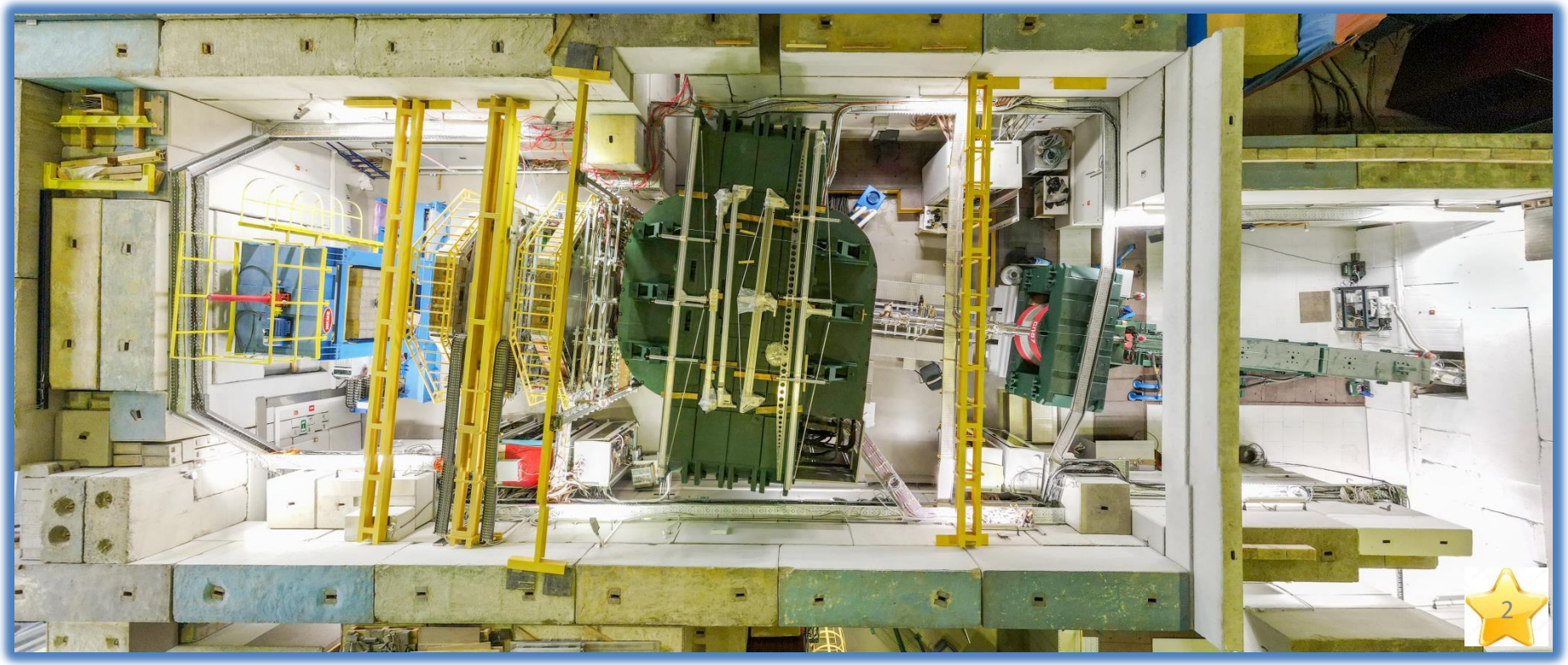
Setup on BM@N experimental hall.

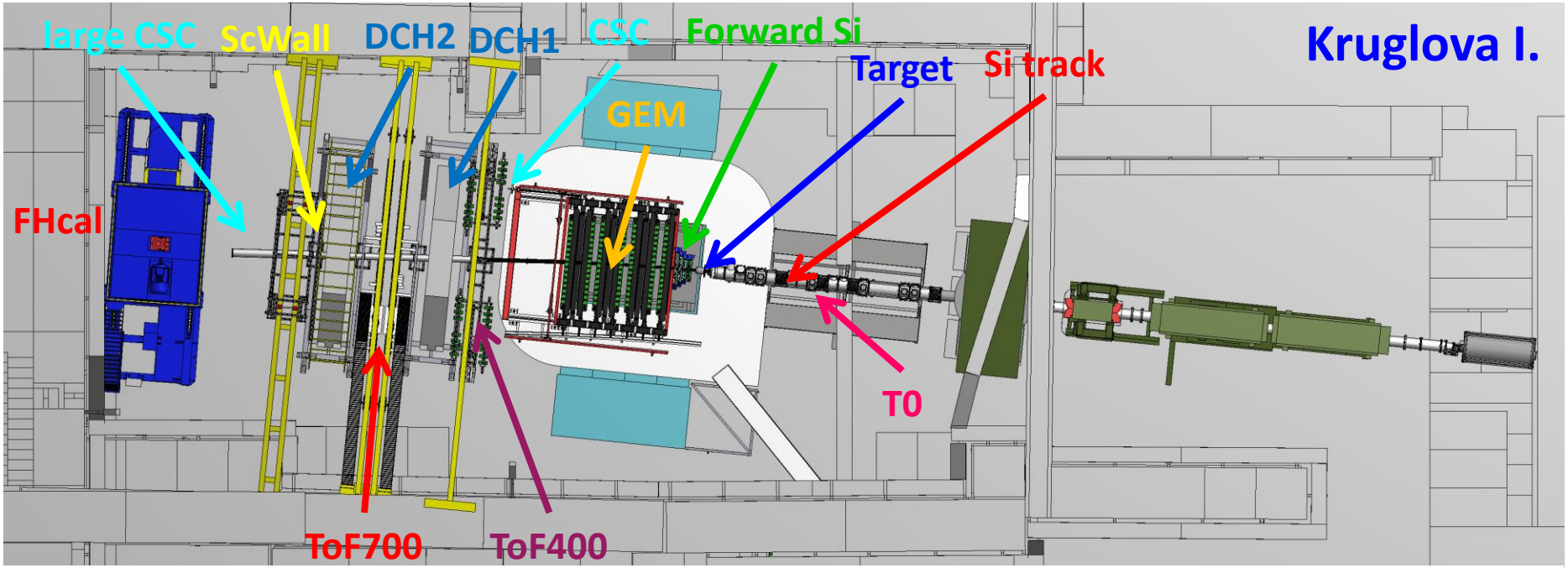
Piyadin S.M.

