132nd session of the JINR Scientific Council

Director’s Report: News, Science, Prospects

acad. Grigory V.Trubnikov

29–30 September 2022, Dubna

THE EXTRAORDINARY SESSION OF THE JINR COMMITTEE OF PLENIPOTENTIARIES (MARCH 2022)

An extraordinary session of the Committee of Plenipotentiaries of the Governments of the JINR Member States was held in Dubna on 17 and 21 March 2022 in videoconference mode.

It was chaired by the representative of Romania – Professor Florin-Dorian Buzatu, Director-General, Institute of Atomic Physics.

At the CP JINR session, the Statement on the necessity to preserve the unity of the Institute and international scientific partnership was adopted.

The CP JINR in its Statement has reiterated the commitment to support further development of JINR as an international intergovernmental research organization, providing a valuable platform for multilateral scientific communication and collaborations. JINR should remain a distinctive scientific bridge between nations for resolution of global challenges confronting humanity in alignment with the Sofia Declaration of the Committee of Plenipotentiaries, which was adopted in Bulgaria in November 2021.

THE SESSION OF THE JINR COMMITTEE OF PLENIPOTENTIARIES
25 MAY 2022

A regular session of the Committee of Plenipotentiaries of the Governments of the JINR Member States was held in Dubna on 25 May 2022 in a hybrid form.

It was chaired by the representative of Romania – Professor Florin-Dorian Buzatu, Director-General, Institute of Atomic Physics.

AGENDA

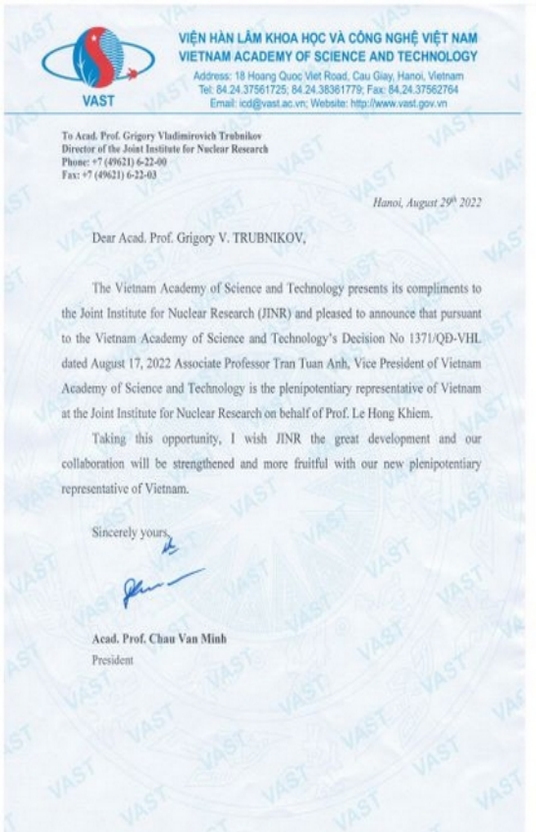
- JINR Director's report (**G. Trubnikov**)
- Execution of the JINR budget for 2021 and draft of the revised budget of JINR for 2022 (**N. Kalinin**)
- Concept of the Seven-year plan for the development of JINR for 2024–2030, taking into account the adjustments of the JINR long-term scientific strategy, the optimization of the structure of the JINR Topical Plan as well as the financing and staffing of research projects (**G. Trubnikov**)
- Results of the meeting of the JINR Finance Committee held on 23 May 2022 (**A. Khvedelidze**)
- Statement by the Plenipotentiary of the Government of the Slovak Republic (**F. Šimkovic**)
- Membership of the JINR Scientific Council (**S. Nedelko**)
- Proposals for changes in the membership of the JINR Scientific Council (**G. Trubnikov**)

Committee of Plenipotentiaries decided, in particular:

- To take note of the information from the JINR Directorate about the recommendations of the 131st session of the JINR Scientific Council, the implementation of the current Seven-year plan for the development of JINR, the efforts of the Member States towards realization of JINR's large projects, the new scientific and technological results obtained, and about the most important events related to JINR's scientific research and educational activities and international cooperation.
- To approve the revised budget of JINR for 2022.
- To support the main directions of the concept of the Seven-year plan or the development of JINR for 2024–2030 and to commission the JINR Directorate to submit the draft of the Seven-year plan for consideration by the JINR Scientific Council at its session on 29–30 September 2022.
- To suspend, in accordance with the statement of the Plenipotentiary of the Government of the Slovak Republic, the rights, privileges and obligations of the Slovak Republic in the JINR until the receipt of further notice.
- To consider it appropriate in holding the next session of the Scientific Council — in order to maintain the viability of its decisions and in order to determine the quorum — to proceed from the membership of the Council without including in it those members of the Scientific Council who have announced their temporary or complete withdrawal from its membership.
- To elect the following members to the JINR Scientific Council for a term of 5 years: Ana María Cetto Kramis (Mexican Physical Society, Mexico City, Mexico), Trần Chí Thành (Vietnam Atomic Energy Institute, Hanoi, Vietnam), and Zhao Hongwei (Institute of Modern Physics of the Chinese Academy of Sciences, Lanzhou, China).
- Considering that the mandate of the current membership of the JINR Scientific Council expires in 2023, to commission the JINR Directorate to prepare proposals on the new composition of the Scientific Council for the next session of the CP.
- To take note of the statement by the Plenipotentiary of the Government of Romania, F.-D. Buzatu, on suspension of collaboration with JINR starting from 1 June 2022.
- To take note of the official letter received from the Plenipotentiary of the Government of the Republic of Bulgaria, Ts. Bachiyski, on suspension of collaboration with JINR.
- To support the proposal by the Plenipotentiary of the Arab Republic of Egypt and by the Directorate of JINR to hold the next meeting of the Finance Committee and the session of the Committee of Plenipotentiaries on November 2022 in Egypt.

New plenipotentiary representative of Vietnam

Le Hong Khiem, the Plenipotentiary representative of JINR from 2013 to 2022



VIỆN HÀN LÂM KHOA HỌC VÀ CÔNG NGHỆ VIỆT NAM
VIETNAM ACADEMY OF SCIENCE AND TECHNOLOGY
Address: 18 Hoang Quoc Viet Road, Cau Giay, Hanoi, Vietnam
Tel: 84.24.37561725; 84.24.38361779; Fax: 84.24.37562764
Email: icd@vast.ac.vn; Website: http://www.vast.gov.vn

To Acad. Prof. Grigory Vladimirovich Trubnikov
Director of the Joint Institute for Nuclear Research
Phone: +7 (49621) 6-22-00
Fax: +7 (49621) 6-22-03

Hanoi, August 29th 2022

Dear Acad. Prof. Grigory V. TRUBNIKOV,

The Vietnam Academy of Science and Technology presents its compliments to the Joint Institute for Nuclear Research (JINR) and pleased to announce that pursuant to the Vietnam Academy of Science and Technology's Decision No 1371/QĐ-VHL dated August 17, 2022 Associate Professor Tran Tuan Anh, Vice President of Vietnam Academy of Science and Technology is the plenipotentiary representative of Vietnam at the Joint Institute for Nuclear Research on behalf of Prof. Le Hong Khiem.

Taking this opportunity, I wish JINR the great development and our collaboration will be strengthened and more fruitful with our new plenipotentiary representative of Vietnam.

Sincerely yours,

Acad. Prof. Chau Van Minh
President

Tran Tuan Anh, the new Plenipotentiary representative of Vietnam appointed in 2022

New members of the JINR Scientific Council

Prof. Zhao Hongwei

Deputy director of the Institute of Modern Physics (IMP)
Academician member of Chinese Academy of Sciences.

Dr. Prof. Ana Maria Cetto Kramis

Research Professor at the Institute of Physics, Faculty of Sciences, Universidad Nacional Autónoma de México (UNAM).
Member of the Mexican Academy of Sciences

Prof. Tran Chi Thanh

President of Vietnam Atomic Energy Institute – VINATOM.

CONGRATULATION!

Professor **Sergey Kilin**, Academician of the National Academy of Sciences of Belarus, on receiving **the International Award of the CIS "Stars of the Commonwealth" for 2021**

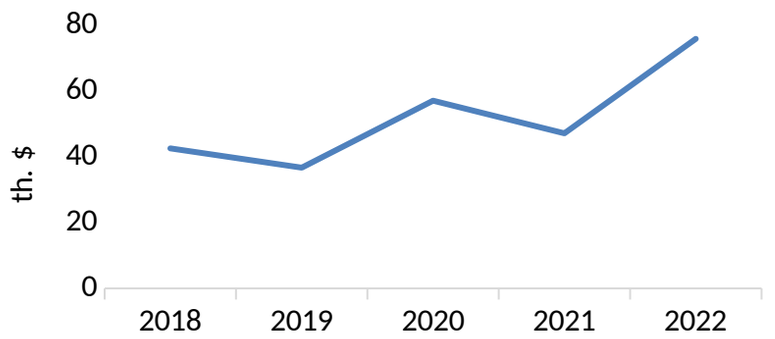
PERFORMANCE INDICATOR TRACKING

Performance indicator tracking monitors the implementation of the JINR development strategy. The indicators are updated every six month, on 1st of January and 1st of July.

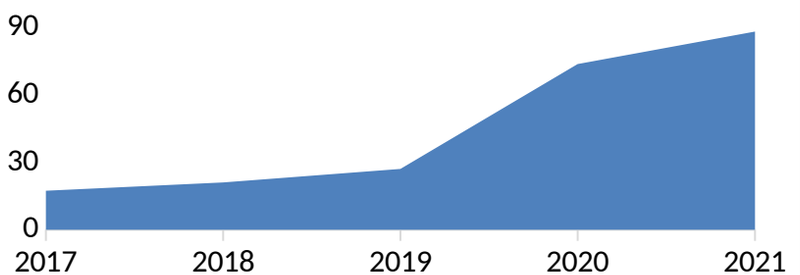
- JINR as an international intergovernmental organization
- The efficiency of international cooperation
- Research capacity-building
- Research quality and efficiency
- Human capacity-building
- Staff

RESEARCH CAPACITY-BUILDING

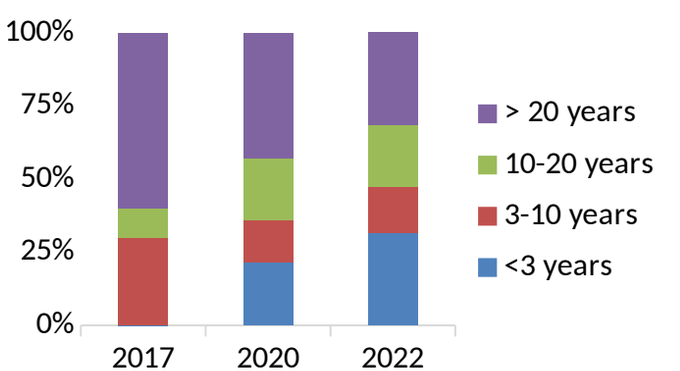
Cost of basic facilities and equipments per research scientist



Total amount of data in the JINR storage system (PB)

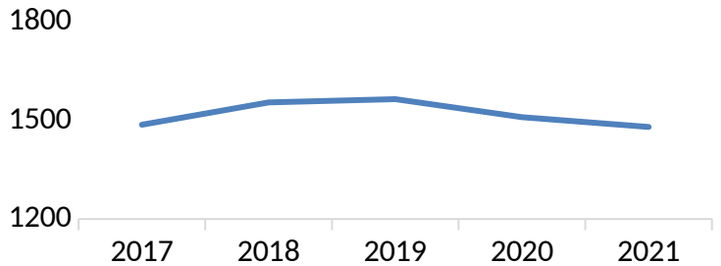


Breakdown of basic facilities by age



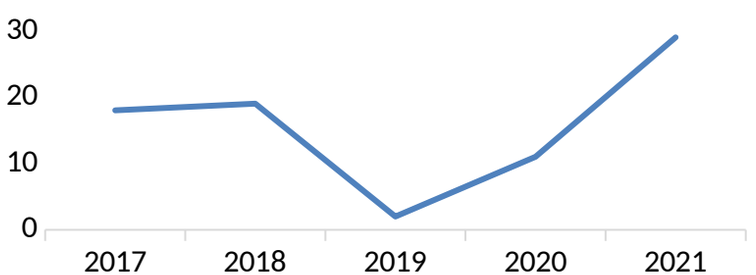
RESEARCH QUALITY AND EFFICIENCY

Total number of Results of Intellectual Activity

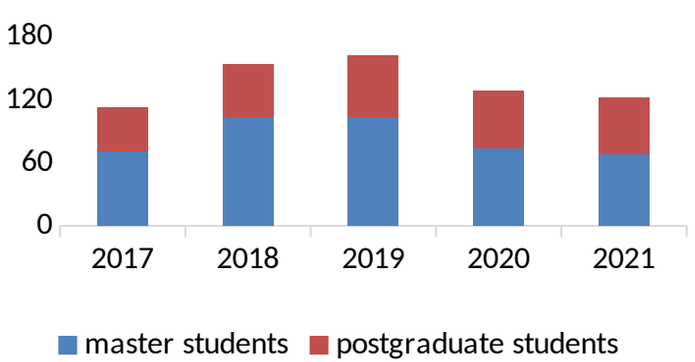


Results of Intellectual Activity (RIA) includes publications, defended dissertations and patents.

Number of dissertations defended by JINR staff



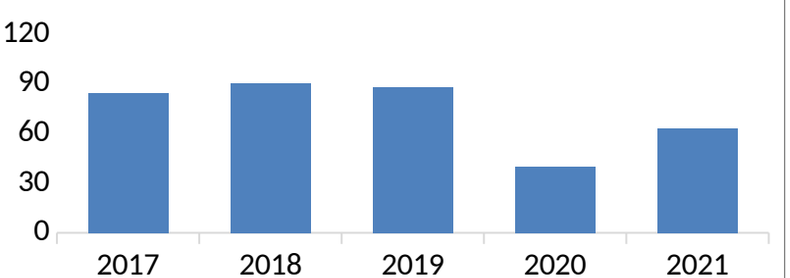
Number of supervisors of postgraduate and master students



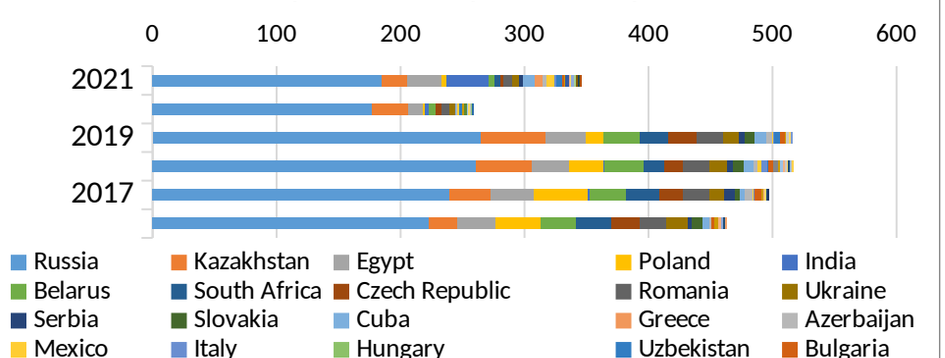
JINR AS AN INTERNATIONAL RESEARCH ORGANIZATION

	2020	2021	2022
Number of organizations in the partner network	931	1005	998
Number of JINR information centres	2	4	8
Number of collaborations	39	39	39

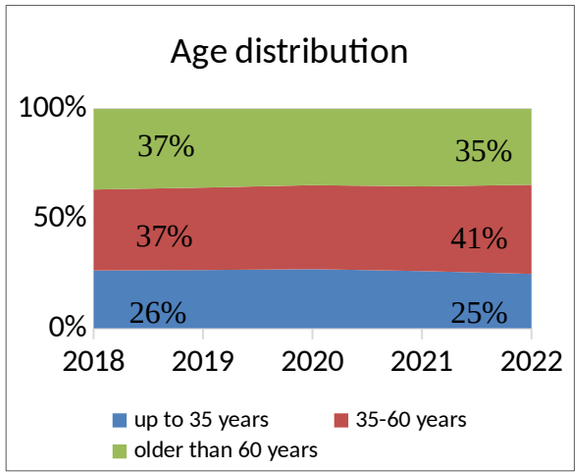
Number of meetings and conferences organized by JINR

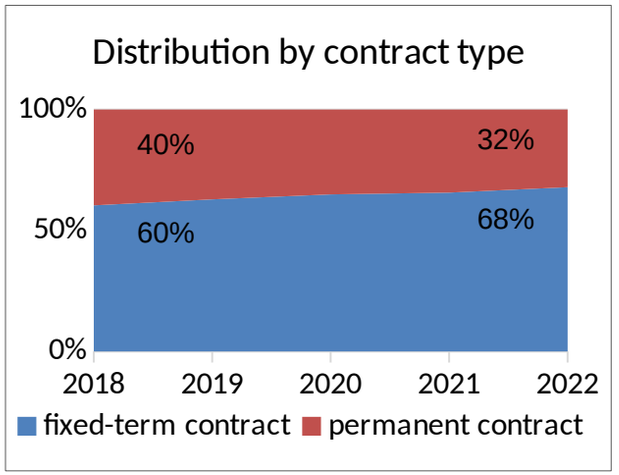


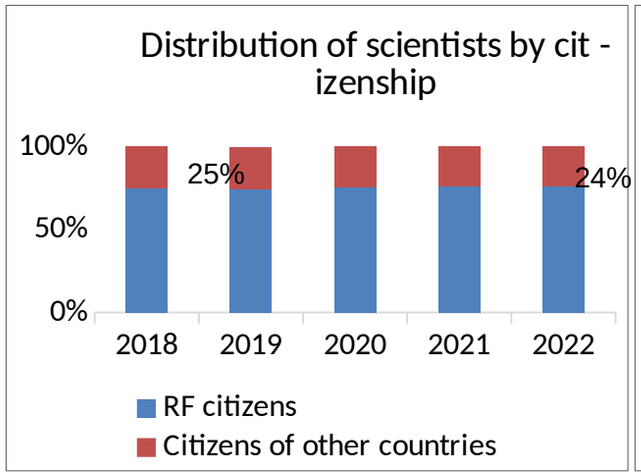
Number of students, young scientists and specialists who took part in JINR practices by countries

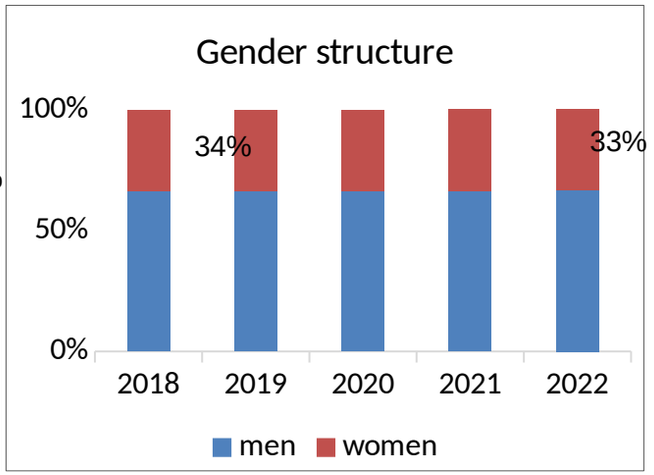


HUMAN CAPACITY-BUILDING

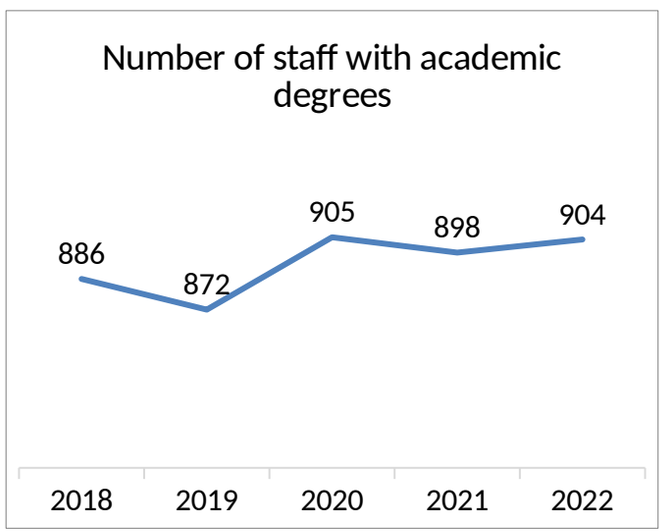


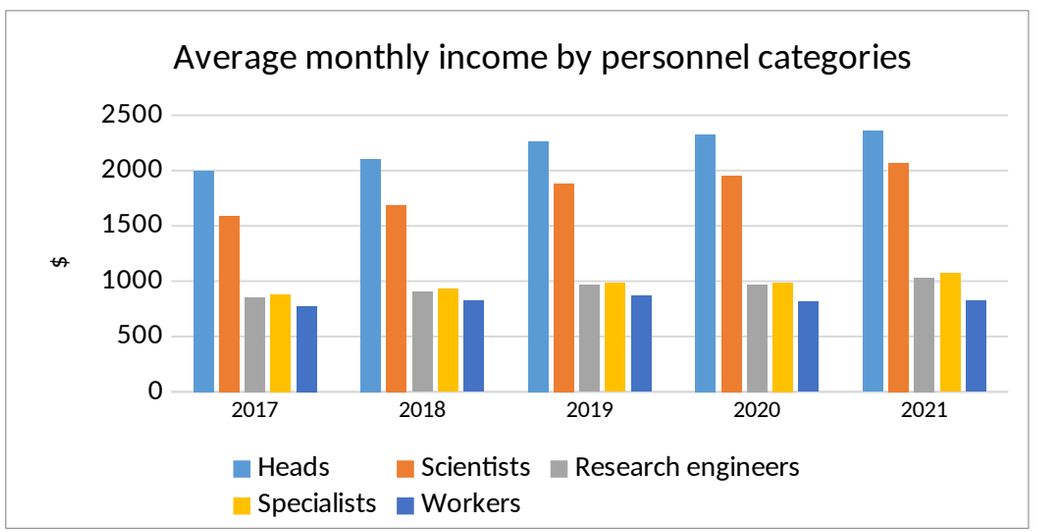


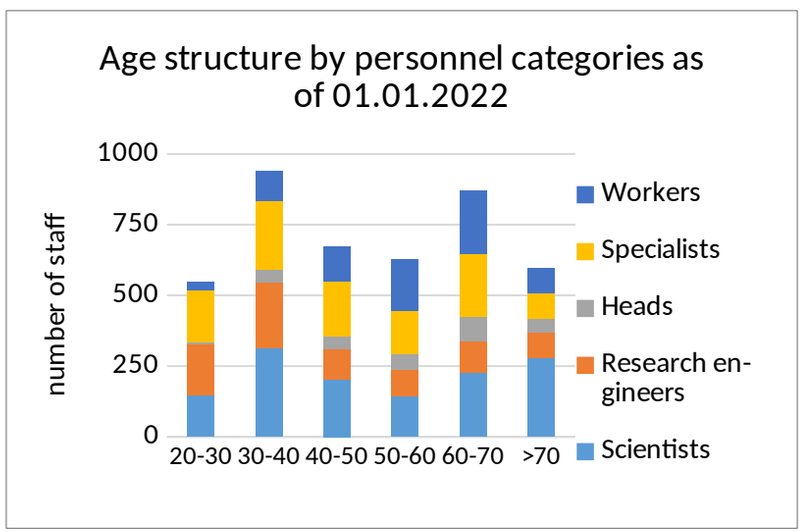




STAFF







SELECTED SCIENTIFIC RESULTS 2022

Theoretical Physics (BLTP): Selected results

Part. phys.

