132th Session of the
JINR Scientific Council

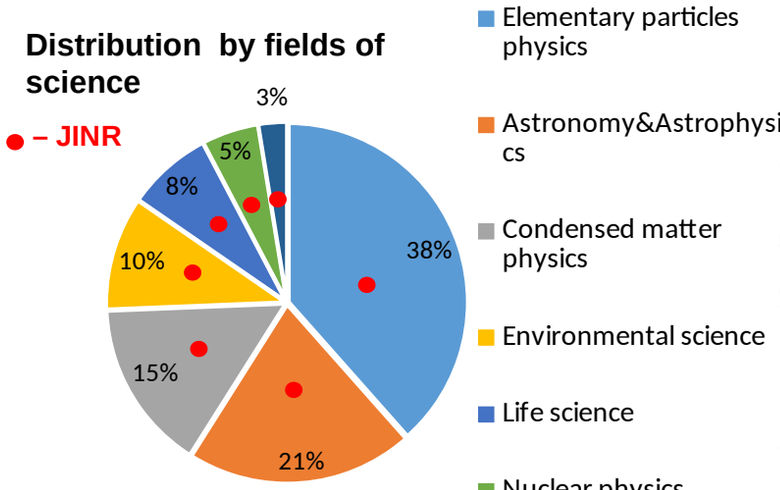
Draft Seven-Year Plan for the Development of JINR for 2024–2030

acad. Grigory V.Trubnikov

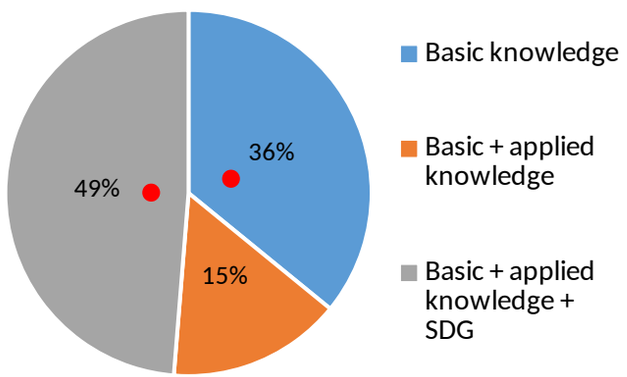
September 29-30, 2022

Global trends and JINR today

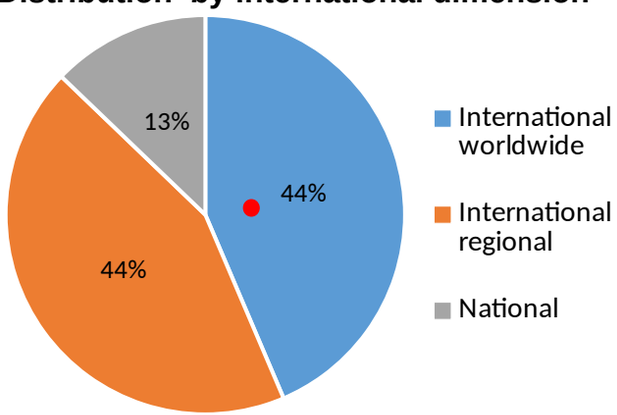
Distribution by fields of science



Distribution by mission



Distribution by international dimension



The statutory for JINR fields of science occupy a priority position in the world scientific agenda and development of a large research infrastructure.

The analysis shows that almost half of modern projects in the field of basic sciences have accompanying programmes of applied research aimed at sustainable development goals (SDG).

Worldwide international dimension, the multi-disciplinary scientific programme and large infrastructure projects of JINR harmoniously complement the global scientific agenda and the worldwide landscape of mega-science infrastructure, assuming, along with the main goals in the field of fundamental research, the achievement of certain SDG.

Large Research Infrastructures:

- Large Hadron Collider (CERN)
- European Spallation Source (ESS)
- Facility for Antiproton and Ion Research (FAIR)
- LBNF-DUNE (Neutrino experiment)
- Future Circular Collider
- SNOLAB (underground neutrino facility)
- European Synchrotron Radiation Facility (ESRF)
- Cubic Kilometre Neutrino Telescope (KM3NeT)
- International Linear Collider
- NICA (Nuclotron-based Ion Collider fAcility)
- SCT (Super charm-tau factory)
- Amundsen arctic research vessel
- Extremely Large Telescope (ELT)
- Square Kilometer Array (SKA)
- **…**

About **40 LRI** in a **wide range of scientific fields** that meet the criteria for a large research infrastructure (**complexity, scale, uniqueness, mission**), both operational and those under construction, as well as some planned ones – ICRI, GSF OECD, 2021

2030+ STRATEGY ARCHITECTURE

JINR DNA: International Research Topical Plan

INNOVATIONS
- Radiobiology
- Nuclear Medicine
- Material Science

DIGITAL JINR
- Machine Learning + Quantum Technologies
- Marketplace and Intellectual Procurement,
- HR Services for Employees

EDUCATION
- International MSU Branch "Dubna"
- JINR High School (UFTS)
- Kadyshevsky Lyceum

SOCIAL ENVIRON
- New Living District in Dubna
- Medicine: modern, digital, high-tech
- International Comfortable City Environment

STRATEGIC COMMUNICATIONS
- Science Diplomatic Club
- Scientific Communications, Outreach, Projects
- JEMS, Information Centers, etc.

JINR EXPO
- New Exhibition Hall
- VR Facility
- Art & Science Projects & Initiatives

JINR DOSCIENCE@DUBNA

SEVEN-YEAR PLAN FOR THE DEVELOPMENT OF JINR FOR 2024–2030

DEVELOPMENT OF A LARGE RESEARCH INFRASTRUCTURE

- NICA,
- MPD, SPD
- DRIBs-III (SHE, U-400R, DC-140, Radiochemical Lab Class-1)
- IBR-2M, NEPTUN
- BAIKAL-GVD

SCIENTIFIC PROJECTS, EQUIPMENT AND MEDIUM-SCALE INFRASTRUCTURE

- Elementary paricle physics and high energy heavy ion physics
- Nuclear physics
- Condensed matter physics
- Radiation research in life sciences
- Theoretical Physics
- Information technology
- Physics and technology of charged particle accelerators

DEVELOPMENT OF ENGINEERING INFRASTRUCTURE

INNOVATION ACTIVITIES

STRENGTHENING HUMAN RESOURCES

ORGANIZATION OF SCIENTIFIC ACTIVITY

DEVELOPMENT OF JINR AS INTERNATIONAL ORGANIZATION

STRATEGIC OUTRICH AND COMMUNICATIONS (IC, PR, GR)

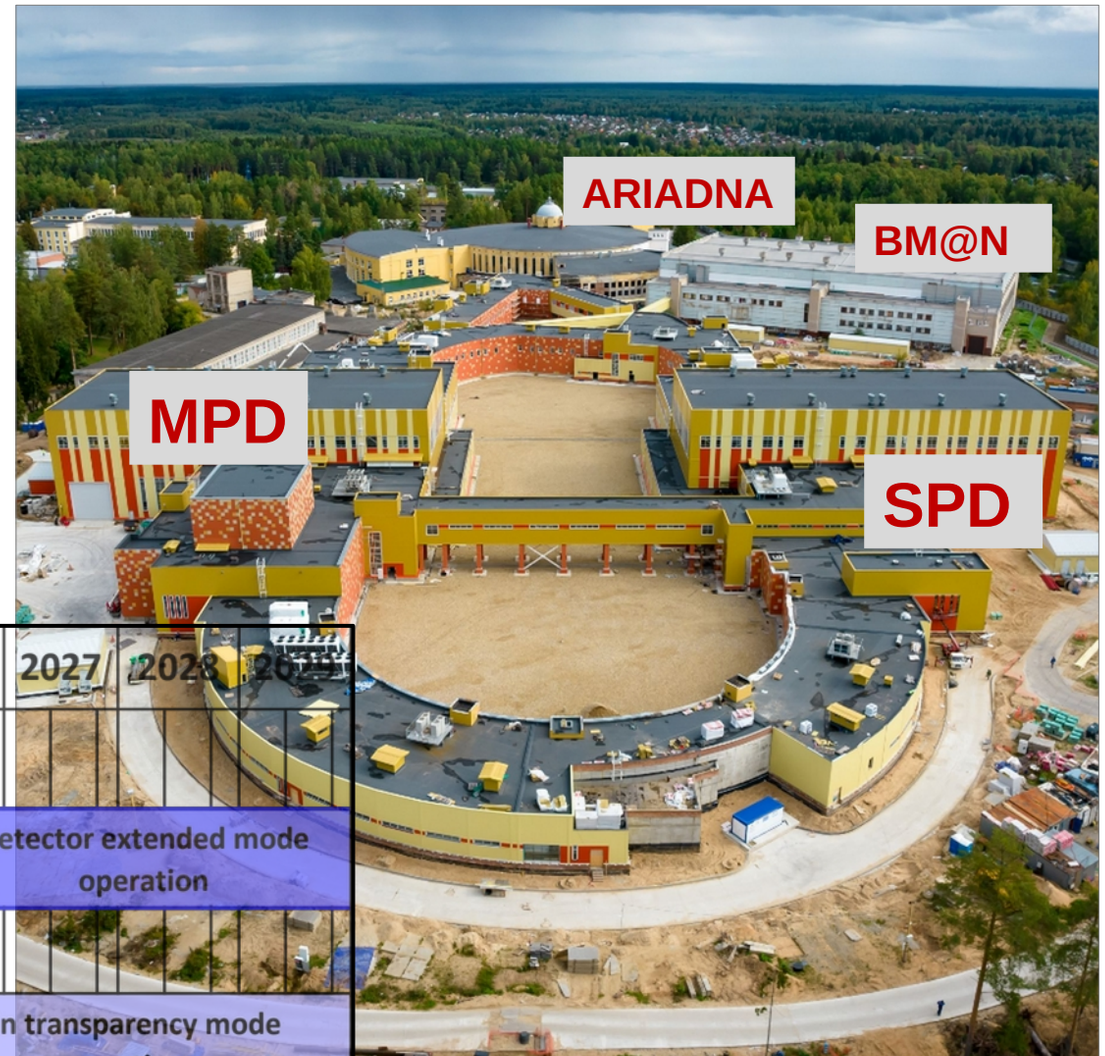
DIGITAL JINR

FINANCIAL SUPPORT

MONITORING THE IMPLEMENTATION OF THE SEVEN-YEAR PLAN AND THE STRATEGY OF DEVELOPMENT

Relativistic Heavy Ion Physics and Study of nucleon structure. Near and Long-Term Future

