JOINT INSTITUTE FOR NUCLEAR RESEARCH

International Intergovernmental Organization

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138th Session of the JINR Scientific Council 15th September 2025, Dubna

Director's Report: News, Science, Prospects

JINR DG, acad. Grigory V. Trubnikov

Session of the JINR Committee of Plenipotentiaries, 25–26 March 2025, Dubna

Chaired by PP of Georgia Prof. A.Khvedelidze

1. Director's Report: News, Science, Prospects
Speaker — G.Trubnikov

2. On the first run at the NICA accelerator complex
Speaker — V.Kekelidze

3. Start of the first run at the NICA complex
(visit to the NICA complex) *Speaker — A.Butenko*

4. Execution of the JINR budget for 2024 and draft of the revised budget of JINR for 2025 *Speaker — N.Kalinin*

5. Results of the meeting of the JINR Finance Committee
Speaker — A.Khvedelidze

6. On the call of elections and nomination of candidates for the position of JINR Director *Speaker — A.Khvedelidze*

7. Scientific report "To the 60th anniversary of the hypothesis of colored quarks and the Dubna model of hadrons"
Speaker — V.Matveev

8. On preparing and holding the events dedicated to the 70th anniversary of JINR
Speaker — S.Nedelko

The Committee of Plenipotentiaries approved the consolidated adjustment of the JINR budget expenditure for 2024 and the revised budget of JINR for 2025 with the income amounting to **US$ 234 017.7 thousand** and the expenditure amounting to **US$ 315 465.3 thousand**, taking into account the positive opening balance amounting to **US$ 40 170.2 thousand**.

Having heard and discussed the report “On the call of elections and nomination of candidates for the position of JINR Director”, taking into account the unanimous decision of the Plenipotentiaries of the Governments of the JINR Member States to nominate G.Trubnikov as the only candidate for the position of JINR Director, **G.Trubnikov** was **unanimously elected** by the CP to the **position of JINR Director** for a term of five years taking office on 1 January 2026.

Having heard the scientific report by Scientific Leader of JINR, V.Matveev, “To the 60th anniversary of the hypothesis of colored quarks and the Dubna model of hadrons”, the Committee of Plenipotentiaries thanked the speaker for his interesting and informative report.

Having heard and discussed the report “On preparing and holding the events dedicated to the **70th anniversary of JINR**” presented by Chief Scientific Secretary of JINR, S.Nedelko, the Committee of Plenipotentiaries approved the **Plan of events** proposed by the Organizing Committee, which includes holding JINR Days in Member States, major scientific conferences, exhibitions, cultural and sporting events dedicated to the anniversary of the Institute, as well as the preparation and publication of a book about the history of JINR.

Celebration of the JINR Foundation Day

On 26 March, the celebration of the 69th anniversary of the foundation day of th Institute for Nuclear Research was held at the JINR Mir Culture Centre. Particip JINR CP session, representatives of the city administration, veterans and the In members attended the ceremonial event.

Last year was a record one in the number of scientists who visited the Joint Institute. In 2024, about 930 scientists, engineers, students from different countries visited JINR to conduct research or start a scientific career.

During the coming two years events will be held dedicated to the jubilee of the Institute and the 70th anniversary of the science city Dubna.
JINR staff members were presented various awards for outstanding service in science and dedicated work.
13 school teachers and educators of additional school education of the city of Dubna who received JINR grants in 2025 were awarded Prizes.

The festive event was concluded with a concert of classical music by the Russian state symphonic orchestra of cinematography conducted by the RF Honored Artist, Laureate of the Prize of the RF Government in culture Professor S.Skripka. The Moscow Premier orchestra celebrated its centenary in 2024.

Meetings of the JINR Programme Advisory Committees

19–20 June, Dubna.
61st meeting of the PAC for Nuclear Physics
Chair of the PAC for Nuclear Physics V.Nesvizhevsky opened the event. He informed the PAC members about the implementation of the previous meeting's recommendations. JINR Vice-Director S.Dmitriev presented the Resolution of the 137th session of the Scientific Council (February 2025) and the decisions of the Committee of Plenipotentiaries of the Governments of the JINR Member States (March 2025).

23–24 June, Dubna.
62nd meeting of the PAC for Particle Physics
Chair of the PAC PP opened the meeting with a one-minute silence honoring the memory of Hans Gutbrod, who passed away. I.Tserruya presented an overview of the implementation of the recommendations adopted at the previous meeting. The Institute's Vice-Director V.Kekelidze highlighted the Resolution of the 137th session of the JINR Scientific Council (February 2025) relevant to particle physics and the decisions of the JINR Committee of Plenipotentiaries (March 2025).

26–27 June, Dubna.
61st meeting of the PAC for Condensed Matter Physics
Chair of the PAC for Condensed Matter Physics D.L.Nagy presented an overview of the implementation of the recommendations made at the previous PAC meeting. JINR Vice-Director L.Kostov informed the PAC about the resolution of the 137th session of the JINR Scientific Council in February 2025 and the decisions of the Committee of Plenipotentiaries of the Governments of the JINR Member States in March 2025.

Meeting of the Working Group under the CP Chair for JINR Financial Issues

(27 June 2025, Tsaghkadzor/Yerevan, Armenia)

- To support the amendments to the Financial rules of JINR and to the Regulations for making adjustments to the JINR budget.
- To support the intentions of the JINR Directorate to further develop instruments with the participation of experts from Member States to attract additional targeted funds for the implementation of joint scientific, educational and infrastructure projects of Member States.
- To support the initiative of the JINR Directorate to implement projects for the development of the Scientific and Clinical Center for Proton Therapy and the International Park of Science and High Technologies in Dubna.
- To take note of the intention of Vietnam to establish, jointly with JINR, the project “Joint Laboratory for Accelerator Technologies and Applications” and the intention of Kazakhstan to establish, jointly with JINR, the project “New Facility at the WWR-K Research Reactor” and to recommend that these Member States develop projects for presentation at one of the subsequent sessions of the CP.
- To support the efforts of the JINR Directorate to annually increase the level of salaries of JINR employees; to maintain the size of the Incentive Fund at the current level when planning the JINR budget; to support the expansion of the practice of stimulating mentoring at JINR; to commission the JINR Directorate to continue work on analyzing the competitiveness of salaries of scientific workers and specialists at JINR.

Composition of the Working Group:
Armenia, Belarus, Cuba, Egypt, Georgia, Kazakhstan, Mongolia, Russia, Vietnam

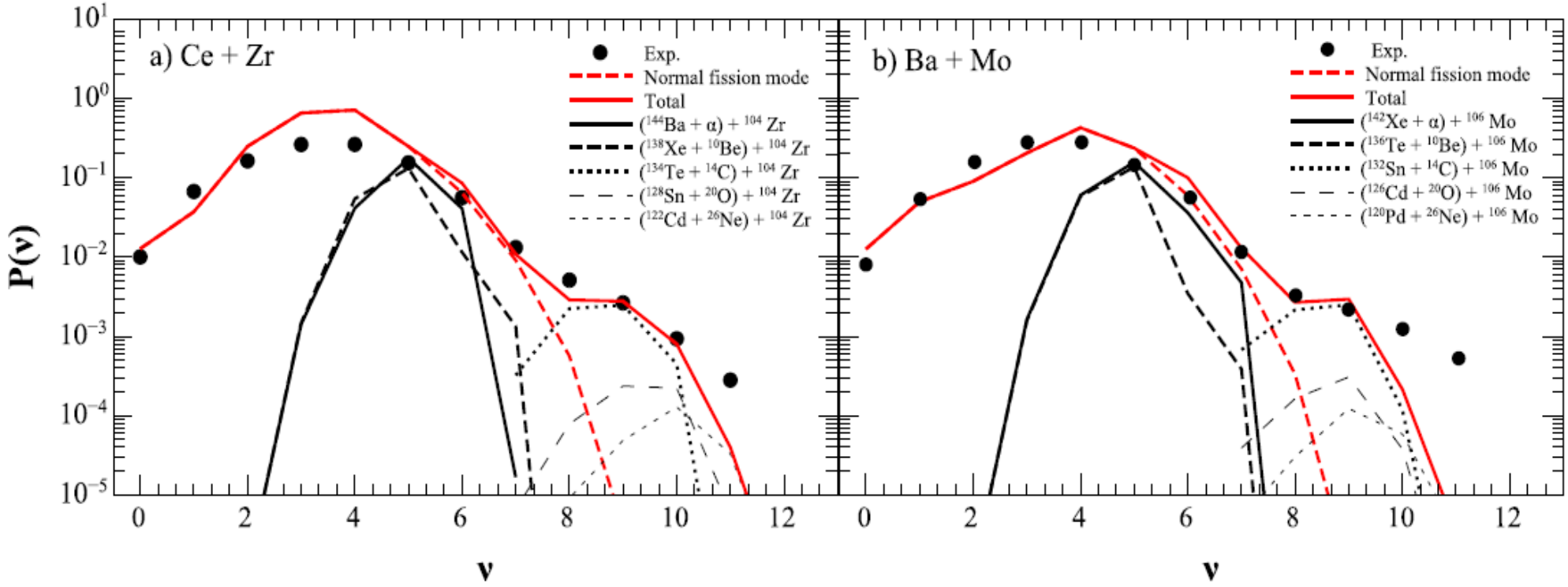
Manifestation of Ternary Clusterization in Binary Spontaneous Fission of ^{252}Cf

Phys. Lett. B 864, 139444, (2025) H.Pasca, G.G.Adamian, N.V.Antonenko

Probability $\mathbf{P(\nu)}$ of emitting exactly $\boldsymbol{\nu}$ neutrons from the pairs **Ce+Zr** (a) and **Ba+Mo** (b) resulting from SF of ^{252}Cf.

Exp.
G.M.Ter-Akopian,
J.Hamilton,
Yu.Ts.Oganessian
et al.

PRL 77(96)32,
PRC 55(97)1196,
PRC 101(20)034610.



The formation of the **trinuclear systems** (C, O, Ne between two fragments) at scission during binary fission process is proposed. This ternary system decays into a light fragment and a dinuclear system with subsequent fusion of nuclei of the dinuclear system and the formation of a hyperexcited heavy fragment. With this mechanism one can describe the **8–11 neutron** evaporation channels for Ce+Zr and Ba+Mo in the spontaneous fission of **^{252}Cf**.

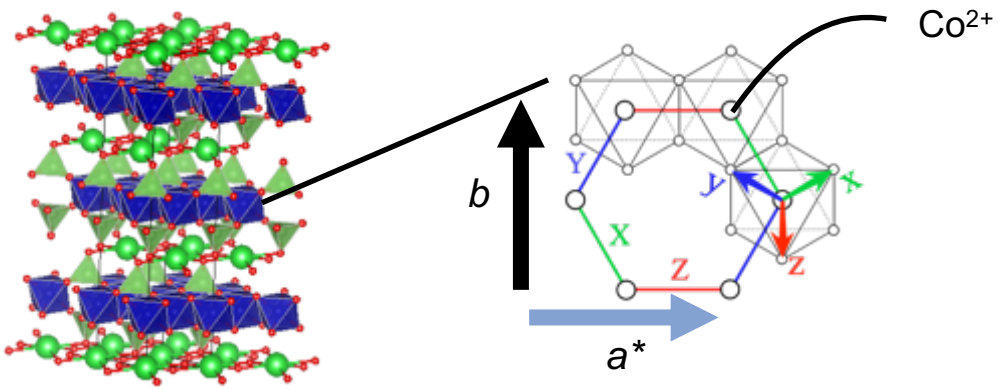
This **ternary cluster mode** is a new type of bimodal fission with “normal” and low TKE for the same charge/mass fragmentation.

Strong Kitaev Interaction in $BaCo_2(AsO_4)_2$

P.A.Maksimov, Shengtao Jiang, L. P.Regnault, and A. L.Chernyshev

Phys. Rev. Lett. 135, 066703 (2025)

Crystal structure of $BaCo_2(AsO_4)_2$: honeycomb planes of cobalt ions



Magnetic model Hamiltonian

Heisenberg interaction — Kitaev interaction

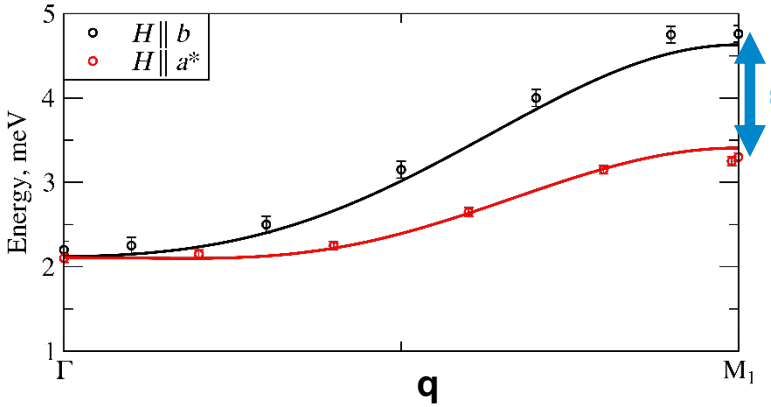
$$\mathcal{H} = J\sum_{\langle ij\rangle}\mathbf{S}_i\mathbf{S}_j + K\sum_{\langle ij\rangle^x} S_i^x S_j^x + K\sum_{\langle ij\rangle^y} S_i^y S_j^y + K\sum_{\langle ij\rangle^z} S_i^z S_j^z$$

- If $K>>J$ → quantum spin liquid;
- No magnetic order;
- Topological quantum computing.

What are the values of *K* and *J*? → Inelastic neutron scattering

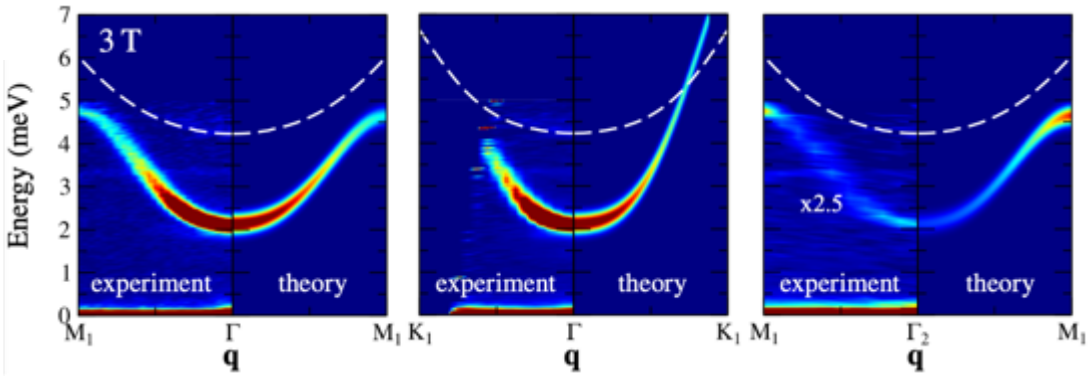
(polarized state for two field directions)

H = 3T spin-wave spectrum (data from Grenoble)



Without Kitaev interaction spectrum would not depend on field direction

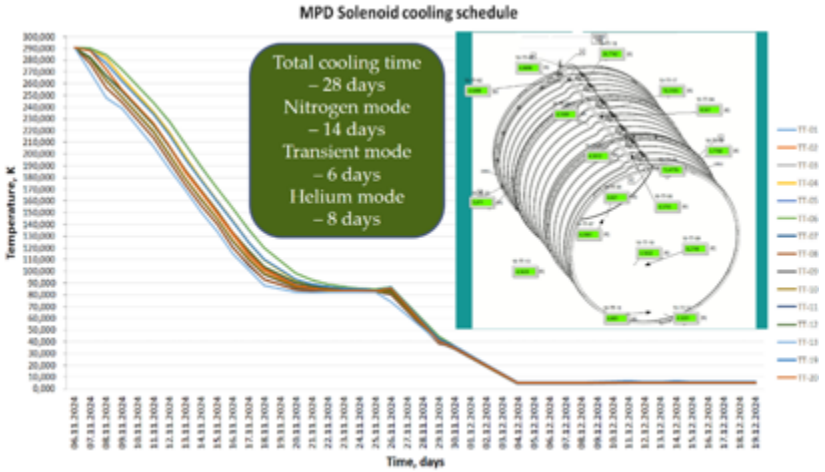
Fitting spin-wave theory to neutron-scattering data:



First material with large Kitaev interaction confirmed

$$J = -3.3\text{meV}, \qquad K = -5.6\text{meV}$$

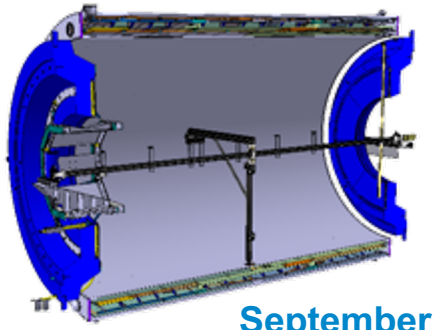
MPD Detector Preparation for Xe Beam



- MPD solenoid cooled down to the working T = 4.5 K, current supply tested at 0.2 T, it took 15 days to get to 80K and another 7 days to 4.5K;
- Heat load and magnetic field measurements are consistent with design parameters.

Start of detector commissioning by the end of 2025

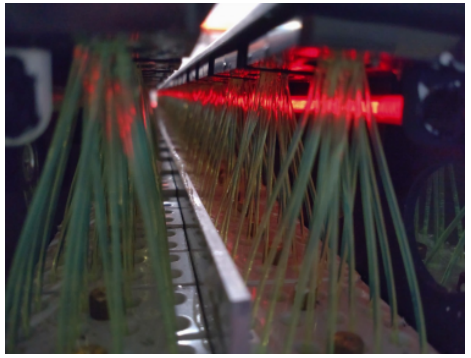
- BINP Magnetic field mapper: 0.1–0.3 Gs accuracy, single 3D Hall probe moves in 3 directions – z , R, ϕ



Number of points:
~ $2 \cdot 10^5$ (90 hours)
Fields to measure:
0.3–0.57 T (5–6 points)
Number of tunes per field: 5

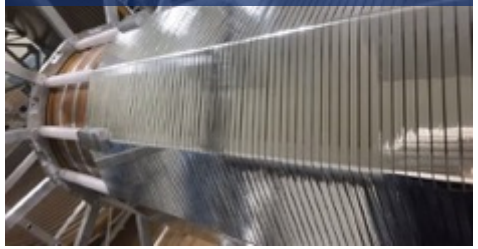
September – start of measurements, total time ~ 2 months.

ECAL



~ 38 400 towers (2 400 modules) produced by Tsinghua University, Shandong University, Fudan University, South China University, Huzhou University and JINR – production in IHEP (Protvino) and Tenzor (Dubna).
40/45 half-sectors to be ready by August/December.

TPC – central tracking detector

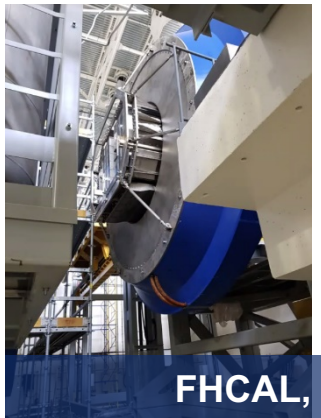


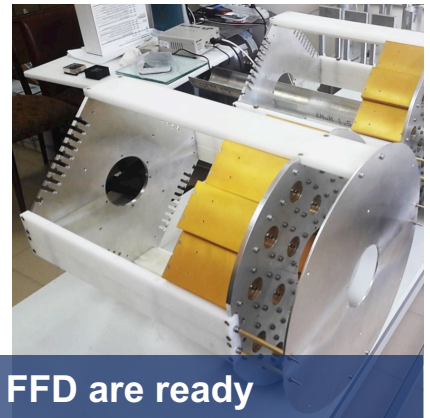
24+ ROC ready; 100+ % FE cards
Ongoing TPC gas volume assembly
Cooling system – commissioning.

TPC assembling – December 2025

Frame – ready

Successful test installation of the carbon fiber support frame in the magnet, sagitta ~ 5 mm at full load, rails for the TPC and TOF are installed.





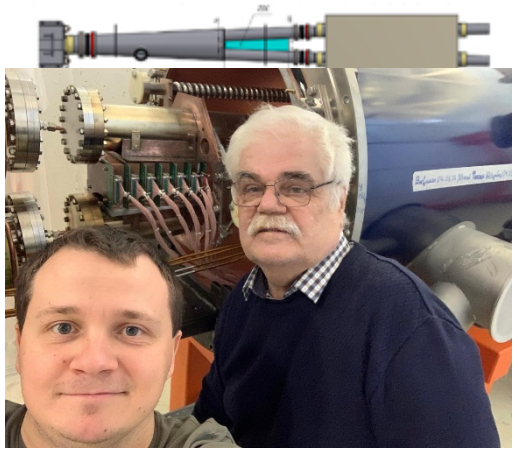
FHCAL, FFD are ready

TOF – ready

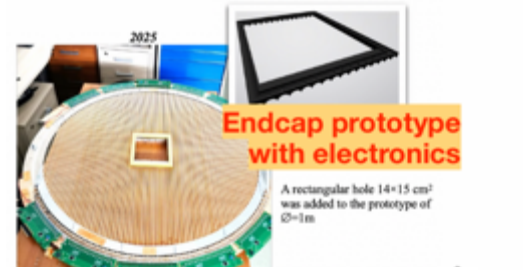
All 28 (100%) TOF modules are assembled, tested, stored and ready for installation. Spare modules in production.

Realization of the SPD Project

The SPD collaboration is focused on the construction of the detector's load-bearing structure, engineering infrastructure, and the Phase-1 detectors.

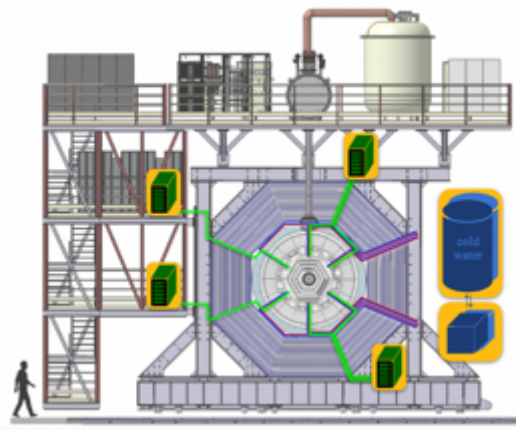


The SPD collaboration is in a good shape, growing and developing dynamically

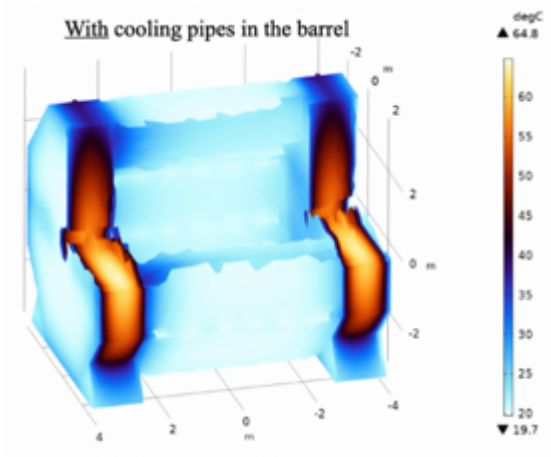


STRAW detector production

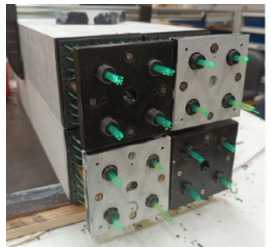
Designing the engineering infrastructure

