JINR development in 2017–2023

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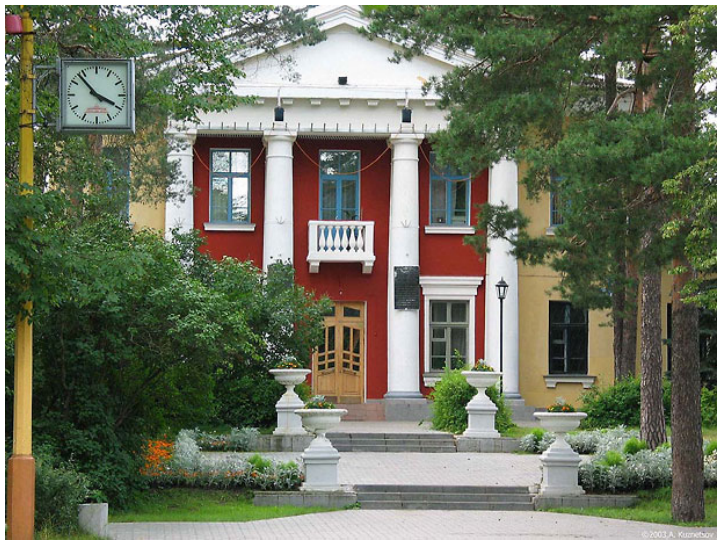
Joint Institute for Nuclear Research — an international intergovernmental organization in the field of basic science



The are 18 member-states of the JINR.
There are cooperation agreements with Egypt, Germany, Hungary, Italy, Republic of South Africa, Serbia at the governmental level.

JINR is
— unique physics of superheavy elements,
— precision nuclear spectroscopy,
— materials and physics of condensed state,
— fundamental work with neutrons,
— particle physics of ultra-high-energy,
— precision neutrino physics
— and modern astrophysics,
— theoretical and mathematical physics,
— information technology and computing,
— advanced technology
— and new technique of experiments,
— biophysics, radiobiology, astrobiology,
— proton medicine, ...

These diversity and multidisciplinarity distinguish significantly JINR from CERN!

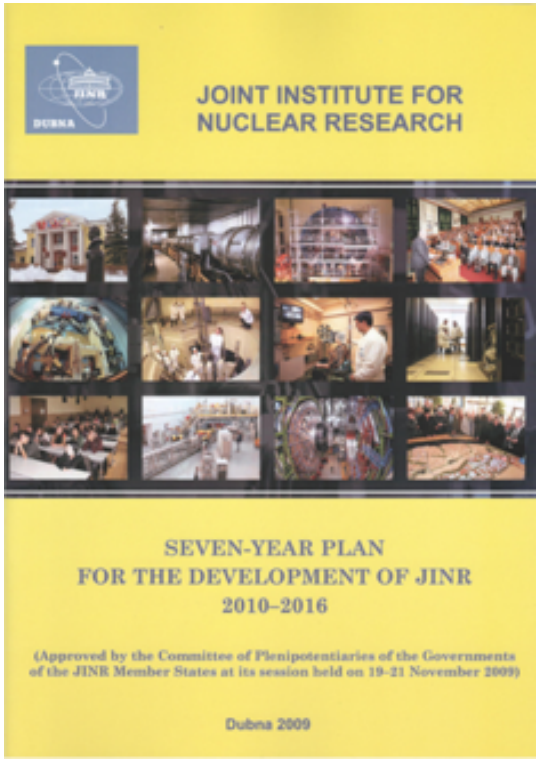
The JINR strategical goal

Strategical goal of JINR is to ensure continuous production of new knowledge based on fundamentality, internationality and multi-disciplinarity of JINR research.

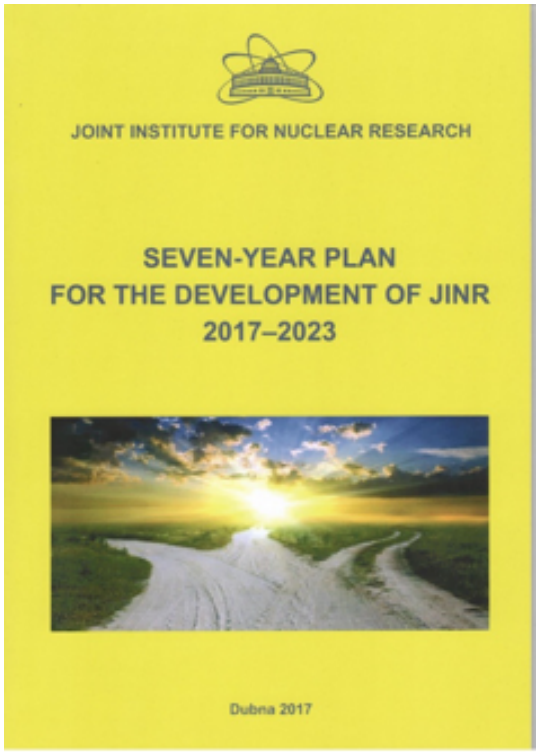
→ **2017 – 2023**

The future success of the Institute is in preservation and multiplication of its unique traditions, and in profitable combination of various scientific directions.

New 7-year plan is a continuation of all our BEST



2017–2023



The concept of previous Plan (2010–2016) was focused on update and qualitative improvement of the accelerator and reactor base (research infrastructure) of JINR:

– neutron reactor IBR-2M for research in condensed matter physics

– complex DRIBs (Dubna Radioactive Ion Beams) for the search for new superheavy elements

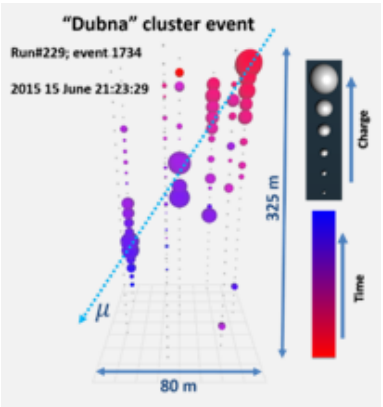
– collider NICA (Nuclotron-based Ion Collider fAcility) for study the hot and dense baryonic matter.

Major objectives of JINR development in 2017–2023

2017–2023:

- Focusing on the effective use of the new and modernized basic facilities, built up under the previous 7-year plan (IBR-2M, SHE factory);
- New fixed target facility BM@N at NUCLOTRON (2017);
- First stage of the NICA collider (2020);
- Full scale Gigaton Volume Detector at Baikal Lake (2023);
- Extension of the international cooperation around basic facilities of JINR, further integration of these facilities to European and worldwide research infrastructure;
- Attracting new countries to the JINR family;
- Adjusting the general infrastructure and "operation models" of JINR accordingly to experience of best international research centers.

Construction and development of JINR main research facilities



Nuclotron-based Ion Collider fAcility — NICA

NICA is the accelerating complex allowing to conduct research on the colliding high-intensity ion beams (up to Au^{+79}) with average luminosity $10^{27}sm^{-2}/sec$ at the energy range 4–11 GeV, and also with beams of polarized protons (up to 26 GeV) and deuterons (up to 12 GeV) with longitudinal and transverse polarization, as well as on the extracted beams of ions and polarized protons and deuterons.

For effective use of opportunities of the accelerating complex NICA the adequate experimental apparatus will be created: BM@N setup — on the extracted beams, and MPD (multi-purpose) and SPD (spin) — on the NICA collider.

Stages of commissioning and development of elements of the NICA complex:

Commissioning: booster – 2017; first configuration of the collider – 2020; design configuration of the collider – 2023.

Development of an experimental area and extracted beam channels of the NICA complex: channels for transportation of heavy and light ions, polarized particles, the test channel and the corresponding infrastructure – 2017–2019.

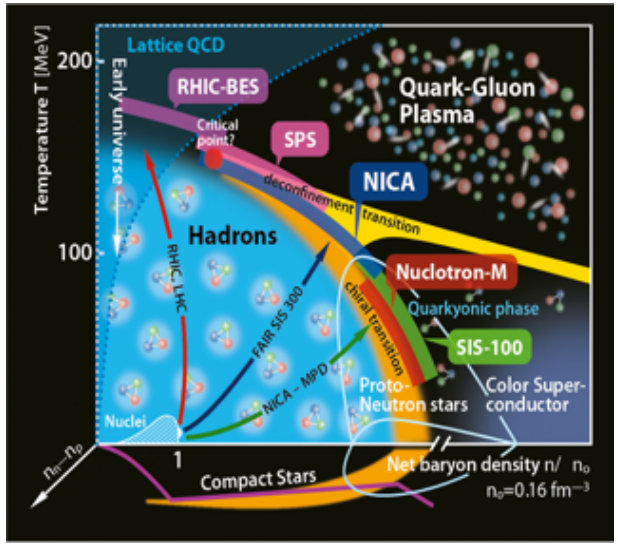
Opportunities:

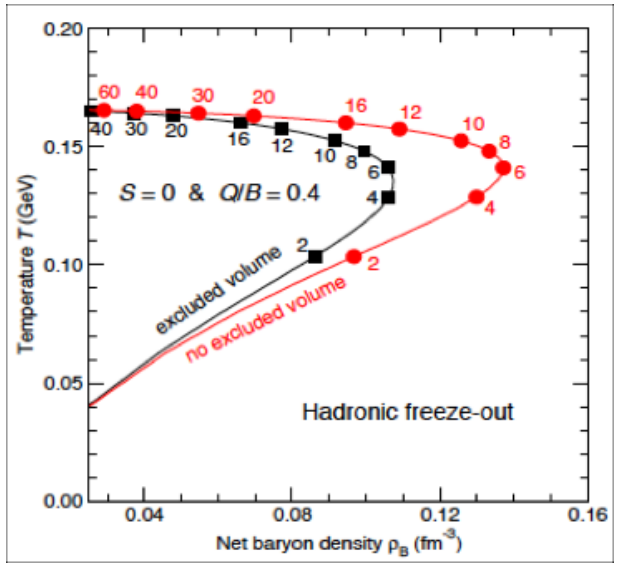
with BM@N setup

- in-medium effects on strangeness and vector meson production; hyperon production
- femtoscopy with variety of hadrons
- NN and NA interactions as a references for AA collisions studies
- electromagnetic probes, ...

with MPD setup

- 1-st stage: new data on the hot and dense baryonic matter in the central rapidity region of heavy ion collision;
- 2-nd stage: search for phase transitions including partial restoration of Chiral symmetry; search for the critical end-point at the Phase Diagram.

