



**93<sup>rd</sup> session of the JINR Scientific Council  
16-17 January 2003**

**A. Sissakian**

**Presentation of the draft of  
“The Programme of JINR’s Scientific Research  
and Development for 2003-2009”**

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# Recommendations of JINR's Committee of Plenipotentiaries and Scientific Council on the long-term scientific programme

● The SC recommends that the JINR Directorate outline a long-term programme of research at JINR.

*(89th session of JINR SC, January 2001)*

● The Scientific Council invites the JINR Directorate to present at its 93rd session a Draft Scientific Programme of JINR for the next 7 years.

*(91st session of JINR SC, January 2002)*

● The Scientific Council endorses the main lines of the proposed Programme and looks forward to a more complete presentation following discussions at meetings of the PACs.

*(92nd session of JINR SC, June 2002)*

● CP supports the SC recommendation and JINR Directorate's activity on the development of the JINR's 7-year research programme.

*(CP session, March 2002)*



# Recommendations of the PAC for Particle Physics November 2002

■ The PAC approves and supports the timely and well-focused effort of the JINR Directorate to develop a sound and competitive scientific foundation for the medium- and long-term future of the Institute, and considers the present draft programme a decisive step in establishing a basis for a final draft of the long range programme. It strongly supports the main international programme elements in the draft document.

■ The PAC recognizes that the period of 2003 to 2009 covered by the plan will be a time of transition where JINR has to change from reacting to the difficult situation in the past to pro-actively shaping the future.



# Recommendations of the PAC for Nuclear Physics (November 2002)

## **HEAVY-ION PHYSICS**

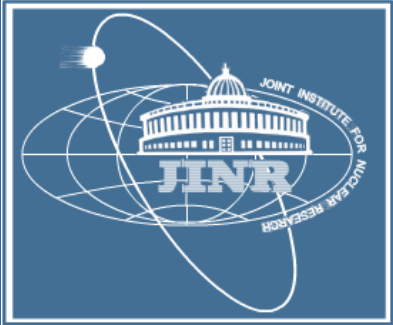
The PAC recommends approval of the general lines of the FLNR Programme of Scientific Research in Heavy-Ion Physics for 2003-2009. These include the modernization of basic facilities, the experimental set-ups and the proposed infrastructure developments.

## **NUCLEAR PHYSICS WITH NEUTRONS**

The FLNP Scientific Programme proposed in the field of Nuclear Physics for the years 2003-2009 is highly appreciated by the PAC, which recommends approval of its general lines. Highest priority is given to experiments aimed at investigations of fundamental symmetries and their possible violations, at neutron properties and at basic interactions with neutrons.

## **LOW- AND INTERMEDIATE-ENERGY PHYSICS**

The general lines of the DLNP Scientific Programme for 2003-2009 in Low- and Intermediate-Energy Physics are recommended for approval. These consist of collaborations in experiments in the field of rare processes and those forbidden by the Standard Model, in neutrino and weak-interaction physics, in nuclear reaction mechanisms, and in the development of new facilities.



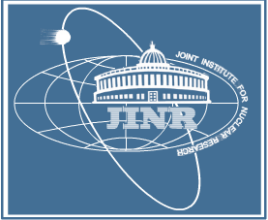
# Recommendations of the PAC for Condensed Matter Physics (November 2002)



**The PAC fully approves the basic directions of the 7-year programme concerning research with neutrons at FLNP, radiobiological research at DRRR, theoretical research in Condensed Matter at BLTP and material science at FLNR.**



**The general educational programme is well presented in the 7-year plan and has indeed a very important impact on JINR. The PAC proposes that each chapter under Condensed Matter studies adds its educational programme.**



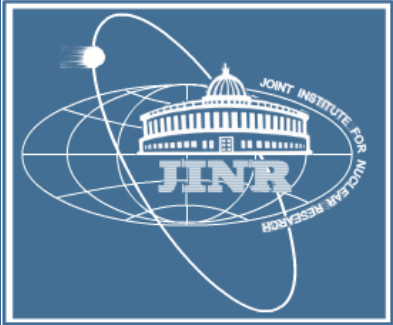
# Statements and Recommendations of the JINR Scientific and Technical Council (STC) (27 December 2002)

## The STC notes that the proposed Programme:

- reflects the present state of the main fields of research at JINR and the tendencies of their future development
- is aimed at addressing challenging tasks of modern physics
- takes into account the interests of the Institute's Member States
- envisages further integration of JINR with world laboratories of basic research, including those constructing new-generation accelerators and instrumentation
- envisages further development of:
  - JINR basic facilities
  - educational activities
  - infrastructure
- considers the social aspects of the development of JINR.

## The STC recommends:

- approval of the general lines of the Programme
- submission of the Programme to the 93rd session of the JINR Scientific Council, taking into account the proposals of the STC and the PACs.



# Recommendations of the Scientific Council's Committee for the JINR Long-Term Scientific Programme (15 January 2003)

## Members of the Committee:

**P. Spillantini (Chairperson)**

**T. Hallman, H. Lauter, M. Mateev, V. Matveev,**

**B. Peyaud, N. Rowley, N. Shumeiko, A. Sissakian**



**The Committee recommends that the Scientific Council adopt the following text of recommendations in the Resolution of its 93<sup>rd</sup> session concerning JINR's long-term scientific programme:**

**The Scientific Council takes note of the comprehensive draft of the "Programme of the Scientific Research and Development of JINR for 2003-2009" presented by Vice-Director A. Sissakian. The Scientific Council appreciates the efforts of the JINR Directorate to develop a competitive long-term scientific programme of JINR.**

**The Scientific Council endorses the general lines of the proposed Draft Programme and asks the JINR Directorate to prepare for the next session the final text of the Programme, taking into account the comments and input of the Scientific Council and the PACs.**

**The Draft Programme reflects the participation of JINR scientists in major international projects and that the Institute itself is capable of providing world-class user facilities for basic research. The Scientific Council recommends that the Committee of Plenipotentiaries consider this Draft Programme as a basis for initiating financial planning for JINR in 2003-2009 and that financial support, at a level consistent with the success of the projects outlined in this document, be requested from the Member States.**

# Scientific Background of the Programme

**JINR's successful and stable work during more than 45 years, which yielded a number of world-renowned major scientific results in high-energy physics, nuclear physics and condensed matter physics.**



A. Baldin



V. Dzhelepov



V. Veksler



N. Bogoliubov, D. Blokhintsev



G. Flerov



I. Frank



M. Meshcheryakov



L. Infeld



H. Niewodniczanski



B. Pontecorvo



L. Janossy



H. Hulubei



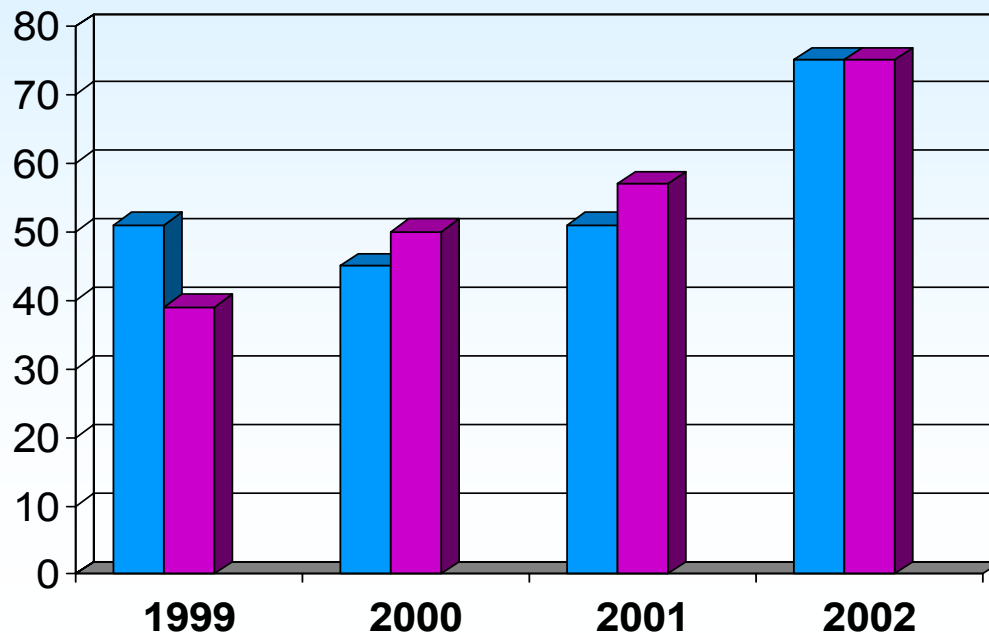
G. Najakov



# Financial Background of the Programme

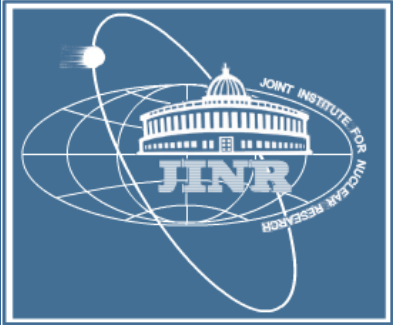
- The Institute's financial condition has definitely improved over the recent years, which allows one to expect the adequate financing of the Institute by the Governments of its Member States.

## Incomes and Expenditures in 1999-2002, % of budget



■ income  
■ expenditure

**Total budget  
37.5 M\$**

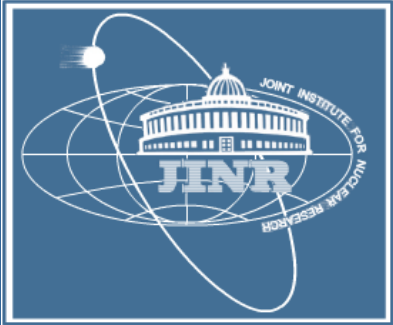


# Draft Programme of JINR's Scientific Research and Development for the Years 2003-2009

## Organizational steps:

- In February 2002, the JINR Directorate established a Committee for the preparation of the Programme, consisting of the following officials of the Institute and its Laboratories:

A. Sissakian (Chairman), A. Belushkin, A. Filippov, M. Itkis, S. Ivanova, V. Katrasev, V. Kekelidze, E. Krasavin, S. Lukyanov, A. Malakhov, I. Meshkov, I. Puzynin, N. Russakovich, A. Ruzaev, V. Senchenko, Ts. Vylov, V. Zhabitsky



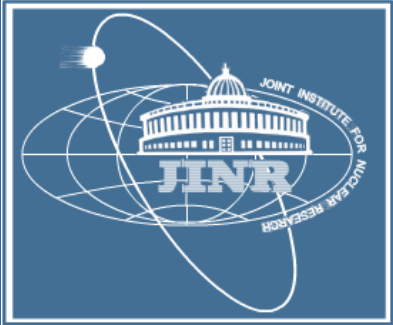
# Draft Programme of JINR's Scientific Research and Development for the Years 2003-2009

## Organizational steps:

- After the SC session, in June 2002, a Task Force was set up to draft the Programme, edit it and finalize it with account of comments and input given at sessions of the JINR SC, meetings of the JINR PACs, meetings of the JINR Science and Technology Council, and given by the Committee for the preparation of the Programme.

## This Task Force includes:

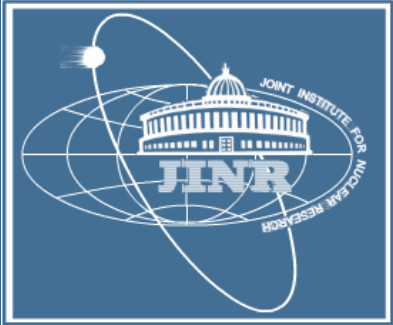
A. Kuznetsov (Coordinator), G. Arzumanyan, B. Barbashov, Ju. Budagov, E. Krasavin, L. Pikelner, V. Senchenko, V. Volkov.



