INTERNATIONAL INTERGOVERNMENTAL ORGANIZATION

JOINT INSTITUTE FOR NUCLEAR RESEARCH

JINR – a look into the future

Alexey Sissakian
Academician, Director of JINR

2009 European School of High-Energy Physics
Bautzen, Germany
14 - 27 June, 2009

CONTENTS

I.


Russia
Moscow Region
Moscow
r.Volga
Dubna
r.Sestra
r.Dubna
Dmitrov
Sheremetyevo Airport
Moscow
Dubna
ДУБНА
JINR

JOINT INSTITUTE for NUCLEAR RESEARCH

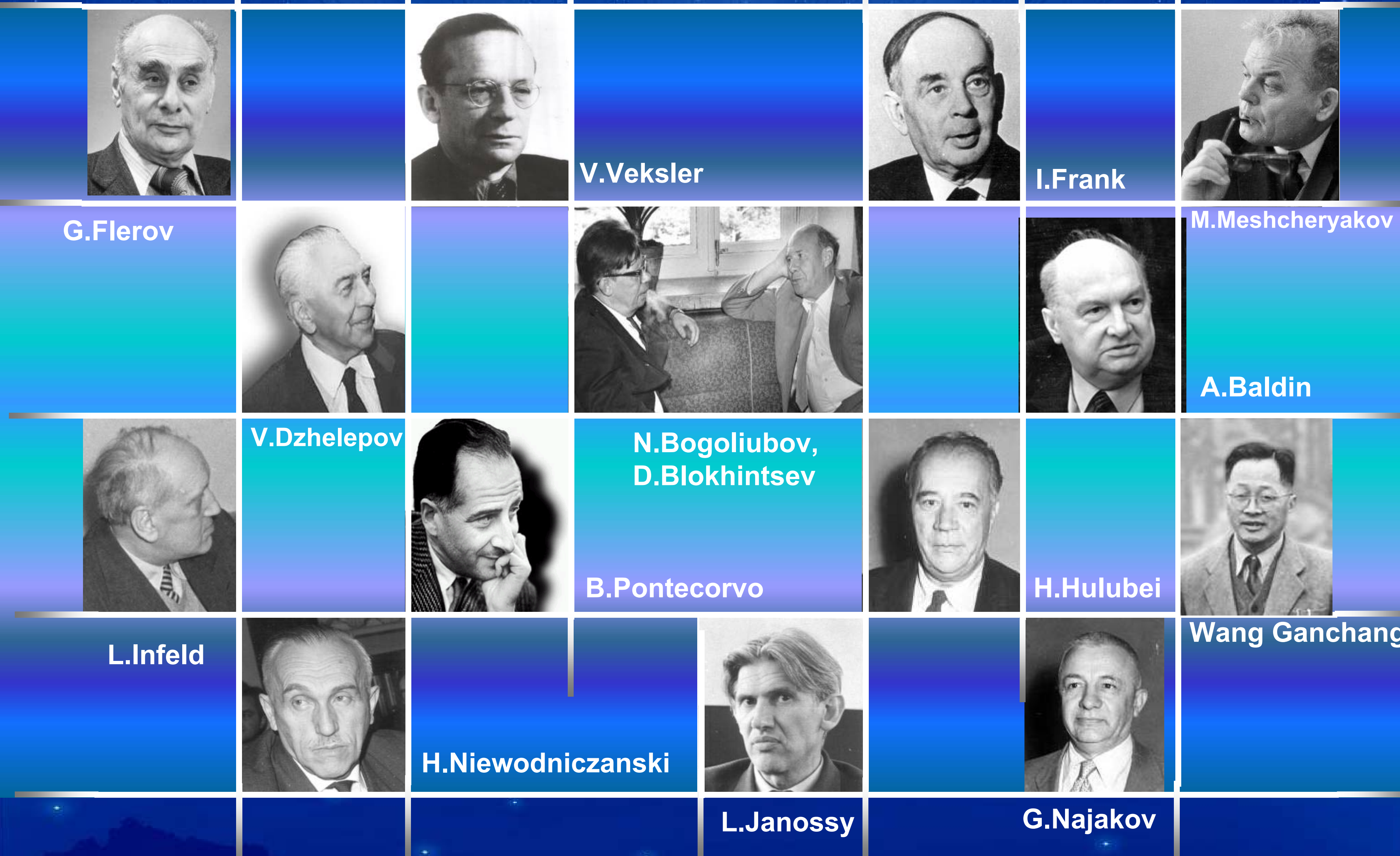
International Intergovernmental Organization

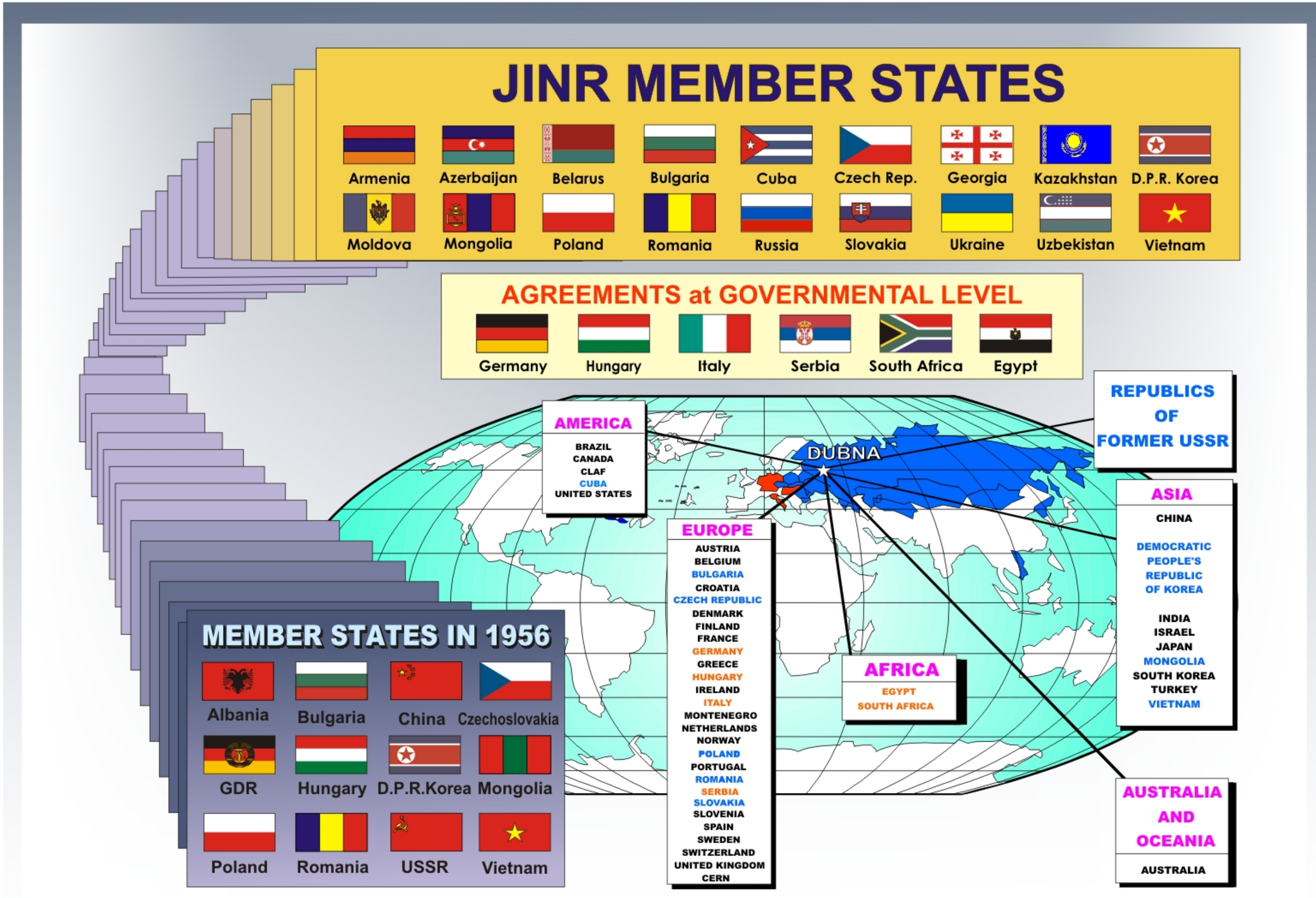
1956

Albania, Bulgaria, China, Czechoslovakia,
GDR, Hungary, D.P.R.Korea, Mongolia,
Poland, Romania, USSR, Vietnam

The agreement on the establishment of JINR was signed on 26 March 1956 in Moscow

Founders


G.Flerov
V.Veksler
I.Frank
M.Meshcheryakov
V.Dzhelepov
N.Bogoliubov,
D.Blokhintsev
A.Baldin
L.Infeld
B.Pontecorvo
H.Hulubei
Wang Ganchang
H.Niewodniczanski
L.Janossy
G.Najakov


JINR MEMBER STATES
Armenia
Azerbaijan
Belarus
Bulgaria
Cuba
Czech Rep.
Georgia
Kazakhstan
D.P.R. Korea
Moldova
Mongolia
Poland
Romania
Russia
Slovakia
Ukraine
Uzbekistan
Vietnam
AGREEMENTS at GOVERNMENTAL LEVEL
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CHINA
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA
INDIA
ISRAEL
JAPAN
MONGOLIA
SOUTH KOREA
TURKEY
VIETNAM
AUSTRALIA AND OCEANIA
AUSTRALIA
MEMBER STATES IN 1956
Albania
Bulgaria
China
Czechoslovakia
GDR
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D.P.R.Korea
Mongolia
Poland
Romania
USSR
Vietnam

Discoveries

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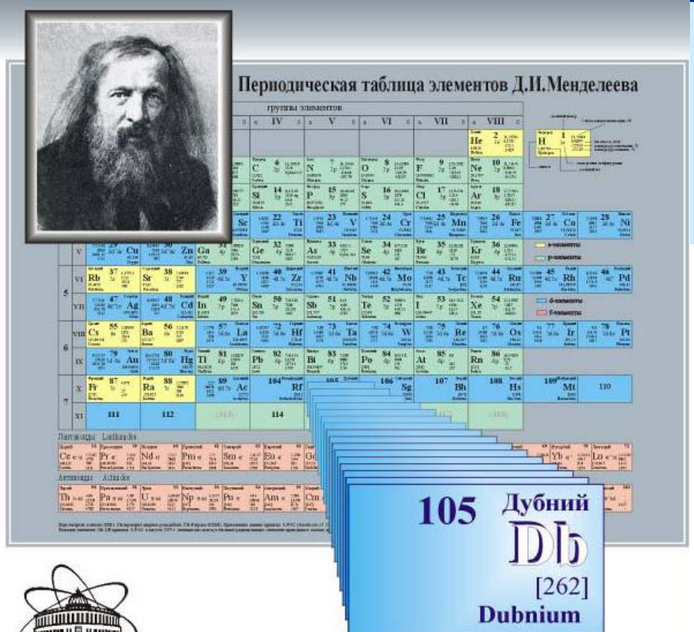
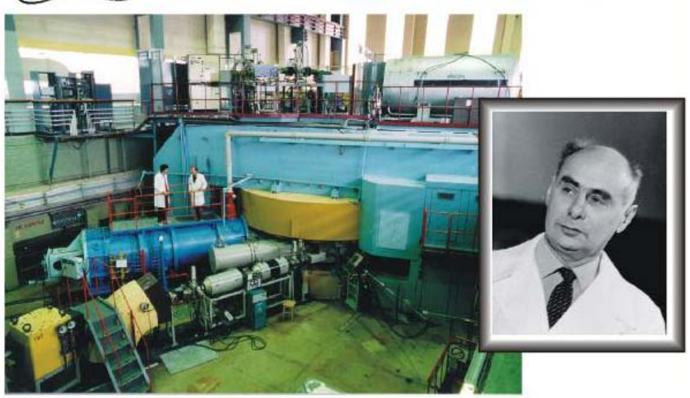




- 46 prestigious academic and state awards, and prizes of Russia, Bulgaria, Georgia, Romania, Czech Republic, Uzbekistan and other countries.

<u>More than 40 discoveries, including:</u>

- 1959 – nonradiative transitions in mesoatoms
- 1960 – antisigma-minus hyperon
- 1963 – element 102
- 1972 – postradiative regeneration of cells
- 1973 – quark counting rule
- 1975 – phenomenon of slow neutron confinement
- 1988 – regularity of resonant formation of muonic molecules in deuterium
- 1999-2005 – elements 114, 116, 118, 115 and 113
- 2006-2009 – chemical identification of superheavy elements

Three Pillars of JINR

Great experience and world-wide recognized traditions of scientific schools:

– more than 40 discoveries
– 46 prestigious academic and state awards of Member States and other countries

Large and unique park of basic facilities for fundamental and applied research:

– various types of particle accelerators
– high flux pulsed reactor

Status of an international intergovernmental organization:

– JINR was established through the Convention signed on 26 March 1956 by eleven founding States and registered with the United Nations on 1 Feb. 1957
– Russian Federal Law on Ratification of "The Agreement between the Government of the RF and JINR on the Location and Terms of Activity of JINR in the Russian Federation" (January 2000)
– broad international cooperation – more than 700 institutions located in 60 countries

Governing Bodies & Structure

- Committee of Plenipotentiaries
  - Scientific Council
    - PAC for Particle Physics
    - PAC for Nuclear Physics
    - PAC for Condensed Matter Physics
  - Directorate
    - Science & Technology Council
    - 7 Laboratories
    - University Centre
    - Office of Administration
  - Finance Committee

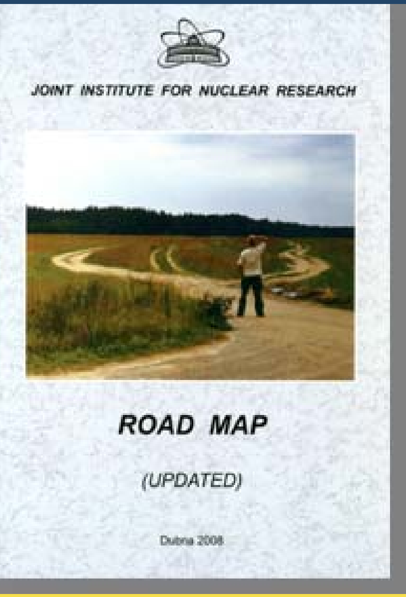
JINR in figures

JINR's staff members ~ 5500
researchers ~ 1300
including from the Member States ~ 500 (but Russia)

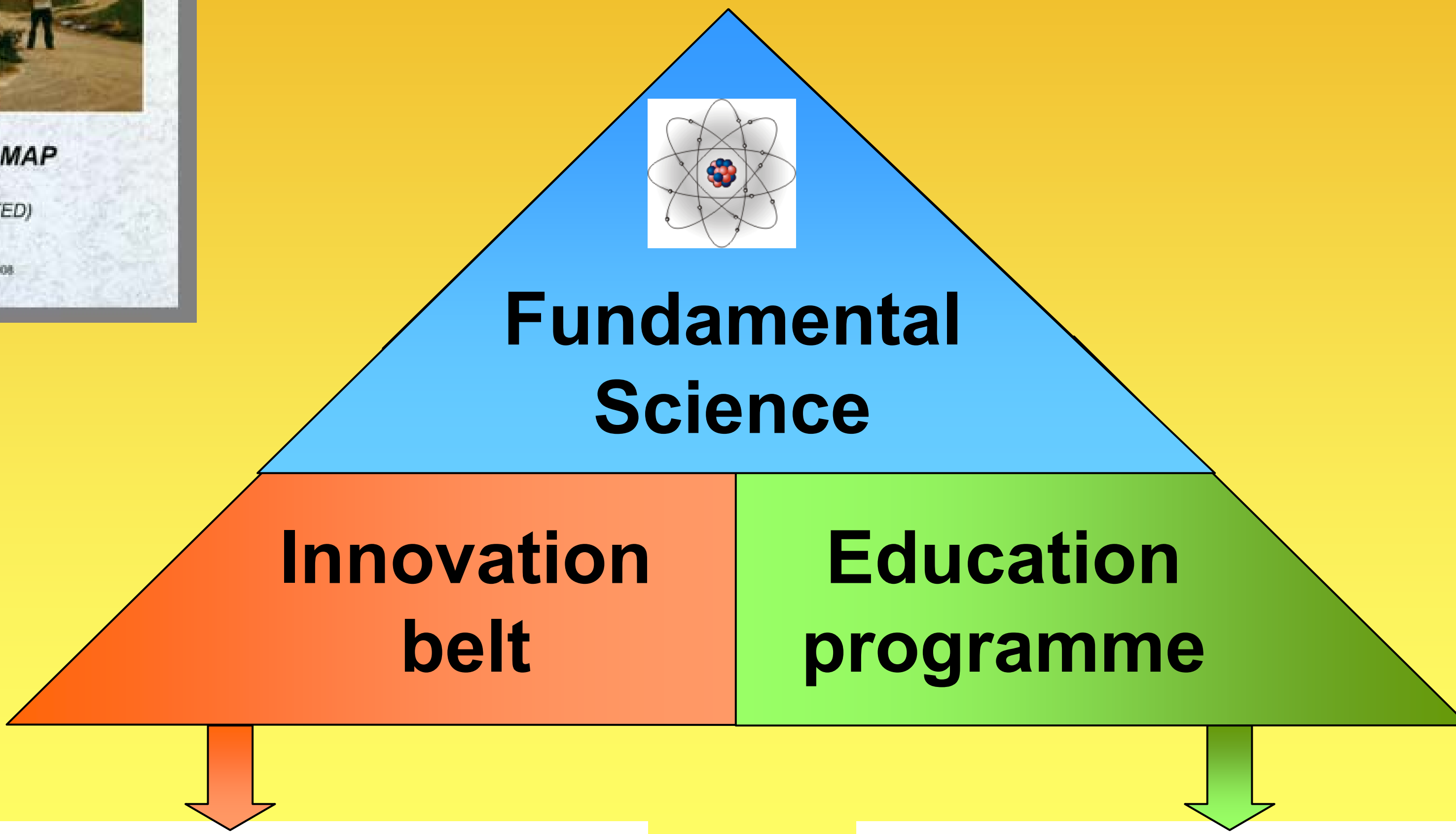
Doctors and PhD ~ 1000

II. Scientific, Educational and Innovative Activities

JINR's Science Policy



- 7-Year Programme: '2003 – 2009'
  '2010 – 2016' (in preparation)
- Road Map (2006-2017)