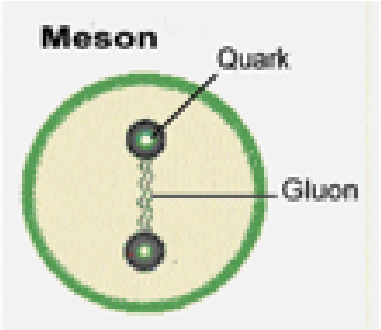


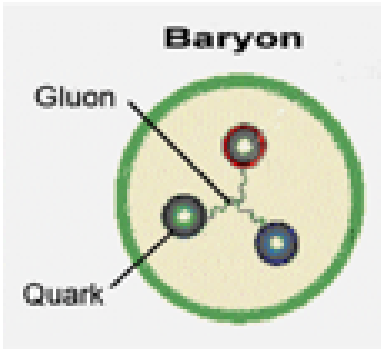


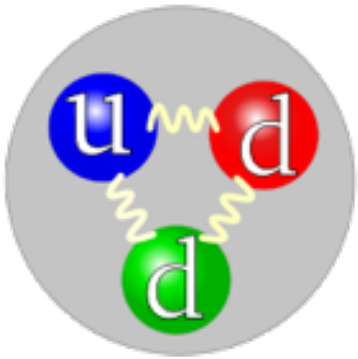
NICA is well suited for exploring the transition between the hadronic and quark-gluon phases at the high net baryon density. Exploring high-density baryonic matter in the region of maximum freeze-out density. This is the top priority of the NICA.

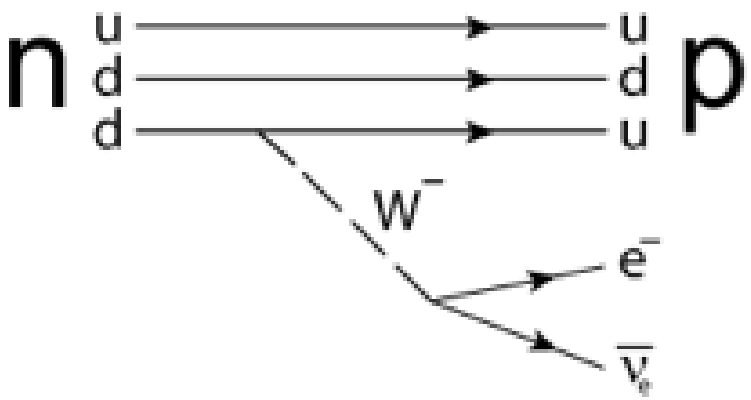
NICA $\rightarrow$ The Nonperturbative QCD

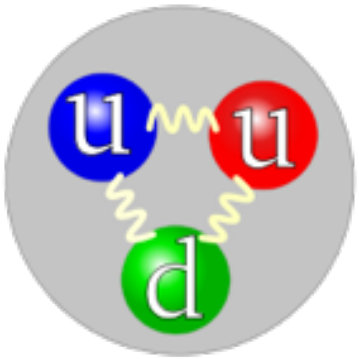
is the important part of the modern Standard Model, able to explain – from the first principles – the dynamical chiral symmetry breaking (which generates about 98% of the visible mass in the Universe), the confinement effect, and to provide basics of the Entire Nuclear Physics, answering – How hadrons are made from quarks and gluons, and how we could explain all diversity of particles and nuclei, interacting with each other?



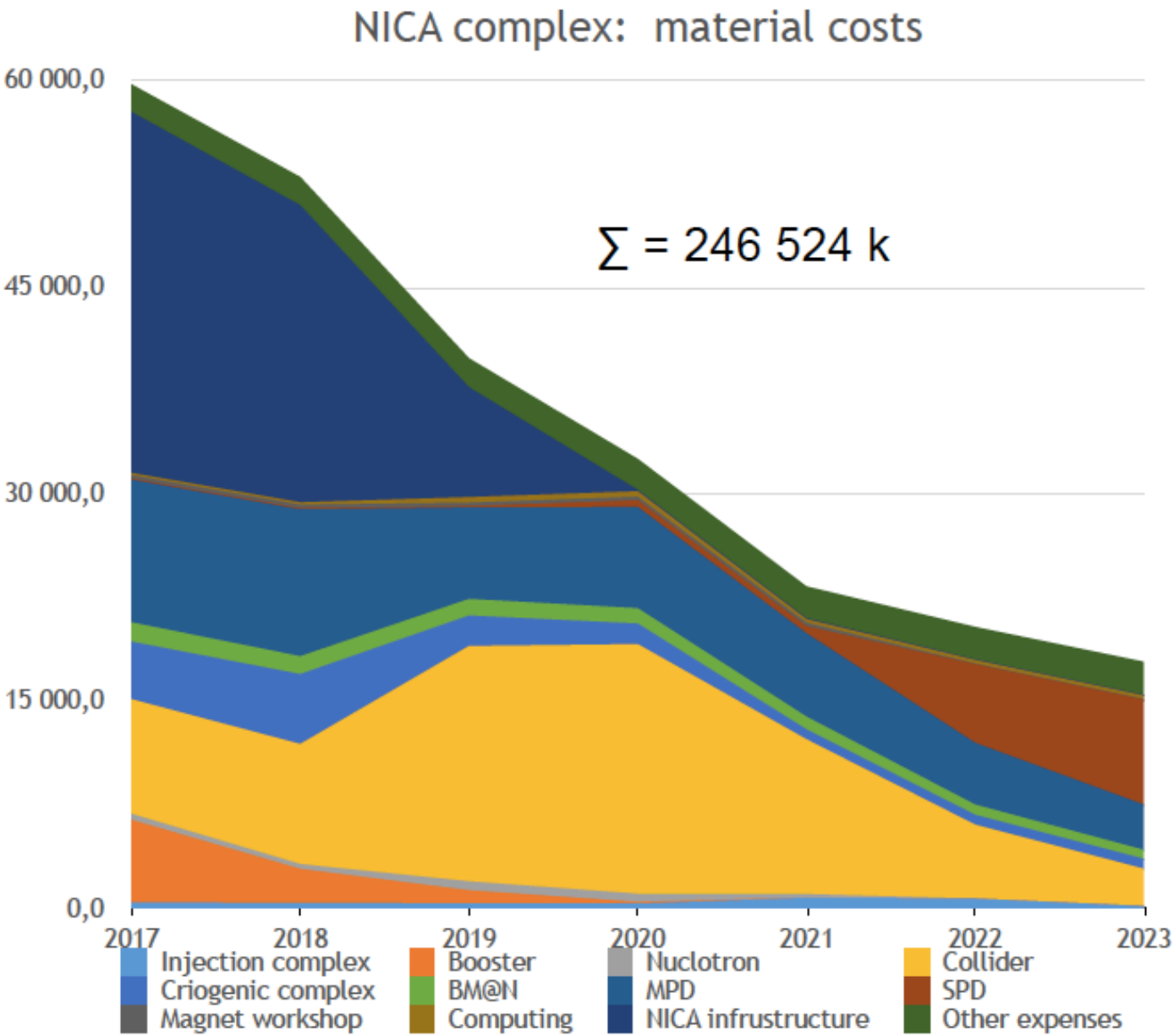








Very small n-p mass difference — about 1.3 MeV (0.14%), but how important !?


NICA complex: material costs
∑ = 246 524 k
60 000,0
45 000,0
30 000,0
15 000,0
0,0
2017
2018
2019
2020
2021
2022
2023
Injection complex
Criogenic complex
Magnet workshop
Booster
BM@N
Computing
Nuclotron
MPD
NICA infrustructure
Collider
SPD
Other expenses

JINR objectives in the field of relativistic nuclear physics:

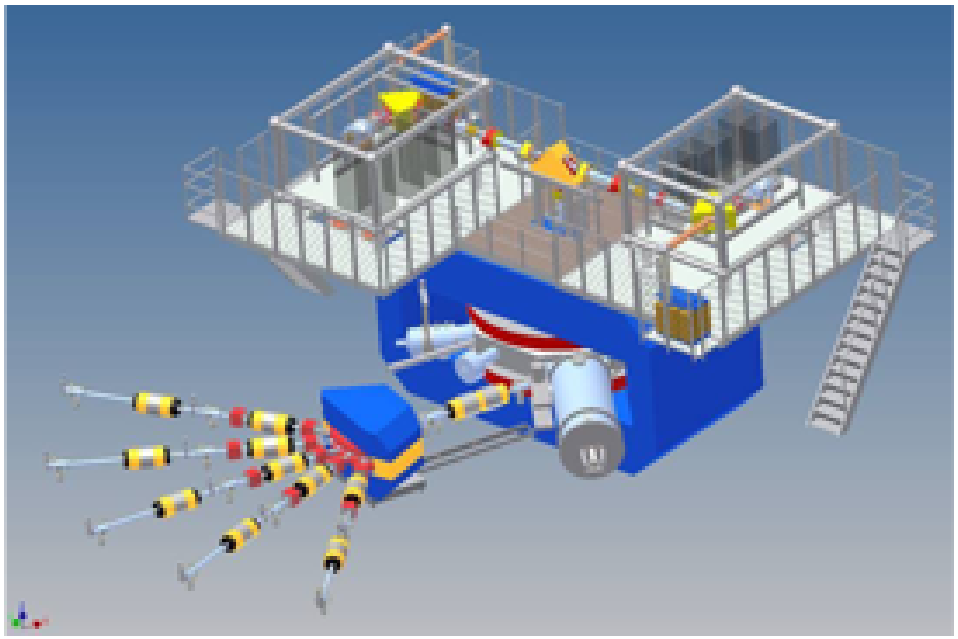
– Developing theoretical models and QCD methods in the region that will be available in the complementary NICA and FAIR projects;
– Establishing an effective interaction system between these two international projects in institutional, technological and research areas, developing regulations for joint data processing, formalizing this cooperation in the European context;
– Developing projects for relatively "distant" research prospects: spin physics, electron-ion collider, concurrent beams, ...;
– Determining the scope and terms of use of opportunities that will be provided to users at the Nuclotron and, subsequently, at NICA. Establishing the User Policy. Disseminating broad information about these opportunities, establishing appropriate committees for the selection of projects.

NICA is going ON!

