JOINT INSTITUTE
FOR NUCLEAR RESEARCH
International Intergovernmental Organization

Status and prospects of the SPD test zone

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SPD Test Zone

SPD test zone – zone for testing systems of SPD.
The zone is located in 205 building.

Task:

- Testing prototypes of detectors, data acquisition systems and other systems of SPD.

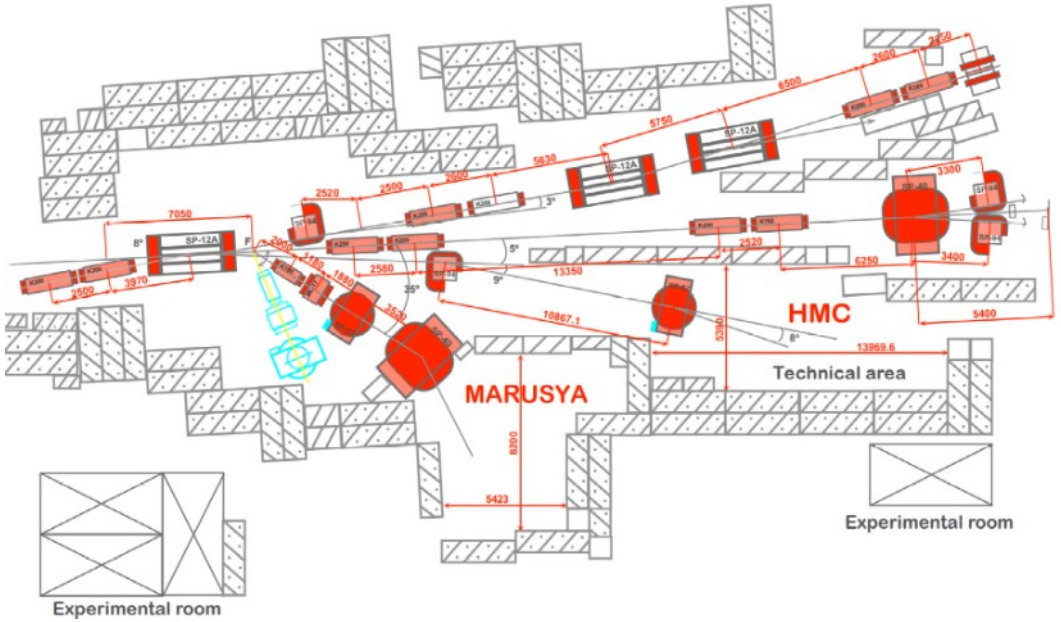
Secondary tasks:

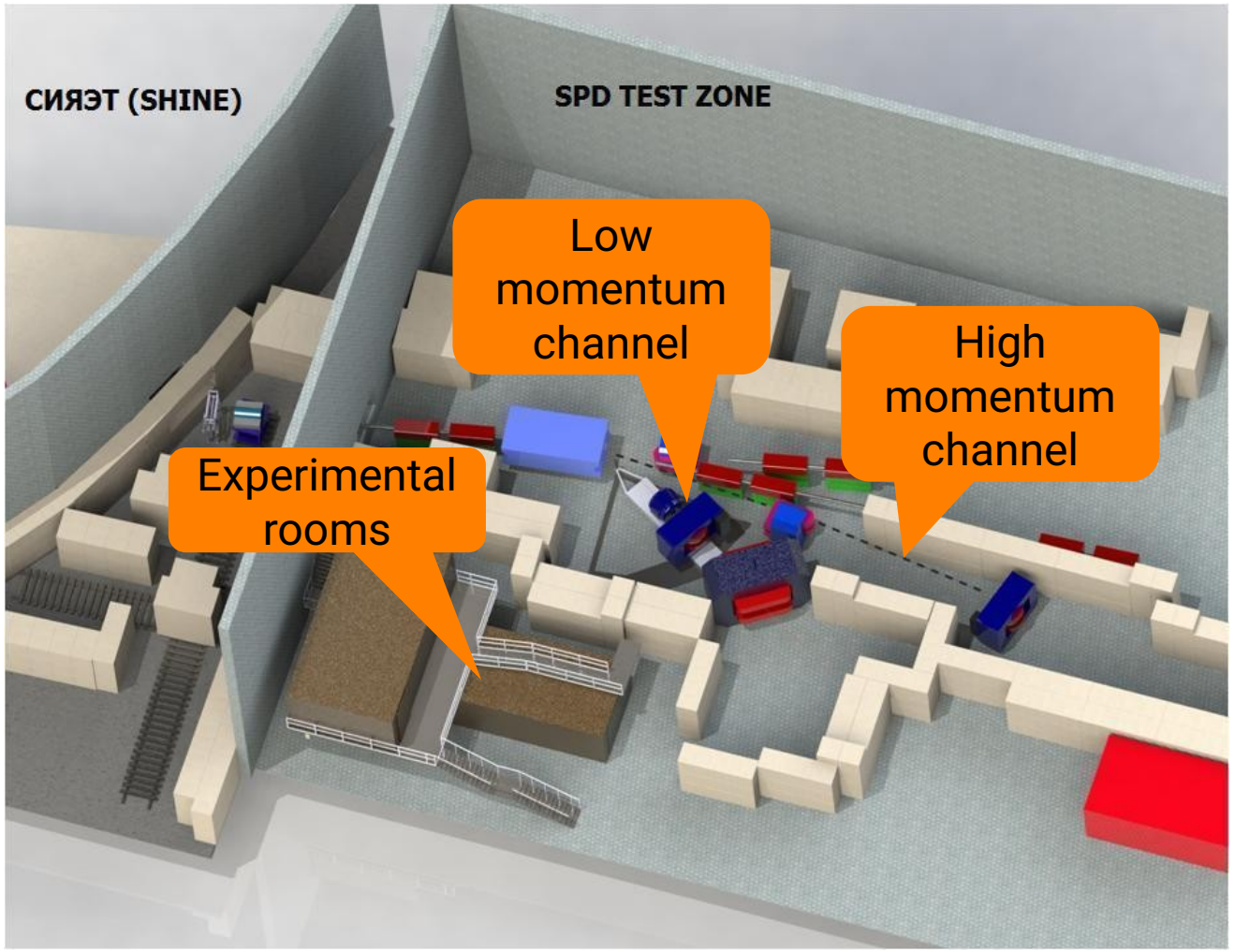
- New physical results in subthreshold and cumulative region with heavy ion and polarized beams.
- Training young scientists and engineers.

