Status update on phase 3 beam pipe

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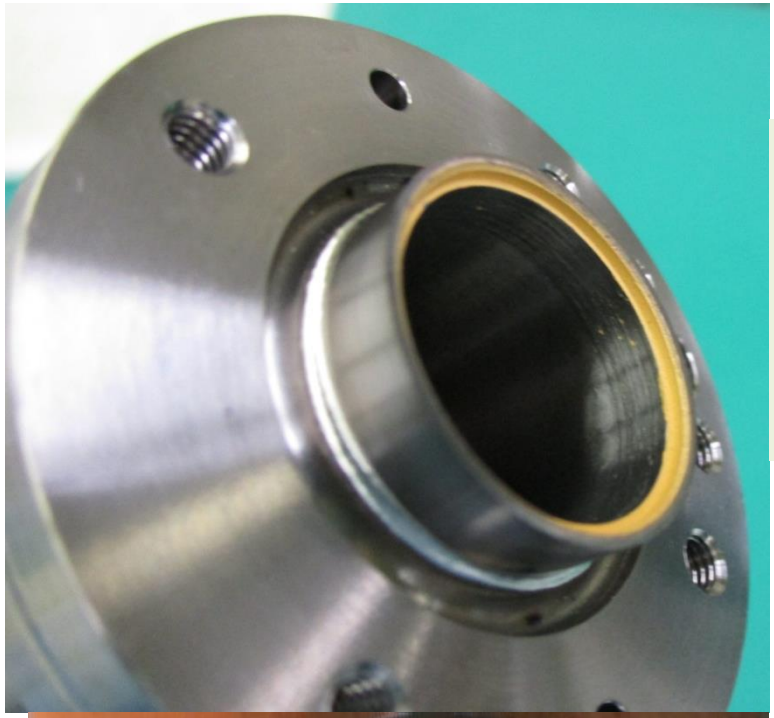
PXD workshop@DESY
2018/1/24

Gold peel-off problem: Phase 3 Beam pipe



Gold peel-off has happen after the sputtering process again.

Considerable reason of this issue

1, The pipe is an double tube with Titanium part and sputtering is applying on vacuum condition

The heating up process might not be enough, as like "thermos structure".

Remedy plan:

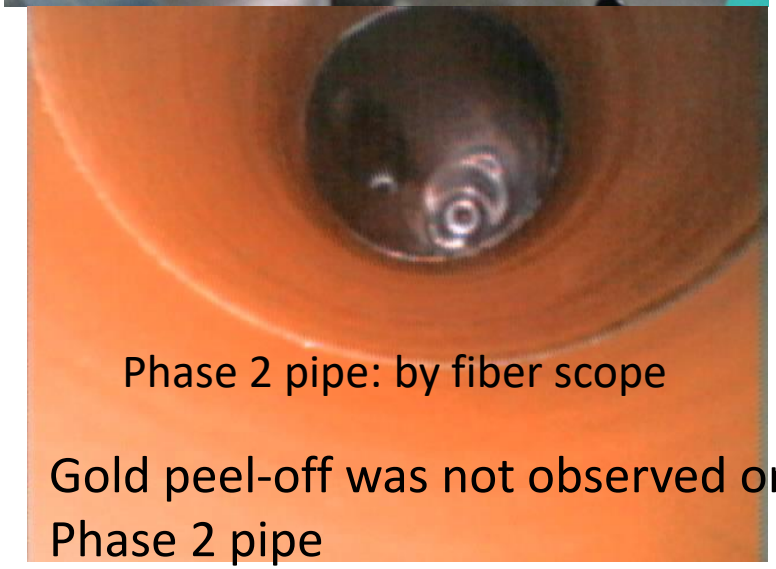
re-production of IP part,

- It started (preparation process)
  - BP will complete in Apr. 2018

– Gold sputtering inside after removing of Gold.

– Gold plating on BP outer surface

- Most quicker and safe solution but we should keep clearance with PXD
  - BP Can complete in Mar. 2018



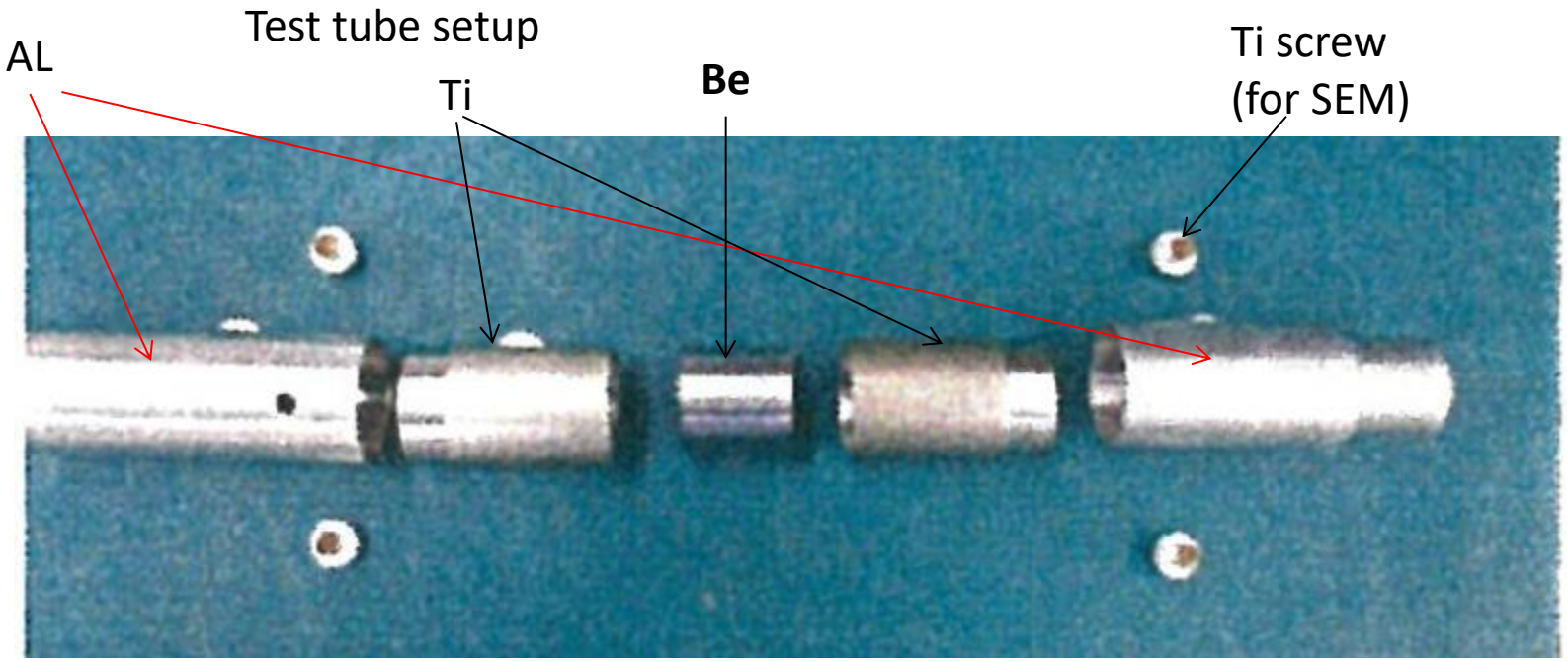
Phase 2 pipe: by fiber scope

Gold peel-off was not observed on Phase 2 pipe

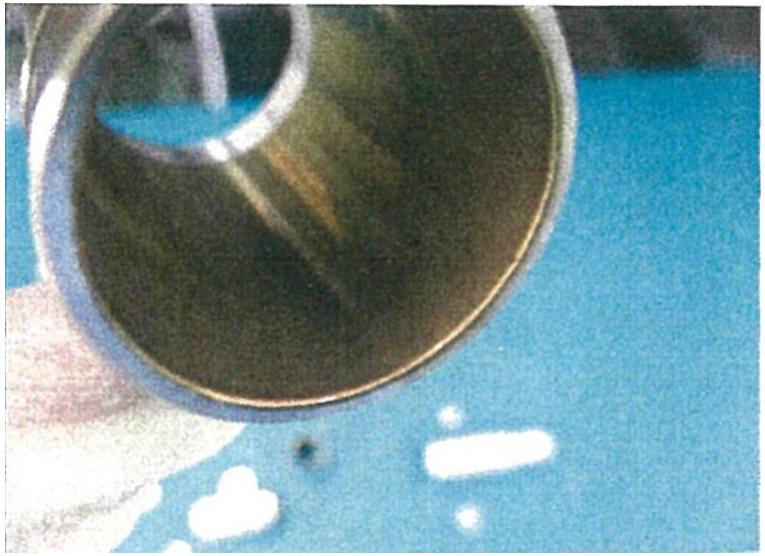
Au Sputtering test

- Comment by Materion (Brush Wellman)
  - Ti as a base material on sputtering (Cr was used on last case)
- On next test, Ti coated Gold electrode was used
  - No electrode exchange work is necessary

    (Oxide material can be avoid in the intermediate layer)



result



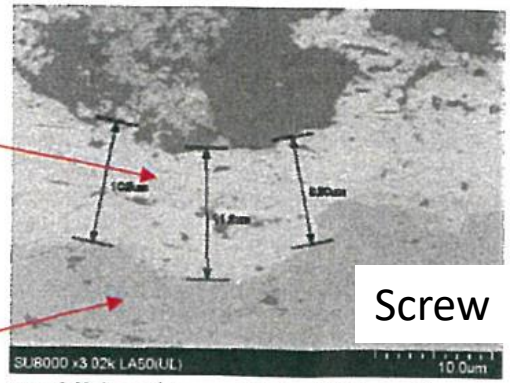
Be pipe: No peel-off

Ti pipe: partly peeled-off
(peel was in the Au layer)

SEM image of Au layer

Au層

Gold layer



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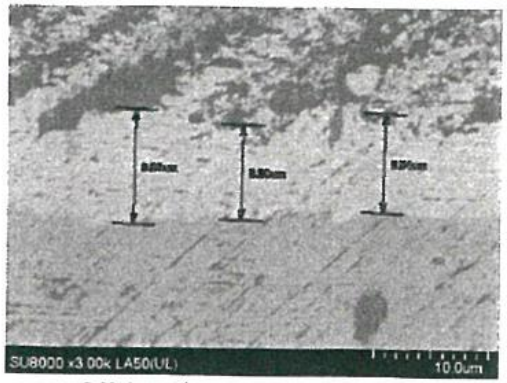
Screw surface

№1断面(Au=10. 33μm)

