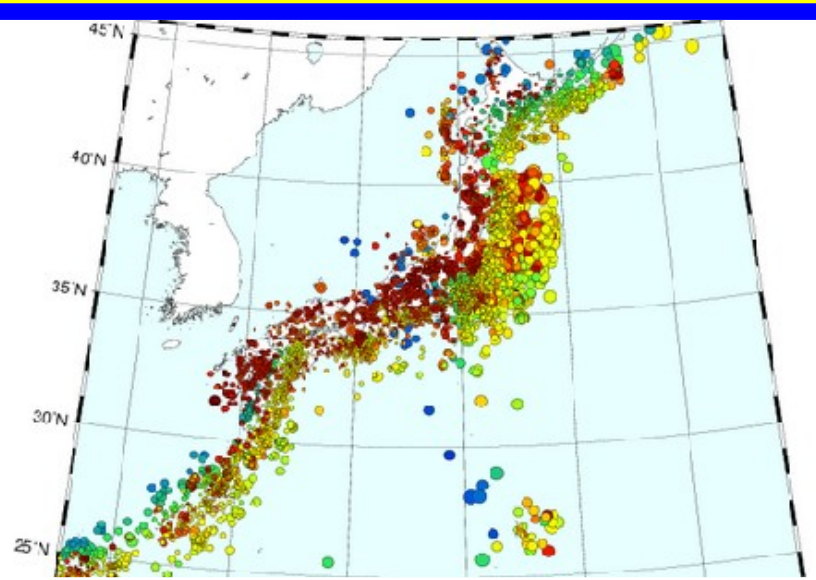
IR status and schedule

Shuji Tanaka

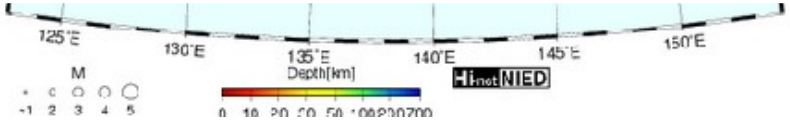
KEK

7th DEPFET workshop (Ringberg)

Japan status



Source point plot within last 30 days



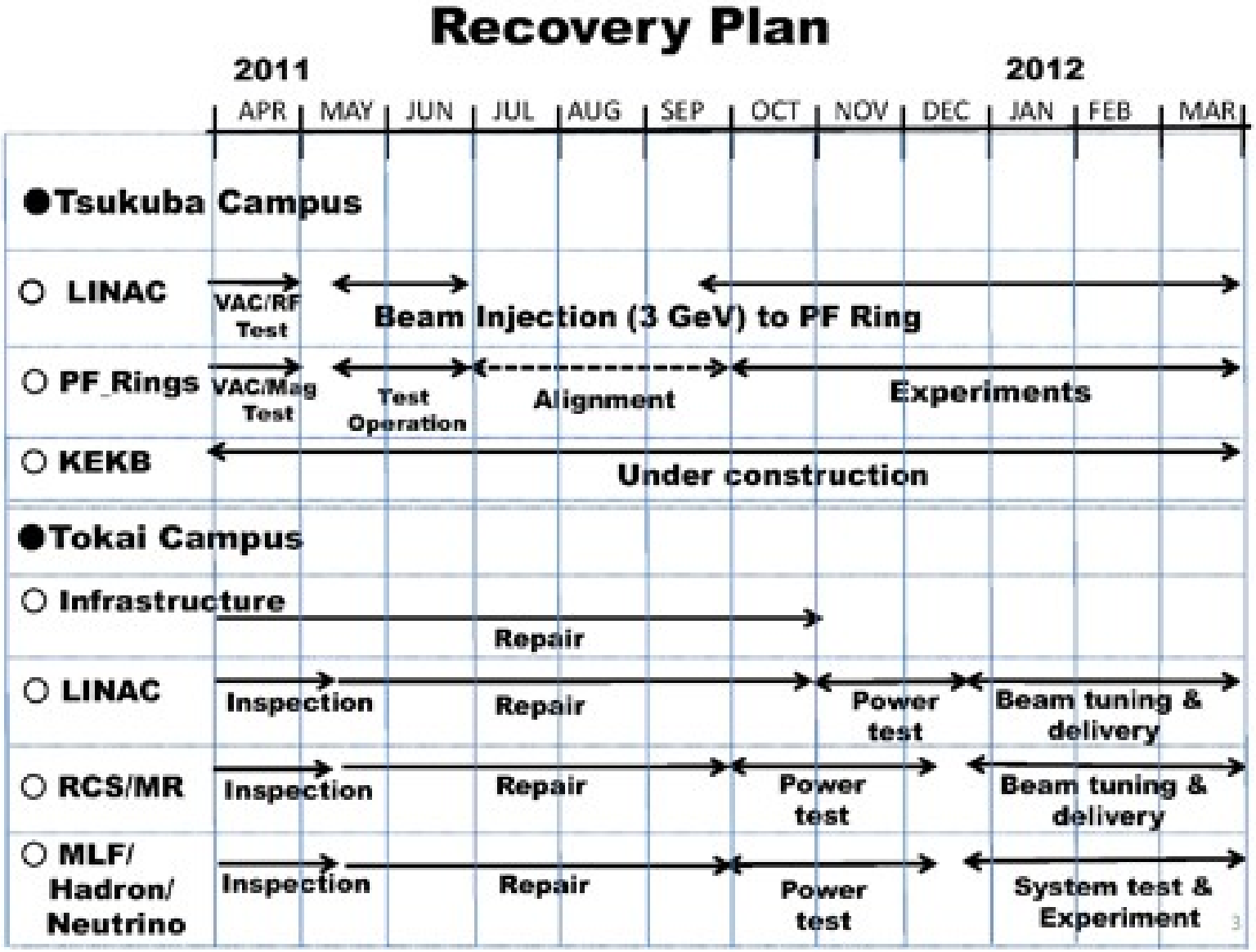
Miyagi earthquake history

Date	Time span	Magnitude
1793/ 2/17		M8.2
1835/7/20	42.4years	M7.3
1861/10/21	26.3	M7.4
1897/2/20	35.3	M7.4
1936/11/3	39.7	M7.4
1978/6/12	41.6	M7.4
2011/3/11	32.7	M9.0

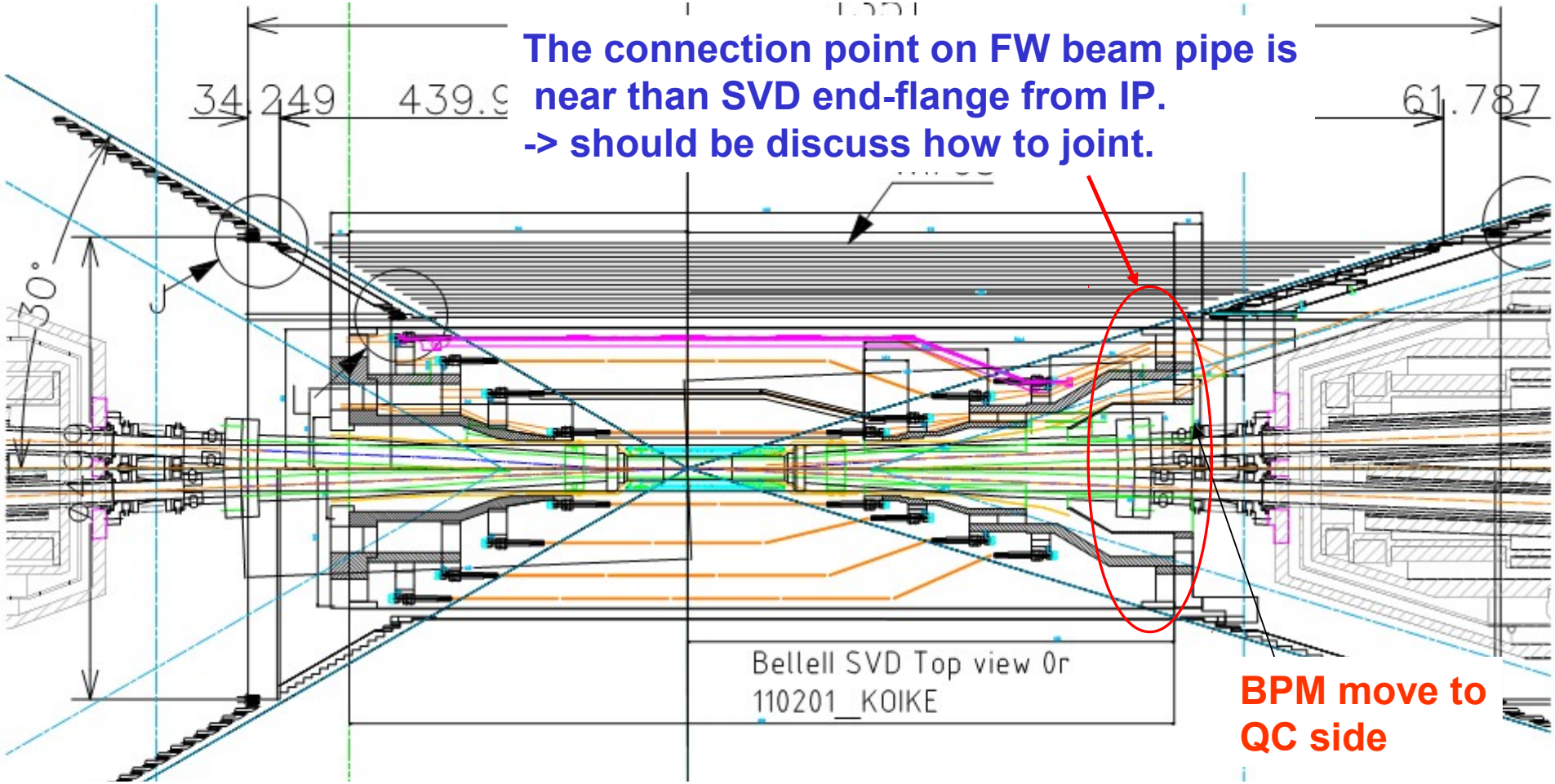
some time span to accumulate deformation stress(now stress has released)

On the other word, next 30 years will be safe
(Japan proverb:
The misfortune comes when forgetting.)

