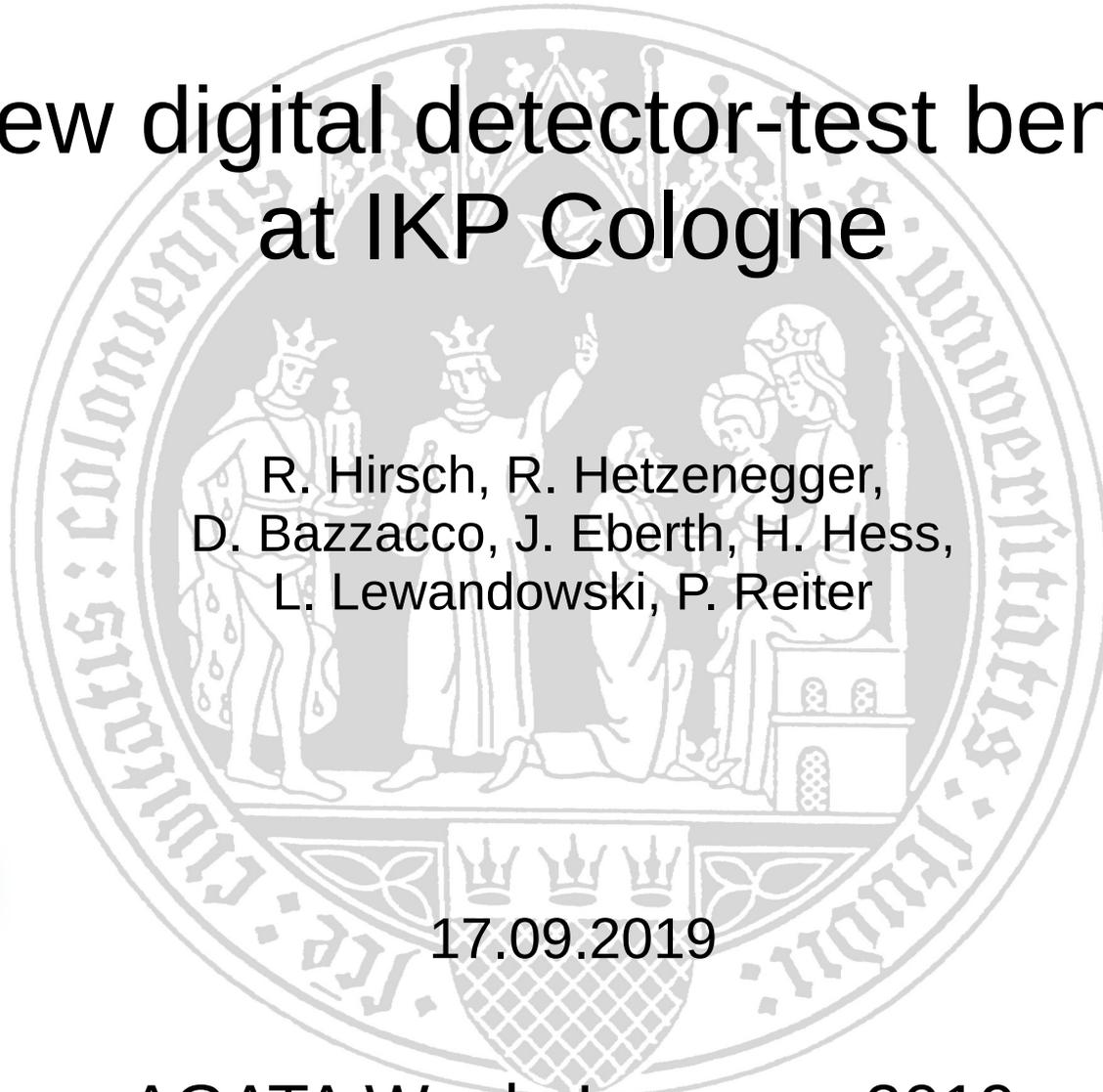


# New digital detector-test bench at IKP Cologne

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L. Lewandowski, P. Reiter

17.09.2019

AGATA Week, Legnaro, 2019



# Overview

## **Detector tests at IKP cologne**

- Customer Acceptance Test
- Final ATC tests

## **New AGATA electronics**

- Setup
- Status and results

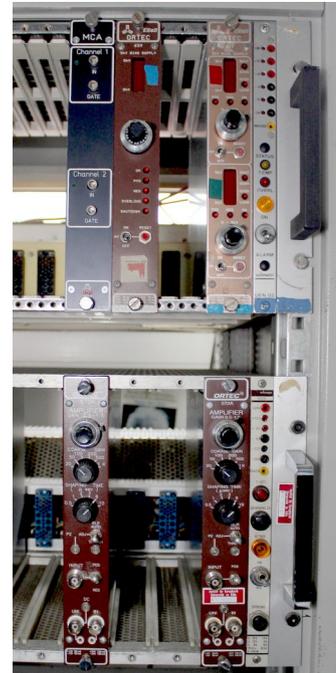
## **Outlook**

- final ATC test
- PSA development

# CAT Detector Tests

## Customer Acceptance Test

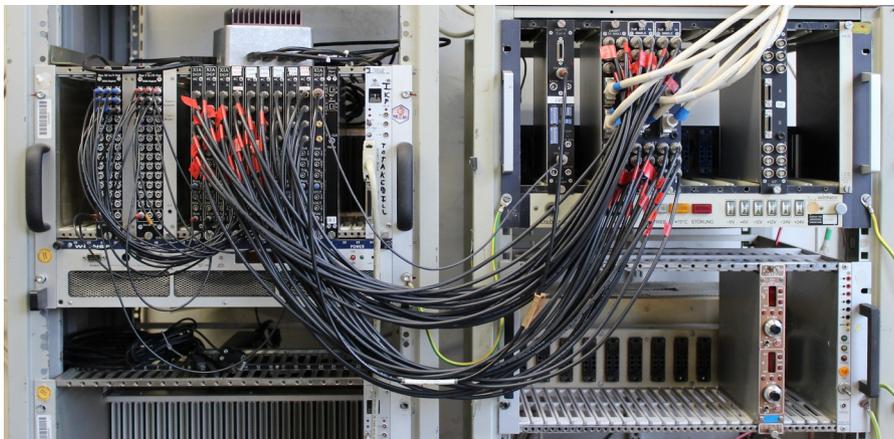
- Setup test cryostat