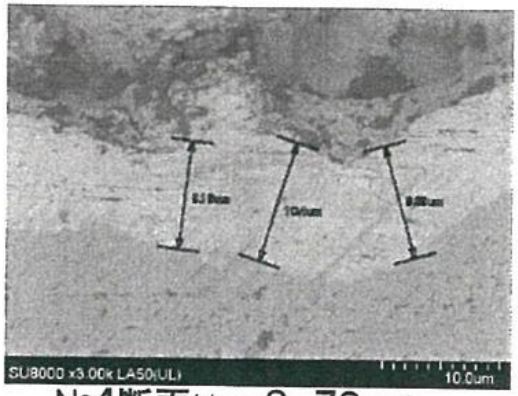


№2断面(Au=9. 01μm)

Sputtering parameter seems not to be not properly optimized

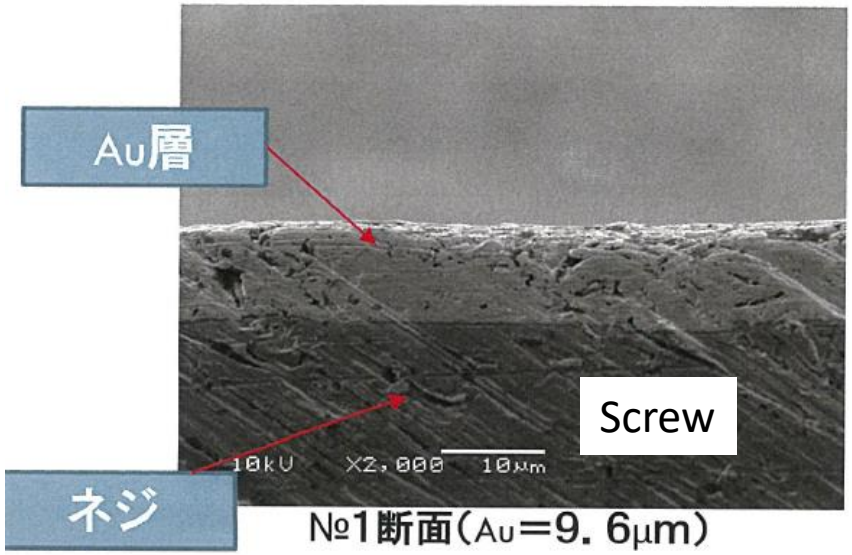
Be part has passed for Peel-off test, but some area of Ti part has not..

№3断面(Au=9. 33μm)



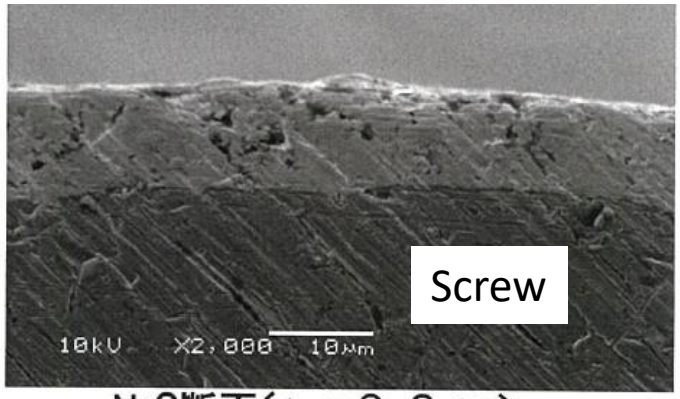
№4断面(Au=9. 72μm)

Second test

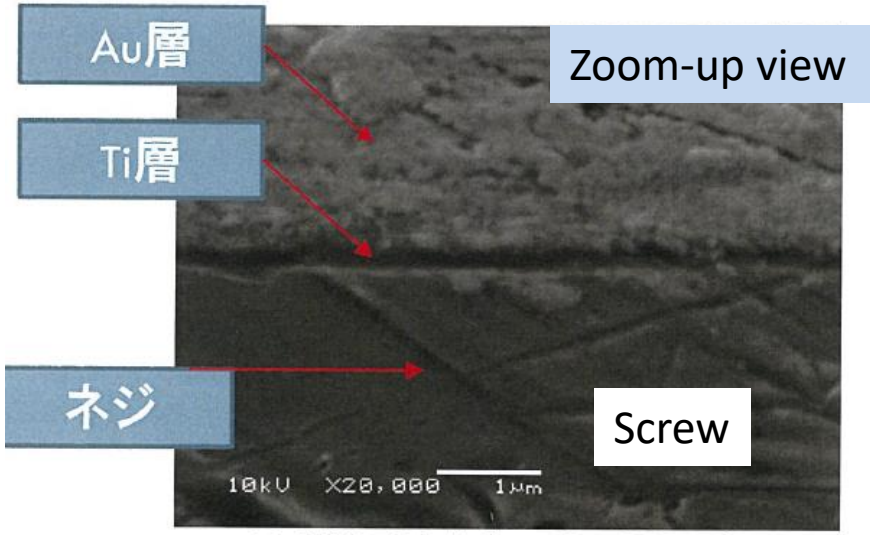


№1断面(Au=9.6μm)

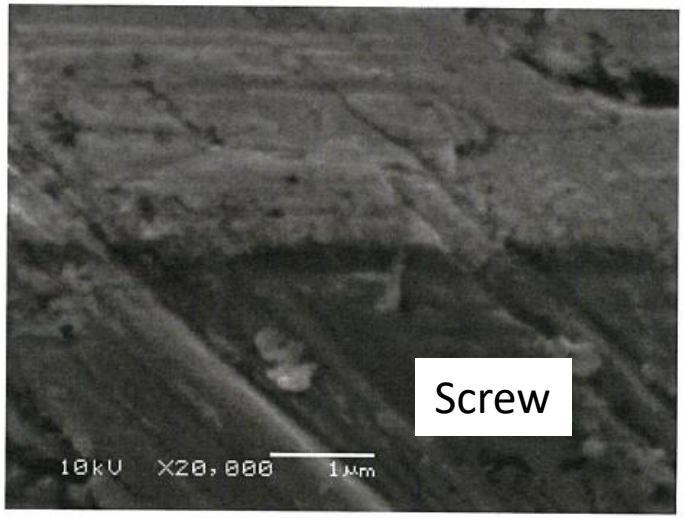
No peel-off has happen both for Be, Ti part



№2断面(Au=9.8μm)



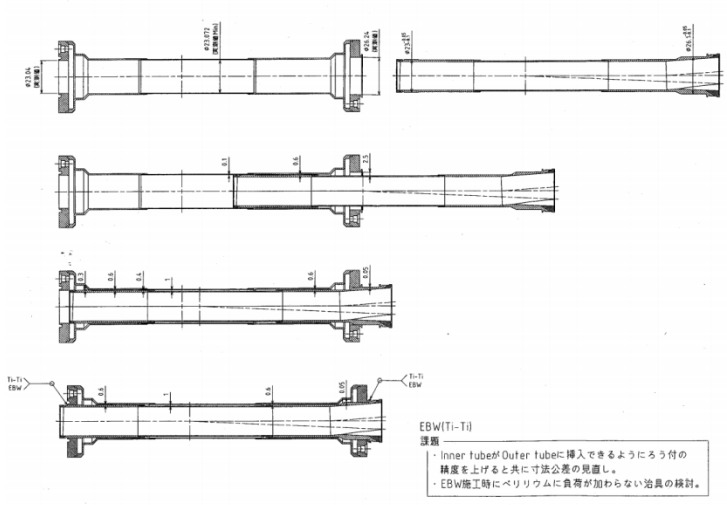
№1断面拡大(Ti=0.26μm)

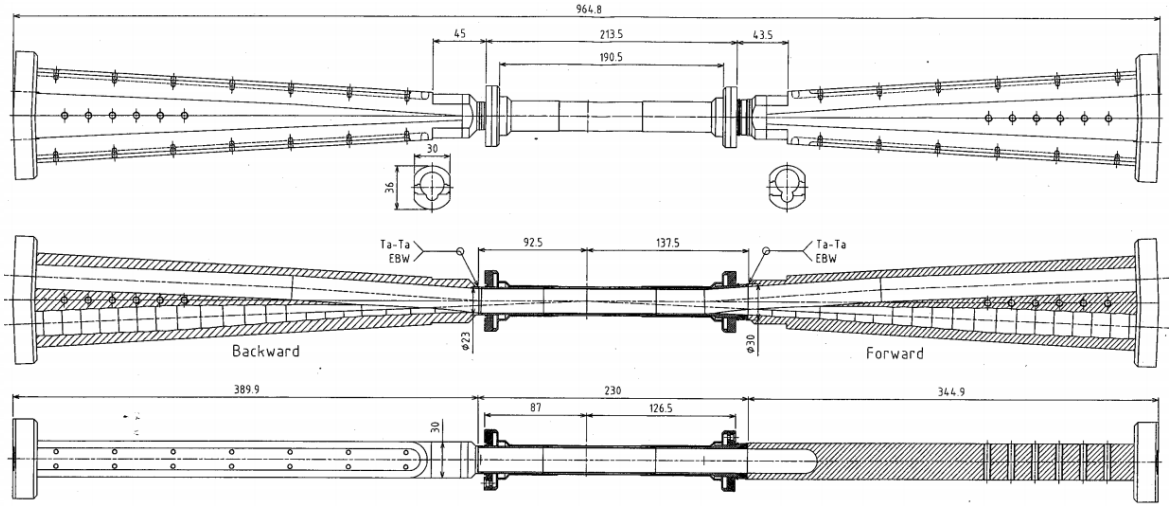


№2断面拡大(Ti=0.29μm)

