



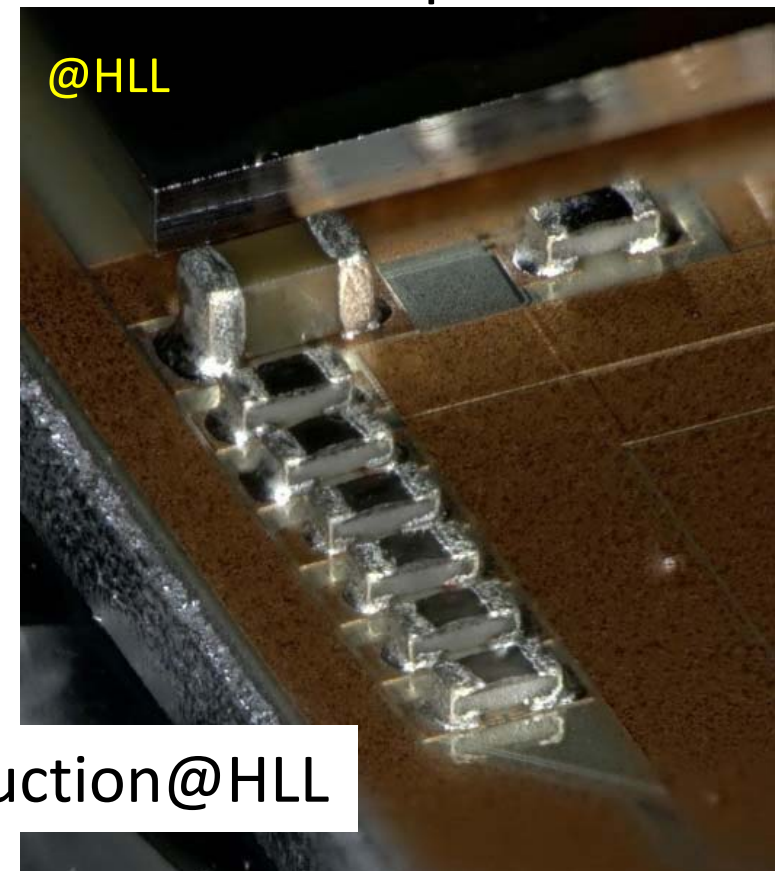
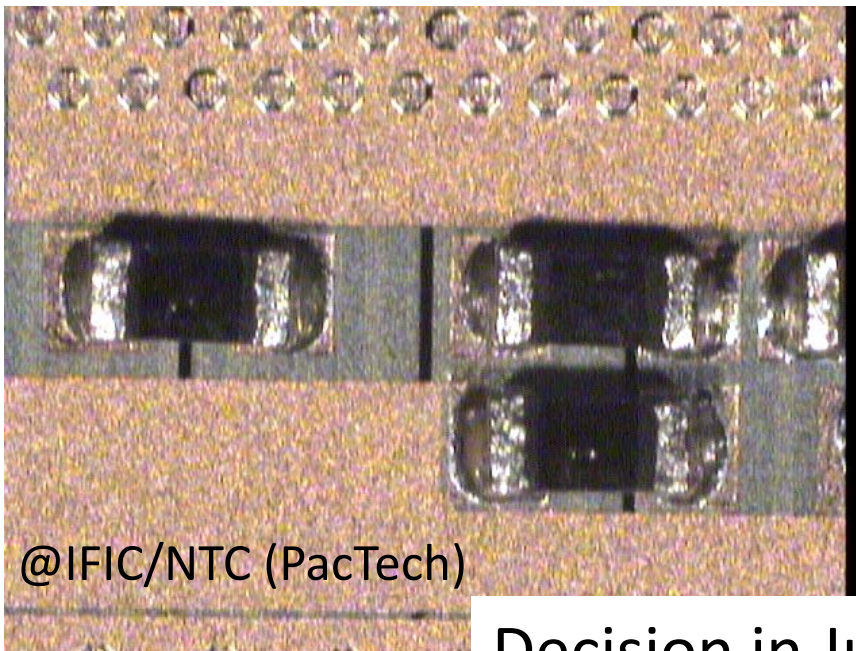
Report of PL



