NICA-FAIR symposium

15-16 November 2016,
Darmstadt Germany

"The JINR: Present Status and Perspectives"

(to the 60 years jubilee of the Joint Institute for Nuclear Research)

Victor A.Matveev

JOINT INSTITUTE for NUCLEAR RESEARCH

International Intergovernmental Organization

The Agreement on the establishing JINR was signed by 11 member states on 26 March 1956 in Moscow

to unite scientific and material potential of its member states in order to study fundamental properties of matter

‘ ‘ ATOM for PEACE ‘ ’

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

JINR has at present 18 Member States:

Armenia
Azerbaijan
Belarus
Bulgaria
Cuba
Czech Republic
Georgia
Kazakhstan
DRP of Korea
Moldova
Mongolia
Poland
Romania
Russian Federation
Slovakia
Ukraine
Uzbekistan
Vietnam

Participation of Egypt, Germany, Hungary, Italy, the Republic of South Africa and Serbia in JINR activities is based on bilateral agreements signed on the governmental level.

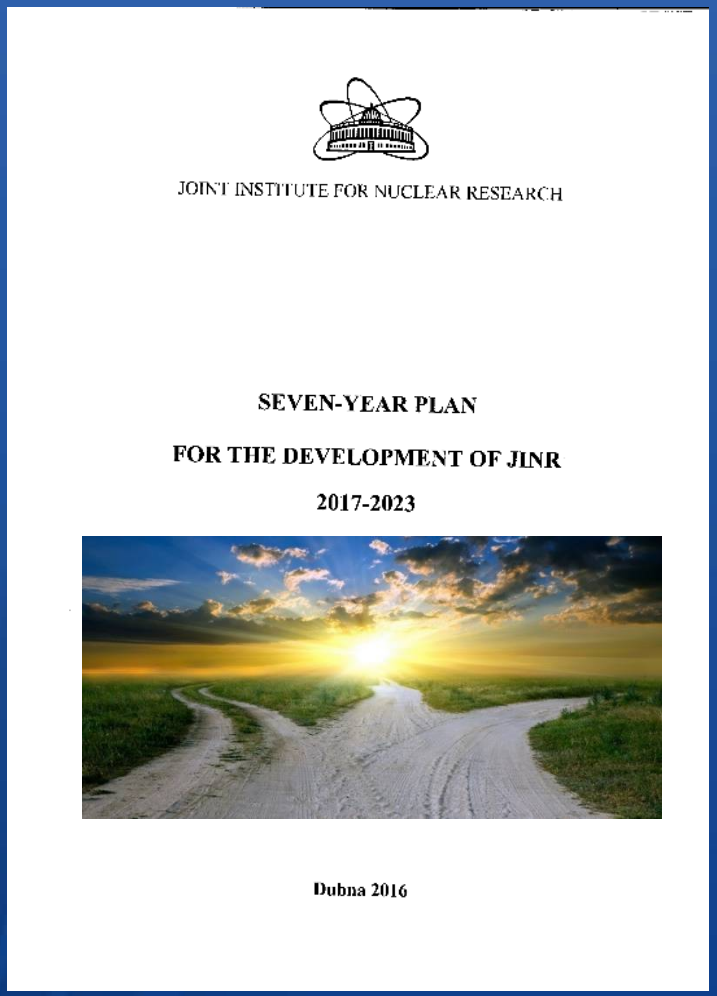
120th session of the Scientific Council

- Director's report (V. Matveev)
- Final Draft of Seven-Year Plan for the Development of JINR for 2017–2023 (N. Russakovich)
- Progress reports: NICA project (V. Kekelidze) , SHE Factory (S.Dmitriev)
- Recommendations of the PACs (A.Cheplakov, F. Piquemal, O.Belov)
- Memberships of the PACs (M. Itkis)
- Reports by young scientists as recommended by the PACs (L.Kolupaeva, P.Nekhoroshkov, E.Zhabitskaya).
- Scientific reports: "Latest ALICE results and detectoe upgrade plans" (P.Giubellino),

  "Nuclear planetology" (I.Mitrofanov)
- Awards and Prizes (V.Matveev)

The 120th session of JINR SC took place on 22-23 September 2016. It was chaired by JINR Director V. Matveev and co-chaired Professors M. Waligórski (INP, Kraków, Poland) .

Introduction into the 7-year JINR plan for 2017 - 2023



JINR is unique for its time-tested trinity of basic research, wide international cooperation, educational and multi-disciplinary approach. Research area of JINR includes particle physics, relativistic heavy ion physics, advanced physics of super heavy elements and exotic nuclei, precision nuclear spectroscopy, neutrino physics and astrophysics, IT and computing, fundamental neutron studies, theoretical and mathematical physics, condensed matter physics, biophysics and radio-biology, modern equipment and experimental technique and innovations.

Working Group on The JINR LONG RANGE STRATEGY up to 2030

JINR Research Experimental Facilities

- Heavy Ion Superconducting Complex **Nuclotron-NICA**
  Physics of dense and hot baryon matter
  Spin structure and dynamics of nuclear matter
- Intensive pulsed neutron breader reactor **IBR-2 :**
  Condensed matter & Nuclear physics **IRENA**
- High Power Cyclotron Complex and **SHE Factory**
  Superheavy elements and Exotic nuclei
  Dubna Radioactive Ions Beam studies **DRIBs**
- Complex of computing & information technologies
  Tier-1 complex for **LHC** and **NICA**
- Neutrino Gigaton Volume Detector **GVD** at Baikal lake
  Neutrino Physics and Astrophysics
- Accelerator facility for radiobiology and medical studies
  Hadron therapy, astrobiology, cosmic medicine

NICA (Nuclotron based Ion Colider fAcility) -

the flagship project in HEP

of Joint Institute for Nuclear Research (JINR)

CUMULATIVE

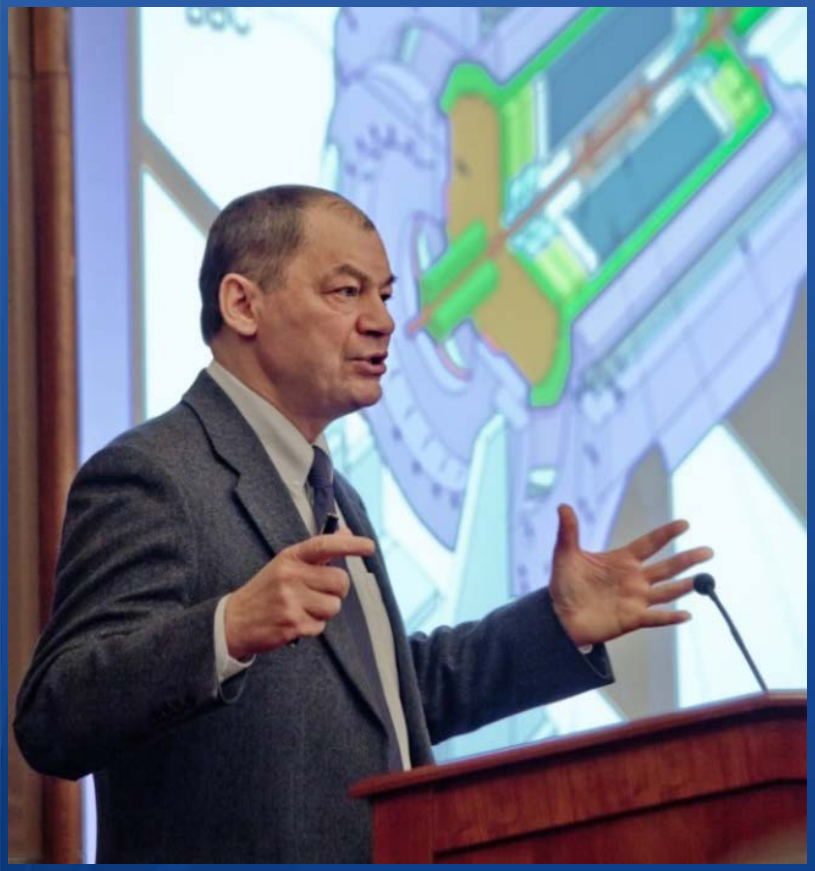
BARYON DENSITY

FRONTIER

120th session of the Scientific Council

RESOLUTION

Recommendations on the NICA project



The Scientific Council took note of the report “Progress of the NICA project” presented by VBLHEP Director V. Kekelidze and expressed satisfaction with the dynamic and comprehensive efforts being taken on this flagship project of JINR.

The Scientific Council appreciated the progress in developing the Nuclotron-NICA accelerator complex, including the commissioning of the new fore-injector of the LU-20 linear accelerator, the installation and testing of the linear accelerator HILac, and the testing of the new polarized source. At the same time, the Scientific Council expressed concern about the delay in manufacturing the superconducting magnets and encouraged intensified work to eliminate it.


Nica

120th session of the Scientific Council

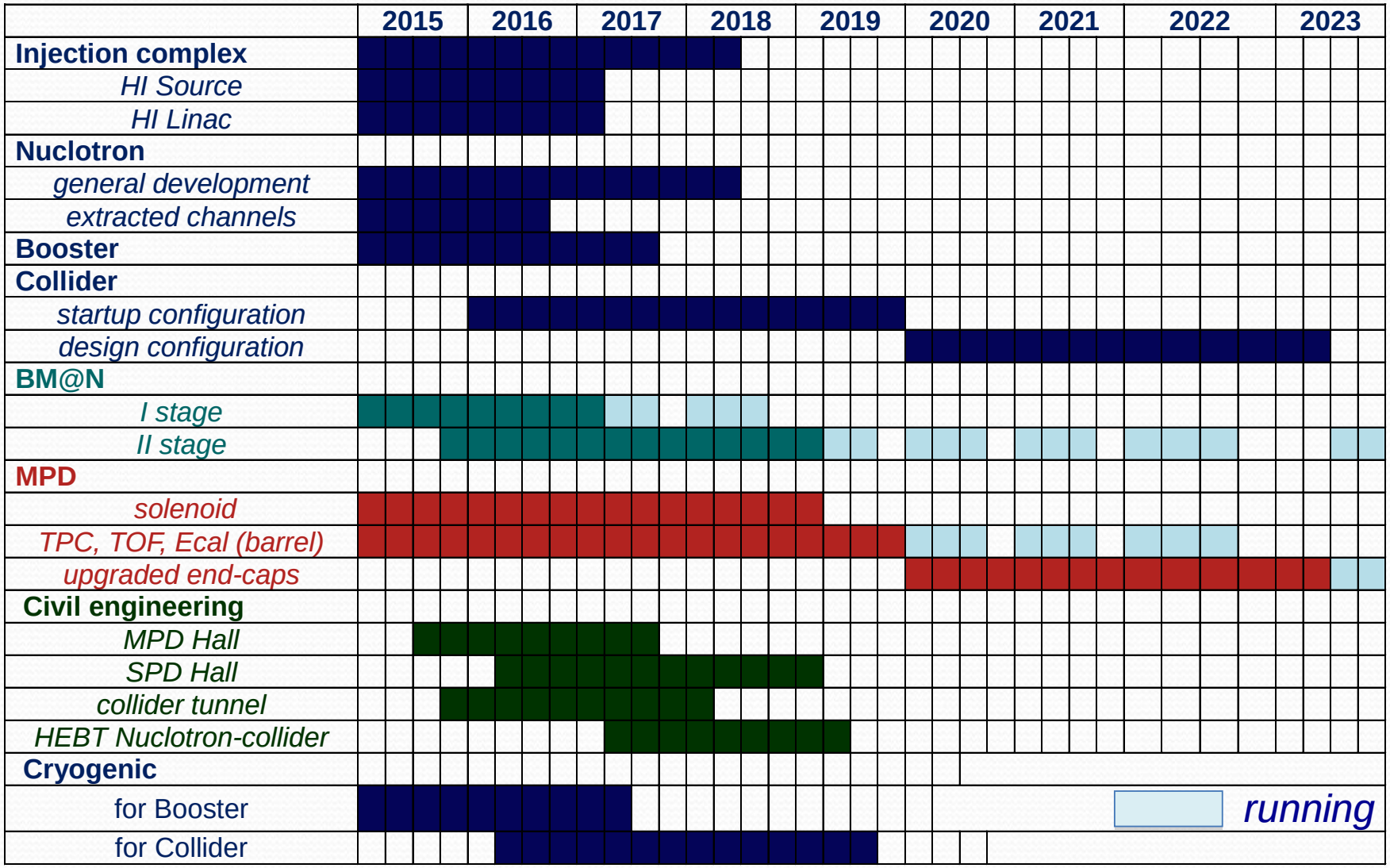
RESOLUTION

Recommendations on the NICA project

The Scientific Council recognized the efforts of the BM@N collaboration towards testing and commissioning new detector subsystems, in particular GEM-based tracking detectors for the development of a state-of-the-art apparatus. It welcomed the signing of the Memorandum of Understanding on the participation of the CBM STS group in construction of four wide-aperture silicon stations for the BM@N detector.