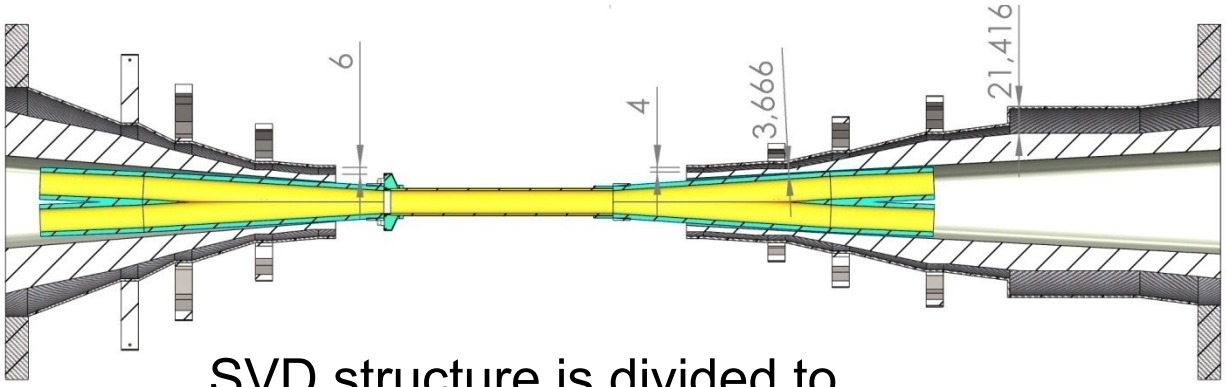
KEK status


Recovery Plan
2011
2012
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
●Tsukuba Campus
○ LINAC
VAC/RF Test
Beam Injection (3 GeV) to PF Ring
○ PF_Rings
VAC/Mag Test
Test Operation
Alignment
Experiments
○ KEKB
Under construction
●Tokai Campus
○ Infrastructure
Repair
○ LINAC
Inspection
Repair
Power test
Beam tuning & delivery
○ RCS/MR
Inspection
Repair
Power test
Beam tuning & delivery
○ MLF/ Hadron/ Neutrino
Inspection
Repair
Power test
System test & Experiment

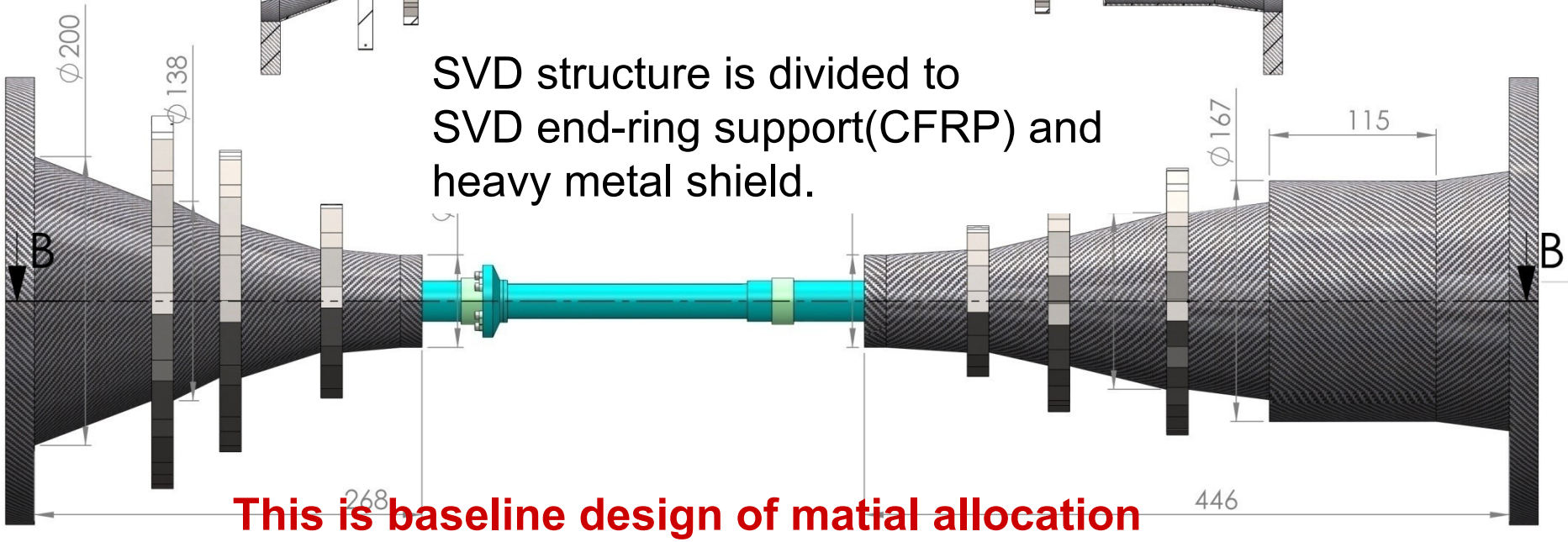
IR design (top view:KEK)



Space Requirement SVD



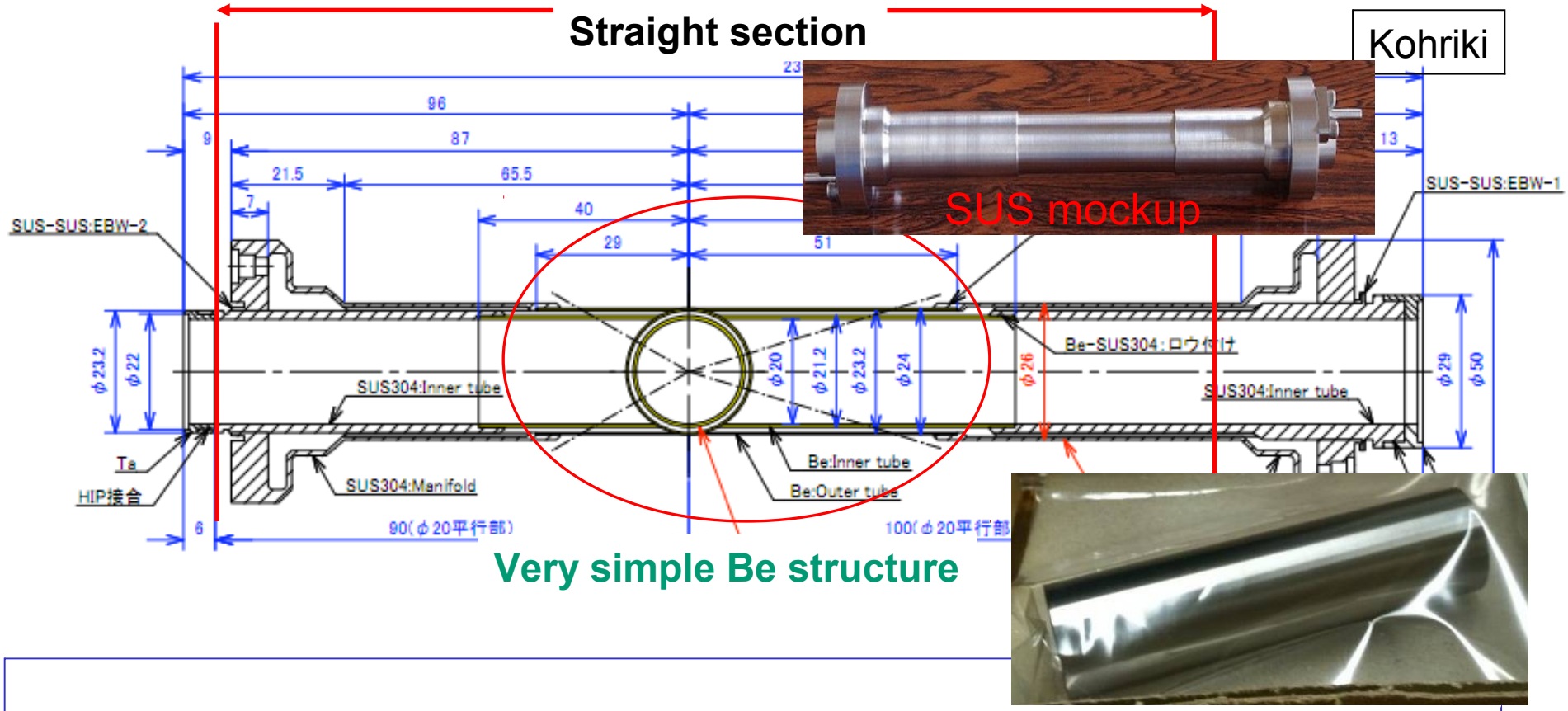
SVD structure is divided to
SVD end-ring support(CFRP) and
heavy metal shield.



