

**TOPICAL PLAN
FOR JINR RESEARCH
AND INTERNATIONAL COOPERATION
2014**

Dubna 2013

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Prepared by
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Dubna 2013

All the themes in the Plan are listed by fields of research. Each theme is coded according to the JINR system of classification and contains the following information:

- the first number * - the field of research
- the second number ** - the conventional number of Laboratory or other Division of JINR
- the third number - the theme's ordinal number
- the fourth and the fifth numbers - the years of the activity's beginning and completion

* 01 - Theoretical Physics 02 - Elementary Particle Physics and - Relativistic Nuclear Physics 03 - Nuclear Physics 04 - Condensed Matter Physics and - Radiobiological Research 05 - Networking, Computing, Computational Physics 06 - Educational Programme 07 - Applied Research with Nuclear Physics Methods	** 0 - All-Institute Topics 1 - Veksler and Baldin Laboratory of High Energy Physics (VBLHEP) 2 - Dzhelepov Laboratory of Nuclear Problems (DLNP) 3 - Bogoliubov Laboratory of Theoretical Physics (BLTP) 4 - Frank Laboratory of Neutron Physics (FLNP) 5 - Flerov Laboratory of Nuclear Reactions (FLNR) 6 - Laboratory of Information Technologies (LIT) 8 - Science Organization Department (SOD) 9 - Laboratory of Radiation Biology (LRB) 10 - Multi Access Centre "Nanobiophotonics" (MAC "Nanobiophotonics")
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Theoretical
Physics
(01)

Theory of Fundamental Interactions

Leaders:

D.I. Kazakov
O.V. Teryaev
A.B. Arbuzov

Participating Countries and International Organizations:

Armenia, Azerbaijan, Belarus, Bulgaria, Canada, CERN, Czech Republic, Finland, France, Georgia, Germany, Hungary, ICTP, Italy, Japan, Kazakhstan, Mexico, Mongolia, New Zealand, Norway, Poland, Republic of Korea, Russia, Serbia, Slovak Republic, Spain, Sweden, Switzerland, Ukraine, United Kingdom, USA, Uzbekistan, Vietnam.

Scientific Programme

The main aim of the research within the theme is the construction of theoretical models and their application to the description of the properties of elementary particles and their interactions. This research includes the following directions of activity. The development of quantum field theory formalism in gauge and supersymmetric theories. Construction and investigation of the models of particle physics beyond the Standard Model. Theoretical support of experiments at the Large Hadron Collider on the search of new physics and the study of the properties of the Higgs boson. Calculation of radiative corrections to the processes of particle creation within the Standard Model and its extensions. Investigation of neutrino properties and neutrino oscillations. Investigation of the hadron properties within quantum chromodynamics and phenomenological quark models. Study of hadron spin structure with the help of generalized and transverse momentum dependent parton distributions. Study of heavy quark properties and of exotic hadrons. Lattice simulations for obtaining nonperturbative results in gauge theories. Investigation of dense hadronic matter and theoretical support of the program NICA. Theoretical support of the wide range of current and future experiments at JINR, IHEP, CERN, GSI, DESY, and other physics centers.

Expected main results in 2014:

- Calculation of the amplitudes in maximally supersymmetric theories in extra dimensions.
Analysis of possible SUSY search strategies at the LHC in the framework of the MSSM and NMSSM.
Calculation of the NLO correction to the BFKL equation in the $N = 2$ SYM theory with matter fields.
Investigation of the Q^2 evolution of the average multiplicities with the double-logarithm resummation taken into account.
Consideration of the Q^2 evolution of the structure function F_2 , its derivations and heavy quark parts at small x in the first three orders of perturbation theory.
Investigation of the low-energy behavior of the hadronic vacuum polarization function within the dispersive approach to QCD.
Calculation of different four-loop contributions to beta-functions and anomalous dimensions in the Standard Model and its supersymmetric and non-supersymmetric extensions.
- Derivation of constraints for properties of vector and scalar mesons implied by exact anomaly sum rules in axial and vector channels.
Investigation of evolution of spin structure functions and their truncated moments at low Q^2 in the NLO approximation and with account for models of coupling in the infrared region and higher twists.
Investigations of transverse-momentum dependent parton distributions for Drell-Yan processes and direct photon production within NICA project. Construction of global fits for Siivers functions with account for evolution effects, constraints from g_2 structure functions and sum rules.

Lattice calculations of form factors related to quark spin and orbital angular momenta and their comparison to the constraints implied by the equivalence principle.

Studies of the mechanism of generation of reactor antineutrino anomaly in the framework of the field-theoretical approach to neutrino oscillations. Development of Monte-Carlo generators for optimization and processing of experimental data, PINGU (IseCube) experiment.

Model calculations of production of mesons and photons and proton-antiproton collisions.

- Calculation of the light-by-light hadronic contribution to the muon g-2 for the full set of diagrams in the leading $1/N_c$ approximation.

Calculation of the $\tau \rightarrow (\eta, \eta') 2\pi\nu$ decays and radiative η, η' decays within the extended Nambu-Jona-Lasinio model.

Derivation of the full set of evolution equations for the transverse-momentum dependent parton distribution functions basing on the results on geometrical and group properties of the Wilson loop space.

Investigation of the role of non-Gaussian probability distributions in the description of the nonperturbative input in the phenomenology of the polarized semi-inclusive processes studied at the JLab, RHIC and future Electron-Ion Collider (EIC).

Investigation of the form factors of the $B(B_s) \rightarrow P(V)$ -transitions in the full kinematic region of momentum transfer squared. Calculation of the widths of the recently observed decays $B_s \rightarrow J/\psi + \eta$ and $B_s \rightarrow J/\psi + \eta'$ which are important for the search of CP-violating New-Physics effects.

Calculation of the branching ratios of the lowest ($J/\Psi, \chi_c(0^{++})$) charmonium decays into two (pseudo) scalar mesons on the base of obtained mixing coefficients of the intermediate scalar $q\bar{q}$ -resonance state vectors with nearby glueball and/or multiquark states.

- Participation in the tmfT Collaboration (finite temperature with twisted mass fermions) aimed at description of the quark-gluon thermodynamics including strange and charmed quarks, consideration of new observables locating the crossover. Investigation of topological aspects of the quark-gluon plasma (monopoles, dyons, vortices etc.) and estimating the contribution of these degrees of freedom to trace anomaly, energy density etc. Evaluation of transport coefficients in the u-d-s-c-gluon plasma (jet quenching, heavy quark diffusion, dilepton rates etc.).

Model calculations of the generation of vorticity in heavy-ion collisions and its effect on P-odd correlations of quarks and mesons at the NICA project.

Investigation of the role of color degrees of freedom in the early stage of heavy-ion interactions within the model of Parton Hadron String Dynamics (PHSD), estimation of the intensity of chromoelectric and chromomagnetic fields created in collisions of relativistic heavy ions. Study of the influence of color forces on the dynamics of parton interactions.

Study of the impact of strong electromagnetic fields (occurring during relativistic heavy-ion collisions) on the character of background gluon fields and the formation of a heterophase mixed hadron system within the domain model of the QCD vacuum. Investigation of observable manifestations of azimuthal anisotropy of the gluon fields in the collision region.

Studies of the thermodynamic properties of non-uniform quark ensembles (quark droplets) on the basis of models with four-fermion interaction. The Keldysh model (featuring an infinite correlation length) will receive special attention.

Further development of effective models for the QCD phase diagram to exhibit further observables (mesonic correlation functions, condensates and dual condensates) ready for comparison with lattice QCD data. Extension of PNJL and PQM models to include baryonic degrees of freedom to describe the region on non-vanishing net-baryon density.

Study of hybrid EoS (equations of state) based on ab-initio nuclear EoS and non-local PNJL models in a wide range of densities, temperatures and isospin asymmetry, for applications in the simulation of heavy-ion collisions, of supernova collapse and in compact star phenomenology.

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers
1. Standard Model and its extension	D.I. Kazakov E.A. Kuraev
BLTP	A.B. Arbuzov, A.V. Bednyakov, A.V. Gladyshev, A.V. Kotikov, G.A. Kozlov, V.K. Mitrjushkin, V.A. Naumov, V.N. Pervushin, A.D. Popov, S.I. Vinitsky + 5 students
LIT	V.P. Gerdt
VBLHEP	V.G. Krivokhizhin, H.M. Beshtoev
DLNP	D.Yu. Bardin, V.A. Bednyakov, L.B. Kalinovskaya
2. QCD parton distributions for modern and future colliders	A.V. Efremov O.V. Teryaev D.V. Shirkov
BLTP	M. Deka, S.V. Goloskokov, S.V. Mikhailov, A.V. Nesterenko, A.V. Radyushkin, O.V. Selyugin, A.V. Sidorov + 3 students
VBLHEP	Yu.I. Ivanshin, I.A. Savin
DLNP	L.L. Nemenov, L.G. Tkatchev, A.S. Khrykin
3. Physics of heavy and exotic hadrons	A.E. Dorokhov M.A. Ivanov
BLTP	I.V. Anikin, I.O. Cherednikov, G. Ganbold, S.B. Gerasimov, G.V. Efimov, S.M. Eliseev, N.I. Kochelev, V.I. Korobov, V.A. Meshcheryakov, S.N. Nedelko, M.K. Volkov, Yu.S. Surovtsev, S.A. Zhaugasheva + 5 students
VBLHEP	Yu.A. Panebratsev, M.V. Tokarev, V.A. Nikitin, Yu.I. Ivanshin, I.A. Savin, M.G. Sapozhnikov
DLNP	V.A. Bednyakov, N.B. Skachkov
4. Hadron Matter under extreme conditions	E.-M. Ilgenfritz S.N. Nedelko D. Blaschke
BLTP	D.E. Alvarez-Castillo, M. Deka, A.E. Dorokhov, A.V. Friesen, M. Hasegawa, A.S. Khvorostukhin, N.I. Kochelev, S.V. Molodtsov, A. Parvan, S. Shin, O.V. Teryaev, V.D. Toneev, A.M. Trunin, V.E. Voronin + 3 students
LIT	Yu.L. Kalinovsky, Zh.Zh. Musulmanbekov, V.Voronyuk
VBLHEP	V.D. Kekelidze, A.G. Litvinenko, M.V. Tokarev, O.V. Rogachevsky
DLNP	G.I. Lykasov

Collaboration

Country or International Organization

City

Institute or Laboratory

Armenia	Yerevan	RAU YerPhI ANL
Azerbaijan	Baku	IP ANAS
Belarus	Minsk	INP BSU JIPNR-Sosny NASB NC PHEP BSU
	Gomel	BelSUT GSU GSTU
Bulgaria	Sofia	INRNE BAS SU
Canada	Montreal	McGill UdeM
	Toronto	U of T
CERN	Geneva	CERN
Czech Republic	Prague	CTU CU IP ASCR NPI ASCR
	Řež	
Finland	Helsinki	UH
France	Lyon	UCBL
	Metz	UPV-M
	Montpellier	UM2
	Saclay	SPhN CEA DAPNIA IRFU
Georgia	Tbilisi	RMI TSU
Germany	Berlin	FU Berlin HUB
	Aachen	RWTH
	Bielefeld	Univ.
	Bochum	RUB
	Bonn	UniBonn
	Dortmund	TU Dortmund
	Erlangen	FAU
	Hamburg	DESY
	Heidelberg	Univ.
	Jena	Univ.
	Jülich	FZJ
	Kaiserslautern	TU
	Karlsruhe	KIT

	Regensburg	UR
	Rostock	Univ.
	Mainz	JGU
	Munich	LMU
	Tübingen	Univ.
	Wuppertal	Univ.
	Zeuthen	DESY
Hungary	Budapest	ELTE
		Wigner RCP
ICTP	Trieste	ICTP
Italy	Bari	INFN
	Naples	INFN
	Padua	UniPd
	Pavia	INFN
	Pisa	INFN
	Trieste	SISSA/ISAS
	Turin	UniTo
Japan	Tokyo	UT
	Kyoto	Kyoto Univ.
	Nagoya	Meiji Univ.
		Nagoya Univ.
	Tsukuba	KEK
Kazakhstan	Almaty	FAPI
	Astana	BA INP NNC RK
Mexico	Cuernavaca	UNAM
Mongolia	Ulaanbaatar	IPT MAS
		NUM
New Zealand	Hamilton	Univ.
Norway	Trondheim	NTNU
Poland	Krakow	NINP PAS
	Kielce	UJK
	Lodz	UL
	Otwock-Swierk	NCBJ
Republic of Korea	Seoul	SNU
Russia	Moscow	IMM RAS
		ITEP
		LPI RAS
		MSU
		MI RAS
		SCC RAS
		SINP MSU
	Moscow, Troitsk	INR RAS
	Belgorod	NRU BelSU
	Chernogolovka	LITP RAS
	Gatchina	PNPI

	Irkutsk	ISU
	Ivanovo	ISU
	Kazan	KFU
	Novosibirsk	IM SB RAS
		BINP SB RAS
	Perm	PSNRU
	Protvino	IHEP
	Rostov-on-Don	SFedU
	St. Petersburg	SPbSU
		SPbSPU
	Samara	SSU
	Saratov	SSU
	Sarov	VNIEF
	Tomsk	TSU
		IHCE SB RAS
	Tver	TvSU
	Yoshkar-Ola	VSUT
Serbia	Belgrade	Univ.
Slovak Republic	Bratislava	CU
		IP SAS
	Košice	IEP SAS
Spain	Santiago de Compostela	USC
	Valencia	UV
Switzerland	Bern	Uni Bern
	Villigen	PSI
Sweden	Lund	LU
United Kingdom	London	QM
		Imperial College
	Canterbury	Univ.
Ukraine	Kiev	BITP NASU
	Dnepropetrovsk	DNU
	Kharkov	KFTI NASU
	Lutsk	VNU
	L'viv	IAPMM NASU
		IFNU
	Sumy	SumSU
USA	New York, NY	RU
		CUNY
	Argonne, IL	ANL
	College Park, MD	UM
	Minneapolis, MN	UofM
	Norman, OK	UO
	Newport News, VA	JLab
	Philadelphia, PA	Penn
	University Park, PA	Penn State

Uzbekistan	Tashkent	IAP NUU
		NUU
Vietnam	Hanoi	IP VAST

Theory of Nuclear Structure and Nuclear Reactions

Leaders:

V.V. Voronov
A.I. Vdovin
N.V. Antonenko

Participating Countries and International Organizations:

Austria, Belarus, Belgium, Brazil, Bulgaria, Canada, China, Czech Republic, Egypt, France, Germany, Greece, Hungary, Italy, Japan, Kazakhstan, Moldova, Norway, Poland, Republic of Korea, Romania, Russia, Republic of Serbia, Slovak Republic, South Africa, Spain, Sweden, Switzerland, Taiwan, Ukraine, USA, Uzbekistan.

Scientific Programme

The main goals are to predict and analyze properties of atomic nuclei beyond the stability valley and investigate structure peculiarities of superheavy and exotic nuclei; to study dynamics of nuclear collisions at low and intermediate energies accompanied by production of stable as well as radioactive nuclides; to investigate fundamental properties of various few-body systems and develop rigorous and effective mathematical methods of calculations of their properties; to explore the dynamics of particle-nucleus and nucleus-nucleus collisions at relativistic energies and nuclear matter properties and its phase transitions at extreme values of temperature and density.

Expected main results in 2014:

- Calculations of neutrino-antineutrino pair emission rates by hot nuclei at temperatures relevant for core-collapse supernova.
Exploration of pairing effect on the properties of the new nuclear excitation modes — nuclear spin-scissors.
Investigation of the isoscalar monopole $E0(T=0)$ resonance in tin and lead isotopes within the Skyrme HFB/RPA approach.
Study of the effect of renormalization of neutrino propagator in nucleus on the neutrinoless double beta decay rate.
- Investigation of the properties of superdeformed states of light nuclei with $Z = N$ (^{36}Ar , ^{40}Ca , etc) within the cluster approach.
Predictive calculations of low-lying spectra of the odd-proton nuclei with $Z \sim 100$ within the Quasiparticle-Phonon Model.
Calculation of probabilities of sub-barrier fusion in reactions of astrophysical interest with light nuclei.
Calculation of excitation functions for production of different isotopes of superheavy nuclide with $Z = 114$ in the reactions of ^{48}Ca with $^{249,250,251}\text{Cf}$.
Exploration of the structure of the one-neutron halo nucleus ^{11}Be within the few-body cluster model with core excitations.
- Development of the effective-range approximation in the problem of two-dimensional scattering by a central short-range potential.
Investigation of dipolar confinement-induced resonances in atomic and molecular traps.
Study of the structure of hidden crossings of the dynamical adiabatic potential energy curves.
Improvement of the bounds on variation of spectral subspaces in the off-diagonal perturbation problems for multichannel Hamiltonians.

- Calculations and analysis of the inelastic scattering cross sections of pions on ^{28}Si , ^{58}Ni and ^{208}Pb with the microscopic optical potential.

Construction of the multirank relativistic complex separable kernels of the neutron-proton interaction for uncoupled D, F partial waves.

Study of anisotropies and other observables of relativistic heavy ion collisions within the parton-hadron-string dynamics transport approach.

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers
1. Nuclear Properties at the Border of Stability	V.V. Voronov A.I. Vdovin J. Kvasil
BLTP	N.N. Arseniev, E.B. Balbutsev, A.A. Dzhioev, V.A. Kuz'min, L.A. Malov, S. Mishev, V.O. Nesterenko, A.P. Severyukhin, H. Ganev, F. Šimkovic, R. Dvornicki, V.M. Shilov, A.V. Sushkov + 3 students
LIT	N.Yu. Shirikova, I.V. Molodtsova
FLNP	A.M. Sukhovoi
DLNP	V.B. Brudanin, V.G. Kalinnikov
2. Low-Energy Dynamics and Nuclear System Properties	S.N. Ershov N.V. Antonenko R.V. Jolos
BLTP	G.G. Adamian, A.V. Andreev, I.A. Egorova, S.I. Fedotov, V.G. Kartavenko, Sh. Kalandarov, A.K. Nasirov, R.G. Nazmitdinov, V.V. Pashkevich, T.M. Shneidman, A.S. Zubov + 1 students
FLNR	L.V. Grigorenko, Yu.E. Penionzhkevich
3. Quantum Few-Body Systems	A.K. Motovilov A.S. Melezhik
BLTP	V.B. Belyaev, S.S. Kamalov, E.V. Kolganova, A.V. Malykh, V.V. Pupyshev, E.A. Soloviev, I.I. Shlyk + 3 students
DLNP	O.I. Kartavtsev
4. Processes with Nuclei at Relativistic Energies and Extreme States of Matter	V.V. Burov M. Gaidarov
BLTP	S.G. Bondarenko, A.V. Frisen, L.P. Kaptari, A. Khvorostukhin, V.K. Lukyanov, A.S. Parvan, N. Sagimbaeva, A.I. Titov, V.D. Toneev + 1 students
LIT	E.B. Zemlianaya, K.V. Lukyanov
VBLHEP	A.I. Malakhov, N.M. Piskunov, Yu.A. Panebratsev, E.P. Rogochaya

Collaboration

Country or International Organization	City	Institute or Laboratory
Austria	Innsbruck	Univ.
Belarus	Minsk	IP NASB
Belgium	Brussels	VUB
Brazil	Florianopolis, SC	UFSC
Bulgaria	Sofia	INRNE BAS
Canada	Hamilton	McMaster
	Saskatoon	U of S
China	Beijing	ITP CAS
		PKU
Czech Republic	Prague	CU
	Řež	NPI ASCR
Egypt	Cairo	EAEA
	Giza	CU
France	Bordeaux	UB
	Caen	GANIL
	Orsay	CSNSM
		IPN Orsay
Germany	Bonn	UniBonn
	Cologne	Univ.
	Darmstadt	GSI
		TU Darmstadt
	Dresden	HZDR
	Erlangen	FAU
	Frankfurt/Main	Univ.
	Hamburg	Univ.
	Giessen	JLU
	Leipzig	UoC
	Mainz	JGU
	Regensburg	UR
	Rostock	Univ.
	Siegen	Univ.
Greece	Thessaloniki	AUTH
	Athens	INP NCSR
		“Demokritos”
Hungary	Budapest	Wigner RCP
	Debrecen	Atomki
Italy	Bologna	Centro, ENEA
	Naples	INFN
	Messina	UniMe
	Perugia	INFN
	Turin	UniTo
Japan	Tokyo	UT

	Kobe	Kobe Univ.
	Morioka	Iwate Univ.
	Osaka	RCNP
		Osaka Univ.
Kazakhstan	Almaty	INP NNC RK
		KNU
Moldova	Chişinău	IAP ASM
Norway	Bergen	UiB
	Oslo	UiO
Poland	Krakow	NINP PAS
	Otwock-Swierk	NCBJ
	Warsaw	UW
		WUT
Republic of Korea	Seoul	SNU
	Daejeon	IBS
Romania	Bucharest	IFIN-HH
		UB
Russia	Moscow	ITEP
		NNRU "MEPhI"
		MSU
		NRC KI
		SINP MSU
	Moscow, Troitsk	INR RAS
	Gatchina	PNPI
	Irkutsk	ISU
	Obninsk	IPPE
	Omsk	OmSU
	Saratov	SSU
	St. Petersburg	SPbSU
	Vladivostok	FEFU
Slovak Republic	Bratislava	CU
		IP SAS
South Africa	Pretoria	Unisa
	Stellenbosch	SU
	Cape Town	iThemba LABS
Spain	Palma	UIB
Sweden	Lund	LU
	Göteborg	Chalmers
Switzerland	Bern	Uni Bern
Taiwan	Taipei	NTU
Ukraine	Kiev	KINR NASU
		BITP NASU
USA	Argonne, IL	ANL
	Los Alamos, NM	LANL
	Notre Dame, IN	ND

Uzbekistan

University Park, PA
Tashkent

Penn State
IAP NUU
INP UAS
Assoc.“P.-S.” PTI

Theory of Condensed Matter

Leaders:

V.A. Osipov
J. Brankov

Participating Countries and International Organizations:

Armenia, Australia, Belarus, Belgium, Brazil, Bulgaria, Canada, Czech Republic, France, Germany, Hungary, India, Ireland, Italy, Moldova, Mongolia, Poland, Romania, Russia, Serbia, Slovak Republic, Slovenia, Spain, Switzerland, Taiwan, Ukraine, USA, Uzbekistan, Vietnam.

Scientific Programme

Effects of strong electron correlations in high-temperature superconductors, colossal magneto-resistance compounds (manganites), heavy-fermion systems, low-dimensional quantum magnets with strong spin-orbit interaction, topological insulators, etc. will be investigated based on a variety of underlying many-band electronic models including extended Hubbard model, Anderson model, super-exchange spin-orbital models of transition metal oxides with strong relativistic spin-orbital coupling. The electronic band structure, spectral properties of charge carrier quasiparticles, magnetic and charge collective excitations, metal-insulator and magnetic phase transitions, Cu- and Fe-based high-T_c superconductivity, charge and spin-orbital ordering will be studied. The obtained results will be used to support neutron scattering experiments performed in the FLNP JINR.

Investigations in the field of nanostructures and nanoscaled phenomena will be addressed to a study of physical characteristics of nanomaterials promising for various applications in modern nanotechnologies. The electronic, thermal and transport properties of carbon nanostructures will be investigated. It is planned to study the problem of quantum transport in molecular devices. Spin dynamics of magnetic nanoclusters will be investigated. The analysis of resonance tunneling phenomena in the layered superconductors and superconducting nanostructures in the external fields will be performed. Numerical modeling of resonance, radiative and chaotic properties of intrinsic Josephson junctions in high temperature superconductors is planned to be carried out.

Models in condensed matter physics will be studied by using methods of equilibrium and non-equilibrium statistical mechanics with the aim of revealing general properties of many-particle systems based on the ideas of self-similarity and universality. Mathematical mechanisms, underlying the kinetic and stationary behavior of model systems, as well as possible links between different models, will be investigated. The study of two-dimensional lattice models by the transfer matrix method will be focused on confirming the predictions of the logarithmic conformal field theory. The theory of integrable systems will be developed in the aspect of finding new integrable boundary conditions for two-dimensional spin systems and the solution of the corresponding Yang-Baxter equations. The universal behavior of correlation functions in non-equilibrium systems will be studied as well. The research in the structure theory and the theory of representations of quantum groups and matrix algebras will be directed to further applications in the theory of integrable models in quantum mechanics and statistical physics. Applications of the elliptic hypergeometric integrals, defining the most general solutions of the Yang-Baxter equation and most complicated known exactly computable path integrals in four-dimensional quantum field theory, to two-dimensional spin systems.

Expected main results in 2014:

- Calculation of the spin-excitation spectrum and thermodynamic characteristics of the high-temperature Fe-based superconductors within the effective anisotropic $J_1 - J_2$ model.
Study of the doping dependence of superconducting temperature T_c within the extended Hubbard model in the Mott-Hubbard regime for various values of the single-site U and intersite V_{ij} Coulomb repulsions.
Study of small-angle neutron scattering from multiphase fractal systems.
Investigation of nonequilibrium properties of trapped cold atoms. Description of the process of generating quantum turbulence and granular states in Bose-condensed trapped systems.
Study of electron and heat transport through graphene-DNA base-graphene system.

Calculation of the density of electronic states in armchair and zig-zag graphene nanoribbons containing topological defects and domain walls.

Investigation of the influence of resonance and tunneling phenomena on radiation of electromagnetic waves in terahertz region in the layered superconductors and superconducting nanostructures in external fields.

Development of a theory for correct description of finite quantum systems with applications to magnetic molecules and nanoclusters.

- Investigation of the conditions of integrability of the fragmentation processes with factorized steady state.
Study of the stationary state of an integrable model of the attractive traffic on the lattice with periodic boundary conditions.
Investigation of the properties of the elliptic modular double and its applications to integrable models of statistical mechanics.
Construction of Yang-Mills instantons on the conifold and a study of their properties.
Explicit implementation of renormalization group transformations in the 3D spherical model.

List of activities:

Activity or experiment	Leaders
Laboratory or other	Main researchers
Division of JINR	
1. Complex materials and nanostructures	V.A. Osipov N.M. Plakida
BLTP	E.M. Anitas, A.Yu. Cherny, A.V. Chizhov, V. Ilkovich, O.G. Isaeva, V.L. Katkov, E.A. Kochetov, D.V. Kolesnikov, S.E. Krasavin, A.N. Novikov, V.N. Plechko, I.R. Rahmonov, J. Schmelzer, Yu.M. Shukrinov, M.A. Smondyrev, J. Smotlacha, A.A. Vladimirov, V.Yu. Yushankhai
2. Contemporary problems of statistical physics	J. Brankov V.B. Priezzhev
BLTP	N.Zh. Bunzarova, V.M. Dubovik, V.I. Inozemtsev, T.A. Ivanova, A.L. Kuzemsky, V. Papoyan, A.E. Patrik, A.M. Povolotsky, P.N. Pyatov, V.P. Spiridonov, V.I. Yukalov, P.E. Zhidkov
FLNP	V.L. Aksenov, A.M. Balagurov, A.I. Kuklin

Collaboration

Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	ANL YSU
Australia	Melbourne Sydney	Univ. Univ.
Belarus	Minsk	IP NASB ICE MES RB JIMB NASB JIPNR-Sosny NASB UCL
Belgium	Louvain-la-Neuve	

Brazil	Brasilia, DF Sao Paulo, SP Natal, RN	UnB USP IIP UFRN
Bulgaria	Sofia	IMech BAS ISSP BAS SU INRNE BAS
Canada	Montreal Quebec Kingston London	Concordia ULaval Queen's Western
Czech Republic	Řež	NPI ASCR
France	Paris Marseille Nice Valenciennes	UPMC UPC UN UVHC
Germany	Bonn Bremen Braunschweig Dortmund Darmstadt Dresden Duisburg Leipzig Magdeburg Rostock Stuttgart Wuppertal	UniBonn Univ. TU TU Dortmund GSI IFW MPI PkS TU Dresden UDE UoC OVGU Univ. MPI-FKF Univ.
Hungary	Budapest	Wigner RCP
India	Mumbai	TIFR
Ireland	Dublin	DIAS
Italy	Catania Salerno	UniCT UniSa
Poland	Krakow Warsaw Katowice Poznan	JU IPCh PAS WUT US AMU IMP PAS
Romania	Bucharest Timișoara	IFIN-HH UVT
Russia	Moscow	MGTU MIREA NNRU "MEPhI"

		MSU
		PFUR
		SINP MSU
		MI RAS
		NRC KI
	Moscow, Troitsk	HPPI RAS
		INR RAS
	Belgorod	NRU BelSU
	Dubna	BMSUT MIREA
	Gatchina	PNPI
	Kazan	KFU
	Protvino	IHEP
	Saratov	SSU
	St. Petersburg	ETU
		IPTI RAS
		SPbSU
	Voronezh	VSU
Moldova	Chişinău	IAP ASM
Mongolia	Ulaanbaatar	NUM
Serbia	Belgrade	INS “VINČA”
Slovak Republic	Bratislava	IP SAS
	Košice	IEP SAS
		TUKE
Slovenia	Ljubljana	UL
Spain	Madrid	ICMM
Switzerland	Villigen	PSI
	Zurich	ETH
Taiwan	Taipei	IP AS
Ukraine	Kharkov	KFTI NASU
	Kiev	IMP NASU
		NUK
	L’viv	ICMP NASU
USA	Louisville, KY	UofL
	New York, NY	CUNY
	Rochester, NY	UR
	Tallahassee, FL	FSU
Uzbekistan	Tashkent	Assoc.“P.-S.” PTI
Vietnam	Hanoi	IMS VAST

Modern Mathematical Physics: Strings and Gravity, Supersymmetry, Integrability

Leaders: A.P. Isaev
A.S. Sorin
Deputy: S.O. Krivonos
Scientific leader: A.T. Filippov

Participating Countries and International Organizations:

Australia, Austria, Armenia, Belarus, Belgium, Brazil, Bulgaria, Canada, CERN, Czech Republic, France, Germany, Greece, Hungary, ICTP, India, Italy, Japan, Mexico, Norway, Poland, Romania, Russia, Serbia, Turkey, Ukraine, United Kingdom, USA.

Scientific Programme

The main purpose of research in modern mathematical physics is the development of mathematical methods for solving the most important problems of modern theoretical physics: clarifying the nature of fundamental interactions and their symmetries, construction and study of effective field models arising in the theory of strings and other extended objects, uncovering the geometric description of quantum symmetries and their spontaneous breaking in the framework of search for a unified theory of all fundamental interactions, including quantum gravity. Mathematical physics in recent years has been characterized by increasing interest in identifying and effective using of integrability in various areas, in applying powerful mathematical methods of quantum groups and of non-commutative geometry to quantum theories of fundamental interactions as well as to classical models.

The main goals and tasks of the research within the theme include: development of new mathematical methods for description of a variety of integrable models and their exact classical and quantum solutions; analysis of a wide range of problems in the theory of superstrings and superbranes, including study of nonperturbative regimes in supersymmetric gauge theories; development of a microscopic description of black holes and constructing cosmological models of the early Universe. The decisive factor to solve the above problems is a crucial use of the mathematical methods of the theory of integrable systems, quantum groups and noncommutative geometry.

Expected main results in 2014:

- In quantum integrable models with high symmetry the closed expression for the scalar product of the nested Bethe vectors in terms of the sums over partitions of the sets of the Bethe parameters will be obtained. The cases when these sums can be reduced to the product of determinants will be investigated. The determinant formulas for the scalar product of the Bethe vectors in the nested quantum integrable models with higher symmetries will be used to calculate the form-factors of the local operators and correlation function.

The dilaton field as a model of dark matter will be taken into account to construct the new self-consistent models of compact relativistic stars. This class of models avoids the well-known difficulties of the $f(R)$ theories of gravity. The models of compact stars with different equations of state will be studied, and the predictions of the models will be compared with astrophysical data.

New relations for the confluent Heun functions will be derived by using the corresponding monodromy group and the asymptotics of these functions around the irregular singular point will be studied. New numerical algorithms for calculations with the confluent Heun functions will be developed.

Existence of bound states of spinor-particles and their physical spectra in the metrics of Schwarzschild, Kerr, Reisner-Nordstrom, Kerr-Newman, Vaidya etc., will be investigated by using new boundary conditions. Nonquantum motion of test particles in these metrics will be studied.

The ingredients of real Lagrangian geometry will be extended to the case of complex variety with holomorphic symplectic form with the aim to find a complex version of the Bohr-Sommerfeld condition for complex Lagrangian submanifolds.

The properties of gluon propagator in the 3d gauge theory on the lattice with $SU(2)$ symmetry will be studied numerically.

The density, correlators and parameters of the interaction of Abelian monopoles near the critical temperature will be calculated within the lattice QCD with gauge group $SU(3)$.

- The off-shell superfield formulations for the $AdS_3 \times S^3$ and $AdS_5 \times S^5$ superstrings within the Pohlmeyer reduction procedure will be constructed. The corresponding quantization procedures will be developed.

The new models of the $N = 4$ and $N = 8$ supersymmetric mechanics which includes semi-dynamical degrees of freedom interacting with the background non-Abelian gauge fields will be constructed.

The new models of Landau type with the extended world-line supersymmetry will be developed. The possibility of their applications in the theory of quantum Hall, Yang-Mills theory and superstrings will be analyzed.

A class of self-dual models of nonlinear electrodynamics and its supersymmetric extensions will be constructed.

- The effective scalar theory, which has cosmological solutions and black hole solutions, will be constructed within the affine generalizations of the Einstein theory of gravity. The integrability of this model will be studied and an iterative procedure for finding the general solutions will be developed.

The new type of phenomenological cosmological Lagrangians will be constructed. Their general properties and methods of their covariant generalization will be developed. The relations between Galilean theory and gravity with torsion will be analyzed in the linear approximation.

The phase transition diagrams for the complete symmetric Toda system will be analyzed. The extreme multi-center black hole solutions of the $D = 4$ $N = 2$ supergravity will be constructed and classified. The integrable supergravity cosmologies will be found and investigated.

List of activities:

Activity or experiment	Leaders
Laboratory or other	Main researchers
Division of JINR	
1. Quantum groups and integrable systems	A.P. Isaev
BLTP	S.A. Belev, R.M. Mir-Kasimov, S.Z. Pakulyak, G.S. Pogosyan, N.A. Tyurin + 4 students
2. Supersymmetry	E.A. Ivanov
BLTP	D. Cirilo, S.A. Fedoruk, S.O. Krivonos, M. Pientek, A.V. Shcherbakov, A.O. Sutulin, B.M. Zupnik + 2 students
3. Quantum gravity, cosmology and strings	A.T. Filippov V.V. Nesterenko A.S. Sorin
BLTP	B.M. Barbashov, E.A. Davydov, B. Dimitrov, D.V. Fursaev, A.B. Pestov, I.G. Pirozhenko, A.D. Popov, E.A. Tagirov, P.V. Tretyakov + 3 students
LIT	I.L. Bogoliubsky, A.M. Chervyakov
VBLHEP	E.E. Donets
UC	S.Z. Pakuliak

Collaboration

Country or International Organization

City

Institute or Laboratory

Armenia	Yerevan	YSU
Austria	Vienna	TU Vienna
Australia	Sydney	Univ.
Belarus	Minsk	IP NASB
Belgium	Leuven	K.U.Leuven
Brazil	Sao Paulo, SP	USP
Bulgaria	Sofia	INRNE BAS SU
Canada	Montreal	McGill UdeM
	Edmonton	U of A
CERN	Geneva	CERN
Czech Republic	Prague	CTU CU
	Řež	NPI ASCR
France	Annecy-le-Vieux	LAPP LAPTh
	Dijon	UB
	Lyon	ENS Lyon
	Marseille	CPT
	Nantes	SUBATECH
	Paris	ENS LP THE
	Palaiseau	Polytech
	Valenciennes	UVHC
Germany	Berlin	FU Berlin HUB
	Bielefeld	Univ.
	Bonn	UniBonn
	Dortmund	TU Dortmund
	Hannover	LUH
	Jena	Univ.
	Leipzig	UoC
	Munich	MPI-P
	Potsdam	AEI
Greece	Athens	UoA
Hungary	Budapest	Wigner RCP
India	Calcutta	BNC
ICTP	Trieste	ICTP
Italy	Bari	INFN
	Frascati	INFN LNF
	Naples	INFN

Japan	Padua	UniPd
	Pavia	INFN
	Pisa	INFN
	Salerno	UniSa
	Trieste	SISSA/ISAS
	Turin	INFN
	Fukuoka	Kyushu Univ.
	Kyoto	KSU
		RIMS
		YITP
Mexico	Tsukuba	KEK
	Leon	UG
Norway	Trondheim	NTNU
Poland	Warsaw	CAC PAS
		UW
	Krakow	JU
		NINP PAS
Romania	Lodz	UL
	Wroclaw	UW
	Bucharest	IFIN-HH
	Moscow	ITEP
Russia		LPI RAS
		MSU
		MI RAS
		NRU HSE
		VNIIMS
	Moscow, Troitsk	INR RAS
	Chernogolovka	LITP RAS
	Petrozavodsk	PetrSU
	Protvino	IHEP
	St. Petersburg	PDMI RAS
Serbia		SPbSU
	Tomsk	TPU
	Belgrade	IPB
		Univ.
Turkey	Istanbul	BU
	Izmir	IYTE
United Kingdom	London	Imperial College
	Cambridge	Univ.
	Durham	Univ.
	Liverpool	Univ.
	Southampton	Univ.
	York	Univ.
Ukraine	Kiev	BITP NASU
	Kharkov	KFTI NASU

USA	New York, NY	CUNY
		RU
		SUNY
	Baltimore, MD	JHU
	Cincinnati, OH	UC
	Clemson, SC	Clemson
	College Park, MD	UM
	Coral Gables, FL	UM
	Minneapolis, MN	UofM
	Norman, OK	UO
	Philadelphia, PA	Penn
	Piscataway, NJ	Rutgers
	Rochester, NY	UR

Dubna International Advanced School of Theoretical Physics (DIAS-TH)

Leaders:

A.S. Sorin

Scientific leader:

V.V. Voronov

A.T. Filippov

Participating Countries and International Organizations:

Austria, Brazil, Bulgaria, Canada, CERN, Czech Republic, France, Germany, Greece, Hungary, India, Israel, Italy, Japan, Mexico, Poland, Romania, Russia, Serbia, South Africa, Turkey, Ukraine, United Kingdom, USA, Vietnam.

The Bogoliubov Laboratory of Theoretical Physics (BLTP) has a good record of organizing international workshops and schools in Dubna. DIAS-TH organizes and supervises all educational programs for students, postgraduates, and young scientists at BLTP. It should function continuously and the standard short schools (about 3-4 a year) should be organized coherently. Other educational programs in Dubna such as the JINR University Center may also correlate with DIAS-TH (common programs on modern theoretical physics, workshops for students and young scientists, etc.).

The main goals of DIAS:

- Training courses for students, graduates, and young scientists in the JINR Member States and other countries (according to special agreements and grants).
- Looking for and supporting gifted young theorists in the JINR Member States; creating databases of students and young researchers.
- Organization of schools of different levels in Dubna and coordination with similar schools in Russia, Germany, and other European countries.
- Support of the JINR experimental programs by organizing lecture courses and review lectures on new trends in modern physics.
- Cooperation with the JINR University Center in training students and postgraduates as well as in organizing schools for students.
- Coordination of the research - training programs with workshops and conferences at JINR.
- Publication of lectures and discussions in different forms, in particular, with the use of modern electronic equipment, etc.
- Supporting the WEB page of DIAS-TH which should become the organizing center of the programs related to DIAS-TH.

The main topics of the DIAS activity should be centered around the most important directions of research at BLTP: Theory of Fundamental Interactions; Nuclear Theory; Theory of Condensed Matter; Modern Mathematical Physics.

Expected main results in 2014:

- Organization of three international schools and a research workshop at BLTP.
- Organization of “educational workshops“, one-day lectures/discussions and regular seminars for students and post-graduates.
- Computer processing of video records of lectures, support of digital archive of video records.
- Support of Web-site of DIAS-TH.

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers
1. DIAS-TH	A.S. Sorin V.V. Voronov
BLTP	D. Blaschke, A.T. Filippov, A.P. Isaev, E.A. Kolganova, V.V. Nesterenko, V.A. Osipov, I.G. Pirozhenko, O.V. Teryaev, P.V. Tretyakov, A.A. Starobinsky, A.A. Vladimirov, V.I. Zhuravlev + 4 students
LIT	V.V. Korenkov
UC	S.Z. Pakuliak
FLNP	V.L. Aksenov
VBLHEP	I.A. Savin, Yu.A. Panebratsev
DLNP	V.A. Bednyakov
FLNR	Yu.Ts. Oganessian

Collaboration

Country or International Organization	City	Institute or Laboratory
Austria	Vienna	Univ. TU Vienna
Brazil	Sao Paulo, SP	USP
Bulgaria	Sofia	INRNE BAS SU
Canada	Montreal	UdeM
	Edmonton	U of A
CERN	Geneva	CERN
Czech Republic	Prague	CTU IP ASCR
	Řež	NPI ASCR
France	Annecy-le-Vieux	LAPP
	Dijon	UB
	Lyon	ENS Lyon
	Marseille	CPT
	Nantes	SUBATECH

	Paris	ENS LPTHE UPMC UVHC
	Valenciennes	HUB
Germany	Berlin	UniBonn
	Bonn	Univ.
	Frankfurt/Main	DESY
	Hamburg	LUH
	Hannover	Univ.
	Jena	UoC
	Leipzig	MPI-P
	Munich	AEI
	Potsdam	Univ.
	Rostock	DESY
	Zeuthen	UoA
Greece	Athens	Wigner RCP
Hungary	Budapest	BNC
India	Calcutta	INFN LNF
Italy	Frascati	UniPd
	Padua	INFN
	Pavia	INFN
	Pisa	UniSa
	Salerno	SISSA/ISAS
	Trieste	INFN
	Turin	WIS
Israel	Rehovot	KSU
Japan	Kyoto	RIMS
	Tsukuba	KEK
	Leon	UG
Mexico	Warsaw	UW
Poland	Otwock-Swierk	NCBJ
	Wroclaw	UW
Romania	Bucharest	IFIN-HH
Russia	Moscow	ITEP
		LPI RAS
		MSU
		SCC RAS
		SINP MSU
		MI RAS
		VNIIMS
	Moscow, Troitsk	INR RAS
	Chernogolovka	LITP RAS
	Gatchina	PNPI
	Petrozavodsk	PetrSU

	Protvino	IHEP
	St. Petersburg	PDMI RAS
	Tomsk	TSU
Serbia	Belgrade	IPB
		Univ.
South Africa	Cape Town	UCT
Turkey	Istanbul	BU
Ukraine	Kiev	BITP NASU
	Kharkov	KFTI NASU
United Kingdom	London	Imperial College
	Durham	Univ.
	Cambridge	Univ.
	Southampton	Univ.
	York	Univ.
USA	New York, NY	CUNY
		SUNY
	Baltimore, MD	JHU
	College Park, MD	UM
	Cincinnati, OH	UC
	Coral Gables, FL	UM
	Minneapolis, MN	UofM
	Newport News, VA	JLab
	Philadelphia, PA	Penn
	Piscataway, NJ	Rutgers
	Rochester, NY	UR
	Salt Lake City, UT	U of U
Vietnam	Hanoi	IP VAST

Elementary
Particle Physics
and
Relativistic
Nuclear Physics
(02)

Study of e^+e^- Interactions: Physics and Detectors

Leader:

A.G. Olshevskiy

Participating Countries and International Organizations:

Armenia, Belarus, Bulgaria, CERN, China, Czech Republic, France, Germany, Georgia, Japan, Italy, Poland, Russia, Switzerland, Ukraine, United Kingdom, USA.

Scientific Programme

Study of e^+e^- interactions from very low up to very high energies has always been considered as an important precision tool, complementary to hadron machines. The project to build the International Linear Collider (ILC) is considered by the high-energy physics community as the next step in accelerator-based particle physics. Development of the physics program and detector design and prototyping are a necessary step to participation in this worldwide activity.

Expected main results in 2014:

- Development of methods for calculation of complex processes.
- Optimization of calorimeter detector parameters.
- Processing of the BES-III experiment data on GRID-farms.

List of projects:

Project	Leader	Priority (period of realization)
1. SANC	D.Yu. Bardin	1 (2003 – 2015)
2. BES-III	A.S. Zhemchugov	1 (2007 – 2016)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
ILC Project	A.G. Olshevskiy	Realization
DLNP	E.M. Syresin, G.A. Chelkov, A.S. Zhemchugov, N.B. Skachkov, N.V. Anfimov, A.N. Skachkova, Z.V. Krumshteyn, V.V. Chalyshev	
BLTP A.V. Efremov	S.B. Gerasimov, A.B. Arbuzov, D.I. Kazakov, E.A. Kuraev, G.A. Kozlov, O.V. Teryaev, S.G. Bondarenko	
VBLHEP I.A. Tyapkin	I.A. Tyapkin, Z. Sadygov, T.Yu. Bokova	
CAR V.N. Samoilov	V.N. Samoilov	

SANC Project**D.Yu. Bardin**

Realization

DLNP

L.V. Kalinovskaya, A.A. Sapronov, P. Christova,
R.R. Sadykov, E.D. Uglov, V.A. Kolesnikov**BES-III Project****A.S. Zhemchugov**

Realization

DLNP

I.R. Boyko, D.V. Dedovich, Yu.A. Nefedov

BLTP

E.A. Kuraev, O.V. Teryaev

Collaboration**Country or International
Organization****City****Institute or Laboratory**

Armenia

Yerevan

ANL

Belarus

Minsk

NC PHEP BSU

JIPNR-Sosny

NASB

Bulgaria

Sofia

INRNE BAS

Shumen

US

CERN

Geneva

CERN

China

Beijing

IHEP CAS

Czech Republic

Prague

CU

CTU

France

Paris

UPMC

College de France

Strasbourg

IPHC

Germany

Hamburg

DESY

Munich

MPI-P

Zeuthen

DESY

Japan

Tsukuba

KEK

Italy

Turin

UniTo

Poland

Krakow

JU

Russia

Moscow

ITEP

Moscow, Troitsk

INR RAS

Gatchina

PNPI

Novosibirsk

BINP SB RAS

Tomsk

TSU

Switzerland

Villigen

PSI

Bern

Uni Bern

Ukraine

Kharkov

ISC NASU

United Kingdom

Oxford

Univ.

USA

Gainesville, FL

UF

Study of Processes with Symmetry Violation

Leader:

A.S. Kurilin

Participating Countries and International Organizations:

Belarus, Japan, Republic of Korea, Russia, Slovak Republic, Taiwan, Ukraine, USA.

Scientific Programme

Test of Standard Model predictions. Investigation of rare decays of K-mesons. Search for the $K_L^0 \rightarrow \pi^0 \nu \bar{\nu}$ decay with direct CP violation in experiments at JPARC and U-70 (SRC-IHEP.)

Expected main results in 2014:

- Development of GEANT4-based simulation, DAQ and data analysis software.
- Design and test of new detectors.
- Data taking and analysis of new data for the rare decay of K_L^0 .
- Data taking on KOTO setup at JPARC (Japan).
- Design of the K_L^0 beam line and setup for the experiment at U-70 (SRC-IHEP).

