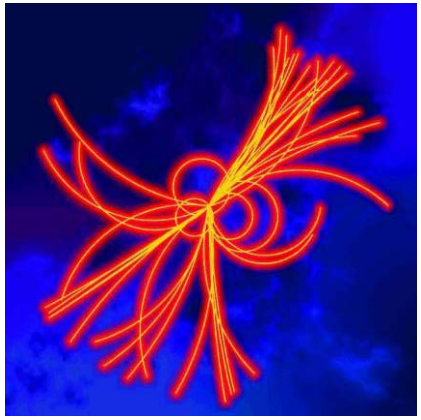
JINR future plans and participation in the ILC

- Joint Institute for Nuclear Research –
  International Intergovernmental Organization
- plans of ILC sitting in the Dubna region;
- participation of JINR in the ILC international activity



Grigori SHIRKOV, FNAL, December 12, 2007

International Intergovernmental Organization
Joint Institute for Nuclear Research

BİRLƏŞMİŞ NÜVƏ TƏDQİQATLARI İNSTITUTU

ՄԻՋՈՒԿԱՅԻՆ ՄԻՋԻԿԱՅԻՆ ՄԻԱՑՅԱԼ ԻՆՍՏԻՏՈՒՏ

АБ'ЯДНАНЫ ІНСТЫТУТ ЯДЗЕРНЫХ ДАСЛЕДАВАННЯЎ

ОБИДЕНЕН ИНСТИТУТ ЗА ЯДРЕНИ ИЗСЛЕДОВАНИЯ

VIỆN LIÊN HIỆP NGHIÊN CỨU HẠT NHÂN

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БІРІККЕН ЯДРОЛЫҚ ЗЕРТТЕУ ИНСТИТУТЫ

