TOPICAL PLAN
FOR JINR RESEARCH
AND INTERNATIONAL COOPERATION
2015

Dubna 2014

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Prepared by
N.A. Boklagova
L.K. Ivanova

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

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* 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

** 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)

Theoretical Physics (01)

01–3–1113–2014/2018	Priority: 1

Status: In-progress

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 Zeland, Norway, Poland, Republic of Korea, Russia, Serbia, Slovakia, 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 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 the hadron spin structure with the help of generalized and transverse momentum dependent parton distributions. Study of heavy quark properties and 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 a wide range of current and future experiments at JINR, IHEP, CERN, GSI, DESY and other physics centers.

Expected main results in 2015:

- 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.

  The interpretation of experimental data on supersymmetry searches coming from the ATLAS and CMS collaborations.

  Theoretical analysis of effects due to radiative corrections in Drell-Yan processes taking into account new experimental conditions being relevant after increasing LHC luminosity and beam energy

  The 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

  Studies of the dark matter problem and searches for different dark matter particle candidates both in the Standard Model and beyond it, in particular within supersymmetric theories.

  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 the complete analytical expression for the missing contribution of the three-loop radiative correction to the pion transition form factor.

  Investigation of the 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 the NICA project. Construction of global fits for Sivers 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 with the constraints implied by the equivalence principle.

Development of the general theory of wave packets. Construction of a model of a covariant asymmetric wave packet and detailed study of its properties. Derivation of general formulae for an effective 4-momentum of neutrino in ultra-relativistic and non-relativistic cases.

Investigation of the correlation functions of the color charged field fluctuations in the confinement regime within the domain model of QCD vacuum. Study of the spectral properties of the color charged quasi-particles and thermodynamics of the heterophase state of hadronic matter under conditions of the relativistic heavy ion collision.

- Description of tau lepton decays with taking into account radial excited states of vector and axial vector mesons 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).

  Complete analysis of nonleptonic decays of the whole family of bottom and charm baryons into an ordinary baryon and a meson. Calculation full of decay widths and parameters of various asymmetries.

  In view of the fact that the rates for the semileptonic decays of B-meson into D (Dstar)-meson and a pair of tau-lepton + tau-neutrino deviate from the Standard Model (SM) predictions by up to 4.5 standard deviations, it is important to scrutinize the corresponding semileptonic baryon decay Lambda-b into Lambda-c. Evaluation of the relevant form factors in the framework of the covariant quark model. Development of the theoretical formalism for these decays by using helicity methods including lepton mass effects.

  In the case of the semileptonic B-decays, in addition to the SM operators one should also take into account the scalar and tensor four-Fermi operators, which can be induced by the effects of new physics. Evaluation of the form factors in the framework of the covariant quark model and derivation of the full angular decay distribution. Numerical analysis of the physical observables.

- 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 indicating the crossover.

  Investigation of topological aspects of the quark-gluon plasma (monopoles, dyons, vortices etc.) and estimation of 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 in the NICA project.

  Investigation of the role of color degrees of freedom at 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.

Study 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** **A.B. Arbuzov**
	BLTP	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, 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
		Foundation ANSL
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
	Řež	NPI ASCR
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	APHI
		INP
	Astana	BA INP
Mexico	Cuernavaca	UNAM
Mongolia	Ulaanbaatar	IPT MAS
		NUM
New Zealand	Hamilton	Univ.
Norway	Trondheim	NTNU
Poland	Krakow	NINP PAS
	Kielce	UJK
	Lodz	UL

	Lublin	MCSU
	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	VNIIEF
	Tomsk	TSU
		IHCE SB RAS
	Tver	TvSU
	Yoshkar-Ola	VSUT
Serbia	Belgrade	Univ.
Slovakia	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
	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	IOP VAST

01–3–1114–2014/2018	Priority: 1

Status: In-progress

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, Slovakia, 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 2015:

- Studies of the effects of phonon-phonon coupling on distributions of $E0-$, $E1$- and $E2$- transition strengths in the neutron-rich $N = 82$ isotones in a wide region of excitation enegies.

  Analysis of anomalous deformation splitting of the E1(T 0) toroidal mode

  Development of the microscopic proton-neutron symplectic model of collective motions.

  Creation of a database on theoretical beta-decay rates for fission and fragmentation products.

  Elucidation of the role of the screening effect in calculation of the phase space factors in single and double beta decays.

- Development of the method to describe phase transitions in the alternating parity bands of even-even nuclei occurring with the increase of the angular momentum.

  Investigation of the formation cross section of neutron-deficient nuclides in incomplete fusion and quasifission reactions as a function of the isospin of colliding nuclei.

  Study of the mechanism and dynamics of transformation of the mononucleus to the dinuclear system along the fission process of a heavy nucleus.

  Analysis of the rotation effects on properties of $E1 - E3$ giant nuclear resonances in a self-consistent analytically solvable model.

- Investigation of anisotropic quantum scattering of ultacold atoms and molecules in two-dimensional and quasi-two-dimensional geometry of optical traps.

  Study of resonant tunneling of composite particles through repulsive barriers.

  Computing of bound states of three-atomic systems formed of the rare gas atoms.

  Investigation of the role of electron correlations in the reaction of capture of an electron from an atomic target by a fast proton.

  Development of the effective-range theory for two-dimensional nuclear-coulomb scattering.

  Dynamic adiabatic representation of inelastic processes in atomic collisions.

- Systematic studies of multi-photon processes in interaction of probe photons and charge leptons and quarks with intensive ultra-short electromagnetic fields both induced and external (generated by lasers of high power).

  Analysis of asimuthal correlations of hadrons produced in ultrarelativistic heavy-ion collisions in the case of asymmetric Cu+Au combinations in terms of parton-hadron string dynamics model.

  Realistic calculations of the spin dependent spectral functions of polarized few-body systems with taking into account the final state interaction and calculations of Collin's and Siver's asymmetries of polarized ^{3}He to extract transverse parton distributions of neutrons.

  Investigation of the masses and widths of dibaryons in nucleon-nucleon scattering for $J = 2$ within Bethe-Salpeter approach.

  Study of the thermodynamic properties of the free neutral scalar field in the framework of the method of the path integral quantization both for the finite sizes of the lattice and in the continuum limit.

  Investigation of the QCD phase diagram dependence on the vector coupling strength in the Nambu-Jona-Lasinio model with Polyakov loop

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, 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, A.N. Bezbakh, I.A. Egorova, S.I. Fedotov, V.G. Kartavenko, Sh. Kalandarov, A.K. Nasirov, R.G. Nazmitdinov, H. Paska, 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.N. Kondratyev, V.V. Pupyshev, E.A. Soloviev, S.I. Vinitsky, P Jaluvkova + 2 students
DLNP	O.I. Kartavtsev

4.	**Processes with nuclei at relativistic energies and extreme states of matter**	**V.V. Burov** **M. Gaidarov**
	BLTP	A. Bekzhanov, 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
		KNU
Moldova	Chişinău	IAP ASM
Norway	Bergen	UiB
	Oslo	UiO
Poland	Krakow	NINP PAS
	Lublin	MCSU
	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
Slovakia	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
	University Park, PA	Penn State
Uzbekistan	Tashkent	IAP NUU
		INP UAS
		Assoc."P.-S." PTI

01–3–1115–2014/2018	Priority: 1

Status: In-progress

Theory of Condensed Matter

Leaders: V.A. Osipov
A.M. Povolotskii

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, Slovakia, 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-Tc superconductivity, charge and spin-orbital ordering will be studied. The obtained results will be used to support neutron scattering experiments performed at 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 2015:

- Investigation of nonequilibrium effects in layered superconductors under external electromagnetic field.

  Investigation of the processes of phonon scattering in crystals having structural disorder due to the presence of linear defects.

  Investigation of electron transport in graphene-vacuum-graphene systems and graphene-based superstructures.

  Study of the diffusivity of a vibron excitation in macromolecular chain.

  Study of small-angle neutron scattering from surface fractals.

  Investigation of nonequilibrium properties of trapped cold atoms.

- Investigation of statistics of non-contractible loops in the dense polymer model and its comparison with that in an associated quantum chain with the twisted boundary conditions.

  Calculation of correlation functions for generalized asymmetric simple exclusion process. Study of the mechanism of Kardar-Parisi-Zhang universality breaking in the limit of macroscopic clusters formation.

  Investigation of statistics of closed contours formed by the motion of the rotor-router walk on infinite graphs.

