

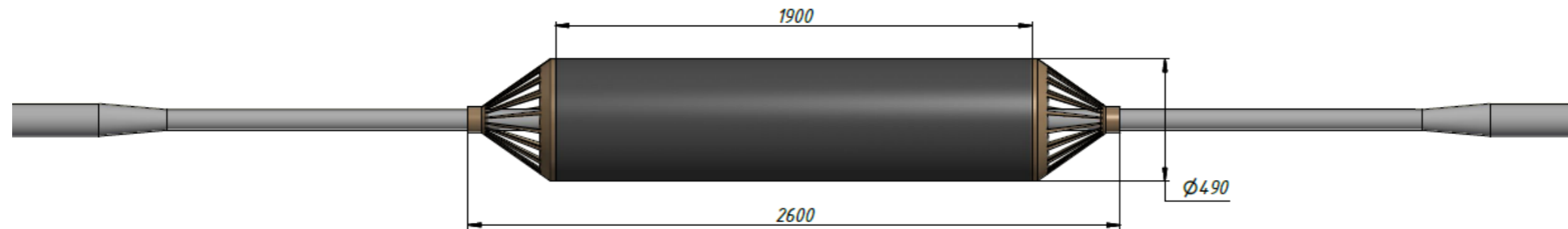
# Issues for discussion at the TB meeting on May 27

Alexander Korzenev

May 13, 2021

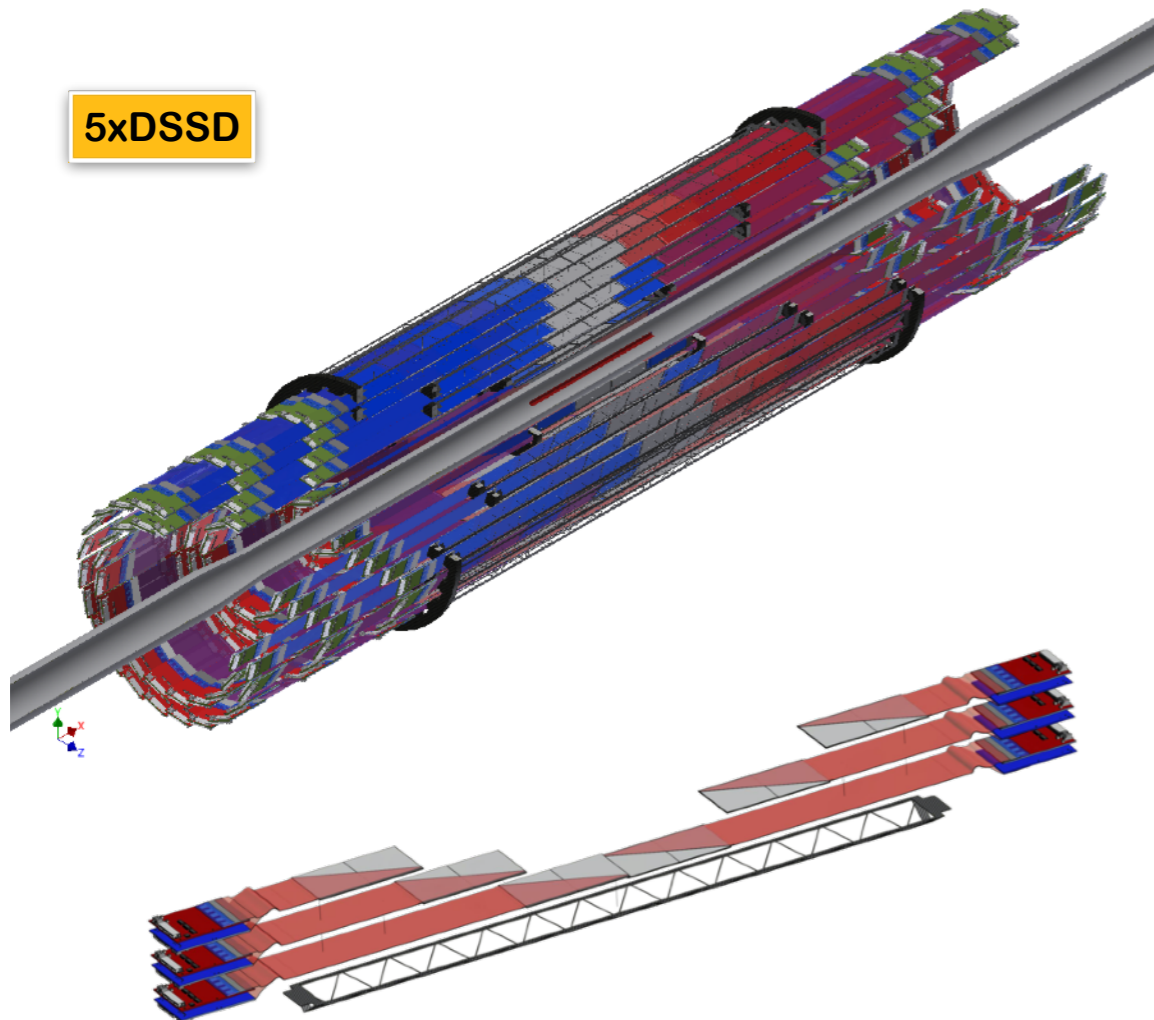
- Technical Board meeting on May 27
  - The idea is to remove mismatches from the CDR version of geometry
  - Formally speaking, now we can show at conferences & seminars only figures of CDR
  - Make release of new detector drawings and assembling procedure
- Collaboration meeting June 7-11
  - One whole day. One talk per detector or system

# Vertex Detector (VD)



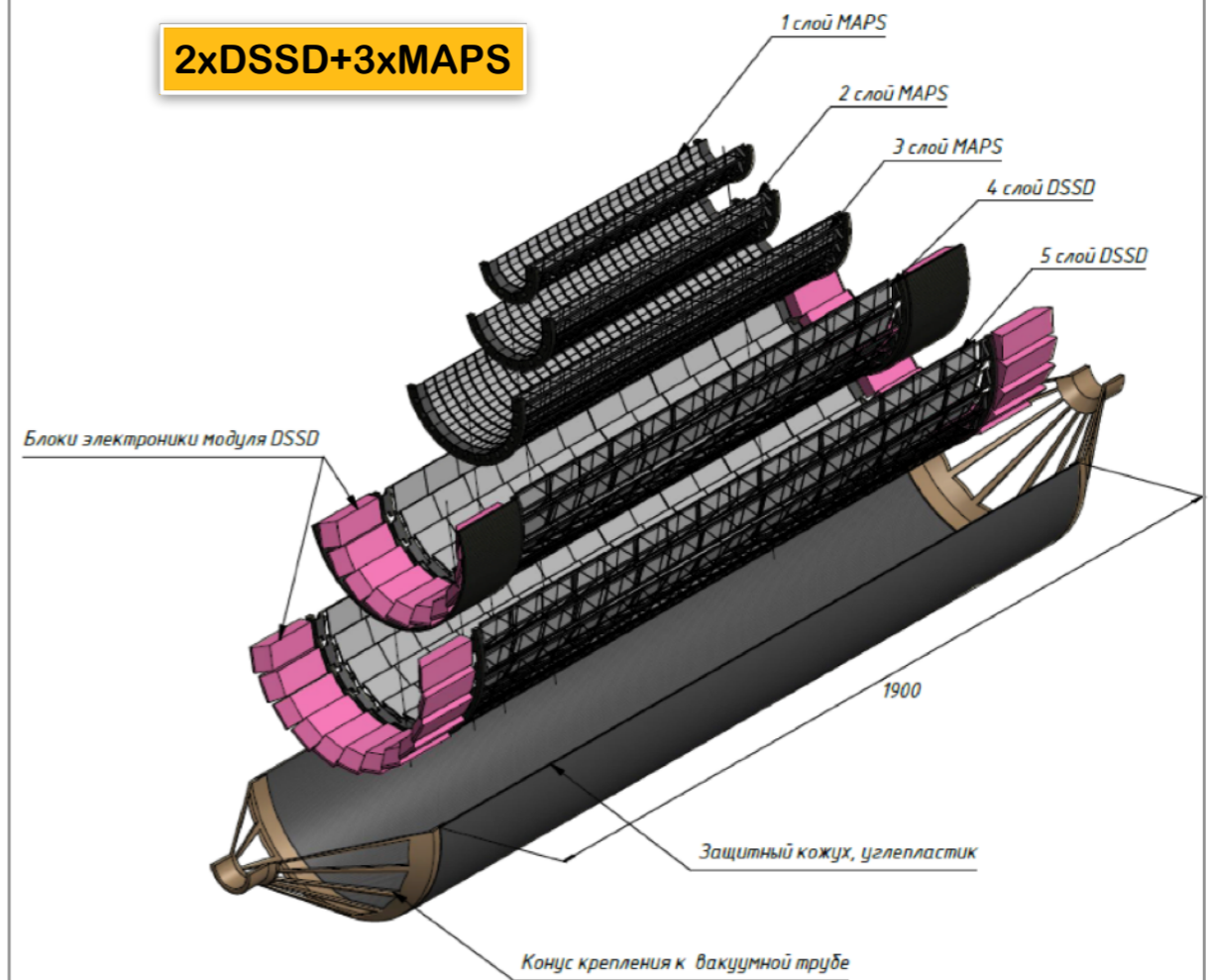
## CDR version (end of 2020)

5xDSSD



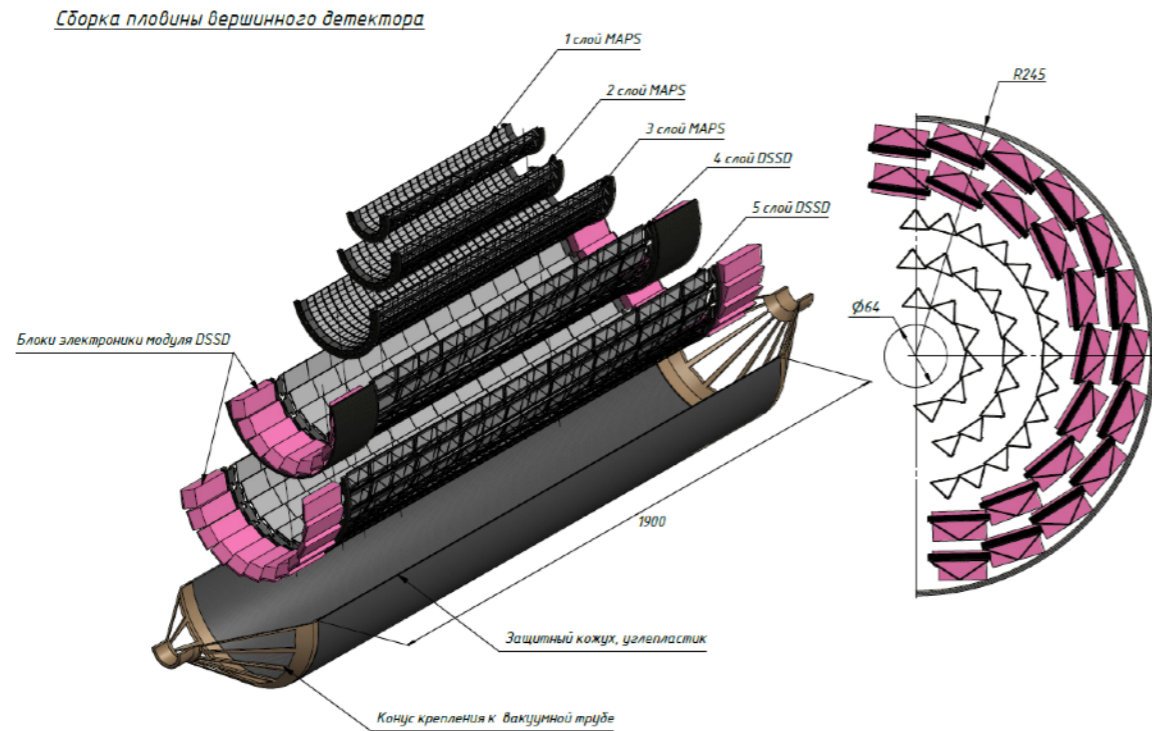
## Update (May 2021)

2xDSSD+3xMAPS



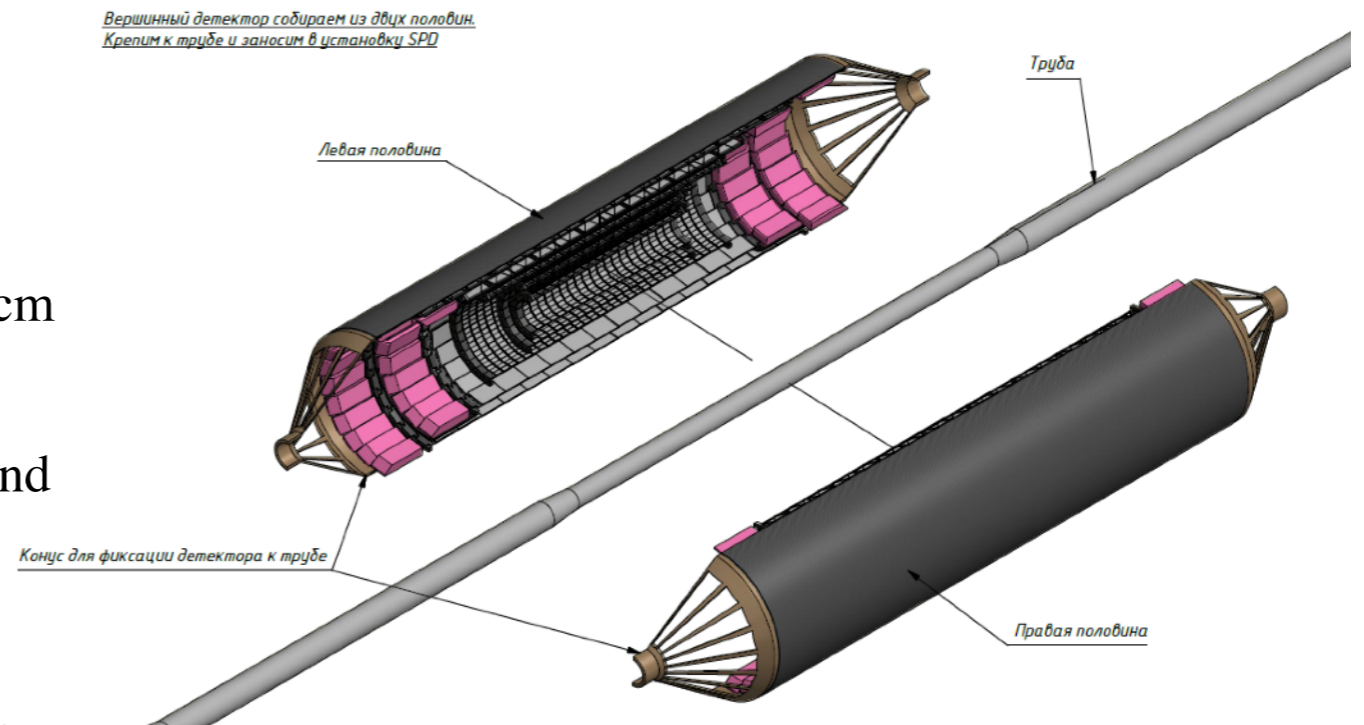
Presented on Mar 4

# Vertex Detector (VD)



- Inner tracking system of SPD: barrel + endcaps
- Reconstruction of D meson decay vertices
- 5 layers = 2 DSSD + 3 MAPS
  - Double Side Silicone Strip (DSSD), 300  $\mu\text{m}$  thickness, strip pitch 95  $\mu\text{m}$  - 281  $\mu\text{m}$
  - Monolithic Active Pixel Sensors (MAPS) designed and produced for ALICE, pixel size 29  $\mu\text{m}$   $\times$  27  $\mu\text{m}$