늘만힘지력연구소

INSTITUTO UNIFICADO DE INVESTIGACIONES NUCLEARES

INSTITUTUL UNIFICAT DE CERCETARI NUCLEARE

ЦӨМИЙН ШИНЖИЛГЭЭНИЙ НЭГДСЭН ИНСТИТУТ

ZJEDNOCZONY INSTYTUT BADAŃ JĄDROWYCH

ОБЪЕДИНЕННЫЙ ИНСТИТУТ ЯДЕРНЫХ ИССЛЕДОВАНИЙ

INSTITUTUL UNIFICAT DE CERCETARI NUCLEARE

SPOJENÝ ÚSTAV JADROVÝCH VÝSKUMOV

ЯДРОВИЙ ТАДҚИҚОТЛАР БИРЛАШГАН ИНСТИТУТИ

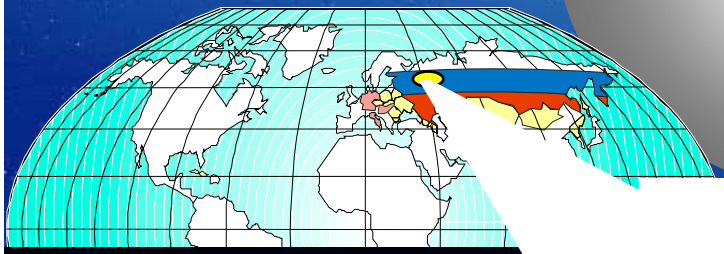
ОБ'ЄДНАНИЙ ІНСТИТУТ ЯДЕРНИХ ДОСЛИДЖЕНЬ

SPOJENÝ ÚSTAV JADERNÝCH VÝZKUMŮ

JOINT INSTITUTE for NUCLEAR RESEARCH

JINR 1956-2006 DUBNA

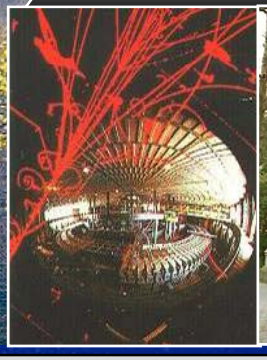
Russia



Moscow Region

Dubna

JINR

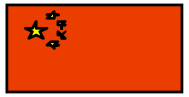


JOINT INSTITUTE for NUCLEAR RESEARCH

1956


Albania


Bulgaria


China


Czechoslovakia


GDR


Hungary


D.P.R.Korea


Mongolia

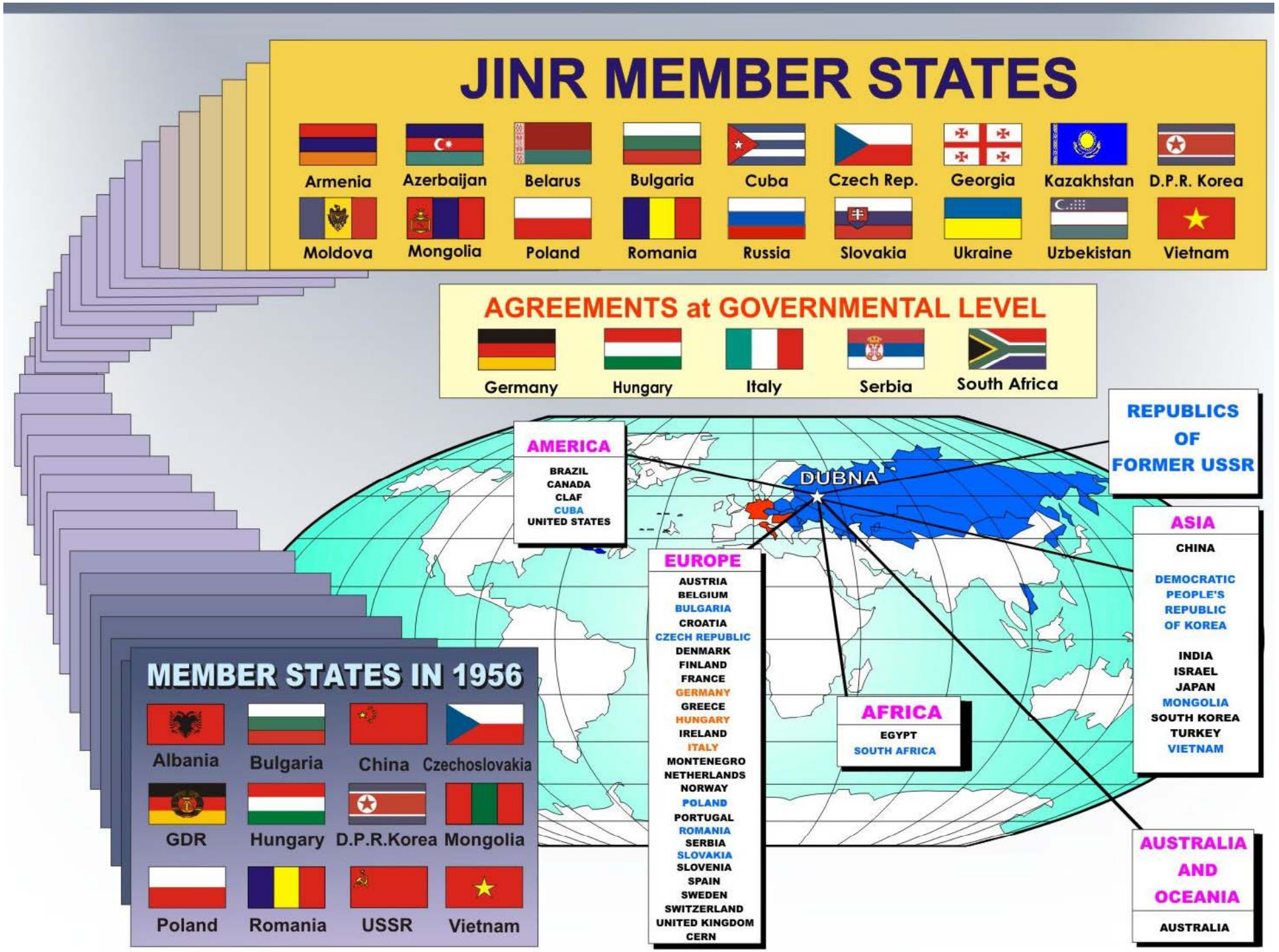

Poland


Romania

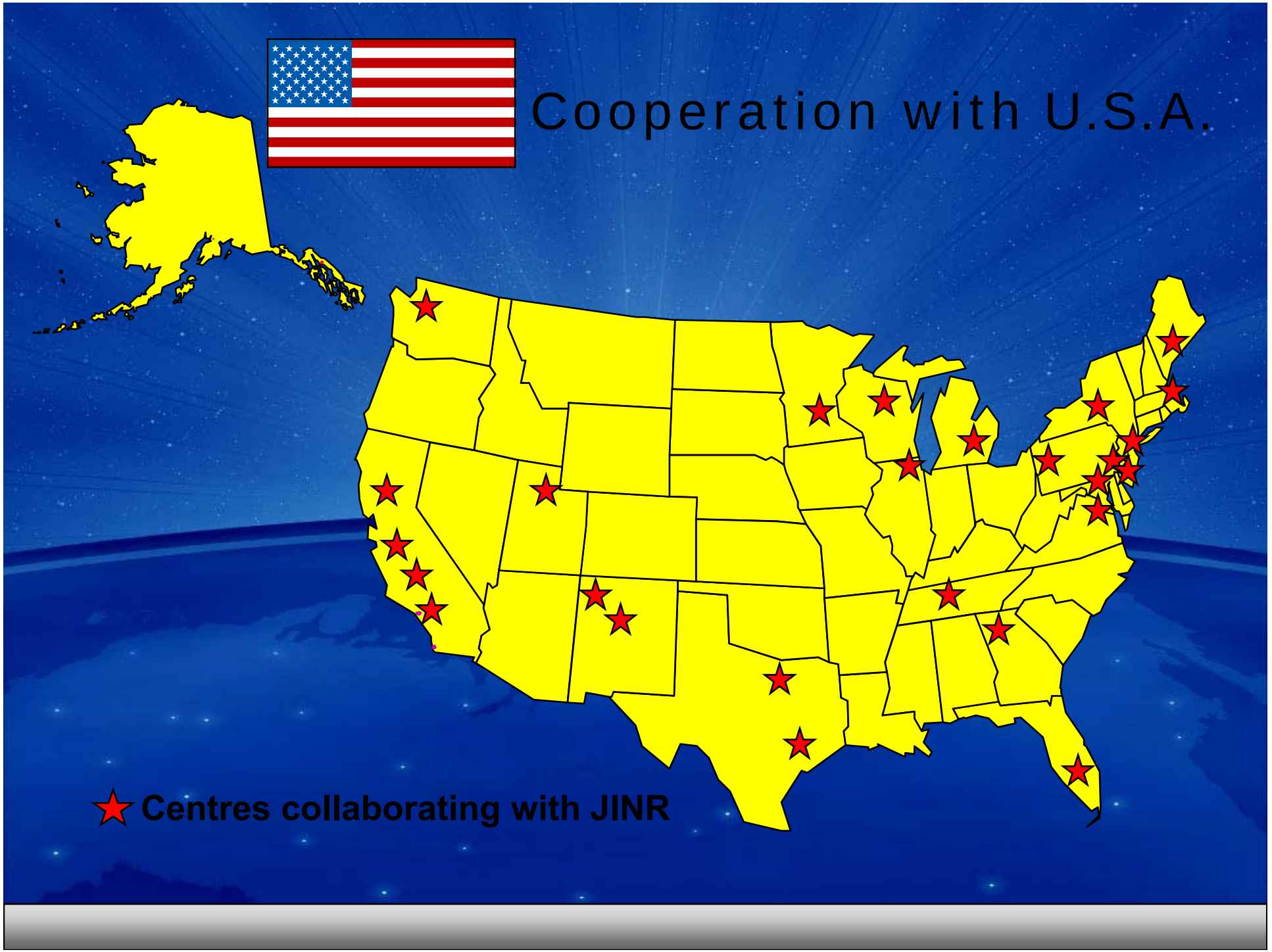

USSR


Vietnam

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


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
Germany
Hungary
Italy
Serbia
South Africa
REPUBLICS OF FORMER USSR
DUBNA
AMERICA
BRAZIL
CANADA
CLAF
CUBA
UNITED STATES
EUROPE
AUSTRIA
BELGIUM
BULGARIA
CROATIA
CZECH REPUBLIC
DENMARK
FINLAND
FRANCE
GERMANY
GREECE
HUNGARY
IRELAND
ITALY
MONTENEGRO
NETHERLANDS
NORWAY
POLAND
PORTUGAL
ROMANIA
SERBIA
SLOVAKIA
SLOVENIA
SPAIN
SWEDEN
SWITZERLAND
UNITED KINGDOM
CERN
ASIA
CHINA
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA
INDIA
ISRAEL
JAPAN
MONGOLIA
SOUTH KOREA
TURKEY
VIETNAM
AFRICA
EGYPT
SOUTH AFRICA
AUSTRALIA AND OCEANIA
AUSTRALIA
MEMBER STATES IN 1956
Albania
Bulgaria
China
Czechoslovakia
GDR
Hungary
D.P.R.Korea
Mongolia
Poland
Romania
USSR
Vietnam

Cooperation with U.S.A.

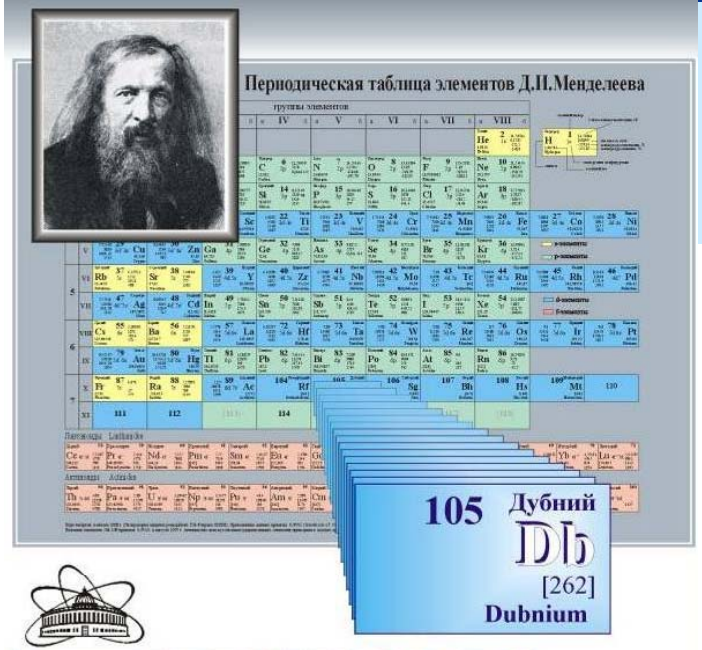


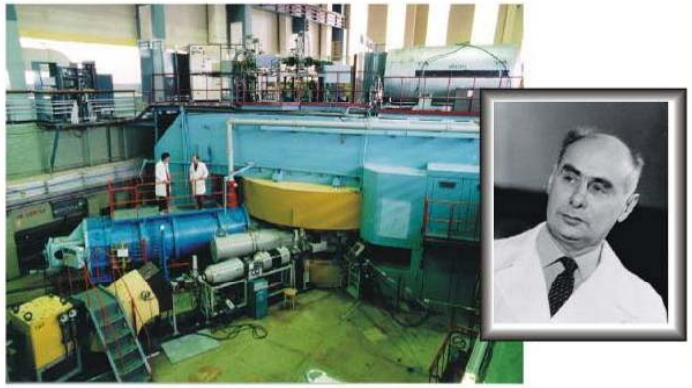
JINR's Scientific Partners in USA

- **Institutions:**
  - Fermi National Accelerator Laboratory
  - Brookhaven National Laboratory
  - Lawrence Berkeley National Laboratory
  - Argonne National Laboratory
  - Los Alamos National Laboratory
  - …
- **Universities:**
  - Boston, Baltimore, New York, Princeton, Florida, California, Michigan, Virginia, …

Discoveries

JOINT INSTITUTE for NUCLEAR RESEARCH





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

More than 40 discoveries, including:

- 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 – chemical identification of element 112

JINR – Russia Agreement

The Agreement was signed by V.Putin on his first working day as Acting President on 2 January 2000.