The Scientific Council also welcomed the signing of the agreement between the MPD collaboration and participants from China for placing an order to manufacture the electromagnetic calorimeter modules. It appreciated the implementation of contracts for manufacturing the MPD superconducting magnet and congratulated the collaboration management on ensuring good progress of work on this very important element.

NICA schedule



The decommissioning is foreseen after 2040

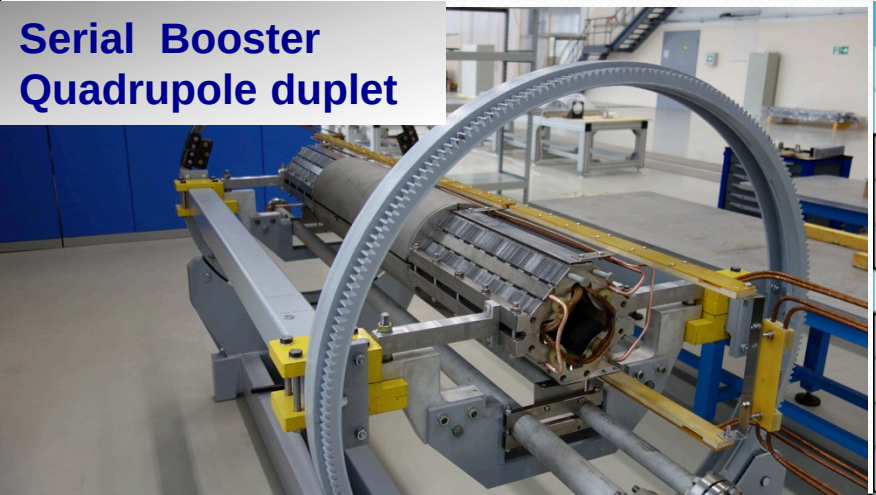
Test Facility for SC magnets of NICA and FAIR: excellent collaboration of JINR and Germany (BMBF). Start of operation – December'14. Serial assembly and cold tests (6 arms) – December 2015

1st cold test of Booster dipole with magnetic measurements made in December'14
Cold test of serial quadrupole duplet – Feb-March 2015

Pre-serial collider dipole

Serial production of Booster dipoles and quadrupoles started in Oct 2014

Serial Booster Quadrupole duplet



		2015				2016				2017				2018				
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I
Booster																		
dipoles	40+3																	
quadrupoles	48+6																	
multipole correctors	40+4																	
Collider																		
dipoles	80+5																	
quadrupoles	86+5																	
multipole correctors																		
nonstructurals																		

Magnet production plan

Khodzhibagiyan, S. Kostromin

Status on 04.04.2016

	total	schedule	delivered yokes
dipoles	40	20	5
quadrup	48	36	26

		2020
		II III IV
Booster		
dipoles		
quadrupoles		
multipole correctors		
Collider		
dipoles		
quadrupoles		
multipole correctors		
nonstructurals		
SIS-100		
pre-series quadrupole		
pre-series sextupole c		
pre-series dipole corre		
pre-series multipole c		
quadrupole		
sextupole correctors		
dipole correctors		
multipole correctors	**12**	

NICA International collaboration

Belarus
NC PHEP BSU (Minsk)
GSU (Gomel)
…
…

Germany
GSI (Darmstadt)
JLU (Giessen)
UR (Regensburk)
Frankfurt/Main Univ.
FIAS
FZJ (Julich)
FAU(Erlangen)

Bulgaria
INRNE BAS (Sofia)
TU-Sofia
SU
ISSP BAS
LTD BAS
SWU
PU (Plovdiv)
TUL (Blagoevgrad)

Ukraine
BITP NASU, KSU (Kiev)
KhNU, KFTI NASU (Kharkiv)

Russia
INR RAS (Moscow)
NRC KI (Moscow)
BINP RAS (Novosibirsk)
MSU (Mscow)
LPI RAS (Moscow)
St.Pet. Univ ersity
RI (St.Petersburg)
…
…

Poland
Tech.University (Warsaw)
Warsaw University
Fracoterm (Krakow)
Wroclaw University
INP (Krakow)

Australia
Azerbaijan
CERN
China
France
Georgia
Greece
India

Czech Republic
TUL (Liberec)
CU (Prague)
Rzezh, …

RSA
UCT (Cape Town)
UJ (Johannesburg)
iThemba Labs

Italy
Japan
Moldova
Mongolia
Romania
Serbia
Slovakia
USA

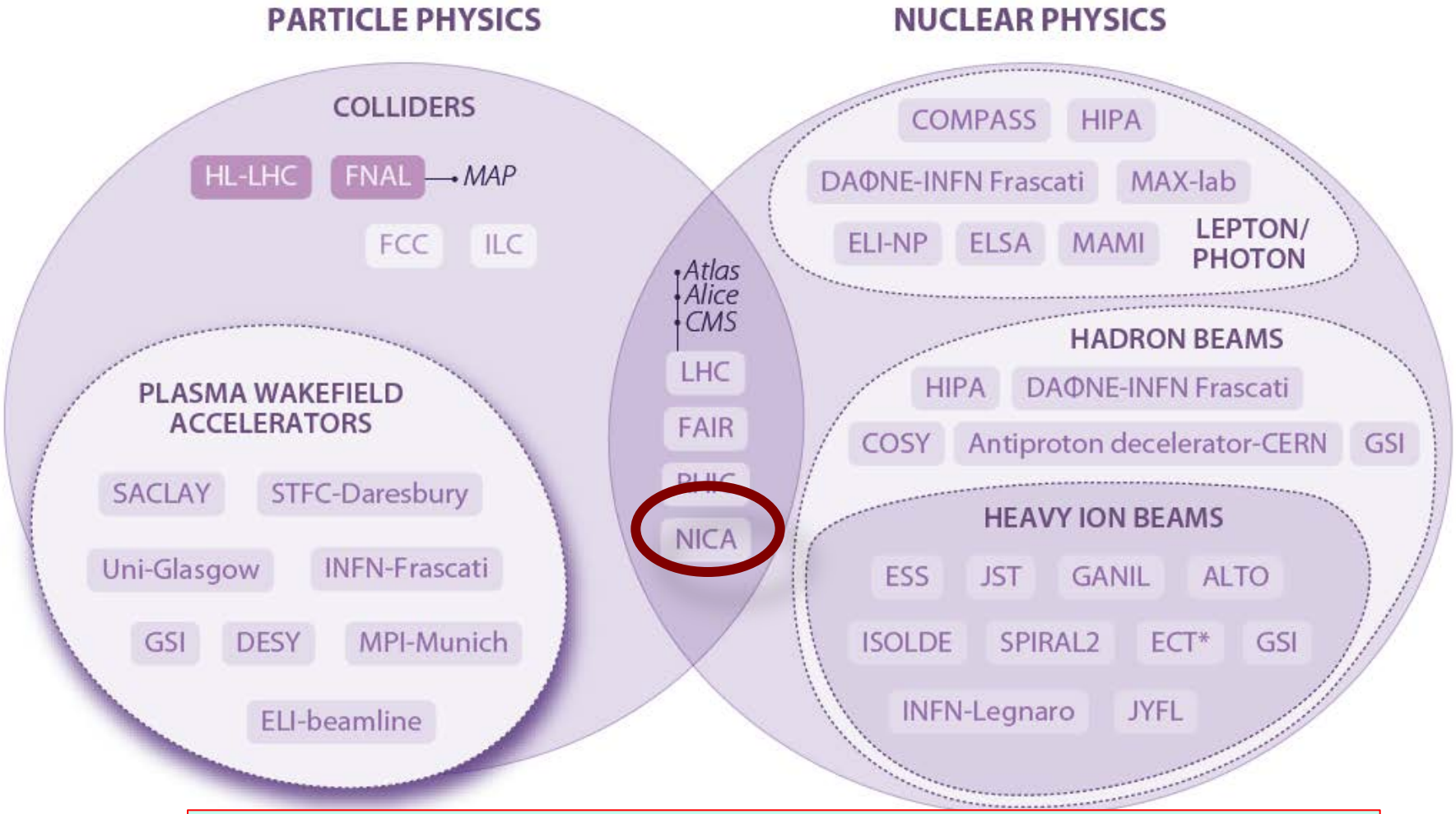
JINR-France (IN2P3) MoU

Megaprojects: Workshop in Dubna (Italy, Germany, France, China, Egypt, SAR, RF)

February 2015
Cooperation Agreement FAIR (Darmstadt) – JINR

New issue of the ESFRI Roadmap

Main Research Infrastructure in Particle and Nuclear Physics



NICA & FAIR – Complementary Projects

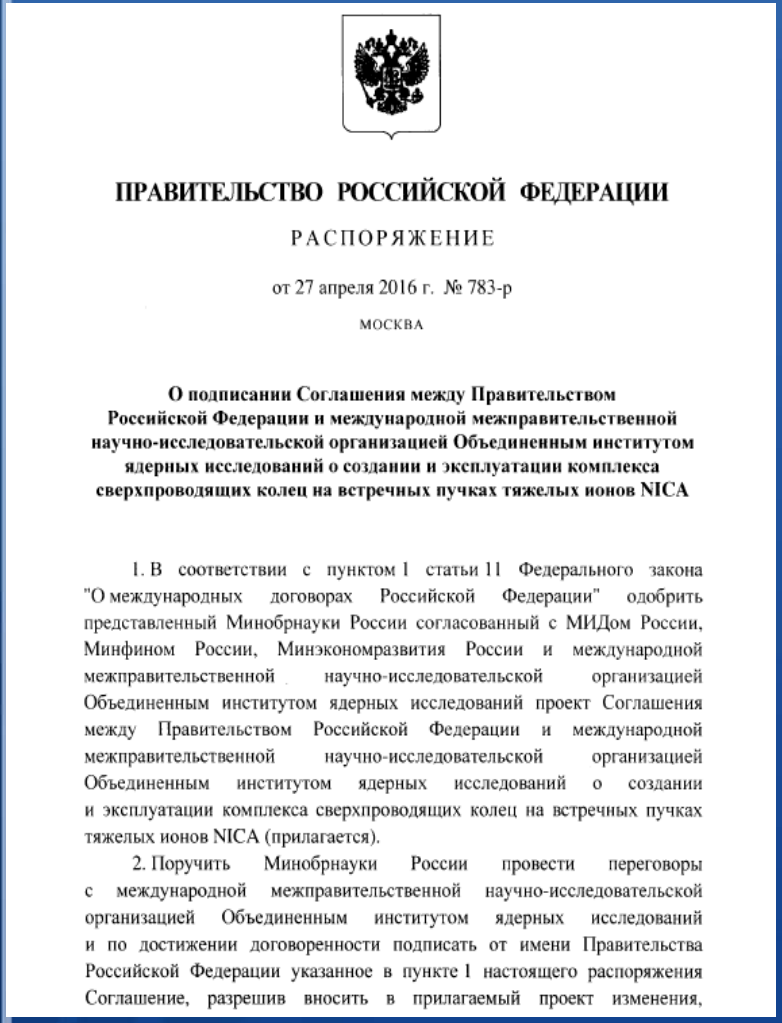
Свежие новости с сессии NuPECC :
В новое издание Long Range Plan по ядерной физике и физике частиц в Европе включена NICA в раздел новых, перспективных установок и инструментов в качестве Approved
and in construction now.