Explanation of the **inverse-square law (ISL) violation** is proposed **without the need for sterile neutrinos**.

A QFT-based theory of neutrino oscillations predicts (along with decoherence and dispersion effects) a violation of the classical inverse-square law at short but macroscopic distances, L, between the neutrino source and detector.

Thus, the ISL violation leads to a decrease in the count rate and could potentially be responsible for the observed **neutrino deficit in the BEST experiment**.

$$\frac{d\Phi_\nu(E_\nu, L)}{dE_\nu} \propto \frac{1}{L^2} \times \begin{cases} \left(1 - L^2/L^2_{\mathrm{SBL}} + \ldots\right) & \text{for } L \ll E_\nu/\Sigma^2_{\mathrm{SBL}}, \\ \left(1 - L^2_{\mathrm{LBL}}/L^2 + \ldots\right) & \text{for } L \gg E_\nu/\Sigma^2_{\mathrm{LBL}}, \end{cases}$$

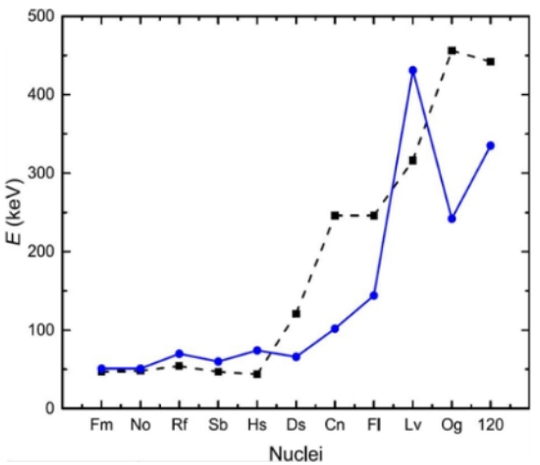
Naumov V. A., Shkirmanov D. S. // **Eur. Phys. J. C 82, 736 (2022).**

Nucl. phys.

The **energies of the 2^+_1 states** of the **superheavy nuclei** were predicted based on the microscopic variant of the Grodzins relation.

$$E(2_1^+) = \frac{\hbar^2}{\beta_2^2}\left(\frac{2}{5}\frac{1}{B_{rot}} + \frac{2}{5}\frac{1}{B_\gamma} + \frac{1}{5}\frac{1}{B_\beta}\right)$$

The energy sharply increases with A and reaches maximum value of 400–500 keV in ^{290}Lv or ^{294}Og.



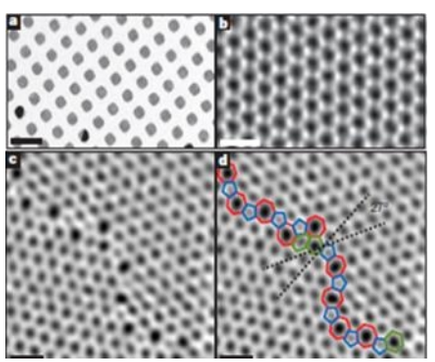
Nucleus	$E(2_1^+)$ (keV) Variant 1	$E(2_1^+)$ (keV) Variant 2
^{258}Fm	51	47
^{262}No	51	48
^{266}Rf	70	54
^{270}Sb	60	47
^{274}Hs	74	44
^{278}Ds	66	121
^{282}Cn	102	246
^{286}Fl	144	246
^{290}Lv	431	316
^{294}Og	242	456
^{298}120	335	442

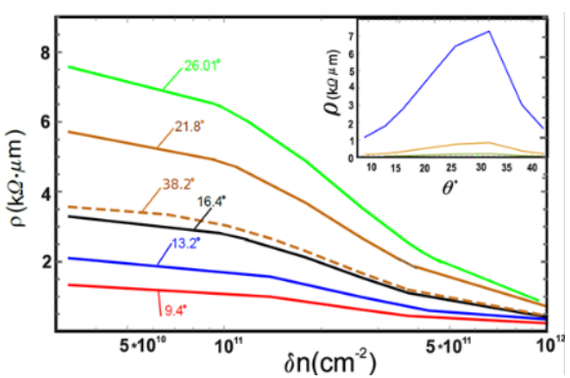
Jolos R. V., Kolganova E. A. // **Phys. Lett. B 820, 136581 (2021).**
Shirikova N.Yu. et.al. // **Phys. Rev. C 105, 024309 (2022).**

Cond. matt.

For the first time the semi-analytical model is proposed which allows to describe the **resistivity in polycrystalline graphene** due to grain boundaries with arbitrary geometries.

The findings may be important in the design of electronic devices based on poly- and nano- crystalline graphene.



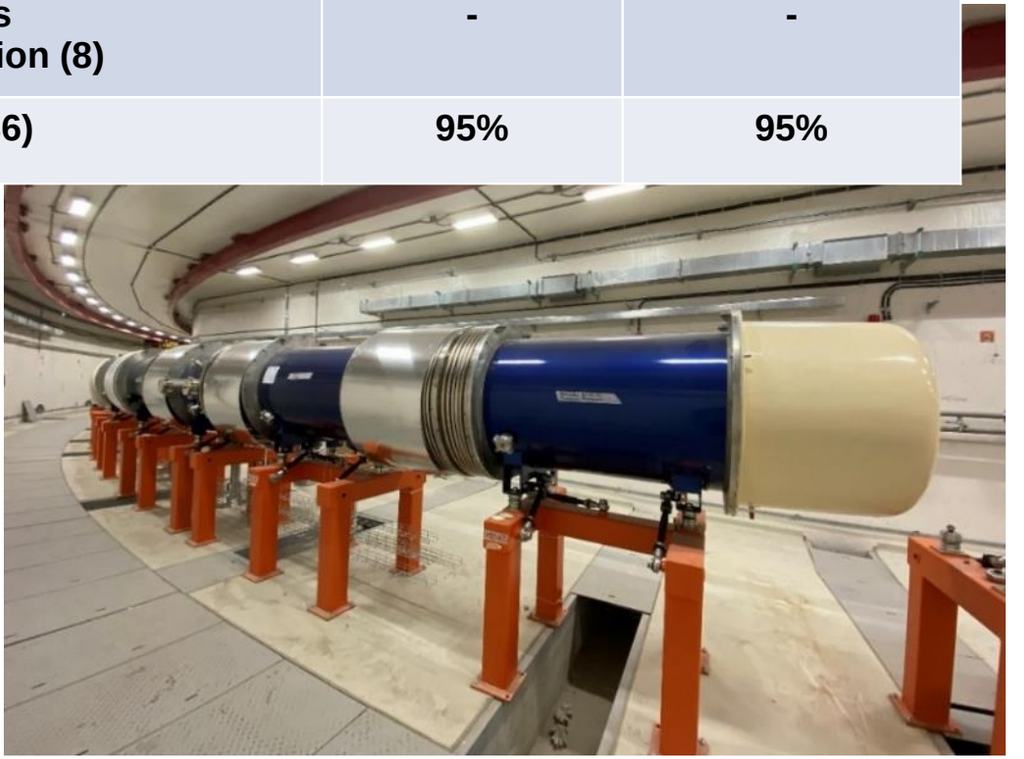


Krasavin S. E., Osipov V. A. // **Sci. Rep. 12, 14553 (2022).**

Status of the NICA magnets production and installation

28 December 2021:
Installation of the first magnet
in the NICA collider tunnel

NICA magnets (August 2022)	Cryogenic tests	Ready for installation
Dipoles (80)	**100%**	**100%**
Quadrupoles in arcs (46)	**100%**	**25%**
Blocks of lenses (24)	**16%**	**-**
Final focus lenses (12)	**8%**	**-**
Dipoles for ion beams convergence/separation (8)	**-**	**-**
Correction lenses (136)	**95%**	**95%**



August 2022:
All 80 dipoles are installed in the arcs, the straight sections of the NICA ring are also being prepared for magnets installation

First run of the HILac & Booster & Nuclotron accelerators with beam lines transportation to fixed target experiments

6 February 2022:
First C^{4+} beam circulation in the Nuclotron after injection from the Booster

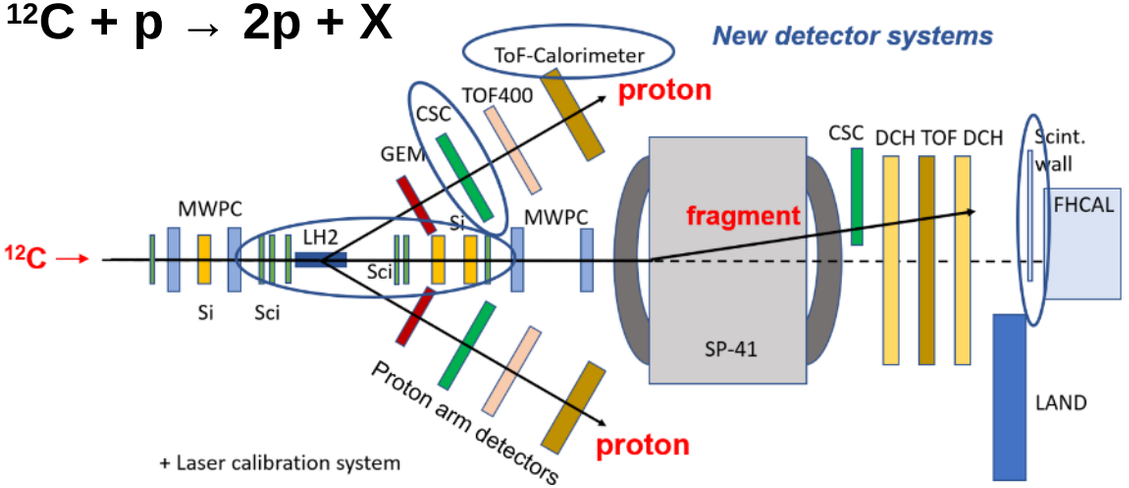
Results:

- ✓ stable operation of the accelerator complex for 2150 h,
- ✓ Carbon beam transportation to the BM@N facility within 24 days,
- ✓ SRC collaboration collected 185M C+p interactions in liquid hydrogen target

Short-Range Correlations in inverse kinematics at BM@N

Setup of the experiment

$^{12}C + p \rightarrow 2p + X$

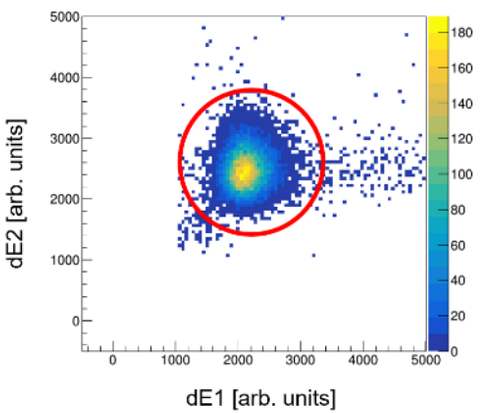


Experiment schedule in March 2022

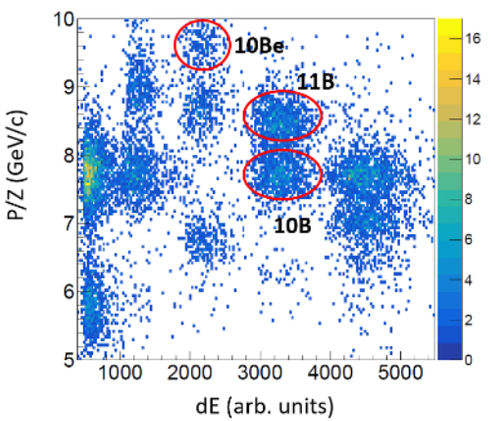
- 1 week calibration with beam
- 2 weeks data taking with LH_2 target
- beam intensity: ~ $4x10^5$ ions/spill, ~ 5s spill
- beam energy: 2.95 GeV/u
- ~ $1.4x10^8$ accumulated physics triggers

Status of the Analysis

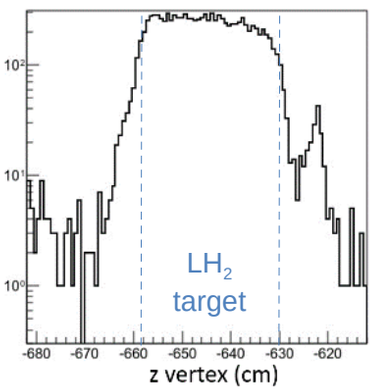
Pure ^{12}C beam

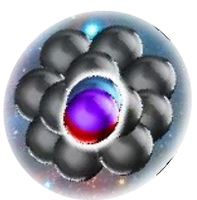


Identification efficiency



Vertex reconstruction





Physics programme

- ✓ Study of nuclear structure of ^{12}C
- ✓ Identification of the close nucleon-nucleon pairs
- ✓ Measurement of the absolute cross sections

Next – joint efforts in upgrade of HyperNIS detector

Status of the MPD detector

Preparation of the MPD solenoid for cryogenic tests and measurements of the magnetic field continues.

Mass production of detector subsystems is on track

JINR's share in production of ECal modules is completed (800 modules)

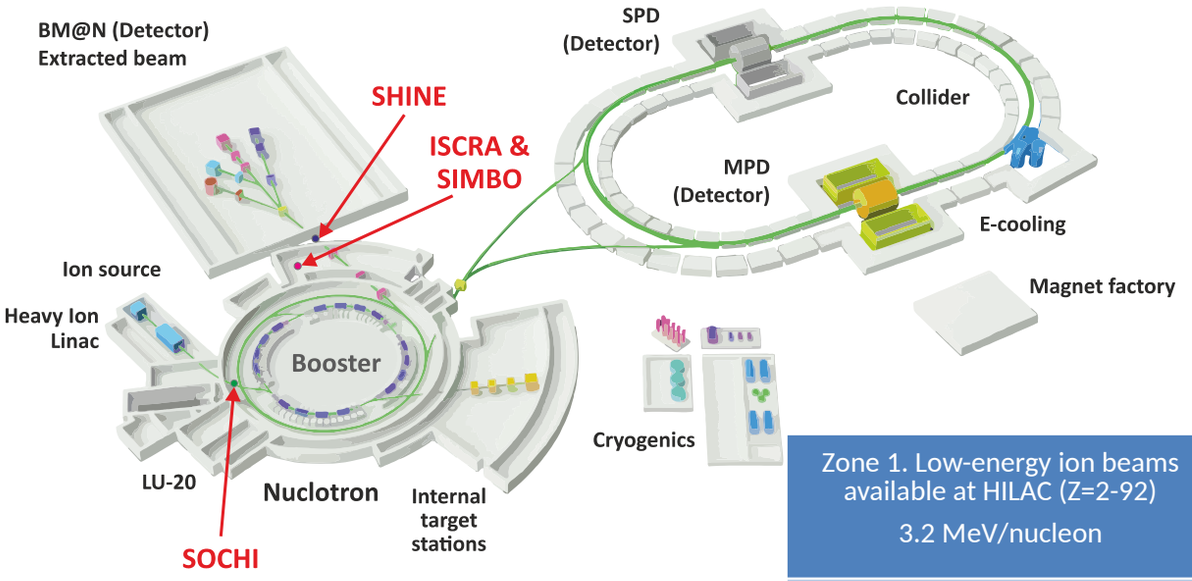
All TOF modules are ready (320 modules)

ARIADNA innovation research infrastructure: status and recent developments

The **Station Of CHip Irradiation (SOCHI)** and corresponding beamline are ready for operation.

The target station is designed for irradiation of decapsulated microcircuits with 3.2 MeV/nucleon ions. Beams of protons and ions with Z = 2 - 92 will be available for experiments.

The construction of target stations for life science and medical applications (SIMBO), for radiation testing of capsulated microelectronics (ISCRA) and for novel developments in nuclear power technology (SHINE) is progressing.



Zone 1. Low-energy ion beams available at HILAC (Z=2-92)

3.2 MeV/nucleon

SOCHI: Radiation hardness of microelectronics

Zone 2. Intermediate-energy ion beams from Nuclotron

150-1000 MeV/nucleon

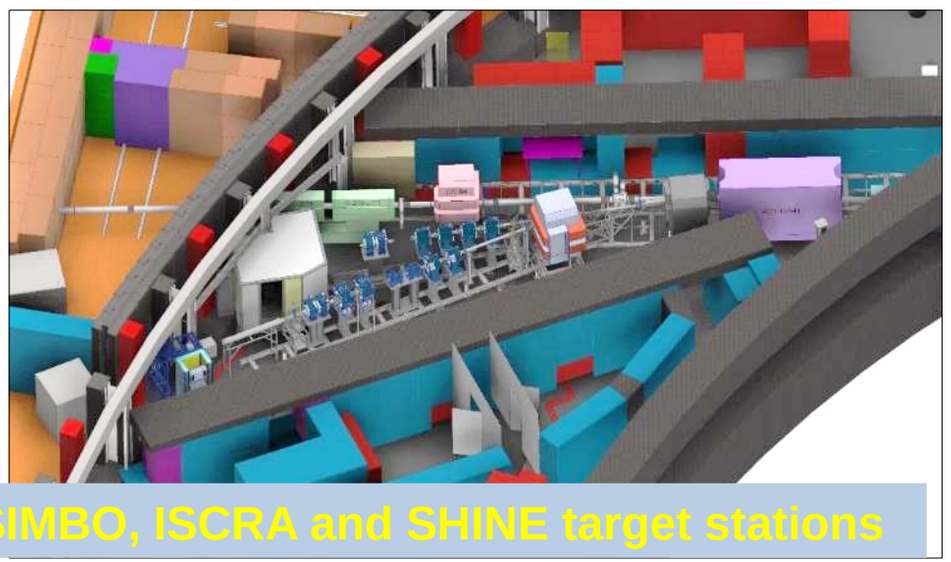
SIMBO: Life science and medical applications; ISCRA: Radiation hardness of microelectronics

Zone 3. High-energy ion beams from Nuclotron

4.5 GeV/nucleon

SHINE: Novel relativistic nuclear technology for energy production

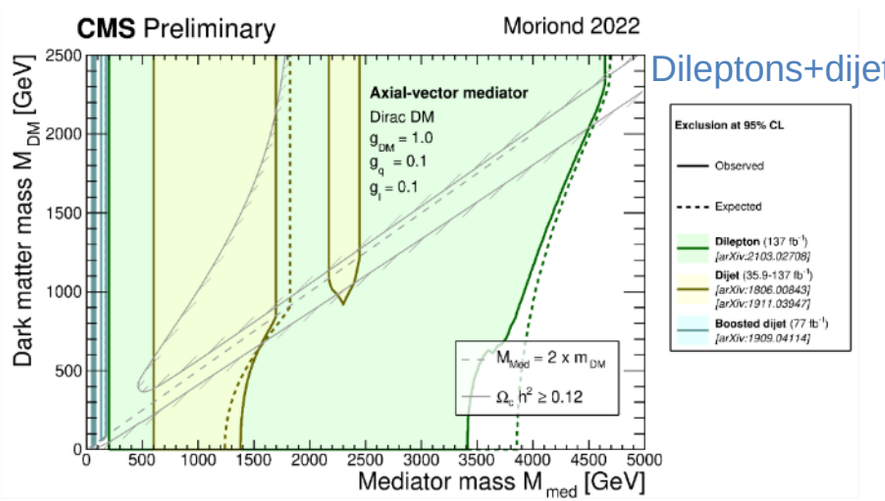
Station Of CHip Irradiation (SOCHI)



SIMBO, ISCRA and SHINE target stations

Examples of JINR Participation in the LHC Experiments

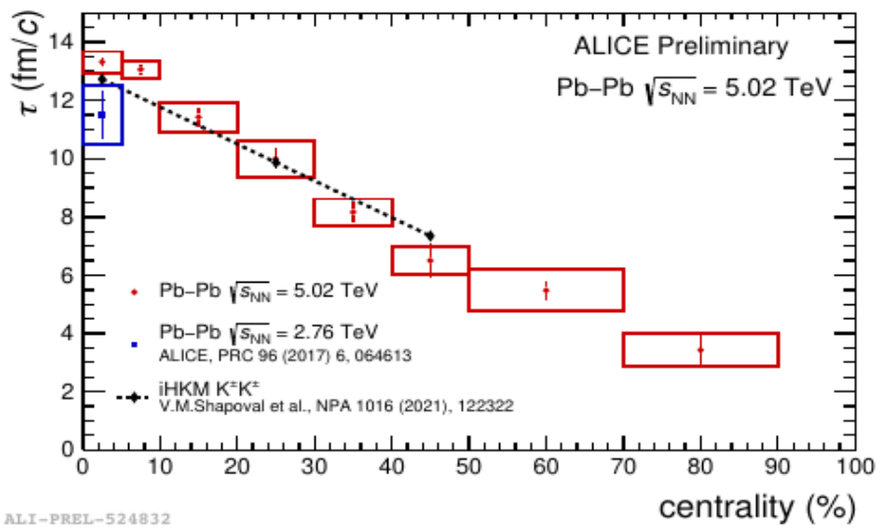
- **CMS** Run2 data analyses – 25 talks were presented at international conferences and workshops, including:
  - studies of Higgs boson with bbar-decays
  - searches for new physics (dark matter, extra Higgs bosons beyond SM, new gauge bosons, extra dimensions, etc) with dileptons/bbar + missing transverse energy
  - testing the Standard Model with dileptons and jets



Exclusion plot for Dark Matter searches

- High Granularity CALorimeter) project for the Phase-II CMS Upgrade:
  - Production of multi-cassette cold room facility is finished. Delivery to CERN is preparing.
  - Development of serial production technology of cooling panels: 3 prototypes will be constructed in Minsk and tested this year.

- New results obtained by the JINR ALICE group in 3D femtoscopic correlation analysis for $K^{\pm}K^{\pm}$ pair production in Pb-Pb collisions at 5.02 TeV were reported at the LXXII International Conference "Nucleus-2022: Fundamental Problems and Applications".