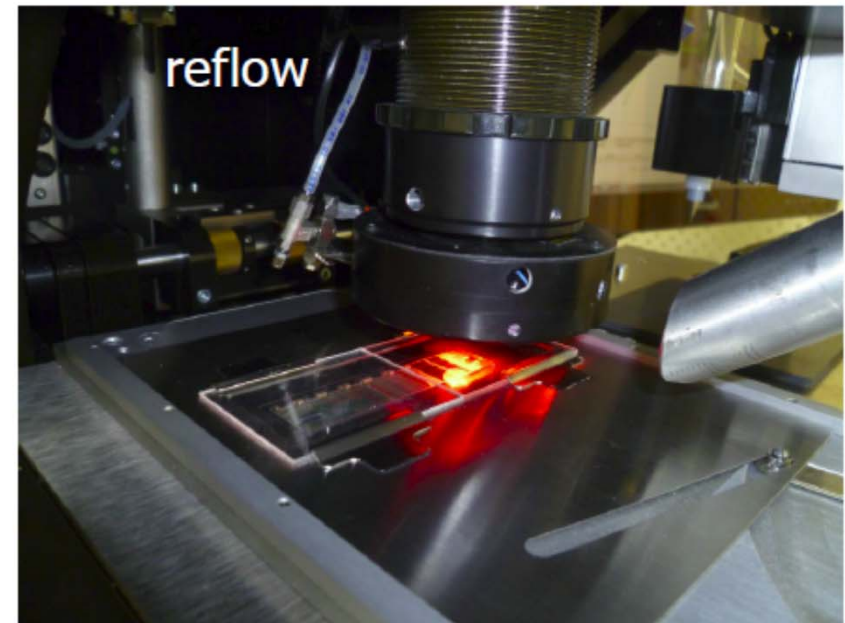
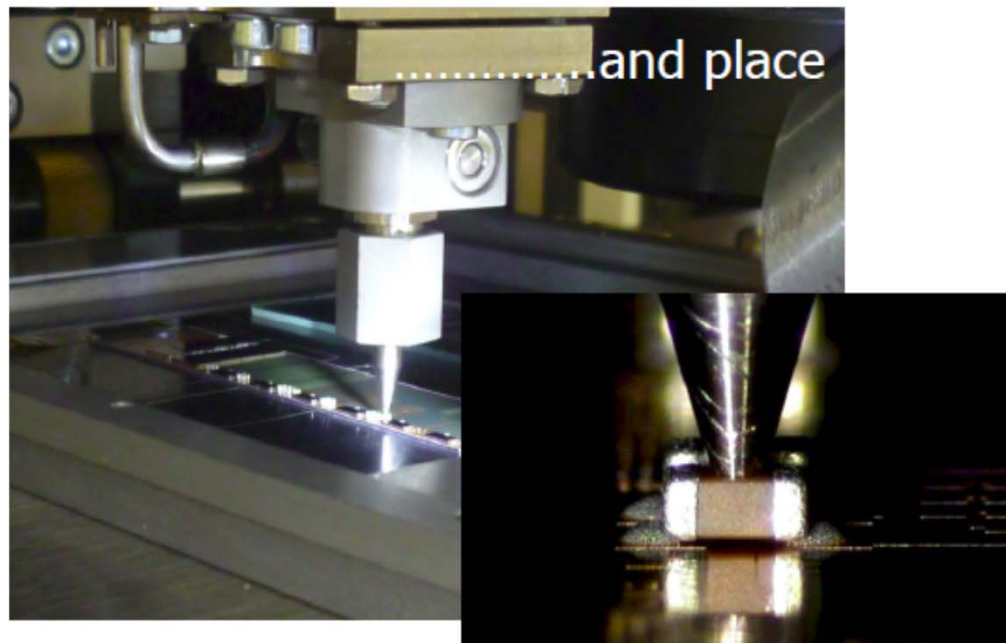
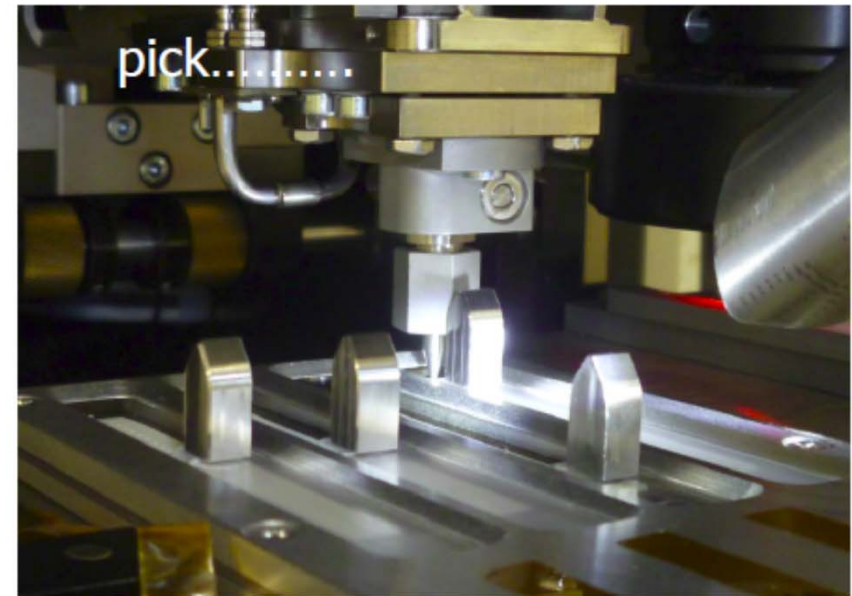
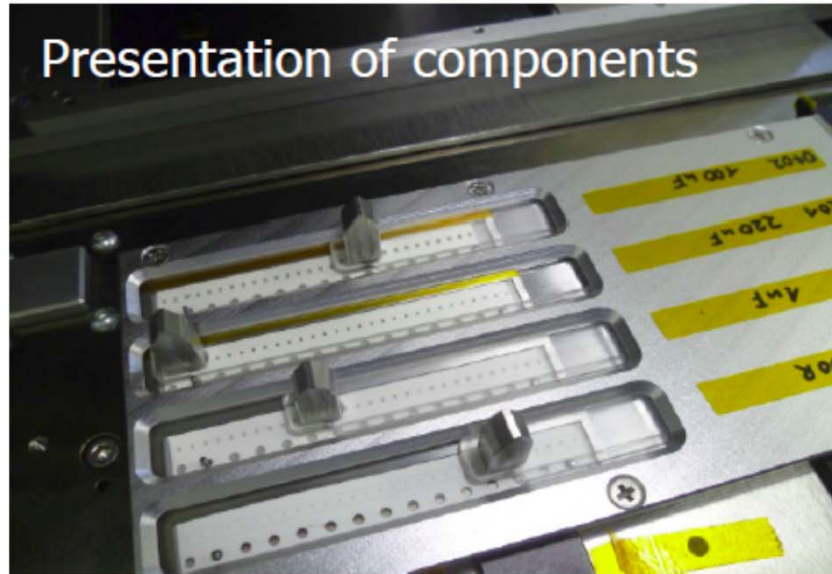
- PXD9 Production Site Overview
- Pilot Production
- Status of ASICs
- Services, DAQ, Slow Control
- CO2 Cooling, Mechanics
- PXD Milestones & Schedule
- Discussion Points and Next Steps
- AOB

Item	Where
DEPFET Sensor (Phases I, II and III)	Semiconductor Lab (HLL)
Flip chipping of ASICs	IZM Berlin
mount SMDs (classify, no immediate rework)	HLL
Add Kapton cable, wire bonding	MPI Munich
Gluing of two modules (= „ladder“)	MPI / HLL
Assembly of PXD half shells	MPI Munich
Commissioning PXD	MPI Munich
Assembly of PXD and Beam pipe	KEK clean room (B1)
Completion of assembly with SVD (= „VXD“)	KEK clean room (B1)
Commissioning of VXD	KEK clean room (B1)
Installation of VXD into Belle II	on SuperKEKB beam line

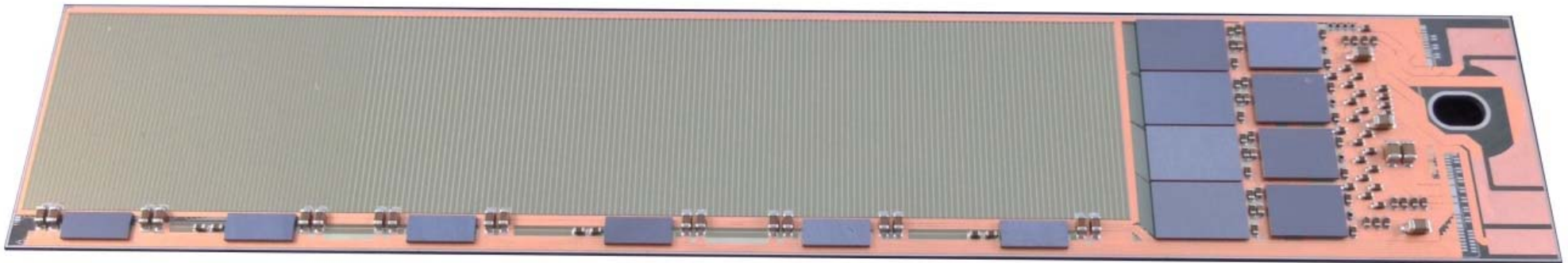
- SMD was under development with two options: (IFIC & HLL)
- prototypes of transport and process jigs available
- @IFIC/NTC: solder ball jetting – process on new machine being installed at NTC, but problem still with Cu oxide layer
- @HLL: solder paste dispensing: method has been proven to work successfully