# Draft Programme of JINR's Scientific Research and Development for the Years 2003-2009

**The Russian and English texts of the  
Draft Programme  
are available since November 2002  
on the JINR web-site:**

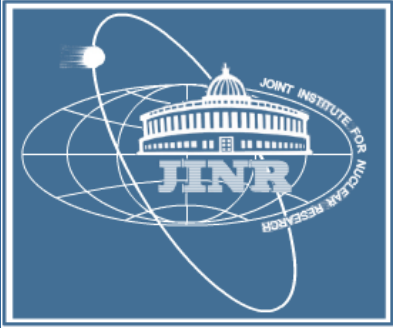
**[http://www.jinr.ru/years\\_7/](http://www.jinr.ru/years_7/)**



# Structure of the Programme

## **The Programme consists of the following items:**

- ***Aims and Tasks.***
- ***Proposals on the Long-Term Development of the Institute's Research Plan and International Scientific and Technical Co-operation.***
- ***Social and Economic Conditions of the Programme. Reforms.***
- ***Financial Resources.***



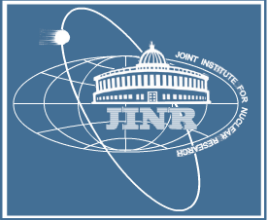
# Three pillars of JINR

**JINR has a huge foundation based on three “pillars”:**

- **world-wide recognized traditions of scientific schools**
- **basic facilities with unique performances**
- **the status of an international intergovernmental organization**



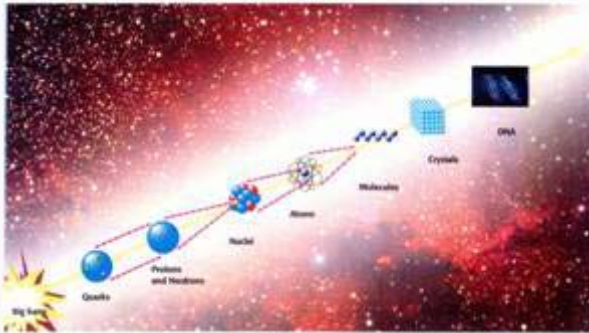




# JINR's Concept of Development

**JINR is a large multidisciplinary scientific centre incorporating:**

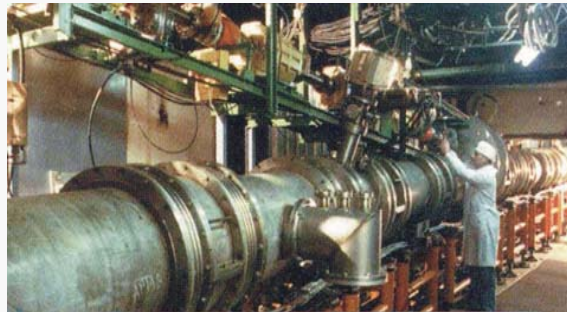
**Basic research of the structure of matter**



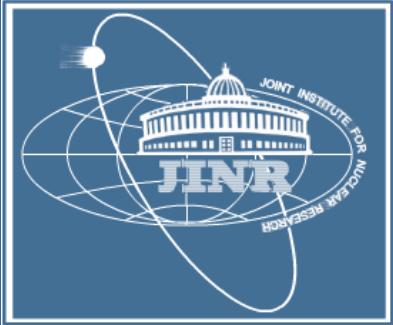
**University education**



**Development of high technologies**



**This concept is in full agreement with the recommendation of the 73rd session of the JINR Scientific Council**

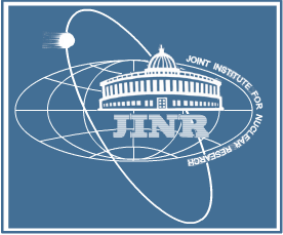


# LONG-TERM RESEARCH PROGRAMME

## Theoretical Physics

**in 2003 – 2009**

- **FIELDS AND PARTICLES**
- **MODERN MATHEMATICAL PHYSICS** *new*
- **THEORY OF NUCLEI AND OTHER FINITE SYSTEMS**
- **THEORY OF CONDENSED MATTER**

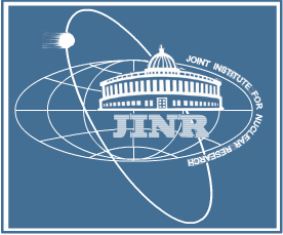


# Fields and Particles



## The main topics:

- **Development of nonperturbative methods: lattice gauge theories, collective variables (instantons, vacuum condensates, chiral approach,...), analytical methods and duality**
- **QCD-based phenomenology**
- **The Standard Model and its extension**



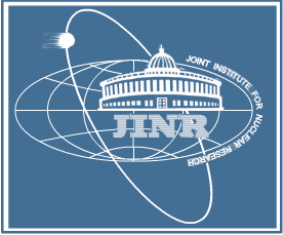
# LONG-TERM RESEARCH PROGRAMME

## Theoretical Physics

## Modern Mathematical Physics

The main directions - fundamental symmetries, unification of fields and forces including gravitation:

- New methods for old symmetries (gauge, SUSY)
- New symmetries (quantum, QFT on noncommutative manifolds,...)
- Integrable models
- Superstrings, p-branes, ...
- New cosmological models.



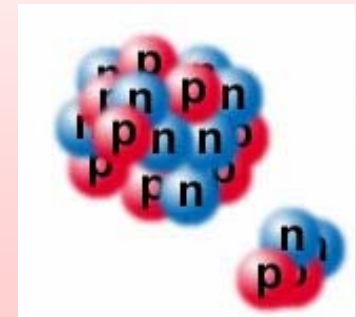
# LONG-TERM RESEARCH PROGRAMME

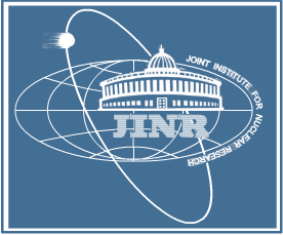
## Theoretical Physics

## Theory of Nuclei and Other Finite Systems

### The main tasks:

- Nuclear structure far from stability valley and clustering phenomena
- Dynamics of resonance phenomena in few-body systems
- Relativistic nuclear dynamics and exotic properties of nuclear matter

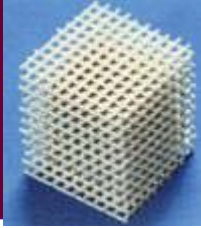




# LONG-TERM RESEARCH PROGRAMME

## Theoretical Physics

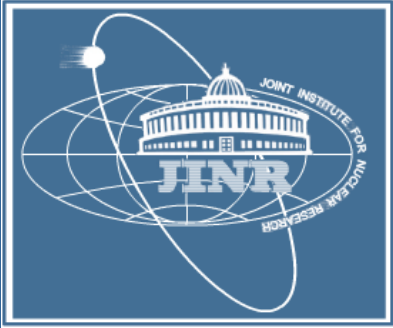
# Condensed Matter Physics



**A perspective programme concerns further development of analytical and numerical methods in studies of complex many-body systems which are of current interest in the present day Condensed Matter Physics.**

***The research will be carried out along the following topics:***

- **Strongly correlated systems**
- **Dynamical systems: chaos, integrability and self-organization**
- **Disordered structures**
- **Mesoscopic and coherent phenomena in quantum systems**



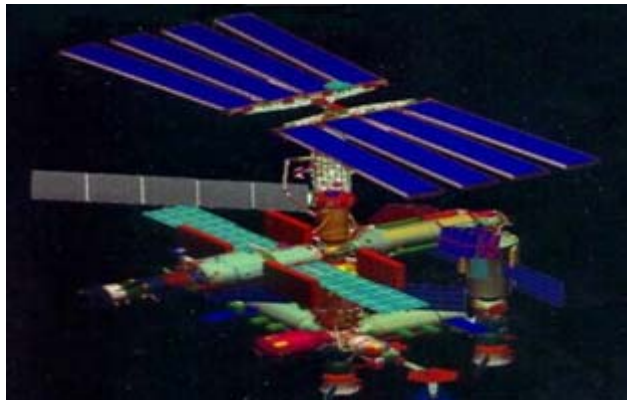
# LONG-TERM RESEARCH PROGRAMME

## Theory and Experiment

# Astrophysics and Cosmology

## Theory

The trend for the future is to study unusual phenomena and forms of matter, especially in astrophysics and cosmology. This requires new conceptual ideas and development of new methods.

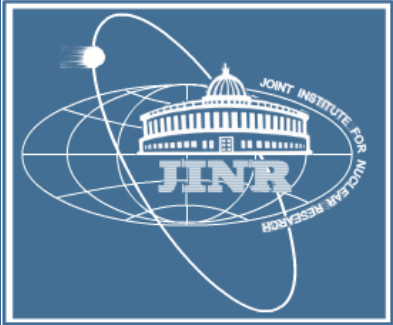


## Experiment, project TUS

**"Astrophysical studies on space satellites"**

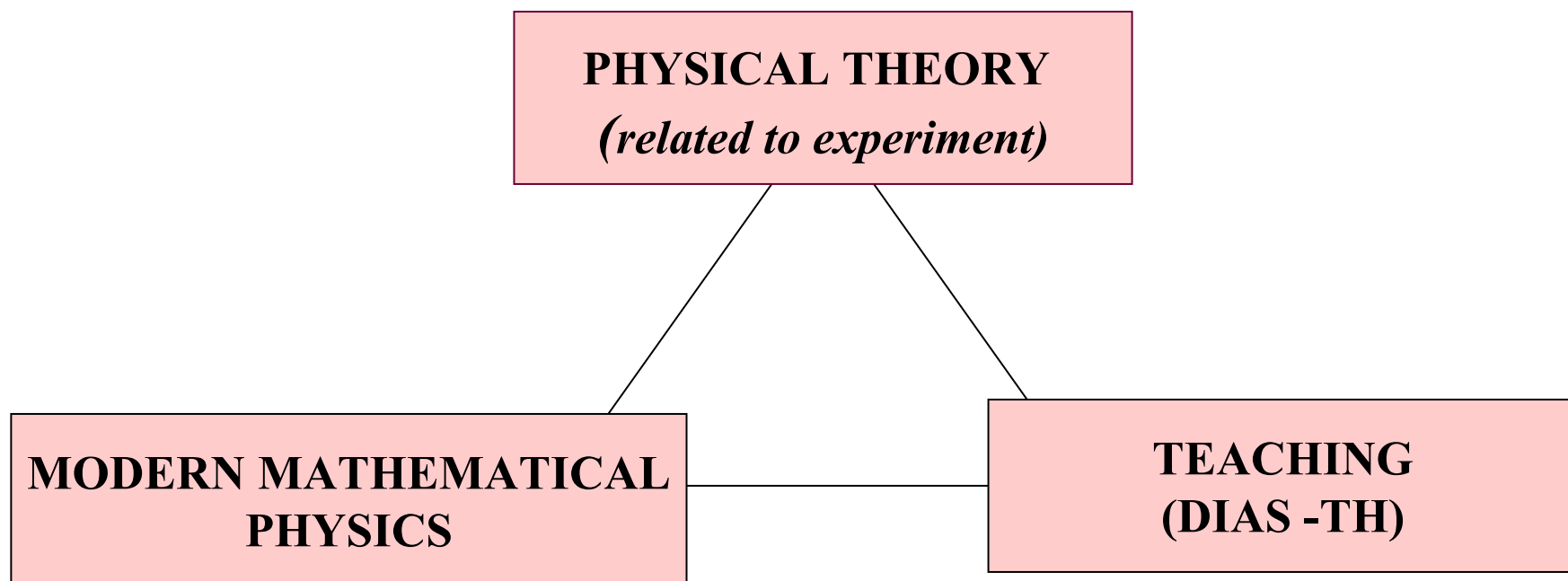
**2003-2005 - construction of instruments**