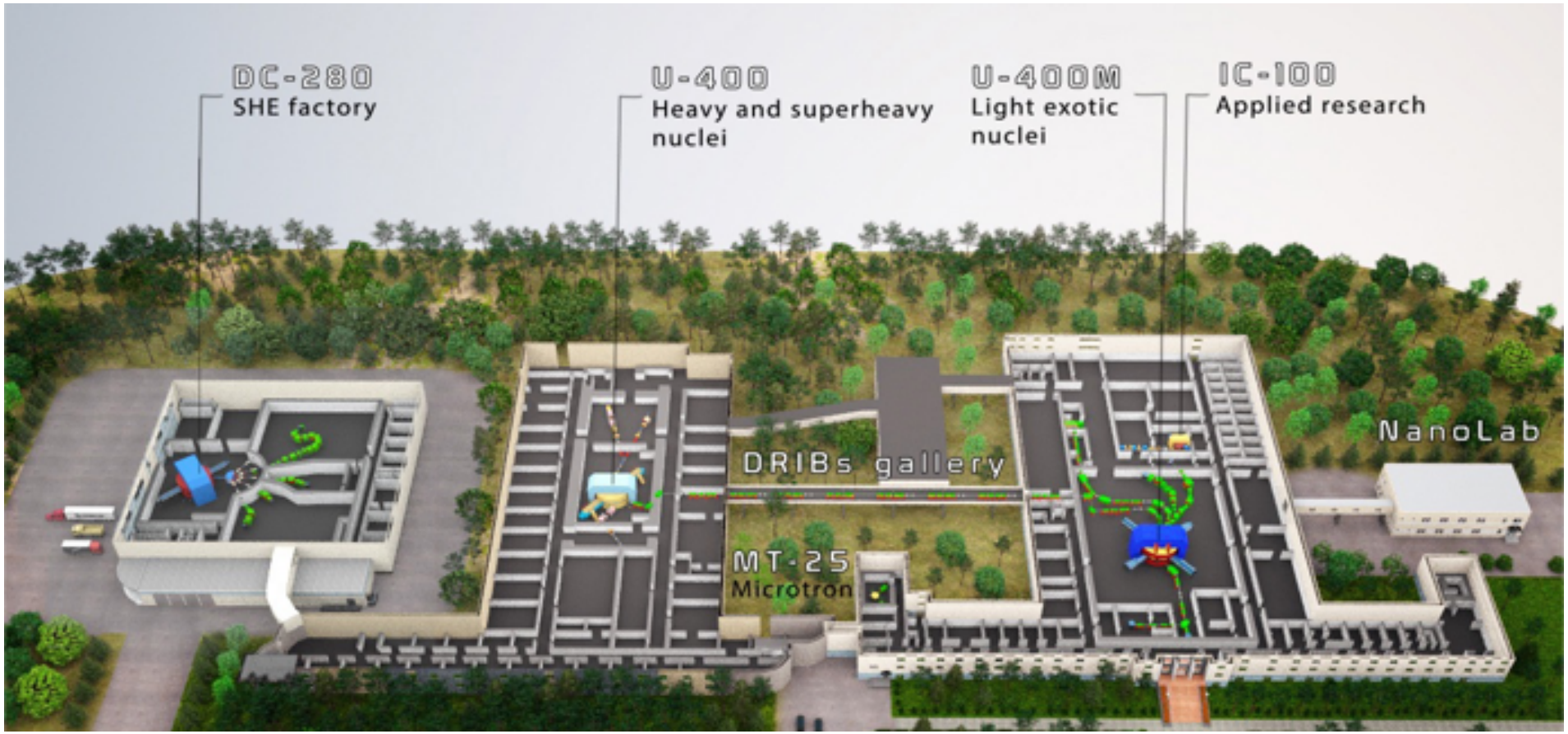
Full-scale startup of the **"Factory of superheavy elements"** (SHE) on the basis of a specialized cyclotron DC-280 and experimental setups of a new generation is the main task of the FLNR for the period of 2017–2023.

It will considerably expand possibilities of carrying out fundamental and applied research on nuclear physics at JINR at the highest level in wide collaboration with scientific centers of the Institute member states and other countries.

Completion of the SHE Factory building and its engineering systems — 2017.
Assembling the DC-280 cyclotron. Installation of new Gas-Filled Recoil Separator — 2017.
First experiments — 2018.



Dubna Radioactive Ion Beams Complex (DRIBs) for new superheavy elements search and study



Unique achievements of Flerov Laboratory of Nuclear Reactions!

IUPAC
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*

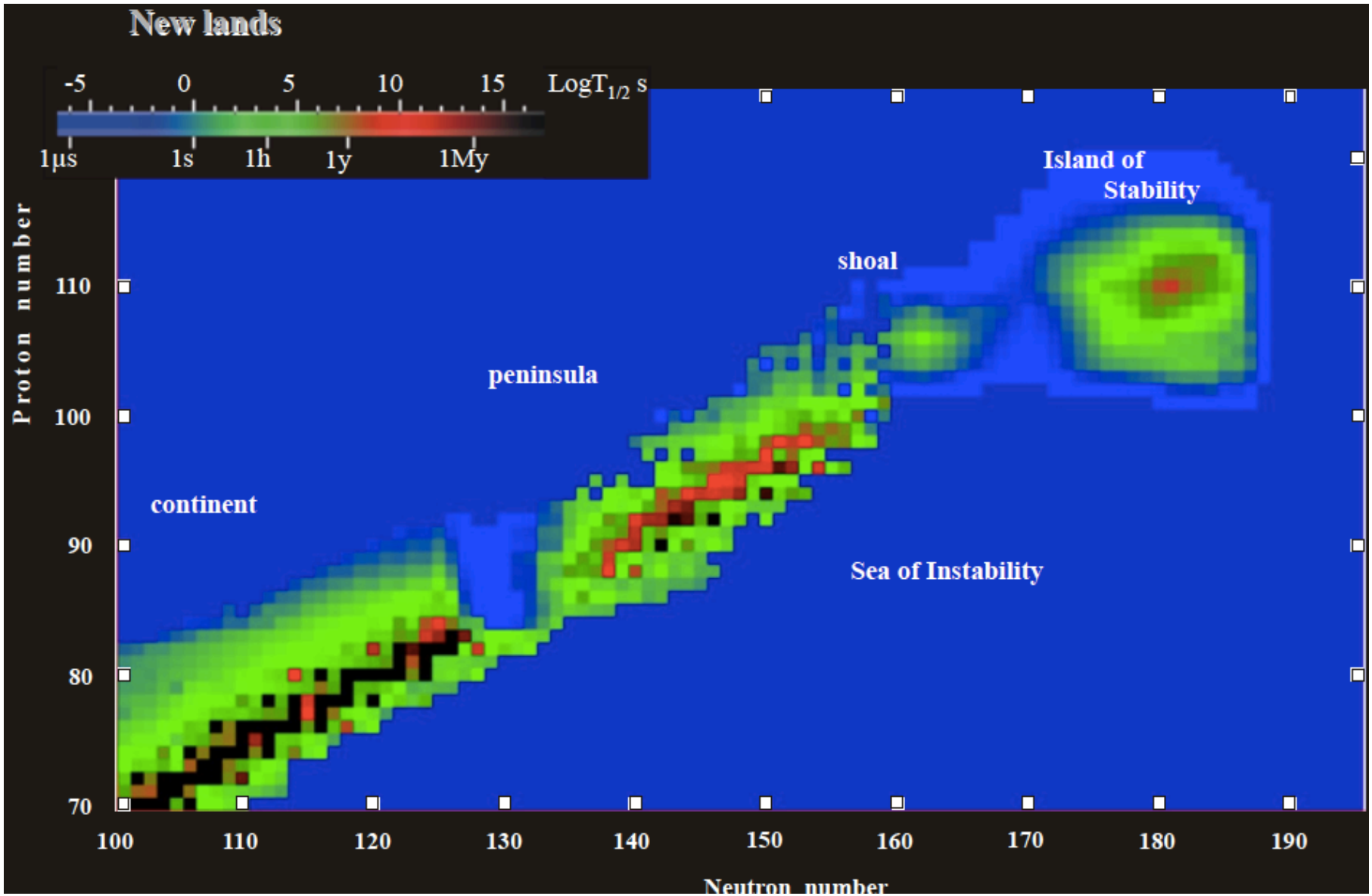
30th December 2015:
Approval of the discovery of new elements *113, 115, 117, and 118*

- 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**.