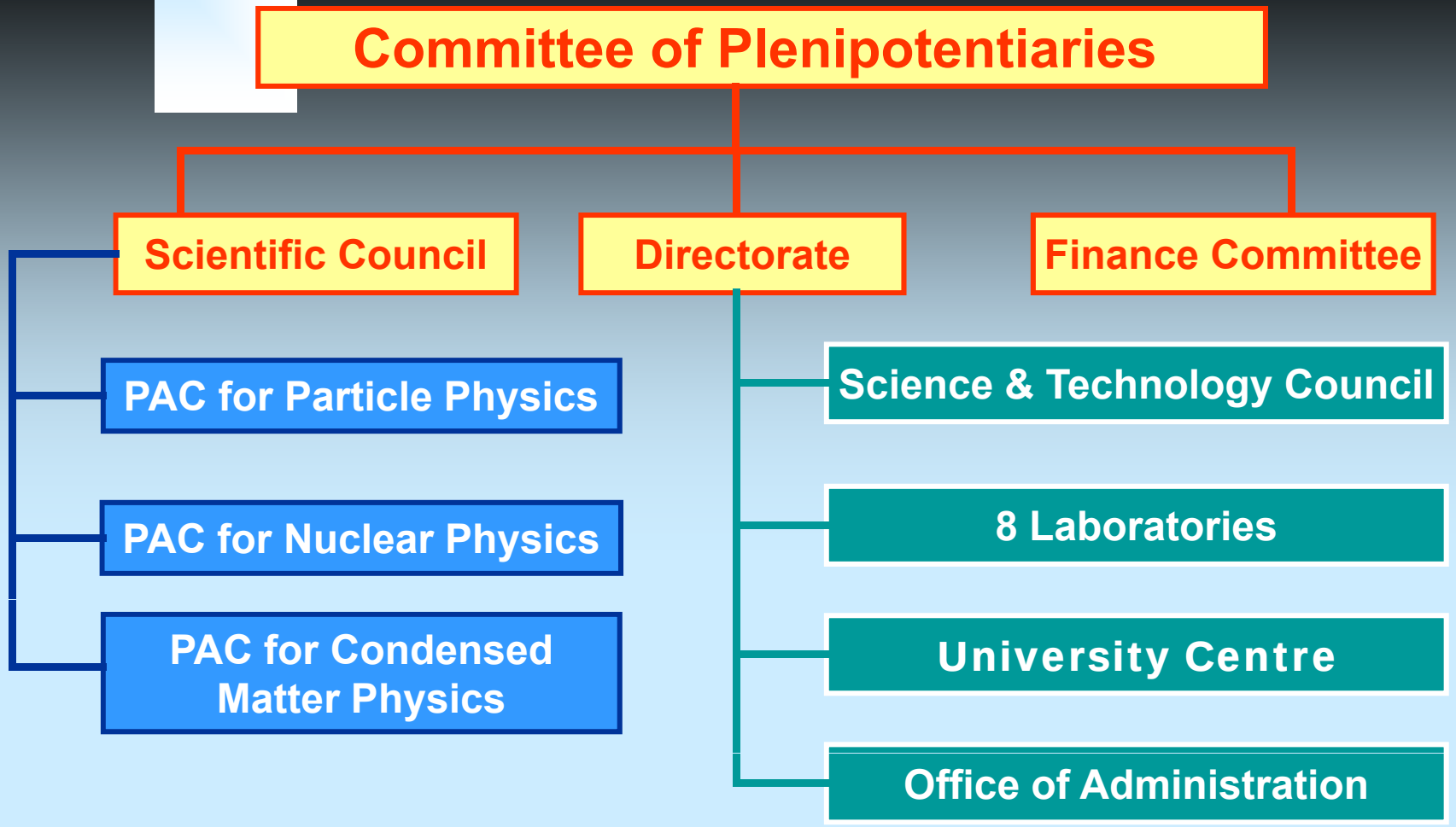
ЧЕТВЕРГ,
6 ЯНВАРЯ
2000 ГОДА
№ 4 (2368)

WWW.RG.RU

газета

On Ratification of the Agreement between the Government of the Russian Federation and the Joint Institute for Nuclear Research on the Location and Terms of Activity of JINR in the Russian Federation

Governing Bodies & Structure



Directorate of JINR

JINR Dubna

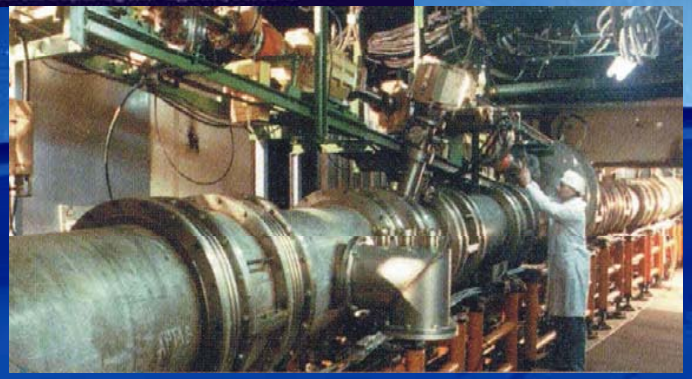
JINR in figures

8 laboratories
JINR's staff members ~ 5500
(~ 3500 in scientific divisions)
researchers ~ 1300
including from the Member States ~ 500 (but Russia)

Doctors of Science and PhD ~ 1000

JINR is a large multidisciplinary scientific centre incorporating:

- basic research in frontier particle, nuclear and condensed matter physics,



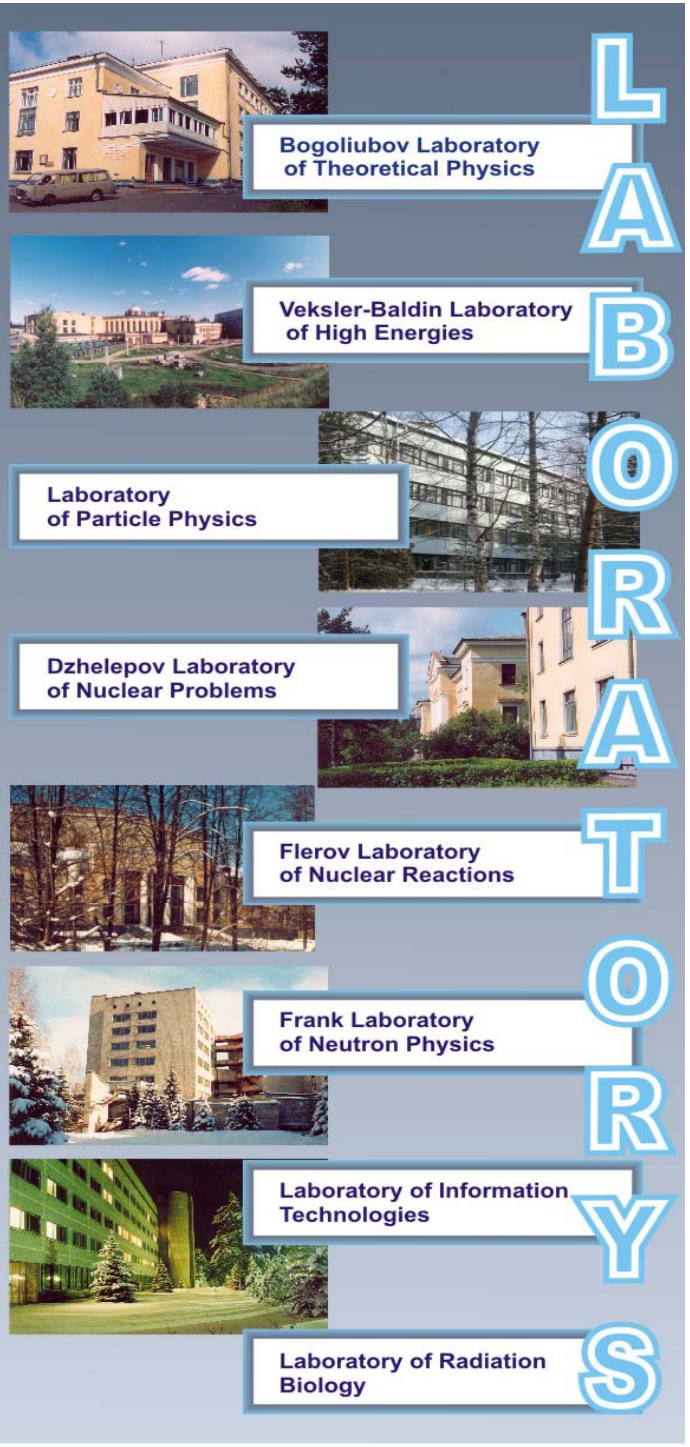
- development and application of high technologies, and

- university education in the relevant fields of knowledge.

