Services (PS, Cables, PPs, Dockboxes)

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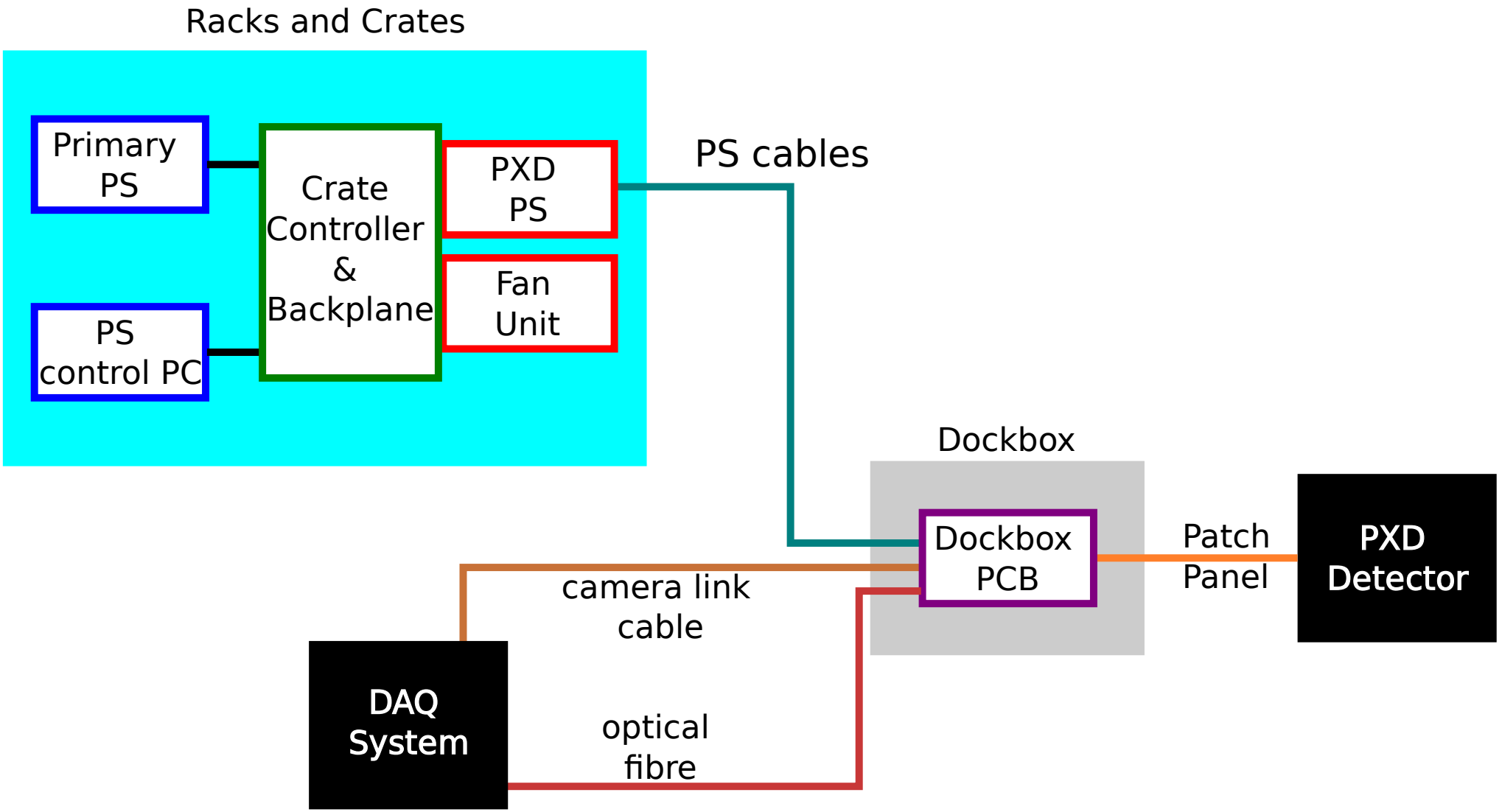
BPAC
16.10.2017

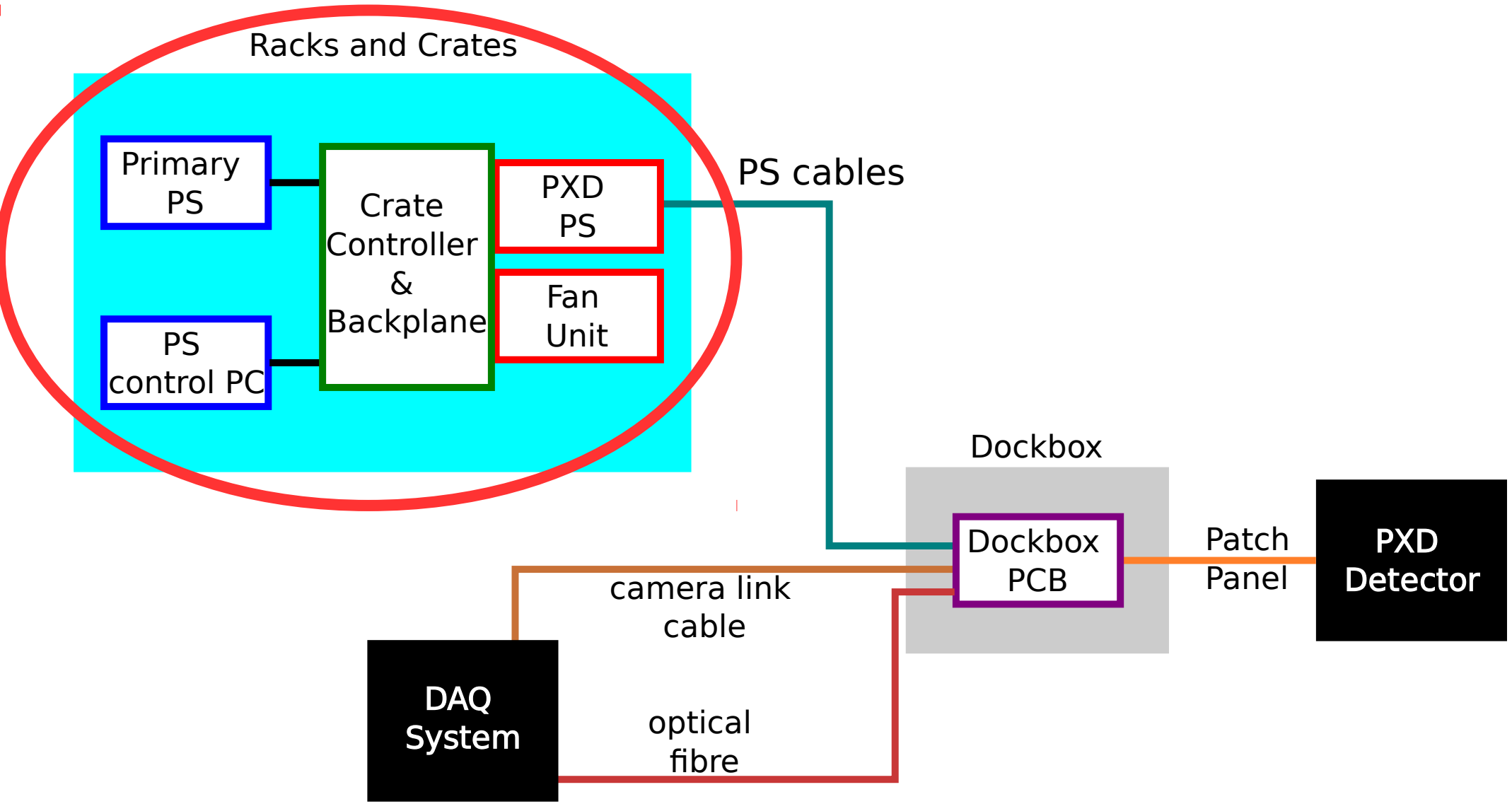
LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

