PXD Commissioning at DESY

Results, issues and experiences

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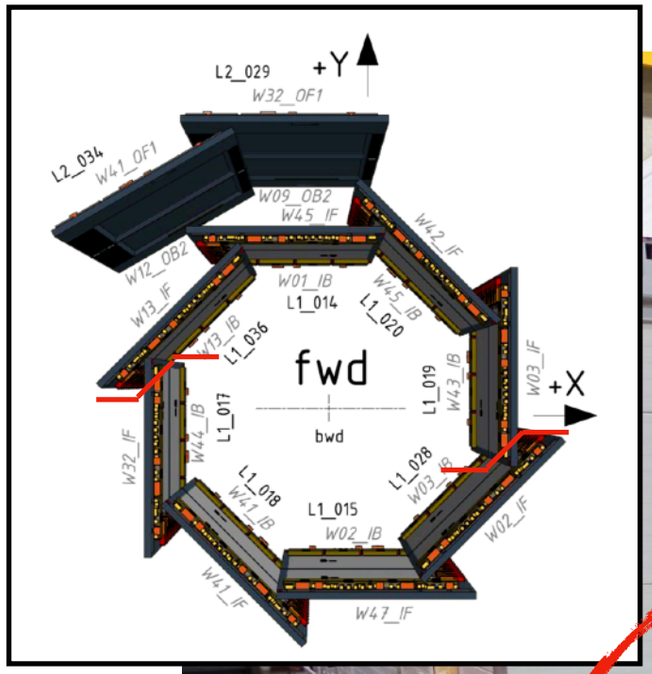
2018.10.09, PXD2020 Workshop, DESY, Hamburg

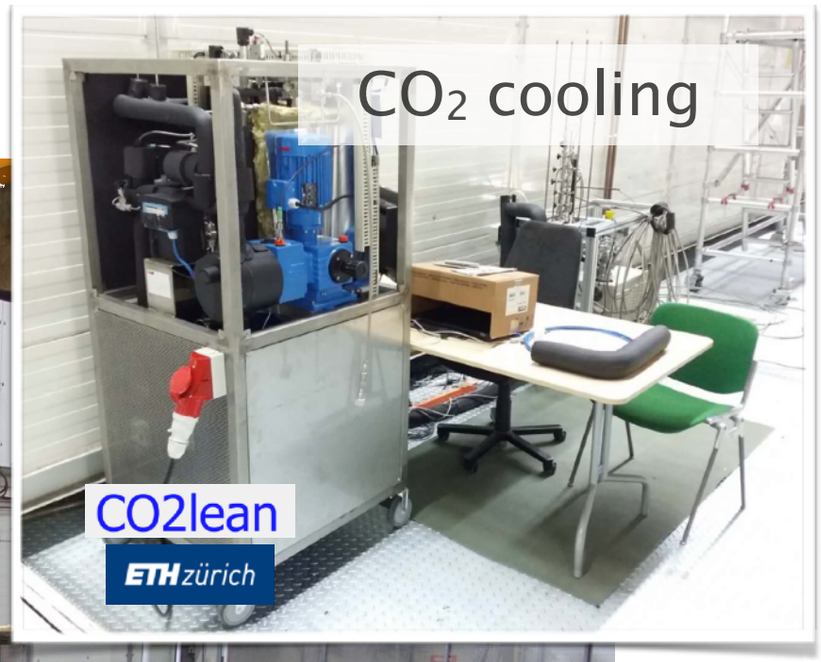
HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

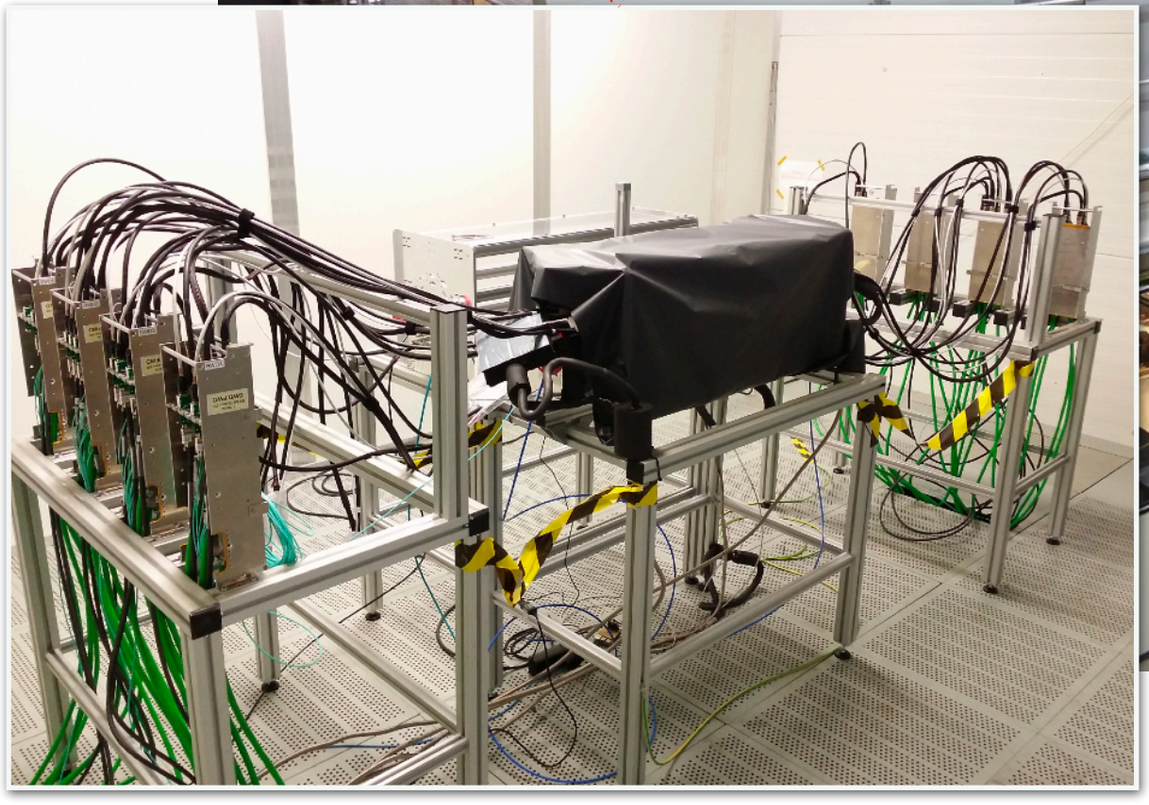
DESY.