Special Economic Zone "Dubna"
Public-Private-Partnership

UC, DIAS-TH
International Univ. "Dubna"

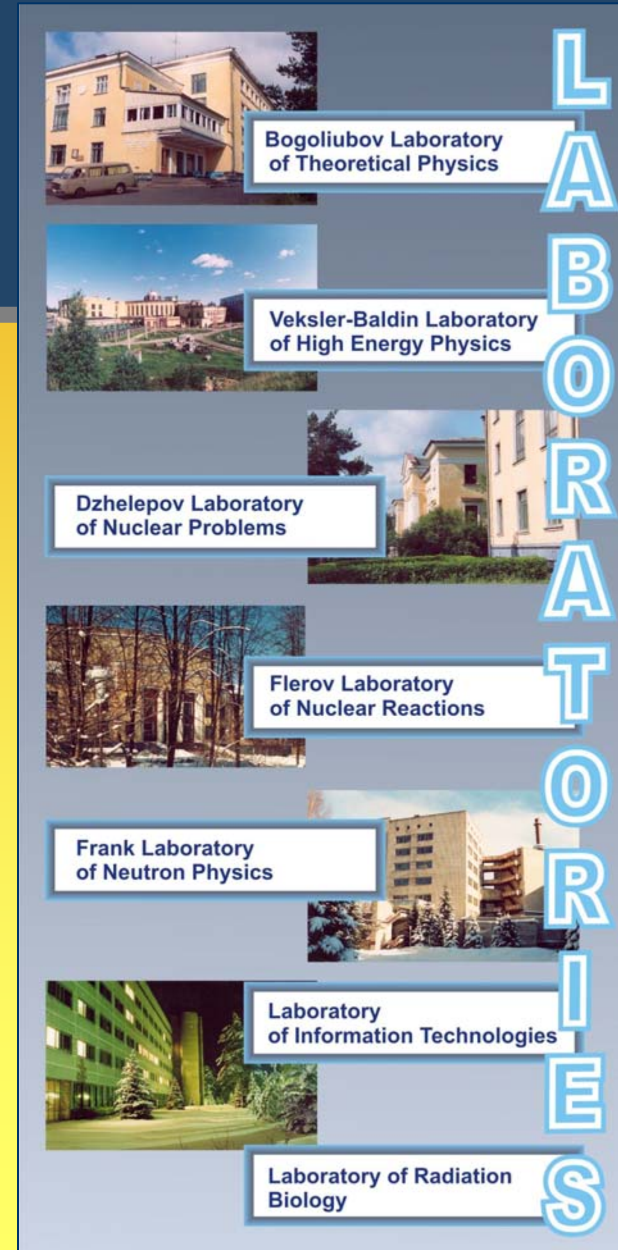
JINR's ROAD MAP

Basic Scientific Directions

- **High Energy Physics**
- **Nuclear Physics**
- **Condensed Matter Physics**

Main Supporting Activities:

- Theory of PP, NP, CMP
- Networking and computing
- Physics instruments and methods
- Training of young staff



The concept of the Road Map

JINR should develop its role as a world leader in certain research domains!

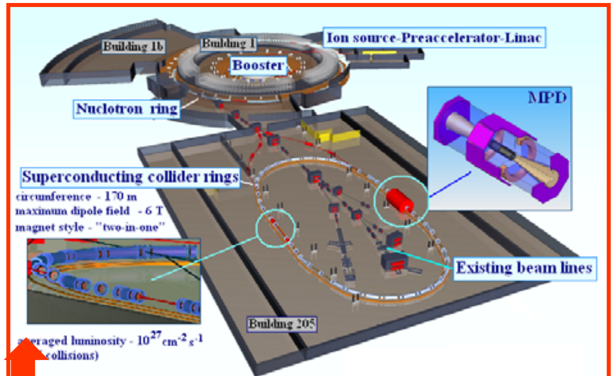
The home experimental base, its upgrade programme should become a priority task for the Institute's further development.

Special attention should be given to the interests of the JINR Member States in developing the Road Map

http://wwwinfo.jinr.ru/Road_Map_2008-2017.htm

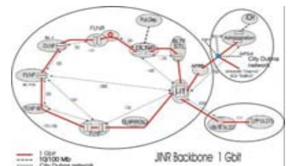
Upgrade of JINR Basic Facilities

II.

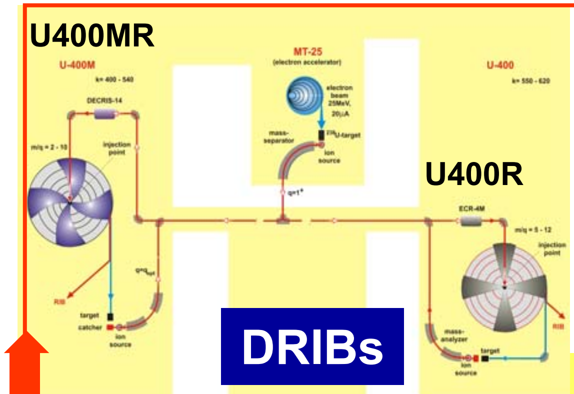


Upgraded Nuclotron-M (2009 – 2010) + NICA (2013-2014)

Telecommunication channels:
20 Gbps – 2009
800 Gbps – 2016



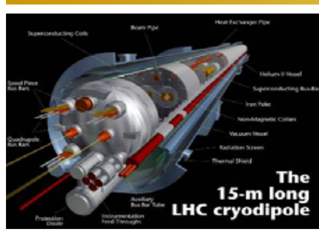
JINR networks:
- **GRID technology**
- **improvement of computer links with Member States (2010-2016)**



DRIBs II – (2009-2010)
DRIBs III – (2011-2015)

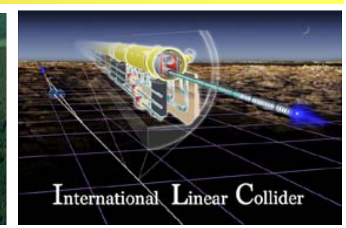
New reactor IBR-2M – 2010
Complex of modern neutron spectrometers (2011-2016)

Participating in LHC, RHIC, TEVATRON…
In future: FAIR, ILC …

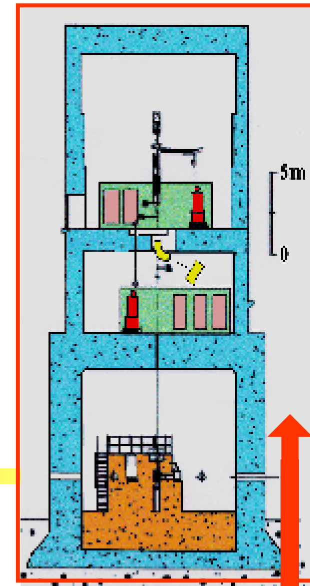


LHC-2008

FAIR-2015



ILC – after 2020 (?)



IREN-I 2008

JINR's research niche offered by home facilities

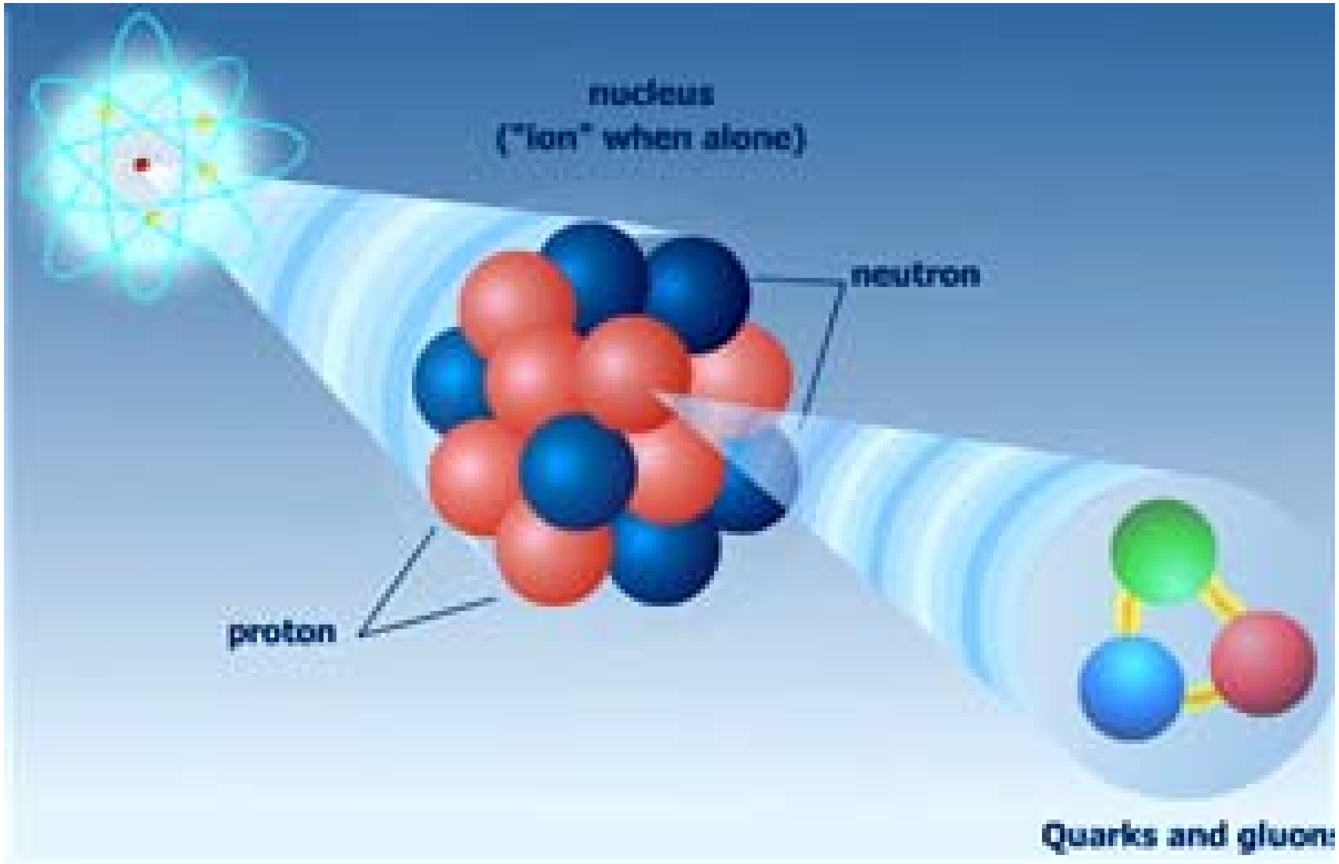
Heavy Ion Physics:

- Heavy-Ion Physics at high energies: Nuclotron-M (up to 4.5 GeV/n), (in future NICA/MPD facility: $\sqrt{s_{NN}}$ = (4 – 11) GeV corresponding to $E_{lab.}$ ~ (8 – 60) GeV/n

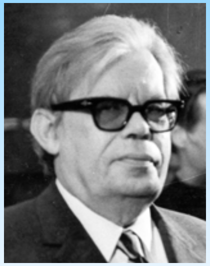
- Heavy-Ion Physics at low and intermediate energies (5 – 100 MeV/n), U400MR, U400R, DRIBs

Condensed Matter Physics using nuclear physics methods, (neutron sources: IBR-2M, IREN-I)

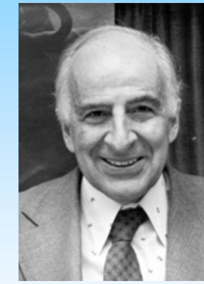
HIGH ENERGY PHYSICS



JINR's Scientific Schools in High Energy Physics








The Institute is proud of the world famous scientists who worked at JINR and made outstanding contributions to HEP. Among them are N.Bogoliubov, D.Blokhintsev, V.Veksler, B.Pontecorvo, M.Markov, A.Baldin, L.Infeld, M.Danysz, H.Hulubei, L.Janossy and others.

Priority tasks:

- origin of mass: electro-weak symmetry breaking (Higgs mechanism), etc.
- properties of strong interactions, including properties of nuclear matter (search of the mixed phase)
- neutrino physics and properties of neutrinos, dark matter, dark energy
- spin physics
- origin of the matter-antimatter asymmetry in the
- Universe
- unification of particles and forces, including gravity
- physics beyond the Standard Model (SUSY, Extra Dim, etc)

…

High Energy Physics

Nuclotron is a superconducting synchrotron for heavy ions

(has been operating since 1993).

The main home facility (today):
Nuclotron complex of VBLHEP (upgrade till 2010).

Future plan: creation of NICA/MPD –
Nuclotron-Based Ion Collider Facility and Multipurpose Detector (2014).

Nuclotron-M: 1st stage of the NICA

The main goal: **development of the existing accelerator facility (Nuclotron-M project) as a basis to generate intense beams over atomic mass range from protons to gold and light polarized ions:**

- **accelerated heavy ions A~200**
- **beam intensity ~ 10^9 A/cycle (0.2-0.4 Hz) at kinetic energy ~ (1,0-4,5) GeV/u for Au^{79+}**

BASIC ACTIVITIES in 2008-2010:

- ***Development of new injection complex***
- ***Modernization of RF system***
- ***Upgrade of diagnostics and beam control systems***
- ***Modernization of the vacuum system***
- ***Modernization of the electric- and cryo- supply systems***
- ***Development of the minimum required infrastructure***

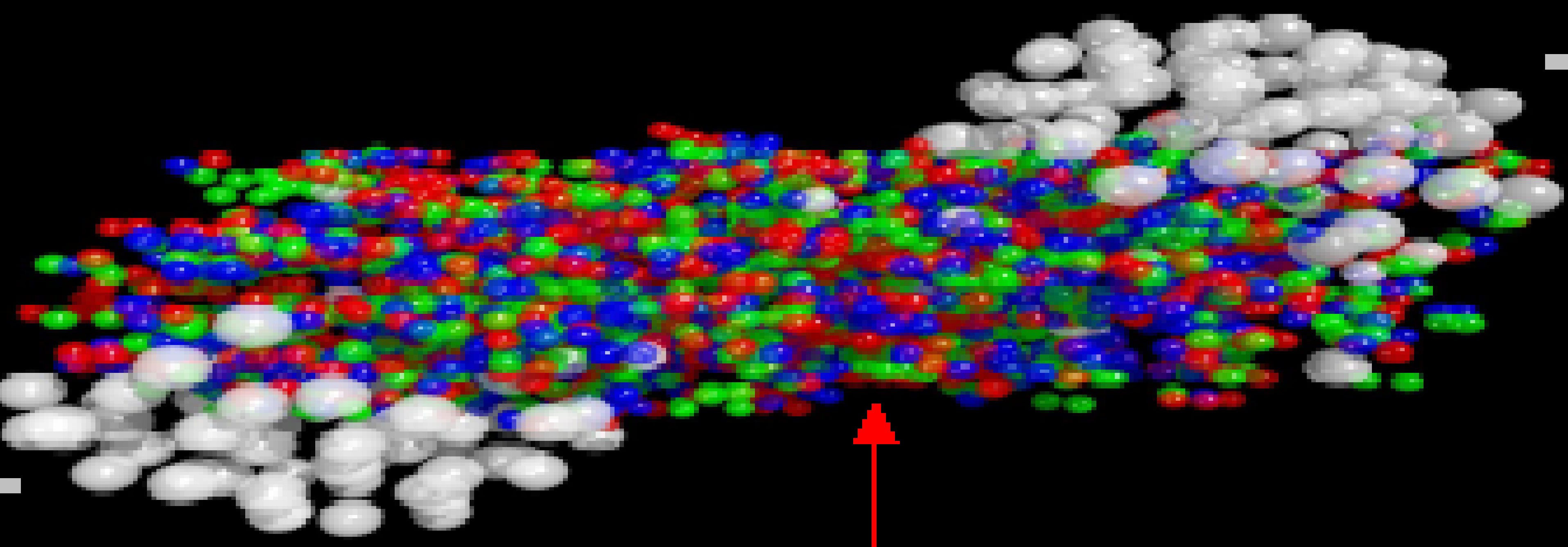
Nuclotron-based Ion Collider fAcility (NICA) at JINR: New Prospect for Heavy Ion Collisions and Spin Physics