В список VIP (Very Important Programs) включены эксперименты BM@N and MPD at NICA .

Ожидается издание LRP в 2017.

(Из сообщения Б.Ю.Шаркова)

Status of the NICA mega-science @ JINR



ПРАВИТЕЛЬСТВО РОССИЙСКОЙ ФЕДЕРАЦИИ

РАСПОРЯЖЕНИЕ

от 27 апреля 2016 г. № 783-р

МОСКВА

О подписании Соглашения между Правительством Российской Федерации и международной межправительственной научно-исследовательской организацией Объединенным институтом ядерных исследований о создании и эксплуатации комплекса сверхпроводящих колец на встречных пучках тяжелых ионов NICA

1. В соответствии с пунктом 1 статьи 11 Федерального закона "О международных договорах Российской Федерации" одобрить представленный Минобрнауки России согласованный с МИДом России, Минфином России, Минэкономразвития России и международной межправительственной научно-исследовательской организацией Объединенным институтом ядерных исследований проект Соглашения между Правительством Российской Федерации и международной межправительственной научно-исследовательской организацией Объединенным институтом ядерных исследований о создании и эксплуатации комплекса сверхпроводящих колец на встречных пучках тяжелых ионов NICA (прилагается).

2. Поручить Минобрнауки России провести переговоры с международной межправительственной научно-исследовательской организацией Объединенным институтом ядерных исследований и по достижении договоренности подписать от имени Правительства Российской Федерации указанное в пункте 1 настоящего распоряжения Соглашение, разрешив вносить в прилагаемый проект изменения,

During 2013-2016 NICA successfully passed several stages of International expertise, had assembled a wide collaboration (95 participants from 25 countries). Very important step – inclusion NICA into ESFRI Strategy Report on Research Infrastructures and ESFRI Roadmap 2016 Update as complimentary project to ESFRI landmark project FAIR

On 27th April 2016 the RG Prime-minister issued the Governmental Decree about establishment of the NICA mega-science on Russian territory at JINR. Russia and JINR co-invest about 17.5 bln. roubles (in 2013 prices) to the "NICA Complex". Agreement between RF Government and JINR (signed on 2nd June 2016) in the frame of Decree formulates basic principles of the setting and development of the International collaboration "Complex NICA". We assume that in coming years similar Agreements will be prepared, agreed and signed with other countries and International Scientific centers, expressed their interest to participate and contribute to NICA.

We invite to join NICA new countries (Germany, China, …), leading International scientific centers (CERN, FAIR, etc) and Universities.

Соглашение

СОГЛАШЕНИЕ

между Правительством Российской Федерации и международной межправительственной научно-исследовательской организацией Объединенным институтом ядерных исследований о создании и эксплуатации комплекса сверхпроводящих колец на встречных пучках тяжелых ионов NICA

Правительство Российской Федерации и международ межправительственная научно-исследовательская организа Объединенный институт ядерных исследований (далее - Объединенн институт ядерных исследований), в дальнейшем именуемые Сторонами

выражая общее желание содействовать укреплению потенци Российской Федерации и Объединенного института ядерных исследова в области проводимых научно-технических и инновацион исследований в соответствии со статьей 30 Соглашения ме Правительством Российской Федерации и Объединенным институ ядерных исследований о местопребывании и об условиях деятельно Объединенного института ядерных исследований в Российской Федерации от 23 октября 1995 года,

стремясь создать комплекс сверхпроводящих колец на встречных пучках тяжелых ионов NICA (Nuclotron-based Ion Collider fAcility), обладающий беспрецедентными параметрами в области исследования физики частиц и ядер высоких энергий и обеспечивающий возможность его применения для инновационных разработок в приоритетных областях научных знаний, техники и технологий,

согласились о нижеследующем:

Статья 1

Между Правительством Российской Федерации и ОИЯИ *подписано 02 июня 2016 года*

ПРИЛОЖЕНИЕ № 3
к Соглашению между Правительством Российской Федерации и международной межправительственной научно-исследовательской организацией Объединенным институтом ядерных исследований о создании и эксплуатации комплекса сверхпроводящих колец на встречных пучках тяжелых ионов NICA

ФИНАНСОВЫЕ РАСХОДЫ

на реализацию базовой конфигурации проекта комплекса сверхпроводящих колец на встречных пучках тяжелых ионов NICA за счет средств федерального бюджета Российской Федерации

млн. рублей

	2016 год	2017 год	2018 год	2019 год	2020 год
Опытно-конструкторские работы	200	310	330	200	130
Капитальные затраты на создание	1290	2030	2170	1300	840
Всего	1490	2340	2500	1500	970

2947103.doc

2016 – 2020 г.г.

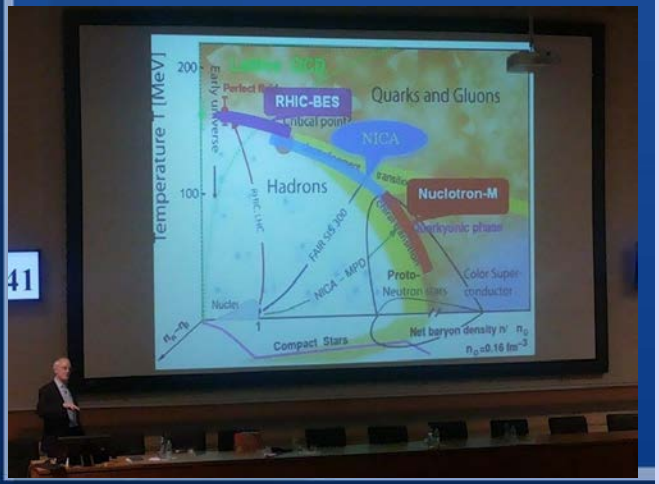
Финансовые вклады:

Бюджет ОИЯИ – 8700 млн.руб.

Целевой вклад РФ – 8800 млн.руб.

(в ценах 2013 года)

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



D.GROSS: «QCD — first example of the consistent theory without limits of credibility. Complicated part of theory: what will happen if to squeeze or to heat strongly particles, say nucleons? If to heat nucleons up to very high temperatures, the quarks inside them will become free. And matter must pass into other state? The same must be at squeeze at the collision.

Such experiments were done and they confirmed up to some extent that nucleons get melted and there appear phase transition into the state of Quark-Gluon Plazma.

NICA will study what will happened at the ultra high baryon density at not too high temperatures. Similar conditions are assumed to be inside the Neutron Stars.

QCD has strong connections with the String theory. String theory has been invented to understand the strong interaction. QCD explain not only properties of quarks and gluons but also of the open and closed strings, what can lead to the understanding of what is the gravitation.

When you study the properties of the phase transitions at the heavy ion collisions the results could be used as well for investigation of the black holes. NICA can investigate a new region at the graphic of the phase transition.

The NICA construction in progress

Первая заливка бетона на строительстве комплекса NICA, 8 ноября 2016 года

О.Васильева пригласила страны ЕАС к участию в проекте коллайдера NICA

МОСКВА, 21 сен – РИА Новости.
Глава Минобрнауки Ольга Васильева в ходе 33 Всемирной конференции Международной ассоциации технопарков и зон инновационного развития (IASP) пригласила страны Евразийского экономического союза (ЕАС) к участию в проекте коллайдера NICA.
"Мы приглашаем страны ЕАС к участие в этом мегапроекте", — сказала Васильева в среду.

Ольга Ю.Васильева

Министр напомнила, что "целью проекта комплекс NICA является создание на территории Российской Федерации междисциплинарного научно-исследовательского центра международного класса, обладающего уникальным набором современных сверхпроводящих ускорителей тяжелых ионов, не имеющих аналогов в мире на сегодняшний день".
В ходе выступления Васильева также отметила усиление взаимодействие российских ученых с учеными стран ЕАС.

XX Intergovernmental Subcommission Russia-China on scienific and technological cooperation,

Shanghai, 19-20 October

RF was represented by vice-minister A.V.Lopatin

Chineese vice-minister YIN Hejun had declared wish of China to join NICA.

Both vice-ministers agreed to ask RF and PRC Governments (level of Intergovernmental Commission) to initiate the procedure of signing the Agreement between PRC and JINR on NICA Collaboration.

JINR was represented by JINR vice-director G.Trubnikov.

120th session of the Scientific Council

RESOLUTION

Recommendations on the SHE Factory

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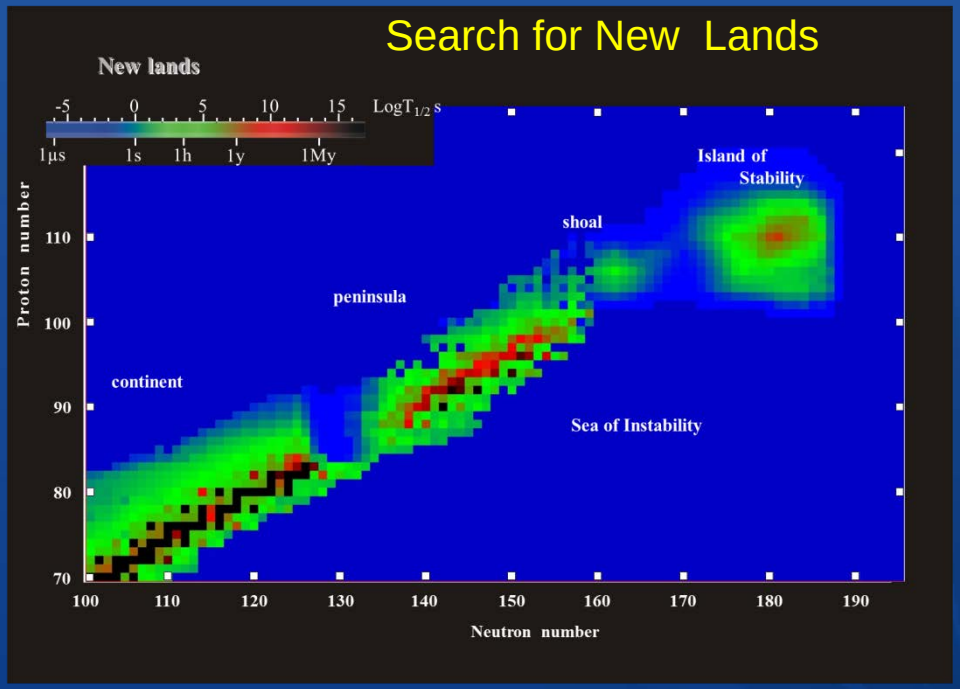
The Scientific Council took note of the report “Status of the Factory of Superheavy Elements (SHE) and its future prospects” presented by FLNR Director **S. Dmitriev**. The Scientific Council appreciated the high pace of construction of the Factory’s experimental building, noted with satisfaction the beginning of installation work for the DC-280 cyclotron in accordance with the schedule proposed by the FLNR Directorate, and supported the proposed programme of first experiments planned at the SHE Factory in 2018–2019.

