

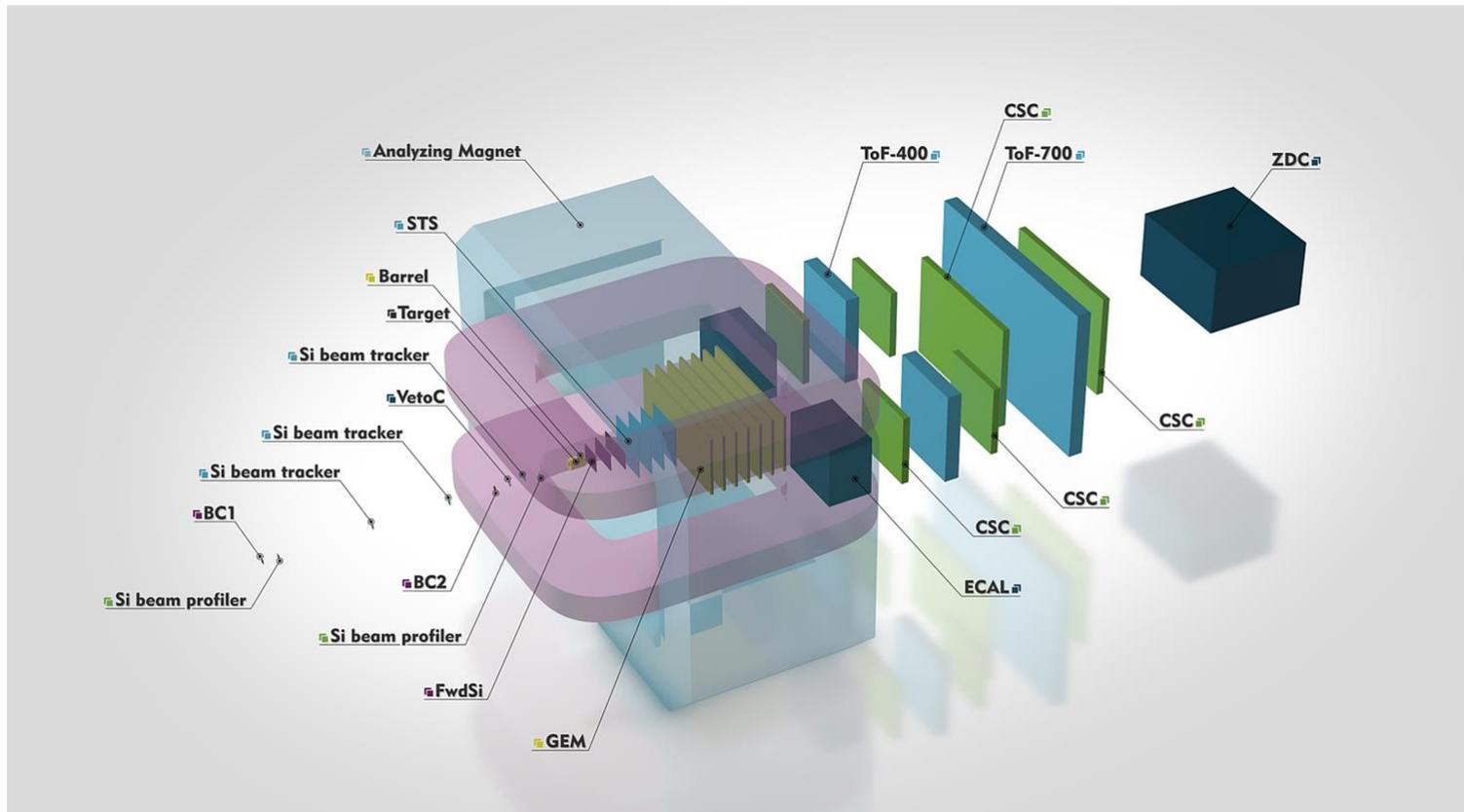
PREPARATION OF THE BM@N EXPERIMENTAL HALL FOR HEAVY ION PROGRAM

Piyadin S.M. et al.



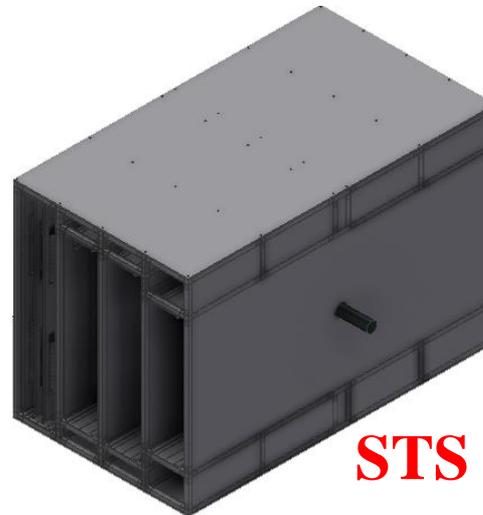
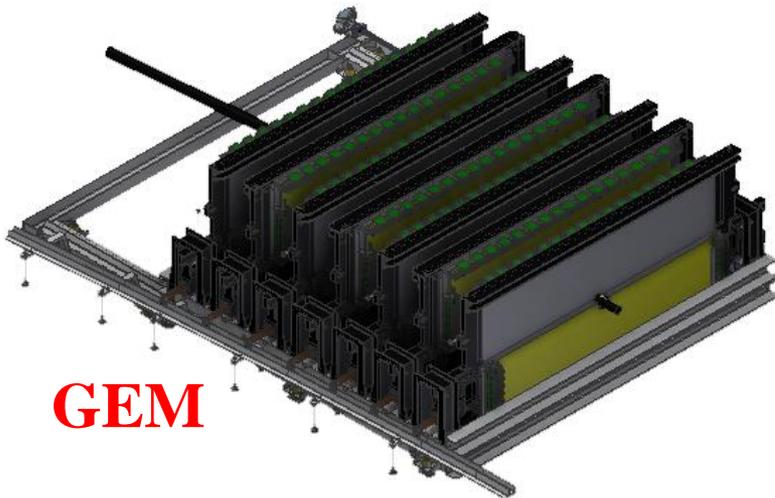
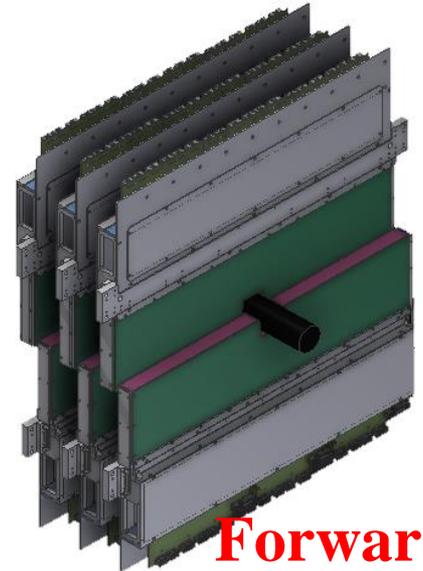
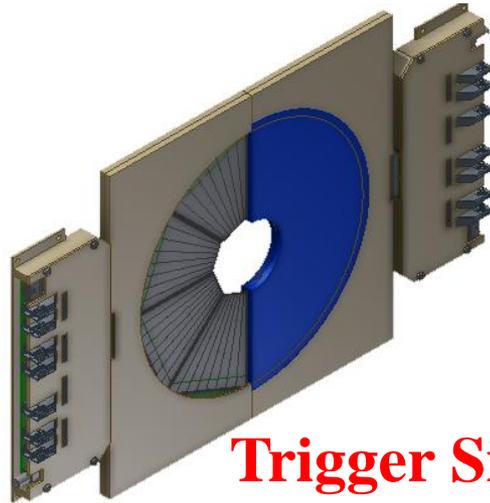
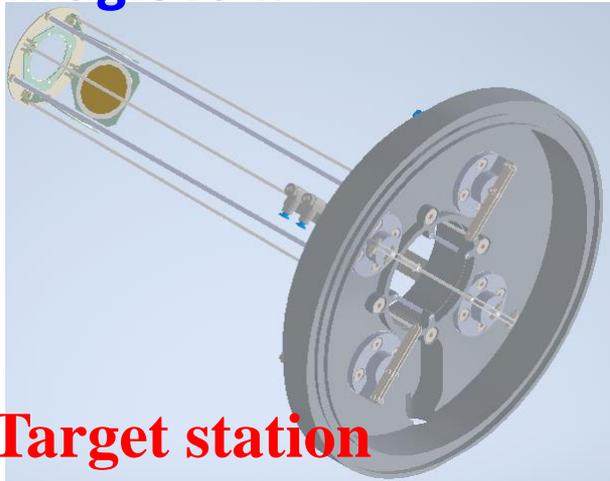
Contents