DESY

Services


Racks and Crates
Primary PS
PS control PC
Crate Controller & Backplane
PXD PS
Fan Unit
PS cables
Dockbox
Dockbox PCB
Patch Panel
PXD Detector
camera link cable
optical fibre
DAQ System

Overview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Mechanics and Infrastructure

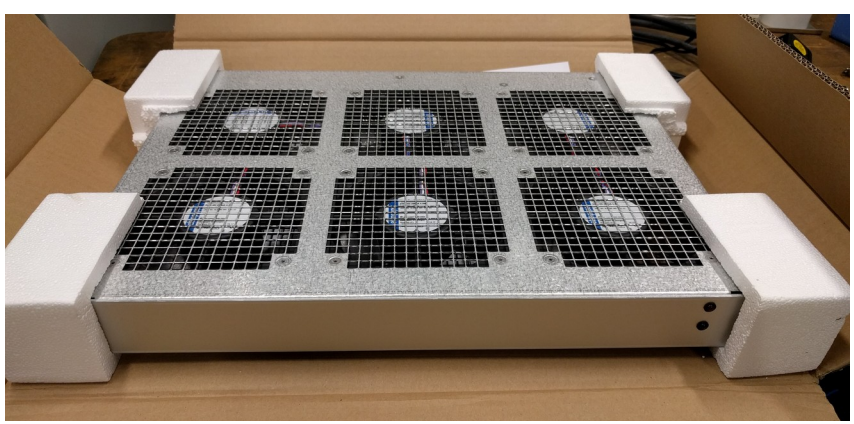
> Racks and Crates are at DESY

- Minor preparations for full detector ongoing

> Primary PS: TDK Lambda 1500 W

- Three bought (KEK, DESY, LMU) and one is ordered

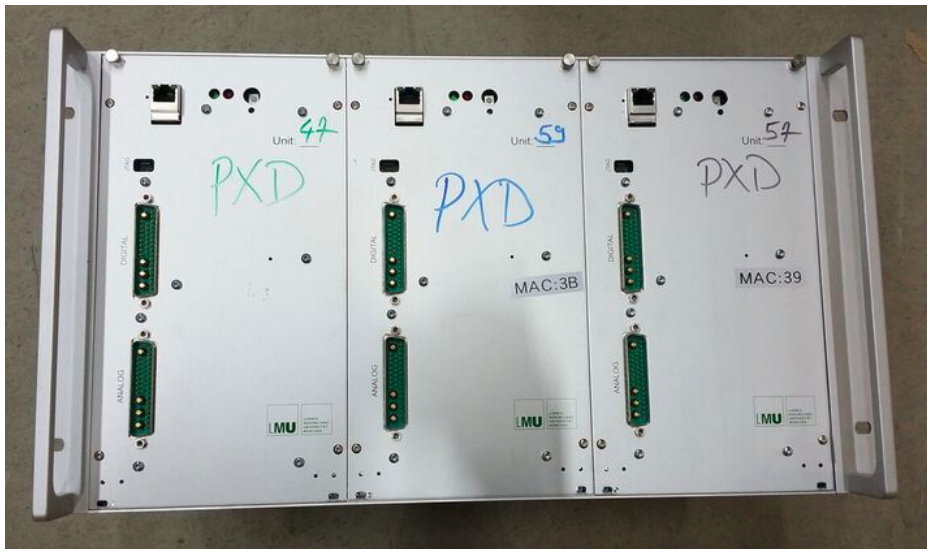
> Fan units are at Munich



Power Supply and Control

> Power supplies:

- Components for PXD available including the Over-Voltage-Protection
- After finishing ~18 units for KEK-PF focus is on the commissioning of the PXD units
- OVP system integration ongoing

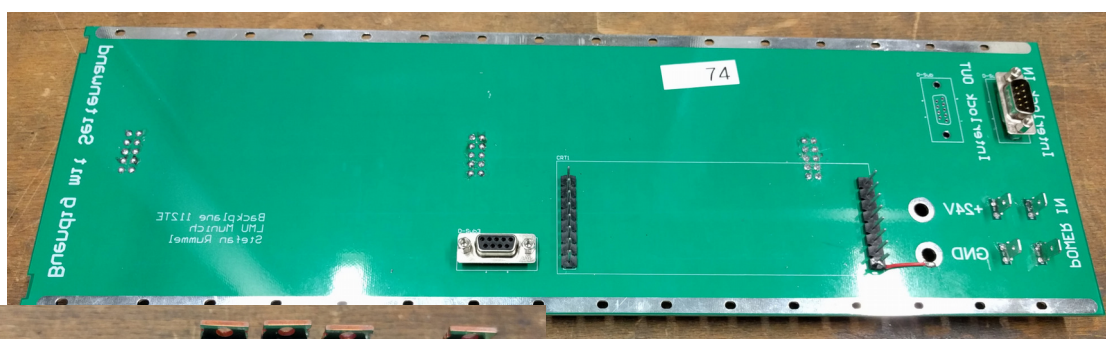


> PS control PC:

- Raspberry Pi
- Exchange with more robust computer system

> Backplane and Crate Controller:

- Already produced
- Mostly at DESY and 4 at KEK for phase 2



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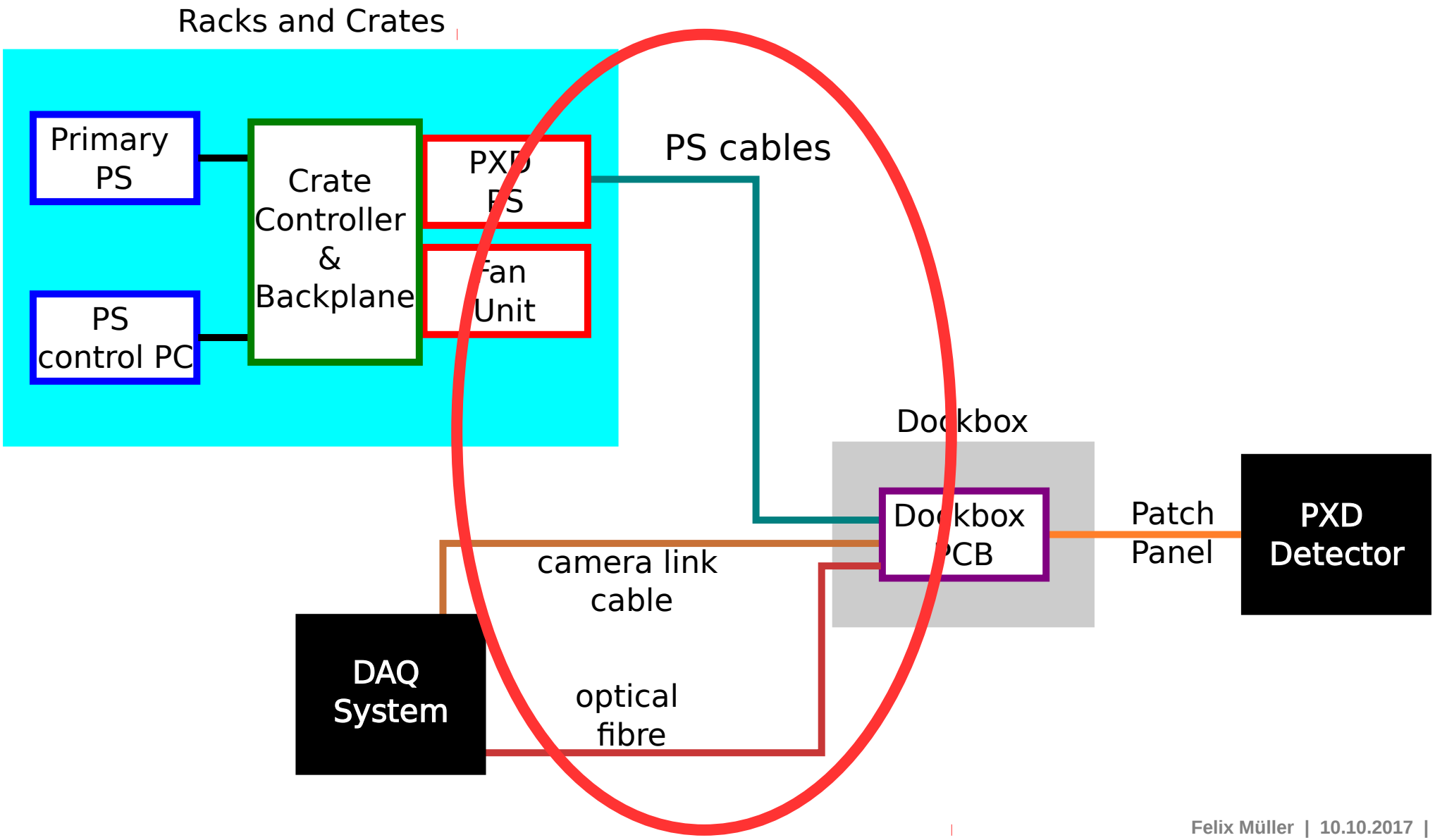
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Cables

> Power cables for commissioning at DESY:

- 40 x 14m power cables are at DESY
- 36 x 14m are available at LMU for testing
- 11 x 14m are in production, shipping expected within 2017