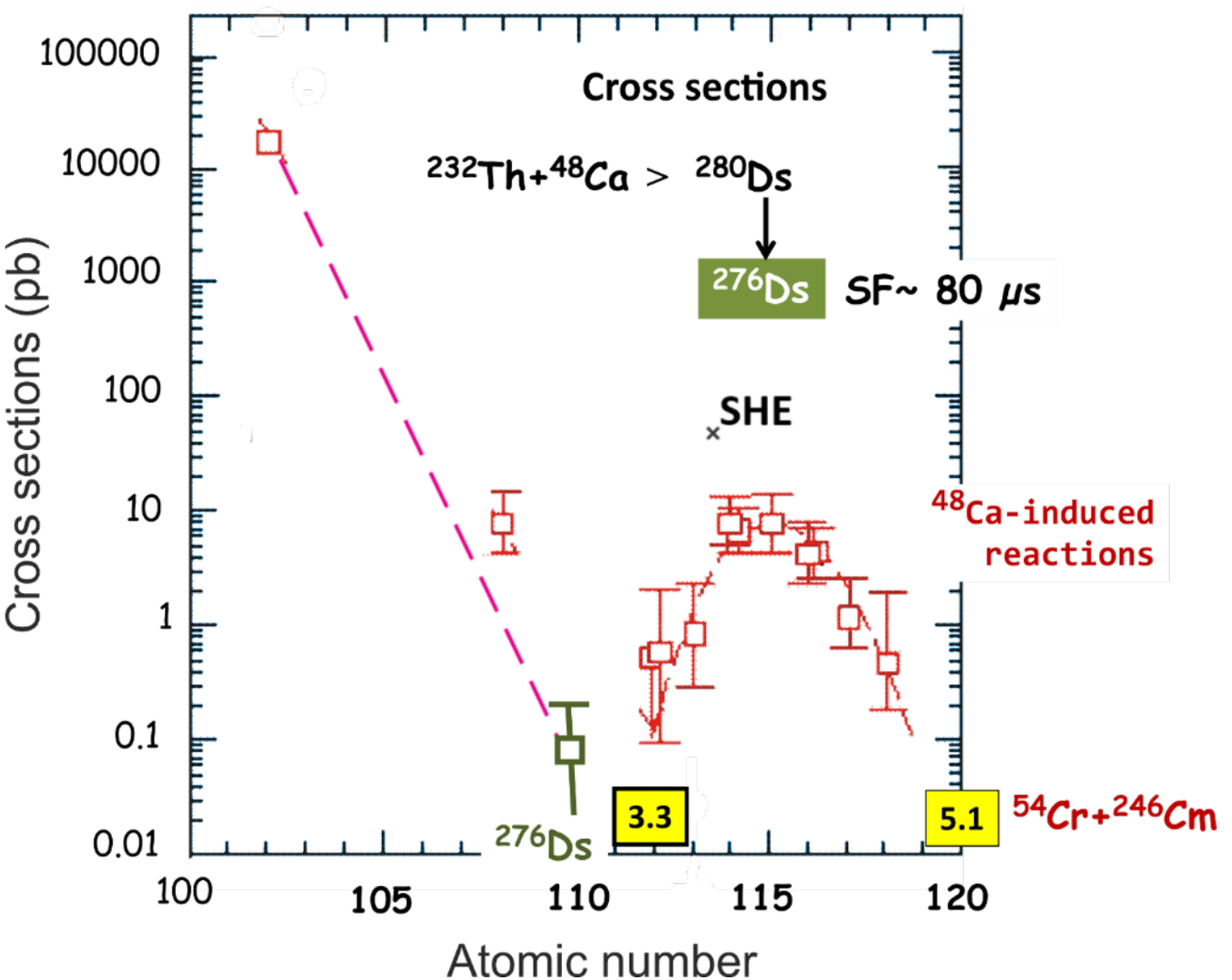
The kaon emission time τ was measured for the first time. It decreases in more peripheral events reflecting decrease of evolution duration and density of the system. The τ values obtained for 5.02 TeV appear to be slightly greater than the ones measured by our group for 2.76 TeV. These results are well reproduced by the hydrokinetic model iHKM.

On the way to new elements @ Superheavy Element Factory in 2022

$^{48}Ca + {}^{232}Th \rightarrow {}^{280}Ds^*$

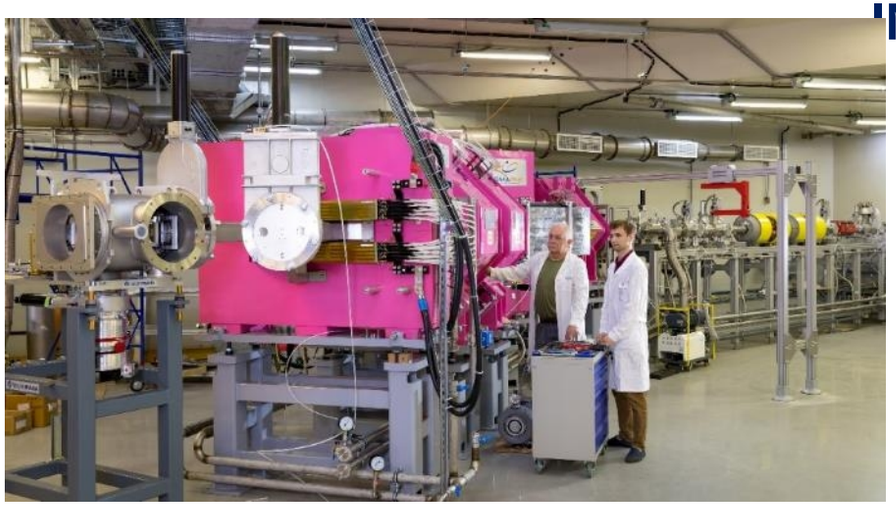
May-June 2022

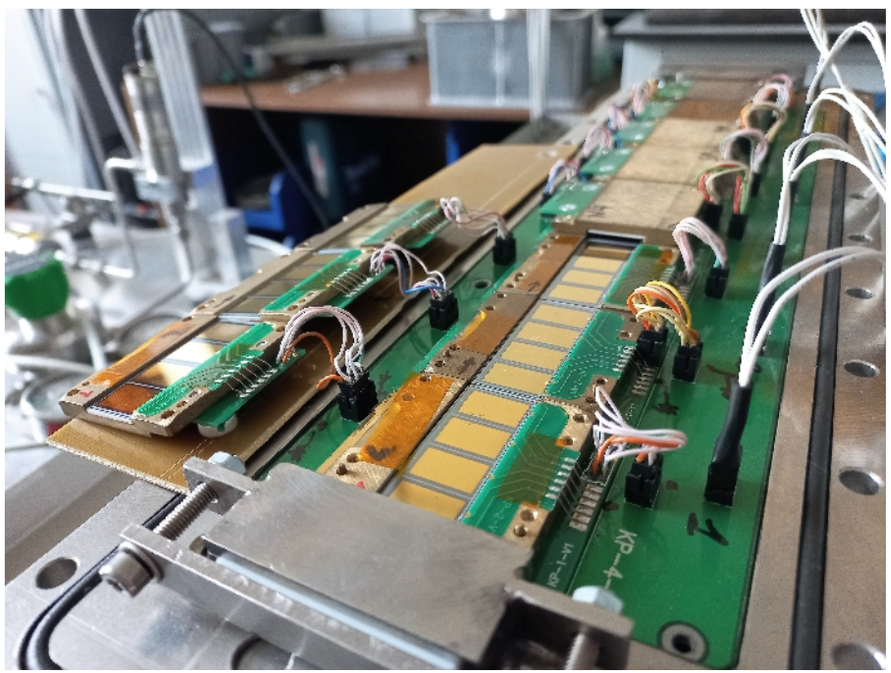
- ✓ Stability and production cross section is expected to have a minimum for the element 110. The fission barrier is predicted to be 3.3 MeV only.
- ✓ The same theory predicts 5.1 MeV barrier for the element 120.
- ✓ 1 event of ^{276}Ds was observed in the experiment at extremely low cross section. That is already the third new isotope of superheavy elements discovered at the SHE Factory.
- ✓ The experimental results are in agreement with expectations.
- ✓ The experiment has been continued at different beam energy since beginning of September.



GRAND (GAS-FILLED RECOIL ANALYZER AND NUCLEI DETECTOR) DGFRS-3

PREPARATION OF THE FIRST EXPERIMENT ON CHEMISTRY OF ELEMENTS 112 AND 114 IN THE $^{48}CA+^{242}PU$ REACTION





Status:

- ✓ The detection setup was developed and installed at the GRAND separator.
- ✓ First test experiments were carried out in June 2022 with mercury and nobelium isotopes produced in fusion reactions. The purpose was to test and further optimize the setup.
- ✓ The second test experiment is expected in the mid of October.
- ✓ Experiment on chemistry of elements 114 and 112 will start in November 2022.

Accelerator complex DRIBs-3

DC280

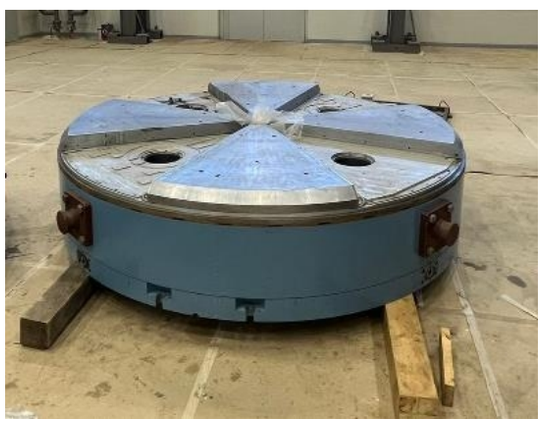
Experimental programme is executed on schedule:

- High intensity ^{48}Ca beam (up to 7.73 *pμA*).
- Long-term stability of ^{48}Ca beam.
- Production of $^{54}Cr^{10+}$ beams (2.5 p*μ*A).
- Production of $^{48}Ti^{9+}$ beams (2.13 p*μ*A).

U400M

Modernization is in progress:

- First harmonic compensation shims were manufactured and installed.
- Valley shims were developed and manufactured to increase the level of the magnetic field at the output radius.
- Installation of engineering systems and cyclotron equipment.
- First beam is expected in the beginning of 2023.



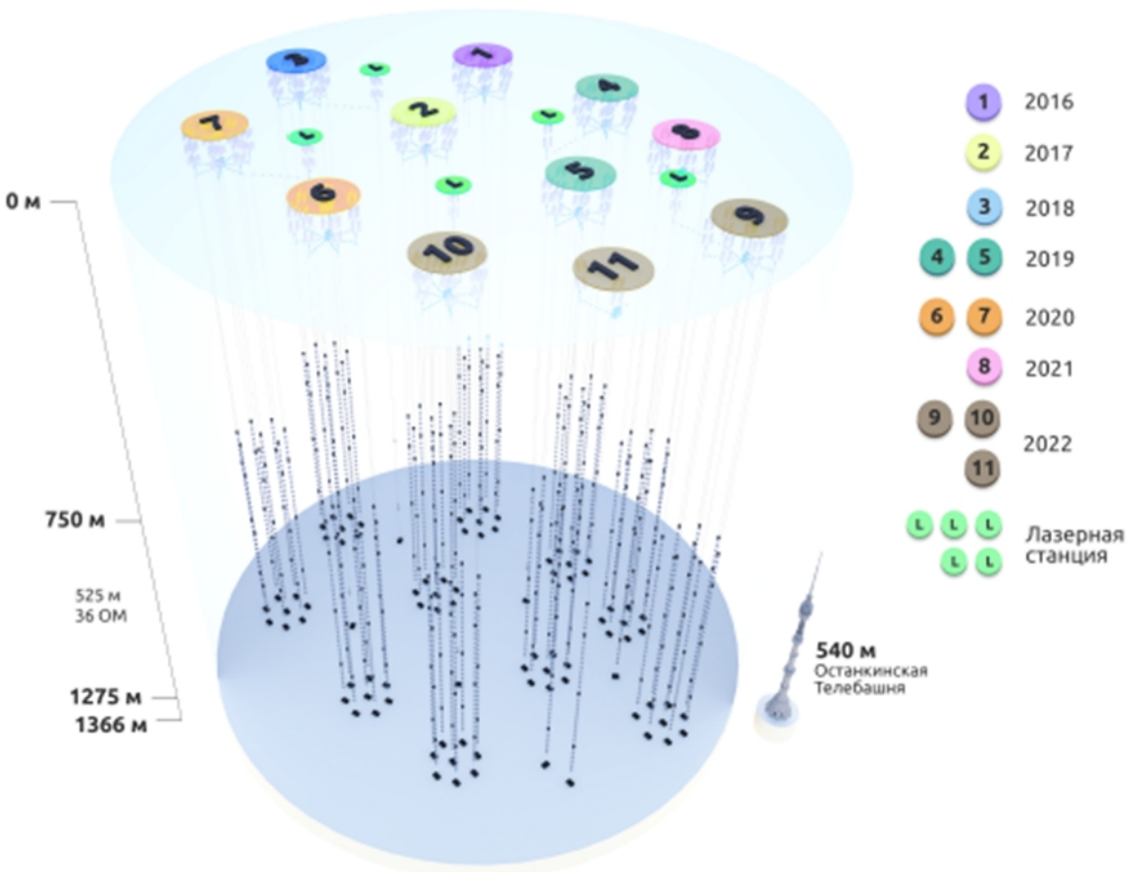
DC140

Creation of a new facility for applied research:

- Accelerator hall is under deep reconstruction
- Footings for the DC-140 cyclotron magnet were installed.
- Production of the cyclotron systems is underway.

Baikal-GVD construction status and analysis progress

Status 2022: 10 clusters, 5 laser stations, experimental cluster prototype with new DAQ system



The array contains 2916 optical modules.

Deployment schedule

Year	Number of clusters	Number of OMs
2016	1	288
2017	2	576
2018	3	864
2019	5	1440
2020	7	2016
2021	8	2304
2022	10	2880

Summary on analysis progress

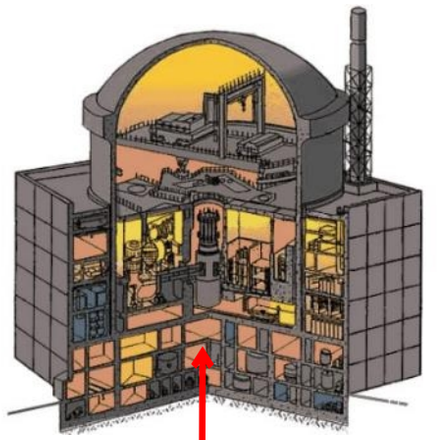
– Atmospheric neutrino measurements agree with expectations in both muon track and cascade modes.

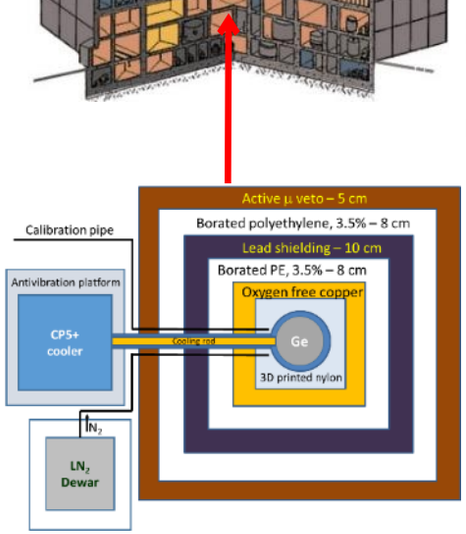
– The alert system of the Baikal-GVD neutrino telescope are developed and introduced in analysis.

– The first results of Baikal-GVD follow up analysis of HE neutrino alerts confirm a promising multimessanger approach to identify and to verify astrophysical neutrino sources.

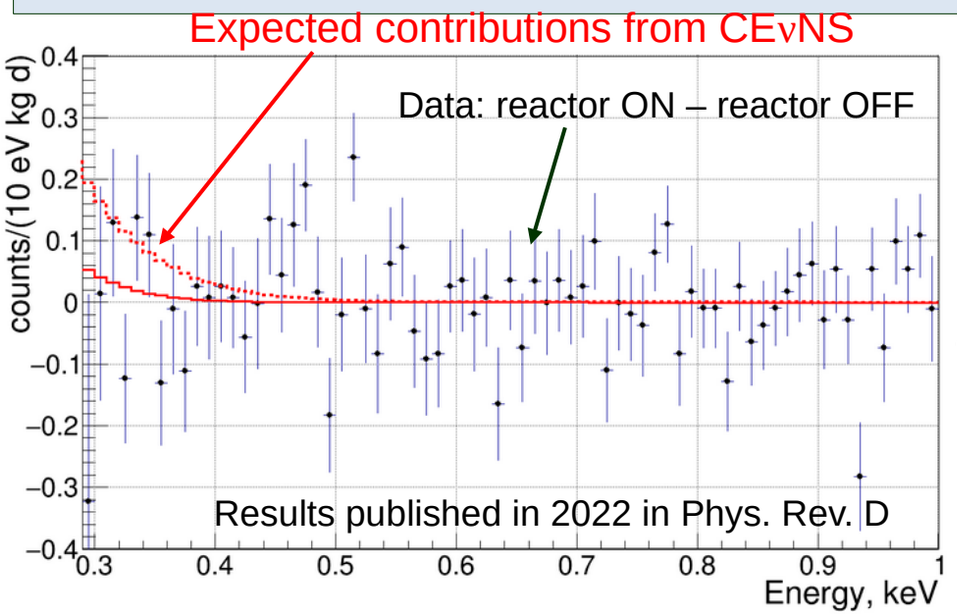
– First 25 high energy neutrino candidate events confirms at 3σ level IceCube discovery of diffuse astrophysical flux

Experiment at Kalinin Nuclear Power Plant





- ✓ The νGeN project studies neutrino scattering at Kalinin Nuclear Power Plant (KNPP, Russia). Main interests: coherent elastic neutrino-nucleus scattering (**CEνNS**), the search for the **magnetic moment of neutrino**, and many other applications, including reactor monitoring.
- ✓ The experimental setup is constructed under reactor unit #3 of KNPP at a distance of **↔ 10 m** from the center of the **3.1_GW$_{th}$** core under enormous antineutrino flux **> 5▾10^{13} ν/cm^2/s**.
- ✓ Installation of setup with 1.4 kg germanium detector was completed in 2020.
- ✓ No significant difference between regimes with reactor on and off has been observed.
- ✓ New limit on quenching parameter in germanium has been obtained (k<0.26).
- ✓ In 2021-2022 we continued data taking, more statistics taken (**additional ↔ 350 days)**
- ✓ Improved measurements technique and analysis. New internal shielding has been tested.
- ✓ The new measurements at closer distance from reactor is started in September 2022.



	Days	Counts per kgd
Reactor on	**94.50**	**2.32 ± 0.15**
Reactor off	**47.09**	**2.34 ± 0.21**
On-off	**-**	**< 0.4 (90% CL)**
CEνNS (expect)	**-**	**↔ 0.058-0.66**

- ✓ New results with more statistics and optimized measurements modes are expected soon.
- ✓ In 2022 the **νGeN** collaboration were extended by groups from CTU (Prague, Czech Republic) and LPI RAS (Moscow, Russia).

DANSS at Kalinin NPP

Achievements

- ✓ Record number of neutrino events (~5000 day^{-1}):
  - Best S/B ratio (S/B = 40)
  - World best limits on sterile neutrino parameters
- ✓ Power reactor monitoring with 1.5% accuracy

Design

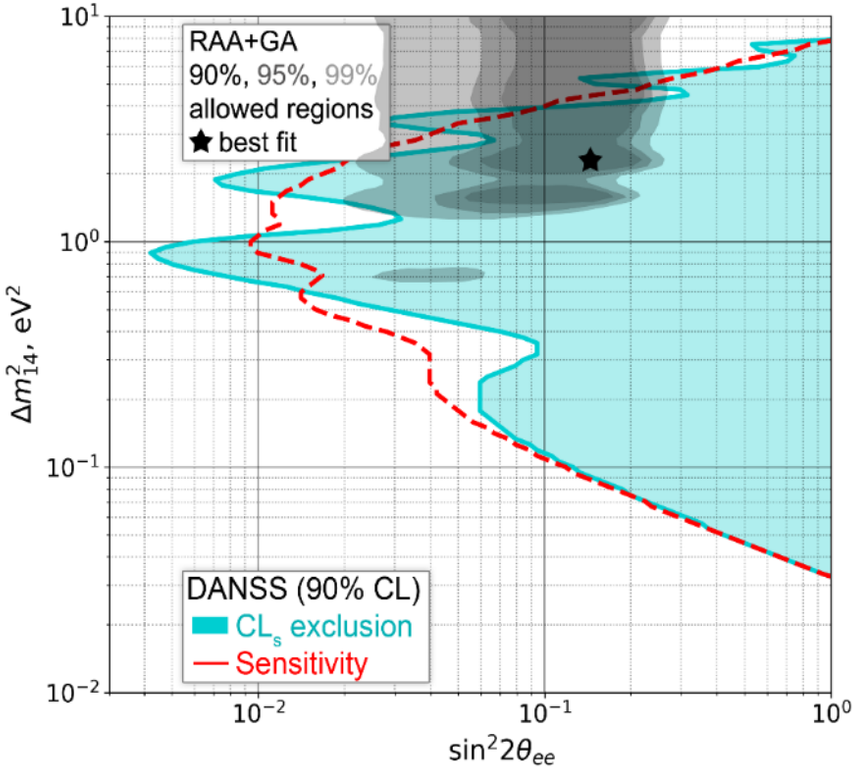
2500 scintillator counters (1 m^3) for 5 cm positioning
+ Each 50 of them are assembled as a module for better background suppression. Combined passive/active shielding.

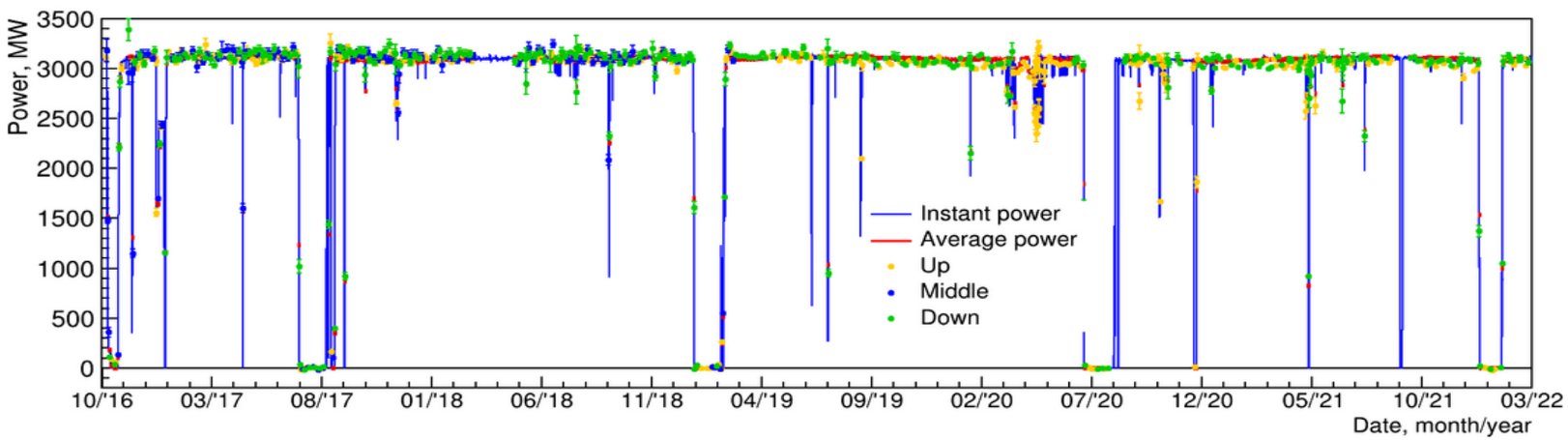
Future detector upgrade
(will be commissioned in 2022–2023)

- ✓ Production of new high resolution calorimeter (JINR)
- ✓ New signal processing scheme
- ✓ Better sterile neutrino sensitivity
- ✓ Fuel decomposition
- ✓ Neutrino-4 claim test

Side project

R&D for a compact neutrino detector





SPD project

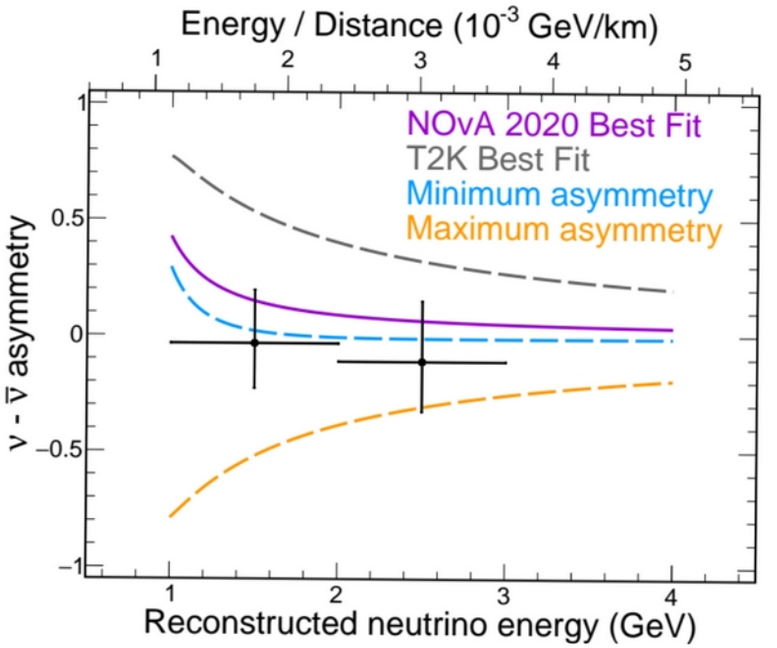
- ✓ The SPD CDR review was presented at the winter PAC by the chair of the SPD DAC A. Bressan. The PAC approved the SPD CDR and asked to speed up with TDR.
- ✓ The SPD TDR is completed and is ready to be presented at the next PAC session.
- ✓ Spokespersons election in the SPD collaboration: A. Guskov (JINR) and V. Kim (PNPI) were elected in March 2022.
- ✓ MoU signing by the collaborating institutes is started: signed – 3, in process – 2, under preparation – 2.
- ✓ Hybrid format SPD collaboration meeting in Dubna is scheduled to 3–6 Oct.
- ✓ SPD subsystems prototypes are ready for the beam tests in the SPD test zone.

