

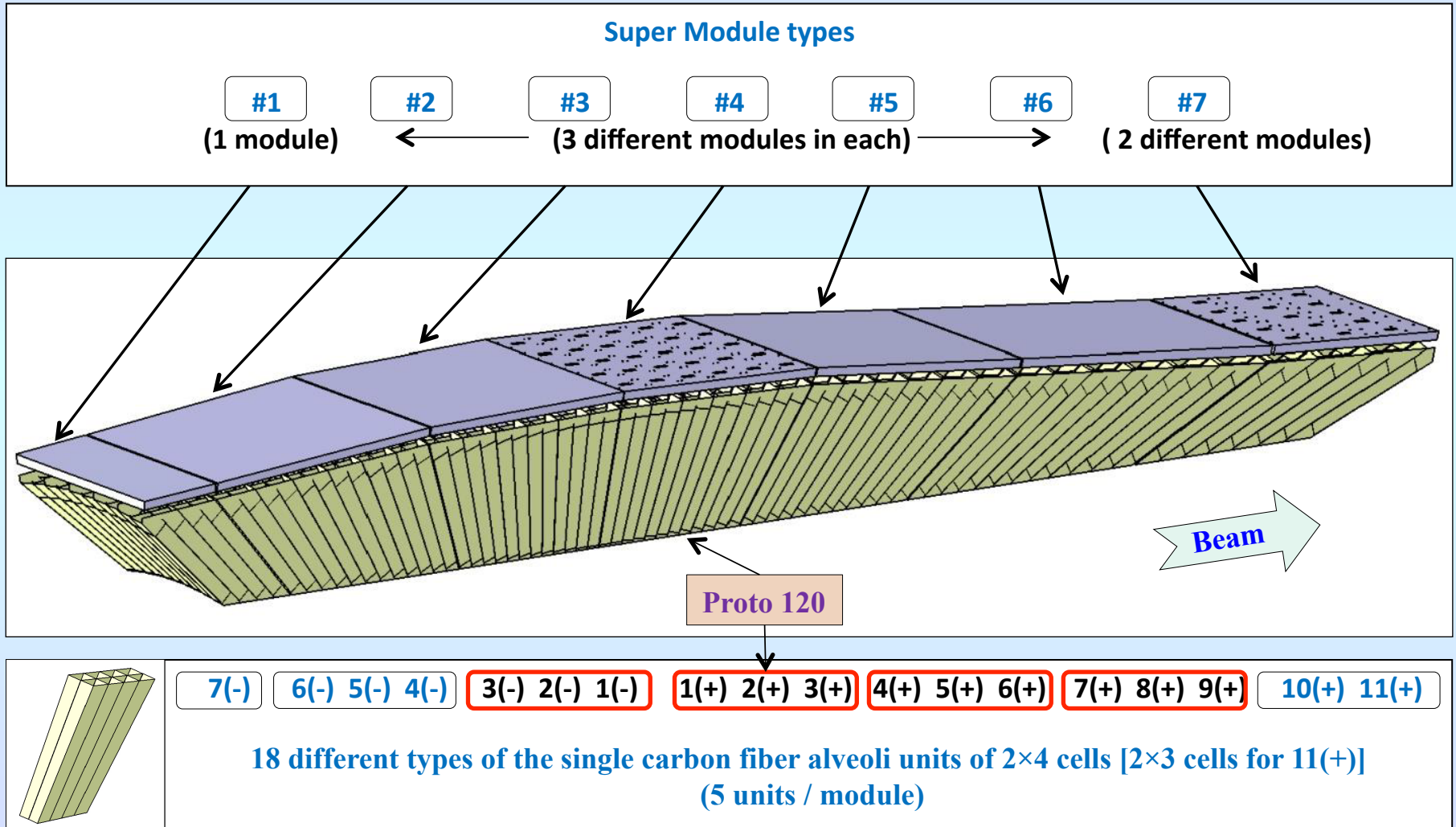
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# Status Report on Barrel Mechanics

*Andrey Ryazantsev*

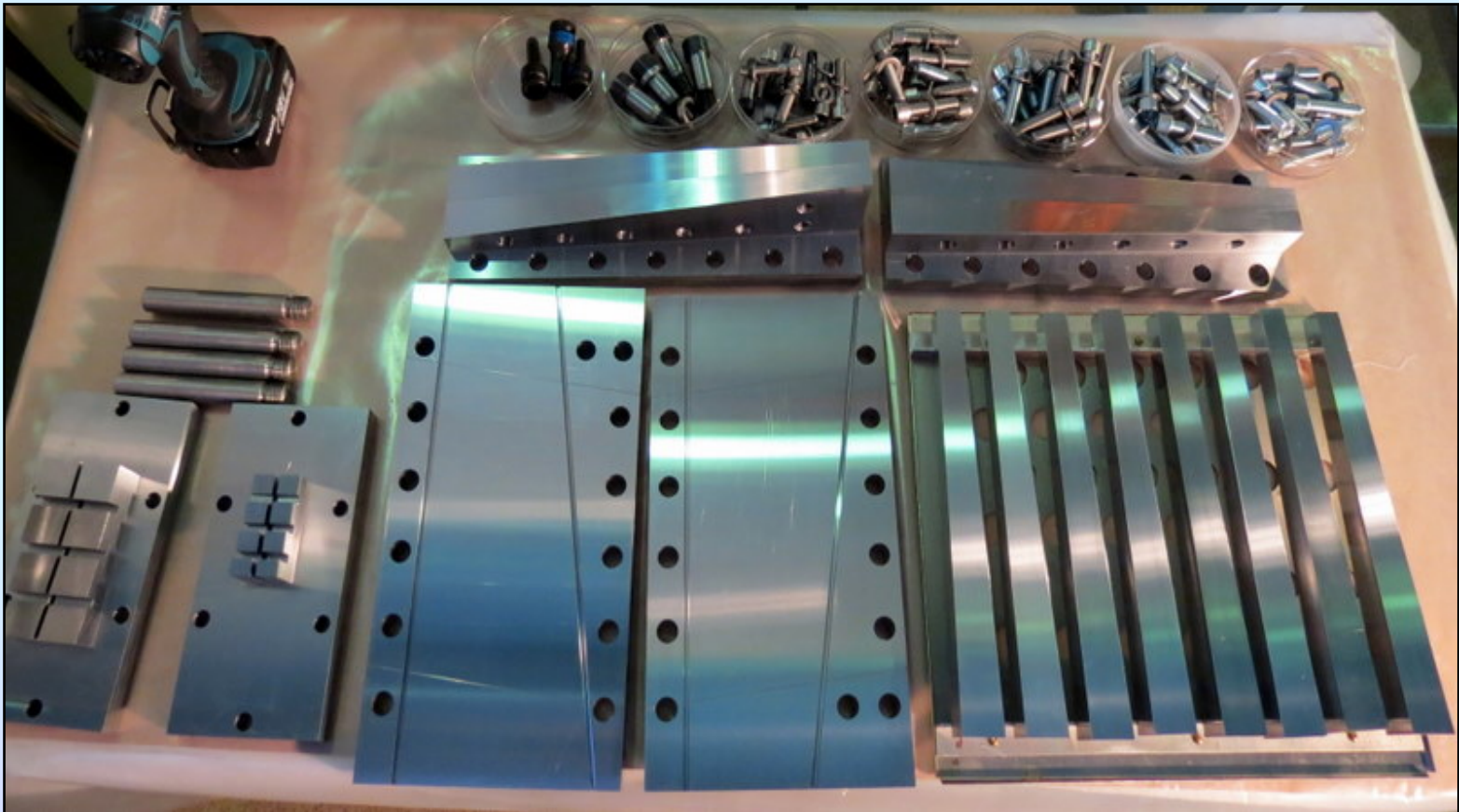
*on behalf of the IHEP-Protvino group*

# Crystals modular support structure



## Mold for single alveoli production

- 18 different types of molds were designed at IHEP and produced by subcontractor
- All pieces were made of special quality steel; flatness  $\sim 5 \mu\text{m}$ ;  $20 \mu\text{m}$  of the dimensions accuracy
- Input control at IHEP was made with CMM before assembling



