

Prototype (Proto16) for the EMC Backward End-Cap

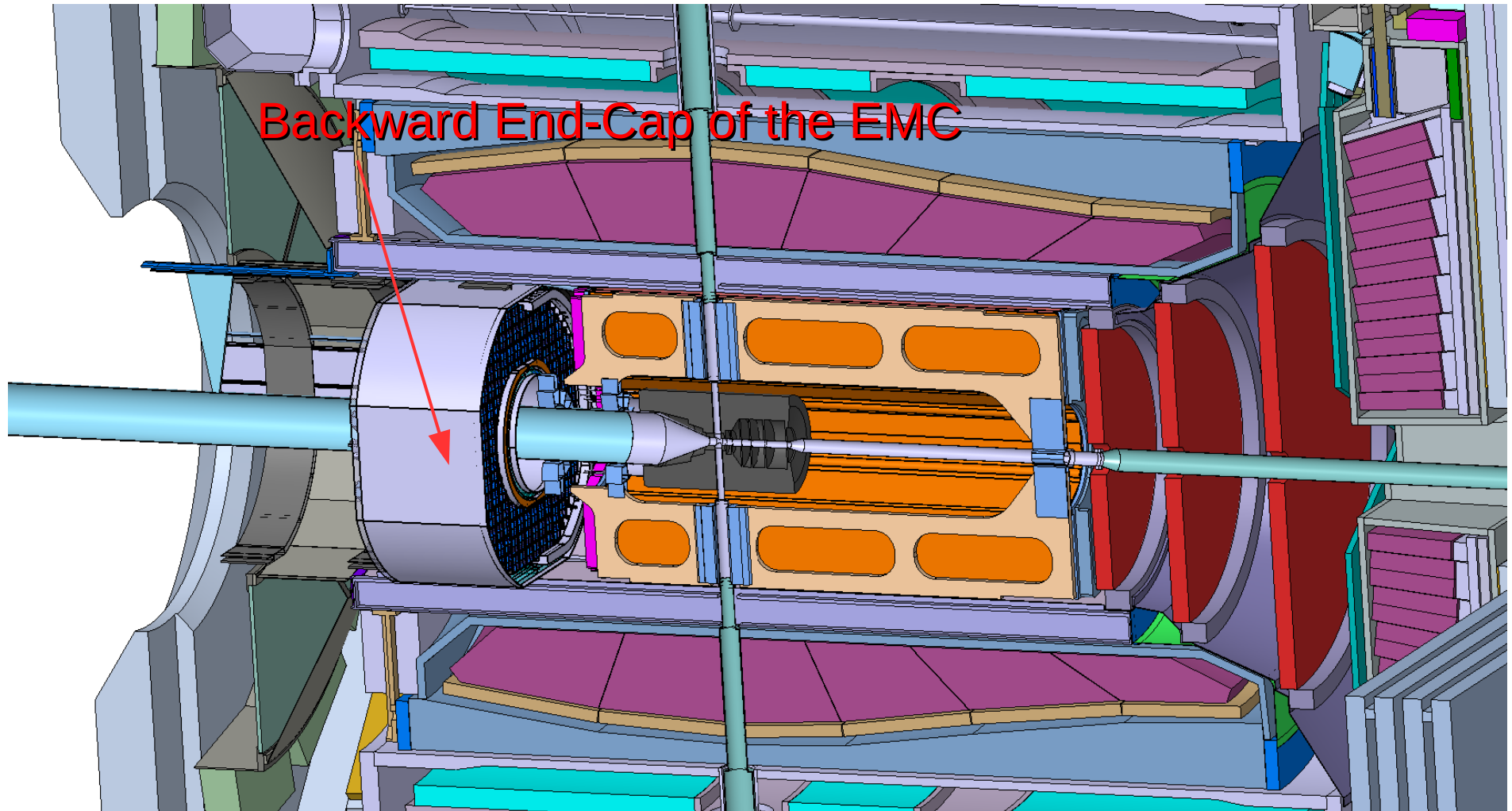
PANDA Collaboration Meeting
9. September 2014
Frascati, Italy

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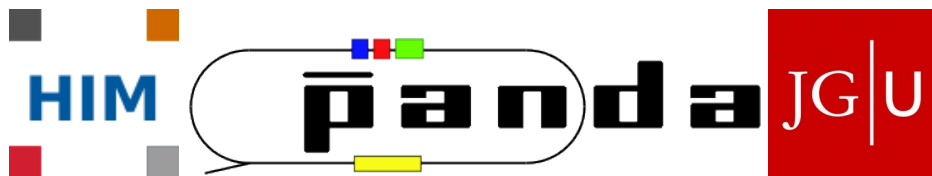


Backward End-Cap



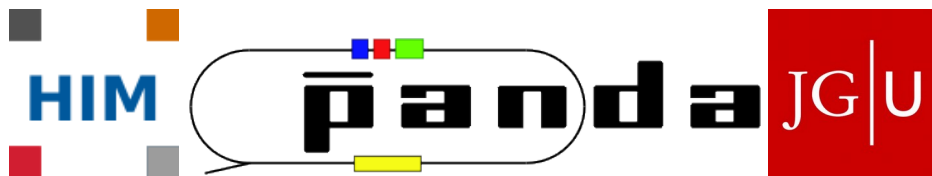
Outline

- Proto16
 - Mechanical setup
 - Cooling
 - Readout electronics
- Beam time at MAMI (July 2014)
 - Setup
 - First results