- Low material budget
- As close as possible to the beam pipe  $5 < R < 25$  cm
- Spatial resolution  $< 100$   $\mu\text{m}$
- Use of MAPS improves the signal-to-background ratio of D meson peak by a factor of 3



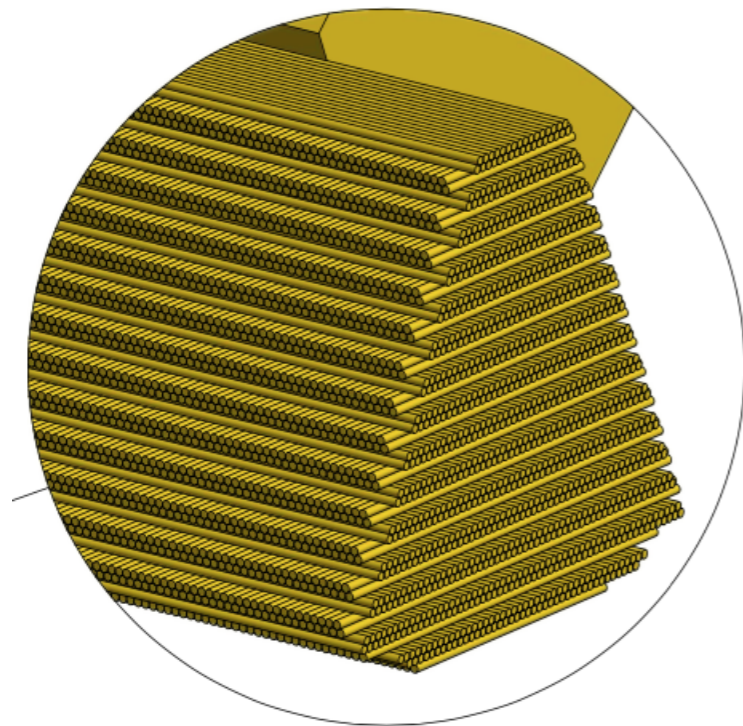


# Straw Tracker (ST)

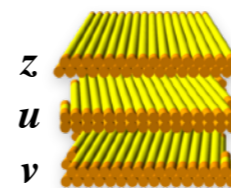
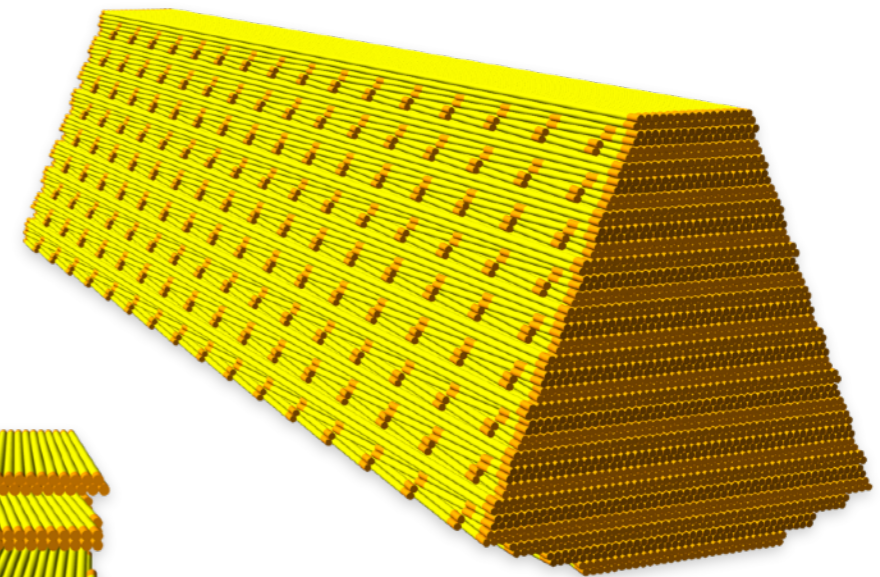
Update (May 2021)

CDR version (end of 2020)

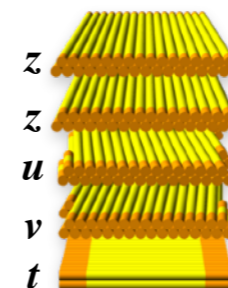
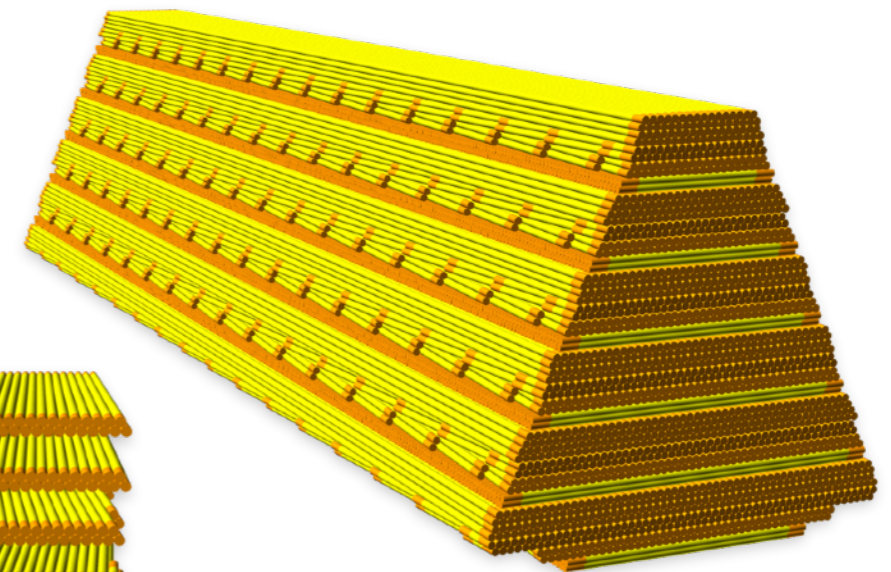
30 double  
layers of straw



Layers 10x(ZUV)



Layers 6x(ZZUVT)



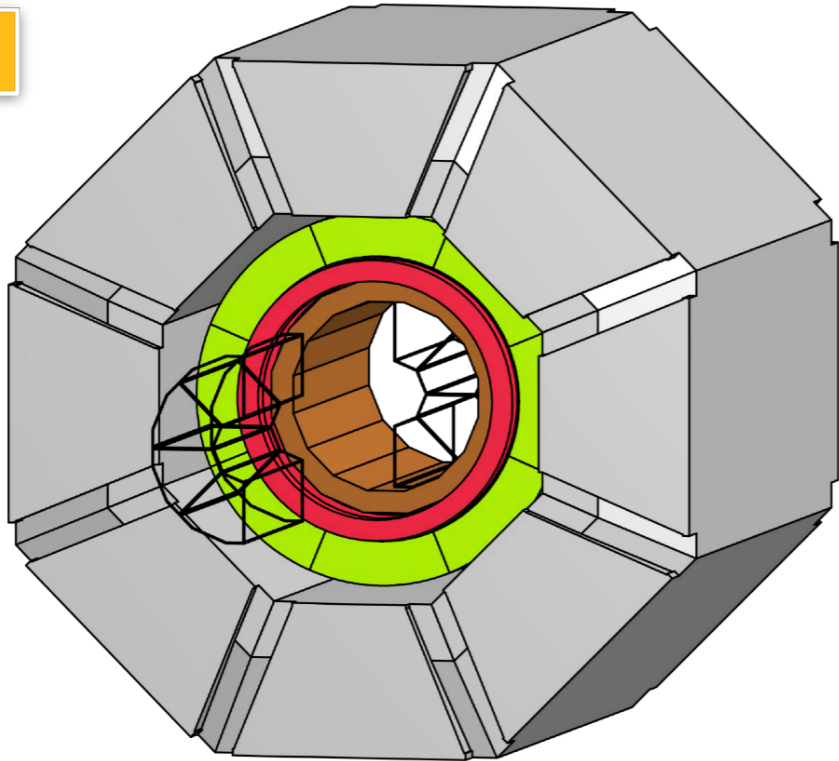
- Majority of tubes should be oriented  $\perp$  to the bending plane
- Number of channels can be reduced by a factor of 3
- Less dead space due to covers & electronics



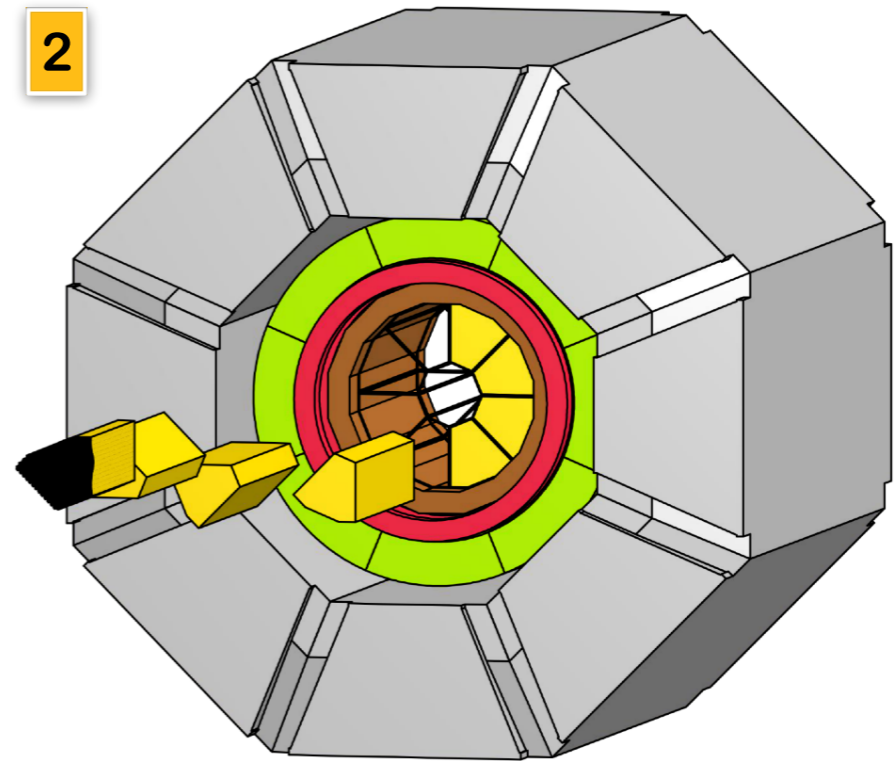
# ST assembling procedure

*all will be done by hand*

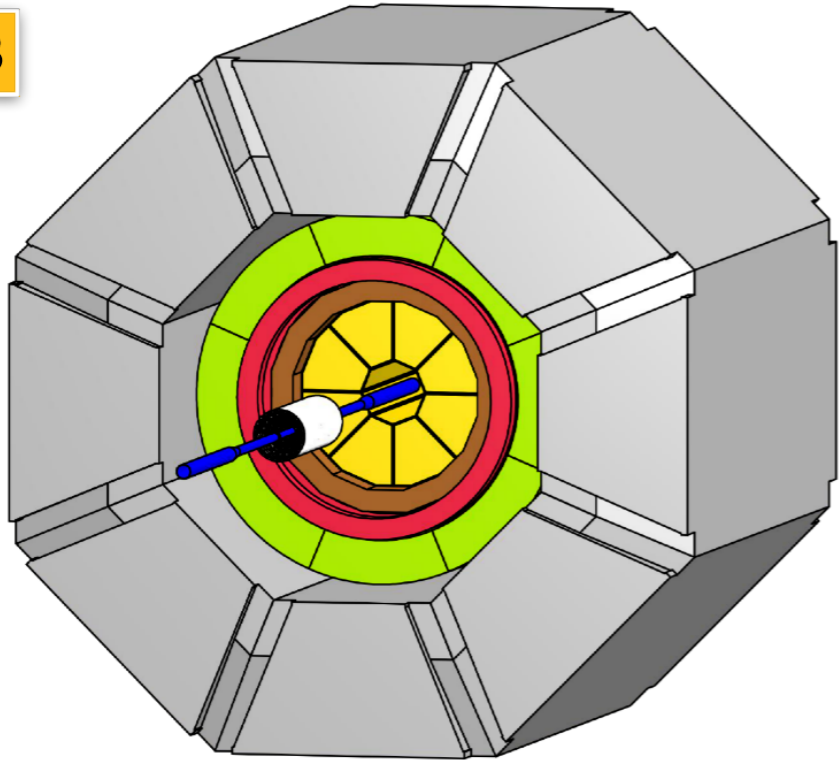
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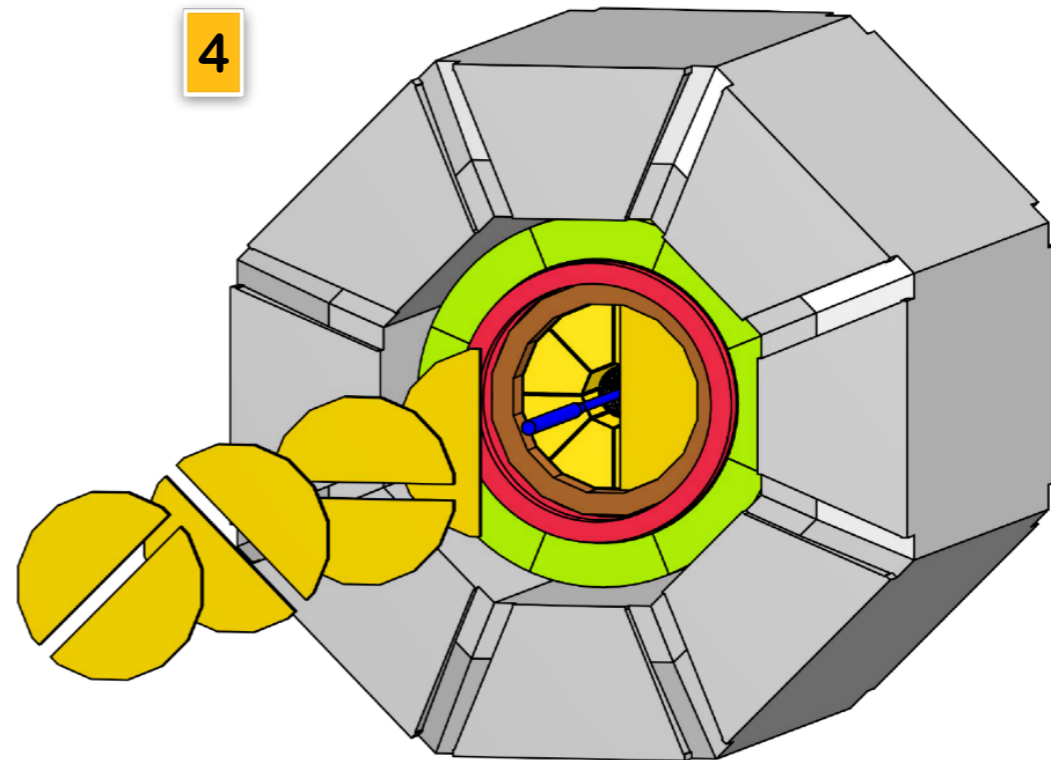
2



