

VXD mechanics summary

S. Tanaka for the VXD mechanics group

Mechanics designer's
MPI, HEPHY, DESY and KEK

VXD mechanics meetings

- VXD mechanics meeting on 30th

Tuesday 30 September 2014

15:00 VXD mechanics preparation status in KEK (20')

15:20   VXD dock space design and VXD load issue (20')

15:40 SVD BEAST setup and assembly plan (20')

16:00     VXD environmental and radiation monitors (20')

16:20   VXD mechanics issues(discussion) (20')

16:40   VXD service work (20')

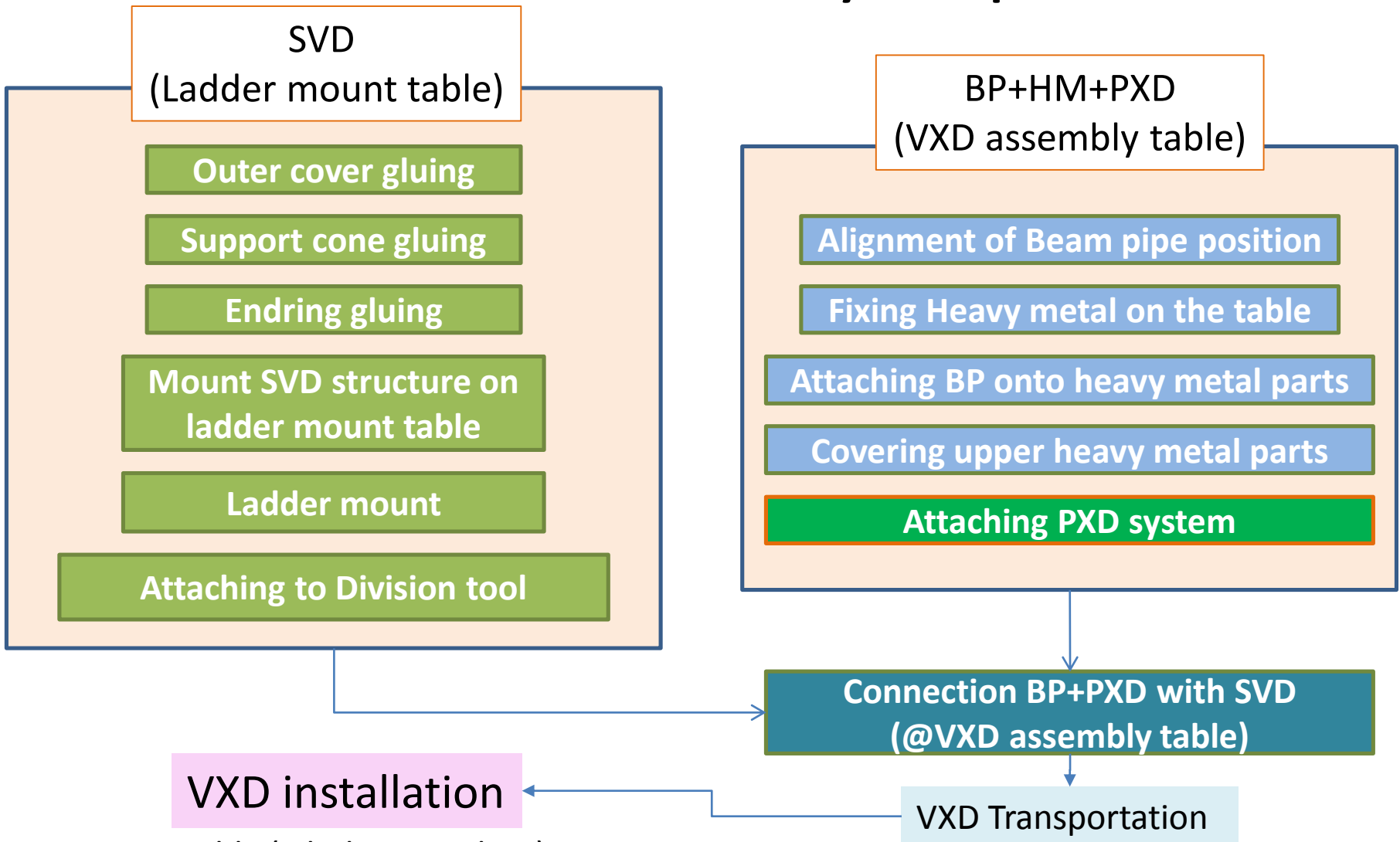
17:00   SVD parts preparation (20')

- CO2/ VXD mechanics meeting on 6-7th @MPI

Monday 06 October 2014

09:30	IBBelle status and schedule (20')
09:50	IBBelle Parts list (20')
10:10	Certification strategy on IBBelle construction (20')
10:30	Location of IBBelle (20')
10:50	PXD BEAST setup (20')
11:10	VXD assembly table (procedure and test plan) (20')
11:30	VXD mechanics issue (discussion) (20')
11:50	Schedule (design, test, parts preparation) (20')
12:10	Mechanics discussion on DEPFET PF project (20')

VXD assembly steps



PXD assembly (whole procedure) :

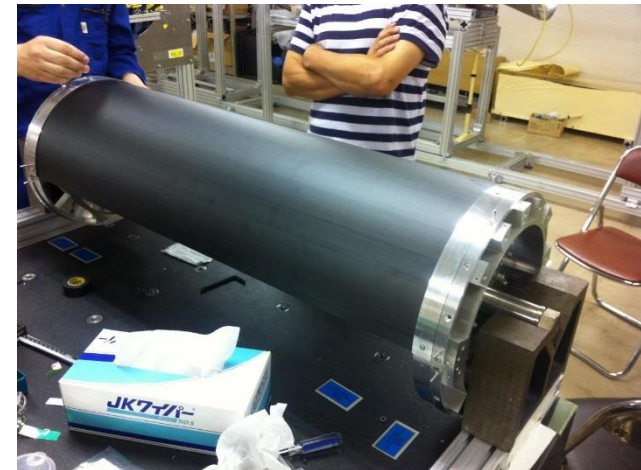
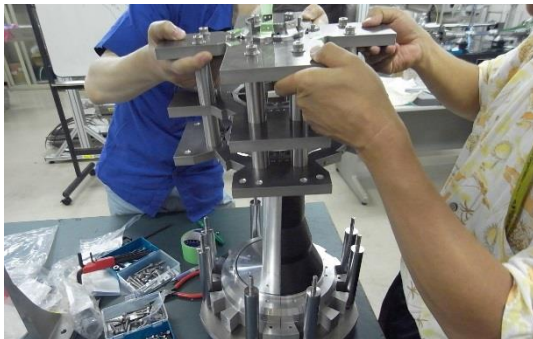
<https://indico.mpp.mpg.de/getFile.py/access?contribId=2&sessionId=1&resId=0&materialId=slides&confId=2933>

VXD design and assembly status

- VXD design
 - Fully agreed between KEK, SVD(rev.2.1)
 - PXD design will include soon to SVD rev.2.1
 - ->VXD rev.2.2
- VXD assembly
 - Assembly procedure -> agreed in 2013 Sep.
 - BPAC focused review 2013 Sep.
 - Installation procedure -> agreed on last B2GM
 - <http://kds.kek.jp/conferenceDisplay.py?confId=15789>

