Report from the 19th B2GM

- New General Schedule for SuperKEKB
- Mainz Group (C. Sfienti) in Belle II
- Mechanics: AIM and Weight of VXD
- Common Slow Control Framework
- Status CO2 Cooling Unit IBBelle
- Preparation for BEAST Phase 2
- Spare / upgrade PXD
- Summary & Outlook

This slide is a summary page of my talk presented in the last B2GM (June 2014).

- Construction of SuperKEKB main rings (LER and HER) and the DR is progressing on schedule.
- Possible plans for beam commissioning are presented.
  - Construction for the Phase 1 commissioning is in the final stage, and will be completed in JFY2014, as scheduled.
  - Subsequently, preparation works to start beam operation, including high-power conditioning of RF cavities and final alignment of magnets around the ring, will be ted in JFY2015.
  - Without additional budget that comes early enough to recover the operation budget cut in JFY2014, the Phase 1 commissioning will start in October 2015, assuming sufficient operation budget comes in JFY2015.
  - Meanwhile, production of the QCS and other co nponents needed for Phase 2 is ongoing to be in time for the Phase 2 commi ning.

no change

no change

has not come

no change

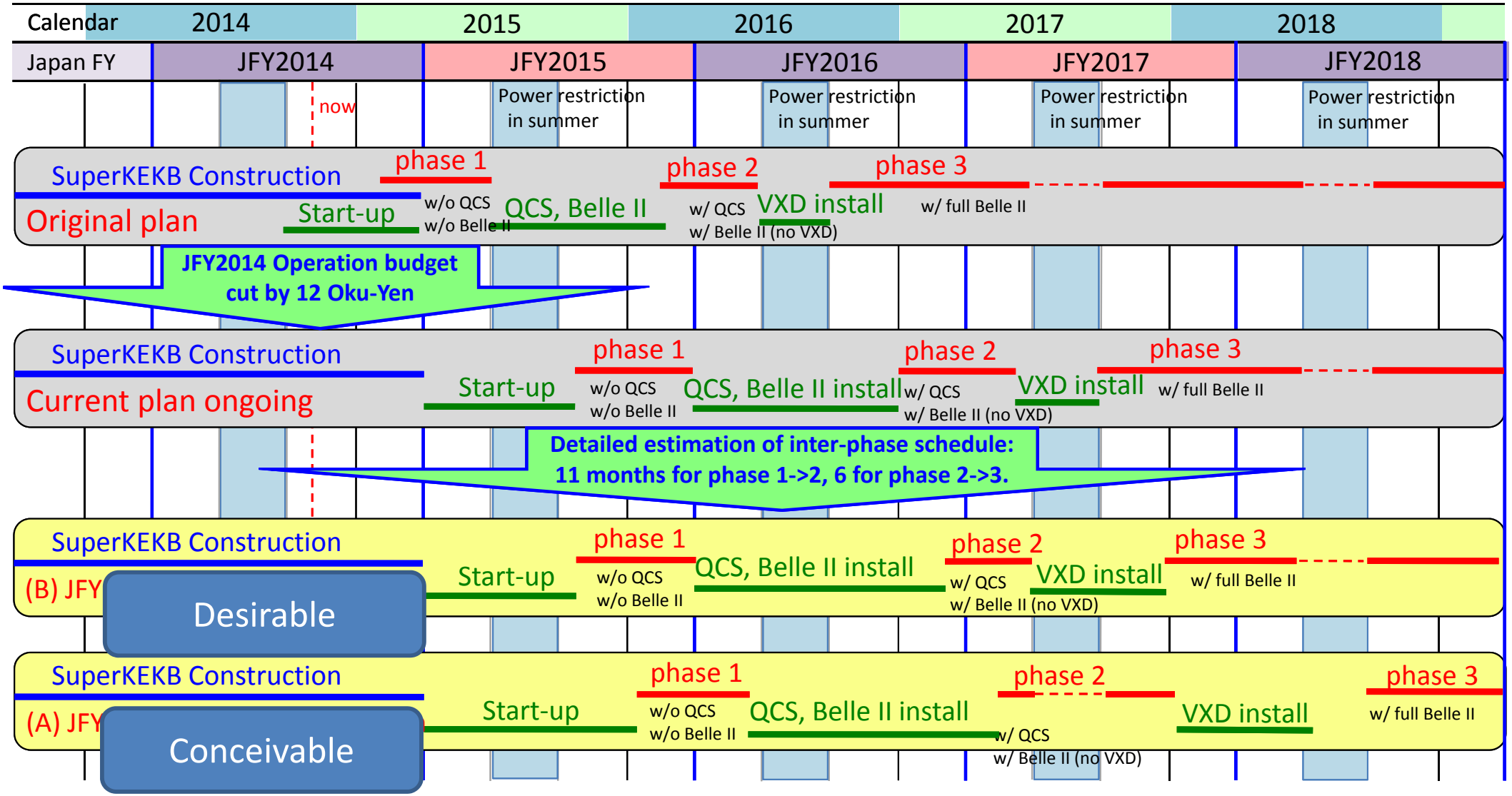
no change

JFY2015 operation budget is under discussion

To be shown at BPAC review

Nov. 7, 2014

SuperKEKB/Belle II Schedule



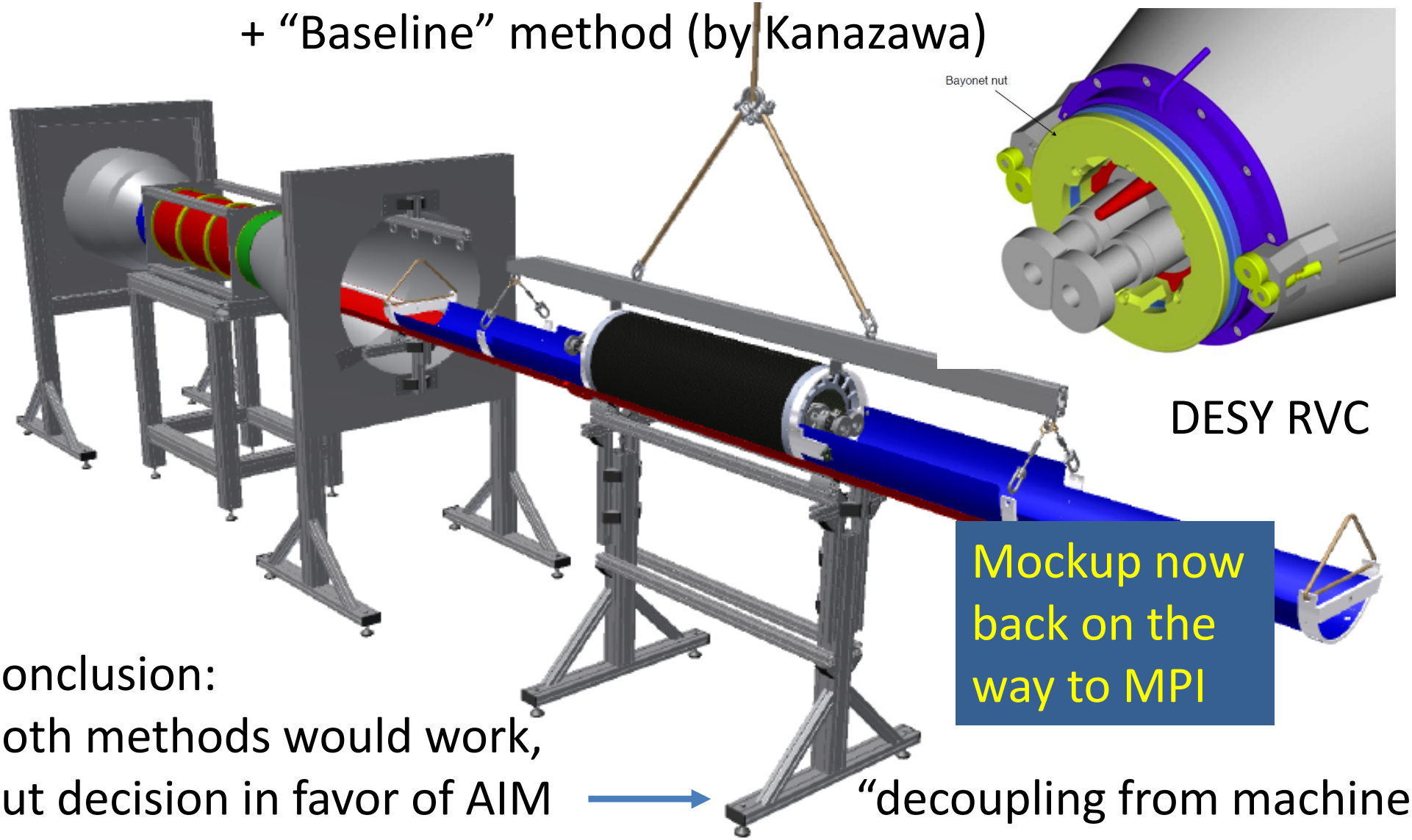
Budget will be clearer in the very end of Dec.

New Group in PXD: Uni Mainz

- Prof. Concettina Sfienti's group joined DEPFET-Collaboration
