Joint Institute for Nuclear Research:
Platform for International Cooperation in Science and Technology

Dr. Dmitry Kamanin,
Director, Department of International Cooperation

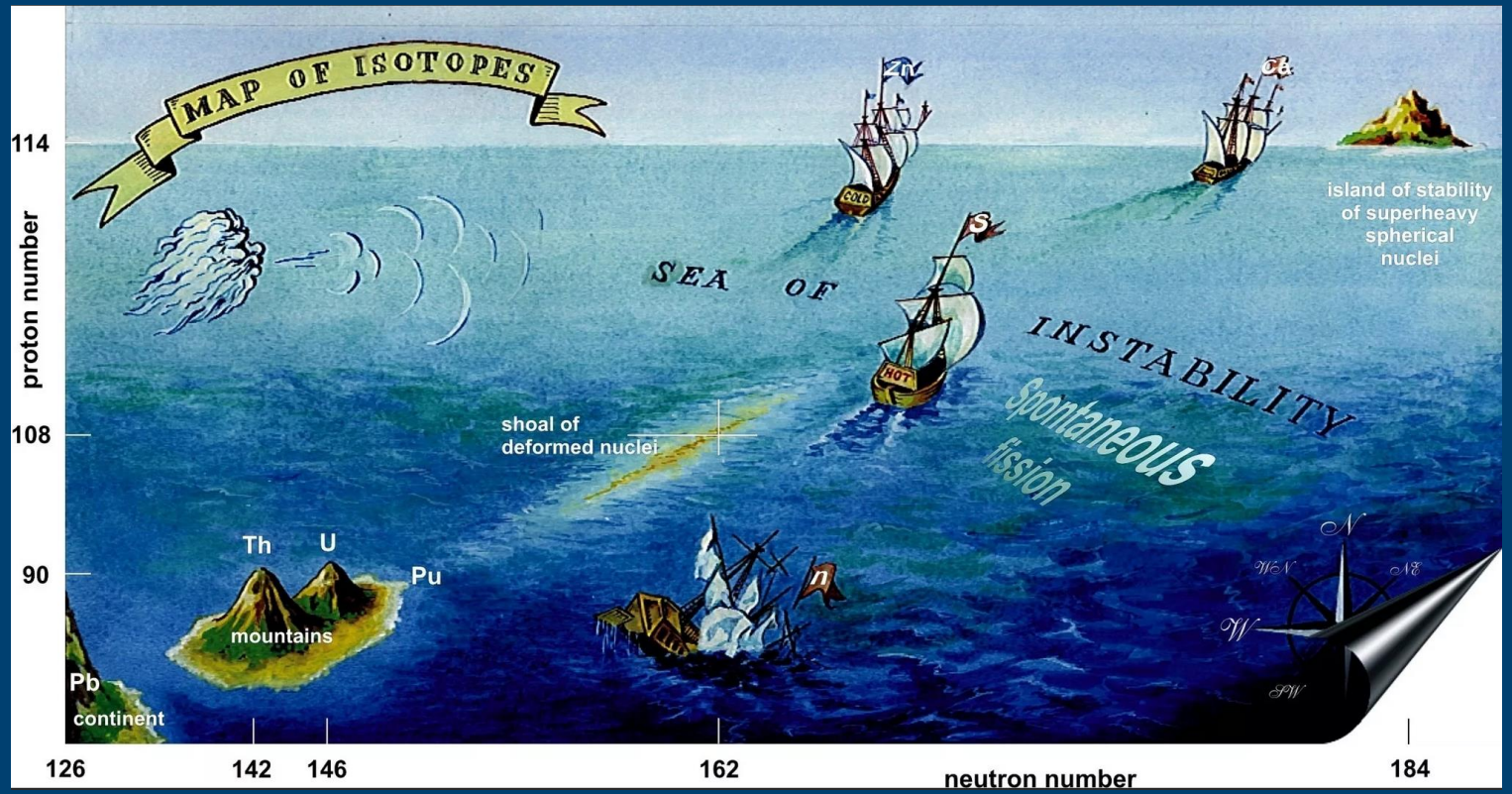
Meeting in Niš, Serbia. 19 October 2021

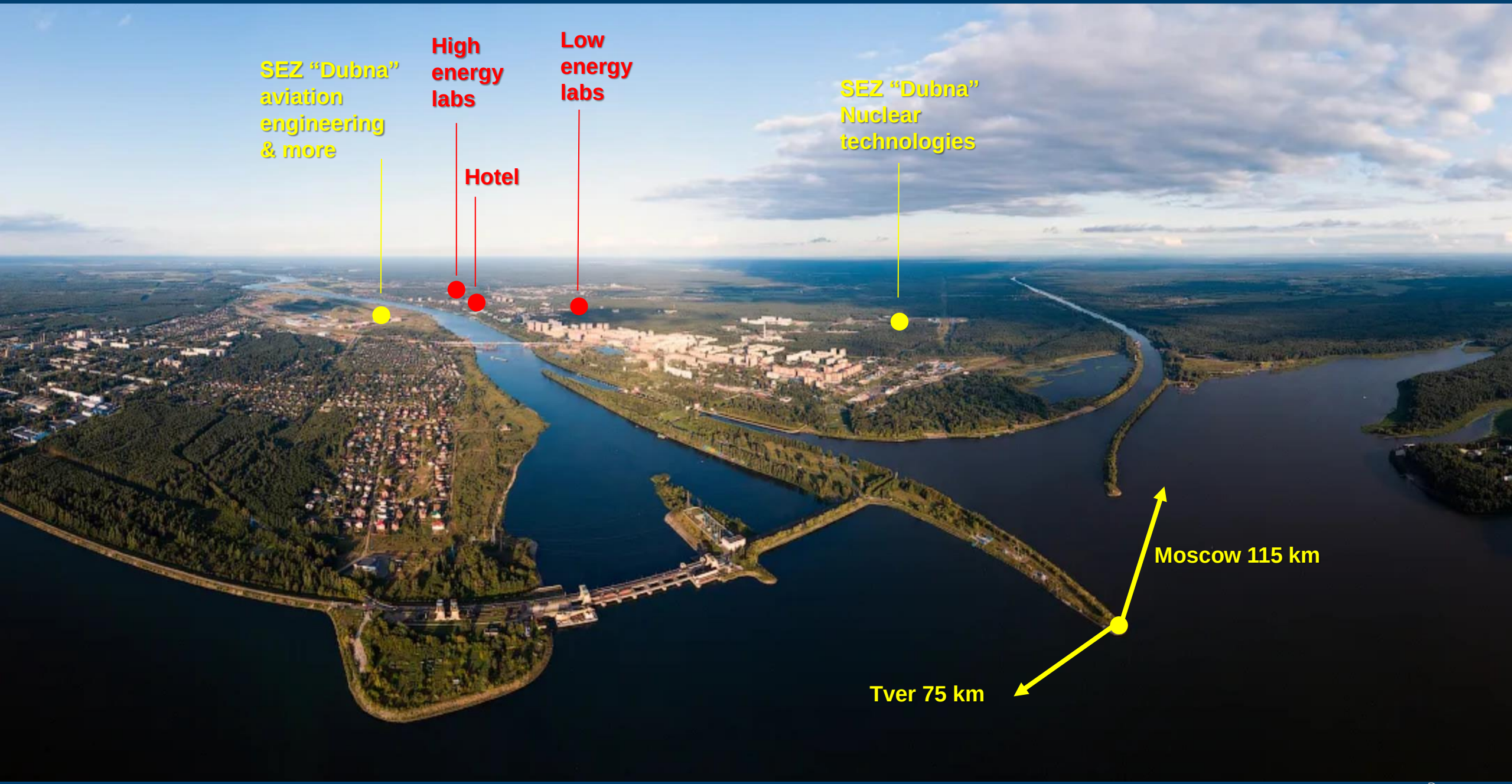
JOINT INSTITUTE FOR NUCLEAR RESEARCH
1956

JOINT INSTITUTE FOR NUCLEAR RESEARCH
1956

Welcome to Dubna – Island of Stability

History since 75 years and some geography




SEZ “Dubna” aviation engineering & more
High energy labs
Hotel
Low energy labs
SEZ “Dubna” Nuclear technologies
Moscow 115 km
Tver 75 km

JINR founding: International background

- 1949 – foundation of the **Council of Europe**
  to promote human rights, democracy and rule of law in Europe
- 1951 – foundation of the **European Coal and Steel community.** The goal -
  to regulate industrial production under a common authority.
  European integration launched which led to the European Union
- 1954, 29 September – the **European Organization for Nuclear Research (CERN)** was founded in response to the interest of many European countries and as a counterbalance to American superiority in the field of nuclear research
- 1955, April – Bandung Conference (Indonesia), Non-Aligned Movement milestone
- 1955, August - International Conference on the Peaceful Uses of Atomic Energy in Geneva
- 1954 – the principle of peaceful coexistence is introduced as one of the basics in international relations (5 postulate, China-India Agreement),
- 1956, February – 20th Congress of the CPSU: the principle of peaceful coexistence becomes the basis for foreign policy of the Soviet Union, JINR hosting country
- 1956, 26 March JINR was founded
- 1957, 29 July - IAEA was created in response to the deep fears and expectations generated by the discoveries and diverse uses of nuclear technology
- 1957, July – **Pugwash Conference**(Canada) united scientists from East and West to discuss jointly global issues.

1949, 14 December

1957, 15 March

Establishment of the Joint Institute for Nuclear Research

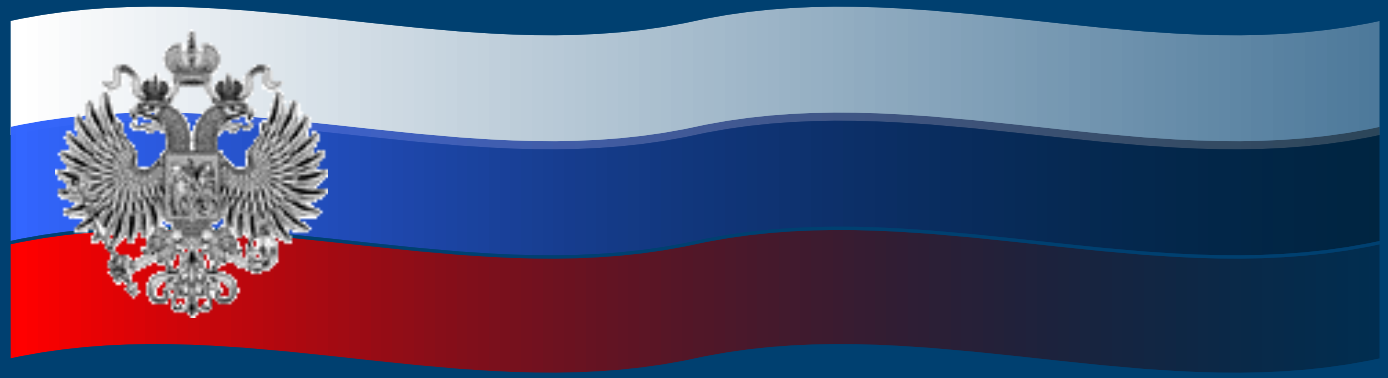
The Joint Institute for Nuclear Research (JINR) is an international intergovernmental scientific research organization established under the Convention signed on 26 March 1956 in Moscow to unite scientific and material potential of its Member States in order to study fundamental properties of matter

Contributions
of JINR founding countries in 1956

№ №	Country	Amount of equity participation
1	USSR	47,25%
2	People's Republic of China	20%
3	German Democratic Republic	6,75%
4	Polish People's Republic	6,75%
5	Romanian People's Republic	5,75%
6	Czechoslovak Republic	5,75%
7	People's Republic of Hungary	4%
8	People's Republic of Bulgaria	3,6%
9	People's Republic of Albania	0,05%
10	Democratic People's Republic of Korea	0,05%
11	Mongolian People's Republic	0,05%

The results of research carried out at the Institute can be used solely for peaceful purposes for the benefit of mankind.

JINR – Russia Agreement



In 1995 JINR and the Government of the Russian Federation signed an “Agreement on Location and Terms of Activity of the Joint Institute for Nuclear Research”, which was ratified in accordance with the existing RF legislative procedure and made effective on 2nd January 2000 by a Decree of the RF President.

Main features of the Agreement:
- inviolability of territory allocated to JINR and all JINR premises;
- non-resident status for JINR on the territory of RF;
- immunities and privileges, including tax, custom duty exemptions for JINR regular activities;
- tax exemptions for ex-pat JINR staff members.