Parts preparation and assembly tools

- Beam pipe
 - EBW connection of IP chamber with FWD crotch part (BEAST)
 - After modification of EBW tool, BWD part will be connected (BEAST)
 - Crotch part machining is ongoing (for Physics run)
 - BP for physics run will be produced in next year
- SVD
 - Gluing tool (KEK SVD group)
 - Outer cover gluing (first try by KEK option)
 - SVD support cone gluing (first try by KEK option)
 - Endring Gluing (first try by KEK option)
 - Ladder mount table (KEK SVD group)
 - Alignment tool
 - Mount arm (tested by SVD2 mount arm)
 - SVD division tool
 - Design ongoing (similar with Belle SVD2)



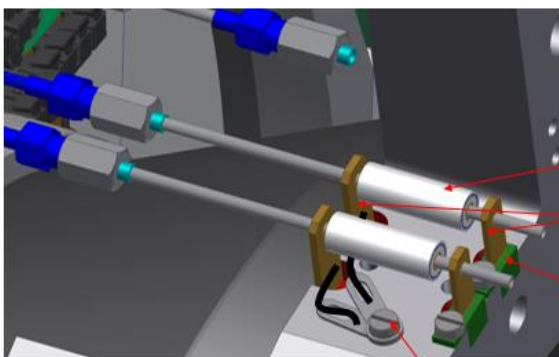
New Cooling Pipe Routing End Rings

Pipe route in SVD



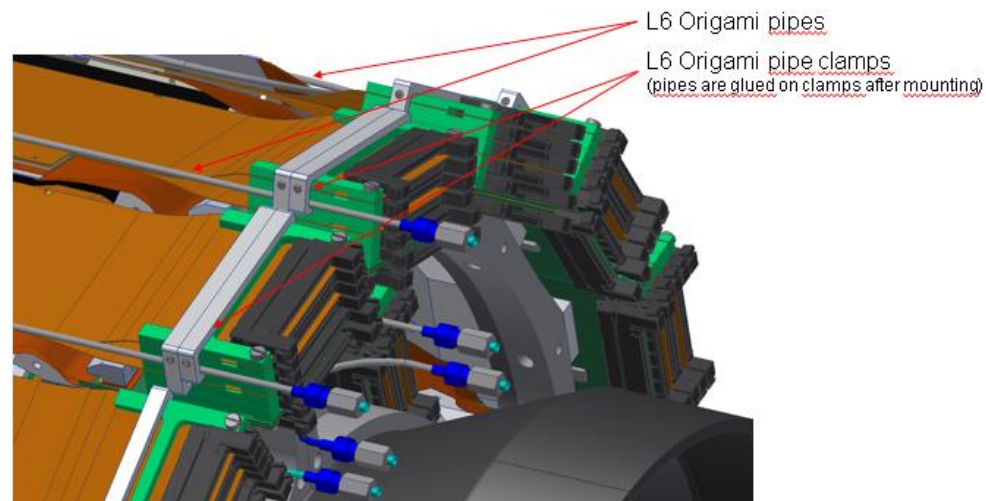
- Slightly changed from Karsten G. pipe routing because of the diamonds
- No extra grounding pipe for L5 end rings (return pipe L4 and L3 is used for grounding the L5 end rings)
- Who can bend these pipes? Welcon? (Toru-san)

Concept For The Pipe Isolation



- Ceramic isolator (Tscharlie)
- Brass torque relief (brazed on pipe)
- Torque relief isolator (FR4, like H shapes)
- Grounding point for pipes on the end flange (cable soldered the brass torque relief)

L6 Origami Cooling Pipes & Clamps



Parts preparation and assembly tools

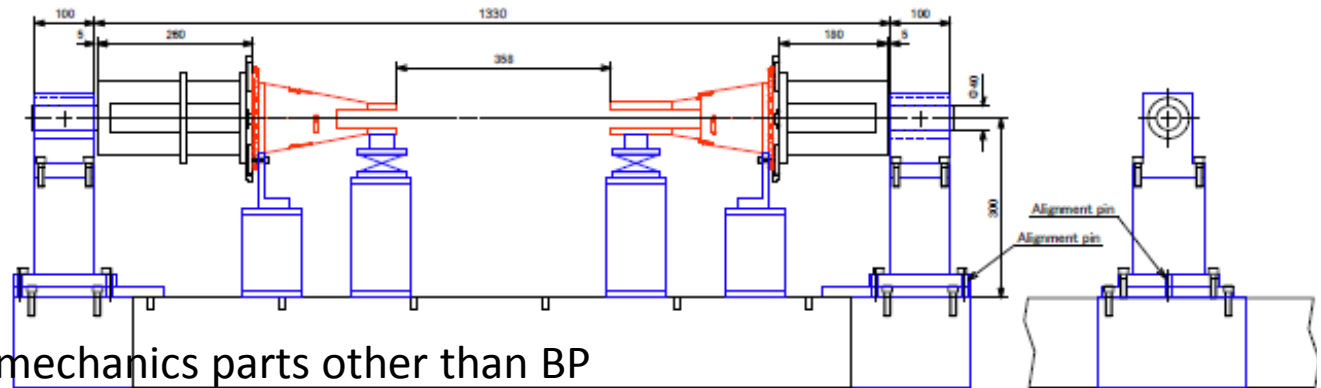
- PXD
 - PXD component is assembled at MPI individually
 - PXD mount block will be produced after delivering BEAST BP.
 - PXD mount test is scheduled in B2GM 2015 Feb.
 - VXD assembly table will be prepared in this fiscal year