JINR Dubna

Main Scientific Directions:

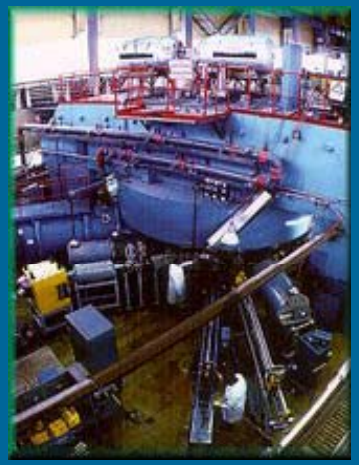
- High Energy Physics
- Nuclear Physics
- Condensed Matter Physics



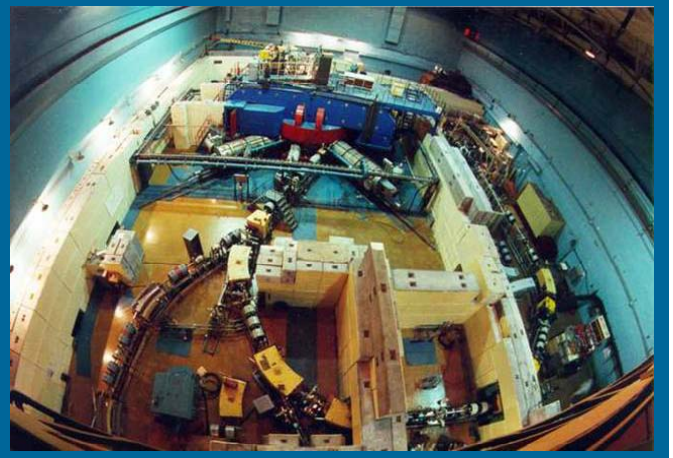
JINR Dubna

JINR's facilities

Nuclotron
(superconducting synchrotron)
has been operating since 1993



Cyclotron U400
has been operating since 1979

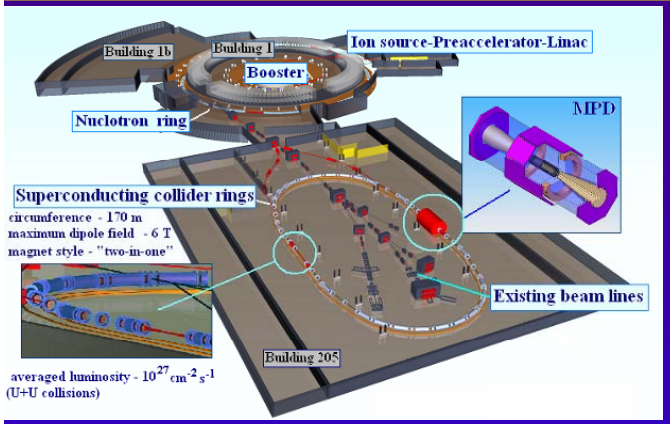


Cyclotron U400M
has been operating since 1993

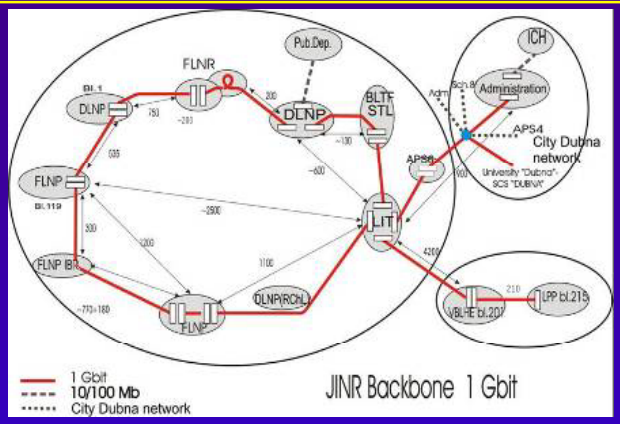
Phasotron (synchrocyclotron)
has been operating since 14.12.1949

Neutron pulsed source IBR-2
has been operating since 1984

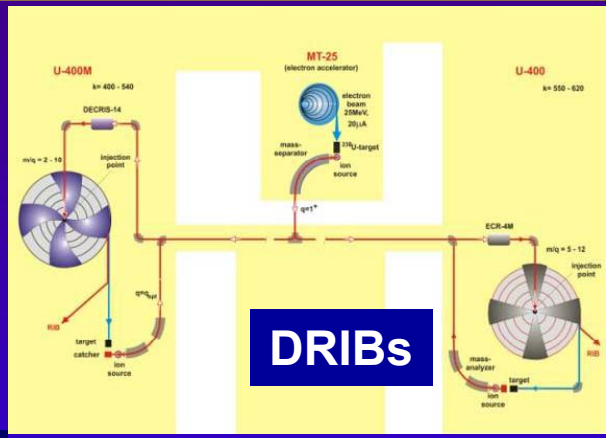
Upgrade of JINR Basic Facilities



Upgraded
NUCLOTRON (2009)
+
NICA

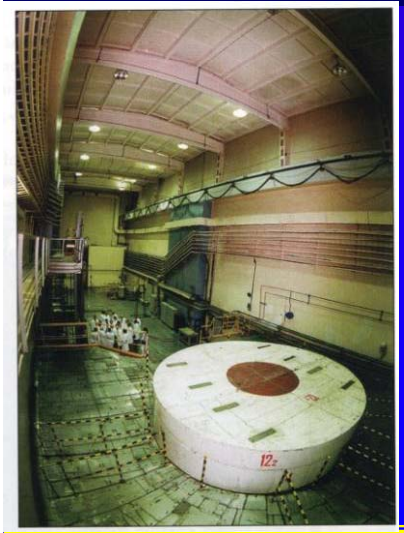


JINR networks,
including GRID technology



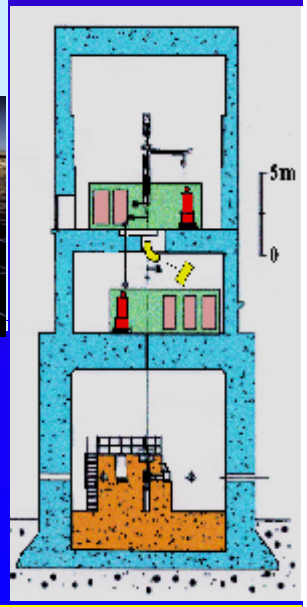
second phase 2009

Participating in LHC, FAIR, XFEL, ILC …

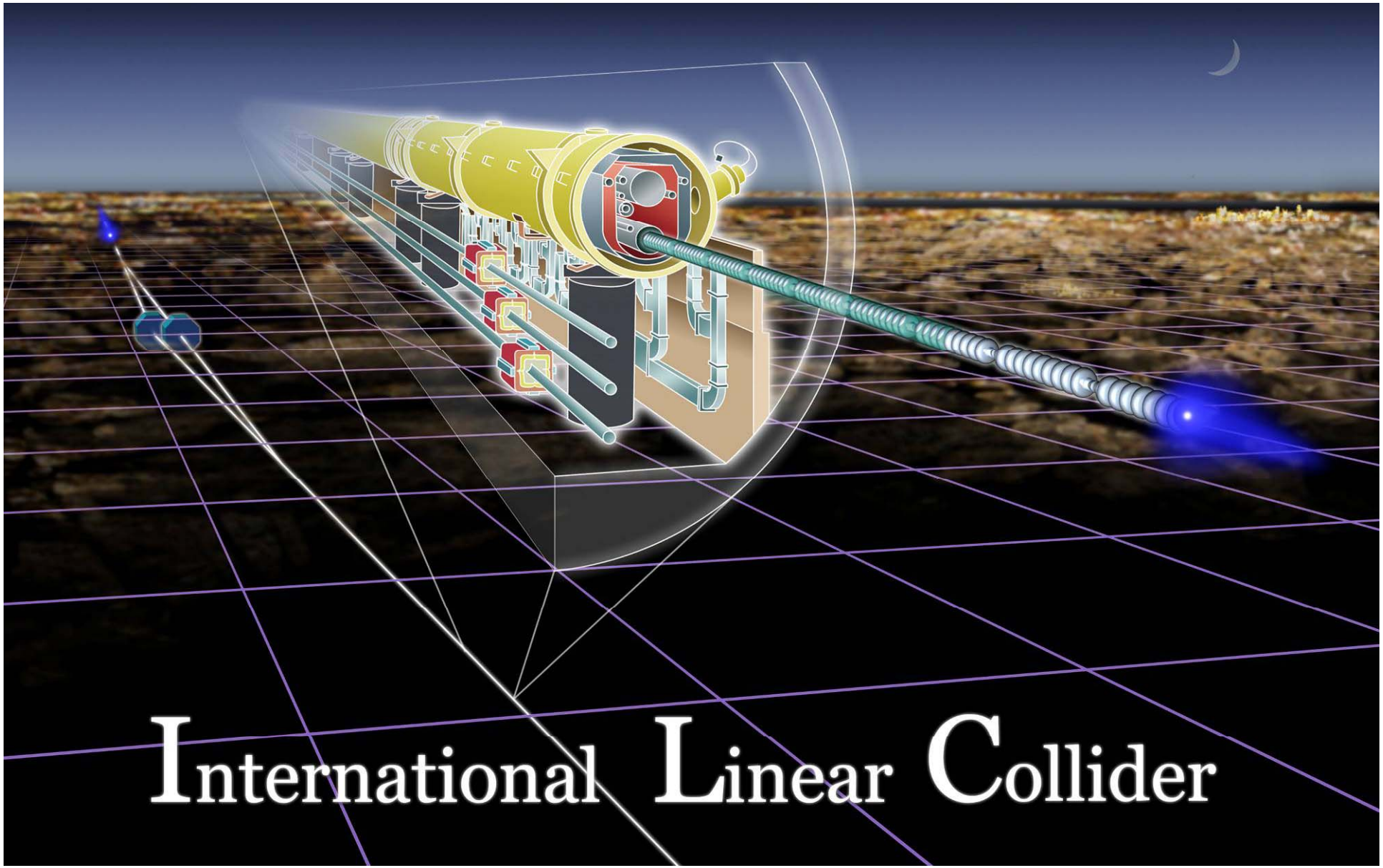


New reactor
IBR-2M
2010

IREN
first stage 2008



ILC Activity in Dubna



Milestones of ILC activity at JINR

Nov 2005 – **PAC Particle Physics** – proposal about ILC sitting in Russia, near Dubna;

Dec 2005 – **GDE, Frascatti** – the delegation of JINR and the first proposals of JINR participation in the Global Design Efforts and Dubna sitting;

Jan 2006 – **JINR Scientific Council** recommended ILC participation and Dubna sitting

Mar 2006 – **Committee of Plenipotentiaries** approved the SC recommendation;

Mar 2006 – **Dubna** visit of European GDE director Prof. B.Foster;

May 2006 – **GDE, DESY** – Detailed information from JINR of the Dubna sample site;

Aug 2006 – **GDE, Vancuver** – Documentation from JINR to BCD with RSPI estimation on CFS (Site Assessment Matrix);

Nov 2006 – **GDE, Valencia** – Documentation from JINR to officially submitted, Dubna site was approved as candidate.