- Analog measurement
  - $^{60}\text{Co}$  FWHM @ 1332.5 keV
  - $^{241}\text{Am}$  FWHM @ 59.5 keV
- Setup
  - Analog amplifier Ortec 572
  - PC based dual channel MCA
- Crystal Specifications
  - FWHM < 1.2 keV @ 59.5 keV
  - FWHM < 2.1 keV @ 1332.5 keV
  - Crosstalk <  $\pm 0.1\%$  @ 1332.5 keV



# XIA Digital Electronics

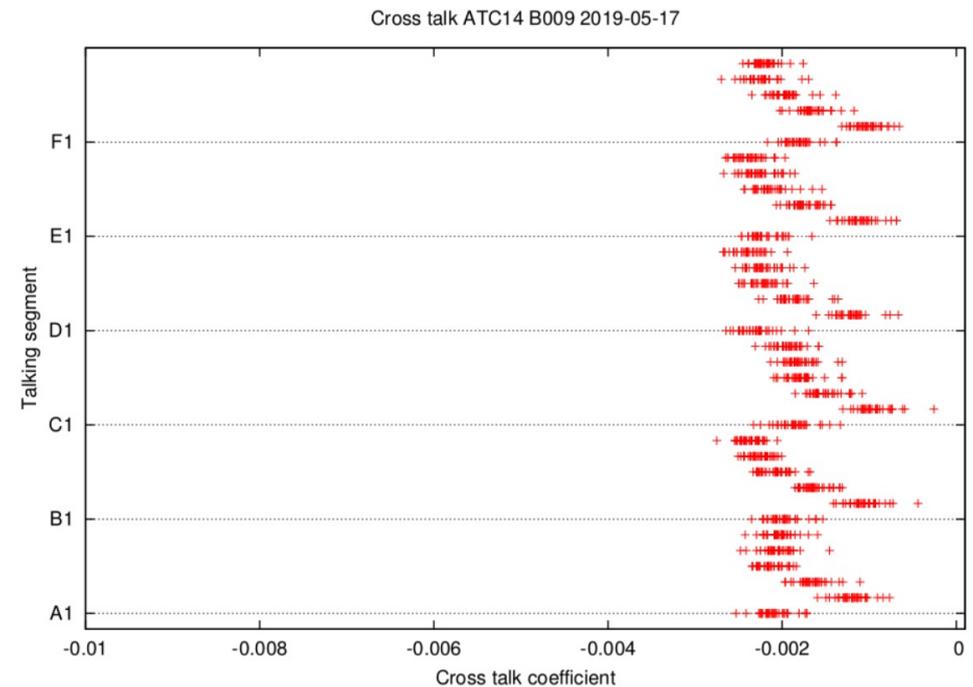
## Crosstalk measurement

- Digitizer
  - 10 XIA - DGF Rev. E
  - 4 channels per module
  - 14-bit ADC
  - 40-MHz sampling rate
- Adjusted parameters
  - Calibration of all segments
  - Preamplifier fall time  $\tau$