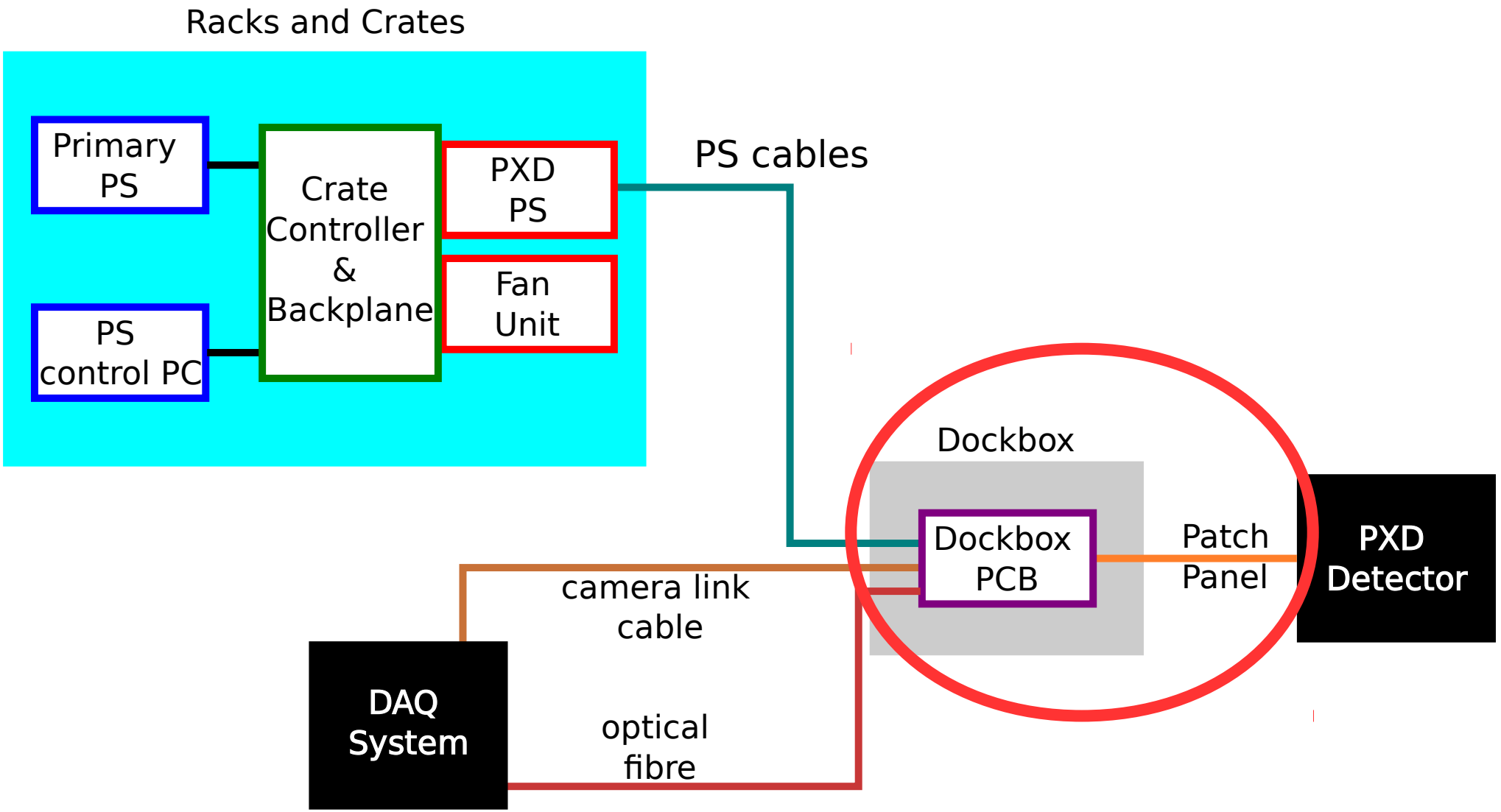
> Camera-link cables:

- First batch of 10 is available at DESY
- Delivery of 27 expected in week 45
- Delivery of 10 scheduled for week 47

> Optical data fibers:

- In stock at LMU

Overview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Dockbox and Patch Panel

> Dockbox PCBs:

- Latest design was used successfully at DESY
- All connectors and passives are in stock
- Without design changes lead time for ~45 PCBs 10-15 WD
- Production within 15-20 WD

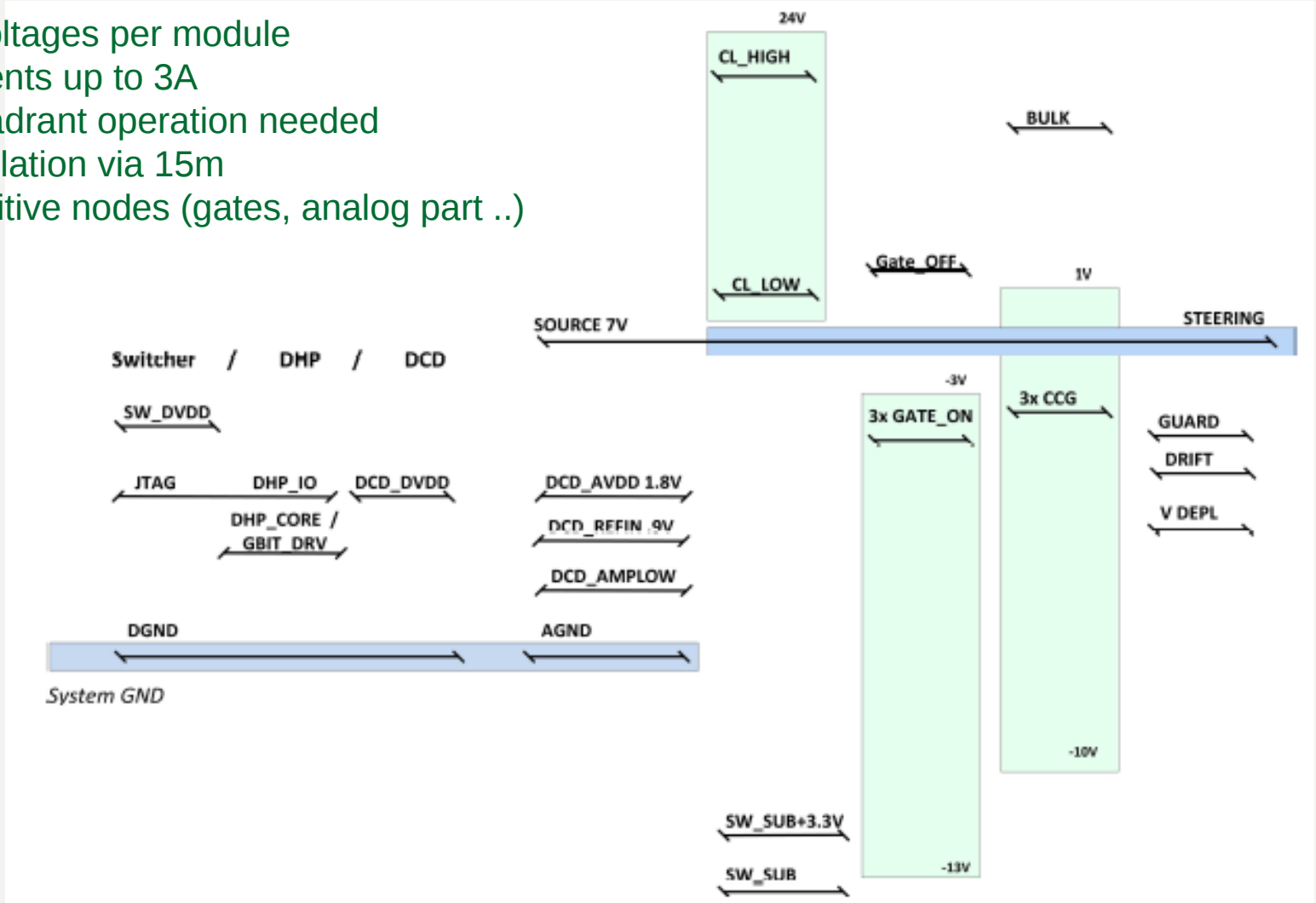
> Patch Panel:

- Latest design was successfully used at DESY
- All Glenair, Infiniband cables are in stock
- Design of mechanics available, lead time 10 WD
- Lead time PCB’s 10-15 WD
- Soldering will determine availability since it is time consuming

Backup

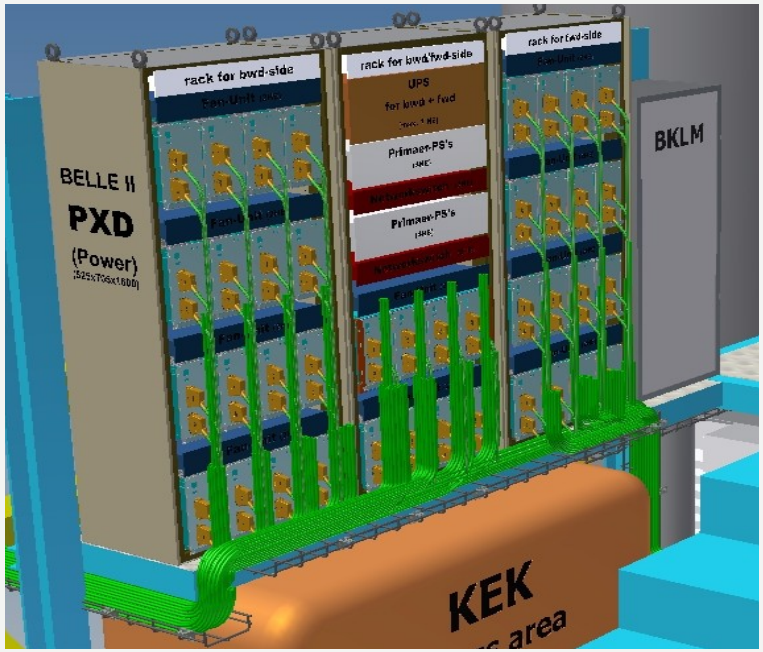
PXD Module – Voltages

- 23 voltages per module
- Currents up to 3A
- 4 quadrant operation needed
- Regulation via 15m
- Sensitive nodes (gates, analog part ..)



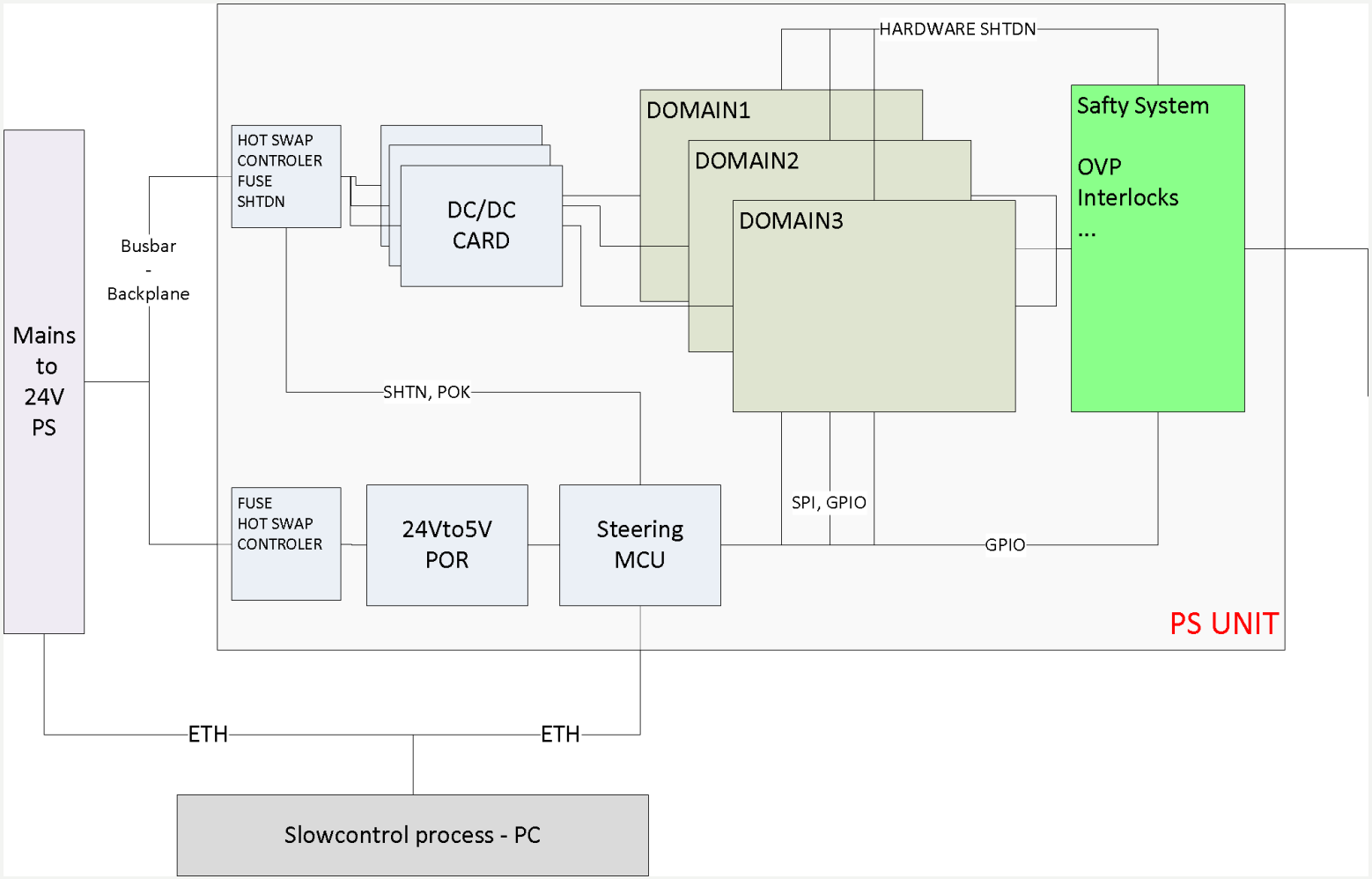
Power supply requirements

- Steering/Biasing voltages for the DEPFET
  - Fine tuning for optimization
  - Parameter changes due to irradiation
  - Precise hardware current limit
  - Four Quadrant operation
  - Low noise essential for SNR
- Supply voltages for the ASICs
  - Sub-micron chips sensitive to over voltage
  - Sink/source output needed
  - Need control on transient behavior of PS-system
- Several dependencies between voltages
  - Dedicated power up and down sequences
  - Additional functionality for protection needed