Dec 2006 – **Nuclear Physics Section of RAS** - reports of A.Sissakian and G.Shirkov;

Apr 2007 – **Moscow region Governor** supported JINR initiative on ILC hosting and proposed to solve problems of region competence.

May 2007 – **Letter to the RF President V.V.Putin** signed by Yu.Osipov, B.Gromov, A.Sissakian in order to support of JINR initiative.

May 2007 – **GDE, Hamburg** –Agreement to create a joint workgroup DESY-JINR for project of technical solution for near-surface ILC localization.

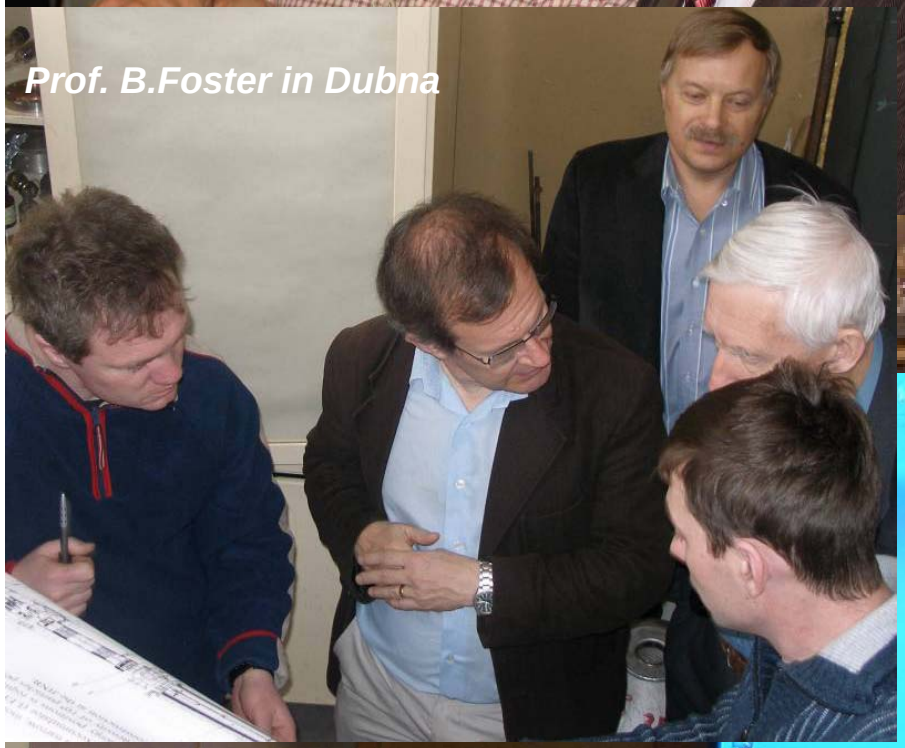
Jun 2007 – **Physics Branch of RAS -**report of G.Shirkov on ILC activity at JINR.

Sept 2007 –**Alushta, Crimea** - ILC Workshop;

GDE - the next European GDE and ILCSC will be in Dubna, June 2-6, 2008.

In Frascati

Prof. A.Wagner at LINAC-800



Prof. B.Foster in Dubna

Round table in Valencia

RDR: Sample Sites

For this reference design, three 'sample sites for the ILC were evaluated. Each site was required to be able to accommodate all the conventional facilities for the 500 GeV CM machine; in addition, the sites needed to have the sufficient length to support an upgrade of the machine to 1 TeV CM, assuming the baseline main linac gradient. There were two reasons for the use of three sample sites for this reference design:

- This procedure demonstrates that each region can provide at least one satisfactory site for the ILC. This is important, since it shows that any of the regions has the potential to be a host for the project.
- The cost of, and technical constraints on, the project could depend strongly on the site characteristics. Since the actual site is not yet known, it is important to assess a range of sites with a diverse set of site characteristics, to provide confidence that when the actual site is chosen, it will not present unexpected technical difficulties or major surprises in cost.

In addition to the three sample sites presented, a second European sample site near DESY in Hamburg, Germany, has also been developed. This site is significantly different from the other sites, both in geology and depth (~25 m deep), and requires further study.

The Joint Institute for Nuclear Research has also submitted a proposal to site the ILC in the neighborhood of Dubna, Russian Federation.

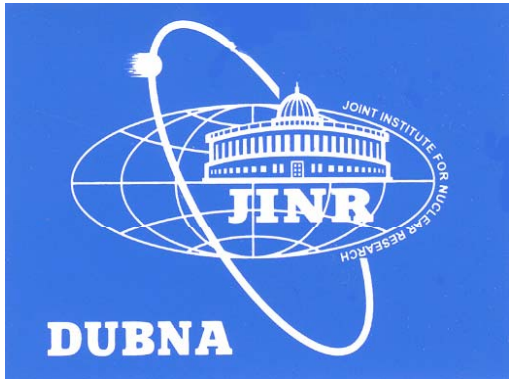
The three sites reported in detail here are all deep-tunnel solutions. The DESY and Dubna sites are both examples of shallow sites. A more complete study of a shallow site – either a shallow tunnel or a cut-and-cover site – will be made in the future as part of the Engineering and Design phase.

Letter to President of Russian Federation Vladimir Putin

Signed by:

Moscow region Governor	Boris Gromov
President of RAS	Yury Osipov
Director of JINR	Alexey Sissakian

Middle of May 2007



Advantages of the ILC construction in Dubna:

1. JINR as a basic scientific and organizational structure with international intergovernmental organization.

2. An unique opportunity to solve the problem of value at the purchase of land. Prevalent legal practice makes it possible to get the land of the ILC location to permanent free use just as it has been done for JINR, according to the agreement between JINR and the RF government.

3. The proposed territory is extremely thinly populated and practically free of industrial structures, rivers and roads.

4. The area is absolutely steady seismically and has stable geological characteristics.

5. A flat relief and the unique geological conditions allow one to place ILC on a small depth (about 20 m) in the dry drift clay and to perform construction of tunnels, experimental halls and other underground objects with the least expenses, including open working.

6. There are sources of the electric power of sufficient capacity : transmission line of 500 kV, the Konakovo electric power station and the Udomlia atomic power plant.

7. The developed system of transport and communication services, advantageous location, good highways and railways, water-way (the Volga river basin), good position in the European region;

8. Presence of a modern network and information infrastructure, including one of the largest center in Europe the “Dubna” Satellite Communication Center.

9. A special the economic zone established in Dubna in 2005 provides preferential terms for development and manufacture of high technology technical production.

10. A powerful scientific and technical potential of Dubna makes it possible to involve additionally specialists from world scientific centers into the already formed international collective of highly-qualified scientific manpower providing comfortable conditions for them to work.