Decision in July: production@HLL

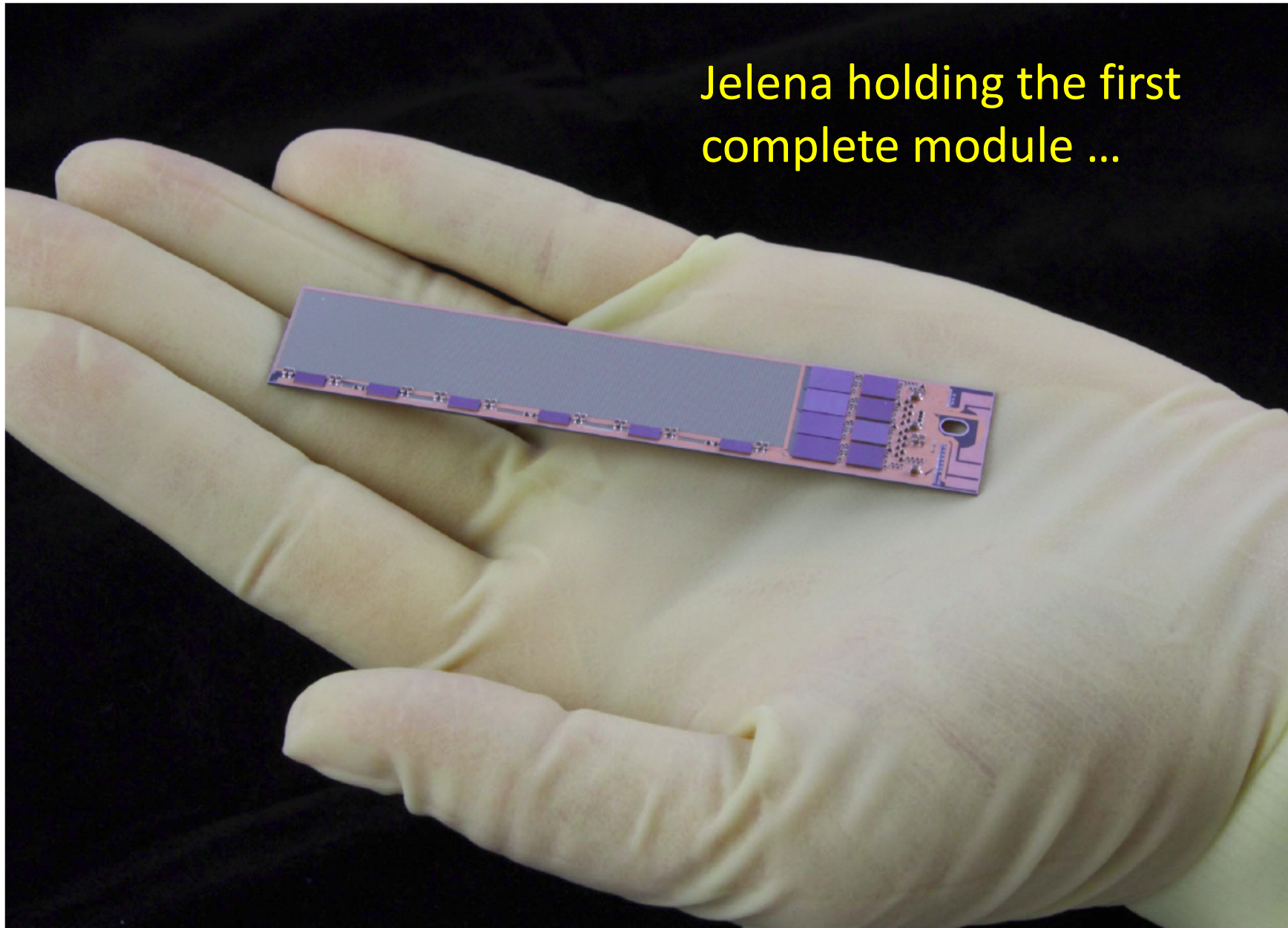


- Highlight (see photo): First COMPLETE DEPFET module from PXD9 pilot production: Sensor, ASICs and SMDs (Kapton cable ready for soldering), tests will start in September, finish by Nov. 2015)



- Pilot Production: 3/30 “hot” wafers (W30, W35, W36) still a lot of process control, tests, measurements “on the fly” [each wafer has 6 sensors (4 Layer2, 2 Layer1), PXD: 24 L2, 16 L1]
- Status :
 - W30 finished and cut, Kapton assembly Sep. 14
 - W36 and W35 in Cu process
- Main production (Phase 2/3) will start in Dec. 2015 (for 6 months)

The First PXD (Belle II) Module



Yield after Poly-Si and Al2

	W30	W35	W36
IF	75.0	100.0	100.0
OF1	100.0	100.0	100.0
OF2	100.0	100.0	100.0
OB1	99.8	99.4	0
OB2	99.6	0	99.8
IB	100.0	0	100.0
TOT	95.7	66.6	83.3

	W30	W35	W36
IF	3 ^a	2a ^b	2a ^b
OF1	0	2a ^b	2a ^b
OF2	2a ^b	2a ^b	2a ^b
OB1	2 ^c	2b ^e	4 ^f
OB2	2 ^d	4 ^f	2 ^c
IB	2a ^b	4 ^f	2a ^b

Yield calculated taking into account the following equation:

$$Yield(\%) = \frac{1}{10} \cdot (D - D_s)$$

With D the total number of drain lines (1000) and D_s the number of drain lines involved in the short.

