

„VXD Matters“

- News from BPAC Meeting on Sept. 9-12, 2013:
 - PXD issues
 - VXD Installation
 - Slow Control
- PXD Preparations for the DESY Test
- CO2 Issues
 - Thermal Mockup
- General Schedule for Belle II
 - On Commissioning
- Coming Meetings
- Conclusions



B-factory Programme Advisory Committee Belle II Focused Review Summary Report

9-12 September 2013 at KEK

D. Brown (LBL)*, D. Cassel (Cornell), W. Cooper (FNAL),
M. Demarteau (ANL), J. Haba (KEK)*, M. Kuze (Tokyo Inst. Tech.)*,
H. Tajima (Nagoya)*, B. Ratcliff (SLAC)*, P. Rieder (CERN)*,
J. Schwiening (GSI)* M. Sullivan (SLAC)*,
and chaired by T. Nakada (EPFL),

*Partially present

Draft version 2

Focus on TOP, PXD, SVD

Generally the preparation for the construction of the PXD is progressing very well and the tasks are clearly attributed within the different teams in the group. The progress on the system level and the integration is commendable. Presently no schedule delays have been indicated. However, the following actions are recommended:

DESY
test

- It is recommended to continue work on the integration and the study of the system level aspects. The beam test in early 2014 at DESY will be a first possibility to study the system aspects of the different VXD components together. It is encouraged to include as many final elements as possible into the system level tests and to continue working on the mock-up tests.

EMCM

- The issue of the aluminium hillock formation has been addressed and a mitigation plan was presented. It is suggested to follow closely the investigation of the metal-metal2 problem in the EMCM and sensor production and give an advanced warning in case a solution cannot be found in the estimated time.
- The production of EMCMs is an important step to monitor the processing and provide components to exercise the assembly and mounting procedure. It is suggested to continue in this direction.
- First tests of the auxiliary ASICs mounted on an EMCM show no major problems. It is recommended to continue these tests to validate as soon as possible a full chain with near final elements.
- Identifying a collaborating institute or company that will take up the mounting of the passive components is recommended.

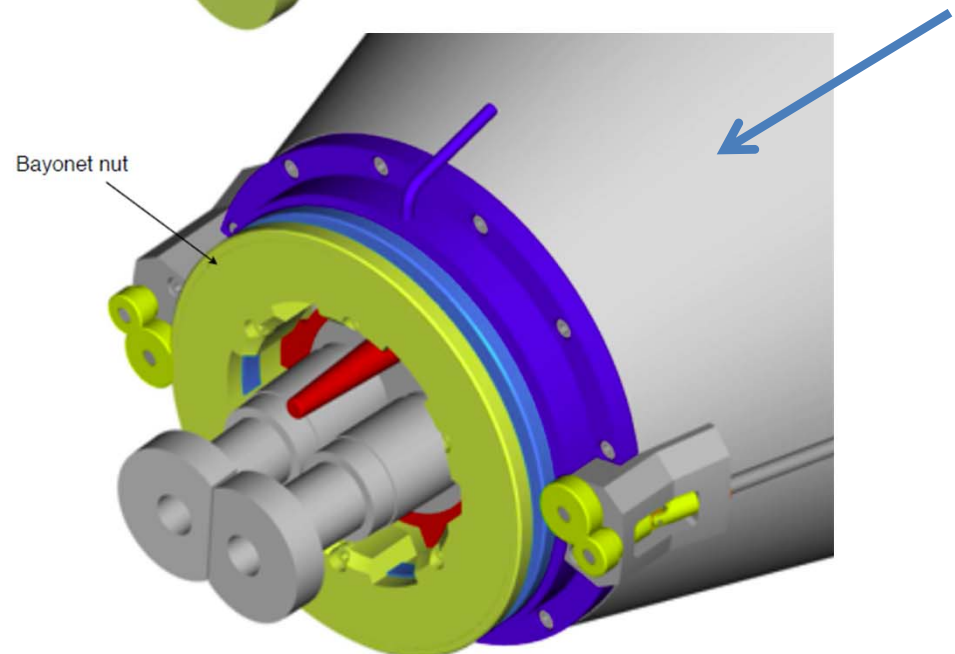
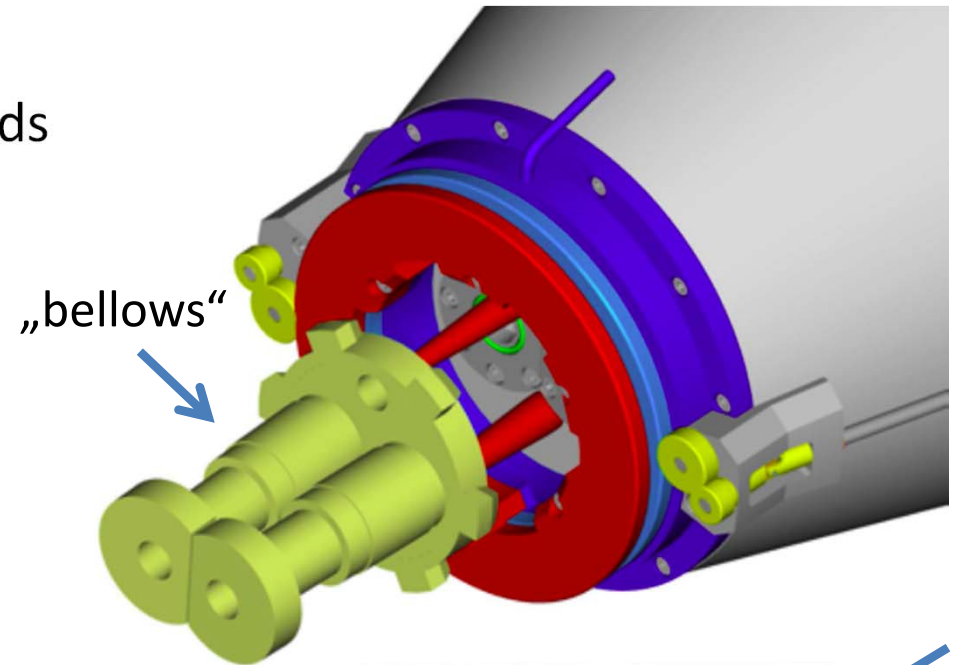
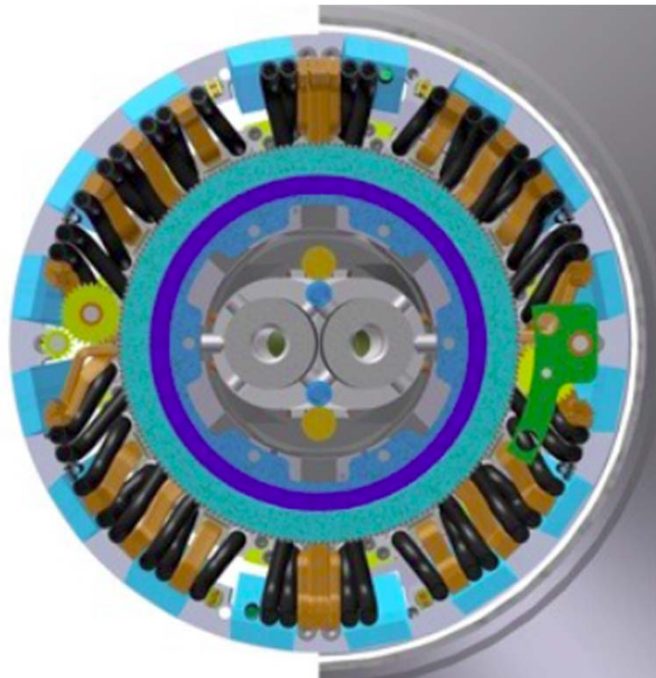


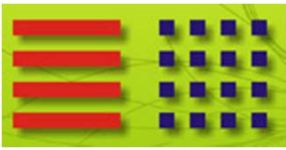
To RVC or Not to RVC

A decision for (or against) the RVC will heavily influence the installation methods for the VXD.