29.12.2023

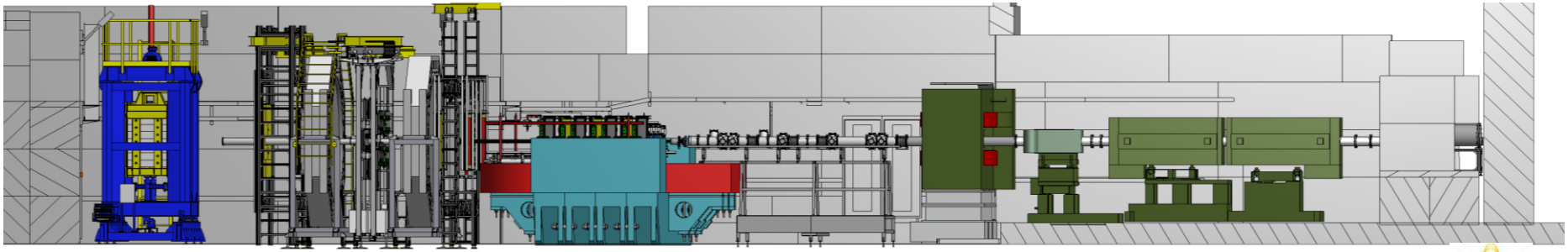
Content of the report



Detector installation in BM@N experimental hall (Run 8)



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



The article about configuration BM@N setup in Run 8

The BM@N facility at the NICA accelerator complex

BMN collaboration

February 2023

1 Introduction

BM@N (baryonic matter at Nuclotron) is the first experiment operational at the ion-accelerating complex Nuclotron/NICA, studying interactions of relativistic ion beams of heavy ions with fixed targets [1] in the energy range of high densities of baryonic matter [2]. At the Nuclotron energies, the density of nucleons in a fireball created by two colliding heavy nuclei is 3-4 times higher than the nuclear saturation density[3]. In addition, these energies are high enough to study strange mesons and (multi)-strange hyperons produced in nucleus-nucleus collisions close to the kinematic threshold [4, 5]. The primary goal of the experiment is to constrain parameters of the equation of state (EoS) of high-density nuclear matter. Studies of the excitation function of strange particle production below and near to the kinematical threshold make it possible to distinguish hard behaviour of the EoS from the soft one [6].

The Nuclotron will provide the experiment with beams of a variety of particles, from protons to gold ions, with kinetic energy in the range from 1 to 6 GeV/nucleon for light ions with Z/A ratio of ~ 0.5 and up to 4.5 GeV/nucleon for heavy ions with Z/A ratio of ~ 0.4.

The BM@N detector is a forward spectrometer covering the pseudorapidity range $1.6 \leq \eta \leq 4.4$. Schematic view of the BM@N setup is shown in Fig. 1. The description of the spectrometer subsystems is organised in a "downstream beam" order. The details for all subsystems are given in a corresponding sections below.

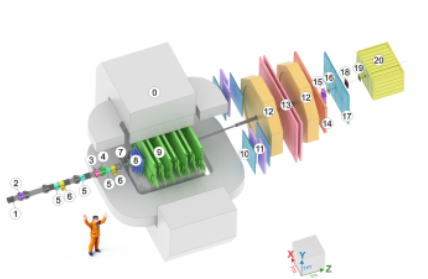
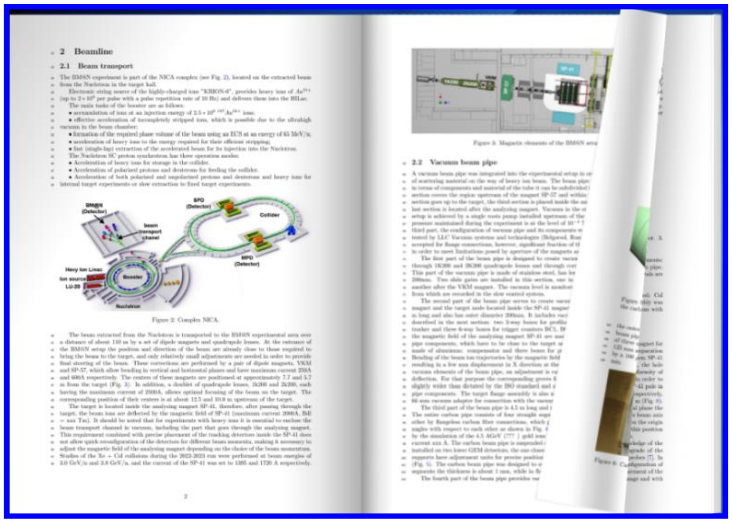
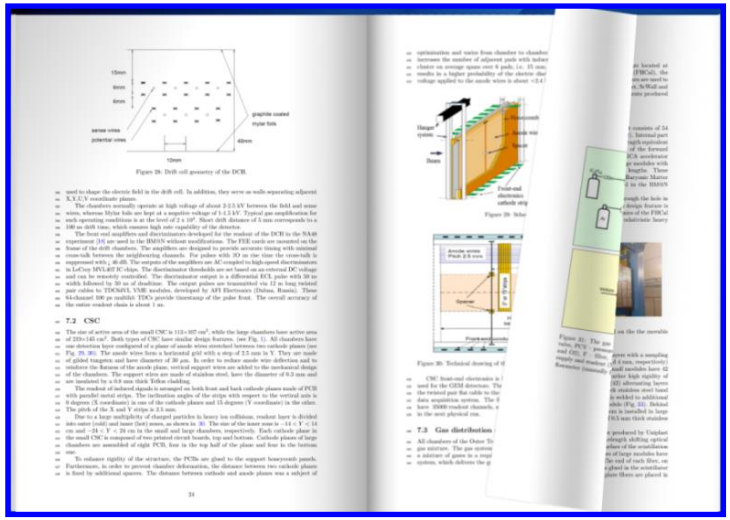


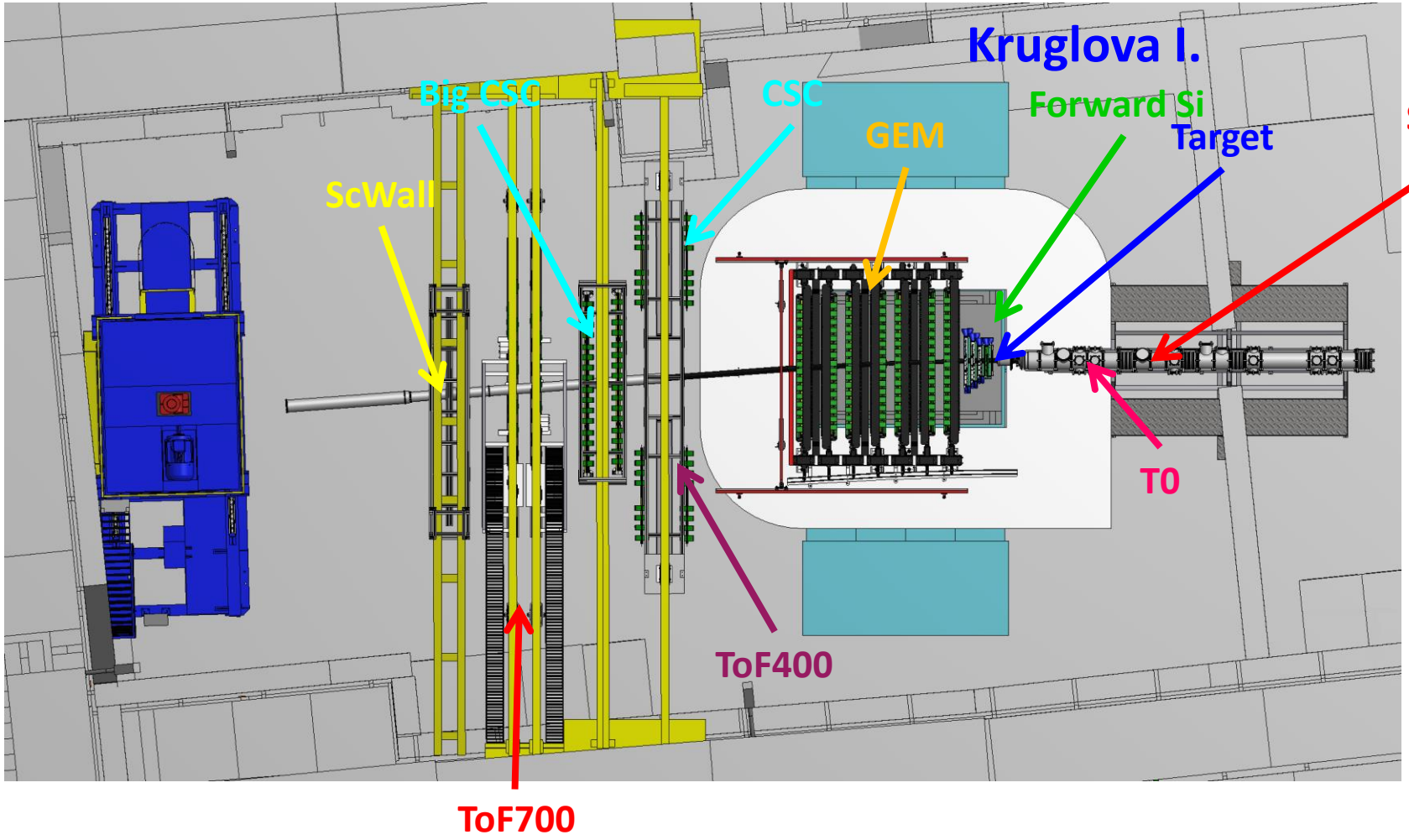
Figure 1: Schematic view of BM@N setup in RUN8.