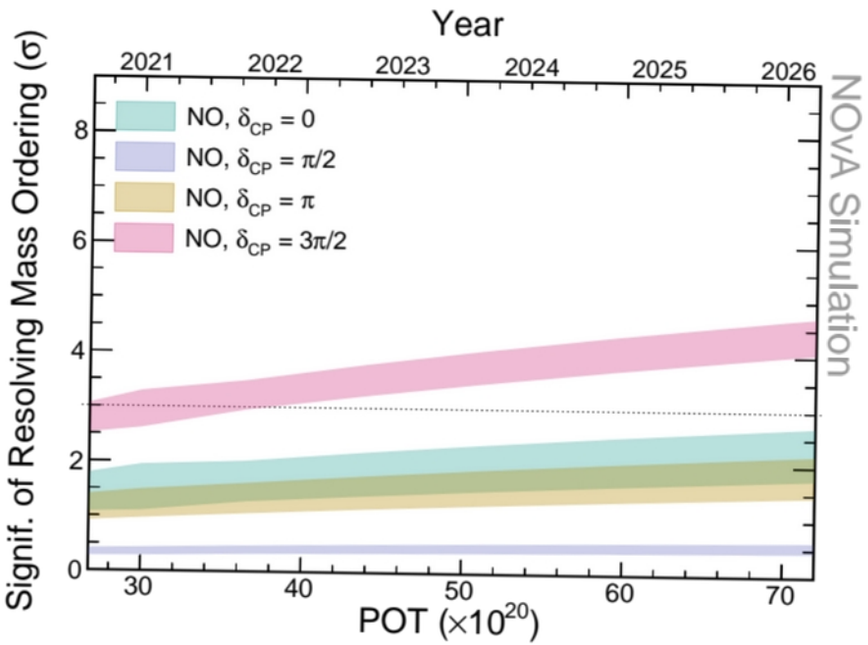
NOvA oscillation results

- The most up to date results with 13.6 and 12.5 POT exposure are the following:
  - best fit is in the Normal Hierarchy, $\delta_{CP} = 0.82\pi$ and upper octant of that implies that asymmetry in − appearance consistent with zero to 25% precision.
- A few new analyses with extensions of three-flavor oscillation model were performed:
  - sterile neutrino search with no evidence of signal but competitive limits for part of parameter space;
  - NSI (Non-Standard Interactions) hypothesis test is not supported.
- Joint NOvA-T2K analysis is in preparation with this exposure and current analysis techniques.
  - It is planned to announce the results by the end of 2022.

With operation until 2026 NOvA expects:

- possible 3-5σ sensitivity to mass hierarchy;
- potential sensitivity to CP violation phase >2σ.

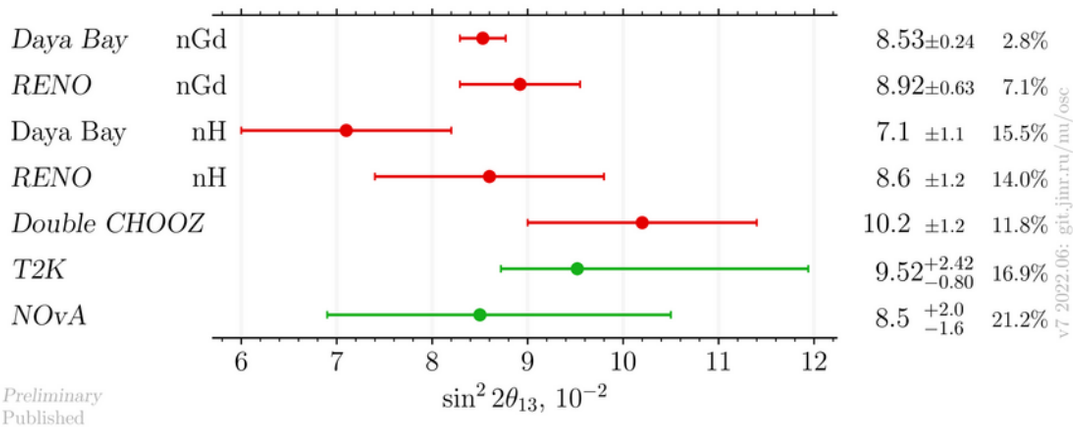




JUNO and Daya Bay: reactor neutrino oscillations

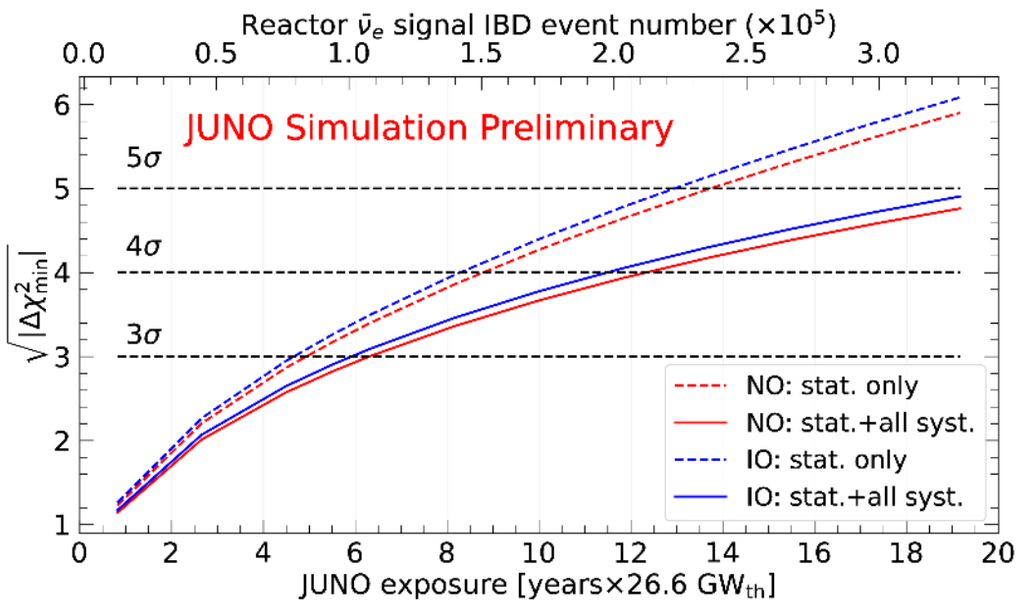
Daya Bay: precision oscillation parameters

- World's best result on a full dataset 2011−2020:
  - $\sin^2 2\theta_{13} 0.0853 \pm 0.0024$
  - $|\Delta m^2_{32}| = (2.454 \pm 0.057) \cdot 10^{-3}$ eV² (normal ordering)



JUNO: neutrino mass ordering

- Updated sensitivity. Paper under preparation.
- JUNO stand alone: at least 3σ in 6 years.



High Voltage supply for JUNO large PMTs

- Most of HV cells produced in 2021.
- Extra 10% produced in 2022.
- Obligations fulfilled.

JUNO: reactor neutrino oscillations

JUNO Top Tracker: muon veto

- Installation documentation prepared.
- A draft of the paper is prepared.

Long term PMT testing

- Thermo-cycling of PMT HV unit during 3 years: suitable reliability.

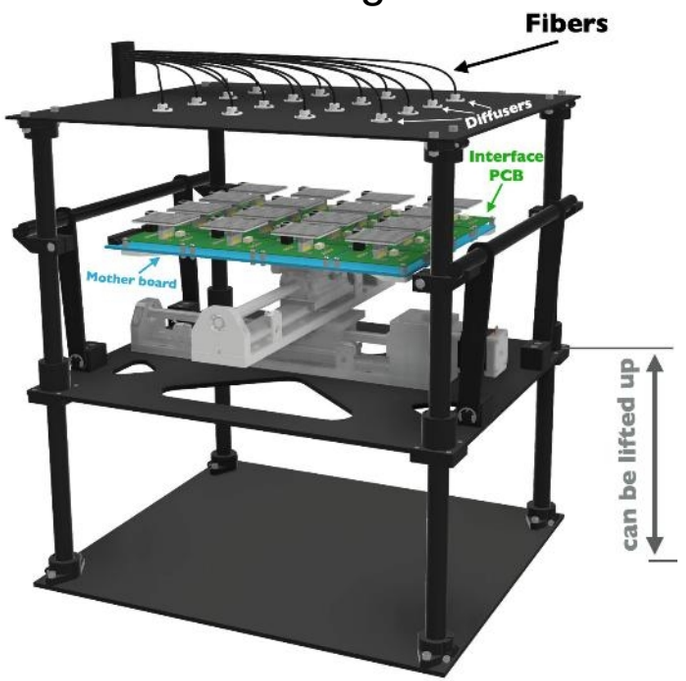
Satellite detector TAO

- SiPM mass testing: FDR passed and approved.
- SiPM Power System: FDR passed and approved.
- Due to limitations power system will be produced in China.

FDR — Final Design Review
SiPM — Silicone PhotoMultiplier
HV — High Voltage

SiPM Power Supply Unit

SiPM Testing Station



Experimental studies of nuclear reactions induced by fast neutrons

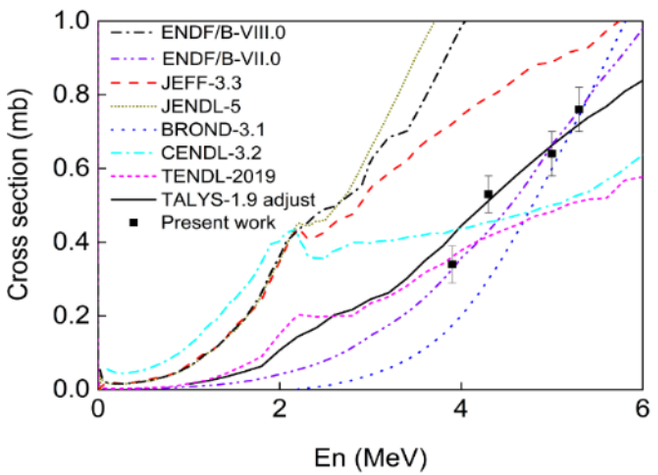
The study of the reaction with the emission of charged particles is of great interest for:
nuclear physics, nuclear astrophysics, nuclear engineering

During three years **cross sections for nuclear reactions** with fast neutrons have been measured at nuclei:
^{91}Zr (*n*,*α*) - EG-5, FLNP, JINR;
^{40}Ca(*n*,α$_0$), ^{40}Ca(*n*,α), ^{232}Th(n,f) – 4.5 MV Van de Graaf accelerator at Peking University and the HI-13 tandem accelerator at China Institute of Atomic Energy.

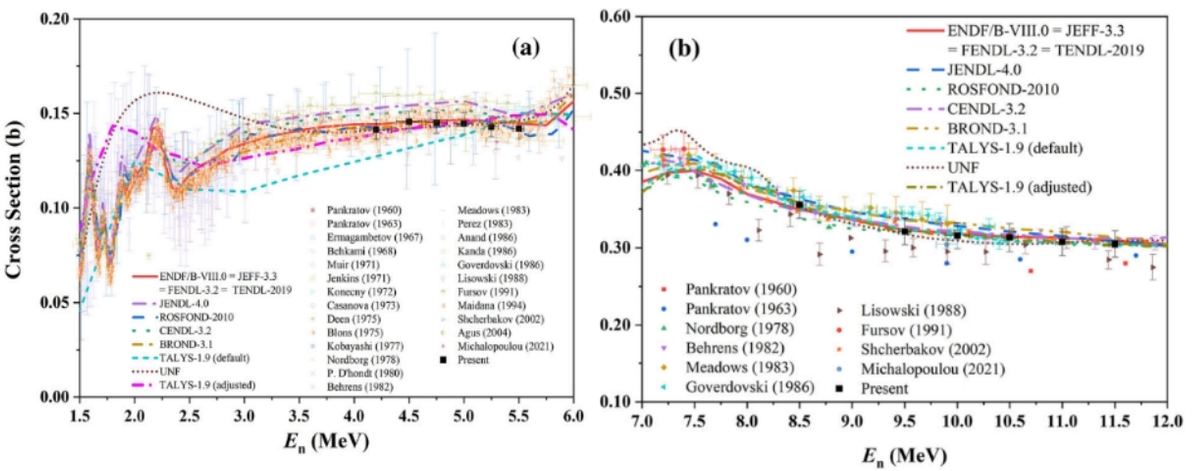
Eur. Phys. J. A (2022) 58:86
https://doi.org/10.1140/epja/s10050-022-00716-8
THE EUROPEAN PHYSICAL JOURNAL A
Regular Article - Experimental Physics

Cross section of the ^{232}Th(n,f) reaction in the MeV neutron energy region

Yu. M. Gledenov[1], Zengqi Cui[2], Jie Liu[2], Haoyu Jiang[2], Yiwei Hu[2], Haofan Bai[2], Jinxiang Chen[2], Guohui Zhang[2,a], E. Sansarbayar[1,3], G. Khuukhenkhuu[3], L. Krupa[4,5], I. Chuprakov[1,6,7], Yinlu Han[8], Xichao Ruan[8], Hanxiong Huang[8], Jie Ren[8]



Present experimental cross sections (obtained for first time) of the ^{91}Zr(n,α)^{88}Sr reaction compared with the results from evaluations



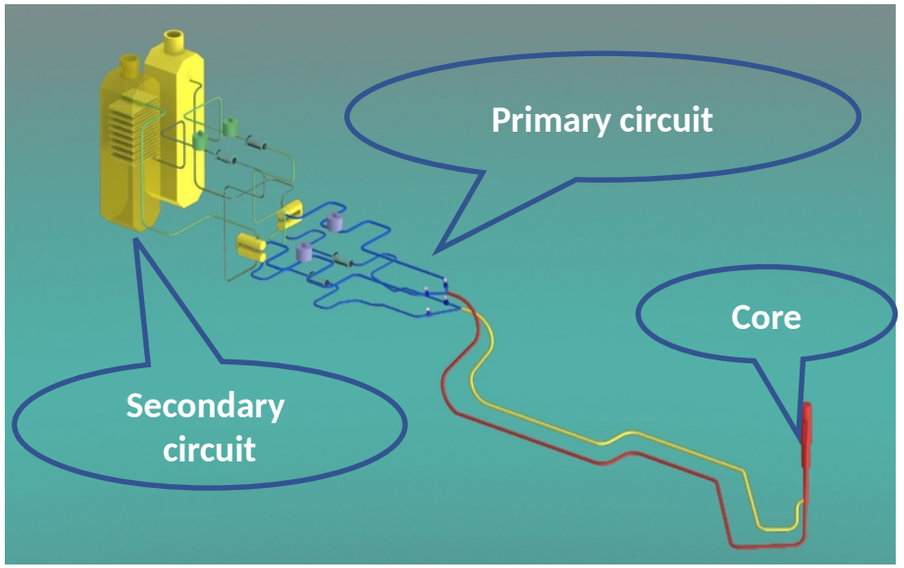
The measured ^{232}Th(n,f) cross section compared with data from previous measurements and evaluations for: a) 1.5 MeV ≤ En ≤ 6.0 MeV and b) 7.0 MeV ≤ En ≤ 12.0 MeV

Status of the IBR-2 reactor

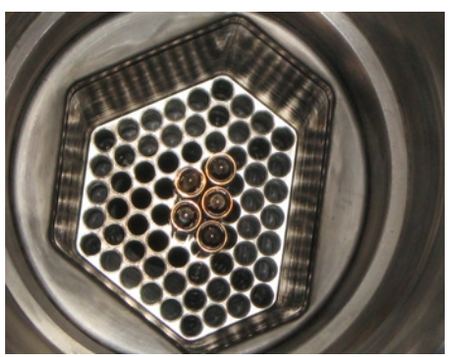
Secondary cooling circuit air heat exchanger (HE)

Time schedule for HE replacement

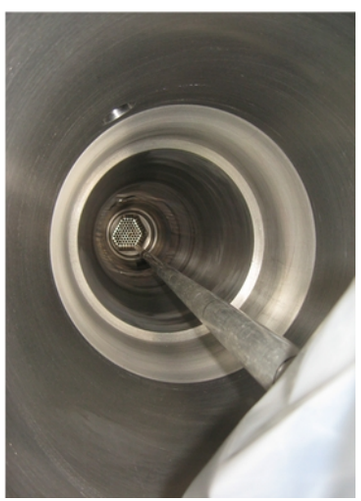
- Repair of the affected HE– December 2021; DONE
- Replacement of the old HE's with the new ones – November 2022; in assembly
- Forming the whole package of the documentation for licensing – October 2022;
- in the process of completion
- Expertise and decision of Rostechnadzor – June 2023;
- Obtaining the license – July 2023;
- Reactor startup – September/October 2023; testing;
- October 2023 operation for physical experiment – first users from FLNP JINR
- Proposal submission in the frame of FLNP User Program - September 1 - October 15



Manufacturing a new fuel load for IBR-2



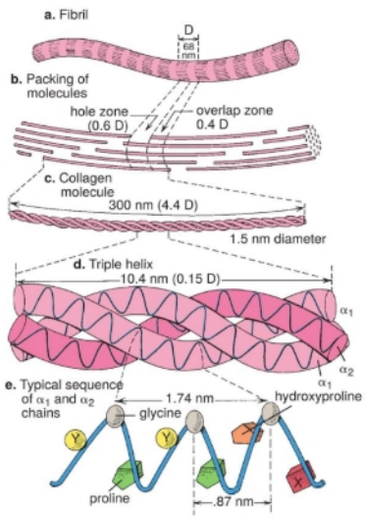
- At the very end of 2021 an official letter, signed by JINR Director was sent to the fuel rod
- manufacturer;
- **On the beginning of 2022 we get the positive response, that such work could be done**
- **before 2025;**
- The term and financial terms of the contract are being agreed;
- **Having new fuel load, we can prolong IBR-2 operation for the period 2040+ .**

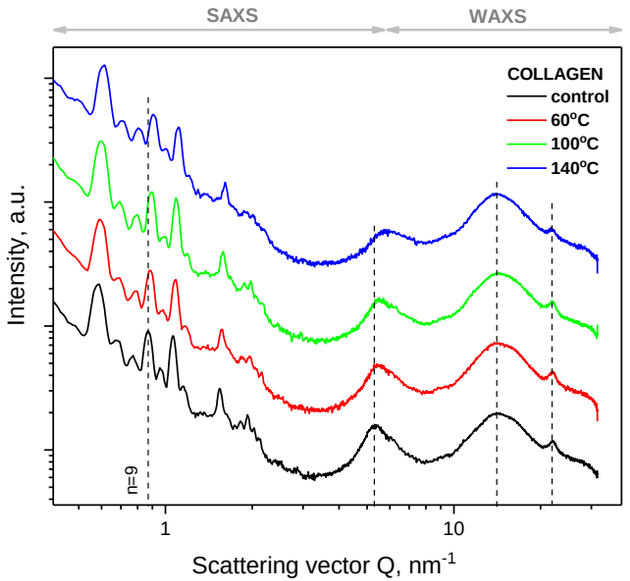


X-ray diffraction analysis for biomedicine – NEW GENERATION IMPLANTS

ARTIFICIAL CORNEA MADE OF PORCINE COLLAGEN

MOTIVATION:
optimization of the process of creating the cornea (maximum survival, preservation of transparency)

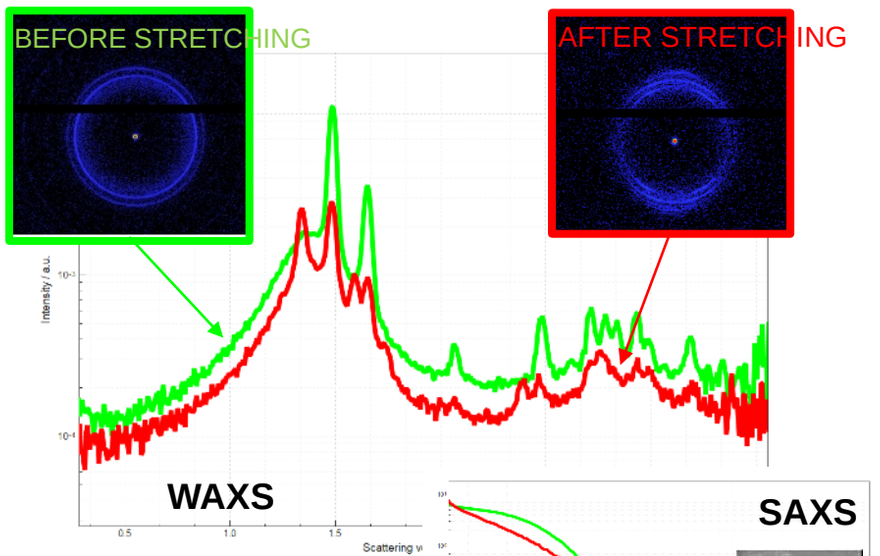




Vostok-Prozrenye
FLNP/FLNR JINR

ULTRA-HIGH-MOLECULAR-WEIGHT POLYETHYLENE FOR JOINT ENDOPROSTHESES

MOTIVATION: **creation of bone grafts with high wear resistance, strength and biocompatibility.**