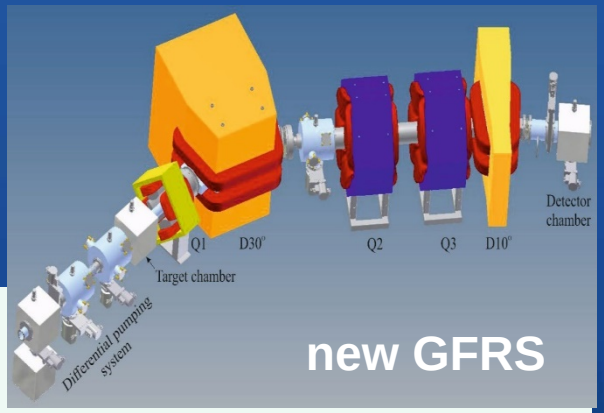
The Scientific Council recommended that the JINR and FLNR Directorates give special attention to the timely completion of the construction of the SHE Factory and to the installation and commissioning of the DC-280 accelerator and of instrumentation (gas-filled separator and pre-separator for chemical studies), which will allow first experiments at the Factory to begin. Given the high priority of the SHE Factory under construction, the Scientific Council recommended that the JINR Directorate ensure full support for the execution of work towards the successful launch and further development of the Factory.

Основной задачей ЛЯР на период с 2017 по 2023гг. является запуск работы фабрики сверхтяжелых элементов (SHE factory), основным проектом которой является циклотрон ДЦ-280. Благодаря данному проекту создадутся условия для проведения экспериментальных и прикладных исследований в области ядерной физики на базе ОИЯИ и расширения научно-технические связей Института с другими международными научными центрами.

SHE Factory with DC-280 Cyclotron

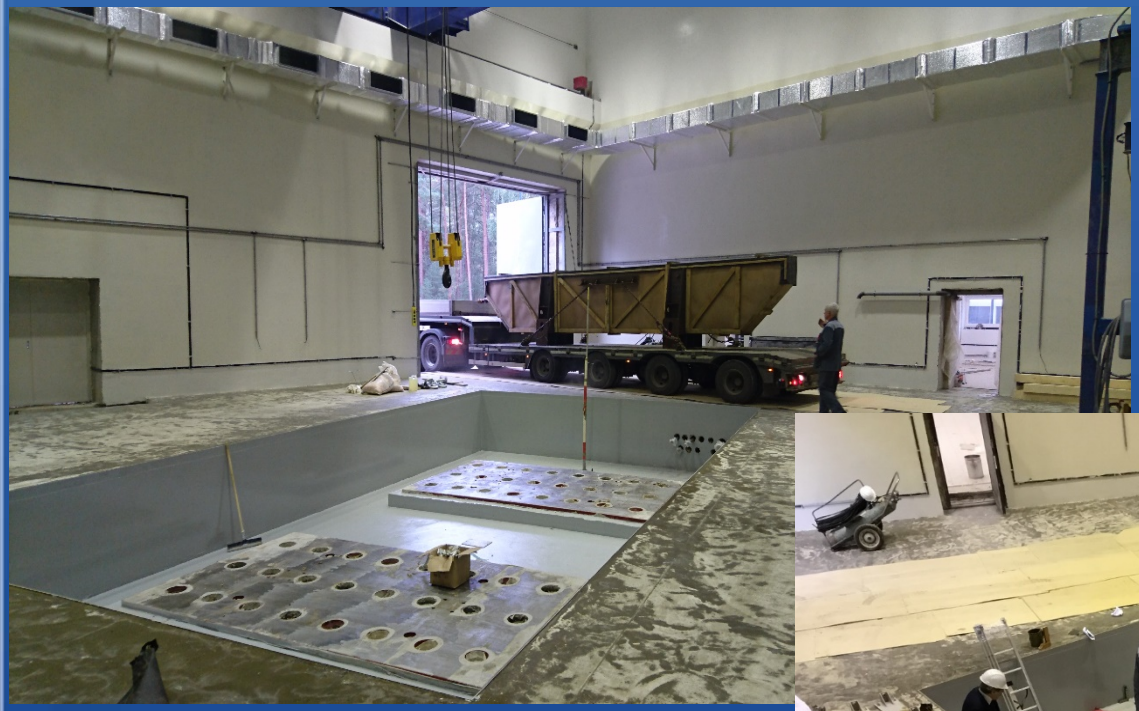


SHE Factory. Time-schedule.



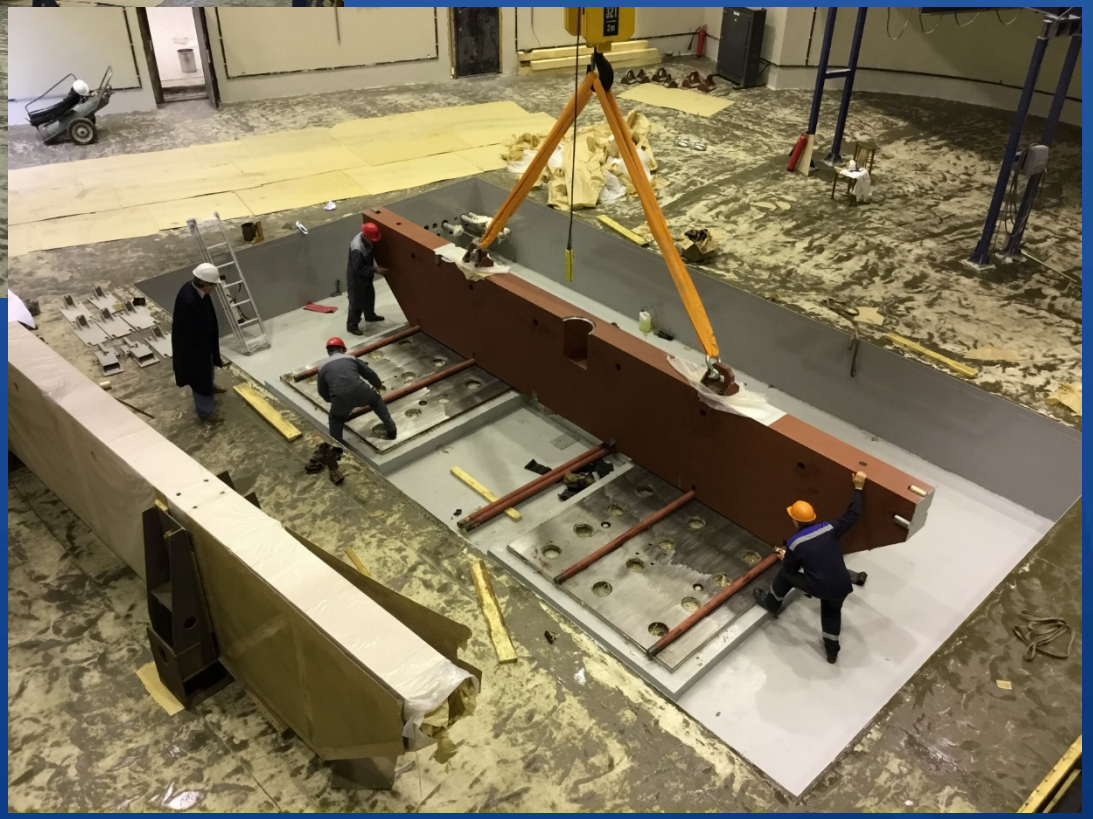
- **Completion of the SHE Factory building and its engineering systems (*2016 – June 2017*)**
- **Assembling the DC-280 cyclotron. Installation of new Gas-Filled Recoil Separator. (*September 2016 – December 2017*)**
- **First experiments (*2018*)**

Assembling of the DC-280 main magnet

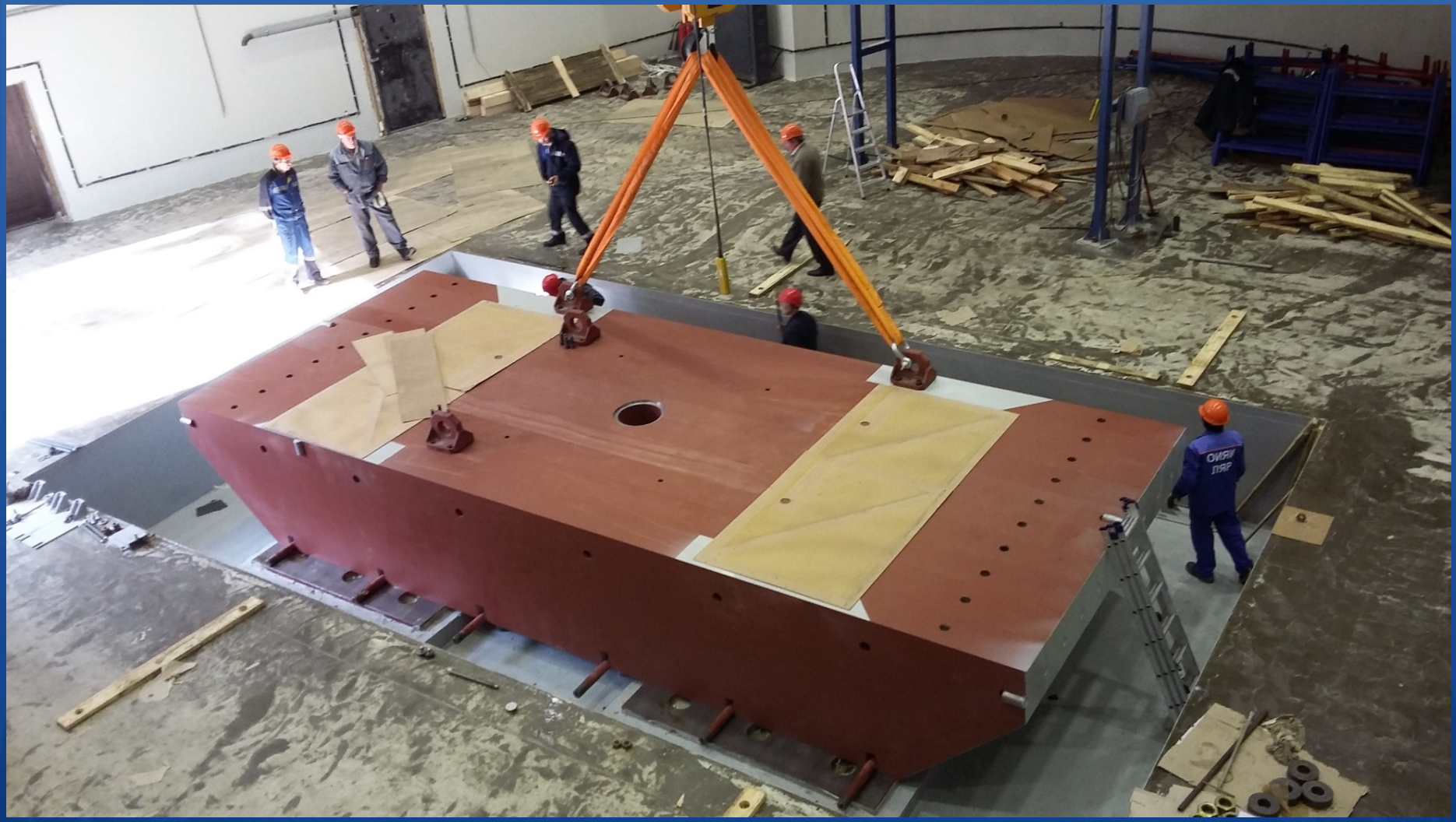


15.09.2016, 9:00

Same day, 14:35



Lower part of the DC-280 main magnet is assembled!