Mounting tool
for PXD
connection to
the beam pipe

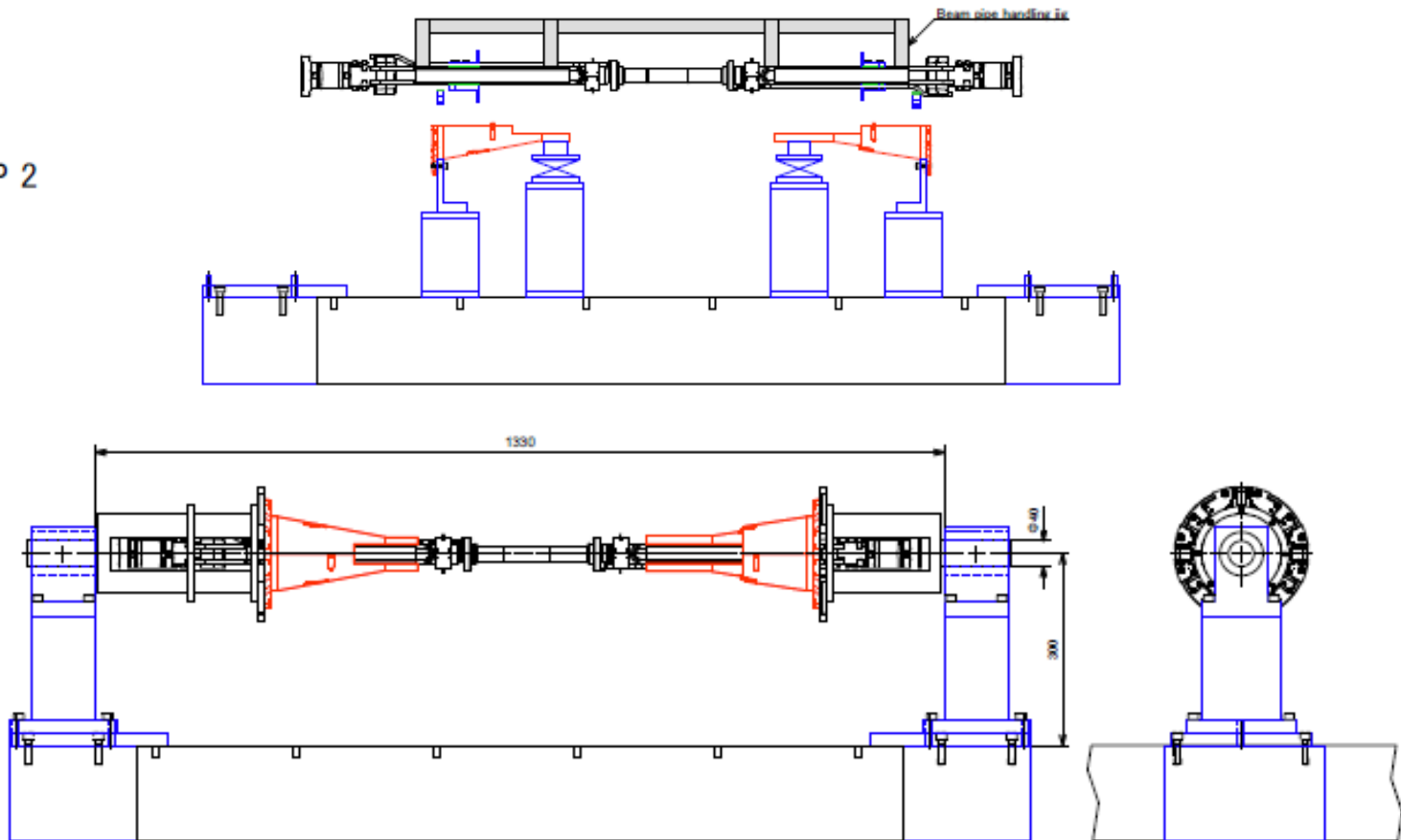


STEP 1

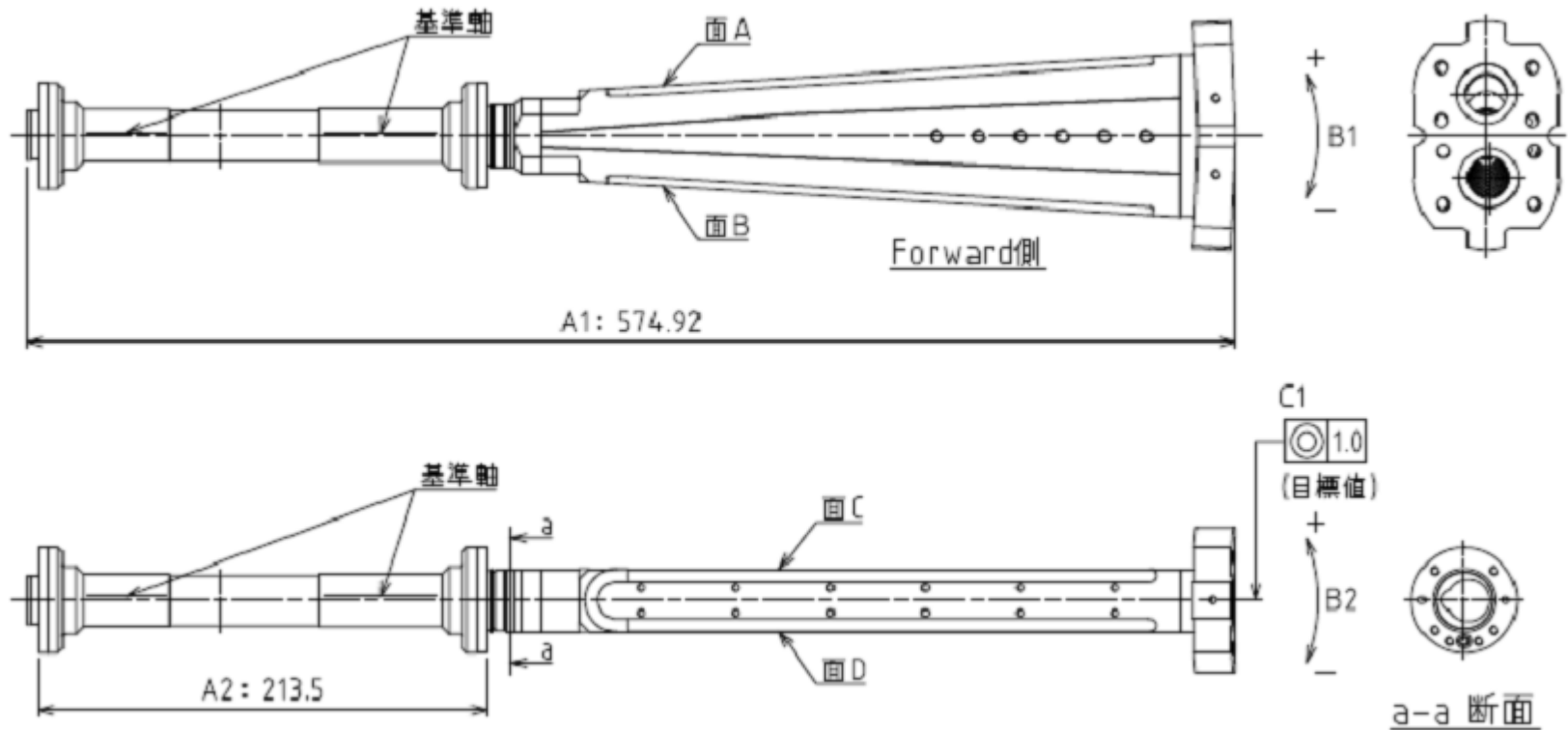
Alignment of mechanics parts other than BP