PXD Commissioning at DESY

PXD Commissioning at DESY



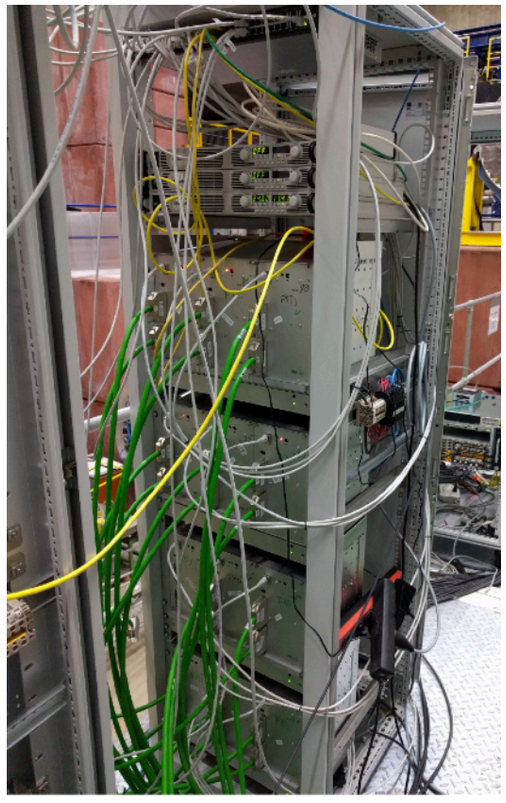


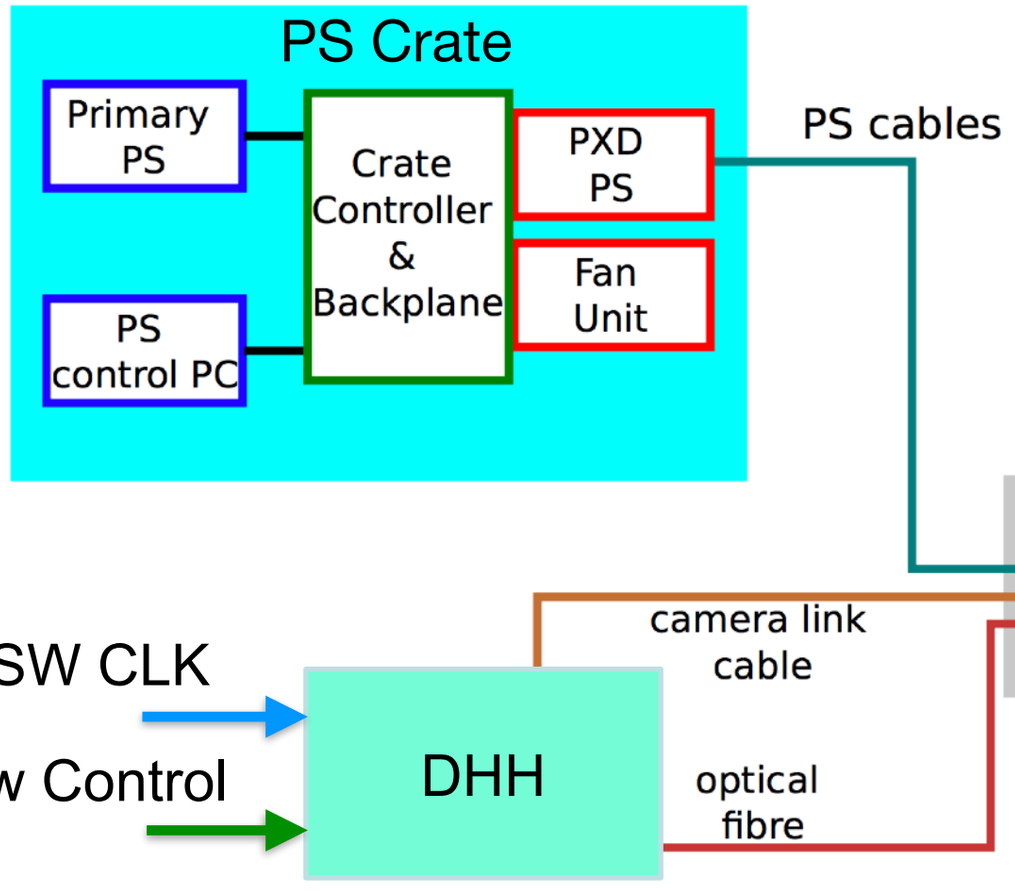


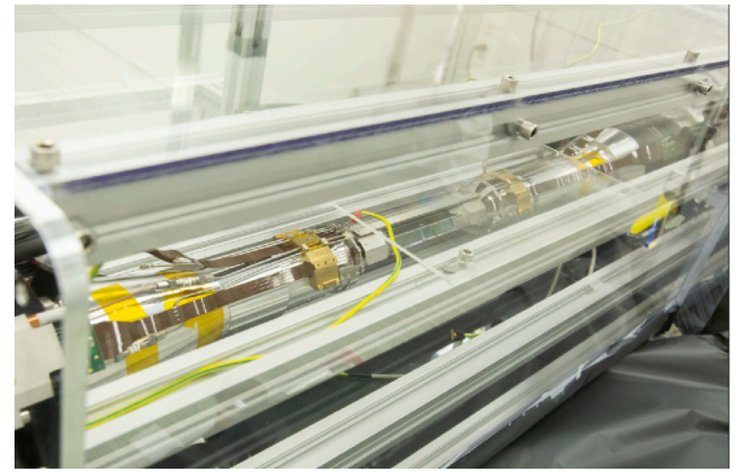
Motivation:
To verify the transport and mounting procedure, study the systematic performance. Pre-commissioning for the final campaign at KEK

- Mar - Apr prepare the clean room
- Apr.30 DHH arrives DESY
- May.10 HS2p3 is mounted onto dummy beam pipe
- July.10 HS2p3 is dismounted and sent back to MPI
- July.11 HS1p3 is mounted
- Aug. 30 HS1p3 is dismounted, delivered to KEK

DESY setup



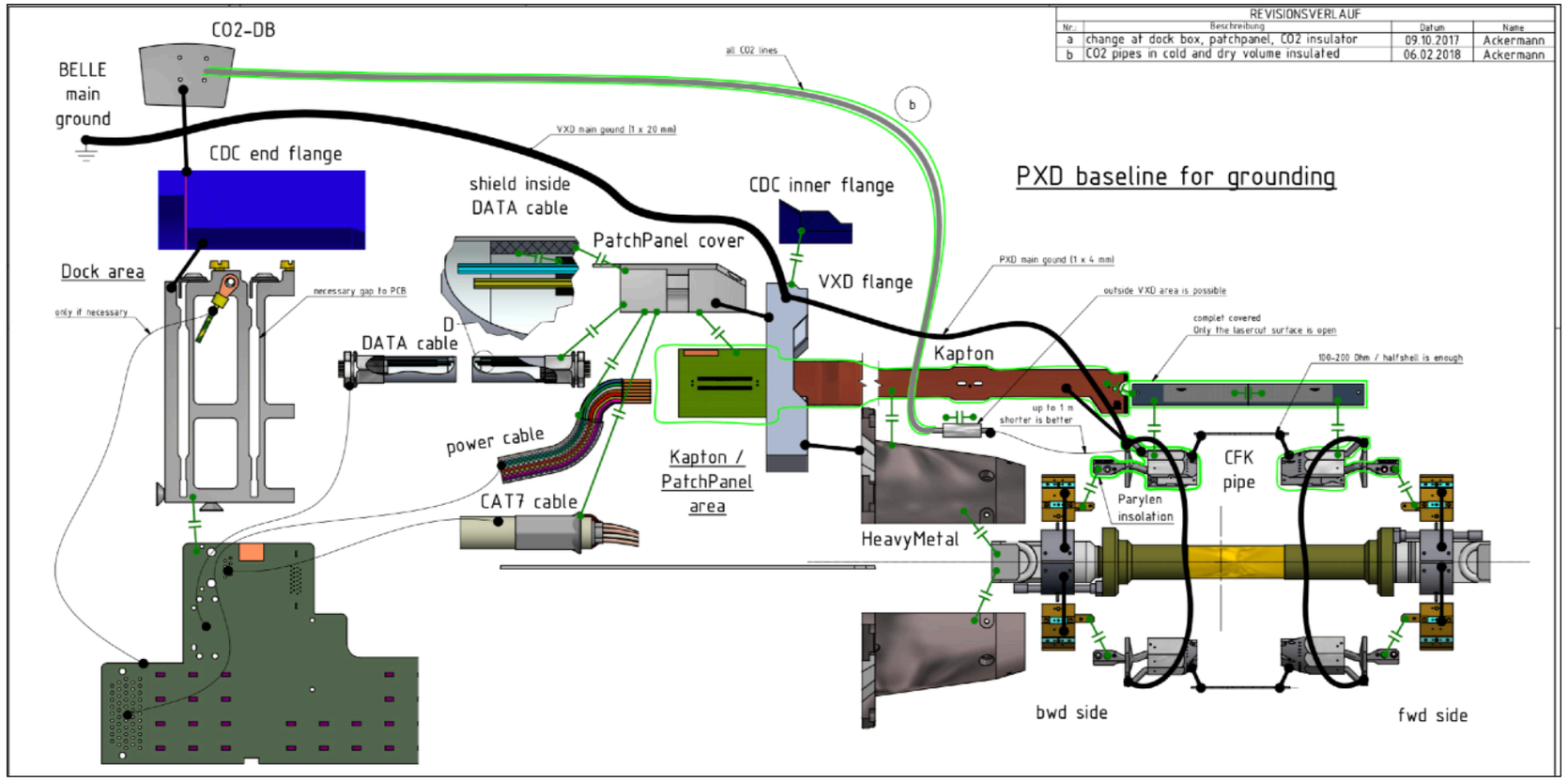

PS Crate
Primary PS
PS control PC
Crate Controller & Backplane
PXD PS
Fan Unit
PS cables
FTSW CLK
Slow Control
DHH
camera link cable
optical fibre
Dockbox
Dockbox PCB
Patch Panel
PXD
SCB
CO_2 in/outlet