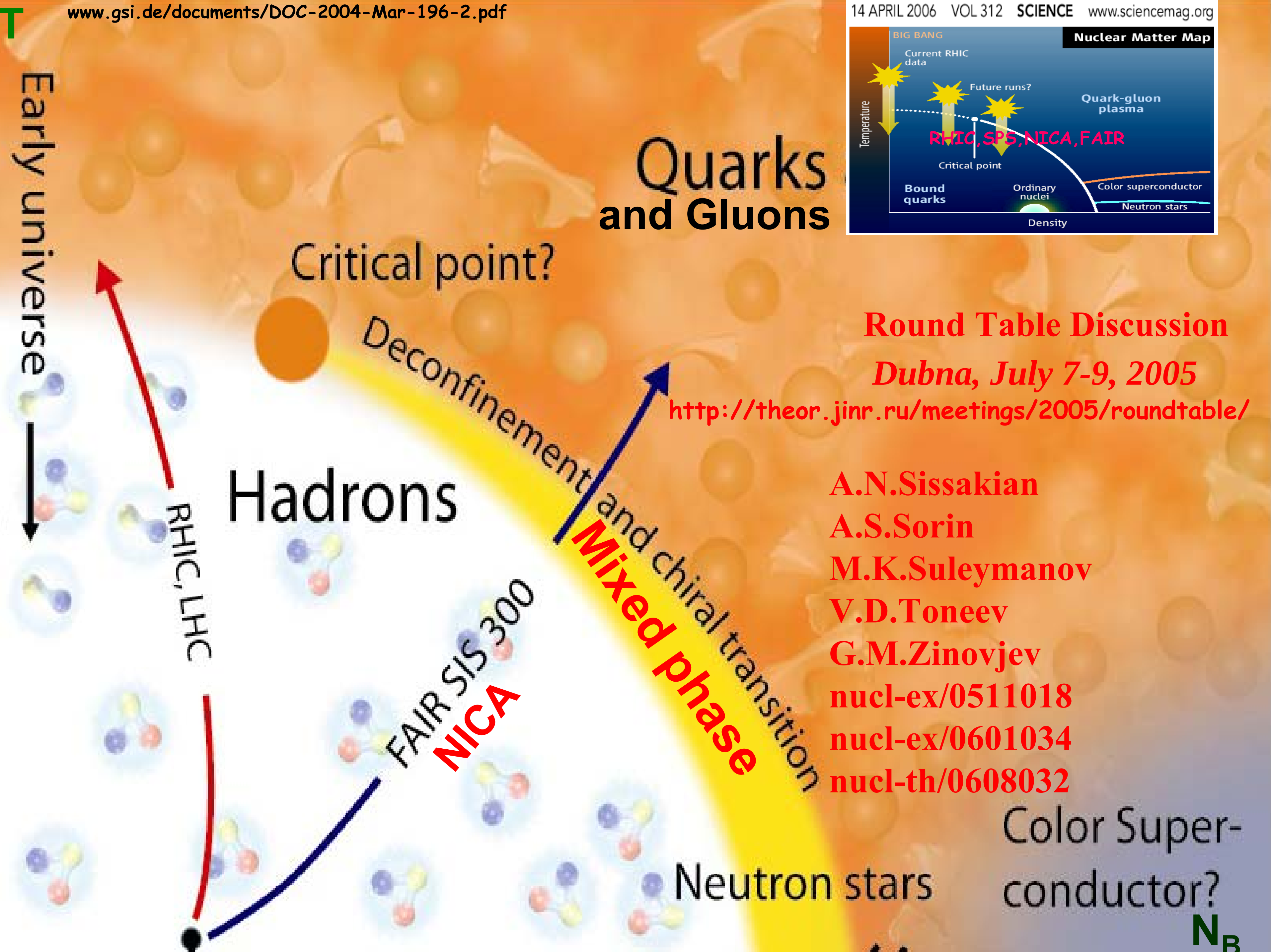
NICA / MPD – JINR's highest priority project for 2010 - 2016

The main goal of the NICA project is an experimental study of hot and dense strongly interacting QCD matter and spin physics at the new JINR facility

Fields of research:

- High Energy Relativistic Ion Physics
- Spin Physics
- SM checks & search for new physics at LHC
- Flavour physics (new physics)
- Neutrino physics and rare phenomena
- International Partnership programs on unique accelerator facilities
- Applied research (medicine, nanotechnology,…)





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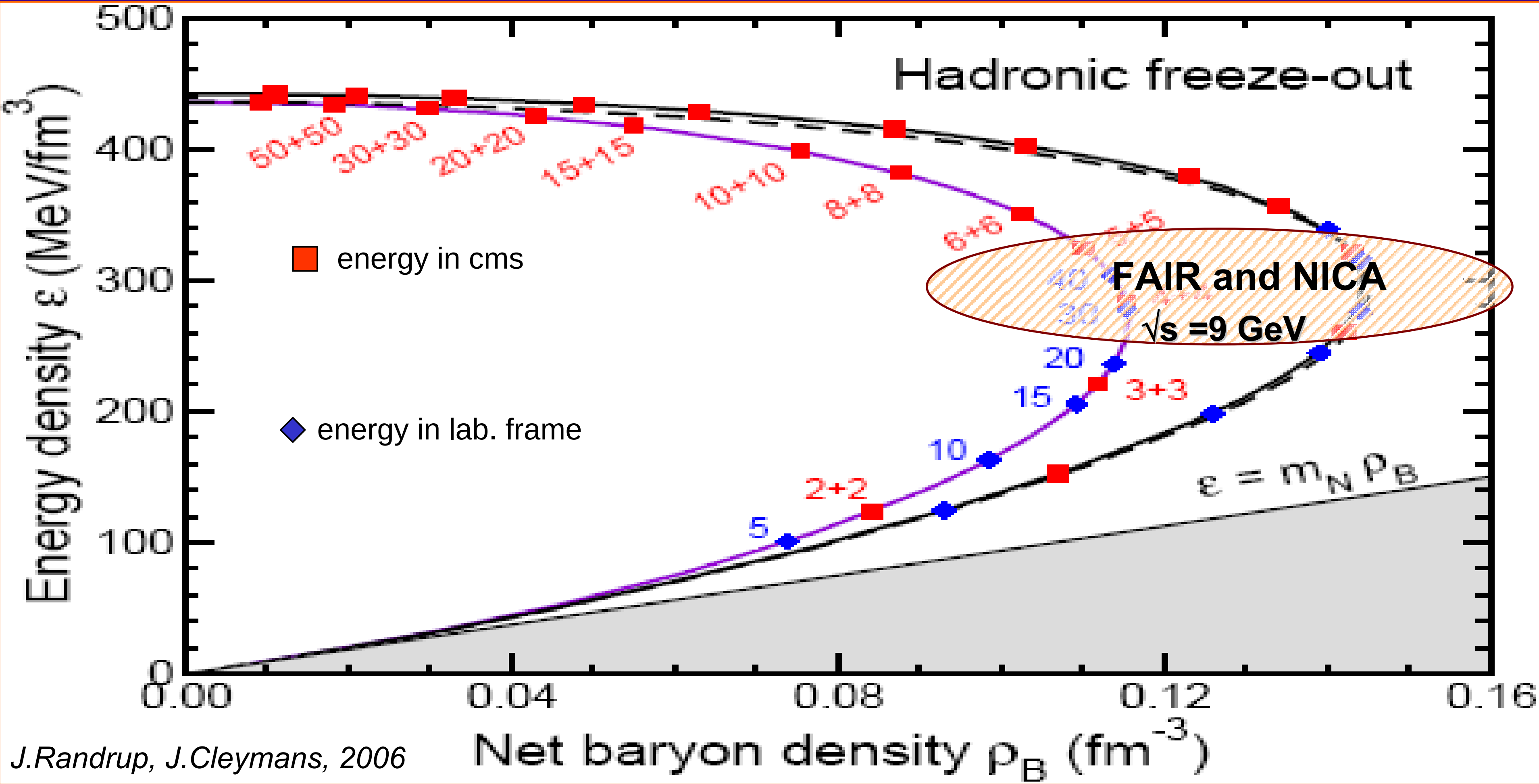
www.gsi.de/documents/DOC-2004-Mar-196-2.pdf
14 APRIL 2006 VOL 312 SCIENCE www.sciencemag.org
BIG BANG
Nuclear Matter Map
Current RHIC data
Future runs?
Quark-gluon plasma
Temperature
RHIC,SPS,NICA,FAIR
Critical point
Bound quarks
Ordinary nuclei
Color superconductor
Neutron stars
Density
Early universe
Quarks and Gluons
Critical point?
Deconfinement and chiral transition
Hadrons
RHIC, LHC
FAIR SIS 300
NICA
Mixed phase
Round Table Discussion
Dubna, July 7-9, 2005
http://theor.jinr.ru/meetings/2005/roundtable/
A.N.Sissakian
A.S.Sorin
M.K.Suleymanov
V.D.Toneev
G.M.Zinovjev
nucl-ex/0511018
nucl-ex/0601034
nucl-th/0608032
Neutron stars
Color Super-conductor?
N_B

High baryonic densities

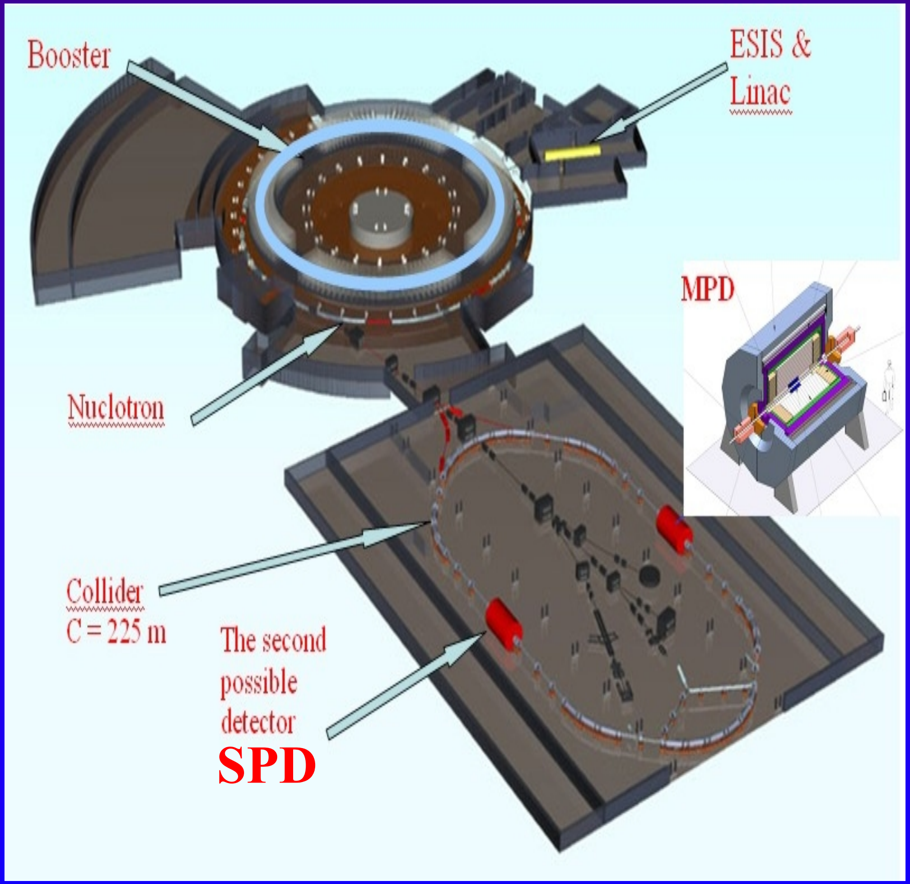


J.Randrup, J.Cleymans, 2006

Maximal baryonic densities on freeze-out curve!

⇨ **High densities on interaction stage!?**

NICA complex parameters



Circumference	m	225
Number of collision points		2
Beta function in the collision point	m	0.5
Rms momentum spread		0.001
Rms bunch length	m	0.3
Number of ions in the bunch		10^9
Number of bunches		15
Incoherent tune shift		0.05
Rms beam emittance at 1 GeV/u / at 3.5 GeV/u	π mm mrad	3.8 / 0.26
Luminosity per one interaction point at 1 GeV/u at 3.5 GeV/u	$cm^{-2}s^{-1}$	$6.6 \cdot 10^{25}$ $1.1 \cdot 10^{27}$

The NICA Project Milestones

- **Stage 1: years 2007 – 2009**

  - Upgrate and Development of the Nuclotron facility
  - Preparation of Technical Design Report of the NICA and MPD
  - Start prototyping of the MPD and NICA elements

- **Stage 2: years 2008 – 2012**

  - Design and Construction of NICA and MPD

- **Stage 3: years 2010 – 2013**

  - Assembling

- **Stage 4: year 2013 - 2014**

  - Commissioning

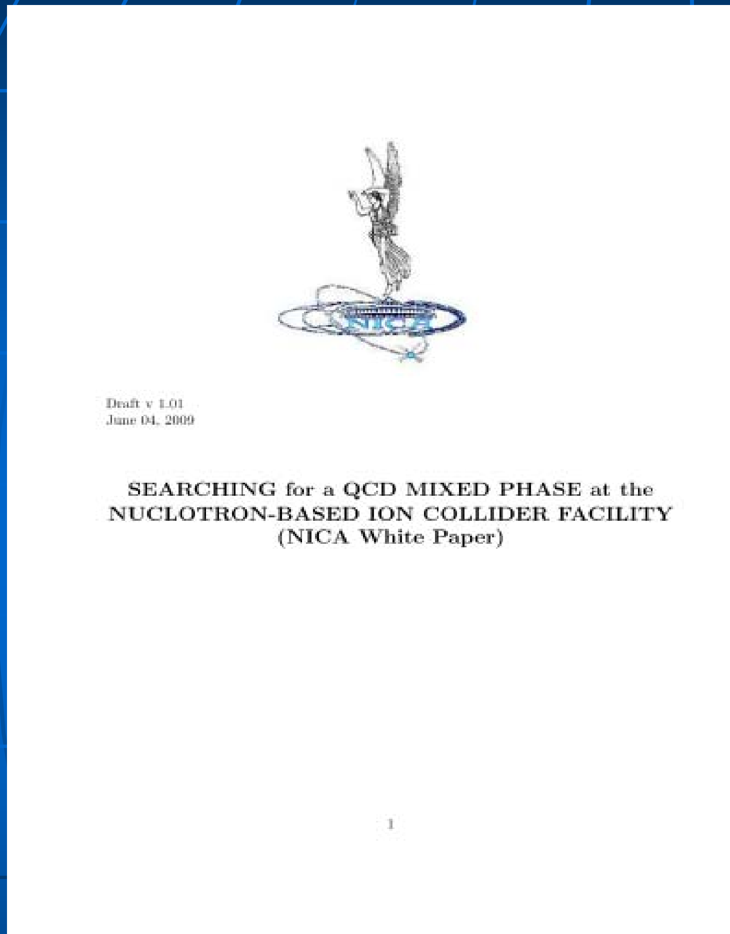
NICA/MPD tentative list of observables

II.

- Anti-proton to proton ratio
- Baryon to meson ratios
- Charged particle directed flow
- Charged particle elliptic flow
- DCC searches
- Elliptic flow for identified charged hadrons & photons
- Femtoscopy of identical particles
- Femtoscopy of Kπ, Ξπ, Ωπ , etc
- Fluctuations of particle ratios, esp. K/π, p/π
- Fluctuations of $<p_T>$, $<v_2>$, photon multiplicity, etc
- Hyperons and light hypernuclei
- Invariant mass and p_T distributions of leptons
- Longe-range forward-backward correlations
- Net-proton and net charge kurtosis
- Nuclear modification factor
- Production of light nuclei and antinuclei
- Standard femtoscopy source parametrs
- Strong parity violation
- Triggered azimuthal correlations
- Untriggered pair correlation in $\Delta\varphi$ and $\Delta\eta$
- Yields of strange particles

…

Progress towards a White Paper on the NICA/MPD



Draft v 1.01
June 04, 2009

SEARCHING for a QCD MIXED PHASE at the
NUCLOTRON-BASED ION COLLIDER FACILITY
(NICA White Paper)

1

Editorial board:
D. Blaschke
D. Kharzeev
A. Sissakian
A. Sorin
O. Teryaev
V. Toneev
I. Tserruya

31 research centres in 15 countries (including 8 JINR Member States).

http://theor.jinr.ru/twiki-cgi/view/NICA/WebHome

Welcome to the collaboration!

JOINT INSTITUTE

JINR

FOR NUCLEAR RESEARCH

NICA

NA48/2 (spokesperson Prof. V.Kekelidze, JINR)

Two major parameters - *a0* and *a2* of pi-pi scattering lengths have been extracted with an unprecedented experimental precision of few percents.

<u>This result is highlighted at CERN as experimental achievement in 2008</u>

Measurement of pi-pi sc. length in two processes

- *Cusp :* $a_0 = 0.224 \pm 0.004 \pm 0.011_{\text{theor.}}$
- *Ke4 (FF phases):* $a_0 = 0.220 \pm 0.008$

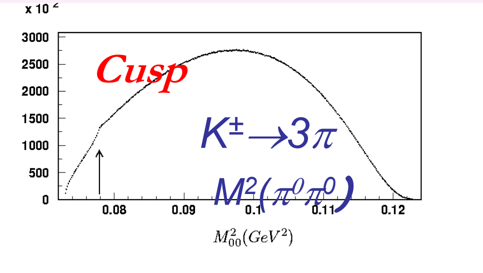
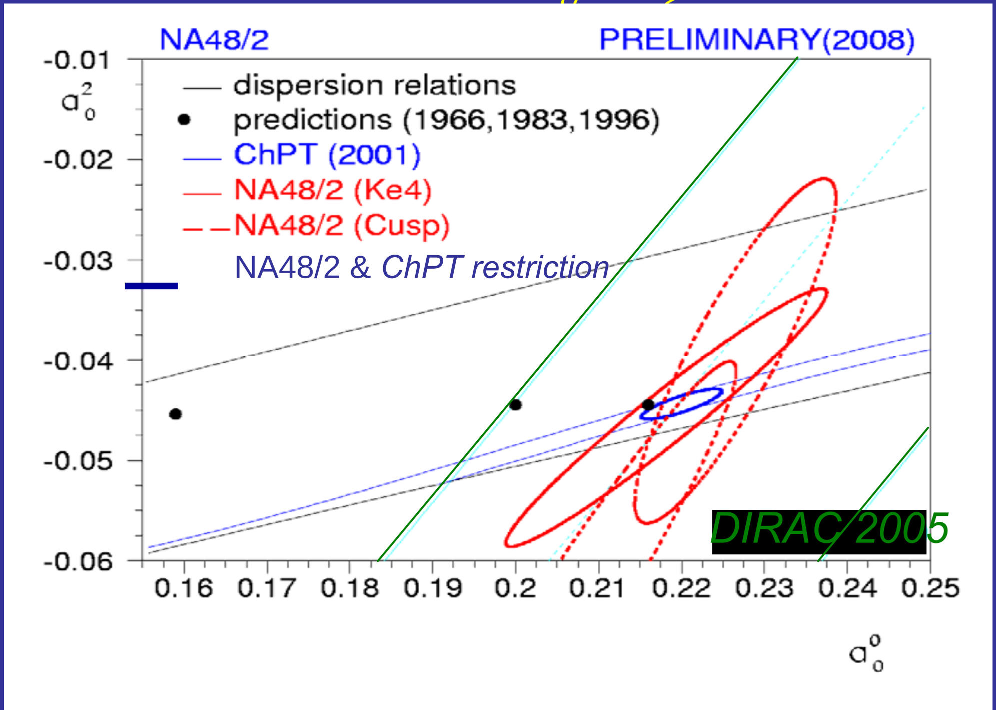
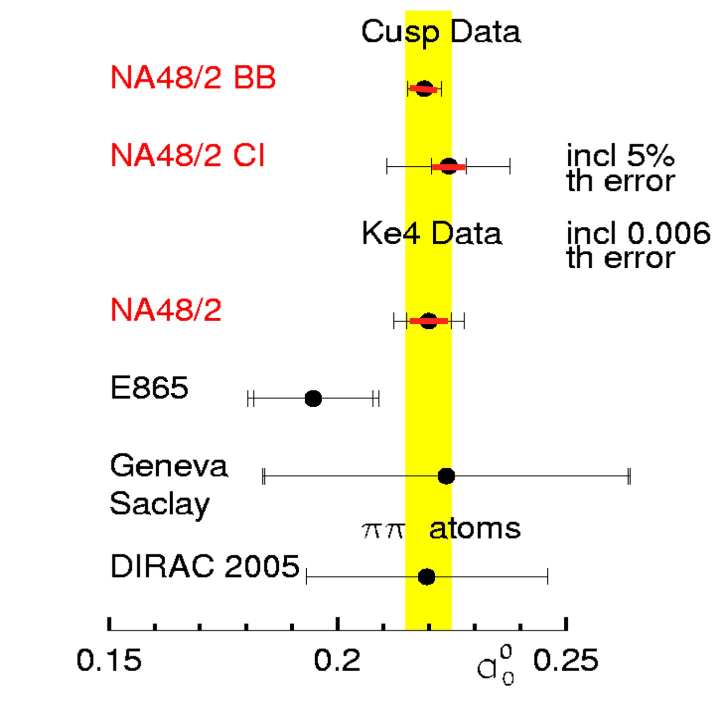