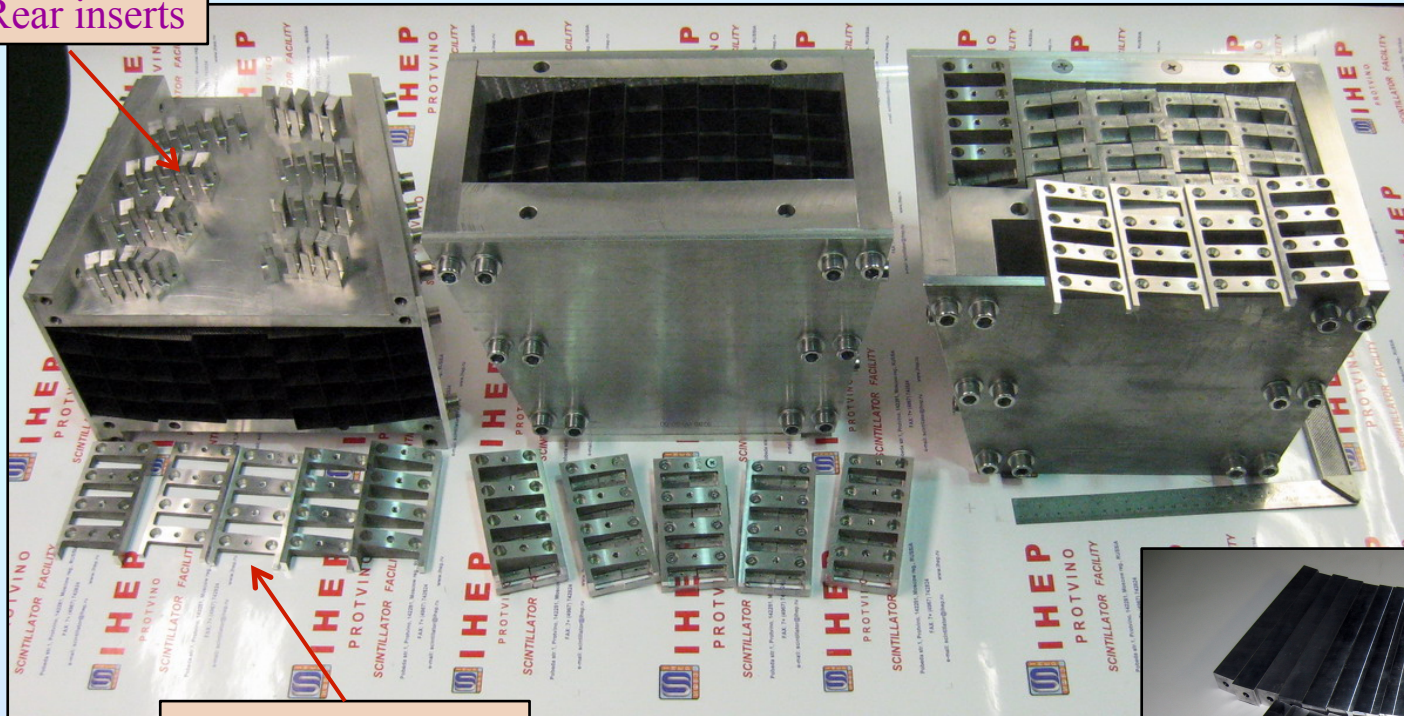
Cutting tools of 18 different types were designed at IHEP and produced by subcontractor



# Assembly devices, rear inserts, intermediate plates, dummy crystals

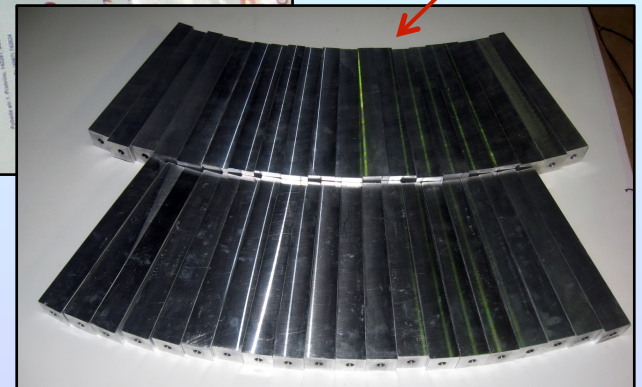
18 different types of high precision assembly devices to glue alveoli packs and assemble modules were designed at IHEP and produced by subcontractor (input control is made at IHEP with CMM)

Rear inserts

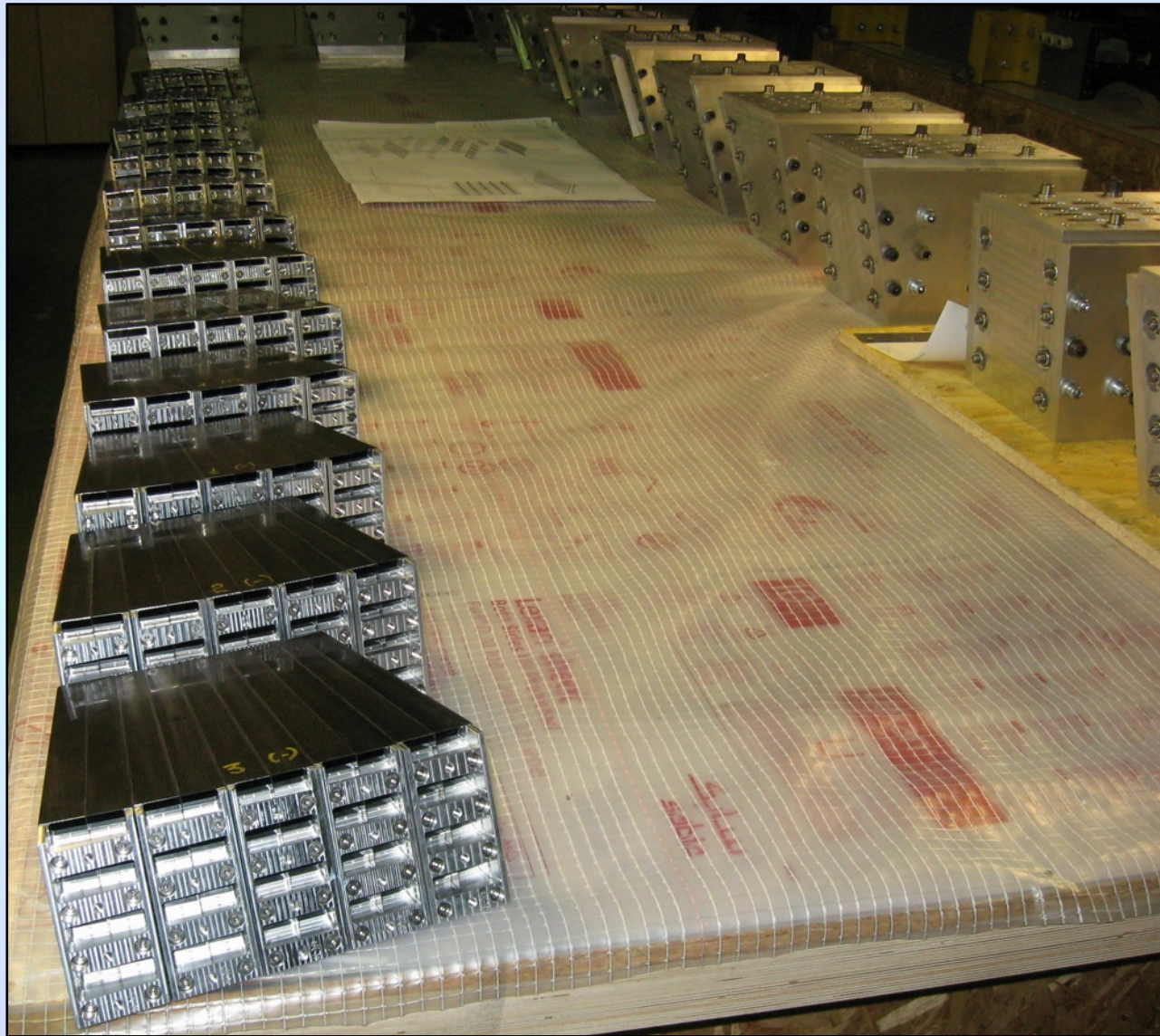


Intermediate plates

Dummy crystals



# 12 alveoli packs with rear inserts and intermediate plates and 12 assembly devices



# 12 modules of crystals support structure



Milestone	Work Description	Prerequisites to start work / procurement	Validation Criteria	Date
<b>Pre-Series Slice</b>				
1.1 M6	Finalise technical specifications		Technical specifications	Nov 2013
1.2	Design and delivery of 3D model and design of main support structures (support beam, support feet, module plate)	0.0, 1.1	Delivered 3D model and design drawings	Apr 2014
1.3 M7	Develop design documentation for Pre-Series Slice	0.0, 0.1, 1.1	Final Design Review for Pre-Series Slice	Sep 2014
1.4	Production and delivery of batch 1 of Pre-Series Slice (PSS-B1)	1.2	SAT Aa for PSS-B1	Mar 2015
1.5	Production and delivery of all remaining components (batch 2) for Pre-Series Slice (PSS-B2)	1.3	SAT Aa for PSS-B2	Sep 2015
1.6 M8	Testing of Pre-Series Slice	1.5	SAT Ab for mechanics of Pre-Series Slice	Mar 2016

Pending...

