

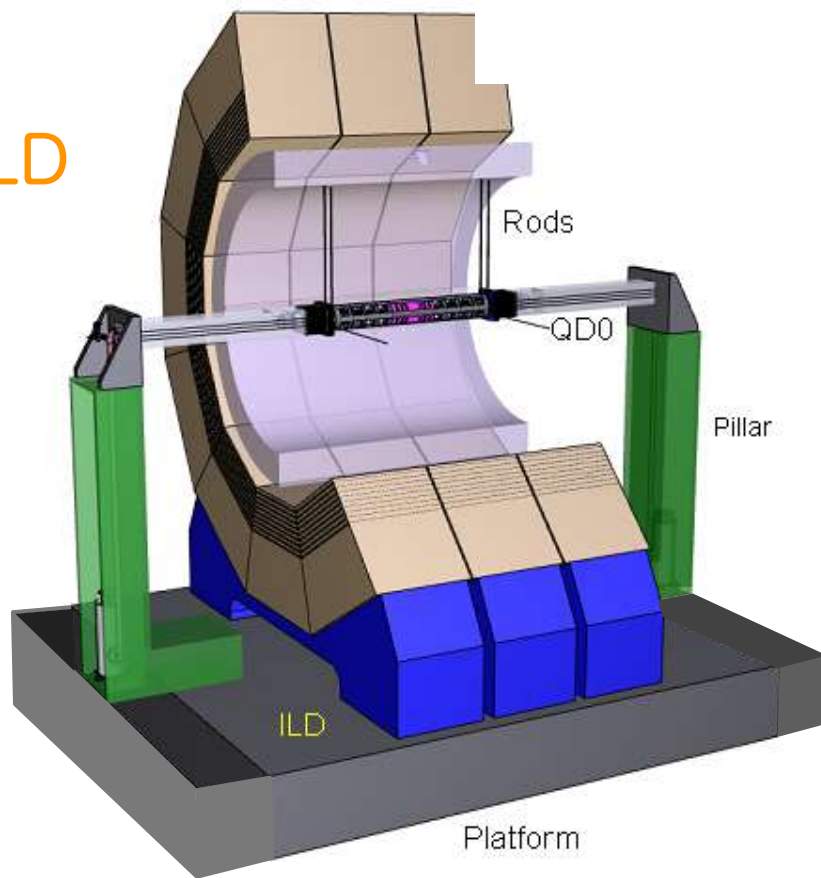
# QD0 Support from BDS tunnel ( $L^*=4.1\text{ m}$ )

## Motivations

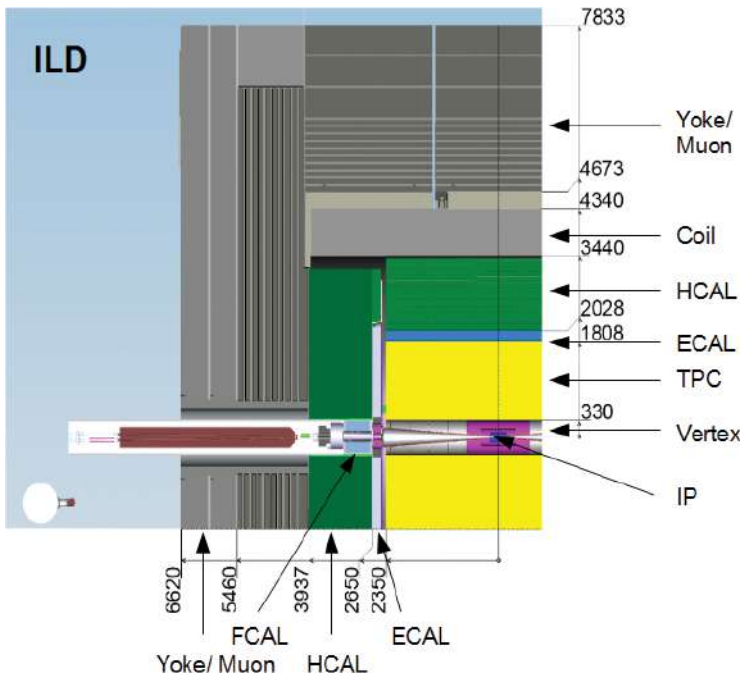
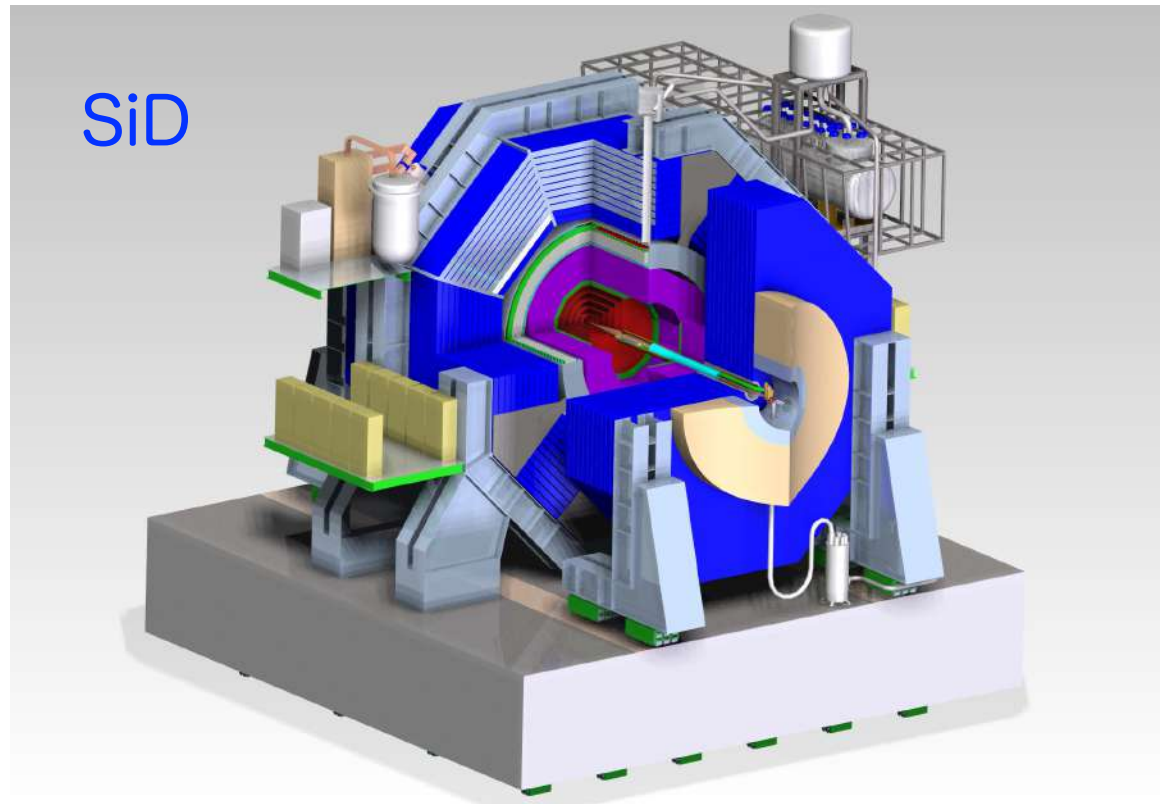
- (1) decoupling from the detector,  
e.g. less vibration transferred from the detector
- (2) separation between the detector and the accelerator elements,  
e.g. less **alignment/repositioning** issues after the push-pull operation/cycle
- (3) in case of the QD0 pillar support in ILD, no endcap yoke splitting needed as shown in following slide, where the endcap yoke has to be split for service of inner sub-detectors
- (4) no duplicated QD0 package for good cost performance

