# CALIFA Electronics & DAQ

**Tobias Jenegger**

CALIFA WG meeting
18.10.2024

Inner Cabling

Preamplifier Status

DAQ status – Exp S091/118 in 2024

DAQ Upgrade

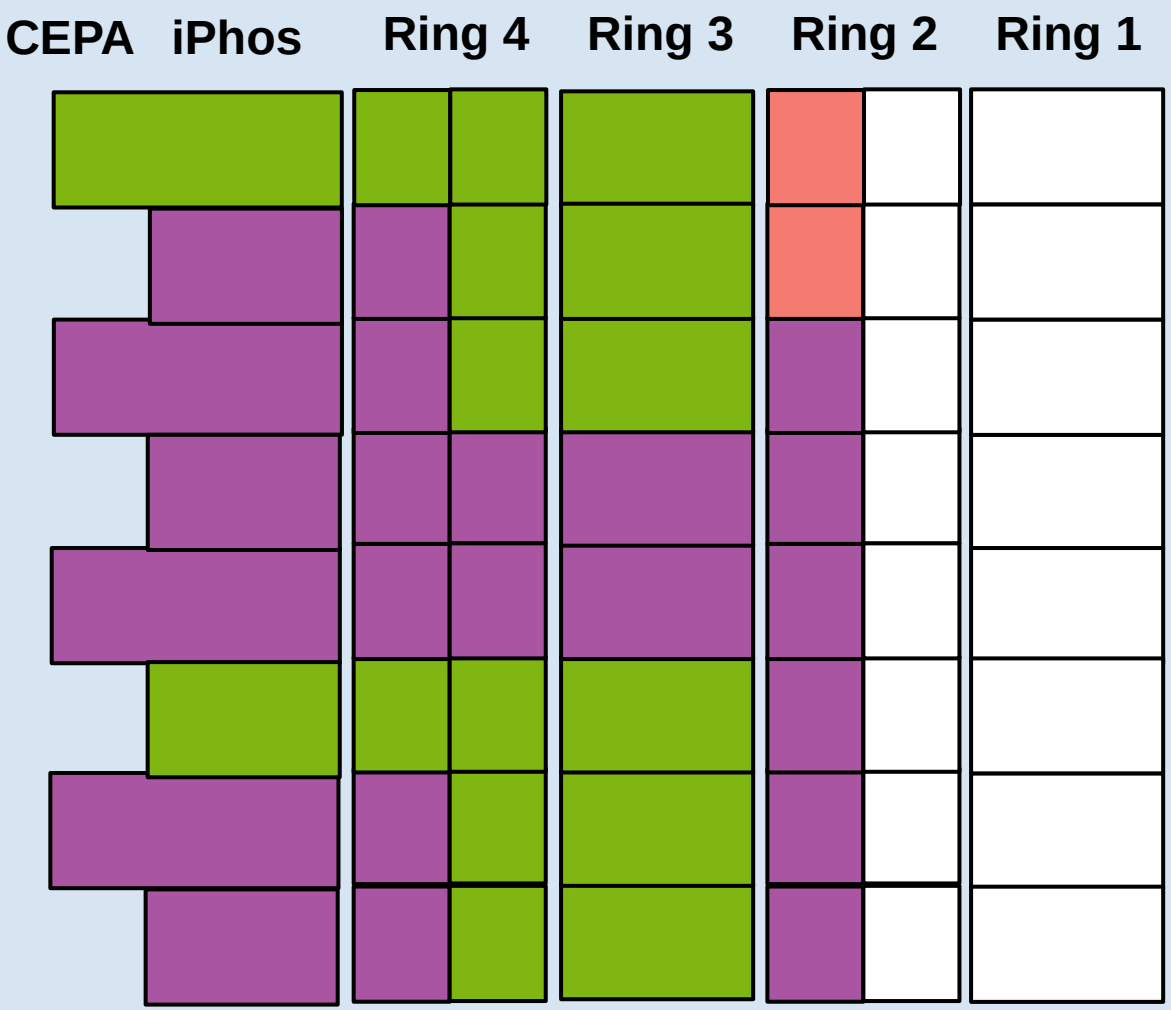
Documentation Status

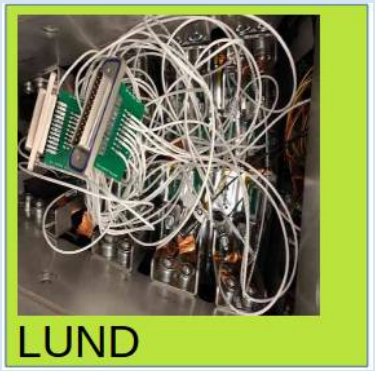
Supported by BMBF 05P15WOFNA and 05P19WOFN1.