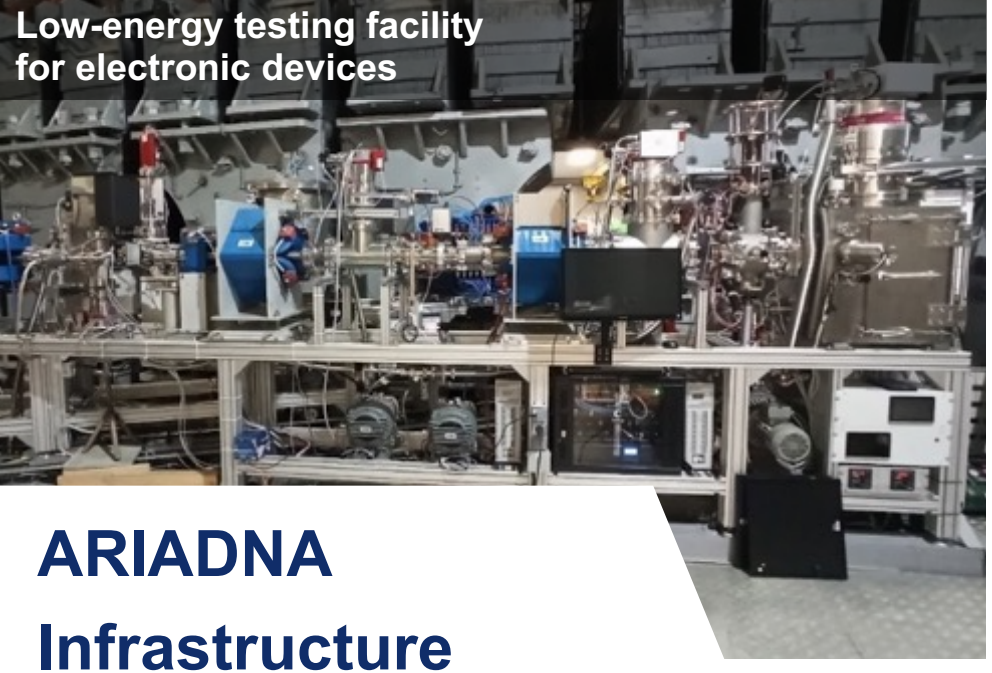


Thermal analysis



ECAL modules assembly ongoing



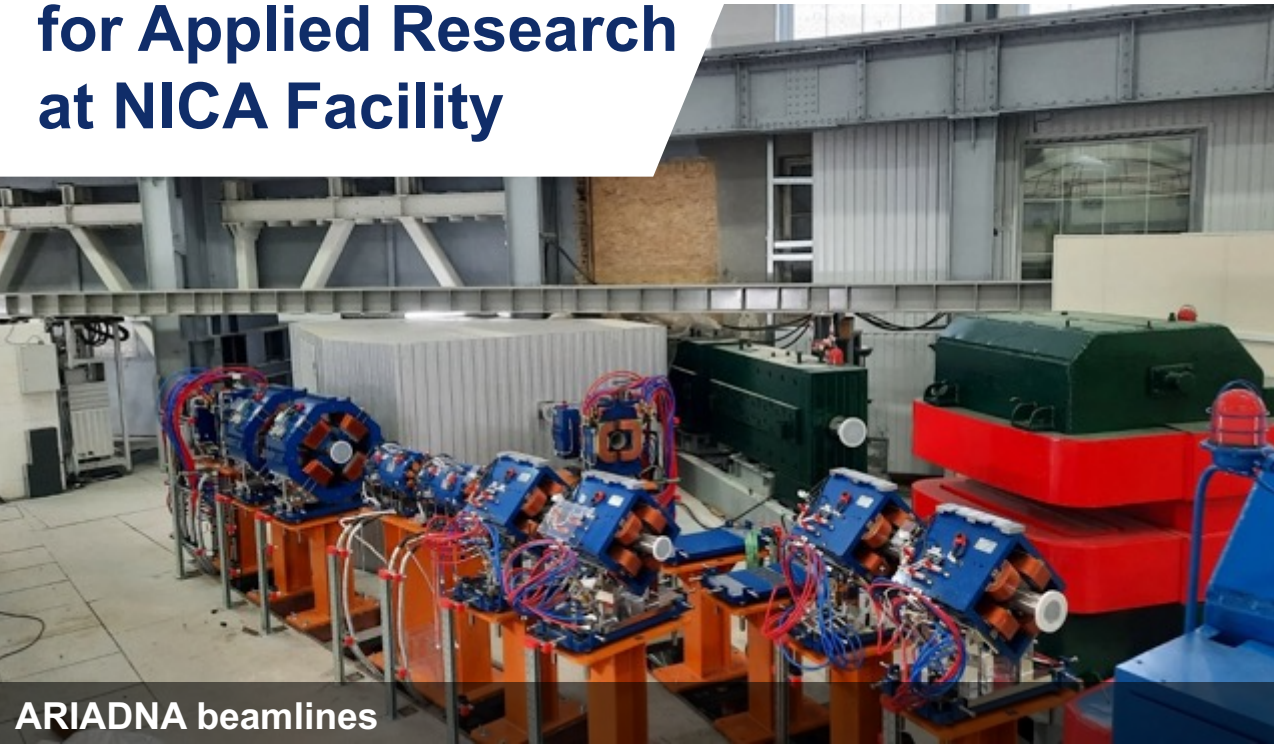

Low-energy testing facility for electronic devices


High-energy testing facility for electronic devices


Target station for biological samples

ARIADNA

Infrastructure for Applied Research at NICA Facility


ARIADNA beamlines


Target station for long-term exposure

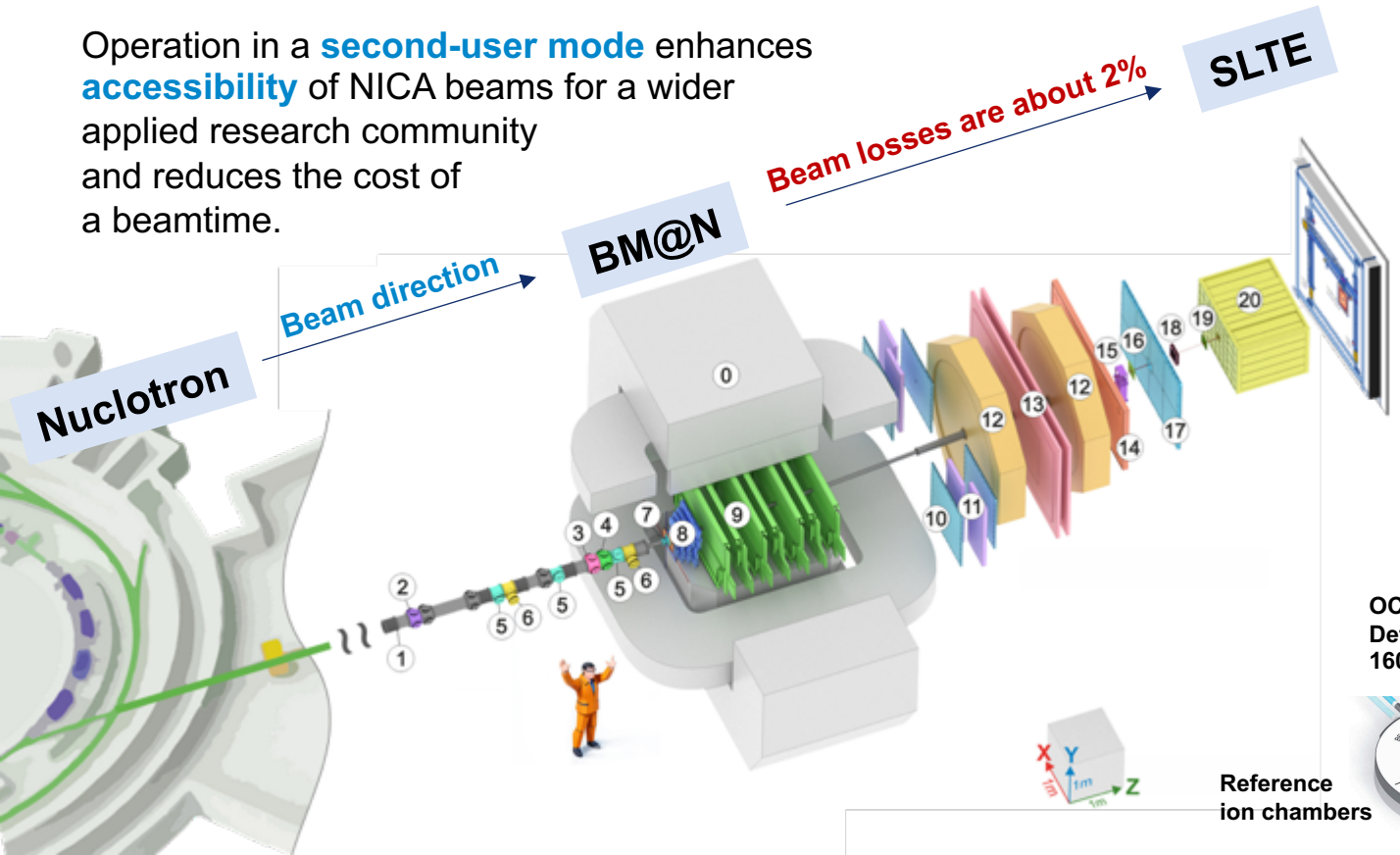
Sample preparation room

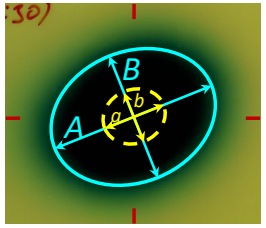
Extending NICA Capabilities for Applied Research via Second-User Mode of Operation with Residual Ion Beams

ARIADNA Station for Long-Term Exposure (SLTE) provides applied research teams with the unique option to use the residual high-energy ion beams of the NICA complex after passing through the primary physics facility BM@N.

BM@N facility utilizes about 2% of the incoming beam while the rest of the beam can be used then for applied research.

Operation in a **second-user mode** enhances **accessibility** of NICA beams for a wider applied research community and reduces the cost of a beamtime.





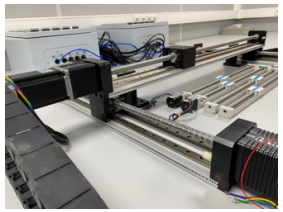
$^{124}Xe^{54+}$

3.8 GeV/nucleon

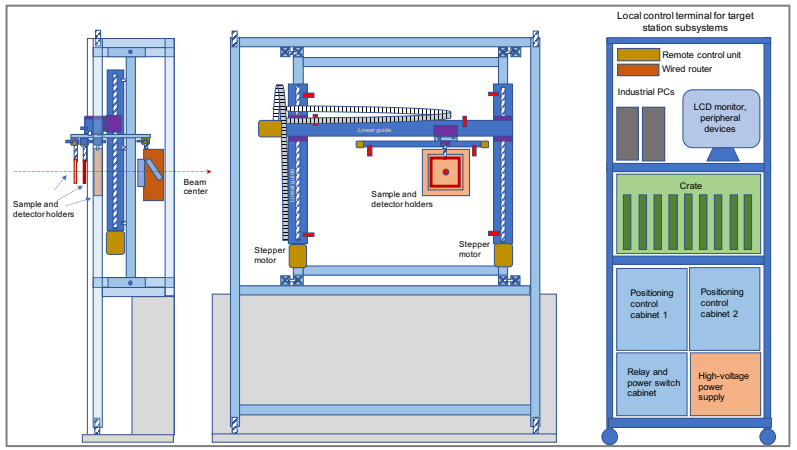
Beam size:
A = 34.2 mm,
B = 29.3 mm.
The most uniform area:
a = 12 mm,
b = 9 mm

Dosimetry complex based on ion chamber matrix

OCTAVIUS Detector 1600 XDR



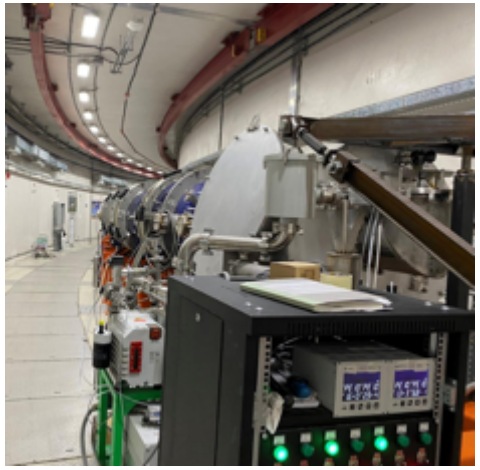
ARIADNA Station for Long-Term Exposure (SLTE) behind the BM@N facility



NICA Nuclotron-based Ion Collider fAcility

Preparation for the NICA Collider Commissioning

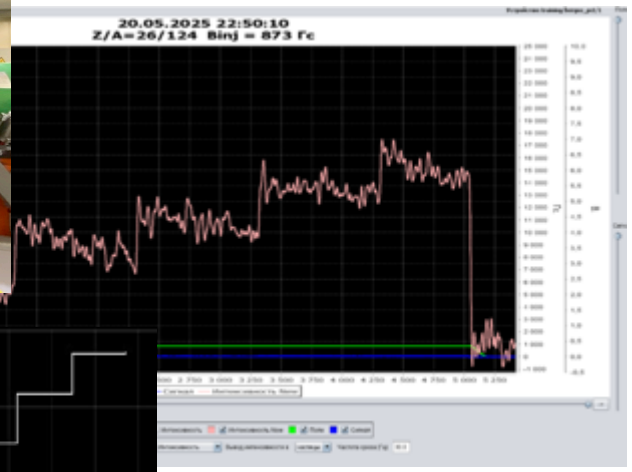
Progress achieved in assembly of the Collider cryo-magnetic system: **vacuum tests are ongoing, cryogenic tests in preparation**.

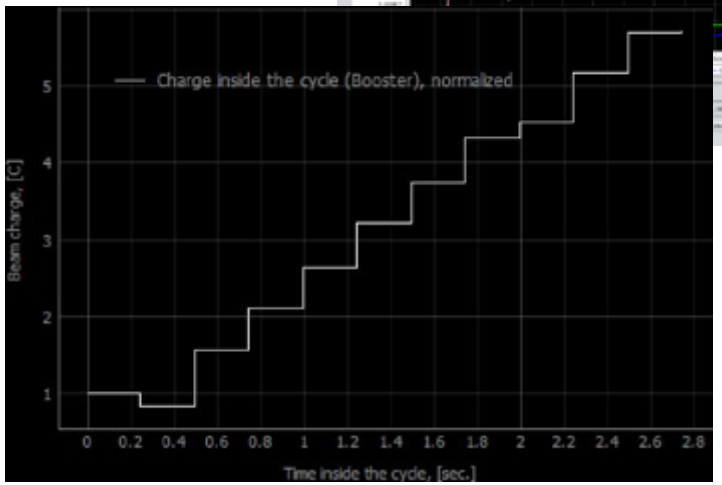


Extraction of Xe beam to the Nuclotron-Collider channel is planned to start in September 2025

Accumulation of Xenon ions in the Booster

Electron cooling system of the Booster



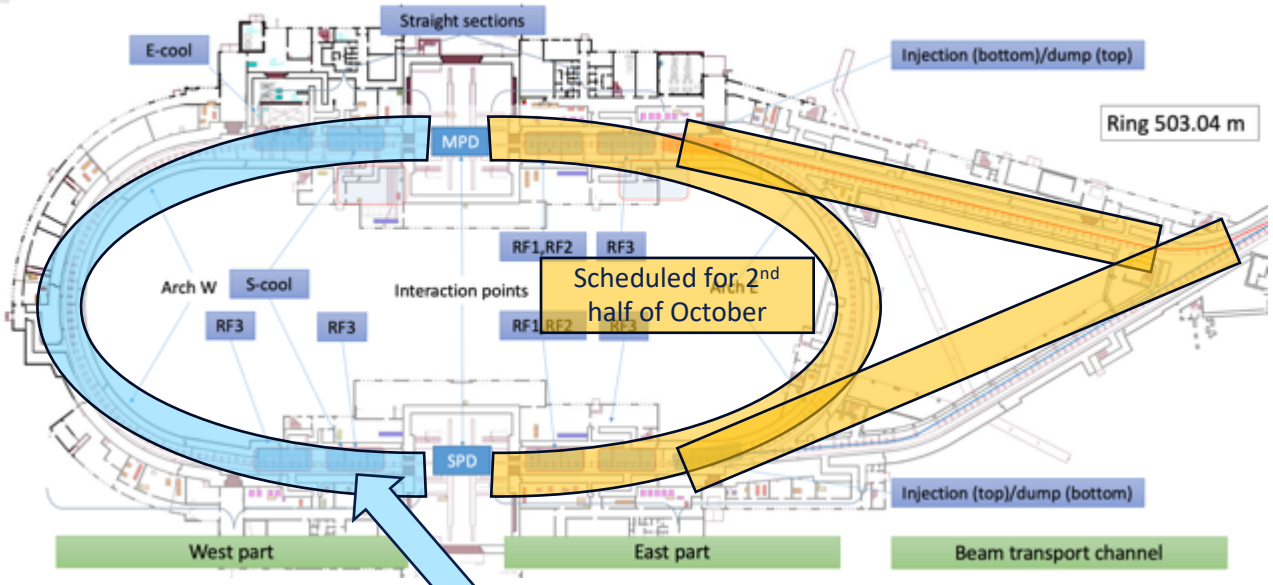


Sixfold increase in beam intensity of Xe ions in Booster with 10x injection

NICA Nuclotron-based Ion Collider fAcility

The NICA Collider Commissioning

Collider ring composition



Progress in Assembly of the Cryo-magnetic System

Already installed:

- the collider magnetic cryostat system,
- RF stations and final focusing lenses,
- the merging of the high-vacuum volume sections in the West arc,
- cryogenic equipment and power supplies in the collider building,
- connection of power lines and energy evacuation system.

Schedule of the Collider Commissioning

16 January – 31 March 2025:

Booster operation

- adjusting optics and power supply units,
- tuning electron cooling,
- optimization of the beam dynamics,
- beam accumulation at injection energy.

April – May 2025:

Booster + Nuclotron operation

- minimization of particle loss,
- tuning of the slow extraction,
- testing fast extraction system,
- running BM@N & ARIADNA programme.

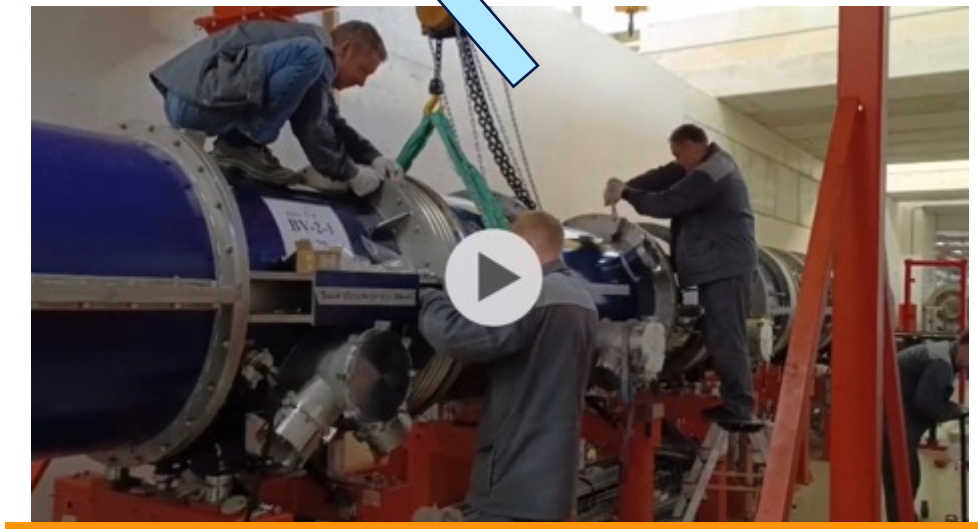
June – August 2025:

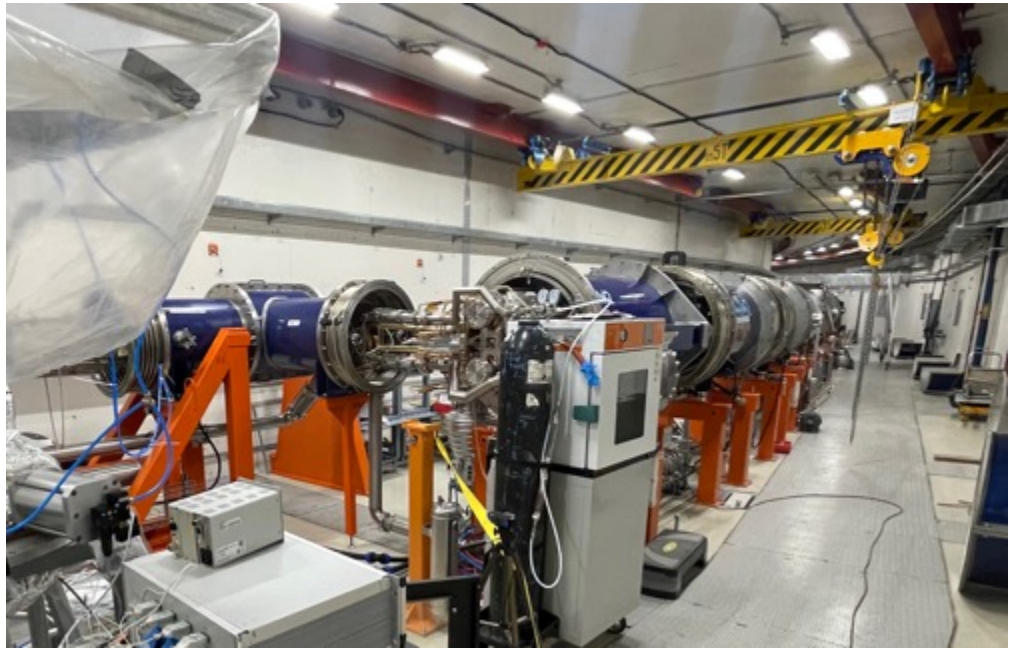
Booster + Nuclotron + Collider operation

- tuning the Nuclotron – collider beam line,
- beam injection into collider,
- first collisions with internal target.

Slide of JINR ScCouncil Feb'2025

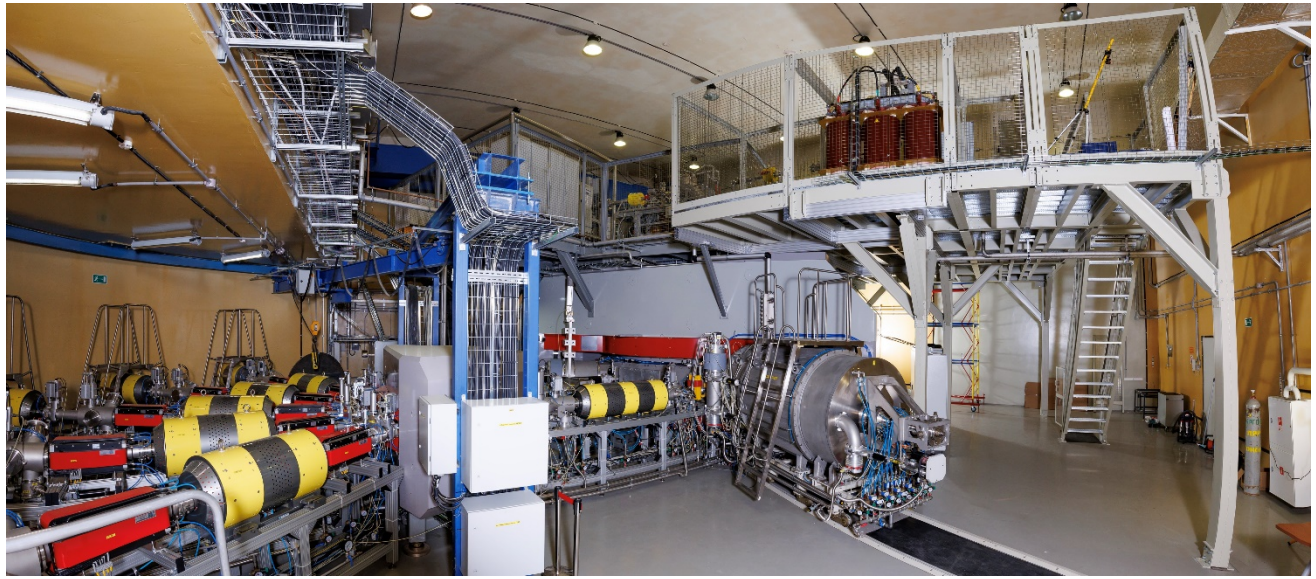
Collider is expected to be ready for beam tests in June 2025





Last flange. Vacuum pumping of the W-arc is started. Sept 12, 2025
Cooling of the cryo-magnetic system has been started 14 Sept 2025

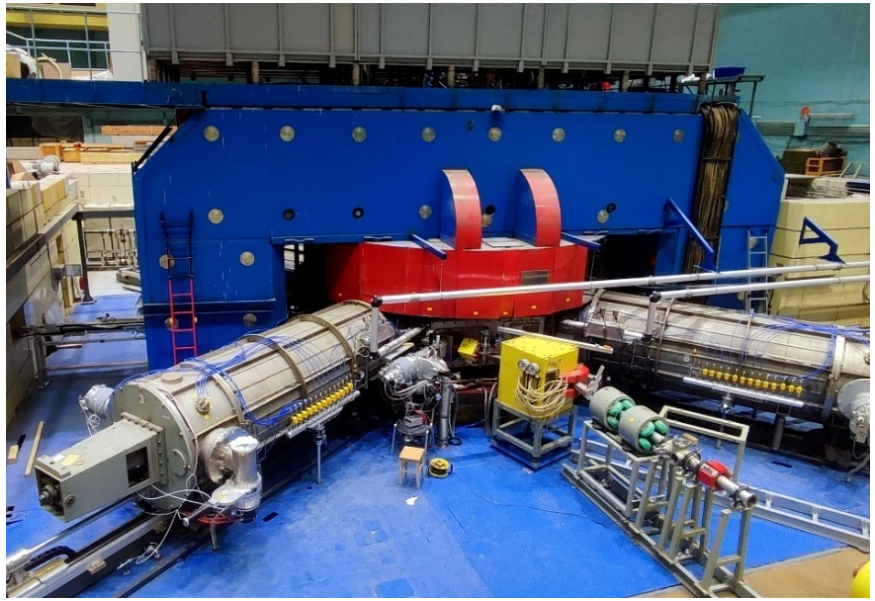
Accelerator Complex DRIBs-3



The total operation time of the accelerators in the first half of the year: 2331 hours.

Main tasks for 2025:

- Continuation of experimental programme;
- Preparation of experiments on synthesis of new elements 119 and 120;
- The experimental halls are being prepared for first-class radiation safety;
- Assembling and commissioning of a new 28 GHz ECR ion source.