The most important milestones in the history of JINR

Formation, 0+

Moscow, 26th March 1956

12 countries - founders:
Albamia, Bulgaria, China, Czechoslovakia, DPRK, German Democratic Republic Hungary, Mongolia, Poland, Romania, USSR, Vietnam

International legal framework: Intergovernmental Agreement on the Organization of JINR of 1956, The Convention on the Legal Status, Privileges and Immunities of Interstate Economic Organizations of December 5, 1980, the Charter of JINR, etc. regulatory and legal documents; Privileges and immunities of the Ministry of Defense, the highest governing body: the international governing Council-CPT, the priority of the decisions of the CPT over the legislation of the country of residence

New Era, 35+

Session of the Committee of Plenipotentiaries, Dubna, 17th March, 1993

New member states:

- *Belarus, Russia, Ukraine (December 1991)*
- *Armenia, Azerbaijan, Georgia, Kazakhstan, Moldova (March 1992)*
- *Uzbekistan (July 1992)*
- *Czech and Slovak Republics (March 1993)*

Associate members:
Germany (July 1991), Hungary (February 1993), Italy (December 1996)

Agreement between the Government of the Russian Federation and JINR on the Location and Terms of Operation of JINR in the Russian Federation
Ratified by the Federal Law of the Russian Federation January 2, 2000 N 39-FZ

Today, 50+

New associate members:
Republic of South Africa(2005),
Republic of Serbia (2007),
Arab Republic of Egypt (2009)

Towards full membership

15th December, 2018, ASRT, Cairo
Signing of the JINR-ARE road map

17th October, 2019, Dubna
Signing of the JINR-Serbia road map

JOINT INSTITUTE FOR NUCLEAR RESEARCH
1956

What is the Joint Institute for Nuclear Research

Member States, Laboratories, Budget, Personnel, JINR-CERN

JINR Member States and Partner Network

Member States

Armenia
Azerbaijan
Belarus
Bulgaria
Cuba
Czech Republic
Georgia
Kazakhstan
DPRK (suspended)
Moldova
Mongolia
Poland
Romania
Russian Federation
Slovakia
Ukraine
Uzbekistan
Vietnam

Participation of Egypt, Germany, Hungary, Italy, the Republic of South Africa and Serbia is based on bilateral agreements signed at governmental level (associated countries).
Partner network – over 1000 destinations in more than 70 countries

Collaborating organizations from JINR Topical Plan 2020

	Russia (host)	192
1.	USA	74
2.	Germany	66
3.	France	40
4.	Romania	39
5.	Italy	37
6.	Poland	33
7.	Japan	27
8.	Ukraine	24
9.	Czech Republic	22
10.	India	21
11.	Bulgaria	20
12.	Belarus	19
13.	Great Britain	19
14.	China	18
15.	Spain	16
....		
European Union		**346**
New agreements		37

International JINR staff
1200 Researchers
from 33 countries
> 450 Expats
> 150 from EU

JINR laboratories and research infrastructure

Bogoliubov Laboratory of Theoretical Physics

Dzhelepov Laboratory of Nuclear Problems

Flerov Laboratory of Nuclear Reactions

Frank Laboratory of Neutron Physics

Laboratory of Radiation Biology

Mescheryakov Laboratory of Information Technologies

Veksler and Baldin Laboratory of High Energy Physics

5 cyclotrons in FLNR

Cyclotron DC-280 / Superheavy Elements Factory

Together with Tier-1 for CMS and cloud computing

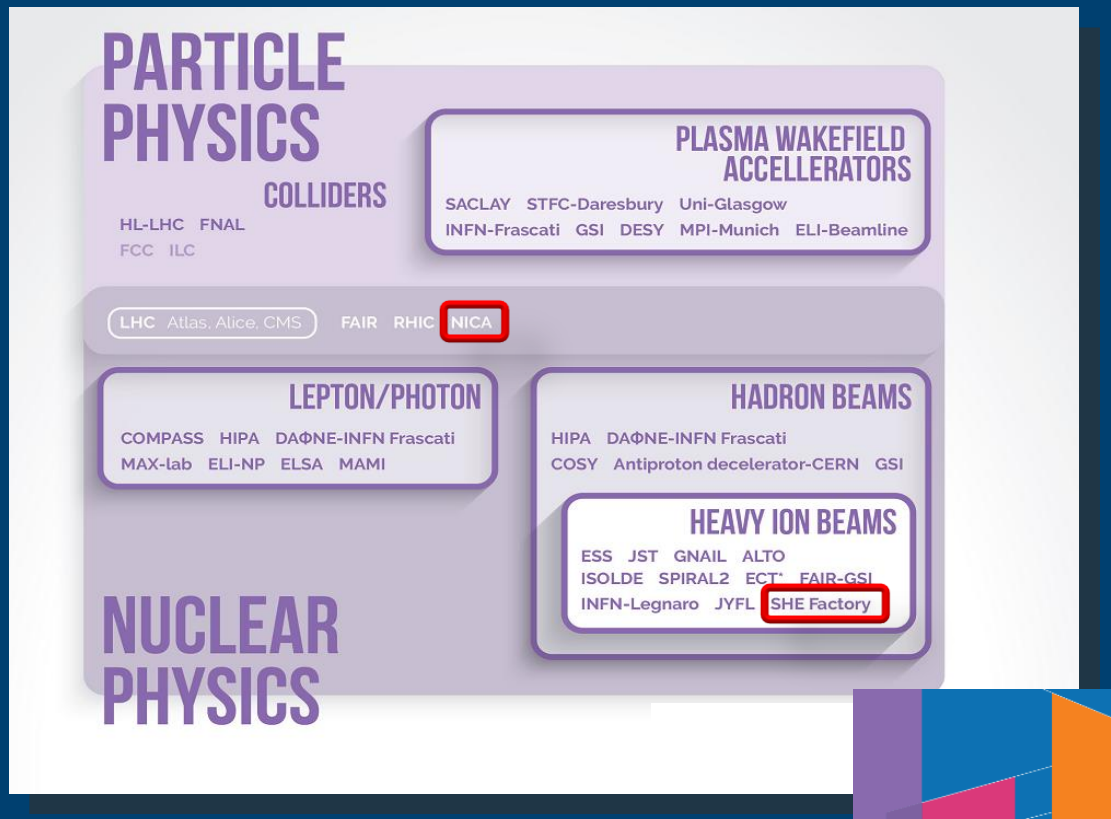
Supercomputer “Govorun”

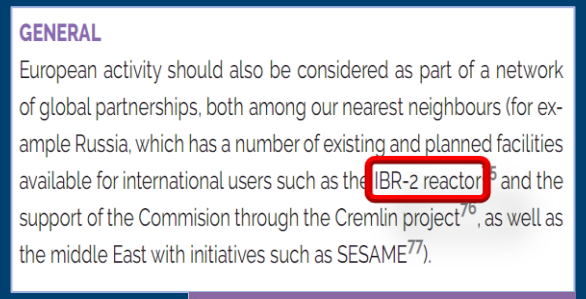
Baikal Neutrino Telescope in Irkutsk

15 instruments, user-programme

IBR-2 Pulsed Research Reactor

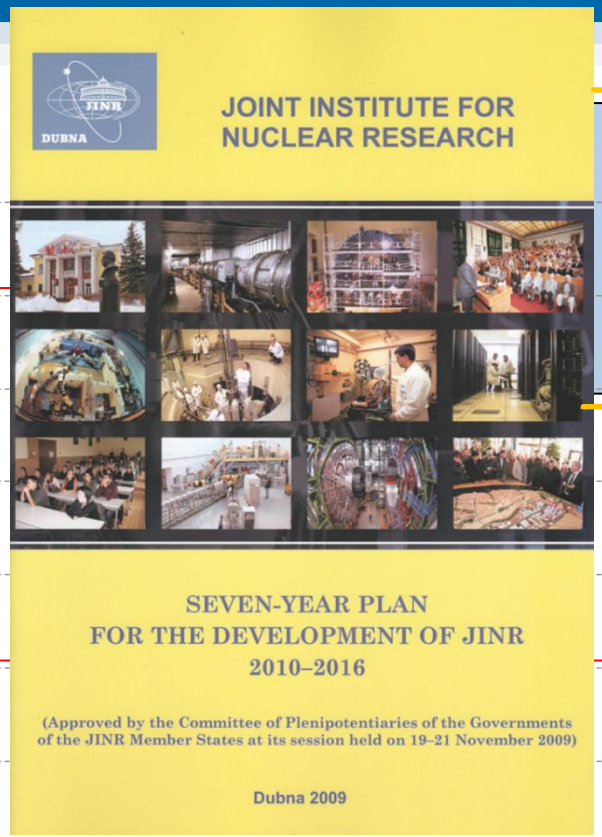
JINR facilities in European research programmes





The ESFRI Roadmap 2018
was officially presented
on September 11 in Vienna

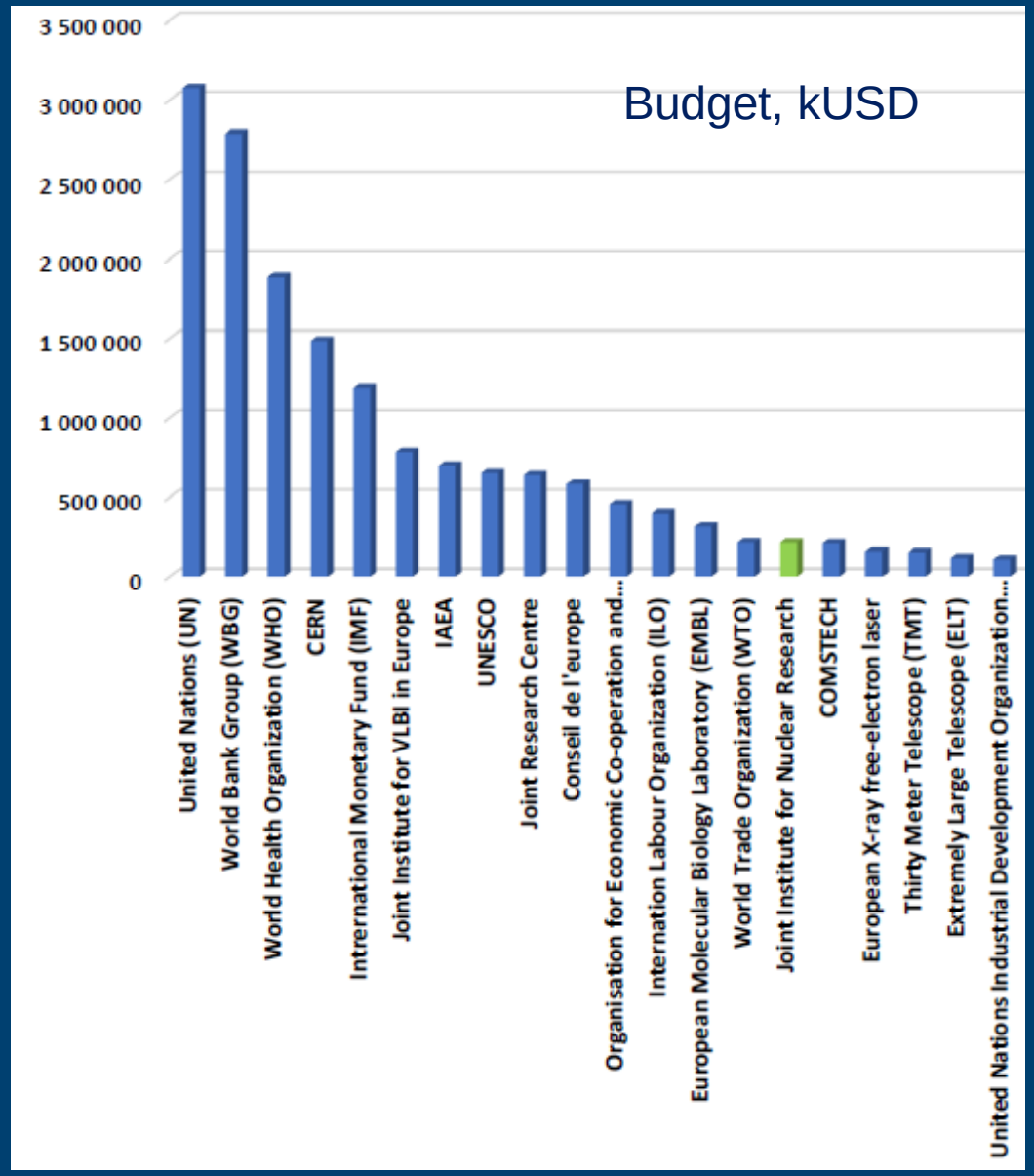
JINR budget since 1993: 25 years

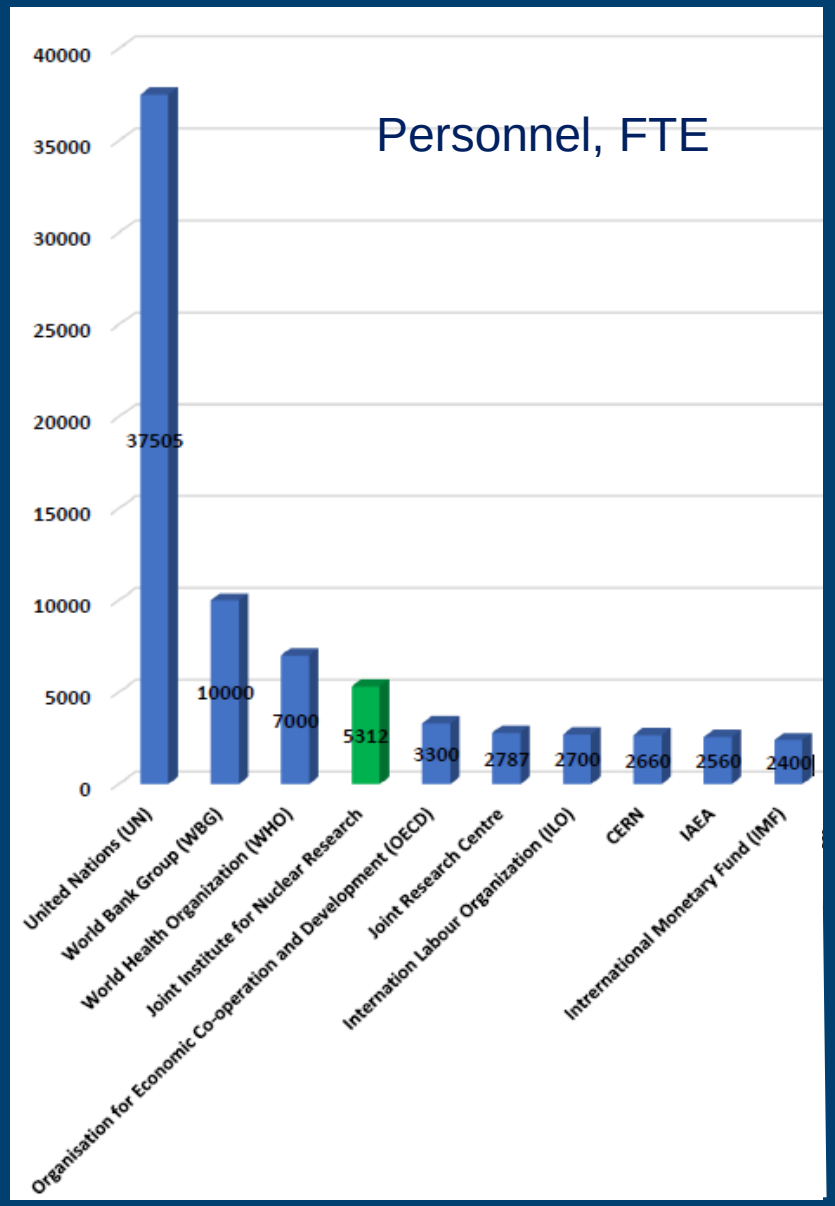


General staff figures

- JINR's staff members ~ 4500
- researchers ~ 1200
  including from the Member States (but Russia) ~ 400
- Doctors and PhD ~ 1000