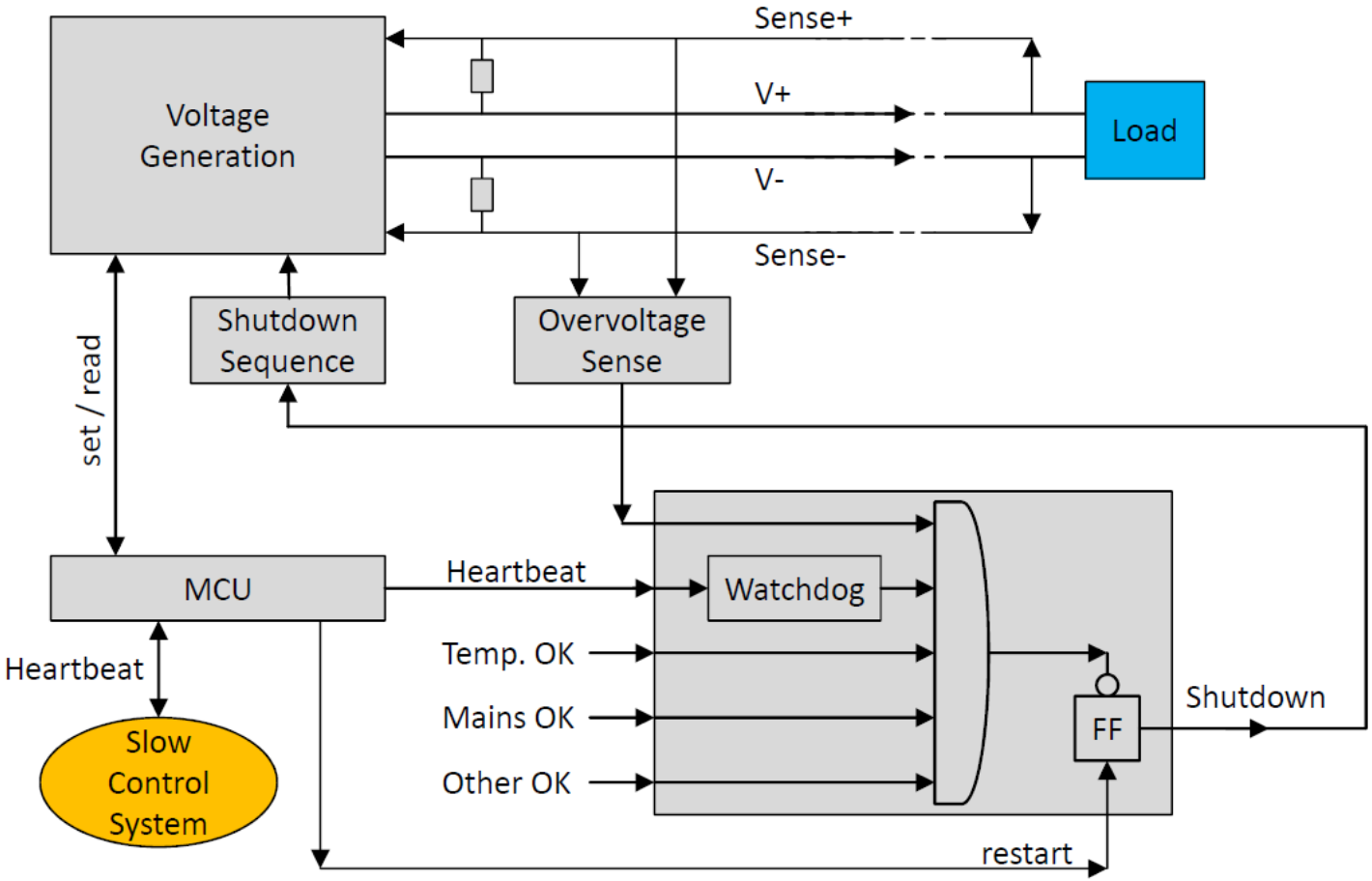


→ **Development of a dedicated low noise power supply system**
→ **Suppling more than 900 voltages to the PXD**

PXD PS implementation



PXD PS implementation – Interlock system



Internal Interlocks:

- Proper MCU operation
- Supply voltages for control system
- Overvoltage conditions via Cracow OVP-Board

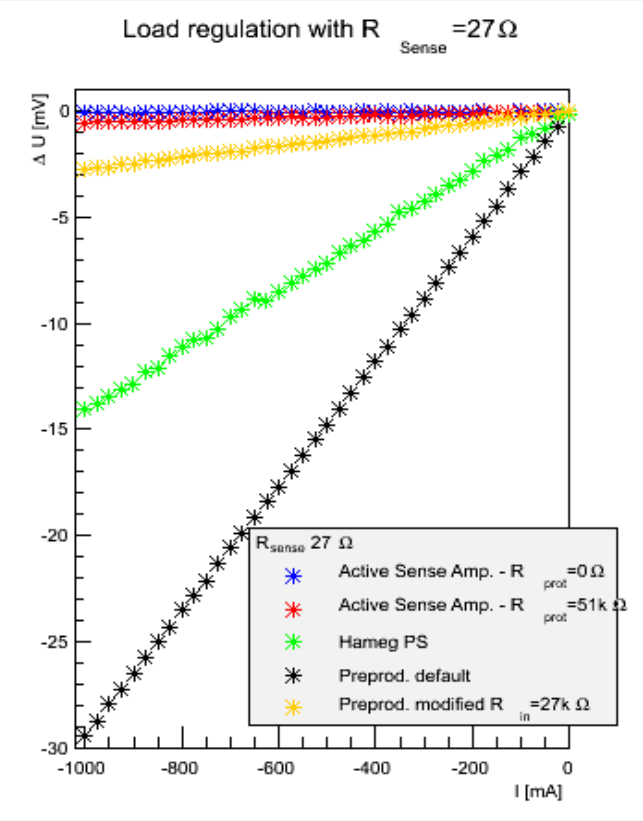
External Interlocks available:

- Cooling
- Slow control connection
- …

Power supply characterization

PS units and individual channels have been characterized with respect to:

- DC output impedance (load regulation)
  - optimization for high sense wire resistance
- EMI – see next slides
- Transient response



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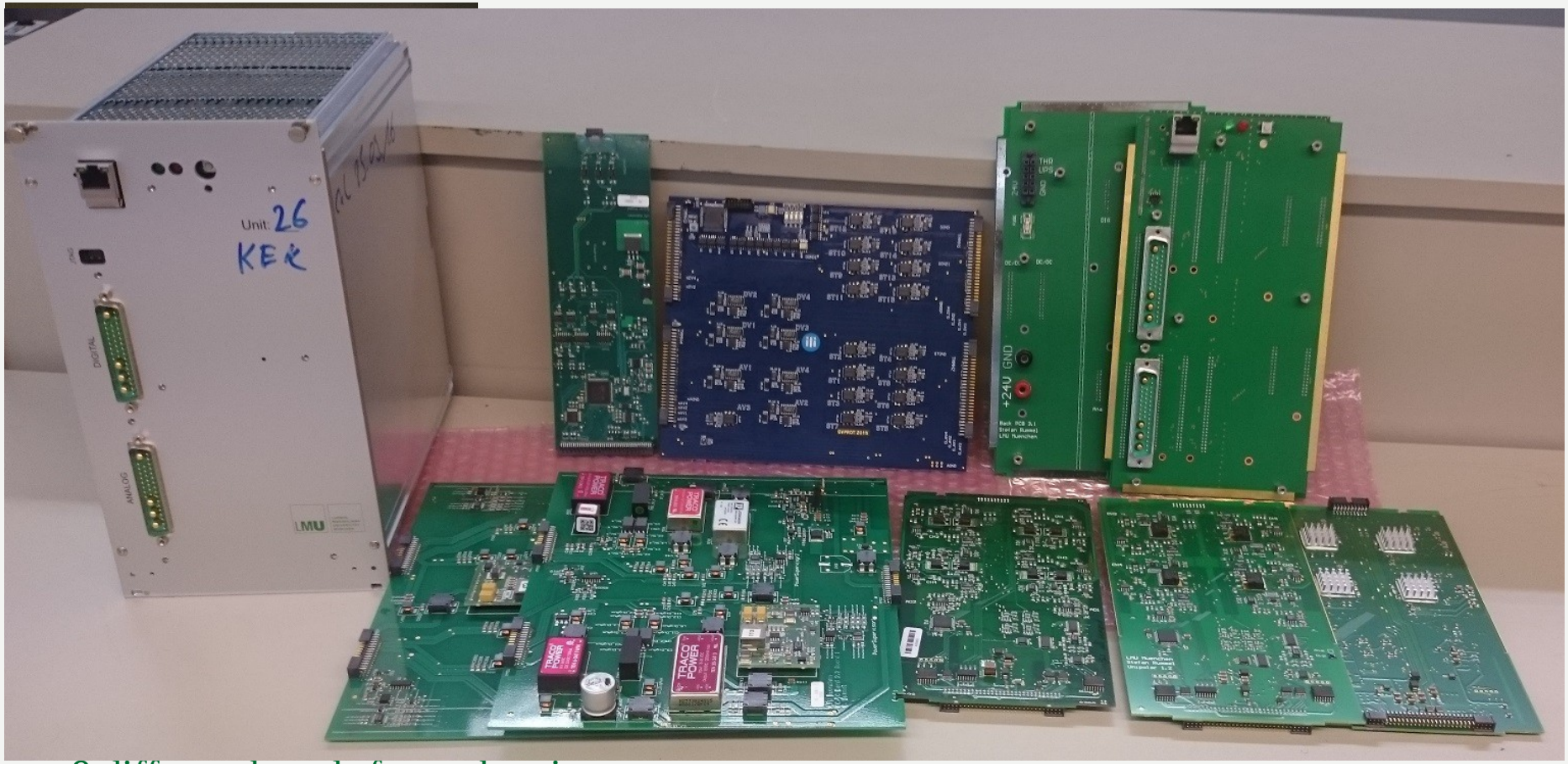


- 9 different boards for each unit
- OVP card developed in Cracow, rest LMU

Study of Electro-Magnetic-Interference (EMI)

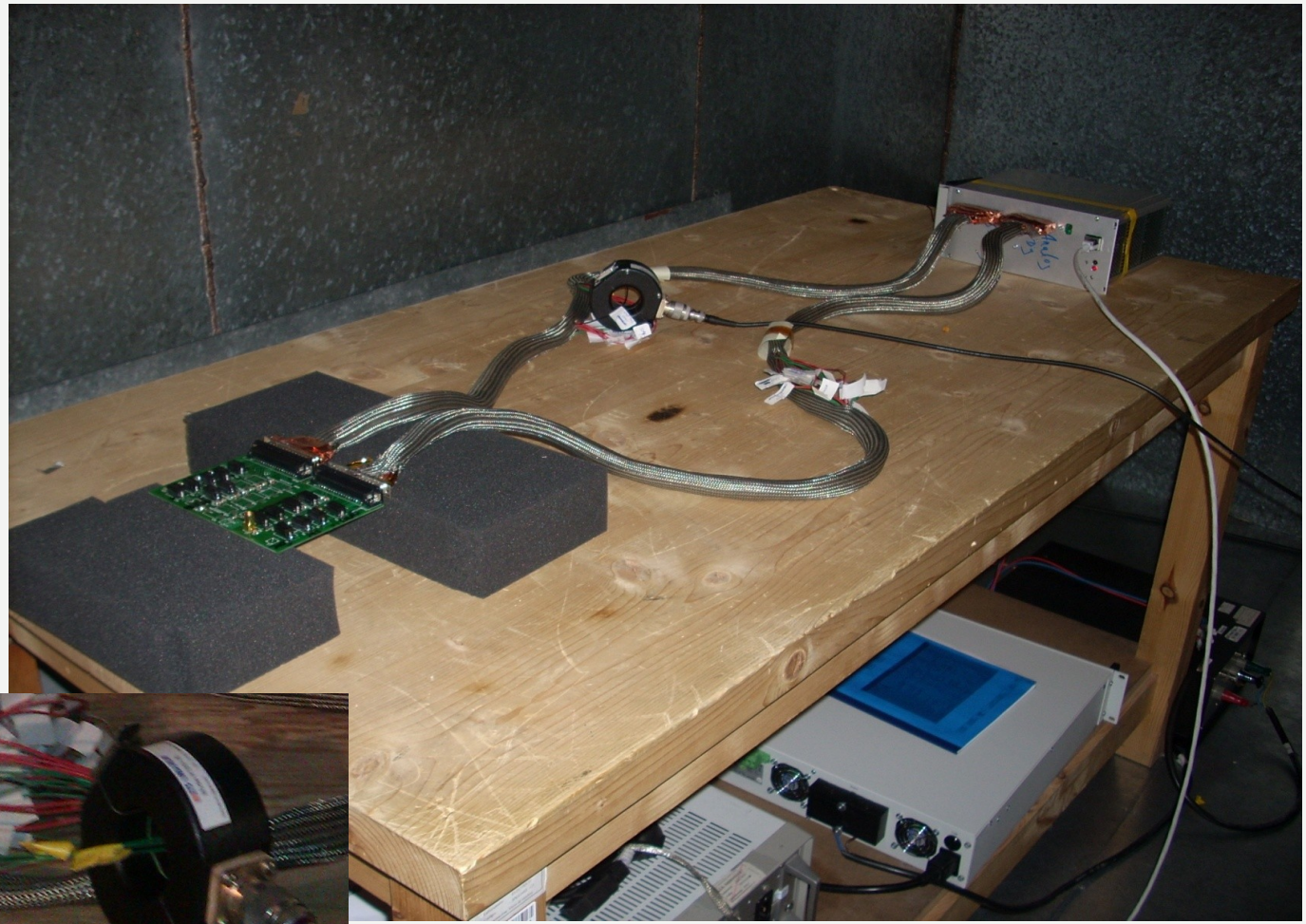
- Key to good SNR close to the laboratory environment is a throughout study of EMI:
  - Susceptibility of system towards radiation and conducted interference
  - Emissions from neighboring detectors
  - Emissions from power supply system