Toshiaki Tauchi (KEK), IDT-WG3 MDI Meeting, 27th January 2022

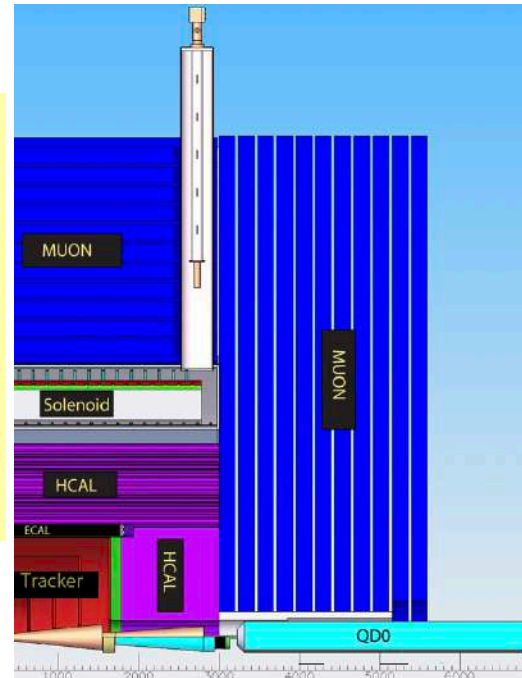
ILD



SiD



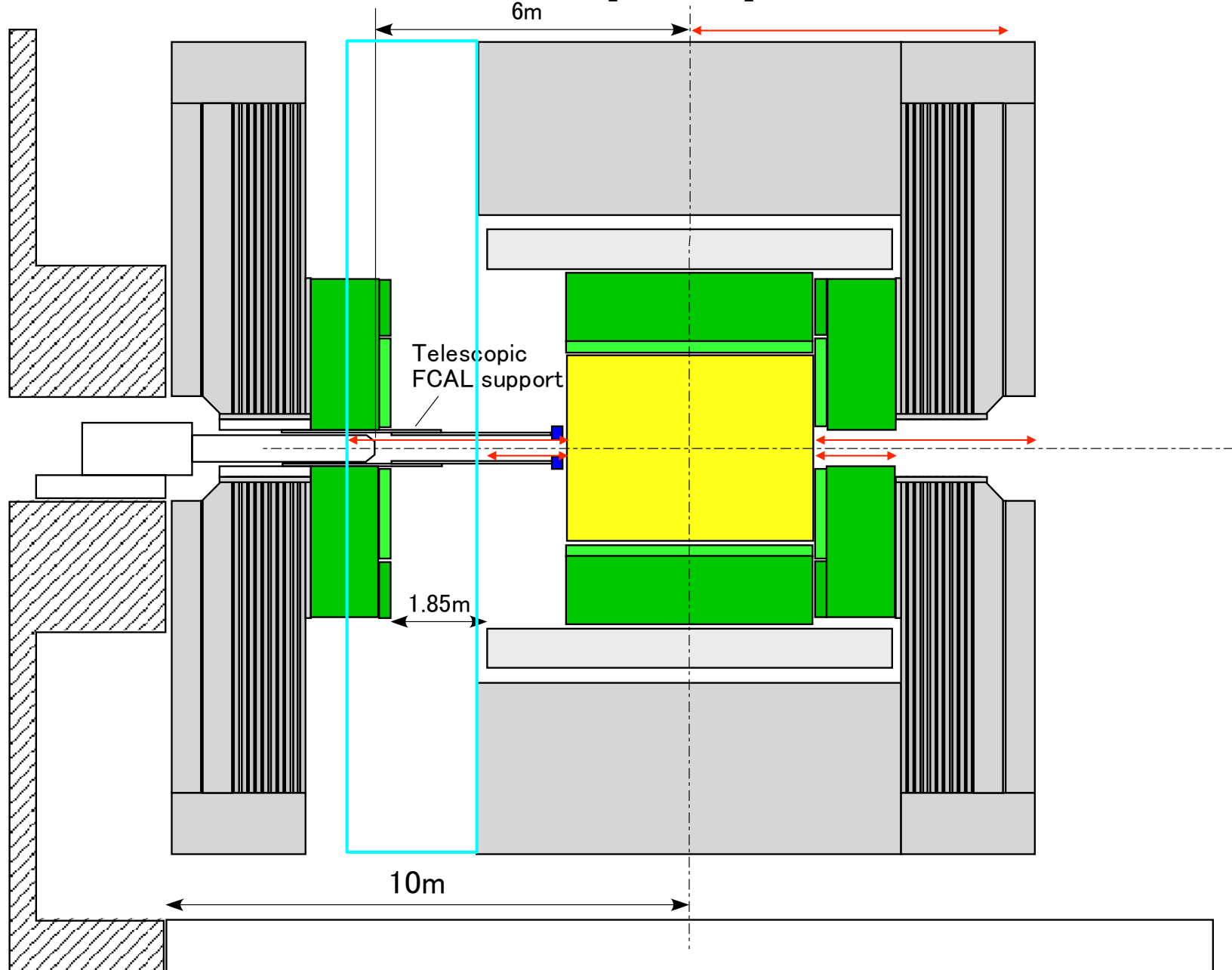
The QD0 magnets of ILD are supported by an external pillar that couples the magnet directly to the platform floor. In the barrel of the detector, the QD0 magnets are stabilised by a tie-rod system.



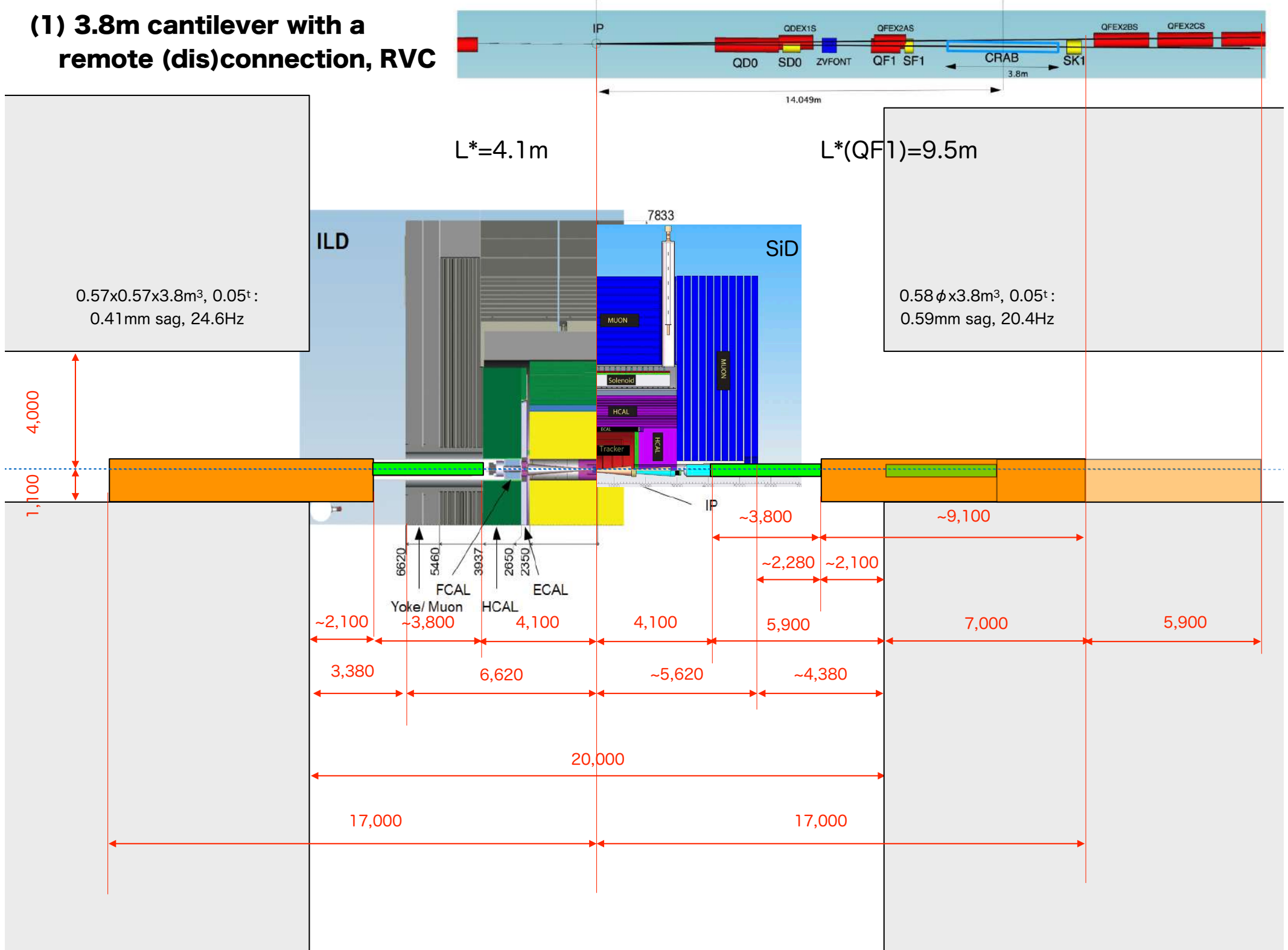
QD0, rests on a 5 d.o.f. magnetically insensitive mover system which in turn rests on cylindrical cutouts in the doors which are only marginally larger than the diameter of the QD0 cryostat.

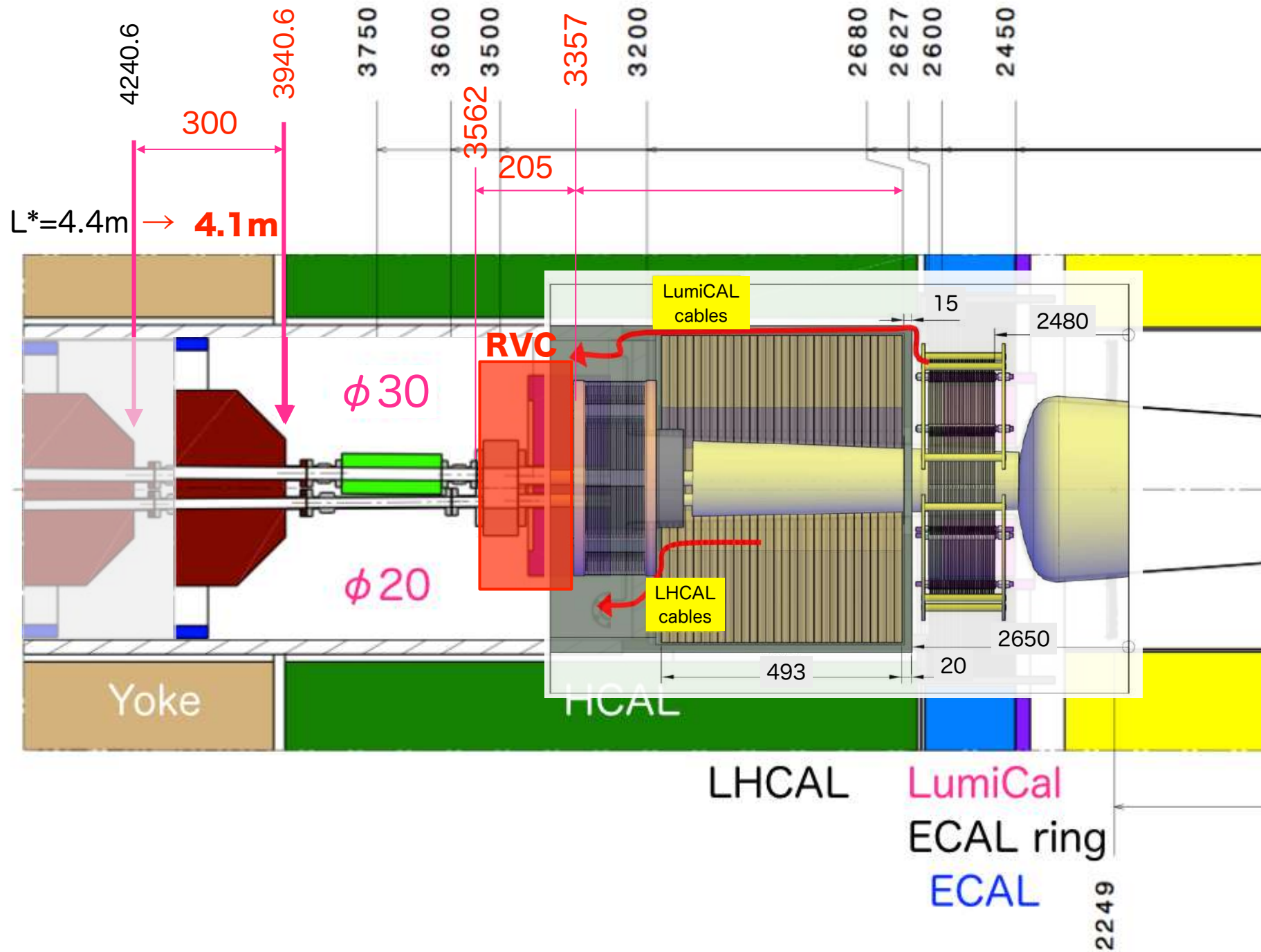
LONGER L\* OPTION

# Endcap open

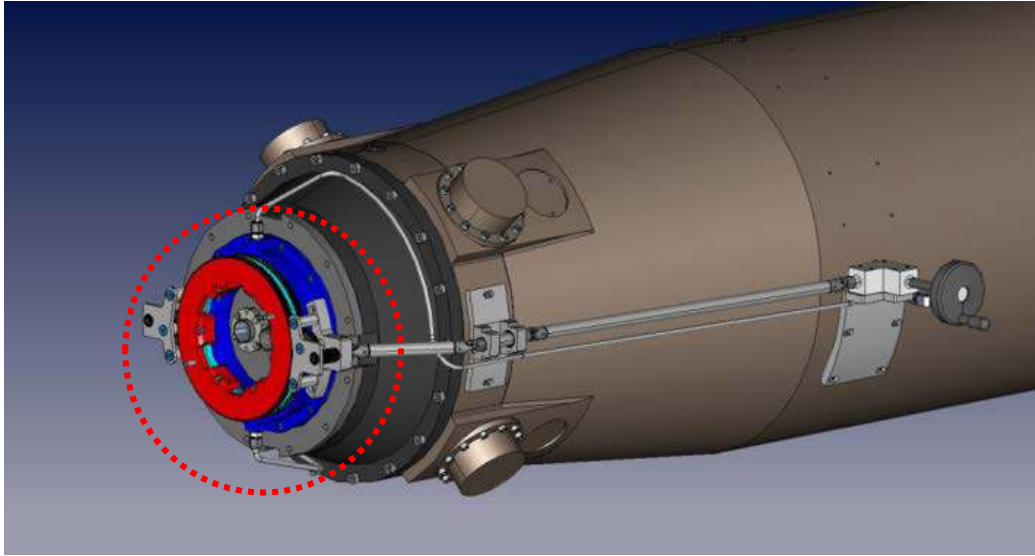


# (1) 3.8m cantilever with a remote (dis)connection, RVC





# Remote Vacuum Connection (RVC)



RVC is a mechanism introduced by Belle group to connect QCS beam pipes to BPM-bellows tubes by a remote manipulation.  
RVC was designed and produced by DESY.