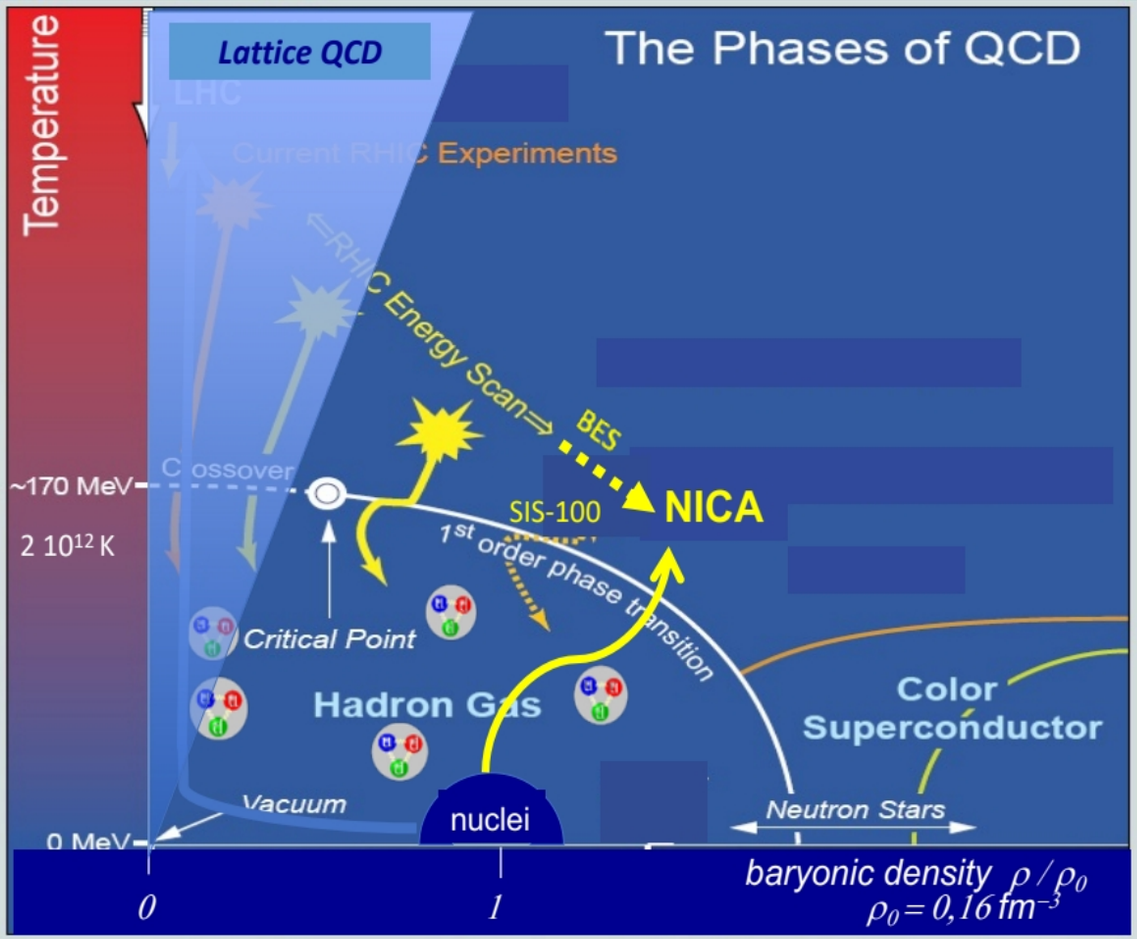
- The timely completion of the NICA project, its commissioning and steady and efficient operation.
- Completion of the detectors: **BM@N**, **MPD** and **SPD** at NICA and successful data taking over the decades to come. JINR will make significant contribution to the basic configuration of the SPD detector.
- After several years of running of MPD, an Upgrade is foreseen, responding to an increase in luminosity of NICA. Adding detectors in the forward region as planned.
- Studies of possible future extension of NICA for acceleration of electrons, opening new physics potential via e-p and e-A collisions.



	2022	2023	2024	2025	2026	2027	2028	20
NICA Collider commissioning		Commissioning runs						
MPD extended config. construction and opration			System design and production		Detector extended mode operation			
Consruction of NICA collider extended config.								
Prep. and start of polarized beam operation		SC-solenoids production and tests			Spin transparency mode operation			
SPD construction and commissioning	R & D, prototyping, testing			SPD systems production and assembly		SPD operation		
Nuclotron modernization	R & D, prototyping, testing			Magnets production, ring assembly		New Nuclotron operation		

NICA

BM@N & MPD



MPD covers this interesting region providing powerful combination of **large luminosity, collision energy and system size scan** (including isobars), large and consistent **acceptance,** full **centrality** range.

NICA is complementary to existing and planned world facilities (FAIR, SPS), and will be a natural and necessary continuation and significant expansion of studies at RHIC BES.

SPD

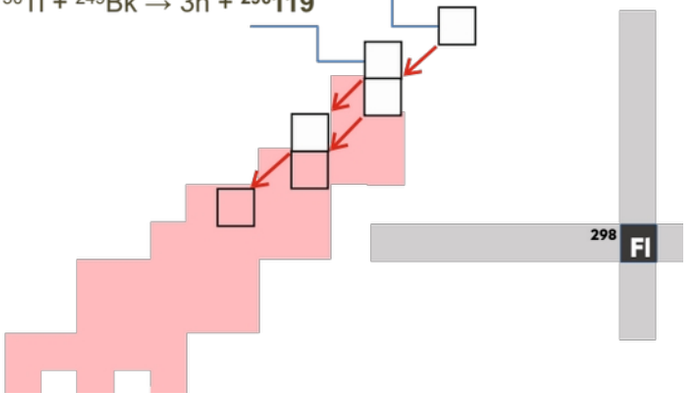
The SPD experiment is aimed at studying the properties of strong interactions in the nonperturbative region, at measuring the proton and deuteron spin structures, and at the development of a three-dimensional model of the nucleon. It is unique in its methodology, breadth of coverage and variety of tasks.

Experimental facility	SPD @NICA	RHIC	EIC	AFTER @LHC	SpinLHC
Scientific center	JINR	BNL	BNL	CERN	CERN
Operation mode	collider	collider	collider	fixed target	fixed target
Colliding particles & polarization	$p^{\uparrow}$-$p^{\uparrow}$ $d^{\uparrow}$-$d^{\uparrow}$ $p^{\uparrow}$-d, p-$d^{\uparrow}$	$p^{\uparrow}$-$p^{\uparrow}$	$e^{\uparrow}$-$p^{\uparrow}$, $d^{\uparrow}$, $^3He^{\uparrow}$	p-$p^{\uparrow}$,$d^{\uparrow}$	p-$p^{\uparrow}$
Center-of-mass energy $\sqrt{s_{NN}}$, GeV	≤27 (p-p) ≤13.5 (d-d) ≤19 (p-d)	63, 200, 500	20-140 (ep)	115	115
Max. luminosity, 10^{32} cm^{-2} s^{-1}	~1 (p-p) ~0.1 (d-d)	2	1000	up to ~10 (p-p)	4.7
Physics run	>2025	running	>2030	>2025	>2025

Synthesis of new elements @ SHE Factory

$^{54}Cr + {}^{248}Cm \rightarrow 3n + {}^{299}120$

$^{50}Ti + {}^{249}Bk \rightarrow 3n + {}^{296}119$



TARGETS:

- Rosatom and ORNL (USA): *Isotopically enriched heavy actinide materials;*
- Radiochemical Lab of class 1

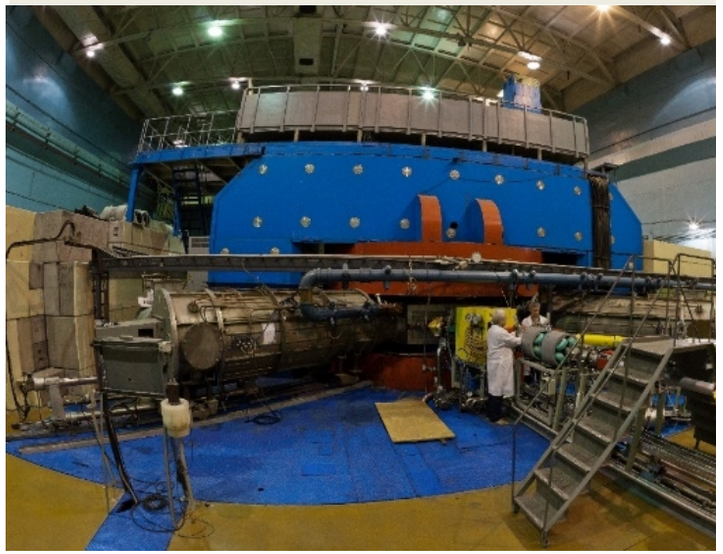
BEAMS:

- Production of high-intensity beams of ^{50}Ti, ^{54}Cr and others
- New ECR-28 GHz (2024)

Radioactive Ion-Beam research

Basic facility: U-400M

Ambitions: E up to 80AMeV, I x 2

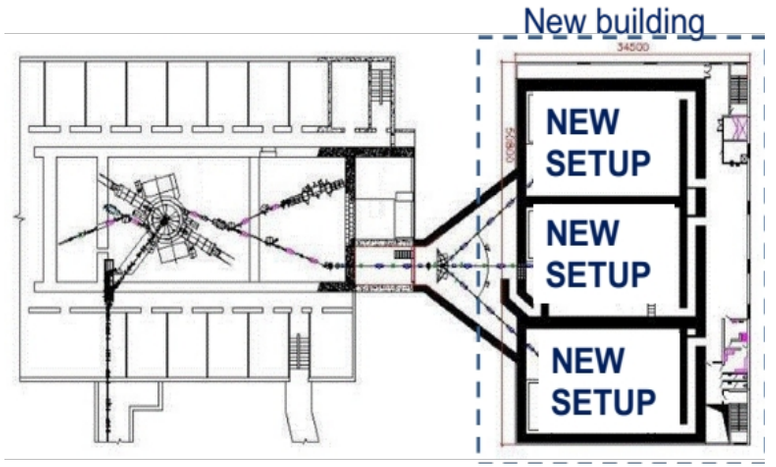


Operation from end of 2023

- Nucleon halo, neutron skin;
- Exotic decays: b-delayed, 2p,2n radioactivity;
- Soft excitation mode;
- New magic numbers;
- Spectroscopy of exotic nuclei;
- Cluster states;
- Reactions with RIBs;
- Astrophysical applications.