3

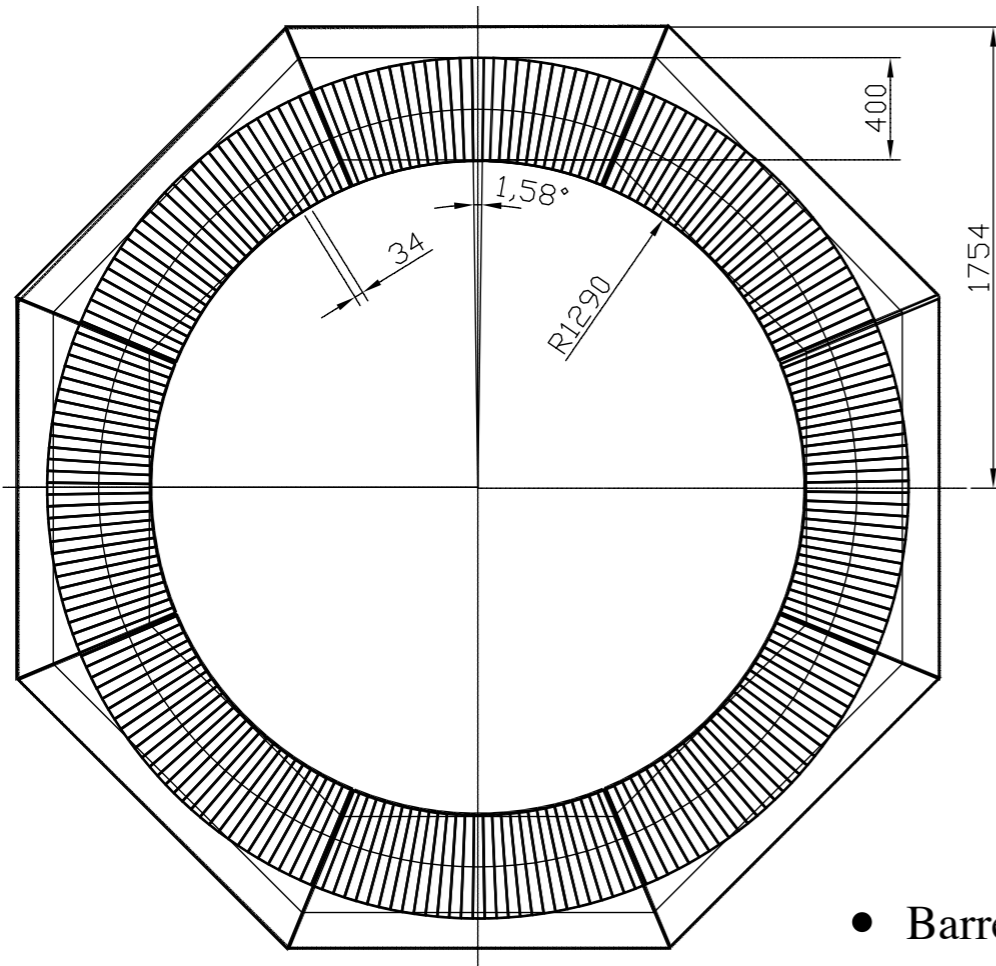


4

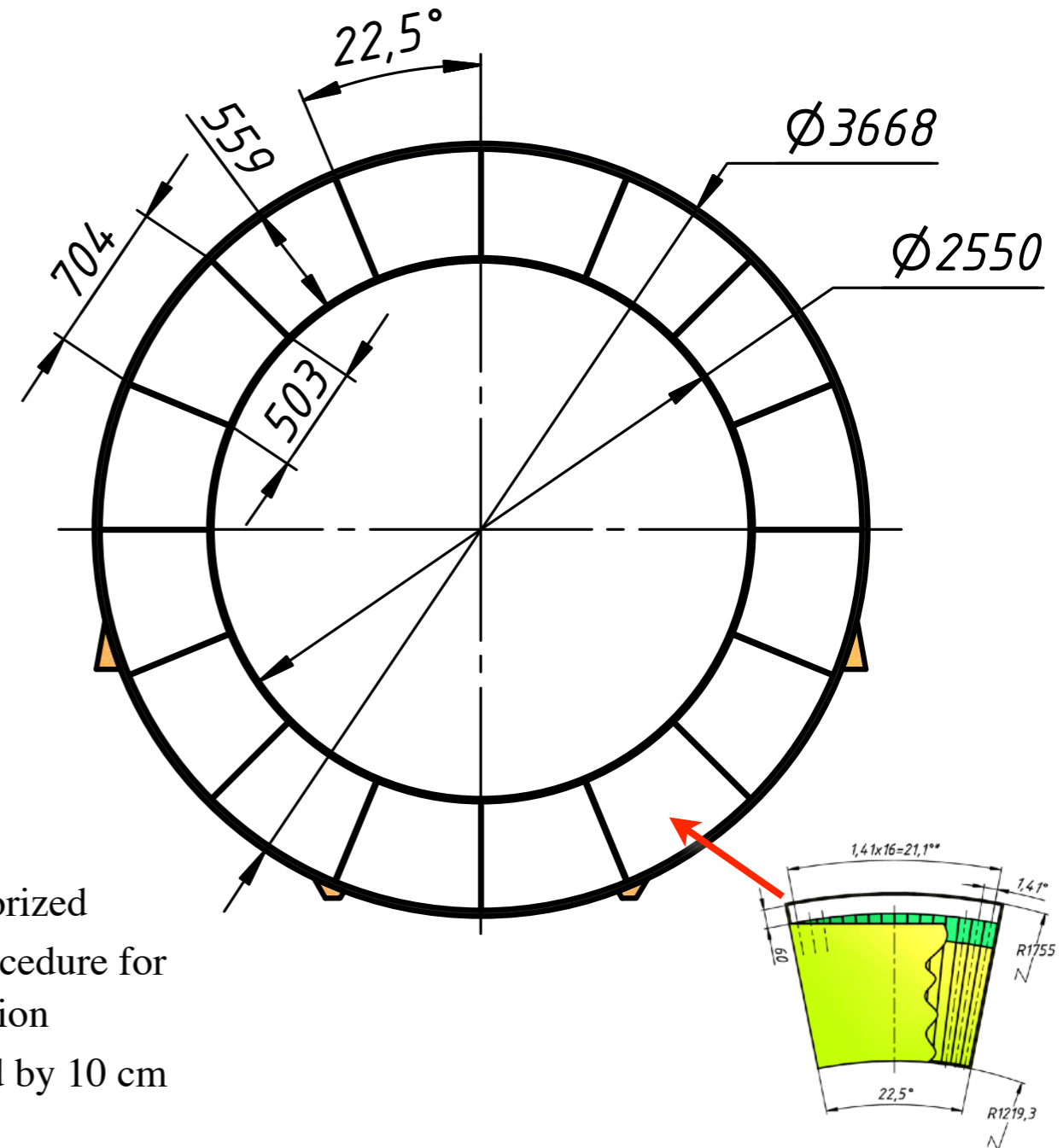


# Electromagnetic Calorimeter (ECal)

CDR version (end of 2020)



Update (May 2021)

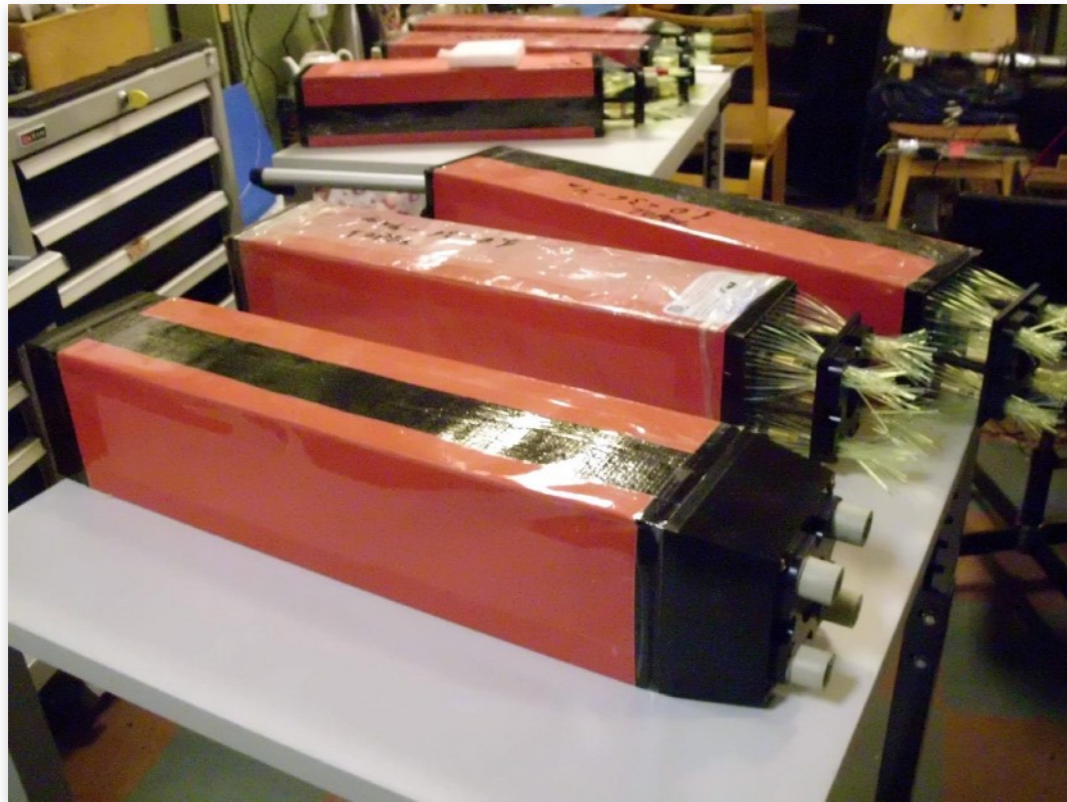


- Barrel layout is sectorized
- Follow the MPD procedure for the frame & installation
- Radial size increased by 10 cm



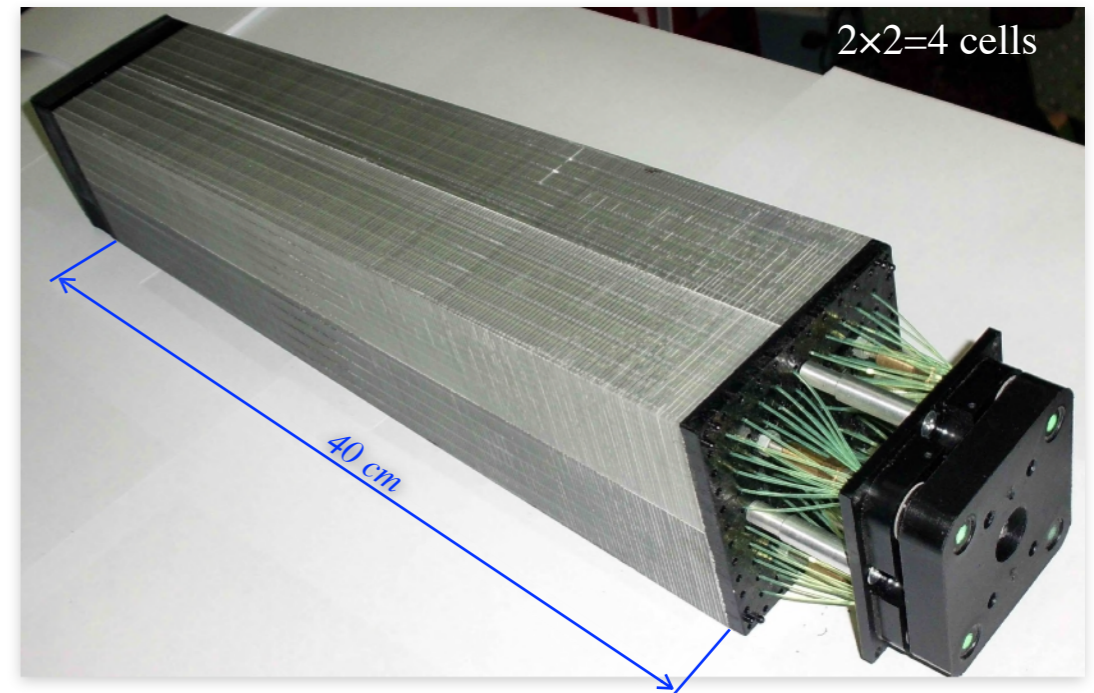
# Electromagnetic Calorimeter (ECal)

*shown on Apr 22*



- Purpose: detection of prompt photons and photons from  $\pi^0$ ,  $\eta$  and  $\chi_c$  decays
- Identification of electrons and positrons
- Number of radiation lengths  $18.6X_0$
- Total weight is  $40\text{t (barrel)} + 2 \times 14\text{t (endcap)} = 68\text{t}$
- Support structure will be made of carbon composite materials
- Total number of channels is  $\sim 30\text{k}$