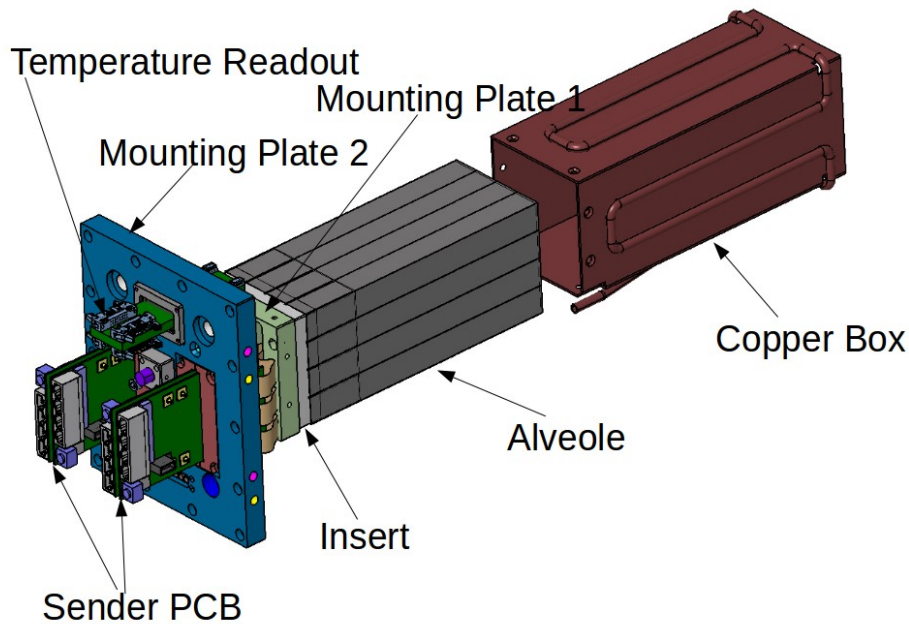


Proto16 a few Facts

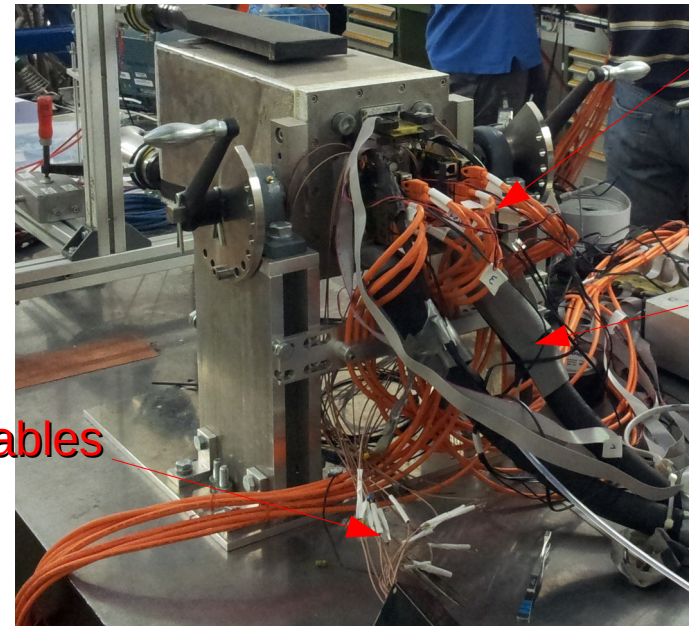
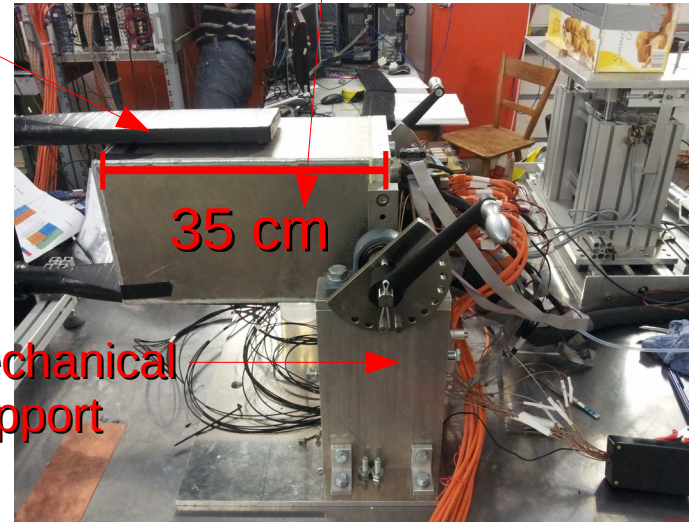
- 16 Crystals
- 32 APDs
- 16 APFEL-ASICs
- $T = -25\text{ }^{\circ}\text{C}$
- 16 thermal sensors
- First beamtime at MAMI with tagged photons (July 2014)



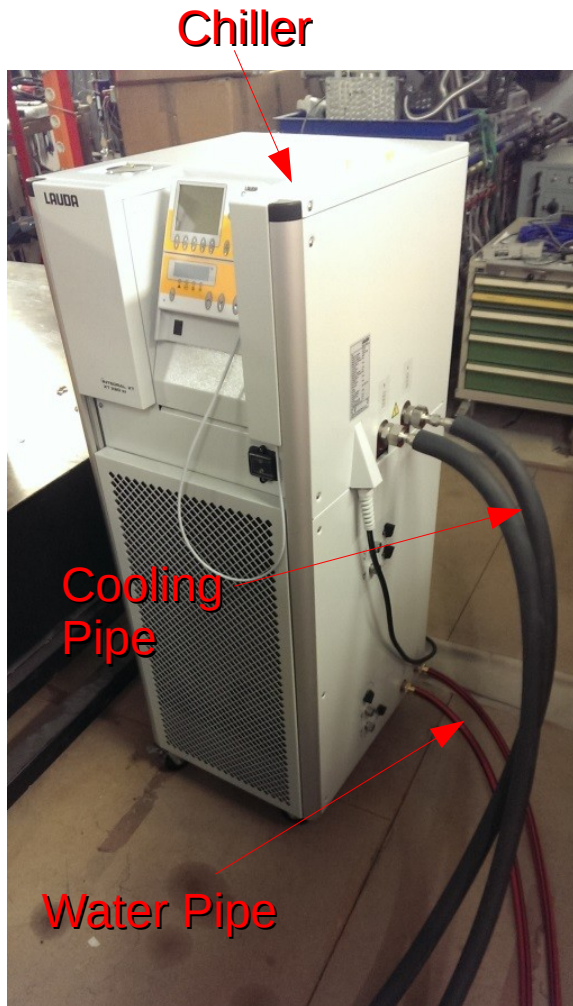
How the Proto16 Looks Like



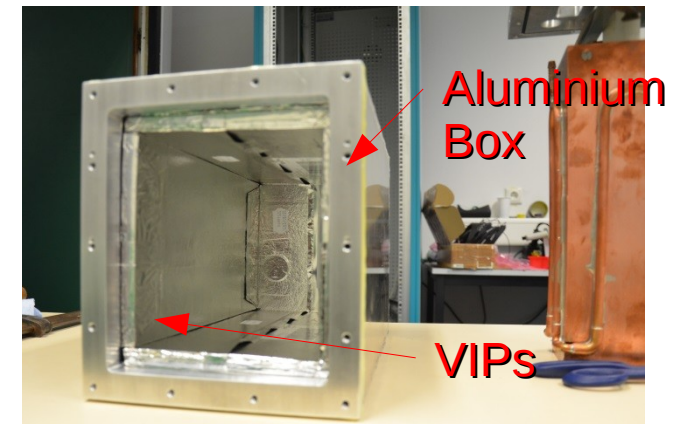
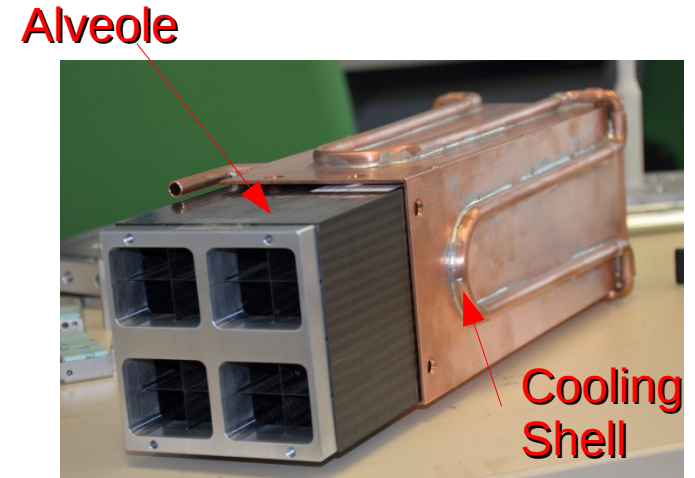
Aluminium Box with Insulation



