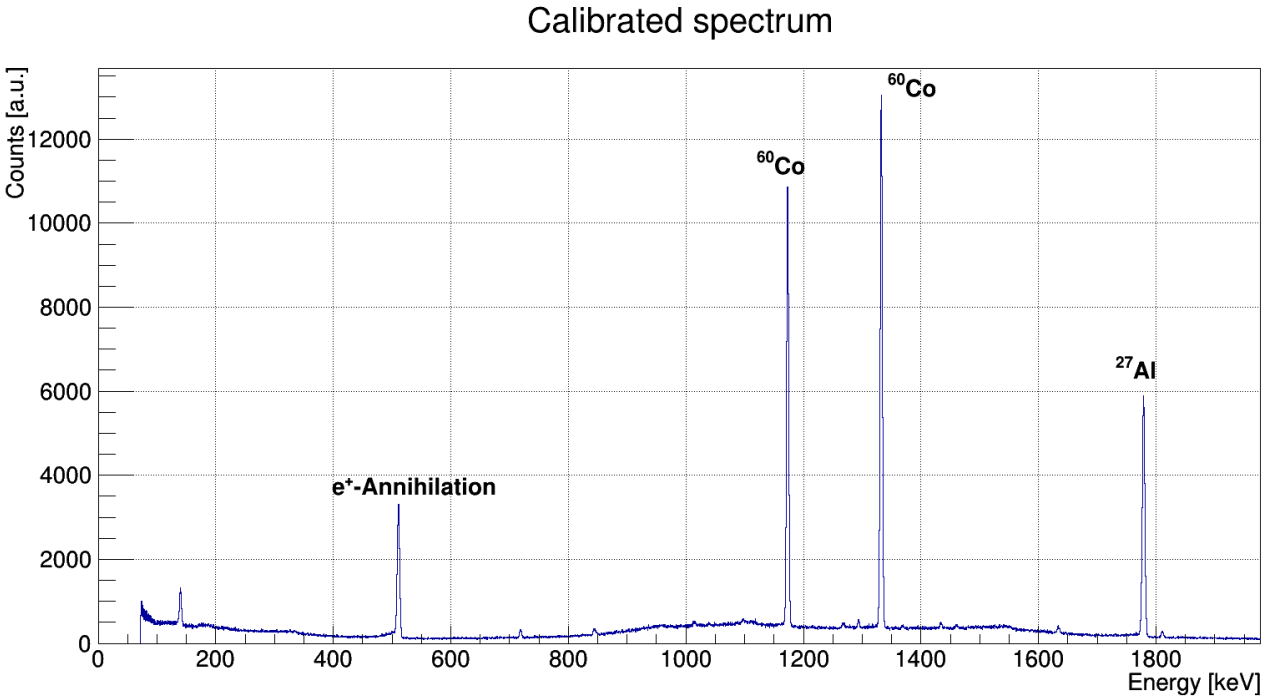
  (~75 days of $\bar{P}$ANDA)
- More detail in geometry and analysis in progress
- Confirmation via neutron detector measurements foreseen