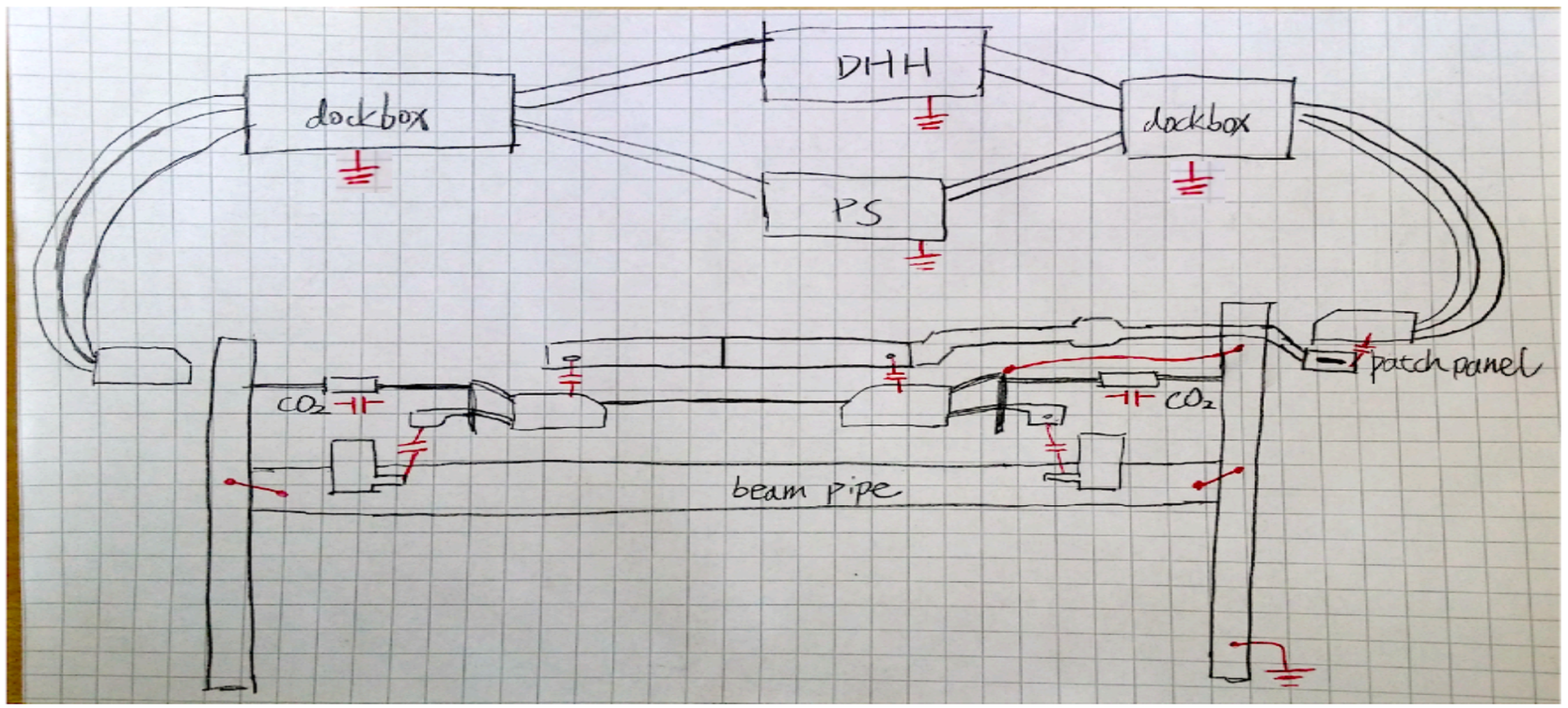


IOCs

- Running on belle-iocpxd:
  - DHC 1x4
  - DHE 5x4
  - DHI master 1x4
  - DHI slave 5x4
  - genesys-ps-phase2-L0
  - iocPowerUpSeq
  - iocpsApp
  - dhh-sequence
  - configApp
- Running on belle-control:
  - Ps-control
  - Archiever
- Running on Raspi:
  - iocCrateController
- Running on Bonndaq:
  - utility_IOC, one for each PXD module

Grounding

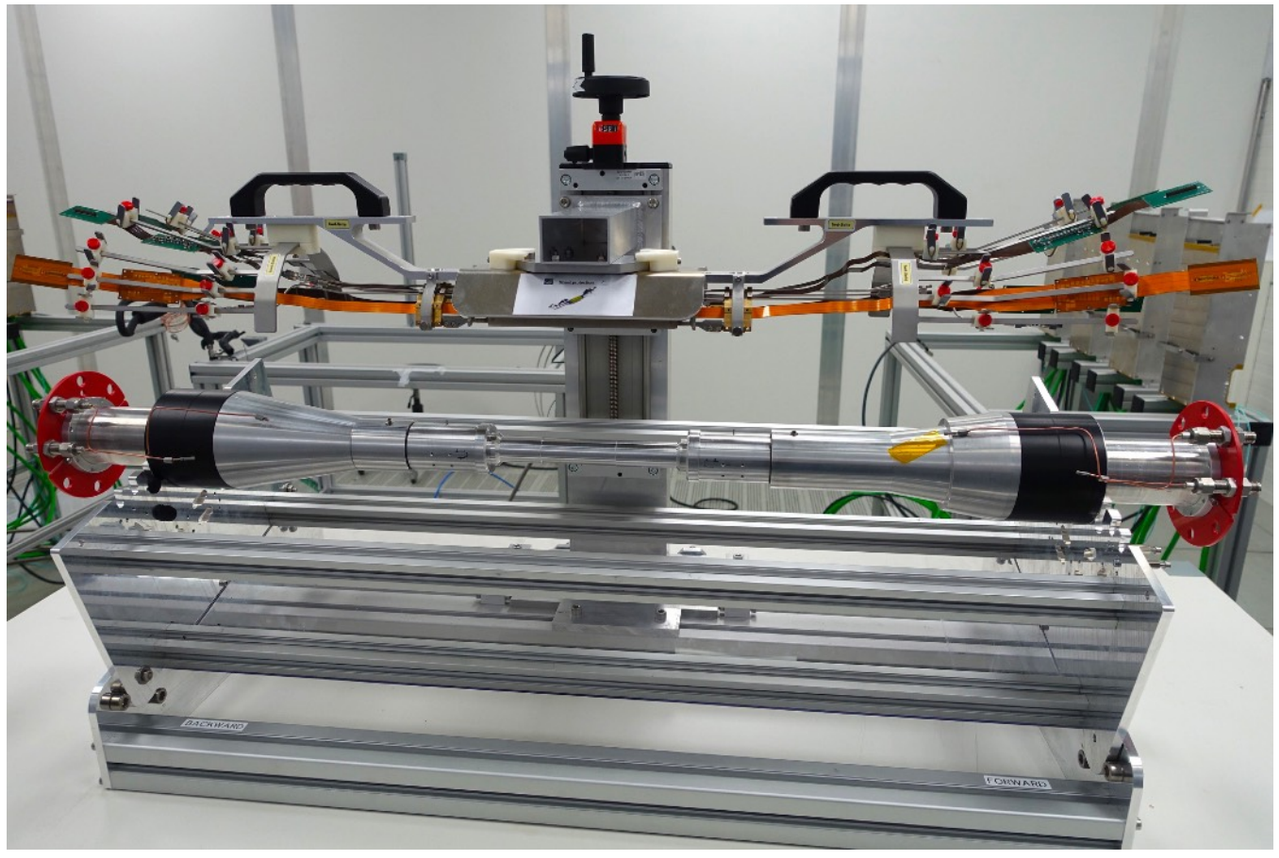

REVISIONSVERLAUF
Nr. | Beschreibung | Datum | Name
a | change at dock box, patchpanel, CO2 insulator | 09.10.2017 | Ackermann
b | CO2 pipes in cold and dry volume insulated | 06.02.2018 | Ackermann
CO2-DB
BELLE main ground
all CO2 lines
b
VXD main gound (1 x 20 mm)
CDC end flange
shield inside DATA cable
CDC inner flange
PXD baseline for grounding
PatchPanel cover
Dock area
necessary gap to PCB
only if necessary
DATA cable
VXD flange
PXD main gound (1 x 4 mm)
outside VXD area is possible
complet covered
Only the lasercut surface is open
Kapton
100-200 Ohm / halfshell is enough
up to 1 m
shorter is better
power cable
Kapton / PatchPanel area
CFK pipe
CAT7 cable
Parylen insolation
HeavyMetal
bwd side
fwd side

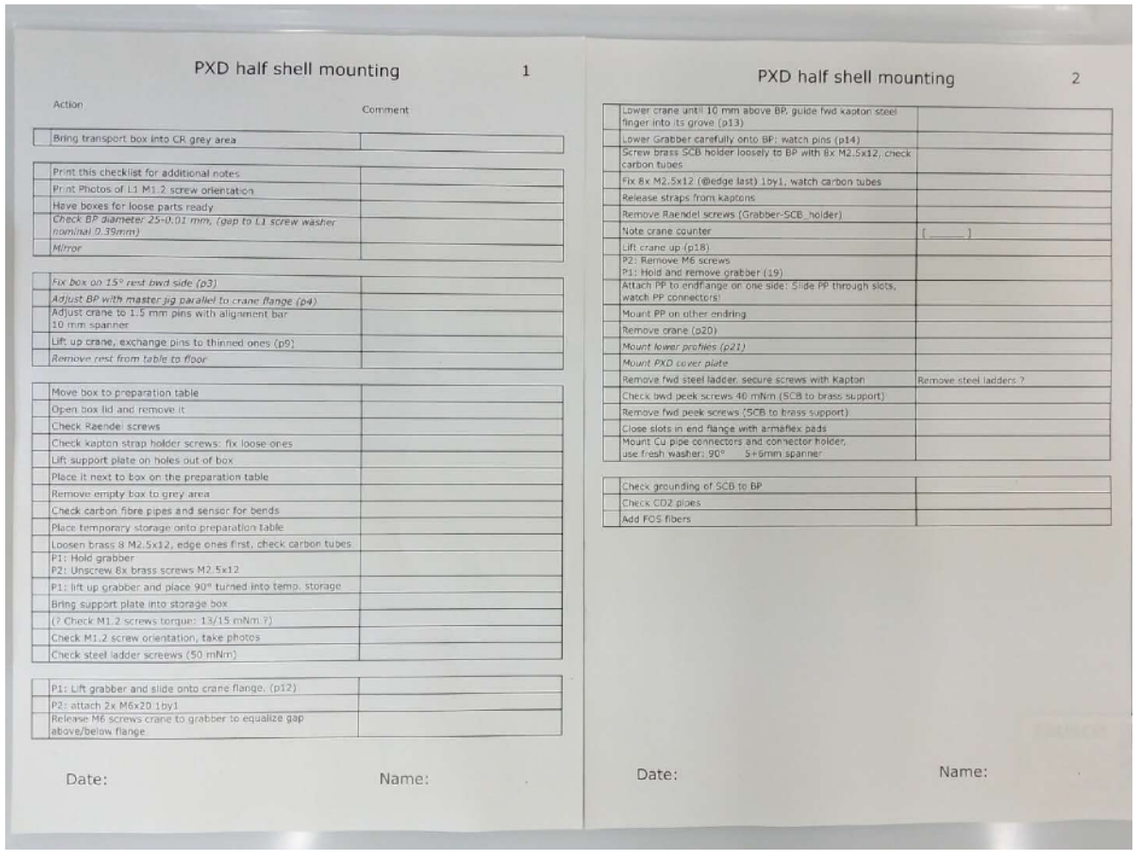

dockbox
DHH
dockbox
PS
patch panel
CO_2
CO_2
beam pipe

Half-shell mounting

It has became a routine.