- 3d models of the elements of the **BM@N** setup
- 3d model of the whole setup with the biological shielding
- Reference metrological grid for the **BM@N**
- Carbon beam pipe (a project of “**KB Arhipov**”)
- Mechanical support for **GEM** detectors



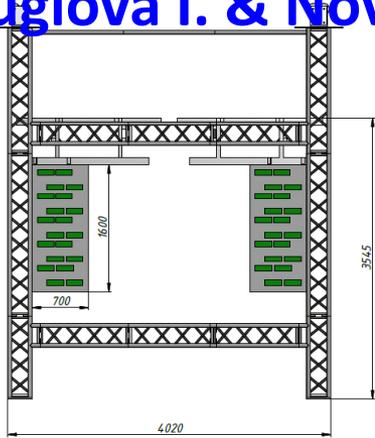
3D model of the BN@N experimental hall (detectors in the SP-41 magnet)

Kruglova I.

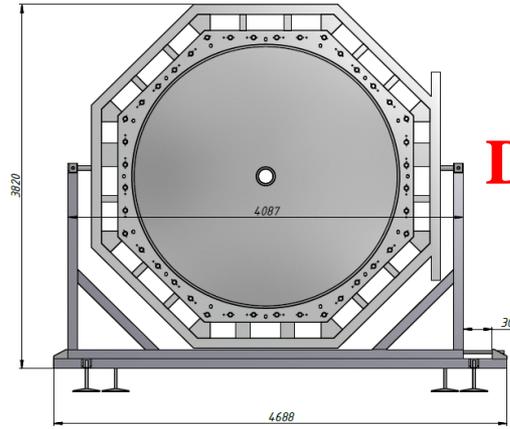
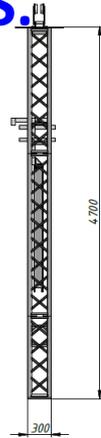


3D model of the BN@N experimental hall (detectors behind the SP-41 magnet)

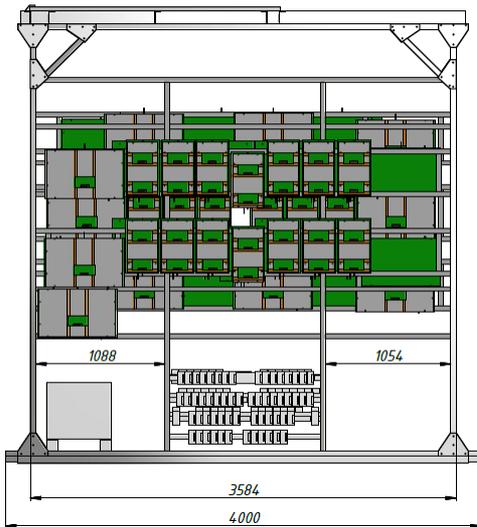
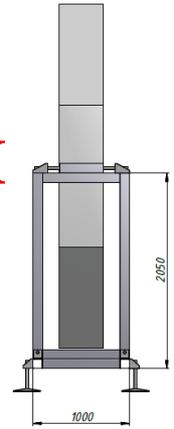
Kruglova I. & Novozhilov S.



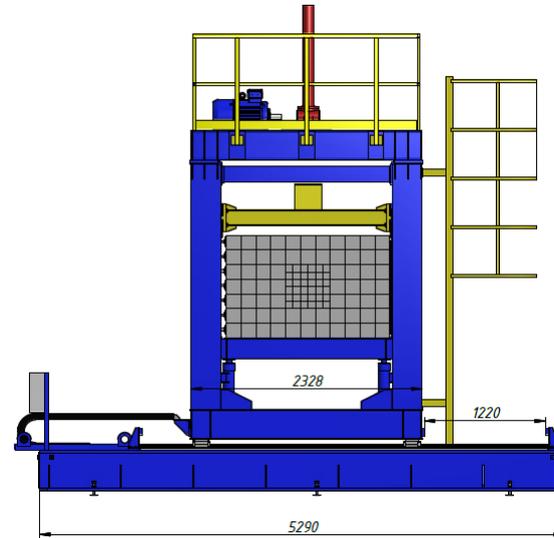
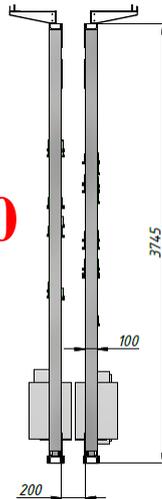
ToF400