Irradiation test: results

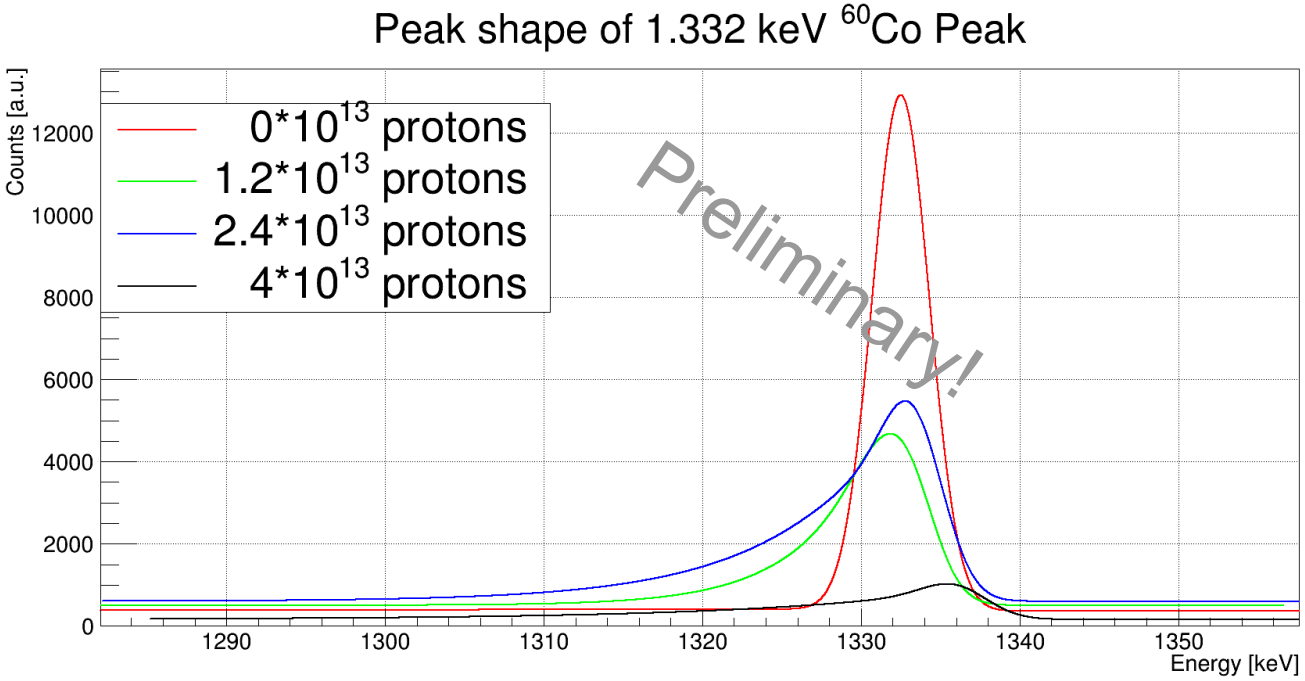
- Spectrum in spill pause
- Activation of surrounding material gives additional lines
- Useful for calibration, but additional background



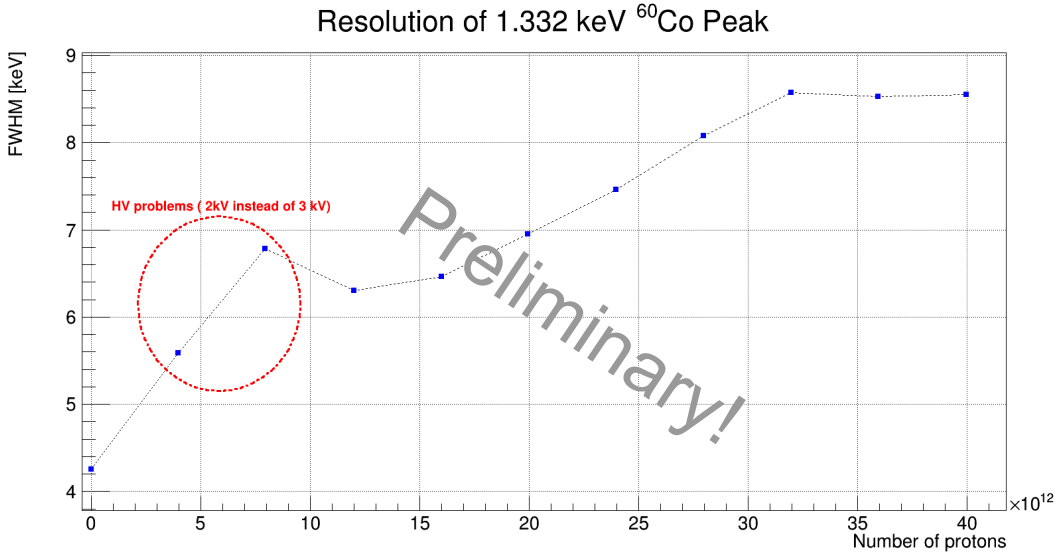
Irradiation test: results

Evolution of line shape:

- Broadening
- Low energy tail
- Position shift due to calibration issues in the analysis