## Final ATC test

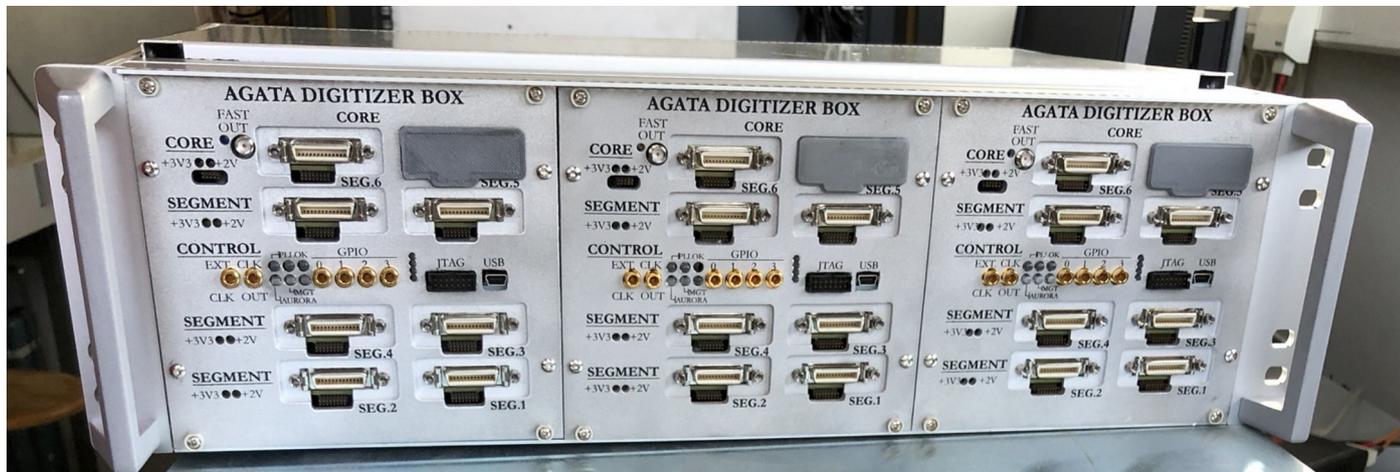
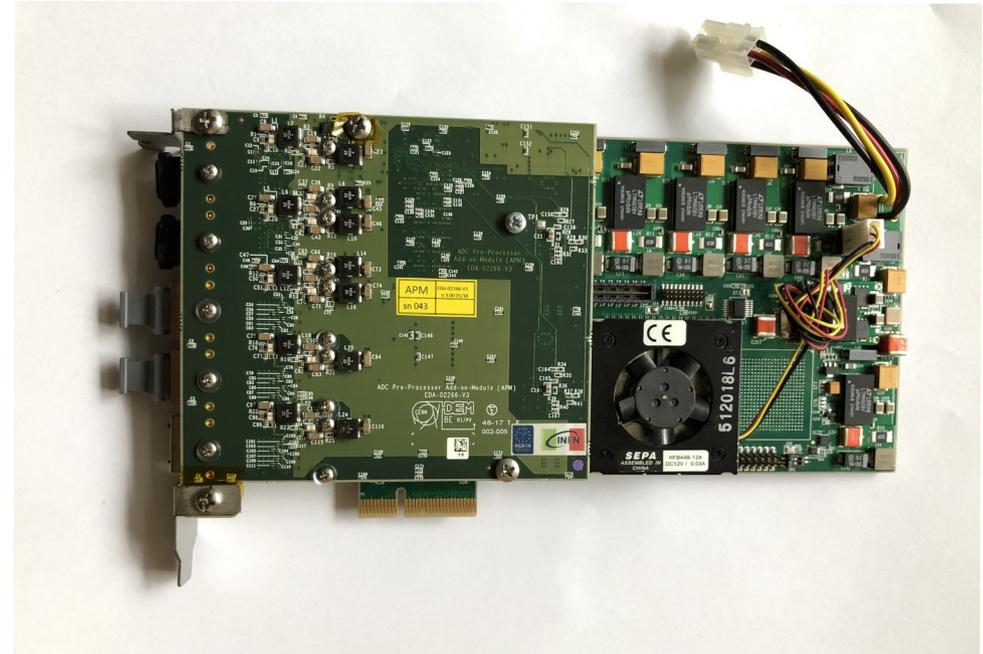
- Analog measurement
  - all 111 channels
- Crosstalk measurement
  - all 3 crystals



# AGATA electronics

## DIGIOPT-12 Digitizers + GGP Pre-Processing card

- 38 channels per module
- 14-bit ADC
- 100-MHz sampling rate
- Water cooled
- Readout with femul



# AGATA electronics

## Setup

- 3 PCs - Dell Precision 3620
- Water chiller - Rittal SK3318.610
- Low Voltage PSU 6/12/48V
- GTS Controller + VME64 Crate

