Detectors in the Xe run and plans

Piyadin S.M.

15.05.2023

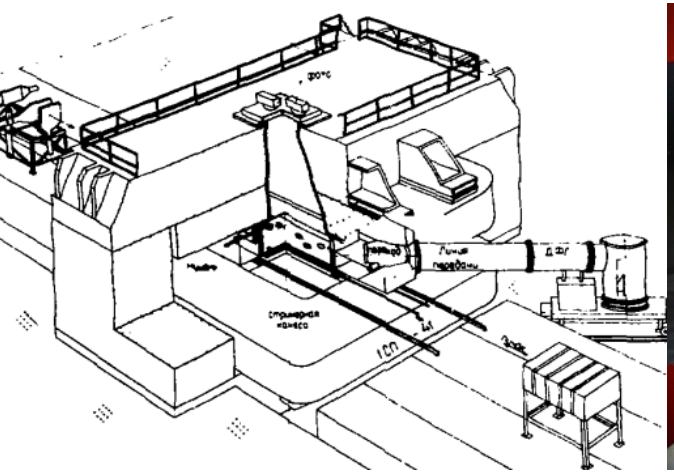
Content of the report

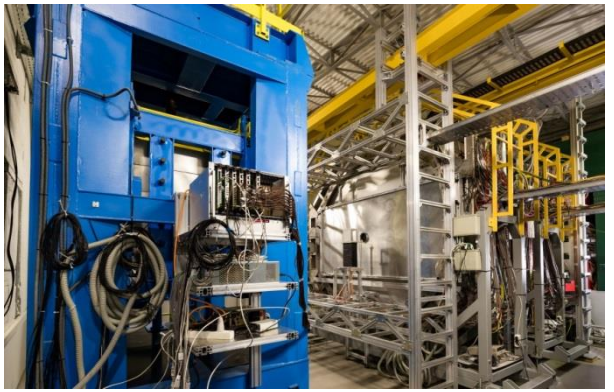
BM@N experimental hall

2012 → 2022

BM@N experimental hall

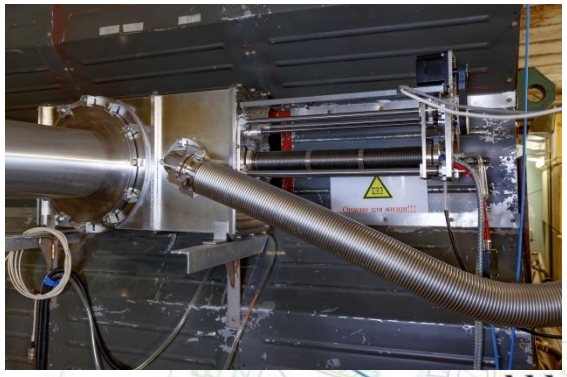
1992 → 2012 → 2022

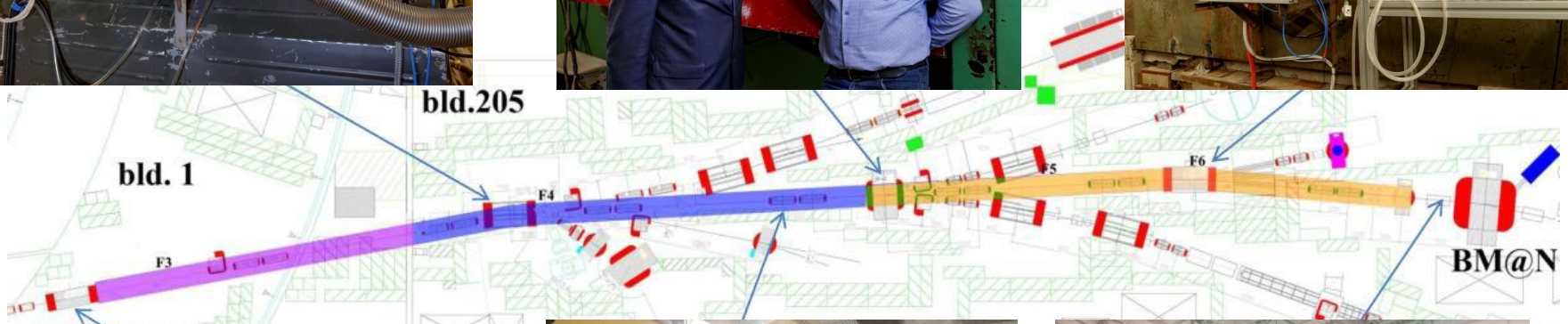




Development of the ion beam pipe from Nuclotron to BM@N

S. Yu. Anisimov **LLC "Vacuum systems and technologies"**





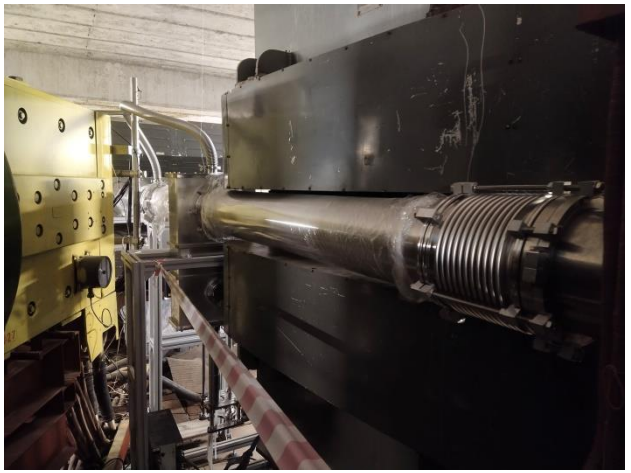
7 pairs of quadruple lenses; 6 magnets; 9 ion beam profilometers

Development of the ion beam pipe from Nuclotron to BM@N

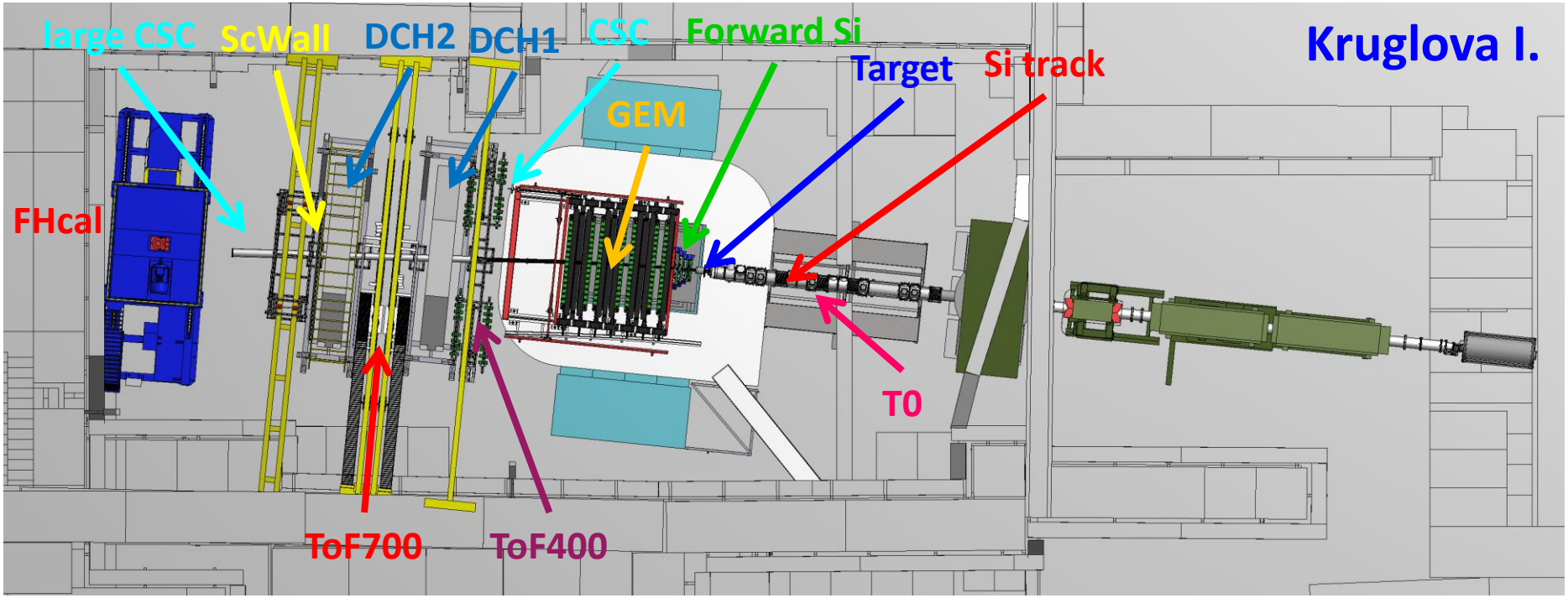
Main elements of the beam pipe:

- Vacuum compatible tubes with ISO200 flanges (the total length is about of 63 m)
- Ion beam profilometers (9 pcs)
- Vacuum boxes for magnets (4 pcs)
- Vacuum pump stations based on roots vacuum pumps (6 pcs)
- Vacuum gate valves (14 pcs)
- Vacuum radiation resistant gauges with controllers (21 pcs)
- Support stages for the ion beam pipe elements (29 pcs)

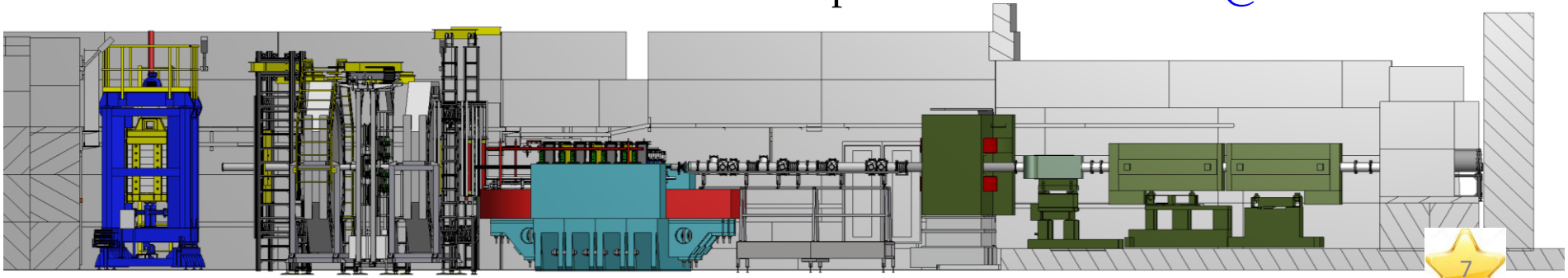
100% of the elements are produced



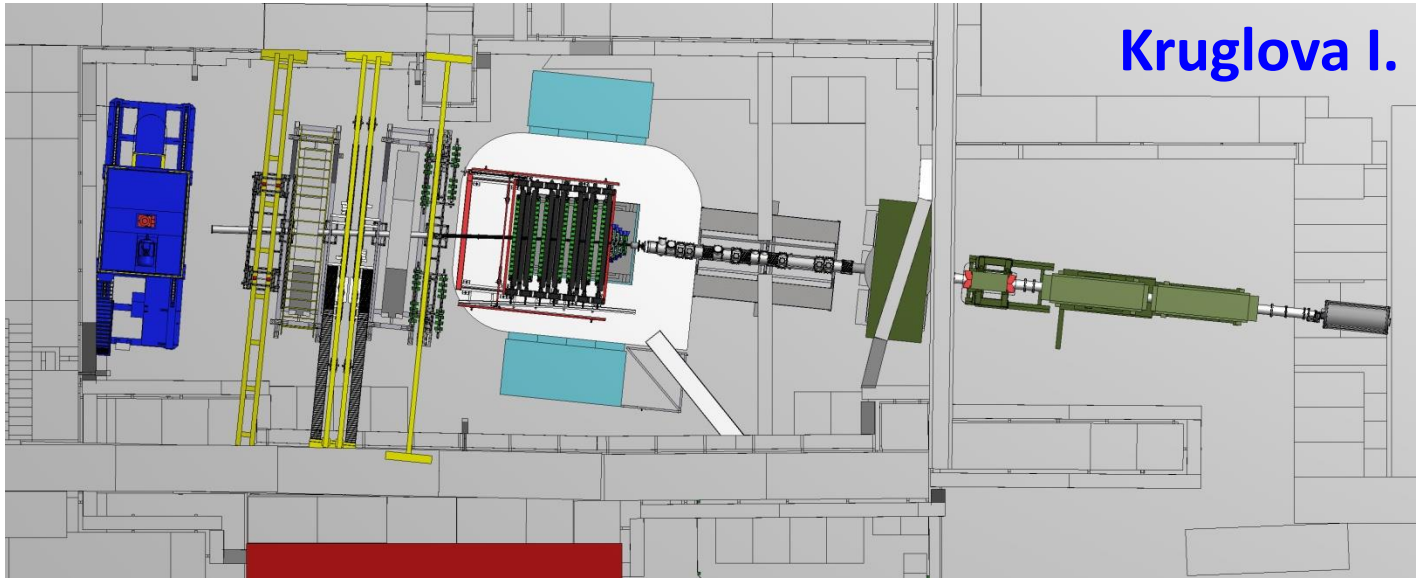
Detector installation in BM@N experimental hall