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Search for the $K_L^0 \rightarrow \pi^0 \nu \bar{\nu}$ decay (KOTO experiment at JPARC)	A.S. Kurilin	R&D Data taking Data analysis
DLNP	V.A. Baranov, V.A. Bednyakov, S.V. Podolsky, A.G. Dolbilov, E.S. Kuzmin, A.S. Moiseenko, Yu.Yu. Stepanenko, S.Yu. Porokhovoy, V.M. Romanov	
BLTP	D.I. Kazakov, A.V. Gladyshev	
VBLHEP	A.I. Malakhov, S.J. Sychkov	
FLNP	V.N. Shvetsov, P.V. Sedyshev	
2. KLOD experiment	Yu.Yu. Stepanenko	Simulation
DLNP	S.V. Podolsky, V.M. Romanov, I.E. Chirikov-Zorin	
VBLHEP	S.J. Sychkov	

Collaboration

Country or International Organization	City	Institute or Laboratory
Belarus	Gomel	GSU
	Minsk	NC PHEP BSU
Japan	Ibaraki	Ibaraki Univ.
	Kyoto	Kyoto Univ.
	Osaka	Osaka Univ.
		RCNP
	Saga	Saga Univ.
Republic of Korea	Tsukuba	KEK
	Yamagata	Yamagata Univ.
	Pusan	PNU
	Chongju	CBNU
	Seoul	SNU
Russia	Moscow	GPI RAS
		ARRICT
		SINP MSU
	Moscow, Troitsk	INR RAS
	Protvino	IHEP
Slovak Republic	Košice	IEP SAS
Ukraine	Kharkov	KFTI NASU
USA	East Lansing, MI	MSU
	Chicago, IL	UChicago
	Tempe, AZ	ASU
Taiwan	Taipei	NTU

Lifetime Measurement of $\pi^+\pi^-$ and $\pi^\pm K^\mp$ Atoms to Test Low-Energy QCD Precise Predictions

Leader:

L.G. Afanasyev

Scientific leader:

L.L. Nemenov

Participating Countries and International Organizations:

CERN, Czech Republic, Italy, Japan, Romania, Russia, Spain, Switzerland.

Scientific Programme

The experiment aims to measure the lifetime of $\pi^+\pi^-$ atoms ($A_{2\pi}$), observe πK atoms ($A_{\pi K}$), and measure their lifetime using the 24 GeV proton beam. The precise measurement of these quantities will enable us to determine the combination of s -wave pion-pion $|a_0 - a_2|$ and pion-kaon $|a_{1/2} - a_{3/2}|$ scattering lengths (with isospin 0, 2 and 1/2, 3/2, respectively) in a model-independent way. The precision of $A_{2\pi}$ lifetime measurement will be better than 6% and the difference $|a_0 - a_2|$ will be determined within 3% or better. The accuracy of $A_{\pi K}$ lifetime measurement will be at the level of 20% and the difference $|a_{1/2} - a_{3/2}|$ will be determined at the level of 10%. Low-energy QCD predicts these values with an accuracy about 2% for the pion-pion scattering lengths and about 10% for the πK scattering lengths. The pion-pion and pion-kaon scattering lengths have never been verified with the experimental data with the same level of precision. For this reason the proposed measurements will be a crucial check of the low-energy QCD predictions and our understanding of the nature of the QCD vacuum.

Expected main results in 2014:

- Completion of the processing of the 2008-2010 data for observation and lifetime measurement of $\pi^\pm K^\mp$ atom. Publishing results.
- Preparation of the letter of intent for investigation of $\pi^\pm K^\mp$ and $\pi^+\pi^-$ atoms at the SPS accelerator, CERN.
- Publishing of the result on observation of the long-lived states of $\pi^+\pi^-$ atom basing on 2012 data.
- Processing of the data collected in 2011-2012 for measurement of the multiple scattering in thin foils with accuracy better than 1%.
- Completion of the processing of the 2008-2010 data for lifetime measurement of $\pi^+\pi^-$ atom. Preparation of publication.

List of activities:**Activity or experiment****Laboratory or other****Division of JINR****Responsible person****Experiment DIRAC****Leaders****Main researchers****L.G. Afanasyev****Status**Data taking
Data analysis

DLNP

M.V. Zhabitsky, A.V. Dudarev, V.V. Kruglov,
V.V. Karpukhin, E. Kulish, A.V. Kulikov, L.L. Nemenov,
M.V. Nikitin

LIT

P.V. Zrelov, O.V. Voskresenskaya, L.Yu. Kruglova

Collaboration		
Country or International Organization	City	Institute or Laboratory
CERN	Geneva	CERN
Czech Republic	Prague	CTU
		IP ASCR
	Řež	NPI ASCR
Italy	Frascati	INFN LNF
	Messina	UniMe
	Trieste	INFN
Japan	Kyoto	KSU
	Tokyo	TMU
	Tsukuba	KEK
Romania	Bucharest	IFA
Russia	Moscow	SINP MSU
	Protvino	IHEP
Spain	Santiago de Compostela	USC
Switzerland	Bern	Uni Bern
	Zurich	UZH

A T L A S: Physics Research at the LHC

Leaders: N.A. Russakovich
V.A. Bednyakov
Deputy: A.P. Cheplakov

Participating Countries and International Organizations:

Armenia, Azerbaijan, Belarus, Canada, CERN, Czech Republic, France, Germany, Georgia, Greece, Israel, Italy, Netherlands, Russia, Slovak Republic, Spain, USA, Uzbekistan.

Scientific Programme

Many-sided and comprehensive investigations of superhigh-energy (7–14 TeV) proton scattering at the Large Hadron Collider with the ATLAS facility (created at the previous stage of the project) will yield utterly new and unique experimental data. Their analysis will allow solution to the most profound physical problems fundamentally important for world outlook.

JINR researchers will take part in solution of some of these problems within the project. Among the most important of them are the clarification of the origin of the elementary particle mass (Higgs mechanism) and search for and investigation of supersymmetry, which will allow an insight into the nature of galactic dark matter and the character of the evolution of our Universe. Other important problems are determination of the applicability boundaries of the modern standard model of elementary particles and observation of evidence for new physical phenomena, such as additional space dimensions or previously unknown particles and interactions. In addition, JINR researchers will get new results allowing more specific knowledge as to the properties of the already known elementary particles such as the W and Z bosons, the top quark, and others.

Implementation of this project aimed at solving highly important scientific problems will result in getting unique applied data.

The “by-products” worth noting are development, debugging, and experience in operation of systems for remote monitoring of highly complicated devices and development and practical use of the distributed computation system (grid) in a long-term, full-scale experiment.

Expected main results in 2014:

- Participation in the LHC and ATLAS detector maintenance and upgrades.
- Data development and analysis of the ATLAS data. The new physical results to be obtained in investigations of some key processes of the Standard Model, exotic physics, search for SUSY.
- Development of the ATLAS physics programme: simulation of physical processes, participation in the ATLAS working group, etc.
- Work on the modernization project of the ATLAS detector, including the toroidal magnets, hadron calorimeters and muon spectrometer.

List of projects:

Project	Leader	Priority (period of realization)
1. ATLAS	N.A. Russakovich V.A. Bednyakov	1 (2010 – 2014)
2. Upgrade of the ATLAS Detector	A.P. Cheplakov	1 (2013 – 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
Experiment ATLAS	N.A. Russakovich V.A. Bednyakov A.P. Cheplakov	Technical proposal
DLNP V.A. Bednyakov, J.A. Budagov, D.I. Khubua, G.A. Chelkov	A.L. Gongadze, I.R. Boyko, M.A. Demichev, Z.V. Krumshteyn, Yu.A. Koultschitski, I.A. Minashvili, M.I. Gostkin, G.L. Glonti, D.V. Dedovich, Yu.A. Nefedov, D.V. Kharchenko, Yu.A. Usov, M.Yu. Kazarinov, V.A. Kolesnikov, S.N. Malyukov, V.Yu. Batusov, E.V. Khramov, V.V. Lyubushkin, R.R. Sadykov, M.V. Chizhov, V.V. Glagolev, P.V. Tereshka, Z.U. Usubov, Yu.P. Ivanov, S.N. Karpov, Z.M. Karpova, M.V. Lyablin, A.B. Lazarev, G.I. Lykasov, A.A. Sapronov, A.N. Shalyugin, M.M. Shiyakova, V.B. Vinogradov, A.C. Zhemchugov, S.N. Baranov, Yu.L. Vertogradova, A.V. Ershova, N. Huseinov, L.K. Gladilin, I.V. Eletskikh, T.V. Lyubushkina, E.M. Plotnikova, E.D. Uglov, Yu.I. Davydov, V. Elkin, S.A. Kotov, V.G. Kruchonok, N.P. Kuznetsov, I.N. Potrap	
VBLHEP A.P. Cheplakov, V.D. Peshekhonov	N. Dzhavadov, E.A. Ladygin, F.N. Ahmadov, V.V. Kukhtin, S.S. Parzhitsky, V.N. Pozdnyakov, B.G. Shaykhatdenov, A.G. Karev, N.G. Fadeev, L.A. Merkulov, V.V. Myalkovsky, E.V. Serochkin, A.A. Soloshenko, N.I. Zimin, A.A. Savenkov, Yu.A. Filippov	
LIT V.V. Korenkov, V.V. Ivanov, P.V. Zrelov	I.N. Aleksandrov, N.I. Gromova, A.V. Yakovlev, V.M. Kotov, V.N. Shigaev, M.A. Mineev, D.A. Oleynik, A.S. Petrosyan	
BLTP D.I. Kazakov	A.V. Gladyshev, A.V. Bednyakov, N.I. Kochelev, A.F. Pikelner, O.B. Teryaev	
FLNP S.A. Kulikov	M.V. Bulavin, E.N. Kulagin, E.P. Shabalin	

Collaboration

Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	ANL
Azerbaijan	Baku	IP ANAS
Belarus	Minsk	IP NASB NC PHEP BSU JIPNR-Sosny NASB GSTU
	Gomel	TRIUMF
Canada	Vancouver	UdeM
	Montreal	

CERN
Czech Republic
France

Germany
Georgia
Greece
Israel
Italy
Netherlands
Russia

Slovak Republic

Spain
USA
Uzbekistan

Geneva
Prague
Clermont-Ferrand
Orsay
Munich
Tbilisi
Athens
Rehovot
Pisa
Amsterdam
Moscow

Protvino
Bratislava

Barcelona
Argonne, IL
Samarkand

CERN
CU
LPC-CF
LAL
MPI-P
HEPI-TSU
UoA
WIS
INFN
NIKHEF
LPI RAS
ITEP
MSU
IHEP
CU
IP SAS
IFAE
ANL
SSU

JINR's Participation in Experiments at the Fermilab

Leaders: G.D. Alexeev
V.V. Glagolev
Scientific leader: J.A. Budagov

Participating Countries and International Organizations:

Belarus, Bulgaria, Chile, Georgia, Greece, Italy, Romania, Russia, Slovak Republic, USA, Ukraine, Uzbekistan.

Scientific Programme

- Data processing, and physics analysis (D0).
- Data processing; physics analysis, Research and Development with calorimeter elements on heavy crystals and extruded scintillator plates (CDF).

Expected main results in 2014:

- Development of the D0 software; data analysis; measurement of the Ξ_b mass, preliminary results on proton structure functions.
- Development of the CDF data analysis; new data for the top mass and for Very High Multiplicity studies.
- R&D with calorimeter elements on heavy crystals and extruded scintillator plates for Mu2e and ORKA experiments.

List of projects:

Project	Leader	Priority (period of realization)
1. D0	G.D. Alexeev	1 (1997 – 2014)
2. CDF	J.A. Budagov V.V. Glagolev	1 (1997 – 2014)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Experiment DØ	G.D. Alexeev	Data analysis
DLNP	V.N. Abazov, G.A. Golovanov, I.N. Churin, L.S. Vertogradov, Yu.L. Vertogradova, A.Yu. Verkheev, N.I. Zhuravlev, D.E. Korablev, V.L. Malyshev, M.A. Patsyuk, Yu.P. Merekov, N.B. Skachkov, V.V. Tokmenin, Yu.N. Kharzhzheev, A.M. Rojdestvenski, Yu.A. Yatsunenko	

2. Experiment CDF

J.A. Budagov
V.V. Glagolev

Data analysis

DLNP

A.M. Artikov, V.Yu. Batusov, V.I. Kolomoets, S.M. Kolomoets, M.V. Lyablin, Yu.A. Koulchitski, I.A. Suslov, F. Prokoshyn, A.V. Simonenko, D.I. Khubua, A.V. Sazonova, A.A. Semenov, I.E. Chirikov-Zorin, V.B. Flyagin, D.Sh. Chokhely, V.Yu. Baranov, Yu.I. Davydov, M.V. Lyablin, V.A. Bednyakov, V.V. Tereschenko, S.V. Tereschenko, N.S. Azaryan, Z.U. Usubov, S.N. Studenov, A.N. Shalyugin, B.M. Sabirov

BLTP

G.A. Kozlov, D.I. Kazakov, M. Davydov

LIT

V.V. Ivanov, P.V. Zrelov, V.V. Uzhinsky, A.M. Raportirenko

CAR

V.N. Samoilov

3. Preparation for the experiment Mu2e and ORKA

V.V. Glagolev
J.A. Budagov

R&D Realization

DLNP

A.M. Artikov, V.Yu. Batusov, V.I. Kolomoets, S.M. Kolomoets, M.V. Lyablin, Yu.A. Koulchitski, I.A. Suslov, F. Prokoshyn, A.V. Simonenko, D.I. Khubua, A.V. Sazonova, A.A. Semenov, I.E. Chirikov-Zorin, V.B. Flyagin, D.Sh. Chokhely, V.Yu. Baranov, Yu.I. Davydov, M.V. Lyablin, V.A. Bednyakov, V.V. Tereschenko, S.V. Tereschenko, N.S. Azaryan, Z.U. Usubov, S.N. Studenov, A.N. Shalyugin, B.M. Sabirov

BLTP

G.A. Kozlov, D.I. Kazakov, M. Davydov

LIT

V.V. Ivanov, P.V. Zrelov, V.V. Uzhinsky, A.M. Raportirenko

CAR

V.N. Samoilov

Collaboration

**Country or International
Organization**

City

Institute or Laboratory

Belarus

Minsk

NC PHEP BSU
"INTEGRAL"

Bulgaria

Sofia

SU

Chile

Valparaiso

Univ.

Georgia

Tbilisi

HEPI-TSU

Greece

Athens

UoA

Italy

Pisa

UniPi

INFN

Udine

UNIUD

Frascati

INFN LNF

Romania

Bucharest

IFIN-HH

Russia

Moscow, Troitsk

INR RAS

Slovak Republic	Bratislava	IP SAS
		CU
USA	Argonne, IL	ANL
	Batavia, IL	Fermilab
	Boston, MA	NU
	Charlottesville, VA	UVa
	New York, NY	SUNY
Ukraine	Kharkov	ISC NASU
Uzbekistan	Samarkand	SSU

Study of Neutrino Oscillations

Leader:

Yu.A. Gornushkin

Deputy:

O.Yu. Smirnov

Participating Countries and International Organizations:

Belgium, CERN, China, Croatia, Czech Republic, France, Germany, Hungary, Japan, Italy, Russia, Spain, Switzerland, Ukraine, USA.

Scientific Programme

- Search for long-baseline neutrino oscillation and study of neutrino oscillation parameters with the OPERA detector in the CNGS beam (CERN–Gran Sasso) OPERA project.
- Direct solar neutrino flux measurements with the BOREXINO detector – phase-II experiment.
- Improving of the precision of the θ_{13} neutrino mixing angle measurement in the Daya Bay experiment.

Expected main results in 2014:

- Scanning and analysis of the OPERA nuclear emulsion at JINR.
- Software development for the Target Tracker data analysis. Development of the Brick Finding software, analysis of the electronic detector data and event vertex location.
- Continuation of the data taking with the BOREXINO detector.
- Improvement of the position reconstruction algorithm for the BOREXINO detector.
- The study seasonal variations of the solar neutrino flux.
- Precise measurement of the pp-neutrino flux with total errors down to 15%.
- Improvement of the current results on the effective solar neutrino magnetic moment.
- Improvement of the current result on the $e \rightarrow \nu \gamma$ reactions.
- Development of Monte Carlo software for background simulation in the Daya Bay experiment.
- Participation in data analysis for θ_{13} mixing angle measurement in the Daya Bay experiment.

List of projects:

Project	Leader	Priority (period of realization)
1. OPERA	Yu.A. Gornushkin	1 (2010 – 2015)
2. BOREXINO	O.Yu. Smirnov	1 (1996 – 2015)
3. Daya Bay	D.V. Naumov	1 (2009 – 2014)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Experiment OPERA	Yu.A. Gornushkin	Data analysis
DLNP	S.G. Dmitrievsky, Z.V. Krumshtein, A.G. Olshevskiy, S.G. Zemskova, A.V. Chukanov, A.B. Sadovsky, D.V. Naumov, A.S. Sheshukov, A.A. Nozdrin	
VBLHEP	Yu.P. Petukhov	
LIT	G.A. Ososkov	
2. Experiment BOREXINO	O.Yu. Smirnov	Data taking
DLNP	K.A. Fomenko, D.V. Korablev, A.P. Sotnikov	
3. Daya Bay Project	D.V. Naumov	Data taking
DLNP	M. Gonchar, Yu.A. Gornushkin, I.P. Nemchonok, E.A. Naumova, A.G. Olshevskiy, O.Yu. Smirnov, O.B. Samoylov, D.V. Korablev, I. Butorov	

Collaboration

Country or International Organization	City	Institute or Laboratory
Belgium	Brussels	ULB VUB
	Geel	IRMM
	Leuven	K.U.Leuven
CERN	Geneva	CERN
China	Beijing	IHEP CAS CIAE
Croatia	Zagreb	RBI
Czech Republic	Prague	CU
France	Annecy-le-Vieux	LAPP
	Strasbourg	IPHC
Germany	Heidelberg	MPIK
	Munich	MPI-P
Hungary	Budapest	Wigner RCP
Japan	Nagoya	Nagoya Univ.
Italy	Bari	UniBa
		INFN
	Genoa	INFN
	Naples	INFN
	Legnaro	INFN LNL
	Milan	UNIMI INFN

	Padua	UniPd
	Perugia	INFN
	Pavia	INFN
	Rome	INFN
	Trieste	INFN
Russia	Moscow	NRC KI
		ITEP
	Moscow, Troitsk	INR RAS
	Gatchina	PNPI
Spain	Valencia	UV
Switzerland	Bern	Uni Bern
USA	Cambridge, MA	MIT
	Berkeley, CA	Berkeley Lab
	Los Angeles, CA	UCLA
	Madison, WI	UW-Madison
	Princeton, NJ	PU
	Upton, NY	BNL
Ukraine	Kharkov	ISC NASU

Experiment PANDA at FAIR

Leader:

A.G. Olshevskiy

Deputies:

G.D. Alexeev

A.S. Vodopyanov

Participating Countries and International Organizations:

Belarus, CERN, Czech Republic, Germany, Italy, Russia, Ukraine.

Scientific Programme

The study of the exotic nuclear-matter states and nucleon structure in the PANDA experiment at FAIR.

Expected main results in 2014:

- Development of MC generators and optimization of the event analysis.
- Coordination of the construction of the superconducting solenoid.
- Preparation of the documentation for magnet production.
- Preparation of the documentation for the production of the muon system.

List of projects:

Project	Leader	Priority (period of realization)
1. PANDA	A.G. Olshevskiy	1 (2011 – 2014)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. PANDA Project	A.G. Olshevskiy	Technical proposal
DLNP G.D. Alexeev	V.M. Abazov, N.B. Skachkov, N. Angelov, D.B. Pontekorvo, A.G. Samartsev, A.N. Skachkova, V.K. Rodionov, V.V. Tokmenin	
VBLHEP A.S. Vodopyanov	E.A. Stokovsky, M.G. Sapozhnikov, V.K. Dodokhov, E.K. Koshurnikov, G.S. Shabratova, M.Yu. Barabanov, V.A. Arefev, V.I. Astakhov, A.A. Efremov, V.I. Lobanov, Yu.Yu. Lobanov, P.V. Nomokonov, I.A. Alex, Yu.N. Rogov, R.A. Salmin, A.A. Feshchenko, M.K. Suleymanov, A.S. Galoyan	
LIT	Gh. Adam, V.V. Uzhinsky	
BLTP	A.S. Sorin, O.V. Teryaev, A.V. Efremov	

Collaboration

Country or International Organization

City

Institute or Laboratory

Belarus

Minsk

NC PHEP BSU

CERN

Geneva

CERN

Czech Republic

Prague

CU

Germany

Darmstadt

GSI

Italy

Turin

UniTo

Russia

Protvino

IHEP

Dubna

BSINP MSU

Ukraine

Kharkov

ISM NASU

Astrophysical Studies in Space Experiments

Leader:

L.G. Tkatchev

Participating Countries and International Organizations:

Belarus, Czech Republic, Japan, Mexico, Republic of Korea, Russia.

Scientific Programme

- The TUS space experiment has been proposed to measure the energy spectrum, composition and angular distribution of the Ultra High Energy Cosmic Rays (UHECR) at $E \approx 10^{19} - 10^{20}$ eV, to study the region beyond the GZK cutoff. Existence of these particles is beyond the Standard Model of particle physics and is of great interest. The study from the orbit is much more effective in comparison with the ground-based detectors. The existing world statistics is assumed to be increased by a factor of 2–3 during 3 years of the global data taking. The TUS detector will make it possible to study UHECP neutrino Extensive Air Showers (EAS) from the space orbit.
- The aim of the NUCLEON Project is direct CR measurements in the energy range 10^{11} – 10^{15} eV and the atomic charge range $Z = 1$ –30 in the near-Earth space to solve mainly the “knee” problem in the CR spectrum. The CR phenomena in this energy region are investigated in terrestrial experiments by measurement of EAS parameters or in balloon or space experiments. Below $\sim 10^{14}$ eV the spectrum and composition are known from direct observation with detectors placed in balloons and earth satellites. However, at higher energies the CR flux is smaller and more difficult for direct and needs observation. Precise measurement of the CR composition and anisotropy will help to test the existing theoretical concepts and will become a basis for further studies.

Expected main results in 2014:

- Completion of the complex tests of the in flight TUS apparatus on the Michail Lomonosov satellite.
- Participation in the data taking of the TUS experiment.
- Participation in production of the TUS on-line programs and off-line analysis.
- Design and production of the fluorescent dataactor for TYHKA array.
- Design of the calibration system for TUS detector on the Earth orbit.
- Completion of the complex tests of the NUCLEON trigger system.
- Development of the MC simulation program for the HERO space detector. Development of on-line data handling programs. Participation in the avant-project preparation.
- Participation in the data taking of the NUCLEON experiment.

List of projects:

Project	Leader	Priority (period of realization)
1. TUS	L.G. Tkatchev	1 (2012 – 2014)

List of activities:

Activity or experiment
Laboratory or other
Division of JINR
Responsible person

Leaders
Main researchers

Status

Experiment TUS

L.G. Tkatchev

Realization

DLNP

V.M. Grebenyuk, S.V. Bektemerova, S.Yu. Porokhovoy,
D.V. Naumov, A.V. Tkachenko, F.F. Grinyuk,
M. Slunečhka, V. Slunečhkov, O. Bakina, N. Zaikova,
A.A. Siniza, N.I. Kalinin, V.F. Boreyko, A.A. Timoshenko,
V.M. Romanov

VBLHEP

A.V. Skrypnik

LIT

S.K. Slepnev

Experiment NUCLEON

L.G. Tkatchev

Realization

DLNP

V.M. Grebenyuk, S.Yu. Porokhovoy, N.I. Kalinin,
V.F. Boreyko, Nguen Man Shat, B.M. Sabirov,
A.B. Sadovsky, Z.B. Krumshtein, A.V. Tkachenko,
A.A. Timoshenko

VBLHEP

N.V. Gorbunov

LIT

V.N. Shigaev

FLNP

A.D. Rogov

Preparation of project
"Showers of knowledges"

G.A. Shelkov

Project preparation

DLNP

A.V. Guskov, V.O. Gromov, A.S. Zhemchugov,
N.N. Khovansky, V.G. Kruchonok

Collaboration

Country or International
Organization

City

Institute or Laboratory

Belarus

Minsk

NC PHEP BSU

IP NASB

Czech Republic

Prague

IP ASCR

CU

Japan

Wako

RIKEN

Mexico

Puebla

BUAP

Republic of Korea

Seoul

EWU

Romania

Bucharest

ISS

Russia

Moscow

SINP MSU

VNIEM

Corporation

Dubna

Raduga

Korolev

RSC "Energia"

Ukraine

Kiev

NUK

Kharkov

ISM NASU

Investigations of Compressed Baryonic Matter at the GSI Accelerator Complex

Leaders:

A.I. Malakhov

Deputy:

V.V. Ivanov

V.P. Ladygin

Participating Countries and International Organizations:

Bulgaria, Germany, Mongolia, Poland, Romania, Russia, Slovak Republic, Uzbekistan, Ukraine.

Scientific Programme

Design and development of the superconducting dipole magnet, transition radiation and straw detectors for the CBM experiment at the GSI accelerator complex. Study of the multiparticle dynamics in heavy ion collisions at SIS100 and SIS300. Development of algorithms and software for the trigger, simulation and data analysis.

Expected main results in 2014:

- Technical design of the superconducting dipole magnet for the CBM experiment.
- Design and testing of the prototype straw detectors.
- Development of the algorithms and software for the trigger and data analysis.
- Simulation of the multiparticle dynamics in heavy ion collisions.

List of projects:

Project	Leader	Priority (period of realization)
1. CBM	A.I. Malakhov	1 (2011 – 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. CBM Project Design and manufacture of the superconducting dipole magnet, and straw detectors. Develop- ment of the algorithms and software for trigger, simulation and data analysis.	A.I. Malakhov	Realization
VBLHEP	E.-M. Ilgenfritz, Yu.S. Anisimov, S.N. Kuznetsov, Yu.V. Zanevsky, V.F. Chepurinov, S.P. Chernenko, O.V. Fateev, V.N. Zryuev, G.A. Cheremukhina, V.P. Ladygin, A.K. Kurilkin, P.K. Kurilkin,	

A.P. Ierusalimov, A.P. Zinchenko, D.V. Peshekhonov, V.N. Pozdnyakov, P.A. Rukoyatkin, S.V. Razin, V.D. Peshekhonov, G.D. Kekelidze, V.V. Myalkovsky, K.I. Davkov, S.S. Parzhitsky, N.S. Grigalashvili, I.V. Boguslavsky, V.M. Golovatyuk, V.M. Lysan, O.V. Rogachevsky, A.V. Shabunov, Yu.V. Gusakov, A.V. Bychkov

LIT

V.V. Ivanov, P.V. Zrelov, P.G. Akishin, E.P. Akishina, T.P. Akishina, V.P. Akishina, D.S. Golub, O.Yu. Derenovskaya, V.V. Ivanov (jr), P.I. Kisel, A.A. Lebedev, S.A. Lebedev, G.N. Ososkov, A.M. Raportirenko, T.P. Sapozhnikova, V. Sheinast

DLNP

V.A. Karnaukhov, V.V. Kirakosyan, Yu.L. Vertogradova, S.P. Avdeev, W. Karch

BLTP

D. Blaschke, V.V. Burov, S.G. Bondarenko, V.D. Toneev

Collaboration

Country or International Organization

City

Institute or Laboratory

Bulgaria

Sofia

INRNE BAS

Germany

Darmstadt

GSi

Dresden

HZDR

Frankfurt/Main

Univ.

Heidelberg

Univ.

Mongolia

Ulaanbaatar

IPT MAS

Poland

Warsaw

WUT

Romania

Bucharest

IFIN-HH

Russia

Moscow

ITEP

SINP MSU

Moscow, Troitsk

INR RAS

Protvino

IHEP

Slovak Republic

Bratislava

IP SAS

CU

Ukraine

Kiev

BITP NASU

Uzbekistan

Jizzakh

JSPI

Samarkand

SSU

Study of Rare Charged Kaon Decays in Experiments at the CERN SPS

Leaders:

V.D. Kekelidze
Yu.K. Potrebenikov

Participating Countries and International Organizations:

Belarus, Belgium, Bulgaria, CERN, Czech Republic, Germany, Italy, Mexico, Romania, Russia, Slovak Republic, Switzerland, United Kingdom, USA.

Scientific Programme

Realization of the NA62 Project allows to clarify CP-violation problem, to measure precisely very rare charged kaon decay to charged pions and two neutrinos, to carry out a search for supersymmetric particles and their partners with a goal to observe a physics beyond the Standard Model. In addition, precise characteristics of rare kaon and hyperon decays will be measured. A high resolution magnetic spectrometer based on the straw drift chambers working in vacuum will be designed and constructed on the stage of preparation of the experiment. Software for simulation, data processing and analysis will be developed.

Expected main results in 2014:

- Two modules of the straw detector will be assembled and delivered to CERN.
- Software for the simulation of magnetic spectrometer and full set-up will be developed; system for detector calibration and event reconstruction will be upgraded; common software of the experiment will be developed.
- Assembling and testing straw detector modules as components of the NA62 set-up will be carried out.
- Data taking by the NA62 set-up and data analysis will be started.

List of projects:

Project	Leader	Priority (period of realization)
1. NA62	V.D. Kekelidze Yu.K. Potrebenikov	1 (2010 – 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Experiment NA62	V.D. Kekelidze Yu.K. Potrebenikov	Construction of detector Simulation
VBLHEP	D.T. Madigozhin, S. Gevorgyan, A.I. Zinchenko, N.A. Molokanova, L.N. Glonti, I.A. Polenkevich, S.N. Shkarovsky, M.H. Misheva, E.A. Gudkovsky, V.P. Falaleev, Yu.P. Petukhov, A.A. Belkova, A.N. Shcherbakov, V.N. Gorbunova,	

L.A. Slepets, S.A. Movchan, V.I. Gursky, E.M. Kislov,
S.V. Khabarov, V.S. Khabarov, S.V. Sergeev,
M.V. Zaytseva, S.V. Kilchakovskaya, V.V. Elsha,
T.L. Enik, A.V. Vishnevsky, N.N. Shcherbakov,
Yu.V. Gusakov, V.A. Samsonov, L.N. Tarasova,
V.V. Tarasov, Yu.S. Kovalev, A.O. Kolesnikov,
A.N. Sotnikov, N.I. Azorsky

DLNP

N.A. Kuchinsky, V.G. Kalinnikov, N.P. Kravchuk

Collaboration

Country or International Organization

City

Institute or Laboratory

Belarus	Minsk	NC PHEP BSU
Belgium	Louvain-la-Neuve	UCL
Bulgaria	Sofia	SU
	Blagoevgrad	SWU
	Plovdiv	PU
CERN	Geneva	CERN
Czech Republic	Prague	CU
Germany	Mainz	JGU
Italy	Florence	INFN
	Ferrara	INFN
	Frascati	INFN LNF
	Perugia	INFN
	Pisa	INFN
	Rome	INFN
		Univ. "Tor Vergata"
	Turin	INFN
Mexico	San Luis Potosi	UASLP
Romania	Bucharest	IFIN-HH
Russia	Moscow, Troitsk	INR RAS
	Protvino	IHEP
Slovak Republic	Bratislava	CU
Switzerland	Bern	Uni Bern
United Kingdom	Birmingham	Univ.
	Bristol	Univ.
	Glasgow	US
	Liverpool	Univ.
USA	Chicago, IL	UChicago
	Fairfax, VA	GMU
	Evanston, IL	NU
	Menlo Park, CA	SLAC
	Merced, CA	UC Merced

CMS. Compact Muon Solenoid at the LHC

Leader:

A.V. Zarubin

Scientific leader:

I.A. Golutvin

Participating Countries and International Organizations:

Armenia, Austria, Belarus, Belgium, Brazil, Bulgaria, CERN, China, Croatia, Cyprus, Czech Republic, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, India, Iran, Italy, Mexico, New Zealand, Pakistan, Poland, Republic of Korea, Russia, Serbia, Slovak Republic, Bratislava, Spain, Switzerland, Taiwan, Turkey, Ukraine, United Kingdom, USA, Uzbekistan.

Scientific Programme

The CMS Collaboration has constructed a general-purpose detector to be operational at the start-up of the Large Hadron Collider (LHC/CERN) to exploit its full discovery potential. Study of fundamental properties of the matter in Super High Energy proton-proton and nucleus-nucleus interactions.

The major activities of JINR are focused on the following directions:

- forward calorimetry, including endcap hadron, and preshower detector;
- forward muon stations with cathode strip chambers;
- development of Physics program to test SM and BSM.

Expected main results in 2014:

- Upgrade and technical support of the CMS detectors.
- CMS start up shifts, data taking, and data quality monitoring.
- Processing and analysis of experimental data, development and improvement of muon and jet reconstruction algorithms.
- Development of software for GRID-based distributed system for data processing and analysis. Data transmission from CERN to JINR.

List of projects:

Project	Leader	Priority (period of realization)
1. CMS	A.V. Zarubin I.A. Golutvin	1 (2010 – 2014)
2. Upgrade of the CMS Detector	A.V. Zarubin	1 (2013 – 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Forward calorimetry	A.V. Zarubin	Upgrade Commissioning Maintenance Data taking

VBLHEP	S.V. Afanasiev, M.G. Gavrilenko, I.A. Golutvin, N.S. Golova, I.N. Gorbunov, P.D. Bunin, A.G. Volodko, Yu.V. Ershov, N.I. Zamyatin, V.D. Kalagin, A.Yu. Kamenev, L.G. Kobylets, V.F. Konoplyanikov, A.M. Kurenkov, P.V. Moisenz, V.A. Smirnov, A.I. Malakhov, A. Mestvirishvili
DLNP	M. Finger, M. Finger (Jn.), A. Khvedelidze, M. Slunečhka, V. Slunečhkova, A. Yanata, T. Toriashvili, Z. Tsamalaidze
2. Forward muon station ME1/1	V.Yu. Karjavin Upgrade Commissioning Maintenance Data taking
VBLHEP	S.E. Vasiliev, A.O. Golunov, I.A. Golutvin, N.V. Gorbunov, Yu.V. Ershov, A.V. Zarubin, A.Yu. Kamenev, A.M. Kurenkov, A.M. Makan'kin, V.V. Perelygin, D.A. Smolin
LIT	V.V. Palchik
3. Upgrade of the CMS detectors	I.A. Golutvin Realization
VBLHEP	S.V. Afanasiev, N.V. Gorbunov, V.Yu. Karzhavin, A.M. Kurenkov, Yu.V. Ershov, S.E. Vasiliev, A.V. Zarubin, A.M. Makan'kin, A.I. Malakhov, P.V. Moisenz, V.V. Perelygin, V.A. Smirnov
LIT	V.V. Palchik
4. Reserch physics programme with the CMS Detector	S.V. Shmatov I.A. Golutvin Realization
VBLHEP	S.V. Afanasiev, M.G. Gavrilenko, I.N. Gorbunov, I.M. Gramenitsky, I.I. Belotelov, P.D. Bunin, A.V. Zarubin, A.Yu. Kamenev, V.F. Konoplyanikov, L.G. Kobylets, A.V. Lanev, P.V. Moisenz, M.A. Podoyntsin, M.V. Savina, A.I. Malakhov
LIT	V.V. Korenkov, D.A. Oleynik, G.A. Ososkov, V.V. Palchik, A.Sh. Petrosyan
BLTP	G.A. Kozlov, A.B. Arbuzov, A.V. Kotikov, E.A. Kuraev, A.V. Sidorov, A.V. Efremov, S.G. Bondarenko, R.S. Pasechnik, O.V. Teryaev
DLNP	G.A. Golovanov, P.X. Khristova, M. Finger, M. Finger (Jr.), N.B. Skachkov, A.N. Skachkova, A.Yu. Verkheev
5. Development of software for distributed computation, data processing and analysis based on GRID–technology	V.V. Korenkov Realization
LIT	V.V. Mitsyn, V.V. Palchik, R.N. Semenov, E.A. Tikhonenko, I.A. Filozova
VBLHEP	I.I. Belotelov, I.N. Gorbunov, N.V. Gorbunov, A.O. Golunov, P.V. Moisenz, S.V. Shmatov

Collaboration

Country or International Organization

City

Institute or Laboratory

Armenia	Yerevan	ANL
Austria	Vienna	HEPHY
Belarus	Minsk	NC PHEP BSU
	Gomel	INP BSU
		BelSUT
		GSU
Belgium	Louvain-la-Neuve	UCL
	Antwerp	UA
	Brussels	ULB
		VUB
	Mons	UMONS
Brazil	Rio de Janeiro, RJ	CBPF
		UERJ
		UFRJ
	Sao Paulo, SP	Unesp
Bulgaria	Sofia	SU
		INRNE BAS
CERN	Geneva	CERN
China	Hefei	USTC
	Beijing	IHEP CAS
		PKU
Croatia	Split	Univ.
Cyprus	Nicosia	UCY
Czech Republic	Prague	CU
Estonia	Tallinn	NICPB
Finland	Helsinki	UH
		HIP
	Jyväskylä	UJ
	Oulu	UO
	Tampere	TUT
France	Annecy-le-Vieux	LAPP
	Lyon	IPNL
	Saclay	IRFU
	Strasbourg	IPHC
Georgia	Tbilisi	HEPI-TSU
		AIP
Germany	Berlin	HUB
	Aachen	RWTH
	Karlsruhe	KIT
Greece	Athens	INP NCSR
		“Demokritos”
		UoA

Hungary	Ioannina	UI
	Budapest	Wigner RCP
	Debrecen	Atomki
India		UD
	Mumbai	BARC
		TIFR
	Bhubaneshwar	IOP
Iran	Chandigarh	PU
	Tehran	IPM
Italy	Bari	INFN
	Bologna	INFN
	Catania	INFN LNS
	Florence	INFN
	Genoa	INFN
	Padua	INFN
	Pavia	INFN
	Perugia	INFN
	Pisa	INFN
	Rome	INFN
	Turin	INFN
Mexico	Mexico	Cinvestav
New Zealand	Auckland	Univ.
	Christchurch	UC
Pakistan	Islamabad	QAU
Poland	Warsaw	UW
	Otwock-Swierk	NCBJ
Republic of Korea	Kwangju	CNU
	Naju	DU
	Namwon	SU
	Seoul	KU
		Konkuk Univ.
		SNUE
Russia	Chongju	CBNU
	Moscow	ITEP
		LPI RAS
		SINP MSU
		NIKIET
		INR RAS
	Moscow, Troitsk	PNPI
	Gatchina	IHEP
	Protvino	VNIITF
	Snezhinsk	Electron
	St. Petersburg	MDB
	Zhukovsky	INS “VINČA”
	Belgrade	STU
	Bratislava	
Serbia		
Slovak Republic		

Spain	Madrid	CIEMAT
		UAM
	Oviedo	Uniovi
Switzerland	Santander	IFCA
	Zurich	ETH
		UZH
	Villigen	PSI
	Basel	Uni Basel
Taiwan	Taipei	NTU
	Chung-Li	NCU
Turkey	Adana	CU
	Ankara	METU
Ukraine	Kharkov	KFTI NASU
		ISC NASU
		KhNU
United Kingdom	London	Imperial College
	Didcot	RAL
	Bristol	Univ.
USA	Ames, IA	ISU
	Baltimore, MD	JHU
	Batavia, IL	Fermilab
	Blacksburg, VA	Virginia Tech.
	Boston, MA	BU
		NU
	Cambridge, MA	MIT
	Chicago, IL	UIC
	College Park, MD	UM
	Columbus, OH	OSU
	Davis, CA	UCDavis
	Gainesville, FL	UF
	Evanston, IL	NU
	Houston, TX	Rice Univ.
	Iowa City, IA	UIowa
	Lincoln, NE	UNL
	Livermore, CA	LLNL
	Los Alamos, NM	LANL
	Los Angeles, CA	UCLA
	Lubbock, TX	TTU
	Madison, WI	UW-Madison
	Minneapolis, MN	UofM
	Notre Dame, IN	ND
	Oxford, MS	UM
	Pasadena, CA	Caltech
	Pittsburgh, PA	Pitt
	Piscataway, NJ	Rutgers

Uzbekistan	Princeton, NJ	PU
	Riverside, CA	UCR
	Rochester, NY	UR
	Tallahassee, FL	FSU
	Tuscaloosa, AA	UA
	Tashkent	INP UAS

Studies of the Nucleon and Hadron Structure at CERN

Leader: A.P. Nagaytsev
Scientific leader: I.A. Savin

Participating Countries and International Organizations:

Armenia, Belarus, Belgium, Bulgaria, Canada, CERN, Czech Republic, France, Germany, Israel, Italy, Japan, Netherlands, Poland, Russia, Switzerland, Ukraine, United Kingdom, USA.

Scientific Programme

Studies of the Primakoff reactions and diffractive processes. Studies of the generalized parton distributions in various exclusive processes and participation in construction of new electromagnetic calorimeter. Studies of the exclusive production of photons, pions and vector mesons in DIS and DVCS. Measurements of nucleon structure in the Drell-Yan processes. Study of inclusive and semi-inclusive processes in Deep Inelastic Scattering (DIS) of muons and hadrons on polarized targets. The measurements of the new structure functions characterizing the transverse quark distributions in polarized nucleons.

- Measurements of the nucleon structure functions, polarized parton distributions.
- Pion and kaon polarizabilities measurements.
- Detector preparation for the COMPASS-II spectrometer. Creation of the new electromagnetic calorimeter.
- Software creation and development for simulation and data analysis. System support of CERN software in COMPASS-II.
- Studies of the inclusive production of photons, pions and ρ -mesons in DIS and DVCS.
- Measurements of nucleons structure in the Drell-Yan processes.

Expected main results in 2014:

- Preparing for measurement of the Drell-Yan process.
- Participation in the data taking.
- Maintenance of the hadron calorimeter HCAL1 and muon system MW1.
- Performance studies of the tracking detectors MWPC, STRAW, W4/5 for COMPASS-II.
- Completion of the production and testing of the new electromagnetic calorimeter ECALO for COMPASS-II.
- Software development and simulation of the various reactions, studied in COMPASS-II. Analyzing of the COMPASS-II data at JINR and publications preparation.
- Theoretical studies COMPASS-II.

List of projects:

Project	Leader	Priority (period of realization)
1. COMPASS-II	A.P. Nagaytsev	1 (2011 – 2016)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
I. Experiment COMPASS	A.P. Nagaytsev	Data taking Data analysis
1. Hadron calorimeter	I.A. Savin O.P. Gavrishchuk	Maintenance
VBLHEP	O.P. Gavrishchuk, G.V. Meshcheryako, N.N. Vlasov, A.S. Yukaev, V.A. Anosov	
2. Electromagnetic calorimeter	A.P. Nagaytsev, Z.V. Krumshstein	Preparation R&D
VBLHEP	O.P. Gavrishchuk, G.V. Meshcheryakov, N.N. Vlasov, A.S. Yukaev, N.S. Rossiyskaya, O.M. Kuznetsov, V.S. Batozskaya, V.A. Anosov	
DLNP	I.E. Tchirikov-Zorin, N. Tchepurnov, N.V. Anfimov, T.V. Rezinko, N. Utkin, I. Orlov, V.V. Tchalyshev, Z.Ya. Sadygov, K.Yu. Gasnikova, V.K. Rodionov, A.V. Rybnikov, D.V. Fedoshev, A.A. Nozdrin, A.S. Selyunin, A.G. Olshevsky, V.O. Gromov	
3. Muon system	G.D. Alekseev	Maintenance
DLNP	V.K. Rodionov, N.I. Zhuravlev, N.A. Kutchinsky, V.L. Malyshev	
4. Software development. Data analysis	E.V. Zemlyanichkina	Realization
VBLHEP	I.A. Savin, V.Yu. Alexain, D.V. Peshekhonov, G.I. Smirnov, A.P. Nagaytsev, O.M. Kuznetsov, N.N. Vlasov, Yu.I. Ivanshin, N.S. Rossijskaya, A.A. Antonov, O.Yu. Shevtchenko, R.R. Akhunzyanov, R. Gushcherski, A.V. Ivanov, V.S. Batozskaya	
DLNP	A.G. Olshevsky, A.V. Guskov, Z.V. Krumshstein, V.K. Rodionov, K.Yu. Gasnikova, I.A. Orlov, T.V. Rezinko	
LIT	P.V. Zrelov	
5. Measurements of generalized parton distributions and transverse spin structure in Drell-Yan processes. Development of new electro-magnetic calorimeter	A.P. Nagaytsev I.A. Savin O.Yu. Shevchenko	Realization
VBLHEP	O.P. Gavrishchuk, A.A. Antonov, G.V. Meshcheryakov, N.N. Vlasov, O.M. Kuznetsov, Yu.I. Ivanshin, O.Yu. Shevtchenko, R.R. Akhuzyanov, N.S. Rossijskaya, E.V. Zemlyanichkina, A.V. Ivanov	

DLNP

A.G. Olshevskiy, Z.V. Krumshstein, A.V. Guskov,
V.K. Rodionov, K.Yu. Gasnikova, I.A. Orlov, T.V. Rezinko

BLTP

A.V. Efremov, O.V. Teryaev

**6. Preparation of the project
on measurement of proton
form-factor ratios
at 13–15 GeV/c**

I.A. Savin
N.M. Piskunov

Project preparation

VBLHEP

O.P. Gavrishchuk, G.V. Meshcheryakov

II. Theoretical studies

A.V. Efremov

Realization

BLTP

S.B. Gerasimov, O.V. Teryaev, A.V. Kotikov,
A.E. Dorokhov, N.I. Kochelev, A.M. Sidorov

Collaboration

**Country or International
Organization**

City

Institute or Laboratory

Armenia

Yerevan

ANL

Belarus

Minsk

NC PHEP BSU

Belgium

Mons

UMONS

Brussels

ULB

Bulgaria

Sofia

INRNE BAS

SU

Canada

Vancouver

TRIUMF

Edmonton

U of A

CERN

Geneva

CERN

Czech Republic

Prague

CTU

France

Saclay

IRFU

Germany

Bielefeld

Univ.

Bochum

RUB

Bonn

UniBonn

Freiburg

Univ.

Hamburg

DESY

Heidelberg

MPIK

Munich

LMU

TUM

Mainz

JGU

Erlangen

FAU

Israel

Tel Aviv

TAU

Italy

Turin

INFN

Trieste

INFN

Frascati

INFN LNF

Japan

Chiba

Toho Univ.

Nagoya

Nagoya Univ.

Osaka

OCU

Sendai

Tohoku Univ.

	Tsukuba	KEK
	Yamagata	Yamagata Univ.
Netherlands	Amsterdam	NIKHEF
Poland	Warsaw	WUT
Russia	Moscow	SINP MSU
		LPI RAS
	Moscow, Troitsk	INR RAS
	Gatchina	PNPI
	Protvino	IHEP
Switzerland	Zurich	UZH
Ukraine	Kharkov	ISM NASU
United Kingdom	Liverpool	Univ.
USA	Argonne, IL	ANL
	Boulder, WY	CU
	Cambridge, MA	MIT
	Pasadena, CA	Caltech

Strangeness in Hadronic Matter and Study of Inelastic Reactions Near Kinematical Borders

Leaders:

E.A. Strokovsky
E.S. Kokouline

Participating Countries and International Organizations:

Belarus, Czech Republic, Germany, Japan, Russia, Ukraine.

Scientific Programme

Strangeness in hadronic matter and study of boundary effects:

search of effects of hidden intrinsic polarized sea of strange quarks in nucleon;

study of stabilizing effects of strangeness in nuclear matter and properties of the lightest hypernuclei;

search for exotic baryons with positive strangeness;

study of multi-particle dynamics in inelastic proton-proton and proton-nucleus interactions with extremely high multiplicity.