Рис. 1: Distribution of the $\pi^0\pi^0$ invariant mass squared in $K^\pm \to \pi^\pm\pi^0\pi^0$ decays for NA48/2 experimental data

measurements of a_0 & a_2



measurement of a_0 using $a_0=f(a_2)$ from ChPT



LHC Damper

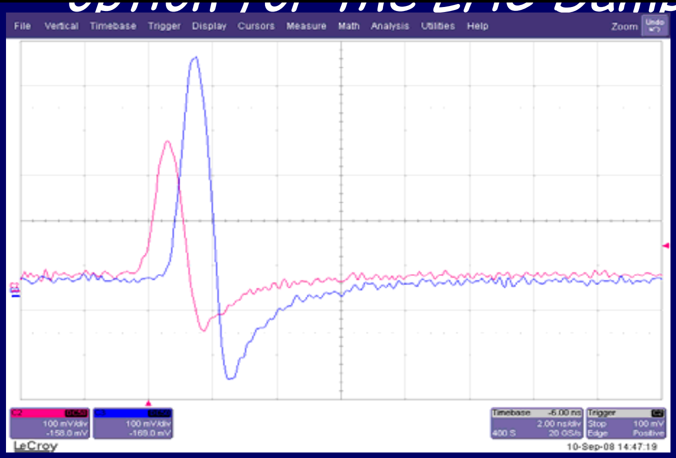
Hardware commissioning:

- *all the required extensive tests were completed; the design specifications have all been met*

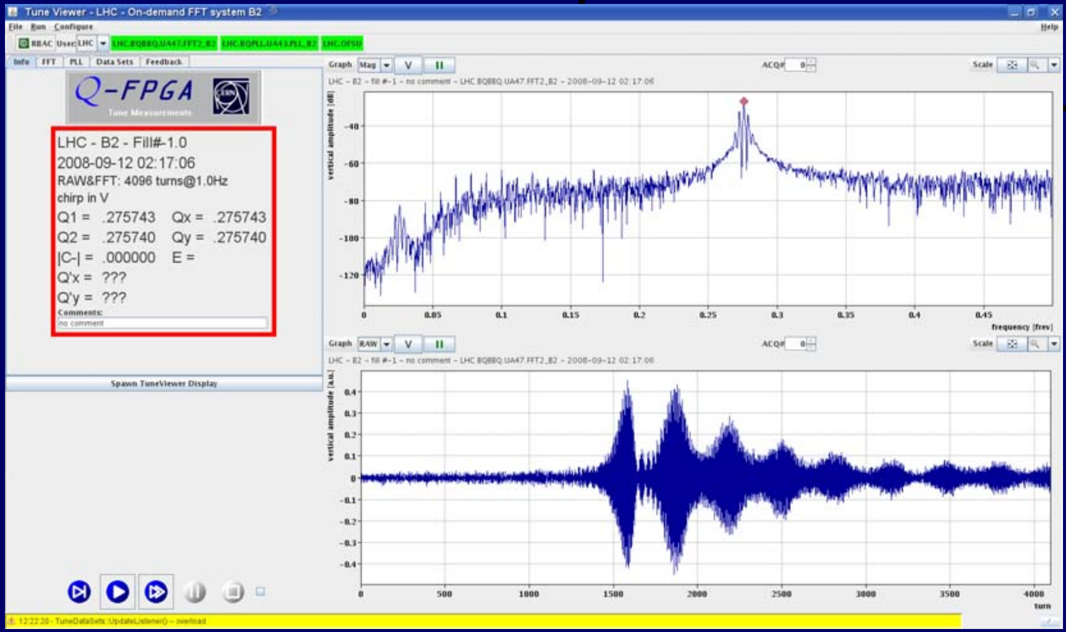
Beam commissioning:

- *16 kickers (JINR) & front-electronics (CERN) were successfully checked for the first LHC beams*
- *tune measurements were the first operational option for the LHC Damper*

The CERN Control Centre



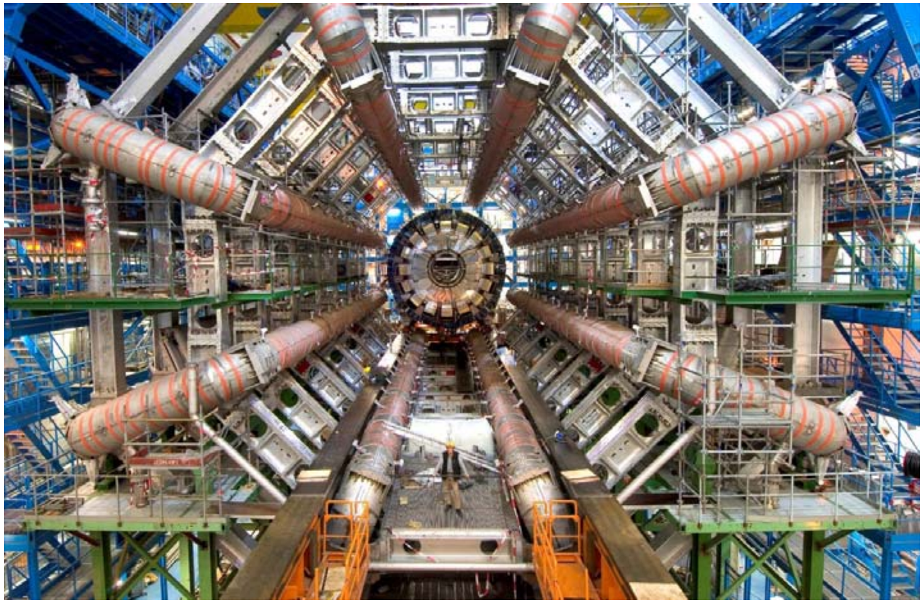
Signals from the LHC Damper pick-up for first shot of beam 2.
10 September 2008.



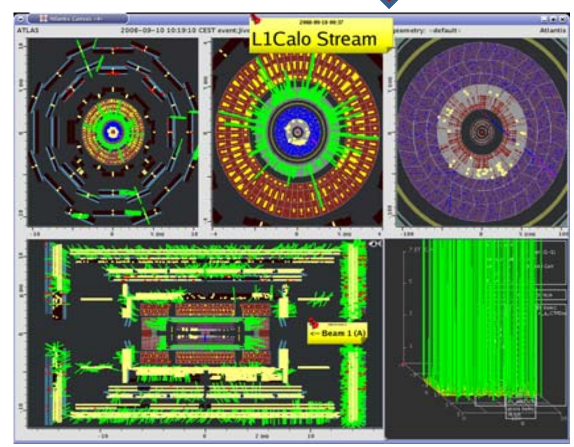
LHC: ATLAS DETECTOR

The experiment was ready for the LHC start-up in September 2008

All JINR's obligations to ATLAS were successfully fulfilled



The very first beam-splash event from the LHC in ATLAS on 10:19, 10th September 2008

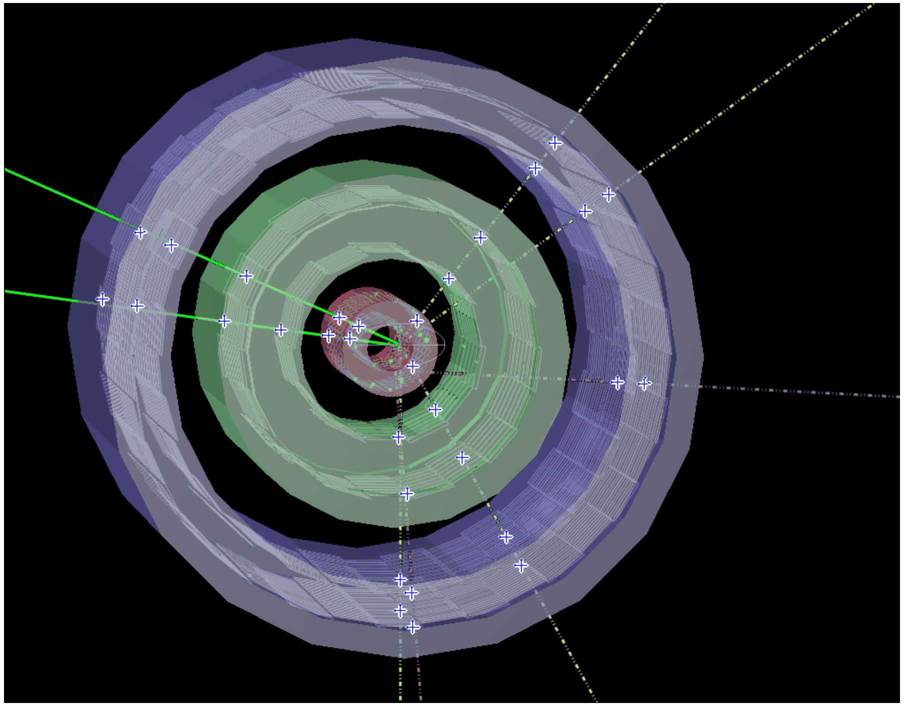


The most important contributions of JINR to the ATLAS detector are:

- *Muon system (MDT chambers)*
- *Tile Calorimeter*
- *Hadronic End Cap LAr Calorimeter*
- *Transition Radiation Tracker*
- *Development of the Data Acquisition*
- *Calorimetry software*
- *Magnet system assembly*

The JINR-ATLAS team now is fully concentrated on the awaited LHC physics

LHC: ALICE DETECTOR



Interaction of the proton beam with residual gas detected by ALICE Inner Tracking System during the start-up of the LHC

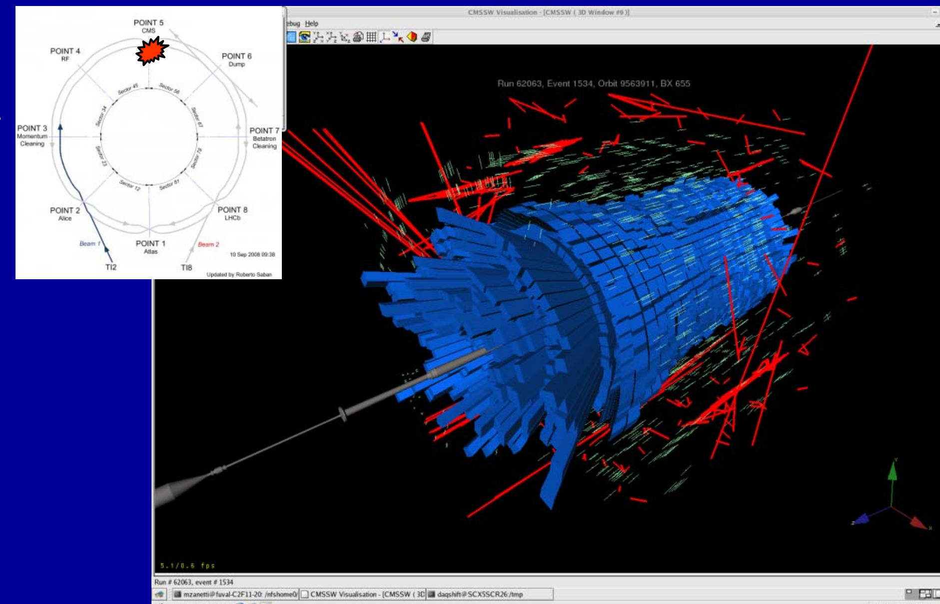
JINR obligations to the construction of the ALICE detector (a very large dipole magnet, drift chambers, lead tungstate crystals) have been fulfilled.

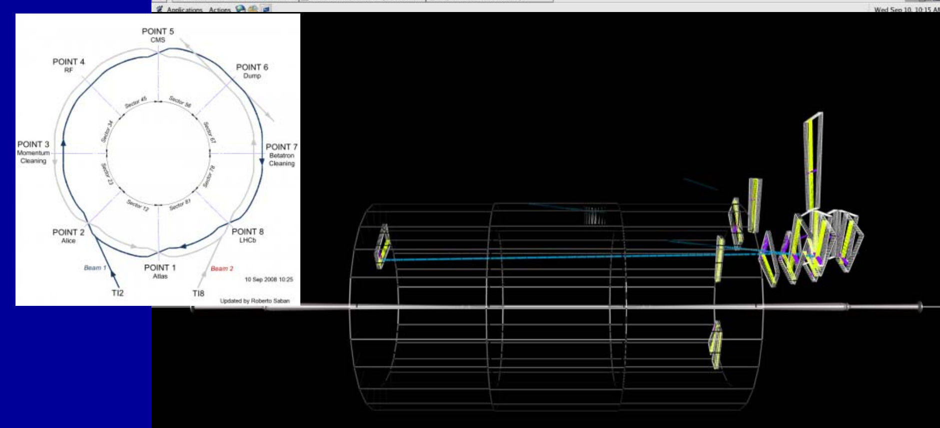
10 TeV proton-proton collisions are expected in August 2009. First data will be analyzed at JINR via ALICE-GRID.

Physics goals: vector meson production (ω, ρ, ϕ), femtoscopy (particle correlations), heavy quarkonia production (J/Ψ – and Υ - families).

LHC: CMS Detector

- *Inner Endcaps including endcap hadron calorimeter HE and Forward Muon Station ME1/1 of full JINR responsibility demonstrated an efficient operation*
  - *with beam dumped on collimator (on top) First Beam-Induced events in hadron calorimeters seen at CMS*
  - *and beam halo (bottom) in endcap muon system*



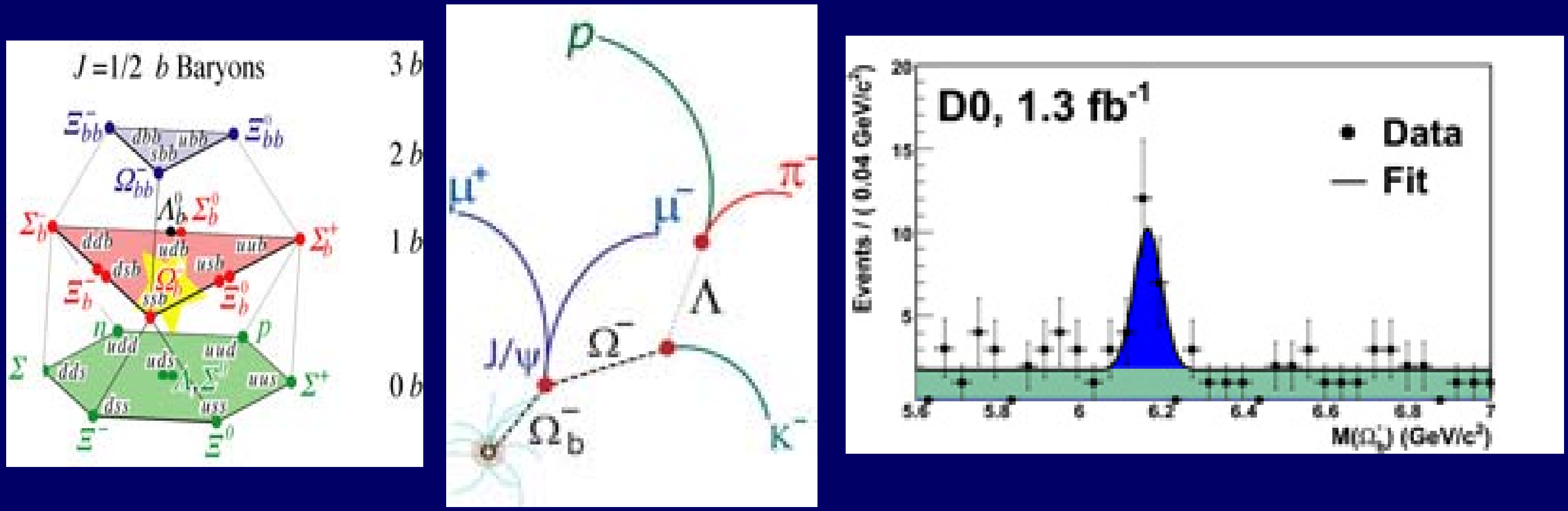


Detectors of full JINR responsibility are ready for data-taking

Fermilab, DO experiment:

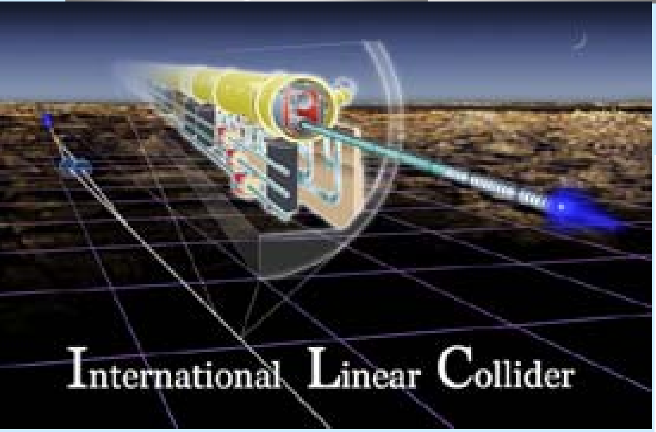
JINR physicists significantly contributed to the physics analysis of the DO data which resulted in the first observation of new "doubly strange" particle Ω_b.