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

# Inner Cabling – Wixhausen Half

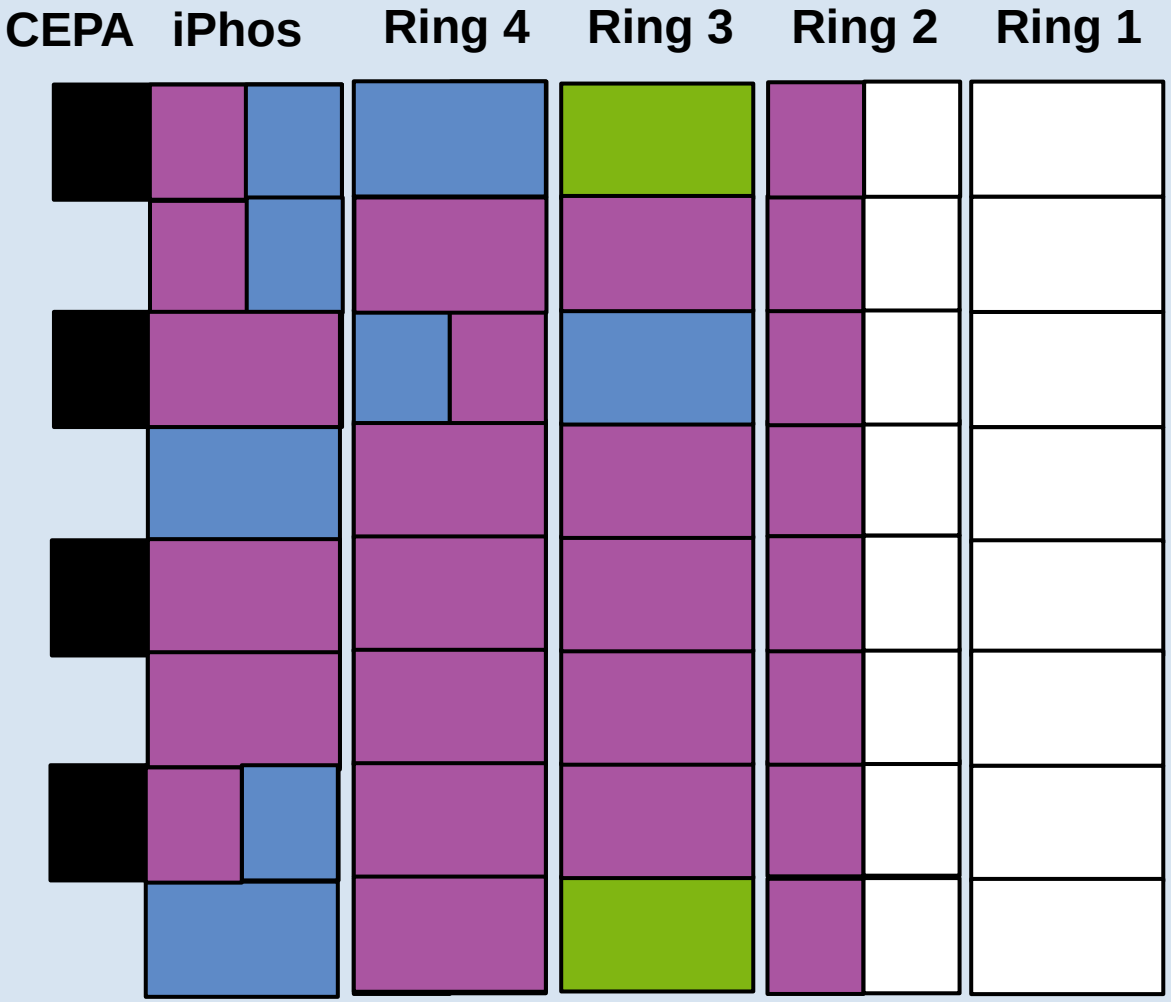


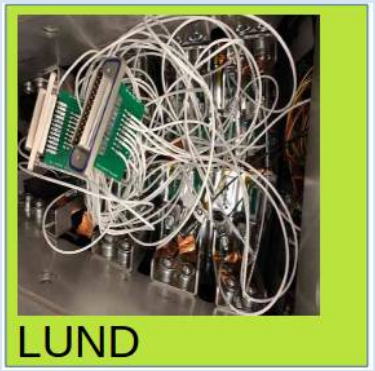





Prototype

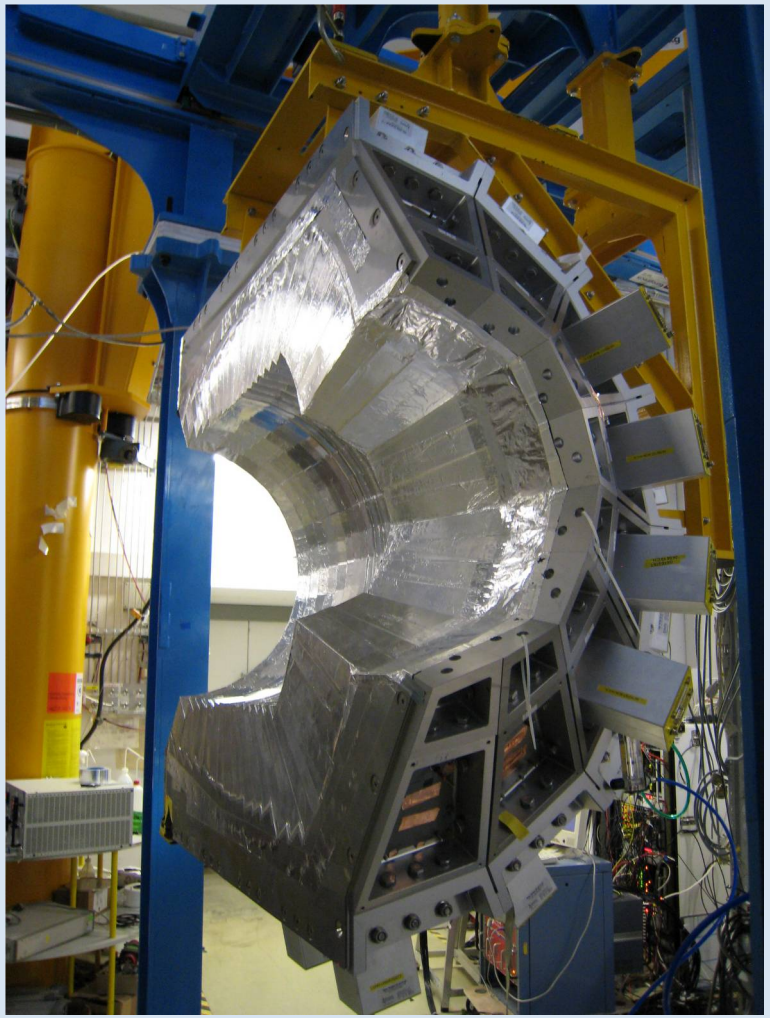