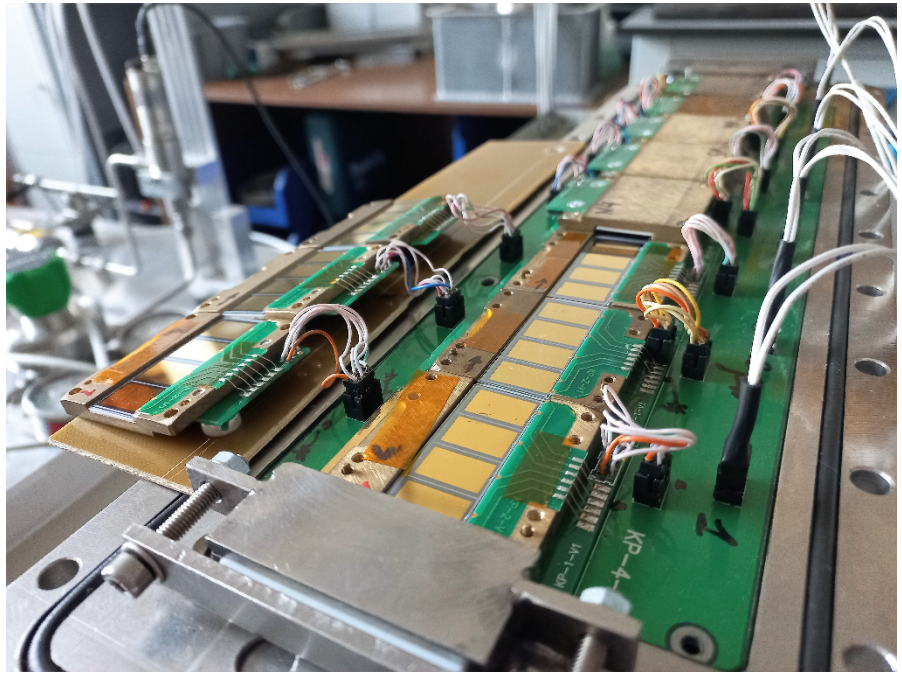


U-400M

Radioactive ion-beam research

- Commissioning works are continued on U-400M with the purpose of optimizing different regimes of acceleration and production of secondary beams;
- Obtained intensity of secondary beams: $^{15}N^{5+}$ (E = 51.4 MeV/n) **2 puA**
  $^{18}O^{6+}$ (E = 48.7 MeV/n) **1 puA**.

Chemistry of Elements Cn and Fl @ the SHE Factory



$^{48}Ca + {}^{242}Pu \rightarrow {}^{287}Fl\ (T_{1/2} = 0.36\ s) \rightarrow {}^{283}Cn\ (T_{1/2} = 3.81\ s)$

The experiment has been carried out in collaboration with IMP CAS, China.

Purpose: chemical properties of superheavy elements by studying the volatility and adsorption of Cn and Fl on gold surface.

Method: gas adsorption thermochromatography.

Beam: stable high-intensity ^{48}Ca beam of 6 pmkA.

Target: New standard 48 cm diameter target of ^{242}Pu.

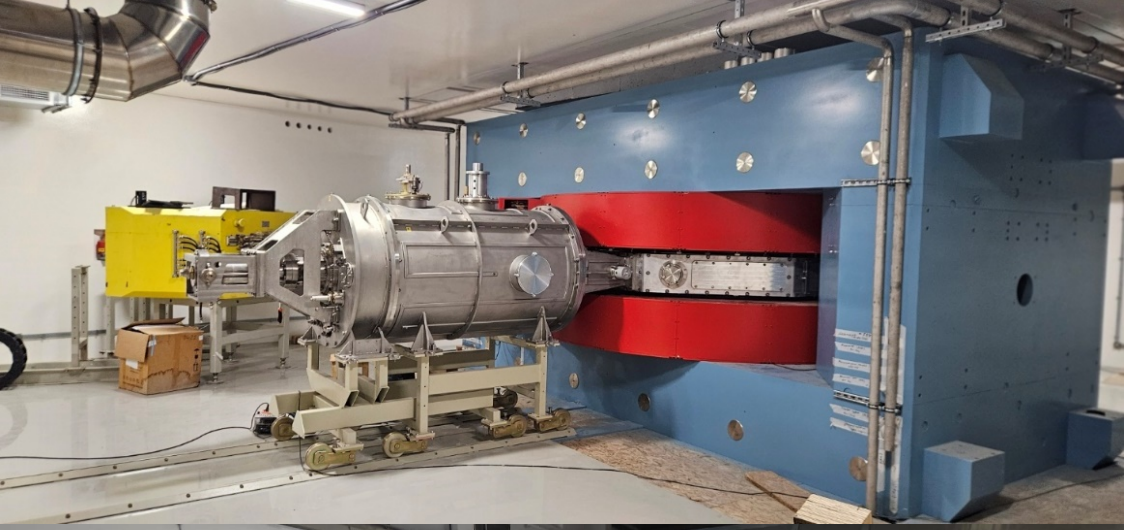
Separator: GRAND (Gas-filled Recoil Analyzer and Nuclei Detector).

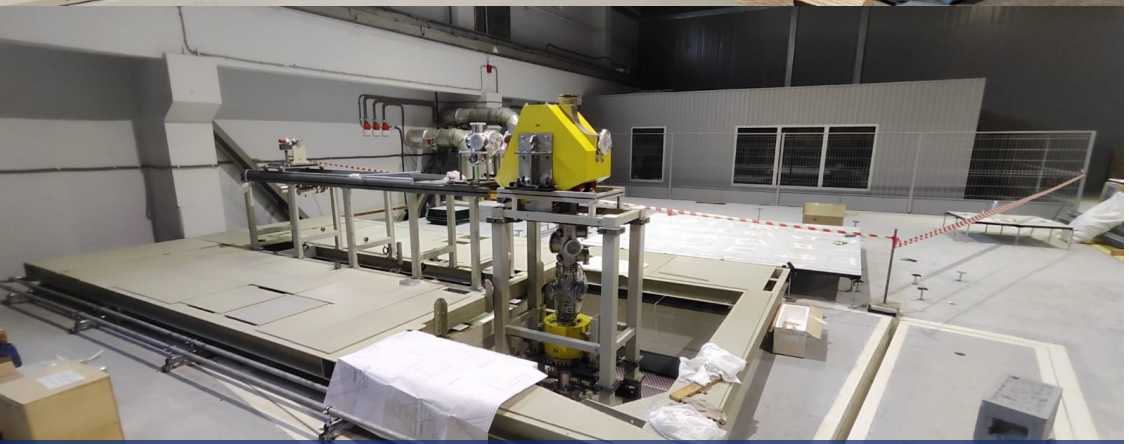
Results: 8 decay chains were detected at the Cryodetector. Analysis is ongoing.

Prospects for elements beyond Flerovium:

- Experiments behind new GASSOL pre-separator. Superconducting GASSOL magnet delivery is scheduled for the end of 2025 – beginning of 2026;
- Next generation SHE chemistry behind the new FLNR cryogenic gas ion catcher.

Accelerator Complex DRIBs-3





Axial injection system

Experimental hall #1. Transport channel 1 and 2

DC140 commissioning

Creation of a new facility for applied research:

- Construction works have been completed;
- Installation of ventilation and water cooling systems have been completed;
- The cyclotron vacuum chamber and the accelerating system resonators have been installed and tested (the achieved vacuum level is 1×10^{-5} Torr);
- The DECRIS-5M ion source has been fully bench-tested and prepared for installation on cyclotron;
- The axial injection system is being installed;
- Installation of the accelerator control system is in progress;
- Beam transportation channels are being installed.

	2022	2023	2024	2025	2026	2027	2028	2029	2030
SHE Factory	Operation. Development of new setups								
U400M	Moderni-zation	Operation. Development of new detectors							
U400R	Operation	• New experimental hall constr. • Modernization of U400→U400R • Development of new setups			Operation. Development of new setups				
DC-140	Construction		Operation						
Class I Radio-Chemical Lab	Pre-design		D						
New RIBs complex	Feasibility St								

Slides of JINR ScCouncil 2023 & 2024

New Experimental Hall for U-400R


View from SHE Factory, June 2025

Progress in construction:

- Finishing works and installation of the building's engineering systems will be carried out. Completion of construction is expected in 2026.
- Design of new experimental set-ups to be placed in the new building is ongoing.

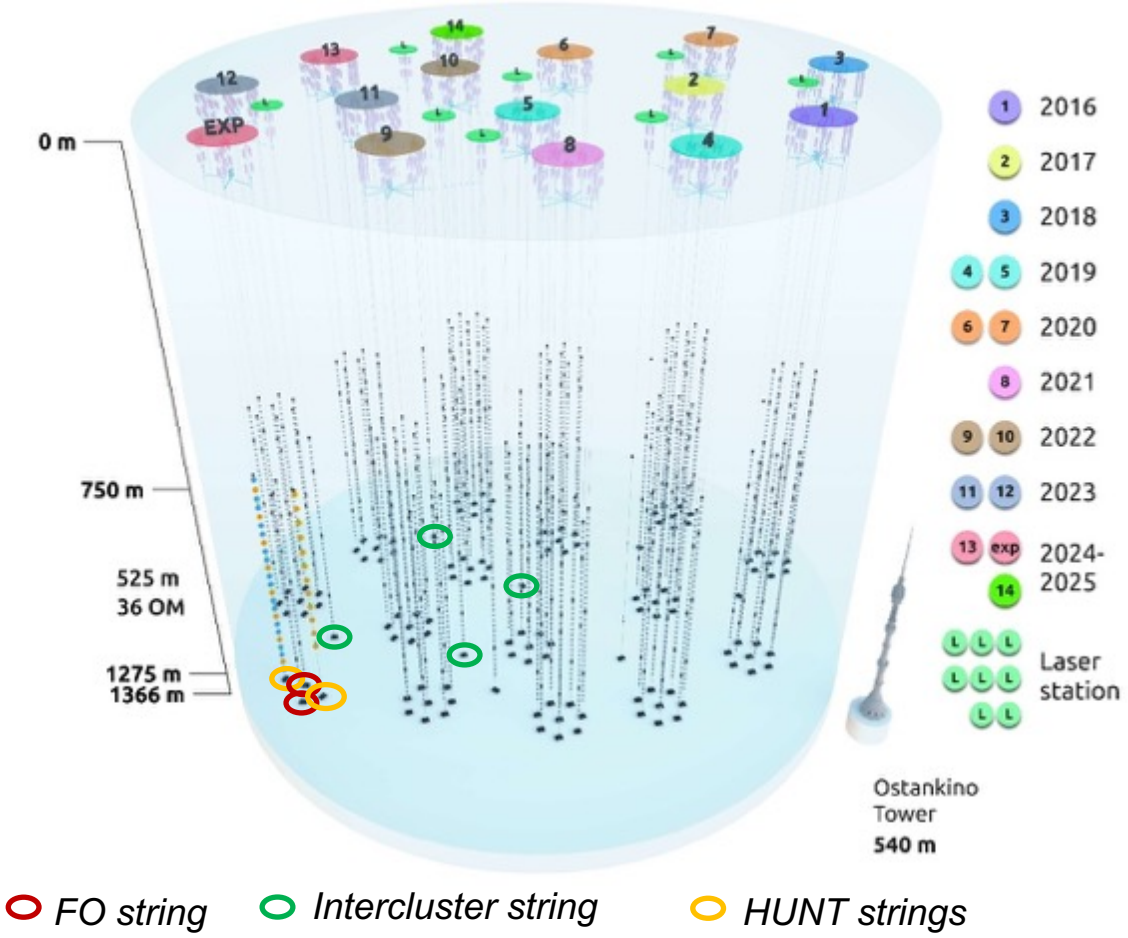

Transport channels gallery

Status of the Neutrino Detector Baikal-GVD

- Currently, the deployment of the Baikal-GVD neutrino telescope is successfully underway. 14 full clusters are installed. The underwater structure of the installation contains about 4300 photodetectors.
- The production and technical base of the Baikal project ensures the deployment of **two clusters annually**.
- GVD has **developed shore infrastructure:** control centre, laboratories, workshops, deployment tools, living quarters and continues it expansion.
- GVD is **testing ground** for the development the systems for next-generation telescope:
  - 2 strings with fiber-optic DAQ;
  - 4 inter-cluster strings;
  - 2 prototype strings with new optical modules an new DAQ system in direction of the next generation detector development together with IHEP (Beijing).

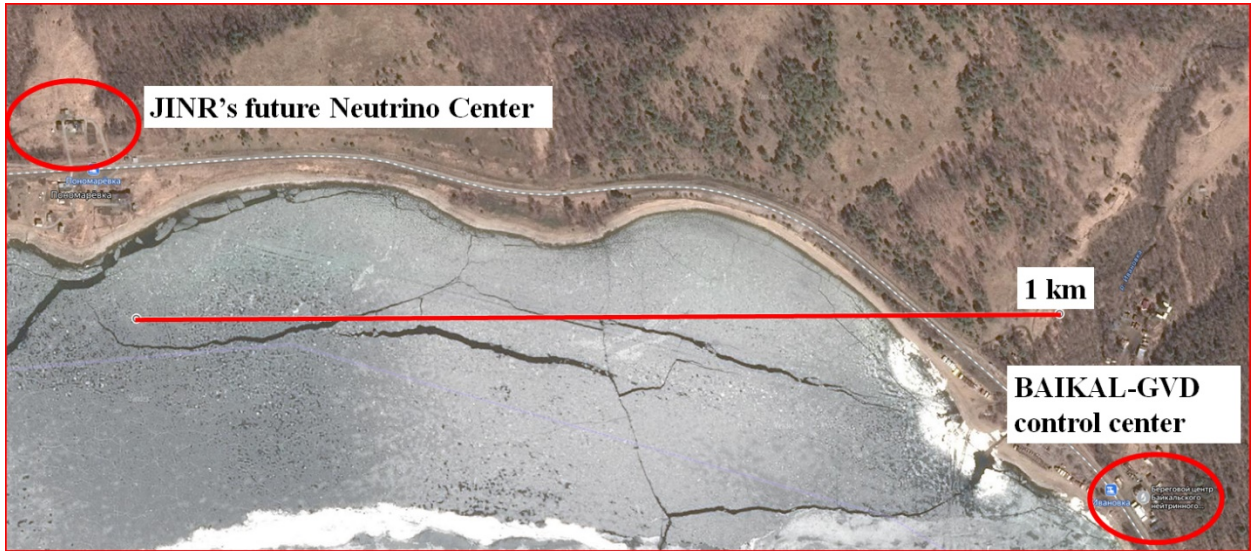
Nearest plans:

- About 600 optical modules will be assembled for deployment in 2026.
- The collaboration is planning to install additional 2 new clusters, 2 additional inter-cluster strings and one full prototype string for the next generation detector with in case a good external conditions (weather and ice).

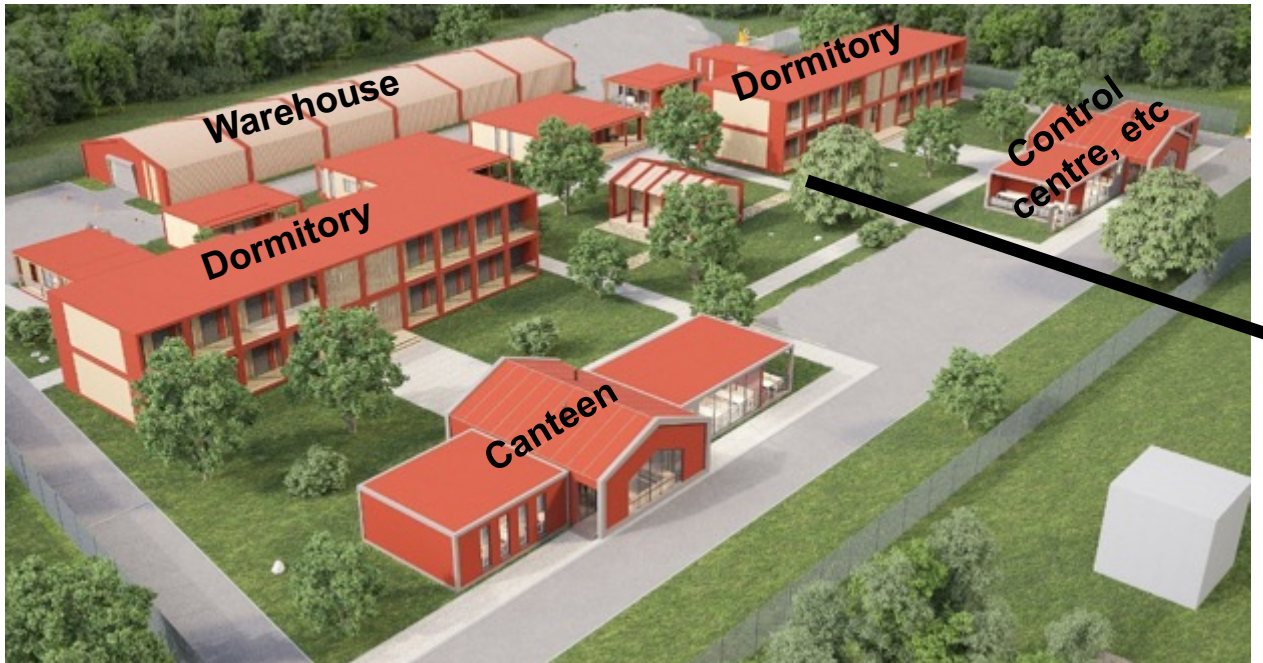


Total: 4284 OM + 8 laser stations

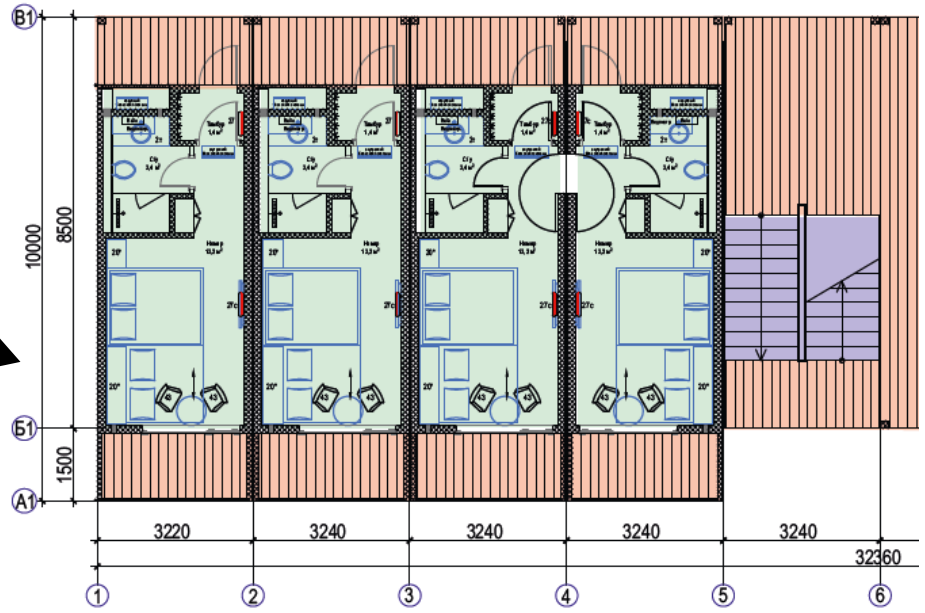
Infrastructure Development of the BAIKAL-GVD Site



DLNP is in process of preparing a project for the JINR's future Neutrino Centre at lake-Baikal, which includes comfortable accommodation for up to 100 people, a new control centre, offices, a conference hall, a dining room, warehouse, workshops, laboratories and technical facilities.



Preliminary design of the JINR's future Neutrino Centre, and a part of the dormitory



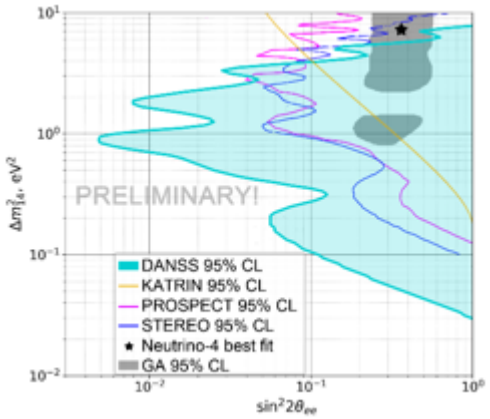
DANSS (Detector of the Reactor AntiNeutrino Based on Solid-state Scintillator)

Main tasks: search for short-range active-sterile neutrino oscillations ($\bar{\nu}_e \rightarrow \nu_s$ disappearance search) and remote monitoring of nuclear reactor core.

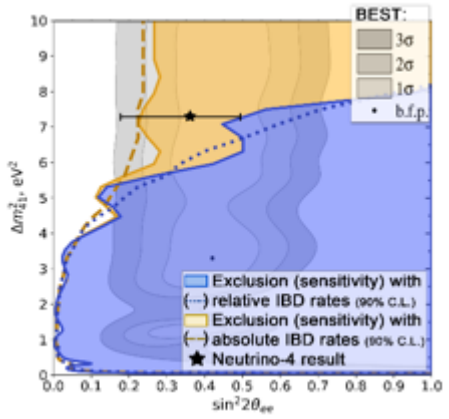
- DANSS recorded the first data in April 2016 and is still running. More than **10M IBD events** collected (**The world's largest IBD event statistics!**);
- DANSS records more than **5k antineutrino events per day** in the closest position to reactor core
- (distance from 10.9 to 12.9 m). **Signal to background ratio is > 50**;
- We measure **reactor power with 1% precision in week** over **7+ years** of operation *[Physics Letters B, V. 866, 139575, 2025];*
- Resent analysis of the data **excludes a large portion of the short based active-sterile oscillations** parameter space. The recent result provides even stronger exclusion of the parameters from **RAA+GA** best fit [**5σ exclusion** was reached already with one-year statistics: *[Phys.Lett. B787(2018)56];*
- **DANSS upgrade** is planned in 2026. Detector will have **improved energy resolution** ($34\%/\sqrt{E} \rightarrow 12\%/\sqrt{E}$) and **1.7 times larger fiducial volume** which provides **a sensitivity to scrutinize Neutrino-4**, **BEST** results **and improve possibilities of reactor monitoring research**.

Sterile neutrino search

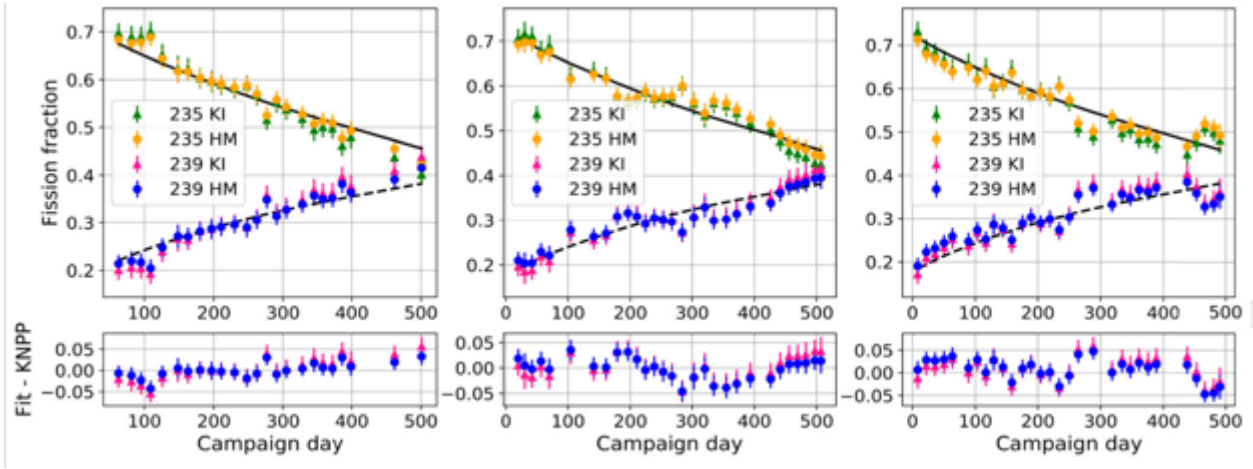
Analysis using relative counting rates (model independent)



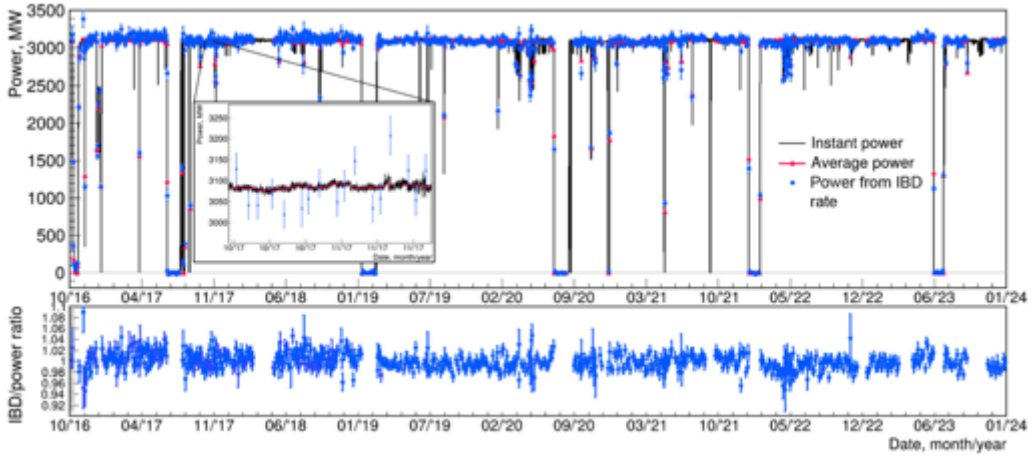
Analysis using absolute counting rates



First extracted ^{239}Pu and ^{235}U fission fractions evolution using antineutrinos