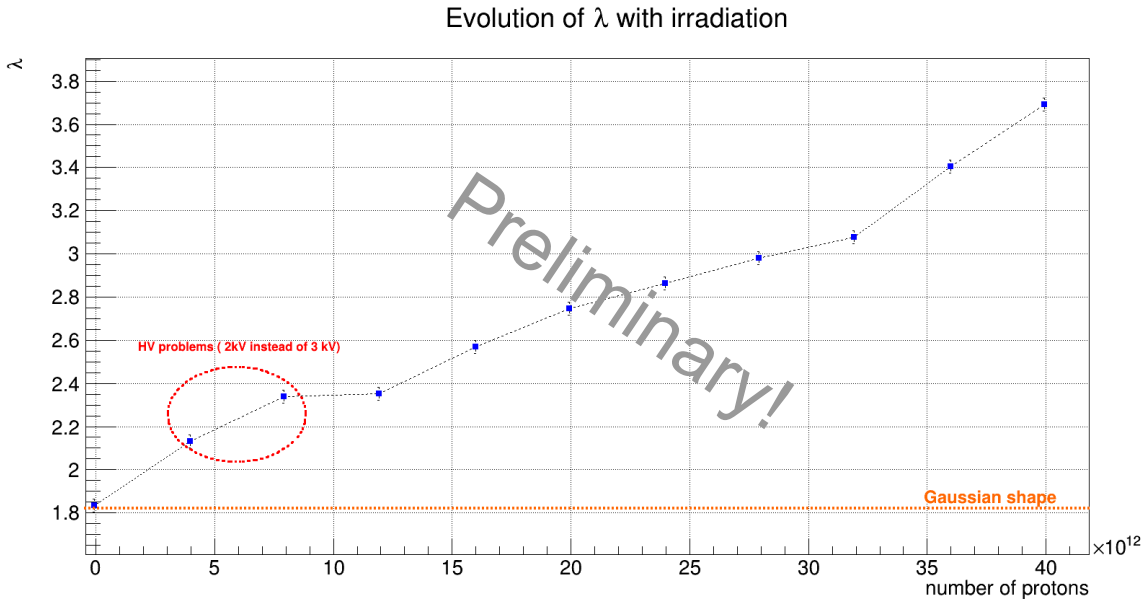
Irradiation test: results



$$\lambda = \frac{\textit{Full width at tenth maximum}}{\textit{Full width at half maximum}}$$

- Gaussian: $\lambda = 1.82$
- Ratio is steadily growing

- Degradation of resolution
- FWHM seems to flatten at 8.5 keV
- No corrections (risetime, variation of window size) applied yet!



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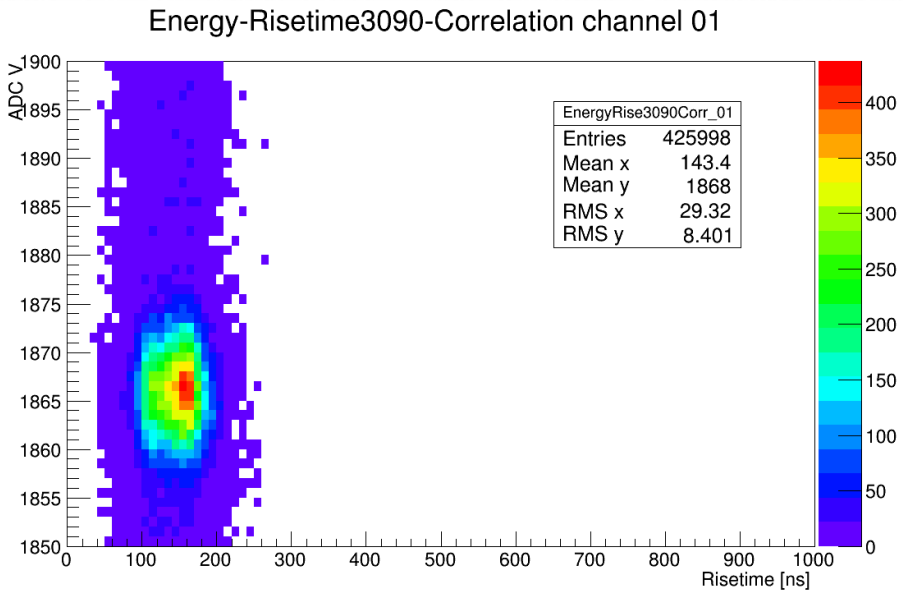
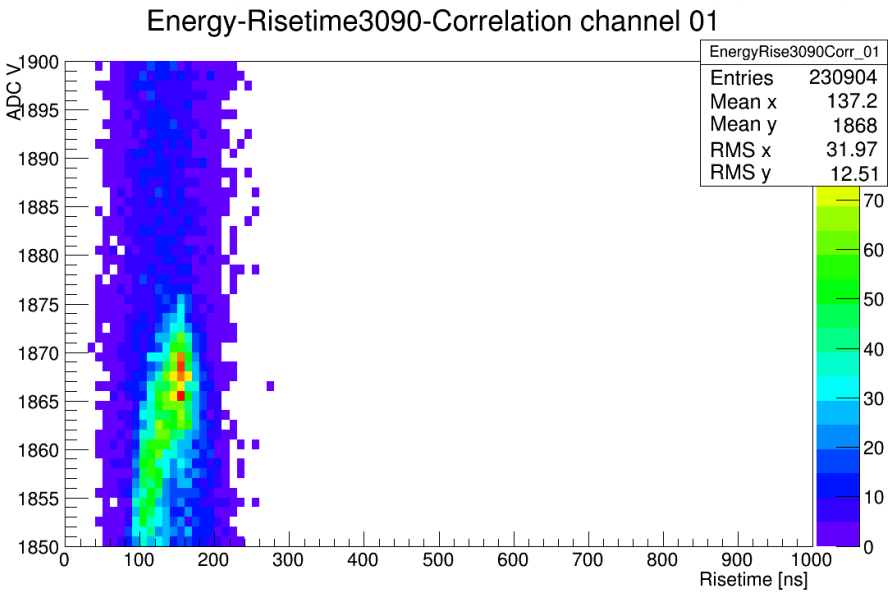