SPD Test Zone

SPD test zone has two channel:

- The low momentum channel (Marusya setup) should provide particle beams with a momentum range from 100 MeV/c to 2 GeV/c.
- The high momentum channel should provide particle beams with a momentum range from 1 GeV/c to 10 GeV/c.

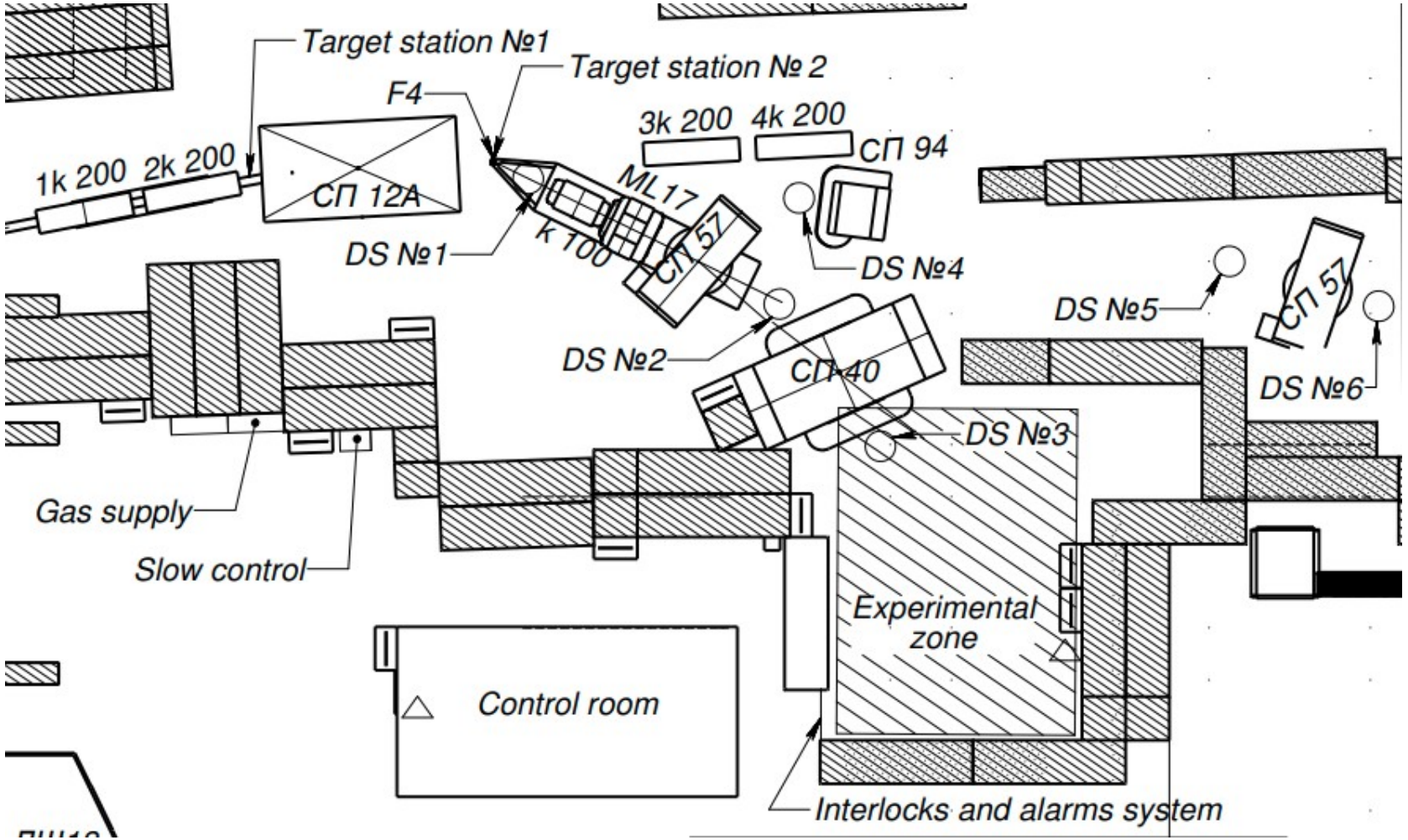




Structure of SPD Test Zone

SPD test zone consists of:

- Target station №1
- Target station №2
- Diagnostic station №1
- Diagnostic station №2
- Diagnostic station №3