First long term precision measurement of reactor power using antineutrinos

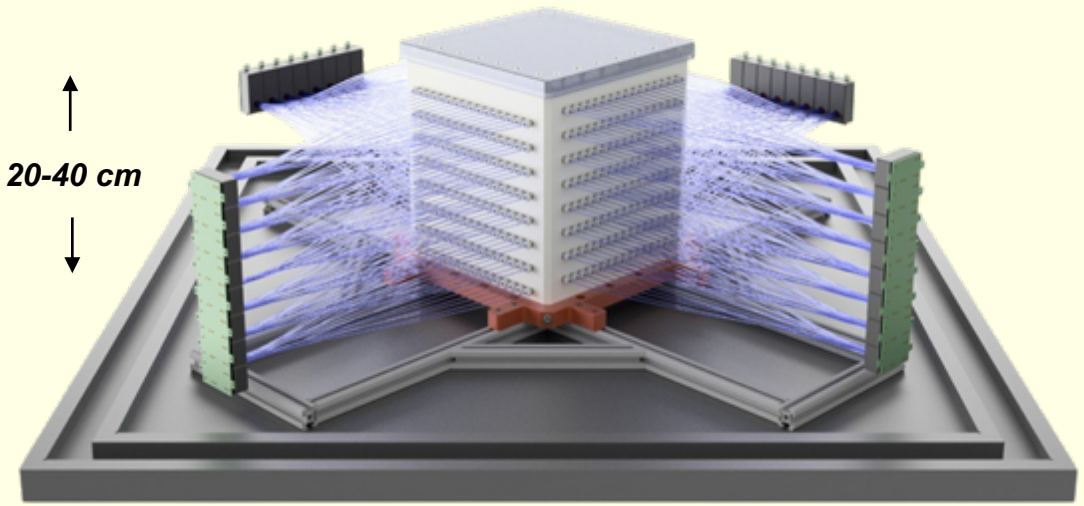


Physics Letters B, V. 866, 139575, 2025

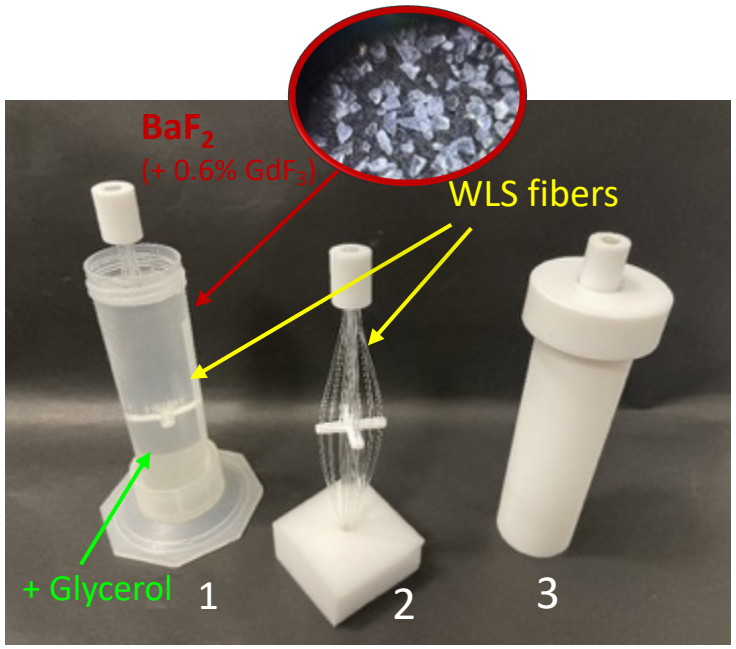
COFE Technology
(Chemical Optical Fluoride Engineering)

D.V. Filosofov *et al* 2025 *JINST* 20 P08008

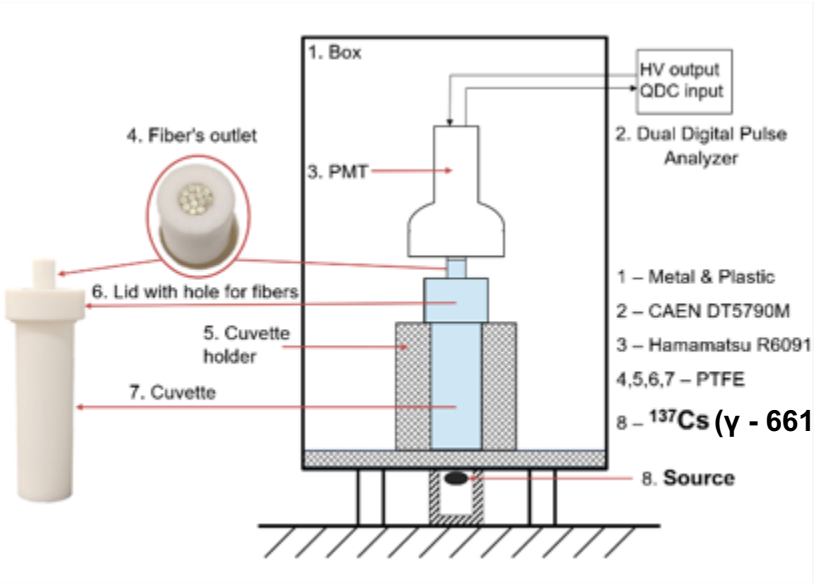
Main goal: Development of a compact neutrino detector



Assembly model of detector



Scintillation system (1), bundle of fibers (2), PTFE cuvette (3)

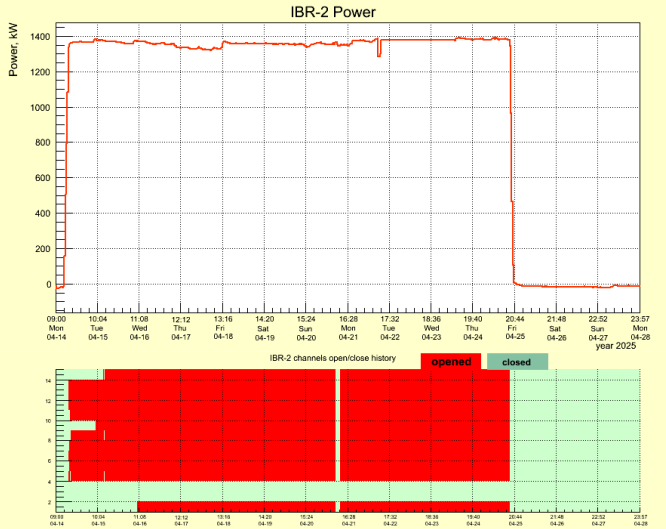


Block diagram of the testbench

For the first time,
through the use of fluorides,
an innovative approach has been developed
that combines an **inorganic scintillator** with a **hydrogen-containing medium** and **wavelength-shifting fibers**

Research at IBR-2

I cycle 2025: 17 February – 7 March
II cycle 2025: 17 March – 24 March
III cycle 2025*: 14 April – 25 April



At present:

- Scheduled preventive maintenance
- Equipment maintenance
- Preparation of the reactor for operation

Scheduled reactor operation:

IV cycle 2025*: 13 October – 24 October
V cycle 2025*: 5 November – 16 November
VI cycle 2025*: 24 November – 5 December
VII cycle 2025*: 15 December – 26 December

*with both cryogenic moderators

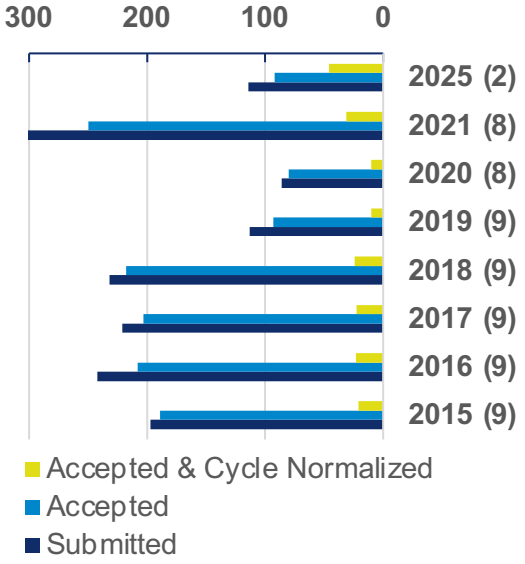
The main conclusions are:

- The reactor started operating in regular cycles after the long shutdown;
- Its condition has not deteriorated during the long shutdown;
- The reactor is stable at a power of up to 1.5 MW;
- The possible increase of the power above 1.5 MW requires further investigation;
- Most beam instruments are ready for measurements (3 of them are temporarily unavailable for external users due to technical reasons).

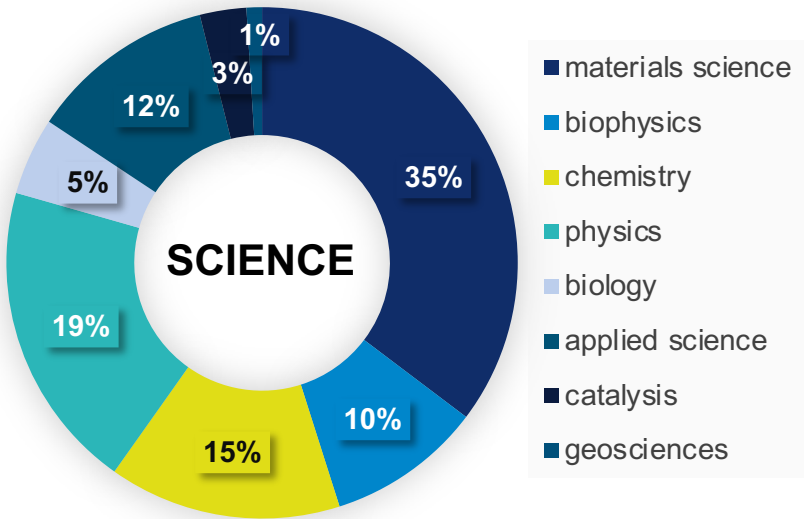
Yu.N.Pepelyshev, A.V.Dolgikh, A.D.Rogov, S.Davaasuren, Ts.Tsogtsaikhan. "The IBR-2M reactor launch after a long shutdown. Reactor dynamics", FLNP Seminar on 22 May, 2025.

Number of Proposals

(the number of IBR-2 cycles in brackets)

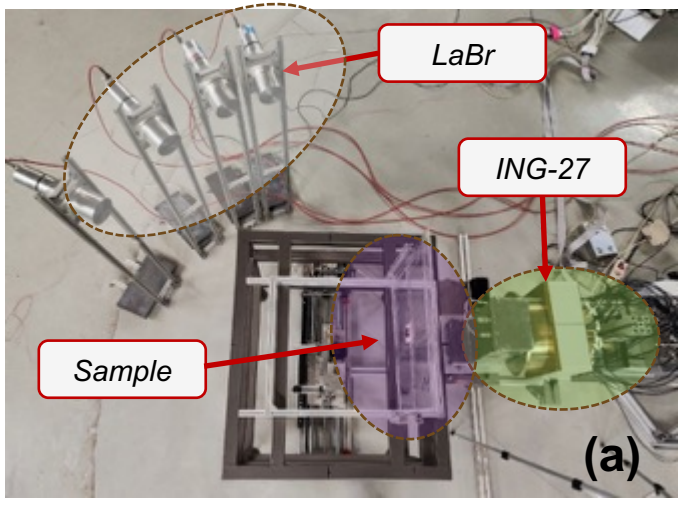


A new round of proposals started on 1 September, 2025.
113 new users registered in 2025



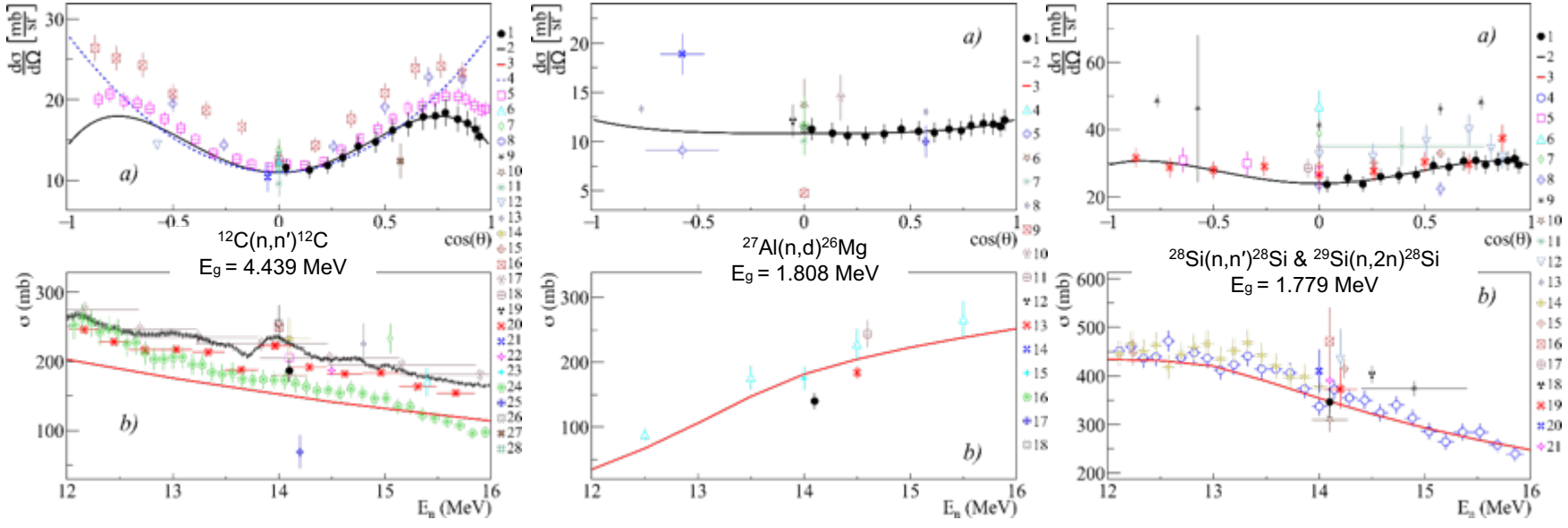
Scientific Highlights

TANGRA Collaboration

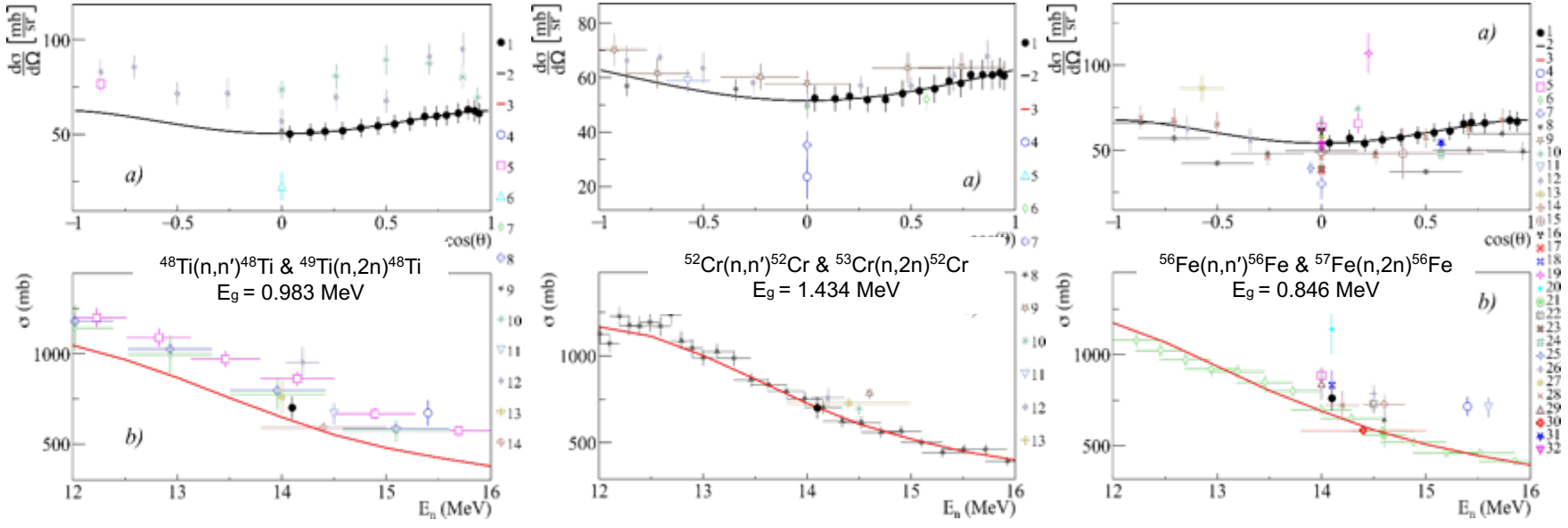


A major investigation of angular distributions **(a)** and cross sections **(b)** of particular *γ*-rays induced by neutrons with an energy of 14.1 MeV is carried out in a wide range of elements.

The total *γ*-ray cross sections have been obtained and compared with the current data. The total error of the gained results is < 9 % for the most intense transitions, good agreement has been achieved for the most intense transitions on GELINA and LANSCE.



1 – TANGRA data; 2 – Approximation; 3 – Talys; 4,5,6.. – Other investigations

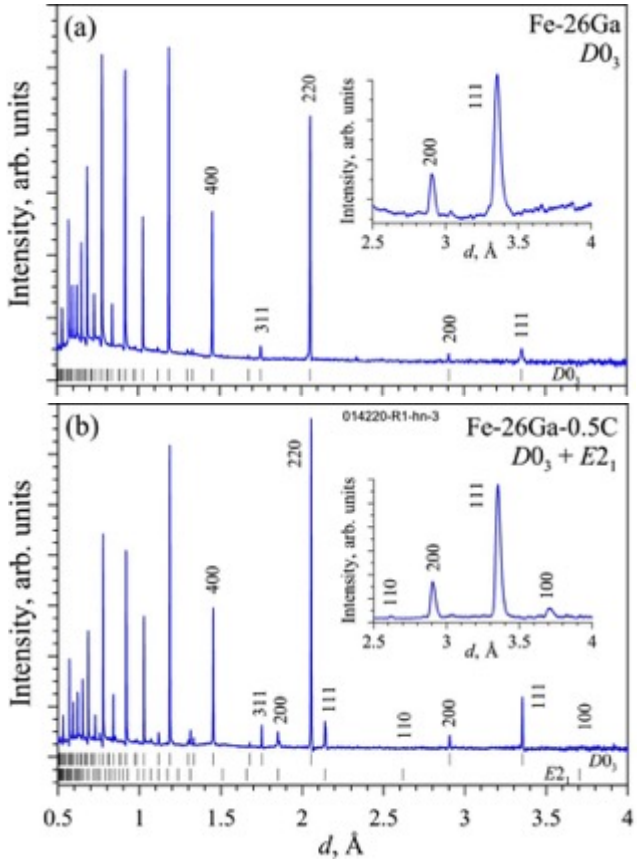


Scientific Highlights

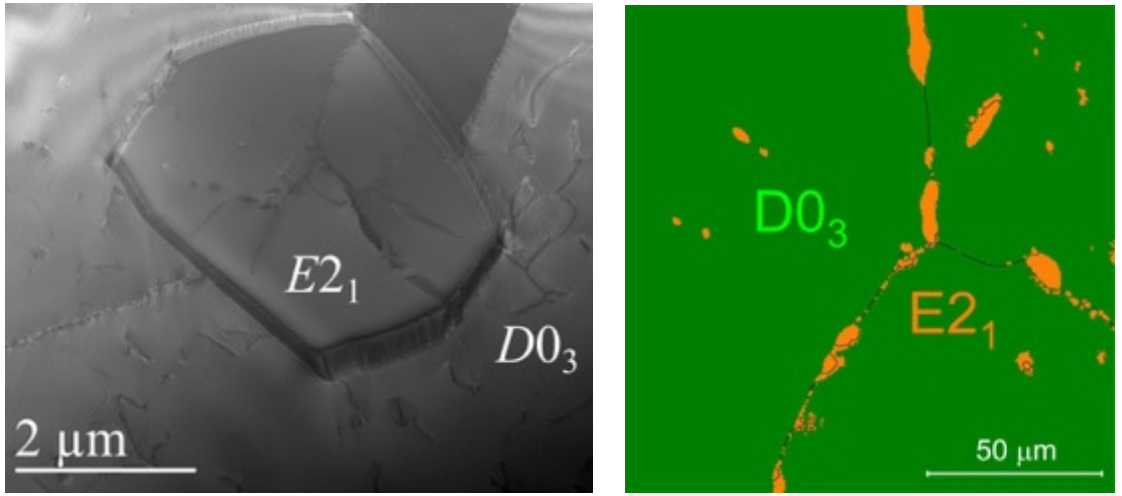
First comprehensive structural investigation of the *κ*-carbide phase in Fe-Ga(Al) alloys

Experimental data obtained in the result of high-resolution neutron diffraction study on bulk samples have shown that the occurrence of carbon in $Fe_{74}Ga_{26}$ and $Fe_{74}(Ga,Al)_{26}$ alloys results in the production of a perovskite-like $E2_1$-type structure (*κ*-carbide).

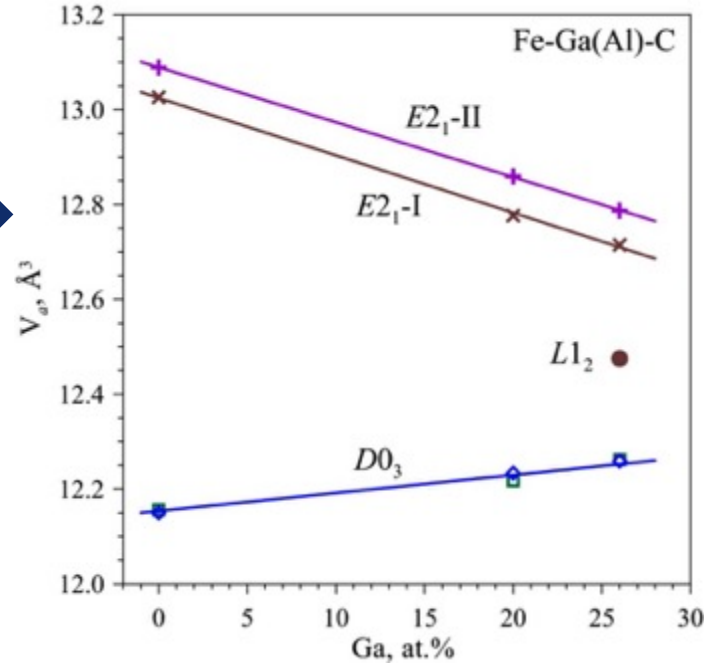
The samples are provided from **National Chung Cheng University**, **Taiwan**. Neutron and electron research was implemented at **FLNP** (HRFD, IBR-2) and **FLNR** in collaboration with **MISIS University** (Russia).



Neutron diffraction patterns of Fe-26Ga ($D0_3$ phase) and Fe-26Ga-0.5C (mixture of $D0_3$ and $E2_1$ phases) alloys.



SEM (left) and EBSD (right) images of the $E2_1$ phase on the surface of the main $D0_3$ phase in the Fe-26Ga-0.5C sample.



Atomic volumes of the $D0_3$ and $E1_2$ structural phases (two components) observed in the Fe-26(Al,Ga)-0.5C compositions as a function of gallium content. Separate dot shows V_a for the standard $L1_2$ phase in Fe-26Ga.

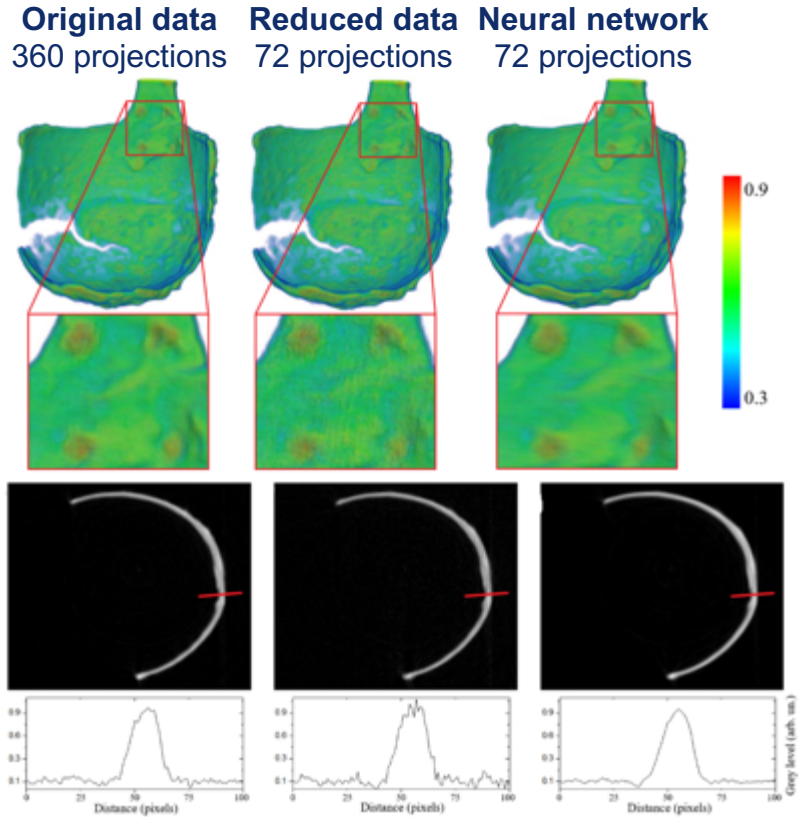
A.M.Balagurov, A.S.Sohatsky, S.V.Sumnikov, B.Yerzhanov, H.W.Chang, I.S.Golovin, ***J. of Alloys and Comp.*** *(2025), submitted.*

Scientific Highlights

Convolutional neural networks for analysis of neutron tomography data

Kiaf is a fragment of the ancient Greek Hellenic civilization.