Start of beam time

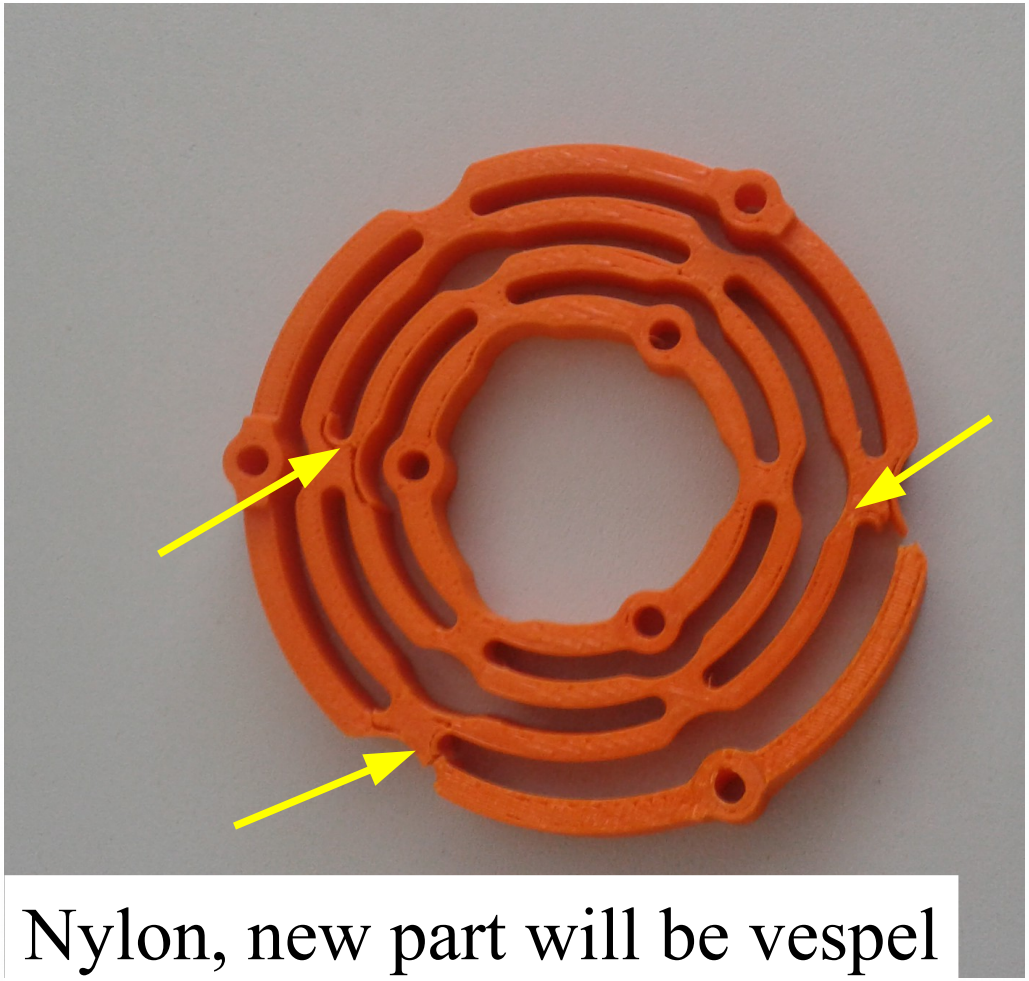


End of beam time

- Energy-risetime Correlation offers room for improvements!