- Diagnostic station №4
- Diagnostic station №5
- Diagnostic station №6
- Interlocks and alarm system
- Magnets
- Slow control



Low momentum channel

Energy of primary beam — up to 2 GeV/n

Commissioning date — 2025 year

Intensities from interaction deuteron 5GeV/n + carbon target

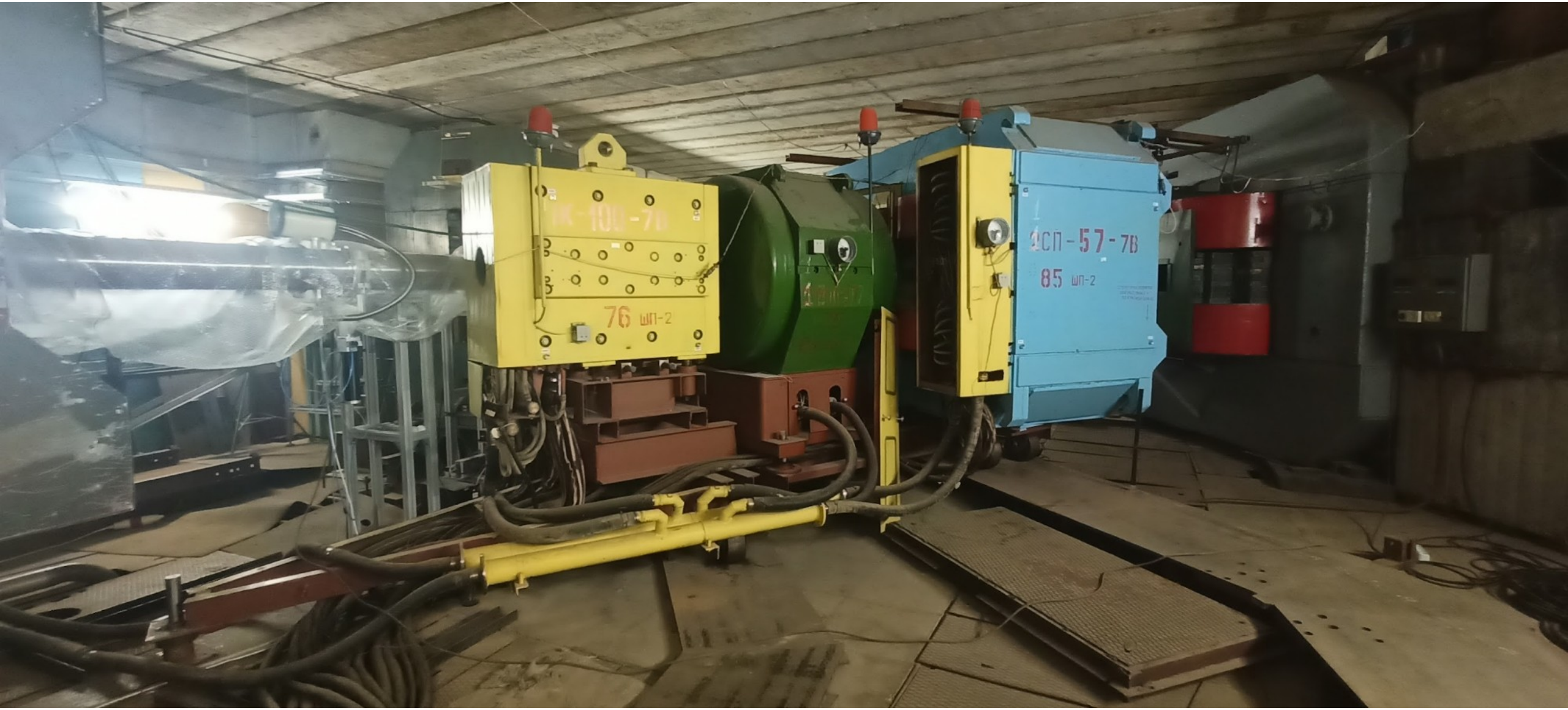
p, MeV/c	d	p,n	$\pi^{\pm}$	K^{+}	K^{-}	$\mu^{\pm}$	$e^{\pm}$
400	10^3	10^5	10^5	10^3	10^2	10^3	10^3
800	10^3	10^4	10^4	10^3	10^2	10^3	10^3
1500	10^2	10^4	10^4	10^3	10^2	10^2	10^2