Schedule until completion

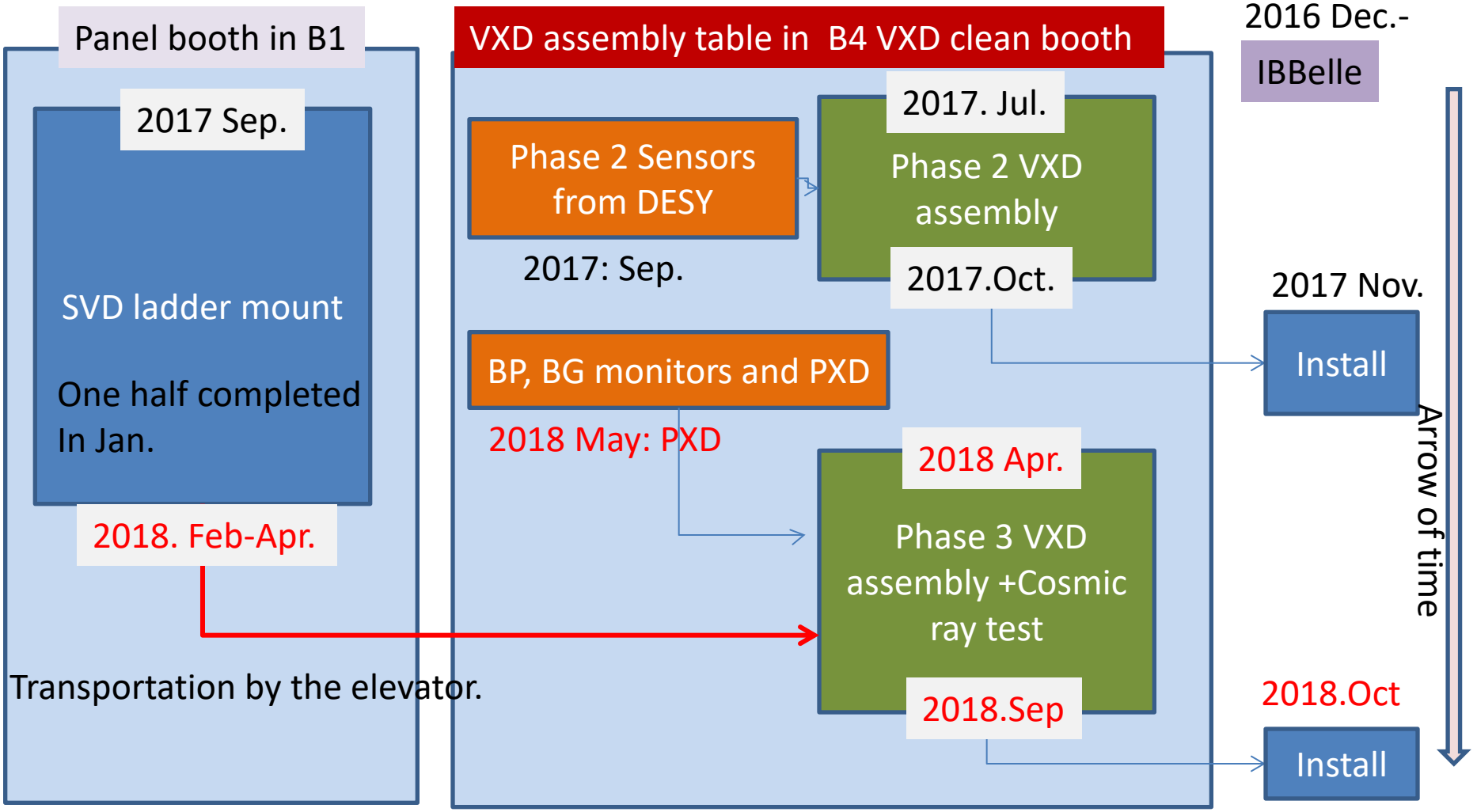
- ~30th Jan.:
  - Au sputtering for Inner tube
  - 1um Al plating for Outer tube surface to avoid water corrosion
    - It was 20um parylene
    - Material budget: 0.006 %Xo (20um parylene), 0.01%Xo (1um Al)
- ~Middle of Feb.
  - Inner tube + Outer tube by EBW
- ~End of March
  - IP tube + Crotch part (final process on the production)





VXD Assembly work management

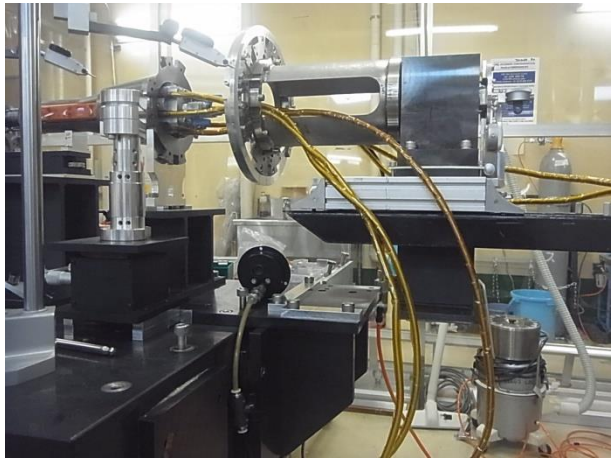
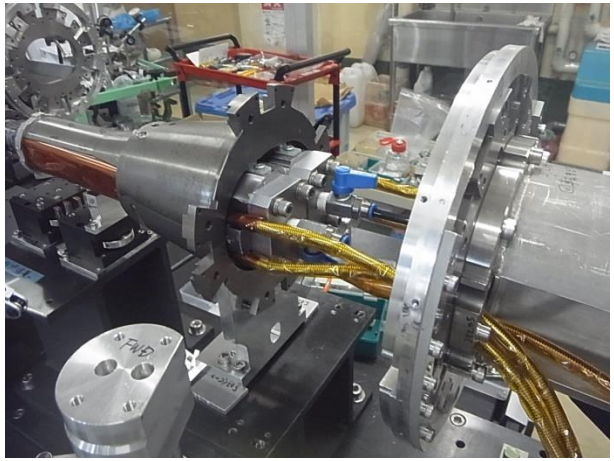
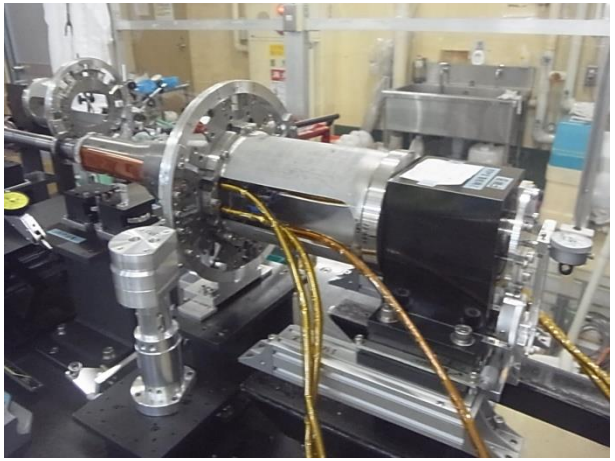
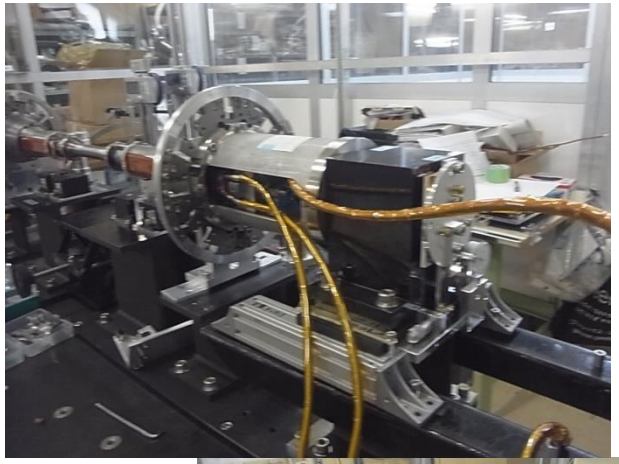
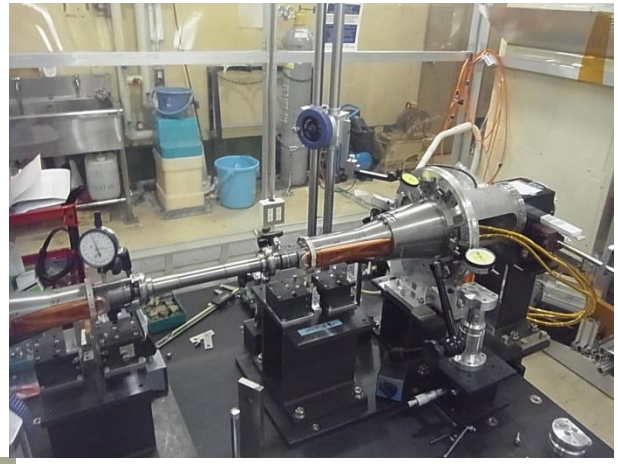
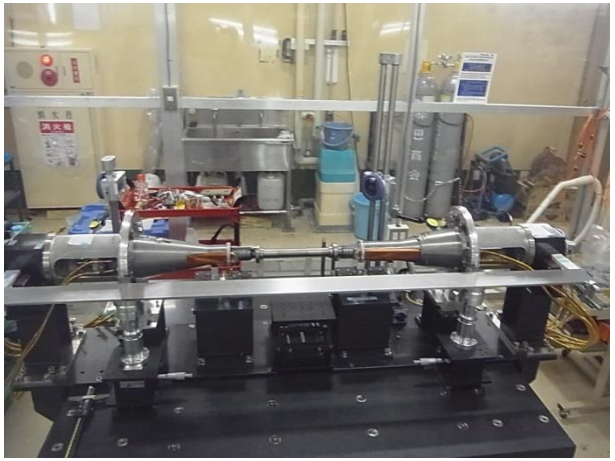
- We will assemble two sets of VXD system
  - VXD for BEAST phase II
  - VXD for phase III physics run



Beam pipe + VXD mechanics integration

1. 3D survey of the pipe: April (in first week?)
2. Modification of the HM and PXD mount block according to the survey data. (also decision of phase 3 pipe position in the detector by discussing with machine group)
3. Test assembly by mock pipe with phase3 HM
4. Phase3 pipe +HM integration: until end of May.
   (including feasibility check of all of phase 3 material integration: i.e. Outer cover, SVD structure)

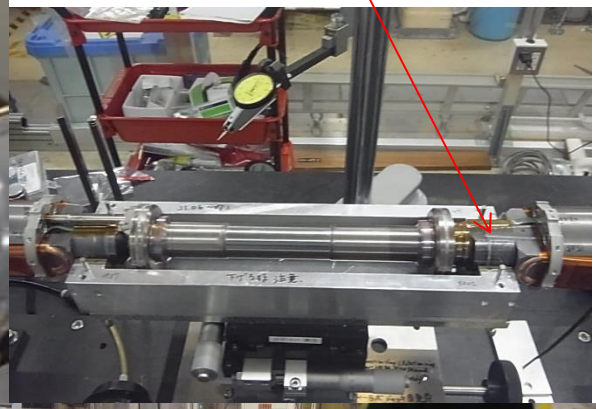
VXD mechanical part integration


BP position control
Leak test
Electrical isolation of BP with other component
PXD mount block position control and so-on
(Test assembly by mock-pipe-> final assembly)