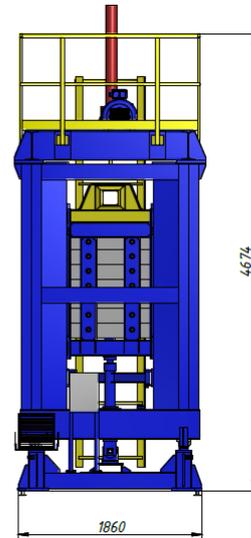
DCH



ToF700

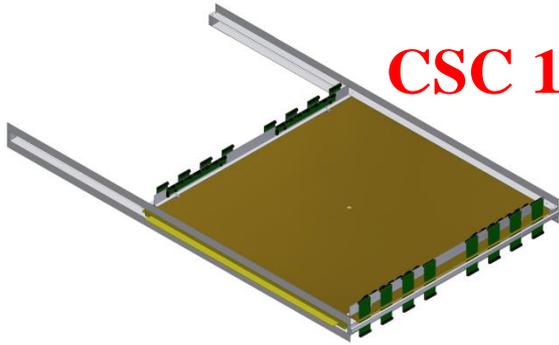


ZDC

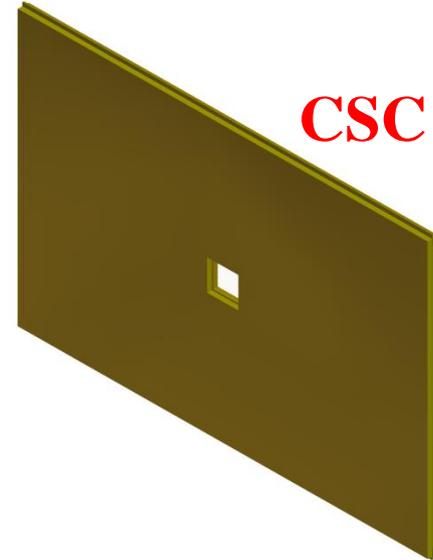
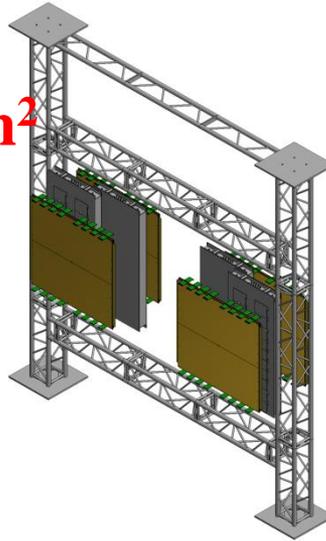


3D model of the BN@N experimental hall (detectors behind the SP-41 magnet)

Kruglova I.