Experimental zone LMC

Focus F4

View of the beam line at F4

Focus F4 and place for the target station 2


76 ШП-2
85 ШП-2

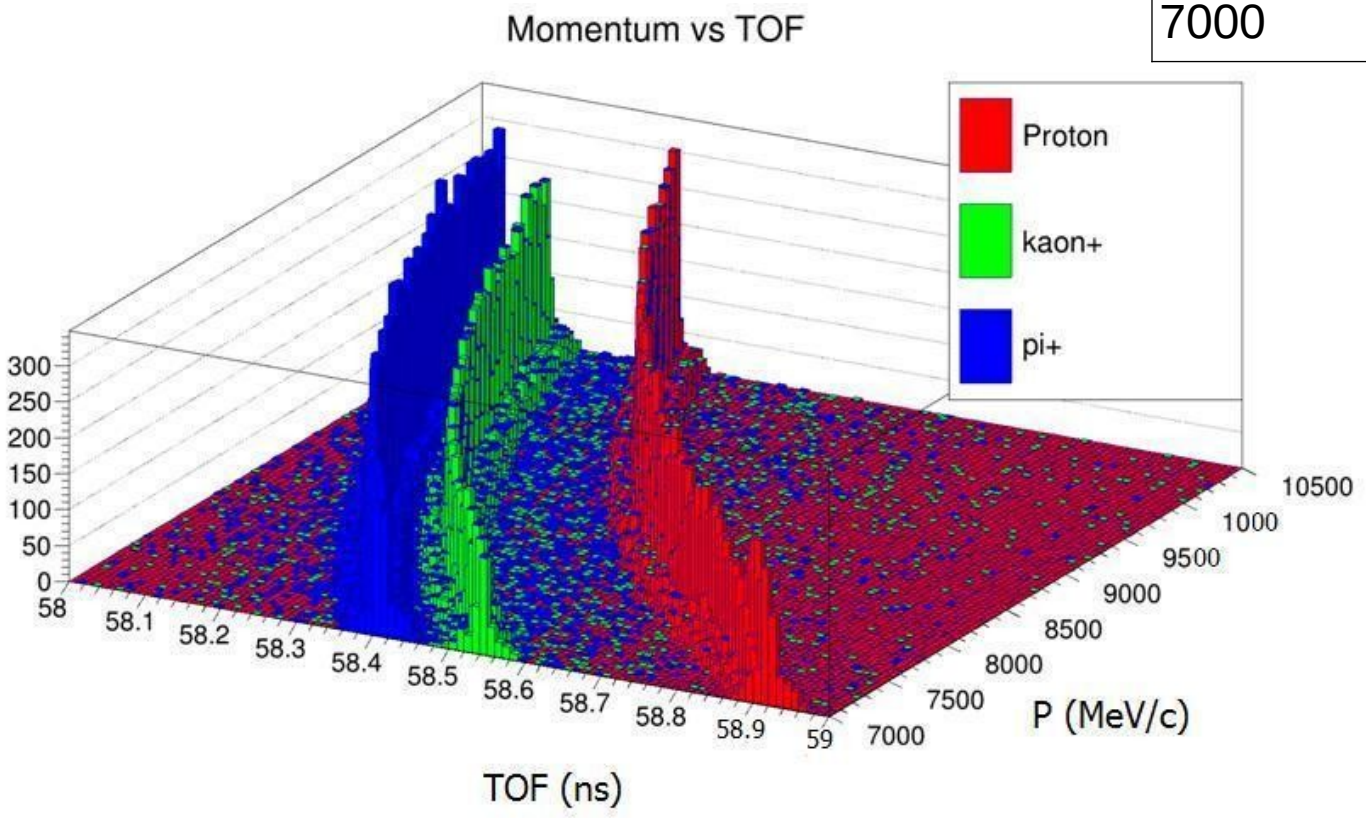
High momentum channel

Energy of primary beam — up to 10 GeV/n

Commissioning date — 2026 year

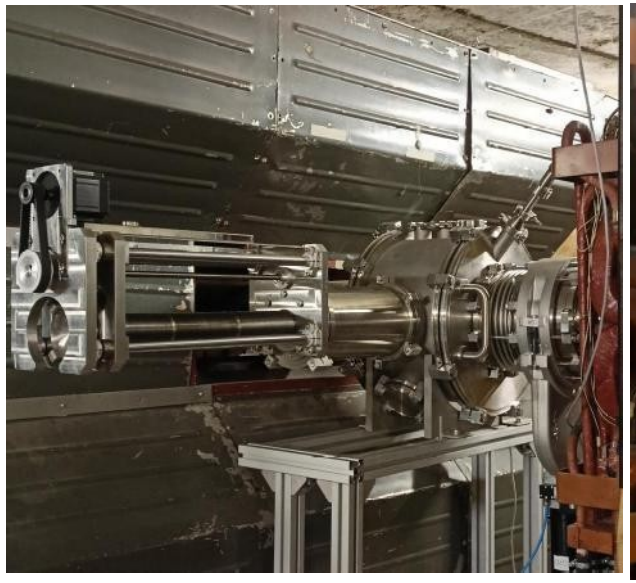
Intensities from interaction deuteron 5GeV/n + carbon target

p, MeV/c	d	p,n	$\pi^{\pm}$	K^{+}	K^{-}	$\mu^{\pm}$	$e^{\pm}$
2000	10^4	10^5	10^4	10^3	10^2	10^2	10^2