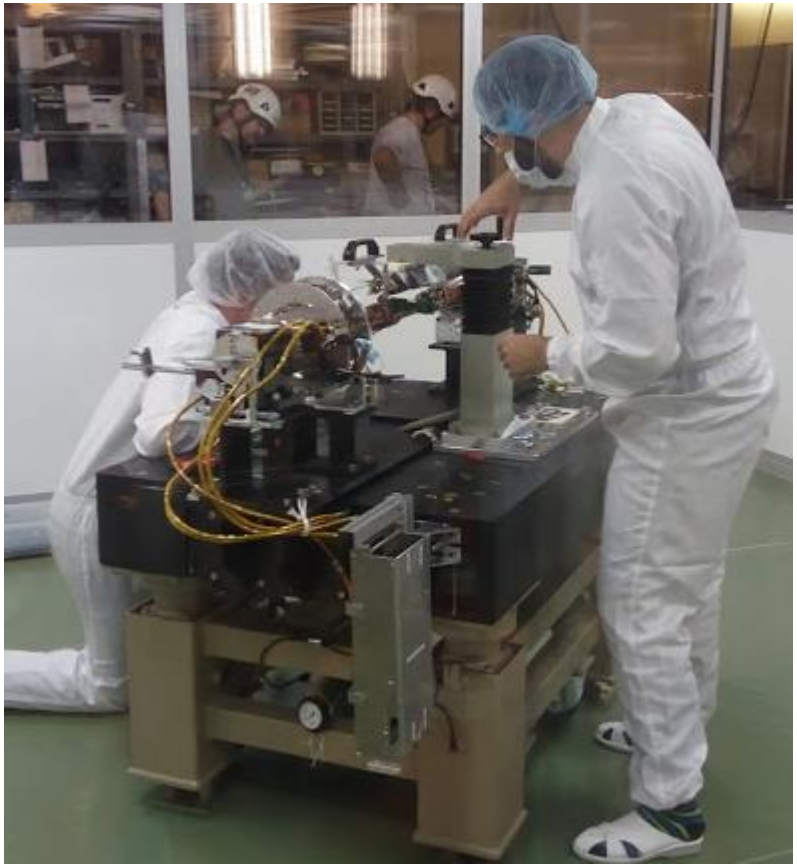
Before PXD mount

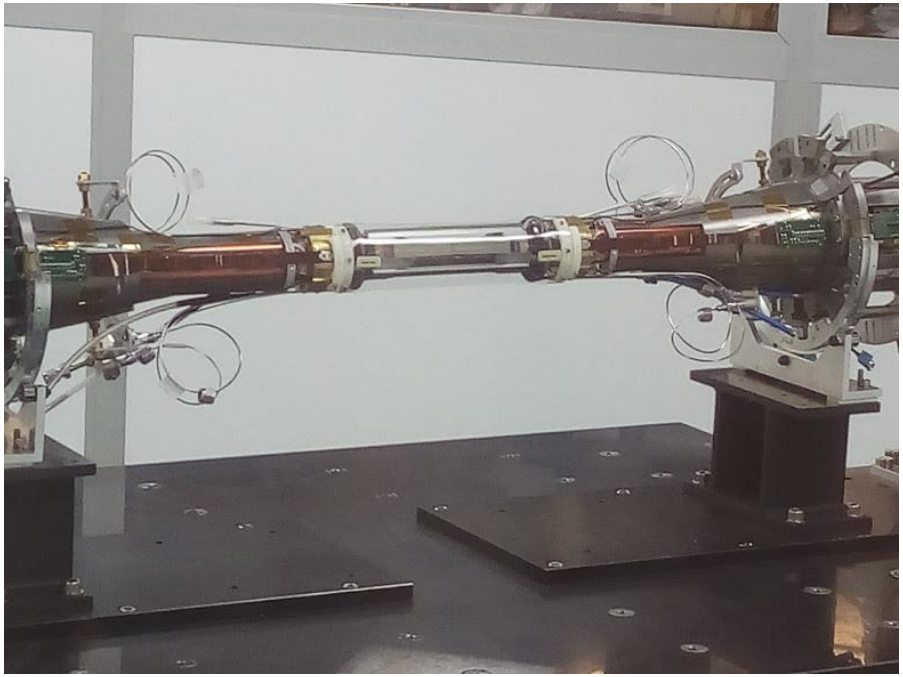
- PXD Mount block(MB) assembly
- MB Control tool is aligned in parallel with IP-chamber
- After fixing position, MB is glued to connect Beam pipe
  (by dotted pattern)



Feasibility check of PXD mount

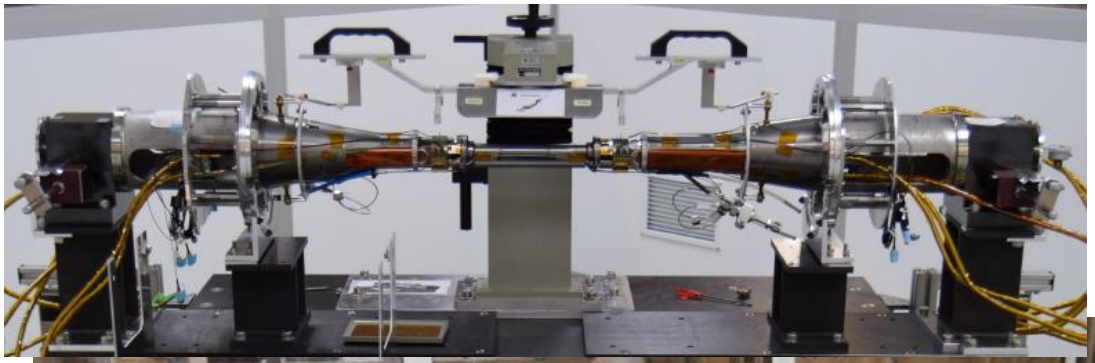
PXD mount



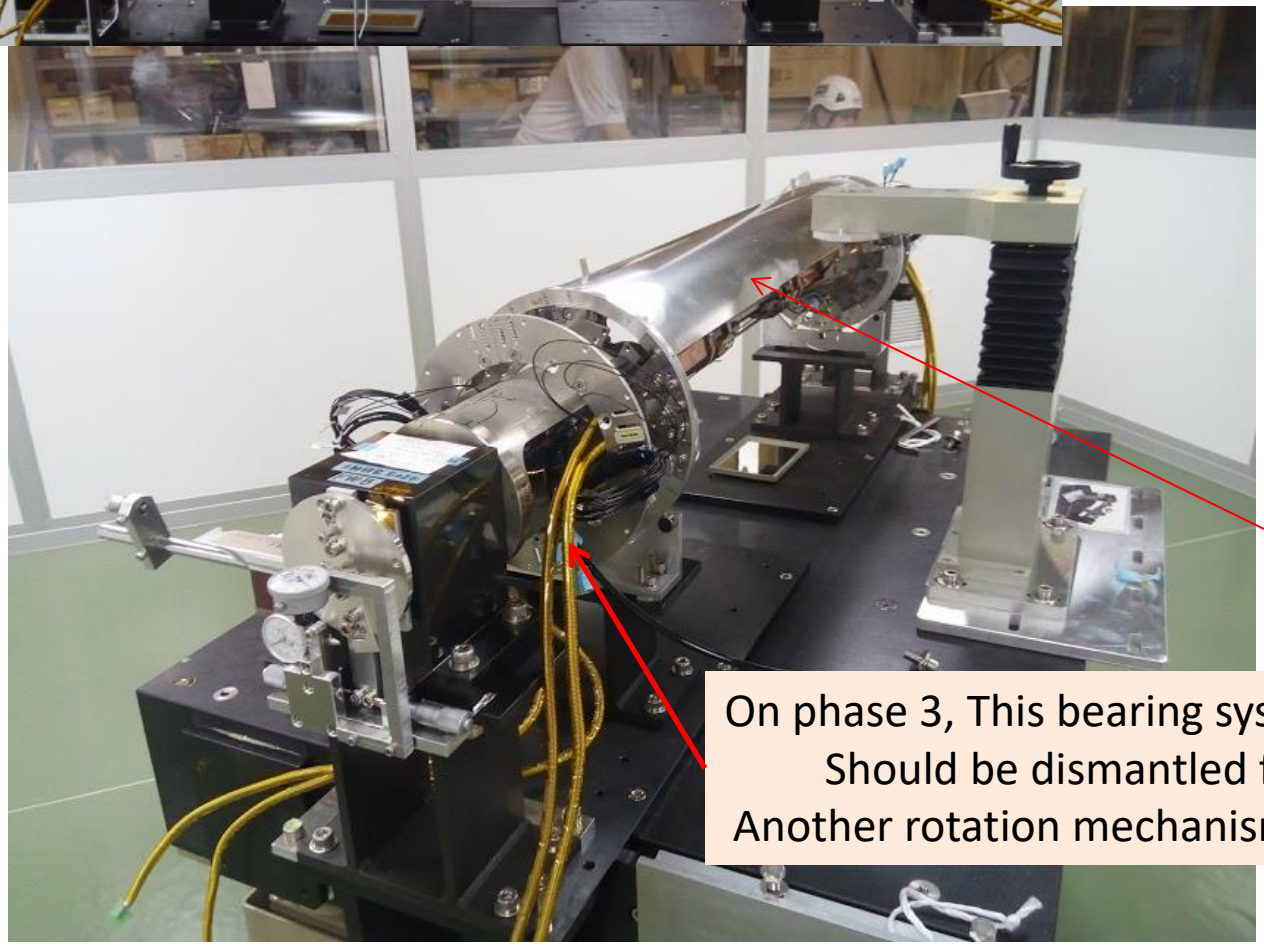


PXD halve attachment by mechanical arm
Mount work is cotrolled by PXD team

On the rotation



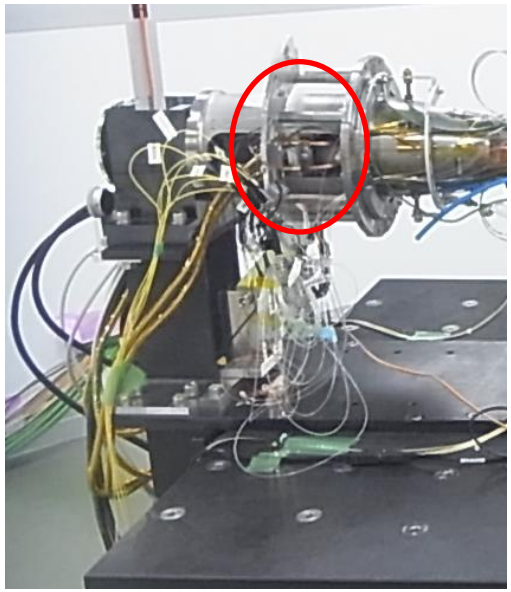
To attach second
PXD half, whole structure
have to Move up side down