Delivered without tools

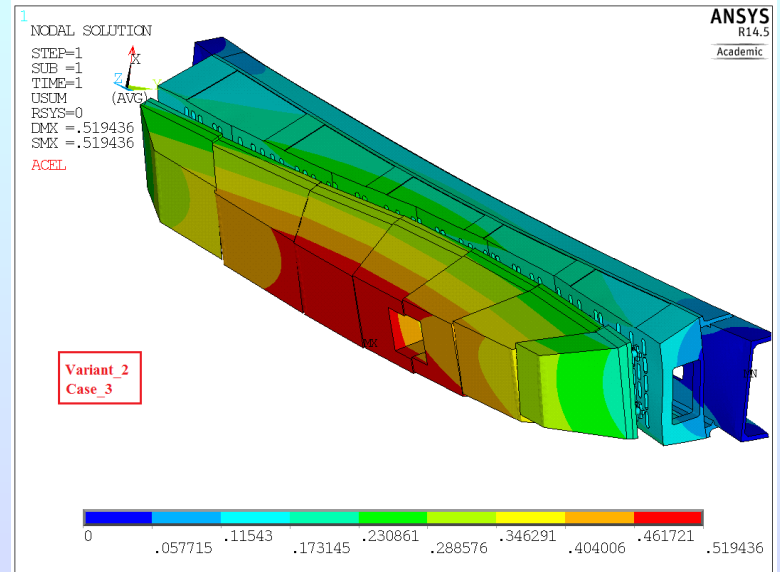
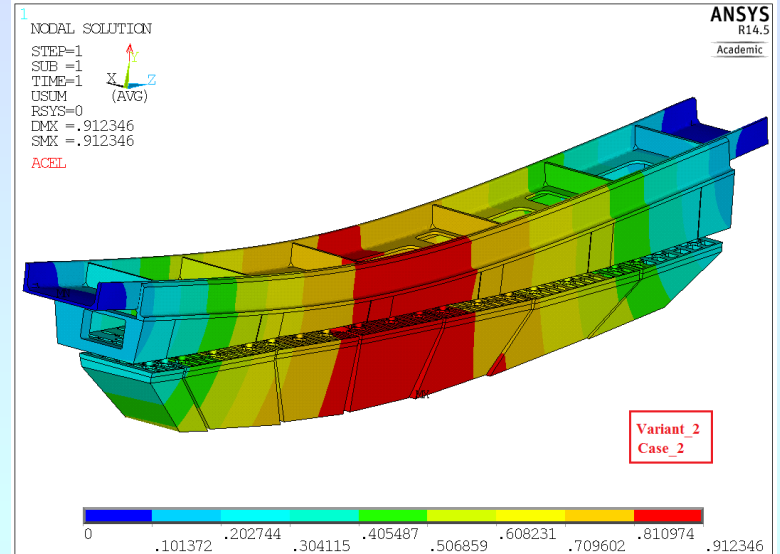
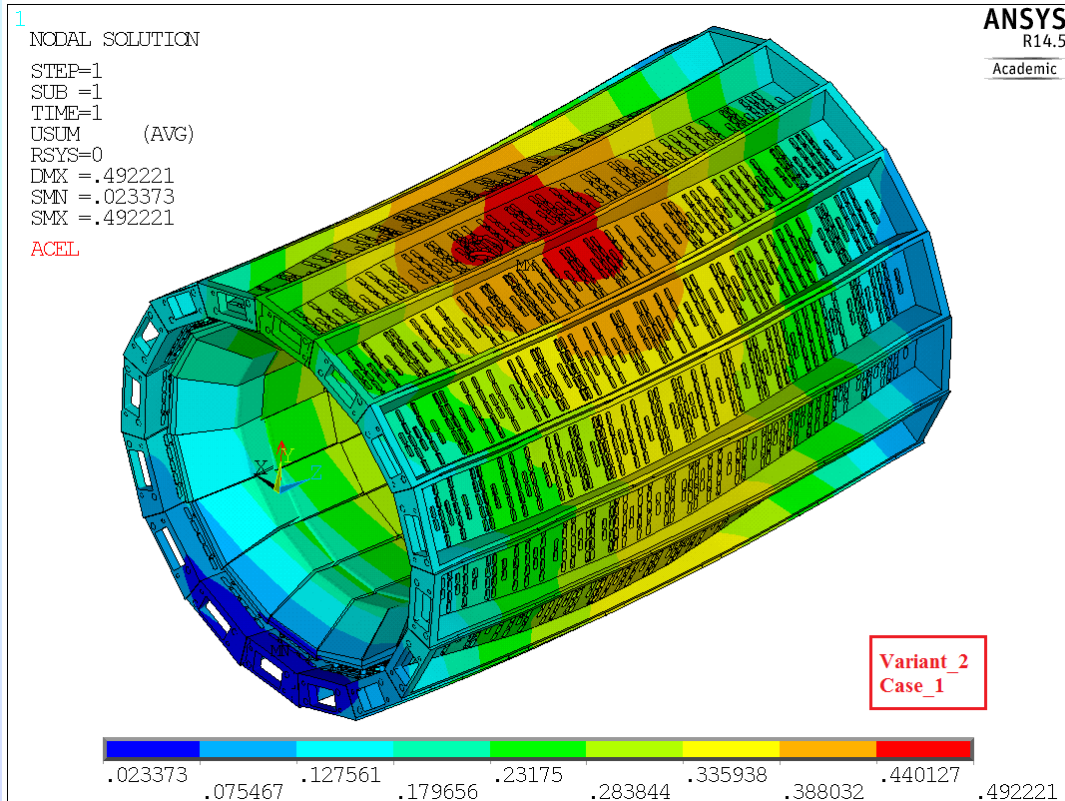
Production in progress

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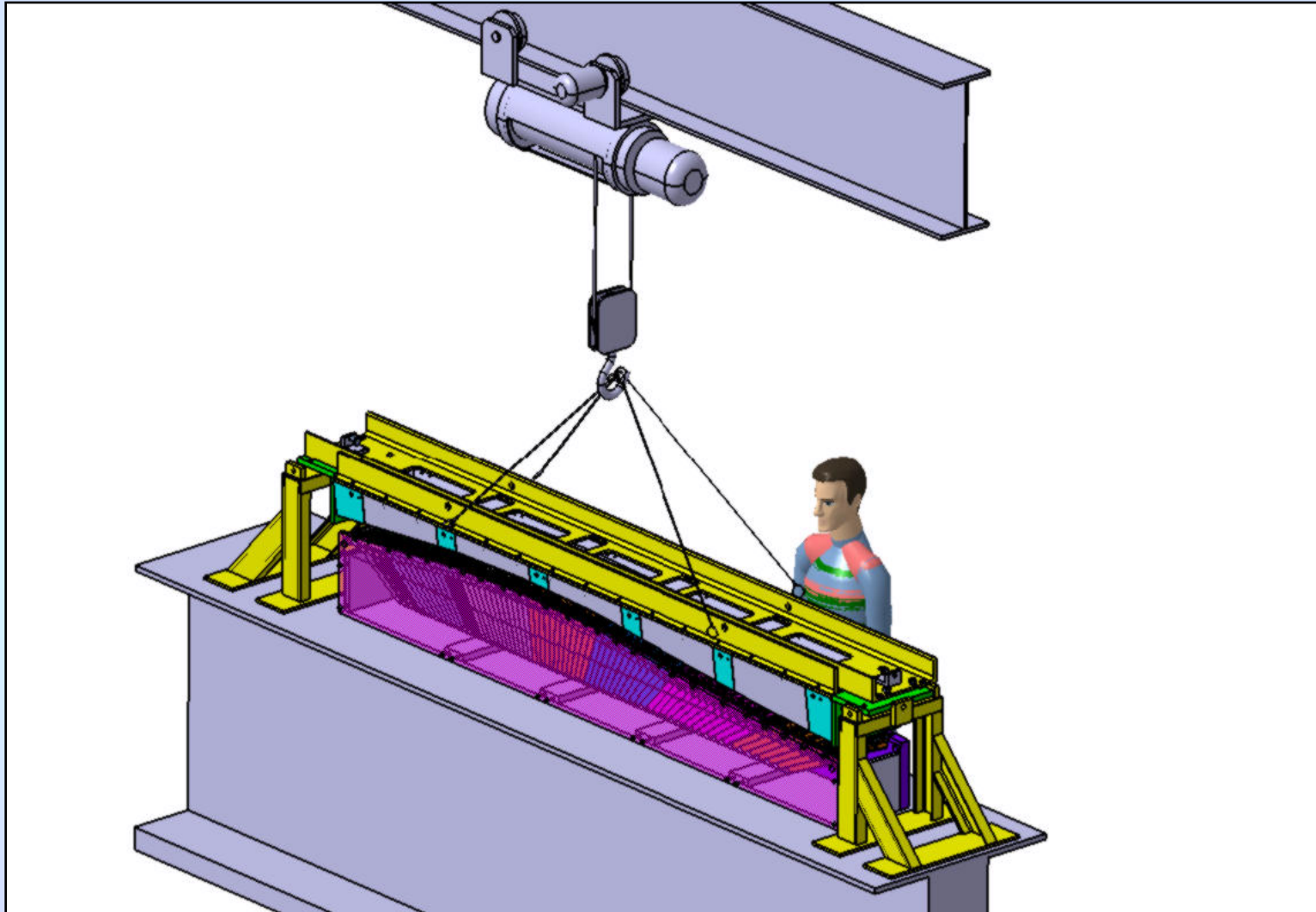