PXD Half-shell mounting procedures





PXD half shell mounting 1

	Action	Comment
	Bring transport box into CR grey area	
	Print this checklist for additional notes	
	Print Photos of L1 M1.2 screw orientation	
	Have boxes for loose parts ready	
	Check BP diameter 25+0.01 mm, (gap to L1 screw washer nominal 0.39mm)	
	Mirror	
	Fix box on 15° rest bwd side (p3)	
	Adjust BP with master jig parallel to crane flange (p4)	
	Adjust crane to 1.5 mm pins with alignment bar 10 mm spanner	
	Lift up crane, exchange pins to thinned ones (p9)	
	Remove rest from table to floor	
	Move box to preparation table	
	Open box lid and remove it	
	Check Raendel screws	
	Check kapton strap holder screws: fix loose ones	
	Lift support plate on holes out of box	
	Place it next to box on the preparation table	
	Remove empty box to grey area	
	Check carbon fibre pipes and sensor for bends	
	Place temporary storage onto preparation table	
	Loosen brass 8 M2.5x12, edge ones first, check carbon tubes	
	P1: Hold grabber P2: Unscrew 6x brass screws M2.5x12	
	P1: lift up grabber and place 90° turned into temp. storage	
	Bring support plate into storage box	
	(? Check M1.2 screws torque: 13/15 mNm ?)	
	Check M1.2 screw orientation, take photos	
	Check steel ladder screews (50 mNm)	
	P1: Lift grabber and slide onto crane flange. (p12)	
	P2: attach 2x M6x20 1by1	
	Release M6 screws crane to grabber to equalize gap above/below flange	

Date: Name:

PXD half shell mounting 2

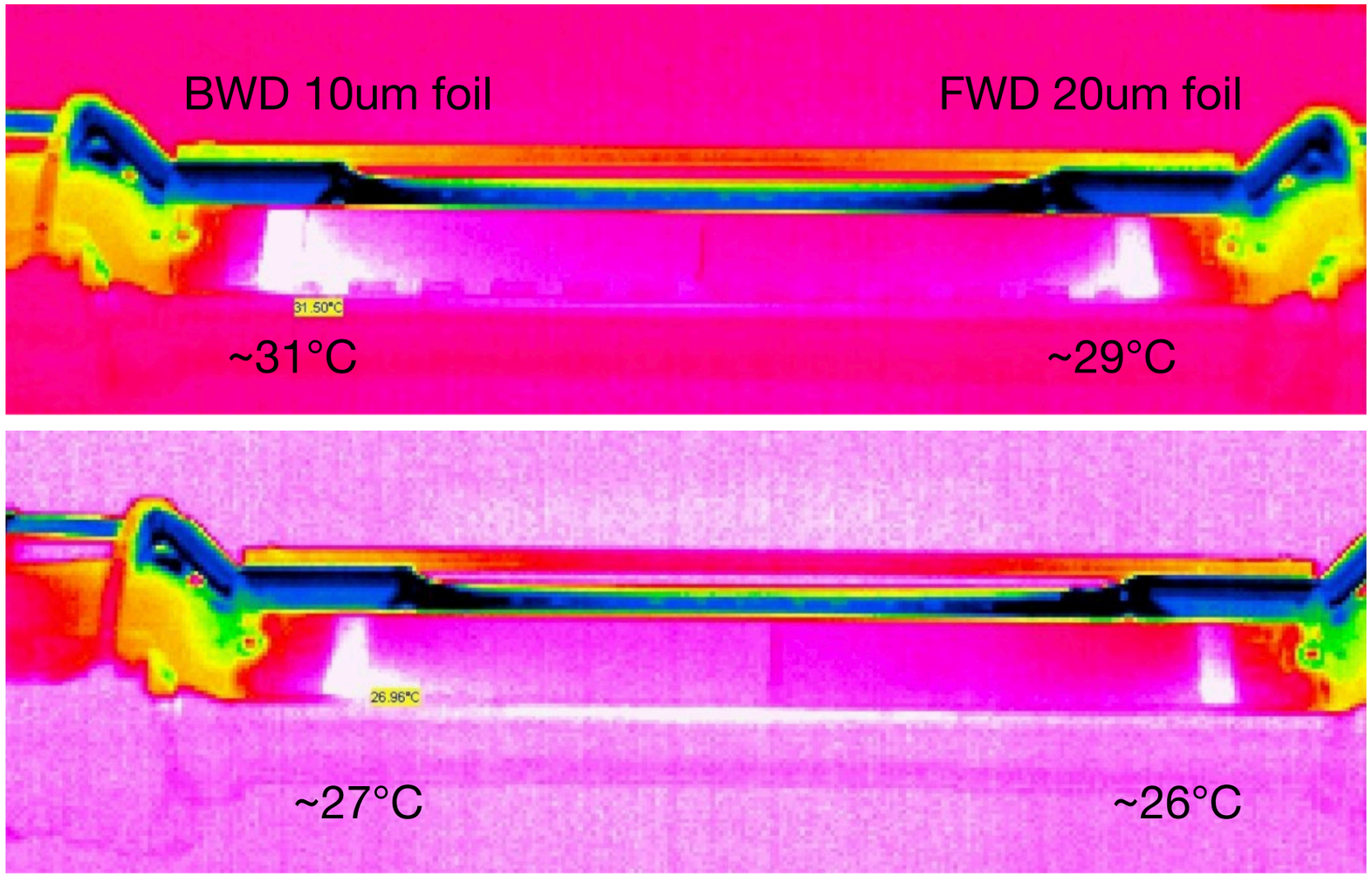
	Lower crane until 10 mm above BP, guide fwd kapton steel finger into its grove (p13)	
	Lower Grabber carefully onto BP; watch pins (p14)	
	Screw brass SCB holder loosely to BP with 8x M2.5x12; check carbon tubes	
	Fix 8x M2.5x12 (@edge last) 1by1, watch carbon tubes	
	Release straps from kaptons	
	Remove Raendel screws (Grabber-SCB_holder)	
	Note crane counter	(_____)
	Lift crane up (p18)	
	P2: Remove M6 screws P1: Hold and remove grabber (19)	
	Attach PP to endflange on one side: Slide PP through slots, watch PP connectors!	
	Mount PP on other endring	
	Remove crane (p20)	
	Mount lower profiles (p21)	
	Mount PXD cover plate	
	Remove fwd steel ladder, secure screws with Kapton	Remove steel ladders ?
	Check bwd peek screws 40 mNm (SCB to brass support)	
	Remove fwd peek screws (SCB to brass support)	
	Close slots in end flange with armaflex pads	
	Mount Cu pipe connectors and connector holder, use fresh washer; 90° 5+5mm spanner	
	Check grounding of SCB to BP	
	Check CO2 pipes	
	Add FOS fibers	

Date: Name:

Thermal tests

Mylar foils between modules and SCB

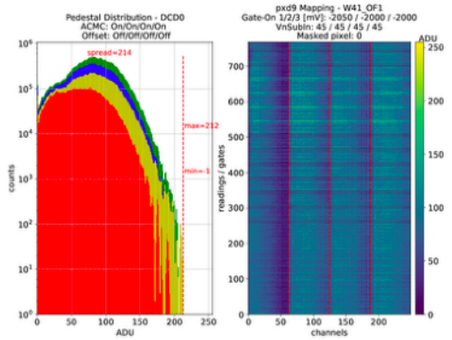
- Dozens fo thermal cycles between -25 to 18°C
- Thermal performance: CO2 at -25°C, L2_022, DCD&DHP on