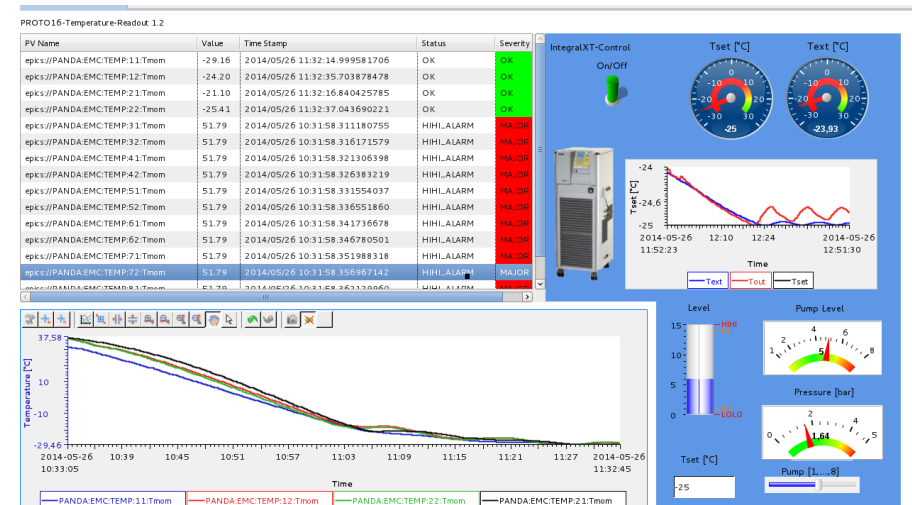
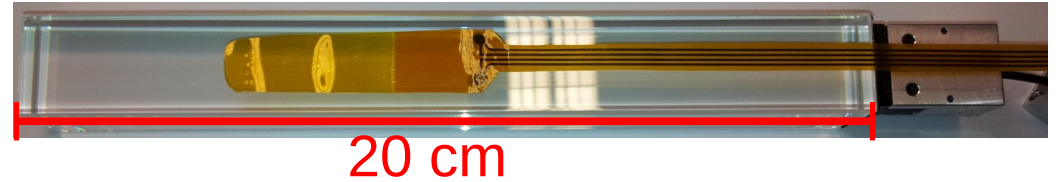
How the Cooling Looks Like



- Coolant ethanol
- Max cooling power of ca. 1.75 kW
- Controlled by EPICS
- Copper cooling shell
- 2 cm of vacuum insulating panels (VIPs)
- Aerogel granulate back insulation



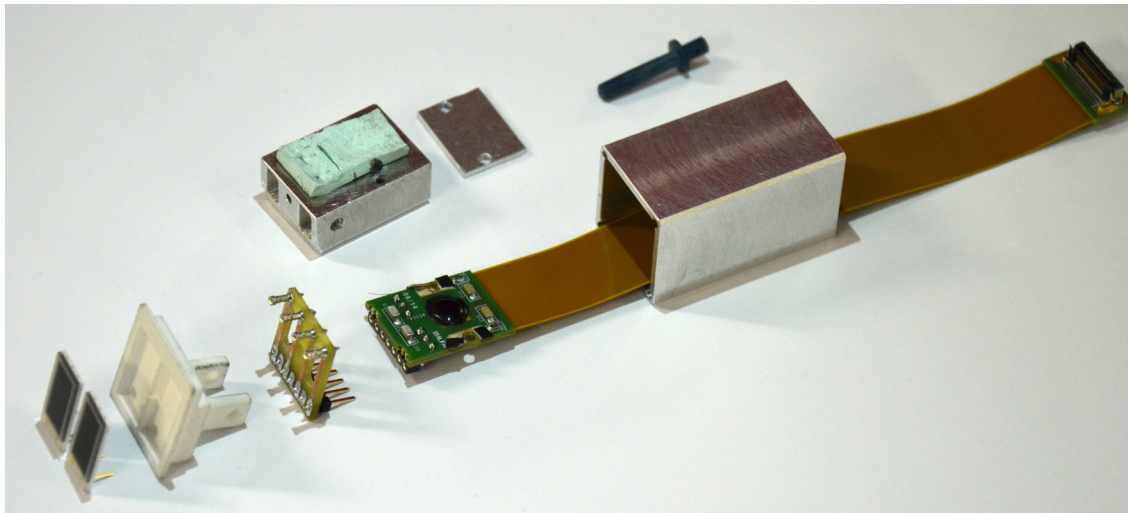
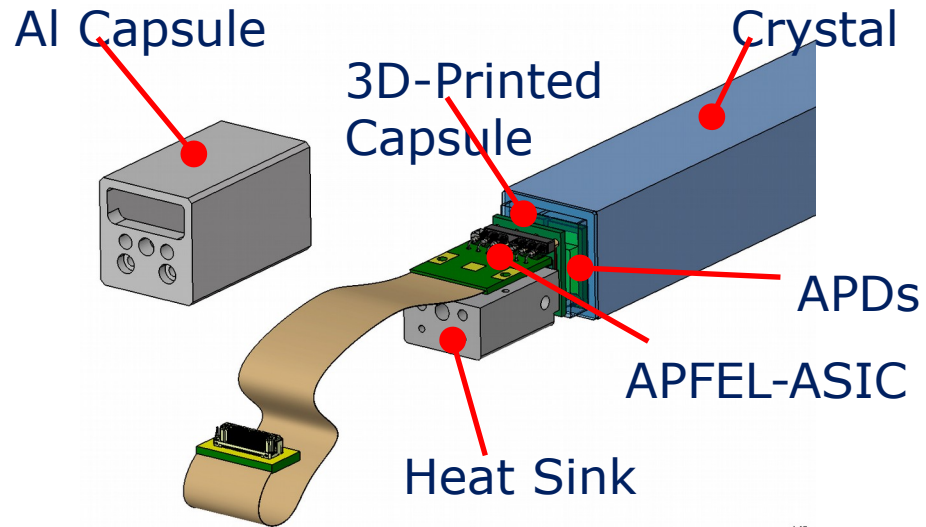
Temperature Readout



- 16 thermal sensors (PT100)
- Gradient for 12 crystals
- Read out with THMP and EPICS (Bochum)

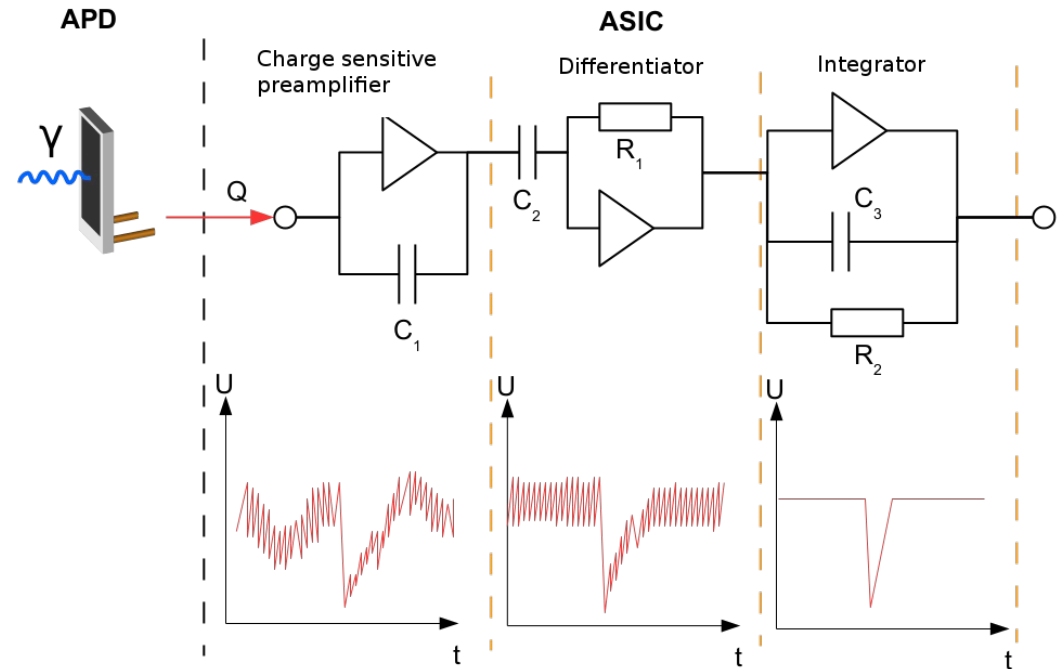


Crystal Assembly



APFEL-ASIC for APD Readout

- Charge sensitive preamplifier
- Shaper
- Main amplifier with high and low gain
- Differential output signal
- Shielded flex cable