Layout of ILC in the Moscow Region

МИНИСТЕРСТВО
ПРОМЫШЛЕННОСТИ И НАУКИ
МОСКОВСКОЙ ОБЛАСТИ

125009, Москва, ул. Тверская, 12, стр. 2 тел.: 629-61-62, факс: 629-02-52

29.03.2007 № 15.3-589/1

На № _____ от _____

Директору Объединенного
института ядерных исследований

А.Н. Сисакяну

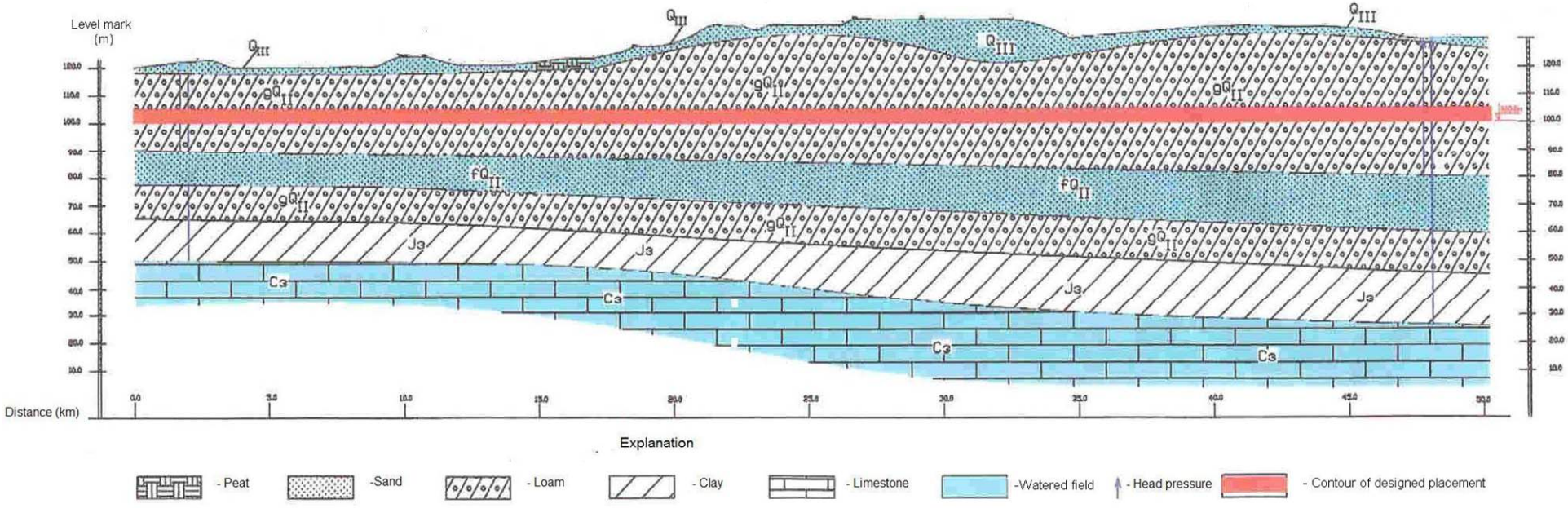
Уважаемый Алексей Норайрович!

Министерству промышленности и науки Московской области поручено проинформировать Вас, что Губернатор Московской области Б.В. Громов поддерживает инициативу ОИЯИ по размещению Международного Линейного Коллайдера на территории Московской области и готов на соответствующем этапе оказать содействие в пределах полномочий Московской области как субъекта Российской Федерации (обращение от 16.02.2007 № 010-28/186).

С уважением,

Министр В.И. Козырев

In front: Russian Satellite Communications Center
In the back ground: the starting point of ILC layout, between Dubna and Volga rivers



The ILC linear accelerator could be placed in the dry drift clay at the depth of 20 m (at the mark of 100.00 m).

Below the tunnel there should be impermeable soil preventing from the underlying groundwater inrush.

It is possible to construct tunnels of the accelerating complex using tunnel shields with a simultaneous wall timbering by tubing or falsework concreting.

Participation of JINR in the ILC International Technical Activity

International Linear Collider: accelerator physics and engineering

Theme leaders:

A.N. Sissakian
G.D. Shirkov

Period: 2007- 2009

-**Preparation of works of JINR;**

- Participation in estimations and design of ILC elements

2007

1. Construction of ILC photoinjector prototype.
2. The LINAC-800 based test-bench with electron beam
3. Development of power supply devices for RF system
4. Metrological laser complex
5. Development and design of cryogenic modules and test systems.
6. Preparation of technical base of cryogenic supply to test cryomodules of the 4th gen.
7. Calculation of electrical and magnetic fields 8. Engineering survey and design works
9. Development of the electron cooling method. LEPTA project.
10. Project CLIC
11. Project FLASH
12. Development of diagnostic systems; development of built-in devices.
13. Development of magnetic systems of the ILC damping rings
14. Development of diagnostics for large cryogenic systems.

Personnel – 97 persons

Salary	Ind. grants	Travels	Contracts	Equipment &materials	Total
97 x 650$ x 12 months x 1,26 x 0,5 = 480 k$	100	90	RSPI: 20 Sarov 10 **Total 30**	200	**900**

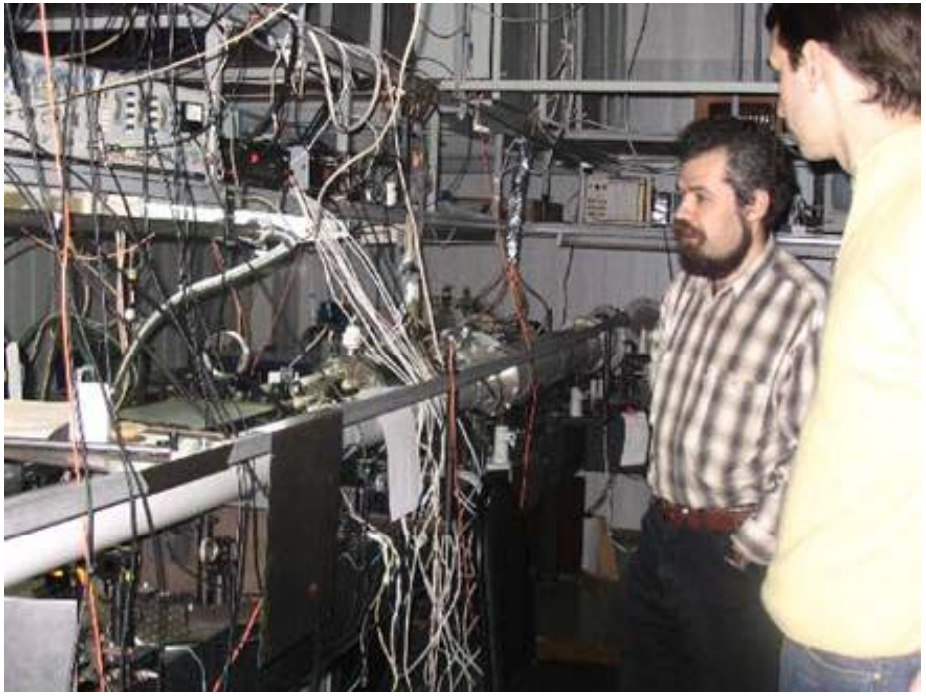
In total year 2007 = 900 k$ (personnel 580 k$ + travels 90 k$ + R&D 230 k$)

Laboratory	Person in charge at the Laboratory	Key excecutors and number of participants
Elaboration of photoinjector prototype (DLNP, LPP) Calculation of electron beam dynamics in the injector (DLNP)	I.N. Meshkov, G.V. Trubnikov	Meshkov + 8, Kobets V.V. + 3.
The LINAC-800 based test-bench; FEL on the base of LINAC-800; photoinjector; Development of the RF system elements Development of diagnostic, Development of inside devices	G.D. Shirkov, N.I. Balalykin, A.I. Sidorov E.M. Syresin	G.D. Shirkov, N.I. Balalykin + 3, A.I.Sidorov + 2 E.M.Syresin + 4.
Metrological laser complex DLNP, LIT	Yu.A. Budagov, V.V.Ivanov D.I. Khubua, G.A. Shelkov	Yu.A. Budagov, V.V. Ivanov + 1, D.I. Khubua+ 5, G.A.Shelkov + 5.
Development of prototype of the 4th generation cryogenic modules and testing systems for them (LPP, DLNP, VBLHE)	Yu.P. Filippov, Yu.A. Usov, Yu.A. Budagov	Yu.P. Filippov + 3. Yu.A. Usov + 3, S.V. Mironov Yu.A. Budagov, B. Sabirov
Preparation of a production basis at JINR for cryogenic ensuring of testing of the 4th generation cryogenic modules VBLHE, LPP, DLNP	N.N. Agapov, Yu.P. Filippov, Yu.A. Usov, Yu.A.Budagov	N.N. Agapov + 3, Yu.A. Usov + 3 Yu.P. Filippov + 3. Yu.A. Budagov, B. Sabirov + 3, S.V. Mironov, A.B.Lazarev + 3.
Calculation of electrical and magnetic fields of complex configuration (DLNP)	S.B. Vorozhtsov, G.V. Trubnikov	V.B. Vorozhtsov + 3, G.V. Trubnikov + 2.
Project of the complex for radiation stability studies (VBLHE)	L.N. Zaitsev	L.N. Zaitsev + 2.
Engineering survey and design developments DLNP, EW	Yu.N. Denisov, G.V. Trubnikov, V.I. Boiko	Yu.N. Denisov + 5. G.V. Trubnikov, V.I. Boiko
Development of magnetic systems of the ILC damping rings	E.M. Syresin, N.A. Morozov	E.M. Syresin + 3, N.A. Morozov + 2.