**2006-2009 - data taking and analysis**

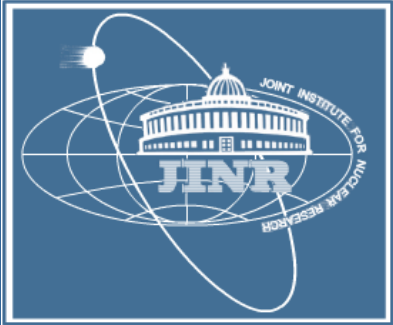


# LONG-TERM RESEARCH PROGRAMME

## Theoretical Physics

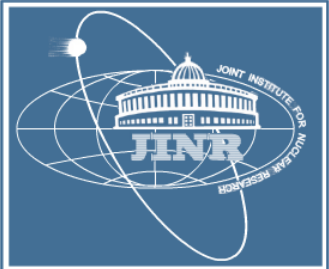






# Long-term HEP Programme

- **Physics -**  
advanced experimental studies in particle physics
- **Detectors -**  
R & D, mass production
- **Accelerator R&D -**  
development & construction of elements and subsystems

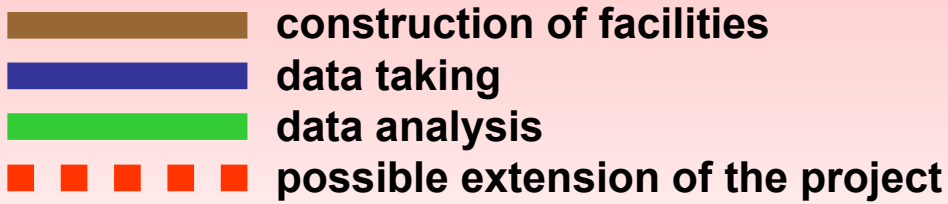


# LONG-TERM RESEARCH PROGRAMME

## Particle Physics

- **Verification of predictions, tests of the Standard Model** (CP-violation, QCD, Higgs mass, etc)
- **Search for the effects beyond the Standard Model** (supersymmetry, superstrings, leptoquarks, technicolour, proton decay, compositeness, extra dimensions, CPT and Lorentz violation, dark matter, etc)
- **Study of the nature and properties of neutrinos** (neutrinoless double beta decay, neutrino oscillations, magnetic moment of the neutrinos, etc)
- **Construction of the model of the Universe, etc**  
by means of investigation of the new physical phenomena with particles, nuclei, stars, galaxies, etc.

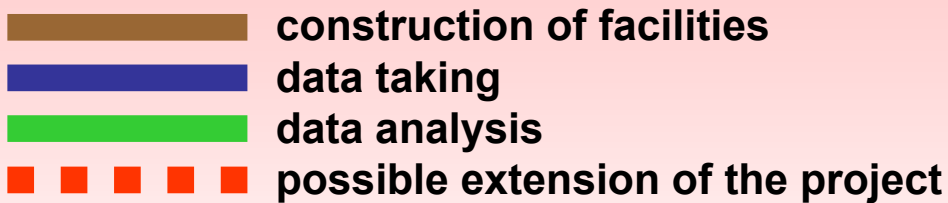
# Time Schedule of External HEP Projects (2003 – 2009)



**CERN - JINR**

Accelerator	Project	2003	2004	2005	2006	2007	2008	2009	
LHC	ATLAS	Construction				Data taking			
	CMS	Construction				Data taking			
	ALICE	Construction					Data taking		
LEP	DELPHI	Data analysis							
PS	DIRAC	Data taking	Possible extension	Data analysis					
	HARP	Data taking		Possible extension					
SPS	NA45	Data taking		Data analysis					
	NA48	Data analysis							
	NA48/1	Data analysis							
	NA48/2	Data taking	Possible extension	Data analysis					
	NA49	Data taking		Data analysis					
	COMPASS	Data taking		Data analysis	Possible extension				
	NOMAD	Data analysis							
CLIC	Accel, R&D	Construction	Possible extension	Possible extension	Possible extension	Possible extension	Possible extension	Possible extension	

# Time Schedule of External HEP Projects (2003 – 2009)



DESY, GSI, BNL, FNAL  
 Uppsala, KEK-PS, IHEP  
 Gran Sasso

Accelerator	Project	2003	2004	2005	2006	2007	2008	2009	
HERA	HERMES	[Data Taking]							
	HERA-B		[Data Taking]						
	H1	[Data Taking]					[Possible Extension]		
TESLA	TTF, beam diagnostics		[Construction]						
RHIC	STAR	[Construction]			[Data Taking]				
	PHENIX	[Construction]			[Data Taking]				
Tevatron	D0	[Data Taking]		[Data Analysis]					
	CDF	[Data Taking]		[Data Analysis]					
Celsius	WASA	[Data Taking]							
KEK-PS	E391a		[Data Taking]						
IHEP	EXCHARM II	[Data Analysis]							
	Thermalization		[Data Taking]			[Possible Extension]			
Gran Sasso	BOREXINO	[Data Taking]							
	OPERA	[Construction]					[Data Analysis]		
SIS	HADES	[Data Taking]							

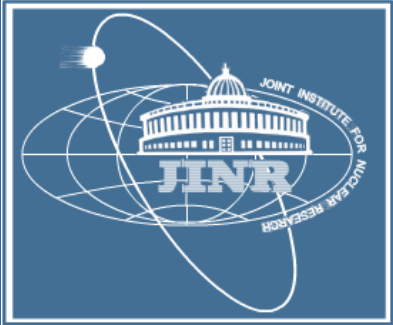
# JINR is a cluster centre in Particle Physics for the Member States



**Increasing role of the home site:**  
**Detector production**  
**Data processing**  
**Data analysis**  
**On-line experiment control**  
**Videoconferences**  
**Experiments at the world best accelerators**  
**in the “remote” mode**  
**Powerful computing facilities**

## Theoretical support for the current and future experiments with the JINR participation

<ul style="list-style-type: none"> <li>• SUSY partners,</li> <li>• Higgs</li> </ul>	CMS, ATLAS, DØ, CDF
<ul style="list-style-type: none"> <li>• <math>\nu</math>-physics,</li> <li>• CP-violation</li> </ul>	NOMAD, NA-48, DØ, CDF
<ul style="list-style-type: none"> <li>• Heavy quark physics</li> </ul>	CMS, ATLAS, DØ, CDF, HERMES-B, H1
<ul style="list-style-type: none"> <li>• High energy, small-x</li> <li>• Very high multiplicity</li> </ul>	CMS, ATLAS, DØ, CDF
<ul style="list-style-type: none"> <li>• Hadron spin and flavor structure</li> <li>• New PDF and PFF</li> <li>• Spin and polarization in QCD</li> </ul>	COMPASS, NOMAD, STAR, HERMES, HERMES-N
<ul style="list-style-type: none"> <li>• Quark-Gluon Plasma</li> </ul>	ALICE, STAR, HADES
<ul style="list-style-type: none"> <li>• Spin effects in few-nucleon systems</li> </ul>	STRELA, MRS, BES, DELTA-SIGMA, KAPPA, SPIN, EXCHARM-2, NIS
<ul style="list-style-type: none"> <li>• Multiquark states and cumulative processes</li> </ul>	SPHERA, GIBS, MARUSYA
<ul style="list-style-type: none"> <li>• Rare processes</li> </ul>	EXCHARM, NIS



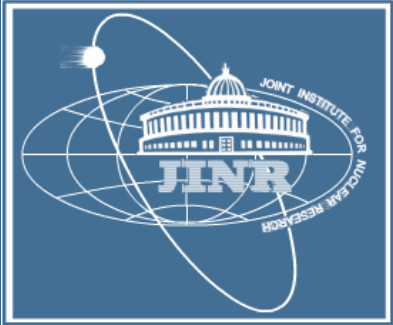
# Long-term HEP Programme

**"Dubna is recognized as one of the most important international Physics Laboratories.**

**At CERN we appreciate the key role Dubna plays through its own expertise and resources and the node where the efforts of its Member-States converge to make crucial contributions to the LHC. We also see the role of Dubna as integrating centre (cluster) and centre of excellence of preparation and training of scientists and engineers for large international projects".**



***Luciano Maiani,***  
**Director-General of CERN**



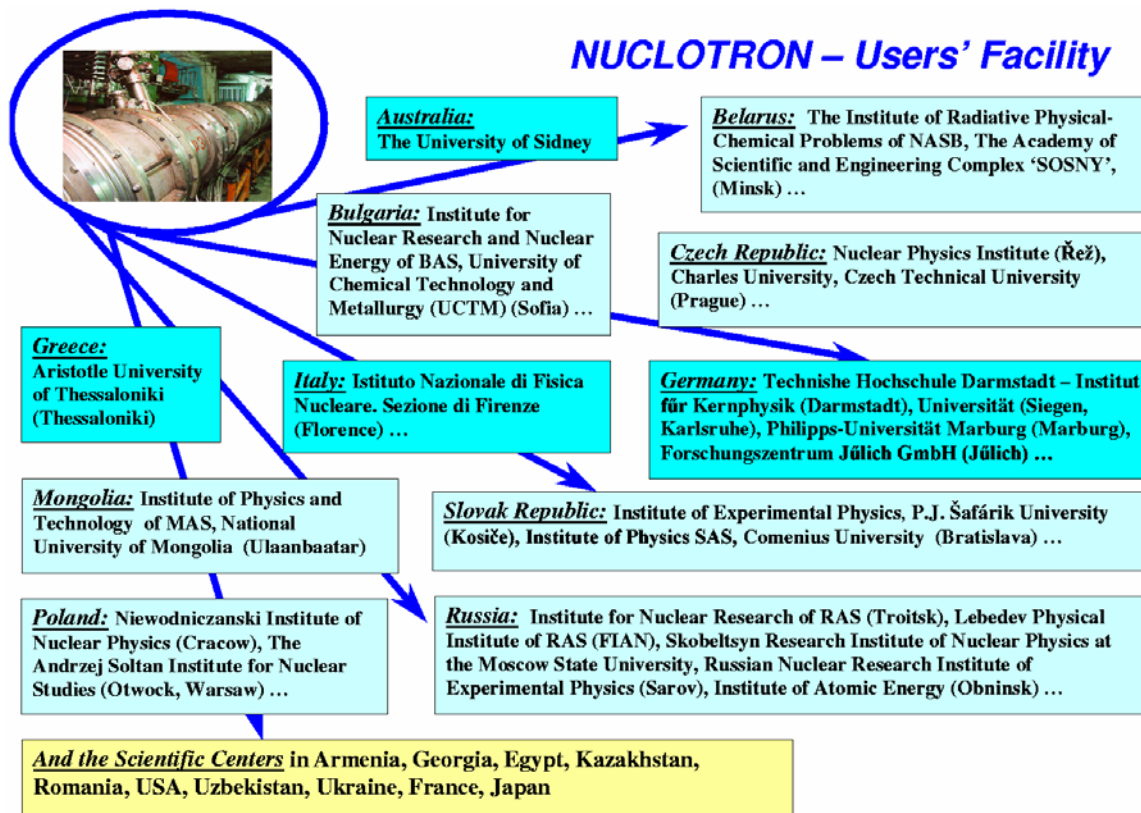
# LONG-TERM RESEARCH PROGRAMME

## Relativistic Nuclear Physics

Search for and study of the properties of strongly excited matter in relativistic and ultrarelativistic nuclear collisions