7000	10^4	10^6	10^3	10^3	10^2	10^2	10^2



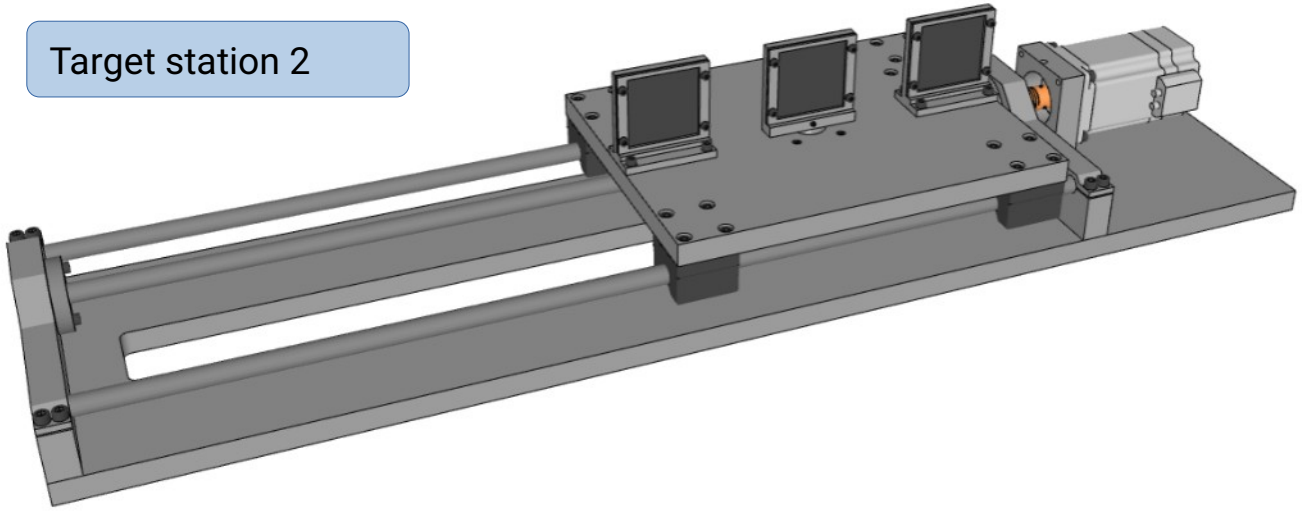
Target stations

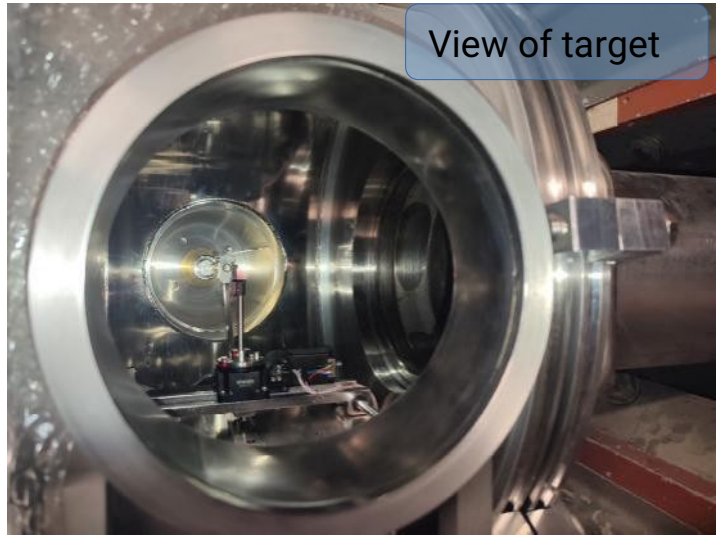
- Target station №1 was produced and installed. It was tested in 2023.
- Target station №2 in the process of delivery. It will be installed at the focus f4 in 2024.



Target station 1

Target station 2





View of target

Diagnostic stations

Diagnostic stations consist of: scintillations detectors, multiwire proportional chamber, DAQ system.