Expected results:

- Data on production cross sections for hyper-fragments of relativistic nuclei. Data on the lifetimes and binding energies of the lightest hypernuclei ${}^4_{\Lambda}H$, ${}^3_{\Lambda}H$, ${}^6_{\Lambda}H$; search for ${}^6_{\Lambda}H$. Study of the decay channels, including non-mesonic decays of the ${}^{10}_{\Lambda}Be$ and ${}^{10}_{\Lambda}B$ hypernuclei.
- New experimental data on total and differential cross sections of ϕ and ω production in pp and np interactions at threshold. Study of mechanisms of the vector meson production in NN interaction at threshold. Data on the OZI-rule violation; its energy dependence and dependence on isospin of the NN system in the initial state at nucleon energies near the ϕ and ω production thresholds.
- Renewal of the electromagnetic calorimeter, upgrade of the magnetic spectrometer; upgrade of the data acquisition system; optimizing of the multiplicity trigger. Software development for reconstruction of high multiplicity events at drift tube tracker and magnetic spectrometer.
- Search and study of production of exotic baryons with positive strangeness ("pentaquarks") in pp and np interactions.
- Construction of the wide acceptance magnetic spectrometer NIS-GIBS with multi-tracking capability and time-of-flight particle identification system at the Nuclotron extracted beam.
- Measurements of the partial cross sections of pA interactions at multiplicity above 20. Measurements of proton spectra and multiplicity. Study of multiparticle correlations, search for "ring-like" events (gluonic Cherenkov radiation). Study of multiplicity fluctuations in pA interactions for Bose-Einstein condensation search. Development of analytic and Monte-Carlo models for description of high multiplicity processes where non-perturbative evolution of quark-gluon matter and phase transitions are taken into account.
- Creation and test of electromagnetic calorimeter for soft photons ($E < 50$ MeV) detection. Measurements of the soft photon yields in dependence upon charged and neutral particle multiplicities.

Expected main results in 2014:

- Modernization of the DAQ and tracking systems of the NIS-GIBS spectrometer.
- Study of the setup characteristics at the extracted deuteron and 7Li beams. Spectrometer calibrating by binary reactions and first physical results obtaining.

- Data taking with the NIS–GIBS spectrometer at the extracted deuteron and ^7Li beams within the hyper–nuclear program.
- Analysis of data from LEPS spectrometer on vector–meson photoproduction by polarized photons.
- Upgrade of the SVD–2 setup:
 - a) upgrade of the electronics of the spectrometer and modernizing of the data analysis software for the drift tracker;
 - b) renewal of the of the electromagnetic calorimeter;
 - c) production of electromagnetic calorimeter for soft photon registration.
- Reconstruction of momentum spectra of the particles produced in pp interactions with multiplicity up to 30. Monte–Carlo simulation of the soft photon calorimeter operation.
- Development of the analytic models for multiple particle production and estimation of the soft photon yields.

List of projects:

Project	Leader	Priority (period of realization)
1. HyperNIS	E.A. Strokovsky	1 (2010 – 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Experiment NIS	E.A. Strokovsky	Realization Data taking
VBLHEP	R.A. Salmin, M.G. Sapozhnikov, V.P. Balandin, S.N. Bazylev, P.A. Rukoyatkin, A.A. Feschenko, S.N. Plyashkevich, J. Lukstins, Yu.T. Borzunov, V.D. Aksinenko, A.I. Maksimchuk, V.B. Chumakov, V.Yu. Ivanenko, O.V. Okhrimenko, A.I. Golokhvastov, S.A. Avramenko, M.H. Anikina, A.V. Averiyarov, A.M. Korotkova, N.G. Parfenova, S.V. Starikova, V.B. Dunin + 2 stud., A.V. Konstantinov	
DLNP	A.N. Shalyugin, V. Tereschenko	
2. Experiment GIBS	J. Lukstins	Realization Data taking
VBLHEP	V.D. Aksinenko, O.V. Okhrimenko, R.A. Salmin, A.I. Maksimchuk, E.A. Strokovsky, S.N. Plyashkevich, A.A. Feschenko, S.A. Avramenko, A.I. Golokhvastov, M.H. Anikina, A.V. Averiyarov, A.M. Korotkova, N.G. Parfenova, S.V. Starikova, V.B. Dunin + 2 stud., A.V. Konstantinov	
DLNP	Yu.A. Batusov, V. Tereschenko	
OCE	A.N. Parfenov	

3. **Excited nuclear matter study at U–70: finalizing of works (activity) on the “Thermalization” program, preparation project**

E.S. Kokoulina
V.A. Nikitin

Realization Data analysis

VBLHEP

V.I. Kireev, V.V. Avdeychikov, Yu.A. Chentsov,
I.A. Rufanov, V.A. Nikitin, M.V. Tokarev, Yu.P. Petukhov,
A.N. Aleev, A.I. Yukaev, N.K. Zhidkov, V.V. Pavlyuchkov,
V.B. Dunin + 3 stud., V.P. Balandin, N.F. Furmanets

BLTP

E.A. Kuraev

Collaboration

**Country or International
Organization**

City

Institute or Laboratory

Belarus

Minsk

NC PHEP BSU
“INTEGRAL”

Gomel

GSTU
GSU

Czech Republic

Prague

CTU

Řež

NRI
NPI ASCR

Germany

Frankfurt/Main

Univ.

Munich

LMU

Jülich

FZJ

Italy

Kosenza

UniCal

Japan

Osaka

RCNP

Russia

Moscow

SINP MSU

Protvino

IHEP

Syktyvkar

DM Komi SC UrD

Ukraine

Kiev

RAS

BITP NASU

Development of High-Precision Straw Detectors

Leader:

V.D. Peshekhonov

Participating Countries and International Organizations:

Bulgaria, Germany, Georgia, Russia.

Scientific Programme

Investigation and development of tracking straw detectors with different pressure of its gas mixture for application in high luminosity accelerator experiments and for application in other fields.

Expected main results in 2014:

- Development of the direct timing method (DTM) for the longitudinal coordinate determination in long straws.
- Study of processes in the high pressure straws in order to improve accuracy of the radial coordinate determination.
- Bench testing of the planar prototype with ~ 7 m. sq. of its sensitive area.
- Development of the MBs and Gas Manifolds for the large-sized planar and wheel type straw chambers.

List of activities:

Activity or experiment
Laboratory or other
Division of JINR
Responsible person

Leaders

Main researchers

Status

STRAW Detectors

V.D. Peshekhonov

Realization

VBLHEP

A.E. Baskakov, S.N. Bazylev, E.V. Vasilieva,
I.V. Boguslavsky, N. Grigalashvili, G.D. Kekelidze,
V.M. Lysan, V.V. Myalkovsky, K. Davkov, S.V. Rabtsun,
V. Cholakov

Collaboration

**Country or International
Organization**

City

Institute or Laboratory

Belarus

Minsk

NC PHEP BSU

Bulgaria

Plovdiv

PU

Georgia

Tbilisi

TSU

Germany

Darmstadt

GSi

Russia

Moscow

SINP MSU

Moscow, Troitsk

INR RAS

Protvino

IHEP

Status: Approved for completion
in 2014

Development of the JINR Basic Facility for Generation of Intense Heavy Ion and Polarized Nuclear Beams Aimed at Searching for the Mixed Phase of Nuclear Matter and Investigation of Polarization Phenomena at the Collision Energies up to $\sqrt{s_{NN}} = 11 \text{ GeV}/n$

Leaders:

A.S. Sorin

Deputies:

V.D. Kekelidze

G.V. Trubnikov

A.D. Kovalenko

I.N. Meshkov

Participating Countries and International Organizations:

Armenia, Azerbaijan, Belarus, Bulgaria, CERN, Czech Republic, France, Georgia, Germany, Italy, Japan, Moldova, Poland, Romania, Russia, Slovak Republic, South Africa, Sweden, Ukraine, USA.

Scientific Programme

Investigation of the mixed phase transition phenomena in strongly interacting nuclear matter at extremely high nuclear densities, study of polarization phenomena in few-body nucleon systems and spin structure of quark matter, nucleon and light nuclei. Development of theoretical models of these processes and theoretical support of the experiments. Development of the Nuclotron accelerator complex, as a base facility for studying of relativistic nuclear collisions in the range of atomic masses $A = 1-197$. Development and construction of the heavy ion collider NICA, multipurpose (NICA/MPD) and spin (NICA/SPD) detectors for the collider experiments with heavy ions. Modernization of the extraction beam lines. Carrying out of experiments with nuclear beams and polarized deuteron beams at the Nuclotron.

Expected main results in 2014:

- Continuation and extension of the “White Paper” – project physics program. Continuation of theoretical studies of non-perturbative QCD processes, development and tests of the models for the nuclear matter at high temperatures and densities aimed at investigation phases of nuclear matter, dynamics of nuclear collisions at extremely dense baryonic matter and observation this phenomena in P-odd parity and spin asymmetries.
- Continuation of works on the Nuclotron modernization in the framework of the Nuclotron-NICA project: modernization of the accelerator stations, design and construction of the beam injection/extraction systems, commissioning and tests of the new ion source KRION-6T, development and increase of the production rate of the cryogenics complex, full-scale modernization of the injection complex. Development of the system for beam diagnostics. Construction and tests of a new source for polarized particles. Annual dedicated machine development runs at Nuclotron on first priority tasks within running time of 400 hours.
- Continuation of the NICA project realization including: construction of new linear injector ($z/A \geq 0.14$) and booster synchrotron; R&D related to the collider magnetic system and development of the beam cooling systems; tests of the stochastic cooling system prototype at Nuclotron. Development of the infrastructure for the mass-production of the superconducting magnets for NICA and FAIR, modernization of the engineering infrastructure.
- Completion of the technical design project to put new injector, booster, collider and beam lines of the NICA complex. Development of the engineering infrastructure of the project, start of the civil engineering.
- Preparation of the technical project of the MPD solenoid and the order for its manufacturing. Prototyping of the detector elements for the first stage of the project. MPD Technical Design Project preparation.

- Preparation of the Conceptual Design Project to study nucleon spin structure with SPD. Continuation of theoretical studies of the Matveev–Muradyan–Tavkhelidze–Drell–Yan processes, J/Ψ productions processes and other processes in light polarized nuclei collisions.
- Nuclotron runs dedicated to physics and machine development within running time of 2000 hours.
- Development of the NICA/MPD/SPD computer infrastructure.

List of projects:

Project	Leader	Priority (period of realization)
1. Nuclotron–NICA	G.V. Trubnikov	1 (2011 – 2015)
2. MPD	V.D. Kekelidze	1 (2011 – 2015)
3. BM@N	V.P. Ladygin	1 (2012 – 2016)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Theoretical investigations, lattice QCD calculations and development of the models for description of prototypes of excited nuclear media under high temperatures and compression, dynamics of nuclear interactions at extreme dense baryon matter, spin and P-odd effects	A.S. Sorin O.V. Teryaev	Realization
BLTP	D. Blaschke, V.D. Toneev, A.V. Efremov, S.V. Molodtsov, A.S. Hovorostukhin, O.V. Teryaev, S.B. Gerasimov, M.K. Volkov, A. Parvan, E.A. Kuraev, Ya.N. Klopov, A.G. Oganesyan, A. Frisen, P.V. Buividovich	
LIT	Yu.L. Kalinovsky, Zh. Musulmanbekov, E.G. Nikonov	
DLNP	G.I. Lykasov	
VBLHEP	V.D. Kekelidze, R. Lednický, E.-M. Ilgenfritz, Kh.U. Abraamyan, M.A. Kozhin, S.G. Reznikov, M.K. Suleymanov, V.N. Zhezher, O.V. Rogachevsky	
2. Nuclotron–NICA: development of the technological systems of the accelerator ring, injection complex and extracted beam channels in the framework of the NICA project	G.V. Trubnikov A.V. Butenko V.I. Volkov A.O. Sidorin I.N. Meshkov A.D. Kovalenko	Realization

VBLHEP

G.G. Khodzhbagiyan + 3 pers., N.N. Agapov, V.I. Batin + 5 pers., A.S. Averichev + 4 pers., V.I. Lipchenko, Yu.A. Mitrofanova, V.E. Sosulnikov, A.I. Pleshakov + 5 pers., E.Yu. Filippova, E.Yu. Ivanenko, D.V. Lobanov, A.I. Govorov + 7 pers., V.V. Seleznev, R.G. Pushkar, K.A. Levterov, A.A. Voronin, V.A. Shurkhovetsky, Yu.V. Prostimkin, A.V. Smirnov + 3 pers., A.R. Galimov, E.V. Komogorov, A.V. Nesterov, G.L. Kuznetsov, O.A. Kunchenko, R.V. Pivin, A.M. Bazanov, E.I. Bugrinov, E.E. Donets, E.D. Donets, D.E. Donets, V.B. Shutov, V.A. Andreev, V.A. Isadov, S.V. Romanov, A.E. Kirichenko, B.V. Vasilishin, O.S. Kozlov, O.I. Brovko, A.M. Nikitin, V.M. Shumkov + 5 pers., O.V. Prozorov, A.V. Gromov + 3 pers., S.A. Rumyantsev, L.P. Skiba, A.N. Pisulina, I.V. Kudashkin, G.P. Reshetnikov, N.N. Blinnikov, L.E. Bogdan, K.N. Gurylev, E.V. Ivanov + 3 pers., Z.I. Smirnova, V.N. Karpinsky, A.L. Osipenkov + 3 pers., N.G. Kondratev, A.V. Kudashkin, A.A. Shurygin, Yu.M. Nozhenko + 3 pers., N.A. Filippov + 3 pers., A.S. Vinogradov, N.A. Blinov + 4 pers., A.Yu. Starikov, P.A. Rukoyatkin + 3 pers., N.I. Lebedev, E.V. Gorbachev, V.V. Fimushkin, G.D. Shirkov, V.V. Kobets, A.V. Alfeev + 3 pers., N.V. Semin, V.P. Chernyaev + 8 pers., A.A. Fateev + 3 pers., N.D. Topilin + 5 pers., A.V. Tuzikov, N.A. Shurkhno

3. R&D work, construction of the prototypes and full-scale superconducting magnets for NICA booster and collider

VBLHEP

**G.V. Trubnikov
G.G. Khodzhbagiyan
A.D. Kovalenko**

R&D Realization

A.V. Butenko, A.V. Smirnov + 3 pers., A.R. Galimov, G.L. Kuznetsov, O.A. Kunchenko, P.V. Pivin, A.M. Bazanov, N.N. Agapov + 8 pers., V.I. Batin + 5 pers., D.S. Shvidky, V.N. Karpinsky, A.L. Osipenkov, P.I. Nikitaev, N.P. Bazyleva, B.D. Morozov, A.V. Kudashkin, N.A. Filippov + 2 pers., A.S. Vinogradov, N.A. Blinov, A.M. Donyagin, I.A. Eliseeva, A.Yu. Starikov, I.E. Karpunina, S.A. Dolgy, V.K. Alexeev, V.N. Surikov, N.A. Zhiltsova, N.D. Topilin, Yu.V. Gusakov, A.V. Shabunov, E.V. Muraveva, A.A. Makarov, Yu.A. Tumanova, T.F. Prakhova, V.V. Agapova, A.V. Buchkov, V.S. Korolev + 3 pers.

4. Construction of the heavy ion source (KRION-6 T), construction of the polarized particle source (PPS) for the NICA complex

VBLHEP

**E.D. Donets
E.E. Donets
V.V. Fimushkin**

Realization

V.B. Shutov + 3 pers., A.Yu. Ramzdorf, D.E. Donets, V.P. Vadeev, Yu.V. Prokofichev, L.V. Kutuzova, A.V. Vadeev, A.I. Govorov, V.V. Seleznev, A.V. Shabunov, K.A. Levterov, S.V. Prokhorov, S.N. Sedykh + 1 pers.

5. Development and construction of the beam injection/extractin systems, beam transportation channels for NICA elements. Development of the control systems for beam diagnostics	V.I. Volkov V.A. Mikhaylov	Realization
VBLHEP	B.V. Vasilishin, O.S. Kozlov, A.G. Kochurov, I.I. Kulikov, L.A. Leonov, S.A. Novikov, A.V. Eliseev, V.A. Andreev + 1 pers., V.M. Gorchenko, S.V. Mikhaylov, A.M. Butenko, G.M. Salnikova, V.A. Isadov, S.V. Romanov, A.E. Kirichenko, P.A. Rukoyatkin, L.N. Komolov, I.V. Zaytsev, R.I. Kukushkina, V.S. Alexandrov, A.V. Tuzikov, E.E. Shirkova, A.A. Fateev, N.I. Lebedev, V.V. Tarasov, L.I. Kosukhina, G.S. Sedukh, T.V. Rukoyatkina, V.V. Kovalev, N.V. Pilyar, G.E. Koroleva, M.E. Pushkin, E.V. Gorbachev, R.A. Smolkov, A.V. Alfeev, D.I. Sherstyanov, E.V. Rudnev, A.S. Isaev, I.Ya. Nefedev, V.S. Sungatulin, V.N. Karpinsky, A.L. Osipenkov	
6. Development of the cryogenic systems for Nuclotron–NICA	N.N. Agapov G.G. Khodzhbagiyev	Projecting Realization
VBLHEP	V.I. Batin + 6 pers., H. Malinovsky + 5 pers., V.M. Drobin, N.G. Anishchenko, Yu.T. Borzunov, A.V. Konstantinov, V.B. Chumakov, V.D. Bartenev, L.V. Petrova, E.A. Kulikov, A.S. Averichev + 4 pers., V.I. Lipchenko, V.E. Kurinov, D.S. Shvidky + 3 pers., Yu.A. Mitrofanova, V.E. Sosulnikov, A.I. Pleshakov + 5 pers., S.A. Smirnov, E.Yu. Filippova, E.Yu. Ivanenko, D.V. Lobanov	
7. Technical design and construction of the NICA injection complex	V.V. Kobets I.N. Meshkov V.A. Monchinsky	Realization
VBLHEP	A.V. Butenko, A.O. Sidorin, A.I. Govorov, V.V. Cekeznev, K.A. Levterov, N.D. Topilin, A.A. Makarov, A.I. Sidorov + 1 pers., A.A. Fateev, G.I. Konnov, I.G. Lebedeva, S.N. Sedykh, A.P. Kozlov, V.V. Kosukhin, V.V. Seleznev	
8. Technical design and construction of the NICA booster synchrotron and its technological systems	A.V. Butenko V.A. Mikhaylov I.N. Meshkov	Project preparation Realization

VBLHEP

G.G. Khodzhibagiyani + 5 pers., A.V. Smirnov + 3 pers., A.R. Galimov, G.L. Kuznetsov, O.A. Kunchenko, R.V. Pivin, A.M. Bazanov, N.N. Agapov + 8 pers., V.I. Batin + 5 pers., D.S. Shvidky, V.N. Karpinsky, A.L. Osipenkov, O.I. Brovko, N.D. Topilin, Yu.V. Gusakov, A.V. Shabunov, E.V. Muraveva, A.A. Makarov, Yu.A. Tumanova, V.I. Volkov + 5 pers., B.V. Vasilishin, O.S. Kozlov, V.A. Andreev, A.V. Eliseev, S.V. Romanov, A.E. Kirichenko, P.A. Rukoyatkin, A.V. Tuzikov, A.A. Fateev, N.I. Lebedev, V.V. Tarasov, T.V. Rukoyatkina, E.V. Gorbachev, A.V. Alfeev, V.N. Karpisky + 3 pers., A.L. Osipenkov + 4 pers., A.S. Valkovich

DLNP

S.L. Yakovenko, E.V. Akhmanova, A.G. Kobets, A.Yu. Rudakov

9. **Technical design, R&D and construction of the heavy ion collider NICA with energy $\sqrt{s_{NN}} = 4\div 11$ GeV/n and average luminosity $1 \cdot 10^{27} \text{ cm}^{-2} \cdot \text{s}^{-1}$ on the base of Nuclotron**

**I.N. Meshkov
G.V. Trubnikov
A.O. Sidorin
A.D. Kovalenko**

Project preparation Realization

VBLHEP

G.G. Khodzhibagiyani + 5 pers., A.V. Butenko, A.V. Smirnov + 3 pers., A.R. Galimov, G.L. Kuznetsov, R.V. Pivin, A.M. Bazanov, N.N. Agapov + 8 pers., V.I. Batin + 5 pers., D.S. Shvidky, V.N. Karpinsky + 3 pers., A.L. Osipenkov, N.V. Semin, V.D. Kalagin, N.D. Topilin, Yu.V. Gusakov, A.V. Shabunov, E.V. Muraveva, A.A. Makarov, Yu.A. Tumanova, V.I. Volkov + 5 pers., B.V. Vasilishin, O.S. Kozlov, V.A. Andreev, A.V. Eliseev, S.V. Romanov, A.E. Kirichenko, P.A. Rukoyatkin, A.V. Tuzikov, A.A. Fateev, N.I. Lebedev, V.V. Tarasov, T.V. Rukoyatkina, E.V. Gorbachev, A.V. Alfeev, V.N. Karpinsky + 3 pers., A.L. Osipenkov + 4 pers., V.A. Monchinsky, O.I. Brovko + 3 pers., V.M. Zhabitsky, G.D. Shirkov, V.S. Alexandrov, A.V. Filippov, A.V. Tuzikov

DLNP

S.L. Yakovenko + 2 pers., A.Yu. Rudakov, A.G. Kobets, T.A. Stepanova, L.V. Soboleva, E.V. Akhmanova, A.A. Sidorin, S.A. Kostromin

LRB

G.N. Timoshenko, V.Yu. Shchegolev

10. **Design and construction of the MPD Detector. Optimization of the conceptual design, preparation of the Technocal Design Project. R&D and construction of the first-stage detector elements: time-projection chamber, time-of-flight system, electromagnetic calorimeter, zero-degree calorimeter, internal tracker**

**V.D. Kekelidze
A.S. Sorin
V.M. Golovatyuk**

Project preparation Realization

VBLHEP		S.V. Volgin, N.M. Vladimirova, V.A. Babkin, S.N. Lobastov, Yu.I. Fedotov, H.U. Abraamyan, A.B. Anisimov, M.A. Kozhin, O.P. Gavrishchuk, N.A. Kuzmin, A.I. Yukaev, E.V. Kostyukhov, Yu.V. Zanevsky, Yu. Lukstinsh, O.V. Fateev, A.M. Korotkova, S.P. Chernenko, V.F. Chepurnov, S.V. Razin, V.N. Zryuev, A.V. Averyanov, A.G. Bazhazhin, S.V. Vereshchagin, A.G. Litvinenko, A.Yu. Isupov, V.F. Peresedov, I.I. Migulina, V.A. Nikitin, O.V. Rogachevsky, V.D. Peshekhonov, K.V. Gertsenberger, Yu. Fedorishin, A.I. Zinchenko, Dzh. Drnoyan, I.A. Tyapkin, I.V. Gapienko, N.S. Grigalashvili, K.I. Davkov, G.D. Kekelidze, V.V. Myalkovsky, Yu.T. Kiryushin, S.A. Movchan, V.M. Lysan, S.V. Khabarov, V.S. Khabarov, A.V. Vishnevsky, Yu.K. Potrebenikov, D.T. Madigozhin, N.A. Molokanova, I.A. Polenkevich, S.N. Shkarovsky, Yu.A. Murin, V.A. Vasendina, V.A. Budilov, V.A. Nikitin, N.K. Zhidkov, V.I. Yurevich, G.S. Averichev, D.N. Bogoslovsky, V.B. Dunin, L.G. Efimov, E.M. Kislov, A.A. Povtoreiko, V.V. Tihomirov, G.A. Yarygin, A.N. Zubarev, S.V. Bazylev, V.M. Slepnev, I.V. Slepnev, A.B. Shutov, A.E. Baskakov, A.V. Shchipunov, V.Yu. Rogov, N.A. Shutova, R.V. Nagdasev
DLNP		A.G. Olshevsky, Z.V. Krumshstein + 8 pers.
LIT		V.V. Ivanov, P.G. Akishin, P.I. Kisel, O.Yu. Derenovskaya, Zh.Zh. Musulmanbekov, A.M. Raportirenko, P.V. Zrellov
11. Design and construction of the superconducting solenoidal and magnet yoke	A.S. Vodopyanov	Project preparation Realization
VBLHEP		A.A. Efremov, Yu.Yu. Lobanov A.F. Makarov
12. Design and creation of the read-out and slow control system	S.V. Bazylev	Project preparation Realization
VBLHEP		V.M. Slepnev, I.V. Slepnev, A.E. Baskakov, A.B. Shutov, A.V. Shchipunov, V.Yu. Rogov, N.A. Shutova, R.V. Nagdasev, S.V. Sergeev, A.F. Mukhamatnabaev
13. Preparation of the physical program and SPD detector project for studying of the spin effects at NICA complex	A.D. Kovalenko A.P. Nagaytsev I.A. Savin O.Yu. Shevtchenko	Project preparation Realization
VBLHEP		G.V. Meshcheryakov, O.P. Gavrishchuk, A.A. Antonov, R.V. Piven, E.V. Zemlyanichkina, N.S. Rossiyskaya, D.V. Peshekhonov, Yu.I. Ivanshin, I.A. Savin, R. Gushcherski, V.A. Nikitin, R. Lednický, V.N. Pozdnyakov, S.S. Shimansky, V.P. Ladygin, S.G. Reznikov, P.K. Kurilkin, A.K. Kurilkin, O.Yu. Shevtchenko + 2 students
DLNP		A.G. Olshevsky, A.V. Kulikov + 3 pers., Z.V. Krumshstein, O.N. Ivanov, G. Macharashvili

LIT	V.V. Palchik	
BLTP	A.V. Efremov, O.V. Teryaev	
14. Development of computer infrastructure for NICA complex	Yu.K. Potrebenikov O.V. Rogachevsky	Realization
VBLHEP	B.G. Schinov, Yu.I. Minaev, V.L. Svalov, V.F. Dyudyushko, D.T. Madigozhin, N.A. Molokanova, D.V. Peshekhonov, I.A. Polenkevich, S.N. Shkarovsky, A.V. Filippov	
LIT	M.V. Bashashin, D.V. Kekelidze, V.N. Shkundenkov, V.V. Korenkov	
15. Technical design and development of the engineering infrastructure of Nuclotron–NICA	I.N. Meshkov V.D. Kalagin G.V. Trubnikov G.D. Shirkov	Projecting Realization
VBLHEP	N.D. Topilin, A.V. Shabunov, E.V. Serochkin, A.A. Makarov, S.V. Rabtsun, N.V. Semin + 10 pers., V.M. Stepanov + 6 pers., A.M. Karetnik, V.P. Zabolotin, V.P. Chernyaev, A.N. Sotnikov, V.Yu. Shilov, M.I. Migulin, E.M. Khabarova, A.V. Alfeev, O.M. Timoshenko	
DLNP	Yu.A. Budagov, S.L. Yakovenko	
OCE	A.V. Dudarev + 1 pers.	
AS&CC Office	S.O. Lukjanov, A.B. Vishnevsky	
GA&C	Yu.N. Denisov	
16. Technical project preparation for the experiment. Baryonic matter at Nuclotron	V.P. Ladygin P. Senger Yu.A. Murin	Realization
VBLHEP	V.V. Avdeychikov, A.V. Averiyarov, S.A. Avramenko, V.D. Aksinenko, P.G. Aksinenko, A.V. Alfeev, V.S. Alfeev, V.A. Babkin, S.N. Bazylev, V.P. Balandin, I.V. Boguslavsky, V.A. Vasendina, T.A. Vasiliev, N.M. Vladimirova, A.V. Vishnevsky, S.V. Volgin, V.V. Voronyuk, V.I. Voskoboynik, O.P. Gavrishchuk, V.M. Golovatyuk, A.I. Golokhvastov, N. Grigalashvili, Yu.V. Gurchin, V. Davkov, K. Davkov, V.I. Demidova, V.B. Dunin, Yu.V. Zanevsky, A.I. Zinchenko, V.N. Zryuev, A.P. Ierusalimov, E.-M. Ilgenfritz, A.Yu. Isupov, Yu.-T. Karachuk, V.D. Kekelidze, G.D. Kekelidze, Yu.T. Kiryushin, E.S. Kokoulina, V.I. Kolesnikov, A.M. Korotkova, A.V. Kuznetsov, N.A. Kuzmin, A.K. Kurilkin, P.K. Kurilkin, E.A. Ladygin, V.P. Ladygin, N.B. Ladygina, S.P. Lobastov, Yu. Lukstins,	

A.I. Malakhov, V.V. Myalkovsky, Yu.N. Murin,
V.A. Nikitin, P.V. Nomokonov, O.V. Okhrimenko,
V.V. Pavluchkov, A.N. Parfenov, Yu.P. Petukhov,
V.N. Pechenov, O.Yu. Pechenova, V.D. Peshekhonov,
S.M. Piyadin, S.G. Reznikov, P.A. Rukoyatkin,
I.A. Rufanov, A.V. Shabunov, V.M. Slepnev, I.V. Slepnev,
S.Ya. Sychkov, A.A. Terekhin, A.V. Terletsky,
V.V. Tikhomirov, N.D. Topilin, O.V. Fateev, Yu.I. Fedorov,
V.S. Khabarov, S.V. Khabarov, A.N. Khrenov,
S.P. Chernenko, A.V. Shutov, A.I. Yukaev

LIT

T.O. Ablyazimov, V.P. Akishina, P.G. Akishin,
D.V. Belyakov, O.Yu. Derenovskaya, P.V. Zrelov,
V.V. Ivanov, P.I. Kisel, A.M. Raportirenko, V. Sheynast

FLNP

E.P. Litvinenko

BLTP

A.S. Sorin, O.V. Teryaev

Collaboration

Country or International Organization

City

Institute or Laboratory

Armenia

Yerevan

YSU

Azerbaijan

Baku

IP ANAS

Belarus

Minsk

NC PHEP BSU
"Planar"

Gomel

GSU

Bulgaria

Sofia

INRNE BAS
ISSP BAS
TU-Sofia
LTD BAS

Blagoevgrad

SWU

Plovdiv

PU

CERN

Geneva

CERN

China

Beijing

"Tsinghua"

Czech Republic

Liberec

TUL

Prague

CU

France

Nantes

SUBATECH

Germany

Darmstadt

GSI

Giessen

JLU

Erlangen

FAU

Frankfurt/Main

Univ.

FIAS

Regensburg

UR

Jülich

FZJ

Japan

Nagoya

Nagoya Univ.

Georgia

Tbilisi

AIP

Italy

Turin

INFN

Moldova

Chişinău

SUM

Poland	Warsaw	IAP ASM
		ETI
	Wroclaw	WUT
		ILTSR PAS
Romania	Lublin	MCSU
	Otwock-Swierk	NCBJ
	Bucharest	INOE2000
		IFIN-HH
Russia	Moscow	INCDIE ICPE-CA
		LPI RAS
		ITEP
		Cryogenmash
		Geliymash
		NRC KI
		VNIINM
		IBMP RAS
		INR RAS
		NRU BelSU
	Moscow, Troitsk	Compressormash
		BINP SB RAS
		IHEP
		Neva-Magnet
		DM Komi SC UrD
	Belgorod	RAS
		NPI TPU
		ISTOK
		IMS SAS
Slovak Republic	Kazan	PJSU
	Novosibirsk	UŽ
	Protvino	UCT
	St. Petersburg	UJ
South Africa	Syktyvkar	SU
	Tomsk	TSL
	Fryazino	BITP NASU
Sweden	Bratislava	KhNU
	Košice	KFTI NASU
Ukraine	Žilina	Fermilab
	Cape Town	BNL
USA	Johannesburg	SUNY
	Stockholm	
	Uppsala	
USA	Kiev	
	Kharkov	
	Batavia, IL	
	Upton, NY	
	Stony Brook, NY	

Advanced Studies in New Generation of Electron–Positron Accelerators and Colliders for Fundamental and Applied Research

Leader:

G.D. Shirkov

Deputies:

G.V. Trubnikov

E.M. Syresin

Participating Countries and International Organizations:

Belarus, Bulgaria, CERN, Germany, Greece, Italy, Japan, Poland, Russia, Slovak Republic, United Kingdom, Ukraine, USA.

Scientific Programme

R&D work in particle accelerator physics and engineering, construction of the free electron laser with the aim to prepare proposals for the project of JINR participation in international collaboration on construction of the future Linear Collider (CLIC/ILC). Studies of free electron laser physics, development and construction of systems applied for formation and diagnostics of ultra short dense bunches in the linear electron accelerators. Construction of the generator of direct positronium fluxes for study of new particles and “new physics”, construction of the installation for positron annihilation spectroscopy. Study of cryomodule components and SC cavities. High precision laser metrology. R&D for laser–plasma accelerators.

Expected main results in 2014:

- Commissioning of the photoinjector Laser driver (10 ps). Mounting of the laser beam optical transportation system at a photoinjector. Startup and adjustment of the photogun electron beam emittance measurement system. Manufacture and research of the “holed” GaAs photocathodes.
- Commissioning of the linear accelerator of electrons (third stage) with electron energy up to 100 MeV. Startup of the fourth stage modulator. Research of performances IR–radiation of an undulator.
- Creation of the prototype of nondestructive laser control system with ray space stability < 50 mcm. Explosion welding of Nb + stainless steel by advanced technology, cryo/vacuum tests. Manufacture and tests of 1–section prototype of high–purity Nb–cavity.
- Optimization of allocation of linear collider elements and related engineering, scientific and social infrastructure in Dubna, Moscow region.
- Low Energy Particle Storage Ring LEPTA: upgrade of the vacuum system of the complex, enhancement of positron storage efficiency and electron cooling of positrons. Performance of experiments on positron annihilation spectroscopy (PAS), design and construction of slow positron channel and experiment chamber for PAS.
- Investigation of electron beam and FEL physics: generation of two color radiation with JINR infrared and UV undulators at FLASH, beam tests and application of detectors on base of microchannel plates at XFEL and FLASH 2, first tests and delivery in DESY (Zeuthen) of laser system applied for formation of 3D ellipsoide shape bunches of light radiation.

List of projects:

Project	Leader	Priority (period of realization)
1. JINR participation in design, manufacturing and testing of the prototypes of linear electron-positron collider elements and FEL	G.D. Shirkov G.V. Trubnikov	1 (2013 – 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. R&D works at DC photoinjector prototype with electron energy up to 400 keV. Construction photoinjector laser system applied for formation of 3D ellipsoid shape bunches of light radiation VBLHEP	G.V. Trubnikov N.I. Balalykin V.F. Minashkin, M.A. Nozdrin, V.G. Shabratov, A.V. Shevelkin	Technical proposal Realization
2. R&D works at dedicated test bench: electron linear accelerator up to 100 MeV for studies of accelerating structures properties and usage as FEL prototype. Laser-plasma acceleration technologies. Optimization of allocation of linear collider complex in Dubna region VBLHEP DLNP CAR	G.D. Shirkov V.V. Kobets A.V. Dudarev V.G. Shabratov, A.V. Skrypnik, A.N. Ukhonov, V.F. Minashkin, M.A. Nozdrin E.M. Syresin, R.S. Makarov, V.M. Romanov V.N. Samoilov	Technical proposal Realization
3. R&D works for ILC cryomodule components and Nb-cavity optimal configuration; and for high precision laser metrology control of CLIC and ILC acceleration units alignment DLNP	J.A. Budagov N.S. Azaryan, V.V. Glagolov, D.L. Demin, D.I. Khubua, V.I. Kolomoets, S.M. Kolomoets, M.V. Lyablin, V.M. Romanov, B.M. Sabirov, S.N. Studenov, A.V. Sazonova	Technical proposal Realization
4. LEPTA facility: electron cooling of positrons and Positronium generation. Development of Doppler positron annihilation spectroscopy	I.N. Meshkov S.L. Yakovenko	Realization

DLNP

E.V. Akhmanova, A.G. Kobets, V.I. Lokhmatov,
V.D. Morozov, V.N. Pavlov, A.Yu. Rudakov, A.A. Sidorin,
L.V. Soboleva, T.A. Stepanova, P. Horodek

**5. Investigation on intense electron
beams and FEL. Development
and construction of systems
applied for formation and
diagnostic of ultra short
dense bunches in the linear
electron accelerators**

**E.M. Syresin
O.I. Brovko
M.V. Yurkov**

Technical proposal Realization

DLNP

N.A. Morozov, A.F. Chesnov, R.S. Makarov, D.S. Petrov,
V.M. Romanov

VBLHEP

G.V. Trubnikov, A.Yu. Grebentsov, E.V. Ivanov,
M.N. Kapishin, O.A. Nozdrina, A.V. Shabunov

Collaboration

Country or International Organization

City

Institute or Laboratory

Belarus

Minsk

NC PHEP BSU
BSUIR
SPMRC NASB
PTI NASB
INP BSU

Bulgaria

Sofia

INRNE BAS

CERN

Geneva

CERN

Germany

Darmstadt

GSI

Hamburg

DESY

Heidelberg

MPIK

Zeuthen

DESY

Greece

Athens

UoA

Italy

Pisa

INFN

Frascati

INFN LNF

Japan

Tsukuba

KEK

Poland

Krakow

NINP PAS

Russia

Moscow

SSDI

Moscow, Troitsk

INR RAS

Nizhny Novgorod

IAP RAS

Novosibirsk

BINP SB RAS

Ryazan

RSU

Sarov

VNIIEF

Ukraine

Kiev

PEWI NASU

United Kingdom

Oxford

JAI

Slovak Republic

Bratislava

IEE SAS

USA

Upton, NY

BNL

Batavia, IL

Fermilab

Study of Polarization Phenomena and Spin Effects at the JINR Nuclotron-M Facility

Leader: A.D. Kovalenko
Deputies: N.M. Piskunov
 V.P. Ladygin
 M. Finger (Jr.)
 R.A. Shindin

Participating Countries and International Organizations:

Bulgaria, CERN, Czech Republic, France, Germany, Japan, Poland, Romania, Russia, Slovak Republic, Sweden, Ukraine, USA, Uzbekistan.

Scientific Programme

Methodical support of the experiments at polarized beams of the Nuclotron-M and NICA facilities, including development of polarimetry systems. Measurement of analyzing power for the reaction $p + CH_2$ at polarized proton momentum up to 7.5 GeV/c at the setup ALPOM-2. Measurement of tensor analyzing power and spin correlation in $d \rightarrow p$ reaction in the deuteron core area with the use of polarized 3He target and polarized deuteron beam of the Nuclotron-M. Study of 2N- and 3N-correlations in deuteron-proton elastic scattering and deuteron break-up reactions at the Nuclotron internal target. Works on modernization of Saclay-Argonne-JINR polarized proton target (setup PPT). The analysis of set of the np spin observables at 0° (the total np cross section differences), using polarized targets and quasi-monochromatic relativistic 1.2–3.6 GeV neutron beams. Determination of the forward scattering NN amplitudes over this energy region. Comparison of the obtained data with QCD motivated model calculations. Study of charge-exchange processes in dp -interactions at the setup STRELA. Development of theoretical models for description of the simplest nuclear systems taking into account relativistic effects, meson and quark-gluon components of the internal movement. Theoretical analysis of experimental data obtained at Nuclotron-M. The study of the properties of strongly interacting matter utilizing polarization phenomena in hadron-nucleon and lepton-nucleon interactions, and in the decay of polarized radioactive atomic nuclei. Study of highly excited nuclear matter and collective effects in nuclear media; delta and other nucleonic resonance excitations on protons and nuclei. Preparation of the setup DELTA-LNS and data taking on the light neutral mesons production in polarized nucleons and nucleus interactions.

Expected main results in 2014:

- Presentation of the proposal on the construction low energy proton and deuteron polarimeter within the frames of the program: "Spin Physics Research Infrastructure at the Nuclotron".
- Completion of stages of the approved projects and collaborative protocols within the frames of their real financial support, including:
 - a) realization of the projects ALPOM-2 and DSS;
 - b) experiments at the setups STRELA and DELTA-LNS, ALPOM-2 analysis of the collected data from DELTA-SIGMA setup;
 - c) works test of the PPT infrastructure.
- Participation in the joint scientific programs and experiments, design and test of the new detectors and electronics for the use at COSY (Jülich), SPS (CERN), RHIC (BNL), TJNAF (Newport News), FAIR (GSI) in accordance with the approved collaborative agreements.
- Continuation of the development of the new methods to calculation of the amplitudes and polarization characteristics of deuteron fragmentation and deuteron elastic scattering on protons and nuclei taking into account FSI and relativistic effects.

List of projects:

Project	Leader	Priority (period of realization)
1. ALPOM-2	N.M. Piskunov	1 (2010 – 2015)
2. DSS	V.P. Ladygin A.I. Malakhov T. Yesaka	1 (2010 – 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Works on the program: “Spin Physics Research Infrastructure at the Nuclotron” VBLHEP BLTP DLNP LIT	A.D. Kovalenko V.P. Ladygin, S.G. Reznikov, P.K. Kurilkin, S.M. Piyadin, Yu.V. Gurchin, V.V. Glagolev, V.I. Sharov, A.I. Malakhov, A.P. Nagaytsev, I.A. Savin, A.N. Livanov, R.A. Shindin, V.I. Fimushkin V.V. Burov, V.K. Lukyanov, A.V. Efremov, O.V. Teryaev M. Finger, M. Finger (Jr.) R.V. Polyakova + 1 student	Realization
2. ALPOM-2 Project VBLHEP	N.M. Piskunov E. Tomasi-Gustafsson C.F. Perdrisat V.V. Glagolev, I.M. Sitnik, A.A. Povtoreyko, Yu.P. Bushuev, D.A. Kirillov, P.A. Rukoyatkin, O.P. Gavrishchuk, S.N. Bazylev, Yu.T. Kiryushin	Data taking
3. DSS Project VBLHEP DLNP	A.I. Malakhov V.P. Ladygin T. Yesaka S.G. Reznikov, A.K. Kurilkin, P.K. Kurilkin, S.M. Piyadin, Yu.V. Gurchin, A.A. Terekhin, Yu.-T. Karachuk, A.N. Livanov, A.N. Khrenov, N.B. Ladygina, A.P. Ierusalimov G.I. Lykasov	Preparation Data taking
4. Modernization of the polarized proton target infrastructure (setup PPT) VBLHEP DLNP	N.S. Borisov R.A. Shindin E.V. Komogorov, N.G. Anishchenko N.S. Borisov, Yu.A. Usov, Yu.A. Plis, N.A. Bazhanov, A.N. Fedorov	Preparation Data taking
5. Development of the Delta-Sigma setup for experiment in high intensity beams	A.D. Kovalenko V.I. Sharov R.A. Sindin	Data analysis Project preparation

VBLHEP	E.V. Chernykh, P.K. Manyakov, L.B. Golovanov, Yu.T. Bozunov, V. Tchumakov, N.A. Kuzmin, I.P. Yudin	
DLNP	I.L. Pisarev, N.S. Borisov, Yu.A. Usov, M. Finger, M. Finger (jr.)	
FLNP	S.B. Borzakov, Ts. Panteleev	
BLTP	N.V. Kochelev, E.A. Kuraev	
LIT	R.V. Polyakova + 1 pers.	
6. Experiments on the program STRELA	N.M. Piskunov	Data taking
VBLHEP	V.V. Glagolev, N.M. Piskunov, L.B. Golovanov, Yu.P. Bushuev, A.A. Povtoreyko, D.A. Kirillov, S.N. Bazylev, P.K. Manyakov	
7. Theoretical calculations of polarized processes	V.V. Burov V.K. Lukyanov	Data analysis
BLTP	V.V. Burov	
VBLHEP	N.B. Ladygina, A.P. Ierusalimov	
8. Spin effects in hadron-nucleon and lepton-nucleon interactions	M. Finger	Data analysis
DLNP	E.I. Bunyatova, M. Slunečkha, V. Slunečhkova, M. Finger (Jr.), A. Yanata	
9. Works on the program DELTA-2	A.B. Kurepin A.N. Livanov	Modernization Data taking
VBLHEP	S.N. Bazylev, A.P. Ierusalimov, P.K. Manyakov, V.P. Ladygin, Yu.S. Anisimov, S.M. Piyadin	

Collaboration

Country or International Organization	City	Institute or Laboratory
Belarus	Minsk	INP BSU
Bulgaria	Sofia	INRNE BAS UCTM
CERN	Geneva	CERN
Czech Republic	Prague	CU CTU
	Brno	ISI ASCR
	Liberec	TUL
	Řež	NPI ASCR
France	Saclay	IRFU
Germany	Dresden	TU Dresden
	Bochum	RUB
	Jülich	FZJ
Japan	Tokyo	UT
	Hiroshima	Hiroshima Univ.

	Osaka	RCNP
Poland	Otwock-Swierk	NCBJ
Romania	Bucharest	INCDIE ICPE-CA
Russia	Gatchina	PNPI
	Moscow	LPI RAS
		NRC KI
	Moscow, Troitsk	INR RAS
Slovak Republic	Bratislava	IP SAS
	Košice	IEP SAS
		PJSU
Sweden	Uppsala	TSL
Switzerland	Geneva	UniGe
	Villigen	PSI
Ukraine	Kharkov	KFTI NASU
USA	Upton, NY	BNL
	Newport News, VA	JLab
	Norfolk, VA	NSU
	Williamsburg, VA	W&M
Uzbekistan	Tashkent	INP UAS
		Assoc.“P.-S.” PTI

Status: Approved for completion
in 2014

Research on Relativistic Heavy and Light Ion Physics. Experiments at the Nuclotron, SPS and SIS18

Leader:

A.I. Malakhov

Deputy:

S.V. Afanasiev

Participating Countries and International Organizations:

Armenia, Belarus, Bulgaria, CERN, China, Czech Republic, France, Germany, Japan, India, Kazakhstan, Mongolia, Poland, Romania, Russia, Slovak Republic, Sweden, Switzerland, Tajikistan, USA, Uzbekistan.

Scientific Programme

Search for manifestation of quark-gluon degrees of freedom in collisions of relativistic nuclei and phase transitions in nuclei and exotic resonances. Study of nuclear multifragmentation processes. The Nuclotron internal target experiments: research using the two-arm EM Calorimeter. Asymptotics in nuclear collisions and nucleon clusters. Development of the data base of the bubble chamber data. Detector development for relativistic heavy-ion experiments at the CERN, BNL and GSI. Investigation of the interactions of nuclei at energy 20-158 GeV on a nucleon on NA61/SHINE experiment (SPS, CERN). Study of hadron production in hadron-nucleus interactions. Use of these data for precise predictions of neutrino fluxes in neutrino oscillation experiments at accelerators. Participation in HADES experimental programs. Obtaining the data on heat generation, neutron multiplication, spectra, fission and radiation capture in the model uranium blanket and target-converter. Studies of transmutation cross sections of radioactive nuclear wastes. Study of fragmentation of light stable and radioactive nuclei with beams of secondary nuclei and data analysis. Study of the properties strong interaction matter. Study of the particles properties in nuclear matter at the Nuclotron.

Expected main results in 2014:

- Continuation of experiments with the internal target at the Nuclotron. Preparation and carrying out of experiments with extracted beams at the Nuclotron. Development of the software for modeling and processing experimental data.
- Participation in realization NA61 project and operation of TOF system for this experiment. Study of hadron production in proton-carbon interactions at 30 GeV in the NA61/SHINE experiment at CERN. Use of these data for improved predictions of neutrino fluxes and precise determination of neutrino oscillation parameters in the T2K experiment in Japan.
- Participation in experimental data taking of $AuAu$ (1.25 GeV) with HADES spectrometer. Further participation in data analysis of dp (1.25 GeV) and np (3.5 GeV). Application of the new gaseous detectors based on GEM in the field of research material structure.
- Experimental study of the properties of hot nuclei produced in the collisions of the relativistic deuterons with heavy target. Measuring and analysis of the relative velocity correlation functions of pairs of intermediate fragments created in the reaction. The elaboration of the trigger system for determination of the total time-scale of hot nucleus disintegration will be done.
- Study of multiparticle dynamics in terms of masses and energies of colliding objects and centrality of interaction. Mathematical modeling of experiments on investigation of the properties of highly excited states of nuclear matter in relativistic nuclear collisions and the mechanism of quark hadronization in the process of pion pair production.
- Search for eta-mesic nuclei formed in dA collisions, the determination of the total cross section of eta-nucleus production in dA collisions and its energy and A-dependence, the construction and production of the neutron detector for this experiment.