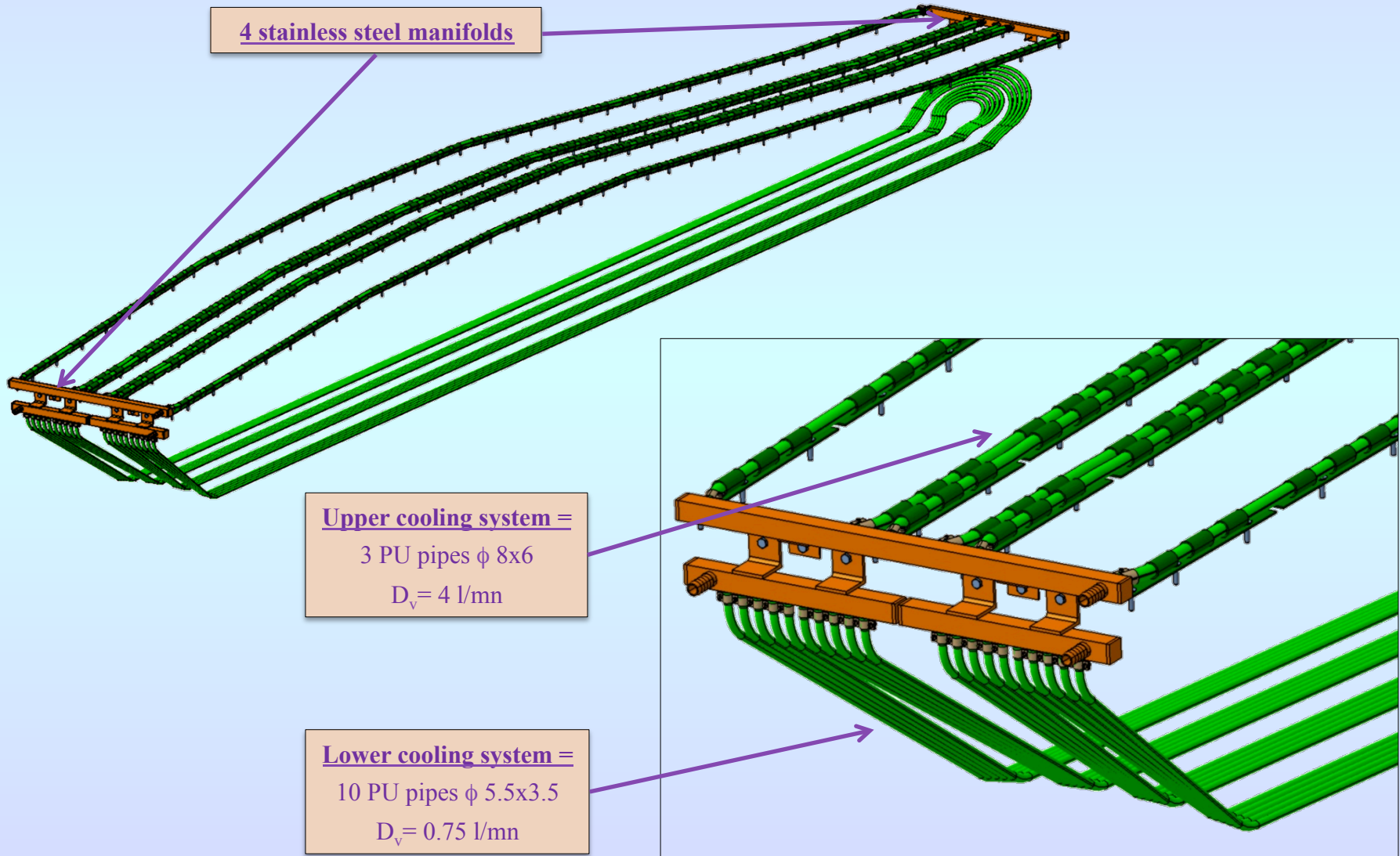
	Case_1	Case_2	Case_3
Variant_0 (Initial design - September, 2014)	0.45	1.00	0.55
Variant_1 (Increased openings in the beam)	0.51	1.02	0.58
Variant_2 (Support feet are shorter by 10 mm)	0.49	0.91	0.52
Variant_3 (Support feet are longer by 10 mm)	0.51	1.12	0.63

## Cryostat, support rings and beam covers are not shown

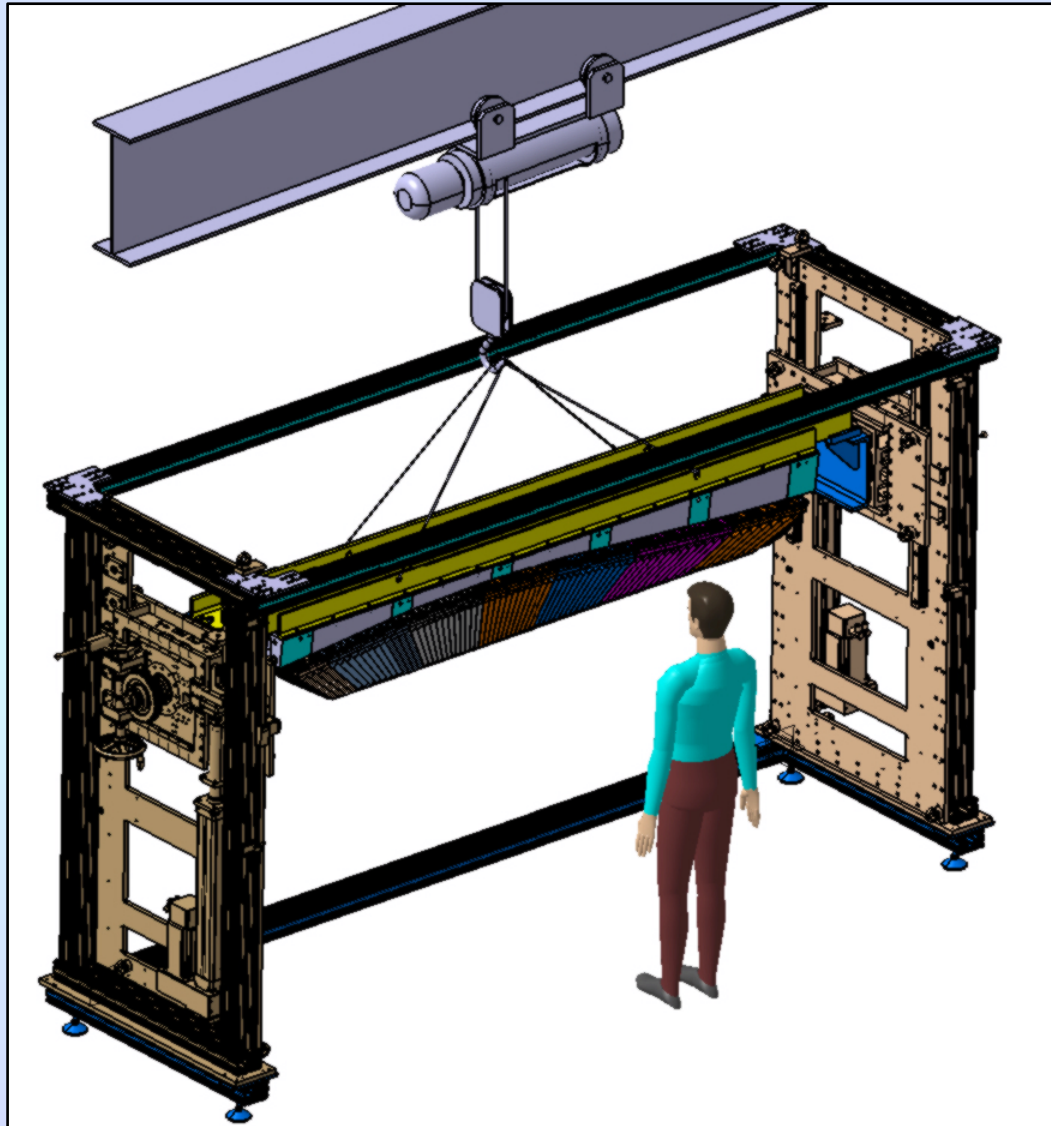


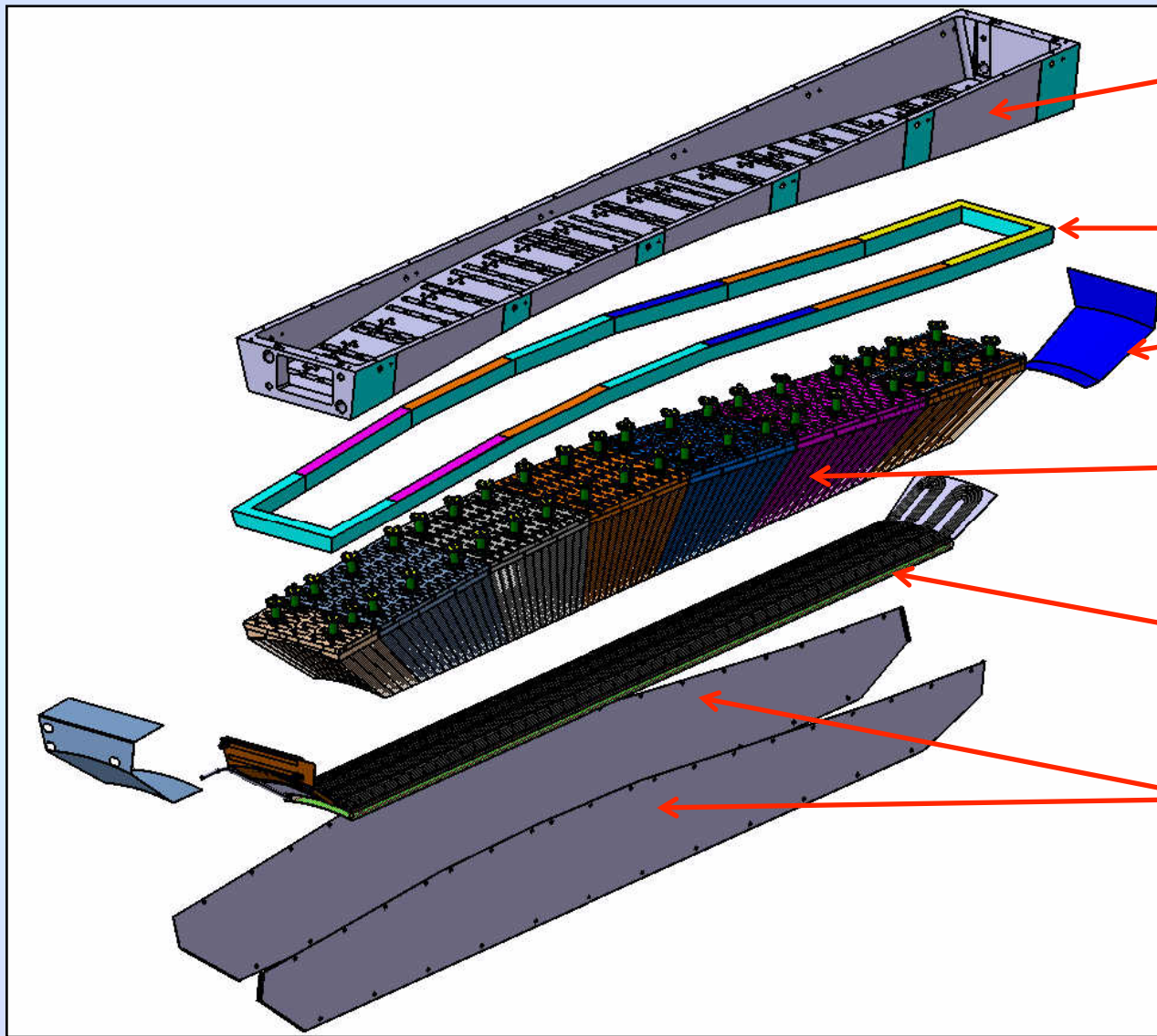
# How to assemble barrel (by V. Ferapontov)