This is baseline design of matial allocation

Status of Mockup production

Latest design of IP chamber

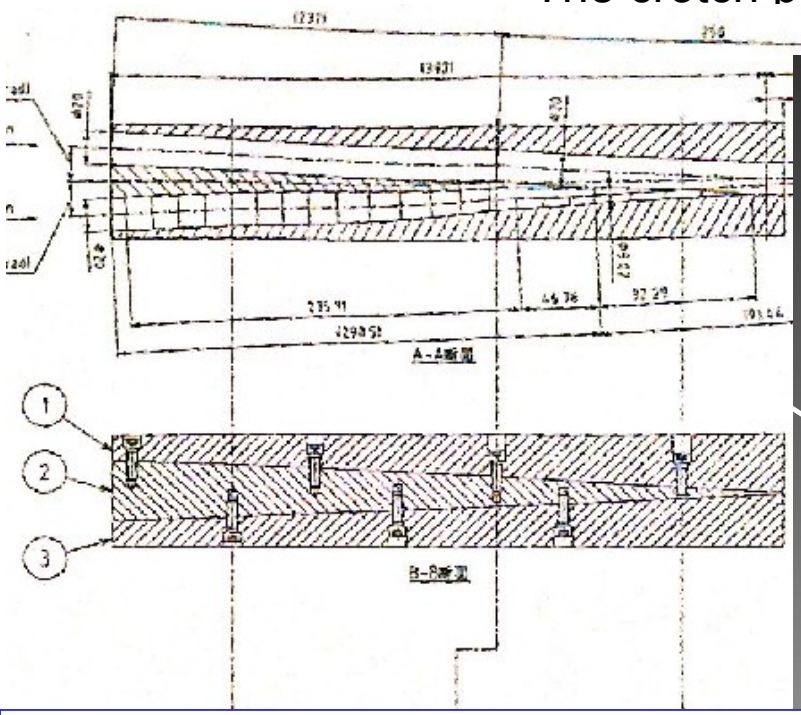


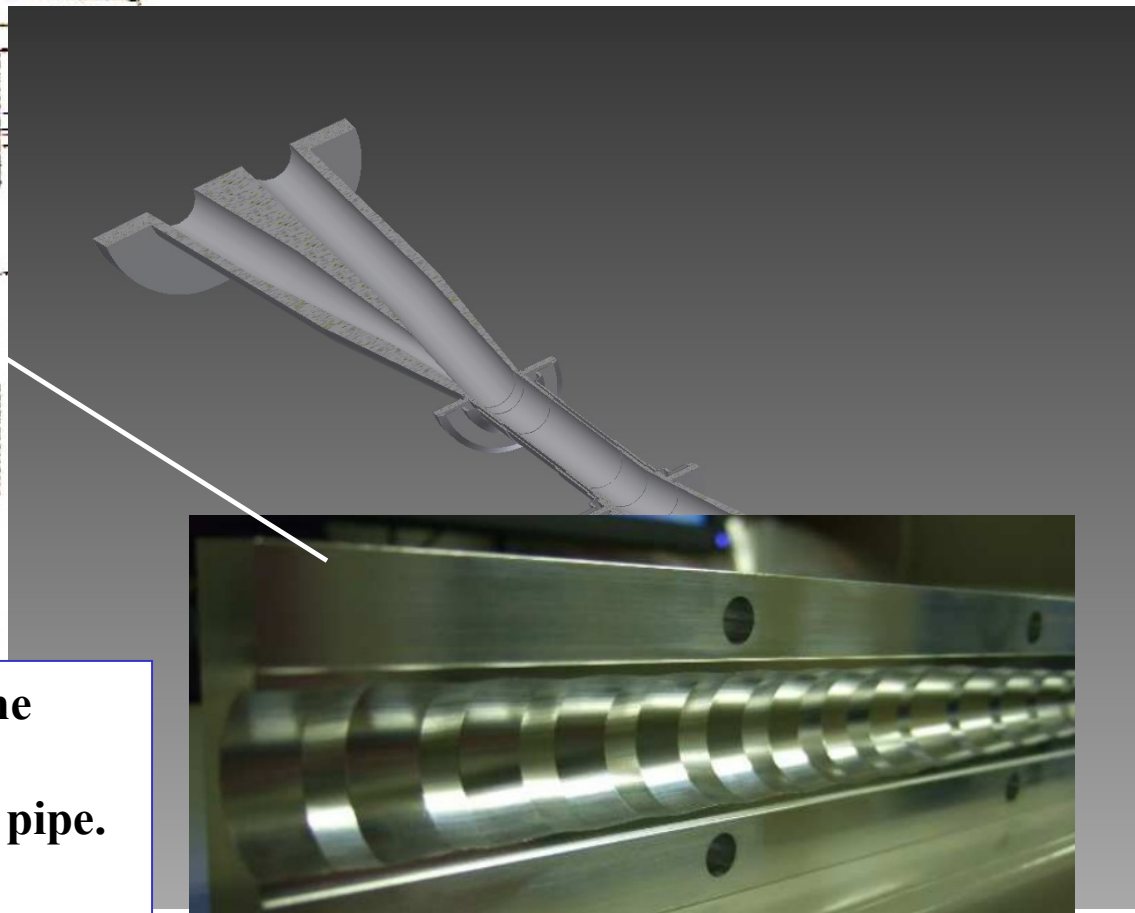
Very simple Be structure

- **Be part test production has finished ->Acceptable precision** Be pipe
  - Inner pipe OD:21.2 +-0.1 ->+0.04 , ID:20.0 +-0.1 ->-0.03
    Outer pipe OD: 24.0 +-0.1->-0.02 , ID 23.2 +-0.1 ->+0.02

Crotch part (Ta)

The crotch part pipe is divided into three parts (vertically)





- **Mock-up production to validate the production procedures how to cut inside(Ridge) of crotch part beam pipe.**

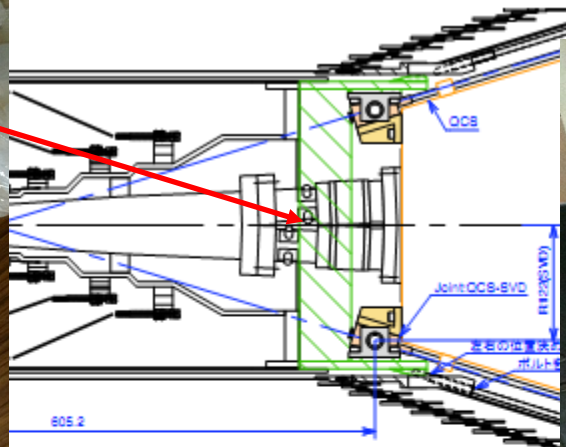
  -> Production has finished, The measurement will be finish within Apr.

- **Optimization of "Ridge" will be done after SR beam test.**

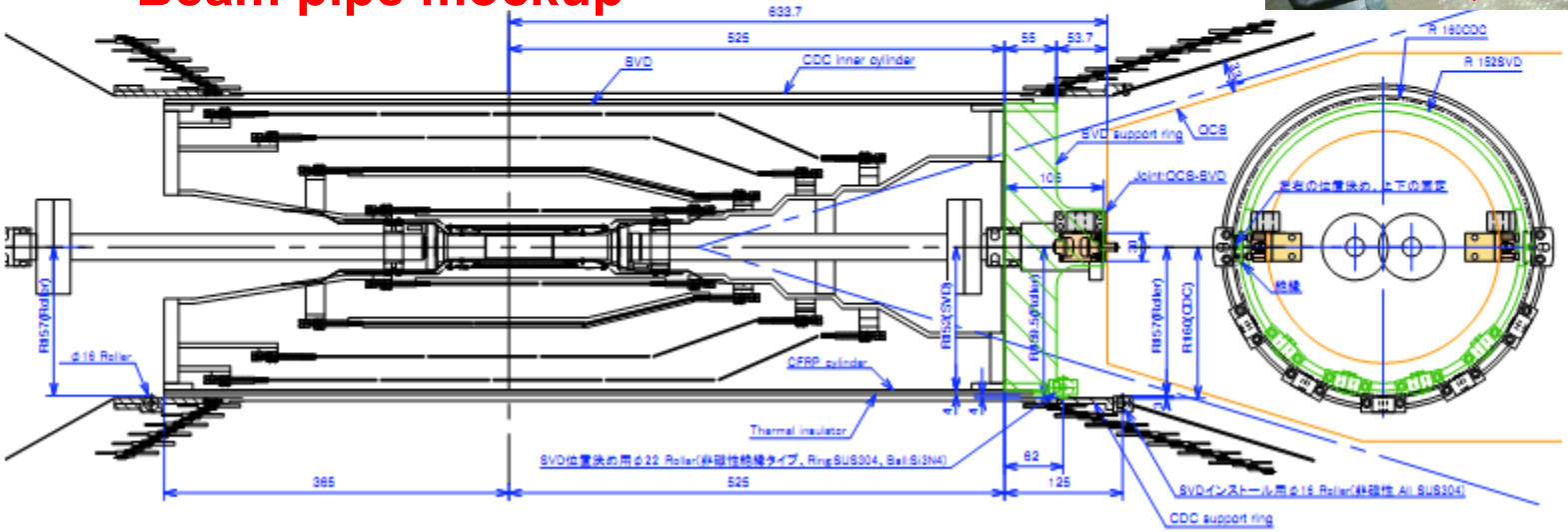
Other mockup

Kohriki

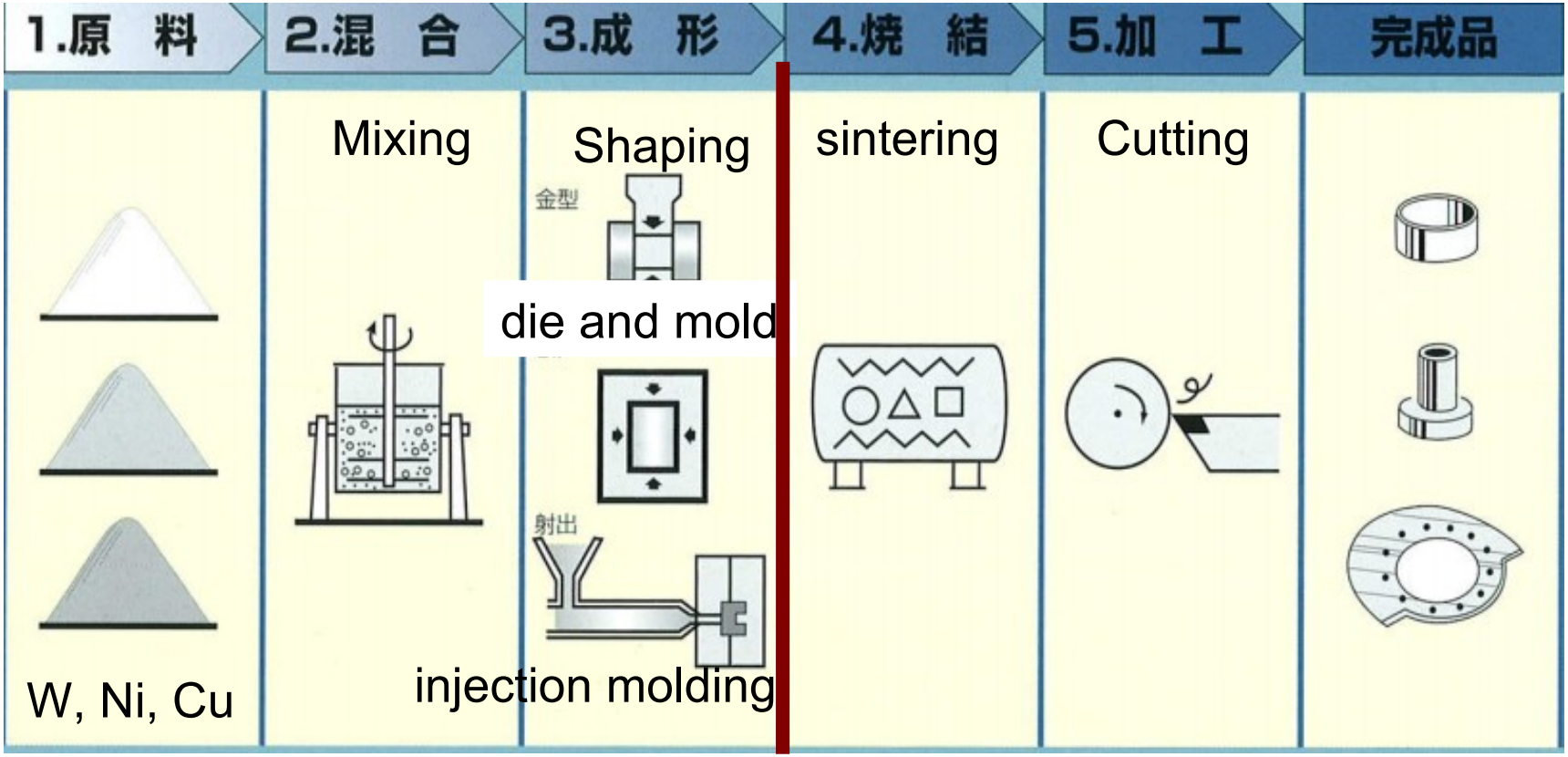
Beam pipe mockup



QCS mockup



Heavy metal parts production (Shield)



simple shape is better

Production cost is depended on design(80Euro/kg-800Euro/kg)

(The material before sintering can be as recycled use)

We'll start prototype design as test production of HM shield

Status of vertex detector mechanics

Beam pipe design

IP region and inner design of crotch part
have almost finished

PXD

Almost mechanical design have finished

(still need to take care of space for services)

Assembly work will be finished before transporting to KEK (Simply attach to beam pipe)

BG simulation

Tousheck BG has roughly estimated

Need final results to optimize material budgets (still there are free space to add materials)

SVD

Preparation for ladder production

Test production of End-ring

Need to make prototype of assembly procedure.
(Production procedure will be similar with SVD2.)

We should start discussing about assembly procedure of inner detectors, (in particular SVD and beam pipe). The mock-up of beam pipe and vertex detectors (incl. structure and shield) should be prepared on this year.