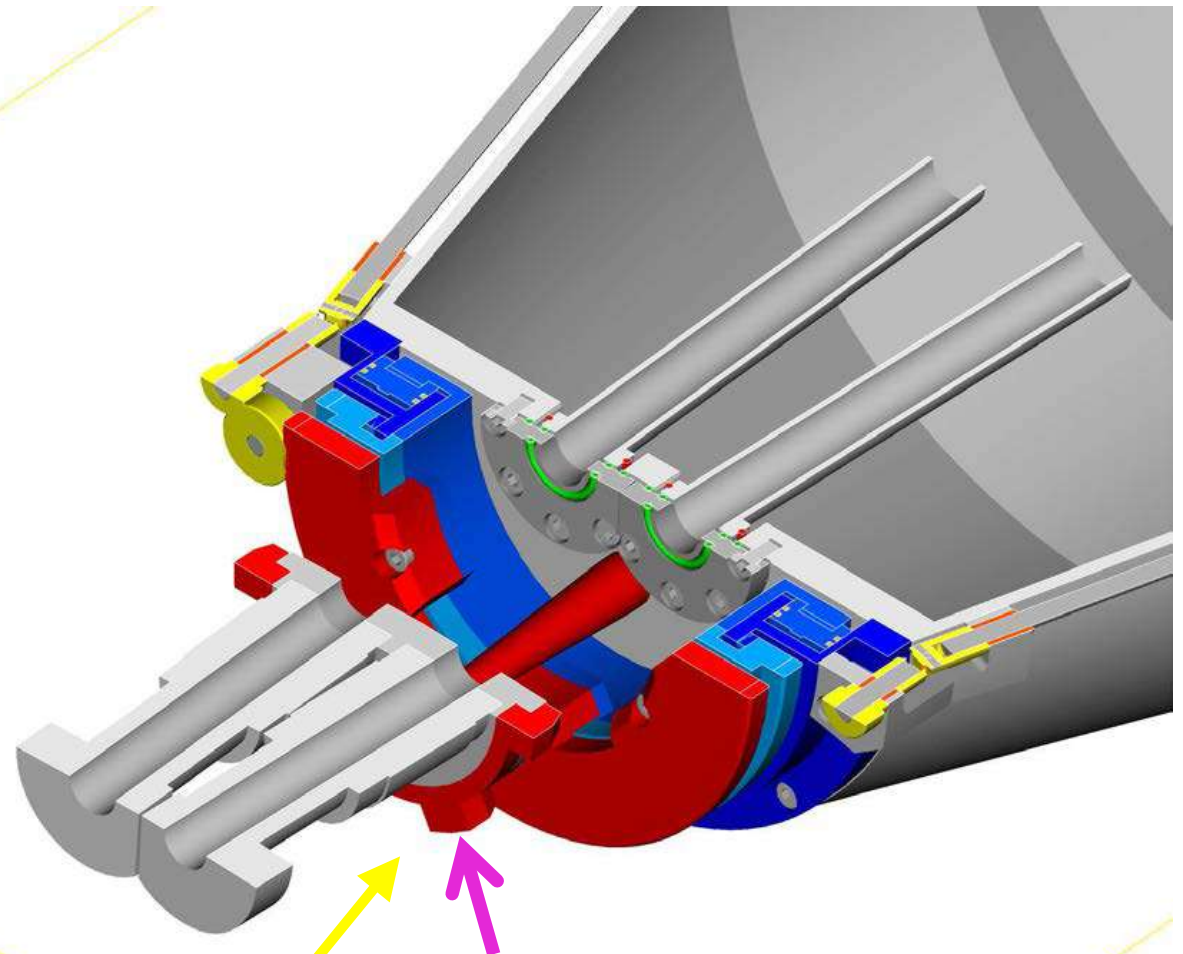
RVC on the new  
QCS head

Photo by DESY

# How RVC works 1/6



BPM-bellows tubes (about 14 cm long)  
set on a lock flange for RVC

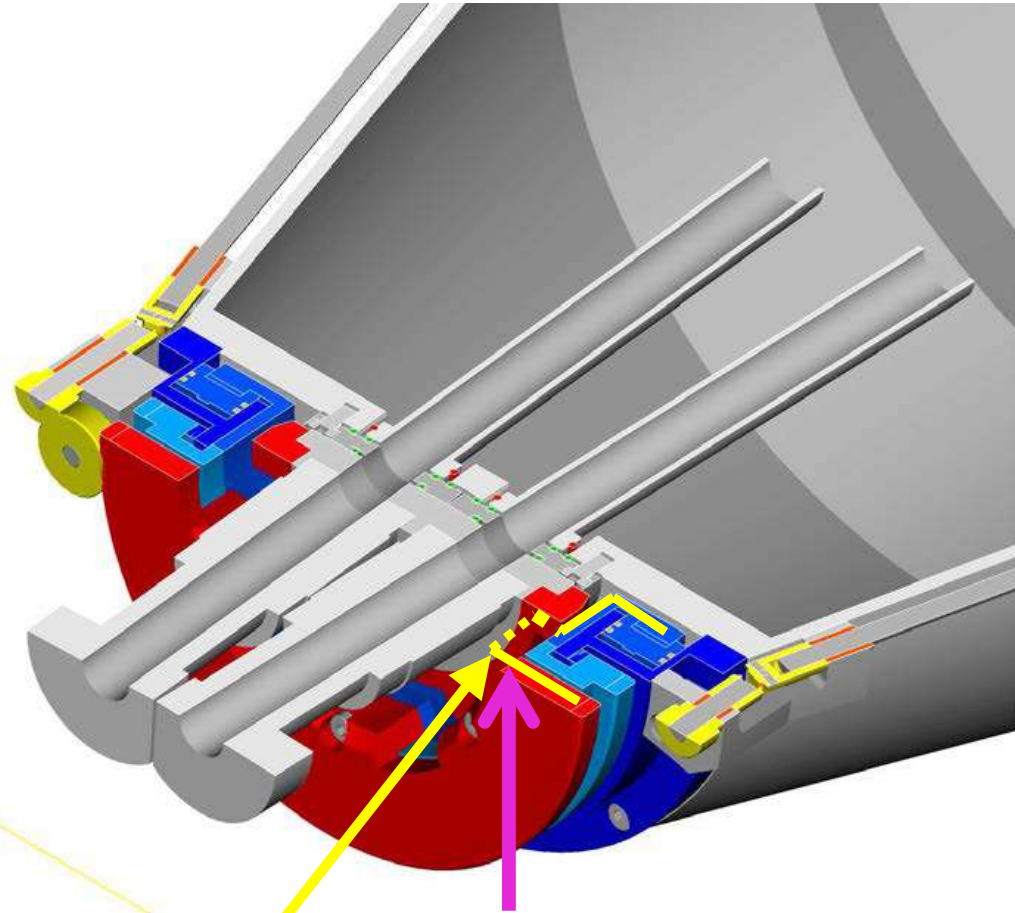


Two bellows units are attached to a  
single flange with a retainer.

lock flange

Drawing by Karsten G.

# How RVC works 2/6



These components (red+blue) rotate to catch the lock flange.

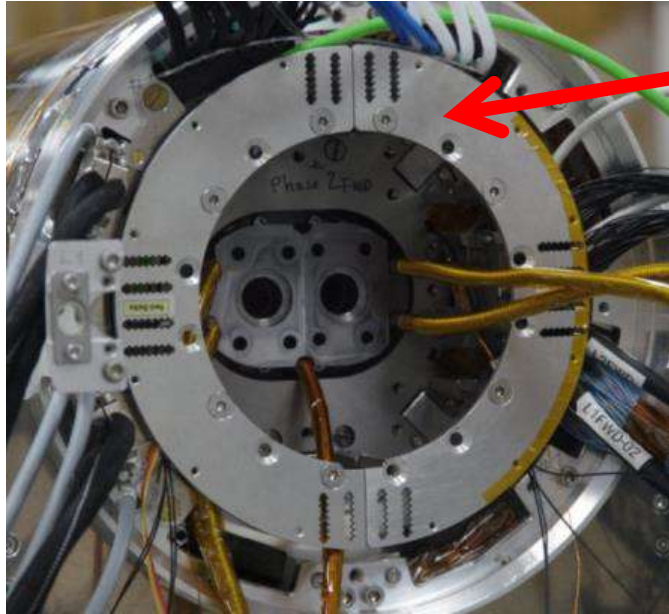
lock flange

BPM-bellows tubes (about 14 cm long)  
set on a lock flange for RVC

Drawing by Karsten G.