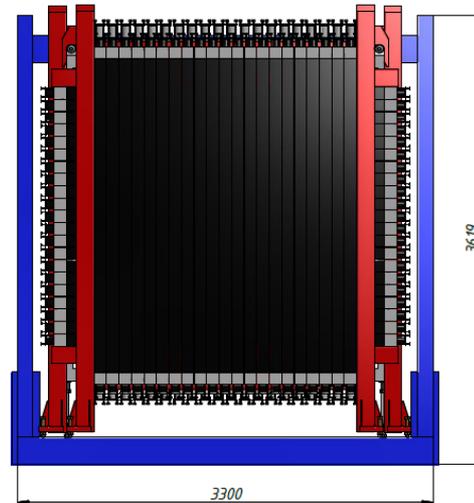


CSC 1×1m²

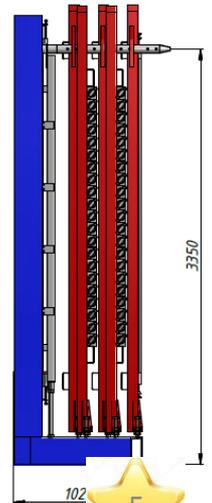


CSC 2×1.5m²

Hydrogen target

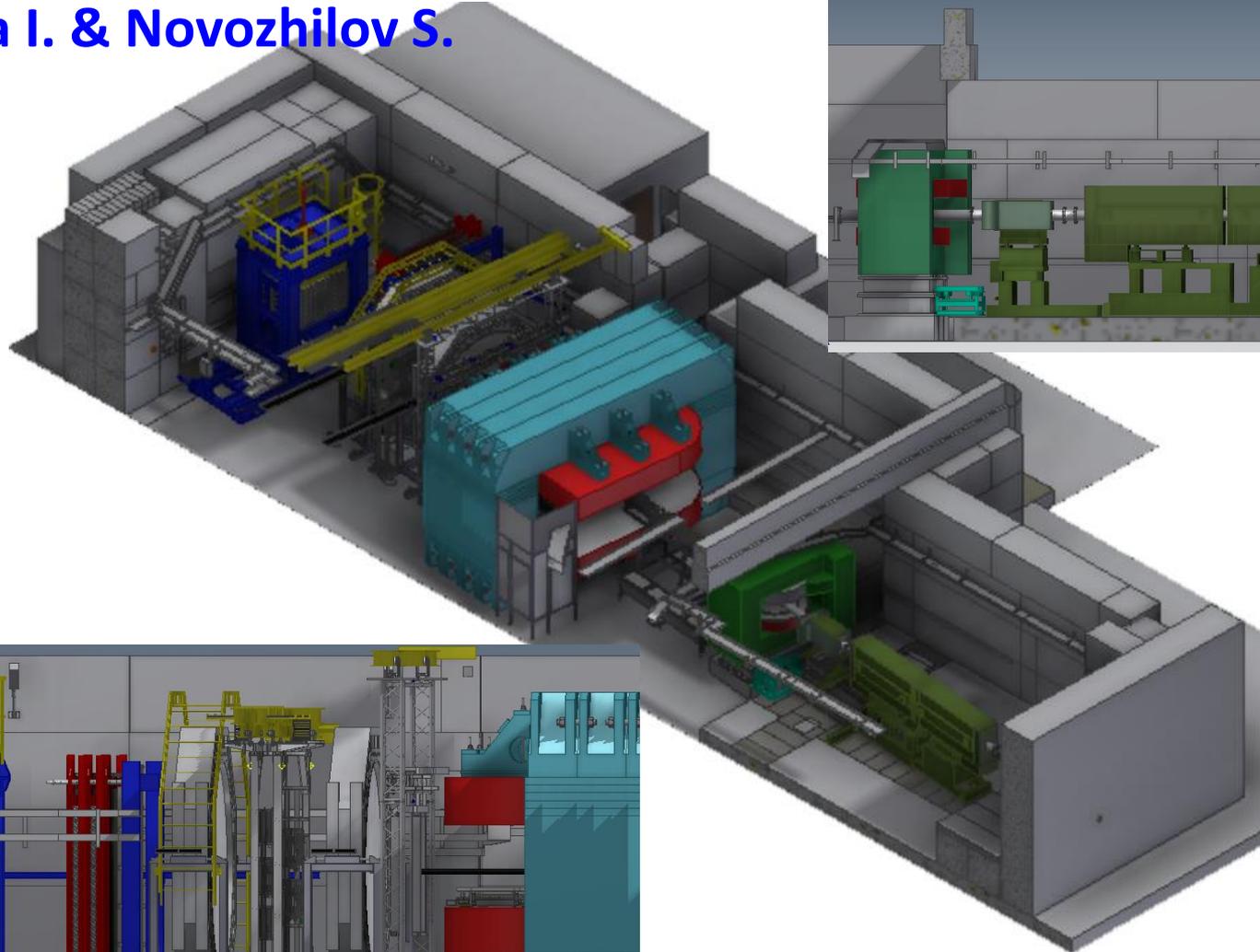


Land

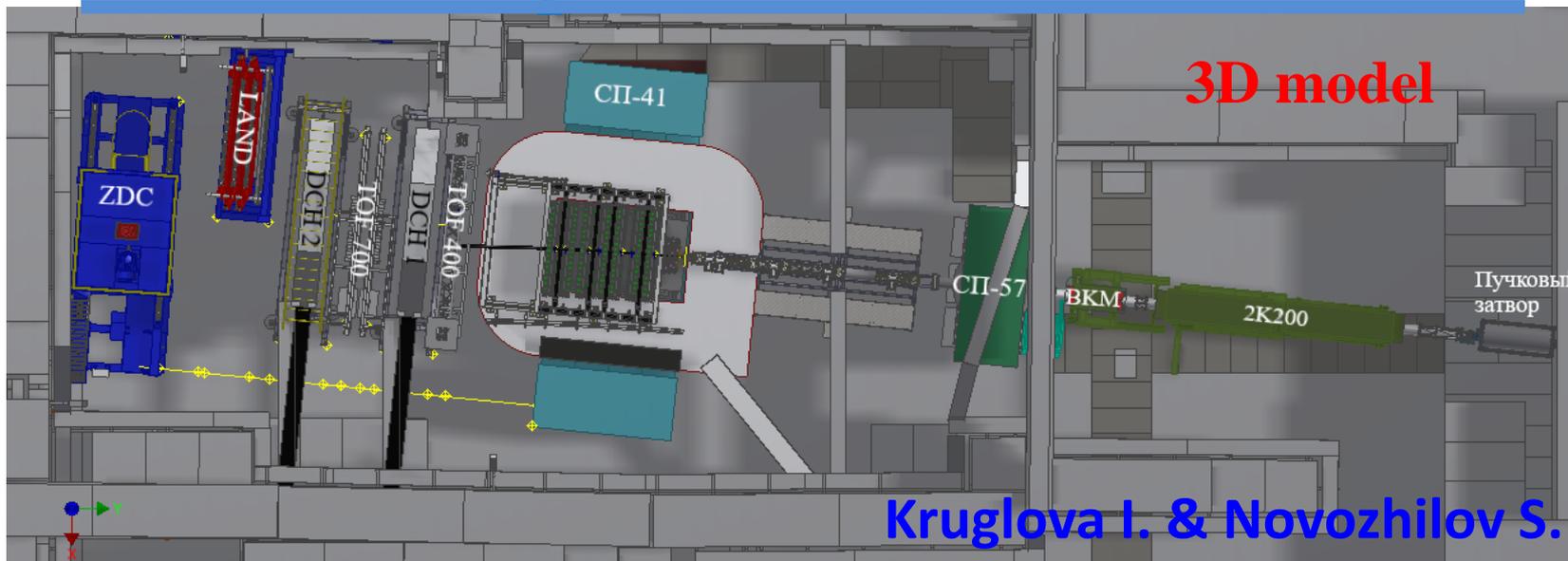


3D model of the BN@N experimental hall

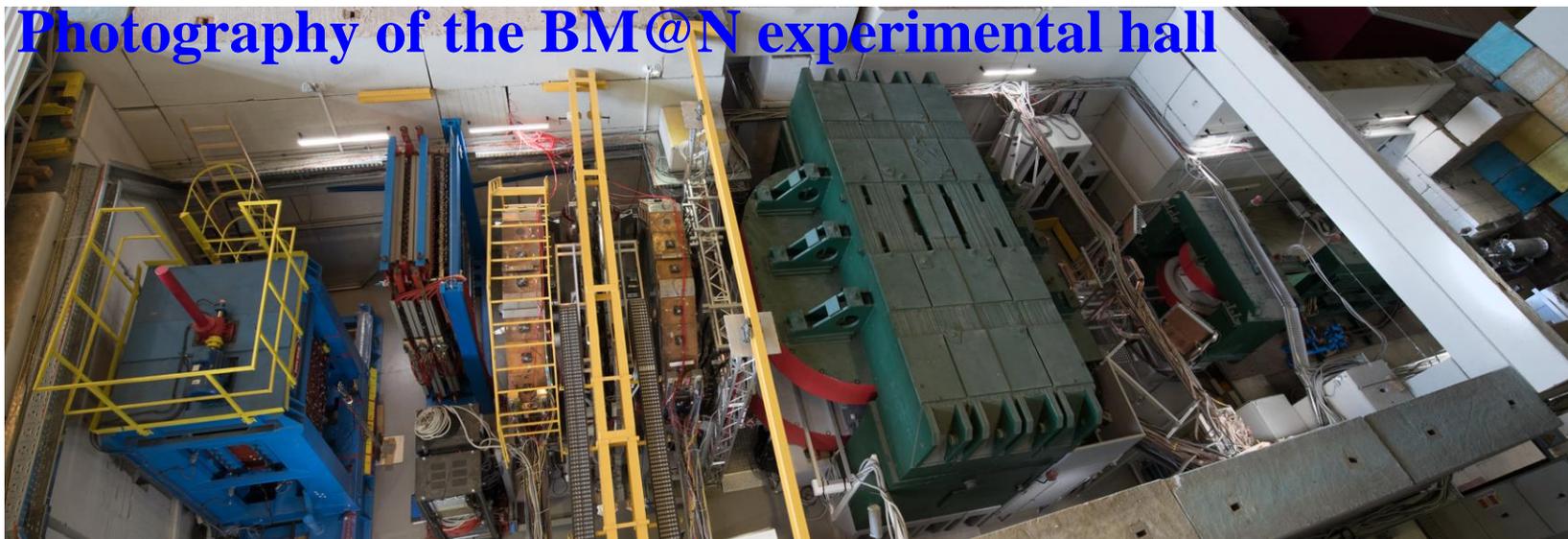
Kruglova I. & Novozhilov S.