JINR among other IGOs





Cooperation with CERN

CERN has been JINR's main partner in Particle Physics for over 50 years.
Dubna physicists are widely involved in more than
20 CERN projects, including 3 LHC experiments & LHC itself

1963, JINR, Dubna
CERN Director-General
Prof. V.Weisskopf,
Prof. V.Dzhelepov and
Prof. B.Pontecorvo

2004, JINR Dubna
CERN Director-General Dr R.Aymar
meeting with
JINR director acad. V. Kadyshevsky

1971, Dubna
CERN Director-General Prof. W.Jentschke
and JINR Director Prof. N.Bogoliubov

2010: CERN – JINR mutual participation in their projects
2014: CERN – JINR reciprocal Observer status

JINR vs CERN @ Web of Science®

JINR publication statistics		in comparison with CERN
2013 – 2019	2019	CERN 2019
Total number of publications: 9 221	Total number of publications: 1 324	Total number of publications: 1 328
Total number of citations: 109 325	Total number of citations: 1 418	Total number of citations: 2 009
Excluding self-citations: 79 779	Excluding self-citations: 1 152	Excluding self-citations: 1 629
Average citations per article: 11.86	Average citations per article: 1.07	Average citations per article: 1.51
h-index: 126	h-index: 12 *(14 in 2017)*	h-index: 17 *(15 in 2017)*

April 2017
*Working group acknowledging NICA/**MPD***
*as **CERN recognized experiment***

Publication Years	JINR	CERN
2007	937	899
2008	927	785
2009	932	778
2010	949	986
2011	1024	997
2012	1149	1354
2013	994	1283
2014	1054	1438
2015	1292	1468
2016	1468	1421

JINR-50

JINR-60

JINR is a part of global research coordination network

Major IGO partners of JINR

New strategic partnership

JINR works closely with ESFRI, ILL, ESS, XFEL, ApPEC, ICFA, ECFA and many others

BRICS

15-16 May 2017

Two-day meeting of the BRICS Working Group on Research Infrastructure and Mega-Science projects. Meeting was focused on cooperation within BRICS based on Research Infrastructures and Mega-Science Projects.

GSO

9-12 October 2017

The 10th Meeting of the Group of Senior Officials on Global Research Infrastructures. Main meeting task - the formulation of strategies and specifying the directions of RI development.

NuPECC

21-22 June 2019

The 95th meeting of the Nuclear Physics European Collaboration Committee (NuPECC). Meeting was devoted to implementation of the European Long Range Plan for nuclear physics and coordination of activities of nuclear physics centres in Europe

JOINT INSTITUTE FOR NUCLEAR RESEARCH
1956

Research infrastructure of the Joint Institute for Nuclear Research

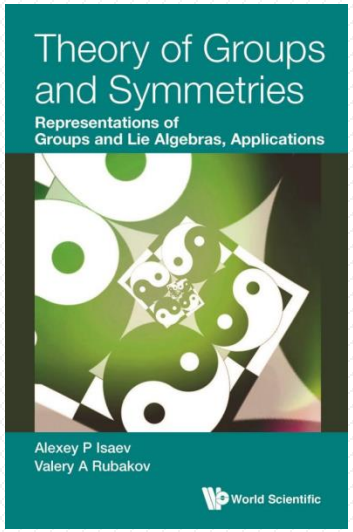
THEORETICAL PHYSICS

Theoretical physics on the basis of advanced mathematics, cross-disciplinary research, support of the JINR experimental program, interplay of research and education

Participation in the JINR flagship projects:

- Theory of hot and dense nuclear matter for NICA
- Analysis of production and properties of SHN
- Theory of neutrino physics
- Theory for material study with neutron beams
- Lattice QCD calculations with Supercomputer "GOVORUN"

2020 scientific activity:



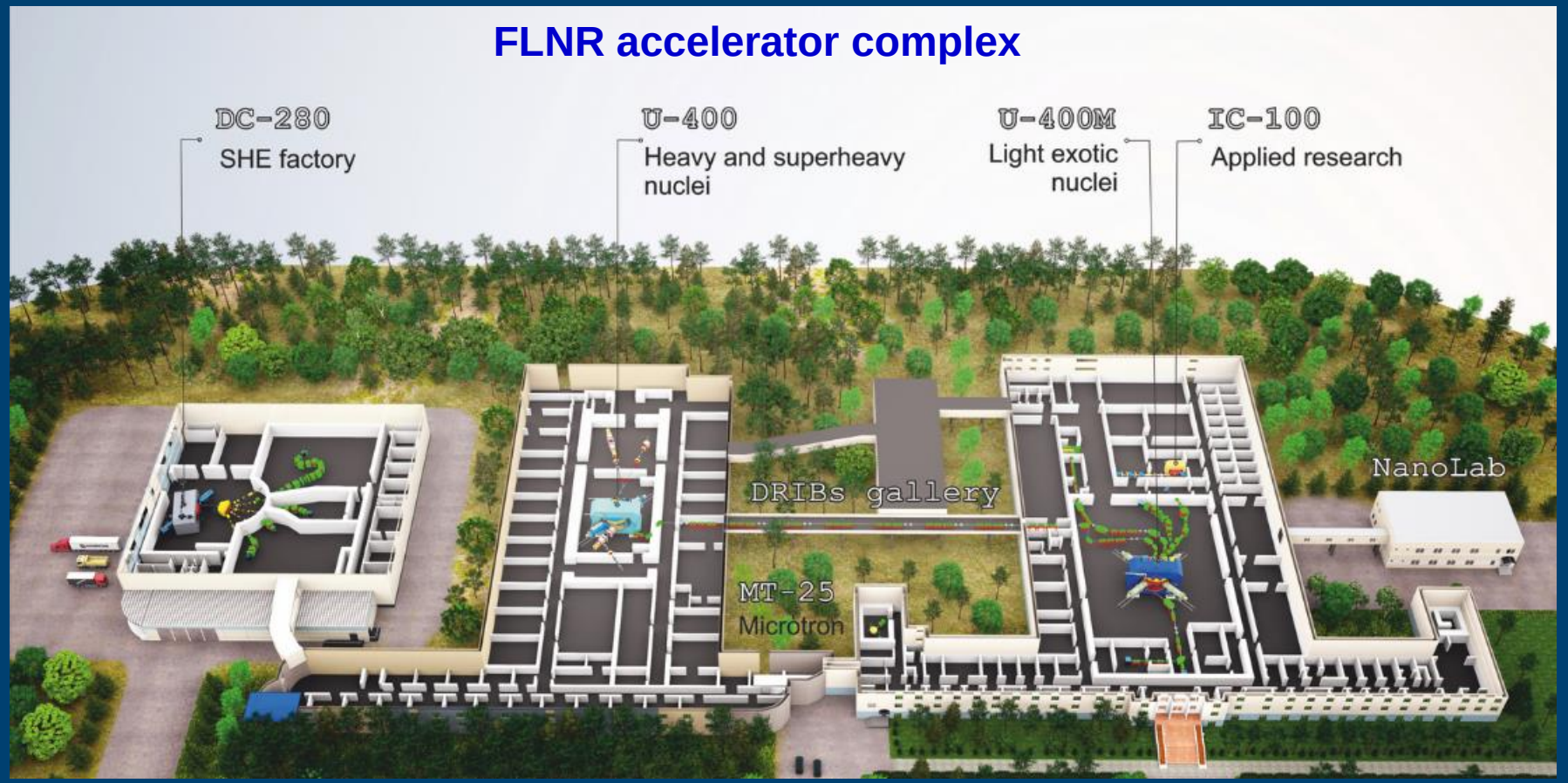
470 journal articles and conference proceedings, **1** monograph
>110 reports at **>60** conferences and workshops, including online

Fedor Šimkovic: ESET Science Award for 2020 - Outstanding individual contributor to Slovak science

Eugeny Mardyban: Scholarship of the President of the Russian Federation for young scientists and graduate students

Horia Pasca: "Ștefan Procopiu" Prize for Physical Sciences from the Romanian Academy

FLNR accelerator complex



International Union of Pure and Applied Chemistry

May 2012:

Official approval of the name *Flerovium* for element *114*
and the name *Livermorium* for element *116*

30th December 2015:

Approval of the discovery of new elements *113, 115, 117, and 118*

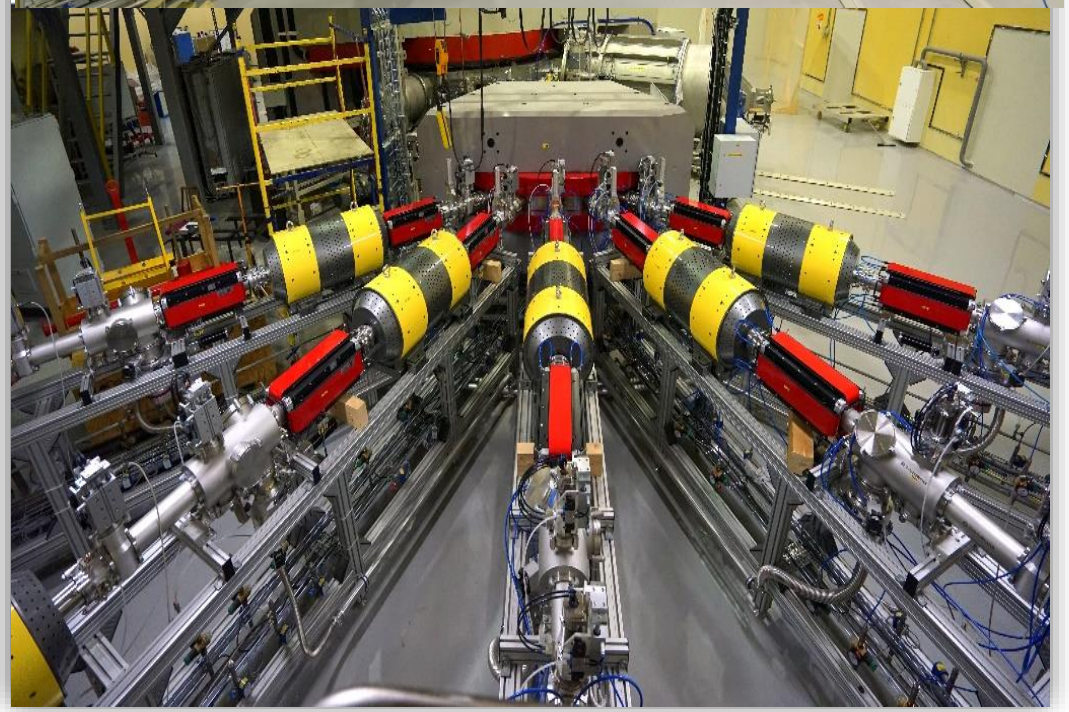
- element 113: RIKEN (Japan)
- elements *115* and *117*: JINR (Dubna) - LLNL (USA) – ORNL (USA) collaboration
- element *118:* JINR (Dubna) – LLNL collaboration.

28th November 2016:

IUPAC formally approved names and symbols of new elements:

Nihonium (Nh) for element 113,
Moscovium (Mc) for element **115**,
Tennessine (Ts) for element **117**, and
Oganesson (Og) for element **118**.