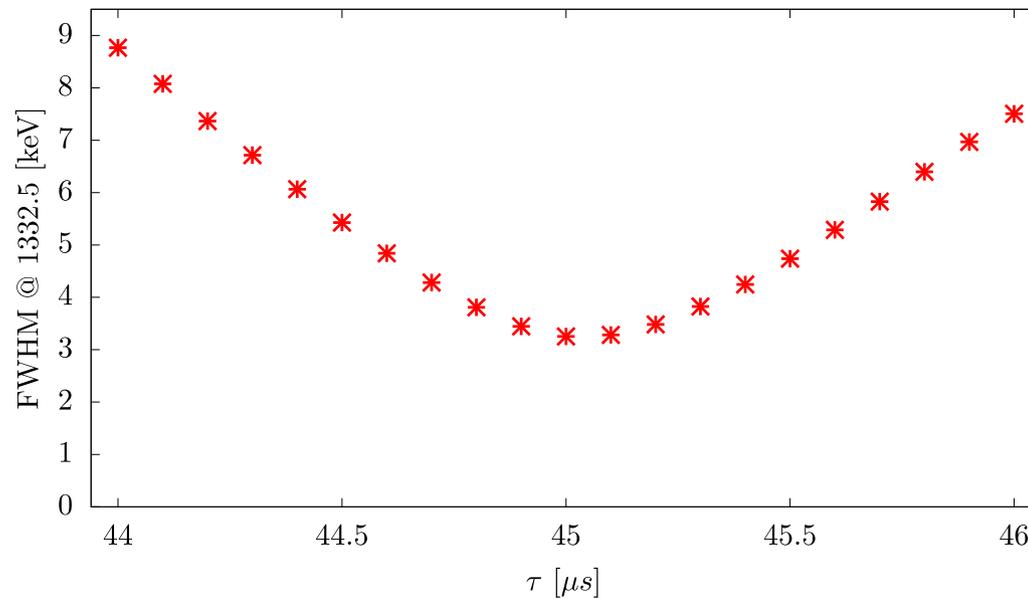
## Per crystal

- 7 MDA cables
- XLR powercable 48V
- Opticle fibers
  - MPO splitter cable
  - 4 MPO patch cables
  - MPO - 12 LC simplex cable



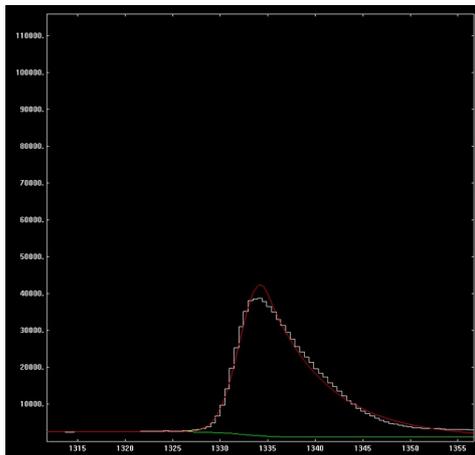
# Tau Scan

Core FWHM @ 48k trigger rate

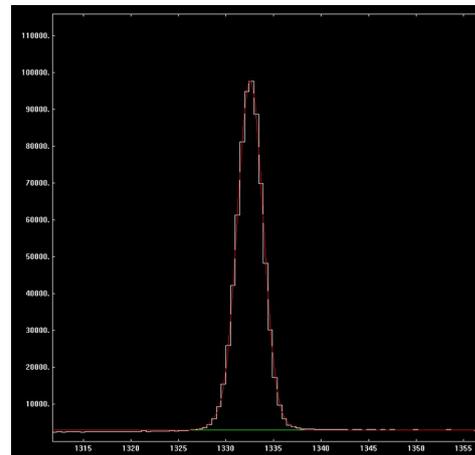


Preamplifier fall time  $\tau$

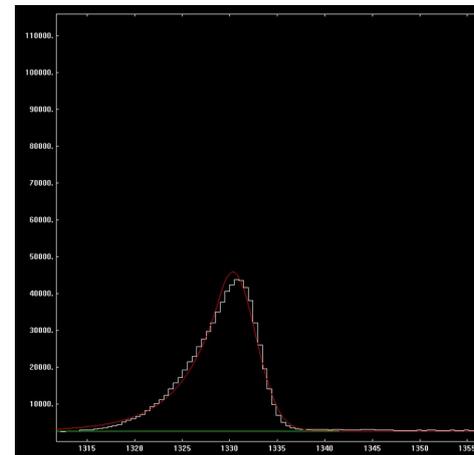
- Exponential fit
  - Inconsistent results
- $\tau$  scan
  - High count rate
  - Energy resolution