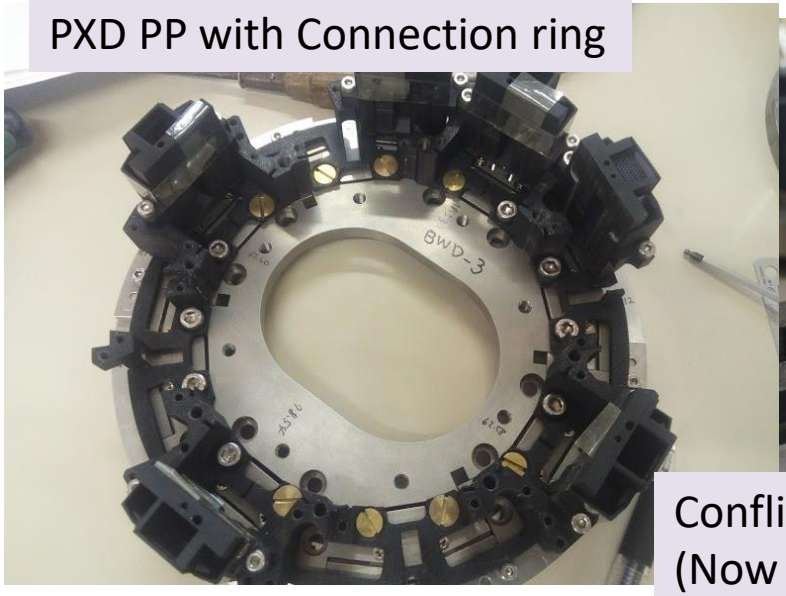
Phase control
By Al cover plate

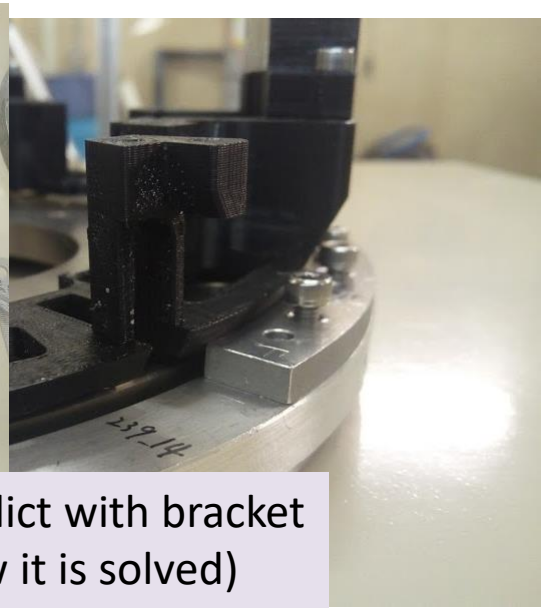
On phase 3, This bearing system
Should be dismantled for PXD cables.
Another rotation mechanism is under test

Mechanical tuning toward to Phase 3



PXD PP with Connection ring





Conflict with bracket
(Now it is solved)

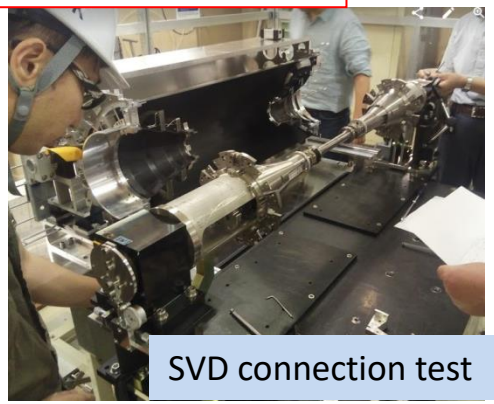
- Solving mechanical space conflict: mainly service space issue
  - Phase 2 assembly is good chance to blush up whole integration steps
- Issues
  - cable connection timing for system test
  - Feasibility of Bellows pipe connection after VXD installation
  - Modification is VXD table setup to give more service space

  and so on

Check list : VXD assembly -> Installation

Light blue: confirmed

- BP + Shields assembly final check:
- PXD mount: block controlled by the Jigs
- PXD attachment
  - Fine tuning of the steps should be considered
- Rotation with phase control
  - For PXD cables, new rotation procedure is on the test
- Cabling/piping in the VXD volume:
- SVD structure transportation from B1 to B4
- SVD attachment: Clearance check between PXD and SVD: OK
- Cable management after VXD completion (outside of VXD):
- Installation ring attachment procedure:
  - Installation Ring-> Bellows pipe->PXD cable cage (learned by phase 2)
- Connection of the crane tool to VXD structure : OK
- Lifting up of VXD and put onto VXD cart:
- VXD cart move to B4 floor: OK
- VXD bring to the installation setup by crane: OK
- VXD installation: OK
- Service work between VXD and dock: (detailed service work steps should be defined for phase3 work)



SVD connection test

VXD cart

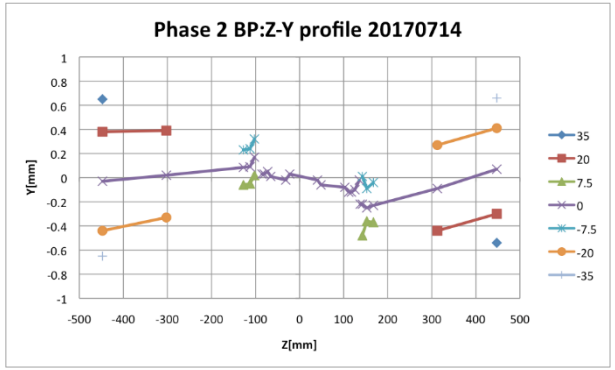
Main issue is to manage large amount of cables and pipes on Phase 3

bkup

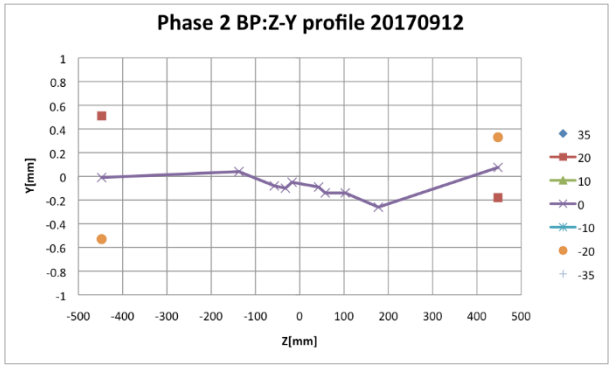
VXD assembly procedure

Phase 2 VXD assembly (BP+HM)