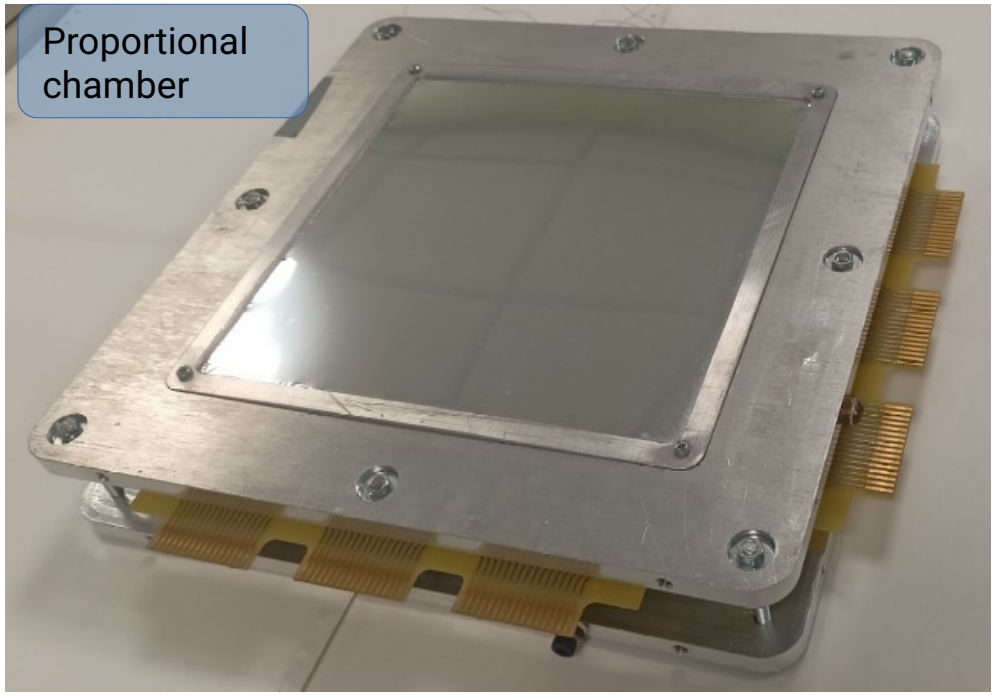
Diagnostic stations at low-energy channel will be setup in 2024