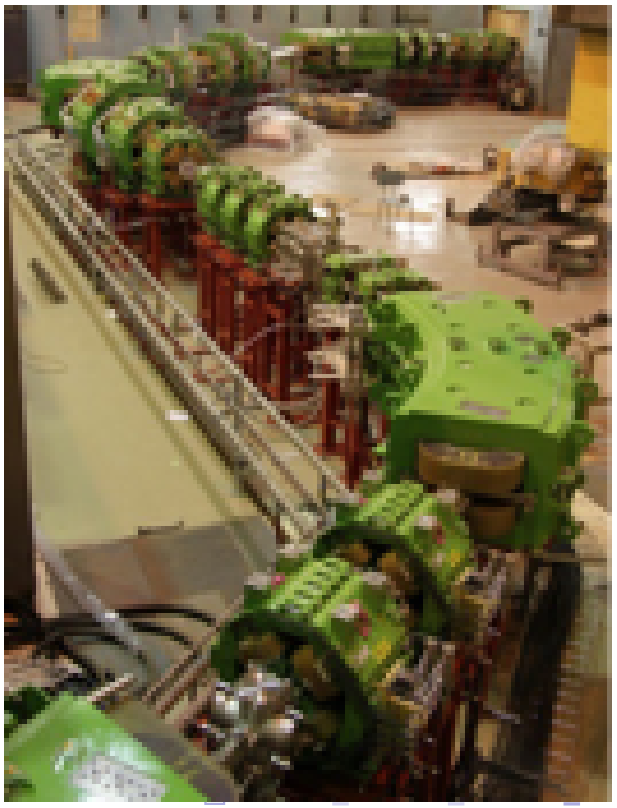
New "super-heavy" horizons

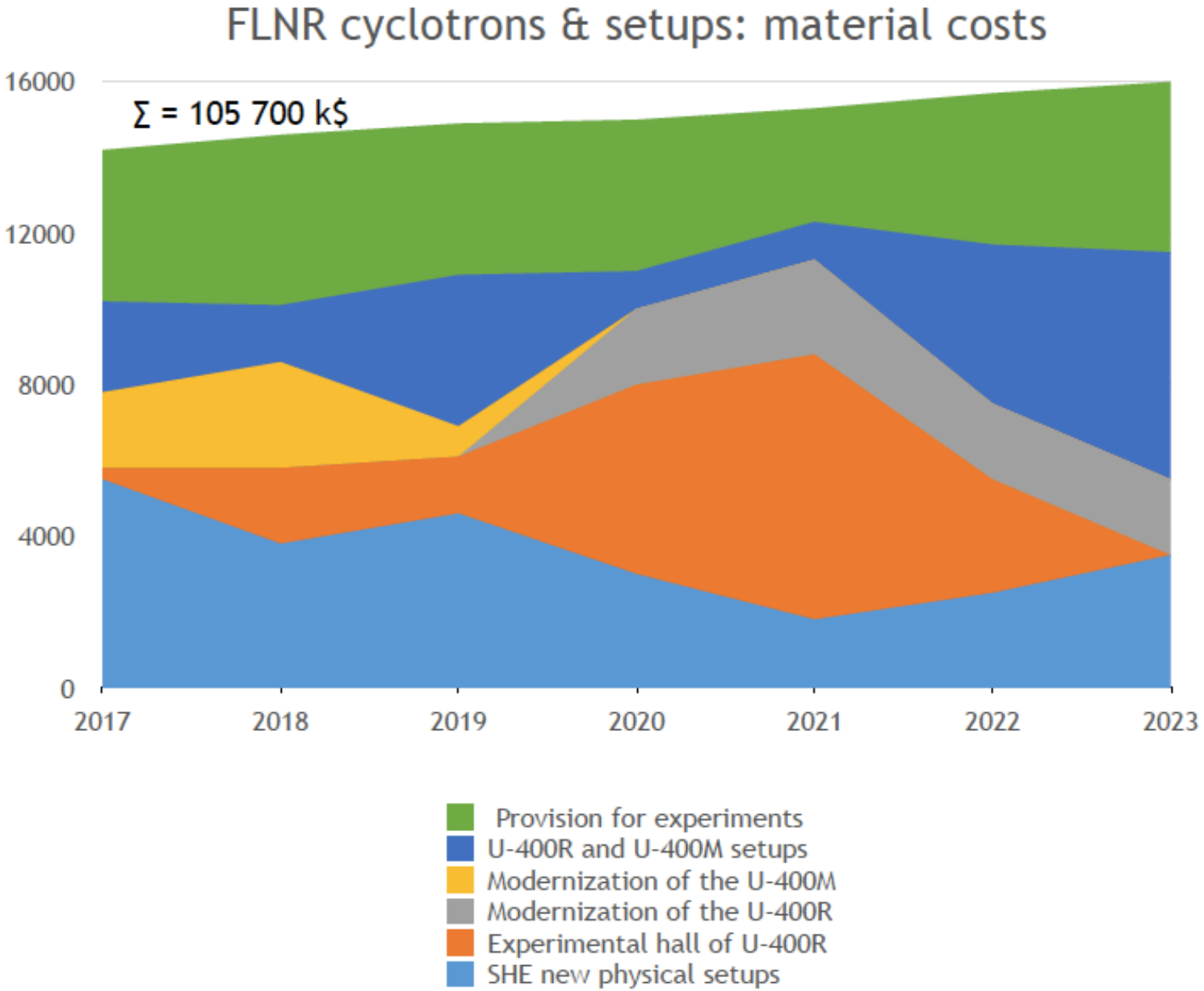


Main stages of the DRIBs project:

– production of beams with smoothly variable energy;
– attaining the maximum beam intensity (up to 10 pμA) for nuclei with A$\leq$100;
– production of intensive beams of rare stable isotopes (^{36}S, ^{48}Ca, etc.) and beams of long-lived radioactive nuclei (^{36}Ar, ^{50}Ni etc.);
– development of the infrastructure for accommodation of the experimental setups from other research centers (in 2017–2023).

Reconstruction of the U-400M cyclotron aimed at:
– production of intensive beams of radioactive ions;
– advancing toward the boundaries of proton and neutron stability of nuclei;
– research with the nuclei of maximum proton and neutron excess employing a new powerful ACCULINNA-II separator (in 2020).




FLNR cyclotrons & setups: material costs
Σ = 105 700 k$
16000
12000
8000
4000
0
2017
2018
2019
2020
2021
2022
2023
Provision for experiments
U-400R and U-400M setups
Modernization of the U-400M
Modernization of the U-400R
Experimental hall of U-400R
SHE new physical setups

Objectives in the field of (heavy) nuclear physics:

– In executing the plans for the seven-year period 2017-2023, the total amount of beam time at the FLNR accelerators will reach more than 15 thousand hours, which more than covers the needs in acceleration time for basic tasks (superheavy elements and exotic nuclei).

Therefore, it will become a possible (and, in fact, necessary) task to organize a system for attraction, selection and support of projects not regulated by the standard procedure of making the JINR Topical Plan (*Users Policy*).
Addressing this task will require both organizational and technical solutions (e.g., creation of conditions for the temporary placement and maintenance of research facilities).

– Determining the scope and scale of JINR's participation in the European ELI (Extreme Light Infrastructure) project.

The IBR-2 pulsed neutron source

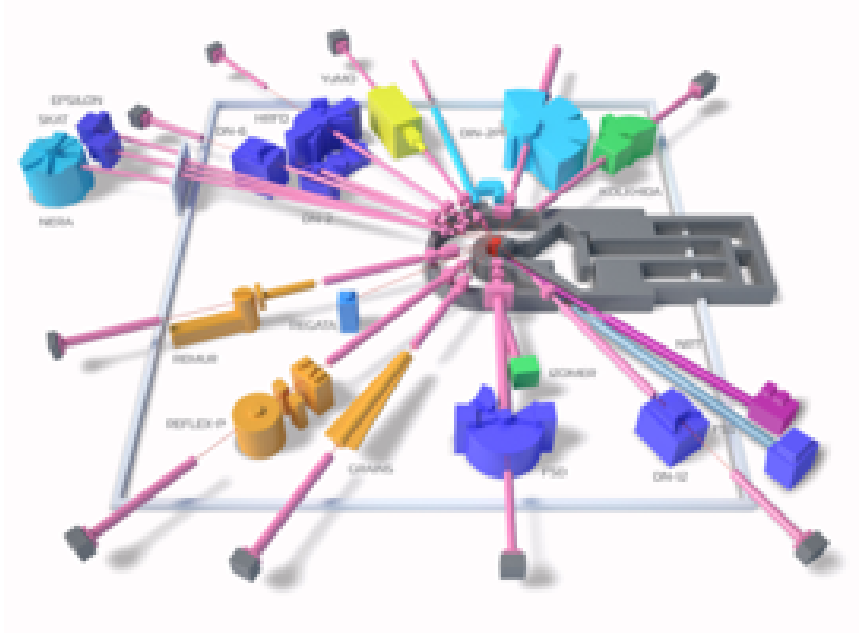
In the framework of the previous 7-year plan the first cryogenic moderators were constructed; reactor spectrometers have been modernized and their number increased from 11 to 14.

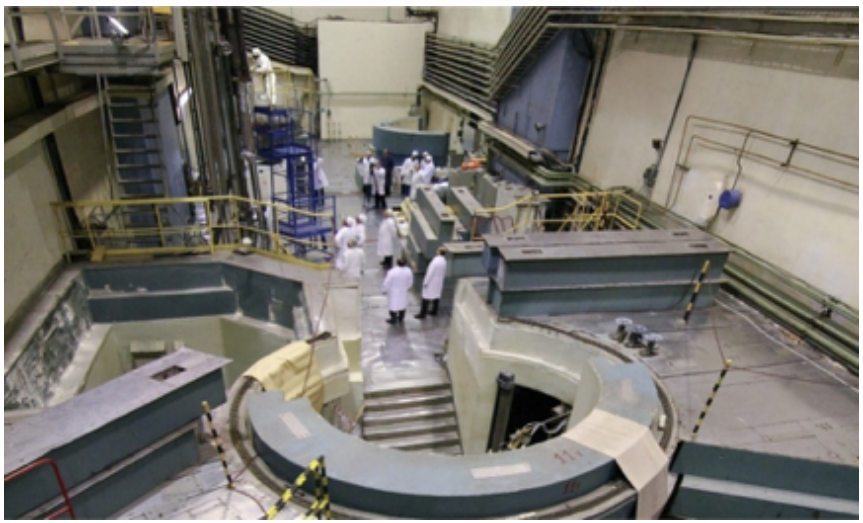
IBR-2 is included in the 20-year European strategic research program in the field of neutron scattering.

IBR-2 is one of the best sources in the world for thermal neutrons.

Parameters:

– 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





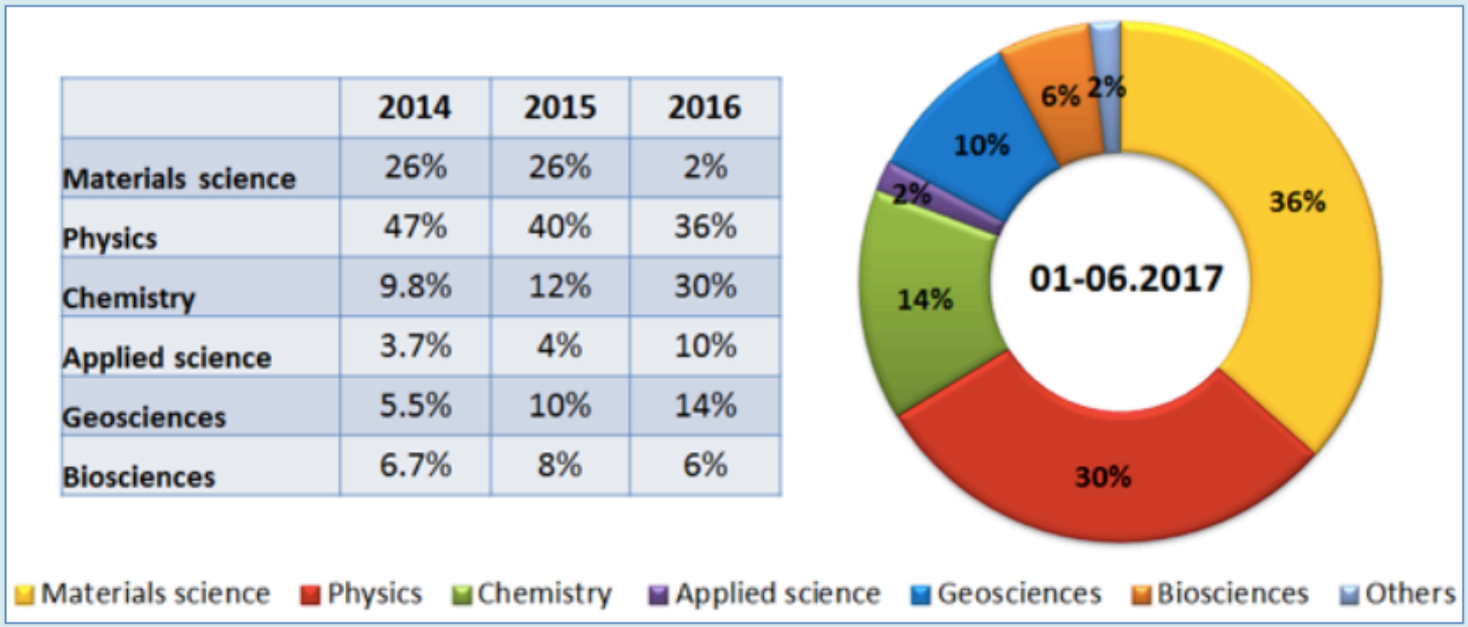
The program of development of the IBR-2 reactor for 2017-2023 assumes:
1. Development and operation of the complex of cryogenic moderators:
– commissioning of a new refrigerator for beam lines 4, 5, 6.;
– development of the control and monitoring systems of the complex of cryogenic moderators CM-201, CM-202, CM-203;
2. Development and construction of a reserve movable reflector MR-3R.
3 Upgrade of the reactor technological equipment with expiring service life (air heat exchangers, electromagnetic pumps, etc.).

