



Status Forward Endcap EMC

PANDA Collaboration Meeting 19/3, GSI, Darmstadt, 2019

Thomas Held

Ruhr-Universität Bochum
Institut für Experimentalphysik I

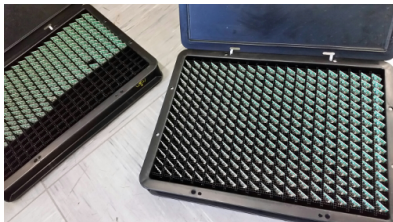
APD Submodule Production

- Submodule parts: Preparation and preassembly
- Stock of inventory at Bochum University:

Preamps delivered	4272/6176	All preamps available in Basel, tests ongoing
2-preamp units	≈1500/3088	Bochum and Stockholm
LV cables red	4108/3088	
LV cables blue	4459/3088	
LV cables black	4140/3088	
HV cables red	3180/3088	
HV cables blue	4114/3088	
HV cables black	3267/3088	
Patch cables red	3100/3088	
Patch cables blue	3200/3088	
Patch cables black	6200/6176	
Signal cables	≈3600/6176	All available uncut at HISKP
Signal cable mark red	3671/3088	
Signal cable mark blue	5655/3088	
Aluminum inserts	769/772	some more to be built
8-crystal mountplates	49/42	
16-crystal mountplates	190/172	
8-crystal alveoles	46/42	
16-crystal alveoles	≈200/172	

APD Submodule Production

Cable bundle hoses (pink, yellow)	168/168 each	
Cable bundle hoses (red, blue, black, green)	688/688 each	
8-crystal ground strap pin	10/42	Raw material in stock
16-crystal ground strap pin	10/172	Raw material in stock
Capsules	3170/3088	
Cable bundle shrinking tube	3200/3088	
Aluminium shielding tape strips	3100/3088	
Aluminum shielding tubes	3090/3088	
Cabled annealing LED Flex-PCBs	≈2100/3088	1000 more equipped flex-cables to be ordered
Carbon fibre crosses (type 1)	817/772	
Carbon fibre crosses (type 2)	813/772	
Crystal covers (3M DF2000MA)	3100/3088	
Crystals	3196/3088	
HV plugs	826/772	
LV plugs	828/772	
LED plugs	824/772	

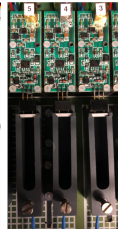
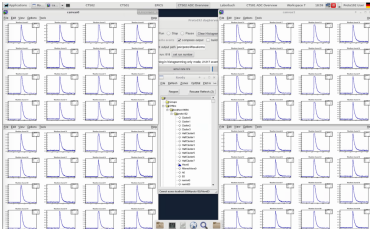
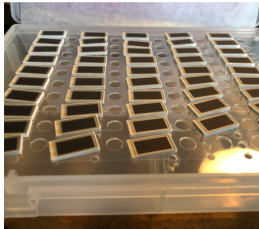


APD Submodule Production: APD Screening

- APD screening setup running smoothly at full capacity
- Nominal throughput 720 APDs per week (600 safe)
- Mean (incl. summer holidays): 580 per week
- Number of APDs fully (post irradiation) screened yet: 6600 (1/3 completely BO, 2/3 pre-irradiation screened at PSL, GSI)
- Plus 6180 APDs pre-irradiation screened
- Mass irradiation at Strahlencentrum Giessen, exchange with Bochum
- More on this topic:
Talk by Jan Reher later in this session

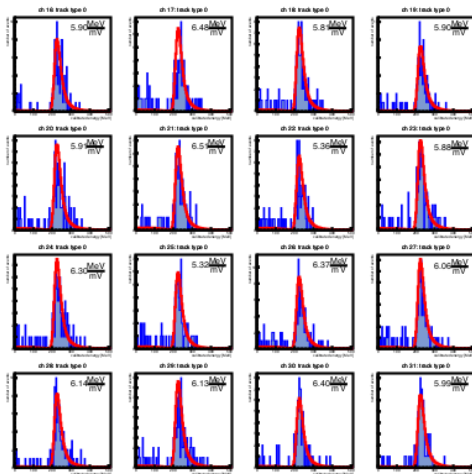
APD Screening/Matching: July Meeting

- Bochum screening facility visited by PANDA Technical Coordinators
- Presentation of the screening setup, procedure, shift scheme (training, checking) (Jan Reher)
- Presentation of the APD matching (Matthias Steinke)
- Protocol of the meeting outcome describing screening and matching available on the PANDA Wiki
- More on this topic: Talk by Jan Reher later in this session