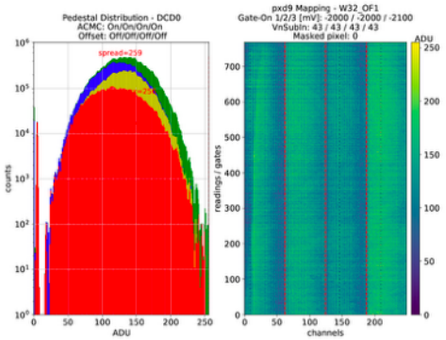


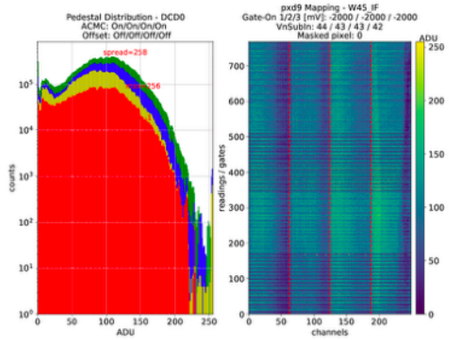
- For reference, in thermal mockup, CO2@-25°C, T(EOS) ~25°C, no Parylene, no Mylar

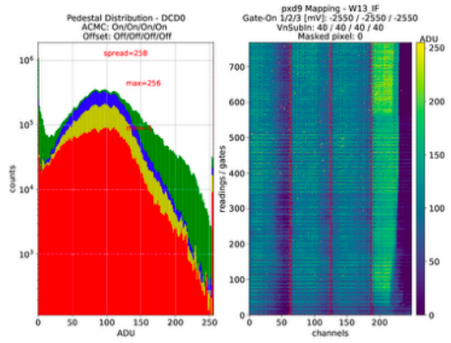
Module performance

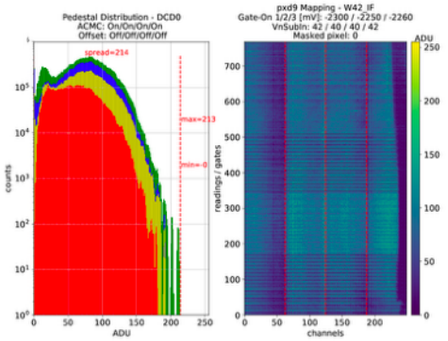
Pedestals: FWD

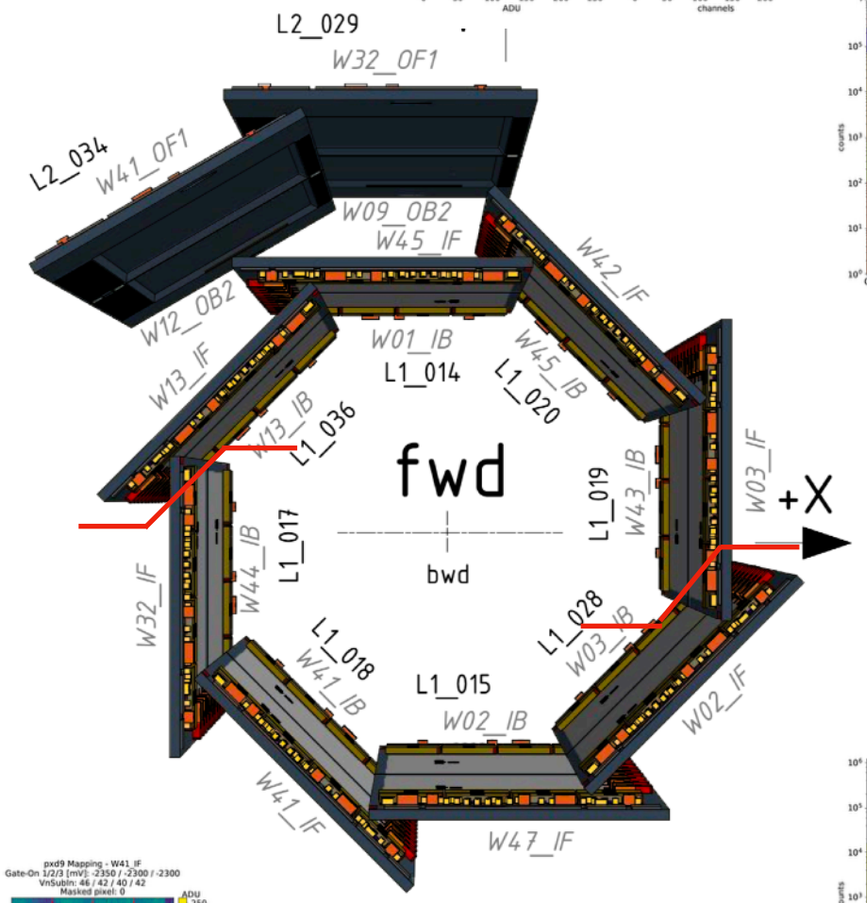


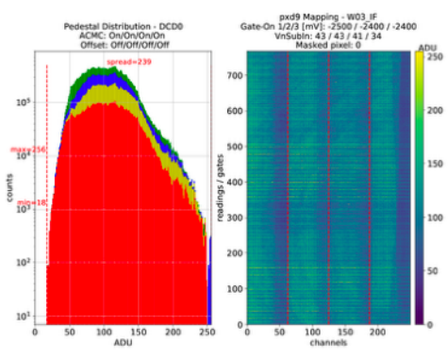


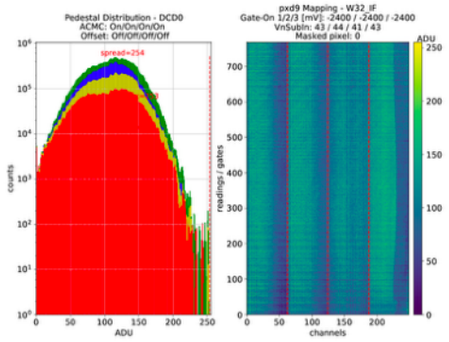


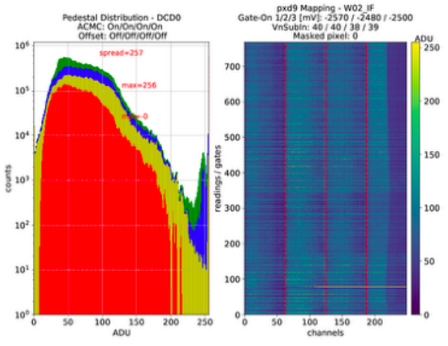


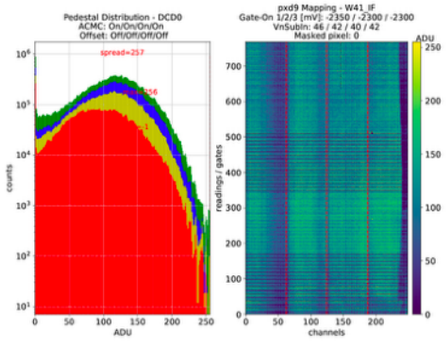


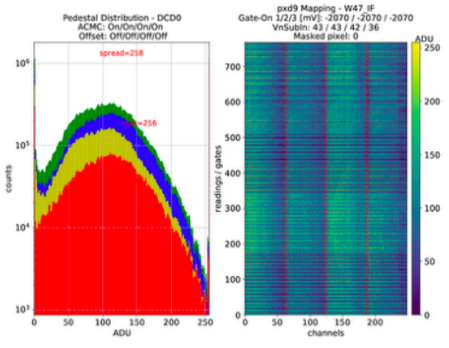






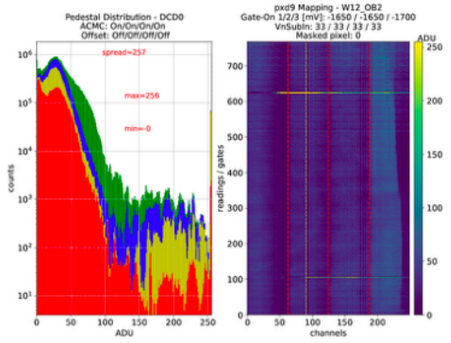


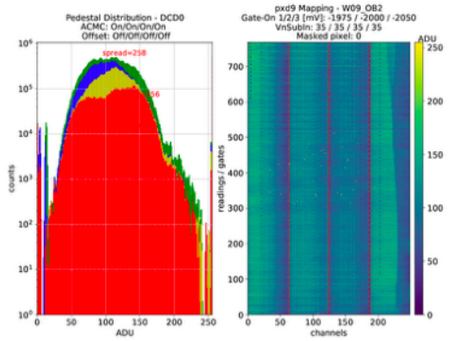


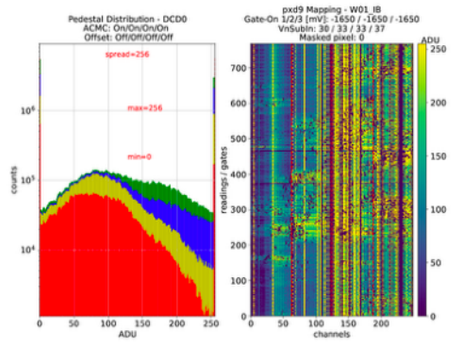


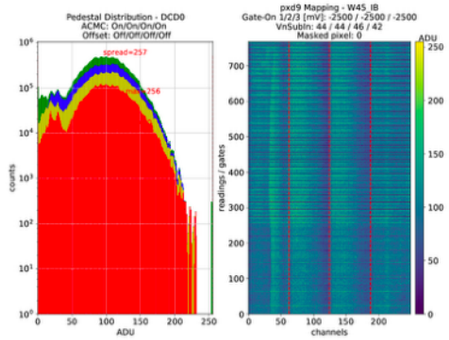
Module performance

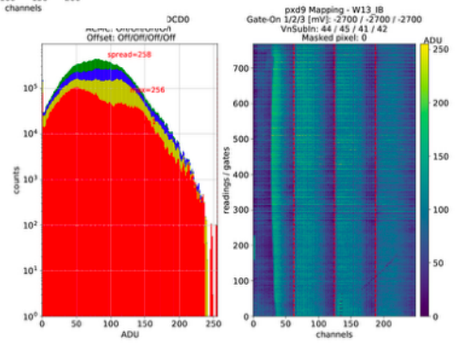
Pedestals: BWD

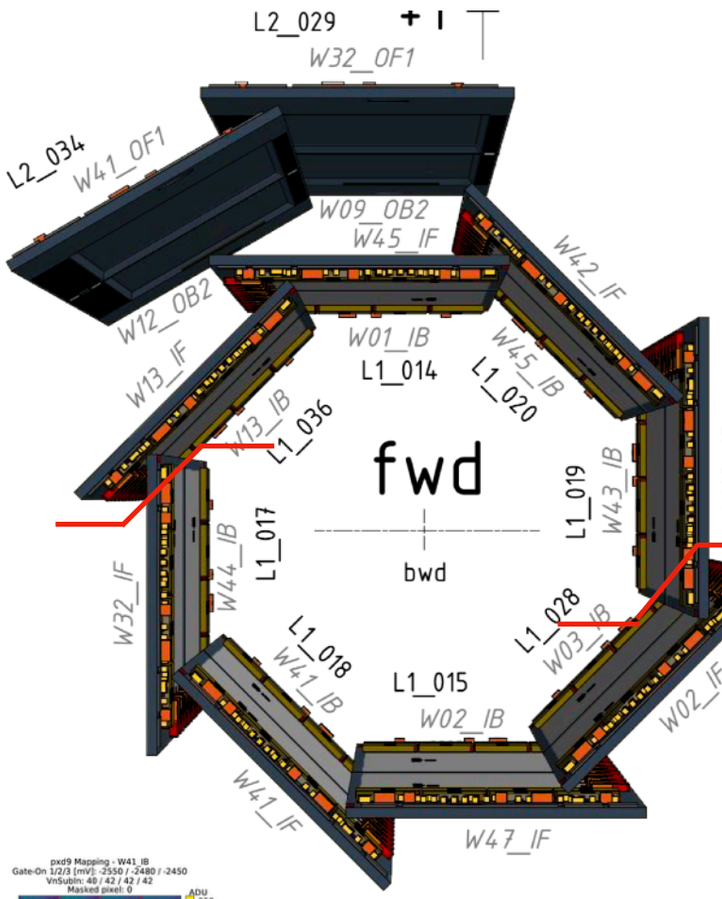


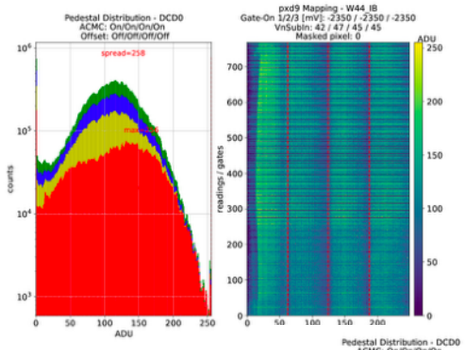


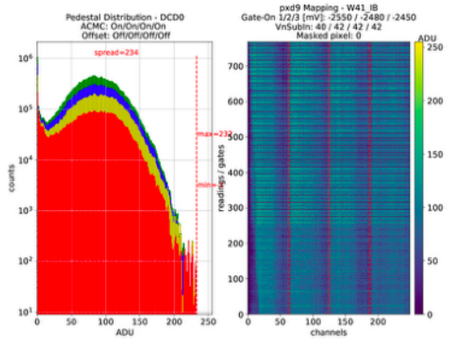


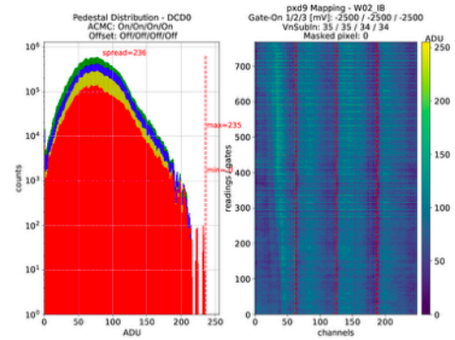


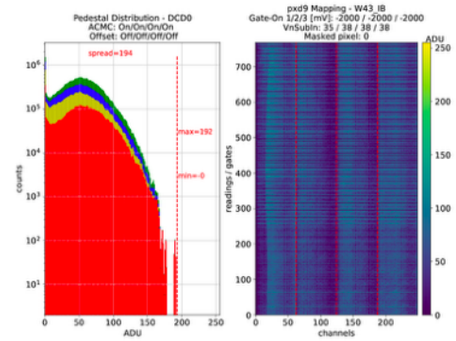


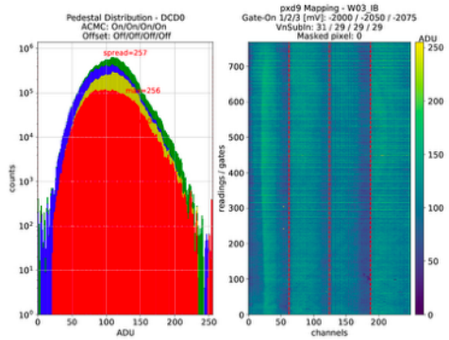






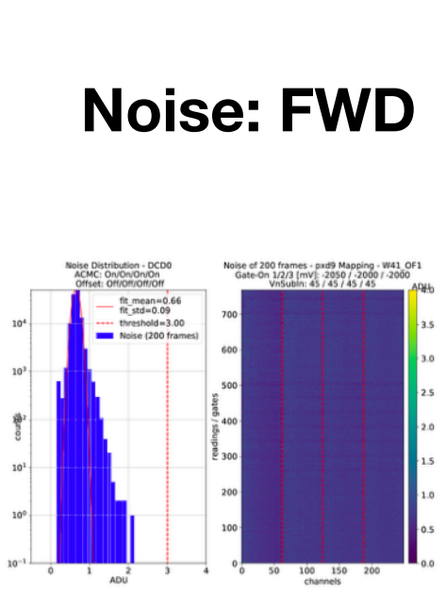


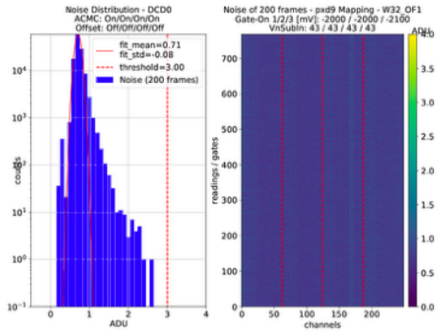