  Investigation of properties of the superconformal index of the simplest four dimensional supersymmetric model with the gauge group SU(2) and three generations of chiral fields.

  Study of a connection between static one-dimensional kinks and monopoles in three, five and seven dimensions.

List of activities:

	Activity or experiment **Laboratory or other Division of JINR**	**Leaders** **Main researchers**
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, D.A. Lobanov, M. Maiti, 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
	FLNP	V.L. Aksenov, A.M. Balagurov, A.I. Kuklin
	LIT	E.B. Zemlianaya, I. Sarhadov, S.I. Serdyukova, L.A. Syurakshina
2.	**Contemporary problems of statistical physics**	**A.M. Povolotsky** **V.B. Priezzhev**
	BLTP	J. Brankov, N.Zh. Bunzarova, V.M. Dubovik, V.I. Inozemtsev, A.L. Kuzemsky, T.A. Ivanova, V. Papoyan, A.E. Patrik, P.N. Pyatov, V.P Spiridonov, O. Turek, V.I. Yukalov, P.E. Zhidkov
	LIT	E.P ukalova

Collaboration

Country or International Organization	**City**	**Institute or Laboratory**
Armenia	Yerevan	Foundation ANSL
		YSU
Australia	Melbourne	Univ.
	Sydney	Univ.
Belarus	Minsk	BSTU
		IP NASB
		ICE MES RB
		JIMB NASB
		JIPNR-Sosny NASB

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

01–3–1116–2014/2018	Priority: 1

Status: In-progress

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:

Armenia, Australia, Austria, Belarus, Brazil, Bulgaria, Canada, CERN, Czech Republic, France, Germany, Greece, Hungary, ICTP, India, Italy, Japan, Norway, Poland, Romania, Russia, Serbia, Spain, 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 2015:

- Construction of the field theory models, realizing the partial breaking of the global supersymmetries in D 3 and D 4 with the hypermultiplet as the Goldstone superfiled.

  Investigation of the determinant formulas for form-factors of the local operators in the quantum integrable models with higher symmetries solvable in the framework of the nested Bethe ansatz.

  Study of the basic equations and relations for the relativistic static spherically symmetric stars (SSSS) in the model of minimal dilatonic gravity (MDG), which is locally equivalent to the f(R) theories of gravity and gives an alternative description of the effects of dark matter and dark energy

  Development of new approach based on the symmetric form of the Heun's differential equation yielded by development of the Felix Klein symmetric form of the Fuchsian equations with an arbitrary number $N > 3$ of regular singular points.

  Construction of the superconnection framing of the derived category of coherent sheaves on non-compact complex varieties. The technique will be exploited to construct complex moduli spaces of objects on the varieties.

  Descripyion of the pairs of unmixed basis in 6 dimensional space with the application to the quantum information theory

  Construction of deformations of lagrangian cycles of Mironov - Panov.

Development of the theory of special Bohr - Sommerfeld cycles. Comparison in these terms of the results of the Kahler and lagrangian approaches in Geometric Quantization.

Longitudinal and transverse gluon propagators in the Landau gauge will be studied in the SU(2) lattice gauge theory at nonzero temperatures near the critical point T_c

The properties of the thermal Abelian color-magnetic monopoles in the maximally Abelian gauge will be studied in the vicinity of the confinement-deconfinement phase transition in the lattice SU(3) gluodynamics and lattice QCD.

- Analysis of the loop structure of the Bagger-Lambert-Gustavsson and Aharony-Bergman-Jaffereris-Maldacena models by using the superfield background field method and manifestly covariant superfield proper-time method, and study of the aspects of the $AdS(4)/CFT(3)$ correspondence.

  Design and analysis of new models of supersymmetric mechanics, including cases of deformed and quasi-complex supersymmetries, and their application to the description of the motion of spin particles in different background non-Abelian gauge fields and in the theory of the quantum Hall effect.

  Further elaboration of the formalism of auxiliary fields in the duality invariant supersymmetric theories and construction of duality-invariant actions for the Born-Infeld theory with partial supersymmetry breaking.

  Construction of new twistor formulations of spinning (super)particles and (super)strings and study of their application in higher spin fields theory

  Study of various black-hole configurations and localized particle-like soliton solutions in the higher dimensional (super)gravity and (super)Yang-Mills theories by numerical analysis.

- Investigation of the Minkowski space-time stability in the framework of the modified gravitation theories with higher derivatives by making use of a new, specially developed, universal method based on the theory of dynamical systems;

  Searches for new physics and creation of new theoretical models for interpretation of observational data for the Galactic Center;

  Creation of advanced theoretical models for exoplanetary systems with gravitational microlensing and polarization observations;

  Development of the heat kernel expansion for manifolds with non-smooth boundaries will be proposed. For domains with boundaries possessing cusps the multiple reflection technique will be extended in order to derive systematically higher order heat kernel coefficients;

  Development of a general approach to calculation of the vacuum noncontact friction by applying the Green's function technique in macroscopic electrodynamics and making resort to the Kubo formulas from nonequilibrium statistical mechanics;

  Investigation of electronic excitations in graphene will be conducted in the framework of the quantum theory of the Dirac field defined on the 2-dimensional graphene sheet and interacting with the electromagnetic field occupying the whole 3-dimensional space. Study ofthe surface plasmon excitations in this system.

List of activities:

Activity or experiment **Laboratory or other Division of JINR**	**Leaders** **Main researchers**
1. **Quantum groups and integrable systems**	**A.P. Isaev**
BLTP	S.A. Belev, S.O. Krivonos, N.Yu. Kozyrev, 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, M Pientek, S.S. Sidorov, Ya.M. Shnir, 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
		LPTHE
	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
	Padua	UniPd
	Pavia	INFN
	Pisa	INFN
	Salerno	UniSa
	Trieste	SISSA/ISAS
	Turin	INFN
Japan	Fukuoka	Kyushu Univ.
	Kyoto	KSU
		RIMS
		YITP
	Tsukuba	KEK
Mexico	Leon	UG
Norway	Trondheim	NTNU
Poland	Warsaw	CAC PAS
		UW
	Krakow	JU
		NINP PAS
	Lodz	UL
	Wroclaw	UW
Romania	Bucharest	IFIN-HH
Russia	Moscow	ITEP
		LPI RAS
		MSU
		MI RAS
		NRU HSE
		VNIIMS
	Moscow, Troitsk	INR RAS
	Chernogolovka	LITP RAS
	Petrozavodsk	PetrSU
	Protvino	IHEP
	St. Petersburg	PDMI RAS
		SPbSU
	Tomsk	TPU
Serbia	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
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

01–3–1117–2014/2018	Priority: 1

Status: In-progress

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

Leaders: V.V. Voronov
A.S. Sorin

Scientific leader: 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 2015:

- 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**	**V.V Voronov** **A.S. Sorin**
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
	Valenciennes	UVHC
Germany	Berlin	HUB
	Bonn	UniBonn
	Frankfurt/Main	Univ.
	Hamburg	DESY

	Hannover	LUH
	Jena	Univ.
	Leipzig	UoC
	Munich	MPI-P
	Potsdam	AEI
	Rostock	Univ.
	Zeuthen	DESY
Greece	Athens	UoA
Hungary	Budapest	Wigner RCP
India	Calcutta	BNC
Italy	Frascati	INFN LNF
	Padua	UniPd
	Pavia	INFN
	Pisa	INFN
	Salerno	UniSa
	Trieste	SISSA/ISAS
	Turin	INFN
Israel	Rehovot	WIS
Japan	Kyoto	KSU
		RIMS
	Tsukuba	KEK
Mexico	Leon	UG
Poland	Warsaw	UW
	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
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	IOP VAST

Elementary Particle Physics and Relativistic Nuclear Physics (02)

02–2–1123–2015/2016	Priority: 1
	Status: New

JINR's Participation at the BES-III Physics Research Program

Leader: A.S. Zhemchugov

Participating Countries and International Organizations:

China, Russia.

Scientific Programme

The BES-III experiment at the electron-positron collider BEPC-II started its operation in the Institute of High Energy Physics (Beijing, China) in 2008. The main tasks of the experiment are the studies of charmonium physics, physics of charmed mesons, tau-leptons and light hadron spectroscopy

Expected main results in 2015:

- BES-III data analysis.
- Development of offline software and analysis tools
- Development of the distributed computing system.