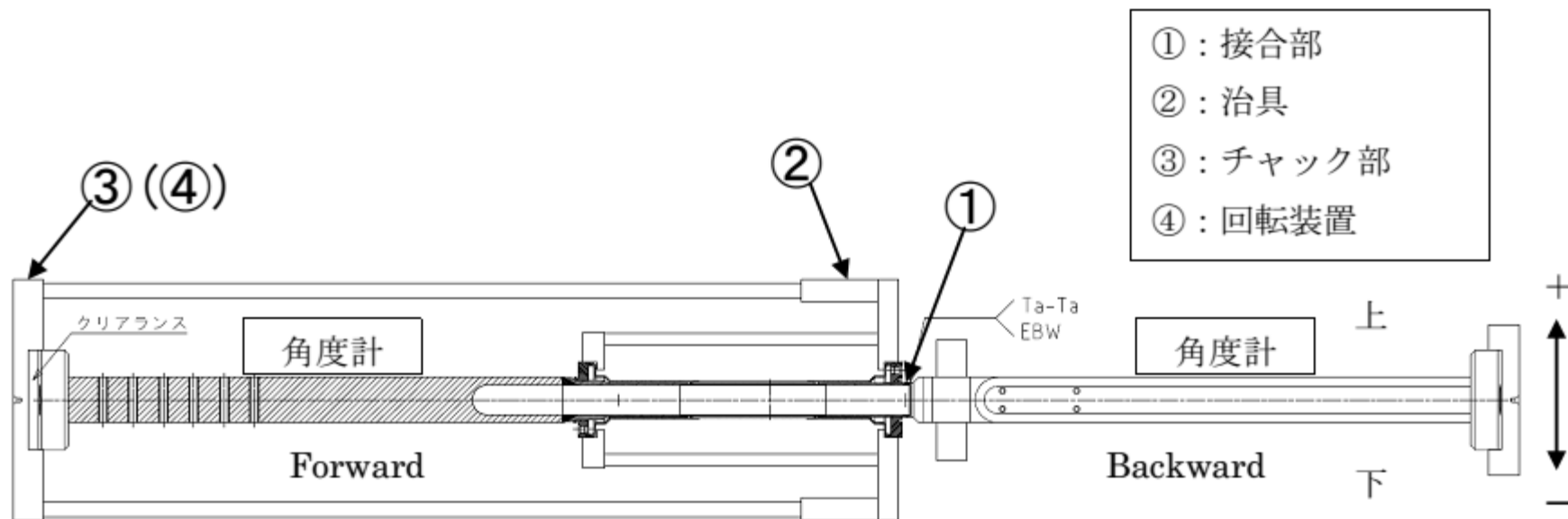
STEP 2



Beam pipe status



	before EBW 前	After EBW 後
A1	574.90mm	574.93mm
A2	213.95mm~214.04mm	213.97mm~214.05mm
B1	-	-0.0141°
B2	-	-0.0742°
C1	-	0.7143

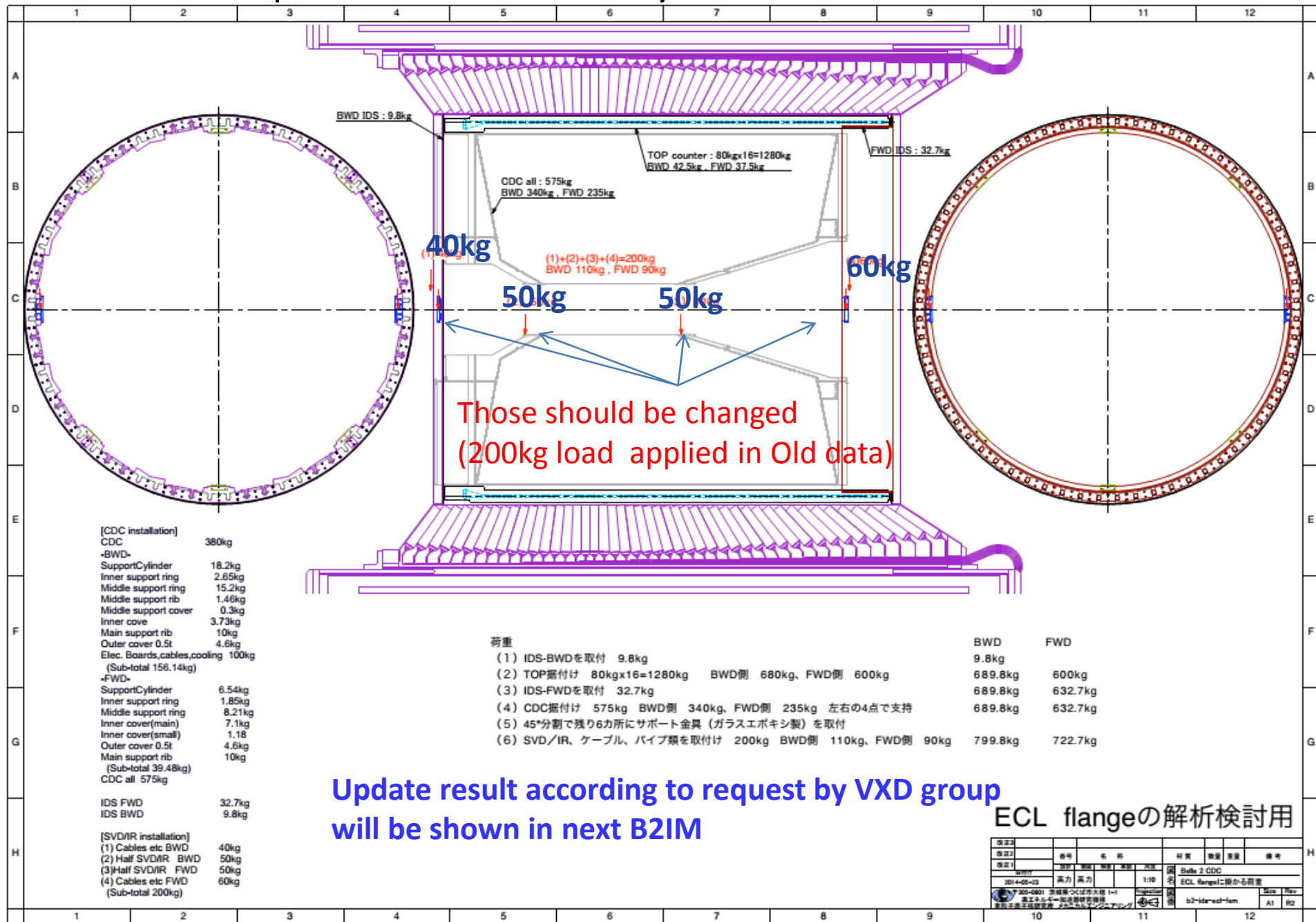


EBW tool optimization is ongoing

CDC load issue

BWD	FWD	Total	
80	80	160	VXD with cables
65	55	120	dock boxes
10	10	20	mechanical support for dock boxes
70	50	120	cables from Docks to iron
15	15	30	CO2 flex lines
240	210	450kg	total

Input data on FEM analysis of IDS



Possible problems

1, If CDC deformation was not acceptable value

We have to reduce load onto CDC.

2, IF CDC deformation is acceptable value and

BP position may sink more than 0.5mm (by bellow pipe tolerance)

We can not rely on CDC inner ring position.

(How to decide FWD connection pin position?)

We may have to take BP alignment after VXD installation.