Status of vertex detector mechanics

http://kds.kek.jp/conferenceDisplay.py?confId=6993

IR assembly meeting

Thursday 05 May 2011
from 10:30 to 18:00
Europe/Vienna

Material: more information

Thursday 05 May 2011 |

Thursday 05 May 2011

top

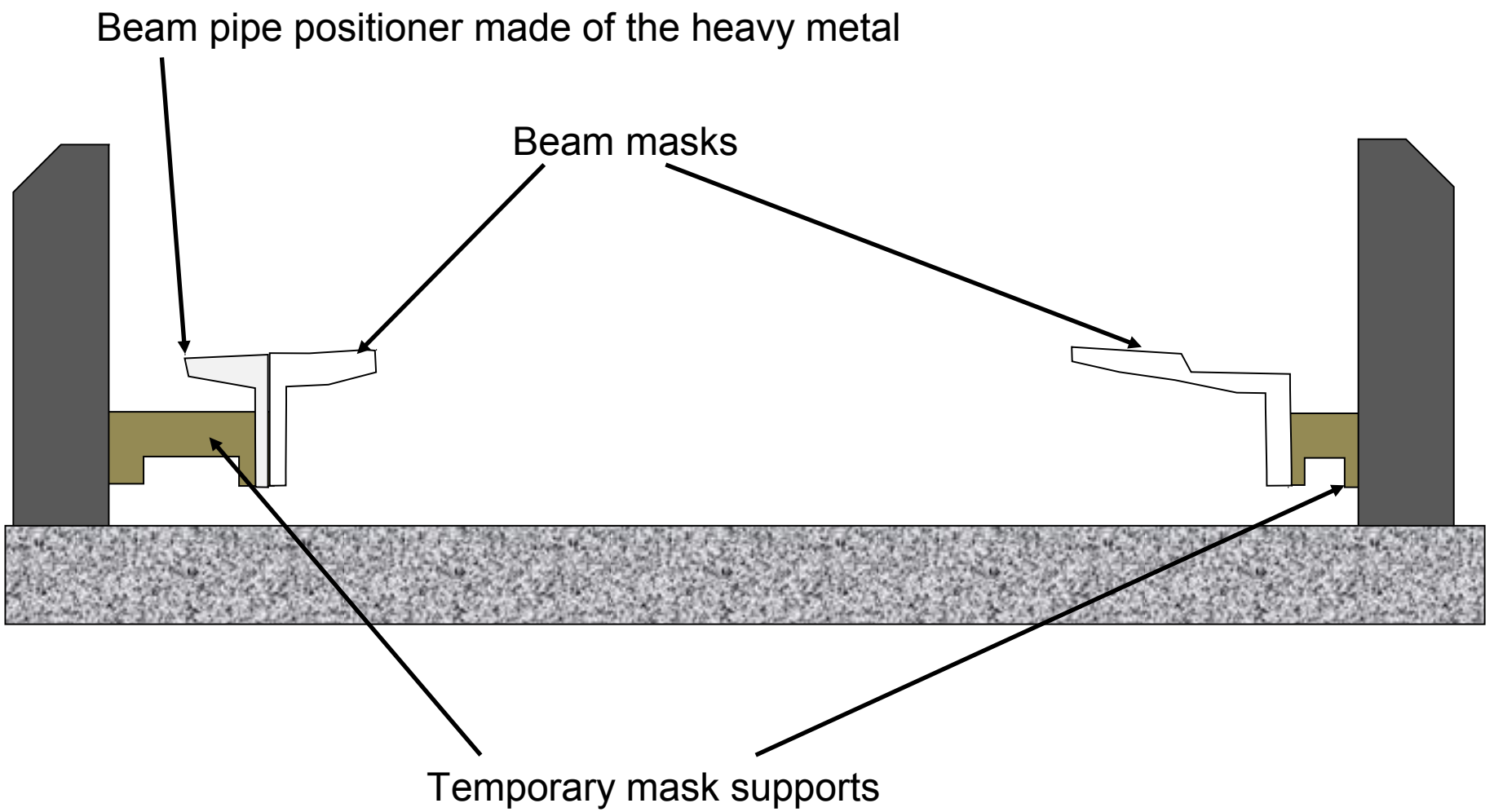
10:30	SVD ladder assembly (30') (Paper, Slides)	Y.Onuki
11:00	IR assembly procedure (20') (Slides)	T.Tsuboyama
11:20	SVD2 production (50') (Slides)	S.tanaka
12:10	Lunch (1h20')	
13:30	BG estimation status and schedule (20') (Slides)	H.Nakayama
13:50	PXD assembly (30') (Slides)	Christian Kiesling
14:20	SVD ladder mount (20')	
14:40	Allocation on IR design and production (20') (document, more information)	

Decision: Mockup(BP,PXD,SVD with real weight) test assembly will start 2012.

We should start discussing about assembly procedure of inner detectors, (in particular SVD and beam pipe). The mock-up of beam pipe and vertex detectors (incl. structure and shield) should be prepared on this year.

Vertex detector assembly scenario

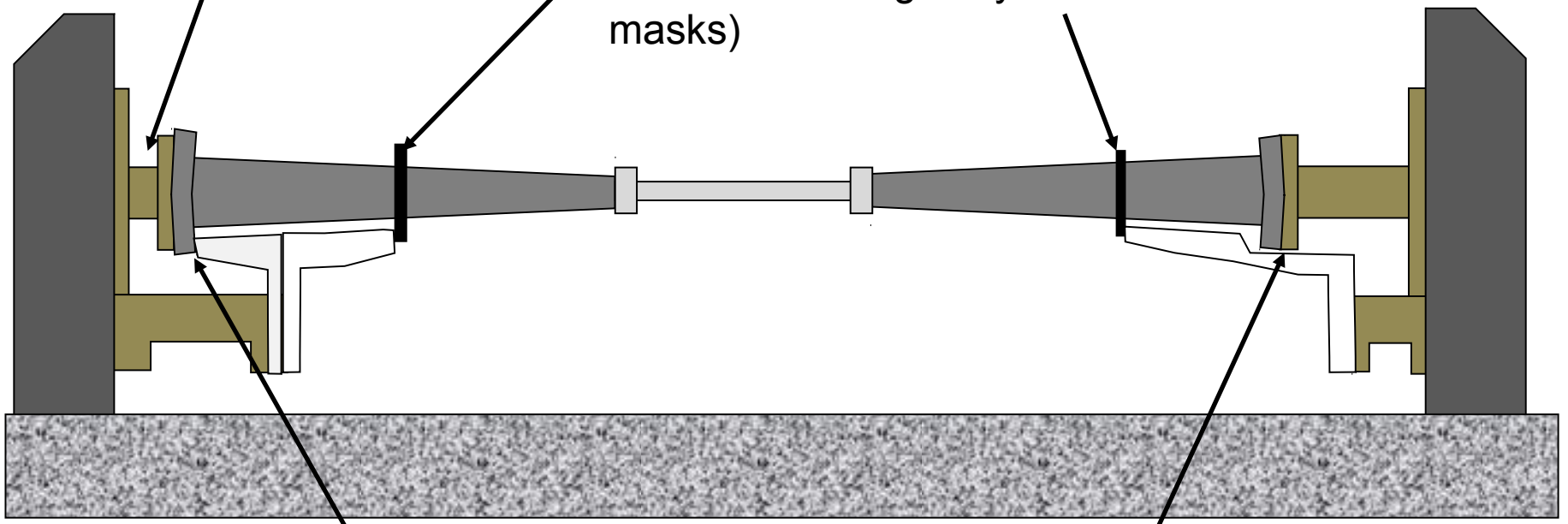
Half Mask


Beam pipe positioner made of the heavy metal
Beam masks
Temporary mask supports

Beam pipe

Beam pipe temporary support

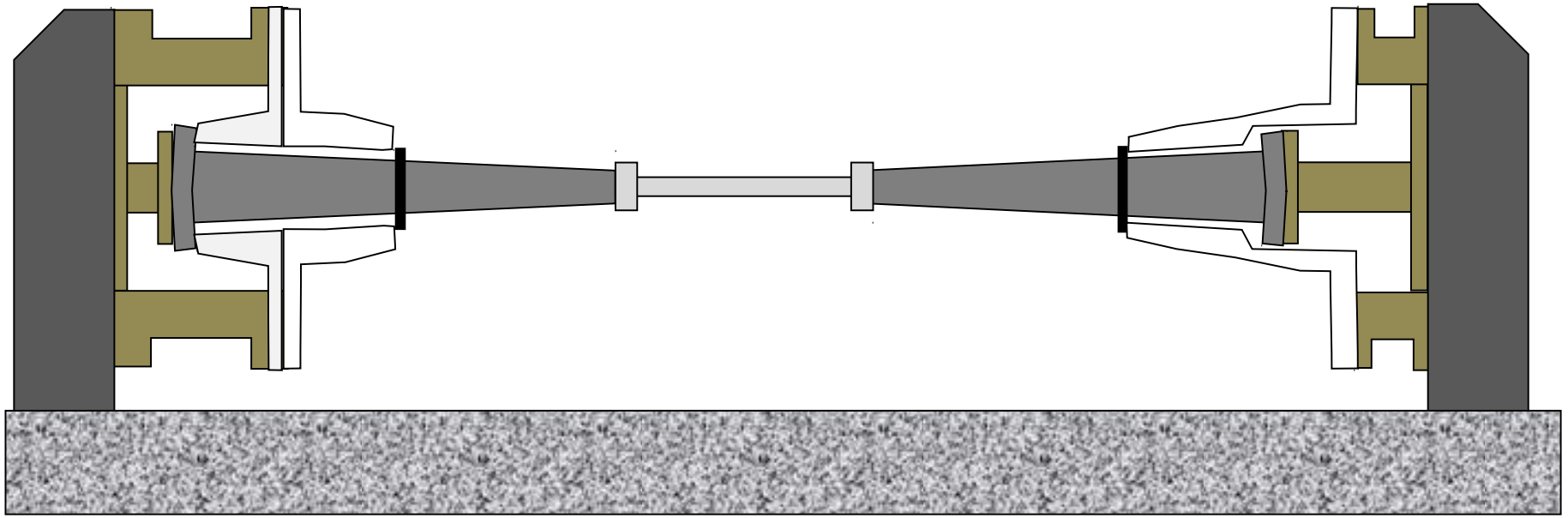
The mass of the masks are supported at these points (close to the center of gravity of masks)



The position of the beam pipe is defined in the backward at this point after installation to CDC.

We need a mechanism that constrains the r-φ position of the beam pipe while allowing a slide in the Z direction. Otherwise, the PXD position can not be defined.

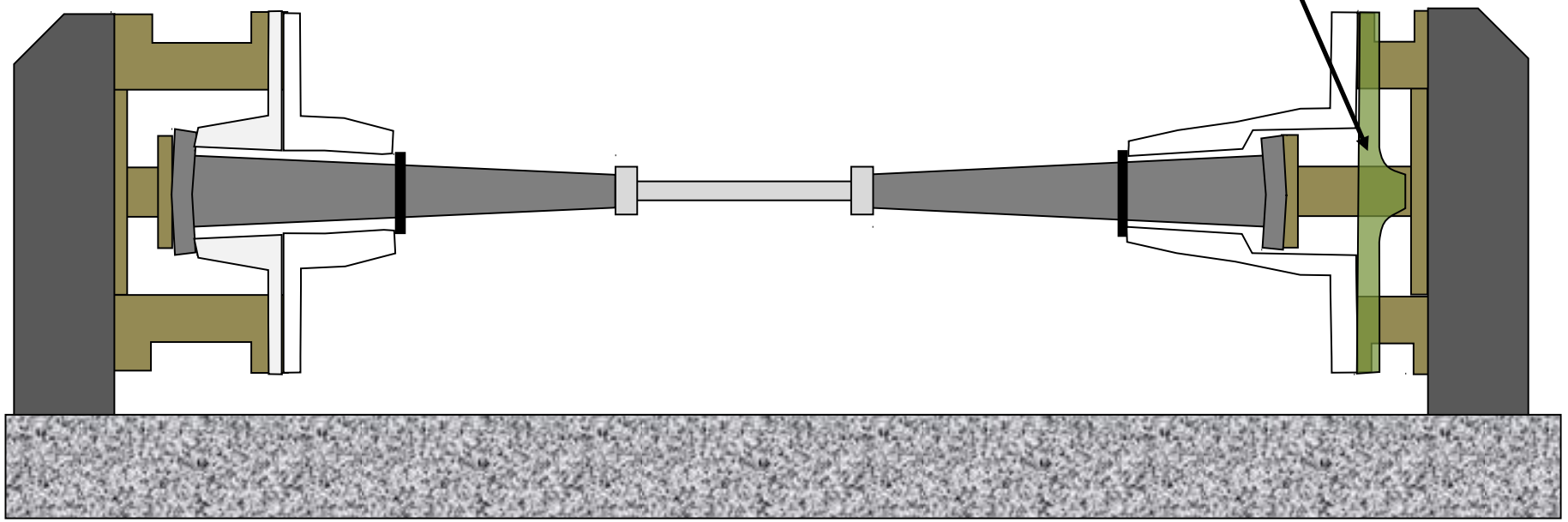
Mask2



(1) The left side and right side masks are screwed into one piece.
(2) Rotate by 90° so that the masks support the beam pipe form left and right.