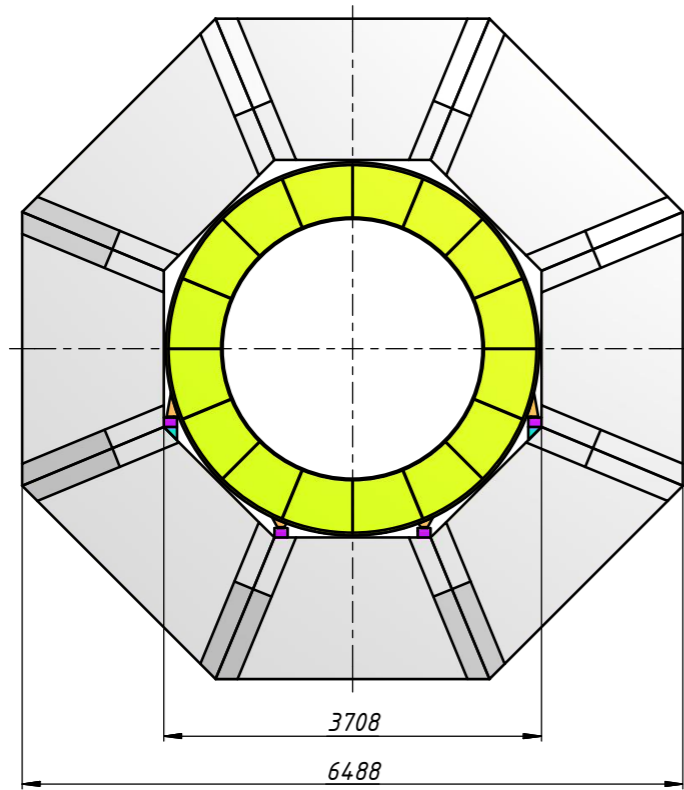
- 200 layers of lead (0.5 mm) and scintillator (1.5mm)
  - Size of one sandwich:  $4 \times 4 \times 40 \text{ cm}^3$
- Moliere radius is  $\sim 2.4 \text{ cm}$
- 36 fibers of one cell transmit light to  $6 \times 6 \text{ mm}^2$  SiPM
- Energy resolution is  $\sim 5\% / \sqrt{E}$
- Low energy threshold is  $\sim 50 \text{ MeV}$
- Time resolution is  $\sim 0.5 \text{ ns}$



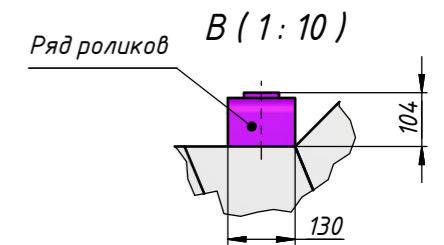
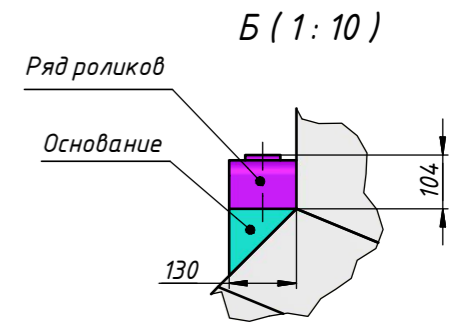
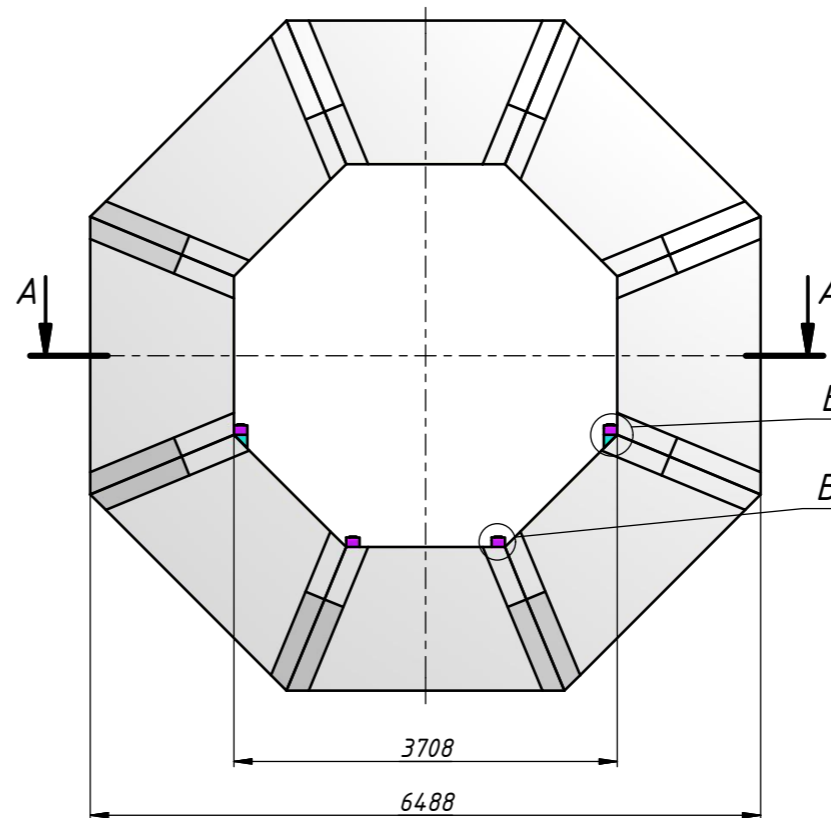


# Electromagnetic Calorimeter (ECal)

Калориметр установлен (1:50)

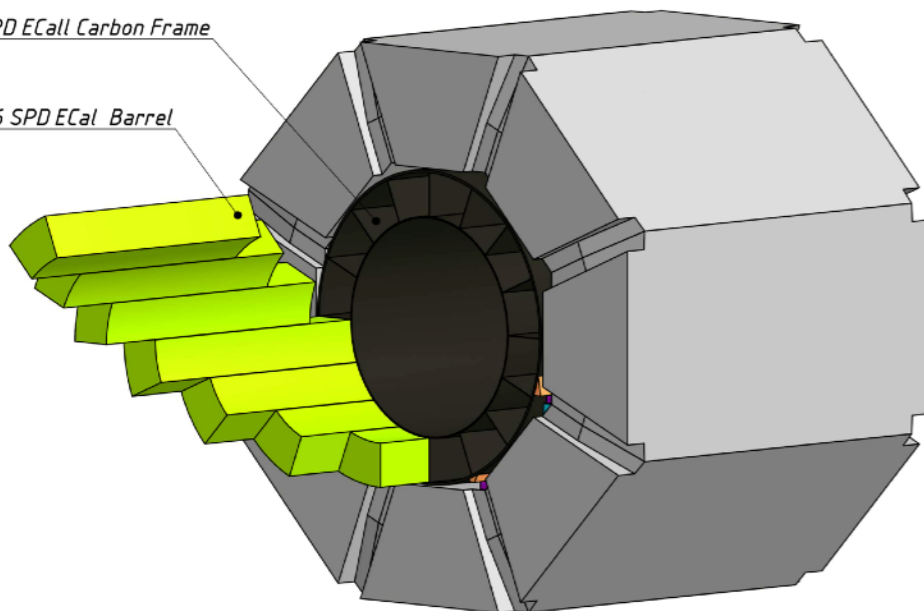


RS Бочка (1:50)

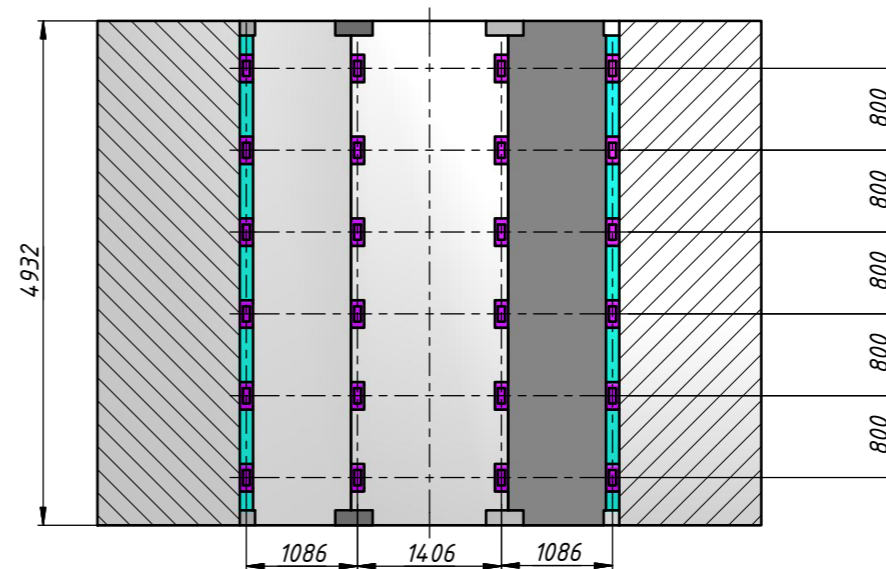


SPD ECal Carbon Frame

1/16 SPD ECal Barrel



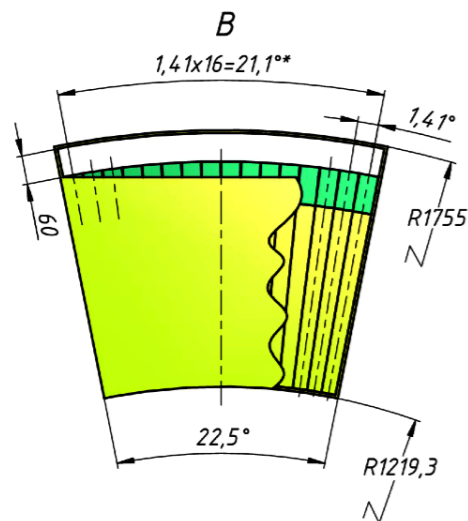
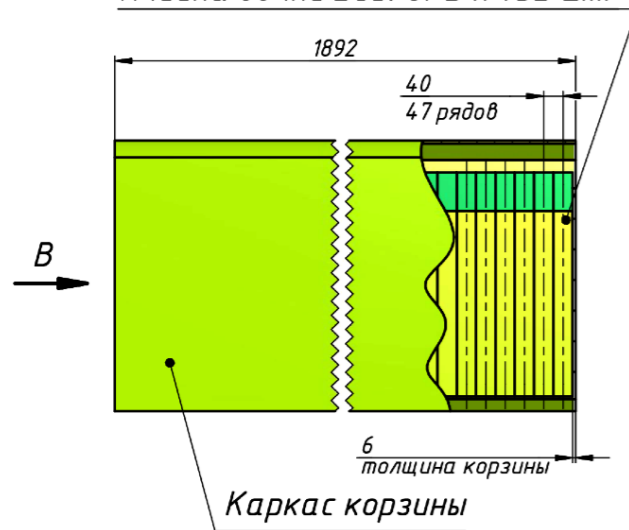
A-A (1:50)



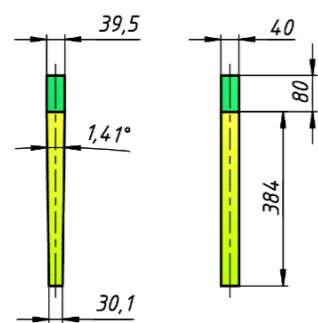
# Electromagnetic Calorimeter (ECal)

Корзина бочки ECal SPD

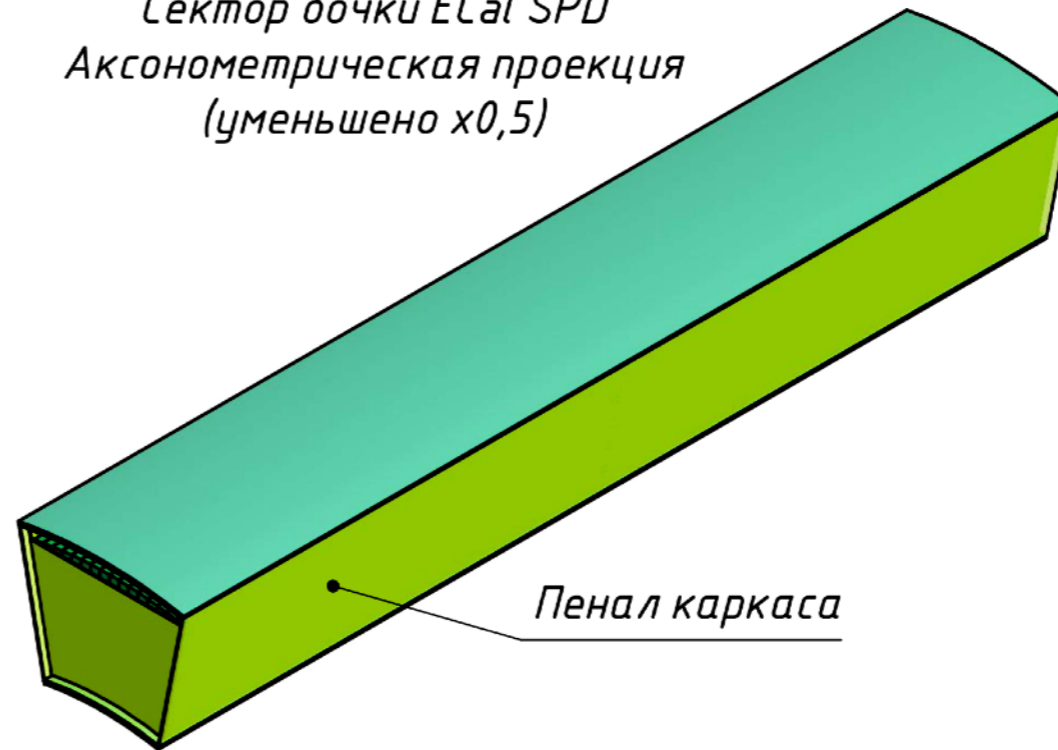
Ячейка бочки ECal SPD x 752 шт.



