



CALIFA Electronics & DAQ

Tobias Jenegger

CALIFA WG meeting
18.10.2024

Inner Cabling

Preamplifier Status

DAQ status & Upgrade

LED System

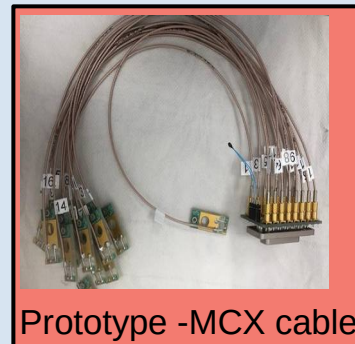
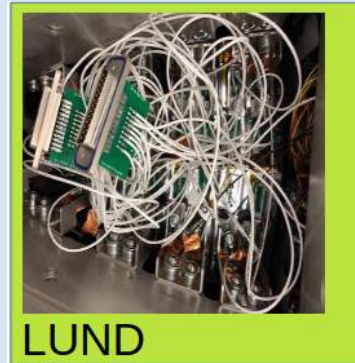
Documentation Status

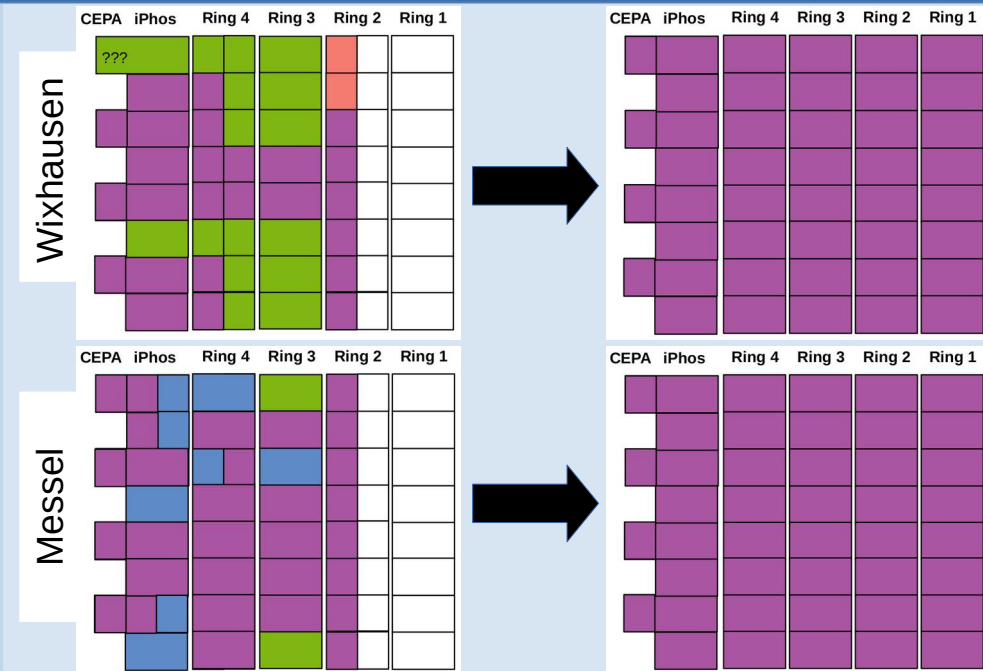
Supported by BMBF 05P15WOFNA and 05P19WOFN1.

The results presented here are based on the experiment s444/s473, which was performed at the beam line/infrastructure Cave C at the GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt (Germany) in the frame of FAIR Phase-0.

TUM Members:

Roman Gernhäuser, Philipp Klenze, Mrunmoy Jena, Gero Bollmann, Tobias Jenegger

[illegible]



Shopping List:

Connectors

(SubD 25Pin, socket strip,...)

1.6 k€

Cables

(Coax cables, APD connector, Fiber connector,)

9.3k€

11k€



New Coax

Production:

Workshop would need ~ **2 weeks**

unclear if they have the capacity...