- Interest in Hadron Physics (strange particles)
- HW/SW activities planned in the Slow Control sector
- 2 meetings so far (Mainz and Munich) to establish work packages
- Presentation of the group during Belle II – IB (+ Plenary)
- Group has been accepted by Belle II - IB

After July B2GM: Decision for AIM

At KEK: Demonstrated AIM ("Alternative Installation Method")
including EDI "emergency de-installation"
+ "Baseline" method (by Kanazawa)



DESY RVC

Mockup now back on the way to MPI

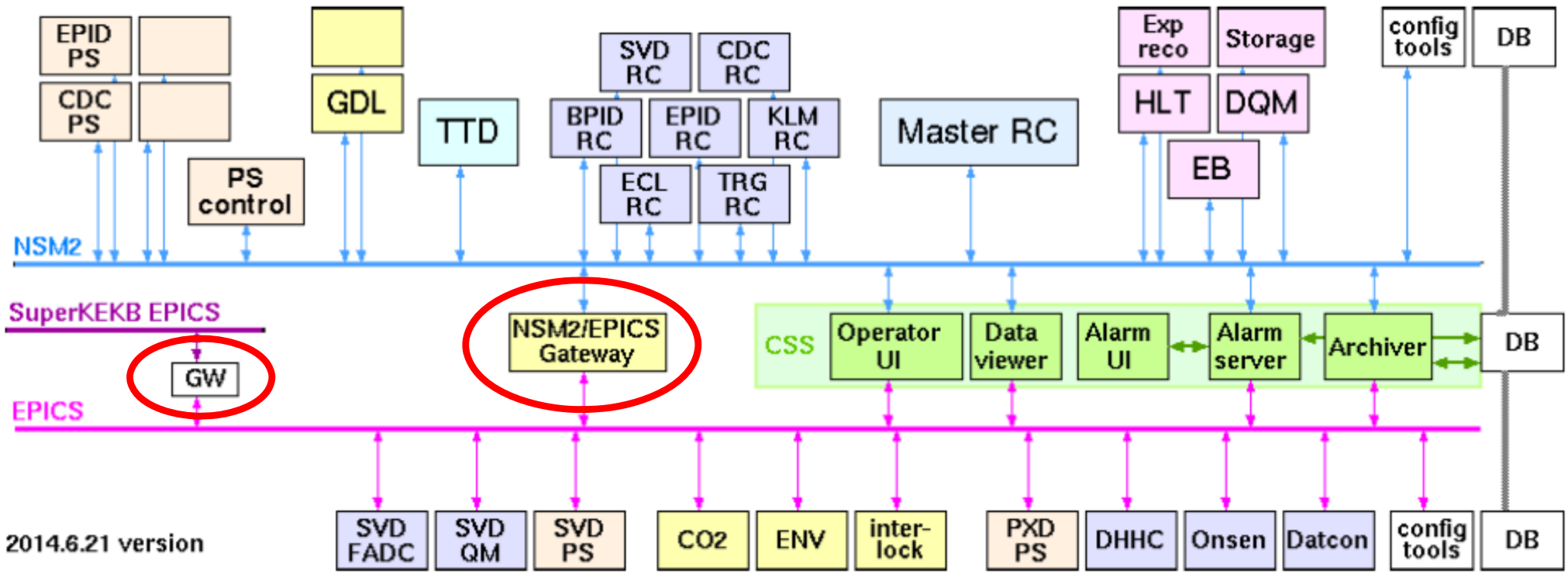
Conclusion:
Both methods would work,
but decision in favor of AIM → "decoupling from machine"

From Ushiroda‘s Summary

Q2: Belle II mechanical structure analysis with new VXD weight

- The 1st FEA study showed that the present CDC system can support VXD. Deformations as well as stresses are found to be small.
- Further studies after including detailed structure to be done in this year.

July B2GM: Decision on Slow Control



Common GUI for Belle II: CSS, NSM2 (Run Ctrl) and EPICS (Slow Contr.)

Michael Ritzert & Thorsten Röder @ KEK (September 2014):

Major Milestones achieved:

- Gateway between NSM2 and EPICS
- Present NSM2 data within CSS

Common Slow Control Framework reconfirmed by SC Coordinator M. Nakao

IBBelle Meeting @ MPI, 6.-7. 10. 2014

Participants:

KEK: Nobuhiro Kimura, Shuji Tanaka, Toru Tsuboyama

NIKHEF: Bart Verlaat

CERN: Lukasz Zwalinski

DESY: Reimer Stever, Carsten Niebuhr (both via SeeVogh)

MPI: Hans-Günther Moser, Sven Vogt, Tscharlie Ackermann, C.K.