- 14/18 chips usable

+

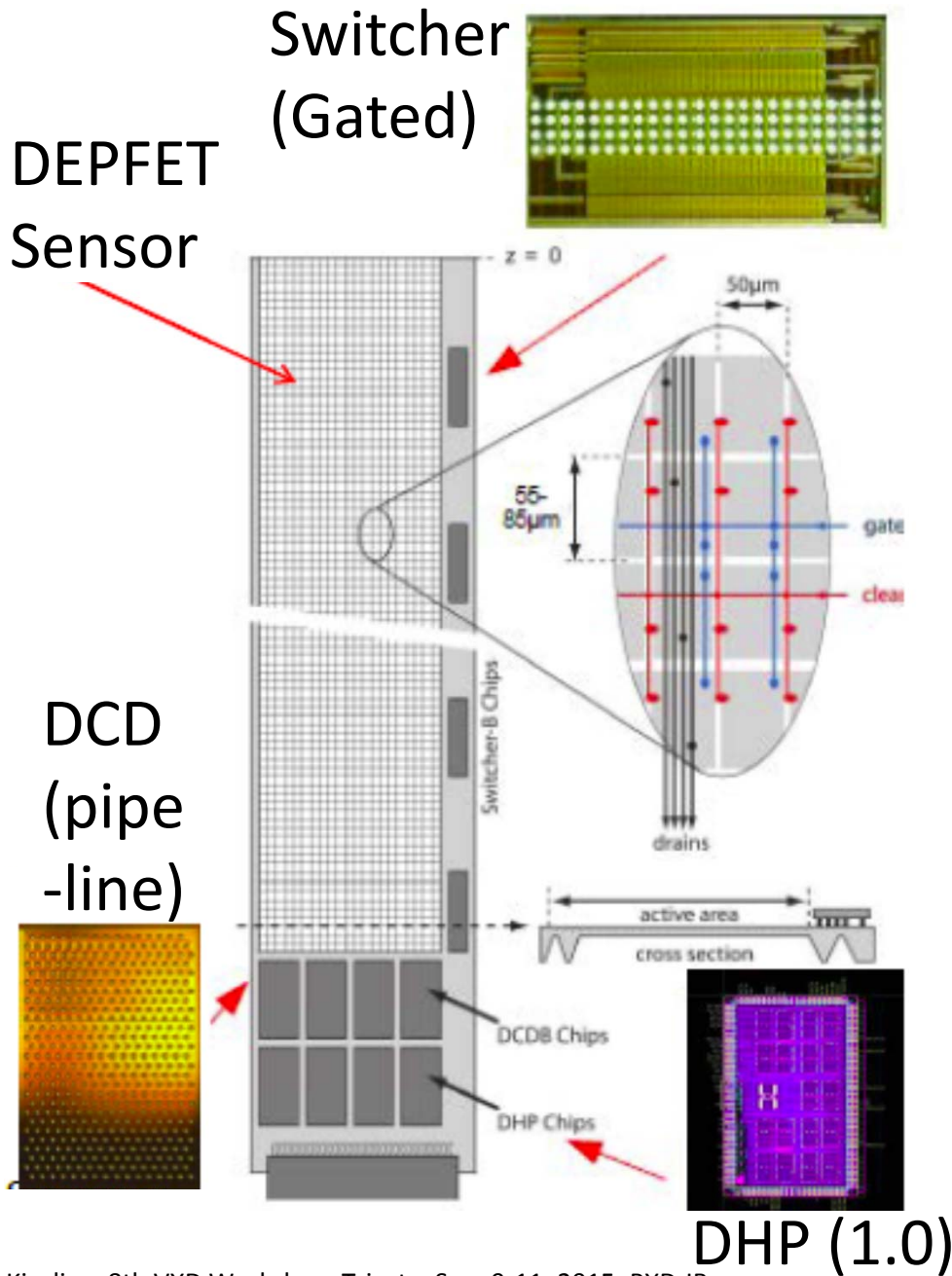
- W30 IF: scratch in DCD4 region

- W30 tests after Cu: 100% okay

- 0: no faults
- 1: pixel level faults
- 2a: row level faults
- 2b: column* level fault
- 3: high impact faults
- 4: lethal faults
- 5: to be clarified

* Column level faults in Al2 can be repaired by rework (grade 2b → 0).

From Jelena's presentation (data by Paola)



2nd generation ASICs

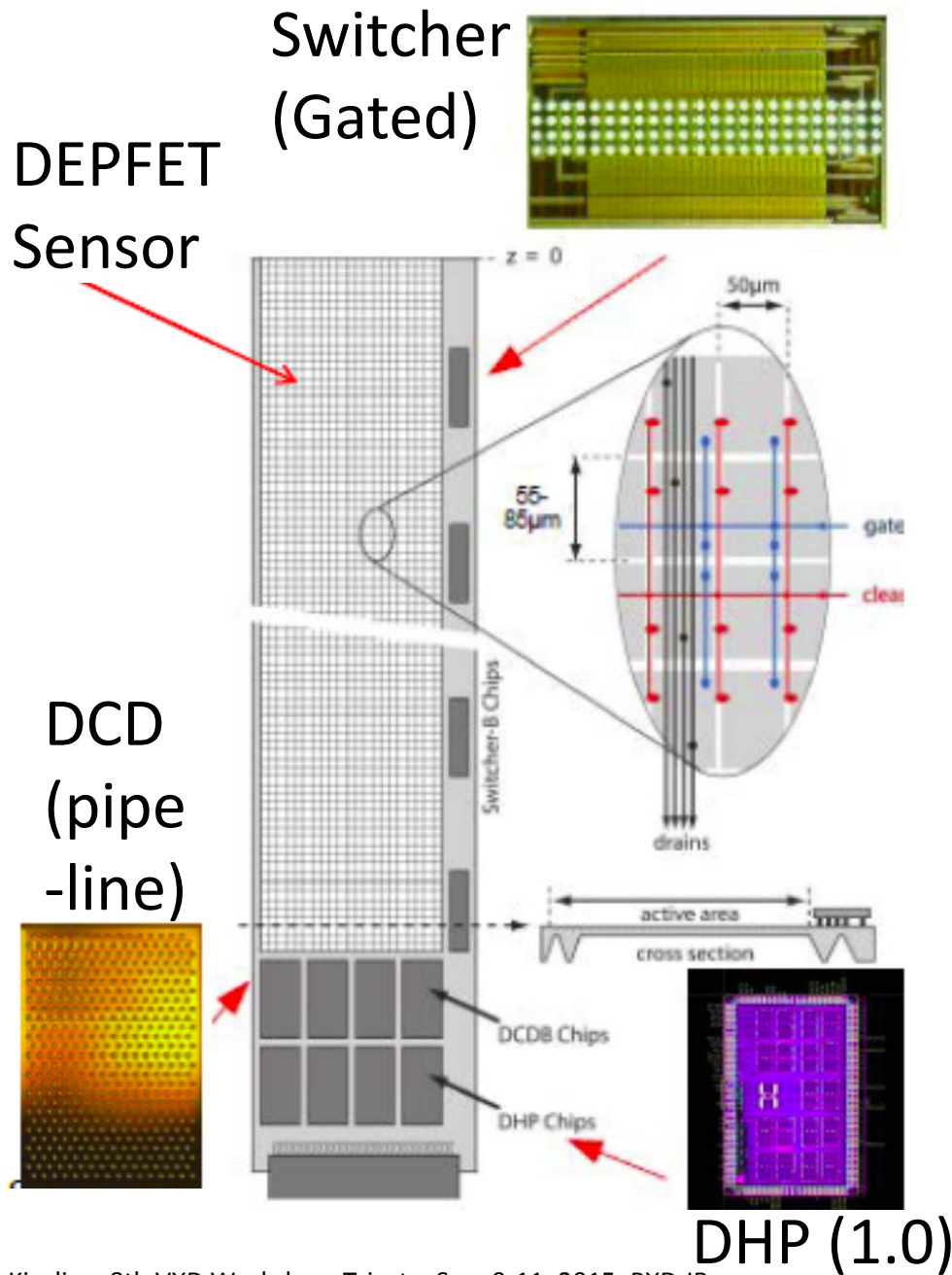
- used in EMCM electrical tests
- used for the **pilot run**

3rd generation under design:

- ASIC-Review in July, (+Report)
- Improve communication between DCD-DHPT
- Faster Switcher

Final Submission:
SWG, DSPT : August
DCD: : September

Final ASICs back in January 2016, to be installed for DESY test and BEAST 2 using Pilot Modules



DHPT: Setup for QC mass tests (needle card) is available in Bonn, ready to go

SWG: “relatively” easy. Heidelberg setup can be used (at KIT)