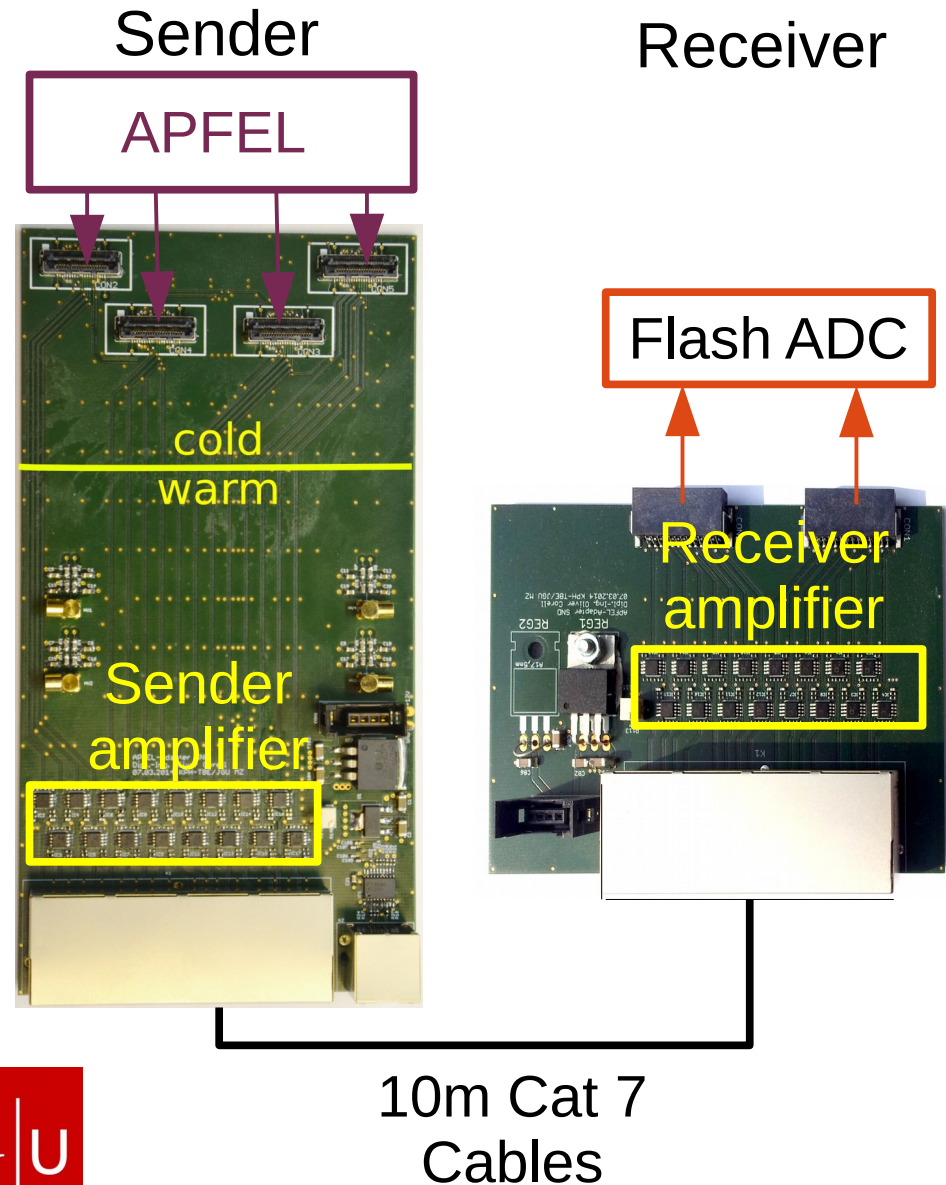


APFEL v 1.5

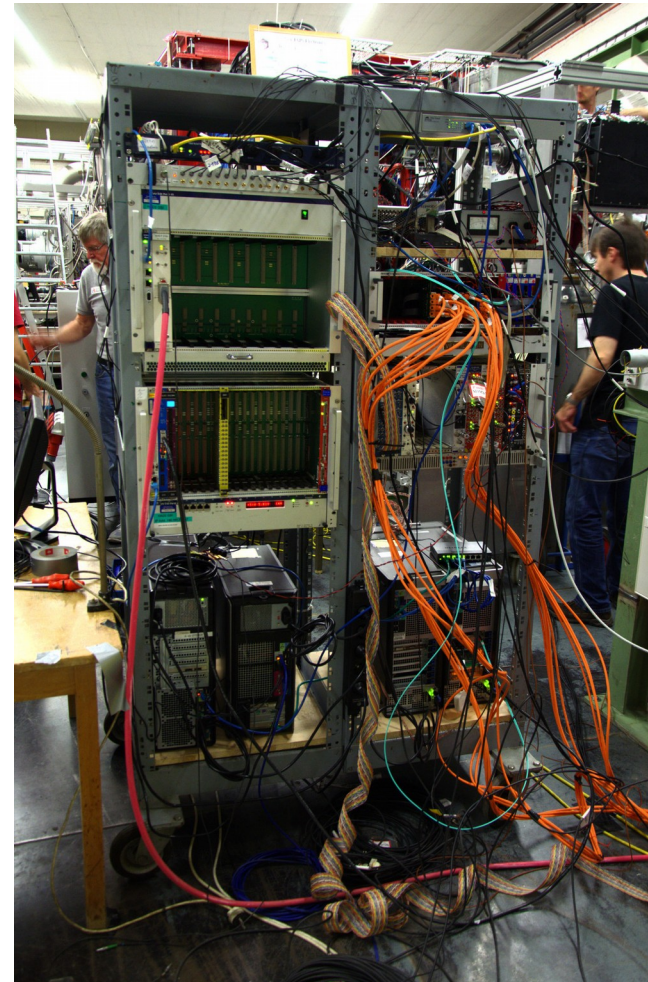
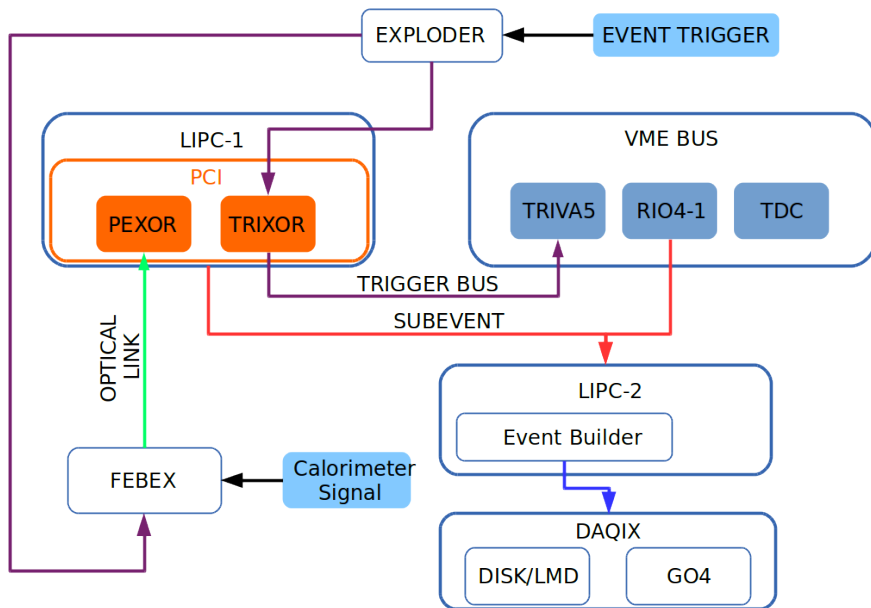