- Analysis of 7-prong events in np -interactions using data given an exposure of the 1m H_2 bubble chamber (HBC) of the VBLHEP (JINR) to a quasimonochromatic neutron beam with $P_n=5.20$ GeV/c with the purpose to investigate resonances in the $\Delta^{++}\pi^+\pi^+$ system.
An investigation of the mechanism of an appearance of σ_0 -mesons with $m < 1$ GeV/ c^2 in the $np \rightarrow np\pi^+\pi^-$ reaction.
- Search and research of stable dibarions at the Nuclotron.
- Analysis of emulsions irradiated with the nuclear beams ${}^7Be, {}^{10}C, {}^{12}N$. Irradiation of emulsions with secondary beams of radioactive ${}^{11}C$. Heavy nucleus exposure.
- Study of nuclear interactions depending on projectile mass and energy with the beams of relativistic nuclei at the Nuclotron and other accelerators with the photo-emulsion method. Study of fragmentation, multifragmentation, multiparticle production together with correlations between them at interaction of nuclei of various energies with photo-emulsion nuclei. Search for collective effects in central nuclear-nuclear collisions in photo-emulsions. Development of the project on further emulsion irradiation with beams of light radioactive nuclei and heavy ions.
- Investigation of the deuteron spin dichroism: measurements of the tensor polarisation of the high energy deuteron beam after interaction with un-polarized target.
- Search and study of new phenomena based on the data obtained using bubble chambers; Theoretical interpretation of these results. Creation of the data base of experimental data and educational programs in the field of relativistic nuclear physics.
- Study of deep subthreshold processes, applied and educational programs at MARUSYA setup. Construction of electromagnetic detector of MARUSYA setup and test channel and corresponding electronics for detector testing.
- Investigations with light and heavy ions for applied research.

List of projects:

Project	Leader	Priority (period of realization)
1. HADES	Yu.V. Zanevsky	1 (2010 – 2015)
2. NA61	A.I. Malakhov	1 (2012 – 2014)
3. FASA-3	V.A. Karnaukhov	1 (2013 – 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Experiment HADES	A.I. Malakhov Yu.V. Zanevsky	Data taking Data analysis
VBLHEP	O.V. Fateev, S.P. Chernenko, C.V. Razin, V.P. Ladygin, A.K. Kurilkin, P.K. Kurilkin, A.P. Ierusalimov, V.F. Tchepurnov, A.Yu. Troyan, Yu.A. Troyan, A.V. Belyaev	
BLTP	V.D. Toneev	
DLNP	G.I. Lykasov	

2. Experiment NA61/SHINE	A.I. Malakhov G.L. Melkumov B.A. Popov S.A. Bunyatov	Data taking Preparation Data analysis
VBLHEP	N. Agagabyan, B. Baatar, D.A. Artyemenkov + 2 students, D.K. Dryablov, A.Yu. Isypov, V.I. Kolesnikov, M.A. Kozhin, D.O. Krivenkov	
DLNP	N.V. Atanov, Yu.P. Ivanov, A.V. Krasnoperov, V.V. Lyubushkin, V.V. Tereshchenko, S.V. Tereshchenko	
3. Experiment BECQUEREL	P.I. Zarubin	Data taking
VBLHEP	V.V. Rusakova, D.A. Artemenkov, V. Bradnova, N.O. Kornegrutsa, D.O. Krivenkov, P.P. Kattabekov, L.Z. Mamatkulov, P.A. Rukoyatkin	
4. Project FASA-3	V.A. Karnaukhov	Preparation Data taking
DLNP	S.P. Avdeev, V.V. Kirakosyan, W. Kartch	
FLNR	G.V. Mushinsky, O.V. Strekalovsky	
VBLHEP	P.A. Rukoyatkin	
5. Search for and study of η -mesic nuclei in pA collisions at the JINR VBLHEP Nuclotron	G.A. Sokol S.V. Afanasiev	Preparation Data taking Upgrade
VBLHEP	S.V. Afanasiev + 4 students, Yu.S. Anisimov, V.I. Ivanov, A.S. Artemov, A.F. Elishev, A.Yu. Isypov, Z.A. Igamkulov, D.K. Dryablov, V.V. Polyansky, S.S. Sidorin, L.M. Pavlyuchenko, A.M. Lvov, L.V. Korniyushina	
6. Investigation of the deuteron spin dichroism	L.N. Zolin	Data taking
VBLHEP	A.G. Litvinenko, V.F. Peresedov, A.Yu. Isypov, I.I. Migulina, P.A. Rukoyatkin + 3 pers.	
7. Search and investigation of new phenomena using informa- tion obtained with bubble chambers and their theoretical interpretation. Creation of data base of experimental data and educational programs in the field of relativistic nuclear physics	A.A. Baldin V.V. Glagolev Yu.A. Troyan	Data analysis
VBLHEP	A.V. Belyaev, V.V. Ilyushchenko, A.Yu. Troyan + 2 pers., A.P. Ierusalimov, S.G. Arakelyan, O.V. Rogachevsky, S.G. Stetsenko	
8. Investigation of deep subthreshold processes, applied and educational programs at MARUSYA set up	A.A. Baldin	Preparation Data taking

VBLHEP

V.A. Arefiev, S.V. Afanasiev, A.V. Belyaev, B.N. Guskov,
I.V. Kudashkin, A.I. Kudashkin, I.V. Slepnev + 4
pers., S.G. Stetsenko, Yu.A. Troyan, A.Yu. Troyan,
A.V. Shabunov, S.S. Shimansky, I.P. Yudin,
E.E. Perepelkin, I.G. Voloshina, T.V. Shavrina

BLTP

V.V. Burov, S.G. Bondarenko

**9. Investigation with light
and heavy ions for
applied research**

A.I. Malakhov

Realization Preparation Data taking

VBLHEP

N.N. Agapov, Yu.S. Anisimov, A.D. Kovalenko

Collaboration

**Country or International
Organization**

City

Institute or Laboratory

Armenia

Yerevan

ANL

YSU

Belarus

Minsk

NC PHEP BSU

Bulgaria

Sofia

INRNE BAS

CERN

Geneva

CERN

China

Beijing

IHEP CAS

CIAE

Wuhan

CCNU

Czech Republic

Prague

IMC ASCR

Řež

NPI ASCR

France

Orsay

IPN Orsay

Germany

Darmstadt

TU Darmstadt

GSI

Dresden

HZDR

Frankfurt/Main

Univ.

Giessen

JLU

Heidelberg

Univ.

Munich

TUM

Siegen

Univ.

Japan

Osaka

RCNP

Tokyo

UT

Tsukuba

Univ.

India

Jaipur

Univ.

Mumbai

BARC

Kazakhstan

Almaty

IPT

Mongolia

Ulaanbaatar

IPT MAS

NEA

Poland

Krakow

NINP PAS

Lodz

UL

Otwock-Swierk

NCBJ

Warsaw

WUT

Romania	Bucharest	UB IFIN-HH INCDIE ICPE-CA ISS UOC
	Constanța	SINP MSU
Russia	Moscow	LPI RAS ITEP INR RAS ISMAN RAS KRI VNIIEF
	Moscow, Troitsk	IP SAS
	Chernogolovka	SOSMT
	St. Petersburg	PJSU
	Sarov	LU
Slovak Republic	Bratislava	PSI UniGe
	Košice	ETH
Sweden	Lund	TNU
Switzerland	Villigen	PHTI ASRT
	Geneva	Berkeley Lab
	Zurich	UIowa
Tajikistan	Dushanbe	NSU
		BNL
USA	Berkeley, CA	W&M
	Iowa City, IA	Assoc.“P.-S.” PTI
	Norfolk, VA	JSPI
	Upton, NY	SSU
	Williamsburg, VA	
Uzbekistan	Tashkent	
	Jizzakh	
	Samarkand	

Investigation of the Properties of Nuclear Matter and Particle Structure at the Collider of Relativistic Nuclei and Polarized Protons

Leaders:

R. Lednický
Yu.A. Panebratsev

Participating Countries and International Organizations:

Armenia, Azerbaijan, Czech Republic, France, Germany, Kazakhstan, Russia, Slovak Republic, USA.

Scientific Programme

Investigation of the properties of nuclear matter with extremely high density and temperature, search for the signs of the quark deconfinement and possible phase transitions at the collisions of heavy nuclei at the energies of the Relativistic Heavy Ion Collider (RHIC). Measurement of spin dependent structure functions of nucleons and nuclei using polarized RHIC beams.

Expected main results in 2014:

- The data on heavy ion and polarized proton collisions taken in the STAR experiment at RHIC.
- Study of AuAu, UU, CuCu, and CuU collisions in the energy range 7-200 GeV.
- Measurements of event structure, collective variables, correlation characteristics, femtosopic correlation functions and high P_T processes.
- Measurement and simulation of spin dependent structure functions of nucleons and nuclei.
- Participation in JINR-BNL and JINR-CERN joint educational programs.

List of projects:

Project	Leader	Priority (period of realization)
1. STAR	Yu.A. Panebratsev R. Lednický	1 (2010 – 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Participation in the spin physics program in STAR experiment at RHIC	Yu.A. Panebratsev	Data taking Data analysis
VBLHEP	M.V. Tokarev, T.G. Dedovich, A.O. Kechechyan, L.G. Efimov, A.N. Zubarev, V.V. Tikhomirov, V.B. Dunin, V.I. Yurevich, D.N. Bogoslavsky, G.A. Yarygin, A.A. Povtoreyko, V.Yu. Rogov, E.M. Kislov	

2. Simulation of physical polarization processes of jet, direct photon and strange particle production in STAR experiment at RHIC	M.V. Tokarev	Realization
	V.V. Lyuboshits, T.G. Dedovich, A.A. Aparin	
	Zh.Zh. Musulmanbekov	
	O.V. Teryaev, A.E. Dorokhov, S.V. Goloskokov	
3. The study of event structure, collective effects, femtoscopic correlations and high pT processes	R. Lednický	Realization
	Yu.A. Panebratsev	
	P. Filip, M. Pakhr, M.V. Tokarev, Yu. Fedorishin, S. Vokal, O.V. Rogachevsky, A.O. Kechechyan, N.Ya. Tchankova-Bnzarova, T.G. Dedovich, L.G. Efimov, I.-Zh. Bnzarov, G.S. Averichev, E.I. Shakhaliyev, V.V. Lyuboshits, G.N. Agakishiev, A.A. Aparin	
	G.A. Ososkov	
4. Participation in the heavy ion program in STAR experiment at RHIC	Yu.A. Panebratsev	Data taking Data processing Data analysis
	E.V. Potrebenikova, M.V. Tokarev, B.G. Shchinov	
5. Participation in JINR-BNL and JINR-CERN joint educational programs	Yu.A. Panebratsev	Realization
	E.V. Potrebenikova	
	V.V. Belaga, N.E. Sidorov, K.V. Klygina, M.S. Stetsenko, P.D. Semchukov, A.V. Shoshin, E.I. Golubeva, N.I. Vorontsova, M.P. Osmachko	
	S.Z. Pakulyak, I.A. Smirnova	

Collaboration

Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	ANL
Azerbaijan	Baku	IRP ANAS
Czech Republic	Prague	CU
	Řež	NRI
France	Nantes	SUBATECH
Germany	Heidelberg	Univ.
Kazakhstan	Almaty	IPT
Russia	Moscow	NNRU "MEPhI"
		ITEP
	Protvino	IHEP
	St. Petersburg	SPbSU
Slovak Republic	Košice	PJSU

USA

Argonne, IL
Berkeley, CA
Detroit, MI
Los Angeles, CA
New Haven, CT
University Park, PA
Upton, NY

ANL
Berkeley Lab
WSU
UCLA
Yale Univ.
Penn State
BNL

ALICE: Study of Interactions of Heavy Ion and Proton Beams at the LHC

Leader: A.S. Vodopyanov

Participating Countries and International Organizations:

Armenia, Bulgaria, CERN, China, Croatia, Czech Republic, Denmark, France, Germany, Greece, Hungary, India, Italy, Mongolia, Netherlands, Norway, Poland, Republic of Korea, Romania, Russia, Slovak Republic, South Africa, Sweden, Switzerland, Ukraine, United Kingdom, USA.

Scientific Programme

1. Participation in the preparation of ALICE upgrade (Photon spectrometer PHOS, assembly of the setup).
2. Realization of experiments at the LHC.
3. Physics research program at the ALICE detector.
4. Development and upgrade of data analysis computing GRID-ALICE in Russia.

Expected main results in 2014:

- Participation in the R&D for the upgrade of photon spectrometer PHOS.
- Participation in the physics project preparation. Physics simulation of heavy ions and protons interactions at LHC energies.
- Data analysis. Preparation of publications.
- Upgrade, testing and supporting of GRID.

List of projects:

Project	Leader	Priority (period of realization)
1. ALICE	A.S. Vodopyanov	1 (2010 – 2014)
2. R&D for the ALICE Photon Spectrometer	A.S. Vodopyanov	1 (2010 – 2016)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Particle detectors	A.S. Vodopyanov	Realization
VBLHEP	V.I. Astakhov, V.A. Arefiev, V.H. Dodokhov, P.V. Nomokonov, V.A. Budilov, S.A. Zaporozhets, I.A. Rufanov	
2. Physical process simulation and data analysis	B.V. Batyunya	Realization

VBLHEP	M.Yu. Barabanov, Yu.A. Belikov, M. Valya, S.S. Grigoryan, S.A. Zaporozhets, L.V. Malinina, P.V. Nomokonov, T.A. Pocheptsov, E.P. Rogachya, M.O. Suleymanov, A.G. Fedunov, G.S. Shabratova, Ya. Mushinski, K.P. Mikhaylov, N.N. Zhigareva	
DLNP	G.I. Lykasov	
LIT	R.M. Yamaleev	
BLTP	V.G. Kadyshevsky, A.V. Sidorov	
3. ALICE Computing in the distributed environment–GRID	A.S. Vodopyanov G.S. Shabratova	Realization
VBLHEP	B.V. Batyunya, S.A. Zaporozhets, T.A. Pocheptsov, M. Valya, A.G. Fedunov, B.G. Shchinov, G.G. Stiforo, G.S. Shabratova + 2 students (A.O. Kondrat'ev, A.S. Schelachyev)	
LIT	V.V. Mitsyn, L. Val'ova	
4. Transition radiation detector	Yu.V. Zanevsky A.I. Malakhov	Realization
VBLHEP	L.G. Efimov, E.M. Kislov, Yu.A. Panebratsev, C.V. Razin, M.F. Tokarev, O.V. Fateev, V.F. Chepurnov, G.A. Cheremukhina, S.P. Chernenko, V.I. Yudin	
BLTP	D. Blaschke	
5. Photon Spectrometer PHOS	A.S. Vodopyanov P.V. Nomokonov	Realization
VBLHEP	V.A. Budilov, S.A. Rufanov, I.A. Zaporozhets	

Collaboration

Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	ANL
Bulgaria	Sofia	SU
CERN	Geneva	CERN
China	Beijing	CIAE
	Wuhan	CCNU
Croatia	Zagreb	RBI
Czech Republic	Prague	IP ASCR
	Řež	NRI
Denmark	Copenhagen	NBI
France	Clermont-Ferrand	LPC-CF
	Lyon	UCBL
	Nantes	SUBATECH
	Orsay	IPN Orsay
	Saclay	IRFU
	Strasbourg	CRN
Germany	Darmstadt	GSi

	Heidelberg	Univ.
	Frankfurt/Main	Univ.
	Marburg	Univ.
	Münster	Univ.
Greece	Athens	UoA
Hungary	Budapest	Wigner RCP
India	Aligarh	AMU
	Bhubaneshwar	IOP
	Calcutta	VECC
		SINP
	Chandigarh	PU
	Jammu	Univ.
Italy	Bari	INFN
	Bologna	INFN
	Cagliari	INFN
	Catania	UniCT
	Legnaro	INFN LNL
	Padua	INFN
	Rome	INFN
	Salerno	INFN
	Turin	INFN
	Vercelli	UPO
Mongolia	Ulaanbaatar	IPT MAS
Netherlands	Amsterdam	NIKHEF
	Utrecht	UU
Norway	Bergen	UiB
	Oslo	UiO
Poland	Krakow	NINP PAS
	Warsaw	ETI
		WUT
	Otwock-Swierk	NCBJ
Republic of Korea	Gangneung	GWNU
Romania	Bucharest	ISS
Russia	Gatchina	PNPI
	Moscow	ITEP
		NNRU “MEPhI”
		NRC KI
		SINP MSU
	Moscow, Troitsk	INR RAS
	Novosibirsk	BINP SB RAS
	Protvino	IHEP
	Sarov	VNIIEF
	St. Petersburg	SPbSU
Slovak Republic	Bratislava	CU
	Košice	PJSU

South Africa	Cape Town	UCT
Sweden	Lund	LU
Switzerland	Lausanne	EPFL
United Kingdom	Birmingham	Univ.
Ukraine	Kharkov	KFTI NASU
	Kiev	BITP NASU
USA	Columbus, OH	OSU
	Oak Ridge, TN	ORNL

Development and Construction of the Prototype of a Complex for Radiotherapy and Applied Research with Heavy-Ion Beams at the Nuclotron-M

Leaders:

S.I. Tyutyunnikov

Participating Countries and International Organizations:

Armenia, Australia, Belarus, Bulgaria, Czech Republic, India, Germany, Greece, Kazakhstan, Moldova, Mongolia, Poland, Romania, Russia, Serbia, Slovak Republic, Ukraine.

Scientific Programme

Investigation of new aspects of electronuclear power engineering and process of energy production and radioactive waste transmutation at various subcritical setups.

Expected main results:

- Investigation of physical characteristics of the following setups: “the lead target plus graphite moderator” (set-up “Gamma-3”), the massive uranium target with a lead reflector – (set-up “Quinta”), the quasi infinite uranium target BURAN at the energies of the Nuclotron proton and deuteron beams within the range from 0.6 up to 12.0 GeV. Data on the multiplicities and special distribution of energy–time neutron spectra. Study on possibilities of energy production and radioactive waste processing at massive targets of natural (depleted) uranium and thorium on the base of basic principles of nuclear relativistic technologies.

Expected main results in 2014:

- Completion of the development of a heavy ion beam spatial monitoring system; On–line operational test at the Nuclotron–M experiments.
- Development of detector for measuring the radiation dose rate based on diamond detectors.
- Study on efficiency of heating FEL ferromagnetic nano–clusters with microwave radiation regarding the feasibility of its application to the cancer cell destruction.
- Study of neutron generation and multiplication in heavy targets (Pb, U, etc.) at the Nuclotron proton and deuteron beams within the energy range from 1.0 to 8.0 GeV. Data taking on energy release, number of fissions, plutonium recovery, on neutron energy spectra and neutron spatial distribution in the uranium target (set-up “Quinta”) and in the lead target with graphite moderator (“Gamma-3” set-up). Precise definition of transmutation rate for highly toxic long–lived radioactive waste (^{129}I , ^{237}Np , ^{238}Pu , ^{239}Pu and ^{241}Am) in the neutron fields with reinforced hard component.
- The technical specifications elaboration and carrying out the 1–st stage of design work on the construction of the experimental setup “Buran”, based on the quasiinfinite target of depleted uranium with the mass of ~21 tons.

List of projects:

Project	Leader	Priority (period of realization)
1. Study of deep subcritical electronuclear systems and feasibility of their application for energy production and radioactive waste transmutation Part II – quasi infinite target	S.I. Tyutyunnikov	1 (2011 – 2016)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Elaboration of the technical specifications for the quasi infinite target "Buran"	S.I. Tyutyunnikov I.P. Yudin A.A. Baldin	Realization
2. Development of the technical specifications for detecting system of the "Buran" setup	A.A. Baldin A. Berlev N.I. Zamyatin V.M. Slepnev	Realization
3. Development and experimental study of the detectors for neutron registration at the Nuclotron-M beams	A.A. Baldin A. Berlev A.V. Vishnevsky N.I. Zamyatin S.E. Vasil'ev A.M. Makankin A.I. Shafranovskaya	Realization
4. Development and production of the detectors for the ions energy measurement within the range $E=0.1 \div 1$ GeV/nucleon. Experiments at the Nuclotron-M beams	N.I. Zamyatin A.E. Cheryemukhin A.I. Shafranovskaya S.V. Khabarov Yu.S. Kovalev	Realization
5. Study of radioactive waste transmutation and research on neutron generation and energy release in heavy targets (Pb, U, Th, etc.) at the Nuclotron deuteron and neutron beams within the energy interval from 0.5 to 6 GeV/nucleon	A.A. Baldin I.P. Yudin S.M. Golubukh	Data taking Data processing Upgrade
VBLHEP	A. Berlev, S.V. Vasil'ev, A.V. Vishnevsky, N.M. Vladimirova, N.I. Zamyatin, E.V. Kostyukhov, A.M. Makankin, I.I. Mar'in, I.V. Kudashkin, M. Paraipan, E.V. Strekalovskaya, S.V. Khabarov	
DLNP	I. Adam, V.M. Tsupko-Sitnikov, A.A. Solnyshkin, Zh. Hushvaktov	
FLNP	Yu.N. Kopach, V.I. Furman, N.A. Gundorin	
LIT	A. Polyanski	
LRB	V.Yu. Shchegolev	
RFMD	B.A. Shestakov, N.N. Kalyakin + 2 pers.	
6. Study on the biological cell destruction for different structures under microwave radiation. Investigation of its properties in dependence on duration and power of the radiation spectrum	S.N. Sedykh E.A. Perelshtein V.N. Shalyapin S.I. Tyutyunnikov	Realization

VBLHEP

A.K. Kamiksly, I.A. Kryachko, V.V. Efimov, Yu.S. Kovalev,
V. Dzhavadova

**7. Production of the monitoring
elements for the superconducting
systems**

Yu.P. Filippov

R&D

VBLHEP

K.S. Panfyerov, I.D. Kakorin + 6 pers.

Collaboration

**Country or International
Organization**

City

Institute or Laboratory

Armenia

Yerevan

YSU

Australia

Sydney

Univ.

Belarus

Minsk

NC PHEP BSU

JIPNR-Sosny

NASB

IP NASB

INP BSU

BSU

SPMRC NASB

Bulgaria

Sofia

INRNE BAS

Czech Republic

Řež

NRI

Brno

BUT

Prague

CTU

Germany

Darmstadt

TU Darmstadt

Marburg

Univ.

Jülich

FZJ

Greece

Thessaloniki

AUTH

India

Mumbai

BARC

Jaipur

Univ.

Kazakhstan

Almaty

IPT

INP NNC RK

Moldova

Chişinău

IAP ASM

Mongolia

Ulaanbaatar

IPT MAS

Poland

Warsaw

WUT

Krakow

NINP PAS

Otwock-Swierk

NCBJ

Russia

Moscow

Atomenergomach

Dubna

BSINP MSU

IAS "Omega"

Obninsk

MRRC

IPPE

St. Petersburg

KRI

Tomsk

TPU

Romania

Bucharest

ISS

		UMF
		INCDIE ICPE-CA
		UAIC
Serbia	Iași	INS “VINČA”
Slovak Republic	Belgrade	SOSMT
	Bratislava	CU
Ukraine	Kharkov	KFTI NASU
	Uzhgorod	UNU

Nuclear
Physics
(03)

Synthesis and Properties of Nuclei at the Stability Limits

Leader:

M.G. Itkis

Scientific leader:

Yu.Ts. Oganessian

Participating Countries and International Organizations:

Belgium, Bulgaria, China, Czech Republic, Cuba, Finland, France, Germany, Egypt, India, Italy, Japan, Kazakhstan, Mongolia, Poland, Romania, Russia, Slovak Republic, South Africa, Spain, Switzerland, Sweden, Ukraine, United Kingdom, USA.

Scientific Programme

Synthesis and investigation of properties of nuclei at limits of stability. Investigation of the mechanisms of heavy-ion-induced reactions. Study of physical and chemical properties of heavy and superheavy elements.

Expected main results in 2014:

- Conducting experiments on the synthesis of neutron-deficient isotopes of superheavy elements Cn - Fl and element 118 in the reactions with ^{48}Ca ions, data processing and analysis of results.
- Completion of experiments aimed at measuring the multiplicity of prompt neutrons from the spontaneous fission of No and Rf isotopes. Alpha-, beta-, and gamma-ray spectroscopy of No and Rf isotopes using the SHELS separator (modernized VASSILISSA set-up) + GABRIELA. Development of the detection system of the separator.
- Conducting experiments on chemical identification of element 113.
- Direct identification of the isotope ^{283}Cn obtained in the $^{48}\text{Ca} + ^{238}\text{U}$ reaction at the MASHA separator.
- Investigation of the properties of new neutron-rich heavy nuclei formed in multinucleon transfer reactions ($^{136}\text{Xe} + ^{208}\text{Pb}$, ^{248}Cm , $^{160}\text{Gd} + ^{186}\text{W}$). Study of exotic fission modes of heavy and superheavy nuclei ($^{36}\text{S} + ^{186}\text{W}$, $^{32}\text{S} + ^{238}\text{U}$). Study of the multicluster decay of heavy nuclei.
- Study of the structure of light nuclei $^9,^{10}\text{He}$, $^{10,11}\text{Li}$ using radioactive beams and a tritium target.
- Experiments aimed at studying the characteristics of nuclear reactions induced by low-bound nuclei with the cluster structures (stable and secondary radioactive beams) at the energies near the Coulomb barrier. Design and manufacture of a focal plane detector and the time-of-flight system for the high-resolution magnetic analyzer (MAVR).
- Theoretical studies of mechanisms of heavy-ion-induced reactions.
- Development of the knowledge base on nuclear physics accessible through the internet.

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1. Synthesis of new elements at the gas-filled separator FLNR	V.K. Utyonkov	Data taking
BLTP	F.Sh. Abdullin, A.A. Voinov, A.M. Zubareva, V.I. Krashonkin, A.N. Polyakov, R.N. Sagaidak, V.G. Subbotin, A.M. Sukhov, Yu.S. Tsyganov, I.V. Shirokovsky, M.V. Shumeiko	
2. α -, β - and γ - spectroscopy of heavy nuclei at the separator VASSILISSA FLNR	V.V. Pashkevich A.V. Yeremin	Data taking
3. Chemical properties of heavy nuclides FLNR	O.N. Malyshev, A.I. Svirikhin, I.N. Izosimov, V.I. Chepigin, M.L. Chelnokov, A.V. Isaev, I.M. Merkin, A.N. Kuznetsov, A.A. Kuznetsova, A.G. Popeko, E.A. Sokol, D.E. Katrasev, V.M. Popov S.N. Dmitriev	Data taking
4. Experiments at the MASHA separator. Laser spectroscopy of nuclei FLNR	V.Ya. Lebedev, N.V. Aksenov, Yu.V. Albin, G.A. Bozhikov, V.I. Vakarov, M.G. Voronyuk, G.K. Vostokin, I. Zvara, E.V. Krasnoyaroova, Ch.G. Kim, K.V. Lebedev, Z. Myanovska, O.V. Petrushkin, A.V. Rykhlyuk, A.V. Sabelnikov, G.Ya. Starodub, E.E. Tereshatov A.M. Rodin	Data taking
5. The study of the processes of fission, quasifission and multinucleon transfer reactions. CORSET-DEMON, CORSAR, MiniFOBOS FLNR	L. Krupa, A.V. Belozerov, D.V. Vanin, V.Yu. Vedeneev, A.V. Guljaev, A.V. Guljaeva, S. Motychak, A.V. Podshibyakin, V.S. Salamatin, I. Sivachek, S.V. Stepantsov, S.G. Zemlyanoy M.G. Itkis	Data taking
	E.M. Kozulin, A.N. Baranov, A.A. Bogachev, V.V. Volkov, Yu.M. Itkis, E.M. Gazeeva, T.F. Loktev, G.N. Knyazheva, N.I. Kozulina, I.V. Lebedev, K.V. Novikov, D.V. Kamanin, I.A. Alexandrova, A.A. Alexandrov, V.E. Zhuchko, N.A. Kondratyev, E.A. Kuznetsova, Yu.V. Pyatkov, Yu.B. Semenov, A.O. Strekalovsky, O.V. Strekalovskiy, J.M. Harka	

6. Study of the structure of light nuclei near and beyond the drip line. ACCULINNA, COMBAS fragment - separators

A.S. Fomichev

Data taking

FLNR

G.M. Ter-Akopian, M.S. Golovkov, L.V. Grigorenko, A.V. Gorshkov, V.A. Gorshkov, A.G. Knyazev, S.A. Krupko, A.A. Bezbakh, Yu.L. Parfenova, S.I. Sidorchuk, R.S. Slepnev, G. Kaminsky, V. Chudoba, R. Wolski, P.G. Sharov, P. Jaluvkova, S. Enhbold, Yu.M. Sereda, A.G. Artukh, A.N. Vorontsov, S.A. Klygin, G.A. Kononenko, D.A. Kislukha, N.A. Tarantin, E. Batchuluun

BLTP

S.N. Ershov, I.A. Egorova

7. Reactions induced by stable and radioactive ion beams leading to the formation of exotic nuclei

Yu.E. Penionzhkevich

Data taking

FLNR

S.M. Lukyanov, R.A. Astabatyanyan, E.A. Voskoboinik, E.R. Markaryan, V.A. Maslov, V.S. Moszhukhin, N.K. Skobelev, Yu.G. Sobolev, M.P. Ivanov, Z.D. Pokrovskaya, R.V. Revenko, D.A. Testov, V.I. Smirnov

8. Theoretical study of mechanisms of heavy ion induced reactions

V.I. Zagrebaev

FLNR

A.V. Karpov, A.S. Denikin, V.V. Samarin, Y. Aritomo, E.A. Cherepanov, Yu.A. Muzichka, V.A. Rachkov, M.A. Naumenko

9. Development and maintenance of the knowledge base on nuclear physics accessible through the Internet

V.I. Zagrebaev

Data taking

FLNR

A.V. Karpov, A.S. Denikin, V.V. Samarin, V.A. Rachkov, M.A. Naumenko

Collaboration

Country or International Organization

City

Institute or Laboratory

Belgium

Brussels

ULB

Bulgaria

Sofia

INRNE BAS

China

Beijing

PKU

Czech Republic

Prague

VP

CTU

Řež

NPI ASCR

Cuba

Havana

HITAS

Egypt

Giza

CU

Finland

Jyväskylä

UJ

France

Caen

GANIL

Orsay

CSNSM

	Saclay	IPN Orsay SPhN CEA DAPNIA CRN
	Strasbourg	IPHC
Germany	Berlin	HZB
	Darmstadt	GSI
	Frankfurt/Main	Univ.
	Tübingen	Univ.
India	Manipal	MU
Italy	Catania	INFN LNS
	Legnaro	INFN LNL
	Messina	UniMe
	Naples	UNINA
Japan	Tokai	JAEA
	Wako	RIKEN
Kazakhstan	Almaty	INP NNC RK
	Astana	ENU
Mongolia	Ulaanbaatar	NUM
Poland	Warsaw	UW
	Krakow	NINP PAS
	Otwock-Swierk	NCBJ
	Poznan	AMU
Romania	Bucharest	IFIN-HH
Russia	Moscow	GEOKHI RAS IPCE RAS MSU NNRU "MEPhI" MUCTR NRC KI SINP MSU INR RAS RIMST ChSU RIAR PNPI VNIIEF KRI IPTI RAS SPbSU ITMO VSU CU IP SAS SU
	Moscow, Troitsk	
	Moscow, Zelenograd	
	Cheboksary	
	Dimitrovgrad	
	Gatchina	
	Sarov	
	St. Petersburg	
	Voronezh	
Slovak Republic	Bratislava	
South Africa	Stellenbosch	

	Cape Town	iThemba LABS
	Pretoria	Unisa
Spain	Huelva	UH
	Madrid	CSIC
Switzerland	Villigen	PSI
Sweden	Göteborg	Chalmers
Ukraine	Kiev	KINR NASU
United Kingdom	Surrey	Univ.
USA	Argonne, IL	ANL
	Berkeley, CA	Berkeley Lab
	College Station, TX	Texas A&M
	East Lansing, MI	MSU
	Livermore, CA	LLNL
	Nashville, TN	VU
	Oak Ridge, TN	ORNL

Accelerator Complex of Ion Beams of Stable and Radioactive Nuclides (DRIBs-III)

Leaders: G.G. Gulbekyan
S.N. Dmitriev
M.G. Itkis
Scientific leader: Yu.Ts. Oganessian

Participating Countries and International Organizations:

Belgium, Bulgaria, China, Czech Republic, Democratic People's Republic of Korea, Egypt, France, Germany, Italy, Kazakhstan, Mongolia, Poland, Romania, Russia, Serbia, Slovak Republic, South Africa, Ukraine, Uzbekistan.

Scientific Programme

Development of the FLNR cyclotron complex: major expansion of laboratory experimental facilities; development of accelerator systems in an attempt to increase beam intensity and improve the quality of beams of stable and radioactive nuclides in the energy range from 5 to 100 MeV/nucleon; improvement of accelerator energy efficiency, reliability, and performance.

Expected results in 2014:

- Conducting experiments with ^{48}Ca at the cyclotron U400.
- Conducting experiments with beams of intermediate-mass ions at 6 - 15 MeV/nucleon at the cyclotron U400M.
- Development of advanced methods and technology for high-efficient production of intense Ti and Fe beams from ion sources.
- Testing of a new DECRIS-SC2-18GGz ion source for the production of intense beams of highly charged Kr and Ar ion.
- Conducting experiments with beams of the upgraded MT25 microtron.
- Conducting experiments with low-energy (<10 MeV) electron beams at the MT25 microtron.
- Development and testing of new methods of beam energy diagnostics for stable and radioactive nuclides.
- Optimization of transport systems of beams of stable and radioactive nuclides.
- Conducting experiments with radioactive beams at the U400M and MT-25 accelerators.
- Development of a new experimental hall, beam transportation systems, a new high-current DC280 accelerator, and technical support systems.
- Development of a new fragment separator ACCULINNA-2.
- Preparation of the technical specifications documents related to the design, construction and commissioning of a new gas-filled separator.
- Development of a gas catcher.
- Development of a new separation facility based on stopping reaction products in gas and their resonance laser ionization.

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1. Development of the Complex of U400M and U400R	B.N. Gikal	Preparation Data taking
FLNR	P.G. Bondarenko, S.L. Bogomolov, A.V. Reshetov, N.F. Osipov, G.N. Ivanov, S.V. Pashenko, M.V. Habarov, I.V. Kalagin, N.Yu. Kazarinov, I.A. Ivanenko	
LIT	V.V. Korenkov, P.G. Akishin, E.A. Airian	
DLNP	G.A. Karamysheva, E.V. Samsonov, S.A. Kostromin, S.B. Vorozhtsov	
LRB	V.E. Aleynikov	
2. ECR-ion sources development	S.L. Bogomolov	Preparation
FLNR	A.A. Efremov, G.N. Ivanov, V.Ya. Lebedev, V.V. Behterev, N.Yu. Yazvitskiy	
VBLHEP	E.D. Donets, V.M. Drobin	
3. MT25 microtron development	S.V. Mitrofanov	Preparation Data taking
FLNR	A.G. Belov, Yu.G. Teterev, S.V. Pashenko, M.V. Habarov, N.F. Osipov	
4. Creation of the new experimental hall in FLNR	G.G. Gulbekian	Preparation
FLNR	B.N. Gikal, V.A. Kostyrev, N.F. Osipov, P.G. Bondarenko, S.L. Bogomolov, A.V. Reshetov, S.V. Pashenko, M.V. Habarov, I.V. Kalagin, N.Yu. Kazarinov, I.A. Ivanenko, V.A. Verevochkin	
5. Development of the project ACCULINNA-2	A.S. Fomichev	Preparation
FLNR	S.A. Krupko, A.V. Gorshkov, V.A. Gorshkov, G.M. Ter- Akopian, A.A. Bezbakh, Yu.L. Parfenova, P.G. Sharov, S.I. Sidorchuk, R.S. Slepnev, G. Kaminsky, A.G. Knyazev, V. Chudoba, R. Wolski, M.S. Golovkov	
6. Modernization of the separator VASSILISSA	A.V. Eremin	Preparation
FLNR	O.N. Malyshev, A.I. Svirikhin, I.N. Izosimov, V.I. Chepigin, M.L. Chelnokov, A.V. Isaev, I.M. Merkin, A.N. Kuznetsov, E.A. Sokol, D.E. Katrasev, V.A. Sbitnev, V.M. Popov	
7. Development of the gas catcher project	A.M. Rodin	Preparation
FLNR	L. Krupa, A.V. Belozerov, D.V. Vanin, A.V. Guljaeva, V.S. Salamatina, I. Sivachek, S.V. Stepanov, S.A. Yukhimchuk	

**8. Development of the project
of a new gas-filled separator**

A.G. Popeko

Preparation

FLNR

O.N. Malyshev, A.I. Svirikhin, A.V. Eremin, A.V. Isaev,
D.V. Vanin

**9. Development of the project
of a separator based on resonance
laser ionization**

V.I. Zagrebaev

Preparation

FLNR

S.G. Zemlynoy, V.I. Zhemenik, G.V. Myshinskiy,
E.M. Kozulin

Collaboration

**Country or International
Organization**

City

Institute or Laboratory

Belgium	Leuven	K.U.Leuven
	Louvain-la-Neuve	IBA
Bulgaria	Sofia	LTD BAS
		INRNE BAS
China	Lanzhou	IMP CAS
Czech Republic	Prague	VP
		CU
	Řež	NPI ASCR
Democratic People's Republic of Korea	Pyongyang	IFR SCNR
Egypt	Cairo	AASTMT
France	Caen	GANIL
	Grenoble	LPSC
	Orsay	IPN Orsay
	Vannes	SigmaPhi
Germany	Darmstadt	GSI
Italy	Catania	INFN LNS
Kazakhstan	Almaty	INP NNC RK
	Astana	BA INP NNC RK
Mongolia	Ulaanbaatar	NRC NUM
Poland	Krakow	NINP PAS
	Warsaw	UW
Romania	Bucharest	IFIN-HH
		N&V
Russia	Moscow	GPI RAS
		ITEP
	Nizhny Novgorod	IAP RAS
	Novosibirsk	BINP SB RAS
	Sarov	VNIIEF
	St. Petersburg	NIIEFA
	Vladimir	ELMAG
Serbia	Belgrade	INS "VINČA"
Slovak Republic	Bratislava	IMS SAS

South Africa	Cape Town	iThemba LABS
Ukraine	Kiev	KINR NASU
Uzbekistan	Samarkand	SSU
USA	College Station, TX	Texas A&M
	Livermore, CA	LLNL
	Nashville, TN	VU
	Oak Ridge, TN	ORNL

Non-Accelerator Neutrino Physics and Astrophysics

Leaders:

V.B. Brudanin
A. Kovalik

Participating Countries and International Organizations:

Armenia, Belarus, Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Kazakhstan, Mongolia, Poland, Romania, Russia, Slovak Republic, Ukraine, USA, Uzbekistan.

Scientific Programme

Search for and investigation of double-neutrino and neutrinoless modes of double beta-decay, clarification of the Majorana neutrino nature, absolute neutrino mass scale and hierarchies. Search for the neutrino magnetic moment and dark matter. Investigation of galactic and extragalactic neutrino sources, diffusive neutrino cosmic background, search for exotic particles (monopoles). Application of the neutrino detector for a distant investigation of process inside of the reactor core of Kalininskaya Nuclear Power Plant. Search for sterile neutrinos. Spectroscopy of nuclei far from stability. Development of new methods for charged and neutral particle detection.

Expected main results in 2014:

- Data taking in the 2β -decay measurements of ^{150}Nd , ^{116}Cd , ^{106}Cd , ^{100}Mo , ^{96}Zr , ^{82}Se , ^{48}Ca with the NEMO, TGV and GERDA spectrometers.
- Processing of experimental data and determination of $T_{1/2}(2\beta 2\nu)$ for ^{100}Mo , ^{82}Se and ^{76}Ge .
- Data taking with the GEMMA-II spectrometer at the Kalinin Nuclear Power Plant; getting an upper limit for the neutrino magnetic moment at the level of $\sim 2 \cdot 10^{-11} \mu_B$.
- In the EDELWEISS experiment a number of innovative improvements in the setup and detector's performances will be implemented. Forty of FID800 detectors will cumulative fiducial mass 24 kg will be installed in the upgraded EDELWEISS setup. The upgrade implies improved cryogenics, new cabling, installation of additional polyethylene shield between the lead layer and the cryostat, supplementary muon veto modules, use of the new integrated DAQ and electronics, e.g. implementation of fast ionization channel with 40 MS/s. The goal of the project is to reach a WIMP-nucleon scattering cross-section sensitivity of $5 \cdot 10^{-45} \text{ cm}^2$. The detector research and development on longer term aims to reach a few 100 eV thresholds on both ionization and heat channels.
- Research and development of the semiconductor-based detecting systems for the GERDA and MAJORANA experiments. Beginning of data taking in the experiment on the search for the ^{76}Ge $2\beta 0\nu$ -decay.
- Mounting of the NT1000 prototype string. Data taking and extraction of physical results with the NT200+ spectrometer.
- Investigation of the astrophysical S-factor and effective dd cross section in the 2–7 keV impact energy for the D_2O target.
- Investigation of KLL and KMM Auger electrons in ^{65}Zn , ^{67}Cu , ^{67}Ga and $^{152,154,155}\text{Eu}$ decays.
- Design and creation of the low-threshold (~ 200 eV) HPGe detector. Production of low-background plastic scintillators for the Super NEMO experiment.
- Design and creation of the reactor antineutrino detector DANSS.

List of projects:

Project	Leader	Priority (period of realization)
1. SuperNEMO	O.I. Kochetov	1 (2013 – 2015)
2. GEMMA-II	V.B. Brudanin	1 (2010 – 2015)
3. EDELWEISS-II	E.A. Yakushev	1 (2010 – 2015)
4. G&M (GERDA)	A.A. Smolnikov	1 (2010 – 2015)
5. BAIKAL	I.A. Belolaptikov	1 (2009 – 2015)
6. DANSS	V.B. Brudanin V.G. Egorov	1 (2011 – 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. SuperNEMO Project	O.I. Kochetov	Data taking
DLNP	V.A. Bednyakov, V.E. Kovalenko, V.V. Timkin, V.I. Tretyak, F. Mamedov, I. Shermak	
BLTP	F. Simkovic	
2. TGV Project	N.I. Rukhadze I. Shtekl	Data taking
DLNP	V.G. Sandukovsky, I. Shtekl, F. Mamedov, I. Shermak	
BLTP	F. Simkovic	
3. G&M (GERDA-MAJORANA Project)	A.A. Smolnikov K.N. Gusev	Preparation Data taking
DLNP	V.G. Sandukovsky, V.B. Brudanin, A.A. Klimenko, D.R. Zinatulina, E.A. Shevchik, I.V. Zhitnikov, F. Mamedov, I. Shermak	
BLTP	F. Simkovic	
4. GEMMA-II Project	V.G. Egorov	Preparation Data taking
DLNP	V.B. Brudanin, D.V. Medvedev, N.S. Rumyantseva, M.V. Fomina, M.V. Shirchenko, A.S. Kuznetsov	
5. EDELWEISS-II Project	E.A. Yakushev	Data taking
DLNP	V.A. Bednyakov, S.V. Rozov, L.L. Perevoshchikov, D.V. Filosofov, A.V. Lubashevsky	
6. BAIKAL Project	I.A. Belolaptikov	Preparation Data taking
DLNP	I.A. Belolaptikov, V.B. Brudanin, K.V. Konishev, E.N. Pliskovski, B.A. Shaibonov, F.F. Sheifler	

7. DANSS Project

V.B. Brudanin

V.G. Egorov

Preparation

DLNP

D.R. Zinatulina, E.A. Shevchik, I.V. Zhitnikov,
I.E. Smirnova, N.S. Rumyantseva, M.V. Fominaa, V. Belov,
A.S. Kuznetsov, M.V. Shirchenko

Collaboration

**Country or International
Organization**

City

Institute or Laboratory

Armenia	Yerevan	YSU ANL
Belarus	Minsk	NC PHEP BSU
Belgium	Leuven	K.U. Leuven
Bulgaria	Sofia	INRNE BAS
	Plovdiv	PU
Czech Republic	Prague	CTU
	Řež	NRI
Finland	Jyväskylä	UJ
France	Orsay	CSNSM LAL
Germany	Heidelberg	MPIK
	Mainz	JGU
Kazakhstan	Almaty	INP NNC RK
Mongolia	Ulaanbaatar	NRC NUM NEA
Poland	Krakow	NINP PAS AGH
	Lublin	MCSU
	Otwock-Swierk	NCBJ
Romania	Bucharest	IFIN - HH UB
Russia	Moscow, Troitsk	INR RAS
	Gatchina	PNPI
	Voronezh	VSU
	Moscow	NRC KI VNIINM NNRU "MEPhI" LPI RAS ITEP SINP MSU INTRA RADON
	Sarov	VNIIEF
	St. Petersburg	SPbSU IPTI RAS

	Tomsk	NPI TPU
		IHCE SB RAS
Slovak Republic	Bratislava	CU
		IP SAS
Ukraine	Kiev	KINR NASU
	Kharkov	ISC NASU
USA	Irvine, CA	UCI
Uzbekistan	Tashkent	INP UAS
		IAP NUU
	Samarkand	SSU

Physics of Light Mesons

Leader:

A.V. Kulikov

Participating Countries and International Organizations:

Belarus, Bulgaria, Croatia, Canada, Czech Republic, Georgia, Germany, Italy, Kazakhstan, Netherlands, Poland, Romania, Russia, Switzerland, USA, Uzbekistan, Japan.

Scientific Programme

Investigation of strong, weak and electromagnetic interactions of elementary particles and light nuclei at intermediate energies with the aim of determining symmetries and dynamics of the interactions. Development and construction of setups for experiments at accelerators for obtaining new information and testing the present theoretical views in the topics. Development of projects for new experiments and experimental methods for intermediate-energy physics.

Expected main results in 2014:

- Processing of the experimental data for decays $\mu^+ \rightarrow e^+ \gamma$ and $\pi \rightarrow e \nu$.
- Measurements of spin observables using longitudinally and transversely polarized COSY beams.
- Data taking and data processing for $p + t$ fusion reaction using the muon catalysis method.
- Determination of branching ratios for reaction channels of pion interactions with the helium nucleus at the JINR Phasotron.
- The study of the relaxation mechanisms of the acceptor centers in the artificial diamond. The comparative study of the superparamagnetic phenomena in the cobalt and iron ferrites by the muon spin rotation technique.
- Experiments with the “Active Target” (GDH).
- Measurement of A_N for the inclusive and exclusive reactions $\pi^- p \rightarrow \omega(782)n$ and $\pi^- p \rightarrow \eta'(958)n$.
- R&D electromagnetic calorimeter and straw-chambers for experiment COMET. Development and production of the prototypes and their tests with an electron beam.