# Connecting BPM-bellows tube



Cable cage

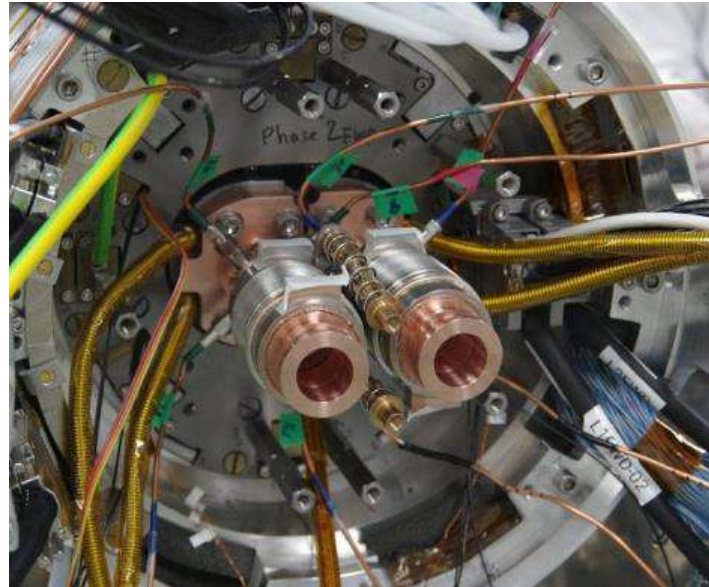
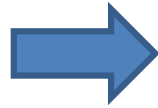
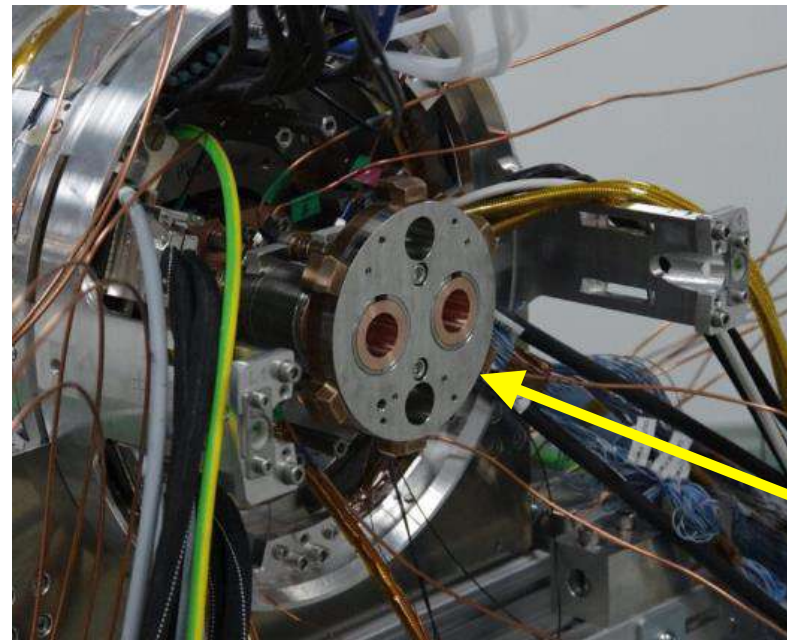


Photo by  
M. Tobiyama



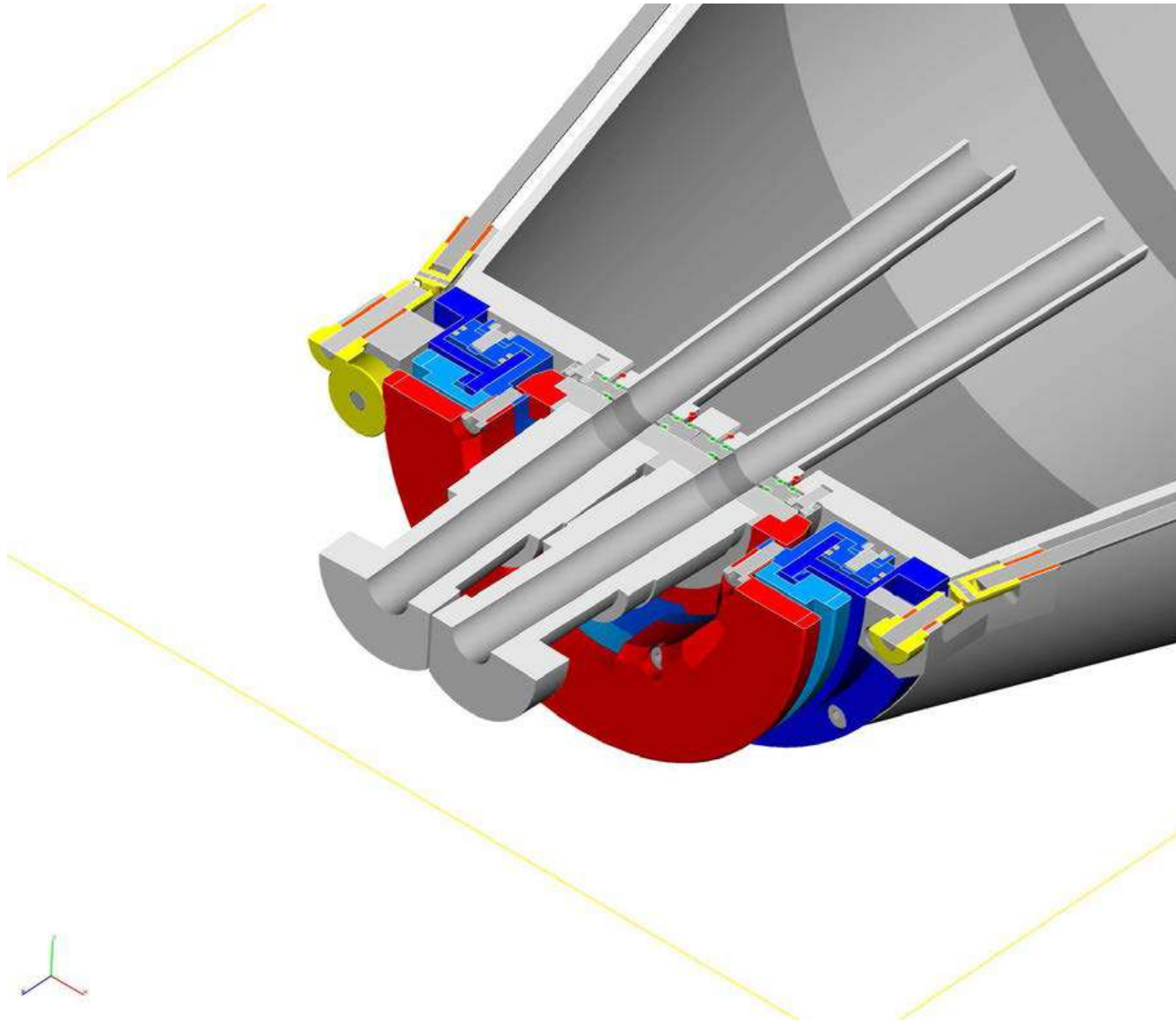
lock flange

## FWD

The vacuum flanges of IP chamber is about 8 cm behind the cable cage.

The cable cage interfered with connecting work. It is temporarily removed.

# How RVC works 3/6

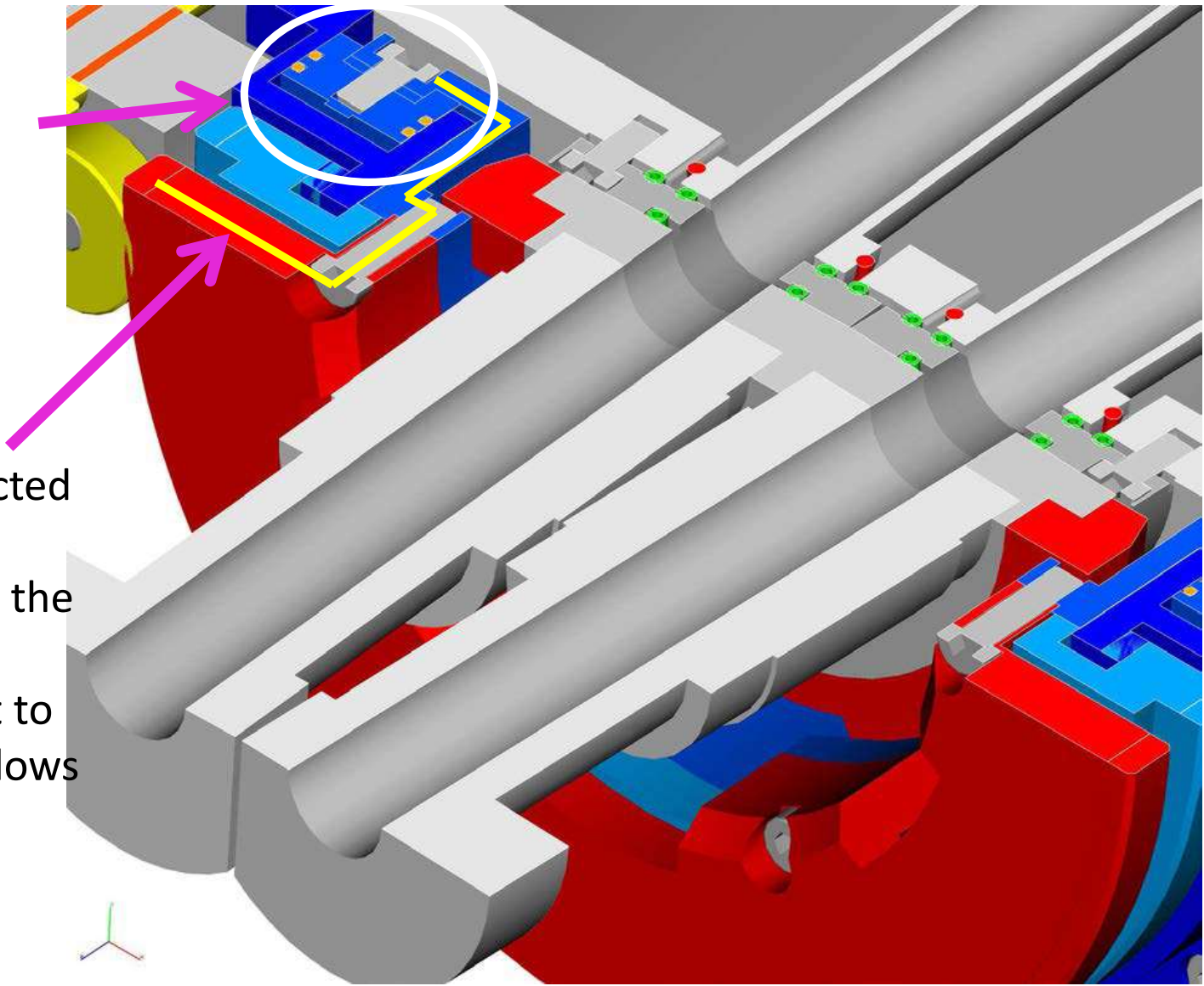


Drawing by Karsten G.