Diagnostic stations at high-energy channel will be setup in 2025

TQDC16VS-E

Scintillation detector

Proportional chamber

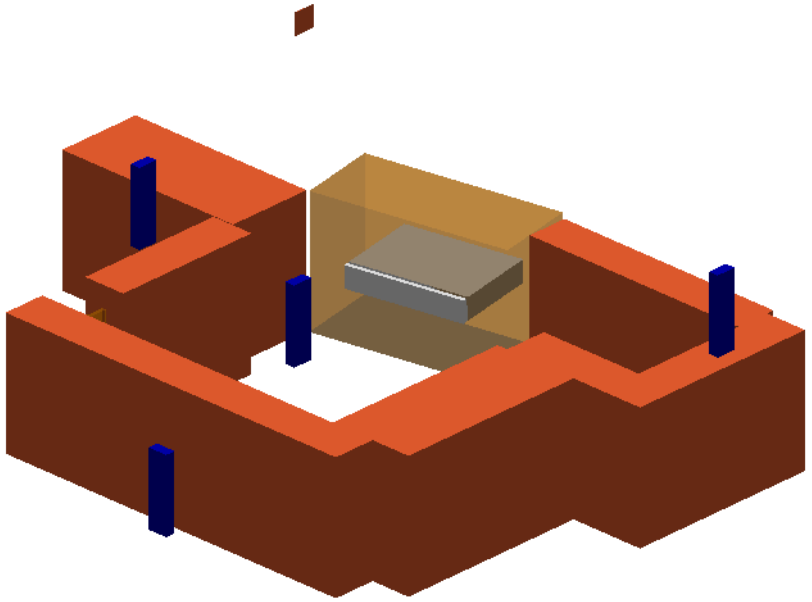


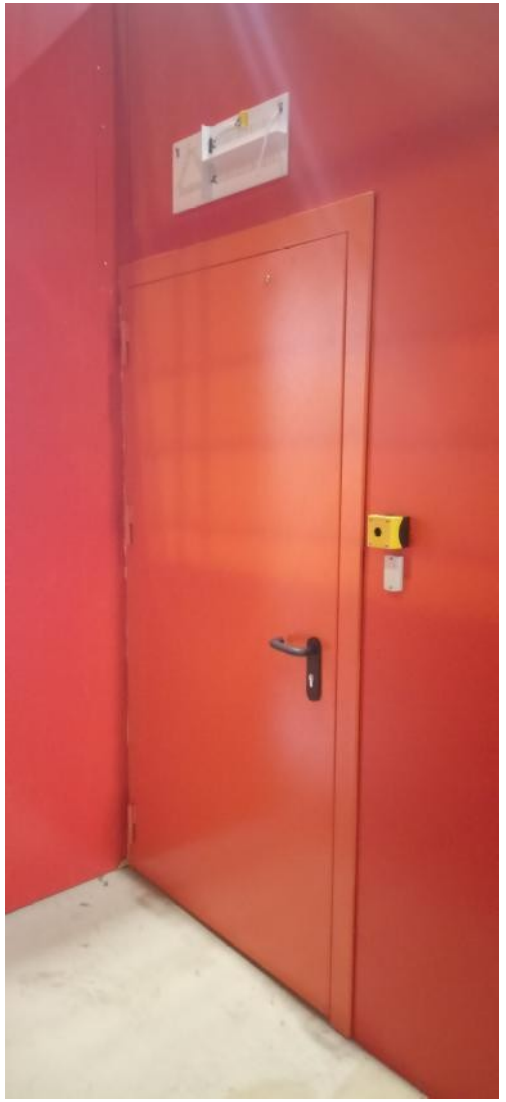
DAQ TIC

Radiation safety in the Test zone

Interlocks and alarm system for Marusya setup are in the process of development and installation.

The installation work will be completed in 2024





Slow control

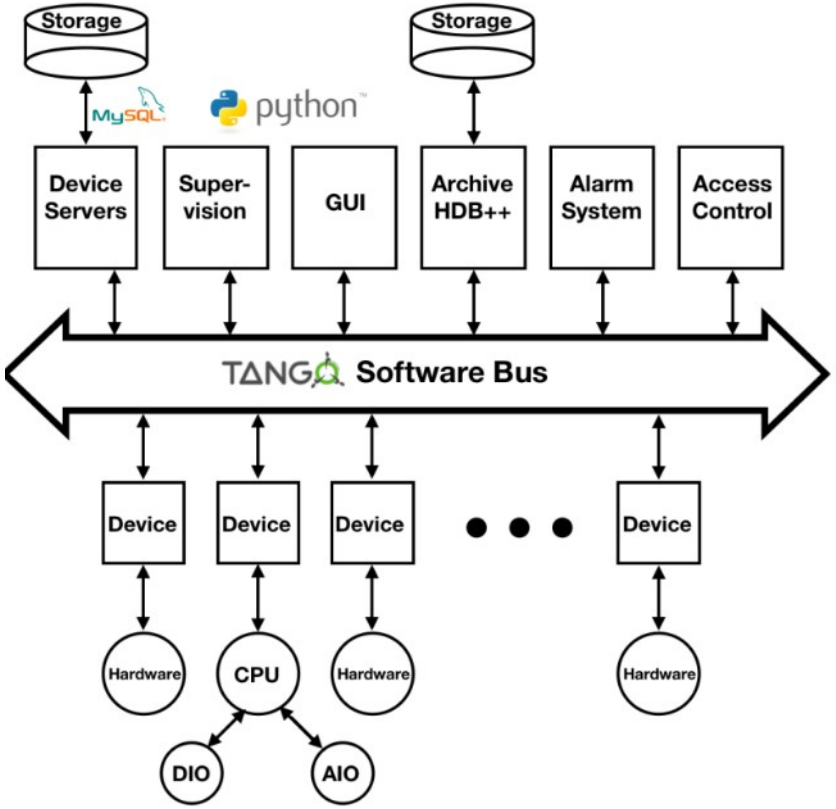
Slow control managing:

- Target motors
- Blocking device
- Temparture sensors
- Controlling magnets
- Gas supply, etc

Framework of slow control will be changed from WinCC OA to Tango.


Gas supply


Slow control cabinet



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Prototype of SPD muon detector