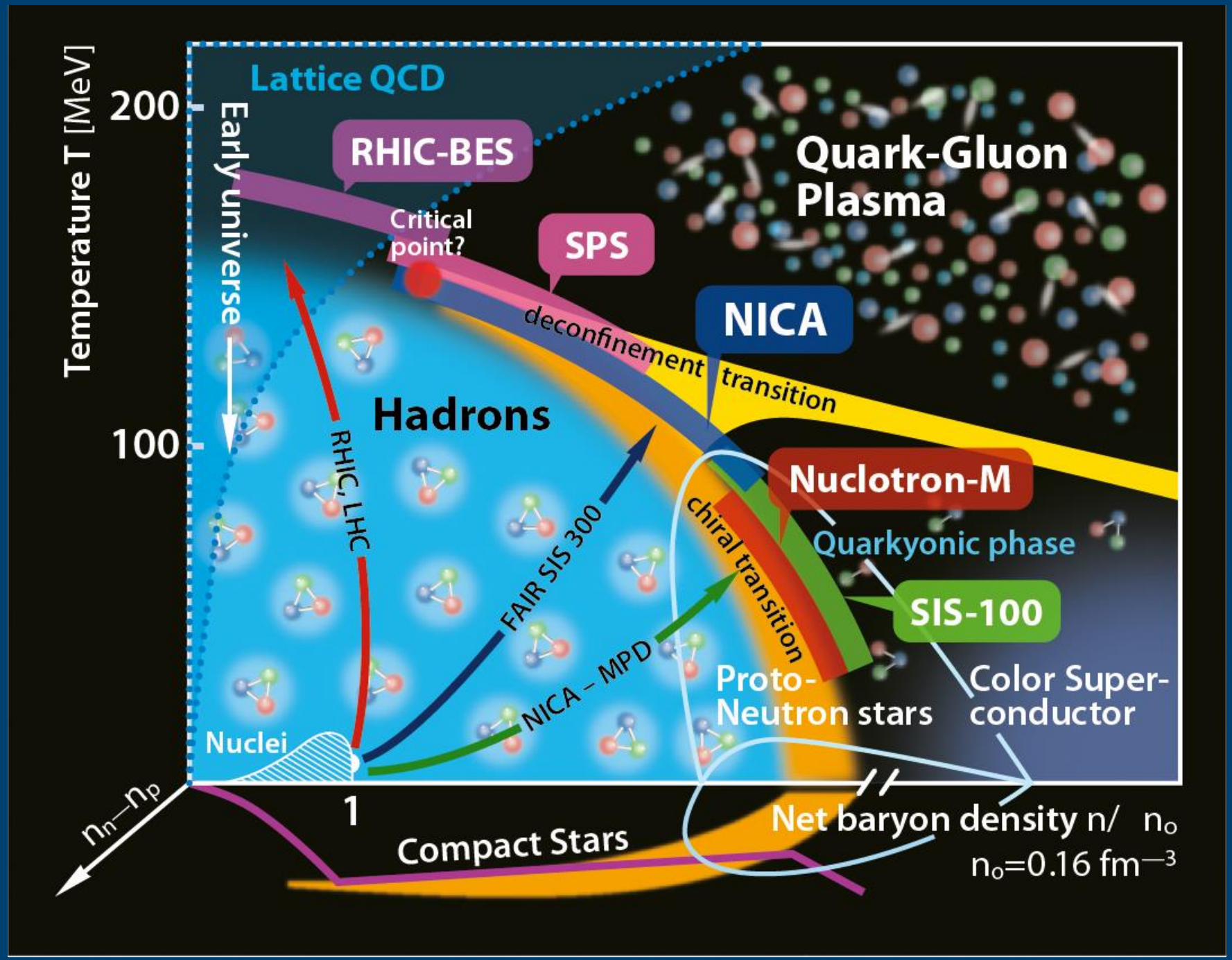
All these elements were synthesized for the first time at the U-400 accelerator complex of the Flerov Laboratory of Nuclear Reactions of JINR.



DC-280 cyclotron

DC280 (expected) E=4÷8 MeV/A		
Ion	**Ion energy [MeV/A]**	**Output intensity**
^{7}Li	4	1×10^{14}
^{18}O	8	1×10^{14}
^{40}Ar	6	6×10^{13}
^{48}Ca	6	$6{,}2\times10^{13}$
^{50}Ti	6	$3{,}1\times10^{13}$
^{54}Cr	6	2×10^{13}
^{58}Fe	5	1×10^{13}
^{124}Sn	5	2×10^{12}
^{136}Xe	5	1×10^{14}
^{238}U	7	5×10^{10}

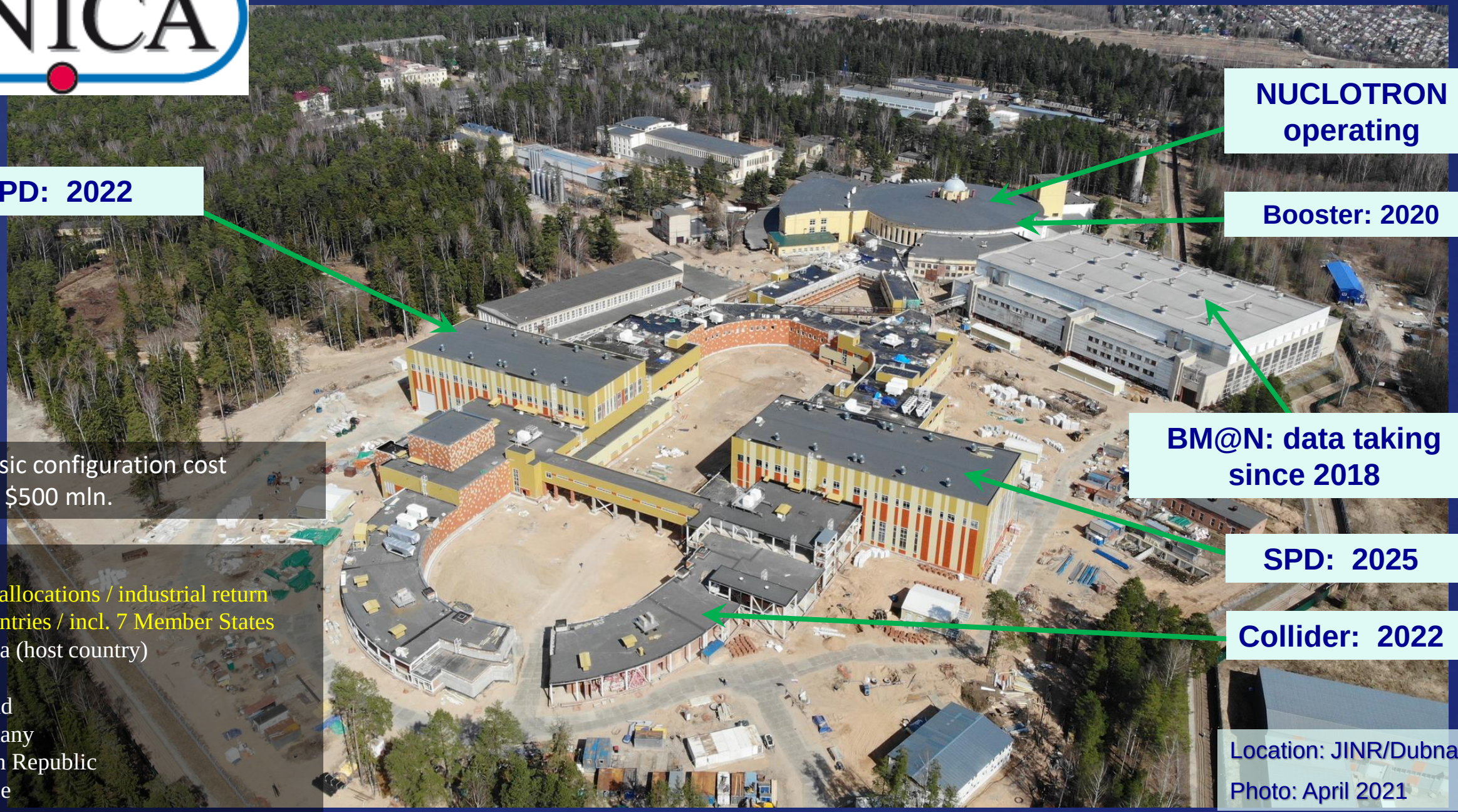
First test beam – very end of 2018
Officially launched – 25 March 2019


Temperature T [MeV]
200
100
Lattice QCD
Early universe
RHIC-BES
Critical point?
SPS
NICA
Quark-Gluon Plasma
deconfinement transition
Hadrons
RHIC, LHC
FAIR SIS 300
NICA – MPD
Nuclotron-M
chiral transition
Quarkyonic phase
SIS-100
Proto-Neutron stars
Color Super-conductor
Nuclei
$n_n - n_p$
1
Compact Stars
Net baryon density n/ n_o
n_o=0.16 fm^{-3}

NICA Layout

25 March 2016. NICA “corner stone” ceremony at LHEP JINR

JINR flagship project – collider complex NICA



NUCLOTRON operating

Booster: 2020

BM@N: data taking since 2018

SPD: 2025

Collider: 2022

MPD: 2022

NICA basic configuration cost is about $500 mln.

Top-5
Contract allocations / industrial return
in 34 countries / incl. 7 Member States

Russia (host country)
1 Italy
2 Poland
3 Germany
4 Czech Republic
5 France

Location: JINR/Dubna

Photo: April 2021

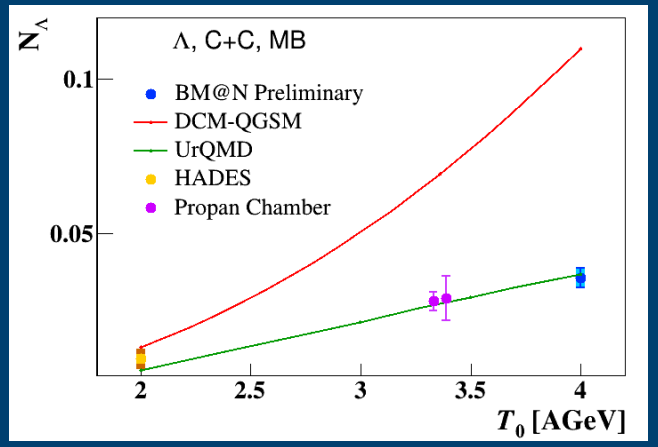
NICA Experiments

MPD hall preparation for the detector installation

MPD superconducting solenoidal magnet elements are delivered in Dubna (July 2019)

The yoke of the magnet consisting of 28 bars, supporting end rings and two pole tips weighs about 700 tons. 39 trucks transported all the elements of the yoke and beds from Czech Republic to JINR.

First physics results of the BM@N Collaboration: Λ hyperon yield in 4A GeV Carbon-nucleus interactions presented in SQM 2019 and ready for publication



Superconductor magnets fabrication and certification for NICA and SIS-100/FAIR

NICA booster delivered the first beam in December 2020

Impact of NICA superconductor accelerator on engineering infrastructure and industry, e.g.

1. Factory for SC magnets in JINR
-» new tasks for high precision mechanical industry in MS

2. Advanced cryogenic complex
-» highest productive He liquefier in RF @JINR

3. JINR know-how in fast oscillating superconductive magnets for accelerators
-» future project of superconductive magnet energy storage

NICA detector collaborations

MPD Collaboration

12 countries
44 Institutes/Universities
>500 participants (485 authors)

5 Physics working groups:

- Global observables
- Light flavour & hypernuclei
- Correlations & fluctuations
- Electromagnetic probes
- Heavy flavour

BM@N Collaboration

10 countries
19 Institutes/Universities
255 participants

Extended physics programme of the ongoing experiment:

- Short-range correlations
- Hyperons & hypernuclei
- Heavy ion physics, etc.