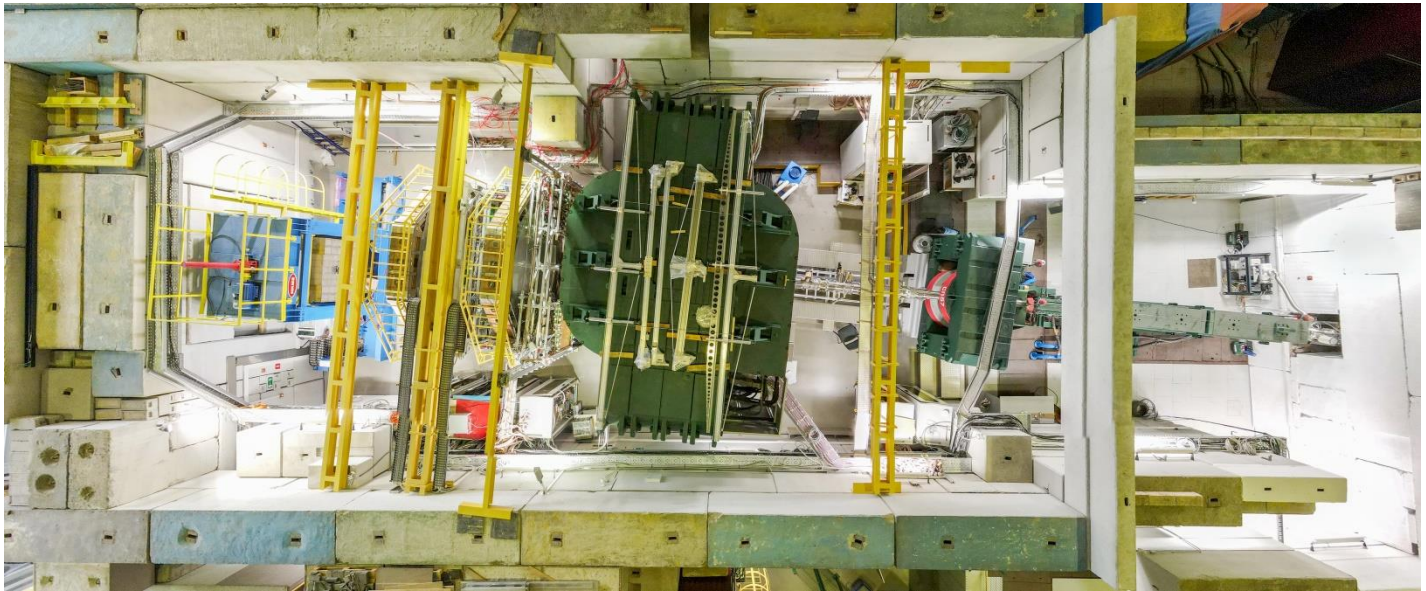


3D model of the entire experimental hall of BM@N

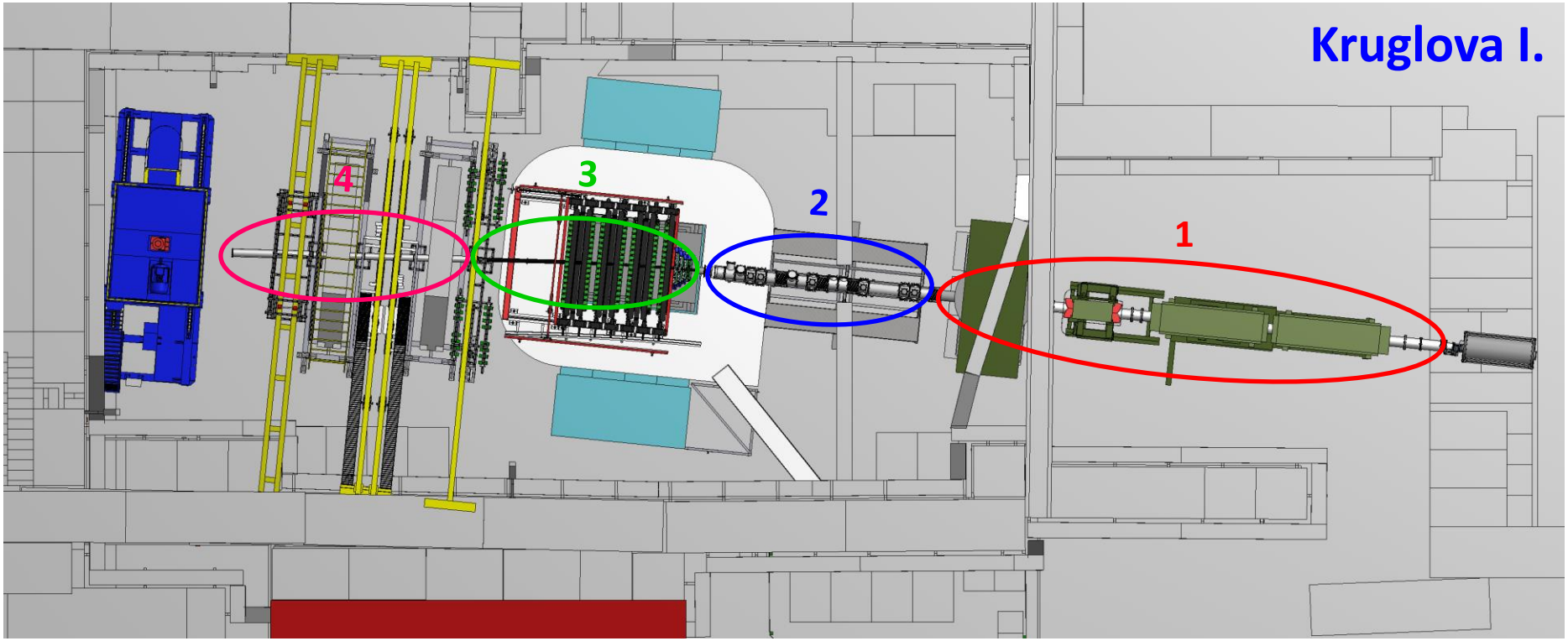


Detector installation in BM@N experimental hall



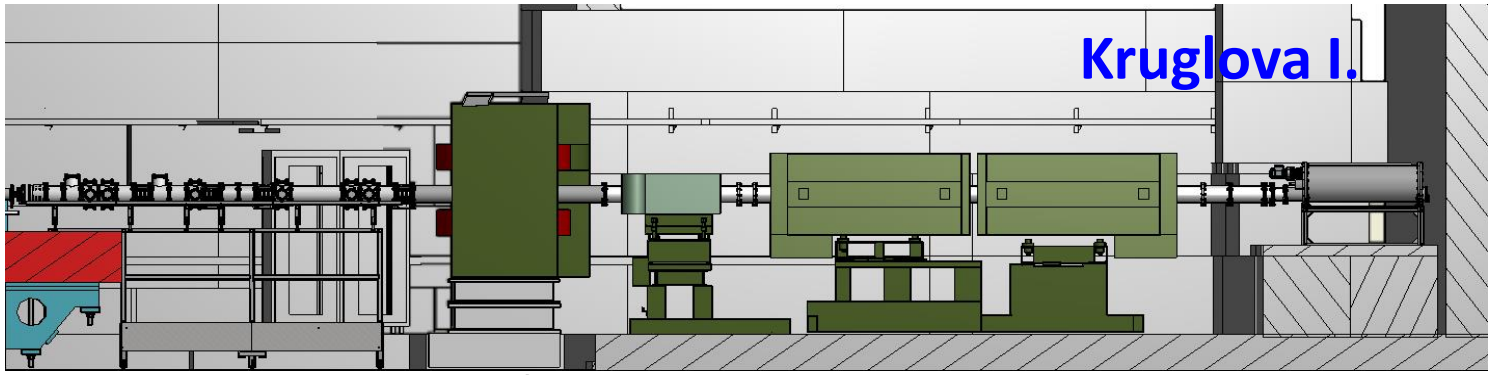


4 segments of vacuum beam pipe in experimental hall of BM@N



1. Beam pipe segment made of stainless steel
2. Stainless steel beam pipe + 4 aluminum elements
3. Carbon beam pipe
4. Aluminum beam pipe

Beam pipe segment made of stainless steel



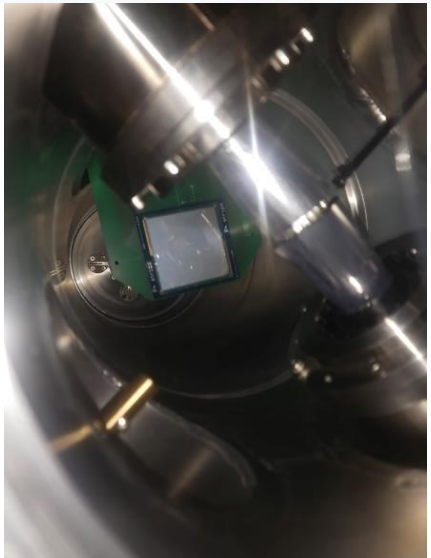
3D view of the beam pipe upstream the target

1. Vacuum pump station based on roots vacuum pump (1 pcs)
2. Vacuum gate valves (2 pcs)
3. Vacuum radiation resistant gauges with controllers (2 pcs)
4. Support stages for the ion beam pipe elements (2 pcs)

Beam pipe upstream the SP-41

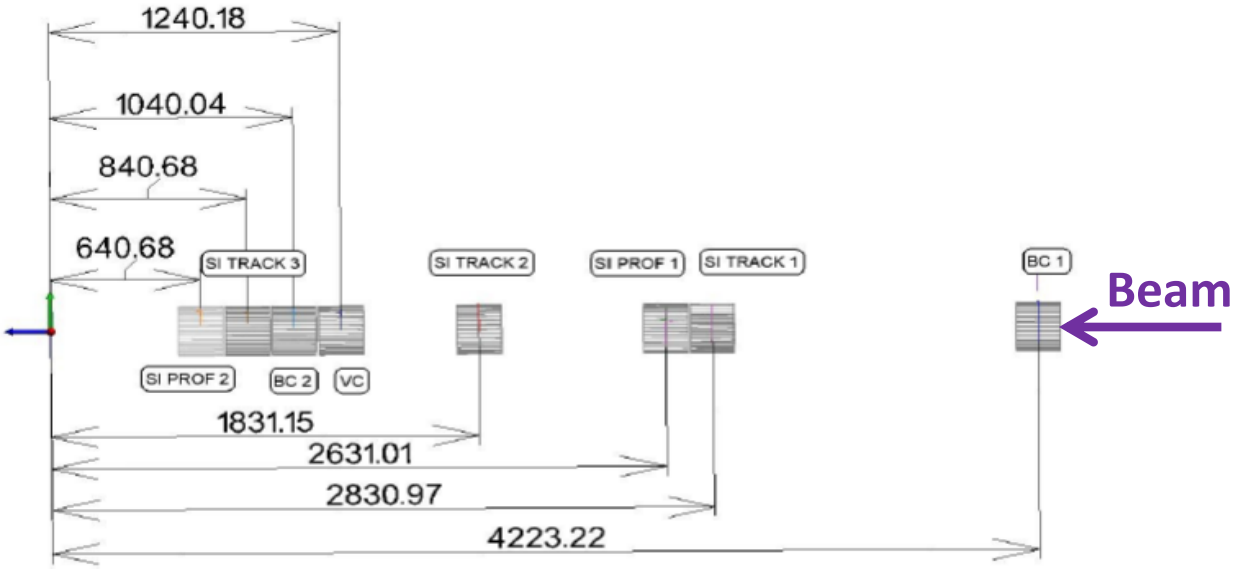
External view of vacuum beam pipe with installed detectors.