44  $\mu\text{s}$



45  $\mu\text{s}$



46  $\mu\text{s}$

# Segment Performance

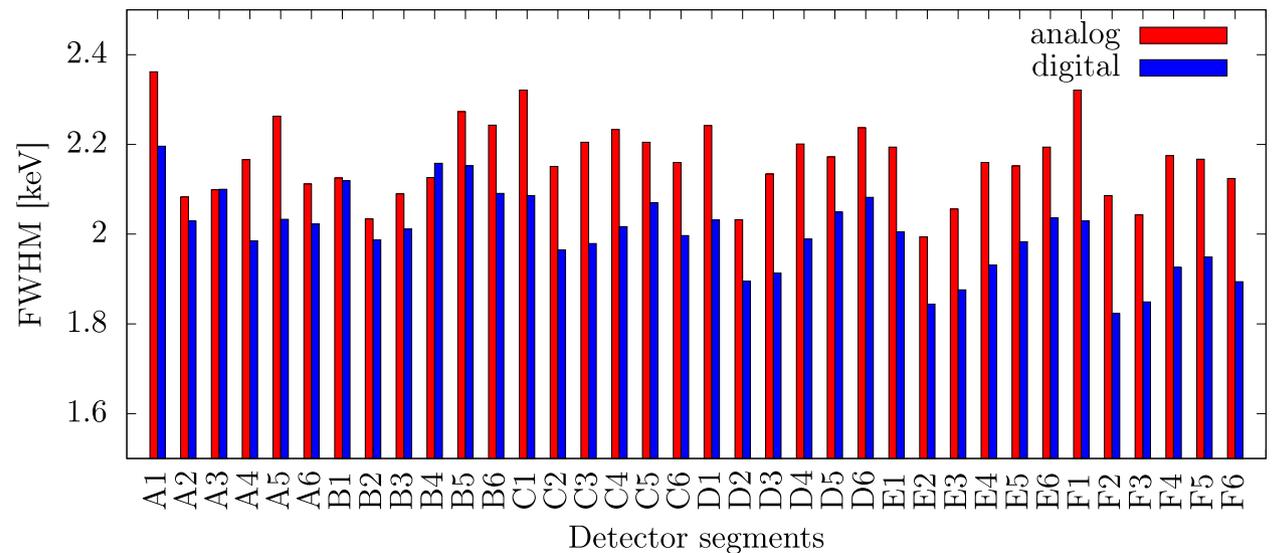
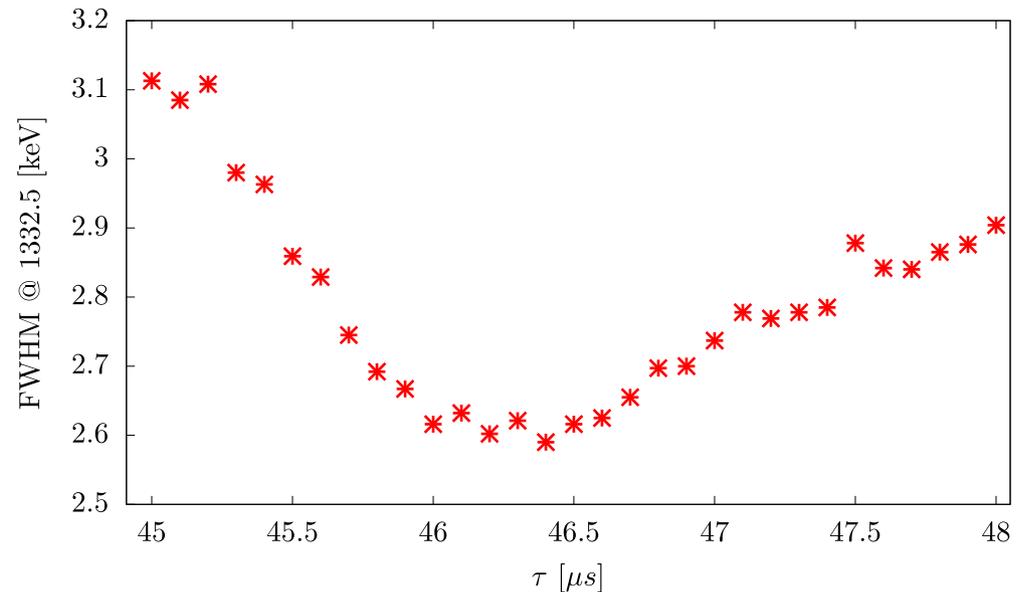
Preamplifier fall time  $\tau$