Support flange

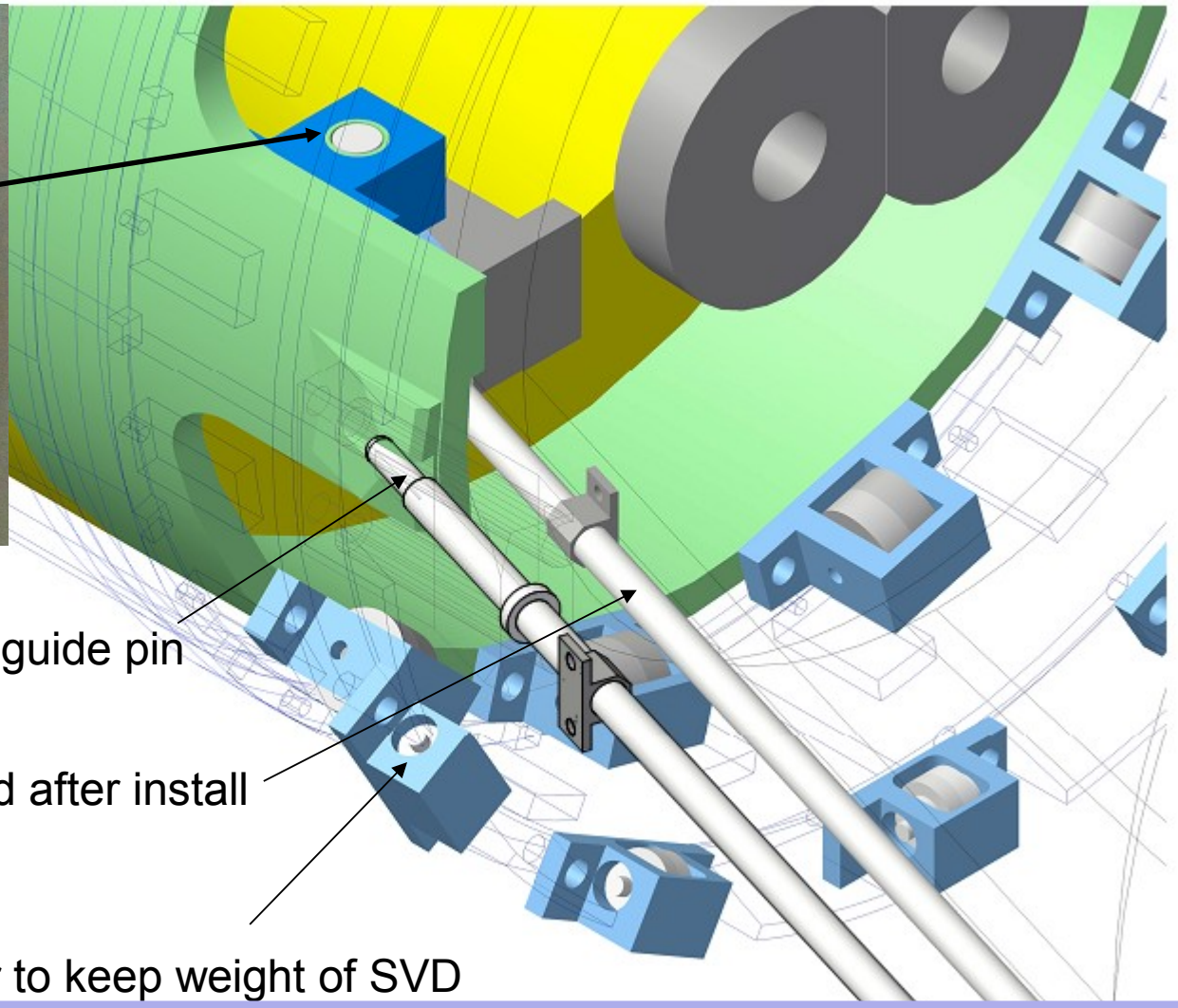
The support flange for supporting the IR system to QCS in the installation and to CDC after the installation



Support flange will be put in the forward side.

Support flange

Support bracket



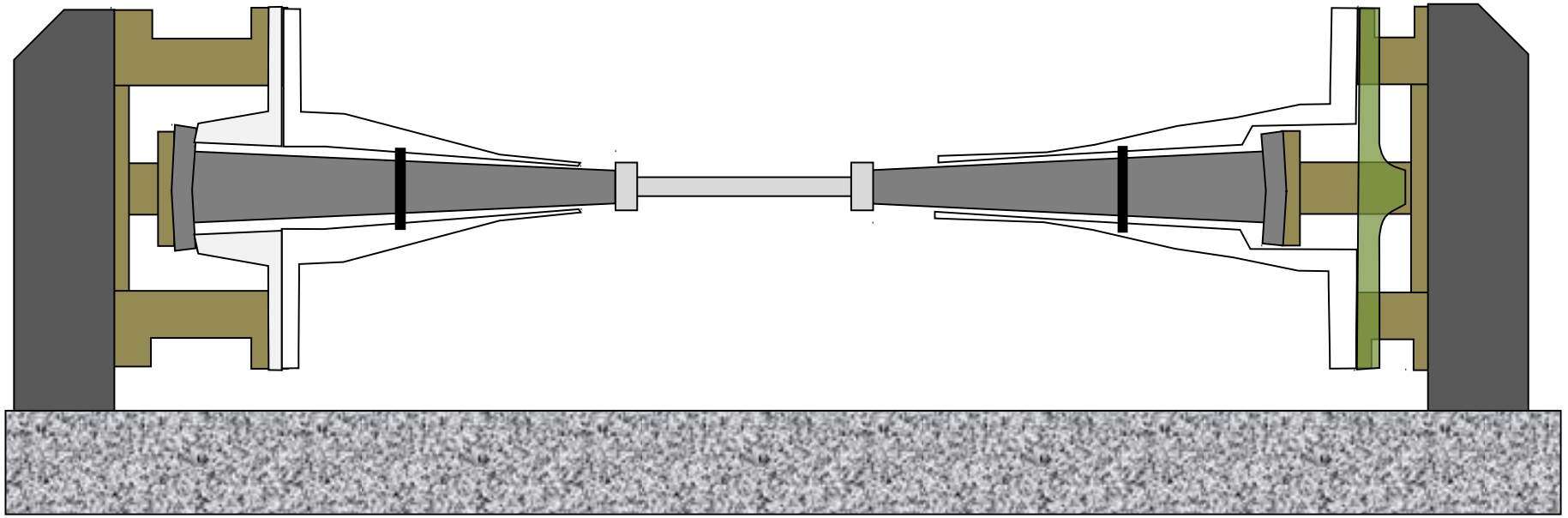
Positioning guide pin
(CDC side)

Release control rod after install
(QC cryostat side)

Guide roller to keep weight of SVD

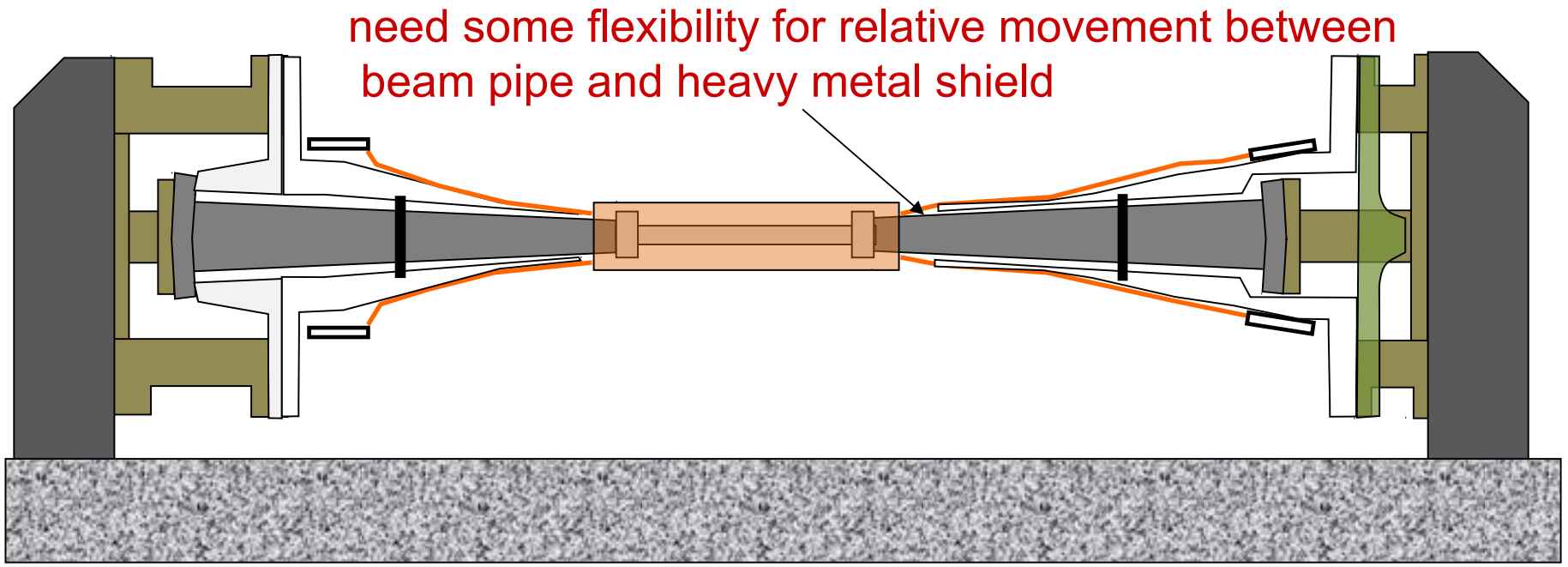
All of sub-parts will be produced in this year. After then we will perform installation procedure test.