# Inner Cabling – Messel Half





TuLu

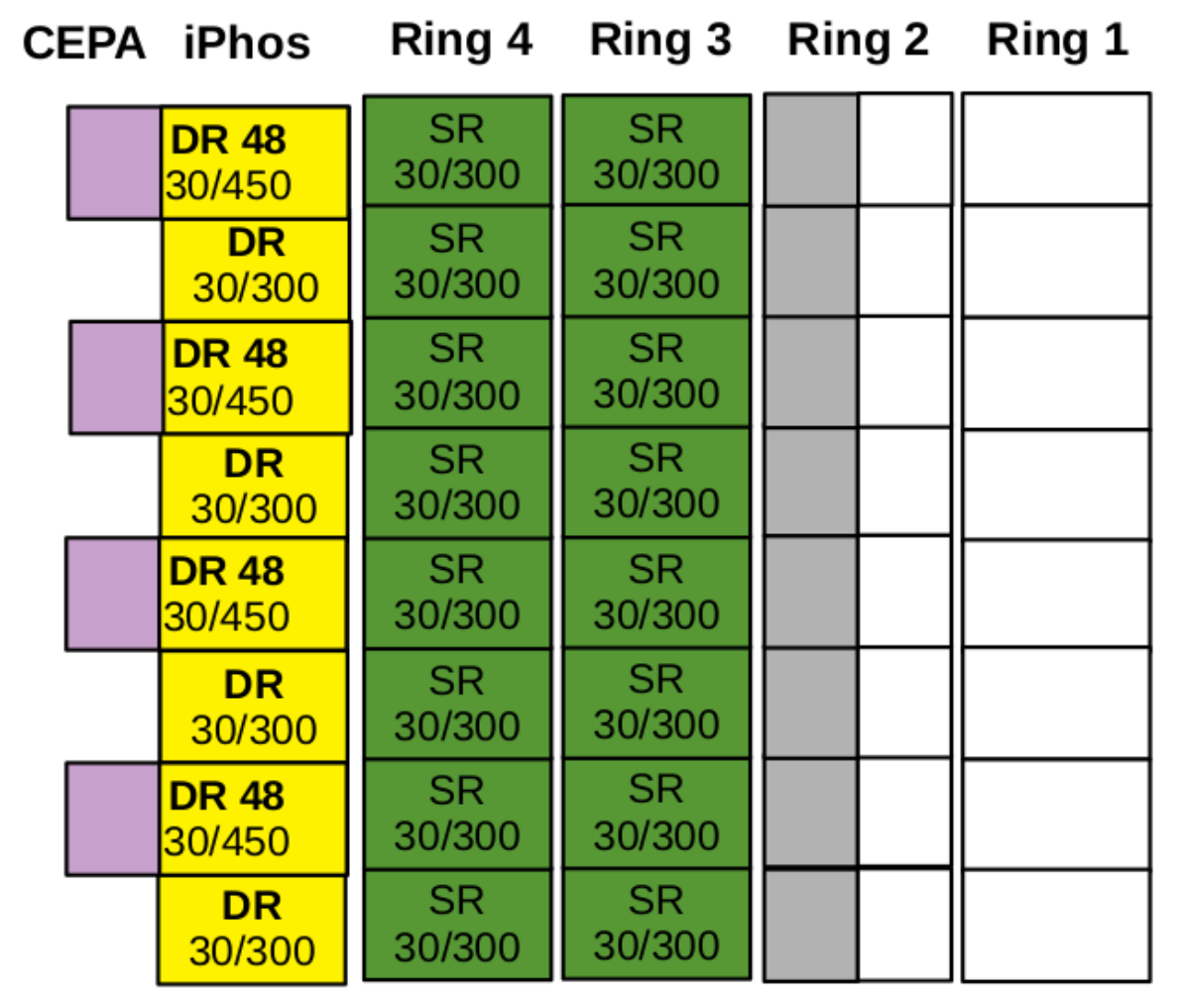


# Inner Cabling – Upgrade Backward Barrel

TODO:
- material needed
- how much workload?
- cost

Phone call with Anna Lena
on Wed.

