

# The modernization in the experimental hall

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# Content of the report

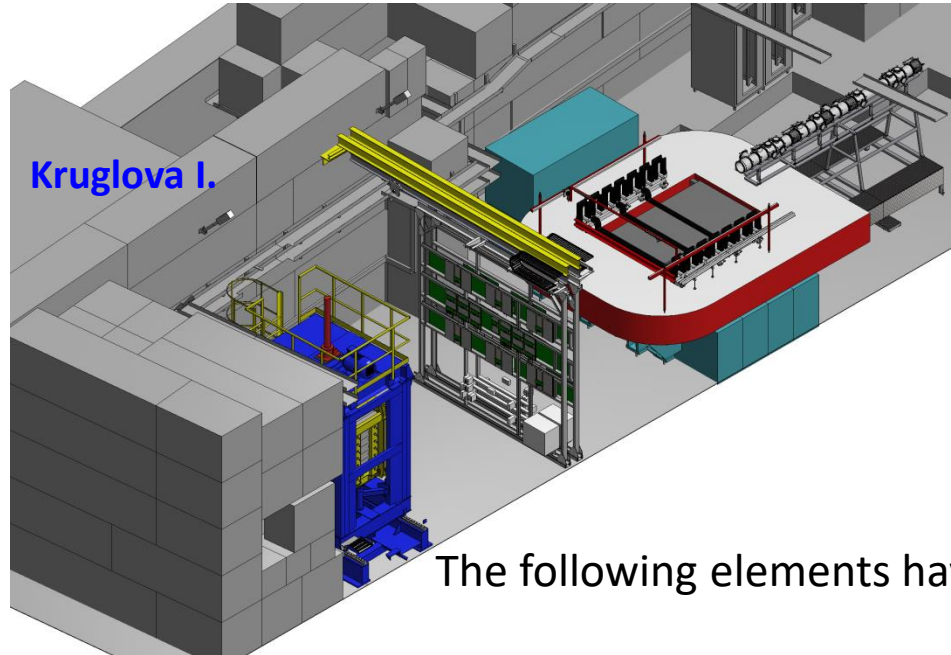
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# BM@N experimental hall

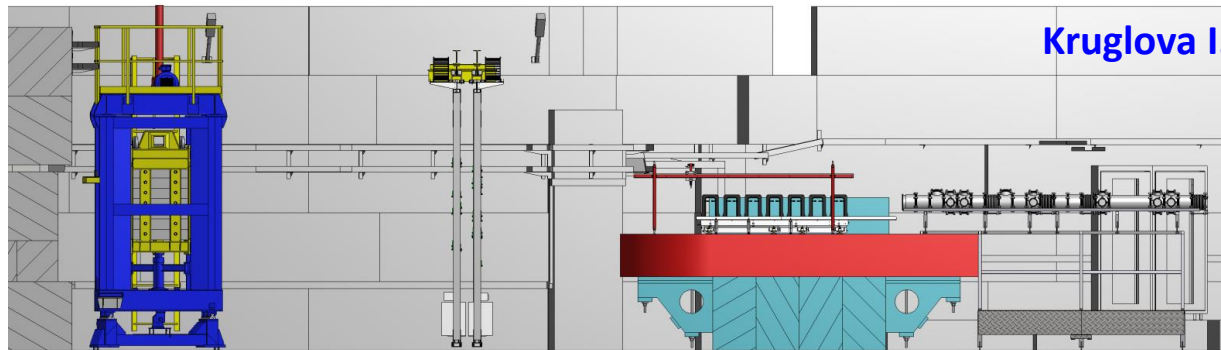
The following elements of the BM@N installation were removed after Run 8:

1. 4 detectors ToF400;
2. 4 detectors CSC 1x1m;
3. CSC 1,5x2m;
4. FD;
5. small Gem;
6. Aluminum beam pipe;
7. SiMD;
8. 8 planes forward Si;
9. 14 Gem;
10. Carbon beam pipe;
11. DCH1;
12. DCH2;
13. ScWall;
14. Target Station.



The following elements have not been deleted:

1. BC1;
2. BC2;
3. VC;
4. Barell;
5. ToF700;
6. BH;
7. FHcal.

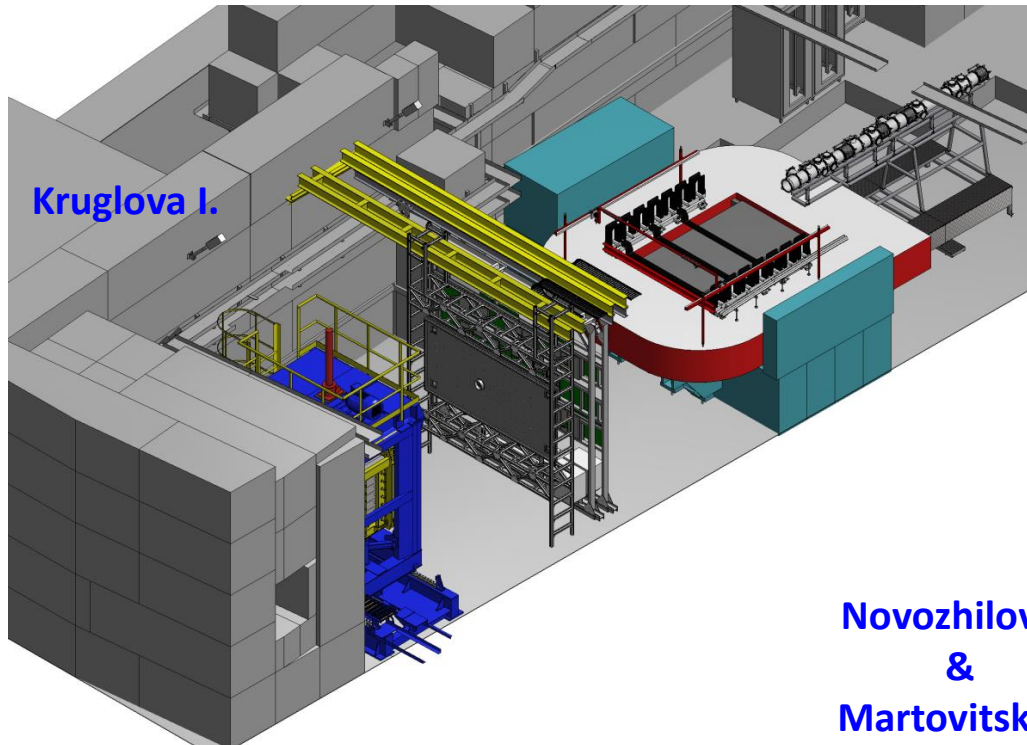
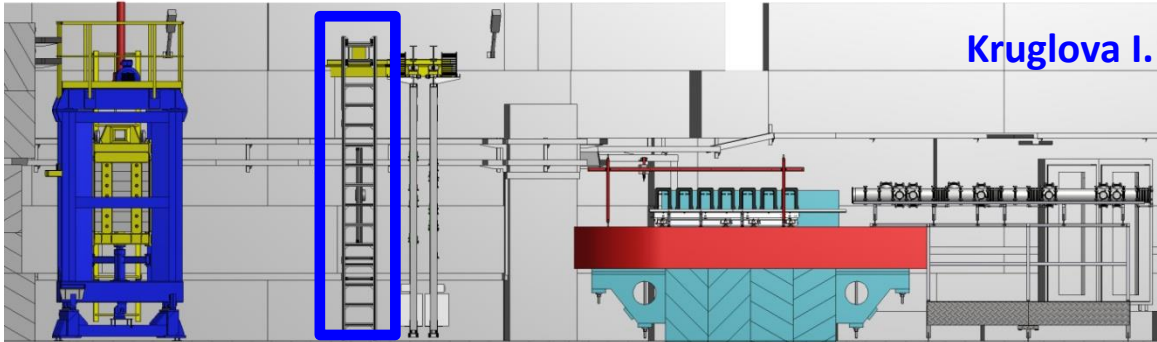