Masks are completed

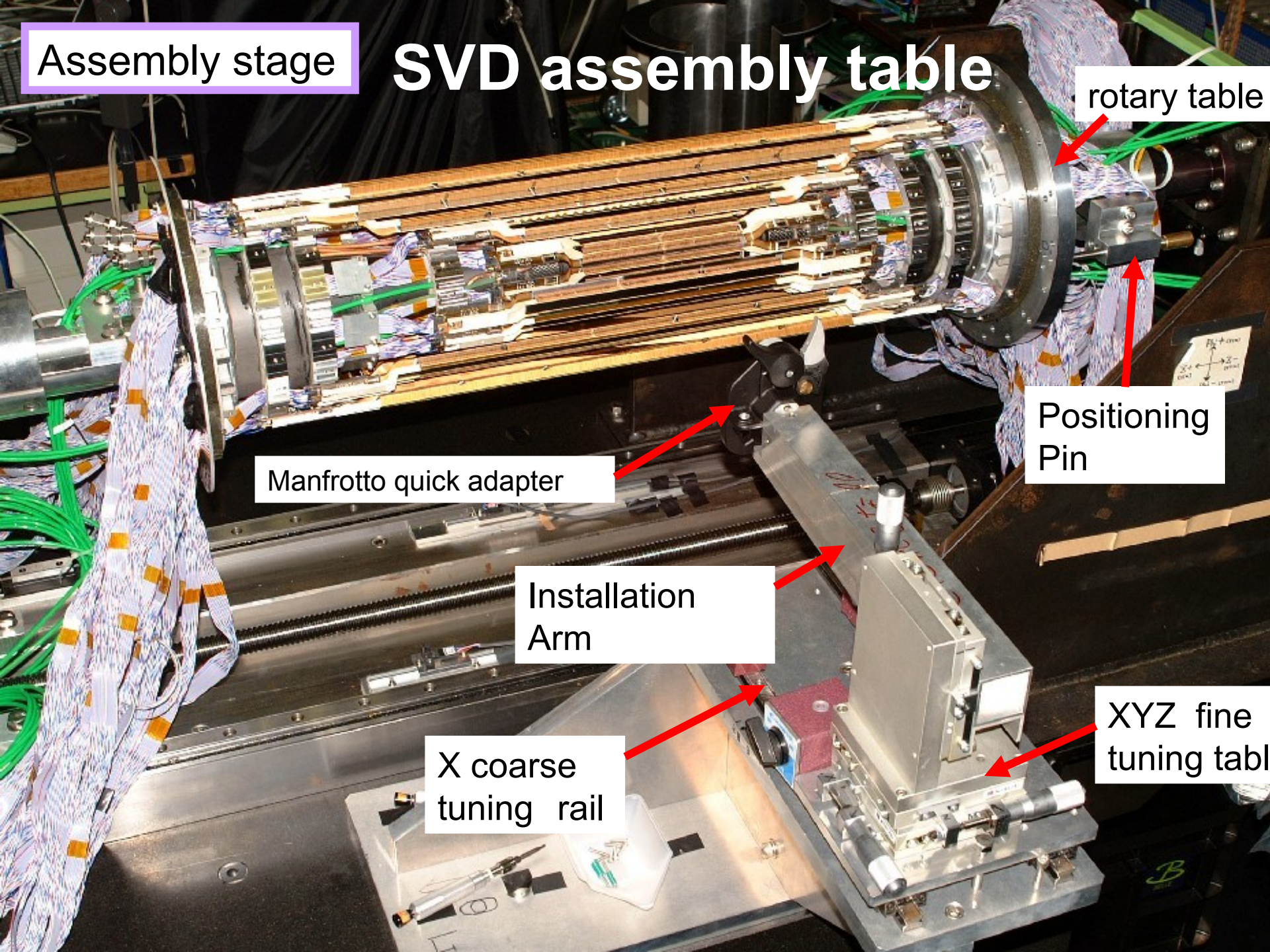


The heavy metal masks are completed.

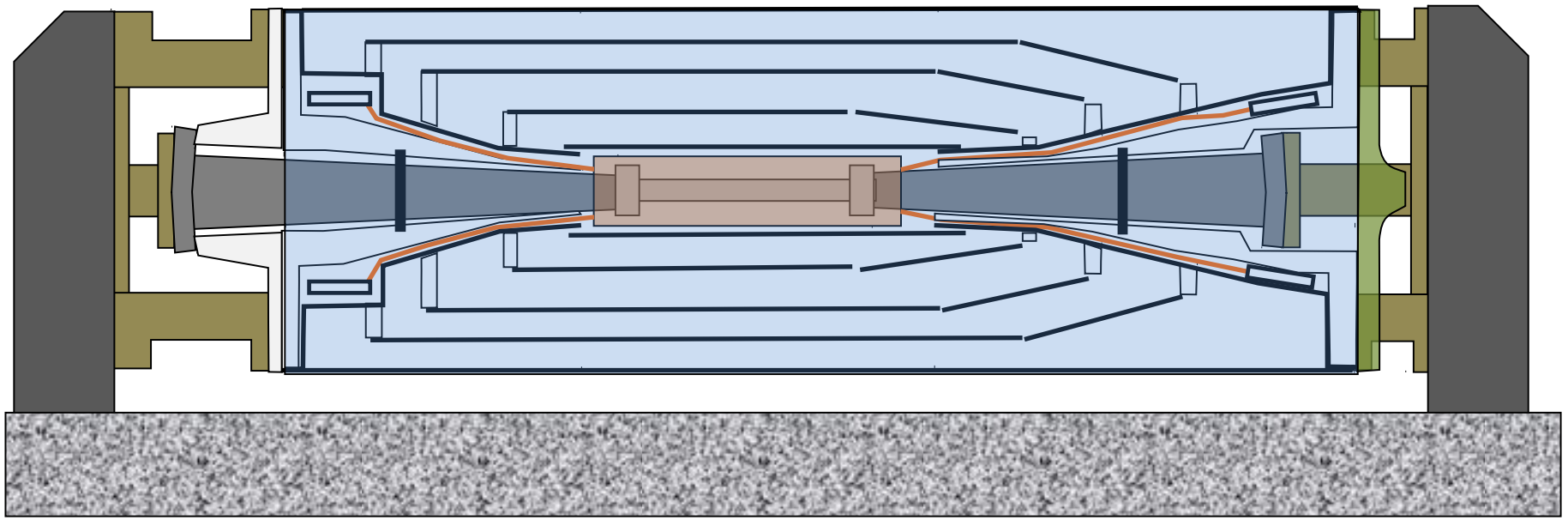
PXD



PXD is assembled to two halves in another stage and put together to the beam pipe. Cables and tubes will go to the slot in the masks.


Assembly stage
SVD assembly table
rotary table
Positioning Pin
Manfrotto quick adapter
Installation Arm
XYZ fine tuning tabl
X coarse tuning rail

Combine with SVD



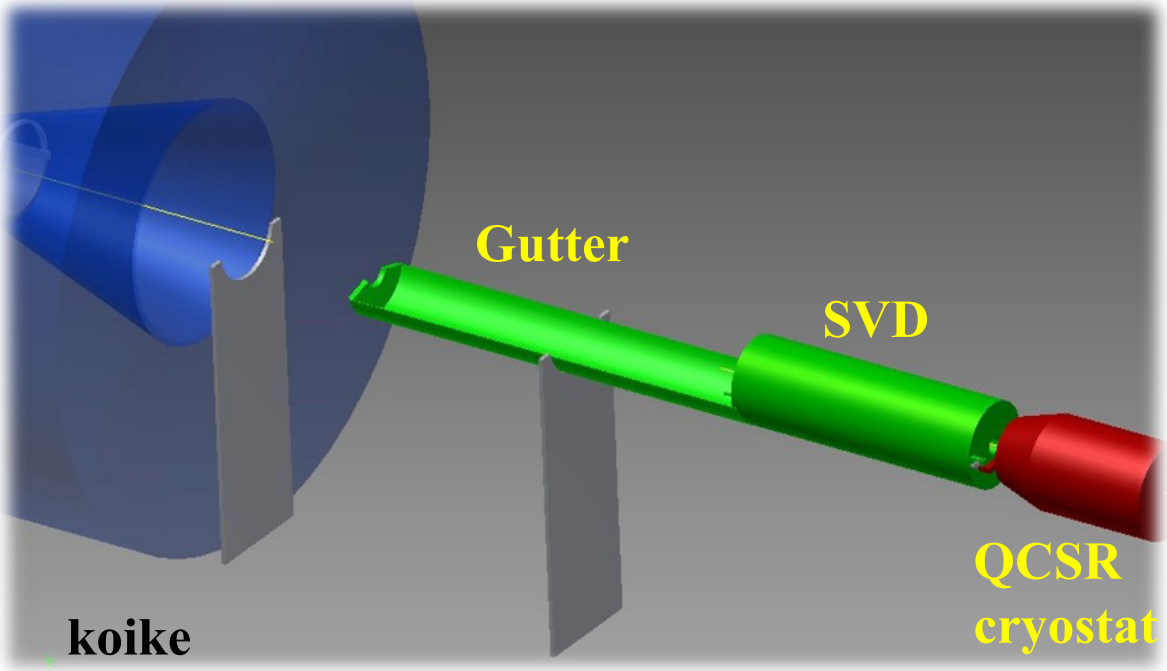
SVD is also assembled in another stage. The forward and backward support cones are then fixed with the outer cover, made of CFRP.
Then they are put together around the beam pipe.

Installation scenario

Step 1 Scenario

•**The gutter is attached to SVD. The other side of SVD is supported by the QCSR cryostat.**

•**SVD must hold by itself. During move-in of the QCSR cryostat, SVD is pushed by the cryostat.**



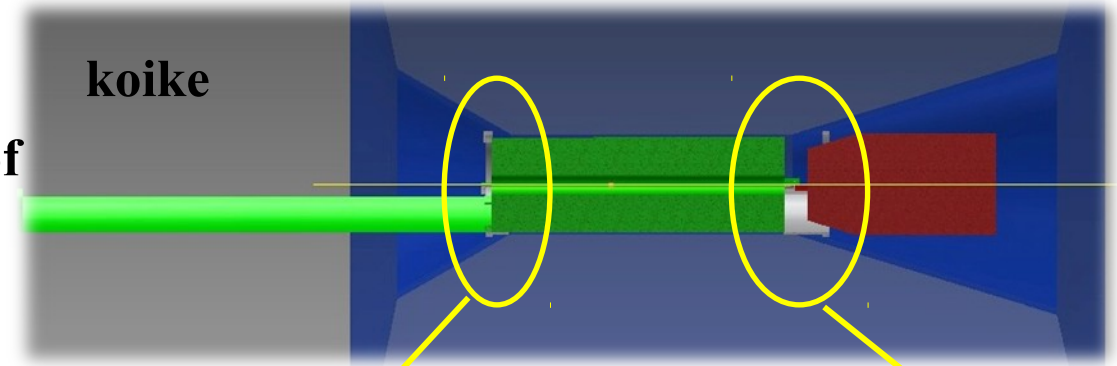
Conceptual view

•**The reduction of the service space for SVD and work space for connecting flanges is very small.**