Irradiation test: results

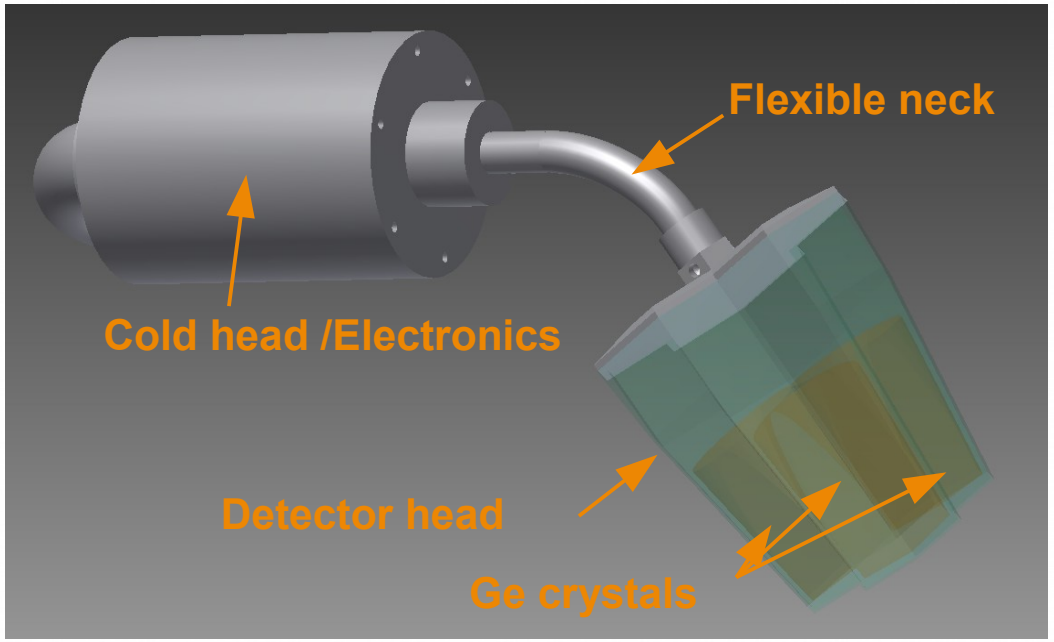
- Hardware and radiation damage on detector
- Used older prototype for second beam time
- Seems to have less radiation damage
- Not analyzed yet



Nylon, new part will be vespel

New detector design

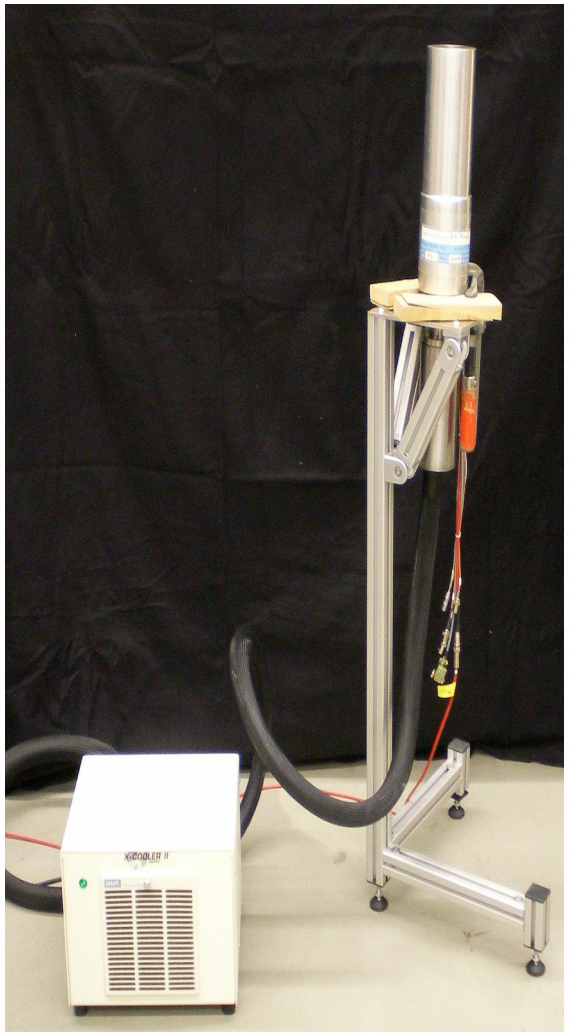
- Triple crystal detector
- Electro.-mech. cooler
- HV and readout “onboard”
- Flexible neck