# CALIFA Preamplifier Status for Exp. S091/118 - 2024




→ **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)

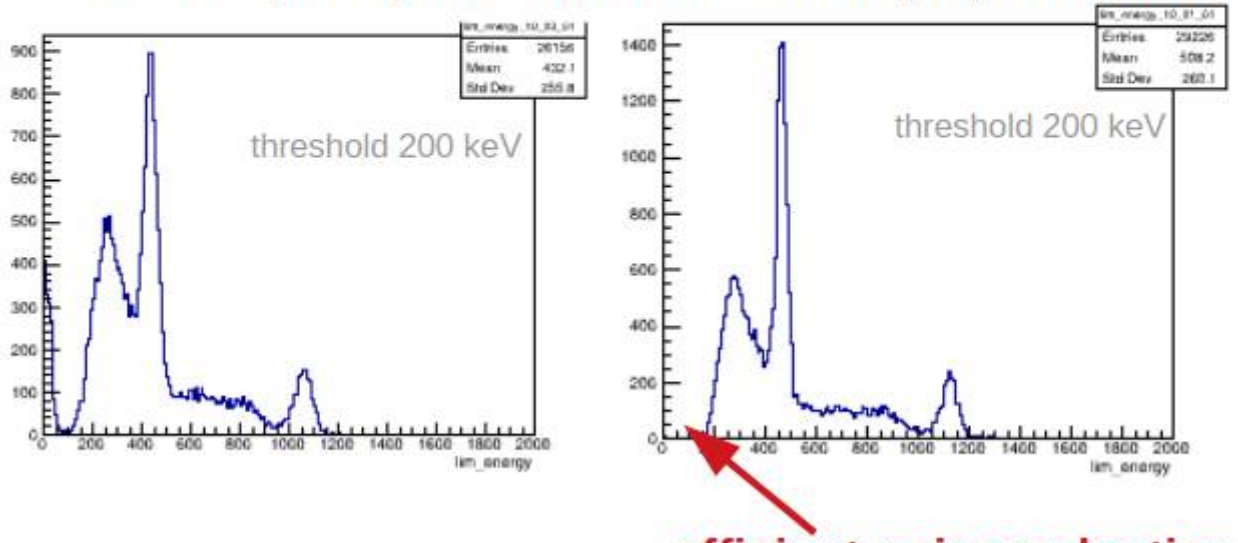
**Modifications:**
12x DR → to low noise input and 3/45pC range
32x SR → lower noise input stage

# Optimization of S/N in Preamplifiers

## Noise Optimization by Mesytec:

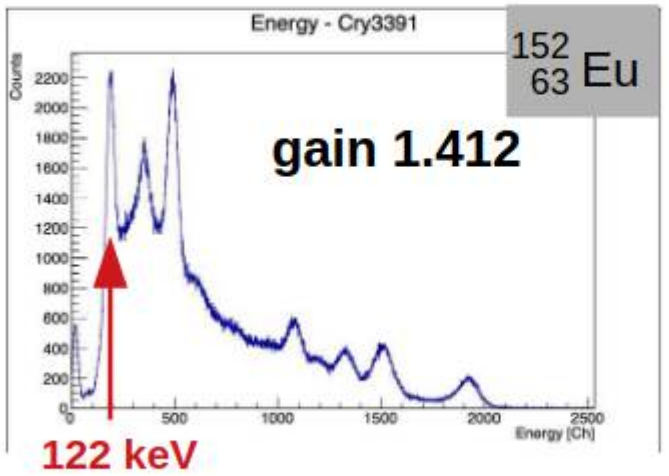
more current in input FET improve S/N ratio