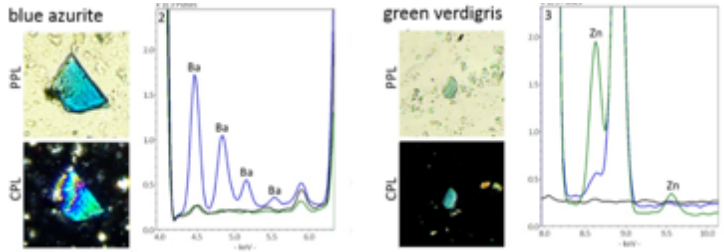
*B.Bakirov, S.E.Kichanov, D.P.Kozlenko, "Convolutional neural networks for reconstruction of neutron tomography from incomplete data", **NIM-B** 563, 165682 (2025)*



Investigation of the problem of colour change in wall painting

The 14th century murals in the *Cathedral of Nativity of Theotokos of the Snetogorsky Monastery* (Pskov, Russia) have been studied using **X-rays & neutrons.**

O.S.Philippova et al. ***Dyes and Pigments** 242, 112910 (2025)*



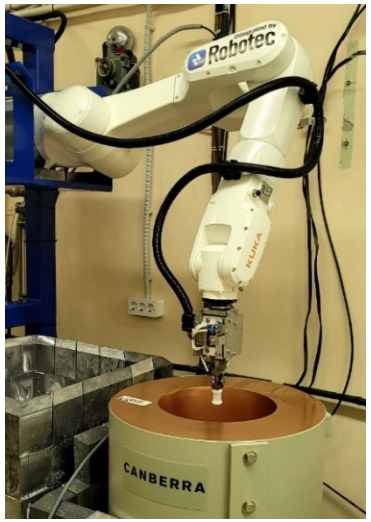
The green and blue copper pigments have impurities of Ba and Zn – *"fingerprints"* of the original colours of the blackened areas.

Digital reconstruction of the original murals:

Modernization of the REGATA facility at the IBR-2 reactor

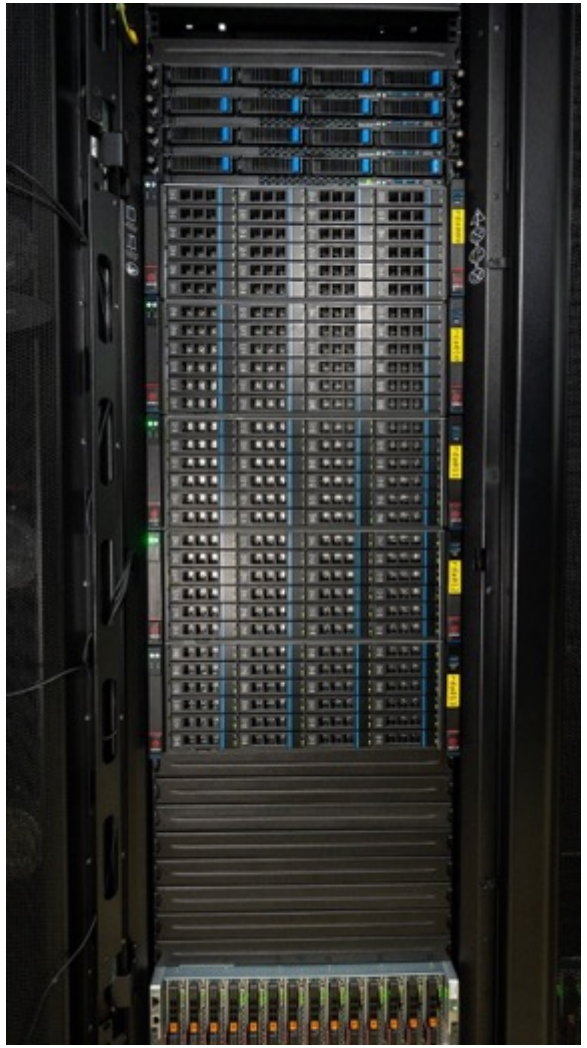
The hardware and software system of the REGATA facility used for the implementation of the instrumental neutron activation analysis at IBR-2 has been modernized:

- new control panel;
- new manipulators;
- new controllers.



*D.Grozdov et al., **J. Radioanal. Nucl. Chem.** 334, 2435 (2025)*

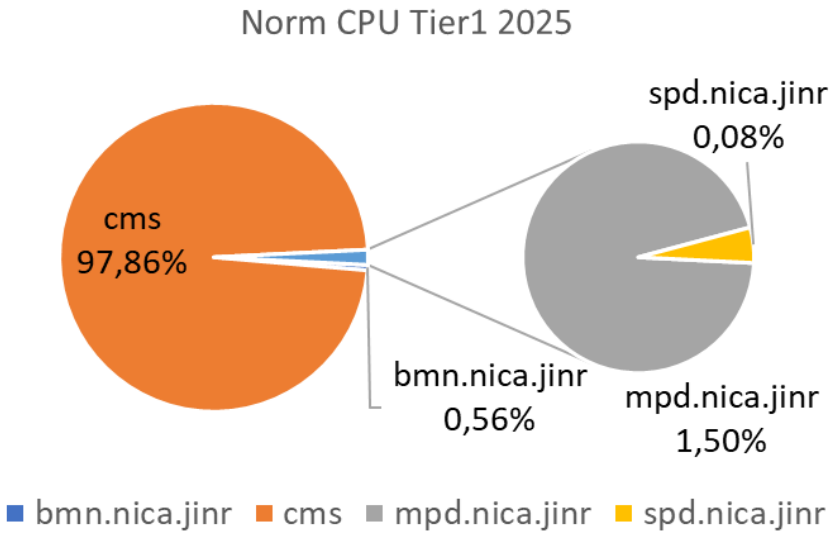
Grid Infrastructure – Tier1 Upgrade

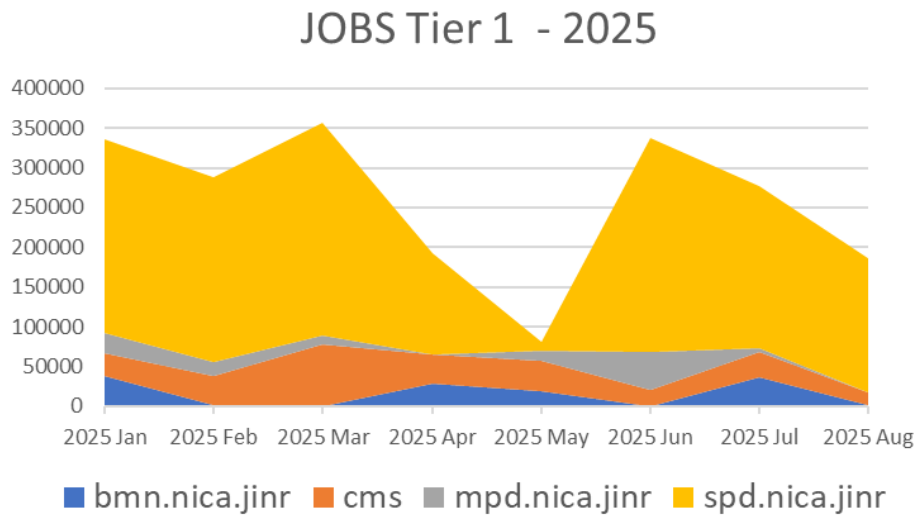


+ 17 servers
Nerpa Nord D5015

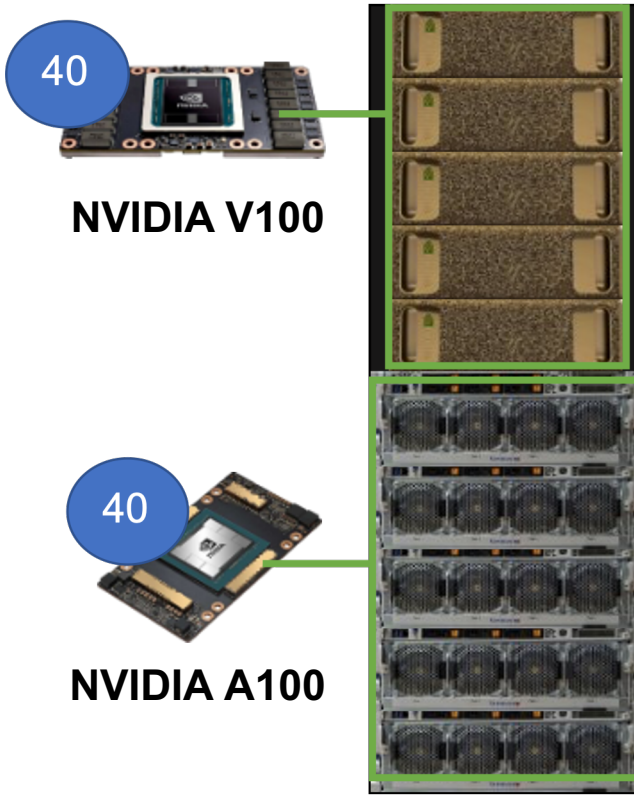
2023–2024	2025
323820.54 HEP-SPEC06	**427920.04 HEP-SPEC06**
20 096 CPU cores	**23 360** **CPU Cores**

Tier1 is used **for modeling, processing, and storing data from the CMS (LHC), BM@N, MPD, and SPD** experiments.





Upgrade of the GPU Component of the Govorun Supercomputer



Peak performance:
900 TFLOPS double precision
26 PFLOPS half precision

Two liquid-cooled RSC Exastream AI servers with 16 NVIDIA **H100**

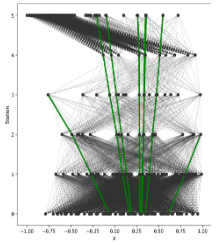
+

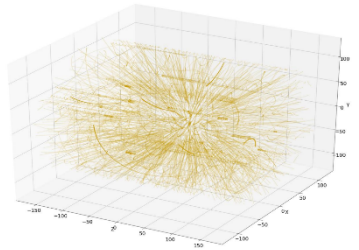
Peak performance:
500 TFLOPS double precision
32 PFLOPS half precision

GPU component:
96 GPU accelerators
Peak performance of the CPU component:
1.4 PFLOPS for Double-Precision computations
58 PFLOPS for Half-Precision computations

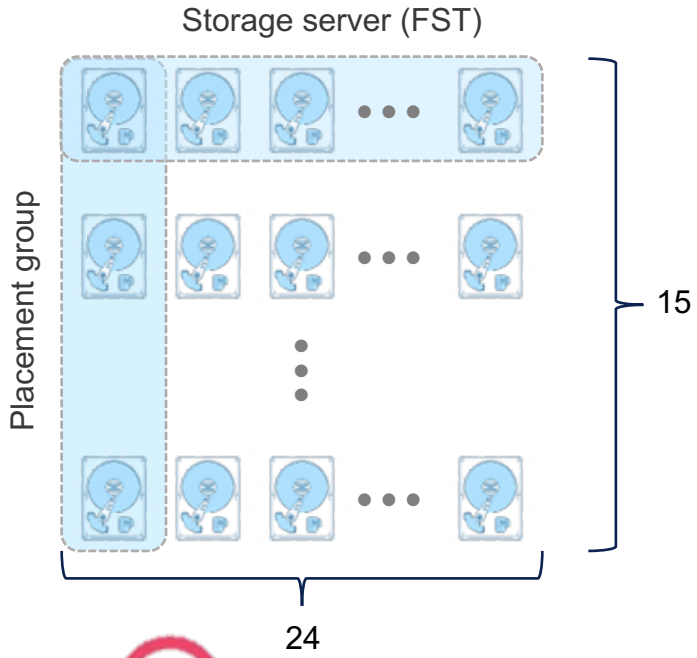
Total peak performance of the Govorun supercomputer:
2.2 PFLOPS for Double-Precision computations
58 PFLOPS for Half-Precision computations

The GPU component provides supercomputer users with the possibility of using machine learning and deep learning algorithms to solve applied tasks by a neural network approach: LRB experiments' data processing within the Information System for radiation biology tasks; experimental data processing and analysis at the NICA accelerator complex, etc.





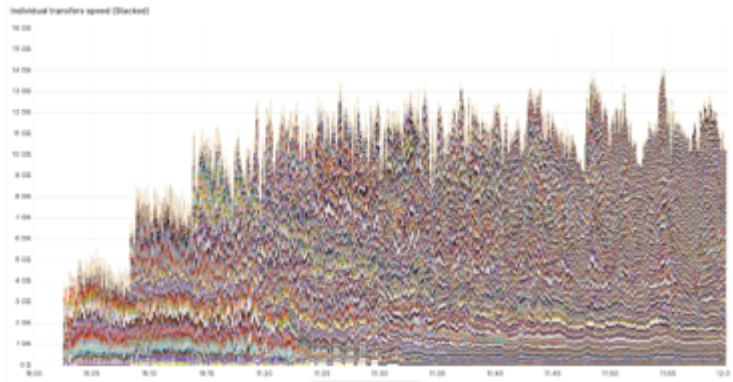
EOS Data Storage Systems for the MPD and SPD Experiments



Both new storages have the same hardware configuration:

- 2 separate racks;
- 18 servers;
- 3 metadata servers with high availability (MGM + QDB);
- 15 storage servers (FST);
- 100 Gbps Interconnect between servers.

- Unique IP for master MGM:
- eos-mpd.jinr.ru and eos-spd.jinr.ru
- 24 placement groups
- 7.2 PB of raw disk storage for each EOS storage



V.Mitin, A.A.Gusev, G.Chuluunbaatar, O.Chuluunbaatar, S.I.Vinitsky, V.L.Derbov, H.L.Luong

Dual Nature of Chemical Bond and Vibration-Rotation Spectrum of the Be_2 Molecule in the Ground $X_1\Sigma_g^+$ State

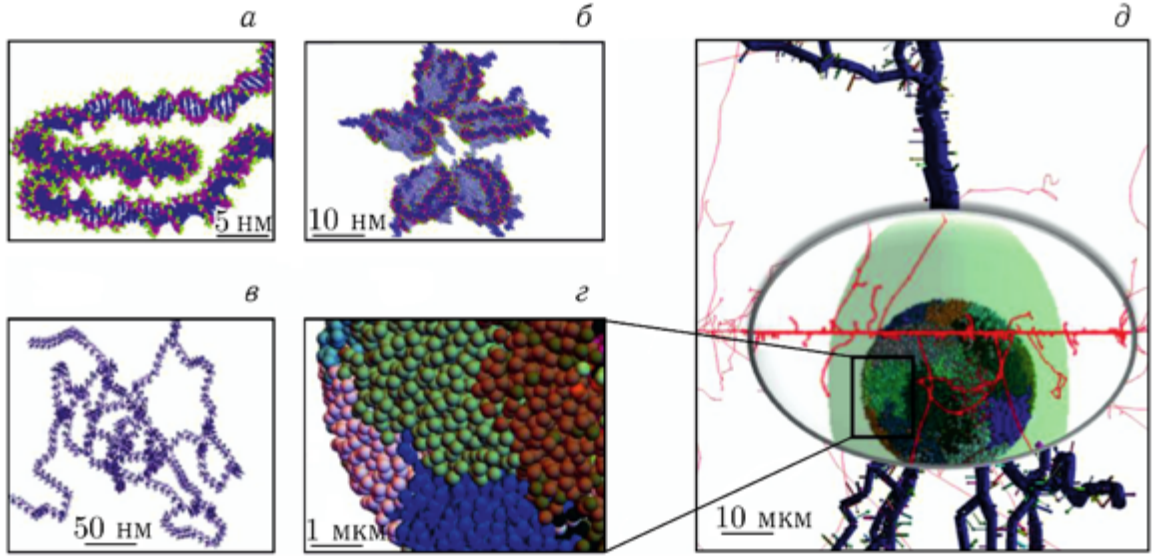
(*Chapter in Chemical and Materials Sciences: Research Findings Vol. 2)*

The main results that lead to understanding the dual nature of the chemical bond in the diatomic beryllium molecule in the ground $X^1\Sigma_g^+$ state are reviewed. High-precision ab initio quantum mechanical calculations of Be_2 resulted in the development of a modified expanded Morse oscillator potential function containing all twelve vibrational energy levels. The calculation of the vibrational-rotational spectrum of the bound states for the modified expanded Morse oscillator potential function and for the function obtained with Slater-type orbitals is considered. The spectrum of bound real-valued energy levels and metastable complex-valued energy levels is calculated. Such calculations are important for further experiments in laser spectroscopy of the beryllium dimer and for modeling its near-surface diffusion in connection with the well-known multifunctional use of beryllium alloys in innovative technologies of electronic, space, and nuclear industries, including the ITER project.

https://stm.bookpi.org/CMSRF-V2/article/view/17910
https://doi.org/10.9734/bpi/cmsrf/v2/4945

Numerical Simulations in Radiation Biology

Mathematical modeling of radiation-induced effects in the structures of the central nervous system following exposure to heavy accelerated charged particles

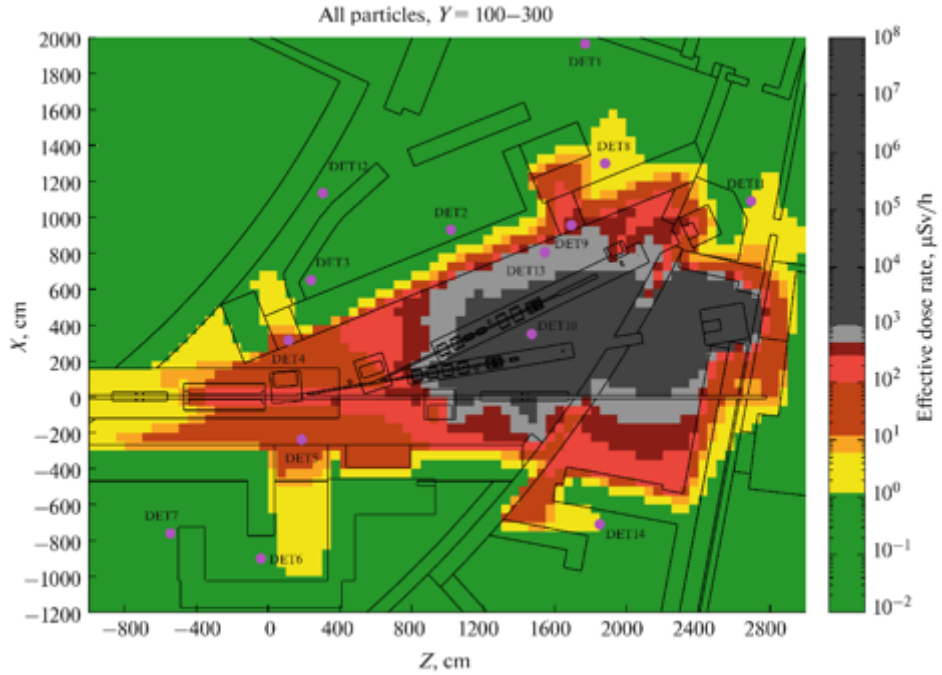


New results on radiation damage in the DNA of neural cells, development of dedicated software for applied studies

LRB and NUM, IPT MAN (Mongolia)

M.Batmunkh, L.Bayarchimeg, A.N.Bugay //
Phys. Part. Nucl. V.56. No.4, P.1698–1749 (2025)

Modeling of Radiation Environment at SIMBO and ISCRA Applied Research Stations and Beamlines at the NICA Complex



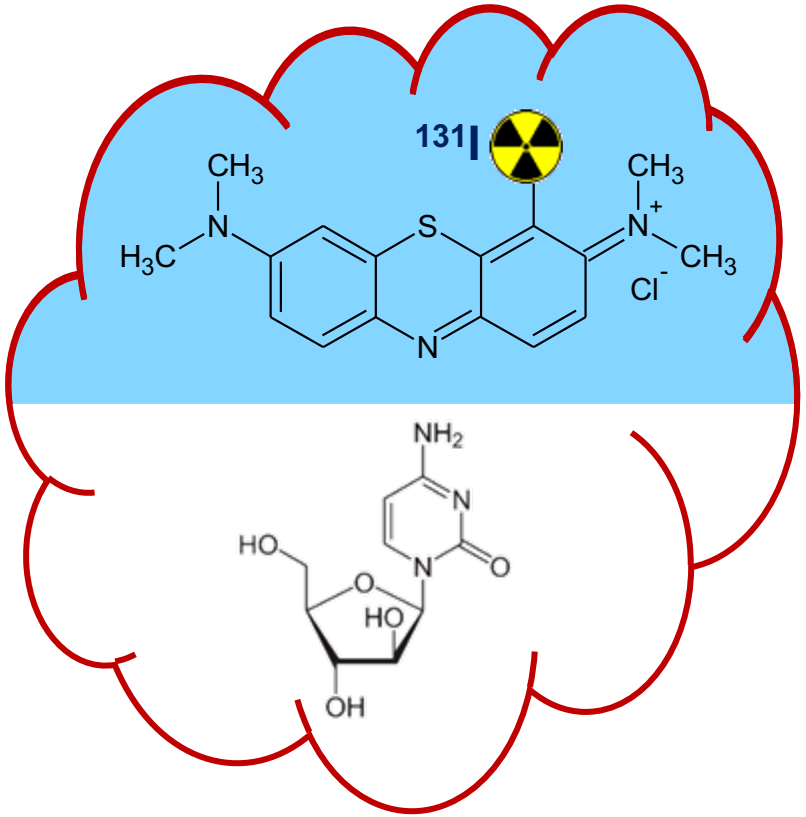
Spatial distribution of total effective dose rate during SIMBO operation

LRB and VBLHEP

I.S.Gordeev, A.A.Slivin & G.A.Filatov //
Phys. Part. Nucl., V. 56, No.3 P. 558–589 (2025)

New Approach to Increase Biological Efficiency of Therapeutic Radionuclides

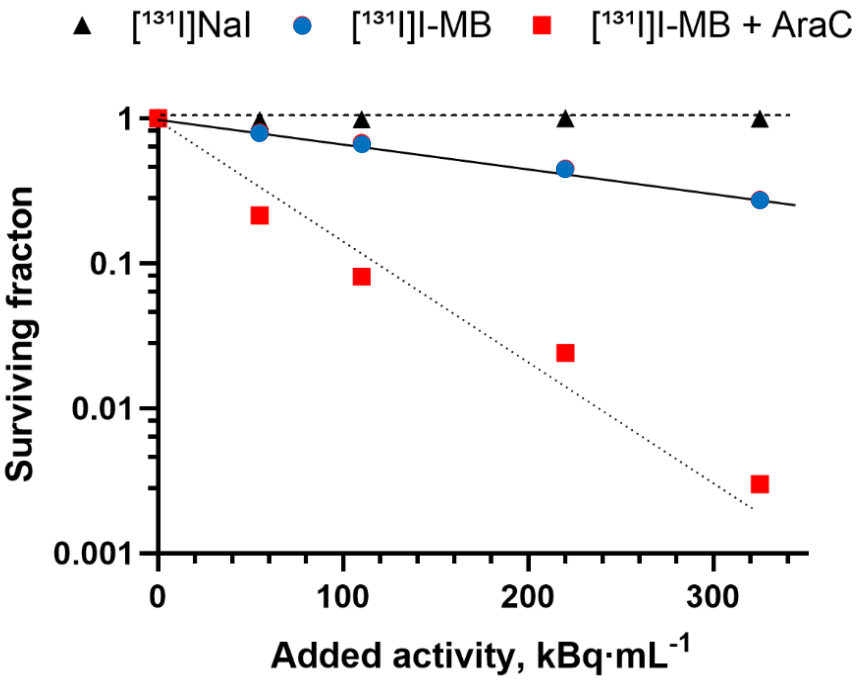
New concept of radiopharmaceutical:
radionuclide + biological vector + radiosensitizer



Metilene Blue (MB) – radiopharmaceutical for imaging and targeted therapy of melanoma (**halogen radioisotopes**)

AraC (nucleoside analog) – molecular radiosensitizer

Proof of principle experiment



Melanoma tumor cell survival decreases **5 times** with respect to targeted ^{131}I radiopharmaceutical

A.E.Zakharkina, A.S.Lunev, K.A.Petrosova, D.M.Zayakova, A.B.Bruskin, A.V.Boreyko, E.A.Krasavin, A.N.Bugay // Phys. Part. Nucl. Lett. 2025 [in print]

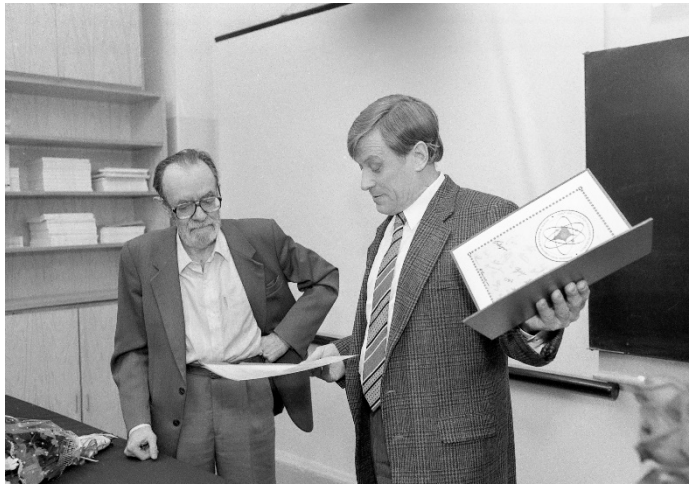
Collaboration of LRB and FMBA

Evgeny Aleksandrovich Krasavin

20.04.1942 – 17.07.2025

On 17 July 2025, the Scientific Leader and organizer of the JINR Laboratory of Radiation Biology, Corresponding Member of the Russian Academy of Sciences, Doctor of Biological Sciences, Professor **Evgeny Aleksandrovich Krasavin** passed away.