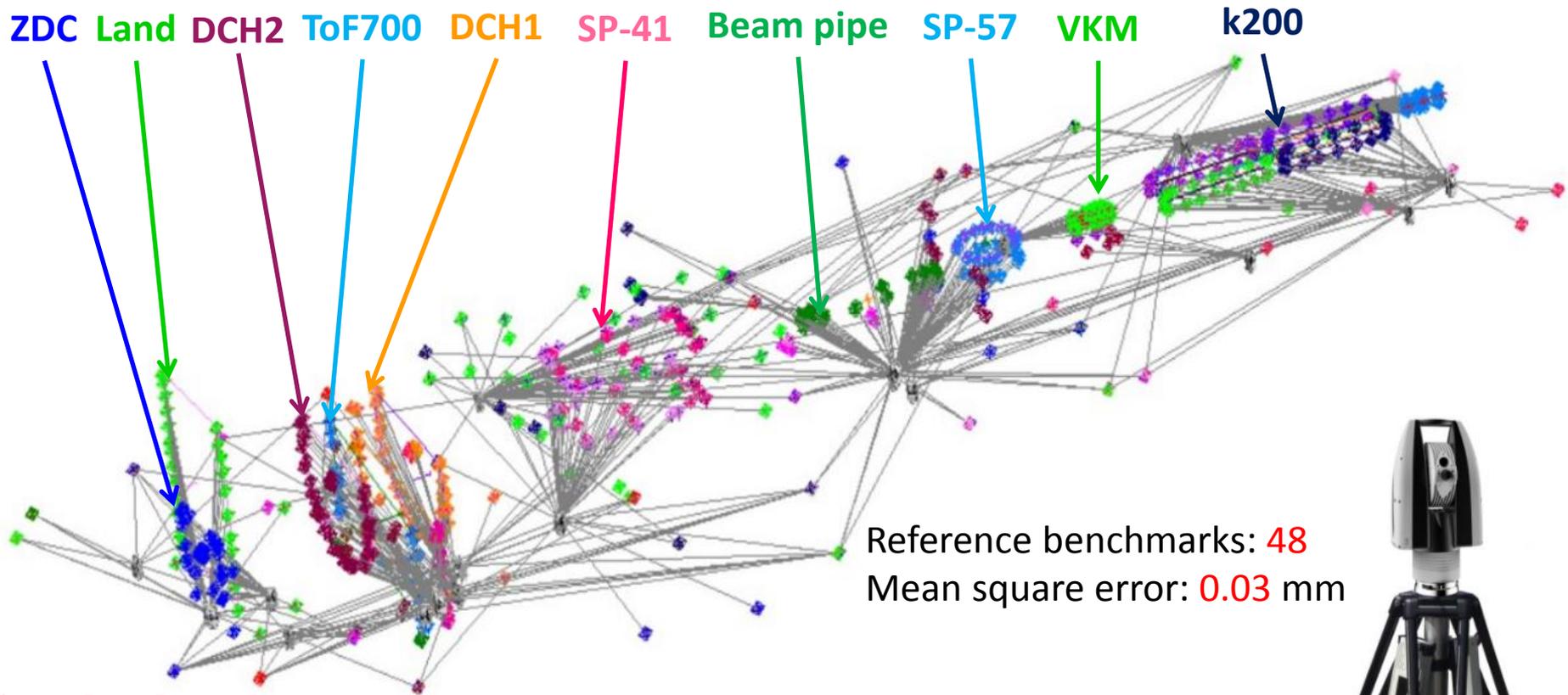
3D model of the BM@N experimental hall



Photography of the BM@N experimental hall



Development of a reference metrological grid of the BM@N



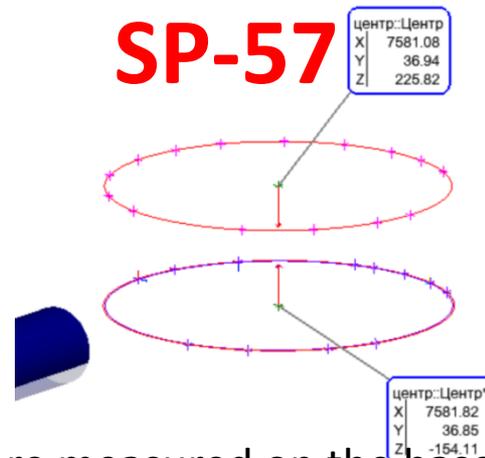
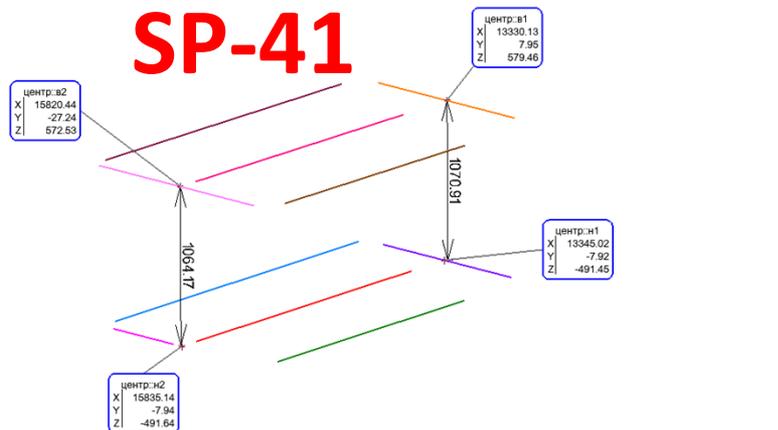
Reference benchmarks: 48
Mean square error: 0.03 mm



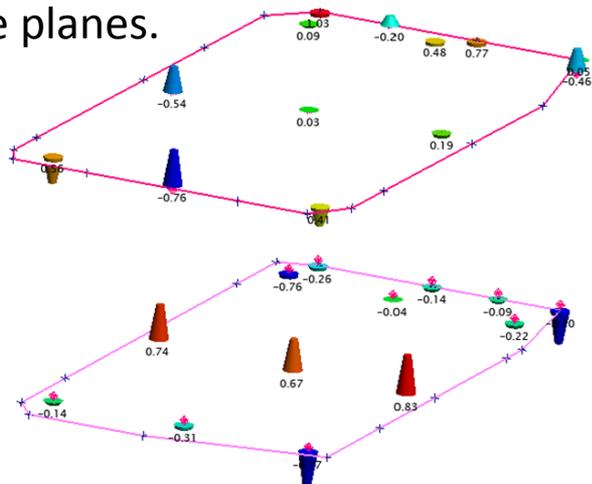
Completed works:

- The **BM@N** coordinate system is fixed.
- Measurements of the coordinates of reference marks and basic elements have been made.
- A reference metrological grid was created in the **BM@N**.
- Measurements of the relative position of the **BM@N** elements were carried out.