Nuclear reaction studies @ U-400R

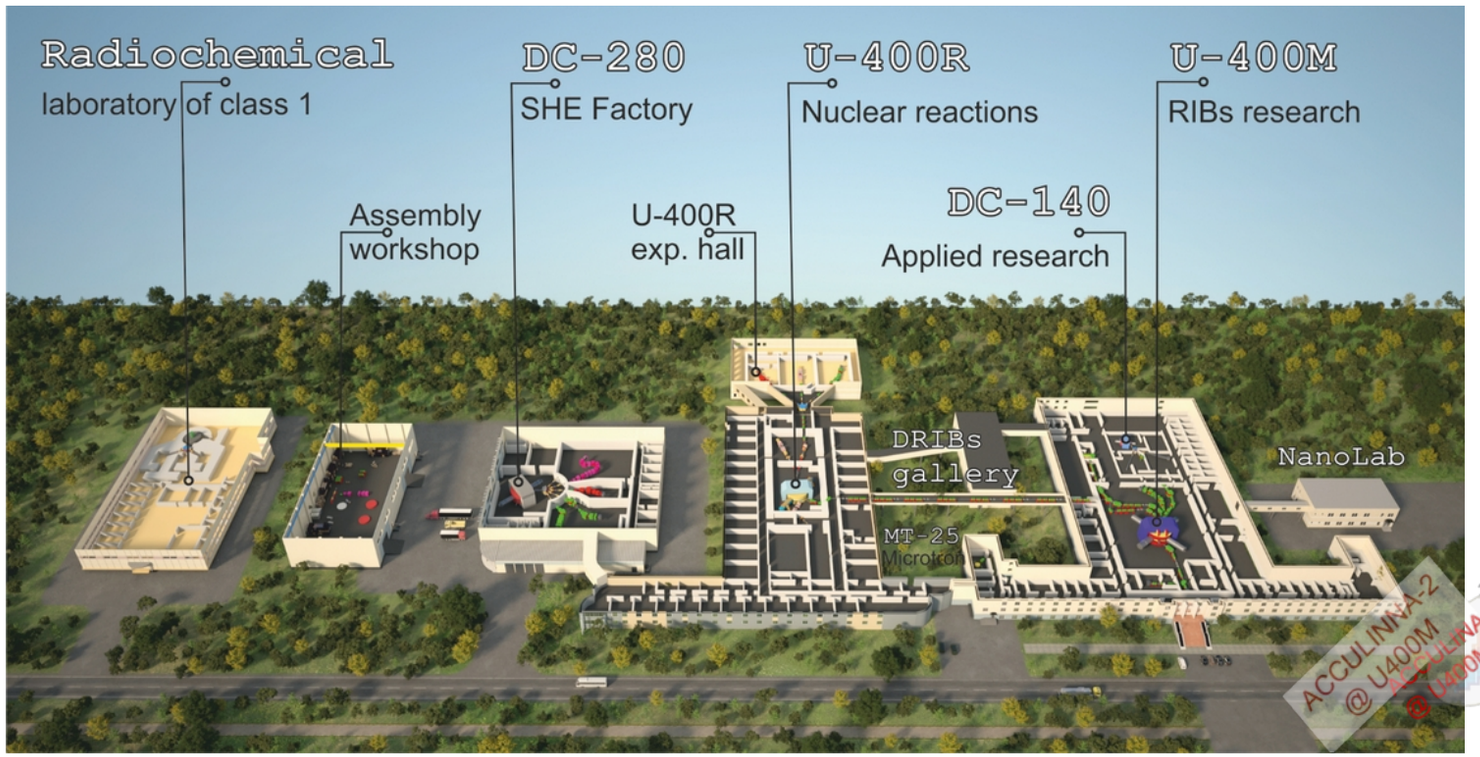
Ambitions: up to 2.6 mA (U-beam) 10^{10-11}, smooth energy variation



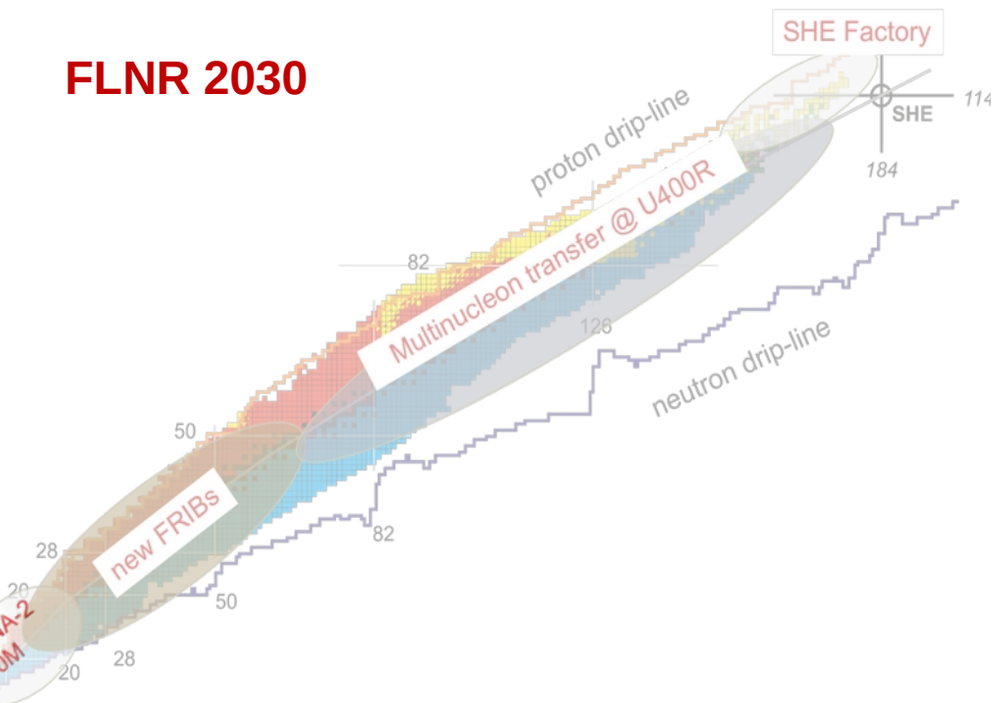
Upgrade in 2023-25. Operation from 2026

- **Multinucleon transfer reactions:** *Production of new isotopes of heavy,SH nuclei; Study of properties of new nuclei.*
- **Decay spectroscopy of heavy nuclei:** *actinides and light transactinides*
- **Study of fusion-fission and quasifission reactions leading to heaviest nuclei**
- **Low-energy and spontaneous fission of heaviest nuclei**
- **Study of nuclei at high excitation energies (several hundred of MeV)**

	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		Design		Construction			Operation	
New RIBs complex	Feasibility Studies, Pre-Design			International Evaluation, Design				Start of construction **(Funding is required)**	



FLNR 2030

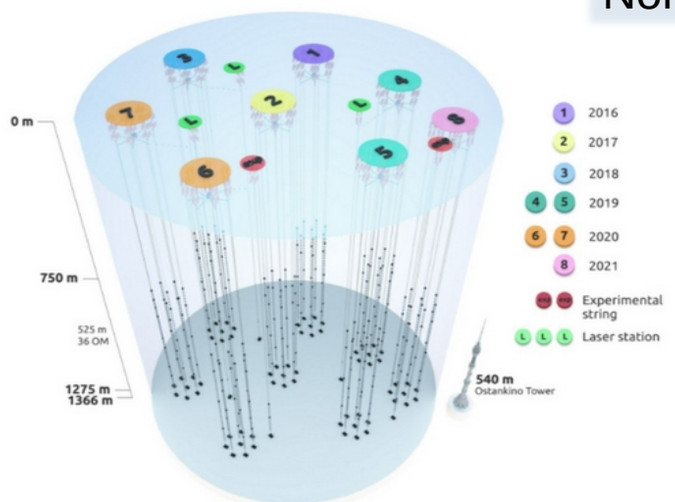


NEUTRINO AND ASTROPARTICLE PHYSICS

PROJECT BAIKAL-GVD

Baikal-GVD: Identification of astrophysical sources of ultra-high energy (exceeding tens of TeV) neutrinos. Actuality: their sources are still unknown. The identification of sources will help to elucidate mechanisms of galaxies creation and evolution.

Main advantage of Baikal-GVD: pure and t-stable water. Angular resolution of muon tracks 0.3-0.5 grad (IceCube: 0.5-1); angular resolution of shower direction 2-3 grad (IceCube: 15);
Northern detectors have better view to the Galaxy center.



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
2023	12	3456
2024	14	4032

Baikal-GVD: flagship experiment of JINR with a leading role in the collaboration. Gain new experience in the detector design, construction, deployment, maintenance, simulation and data analysis. Expected breakthrough discoveries.
More dense configuration, + light sensors, fiber vs Cu, smart data transmission, + radio-antennas → New Quality and Efficiency.

Global competence in 2030 horizon: Ice-Cube: 2025-2034 ⟶ 8km³ (w RA 100 km3 => PeV); Km3NET: ⟶ few km³; Baikal-GVD (Phase II) = new type of OM, trigger-less operation, ML&AI, ⟶ ~ 10 km³ ? (CDR in 2024).