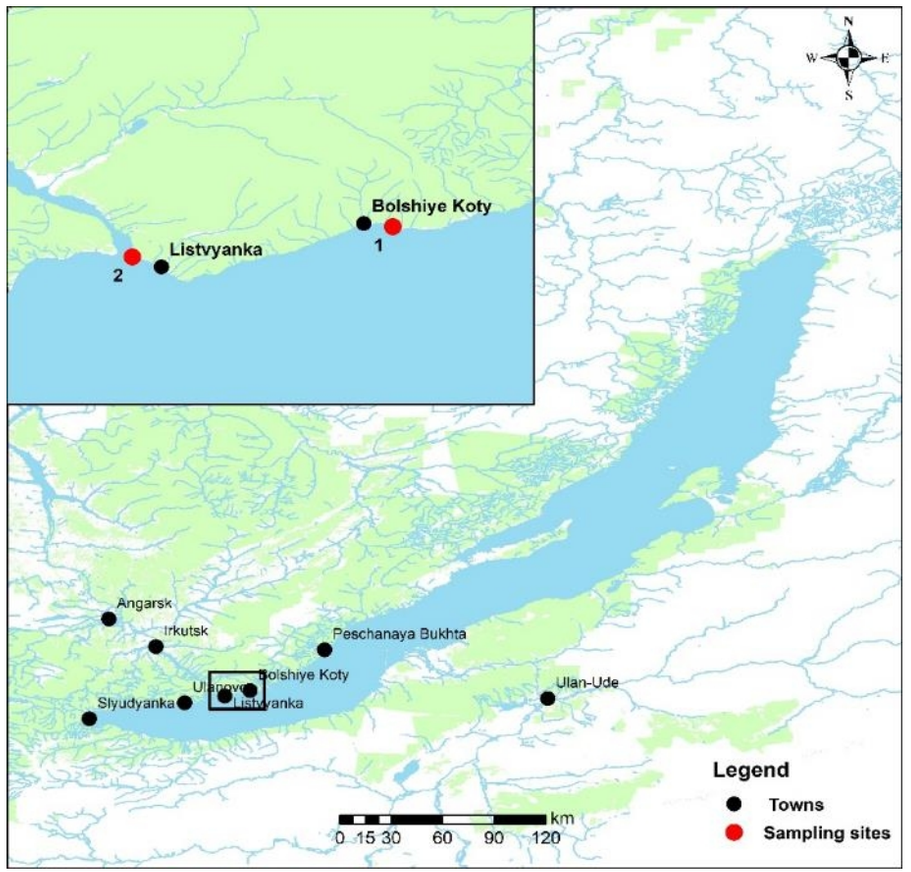


MISiS
FLNP JINR

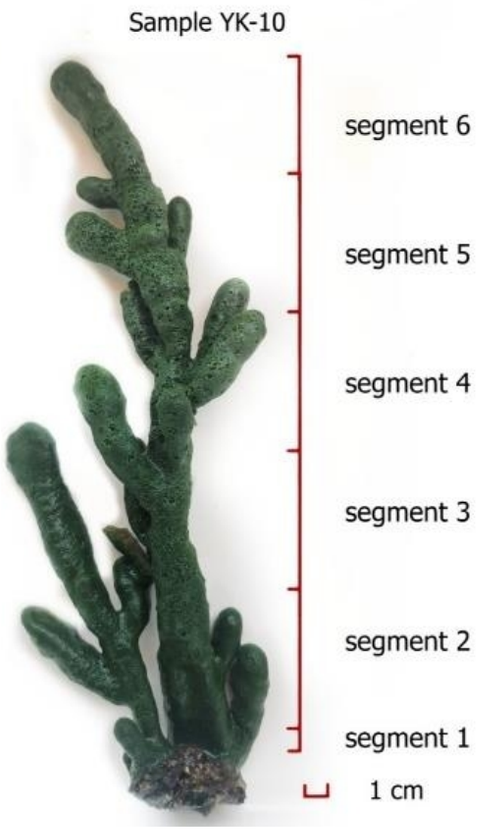
Xeuss 3.0 Small-angle X-ray scattering research facility. FLNP JINR

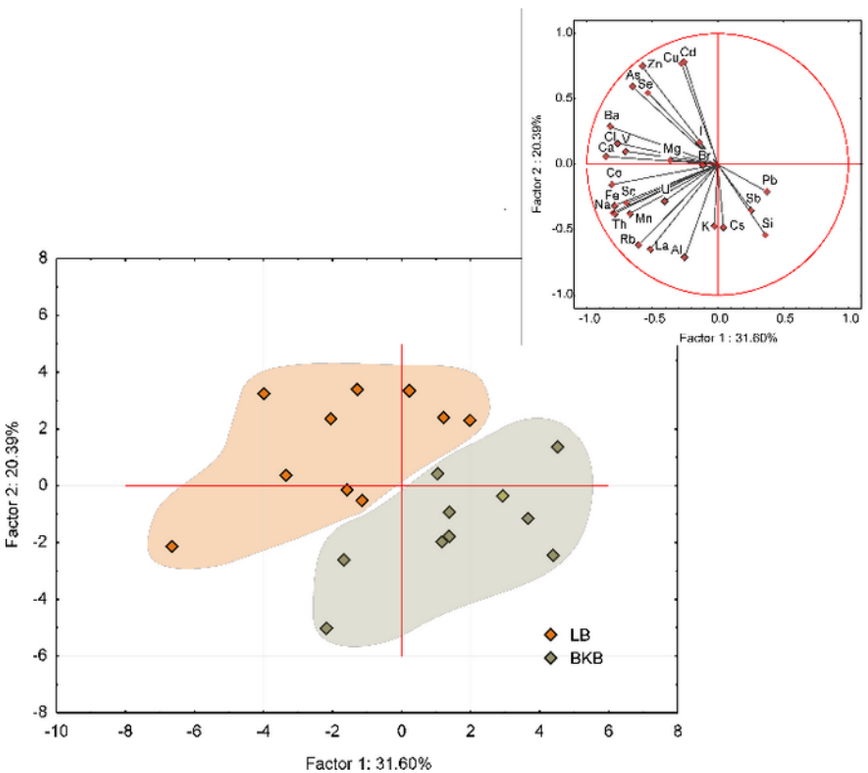
Integrated Loading Machine for In Situ Experiments (MISiS)

Endemic sponge Lubomirskia baikalensis as a bioindicator of chemical elements pollution in Baikal Lake



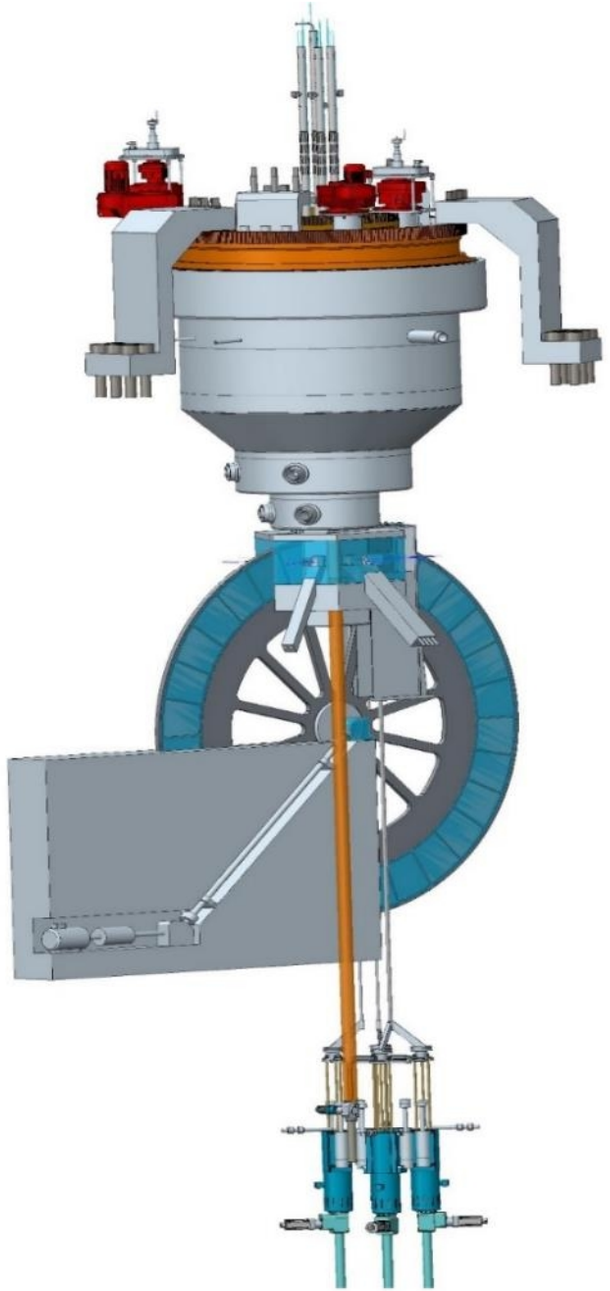
Sampling sites: Bolshye Koty Bay and Listvennichny Bay





Results of Principal Component Analysis for the samples of sponges collected in two bays of Lake Baikal

New Project



Research of NEPTUNE reactor’s dynamics and its stability

Theoretical computation research have been carried out, which made it possible to formulate the basic principles of the dynamics of pulsed high-power reactors, to determine critical parameters and conditions for stable operation. On this basis, the development of a refined model of the behavior of a pulsed reactor has begun, taking into account all the design features of the NEPTUNE reactor.

R&D of neptunium-nitride fuel of NEPTUNE reactor

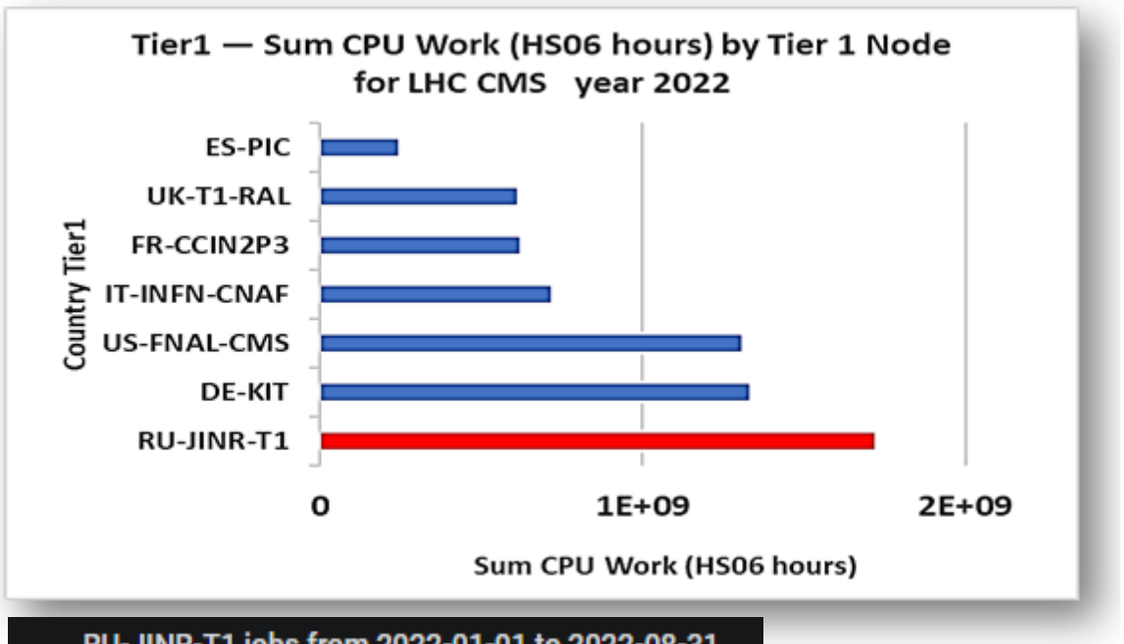
Contract with JSC VNIINM (Rosatom) for First stage of neptunium nitride fuel development (2022–2023) is being under signification; **there are following problems which will be resolved after finishing this contract:**

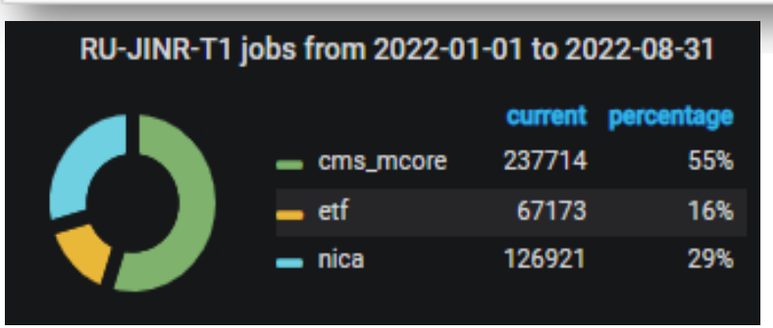
- getting permission of using of nuclear materials, which is in federal ownership;
- development a complex of fuel characteristics’ measurement methods;
- development a technology of fuel fabrication for experimental fuel rods;
- carry out of fuel rods researches before reactor irradiation.

MICC – Grid infrastructure – Tier1 and Tier2

The JINR Tier1 center has demonstrated stable work not only for CMS (LHC), but also for MPD (NICA).

The Tier1 site for CMS is ranked first among world centers for CMS.

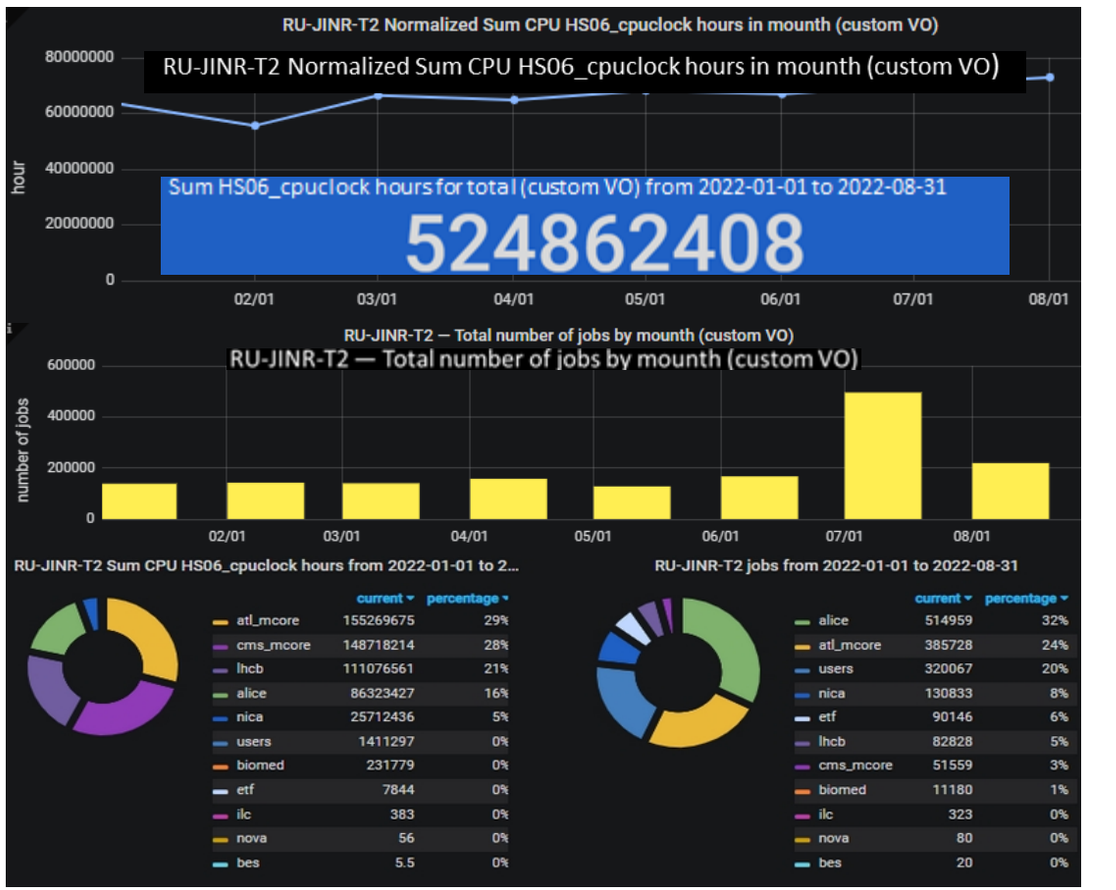




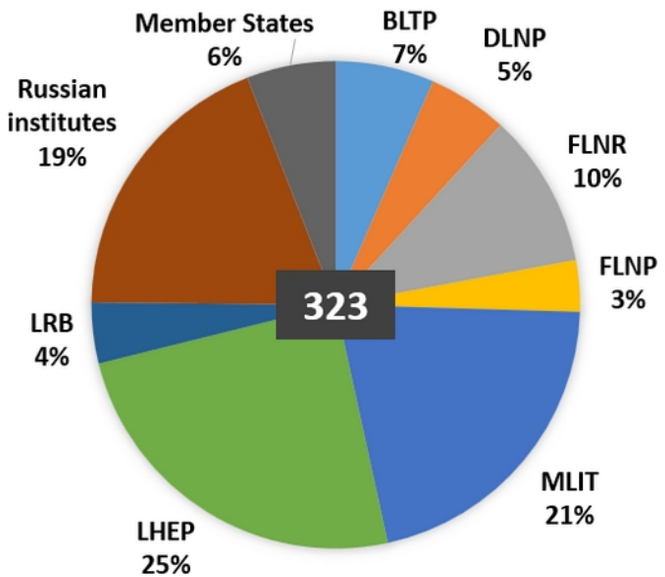
30% of all jobs executed at Tier1 JINR are NICA MPD jobs.

This year, a new accounting system for the MICC was put into operation at litmon.jinr.ru

524 862 408 HS06 hours were used at Tier2 for 1 587 723 jobs from NICA, LHC, ILC, NOvA, BIOMED and local users from 2022-01-01 to 2022-08-31.



“Govorun” supercomputer

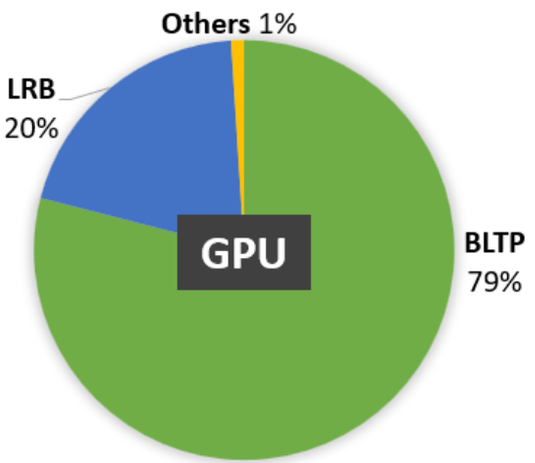


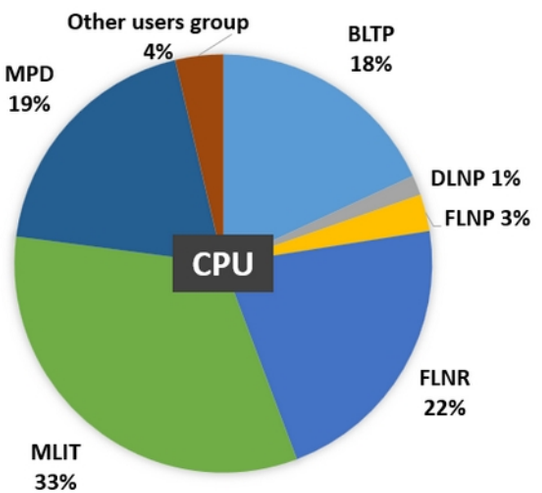
Key projects that use the resources of the “Govorun” supercomputer:

- ✓ NICA megaproject,
- ✓ calculations of lattice quantum chromodynamics,
- ✓ computations of the properties of atoms of superheavy elements,
- ✓ studies in the field of radiation biology,
- ✓ calculations of the radiation safety of JINR’s facilities.

Total number of users of the "Govorun" supercomputer: 323

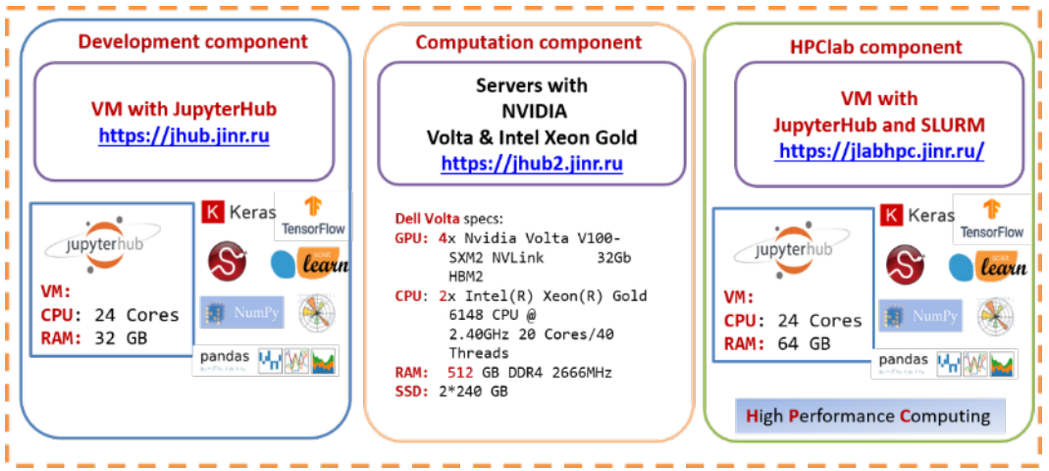
Distribution of the GPU and CPU resources by user group





During February-August 2022, **555079** jobs were performed on the **CPU** component of the “Govorun” supercomputer, which corresponds to **~8M** core hours, and **455** jobs were carried out on its **GPU** component, which corresponds to **32890** GPU hours.
The average load of the CPU and GPU components amounted to 96.2% and 91.4% respectively.

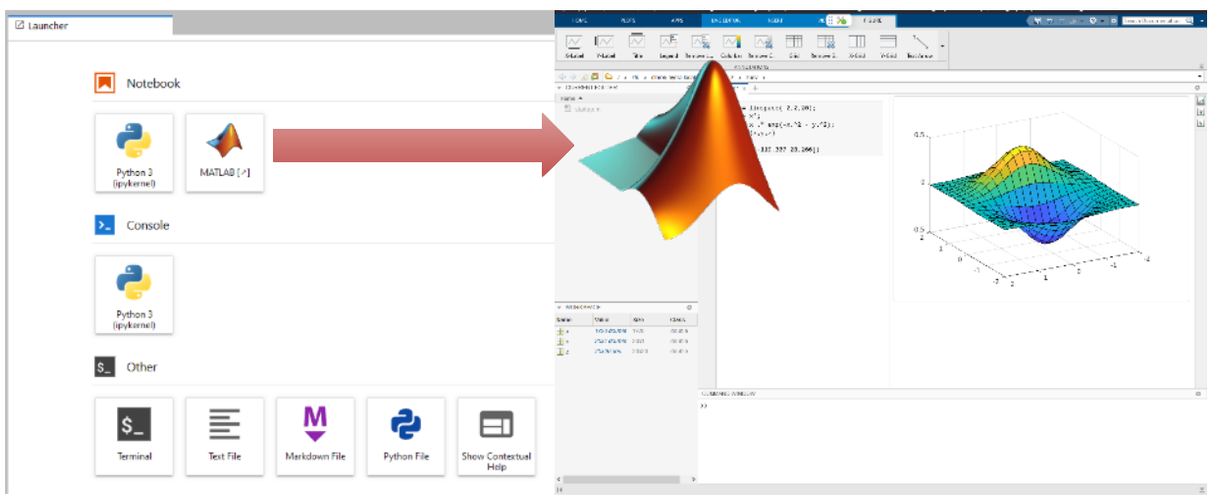
ML/DL/HPC Ecosystem of the HybriLIT Heterogeneous Platform: New Opportunities for Applied Research



The **ML/DL/HPC ecosystem** is now actively used **for machine and deep learning tasks.** At the same time, the accumulated tools and libraries **can be more widely used for scientific research**, including:

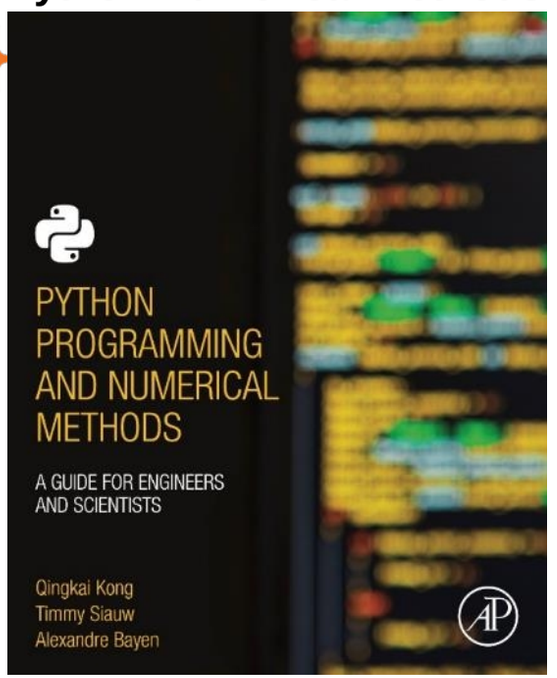
- numerical computations;
- parallel computing on CPUs and GPUs;
- visualization of results;
- accompanying them with the necessary formulas and explanations.