# How RVC works 4/6

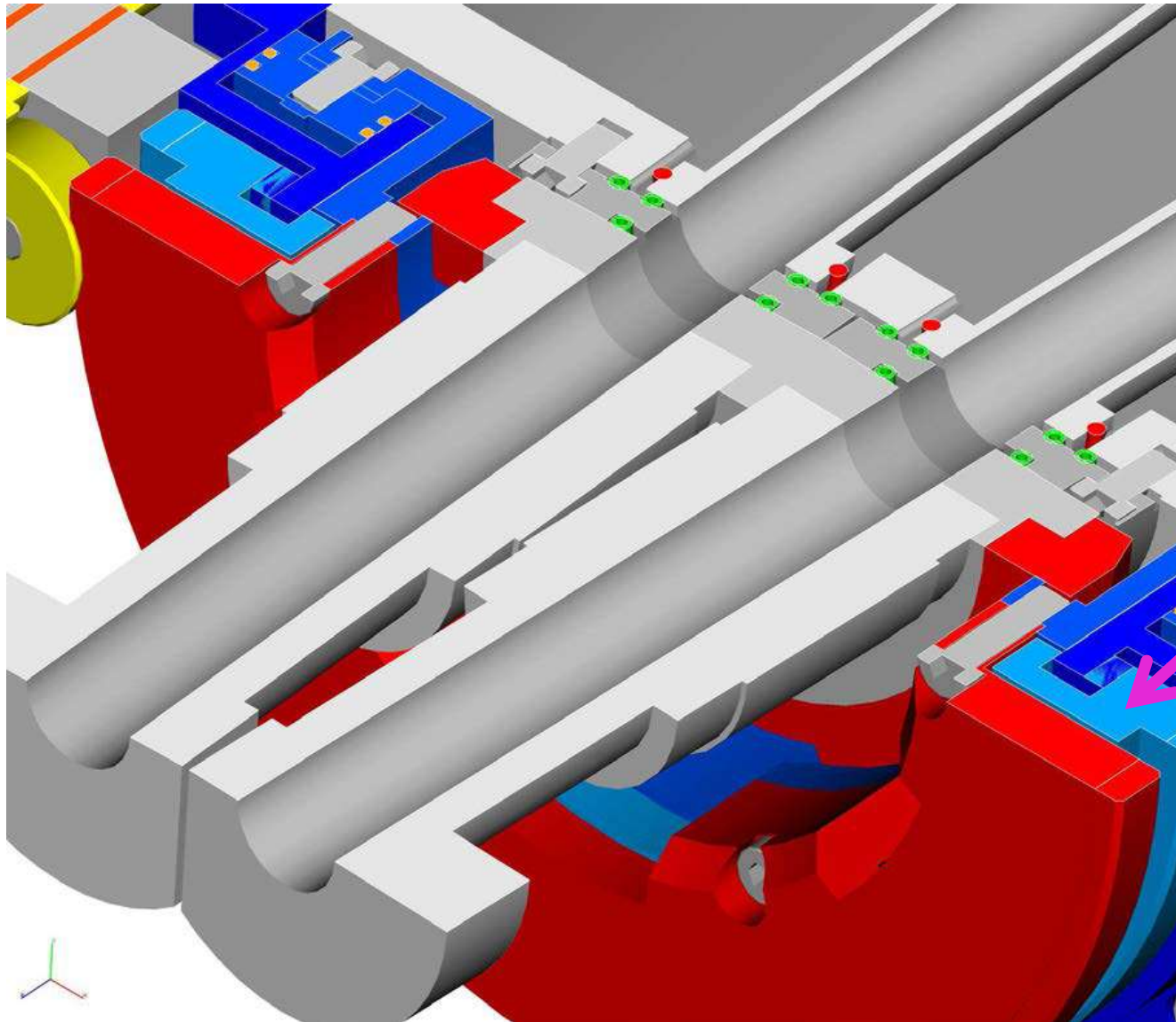
Cylinder  
for dry N<sub>2</sub>  
(about 50  
bar)

These connected  
components  
connected to the  
piston in the  
cylinder, shift to  
press the bellows  
flange to the  
cryostat.



Drawing by Karsten G.

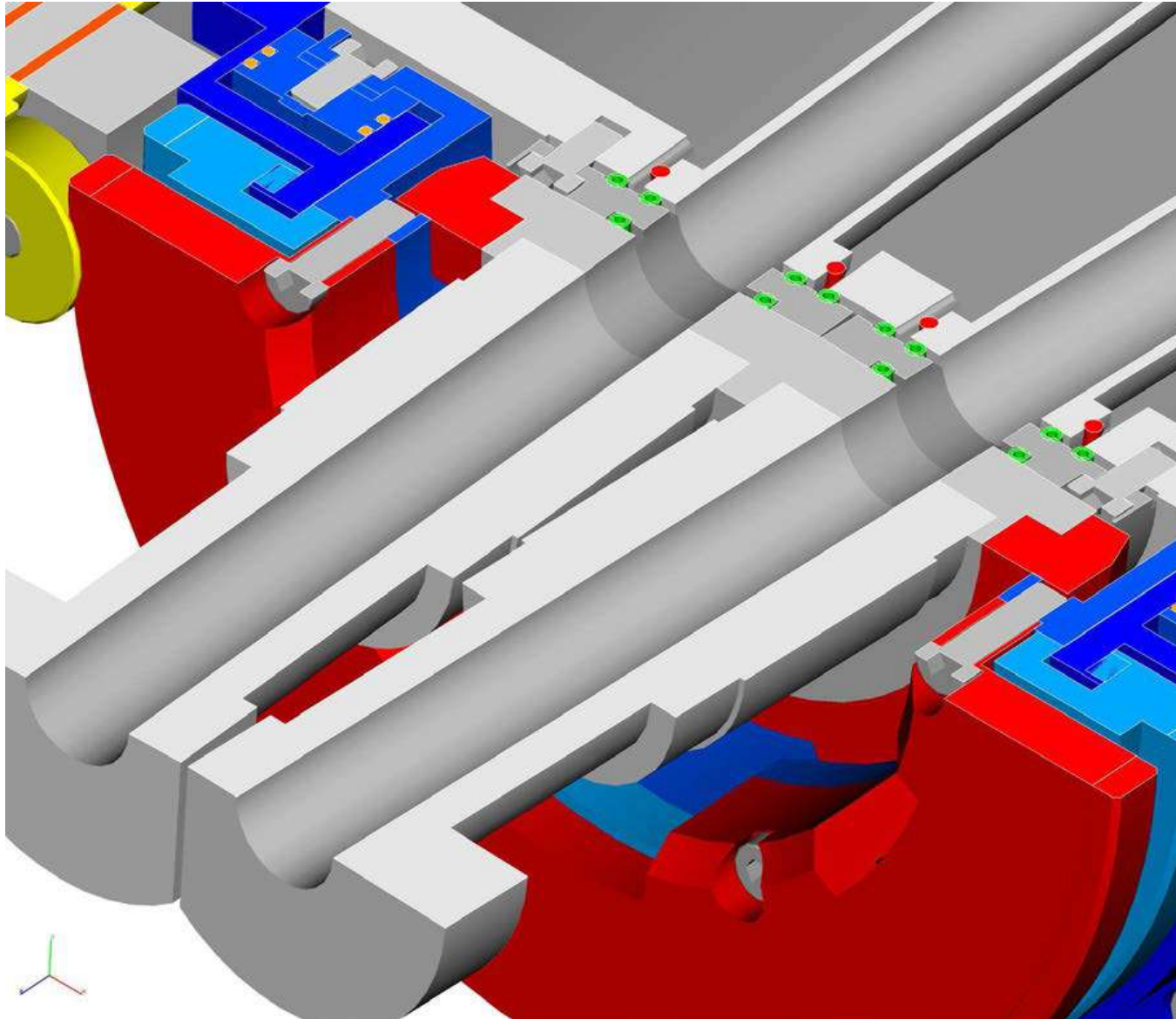
# How RVC works 5/6



This large light blue screw nut turns to lock the mechanism.

Drawing by Karsten G.

# How RVC works 6/6



Drawing by Karsten G.