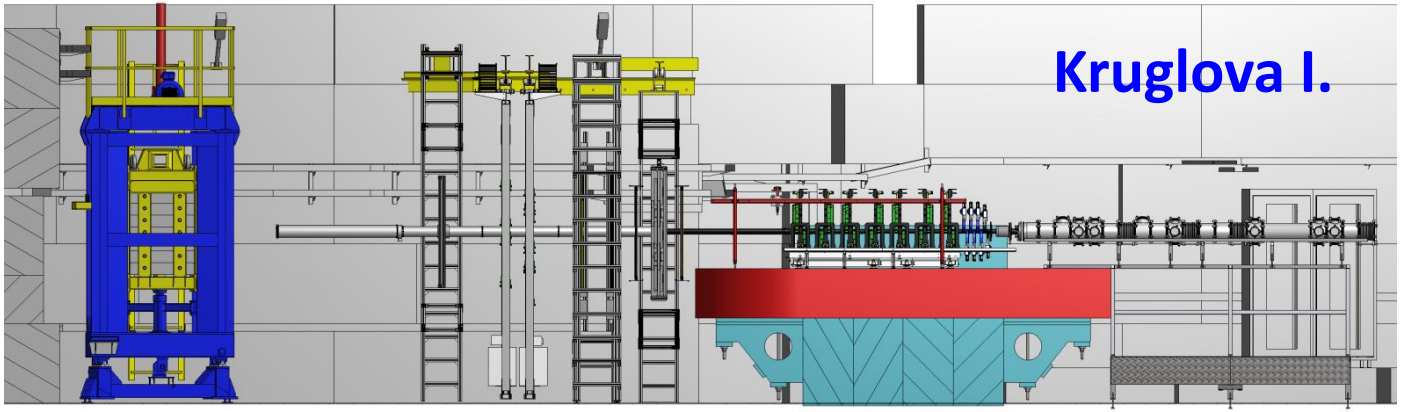
Content:

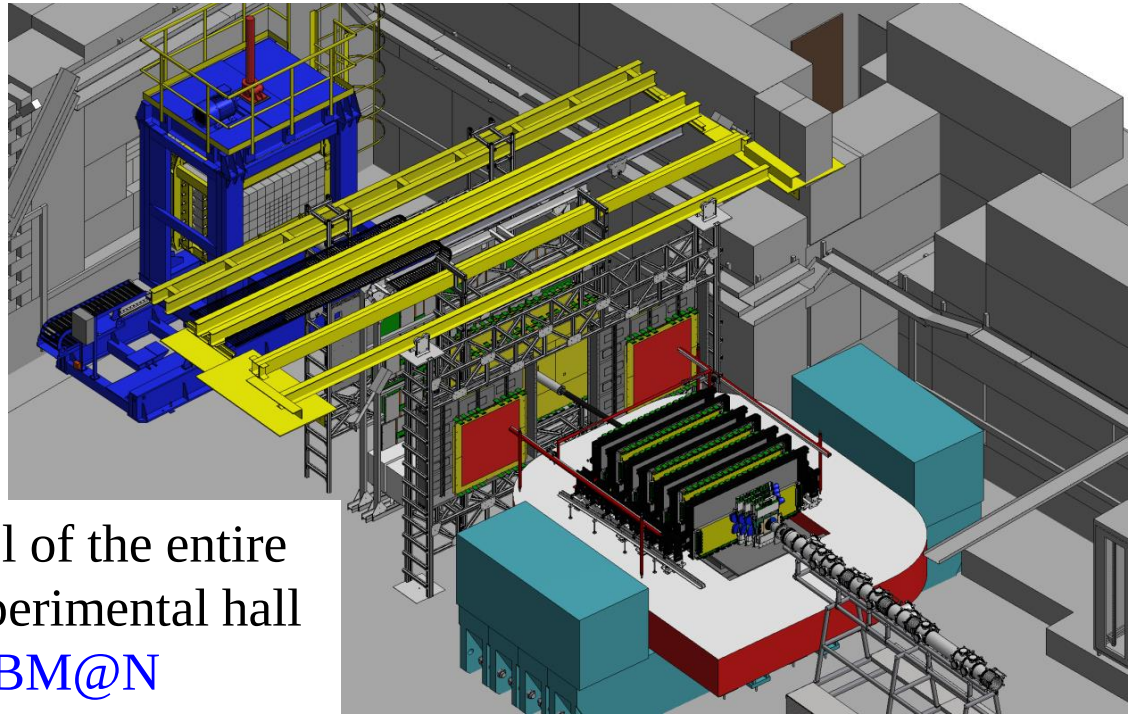
Future detector configuration in BM@N experimental hall



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

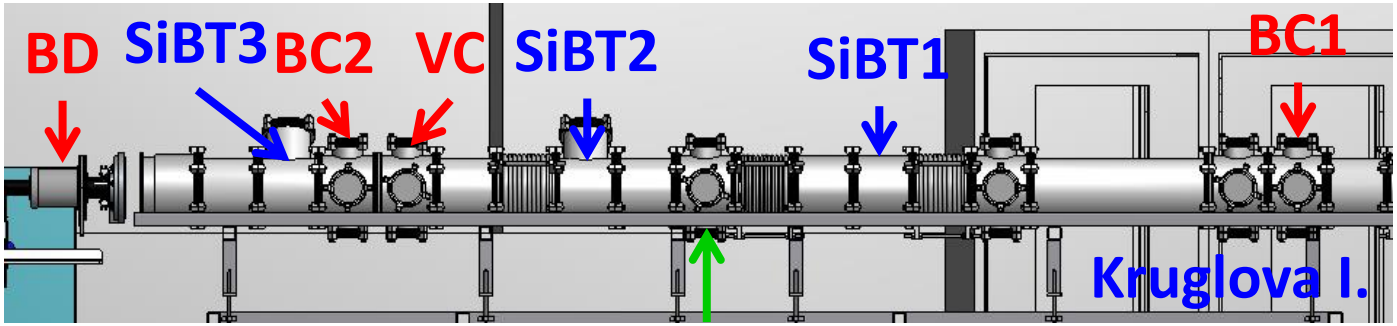
Future detector configuration in BM@N experimental hall





