“Strengths and Weaknesses of EU-Russia/CIS cooperation in S&T”
ISTC experience, Russian vision

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For Russian scientists (firstly those who were formerly engaged in the development of weapons of mass destruction), ISTC activity was of significant use in

1. Acquiring information on advanced achievements in science and technology through
   • Cooperation with collaborators from donor states,
   • ISTC sponsored participation in international conferences and workshops, and
   • Participation in ISTC and ISTC SAC seminars;
2. Shifting their emphasis to new research areas;
3. Getting financial support (especially in the hard 90-s);
4. Re-establishment and expansion of contacts with research institutions in Russia and CIS.
5. New scientific managers appearance.
It is possible to distinguish several groups of especially successful projects, whose results greatly contribute to world science and which were very useful for Russia (and sometimes for CIS and EU countries):
1. Environmental research.
2. Power research
3. Biological research
4. Space research
5. ISTC projects implemented for CERN
1. Environmental research.

A large number of projects were devoted to problems associated with radioactive and chemical contamination, development of methods and equipment for environmental monitoring, human health and environmental effects of contamination, cleanup technologies.
Of particular value are studies into environmental conditions in the Ural region, for example, radioactive contamination in the MAYAK area and chemical pollution in the Karabash area. These projects united efforts of many Russian and European laboratories.

These environmental projects resulted in the development of mathematical models to simulate the atmospheric transport of contaminants and their migration in groundwater, in the improvement of experimental methods and equipment, and in the statistical treatment of data on morbidity among members of general public and personnel.
Radiating conditions near to "Majak" enterprise
Projects #0033,0048,0051,0060,0261,0500,0519,1352,2177,2311
Participants:
• IGEM (Geology & Mineralogy), Moscow, Russia
• VNIITF, Snezhinsk, Chelyabinsk reg., Russia
• NPO Mayak, Oziorsk, Chelyabinsk reg., Russia
• Institute of Biochemical Physics, Moscow, Russia
• VNIIEF, Sarov, N. Novgorod reg., Russia
• Khlopin Radium Institute, St Petersburg, Russia
• Vavilov State Optical Institute (GOI), St Petersburg, Russia
• Gidrospetsgeologiya, Moscow, Russia
• Institute of Dynamics of the Geosphere, Moscow, Russia

EU Collaborators:
• Forschungszentrum für Umweltund Gesundbeit / Institut für Tieflsgertung, Braunschweig, Germany
• British Nuclear Fuels Ltd (BNFL), Risley Warrington, Chesire, UK
• ECN Petten, Petten, Netherlands
• SCK-CEN, Mol, Belgium
• Wismuth GmbH, Chemnitz, Germany
• CEA / DRT (Direction de la Recherche Technologique) / LIST (Laboratoire d'Integration des Systemes et des Technologies), Ile-de-France, France
• Radiobiological Institute of the University of Munich, Munich, Germany
East-Ural radioactive trace
ISTC Project #2177

Karachay Lake and «MAYAK» facility
Actinides distribution near lake Karachay
Karabash area pollutions
Another example involves projects devoted to environmental assessment in Kyrgyzstan. They include investigation into the environmental effects of uranium mining and permanent monitoring of global atmospheric pollution. These projects are good examples of collaboration between scientists from many Russian and Kirghiz research institutes.
Projects ##

Participants
- Kyrgyz State National University / Institute of Fundamental Sciences, Bishkek, Kyrgyzstan
- VNIITF, Snezhinsk, Chelyabinsk reg., Russia
- Kyrgyz-Russian Slavonic University, Bishkek, Kyrgyzstan
- Institute of Physics of National Academy of Sciences, Bishkek, Kyrgyzstan
- Moscow Engineering Physics Institute (State University) (MEPhI)

Collaborators:
- URA 0073/Universite Paris-Sud, Orsay, France
- Università di Roma "La Sapienza", Rome, Italy
- Pirkanmaa Regional Environment Centre, Tampere, Finland
- Fraunhofer Institute Atmosphärische Umweltforschung, Garmisch-Partenkirchen, Germany
- Max-Planck Society / Max-Plank-Institute fur Biogeochemie, Jena, Germany
- World Meteorological Organization, Geneva, Switzerland
- Service d'Aeronomie, Verrieres le Buisson, France
- University of Cologne / Institute of Geophysics and Meteorology, Köln, Germany
- Wismuth GmbH, Chemnitz, Germany
- SELOR eeig, Amsterdam, Netherlands
3D Rn distribution above the Kara Balta radiation waste storage in Kirghizia
2. Power research aimed at different aspects of nuclear, thermonuclear and other types of energy.