SPD Collaboration

10 countries
23 Institutes/Universities
~300 authors + individuals

Physics goals:

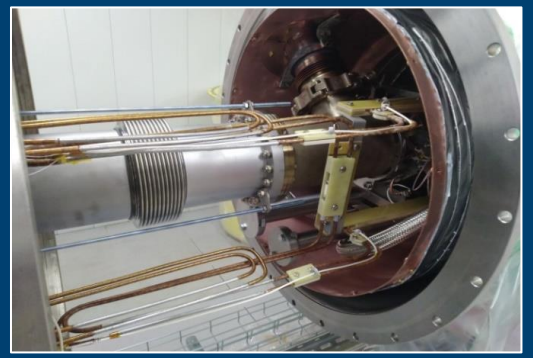
- Gluon content in p and d
- Charmonia
- Open charm
- Prompt photons

MPD fosters unique high technology industry, e.g.
Magnet Yoke - Vitkovice HM / Czech
Cryostat/SC coils - ASG Genova / Italy
MPD promotes creating intellectual clusters in Universities, e.g.
ECAL subsystem - University consortium in China
BD scintillator array - University consortium in Mexico
MPD demands development of local production, e.g.
Clean room labs for advanced semiconductor detectors

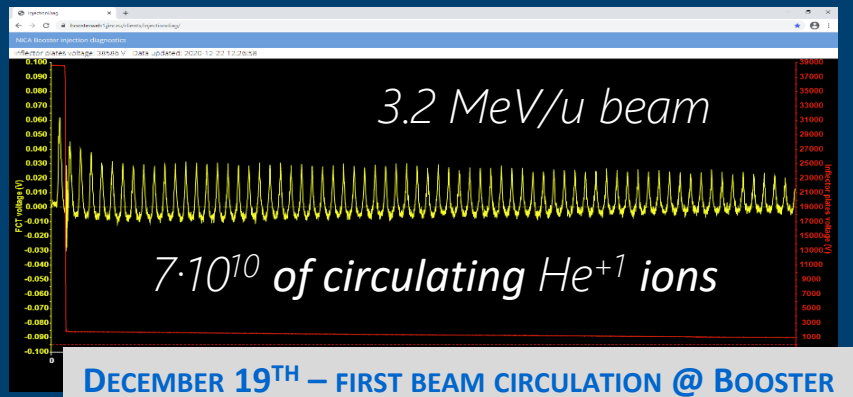
NICA: Booster commissioning. The first run

Technological start-up of the Booster, 23 December 2019

20 November 2020, start of technological run.
Russian Prime-minister Mikhail Mishustin



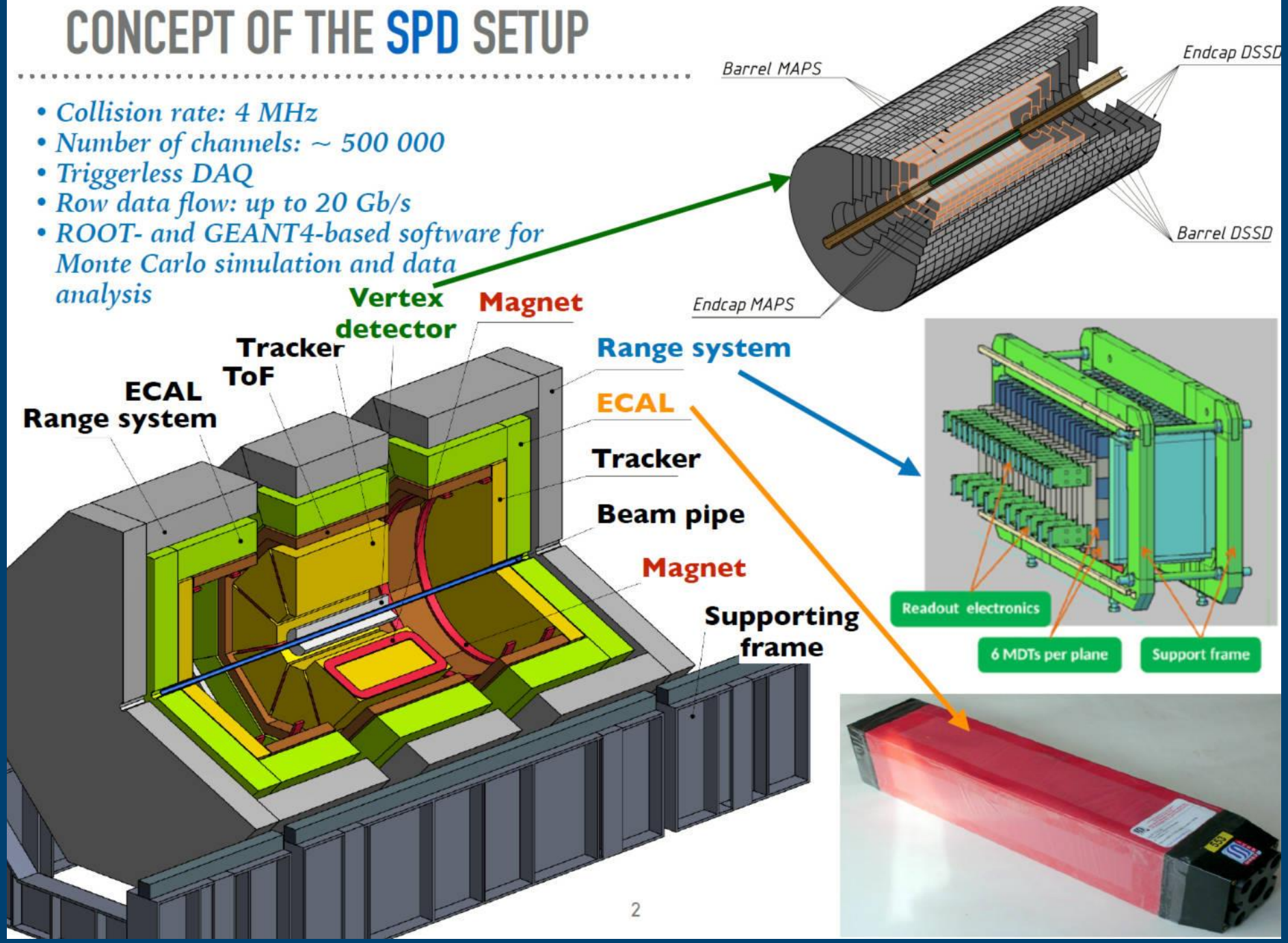
All SC magnets of the NICA Booster are manufactured, tested and installed in the tunnel inside the old Synchrophasotron playing the role of biological shield.



December 19th – first beam circulation @ Booster

CONCEPT OF THE SPD SETUP

- *Collision rate: 4 MHz*
- *Number of channels: ~ 500 000*
- *Triggerless DAQ*
- *Row data flow: up to 20 Gb/s*
- *ROOT- and GEANT4-based software for Monte Carlo simulation and data analysis*



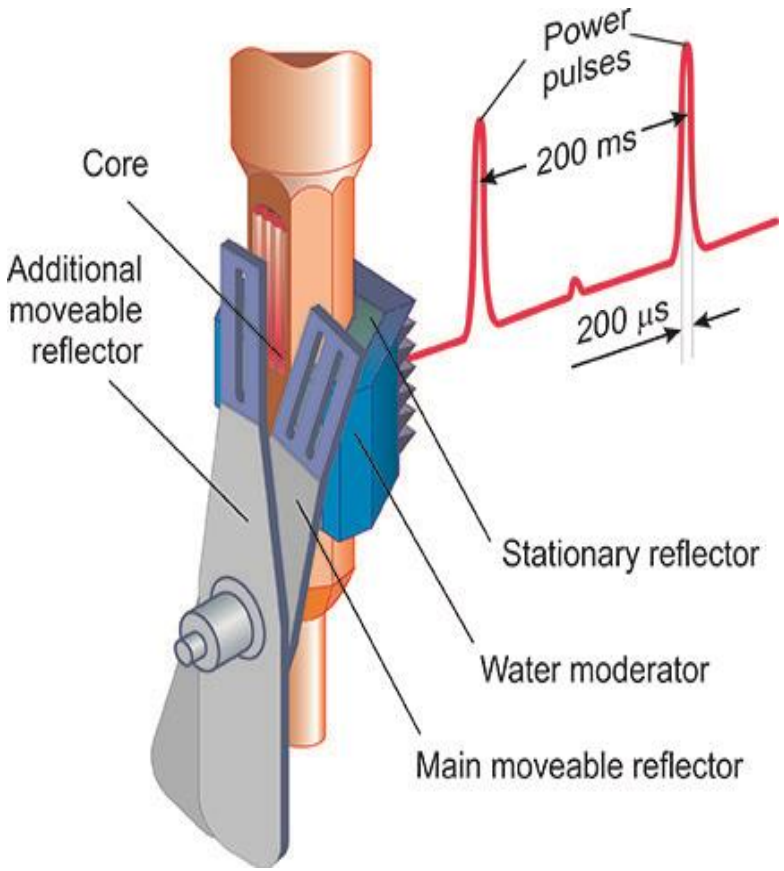
IBR-2: Pulsed reactor with fast neutrons

*mean power **2 MW***
*pulse frequency **5 Hz***
*pulse width for fast neutrons **200 μs***
*thermal neutrons flux density on the moderator surface: **10^{13} n/cm^2 /s***
*maximum in pulse: **10^{16} n/cm^2 /s***

IBR-2 is included in the 20-year European strategic research program in the field of neutron scattering

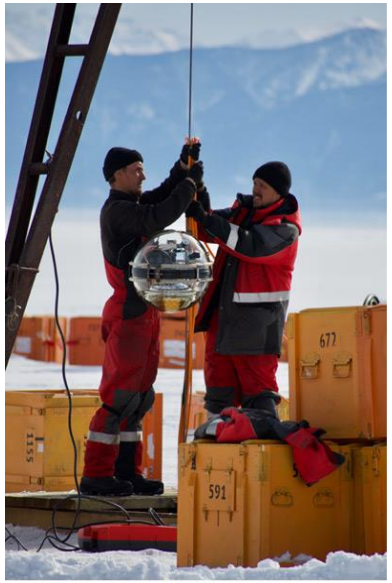
Facilities at IBR-2 reactor

15 instruments are in operation a the Spectrometer Complex of the IBR-2M Reactor



Reactor operation for physics experiments, hr/year ~2500

The user policy of the IBR-2 is world friendly.
~200 proposals from ~20 countries are selected annually



Очередной оптический модуль подготовлен к погружению

Центральный модуль секции

Гидроакустический модем

Joint expedition-2020
two more clusters with 288 OMs each were installed

BAIKAL-GVD LAUNCHED!

On 13 March 2021, a ceremonial launch of the largest in the Northern hemisphere deep underwater neutrino telescope Baikal-GVD was held. This significant for the JINR and world science event has become one of the key events of the current Year of Science and Technology in Russia. Moreover, this day, the Ministry of Science and Higher Education of Russia and the Joint Institute for Nuclear Research signed a Memorandum of understanding for the development of the Baikal deep underwater neutrino telescope.

JOINT INSTITUTE FOR NUCLEAR RESEARCH
1956

Год науки и технологий '21

Neutrino experiments at Kalinin NPP

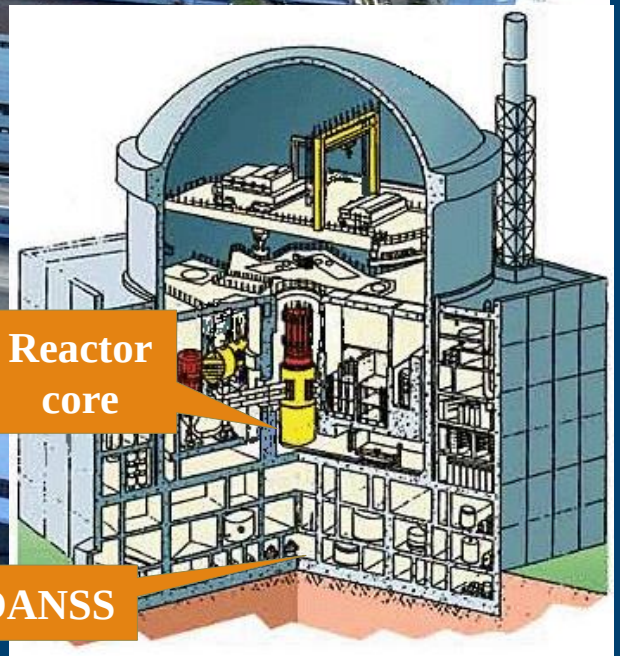
(Tver region, 285 km NW from Dubna)

- Pressurised Water Reactor (ВВЭР-1000)
- Thermal Power: 3 100 MW
- Neutrino Flux: $\sim 6 \times 10^{20}\ \bar{\nu}_e$ / 4π / day
- Campaign: 18 months

DANSS (ongoing)
reactor monitoring and search for sterile neutrino oscillations

GEMMA (completed)
neutrino magnetic moment

νGeN (in preparation)
coherent ν-Ge scattering



2000: Reorganization of the Laboratory of Computing Techniques and Automation (LCTA) into the Laboratory of Information Technologies (LIT)

Challenges before 2000:

- Transition of the developed countries worldwide to the unified information society
- Transition to distributed computing ensuring participation in large-scale international research projects (LHC)
- The need to connect to computer networks for science and higher education
- Application of international standards
- Transition to electronic methods of particle detection

Laboratory today:

MICC main components


GRID


HPC


Cloud


Networking


Power@cooling

LAN	• 10 Gbps
WAN	• 100 Gbps + 2x10 Gbps
Tier-1	• 4160 core, • 5,4 PB disk, 9 PB tape
CICC-Tier-2	• 3640 core, 2PB disk
HPC-HybriLIT	• 252 CPU, 77184 GPU cores, 182 PHI-cores, 2.4 TB RAM, 57.6 TB HDD, 142 Tflops
Cloud	• 700 CPU, 2 TB RAM

Today LIT IT-infrastructure is one of JINR basic facilities

New facility at JINR: “GOVORUN” supercomputer launched on 27.03.18

GOVORUN is highly ranked: 9th position in the latest edition of IO500 List, a new industry benchmark for HPC storage systems.