# How to assemble barrel (by V. Ferapontov)





Aluminum Support Beam

Foam

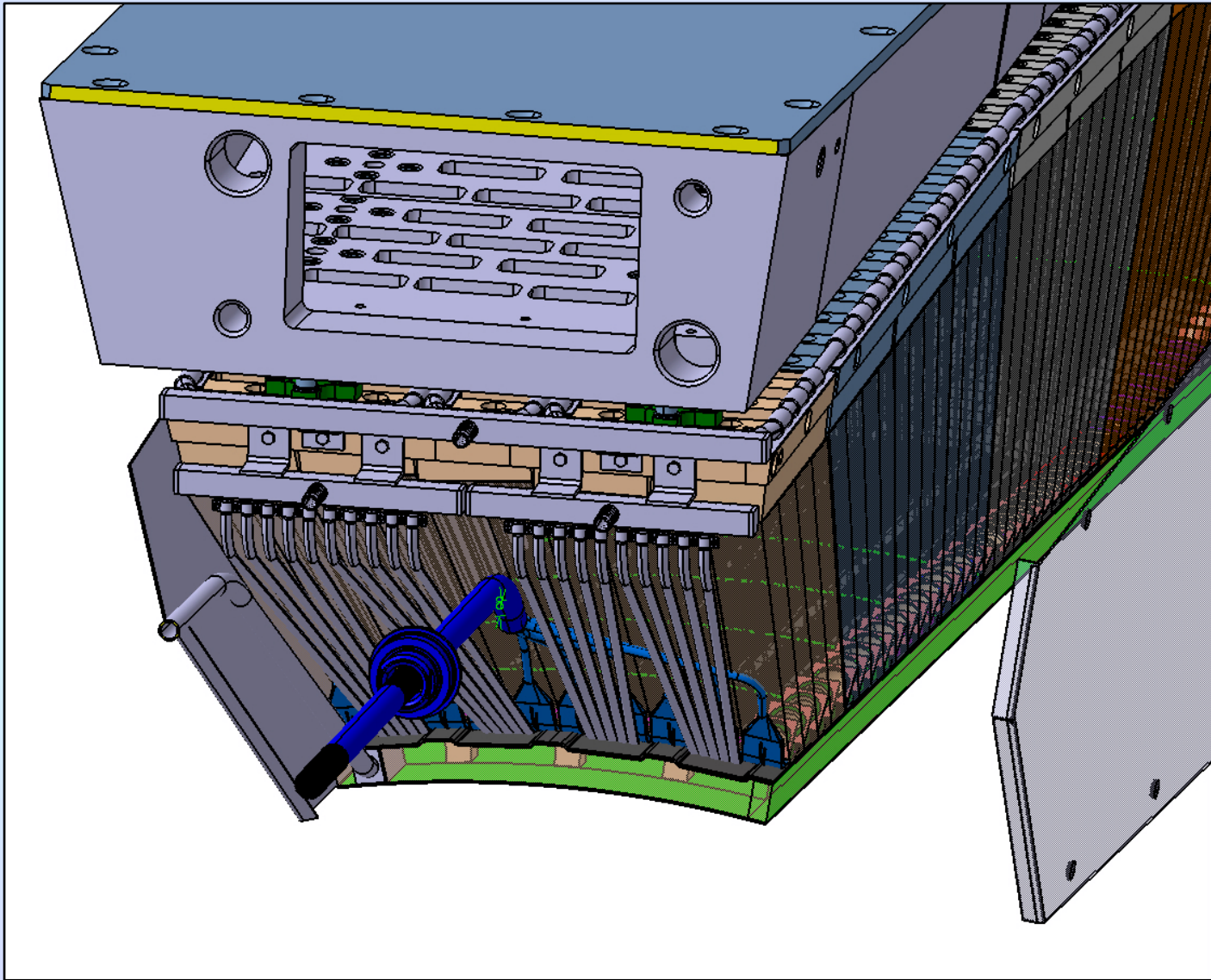
Back Cover

Super-Modules

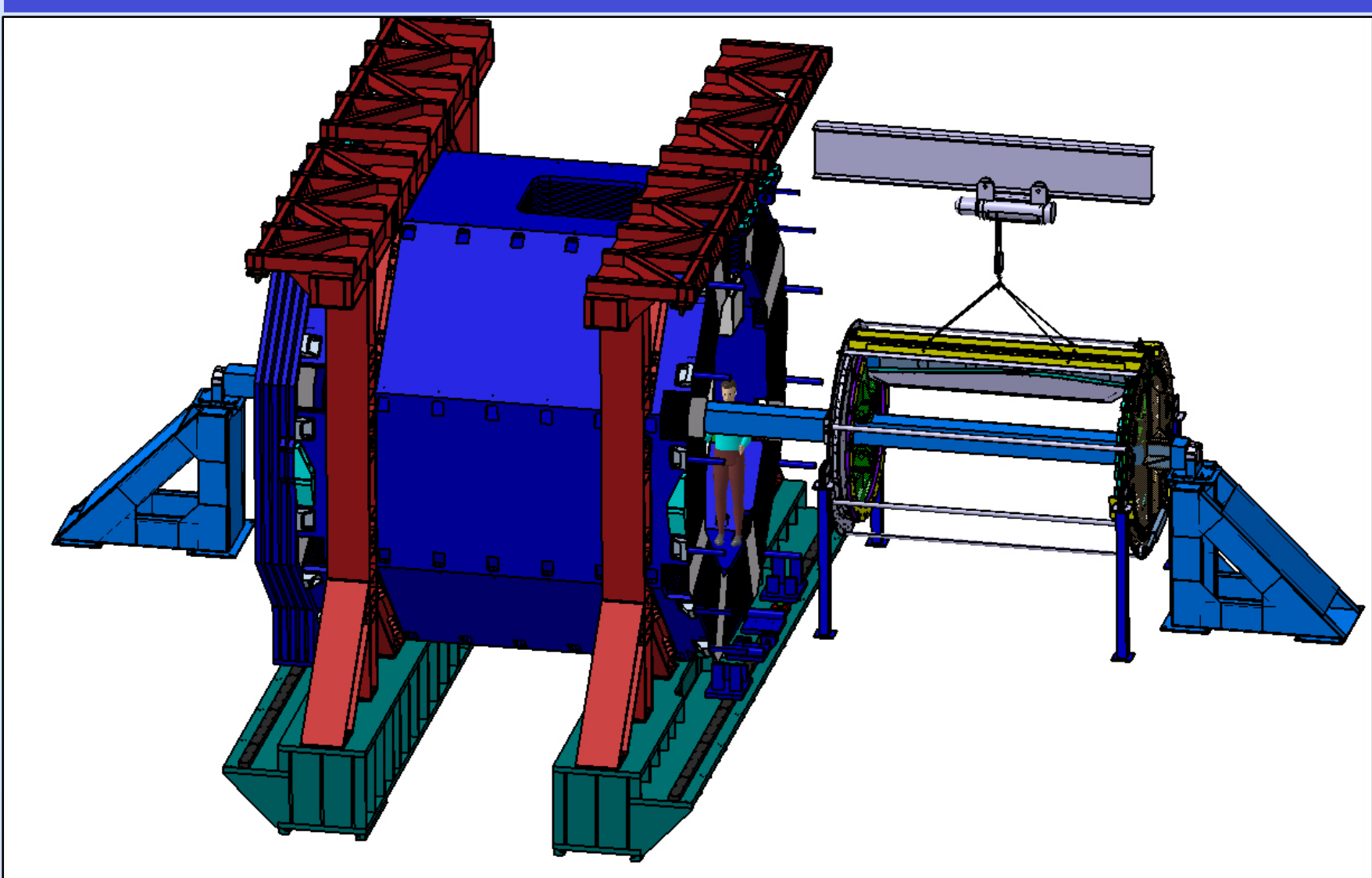
Cooling System

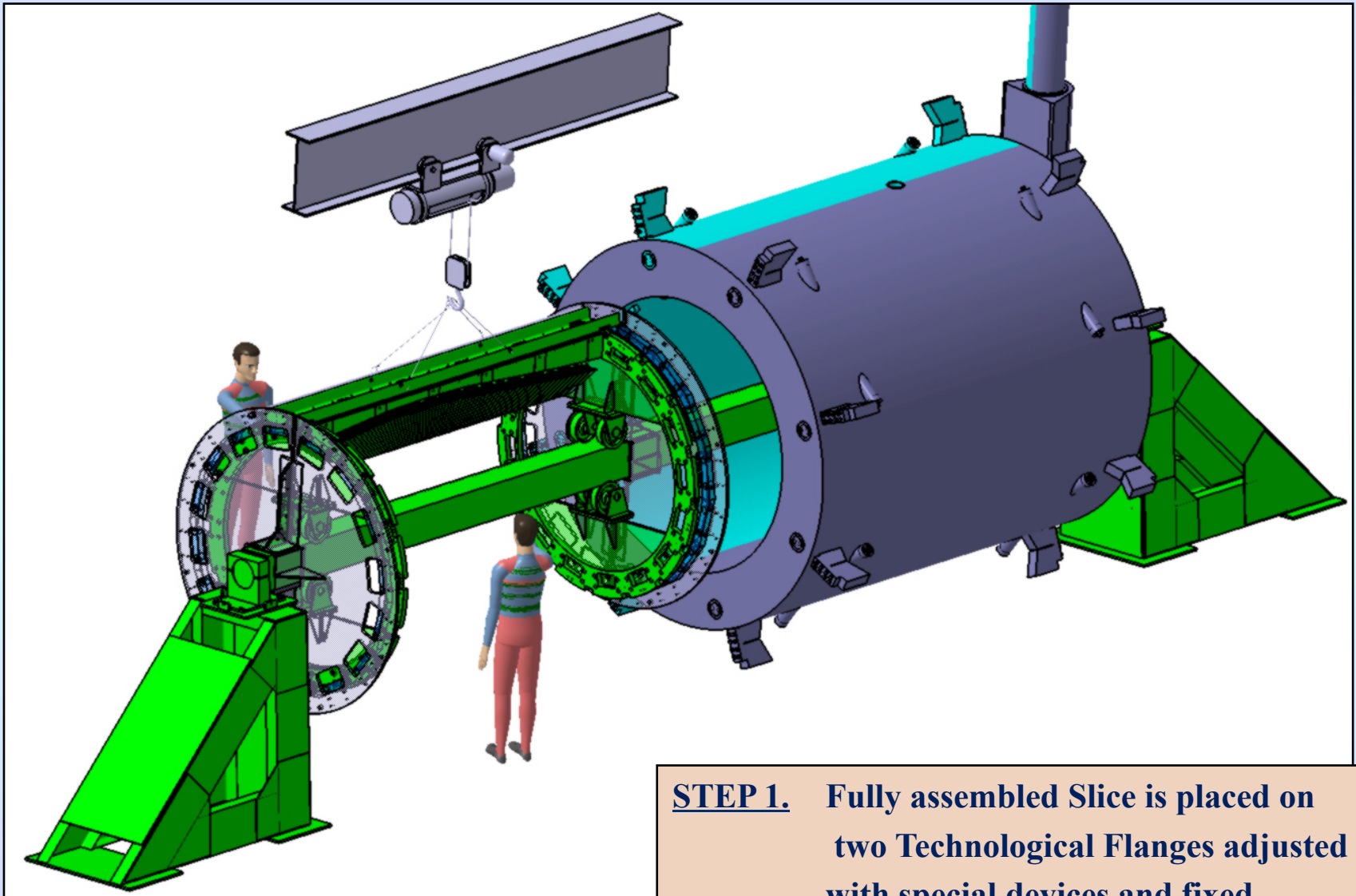
Side Covers