List of projects:

Project	Leader	Priority (period of realization)
1. SPRING	A.V. Kulikov	1 (2010 – 2015)
2. MEG–PEN	N.A. Kuchinskiy	1 (2010 – 2015)
3. TRITON	D.L. Demin	1 (2011 – 2015)
4. GDH&SPASCHARM	Yu. Usov A. Kovalik	1 (2011 – 2016)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. MEG–PEN Project	N.A. Kuchinskiy	Preparation Data taking
DLNP	V.A. Baranov, V.A. Kalinnikov, N.V. Khomutov, A.S. Korenchenko, S.M. Korenchenko, N.P. Kravchuk, E.S. Kuzmin, A.S. Moiseenko, A.M. Rozhdestvensky, Z. Tsamalaidze, E.P. Velicheva, V.P. Volnykh, A.S. Khrykin	
2. SPRING Project	A.V. Kulikov	Data taking Data analysis
DLNP	V.I. Komarov, Yu.N. Uzikov, A.D. Volkov, O. Imambekov, G. Macharashvili, N. Kadaridze, S.N. Dymov, V.V. Shmakova, T.I. Azaryan, V.S. Kurbatov, D.A. Tsirkov, M.V. Zhabitsky, Yu.V. Prokofichev	
3. Experiment PAINUC	N.A. Russakovich G. Piragino	Data taking Data analysis
DLNP	G.B. Pontecorvo, V.I. Lyashenko, N.S. Angelov, Yu.A. Batusov, P.N. Batyuk, I.A. Belolaptikov, T.D. Blokhintseva, V.A. Drozdov, V.N. Frolov, V.M. Grebenyuk, V.E. Kovalenko, A.S. Moiseenko, A.M. Rozhdestvensky, S.A. Gustov	
LIT	V.V. Ivanov	
LRB	V.A. Panyushkin	
FLNP	V.A. Drozdov	
4. Experiment MUON	V.N. Duginov T.N. Mamedov	Data taking Data analysis
DLNP	E.I. Bunyatova, K.I. Gritsaj, A.I. Rudenko, G.D. Soboleva, V.A. Stolupin	
FLNP	M. Balasoïu + 2 pers.	
5. TRITON Project	D.L. Demin	Data taking Data processing
DLNP	A.M. Artikov, N.A. Baranova, A.I. Boguslavsky, V.P. Volnykh, K.I. Gritsaj, V.N. Duginov, V.I. Kolomorets, A.D. Konin, A.P. Kustov, N.N. Kuchinskaya, T.N. Mamedov, A.I. Puzynin, A.I. Rudenko, A.V. Simonenko, V.A. Stolupin, Yu.A. Polyakov, S.A. Gustov, N.A. Shakun, E.V. Kolesov	
FLNR	S.A. Yukhimchuk	
LRB	V.B. Buchnev, V.Yu. Schegolev	

6. GDH&SPASCHARM Project**Yu. Usov**
A. KovalikData taking
Data processing

DLNP

N.S. Borisov, N.A. Bazhanov, A.N. Fedorov, Yu.A. Plis,
A.B. Lazarev, A.B. Neganov, A.B. Sadovsky,
I.V. Gapienko

BLTP

S.B. Gerasimov, S.S. Kamalov

7. Preparation of the experiment
COMET**Z.B. Tsamalaidze**R&D
Realization

DLNP

P.G. Evtukhovich, A.S. Moiseenko, G. Macharashvili,
V.G. Kalinnikov, A.V. Kulikov, E.P. Velicheva,
S.N. Dymov, V.V. Shmakova, A.D. Volkov, V.P. Volnykh,
B.M. Sabirov, N. Tsverava, L. Lukhumaidze, T. Toriashvili,
I.L. Evtukhovich, Kh. Khubashvili

LIT

A. Khvedelidze

FLNP

A.A. Kustov

Collaboration**Country or International**
Organization**City****Institute or Laboratory**

Belarus

Minsk

NC PHEP BSU
BSU
IP NASB

Bulgaria

Sofia

SU

Czech Republic

Prague

CU

Řež

NRI

France

Saclay

IRFU

Croatia

Zagreb

RBI

Canada

Vancouver

TRIUMF

Georgia

Tbilisi

HEPI-TSU

Germany

Aachen

RWTH

Heidelberg

Univ.

Jülich

FZJ

Cologne

Univ.

Dresden

HZDR

Münster

Univ.

Stuttgart

MPI-MF

Italy

Frascati

INFN LNF

Ferrara

UniFe

Rome

Univ. "La
Sapienza"

Turin

INFN

Japan

Kyoto

Kyoto Univ.

Osaka

Osaka Univ.

Tsukuba

KEK

Netherlands	Delft	TU Delft
Poland	Krakow	NINP PAS
	Otwock-Swierk	NCBJ
Romania	Bucharest	IFIN - HH
	Timișoara	CFATR
Russia	Alexandrov	VNIISIMS
	Gatchina	PNPI
	Moscow	ITEP
		GPI RAS
		MSU
		SINP MSU
		NRC KI
	Moscow, Troitsk	INR RAS
	Sarov	VNIIEF
Switzerland	Zurich	UZH
	Villigen	PSI
USA	Charlottesville, VA	UVa
	Pittsburgh, PA	Pitt
	Tucson, AZ	UA

Improvement of the JINR Phasotron and Design of Cyclotrons for Fundamental and Applied Research

Leaders: M.Yu. Kazarinov
G.A. Karamysheva
Scientific leader: L.M. Onischenko

Participating Countries and International Organizations:

Belgium, China, Poland, Japan, Uzbekistan.

Scientific Programme

Improvement of the JINR Phasotron and beam channels. Design of the cyclotrons for medical purposes. Development of the cyclotron method for high-current beam acceleration.

Expected main results in 2014:

- Completion of the modernization of the automated beam channel control system of JINR Phasotron.
- Development of a proposal of the superconducting cyclotron for the hadron therapy.
- Optimization of key parameters of the FFAG accelerator with proton energy up to 250 MeV based on radial-sector structure of magnetic system.
- Development of a proposal for construction of an H^- -cold steel superconducting cyclotron on energy 12.5 MeV for medical applications.
- Carrying out simulation and experimental works on AIC-144 cyclotron increase of the beam extraction factor. Development of the computer model of the beam transport line to the cabin of the eye melanome therapy.

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Improvement of the JINR Phasotron and beam channels DLNP	M.Yu. Kazarinov N.G. Shakun L.M. Onischenko J.V. Savchenko, A.S. Vorozhtsov, S.B. Vorozhtsov, S.A. Gustov, G.A. Kononenko, N.A. Morozov, I.V. Mirokhin, Yu.A. Polyakov, V.I. Smirnov, E.V. Samsonov, V.M. Romanov, V.A. Utkin, N.S. Tolstoi, V.G. Sazonov	Realization
2. Design and modernization of the cyclotrons for medical purpose	Yu.G. Alenitsky G.A. Karamysheva N.A. Morozov	Technical proposal

DLNP

N.S. Azaryan, A.S. Vorozhtsov, S.V. Gursky,
S.B. Vorozhtsov, S.N. Dolya, O.V. Karamyshev,
R.V. Galkin, D.S. Petrov, O.E. Lepkina, O.V. Lomakina,
S.G. Shirkov, N.L. Zaplatin, G.G. Kazakova, I.N. Kiyan,
S.A. Kostromin, E.V. Samsonov, V.M. Romanov,
V.G. Sazonov, A.F. Chesnov, B.R. Suleimenov

LIT

I.V. Amirkhanov

**3. Development of the cyclotron
method for high-current beam
acceleration**

**L.M. Onischenko
S.B. Vorozhtsov**

Technical proposal

DLNP

Yu.G. Alenitsky, A.S. Vorozhtsov, N.L. Zaplatin, E.V.
Samsonov, V.L. Smirnov, V.M. Romanov

Collaboration

**Country or International
Organization**

City

Institute or Laboratory

Belgium

Louvain-la-Neuve

IBA

China

Lanzhou

IMP CAS

Japan

Chiba

NIRS

Poland

Krakow

NINP PAS

Uzbekistan

Tashkent

INP UAS

Investigations in the Field of Nuclear Physics with Neutrons

Leader:

V.N. Shvetsov

Deputies:

Yu.N. Kopatch

E.V. Lychagin

P.V. Sedyshev

Participating Countries and International Organizations:

Albania, Australia, Austria, Belarus, Belgium, Bulgaria, CERN, China, Czech Republic, Egypt, Finland, France, Georgia, Germany, Hungary, Italy, Japan, Kazakhstan, Latvia, Macedonia, Moldova, Mongolia, Norway, Poland, Republic of Korea, Romania, Russia, Serbia, Slovak Republic, Slovenia, South Africa, Switzerland, Thailand, Ukraine, USA, Vietnam.

Scientific Programme

Experimental and theoretical investigations aimed at studies of fundamental properties of the neutron, symmetry breaking effects in neutron-induced reactions, and fundamental interactions of neutrons with nuclei. Application of neutron physics methods in other fields of science and technology. Development and construction of detectors of neutrons and other ionizing radiation, as well as applied methods in nuclear physics with neutrons. Development of the Intense REsonance Neutron Source (IREN) and of the experimental base at the IREN facility and at the IBR-2 facility.

Expected main results in 2014:

Development of the IREN source:

- Providing the neutron beam time of 1500 hours from IREN for physical experiments.
- Modernization of the radio-frequency system of the first accelerating section.
- Equipping of experimental channels 1, 4, 6 of the IREN facility.
- Putting into operation of the first section of the LUE-200 accelerator with the Toshiba E3730A clystron and the DAWONSYS modulator.
- Development of the project for mounting of the second stage of the LUE-200 accelerator.
- Experimental verification of the neutron yield increase for the IREN operation with a natural uranium target.

Fundamental investigations of nuclear reactions with neutrons:

- Preparation of an experiment to measure T-odd effects in fission at beam N1 of the IBR-2 facility.
- Measurement of neutron cross sections using the detector system "Romashka" at the IREN beam.
- Finishing measurements of the reactions $^{66}\text{Zn}(n, \alpha)^{63}\text{Ni}$, $^{144}\text{Sm}(n, \alpha)^{141}\text{Nd}$ in the energy region 4 – 6.5 MeV at the facilities EG-5 (FLNP JINR) and EG-4.5 (Beijing University). Preparation of the samples ^{91}Zr and ^{144}Nd for subsequent experiments.
- Commissioning of the multi-detector system, consisting of a position sensitive double ionization fission chamber and fast neutron detectors. Performing calibration measurements of the multiplicity and energy spectra of the prompt fission neutrons from the $^{235}\text{U}(n, f)$ reaction.
- Setting up of an experiment to measure ternary spontaneous fission of ^{252}Cf using pixel silicon detectors.

- Measurement of the spin-lattice relaxation for the ^{27}Al and ^{51}V nuclei. Measurement of the neutron nuclear precession for ^{27}Al and ^{51}V as a function of the neutron energy.
- Determination of breakup thresholds of 3-4 Cooper pairs of nucleons for nuclei of the $39 < A < 201$ region on the basis of the available data on the two-quantum cascade intensities. Continuation of gathering of these data for other nuclei including actinides. Development of a universal modern practical model of cascade gamma decay of a neutron resonance for nuclei of any types.
- Measurements of spectral characteristics of neutron fields formed in a massive target of natural uranium "QUINTA" irradiated by deuterons with energies of 1-8 GeV, as well as of total multiplicity and neutron leakage. Preparation of a quasi-infinite target "BURAN" to measurements on beam F-3 of the Nuclotron.

Investigation of the fundamental properties of the neutron, UCN physics:

- Test experiment on the observation of the Goos-Haenchen effect in neutron optics
- Determination of instrumental anisotropy of the AURA installation for (n,e)-scattering experiments.
- Experimental determination of the flux density of neutrons with a wavelength of 10 Å accumulated in a cavity of solid methane. The measurement is carried out within the framework of the project on the development of a high-density UCN source on extracted thermal neutron beams.
- Measurement of the hydrogen flux, emitted by the wall of the vacuum chamber in the n-n scattering experiment, as a function of the pulse power of the JAGUAR reactor.

Applied research:

- Completion of the analysis to search for cosmic dust in glacial silt by neutron spectroscopy technique on the IREN facility. Continuation of work on the analysis of boron content in new composite materials.
- Study of concentration depth profiles for various elements in the near-surface layers of building materials.
- Mathematical and physical modeling and calibration of the DAN equipment complex intended for search of water ice from aboard the CURIOSITY Mars rover. Mathematical and physical modeling and calibration of the second flight hardware device MGNS for the European Mercury mission BEPPY-COLOMBO.
- Biomonitoring of atmospheric deposition of trace elements in some selected areas of Russia, Europe, Asia and Africa. Continuation of investigations using NAA in ecology, medicine, biotechnology and development of novel materials.

List of activities:

Activity or experiment	Leaders	Status
Laboratory or other Division of JINR	Main researchers	
1. Development of the IREN facility	V.N. Shvetsov	Upgrade
FLNP	V.G. Pjataev, G.N. Pogodaev, V.D. Denisov + 15 engineers	
VBLHEP A.P. Sumbaev	V.V. Kobets, V.F. Minashkin, V.G. Shabratov, V.N. Zamrij, A.N. Skrypnik, J. Betscher	
DLNP	I.N. Meshkov	

2. Fundamental investigations of nuclear reactions with neutrons

Yu.N. Kopatch

Upgrade
Data taking
Data analysis

FLNP

G.S. Ahmedov, N.V. Bazjazjima, S.B. Borzakov, Ju.M. Gledenov, N.A. Gundorin, Sh.S. Zeynalov, A.P. Kobzev, D. Mahajdik, Zh.V. Mezentseva, V.V. Novitsky, I.A. Oprea, K.D. Oprea, L.B. Pikel'ner, I.N. Ruskov, P.V. Sedyshev, M.V. Sedysheva, V.R. Skoj, A.M. Suhovoj, S.A. Telezhnikov, V.A. Hitrov, M. Tsulaja, Ts.Ts. Panteleev + 13 engineers

LIT

O.V. Zeynalova

DLNP

V.A. Stolupin

3. Investigation of the fundamental properties of the neutron, UCN physics

E.V. Lychagin

Upgrade
Data taking
Data analysis

FLNP

G.G. Bunatyan, V.K. Ignatovich, G.V. Kulin, D. Kustov, L.V. Mitsyna, A.Yu. Muzychka, Yu.N. Pokotilovskij, A.B. Popov, A.V. Strelkov, A.I. Frank, W.I. Furman, E.I. Sharapov + 2 engineers

4. Applied research

P.V. Sedyshev

Upgrade
Data taking
Data analysis

FLNP

M.V. Frontasyeva, Yu.V. Alekseenok, K.N. Vergel, Z.I. Gorjajnova, A.Ju. Dmitriev, I.I. Zinikovskaja, O.F.Culikov, B. Njamsuren, G.S. Ahmedov, N.V. Bazjazjima, S.B. Borzakov, Ju.M. Gledenov, N.A. Gundorin, Sh.S. Zeynalov, A.P. Kobzev, Yu.N. Kopatch, D. Mahajdik, Zh.V. Mezentseva, V.V. Novitsky, I.A. Oprea, K.D. Oprea, L.B. Pikel'ner, I.N. Ruskov, M.V. Sedysheva, V.R. Skoj, A.M. Suhovoj, S.A. Telezhnikov, V.A. Hitrov, M. Tsulaja + 10 engineers

Collaboration

Country or International Organization

City

Institute or Laboratory

Albania

Tirana

UT

Australia

Melbourne

Univ.

Austria

Vienna

IAEA

Innsbruck

Univ.

Belarus

Minsk

INP BSU

JIPNR-Sosny

NASB

RI PCP BSU

Belgium

Geel

IRMM

Brussels

ULB

Bulgaria

Sofia

INRNE BAS

	Plovdiv	PU
		UFT
CERN	Geneva	CERN
China	Beijing	IHEP CAS
Czech Republic	Prague	CEI
		CTU
Egypt	Cairo	EAEA
Finland	Jyväskylä	UJ
France	Cadarache	CC CEA
	Grenoble	ILL
		LPSC
	Saclay	LLB
	Strasbourg	IPHC
Georgia	Tbilisi	AIP
Germany	Darmstadt	GSI
	Dresden	HZDR
	Mainz	JGU
	Munich	TUM
	Tübingen	Univ.
Greece	Athens	AUA
Hungary	Gödölö	SZIU
Italy	Rome	ENEA
Japan	Kyoto	KSU
	Tsukuba	KEK
Kazakhstan	Ust-Kamenogorsk	TRCE
Latvia	Riga	IPUL
Macedonia	Skopje	UKiM
Moldova	Chişinău	IMB ASM
Mongolia	Ulaanbaatar	CGL
		NUM
Norway	Trondheim	NTNU
Poland	Gdansk	GUT
	Krakow	NINP PAS
	Lodz	UL
	Lublin	MCSU
	Opole	OU
	Otwock-Swierk	NCBJ
	Poznan	AMU
Republic of Korea	Pohang	PAL
	Taejon	KAERI
Romania	Bucharest	IFIN-HH
		INCDIE ICPE-CA
		ISS
		UB
	Baia Mare	NUBM

Russia	Constanța	NIMRD
		UOC
	Galați	UG
	Iași	UAIC
	Oradea	UO
	Pitești	SCN
	Râmnicu Vâlcea	ICSI
	Târgoviște	UVT
	Moscow	Atomenergomach
		GIN RAS
		IKI RAS
		ITEP
		NNRU “MEPhI”
		MSU
		NRC KI
	Moscow, Troitsk	SINP MSU
	Borok	INR RAS
	Chernogolovka	IBIW RAS
	Dubna	IPTM RAS
	Gatchina	“Dubna” Univ.
	Irkutsk	PNPI
	Ivanovo	LI SB RAS
	Izhevsk	ISUCT
	Magnitogorsk	UdSU
	Obninsk	MagTU
	Sarov	IPPE
	Snezhinsk	VNIIEF
	St. Petersburg	VNIITF
		FIP
		Hermitage
Serbia		KRI
	Tomsk	NPI TPU
	Tula	TSPU
	Voronezh	VSU
	Yekaterinburg	UrFU
	Belgrade	IPB
		Univ.
	Novi Sad	UNS
	Bratislava	IP SAS
		IEE SAS
Slovak Republic		ILE SAS
		CU
Slovenia	Ljubljana	GeoSS
South Africa	Pretoria	Necsa
		Unisa

Switzerland	Villigen	PSI
Thailand	Hat Yai	PSU
Turkey	Çanakkale	ÇOMU
Ukraine	Kiev	KINR NASU
		NUK
	Donetsk	DonIPE NASU
	Sevastopol	IBSS NASU
	Sumy	IAP NASU
	Uzhgorod	IEP
	Kharkov	ISM NASU
		KFTI NASU
United Kingdom	London	NHM
Vietnam	Hanoi	VNU
USA	Durham, NC	Duke
	Gettysburg, PA	GC
	Kingston, RI	URI
	Los Alamos, NM	LANL
	Oak Ridge, TN	ORNL

Condensed
Matter Physics,
Radiation
and Radiobiological
Research
(04)

Investigations of Nanosystems and Novel Materials by Neutron Scattering Methods

Leaders:

V.L. Aksenov
A.M. Balagurov
D.P. Kozlenko

Participating Countries and International Organizations:

Azerbaijan, Belarus, Bulgaria, Czech Republic, Egypt, France, Germany, Hungary, Japan, Latvia, Moldova, Mongolia, Norway, Poland, Romania, Russia, Serbia, Slovak Republic, South Africa, Switzerland, Taiwan, Ukraine, United Kingdom, Uzbekistan.

Scientific Programme

Investigations of structure, dynamics and microscopic properties of nanosystems and novel materials, interesting for fundamental research in the fields of condensed matter physics, chemistry, materials science, geophysics, and important for development of nanotechnologies in the fields of electronics, pharmacology, medicine, by neutron scattering and complimentary methods.

Expected main results in 2014:

Realization of the scientific program:

- Determination of the crystal and magnetic structure of functional and nanostructured materials demonstrating interesting physical phenomena and promising for technological applications in a wide range of thermodynamic parameters, clarification of the role of structural parameters and clusterization in the formation of physical properties.
- Analysis of the structural mechanisms of magnetoelectric phenomena in oxide multiferroics.
- Determination of magnetization profiles of layered magnetic nanostructures in stationary and oscillating magnetic fields.
- Determination of structural characteristics of biocompatible magnetic fluids.
- Structural characterization and analysis of clusterization regimes in liquid dispersions of nanodiamonds and fullerenes.
- Experimental and theoretical analysis of crystal structure and vibrational spectra of molecular complexes, including ion-inclusive materials, complexes with electric charge transfer, structural and dynamical parameters of hydrogen bonds in biologically active materials.
- Determination of structural and functional characteristics of biological nanosystems: proteins, DNA, RNA macromolecules and their complexes.
- Determination of nanostructure and diffusion properties of model lipid nanosystems for understanding drug delivery mechanisms through the upper layer of the skin.
- Determination of structural and dynamical characteristics of reactor materials including fuel compositions at high temperatures up to 2000 K.
- Determination of structural instability conditions of rock materials under the action of high pressures and temperatures, especially during polymorphic phase transformations, for the development of earthquake mechanism concept.

- Development of the model of solid polycrystalline materials for the prediction of elastic, strength and thermal properties, taking into account the effects of texture, inclusions, pores and microcracks. Quantitative description of crystallographic texture.
- Determination of residual stresses in construction materials for nuclear industry, novel ferritic-martensitic steels, welds of Charpy samples of nuclear reactors, novel prospective materials.
- Determination of local structure parameters of complex metallic clusters in oxide matrices.

Realization of the instrument development program for the IBR-2 spectrometers:

- Creation of the elements of the detector system and the set of high pressure cells of the DN-6 diffractometer.
- Creation of the polarizing system and sample units of the multifunctional reflectometer GRAINS.
- Modernization of the instruments SKAT/Epsilon, YuMO, HRFD, FSD, Reflex, NERA-PR, DIN-2PI, aimed at improving technical parameters – increase of neutron counting rate, reduction of background, improvement of experimental conditions.
- Modernization of the REMUR reflectometer – development of 2D polarization analysis.
- Reconstruction of the high intensity diffractometer DN-2 into a diffractometer for real-time measurements.
- Development and testing of neutron scattering techniques for studies of materials and nanosystems including radiography, spin-echo, standing waves, neutron magnetic resonance.

List of projects:

Project	Leader	Priority (period of realization)
1. RTD Diffractometer	A.M. Balagurov	1 (2012 – 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1. Structure and Properties of Novel Crystalline and Nanostructured Materials FLNP	A.M. Balagurov D.P. Kozlenko A.I. Beskrovnyi, B.N. Savenko, E.B. Askerov, I.A. Bobrikov, N.O. Golosova, Zh. Gombo, S.G. Dzhabarov, S.E. Kichanov, M.L. Craus, N.V. Loshak, E.V. Lukin, A.I. Madadzada, G.M. Mironova, D.T. Neov, A.V. Rutkauskas, Ya.I. Sagan', S.A. Samoilenko, E.A. Sivachenko, S.G. Sheverev, V.A. Turchenko, U. Enhnaran	Data taking
2. Magnetic colloid systems in bulk and at interfaces FLNP	M.V. Avdeev V.I. Petrenko, A.V. Nagornyi, A.V. Tomchuk, Zh. Narmandah, I.V. Gapon	Data taking
3. Magnetism of layered nanostructures FLNP	Yu.V. Nikitenko S.V. Kozhevnikov, E.B. Dokukin	Data taking

4. Structure of carbon nanomaterials FLNP	V.L. Aksenov	Data taking
	T.V. Tropin, O.A. Kizima	
5. Atomic dynamics of nanosystems and materials IPPE (Obninsk)	A.V. Puchkov (IPPE, Obninsk)	Data taking
	I.V. Kalinin, V.M. Morozov, V.V. Savostin, A.G. Novikov, V.A. Semenov	
6. Molecular dynamics of biologically active materials, polymorphic phases of liquid crystals and nanomaterials for hydrogen energetics FLNP	D.M. Chudoba	Data taking
	I. Natkaniec, A. Pawlukojs, S. Zalewski, I.L. Sashin, L.R. Hetmanczyk, J. Hetmanczyk, K.M. Luczynska, M. Kosych, A.Filarowski	
7. Computer modeling of physical and chemical properties of novel crystalline and nanostructured materials FLNP	A. Pawlukojs	Data taking
	D.M. Chudoba, V.Yu. Kazimirov, K.S. Druzicki, K.M. Luczynska	
8. Structural and functional characteristics of biological, colloid and polymer nanodispersed materials FLNP	A.I. Kuklin	Data taking
	M. Balasoiu, A.Kh. Islamov, T.N. Murugova, A.V. Rogachev, A. Raewska, Yu.E. Gorshkova, O. Ivan'kov, R.V. Erhan, D.V. Solovyev, Yu.S. Kovalev	
9. Lipid nanostructures FLNP	M.A. Kiselev	Data taking
	E.V. Ermakova, N.Y. Ryabova	
10. Texture, composition and properties of Earth minerals and rocks FLNP	T.I. Ivankina	Data taking
	Ch. Scheffzuek, V.V. Sikolenko, R.N. Vasin, Z. Matthies, D.I. Nikolaev, T.A. Lychagina, A.A. Kruglov, D.M. Levin	
11. Residual stresses in bulk materials and factory-made goods FLNP	V.V. Sumin	Data taking
	G.D. Bokuchava, Yu.V. Taran, I.V. Papushkin, D. Aznabaev, B. Muhametuly, A.V. Tamonov	
12. Development of neutron methods of investigations of structure and dynamics of nanosystems and materials	V.I. Bodnarchuk Yu.V. Nikitenko D.P. Kozlenko	Data taking

FLNP	S.V. Kozhevnikov, S.P. Yaradaikin, S.E. Kichanov E.V. Lukin, A.B. Rubtsov, A.V. Rutkauskas	
13. Development of the complex of spectrometers of the IBR-2 facility	A.M. Balagurov D.P. Kozlenko	Realization
FLNP	M.V. Avdeev, A.I. Beskrovnyy, A.I. Kuklin, V.I. Bodnarchuk, I. Natkaniec, D.M. Chudoba, Yu.V. Nikitenko, A.V. Petrenko, A.V. Puchkov, B.N. Savenko, V.V. Sikolenko, V.G. Simkin, V.V. Sumin, V.I. Sukhanov, Ch. Scheffzuek, B. Altangerel	
14. Creation of the diffractometer for studies of transient processes in real time at the IBR-2 facility (RTD diffractometer project)	A.M. Balagurov	Realization
FLNP	A.I. Beskrovnyi, V.V. Zhuravlev, G.M. Mironova	
15. X-ray spectroscopy	S.I. Tyutyunnikov	Data taking Realization
VBLHEP	V.N. Shalyapin, V.V. Efimov, E.A. Efimova	

Collaboration

Country or International Organization	City	Institute or Laboratory
Argentina	Buenos Aires	CNEA
Azerbaijan	Baku	IP ANAS
Belarus	Minsk	IAP NASB BSU INP BSU NC PHEP BSU SPMRC NASB RI PCP BSU
Bulgaria	Grodno Sofia	SUG IMS BAS IE BAS INRNE BAS ISSP BAS
Czech Republic	Prague	CTU IG ASCR IMC ASCR IP ASCR
Egypt	Řež Cairo	NPI ASCR CMRDI NRC TIMS
	Giza	NILES CU

France	Saclay	LLB
Germany	Berlin	HZB
	Bayreuth	Univ.
	Bochum	RUB
	Darmstadt	TU Darmstadt
	Dortmund	TU Dortmund
	Göttingen	Univ.
	Geesthacht	GKSS
	Halle	MLU
	Hamburg	DESY
	Freiberg	TUBAF
	Jülich	FZJ
	Karlsruhe	KIT
	Kiel	CAU
		IFM-GEOMAR
	Leipzig	UoC
	Rostock	Univ.
	Stuttgart	MPI-FKF
Hungary	Budapest	Wigner RCP
	Szeged	US
Japan	Nagano	Shinshu Univ.
Latvia	Riga	ISSP UL
		IPE
Moldova	Chişinău	IC ASM
Mongolia	Ulaanbaatar	IPT MAS
		MUST
Norway	Trondheim	NGU
Poland	Warsaw	INCT
	Krakow	JU
		NINP PAS
	Lublin	MCSU
	Poznan	AMU
	Siedlce	UNSH
	Szczecin	WPUT
	Wroclaw	WUT
		UW
Romania	Bucharest	IFIN-HH
		INCDIE ICPE-CA
		NIMP
		ISS
		UB
		UPB
		UTM
	Craiova	UC
	Cluj-Napoca	INCDTIM

	Iași	UBB NIRDTP UAI UAIC
	Pitești	SCN
	Timișoara	LMF CFATR UVT
Russia	Moscow	GC RAS IBMC RAMS IC RAS IGEM RAS IGIC RAS IMET RAS INMI RAS IPCE RAS ITEP IPE RAS ISPM RAS NNRU “MEPhI” MIET MITHT MSU MUCTR NIKIET NRC KI SINP MSU VNIINM HPPI RAS ISAN INR RAS NRU BelSU MIPT ISSP RAS PNPI KNRTU UNN IPM RAS IPPE IG KRS RAS GIDROPRESS RIP SFU IPTI RAS SSPA NPI TPU TSU
	Moscow, Troitsk	
	Belgorod Dolgoprudny Chernogolovka Gatchina Kazan Nizhny Novgorod Obninsk Petrozavodsk Podolsk Rostov-on-Don St. Petersburg Sterlitamak Tomsk Tula	

	Yekaterinburg	IMP UB RAS
		UrFU
Serbia	Novi Sad	UNS
Slovak Republic	Bratislava	CU
	Košice	IEP SAS
South Africa	Pretoria	Necsa
Switzerland	Villigen	PSI
	Zurich	ETH
Taiwan	Hsinchu	NSRRC
Ukraine	Kiev	IPMS NASU
		NUK
		ISC NASU
	Donetsk	DonIPE NASU
	Kharkov	IERT NASU
		KFTI NASU
United Kingdom	Didcot	RAL
Uzbekistan	Tashkent	INP UAS

Development of the IBR-2 Facility with a Complex of Cryogenic Neutron Moderators

Leaders:

A.V. Belushkin
A.V. Vinogradov

Participating Countries and International Organizations:

Argentina, Azerbaijan, Belarus, Japan, Poland, Romania, Russia, Spain, United Kingdom, USA.

Scientific Programme

The theme main task is to increase the efficiency of use of the IBR-2 facility at realization of the program of experimental investigations, maintenance of operational reliability and safety of the reactor, creation of a complex of cryogenic neutron moderators.

Expected main results in 2014:

- Maintenance of the IBR-2 reactor operation for physical investigations.
- Obtaining of a Rostekhnadzor license for operation of the IBR-2 facility for 10 years starting in 2014.
- Development of a reserve movable reflector MR-3R
- Construction of a test stand of a cryogenic moderator CM 201 with extension of work in 2015.
- Step-by-step replacement and upgrading of the technological and electrical equipment in accordance with the Rostekhnadzor license requirements.

List of projects:

Project	Leader	Priority (period of realization)
1. Construction of a Complex of Cryogenic Moderators at the IBR-2 Facility	A.A. Belyakov	1 (2014 – 2016)

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1. Regular operation of the IBR-2 facility FLNP	A.V. Dolgikh A.V. Vinogradov A.A. Belykov, S.A. Tsarenkov, V.G. Ermilov, S.V. Rudenko, Yu.N. Pepelyshev, V.A. Trepalin + 30 engineers, + 50 workers	Realization
2. Maintenance of the program of physical investigations FLNP	V.D. Ananiev A.V. Vinogradov A.V. Dolgikh A.A. Belyakov, Yu.N. Pepelyshev, V.A. Trepalin, S.V. Rudenko + 30 engineers, + 50 workers	Realization

3. Construction of a stand of the cryogenic moderator CM201. Development of a project, production and installation of a new cryogenic moderator CM201 on its regular place (with an extension of work to 2017). Improvement and completion of the project of the cryogenic moderator CM203 with due regard to the results obtained at the physical start-up of CM202. Purchase and installation of a new refrigerator on its regular place.	A.A. Belyakov K.A. Mukhin	Realization
	FLNP V.D. Ananiev, S.A. Kulikov, E.P. Shabalin + 15 engineers, + 15 workers	
4. Development and manufacturing of a reserve movable reflector MR-3R.	A.V. Vinogradov A.V. Dolgikh	Realization
	LRB A.A. Belyakov, V.D. Ananiev + 5 engineers, + 5 workers	
5. Step-by-step replacement and upgrade of the basic technological and electrical equipment	A.V. Vinogradov A.V. Dolgikh	Realization
	LRB A.A. Belyakov, A.V. Trepalin, + 30 engineers, + 50 workers	

Collaboration

Country or International Organization	City	Institute or Laboratory
Argentina	Buenos Aires	CNEA
Azerbaijan	Baku	IRP ANAS
Belarus	Minsk	JIPNR-Sosny NASB
Czech Republic	Řež Plzen	UJV Skoda JS s.a.
Japan	Sapporo Osaka	Hokkaido Univ. ISIR
Mongolia	Ulaanbaatar	MUST
Poland	Krakow	AGH
Romania	Bucharest	IFIN-HH
Russia	Moscow	NIKIET Geliymash INEUM SYSTEMATOM SSDI ENES
Spain	Valencia	Profimontazhservis UPV

Ukraine
United Kingdom
USA

Kiev
Didcot
Indianapolis, IN

KINR NASU
RAL
IUPUI

Novel Development and Creation of Equipment for the Spectrometer Complex of the IBR-2 Facility

Leaders:

S.A. Kulikov
V.I. Prikhodko

Participating Countries and International Organizations:

Bulgaria, Czech Republic, France, Germany, Hungary, Romania, Russia, Slovak Republic.

Scientific Programme

Calculation, research and development of the moderator complex and elements of spectrometers of the IBR-2 facility; development of advanced neutron detectors, a new generation of data acquisition systems, computing infrastructure, cryostats and cryomagnetic systems, beam-forming and sample environment systems for condensed matter investigations in accordance with the plan for strategic development of JINR and the development programme for spectrometers of the IBR-2 spectrometer complex.

Expected main results in 2014:

- Continuation of research of a new complex of moderators for IBR-2 and adaptation of technological systems of the cryogenic moderator for a complex of moderators in the direction of beams 4, 5, 6.
- Creation of infrastructure on beams 13-14 for testing spectrometer equipment (installation and testing of neutron guide vacuum systems, installation and adjustment of Fourier choppers).
- Development of the software package VITESS and its application for simulation of spectrometers. Application of the Reverse Monte Carlo method (RMC_{POT} program) for processing data from neutron diffraction experiments on amorphous structures.
- Completion of the development, manufacturing and commissioning of three He3-counter-based detector systems for a new real-time diffractometer (RTD).
- Modernization and equipping of some actuating mechanisms of the YuMO and REMUR spectrometers with sensors. Putting into operation of control systems for the spectrometers on IBR-2 beams 6b and 12.
- Commissioning of a horizontal cryostat on the DN-6 spectrometer. Development of a shaft cryostat ($\varnothing \leq 30\text{mm}$, temperature range of 6-290K) with a GM cold head SRP-101D for the RTD diffractometer.
- Manufacturing and testing of a monitor 2D PSD for obtaining thermal neutron beam profiles on the FLNP facilities; carrying out of measurements. Manufacturing of 3d section of the detector system ASTRA (FSD). Modernization of a 2D detector of the REMUR spectrometer.
- Completion of modernization of data acquisition and accumulation systems on the operating IBR-2 spectrometers (new generation of electronics and software).
- Development and extension of the software package Sonix+ in accordance with the changes in the structure of equipment of the operating IBR-2 spectrometers, as well as maintenance of the software package and its implementation on new spectrometers.
- Development of the FLNP information infrastructure in accordance with the strategy of development of the JINR computer network. Purchase, installation and putting into service of a second file-server for FLNP LAN.

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1. Development and research of a new complex of moderators at the IBR-2 facility. Commissioning of the complex of moderators at the IBR-2 facility on channels 7, 8, 10, 11 and adjustment of all operating systems of the cryogenic moderator complex FLNP	S.A. Kulikov E.P. Shabalin M.V. Bulavin + 5 engineers, + 7 workers	Realization
2. Complex calculations of neutron spectrometers (from the moderators to the sample position) FLNP	S.A. Kulikov E.P. Shabalin, S.A. Manoshin + 2 engineers	Realization
3. Completion of reconstruction of neutron guides on channel 7 at the IBR-2 facility . Modernization, adjustment and testing of equipment for the EPSILON, SKAT and NERA-PR spectrometers; putting into operation, start of experiments. Joint JINR-BMBF project FLNP	A.V. Belushkin A. Schilling V.V. Zhuravlev, V.I. Prikhodko, A.P. Sirotin, A.N. Chernikov + 4 engineers, K. Scheffzuek + 2 engineers, A.A. Bogdzel + 3 engineers	Realization
4. Creation of infrastructure for testing spectrometer equipment (scintillation and gas-filled neutron detectors, cryostats, etc.) on beams 13-14 at IBR-2 facility and carrying out the instrument development work, in particular, on high-resolution Fourier diffractometry FLNP	V.N. Shvetsov S.A. Kulikov A.M. Balagurov G.D. Bokuchava, A.N. Chernikov, V.V. Zhuravlev + 5 engineers, A.V. Churakov + 3 engineers	Realization

5. Commissioning of gas-filled position-sensitive detector systems at the IBR-2 spectrometers (REFLEX, HRFD, YuMO, GRAINS, DN-2, etc.) and at the cold moderator. Completion of development and commissioning of the ring-shaped multi-section detector at the DN-6 spectrometer. Completing the ASTRA scintillation detector with modules for the FSD diffractometer	A.V. Belushkin S.A. Kulikov	Realization
FLNP	V.N. Shvetsov, D.P. Kozlenko + 5 engineers, G.D. Bokuchava + 2 engineers, A.V. Churakov + 3 engineers, A.A. Bogdzel + 4 engineers, V.V. Zhuravlev, V.V. Kruglov, A.S. Kirilov + 1 engineer	
6. Development of control systems of spectrometer equipment and sample environment systems at IBR-2 facility, creation of cryostats	A.P. Sirotin	Realization
FLNP	V.V. Zhuravlev, A.N. Chernikov + 5 engineers	
7. Modernization of data acquisition systems of the IBR-2 spectrometer complex. Development, enhancement and support of the Sonix+ software package and its introduction at the IBR-2 spectrometers. Development of the FLNP information-computing infrastructure in accordance with the strategy of development of the JINR computer network	V.I. Prikhodko	Realization
FLNP	A.A. Bogdzel + 2 engineers, F.V. Levtschanovski + 2 engineers, A.S. Kirilov + 3 engineers, G.A. Sukhomlinov + 2 engineers	
LIT	V.V. Korenkov + 2 engineers.	

Collaboration

Country or International Organization	City	Institute or Laboratory
Bulgaria	Sofia	INRNE BAS
Czech Republic	Řež	NPI ASCR
France	Grenoble	ILL
	Saclay	LLB
Germany	Berlin	HZB
	Heidelberg	Univ.
	Magdeburg	OVGU
	Munich	TUM

	Karlsruhe	KIT
	Zeuthen	DESY
	Jülich	FZJ
Hungary	Budapest	Wigner RCP
Romania	Bucharest	INCDIE ICPE-CA
		IFIN-HH
	Târgoviște	UVT
Russia	Moscow	NNRU “MEPhI”
		NRC KI
	Moscow, Troitsk	INR RAS
	Gatchina	PNPI
	Yekaterinburg	IMP UB RAS
	Nizhny Novgorod	IPM RAS
	Obninsk	Branch KIPC
Slovak Republic	Bratislava	IMS SAS
Ukraine	L’viv	LPNU

Radiation Effects and Physical Basis of Nanotechnology, Radioanalytical and Radioisotope Investigations at the FLNR Accelerators

Leaders:

S.N. Dmitriev
P.Yu. Apel

Participating Countries and International Organizations:

Belarus, Bulgaria, China, Czech Republic, Egypt, Germany, Hungary, Kazakhstan, Moldova, Mongolia, Poland, Romania, Russia, Serbia, Slovak Republic, South Africa, Spain, Ukraine, United Kingdom, USA, Vietnam.

Scientific Programme

Study of the effects produced by heavy ions in matter for potential applications of ion beams in nanoscience and nanotechnology. Works related to life sciences: production of ultrapure isotopes and study of properties of radionuclides of practical importance. Upgrade of the FLNR accelerator complex to create the capability of producing medical isotopes and developing methods of material modification.

Expected main results in 2014:

- Transmission electron microscopy studies of radiation damage morphology in tracks of high-energy heavy ions in Al_2O_3 .
- Study of nuclear chemical processes in metals in gaseous atmosphere of H_2 and D_2 under gamma-quanta irradiation.
- Study of differential and synergistic effects of elastic and inelastic energy losses of high-energy xenon ions on the development of hydrogen pores in silicium.
- Development of single- and multiple-ion irradiation procedure aimed at the fabrication of one-pore and oligo-pore asymmetric track-etched membranes.
- Collection of data on the properties of asymmetric track-etched membranes with the inversion of pore surface charge.
- Development of composite metal/polymer membranes with asymmetric conductivity.
- Development of new methods of separation and concentration of radioactive isotopes - ^{99}Mo (^{99}Tc), ^{97}Ru , $^{117\text{m}}\text{Sn}$, ^{186}Re , ^{188}Re , ^{225}Ac , ^{237}U , ^{236}Pu , ^{236}Np for the use in nuclear medicine and environmental research.

List of activities:

Activity or experiment	Leaders	Status
Laboratory or other Division of JINR	Main researchers	
1. Investigations of radiation damages in solids and formation of nanostructures	V.A. Skuratov P.Yu. Apel	Data taking
FLNR	V.A. Skuratov, P.Yu. Apel, A.Yu. Didyk, V.K. Semina, O.L. Orelovich, V.V. Shirkova, A.N. Nechaev, I.V. Blonskaja, L.I. Kravets, O.M. Ivanov, V.A. Shchegolev	
LIT	I.V. Amirhanov, I.V. Puzynin, V.N. Robuk, E.G. Nikonov	

FLNP	A.I. Kuklin	
2. Investigation of materials with low energy ions using ECR ion source	V.F. Reutov	Preparation
FLNR	V.F. Reutov, A.S. Sokhatsky	
3. Production of ultra-pure isotopes	S.N.Dmitriev	Data taking
FLNR	O.D. Maslov, G.Ya. Starodub, A.V. Sabelnikov, Yu.V. Albin, G.A. Bozhikov, G.K. Vostokin, M.V. Gustova, T.P. Drobina, V.A. Shchegolev	
4. Radioanalytical studies	O.D. Maslov	Data taking
FLNR	O.D. Maslov, A.V. Sabelnikov, M.V. Gustova, T.P. Drobina	
5. Design of accelerator complexes for nuclear medicine and radiation physics	S.N. Dmitriev A.A. Chumbalov	Preparation Manufacturing
FLNR	B.N. Gikal, I.V. Kolesov, A.A. Chumbalov	
DLNP	A.G. Molokanov	

Collaboration

Country or International Organization	City	Institute or Laboratory
Belarus	Minsk	BSU NC PHEP BSU RIAPP BSU
	Gomel	GSU GB NASB GEI
Bulgaria	Plovdiv	PU
China	Beijing	Beijing Fert Co
Czech Republic	Řež	NPI ASCR
Egypt	Cairo	TIMS
Germany	Darmstadt	GSI
	Quedlinburg	IST MiCryon Technik
Hungary	Budapest	ELTE
Kazakhstan	Almaty	INP NNC RK IPT
Moldova	Chişinău	IAP ASM
Mongolia	Ulaanbaatar	NUM
Poland	Warsaw	INCT ITR

Russia	Lublin	MCSU
	Torun	NCU
	Moscow	IC RAS
		MATI
		MIEM
		LPI RAS
		GPI RAS
		Technomedexport
		ISPM RAS
		MUCTR
		SINP MSU
	Moscow, Troitsk	ISAN
	Dubna	Trackpore
		Technology
		IINC
	Lytkarino	RISI
	Novosibirsk	ISP SB RAS
	St. Petersburg	IPTI RAS
	Saratov	SSMU
	Belgrade	INS “VINČA”
Serbia		INFLPR
Romania	Bucharest	BIONT
Slovak Republic	Bratislava	CU
		IEE SAS
South Africa	Port Elizabeth	NMMU
Spain	Madrid	IA
	Valencia	UV
Ukraine	Kharkov	IERT NASU
	Simferopol	SIMPEX
United Kingdom	London	Middlesex Univ.
USA	Ann Arbor, MI	U-M
	Irvine, CA	UCI
	Oak Ridge, TN	ORNL
Vietnam	Hanoi	IP VAST

Research on the Biological Effect of Heavy Charged Particles with Different Energies

Leaders:

E.A. Krasavin
G.N. Timoshenko

Participating Countries and International Organizations:

Armenia, Belarus, Bulgaria, Czech Republic, Egypt, Italy, Japan, Moldova, Mongolia, Romania, Russia, Slovak Republic.

Scientific Programme

Theoretical and experimental research on the biological effect of heavy charged particles with different energies at JINR's basic facilities.

The research and development will include:

- Research on the effect of accelerated heavy ions of different energies on genetic structures.
- Research on the interaction between the main cataractogenic factors (ionizing radiation, ultraviolet radiation, and age) during lens opacity formation.
- Research on the effect of different doses of accelerated charged particles on the retina and central nervous system of experimental animals.
- Mathematical modeling of induced mutagenesis in bacterial and eukaryotic cells.
- Molecular dynamics modeling of spatial structures of complex protein aggregates participating in DNA repair in bacterial and higher eukaryotic cells.
- Working out radiation protection measures for new nuclear physics facilities, evaluation of their radiation environment, and development of radiation safety systems for them.

As the results:

- Acquisition of new data on the regularities and mechanisms of the initiation of molecular disorders in the DNA structure; DNA damage repair; and radiation-induced apoptosis in human cells under radiations with different linear energy transfer (LET).
- Decoding of the mechanisms underlying cell hypersensitivity and hyperresistance to low doses of ionizing radiation.
- Acquisition of comparative data on the regularities of the induction of gene and structural mutations in mammalian and yeast cells by radiations with different LET.
- Drawing up recommendations on the threshold doses of heavy charged particles able to damage the eye lens and retina. Development of the preventive measures against cataract in persons occupationally exposed to irradiation with heavy charged particles.
- Research on the character of the heavy charged particle-induced damage of central nervous system (CNS) cells and regularities of their death. Identification of the heavy charged particle-induced functional disorders in the CNS.
- Molecular dynamics modeling of radiation-induced conformational changes in biological structures.
- Mathematical modeling of the mutagenic effect of ionizing radiations with different LET on bacterial and mammalian cells.

- Calculation of the radiation shielding of new nuclear physics facilities; evaluation of the radiation environment and development of radiation safety systems.
- Estimation of the galactic radiation dose received by cosmonauts in different flight scenarios for working out the criteria and grounds of the radiation safety standards for interplanetary flights.
- Acquisition of new data on the performances of nanotechnology-based thermoluminescent detectors.

Expected main results in 2014:

- Continuation of research on the regularities of DNA damage induction and repair in human and mammalian cells in the presence of modifiers of DNA replication and repair synthesis.
- Continuation of research on the mechanisms of radiation-induced apoptosis and different ways of DNA damage repair under ionizing radiations of different qualities.
- Continuation of research on the regularities of the formation and repair of DNA double-strand breaks and clustered damage using the method of DNA foci.
- Continuation of research on the induction of gene and structural mutations in yeast cells by ionizing radiations of different LET.
- Completion of the experiments on the induction of gene and structural mutations in yeast cells by ultraviolet and gamma radiation.
- Performing a comparative analysis of the induction of the HPRT gene structural mutations and morphological changes in mutant subclones of mammalian cells by radiations of different LET.
- Continuation of research on the mechanisms of the action of low doses of radiations of different LET with the use of modifiers of the intracellular cytoprotective systems.
- Continuation of the acquisition of data on the regularities in the functional disorders in the rodent retina induced by radiations of different qualities and mutagens.
- Carrying out a study of the structural characteristics of the photoreceptor membrane containing the visual pigment rhodopsin – the receptor associated with the G-proteins.
- Development of a model approach to the description of the functional disorders in the rodent retina induced by ionizing radiations and mutagens.
- Performing a research on the specifics of the biological effect of protons of different energies on the mouse organism.
- Carrying out an evaluation of the exposure of the central nervous system to the galactic and solar cosmic rays during a two-year interplanetary flight performed in different periods of the solar cycle.
- Continuation of the development of mathematical models of the functional activity of neurons under exposure to radiations of different LET.
- Development of a conceptual model of the diminution of an operator's functioning reliability associated with disorders in higher nervous activity.
- Continuation of the development of mathematical models of DNA double-strand break induction and repair in human cells.
- Conduction of radiobiological experiments at the Nuclotron (LHEP), U-400M (FLNR), and the medical beam of the Phasotron (DLNP).
- Carrying out the molecular dynamics modeling of the structural and functional properties of the DNA photolyase protein, G-proteins, and the protein rhodopsin surrounded by amino acid residues.