Agenda:

- Services for IBBelle
- Location of IBBelle
- Acceptance tests for parts
- System tests
- Documentation and parts ordering
- Construction & commissioning
- Certification process (-> TÜV)

Services for IBBelle

- European standard P/S at KEK, needs to be reactivated
  Requirement: 400 [V] ± 10 % (filtering of V spikes)
- Water for the chiller cooling: 20 l/min, room temp OK,
  only filter needed, connections to be specified
- N2: 50 l/min (Gas), room temp OK
- Air conditioning: room temp ± 3°C, rel. humidity < 70 %
- Transferlines & connection standards still need to be specified
  (depending on location of IBBelle)

CO2 Vacuum Flex Lines

Flex line design (by CERN/NIKHEF)

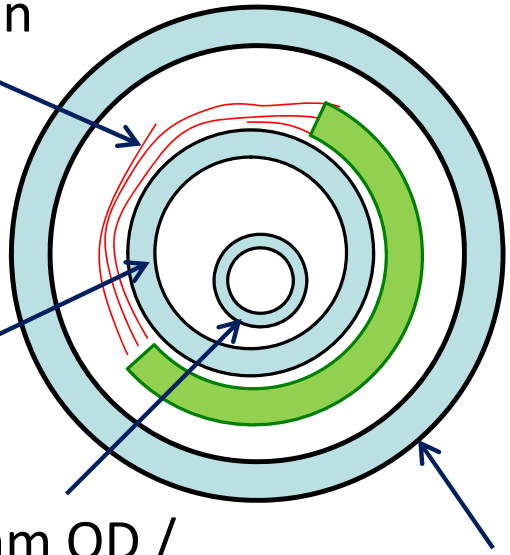
~ 12m long

MLI (super) insulation

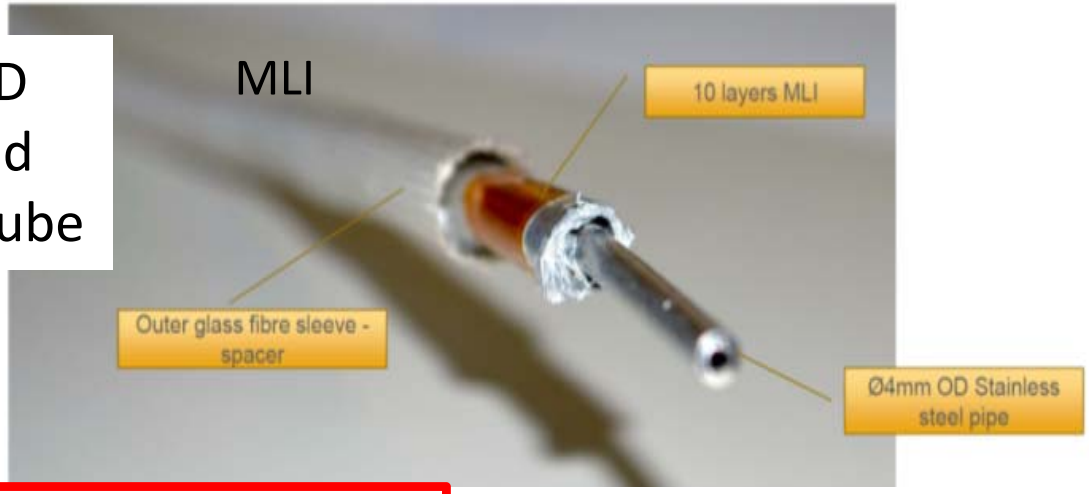
4 mm OD / 3 mm ID outlet tube

1.6 mm OD / 1.0 mm ID concentric inlet tube

18 mm OD corrugated vacuum tube



admissible bending radius:
~ 50 mm



CERN crew offers help building the tubes

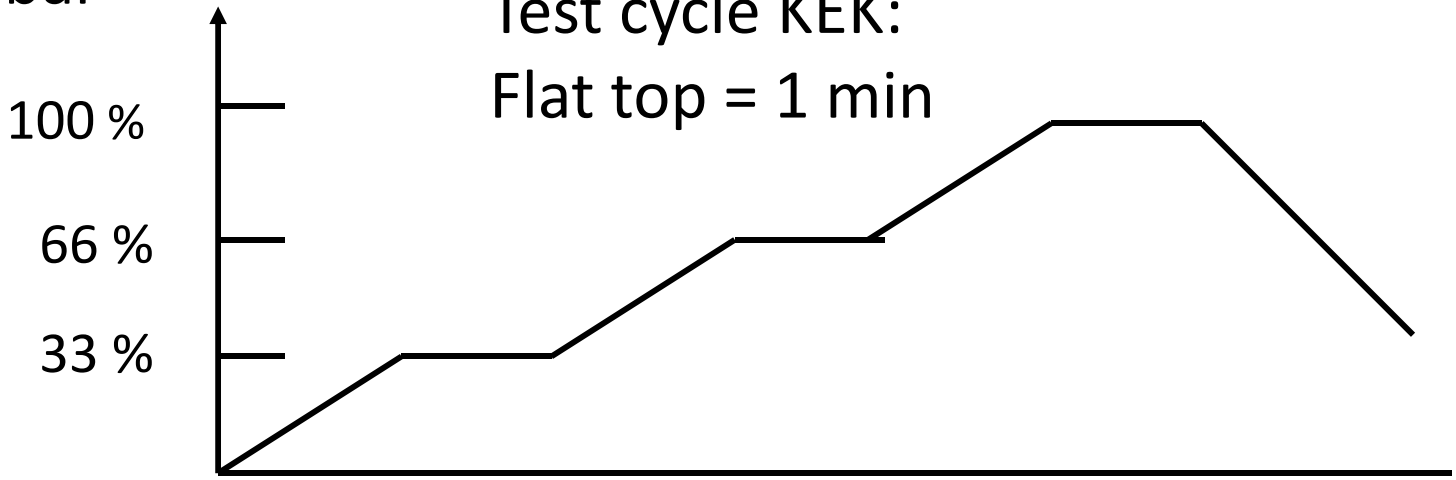
Certification Procedures

- Certification via German TÜV
  Parts mostly CE Standard (valves etc.)
  Other parts (cooling block, micro joints, origami tubes):
  Pressure test with one sample to 300 bar, leak OK, but no burst

- Standard for piping: 186 bar for all certified equipment (130 x 1.43)