DCD: No viable procedure at present (HD needle card does not work reliably)+ä

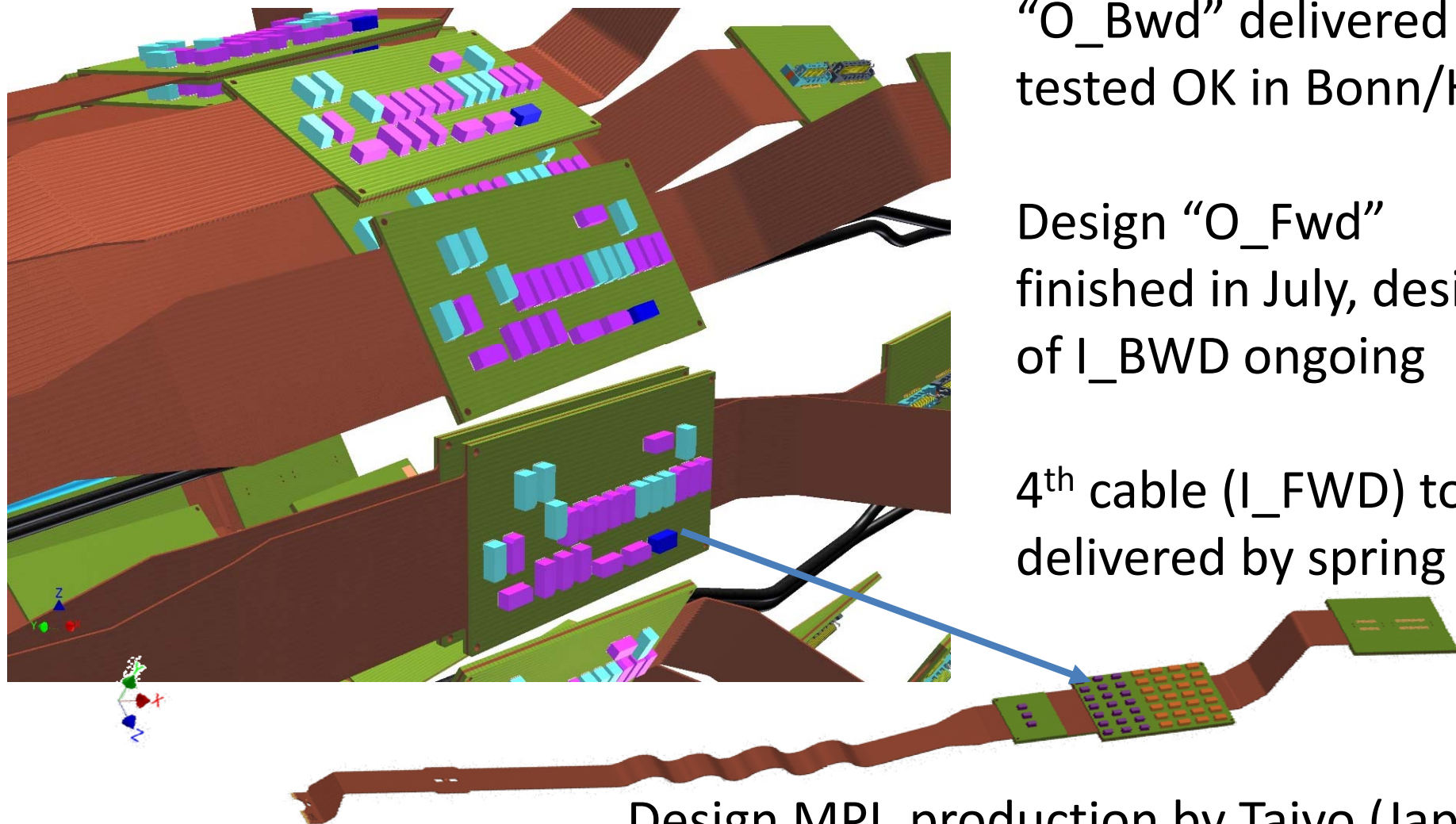
But: KIT management may offer support with infrastructure

4 types: layer 1 (I_Fwd, I_Bwd), layer 2 (O_Fwd, O_Bwd)

First samples (15)
“O_Bwd” delivered &
tested OK in Bonn/HLL

Design “O_Fwd”
finished in July, design
of I_BWD ongoing

4th cable (I_FWD) to be
delivered by spring 2016



Design MPI, production by Taiyo (Japan)

- Application specific PS unit successfully used in the EMCM module tests
Production of 50 units is under way (includes spares).



- Pocket-Onsen system installed at KEK, tested successfully with HLT and EVB
Next steps: 30 kHz high rate test in 10/2015, DESY test 04/2016: Here support needed (again) by KEK DAQ group
- Optical transmission (dock->DHH) tested for radiation hardness: Glenair OK, now serious steps towards realization, to be implemented for DESY test in April 2016

- PS / DHE / JTAG control and startup sequences stable and in daily use, including software interlock.

IPMI interface for ONSSEN with actual hardware successfully tested, but still lot of work to do on the software side ...

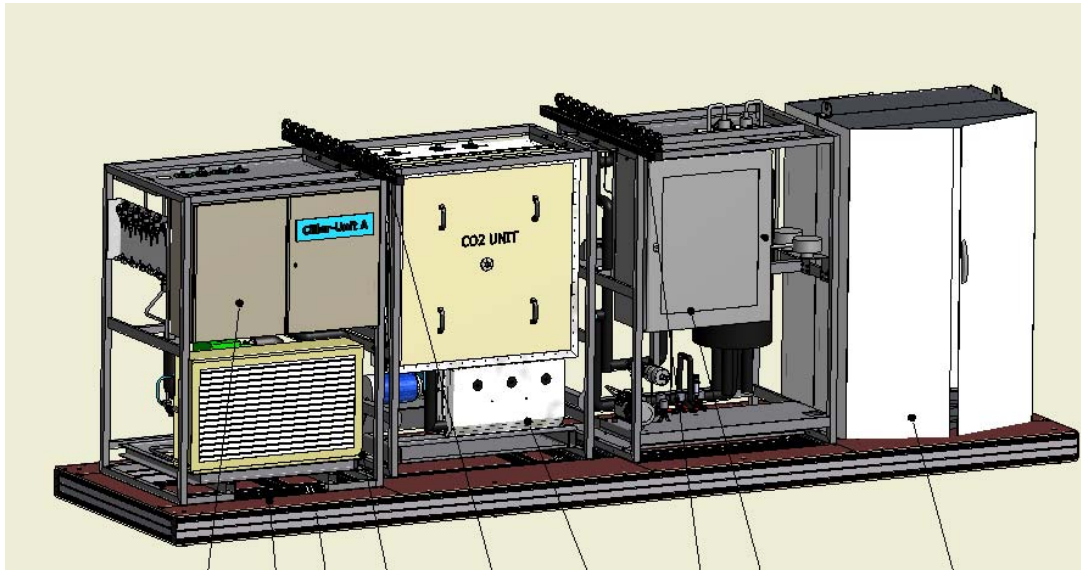
IBBelle CO2 cooling plant GUI in development for commissioning @ MPI

First GUI demonstrator according to new guidelines under development.
Milestone: Full system test during next test beam @ DESY (April 2016)

- CO2 Cooling unit (“IBBelle”) for VXD under construction at MPI (on schedule).

TÜV being involved in certification process.