# Installation of ScWall detector

The following mechanical support elements have been prepared:

1. Mechanical support materials: **Yes**
2. Supporting structure for mechanical support : **Yes**
3. Brackets for fastening the supporting structure : **Yes**
4. Mechanical Support Project: **Yes**
5. The detector is ready for installation: **Yes**

ScWall is completely installed in the experimental hall now

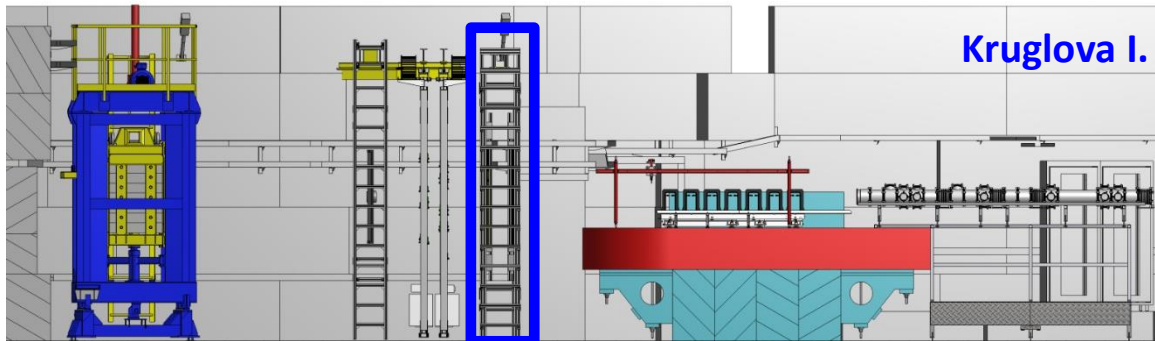


Novozhilov S.  
&  
Martovitsky E.



# Installation of 2 CSC big detectors

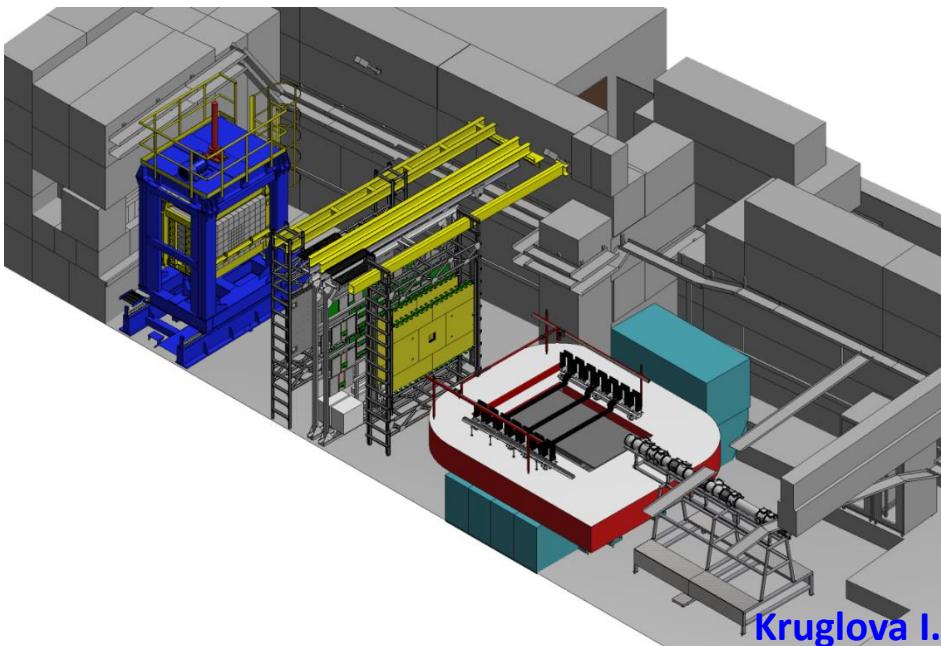
The following mechanical support elements have been prepared:



Kruglova I.

1. Mechanical support materials: **Yes**
2. Supporting structure for mechanical support : **Yes**
3. Brackets for fastening the supporting structure : **Yes**
4. Mechanical Support Project: **Yes**
5. The detector is ready for installation: **Yes**

2 CSC big are completely installed in the experimental hall now

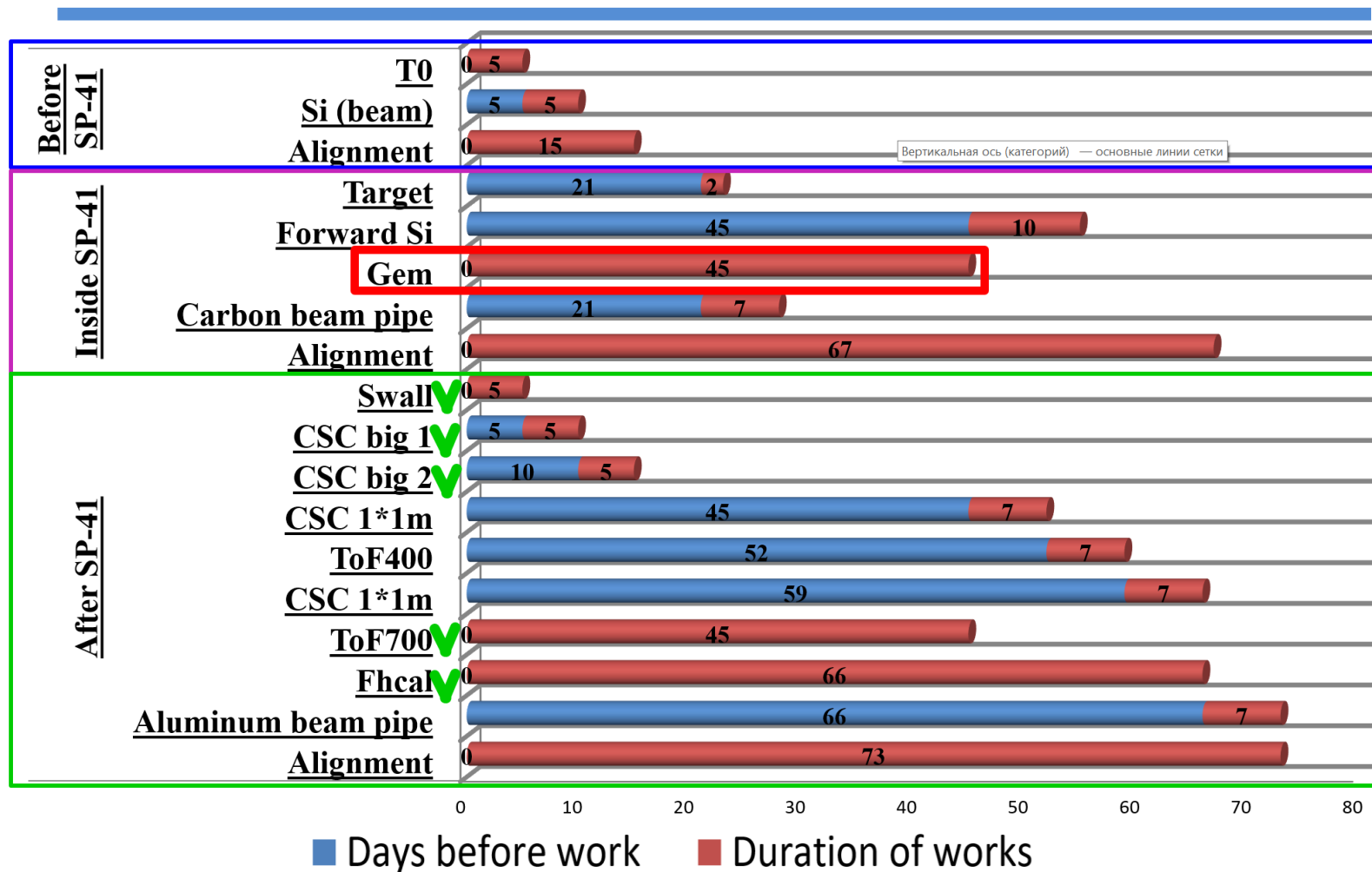


Kruglova I.