List of projects:

Project	Leader	Priority (period of realization)
1. 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
BES-III Project	**A.S. Zhemchugov**	Realization
DLNP	I.R. Boyko, D.V. Dedovich, Yu.A. Nefedov, G.A. Shelkov, I.I. Denisenko, E.A. Boger, O.L. Fedorov, O.V. Bakina	
BLTP	V.V. Bytev, O.V. Teryaev	
LIT	V.V. Korenkov, A.V. Uzhinsky, S.D. Belov, I.S. Pelevanyuk, O.V. Ustimenko, V.V. Trofimov	

Collaboration

Country or International Organization	City	Institute or Laboratory
China	Beijing	IHEP CAS
Russia	Gatchina	PNPI
	Novosibirsk	BINP SB RAS
	Irkutsk	ISU

02–2–1098–2010/2015	Priority: 1

Status: Approved for completion in 2015

Study of Processes with Symmetry Violation

Leader: A.S. Kurilin

Participating Countries and International Organizations:

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

Scientific Programme

Test of Standard Model predictions. Investigation of rare decays of K-mesons. Search for the $K_L^0 \to \pi^0\nu\bar{\nu}$ decay with direct CP violation in experiment at JPARC.

Expected main results in 2015:

- 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).

List of activities:

Activity or experiment **Laboratory or other Division of JINR** **Responsible person**	**Leaders** **Main researchers**	**Status**
1. **Search for the $K_L^0 \to \pi^0\nu\bar{\nu}$ 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	

Collaboration

Country or International Organization	**City**	**Institute or Laboratory**
Belarus	Gomel	GSU
	Minsk	NC PHEP BSU
		BSU
Japan	Mito	Ibaraki Univ.
	Kyoto	Kyoto Univ.
	Osaka	OCU

		RCNP
	Saga	Saga Univ.
	Tsukuba	KEK
	Yamagata	Yamagata Univ.
Republic of Korea	Pusan	PNU
	Chongju	CBNU
	Seoul	SNU
Russia	Moscow	GPI RAS
		ARRICT
		SINP MSU
Slovakia	Košice	IEP SAS
Ukraine	Kharkov	KFTI
USA	East Lansing, MI	MSU
	Chicago, IL	UChicago
	Tempe, AZ	ASU
Taiwan	Taipei	NTU

02–2–1080–2009/2015	Priority: 1

Status: Approved for completion in 2015

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 2015:

- Preparation of the letter of intend 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 thing foils with accuracy better than 1%.
- Publication of results on lifetime measurement of $\pi^+\pi^-$ atom basing on 2008-2010 data.

List of activities:

Activity or experiment **Laboratory or other Division of JINR** **Responsible person**	**Leaders** **Main researchers**	**Status**
Experiment DIRAC	**L.G. Afanasyev**	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.O. 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

02–0–1081–2009/2016	Priority: 1

Status: In-progress

A T L A S.
Upgrade of the ATLAS Detector and Physics Research at the LHC

Leader: V.A. Bednyakov
Deputies: E.V. Khramov
A.P Cheplakov

Participating Countries and International Organizations:

Armenia, Azerbaijan, Belarus, Canada, CERN, Czech Republic, France, Germany, Georgia, Greece, Israel, Italy, Netherlands, Russia, Slovakia, 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 2015:

- Participation in the LHC and ATLAS detector maintenance and upgrades. Participation in LHC and ATLAS restart.
- 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. Physics.	E.V. Khramov	1 (2010 2019)
2.	Upgrade of the ATLAS Detector	A.P Cheplakov	1 (2013 2015)
3.	SANC	D.Yu. Bardin	1 (2003 2015)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. **Experiment ATLAS**	**V.A. Bednyakov** **E.V. Khramov** **A.P. Cheplakov**	Technical proposal
DLNP V.A. Bednyakov, J.A. Budagov, N.A. Russakovich, G.A. Chelkov	A.L. Gongadze, I.R. Boyko, M.A. Demichev, Z.V. Krumshteyn, Yu.A. Koultchitski, 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, 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, V.N. Pozdnyakov, B.G. Shaykhatdenov, 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, 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	
2. **SANC Project**	**D.Yu. Bardin**	Realization
DLNP	L.V. Kalinovskaya, A.A. Sapronov, P Christova, R.R. Sadykov, E.D. Uglov, V.A. Kolesnikov, L.A. Rumyantsev	
BLTP	A.B. Arbuzov, S.G. Bondarenko	

Collaboration

Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	Foundation ANSL
Azerbaijan	Baku	IP ANAS
Belarus	Minsk	IP NASB

		NC PHEP BSU
		JIPNR-Sosny
		NASB
	Gomel	GSTU
Canada	Vancouver	TRIUMF
	Montreal	UdeM
CERN	Geneva	CERN
Czech Republic	Prague	CU
France	Clermont-Ferrand	LPC
	Orsay	LAL
Germany	Munich	MPI-P
	Zeuthen	DESY
Georgia	Tbilisi	HEPI-TSU
Greece	Athens	UoA
Israel	Rehovot	WIS
Italy	Pisa	INFN
Netherlands	Amsterdam	NIKHEF
Russia	Moscow	LPI RAS
		ITEP
		MSU
	Protvino	IHEP
Slovakia	Bratislava	CU
		IP SAS
Spain	Barcelona	IFAE
USA	Argonne, IL	ANL
Uzbekistan	Samarkand	SSU

02–2–1124–2015/2017	Priority: 1
	Status: New

Search for New Physics in Experiments with the Fermilab High-Intensity Muon Beams

Leader: V.V. Glagolev
Scientific leader: J.A. Budagov

Participating Countries and International Organizations:

Belarus, Bulgaria, Georgia, Italy, Russia, Slovakia, USA, Ukraine.

Scientific Programme

The muon anomalous magnetic moment a_μ can be measured and computed to high precision. The comparison between experiment and the SM therefore provides a sensitive search for New Physics (NP). At present, both measurement and theory have sub-part-per-million (ppm) uncertainties, and the "g-2 test" is being used to constrain SM extensions. The difference between experiment and theory, $\Delta a_\mu(Expt - SM) = (255 \pm 80) \times 10^{-11}$ $(3, 2\sigma)$, is a highly cited result and a possible harbinger of new TeV-scale physics. Potential explanations of the deviation include: supersymmetry, lepton substructure, dark matter loop etc., all well motivated by theory and consistent with other experimental constraints. Fermilab experiment has a plan to reduce the experimental uncertainty by a factor of 4 or more. A precise g-2 test, no matter where the final value lands, will sharply discriminate among models and will enter as one of the central observables in a global analysis of any SM extensions.

The Mu2e experiment at Fermilab is a dedicated search for the CLFV process $\mu^- N \to e^- N$, which is the coherent conversion of a muon into an electron in the vicinity of a nucleus. Once neutrinos masses are included, the process is allowed but effectively still absent since the rate is proportional to $(\Delta m^2_{ij}/M^2_W)^2$, where Δm^2_{ij} is the mass difference squared between i-th and j-th neutrino mass eigenstates, and M_W is the mass of the W-boson. The predicted rates for the $\mu^- N \to e^- N$ and $\mu^+ \to e^+ \gamma$ CLFV processes are less than 10^{-50} each. This makes this process a very theoretically clean place to search for NP effects. In many NP models that include a description of neutrino mass, the rates for these processes are enormously enhanced so that they occur at a level to which Mu2e experiment will have sensitivity

Expected main results in 2015:

- Simulation to define optimal crystal type and sizes for e.m. calorimeter of the Mu2e experiment.
- Tests of the different type (LYSO, CsI, Baf2) e.m. calorimeter elements on the gamma sources and electron beam.
- Tests of the extruded scintillation strips different geometry and manufacture with wave length shifter fibers readout to optimize the final version of counters.
- Creation of the working version of the on-line control and data visualization program for Muon g-2 experiment and its integration in the common DAQ system.
- Performing R@D for choosing optimal tracker detector element for Muon g-2 experiment.