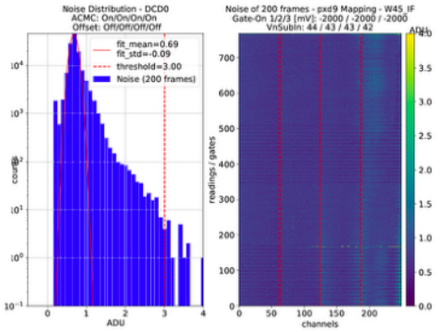


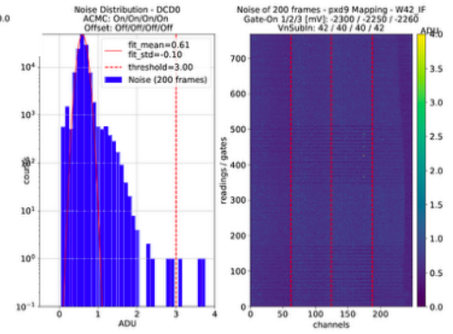
Module performance

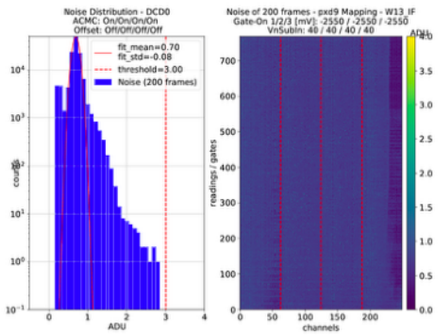
Noise: FWD

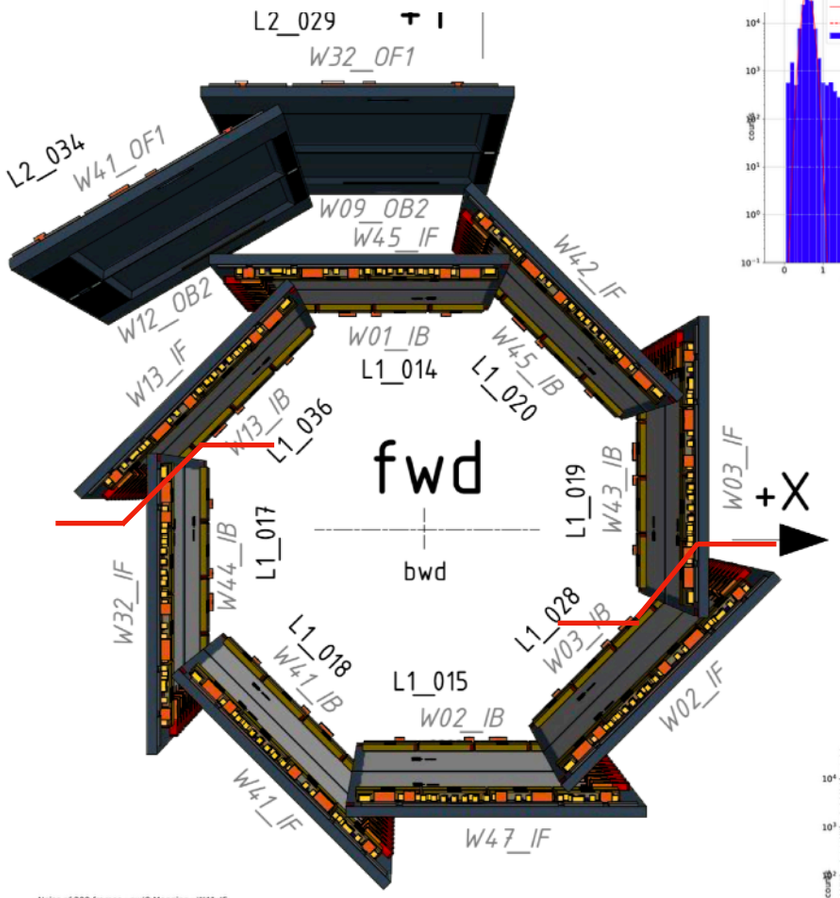


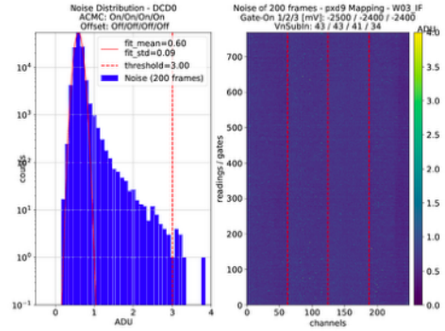


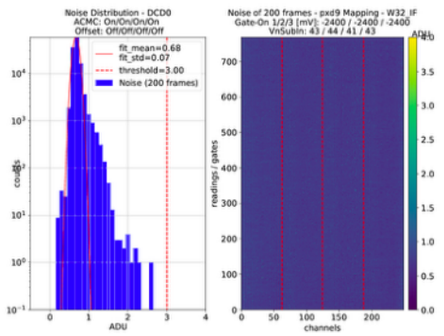


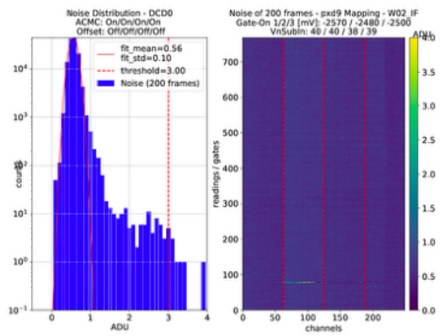


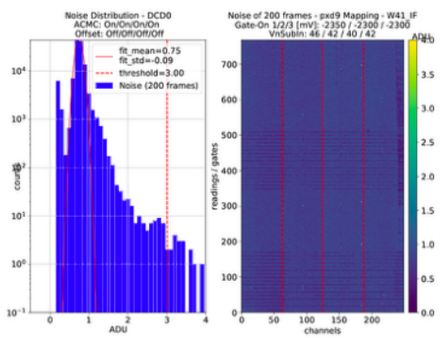


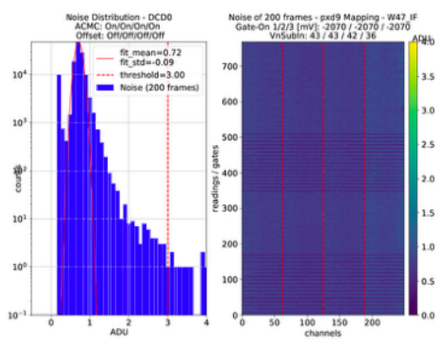






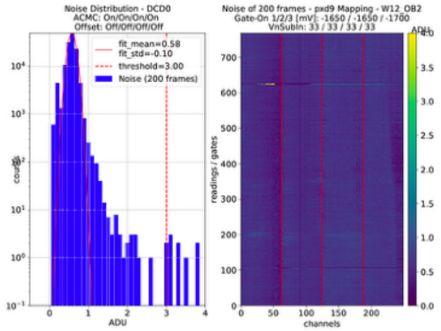


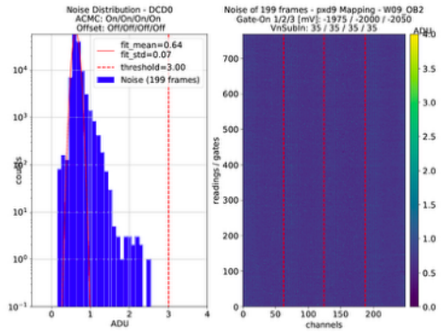


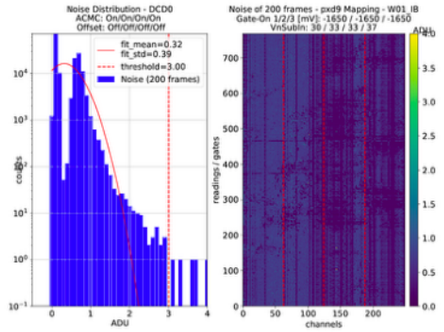


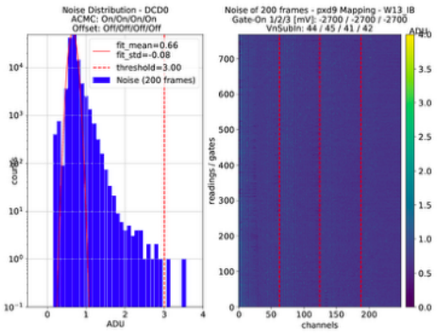
Module performance

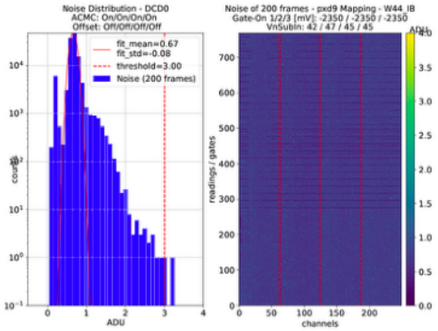
Noise: BWD

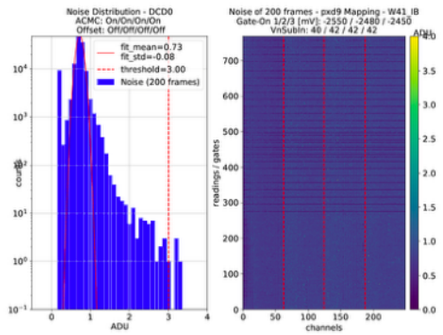


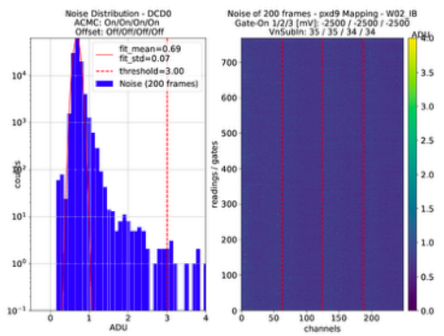


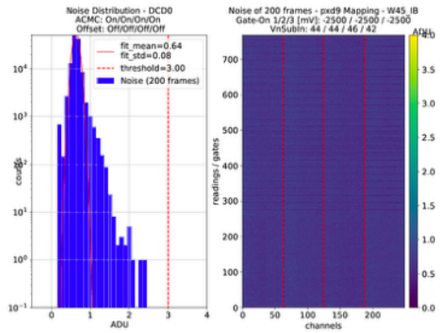


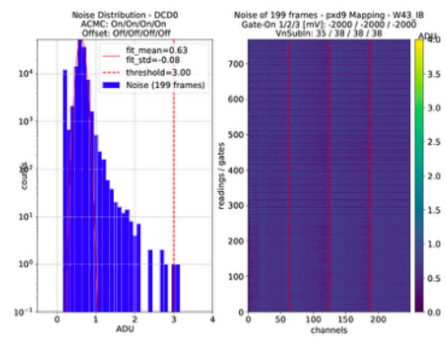


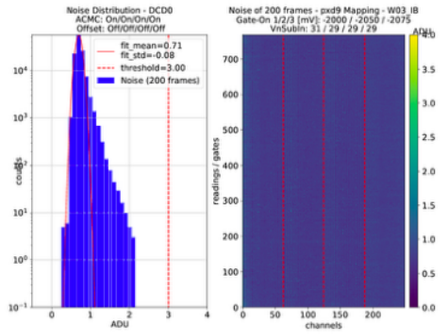


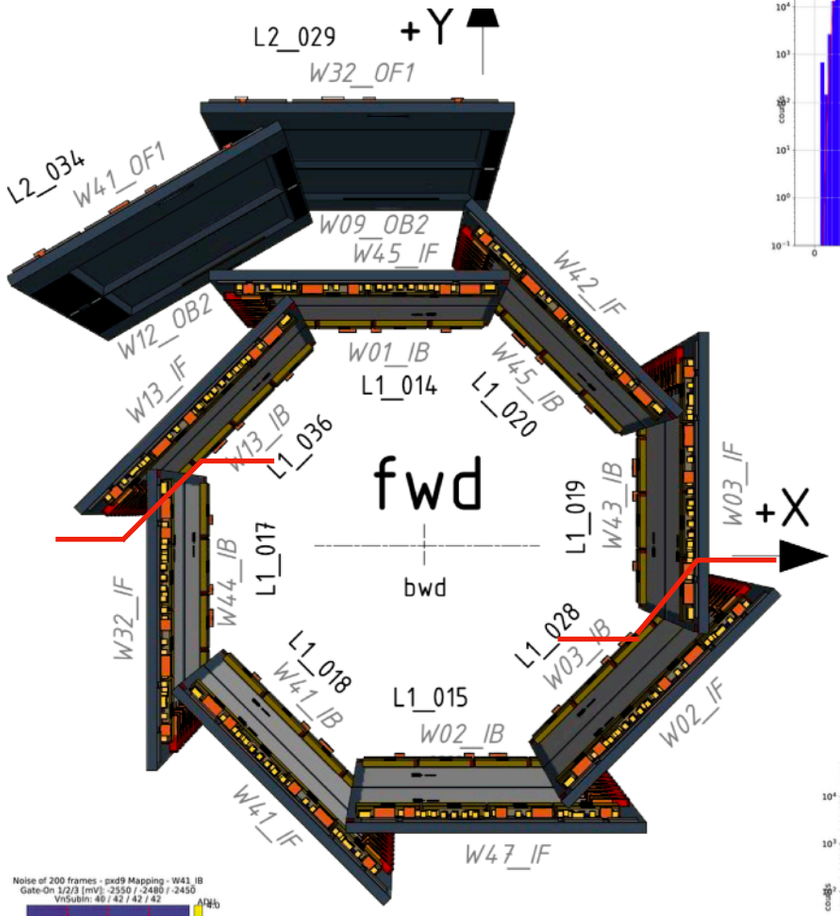










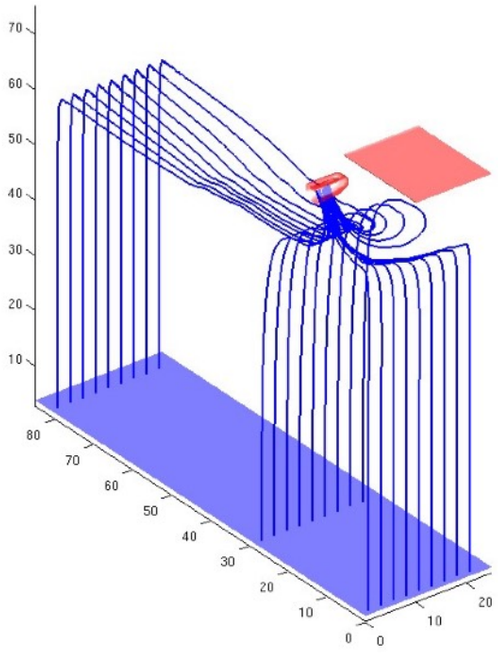


Module performance

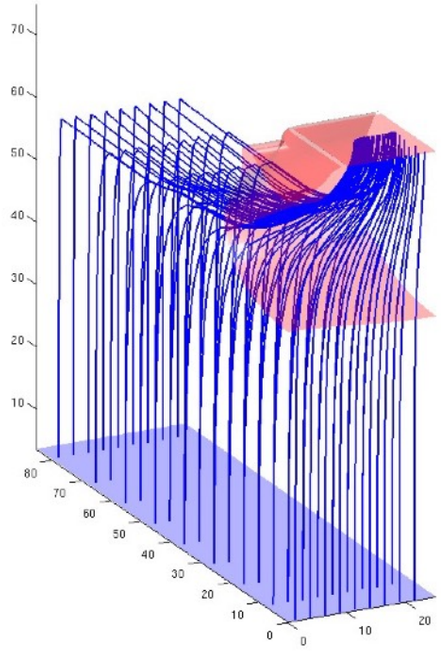
HS1p3
- L1_019:
  - W43_IB, https://elog.belle2.org/elog/PXD-Mass-Testing/9884