Novozhilov S.  
&  
Martovitsky E.



# Installation timetable



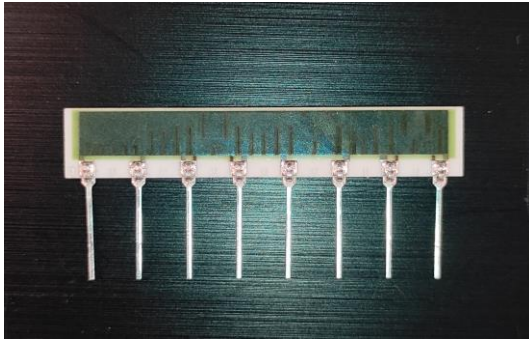
The table is divided into 3 zones.

In zone 3, work can be carried out in parallel.

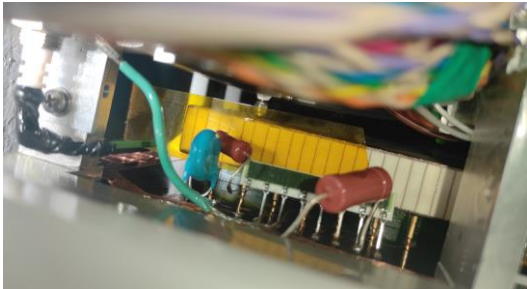
But work on installing TOF 400 and GEM can only be carried out one after the other.

# GEM modernization

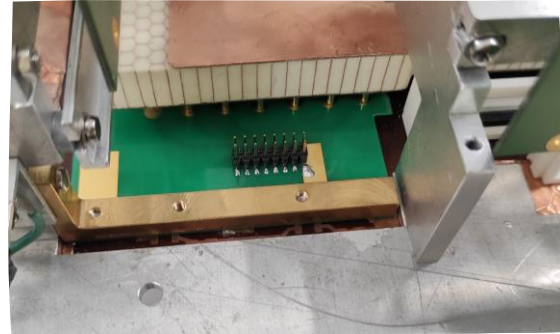
Divider old configuration



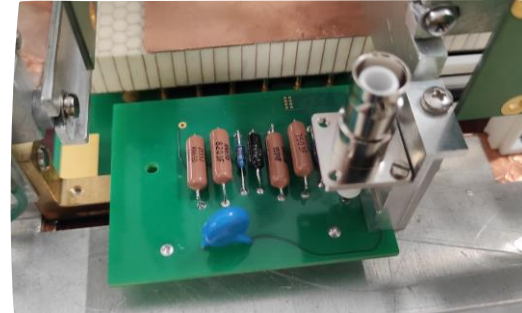
Location of the old divider on the Gem detector



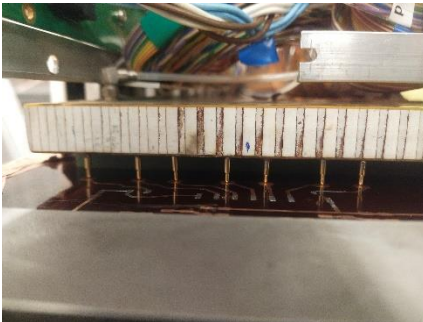
The board on the detector



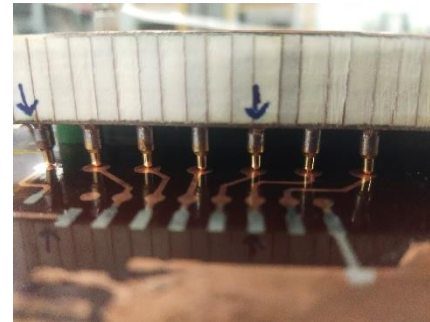
Divider new configuration



High voltage pin old configuration



High voltage pin new configuration



# GEM modernization

	Top GEM detectors							Bottom GEM detectors						
	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
Remove the mechanics	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Remove old HV divider	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Cut off the protective Kapton	✓			✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Resolder pins	✓		✓ <sup>*</sup>	✓	✓			✓	✓	✓	☹️ <sup>2</sup>	✓	✓	✓
Clean after soldering	✓			✓				✓	✓	✓		✓	✓	
Check the pin plungers	✓			☹️ <sup>1</sup>				✓	✓	✓		✓	✓	
Check for short circuit	✓							✓	✓	✓		✓	✓	
Glue on new Kapton	✓			✓				✓	✓	✓		✓	✓	
Prepare a stationary PCB	✓							✓	✓	✓	✓	✓	✓	✓
Install the removable divider PCB	✓							✓	✓					
Install the mechanics								✓	✓					
Test with cosmic rays (new pins)								☹️ <sup>3</sup>						

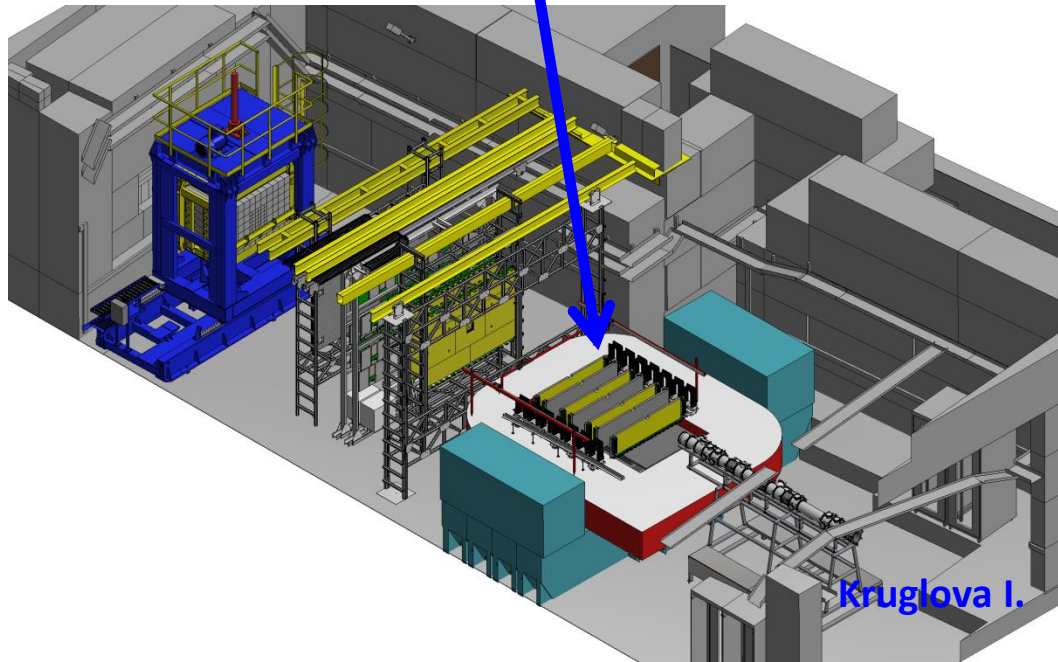
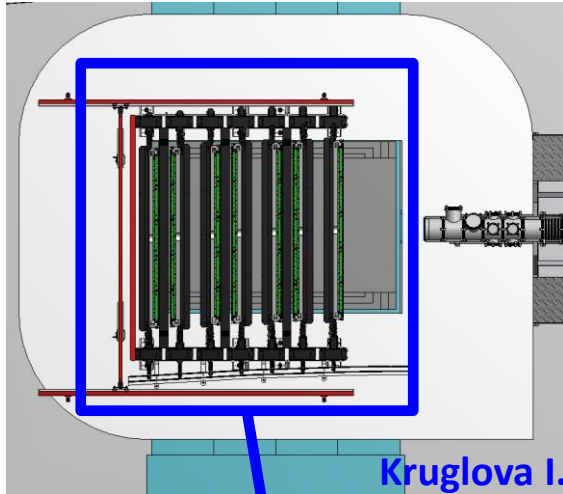