Discovery of the OMEGA_b baryon was ranked among the ten most significant achievements in physics in 2008 by the American Physics Society



The D0 collaboration identified 18 events that have the distinctive signature of the expected decay products of the Omega-sub-b. The mass of the particle is 6.165 ± 0.016 GeV/c2

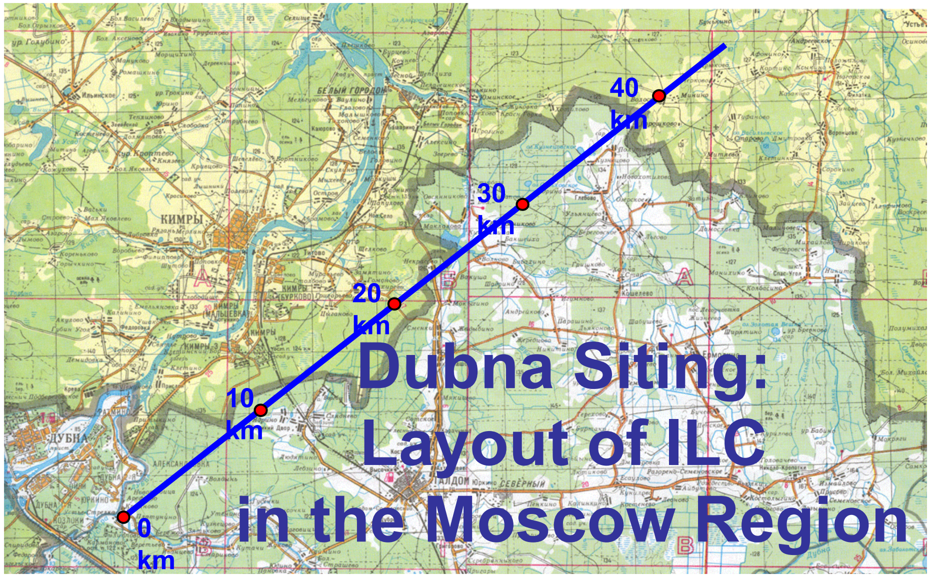
International Linear Collider



The activities at JINR on Physics and Detector for ILC are underway and will be continued in order to provide JINR's visible participation in this ambitious project.

Challenging tasks

- Factory of the Higgs boson
- Supersymmetry
- Dark matter, dark energy
- …



A. Fursenko
Minister of Education
and Science
of the Russian Federation

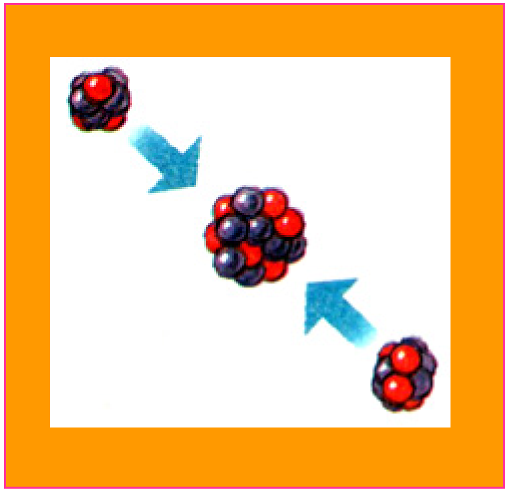
«We hope that at a certain stage Russia-based international projects will come forth.

The research centre in Dubna could be a possible basing site for such an international project».

From an interview with A. Fursenko after the LHC inauguration ceremony
22.10.2008

JINR SCIENTIFIC COUNCIL

NUCLEAR PHYSICS



Home Research programme in Nuclear Physics:

- Heavy ion physics at low energies
- Nuclear physics with neutrons
- Low and intermediate energy nuclear physics

The main home facilities (today):
Cyclotrons U400MR and U400,
accelerator complex DRIBs-I, IREN-I, Phasotron.

Future plans:

- **U400R, accelerator complex DRIBs-II (2009), DRIBs-III (2015)**

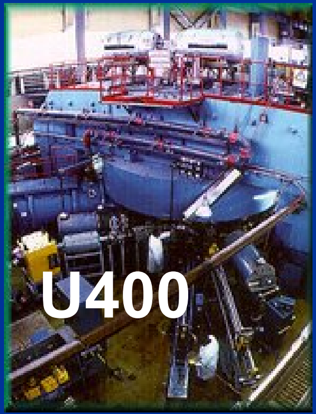
Low Energy Heavy Ion Physics

The main home facilities (today):
Cyclotrons U400 and U400MR,
accelerator complex DRIBs-I

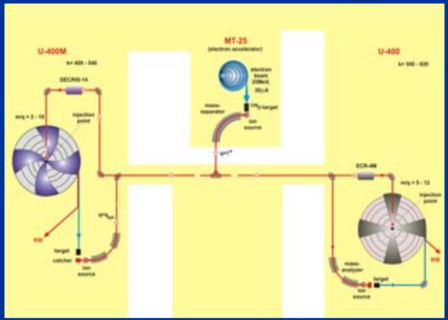
Future plans:
U400R, accelerator complex DRIBs-II

PRIORITIES:

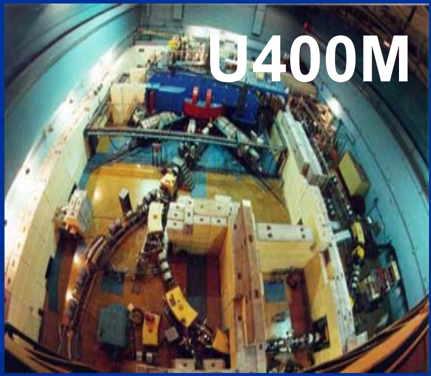
- **Physics and chemistry investigations of the superheavy nuclei with $Z \geq 112$; structure and properties of the neutron-rich light exotic nuclei**
- **Heavy ion interaction with matter; accelerator technology, applied research.**



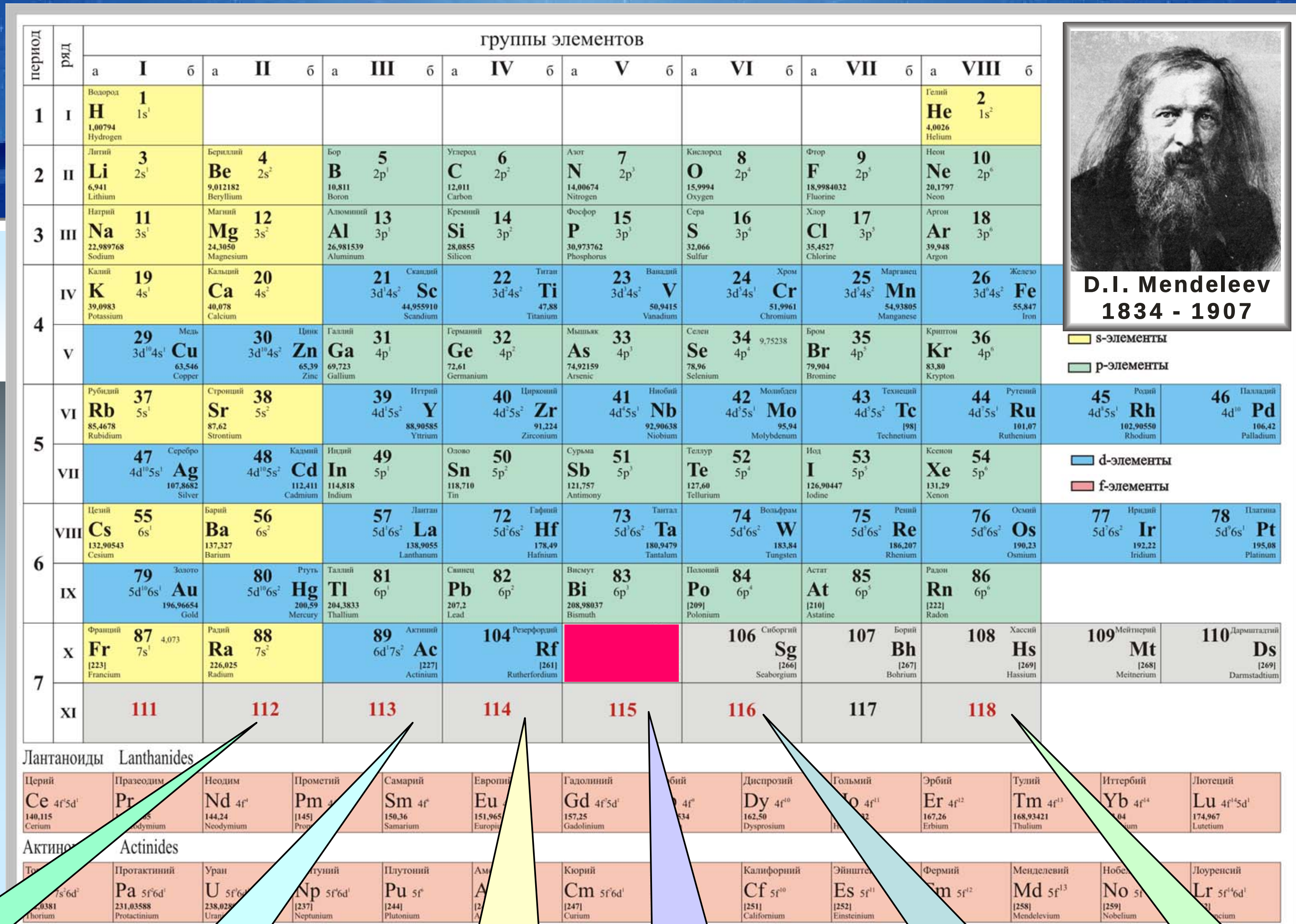
(in operation since 1979)



DRIBs –
Dubna Radioactive Ion Beams



(in operation since 1993)



112
Chemical identification in 2006

113
Discovered at JINR in 2003

114
Discovered at JINR in 1999

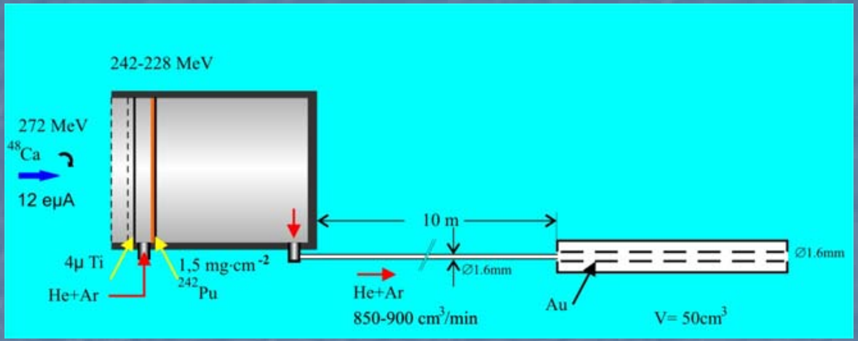
115
Discovered at JINR in 2003

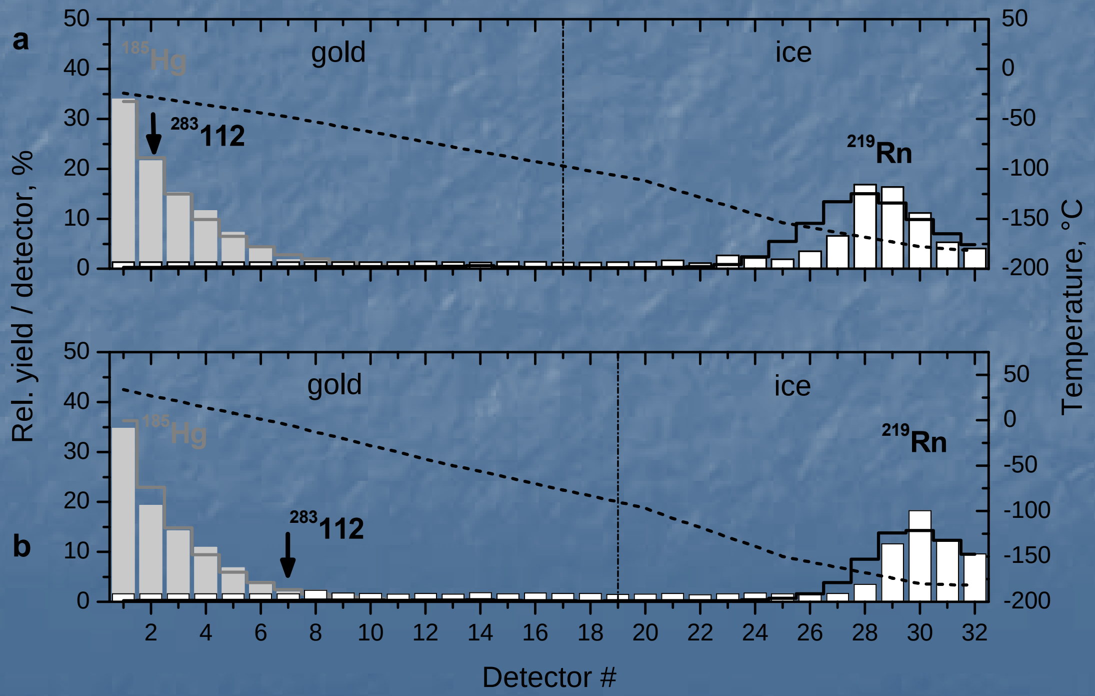
116
Discovered at JINR in 2000

118
Discovered at JINR in 2001

Chemistry of element 112

PSI-University Bern-FLNR-IE collaboration



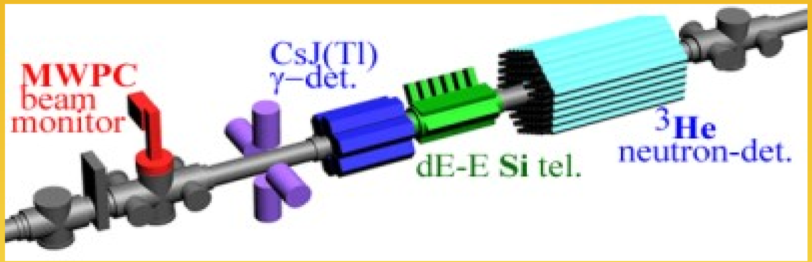


The adsorption enthalpy

$-\Delta H_{ads}^{Au}(112) = 52^{+46}_{-7}$ kJ/mol

typical group 12 element behaviour.

JINR's LIGHT EXOTIC NUCLEI PROGRAMME

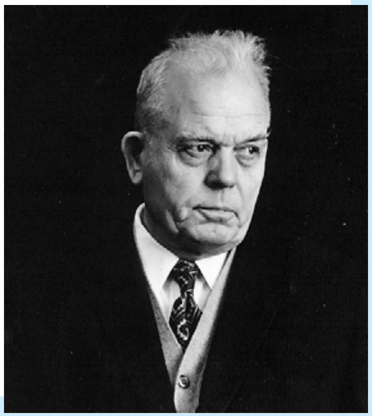


"MULTI" multi-detector setup was designed to study properties of light nuclei, such as ^{6}He, ^{6}Li and exotic-nuclei reaction mechanism.