Development of a reference metrological grid of BM@N (magnets)



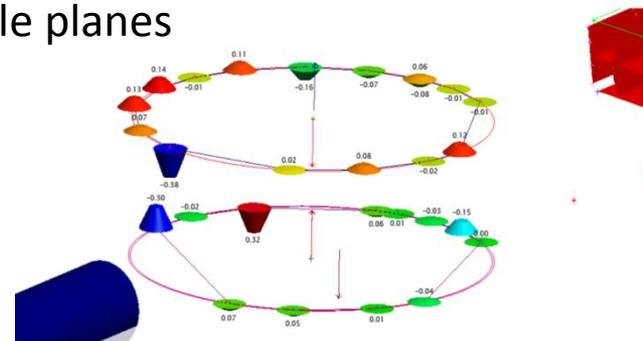
69 points measured on base surfaces of SP-41
4 planes are determined from points.
The axis is built from the intersection of two middle planes.



Flatness deviation cartogram SP-41

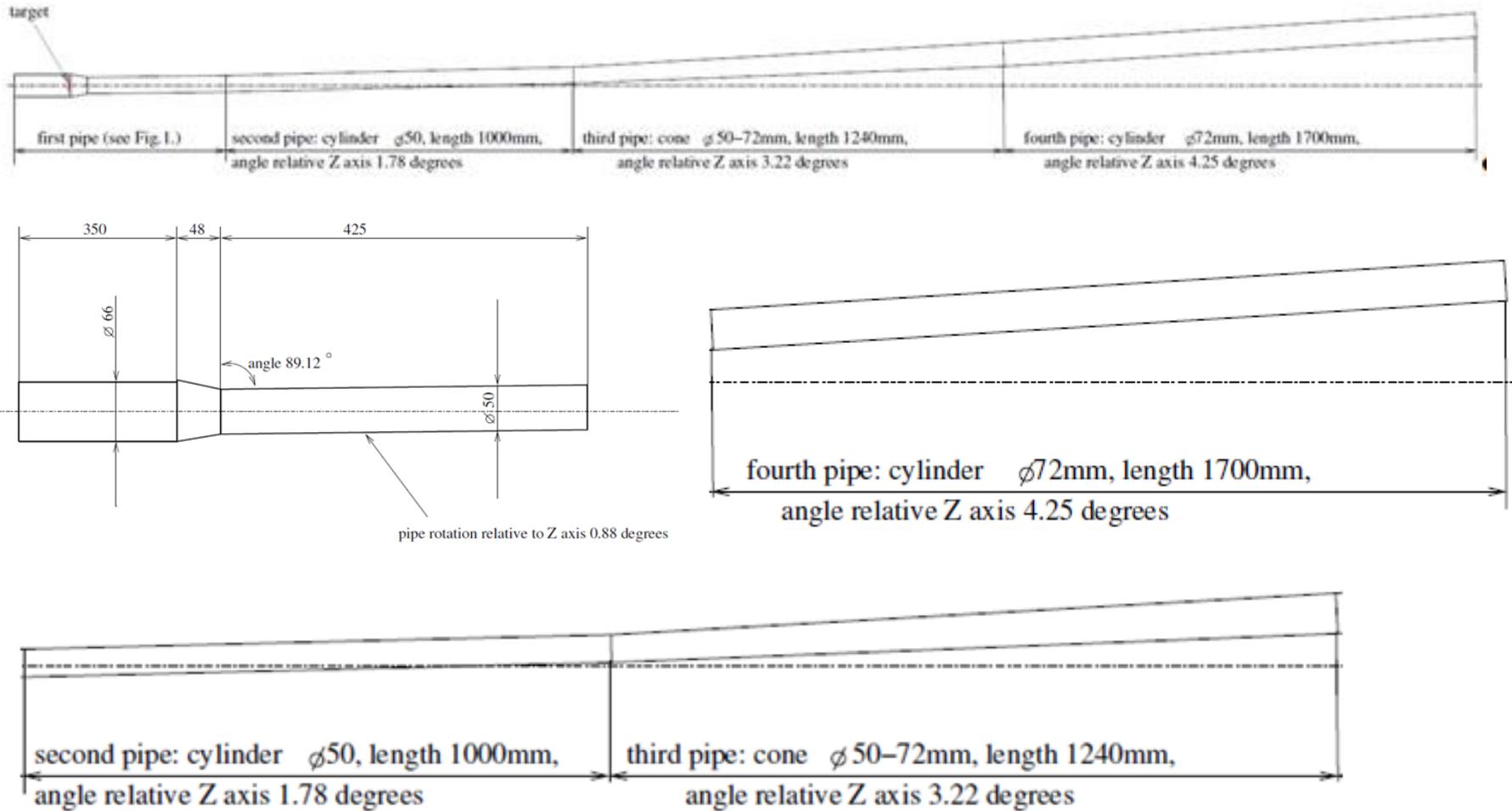
76 points were measured on the base surfaces of the SP-57.
4 planes are determined from points.