A first meeting scheduled for Sep. 30 at MPI



Built in two phases (due to space limitations in Tsukuba hall):

1. “Little Brother”: fully functioning CO2 unit, but no operation redundancy
2. Later: add “Little Sister”, identical, but no accumulator



Construction on schedule, industrial chiller to be delivered end of September

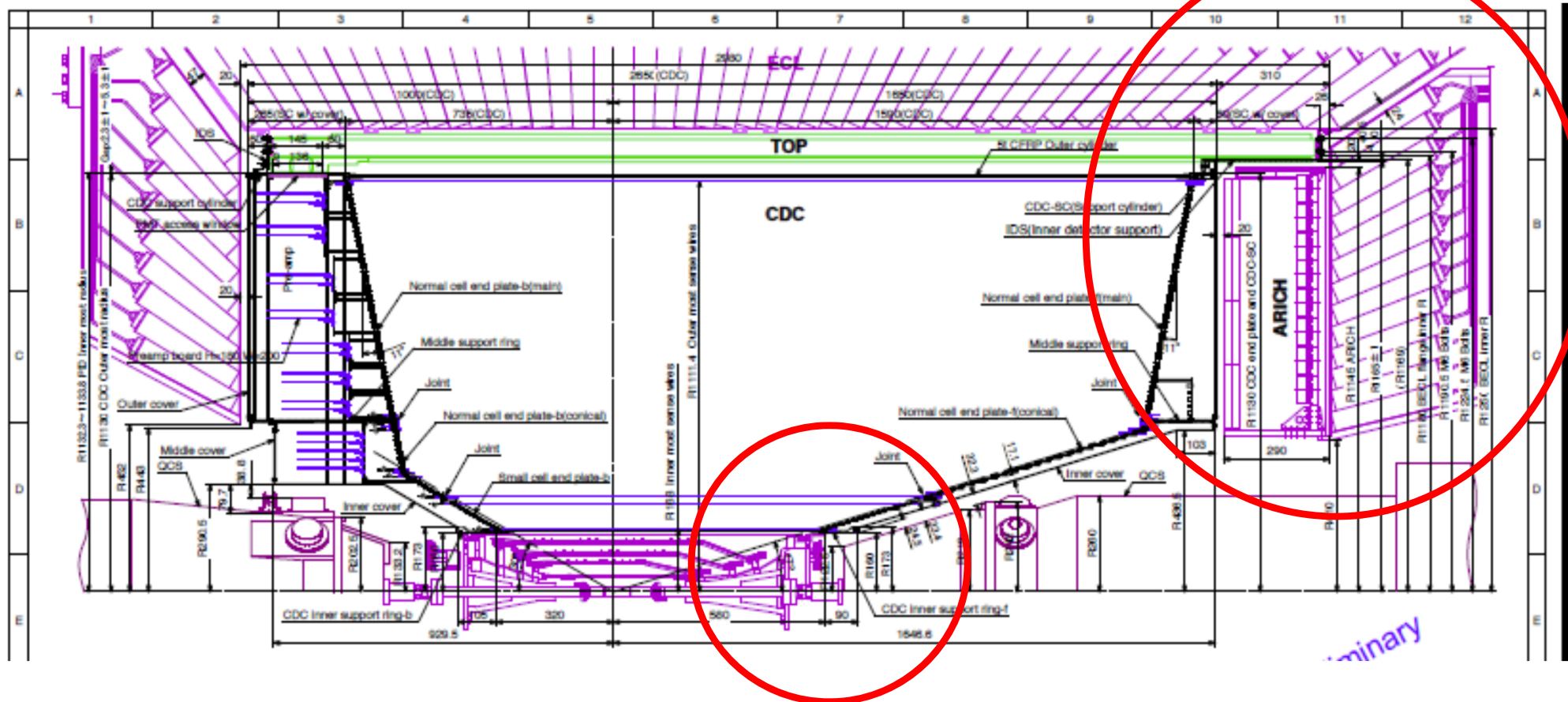
CO₂ cooling needed in the following phases:

- | | |
|--|---------------------------------------|
| - assembly of “DESY Test” ladders at MPI | MPI cooler
(alcohol, OK for SCB) |
| - DESY Test itself | MARCO
(needs new pump) |
| - Assembly of half shells @ MPI | MARCO (!?) |
| - BEAST Phase 2 @ KEK (in Belle) | IBBelle (decided) |
| - Test of VXD @ KEK B1 | MARCO (decided,
but needs CERN OK) |

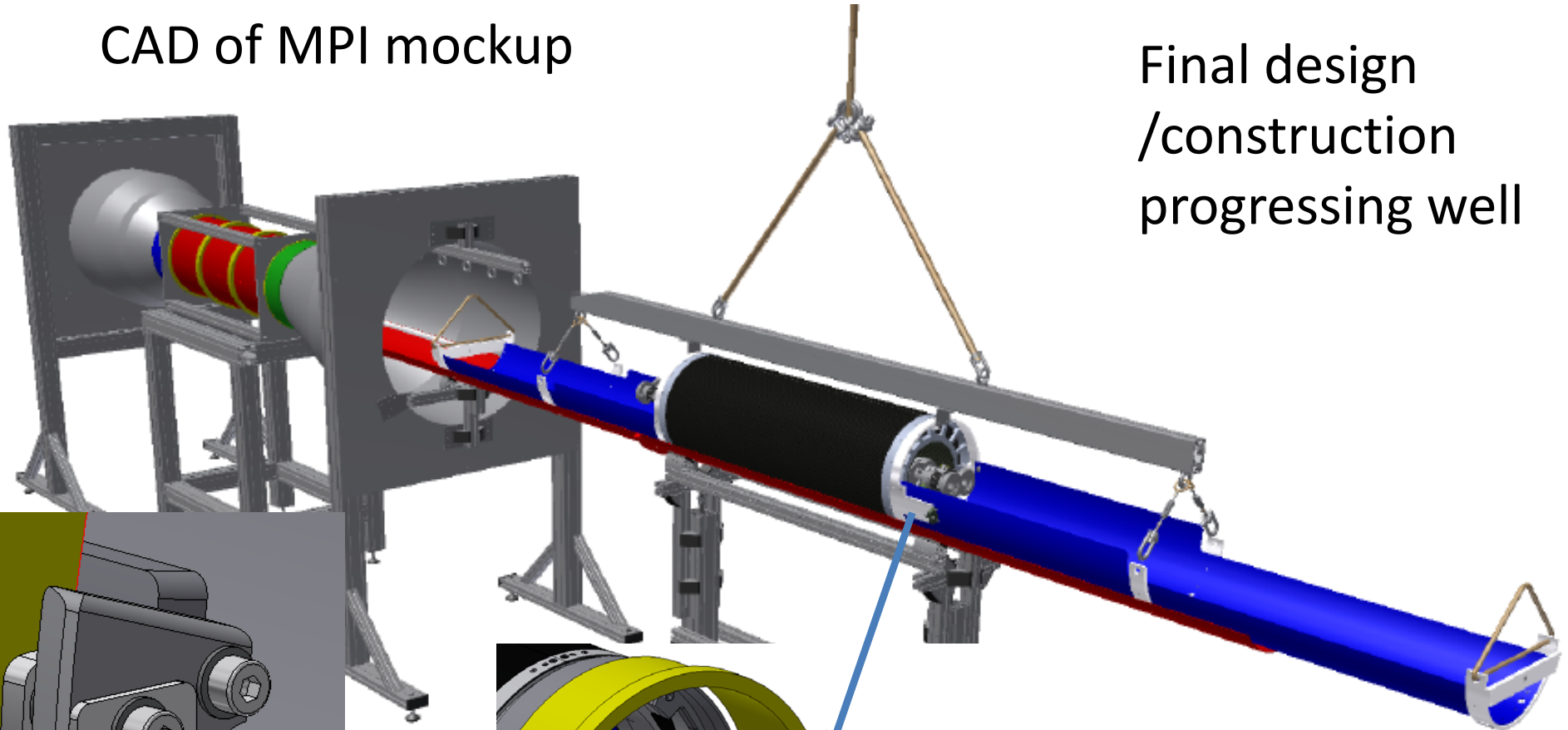
TÜV certification for MARCO also needed
(will be addressed in the pre-meeting with TÜV on Sep. 30, 2015)