Condensed Matter Physics, Neutron Physics. Priority research in 2024-2030

THE IBR-2 FACILITY

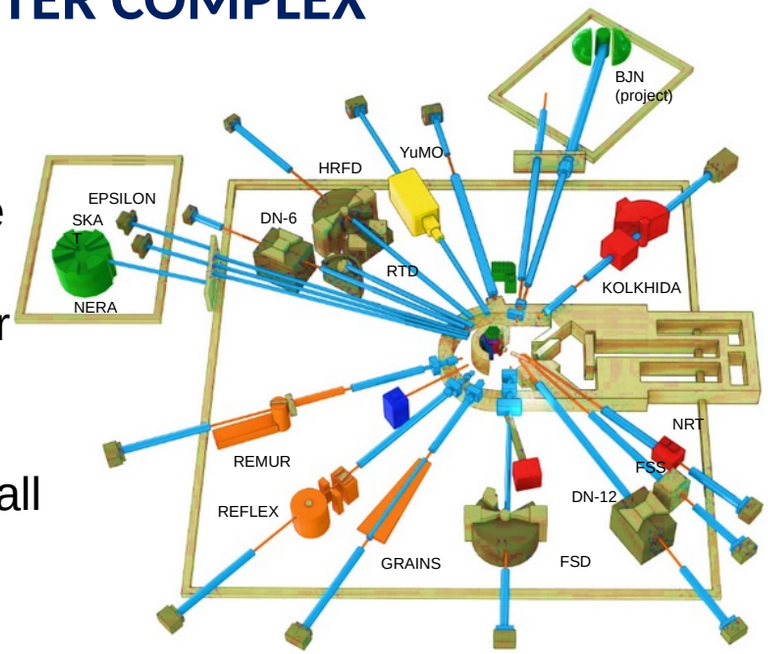
The service life of the core IBR-2 reactor is expected to end in 2032-35. **The possibility to extend the operation of the IBR-2 until 2040 is being studied.** To extend the reactor core campaign – new fuel (manufacture of FA with FR) around 2025.

Considering the present-day tendency, **after 2030 only five sources will be available in Europe**: ISIS (Didcot, UK), SINQ (PSI, Villige), FRM II (TU Munich), and two new sources: ESS (Lund, Sweden) and reactor PIK (NRC KI, Gatchina, Russia), both under construction with the start of operations planned for 2023-2024. Oak Ridge (STS SNS) –**is planned in 2037**.

JINR provides FS for new neutron source (**IBR-3** = "N**EPTUNE**"). The goal – is to have the **best** pulsed neutron source in the world by 2037: with brightness of 7*10^15 (for TN), and 9*10^14 (for CN)

SPECTROMETER COMPLEX

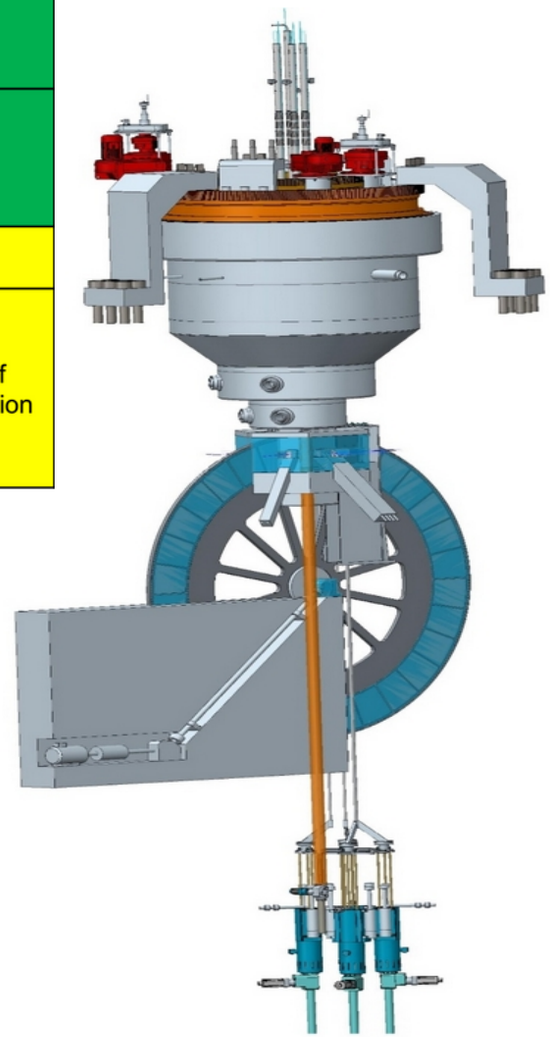
- Development of the basic configuration elements of the inverse geometry inelastic n-scattering spectrometer BJN.
- Completion of basic configuration of the small angle n-scattering and imaging spectrometer.



- Modernization and reconstruction of spectrometers HRFD, YuMO, RTD, DN-6, DN-12, FSD, NERA, REMUR, REFLEX, SKAT, EPSILON, FSS, NRT, focused on improvement of technical parameters and extension of research capabilities.
- Development of laboratory equipment for samples characterization and physical properties measurements.
- Support and modernization of the complex of cryogenic moderators. **New operating reliable UCN channel.**

FLNP LONG-TERM PLAN UP TO 2030

	2022	2023	2024	2025	2026	2027	2028	2029	2030
IREN	Operation. Development of new experimental setups.								
			Experimental hall modernization.						
EG-5	Operation.	Modernization.		Operation.					
TANGRA	Operation.			Hall and lab modernization.	Operation.				
UCN source	Pre-design.				Design.		Construction.		
New fast neutron source based on tandetron accelerator	Feasibility studies, Pre-design.					International Evaluation, Design			Start of construction



R&D of neptunium-nitride fuel of NEPTINE reactor (JSC VNIINM, 2022)

R & D for the development of fuel rods includes the following stages:

1) permit to use of nuclear materials, which is in federal ownership;
2) development of preliminary design specifications for neptunium nitride fuel;
3) development a complex of fuel characteristics' measurement methods;
4) development a technology of fuel fabrication for experimental fuel rods;
5) carry out of fuel rods researches before reactor irradiation;
6) reactor irradiation of fuel rods (with dose of 77 dpa)
7) post-irradiation researches of fuel rods in hot cells

Neutrino, Astroparticle Physics

Neutrino oscillation experiments

- **Determination of CP-violating phase: DUNE (5σ significance in just two years)**
- **Determination of n mass ordering: NOvA (gaining new experience), JUNO**
- **Precise determination of elements of the lepton mixing matrix: JUNO (gaining further experience with reactor neutrino), DUNE**

Physical properties of neutrino

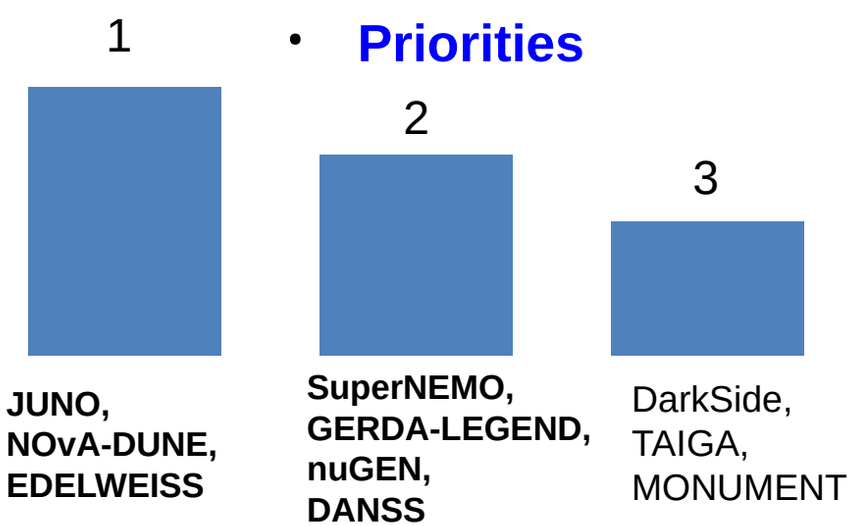
- **Determine if a neutrino is a Majorana particle: SuperNEMO, GERDA-LEGEND**
- **Coherent elastic n-nucleus scattering process at reactors: nuGEN (GEMMA)**
- **Sterile neutrino oscillation: DANSS**

Motivation: involvement in possible major discovery, new instruments

Astroparticle Physics, Dark Matter discovery

- **Existence of the dark matter particles: DarkSide, EDELWEISS**
- **Sources of high-energy (exceeding tens of TeV) gammas: TAIGA**
- **Determination of nuclear matrix elements via muon capture: MONUMENT**

Motivation: involvement in possible major discovery, new instruments



Exp. Data Level&Scale | JINR recognition
Human Resources | Finance Resources

Participation in experimental collaborations worldwide

JINR intends to participate in advanced external experiments in the relativistic heavy-ion physics, particle physics and neutrino physics, provided that the potential for discoveries in these experiments is high, JINR researchers can play a leading role, and partner scientific organizations show mutual interest in strengthening cooperation.

Relativistic heavy ion physics

JINR scientists will continue the study of the properties of nuclear matter under extreme conditions, in the search for quark deconfinement and possible phase transitions within the framework of common research programmes in the STAR experiment at RHIC, BNL, in the NA61 experiment at the SPS accelerator (CERN), in the ALICE experiment at LHC (CERN), and in the CBM experiment at FAIR (GSI).

JINR's participation will depend on the progress in implementing the NICA project, as well as on the need to consolidate work at the JINR accelerator complex.

The nucleon spin structure and other polarization phenomena in nucleon–nucleon and nucleon–nucleus interactions

The SPD research programme will extend the ongoing research programmes of the COMPASS++/AMBER experiment (at SPS, CERN) on hadron structure and spectroscopy investigations with high-intensity muon and hadron beams, as well as with polarized proton beams at the STAR facility (RHIC), in which teams of VBLHEP and DLNP scientists of JINR will continue to take part during 2024–2028.

JINR's participation in these programmes will be coordinated with the JINR's efforts on the creation of the SPD detector and its research programme.