21.09.2016

Assembling of the DC280 magnet

01.11.2016

10.11.2016

Периодическая таблица элементов Д.И. Менделеева (2016 год)

Бор 5	Углерод 6	Азот 7	Кислород 8	Фтор 9	Неон 10
B 10,811 Boron	**C** 12,011 Carbon	**N** 14,0067 Nitrogen	**O** 15,9994 Oxygen	**F** 18,9984 Fluorine	**Ne** 20,1797 Neon

Алюминий 13	Кремний 14	Фосфор 15	Сера 16	Хлор 17	Аргон 18
Al 26,981539 Aluminum	**Si** 28,0855 Silicon	**P** 30,97376 Phosphorus	**S** 32,066 Sulfur	**Cl** 35,4527 Chlorine	**Ar** 39,948 Argon

Никель 28	Медь 29	Цинк 30	Галлий 31	Германий 32	Мышьяк 33	Селен 34	Бром 35	Криптон 36
Ni 58,6934 Nickel	**Cu** 63,546 Copper	**Zn** 65,39 Zinc	**Ga** 69,723 Gallium	**Ge** 72,61 Germanium	**As** 74,92159 Arsenic	**Se** 78,96 Selenium	**Br** 79,904 Bromine	**Kr** 83,80 Krypton

Палладий 46	Серебро 47	Кадмий 48	Индий 49	Олово 50	Сурьма 51	Теллур 52	Иод 53	Ксенон 54
Pd 106,42 Palladium	**Ag** 107,8682 Silver	**Cd** 112,411 Cadmium	**In** 114,818 Indium	**Sn** 118,710 Tin	**Sb** 121,757 Antimony	**Te** 127,60 Tellurium	**I** 126,90447 Iodine	**Xe** 131,29 Xenon

Платина 78	Золото 79	Ртуть 80	Таллий 81	Свинец 82	Висмут 83	Полоний 84	Астат 85	Радон 8
Pt 195,08 Platinum	**Au** 196,96654 Gold	**Hg** 200,59 Mercury	**Tl** 204,3833 Thallium	**Pb** 207,2 Lead	**Bi** 208,98037	**Po** [209]	**At** [210]	**Rn** [222]

Дармштадтий 110	Рентгений 111	Коперниций 112	(Нихоний) 113
Ds [269] Darmstadtium	**Rg** [272] Roentgenium	**Cn** [277] Copernicium	**(Nh)** [286] (Nihonium)

Flerovium 114	(Moscovium) 115	Livermorium 116	(Tennessine) 117	(Oganesson) 118
Fl Флеровий	**(Mc)** (Московий)	**Lv** Ливерморий	**(Ts)** (Теннессин)	**(Og)** (Оганесон)

105

Db

Dubnium

ПЕРИОДИЧЕСКАЯ ТАБЛИЦА ЭЛЕМЕНТОВ Д. И. МЕНДЕЛЕЕВА

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H Водород 1,00794																	2 He Гелий 4,0026
3 Li Литий 6,941	4 Be Бериллий 9,01218											5 B Бор 10,811	6 C Углерод 12,011	7 N Азот 14,0067	8 O Кислород 15,9994	9 F Фтор 18,9984	10 Ne Неон 20,1797
11 Na Натрий 22,989768	12 Mg Магний 24,3050											13 Al Алюминий 26,981539	14 Si Кремний 28,0855	15 P Фосфор 30,97376	16 S Сера 32,066	17 Cl Хлор 35,4527	18 Ar Аргон 39,948
19 K Калий 39,0983	20 Ca Кальций 40,078	21 Sc Скандий 44,95591	22 Ti Титан 47,88	23 V Ванадий 50,9415	24 Cr Хром 51,9961	25 Mn Марганец 54,93805	26 Fe Железо 55,847	27 Co Кобальт 58,93320	28 Ni Никель 58,6934	29 Cu Медь 63,546	30 Zn Цинк 65,39	31 Ga Галлий 69,723	32 Ge Германий 72,61	33 As Мышьяк 74,92159	34 Se Селен 78,96	35 Br Бром 79,904	36 Kr Криптон 83,80
37 Rb Рубидий 85,4678	38 Sr Стронций 87,62	39 Y Иттрий 88,90585	40 Zr Цирконий 91,224	41 Nb Ниобий 92,90638	42 Mo Молибден 95,94	43 Tc Технеций [98]	44 Ru Рутений 101,07	45 Rh Родий 102,90550	46 Pd Палладий 106,42	47 Ag Серебро 107,8682	48 Cd Кадмий 112,411	49 In Индий 114,818	50 Sn Олово 118,710	51 Sb Сурьма 121,757	52 Te Теллур 127,60	53 I Иод 126,90447	54 Xe Ксенон 131,29
55 Cs Цезий 132,90543	56 Ba Барий 137,327	57 La Лантан 138,9055	72 Hf Гафний 178,49	73 Ta Тантал 180,9479	74 W Вольфрам 183,84	75 Re Рений 186,207	76 Os Осмий 190,23	77 Ir Иридий 192,22	78 Pt Платина 195,08	79 Au Золото 196,96654	80 Hg Ртуть 200,59	81 Tl Таллий 204,3833	82 Pb Свинец 207,2	83 Bi Висмут 208,98037	84 Po Полоний [209]	85 At Астат [210]	86 Rn Радон [222]
87 Fr Франций [223]	88 Ra Радий 226,025	89 Ac Актиний [227]	104 Rf Резерфордий [261]	105 Db Дубний [262]	106 Sg Сиборгий [266]	107 Bh Борий [262]	108 Hs Хассий [269]	109 Mt Мейтнерий [268]	110 Ds Дармштадтий [269]	111 Rg Рентгений [272]	112 Cn Коперниций [285]	113 Uut Унунтрий [286]	114 Fl Флеровий [289]	115 Uup Унунпентий [289]	116 Lv Ливерморий [293]	117 Uus Унунсептий [294]	118 Uuo Унуноктий [294]

Лантаноиды

58 Ce Церий 140,115	59 Pr Празеодим 140,90765	60 Nd Неодим 144,24	61 Pm Прометий [145]	62 Sm Самарий 150,36	63 Eu Европий 151,965	64 Gd Гадолиний 157,25	65 Tb Тербий 158,92534	66 Dy Диспрозий 162,50	67 Ho Гольмий 164,93032	68 Er Эрбий 167,26	69 Tm Тулий 168,93421	70 Yb Иттербий 173,04	71 Lu Лютеций 174,967

Актиноиды

90 Th Торий 232,0381	91 Pa Протактиний 231,03588	92 U Уран 238,0289	93 Np Нептуний [237]	94 Pu Плутоний [244]	95 Am Америций [243]	96 Cm Кюрий [247]	97 Bk Берклий [247]	98 Cf Калифорний [251]	99 Es Эйнштейний [252]	100 Fm Фермий [257]	101 Md Менделевий [258]	102 No Нобелий [259]	103 Lr Лоуренсий [262]

Водород 1 $1s^1$ — H — 1,00794 — 13,59844 — 0,0899 — −259,34 — −252,87 — Hydrogen

H — символ
1,00794 — атомная масса
$1s^1$ — электронная конфигурация
13,59844 — 1-й потенциал ионизации, эВ
0,0899 — плотность, кг/м³
−259,34 — температура плавления, °C
−252,87 — температура кипения, °C

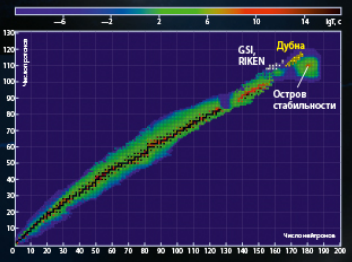
s-элементы · d-элементы · p-элементы · f-элементы

За последние 60 лет 11 новых элементов были открыты в ОИЯИ

102 No Нобелий	103 Lr Лоуренсий	104 Rf Резерфордий	105 Db Дубний	108 Hs Хассий
[259] Nobelium	[262] Lawrencium	[261] Rutherfordium	[262] Dubnium	[269] Hassium

113 Uut Унунтрий	114 Fl Флеровий	115 Uup Унунпентий	116 Lv Ливерморий	117 Uus Унунсептий	118 Uuo Унуноктий
[286] Ununtrium	[289] Flerovium	[289] Ununpentium	[293] Livermorium	[294] Ununseptium	[294] Ununoctium

Карта нуклидов



Остров стабильности — гипотетическая область долгоживущих сверхтяжелых ядер, центр которой находится, предположительно, вблизи дважды магического ядра с числом протонов 114 и нейтронов 184.

За последние 16 лет в Лаборатории ядерных реакций (ЛЯР) им. Г. Н. Флерова ОИЯИ под руководством академика Ю. Ц. Оганесяна в реакциях слияния ядер ^{48}Ca с изотопами трансурановых элементов были впервые синтезированы элементы с атомными номерами 113–118. Одним из важнейших результатов этих экспериментов стало подтверждение существования Острова стабильности: было обнаружено резкое увеличение времен жизни ядер в его окрестности от долей миллисекунды до десятков секунд.

Открытие всех новых элементов было признано IUPAC: в 2011 г. — элементов 114 и 116, а в 2015 г — элементов 113, 115, 117 и 118. В 2012 году официальные названия — Флеровий (Fl) и Ливерморий (Lv) — получили элементы 114 и 116. Элемент 118 завершает 7-ой период Таблицы Менделеева и является в настоящее время самым тяжелым.

Синтез и изучение свойств новых сверхтяжелых элементов и их изотопов продолжается в ведущих мировых центрах. В ЛЯР ОИЯИ создается новый рекордный по характеристикам ускорительный комплекс — первая в мире Фабрика сверхтяжелых элементов, которая станет базой для будущих исследований сверхтяжелых ядер.

ОИЯИ

"I expect that around November 8, Division II [Inorganic Chemistry Division] will consider all the comments, and make a final decision on the text of the Provisional paper dated June 8 to make it final, so that the IUPAC Bureau can soon thereafter decide on the final names and symbols".

Jan Reedijk, President Division II IUPAC

IUPAC President Prof. Kazuyuki Tatsumi

Inauguration of new elements

114 - Flerovium

116 – Livermorium

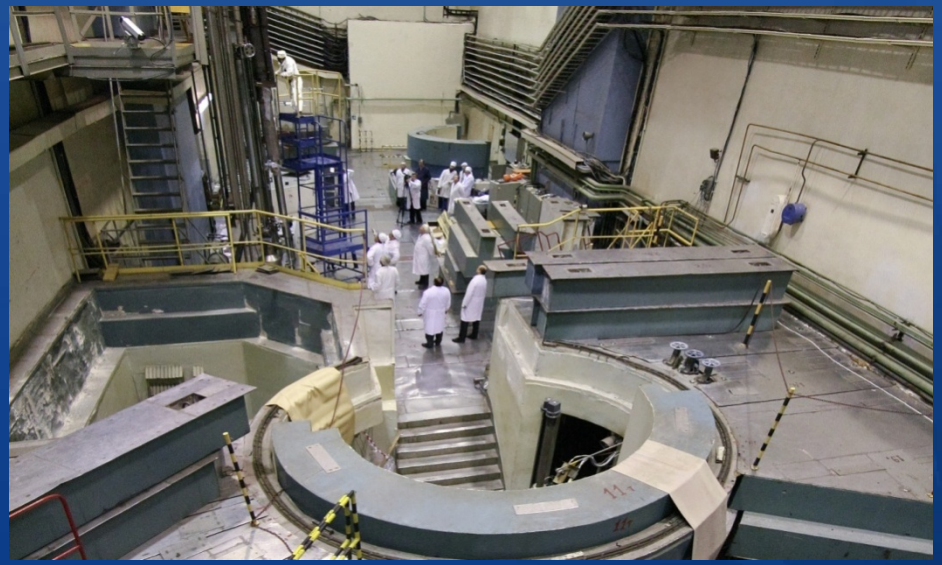
Moscow, October 24, 2012

Inauguration of new elements
115 – (Moscovium),
117 – (Tennessine),
118 -- (Oganesson)

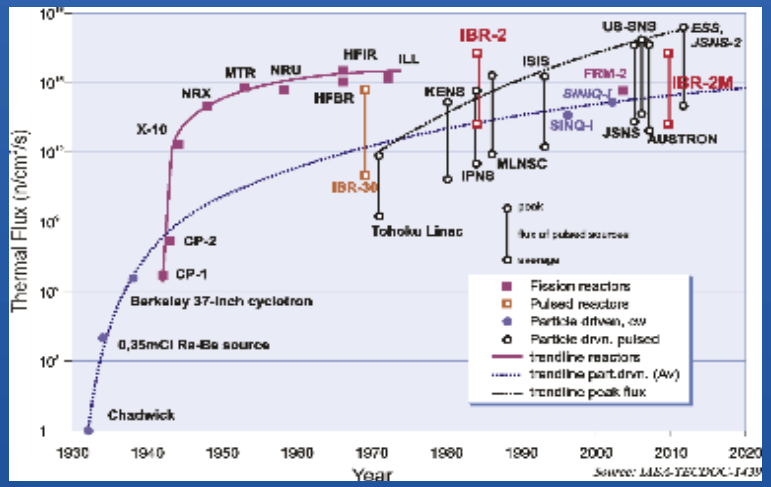
expected in *Moscow, beginning of 2017 (expected)*
after formal approval by the IUPAC Bureau

Frank Laboratory of Neutron Physics

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*



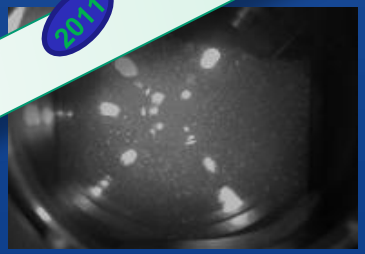
Modernization of the reactor has been performed as scheduled. The extensive program of experiments on the reactor (more than 150 per year, with large geographical coverage of users) is ongoing.