  - W03_IF, https://elog.belle2.org/elog/PXD-Mass-Testing/9990
- L1_020:
  - W45_IB, https://elog.belle2.org/elog/PXD-Mass-Testing/9998
  - W42_IF, https://elog.belle2.org/elog/PXD-Mass-Testing/9989
- L1_014:
  - W01_IB, https://elog.belle2.org/elog/PXD-Mass-Testing/10000
  - W45_IF, https://elog.belle2.org/elog/PXD-Mass-Testing/9992
- L1_036:
  - W13_IB, https://elog.belle2.org/elog/PXD-Mass-Testing/9999
  - W13_IF, https://elog.belle2.org/elog/PXD-Mass-Testing/9997
- L2_029:
  - W09_OB2, https://elog.belle2.org/elog/PXD-Mass-Testing/9883
  - W32_OF1, https://elog.belle2.org/elog/PXD-Mass-Testing/9988
- L2_034:
  - W12_OB2, https://elog.belle2.org/elog/PXD-Mass-Testing/9901
  - W41_OF1, https://elog.belle2.org/elog/PXD-Mass-Testing/9996

HS2p3
- L1_017:
  - W44_IB, https://elog.belle2.org/elog/PXD-Mass-Testing/9469
  - W32_IF, https://elog.belle2.org/elog/PXD-Mass-Testing/9472
- L1_018:
  - W41_IB, https://elog.belle2.org/elog/PXD-Mass-Testing/9470
  - W41_IF, https://elog.belle2.org/elog/PXD-Mass-Testing/9471
- L1_015:
  - W02_IB, https://elog.belle2.org/elog/PXD-Mass-Testing/9476
  - W47_IF, https://elog.belle2.org/elog/PXD-Mass-Testing/9474