Elementary particle physics

The search for physical phenomena beyond the Standard Model will be continued in the CMS and ATLAS experiments at CERN’s LHC. JINR will take part in the second phase of detectors’ upgrade during the LHC shutdown periods in 2026–2028 and will continue analysis of data from the LHC. The JINR group will continue to participate in the NA64 experiment to search for weakly interacting particles of dark matter at the SPS accelerator at CERN. JINR will also take part in a search for charged lepton flavor violation in muon-to-electron conversion in nuclei in the μ2e (FNAL) and COMET (J-PARC) experiments.

JINR Life Science Program: Basic and Applied Research

Applied Research and Innovation Committee at NICA (NICA ARIC) – core of future SAC: F. Cucinotta (Univ. of Nevada, USA), M. Durante (GSI, Germany), T. Hei (Columbia Univ, USA), Rubén García Alía (RADNEXT Project, CERN), C. Trautmann (GSI, Germany), A. Paccagnella (Univ. of Padua, Italy), A. Pesce (ESA), Yu. Titarenko (ITEP KI, Russia), H. Sakurai (Nishina Center, RIKEN, Japan), A. Osipov (Burnasyan Center FMBA, Russia), F. Azaiez (iThemba LABS, South Africa).

Dzhelepov Laboratory of Nuclear Problems

- Study for p-therapy
- Study of damage suppressor of tardigrades
- Study of genetic modify's due to radiation dose
- Detectors and Tomography

Laboratory of Radiation Biology - Integrator

- Fundamental Radiobiology
- Radiation Neuroscience
- Clinical Radiobiology
- Mathematical Modeling
- Radiation Protection
- Astrobiology

Infrastructure for molecular, cellular and animal research

Veksler and Baldin Laboratory of HEP

- Heavy ion beamlines for radiobiology, beam therapy, animal research

Frank Laboratory of Neutron Physics

- Beamline for neutron capture therapy of cancer
- Structural biology
- Ecology

Mecheryakov Lab. of Information Technologies

- High performance computing
- System for biological data storage and processing
- Bioinformatics, Machine Learning

Flerov Laboratory of Nuclear Reactions

- Ion beams for cellular research
- Radionuclides synthesis for radiation medicine

Development of vivarium, animal imaging and tomography, super-resolution microscopy; Equipment for multi-OMICS research; Construction of radiochemical class III lab blocks; R&D on compact irradiators for cellular research.

THEORETICAL PHYSICS (BLTP)

Theory of Fundamental Interactions

Theory of Atomic Nucleus

Theory of Condensed Matter

Modern Mathematical Physics

Interlaboratory cooperation

VBLHEP Hot and dense nuclear matter in heavy-ion collisions

DLNP
Neutrino physics

MLIT
Lattice QCD calculations

FLNR
Superheavy and exotic nuclei

DLNP *Few-body systems, Exotic nuclei*

FLNP
Condensed Matter, New materials

FLNR
Nanoporous 2D membranes, Ion irradiation

MLIT Computational methods for nuclear physics and quantum chemistry

Research and educational project

DIAS-TH

"Dubna International Advanced School of Theoretical Physics"

Human strategy:

- ❑ Attraction of leading scientists
- ❑ Attraction of young researchers
- ❑ Stimulation of scientific activity

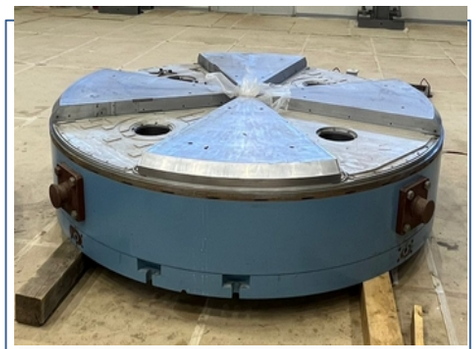
Scientific strategy:

- ❑ Extension of international collaboration
- ❑ Keeping up with current scientific trends
- ❑ Interplay of research and education

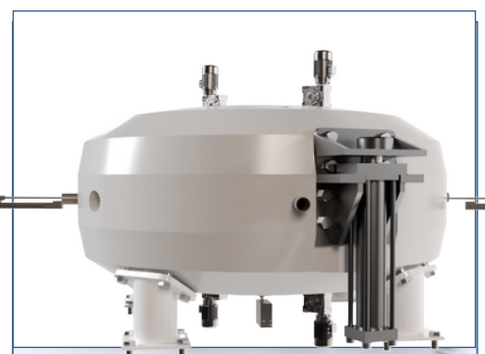
INNOVATIONS: INTERNATIONAL CENTRE FOR NUCLEAR TECHNOLOGIES RESEARCH: STATUS AND PROGRESS

Development of technologies and methods in the field of nuclear and radiation medicine, radiation materials science, advanced training of specialists for JINR Member States for radiation biology, medical physics, material studies.

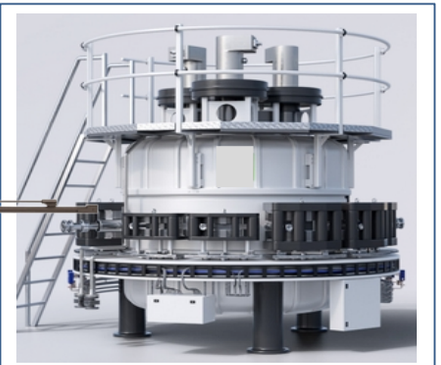
- **OMICS@LRB** and neuro-RB studies. Radiation neuroscience. Approaches to increase radiosensitivity: pharmaceuticals, transgene systems, targeted delivery (molecular vectors) and radionuclide;
- **ARIADNA.** Applied beams@NICA: radiobiological studies (400-800 MeV/n); radiation testing of semiconductor electronics (3; 150-350 MeV/n); nuclear physics @ 1-4.5 GeV/n. **Start in 2023**;
- **DC-140 cyclotron** for electronic component testing, radiation material science, track pore membrane research. **2021–2023**;
- **SC proton cyclotron (MSC-230)** for R&D in beam therapy: treatment planning; radiomodificators for g- and p- therapy, flash-therapy, pencil beam (10 μA, >5 Grey/l @ 50 ms pulse). **2021–2024 (beam in 2023)**.
- **Radiochemical Laboratory Class-I** for production of radioisotopes (Ac^{225}, ^{99m}Tc), nuclear medicine R&D in photonuclear reactions @ 40MeV (e-beam, Rhodotron). **2022–2027.**



DC-140 (construction phase)



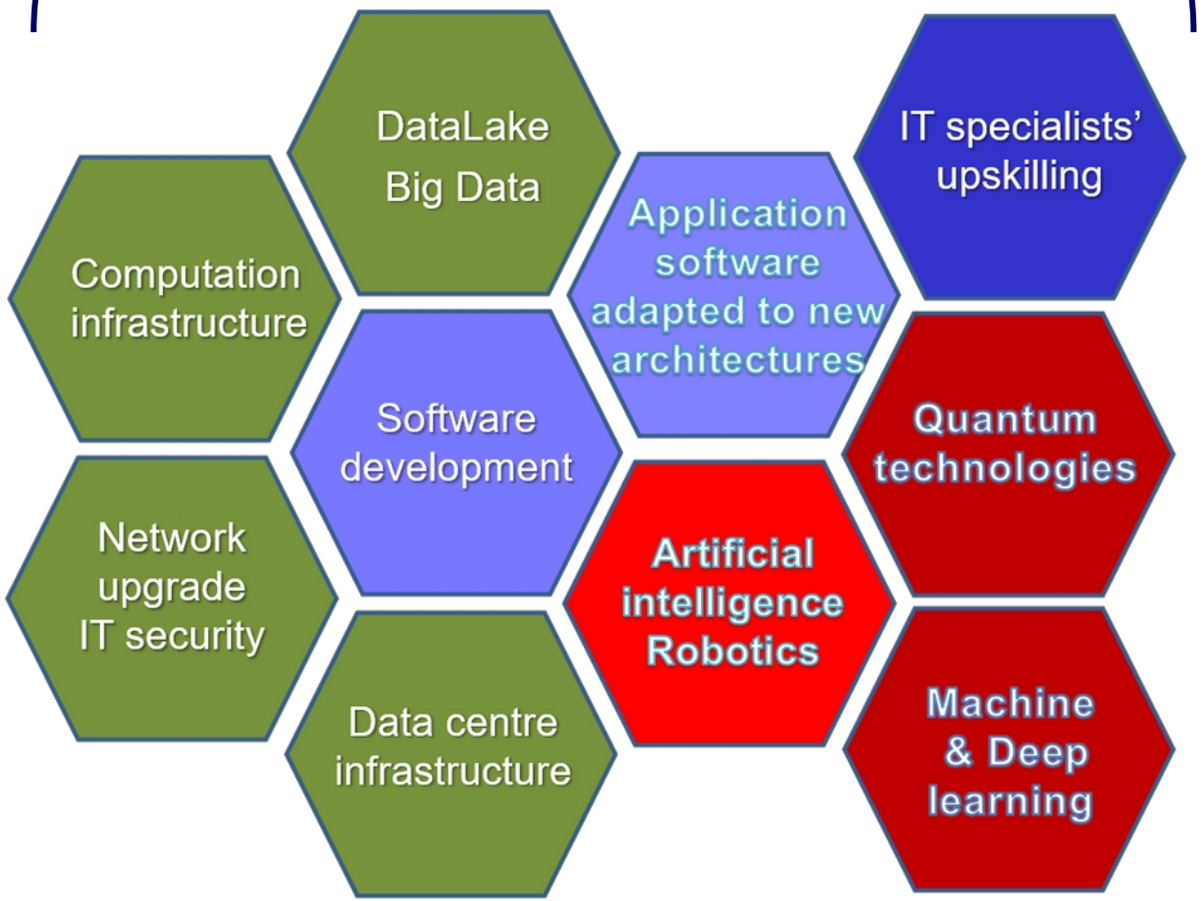
MSC-230 (general view)



Radiochemical Lab Class-I

Strategy for Information Technology and Scientific Computing at JINR

Scientific IT ecosystem:



The coordinated development of interconnected IT technologies and computational methods

It will be **steady implementation/upgrades** of

- Networking (**Tb/s** range),
- Computing infrastructure within the Multifunctional Information & Computing Complex (MICC) and
- "Govorun" Supercomputer,
- Data center infrastructure,
- Data Lake & long-term storage

for all the experiments.