On VXD load test, 200um sink by 80 kg dummy load

FWD position is controlled relatively with CDC inner ring



SVD in Phase-2

Katsuro Nakamura

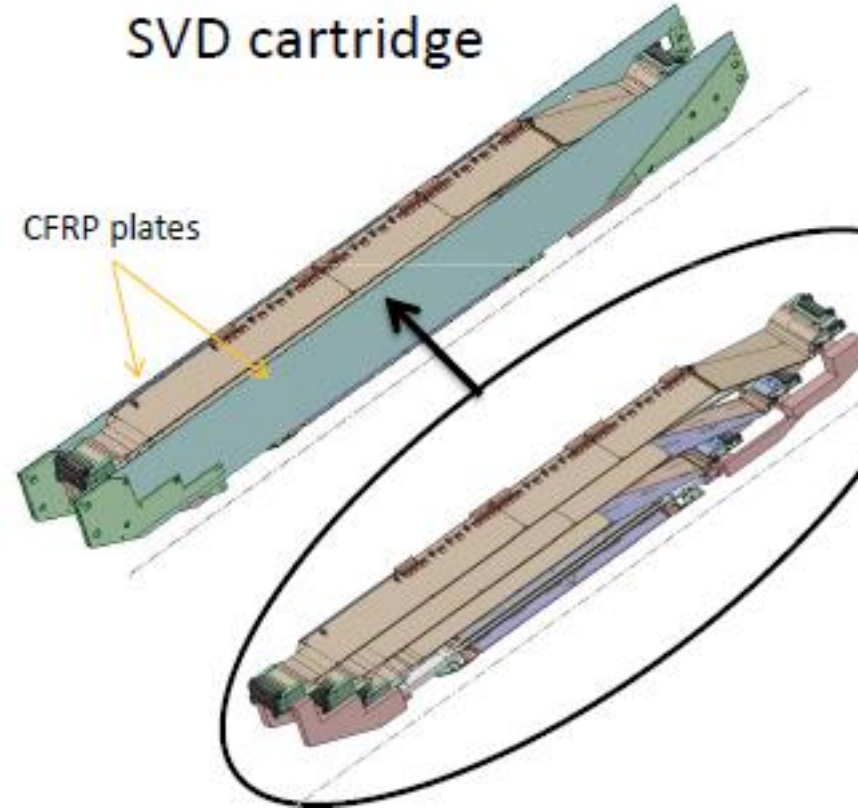
Sep. 30, 2014

1

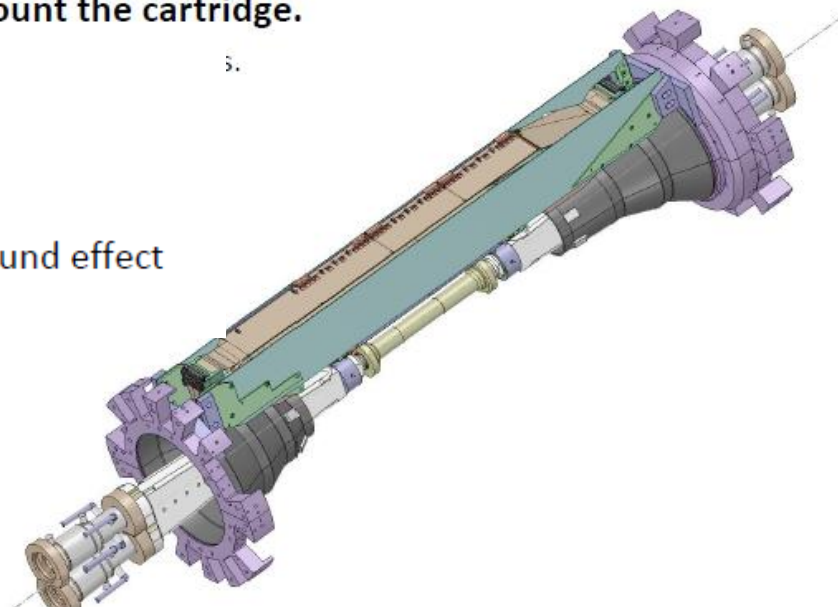
- **1 ladder / 1 layer**
 - 4 ladders in total
- **The installation direction is +X ($\theta = 0^\circ$)**
 - -X ($\theta = 180^\circ$) is another option, it depends on background effect on PXD

SVD cartridge

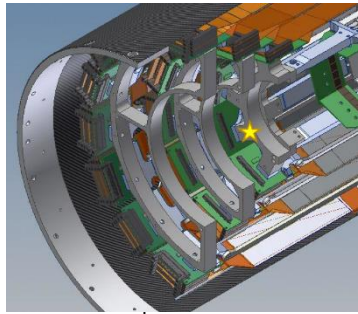
CFRP plates



- **Mount the cartridge.**

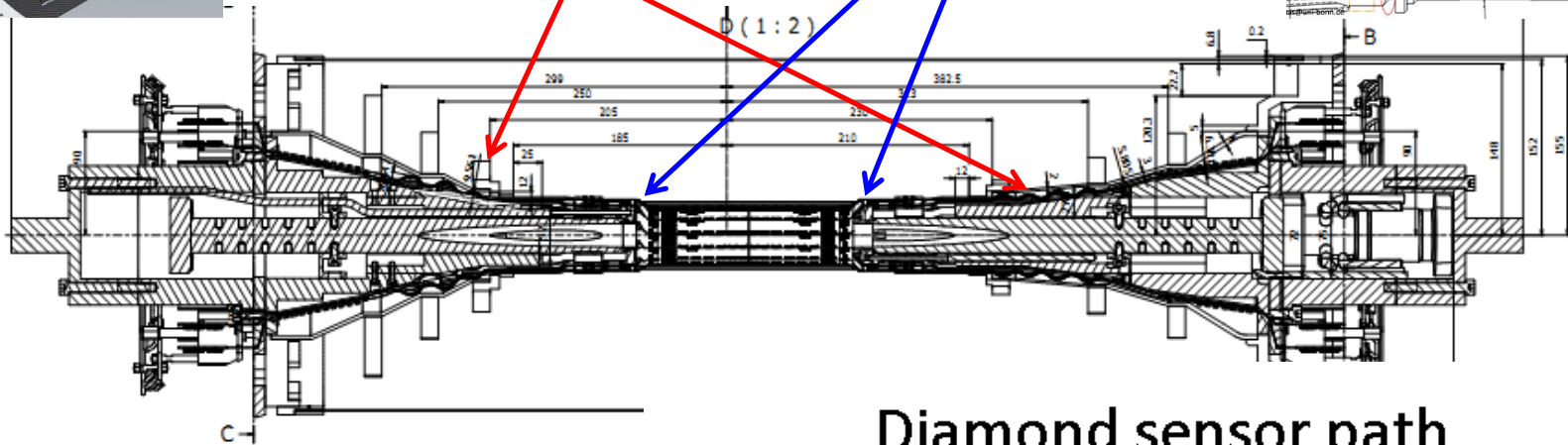
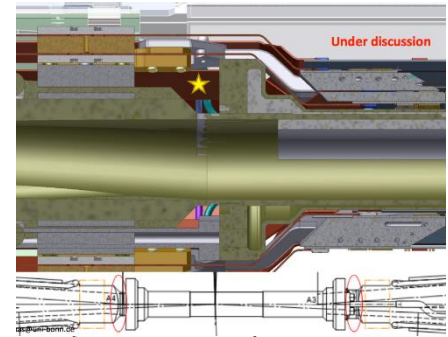


Radiation Monitoring and Beam Abort

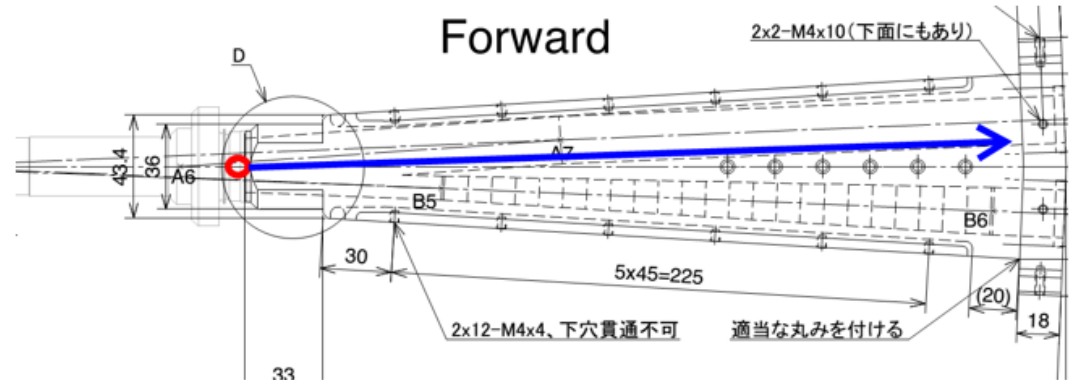
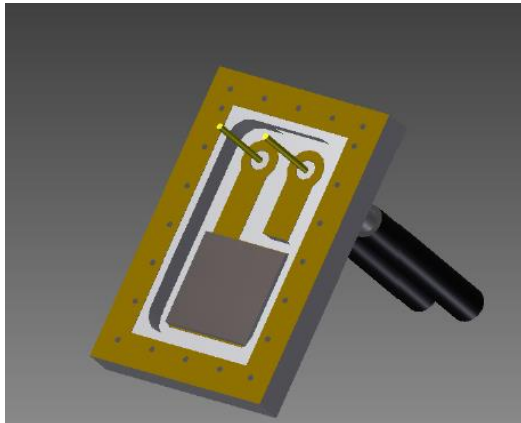