Photoinjector prototype

Several visits and officially organized collaboration with:

1. KEK (Tsukuba, Japan). Visits: June 2006 (I.Meshkov,G.Trubnikov) – signed MoU, October-November (50 days) – Dr. Yu.Korotaev, I.Kryachko for experiments with new KEK RF photogun (participation in design, assembly, tests of injector elements, study of different gun regimes). Collaboration in design and creation of new laser system for KEK "ILC drive beam".
2. Institute for Applied Physics (Nizhny Novgorod). Collaboration and MoU on design and manufacturing of laser system for KEK and for JINR photoinjector test bench.
3. DESY (Zoethen and Hamburg), visits of G.D. Shirkov and G.V.Trubnikov (Dec. 2006) – coordination of works on X-FEL, FLASH & ILC. 2007 (May) Yu.V.Korotaev and G.V.Trubnikov – discussion of the scheme of JINR testbench, collaboration on elliptical laser for RF gun, participation in runs on testing of new XFEL RF photogun.
4. Visit of KEK delegation (March 2007), the Protocol of Intentions on the collaboration for creation of the laser system for injector of STF drive beam.



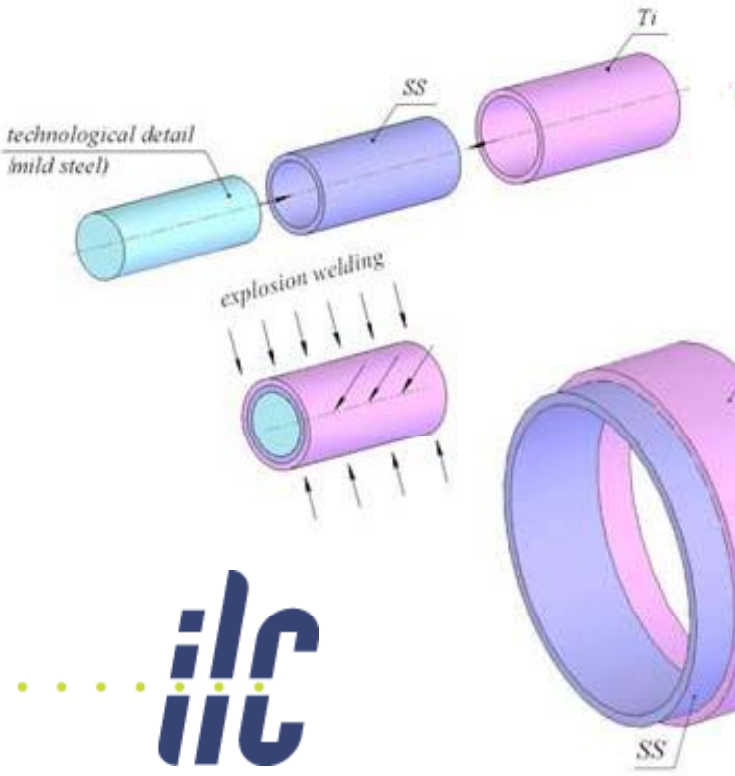
By initiative of Prof. Yu.Budagov it was required from specialist of VNIIEF (Sarov) to investigate the possibility to produce a tube type bimetal (stainless steel 12X18H10T + titanium VT1-0) by explosion welding in order to use it as a transitional load-bearing element in the construction of ILC and XFEL.

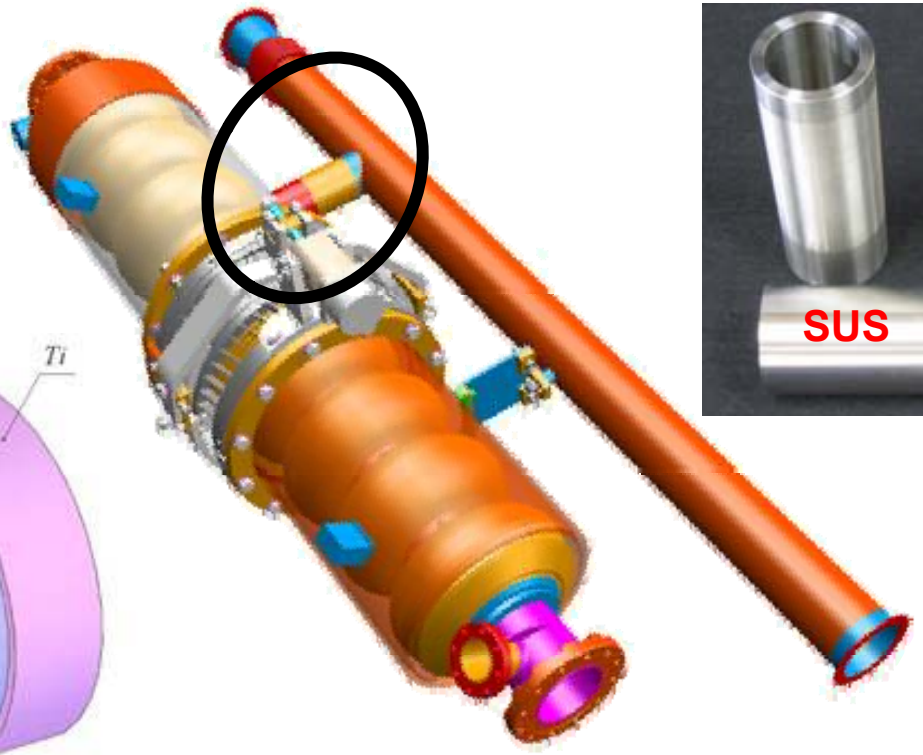
The following tasks were solved :

developing the pilot technical process for production of bimetal billet of tube type by explosion welding;

researching a micro-structure of the welded joint made by explosion welding;

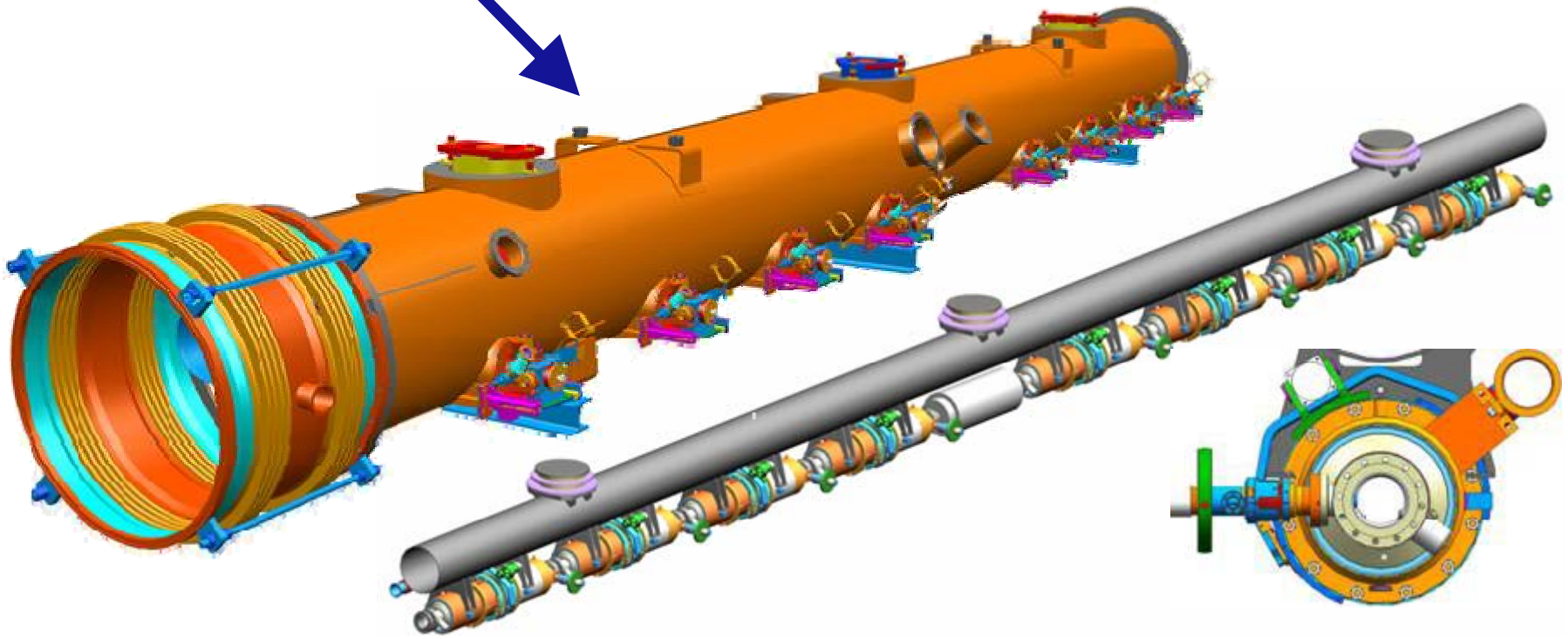
leakage testing of the welded joint at indoor and nitric temperatures.