CEPA	iPhos	Ring 4	Ring 3	Ring 2	Ring 1
	DR 48 30/450	SR 30/300	SR 30/300		
	DR 30/300	SR 30/300	SR 30/300		
	DR 48 30/450	SR 30/300	SR 30/300		
	DR 30/300	SR 30/300	SR 30/300		
	DR 48 30/450	SR 30/300	SR 30/300		
	DR 30/300	SR 30/300	SR 30/300		
	DR 48 30/450	SR 30/300	SR 30/300		
	DR 30/300	SR 30/300	SR 30/300		

- **CEPA:** 8 x 3/45pC DR Preamplifier
- **iPhos:** mixed configuration:
 - 8 x 3/45pC DR PA
 - 8 x 3/30pC DR PA
- **Barrel – Ring 4&3:** 32 x 3/30pC SR PA
- **Backward Barrel (BB) – Ring 2:**
 - Bricolage** of 16 PA (SR/DR)

What is still needed?

32 x SR 3/30pC PA for BB
(the current BB are spares for different applications)

Modifications:

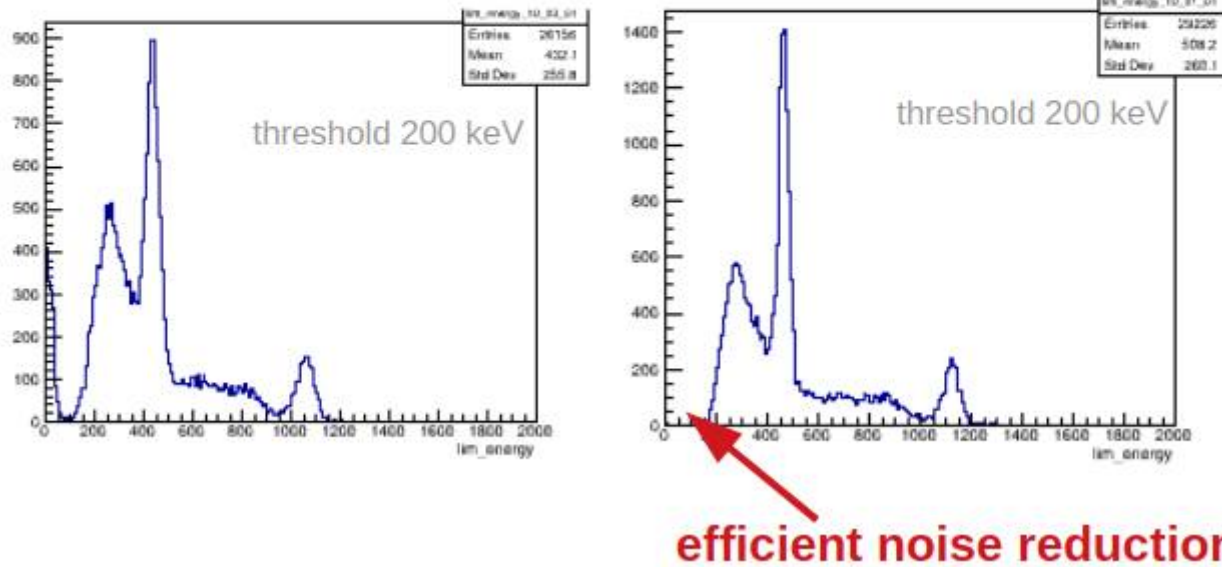
12x DR → to low noise input and 3/45pC range
32x SR → lower noise input stage

Optimization of S/N in Preamplifiers

Noise Optimization by Mesytec:

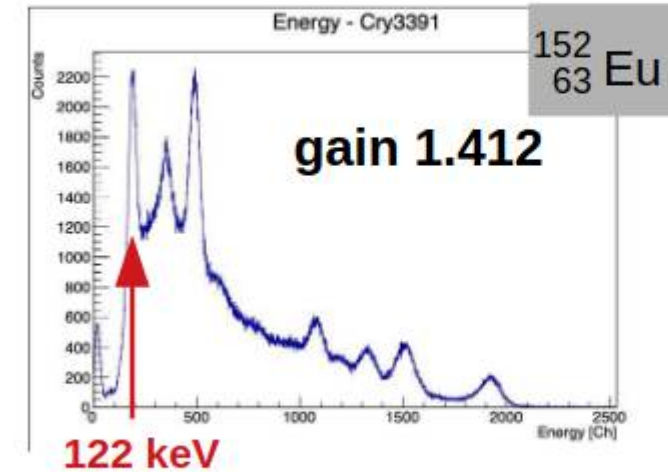
more current in input FET improve S/N ratio

reference preamplifier low noise DR 3/45pC preamplifier



Gain Optimization:

Stefan Eder's talk in R³B Week in Budapest



larger APD gain – constant electronic noise
gain ~ S/N with N= const

3/45pC DR Preamplifiers:

- allow to increase gain → lower thresholds
- 45pC covers full range up to 300 MeV

What we still need:

“Default Config.”