- A large group of successful projects were devoted to nuclear power alternatives such as accelerator- or thermonuclear-driven subcritical reactors, molten salt reactors, or units for transmutation of long-lived isotopes (actinides and other fission products).
- These projects resulted in the establishment of a very competent and efficient collaboration between many Russian and European scientists.
Projects ## 0017,0698,1486,1606,1608, 2267,3261

Participants:
- ITEF (ITEP), Moscow, Russia
- VNIINM Bochvar, Moscow, Russia
- FEI (IPPE), Obninsk, Kaluga reg., Russia
- VNIIEF, Sarov, N. Novgorod reg., Russia
- VNIITF, Snezhinsk, Chelyabinsk reg., Russia
- VNIPIET (Sosnovy Bor Branch), Sosnovy Bor, Leningrad reg., Russia
- Khlopin Radium Institute, St Petersburg, Russia
- Kurchatov Research Center, Moscow, Russia
- High Temperature Electrochemistry Institute, Ekaterinburg, Sverdlovsk reg., Russia
- VNIKhT (Chemical Technology), Moscow, Russia
- NIIAR (Atomic Reactors), Dimitrovgrad, Ulianovsk reg., Russia

EU Collaborators:
- CEA-Saclay;
- CEA-Cadarache;
- BNFL;
- European Commission;
- KTH- RIT;
- EdF;
- FZK/ IKET;
- RNI Rez;
- IAEA
LIQUID SALTS POTENTIAL APPLICATIONS

THE MSR FOR BREEDING

A REFERENCE CONCEPT: MSBR (MOLTEN SALT BREEDER REACTOR)
Molten Salt Corrosion Research Stand
2. Power research aimed at different aspects of nuclear, thermonuclear and other types of energy (cont)

Very interesting results were obtained in projects aimed at the development of fuel cells of different types. A number of Russian academic and applied-research institutes achieved much success in designing the structure of fuel elements, developing materials for electrodes and electrolytes, and improving automation and control systems.
Projects
#0257,0483,0712,0826,1643,1647,2729,2904

Participants:
• VNIIEF, Sarov, N. Novgorod reg., Russia
• Kurchatov Research Center, Moscow, Russia
• VNIITF, Snezhinsk, Chelyabinsk reg., Russia
• Institute of Electrophysics, Ekaterinburg, Sverdlovsk reg., Russia
• NPO Lutch, Podolsk, Moscow reg., Russia
• Boreskov Institute of Catalysis, Novosibirsk, Russia

EU collaborators:
• TU Delft, Delft, Netherlands
• St Andrews University, St Andrews, UK
• Forschungszentrum Karlsruhe Technik und Umwelt / Institut für Neutronenphysik und Reaktortechnik, Karlsruhe, German
• EBZ, Dresden, Germany
• CEA / DAM / CE Bruyères le Châtel, Bruyères le Châtel, France
• Firebrick S.A., Madrid, Spain
High temperature Fuel Cells

The Cell

The module

The Block
3. Biological research

Especially interesting results were obtained in the study of epidemic diseases and in the development of vaccines and medicines (sometimes with use of advanced biomolecular modeling methods). I hope these projects will be presented here later.
4. Space research

They covered a wide range of topics including simulation of stellar processes (here supernova simulations were especially interesting), experimental investigation into the composition of comets, simulations of meteorite impacts on the planet surface, and space protection problems.
5. I would like to specially note results from a large group of ISTC projects implemented for CERN. Since 1995, 34 projects have been fulfilled, some of them being not once extended. The projects covered all the basic experimental units of the Big Hadron Collider: ATLAS, CMS, ALICA. Project activities included designing, mathematical modeling, fabrication of special materials, and manufacture of some devices and their parts.
Status of ISTC Projects

- From 1995: 34 projects, some of them with multiple extensions, among them:
  - 14 Regular projects
  - 14 Regular projects with CERN co-funding
  - 5 Partner Projects
- More than 3/4 of the projects are successfully completed and the others are continuing
- Total projects volume 27.6 M$US
- of which ISTC contributed 10.6 M$US
ISTC Projects for CERN LHC