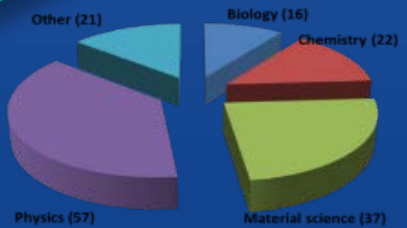
Creation and testing of the stand for the 2nd cold moderator

The modernized IBR-2 reactor physical start up was commenced according to the plan

- **The user program restarts**
- **Physical start up of the 1st cold moderator: first cold neutrons for users!**



Commissioning of two new spectrometers: DN-6 and GRAINS



Development of three new spectrometers NRT, FSS and RTD

Technical design and manufacturing of the 2nd cold moderator

2010 2011 2012 2013 2014 2015 2016

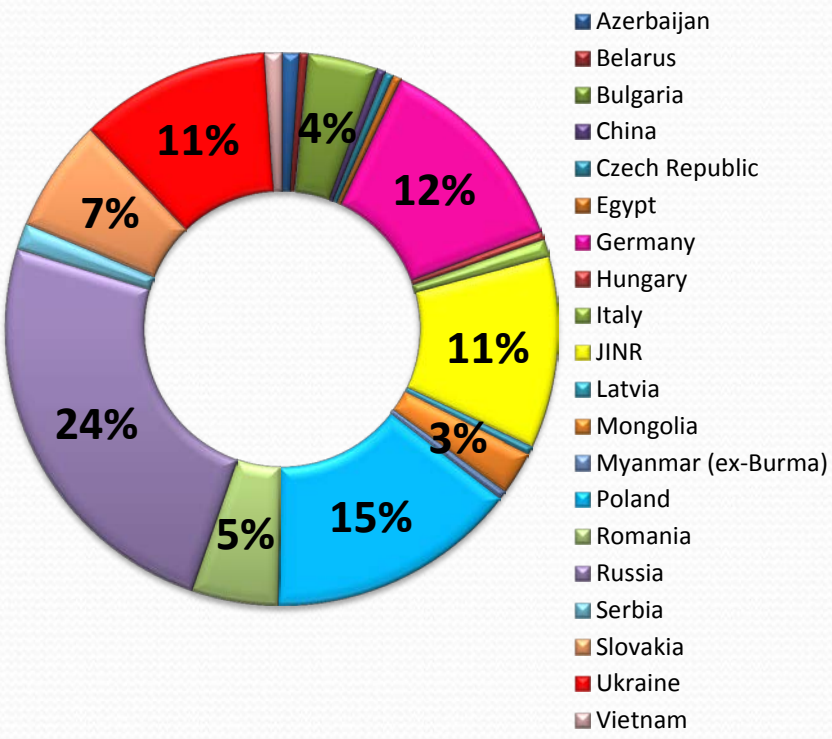
Starting of the work for physical experiments

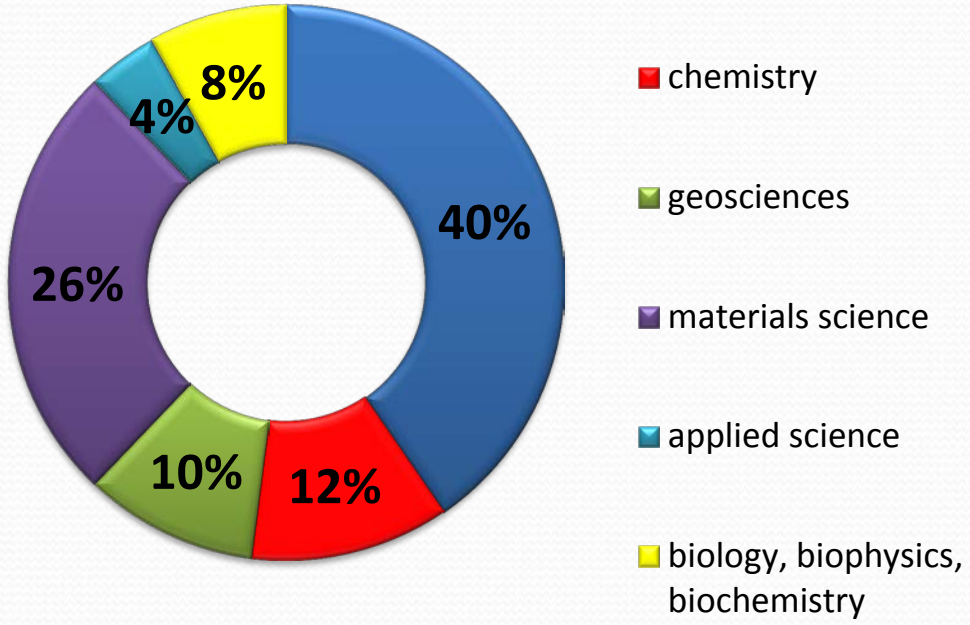
- **Testing of the stand for the 1st cold moderator**

IBR-2M – один из лучших источников тепловых и ультрахолодных нейтронов в мире! 2МВт, 5Гц, до 10^{16} н/см^2/с

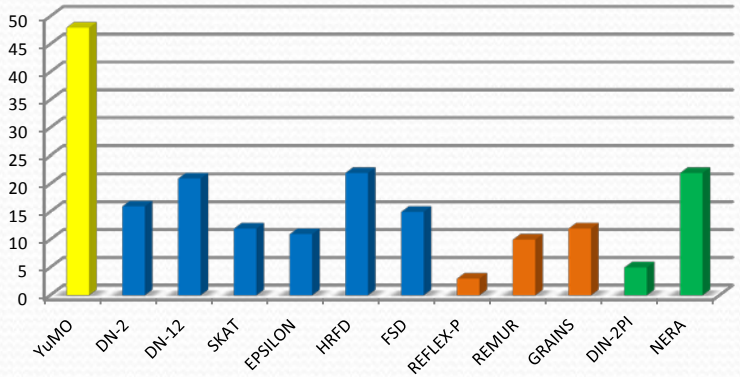
ИБР-2: программа пользователей, 2015 г.

197 предложений
19 стран





Около 60 пользователей из более чем 10 стран

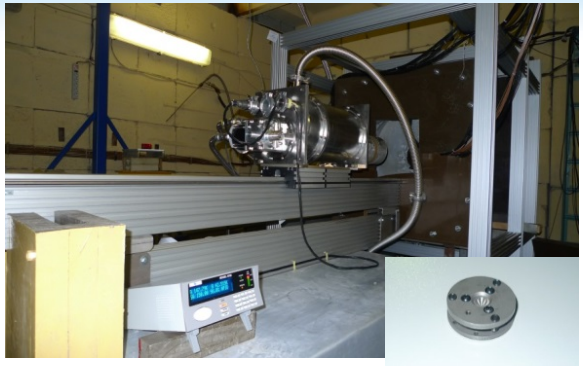


Development of the Spectrometer Complex of the Modernized IBR-2 Reactor

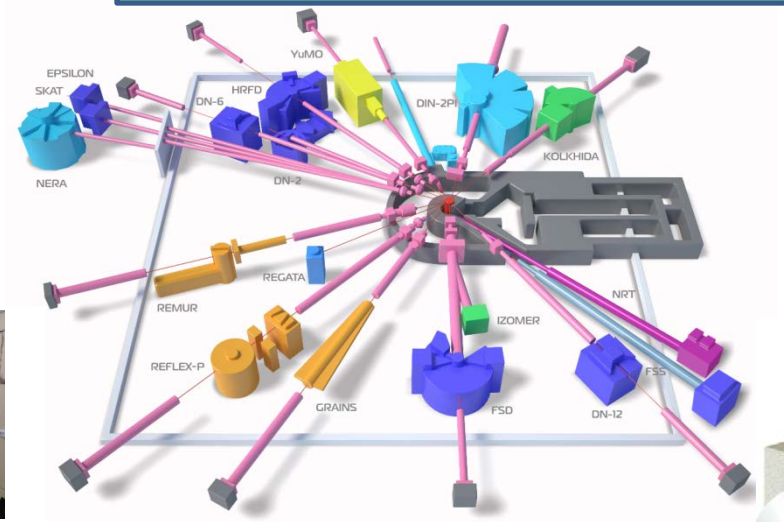
2011:
11 instruments in operation

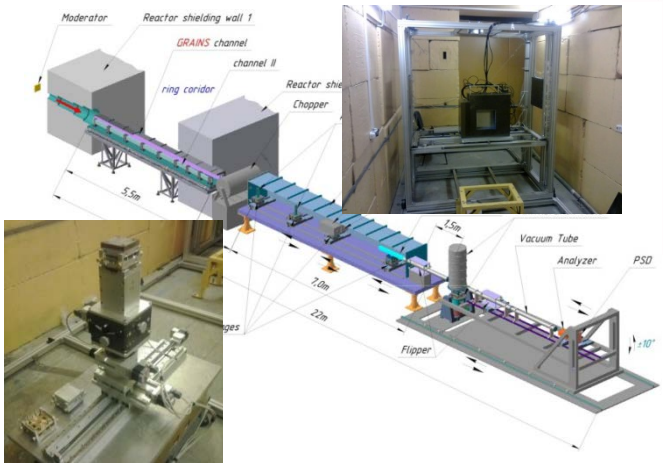
→

2016:
15 instruments in operation

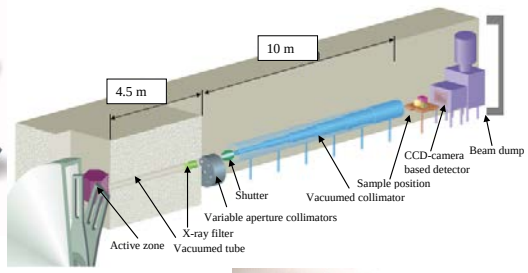


DN-6 diffractometer for studies of microsamples under extreme conditions (ultrahigh pressures up to half-megabar)



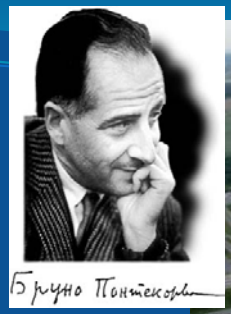


Multifuntional GRAINS reflectometer for studies of soft and liquid interfaces



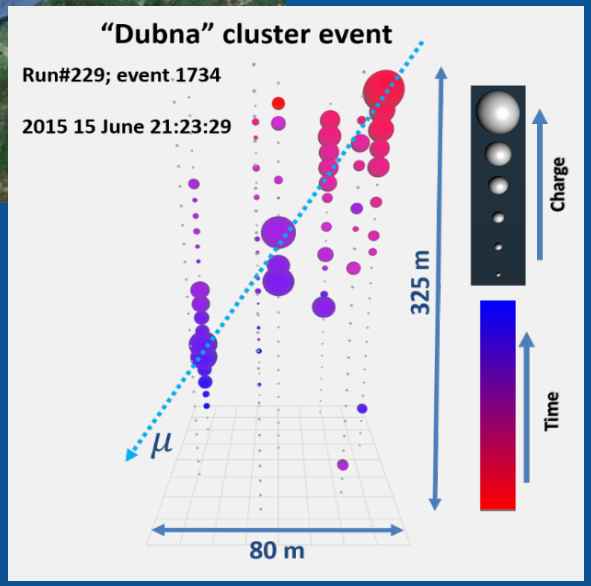
Neutron imaging (radiography and tomography) spectrometer