Ячейка бочки ECal SPD

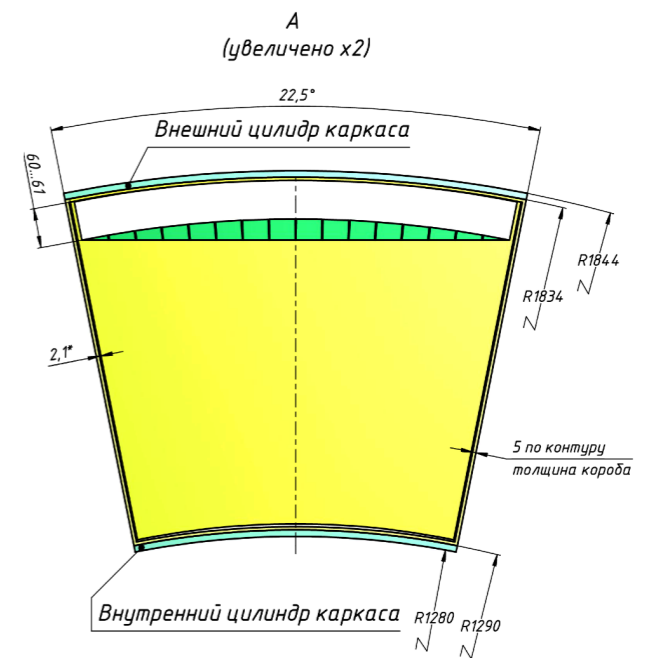
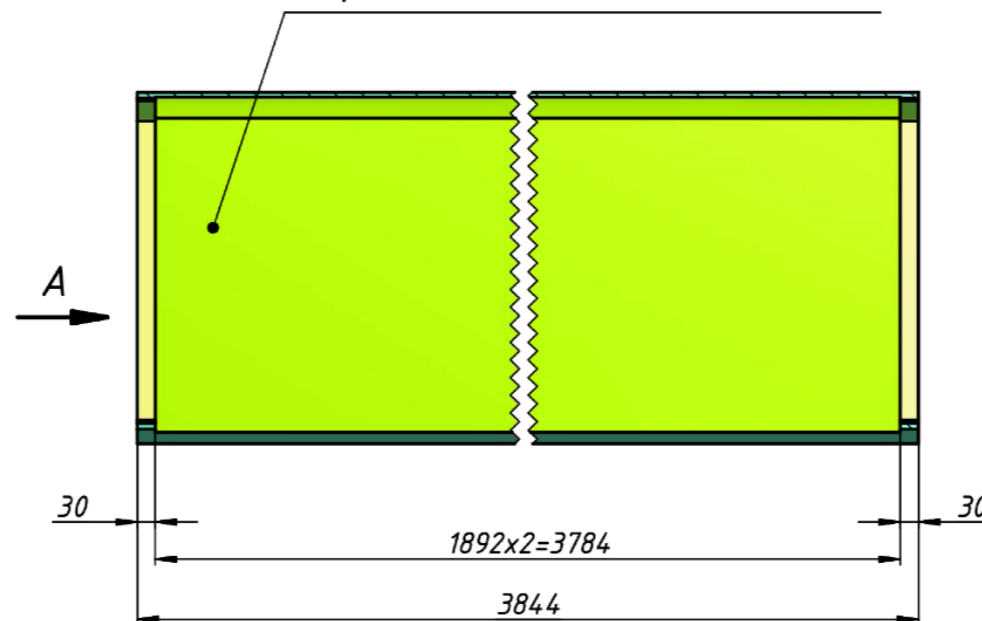


Сектор бочки ECal SPD  
Аксонетрическая проекция  
(уменьшено x0,5)



Сектор бочки ECal SPD

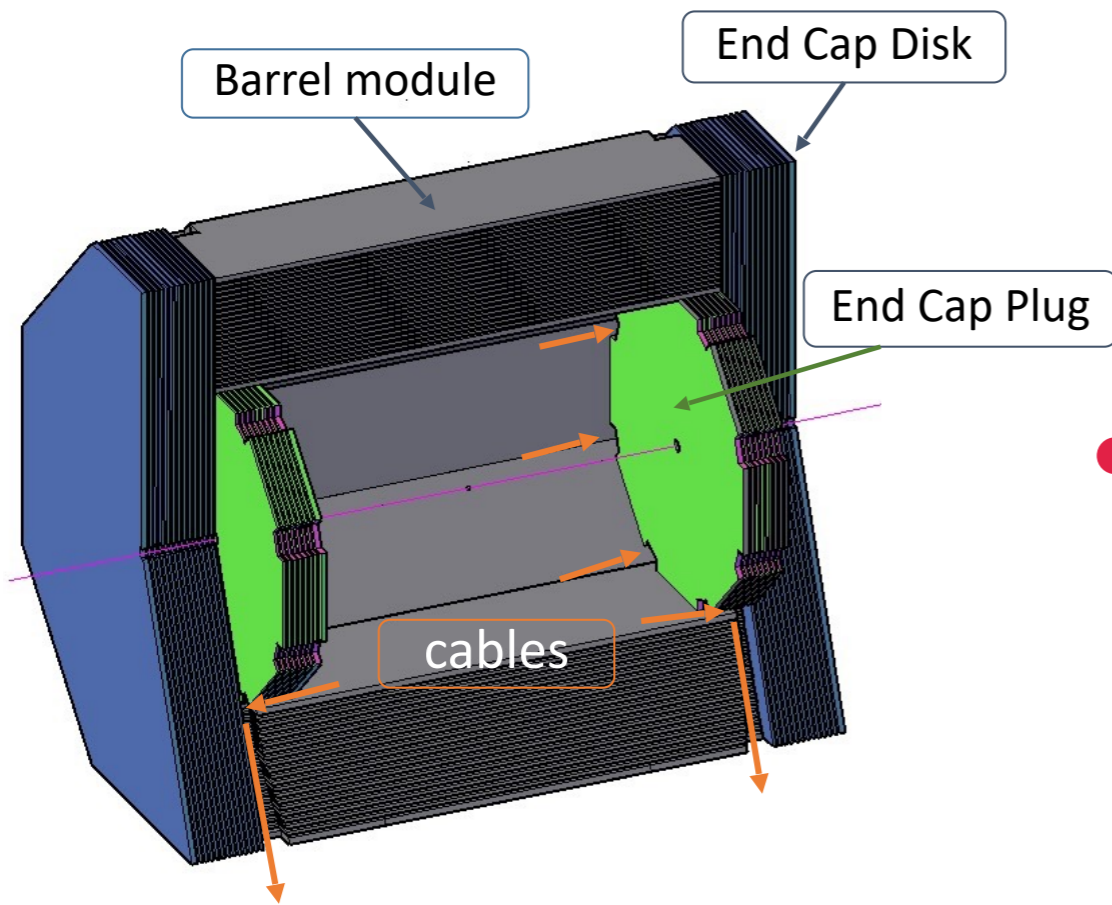
Корзина бочки ECal SPD x 2 шт.



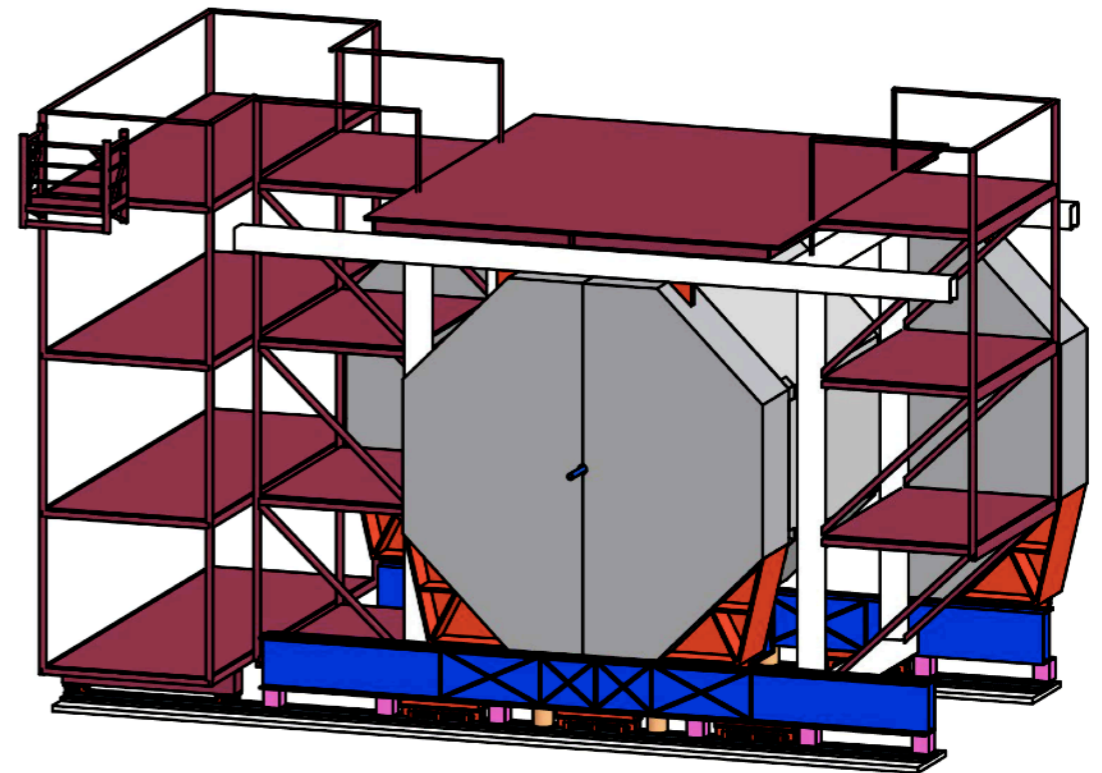
1. \*Размеры для справок.

# Range System (RS)

CDR version (end of 2020)



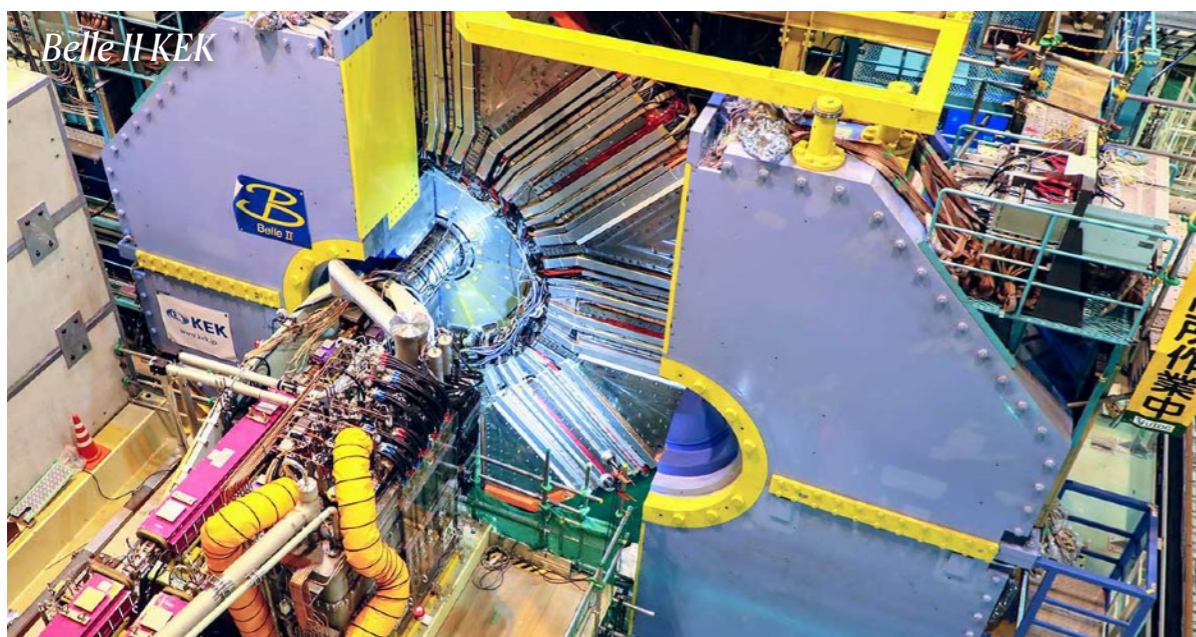
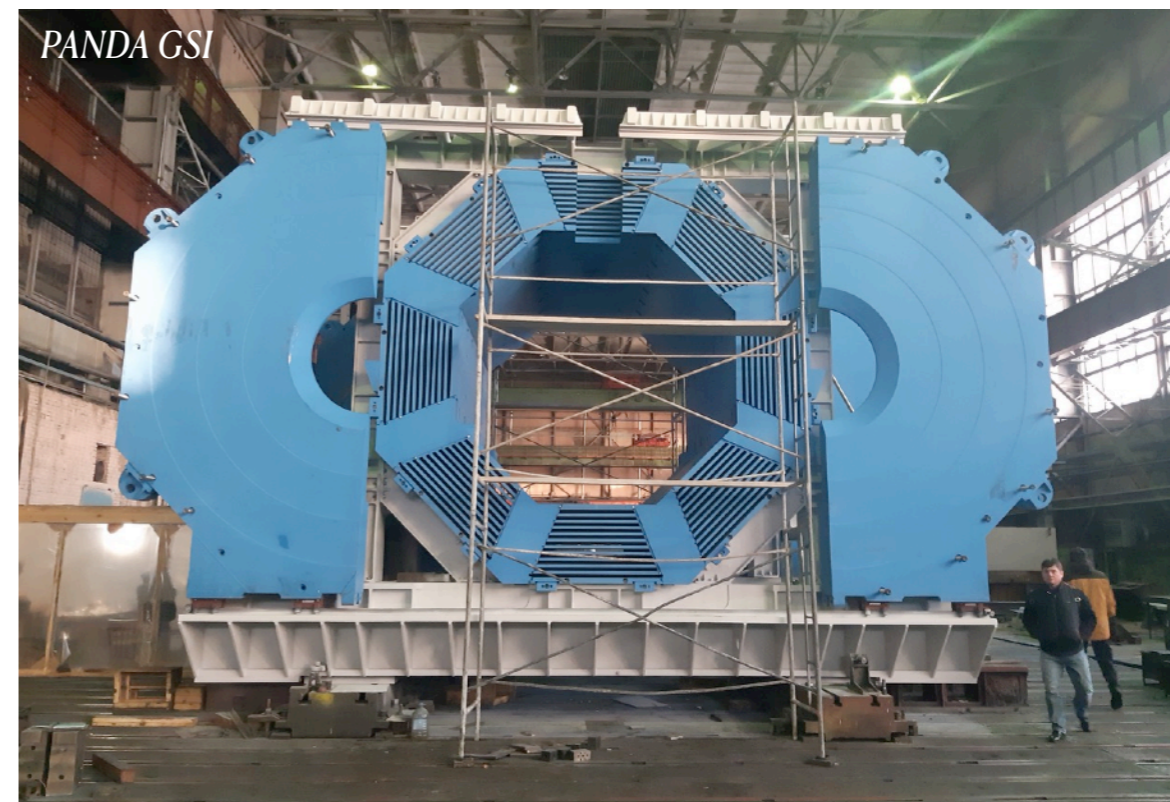
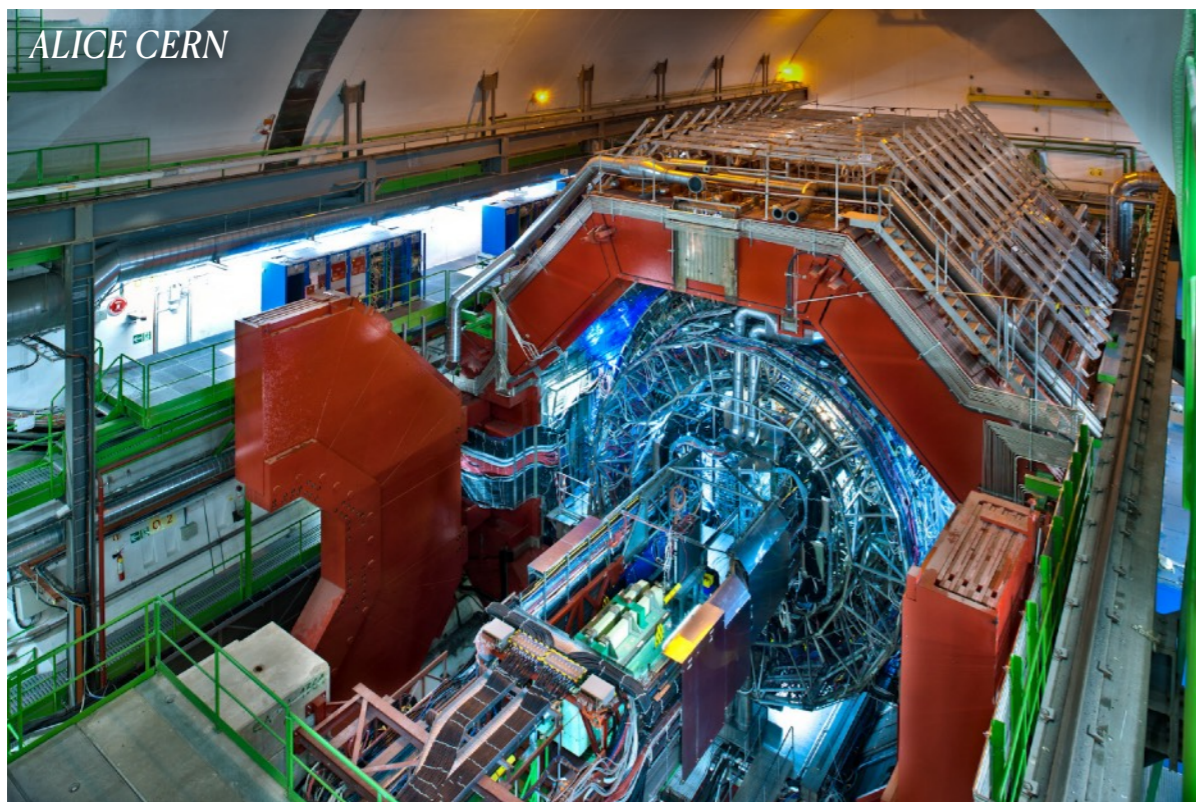
Update (May 2021)