The **development of new data processing and analysis algorithms** based on

- ML/DL,
- artificial intelligence,
- Big Data
- Quantum technologies.

A variety of means will be used for IT specialists upskilling.

MICC as Resources Provider for NICA, LHC, HL LHC, Baikal-GVD, etc.

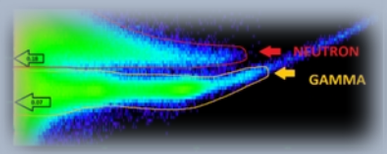
- The are three pillars in HEP experiments: accelerators – detectors – computing.
- To achieve physical results, HEP projects must proceed a huge amount of experimental data.
- Distributed heterogeneous computing must be used in future to support strategic research.
- The elaboration of new deep and machine learning algorithms for data processing and analysis will require support and development of a high-performance computing infrastructure.

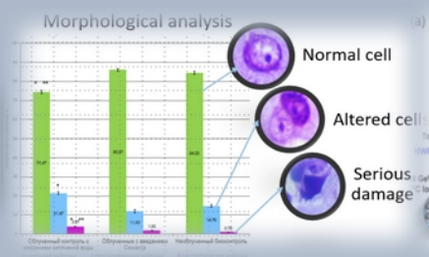
Needed computing for:

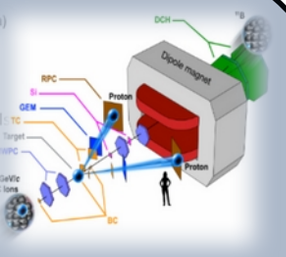
NICA Tier0 – Tier1 – number of Tier2

Baikal-GVD, NOvA, JUNO – **all types of resources**

LHC@HL-LHC – Tier1 for CMS,
Tier2 for ATLAS, ALICE







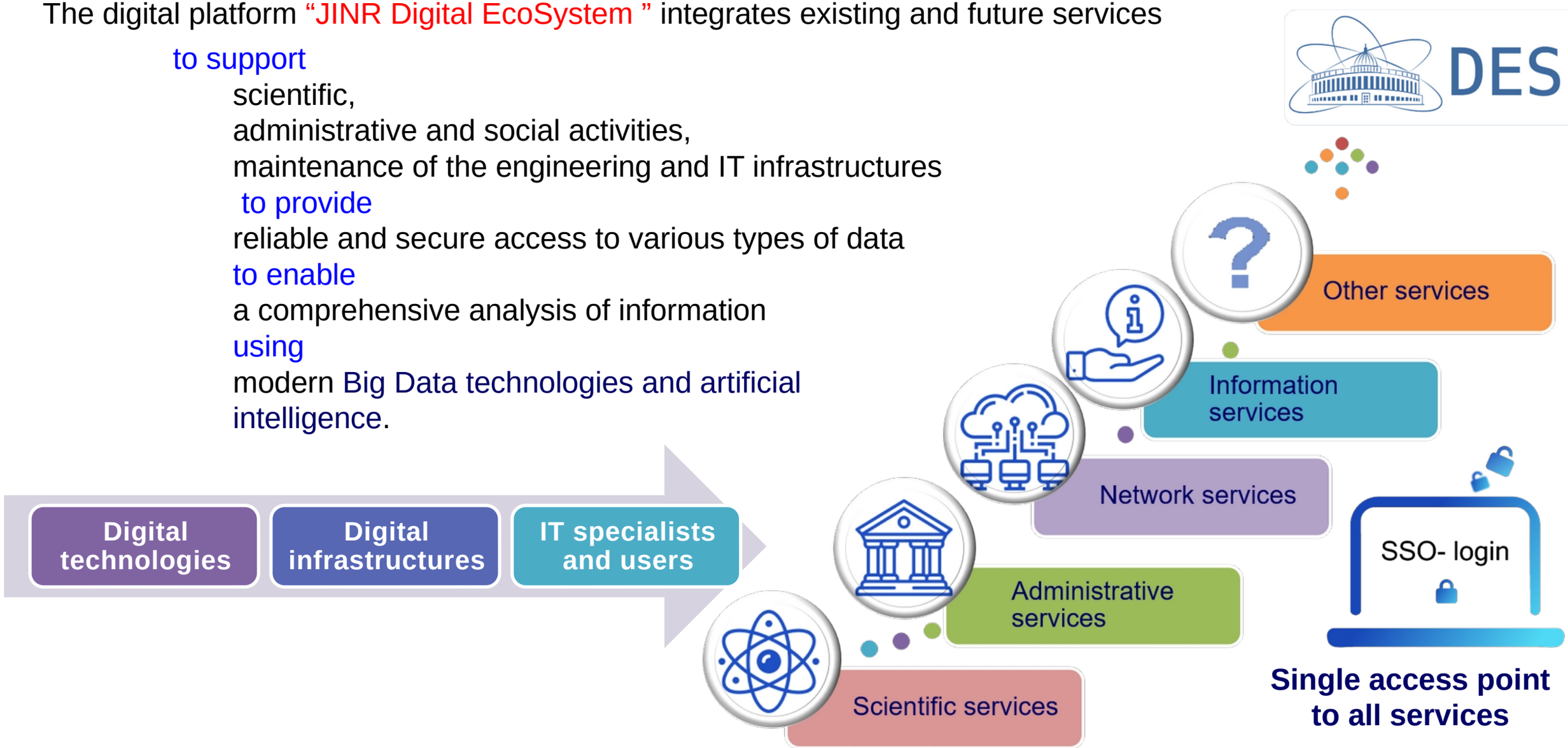
RESEARCH ENVIRONMENT FOR SOLVING RESOURCE-INTENSIVE TASKS OF JINR WITH "GOVORUN" SUPERCOMPUTER :

- Parallel computing
- ML/DL/AI tasks
- Quantum computing
- Tools for data analysis and visualization
- Calculations on application packages
- Web services for application programs
- Training courses

JINR Digital EcoSystem (DES)

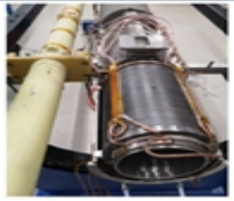
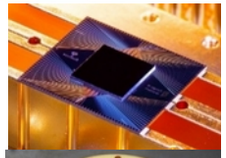
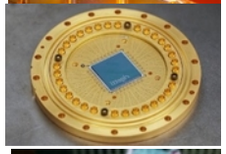
The digital platform “JINR Digital EcoSystem ” integrates existing and future services

to support
scientific,
administrative and social activities,
maintenance of the engineering and IT infrastructures
to provide
reliable and secure access to various types of data
to enable
a comprehensive analysis of information
using
modern Big Data technologies and artificial intelligence.



Quantum computing in the quantum robust control design

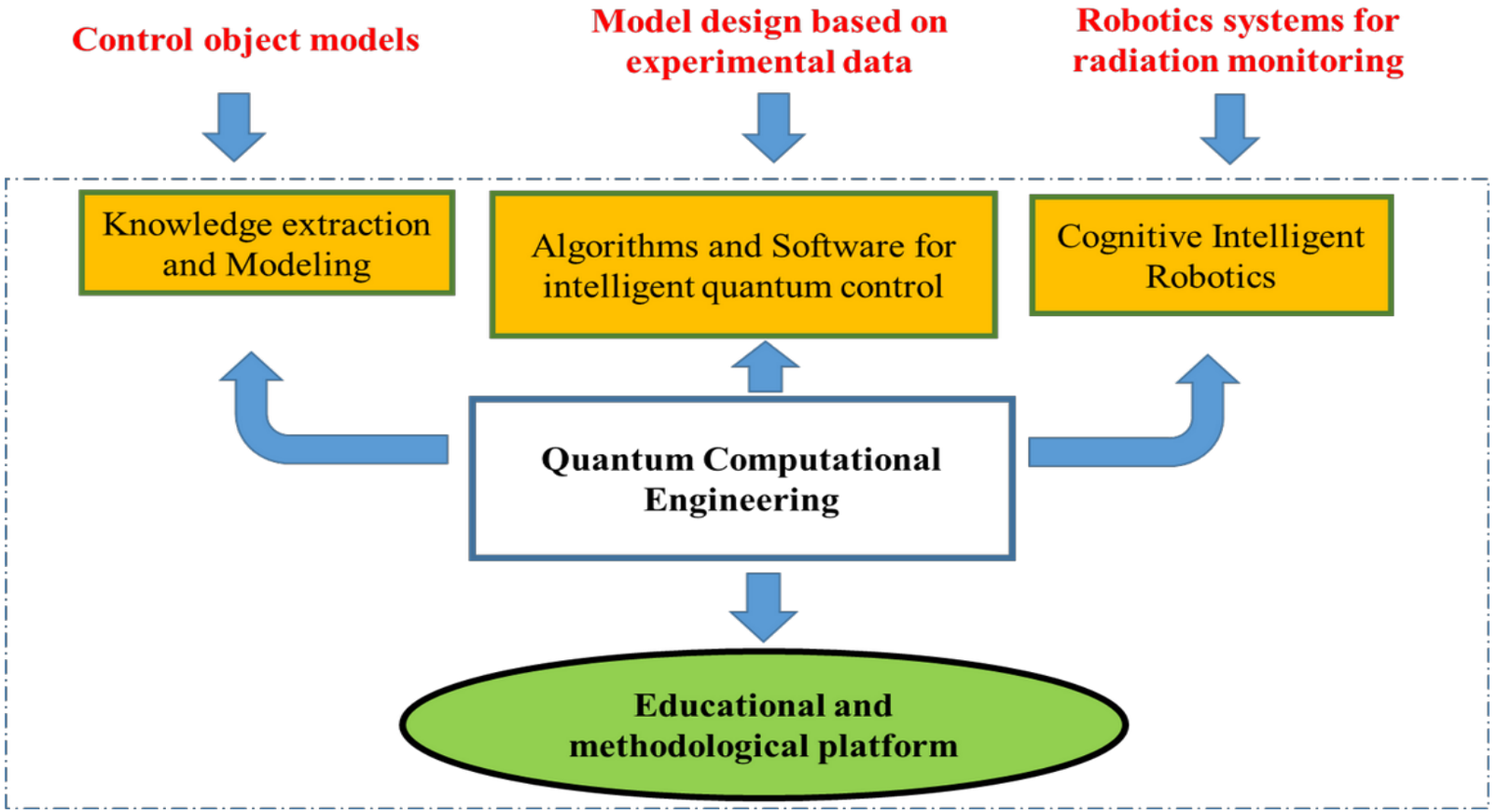



GOAL: Intelligent control of JINR physical experimental facilities
Robust control in unforeseen and unpredictable situations