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1. Radiobiological research at charged particle beams	E.A. Krasavin	Data taking Realization Data taking
LRB	A.N. Abrosimova, S.V. Aksenova, E.V. Baranova, K.V. Belokopytova, O.V. Belov, A.V. Boreyko, A.N. Bugay, N.N. Budennaya, V.N. Chaurov, N.A. Emelyanova, T.A. Fadeeva, R.D. Govorun, E.V. Ilyina, A.A. Ivanov, A.A. Khachenkova, A.N. Kokoreva, N.A. Koltovaya, O.V. Komova, I.V. Koshlan, M.S. Lyashko, E.A. Nasonova, A.Yu. Parkhomenko, V.M. Petrov, I.I. Ravnachka, N.L. Shmakova, N.V. Shvaneva, S.I. Tiunchik, M.A. Vasilyeva, S.V. Vorozhtsova, A.Kh. Yagova, E.M. Zaytseva, N.I. Zhuchkina + 2 engineers, + 6 workers	
2. Radiation research	G.N. Timoshenko	Preparation Data taking R&D
LRB	V.E. Aleinikov, L.G. Beskrovnaya, A.R. Krylov, V.A. Krylov, E.N. Lesovaya + 10 engineers, + 2 workers	
3. Photoradiobiological research	M.A. Ostrovsky	
LRB	T.B. Feldman, D.M. Kryuchkova, P.V. Kutsalo, K.O. Muranov, N.B. Polyansky, Yu.S. Severyukhin, V.A. Tronov, Yu.V. Vinogradova + 1 engineers, + 1 workers	
4. Computer molecular modeling	Kh.T. Kholmurodov	
LRB	G.F. Aru, E.B. Dushanov, V.L. Korogodina + 1 workers	
5. Training activity	E.A. Krasavin S.Z. Pakuliak	
LRB	V.E. Aleinikov, M.V. Altaisky, O.A. Bakerin, E.V. Baranova, O.V. Belov, A.V. Boreyko, N.N. Budennaya, T.B. Feldman, R.D. Govorun, A.A. Ivanov, Kh.T. Kholmurodov, N.A. Koltovaya, O.V. Komova, M.M. Komochkov, I.V. Koshlan, Yu.V. Mokrov, M.A. Ostrovsky, A.Yu. Parkhomenko, V.M. Petrov, G.N. Timoshenko	
UC	S.Z. Pakuliak	

Collaboration

Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	YSU
Belarus	Gomel	IRB NASB
Bulgaria	Sofia	IE BAS

Czech Republic	Brno Řež	NCRRP IBP ASCR NPI ASCR NRI
Egypt	Giza Cairo	CU ASRT EAEA
Italy	Udine	UNIUD
Japan	Yokohama	RIKEN
Mongolia	Ulaanbaatar	NUM
Poland	Warsaw Krakow	INCT NINP PAS
Romania	Bucharest Iași	UMF ISS UAIC
Russia	Moscow	IBR MSU MSMU IBMP RAS ITEP
Slovak Republic	Bratislava	CU

Research on Cosmic Matter on the Earth and in Nearby Space; Research on the Biological and Geochemical Specifics of the Early Earth

Leaders:

E.A. Krasavin
A.Yu. Rozanov
V.N. Shvetsov

Participating Countries and International Organizations:

Italy, Norway, Poland, Romania, Russia, United Kingdom, USA.

Scientific Programme

Research and development will include:

- Biogeochemical studies of cosmic dust
- Studies of biofossils and organic compounds in meteorites and ancient terrestrial rocks
- Studies of cosmic matter with nuclear physics methods
- As a result of studying and generalizing the research materials on modern and fossil cosmic dust as well as ancient terrestrial objects and modern organisms of the extreme ecosystems, data will be obtained on the forms of ancient terrestrial and extraterrestrial life.

As the results:

- Obtaining new data on the amount of cosmic matter falling on the whole Earth's surface.
- Obtaining data on the dynamics of cosmic dust fallout on large territories.
- Evaluation of the following parameters of particles of extraterrestrial origin (focusing on carbonaceous chondrites): morphology, structure, size distribution, and elemental, isotopic, and mineralogical composition. Assessment of changes in these characteristics in different plates in different time intervals.
- Creation of a cosmic dust collection, where dust microparticles will be characterized by quantity (concentration) and the size distribution.
- Cosmic dust research with spacecraft at the altitudes of 300 - 600 km: data generalization; creation of a comparative collection that is necessary for the isolation of the space component of the samples from the Earth's surface.
- Obtaining new information on the role of microorganisms in the formation and evolution of life on the Earth and processes of weathering, precipitation growth, etc.
- Obtaining data on Archaean and Proterozoic microfossils (including possible eukaryotic organisms) from different regions and microfossils in ancient residual soils and volcanogenic sedimentary rocks. The new data will be compared with data on younger - Phanerozoic - rocks.
- Generalization of the obtained data on the forms of ancient terrestrial and extraterrestrial life.

Expected main results in 2014:

- Continuation of the detection and study of biofossils and organic matter in meteorites and the most ancient terrestrial rocks.
- Continuation of the development of methods of microorganism remnant diagnostics in Archean and Proterozoic rocks and evaluating the level of their organization.

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1. Studies of biofossils in meteorites and ancient terrestrial rocks	A.Yu. Rozanov E.A. Krasavin	Data taking Realization Simulation
LRB	M.I. Kapralov	
2. Biogeochemical and biological studies of cosmic dust	L.M. Gindilis	Data taking Realization Simulation
LRB	I.A. Bobrikov	
3. Cosmic matter research with nuclear physics methods	V.N. Shvetsov	Data taking Realization Simulation
FLNP	A.Yu. Dmitriev, P.V. Sedyshev, M.V. Frontasyeva	

Collaboration

Country or International Organization	City	Institute or Laboratory
Italy	Rome	Univ. "La Sapienza"
	Viterbo	UNTUS
Norway	Trondheim	NTNU
Poland	Poznan	AMU
Romania	Bucharest	UB
Russia	Moscow	IGEM RAS IKI RAS MSU PIN RAS SAI MSU
	Borok	IPE RAS
	Gatchina	PNPI
	Novosibirsk	BIC SB RAS
United Kingdom	Buckingham	UB
USA	Athens, AL	ASU

Medical and Biological Research with JINR Hadron Beams

Leader:

G.V. Mitsyn

Participating Countries and International Organizations:

Czech Republic, Israel, Poland, Romania, Russia.

Scientific Programme

Medico-biological and clinical research for the treatment of cancer patients with beams of heavy nuclear particles of the JINR Phasotron and for the accompanying diagnostics.

Expected main results in 2014:

- Continuation of clinical researches on proton therapy of cancer patients in room No 1. To evaluate the effectiveness of the conducted radiation treatment of different neoplasms.
- Development of hardware and software for verification of patient set-up based on an X-ray digital detector.
- Test of the prototype equipment for dynamic conformal irradiation of deep-seated tumours with the proton beam.
- Development and improvement of detectors and tools for clinical dosimetry of the medical hadron beams.
- Exploration of the possibilities of laser radioprotection against damage after exposure to ionizing radiation in experimental mice like C57VL/6.
- Investigations of the molecular spectra of gene mutations induced by radiation in animal and human cells induced by ionizing radiation of different quality.

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Medico-biological and clinical research for the treatment of cancer patients and accompanying diagnostics at the medical-technical complex of JINR DLNP	G.V. Mitsyn	R&D
	S.V. Shvidky, I.V. Alexandrova, I.D. Alexandrov, A.V. Agapov, M.V. Alexandrova, K.P. Afanasieva, S.Yu. Bakaev, K.Sh. Voskanyan, V.N. Gaevsky, G.V. Donskaya, V.M. Breyev, D.M. Borovich, Ye.I. Luchin, S.V. Korablinova, I.I. Klochkov, L.N. Korovina, Ya.V. Kurgansky, N.V. Levkovich, A.G. Molokanov, L.N. Namolovan, S.A. Pisareva, M.V. Repin, D.K. Sobolev, S.S. Uglova, M.A. Zeitlina, K.N. Shipulin, K. Oancea	

Collaboration

Country or International Organization

City

Institute or Laboratory

Czech Republic

Řež

NRI

Israel

Haifa

IOE

Poland

Krakow

NINP PAS

Otwock-Swierk

NCBJ

Poznan

GPCC

Romania

Bucharest

UMF

UB

Russia

Moscow

VIGG RAS

IBMP RAS

Dubna

RDH-9

Obninsk

MRRC

Multimodal Platform for Raman and Nonlinear Optical Microscopy and Microspectroscopy for Condensed Matter Studies

Leader: G.M. Arzumanyan

Participating Countries and International Organizations:

Armenia, Belarus, Germany, Latvia, Moldova, Romania, Russia, USA.

Scientific Programme

Experimental studies on optical analysis of condensed matter by Raman and nonlinear optical microscopy and microspectroscopy, including CARS (Coherent Anti-Stokes Raman Scattering) spectroscopy, which is sensitive to the vibrational signatures of molecules, typically the nuclear vibrations of chemical bonds. Research of optical properties, chemical analysis, surface morphology and other characteristics of condensed matter on the multimodal optical platform constructed on the basis of the confocal laser scanning microscope "CARS".

Expected main results in 2014:

- Installation and acquisition of the motorised scanning stage (model H117, PRIOR) on the NIKON TE2000S microscope.
- Continuation of studies of the effectiveness of up-conversion luminescence of oxyfluoride glasses and nanoglassceramics depending on the content of the doped Er^{3+} and Yb^{3+} rare earth elements, and heat treatment.
- Study of structural features of nanoglassceramics by small-angle neutron scattering.
- A series of experiments to identify the specific features of the structural alters of silicon wafers, doped with H, D, and He ions at various doses.
- Formation of highly selective Raman and CARS images of biological samples, in particular of the DPPC lipids.

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1. Final adjustment and functional launch of the multimodal optical platform	G.M. Arzumanyan	Realization
MAC "Nanobiophotonics"	V. Vartic, A.V. Filippov, A. Kapitonova	
2. Testing, data taking and processing	G.M. Arzumanyan	Data taking
MAC "Nanobiophotonics"	V. Vartic, K.Sh. Voskanyan, K. Mamatkulov, A.V. Filippov	

3. Study of optical properties and structural features of up-conversion luminescent glass materials and nanoglassceramics	G.M. Arzumanyan	Data taking
	MAC “Nanobiophotonics” FLNP	V.Vartic, F.V. Filippov + 1 engineer A.I. Kuklin, D.V. Soloviev + 1 engineer
4. Investigation of structural modifications and spectroscopic characteristics of the silicon wafers surfaces induced by ionizing radiation	G.M. Arzumanyan	Data taking
	MAC “Nanobiophotonics” FLNR	K. Mamatkulov, A.V. Filippov V.F. Reuto + 1 engineer
5. Preparatory works for creation of infrastructure to study biological and biocompatible samples	G.M. Arzumanyan V.I. Gordeliy	Preparatory work
	MAC “Nanobiophotonics” VBLHEP FLNP	K.Sh. Voskanyan, V. Vartic, A. Kapitonova, A.V. Filippov S.I. Tjutjunnikov M. Balasoju + 2 engineers

Collaboration

Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	YSU
Belarus	Minsk	BSTU
Germany	Jülich	FZJ
Latvia	Riga	ISSP UL
Moldova	Chişinău	IEEM ASM SUM TUM
Russia	Moscow	PFUR
	Moscow, Zelenograd	NT-MDT Co.
	Dolgoprudny	MIPT
	St. Petersburg	NITIOM
Romania	Bucharest	IFIN-HH UPB
USA	Buffalo, NY	UB's ILPB

Networking,
Computing,
Computational
Physics
(05)

Information and Computing Infrastructure of JINR

Leader:

V.V. Korenkov

Deputy:

T.A. Strizh

Participating Countries and International Organizations:

Armenia, Azerbaijan, Belarus, Bulgaria, CERN, Czech Republic, Egypt, Georgia, Germany, Moldova, Mongolia, Poland, Romania, Russia, Slovak Republic, South Africa, Sweden, Ukraine, USA, Uzbekistan.

Scientific Programme

Further development of the JINR network, information and computing infrastructure for the research activity of the Institute and its Member States on the basis of present-day information technologies in accordance with the Seven-Year Plan for JINR development and its amendment in view of the creation of a Tier-1 level grid-infrastructure in JINR. Creation of a unified information and computing environment of the JINR Member States.

Expected main results in 2014:

- Provision of the reliable functioning of the main and backup dedicated fiber optic channels JINR-Moscow. Increase of the LHCOPN network throughput for the operation of the JINR Tier-1 center. Increase reliability of the central telecommunication node of the Institute's IT-infrastructure as well as provision of the reliable functioning of the JINR LAN.
- Testing and achievement of the required operational characteristics of the Tier-1 center at JINR. Upgrade and commissioning of the full-scale Tier-1 center.
- Increase of performance of the JINR Central information and computing complex and storage systems to meet the requirements of the JINR scientific program in accordance with the Seven-Year Plan for JINR development. Provision of stable operation of the JINR grid site in the frameworks of the regional, national and application-specific grid infrastructures. Cooperation with the JINR Member States within the currently operating and planned grid projects. Preparation of a project for a multifunctional center for data storage, processing and analysis.
- Maintenance of the hardware and software environment for information, algorithmic and software support of the JINR activities. Support of the JINRLIB program library. Development and support of the central information servers, participation in the development, creation and support of the information sites of conferences and workshops, including hosting mode. Implementation of further features of the 1C:Enterprise 8.2 system dedicated to the daily accounting and administrative reporting; start-up of the trial operation of the 1C DocFlow system. Start-up of the trial operation of a project management system for NICA. Development of the project to create the JINR corporate information system.
- Enhancement of the JINR distributed educational and research infrastructure based on cloud and grid technologies, provision on its basis of training and retraining of IT specialists. Development of the Helpdesk project for JINR information and computing infrastructure user support.

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers
1. JINR telecommunication data links and JINR local area network	V.V. Korenkov A.G. Dolbilov N.N. Karpenko
LIT	K.N. Angelov, B.A. Bezrukov, D.V. Belyakov, E.Yu. Bulaeva, A.I. Churin, N.M. Egoshina, M.F. Ermakova, S.V. Gavrilov, L.I. Gorodnicheva, V.A. Kapitonov, G.A. Korobova, V.I. Krasnoslobotsev, N.N. Mischenko, L.A. Popov, Ya.I. Rozenberg, E.V. Toneeva, V.P. Sheyko, A.Yu. Zakomoldin
DLNP V.A. Bednyakov	A.G. Dolbilov, Yu.P. Ivanov
LRB V.A. Krylov	
BLTP A.P. Isaev	A.A. Sazonov
FLNP S.A. Kulikov	V.I. Prikhodko, G.A. Sukhomlinov
VBLHEP Yu.K. Potrebenikov	Yu.P. Minaev, B.G. Shchinov
FLNR V.I. Zagrebaev	G.G. Gulbekyan, S.V. Pashchenko
UC S.Z. Pakuliak	I.N. Semenushkin
2. JINR Tier-1 center	V.V. Korenkov V.V. Mitsyn T.A. Strizh A.G. Dolbilov
LIT	N.S. Astakhov, A.S. Baginyan, N. Balashov, A.V. Baranov, S.D. Belov, P.V. Dmitrienko, A.P. Gavrish, N.N. Karpenko, N.A. Kutovskiy, I.I. Lensky, S.B. Marchenko, A.V. Nechaevsky, N.N. Voitishin, A.S. Vorontsov, E.A. Tikhonenko, V.V. Trofimov, V.E. Zhiltsov
VBLHEP S.V. Shmatov	I.I. Belotelov, A.O. Golunov, I.N. Gorbunov, A.Yu. Kamenev

**3. JINR Central Information
and Computing Complex**

LIT

**V.V. Korenkov
V.V. Mitsyn**

N.S. Astakhov, S.D. Belov, N.I. Chuadze, N.V. Chuenkova,
P.V. Dmitrienko A.G. Dolbilov, A.P. Gavrish,
V.V. Galaktionov, N.I. Gromova, I.S. Kadochnikov,
A.S. Kamensky, N.N. Karpenko, I.A. Krokhotina,
I.A. Kudasova, O.N. Kudryashova, E.Yu. Kulpin,
N.A. Kutovskiy, A.A. Lavrentiev, S.B. Marchenko,
S.V. Mitsyn, Yu.A. Nazarov, I.K. Nekrasova,
D.A. Oleynik, A.Sh. Petrosyan, A.I. Radov,
V.T. Razuvakina, T.F. Sapozhnikova, E.A. Tikhonenko,
V.V. Trofimov, A.V. Uzhinskiy, L. Valova, V.A. Vasiliev,
A.S. Vorontsov, V.E. Zhiltsov

**4. Information and software support
of the research-and-production
activity at JINR**

LIT

**P.V. Zrelov
V.V. Korenkov
M.V. Bashashin**

T.O. Ablyazimov, D.V. Belyakov, A.A. Bogolubskaya,
N.A. Davyudova, I.A. Filozova, V.P. Gerdt,
T.M. Goloskokova, D.S. Golub, L.A. Kalmykova,
A.A. Karlov, D.V. Kekelidze, S.A. Kretova,
A.A. Kutovskaya, G.A. Kurmaeva, G.G. Musulmanbekov,
E.A. Paschenko, V.V. Pervushov, L.V. Popkova,
A.V. Prikhodko, V.M. Pushkina, A.M. Raportirenko,
D.B. Rumyantseva, A.P. Sapozhnikov, T.F. Sapozhnikova,
S.V. Semashko, R.N. Semenov, G.V. Shestakova,
A.V. Sheyko, V.P. Shirikov, V.A. Stepanenko,
T.S. Syresina, N.N. Vorobieva, V.M. Yagafarova,
A.G. Zaikina, T.N. Zaikina

SOICO
N.A. Russakovich

V.F. Borisovskiy, S.V. Kunyaev

**5. Development of a system of
training and advanced training of
IT professionals based on
educational and research
infrastructure and creation of an
information system to provide
assistance to users (Helpdesk)**

LIT

**V.V. Korenkov
T.A. Strizh**

S.D. Belov, P.V. Dmitrienko, V.V. Galaktionov,
N.I. Gromova, I.S. Kadochnikov, D.V. Kekelidze,
I.A. Krokhotina, N.A. Kutovskiy, V.V. Mitsyn,
S.V. Mitsyn, A.V. Nechaevsky, I.K. Nekrasova,
D.A. Oleynik, A.Sh. Petrosyan, E.A. Tikhonenko,
V.V. Trofimov, A.V. Uzhinskiy, L. Valova, V.A. Vasiliev,
V.E. Zhiltsov

UC
S.Z. Pakuliak

Collaboration Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	ANL IIAP NAS RA YSU
Azerbaijan	Baku	IP ANAS
Belarus	Minsk	NC PHEP BSU JIPNR-Sosny NASB GSTU
	Gomel	
Bulgaria	Sofia	INRNE BAS SU
	Blagoevgrad	SWU
CERN	Geneva	CERN
Czech Republic	Prague	IP ASCR
Egypt	Giza	CU
Georgia	Tbilisi	GRENA TSU UG
Germany	Darmstadt	GSI
	Frankfurt/Main	Univ.
	Hamburg	DESY
	Karlsruhe	KIT
	Munich	LMU
	Zeuthen	DESY
Moldova	Chişinău	ASM IMCS ASM IAP ASM RENAM
Mongolia	Ulaanbaatar	II MAS MUST NUM
Poland	Krakow	CYFRONET
	Poznan	AMU
	Wroclaw	WUT
Romania	Bucharest	IFA IFIN-HH
	Cluj-Napoca	INCDTIM
Russia	Moscow	CIT&S e-ARENA IOC RAS IPI RAN IITP RAS ISP RAS

		ITEP
		JSCC RAS
		KIAM RAS
		MPEI
		MSU
		RCC MSU
		RIPN
		NRC KI
		RSCC
		SINP MSU
		SRI "Voskhod"
	Moscow, Troitsk	INR RAS
	Cherkessk	NCSHTA
	Chernogolovka	SCC IPCP RAS
		LITP RAS
	Dubna	Adm. of Dubna
		BSINP MSU
		"Dubna" Univ.
		Raduga
		SEZ "Dubna"
		SCC "Dubna"
		Tensor
	Gatchina	PNPI
	Novosibirsk	BINP SB RAS
	Pereslavl-Zalesskiy	PSI RAS
	Protvino	IHEP
	Puschino	IMPB RAS
	St. Petersburg	FIP
		IHPCIS
		SPbSPU
		CC SPbSU
		IEP SAS
		UCT
		LU
		UTA
		Fermilab
		UChicago
		Caltech
		BNL
		BITP NASU
		NTUU KPI
		KFTI NASU
		IMIT UAS
Slovak Republic	Košice	
South Africa	Cape Town	
Sweden	Lund	
USA	Arlington, TX	
	Batavia, IL	
	Chicago, IL	
	Pasadena, CA	
	Upton, NY	
Ukraine	Kiev	
	Kharkov	
Uzbekistan	Tashkent	

Methods, Algorithms and Software for Modeling Physical Systems, Mathematical Processing and Analysis of Experimental Data

Leaders:

Gh. Adam
P.V. Zrelov

Participating Countries and International Organizations:

Armenia, Australia, Belarus, Belgium, Brazil, Bulgaria, Canada, CERN, Chile, Czech Republic, Egypt, France, Georgia, Germany, Greece, India, Italy, Japan, Kazakhstan, Moldova, Mongolia, Poland, Portugal, Romania, Russia, Slovak Republic, South Africa, Sweden, Switzerland, Taiwan, Tajikistan, Ukraine, USA, Vietnam.

Scientific Programme

Research in the field of computational mathematics and computational physics, directed to the creation of mathematical methods, algorithms, and software for the numerical or symbolic-numerical solution of topics arising in experimental and theoretical studies, by using the newest computational tools. This subject area includes a wide spectrum of investigations underway at JINR in high energy physics, nuclear physics, condensed matter physics, biophysics, information technologies, etc. which demand the development of new mathematical methods and approaches for modeling physical processes, processing and analysis of experimental data. A distinctive feature of these investigations is the close cooperation of LIT with research groups from all the JINR laboratories and from Member State institutions.

Expected main results in 2014:

- Development of methods and program environment for modelling physical processes, event reconstruction and optimization of installations at accelerator complex NICA.

Development of new approaches and algorithms for analysis of data of the ATLAS and CMS experiments.

Implementation of artificial neural network codes for solving detector calibration problems enabling increased accuracy energy reconstruction and estimates of primary cosmic ray parameters.

Further extension of the SAS package for the modernized YUMO installation.

Processing and creation of computer code for on-line analysis of the phase structures of polycrystals in experiments done at the IBR-2M high resolution Fourier diffractometer.

Development and implementation of multi-core scalable program modules in the Geant4 package. Geant 4 hadronic model implementations into the HEPWEB system.

Highly accurate 3D simulation of nonlinear heat processes in a cryogenic cell.

Modeling of nanostructures and properties of organic membranes on the basis of experimental data on small-angle scattering of neutrons and X-rays.

- Development of new algorithms for function approximation and experimental data smoothing.

Modeling nuclear physical processes in heavy ion collisions in the MPD experiment. Development of parallel algorithms and software for recognition of trajectories of elementary particles in the CBM and NICA-MPD experiments.

Software implementation of a new method for the definition of display time of the scintillators using a self-correlating time spectrometer of retarded coincidences.

Development of software for the automatic calibration of multidetector systems.

Development of wavelet-based algorithms and software for online diagnostic of formation of instabilities in charged plasma.

- Study of the mathematical and algorithmic basis of a new generation computer programs for finite-element simulation of complex electrophysical installations.

Development of a parallel algorithm for calculating Boolean and algebraic involutive bases in frames of the MPI technology.

Software development using the CUDA and MPI technologies for numerical study of relaxation processes in 3D classical spin glasses subject to external fields.

CUDA - technology-based realization of algorithms for numerical computation of the proper modes of irregular integrated-optical waveguides, surface plasmon-polaritons and spin waves in graphene structures.

Hybrid architecture (CPU+GPU) algorithms and software for studying boson behavior in magneto-optical traps.

- Development of an algorithm for computing the full set of Lagrange constraints for singular dynamic and field models and its realization in the Maple system.

Generalization to the Pauli equation of the symbolic-numeric methodology for simulation of multiparticle quantum dynamics in external fields that has been developed for Shrödinger equation.

Development of an adiabatic method of computing one-particle energies and wave functions for deformed Woods-Saxon potentials.

Upgrade of the QuantumCircuit simulator package with new algorithms and data structures for modeling the dynamics of pure entangled quantum states.

Symbolic - numerical investigation of qubit-qubit and qubit-qutrit two-particle mixed quantum states.

Generalization of a modeling algorithm based on computing group theory, to the case of nontrivial multiplicities of the permutation representations.

List of activities:

Activity or experiment	Leaders
Laboratory or other	Main researchers
Division of JINR	
1. Mathematical and computation methods for simulation of complex physical systems	Gh. Adam P.V. Zrelov I.V. Puzynin
LIT	S. Adam, I.V. Amirkhanov, E.A. Ayrjan, A.S. Ayriyan, D.A. Baranov, I.V. Barashenkov, B. Batgerel, I.L. Bogolubsky, A.M. Chervyakov, O. Chuluunbaatar, Yu.L. Kalinovsky, N.V. Makhaldiani, A.V. Melezhik, T.I. Mikhailova, I.V. Molodtsova, D.I. Podgainy, R.V. Polyakova, T.P. Puzynina, V.S. Rikhvitsky, V.N. Robuk, B. Saha, N.R. Sarkar, I. Sarkhadov, S.I. Serdyukova, Z.A. Sharipov, V.A. Stepanenko, O.I. Streltsova, Z.K. Tukhliev, Vo Trong Thach, A.V. Volokhova, R.M. Yamaleev, O.I. Yuldashev, M.B. Yuldasheva, E.V. Zemlyanaya, E.I. Zhabitskaya

2. Software complexes and mathematical methods for processing and analysis of experimental data

**P.V. Zrelov
Gh. Adam
V.V. Ivanov**

LIT

T.O. Ablyazimov, V.P. Akishina, E.I. Aleksandrov, I.N. Aleksandrov, O.Yu. Derenovskaya, N.D. Dikoussar, V.P. Filinova, I.M. Ivanchenko, V.M. Karnaukhov, A.A. Kazakov, P.I. Kisel, B.F. Kostenko, V.M. Kotov, Gh.E. Kozlov, L.Yu. Kruglova, I.N. Kukhtina, A.A. Lebedev, S.A. Lebedev, K.V. Lukyanov, A. Machavariani, M.A. Mineev, G.A. Ososkov, V.I. Palichik, A.S. Rakityanskaya, A.M. Raportirenko, V.S. Shigaev, N.Yu. Shirikova, L.A. Siurakshina, A.G. Soloviev, A.N. Sosnin, V.V. Uzhinsky, N.N. Voitishin, O.O. Voskresenskaya, A.V. Yakovlev, V.B. Zlokazov

3. Numerical methods, algorithms and software computationally adapted to multicore and hybrid architectures

**Gh. Adam
P.V. Zrelov**

LIT

A.S. Ayriyan, O. Chuluunbaatar, V.P. Gerdt, A.A. Gusev, V.V. Ivanov, A.M. Khvedelidze, Yu.G. Palii, O.I. Streltsova, E.P. Yukalova, E.V. Zemlyanaya, M.I. Zuev

4. Methods, algorithms and software of computer algebra

V.P. Gerdt

LIT

A.A. Bogolubskaya, S.A. Evlakhov, A.A. Gusev, A.M. Khvedelidze, V.V. Kornyak, Yu.G. Palii, A.M. Raportirenko, I.A. Rogozhin, V.A. Rostovtsev, O.V. Tarasov, D.A. Yanovich

Collaboration

Country or International Organization

City

Institute or Laboratory

Armenia

Yerevan

YSU
IIAP NAS RA
RAU

Ashtarak

IPR NAS RA

Australia

Sydney

Univ.

Belarus

Minsk

IM NASB

Belgium

Brussels

ULB

Liege

ULg

Brazil

Sao Carlos, SP

IFSC USP

Bulgaria

Sofia

IMI BAS
INRNE BAS
SU

Plovdiv

PU

Canada

Edmonton

U of A

Toronto

IBM Lab

CERN

Geneva

CERN

Chile	Valparaiso	USM
Czech Republic	Řež	NPI ASCR
Egypt	Cairo	TIMS
France	Metz	UPV-M
	Nantes	SUBATECH
Georgia	Tbilisi	UG
		RMI TSU
		TSU
		GTU
Germany	Berlin	HUB
		FU Berlin
	Bonn	UniBonn
	Darmstadt	GSi
	Dresden	IFW
	Frankfurt/Main	Univ.
	Giessen	JLU
	Heidelberg	Univ.
	Jülich	FZJ
	Kassel	Uni Kassel
	Marburg	Univ.
	Potsdam	IASS
	Regensburg	UR
	Tübingen	Univ.
Greece	Thessaloniki	AUTH
India	Pune	IUCAA
Italy	Turin	INFN
	Bari	UniBa
Japan	Osaka	Kansai Univ.
Kazakhstan	Almaty	INP NNC RK
		IPT
Moldova	Chişinău	IAP ASM
Mongolia	Ulaanbaatar	NUM
Poland	Krakow	AGH
	Otwock-Swierk	NCBJ
	Rzeszow	UR
Portugal	Coimbra	UC
Romania	Bucharest	IFA
		IFIN-HH
		ISS
		UB
	Cluj-Napoca	INCDTIM
Russia	Moscow	CC RAS
		ITEP
		NNRU “MEPhI”
		KIAM RAS

		MSU
		PFUR
		SINP MSU
		VIGG RAS
	Belgorod	NRU BelSU
	Protvino	IHEP
	Puschino	IMPB RAS
		ITEB RAS
		IPR RAS
	Saratov	SSU
	St. Petersburg	FIP
		NIIEFA
	Tomsk	TSU
	Tver	TvSU
Slovak Republic	Košice	IEP SAS
		TUKE
		PJSU
	Prešov	PU
South Africa	Cape Town	UCT
	Pretoria	UP
Sweden	Stockholm	KTH
Switzerland	Zurich	ETH
Taiwan	Taipei	AS
Tajikistan	Dushanbe	TNU
		PHTI ASRT
	Khujent	KSU
USA	Argonne, IL	ANL
Ukraine	Kiev	BITP NASU
		IM NASU
	Kharkov	IERT NASU
		KFTI NASU
Vietnam	Hanoi	VNU

Analytical and Methodological Work to Assess the Prospects of Scientific Research and Cooperation in the Main Directions of JINR's Development. Organization of International Cooperation

Leader: N.A. Russakovich

Participating Countries and International Organizations:

Member States of JINR, non-Member States participating in JINR activities on the basis of bilateral agreements, and international organizations.

Scientific Programme

Preparation by the JINR Science Organization Department of analytical materials on the prospects of scientific research. Preparation of research plans. Preparation of scientific-organizational and methodological materials concerning project-topical and special-purpose financing of research programmes and projects. Application of data base systems for the analysis of results of theoretical and experimental research activities. Organization of international cooperation with the Member States of JINR, non-Member States participating in JINR activities on the basis of bilateral agreements, and with scientific research institutions with which JINR has collaboration agreements.

Expected main results in 2014:

- Analysis of the results of JINR's activities in the main directions of research. Preparation for publication of the JINR Topical Plan for Research and International Cooperation for 2015.
- Information and technical preparation of the JINR Web site. Further development of the data base information search system for JINR research themes and projects. Information support of the electronic system of protocols for scientific and technical collaboration.
- Development and application of software for automation of scientific and financial planning. Analysis of the use of budgetary resources by fields of research, themes, and research groups. Actualization and putting into trial operation of an "Interactive Formation System for the Topical Plan of Research of a Scientific Organization (by example of JINR)".
- Maintenance of interaction on issues of scientific research work with representatives of the Member States of JINR and non-Member States participating in JINR activities on the basis of bilateral agreements. Organization and holding of meetings on cooperation with international organizations.

List of activities:

Activity or experiment	Leaders
Laboratory or other	Main researchers
Division of JINR	
1. Preparation for publication of the JINR Topical Plan for Research and International Cooperation for 2014	N.A. Russakovich V.A. Bednyakov
SOD	N.A. Boklagova, L.K. Ivanova, N.I. Sissakian

**2. JINR internet-site activities
maintenance**

SOD

AMISD

Editorial office, weekly newspaper
“Dubna: Science, Cooperation,
Progress”

LIT

**3. Automation of scientific
planning**

SOD

AMISD

LIT
P.V. Zrelov

**4. International
cooperation**

IRD

**N.A. Russakovich
V.A. Bednyakov**

N.A. Boklagova, L.K. Ivanova, L.I. Kalina,
T.B. Ivashkevich, O.K. Kronshtadtov, K.P. Moisenz,
A.G. Nanev, N.I. Sissakian

V.F. Borisovskiy, S.V. Kunyaev, P.V. Ustenko

E.M. Molchanov

P.V. Zrelov, L.A. Kalmykova, A.V. Prihodko

**N.A. Russakovich
V.A. Bednyakov**

N.A. Boklagova, L.K. Ivanova

V.F. Borisovskiy, S.V. Kunyaev

N.F. Davydova, L.A. Kalmykova, T.S. Syresina

N.A. Russakovich

D.V. Kamanin

Educational
Programme
(06)

Organization, Support and Development of the JINR Educational Programme

Leaders:

V.A. Matveev
S.Z. Pakuliak

Participating Countries and International Organizations:

Armenia, Belarus, Bulgaria, CERN, Czech Republic, Kazakhstan, Moldova, Poland, Romania, Russia, Slovak Republic, South Africa, Ukraine, USA, Vietnam.

Scientific Programme

Support and development of the JINR Educational Programme in general (training of physicists and engineers in JINR's fields of research and in the interests of the Member States). Professional development, training and retraining of JINR engineering and technical staff. Promotion of physics research and of the Institute's activities among the youth of the JINR Member States including secondary school pupils.

Expected main results in 2014:

- Support and maintenance of the study process at the UC. Preparation and publication - as tutorials - of lectures given to the UC students and postgraduates. Getting the state accreditation of postgraduate professional education programs.
- Organization and holding of the Summer Student Practice in JINR's fields of research for students of higher education institutions of the JINR Member States. Participation in the organization and holding of international schools on nuclear physics and particle physics for young scientists.
- Cooperation with international funds for organizing student and postgraduate exchanges between the UC and foreign research centres regulated by special agreements.
- Development of the computer infrastructure for organizing and conducting training programs for data analysis in high-energy physics experiments.
- Offering lecture courses and practical classes in physics for secondary school pupils of Dubna and JINR Member States on the basis of the UC's school laboratory class.
- Organization of excursions to JINR and video-conferences for secondary school pupils from Member States. Development of the system of teaching English and French to JINR young staff.
- Work-out of training and education programs in relativistic nuclear physics and the particle physics.
- Participation in the activities of the Academician Alexey Sissakian education Center.

List of projects:

Project	Leader	Priority (period of realization)
1. Development of Modern Education Programmes	Y.A. Panebratsev	1 (2014 – 2016)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers
1. Organization of the Education Process at JINR	V.A. Matveev S.Z. Pakuliak
DLNP A.G. Olshevskiy	G.A. Chelkov, V.B. Brudanin, V.A. Bednyakov
BLTP V.V. Voronov A.P. Isaev A.B. Arbuzov	D.I. Kazakov, A.V. Gladyshev, V.A. Osipov, S.N. Nedelko
FLNP A.V. Belushkin V.N. Shvetsov	B.N. Savenko, A.M. Balagurov, Yu.N. Kopach, O.A. Culikov
VBLHEP R. Lednický V.D. Kekelidze	I.A. Golutvin, S.V. Shmatov, M.G. Sapozhnikov, N.N. Agapov, S.S. Shimansky
FLNR S.N. Dmitriev	A.V. Eremin, V.I. Zagrebaev, A.G. Popeko, A.S. Denikin
LIT V.V. Korenkov	V.V. Ivanov, N.A. Kutovskiy, S.D. Belov, V.P. Gerdt
LRB E.A. Krasavin	O.V. Belov, I.V. Koshlan
SOICO D.V. Kamanin	W. Chmielowski, M.G. Loschilov
2. Developing of modern educational projects	Y.A. Panebratsev

Collaboration

Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	YSU
Belarus	Minsk	BSU NC PHEP BSU
	Gomel	GSU
Bulgaria	Sofia	INRNE BAS SU
	Blagoevgrad	SWU
CERN	Geneva	CERN
Czech Republic	Prague	CU CTU
	Řež	NPI ASCR
Egypt	Cairo	ASRT
Kazakhstan	Almaty	KNU

Moldova	Chişinău	ASM
Poland	Krakow	JU
	Lodz	UL
	Poznan	AMU
Romania	Bucharest	UB
Russia	Moscow	MGTU MIREA
		NNRU “MEPhI”
		SINP MSU
	Dolgoprudny	MIPT
	Dubna	“Dubna” Univ.
		BMSUT MIREA
		BSINP MSU
	Kostroma	KSU
	Tver	TvSU
	Tula	TSU
Slovak Republic	Bratislava	CU
	Košice	PJSU
South Africa	Pretoria	Necsa
Ukraine	Kiev	BITP NASU
		NUK
USA	Upton, NY	BNL
Vietnam	Hanoi	VNU

Applied Research with
Nuclear Physics
Methods
(07)

07-1-1110-2012/2014

Priority:

2

Status:

Extended

Tests of the Universal Multiphase Separationless Flow-Meter (RhUMB)

Leader:

Yu.P. Filippov

Participating Countries and International Organizations:

Russia

Scientific Programme

Tests of the model of the “oil-gas-formation water” three-phase flow-meter at the VNIIR test bench, Kazan.

Expected main results in 2014:

- Development of the model of the three-phase flow-meter based on two-channel spectrometric gamma-densitometer and narrowing device.
- Tests of the model of the three-phase flow-meter at the VNIIR test bench with mixtures “eksol-gas-water”.

List of projects:

Project	Leader	Priority (period of realization)
1. RhUMD	Yu.P. Filippov	2 (2012 – 2014)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. Investigation of the characteristics of the two-channel spectrometric gamma-densitometer	I.D. Kakorin Yu.P. Filippov	Realization
2. Preliminary tests of the model of the three-phase flow-meter at the JINR	A.M. Kovrizhnykh	Realization
3. Preparation of the necessary documents jointly with IPTP	Yu.P. Filippov	Realization
4. Tests at the VNIIR test bench	A.M. Kovrizhnykh Yu.P. Filippov I.D. Kakorin	Realization
5. Analysis of the obtained results	I.D. Kakorin Yu.P. Filippov	Realization

Collaboration Country or International Organization	City	Institute or Laboratory
Russia	Dubna	IPTP
	Kazan	VNIIR

Alphabetic List of Collaborators

Albania

Tirana

UT (University of Tirana |
<http://www.unitir.edu.al/>), 125

Argentina

Buenos Aires

CNEA (National Atomic Energy Commission |
<http://www.cnea.gov.ar/>), 133, 138

Armenia

Ashtarak

IPR NAS RA (Institute for Physical Research of
the National Academy of Sciences of the
Republic of Armenia |
<http://www.ipr.sci.am/>), 165

Yerevan

ANL (Alikhanian National Laboratory |
<http://www.yerphi.am/>), 11, 21, 35, 41, 59,
65, 90, 93, 96, 115, 161

IIAP NAS RA (Institute for Informatics and
Automation Problems of the National
Academy of Sciences of the Republic of
Armenia | <http://www.iiap.sci.am/>), 161, 165

RAU (Russian-Armenian (Slavonic) University |
<http://www.rau.am/>), 11, 165

YSU (Yerevan State University |
<http://www.ysu.am/>), 21, 26, 78, 90, 101, 115,
149, 156, 161, 165, 173

YerPhi (Yerevan Physics Institute |
<http://www.yerphi.am/>), 11

Australia

Melbourne

Univ. (University of Melbourne |
<http://unimelb.edu.au/>), 21, 125

Sydney

Univ. (University of Sydney |
<http://sydney.edu.au/>), 21, 26, 101, 165

Austria

Innsbruck

Univ. (University of Innsbruck |
<http://www.uibk.ac.at/>), 17, 125

Vienna

HEPHY (Institute of High Energy Physics of the
Austrian Academy of Sciences |
<http://www.hephy.at/>), 59

IAEA (International Atomic Energy Agency |
<http://www.iaea.org/>), 125

TU Vienna (Vienna University of Technology |
<http://www.tuwien.ac.at/>), 26, 30

Univ. (University of Vienna |
<http://www.univie.ac.at/>), 30

Azerbaijan

Baku

IP ANAS (Institute of Physics of the Azerbaijan
National Academy of Sciences |
<http://www.elm.az/physics/>), 11, 41, 78, 133,
161

IRP ANAS (Institute of Radiation Problems of
the Azerbaijan National Academy of Sciences |
<http://www.science.gov.az/>), 93, 138

Belarus

Gomel

BelSUT (Belarusian State University of
Transport | <http://www.belsut.gomel.by/>), 11,
59

GB NASB (Gomel Branch of the National
Academy of Sciences of Belarus |
<http://www.gbnas.by/>), 145

GEI (Gomel Engineering Institute of the
Ministry for Emergency Situations of the
Republic of Belarus |
<http://www.gii.gomel.by/>), 145

GSTU (Pavel Sukhoi State Technical University
of Gomel | <http://www.gstu.by/>), 11, 41, 69,
161

GSU (Francisk Skorina Gomel State University |
<http://www.gsu.by/>), 11, 37, 59, 69, 78, 145,
173

IRB NASB (Institute of Radiobiology of the
National Academy of Sciences of Belarus |
<http://irb.basnet.by/>), 149

Grodno

SUG (Yanka Kupala State University of Grodno
| <http://www.grsu.by/>), 133

Minsk

BSTU (Belarusian State Technological
University | <http://www.bstu.unibel.by/>), 156

BSU (Belarusian State University |
<http://www.bsu.by/>), 101, 119, 133, 145, 173

BSUIR (Belarusian State University of
Informatics and Radioelectronics |
<http://www.bsuir.by/>), 82

IAP NASB (State Scientific Institution "Institute
of Applied Physics of the National Academy of
Sciences of Belarus | <http://iaph.bas-net.by/>),
133

ICE MES RB (Institute for Command Engineers
of the Ministry for Emergency Situations of the
Republic of Belarus | <http://kii.gov.by/>), 21

IM NASB (Institute of Mathematics of the National Academy of Sciences of Belarus | <http://im.bas-net.by/>), 165

INP BSU (Research Institute for Nuclear Problems of the Belarusian State University | <http://www.inp.bsu.by/>), 11, 59, 82, 85, 101, 125, 133

IP NASB (B.I.Stepanov Institute of Physics of the National Academy of Sciences of Belarus | <http://ifanbel.bas-net.by/>), 17, 21, 26, 41, 52, 101, 119

JIMB NASB (Joint Institute of Machine Building of the National Academy of Sciences of Belarus | <http://www.oim.by/>), 21

JIPNR-Sosny NASB (Joint Institute for Power and Nuclear Research - Sosny of the National Academy of Sciences of Belarus | <http://sosny.bas-net.by/>), 11, 21, 35, 41, 101, 125, 138, 161

NC PHEP BSU (National Scientific and Educational Centre of Particle and High Energy Physics of the Belarusian State University | <http://www.bsu.by/>), 11, 35, 37, 41, 44, 50, 52, 56, 59, 65, 69, 70, 78, 82, 90, 101, 115, 119, 133, 145, 161, 173

PTI NASB (Physical Technical Institute of the National Academy of Sciences of Belarus | <http://fiztech.basnet.by/>), 82

RI PCP BSU (Research Institute for Physical Chemical Problems of the Belarusian State University | <http://www.fhp.bsu.by/>), 125, 133

RIAPP BSU (Research Institute of Applied Physical Problems of the Belarusian State University | <http://www.bsu.by/>), 145

SPMRC NASB (Scientific-Practical Materials Research Centre of the National Academy of Sciences of Belarus | <http://www.physics.by/>), 82, 101, 133

“INTEGRAL” (“INTEGRAN” JSC | <http://www.integral.by/>), 44, 69

“Planar” (Planar Corporation | <http://www.planar.by/>), 78

Belgium

Antwerp

UA (University of Antwerp | <http://www.ua.ac.be/>), 59

Brussels

ULB (Brussels Free University | <http://www.ulb.ac.be/>), 47, 59, 65, 106, 125, 165

VUB (Vrije University Brussels | <http://www.vub.ac.be/>), 17, 47, 59

Geel

IRMM (European Commission Joint Research Centre Institute for Reference Materials and Measurements | <http://irmm.jrc.ec.europa.eu/>), 47, 125

Leuven

K.U.Leuven (Catholic University of Leuven | <http://www.kuleuven.ac.be/>), 26, 47, 111, 115

Liege

ULg (University of Liège | <http://www.ulg.ac.be/>), 165

Louvain-la-Neuve

IBA (Ion Beam Applications | <http://iba-worldwide.com/>), 111, 122

UCL (Catholic University of Louvain | <http://www.uclouvain.be/>), 21, 56, 59

Mons

UMONS (University of Mons | <http://portail.umons.ac.be/>), 59, 65

Brazil

Brasilia, DF

UnB (University of Brasilia | <http://www.unb.br/>), 22

Florianopolis, SC

UFSC (Federal University of Santa Catarina | <http://ufsc.br/>), 17

Natal, RN

IIP UFRN (International Institute of Physics of the Federal University of Rio Grande do Norte | <http://www.iip.ufrn.br/>), 22

Rio de Janeiro, RJ

CBPF (Brazilian Center for Physics Research | <http://portal.cbpf.br/>), 59

UERJ (Rio de Janeiro State University | <http://www.uerj.br/>), 59

UFRJ (Federal University of Rio de Janeiro | <http://www.ufrj.br/>), 59

Sao Carlos, SP

IFSC USP (Institute of Physics of São Carlos of the University of São Paulo | <http://www.ifsc.usp.br/>), 165

Sao Paulo, SP

USP (University of São Paulo | <http://www5.usp.br/>), 22, 26, 30

Unesp (São Paulo State University | <http://www.unesp.br/>), 59

Bulgaria

Blagoevgrad

SWU (South-West University “Neofit Rilski” | <http://www.swu.bg/>), 56, 78, 161, 173

Plovdiv

PU (Plovdiv University “Paisii Hilendarski” | <http://www.uni-plovdiv.bg/>), 56, 70, 78, 115, 126, 145, 165

UFT (University of Food Technologies |
<http://uft-plovdiv.bg/>), 126

Shumen

US (Konstantin Preslavsky University of
Shumen | <http://www.shu-bg.net/>), 35

Sofia

IE BAS (Academician Emil Djakov Institute of
Electronics of the Bulgarian Academy of
Sciences | <http://ie-bas.dir.bg/>), 133, 149

IMI BAS (Institute of Mathematics and
Informatics of the Bulgarian Academy of
Sciences | <http://www.math.bas.bg/>), 165

IMS BAS (Institute of Metal Science, Equipment
and Technologies “Acad. A.Balevski” with
Hydroaerodynamics Centre of the Bulgarian
Academy of Sciences |
<http://www.ims.bas.bg/>), 133

IMech BAS (Institute of Mechanics of the
Bulgarian Academy of Sciences |
<http://www.imbm.bas.bg/>), 22

INRNE BAS (Institute for Nuclear Research and
Nuclear Energy of the Bulgarian Academy of
Sciences | <http://www.inrne.bas.bg/>), 11, 17,
22, 26, 30, 35, 54, 59, 65, 78, 82, 85, 90, 101,
106, 111, 115, 125, 133, 142, 161, 165, 173