JINR supercomputer ‘Govorun’ – revolutionary ultra-high dense HPC solution

JOINT INSTITUTE FOR NUCLEAR RESEARCH
1956

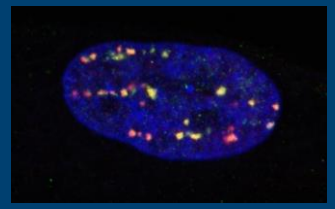
JINR research
is not only Mega-Science and not only “Nuclear”

Research focus of the Laboratory of Radiation Biology

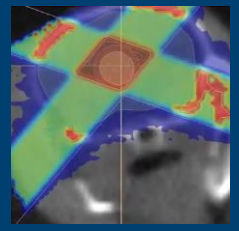
Since 2005 : LRB
Leading centre for accelerator-based radiation biology in former Soviet Union and Eastern Europe

Development of innovations in radiation medicine and space research

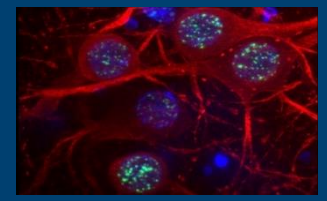
Molecular Radiobiology



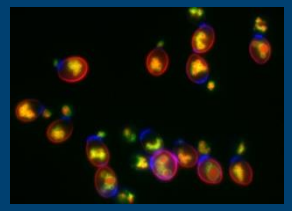
Clinical Radiobiology



Radiation Neuroscience

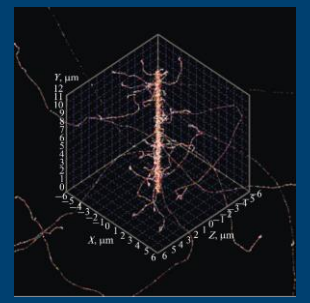


Radiation Genetics

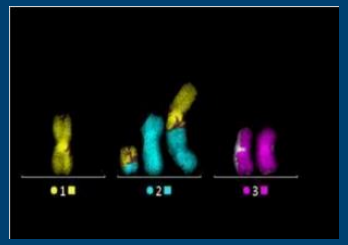


Radiation Physiology

Mathematical Modeling

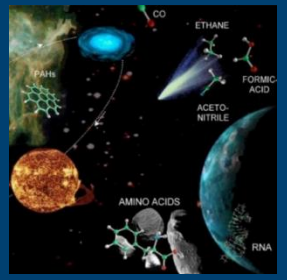


Radiation Cytogenetics



Radiation Protection

Astrobiology



DLNP JINR Sector of Molecular Genetics of the Cell

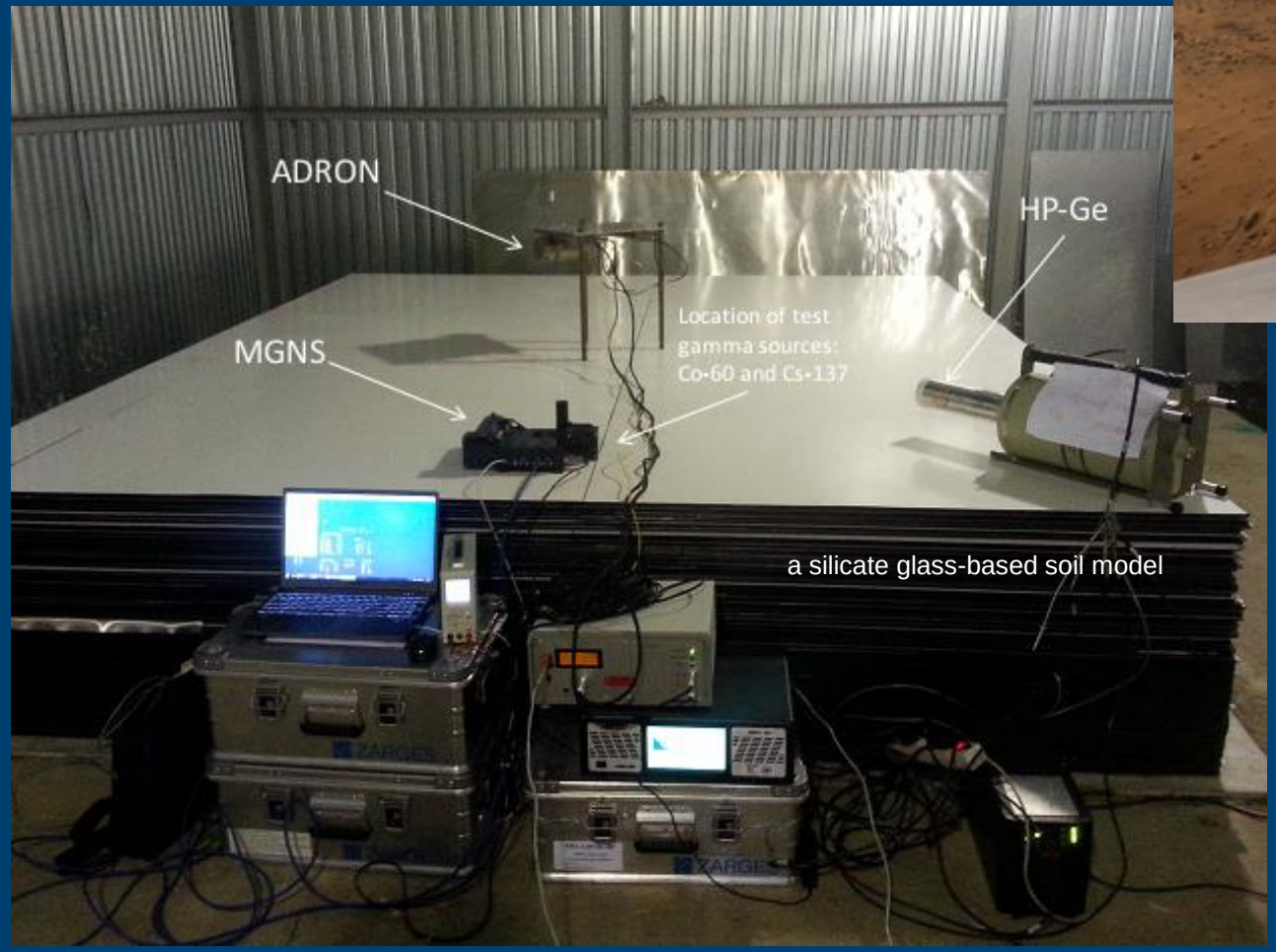
SeqStudio Genetic Analyzer

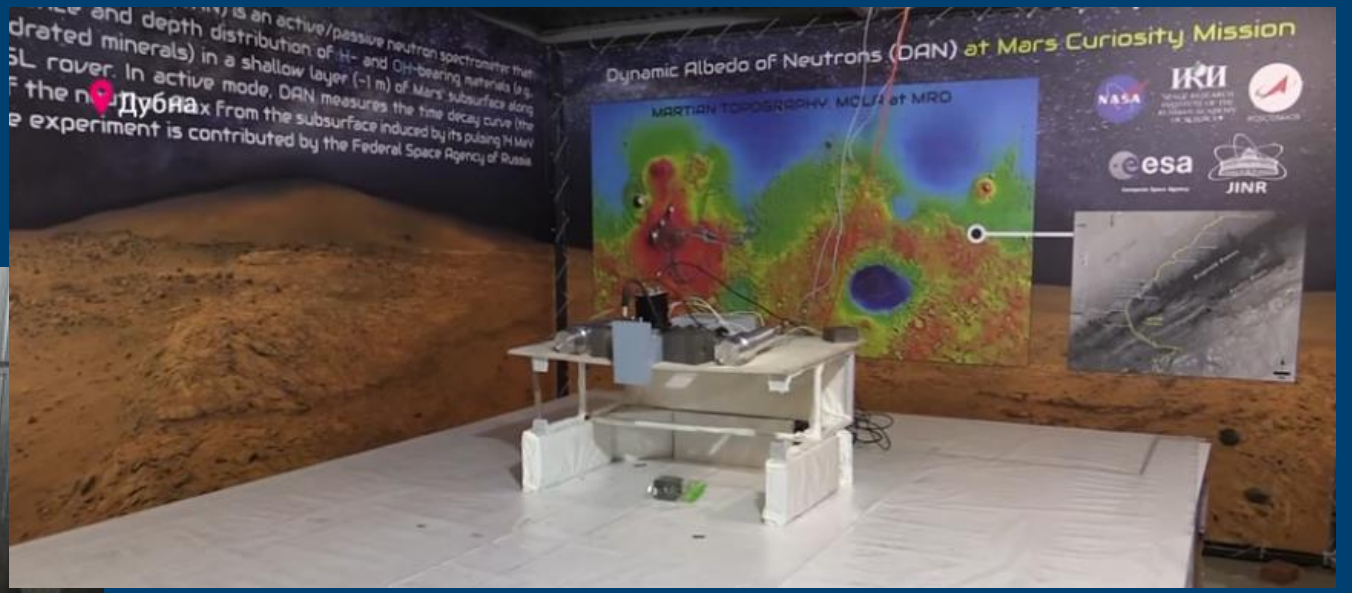
Varioskan LUX multimode microplate reader

Affymetrix GeneChip system

Zeiss AxioVert microscope
with microinjection/micromanipulation system

Nuclear planetary science





Precision Laser Inclinometer (PLI)

PLI for NICA (MPD hall): monitoring angular microseisms during the operation of the collider

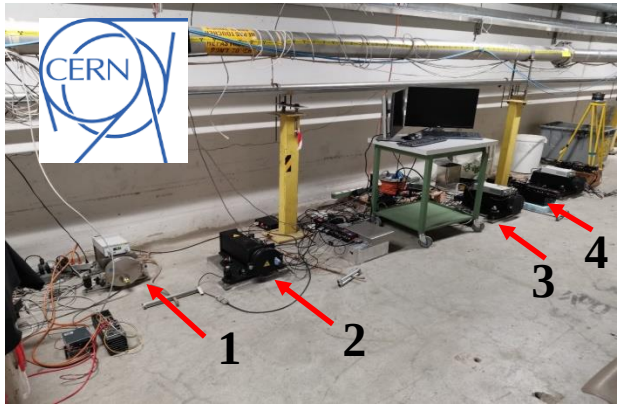
Development of a PLI network for earthquake prediction (agreements):

Institute of Seismology, Armenia

Academy of Sciences of Uzbekistan

VIRGO gravitational antenna: installation of two PLIs

CERN Transport Tunnel: installation of four PLIs



GGO (Armenia): installation of one PLI

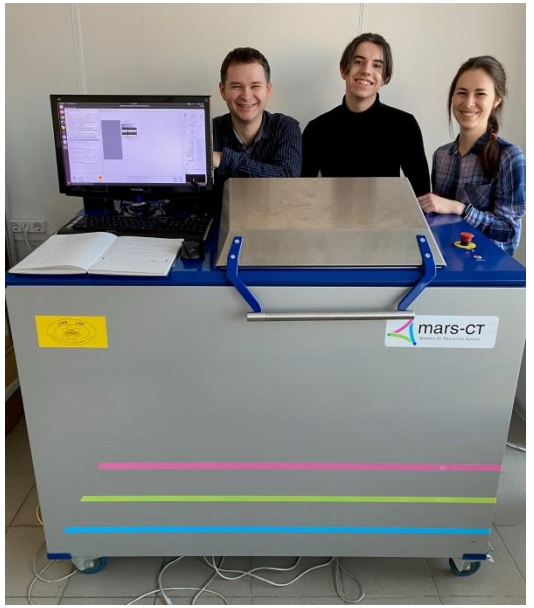
New semiconductor detectors for fundamental and applied research

Modern semiconductor detectors: unique chips of the Medipix series

JINR micro-CT MARS was transported to MIPT University

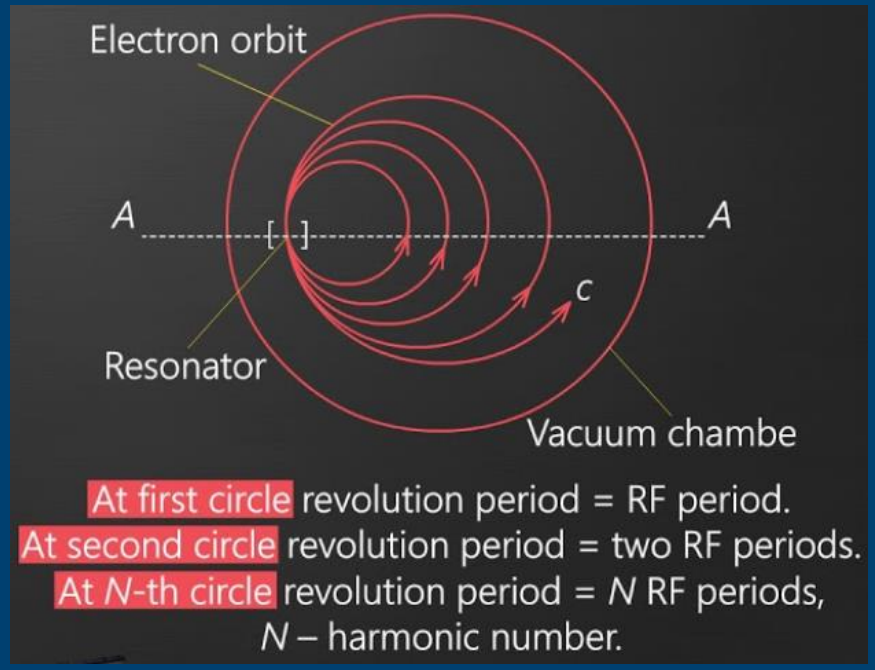
Scientific group is being formed to conduct joint research with biologists, physicists and chemists from Moscow Institute of Physics and Technology and Moscow State University