USE@DO: Modern software technologies
Design of embedded intelligent controllers

PRODUCE: Intellectualization of innovative products
Communication of knowledge (master-slave system), adaptation and teaching in industrial complexes



Expected results:

- Applied library of quantum algorithms for JINR projects;
- Quantum simulators for modeling quantum algorithms on the “Govorun” supercomputer;
- Quantum control systems for NICA;
- Intelligent cognitive quantum robust controllers for intelligent control systems;

BEAM PHYSICS AND ACCELERATOR TECHNOLOGIES

Scientists and engineers of JINR are active participants of the projects of state-of-the-art international accelerator complexes: LHC, XFEL, FAIR, RHIC, GANIL, INFN centers, J-PARC, IMP CAS, HIAF, EIC, ILC, CLIC, FCC, etc. **We will focus on R&D in the following areas:**

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

– superconducting magnetic technologies: high-field magnets with fields up to 14–20 T, fast-cycling high-field magnets (B > 4 T, ramp > 4 T/s), high-current cables and windings (I_cr >30 kA);

– studies in the field of high-temperature superconductivity, development of Dubna superconducting cable technologies;

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

– superconducting resonators (RFQ and DTL) and cryomodules of RF structures for accelerating intense proton and ion beams, including those operating in the quasi-continuous mode at low initial particle velocities;

– research in the field of colliding beam accelerators: final optical structures, collision effects, focusing elements also based on radiation-resistant focusing on permanent magnets;

– issues of implementation of future colliders (FCC, ILC, CpeC, etc.);

– development of RF power systems based on solid-state power amplifiers;

– technologies of fast cycling synchrotrons for acceleration and accumulation of intense heavy-ion beams;

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

– deep machine learning for operation optimization and synchronization of systems of large accelerator complexes;

– development of modeling methods (including using artificial intelligence methods) of beam dynamics with the “real” accelerating and focusing electromagnetic fields in accelerator structures and in-flight beam parameters (emittance, intensity, charge composition, etc.).

TOPICAL PLAN for JINR Research and International Cooperation *Structure*

Section I include:
-projects
-subprojects (optional)
-activities (optional)

Human and financial resources – also Projects

Sections II-X include:
-Themes
-Projects
-subprojects (optional)
-activities (optional)

Section VIII include R&D:
Detectors and accelerators

Topical Plan

- **I** Basic scientific infrastructure projects
  - IBR-2
  - DRIBS-III
  - NICA
  - BAIKAL-GVD
- **II** Theoretical Physics
- **III** Particle Physics
- **IV** Nuclear Physics
- **V** Condensed Matter Physics
- **VI** Life Sciences
- **VII** Information Technology
- **VIII** Accelerator / Detector R&D, Applied research
- **IX** Analytical and Methodological Problems of Scientific Research Organization
- **X** Educational Programme

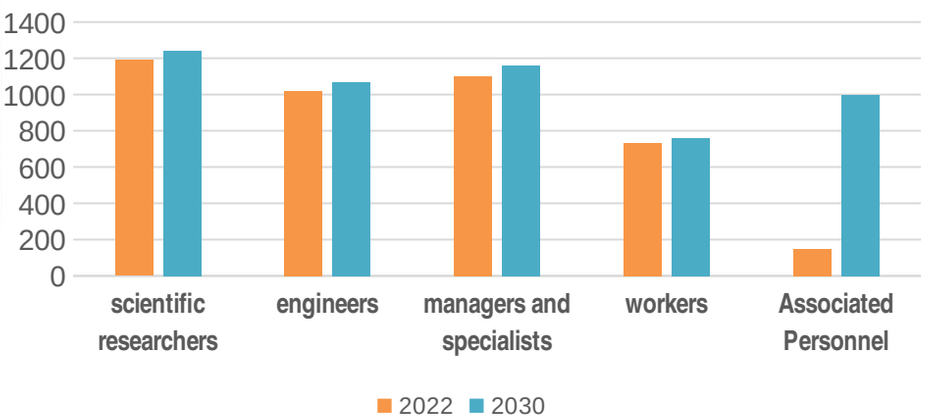
SCIENTIFIC DIRECTIONS

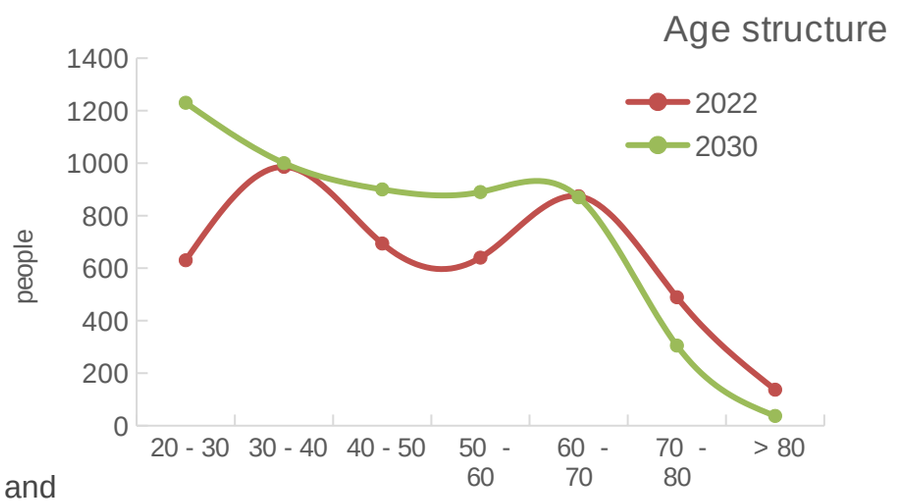
Directions of the Personnel Strategy 2024–2030

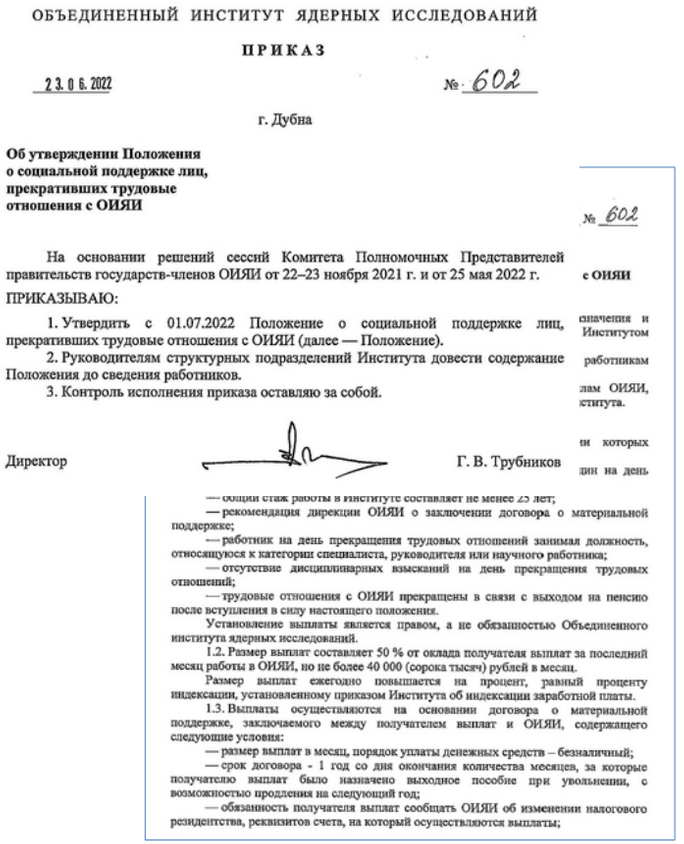
Moscow Regional Physics and Mathematics Lyceum named after Academician V. G. Kadyshevsky

Moscow State Univ. Branch in Dubna
Departments of Elementary Particle Physics and
Department of Fundamental Nuclear Interactions
and
Departments at **MIPT, MEPhI, SPbSU, Dubna University** and several others.

Personnel Structure of JINR
(total employees 4190 in 2022 and 5230 in 2030)







ОБЪЕДИНЕННЫЙ ИНСТИТУТ ЯДЕРНЫХ ИССЛЕДОВАНИЙ

ПРИКАЗ

23.06.2022 № 602

г. Дубна

Об утверждении Положения о социальной поддержке лиц, прекративших трудовые отношения с ОИЯИ

№ 602

На основании решений сессий Комитета Полномочных Представителей правительств государств-членов ОИЯИ от 22–23 ноября 2021 г. и от 25 мая 2022 г.

ПРИКАЗЫВАЮ:

1. Утвердить с 01.07.2022 Положение о социальной поддержке лиц, прекративших трудовые отношения с ОИЯИ (далее — Положение).
2. Руководителям структурных подразделений Института довести содержание Положения до сведения работников.
3. Контроль исполнения приказа оставляю за собой.

Директор Г. В. Трубников

— общий стаж работы в Институте составляет не менее 25 лет;
— рекомендация дирекции ОИЯИ о заключении договора о материальной поддержке;
— работник на день прекращения трудовых отношений занимал должность, относящуюся к категории специалиста, руководителя или научного работника;
— отсутствие дисциплинарных взысканий на день прекращения трудовых отношений;
— трудовые отношения с ОИЯИ прекращены в связи с выходом на пенсию после вступления в силу настоящего положения.

Установление выплаты является правом, а не обязанностью Объединенного института ядерных исследований.