reference preamplifier **low noise DR 3/45pC preamplifier**




## Gain Optimization:

Stefan Eder's talk in R$^3$B Week in Budapest




larger APD gain – constant electronic noise

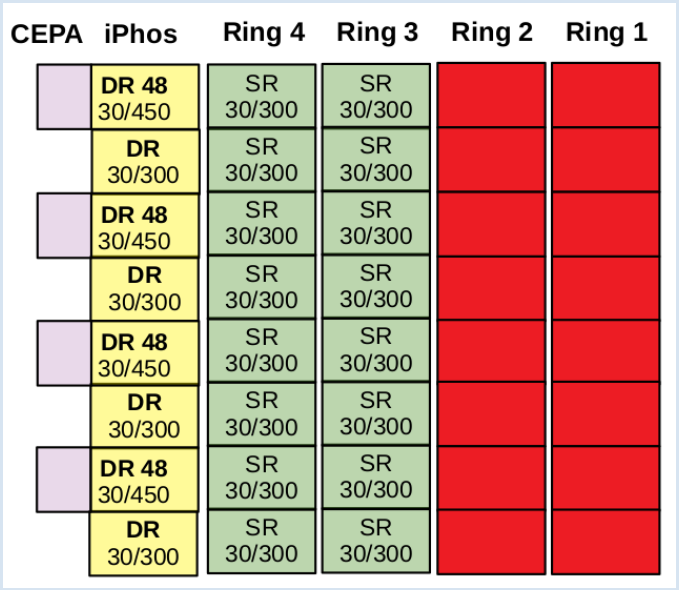
**gain ~ S/N with N= const**

**3/45pC DR Preamplifiers:**

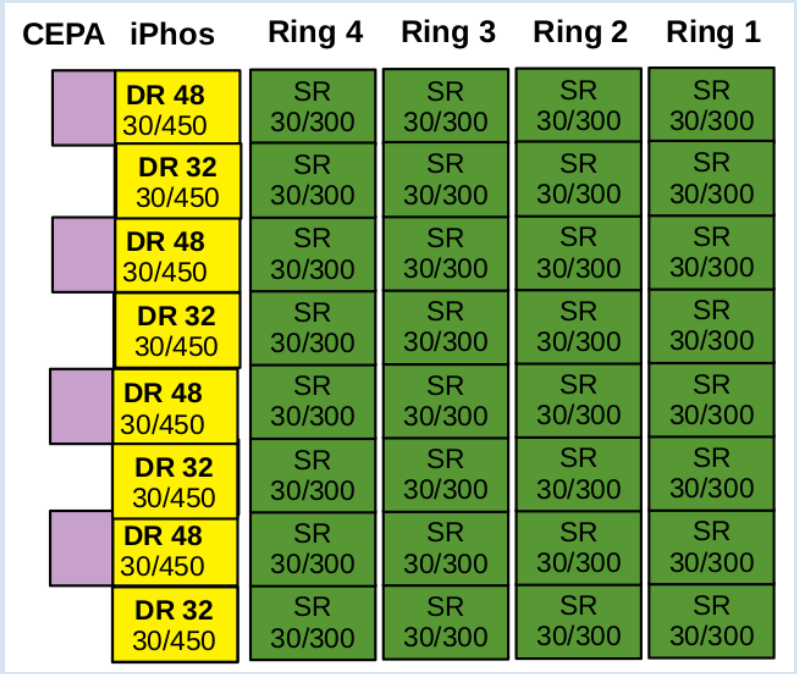
→ allow to increase gain → lower thresholds

→ 45pC covers full range up to 300 MeV

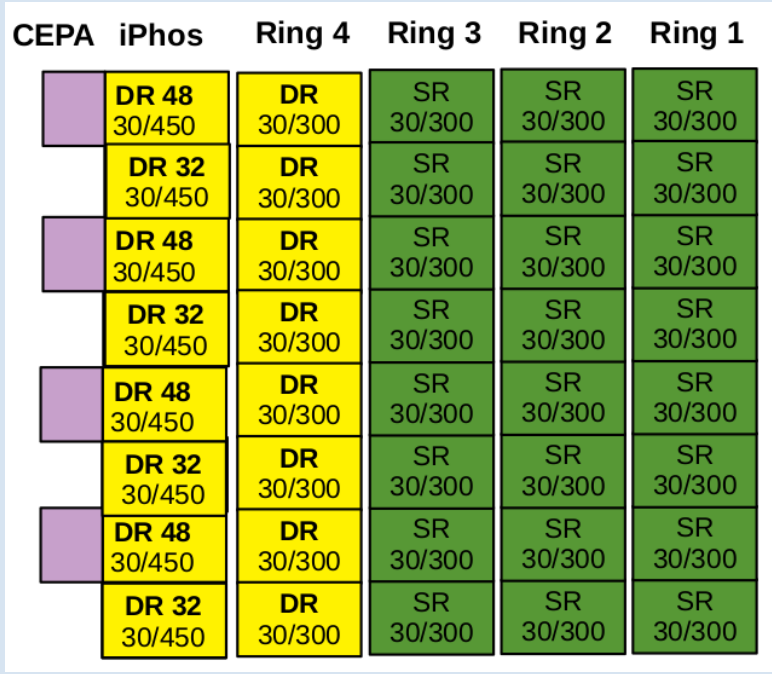
# What we still need:




## “Default Config.”




## “4π Config.”




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

# Workload & Costs

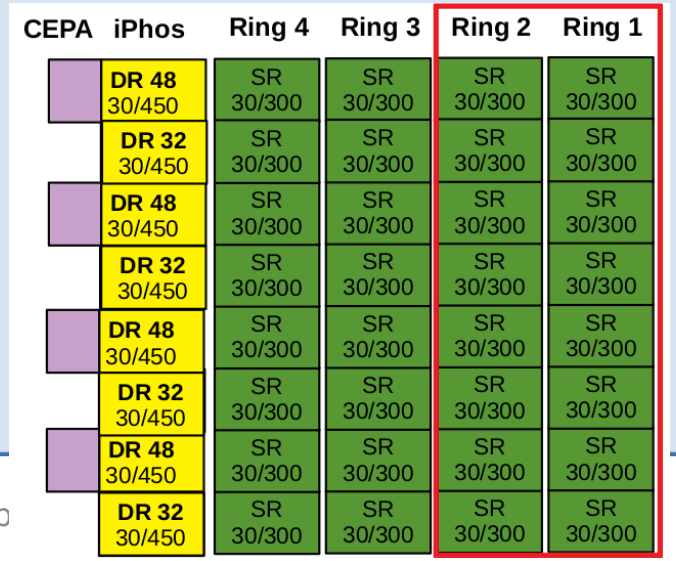
## “Default Config.”