The Directorate of the Institute and Laboratory of Radiation Biology deeply mourns the death of E.Krasavin and expresses its sincere condolences to his family and friends.



New JINR Interlaboratory Councli for Byophysics Research established

(chair – Prof. L. Kostov, deputy – Prof. A. Bugay)

Created to harmonize the scientific and organizational activities of JINR in the field of radiation research in the life sciences, to increase the efficiency of the use of the research infrastructure, to optimize the interaction between the laboratories of the Institute, and to further develop multilateral international cooperation on the basis of JINR in a wide range of scientific fields of radiation research in the life sciences, in order to achieve the goals of sustainable development in priority areas Member States and Partner Countries of JINR, taking into account the recommendations of the JINR STC dated 02.06.2025

23 experts, including external. Armenia, Bulgaria, Cuba, Romania, Russia, Slovakia

The tasks of the Council are to:

- coordinate radiation research in the life sciences at JINR, including expert support for the opening of new projects and activities;
- formation of the JINR research programme in the field of radiation research in the life sciences taking into account the fundamental problems of world science, priorities of the JINR Member States and partner countries;
- coordination of the Institute's current activities in the field of radiation research in the life sciences;
- expert support of the scientific programme of international collaborations based on the JINR infrastructure;
- other expert and analytical works related to the planning and organization of scientific research in the field of life sciences.

JUNO: Reactor Antineutrino Oscillations

20 kt liquid scintillator detector, 26.6 GW_{th} reactors, 52.5 km baseline: 47 $\bar{\nu}_e$/day. Neutrino Mass Ordering: 3σ in ~6 years.

JUNO Status: Filling completed, **physical data taking started (!!!)**.

TAO Status: Commissioning, data taking late 2025.

JINR Contribution to TAO:

- Assembly and commissioning of the detector.
- SiPM power supply system is completed (dev@JINR), 10 spare boards in production.

Analysis:

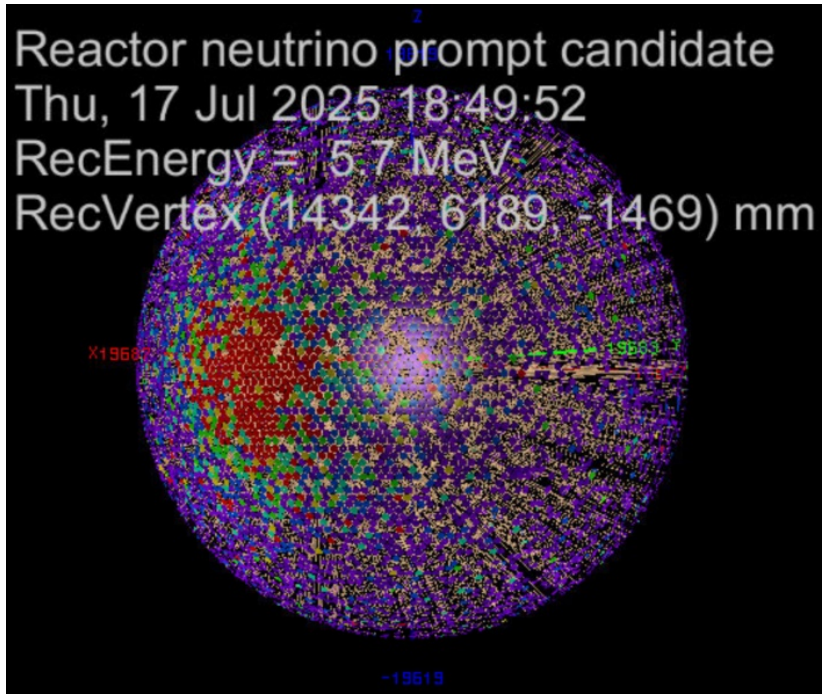
- JINR with Shanghai colleagues works on muon track reconstruction, event selection, background estimation, and statistical analysis.
- First antineutrino data analysis is ongoing; a preprint is expected in November 2025, with a paper in 2026. Results aim for world-leading precision.

Muon Veto: Top Tracker (TT):

- JINR designed and built the TT support structure (~3000 m²) and developed its DAQ software.
- Detector construction and commissioning completed; TT is now operating within JUNO.

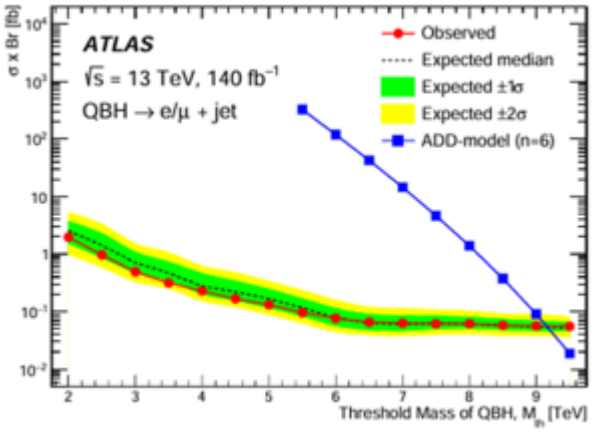
Computing:

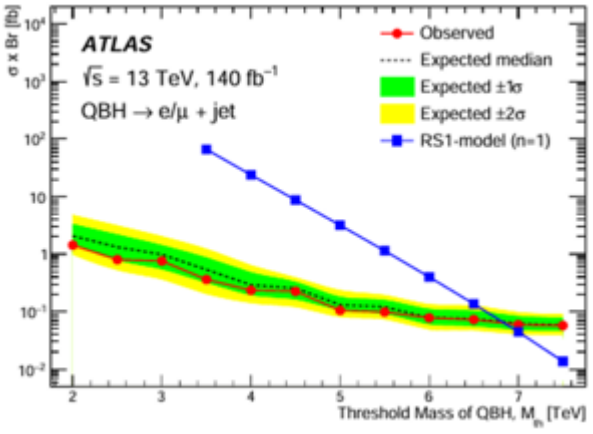
- Tier-1 Grid site at MLIT provides at least 2000 cores, 1.4 PB disk, 5 PB tape; 2.5 PB extra disk being added for full dataset replica.
- JINR contributes to Grid software development and data quality tools within the Data Quality Group.



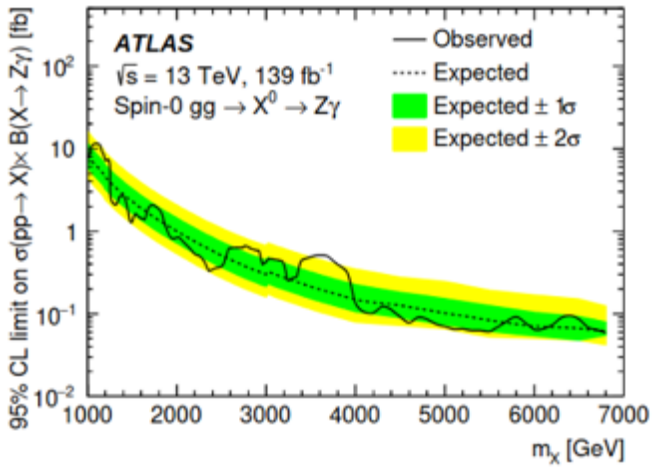
Results of the LHC Experiments at CERN

New mass/cross-section limits for **Quantum Black Holes** are set for the ADD and RS1 models and for model-independent approach.



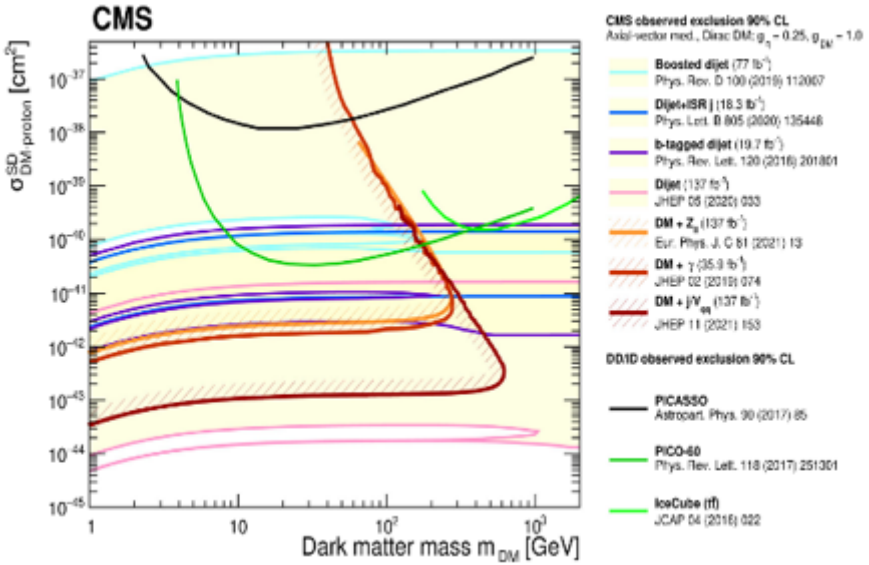


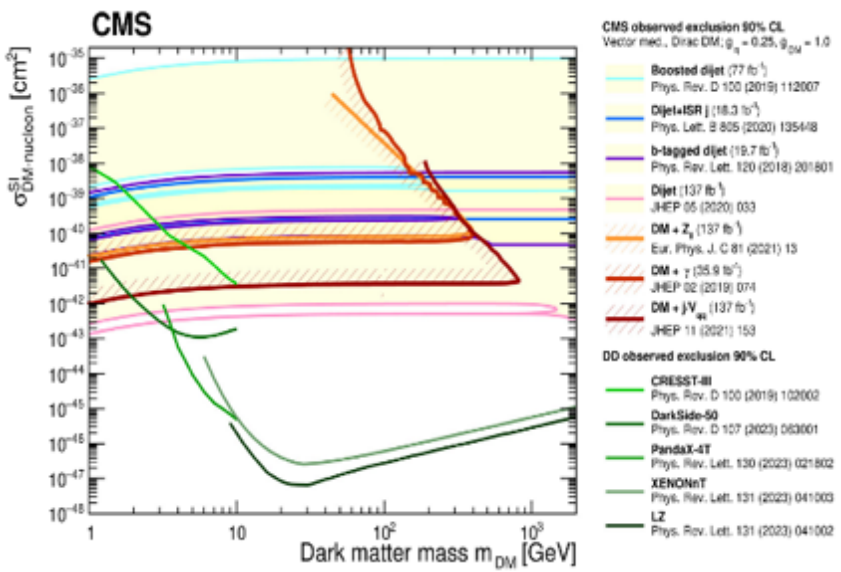
Experiments at LHC are focused on precision tests of the Standard Model and on direct / indirect searches for "New Physics"

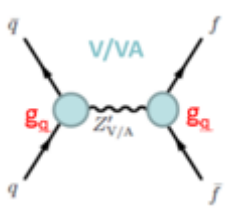


ATLAS EXPERIMENT

Search for **deviations from SM** predictions was performed in Zγ and Wγ final states with full Run2 dataset. The largest deviation from expectation is 2.5σ for spin-0 channel at 3.64TeV.







CMS

Dark Matter searches in dijets+dileptons events assuming existence of a single DM particle that interacts with the SM particles through a spin-1 mediator

- vector mediator (right) with small couplings to leptons, $g_{DM} = 1.0$, $g_q = 0.1$, $g_l = 0.01$;
- axial-vector mediator (left) with equal couplings to quark and leptons:

  $g_{DM} = 1.0$, $g_q = g_l = 0.1$.

CMS Data Processing and Analysis

MLIT's research activity in CMS @ LHC focuses on the development of methods and algorithms for

Muon Reconstruction and Selection

- high-momentum muon reconstruction and triggering, including AI methods,
- hits and track segments in the Cathode Strip Chambers using neural networks,
- muon track reconstruction for High Granularity Calorimeter (HGCal) testing and study of the efficiency of HGCal sensor elements.

HGCal-based algorithms

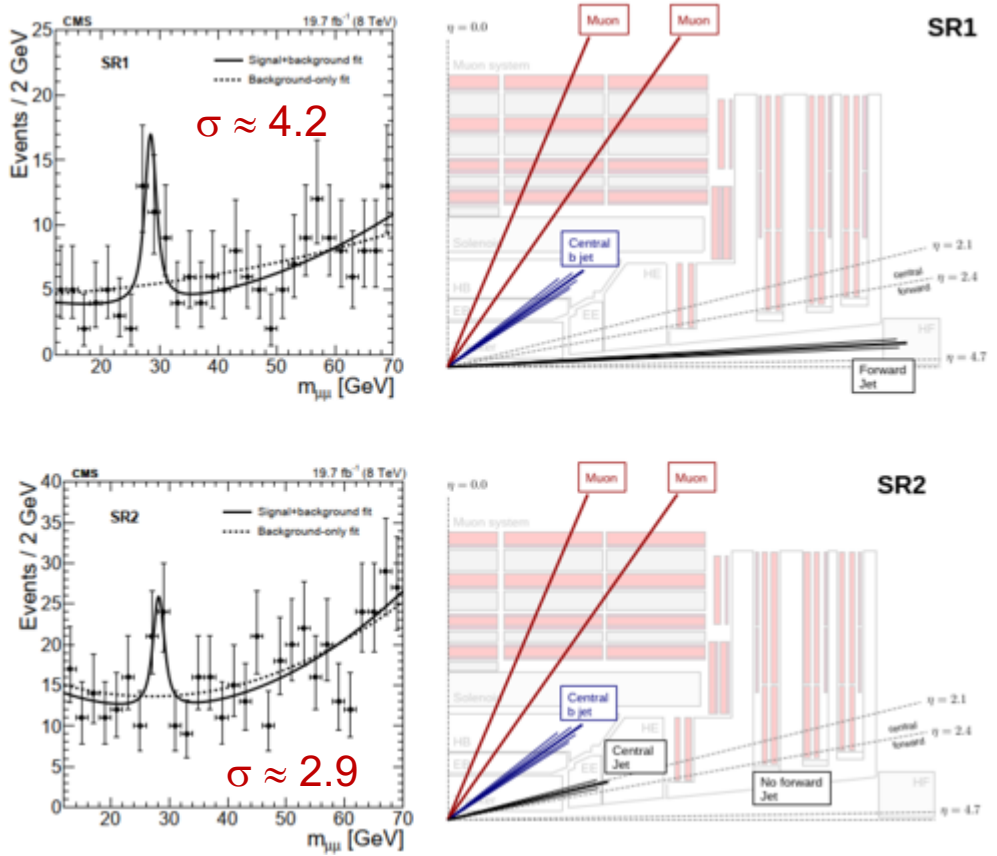
- particle-flow algorithms for the reconstruction of energy flows (information from all detector systems) ⇒ Missing Transverse Energy reconstruction.

Simulation of Physics Processes and the Detector Facility

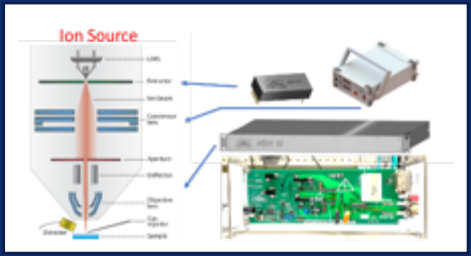
- simulation of dark matter scenarios, the extended Higgs sector, extended gauge models, Drell-Yan production within the Standard Model, etc,
- full chains of MC mass production,
- modeling of HGCal test facilities,
- HGCal working release in the CMS software package.

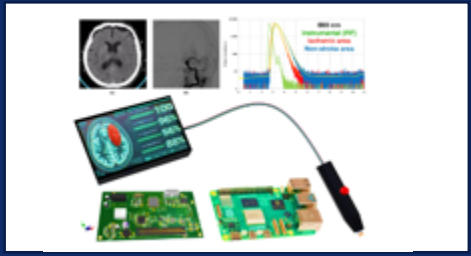
MLIT in collaboration with VBLHEP and BLTP actively participates in exploratory searches for new physics

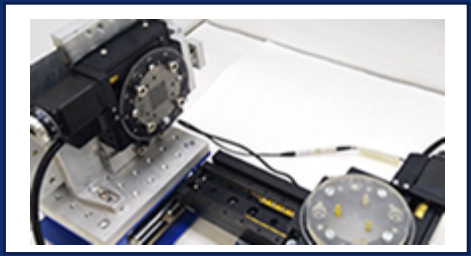
Smoking gun (!) ⇒ Observation of dimuon event excess at 8 TeV. Needs to be confirmed @ 13 TeV.

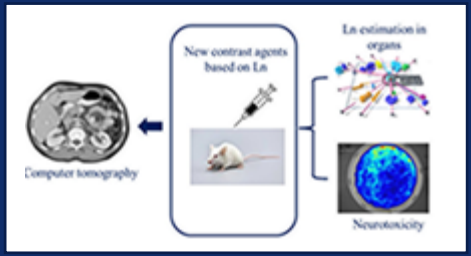


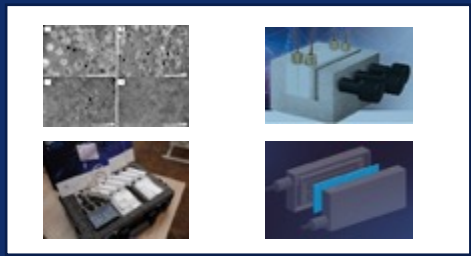
New results are expected by the end of this year











JINR R&D in Innovations Competition 2025

First CALL – February 2025 **30+ Proposals** **17 – Final stage** **Summing Up – June 2025** **Start – July 2025**


Dmitry Ponkin

“Creation of a line of high voltage power supplies and voltage switches for experimental facilities”, supervised by **Dmitry Ponkin** (VBLHEP). The successful implementation of this R&D project will not only improve the technical equipment at the facilities of both JINR and its partners, but will also allow occupying the related market niche.


Alexandr Selyunin

“Development of deep tissue oxygenation measurement systems using time-domain diffuse optics (TD-DO)”, supervised by **Alexandr Selyunin** (DLNP). The project team unites DLNP JINR physicists with medical scientists and chemists from Moscow State University. As part of the R&D project, it is planned to create equipment aimed at solving the problems of rapid diagnosis of circulatory disorders, including strokes, along with monitoring oxygen levels in the brain during surgeries.


Vladislav Rozhkov

“Development of micro-SPECT systems for precision imaging in preclinical biological experiments”, supervised by **Vladislav Rozhkov** (DLNP). The results of this R&D project may be utilized in applied biomedical studies, the development of radiopharmaceuticals, testing of new diagnostic and therapeutic methods, and in the problems of fundamental radiation biophysics.“


Inga Zinicovscaia

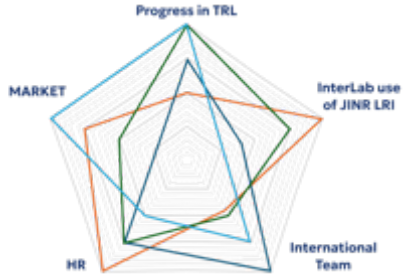
“Testing of neurotoxicity and assessment of contrast agents, nanoparticles, and other compounds’ accumulation in animal models in TaaS (Testing as a Service) format”, supervised by **Inga Zinicovscaia** (FLNP). The successful implementation of the project will allow the Institute to conduct a wide range of pharmacological and pilot toxicological studies of new medicines and contrast agents being developed in the JINR Member States.


Ilya Vinogradov

“Multifunctional preparative system of tangential filtration”, supervised by **Ilya Vinogradov** (FLNR Centre of Applied Physics). As part of the R&D project, tangential filtration devices in reusable and single-use designs will be developed. These are in demand in a number of laboratory and medical filtration tasks, along with the manufacture of pharmaceuticals.

In Focus:

- Support for innovative product-oriented R&D;
- Consistent project approach implemented by young leaders;
- International, Interlaboratory and Interdisciplinary teams;
- Technology agenda relevant for Member States;
- Development of HR: young leaders, students and postgraduates involved (leader & 70% of team members – under 39 years old);
- Annual reporting (a brochure).

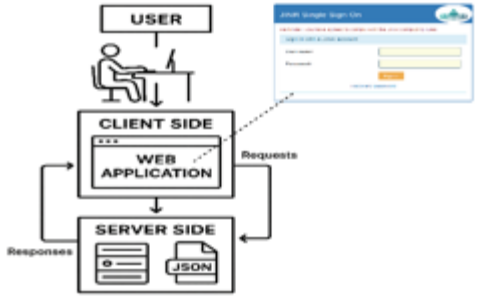


Special Criteria:

- Increase of TRL;
- Prospects for technology transfer (Market, IP, Industrial partner, etc.);
- International, interlaboratory and interdisciplinary nature of using JINR LRI in R&D;
- Importance for HR development.

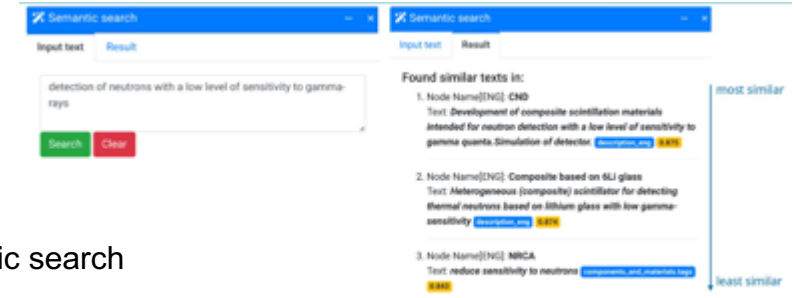
Mapping of JINR Technology Domains. ***Detectors***

- Interactive tool (Developed in MLIT) for Data Base creation & visualization;
- SSO-login. Today access is possible for JINR community only;
- Growing Team of participants;
- Low hanging fruits – «Where can I find necessary equipment, etc.";
- Next steps: Accelerators; Smart search.



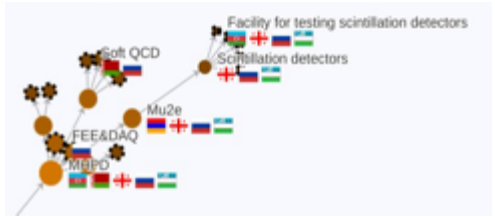
Technology = What is it made of ("**Components & Materials**"), How ("**Competencies**"), On what **Equipment**

NEW



☑ AI based Semantic search

☑ Participated countries on The Map



deepseek , etc

☑ AI based generation of new nodes (drafts, to be verified by expert)

Big Science for Business

DOKAGENE — **Machine learning**

Центр водородных технологий / Центр водородной энергетики — **Hydrogen energy**

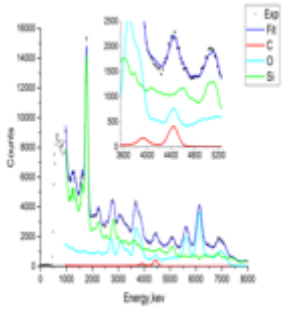
ВладисарТ — **Modules for immunoenzyme preparations and vaccines**

Some recent results

Sustainable Development. Mitigating Climate Change

Measurement of carbon concentration in soil without sample extraction & preparation.

Tagged Neutron based scanner (FLNP and Diamant LLC) on unmanned transport platform.

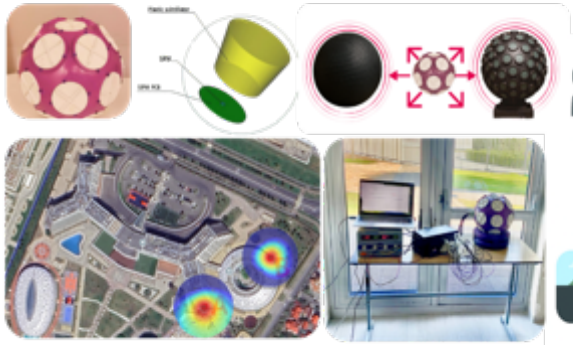


Сириус Образовательный центр

Axenter

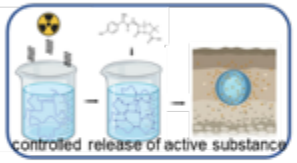
Большие вызовы

DSTAR
(Detection System for Tracking Angular Radiation)»



COSMIC-RAY MUOGRAPHY

"EcoRadGel: Radiation-crosslinked hydrogels as a platform for biotechnological applications"



Development of technology for obtaining radiation-crosslinked hydrogels functionalized with the required active substance (antibiotics, probiotics, growth factors, fertilizers)
+
Development of technology for the slow release of the active substance from the hydrogel in an aqueous medium or soil with specified properties (temperature, pH)

Clear water — Реатрек

Carbon supersites — ДИАМАНТ

Proton therapy — РОСАТОМ

Implants — Глазной центр Восток-Прозрение

BEAM PHYSICS AND ACCELERATOR R&D and TECHNOLOGIES

Researchers of JINR are active participants of the of state-of-the-art international accelerator projects: LHC, FAIR, RHIC & EIC, GANIL, INFN, HIAF, CePC, FCC, Linear colliders, etc. **We will focus on R&D in the following areas:**

– highly charged intense ion sources for generating heavy-ion beams (Z > 40+);

– superconducting magnetic technologies: high-field fast-cycling magnets (B > 4 T, ramp 4-10 T/s), high-current cables and windings (I_cr > 30 kA), high-field solenoids;

– R&D of ”Dubna SC” cable for synchrotrons and novel cyclotrons, including HTSC technologies;

– fast beam cooling systems for intense hadron beams (~ 10 - 100 ms);

– superconducting RF structures (RFQ and DTL) and cryomodules for intense p- and i- beams;

– research in the field of colliding beams. Problems of future colliders (CePC, FCC, LC, etc.);

– R&D on hadron beam therapy (flash, pencil beam, light ions, neutrons);

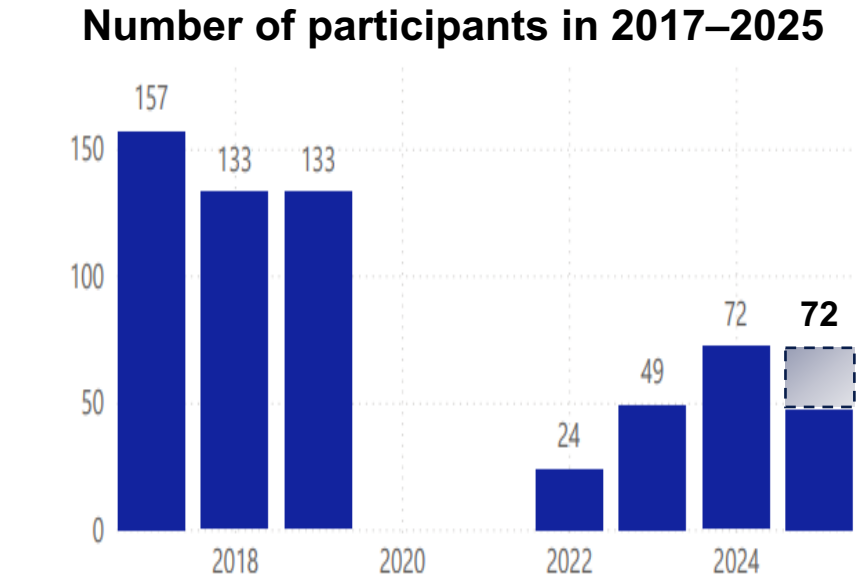
– Innovative Accelerators for applied research (positron and electron beam facilities), SMES;

– development of modeling methods, including using AI, for beam dynamics in real electromagnetic fields, deep machine learning for operation.