- End-cap disk&plug is replaced with sliding halves
- Radial size increased by 10 cm



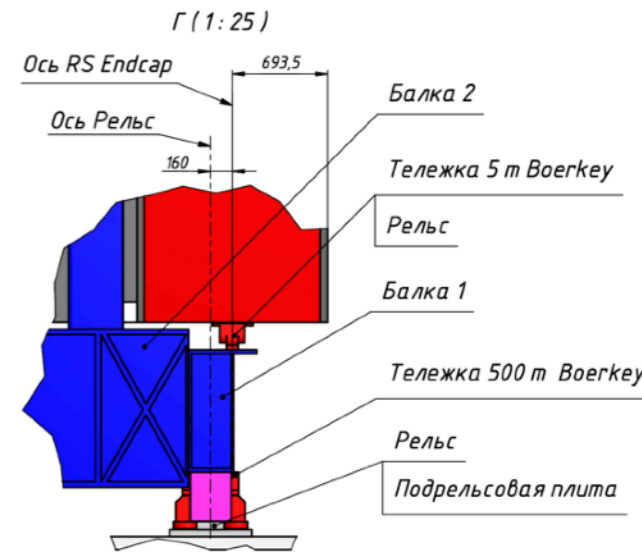
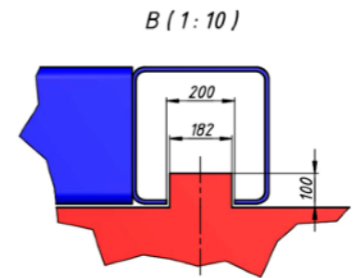
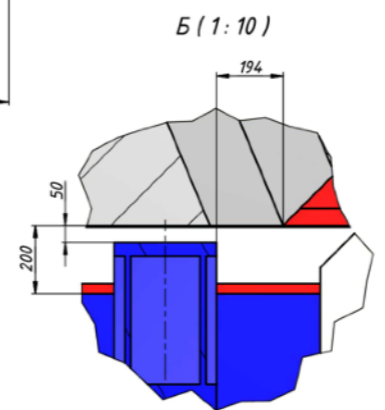
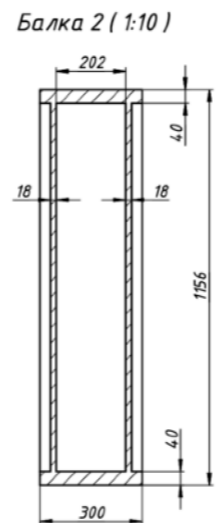
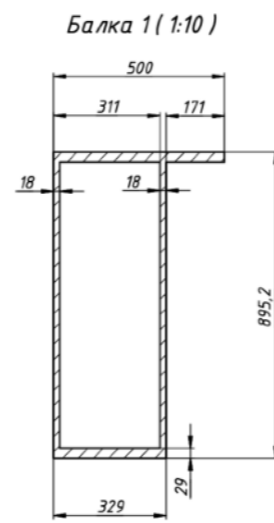
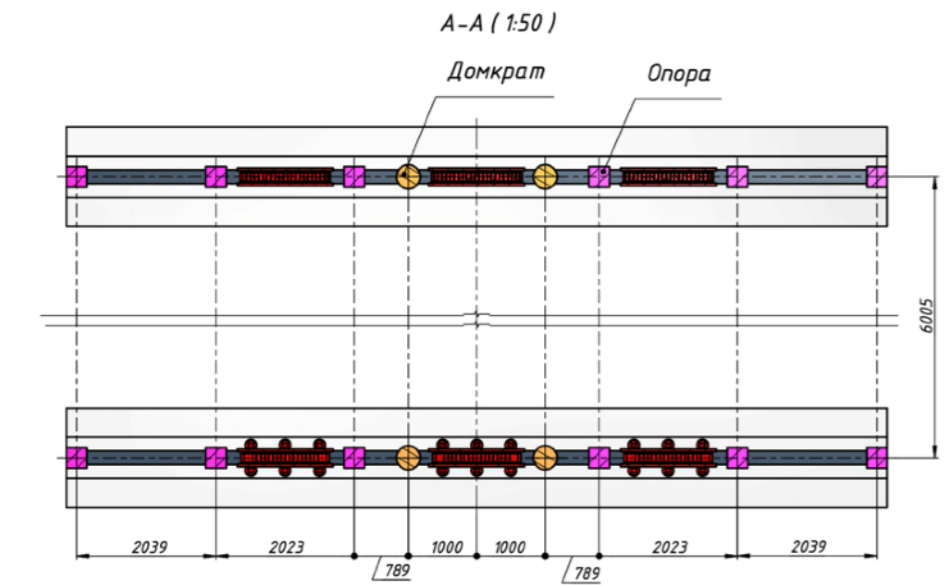
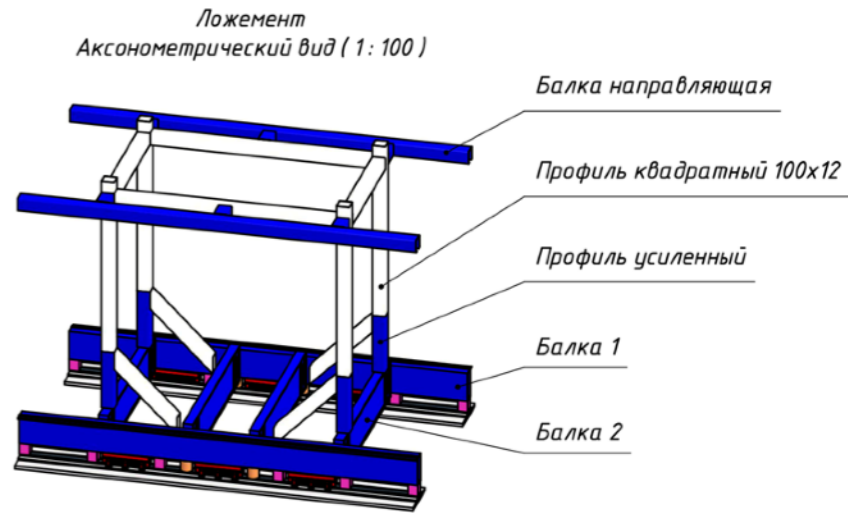
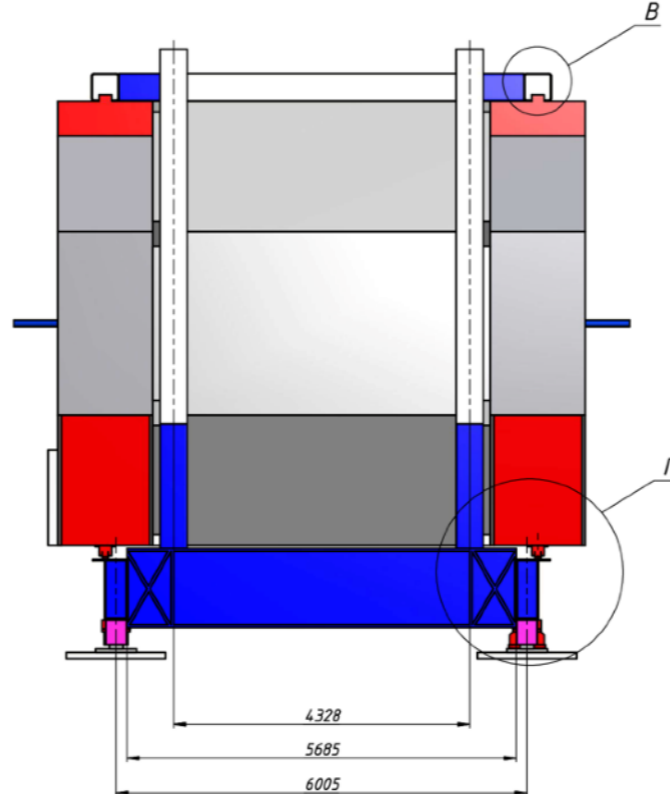
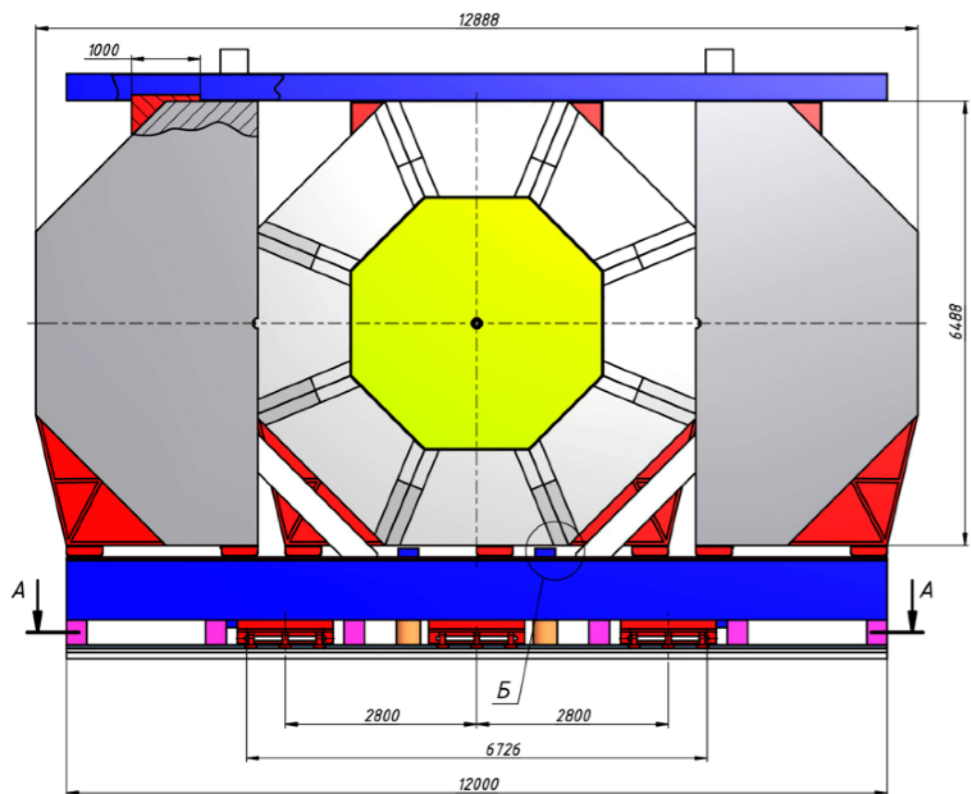
# Motivation for the RS end-cap update