A different type of pin was soldered here. These pins will need to be replaced with the latest type of pins.

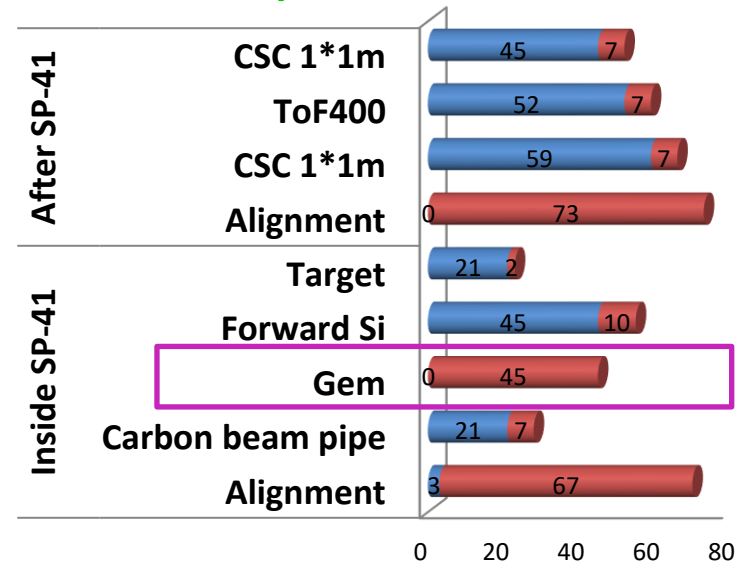
1. The plunger of one pin is stuck. This pin must be replaced with a new one.
2. During soldering, the HV pad and part of the line were torn off. It is necessary to restore the pad and line and solder a new pin.
3. During test with cosmic rays, the detector began to trip. Performed procedures did not help. To detect the problem, we need to disassemble the detector.



# Installation of 7 GEM detectors



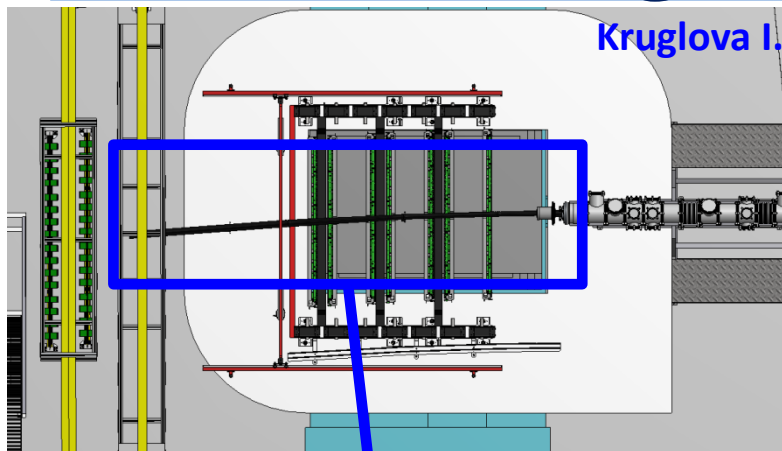
1. Mechanical support : **Yes**
2. The detector is ready for installation: **No**  
(Modernization now)



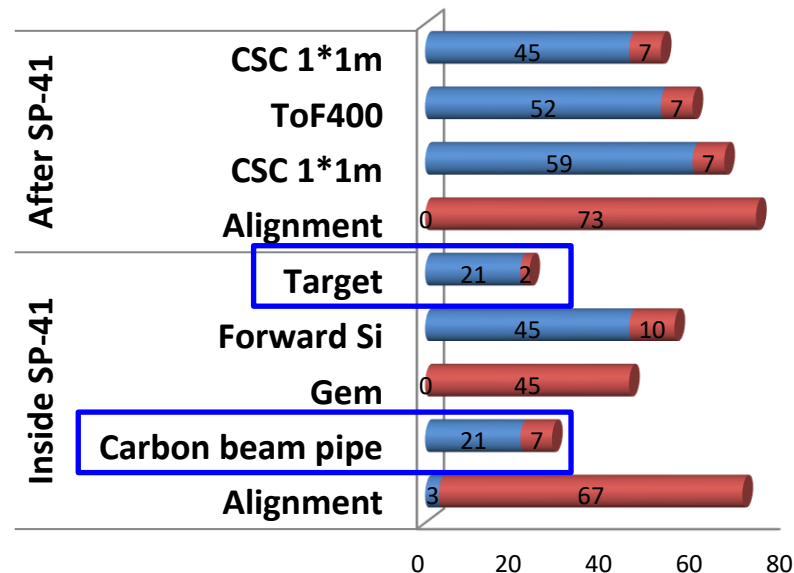
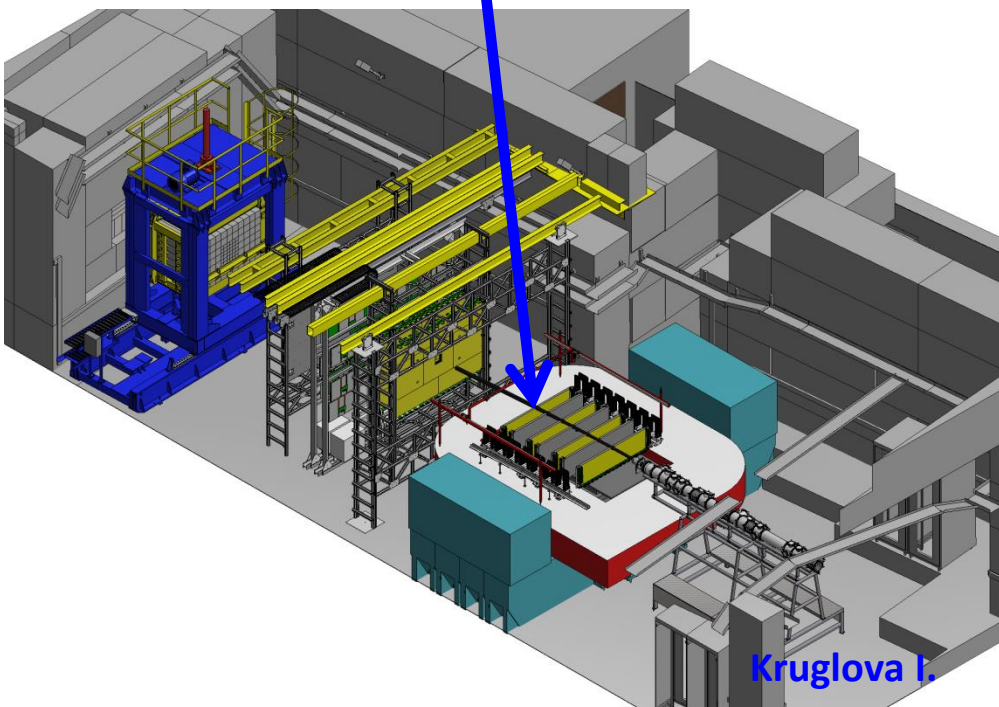
Only after installing all **GEM** will we be able to complete the installation of **CSC** and **TOF400**