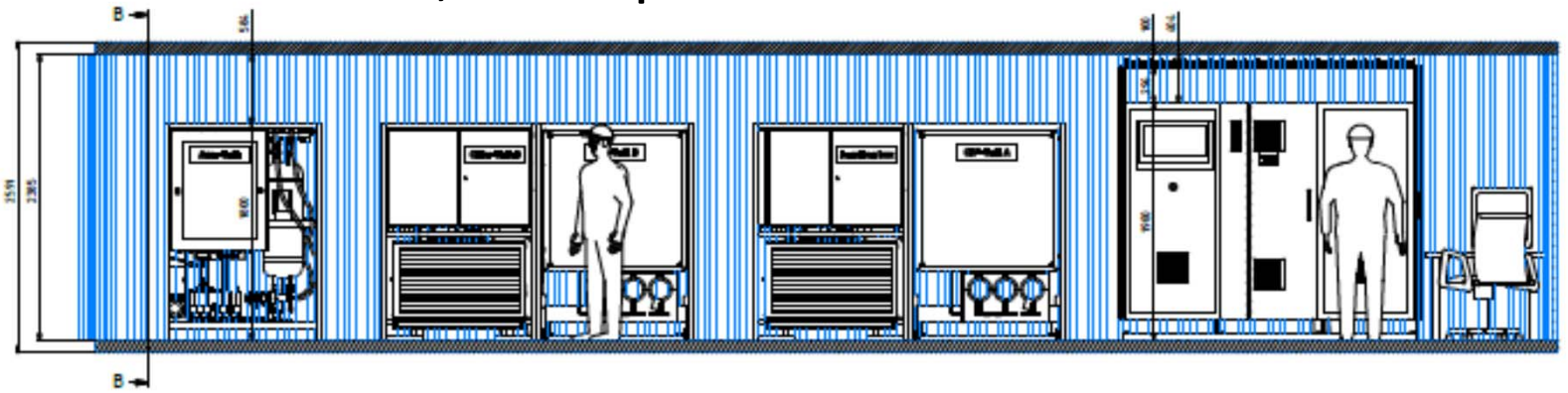
- Safety valve: 110 bar
  Burst disk: 130 bar

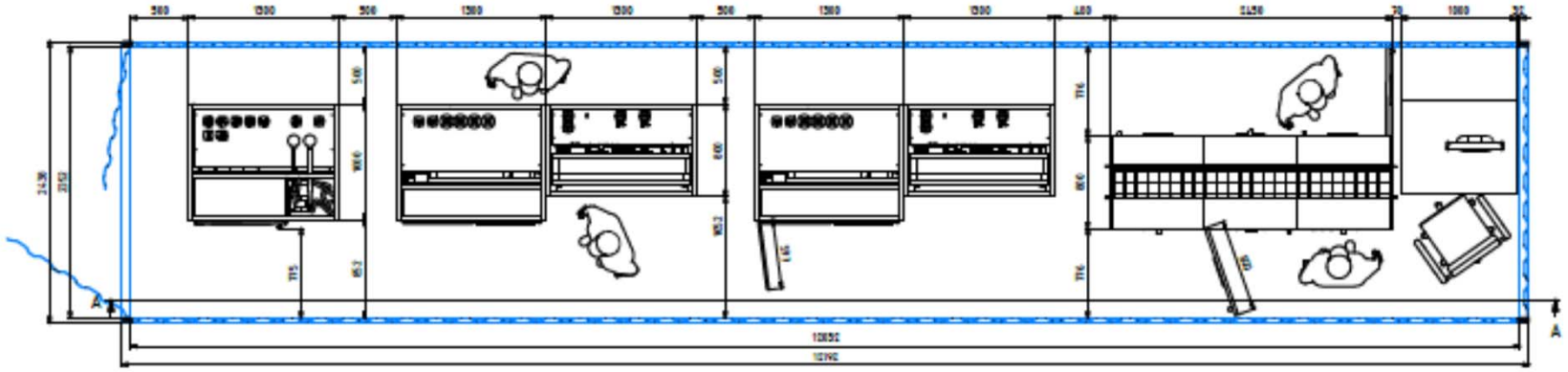
CERN:
100 % for
1 hour



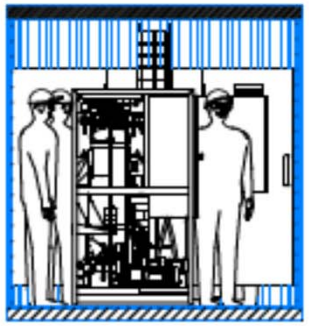
Location: Alternative Arrangement

40’ Container, to be placed outside of Tsukuba hall





B-B (1 : 20)



Advantage: unit can be assembled and commissioned at MPI, no need to take it apart for transport, no reassembly at KEK
This option is favored now

Steps During PXD Production

Item	Where
DEPFET Sensor (Phases I, II and III)	Semiconductor Lab (HLL)
Flip chipping of ASICs	IZM Berlin
SMD components and rework	NTC Valencia & IFIC V.
Add Kapton cable, wire bonding	MPI Munich
Gluing of two modules (= „ladder“)	MPI Munich
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

Pilot Assembly

- Start a pilot run with PXD9 3 wafers + 5 EMCM-likes (final metallization + thinning)

- Equip sensors with present ASICs (Gates Mode should work)

- Submit “final” Kapton design this year (back early 2015)

- Do thorough tests with full modules assembly (+ gated mode) (flip chip @IZM Germany, SMD @ NTC Valencia)

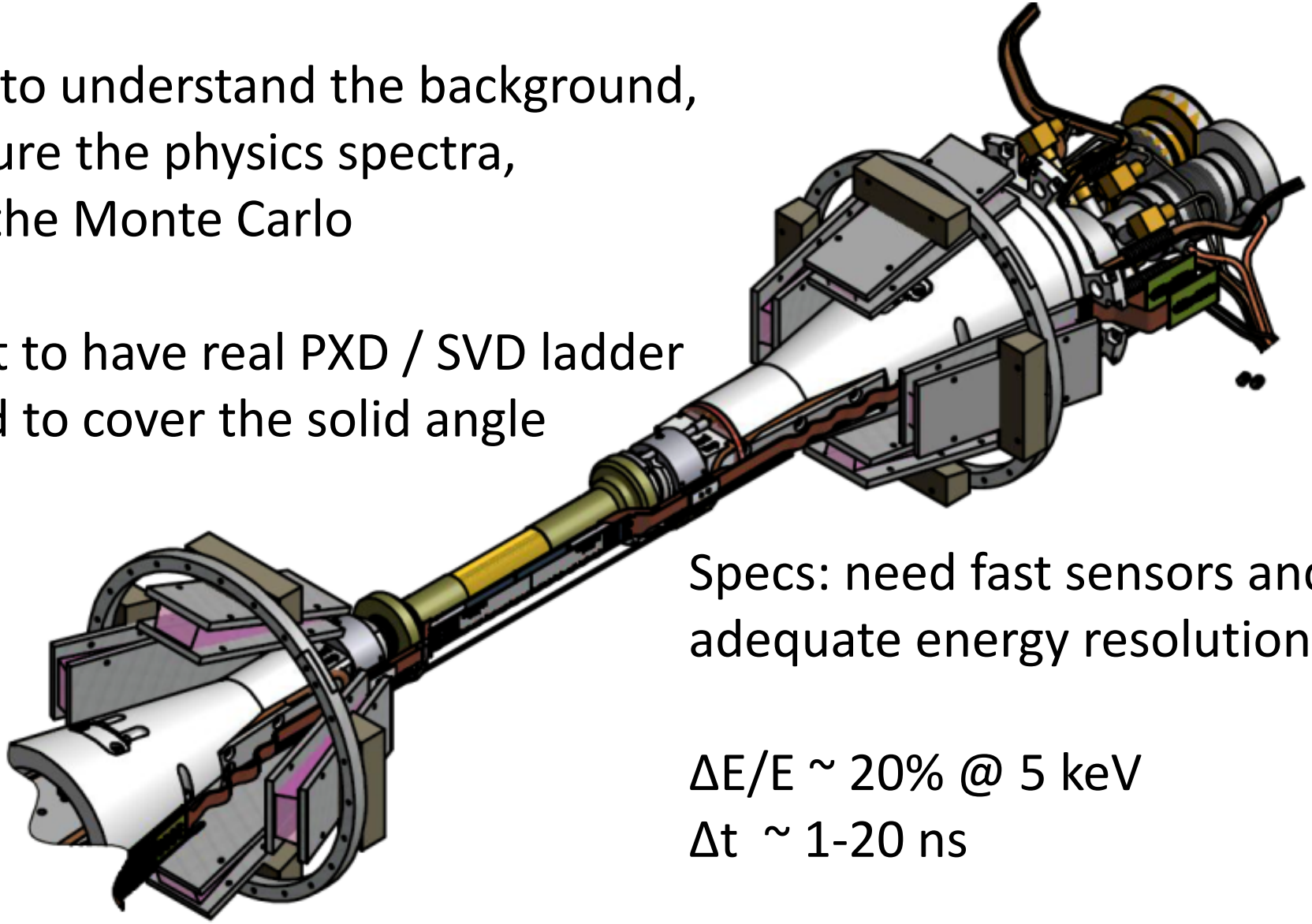
- Submit final ASICs by end of June 2015 (unless major problems)