### Tasks

confinement,  
 colour,  
 mechanisms  
 of hadronization,  
 chiral symmetry  
 violation,  
 new state of matter,  
 and spin physics



**Nuclotron**

**Experiments  
with relativistic  
nuclei**



**Experiments  
with polarized  
beams**

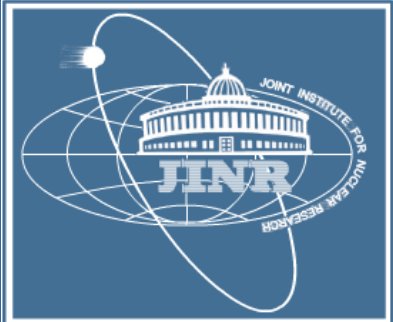


**Upgrade programme**

**Applied  
investigations**



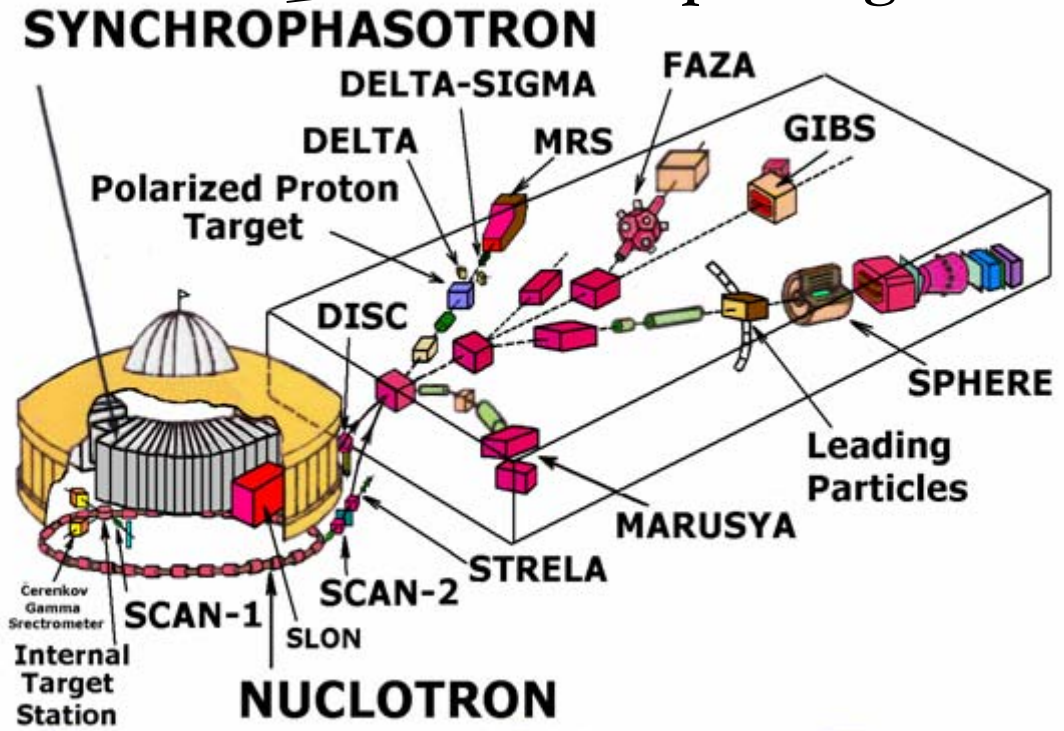




# LONG-TERM RESEARCH PROGRAMME

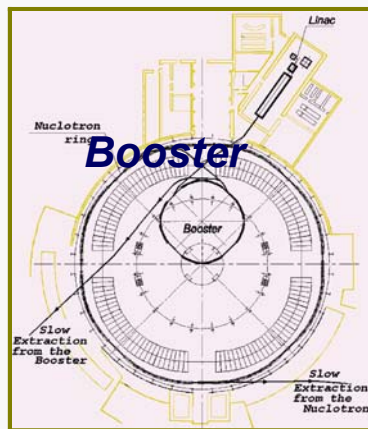
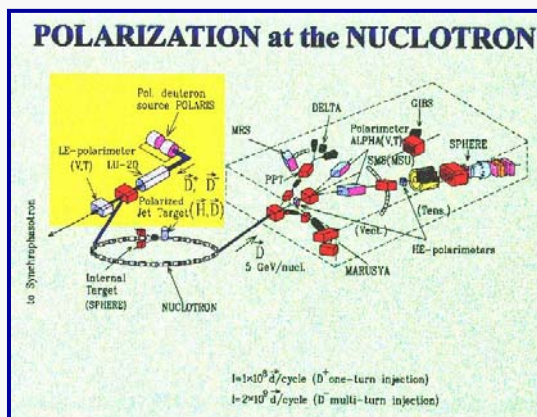
## Physics at the Nuclotron

Outphasing in 2003



# Development of the Nuclotron Accelerator Complex

## Injector complex



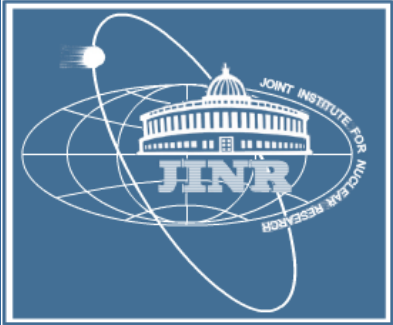
It is planned to upgrade the Nuclotron and establish on its territory a user centre for relativistic nuclear physics and applied research using relativistic ions with the energy of several GeV per nucleon.

## Superconductive beam lines



Now: 8-13 MW

Superconductive: ~280 kW

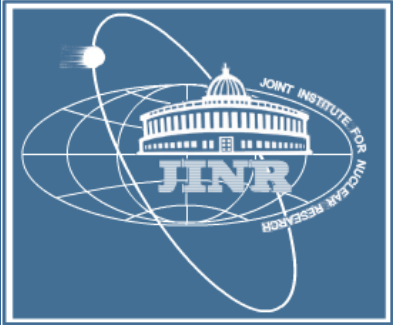


# LONG-TERM RESEARCH PROGRAMME

## Heavy-Ion Physics

### The main fundamental and applied tasks:

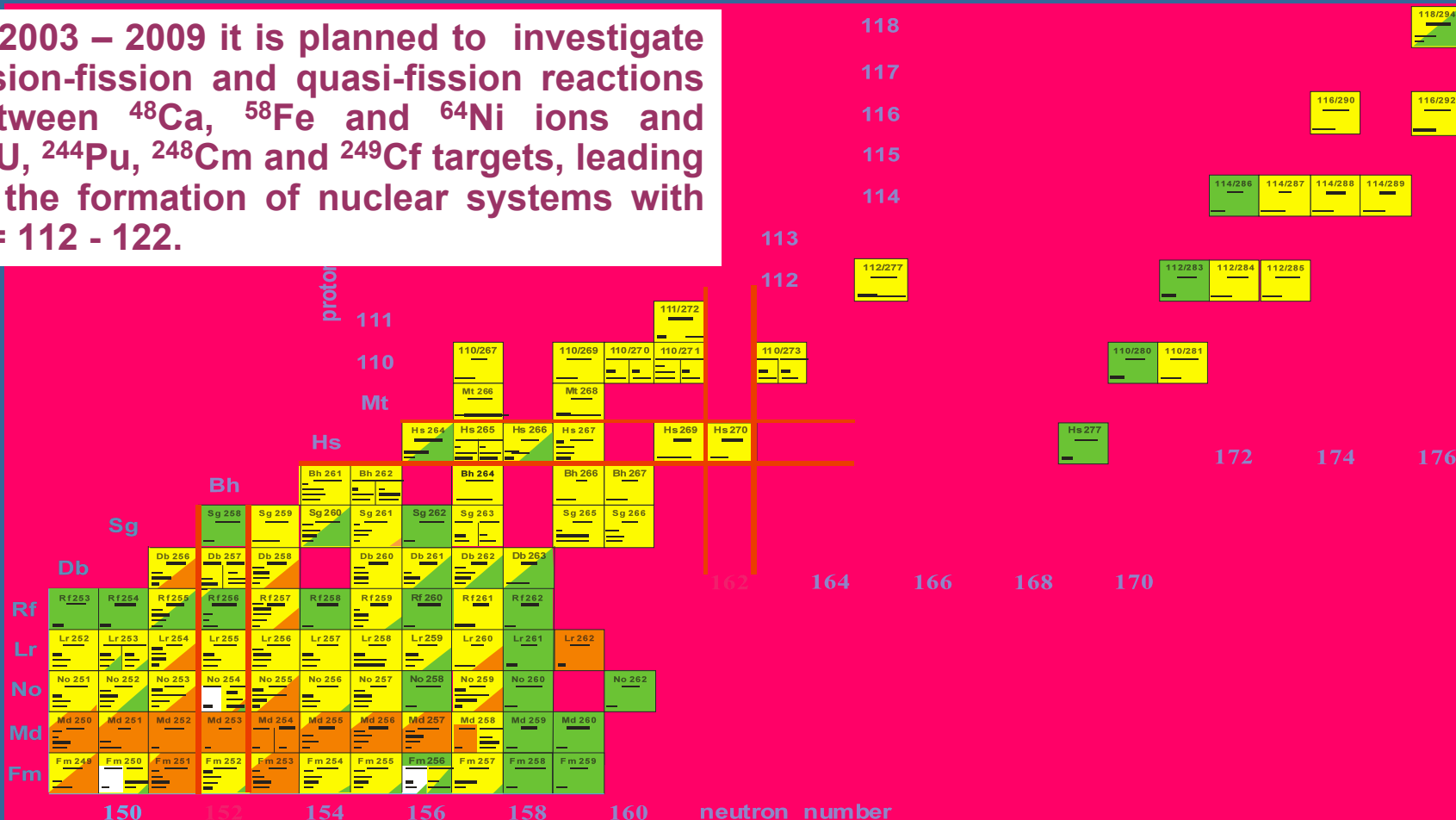
- the stability of super-heavy nuclei and the boundaries of the existence of elements in nature
- the structure and properties of the lightest elements close to and beyond neutron and proton drip-lines
- the interaction mechanism for composite nuclei
- advancements in acceleration technologies, creation of new materials, etc.

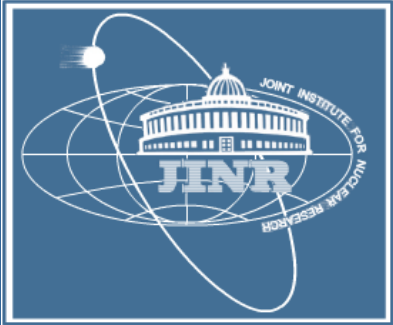


# LONG-TERM RESEARCH PROGRAMME

## Heavy-Ion Physics

In 2003 – 2009 it is planned to investigate fusion-fission and quasi-fission reactions between  $^{48}\text{Ca}$ ,  $^{58}\text{Fe}$  and  $^{64}\text{Ni}$  ions and  $^{238}\text{U}$ ,  $^{244}\text{Pu}$ ,  $^{248}\text{Cm}$  and  $^{249}\text{Cf}$  targets, leading to the formation of nuclear systems with  $Z = 112 - 122$ .