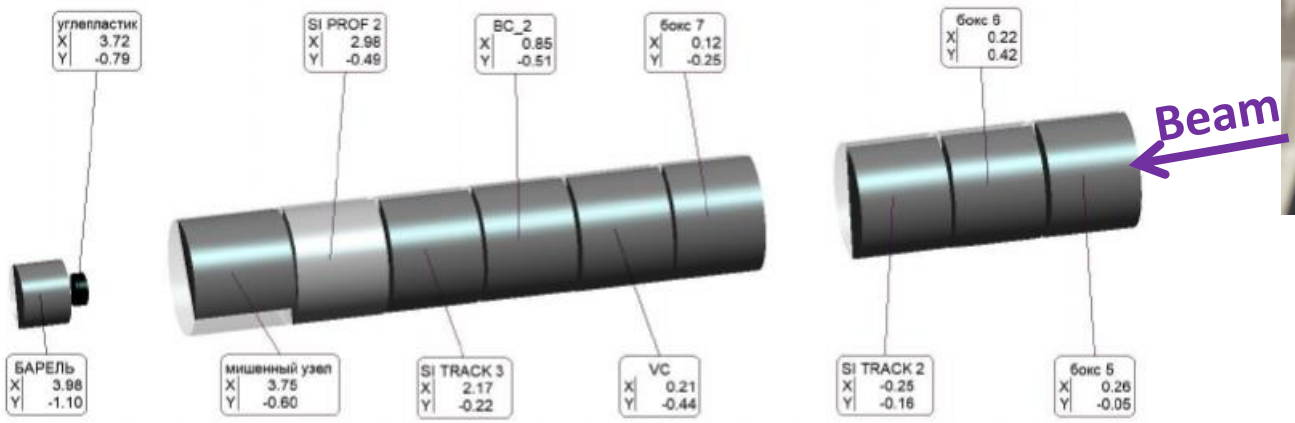
View from the inside of a vacuum beam tube with installed detectors.



We have developed a design that allows you to arrange the elements of the beam pipe in a different order. The foto shows the selected configuration and sequence of vacuum boxes of the beam pipe.

Beam pipe upstream the SP-41

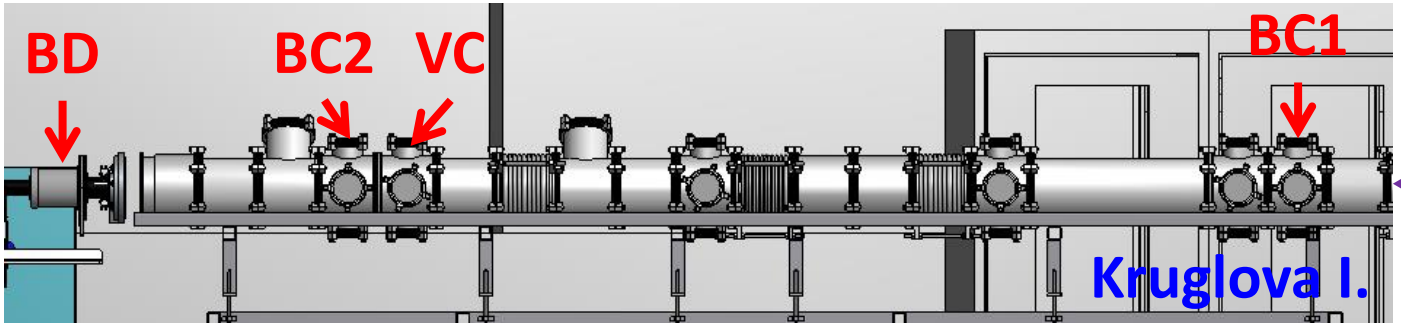




Adjustment of the support for the beam pipe for different detectors

Taking measurements during adjustment

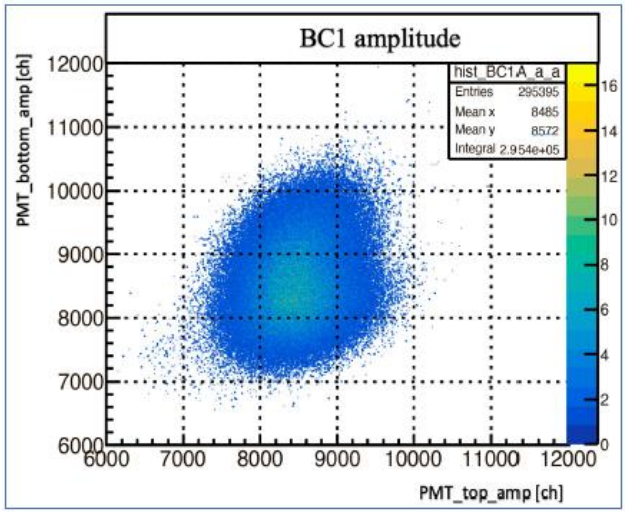
Beam pipe upstream the SP-41
Trigger detectors



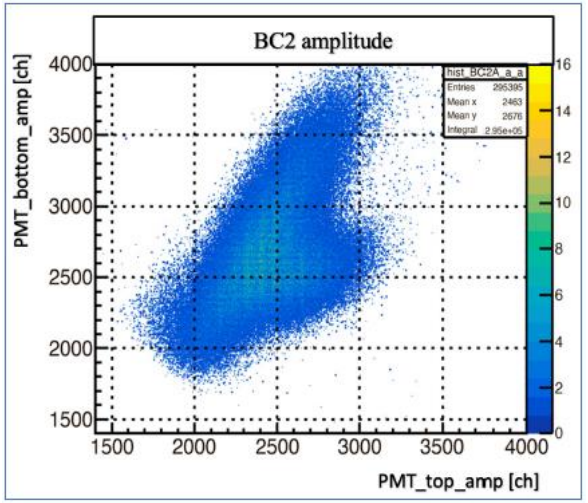
The position of the trigger detectors in a complete vacuum beam pipe configuration

All elements counter BC2

Amplitude correlation from two PMTs BC1 counter

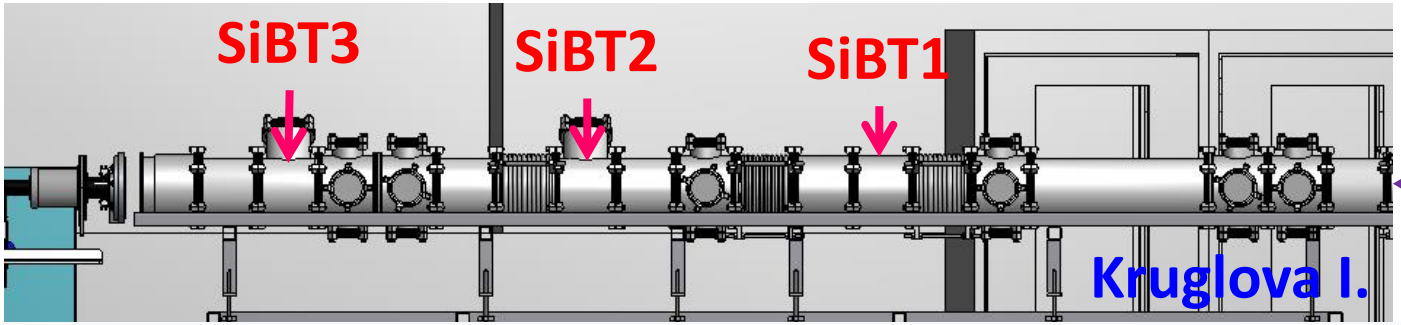


Amplitude correlation from two PMTs BC2 counter

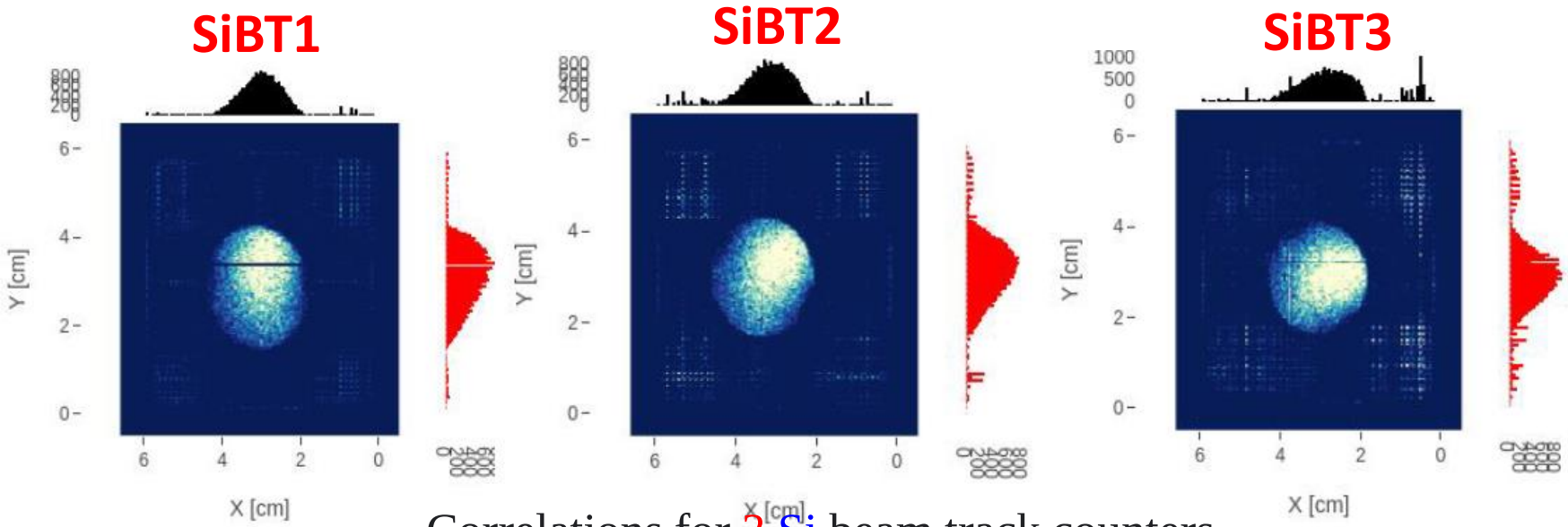


V.Rogov will talk in more detail about the operation of trigger detectors

Beam pipe upstream the SP-41
Si Beam Tracker detectors



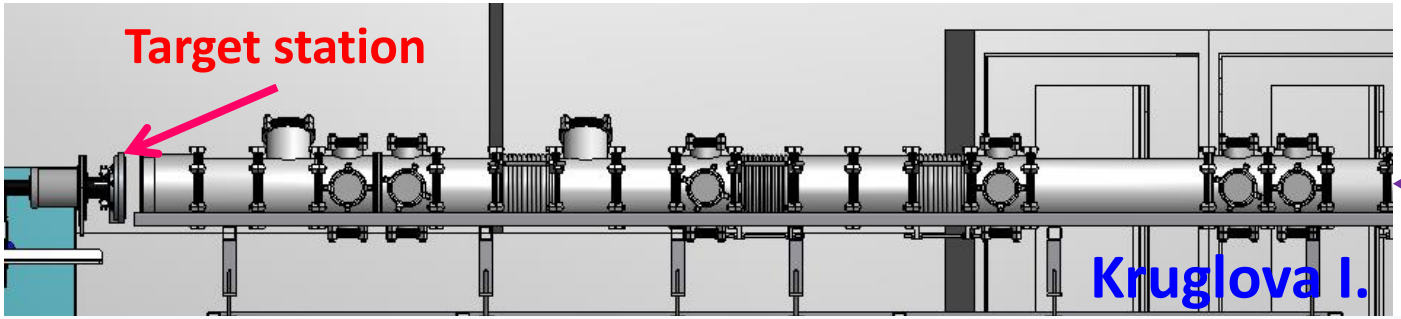
The position of the Si beam track counters in a complete vacuum beam pipe configuration