- Prepare beam test (at DESY) with 2 sensors (ladders) together with final SVD ladders for the end of 2015 / early 2016 (BEAST Phase 2 will have final ladders)

VXD Preparation for Phase 2

Need to understand the background,
measure the physics spectra,
train the Monte Carlo

- want to have real PXD / SVD ladder
- need to cover the solid angle



Specs: need fast sensors and / or adequate energy resolution

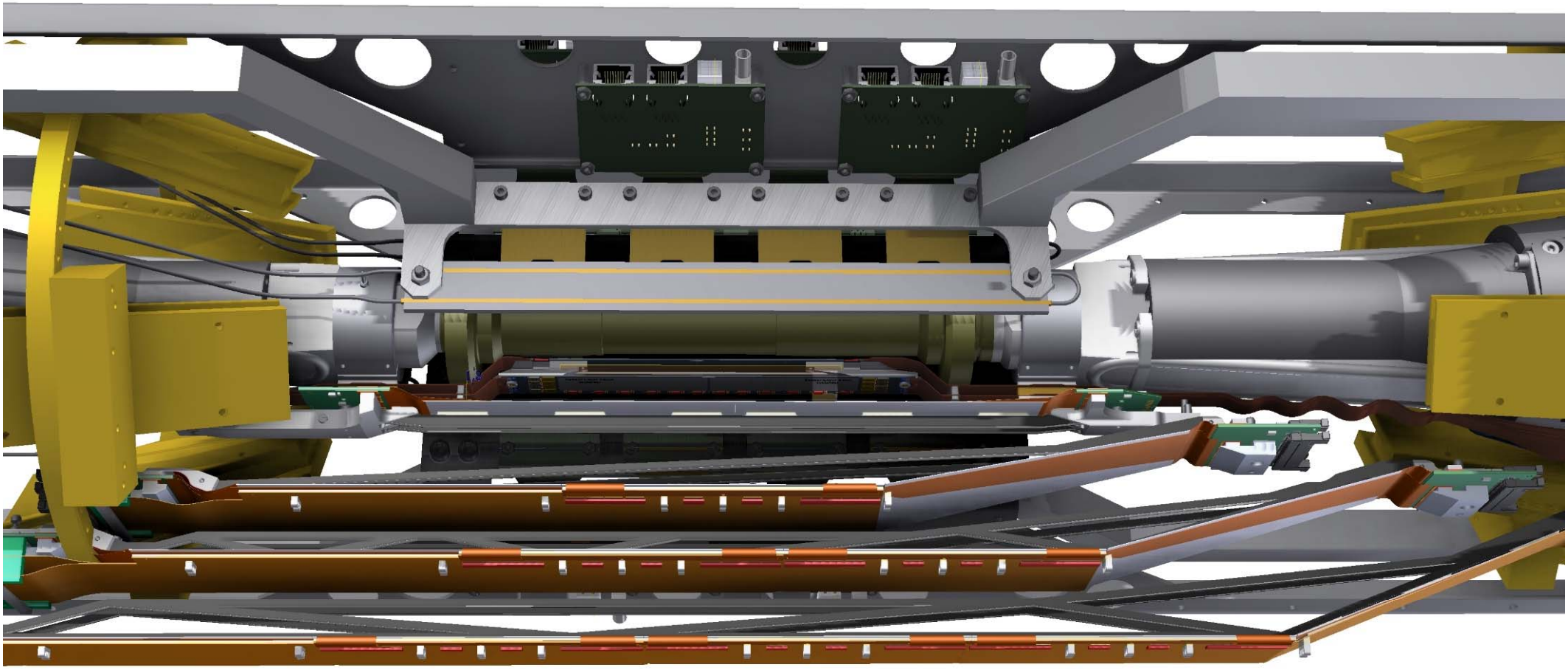
ΔE/E ~ 20% @ 5 keV
Δt ~ 1-20 ns

Strasbourg group wants to contribute (have to discuss)