- Study of EMI related to PXD-SVD together with ITA Zaragoza
  - Optimizing grounding scheme
  - Noise emission measurement of PS
  - Evaluation of module detector susceptibility
  - Common SVD – PXD operation

→ Valuable input for development
→ Lead to implementation of CMD filters close to the detector

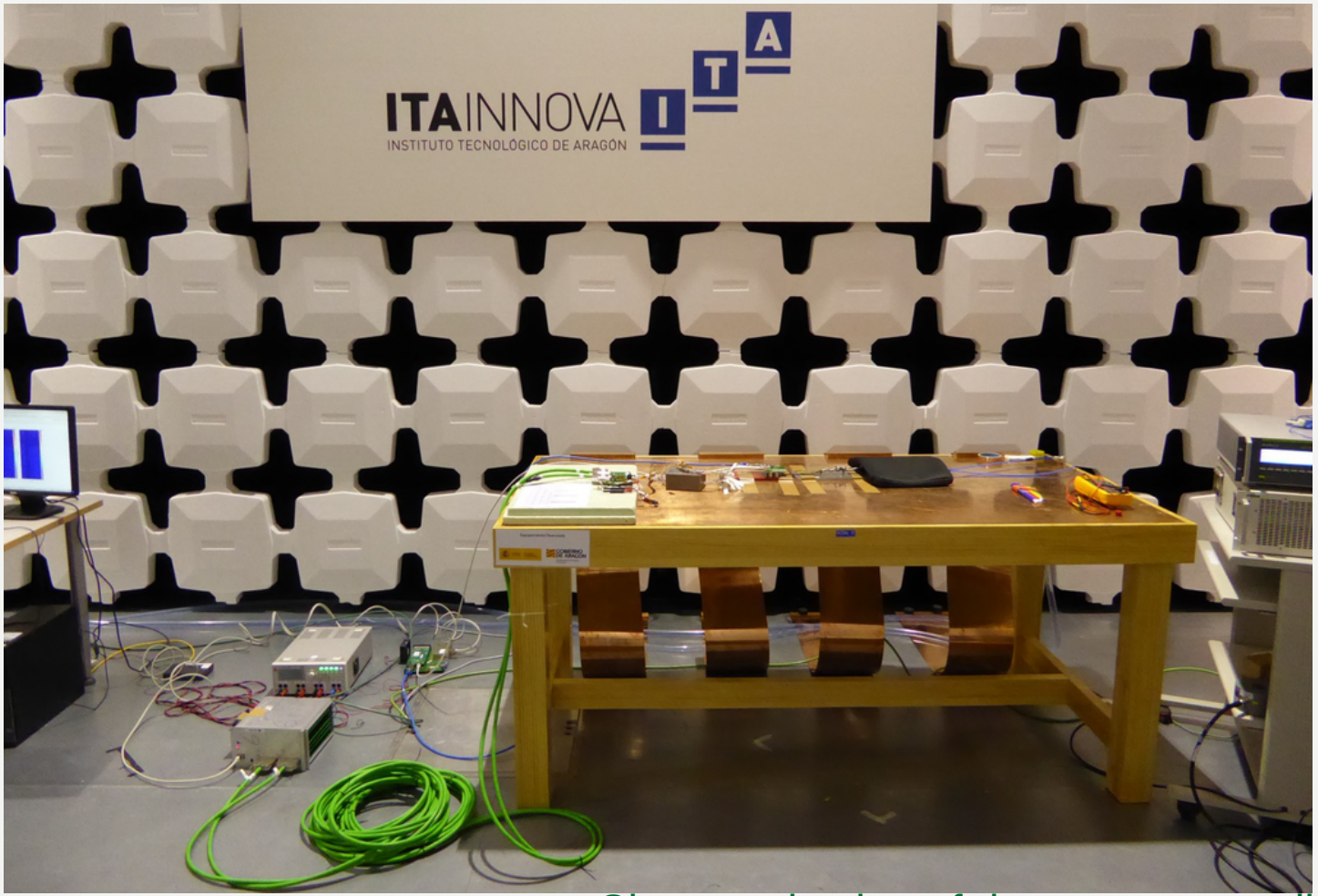
Characterization radiated emmissions

Study of Electro-Magnetic-Interference (EMI)



Characterization of conducted PS emissions

Study of Electro-Magnetic-Interference (EMI)



Characterization of detector susceptibility