We will begin installing detectors once the high power system is fully upgraded. (about **30.03.2024**)

# Installation of carbon beam pipe & target station

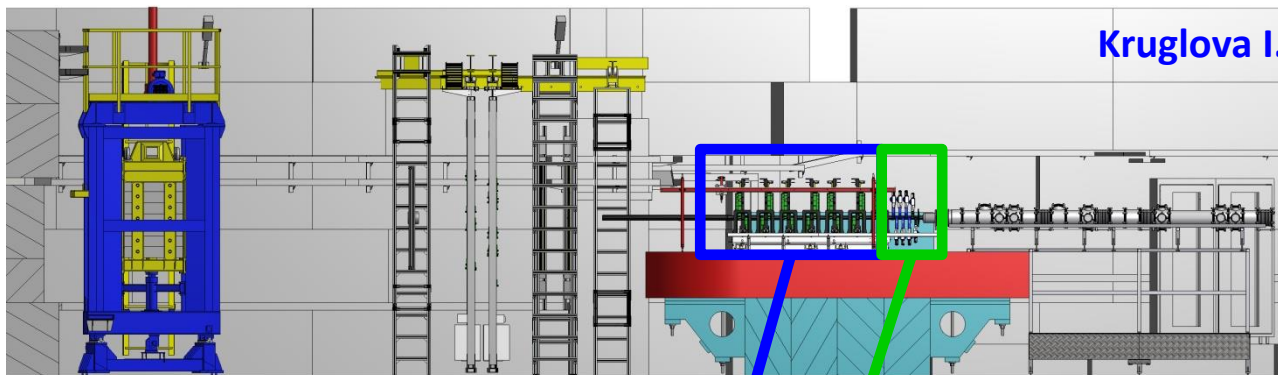


1. Carbon beam pipe is ready for installation: **Yes**
2. Target station is ready for installation : **Yes**

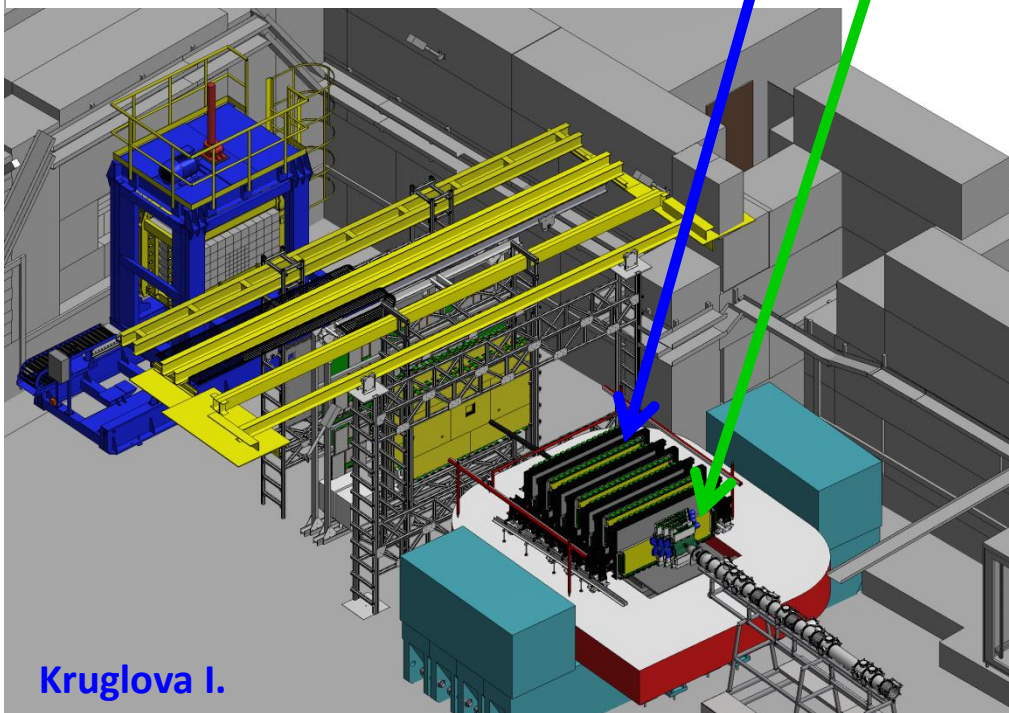


We will start installing the target station and carbon tube after installing the 7 bottom GEM detectors.

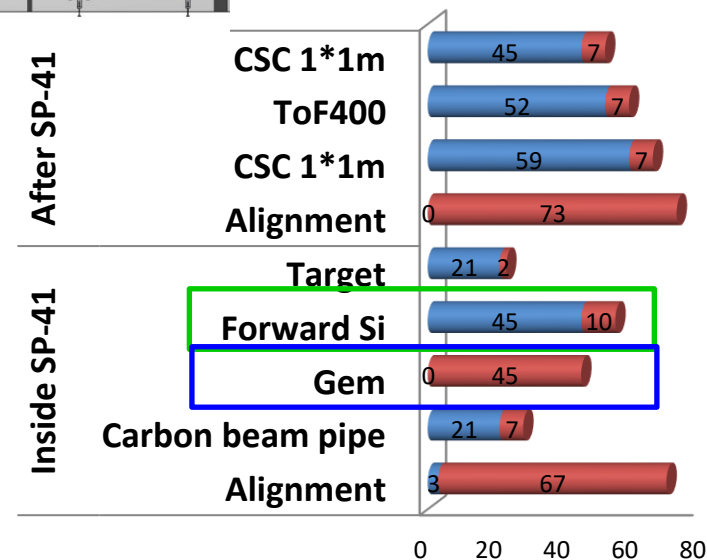
# Installation of 7 GEM detectors & Forward Si



**Kruglova I.** We will start installing the 7 top GEM detectors after installing the carbon beam pipe and target station.

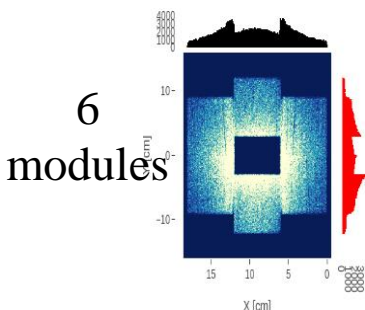


**Kruglova I.**



After installing all GEM detectors, Forward Si will be installed.

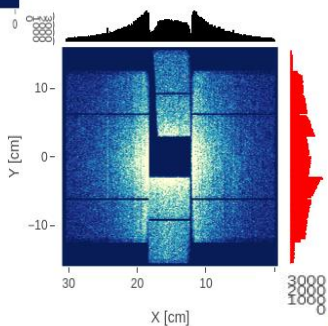
# Forward Si modernization



**PI#1:**  
 $I_d = 8.9 \mu\text{A} / 8.2 \mu\text{A}$   
*(100% chips work, there were no problems)*

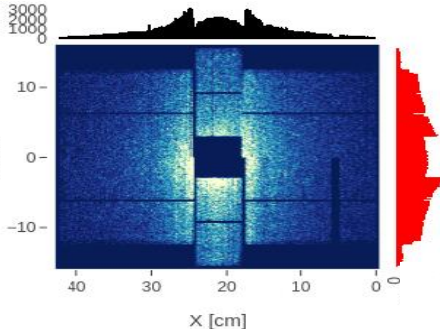
The correlation plots for Forward Si detectors obtained during Run 8.