6 + 6 sensors (was 8+8)
on SVD support cone
(close to L3 rings)

4 + 4 sensors
PXD-beam pipe



Diamond sensor path



- Between HM and BP

Temperature 1: NTC Thermistors

System now foresees up to 96 thermistors NTC (Betatherm 100kΩ)

24=12 pairs: 12 half-rings supporting the SVD ladders

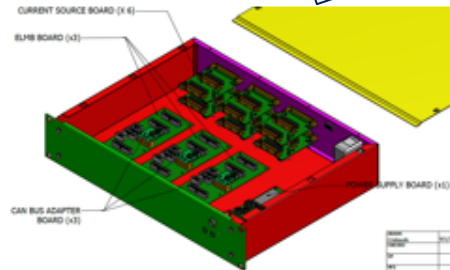
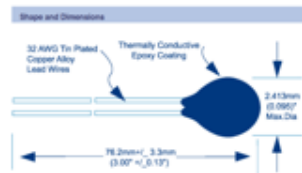
32=16 pairs: inlets and outlets of the CO₂ cooling pipes

38 still available: a few near FOS fibers for cross-calibration, and possibly at other locations

Readout based on ELMB (Embedded Local Monitor Board)

1 power supply board, 3 motherboards with ELMB and CANbus adapter,

3 x 2 current source boards, 3 x 2 x 16-channel connectors



New requests for space

Appellation CERN catalogue
Câble multiconducteur torsadé par paires
Appellation Alice

MA42

Code SCEM
04.21.51.410.5

CARACTERISTIQUES ELECTRIQUES

Tension de service (v/dc): 100 V eff.

Tension d'essai (kv/ac, 1mn) 50Hz:

Entre conducteurs:

Entre conducteurs et blindage:

Rigidité diélectrique entre conducteurs: 1000 Vcc

Résistance d'un conducteur: 235 ohm/km

Résistance d'isolation:

Entre conducteurs (Mohm/km):

Entre conducteurs et blindage:

Capacité (nF/km):

Entre conducteurs:

Entre conducteurs et blindage:

Impédance: 120 ohm±10% à 50 Mhz

Vitesse de propagation (v/c):

Diaphonie (db/km): 67

Atténuation (db/100m) à 1Mhz: 2,3

à 10 Mhz: 8,4

Température d'utilisation °C: -20 à +70°C

Indice de radiation: 6,0

CONSTRUCTION

Nb de conducteurs: 21x2

Section ou Ø conducteur: 0,088mm² Ø 0,38mm

Construction d'un conducteur: 7x0,127mm AWG 26

Section fil drain:

Diélectrique ou isolant: PE cellulaire

Ø extérieur (mm): 11.0

Poids cuivre (kg/km):

Poids total (kg/km): 5 X Ø ext.

Rayon de courbure: Voir liste fournie

Représentation des fils: Polyoléfine, gris moyen 7032

Couleur gaine:

Conforme à l'instruction de sécurité IS 23

Signification de MA42

M: Multiconducteur

A: Section d'un conducteur AWG 26/7

42: Nombre de conducteurs

Current negotiation strategy for space allocation

For cable and pipes which not included in SVD.Rev.2.1 or PXD design.

Please pay attention to make negotiation with relevant person.

1, VXD design : KEK(BP+HM), MPI(PXD), HEPHY(SVD))

2, Between FWD VXD and QCS, requiring mockup test

3, Dock space allocation: MPI

4, B-ECL Space between CDC and endcap (At first, summarizing by VXD mechanics group
->taking agreement with Adachi-san)