Нейтринная программа ОИЯИ

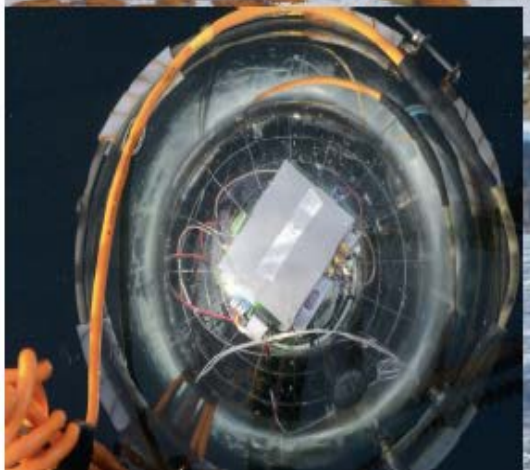


- Когерентное нейтрино-ядерное рассеяние (**vGEN, DANSS**)
- Прецизионные измерения нейтринных осцилляций (**Daya Bay, BOREXINO**)
- Иерархия нейтринных масс (**JUNO, NOvA, DUNE)**
- Безнейтринный двойной бета распад (**SuperNEMO, GERDA, Majorana**)
- Астрофизические источники нейтрино

Байкал (GVD)



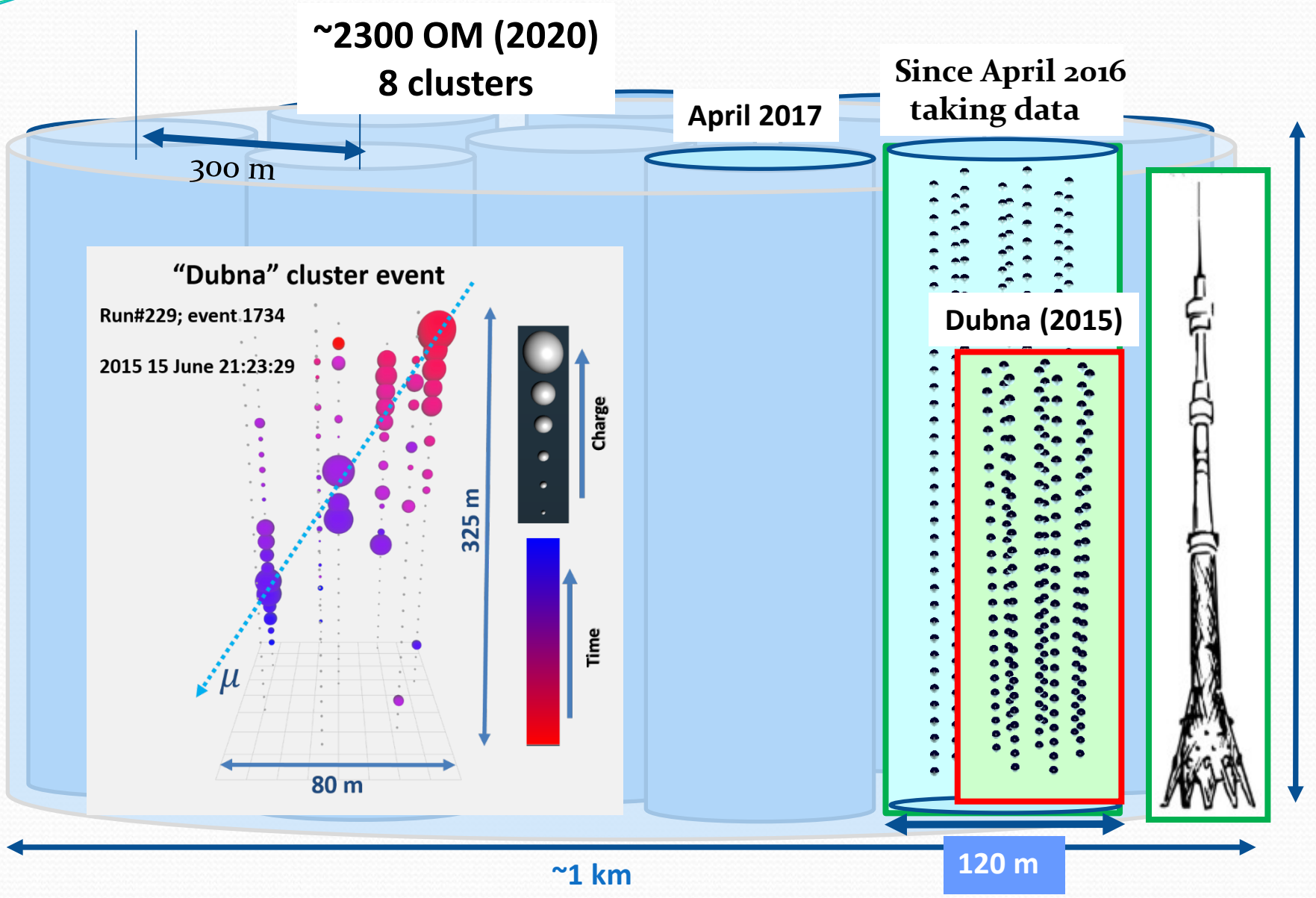
Assembling of the First Cluster of the GVD at the Baikal lake, Start at March 2015



JINR
Dzhelepov Laboratory for Nuclear Problems
INR of RAS
Institute for Nuclear Research of the Russian Academy of Sciences

M.A.Markov

Present and future of the BAIKAL-GVD



Nobel Prize Award in Physics
6 October 2015

The Royal Swedish Academy of Sciences has decided
to award the Nobel Prize in Physics for 2015 to

Takaaki Kajita
Super-Kamiokande Collaboration
University of Tokyo, Kashiwa, Japan

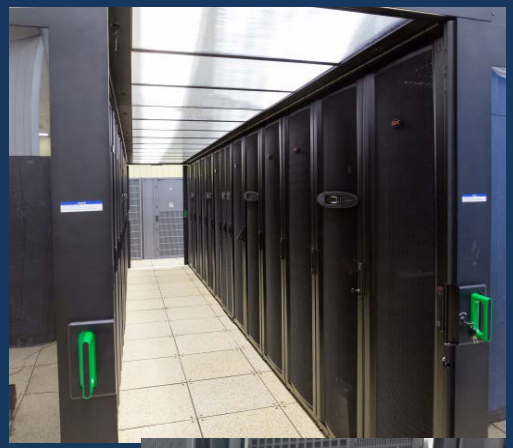
Arthur B. McDonald
Sudbury Neutrino Observatory Collaboration
Queen's University, Kingston, Canada
"for the discovery of neutrino oscillations, which shows that neutrinos have mass"

It was Big Day for DUBNA !

The hypothesis of the neutrino oscillations has been introduced In science by Bruno Pontecorv in Dubna in 1957

LIT Achievement for 2010-2016

During the last 7 years three new components of the CICC were put into operation:



- **Tier1 level center – one of 7 world centers for the CMS experiment and only one in JINR Member States**
- **JINR cloud infrastructure**
- **Heterogeneous computation cluster HybriLIT**

Development of computing and network:

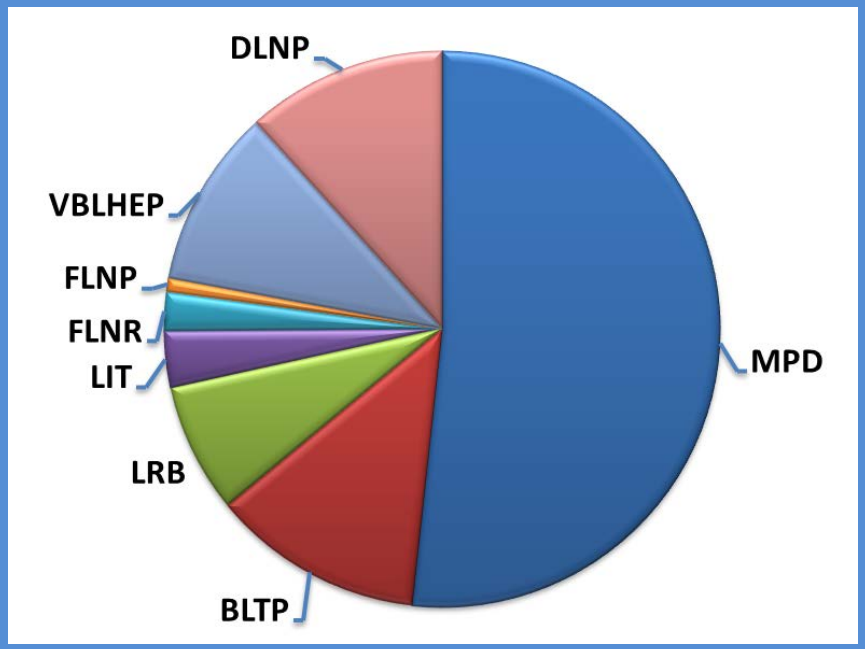
- Increase of computational nodes by **6** times: **from 960 to 6160**
- Increase of disk storage by **10** times: **from 500 to 5200 TB**
- Tape robot for **5400 TB** was put into operation
- The speed of local network increased by **10** times: **from 1 to 10 Gbps**
- The speed of the external telecommunication channels increased by **6** times: **from 20 to 120Gbps**
- Incoming traffic increased by ~**17** times: **from 536 to 8900 TB**
- Output traffic increased by ~**20** times: **from 412 to 8300 TB**

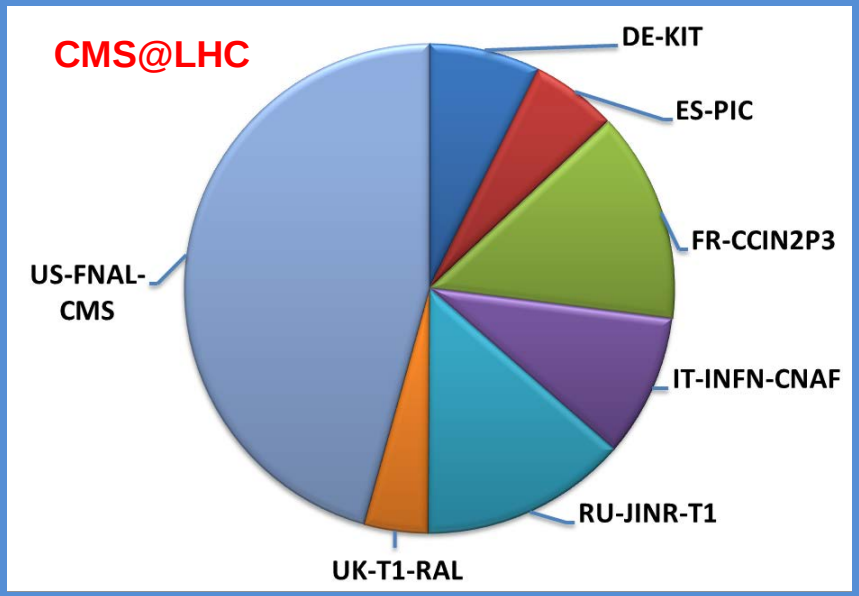
LIT IT-infrastructure is the one of JINR basic facilities

Computing resource usage

Experiments:

BM@N
MPD
LHC (CMS, ATLAS, ALICE, LHCb)
STAR (RHIC)
PANDA
COMPASS
NOvA
BESIII
CBM(FAIR)
DIRAC
Mu2e
NUCLON
TAIGA
GEANT4
IBR-2