List of projects:

	Project	Leader	Priority (period of realization)
1.	Search for new physics in experiments with the Fermilab high-intensity muon beams	V.V. Glagolev	1 (2015 2017)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. **Experiment Mu2e**	**V.V. Glagolev**	R&D Realization
DLNP	A.M. Artikov, N.V. Atanov, O.S. Atanova, N.S. Azaryan, V.Yu. Baranov, V.Yu. Batusov, J.A. Budagov, D.Sh. Chokheli, Yu.I. Davydov, D.L. Demin, V.B. Flyagin, D.S. Guskov, Yu.N. Kharzheev, V.I. Kolomoets, S.M. Kolomoets, M.V. Lyablin, Yu.A. Koultchitski, V.M. Romanov, A.V. Sazonova, A.N. Shalyugin, A.V. Simonenko, S.N. Studenov, I.A. Suslov, A.K. Suhanova, I.V. Titkova, V.V. Tereschenko, S.V. Tereschenko, Z.U. Usubov	
BLTP	D.I. Kazakov, G.A. Kozlov, O.V. Tarasov	
LIT	V.V. Korenkov, V.V. Uzhinsky	
VBLHEP	A. Galoyan	
Experiment Muon g-2	**N.V. Khomutov**	R&D Realization
DLNP	V.A. Baranov, V.N. Duginov, K.I. Gritsaj, A.S. Korenchenko, N.P Kravchuk, N.A. Kuchinsky, T.N. Mamedov , A.I. Rudenko, V.P olnykh	
VBLHE	S.A. Movchan	
LRB	V.A. Krylov	

Collaboration

Country or International Organization	City	Institute or Laboratory
Belarus	Minsk	NC PHEP BSU
		"INTEGRAL"
Bulgaria	Sofia	SU
Georgia	Tbilisi	HEPI-TSU
Italy	Pisa	UniPi
	Frascati	INFN LNF
Russia	Moscow, Troitsk	INR RAS
	Gatchina	PNPI
Slovakia	Bratislava	IP SAS
		CU
USA	Batavia, IL	Fermilab
	Charlottesville, VA	UVa
	Lexington, KY	UK
Ukraine	Kharkov	ISMA NASU

02–2–1099–2010/2015	Priority: 1

Status: Approved for completion in 2015

Study of Neutrino Oscillations

Leaders: D.V. Naumov
A.G. Olshevskiy

Participating Countries and International Organizations:

Czech Republic, Germany, Japan, Italy, Turkey, USA.

Scientific Programme

- Measurement of the θ_{13} neutrino mixing angle and Δm^2_{ee} squared mass difference in Daya Bay experiment.
- Measurement of the solar neutrino fluxes in Borexino experiment, search for the sterile neutrino state.
- Study of the neutrino oscillations in OPERA experiment.
- Neutrino mass hierarchy determination and measurement of CP violation phase of the neutrino mixing matrix in JUNO and NOvA experiments.
- R&D for the new photo-detectors and detector equipment for the neutrino experiments.
- Improving of the precision of direct solar neutrino flux measurements with the Borexino detector, phase-II experiment.

Expected main results in 2015:

- Development of our own selection of inverse beta decay (IBD) events and of various backgrounds to IBD events in the Daya Bay experiment. Study of background energy spectra. Reactor antineutrino flux and rate measurement in the Daya Bay experiment.
- Study of quantum decoherence effects in neutrino oscillations taking into account Daya Bay data. Search for light sterile neutrino in the Daya Bay experiment.
- Simulation, reconstruction and analysis software development for JUNO experiment.
- Feasibility study of Top Muon Veto detector based on re-using of OPERA Target Tracker detector.
- Development and tests of high voltage system for JUNO PMT.
- Software development for the global analysis of neutrino oscillation data with the primary goal of combining reactor and accelerator neutrino data to measure the mass hierarchy
- Development of the event selection algorithms for the NOvA experiment.
- Continuation of the data taking with the Borexino detector. Improvement of the position reconstruction algorithm.
- Measurements with artificial neutrino source within sterile neutrino search project SOX (Borexino).
- Measurement or setting limits of the solar neutrino flux from the CNO cycle (Borexino).
- Improving of the current results on the effective solar neuntrino magnetic moment and on the $e \to \nu\gamma$ reaction (Borexino).
- Search for the neutrino interactions by scanning and analysing nuclear emulsions from OPERA detector in JINR. Search for the new tau-neutrino candidates in OPERA experiment. Software development and data analysis for electron neutrino search in OPERA experiment.
- OPERA detector decommission.

List of projects:

	Project	Leader	Priority (period of realization)
1.	BOREXINO	O.Yu. Smirnov	1 (1996 2015)
2.	Daya Bay/JUNO	D.V. Naumov	1 (2009 2017)
3.	NOvA	A.G. Olshevskiy	1 (2015 2017)
4.	OPERA	Yu.A. Gornushkin	1 (2010 2015)

List of activities:

	Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1.	**Experiment BOREXINO**	**O.Yu. Smirnov**	Data taking
	DLNP	K.A. Fomenko, D.V. Korablev, A.P Sotnikov	
2.	**Daya Bay/JUNO Project**	**D.V. Naumov** **M.O. Gonchar**	Data taking R&D
	DLNP	I.V. Butorov, M.O. Gonchar, M.A. Dolgareva, E.A. Naumova, I.B. Nemchenok, A.G. Olshevskiy, A.V. Chukanov, D.V. Taichenachev, N.V. Anfimov, S.V. Biktemerova, Yu.A. Gornushkin, S.G. Dmitrievsky, A.V. Krasnoperov, Z.V. Krumshtein, N.A. Morozov, A.V. Rybnikov, A.B. Sadovsky, A.S. Selunin, O.Yu. Smirnov, K.A. Fomenko, D.V. Fedoseev	
3.	**NOvA Project**	**A.G. Olshevskiy** **O.B. Samoylov**	Data taking
	DLNP	N.V. Anfimov, A.E. Bolshakova, S.G. Dmitrievsky, A.G. Dolbilov, A.A. Dolmatov, Yu.A. Gornushkin, Ch. Kullenberg, D.V. Naumov, A.B. Sadovsky, I.M. Shandrov, A.S. Sheshukov, A.P Sotnikov	
	BLTF	S.M. Bilenky, K.S. Kuzmin, V.A. Matveev, V.A. Naumov, O.N. Petrova	
	LIT	V.V. Korenkov + 2 pers	
4.	**Experiment OPERA**	**Yu.A. Gornushkin**	Data taking
	DLNP	S.G. Dmitrievsky, Z.V. Krumshtein, A.G. Olshevskiy, S.G. Zemskova, A.V. Chukanov, A.B. Sadovsky, A.S. Sheshukov, A.A. Nozdrin	
	VBLHEP	Yu.P etukhov	
	LIT	G.A. Ososkov	
5.	**Development of new photodetectors and the equipment for application in registering systems of neutrino experiments**	**A.G. Olshevskiy**	R&D

DLNP Z.V. Krumshtein	A. Antoshkin, N.V. Anfimov, T.V. Rezinko, A.V. Rybnikov, A.V. Selunin, V.V. Chalyshev, I.E. Chirikov-Zorin, D.V. Fedoseev
VBLHEP Z.Ya. Sadygov	T.Yu. Bokova, I.A. Tyapkin, B. Marinova
LIT	G.A. Ososkov

Collaboration

Country or International Organization	**City**	**Institute or Laboratory**
Germany	Hamburg	Univ.
Czech Republic	Prague	CU
Italy	Salerno	INFN
USA	Indianapolis, IN	IUPUI
	Batavia, IL	Fermilab
	Cambridge, MA	Harvard Univ.
Turkey	Ankara	METU
Japan	Tokyo	Toho Univ.

02–0–1108–2011/2016	Priority: 1

Status: In-progress

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 2015:

- Inclusion of MC generators into the PANDA software and optimization of the event analysis.
- Calculations and coordination of the work for the production of the superconducting solenoid sub-systems.
- Preparation of the technical specifications for the production of the PANDA muon system.
- Test of MDT at CERN PS.

List of projects:

	Project	Leader	Priority (period of realization)
1.	PANDA	A.G. Olshevskiy	1 (2011 2017)

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.V. Tokmenin	
	VBLHEP A.S. Vodopyanov	E.A. Strokovsky, M.G. Sapozhnikov, V.X. Dodokhov, E.K. Koshurnikov, 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, A.S. Galoyan	
	LIT	Gh. Adam, V.V. Uzhinsky	
	BLTP	A.S. Sorin, O.V. Teryaev, A.V. Efremov	
2.	**Development of MDT two-coordinate readout including MDT design, electronics and prototype tests**	**G.D. Alexeev**	R&D

DLNP	V.M. Abazov, A.G. Samartsev, V.V. Tokmenin, V.A. Malyshev, A.A. Piskun, S.A. Kutuzov, L.S. Vertogradov, Yu.A. Yatsunenko, Yu.A. Kozhevnikov, N.T. Zhuravlev

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	ISMA NASU

02–2–1125–2015/2017	Priority: 2
	Status: New

Astrophysical Studies in the Experiment TAIGA

Leader: L.G. Tkatchev
Deputy: V.M. Grebenyuk

Participating Countries and International Organizations:

Czech Republic, Germany, Japan, Italy, Mexico, Republic of Korea, Romania, Russia, Ukraine.