VXD dismantle/installation work

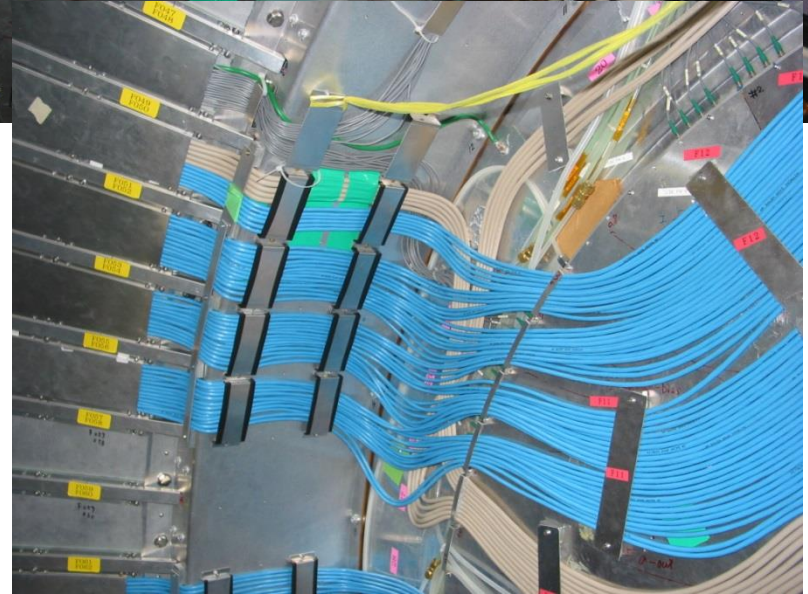
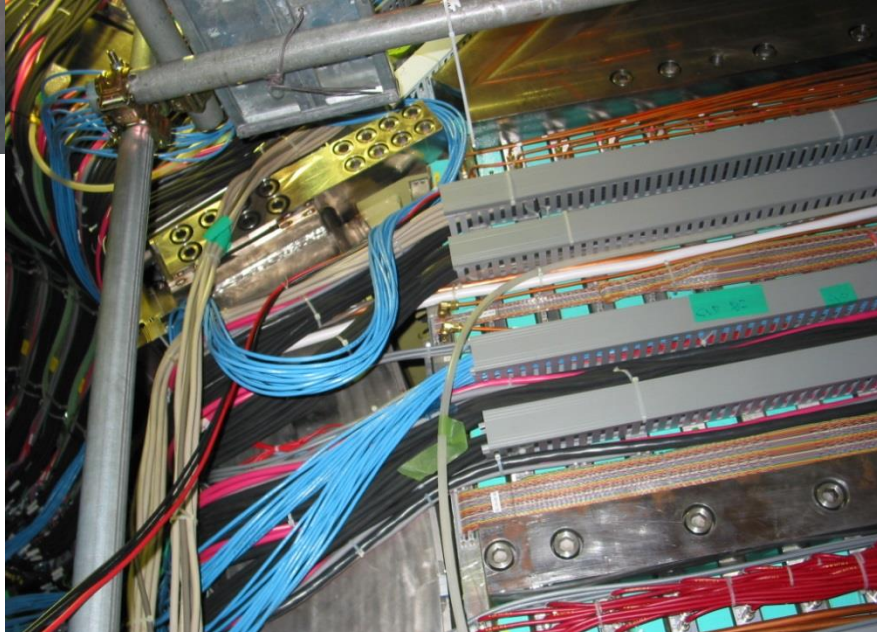
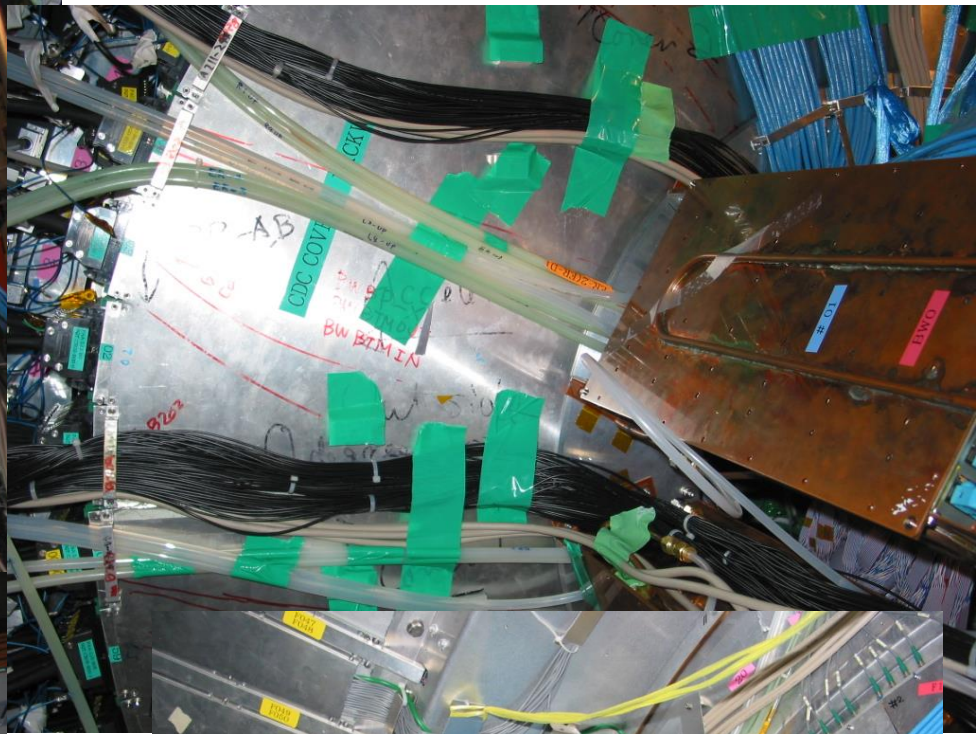
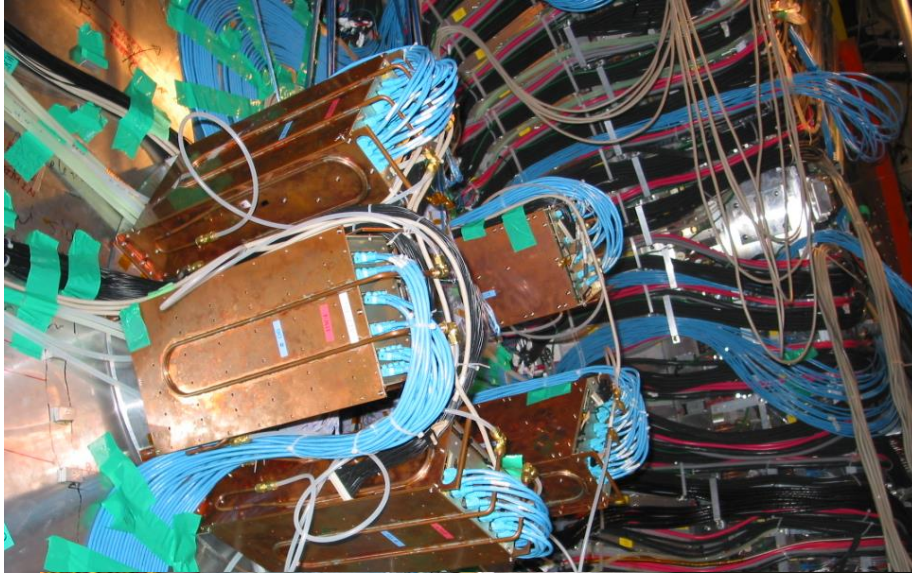
2003 (SVD1->SVD2)

<http://kds.kek.jp/materialDisplay.py?contribId=11&materialId=slides&confId=16701>

Learn from history

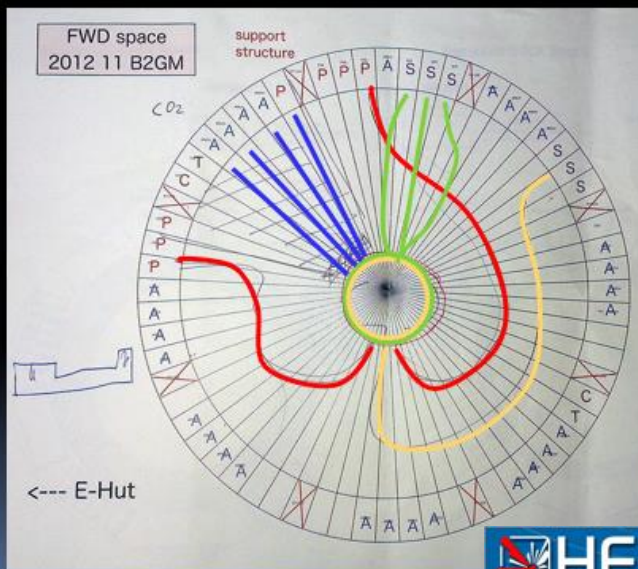
Service work

example slide discussed



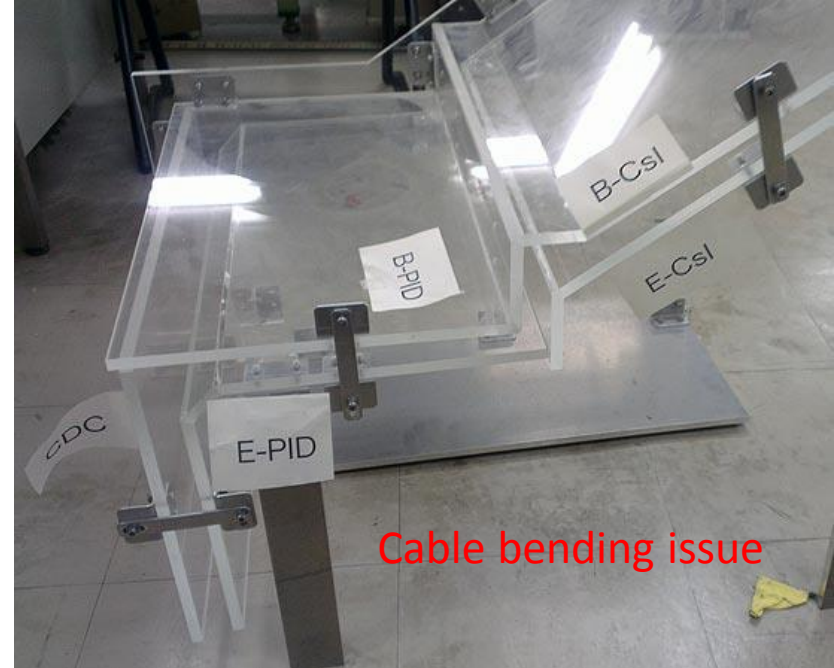
CO₂ PXD SVD data SVD power

- Cable routing on CDC end wall considering PXD cables and CO₂
- No crossing between thick cables allowed
- Crossing OK (inevitable) for flat SVD data cables