Progress for the implementation depends on the coordination of priorities / resources, which must be carried out in close JINR **InterLaboratory** cooperation with involvement of Research centers from Member States.
It is feasible to combine some Activities/Projects within an All-Institute theme for the period after 2026.

International Student Practice (ISP) Programme

Path to Full Recovery from Covid-2019



ISP drivers: demands of member states and needs of joint projects

New tendencies

ISP features: Acquaintance with Russian culture and cross-culture communications

ISP Progress: Path to Full Recovery

- **7 countries** participated at once at Fall session 2024;
- **47 participants** in Summer session 2025;
- We expect arrival of another **25 for Fall session 2025.**

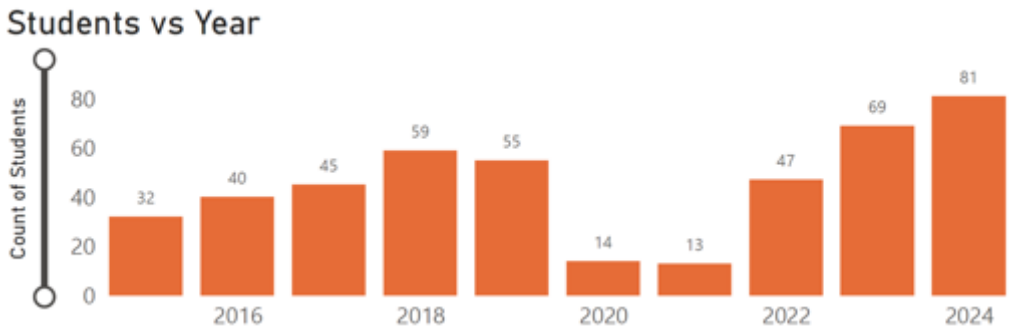
Highlights of 2025

- Summer session: First time **connected Africa –** ARE and RSA;
- **Vietnam:** first time selected 12 students from 6 universities via national call (only 6 students last year);
- **Serbia**: nominated 10 students (4 last year).

From START and INTEREST to JINR International Staff

Assessment of START efficiency in 2015–2024

Total No of Students	Total no of supervisors	Total No. of publications	Total Recruitment
467	225	779	77



Summer session 2025
Running now
Applied **357**
Selected **65**
From **13 countries**

Winter session
Starts February 2026
Registration
opened till October 30th

INTEREST in figures

450 participants overall

In 2021–2025 from **27 countries**

85 participants in 2024

33 participants in Wave 12 in Spring 2025

Wave 13 starts on October 20th

START & INTEREST: Impact and Growth

- **START**: **81 participants in 2024** (exceeding pre-pandemic levels)
- **START: 17% of alumni employed** at JINR;
- **INTEREST now keeps pool of 617 active students from >30 countries:** broad seeding of future scientific partnerships;
- **INTEREST** is worth repeating for a number of students. The champion from Vietnam An Binh (5 times) worked in FLNP and in FLNR now.

JINR School of Information Technologies

9-10 April 2025

33 students from Russian and Belarusian universities

Competition for the best report 7 winners

Student presentations and reports with the results of the work performed and plans for the further development of the project.

- Distributed and high-performance computing for the preparation, implementation, and support of JINR experimental and theoretical research;
- Mathematical modeling, numerical methods and algorithms for solving JINR applied tasks;
- Modern methods and technologies for information processing and analysis;
- JINR Digital EcoSystem;
- Support and development of the JINR Multifunctional Information and Computing Complex (MICC);
- Engineering infrastructure: automation and monitoring.

International Accelerator School: Linear Accelerators

On 24–29 August 2025, the International Accelerator School: Linear Accelerators (IAS-2025) was held in the village of Verbilki (Moscow Region). During the week, young scientists and specialists not only listened to lectures by leading experts in the field of physics and technology of charged particle accelerators, but also applied their knowledge in practical exercises and project work.

In 2025, the school's programme covered the following thematic areas:

- physics of charged particle beams,
- basic engineering systems of linear accelerators,
- fundamental and applied research,
- acquaintance with JINR facilities: an overview of the VBLHEP and DLNP accelerator complexes.

School of Accelerator Physics is attended by more than 50 young scientists and specialists from four JINR laboratories, as well as six leading research centres and universities of the Russian Federation. The school's programme allowed for a comprehensive study of the principles of operation, design and operation of modern accelerator complexes, and also to communicate with lecturers — leading experts in their field.

As part of the practical part of the programme, there is a task to develop two concepts of an electronic accelerator. Working in groups and using lecture materials, on the final day, the school participants presented their accelerator projects designed for basic research at the NICA complex, as well as for solving applied scientific problems.

International Cooperation

Member States

25–27 August 2025

JINR Director, Academician **Grigory Trubnikov** visited Belarus. In Minsk, the JINR Director participated in the 16th International School and Conference entitled **“The Actual Problems of Microworld Physics”**. In addition, the programme included meetings with the Plenipotentiary of the Government of the Republic of Belarus at JINR **Sergey Shlychkov** and the Chair of the Presidium of the National Academy of Sciences of Belarus (NASB) **Vladimir Karanik**.

During a working meeting with the Plenipotentiary of Belarus, Chair of the State Committee on Science and Technology of the Republic of Belarus **Sergey Shlychkov**, the parties discussed prospects for the expansion of scientific cooperation, along with training provided for students and young scientists from Belarus at the Joint Institute.

The JINR Director warmly congratulated **Vladimir Karanik** on his appointment and expressed confidence that the activities of the NASB Presidium Chair would further strengthen the partnership between JINR and organizations subordinate to the NASB. The parties discussed the prospects for further cooperation development, particularly in high energy physics and life sciences, and reached agreement on Vladimir Karanik’s visit to JINR to get acquainted with the Institute’s flagship facilities.

International Cooperation

Member States

7–8 April 2025

Members of the National Assembly of the Republic of Bulgaria, **Yordan Todorov** and **Angel Yanchev**, visited JINR. The delegates became familiar with JINR's laboratories, where they got acquainted with the scientific infrastructure and research projects of the Institute, and also met with representatives of the national group of the Republic of Bulgaria at JINR.

The meeting with representatives of the JINR Directorate concluded the event's programme. The parties emphasized the fundamental importance of multilateral cooperation between JINR Member States for the national research and technological advancement of these countries, the strengthening of international partnership in science and technology in accordance with the principles of the Sofia Declaration on the Value of International Integration in Science and Technology adopted by the Plenipotentiaries of the Governments of the JINR Member States at the November 2021 session in Sofia.

International Cooperation
Member States

11 February 2025

A delegation from the VINATOM, headed by President **Tran Thi Thanh**, and representatives of the State Specialized Design Institute, part of Rosatom, visited the Frank Laboratory of Neutron Physics and got introduced to the work of the unique IBR-2M Pulsed Reactor and facilities using extracted neutron beams.

During the working meeting, the parties discussed FLNP specialists' participation in identifying promising scientific directions for the research reactor being designed in Vietnam and the development of its instruments using extracted neutron beams, and also agreed to involve Vietnam scientists, students, and postgraduates in the activities at the IBR-2M reactor in order for them to gain experience in developing spectrometer elements and working at facilities using extracted beams.

10–16 May 2025

In Hanoi, representatives of VBLHEP, FLNP, FLNR, MLIT, and the University Centre of the Joint Institute participated in a number of meetings on education and personnel training with universities and scientific centres of Vietnam.

The JINR delegation visited a number of universities. Round tables on JINR's scientific and educational opportunities, meetings with the administration, teachers, and young scientists of relevant students of specialized faculties were held. In addition, the soft opening of a JINR Information Centre took place in the format of a seminar at the Institute of Physics of the VAST.

International Cooperation
Member States

27 March 2025

Plenipotentiary Representative of the Government of Mongolia at JINR, Senior Officer of the Executive Office of the Nuclear Energy Commission of the Government of Mongolia **Suren Davaa** and Director of the Nuclear Research Centre at the National University of Mongolia **Byambajav Munkhbat** visited JINR.

The delegates held a number of meetings with the Institute's Directorate and representatives of the Mongolia national group at JINR. One of the results of the visit was an agreement to hold the **2025 NUMAR-Gobi International School on Nuclear Methods and Applied Research in Environmental, Material, and Life Sciences** in Ulaanbaatar this summer.

30 June – 4 July 2025

The International School on Nuclear Methods and Applied Research in Environmental, Material and Life Sciences (NUMAR-Gobi 2025) was held in Ulaanbaatar. The event is organized by the Joint Institute for Nuclear Research in cooperation with the Nuclear Energy Commission under the Government of Mongolia, the National University of Mongolia, and the Mongolian Academy of Sciences. About forty Mongolian students at least the third year of their bachelor's degree, as well as undergraduates and postgraduates, became participants of the school. The lecturers of the school are JINR scientists and the Institute's partner organizations from Mongolia.

International Cooperation
Member States

24–26 February 2025

Vice-Director of the JINR **Latchesar Kostov** and Deputy Director of the Frank Laboratory of Neutron Physics **Sergey Kulikov** visited the Academy of Sciences of the Republic of Uzbekistan (AS RUz) and the AS RUz Institute of Nuclear Physics (INP). The Presidium of the Academy of Sciences hosted a meeting between the delegation of the Joint Institute and President of the Uzbekistan Academy of Sciences **Shavkat Ayupov**.

The AS RUz President expressed high appreciation of the role of the JINR in training qualified personnel for Uzbekistan. During the meeting, the parties discussed prospects for expanding cooperation between the Academy of Sciences and current organizational issues.

The working meeting with INP AS RUz Director **Ilkham Sadikov** and Deputy Director **Mannab Tashmetov** focused on the progress and prospects of cooperation between the institutes and the programme of the JINR Days in Uzbekistan scheduled for April 2025.

24–26 March 2025

President of the Uzbekistan Academy of Sciences **Shavkat Ayupov** visited JINR on a working visit.

Academician **Shavkat Ayupov** participated in a JINR Finance Committee meeting, a session of the Committee of Plenipotentiaries of the Governments of the JINR Member States, and meetings with JINR Director, RAS Academician **Grigory Trubnikov** and members of the Institute's Directorate. Manager of the COMET Project (J-PARC) **Satoshi Mihara** and a member of the JINR–Mexico Joint Coordination Committee **Alejandro Ayala** took part in the visit.

International Cooperation

Deepening Ties with Latin America

24–27 February 2024

The Second International School on Nuclear Methods and Applied Research in Environmental, Material, and Life Sciences (**NUMAR-2025**), organized by the Joint Institute for Nuclear Research and the Agency for Nuclear Energy and Advanced Technologies (AENTA, the Republic of Cuba), took place in Havana, Cuba.

The programme of the event included lectures for students and young specialists from Latin American countries by leading scientists from JINR and scientific organizations from Argentina, Brazil, Cuba, Mexico, and South Africa.

26 February 2025

Representatives of the JINR paid an official visit to the University of Havana, the Republic of Cuba. The delegation met with the university's leadership and researchers to discuss the prospects for the development of joint research projects and the issues of training young specialists.

As a result of the visit, the parties renewed the General Cooperation Agreement aimed at expanding Cuba's participation in JINR. The document was signed by the University's Rector **Miriam Nicado García** and JINR Chief Scientific Secretary **S.Nedelko**.

This year, 36 students and young specialists representing scientific and educational organizations of Brazil, Costa Rica, Cuba, Dominican Republic, Mexico, and Paraguay participated in the school. Plenipotentiary Representative of the Government of the Republic of Cuba in JINR **Gonzalo Walwyn Salas** acted as event coordinator.

International Cooperation

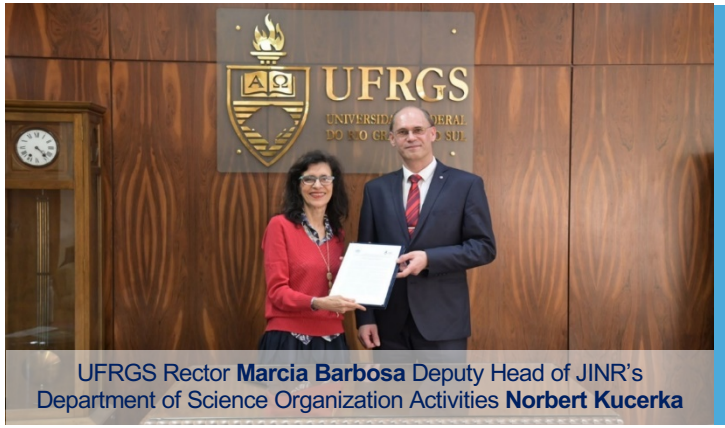
Deepening Ties with Latin America

8 May 2025

JINR and the Ministry of Science, Technology and Innovation of the Federative Republic of Brazil (MCTI) signed a Memorandum of Understanding at the Bauman Moscow State Technical University, Russia.

JINR Director, Academician **Grigory Trubnikov** and Minister of Science, Technology, and Innovation of Brazil **Luciana Barbosa de Oliveira Santos**

The document is aimed at strengthening cooperation between the parties in fundamental and applied research. The agreement provides for the creation of a JINR–Brazil Joint Coordinating Committee (JCC) at high governmental level. The JCC is designed to establish a structured method of selecting and implementing collaborative projects, particularly those that involve using the large research infrastructure of JINR and Brazil to achieve the national goals of scientific and technological development of Brazil and the JINR Member States.



UFRGS Rector **Marcia Barbosa** Deputy Head of JINR's Department of Science Organization Activities **Norbert Kucerka**

12 May 2025

JINR and the Federal University of Rio Grande do Sul (UFRGS) signed a Memorandum of Understanding in Porto Alegre, Brazil.

JINR and educational organizations of the Federative Republic of Brazil thus established a partnership in fundamental and applied research and made a significant step in developing scientific cooperation.

During the visit, the parties discussed the prospects of implementing joint projects. The main areas of collaboration will be radiobiology, materials science, life sciences, and ecology, as well as academic exchange for students and researchers.

On 13 May, the delegation from Dubna visited several scientific and educational departments of the University of Rio Grande do Sul. While getting acquainted with the laboratories of the UFRGS Institute of Physics, the parties discussed areas for joint research and noted the complementarity of the existing scientific infrastructure.

International Cooperation

Associate Members

27 March 2025

One of the State Secretaries of the Ministry of Science, Technological Development and Innovation of Serbia, **Miroslav Trajanović**, met with the JINR Directorate. The parties discussed the prospects of JINR–Serbia cooperation and outlined the next steps to implement joint initiatives and projects. Representatives of the Serbian delegation participated in the JINR Committee of Plenipotentiaries session and visited the Institute's laboratories, where they got acquainted with the modern scientific infrastructure.

The State Secretary of the Ministry of Science introduced Deputy Director of the Vinča Institute **Marija Janković** as the new coordinator of Serbia–JINR cooperation. She said that the result of S.Dimović's visit to JINR was the prompt establishment of a special committee for the development of accelerator projects at the Vinča Institute, which will work together with the JINR expert group.

20–23 May 2025

The 67th International Fair of Technics and Technical Achievements is taking place in Belgrade with the participation of a Joint Institute for Nuclear Research delegation. The JINR booth presents information on the Institute's main facilities, projects, and educational programmes, along with the results of joint research with partners from Serbia.

One of the elements that the JINR delegation presented is a prototype of a preparative system for tangential flow filtration of solutions, developed by the Centre of Applied Physics at the JINR Laboratory of Nuclear Reactions.

International Cooperation

Scientific Cooperation with South Africa

16–20 June 2025

South Africa Days at JINR: 20 years of international cooperation

Dubna is hosting the Days of the Republic of South Africa at JINR, dedicated to the 20th anniversary of the strategic scientific partnership between the Joint Institute for Nuclear Research and the Republic. At the opening of the event, three new cooperation agreements were signed with the University of Zululand (UNIZULU), the University of Venda (UNIVEN), and North-West University (NWU). During the week, representatives of the delegation from South Africa will tell their JINR colleagues about the achievements and prospects of collaboration, visit the JINR laboratories, and discuss future joint projects and studies.

Meeting of the South Africa–JINR Joint Coordinating Committee was held on 18 June.

International Cooperation

Scientific Cooperation with South Africa

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International Cooperation

13 May 2025

A delegation of the French Embassy in the Russian Federation, headed by Minister-Counsellor Zacharie Gross, visited JINR to get acquainted with its scientific infrastructure and research projects.

At the end of the meeting, representatives of the embassy visited the sites of the Superheavy Element Factory at the Laboratory of Nuclear Reactions, the IBR-2 Research Reactor at the Laboratory of Neutron Physics, and the NICA Accelerator Complex at the Laboratory of High Energy Physics.

Ciencia y Tecnología
Secretaría de Ciencia, Humanidades, Tecnología e Innovación

20 March 2025

JINR management held an online meeting with representatives of Ministries of Science, Humanities, Technology and Innovation (SECIHTI) Mexico and a number of leading universities, such as the National Autonomous University of Mexico (UNAM), the University of Colima, the University of Michoacan, etc.

Dr. **Ana Maria Cetto Kramis** (Physics Institute, UNAM)

Dr. **Alejandro Ayala** (Institute of Nuclear Sciences UNAM)

Dr. **Violeta Vázquez Rojas Maldonado**, Underminister of Humanistic and Scientific Research

The meeting was designed to strengthen scientific and technical cooperation between JINR and SECIHTI.

The meeting programme included:

- JINR presentation by D.Kamanin;
- Presentation of the NICA project — V.Kekelidze;
- Identification of areas of common interest;
- An open discussion.

A meeting of the JINR–Mexico Joint Coordination Committee is scheduled for the second half of 2025.

International Cooperation

JINR Delegation in Japan

19–21 May 2025

Representatives of the Joint Institute for Nuclear Research visited Japan. A delegation led by JINR Director, Academician **G.Trubnikov** took part in working meetings at major national research centres: **KEK (High Energy Accelerator Research Organization)** and **J-PARC (Japan Proton Accelerator Research Complex).**

Meeting with KEK Director **Shoji Asai**, Director of the KEK Institute of Particle and Nuclear Studies **Naohito Saito**, and COMET Project Manager **Satoshi Mihara**

During the visit, bilateral negotiations aimed at deepening the partnership between the JINR and Japanese organizations in science and collaborative studies took place. The parties discussed promising areas of physics research and opportunities for cooperation in JINR, KEK, and J-PARC projects. The participants of the negotiations expressed mutual interest and noted they were willing to update the current Memorandum of Understanding.

Meeting with J-PARC Director **Takashi Kobayashi**, J-PARC Deputy Director **Takeshi Komatsubara**, Head of the J-PARC Materials and Life Science Division **Toshiya Otomo**, Professor at the J-PARC Particle and Nuclear Physics Division **Takeshi Nakadaira**, and COMET Project Manager **Satoshi Mihara**

For several years, JINR scientists have been actively involved in the projects of the J-PARC scientific centre, particularly the COMET and T2K experiments, making a significant contribution to creating and developing detector systems, along with conducting experimental data analysis. The KEK and J-PARC leadership highly appreciated the achievements of the JINR specialists and noted the potential for their participation in the future international Hyper-Kamiokande Project. In addition, the parties expressed mutual interest in involving Japanese scientists in experiments carried out at JINR's main facilities, and also highlighted the importance of academic mobility for theoretical and experimental physicists, as it will contribute not only to strengthening scientific ties, but also to actively exchanging knowledge and practical experience in priority areas of research.

International Cooperation

22–24 August 2025
JINR Director, RAS Academician **Grigory Trubnikov** visited China as part of a delegation headed by Russian Minister of Science and Higher Education **Valery Falkov**.

In Beijing, the Russian delegation met with the Minister of Science and Technology of the People's Republic of China **Yin Hejun** to discuss prospects for expanding scientific and technical cooperation and joint projects in fundamental research.

In particular, during the visit in Hefei, the delegation visited with the Chinese Experimental Advanced Superconducting Tokamak (EAST) of the Institute of Plasma Physics of the Chinese Academy of Sciences. The EAST's results significantly contribute to the advancement of research on thermonuclear fusion. Particular attention was paid to the development of partnership in megascience projects. Chinese scientists are taking part in the work of international collaborations at the NICA accelerator complex at the Joint Institute for Nuclear Research. Employees of JINR and the Institute of Plasma Physics are currently coordinating a programme for the development of medical proton accelerators in China.

JINR Information Centres

Vladimir Kekelidze and Sergey Dmitriev Elected Academician and Corresponding Member of Russian Academy of Sciences

30 May 2025

The General Meeting of members of the Russian Academy of Sciences (RAS) finished. According to the results of an election, scientists of the Joint Institute for Nuclear Research were elected RAS Academician and Corresponding Member.

JINR Vice-Director, Doctor of Physics and Mathematics **Vladimir Kekelidze** became a RAS Academician with an honorary degree in nuclear physics.

JINR Vice-Director, Doctor of Physics and Mathematics **Sergey Dmitriev** was elected a RAS Corresponding Member with an honorary degree in nuclear physics.

In addition, a ceremony took place at the Great Hall of the Russian Academy of Sciences to present gold medals named after eminent researchers – the Academy's highest awards for outstanding scientific studies, discoveries, or innovations that made a significant impact on theoretical and applied research.

The N.N.Bogoliubov Gold Medal was given to JINR Scientific Leader, Doctor of Physics and Mathematics, RAS Academician **Victor Matveev**.

Congratulations to the employees of the Joint Institute for Nuclear Research on the titles and awards! We wish them new achievements and successes for the benefit of global science!

Sergey Dmitriev was Awarded the Order of Friendship of the Russian Federation

By decree of the President of Russia dated **17 July 2025**, JINR Vice-Director, Doctor of Physics and Mathematics **Sergey Dmitriev** was honored with a state award, the **Order of Friendship**, for his scientific contributions and many years of distinguished work.

The team of the Joint Institute for Nuclear Research congratulates Sergey Dmitriev on receiving the prestigious award!

Young JINR Scientist Awarded Medal of Russian Academy of Sciences

A DLNP research intern **Sergey Zavyalov** was awarded a **Medal of the Russian Academy of Sciences** in nuclear physics for developing software for the Baikal-GVD experiment.

Concomitantly with his work at JINR, he is a postgraduate student at the Department of Particle Physics of the Faculty of Physics at Moscow State University. He won the RAS competition for the best student scientific papers in 2024 for his master's thesis entitled **"Development of the NTSim software package for designing neutrino telescopes and evaluating detection of neutrino-induced events in the Baikal-GVD Experiment"**.

We congratulate Sergey on receiving the medal of the Russian Academy of Sciences and wish him further scientific achievements and creative success!

FLNP JINR Scientists Among International Exhibition Winners

On 8–10 May 2025, the 17th European Exhibition of Creativity and Innovation, Euroinvent-2025, took place in Iași, Romania. Among winners were researchers of the Laboratory of Neutron Physics at JINR.

Inga Zinicovscaia, **Dmitrii Grozdov**, and **Aleksandra Kravtsova** were honored with a **gold medal** for a study of the biocompatibility and physiological impacts of silver nanoparticles functionalized with Spirulina protein extract employing laboratory rats.

Inga Zinicovscaia, **Aleksandra Kravtsova**, **Alexandra Peshkova**, and **Pavel Nekhoroshkov** won a **silver medal** for their research into the impact of metal-containing industrial effluents on leafy and root crops, as well as health risks associated with their consumption.

Congratulations to the JINR scientists on receiving the awards!

Congratulations to Ana María Cetto Kramis – Laureate of the Tate Medal for International Leadership in 2025

On 23 January, the Board of Directors of the **American Institute of Physics** unanimously approved the nomination of **Ana María Cetto Kramis** for the award.

The citation reads:

"For her outstanding contributions to the promotion of science, and scientific outreach and cooperation worldwide; including transforming open access through Latindex, championing gender equity through the Organization for Women in Science for the Developing World, and advancing peaceful progress through science including at the International Atomic Energy Agency and in other international fora."