In 2022, on the ML/DL/HPC ecosystem, it became possible **to run the MATLAB code in Jupyter Notebook**, which allows one to effectively perform applied and scientific computations.



Parallel computations with Joblib

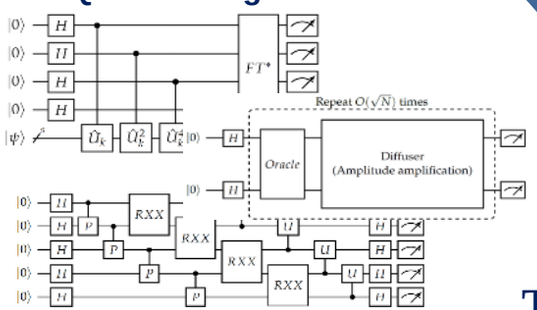
Python Numerical Methods



Quantum computing and quantum algorithms

Objective: development of quantum algorithms (QAs) to calculate complex atomic and molecular systems, taking into account the limiting capabilities of available computing resources.

Quantum algorithms



Quantum simulators

Qiskit
QuEST
qsim
CUQUANTUM

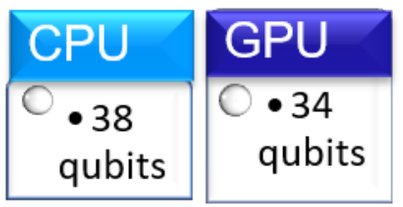
SC “Govorun”

TASKS

- Form a list of QAs required to solve tasks within the studied physical models
- Select the type of quantum simulator to simulate a classical architecture on computers
- Define resources for the selected quantum-limiting capabilities of available computing simulators (number of qubits and computation time)
- Search for exact solutions to urgent problems of quantum chemistry and study the chemical properties of heavy elements

Current result

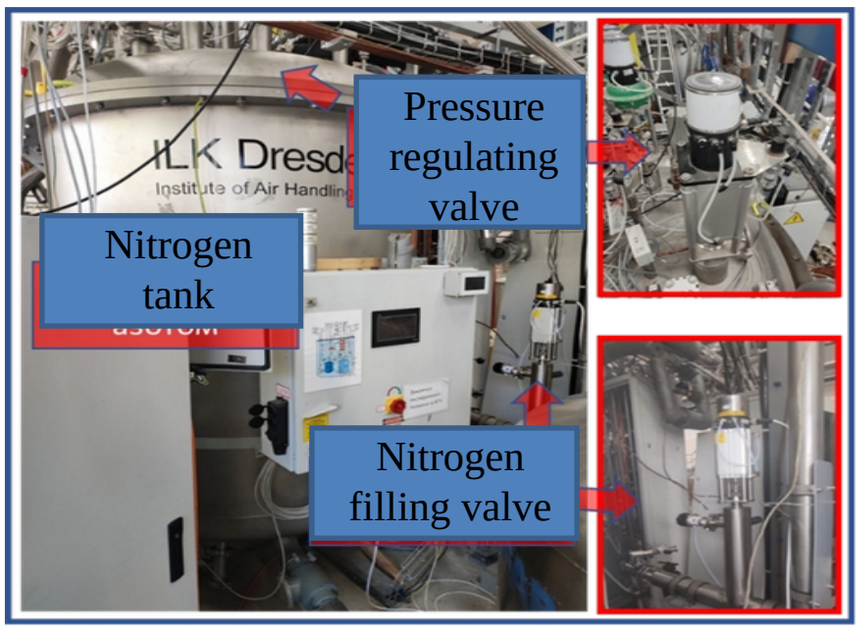
The limiting computing capacities of the “Govorun” supercomputer are revealed on the example of simulating quantum algorithms (quantum Fourier transform, quantum phase estimation, Grover’s algorithm, test synthetic algorithm) using a different class of quantum circuits for the following simulators: QuEST, Qiskit, CuQuantum.

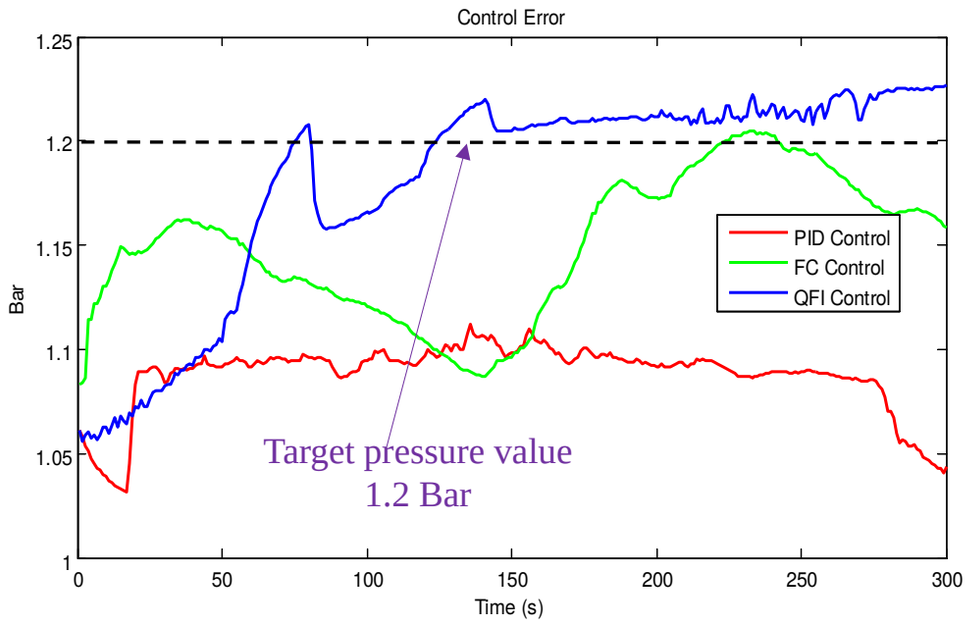


According to modern concepts, from 30 to 50 qubits are sufficient for the exact solution of most practically significant problems of quantum chemistry.

Quantum intelligent control

Tests of an **intelligent automatic control system for the nitrogen collector** of the satellite helium refrigerator #1 at the site of the cryogenic testing of superconducting magnets at VBLHEP **on the basis of quantum algorithms** (QFI) are successfully completed.





Control of the process of reaching a predetermined pressure level in cooling mode

- The quantum controller (blue curve) is **almost 5 times faster in reaching the target value** than the closest controller on soft computing (green curve), while the PID-controller (red curve) does not reach the target value.
- The quantum controller demonstrates **low overshoot and accuracy in achieving the control goal** compared to other types of controllers.
- **Automatic control** based on the quantum controller **reduces nitrogen consumption by 53%.**

In the future, the system will be put into operation, and its regular operation will start.

TUGAL ZHANLAV

(born 25 September 1943) is a Mongolian mathematician. He is an academician of the Mongolian Academy of Sciences, where he holds the position of senior researcher. His research includes topics in numerical analysis, partial differential equations, computational aspects of wavelet analysis, wavelet and spline approximations, numerical methods for solving linear algebra problems, iterative methods for solving systems of nonlinear equations, the convergence and stability of finite-difference schemes. He was a recipient of the 2012 Laureate of the State Prize of Mongolia. He is also an honorary doctor of the Joint Institute for Nuclear Research, Dubna, Russia (2012) and an emeritus professor of the National University of Mongolia (2019). Zhanlav is the author or co-author of over 140 research papers.

OCHBADRAKH CHULUUNBAATAR

(born 24 July 1974) is a Mongolian mathematician. He is an academician of the Mongolian Academy of Sciences, where he holds the position of senior researcher. His research includes topics in computational physics, mathematical modelling, variational and numerical methods in the few-body problem, high-accuracy calculations of the energies of atomic and molecular systems, the impact ionization of helium by a fast electron or proton in Born's approximation, the multichannel scattering problem. He was a recipient of the 2012 Laureate of the State Prize of Mongolia. Chuluunbaatar is the author or co-author of over 210 research papers and the creator of 14 computational codes registered in international program libraries.

ISBN 978-5-907535-48-0

КУРС INTERACTIVE ON-LINE

NEW DEVELOPMENTS OF NEWTON–TYPE ITERATIONS FOR SOLVING NONLINEAR PROBLEMS

T. ZHANLAV AND O. CHULUUNBAATAR

MONOGRAPHY

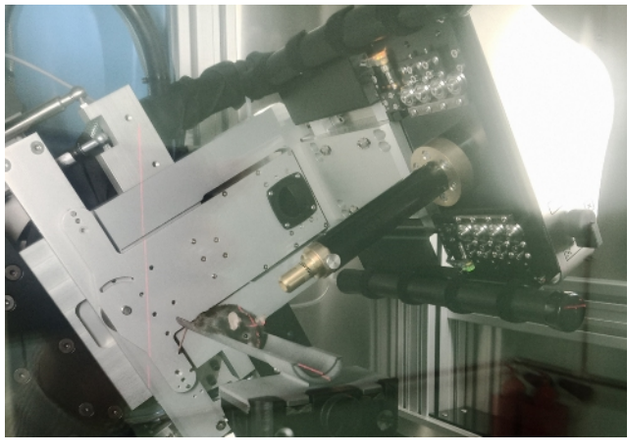
«In Newton-type methods, iteration parameters play a key role. Suitable choices of these parameters not only speed up convergence, but also extend the convergence domain. Moreover, special choices allow us to control the convergence behaviour of iterations. Over the last two decades, many papers on this topic have been published, and it is highly desirable to systematically collect these results. This motivates us to write this monograph based on our research results obtained in collaboration with the co-authors».

This **book** will be useful to readers, graduate students and researchers interested **in the field of applied mathematics, numerical analysis and applied sciences.**

RADIATION BIOLOGY

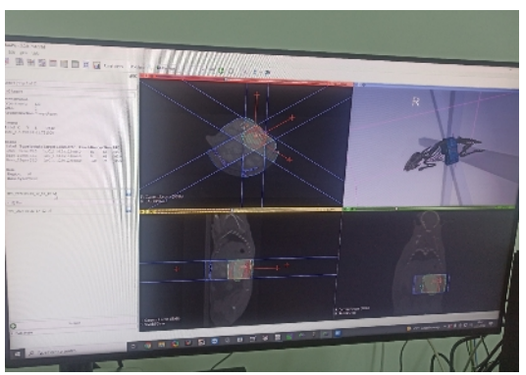
New basic facility of LRB JINR: SARRP (Small Animal Radiation Research Platform)

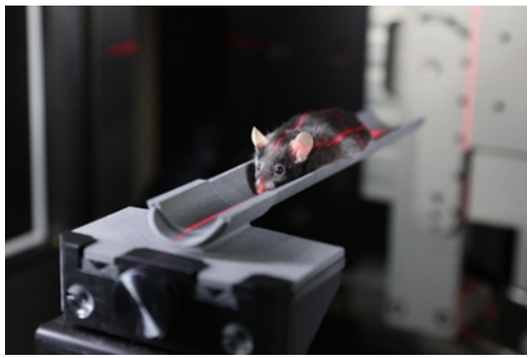
SARRP imitates modern X-ray radiation therapy systems for animal research.



The 360° gantry and motorized stage allow for non-coplanar beam delivery from any angle.

Techniques utilizing planar static beams, parallel opposed beams, continuous arc therapies, multiple isocenter treatments, and non-planar arcs can all be planned, evaluated, and delivered with SARRP.

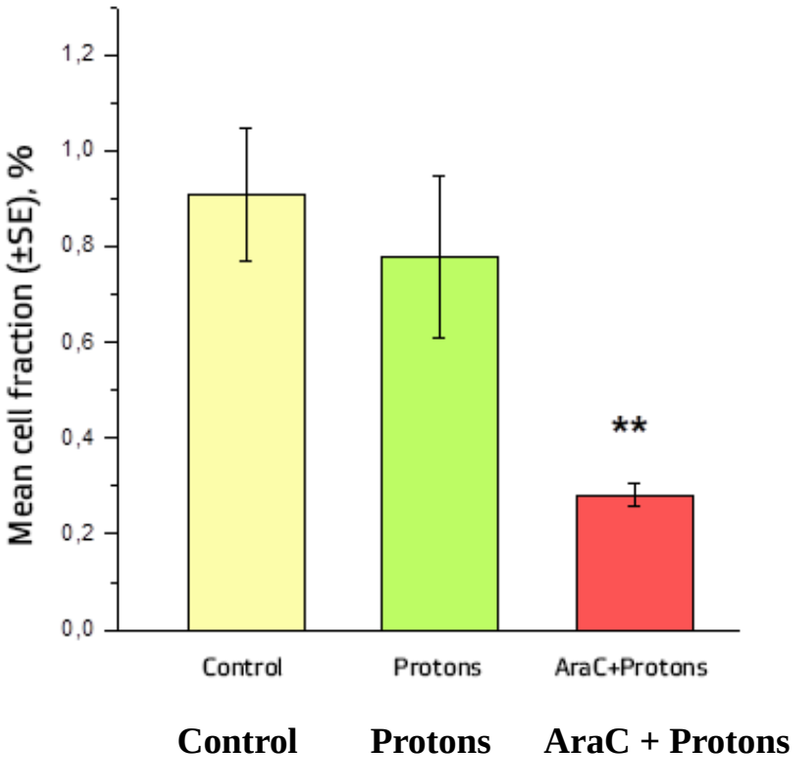


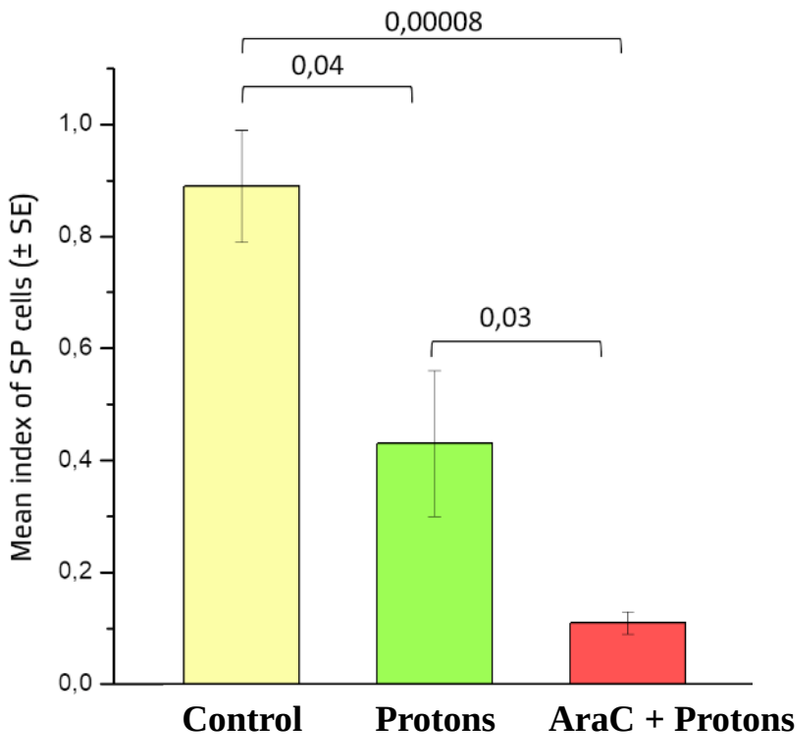


First experiments on mice tumor irradiation at SARRP

A new method to suppress tumor stem cell population after proton irradiation of melanoma has been developed and patented by JINR and MRRC

A decrease in the relative (left) and the absolute fraction (right) of tumor stem cells by 2.8 and 3.9 times, respectively, was observed.





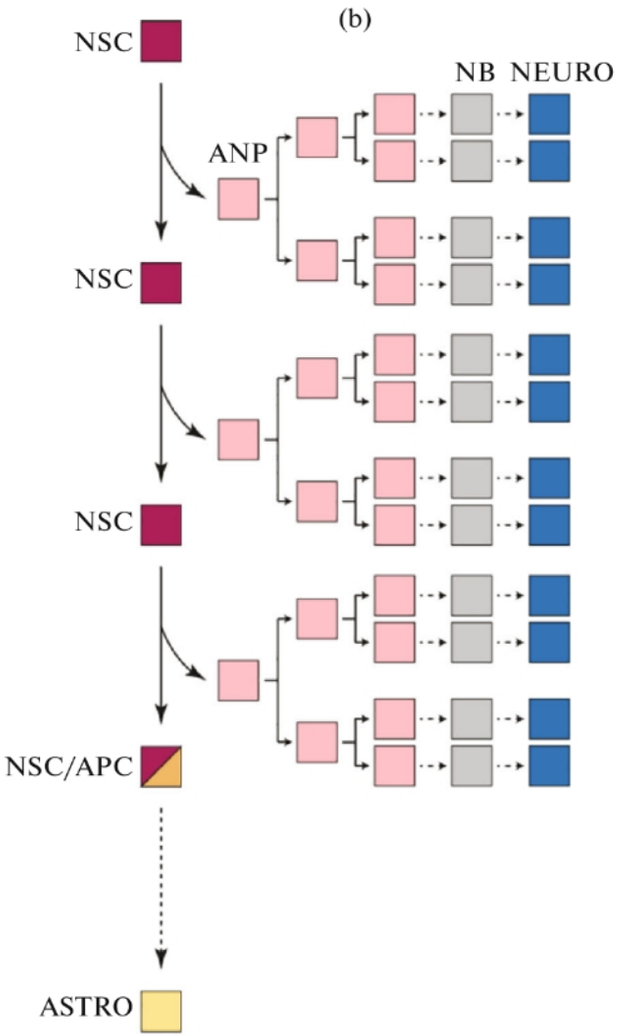
Patent No. 2774032 (14.06.2022)

Method for increasing the effectiveness of ionizing radiation on melanoma

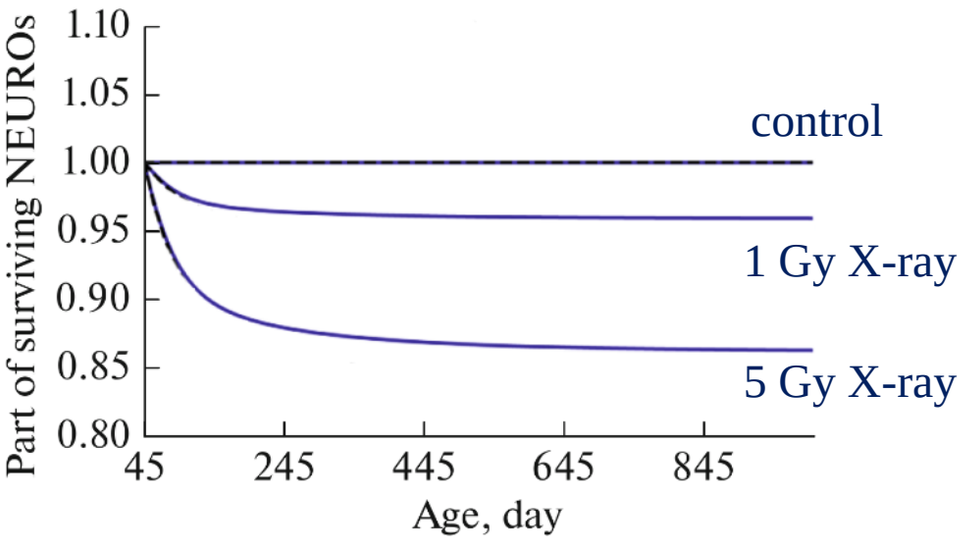
Zamulaeva I.A., Boreyko A.V., Bugay A.N., Kaprin A.D., Koryakin S.N., Krasavin E.A., Matchuk O.N., Mosina V.A., Selivanova E.I., Chausov V.N.

Mathematical Model of a Radiation-Induced Neurogenesis Impairment

Model of asymmetric division of neural stem cells in mice



NSC – neural stem cells,
NSC/APC – astrocyte progenitors,
ASTRO – astrocytes,
ANP – amplifying neural progenitors,
GB – glioblasts,
NB – neuroblasts;
NEURO – mature neurons.



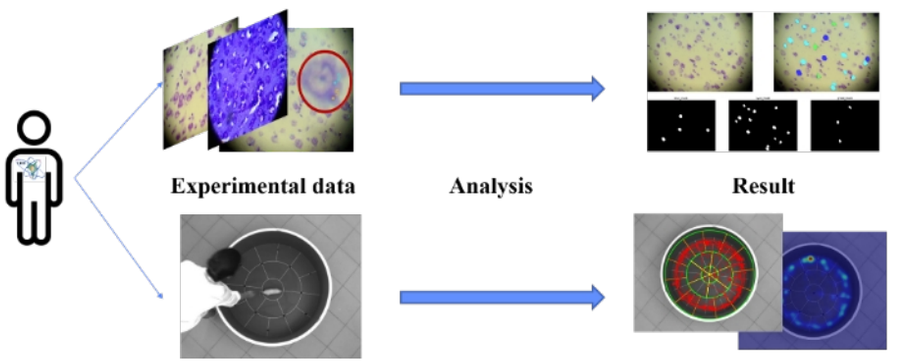
The proportions of surviving mature neurons, astrocytes, and oligodendrocytes in mice brain after exposure to X-ray radiation have been calculated for the first time.

Glebov A. A., Kolesnikova E. A. Bugai A. N. // Phys. Part. Nuclei Lett. 19, 422–433 (2022).

BIOHLIT information system for radiobiological studies

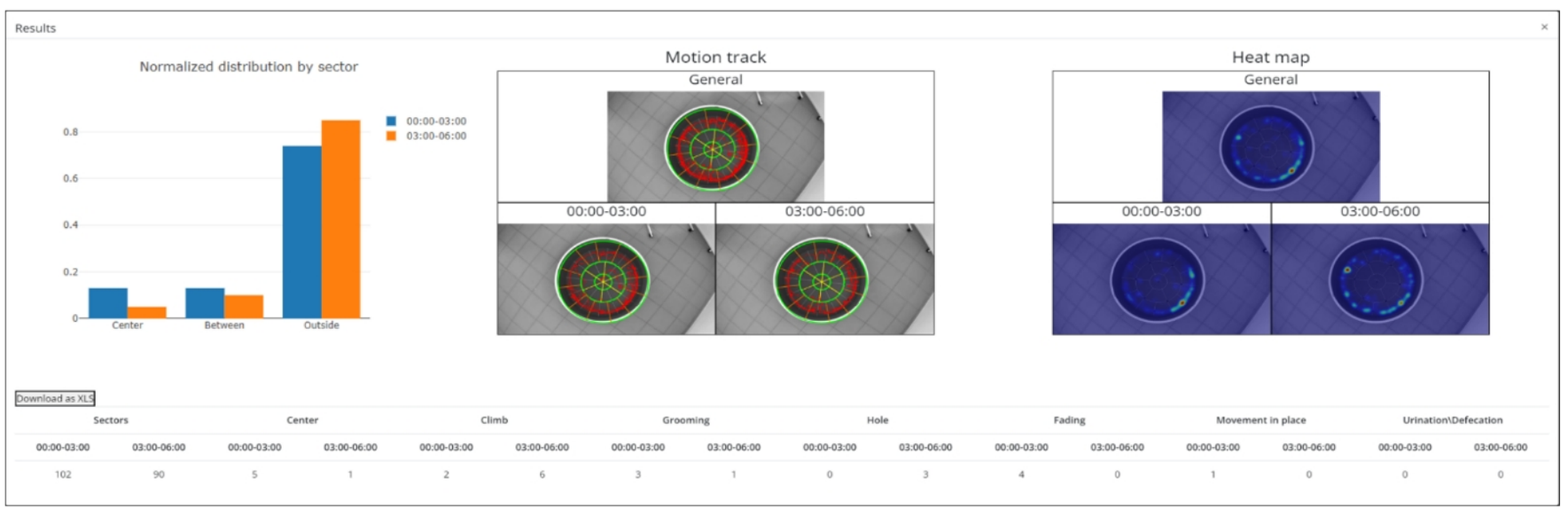
The information system allows one to store, quickly access and process data using a stack of neural network and classical algorithms of computer vision, providing a wide range of possibilities for automating routine tasks. It gives an increase in productivity, quality and speed of obtaining results.