The axis is built from the intersection of two middle planes



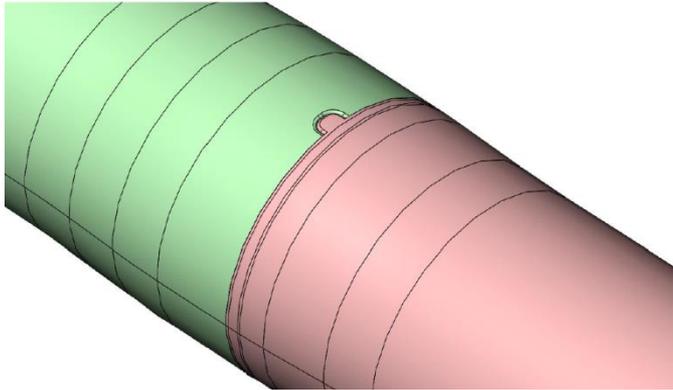
Flatness deviation cartogram SP-57

Carbon beam pipe

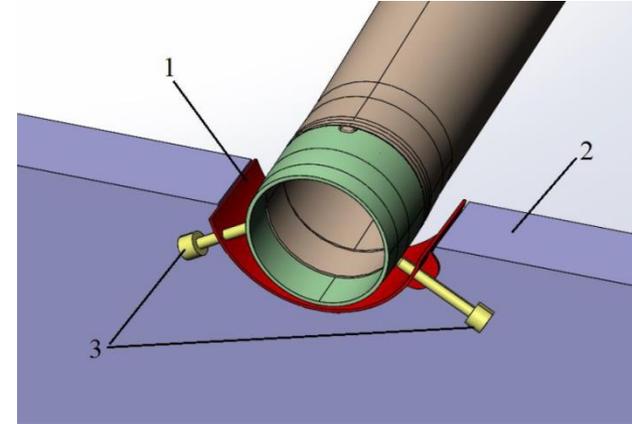


The geometry and design requirements for the carbon beam pipe.

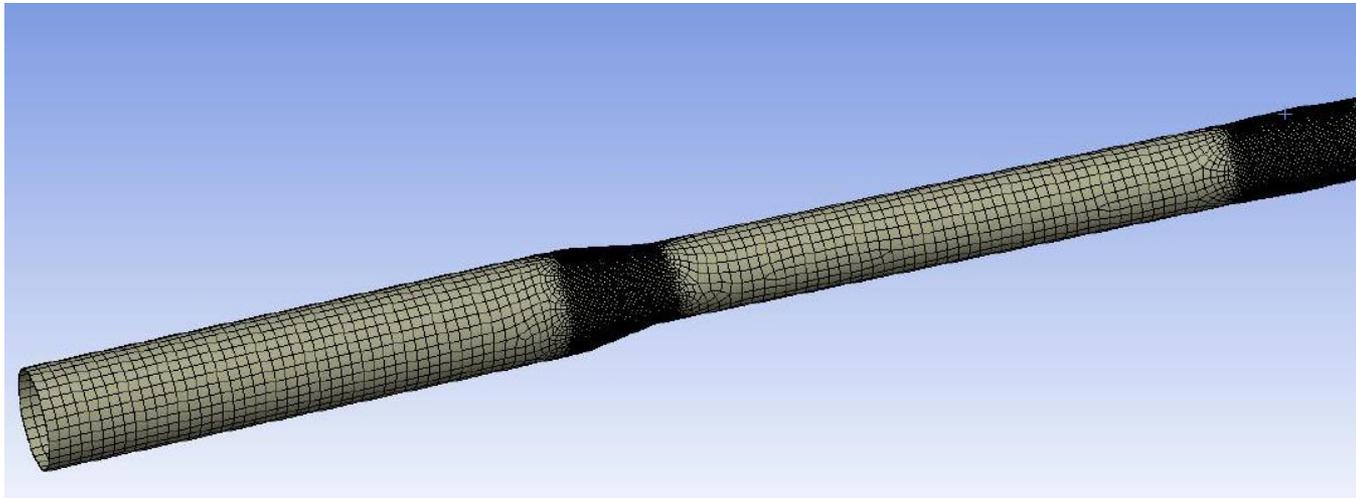
Carbon beam pipe (project of “KB Arhipov”)



“Tongue and Groove” system is used to prevent the connection from rotation.

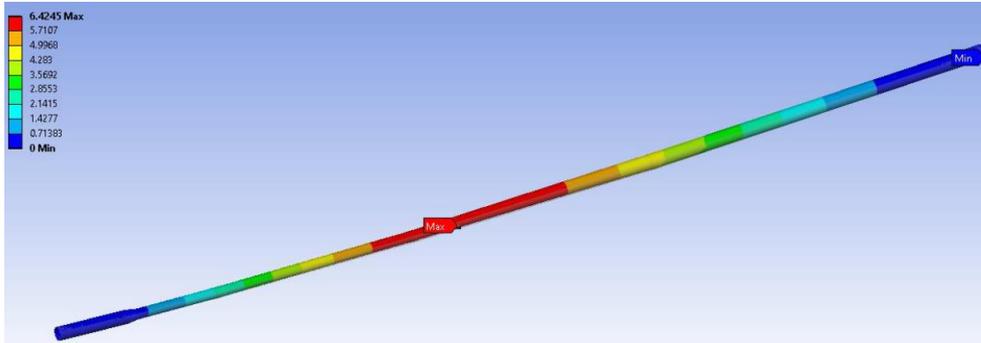


1. Adjusting unit
2. GEM detector
3. Plastic screws



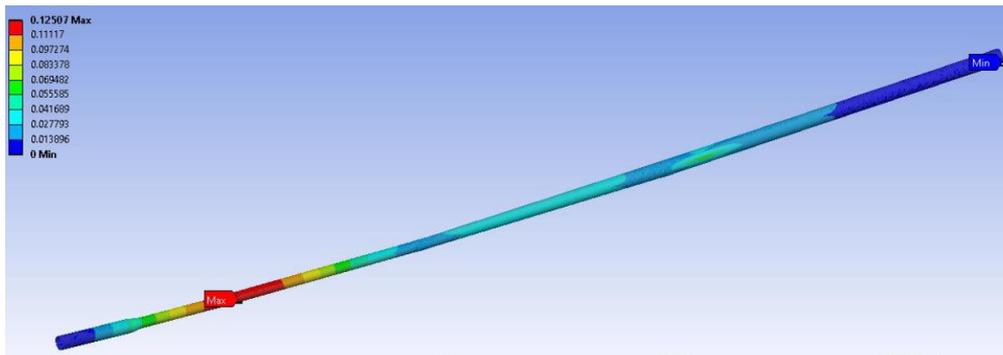
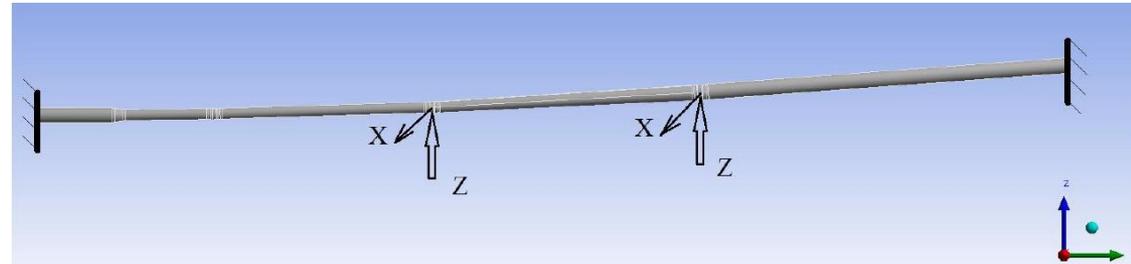
Final model

Carbon beam pipe (project of “KB Arhipov”)



Static calculations of deformation strength and maximum stresses acting in the structure during operation were carried out without points of support. Final element analysis (FEM) was performed in [ANSYS Workbench 19.2](#).