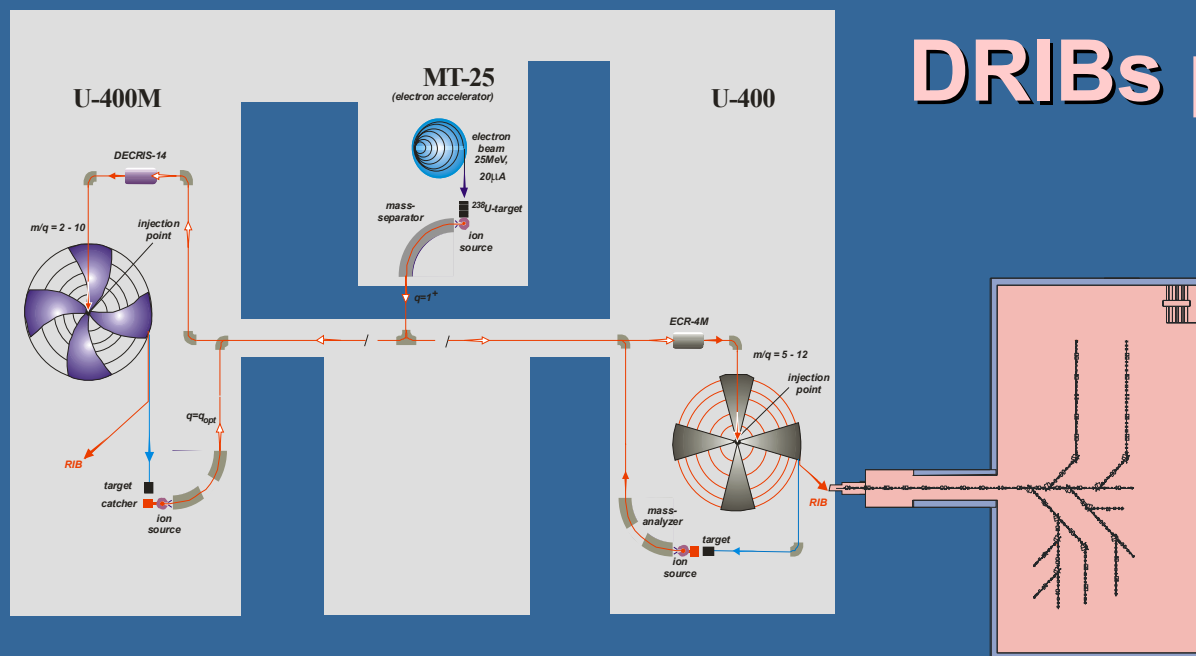




# LONG-TERM RESEARCH PROGRAMME

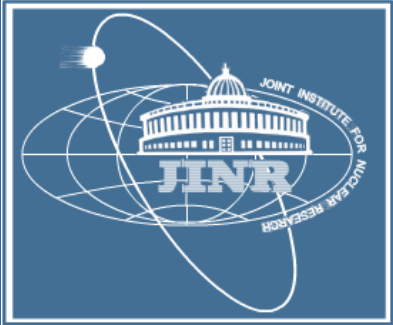
## Heavy-Ion Physics

Intense beams of ions of stable and radioactive isotopes



## DRIBs project

Secondary beams of 25-35 MeV/AMU of  ${}^6,8\text{He}$ ,  ${}^9,11\text{Li}$ ,  ${}^{12,14}\text{Be}$ ,  ${}^8\text{B}$  nuclei were produced using primary U400M cyclotron beams, and first experiments with accelerated ions of exotic radioactive isotopes started at JINR.

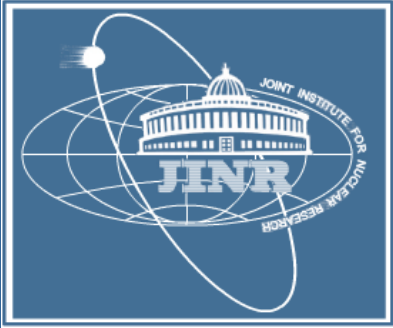


# LONG-TERM RESEARCH PROGRAMME

## Heavy-Ion Physics

**It is proposed to keep three traditional directions in heavy-ion physics research at JINR**

- **Synthesis of new nuclei and study of nuclear properties and heavy-ion reaction mechanisms using ion beams of stable and radioactive isotopes.**
- **Development of the U400+U400M cyclotrons + MT25 microtron Complex for producing intensive beams of accelerated ions of stable and radioactive Isotopes (DRIBs project).**
- **Radiation effects and modification of materials, radioanalytical and radioisotopic investigations with heavy ions, applied research.**



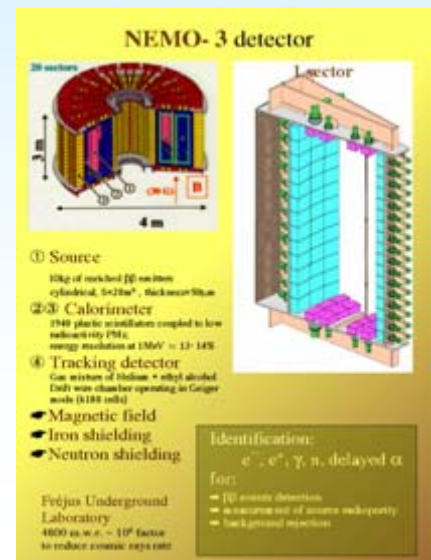
# LONG-TERM RESEARCH PROGRAMME

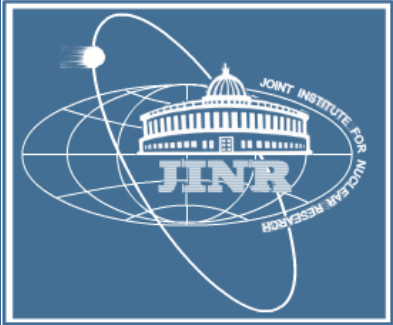
## Low- and Intermediate-Energy Physics

### Aims:

- fundamental physics phenomena and processes in nuclear physics
- rare decays of elementary particles and nuclei
- non-accelerator particle physics.

The key tasks in non-accelerator particle physics, astrophysics, and cosmology are investigations of the neutrino nature and its properties. The shortest way to gaining important information in this area is the study of the neutrinoless double beta decay of nuclei (projects NEMO, TGV, GENIUS, and MAJORANA).





# LONG-TERM RESEARCH PROGRAMME

## Low- and Intermediate-Energy Physics

### Rare processes

**PIBETA (PSI, Switzerland), FAMILON (Phasotron, JINR)**

The ground of low- and intermediate-energy particle physics is the study of extremely rare electroweak processes to verify predictions and to reveal applicability limits of the Standard Model of particle physics as well as to search for so-called “new physics”, which requires explicit going beyond the present concepts.





**TOPIC A**

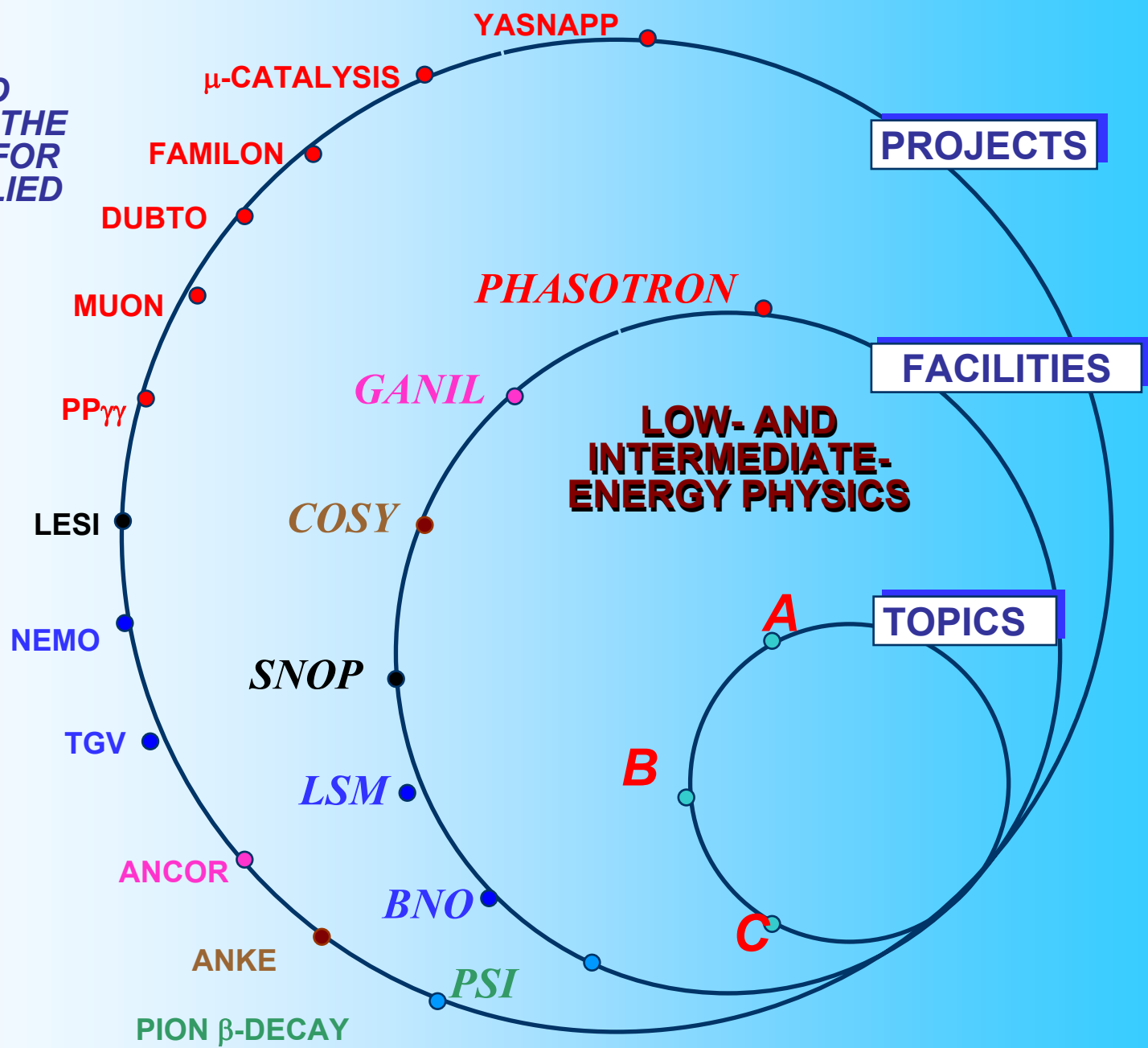
IMPROVEMENT AND DEVELOPMENT OF THE LNP PHASOTRON FOR PHYSICS AND APPLIED INVESTIGATIONS

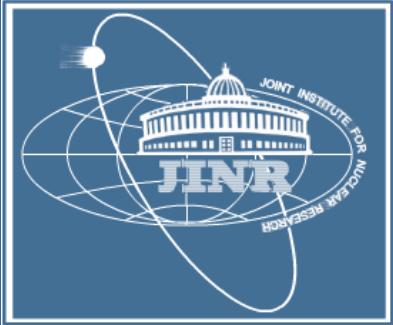
**TOPIC B**

NUCLEUS AND PARTICLE INTERACTION AT INTERMEDIATE ENERGIES

**TOPIC C**

INVESTIGATION OF FUNDAMENTAL INTERACTIONS IN NUCLEI AT LOW ENERGIES





# LONG-TERM RESEARCH PROGRAMME

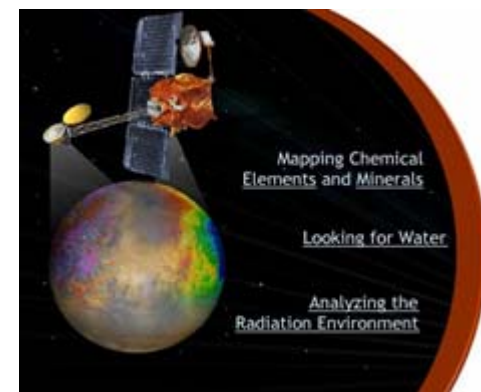
## Nuclear Physics with Neutrons

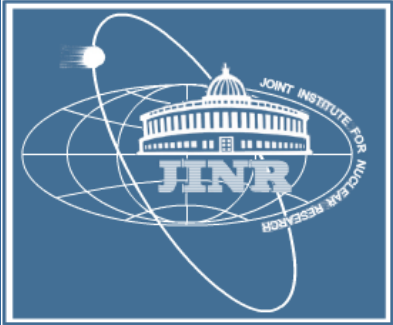
### Fundamental Investigations

- T-violation search in neutron-induced reactions
- Direct measurements of  $nn$  scattering length
- Experiments with ultracold neutrons
- Neutron-electron interaction studies
- Experimental and theoretical studies of nuclear fission