4th generation cryomodules design

- International collaborative Effort in the three regions
- Design changes are towards nailing down slot length of components
  - Costing should be straight-forward from TTF (and possibly XFEL) experience

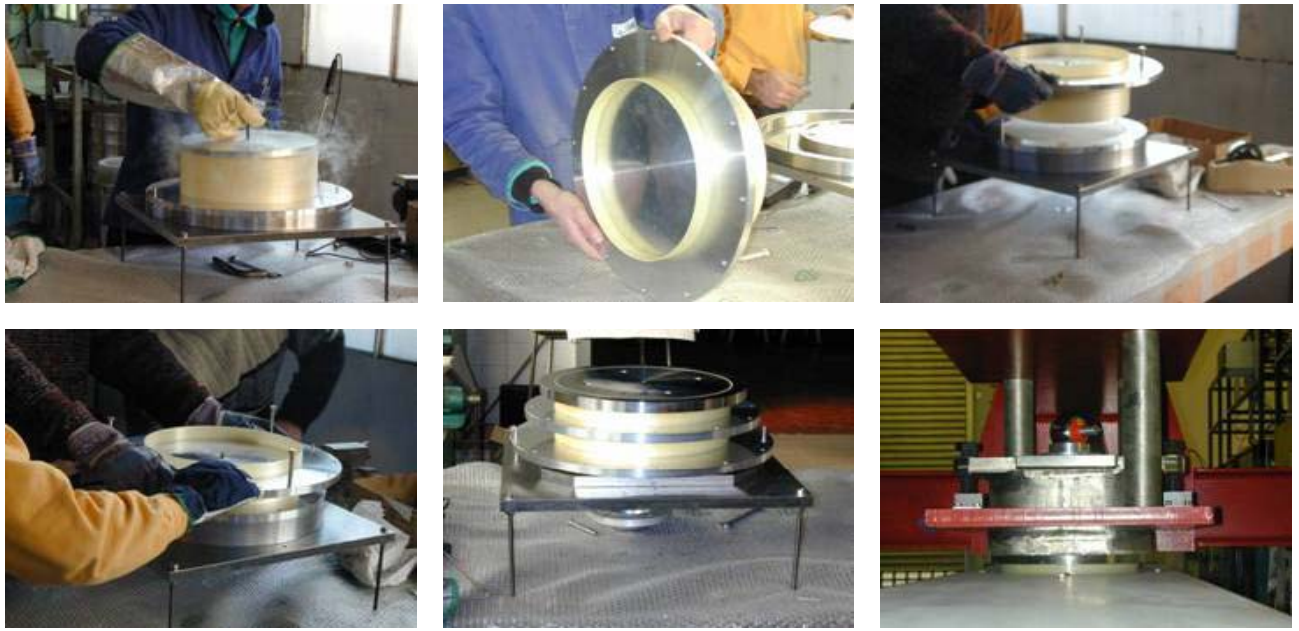


Collaboration with INFN (Pisa).

Scientist from JINR for almost a year actively works in design bureau at INFN (Pisa). The task is to learn software and standards of cryomodule elements design (ANSYS, I-DEAS)

Several design documents were created and successfully submitted by INFN and ZENON (Milan) in 2006 and 2007 by persons from JINR design bureau at INFN to be involved in. Also two engineers are planned to take part In construction of test cryomodules for XFEL (DESY)

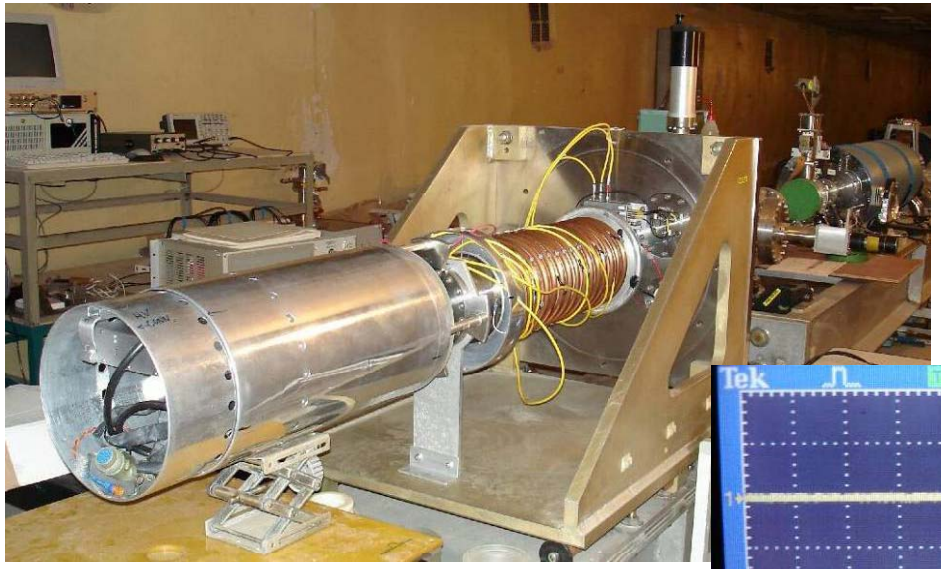
Support Posts and Brackets

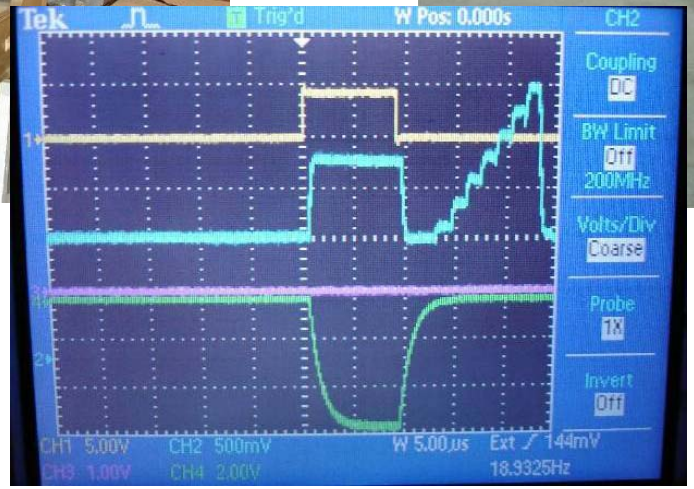


At JINR the activity on cryogenic diagnostics is already started and rather well developing and challenging.

Test bench with e- beam at LINAC-800

First beam obtained.
A lot of users (including possible ILC – irradiation of detector parts with beam) are ready (Dr.G.Shelkov & team).
Experimental R&D are provided at injector test-bench in LPP.





Laser metrology

JINR developed test bench at CERN for precise laser metrology. Results ofAug'06 0.5 micron precision of laser beam position measurement on the base of 40m is achieved. At JINR it is planned to set this complex at b.118 (base is 2x250m).

DR magnetic system simulations and magnet prototype construction

Dr. E. Syresin, Dr. N. Morozov (with group) in collaboration with SLAC (A. Seryi) works on design and possibility to construct at JINR workshop series of magnetic system elements of DR (few dipole magnets). It is also planned to provide test of those elements.
This activity is performed in frames of MoU JINR-KEK on ATF collaboration. Similar MoU between JINR and SLAC is under assignment

Civil engineering

Very fruitful collaboration with GSPI. All official documentations (Site Assessment Matrix, Work Breakdown structure, geological and geodetically characteristics) was made by GSPI in the frame of Contracts with JINR. Work is actively going on.

DESIGN WORKS ON CIVIL ENGENERING OF ILC CONSTRUCTION IN DUBNA (MOSCOW REGION) PROVIDED BY GSPI
July - September 2007 (with assistance of Moscow region government)

- Basic data acquisition for construction R&D works of ILC project.

- To provide routing researches with the description of characteristics of the offered line of the accelerator location and the infrastructure connected with it;

- To specify character of surface structures, real population, topographical features (including depth of the crossed rivers and other reservoirs), an actual accessory and economic use of the wood and ground resources getting in a zone of alienation of the accelerator;

- To check a real state of a road network in area of construction, an opportunity of its use at a stage of a pre-construction works and during a construction and operation of an accelerating complex;

- To provide drilling of several control prospecting chinks for acknowledgement of prospective soil structure on the chosen line of the accelerator location.

ILC Conventional Facilities and Siting, GDE Meeting, Dubna, June 02-06, 2008

JINR,Dubna

From Workshop on Electron-Positron Colliders in Alushta, September 2007 to ILC GDE and ILCSC Meetings in Dubna, June 02-06, 2008

Welcome to JINR (Dubna)

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