2 Options considered:
one favored by the machine, and
one favored by the VXD groups

Concern by the machine: How to access the bellows in case of repair

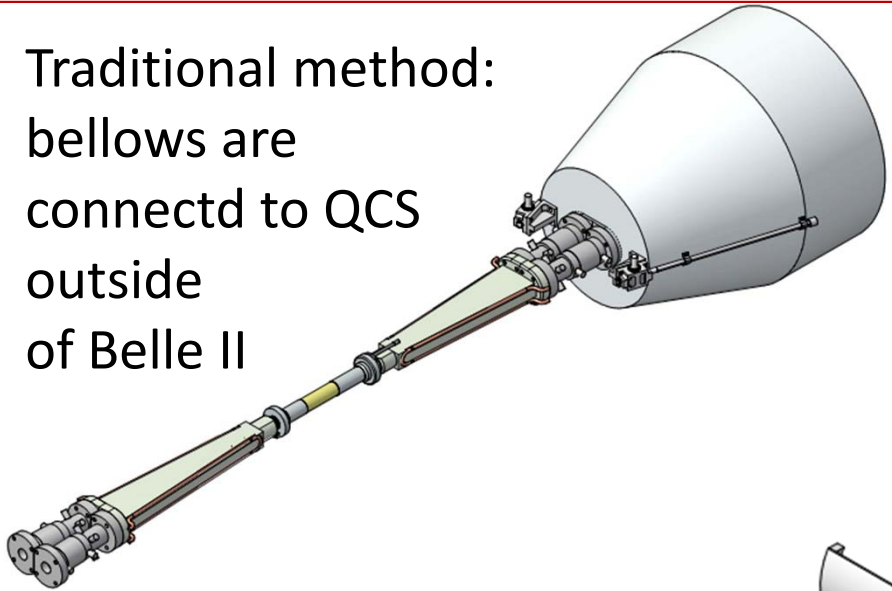




Baseline Installation Method (BIM)



Traditional method:
bellows are
connectd to QCS
outside
of Belle II

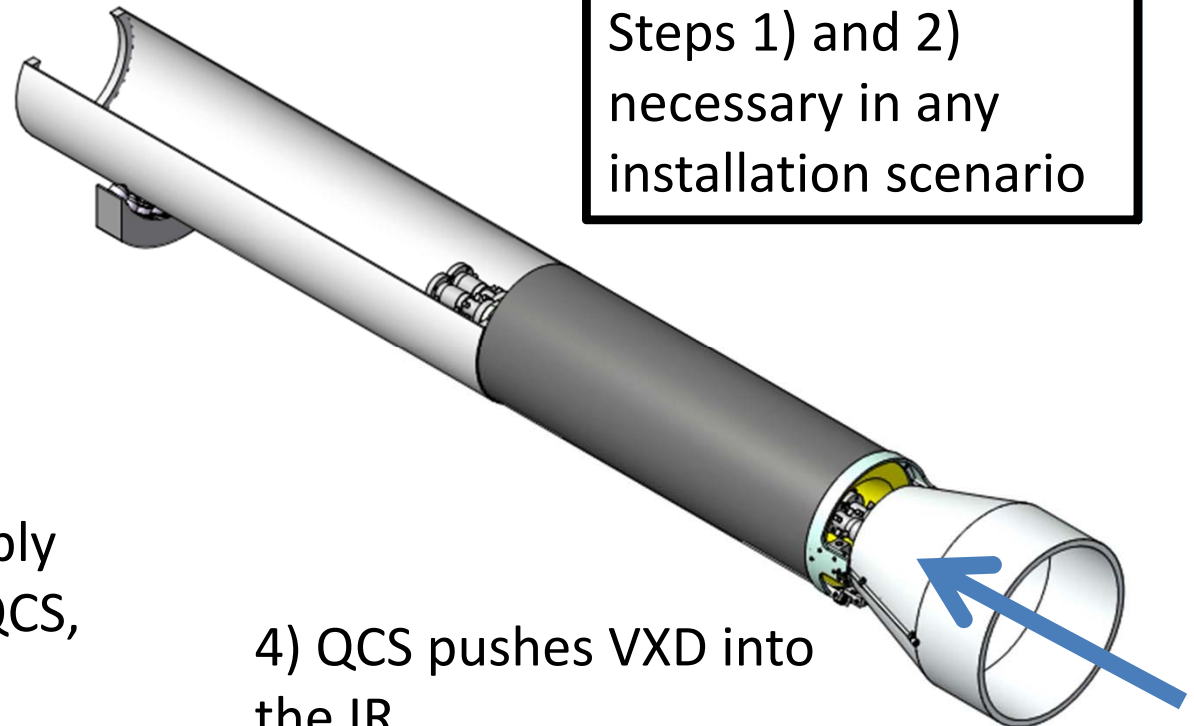


1) Connection of bellows with
beampipe and tightness checks are
done BEFORE any steps towards
assembly of the VXD are taken.

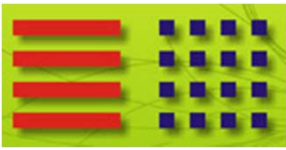
Steps 1) and 2)
necessary in any
installation scenario

2) VXD assembled around HM
and beampipe (not shown
here)

3) Beampipe + HM + VXD assembly
Then mounted onto the (FWD) QCS,
vacuum connection on QCS side



4) QCS pushes VXD into
the IR
(no tactile feedback)