Correlations for 3 Si beam track counters

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

Beam pipe upstream the SP-41 Target Station



The position of the Target Station in a complete vacuum beam pipe configuration

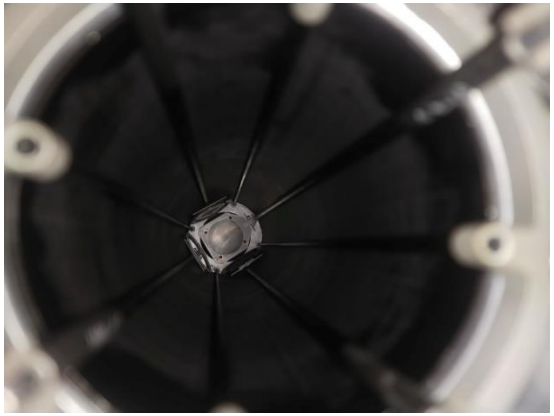
Target station with pneumatic motors:

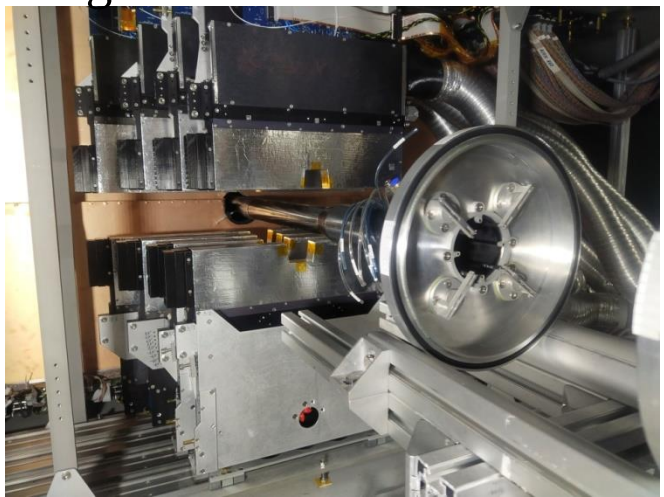
3 target + 1 without target for evaluating background;

Drive: pneumatic motors;

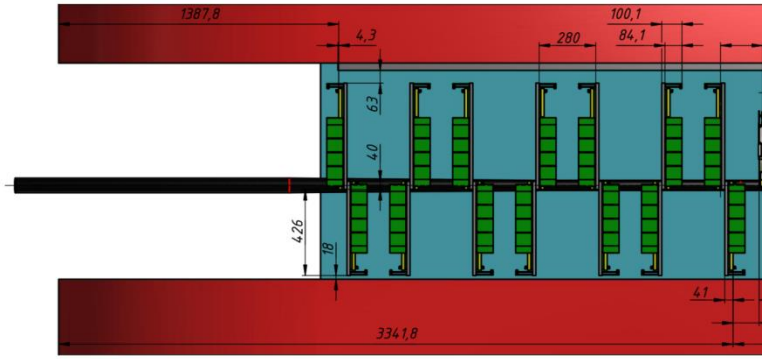
Target elements: use with non-magnetic materials;

Target installation control: KTIR0411S optocoupler (4 pcs.).

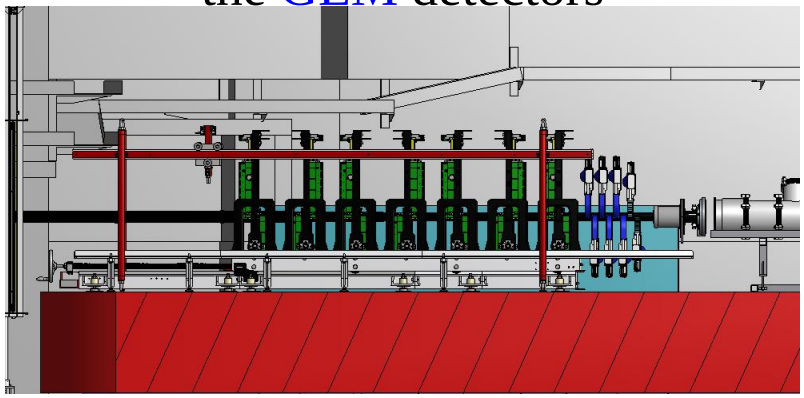




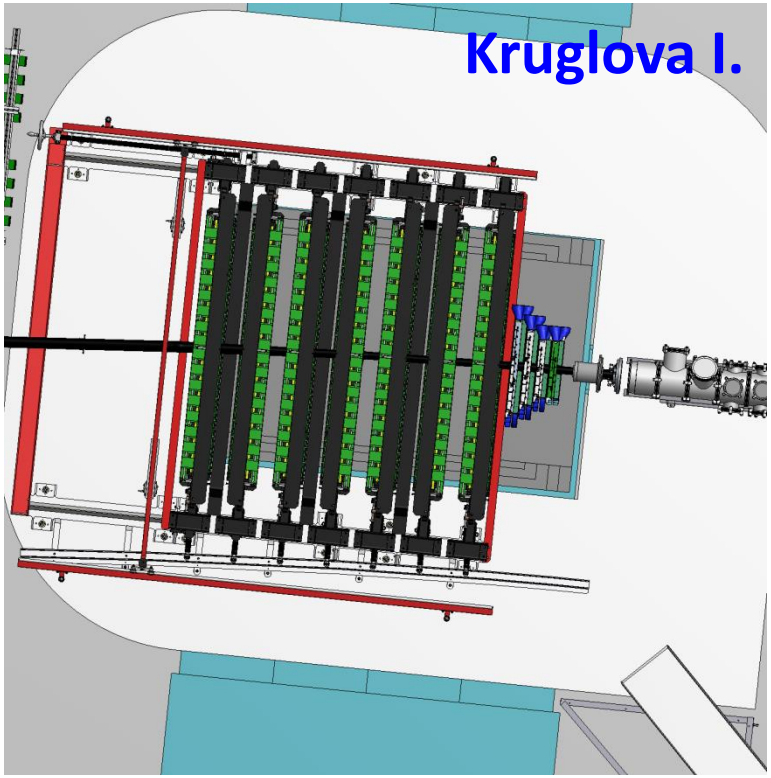
Inside the SP-41



Demonstration of distances between the surface of the analyzing magnet and the GEM detectors

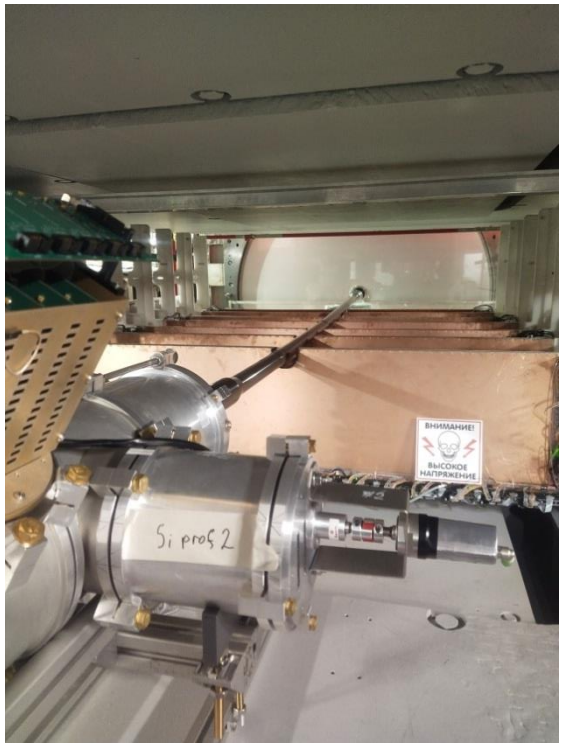


3D model of GEM detectors. Side view



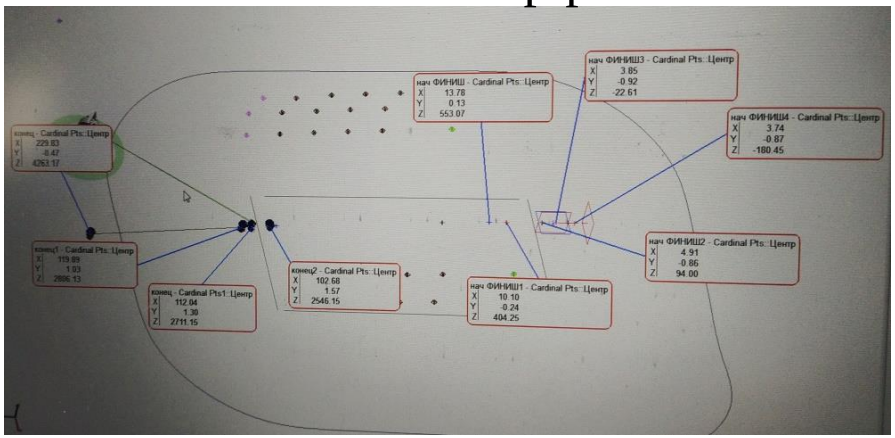
3D model of GEM detectors. Top view

Inside the SP-41
Carbon beam pipe

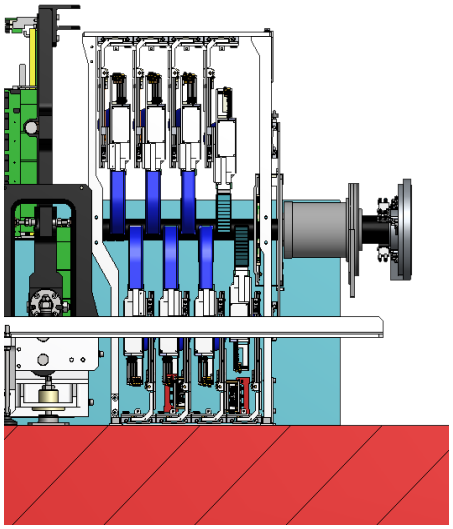


The position of the carbon beam pipe with installed lower GEM detectors

The moment of adjustment of the carbon beam pipe



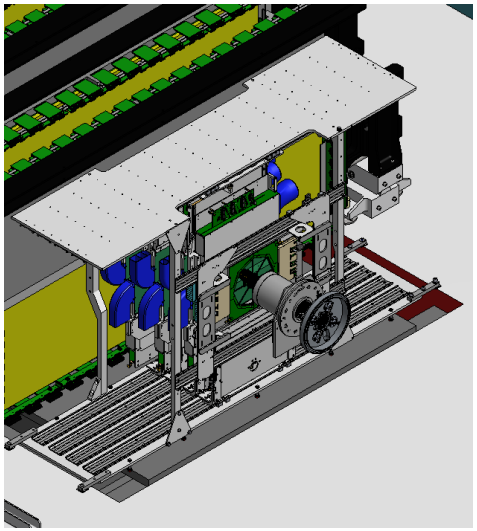
Inside the SP-41
Forward Si detector

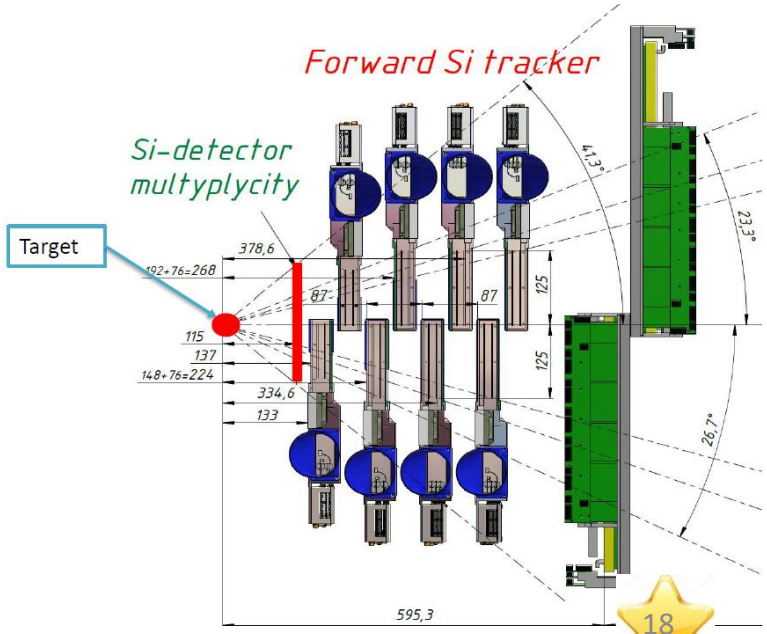


Yu.Kopylov & O.Tarasov
will talk in more detail about
the operation of Si detectors