Program of development of the spectrometer complex for IBR-2 will be aimed at:
– Implementation of the final configuration and development of new spectrometers (DN-6, GRAINS, spectrometer of tomography and radiography, FSS).
– Upgrade of the existing spectrometers aimed at improving their technical parameters, extending the experimental capabilities and ensuring trouble-free operation.
– Creation of the basic configuration of a new small-angle scattering spectrometer.

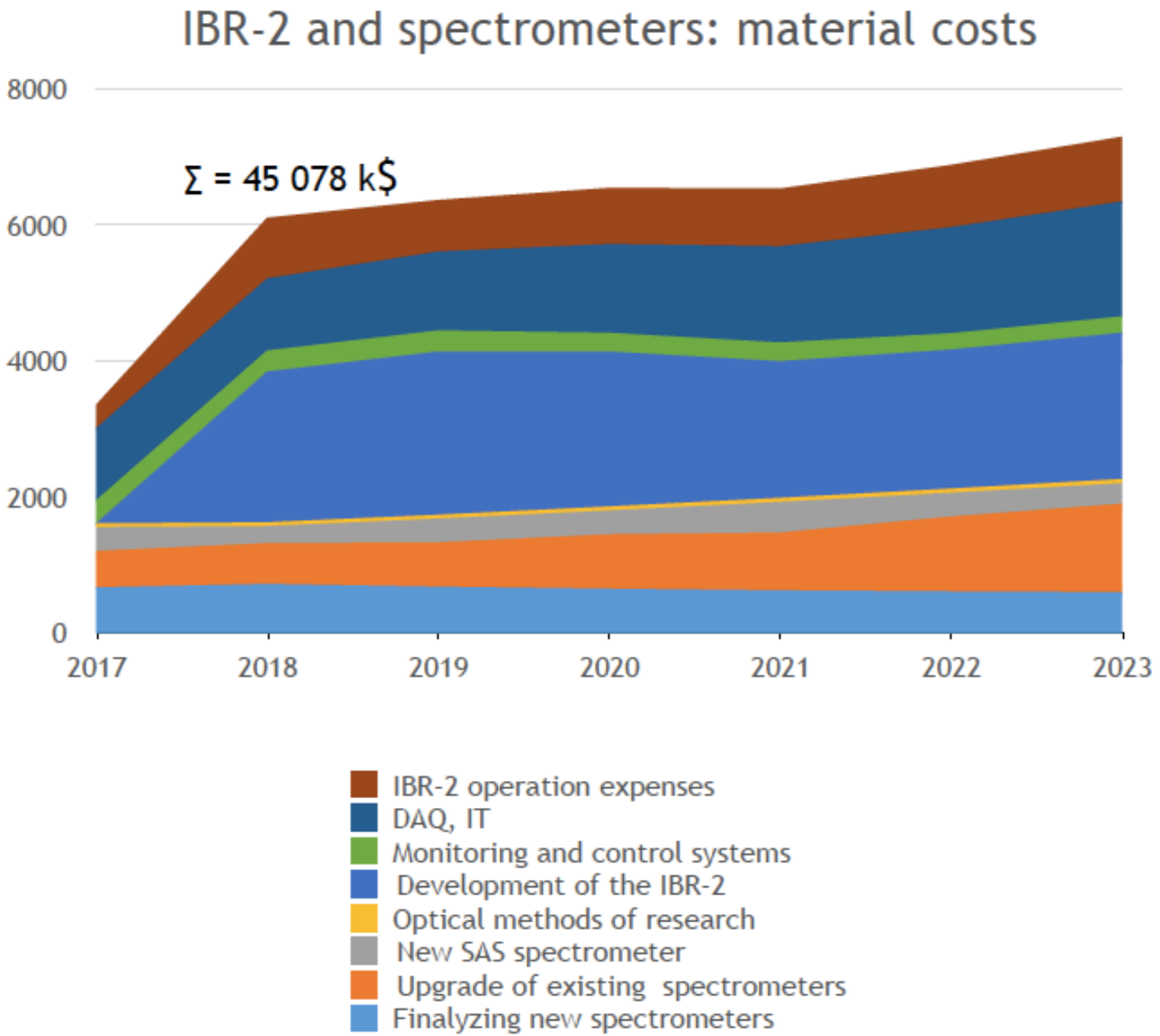
FLNP User Program

	2014	2015	2016	01-06.2017
Submited proposals	163	197	238	104
Accepted proposals	150	174	208	101
Countries	17	19	19	17
Visitors	59	67	102	57

	2014	2015	2016
Materials science	26%	26%	2%
Physics	47%	40%	36%
Chemistry	9.8%	12%	30%
Applied science	3.7%	4%	10%
Geosciences	5.5%	10%	14%
Biosciences	6.7%	8%	6%



The Program is very well developed and very good running ...


IBR-2 and spectrometers: material costs
8000
6000
4000
2000
0
Σ = 45 078 k$
2017
2018
2019
2020
2021
2022
2023
IBR-2 operation expenses
DAQ, IT
Monitoring and control systems
Development of the IBR-2
Optical methods of research
New SAS spectrometer
Upgrade of existing spectrometers
Finalyzing new spectrometers

Objectives in the field of condensed matter physics:

– The IBR-2 reactor is stable, the user programme is running.

The challenge is to make this facility significant among other European neutron sources. For a qualitative increase of the role of JINR, it is necessary to develop and consistently implement a programme to create instruments with unique parameters not available at other neutron sources.

One should take into account that part of the powerful sources in Europe will be shut down in the next 10 years, and the demand for IBR will grow up.

– Long-term plan for possible future facility for CMP at JINR (after "natural" IBR-2 shut down, mid of 2030's) has to be developed.

The new JINR Neutrino Program has started in 2013

— BAIKAL-GVD: detection of ultrahigh-energy cosmic neutrinos. A continuous increase of the observable volume up to 0.4 km^3 in parallel with data taking is foreseen during 2017–2023.

— JUNO and NOvA experiments: the mass hierarchy and CP violation problems. JINR aims to complete its major contribution to the construction of the JUNO experiment, to maintain the NOvA remote control room and to perform physical analysis.

— R&D work on the calorimetry of the DUNE detectors based on the unique experience of JINR (in 2017–2023).

— Experiments at Kalinin Nuclear Power Plant: search for sterile neutrinos (DANSS), neutrino magnetic moment (GEMMA) and coherent scattering (νGEN).

— As well as neutrino-less beta decay search (SuperNEMO, GERDA) and astrophysics (Baikal-GVD, TAIGA, Dark Matter search).

"White Book" documents the JINR neutrino program

Every experiment — participant of the neutrino program — is described in a uniform format in the Book (about 300 pages):

THE WHITE BOOK
JINR NEUTRINO PROGRAM

Editors: Vadim A.Bednyakov, Dmitry V.Naumov.
Dubna/JINR. May 13, 2014

Contents

Chapter 3

BAIKAL Experiment

Editors: I.A.Belolaptikov, V.B.Brudanin

3.1 Front Matter

Project Title

BAIKAL Experiment. Deep underwater muon and neutrino detector in the Baikal Lake.

Project Leaders

- I.A.Belolaptikov

Abstract

The BAIKAL-GVD Project in the Lake Baikal [1] is an extension of the research and development work performed over the past several years by the BAIKAL Collaboration on the first phase. The optical properties of the deep water lake have been established, and the detection of high-energy neutrinos has been demonstrated with the existing detector NT200/NT200+. This achievement represents a proof of concept for commissioning a new instrument, the Gigaton Volume Detector (BAIKAL-GVD), with superior detector performance and an effective telescope size at or above the kilometer-scale.

The second-stage neutrino telescope BAIKAL-GVD will be a new research infrastructure aimed primarily at studying astrophysical neutrino fluxes. The detector will utilize Lake Baikal water instrumented at depth with optical sensors that detect the Cherenkov radiation from secondary particles produced in interactions of high-energy neutrinos inside or near the instrumented volume. The concept of BAIKAL-GVD is based on a number of evident requirements to the design and architecture of the recording system of the new array: the utmost use of the advantages of array deployment from the ice cover of Lake Baikal, the extendability of the facility and provision of its effective operation even in the first stage of deployment, and the possibility of implementing different versions of arrangement and spatial distribution of light sensors within the same measuring system.

keywords: neutrino oscillations, neutrino mass hierarchy, astrophysical neutrinos

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About 200 (100) participants (scientists) take part in the JINR neutrino program, 60 of them are younger 35 years old. JINR member-states are strongly involved. Internationality — NOvA, JUNO, EDELWEISS, SuperNEMO, ... → http://dlnp.jinr.ru/en/neutrino-research

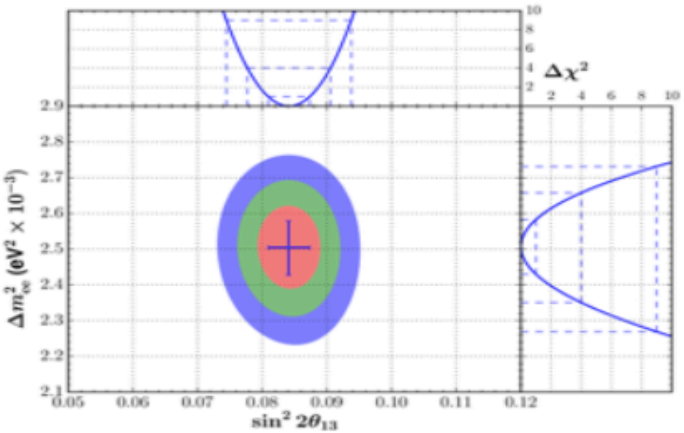
Most important recent results:

— Precise measurement of θ_{13} and Δm^2_{32} (Daya Bay)
— Discovery of geo-neutrinos (BOREXINO)
— Observation of $\nu_\mu \rightarrow \nu_\tau$ oscillations (OPERA)
— Best limits on existence of sterile neutrino (Daya Bay)
— First hints for neutrino mass hierarchy (NOvA)
— Best limits on neutrino magnetic moment (GEMMA-2)
— Best limits on Majorana neutrino mass (SuperNEMO, GERDA)
— Two full scale GVD-clusters have already been installed at lake Baikal.
— First astrophysical event UHE (BAIKAL GVD)
— Progress of works at the NuLab at the Kalinin Atomic Power Station.