Scientific Programme

- The main topic of multi-messenger TAIGA array are Gamma-ray astronomy, charged cosmic ray physics and particle physics. Gamma-ray astronomy - one of the most intriguing questions in high-energy astroparticle physics is a search for galactic objects for accelerating of particles up to PeV-energies (thr so-called Pevatrons); VHE spectra of known sources: where do they stop; absorption in IR and CMB; diffuse emission from galactic plane and local supercluster.Charged cosmic ray physics the energy spectrum and mass composition measurements from 10^{14} to 10^18 eV. Particle physics - axion/photon conversion; hidden photon/photon oscillations; Lorentz invariance violation; pp cross-section measurement; search for quark-gluon plasma phenomena.

- 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 up to Z≈40 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 2015:

- Completion of the complex tests of the TUS apparatus.
- Participation in the data taking of the TUS experiment.
- Participation in the TUS data off-line analysis.
- Test of the fluorescent datactor for TУНКА array
- Production and test of the calibration system for TUS detector on the Earth orbit.
- Development of the MC simulation program for the NEUTRONYI detector at the Moon surface. Participation in the avant-project preparation of the NEUTRONYI detector.
- Participation in the data taking of the NUCLEON experiment.

List of projects:

Project	Leader	Priority (period of realization)
TAIGA	L.G. Tkatchev	2 (2015 2017)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. **Experiment TAIGA**	**L.G. Tkatchev**	Realization
DLNP	V.M. Grebenyuk, S.Yu. Porokhovoy, A.V. Tkachenko, F.F. Grinyuk, M. Slunečhka, V. Slunečhkova, N. Zaikova, N.I. Kalinin , V.F. Boreyko, A.A. Timoshenko, V. Romanov, M. Finger, B.M. Sabirov, Nguen Man Shat	
VBLHEP	N.V. Gorbunov	
LIT	S.K. Slepnev	
2. **Experiment TUS**	**L.G. Tkatchev**	Realization
DLNP	V.M. Grebenyuk, S.Yu. Porokhovoy, A.V. Tkachenko, F.F. Grinyuk, M. Slunečhka, V. Slunečhkova, N. Zaikova, N.I. Kalinin , V.F. Boreyko, A.A. Timoshenko	
VBLHEP	N.V. Gorbunov	
3. **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, A.V. Tkachenko, A.A. Timoshenko	
VBLHEP	N.V. Gorbunov	
LIT	V.N. Shigaev, S.K. Slepnev	
FLNP	A.D. Rogov	

Collaboration

Country or International Organization	City	Institute or Laboratory
Czech Republic	Prague	CU
Germany	Zeuthen	DESY
	Munich	MPI-P
	Hamburg	Univ.
	Tübingen	Univ.

Japan	Wako	RIKEN
Mexico	Puebla	BUAP
Italy	Turin	UniTo
Republic of Korea	Seoul	EWU
Romania	Bucharest	ISS
Russia	Moscow	SINP MSU
		NNRU "MEPhI"
		VNIIEM Corporation
	Irkutsk	ISU
	Korolev	RSC "Energia"
	St. Petersburg	KB "Arsenal"
	Moscow, Troitsk	INR RAS
Ukraine	Kiev	NUK
	Kharkov	ISMA NASU

02–1–1106–2011/2016	Priority: 1

Status: In-progress

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, Slovakia, 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 2015:

- Detail design of individual parts 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. Development of the algorithms and software for trigger, simulation and data analysis**	**A.I. Malakhov** **V.V. Ivanov**	Realization
	VBLHEP	E.–M. Ilgenfritz, Yu.S. Anisimov, S.N. Kuznetsov, Yu.V. Zanevsky, V.F. Chepurnov, 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, 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 vdeev, 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
Slovakia	Bratislava	IP SAS
		CU
Ukraine	Kiev	BITP NASU
Uzbekistan	Jizzakh	JSPI
	Samarkand	SSU

02–1–1096–2010/2019	Priority: 1

Status: Extended

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, Slovakia, 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 carried out a search for supersymmetric particles and their partners with a goal to observe a physics beyond the Standard Model. In addition, characteristics of rare kaon and hyperon decays will be improved. A high resolution straw–detectors of the NA62 magnetic spectrometer working in vacuum will be supported during experimental runs. Software for simulation, data processing and analysis will be developed.

Expected main results in 2015:

- Data taking by the NA62 set–up and data analysis will be carried out.
- 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.
- Calibration, testing a nd support of the NA62 straw detectors will be carried out.

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 Data taking
	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. Gudzovsky, 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, M.V. Zaytseva, S.V. Kilchakovskaya, V.V. Elsha, T.L. Enik, N.N. Shcherbakov, Yu.V. Gusakov, V.A. Samsonov, 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
	Naples	INFN
	Perugia	INFN
	Padua	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
Slovakia	Bratislava	CU
United Kingdom	Birmingham	Univ.
	Bristol	Univ.
	Glasgow	US
	Liverpool	Univ.
USA	Boston, MA	BU
	Chicago, IL	UChicago
	Fairfax, VA	GMU
	Menlo Park, CA	SLAC
	Merced, CA	UC Merced

02–0–1083–2009/2016	Priority: 1

Status: In-progress

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, Slovakia, 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–nucleaus interactions.

The major activities of JINR are focused on the following directions:
–f orward calorimetry, including endcap hadron, and preshower detector;
–f orward muon stations with cathode strip chambers;
–d evelopment of Physics program to test SM and BSM.

Expected main results in 2015:

- 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 2019)
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, A.M. Kurenkov, P.V. Moisenz, V.A. Smirnov, A.I. Malakhov, B.S. Yuldashev	
	DLNP	A. Mestvirishvili, 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, N.N. Voytishin	
3.	**Upgrade of the CMS detectors**	**I.A. Golutvin**	Realization
	VBLHEP	S.V. Afanasiev, N.V. Gorbunov, V.Yu. Karjavin, 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, N.N. Voytishin	
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. Podoynitsin, M.V. Savina, A.I. Malakhov, S.G. Shulga, B.S. Yuldashev	
	LIT	V.V. Korenkov, D.A. Oleynik, G.A. Ososkov, V.V. Palchik, A.Sh. Petrosyan, N.N. Voytishin	
	BLTP	G.A. Kozlov, A.B. Arbuzov, A.V. Kotikov, 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, N.N. Voytishin	
	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	Foundation ANSL
Austria	Vienna	HEPHY
Belarus	Minsk	NC PHEP BSU
		INP BSU
	Gomel	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

	Ioannina	UI
Hungary	Budapest	Wigner RCP
	Debrecen	Atomki
		UD
India	Mumbai	BARC
		TIFR
	Bhubaneshwar	IOP
	Chandigarh	PU
Iran	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
	Chongju	CBNU
Russia	Moscow	ITEP
		LPI RAS
		SINP MSU
		NIKIET
	Moscow, Troitsk	INR RAS
	Gatchina	PNPI
	Protvino	IHEP
	Snezhinsk	VNIITF
	St. Petersburg	Electron
	Zhukovsky	MDB
Serbia	Belgrade	INS “VINČA”
Slovakia	Bratislava	STU

Spain	Madrid	CIEMAT
		UAM
	Oviedo	Uniovi
	Santander	IFCA
Switzerland	Zurich	ETH
		UZH
	Villigen	PSI
	Basel	Uni Basel
Taiwan	Taipei	NTU
	Chung–Li	NCU
Turkey	Adana	CU
	Ankara	METU
Ukraine	Kharkov	KFTI
		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

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

02–0–1085–2009/2016	Priority: 1

Status: In-progress

Studies of the Nucleon and Hadron Structure at CERN

Leader: A.P agaytsev .N
Scientific leader: I.A. Savin

Participating Countries and International Organizations:

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

Scientific Programme

Studies of the Primakoff reactions and diffractive proctsses. Studies of the generalized parton distributions in various exclusive processes and participation in construction of new electromagnatic 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 mesurements 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.
- Search of new bound states of quarks and gluons.
- Measurements of nucleons structure in the Drell–Yan processes.
- Studies of the inclusive production of photons, pions and ρ–mesons in DIS and DVCS.
- Software creation and development for simulation and data analysis. System support of CERN software in COMPASS–II.
- Creation of the new electromagnetic calorimeter for COMPASS–II.
- Detector preparation for the COMPASS–II spectrometer.