### Applied Investigations

- Neutron activation analysis at IBR-2 - environmental studies
- Novel-type neutron detectors and its applications (*Mars Odyssey 2001* mission)

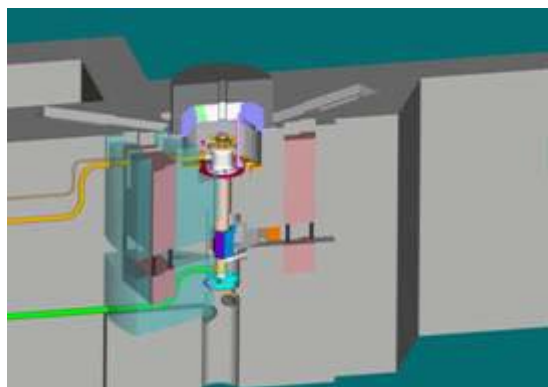




# LONG-TERM RESEARCH PROGRAMME

## Nuclear Physics with Neutrons

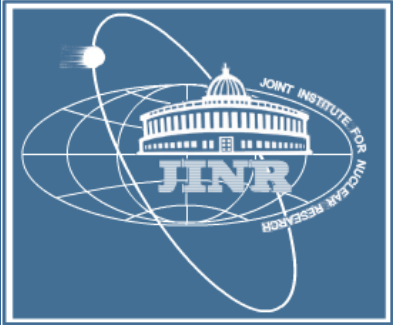
### Plan for Creation and Operation of IREN source



#### Main Parameters:

- Electron beam energy – 200 MeV
- Neutron flux –  $10^{15}$  n/s
- Neutron pulse duration – 400 ns
- Repetition rate – 150 Hz

2003	2004	2005	2006	2007-2009	
Creation and start, first stage					1272 K\$
		Full completion			350 K\$
Modernization of spectrometers					950 K\$
				Data taking	760 K\$



# LONG-TERM RESEARCH PROGRAMME

## Condensed Matter Physics

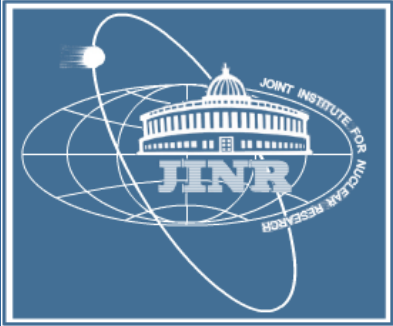
### Scientific Research

- **Nanostructures. Biopolymers. Fullerenes in solutions. Medicobiological applications**
- **Systems with strong electron correlations. Magnetism of layered nanostructures and organic compounds**
- **Crystalline structure and defects in constructional materials for nuclear power engineering**

### Experimental Methods

- **Neutron optics with polarized and cold neutrons. Reflectometry and small-angle scattering**
- **Diffraction of internal stresses and textures of materials**
- **High-efficiency neutron detectors**





# LONG-TERM RESEARCH PROGRAMME

## IBR-2 Reactor Modernization Programme

**IBR-2 is included into 20 years' strategic programme of neutron scattering research in Europe.**

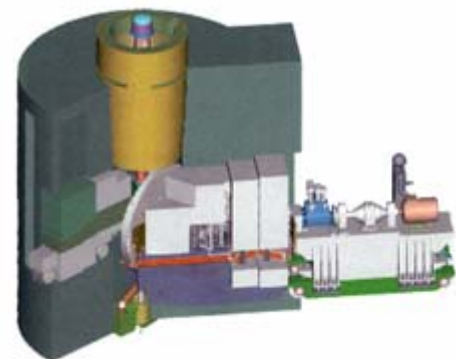
### Main Parameters:

Peak power in pulse – 1500 MW (2000 MW after modernization)

Flux in moderator –  $2.4 \cdot 10^{16} \text{ n cm}^{-2} \text{ s}^{-1}$

Pulse width – 200  $\mu\text{s}$

*Purposes of modernization: higher nuclear safety, operation reliability and stability, longer life-time of major equipment*

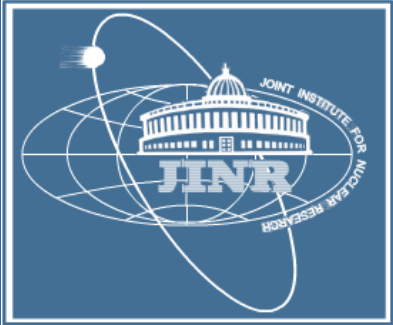


$\Sigma_{2003-2009} = \text{k\$ } 4,620$

JINR = k\$ 2,100

MAE = k\$ 2,520

2003	2004	2005	2006	2007	2008	2009	2010
	IBR-2 operation						
MR-3							
Fuel elements							
Manufacturing of main equipment							
				Disassembly			
					Equipment Installation		
						IBR-2M startup	

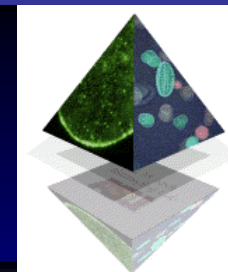


# LONG-TERM RESEARCH PROGRAMME

## Radiation and Radiobiological Research

### ***The main areas of research:***

- Radiation biology
- Biophysics of photo-biological processes (new)



### **Radiation biology**

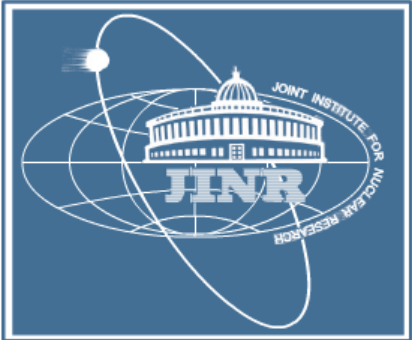
#### **The main tasks:**

- *low doses of irradiation*
- *molecular mechanisms of induced mutagenesis*
- *cancer risk assessment under low doses*
- *improvement of targeted therapy methods*

### **Biophysics of photo-biological processes**

#### **The main tasks:**

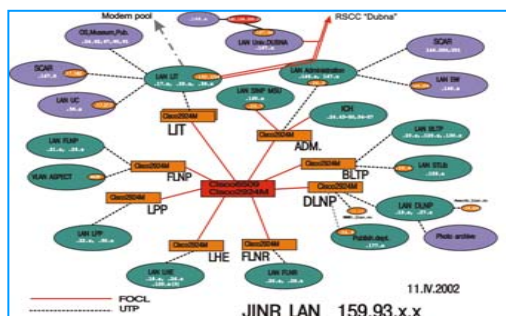
- *molecular mechanisms of photo-reception*
- *mechanism of cataract genesis induced by heavy charged particles*
- *effects of heavy ion irradiation on retina and rhodopsin*



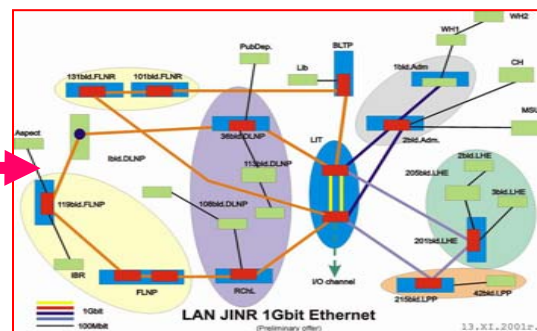
# LONG-TERM RESEARCH PROGRAMME

## Networking, computing and computational physics

General lines should be construction of the **1 Gbps JINR Local Area Network** and organization of **external communication links up to 1 Gbps** that should correspond to the latest technological advances.

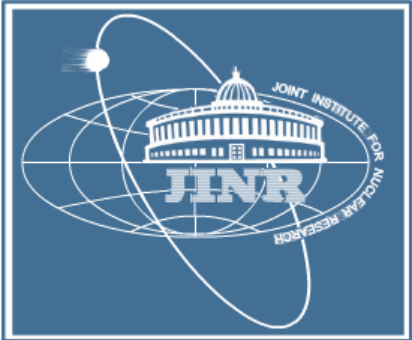


1 Gbps



JINR Computer Communication Links

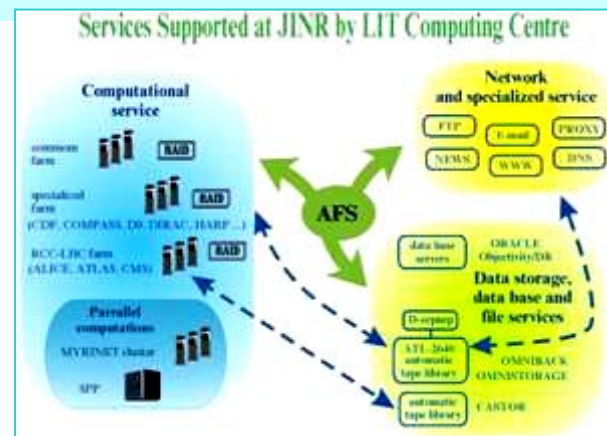




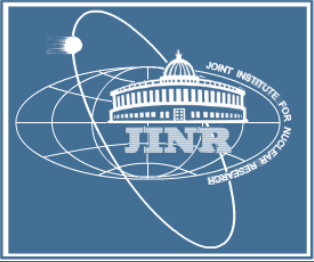
# LONG-TERM RESEARCH PROGRAMME

## Networking, computing and computational physics

The **high-speed backbone** with effective **security and data flow management** system connected to high-speed communication links of the scientific **computer network of the new generation** will provide a way for creating at JINR a system of **distributed computations, data processing and data storage** that completely correspond to the global up-to-date tendencies in the area of information technologies.







# LONG-TERM RESEARCH PROGRAMME

## Accelerator Physics and Engineering

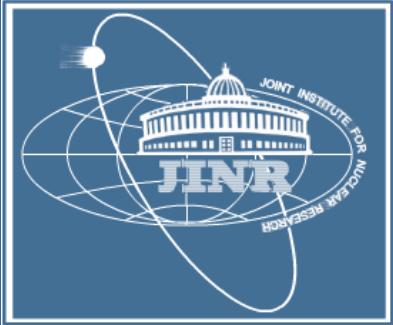
### APPLIED RESEARCH

Upgrading of the **PHASOTRON** and its beam lines in 2002–2007 is aimed at increasing the intensity of secondary beams by a factor of 5–10 for experimental investigation of  $\mu$ -capture, study of rare decays,  $\mu$ SR investigation of condensed matter, etc.

R&D and simulation investigations of the electronuclear method of energy production and radioactive waste transmutation (project **SAD**).

The project **LEPTA** is aimed at constructing an electron-cooled positron storage ring. It will allow to conduct experiments on measurement of the ortho- and parapositronium parameters, to carry out direct precise measurement of the charge difference between the electron and the positron etc.

The project **DELSY** - a third-generation synchrotron radiation source.