Booster Boards to Transmit the Signals

- Provides HV and LV to the APFEL-ASICs
- 4 APFEL-ASICs can be mounted
- Boosts signal to transmit it over 10m (repeater)
- Cat 7. Cables



Electronics and Data Processing

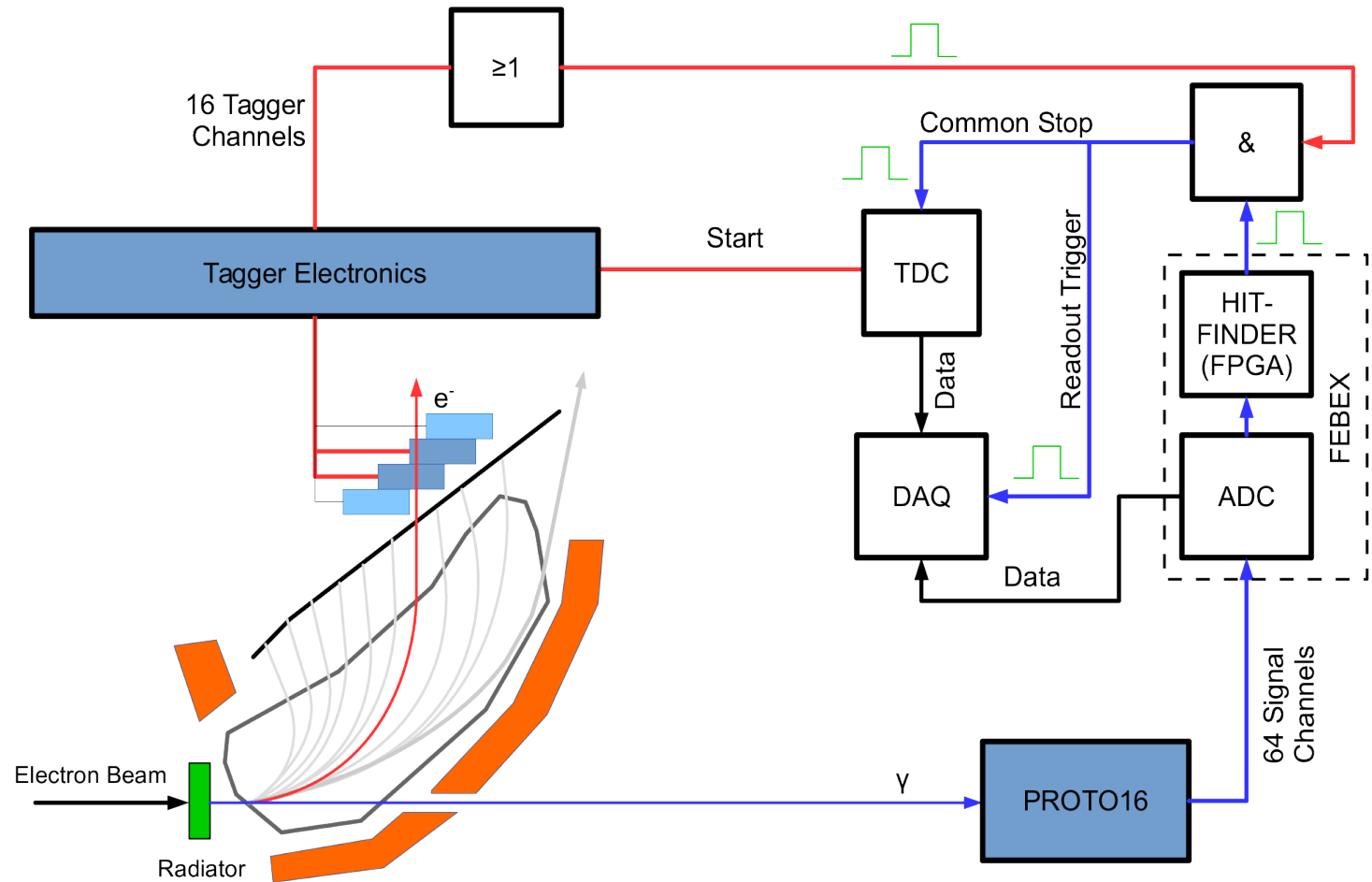


- Multi branch system (MBS) from GSI
- Flash ADCs are FEBEX from GSI → readout

**BEAM TIME
JULY 2014**

Measurements at MAMI (Mainz) with Tagged Photons

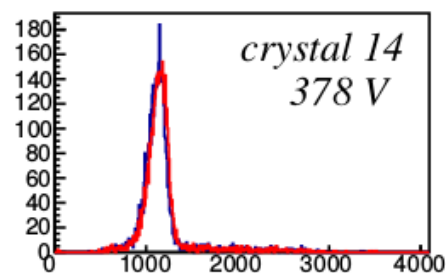
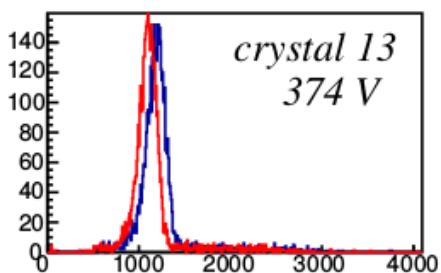
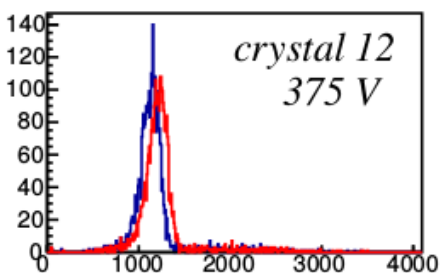
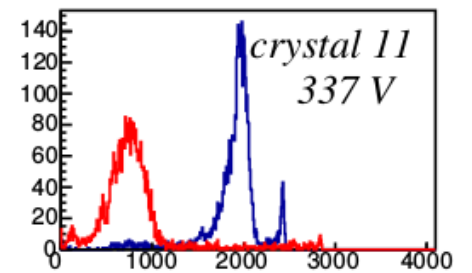
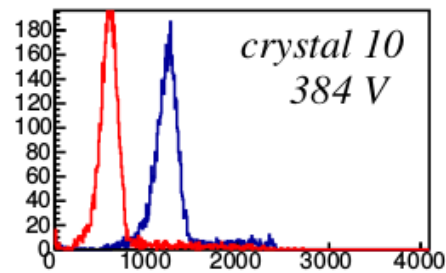
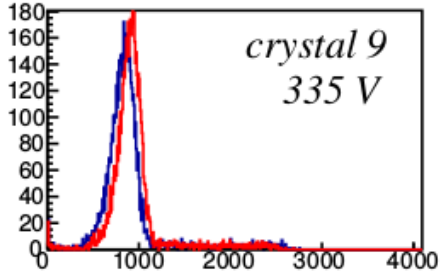