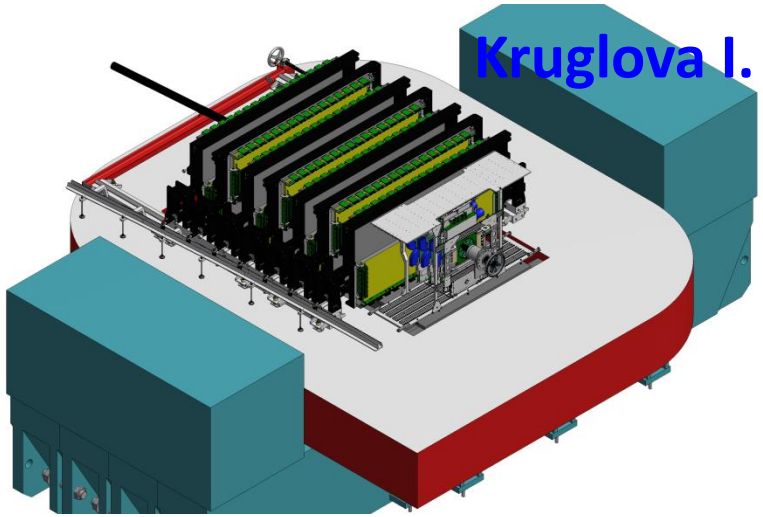
forward SI installed in BM@N

3D view of forward Si





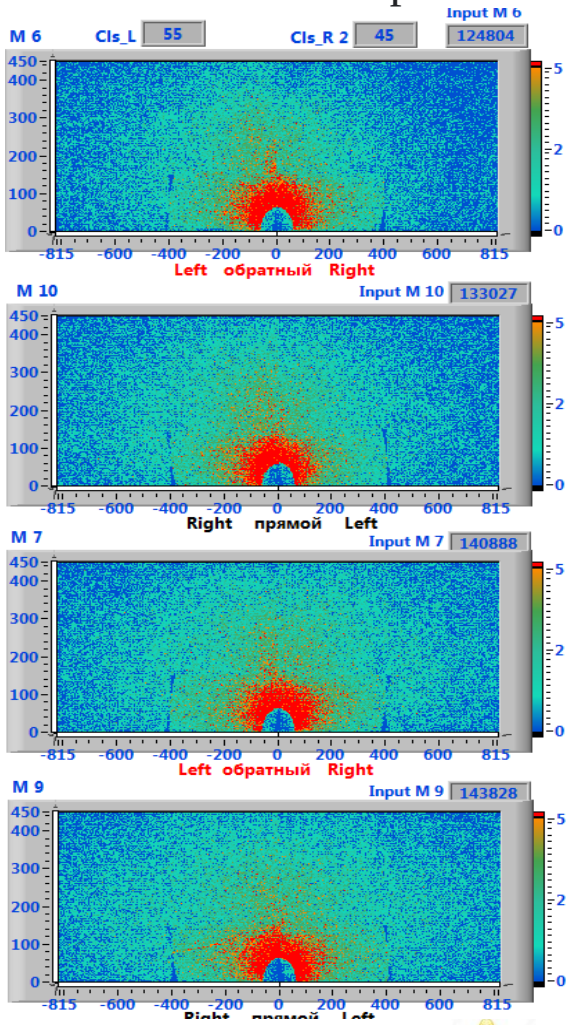
Inside the SP-41
14 Gem detectors



3D model of GEM detectors.

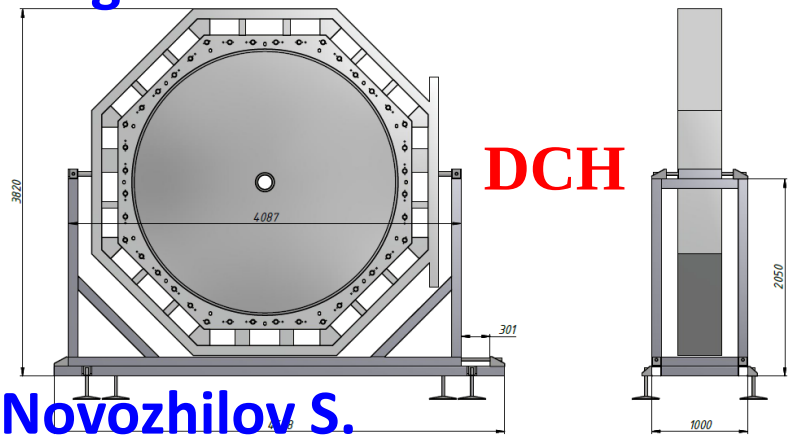
A.Galavanov will talk in more detail about the operation of GEM detectors

Correlations for 4 GEM top detectors



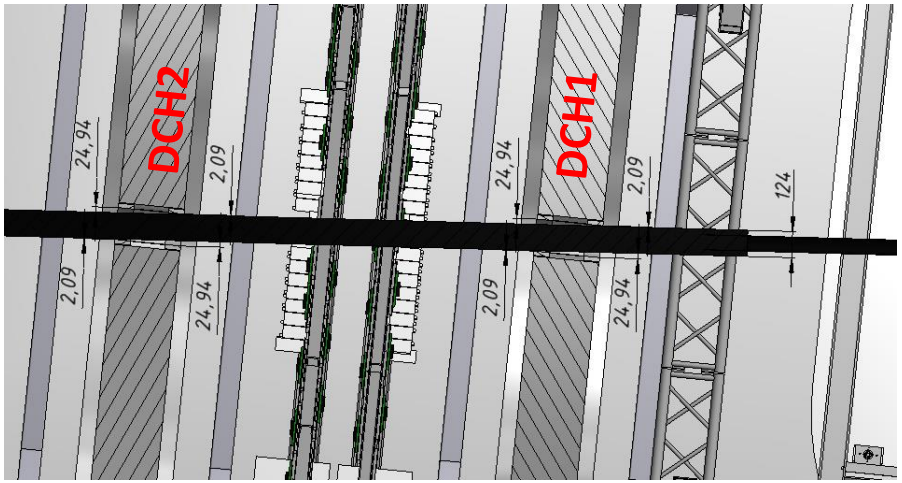
Beam pipe downstream the SP-41

Kruglova I.



DCH

Novozhilov S.

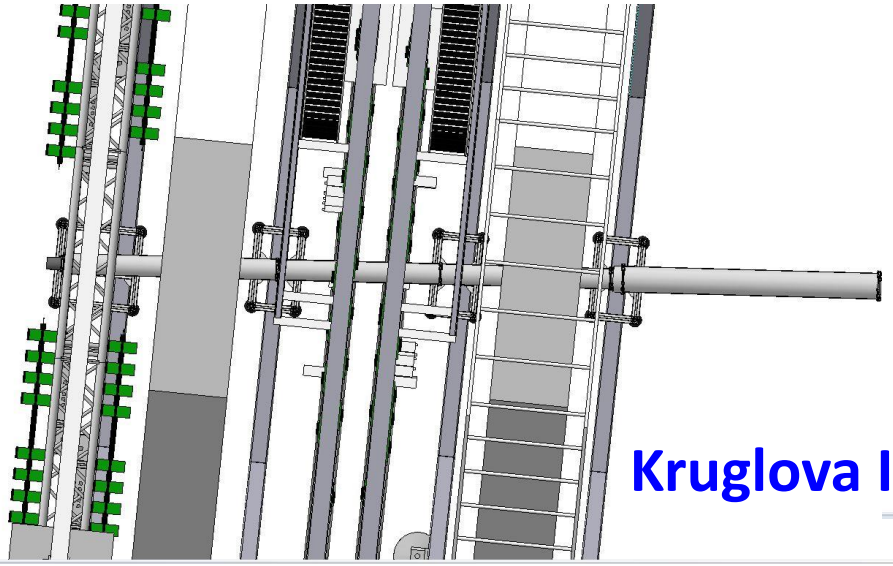


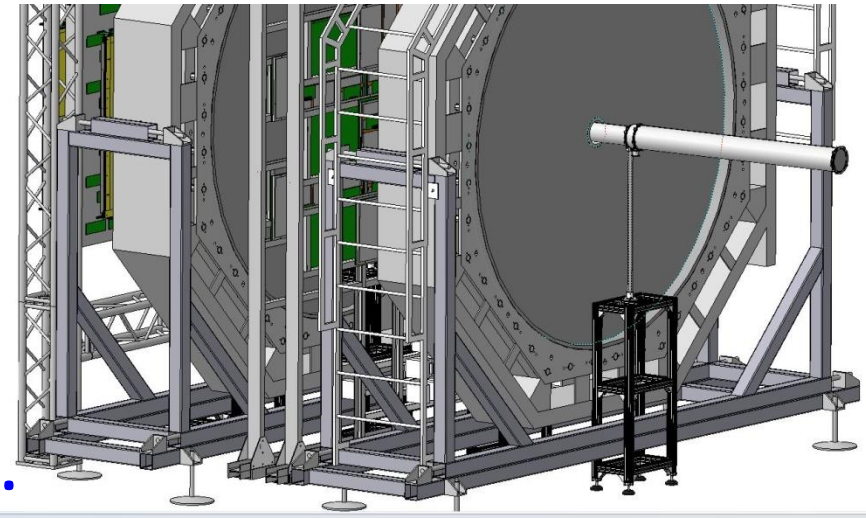
3D view of DCH

Gaps between DCH flanges and aluminum beam pipe

Researchers are connecting and testing the DCH after rearranging and aligning the detectors

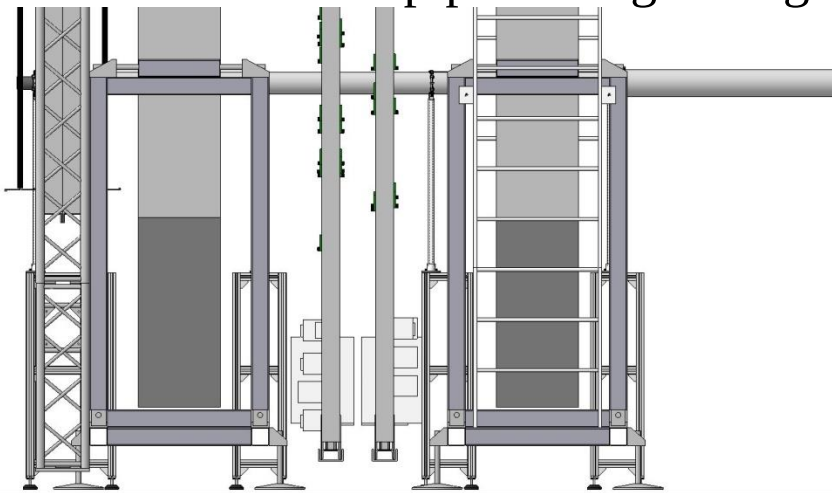
Beam pipe downstream the SP-41

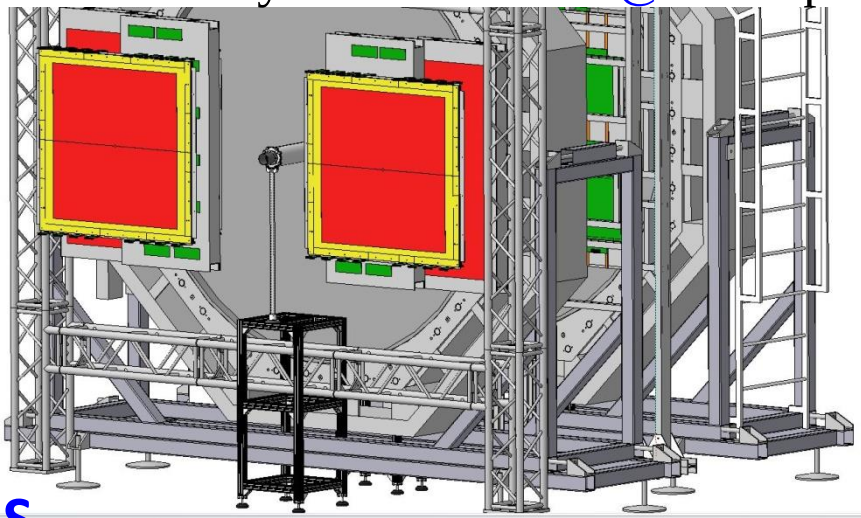




Kruglova I.