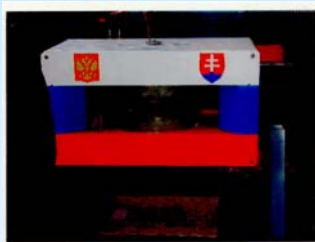


# LONG-TERM RESEARCH PROGRAMME

## APPLIED RESEARCH

### New Accelerators for Nuclear Medicine and High Technologies

#### Cyclotron DC-72 (72 MeV protons, heavy ions) Cyclotron Centre of Slovak Republic, Bratislava, 2001-2006

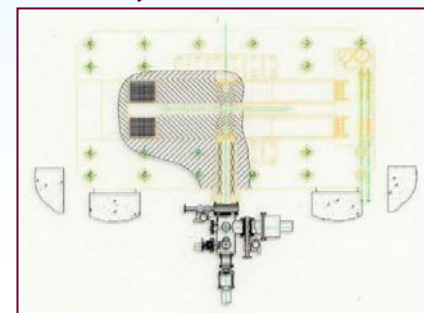


Model of the DC-72 magnet

- production of radioisotopes for nuclear medicine
- beam therapies
- new technologies using heavy ion beams (new composite materials, track membranes, etc.)

#### Cyclotron DC-60 (heavy ions with $E=0.2-1.5$ MeV/A) Interdisciplinary Cyclotron Centre, Astana, Kazakhstan, 2002-2004

- semi-industrial, technological facilities for micro- and nanoelectronics, biotechnologies and medicine
- basic and applied research in atomic physics, new materials



# JINR Educational Programme



**Training and education  
of highly skilled young  
staff for the Institute  
and its Member States**

**Education and  
professional training:**

- a) physicists: students  
and postgraduates;**
- b) engineering staff;**
- c) technical staff.**

**The outreach  
activity of the  
Institute**

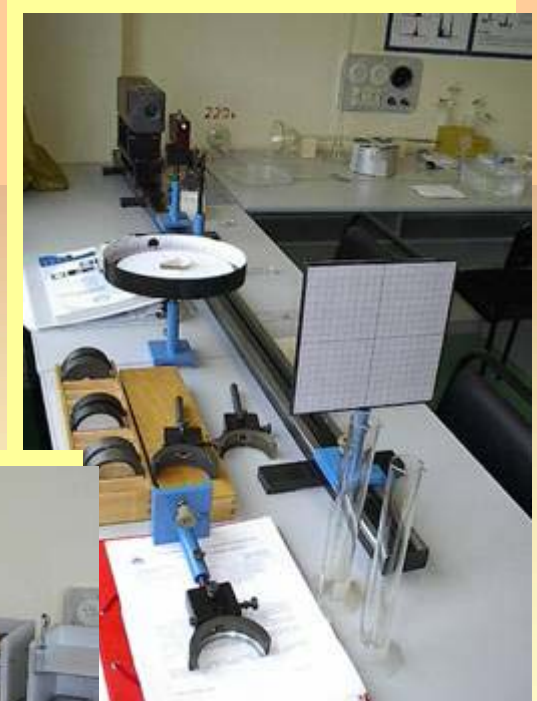
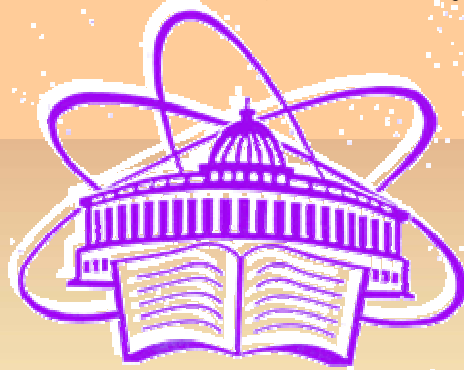


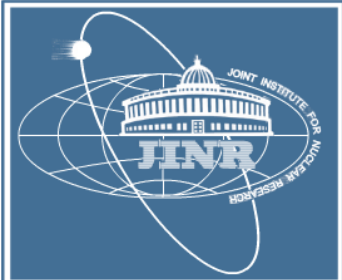
**The educational activities:  
active cooperation with higher education institutions,  
including:**

- Moscow State University**
- Moscow Engineering Physics Institute**
- Moscow Institute of Physics and Technology**
- Moscow Institute of Radio Engineering, Electronics and Automatics**
- Moscow Power Engineering Institute**
- Adam Mickiewicz University (Poznan)**
- Czech Technical University (Prague)**
- Slovak Technical University (Bratislava)**
- Tver State University**
- Saratov State University**

**and other universities of JINR Member States including  
Dubna educational institutions (Dubna University, Dubna Branches of  
MSU and MIREEA, etc.)**

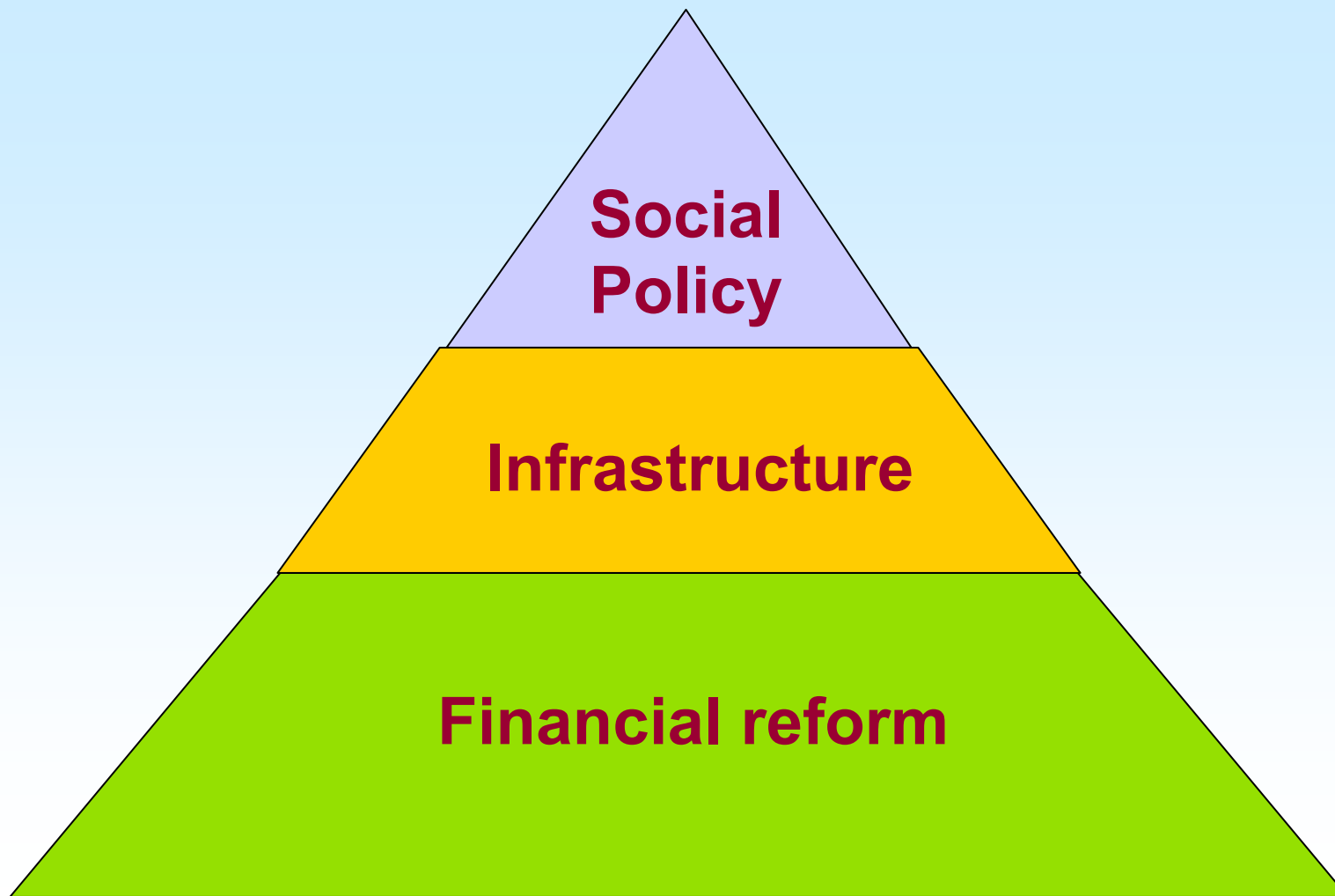
To attract youth to science, efforts must be made to realize the idea of **continuous education** extending over the secondary school, higher education institution, and research institution. The UC has already made the first steps in this direction: a physics practicum is being developed for school students.

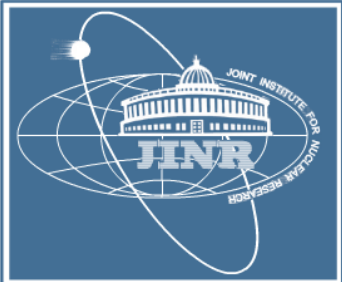




# LONG-TERM RESEARCH PROGRAMME

## Main Directions of the Reforms

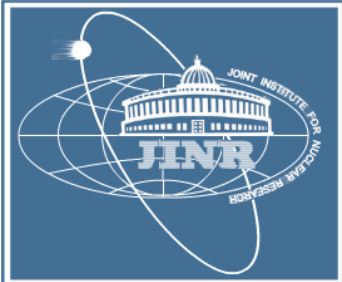




# LONG-TERM RESEARCH PROGRAMME

## Financial reform

- 1. Basic regulation documents** – improvement and adoption
- 2. Member States' contributions and settling of debts** – development of an efficient technique of calculating
- 3. Budget income and expenditure** – achievement of transparency, introduction of international standards of cost accounting
- 4. Financial Intranet** – provision with financial information for Committee of Plenipotentiaries, Finance Committee, Directorate and Laboratories
- 5. Member States' status and participation** – working out of the different forms of the participation in the activity of JINR
- 6. Technology transfer** – more effective use of intellectual property and venture financing of applied research.



# LONG-TERM RESEARCH PROGRAMME

## Financial regulation

- *Contributions and debts*
- *Financial regulation documents*
- *Different forms of the Member States' status and participation in the JINR activities*

ОИЯИ / ФК / 27 ноября 2002 г.