U400 and the transport line with U400MR

Low and Intermediate Energy Physics

First Accelerator in Dubna

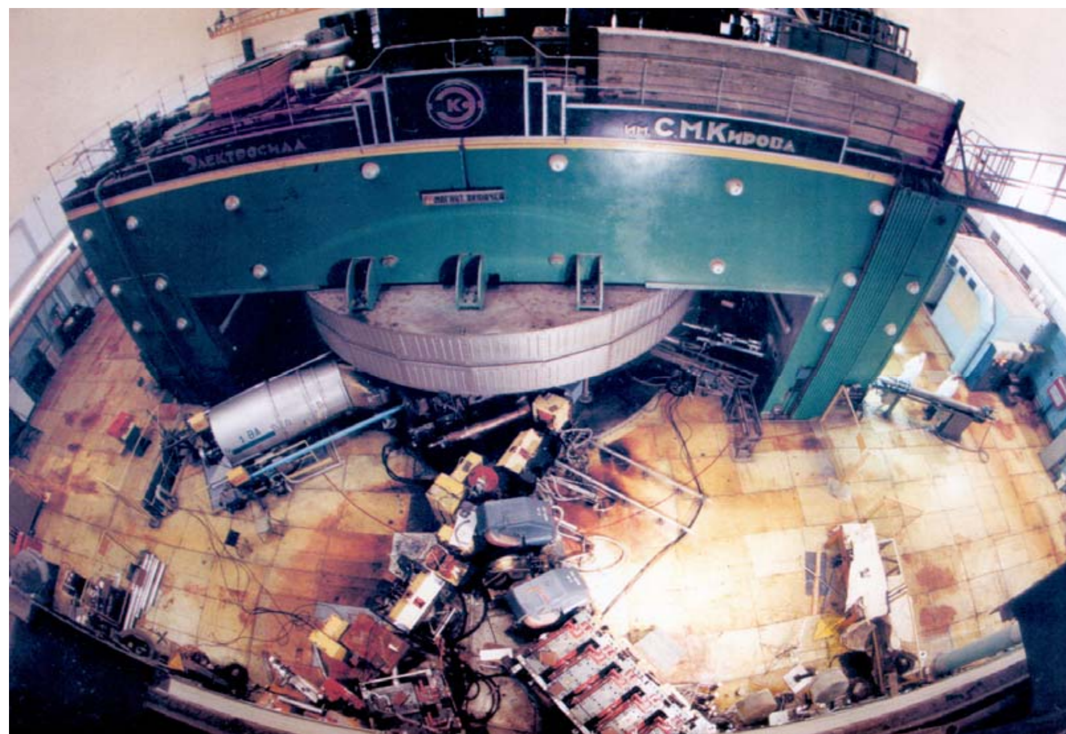


M. Meshcheryakov

I. Kurchatov and V. Dzhelepov

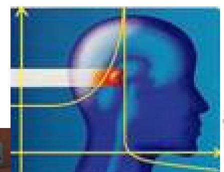
Synchrocyclotron
has been operating since 14 December 1949

(reconstructed in 1984 into Phasotron)

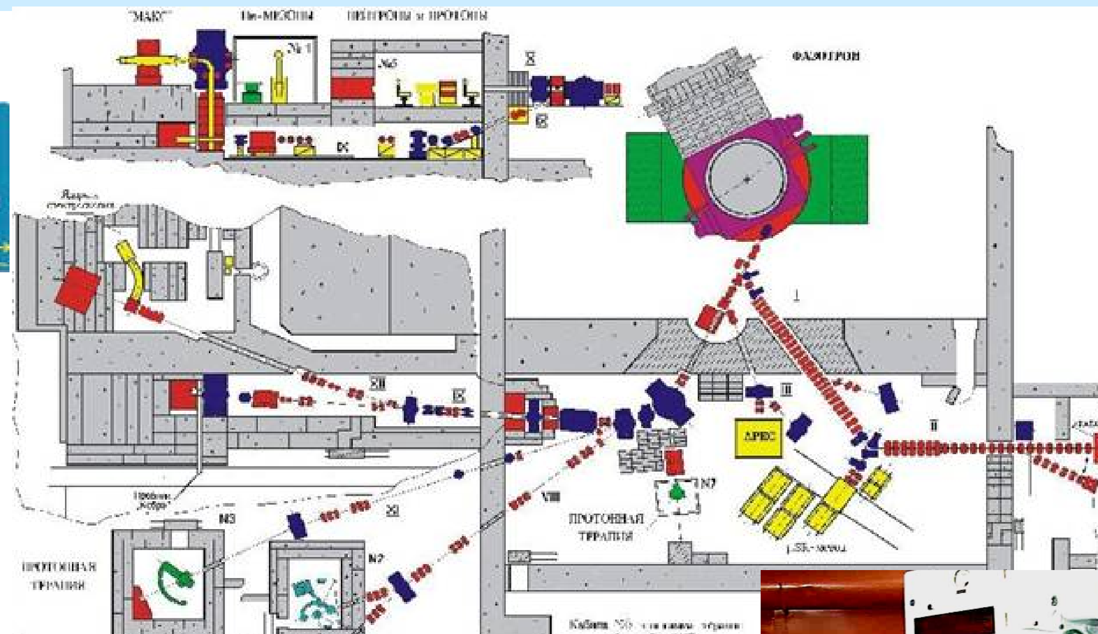


applied research: hadron therapy and electronuclear investigations with the installation "Subcritical Assembly at Dubna" (SAD).

Medico-technical complex of hadron therapy



Proton therapy



Beams layout

for hadron therapy at the JINR Phasotron

γ-therapy

11 December 2008

IREN: JINR's NEW BASIC FACILITY STARTUP

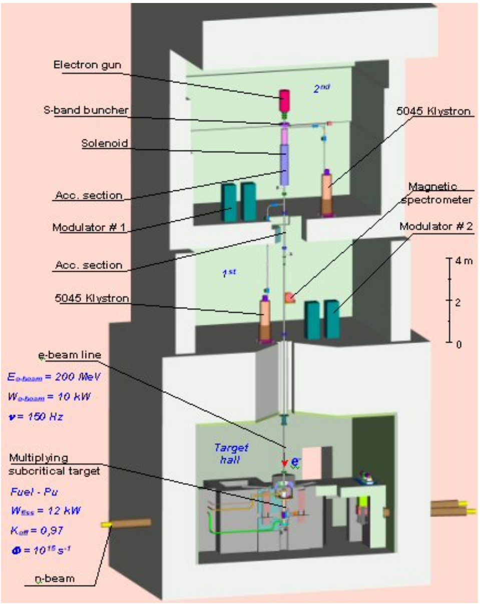
IREN 1-st stage assembling was accomplished in December 2008 and the physical startup took place in January 2009

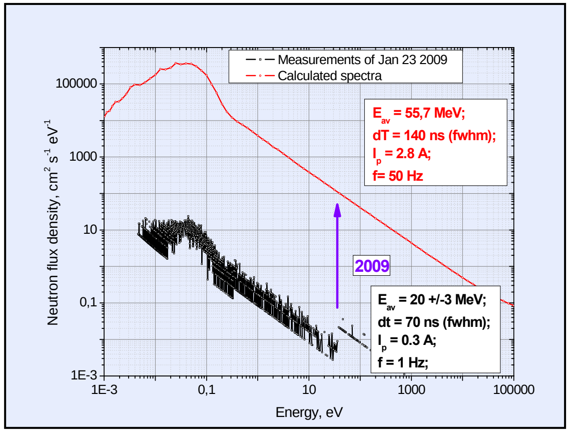
Main contribution was made by the staff of VBLHEP and FLNP, with an active participation of the Budker Institute of Nuclear Physics (director Academician A.Skrinsky).

Project leader – Dr V. Shvetsov

Scientific leader of IREN accelerator complex – Prof. I. Meshkov

Prof. I.Meshkov with leading staff members of the project: A.Sumbaev, V.Shvetsov and V.Kobets.





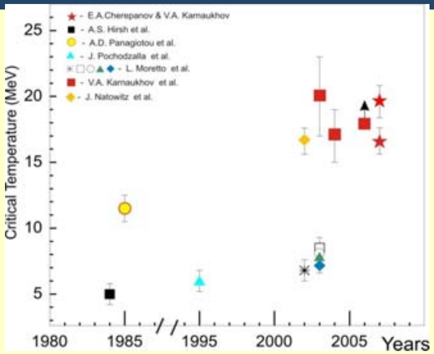
Time of flight neutron spectra registered at beam #3 of IREN facility on 23 January 2009 (black line).

Nuclear Physics

II.

FASA:

Reliable measurement of Critical Temperature parameter for liquid-gas phase transition of nuclear matter solved the long standing contradiction that existed previously



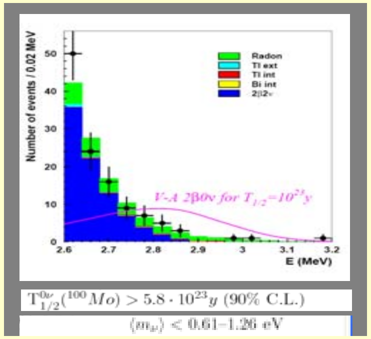
GEMMA:

Best limit on neutrino magnetic moment was obtained in GEMMA experiment at Kalinin Power Plant

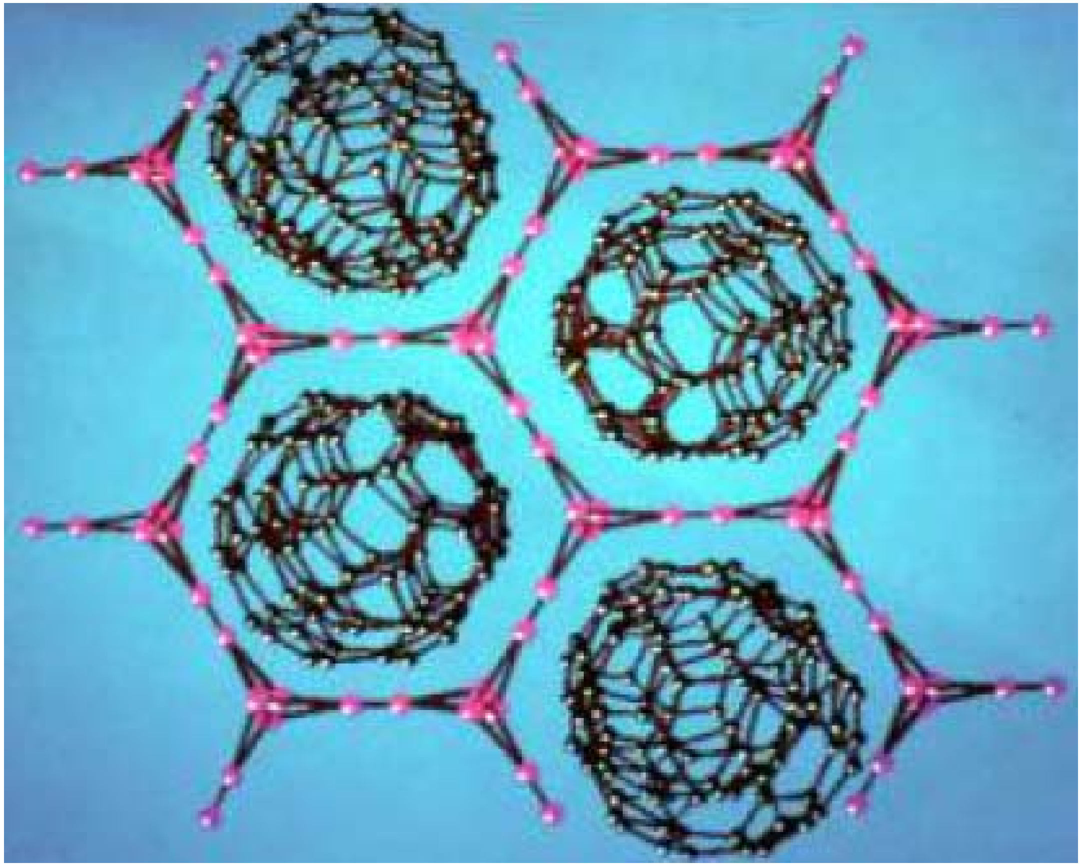
MUNU (Bugey, 2003)	$\mu\nu < 0.9 \times 10^{-10}\ \mu B$
TEXONO (Taiwan, 2003):	$\mu\nu < 7.4 \times 10^{-11}\ \mu B$
GEMMA-1 (2006):	$\mu\nu < 5.8 \times 10^{-11}\ \mu B$
BOREXINO (2008)	$\mu\nu < 5.4 \times 10^{-11}\ \mu B$
GEMMA-1 (2008):	$\mu\nu < 5.2 \times 10^{-11}\ \mu B$

NEMO:

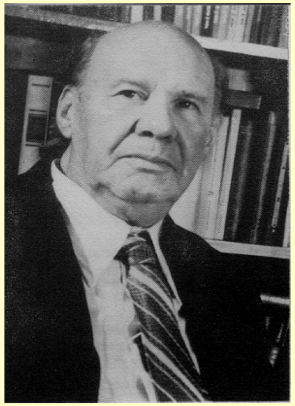
World class results were obtained on double beta decay from NEMO experiment



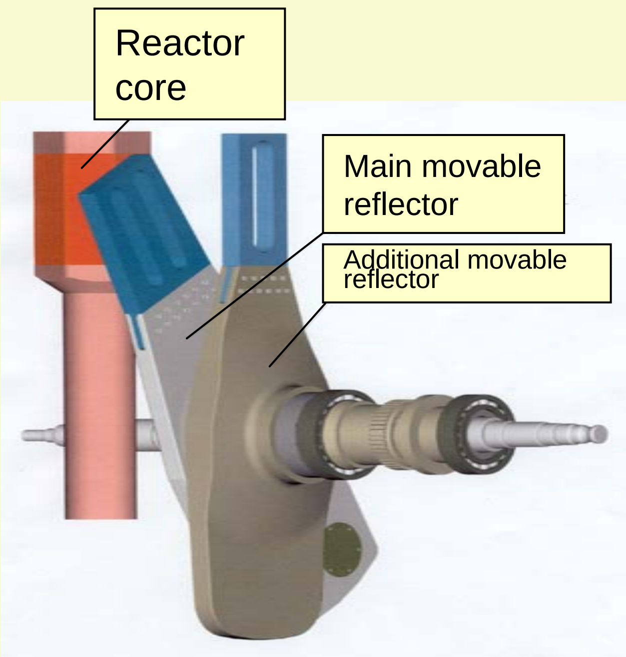
CONDENSED MATTER PHYSICS



The IBR-2 reactor is included in the 20-year European strategic programme of neutron scattering research.



D. Blokhintsev



Parameters

Fuel	PuO_2
Active core volume	22 dm^3
Cooling	liquid Na
Average power	2 MW
Pulsed power	1500 MW
Repetition rate	5 s^{-1}
Average flux	$8 \cdot 10^{12}$ $n/cm^2/s$
Pulsed flux	$5 \cdot 10^{15}$ $n/cm^2/s$
Pulse width	
(fast / therm.)	215 / 320 μs
Number of channels	14

Milestones in Condensed Matter Physics

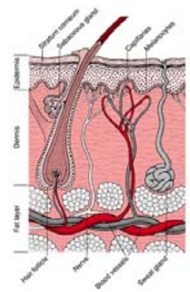
- IBR-2M: operation at design parameters of the reactor
- Realisation of the full-scale cryogenic complex
- Complex of modern neutron spectrometers
- Wide international user policy

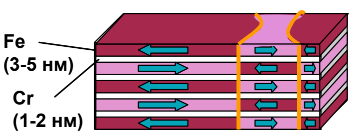
Condensed Matter Physics at IBR-2M
(priority directions)

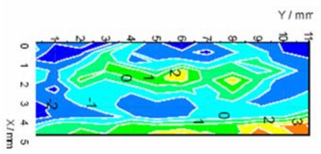
Nanosystems and Nanotechnologies

Biomedical Research

Novel Materials



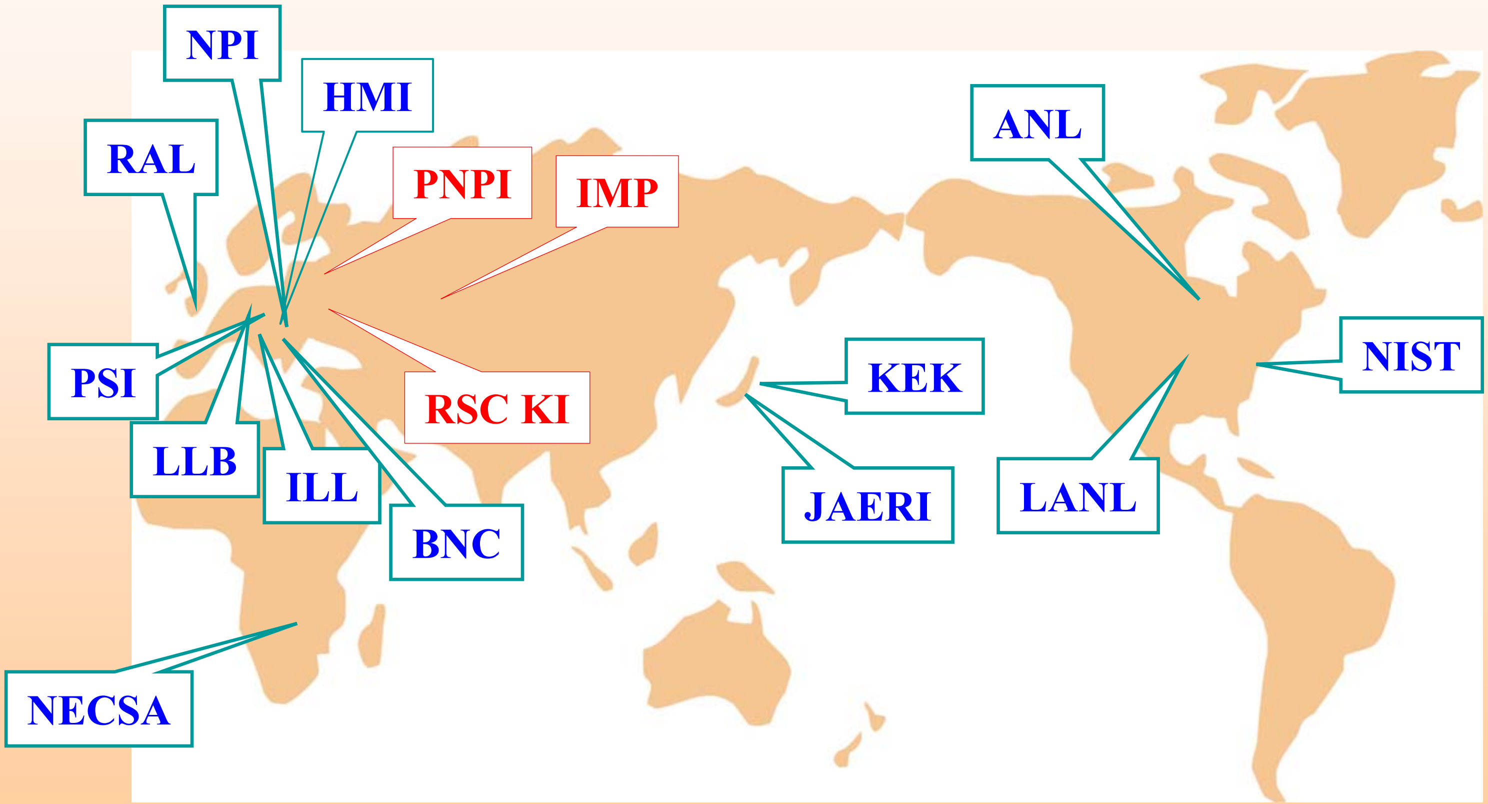




Engineering Diagnostics. Earth Sciences

Neutron scattering investigations of condensed matter in 2007 - 2010

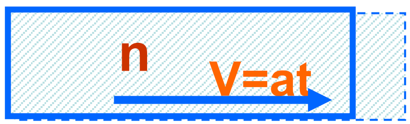
Collaboration with other neutron centers in Russia, Europe, USA, Japan, and South Africa



New universal optical effect was first observed with UCNs

$$\psi = \exp\left[i\left(nk_0x - \omega_0 t\right)\right]$$

$$\psi = \exp\left[i\left(k_0x - \omega_0 t\right)\right]$$



$$\psi = \exp\left[i\varphi_1 + i\left(k'x - \omega' t\right)\right]$$

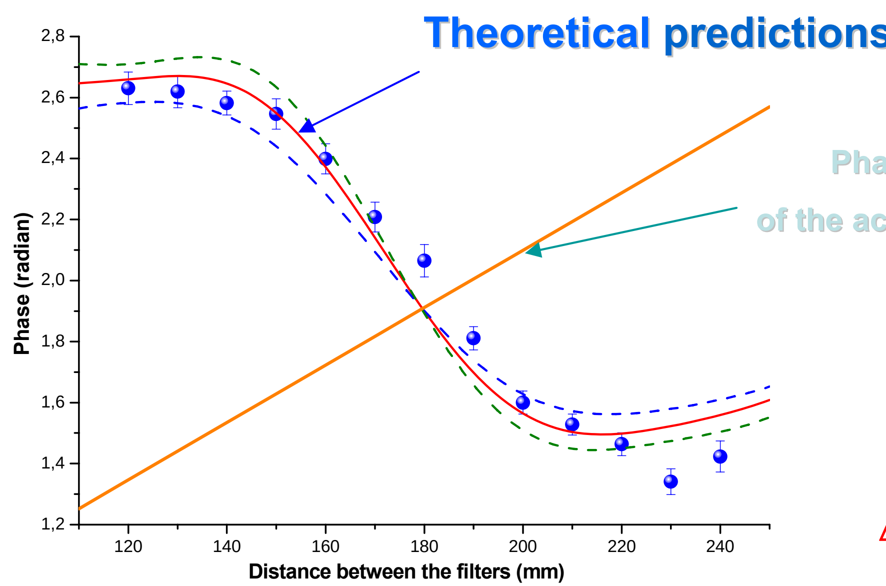
$$\Delta E = \hbar(\omega - \omega')$$

V=0 V=aτ

A.Frank, G.Kulin, D.Kustov
FLNP JINR

Theoretical predictions:
K.Tanaka (1982) – for light
F.V. Kowalski (1993)
V.G.Nosov, A.I.Frank (1998) – for neutrons;

Experimental verification 2005-2007 (FLNP - ILL)



Phase in the absence
of the accelerating matter effect
(simulation)

$$\Delta E = \left(\frac{1-n}{n}\right) maL$$

$$\Delta E = (2 \div 5)\cdot 10^{-10}\,\mathrm{eV}$$

LRB

LABORATORY OF RADIATION BIOLOGY

Main fields of research for 2010-2016:

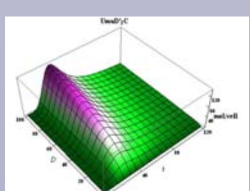
❖ Research into the mechanisms of the ***genetic action*** of accelerated heavy ions and neutrons with different energies.