**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:**

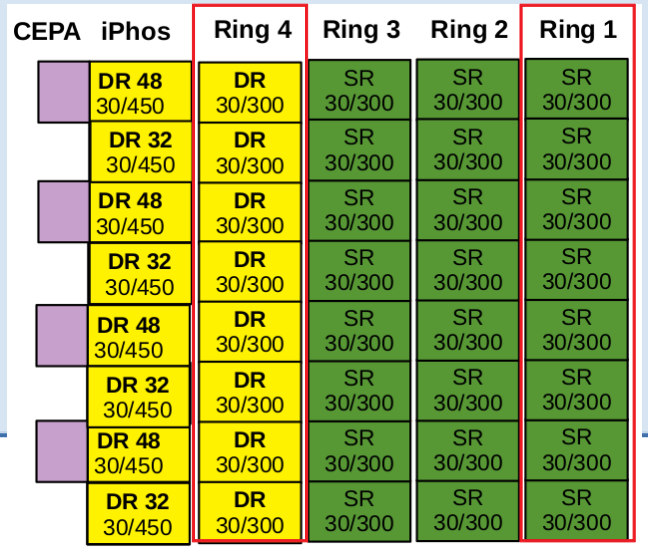
16 x 3/30pC **DR** PA for Ring4
16 x 3/30pC **SR** PA for Ring1

**To Modify:**

| | |
|---|---|
| 12x DR → to low noise input and 3/45pC range | **??** |
| 32x SR → low noise input stage | **??** |
| | **??** |