3D model of beam pipe tracing through outher tracker system of the BM@N setup

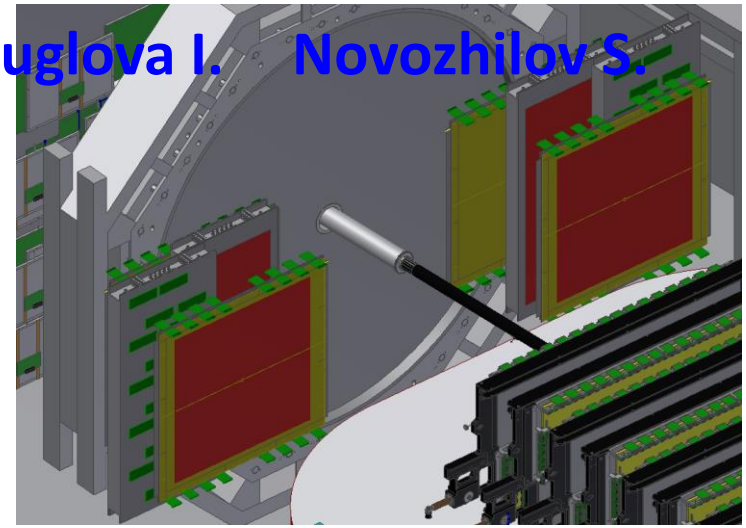




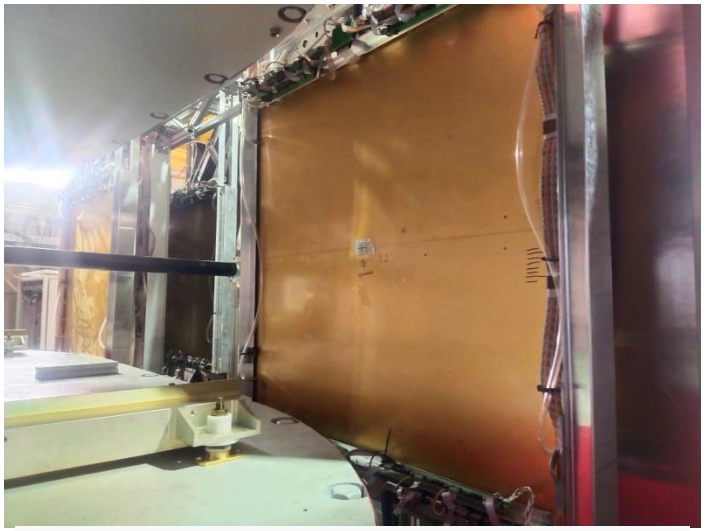
Novozhilov S.

Beam pipe downstream the SP-41
CSC 1x1 m

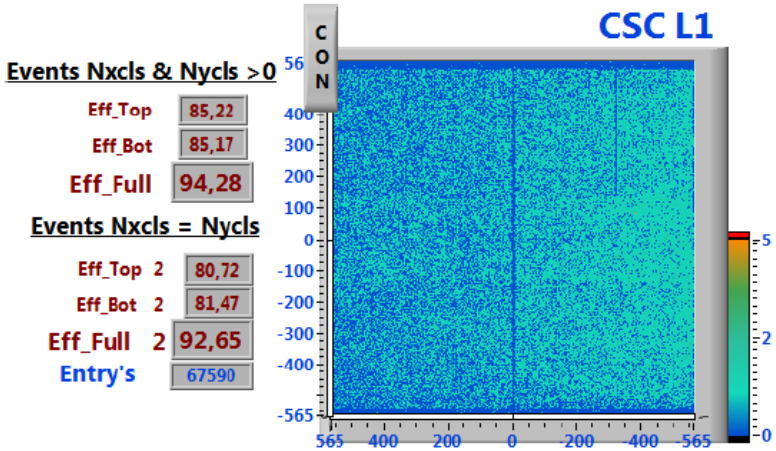
Kruglova I. Novozhilov S.



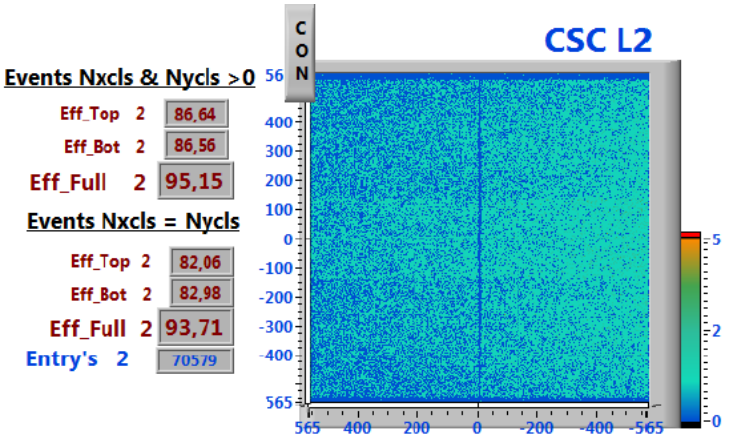
3D view of CSC



Realistic view of installed CSC



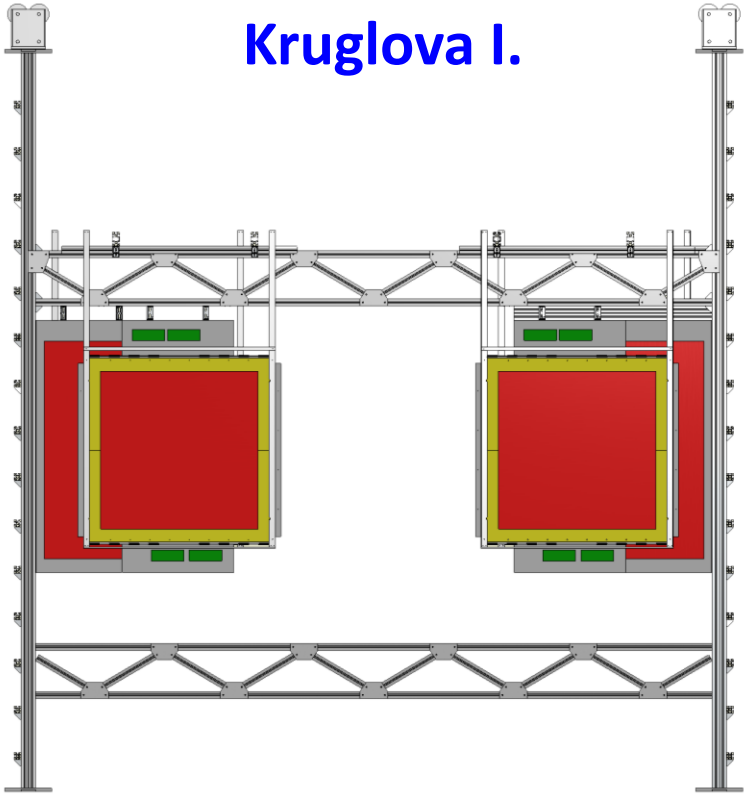
Correlations for 2 CSC detectors

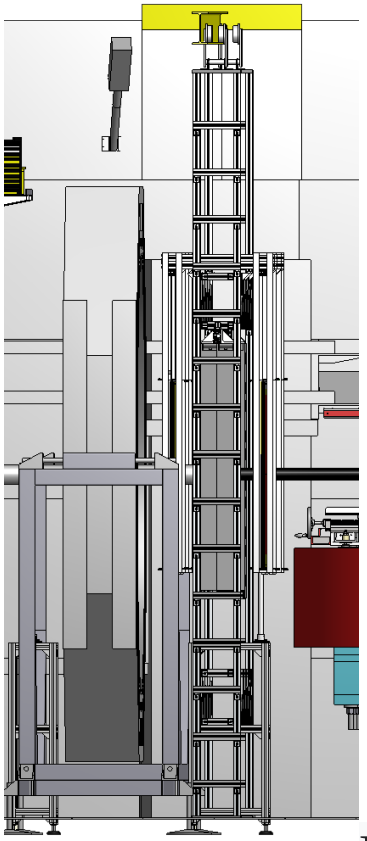


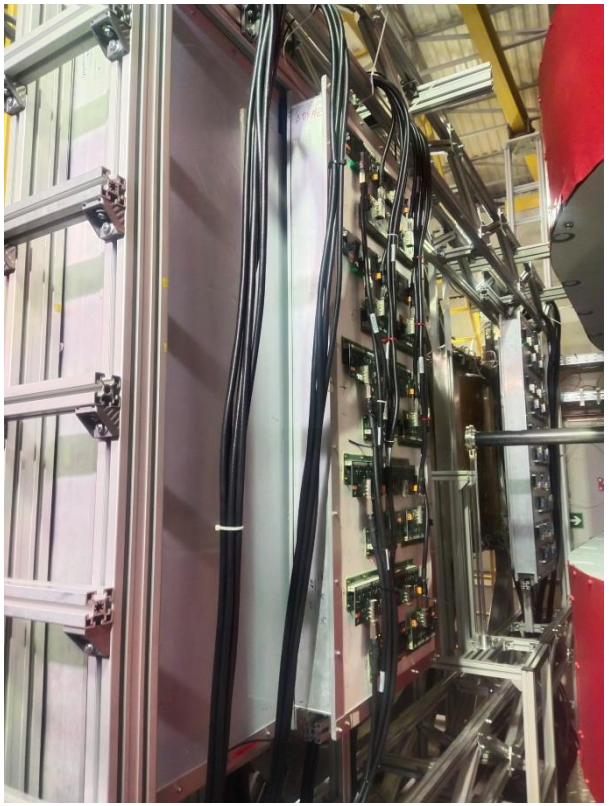
A.Galavanov will talk in more detail about the operation of CSC detectors

Detectors downstream the SP-41
ToF400

Kruglova I.