“4 π Config.”

CEPA	iPhos	Ring 4	Ring 3	Ring 2	Ring 1
	DR 48 30/450	SR 30/300	SR 30/300		
	DR 30/300	SR 30/300	SR 30/300		
	DR 48 30/450	SR 30/300	SR 30/300		
	DR 30/300	SR 30/300	SR 30/300		
	DR 48 30/450	SR 30/300	SR 30/300		
	DR 30/300	SR 30/300	SR 30/300		
	DR 48 30/450	SR 30/300	SR 30/300		
	DR 30/300	SR 30/300	SR 30/300		



CEPA	iPhos	Ring 4	Ring 3	Ring 2	Ring 1
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300

CEPA	iPhos	Ring 4	Ring 3	Ring 2	Ring 1
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300

* in both versions all preamps are upgraded to lower noise input stage

“Default Config.”

To Buy:

32 x 3/30pC SR PA for BB

128k€

To Modify:

12x DR → to low noise input and 3/45pC range

??

32x SR → low noise input stage

??

??

“4π Config.”

To Buy:

16 x 3/30pC **DR** PA for Ring4

16 x 3/30pC **SR** PA for Ring1

To Modify:

12x DR → to low noise input and 3/45pC range

??

32x SR → low noise input stage

??

??

Note:

+ 32 FEBEX cards are needed for this configuration
LV load balancing may be critical

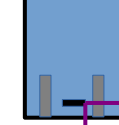
CEPA	iPhos	Ring 4	Ring 3	Ring 2	Ring 1
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300

CEPA	iPhos	Ring 4	Ring 3	Ring 2	Ring 1
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300

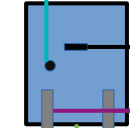
CEPA iPhos Ring 4 Ring 3 Ring 2 Ring 1

	DR 48 30/450	SR 30/300	SR 30/300			
	DR 30/300	SR 30/300	SR 30/300			
	DR 48 30/450	SR 30/300	SR 30/300			
	DR 30/300	SR 30/300	SR 30/300			
	DR 48 30/450	SR 30/300	SR 30/300			
	DR 30/300	SR 30/300	SR 30/300			
	DR 48 30/450	SR 30/300	SR 30/300			
	DR 30/300	SR 30/300	SR 30/300			

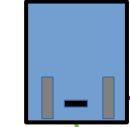
Overlord



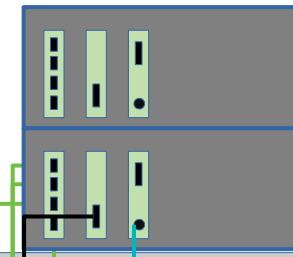
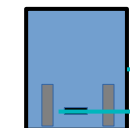
Exploder



Exploder



Exploder



LV - WIENER
Power Distributer



TDK Lambda



TDK Lambda

NIM Crate

PC1:
108 (MES)
109 (WIX)

PC0:
75 (MES)
76 (WIX)