Nowhere in the World one can find such a Neutrino program!

Neutrino program: Daya Bay/JUNO

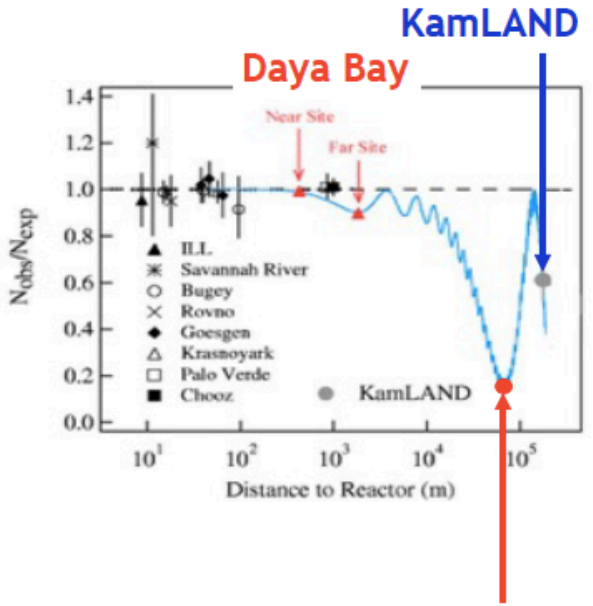
- New result for
- neutrino mixing angle θ_{13}
- F. P. An *et al.* "Measurement of electron antineutrino oscillation based on 1230 days of operation of the Daya Bay experiment", arXiv: 1610.04802 [hep-ex], accepted in PRD



$\sin^2 2\theta_{13} = 0.0841 \pm 0.0033$

$\Delta m^2_{ee} = 2.45\ ^{+0.08}_{-0.08}$

Future: Mass Hierarchy



JUNO (Daya Bay II)

Daya Bay sees no signal of the sterile neutrino and sets limits on its parameters Δm^2_{41} and θ_{14} in the range of Δm^2_{41} between 0.001 eV^2 and 0.3 eV^2

Neutrino program:

NOvA - remote operation center

- Developed infrastructure of the ROC-Dubna allows for non-interruptible continuous work
- Includes: stable and backed up internet connection, communication tools including international land-line, kitchen, etc.
- A computing monitoring system, based on Nagios, controls ROC-Dubna equipment and notifies JINR experts in case of trouble.

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Pressurised water reactor;
Termal power 3 100 MW;
Neutrino flux ~ 6 10^{20} ν_e

Neutrino experiments at Kalinin APS

(Tver region, 285 km from Dubna)

BAIKAL-GVD:

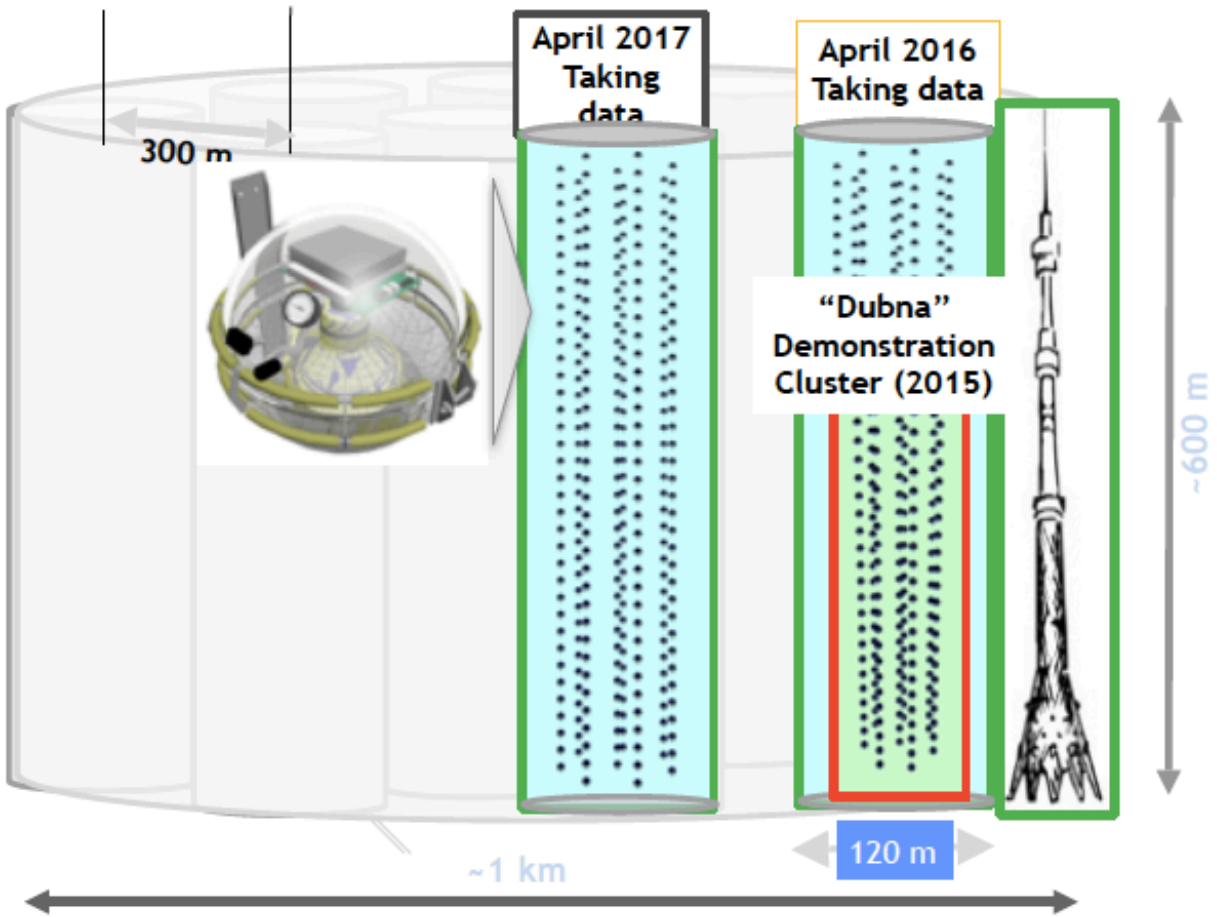
2304 light sensors combined in 8 clusters of vertical strings at 750 - 1300 m depths.

Detection volume 0.4km^3

Objectives:

- Neutrino astrophysics above few TeV
- Dark matter - indirect search
- Exotic particles - monopoles, Q-balls, nuclearites, ...

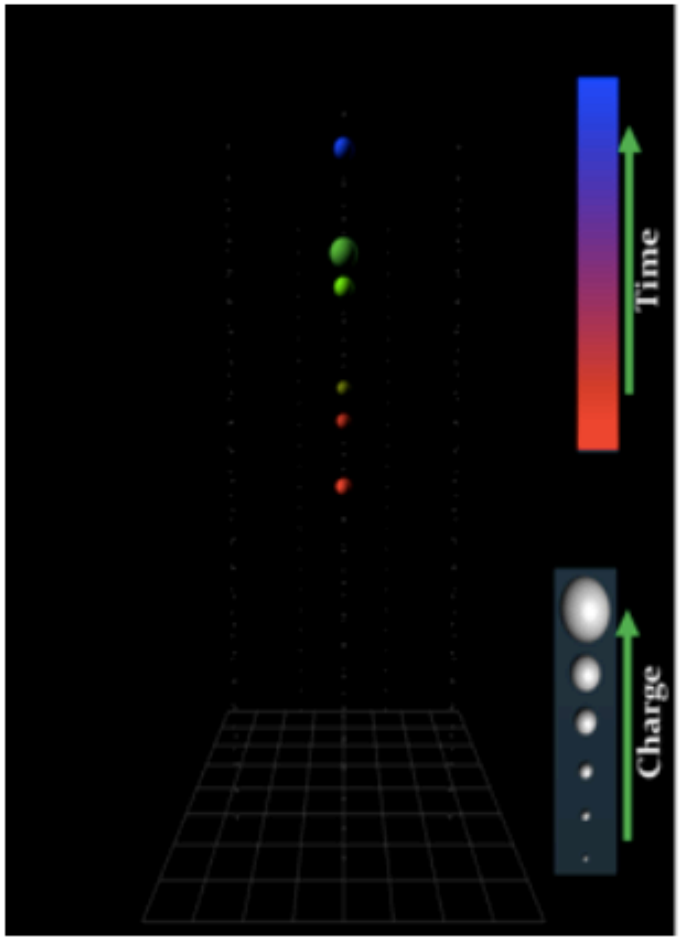
2017 - successfully installed the second cluster!!!



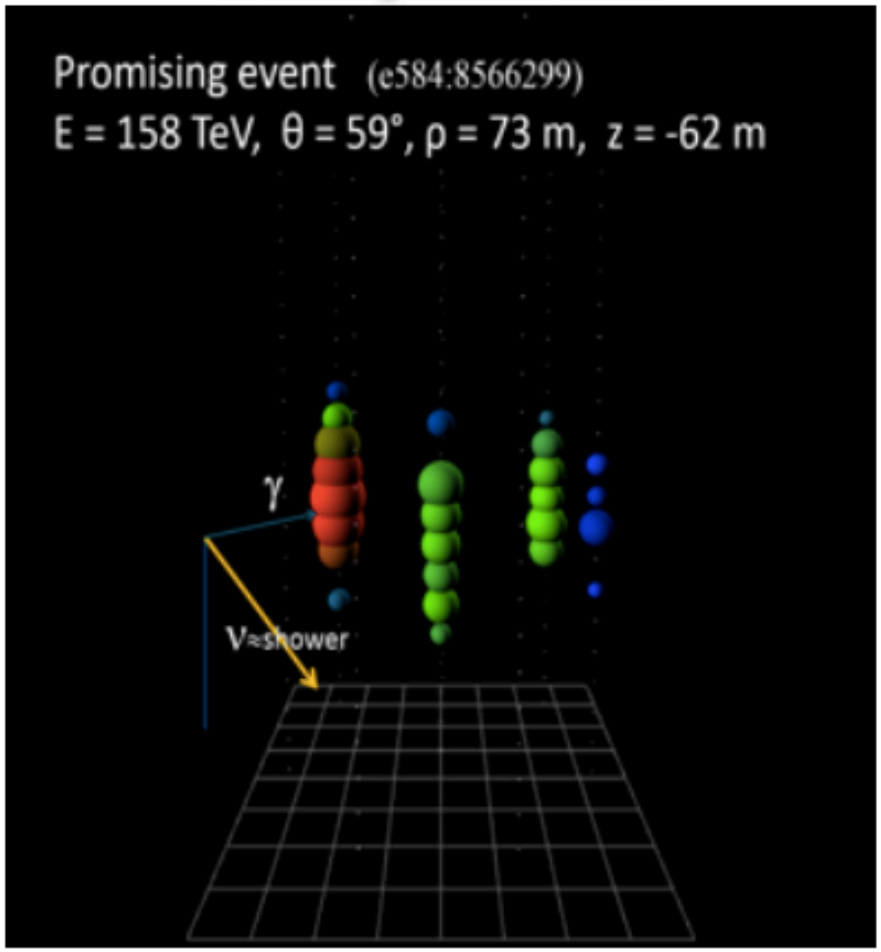
Events of the "DUBNA" cluster

Neutrino event

#11469229



Promising cascade event



Baikal-GVD project time scales:

2009-2010: R&D with single prototype strings
2011-2014: R&D with prototype cluster of 3 to 5 strings
2015: *Dubna* Demonstration cluster

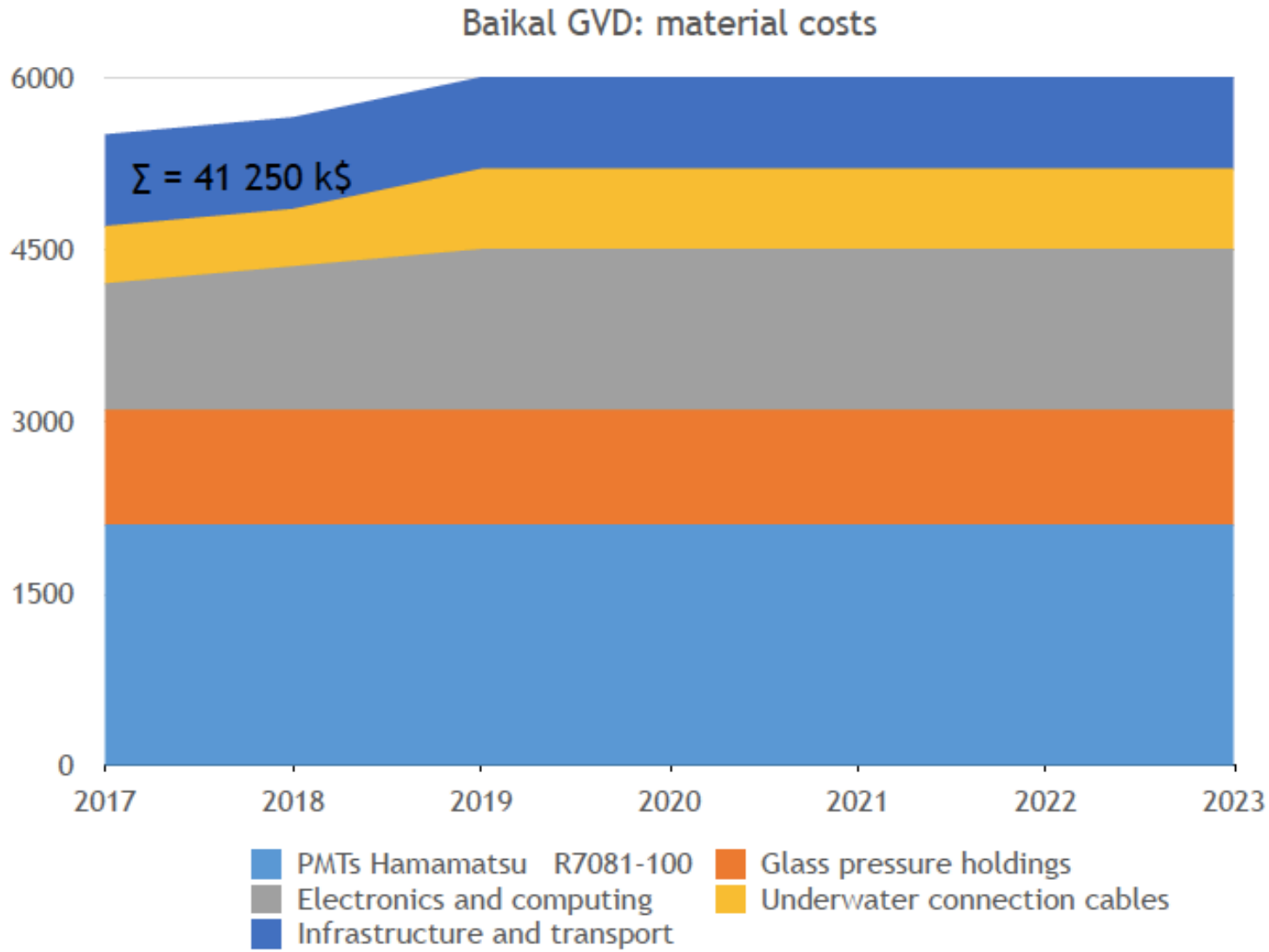
Cumulative number of full clusters vs. year

Year	2016	2017	2018	2019	2020
Cluster-	*1*	*2*	*4*	*6*	*8*
288 OM	*288*	*576*	*1152*	*1728*	*2304*

Permanent data taking

Effective volume GVD-1 (cascades) ~ 0.4 km^3

After long development, big steps were made in 2014–2017.


Baikal GVD: material costs
6000
4500
3000
1500
0
Σ = 41 250 k$
2017
2018
2019
2020
2021
2022
2023
PMTs Hamamatsu R7081-100
Electronics and computing
Infrastructure and transport
Glass pressure holdings
Underwater connection cables

Objectives in the field of neutrino physics and astrophysics:

– Establishing real cooperation (GNN) between the Baikal-GVD and other major experiments in this area (IceCube, KM3Net). Preparing the framework on exchange of data and algorithms, holding joint workshops, etc.

– Defining the role of JINR in the implementation of the DUNE international project in the USA (jointly with CERN).

– Organizing JINR's participation in the SKA (Square Kilometre Array Telescope) project (this refers, first of all, to the processing and storage of large amounts of (Big) data).

Other JINR research activities

Modern trends in radiobiology

Fundamental radiobiological research: *studying mechanisms of radiation action at the molecular, cellular, tissue, and organismal levels of biological organization*

Radiation and nuclear medicine: *refinement of tumor radiation therapy techniques (proton and carbon therapy); designing new radiosensitizers and radioprotectors; extension of the list of the radionuclide pharmaceuticals for diagnostics and treatment*

Radiation safety of deep space flights: *refinement of the approaches to human protection from heavy charged particles*

JINR's Laboratory of Radiation Biology

Fundamental aspects of radioecology: *research at the level of ecosystems and populations*

Applied radiation technologies: *development of methods of raising crop capacity and improvement of agricultural product quality; elimination of pathogenic micro- and macroflora; disinfection of agricultural waste, etc.*

LRB's main fields of research in 2017—2023:

— Research on the regularities and mechanisms of molecular damage induction and repair in the DNA structure in mammalian and human cells for radiations with different linear energy transfer (LET) in vivo and in vitro.

— Obtaining comparative data on the regularities in the induction of gene and structural mutations in mammalian and lower eukaryotic cells under exposure to sparsely and densely ionizing radiations with different LET.

— Research on the mechanisms of the heavy ion-induced damage to the eye retina and its repair.

— Identification of the heavy ion-induced functional and morphological disorders in the central nervous system.

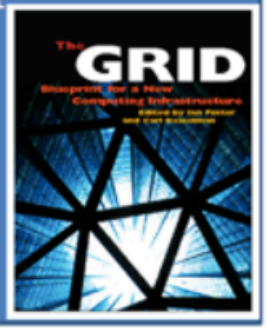
— Mathematical modeling of the effects of ionizing radiations with different LET at the molecular and cellular levels. Development and analysis of mathematical models of the molecular mechanisms of ionizing radiation-induced disorders in the CNS structure and functions.

— Astrobiological research will be focused on the problem that is central for understanding the production of the prebiotic compounds underlying the formation of the living systems: what is primary for the origin of life, genetics or metabolism?

Modern Computing at JINR

Grids

- Collaborative environment
- Distributed resources



Supercomputers

Titan System (Cray XK7)

Peak Performance	27.1 PF 18,688 compute nodes	24.5 PF GPU / 2.6 PF CPU
System memory	710 TB total memory	
Interconnect	Gemini High Speed Interconnect	3D Torus
Storage	Lustre Filesystem	32 PB
Archive	High-Performance Storage System (HPSS)	29 PB
I/O Nodes	512 Service and I/O nodes	

Clouds

Big Data

- *Volume*
- *Velocity*
- *Variety*

122nd session of SC | V. Matveev | SCIENCE BRINGING NATIONS TOGETHER | 49

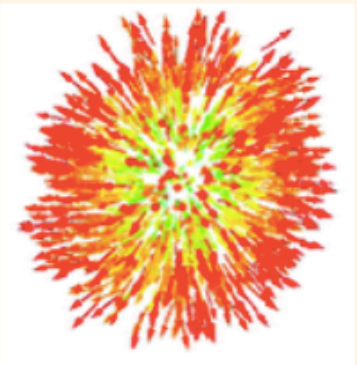
To be widely discussed within NEC2017.

Bogoliubov Laboratory of Theoretical Physics

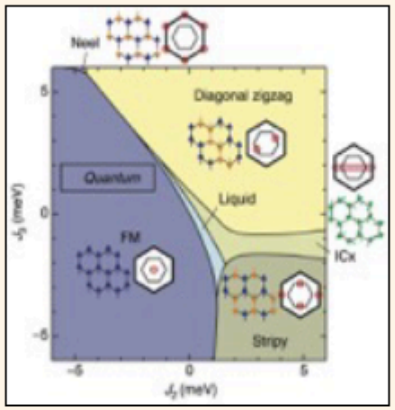
Theory at JINR

The whole spectrum of modern quantum physics studies including:

Quantum field theory and particle physics – support of programmes of major international collaborations with JINR's participation (LHC, RHIC, FAIR, etc.) and of those at the JINR basic facilities, primarily, the NICA/MPD. The Standard Model and searches for new physics beyond the SM.



Nuclear physics – properties of unstable and exotic nuclei, which are the goal of experimental projects with radioactive ion beams. Nuclear astrophysics.



Theory of condensed matter – contemporary problems of condensed matter theory include studying the properties of new materials and fundamental aspects of statistical mechanics.

Modern mathematical physics – Superstring theory, the most serious and worldwide pursued candidate for the unification of all fundamental interactions including quantum gravity.