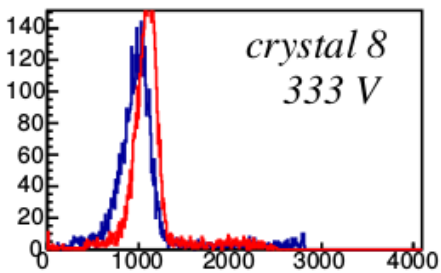
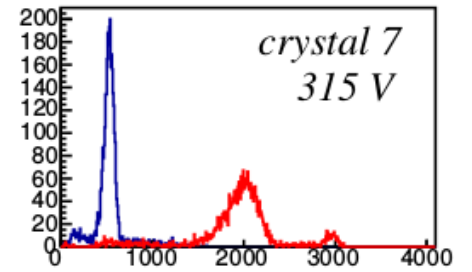
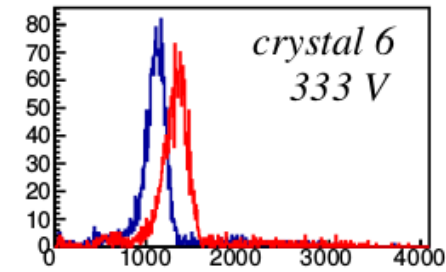
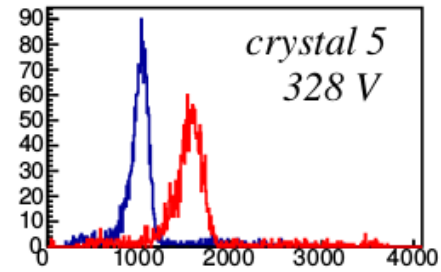
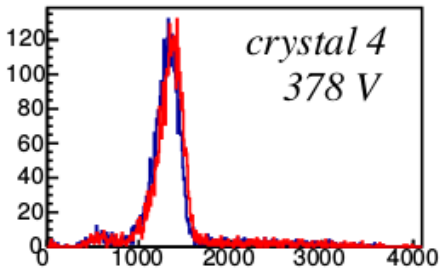
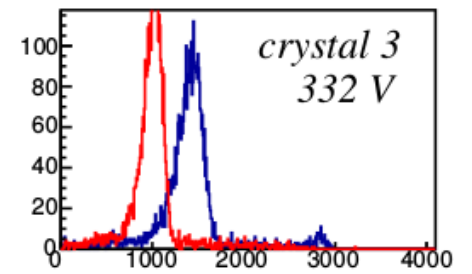
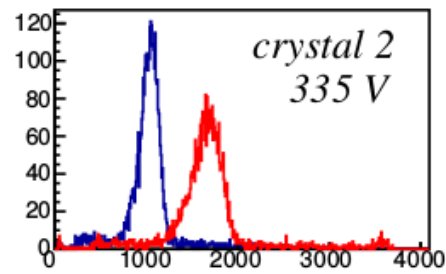
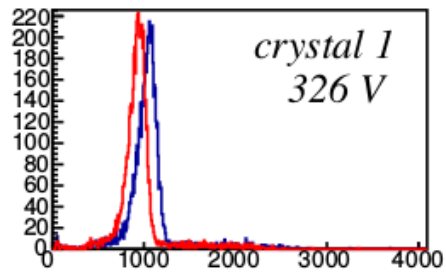
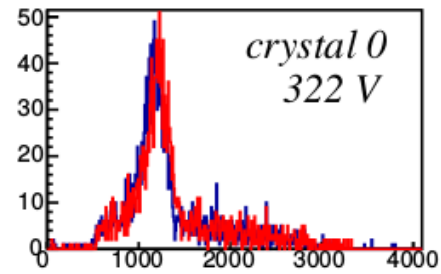
- 855 MeV
- 16 energies
- E_{\min} : 50MeV
- E_{\max} : 700MeV
- 3 days



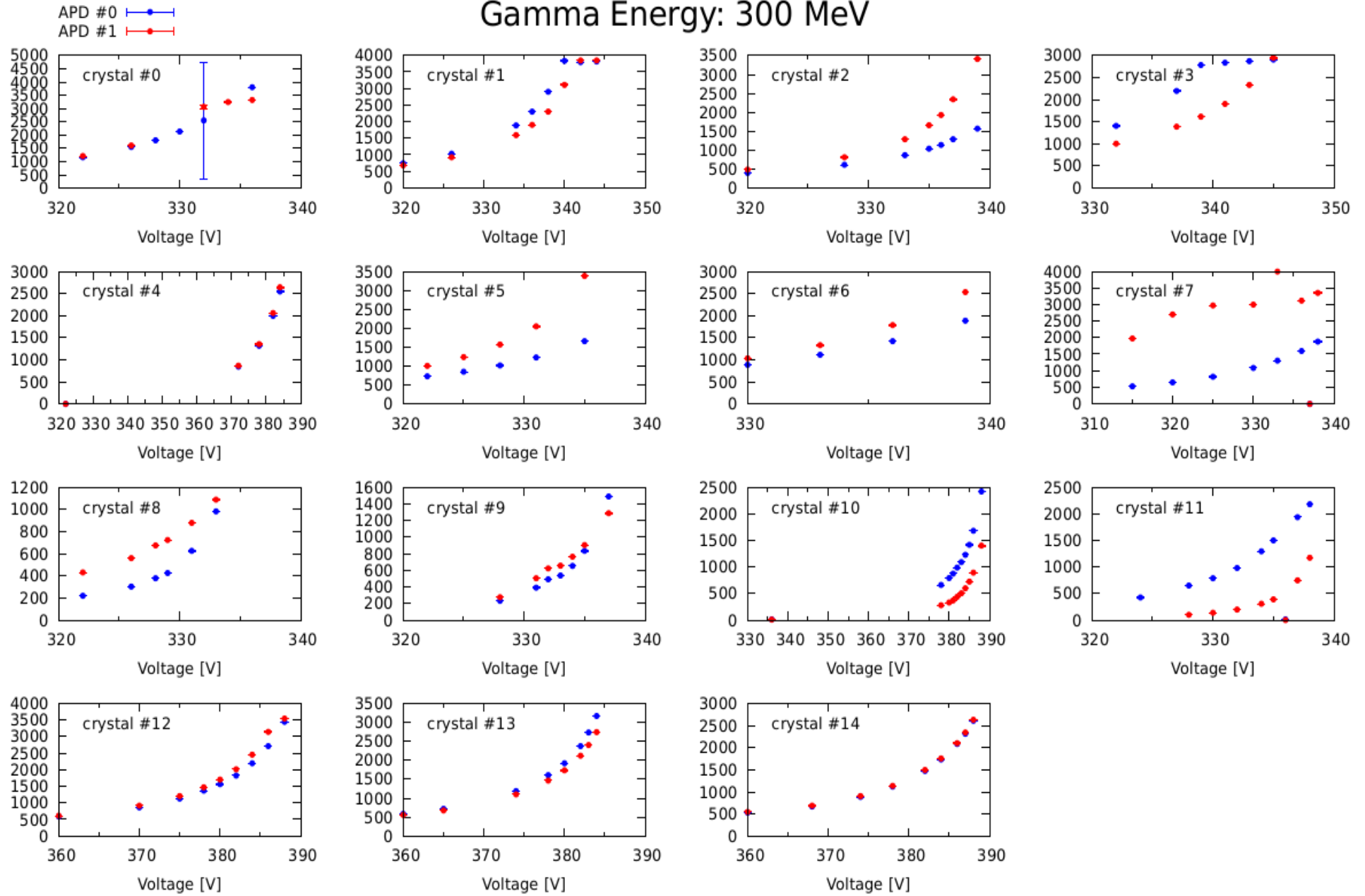
HV Scan

- Goals
 - Check the APD gain and matching
 - Find HV having the same gain in each crystal
 - See improvement in energy resolution
- Method
 - Beam centered on each crystal
 - HV varied