3D view of mechanical support of new type for Tof400 & CSC

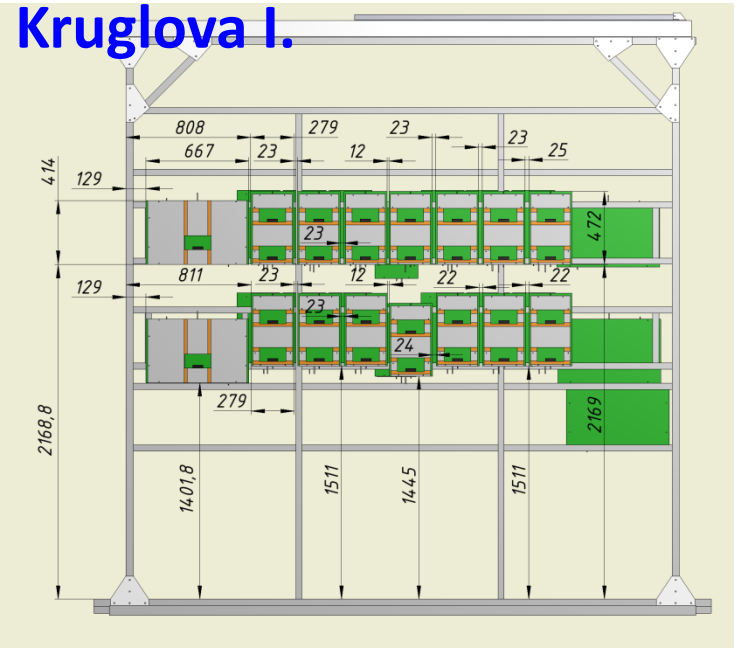
Realistic view of installed ToF400

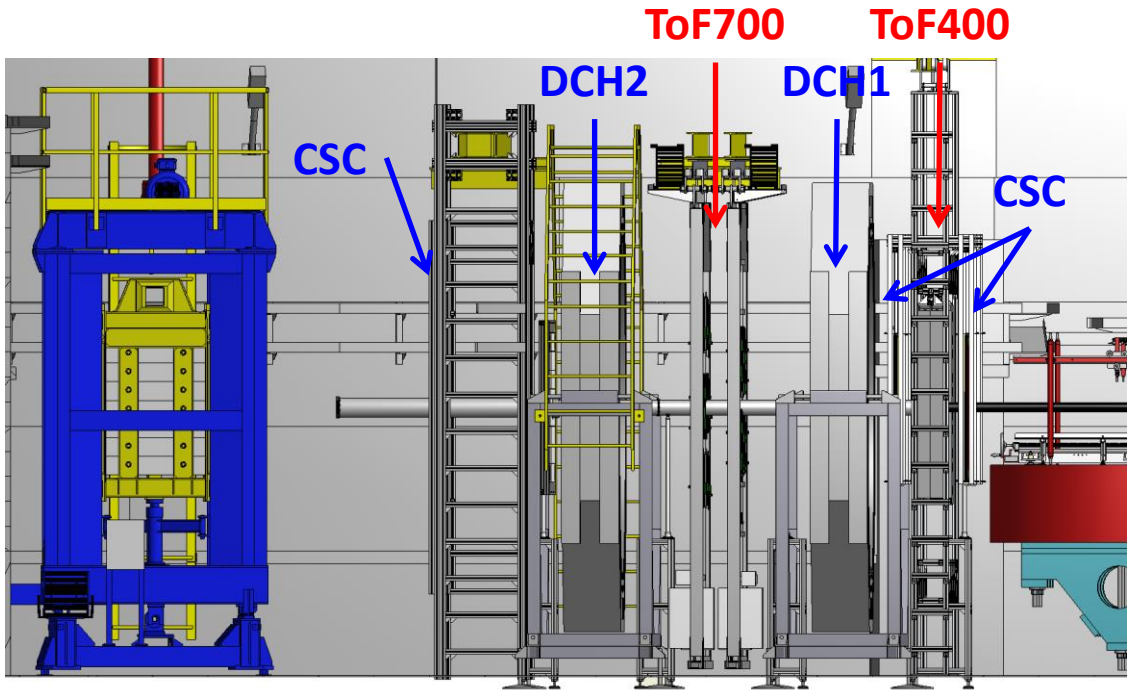
M.Rumyantsev will talk in more detail about the operation of ToF400 detectors

Detectors downstream the SP-41

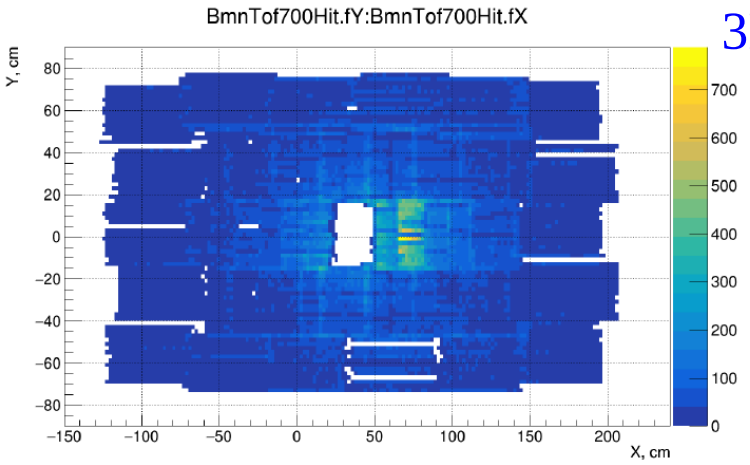
ToF700

Kruglova I.





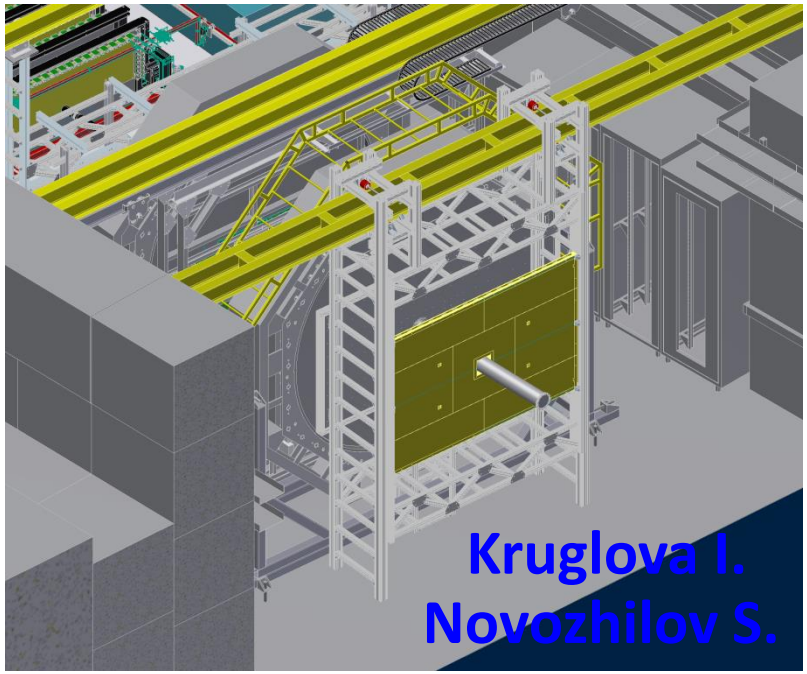
3D view of mechanical support of new type for Tof700