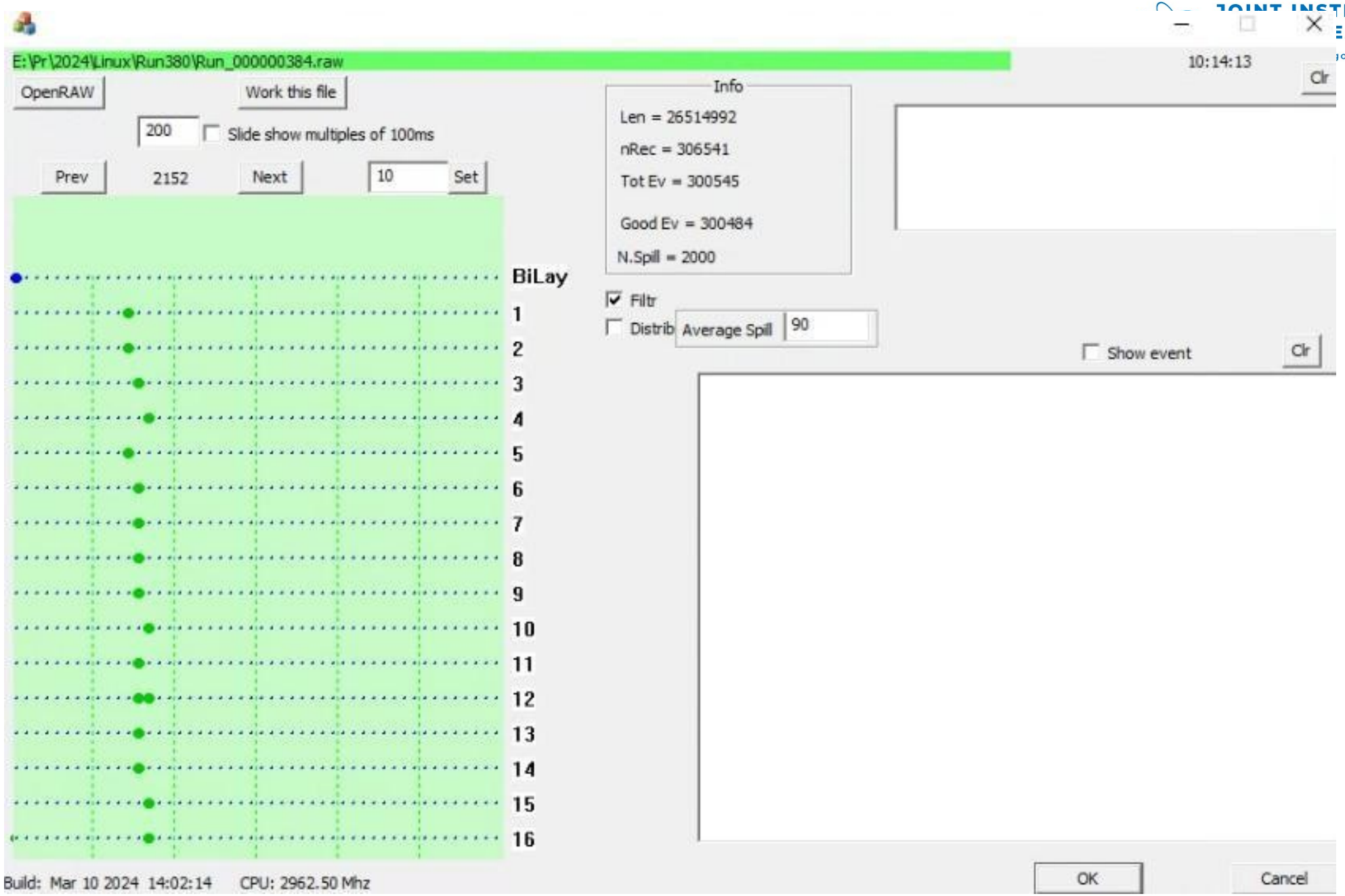
Conclusions

1. Tasks and objectives.
2. Placement of equipment and biological shielding in the reconstructed zone. 6 rooms, including experimental rooms, reconstructed.
3. Target stations. DONE
3.1 Design and specific features of station at focus F4. DONE
3.2 Design and specific features of station in channel VP1 before input magnet SP12. Station 1 manufactured, assembled, and tested. Station 2 manufactured, in progress delivery.
4. System of extracted beam monitoring at the target stations. Designed, manufactured, waiting to be tested.
5. Systems of local vacuum pumping of target stations and elements of test channel beam lines. Designed, manufactured, installed.
6. Magnetooptical system of low momentum channel (LMC, magnetooptical spectrometer MARUSYA).
6.1. General description of LMC. DONE
6.2. Operation modes of LMC. DONE
6.3. Scintillation time of flight detectors (hodoscopes) at LMC. DONE
6.4. Coordinate detectors at LMC. DONE
6.5. Cherenkov detectors at LMC. IN PROGRESS

Conclusions

7. Magnetooptical system of high momentum channel (HMC).
7.1. General description of HMC. DONE
7.2. Calculation of HMC operation modes. DONE
7.3. Scintillation time of flight detectors (hodoscopes) at HMC . DONE
7.4. Coordinate detectors at HMC. IN PROGRESS
7.5. Cherenkov detectors at HMC . IN PROGRESS
7.6. System of movement and positioning of detectors and samples. IN PROGRESS
8. Infrastructure of the Test zone for experiment SPD of collider NICA.
8.1. Experimental rooms. DONE
8.2. Furniture, metrological and instrumental equipment at workplaces of the Test zone. DONE
8.3. Power supply of the Test zone. DONE
8.4. Computer and network equipment of the Test zone. DONE
8.4.1. Network infrastructure. DONE
8.4.2. Servers. DONE
8.4.3. Computers. DONE
8.4.4. Data acquisition, analysis and storage system. IN PROGRESS
8.5. Gas control panel for detectors PC, STAW, RPC. DONE
9. System of data acquisition from detectors and slow control. DONE
10. Radiation safety in the Test zone. IN PROGRESS

THANK YOU FOR YOUR ATTENTION!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