



Status Forward Endcap EMC

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APD Submodule Manufacturing: Progress

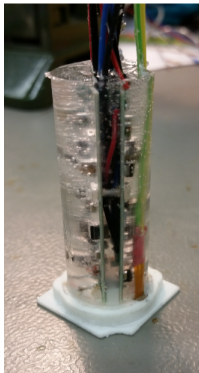
- Submodule manufacturing and shipping proceeding (shipping 5 modules/2 weeks to Bonn, no shipping in June, though)
- 103 (of 193) APD submodules built so far (glued)
- < 100 submodules shipped to Bonn for cosmics tests (some needed to be returned for repair)
- Regular transport of tested (VPTT) submodules to Jülich started in March (no delivery in June)
- 24 VPTT submodules currently stored in Jülich

APD Submodule Manufacturing: Problems

- Bonn colleagues found problems in several submodules concerning 'mixups of readout':
 - ▶ APDs selected in groups of 8 similar devices, each group supplied by one main HV channel
 - ▶ For reasons of redundancy two APDs from different groups on one crystal
 - ▶ Observation: Response of the 32 readout channels not as equal as expected
 - ▶ Responses equalize by assuming blue/red APD mixups on single crystals
 - ▶ Mixup of HV cabling would give the same result
- Blue/red color coding of HV supply: Blue preamp must be close to annealing LED hole in capsule

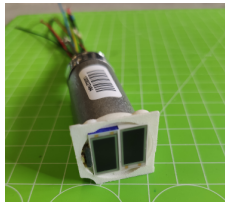
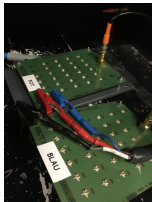
APD Submodule Manufacturing: Problems

- Signal cable labeling only after unit is closed in aluminum housing, 'blue' signal cable label goes on signal cable of preamp closest to annealing LED!
- As a consequence of reversed capsule mounting one ends up with readout units having mixed up HV cables (wrt signal cable labeling) - Remedy: reversing HV cable color coding by means of colored shrinking tube
- There is a considerable number of 2-preamp sandwiches that is wrongly orientated to its capsule
- All problems of this kind so far tracked down to this reason (no APD mixup in capsule)



APD Submodule Manufacturing: Problems

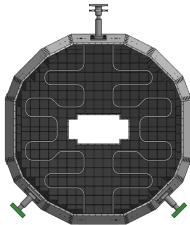
- In order to prevent this kind of mistake in the future the unit test stand has been upgraded to a 2-channel HV supply: Check if red/blue signal is correlated to red/blue HV channel
- Further measure: Color coding of APD's ceramic housing in order to be able to visually check position of correct APD in capsule (serial number inaccessible once the APD is glued to the capsule)



- APD screening ongoing regularly
 - ▶ Back in (mostly) standard mode (two shifts a day on week days, one on weekend days)
 - ▶ New APDs from Hamamatsu (3000 pieces) arrived in March, 4500 ordered
- Current numbers:
 - ▶ Screened - irradiated - screened: 19875 - 67 % of whole target calorimeter
 - ▶ Slow increase compared to March numbers
b/c now all APDs have to be screened twice in Bochum (all pre-irradiation screened APDs from GSI used up)
 - ▶ Pre-irradiation screened only: 7827 APDs
 - ▶ Matched (on demand): 5000
(100+ FWEC APD submodules plus complete BWEC)

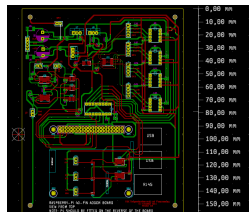
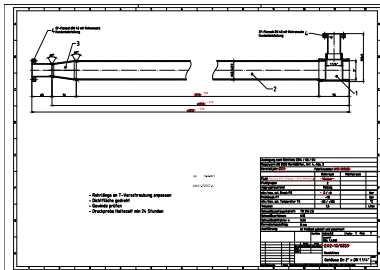
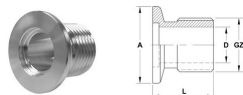
Cooling: Front Lid

- Preparation of cooling line (1st half), front lid w/ frame
- Tests on build-up of permanent seal glued to stiffener ring for easy removal of front lid
- Seals, gluings: Sikaflex 295UV plus activator, primer
- Mockup of seal currently at Strahlenzentrum Gießen



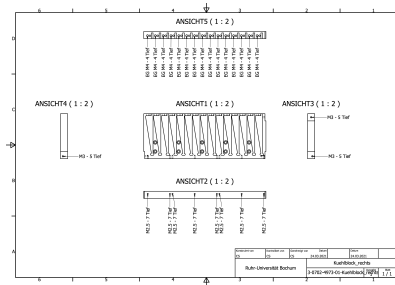
Cooling: Ordering of Parts

- 7 cooling pipe heaters (4.5 kW each)
- 7 corresponding 40 A thyristor actuators
- 6 flow sensors 9-150 l/min (4-20 mA output) plus adaptor pipes
- PCBs for heater regulation and sensor readout
















SADC Crates

- 15-SADC crate parts delivered to Bochum (external company)
- Originally foreseen silicon thermal coupling pads (supplied by KVI) no longer available
- New silicon material available:
3 times the thermal conductivity, twice the cost



1st version of Safety Assessment Sheet for FWEC EMC:

Risk Id.	5	Description of Risk (concerning to the hazard)	Life cycle	Residual consequences	Risk Rating Pre-Initiation	Risk Rating Post-Initiation	Risk Mitigation Pre-Initiation	Risk Mitigation Post-Initiation	Applicable Protocols	Comments/References to the Documents
		Electricity Risks								
		Electrostatic Risks								
RI-001	1	Timing of an electromagnetic during installation and removal due to small footprints in suspension with elevated position of center of gravity	Assembly, installation, disassembly	Loss of equipment Functionality, injury of personnel	3	2	Yellow handling and installation instructions, wear of hand band shoes (class 10); Fitting of corresponding pictograms (M008 according to EN 61340-5); use mechanical locking system, operation only by qualified personnel	3	2	
RI-002	2	Danger of climbing and falling when ascending forward in the vehicle	Assembly, installation, commissioning, regular use, decommissioning, dismantling	Loss of equipment Functionality, injury of personnel	2	2	Installation and use of hand rail - Fitting of corresponding pictograms (M012 according to EN 61340-5)	2	2	
RI-003	3	Falling parts (screws, bolts) during installation of securing pins to magnet	Assembly, installation, disassembly	Loss of equipment Functionality, injury of personnel Risk of burning	2	2	Yellow handling and installation instructions, wear personal protective equipment (protective gloves, helmet etc.); Fitting of corresponding pictograms (M009) according to EN 61340-5 ; secure parts against falling, safety distance	2	2	
		Electrical Risks								
RI-004	4	Electrical hazards due to high voltage (100 V supply of 400V, 1000 V supply of 400V)	Assembly, commissioning, decommissioning, dismantling	Injury of personnel - electrical shock	3	2	Switch off power during assembly and commissioning as well as decommissioning and dismantling; follow handling and installation instructions; electrical grounding of metal frames; integration of an electrical system to prevent accidental switch-on during maintenance/installation; fitting of corresponding pictograms (M009) according to EN 61340-5	3	2	
RI-005	5	Power cable insulation breaks	Assembly, installation, commissioning, regular use, decommissioning, dismantling, disposal	Loss of equipment Functionality, fire, injury of personnel - electrical shock	3	2	Cables must be labelled; cables must be traceable, removable and accessible; cables must be protected from mechanical damage; avoid creating standing heads with cables; regular inspection of insulation and connections; broken cables must be marked, apply a die not use tag; broken cables must be replaced; correct type of circuit breakers and fuses	3	2	
RI-006	6	Electrical hazards due to high power	Assembly, commissioning, decommissioning, dismantling	Injury of personnel - electrical shock	3	2	Switch off power during assembly and commissioning as well as decommissioning and dismantling; follow handling and installation instructions; electrical grounding of metal frames; integration of an electrical system to prevent accidental switch-on during maintenance/installation	3	2	
		Thermal Risks								
RI-007	7	Accidental contact to cooling pipe surfaces	Commissioning, regular use, decommissioning	Injury of personnel - Burns	2	2	Yellow handling and installation instructions; caution of surface heat; covering of hot/cold parts by thermal insulation; fitting of corresponding pictograms (M005 after M017 according to EN 61340-5)	2	2	
		Noise Risks								
RI-008	8	Performance noise originating from the bottom of the cooling system	Commissioning, regular use, decommissioning	Injury of personnel - damage to ears	2	2	Mandatory use of ear protection when working near to noise; fitting of corresponding pictograms (M001 according to EN 61340-5)	2	2	
		Explosion Risks								
RI-009	9	Radioactive source (220kV) in reference	Commissioning, regular use, decommissioning	Injury of personnel	2	2	Yellow handling and installation, fitting of corresponding pictograms (M003 according to EN 61340-5)	2	2	
RI-010	10	Accidental release of detector parts during tests	Regular use, decommissioning	Injury of personnel	2	2	Wear for clearance after release measurement; fitting of corresponding pictograms (M009) according to EN 61340-5	2	2	
		Reference Risks								
RI-011	11	Spilling of coolant/water mixture, leakage, coating system reservoir	Filling of cooling systems Installation, regular use, decommissioning	Injury of personnel - contamination, loss of equipment Inflammation, suffocation of non-aqua-water mixture	2	2	Yellow handling and installation instructions; operation by qualified personnel only; mandatory wear of gas mask (filter category A2); fitting of corresponding pictograms (M006 and M002 according to EN 61340-5)	2	2	
		Contamination Risks								
RI-012	12	Release of internal oil/air coolant	Commissioning, regular use, decommissioning	Loss of equipment Functionality, fire, injury of personnel - electrical shock, chemical shock, toxic	2	2	Regular maintenance (once a year) of oil/air by qualified company	2	2	
		Logistics Risks								
RI-013	13	Carrying and accidental dropping of heavy components	Assembly, installation, disassembly	Personnel pain and stress (for example in the back, knees etc.); loss of equipment Functionality, injury of personnel - loading and unloading	2	2	Lift heavy things using the proper technique; use appropriate lifting equipment (e.g. pallet jack, crane etc.); use personal safety equipment (e.g. hand band shoes, helmets etc.); fitting of corresponding pictograms (M007, M008, M009, and M010)	2	2	

Summary

- Construction of Forward Endcap proceeds (medium, slowly increasing speed)
- Production of submodules:
 - ▶ 103 APD submodules so far (passing gluing step) (more than half of the total number of APD modules)
 - ▶ Bochum U regulations yet unchanged: Students allowed to work (picking of APD sets, building submodules)
 - ▶ Transport of submodules to Jülich started in March, skipping June dates (repair of submodules)
- APD screening ongoing (back in 2-shift mode)
- Progress in mechanics: (front) cooling, SADC crates
- Work progress may increase as Covid-19 regulations change (student vaccination program at RUB)