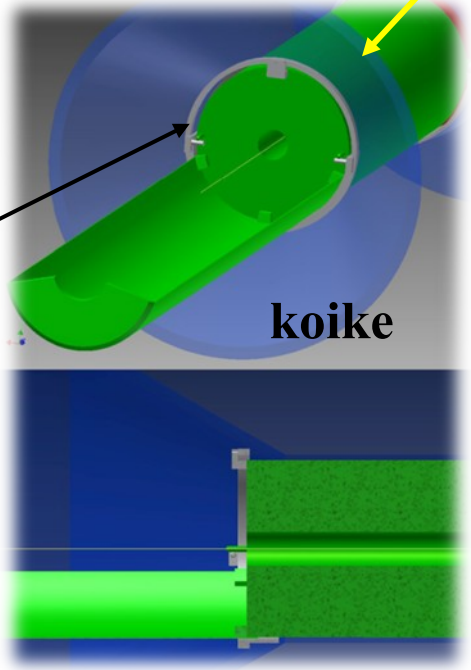
•**Mechanical design is simple.**

Step 1 Scenario

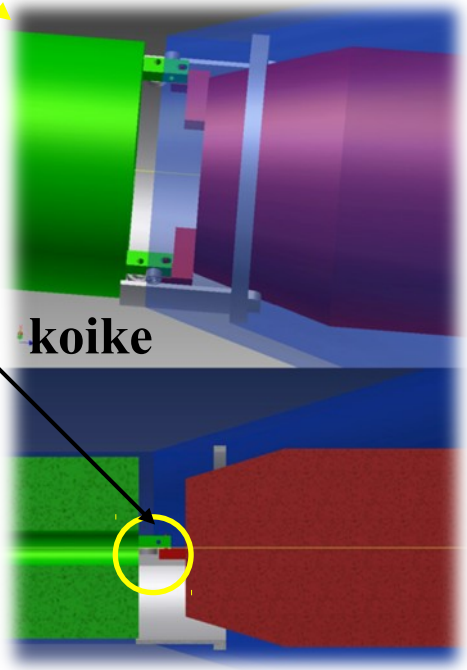
Side view
After move-in of the QCSR cryostat



This ring fix the L-side of SVD



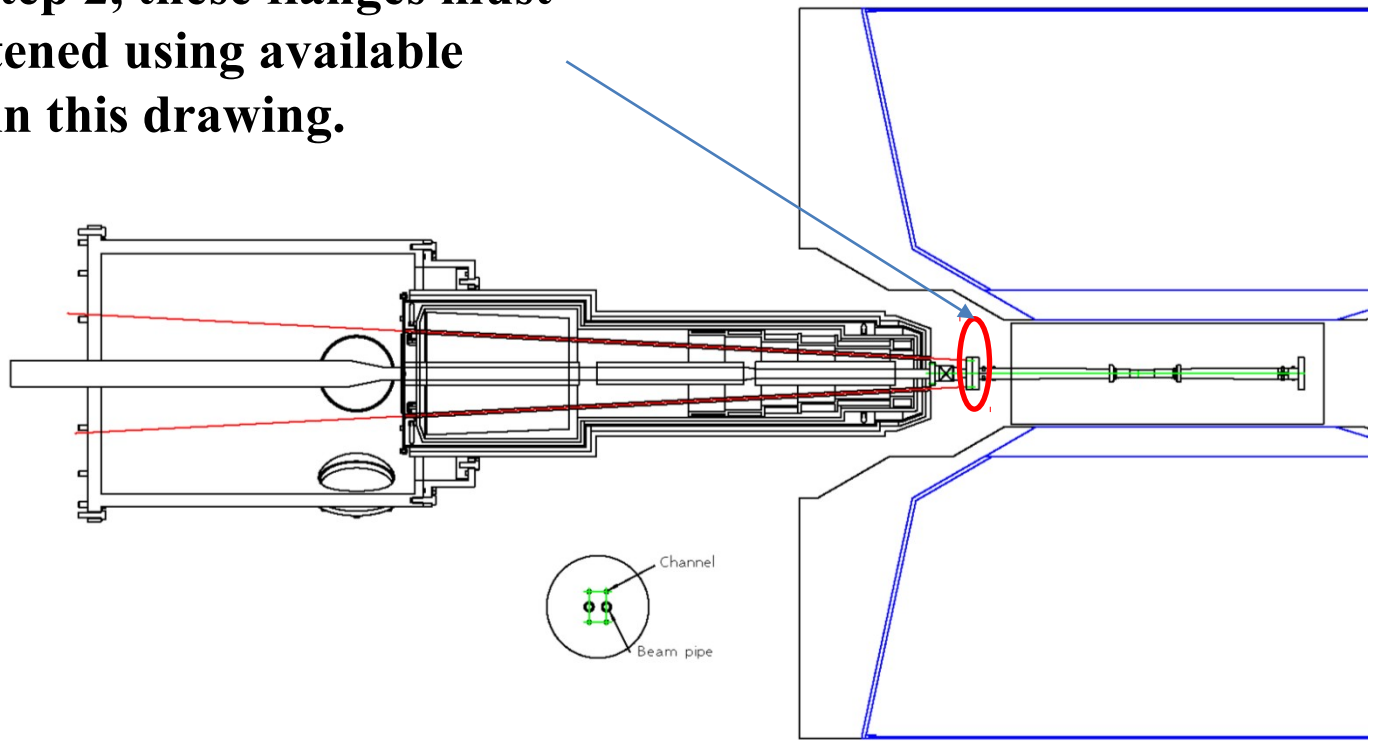
After the installation of SVD, this junction must be decoupled so that the shift of the cryostat after exciting every magnet may not make it touch again.



Step 2 Scenario

In the step 2, these flanges must be tightened using available spaces in this drawing.

Side view



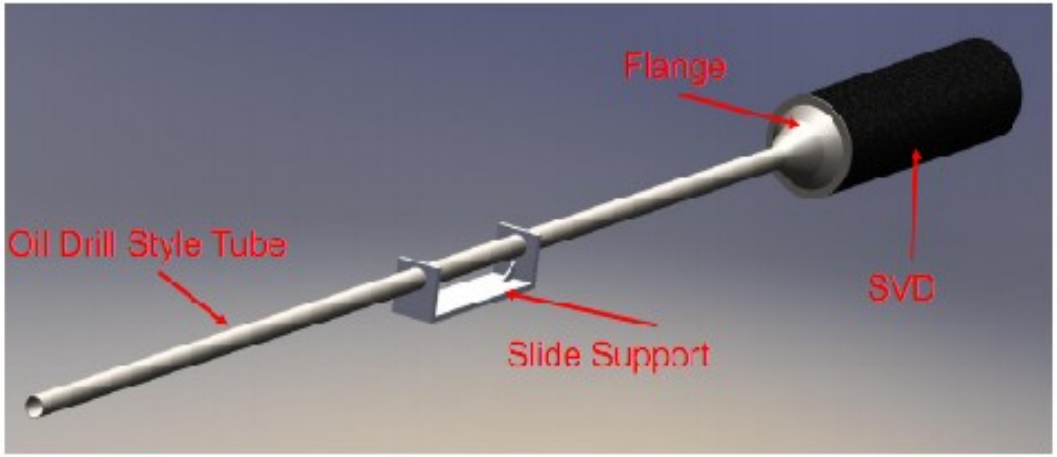
- **If the flanges are accessible by hands, screws or a quick disconnect system can be used.**
- **As an option in case the flanges cannot be accessible by hands, an idea to provide the cryostat with channels (along the red lines in the figure) for a tightening rod is proposed.**

Another idea of IR installation

HEPHY Institute of High Energy Physics — SVD IR Mechanics — ÖAW

Installation Support Proposal

- SVD will be very heavy
- Suitable support for installation required
- "Sled" from SVD 2 not sufficient
- Oil drill style sliding tube for installation support



We will start test and dicussion installation scenario with Moukup from 2012

The issues on IR assembly

- Beam pipe
  - IP chamber
    - Structure design
      - Inner shape (fixed)
      - Outer shape(should satisfy PXD pace requirement,but not yet)
    - Connection test
      - Be-SUS (not yet: will be finish before this summer)
    - Mechanical analysis (Seems OK)
  - Crotch part
    - Structure design
      - Inner shape (design strategy has established)
      - Outer shape (depended on BG result)
      - PXD mount block (will produce this year)
  - Stabilizer (not yet: will produce test pieces)

The issues on IR assembly

- **Shield(final version will be before 2013)**
  - **Material selection (done)**
  - **Design (depended on acceptable total weight and BG simulation)**
  - **PP mounting (need information from PXD group)**
  - **PXD cabling and cooling service (need some flexibility for relative movement between beam pipe and heavy metal shield)**
- **End Flange (still many open issues)**
  - **SVD system mount bracket**
  - **Heavy metal Shield mount**
  - **Connection with assembly table**
  - **Connection with SVD guide ring for installation**
- **Installation**
  - **1st installtion test will perform in this year.**
- **Assembly table (for beam pipe and SVD)**
  - **Just start discussion about this**

Summary

- **Preparation to produce IP beam pipe:**
  - **Mechanical analysis has finished (acceptable values).**
  - **Studies of connection technologies**
    - HIP (diffusion bonding) between Ta-SUS (finish in this Apr.)
    - Welding between SUS-Be (this summer)
  - **Some mockup production (QCS, beam pipe of BPM region, SVD support bracket) have finished**
    - Almost test parts will produce in this year.
- **Installation test will be perform within a year (simple version).**
- **We decided to have Mockup assemble test in 2012**

Schedule

- 2011 Apr-
  - Connection test (SUS-Be)
  - Final mechanical design (cooling, cabling, monitors)
  - Service space allocation will be decided
  - 1st installation test (Kohriki-san's plan)
  - 1st End-flange prototype production
  - HM Shield test production
- 2012
  - Assembly table and tools production (each for Beam pipe and SVD)
  - Beam pipe production(for Beast II and real BelleII)
  - Mockup production(shields)
  - Mockup assembly (BP,PXD,SVD)+Installation test
- 2013-
  - IR Assembly (SVD, PXD individually)