## QCSR-Beast II connection (Jan. 9, 2018)

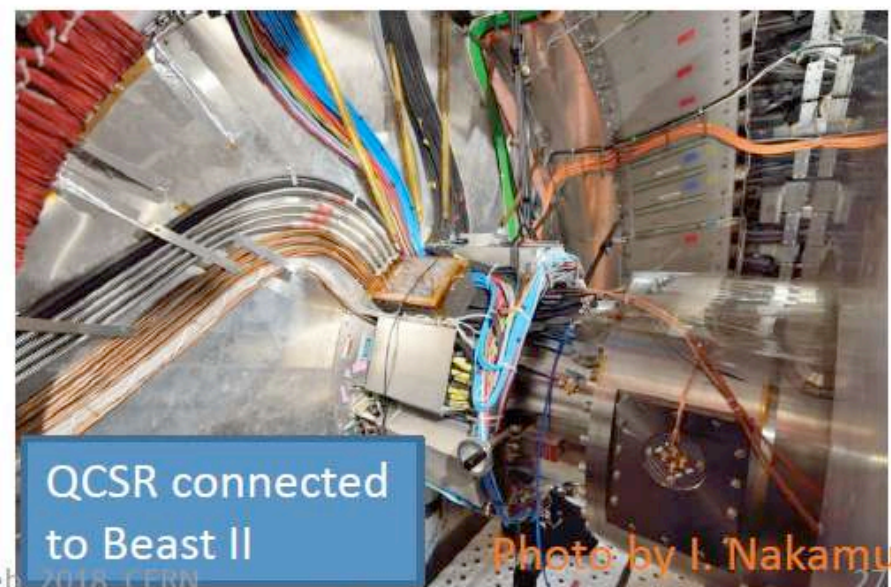
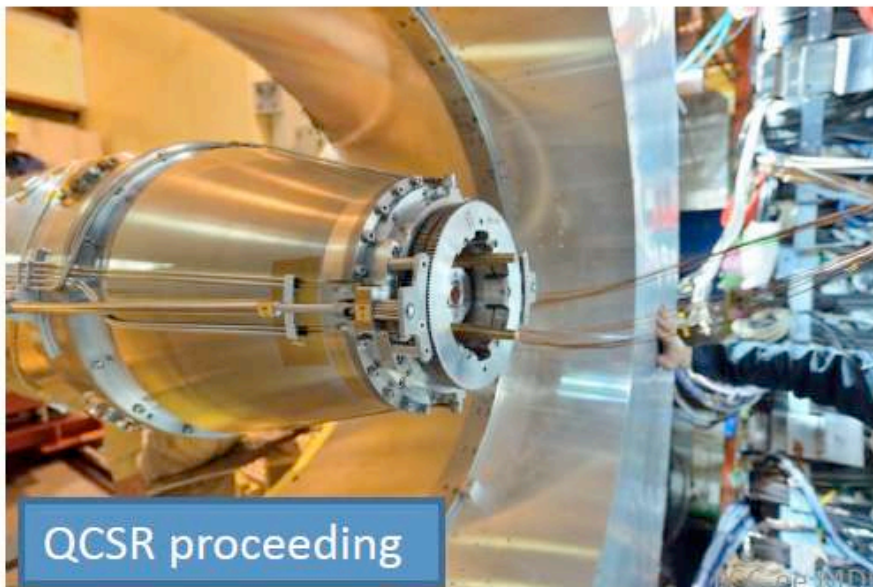
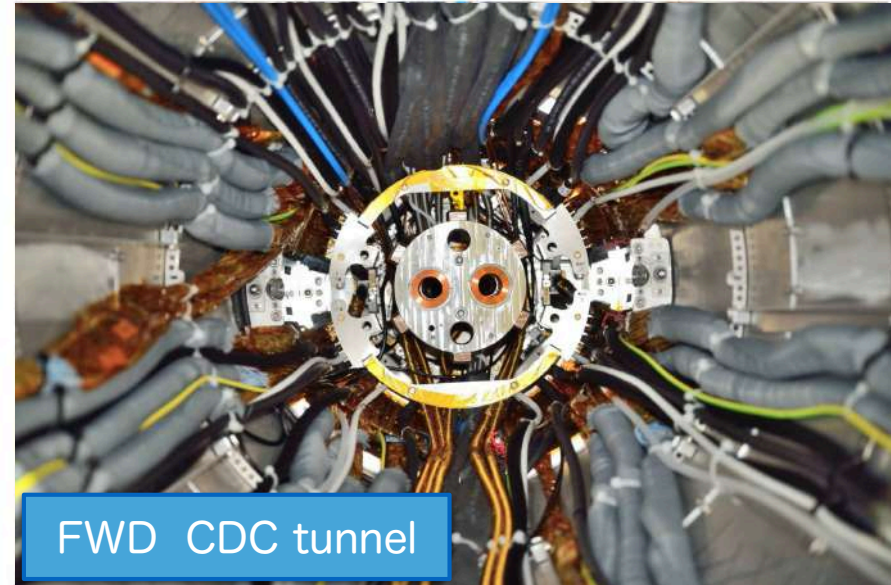
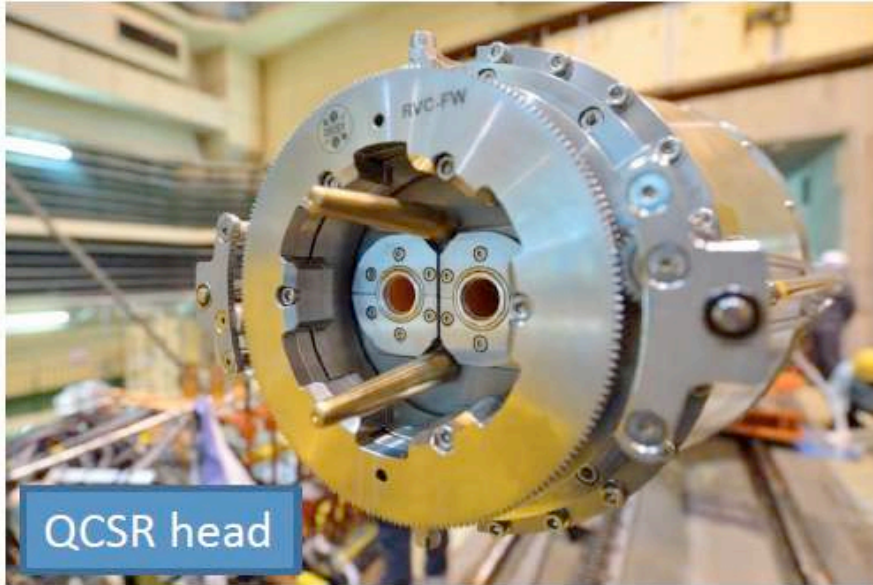
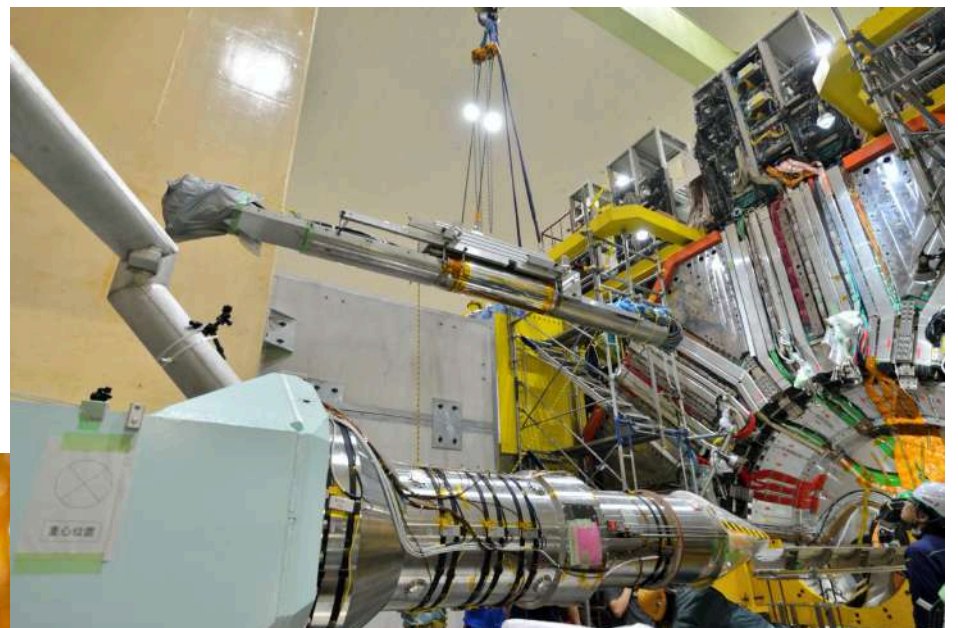
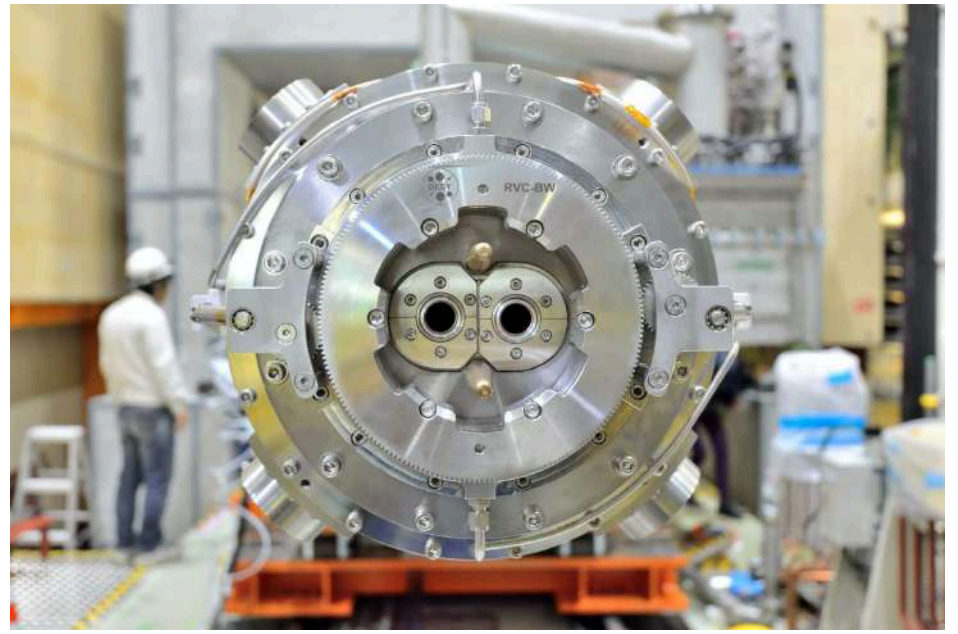
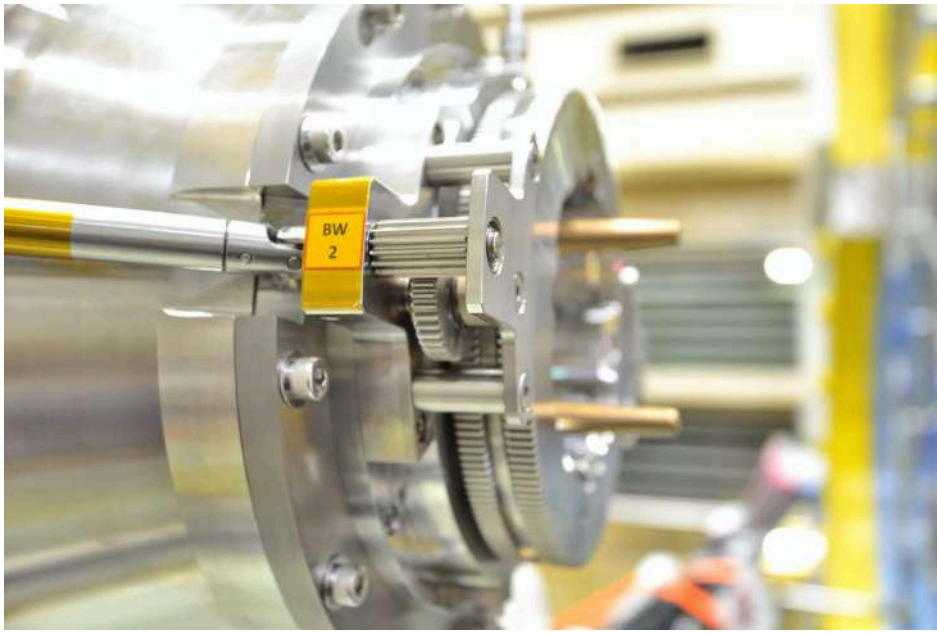
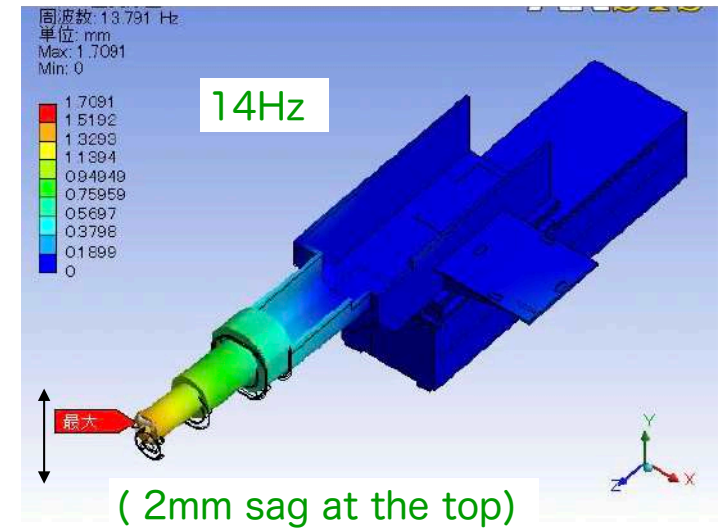
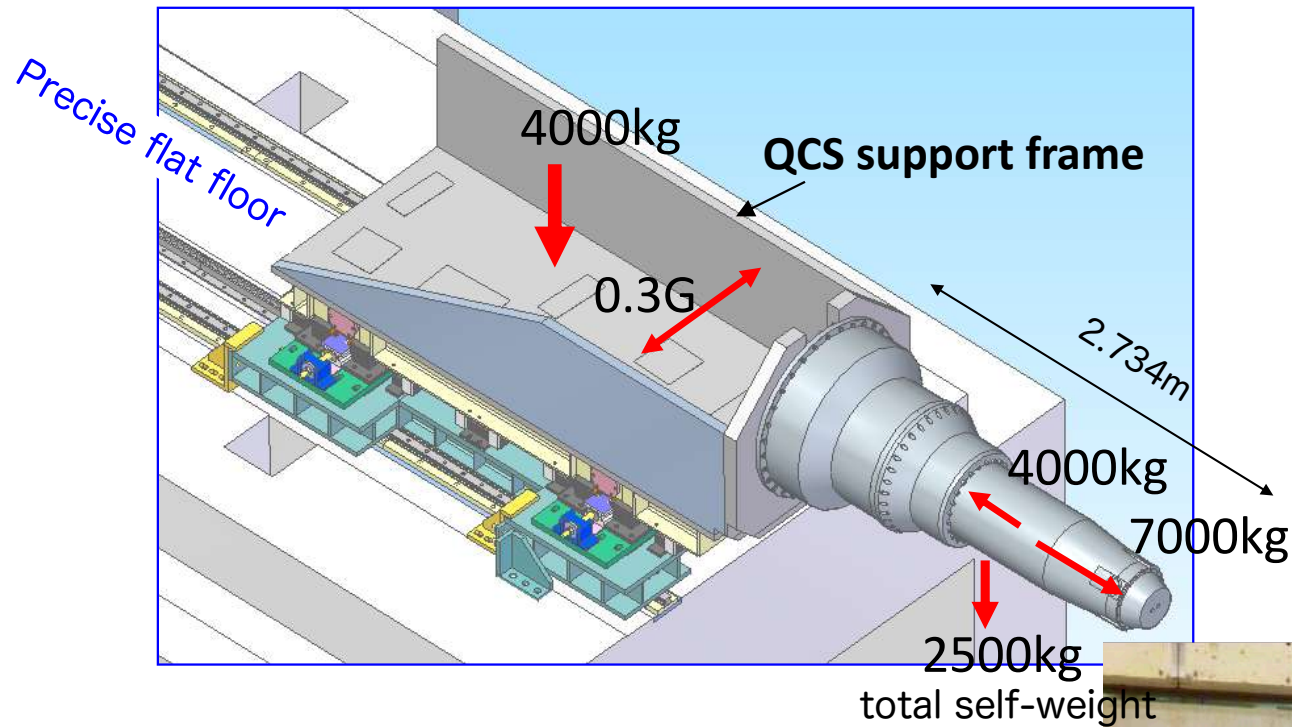