JINR University Centre

JINR UC Educational Programmes

and 7-year Plan for the Development of JINR

Implementing the goal "Attracting Youth to Science"



Major JINR UC educational activities:

- Outreach programmes for school students and teachers;
- Preparation of qualification works at Bachelor, Master, or PhD level;
- International Student Practices at JINR;
- Summer Student Programme;
- Training programmes for engineers, etc.

- In 2017 JINR has addressed the Russian Government to join the system of defending theses at JINR and assigning the JINR PhD degree.
- JINR is intend to establish a special fund to support JINR postdoc positions.

Other JINR activities — JINR in Education

ПРАВИТЕЛЬСТВО РОССИЙСКОЙ ФЕДЕРАЦИИ

Р А С П О Р Я Ж Е Н И Е

От 23 августа 2017 г. No 1792-р

МОСКВА

1. Утвердить прилагаемый перечень научн
и образовательных организаций высш
предоставляются права, предус
четвертым
пункта 3-1 статьи 4
научно - техн
2. Наст

1. Объ **ации:**
2. Федо **ное учреждение науки Физико-**
техниче **ре Российской академии наук**
3. Федер **ное бюджетное учреждение науки Институт**
общей и н **химии им. Н.С.Курнакова Российской академии наук**
4.Федерал **осударственное бюджетное учреждение науки Институт**
химической биологии и фундаментальной медицины Сибирского отделения
Российской академии наук

In 2017 JINR has applied to the Russian Government to be allowed to participate in the competition giving the right of issue its own diploma of assigning the JINR PhD degree. And has got this right by the RF Government decision issued on 23 August 2017 !

Very important possibility to increase JINR visibility!

JINR became the member of APPEC and NuPECC

NuPECC

Prof. Victor Matveev
Joint Institute for Nuclear Research
Dubna Moscow Region
Russia 141980

October 21, 2014

Dear Prof. Matveev,

In the last NuPECC meeting we discussed your request of having one representative of JINR as a member of NuPECC.
As a first important comment let me convey to you that the board was very happy to have received attention by such a prestigious institution operating in the field of nuclear science with many top line activities.
As you mentioned in your letter, we are well aware of the many productive collaborations that JINR has with many colleagues in several countries that are members of NuPECC. To have JINR in NuPECC will surely strengthen further our collaborations.
The board has thus decided to have one colleague from JINR as a NuPECC member. The next meeting will be in Athens on March 13 and 14, 2015 (see also http://www.nupecc.org/index.php?display=misc/meetings)
Concerning the membership please also contact Jean-Claude Worms at ESF under jcworms@esf.org
Looking forward to receiving from you the name of the expert in nuclear physics who will join us in our NuPECC meetings and activities.

Yours sincerely,

Prof. Angela Bracco
University of Milano and INFN
NuPECC Chair

PS: You will receive an invoice for the membership fee (5626.80 €) from ESF.

NuPECC is an Expert Committee of the European Science Foundation

…"To have JINR in NuPECC will surely strengthen further our collaborations."

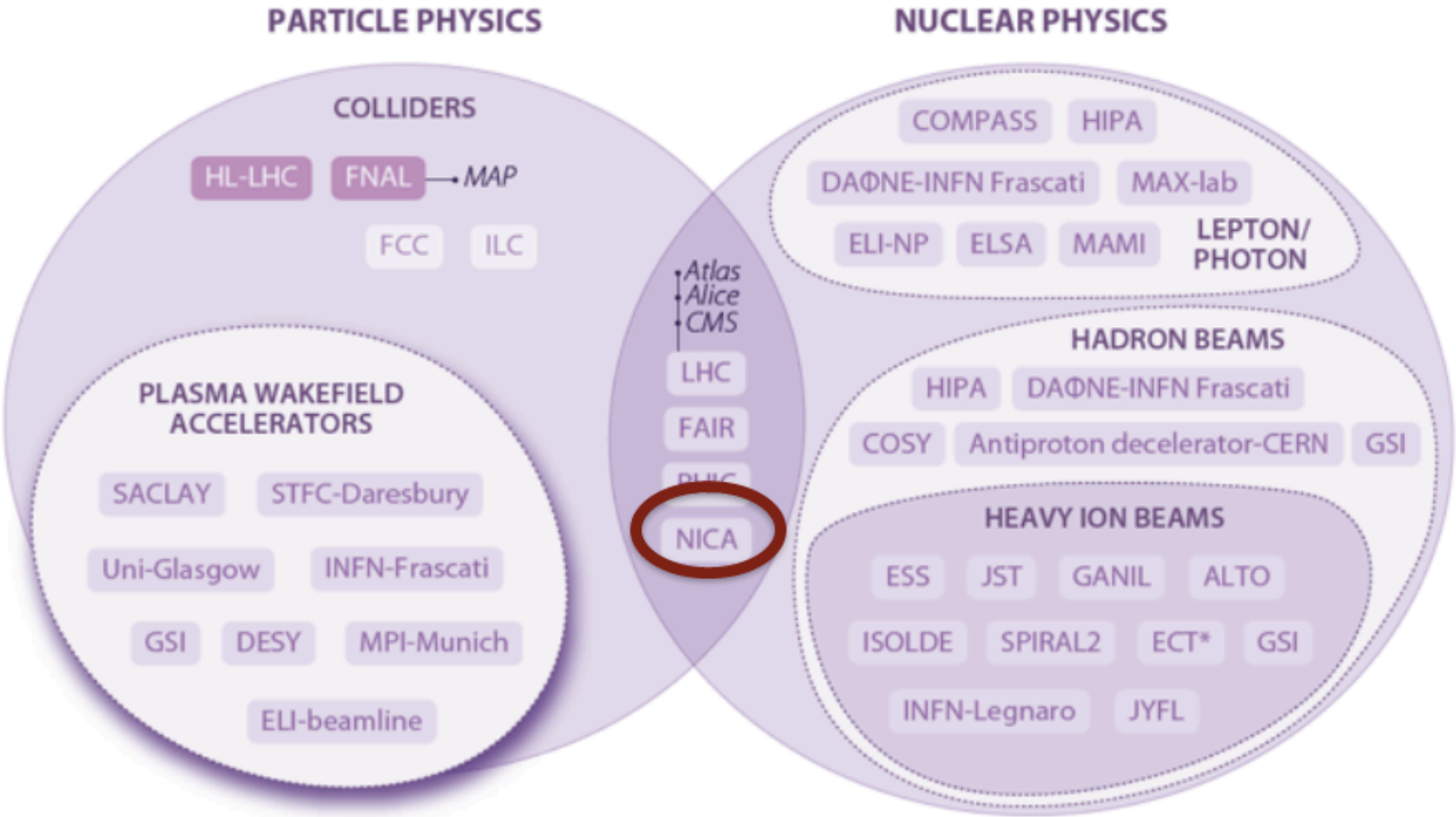
…"The board has thus decided to have one colleague from JINR as a NuPECC member. The next meeting will be in Athens on March 13 and 14, 2015."

…"Looking forward to receiving from you the name of the expert in nuclear physics who will join us in our NuPECC meetings and activities."

Since 2015, JINR's delegate (prof. M.Itkis) is taking part at NuPECC meetings.

New issue of the ESFRI Roadmap (2016)

Main Research Infrastructure in Particle and Nuclear Physics



NICA – Complementary Project

JINR — European Research infrastructure ...

JINR on the way for integration to European research landscape

2014: CERN–JINR reciprocal Observer status

"… the reciprocal granting of Observer status by CERN and JINR, as proposed by JINR, would further strengthen the close ties between the two organisations. The improved exchange of information and mutual consultation on programmes and strategies would create new synergies and provide a basis for even more intense and successful co-operation in the future ..."

(CERN Council September 2014)

JINR at ATLAS: 25 years

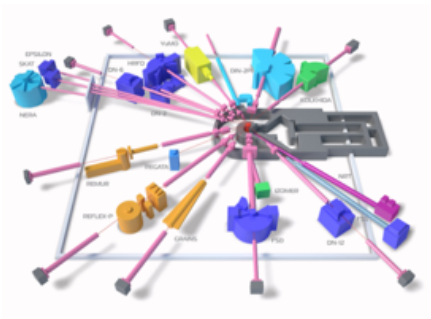
2017 marks the 25th anniversary of the world's largest collaboration, ATLAS, set up in October 1992 for carrying out basic research at CERN's LHC. This outstanding event was celebrated by a conference organized and held by JINR in Montenegro on 24–29 April 2017.

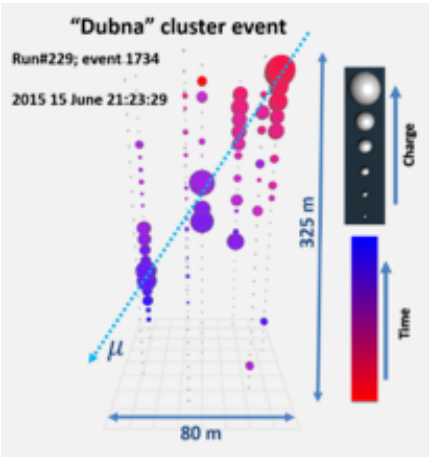
The conference was attended by scientists from JINR and other Russian, European, and US research centers.

Very good JINR-CERN cooperation ... in a very nice place! Have a nice time here again!

Conclusion ...

1. JINR is unique for its time-tested unity of multidisciplinary basic research, international cooperation, and interplay of research and education.
2. JINR is keeping its multidisciplinary approach for the next 7-years period.
3. JINR has started to develop a new Strategic Long Range Plan for years beyond 2030.
4. In all directions of development JINR has good prospects for decisive contributions.





Thanks a lot for your attention!

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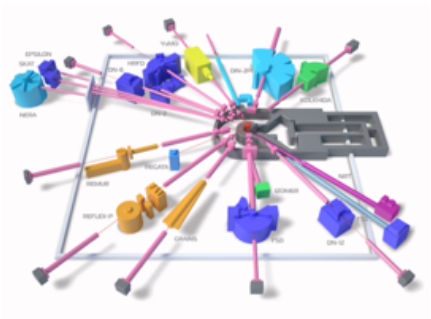

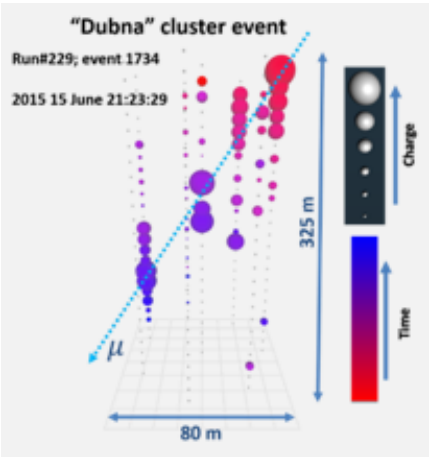

Thanks a lot for your attention!