Present activities:

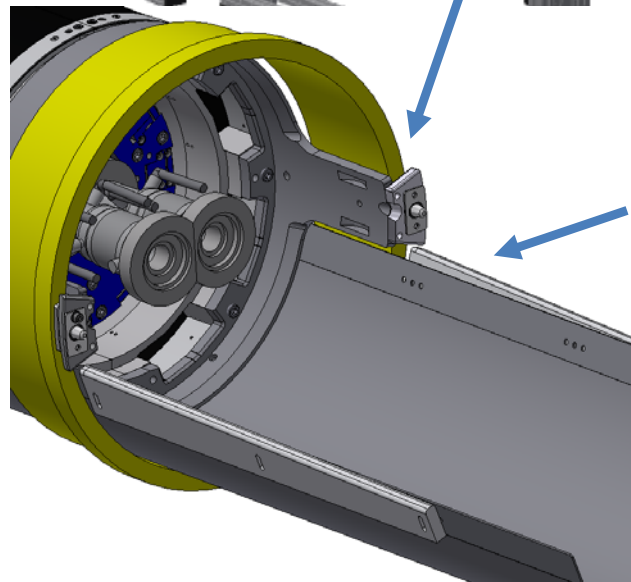
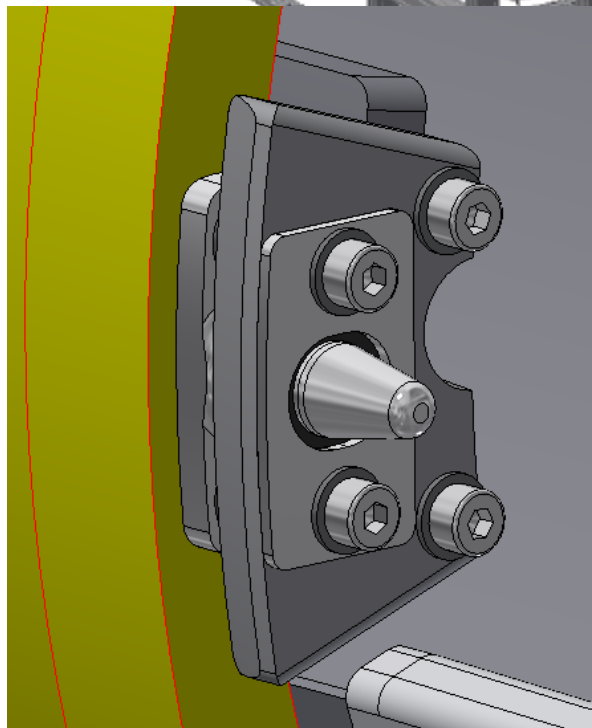
- Preparation of jigs for the module / ladder production
- Final design and construction for AIM and RVC
- Construction of IBelle and thermal mockup
- Work on service (cable routing)



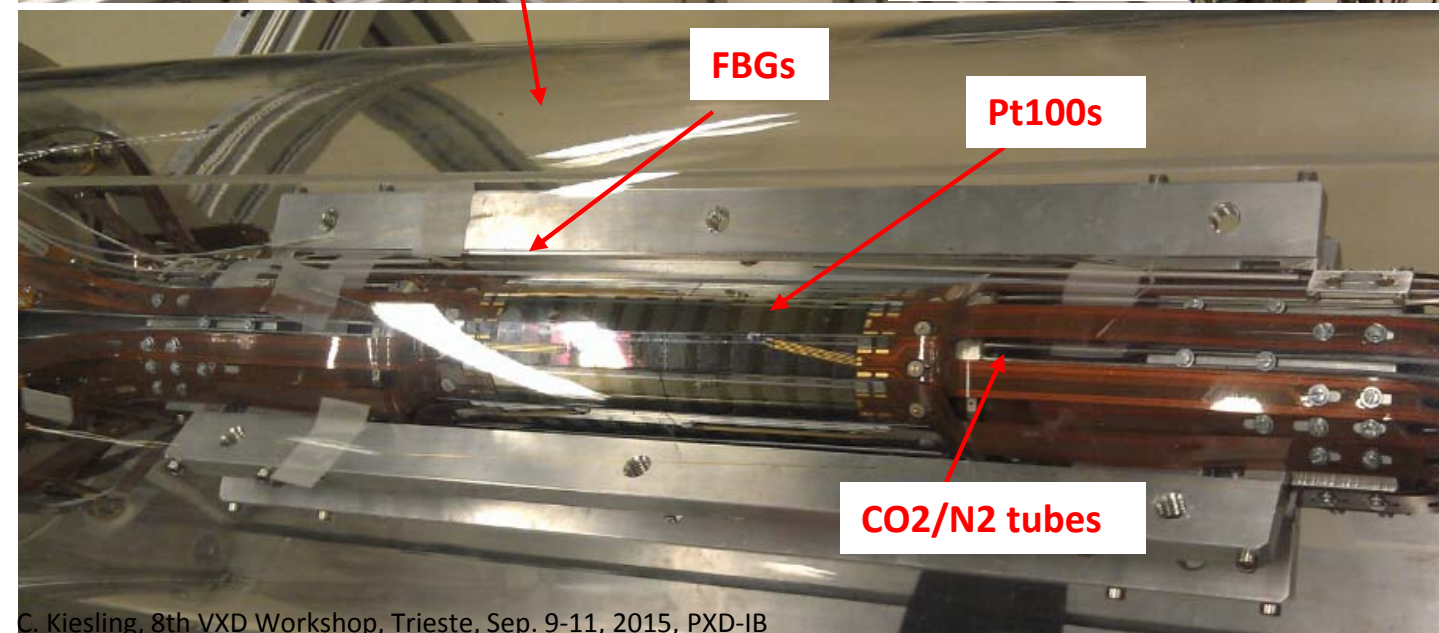
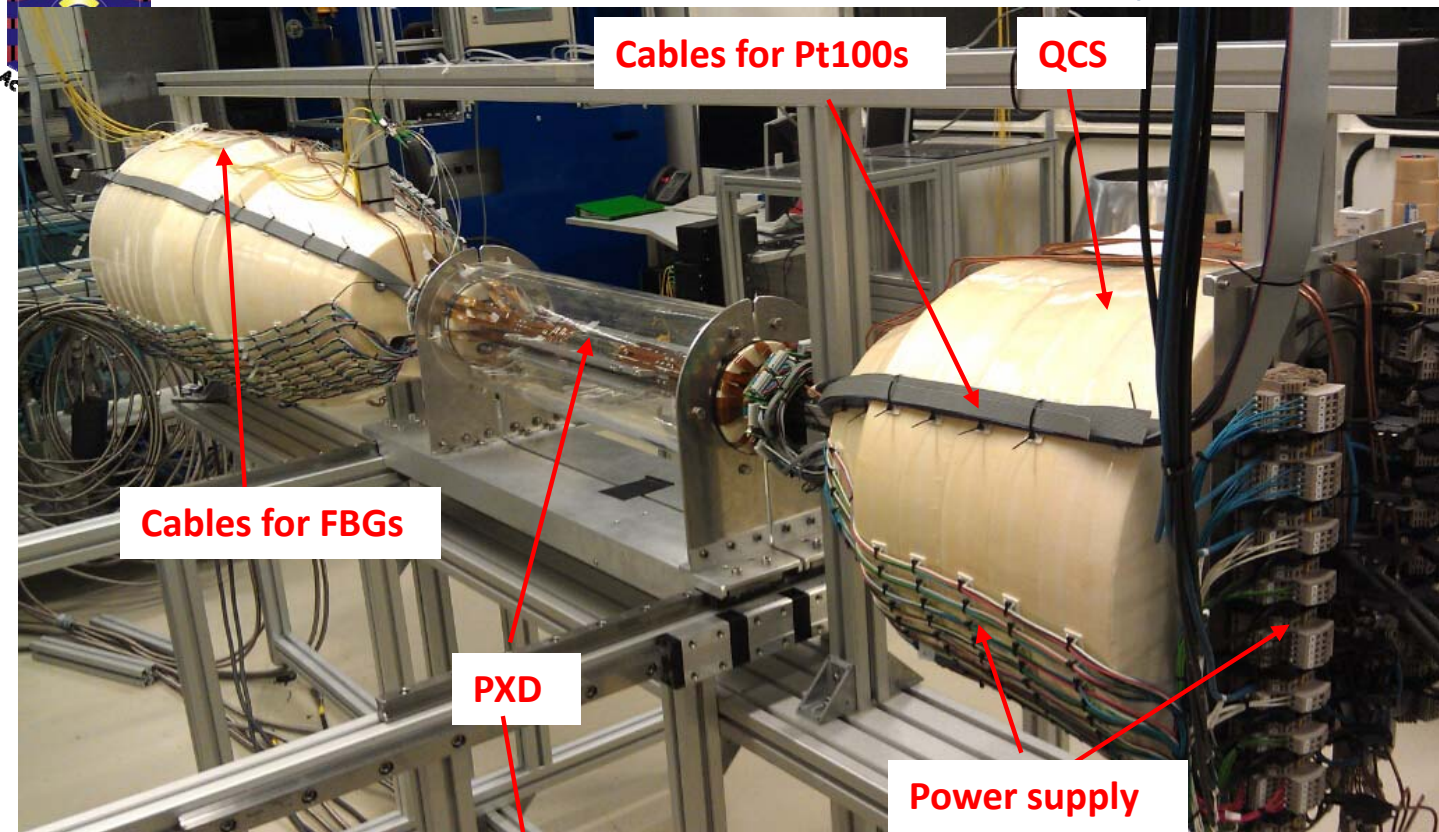
CAD of MPI mockup