Expected main results in 2015:

- Measurement of the Drell-Yan process.
- Participation in the data taking.
- Maintenance of the hadron calorimeter HCAL1 and muon system MW1.
- Testing, assembly and commissioning 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 for COMPASS–I and 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	G.V. Meshcheryakov, N.N. Vlasov, A.S. Yukaev, V.A. Anosov	
2. **Electromagnetic calorimeter**	**A.P. Nagaytsev,** **Z.V. Krumshtein**	Preparation R&D
VBLHEP	O.P Gavrishchuk, G.V. Meshcheryakov, A.S. Yukaev, N.S. Rossiyskaya, O.M. Kuznetsov, V.A. Anosov	
DLNP	I.E. Tchirikov–Zorin, N.V. Anfimov, T.V. Rezinko, I.A. Orlov, V.V. Tchalyshev, A.V. Rybnikov, D.V. Fedossev, A.S. Selyunin, A.G. Olshevskiy, O.V. Gromov	
3. **Muon system**	**G.D. Alekseev**	Maintenance
DLNP	N.I. Zhuravlev, N.A. Kutchinsky, V.L. Malyshev	
4. **Software development. Data analysis**	**E.V. Zemlyanichkina**	Realization
VBLHEP	I.A. Savin, D.V. Peshekhonov, G.I. Smirnov, A.P Nagaytsev, O.M. Kuznetsov, Yu.I. Ivanshin, N.S. Rossijskaya, R.R. Akhunzyanov, R. Gushcherski, A.V. Ivanov, V.S. Batozskaya, E.A. Salmina	
DLNP	A.G. Olshevsky, A.V. Guskov, Z.V. Krumshtein, K.Yu. Gasnikova, I.A. Orlov, N.V. Anfimov, T.V. Rezinko, A.V. Rybnikov, A.S. Selyunin	
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**	Realization
VBLHEP	O.P Gavrishchuk, G.V Meshcheryakov, O.M. Kuznetsov, Yu.I. Ivanshin, R.R. Akhuzyanov, N.S. Rossijskaya, E.V. Zemlyanichkina, A.V. Ivanov	
DLNP	A.G. Olshevskiy, Z.V. Krumshtein, A.V. Guskov, K.Yu. Gasnikova, I.A. Orlov, N.V. Anfimov, T.V. Rezinko, A.V. Rybnikov, A.S. Selyunin	
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 avrishchuk, 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	Foundation ANSL
Belarus	Minsk	NC PHEP BSU
		JIPNR-Sosny
		NASB
Bulgaria	Sofia	INRNE BAS
		SU
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.
Poland	Warsaw	WUT
Russia	Moscow	SINP MSU
		LPI RAS
	Moscow, Troitsk	INR RAS

	Gatchina	PNPI
	Protvino	IHEP
Switzerland	Zurich	UZH
Ukraine	Kharkov	ISMA NASU
United Kingdom	Liverpool	Univ.
USA	Urbana, IL	UIUC

02–1–1086–2009/2017	Priority: 1

Status: Extended

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

Leaders: E.A. Strokovsky
E.S. Kokoulina

Participating Countries and International Organizations:

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

Scientific Programme

Strangeness in hadronic matter and study of boundary effects:
study of stabilizing effects of strangeness in nuclear matter and properties of the lightest hypernuclei;
study of multi–particle dynamics in inelastic proton–proton and proton–nucleus interactions with extremally high multiplicity;
study of spectra and yields of soft photons in deuteron–nucleus and nucleus–nucleus interactions.

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 about the drip–line location for loosly bound light hypernuclei with high neutron excess. Development of theory of the neutron–rich hyper nuclei and models of their production in non–central nucleus–nucleus interactions.
- New experimental data about soft photon emission in deuteron–nuclei and nuclei–nuclei interactions, including study of dependence of their energy spectra on electric charges of the projectile and target nuclei, as well as on multiplicity of secondaries.
- Development of theoretical and phenomenological models for description of data on the soft photon yields in tne non–central deuteron–nuclei and nuclei–nuclei iteractions, differentiated on multiplicity of secondaries.
- Construction of two–arm electromagnetic calorimeter for soft photon registration in a wide region of emission angles for study of interference patterns aimed on search of new resonances and verification of theoretical predictions about new phenomena in a dense nuclear matter.

Expected main results in 2015:

- Modernization of the FFE, DAQ and tracking systems of the NIS–GIBS spectrometer.
- Data taking on the hyper–nuclear program (search for the hyper–hydrogen 6) using the NIS–GIBS spectrometer at extracted beams of deuterons and ${}^{7}Li$ nuclei.
- Analysis of data from LEPS spectormeter on vector–meson photoproduction by polarized photons.
- Analysis of data on soft ($E_{\gamma} < 50$ MeV) photon emission in deuteron–nuclei and nuclei–nuclei interactions at kinetic energies above 2 GeV/nucleon.
- Preparation of the NEMAN project aimed on study of photon emission in non–central collisions of relativistic (with kinetic energies above 1 GeV/nucleon) heavy nuclei with nuclei at the BM@N setup.

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–GIBS**	**E.A. Strokovsky** **J. Lukstins**	Realization Data taking
VBLHEP	V.D. Aksinenko, R.A. Salmin, 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. Averiyanov, A.M. Korotkova, N.G. Parfenova, S.V. Starikova, V.B. Dunin + 2 students, A.V. Konstantinov	
DLNP	V. Tereschenko, Yu.A. Batusov	
OCE	A.N. Parfenov	
2. **Experiment NEMAN**	**E.S. Kokoulina** **V.A. Nikitin**	Project preparation Data taking
VBLHEP	V.I. Kireev, V.V. Avdeychikov, Yu.A. Chentsov, I.A. Rufanov, V.A. Nikitin, M.V. Tokarev, Yu.P etukhov, A.N. Aleev, A.I. Yukaev, N.K. Zhidkov, V.V. Pavlyuchkov, V.B. Dunin + 3 students, V.P Balandin, N.F. Furmanets	
BLTP	Yu.A. Bystritsky	

Collaboration

Country or International Organization	City	Institute or Laboratory
Belarus	Minsk	NC PHEP BSU
		BSUIR
	Gomel	GSTU
		GSU
Czech Republic	Prague	CTU
	Řež	UJV
		NPI ASCR
Germany	Frankfurt/Main	Univ.
	Jülich	FZJ
Japan	Osaka	RCNP

Russia	Moscow	SINP MSU
	Protvino	IHEP
	Syktyvkar	DM Komi SC UrD RAS
Ukraine	Kiev	BITP NASU

02–1–1093–2009/2015	Priority: 1

Status: Approved for completion in 2015

Development of High-Precision Straw Detectors

Leader: V.D. Peshekhonov

Participating Countries and International Organizations:

Belarus, 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 2015:

- Preparing documentation on the coordinate detector modules with a sensitive area of ∼14 m^2 sq based on the results of the engineering prototype studies.
- Creation of the detector prototype with the cathode registration readout and preparation to bench and beam tests.
- Study possibility the detect of the pairs events with small distances between them.
- Development of the fast analog electronics for the straw detectors.
- Development and production of the tipical elements for the straw detectors and the assembly tools.

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, G.S. Berezin, 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
		LPI RAS
	Moscow, Troitsk	INR RAS
	Protvino	IHEP

02–0–1065–2007/2019	Priority: 1

Status: Extended

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 GeV/n

Leaders: A.S. Sorin
V.D. Kekelidze

Deputies: G.V. Trubnikov
I.N. Meshkov
A.D. Kovalenko

Participating Countries and International Organizations:

Armenia, Azerbaijan, Belarus, Bulgaria, CERN, China, Czech Republic, France, Georgia, Germany, Italy, Japan, Moldova, Poland, Romania, Russia, Slovakia, 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 2015:

- Development and extension of the "White Paper" project physics program. Continuation of theoretical sudies 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.
- 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, continuation of tests of the new heavy ion source KRION–6T, technical improvement of the cryogenic and injection complex. Development of the system for beam diagnostics. Tests of the source for polarized particles SPI. Annual dedicated machine development runs at Nuclotron on first priority tasks within running time of 400 hours.
- Start of new linear injector ($z/A \geq 0.14$) and RFQ fore–injector of LU–20. Construction pf the prototypes related to the collider magnetic system and development of the beam cooling systems; tests of the stochastic cooling system prototype at Nuclotron. Start of mass–production of the superconducting magnets for NICA and the prototype for 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 technical project for beam cooling systems manufacturing.
- Realization of the plan of first turn works for BM@N project.