- Less sensitive
- Wide range
  - 41  $\mu\text{s}$  – 50  $\mu\text{s}$

Measured performance

- AGATA S001
- Energy resolution
  - @ 1332.5 keV
  - Analog vs. digital

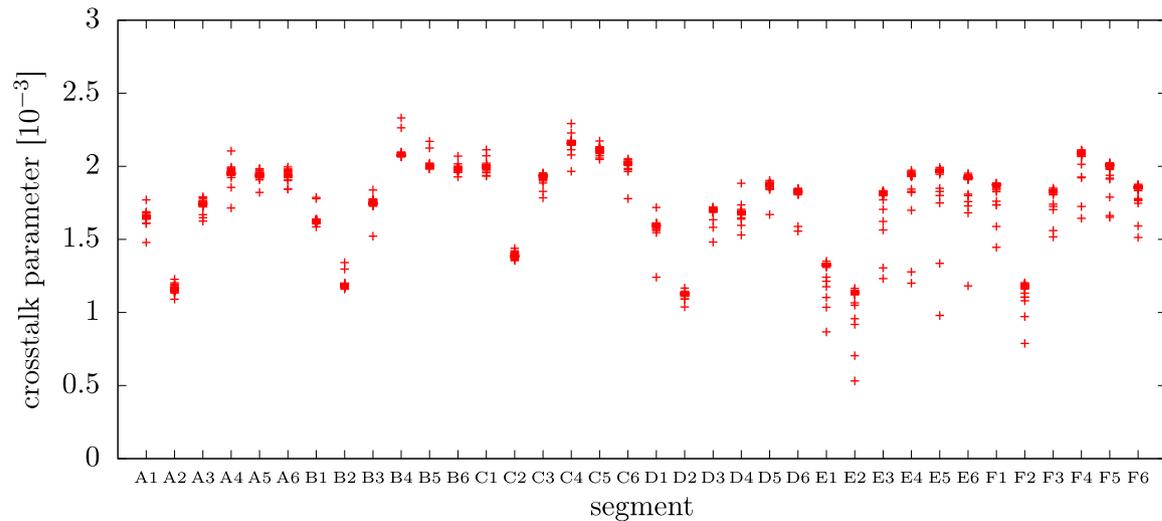
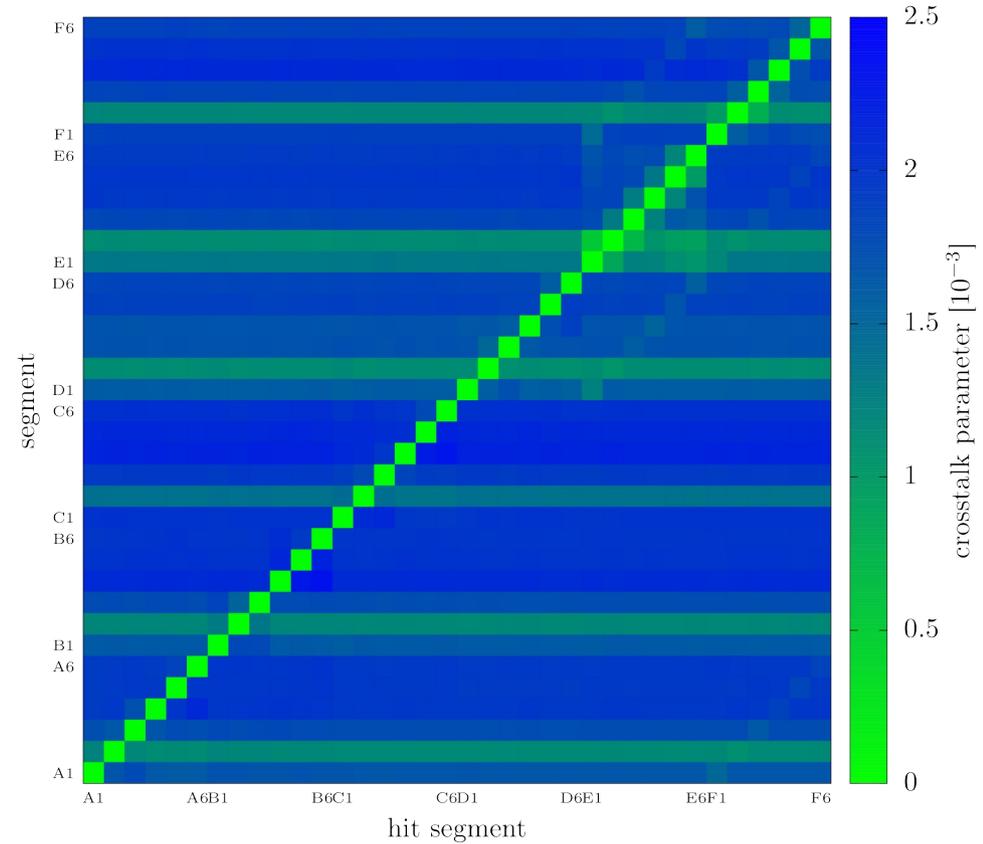
Segment E1 FWHM @ 48k core trigger rate