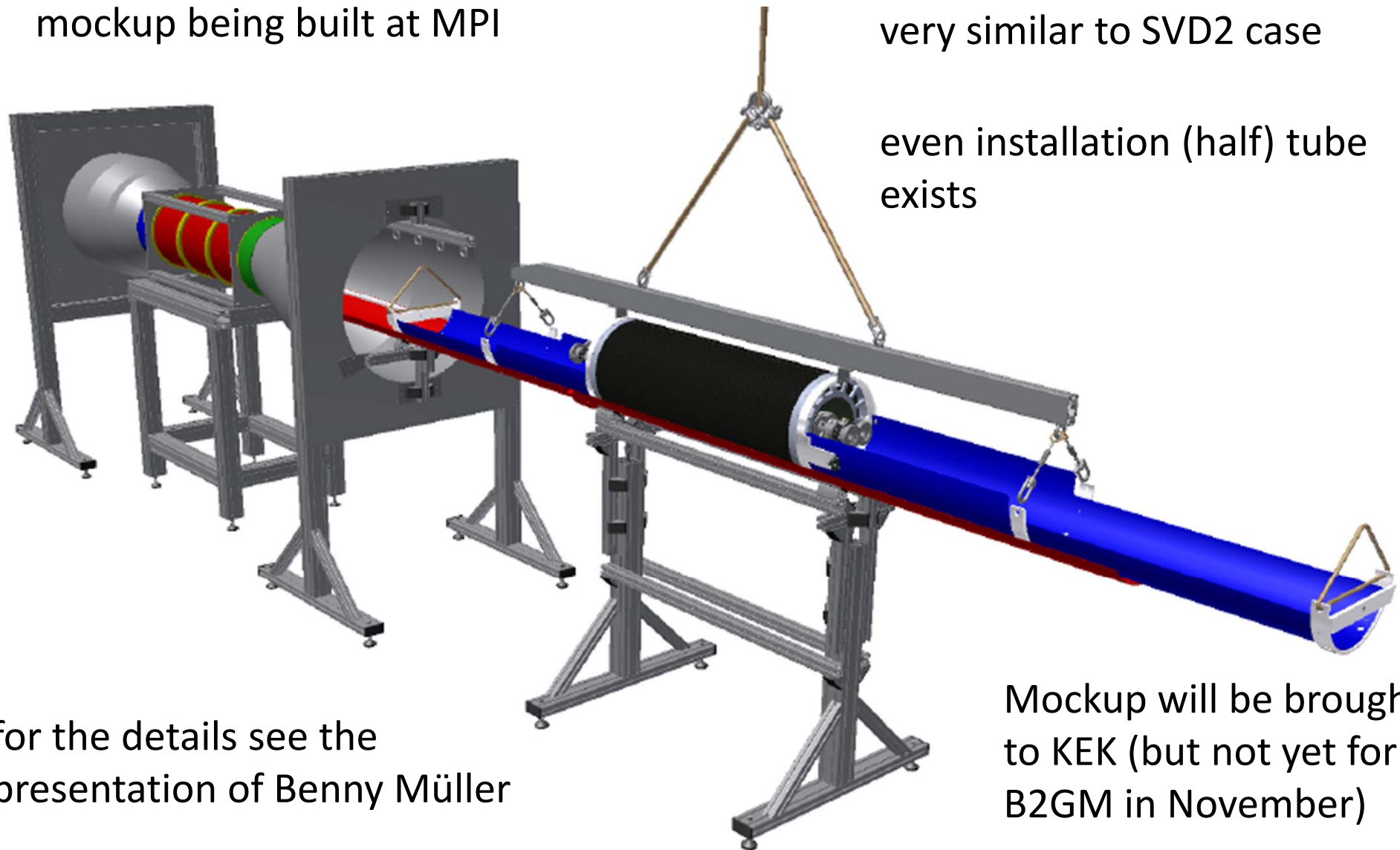
Alternative Installation Method (AIM)



Method developed and designed,
mockup being built at MPI

very similar to SVD2 case

even installation (half) tube
exists



for the details see the
presentation of Benny Müller

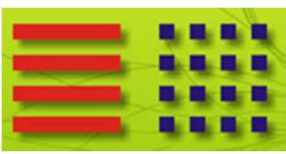
Mockup will be brought
to KEK (but not yet for
B2GM in November)



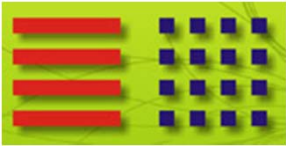
Comparison of Installation Methods



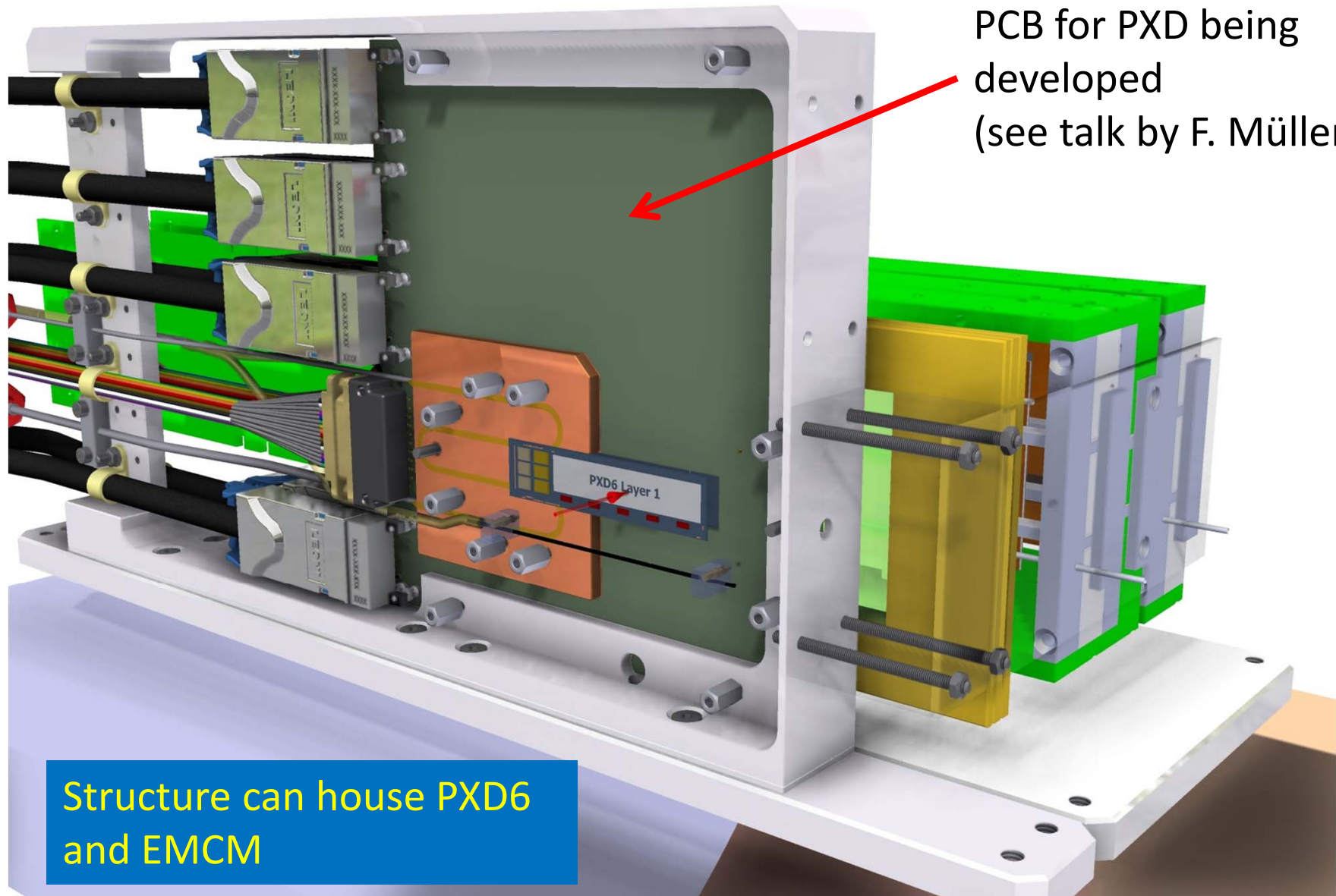
Item	Baseline	Alternative option
fixing cables+pipes from VXD between end flange and docks (FWD)	on QCS before install	on CDC after install
Cable and pipe connection in dock area	after installation	after installation
service work FWD	work in dock area, space limited by QCSR (difficult)	work in dock area, no QCSR
constraints on cables / pipes (FWD)	fixed to QCS and to CDC (docks): movement of QCS relative to CDC ??	fixed only to CDC (docks)
Cable stress estimation to VXD structure on operation	Need verification	No issue after installation
service work BWD	identical	identical
QCS disassembly	disconnect all cables on BWD and FWD, dismount dock boxes, disconnect all CO2/air pipes, separate VXD from QCS after pull-out	VXD not involved
install/de-install bellows (FWD)	outside detector, after dismount VXD from QCS (easy)	inside CDC cone (difficult and risky)