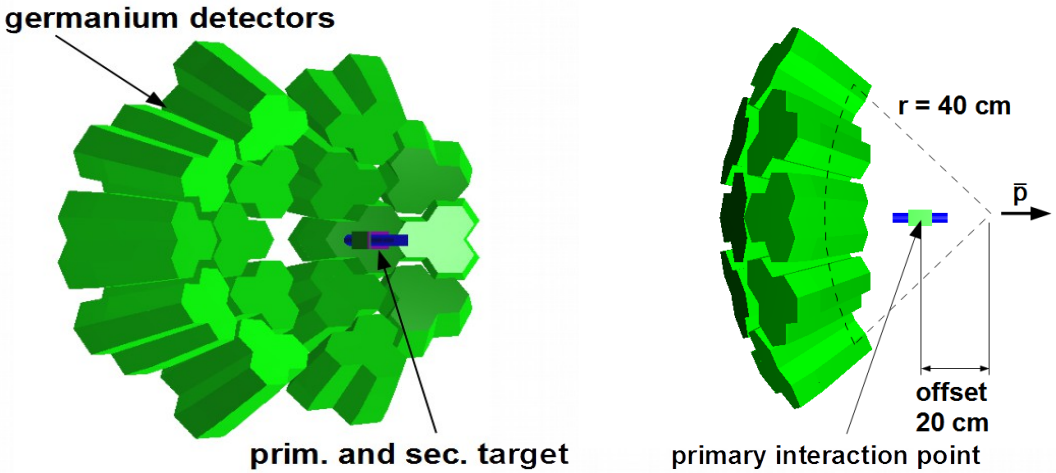
- Prototype is planned to be finished until end of 2014 / begin of 2015

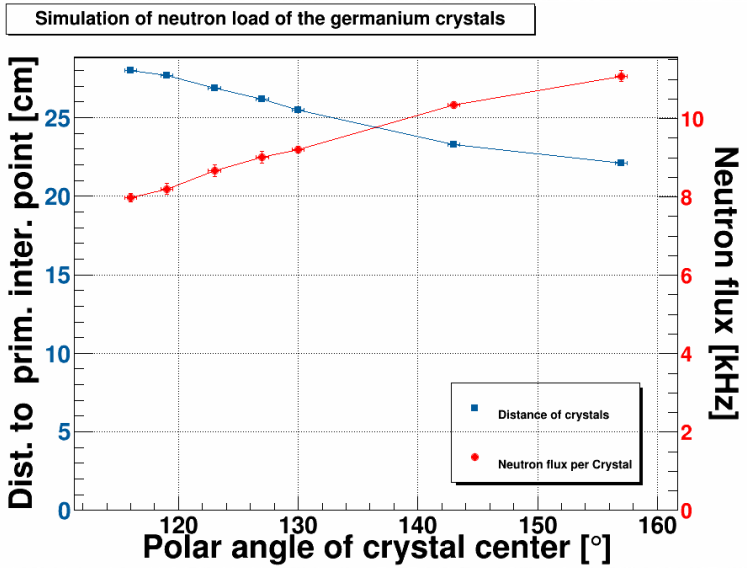
Electro mechanical cooler

- Ortec X Cooler II
- Placed outside of the $\bar{P}$ANDA barrel (space, magnetic field)
- Limited but sufficient cooling power for three crystals
- Resolution of prototype detector deteriorates slighty due to higher temperature of 95 K (2.25 keV @ 1.332 MeV)



Simulation of the detector





- Efficiency and background simulations
- PandaRoot framework (ROOT, Geant4)
- $2.9*10^9$ n/cm^2 accumulated over

  100 days of $\bar{P}$ANDA conditions

  @ 10^6 interactions/s