NTU group wants to measure Bhabhas: install BGO crystals

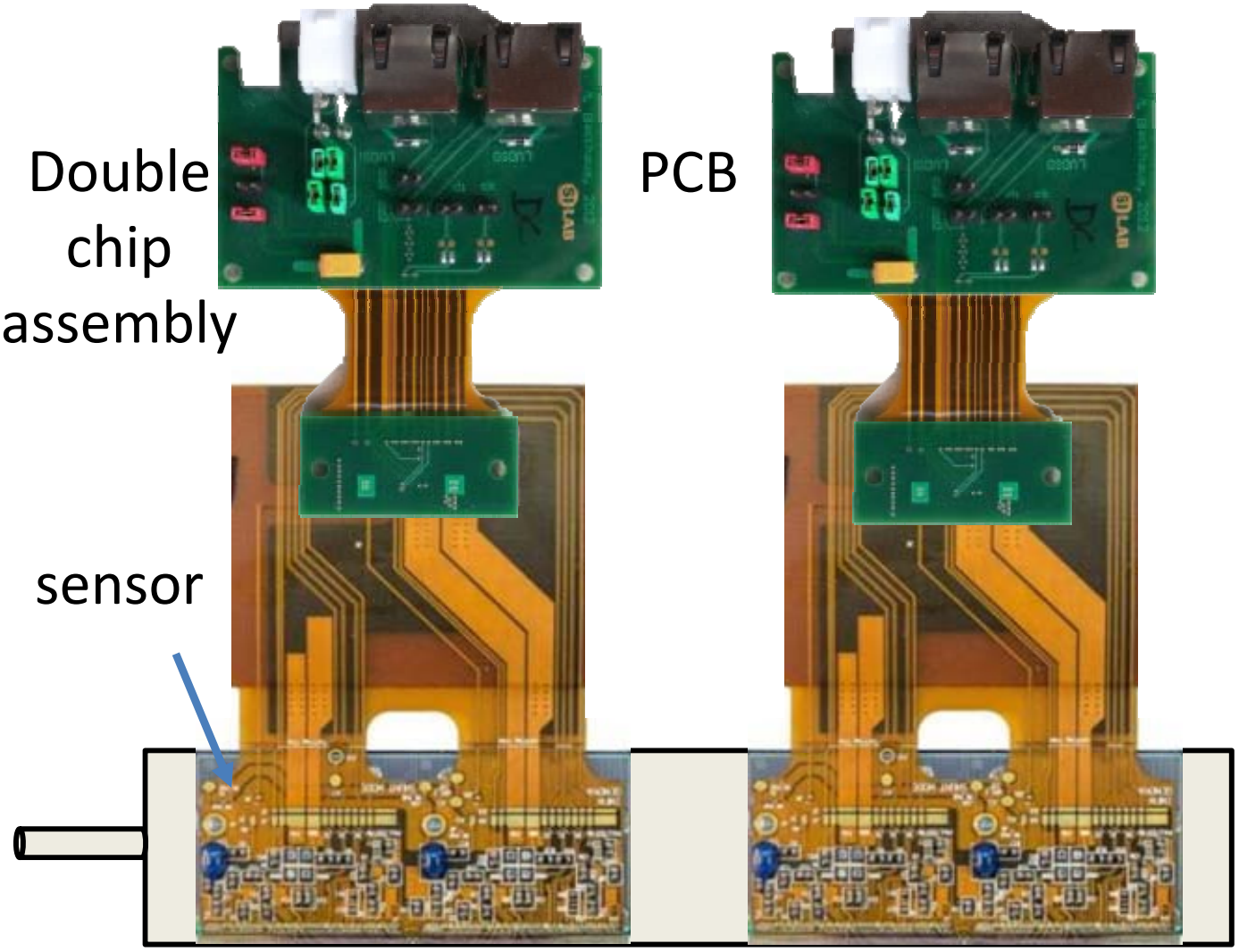
VXD Equipment during Phase 2

X-ray detectors: ATLAS IBL test sensors (+FE-I4) :
cover 90°, 180°, 270° in ϕ, full acceptance in θ (Bonn project)



135°, 225°: cover with fast scintillator and SiPM: offer by KEK
MPI ILC group interested to step in

VXD Equipment during Phase 2



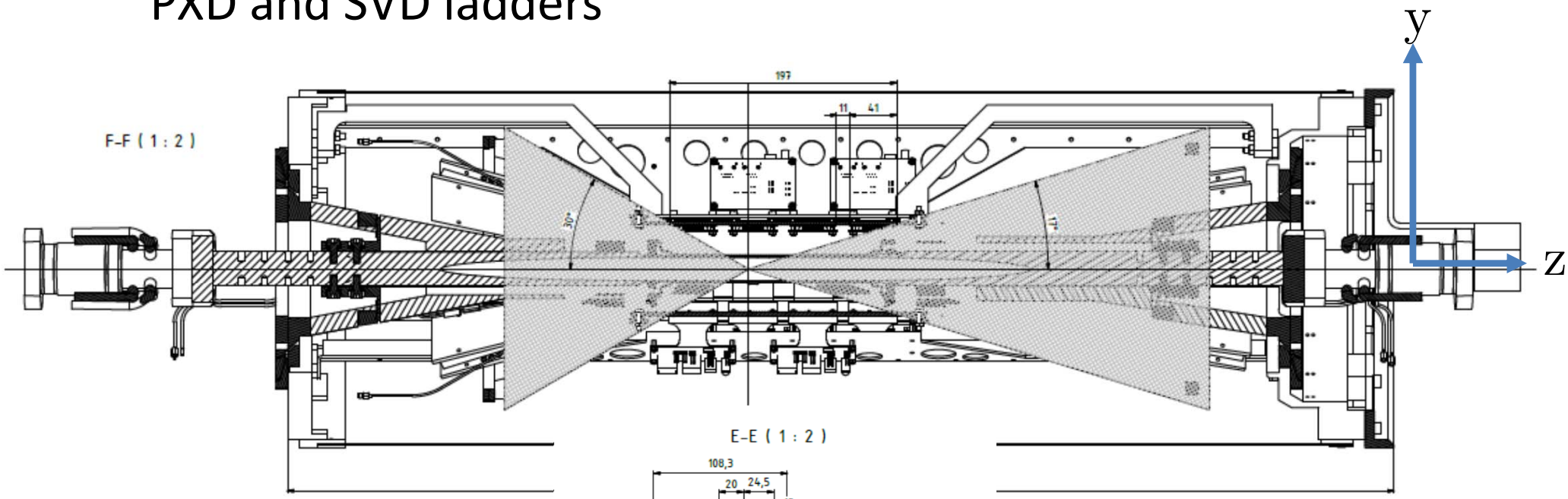
Hybrid planar sensor
FE-I4 based
(used in ATLAS IBL upgrade project)

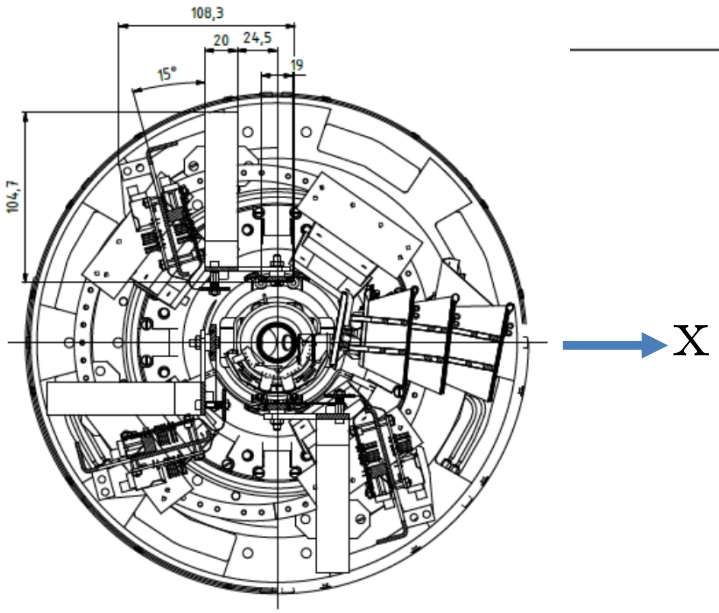
- Pixel size: 50 x 250 μm^2
- Radiation tolerance: 300 Mrad
- Hit-trigger association resolution: 25 ns

(shown by Carlos in BEAST Session)