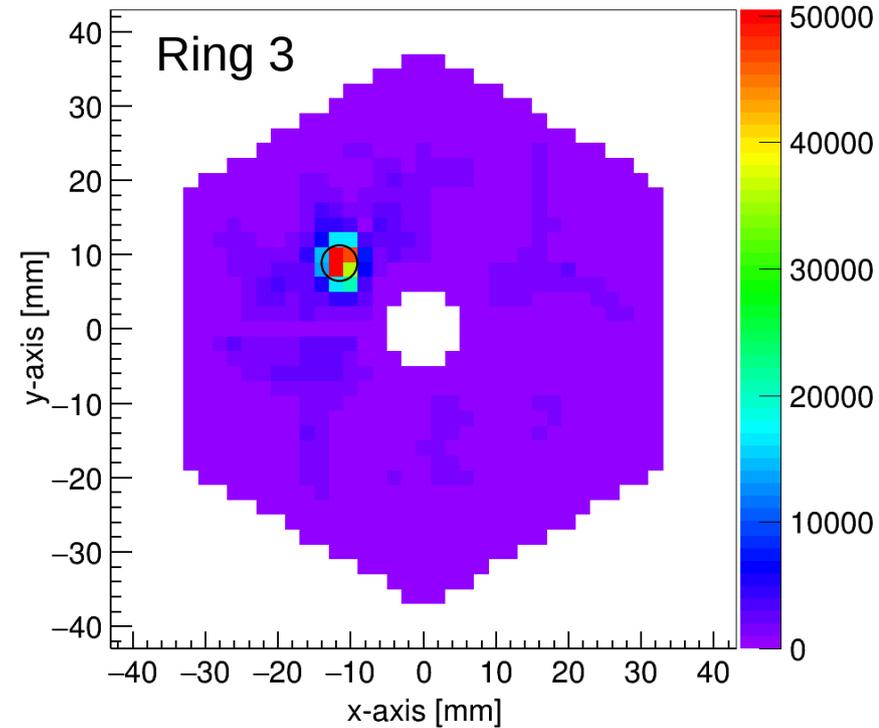
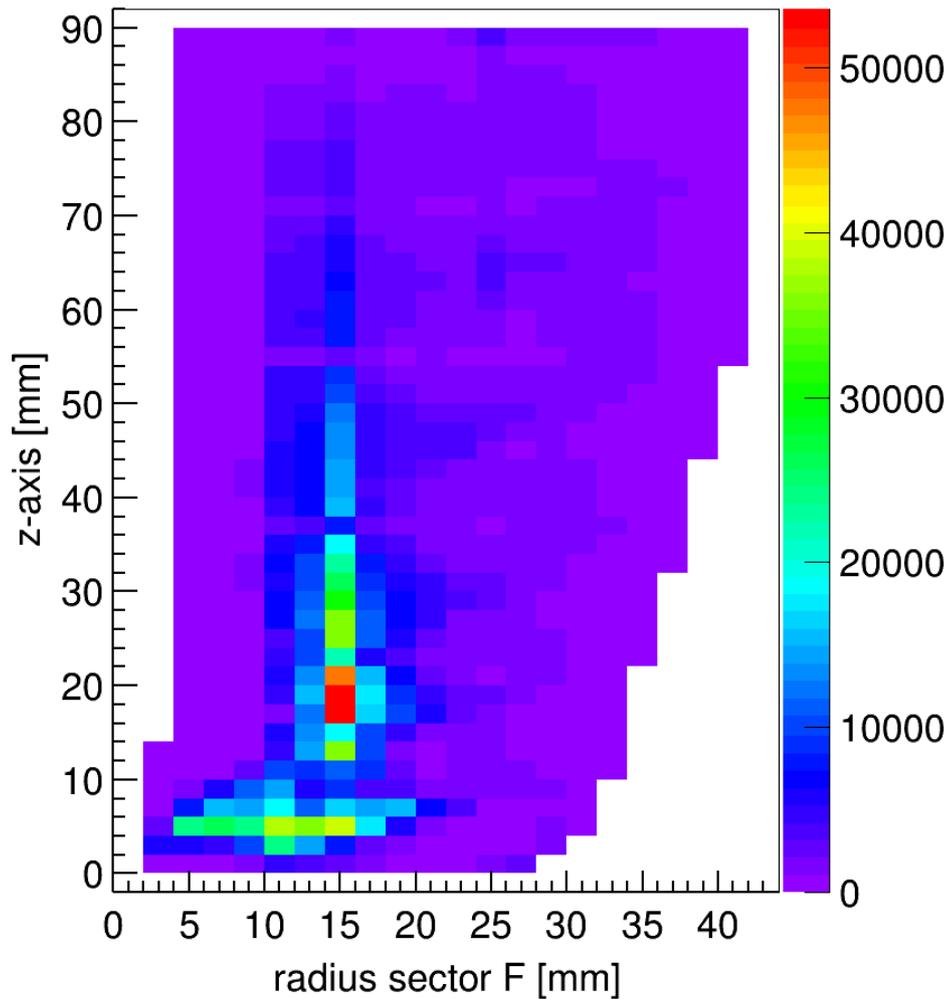
# Crosstalk

## Crosstalk measurement

- Crosstalk parameters
  - Average 1.75‰
- Expected shape
- No additional crosstalk due to cryostat.

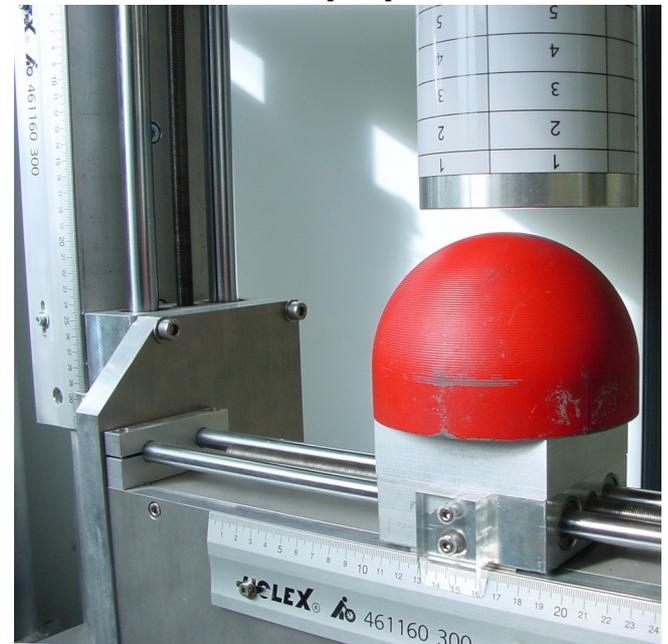


# PSA results



## Collimated Cs-137 source

- Sector F
- $E_{\gamma} > 300$  keV
- Radius = 1.5 cm
- 5.5 mm beam spot at ring 3