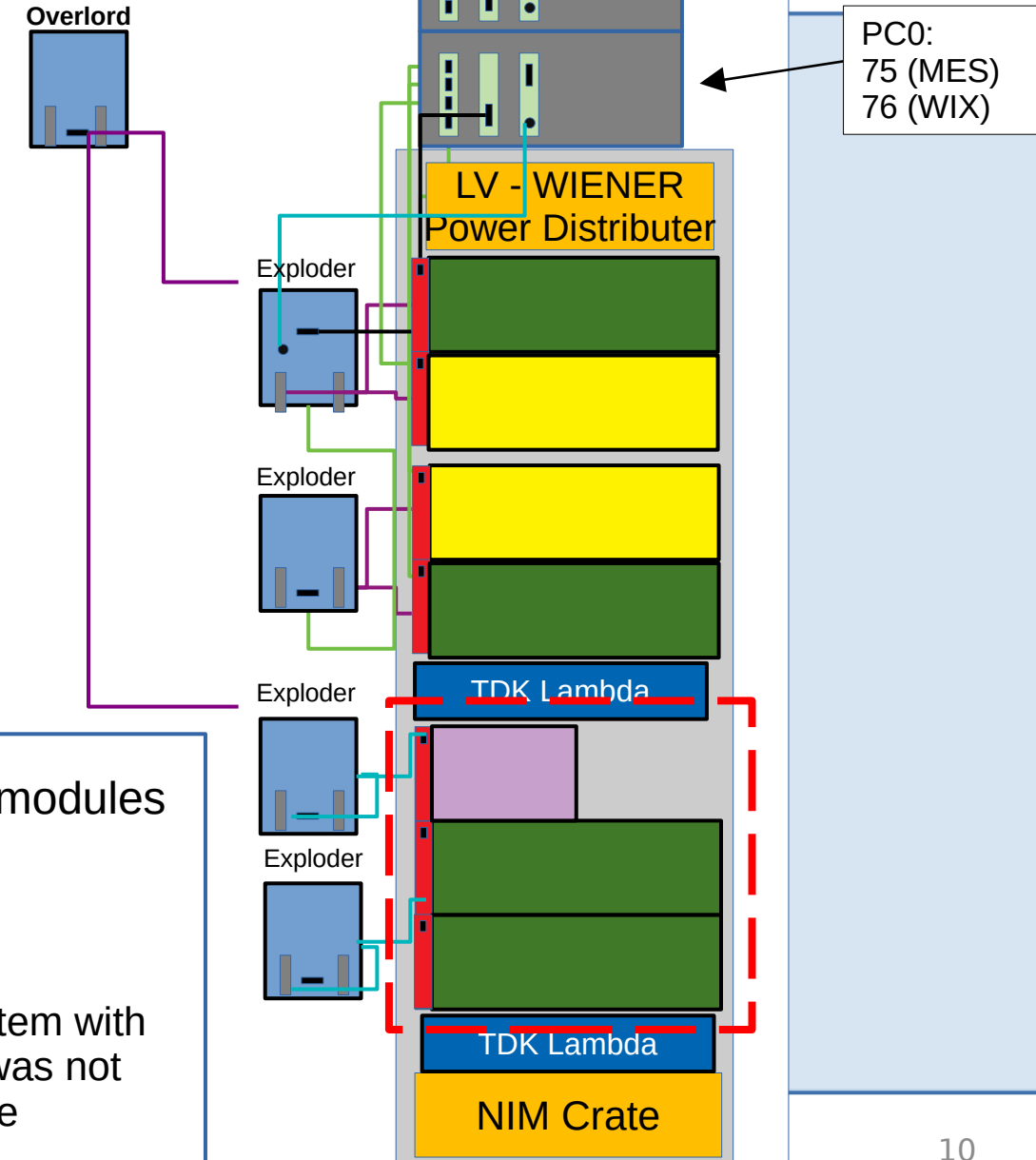
DAQ – Future Upgrades - “Default Config”

CEPA	iPhos	Ring 4	Ring 3	Ring 2	Ring 1
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300