VXD Equipment during Phase 2

Plan: Cover large part of the area not instrumented by PXD and SVD ladders

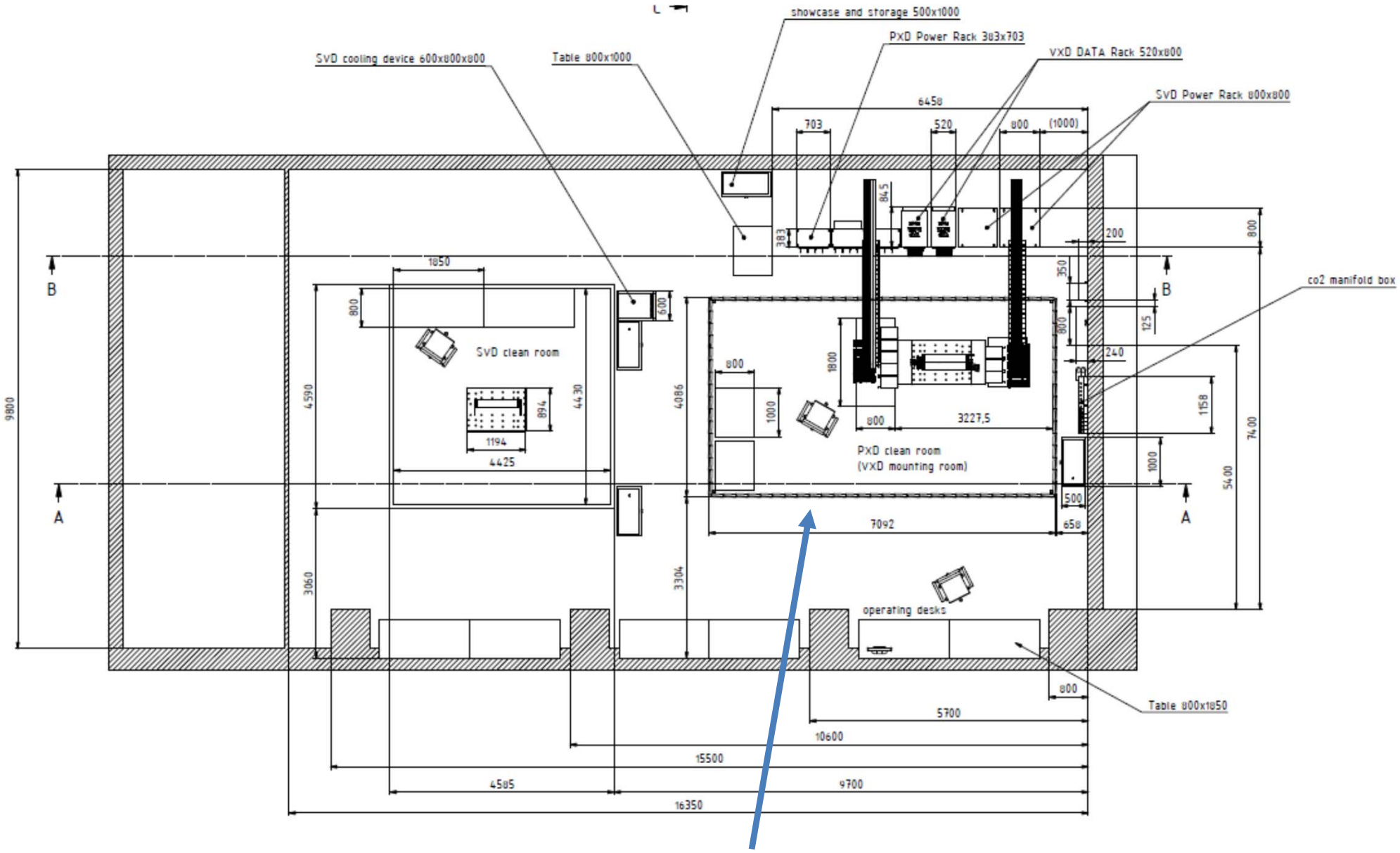




Sensors to be placed in the accelerator plane and perpendicular to it. (24 single sensors total)

Supports within the acceptance is mandatory, but will try to minimize material

Phase 2 / PXD Integration



VXD Assembly clean room in B1

VXD Clean Room in B1

Should already be available
for BEAST Phase 2 assembly

Tscharlie Ackermann

Various Assemblies, MPI, DESY, B1

- DESY Test:

  2 full ladders, mounted on SCB, 4 SVD layers in cassette
  (still decide on preassembly location)

- Phase 2:

  Pre-assemble sensors at MPI (PXD, FE-I4, SiPM)
  (PXD ladders same as DESY test)

- PXD / SVD:

  pre-assemble half shells at MPI (including tests)
  transport to KEK and mount on beampipe,
  include SVD, add cosmic ray trigger, commission

Detailed procedure lists mandatory to organize assemblies, including CO2 (IBBelle, transfer lines. flex lines), power etc.

Program for Spare / Upgraded PXD

- Construct spare PXD by the summer of 2019 (~ 5 years from now)
  Plan supported by Belle II management

- Need 2 years of production of sensors + < 2.5 years for construction, optional development of new ASICs, and commissioning

  -> continue production of new sensors when the present production is finished (sensors will be paid by MPI)