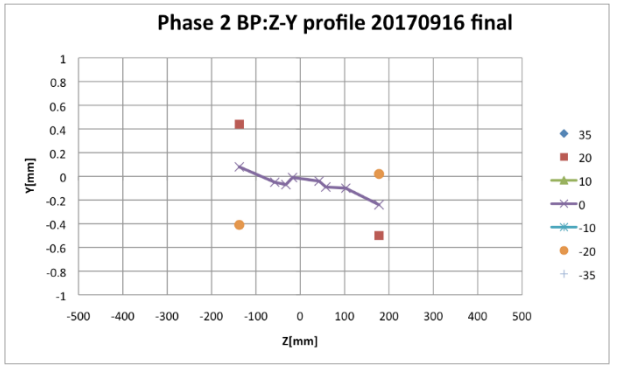
Beam pipe only

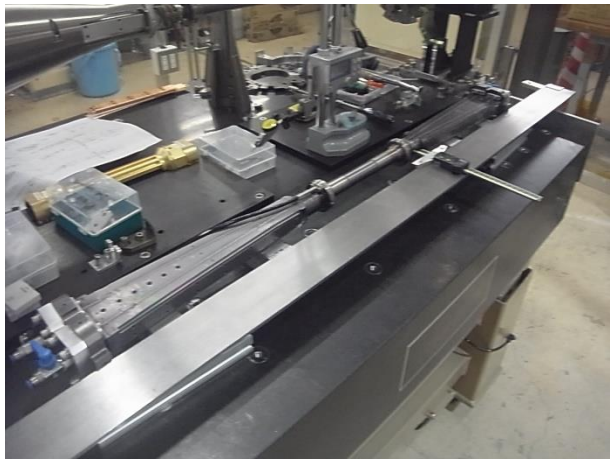


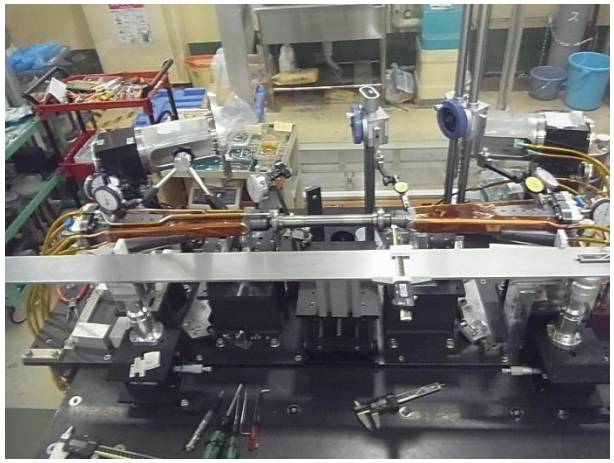
BP+ lower side Shield

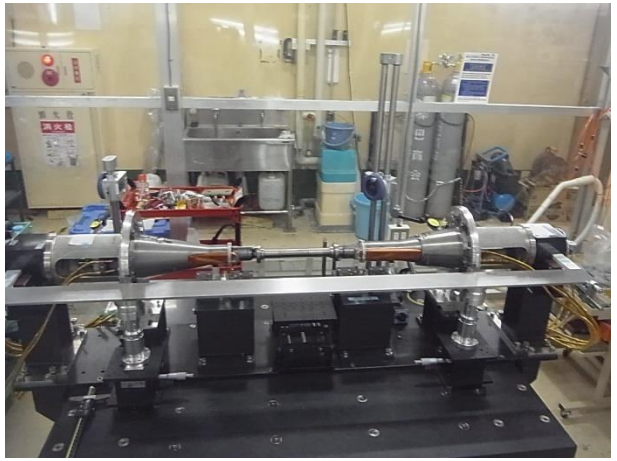


After BP+HM Assembly









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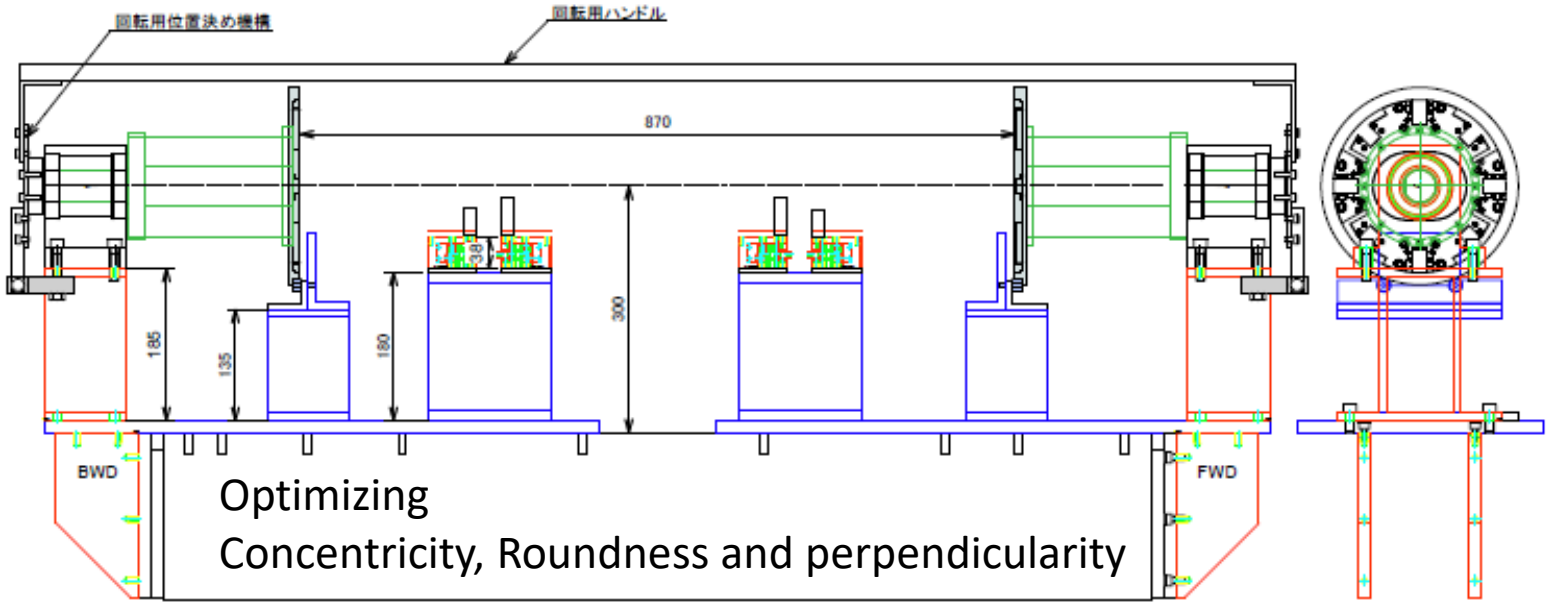
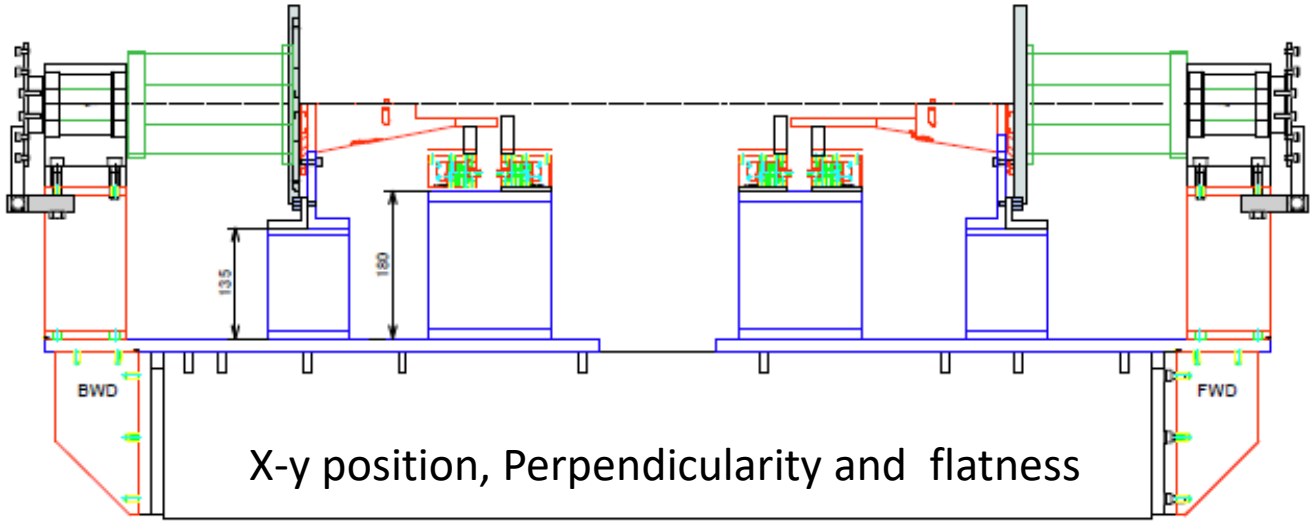
BP+HM assembly



Optimizing
Concentricity, Roundness and perpendicularity



X-y position, Perpendicularity and flatness

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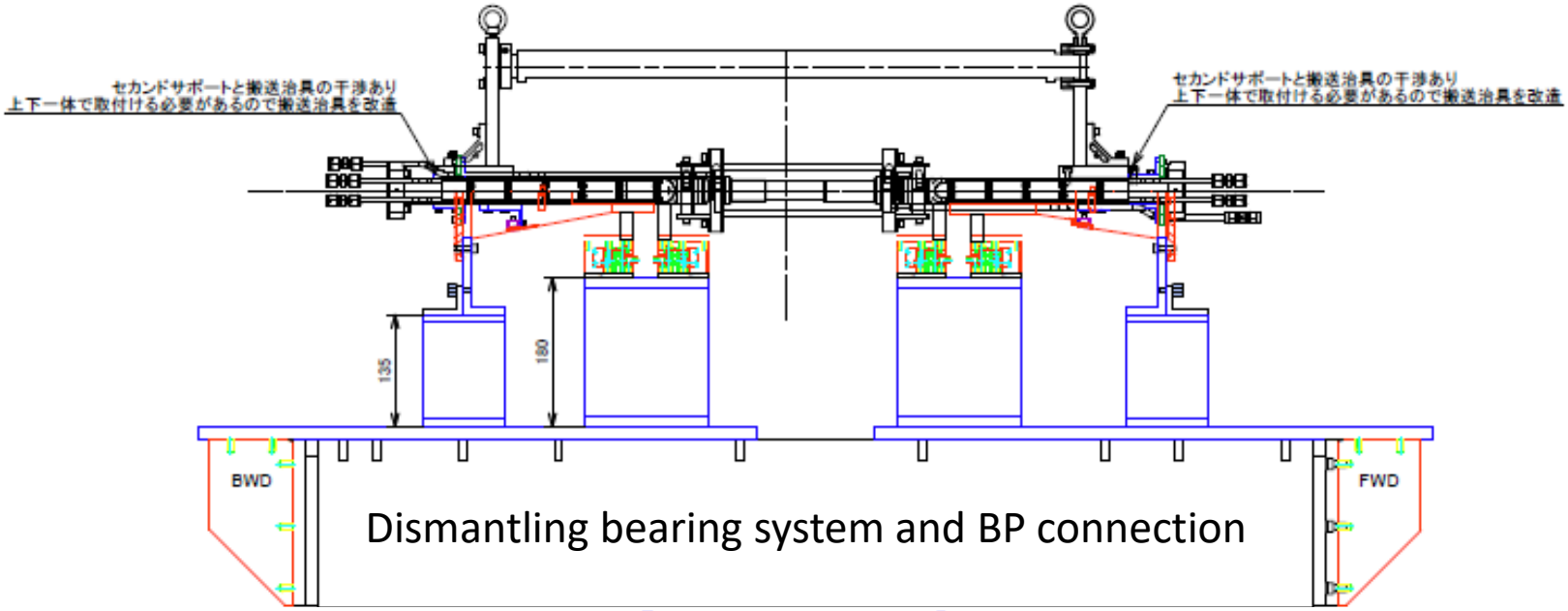
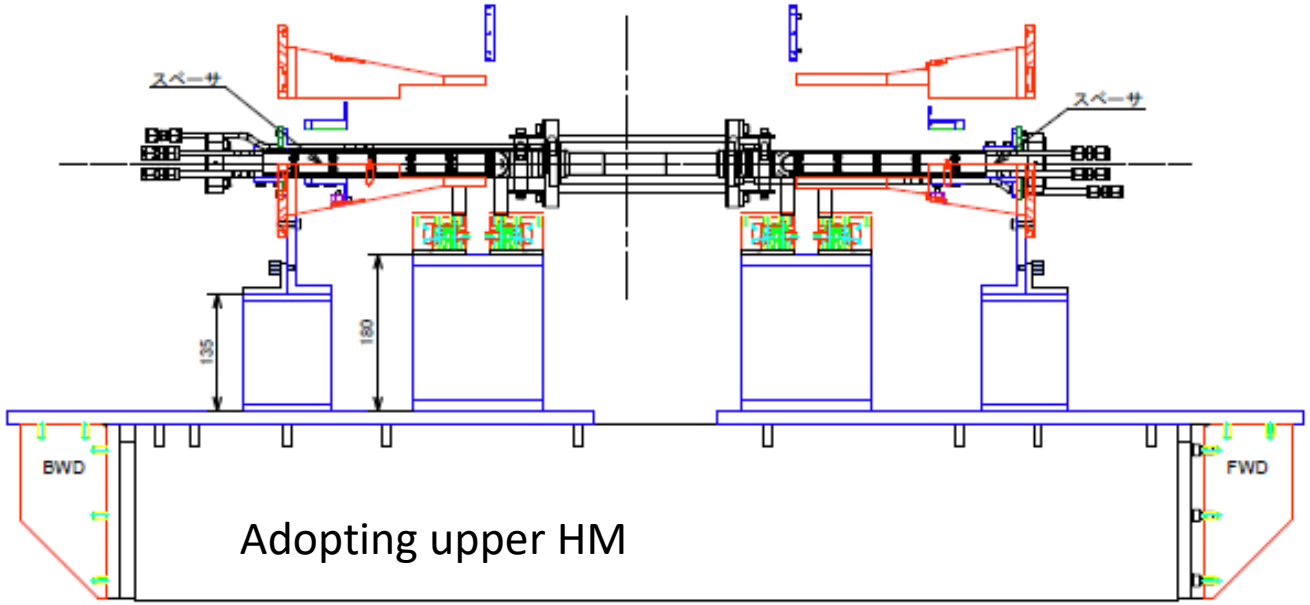
VXD assembly