# How to assemble barrel (by V. Ferapontov)



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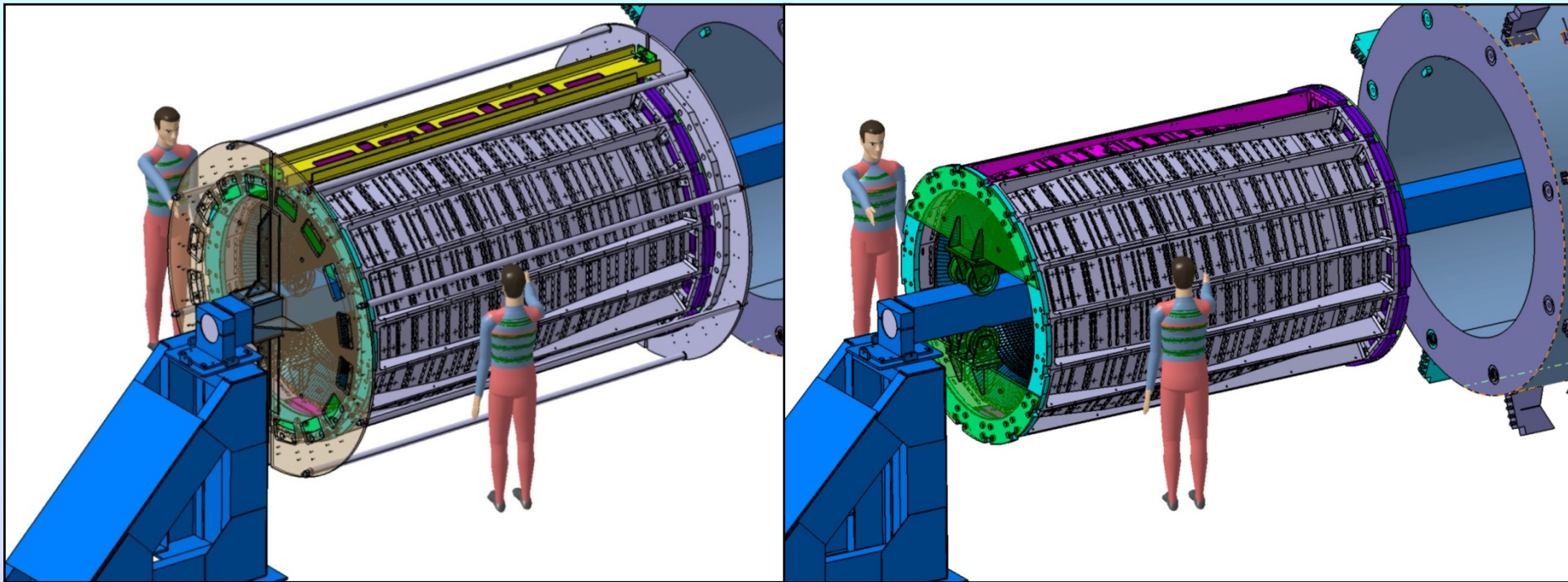


**STEP 1.** Fully assembled Slice is placed on two Technological Flanges adjusted with special devices and fixed



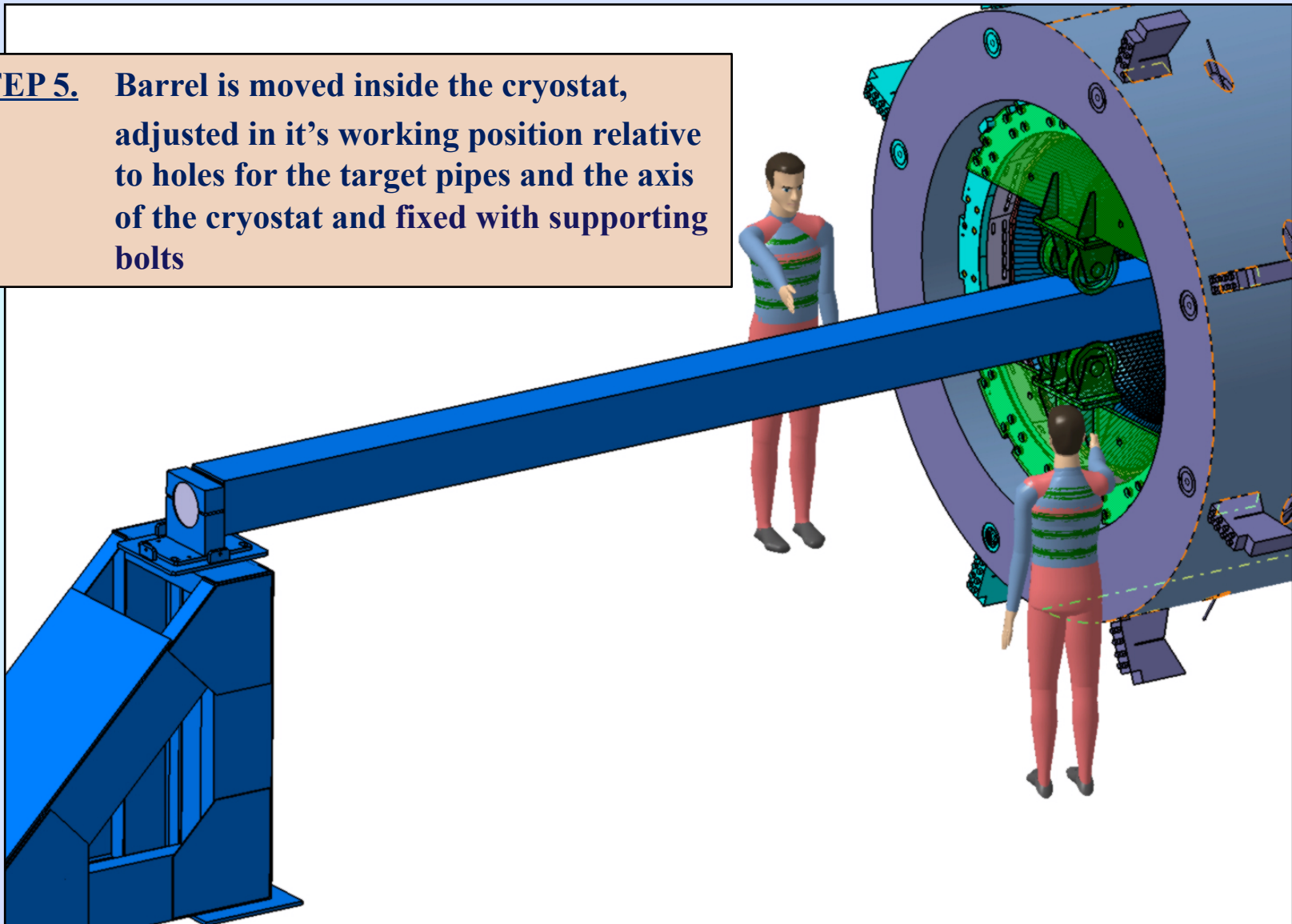
## How to assemble barrel (by V. Ferapontov)