# Summary and Outlook

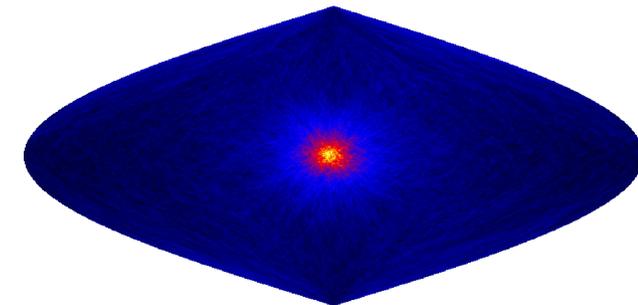
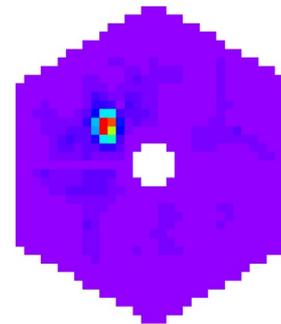
## AGATA Electronics

- Setup completed
- Ready for detector tests
- Optimization ongoing

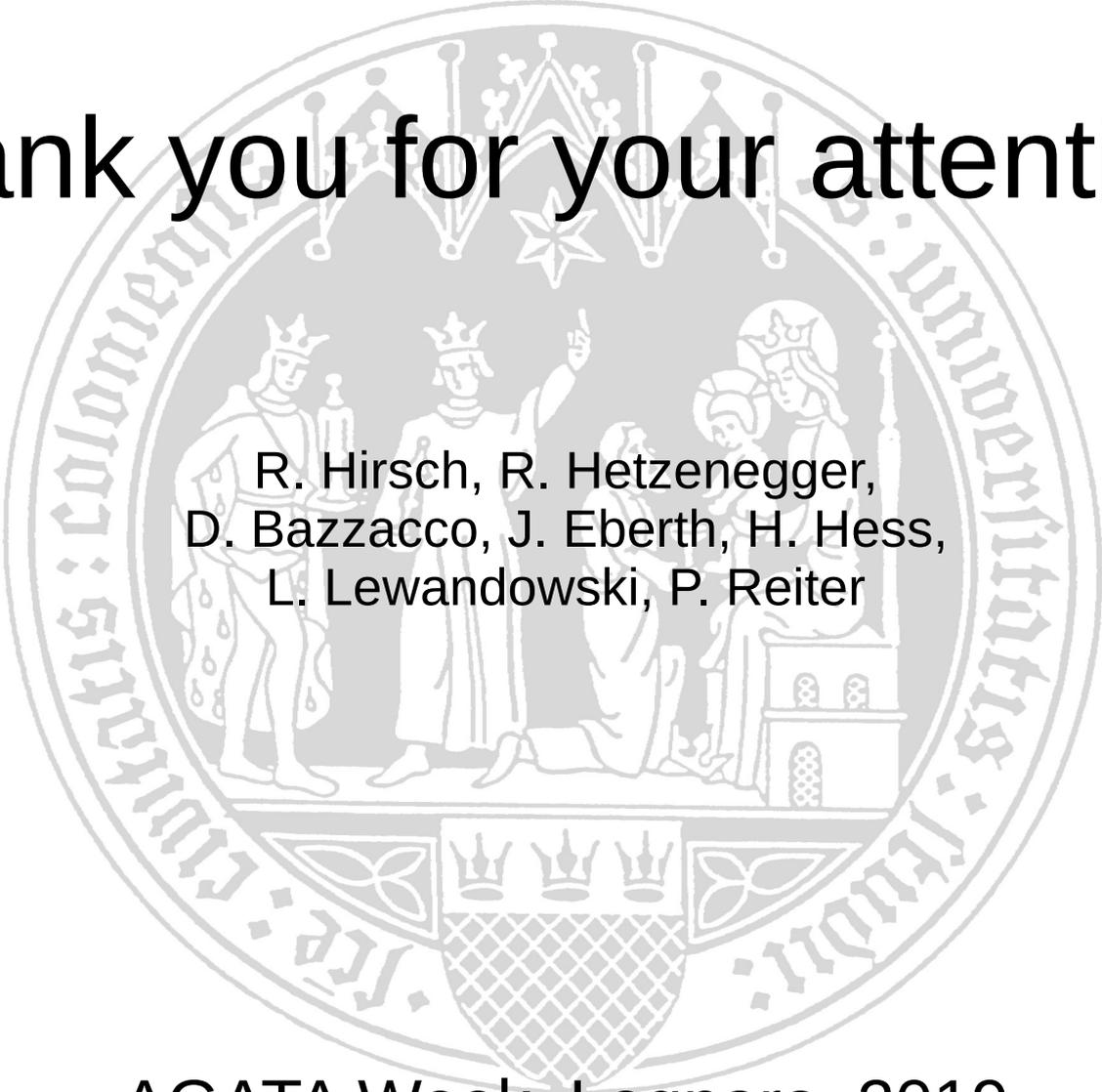


## Pulse Shape Analysis

- Collimated measurements
- Imaging performance
- ADL adjustments
  - Geometry
  - Impurity concentration
  - Mobilities



# Thank you for your attention!

The seal of the University of Cologne is a circular emblem. It features a central scene with several figures: a king on the left holding a scepter, a central figure pointing upwards, and a seated figure on the right. Above them is a star. The Latin text 'Universitas Studii Coloniensis' is inscribed around the perimeter. Below the central scene is a shield with three crowns and a checkered pattern.

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