10 modules



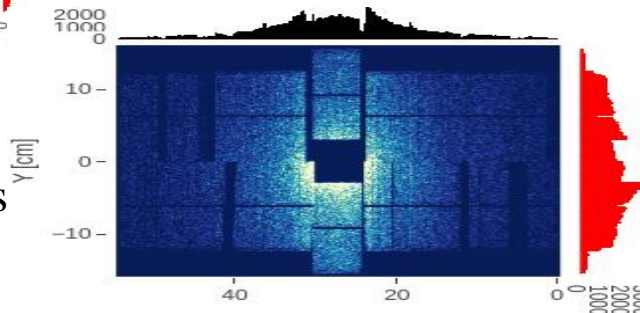
**PI#2:**  
 $I_d = 27.6 \mu\text{A} / 28.5 \mu\text{A}$   
*(1% chips didn't work = 1 chip of 100 pcs., as of 09/26/23 everything is 100% working)*

14 modules



**PI#3:**  
 $I_d = 40 \mu\text{A} / 48 \mu\text{A}$   
*(2 chips out of 140 do not work)*

18 modules

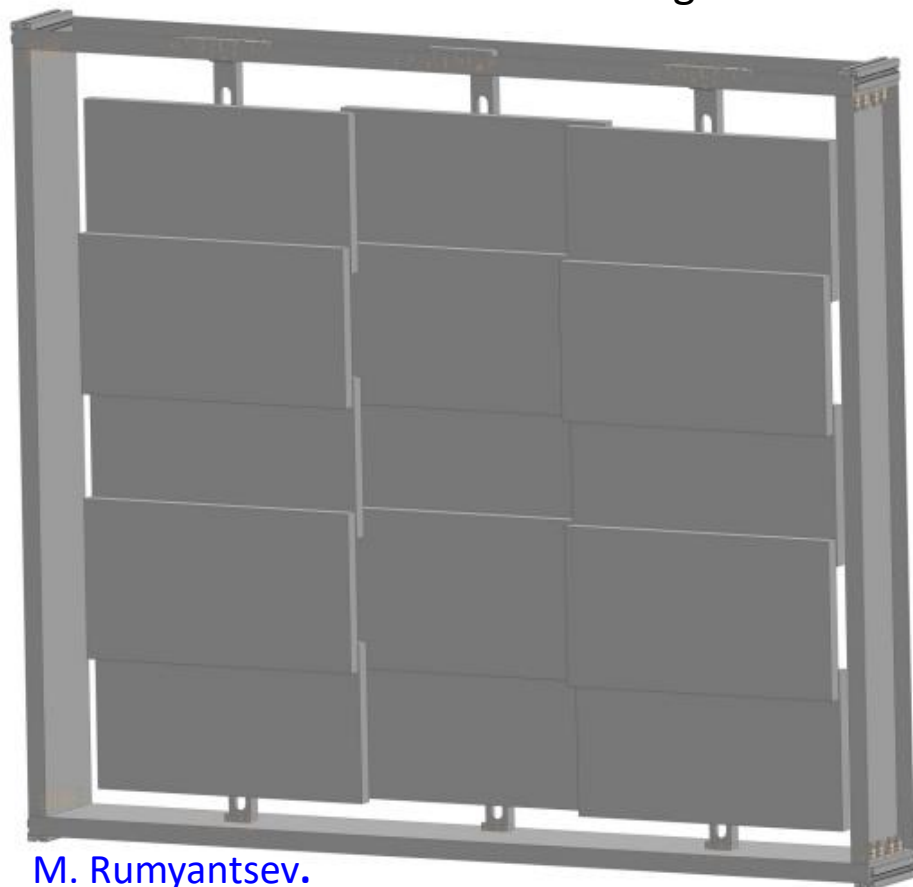


Forward Silicon experts are currently looking into underperforming sectors.

D. Chemezov will talk in more detail about the operation of Si detectors

# ToF400 modernization

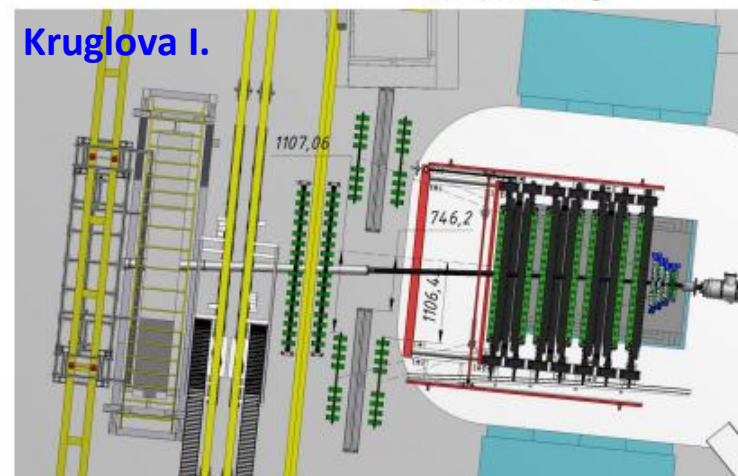
We decided to expand ToF400 acceptance.  
To do this we will have to change the detector boxes.