- STEP 2.** 16 assembled Slices are placed and joined one-by-one on Technological Flanges and fixed
- STEP 3.** Two Support Rings are fixed with special Pins and Bolts.
- STEP 4.** Technological Flanges are disassembled

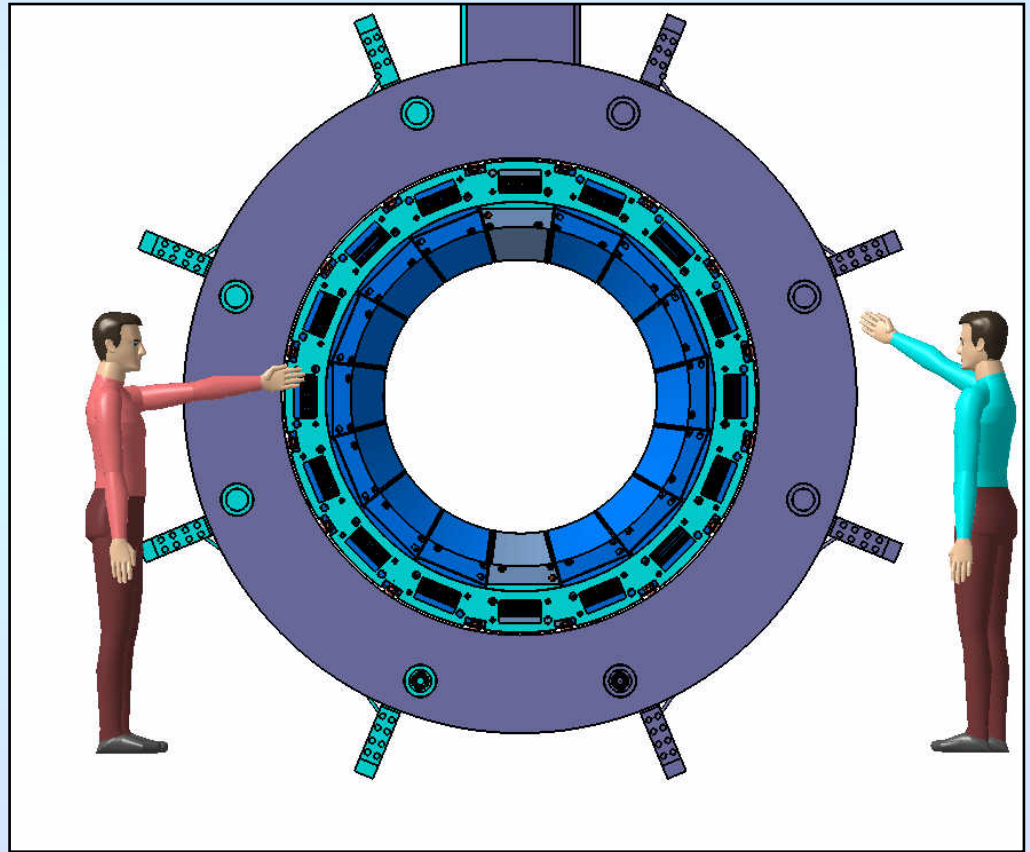
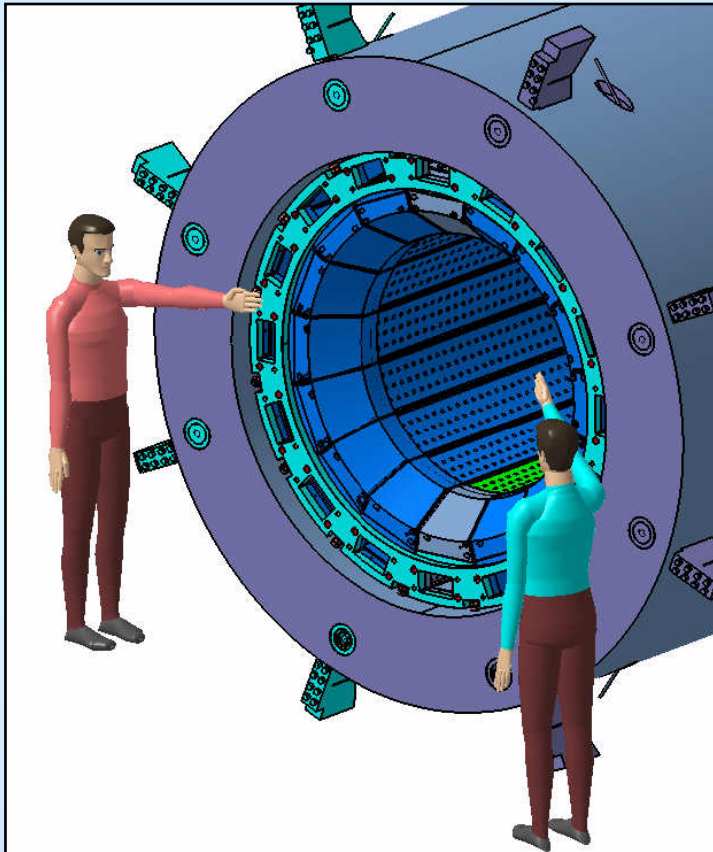


## How to assemble barrel (by V. Ferapontov)

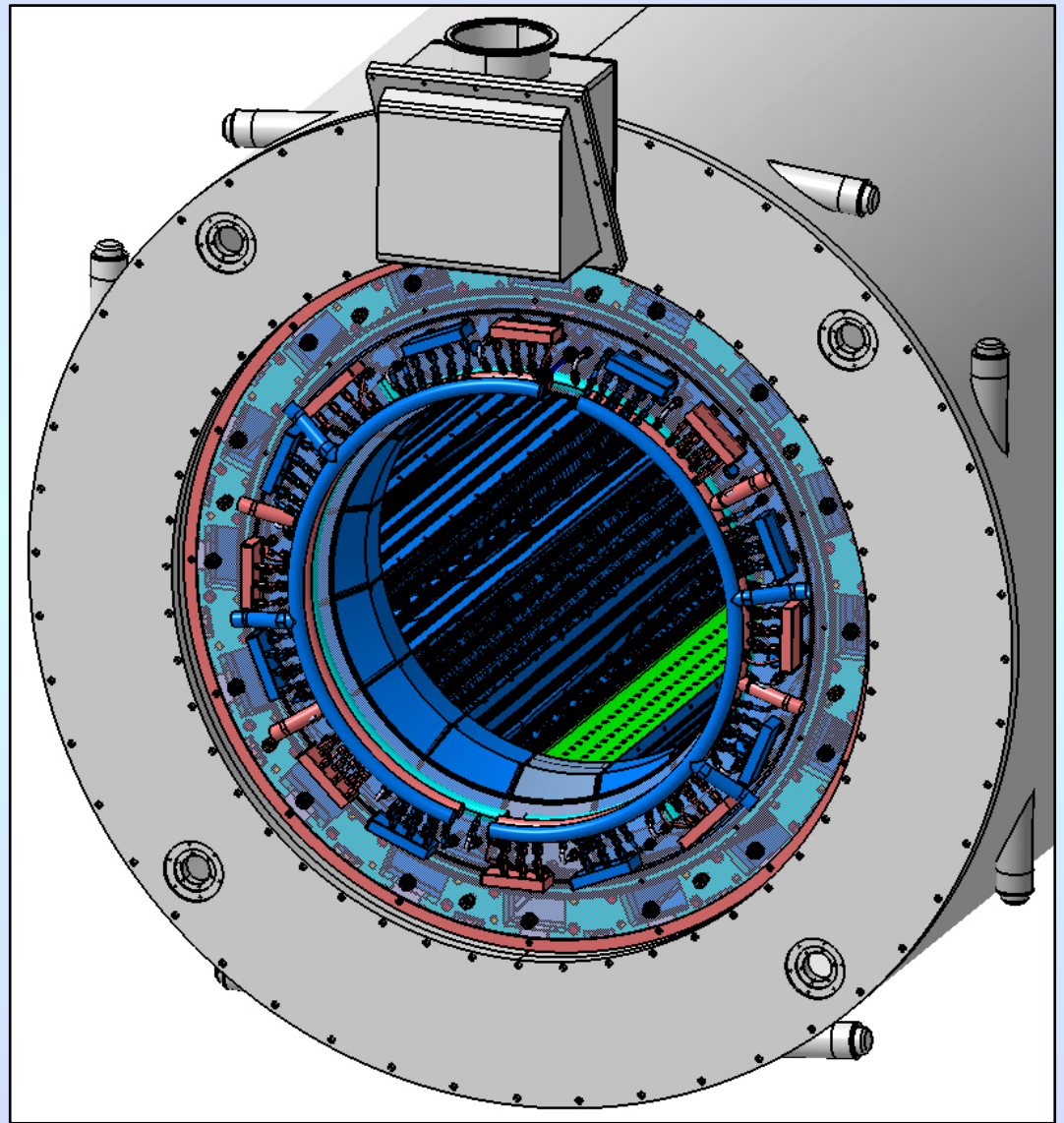
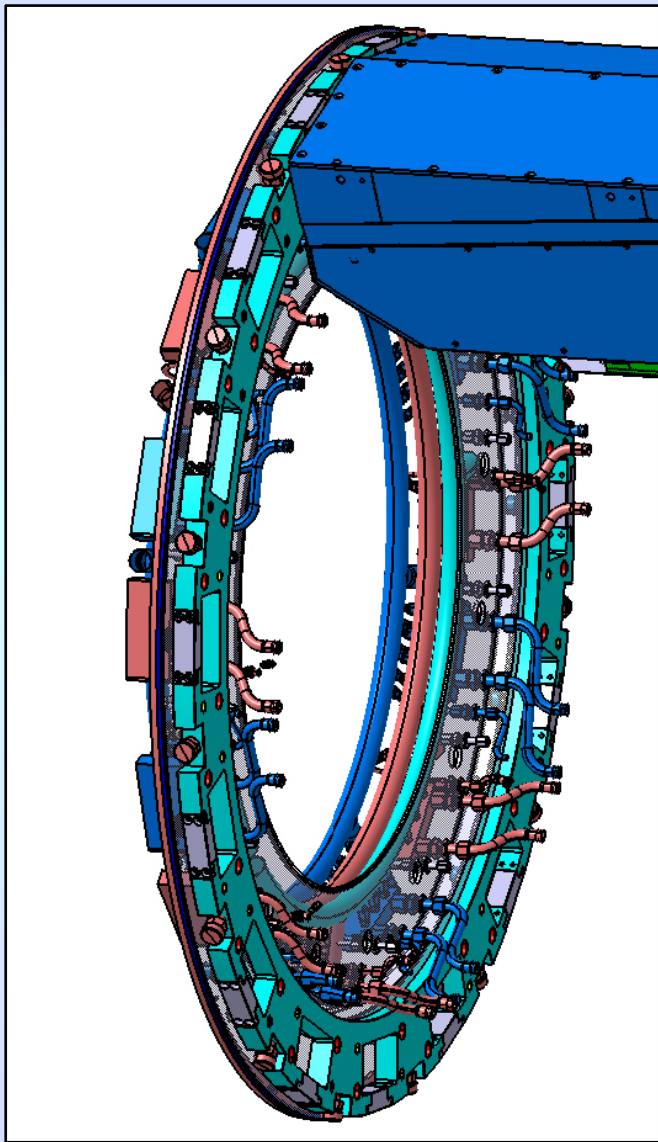
**STEP 5.** Barrel is moved inside the cryostat, adjusted in it's working position relative to holes for the target pipes and the axis of the cryostat and fixed with supporting bolts