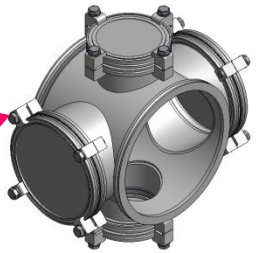
3D model of the entire future experimental hall of BM@N

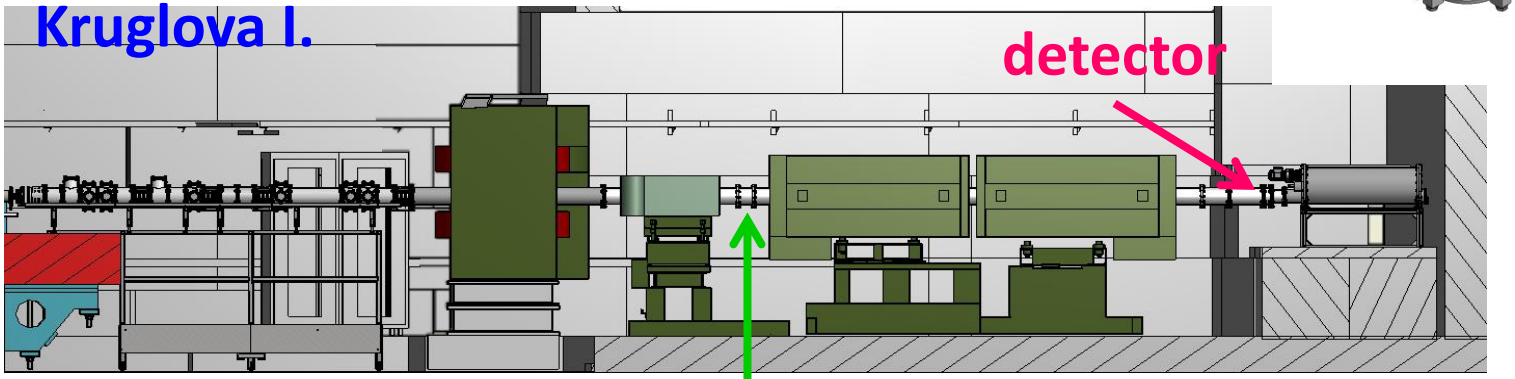
The position of new vacuum boxes on beam pipe before SP-41 magnet