Final design
/construction
progressing well



e.g. new design of
positioning pins at
CDC wall and torsion-
free sliding-in of VXD



The thermal mock-up:
optimize the cooling
system for the VXD

- 2 phase CO₂ to cool ASICs
- Colde N₂ to cool sensors / Switcher
- Pt100s to monitor temperatures
- Fiber Sensors (FBG) for temperature and humidity

Status:

- CO₂ and N₂ ready
- Pt100s / FBGs ready
- Power supply of PXD in preparation
- SVD ladders being prepared

- | | | |
|--|---------------------|-------|
| - Bare PXD9 pilot modules: | July 2015 | ✓ |
| - Decision of SMD site/process (-> HLL): | July 2015 | ✓ |
| - External ASIC review: | July 2015 | ✓ |
| - final ASIC submission: | Aug / Sep 2015 | (✓) |
| - first pilot modules assembled: | September 2015 | (✓) |
| - pilot module testing: | Sept - Nov 2015 | |
| - start main sensor metallization (Phase 2/3): | December 2015 | |
| - final ASICs tested: | February 2016 | |
| - test beam (DESY) with final ASICs: | April 2016 | |
| - Install IBelle (Unit A) at Tsukuba hall: | Summer 2016 | |
| - Commission BEAST 2 detector: | February 2017 (?) | |
| - PXD at B1: | March 2017 (?) | |
| - VXD Integration and Cosmic Tests (B1): | June 2017 (?) | |
| - VXD installation | Summer 2018 | |

- CO2 cooling strategy for BEAST 2 and VXD Commissioning
- Preparation of DESY VXD Test
assembly of 2 PXD ladders on SCBs + SVD 4L cartridge
(special support for SCBs, replacing the beam pipe)
- Pre-assembly of BEAST 2 commissioning detector in Europe
(2 PXD ladders, 4 FANGS, 2 CLAWS, 2 Plume ladders = "PXD-type")
- Final assembly of BEAST 2 commissioning detector at KEK
"PXD-type" to be mounted on beampipe, add SVD 4L cartridge)
+ all services
- Commissioning Team BEAST 2
Who will lead the BEAST 2 campaign: Carlos Marinas + ?
How many people are needed, who will be in the crew?

We need to better document the work share between European groups and our Japanese colleagues.

IBBelle will cool BEAST Phase 2

MARCO will cool the PXD / SVD / VXD setup in B1

Examples: We need to provide a list of services for the CO2 cooling unit IBBelle, such as

- European 3 phase power supply with 65 A current limit,
- water supply specification, including connectors
- N2 supply with min pressure and flow rate
- piping from IBBelle to the junction box,
- support for junction box and manifolds
- vacuum pump for flex lines

We need to write threquirements down in a document, check and sign mutually and put the document onto the Twiki

Let us proceed step by step:

- CLAWS BEAST Phase 1 Frank Simon (confirmed)
(this project is already ongoing -> still document useful)
- CO2: IBelle and MARCO Hans-Günther M. (proposal by PL)
- BEAST Phase 2
Commissioning Leader Carlos M. (proposal by PL)
 - > need to define a deputy from the SVD crew
 - > need to form a commissioning team
 - > collect the requests for services provided by KEK, e.g.
P/S, N2, vacuum etc.
- Installation of services, e.g. requirements for brackets to fix CO2 lines
and cables across the CDC endplate (already needed for Phase 2)

DCD testing and optimization is ongoing,
new measurements are coming in (see parallel session),

- need to be understood and
- analyzed for relevance to the coming DCD submission
(towards end of September, not later)

Essential: involve KIT (Ivan) in the analysis NOW

Proposal: find a common set of dates in the coming weeks to
discuss with Ivan

agreed by colleagues concerned

PL has contacted Ivan by email

Quality Check List for PXD9 production (trained with pilot run modules)

First Module is ready up to Kapton attachment: this will happen next week

Important coming months: Test of Pilot Production modules

Goal #1: verify metallization process

Goal # 2: find so far unknown bugs in the ASICs
(e.g. in tests of the Gated Mode)

Crucial: need to prepare a **solid test program** addressing the two issues

Goal # 1 must be reached by end of November: Phase 2/3 of DEPFET
Production must be started in December

For Goal # 2 we might have some one more month (end of 2015)

- Need to apply for the DESY Combined Test

- Coming Dates:

KEK	VXD Mechanics Gemba	Oct. 17
KEK	BEAST 2 mini workshop	Oct. 18
KEK	B2GM	Oct. 19 – 23
KEK	VXD - BPAC	Oct. 24 - 26
[DESY?]	Next VXD Workshop	April 2016