- #0121 Liquid Kripton Calorimeter (Dubna, Khrunichev)
- ##0515, 2719 Scintillating Tiles for ATLAS (Protvino, Lutch)
- ##0354,1718 PbWO₄ Crystals (Bogoroditsk)
- ##345,1666 Carbon support Frame for ALICE (St-Pt State University, CKBM)
- #2880 Starting trigger detector for ALICE (INR-NIIT)
- ##441,1800 Carbon-fiber rings for ATLAS (MEPhI, “Mashinostroitel” Plant)
- #1639 MDT Chambers for ATLAS (Protvino, Dubna, Snezhinsk)
- #3169 Gyroclystron (N.Novgorod)
- ##2134,3016 Thermal regime of ATLAS (Snezhinsk)
Liquid krypton calorimeter for NA 48 # 121

CERN – Dubna – Khrunichev ~ 670 k$US; 1995 - 97
Bogoroditsk PbWO$_4$ Crystals for the CMS Ecal

# 354 - # 354 B

#1718

62’000 crystals needed for CMS Electromagnetic Calorimeter
Super light carbon support frame for ALICE
# 345 – # 1666, St-Pt. State University – CKBM (St-Pt)

Length 1.1m, weight 24 g

Full-scale carbon fibre model (>2000 components)
Starting trigger detector (T0) for ALICE # 2880
INR - Institute of Pulse technique, Moscow
The ring characteristics:
light weight and high modulus,
high accuracy of hole drilling

Each pair of rings supports
about 3000 straw tubes used to
track relativistic charged particles

# 441 MEPhI – PNPI - «Mashinostroitel» plant (Perm) Technology for the production of Carbon-fibre rings for the ATLAS TRT –
spin off PP #1800 for the production of 350 C-fibre rings for a
total value of 2 M$ (US)
Monitor Drift Tubes (MDT) Chambers for precise measurements of muon trajectories in the ATLAS Muon Spectrometer # 1639; Protvino, Dubna, Snejinsk 2001 - 2010

208 MDT Chambers should be produced with highest uniformity
CLIC study – Project # 3169 – Novgorod Institute of Applied Physics

CERN is studying the feasibility of building a 3 TeV linear collider based on high wave accelerating structures operating at 30 GHz

Assembled gyrokystron
Projects ##2134,3016

Thermal regime of ATLAS
Traverse view of Spectrometer
Ventilation at ATLAS cavern
THERMAL ANALYSIS OF ATLAS MUON BARREL – Temperature map
A number of proposals are prepared, concerning participation in the development of the LINAC-4 linear accelerator. Two groups of Russian institutes have already accomplished a considerable preliminary effort to develop basic structures and to test technologies ##2888,2889,3845 (ITEPh,VNIIEF) ##2875, NEW (VNIITF, BINR)
Linac4

New linear accelerator (H- ions, 160 MeV energy), replacing the present Linac2 (protons, 50 MeV, 1978)

Aerial photograph of the CERN site: in green the present accelerators, in red a possible layout of the new LHC injectors.
Linac4 R&D collaborations

INDIA: klystron power supplies, RF structures

CHINA: quadrupoles, magnets

SAUDI ARABIA: RF prototypes
Section assembling
A prototype CCDTL is finished and has been delivered to CERN (6/2/2007)

ISTC #2875 (VNIITF, BINP)
Original technology developed at CERN
ISTC project covers adaptation of the technology to Russian production and improvements (supporting, alignment)

Reassembling: March 07
Testing (vacuum, RF power):
  Summer 2007
Assessing of the technology in 2007
Revised drawings from CERN end 07
Conclusion, Strengths

- ISTC successes can be ascribed primarily to the fact that unlike other programs of scientific and technical cooperation, ISTC establishment involved a thorough consideration into all aspects of its activity, specifically procedures for development, submission, evaluation and approval of proposals, financial issues (grant payment, funds for equipment and materials, support of participation in international conferences, audit requirements etc.), and issues related to the access of ISTC personnel and auditors to workplaces of project participants.
Conclusion, Weaknesses

- Spontaneous process of submission of project proposals and lack of coordination between the projects in similar scientific areas.
- More active collaborators participation in work above projects would be useful.
- It is desirable to specify questions of intellectual property.
- It is necessary to aspire to accelerate process of consideration of projects (often it is stretched more, than for a year).