M.Friedl: SVD Cables

1 July 2014

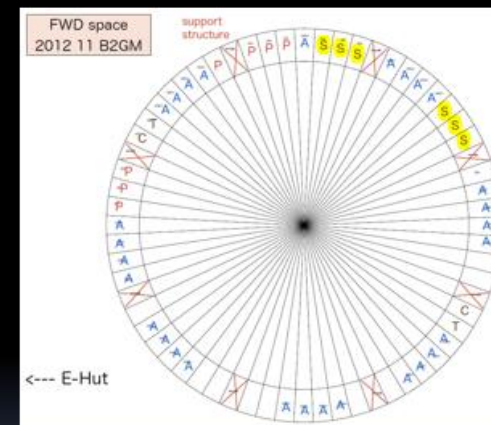
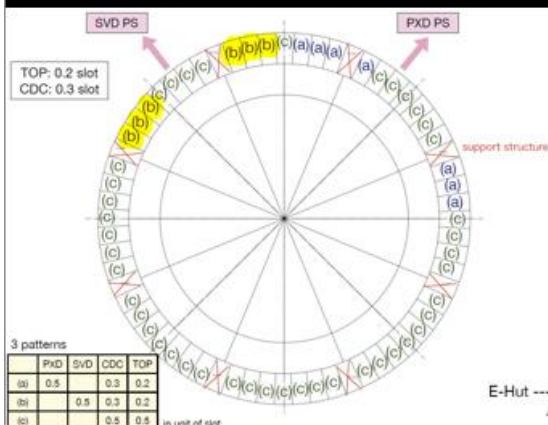


Cable bending issue

M. Friedl

Cabling without overlapping each other,
Because of 20mm clearance between
CDC and End cap

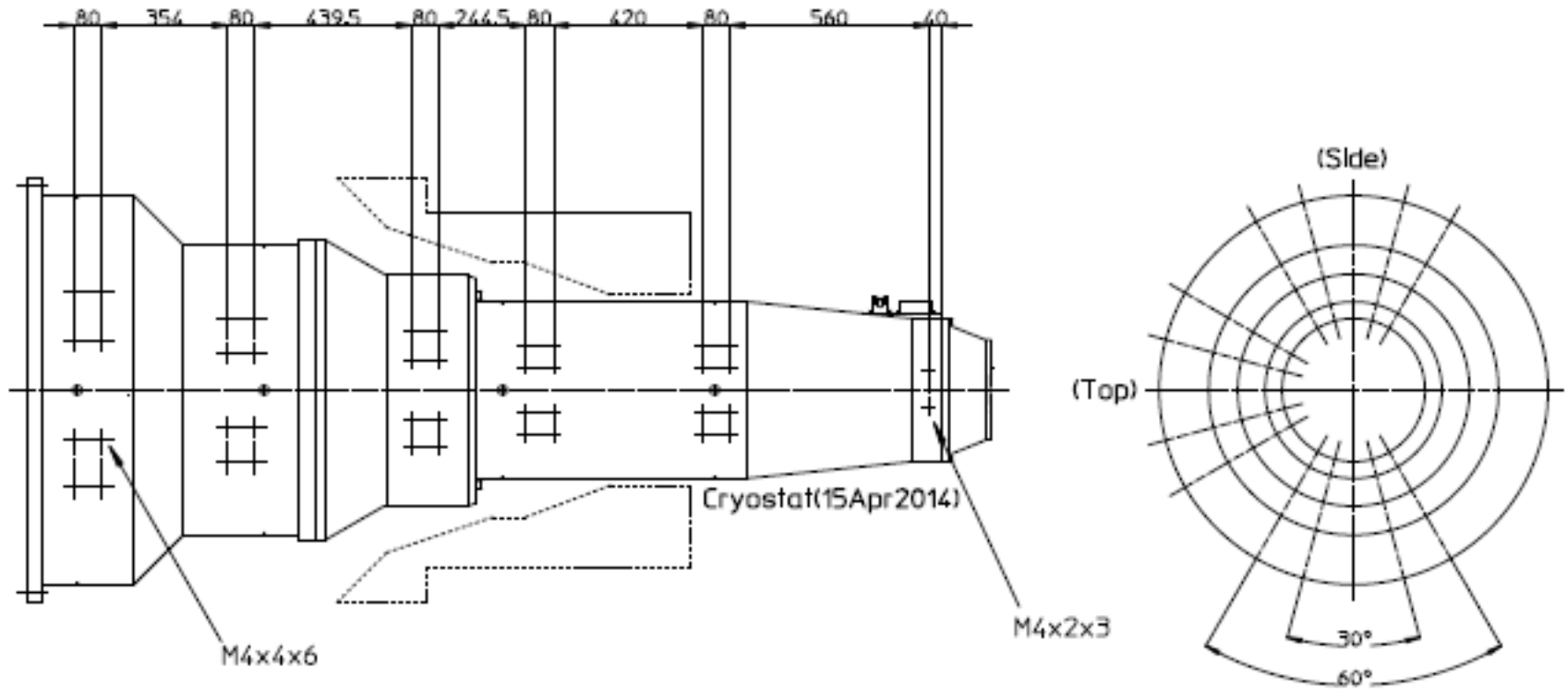
Cable Slot Assignments



- BWD: only shared slots
 - Labeling very important

Space allocation by Adachi-san

Screw hole position (QCSL)



Screw hole position is discussing between Karsten(DESY) and Kanazawa(KEK machine).
QCSR (FWD) design is not prepared yet.

Conclusion

- VXD mechanics meeting (satellite meeting on 30th)
 - VXD load issue (result will be reported in next B2IM)
 - SVD BEAST (cartridge idea)
 - service work (some mockup test should be done beforehand)
 - VXD assembly procedure (BP,SVD by KEK, PXD by MPI)
 - BEAST Beam pipe (will be completed soon)
 - Beam pipe for Physics run (just starting, until 2016 Mar.)
 - Cooling pipe diameter
 - End-flange modification (for phys. Run) for cooling pipes
 - Endring modification for cooling pipe path
 - Radiation monitors and monitors
 - IBelle (with CERN experts @MPI on 6th, 7th)

Tentative milestone(next half year)

- Nov B2GM (Gemba/satellite meeting)
 - PXD PP area service work check
 - SVD ladder mount table demonstration
 - Check position error with test gluing product (End-flange+cone+endings)
 - Decision of producing FWD endring gluing jig
 - VXD BEAST (PXD, SVD, monitors) space and services
 - VXD load discussion (on outer detector session)
- 2015 Feb. B2GM
 - VXD assembly table
 - BP + alignment,
 - PXD mount test(partial test is OK)
 - SVD connection by division tool
 - SVD ladder mount test (final iteration)
 - Cooling pipe assembly (Origami, Endring pipes)
 - SVD BEAST system mount test
- Cabling test between Docks to outside (@MPI Jan 2015)
 - CO2 cooling pipings, PXD cablings, SVD cablings and monitors

SVD ladder mount starting
From 2015 summer