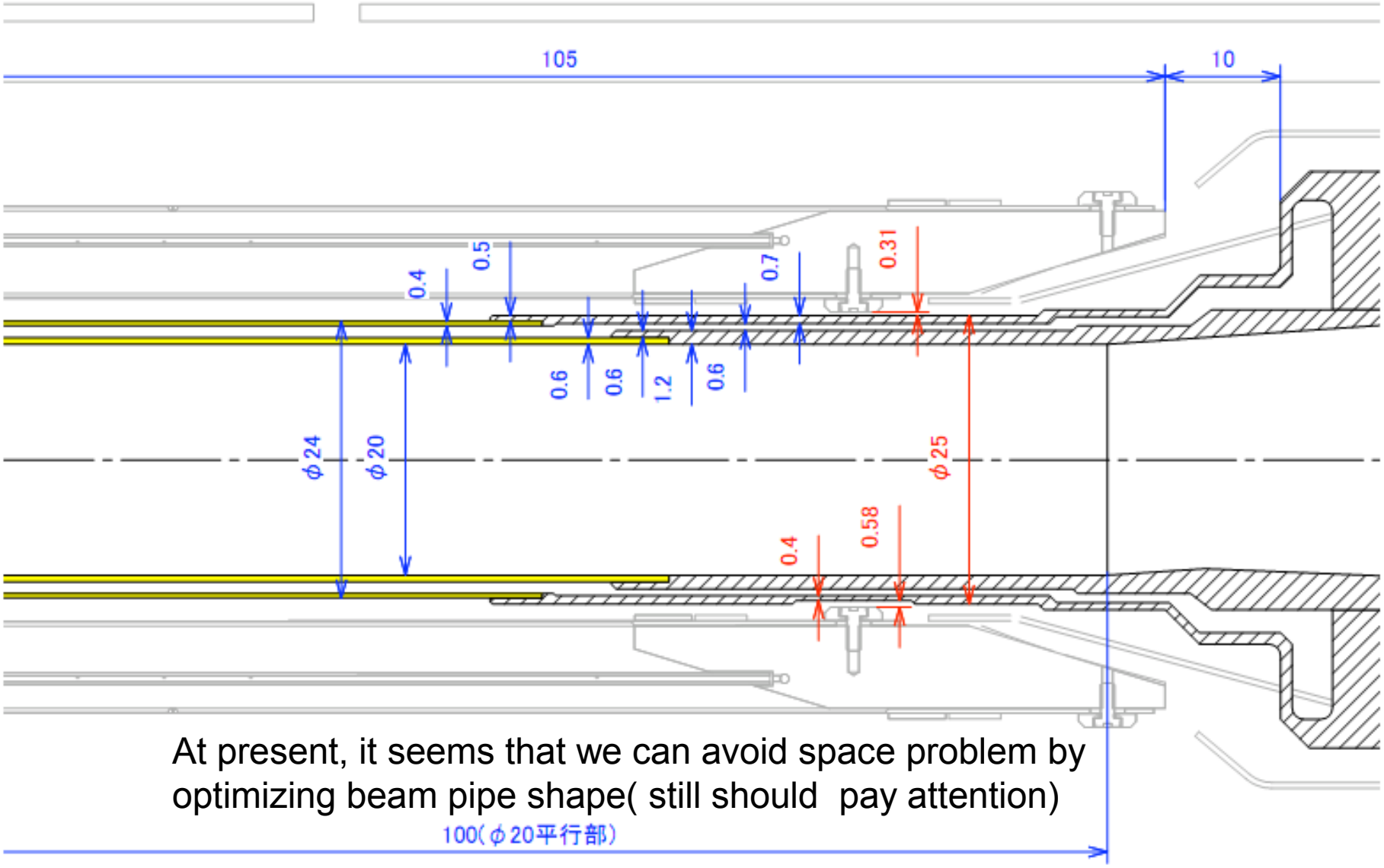
bkup

Design/production allocation

IR mechanics Items	Design	Production
Beam pipe IP	KEK	KEK
Beam pipe Crotch	KEK	KEK
PXD mount block	KEK	KEK
Beam pipe cooling	KEK	KEK
Beam masks	BG group,KEK	KEK
BP fixing structure(assembly)	KEK	KEK
PXD PP clamp	KEK+MPI	KEK
PXD mechanics(structure)	MPI	MPI
PXD shell mounting	MPI	MPI
PXD service(Kapton cable)	Bonn+LMU+MPI	MPI
PXD service(CO2 Cooling)	HEPHY+MPI+CERN	MPI+HEPHY?
PXD service (Air cooling)	IFIC+MPI	
PXD mockup	MPI	MPI
SVD mechanics (Endring)	HEPHY	KEK
SVD mechanics(main structure)	HEPHY(KEK)	KEK
SVD cabling procedure	HEPHY(+KEK)	KEK
Joint between masks and endflange	KEK	KEK
SVD mechanics (Endflange)	KEK	KEK
SVD laddar mount	HEPHY	KEK
SVD outer shell	HEPHY	HEPHY
SVD support cone	HEPHY	HEPHY
SVD service (cooling CO2)	HEPHY	HEPHY+MPI?
SVD service (cooling Air)	HEPHY	HEPHY

Updated on 2011May

Narrow Space issue between PXD and IP

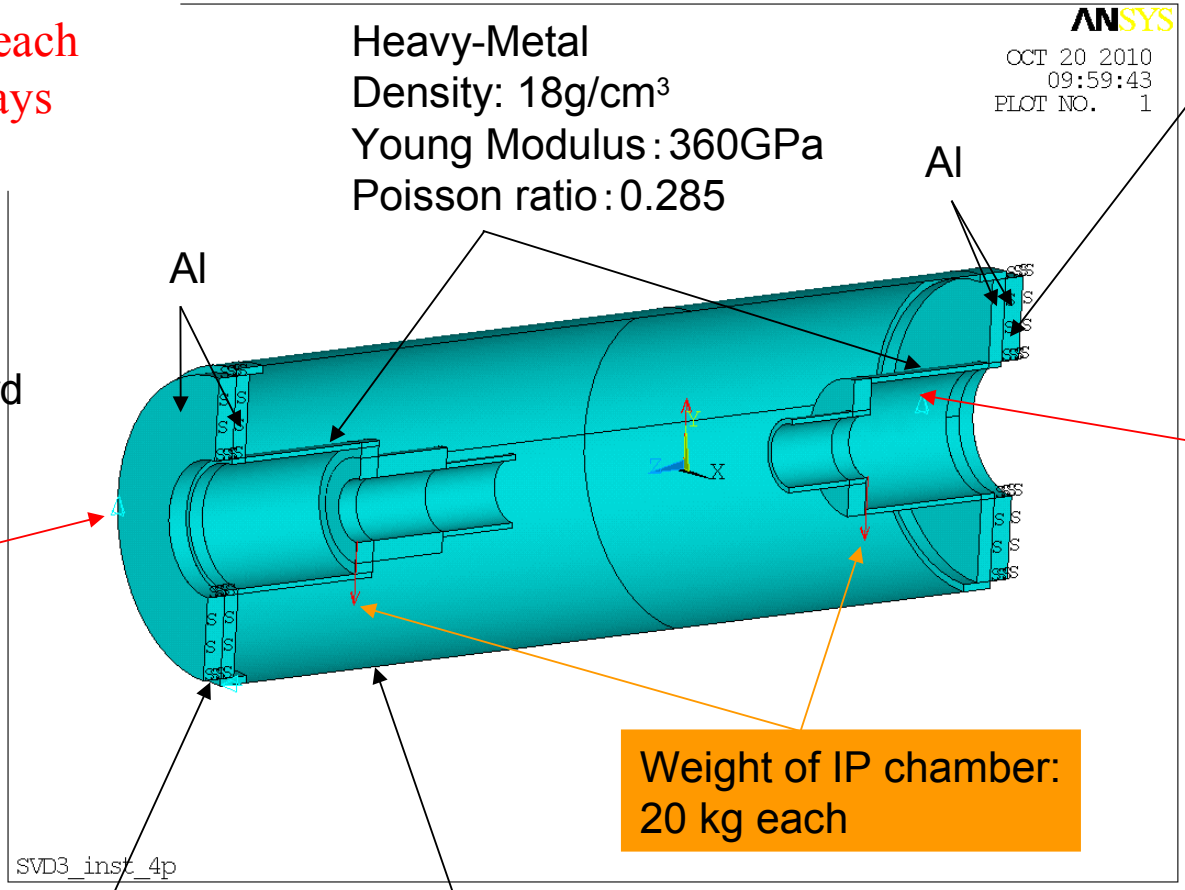


At present, it seems that we can avoid space problem by optimizing beam pipe shape(still should pay attention)

Installation
Stress Analysis of SVD

The outside CFRP and heavy-metal structure in each half are always separated.

(Koike)



s:This surface is fixed to the other half.

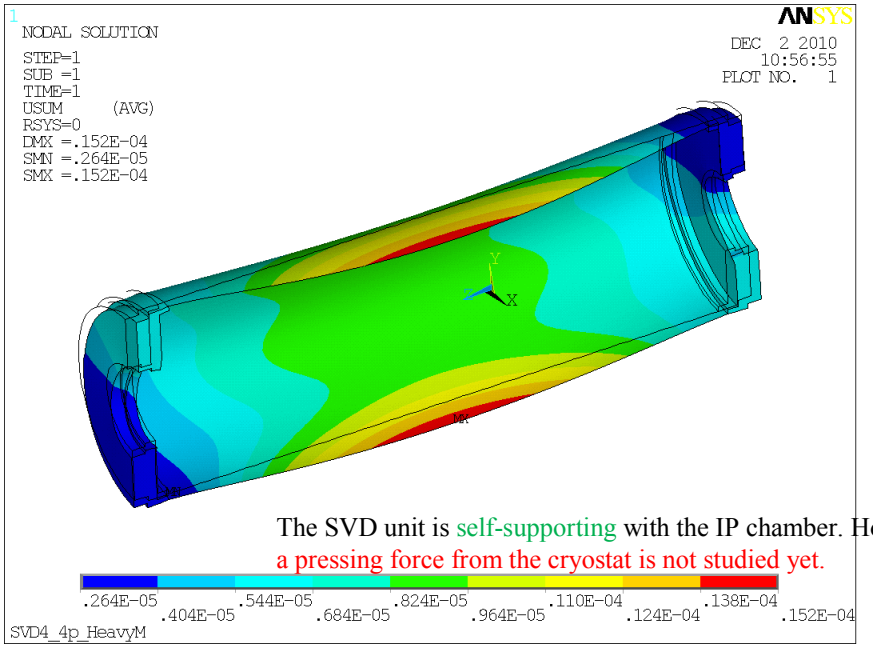
s:This surface is fixed to the other half.

Total weight ~78 kg

CFRP : 1 mm
Young modulus: 200GPa
Tensile strength: ~GPa

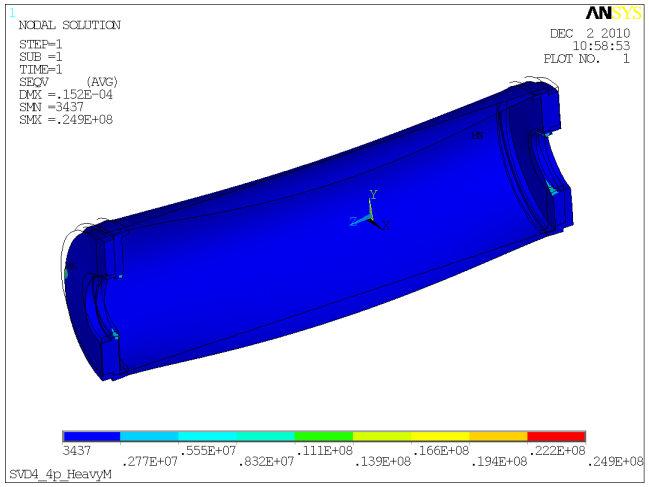
Installation
Stress Analysis of SVD - Results

(Koike)

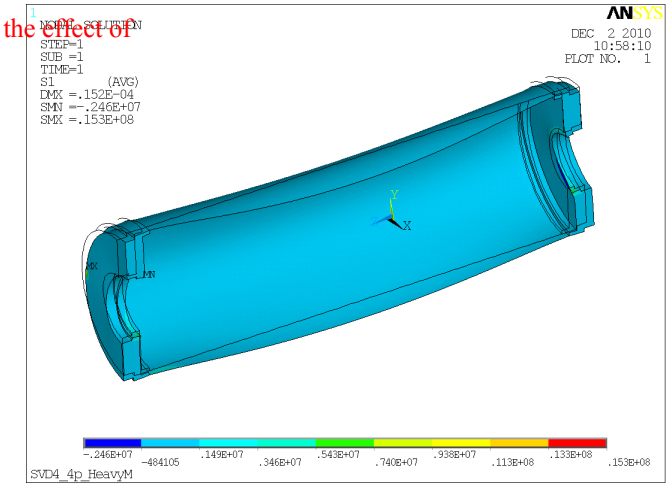


Maximum displacement: 0.015mm

The SVD unit is self-supporting with the IP chamber. However, the effect of a pressing force from the cryostat is not studied yet.



Equivalent stress : Max 25MPa



Principal stress : Max 15MPa

The results for CFRP are shown.

- Deformation is very small.
- Stress is much less than the tensile strength.

SVD keeps its shape when supported at both ends.