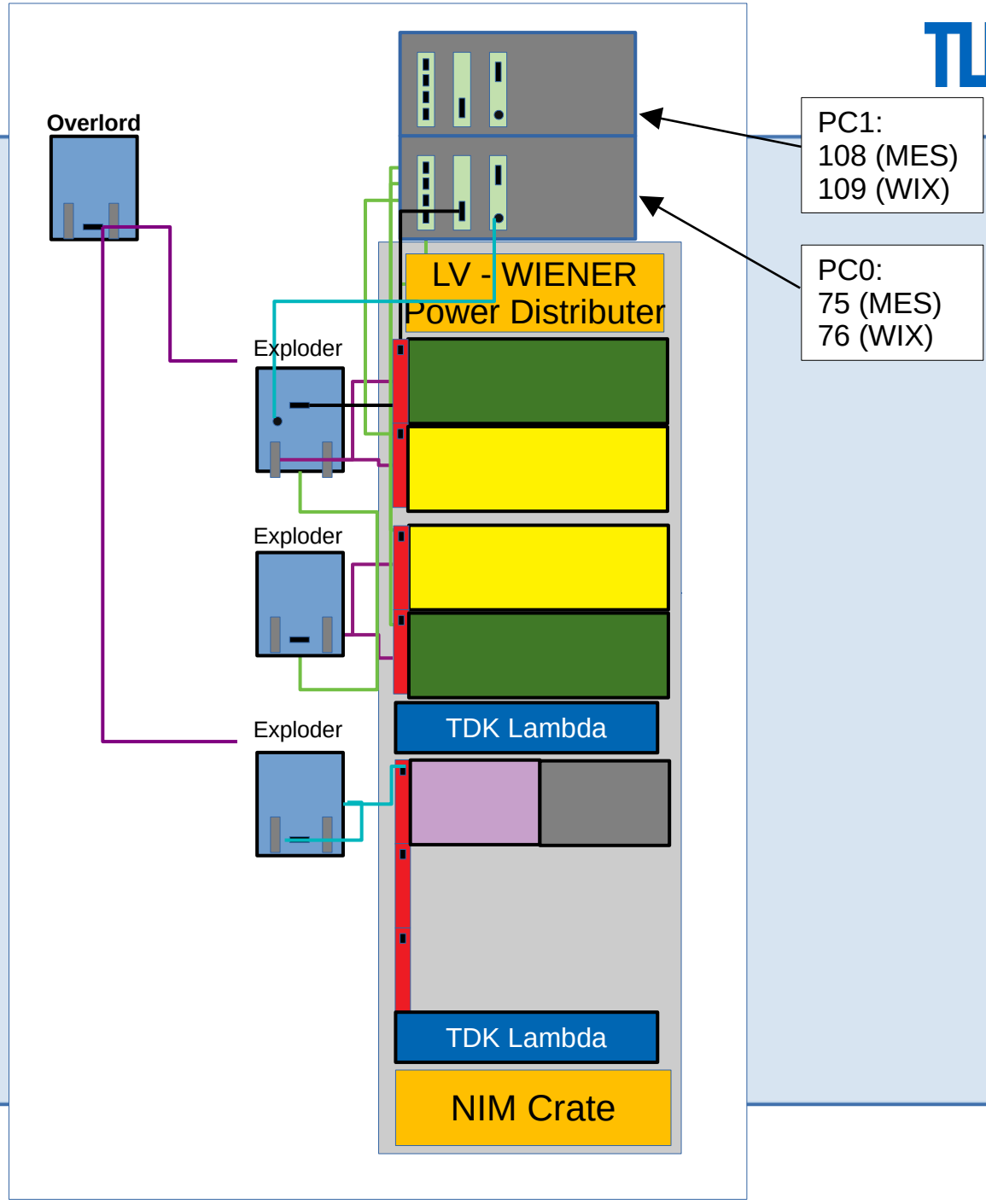
**Note:**

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



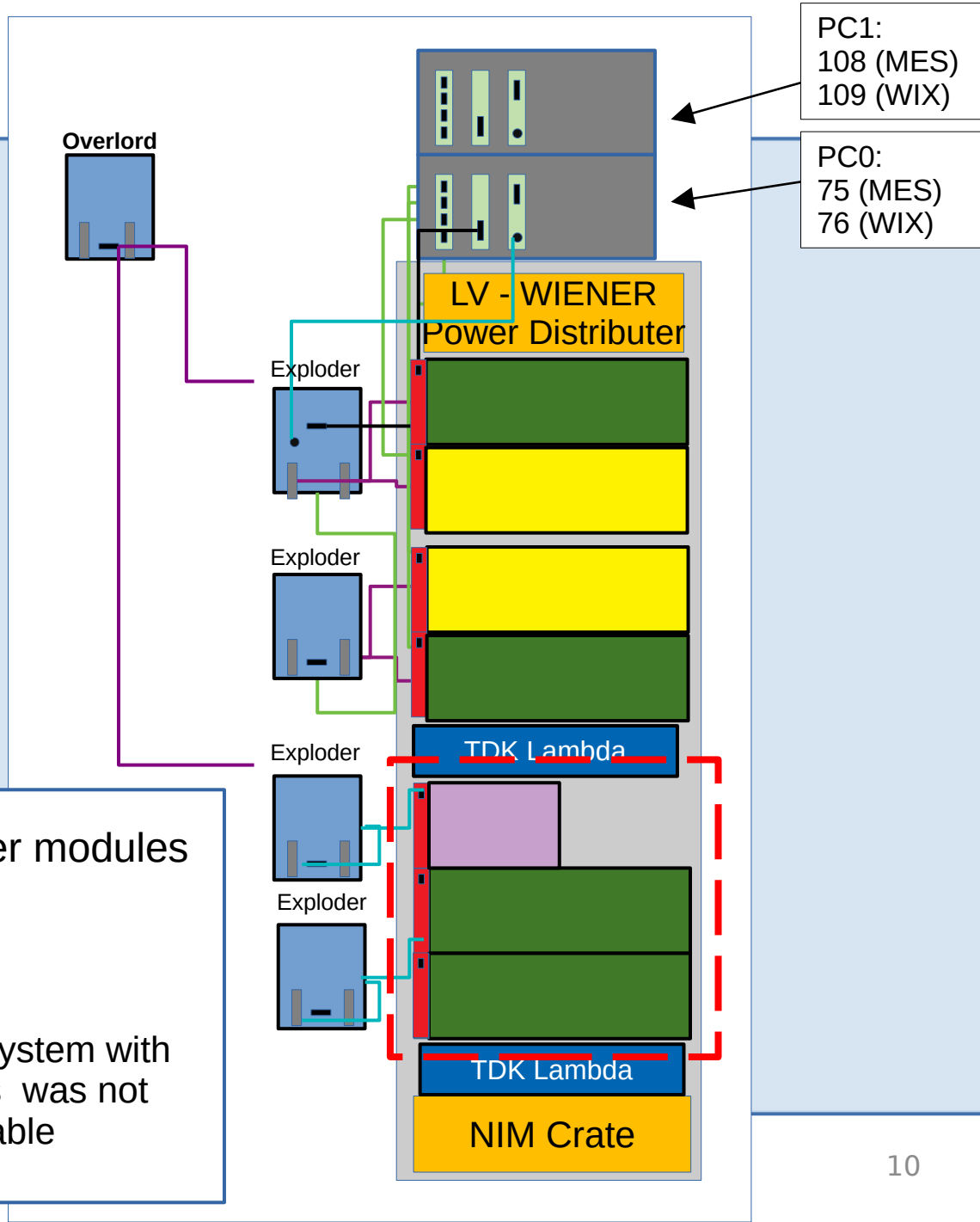
# DAQ Status for Exp. S091/118 - 2024

| 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 | | |



# 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 30/3 |



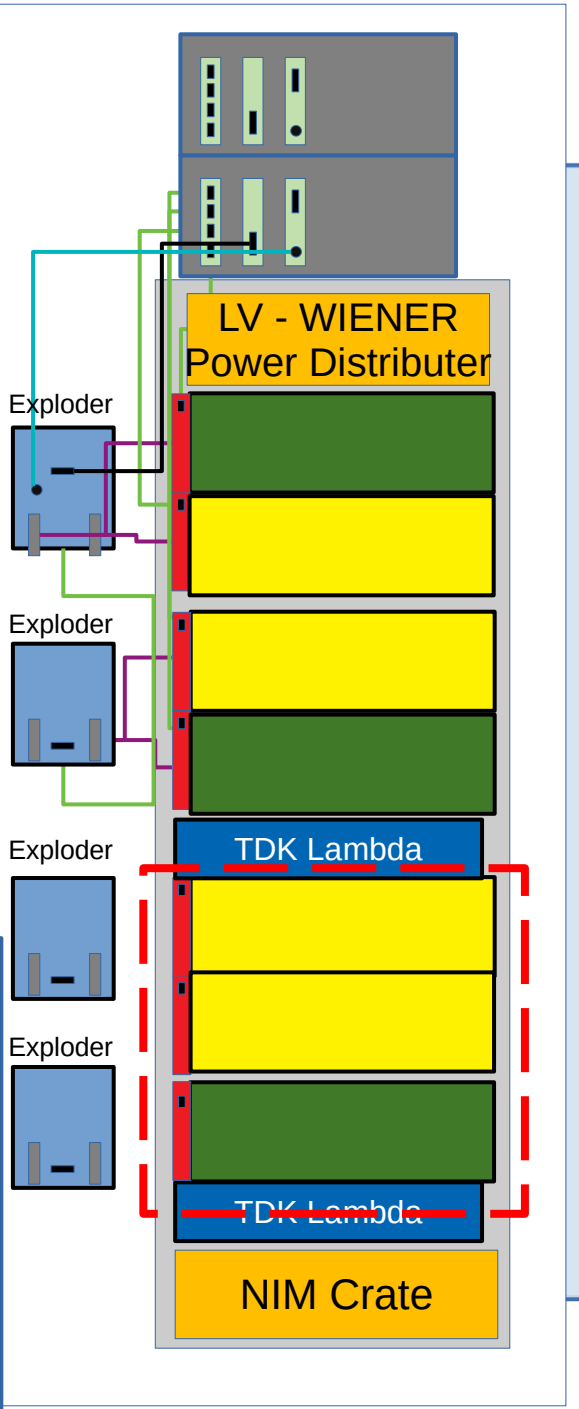

- ✘ 2+ Nim Power modules needed
- ✘ Running sub-system with all three crates was not possible, unstable