The Medal, established in 1959, recognizes leadership and service to the physics community on an international level by non-US physicists. Services that further international understanding and exchange are considered to be of primary importance. The award consists of a bronze medal, a certificate, and a cash award of $10,000. AIP staff will be in touch with you to identify an appropriate event at which to present the award.

Previous winners of the Tate Medal, presented every two years, include Mahouton Norbert Hounkonnou, Catherine Cesarsky, Fabiola Gianotti, Neil Turok, Jean Tran Thanh Van, Gustav-Adolf Voss, Yu Lu, Erio Tosatti, Herwig Franz Schopper, Willibald Jentscke, Roald Sagdeev, Edorado Amaldi, Pierre Aigrain, and Abdus Salam.

2025 OGANESSON Prize laureates

Michel SPIRO

Université Paris - Saclay (France)

Chair of The Earth-Humanity Coalition

Past President of the International Union of Pure and Applied Physics (IUPAP)

For outstanding research in high energy and nuclear physics, along with passionate leadership in global initiatives supporting fundamental science

Natalia Pavlovna TARASOVA

RAS Corresponding Member, Professor, Doctor of Chemistry,

Director of the Institute of Chemistry and Sustainable Development Problems at the Mendeleev University of Chemical Technology of Russia

For outstanding contribution to cooperation with international organizations and scientific unions (UNESCO, IUPAC, ISC), aimed at achieving the Sustainable Development Goals

Arutyun Ishkhanovich AVETISYAN

Mathematician, system programming specialist, RAS Academician, Faculty of Computational Mathematics and Cybernetics at MSU, also MIPT and HSE,

Director of the RAS Institute for System Programming

For outstanding contribution to the creation of trustworthy AI in scientific and applied fields and the training of highly qualified young specialists in modern IT

Alexei Mikhailovich SEMIKHATOV

Doctor of Physics and Mathematics,

Division of Theoretical Physics at the RAS Lebedev Physical Institute, host of the *Question of Science* program on the Nauka TV, lecturer and author of popular science films and books

For outstanding contribution to the popularization of scientific knowledge in Russia, particularly in quantum physics

Operation of JINR Dissertation Councils

Since 1 September 2019, **129 dissertations** were defended in the JINR Dissertation Councils, including **100 PhD theses** and **29 Dr.Sc. theses**.

In the period of January-August 2025, **11 dissertations** were defended, including **7 Ph.D. theses** and **4 Dr.Sc. theses**.

The JINR Qualification Committee pays special attention to self analysis of processes of getting academic degrees at JINR and acts in close coordination with the Higher Qualification Committee under the Ministry of Science and Higher Education of the Russian Federation.

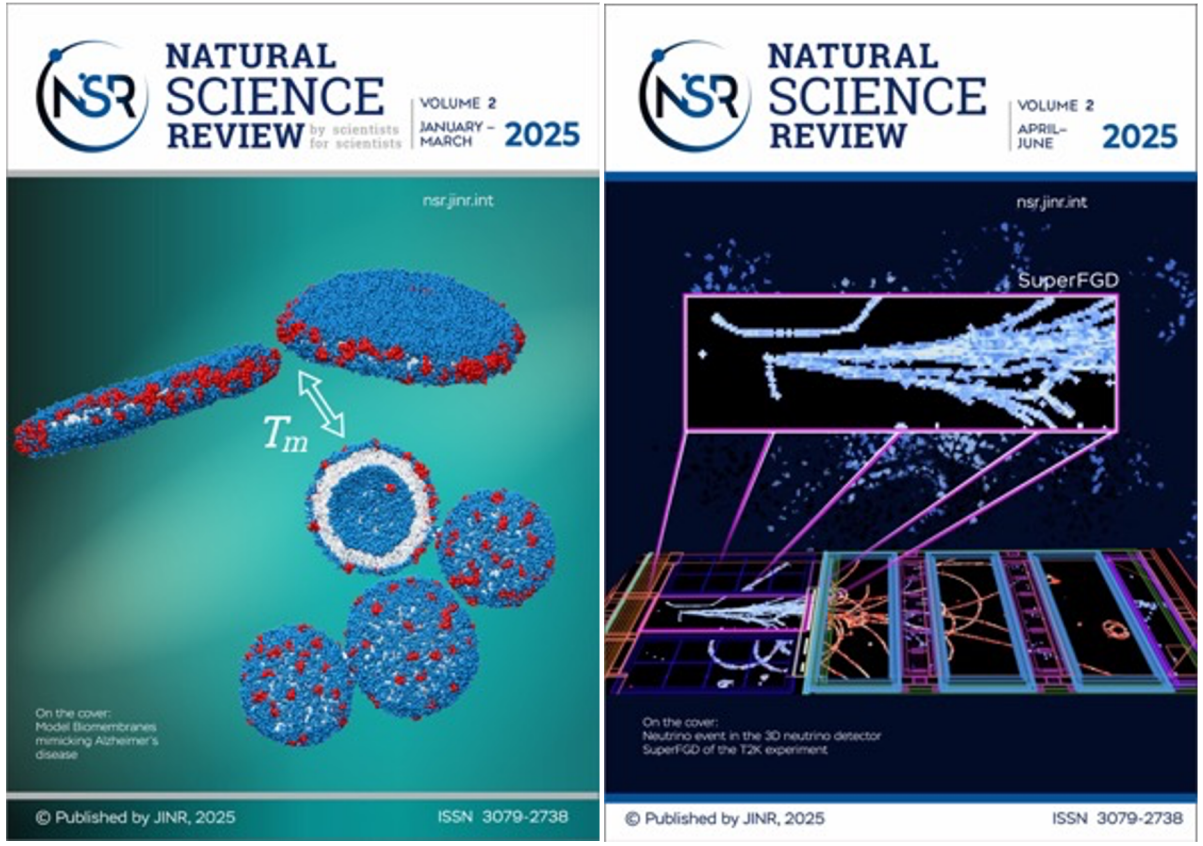
JINR Qualification Committee holds round tables on the experience of independent awarding academic degrees. The meetings are focused on the feedback of laboratories regarding the activity of local dissertation councils as well as on best practices in solving organizational issues.

Natural Science Review

Two Issues in 2025, Third Issue is in Progress

nsr.jinr.int

- An international online peer–reviewed periodical scientific journal on natural and technical sciences;
- Published by JINR since 2024;
- Continuous publication model, 4 issues per year, prompt publication process.



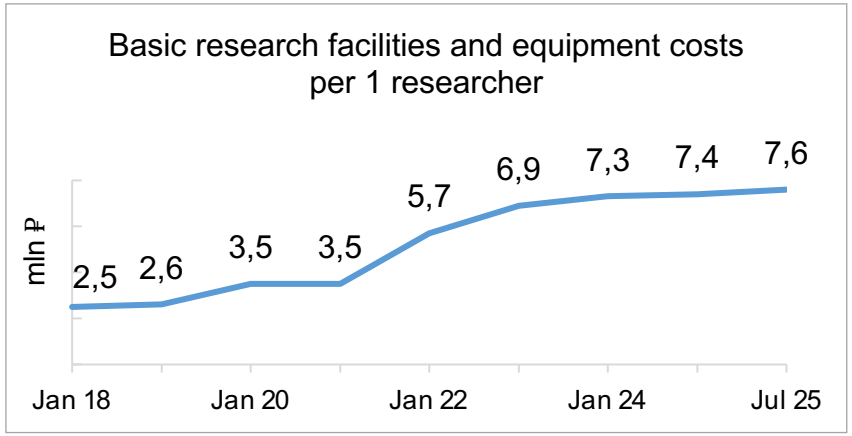
- Two issues were published in 2025 with 4 and 5 articles (range of pages per article: from 10 up to 192);
- Journal articles are recognized and accepted by JINR dissertation councils;
- International ISSN, all articles get DOI;
- Journal is indexed by INSPIRE-HEP, GoogleScholar, ResearchGate;
- Prepare application to Scopus and WoS.

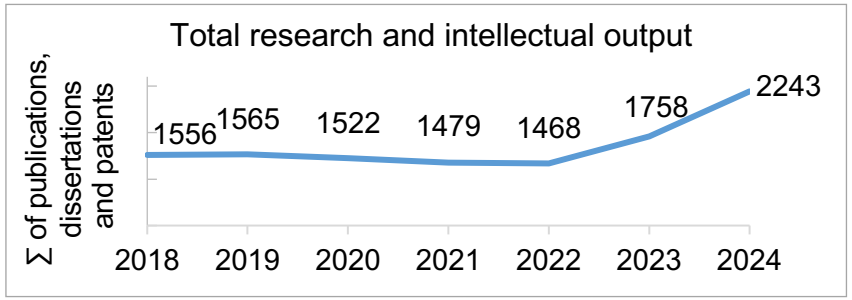
Editorial board: 21 member.

Advisory board: 20 members from 9 countries and JINR.

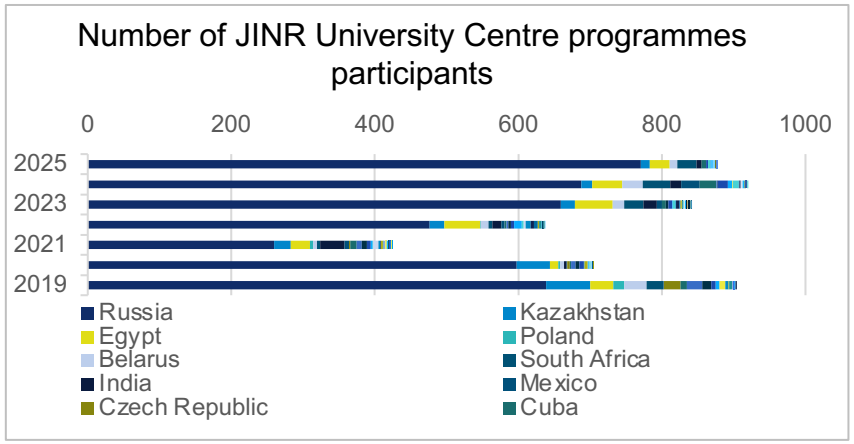
- First meeting on 16 September.

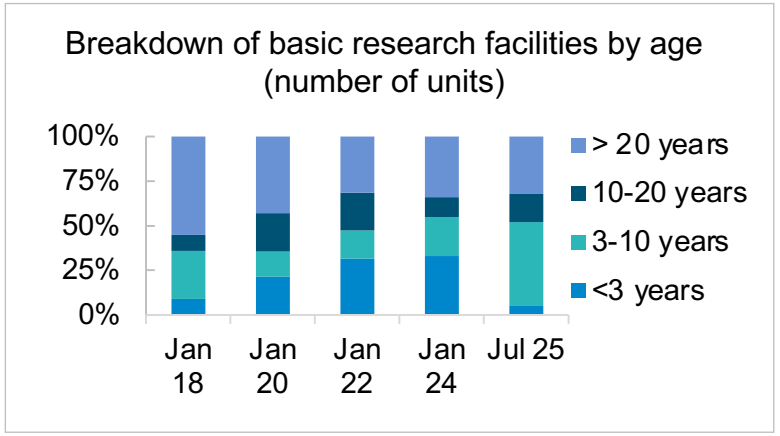
Monitoring Performance Indicators

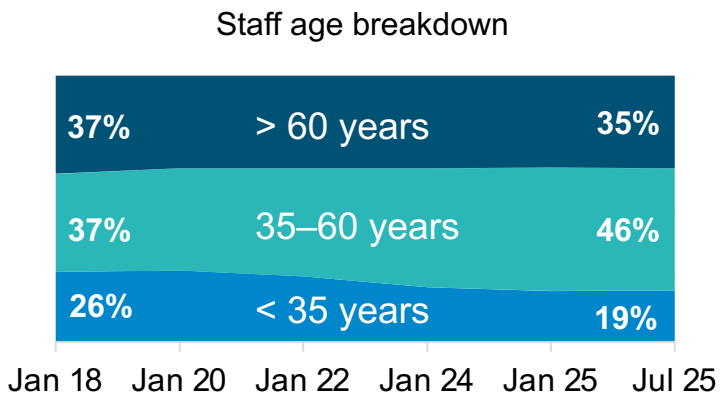


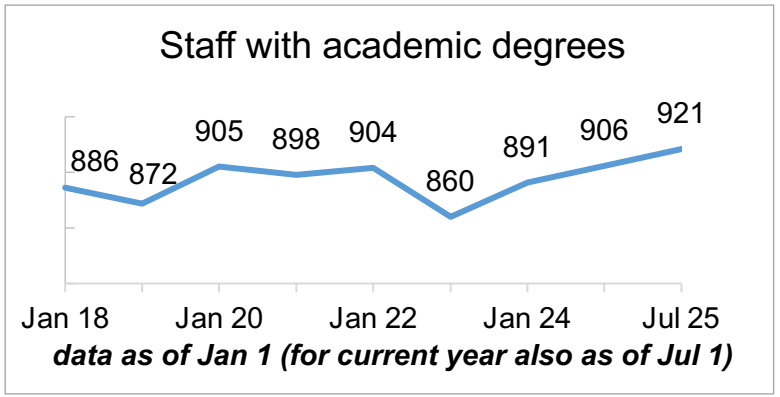


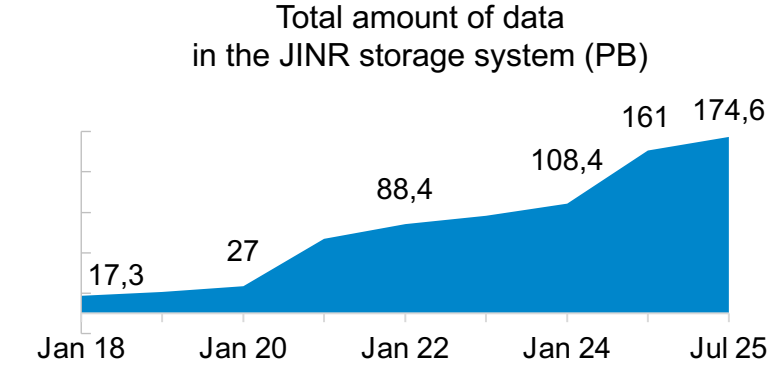
	2021	2022	2023	2024	2025
Number of publications by Scopus	1454	1352	1427	1501	812

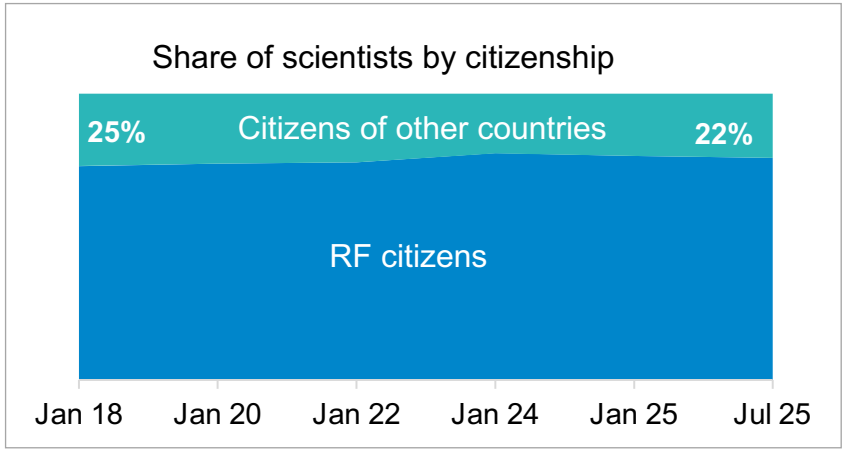


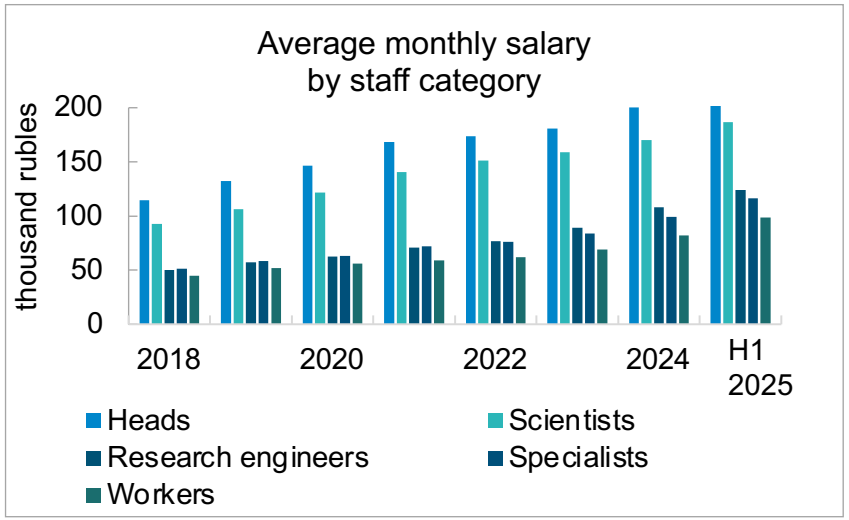












JINR
DOSCIENCE@DUBNA

Danke
Rahmat
Շնորհակալություն
Благодаря
감사합니다
جزيلاً
شكرًا
Mulțumesc
Спасибо
Gracias
Ďakujem
Thank you
Mulțumesc
Grazie
Рақмет
Дзякуй
谢谢
Çox sağ ol
Cảm ơn
გმადლობთ
Gracias
Köszönöm
Хвала

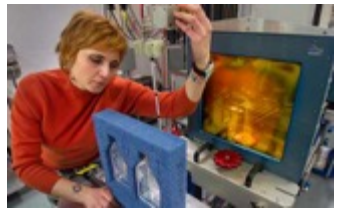
ARIADNA in a Global Context of Applied Research Programmes at Large Particle Accelerator

ARIADNA Collaboration Established in **2022**

30 cooperating organizations
202 participants
7 countries

Applied research programmes hosted by a single institution

Example is Brookhaven National Lab facilities for applied research (**NASA Space Radiation Laboratory; Tandem Van de Graaff generators** and **Brookhaven Linac Isotope Producer)**



Applied research networks involving multiple research centres.

Recent trend in managing applied research requesting a wide range of particle types and energies aims is organization of distributed infrastructure combining opportunities of multiple accelerator facilities.

RADNEXT

Coordinated by CERN

Coordinated by CERN and GSI

ARIADNA collaboration

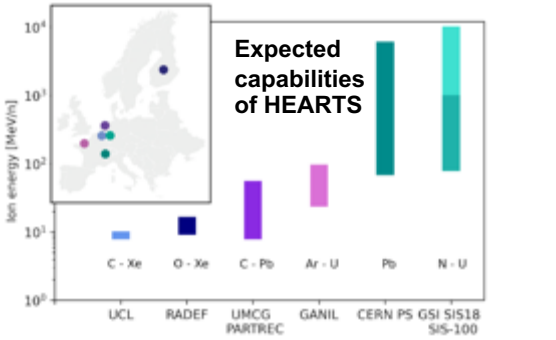
Operated by JINR

RADNEXT is an H2020 INFRAIA-02-2020 infrastructure project with the objective of creating a network of facilities for responding to the needs of electronics component as well as for optimizing the radiation hardness assurance.

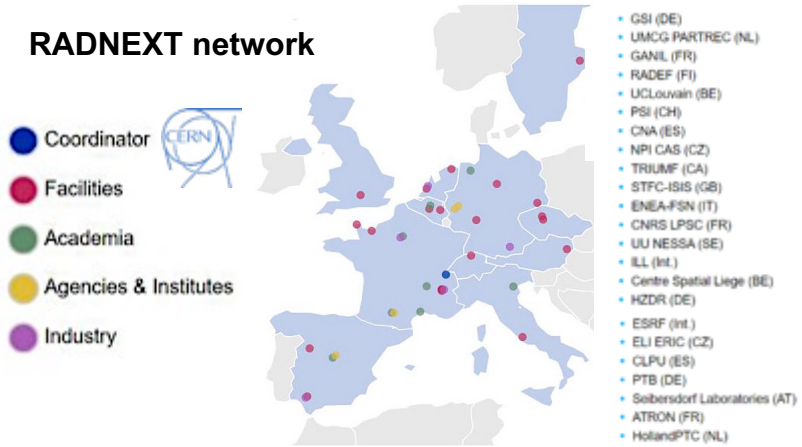
HEARTS Project aims at increasing Europe's capabilities on critical radiation-testing infrastructures by creating high-quality, high-energy heavy ion irradiation facilities in Europe, accessible to and tailored for space users and applications.

ARIADNA research infrastructure aims at providing accesses of the JINR Member States' community to ion beams. It operates on the basis on the international intergovernmental research organization.

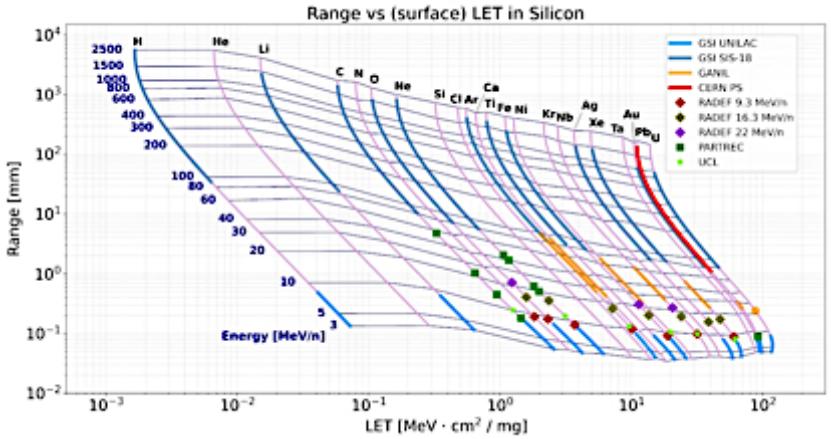
Particle accelerators within RADNEXT	Particle energy, MeV/nucleon	Flux, particle/cm²/s
CHARM (CH)	6000	10^5–10^6
UCL (BE)	9,3	10^1–10^4
GSI SIS18 (DE)	80-2000	10^2–10^8
GSI UNILAC (DE)	3,4-11,4	10^6–10^{10}
RADEF (FI)	9,3-22	10^2–10^5
GANIL (FR)	4-95	10^1–10^4
PARTREC (NL)	30-90	10^2–10^8



RADNEXT network



Global needs for most of applications



Low-energy ion beams 3.2 MeV/nucleon	Intermediate-energy ion beams 150-1000 MeV/nucleon	High-energy ion beams up to 4.5 GeV/nucleon
Protons and ions with Z = 2 to 92	**$^{12}C^{6+}$, $^{40}Ar^{18+}$, $^{56}Fe^{26+}$, $^{84}Kr^{36+}$, $^{131}Xe^{54+}$, $^{197}Au^{79}$**	**$^{1}H^{1+}$, $^{2}D^{1+}$, $^{12}C^{6+}$, $^{40}Ar^{18+}$, $^{7}Li^{3+}$**
Irradiation of decapsulated microcircuits and solid materials with 3.2 MeV/nucleon ions.	Capsulated microcircuits with 150-350 MeV/nucleon ions. 500-1000 MeV/nucleon ions for biological sample irradiation.	Station will be equipped with targets from C to Pb and with the systems of beam and target diagnostics, data acquisition, etc.

Digital EcoSystem

Repository of publications of JINR staff members

Service development;
Automatic operational filling:
1,072 for **2025,**
2,226 for **2024**,
16,570 in total – and continues to increase in depth over time

Integration of the repository with PIN-2

The transition to deeply **redesigned PIN-2** was completed, it implements new functionality, additional information about the employee, and data from the previous PIN version was transferred.

Platform for automation Radiation safety exams (in progress)

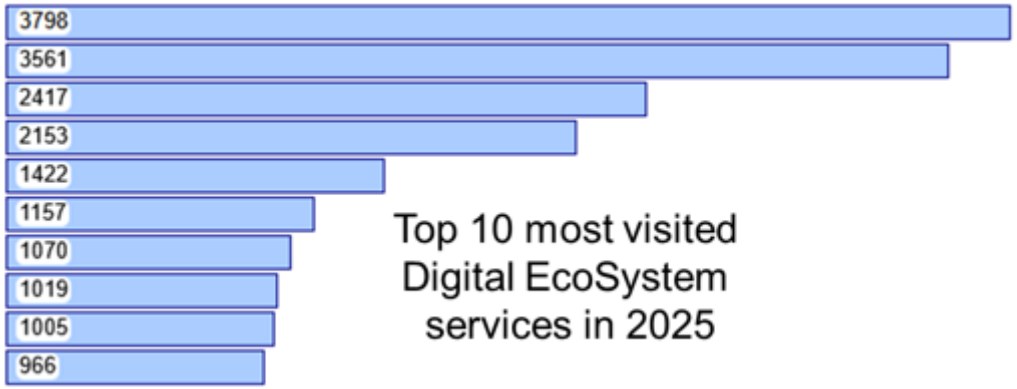
Platform for automating the exam procedure.
Users in 2026: ~1,500

Geoinformation system

Automation of adding buildings and premises, integration with PIN-2 (in progress)

SED “Dubna” improvements (in progress)

Parallel document approval;
Moving documents base to SED



Top 10 most visited Digital EcoSystem services in 2025

disk@jinr modernization

exchange and storage of user data: documents, multimedia, archives and other work information
1120 users
SSO login
3 data replications
storage expansion by the end of 2025 from 900 TB to 5 PB

Document management service

Users: Accelerator Department (NICA), BAIKAL-GVD and other neutrino experiments (in progress)