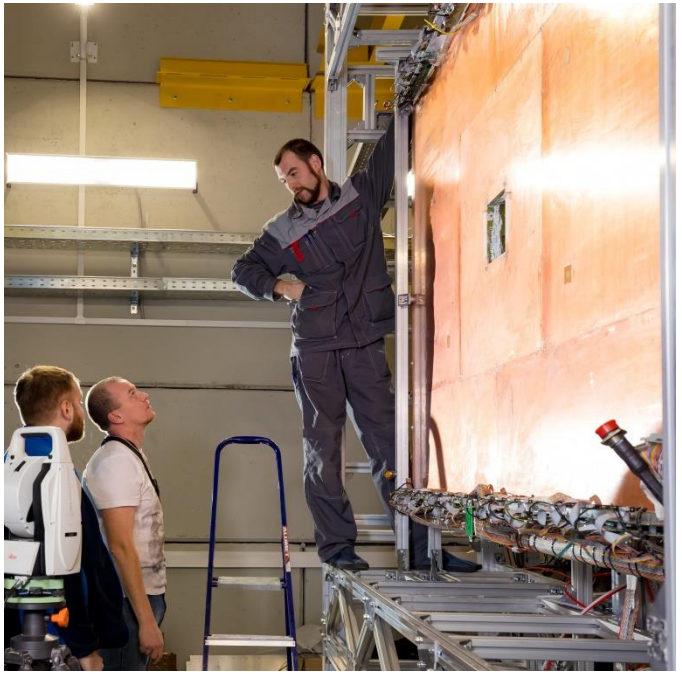
Correlations
for ToF700

M.Rumyantsev will talk in more detail about the operation of ToF700 detectors

Detectors downstream the SP-41
Large CSC



3D view of mechanical support for installation of large CSC 1.5x2m

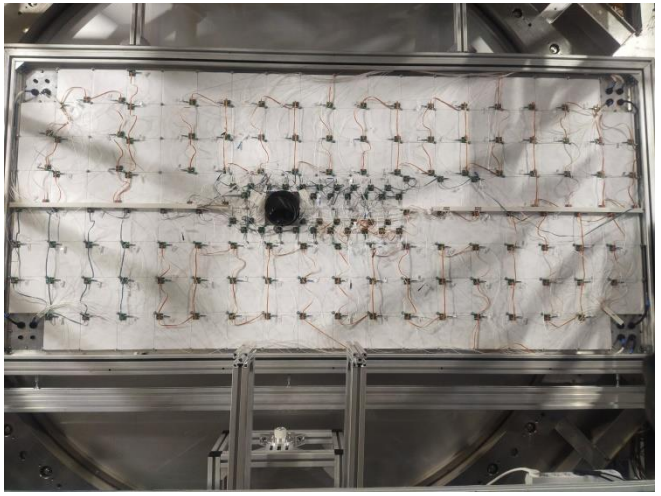


Procedure for adjusting a large CSC

A.Galavanov will talk in more detail about the operation of CSC

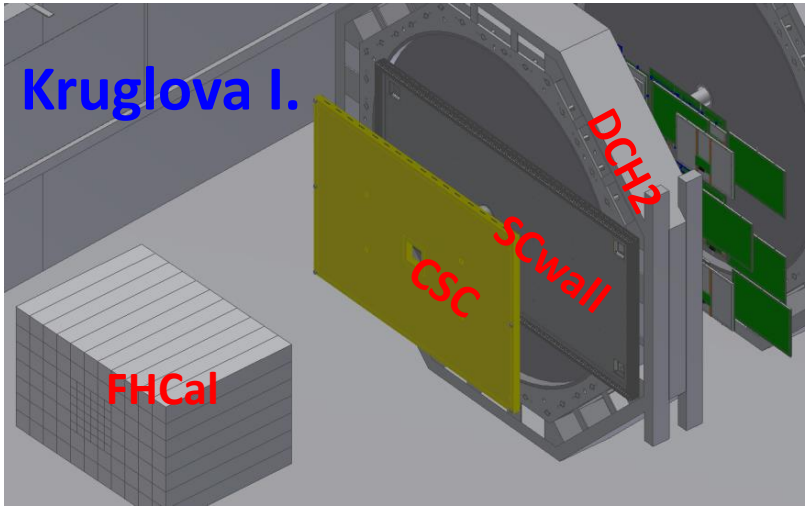
Detectors downstream the SP-41
ScWall

Realistic view of installed ScWall

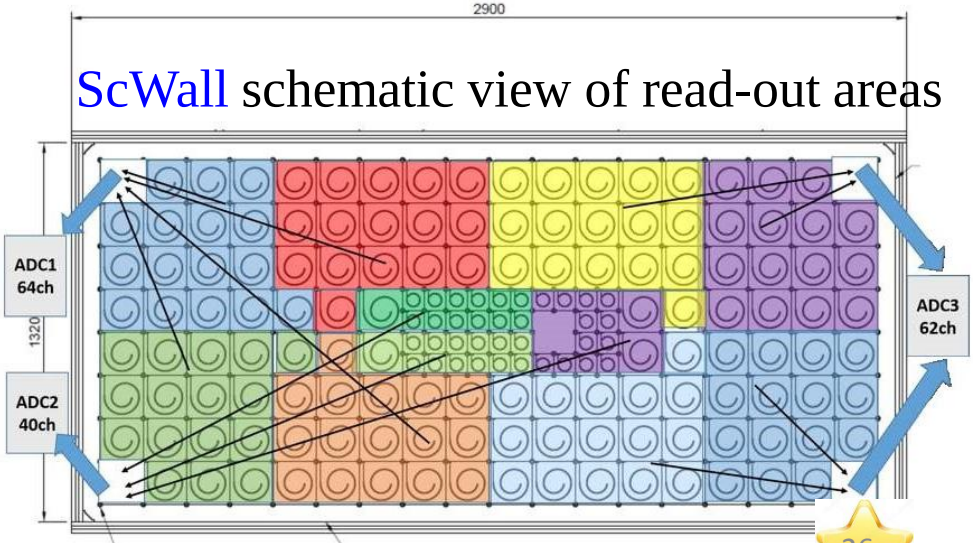


ScWall view inside

3D view of SCWall

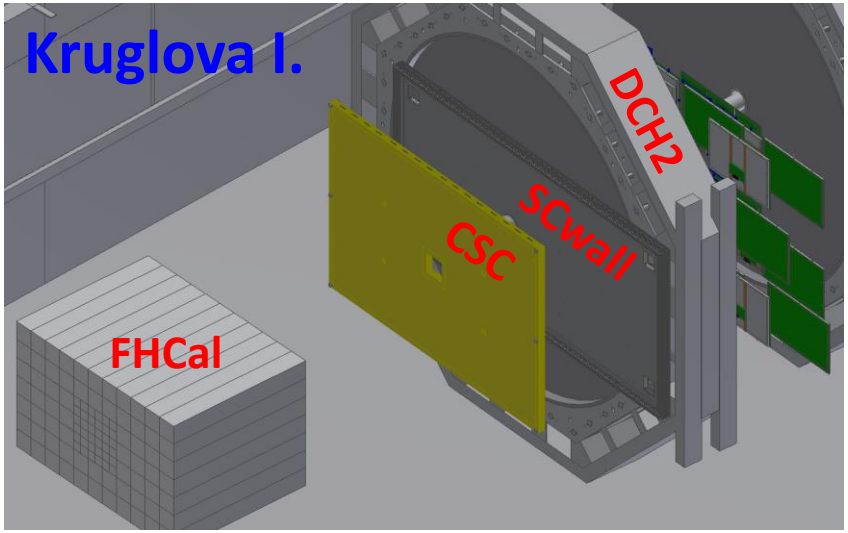


ScWall schematic view of read-out areas

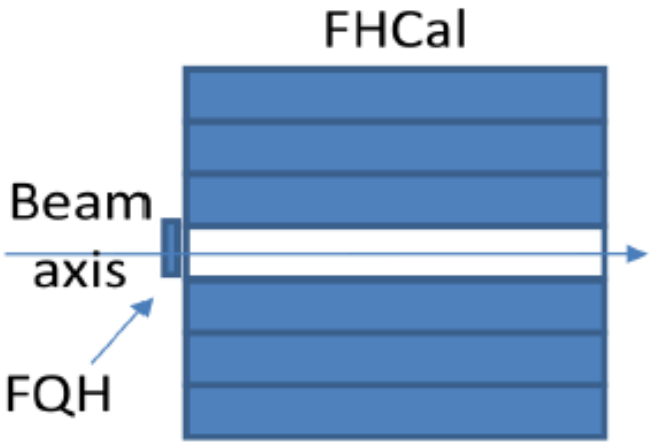


V.Volkov will talk in more detail about the operation of ScWall

Detectors downstream the SP-41
FHCal



3D view of FHCal



35	36	1	2	3	4	5	45	46
		6	7	8	9	10		
37	38	11	12	13	14	15	47	48
39	40	16	17		18	19	49	50
41	42	20	21	22	23	24	51	52
		25	26	27	28	29		
43	44	30	31	32	33	34	53	54

FHCal - (Forward Hadron Calorimeter):

- 20 modules with 10 longitudinal sections (PSD CBM), transverse size 20x20cm2 , length – 5.6 λ int.
- 34 modules with 7 longitudinal sections (FHCal MPD like) – 15x15cm2 (– 4.0 λ int).
- Hamamatsu MPPC S12572-010P, 3 x 3 мм2.
- 434 readout channels.

N.Karpushkin will talk in more detail about the operation of FHCal

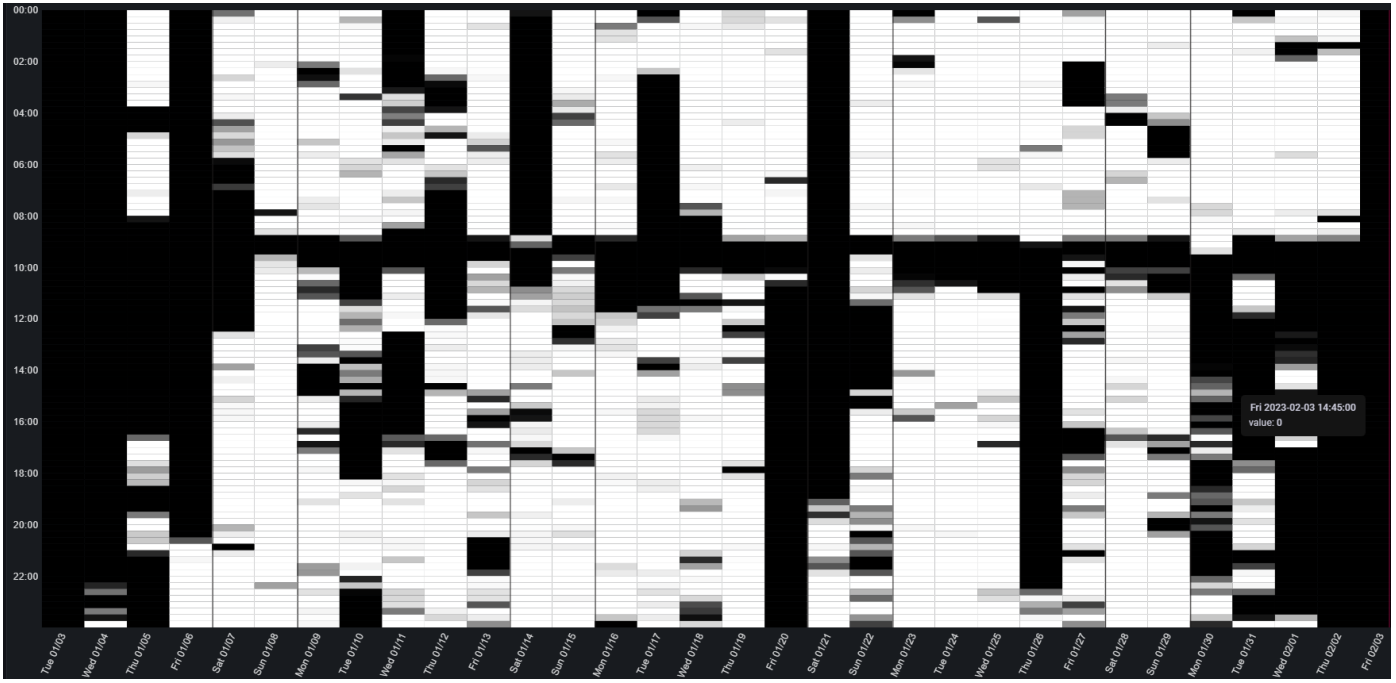
First physics run with Xe beam December 2022 – January 2023

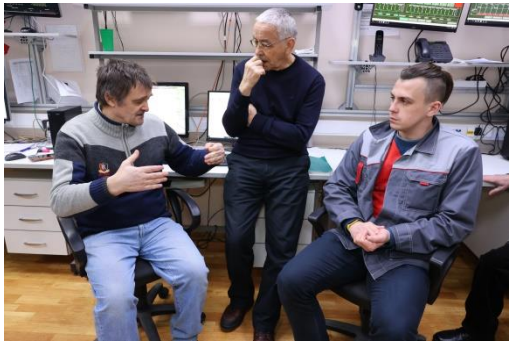
12.12.22-7.01.23
efficiency 32%

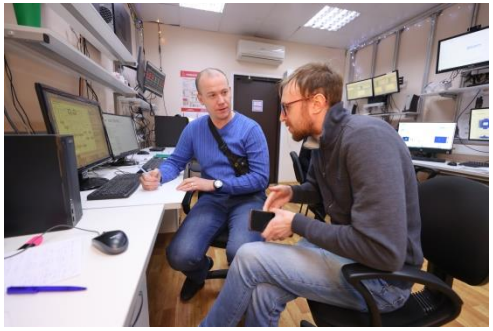
5.01.23-2.02.23
efficiency 62%

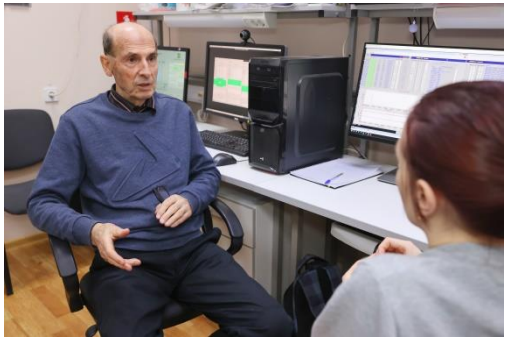
First physics run with Xe beam
December 2022 – January 2023

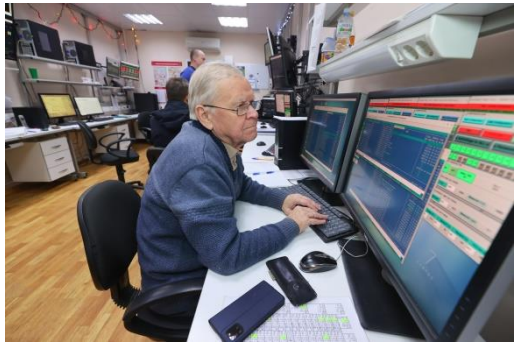
Correlation of hours per day from date







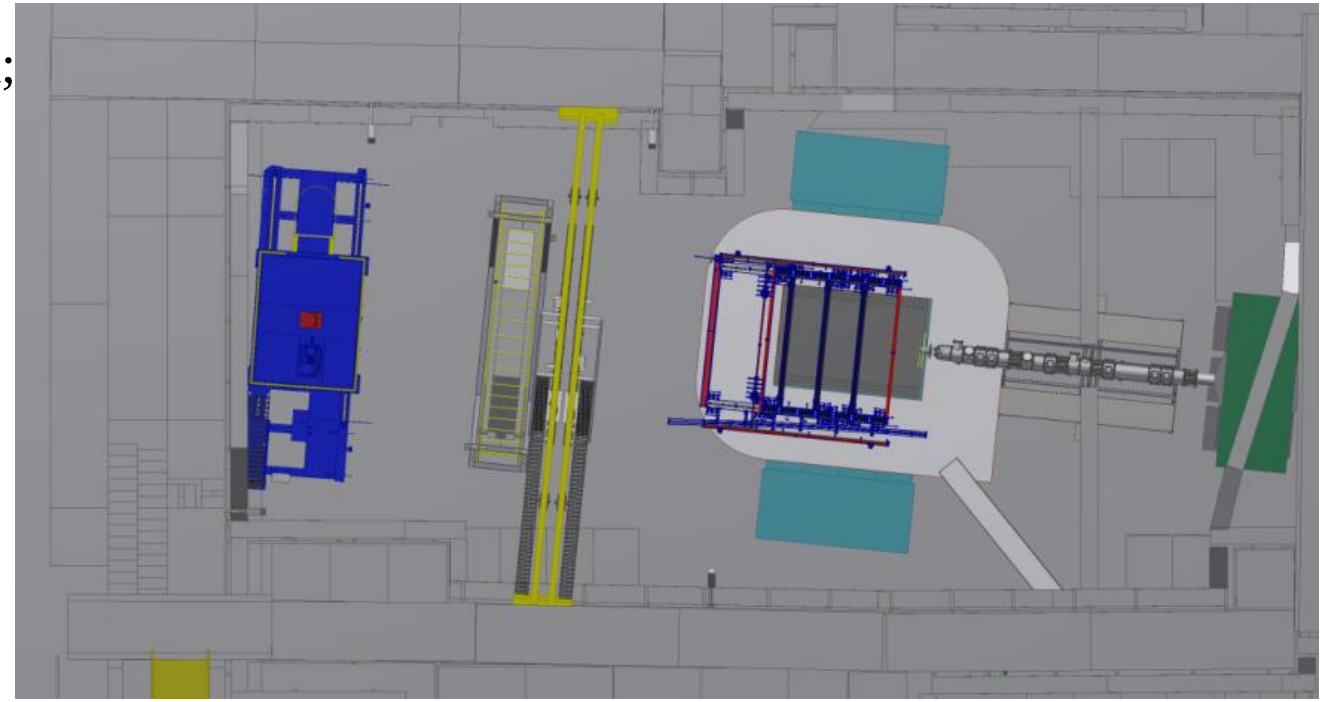




BM@N installation work plans

The following elements of the BM@N installation were dismantled after RUN8:

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. Target Station.



BM@N installation work plans

The following work is started:

1. design work on the manufacture of various vacuum boxes for profilers and other detectors;
2. design work on the modernization of power supply at the setup;
3. design work on the construction of new mechanical supports for CSC & ToF400, large CSC;
4. design work on the modernization of beam dump.

The start of work on the assembly and installation of all detectors on the BM@N setup is scheduled for early September 2023.

Baryonic Matter
BM@N
at Nuclotron

THANK YOU FOR YOUR ATTENTION