- L1_028:
  - W03_IB, https://elog.belle2.org/elog/PXD-Mass-Testing/9475
  - W02_IF, https://elog.belle2.org/elog/PXD-Mass-Testing/9473

Gated Mode tests



Normal charge collection



Gated mode

Clear on/off currents:
Normal: ~27/-23mA
1xGM per frame: ~45/-30mA
2xGM per frame: ~65/-50mA

Present by Felix J. Mueller in this session

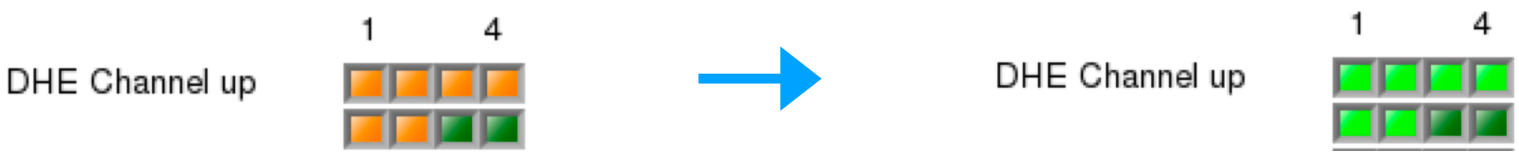
Issues and Experiences

What we suffered

- Mysterious Noise in the power phase in Hera-west hall (source: a broken monitor?)
  - Different link stability between prototype and final DHI (within VME and ATCA crates)
    - Adjust the optical transmitter voltage: 3V -> 3.3V
  - UPS is necessary?

What we have learned

- Systematic tests of multiple modules working with the final DHH.
- crosstalk exists between modules, high noise was observed in neighbour modules when they are in different DHH.
  - need to synchronized the DHH with FTSW



- Many experiences gained during transport, mounting, etc.
- The system is still much simpler than the final system at KEK.

Acknowledgement

To all of you.

Vielen Dank!

Thanks a lot!

ありがとうございます!

谢谢！