ОБЪЕДИНЕННЫЙ ИНСТИТУТ ЯДЕРНЫХ ИССЛЕДОВАНИЙ  
JOINT INSTITUTE FOR NUCLEAR RESEARCH

Предназначено

Процедура голосования

Для принятия	Рабочая группа Комитета полномочных представителей по выработке стратегии формирования проекта бюджета и долевого вноса в бюджет ОИЯИ. Заседание 27.11.2002	Единогласно
Для рекомендации КПП	Финансовый комитет Заседание февраль 2003 г.	2/3 присутствующих, имеющих право голосовать
Для утверждения	Комитет Полномочных представителей Сессия март 2003 г.	2/3 присутствующих, имеющих право голосовать

ПРОТОКОЛ  
совещания Рабочей группы Комитета  
полномочных представителей  
по выработке стратегии формирования  
проекта бюджета и долевого вноса в  
бюджет ОИЯИ

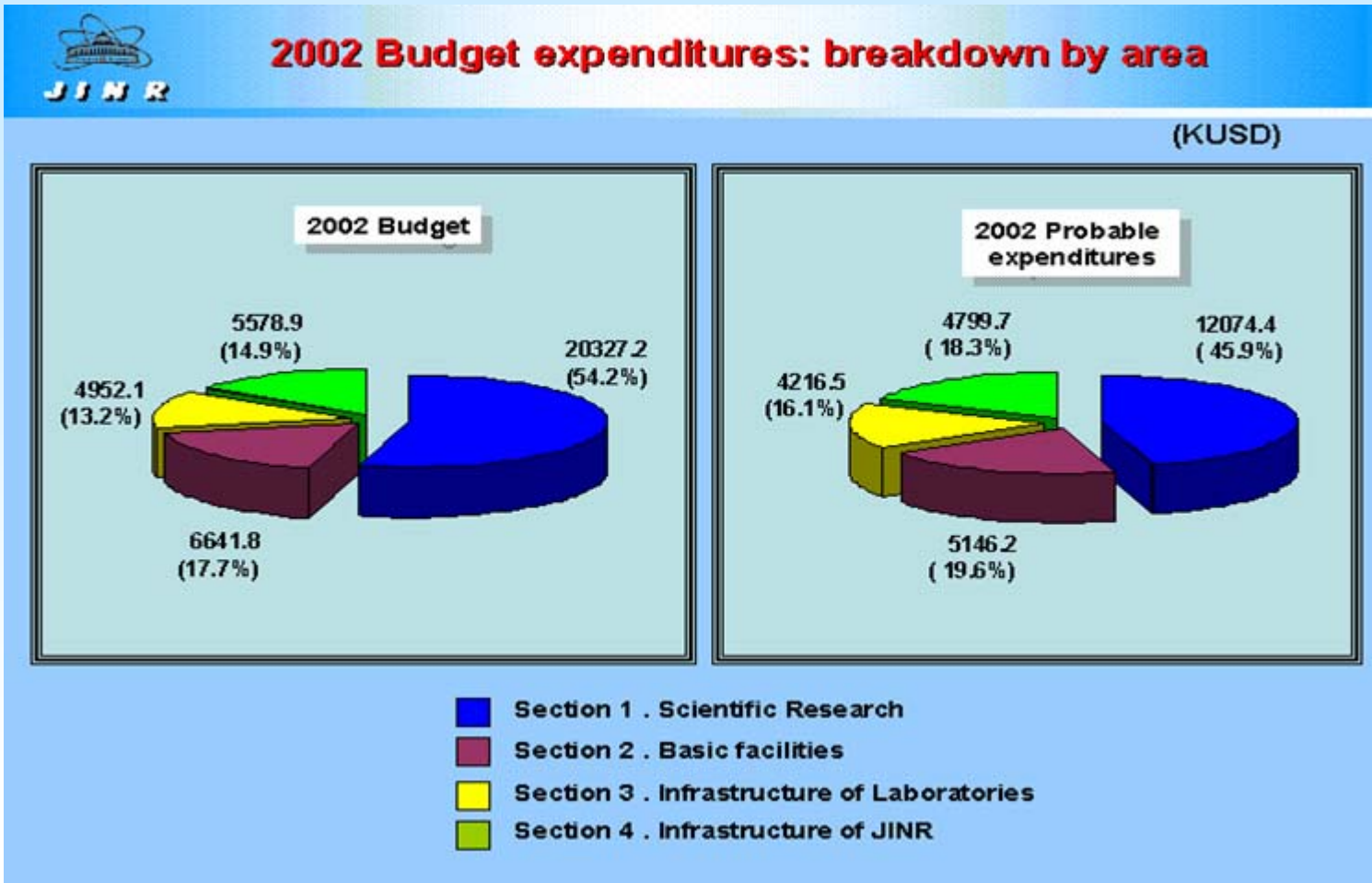
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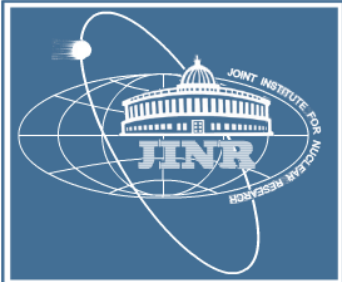




# LONG-TERM RESEARCH PROGRAMME

## Transparency of Budget Incomes & Expenditures

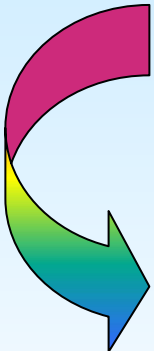




# LONG-TERM RESEARCH PROGRAMME

## Infrastructure

***The main tasks of development of JINR infrastructure are:***

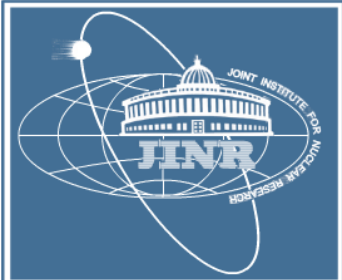


The preservation of the **international property** of the Institute's infrastructure



Attraction of **non-budgetary resources** and investments for the modernization of the infrastructure

**Optimization** of the use of buildings and facilities



# LONG-TERM RESEARCH PROGRAMME

## Infrastructure

### Self-Financing Divisions of JINR

#### **Self-Financing Divisions**

**Production**

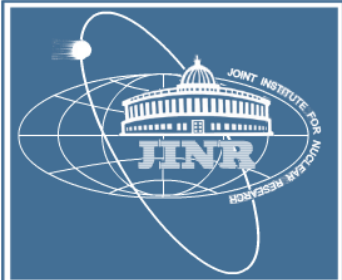
**Energy and water**

**Construction and repairs**

**Transportation**

**Hotel and restaurant services**

**Culture, sports facilities**

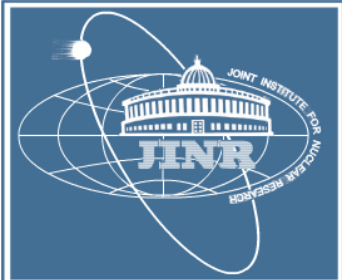


## Social Policy

### **Efficient social policy**

**requires a range of important transformations**

- stable and substantial increase of the salaries for all categories of personnel
- recruitment of young scientists and engineers
- provision of JINR staff members with housing
- pension insurance for the personnel
- introduction of modern tools of financial servicing
- development of cultural and sports facilities and medical services



# LONG-TERM RESEARCH PROGRAMME

## Financial resources

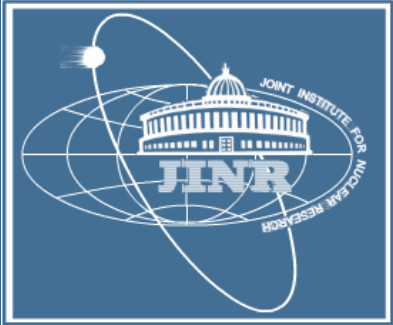
**The income and expenditure estimates are based on the following principles:**

- the Institute's stable budgetary incomes not less than M\$ 37.5 with annual increase in 2006-09 by 5%***
- the concentration of financial resources on the most important areas of scientific programme***
- optimization of the Institute's expenditure scheme, achievement of higher cost efficiency***

# BUDGET INCOME

*In 2003-2009 JINR is expected to develop at a stable level of budget income amounting to not less than MUSD 37.5*

Annual Budget							Total
2003	2004	2005	2006	2007	2008	2009	
37.5	37.5	37.5	39.4	41.3	43.4	45.6	282.2

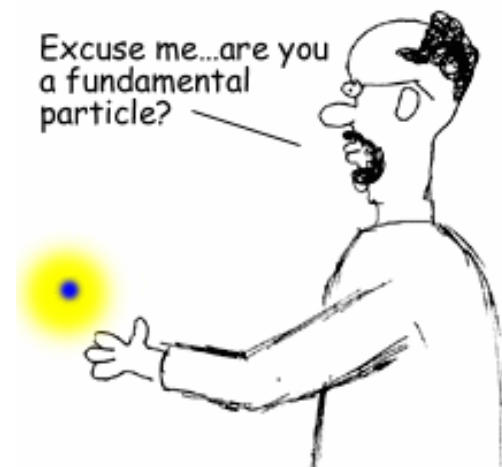


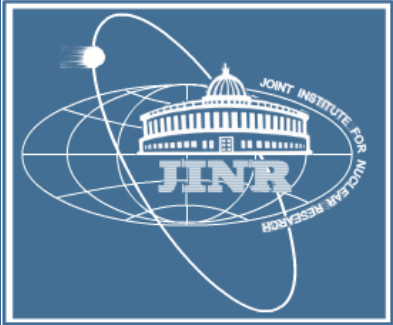
# LONG-TERM RESEARCH PROGRAMME

## CONCLUSIONS

### The Aims and Tasks of the Programme

As previously, the main aim of JINR's research activities **in 2003–2009** will consist in obtaining **new scientific knowledge** in elementary particle physics, nuclear physics, and condensed matter physics, as well as formulating and conducting theoretical and experimental research that significantly affects the development of the physics of fundamental interactions and of the modern concepts of the structure of matter.





# LONG-TERM RESEARCH PROGRAMME

## CONCLUSIONS

### The Aims and Tasks of the Programme

#### **All JINR's major research fields will be preserved**

Fields of Research	Share, %
Theoretical Physics	6.5
Elementary Particle Physics	17.0
Relativistic Nuclear Physics	16.5
Heavy-Ion Physics	18.0
Low- and Intermediate-Energy Physics	12.6
Nuclear Physics with Neutrons	4.3
Condensed Matter Physics	16.0
Radiation and Radiobiological Research	1.4
Networks and Computing	7.7
Educational Programme	*)
<b>Total</b>	<b>100.0</b>

\*) The Educational Programme is financed from the funds assigned for the fields of research taking into account actual enrolment.

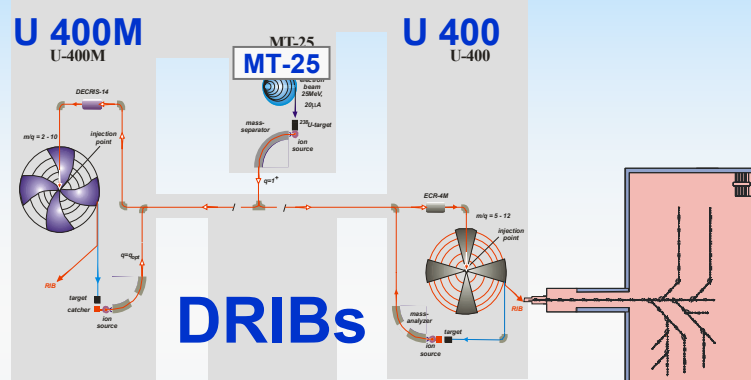


# In-House Facilities of JINR in 2009

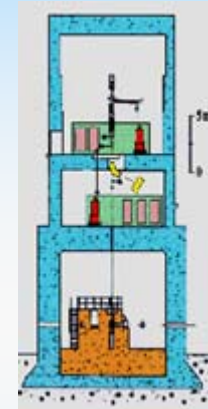
## FUNDAMENTAL RESEARCH



upgraded  
NUCLOTRON



modernized complex  
of heavy-ion cyclotrons

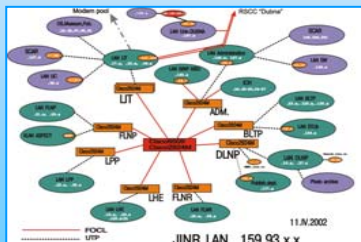


IREN

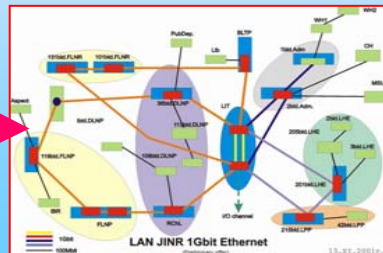


Upgraded  
IBR-2

## JINR's NETWORK



1  
Gbps



PHASOTRON  
DELSY (?)

Applied and basic  
research  
(nonbudgetary resources)