- A single framework for the Belle II experiment, which includes slow control, monitoring, alarms and interlocks, should be developed. Failure modes should be analysed together with their consequences during the development of the framework. Necessary actions and recovery procedures must be in place together with the evaluation of necessary hardware so that the detector will not be damaged by the possible emergency cases, such as power cut and cooling failure.
- It is important to demonstrate in the DESY Test a viable concept for the Slow Control of the VXD (PXD and SVD) based on EPICS.
- This should include not only the Power and Cooling, but also the environmental sensors and, if possible, status information on the incoming data.
- The SC for the Silicon systems could serve as an example for Belle II.

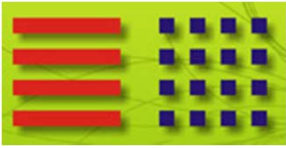


„PXD“ in the DESY Test

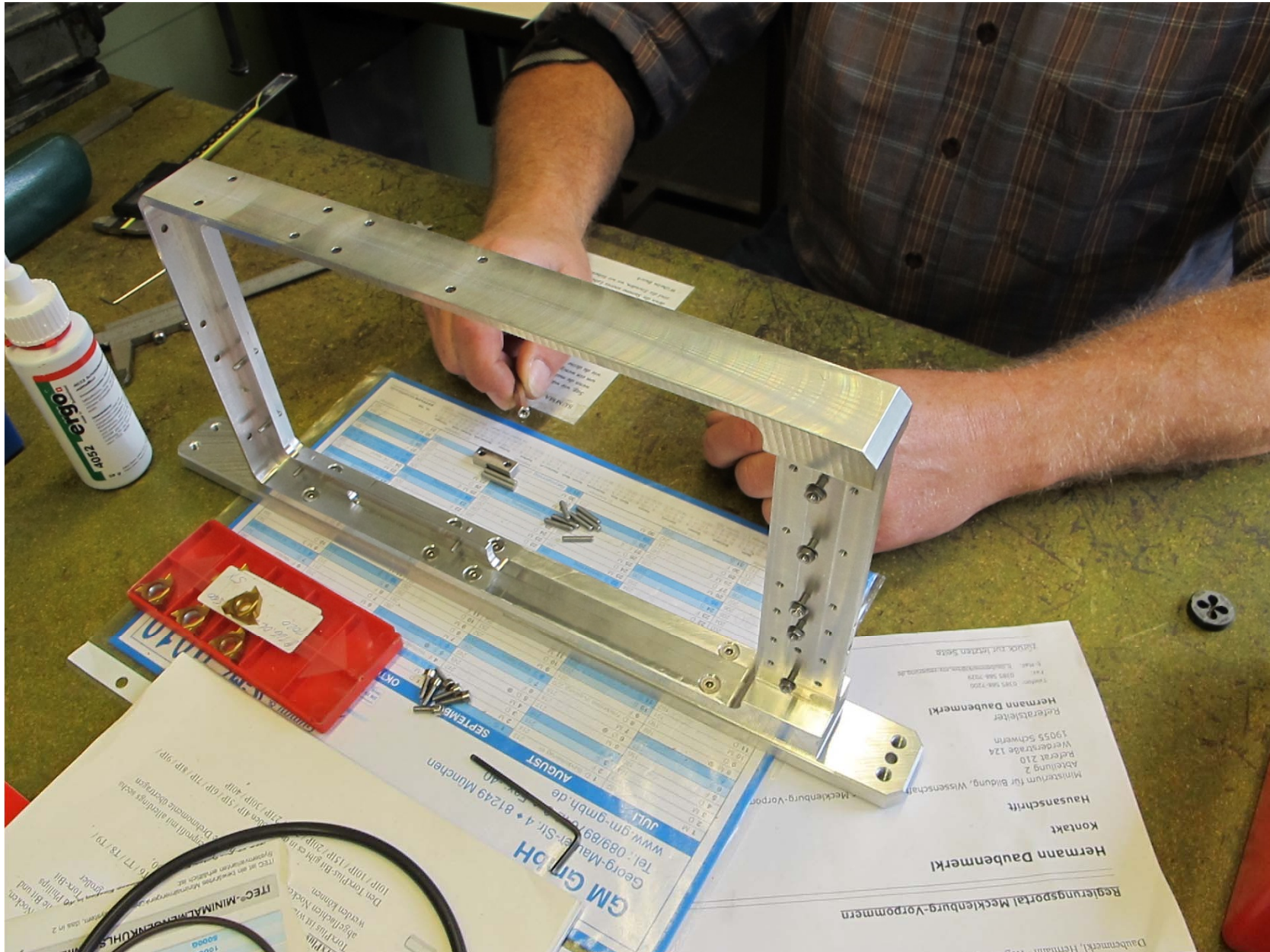


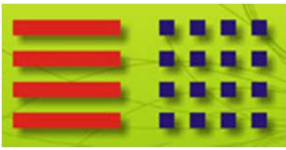
PCB for PXD being developed
(see talk by F. Müller)

Structure can house PXD6
and EMCM

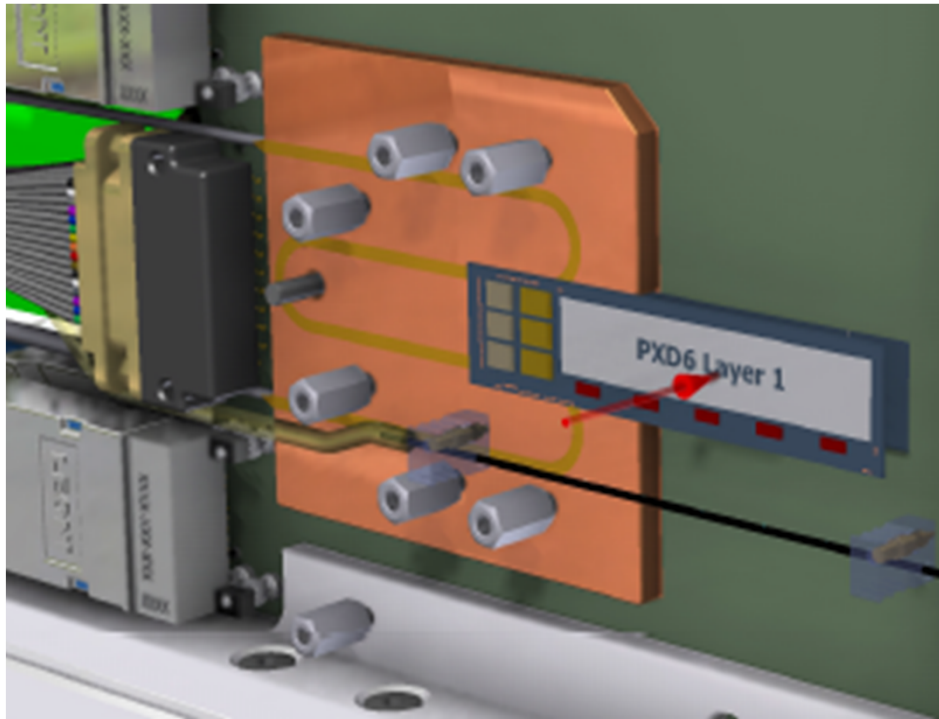


PXD Frame for the Belle II





EMCM and PXD6 Tests



Essential to have two large PXD6 matrices operational for the DESY test

Three PXD6 large matrices exist:

2 are being prepared for the DESY test
(1 will be waiting for new DHP)

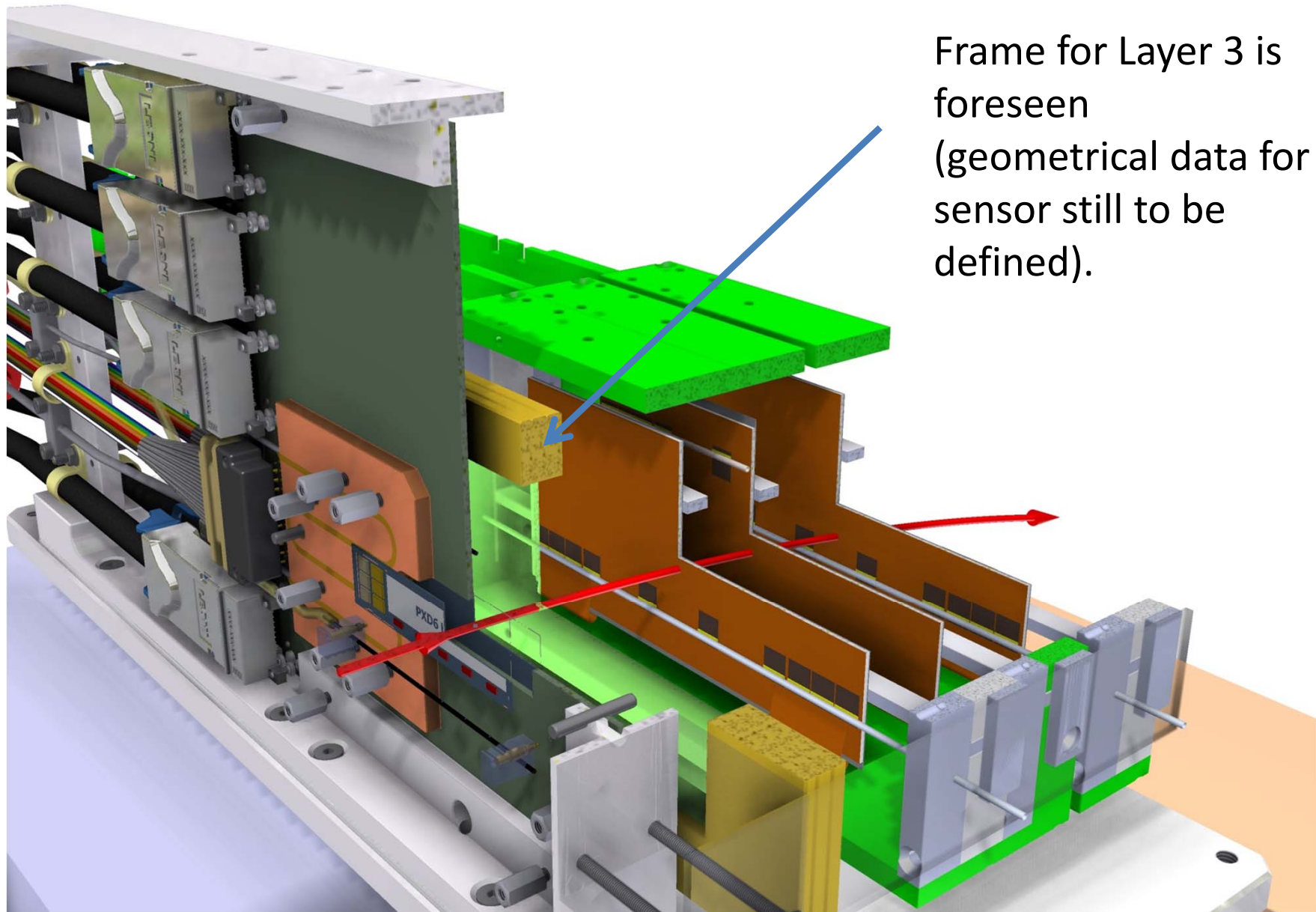
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Next step: flip chipping at IZM

(see Jelena's and Laci's presentations)

- Continued testing of EMCMs mandatory: PXD9 metallization depends on it.
- However: conflict with testing PXD6 for DESY Test (set-up, manpower)
- decided to operate second set-up in parallel with new manpower: M. Valentan

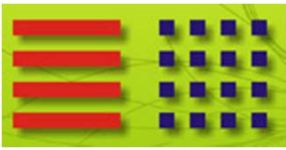


„VXD“ in the DESY Test



Frame for Layer 3 is foreseen (geometrical data for sensor still to be defined).

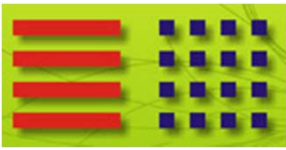
see Wednesday presentations ...



Thermal Mockup



- Thermal Mockup very important: many open questions, difficult to model
- Major effort launched at DESY to build and fully test a realistic thermal mockup of the entire VXD (CO₂ cooling by MARCO)
- Mockup includes beampipe + paraffine cooling, PXD with thinned sensors mounted on the „final“ cooling blocks. heating elements simulate ASICs.
- For the SVD a similarly realistic mockup needed, including CFRP cones, endrings and CO₂ cooling pipes + heating elements to simulate APV25's. CFRP enclosure needed for realistic heat transfer simulation to the outside.
- Efforts on the PXD side: design and fabrication of new FWD cooling block thinned „PXD9“ dummies for full detector, Kapton dummies to simulate heat load and transfer, (all by the end of the year)
- Important: start designing test procedures (sector / half / full detector)