Box for
profilometer 128x128mm

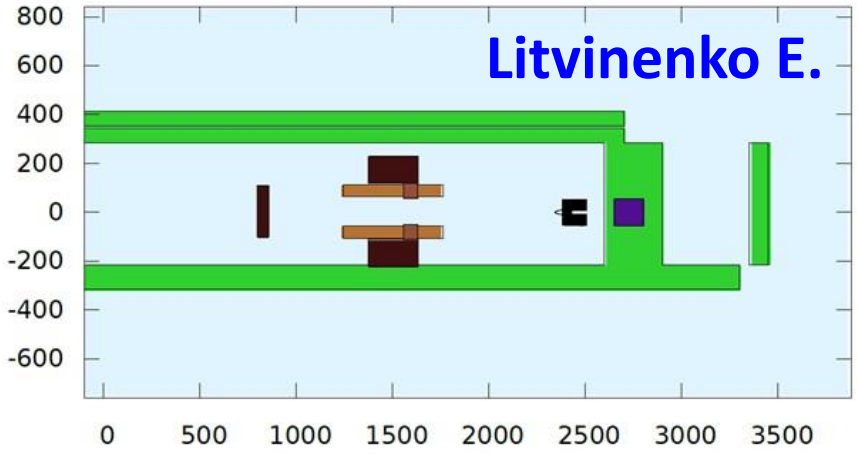
Box for
scintillation
detector

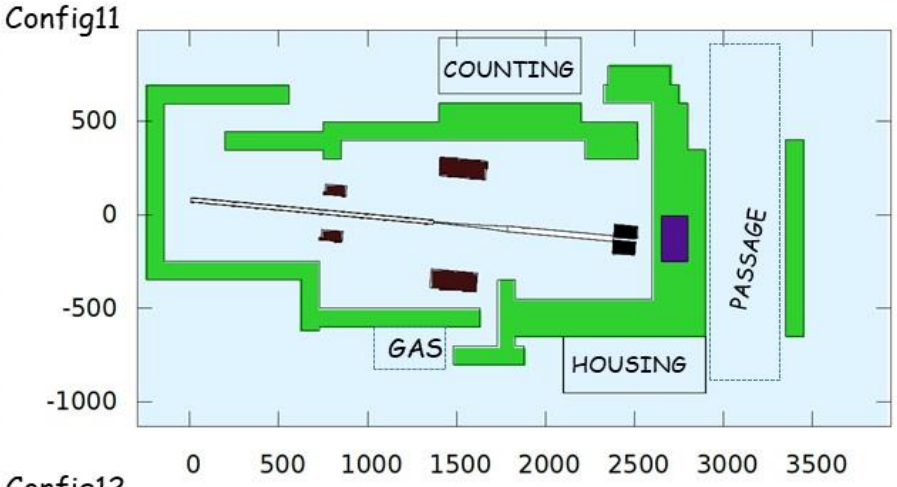


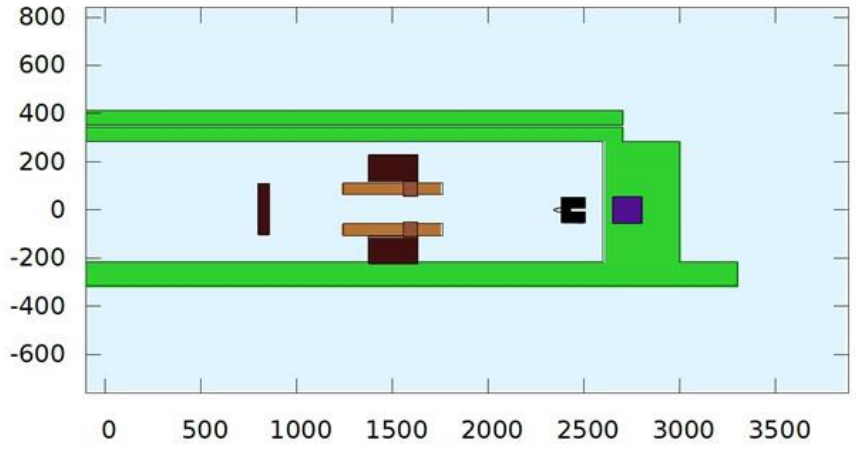


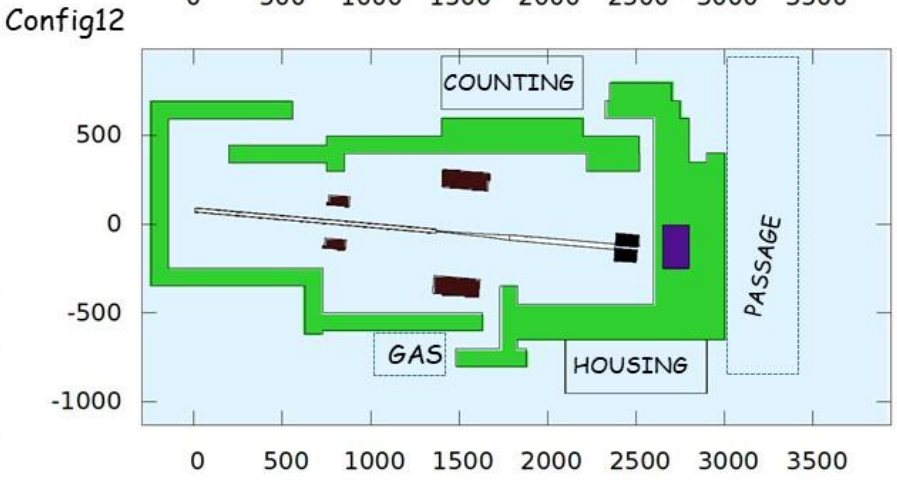
Box for
profilometer 200x200мм

Modeling of biological protection of the BM@N installation



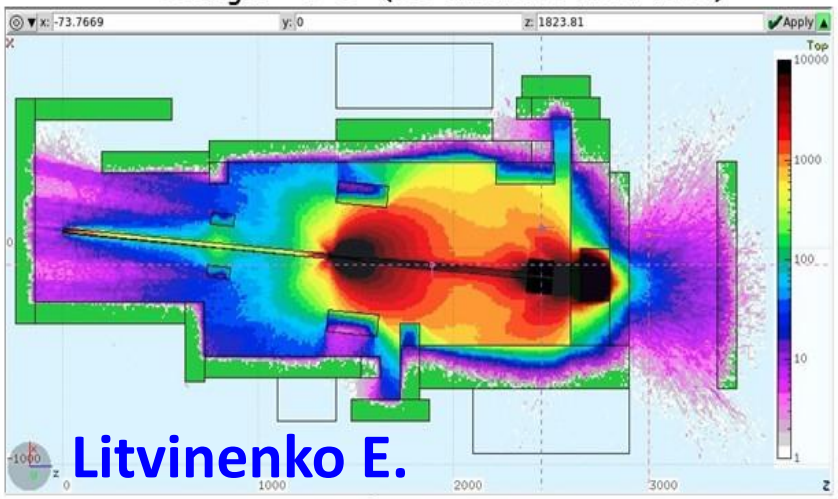






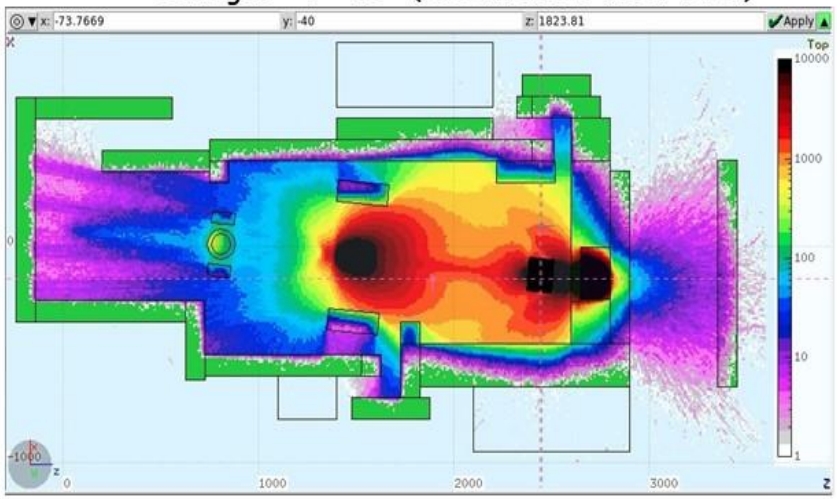
Modeling of biological protection of the BM@N installation

Config11 Y=0 (216 cm above floor level)

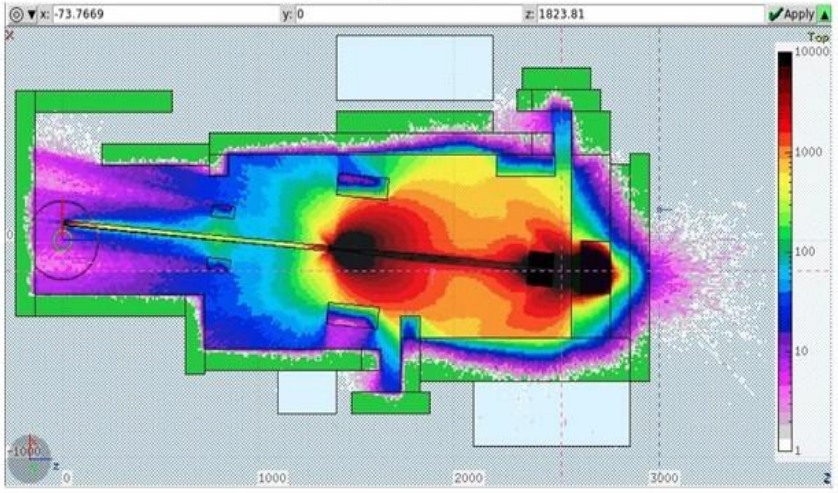


Litvinenko E.

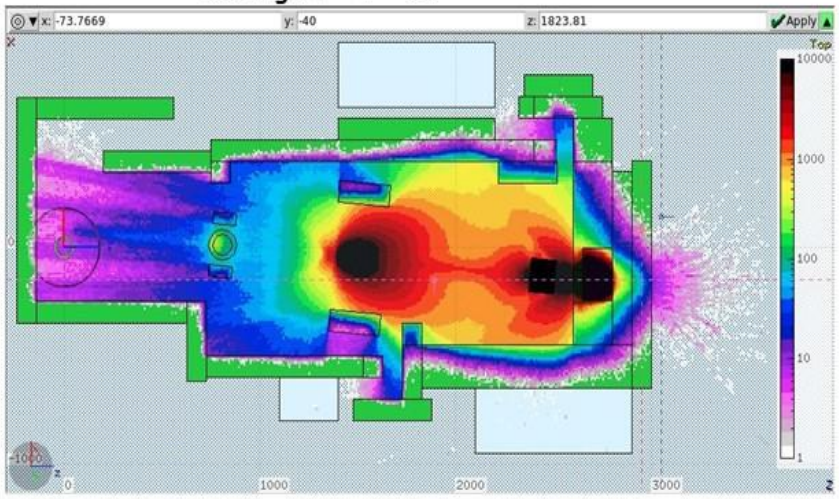
Config11 Y=-40 (176 cm above floor level)



Config12 Y=0



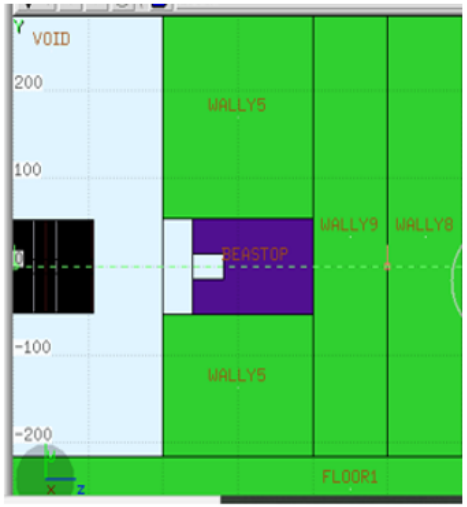
Config12 Y=-40



Modeling of biological protection of the BM@N installation

1) Energy 3.8
2) Intensity 5E5 (2sec/10sec)
3) Gauss 5
4) Configs: conf19n, conf20n, conf21n, conf22n, conf12n, conf6n, conf6nn