More about CALIFA DAQ Status:
Presentation Philipp Klenze,
Wed, 11am

Tobias Jenegger

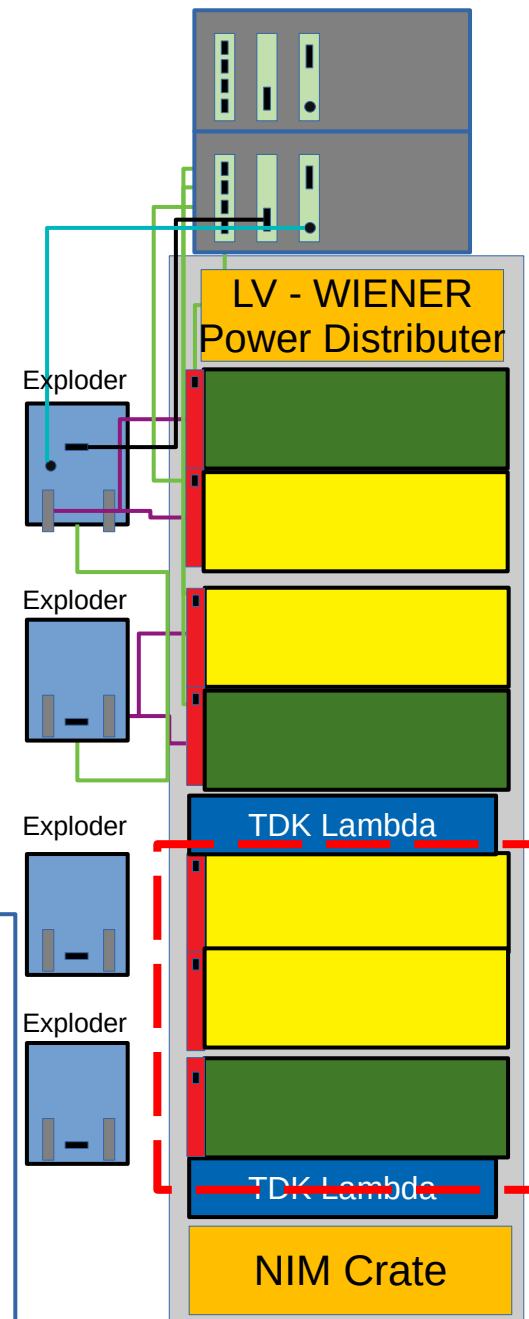
- ✗ 2+ Nim Power modules needed
- ✗ Running sub-system with all three crates was not possible, unstable



CEPA iPhos Ring 4 Ring 3 Ring 2 Ring 1

	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300

- ✗ 2+ Nim Power modules needed
- ✗ Load balancing
- ✗ Running sub-system with all three crates was not possible, unstable



+



Rack extension already available

Already available or ordered:

- 5 Exploders
- 16+ FEBEX cards
- NIM Power Crate

Still to buy:

- 2 x PEXOR cards
- 2 x PEXARIA cards
- 2 x TRIXOR cards
- 1 x DAQ Pc
- 2 x TDK Lambdas

TODO:
Costs?

For “Default Config.”:

- 48+ 32pin cables (BB) need to be produced
- 16+ LV cables need to be produced

Components
on stock or
easily
available



Workload: 2-3 weeks

For “**4 π Config.**”:

- 16+ 32pin cables (BB) need to be produced
- 16+ LV cables need to be produced
- 32+ 64pin DR SCSI cables for Ring 4



Workload: 1-2 weeks

No ~3.5 m SCSI cables available on the market !

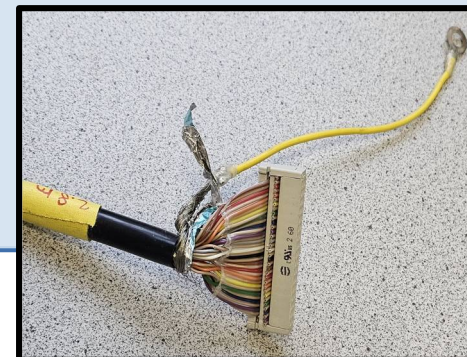
SCSI cables



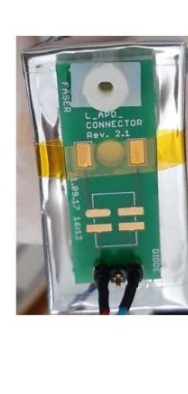
LV cables



32 pin cables



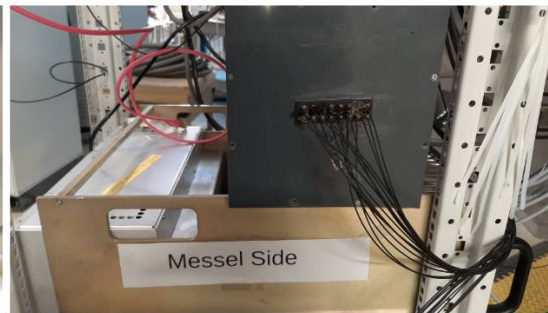
PCB-Boards with a mount for the fibre are installed/available



LED-system is connected to Messel side,
16 fibres are connected



(a) The fibres connected to the adapter, which was glued to the box



(b) The gain monitoring system connected on the Messel beam-side of CALIFA

Further Proceedings?