Dismantling bearing system and BP connection



Adopting upper HM

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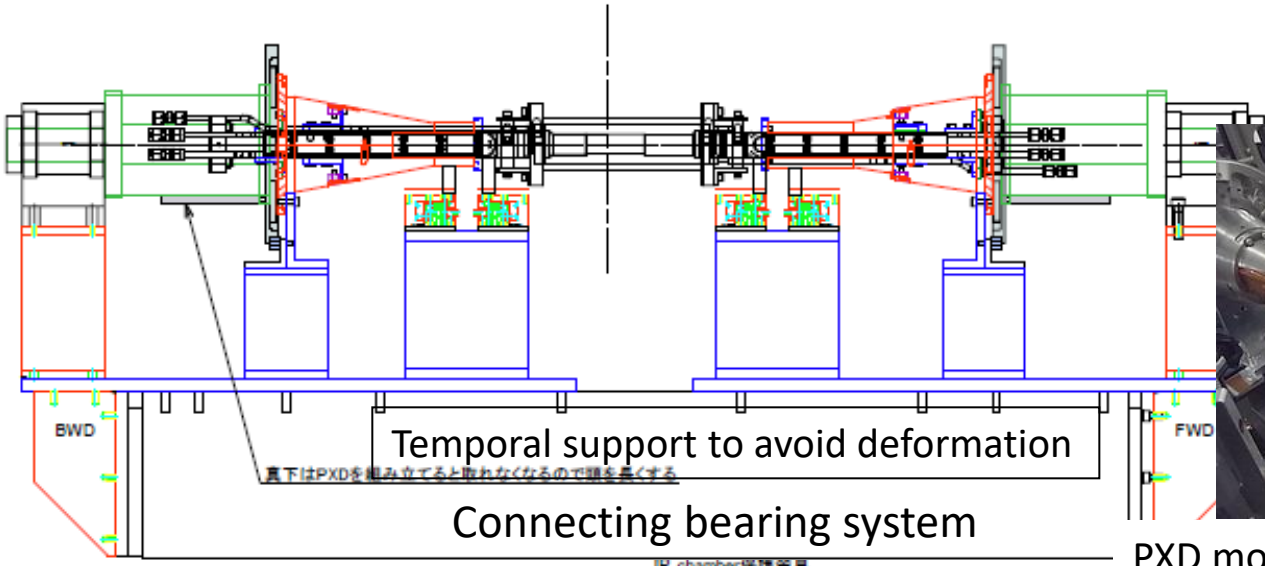
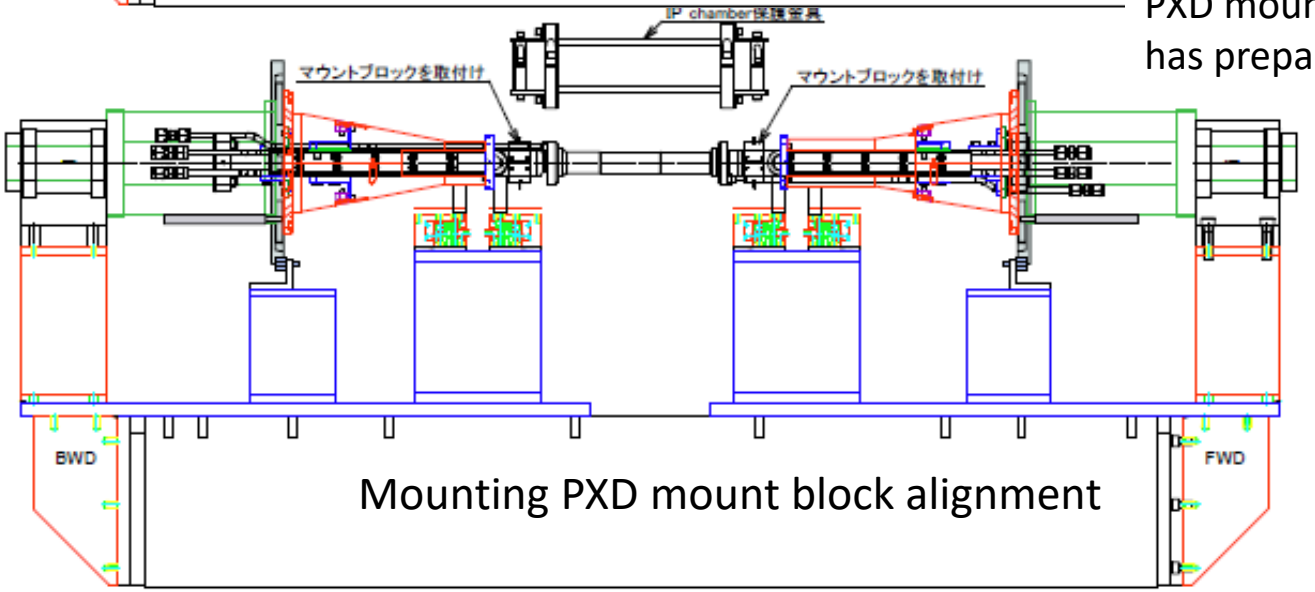
VXD assembly



PXD mount block Alignment tool has prepared (controlling xyz position)



Position checking jig before PXD mount by prepared MPI

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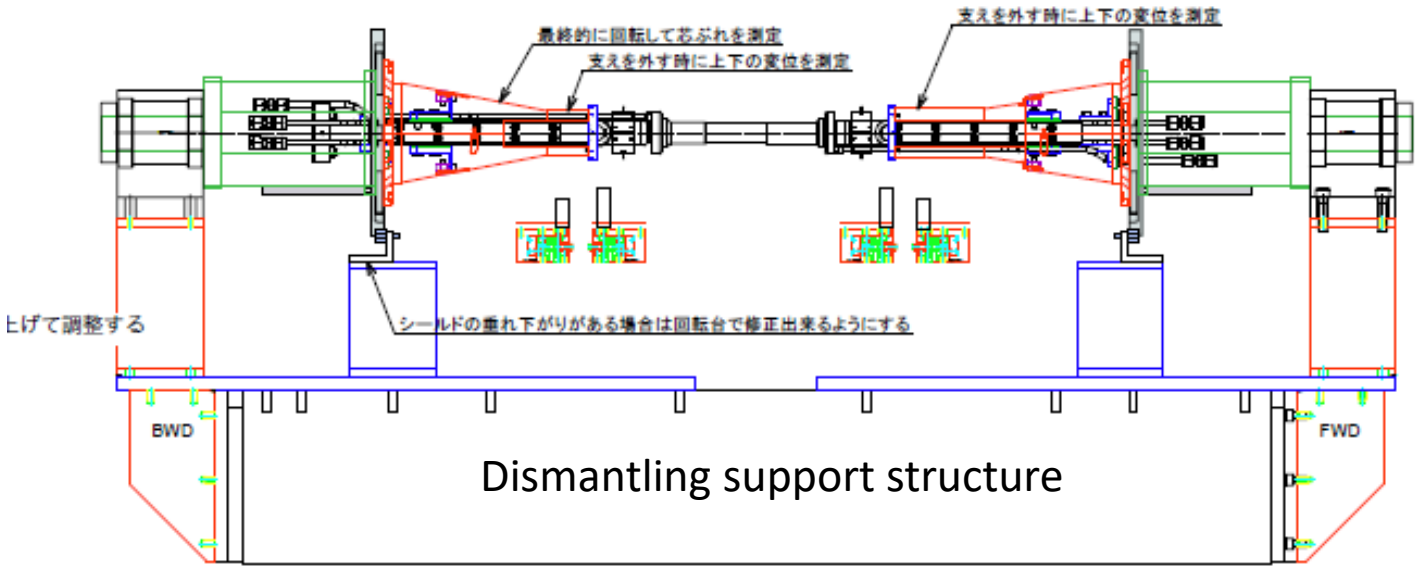
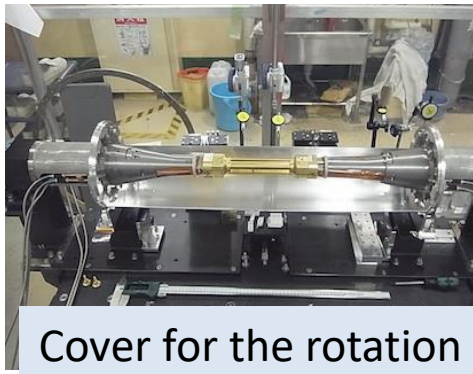
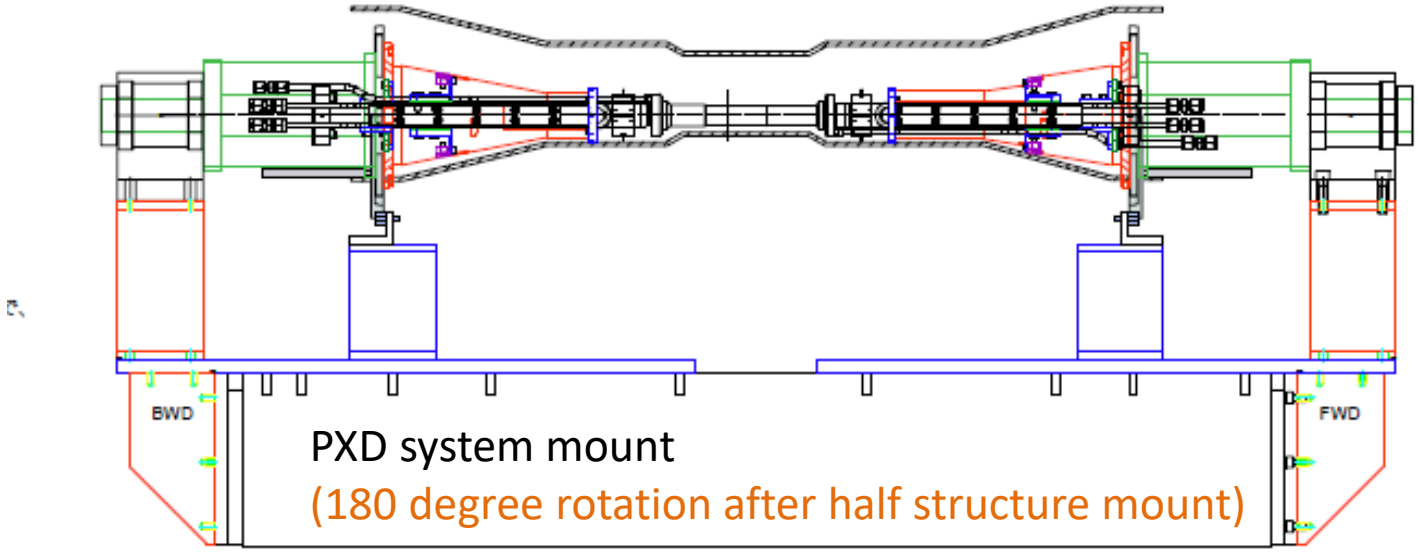
VXD assembly



Dismantling support structure



Cover for the rotation



PXD system mount
(180 degree rotation after half structure mount)