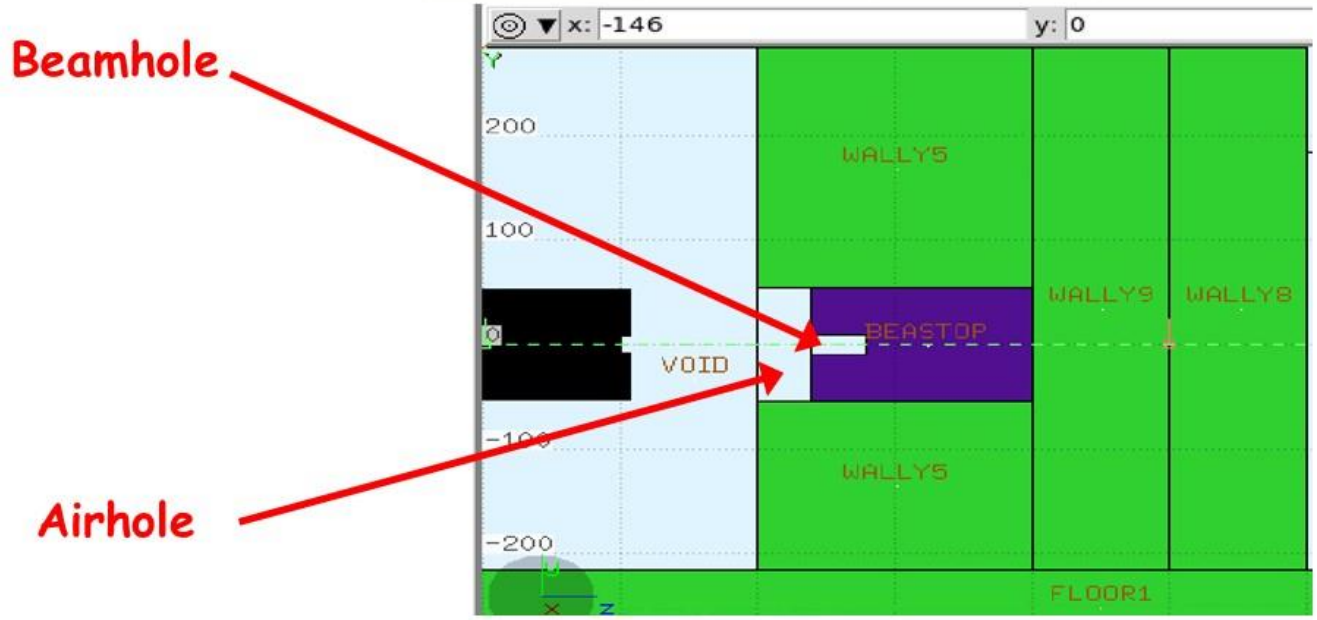
Config	Beamstop	Roof	wally9	wally8
6n	very_old	+	+	-
6nn	very_old	-	+	-
12n	old	+	+	+
12nn	old	-	+	+
19n	new	-	+	+
20n	new	+	+	+
21n	new	+	+	-
22n	new	-	+	-



Modeling of biological protection of the BM@N installation

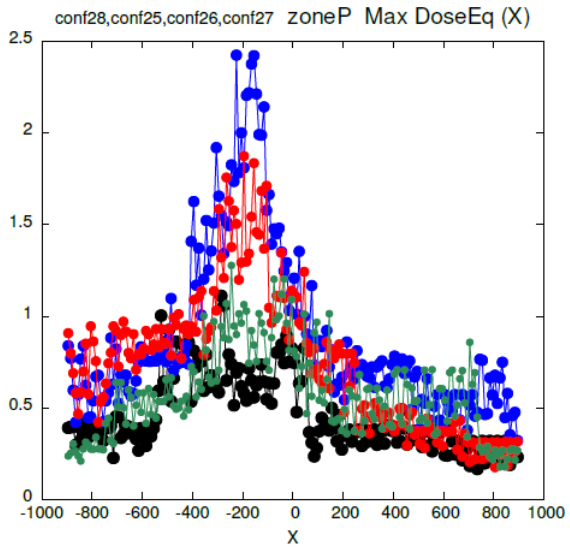
Last step:
1) Energy 3.8
2) Intensity 5E5 (2sec/10sec)
3) Gauss 5
4) conf25, conf26, conf27,conf28

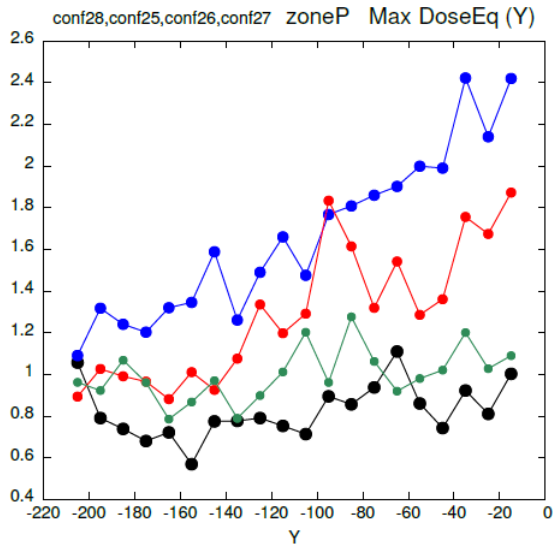
Config	Beamstop	Beamhole	Airhole	wally8,wall9
25	steel	air	polyethylene	++
26	steel	air	concrete	++
27	steel	concrete	concrete	++
28	steel	steel	concrete	++

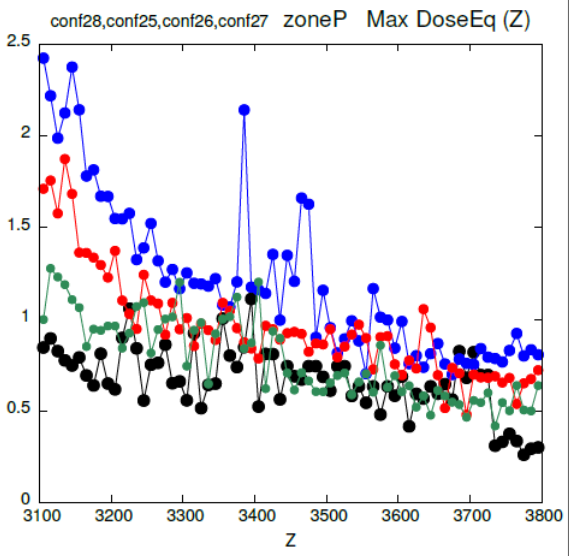


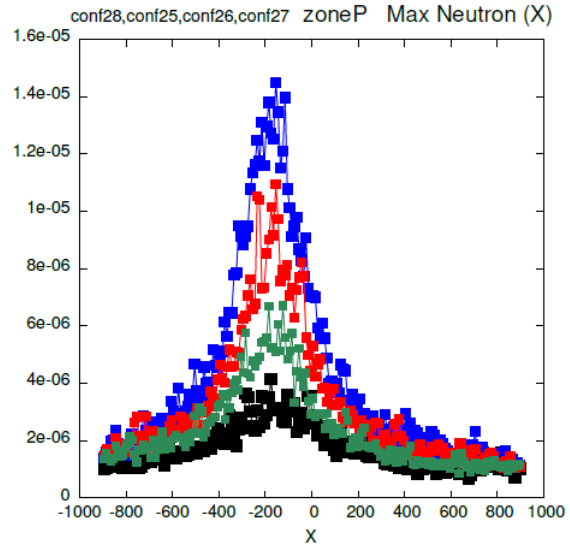
Modeling of biological protection of the BM@N installation