- Realization of the technical project of the MPD solenoid and the oeder for its manufacturing. Prototyping of the detector elements for the first 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, productions processes and other processes in light polarized nuclei collisions.
- Nuclotron runs dedicated to physics and machine development within running time of 1000 hous.
- 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	M.N. Kapishin	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** **D. Blaschke**	Realization
	BLTP	A.V. Efremov, S.V. Molodtsov, A.S. Hvorostukhin, O.V. Teryaev, S.B. Gerasimov, M.K. Volkov, A. Parvan, Ya.N. Klopot, 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. Lednicky, 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

H.G. Khodzhibagiyan + 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.V. Alfeev, V.A. Monchinsky, A.I. Govorov + 7 pers., V.V. Seleznev, R.G. Pushkar, K.A. Levterov, A.A. Voronin, B.V. Golovensky, K.B. Shevchenko, V.P Vadeev, D.A. Lyusev, I.V. Shirikov, A.V. Smirnov + 3 pers., A.R. Galimov, A.V. Nesterov, G.L. Kuznetsov, O.A. Kunchenko, R.V. Pivin, A.M. Bazanov, E.E. Donets, E.D. Donets, D.E. Donets, V.B. Shutov, D.O. Ponkin, V.S. Alexandrov, V.A. Andreev, V.A. Isadov, A.V. Eliseev, S.V. Romanov, V.V. Tarasov, A.E. Kirichenko + 3 pers , D.V. Monakhov, 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., A.V. Filippov, N.I. Lebedev, E.V. Gorbachev, V.V. Fimuskin, 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, V.M. Slepnev + 4 pers.

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

G.V. Trubnikov
G.G. Khodzhibagiyan
A.D. Kovalenko
S.A. Kostromin

R&D
Realization

VBLHEP

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., 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, 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, A.A. Makarov, Yu.A. Tumanova, T.F. Prakhova, V.V. Agapova, A.V. Buchkov, V.S. Korolev + 3 pers , V.V. Borisov

4. **Commissioning of the heavy ion source (KRION–6 T), commissioning of the polarized particle source (SPI) for the NICA complex**

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

Realization

	VBLHEP	V.B. Shutov + 3 pers., A.Yu. Ramzdorf, D.E. Donets, A.Yu. Boitsov, D.O. Ponkin, 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.N. Sedykh + 1 pers., A.D. Kovalenko	
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	A.V. Butenko, B.V. Vasilishin, O.S. Kozlov, A.G. Kochurov, 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, R.I. Kukushkina, V.S. Alexandrov, A.V. Tuzikov, 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, I.Ya. Nefedev, V.N. Karpinsky, A.L. Osipenkov, A.I. Sidorov	
6.	**Development of the cryogenic systems for Nuclotron–NICA**	**N.N. Agapov** **H.G. Khodzhibagiyan**	Projecting Realization
	VBLHEP	V.I. Batin + 6 pers., H. Malinovsky + 5 pers., V.M. Drobin, Yu.T. Borzunov, A.V. Konstantinov, V.D. Bartenev, L.V. Petrova, E.A. Kulikov, A.S. Averichev + 4 pers , V.I. Lipchenko, V.E. Kurinov, Yu.A. Mitrofanova + 3 pers , 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**	**A.V. Butenko** **V.V. Kobets** **I.N. Meshkov** **V.A. Monchinsky**	Realization
	VBLHEP	A.O. Sidorin, A.I. Govorov, V.V. Seleznev + 4 pers , K.A. Levterov, A.A. Voronin, B.V. Golovensky, K.V. Schevchenko, V.P adeev, D.A. Lyusev, I.V. Shirikov, A.V. Smirnov, A.V. Nesterov, A.M. Bazanov, N.D. Topilin, A.I. Sidorov + 1 pers , A.A Fateev, I.G. Lebedeva, S.N. Sedykh, A.P ozlov, V.V. Kosukhin	
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. Khodzhibagiyan + 5 pers , S.A. Kostromin, A.V. Smirnov + 3 pers., A.R. Galimov, A.V. Nesterov, G.L. Kuznetsov, O.A. Kunchenko, R.V. Pivin, A.M. Bazanov, V.V. Seleznev, N.N. Agapov + 8 pers.,	

		V.I. Batin + 5 pers., V.N. Karpinsky, A.L. Osipenkov, O.I. Brovko, N.D. Topilin, Yu.V. Gusakov, A.V. Shabunov, 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.
	DLNP	S.L. Yakovenko, E.V. Akhmanova, A.G. Kobets, A.Yu. Rudakov, N.A. Rybakov	
9.	**Technical design, R&D and construction of the heavy ion collider NICA with energy $\sqrt{s_{NN}}$ = 4÷11 GeV/n and average luminosity 1 $\cdot 10^{27}$cm$^{-2} \cdot s^{-1}$ and light polarized ions on the base of Nuclotron**	**I.N. Meshkov** **G.V. Trubnikov** **A.O. Sidorin** **A.D. Kovalenko**	Project preparation Realization
	VBLHEP	G.G. Khodzhibagiyan + 5 pers., A.V. Butenko, A.V. Smirnov + 3 pers., S.A. Kostromin, A.R. Galimov, G.L. Kuznetsov, R.V. Pivin, A.M. Bazanov, N.N. Agapov + 8 pers, V.I. Batin + 5 pers., 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, E.I. Urazakov	
	DLNP	A.G. Kobets + 2 pers., T.A. Stepanova, L.V. Soboleva, E.V. Akhmanova, A.A. Sidorin, S.L. Yakovenko	
	LRB	G.N. Timoshenko, V.Yu. Shchegolev	
10.	**Design and construction of the MPD detector. Preparation of the Technical Design Project. R&D and construction of the first–stage detector elements: time–projection chamber, time–of–flight system, electro-magnetic calorimeter, zero–degree calorimeter, internal tracker**	**V.D. Kekelidze** **A.S. Sorin** **V.M. Golovatyuk**	R&D Technical proposal
	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. Olshevskiy, Z.V. Krumshtein + 8 pers.
	LIT	V.V. Ivanov, P.G. Akishin, P.I. Kisel, O.Yu. Derenovskaya, Zh.Zh. Musulmanbekov, A.M. Raportirenko, P.V. Zrelov
11.	**Design and construction of the superconducting solenoidal and magnet yoke**	**A.S. Vodopyanov** — R&D, Technical proposal
	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**	**I.A. Savin** **A.D. Kovalenko** **V.V. Kukhtin** — Project preparation, Realization
	VBLHEP	A.P Nagaytsev, G.V. Meshcheryakov, E.V. Zemlyanichkina, A.I. Zinchenko, N.S. Rossiyskaya, D.V. Peshekhonov, V.D. Peshekhonov, Yu.I. Ivanshin, P.V. Moisenz, V.V. Myalkovsky, A.V. Ivanov, N. Dzhavadov, O.M. Kuznetsov, A.I. Malakhov, B. Marineva, F. Ahmadov, R.R. Akhunzyanov, G.I. Smirnov, E.A. Strokovsky, R. Lednicky, S.S. Shimansky, N.D. Topilin, V.P Ladygin, P.K. Kurilkin, A.K. Kurilkin, V.A. Anosov, A.A. Baldin, A.P Cheplakov, I.A. Golutvin