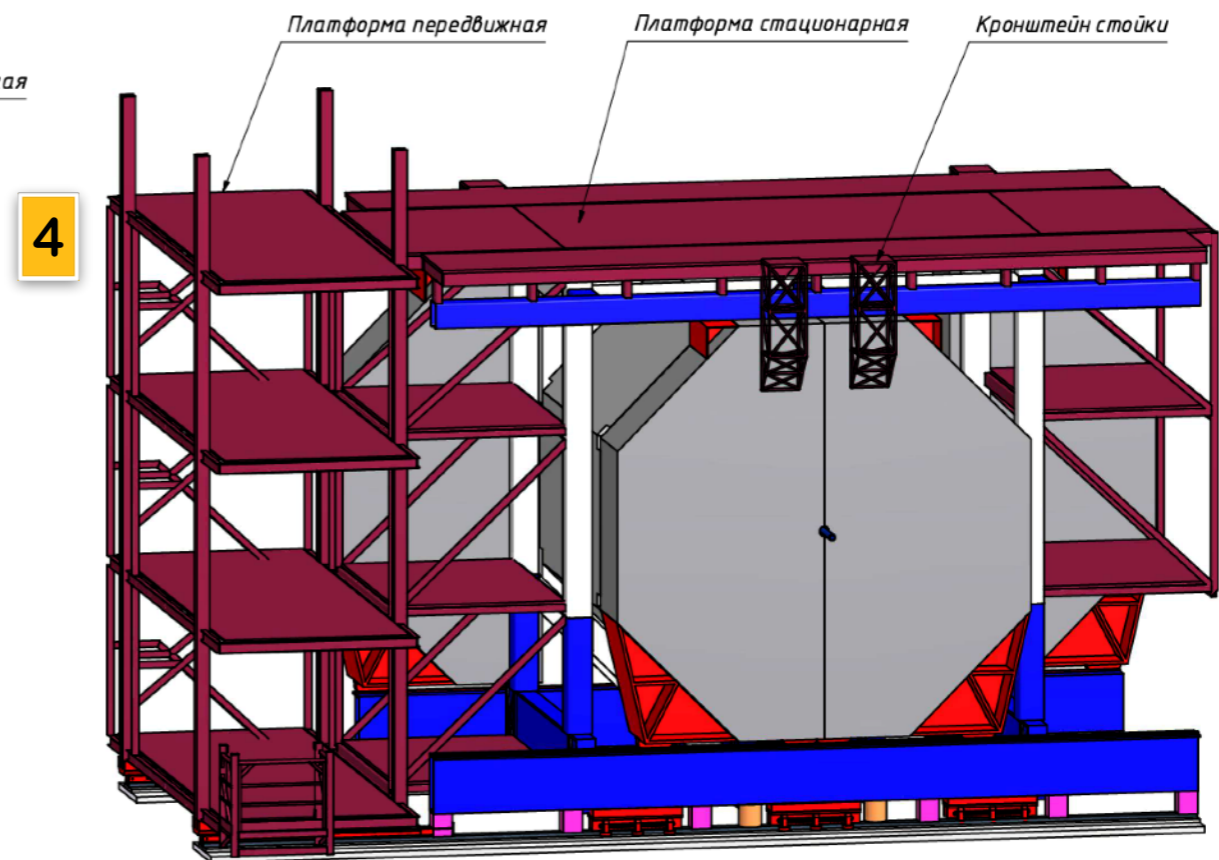
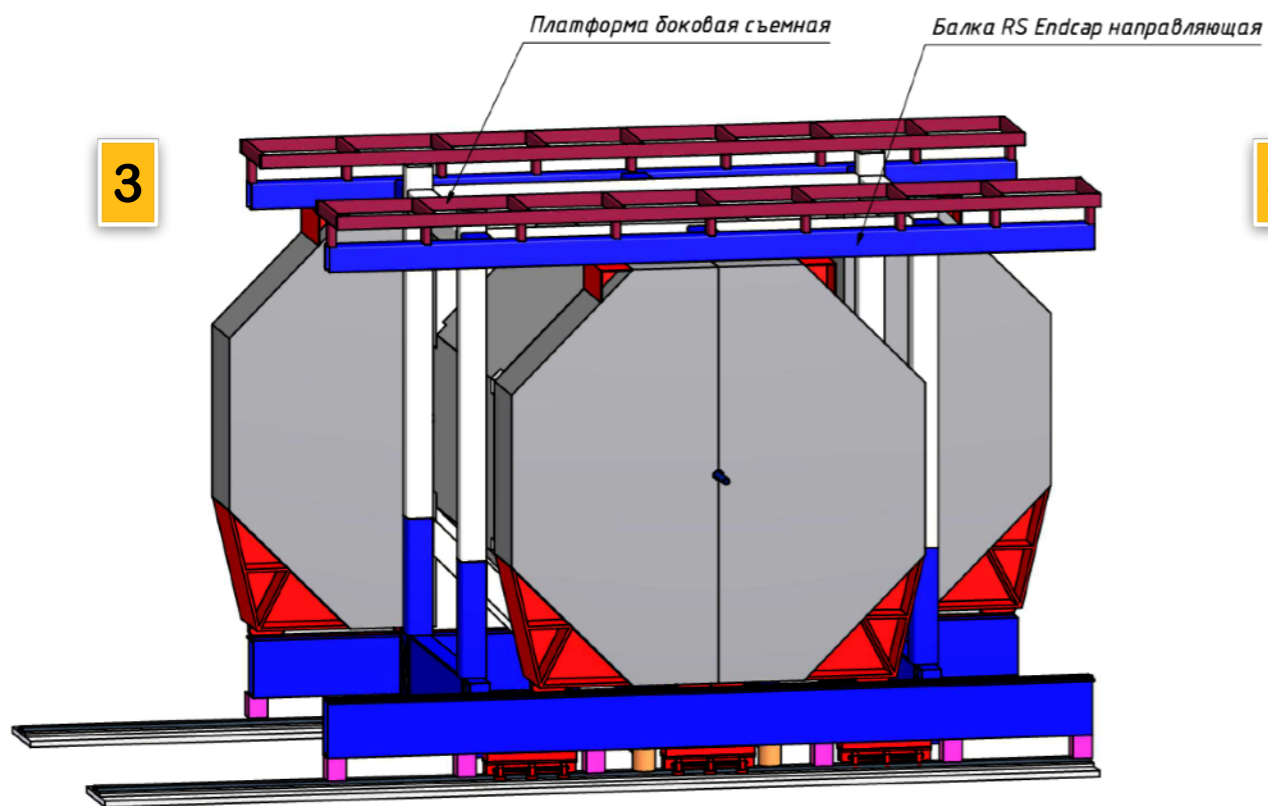
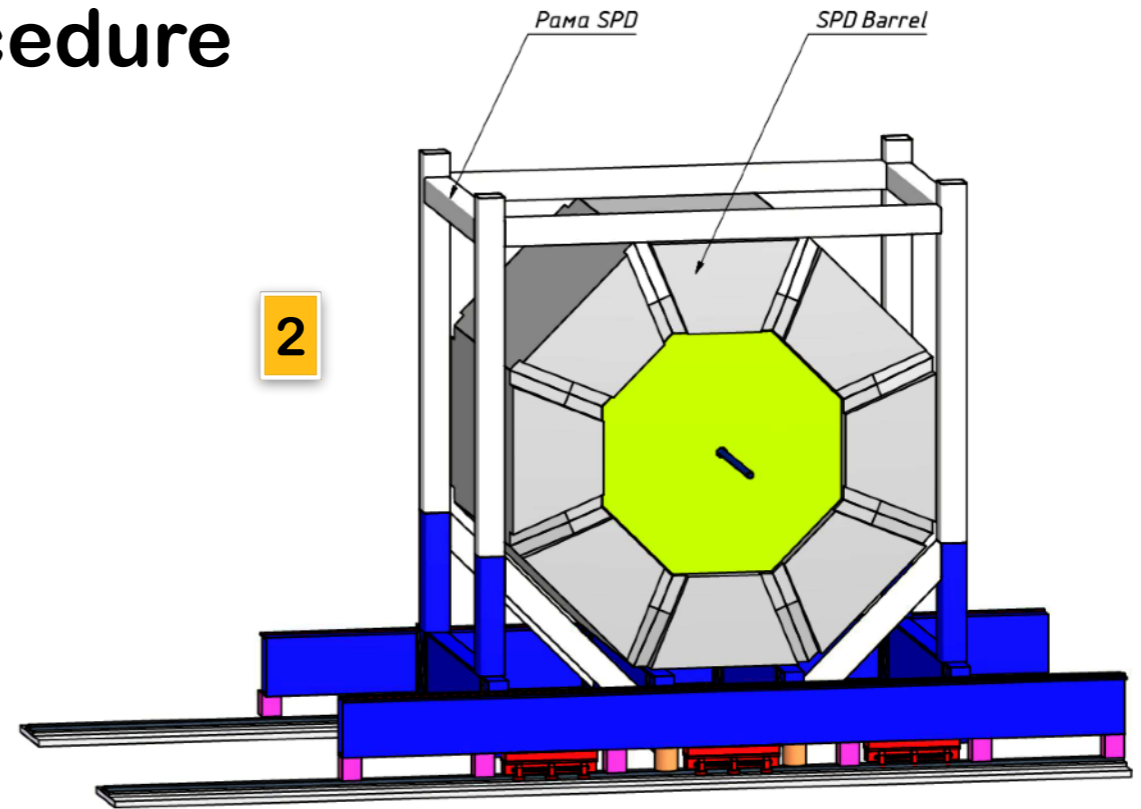
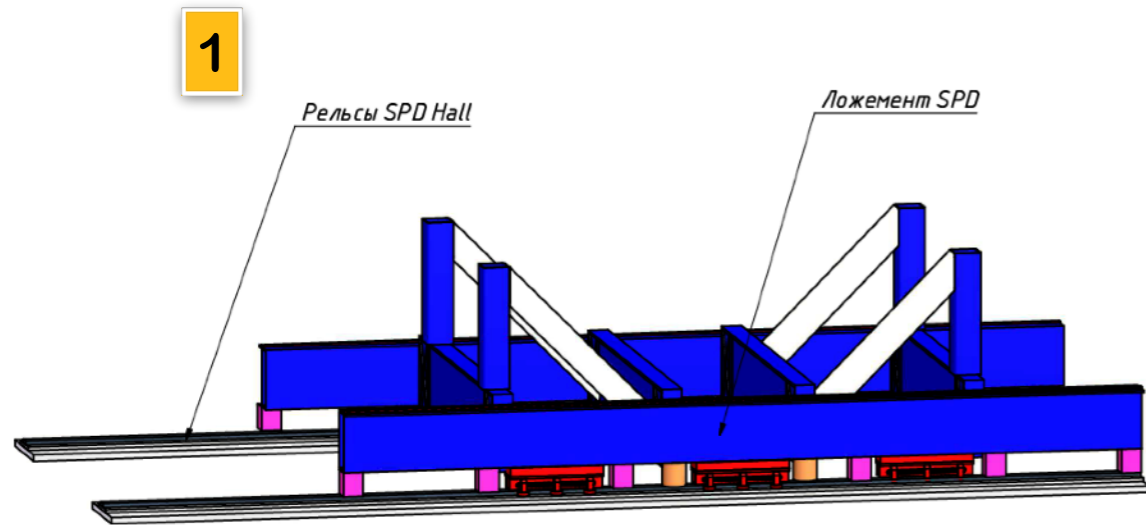
- Sliding end-cap halves are more convenient for long-term use
  - faster and safer to open
  - no need to disconnect cables



# RS + Lodgement



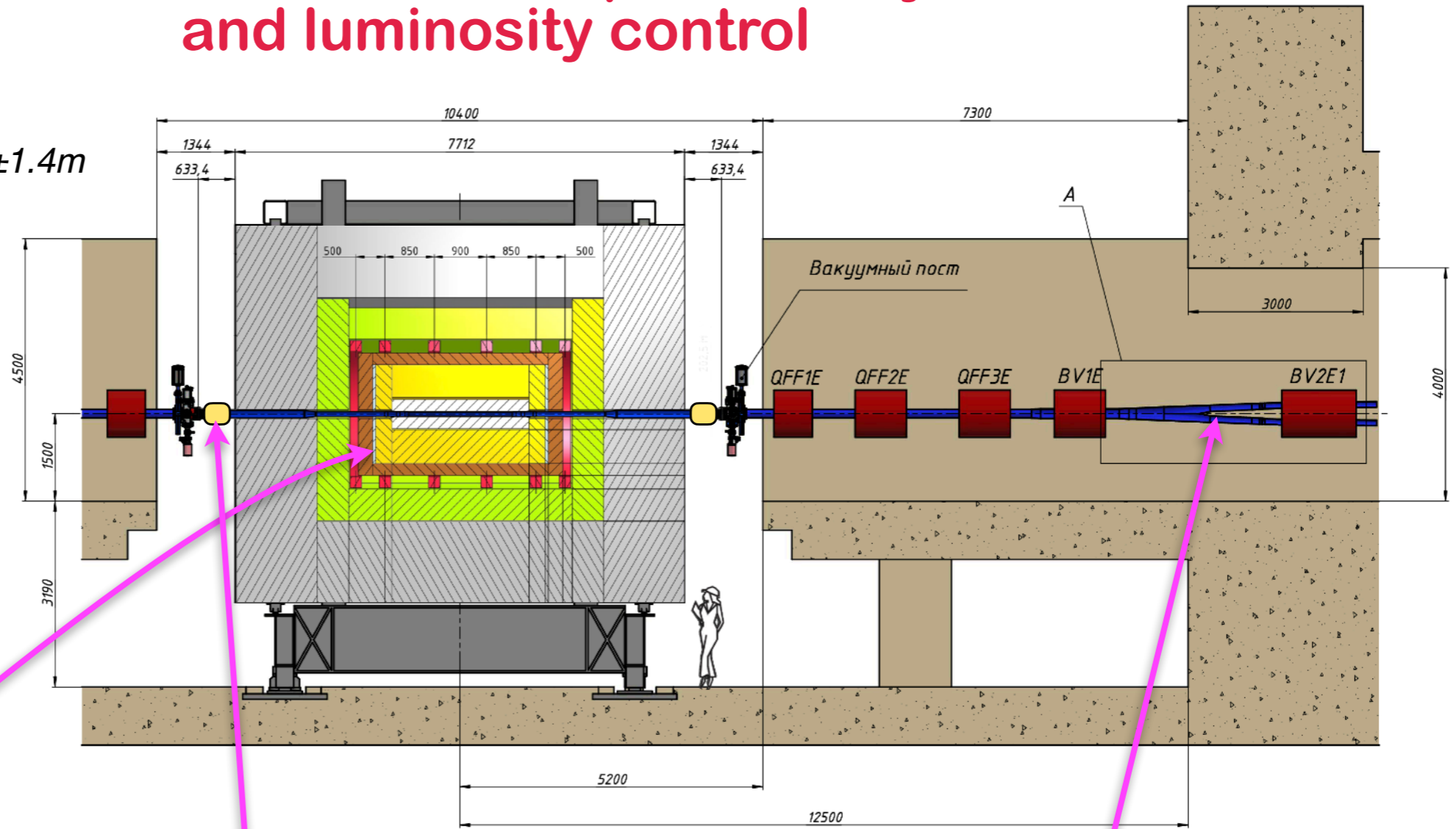
# RS assembling procedure



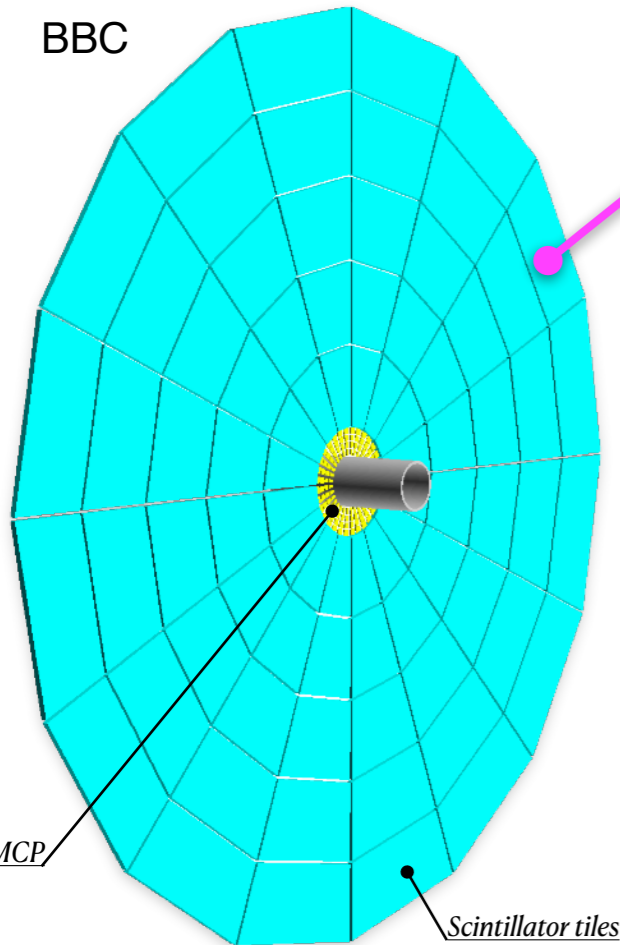


# Detectors for local polarimetry and luminosity control

- BBC (MCP+SciTil) at  $z=\pm 1.4m$
- MCP at  $z=\pm 3.9m$
- ZDC at  $z=\pm 12.9m$