Conceptual scheme of the service



Developed algorithms:

- ✓ algorithms for the automated marking of the field of experimental setups,
- ✓ algorithms for tracking the animal's position in experimental setups of different types,
- ✓ algorithms for evaluating the animal's behavioral patterns.



The obtained information is stored in different forms:

- visualized track of the animal's movement,
- video file with tracking the animal's position,
- heat map by sectors,
- file that stores all the information for subsequent statistical analysis.

Building research and technology cooperation with partners

The **ARIADNA** research programme was carefully reviewed at the number of dedicated seminars and panel discussions.

Three new collaborations on applied research are established. Statuary documents of collaborations are developed and agreed with partner organizations.

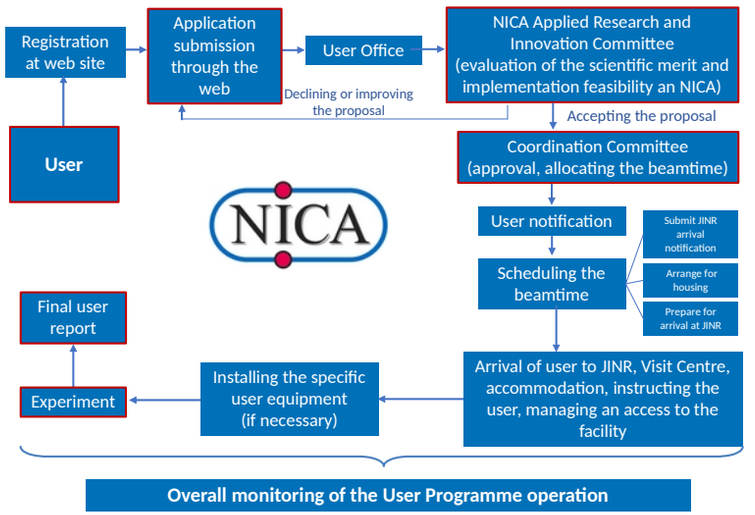
Several organizations have signed Letters of Intent and MoUs to enter ARIADNA collaborations.

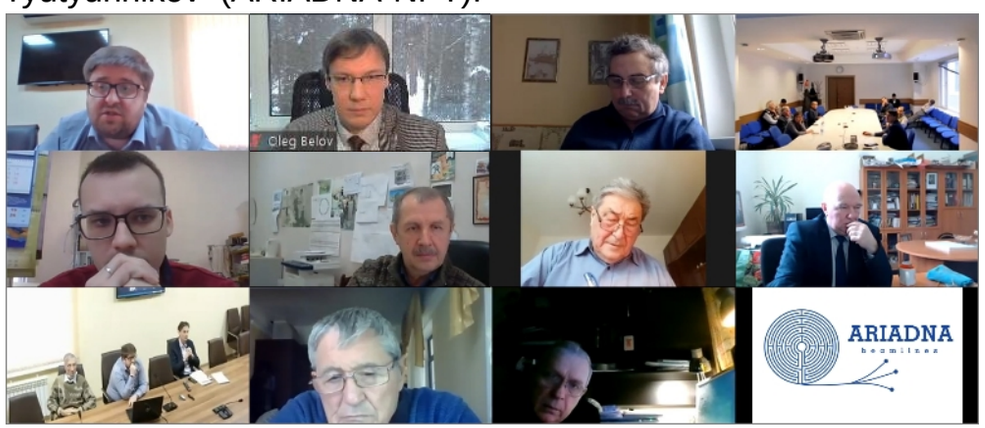
First working package with proposals to apply for the beamtime is collected.

Acting spokespersons of the collaborations are assigned: Oleg Belov (ARIADNA-LS), Mikhail Novikov (ARIADNA-MSTE), Sergei Tyutyunnikov (ARIADNA-NPT).

24 December 2021. Meeting with National Medical Research Radiological Centre of Russia

DEVELOPMENT OF THE ARIADNA USER PROGRAMME CONCEPT AND AN ELECTRONIC SUBMISSION SYSTEM





26 January 2022. International seminar on formulating the research programme in life science and radiation material science

28 June 2022. Meeting with representatives of partner organizations intending to enter ARIADNA collaborations

SEARCH FOR INDUSTRIAL PARTNERS FOR JOINT R&DS IS ALSO IN PROGRESS

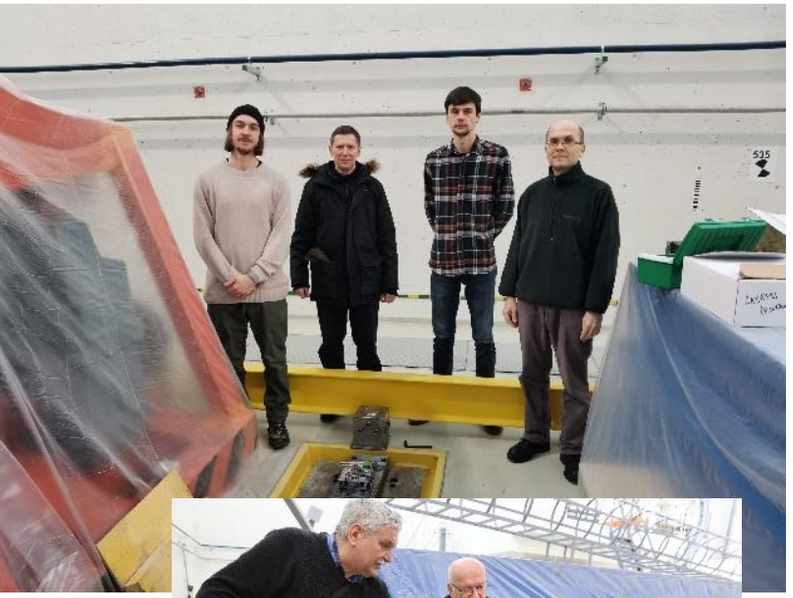
Angular microseismic activity monitoring in the MPD hall of the NICA collider

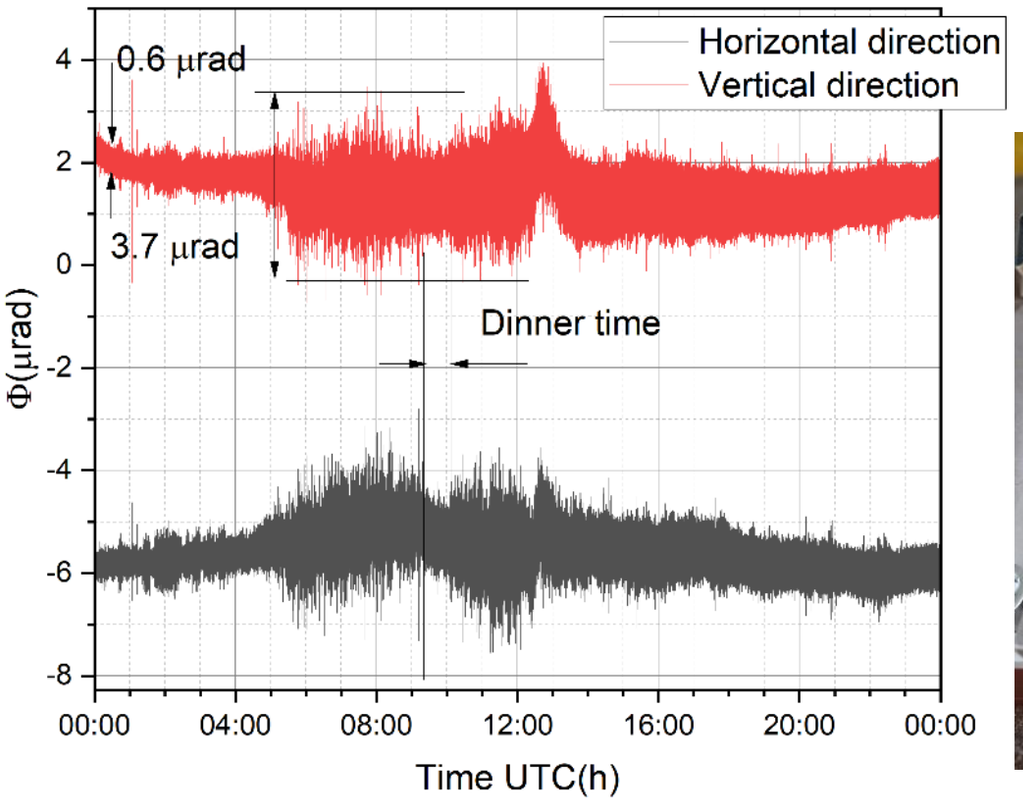
Two Compact Precision Laser Inclinometers (CPLI) were installed in the MPD hall in spring 2022.

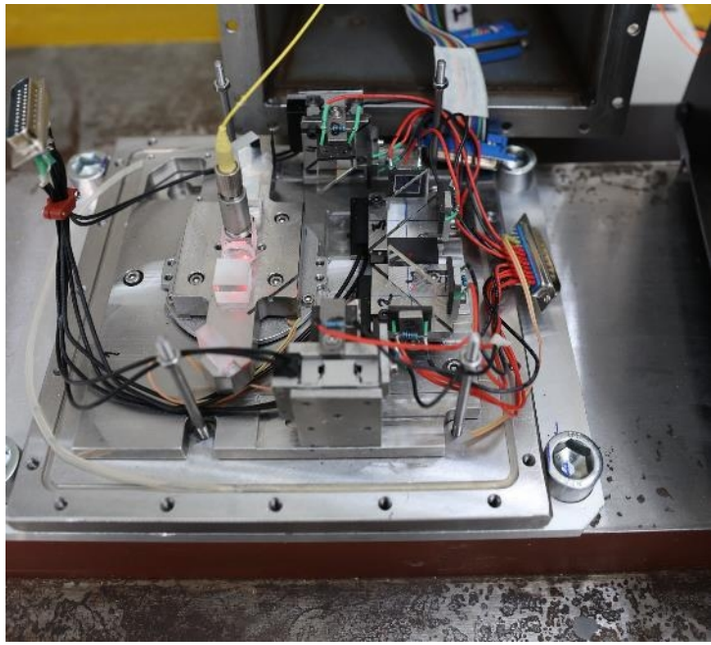
Data on microseismic activity of an industrial nature have been obtained, and the amplitudes of the angles of floor oscillations in the MPD hall have been determined.

Monitoring of oscillations of the MPD hall base and supports of the magneto-optical elements of the NICA collider will be continued with the installation of additional MPLs.

In the future, the largest microseismic noises sources will be defined and the compensating feedbacks are going to be implemented for the accelerator elements to stabilize the beam orbits and the region of their interactions.



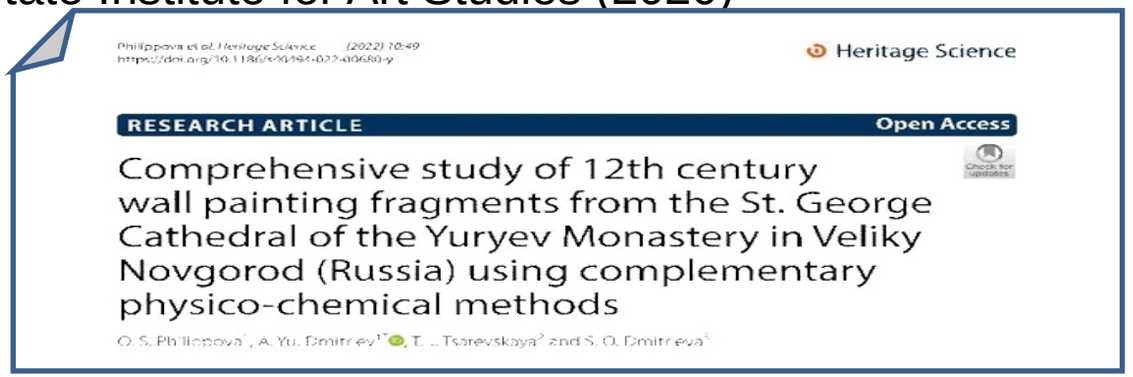




Collaboration of GNAA FLNP JINR with organizations of the Ministry of Culture of Russia

Cooperation agreements with:

1. State Institute for Art Studies (2020)


Heritage Science

RESEARCH ARTICLE Open Access

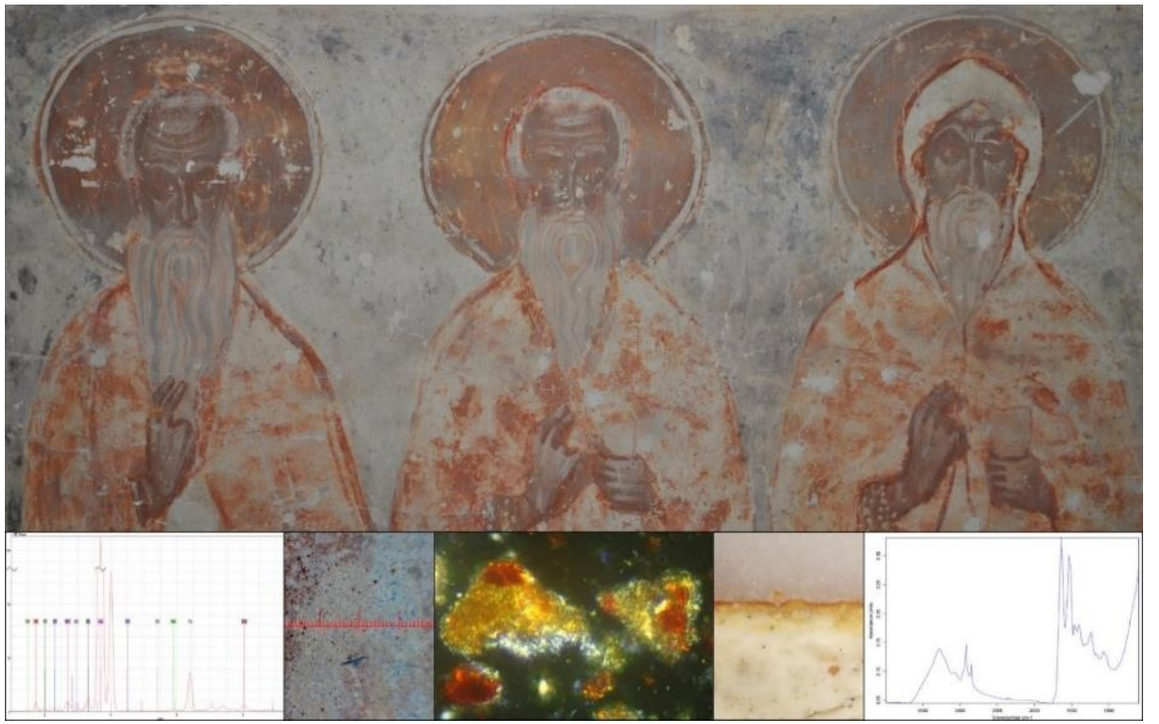
Comprehensive study of 12th century wall painting fragments from the St. George Cathedral of the Yuryev Monastery in Veliky Novgorod (Russia) using complementary physico-chemical methods

2. Interregional Agency for Scientific Restoration of Works of Art (2022)

   Physico-chemical research of the 14th century wall painting for development of the restoration project of the Nativity of the Most Holy Theotokos Cathedral of the Snetogorskiy Convent in Pskov

3. The Moscow Kremlin State Historical and Cultural Museum and Heritage Site (2022)

   The joint work plans include a study of the monumental painting of the Assumption Cathedral in the Moscow Kremlin

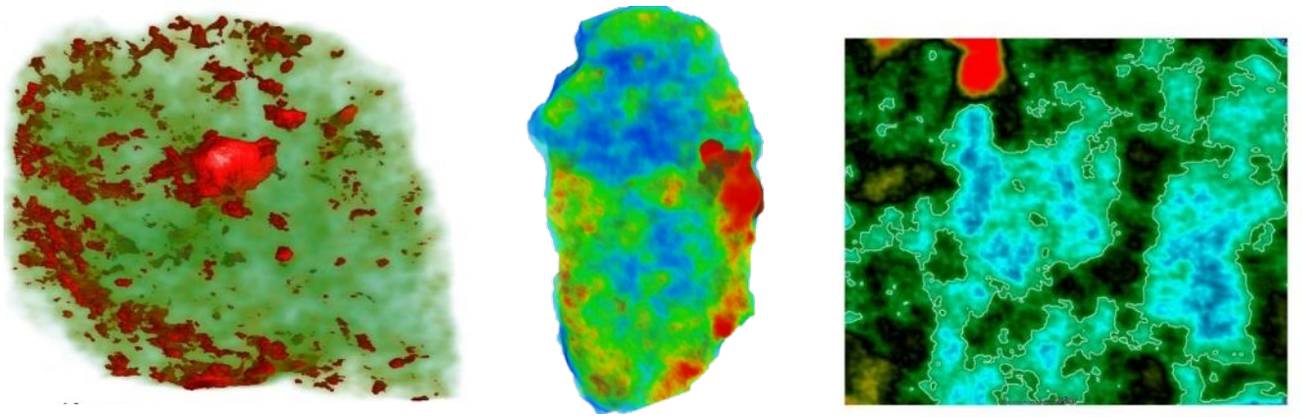


Research methods:

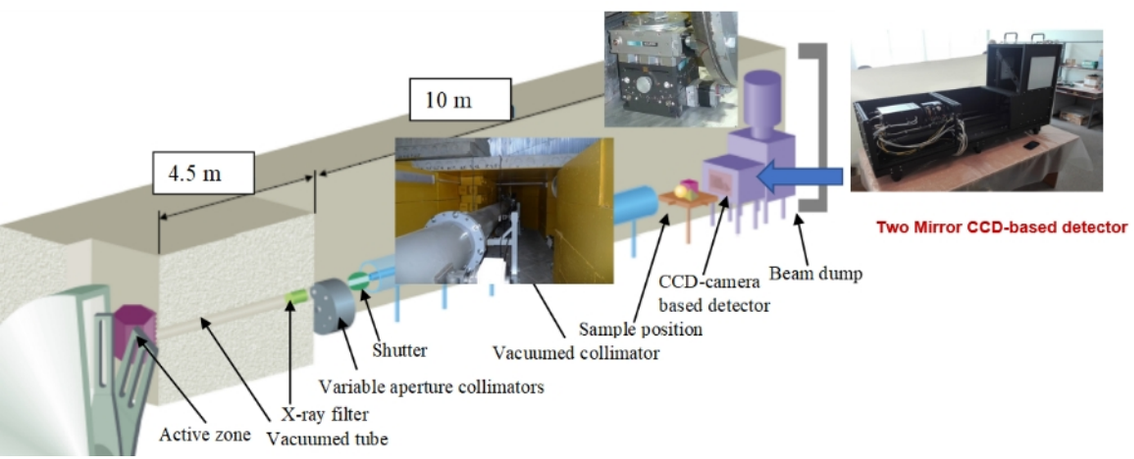
1. Elemental analysis:
   - Neutron activation analysis
   - Prompt-gamma activation analysis
   - X-Ray fluorescent analysis
2. Molecular and mineral analysis
   - Infrared spectroscopy
   - Raman spectroscopy
3. Microscopic methods
   - Stratigraphy
   - Polarized microscopy
   - Scanning electron microscopy with EDX analysis and mapping
4. Drop chemical analysis

The neutron tomography studies of Kunya-Urgench ("Turkmenbashi") meteorite

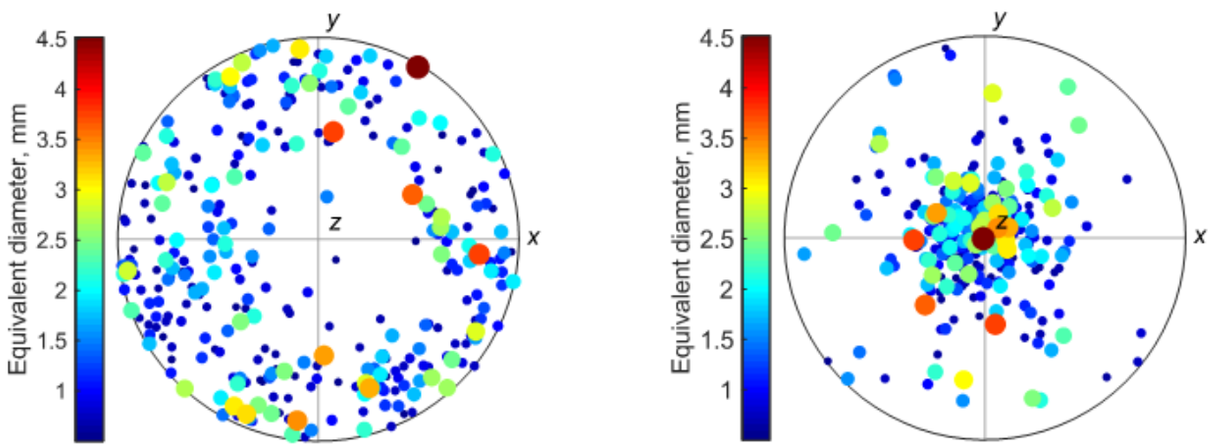
TOP-10 of the world largest meteorites



Neutron tomography model of Kunya-Urgench meteorite with metal inclusions



Neutron radiography and tomography facility, IBR-2



The polar plots of orientation of Fe(Ni) metal grains inside of meteorite

Kichanov S. E. et al. // Meteoritics & Planetary Science 1–10 (2022), doi: 10.1111/maps.13903

Using CPLI for Long-Term Earthquake Prediction

In Armenia, the International Geophysical Center "Garni Geophysical Observatory" hosts two PLIs. Angular microseismic activity is being monitored in the Armenian Highlands. In 2022, it is planned to modernize one MPLI and in subsequent years to create a network of several CPLIs in order to determine the zones of accumulation of seismic energy and predict earthquakes.

An agreement was signed between JINR and the Institute of Seismology of the Academy of Sciences of the Republic of Uzbekistan on the creation of a network of several CPLIs for long-term monitoring of changes in the Earth's surface for earthquake prediction.

JINR signed an agreement with the Kamchatka Branch of the Federal Research Center "Unified Geophysical Service of the Russian Academy of Sciences" and Kamchatka State University named after V.I. Vitus Bering on the start of work on forecasting earthquakes and volcanic activity on the Kamchatka Peninsula. Delivery of CPLI to Kamchatka and joint monitoring activities are planned.

JINR is planning common works with the Center for Geophysical Monitoring of the National Academy of Sciences of the Republic of Belarus on monitoring microseismic activity on the territory of the Republic of Belarus.