M. Rumyantsev.

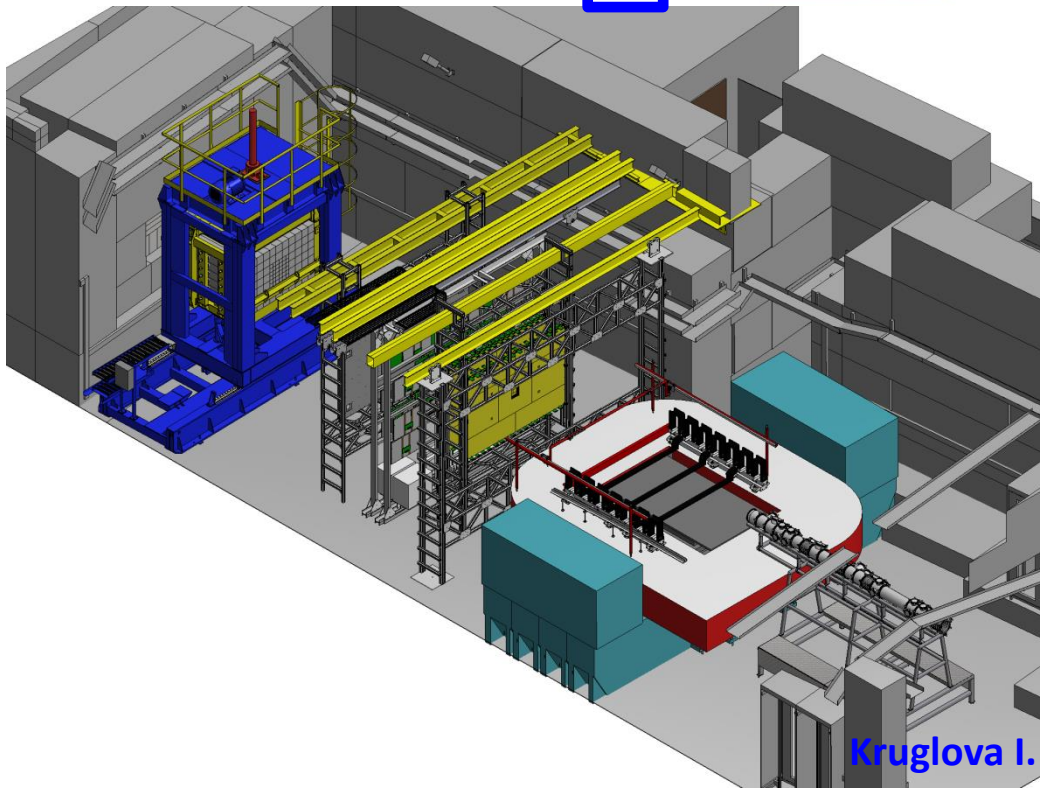
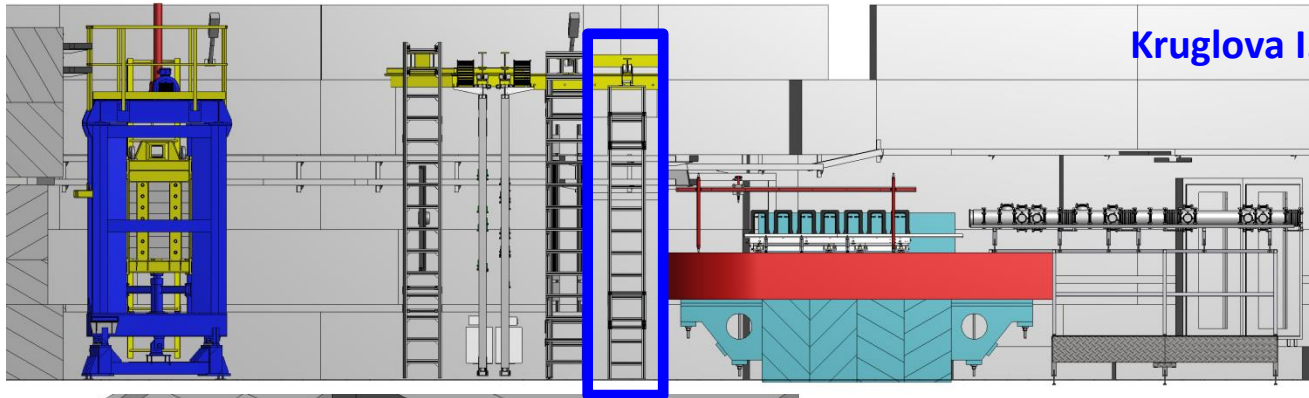
Box size -  $\sim 1,5 \times 1,8 \text{ m}^2$   
Material — aluminium  
Minimizing material budget near to beam axis

The aluminum box guides are currently fully manufactured



Assembled detectors will be ready by 15 May 2024

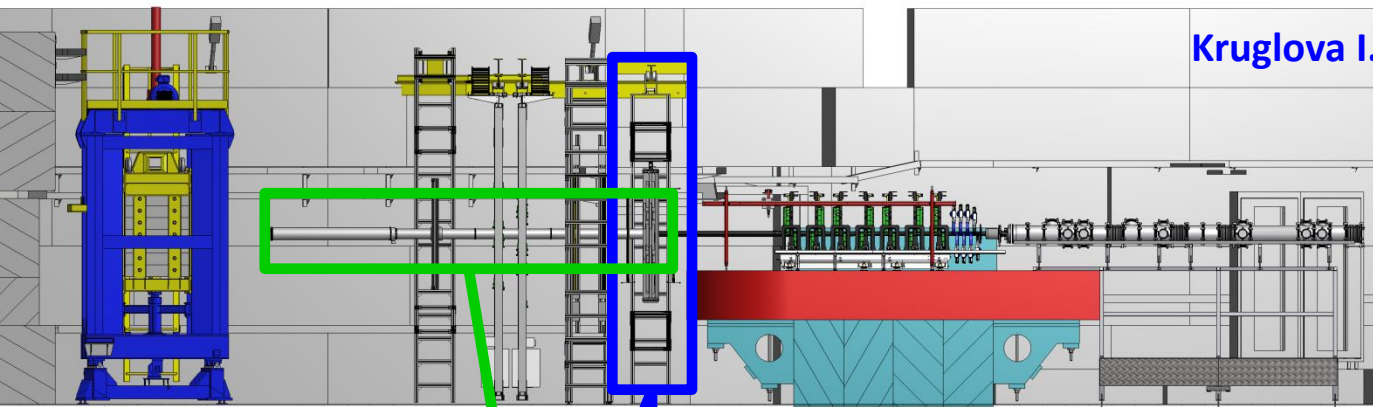
# Installation of 2 new ToF400



1. Mechanical support materials: **Yes**
2. Supporting structure for mechanical support : **Yes**
3. Brackets for fastening the supporting structure : **Yes**
4. Mechanical Support Project: **Yes**
5. The detector is ready for installation: **No (Modernization now)**

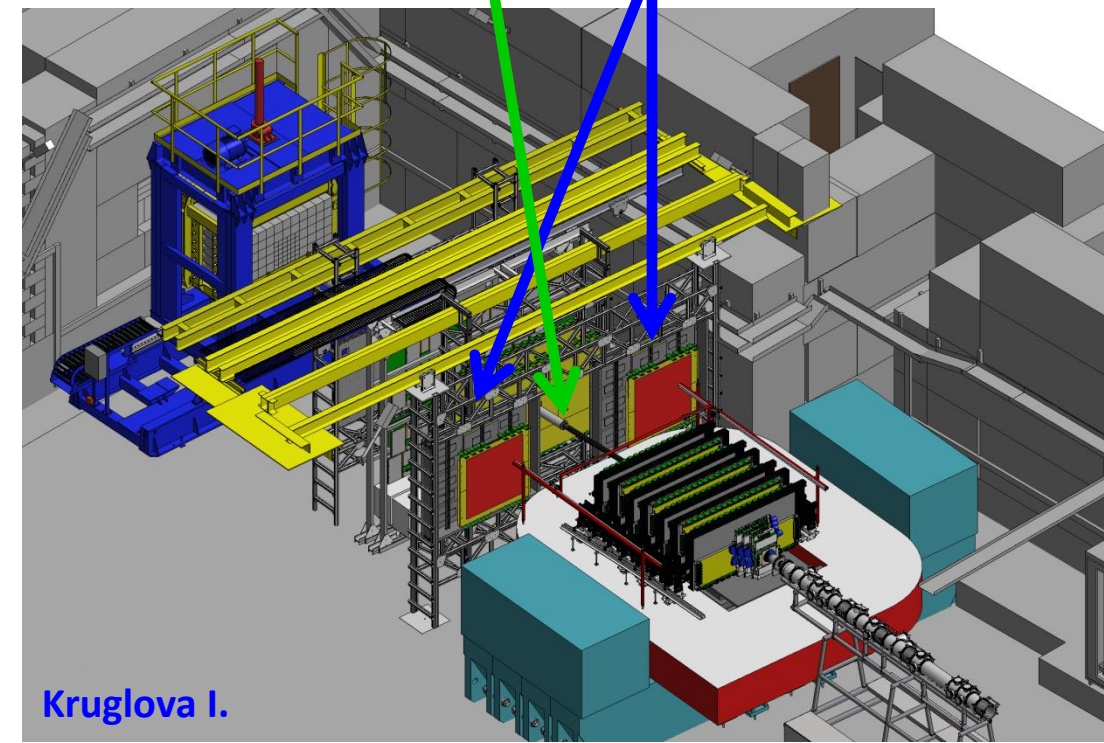
Mechanical support for new ToF400 modules installed in the experimental hall