Photo by I. Nakamura



# Mechanical design of the QCS Support at SuperKEKB



## Load conditions (Vertical dir.)

Weight (QCS) : 2500kg

Weight(Support Frame): 10000kg

Weight of magnets: 4000kg

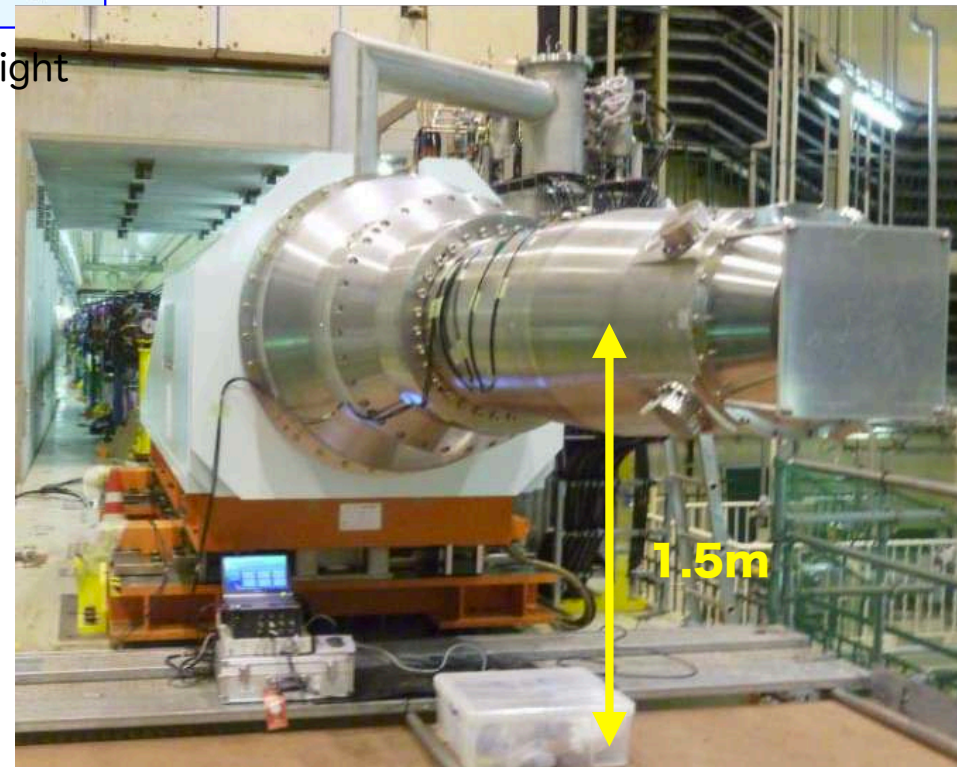
Magnetic force(axial dir.) by the BelleII solenoid and the compensation sol.(ES)