Linear electron accelerator Linac-200 – a new basic facility of DLNP

Purposes:

1. **R&D of elementary particle detectors** for
   - experiments at the NICA collider: for MPD, SPD, beam diagnostics;
   - external experiments – XFEL (LUXE), SPS CERN (AMBER).
2. **Generation and acceleration of "twisted“ electrons** together with ITMO.
3. **Generation and use of terahertz radiation.**
   - Search for new methods and design of equipment for the diagnosis of electron beams ((within the framework of the international collaboration FLAP (together with the University of London, AS, Belgorod University, Tomsk Polytechnic University, etc., there are more than 10 institutes in total).
   - Radiobiological research (in conjunction with LRB).
4. **Educational program, experiments on photonuclear reactions, irradiation of samples for radiation hardness, etc.**

6th International Workshop on Deep Learning in Computational Physics (DLCP-2022)

DLCP 2022

6-8 July 2022

Machine Learning in Particle Astrophysics and High Energy Physics	• ML methods in particle astrophysics and HEP. • Fast event generators based on ML for modelling of physics phenomena. • Multi-messenger data analysis of experimental data. • Application ML for data analysis in LHC, NICA, TAIGA.
Modern Machine Learning Methods	• Convolutional neural networks. • Recurrent neural networks. • Graph neural networks. • Modern trends in machine learning.
Machine Learning in Natural Sciences	• Biology and bioinformatics. • Engineering sciences. • Climate prediction and Earth monitoring.
Machine Learning in Education	• Machine learning in High education. • Outreach knowledge in machine learning.

More than **130 scientists** (90 in person, over 40 remotely) from research centers of **India, Kazakhstan, Mongolia, Poland, Romania, Serbia, Slovakia, Turkey, Uzbekistan** took part in the workshop. **Russia** was represented by participants from 15 universities and research centers.

International Conference on Quantum field theory, high-energy physics, and cosmology

18 – 21 July, BLTP JINR

More than 200 scientists from research more than 30 research centers and Universities of JINR member states and other countries discussed hot topics in Quantum field theory and gravity, collider physics and 3D hadron structure, QCD at high temperature and density, neutrino physics and non-accelerator physics, Dark matter and cosmology.

JINR Dissertation Councils: recent news

- Since 1 September 2022, the JINR Dissertation Councils resumed their work. Activity of the Dissertation Councils was paused in the period of 24 to 31 August 2022 to re-register for the new set of scientific specialities, officially introduced in Russia. The membership of the Dissertation Councils was also updated. The submission of dissertations is now opened again.

- A new speciality "Low temperature physics" in Technical Sciences has been added to the Dissertation Council for Particle Physics at VBLHEP.

- The Dissertation Council for Nuclear Physics at DLNP has introduced the speciality "Charged Particle Beam Physics and Accelerator Engineering" in the Physics and Mathematics.

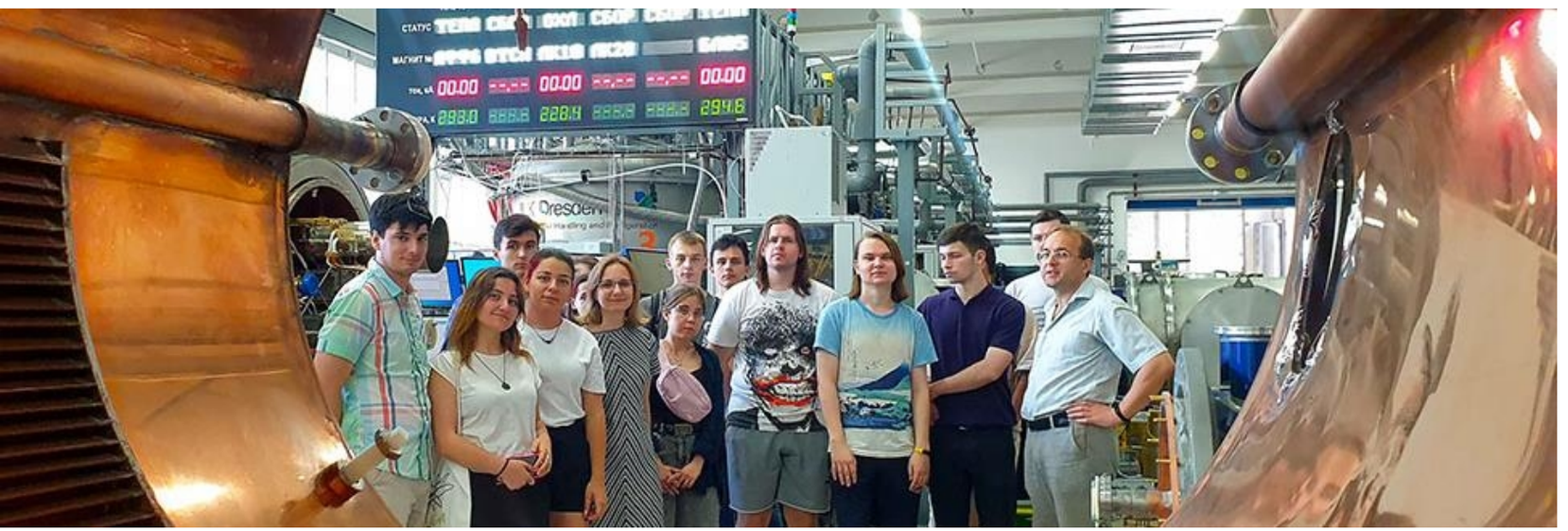
- In the beginning of this year, the Regularities on Conferring the Academic Degrees at JINR were also updated according to the legislation in force. 11 theses are already defended according to the updated Regulations.

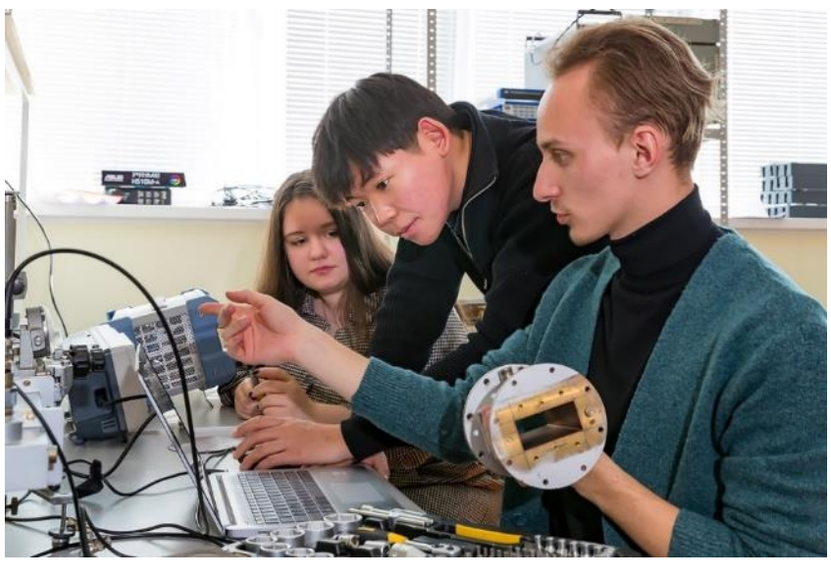
Total Score:

Since 1 September 2019, when JINR started implementing the right to award academic degrees independently, 59 Full Doctoral and 13 PhD theses were defended.

Student programmes: back to the on-site format

- **JINR-attached** undergraduate and postgraduate **students** (over 200 from 7 universities)
- **International Practice** for students from Egypt (24 participants)
- **START** summer session (47 participants from 10 countries)
- **INTEREST** (2 waves in 2022, 80 participants from 22 countries)
- **Engineering training** for students (13 FEFU, Vladivostok, 14 Dubna University, 2 MEPhI, Obninsk)





Service for planning and logging excursions at JINR https://jinrex.jinr.ru

MLIT, together with the UC, developed a service for planning and logging excursions at JINR.

Main functions

COORDINATE THE CONDUCT OF EXCURSIONS

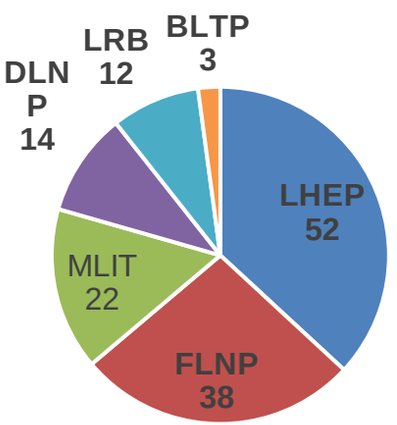
SAVE INFORMATION

MONITOR THE WORKLOAD OF THE VISIT POINTS

RECEIVE STATISTICS

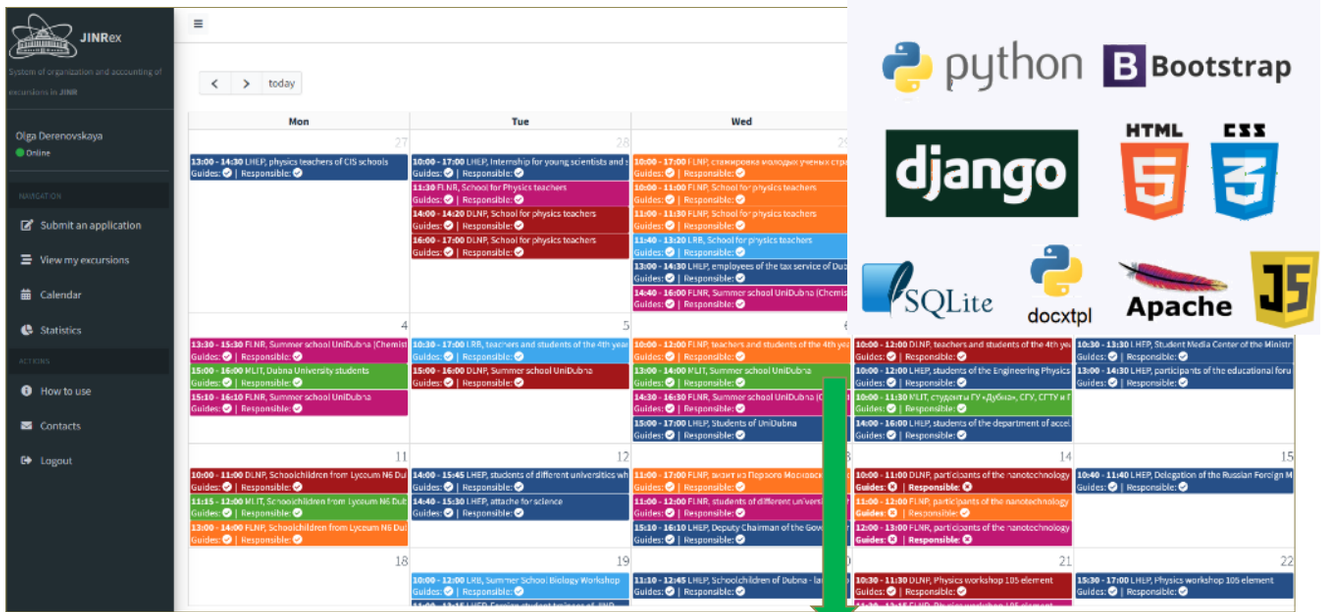
The service provides summary information about all ongoing, planned and completed excursions and automatically sends email notifications about all important events.

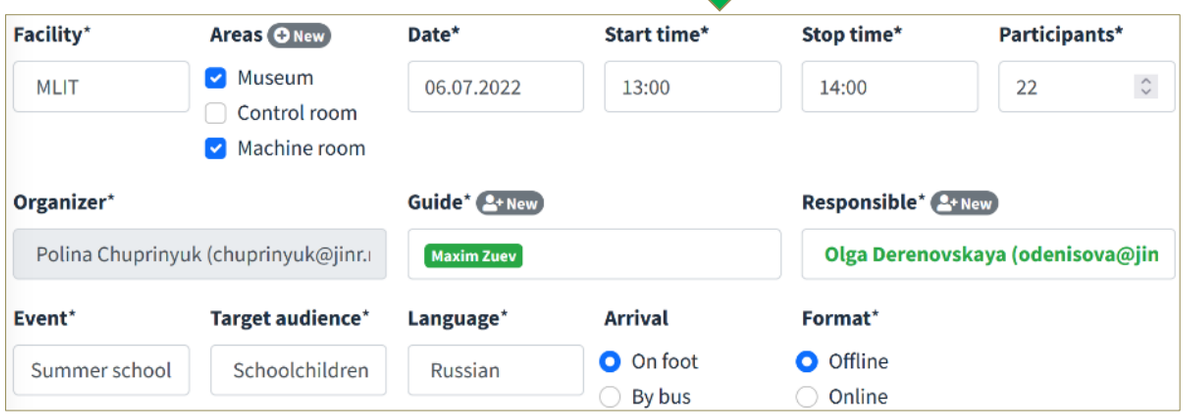
Total number of excursions in April-August 2022



Used technologies

python Bootstrap django HTML CSS SQLite docxtpl Apache JS





Outreach activities

- **Collaboration with Universities (incl. JINR InfoCentres)**
  Series of online lectures and visits, live events (almost 50 events)

- **JINR Exposition**
  In Culture Centre Mir
  Permanent exhibition in the Dubna Museum
  opening on 29 July

- **Science Festivals**
  Geek Picnic
  «Element 105» workshop
  at the Multidisciplinary «Summer School»
  (20 students from 12 universities)

- **Information Screen support**

School students and teachers

- **XI Scientific School for Physics Teachers at JINR,** 20 participants from Russia and Armenia
- **Visit of school teachers** from Nizhny Novgorod
- **Offline excursions** for school students from Moscow, Vologda, Dubna, as well as for students from Vietnam (over 300 people)

Collaboration with the V.G. Kadyshevsky Lyceum

“Hackathon” robotics tournament, “Physics Days”, “English Language Week”

Moscow State University branch “Dubna” established and started the academic year!

On February 28, 2022, the RF Government amended the Charter of the Lomonosov Moscow State University (MSU): the branch of MSU was created in Dubna.

Two departments of the Faculty of Physics in Dubna: Department of Elementary Particle Physics and Department of Fundamental Nuclear Interactions. In the future, the range of areas of study will be expanded in cooperation with the RadioChemistry, Biology and Medicine, Data Science and other faculties of Moscow State UniversityThe branch in Dubna will use the opportunities of JINR, as an international organization, to establish links and use the best educational practices through participation in international scientific projects in order to train personnel for fundamental research in the JINR Member States.

On 2 September, as part of the launch of the opened MSU Branch in Dubna, students of the Departments of Elementary Particle Physics and Fundamental Nuclear Interactions met with their scientific advisors, leaders and lecturers of the Departments and the branch, as well as representatives of the JINR Directorate.

INTERNATIONAL ACTIVITY 2022

JINR Information Center network in progress

Meeting with Minister of Higher Education and Scientific Research of Egypt

1 September, Cairo:
Meeting with Minister of Higher Education and Scientific Research **Mohamed Ayman Ashour.**
Participants:

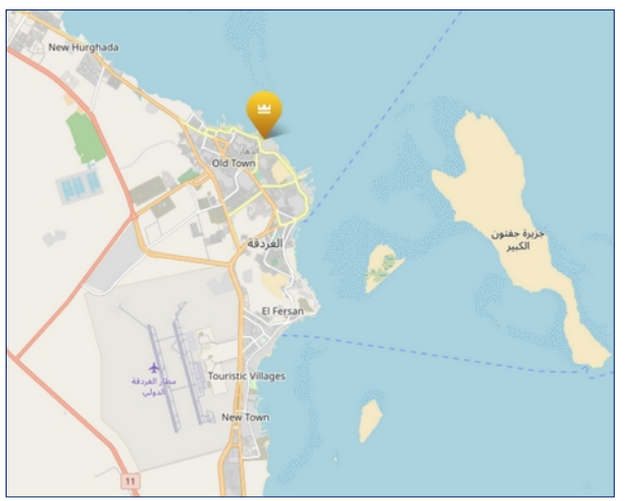
- Dr. Mahmoud Sakr, President of the ASRT
- Dr. Gina El-Feky, Acting Vice President of the ASRT;
- ICD Director Dr. Dmitry Kamanin;
- ICD Deputy director Anna Kotova.

Agenda of the meeting:
Development of cooperation between Egypt and JINR in the status of a full member.

Main highlights of the meeting:

- regular session of the Committee of Plenipotentiaries of the Governments of the JINR Member States in Egypt in November 2022;
- formation of an Egyptian scientific group at the institute;
- various formats of interaction, including Summer schools for schoolchildren and students, participation of Egyptian representatives in JEMS programs, etc.

Choice of the venue for FC and CP in November 2022: Hurgada



JINR delegation participated in INPC 2022

INPC 2022, Cape Town, 11-16 September

JINR delegation led by Director acad. Trubnikov and representing the Laboratories of Theoretical physics, Nuclear reactions and Radiobiology participated in the
28th International Nuclear Physics conference.

On the margins of the INPC the 21th JINR-RSA JCC was held.

21st meeting of the Joint Coordinating Committee of South Africa – JINR

JCC decisions: Developing and strengthening cooperation in the field of education, research and innovation.

The representatives of the delegation participated in the launch ceremony of South African Isotope Facility (SAIF) in iThemba LABS.

Participants from JINR:
G. Trubnikov, Director;
S. Nedelko, Chief Scientific Secretary;
D. Kamanin, ICD Director;
B.Sharkov, special representative of the Director;
S. Pakuliak, UC Director;
A. Kotova, JCC Secretary;
S. Mitrofanov, FLNR;
A.Guskov, Head of SPD collaboration

Participants from RSA:
C. Nksomani, NRF Deputy Executive Director;
I. Patel, DSI Deputy Director General;
R. Maharaj, NRF Executive Director;
S. Manoto, NRF Director;
K. van der Heyden, NRF Director;
Rudolf Nhodu, iThemba LABS;
S. Mokonoto, DSI;
N. Ditlopo, DSI.

Recent events in Serbia

19-22 September 2022 / World Conference on Basic Sciences and Sustainable Development (Belgrade)

IYBSSD 2022

V. Kekelidze, A. Bugay, A. Karpov, M. Frontasieva:

- NICA Project.
- Radiation and human brain: Problems on Earth and in deep space.
- Island of stability in the periodic table of chemical elements.
- Monitoring long-term and large-scale deposition of air pollutants based on moss analysis in the framework of the UNECE ICP Vegetation.

Program Committee, Co-Chair Nebojša Nešković, Secretary-General of WAAS and member of Scientific Council of JINR

8 September 2022/ Progress review meeting at Ministry of Education, Science and Technological Development of Serbia

M. Dukić-Mijatović, State Secretary **D. Kamanin,** JINR

Progress made on the **Action Plan signed at CP in Bulgaria in November 2021**.

Ways to develop cooperation with JINR.

12–16 September 2022 / Focus on Radiobiology

Institute for Biological Research “Siniša Stanković”, Vinča Institute

JINR team headed by Alexander Bugay, Director of LRB

The 4th International Meeting of the BRICS Working Group on Research Infrastructure and Megascience Projects

23 – 24 August, Novosibirsk

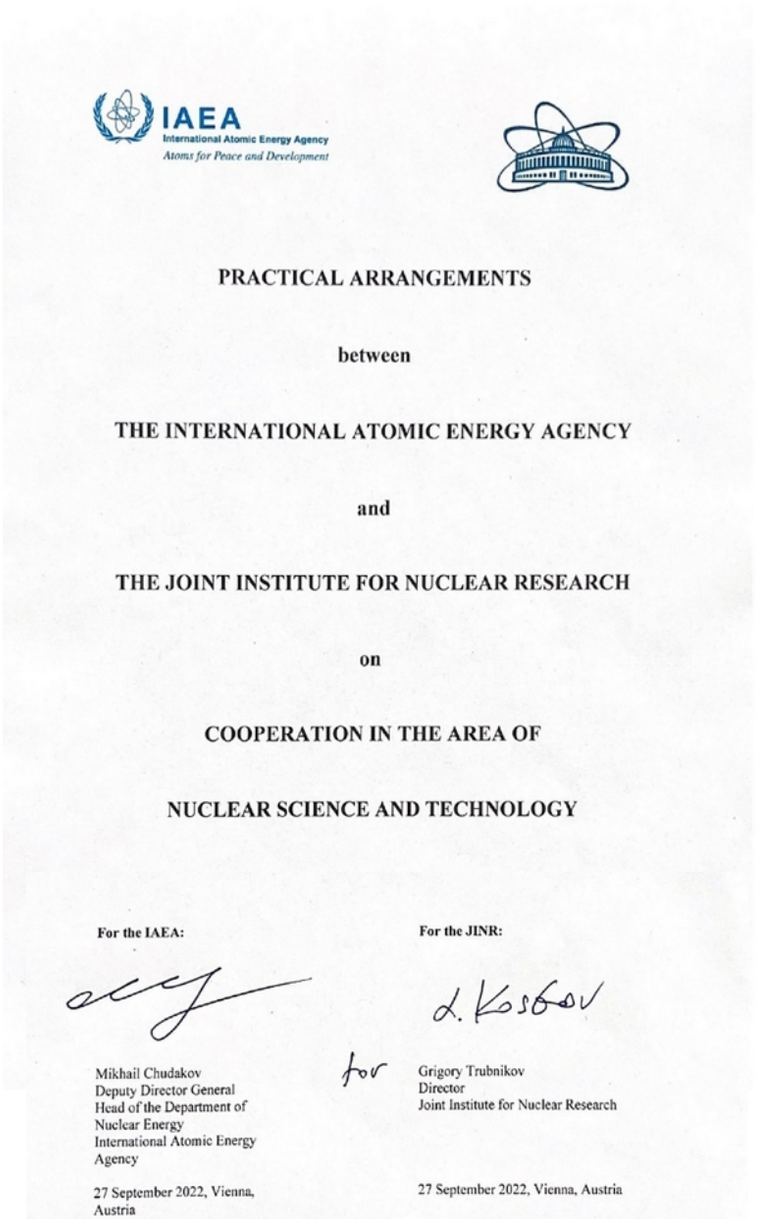
The two-day meeting brought together representatives of ministries, relevant state agencies and scientific organizations of the BRICS countries to discuss the Strategic Plan for development of the BRICS Global Research Advanced Infrastructure Network (GRAIN), which was the key topic of the event.

The invited JINR experts led by JINR Director Grigory Trubnikov shared Institute's unique experience in building-up international scientific cooperation at the frontiers of science using the megascience facilities.

Reinforsing JINR- IAEA cooperation

September 27, 2022

Signing of the new Practical Arrangements on the sidelines of the General Conference at the IAEA headquarters



IAEA
International Atomic Energy Agency
Atoms for Peace and Development

PRACTICAL ARRANGEMENTS

between

THE INTERNATIONAL ATOMIC ENERGY AGENCY

and

THE JOINT INSTITUTE FOR NUCLEAR RESEARCH

on

COOPERATION IN THE AREA OF

NUCLEAR SCIENCE AND TECHNOLOGY

For the IAEA:

Mikhail Chudakov
Deputy Director General
Head of the Department of
Nuclear Energy
International Atomic Energy
Agency

27 September 2022, Vienna,
Austria

for

For the JINR:

Grigory Trubnikov
Director
Joint Institute for Nuclear Research

27 September 2022, Vienna, Austria

The parties will cooperate on training, manpower development and infrastructure development in the following areas:

- Safe operation and utilization of nuclear research reactors and particle accelerators including expert support in establishment new facilities;
- Internet Reactor Laboratories for nuclear education and training;
- Applications of radiation and radiolabeled products in healthcare and industry;
- Nuclear Physics and nuclear data development for heavy ion, neutron and gamma induced reactions; and
- Cooperation in promoting nuclear information in industry and education and training on use of INIS Collection.

Thank you for your attention and support!