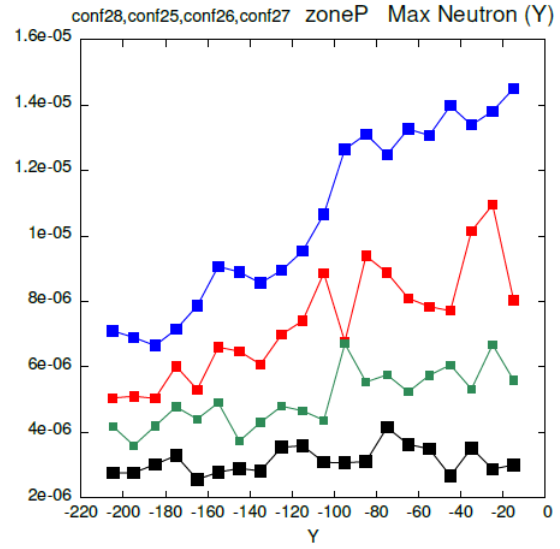
conf28 [black],conf25 [blue],conf26 [red],conf27 [green] - zoneP

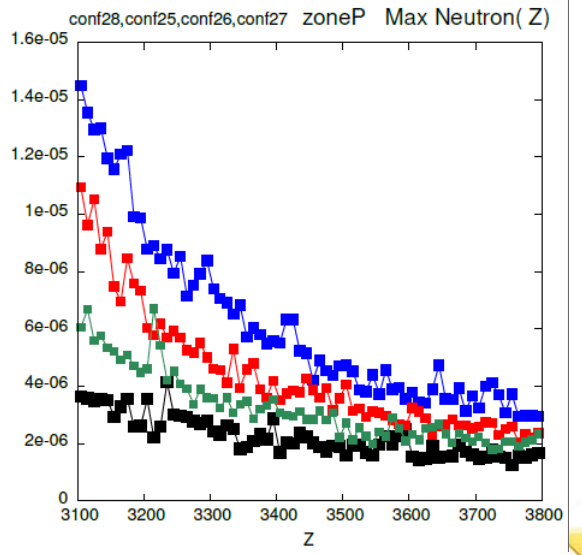




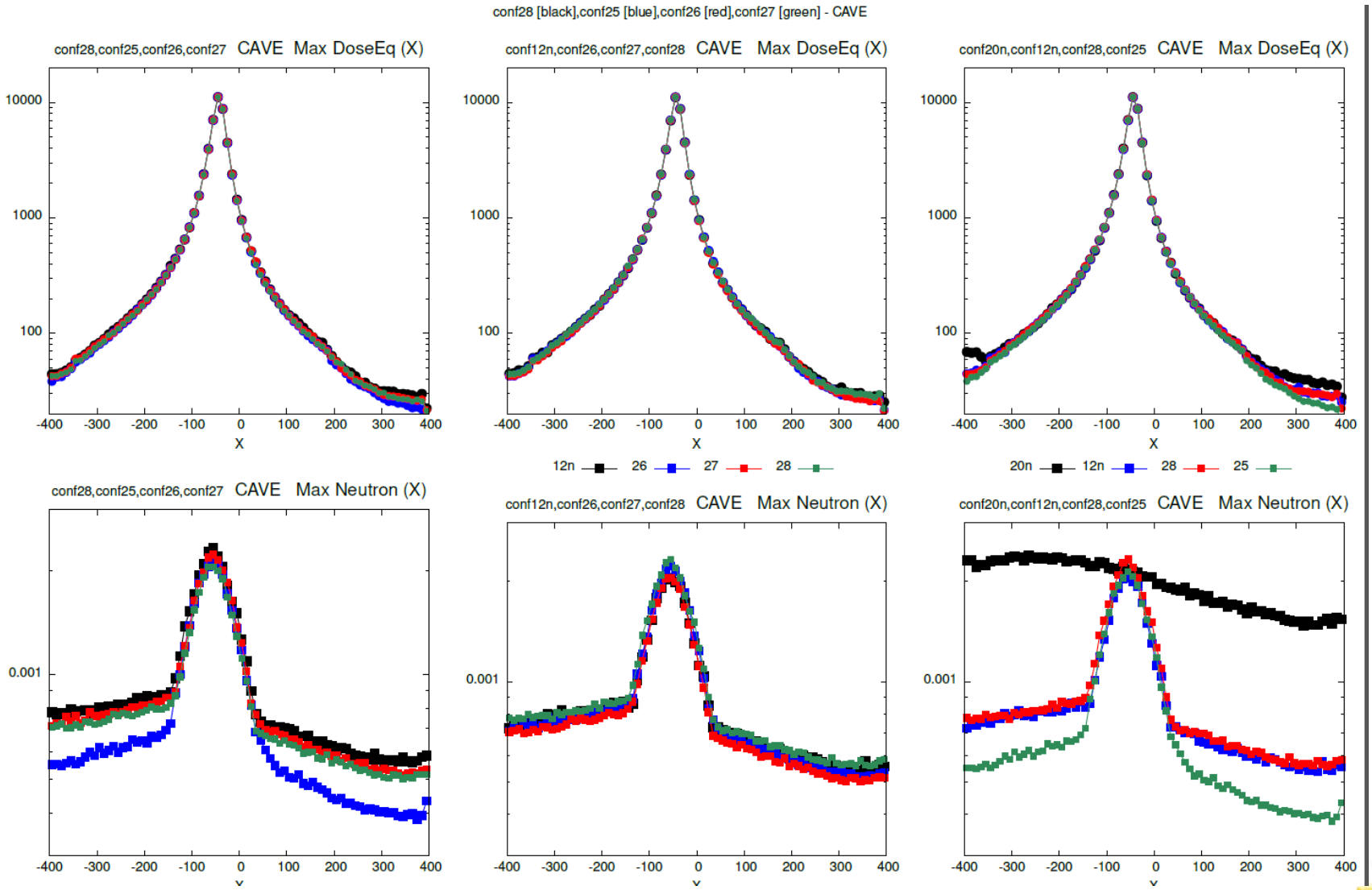








Modeling of biological protection of the BM@N installation

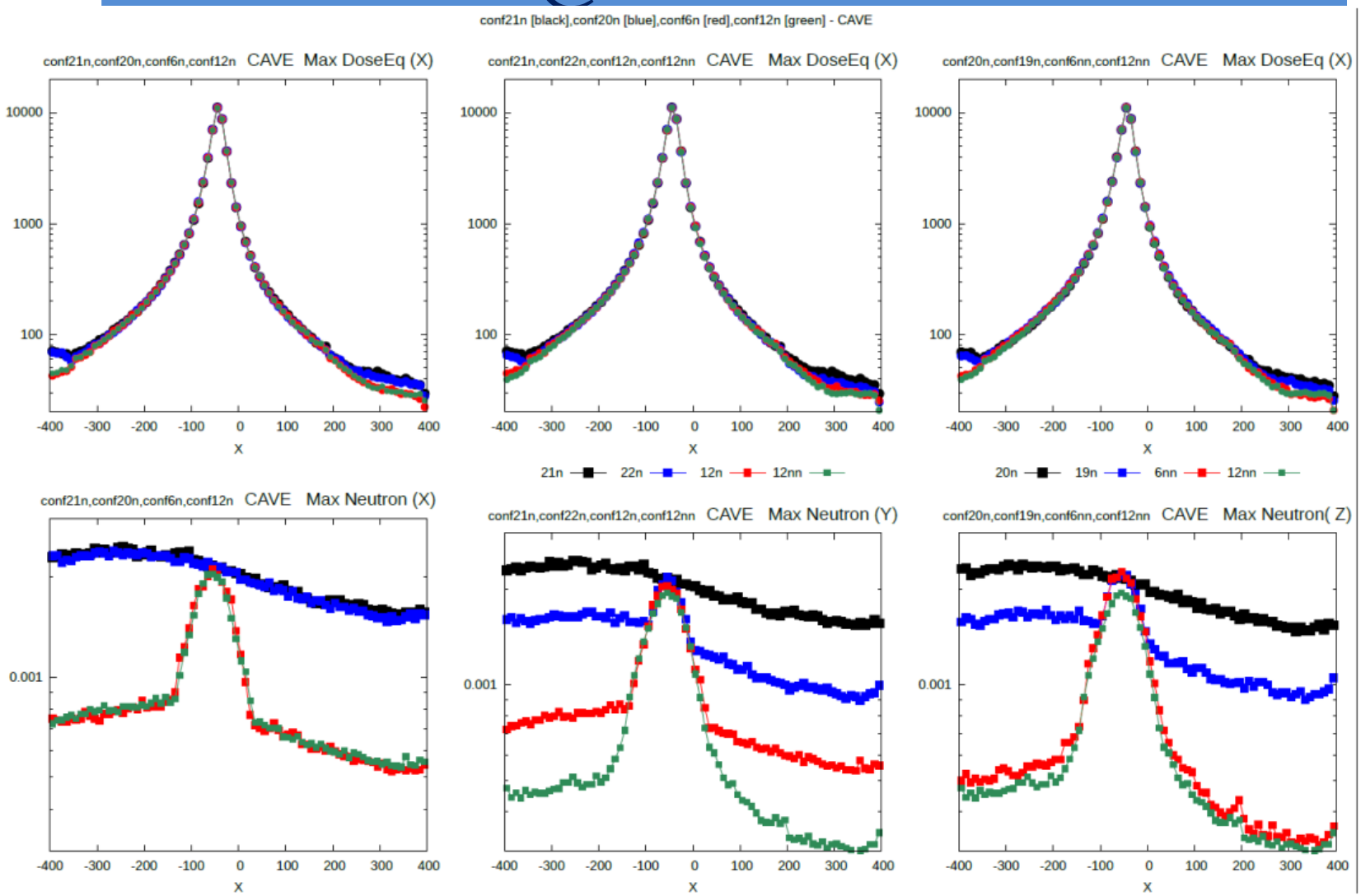


Conclusion

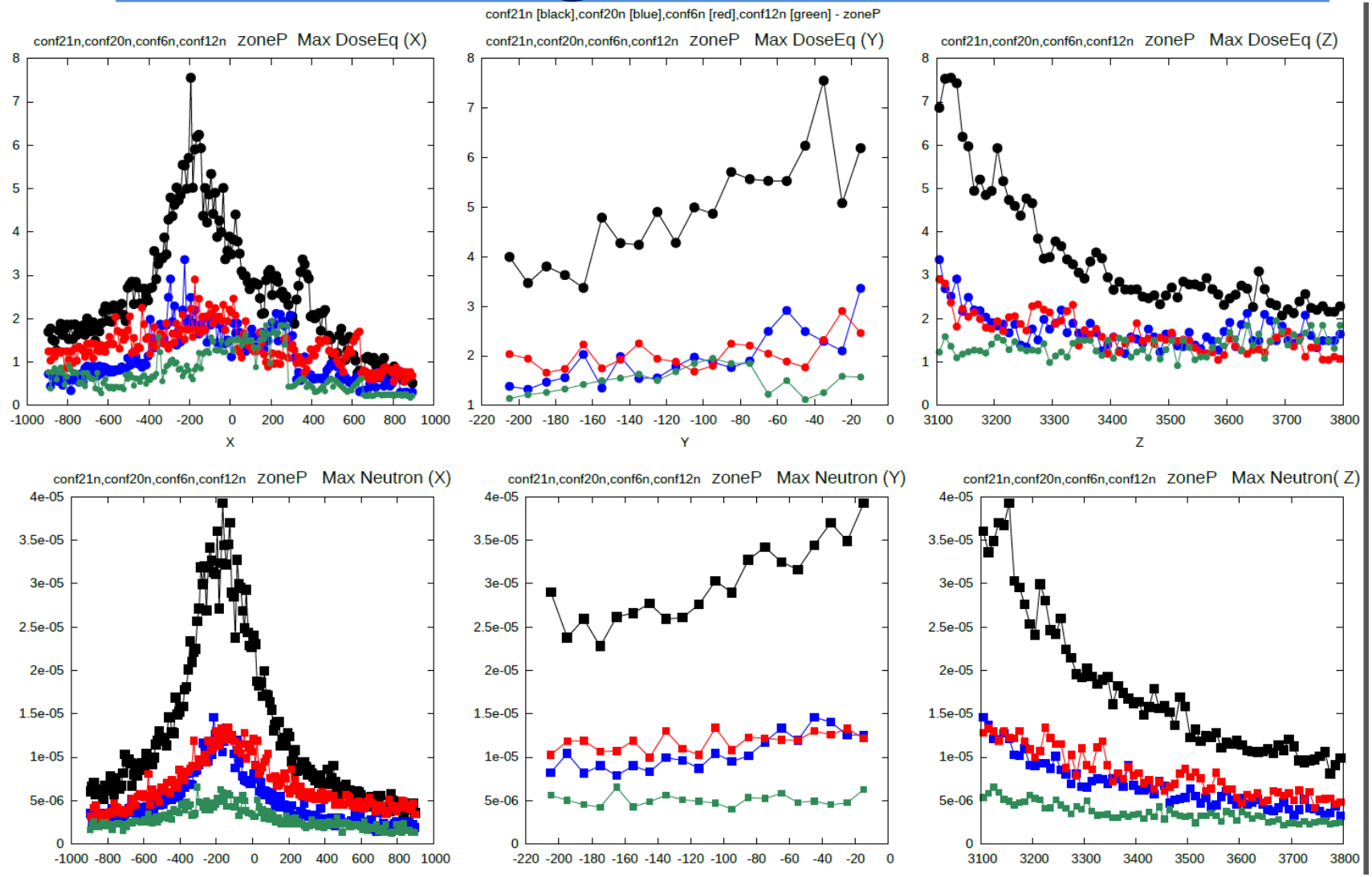
1. All work of the design and creation of mechanical supports was completed, taking into account the modernization of the external track system of the BM@N installation.
2. To begin work on installing mechanical supports on the BM@N installation, a group of installers is required.
3. The installation of a central tracking system inside the SP-41 magnet will begin after the completion of the modernization process of the detectors themselves.
4. We will begin the procedure for forming a contract for the production of new vacuum boxes with mechanical drives and profilometers.
5. We will begin work on upgrading the beam dump after confirming a decrease in the neutron background inside the experimental hall and the absence of deterioration in the conditions behind the biological shield.

THANK YOU
FOR YOUR
ATTENTION

Modeling of biological protection of the BM@N installation



Modeling of biological protection of the BM@N installation



Modeling of biological protection of the BM@N installation