# Installation of 2 ToF400 & 4 CSC & aluminum beam pipe

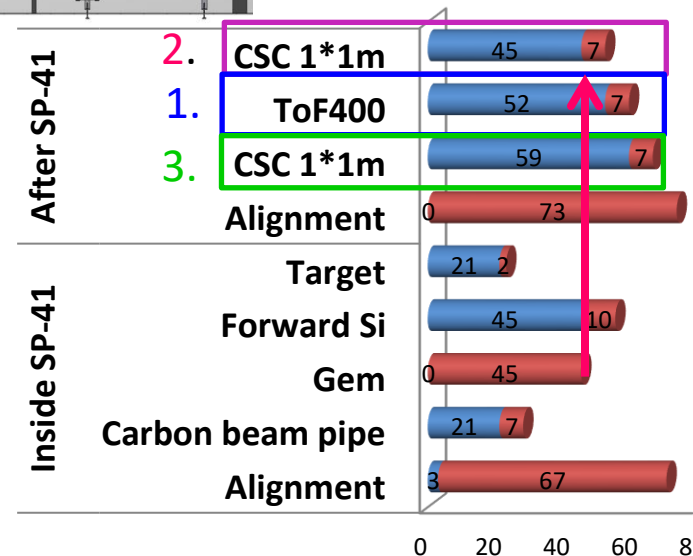


Kruglova I.

1. After installing all GEM detectors, 2 new ToF400 will be installed.
2. The next stage will be the installation of 4 CSC 1x1 m.

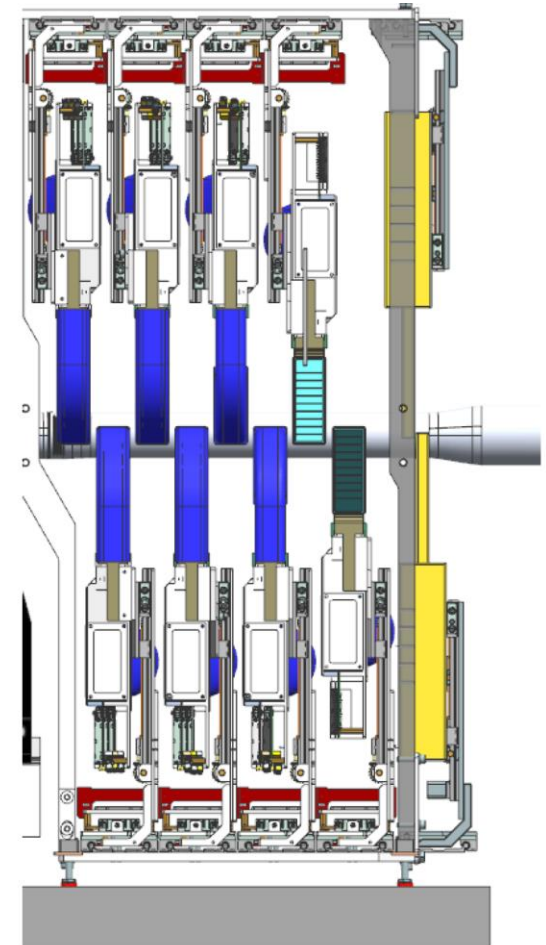
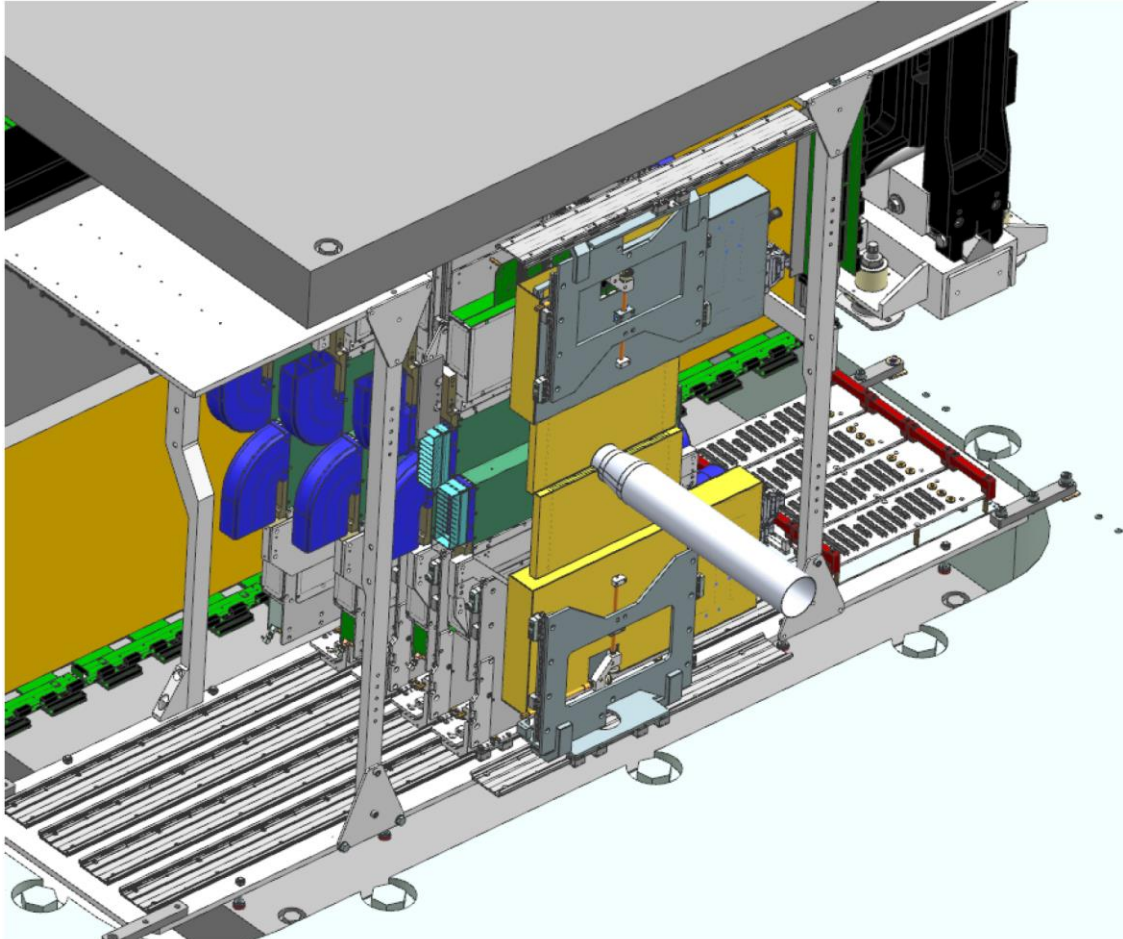


Kruglova I.



We will be able to install the last 4 CSC only after the 2 ToF400 detectors are fully installed.

# Installation Si-station based on STS modules



D. Dementev will talk in more detail about the operation of **Si-station**



# Conclusion

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1. All work on the design and creation of mechanical supports was completed, taking into account the modernization of the external track system of the **BM@N** installation.
2. The installation of a central tracking system inside the **SP-41** magnet will begin after the completion of the modernization process of the detectors themselves.
3. **ScWall** & 2 big **CSC** installed in the experimental hall of the **BM@N** installation.
4. Mechanical support for 2 new **ToF400** & 4 **CSC** installed in the experimental hall.



**THANK YOU  
FOR YOUR  
ATTENTION**