Positions of adjusting units



Maximum deformations in the beam pipe under operational load using **2** points of support

Mechanical support for GEM detectors

1.



2.



3.

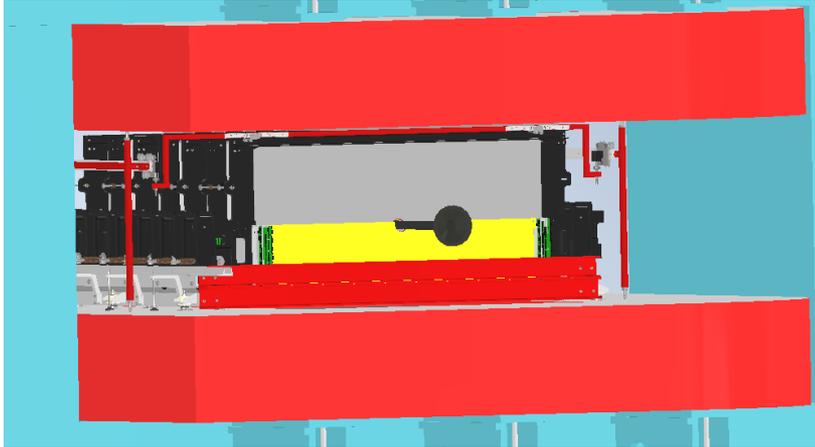


4.

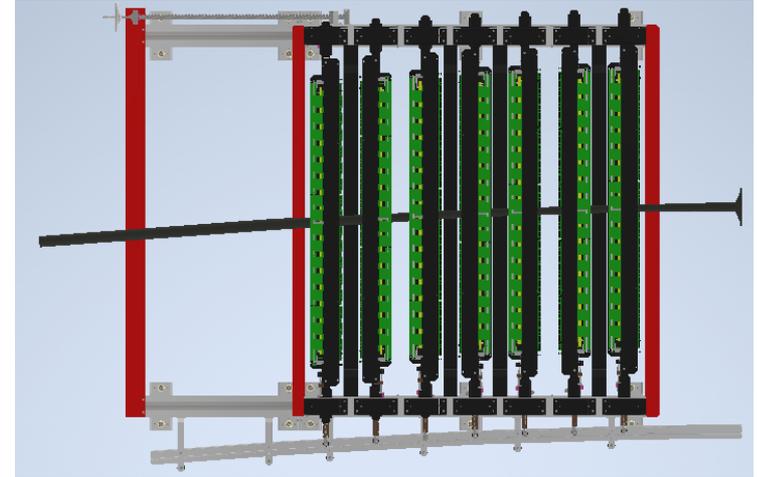


Stages of changing the mechanical support for GEM detectors, taking into account the future stages of modernization of the central tracking system of the BM@N setup

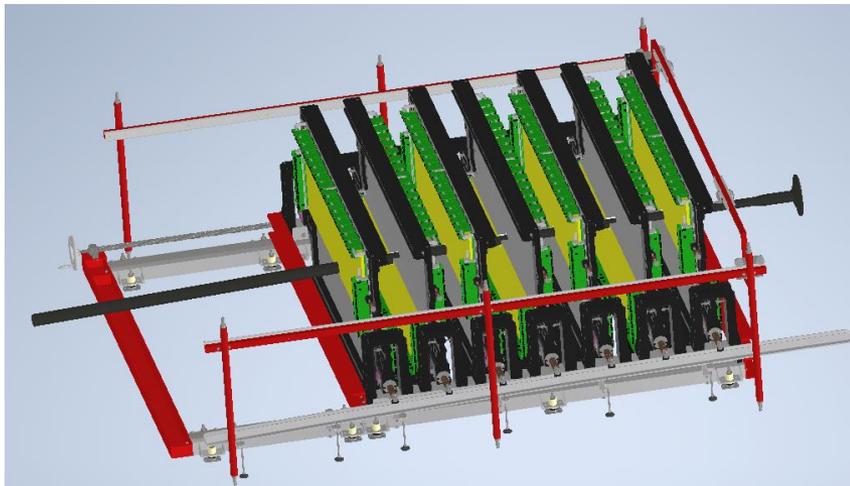
Mechanical support for GEM detectors



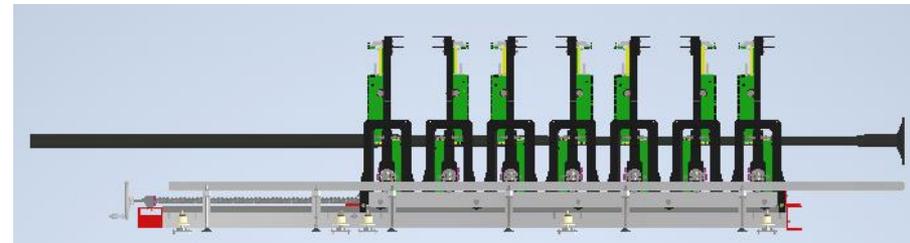
Location of **GEM** detectors with mechanical support inside the **SP-41** analyzing magnet



GEM detectors with mechanical support (top view)



GEM detectors with mechanical support and with mechanics designed for installation of upper planes



GEM detectors with mechanical support (side view)

Conclusion

- ✓ 3d models of the elements and of the whole setup with the biological shielding was created. The detailed model of the BM@N allows to create the mechanical supports for the detectors, taking into account all future changes and updates of the setup.
- ✓ The BM@N coordinate system was fixed. A reference metrological grid was created in the experimental hall.
- ✓ Development of the project of the carbon beam pipe was completed. Design of a flangeless connection was developed by KB Arkhipov.
- ✓ The project of the mechanical support for GEM detectors was also completed (Ltd “PELCOM”).

**THANK YOU
FOR YOUR
ATTENTION**