  -> Funding for electronics requested from BMBF for 2015-18

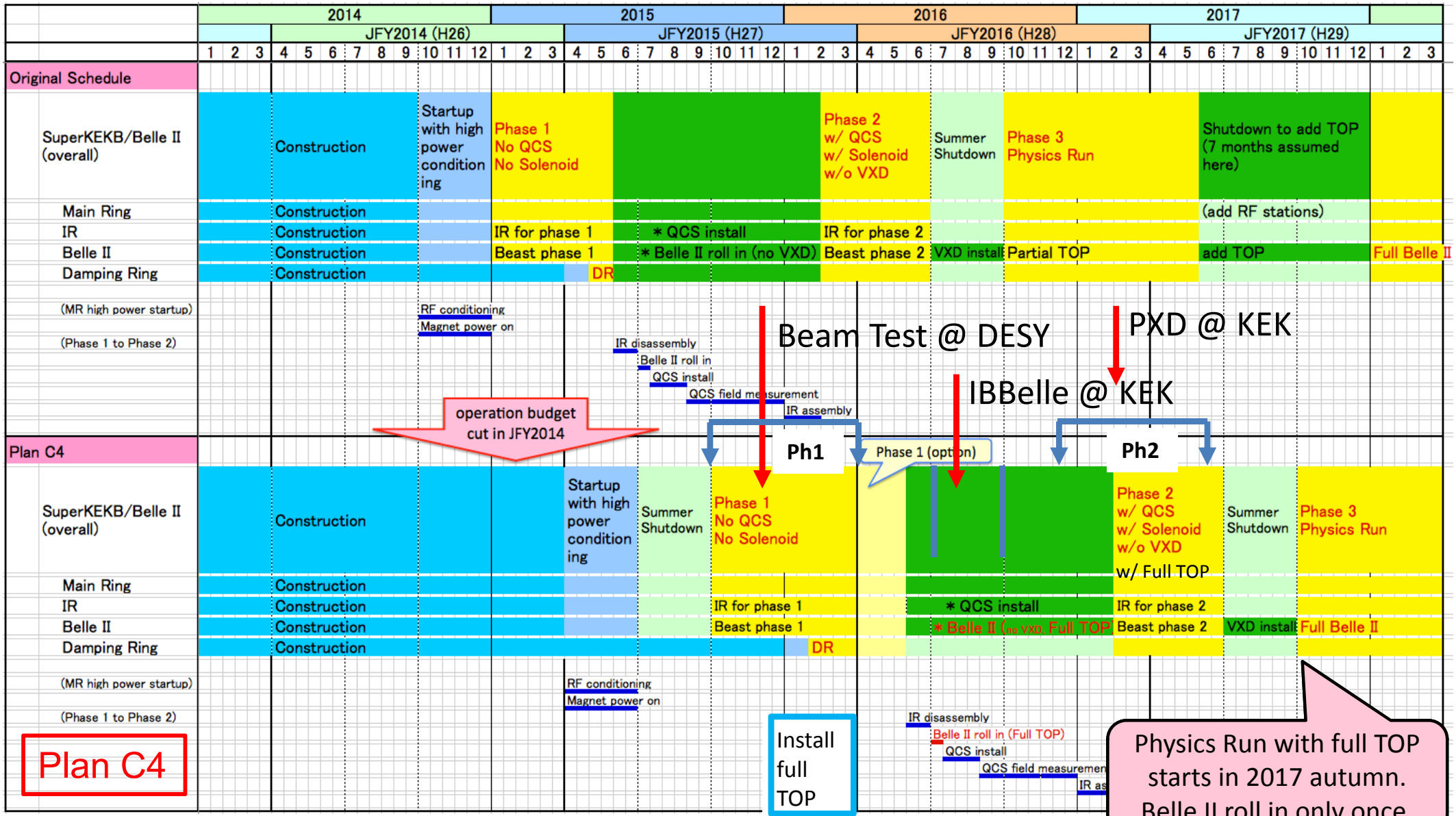
- Development of ASICs (+DAQ H/W) should wait for significant experience in beam operation (start development in 2017)

Conclusion & Outlook

- Critical milestones for DEPFET ladder production achieved
- ASICs close to final, Gated Mode on PXD9 to be tested, final submission hopefully by end of June 2015.
- Pilot Run with 3 wafers (10 %) started, equip with the present generation of ASICs, final.
- “DESY” Thermal Test 2015 , beam test with final sensors in Jan. 2016
- Slow Control efforts strengthened by new Mainz group
- Further iteration on VXD components for BEAST Phase 2
- Concrete plans for “backup” PXD for the year 2019 (BMBF applications have been submitted

Backup

Plan “C4” (top: present baseline)



VXD and Plan C4

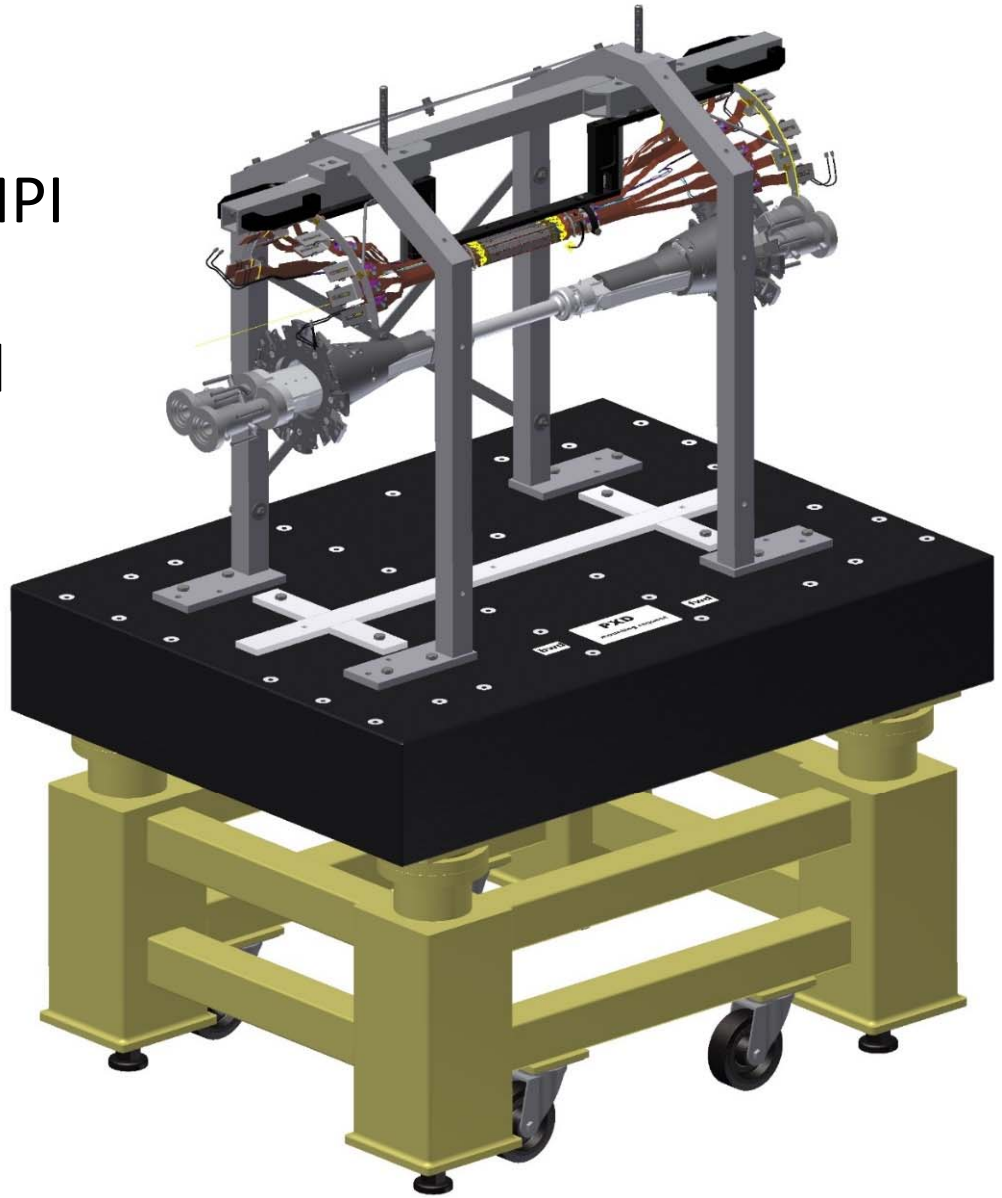
Sensor Count

	Class 0/1	Class 2-5	Sum	PXD	Safety factor
inner	36	20	56	16	2.3
outer	70	43	113	24	2.9
Sum	106	63	169	40	2.7

VXD Mechanics: PXD Integration

PXD will be assembled at MPI

2 half shells will come to KEK



Mounting tool for PXD: connection to the beam pipe

VXD assembly table