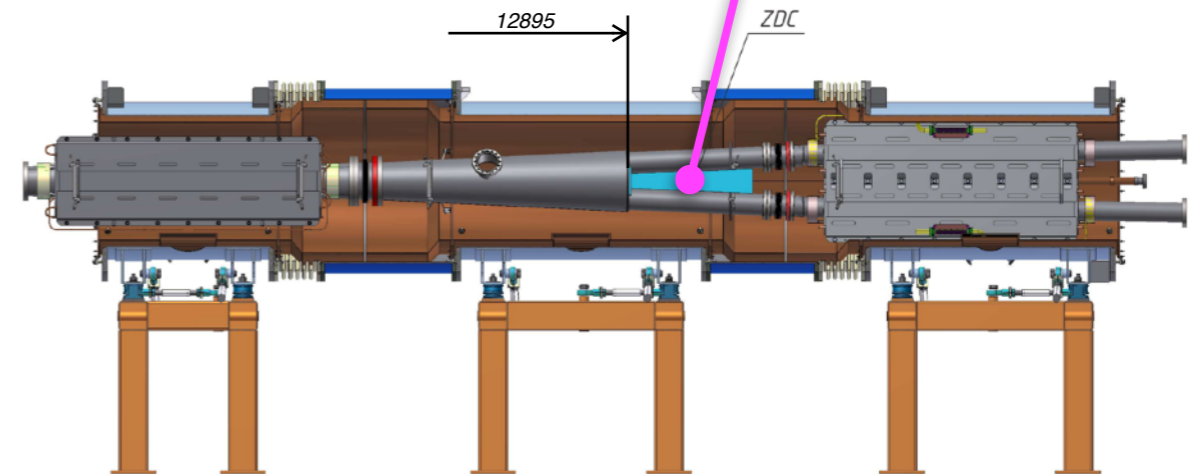
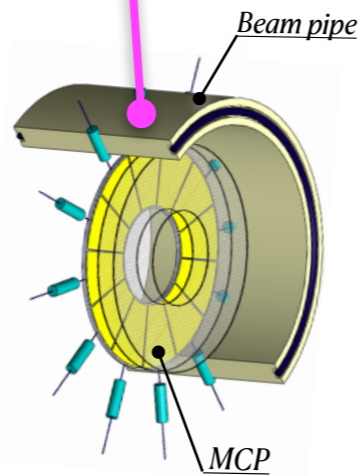


BBC



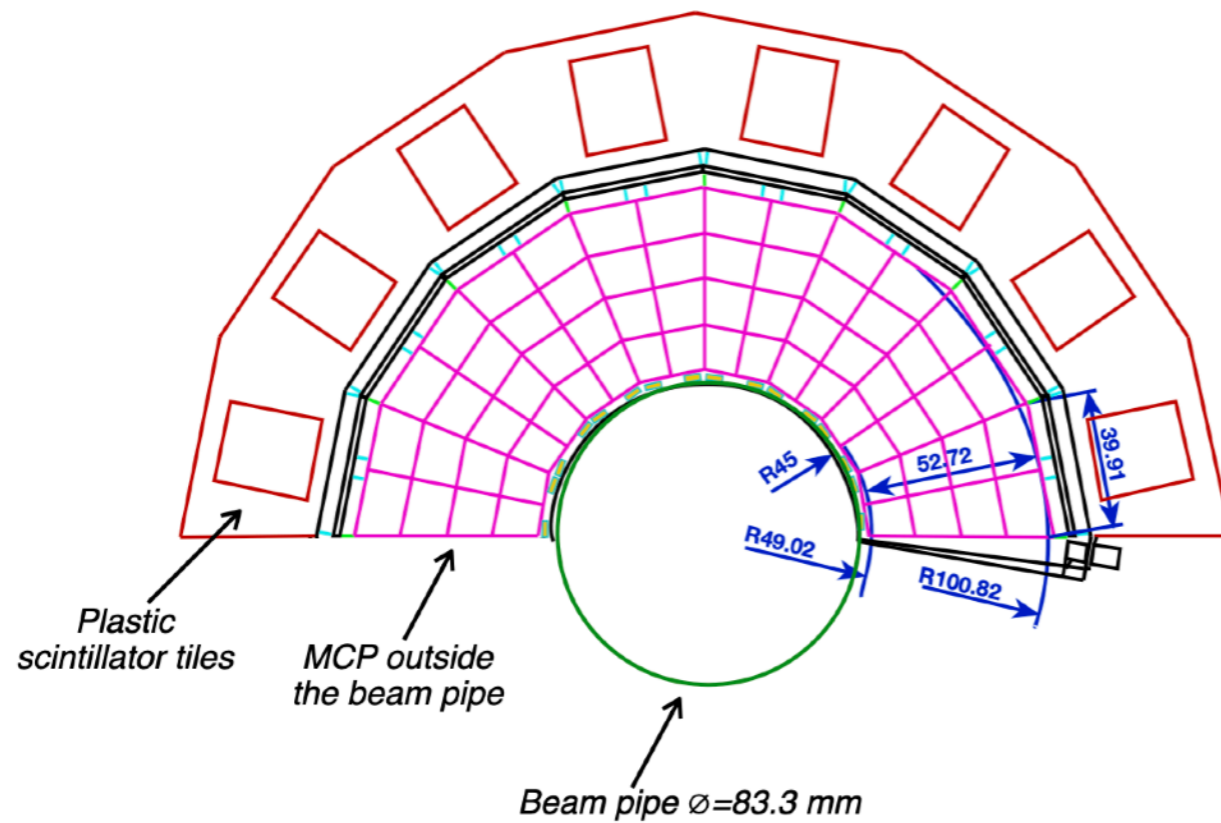
MCP

Scintillator tiles

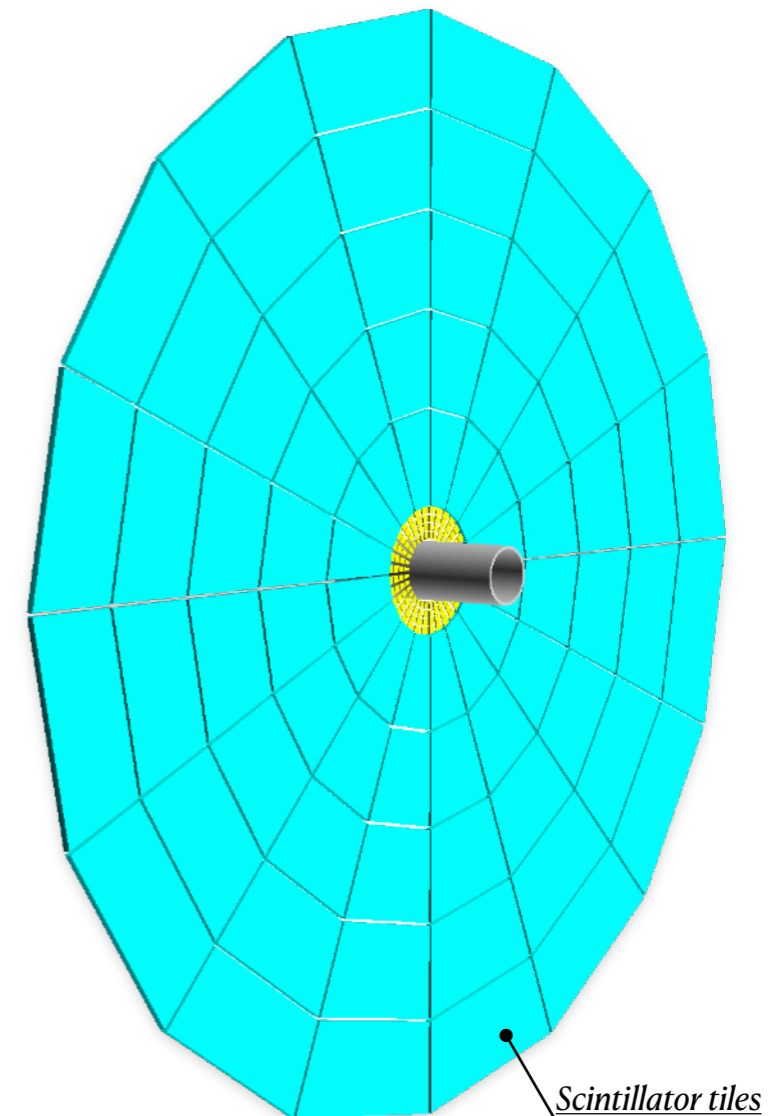
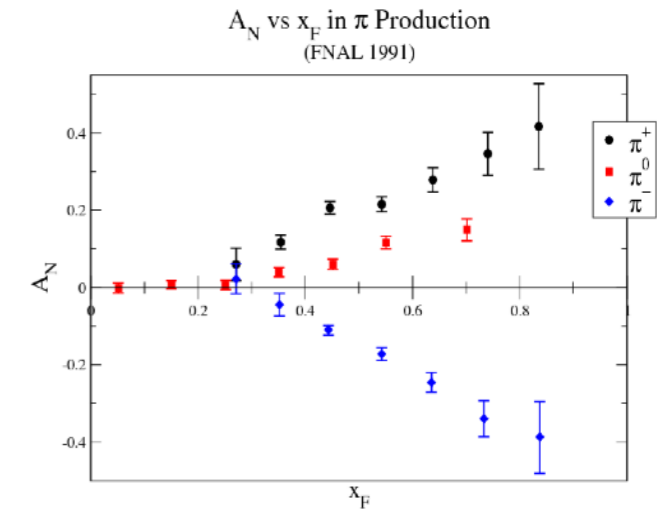


# Beam Beam Counter (BBC)

BBC at  $z = \pm 1.4$  m (CDR version)

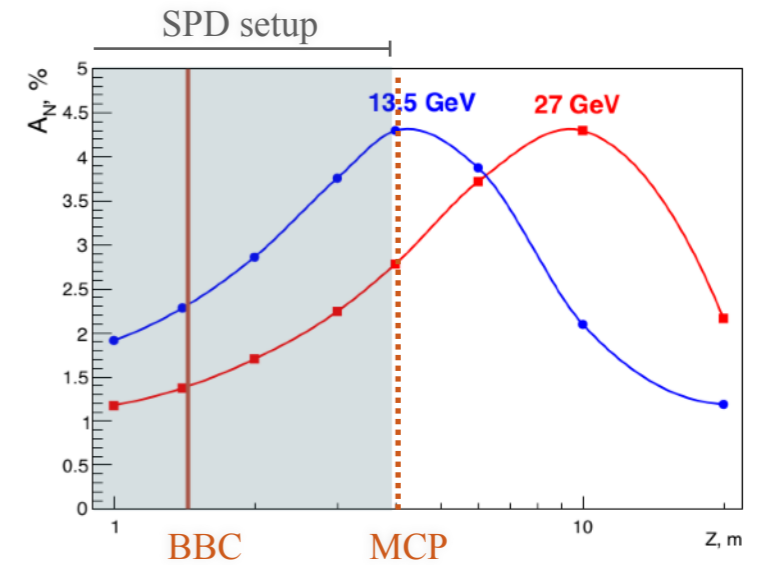


- BBC consists of inner and outer parts
  - *Inner part*: Micro-Channel Plates (MCP) located outside the beam pipe in its own vacuum volume
  - *Outer part*: plastic scintillator tiles with SiPM readout

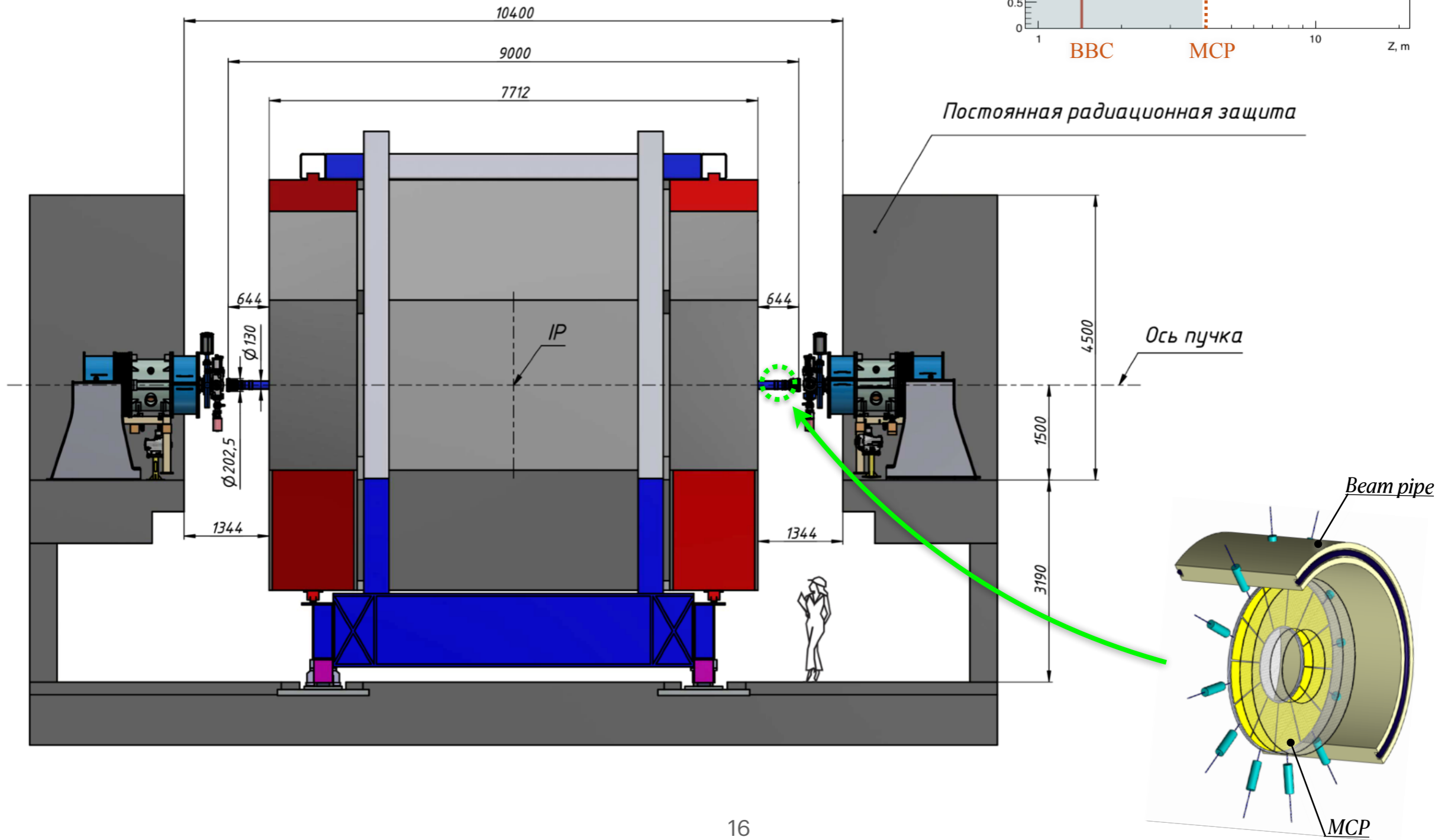


# Two MCP stations inside the beam pipe

- Can be placed in a separate segment of the beam-pipe attached to the accelerator pipe
- Can be used to study elastic scattering (see talk of A.Guskov on Mar 3)



Guskov,  
Mar 3





## Changes wrt CDR to be released on TB

- *Vertex Detector*: Drawings with 3MAPS+2DSSD
- *Straw Tracker*: Orientation of tubes in barrel
- *ECal*: Sectorized power frame + assembling
- *Range System*: New structure of endcaps + assembling
- *Lodgement+platforms*: All is new
- *Polarimetry*: Two new MCP stations