Angle fine control jig
for PXD mount

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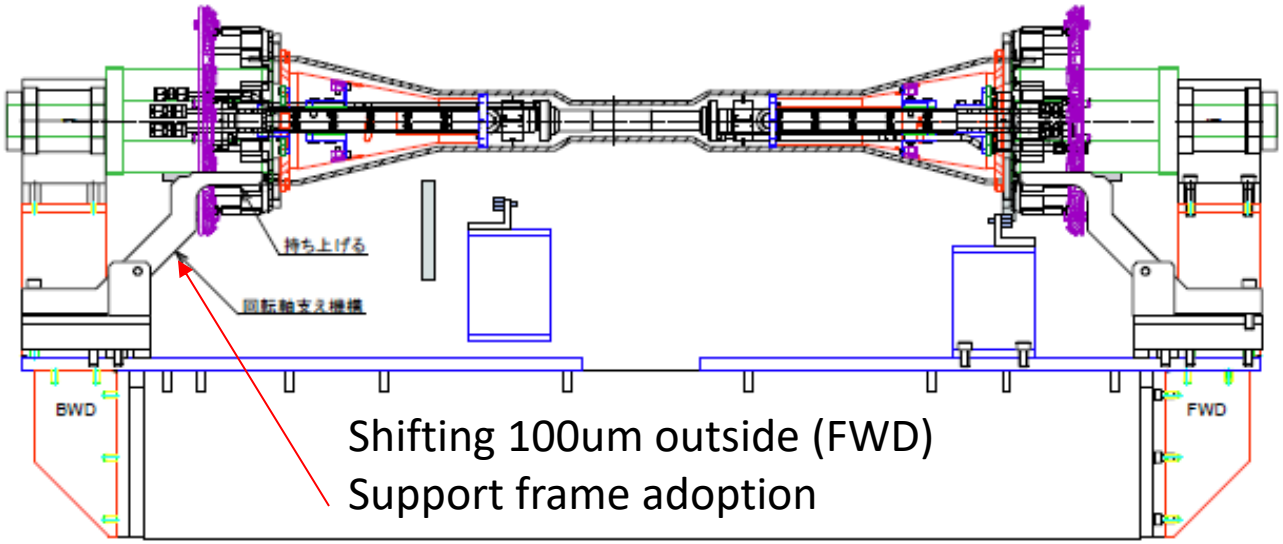
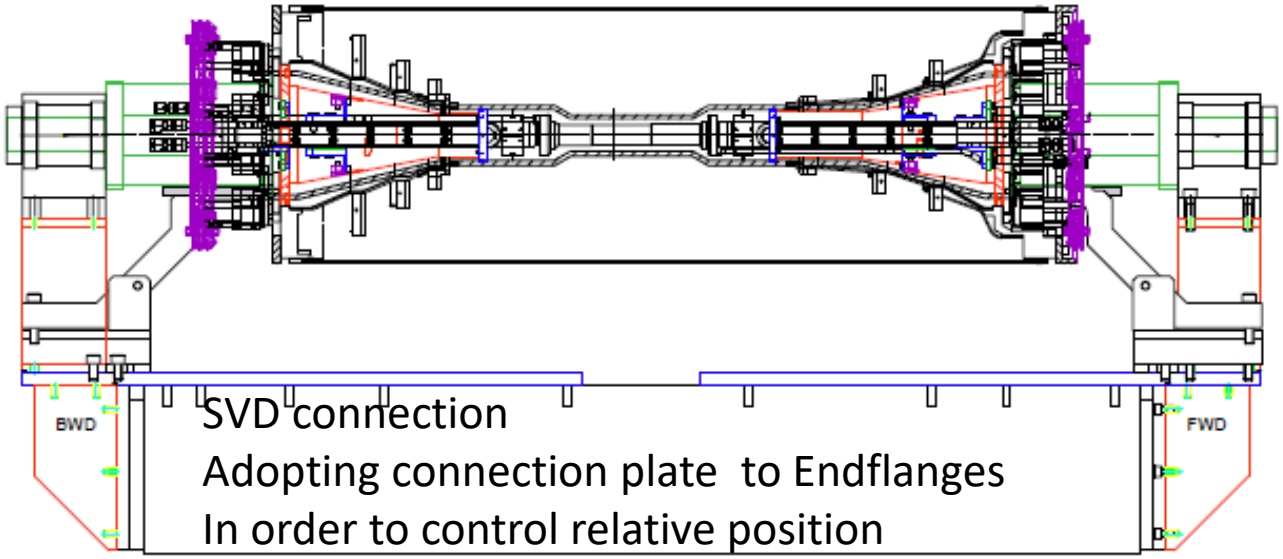
VXD assembly

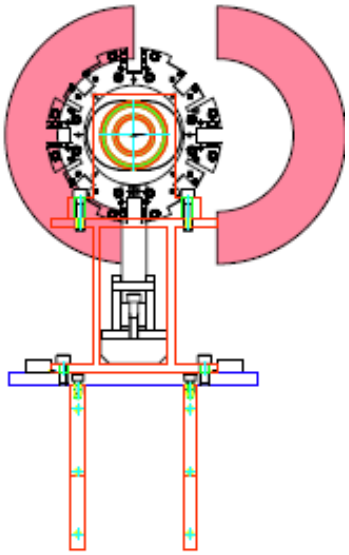


Shifting 100um outside (FWD)
Support frame adoption

Support arm to
control mechanical sagging



SVD connection
Adopting connection plate to Endflanges
In order to control relative position



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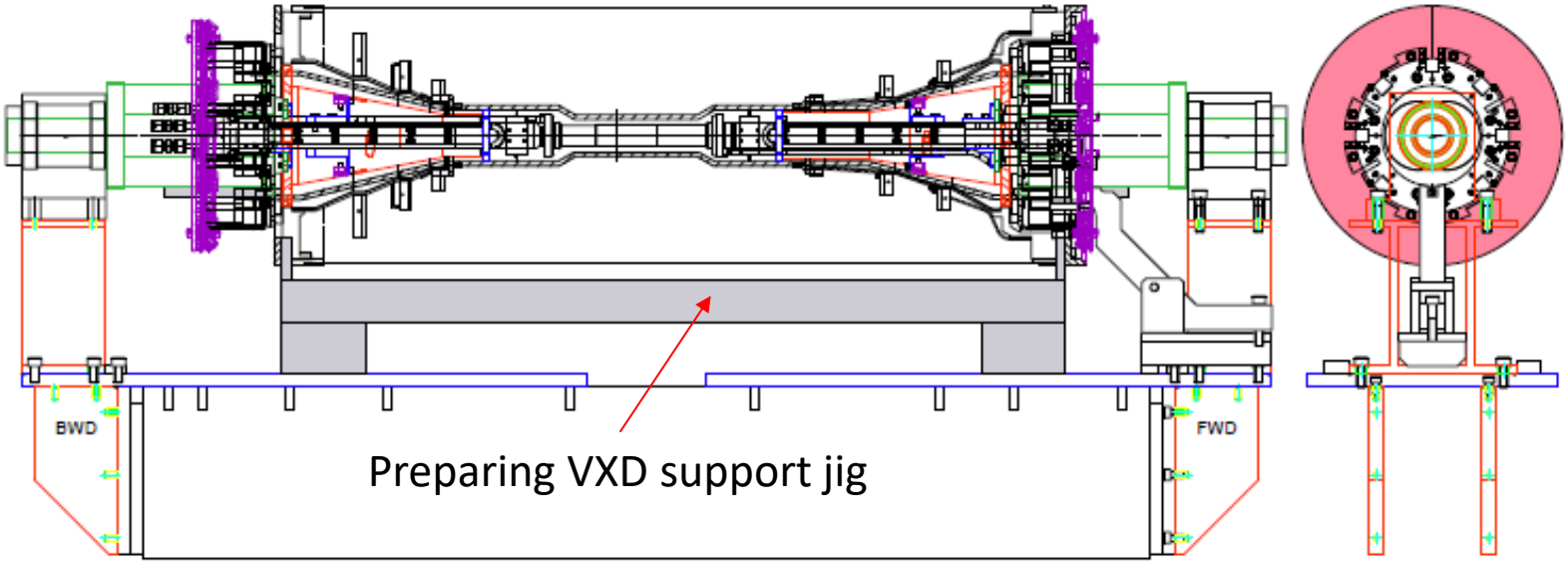
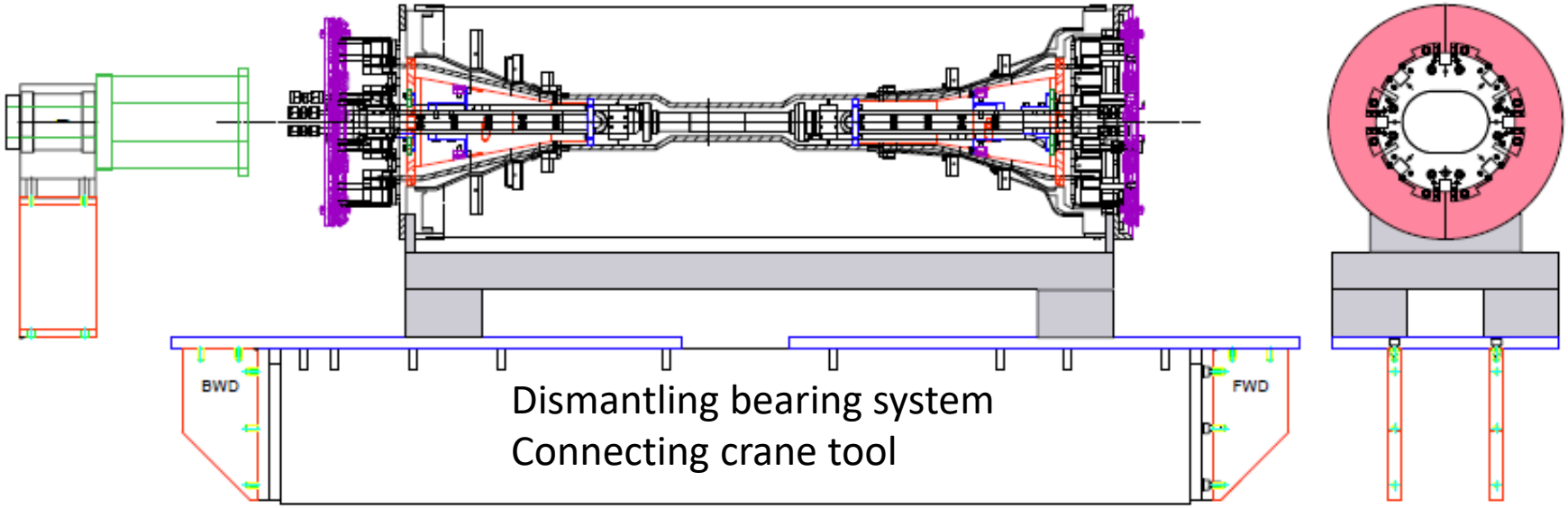
VXD assembly



Preparing VXD support jig



Dismantling bearing system
Connecting crane tool