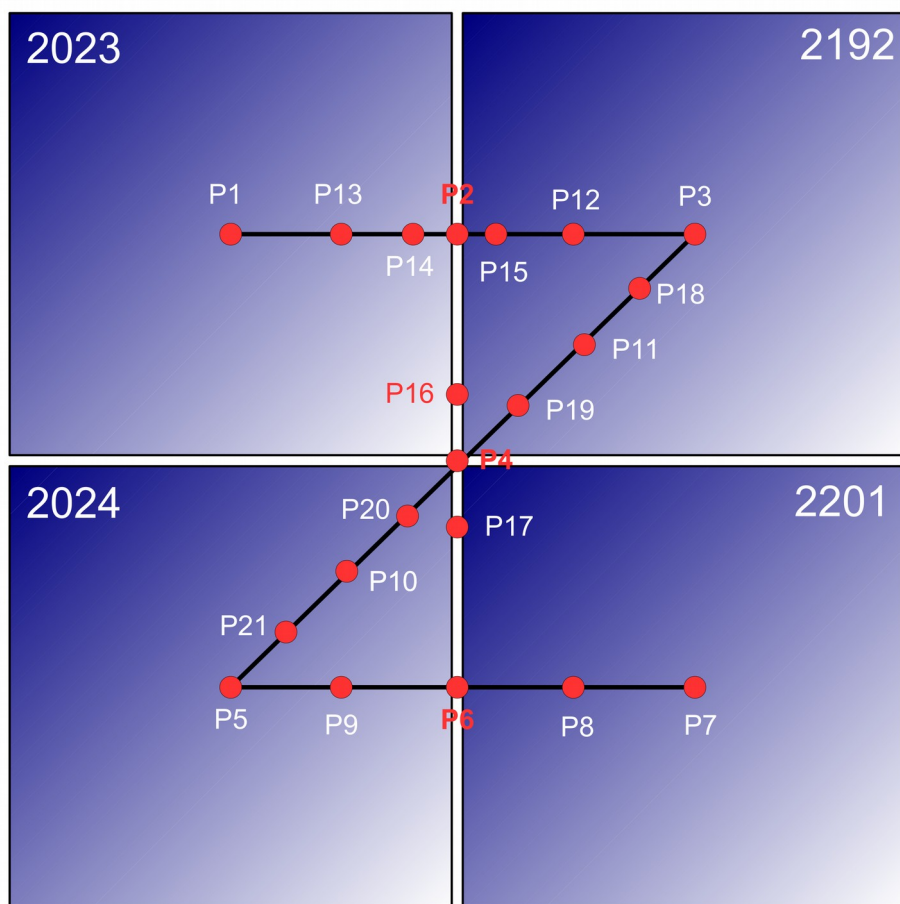
Gamma energy: 300 MeV



Gamma Energy: 300 MeV

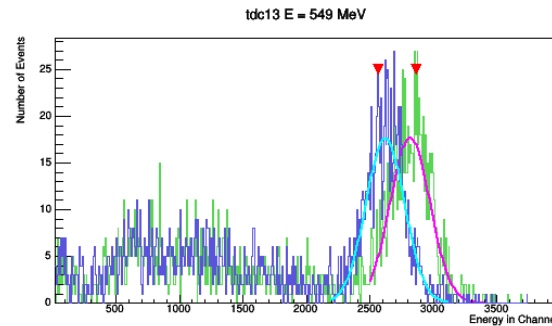
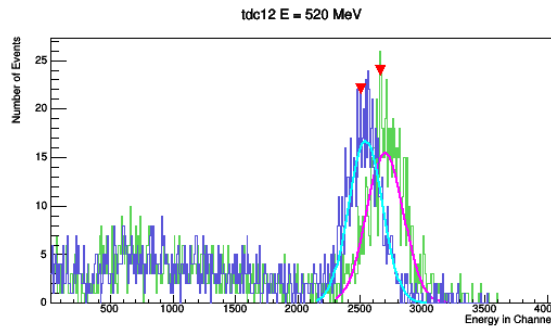
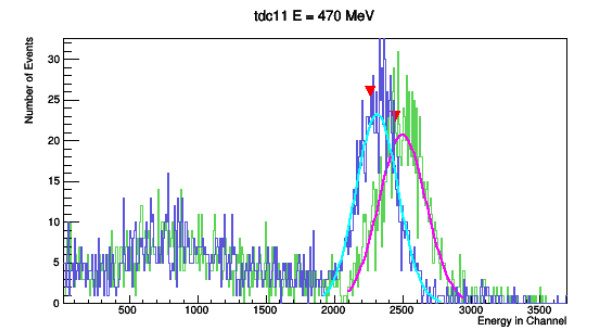
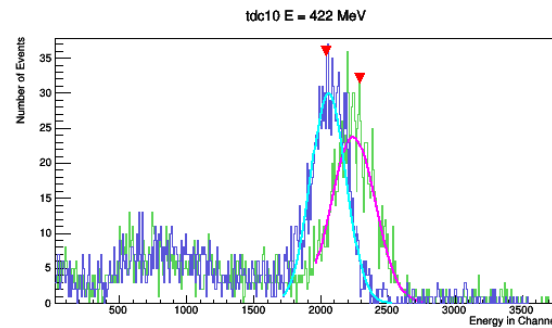
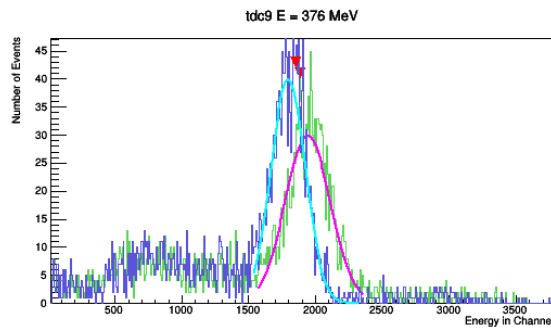
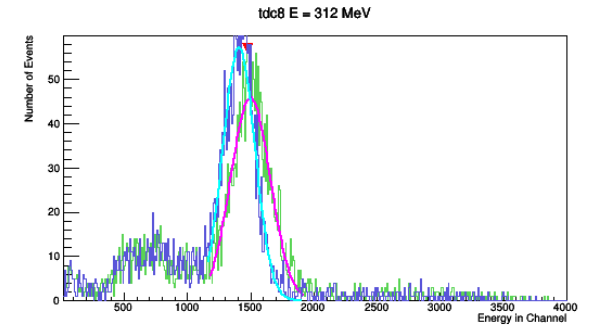
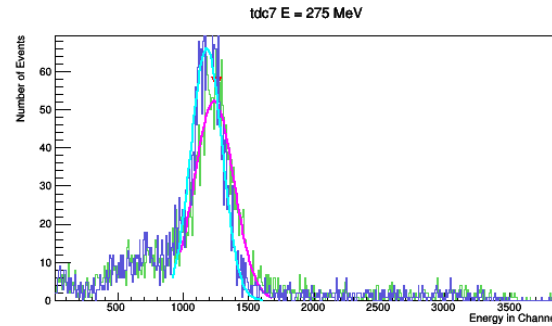
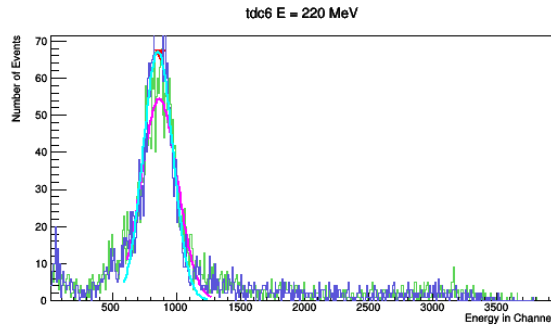