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

# DAQ – Future Upgrades - 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 | | |

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

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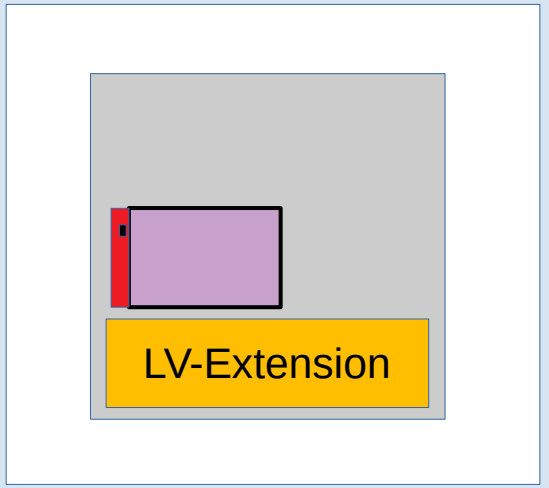



✔ Rack extension already available

# Backup Electronics needed:

**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?

# Outer Cabling

For **“Default Config.”:**

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

Components on stock or easily available

For **“4π 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: 2-3 weeks**

**Workload: 1-2 weeks**

**No ~3.5 m SCSI cables available on the market !**

SCSI cables

LV cables

32 pin cables

# Documentation Status

- Info about FAB,FEBEX,PAs, Exploders on google spreadsheet:

https://docs.google.com/spreadsheets/d/1TqvlTK1xVxb5rhWSQlSCEBDzf2x7GS8RSkM1WwQoNJM/edit?hl=de&pli=1&gid=1790449867#gid=1790449867

- Info califa-cabling-slowcontrol:

https://elog.gsi.de/land/CALIFA/375

- More (more or less structured) info on our wiki:

https://wiki.r3b-nustar.de/detectors/califa/overview



**General Questions:**

- Do we have an overview what we have documented and what not?
- Where and how should the documentations be stored?
  - → lifetime ( how long will google spreadsheets be available (for free) ?)
  - → accessibility (read and write permissions?)

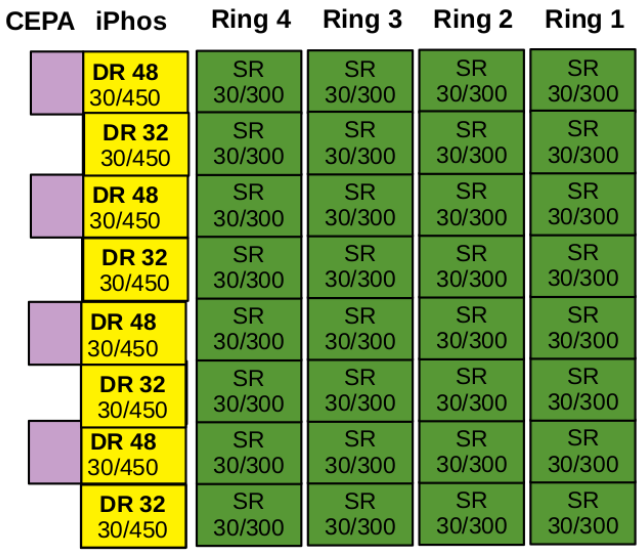
Maybe open question for R3BWeek-Paris,

since all detector groups should be affected

# Summary & To Dos

## Decision has to be taken:

### “Default Config.”




Costs:

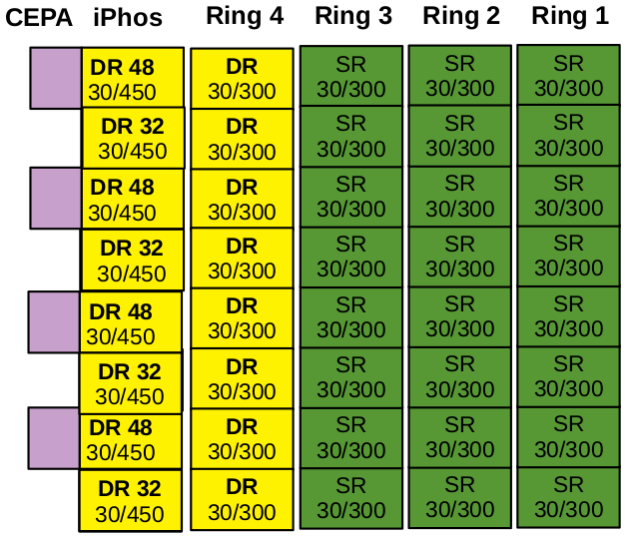
Workload cable production:

2-3 weeks

→ provide backup-electronics

→ **Documentation**

### “4π Config.”




Costs:

Workload cable production:

1-2 weeks

Todo:
Add something about light pulser system