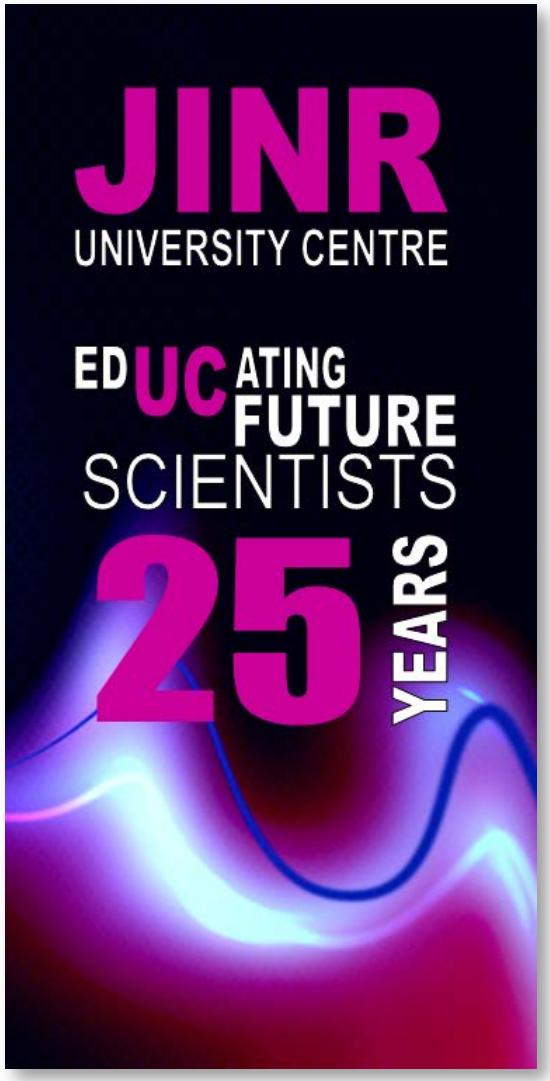


Computing resources usage by JINR Laboratories

JINR Tier-1 resources usage by CMS

JINR University Centre

Attracting youth to science



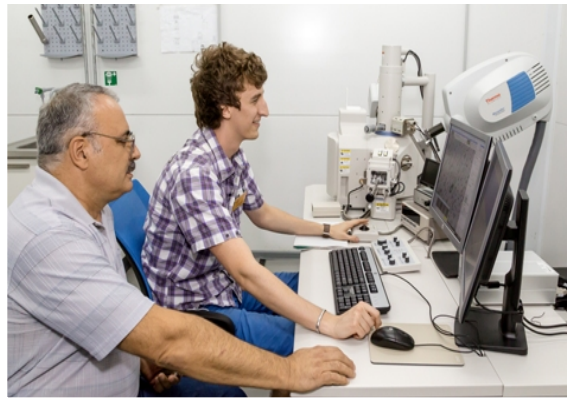
STUDENTS & POSTGRADUATES

International Student Practices

uc.jinr.ru (events)

Summer Student Programme

students.jinr.ru



Bachelor's, Master's & PhD theses at JINR

OUTREACH ACTIVITIES

International Scientific Schools for Physics Teachers at JINR and CERN

teachers.jinr.ru

For School Students

- **Visits**
- **Video conferences**
- **Days of Physics**
- **Interschool Course of Physics and Maths**

SKILL IMPROVEMENT

Skill improvement courses and seminars for JINR employees

Language courses for JINR

English German French Russian

as a foreign language

NEW UC DEPARTMENTS

Scientific-Engineering Group
Training for engineers
from JINR Member States
uc.jinr.ru

Development of the Modern Education Programmes:

- **Virtual Laboratory of Nuclear Fission**
- **Web-resource Nuclear Science and Technology**
  http://nsww.org/
-

RENOVATED STUDENT HOSTEL

120th session of the Scientific Council

RESOLUTION

Invited reports

The Scientific Council highly appreciated the reports:

– “Latest results of the ALICE experiment and detector upgrade plans”

– “Nuclear planetology: space experiments and recent results

and thanked the speakers Professors P. Giubellino (CERN) and

I. Mitrofanov (Space Research Institute. Moscow) for their excellent presentations.

120th session of the Scientific Council

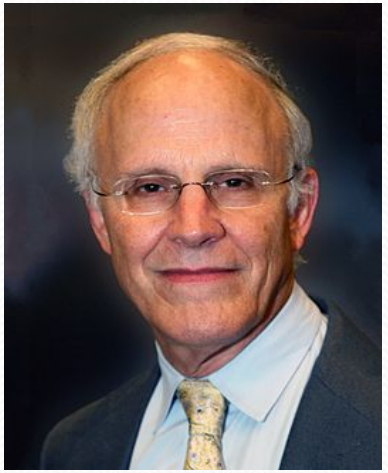
RESOLUTION

Awards and prizes

The Scientific Council congratulated Professor G. Bellini (Italy) on receiving the B. Pontecorvo Prize and appreciated his scientific report "The impact of the Borexino results on neutrino and solar physics".

JINR Directorate Council nominated for the election as Foreign Members of the Russian Academy of Sciences:

Professor David Gross (Kavli Institute for Theoretical Physics, USA) in recognition of his outstanding and fundamental contributions to Quantum Chromodynamics, whose fundamental predictions at very high baryonic density is the NICA@JINR Collider mission to investigate experimentally



Professor Sergio Ferrara (CERN & INFN) in recognition of his outstanding c to the very founding and to the development of the Theory of Supergravity

The election procedure started at the General Meeting of RAS on October 24, 2016, and it was officially finalized on October 28, 2016

Prof. Gross and Prof. Ferrara were elected as Foreign Members of Russian Academy of Sciences

Избрание сотрудников и партнеров ОИЯИ в члены Российской академии наук

Общее собрание Отделения физических наук (24-25 октября 2016) и Общее собрание РАН (26-28 октября 2016)

Действительными членами РАН избраны:

Г.В.Трубников – вице-директор ОИЯИ

Б.Ю Шарков – член Ученого совета ОИЯИ

Член-корреспондентами РАН избраны:

Д.И. Казаков – главный научный сотрудник ЛТФ

Л.В.Григоренко – ведущий научный сотрудник ЛЯР

Иностранными членами РАН избраны:

Д. Гросс (США)

С.Феррара (Италия)

Р.М.Мартиросян (Армения, президент НАНА)

А.М.Магеррамов (Азербайджан, ректор БГУ)

JINR-60 summary in 2015

Days of JINR in the Member States

2-6 March 2015 6th October city - Cairo
Forum "JINR-Egypt. 5 years together“

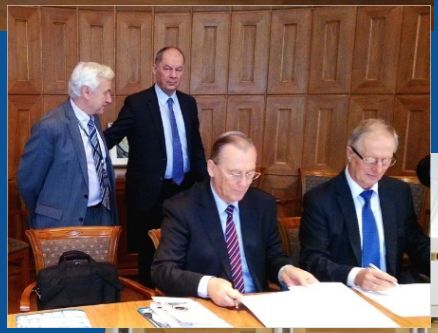
28-30 May 2015 Tbilisi
“JINR Days in Georgia”

22-23 October 2015 Prague
“JINR Days in Czech Republic”.

2-5 November 2015 Bucharest
“JINR Days in Romania”

3-7 November 2015 Poland
“NICA Days in Warsaw”

16-22 November 2015 Minsk
FC and CP sessions in Belarus



9 International Conferences JINR-60

2x Russia, 2x Slovakia, Belarus, Bulgaria, Czech Republic, Montenegro, *Romania*

4 bilateral Forums in Dubna

JINR-Czech Republic, Italy-Russia@Dubna.
JINR-Brazil, Week of South Africa in JINR

Summary at the JINR Web-Page http://www.jinr.ru/about/60-let/

Conferences dedicated to 60th anniversary of JINR in 2015

29 June- 3 July 2015 - St.Petersburg, Russia
65th International Conference on Nuclear Physics

13 – 17 July 2015 Tatry, Slovakia
International Conference «Mathematical Modeling and Computational Physics»

27 July – 2 August 2015 - Prague, Czech Republic
International conference «Symmetries and Spin»

27 July – 7 August 2015 - Gomel, Belarus
International School Conference «Actual Problems of Micro world Physics»

20 – 26 August 2015 - Moscow, Russia
17th Lomonosov Conference on Elementary Particle Physics

6 August – 12 September 2015 Varna, Bulgaria
21st Summer School Nuclear Physics

27 August – 4 September 2015 Horny Smokovets, Slovakia
6th International Pontecorvo Neutrino Physics School

28 September - 3 October 2015 Montenegro
25th International Symposium on Nuclear Electronics & Computing (NEC-2015)

28 - 30 October 2015 Cluj-Napoca Romania
Grid, Cloud & High Performance Computing in Science.

24-28 November 2015 JINR Dubna
7th Round Table Italy – Russia@Dubna

JINR Days in Azerbaijan

12-14 October, 2016

12 October, 2016

Session of the Working Group for JINR Financial Issues under the CP chairmanship Prof. Latchesar Kostov at the presence of President NASA academician R.M.Martirossyan

13 October, 2016

Opening ceremony and poster exhibition (*House of Scientists, Azerbaijan National Academy of Sciences*)

Visits:

- institutes of the Azerbaijan Academy of Sciences
- National Centre for Nuclear Research
- Baku State University

JINR Days in Armenia

19-22 October, 2016

President of Armenia Serzh Sargsyan met the JINR Directorate promised to encourage the scientific cooperation between Armenia and JINR

19 October, 2016

Ceremonial opening venue:
Mesrop Mashtots Institute of Ancient Manuscripts

Visits:

- RA NAS President R. Martirosyan
- Mayor of Yerevan T.Margaryan
- Yerevan State University
- CANDLE Synchrotron Research Institute
- A.Alikhanyan National Laboratory
- (Yerevan Physics Institute)

Collaboration:

- PET-tomography diagnostic center (YerPhI)
- Yerevan synchrotron LUE-75
- Garni Geophysical Observatory (GGO)

The theoretical support of the NICA research programme

Relativistic Heavy Ion Physics

Future developments – optimal combination of fundamental and phenomenological studies in the framework of international cooperation

"Working group on theory of hadronic or quark–gluon matter under extreme conditions",

(Dubna, October 31-November 3, 2016)

BLTP

LHEP ЛФВЭ

This meeting is being organized within the preparation of the full-profile theoretical project at the BLTP JINR in cooperation with the VBLHEP JINR and the "White Book" collaboration coordinated by V.Kekelidze and A.Sorin.

The main aim of the project is to enhance a systematic theoretical investigations related to relativistic heavy ion physics, well-balanced both in terms of optimal topical content and international cooperation and focused at the NICA/FAIR energy range specifically.

Scientific program includes the following main topics and related theoretical methods: confinement & chiral symmetry breaking in QCD, hadronic matter at nonzero temperature and baryon density, QCD phase diagram, hydrodynamical and kinetic approach to QGP, approach to equilibrium, critical phenomena in finite statistical systems, strong electromagnetic fields in relativistic heavy ion collisions, lattice QCD, functional continuum methods, models of confinement and hadronization in QCD.

NICA-FAIR symposium

15-16 November 2016, Darmstadt Germany

One of the main results of the Symposium could be signing of the

MEMORANDUM OF UNDERSTANDING
between
FACILITY FOR ANTIPROTON AND ION RESEARCH IN EUROPE GmbH
and
the JOINT INSTITUTE FOR NUCLEAR RESEARCH
concerning
COLLABORATION IN NUCLEAR AND ACCELERATOR SCIENCES AND TECHNOLOGIES AND OTHER SCIENTIFIC DOMAINS OF MUTUAL INTEREST

Welcome to Dubna!

Our colleagues in member–states are saying:
“JINR in Dubna – it is our common house on the bank of the great Russian river Volga”

Спасибо за внимание!