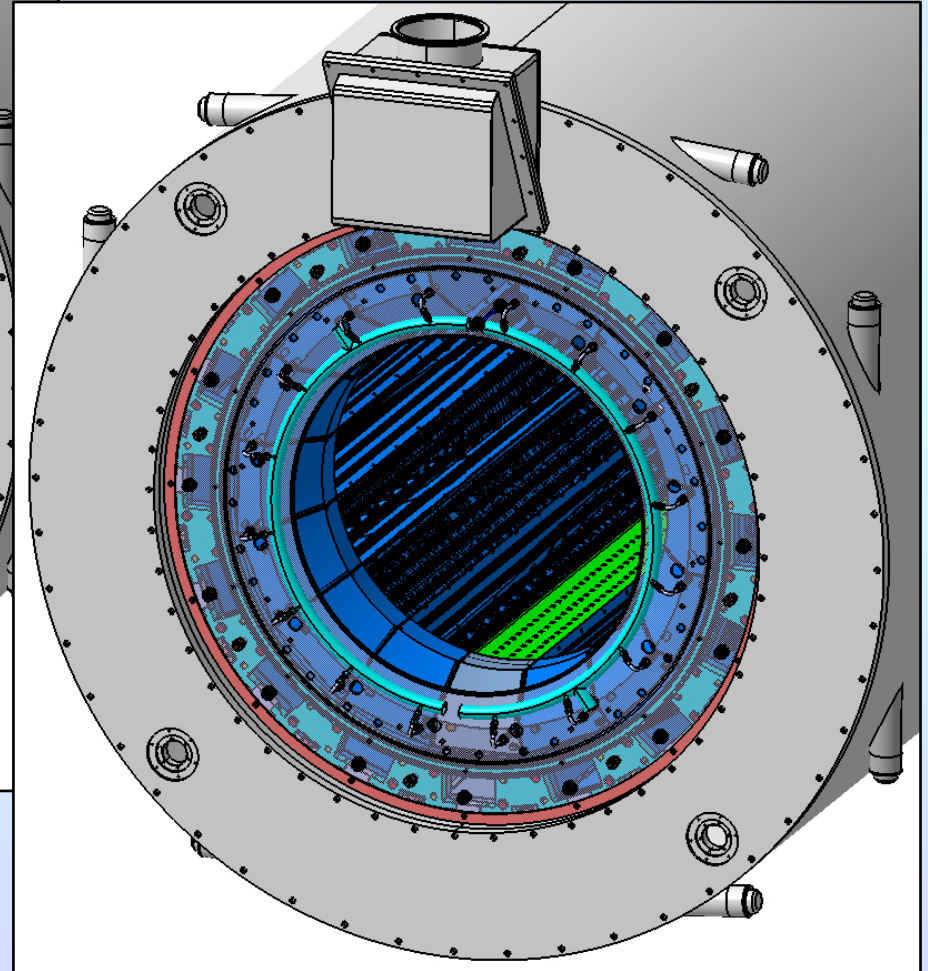
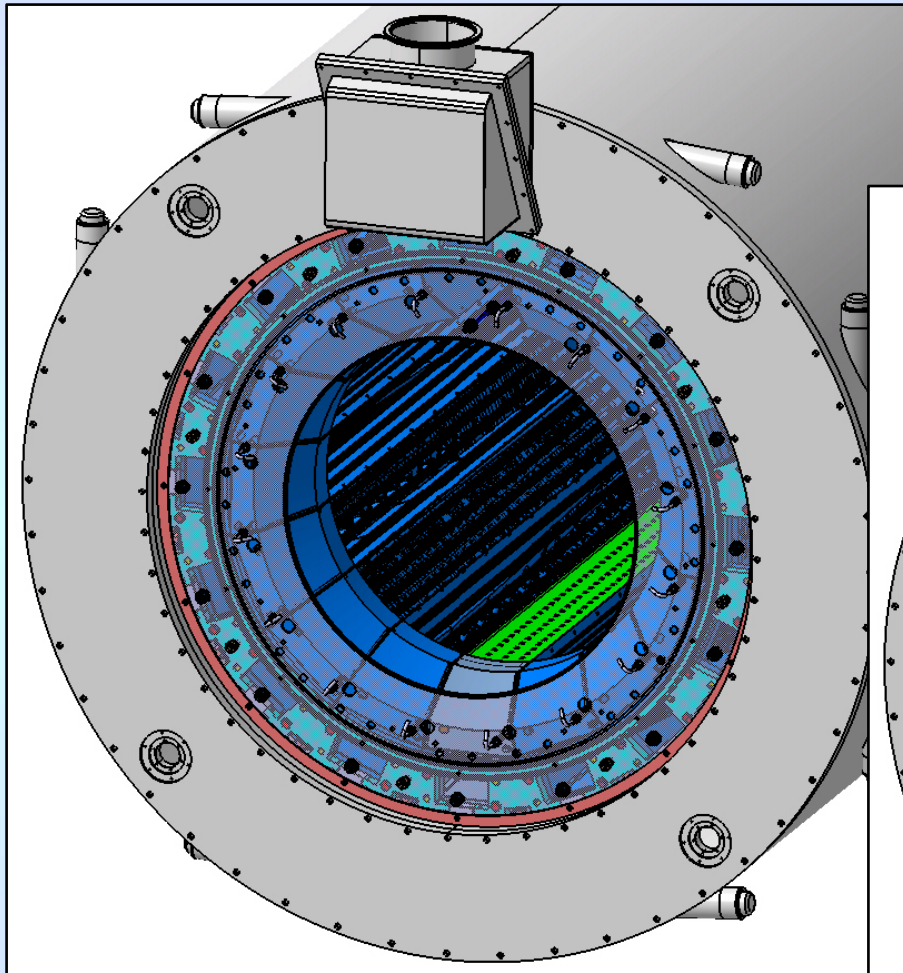
**STEP 6. All technological devices and tools are disassembled**



# How to assemble barrel (by V. Ferapontov)



# How to assemble barrel (by V. Ferapontov)



- *Batch 1 of the pre-series slice (excluding assembling devices) is shipped to Giessen.*
- *All 18 types of molds and assembly devices were produced and delivered to IHEP, production of the alveoli packs for the Batch 2 of the pre-series slice will be completed in time (September 2015).*
- *Assembling scenario was developed – additional tools and devices will be necessary to execute this work. They have been designed. We need a plan of the working space where the slice will be assembled.*
- ❑ *Production of back module plates, support feet and support beam was not started because the complete design of the pre-series slice is not yet approved - waiting for the successful PROTO120 tests !!!*
- ❑ *Design of front inserts was suggested and some prototype was made at Giessen - waiting for the final solution about the monitoring system*
- ❑ *Final solution on the electronics & cables inside the support beam – PROTO 120 test !!!*
- ❑ *Cooling system design and integration - ???*