CO2 System for VXD



IBBelle

- Cold CO2 line
- Cold R404a line
- Warm service line

System A

System B

insulation

Fill port

Fill port

FL106

FL306

MV106

MV306

ET106

ET306

FL104

FL304

PT104

PT304

TT104

TT304

LP10

LP301

EH101 / EH102 / EH103

EH301 / EH302 / EH303

TT101 / TT102 / TT103

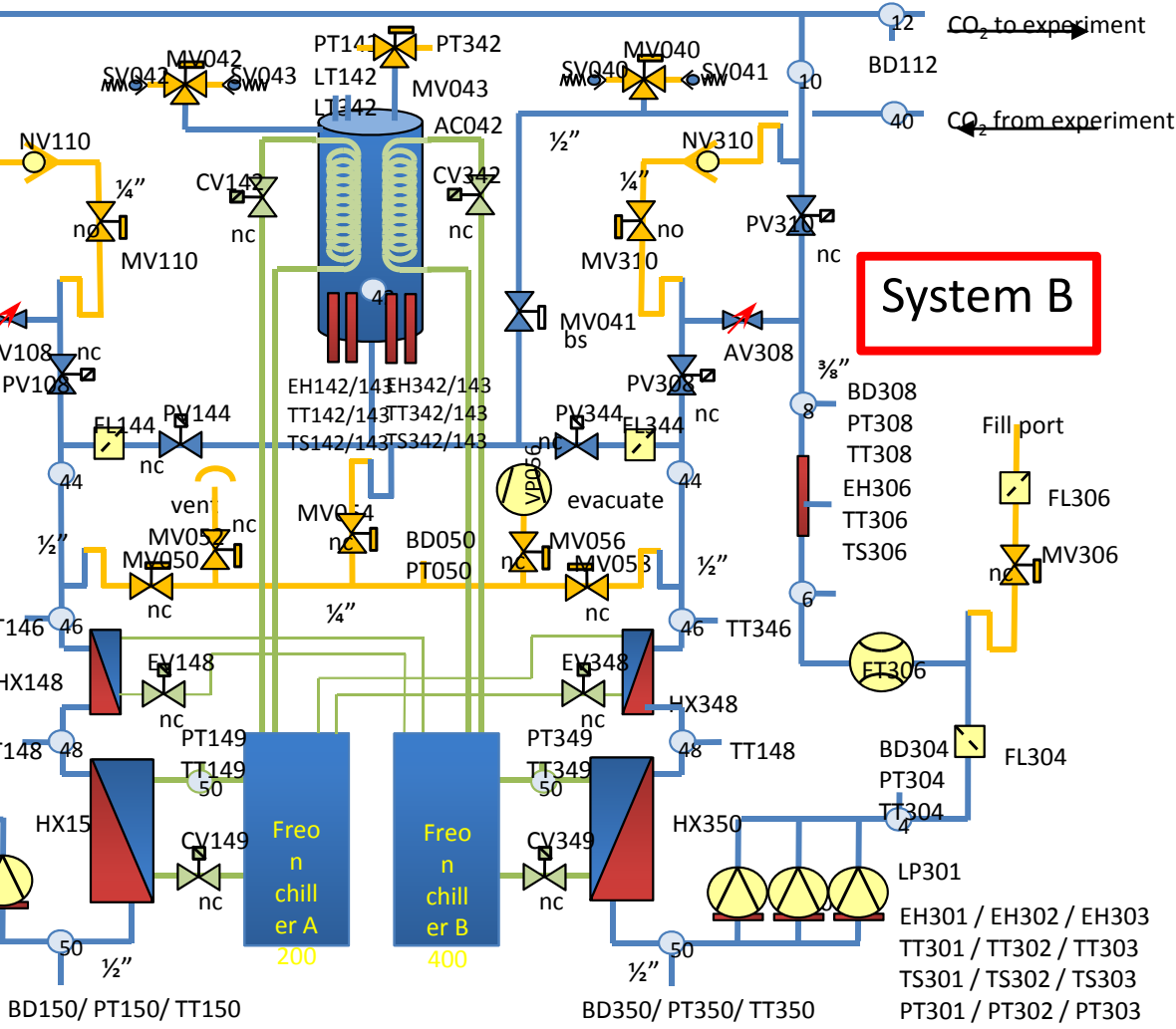
TT301 / TT302 / TT303

TS101 / TS102 / TS103

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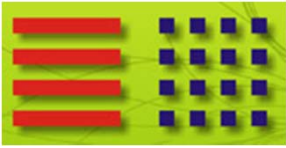


2 completely independent systems A&B, sharing the accumulator vessel only

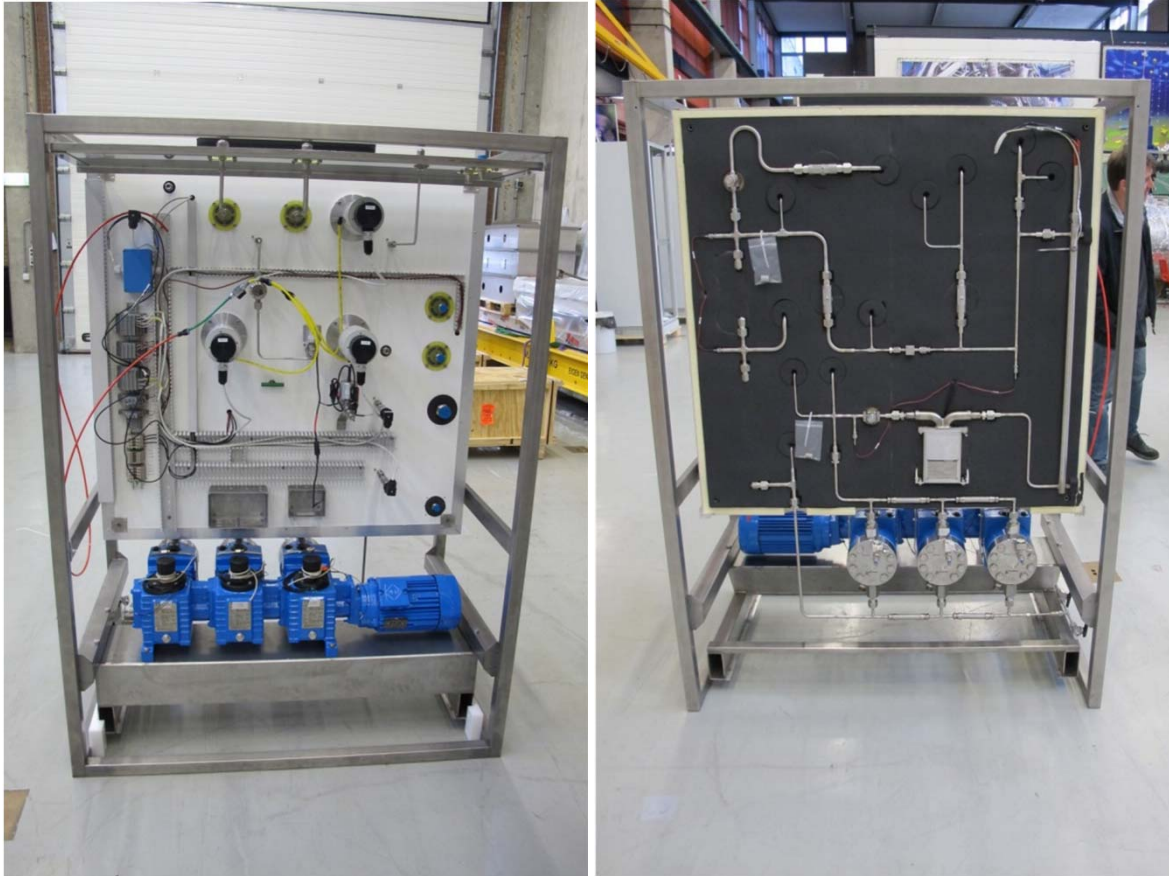
System developed by NIKHEF/CERN together with MPI for ATLAS IBL and Belle II

(IBBelle being delivered now for ATLAS IBL)

Other components:
vacuum-insulated transfer line to junction box / manifold
Vacuum-insulated flex lines from manifold to detector



IBBelle Unit B (Visit at NIKHEF)



3D-model of IBBelle exists

production drawings with recent changes being done

Commissioning at CERN in January to March, training for operators in April / May.