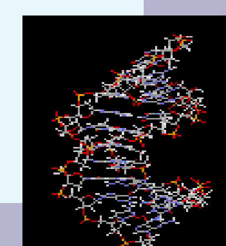
❖ Study of the action of heavy particles and neutrons on the ***eye's lens and retina.***

❖ Research into the regularities of the biological action of accelerated heavy ions on the ***central nervous system***.

❖ ***Mathematical modelling*** of biophysical systems.

❖ ***Radiation research***.



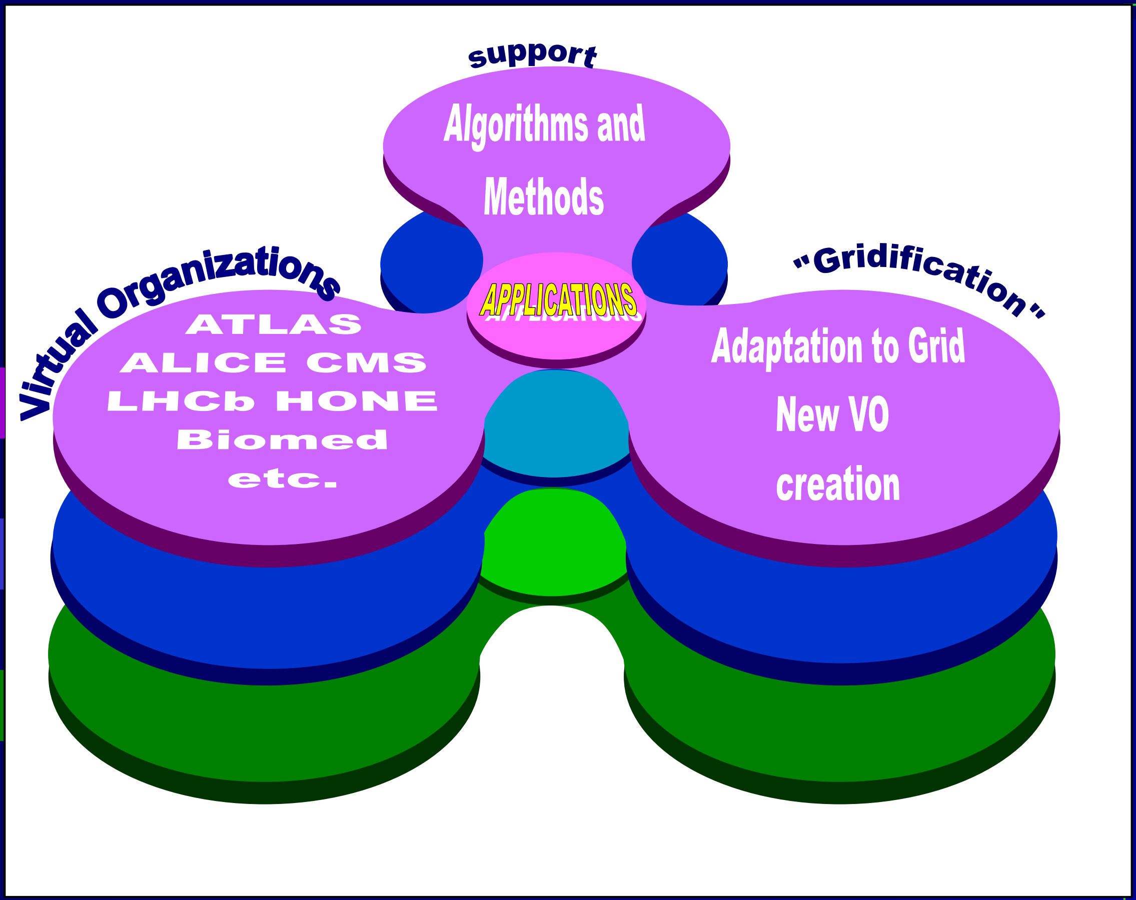


Development of the JINR Grid-environment – 2010-2016

APPLIED

RESOURCE

NETWORK

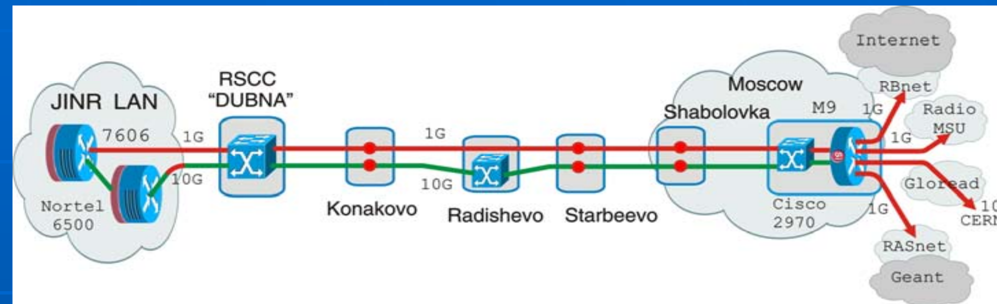


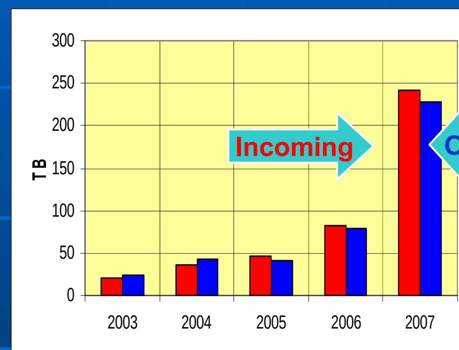
The formation of a unified Grid-environment of the JINR Member States is a pillar of the 7-year plan within the direction "Networks. Computing. Computational Physics".

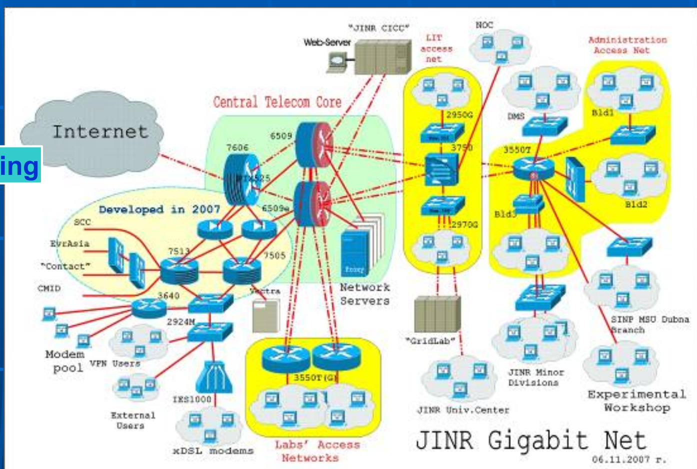
Three main levels within the Grid-environment: network, resource and applied???.

LHC experiments support

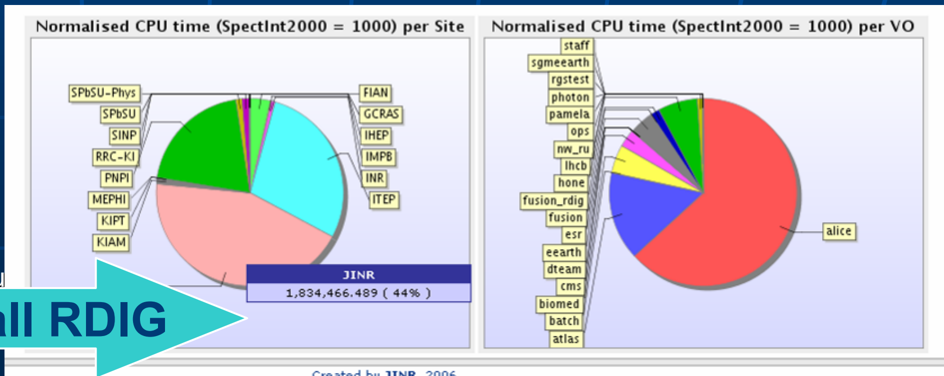
- Networking
- Computer power
- Data storage
- Software installation and maintenance
- Mathematical support





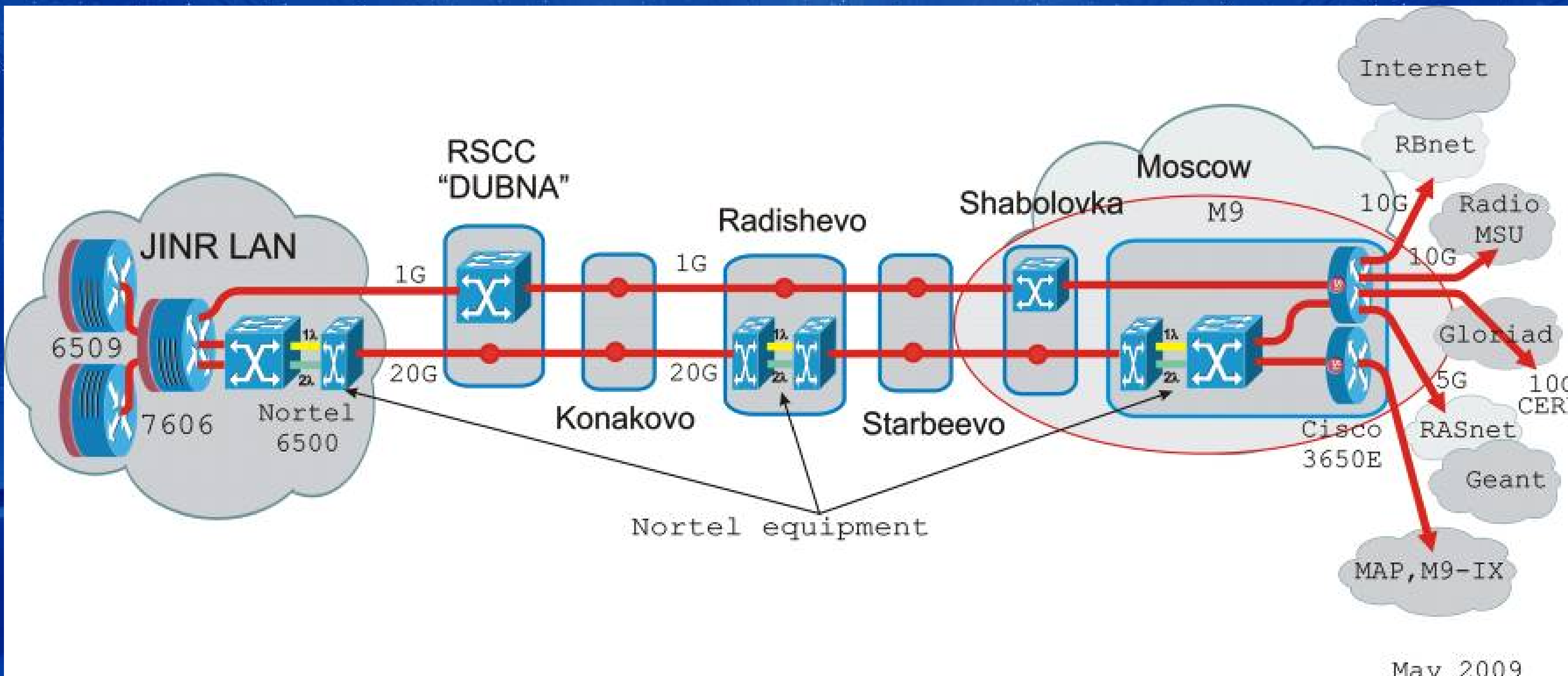


Grid – solution for LHC and other research



JINR – 44% of all RDIG

11 JUNE 2009
«Presentation of the new telecommunication channel JINR-Moscow and of the JINR Grid-segment»



Collaboration with RSCC, RIPN, MSK-IX, JET Infosystems, Nortel

Russian Satellite Communications Company
Federal State Unitary Enterprise

RIPN Russian Institute for Public Networks

MSK IX Московский Internet Exchange

III. Education Programme and Innovation activities

A vitally important task is attracting young people from all the Member States to science

II.

EDUCATIONAL PROGRAMME

JINR UNIVERSITY CENTRE

More than 300 students and postgraduates from Member States are trained at the UC

Chairs: MSU | MIPT | MEPI | MIREA | others

JINR is a school of excellence for the Member States!

"Dubna" International University

BLTP

DIAS - TH

Dubna International Advanced School on Theoretical Physics

The UC offers graduate programmes in the fields of:

- Elementary Particle Physics
- Nuclear Physics
- Theoretical Physics
- Condensed Matter Physics
- Technical Physics
- Radiobiology

EDUCATIONAL PROGRAMME
JINR University Centre: 1997-2008

- The number of students preparing their graduation diplomas at JINR has increased 9 times
- 7 new JINR-based university chairs have been opened
- more than 150 Master's theses are prepared each year
- creation of student laboratories began in 2005
- 174 people have completed the PhD programme at JINR
- International student practice in the JINR fields of research has been held since 2004
- Weekly classes (practicum) for secondary schools have been functioning since 2002
- 760 people have completed programs of training specialists for equipment operating and received their qualifications.

INNOVATION ACTIVITIES

General Information

Special Economic Zones

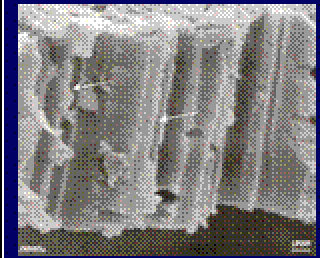
II.

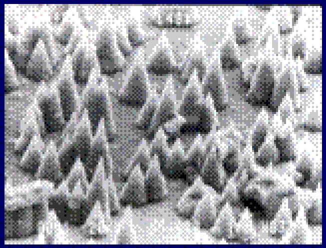
The Special Economic Zone in Dubna, Moscow region

SEZ main specialization

II.

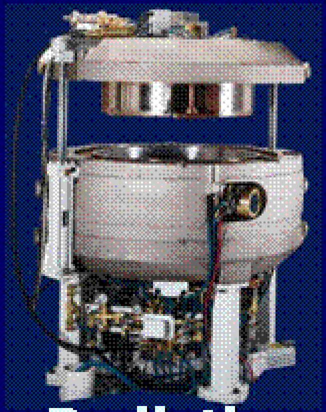
Nanotechnologies

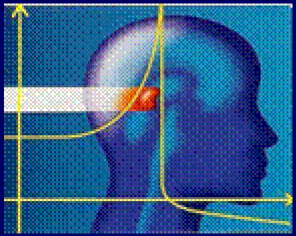




COPPER MICROTUBES

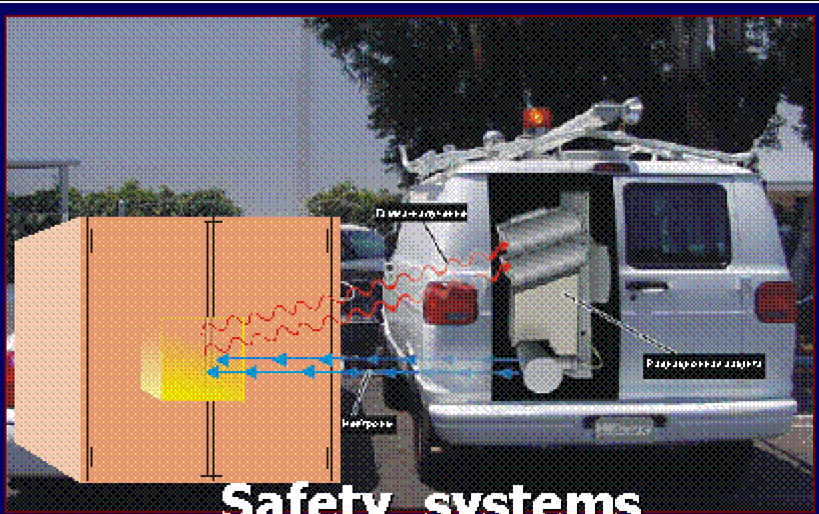
METALLIC NEEDLES





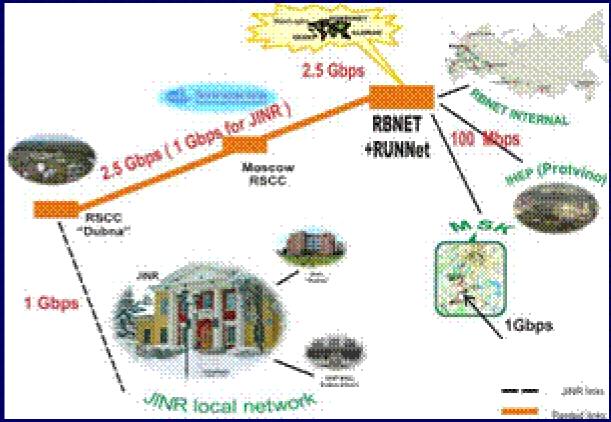
Hadron therapy

Radiation medicine



Safety systems

IT and Telecommunication



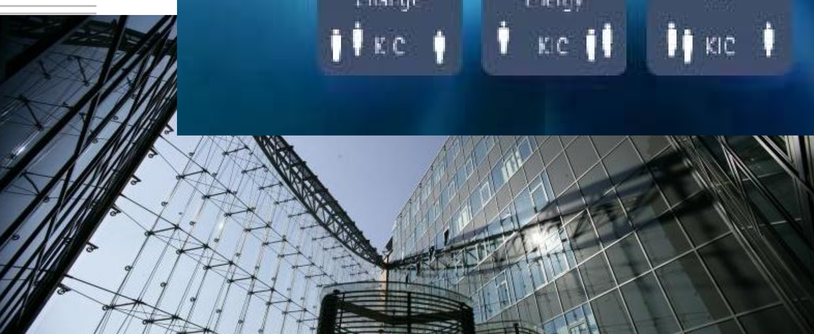
President D. Medvedev Visits JINR on 18 April 2008

II.