- Info about FAB, FEBEX, PAs, Exploders on google spreadsheets

Commercial, lifetime, availability

- Info califa-cabling-slowcontrol

Documentation in Elog-entries, difficult to keep track and search for

- More (or less structured) info on our wiki:
<https://wiki.r3b-nustar.de/detectors/califa/overview>

Good as overview page, not suitable to store expert-documentation



Google Sheets



Where to store documentation?

Cloud Storage for sharing and synchronising



How is documentation done by other WGs ? Synergy effects..

Decision has to be taken:

“Default Config.”

CEPA	iPhos	Ring 4	Ring 3	Ring 2	Ring 1
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	SR 30/300	SR 30/300	SR 30/300	SR 30/300

Costs:

Workload cable
production:
2-3 weeks

“4π Config.”

CEPA	iPhos	Ring 4	Ring 3	Ring 2	Ring 1
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 48 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300
	DR 32 30/450	DR 30/300	SR 30/300	SR 30/300	SR 30/300

Costs:

+ 3k€ (SCSI cables)
+ 32k€ (FEBEX cards)
Workload cable
production:
1-2 weeks

- Inner cables (11k€) - production ?
- Provide backup-electronics (20k€)
- Proceeding on LED System
- **Documentation**

BACKUP

Connectors

Parts needed for one connector:						
	Quantity	Number	Supplier	~Price		
Sub-D-Connector	1	D-SUB ST 25 IPS W+P 153PF-008-	Reichelt	11.8		
Buchsenleiste	8	2	Reichelt	1.56		
CALIFA_PIGTAIL2SUBD	1	AN-1621452	Multi-cb	1.31		
T-Sensor(Sensor+Cable)	1					
Buchse T-Sensor	1					
				25.59		
Necessary connectors:						
	R6	R5	R4	R3	R2	R1
W	4	16	16	16	16	16
M	4	16	16	16	16	16
	8	32	32	32	32	32
					Total	176
					already in	77
					ready to go	12
						87
Parts needed :						
		missing	existing parts	order:	costs	
Sub-D-Connector		87	53	34	401.2	
Buchsenleiste		696	4	692	1079.52	
CALIFA_PIGTAIL2SUBD		87	20	67	87.77	
T-Sensor(Sensor+Cable)		87	118	-31	0	
Buchse T-Sensor		87	0	87	0	
					1568.49	

Kind contribution by Anna-Lena Hartig

Kind contribution by Anna-Lena Hartig

Cable

Cable							
Parts needed for one cable pair:							
	Quantity	Number	Supplier	~Price			
CALIFA_Pigtail	1	AN-1621452	Multi-cb	0.21			
Steckerleiste	1	MPE 087-2-008 0.21	Reichelt	0.21			
Coax cable 40cm	2	AN-1621452	lemo	2.42			
Fiber connector	2	0388015800880	Mous	0.25			
APD_Connector left	1	AN-16148	Multi-cb	0.5			
APD_Connector right	1	AN-16148	Multi-cb	0.5			
Leiterplattenbuchse	4	8579-0-15-15-11-27-10-0					
				6.76			
Necessary cables:							
	R6	R5	R4	R3	R2	R1	
W	56	256	256	256	256	208	
M	56	256	256	256	256	208	spares
	112	512	512	512	512	416	48
					Total	2624	
					already in	1104	
					ready to go in		
						1520	
					number of	760	
					3		
Parts needed :							
		missing	existing pa	order:	costs		
CALIFA_Pigtail		1520	457	1063	223.23		
Steckerleiste		1520	81	1439	302.19		
Coax cable 40cm		3040	325	2715	6570.3		
Fiber connector		3040	400	2640	660		
APD_Connector left		760	0	760	380		
APD_Connector right		760	0	760	380		
Leiterplattenbuchse		6080		6080	730		
					9245.72		
Kind contribution by Anna-Lena Hartig							

Kind contribution by Anna-Lena Hartig