MPI will build an exact copy, starting in spring 2014

The bad news:

IBBelle (A&B) is very expensive:

From NIKHEF (materials, no tax):

~ 250 000 € (hardware)

~ 120 000 € (electronics)

almost ready to be transported to CERN ...

... more details by Luigi Li Gioi



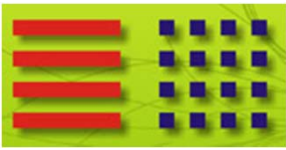
Schedule for VXD Cooling Systems



		2013				2014				2015	
Schedule for CO2 Cooling System		1st Q 13	2nd Q 13	3rd Q 13	4th Q 13	1st Q 14	2nd Q 14	3rd Q 14	4th Q 14	1st Q 15	2nd Q 15
Commissioning of MARCO		█		█	█	█					
IBBelle	Design		█	█							
	Construction				█	█	█				
	Commissioning							█	█		
	Transport to KEK									█	
	Installation at KEK										█
Junction Box	Design		█								
	Construction			█							
	Test				█						
	Installation					█	█			█	
Manifolds	Design			█							
	Construction				█						
	Test					█					
	Installation						█	█		█	
Transfer lines	Design				█						
	Construction				█	█	█				
	Test						█				
	Installation								█	█	
Cold Air / N2	Design					█					
	Construction						█				
	Test							█			
System Integration	at MPI							█	█		
	at KEK										█



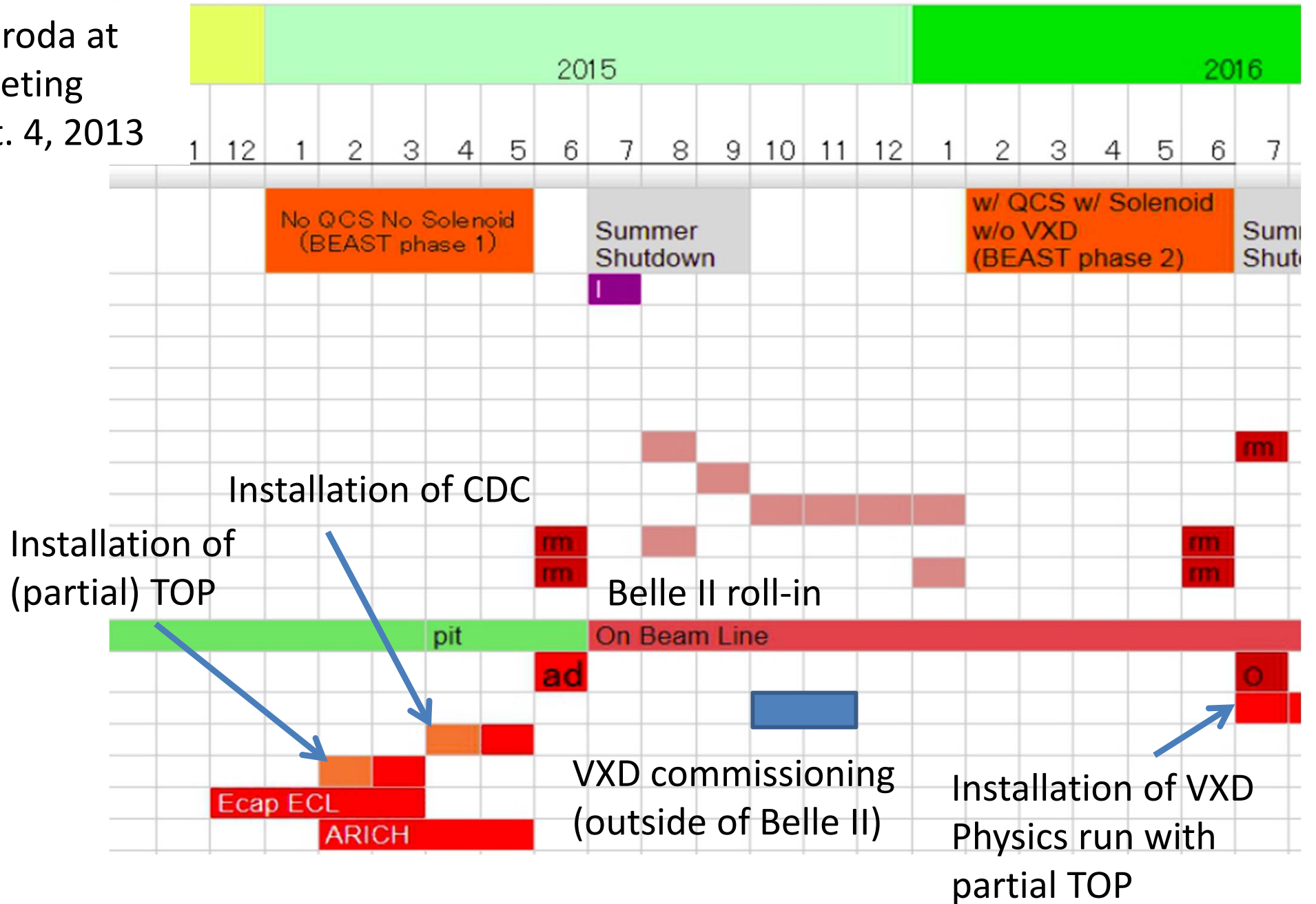
install CO2 System at KEK in April 2015

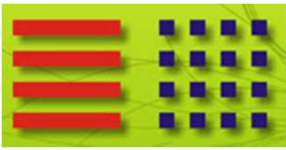


General Schedule for Belle II



Y. Ushiroda at
EB Meeting
on Oct. 4, 2013



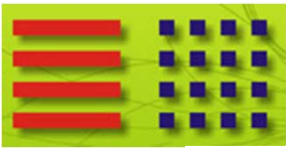


- Commissioning the PXD / SVD is a major task, needs thorough preparation:

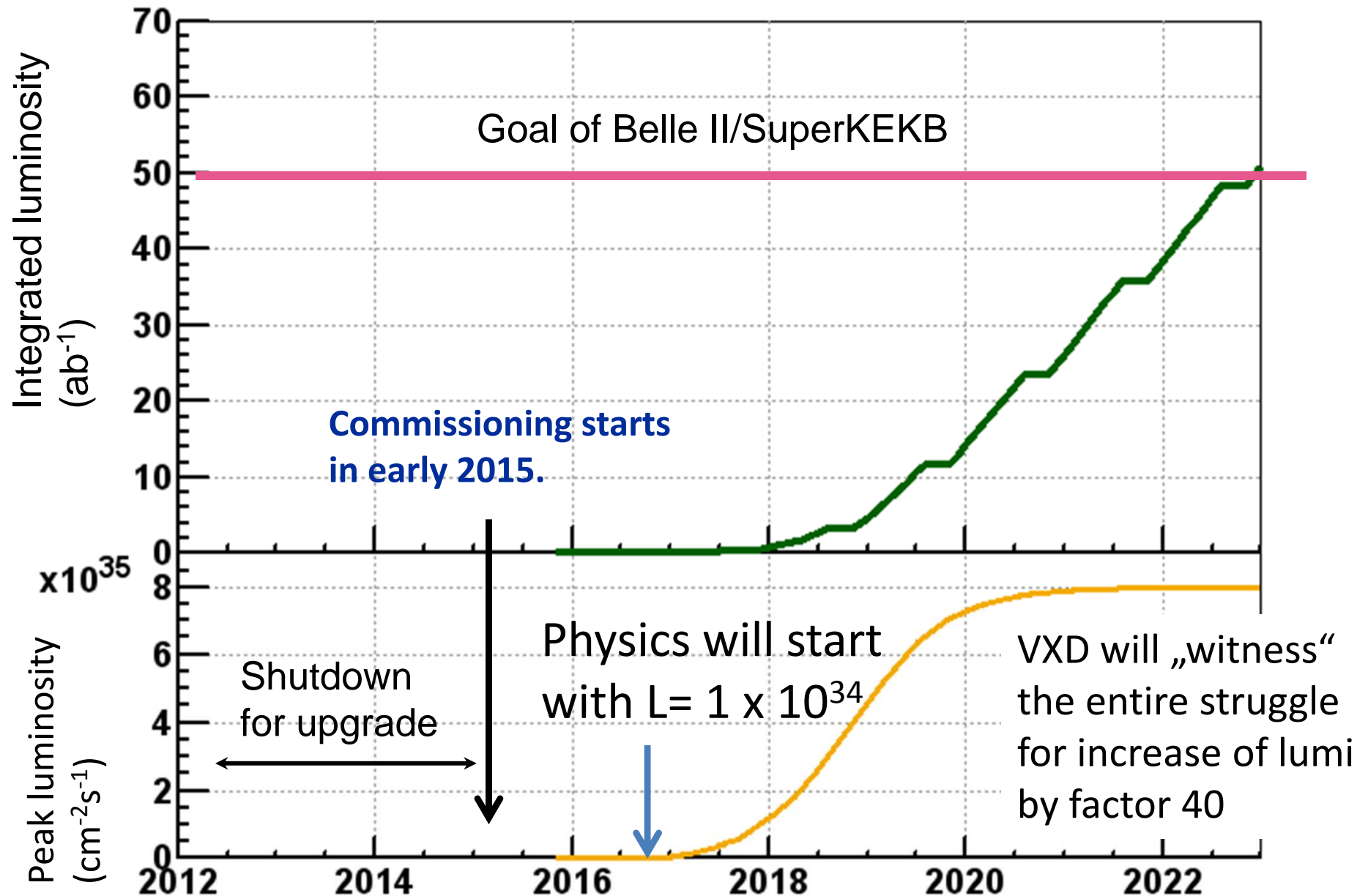
Hardware AND Software AND People

- Phase „0“: The DESY Telescope Test - an excellent first exercise
- Phase „1“: The Beast (I & II) - learning about the machine background
- Phase „2“: The „real thing“ - when it all comes together ...
- Proposal: Let us develop a first approximate installation and commissioning scenario for the two phases to come, based on the experience we get right now.

Target date: B2GM in February 2014, with first ideas for B2GM in Nov. 2013



Climbing up in Luminosity



„Upgrade“ of PXD (new production) seems mandatory

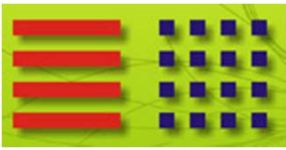
Calendar Year



Coming Meetings



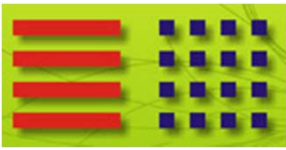
- B2GM at KEK, Nov. 2013
- VXD Meeting, DESY January 20, 2014 (?)
- B2GM at KEK, Feb. 5-8, 2014
- BPAC Meeting (at KEK), Feb. 9-10, 2014
- International Workshop on DEPFET Detectors and Applications
Kloster Seeon, May 25-28, 2014
- B2GM, July 2014 Meeting is no yet fixed (when, where ?)



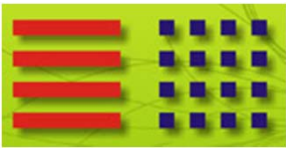
Conclusions



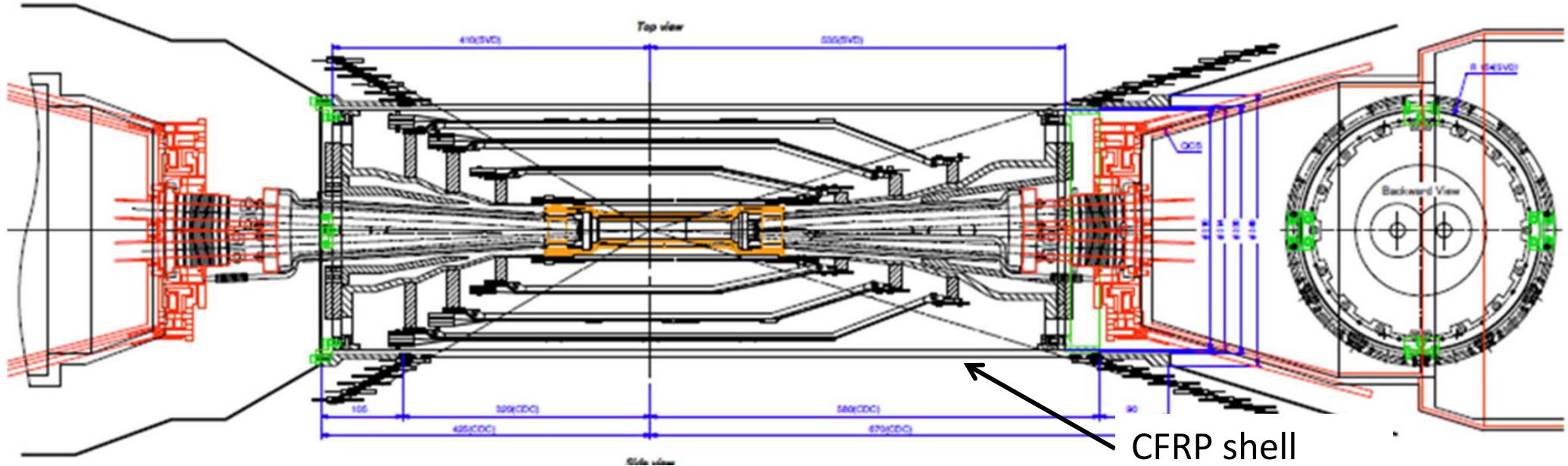
- Draft of BPAC Focused Review encouraging: strong support for the ongoing DESY Telescope Test: first successes for the new PXD DAQ
- First SVD / PXD Meeting with real „commissioning“
- PXD6 modules scheduled for beginning of December
bottlenecks: ASIC selection, flip chipping and subsequent testing
- Items needing attention: RVC and Installation Method:
Need to intensify analysis and come to a clear statement from the VXD groups
- Strong support by new Italian groups (hardware and software)
- Growing interest for Belle II in the Hamburg area ...



Backup



IR Region and Silicon Systems („VXD“)



- The VXD (PXD + SVD) is a “mechanical unit”, dimensions essentially defined by the cylindrical CFRP shell and the end flanges.
- But: PXD and SVD have independent supports:
 - PXD: supported by the beampipe (but not independent of CDC !)
 - SVD: supported by the CDC (as in the Belle case)
- Many common mechanical/thermal issues, close collaboration of the two teams