ISSP BAS (Georgi Nadjakov Institute of Solid
State Physics of the Bulgarian Academy of
Sciences | <http://www.issp.bas.bg/>), 22, 78,
133

LTD BAS (Laboratory for Technical
Development of the Bulgarian Academy of
Sciences | <http://www.pronto.phys.bas.bg/>),
78, 111

NCRRP (National Centre of Radiobiology and
Radiation Protection |
<http://www.ncrrp.org/>), 150

SU (Sofia University “St.Kliment Ohridski” |
<http://www.uni-sofia.bg/>), 11, 22, 26, 30, 44,
56, 59, 65, 96, 119, 161, 165, 173

TU-Sofia (Technical University of Sofia |
<http://www.tu-sofia.bg/>), 78

UCTM (University of Chemical Technology and
Metallurgy-Sofia | <http://www.uctm.edu/>), 85

Canada

Edmonton

U of A (University of Alberta; Theoretical
Physics Institute; Avadh Bhatia Physics
Laboratory | <http://www.ualberta.ca/>), 26,
30, 65, 165

Hamilton

McMaster (McMaster University |
<http://www.mcmaster.ca/>), 17

Kingston

Queen’s (Queen’s University |
<http://www.queensu.ca/>), 22

London

Western (University of Western Ontario |
<http://www.uwo.ca/>), 22

Montreal

Concordia (Concordia University |
<http://www.concordia.ca/>), 22

McGill (McGill University |
<http://www.mcgill.ca/>), 11, 26

UdeM (University of Montreal |
<http://www.umontreal.ca/>), 11, 26, 30, 41

Quebec

ULaval (Laval University |
<http://www2.ulaval.ca/>), 22

Saskatoon

U of S (University of Saskatchewan |
<http://www.usask.ca/>), 17

Toronto

IBM Lab (IBM Toronto Software Lab |
<http://www.ibm.com/>), 165

U of T (University of Toronto |
<http://www.utoronto.ca/>), 11

Vancouver

TRIUMF (Canada’s National Laboratory for
Particle and Nuclear Physics |
<http://www.triumf.ca/>), 41, 65, 119

Chile

Valparaiso

USM (Federico Santa Maria Technical University
| <http://www.utfsm.cl/>), 166

Univ. (Valparaiso University |
<http://www.valpo.edu/>), 44

China

Beijing

Beijing Fert Co (Beijing Fert Medical
Instruments Technology Co., Ltd. |
<http://www.china-fert.com/>), 145

CIAE (China Institute of Atomic Energy |
<http://www.ciae.ac.cn/>), 47, 90, 96

IHEP CAS (Institute of High Energy Physics of
the Chinese Academy of Sciences |
<http://www.ihep.ac.cn/>), 35, 47, 59, 90, 126

ITP CAS (Institute of Theoretical Physics of the
Chinese Academy of Sciences |
<http://english.itp.cas.cn/>), 17

PKU (Peking University |
<http://www.pku.edu.cn/>), 17, 59, 106

“Tsinghua” (Tsinghua University |
<http://www.tsinghua.edu.cn/>), 78

Hefei

USTC (University of Science and Technology of
China | <http://www.ustc.edu.cn/>), 59

Lanzhou

IMP CAS (Institute of Modern Physics of the
Chinese Academy of Sciences |

<http://www.impcas.ac.cn/>), 111, 122

Wuhan

CCNU (Central China Normal University;
Institute of Particle Physics |
<http://www.ccnu.edu.cn/>), 90, 96

Croatia

Split

Univ. (University of Split |
<http://www.unist.hr/>), 59

Zagreb

RBI (Rudjer Boskovic Institute |
<http://www.irb.hr/>), 47, 96, 119

Cuba

Havana

HITAS (Higher Institute of Technologies and
Applied Sciences), 106

Cyprus

Nicosia

UCY (University of Cyprus |
<http://www.ucy.ac.cy/>), 59

Czech Republic

Brno

BUT (Brno University of Technology |
<http://www.vutbr.cz/>), 101

IBP ASCR (Institute of Biophysics of the
Academy of Sciences of the Czech Republic,
v.v.i. | <http://www.ibp.cz/>), 150

ISI ASCR (Institute of Scientific Instruments of
the Academy of Sciences of the Czech
Republic, v.v.i. | <http://www.isibrno.cz/>), 85

Liberec

TUL (Technical University of Liberec |
<http://www.tul.cz/>), 78, 85

Plzen

Skoda JS s.a. (Company Škoda |
<http://www.skoda-js.cz/>), 138

Prague

CEI (Czech Environmental Institute |
<http://www.ceu.cz/>), 126

CTU (Czech Technical University in Prague |
<http://www.cvut.cz/>), 11, 26, 30, 35, 39, 65,
69, 85, 101, 106, 115, 126, 133, 173

CU (Charles University in Prague |
<http://www.cuni.cz/>), 11, 17, 26, 35, 42, 47,
50, 52, 56, 59, 78, 85, 93, 111, 119, 173

IG ASCR (Institute of Geology of the Academy
of Sciences of the Czech Republic, v.v.i. |
<http://web.gli.cas.cz/>), 133

IMC ASCR (Institute of Macromolecular
Chemistry of the Academy of Sciences of the
Czech Republic, v.v.i. |
<http://www.imc.cas.cz/>), 90, 133

IP ASCR (Institute of Physics of the Academy
of Sciences of the Czech Republic, v.v.i. |
<http://www.fzu.cz/>), 11, 30, 39, 52, 96, 133,
161

VP (Vacuum PRAGUE |
<http://www.vakuum.cz/>), 106, 111

Řež

NPI ASCR (Nuclear Physics Institute of the
Academy of Sciences of the Czech Republic,
v.v.i. | <http://www.ujf.cas.cz/>), 11, 17, 22, 26,
30, 39, 69, 85, 90, 106, 111, 133, 142, 145, 150,
166, 173

NRI (Nuclear Research Institute Řež, a.s. |
<http://www.nri.cz/>), 69, 93, 96, 101, 115, 119,
150, 154

ÚJV (“ÚJV Řež, a.s.” | <http://www.ujv.cz/>), 138

Democratic People’s Republic of Korea

Pyongyang

IFR SCNR (Institute of Fundamental Research
of the Yongbyon Nuclear Scientific Research
Centre), 111

Denmark

Copenhagen

NBI (Niles Bohr Institute of the University of
Copenhagen | <http://www.nbi.ku.dk/>), 96

Egypt

Cairo

AASTMT (Arab Academy for Science and
Technology and Maritime Transport |
<http://www.aast.edu/>), 111

ASRT (Academy of Scientific Research and
Technology | <http://www.asrt.sci.eg/>), 150,
173

CMRDI (Central Metallurgical Research and
Development Institute |
<http://www.cmrdi.sci.eg/>), 133

EAEA (Egyptian Atomic Energy Authority |
<http://www.eaea.org.eg/>), 17, 126, 150

NRC (National Research Centre |
<http://www.nrc.sci.eg/>), 133

TIMS (Tabbin Institute for Metallurgical
Studies), 133, 145, 166

Giza

CU (Cairo University |
<http://cuportal.cu.edu.eg/>), 17, 106, 150, 161

NILES CU (National Institute of Laser
Enhanced Sciences of Cairo University |
<http://niles.cu.edu.eg/>), 133

Estonia

Tallinn

NICPB (National Institute of Chemical Physics
and Biophysics | <http://www.kbfi.ee/>), 59

Finland

Helsinki

- HIP (Helsinki Institute of Physics |
<http://www.hip.fi/>), 59
UH (University of Helsinki |
<http://www.helsinki.fi/university>), 11, 59

Jyväskylä

- UJ (University of Jyväskylä |
<http://www.jyu.fi/>), 59, 106, 115, 126

Oulu

- UO (University of Oulu; Microelectronics
Instrumentation Laboratory |
<http://www.oulu.fi/>), 59

Tampere

- TUT (Tampere University of Technology; Digital
and Computer Systems Laboratory |
<http://www.tut.fi/>), 59

France

Annecy-le-Vieux

- LAPP (Laboratory of Annecy-la-Vieux for
Particles Physics of the National Institute for
Nuclear Physics and Particles Physics of the
National Centre for Scientific Research |
<http://lappweb.in2p3.fr/>), 26, 30, 47, 59
LAPTh (Laboratory of Theoretical Physics of
Annecy-la-Vieux of the National Institute for
Nuclear Physics and Particles Physics of the
National Centre for Scientific Research |
<http://lappweb.in2p3.fr/lapth-2005>), 26

Bordeaux

- UB (University of Bordeaux |
<http://www.univ-bordeaux.fr/>), 17

Cadarache

- CC CEA (Cadarache est un Centre de Recherche
du Commissariat à l'Energie Atomique |
<http://www-cadarache cea.fr/>), 126

Caen

- GANIL (Grand Accélérateur National d'Ions
Lourds; Laboratoire Commun
CEA/DSM/CNRS/IN2P3 |
<http://www.ganil-spiral2.eu/>), 17, 106, 111

Clermont-Ferrand

- LPC-CF (Laboratoire de Physique Corpusculaire
de Clermont-Ferrand de l'Université Blaise
Pascal - IN2P3/CNRS |
<http://clrwww.in2p3.fr/>), 42, 96

Dijon

- UB (University of Bourgundy |
<http://www.u-bourgogne.fr/>), 26, 30

Grenoble

- ILL (Institute Laue-Langevin |
<http://www.ill.eu/>), 126, 142
LPSC (Laboratoire de Physique Subatomique et
de Cosmologie | <http://lpscwww.in2p3.fr/>),
111, 126

Lyon

- ENS Lyon (Ecole Normale Supérieure de Lyon;
Laboratoire de Physique/CNRS |
<http://www.ens-lyon.eu/>), 26, 30
IPNL (Institute of Nuclear Physics of Claude
Bernard University Lyon 1 - IN2P3/CNRS |
<http://www.ipnl.in2p3.fr/>), 59
UCBL (Claude Bernard University Lyon 1 |
<http://www.univ-lyon1.fr/>), 11, 96

Marseille

- CPT (Centre of Theoretical Physics |
<http://www.cpt.univ-mrs.fr/>), 26, 30
UPC (University Paul Cézanne - Aix-Marseille
III | <http://www.univ-cezanne.fr/>), 22

Metz

- UPV-M (Paul-Verlaine University of Metz |
<http://www.univ-metz.fr/>), 11, 166

Montpellier

- UM2 (University of Montpellier 2 |
<http://www.univ-montp2.fr/>), 11

Nantes

- SUBATECH (Laboratoire de Physique
Subatomique et des Technologies Associées;
UMR/EMN/IN2P3/CNRS et de l'Université
de Nantes | <http://www-subatech.in2p3.fr/>),
26, 30, 78, 93, 96, 166

Nice

- UN (University Nice Sophia Antipolis |
<http://unice.fr/>), 22

Orsay

- CSNSM (Centre de Spectrométrie Nucléaire et
de Spectrométrie de Masse - IN2P3/CNRS |
<http://www-csnm.in2p3.fr/>), 17, 106, 115
IPN Orsay (Institute of Nuclear Physics Orsay -
IN2P3/CNRS | <http://ipnweb.in2p3.fr/>), 17,
90, 96, 107, 111
LAL (Laboratoire de l'Accélérateur Linéaire;
Université de Paris-Sud 11 - IN2P3/CNRS |
<http://www.lal.in2p3.fr/>), 42, 115

Palaiseau

- Polytech (Ecole Polytechnique |
<http://www.polytechnique.fr/>), 26

Paris

- College de France (College de France |
<http://www.college-de-france.fr/>), 35
ENS (École Normale Supérieure Paris |
<http://www.ens.fr/>), 26, 31
LPTHE (Laboratoire de Physique Théorique et
Hautes Energies et Université Pierre et Marie
Curie - IN2P3/CNRS |
<http://parthe.lpthe.jussieu.fr/>), 26, 31
UPMC (Pierre et Marie Curie University Henri
Poincaré Institute Paris 6 |
<http://www.upmc.fr/>), 22, 31, 35

Saclay

IRFU (Institute of Research into the Fundamental Laws of the Universe | <http://irfu.cea.fr/>), 11, 59, 65, 85, 96, 119
LLB (Léon Brillouin Laboratory CEA-CNRS | <http://www-llb.cea.fr/>), 126, 134, 142
SPhN CEA DAPNIA (Service de Physique Nucléaire Commissariat à l'Energie Atomique Département d'Astrophysique, de Physique des Particules, de Physique Nucléaire et l'Instrumentation Associée (Gif-sur-Yvette) | <http://irtu.cea.fr/sphn>), 11, 107

Strasbourg

CRN (Centre of Nuclear Research - IN2P3/CNRS | <http://ireswww.in2p3.fr/>), 96, 107
IPHC (Institut Pluridisciplinaire Hubert Curien de l'Université de Strasbourg - IN2P3/CNRS | <http://www.iphc.cnrs.fr/>), 35, 47, 59, 107, 126

Valenciennes

UVHC (University of Valenciennes and Hainaut-Combrésis | <http://www.univ-valenciennes.fr/>), 22, 26, 31

Vannes

SigmaPhi (Company SigmaPhi Accelerator Technologies | <http://www.sigmaphi.fr/>), 111

Georgia

Tbilisi

AIP (Elevter Andronikashvili Institute of Physics of the Ivane Javakishvili Tbilisi State University | <http://aiphysics.ge/>), 59, 78, 126
GRENA (Georgian Research and Educational Networking Association | <http://www.grena.ge/>), 161
GTU (Georgia Technical University | <http://www.gtu.ge/>), 166
HEPI-TSU (High Energy Physics Institute of Ivane Javakishvili Tbilisi State University | <http://www.hepi.edu.ge/>), 42, 44, 59, 119
RMI TSU (Andrea Razmadze Mathematical Institute of the Ivane Javakishvili Tbilisi State University | <http://www.rmi.ge/>), 11, 166
TSU (Ivane Javakishvili Tbilisi State University | <http://www.tsu.ge/>), 70, 161, 166
UG (University of Georgia | <http://www.ug.edu.ge/>), 161, 166

Germany

Aachen

RWTH (Aachen University | <http://www.rwth-aachen.de/>), 11, 59, 119

Bayreuth

Univ. (University of Bayreuth | <http://www.uni-bayreuth.de/>), 134

Berlin

FU Berlin (Free University of Berlin | <http://www.fu-berlin.de/>), 11, 26, 166
HUB (Humboldt University of Berlin | <http://www.hu-berlin.de/>), 11, 26, 31, 59, 166
HZB (Helmholtz Zentrum Berlin of the Helmholtz Association | <http://www.helmholtz-berlin.de/>), 107, 134, 142

Bielefeld

Univ. (University of Bielefeld | <http://www.uni-bielefeld.de/>), 11, 26, 65

Bochum

RUB (Ruhr University of Bochum | <http://www.ruhr-uni-bochum.de/>), 11, 65, 85, 134

Bonn

UniBonn (University of Bonn | <http://www3.uni-bonn.de/>), 11, 17, 22, 26, 31, 65, 166

Braunschweig

TU (Technical University Carolo-Wilhelmina at Braunschweig | <http://www.tu-braunschweig.de/>), 22

Bremen

Univ. (University of Bremen | <http://www.uni-bremen.de/>), 22

Cologne

Univ. (University of Cologne | <http://www.uni-koeln.de/>), 17, 119

Darmstadt

GSi (Helmholtz-Centre for Heavy Ion Research of the Helmholtz Association | <http://www.gsi.de/>), 17, 22, 50, 54, 70, 78, 82, 90, 96, 107, 111, 126, 145, 161, 166
TU Darmstadt (Technische University of Darmstadt | <http://www.tu-darmstadt.de/>), 17, 90, 101, 134

Dortmund

TU Dortmund (Technical University of Dortmund | <http://www.uni-dortmund.de/>), 11, 22, 26, 134

Dresden

HZDR (Dresden-Rossendorf Helmholtz Centre | <http://www.hzdr.de/>), 17, 54, 90, 119, 126
IFW (Leibniz Institute for Solid State and Materials Research Dresden | <http://www.ifw-dresden.de/>), 22, 166
MPI PkS (Max Planck Institute for the Physics of Complex Systems | <http://www.mpi-pks-dresden.mpg.de/>), 22
TU Dresden (Technical University of Dresden | <http://tu-dresden.de/>), 22, 85

- Duisburg*
UDE (University of Duisburg-Essen | <http://www.uni-due.de/>), 22
- Erlangen*
FAU (Friedrich Alexander University of Erlangen-Nuremberg | <http://www.uni-erlangen.org/>), 11, 17, 65, 78
- Frankfurt/Main*
FIAS (Frankfurt Institute for Advanced Studies | <http://fias.uni-frankfurt.de/>), 78
Univ. (Goethe University of Frankfurt on Main | <http://www.uni-frankfurt.de/>), 17, 31, 54, 69, 78, 90, 97, 107, 161, 166
- Freiberg*
TUBAF (Technical University Bergakademie of Freiberg | <http://tu-freiberg.de/>), 134
- Freiburg*
Univ. (Albert-Ludwigs University of Freiburg | <http://www.uni-freiburg.de/>), 65
- Göttingen*
Univ. (University of Göttingen | <http://www.uni-goettingen.de/>), 134
- Geesthacht*
GKSS (Research Center in Geesthacht of the Helmholtz Association | <http://www.hzg.de/>), 134
- Giessen*
JLU (Justus Liebig University Giessen | <http://www.uni-giessen.de/>), 17, 78, 90, 166
- Halle*
MLU (Martin-Luther University of Halle-Wittenberg | <http://www.uni-halle.de/>), 134
- Hamburg*
DESY (Deutsches Elektronen-Synchrotron of the Helmholtz Association | <http://www.desy.de/>), 11, 31, 35, 65, 82, 134, 161
Univ. (University of Hamburg | <http://www.uni-hamburg.de/>), 17
- Hannover*
LUH (Leibniz University of Hannover | <http://www.uni-hannover.de/>), 26, 31
- Heidelberg*
MPIK (Max Planck Institute for Nuclear Physics | <http://www.mpi-hd.mpg.de/>), 47, 65, 82, 115
Univ. (University of Heidelberg | <http://www.uni-heidelberg.de/>), 11, 54, 90, 93, 97, 119, 142, 166
- Jülich*
FZJ (Research Centre Jülich of the Helmholtz Association | <http://www.fz-juelich.de/>), 11, 69, 78, 85, 101, 119, 134, 143, 156, 166
- Jena*
Univ. (Friedrich-Schiller University of Jena | <http://www.uni-jena.de/>), 11, 26, 31
- Kaiserslautern*
TU (Technical University of Kaiserslautern | <http://www.uni-kl.de/>), 11
- Karlsruhe*
KIT (Karlsruhe Institute of Technology | <http://www.kit.edu/>), 11, 59, 134, 143, 161
- Kassel*
Uni Kassel (University of Kassel | <http://www.uni-kassel.de/>), 166
- Kiel*
CAU (Christian Albrechts Kiel University | <http://www.uni-kiel.de/>), 134
IFM-GEOMAR (Leibniz Institute for Marine Science of the Kiel University | <http://www.geomar.de/>), 134
- Leipzig*
UoC (University of Leipzig | <http://www.zv.uni-leipzig.de/>), 17, 22, 26, 31, 134
- Münster*
Univ. (University of Münster | <http://www.uni-muenster.de/>), 97, 119
- Magdeburg*
OVGU (Otto-von-Guericke University Magdeburg | <http://www.uni-magdeburg.de/>), 22, 142
- Mainz*
JGU (Johannes Gutenberg University of Mainz | <http://www.uni-mainz.de/>), 12, 17, 56, 65, 115, 126
- Marburg*
Univ. (Philipps University of Marburg | <http://www.uni-marburg.de/>), 97, 101, 166
- Munich*
LMU (Ludwig Maximilians University of Munich | <http://www.uni-muenchen.de/>), 12, 65, 69, 161
MPI-P (Max Planck Institute for Physics of Munich | <http://www.mpp.mpg.de/>), 26, 31, 35, 42, 47
TUM (Technical University of Munich | <http://portal.mytum.de/>), 65, 90, 126, 142
- Potsdam*
AEI (Max Planck Institute for Gravitational Physics (Albert Einstein Institute) | <http://www.aei-potsdam.mpg.de/>), 26, 31
IASS (Institute for Advanced Sustainability Studies e.V. | <http://www.iass-potsdam.de/>), 166
- Quedlinburg*
IST (Ionen Strahl Technologie GmbH | <http://www.istechnologie.de/>), 145

MiCryon Technik (MiCryon Technik GmbH |
<http://www.micryon.de/>), 145

Regensburg

UR (University of Regensburg |
<http://www.uni-regensburg.de/>), 12, 17, 78,
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Rostock

Univ. (University of Rostock |
<http://www.uni-rostock.de/>), 12, 17, 22, 31,
134

Siegen

Univ. (University of Siegen |
<http://www.uni-siegen.de/>), 17, 90

Stuttgart

MPI-FKF (Max Planck Institute for Solid State
Research | <http://www.fkf.mpg.de/>), 22, 134
MPI-MF (Max Planck Institute for Metals
Research | <http://www.mf.mpg.de/>), 119

Tübingen

Univ. (Eberhard Karls University of Tübingen |
<http://www.uni-tuebingen.de/>), 12, 107, 126,
166

Wuppertal

Univ. (University of Wuppertal |
<http://www.uni-wuppertal.de/>), 12, 22

Zeuthen

DESY (Deutsches Elektronen-Synchrotron of the
Helmholtz Association |
<http://www.desy.de/>), 12, 31, 35, 82, 143, 161

Greece

Athens

AUA (Agricultural University of Athens |
<http://www.aua.gr/>), 126
INP NCSR “Demokritos” (Institute of Nuclear
Physics of the National Centre for Scientific
Research “Demokritos” |
<http://www.inp.demokritos.gr/>), 17, 59
UoA (National and Kapodistrian University of
Athens | <http://www.uoa.gr/>), 26, 31, 42, 44,
59, 82, 97

Ioannina

UI (University of Ioannina |
<http://www.uoi.gr/>), 60

Thessaloniki

AUTH (Aristotle University of Thessaloniki |
<http://www.auth.gr/>), 17, 101, 166

Hungary

Budapest

ELTE (Eötvös Loránd University |
<http://www.elte.hu/>), 12, 145
Wigner RCP (Institute for Particle and Nuclear
Physics, Wigner Research Centre for Physics
of the Hungarian Academy of Science |

<http://wigner.mta.hu/>), 12, 17, 22, 26, 31, 47,
60, 97, 134, 143

Debrecen

Atomki (Institute of Nuclear Research of the
Hungarian Academy of Science |
<http://www.atomki.hu/>), 17, 60

UD (University of Debrecen |
<http://www.unideb.hu/>), 60

Gödöllő

SZIU (Szent István University |
<http://www.sziu.hu/>), 126

Szeged

US (Univesity of Szeged |
<http://www.u-szeged.hu/>), 134

India

Aligarh

AMU (Aligarh Muslim University |
<http://www.amu.ac.in/>), 97

Bhubaneswar

IOP (Institute of Physics of Bhubaneswar |
<http://www.iopb.res.in/>), 60, 97

Calcutta

BNC (S.N.Bose National Centre for Basic
Sciences | <http://www.bose.res.in/>), 26, 31
SINP (Saha Institute of Nuclear Physics |
<http://www.saha.ernet.in/>), 97
VECC (Variable Energy Cyclotron Centre of the
Department of Atomic Energy |
<http://www.veccl.ernet.in/>), 97

Chandigarh

PU (Panjab University |
<http://www.puchd.ac.in/>), 60, 97

Jaipur

Univ. (University of Rajasthan |
<http://www.uniraj.ernet.in/>), 90, 101

Jammu

Univ. (University of Jammu |
<http://www.jammuuniversity.in/>), 97

Manipal

MU (Manipal University |
<http://www.manipal.edu/>), 107

Mumbai

BARC (Bhabha Atomic Research Centre of the
Department of Atomic Energy |
<http://www.barc.ernet.in/>), 60, 90, 101
TIFR (Tata Institute of Fundamental Research |
<http://www.tifr.res.in/>), 22, 60

Pune

IUCAA (Inter-University Centre for Astronomy
and Astrophysics |
<http://www.iucaa.ernet.in/>), 166

Iran

Tehran

IPM (Institute for Studies in Theoretical Physics and Mathematics of the Institute for Research Fundamental Sciences | <http://www.ipm.ac.ir/IPM/>), 60

Ireland

Dublin

DIAS (Dublin Institute for Advanced Studies | <http://www.dias.ie/>), 22

Israel

Haifa

IOE (Institute of Evolution of the University of Haifa | <http://evolution.haifa.ac.il/>), 154

Rehovot

WIS (Weizmann Institute of Science | <http://www.weizmann.ac.il/>), 31, 42

Tel Aviv

TAU (Tel Aviv University | <http://www.tau.ac.il/>), 65

Italy

Bari

INFN (National Institute for Nuclear Physics, Section of Bari | <http://www.ba.infn.it/>), 12, 26, 47, 60, 97

UniBa (University of Bari Aldo Moro | <http://www.uniba.it/>), 47, 166

Bologna

Centro, ENEA (Bologna Research Centre of the Italian National Agency for New Technologies, Energy and the Environment | <http://www.bologna.enea.it/>), 17

INFN (National Institute for Nuclear Physics, Section of Bologna | <http://www.bo.infn.it/>), 60, 97

Cagliari

INFN (National Institute for Nuclear Physics, Section of Cagliari | <http://www.ca.infn.it/>), 97

Catania

INFN LNS (National Institute for Nuclear Physics, National Laboratory of the South | <http://www.lns.infn.it/>), 60, 107, 111

UniCT (University of Catania | <http://www.unict.it/>), 22, 97

Ferrara

INFN (National Institute for Nuclear Physics, Section of Ferrara | <http://www.fe.infn.it/>), 56

UniFe (University of Ferrara | <http://www.unife.it/>), 119

Florence

INFN (National Institute for Nuclear Physics, Section of Florence | <http://www.fi.infn.it/>),

56, 60

Frascati

INFN LNF (National Institute for Nuclear Physics, National Laboratory of Frascati | <http://www.lnf.infn.it/>), 26, 31, 39, 44, 56, 65, 82, 119

Genoa

INFN (National Institute for Nuclear Physics, Section of Genoa | <http://www.ge.infn.it/>), 47, 60

Kosenza

UniCal (University of Calabria | <http://www.unical.it/>), 69

Legnaro

INFN LNL (National Institute for Nuclear Physics, Legnaro National Laboratories | <http://www.lnl.infn.it/>), 47, 97, 107

Messina

UniMe (University of Messina | <http://www.unime.it/>), 17, 39, 107

Milan

INFN (National Institute for Nuclear Physics, Section of Milan | <http://www.mi.infn.it/>), 47

UNIMI (University of Milan | <http://www.unimi.it/>), 47

Naples

INFN (National Institute for Nuclear Physics, Section of Naples | <http://www.na.infn.it/>), 12, 17, 26, 47

UNINA (University of Naples Federico II | <http://www.unina.it/>), 107

Padua

INFN (National Institute for Nuclear Physics, Section of Padua | <http://www.pd.infn.it/>), 60, 97

UniPd (University of Padua | <http://www.unipd.it/>), 12, 27, 31, 48

Pavia

INFN (National Institute for Nuclear Physics, Section of Pavia | <http://www.pv.infn.it/>), 12, 27, 31, 48, 60

Perugia

INFN (National Institute for Nuclear Physics, Section of Perugia | <http://www.pg.infn.it/>), 17, 48, 56, 60

Pisa

INFN (National Institute for Nuclear Physics, Section of Pisa | <http://www.pi.infn.it/>), 12, 27, 31, 42, 44, 56, 60, 82

UniPi (University of Pisa | <http://www.unipi.it/>), 44

Rome

ENEA (Italian National Agency for New Technologies, Energy and Environment | <http://www.enea.it/>), 126

INFN (National Institute for Nuclear Physics,
Section of Rome | <http://www.roma1.infn.it/>),
48, 56, 60, 97

Univ. “La Sapienza” (University of Roma “La
Sapienza” | <http://www.uniroma1.it/>), 119,
152

Univ. “Tor Vergata” (University of Rome “Tor
Vergata” | <http://web.uniroma2.it/>), 56

Salerno

INFN (National Institute for Nuclear Physics,
Section of Naples | <http://www.sa.infn.it/>), 97

UniSa (University of Salerno |
<http://www3.unisa.it/>), 22, 27, 31

Trieste

INFN (National Institute for Nuclear Physics,
Section of Trieste | <http://www.ts.infn.it/>),
39, 48, 65

SISSA/ISAS (International School for Advanced
Studies | <http://www.sissa.it/>), 12, 27, 31

Turin

INFN (National Institute for Nuclear Physics,
Section of Turin | <http://www.to.infn.it/>), 27,
31, 56, 60, 65, 78, 97, 119, 166

UniTo (University of Turin |
<http://www.unito.it/>), 12, 17, 35, 50

Udine

UNIUD (University of Udine |
<http://www.uniud.it/>), 44, 150

Vercelli

UPO (Amedeo Avogadro Piemonte Eastern
University | <http://www.unipmn.it/>), 97

Viterbo

UNTUS (University of Tuscia |
<http://www3.unitus.it/>), 152

Japan

Chiba

NIRS (National Institute of Radiological
Sciences | <http://www.nirs.go.jp/>), 122

Toho Univ. (Toho University Foundation |
<http://www.toho-u.ac.jp/>), 65

Fukuoka

Kyushu Univ. (Kyushu University |
<http://www.kyushu-u.ac.jp/>), 27

Hiroshima

Hiroshima Univ. (Hiroshima University |
<http://www.hiroshima-u.ac.jp/>), 85

Ibaraki

Ibaraki Univ. (Ibaraki University |
<http://www.ibaraki.ac.jp/>), 37

Kobe

Kobe Univ. (Kobe University |
<http://www.kobe-u.ac.jp/>), 18

Kyoto

KSU (Kyoto Sangyo University |
<http://www.kyoto-su.ac.jp/>), 27, 31, 39, 126

Kyoto Univ. (Kyoto University |
<http://www.kyoto-u.ac.jp/>), 12, 37, 119

RIMS (Research Institute for Mathematical
Sciences of Kyoto University |

<http://www.kurims.kyoto-u.ac.jp/>), 27, 31

YITP (Yukawa Institute for Theoretical Physics
of Kyoto University |

<http://www.yukawa.kyoto-u.ac.jp/>), 27

Morioka

Iwate Univ. (Iwate University |
<http://www.iwate-u.ac.jp/>), 18

Nagano

Shinshu Univ. (Shinshu University |
<http://www.shinshu-u.ac.jp/>), 134

Nagoya

Meiji Univ. (Meiji University |
<http://www.meiji.ac.jp/cip/>), 12

Nagoya Univ. (Nagoya University |
<http://www.nagoya-u.ac.jp/>), 12, 47, 65, 78

Osaka

ISIR (Institute of Scientific and Industrial
Research of Osaka University |

<http://www.sanken.osaka-u.ac.jp/>), 138

Kansai Univ. (Kansai University-Osaka |
<http://www.kansai-u.ac.jp/>), 166

OCU (Osaka City University |
<http://www.osaka-cu.ac.jp/>), 65

Osaka Univ. (Osaka University |
<http://www.osaka-u.ac.jp/>), 18, 37, 119

RCNP (Research Centre for Nuclear Physics of
Osaka University |

<http://www.rcnp.osaka-u.ac.jp/>), 18, 37, 69,
86, 90

Saga

Saga Univ. (Saga University |
<http://www.saga-u.ac.jp/>), 37

Sapporo

Hokkaido Univ. (Hokkaido University |
<http://www.hokudai.ac.jp/>), 138

Sendai

Tohoku Univ. (Tohoku University |
<http://www.tohoku.ac.jp/>), 65

Tokai

JAEA (Japan Atomic Energy Agency |
<http://www.jaea.go.jp/>), 107

Tokyo

TMU (Tokyo Metropolitan University |
<http://www.tmu-u.ac.jp/>), 39

UT (University of Tokyo; Centre for Nuclear
Study (CNS); Institute for Cosmic Ray
Research; Institute Centre for Elementary
Particle Physics (ICEPP) |
<http://www.u-tokyo.ac.jp/>), 12, 17, 85, 90

Tsukuba

KEK (High Energy Accelerator Research Organization | <http://legacy.kek.jp/>), 12, 27, 31, 35, 37, 39, 66, 82, 119, 126
Univ. (University of Tsukuba | <http://www.tsukuba.ac.jp/>), 90

Wako

RIKEN (RIKEN Wako Institute of the Institute of Physical and Chemical Research | <http://www.riken.go.jp/>), 52, 107

Yamagata

Yamagata Univ. (Yamagata University | <http://www.yamagata-u.ac.jp/>), 37, 66

Yokohama

RIKEN (RIKEN Yokohama Institute of the Institute of Physical and Chemical Research | <http://www.riken.go.jp/>), 150

Kazakhstan

Almaty

FAPI (Fesenkov's Astrophysical Institute | <http://www.aphi.kz/>), 12
INP NNC RK (Institute of Nuclear Physics of the National Nuclear Centre of the Republic of Kazakhstan | <http://www.inp.kz/>), 18, 101, 107, 111, 115, 145, 166
IPT (Institute of Physics and Technology of the Ministry of Sciences of the Republic of Kazakhstan | <http://www.sci.kz/>), 90, 93, 101, 145, 166
KNU (Al-Farabi Kazakh National University | <http://www.kaznu.kz/>), 18, 173

Astana

BA INP NNC RK (Branch of the Astana Institute of Nuclear Physics of the National Nuclear Centre of the Republic of Kazakhstan | <http://www.inp.kz/>), 12, 111
ENU (L.N.Gumilyov Eurasian National University | <http://www.enu.kz/>), 107

Ust-Kamenogorsk

TRCE (Training and Research Centre of Ecology of the S.Amanzholov East Kazakhstan State University | <http://www.vkgu.kz/>), 126

Latvia

Riga

IPE (Institute of Physical Energetics | <http://www.innovation.lv/fei/>), 134
IPUL (Institute of Physics of the University of Latvia | <http://ipul.lv/>), 126
ISSP UL (Institute of Solid State Physics of the University of Latvia | <http://www.cfi.lu.lv/>), 134, 156

Macedonia

Skopje

UKiM (Ss. Cyril and Methodius University-Skopje | <http://www.ukim.edu.mk/>), 126

Mexico

Cuernavaca

UNAM (National Autonomous University of Mexico | <http://www.unam.mx/>), 12

Leon

UG (University of Guanajuato | <http://www.ugto.mx/>), 27, 31

Mexico

Cinvestav (Centre for Advanced Investigations and Studies of the National Polytechnical Institute | <http://www.cinvestav.mx/>), 60

Puebla

BUAP (Autonomous University of Puebla | <http://www.buap.mx/>), 52

San Luis Potosi

UASLP (Autonomous University of San Luis Potosi | <http://www.uaslp.mx/>), 56

Moldova

Chişinău

ASM (Academy of Sciences of Moldova | <http://www.asm.md/>), 161, 174
IAP ASM (Institute of Applied Physics of the Academy of Sciences of Moldova | <http://www.phys.asm.md/>), 18, 23, 79, 101, 145, 161, 166
IC ASM (Institute of Chemistry of the Academy of Sciences of Moldova | <http://chem.asm.md/>), 134
IEEM ASM (Chitu Institute of the Electronic Engineering and Nanotechnologies of the Academy of Sciences of Moldova | <http://nano.asm.md/>), 156
IMB ASM (Institute of Microbiology and Biotechnology of the Academy of Sciences of Moldova | <http://www.imb.asm.md/>), 126
IMCS ASM (Institute of Mathematics and Computer Science of the Academy of Sciences of Moldova | <http://www.math.md/>), 161
RENAM (Research and Educational Networking Association of Moldova | <http://www.renam.md/>), 161
SUM (State University of Moldova | <http://usm.md/>), 78, 156
TUM (Technical University of Moldova | <http://www.utm.md/>), 156

Mongolia

Ulaanbaatar

- CGL (Central Geological Laboratory | <http://www.cengeolab.com/>), 126
- II MAS (Institute of Informatics of the Mongolian Academy of Sciences | <http://www.informatic.ac.mn/>), 161
- IPT MAS (Institute of Physics and Technology of the Mongolian Academy of Sciences | <http://www.mas.ac.mn/>), 12, 54, 90, 97, 101, 134
- MUST (Mongolian University of Science and Technology | <http://www.must.edu.mn/>), 134, 138, 161
- NEA (Nuclear Energy Agency of Mongolia), 90, 115
- NRC NUM (Nuclear Research Center of the National University of Mongolia | <http://www.num.edu.mn/nrc/>), 111, 115
- NUM (National University of Mongolia | <http://www.num.edu.mn/>), 12, 23, 107, 126, 145, 150, 161, 166

Netherlands

Amsterdam

- NIKHEF (National Institute for Subatomic Physics | <http://www.nikhef.nl/>), 42, 66, 97

Delft

- TU Delft (Delft University of Technology | <http://www.tudelft.nl/>), 120

Utrecht

- UU (University of Utrecht | <http://www.uu.nl/>), 97

New Zealand

Auckland

- Univ. (University of Auckland | <http://www.auckland.ac.nz/uoa/>), 60

Christchurch

- UC (University of Canterbury | <http://www.canterbury.ac.nz/>), 60

Hamilton

- Univ. (University of Waikato | <http://www.waikato.ac.nz/>), 12

Norway

Bergen

- UiB (University of Bergen | <http://www.uib.no/>), 18, 97

Oslo

- UiO (University of Oslo | <http://www.uio.no/>), 18, 97

Trondheim

- NGU (Geological Survey of Norway | <http://www.ngu.no/>), 134

- NTNU (Norwegian University of Science and Technology | <http://www.ntnu.no/>), 12, 27, 126, 152

Pakistan

Islamabad

- QAU (Quaid-i-Azam University | <http://www.qau.edu.pk/>), 60

Poland

Gdansk

- GUT (Gdańsk University of Technology | <http://www.pg.gda.pl/>), 126

Katowice

- US (University of Silesia in Katowice | <http://www.us.edu.pl/>), 22

Kielce

- UJK (Jan Kochanowski University of Humanities and Science | <http://www.ujk.edu.pl/>), 12

Krakow

- AGH (AGH University of Science and Technology | <http://www.agh.edu.pl/>), 115, 138, 166

- CYFRONET (Academic Computer Centre CYFRONET of the AGH-University Science and Technology | <http://www.cyfronet.pl/>), 161

- JU (Jagiellonian University in Kraków | <http://www.uj.edu.pl/>), 22, 27, 35, 134, 174

- NINP PAS (Henryk Niewodniczański Institute of Nuclear Physics of the Polish Academy of Sciences | <http://www.ifj.edu.pl/>), 12, 18, 27, 82, 90, 97, 101, 107, 111, 115, 120, 122, 126, 134, 150, 154

Lodz

- UL (University of Łódź | <http://www.uni.lodz.pl/>), 12, 27, 90, 126, 174

Lublin

- MCSU (Marie Curie-Skłodowska University in Lublin | <http://www.umcs.lublin.pl/>), 79, 115, 126, 134, 146

Opole

- OU (Opole University | <http://www.uni.opole.pl/>), 126

Otwock-Swierk

- NCBJ (National Centre for Nuclear Research | <http://www.ncbj.gov.pl/>), 12, 18, 31, 60, 79, 86, 90, 97, 101, 107, 115, 120, 126, 154, 166

Poznan

- AMU (Adam Mickiewicz University in Poznań | <http://www.guide.amu.edu.pl/>), 22, 107, 126, 134, 152, 161, 174

- GPCC (Greater Poland Cancer Center | <http://www.wco.pl/>), 154

- IMP PAS (Institute of Molecular Physics of the Polish Academy of Sciences |

<http://www.ifmpan.poznan.pl/>), 22

Rzeszow

UR (University of Rzeszów |
<http://www.univ.rzeszow.pl/>), 166

Siedlce

UNSH (University of Natural Sciences and
Humanities in Siedlce |
<http://www.uph.edu.pl/>), 134

Szczecin

WPUT (West Pomeranian University of
Technology in Szczecin |
<http://www.zut.edu.pl/>), 134

Torun

NCU (Nicolaus Copernicus University |
<http://www.umk.pl/>), 146

Warsaw

CAC PAS (N.Copernicus Astronomical Centre of
the Polish Academy of Sciences |
<http://www.camk.edu.pl/>), 27

ETI (Elektrotechnical Institute |
<http://www.iel.waw.pl/>), 79, 97

INCT (Institute of Nuclear Chemistry and
Technology | <http://www.ichtj.waw.pl/>), 134,
145, 150

IPCh PAS (Institute of Physical Chemistry of
the Polish Academy of Sciences |
<http://ichf.edu.pl/>), 22

ITR (Tele and Radio Research Institute |
<http://www.itr.org.pl/>), 145

UW (University of Warsaw |
<http://www.uw.edu.pl/>), 18, 27, 31, 60, 107,
111

WUT (Warsaw University of Technology |
<http://www.pw.edu.pl/>), 18, 22, 54, 66, 79,
90, 97, 101

Wroclaw

ILTSR PAS (Institute of Low Temperature and
Structure Research of the Polish Academy of
Sciences | <http://www.int.pan.wroc.pl/>), 79

UW (University of Wroclaw |
<http://www.uni.wroc.pl/>), 27, 31, 134

WUT (Wroclaw University of Technology |
<http://www.pwr.wroc.pl/>), 134, 161

Portugal

Coimbra

UC (University of Coimbra |
<http://www.uc.pt/>), 166

Republic of Korea

Chongju

CBNU (Chungbuk National University |
<http://www.chungbuk.ac.kr/>), 37, 60

Daejeon

IBS (Institute for Basic Science |
<http://www.ibs.kr/>), 18

Gangneung

GWNU (Gangneung-Wonju National University
| <http://www.gwnu.ac.kr/>), 97

Kwangju

CNU (Chonnam National University |
<http://www.jnu.ac.kr/>), 60

Naju

DU (Dongshin University; Laboratory for High
Energy Physics | <http://www.dsu.ac.kr/>), 60

Namwon

SU (Seonam University |
<http://www.seonam.ac.kr/>), 60

Pohang

PAL (Pohang Accelerator Laboratory |
<http://pal.postech.ac.kr/>), 126

Pusan

PNU (Pusan National University |
<http://www.pusan.ac.kr/>), 37

Seoul

EWU (Ewha Womans University | <http://www.ewha.ac.kr/>), 52

KU (Korea University |
<http://www.korea.ac.kr/>), 60

Konkuk Univ. (Konkuk University |
<http://www.kku.ac.kr/>), 60

SNU (Seoul National University |
<http://www.snu.ac.kr/>), 12, 18, 37

SNUE (Seoul National University of Education |
<http://www.snue.ac.kr/>), 60

Taejeon

KAERI (Korea Atomic Energy Research
Institute | <http://www.kaeri.re.kr:8080/>), 126

Romania

Baia Mare

NUBM (North University of Baia Mare |
<http://www.ubm.ro/>), 126

Bucharest

IFA (Institute of Atomic Physics |
<http://www.ifa-mg.ro/>), 39, 161, 166

IFIN-HH (Horia Hulubei National Institute of
Physics and Nuclear Engineering |
<http://www.nipne.ro/>), 18, 22, 27, 31, 44, 54,
56, 79, 91, 107, 111, 115, 120, 126, 134, 138,
143, 156, 161, 166

INC DIE ICPE-CA (National Institute of
Research and Development in Electrical
Engineering ICPE-CA | Institutul National de
Cercetare pentru Inginerie Electrica ICPE-CA |
<http://www.icpe-ca.ro/>), 79, 86, 91, 102, 126,
134, 143

INFLPR (National Institute for Laser, Plasma
and Radiation Physics |
<http://www.inflpr.ro/>), 146

INOE2000 (National Institute for Research and
Development in Optoelectronics |

<http://inoe.inoe.ro/>), 79
 ISS (Institute for Space Sciences | <http://www2.space-science.ro/>), 52, 91, 97, 101, 126, 134, 150, 166
 NIMP (National Institute of Materials Physics | <http://www.infim.ro/>), 134
 N&V (<http://www.nuclearvacuum.ro/>), 111
 UB (University of Bucharest | <http://www.unibuc.ro/>), 18, 91, 115, 126, 134, 152, 154, 166, 174
 UMF (Carol Davila University of Medicine | <http://www.unf.ro/>), 102, 150, 154
 UPB (University Politehnica of Bucharest | <http://www.upb.ro/>), 134, 156
 UTM (Titu Maiorescu University | <http://www.utm.ro/>), 134
Cluj-Napoca
 INCDTIM (National Institute for Research and Development of Isotopic and Molecular Technologies | <http://www.itim-cj.ro/>), 134, 161, 166
 UBB (Babeş-Bolyai University | <http://www.ubbcluj.ro/>), 135
Constanţa
 NIMRD (National Institute for Marine Research and Development “Grigore Antipa” | <http://www.rmri.ro/>), 127
 UOC (“Ovidius” University of Constanta | <http://www.univ-ovidius.ro/>), 91, 127
Craiova
 UC (University of Craiova | <http://www.ucv.ro/>), 134
Galaţi
 UG (University of Galaţi | <http://www.ugal.ro/>), 127
Iaşi
 IBR (Institute of Biological Research Iaşi of the National Institute of Research and Development for Biological Sciences | <http://www.dbioro.eu/>), 150
 NIRDTP (National Institute of Research and Development for Technical Physics | <http://www.phys-iasi.ro/>), 135
 UAI (University “Apollonia” of Iaşi | <http://www.univapollonia.ro/>), 135
 UAIC (Alexandru Ioan Cuza University of Iaşi | <http://www.uaic.ro/>), 102, 127, 135, 150
Oradea
 UO (University of Oradea Romania | <http://www.uoradea.ro/>), 127
Piteşti
 SCN (Institute for Nuclear Research - Piteşti | <http://www.nuclear.ro/>), 127, 135

Râmnicu Vâlcea
 ICSI (National Research and Development Institute for Cryogenics and Isotopic Technologies | <http://www.icsi.ro/>), 127
Târgovişte
 UVT (VALAHIA University of Târgovişte | <http://www.valahia.ro/>), 127, 143
Timişoara
 CFATR (Center for Fundamental and Advanced Technical Research of the Romanian Academy, Branch Timişoara Filiala Timişoara | <http://acad-tim.tm.edu.ro/cctfa>), 120
 LMF CFATR (Laboratory of Magnetic Fluids of the Center for Fundamental and Advanced Technical Research of the Romanian Academy, Branch Timişoara | <http://acad-tim.tm.edu.ro/cctfa>), 135
 UVT (West University of Timişoara | <http://www.uvt.ro/>), 22, 135

Russia

Alexandrov
 VNIISIMS (Russian Research Institute for the Synthesis of Minerals | <http://vniisims.da.ru/>), 120
Belgorod
 NRU BelSU (National Research University “Belgorod State University” | <http://www.bsue.ru/>), 12, 23, 79, 135, 167
Borok
 IBIW RAS (Federal State Budgetary Institution of Science “I.D.Papanin Institute for the Biology of Inland Waters of the Russian Academy of Sciences” | <http://ibiw.ru/>), 127
 IPE RAS (Federal State Budgetary Institution of Science “Schmidt Institute of the Physics of the Earth of the Russian Academy of Sciences” | <http://old.ifz.ru/>), 152
Cheboksary
 ChSU (Chuvash State University | <http://www.chuvsu.ru/>), 107
Cherkessk
 NCSHTA (North-Caucasian State Humanitarian Technological Academy | <http://www.kchgta.ru/>), 162
Chernogolovka
 IPTM RAS (Federal State Budgetary Institution of Science “Institute of Microelectronics Technology and High Purity Materials of the Russian Academy of Sciences” | <http://www.iptm-hpm.ac.ru/>), 127
 ISMAN RAS (Federal State Budgetary Institution of Science “Institute of Structural Macrokinetics and Materials Science of the Russian Academy of Sciences” | <http://www.ism.ac.ru/>), 91