Position Scan (Z-Scan)

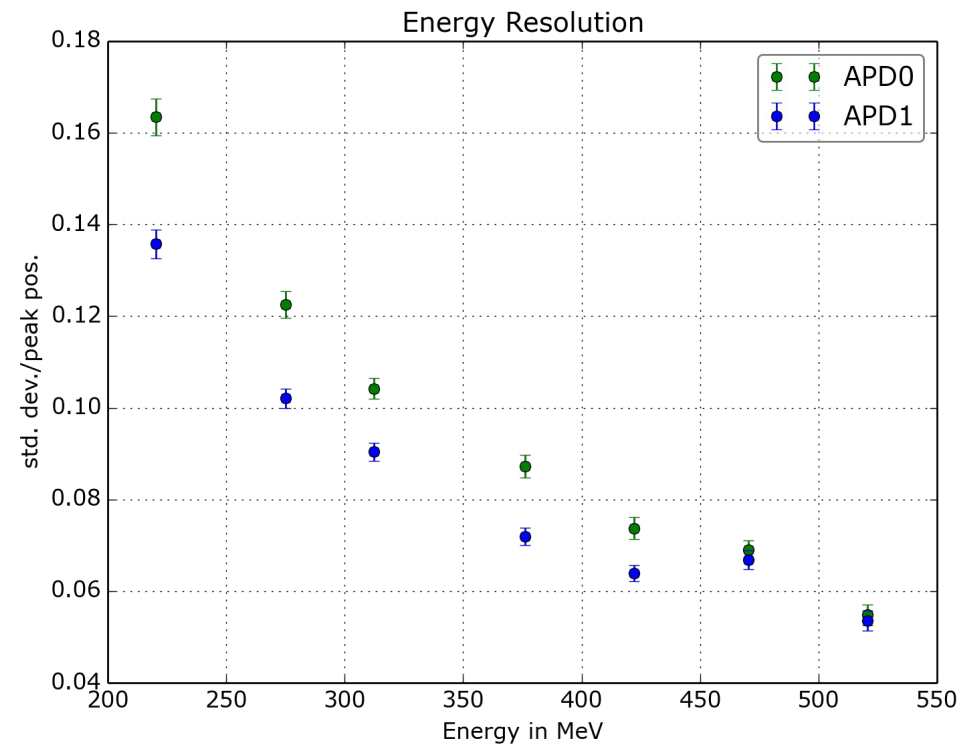
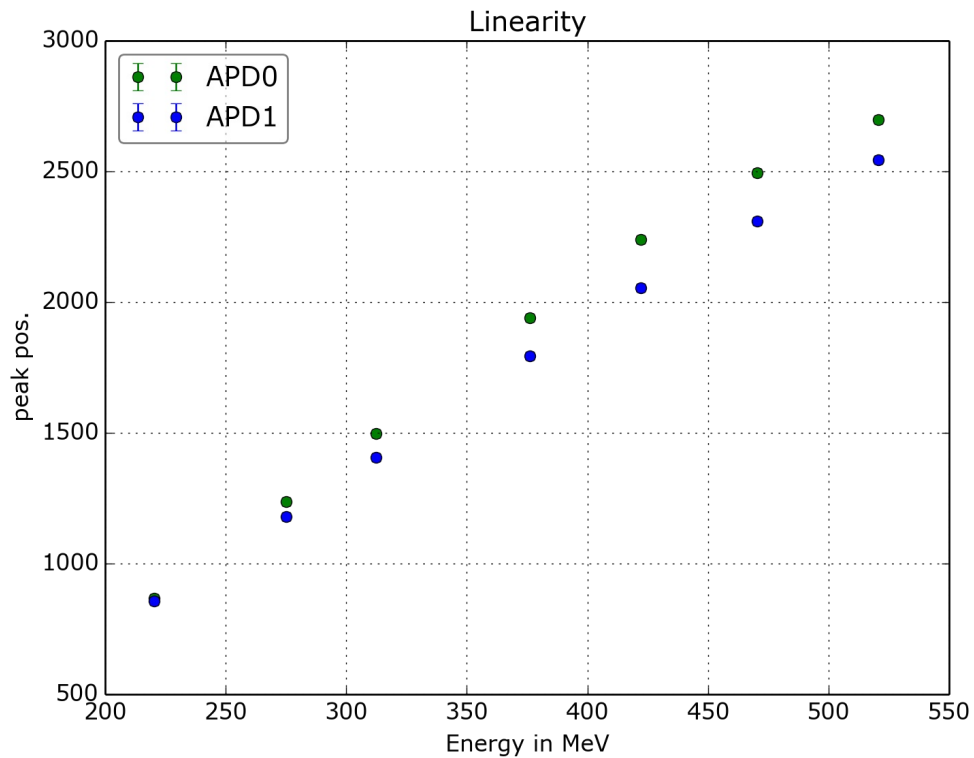


- Scan impact position
- Sum 3x3 matrix around maximum
- Study effects on energy resolution

First Spectra with Fits

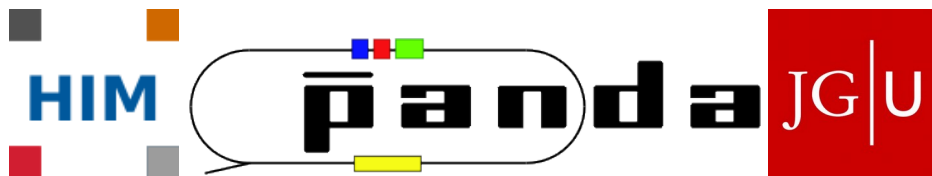


First Results for the Energy Resolution



Summary

- Proto16 built
- As similar as possible to the final backward end-cap design
- Latest APFEL version in use
- Test at MAMI
 - Response of APDs
 - Energy resolution
 - Preliminary results



Outlook

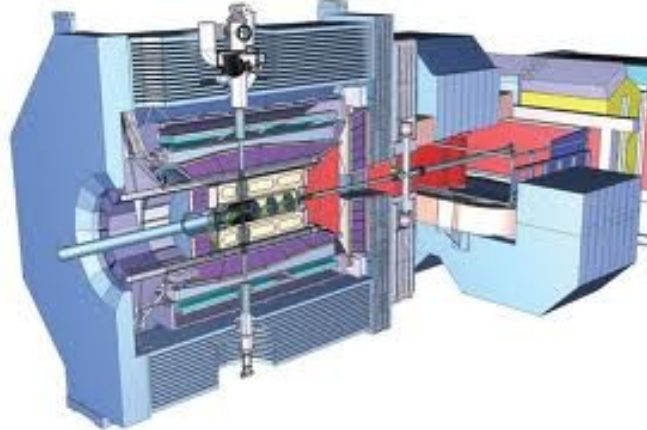
- Finish test beam data analysis
- More tests with cosmic muons and light pulser
- Small changes e.g. placing ADCs directly on the detector without driver boards
- Start building BWEC

Thank You

This is not a Panda



But this



L. Capozza

M. Deiseroth

F. Maas

O.Noll

D. Rodríguez Piñeiro

R. Valente