Inner direction : only BelleII 7000kg

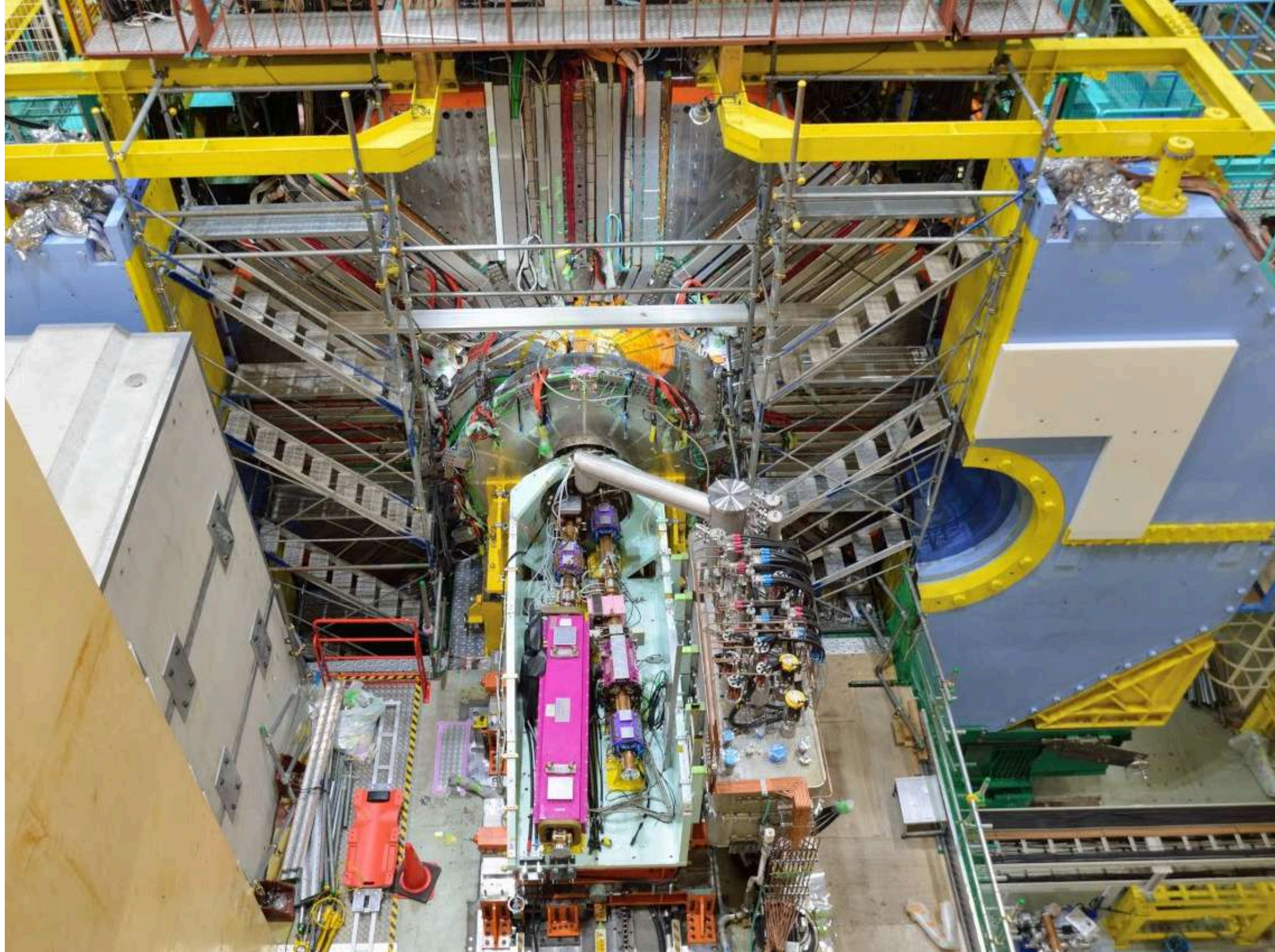
Outer direction: BelleII and ES 4000kg

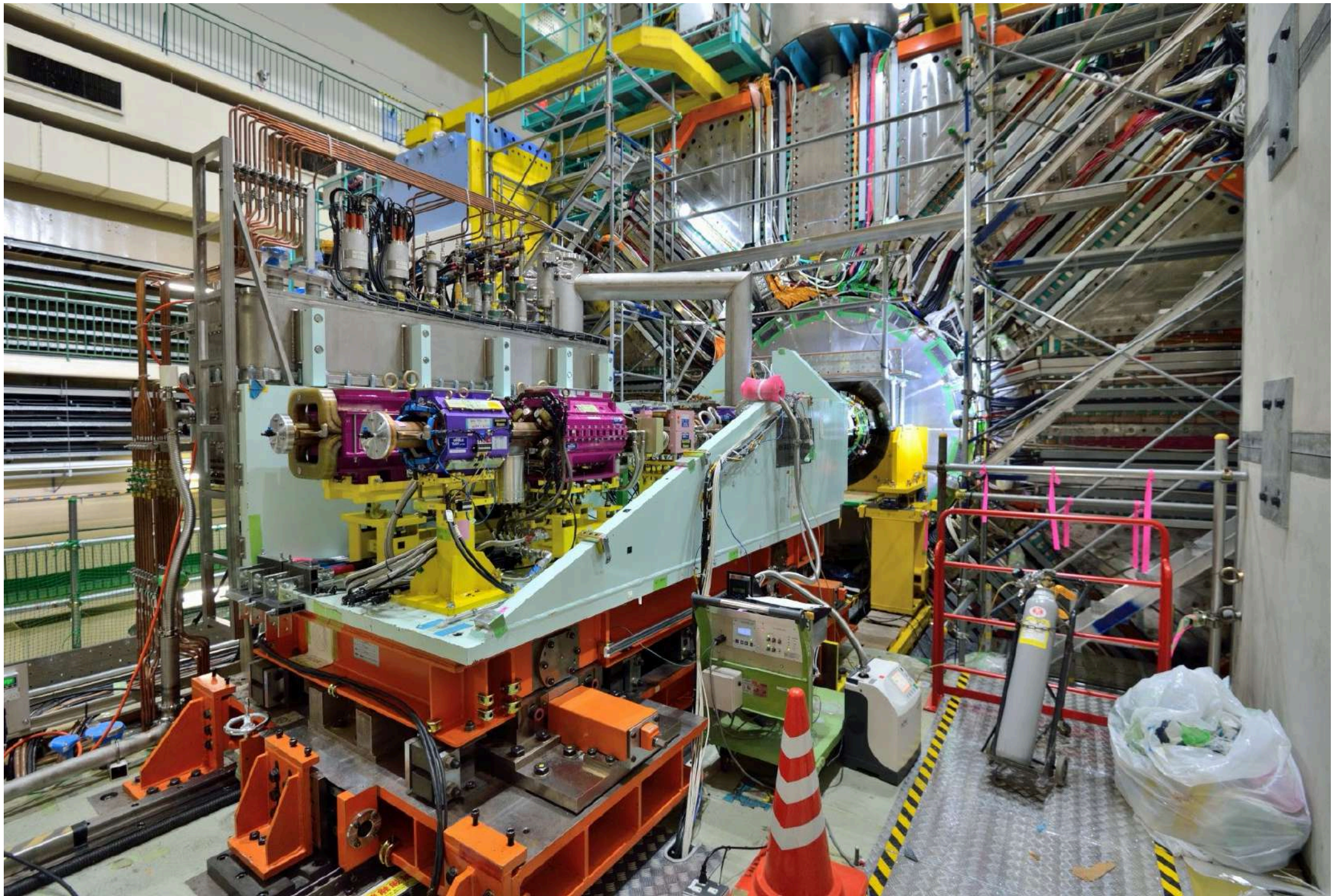
## Seismic load

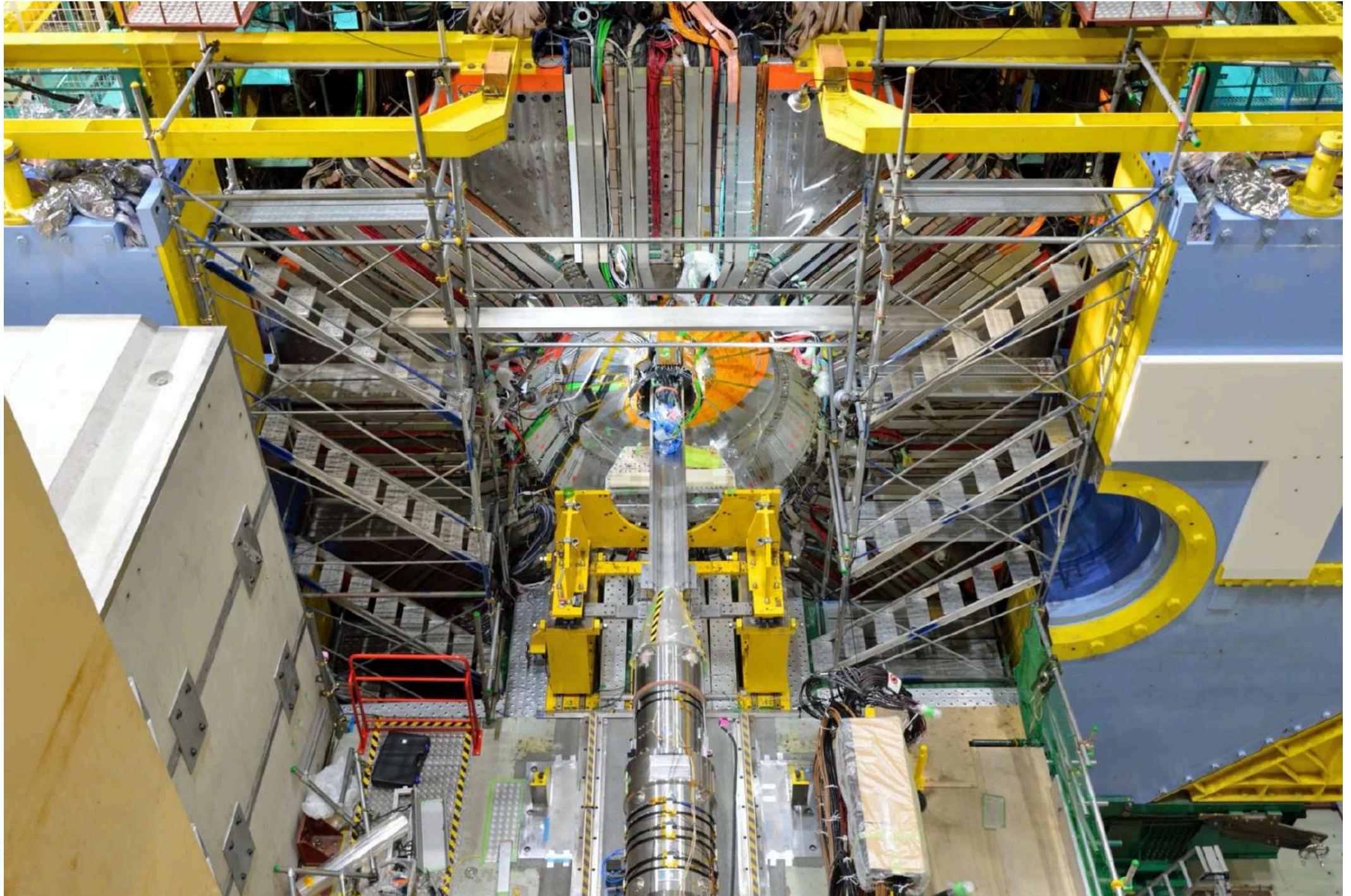
0.3G in the horizontal direction







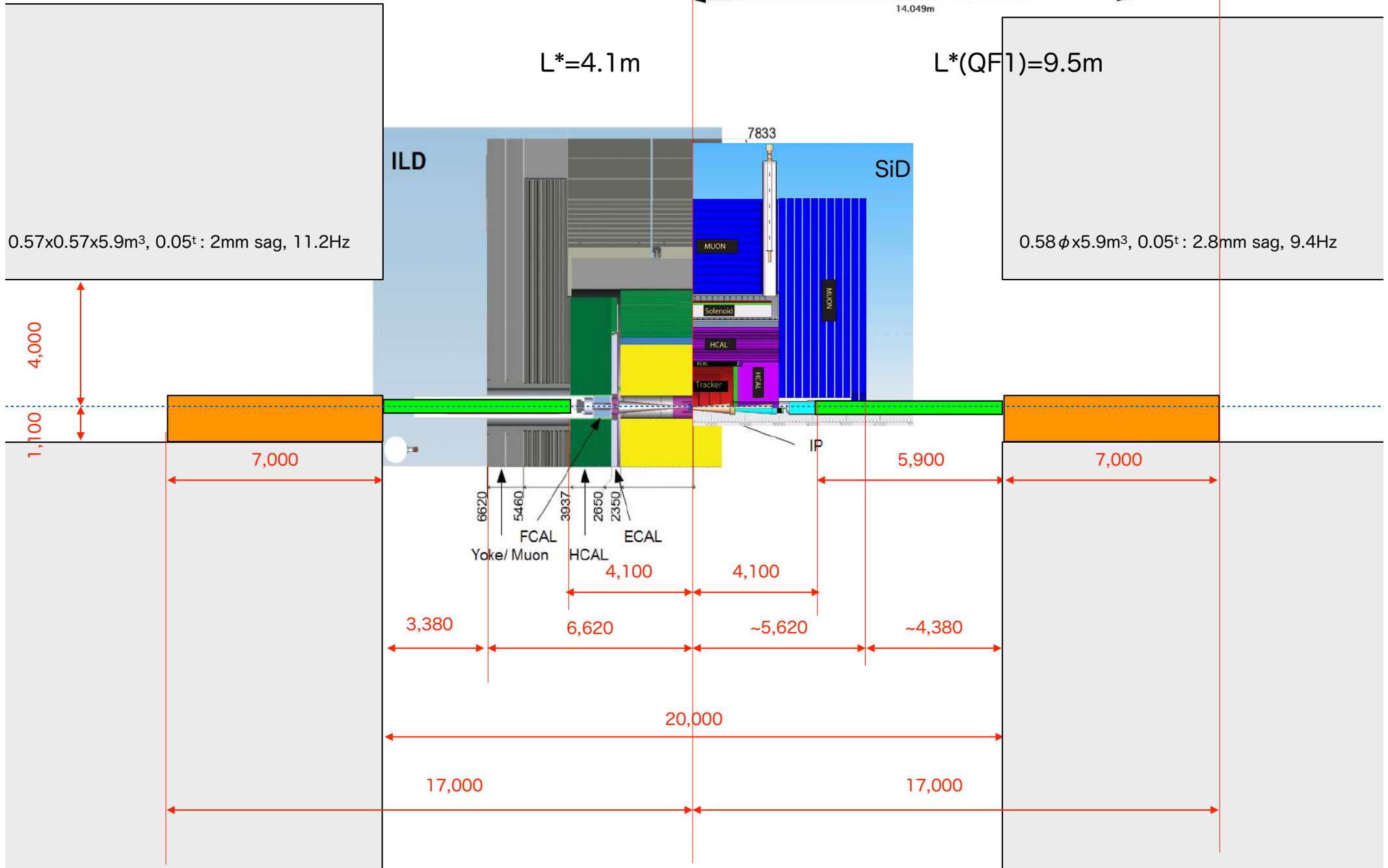








## (2) 5.9m cantilever with a manual (dis)connection



## **Possible study items in the ILC prelab are listed as follows;**

(1) mechanical design of RVC,

if the length exceeds 205mm, the forward calorimeters should be relocated to make enough space for the RVC

(2) engineering design of the cantilever system with girder carrying the magnets and the crab cavity including repositioning and alignment along the BDS beam line

(3) engineering design of the telescopic FCAL support

(4) ANSYS analysis with these engineering models to estimate the realistic stabilization of QD0 as much as possible

We also need agreement for the same QD0 support system with the SiD group.