- ISSP RAS (Federal State Budgetary Institution of Science "Institute of Solid State Physics of the Russian Academy of Sciences" | <http://issp3.issp.ac.ru/>), 135
- LITP RAS (Federal State Budgetary Institution of Science "L.D.Landau Institute for Theoretical Physics of the Russian Academy of Sciences" | <http://itp.ac.ru/>), 12, 27, 31, 162
- SCC IPCP RAS (Federal State Budgetary Institution of Science "Supercomputer Centre of the Institute of Problems of Chemical Physics of the Russian Academy of Sciences" | <http://www.icp.ac.ru/>), 162
- Dimitrovgrad*
- RIAR (Open Joint Stock Company "State Scientific Centre Research Institute of Atomic Reactors" Rosatom State Nuclear Energy Corporation, JSC "Atomenergoprom" | <http://www.niiar.ru/>), 107
- Dolgoprudny*
- MIPT (Moscow Institute of Physics and Technology (State University) | <http://mipt.ru/>), 135, 156, 174
- Dubna*
- Adm. of Dubna (Administration of Dubna | <http://naukograd-dubna.ru/>), 162
- BMSUT MIREA (Branch of the Moscow State University of Technology of Radioengineering, Electronics and Automation | <http://www.mirea.ru/>), 23, 174
- BSINP MSU (Branch of the Skobeltsyn Institute of Nuclear Physics of the Lomonosov Moscow State University | <http://www.msu.dubna.ru/>), 50, 101, 162, 174
- IAS "Omega" (Institute for Advanced Studies "Omega" | <http://dubna-oez.ru/>), 101
- IINC (Closed Joint Stock Company "International Innovation Nanotechnological Center" | <http://www.nanonewsnet.ru/>), 146
- IPTP (Institute in Physical and Technical Problems | <http://www.ittp.ru/>), 177
- RDH-9 (Radiological Department of Hospital № 9), 154
- Raduga (Open Joint Stock Company "Raduga" State Machine-Building Design Bureau" | <http://www.ktrv.ru/>), 52, 162
- SCC "Dubna" ("Dubna" Satellite Communication Centre, Branch of the Federal State Unitary Enterprise "Russian Satellite Communication Company" | <http://www.rsc.ru/>), 162
- SEZ "Dubna" (Special Economic Zone in Dubna | <http://dubna.rosuez.ru/>), 162
- Tensor (Open Joint Stock Company "Instrumental Plant "Tensor" | <http://www.tensor.ru/>), 162
- Trackpore Technology (Closed Joint Stock Company "Trackpore Technology" Membrane Technologies and the Future Branch of the Dubna | <http://www.trackpore.ru/>), 146
- "Dubna" Univ. (International University "Dubna" | <http://www.uni-dubna.ru/>), 127, 162, 174
- Fryazino*
- ISTOK (Federal State Unitary Enterprise "Scientific Industrial Enterprise "ISTOK" | <http://www.istokmw.ru/>), 79
- Gatchina*
- PNPI (Federal State Budgetary Institution "B.P.Konstantinov Petersburg Nuclear Physics Institute" of the National Research Centre "Kurchatov Institute" | <http://www.pnpi.spb.ru/>), 12, 18, 23, 31, 35, 48, 60, 66, 86, 97, 107, 115, 120, 127, 135, 143, 152, 162
- Irkutsk*
- ISU (Irkutsk State University | <http://www.isu.su/>), 13, 18
- LI SB RAS (Federal State Budgetary Institution of Science "Limnological Institute of the Siberian Branch of the Russian Academy of Sciences" | <http://www.lin.irk.ru/>), 127
- Ivanovo*
- ISU (Ivanovo State University | <http://www.ivanovo.ac.ru/>), 13
- ISUCT (Ivanovo State University of Chemistry and Technology | <http://main.isuct.ru/>), 127
- Izhevsk*
- UdSU (Udmurtia State University | <http://www.udsu.ru/>), 127
- Kazan*
- Compressormash (Open Joint Stock Company "Kazancompressormash" | <http://compressormash.ru/>), 79
- KFU (Kazan (Volga Region) Federal University | <http://www.kpfu.ru/>), 13, 23
- KNRTU (Kazan National Research Technological University | <http://www.kstu.ru/>), 135
- VNIIR (Federal State Unitary Enterprise "All-Russian Scientific-Research Institute of Flow Measurement" | <http://www.vniir.org/>), 177
- Korolev*
- RSC "Energia" (Open Joint Stock Company "S.P.Korolev Rocket and Space Corporation "Energia" | <http://www.energia.ru/>), 52
- Kostroma*
- KSU (Kostroma State University | <http://ksu.edu.ru/>), 174

Lytkarino

RISI (Federal State Unitary Enterprise
“Research Institute of Scientific Instruments” |
<http://www.niipriborov.ru/>), 146

Magnitogorsk

MagTU (Magnitogorsk State Technical
University named after G.I.Nosov |
<http://www.magtu.ru/>), 127

Moscow

ARRICT (Open Joint Stock Company “Leading
Research Institute of Chemical Technology” |
<http://www.vniht.ru/>), 37

Atomenergomach (“Atomenergomach” |
<http://www.cftp-aem.ru/>), 101, 127

CC RAS (Federal State Budgetary Institution of
Science “Dorodnicyn Computing Centre of the
Russian Academy of Sciences” |
<http://www.ccas.ru/>), 166

CIT&S (Federal State Research Institution
“Centre of Information Technologies and
Systems for Executive Power Authorities” |
<http://www.citis.ru/>), 161

Cryogenmash (Open Joint Stock Company
“Cryogenmash” |
<http://www.cryogenmash.ru/>), 79

ENES (LLC “Engineering Center of Nuclear
Equipment Strength” |
<http://www.icpmae.ru/>), 138

GC RAS (Federal State Budgetary Institution of
Science “Geophysical Center of the Russian
Academy of Sciences” |
<http://www.gcras.ru/>), 135

GEOKHI RAS (Federal State Budgetary
Institution of Science “Vernadsky Institute of
Geochemistry and Analytical Chemistry of the
Russian Academy of Sciences” |
<http://www.geokhi.ru/>), 107

GIN RAS (Federal State Budgetary Institution
of Science “Geological Institute of the Russian
Academy of Sciences” |
<http://www.ginras.ru/>), 127

GPI RAS (Federal State Budgetary Institution
of Science “General Physics Institute of the
Russian Academy of Sciences” |
<http://www.gpi.ru/>), 37, 111, 120, 146

Geliymash (Open Joint Stock Company
“Researching and Production Association of
Helium Engineering” | <http://geliymash.ru/>),
79, 138

IBMC RAMS (Institution of the Russian
Academy of Medical Sciences Institute of
Biomedical Chemistry of the Russian
Academy of Medical Sciences |
<http://www.ibmc.msk.ru/>), 135

IBMP RAS (Federal State Budgetary Institution
of Science “State Scientific Centre of the
Russian Federation - Institute for Biomedical
Problems of the Russian Academy of Sciences”
| <http://www.imbp.ru/>), 79, 150, 154

IC RAS (Federal State Budgetary Institution of
Science “A.V.Chubnikov Institute of
Crystallography of the Russian Academy of
Sciences” | <http://www.crys.ras.ru/>), 135, 146

IGEM RAS (Federal State Budgetary Institution
of Science “Institute of Geology of Ore
Deposits, Petrography, Mineralogy and
Geochemistry of the Russian Academy of
Sciences” | <http://www.igem.ru/>), 135, 152

IGIC RAS (Federal State Budgetary Institution
of Science “Kurnakov Institute of General and
Inorganic Chemistry of the Russian Academy
of Sciences” | <http://www.igic-ras.ru/>), 135

IITP RAS (Federal State Budgetary Institute of
Science “Institute for Information
Transmission Problems (Kharkevich Institute)
of the Russian Academy of Sciences” |
<http://www.iitp.ru/>), 161

IKI RAS (Federal State Budgetary Institution of
Science “Space Research Institute of the
Russian Academy of Sciences” |
<http://www.iki.rssi.ru/>), 127, 152

IMET RAS (Federal State Budgetary Institution
of Science “A.A.Baikov Institute of Metallurgy
and Materials Science of the Russian Academy
of Sciences” | <http://www.imet.ac.ru/>), 135

IMM RAS (Federal State Budgetary Institution
of Science “Institute for Mathematical
Modeling of the Russian Academy of Sciences”
| <http://www.imamod.ru/>), 12

INEUM (Open Joint Stock Company “Institute
of Electronic Control Computers named after
I.S.Bruk” | <http://www.ineum.ru/>), 138

INMI RAS (Federal State Budgetary Institution
of Science “Winogradsky Institute of
Microbiology of the Russian Academy of
Sciences” | <http://www.inmi.ru/>), 135

INTRA (Closed Joint Stock Company “INTRA”
| <http://www.intra-zao.ru/>), 115

IOC RAS (Federal State Budgetary Institution
of Science “N.D.Zelinsky Institute of Organic
Chemistry of the Russian Academy of
Sciences” | <http://www.ioc.ac.ru/>), 161

IPCE RAS (Federal State Budgetary Institution
of Science “A.N.Frumkin Institute of Physical
Chemistry and Electrochemistry of the
Russian Academy of Sciences” |
<http://www.phyche.ac.ru/>), 107, 135

IPE RAS (Federal State Budgetary Institution
of Science “Shmidt Institute of Physics of the

- Earth of the Russian Academy of Sciences" | <http://www.ifz.ru/>), 135
- IPI RAN (Federal State Budgetary Institution of Science "Institute of Informatics Problems of the Russian Academy of Sciences" | <http://www.ipiran.ru/>), 161
- ISP RAS (Federal State Budgetary Institution of Science "Institute for System Programming of the Russian Academy of Sciences" | <http://www.ispras.ru/>), 161
- ISPM RAS (Federal State Budgetary Institution of Science "Enikolopov Institute of Synthetic Polymeric Materials of the Russian Academy of Sciences" | <http://www.ispm.ru/>), 135, 146
- ITEP (Federal State Budgetary Institution "Russian Federation State Scientific Centre - Alikhanov Institute for Theoretical and Experimental Physics" of the National Research Centre "Kurchatov Institute" | <http://www.itep.ru/>), 12, 18, 27, 31, 35, 42, 48, 54, 60, 79, 91, 93, 97, 111, 115, 120, 127, 135, 150, 162, 166
- JSCC RAS (Federal State Budgetary Institution of Science "Joint Supercomputer Centre of the Russian Academy of Sciences" | <http://www.jscc.ru/>), 162
- KIAM RAS (Federal State Budgetary Institution of Science "Keldysh Institute of Applied Mathematics of the Russian Academy of Sciences" | <http://www.keldysh.ru/>), 162, 166
- LPI RAS (Federal State Budgetary Institution of Science "P.N.Lebedev Physical Institute of the Russian Academy of Sciences" | <http://www.lebedev.ru/>), 12, 27, 31, 42, 60, 66, 79, 86, 91, 115, 146
- MATI (Russian State Technological University | <http://www2.mati.ru/>), 146
- MGTU MIREA (Moscow State Technical University of Radioengineering, Electronics and Automation | <http://www.mirea.ru/>), 22, 174
- MI RAS (Federal State Budgetary Institution of Science "Steklov Mathematical Institute of the Russian Academy of Sciences" | <http://www.mi.ras.ru/>), 12, 23, 27, 31
- MIEM (Moscow State Institute of Electronics and Mathematics (Technical University) | <http://miem.hse.ru/>), 146
- MIET (National Research University of Electronic Technology | <http://www.miet.ru/>), 135
- MITHT (Lomonosov Moscow University of Fine Chemical Technology | <http://www.mitht.ru/>), 135
- MPEI (National Research University Moscow Power Engineering Institute | <http://www.mpei.ru/>), 162
- MSMU (I.M. Sechenov First Moscow State Medical University | <http://www.mma.ru/>), 150
- MSU (Lomonosov Moscow State University | <http://www.msu.ru/>), 12, 18, 23, 27, 31, 42, 107, 120, 127, 135, 150, 152, 162, 167
- MUCTR (Mendeleev University of Chemical Technology of Russia | <http://www.muctr.ru/>), 107, 135, 146
- NIKIET (Open Joint Stock Company "A.N.Dollezhal Research and Development Institute of Power Engineering" | <http://www.nikiet.ru/>), 60, 135, 138
- NNRU "MEPhI" (National Nuclear Research University "MEPhI" | <http://www.mephi.ru/>), 18, 22, 93, 97, 107, 115, 127, 135, 143, 166, 174
- NRC KI (National Research Centre "Kurchatov Institute" | <http://www.nrcki.ru/>), 18, 23, 48, 79, 86, 97, 107, 115, 120, 127, 135, 143, 162
- NRU HSE (National Research University Higher School of Economics | <http://www.hse.ru/>), 27
- PFUR (Peoples' Friendship University of Russia | <http://www.rudn.ru/>), 23, 156, 167
- PIN RAS (of the Russian Academy of Sciences | <http://www.paleo.ru/>), 152
- Profimontazhservis (Open Joint Stock Company "PROFIMONTAZHSERVISP"), 138
- RADON (State Unitary Enterprise "RADON" | <http://www.radon.ru/>), 115
- RCC MSU (Research Computer Centre of the M.V.Lomonosov Moscow State University | <http://www.srcc.msu.ru/>), 162
- RIPN (Russian Institute for Public Networks | <http://www.ripn.net/>), 162
- RSCC (Federal State Unitary Enterprise "Russian Satellite Communications Company" | <http://www.rscs.ru/>), 162
- SAI MSU (Sternberg Astronomical Institute of the M.V.Lomonosov Moscow State University | <http://www.sai.msu.ru/>), 152
- SCC RAS (Scientific Council for Cybernetics of the Russian Academy of Sciences | <http://www.ras.ru/>), 12, 31
- SINP MSU (Skobeltsyn Institute of Nuclear Physics of the M.V.Lomonosov Moscow State University | <http://www.sinp.msu.ru/>), 12, 18, 23, 31, 37, 39, 52, 54, 60, 66, 69, 70, 91, 97, 107, 115, 120, 127, 135, 146, 162, 167, 174
- SRI "Voskhod" (Scientific research institute "Voskhod" | <http://www.voskhod.ru/>), 162
- SSDI (Open Joint Stock Company "State Specialized Design Institute" |

- <http://oaogspi.ru/>), 82, 138
 SYSTEMATOM (Closed Joint Stock Company "Nuclear and Radiation Safety Systems" | <http://www.systematom.ru/>), 138
 Technomedexport (Closed Joint Stock Company "Technomedexport"), 146
 VIGG RAS (Federal State Budgetary Institution of Science "Vavilov Institute of General Genetics of the Russian Academy of Sciences" | <http://www.vigg.ru/>), 154, 167
 VNIIEM Corporation (Research and Production Corporation "Space Monitoring Systems, Information & Control and Electromechanical Complexes named after A.G.Iosifian" | <http://www.vniiem.ru/>), 52
 VNIIMS (Federal State Unitary Enterprise "All-Russian Scientific Research Institute of Metrological Service" | <http://www.vniims.ru/>), 27, 31
 VNIINM (Open Joint Stock Company "A.A.Bochvar High-Technology Research Institute of Inorganic Materials" | <http://www.bochvar.ru/>), 79, 115, 135
 e-ARENA (National Association of Research and Educational e-Infrastructures "e-ARENA" | <http://www.e-arena.ru/>), 161
- Moscow, Troitsk*
 HPPI RAS (Federal State Budgetary Institution of Science "Institute for High Pressure Physics of the Russian Academy of Sciences" | <http://www.hpptroitsk.ru/>), 23, 135
 INR RAS (Federal State Budgetary Institution of Science "Institute for Nuclear Research of the Russian Academy of Sciences" | <http://www.inr.ac.ru/>), 12, 18, 23, 27, 31, 35, 37, 44, 48, 54, 56, 60, 66, 70, 79, 82, 86, 91, 97, 107, 115, 120, 127, 135, 143, 162
 ISAN (Federal State Budgetary Institution of Science "Institute of Spectroscopy of the Russian Academy of Sciences" | <http://www.isan.troitsk.ru/>), 135, 146
- Moscow, Zelenograd*
 NT-MDT Co. (Closed Joint Stock Company "NT-MDT Co." | <http://www.ntmdt.ru/>), 156
 RIMST (Closed Joint Stock Company "Research Institute of Material Science and Technology" | <http://www.niimv.ru/>), 107
- Nizhny Novgorod*
 IAP RAS (Federal State Budgetary Institution of Science "Institute of Applied Physics of the Russian Academy of Sciences" | <http://www.iapras.ru/>), 82, 111
 IPM RAS (Federal State Budgetary Institution of Science "Institute for Physics of Microstructures of the Russian Academy of Sciences" | <http://ipmras.ru/>), 135, 143
 UNN (N.I.Lobachevsky State University of Nizhny Novgorod (National Research University) | <http://www.unn.ru/>), 135
- Novosibirsk*
 BIC SB RAS (Federal State Budgetary Institution of Science "Boreskov Institute of Catalysis of the Siberian Branch of the Russian Academy of Sciences" | <http://www.catalysis.ru/>), 152
 BINP SB RAS (Federal State Budgetary Institution of Science "Budker Institute of Nuclear Physics of the Siberian Branch of the Russian Academy of Sciences" | <http://www.inp.nsk.su/>), 13, 35, 79, 82, 97, 111, 162
 IM SB RAS (Federal State Budgetary Institution of Science "Sobolev Institute of Mathematics of the Siberian Branch of the Russian Academy of Sciences" | <http://math.nsc.ru/>), 13
 ISP SB RAS (Federal State Budgetary Institution of Science "A.V.Rzhanov Institute of Semiconductor Physics of the Siberian Branch of the Russian Academy of Sciences" | <http://www.isp.nsc.ru/>), 146
- Obninsk*
 Branch KIPC (Obninsk branch of the Karpov Institute of Physical Chemistry | <http://www.karpovipc.ru/>), 143
 IPPE (State Scientific Centre of the Russian Federation - Institute of Physics and Power Engineering | <http://www.ippe.ru/>), 18, 101, 127, 135
 MRRC (Institution of the Russian Academy of Sciences "Medical Radiological Research Centre" | <http://www.mrrc.obninsk.ru/>), 101, 154
- Omsk*
 OmSU (F.V. Dostoevsky Omsk State University | <http://www.omsu.ru/>), 18
- Pereslavl-Zalesskiy*
 PSI RAS (Federal State Budgetary Institution of Science "Program Systems Institute of the Russian Academy of Sciences" | <http://www.botik.ru/PSI/>), 162
- Perm*
 PSNRU (Perm State National Research University | <http://www.psu.ru/>), 13
- Petrozavodsk*
 IG KRS RAS (Federal State Budgetary Institution of Science "Institute of Geology Karelian Research Center of the Russian Academy of Sciences" | <http://ig.krc.karelia.ru/>), 135

- PetrSU (Petrozavodsk State University | <http://petrsu.karelia.ru/>), 27, 31
- Podolsk*
- GIDROPRESS (Open Joint Stock Company “Experimental & Design Organization “GIDROPRESS” | <http://www.gidropress.podolsk.ru/>), 135
- Protvino*
- IHEP (Federal State Budgetary Institution “Russian Federation State Scientific Centre - Institute for High Energy Physics” of the National Research Centre “Kurchatov Institute” | <http://www.ihep.ru/>), 13, 23, 27, 32, 37, 39, 42, 50, 54, 56, 60, 66, 69, 70, 79, 93, 97, 162, 167
- Puschino*
- IMPB RAS (Federal State Budgetary Institution of Science “Institute of Mathematical Problems of Biology of the Russian Academy of Sciences” | <http://www.impb.ru/>), 162, 167
- IPR RAS (Federal State Budgetary Institution of Science “Institute of Protein Research of the Russian Academy of Sciences” | <http://www.protres.ru/>), 167
- ITEB RAS (Federal State Budgetary Institution of Science “Institute of Theoretical and Experimental Biophysics of the Russian Academy of Sciences” | <http://web.iteb.psn.ru/>), 167
- Rostov-on-Don*
- RIP SFU (Research Institute of Physics of the Southern Federal University | <http://ip.sfedu.ru/>), 135
- SFedU (Southern Federal University | <http://www.sfedu.ru/>), 13
- Ryazan*
- RSU (S.A.Esenin Ryazan State University | <http://www.rsu.edu.ru/>), 82
- Samara*
- SSU (Samara State University | <http://www.samsu.ru/>), 13
- Saratov*
- SSMU (Saratov State Medical University named after V.I.Razumovsky | <http://www.sgmru.ru/>), 146
- SSU (Saratov State University named after N.G.Chernyshevsky | <http://www.sgu.ru/>), 13, 18, 23, 167
- Sarov*
- VNIIEF (Russian Federal Nuclear Centre - All-Russian Research “Institute of Experimental Physics” | <http://www.vniief.ru/>), 13, 82, 91, 97, 107, 111, 115, 120, 127
- Snezhinsk*
- VNIITF (Russian Federal Nuclear Centre - All-Russian Scientific Research Institute of Technical Physics | <http://www.vniitf.ru/>), 60, 127
- St. Petersburg*
- CC SPbSU (Computer Center of the Saint Petersburg State University | <http://www.cc.spbu.ru/>), 162
- ETU (Saint Petersburg Electrotechnical University “LETI” | <http://www.eltech.ru/>), 23
- Electron (Open Joint Stock Company “National Research Institute “Electron” | <http://www.electron.spb.ru/>), 60
- FIP (V.F.Fock Institute of Physics of the Saint Petersburg State University | <http://www.niif.spbu.ru/>), 127, 162, 167
- Hermitage (State Hermitage Museum | <http://www.heritagemuseum.org/>), 127
- IHCIS (Institute for High-Performance Computing and Information Systems (Computational Science Alliance - CSA) | <http://www.csa.ru/>), 162
- IPTI RAS (Federal State Budgetary Institution of Science “Ioffe Physic & Technical Institute of the Russian Academy of Sciences” | <http://www.ioffe.ru/>), 23, 107, 115, 135, 146
- ITMO (National Research University of Information Technologies, Mechanics and Optics | <http://www.ifmo.ru/>), 107
- KRI (V.G.Khlopin Radium Institute | <http://www.khlopin.ru/>), 91, 101, 107, 127
- NIEFA (D.V.Efremov Scientific Research Institute of Electrophysical Apparatus | <http://www.niefa.spb.su/>), 111, 167
- NITIOM (Research and Technology Institute of Optical Materials | <http://www.goi.ru/>), 156
- Neva-Magnet (Neva-Magnet S&E, Ltd | <http://www.magnet.spb.su/prd2.html/>), 79
- PDMI RAS (Federal State Budgetary Institution of Science “St.Petersburg Department of V.A.Steklov Institute of Mathematics of the Russian Academy of Sciences” | <http://www.pdmi.ras.ru/>), 27, 32
- SPbSPU (St. Petersburg State Polytechnical University | <http://www.spbstu.ru/>), 13, 162
- SPbSU (Saint Petersburg State University | <http://www.spbu.ru/>), 13, 18, 23, 27, 93, 97, 107, 115
- Sterlitamak*
- SSPA (Sterlitamak State Pedagogical Academy | <http://www.sspa.edu.ru/>), 135

Sykttyvkar

DM Komi SC UrD RAS (Federal State Budgetary Institution of Science "Department of Mathematics Komi Sciences Centre of the Ural Division of the Russian Academy of Sciences" | <http://www.komise.ru/>), 69, 79

Tomsk

IHCE SB RAS (Federal State Budgetary Institution of Science "Institute of High Current Electronics of the Siberian Branch of the Russian Academy of Sciences" | <http://www.hcei.tsc.ru/>), 13, 116

NPI TPU (Nuclear Physics Institute of the National Research Tomsk Polytechnic University | <http://past.tpu.ru/html/nii-yf.htm>), 79, 116, 127, 135

TPU (National Research Tomsk Polytechnic University | <http://tpu.ru/>), 27, 101

TSU (National Research Tomsk State University | <http://www.tsu.ru/>), 13, 32, 35, 167

Tula

TSPU (Tula State Pedagogical University | <http://tspu.ru/>), 127

TSU (Tula State University | <http://tsu.tula.ru/>), 135, 174

Tver

TvSU (Tver State University | <http://www.university.tversu.ru/>), 13, 167, 174

Vladimir

ELMAG ("ELMAG Ltd" | <http://www2.vtsnet.ru/elmag/about.htm/>), 111

Vladivostok

FEFU (Far Eastern Federal University | <http://dvfu.ru/>), 18

Voronezh

VSU (Voronezh State University | <http://www.vsu.ru/>), 23, 107, 115, 127

Yekaterinburg

IMP UB RAS (Federal State Budgetary Institution of Science "Institute of Metal Physics, Ural Division of the Russian Academy of Sciences" | <http://www.imp.uran.ru/>), 136, 143

UrFU (Urals Federal University named after the First President of Russia B.N.Yeltsin | <http://www.urfu.ru/>), 127, 136

Yoshkar-Ola

VSUT (Volga State University of Technology | <http://www.volgatech.net/>), 13

Zhukovsky

MDB (Open Joint Stock Company "Myasishchev Design Bureau" |

<http://www.emz-m.ru/>), 60

Serbia

Belgrade

INS "VINČA" ("Vinč'a" Institute of Nuclear Sciences | <http://www.vin.bg.ac.rs/>), 23, 60, 102, 111, 146

IPB (Institute of Physics Belgrade of the University of Belgrade | <http://www.phy.bg.ac.rs/>), 27, 32, 127
Univ. (University of Belgrade | <http://www.bg.ac.rs/>), 13, 27, 32, 127

Novi Sad

UNS (University of Novi Sad | <http://www.uns.ac.rs/>), 127, 136

Slovak Republic

Bratislava

BIONT (Bratislava Ionic Technologies Co. | <http://www.biont.sk/>), 146

CU (Comenius University in Bratislava | <http://www.uniba.sk/>), 13, 18, 42, 45, 54, 56, 97, 102, 107, 116, 127, 136, 146, 150, 174

IEE SAS (Institute of Electrical Engineering of the Slovak Academy of Sciences | <http://www.elu.sav.sk/>), 82, 127, 146

ILE SAS (Institute of Landscape Ecology of the Slovak Academy of Sciences | <http://www.upkm.sk/ipcm/>), 127

IMS SAS (Institute of Measurement Science of the Slovak Academy of Sciences | <http://www.um.sav.sk/>), 79, 111, 143

IP SAS (Institute of Physics of the Slovak Academy of Sciences | <http://www.fu.sav.sk/>), 13, 18, 23, 42, 45, 54, 86, 91, 107, 116, 127

SOSMT (Slovak Office of Standards, Metrology and Testing | <http://www.unms.sk/>), 91, 102

STU (Slovak University of Technology in Bratislava | <http://www.stuba.sk/>), 60

Košice

IEP SAS (Institute of Experimental Physics of the Slovak Academy of Sciences in Košice | <http://uef.saske.sk/>), 13, 23, 37, 86, 136, 162, 167

PJSU (Pavol Jozef Šafárik University in Košice | <http://www.upjs.sk/>), 79, 86, 91, 93, 97, 167, 174

TUKE (Technical University of Košice | <http://www.tuke.sk/>), 23, 167

Prešov

PU (University of Presov | <http://www.unipo.sk/>), 167

Žilina

UŽ (University of Žilina | <http://www.uniza.sk/>), 79

Slovenia

Ljubljana

GeoSS (Geological Survey of Slovenia |
<http://www.geo-zs.si/>), 127
UL (University of Ljubljana |
<http://www.uni-lj.si/>), 23

South Africa

Cape Town

UCT (University of Cape Town |
<http://www.uct.ac.za/>), 32, 79, 98, 162, 167
iThemba LABS (iThemba Laboratory for
Accelerator Based Sciences |
<http://www.tlabs.ac.za/>), 18, 108, 112

Johannesburg

UJ (University of Johannesburg |
<http://www.uj.ac.za/>), 79

Port Elizabeth

NMMU (Nelson Mandela Metropolitan
University | <http://www.nmmu.ac.za/>), 146

Pretoria

Necsa (South African Nuclear Energy
Corporation | <http://www.necsa.co.za/>), 127,
136, 174
UP (University of Pretoria |
<http://web.up.ac.za/>), 167
Unisa (University of South Africa |
<http://www.unisa.ac.za/>), 18, 108, 127

Stellenbosch

SU (Stellenbosch University |
<http://www.sun.ac.za/>), 18, 107

Spain

Barcelona

IFAE (Institute for High Energy Physics |
<http://www.ifae.es/>), 42

Huelva

UH (University of Huelva |
<http://www.uhu.es/>), 108

Madrid

CIEMAT (Research Centre for Energy,
Environment and Technology |
<http://www.ciemat.es/>), 61
CSIC (Spanish National Research Council |
<http://www.csic.es/>), 108
IA (Institute of Acoustics of the Spanish
National Research Council |
<http://www.ia.csic.es/>), 146
ICMM (Materials Science Institute of Madrid of
the Spanish National Research Council |
<http://www.icmm.csic.es/>), 23
UAM (Autonoma University of Madrid |
<http://www.uam.es/>), 61

Oviedo

Uniovi (University of Oviedo |
<http://www.uniovi.es/>), 61

Palma

UIB (Illes Balears University |
<http://www.uib.es/>), 18

Santander

IFCA (Institute of Physics of Cantabria of the
University of Cantabria |
<http://www.ifca.unican.es/>), 61

Santiago de Compostela

USC (University of Santiago de Compostela |
<http://www.usc.es/>), 13, 39

Valencia

UPV (Polytechnic University of Valencia |
<http://www.upv.es/>), 139
UV (University of Valencia |
<http://www.uv.es/>), 13, 48, 146

Sweden

Göteborg

Chalmers (Chalmers University of Technology |
<http://www.chalmers.se/>), 18, 108

Lund

LU (Lund University | <http://www.lu.se/>), 13,
18, 91, 98, 162

Stockholm

KTH (Royal Institute of Technology |
<http://www.kth.se/>), 167
SU (Stockholm University | <http://www.su.se/>),
79

Uppsala

TSL (The Svedberg Laboratory of the Uppsala
University | <http://www4.tsl.uu.se/tsl/>), 79,
86

Switzerland

Basel

Uni Basel (University of Basel |
<http://www.unibas.ch/>), 61

Bern

Uni Bern (University of Bern |
<http://www.unibe.ch/>), 13, 18, 35, 39, 48, 56

Geneva

UniGe (University of Geneva |
<http://www.unige.ch/>), 86, 91

Lausanne

EPFL (Ecole Polytechnique Fédérale de
Lausanne | <http://www.epfl.ch/>), 98

Villigen

PSI (Paul Scherrer Institute |
<http://www.psi.ch/>), 13, 23, 35, 61, 86, 91,
108, 120, 128, 136

Zurich

ETH (Swiss federal Institute of Technology
Zurich | <http://www.ethz.ch/>), 23, 61, 91, 136,
167
UZH (University of Zurich |
<http://www.uzh.ch/>), 39, 61, 66, 120

Taiwan

Chung-Li

NCU (National Central University | <http://www.ncu.edu.tw/>), 61

Hsinchu

NSRRC (National Synchrotron Radiation Research Center | <http://www.srrc.gov.tw/>), 136

Taipei

AS (Academia Sinica | <http://www.sinica.edu.tw/>), 167
IP AS (Institute of Physics of the Academia Sinica | <http://www.phys.sinica.edu.tw/>), 23
NTU (National Taiwan University | <http://www.ntu.edu.tw/>), 18, 37, 61

Tajikistan

Dushanbe

PHTI ASRT (S.U.Umarov Physical-Technical Institute of the Academy of Sciences of the Republic of Tajikistan | <http://www.phti.tj/>), 91, 167
TNU (Tajik State University | <http://tnu.tj/>), 91, 167

Khujent

KSU (Khujent State University | <http://www.hgu.tj/>), 167

Thailand

Hat Yai

PSU (Prince of Songkla University | <http://www.psu.ac.th/>), 128

Turkey

Adana

CU (Çukurova University | <http://www.cu.edu.tr/>), 61

Ankara

METU (Middle East Technical University | <http://www.metu.edu.tr/>), 61

Istanbul

BU (Boğaziçi University | <http://www.boun.edu.tr/>), 27, 32

Izmir

IYTE (Izmir Institute of Technology | <http://www.iyte.edu.tr/>), 27

Çanakkale

ÇOMU (Çanakkale Onsekiz Mart University | <http://www.comu.edu.tr/>), 128

USA

Ames, IA

ISU (Iowa State University | <http://www.iastate.edu/>), 61

Ann Arbor, MI

U-M (University of Michigan; Harrison M. Randall Laboratory |

<http://www.umich.edu/>), 146

Argonne, IL

ANL (Argonne National Laboratory | <http://www.anl.gov/>), 13, 18, 42, 45, 66, 94, 108, 167

Arlington, TX

UTA (University of Texas Arlington | <http://www.uta.edu/>), 162

Athens, AL

ASU (Athens State University | <http://www.athens.edu/>), 152

Baltimore, MD

JHU (Johns Hopkins University | <http://www.jhu.edu/>), 28, 32, 61

Batavia, IL

Fermilab (Fermi National Accelerator Laboratory | <http://www.fnal.gov/>), 45, 61, 79, 82, 162

Berkeley, CA

Berkeley Lab (Lawrence Berkeley National Laboratory of the University of California | <http://www.lbl.gov/>), 48, 91, 94, 108

Blacksburg, VA

Virginia Tech. (Virginia Polytechnic Institute and State University; Institute for High Energy Physics | <http://www.vt.edu/>), 61

Boston, MA

BU (Boston University | <http://web.bu.edu/>), 61
NU (Northeastern University | <http://www.northeastern.edu/>), 45, 61

Boulder, WY

CU (University of Colorado at Boulder | <http://www.colorado.edu/>), 66

Buffalo, NY

UB's ILPB (Institute for Lasers, Photonics and Biophotonics of the University at Buffalo of the State University of New York | <http://www.photonic.buffalo.edu/>), 156

Cambridge, MA

MIT (Massachusetts Institute of Technology | <http://web.mit.edu/>), 48, 61, 66

Charlottesville, VA

UVa (University of Virginia | <http://www.virginia.edu/>), 45, 120

Chicago, IL

UChicago (University of Chicago | <http://www.uchicago.edu/>), 37, 56, 162
UIC (University of Illinois at Chicago | <http://www.uic.edu/>), 61

Cincinnati, OH

UC (University of Cincinnati | <http://www.uc.edu/>), 28, 32

Clemson, SC

Clemson (Clemson University | <http://www.clemson.edu/>), 28

College Park, MD
 UM (University of Maryland | <http://www.umd.edu/>), 13, 28, 32, 61

College Station, TX
 Texas A&M (Texas A&M University | <http://www.tamu.edu/>), 108, 112

Columbus, OH
 OSU (Ohio State University | <http://www.osu.edu/>), 61, 98

Coral Gables, FL
 UM (University of Miami | <http://www.miami.edu/>), 28, 32

Davis, CA
 UCDavis (University of California | <http://www.ucdavis.edu/>), 61

Detroit, MI
 WSU (Wayne State University | <http://wayne.edu/>), 94

Durham, NC
 Duke (Duke University | <http://www.duke.edu/>), 128

East Lansing, MI
 MSU (Michigan State University | <http://www.msu.edu/>), 37, 108

Evanston, IL
 NU (Northwestern University | <http://www.northwestern.edu/>), 56, 61

Fairfax, VA
 GMU (George Mason University | <http://www.gmu.edu/>), 56

Gainesville, FL
 UF (University of Florida | <http://www.ufl.edu/>), 35, 61

Gettysburg, PA
 GC (Gettysburg College | <http://www.gettysburg.edu/>), 128

Houston, TX
 Rice Univ. (Rice University | <http://www.rice.edu/>), 61

Indianapolis, IN
 IUPUI (Indiana University - Purdue University | <http://www.iupui.edu/>), 139

Iowa City, IA
 UIowa (University of Iowa | <http://www.uiowa.edu/>), 61, 91

Irvine, CA
 UCI (University of California, Irvine | <http://www.uci.edu/>), 116, 146

Kingston, RI
 URI (University of Rhode Island | <http://www2.uri.edu/>), 128

Lincoln, NE
 UNL (University of Nebraska-Lincoln | <http://www.unl.edu/>), 61

Livermore, CA
 LLNL (Lawrence Livermore National Laboratory | <http://www.llnl.gov/>), 61, 108, 112

Los Alamos, NM
 LANL (Los Alamos National Laboratory; Meson Physics Facility (LAMPF) | <http://www.lanl.gov/>), 18, 61, 128

Los Angeles, CA
 UCLA (University of California, Los Angeles | <http://www.ucla.edu/>), 48, 61, 94

Louisville, KY
 UofL (University of Louisville | <http://louisville.edu/>), 23

Lubbock, TX
 TTU (Texas Tech University | <http://www.ttu.edu/>), 61

Madison, WI
 UW-Madison (University of Wisconsin-Madison | <http://www.wisc.edu/>), 48, 61

Menlo Park, CA
 SLAC (SLAC National Accelerator Laboratory is operated by Stanford University | <http://www.slac.stanford.edu/>), 56

Merced, CA
 UC Merced (University of California, Merced | <http://www.ucmerced.edu/>), 56

Minneapolis, MN
 UofM (University of Minnesota | <http://www1.umn.edu/>), 13, 28, 32, 61

Nashville, TN
 VU (Vanderbilt University | <http://www.vanderbilt.edu/>), 108, 112

New Haven, CT
 Yale Univ. (Yale University | <http://www.yale.edu/>), 94

New York, NY
 CUNY (City University of New York | <http://www.cuny.edu/>), 13, 23, 28, 32
 RU (Rockefeller University | <http://www.rockefeller.edu/>), 13, 28
 SUNY (State University of New York | <http://www.suny.edu/>), 28, 32, 45

Newport News, VA
 JLab (Thomas Jefferson National Accelerator Facility; Southeastern Universities Research Association (SURA) | <http://www.jlab.org/>), 13, 32, 86

Norfolk, VA
 NSU (Norfolk State University | <http://www.nsu.edu/>), 86, 91

Norman, OK
 UO (University of Oklahoma | <http://www.ou.edu/>), 13, 28

Notre Dame, IN
 ND (University of Notre Dame | <http://www.nd.edu/>), 18, 61

Oak Ridge, TN
 ORNL (Oak Ridge National Laboratory | <http://www.ornl.gov/>), 98, 108, 112, 128, 146

Oxford, MS
 UM (University of Mississippi | <http://www.olemiss.edu/>), 61

Pasadena, CA
 Caltech (California Institute of Technology | <http://www.caltech.edu/>), 61, 66, 162

Philadelphia, PA
 Penn (University of Pennsylvania | <http://www.upenn.edu/>), 13, 28, 32

Piscataway, NJ
 Rutgers (State University of New Jersey | <http://www.rutgers.edu/>), 28, 32, 61

Pittsburgh, PA
 Pitt (University of Pittsburgh | <http://www.pitt.edu/>), 61, 120

Princeton, NJ
 PU (Princeton University; Joseph Henry Laboratories of Physics | <http://www.princeton.edu/>), 48, 62

Riverside, CA
 UCR (University of California, Riverside | <http://www.ucr.edu/>), 62

Rochester, NY
 UR (University of Rochester | <http://www.rochester.edu/>), 23, 28, 32, 62

Salt Lake City, UT
 U of U (University of Utah | <http://www.utah.edu/>), 32

Stony Brook, NY
 SUNY (State University of New York at Stony Brook | <http://www.stonybrook.edu/>), 79

Tallahassee, FL
 FSU (Florida State University | <http://www.fsu.edu/>), 23, 62

Tempe, AZ
 ASU (Arizona State University | <http://www.asu.edu/>), 37

Tucson, AZ
 UA (University of Arizona | <http://www.arizona.edu/>), 120

Tuscaloosa, AA
 UA (University of Alabama | <http://www.ua.edu/>), 62

University Park, PA
 Penn State (Pennsylvania State University | <http://www.psu.edu/>), 13, 19, 94

Upton, NY
 BNL (Brookhaven National Laboratory | <http://www.bnl.gov/>), 48, 79, 82, 86, 91, 94,

162, 174

Williamsburg, VA
 W&M (College of William & Mary | <http://www.wm.edu/>), 86, 91

Ukraine

Dnepropetrovsk
 DNU (Dnepropetrovsk National University | <http://www.dnu.dp.ua/>), 13

Donetsk
 DonIPE NASU (Donetsk Institute for Physics and Engineering named after O.O.Galkin of the National Academy of Sciences of Ukraine | <http://www.fti.dn.ua/>), 128, 136

Kharkov
 IERT NASU (Institute of Electrophysics and Radiation Technology of the National Academy of Sciences of Ukraine | <http://www.iert.kharkov.ua/>), 136, 146, 167
 ISC NASU (Institute for Single Crystals of the National Academy of Sciences of Ukraine | <http://www.isc.kharkov.com/>), 35, 45, 48, 61, 116
 ISM NASU (Institute for Scintillation Materials of the National Academy of Sciences of Ukraine | <http://www.isma.kharkov.ua/>), 50, 52, 66, 128
 KFTI NASU (National Science Centre - Kharkov Institute of Physics and Technology of the National Academy of Sciences of Ukraine | <http://www.kipt.kharkov.ua/>), 13, 23, 27, 32, 37, 61, 79, 86, 98, 102, 128, 136, 162, 167
 KhNU (V.N.Karasin Kharkov National University | <http://www.univer.kharkov.ua/>), 61, 79

Kiev
 BITP NASU (M.M.Boholubov Institute for Theoretical Physics of the National Academy of Sciences of Ukraine | <http://www.bitp.kiev.ua/>), 13, 18, 27, 32, 54, 69, 79, 98, 162, 167, 174
 IM NASU (Institute of Mathematics of the National Academy of Sciences of Ukraine | <http://www.imath.kiev.ua/>), 167
 IMP NASU (G.V.Kurdyumov Institute of Metal Physics of the National Academy of Sciences of Ukraine | <http://www.imp.kiev.ua/>), 23
 IPMS NASU (Frantsevich Institute for Problems of Materials Science of the National Academy of Sciences of Ukraine | <http://www.materials.kiev.ua/>), 136
 ISC NASU (Institute of Surface Chemistry of the National Academy of Sciences of Ukraine | <http://www.surfacechem.com.ua/>), 136
 KINR NASU (Kiev Institute for Nuclear Research of the National Academy of Sciences

of Ukraine | <http://www.kinr.kiev.ua/>), 18, 108, 112, 116, 128, 139

NTUU KPI (National Technical University of Ukraine “Kyiv Polytechnic Institute” | <http://kpi.ua/>), 162

NUK (Taras Shevchenko National University of Kyiv | <http://www.univ.kiev.ua/>), 23, 52, 128, 136, 174

PEWI NASU (Paton Electric Welding Institute of Surface Chemistry of the National Academy of Sciences of Ukraine | <http://paton.kiev.ua/>), 82

L'viv

IAPMM NASU (Pidstryhach Institute for Applied Problems of Mechanics and Mathematics of the National Academy of Sciences of Ukraine | <http://www.iapmm.lviv.ua/>), 13

ICMP NASU (Institute for Condensed Matter Physics of the National Academy of Sciences of Ukraine | <http://www.icmp.lviv.ua/>), 23

IFNU (Ivan Franko National University in L'viv | <http://www.franko.lviv.ua/>), 13

LPNU (L'viv Politechnic National University | <http://www.lp.edu.ua/>), 143

Lutsk

VNU (Volyn National University of Lesya Ukrainka | <http://www.vnu.edu.ua/>), 13

Sevastopol

IBSS NASU (Institute for Biology of the Southern Seas of the National Academy of Sciences of Ukraine | <http://www.ibss.nas.gov.ua/>), 128

Simferopol

SIMPEX (Joint-Stock Company “Simpex” | <http://www.filter-systems.com/>), 146

Sumy

IAP NASU (Institute of Applied Physics of the National Academy of Sciences of Ukraine | <http://www.nas.gov.ua/>), 128

SumSU (Sumy State University | <http://sumdu.edu.ua/>), 13

Uzhgorod

IEP (Institute of Electron Physics | <http://www.nas.gov.ua/>), 128

UNU (Uzhgorod National University | <http://www.univ.uzhgorod.ua/>), 102

United Kingdom

Birmingham

Univ. (University of Birmingham | <http://www.birmingham.ac.uk/>), 56, 98

Bristol

Univ. (University of Bristol | <http://www.bris.ac.uk/>), 56, 61

Buckingham

UB (University of Buckingham | <http://www.buckingham.ac.uk/>), 152

Cambridge

Univ. (University of Cambridge | <http://www.cam.ac.uk/>), 27, 32

Canterbury

Univ. (University of Kent | <http://www.kent.ac.uk/>), 13

Didcot

RAL (Rutherford Appleton Laboratory; Science and Technology Facilities Council | <http://www.stfc.ac.uk/>), 61, 136, 139

Durham

Univ. (Durham University | <http://www.dur.ac.uk/>), 27, 32

Glasgow

US (University of Strathclyde | <http://www.strath.ac.uk/index.html>), 56

Liverpool

Univ. (University of Liverpool | <http://www.liv.ac.uk/>), 27, 56, 66

London

Imperial College (Imperial College London | <http://www3.imperial.ac.uk/>), 13, 27, 32, 61

Middlesex Univ. (Middlesex University | <http://www.mdx.ac.uk/>), 146

NHM (Natural History Museum | <http://www.nhm.ac.uk/>), 128

QM (Queen Mary of the University of London | <http://www.qmul.ac.uk/>), 13

Oxford

JAI (John Adams Institute for Accelerator Science | <http://www.adams-institute.ac.uk/>), 82

Univ. (University of Oxford | <http://www.ox.ac.uk/>), 35

Southampton

Univ. (University of Southampton | <http://www.soton.ac.uk/>), 27, 32

Surrey

Univ. (University of Surrey | <http://www2.surrey.ac.uk/>), 108

York

Univ. (University of York | <http://www.york.ac.uk/>), 27, 32

Uzbekistan

Jizzakh

JSPI (Jizzakh State Pedagogical Institute named after Abdulla Qodiriy | <http://www.jspi.uz/>), 54, 91

Samarkand

SSU (Samarkand State University named after Alisher Navoi | <http://www.samdu.uz/>), 42, 45, 54, 91, 112, 116

Tashkent

- Assoc.“P.-S.” PTI (Physical Technical Institute Association “Physics-Sun” named after S.A.Azimov of the Uzbekistan Academy of Sciences | <http://www.fti.fan.uz/>), 19, 23, 86, 91
- IAP NUU (Institute of Applied Physics of the National University of Uzbekistan named after Mirzo Ulugbek | <http://www.nuu.uz/>), 14, 19, 116
- IMIT UAS (Institute of Mathematics and Information Technology of the Uzbekistan Academy of Sciences | <http://www.mathinst.uzsci.net/>), 162
- INP UAS (Institute of Nuclear Physics of the Uzbekistan Academy of Sciences | <http://www.inp.uz/>), 19, 62, 86, 116, 122, 136
- NUU (National University of Uzbekistan named after Mirzo Ulugbek | <http://www.nuu.uz/>), 14

Vietnam

Hanoi

- IMS VAST (Institute of Material Science of the Vietnam Academy of Science and Technology | <http://www.ims.vast.ac.vn/>), 23
- IP VAST (Institute of Physics of the Vietnam Academy of Science and Technology | <http://www.iop.vast.ac.vn/>), 14, 32, 146
- VNU (Vietnam National University Hanoi | <http://www.vnu.edu.vn/>), 128, 167, 174

CERN

Geneva

- CERN (European Organization for Nuclear Research (Switzerland) | <http://public.web.cern.ch/>), 11, 26, 30, 35, 39, 42, 47, 50, 56, 59, 65, 78, 82, 85, 90, 96, 126, 161, 165, 173

ICTP

Trieste

- ICTP (Abdus Salam International Centre for Theoretical Physics (Italy) | <http://www.ictp.it/>), 12, 26