President D. Medvedev noted the importance of the future realization of two large-scale projects proposed by JINR: establishment at Dubna of a Centre for Radiation Medicine and of an International Innovation Centre for Nanotechnology (IINC).

ОИЯИ

Integration of IINC to Europe



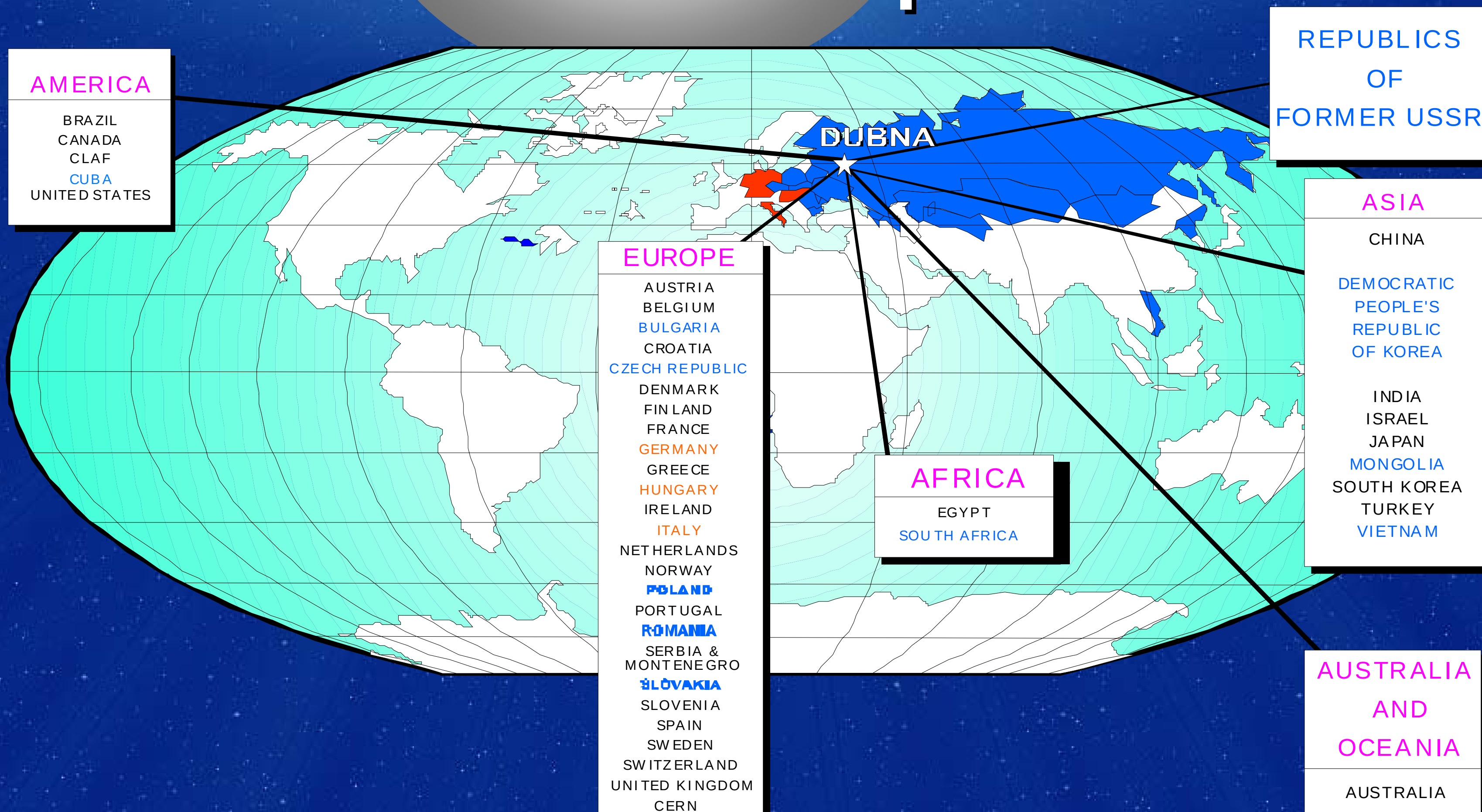
EIT building in Budapest

European Institute of Innovation and Technology (EIT), Budapest

REGULATION (EC) No 294/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 March 2008 establishing the European Institute of Innovation and Technology

«Knowledge and Innovation Community' (KIC) means an autonomous partnership of higher education institutions, research organisations, companies and other stakeholders in the innovation process in the form of a **strategic network** based on joint mid- to long-term innovation planning to achieve the EIT challenges, regardless of its precise legal form».

International Cooperation



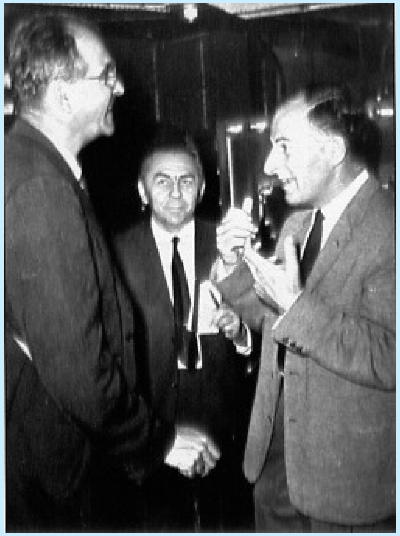
JINR's partners are about 700 institutions located in 60 countries

Cooperation with CERN

The history of cooperation between CERN and JINR spans over 45 years.

CERN is JINR's main partner in Particle Physics.

Dubna physicists are widely involved in more than 20 CERN projects, including 3 LHC experiments



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

2004, CERN Director-General
Dr R.Aymar in Dubna

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

Science Bringing Nations Together

European School on High-Energy Physics
Joint CERN-JINR schools since 1970

Tsakhkadzor, Armenia
24 August – 6 September 2003

Sant Feliu de Guíxols, Spain
May 30 - June 12, 2004

Following discussions between the Directors-General of CERN and of JINR, it was agreed that CERN should organize the 1970 School in collaboration with JINR in Finland, which at that time was not a Member State of either CERN or of JINR.

In 1971, JINR organized a School in Bulgaria in collaboration with CERN, following which it was decided to hold joint CERN – JINR Schools.

Cooperation with Germany

- Location of centres collaborating with JINR

- **JINR's partners are**
  - 71 institutions located in 45 cities
- Research activities are regulated by the Agreement between BMBF and JINR concluded in 1991
- About 300 joint publications annually

JINR-USA Cooperation

Main Scientific Partners

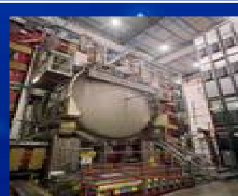
Institutions:

- Fermi National Accelerator Laboratory
- Brookhaven National Laboratory
- Lawrence Berkeley National Laboratory
- Lawrence Livermore National Laboratory
- Argonne National Laboratory
- Los Alamos National Laboratory
- …

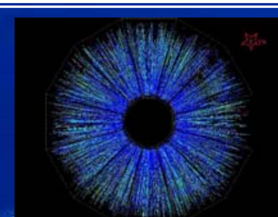
At present, JINR collaborates with 75 U.S. scientific centres and universities

Dr. J. Marburger at JINR, Dubna, 3 June 2002

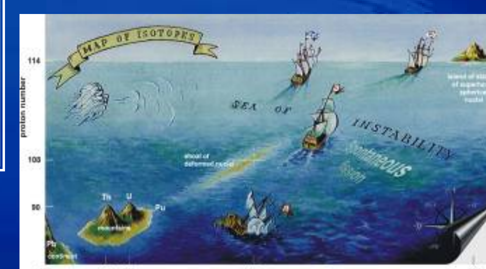
CDF II



DZero



STAR



synthesis of superheavy elements

N.N.Bogoliubov – a classic of the world science and an illuminer

III.

Decree of the President of the Russian Federation 9 December 2008

УКАЗ

ПРЕЗИДЕНТА РОССИЙСКОЙ ФЕДЕРАЦИИ

О праздновании 100-летия со дня рождения Н.Н. Боголюбова

Учитывая выдающийся вклад великого русского ученого Н.Н.Боголюбова в развитие отечественной и мировой науки и в связи с исполняющимся в 2009 году 100-летием со дня его рождения, постановляю:

1. Принять предложение Правительства Российской Федерации о праздновании в 2009 году 100-летия со дня рождения Н.Н.Боголюбова.

2. Правительству Российской Федерации в 3-месячный срок:

образовать организационный комитет по подготовке и проведению празднования 100-летия со дня рождения Н.Н.Боголюбова и утвердить его состав;

обеспечить разработку и утверждение плана основных мероприятий по подготовке и проведению празднования 100-летия со дня рождения Н.Н.Боголюбова.

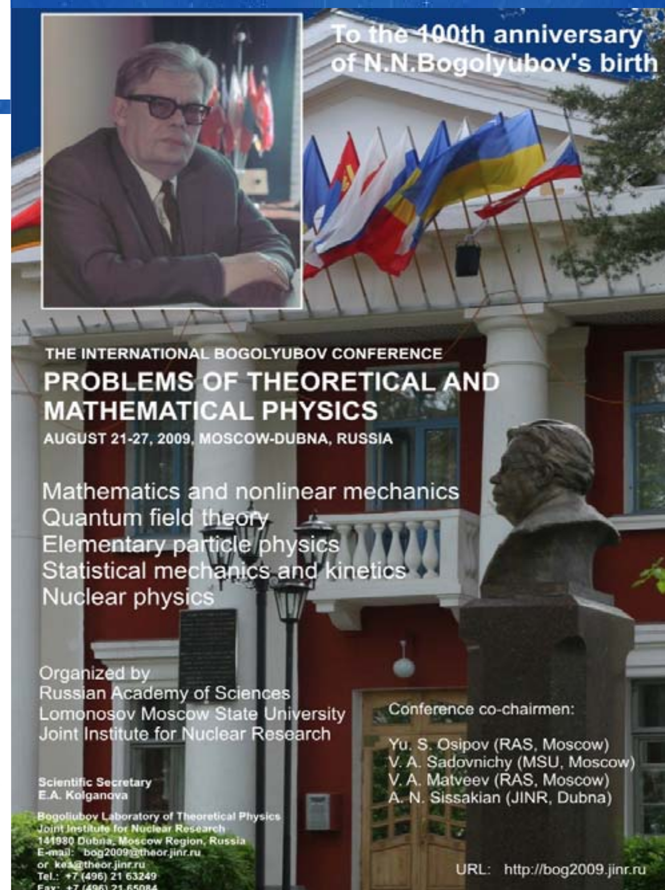
3. Министерству иностранных дел Российской Федерации и Российской академии наук проинформировать ЮНЕСКО и заинтересованные международные научные организации о праздновании в Российской Федерации в 2009 году 100-летия со дня рождения Н.Н.Боголюбова.

4. Рекомендовать органам государственной власти субъектов Российской Федерации принять участие в мероприятиях по подготовке и проведению празднования 100-летия со дня рождения Н.Н.Боголюбова.

КАНЦЕЛЯРИЯ

Президент Российской Федерации Д.Медведев

Москва, Кремль
9 декабря 2008 года
№ 1751



Decree of the President of the Ukraine 11 December 2008

УКАЗ ПРЕЗИДЕНТА УКРАЇНИ № 1154/2008

Про відзначення 100-річчя від дня народження Миколи Боголюбова

З метою вшанування пам'яті видатного вченого в галузі теоретичної фізики і математики, одного з основоположників української школи теоретичної та статистичної фізики академіка Миколи Миколайовича Боголюбова та з нагоди відзначення у 2009 році 100-річчя від дня його народження **постановляю:**

1. Кабінету Міністрів України:

1) утворити у місячний строк організаційний комітет з підготовки та відзначення 100-річчя від дня народження Миколи Боголюбова і затвердити його персональний склад;

2) розробити за участю Національної академії наук України і затвердити план заходів з підготовки та відзначення 100-річчя від дня народження Миколи Боголюбова, передбачивши, зокрема:

організацію і проведення у травні – вересні 2009 року наукових конференцій, зустрічей і круглих столів за участю вчених та громадськості;

організацію пересувної виставки, присвяченої життю та діяльності академіка Миколи Боголюбова;

видання збірки фотодокументів і спогадів про Миколу Боголюбова;

карбування та введення в обіг у встановленому порядку ювілейної монети, випуск в обіг поштової марки і конверта, присвячених 100-річчю від дня народження Миколи Боголюбова, здійснення спецпогашення поштової марки;

3) забезпечити фінансування заходів, пов'язаних із підготовкою та відзначенням 100-річчя від дня народження Миколи Боголюбова.

2. Кабінету Міністрів України, Раді міністрів Автономної Республіки Крим, обласним, Київській та Севастопольській міським державним адміністраціям вивчити питання щодо можливості присвоєння окремим навчальним і науковим закладам та установам імені Миколи Боголюбова, а також найменування чи перейменування в установленому порядку вулиць та площ у населених пунктах України.

3. Київській міській державній адміністрації вирішити в установленому порядку питання щодо встановлення академіку Миколі Боголюбову меморіальної дошки на одному з корпусів Київського національного університету імені Тараса Шевченка та пам'ятника (погруддя) на території Інституту теоретичної фізики імені М.М.Боголюбова Національної академії наук України.

4. Державному комітету телебачення та радіомовлення України організувати цикли тематичних теле- і радіопередач, забезпечити широке висвітлення у засобах масової інформації заходів з відзначення 100-річчя від дня народження Миколи Боголюбова.

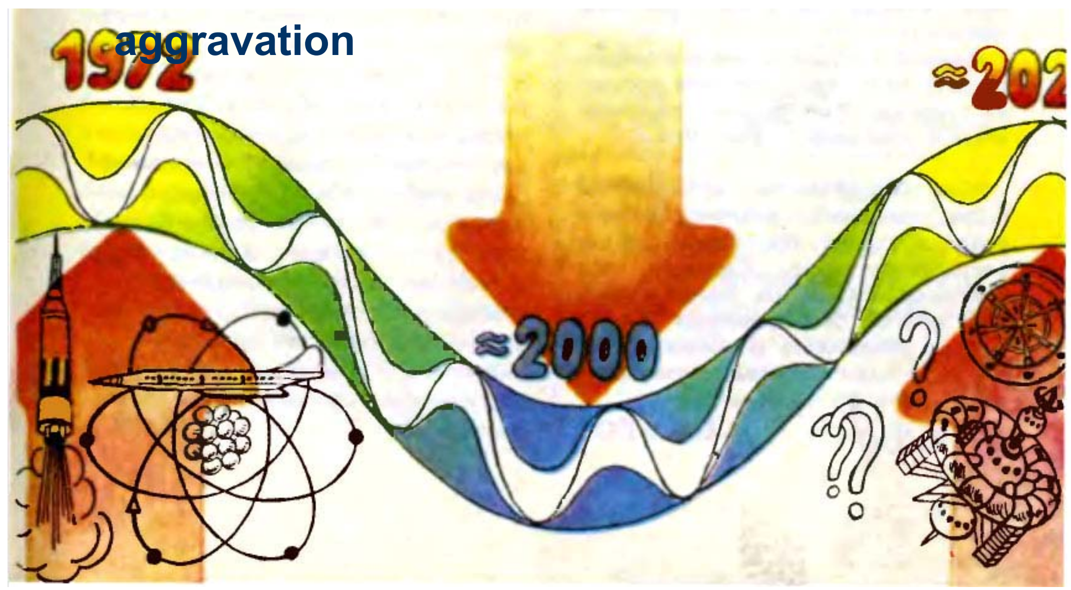
Президент України Віктор ЮЩЕНКО

11 грудня 2008 року

CONCLUSION

Nikolai Kondratev (1892-1938) – famous Russian economist

"Wars and revolutions rise on the grounds of real, and primarily, economic prerequisites: speeding tempo and pressure of the economic life environment, aggravation of the economic rivalry for markets and feedstocks."



CONCLUSION

"Science will overcome everything, and the financial crisis as well".

Academician B.E. Paton
December 8, 2008, Moscow

"At such a difficult moment, there are those who say we cannot afford to invest in science, that support for research is somehow a luxury at moments defined by necessities. I fundamentally disagree. Science is more essential for our prosperity, our security, our health, our environment, and our quality of life than it has ever been before".

Barack Obama
President of the USA
April 27, 2009

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