MARS (*Medipix All Resolution System*) microtomograph



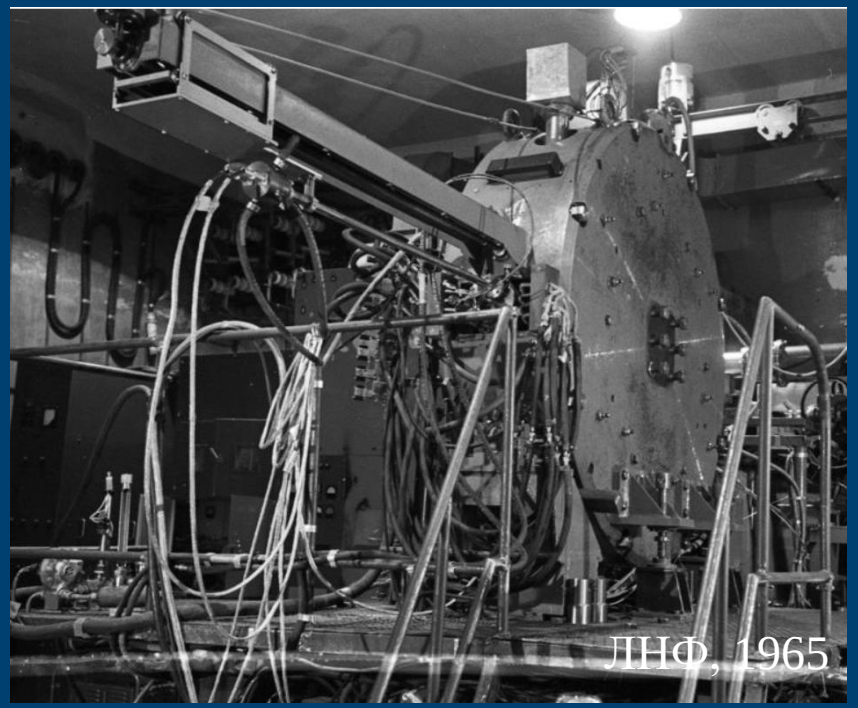
JOINT INSTITUTE FOR NUCLEAR RESEARCH
1956

Knowledge and technology transfer to JINR Member States and Partner Countries



Microtron

- JINR own experience
- Havana
- Hanoi
- Prague
- Ulaanbaatar


ЛНФ, 1965


ЛЯР, 1984


Prague, 1982

Kazakhstan: Cyclotron center in Nur-Sultan

- **2003:** Government decision to develop a cyclotron center in Astana
- **2004–2005:** Design and manufacture of equipment of DC-60 cyclotron
- **2006:** Delivery of equipment to Astana; mounting, tuning and adjustment; first beam generation

Example of distributed infrastructure: JINR Cloud

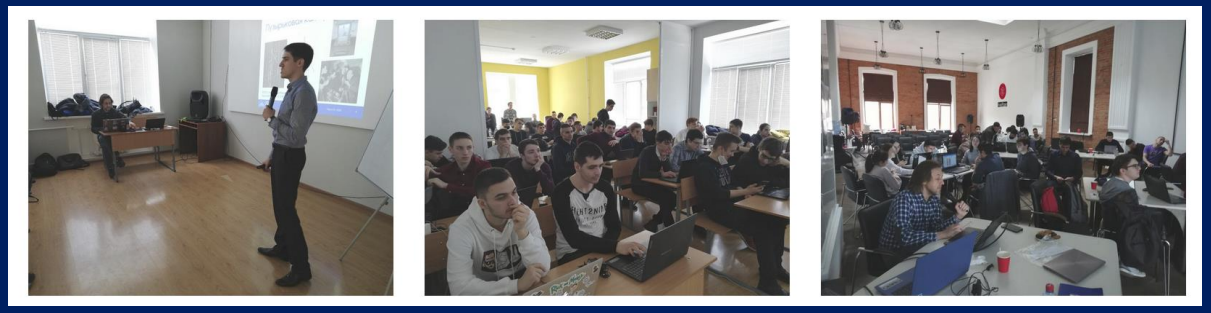
JINR Information Center in the South of Russia

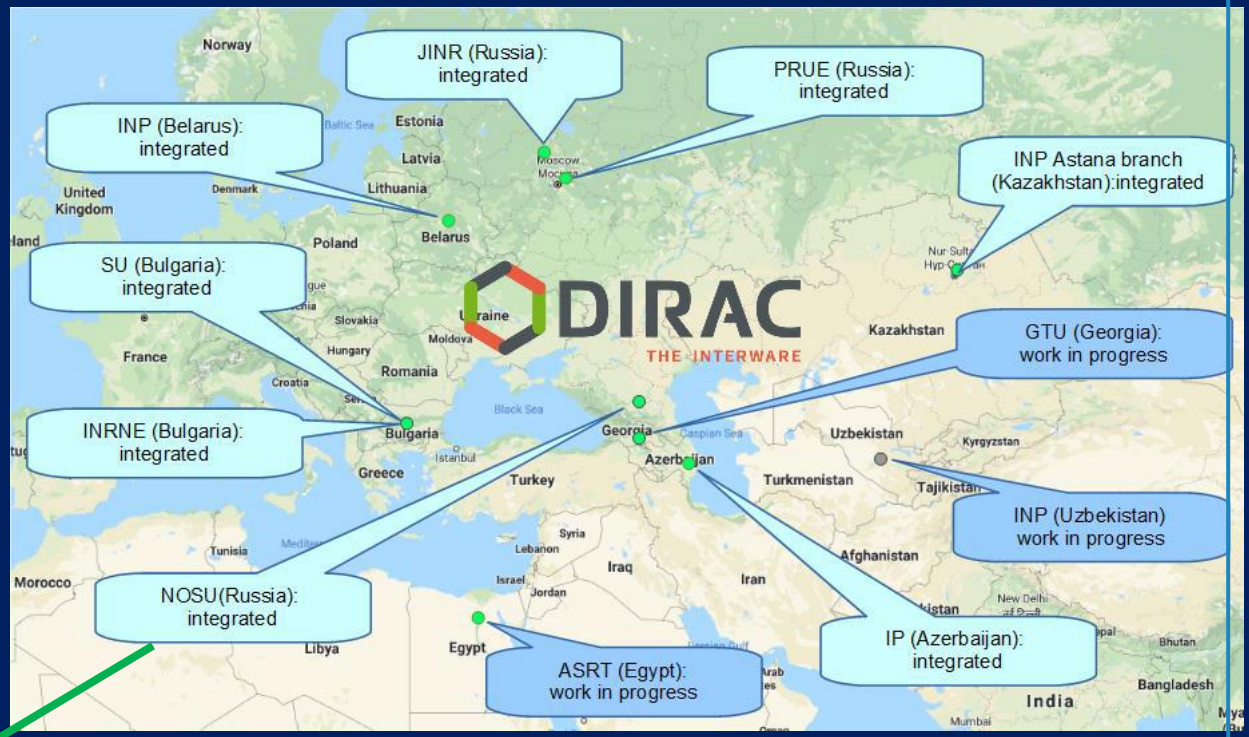
October 2018
Opening ceremony in Vladikavkaz
in North Ossetian State University (NOSU)

December 2017
The idea is to use access to the modern research infrastructure as driver for raising interest in natural sciences

February 2020
Cloud Cluster launched in NOSU

April 2021
School Conference and the workshop “Distributed Computing and Data Science” in NOSU
NOSU will join JINR international IT-School “Analytics of BIG Data”





Distributed information and computing environment
based on the resources of JINR and its Member States’ organizations

Main achievements of IC

2018 number of physics students doubled
2019 competition rate rose to 2.5
2020 full course of 1st year physics students despite pandemic

Groundwork for cooperation

in NICA, ecology, material research, IT, modern education, …

Human capacity building @ JINR

JINR University Centre

The main fields of activity are:

Student programmes

- BS and MS theses at JINR
- INTEREST – new online programme
- International Student Practices
- Summer Student Programme
- Conferences for young scientists and specialists

Science popularisation

- Scientific Schools for physics teachers at JINR and CERN
- Visits to the JINR labs for students
- Open resource **edu.jinr.ru**
- Science festivals and more

Skill improvement

- Advanced practices
- Attachment of degree-seekers
- Engineering training
- Professional course
- Foreign language course

To ensure the effective use of JINR facilities and expertise

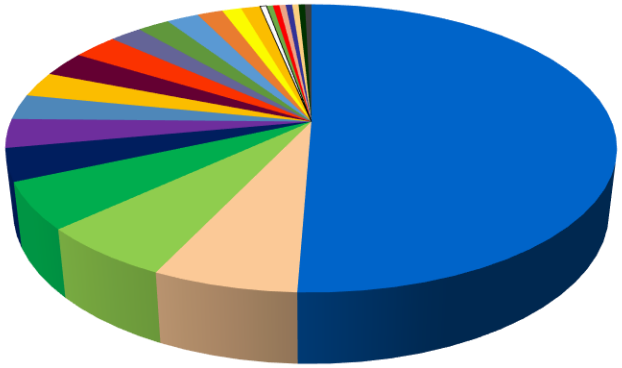
To train highly qualified scientists and engineers from the Member States

To bring up-to-date scientific knowledge to the general public and to highlight recent scientific achievements of JINR

Research Infrastructure as a magnet for young talents

Summer Student Programme

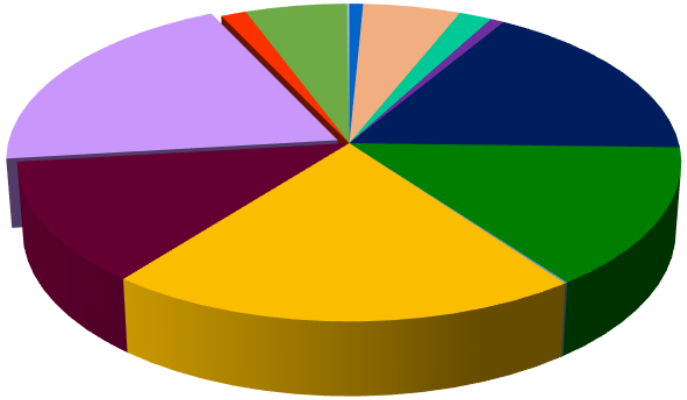
247 participants in 2014-2019



- Russia
- Belarus
- Cuba
- Kazakhstan
- Mexico
- Bulgaria
- Italy
- Slovakia
- Czech Republic
- Poland
- Egypt
- Romania
- Uzbekistan
- Serbia
- Ukraine
- South Africa
- Brazil
- Spain

International Student Practice

1716 participants since 2004



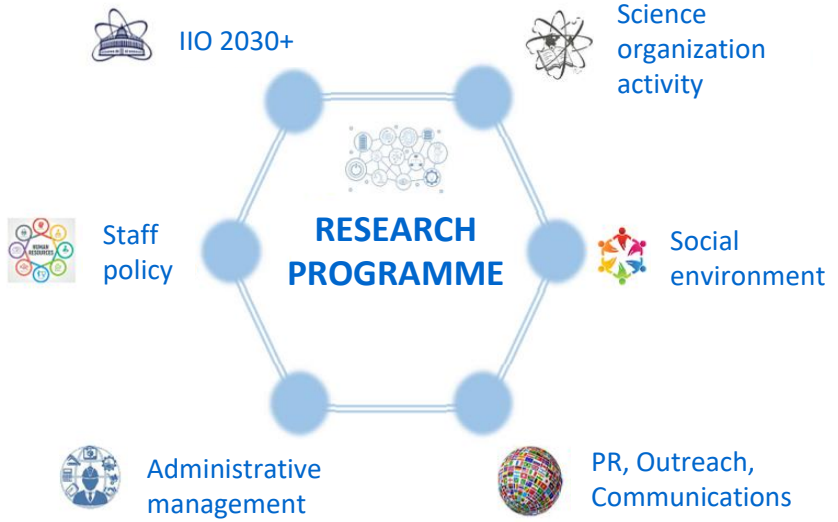
- Azerbaijan
- Belarus
- Bulgaria
- Cuba
- Czech Republic
- Egypt
- Mongolia
- Poland
- Romania
- RSA
- Serbia
- Slovakia
- Chile

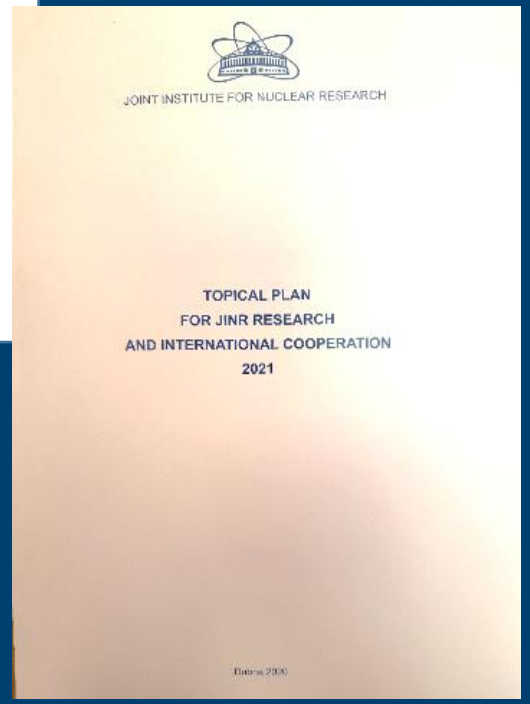
JOINT INSTITUTE FOR NUCLEAR RESEARCH
1956