1.2. Размер выплат составляет 50 % от оклада получателя выплат за последний месяц работы в ОИЯИ, но не более 40 000 (сорока тысяч) рублей в месяц.

Размер выплат ежегодно повышается на процент, равный проценту индексации, установленному приказом Института об индексации заработной платы.

1.3. Выплаты осуществляются на основании договора о материальной поддержке, заключаемого между получателем выплат и ОИЯИ, содержащего следующие условия:
— размер выплат в месяц, порядок уплаты денежных средств – безналичный;
— срок договора - 1 год со дня окончания количества месяцев, за которые получателю выплат было назначено выходное пособие при увольнении, с возможностью продления на следующий год;
— обязанность получателя выплат сообщать ОИЯИ об изменении налогового резидентства, реквизитов счета, на который осуществляются выплаты;

- Обновление персонала (непрерывное образование)
- Возможность выхода на пенсию (договор социальной поддержки)
- Изменение возрастной структуры
- Значительное увеличение ассоциированного персонала.

DIGITAL JINR

The digitalization of JINR will develop in two main directions - the digitalization of the areas of scientific activities and the digitalization of administrative processes, as well as the businesses of the self-financing divisions of the Institute.

The unifying element of these two directions is the creation of a unified architecture of information systems on the basis of which various services could be developed aimed at improving the efficiency of the Institute's processes, as well as increasing employee satisfaction.

Digitalization in scientific activities

Responsible division – **Laboratory of Information Technologies**

Main projects:

1. Base digital platform for scientific and related services
2. Digital services mart – single access point
3. Collaborations and experiments support services (databases of technical documents, e-logging, infrastructure maps etc.)
4. Scientific activities analytics service (publications, collaborations, JINR overview, etc.)

Digitalization in administrative processes

Responsible division – **Digital Services Development Department**

Main projects:

1. Migration of all administrative processes (accounting, budgeting, human resources, procurement, etc.) from various old information systems to a new single system of ERP class.
2. Development and launch of a digital administrative services platform.
3. Development, launch and technical support of administrative digital services.

Scientific projects preliminary material costs for 2024–2030 (M$)

Scientific projects	Material costs for development and modernization of facilities	Material costs for operation and maintenance of facilities	Electricity costs for operation of facilities	**Total 2024–2030**
NICA accelerator complex	211.3	49.0	32.7	**293.0**
DRIBs-III cyclotron complex	88.8	10.0	9.8	**108.6**
Deep underwater neutrino telescope Baikal-GVD	30.0	5.6	-	**35.6**
IBR-2 reactor and spectrometers	24.5	17.7	2.4	**44.6**
Development of the pulsed fast reactor NEPTUN	20.0	-	-	**20.0**
Multifunctional information and computing complex	40.0	10.0	4.7	**54.7**
Other scientific projects and activities	68.6	4.5	1.3	**74.4**
Total	**483.2**	**96.8**	**50.9**	**630.9**

Preliminary expenses for 2024–2030 (M$)

Personnel	794.3
Scientific projects material costs	630.9
Modernization and development of facilities	*483.2*
Operation and maintenance of facilities (incl. electricity)	*147.7*
Infrastructure material costs	240.0
Engineering and social infrastructure modernization	*70.0*
Buildings repear and reconstruction, energy and water, administrative costs	*170.0*
International cooperation	45.3
Services (incl. engineering and information support, safety, transport services, communication services, social services, security)	91.0
Reserve for grants of PPs, cooperation programmes, joint projects with non-member states	52.5
Reserve of the JINR Directorate	90.6
Total	**1 944.6**

Preliminary revenues for 2024–2030

The sum of the contributions should be increased by 5% annually to fully cover the expenses.

An increase of the sum of the contributions by 2.5% annually (total revenues 1760.6 M$) will lead to underfunding of certain stages of work on major scientific projects.

7-YP (2024-2030):

- Physics, Data acquisition and analysis, ”Harvesting”. Reliable, open, globally demanded Research (NICA, SHE, IBR2, nF, MICC, LS+IC)
- advanced R&D, Feasibility studies for new large-scale project @ JINR.

Research@Dubna: Topical Plan → Directions (Areas) → Projects → Activities. Basic Research Landscape and Priorities: where Dubna has recognized groundwork, and level/scale of tasks is/definitely will be world leading. Projects (approach «plan/schedule/results”) – are instruments.

Research @ Dubna: of great importance the Openness and the Institute's participation in experiments at world Research centers (CERN, FAIR/GSI, GANIL, BNL, DESY, INFN, IHEP, RIKEN, KEK etc), as well as in neutrino experiments and IT, where unique conditions for research are created. Key factors: JINR's participation should be recognizable and defined by the scientific significance/scale of the Physics data obtained, as well as on the role of scientists from JINR; The mutual benefit from exchange of new data, new scientific technologies and theoretical developments must be followed.

Important elements of the new 7-year plan

- New researchers are needed (~ +500), and competitive conditions: a modern salary system for stimulating professional growth; decent jobs and offices; digital services;
- Reliable operation of Facilities (engineering, health and safety);
- Novell Educational (UC, Higher School in Dubna, Lyceum);
- Development of a social international environment: modern medicine, social support programs, housing construction, comfortable urban environment;
- New environmental standards in the work of the Institute;
- Proactive development of ISTC and Information Communications tools. Involvement of new countries in the orbit of JINR.

Resources will be foreseen

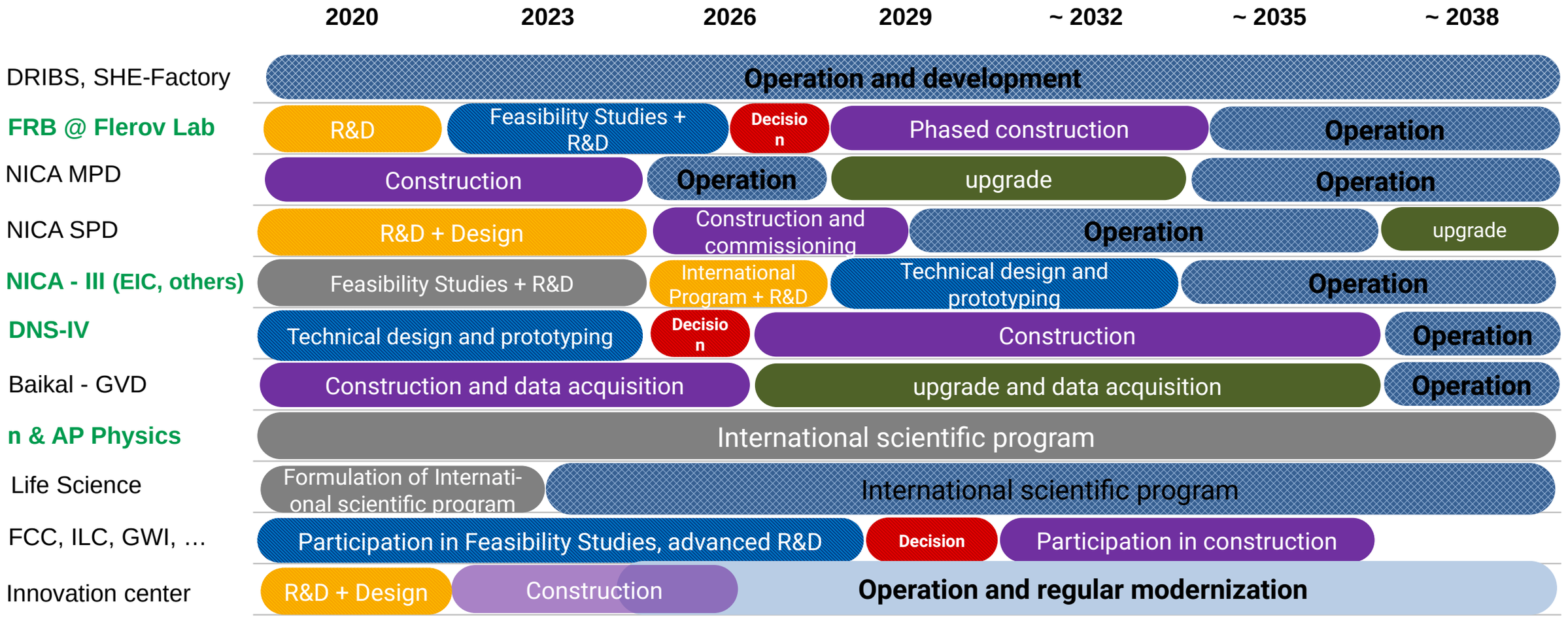
Risks and Challenges: International political sanctions (expertise, delivery, payment, inflation), budget underfilled → staff + operation, barriers in academic mobility, new ecological and safety standards, delays, global cataclysms.

ROAD MAP TOWARDS NEW 7-YEAR PLAN

	Stage	Due date	Main source documents	Recommendations or approval	Main Supporting regulatory documents
1.	Presentation of the **Concept of the 7-year development strategic plan for 2024–2030**	Feb. 2022	**The updated JINR Long-Term Development Strategic Plan up to 2030 and Beyond**, current 7-year Development strategic plan and current JINR's Topical Plan	**131th Session of the JINR SC**	**Regulations on the planning of scientific activities at JINR:** updating of the structure, optimization of expertise and the order of implementation of the JINR's topical plan
2.	Presentation of the **Draft 7-year development strategic plan for 2024–2030**	Sept. 2022	Draft 7-year development strategic plan for 2024–2030	**132th Session of the JINR SC**	**Draft 7-year development strategic plan for 2024–2030**
3.	**Presentation of the Revised Draft 7-year development strategic plan for 2024–2030**	Nov. 2022	**Revised Draft**	**JINR CP Meeting**	**Revised Draft 7-year development strategic plan for 2024–2030**
4.	**Expertise and approval of the 7-year development strategic plan for 2024–2030**	January -March 2023	**The 7-year JINR's development strategic plan for 2024–2030**	**PACs, SC,CP**	**7-year development strategic plan for 2024–2030**

JINR
DOSCIENCE@DUBNA

MATRIX OF JINR KEY PROJECTS



Thank you !

BACKUP