APD Submodule Production: First of Series Submodules

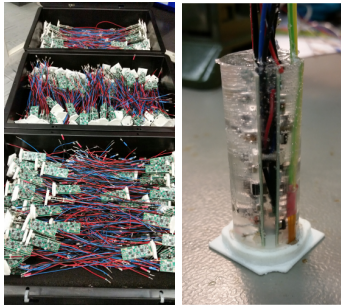
- Two first of series APD-equipped 16-crystal submodules built
- Bonn cosmics test stand measurements: Best APD equipped submodules built so far in terms of
 - ▶ Relative response (mean dev. 6%)
 - ▶ Absolute response (12 GeV maximum)
- Fully satisfying performance
- Proof of procedure (APD matching)



(Preliminary Bonn cosmics test stand data)

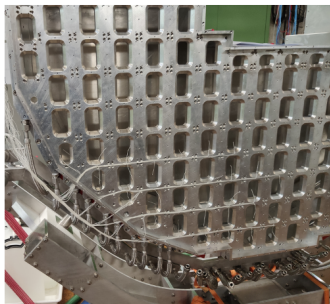
APD Submodule Production: Submodule Production

- However, no further APD submodules built yet
- Noise introduction to APDs via annealing-LED-cabling (Bonn test stands) turns out to be unexpected problem
- Actually two different cabling schemes for LEDs tested in the two APD submodules
- For the time being all man power going into preparatory work, i.e. 2-preamp-unit soldering

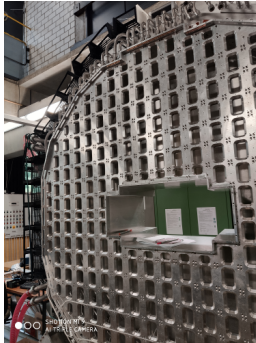


Forward Endcap Cooling/Heating

- Problems with leaking VCR-NPT adapter pieces that couple Swagelok hoses to cooling drills
- Consulting by Polarized Target group members (Bochum): Epoxy glueing of threads rather than PTFE tape sealing
- Checked on test pieces with vacuum pump in climate chamber



SADCs: Crate Mock-Ups, Cabling



- Complete 3D-printed SADC crate mock-ups now installed at Forward Endcap frame
- Cabling tests (paths, lengths) at all positions possible (Claudius, Christoph)

SADC-Crates: Power Supply Irradiation at KVI

- Module tested contained four power supply channels, one controller, one driver
- 1 channel stopped working at $1.3 \cdot 10^{11}$ protons/cm²
- 2nd channel stopped working at $2.4 \cdot 10^{11}$ protons/cm²
- Expected PANDA doses somewhat higher (not much)
- Dose rate much lower than in previous irradiation tests, damage, however, occurred at about the same total dose (no rate effect)
- What exactly died on the boards is not yet clear - items have been too hot to handle (needed to wait for declining activity), now back in Uppsala for closer inspection
- A radiation hard alternative may be the CERN supplies (less efficient)
- 15 power supplies we need soon for the endcap operation in Jülich, ordered

Jülich Installation

- Mounting arm maintenance done, ready to operate
- Submodule suspension adapter designed, needs to be built
- Mobile test stand for submodule read-out prior to/immediately after installation on backplane



- Working DAQ needed (Data Concentrators etc.) !

Summary

- APD submodule production started with two 16-crystal units
 - ▶ Well performing in terms of cosmics response
 - ▶ Noise introduction via annealing LED cabling
 - ▶ Preparatory work for submodule production ongoing (preamp cabling)
 - ▶ Need to resume submodule production as soon as possible
- APD screening running constantly with high throughput
- Work on Forward Endcap cooling, read-out (SADC crates), Jülich installation (submodule mounting tool, mobile submodule test stand) ongoing
- We need a running DAQ system in Jülich