Short look into future of JINR and Serbia-JINR cooperation

Do Science@Dubna

ARCHITECTURE OF THE STRATEGIC PLAN





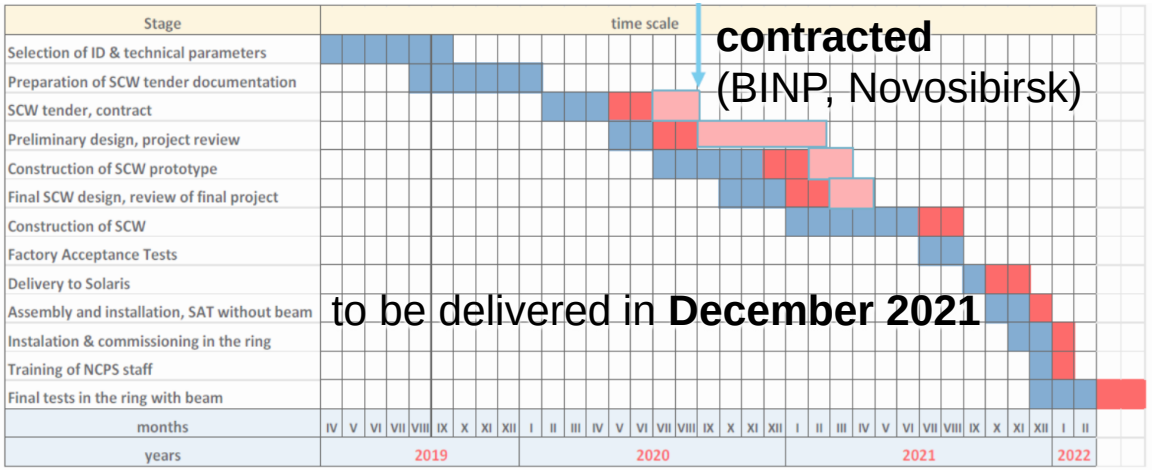
http:// plan.jinr.ru

SOLCRYS – A JINR FACILITY FOR STRUCTURAL RESEARCH AT SYNCHROTRON SOLARIS

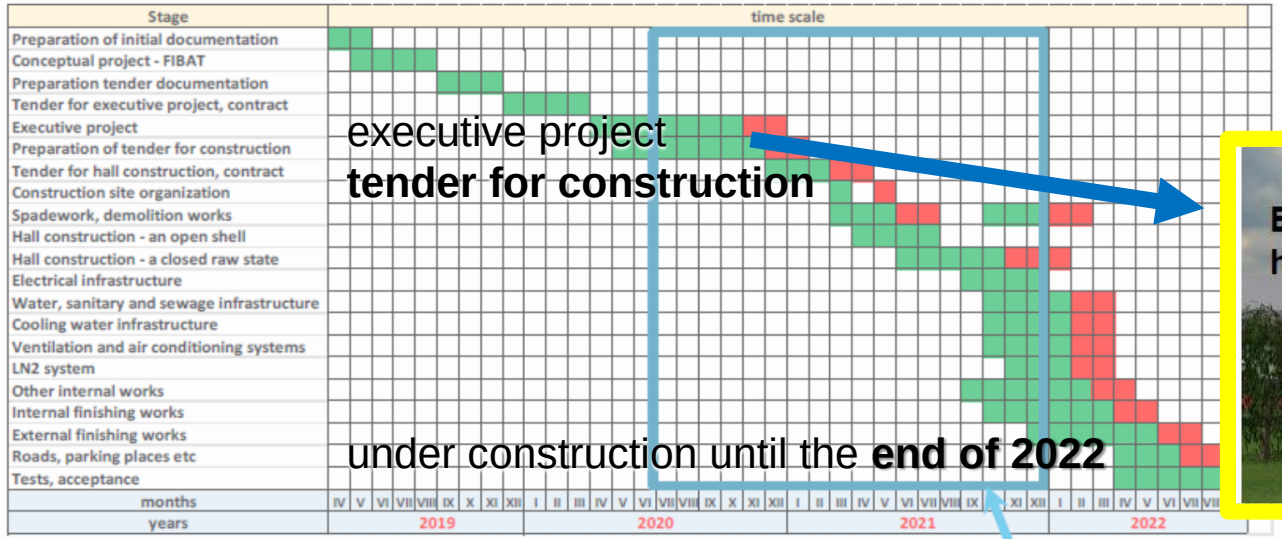
The Polish national synchrotron centre SOLARIS

Krakow, Poland

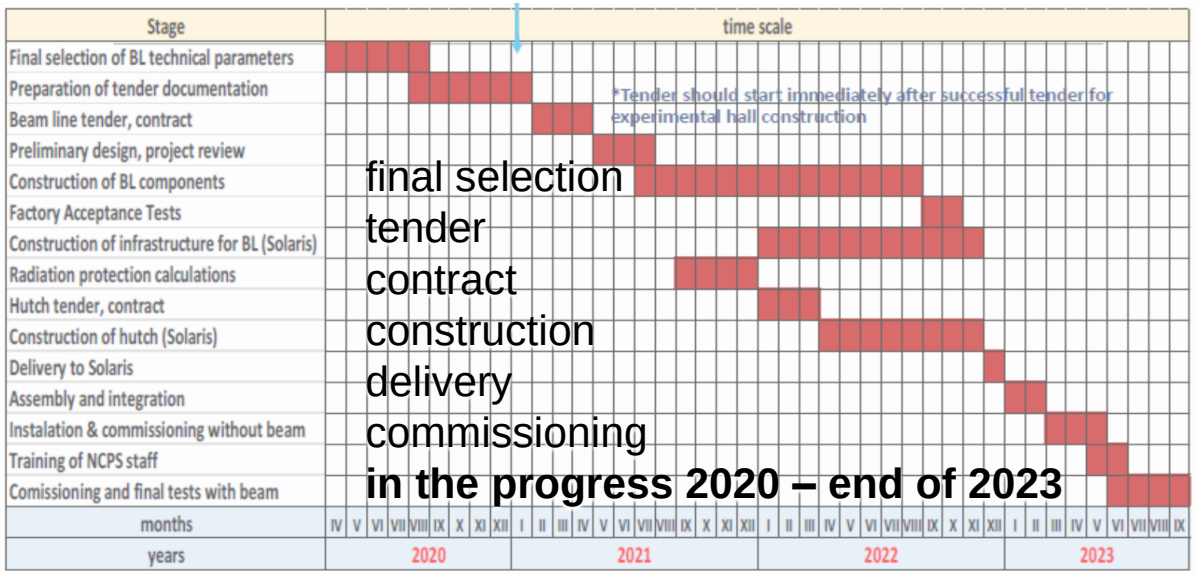
- **Synchrotron radiation source** (superconducting wiggler)



- **Experimental hall extension**



- **Experimental beamlines**



New: Innovation center

Main tasks:
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 and medical physics.

Main stages:

- New facility: DC-140 cyclotron for electronic component testing, radiation material science, track pore membrane research and production, etc. (period of realization: 2021–2023);

- New facility: Radiochemical Laboratory Class-I for production of radioisotopes (Ac^{225}, ^{99m}Tc) for nuclear medicine in photonuclear reactions @ 40MeV Rhodotron accelerator (period of realization: 2022–2026);

- User facility (beam lines from MeV/u to GeV/u) @ NICA: radiobiological studies (400-800 MeV/n); radiation testing of semiconductor electronics (3; 150-350 MeV/n); nuclear physics data @ 1-4.5 GeV/n (period of realization: 2021–2024);

- Radiation biology: OMICS technologies and neuroradiobiological studies. Radiation neuroscience. Approaches to increase radiosensitivity: pharmaceuticals, transgene systems, targeted delivery (molecular vectors) and radionuclide;

- New facility for R&D in beam therapy: treatment planning; radiomodificators for photon and proton therapy, flash-therapy and pencil beam, other breakthrough technologies. 230 MeV SC p-cyclotron as a pilot facility for future medical centre. Period of realization: 2021–2024.

The RoadMap for Innovation Center will be presented at the JINR session of Committee of Plenipotentiaries in November 2021.

QC Milestones JINR – Serbia

1994 Multilateral agreement JINR-“Vinča” institute
1996 Construction of “Vinča cyclotron complex started
2001 Ministerial visit to JINR
2007 Cooperation Agreement with Serbian government
2009 Funding from Serbia started
2010 Bilateral coordination meeting FAMA-FLNR on material science with ion beams
2014 International coordination meeting (Belgrade)
2017 Days of JINR in Serbia (Belgrade, Novi Sad)
2017 Endorsement of the Road Map, increased contribution
2019 Road Map of the cooperation is signed, readiness to full member in 2024
2020 Open Days of JINR in Belgrade

2021 Action Plan for fast track on the Road Map (expected)

WoS Publications Year	JINR, Serbia with others	JINR, Serbia without CERN	CERN, Serbia without JINR
2004	1	1	2
2005	-	-	1
2006	4	1	1
2007	13	3	-
2008	15	6	2
2009	21	6	-
2010	69	6	1
2011	146	4	1
2012	263	11	-
2013	196	10	1
2014	189	8	-
2015	226	9	1
2016	246	17	4
2017	222	12	3
2018	277	15	-

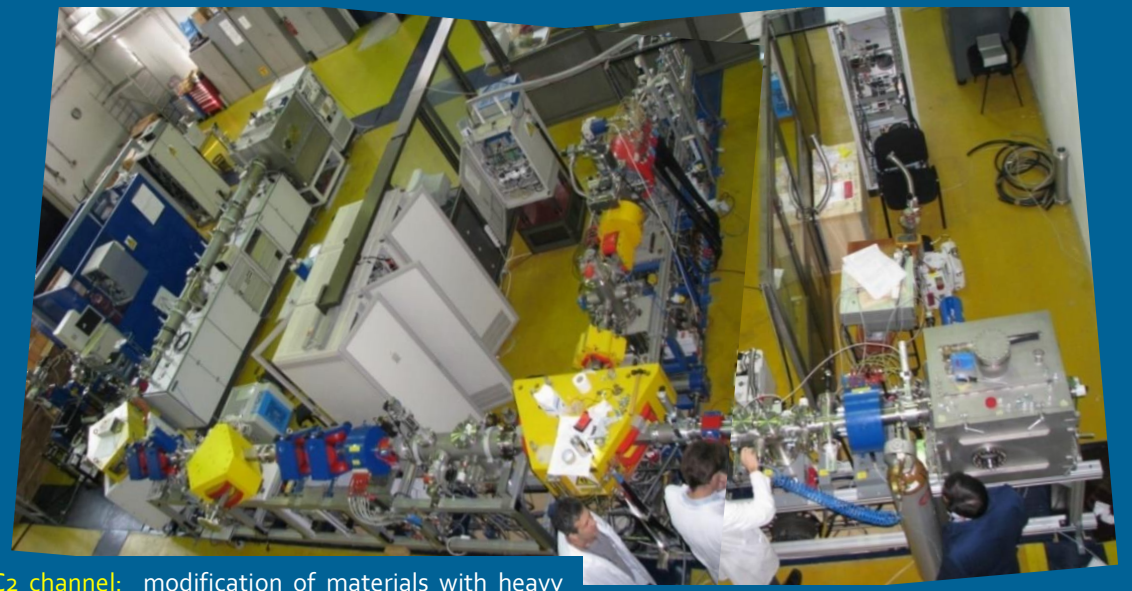
Member of SC since 2018
Member of the NC of Science
Secretary General
of the World Academy
of Art and Science

Serbia in JINR in 2020:
12 Joint Research Projects
Annual contribution
150 kUSD in 2019

Main cyclotron of the TESLA Acceleration Installation complex aiming to deliver 70 MeV protons for the proton therapy, experimental production of radiopharmaceuticals and the analysis of materials.

First ECR ion source of TESLA project
JINR Directorate visit
to “Vinča” Institute, 2009

FAMA: Facility for modification and analysis of materials with ion beams



C2 channel: modification of materials with heavy ions (various metal, semiconductor, carbon, polymer and ceramic targets).

C1 channel: irradiation of polycrystalline and monocrystalline targets.

JINR Expertise for Member States and Partner Countries

* 15 training programs for science administration implemented during April 2017 - February 2020
* 183 participants from 30 countries and one IGO

Universities	Rectors and Vice-Rectors	6
	Deans and directors of research units	19
	Local contact points	45
Research organizations	Directors and vice-directors	17
	Heads of departments	51
	Local contact points/experts	30
Governments and IGO	Minister, DG, CEO/ deputies	3
	Governmental & IGO officers	8
	JINR Board members	4

JINR Open Days in Serbia

5-6 March 2020, Belgrade

Serbian Academy of Sciences and Arts (SANU)

Reports, collaborative meetings
and presentations from:

- *Ministry of Education, Science and Technological Development of Serbia*
- *JINR Directorate*
- *Chamber of Commerce and Industry of Serbia*
- *Vinča Institute of Nuclear Sciences, Belgrade*

Grand Hall, SANU

5 March 2020, Belgrade

Meeting with **M. Šarčević**,
Minister of Education,
Science and Technological
Development
of the Republic of Serbia

Exhibition of industrial developments
of the Republic of Serbia

CHAMBER OF COMMERCE AND INDUSTRY OF SERBIA
1857

M. Vesović
Director of the Division
for Strategic Analyses,
Services
and Internationalization,
Chamber of Commerce
and Industry of Serbia

Welcome to JINR!

How to get informed:

www.jinr.ru	general information
plan.jinr.ru	for researchers
uc.jinr.ru	for students and for teachers
www.jinr.ru/jems	for decision makers