	DLNP	Z.V. Krumshtein, R. Abramishvili, A.V. Guskov, I.A. Orlov, N.V. Anfimov, I.E. Chirikov-Zorin, I.B. Gongadze,A.L. Gongadze, M. Finger(junior), M. Finger A. Janata, M. Slunechka,V. Slunechkova, N.B. Skachkov, G.A. Shelkov	
	LIT	T.A. Strizh, V.V. Palchik	
	BLTP	A.V. Efremov, O.V. Teryaev, G.A. Kozlov, A.V. Radyushkin, A.V. Sidorov, Yu.I. Uzikov	
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. Dydyshko, 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.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 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, Yu.N. Balandin	
	GA&C	Yu.N. Denisov	
16.	**Works on realization of the experiment Baryonic matter at Nuclotron (BM@N)**	**M.N. Kapishin** **V.P. Ladygin** **P. Senger** **Yu.A. Murin**	Realization
	VBLHEP	V.V. Avdeychikov, A.V. Averiyanov, 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.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.D. Kovalenko, 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. Lukstinsh, A.I. Malakhov, V.V. Myalkovsky, Yu.N. Murin, V.A. Nikitin, P.V. Nomokonov, O.V. Okhrimenko, V.V. Pavluchkov, 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, A.S. Sorin, E.A. Strokovsky, 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	O.V. Teryaev

Collaboration

Country or International Organization	**City**	**Institute or Laboratory**
Armenia	Yerevan	YSU
Azerbaijan	Baku	IP ANAS
Belarus	Minsk	NC PHEP BSU
		JIPNR-Sosny
		NASB
		“Planar”
		BSUIR
	Gomel	GSU
	Gomel	GSTU
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
	Dresden	ILK
	Giessen	JLU
	Erlangen	FAU
	Frankfurt/Main	Univ.
		FIAS
	Mainz	JGU
	Regensburg	UR

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

02–0–1067–2007/2015	Priority: 1

Status: Approved for completion in 2015

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, Slovakia, 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 lase metrology R&D for laser–plasma accelerators.

Expected main results in 2015:

- Mechanical design and production of the photoinjector support. Main photoinjector units assembling. Startup of the second emittance measurement station. Production and research of "transparent" thin film photocathodes.
- Commissioning of the linear electron accelerator (fourth segment) with electron energy up to 150 MeV. Assembling and testing of the waveguide line and the beamline section with quadrupole focusing magnets.
- Creation of the prototype of 50 meters long Laser Fiducial Line in air with spatial stability of the beam of 50 microns. Manufacturing Nb++SS transition samples for the newly designed (triple–metalic) construction using the advanced technology of explosive welding of niobium with titanium and stainless steel, cryo/vacuum and metallographic tests, neutron diffraction investigation. Manufacture and tests of prototypes of single–cell cavities of high–pure niobium.
- Low Energy Particle Storage Ring LEPTA: storage of intense positron bunch in Malmberg–Surko trap and its injection into LEPTA storage ring, enhancement of intensity of circulating positrons. electron cooling of positrons and Positronium generation. Construction of cryogenic source of monochromatic positrons based on autonomic system of liquid helium supply erformance of experimantal studies of constructional.P materials and semiconductors using positron annihilation spectroscopy (PAS) method, construction of "tagged" slow positron channel.
- Investigation of electron beam and FEL physics: investigation of bunch longitudinal structure on basis of infrared radiation produced by JINR undulators at FLASH, analysis of beam formation in FLASH2 using microchannel plate detector, installation of three microchannel plate detectors of XFEL, first experiments with PITZ photoinjector applied for formation of 3D ellipsoidal shape electron bunches.
- Creation of the laboratory and practical works complex based on linear accelerator bench for students from JINR member states.
- Preparation of the proposal of the JINR participation in the FCC design study at CERN.

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**	**G.V. Trubnikov** **N.I. Balalykin**	Technical proposal Realization
VBLHEP	V.F. Minashkin, M.A. Nozdrin, V.G. Shabratov, A.V. Shevelkin	
2. **R&D works at dedicated test bench: electron linear accelerator up to 200 MeV for studies of accelerating structures properties and usage as FEL prototype. Laser–plasma acceleration technologies**	**G.D. Shirkov** **V.V. Kobets** **A.V. Dudarev**	Technical proposal Realization
VBLHEP	V.G. Shabratov, A.V. Skrypnik, A.N. Ukhanov, V.F. Minashkin, M.A. Nozdrin	
DLNP	E.M. Syresin, R.S. Makarov, V.M. Romanov	
UC	S.Z. Pakulyak	
CAR	V.N. Samoilov	
3. **R&D works for particle accelerator cryomodule components and superconducting cavity optimal configuration; and for high precision laser metrology control of element alignment of large accelerator facilities**	**J.A. Budagov**	Technical proposal Realization
DLNP	N.S. Azaryan, V.V. Glagolv, 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	

4. **LEPTA facility: electron cooling of positrons and Positronium generation. Development of Doppler positron annihilation spectroscopy** — **I.N. Meshkov, A.G. Kobets** — Realization

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

   VBLHEP: V.N. Karpinsky, V.M. Drobin, V.V. Seleznev

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** — Realization

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

   VBLHEP: A.Yu. Grebentsov, N.I. Zamyatin, O.A. Myslinskaya

6. **Preparation of the proposal of the JINR participation in the FCC design study at CERN** — **A.D. Kovalenko** — Preparation

   VBLHEP: A.M.Taratin + 2 pers.

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
	Kharkov	IERT NASU
United Kingdom	Oxford	JAI
Slovakia	Bratislava	IEE SAS
USA	Upton, NY	BNL
	Batavia, IL	Fermilab

02–1–1097–2010/2015	Priority: 1

Status: Approved for completion in 2015

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:

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

Scientific Programme

Methodical support of the experiments at polarized beams of the Nuclotron-M and NICA facilities, including development of polarimetery 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 2015:

- Preparation of the proposals:
  a) on the construction low energy proton and deuteron polarimeter within the frames of the program: "Spin Physics Research Infrastructure at the Nuclotron";
  b) on the measurements of analyzing power of neutron–CH scattering at polarized neutron momentum from 3 to 4.5 GeV/c.
- 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.
- Participation in the design and construction of BM@N setup in in accordance with general plan.
- Participation in the joint scientific programs and experiments, design and test of the new detectors and electronics for the use at COSY (Julich), 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"**	**A.D. Kovalenko**	Realization
VBLHEP	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.V. Fimushkin	
BLTP	V.V. Burov, V.K. Lukyanov, A.V. Efremov, O.V. Teryaev	
DLNP	M. Finger, M Finger (Jr.)	
LIT	R.V. Polyakova + 1 pers.	
2. **ALPOM-2 Project**	**N.M. Piskunov** **E. Tomasi–Gustafsson** **C.F. Perdrisat**	Data taking
VBLHEP	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	
3. **DSS Project**	**A.I. Malakhov** **V.P. Ladygin** **T. Yesaka**	Preparation Data taking
VBLHEP	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, A.Yu. Isupov	
DLNP	G.I. Lykasov	
4. **Modernization of the polarized proton target infrastructure (setup PPT)**	**N.S. Borisov** **R.A. Shindin**	Preparation Data taking
VBLHEP	R.A. Shindin	
DLNP	N.S. Borisov, Yu.A. Usov, Yu.A. Plis, N.A. Bazhanov, A.N. Fedorov	

5. **Development of the Delta–Sigma program for future experiments at setup BM@N**	**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, N.A. Kuzmin, I.P udin	
DLNP	N.S. Borisov , Yu.A. Usov, M. Finger, M. Finger (jr.)	
FLNP	S.B. Borzakov, Ts. Panteleev	
BLTP	N.V. Kochelev	
LIT	R.V. Polyakova + 1 pers.	
6. **Experiments on the program STRELA**	**N.M. Piskunov**	Data taking
VBLHEP	V.V. Glagolev, I.M. Sitnik, 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. Slunečhka, V. Slunečhkova, M. Finger (Jr.), A. Yanata	
9. **Works on the program DELTA–2 (INR RAS - JINR)**	**A.B. Kurepin** **A.N. Livanov**	Preparation 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	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
Slovakia	Bratislava	IP SAS
	Košice	IEP SAS
		PJSU
Sweden	Uppsala	TSL
Switzerland	Geneva	UniGe
	Villigen	PSI
Ukraine	Kharkov	KFTI
USA	Upton, NY	BNL
	Newport News, VA	JLab
	Norfolk, VA	NSU
	Williamsburg, VA	W&M
Uzbekistan	Tashkent	INP UAS
		Assoc.“P.-S.” PTI

02–1–1087–2009/2017	Priority: 1

Status: Extended

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, Slovakia, 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. Asymptotics in nuclear collisions and nucleon clusters. 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. 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 2015:

- 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. 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. Furter participation in data analysis of dp (1.25 GeV) and np (3.5 GeV).
- 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–depedence, the construction and production of the neutron detector for this experiment. Investigation of scintillators at high beam intensity
- Analysis of emulsions irradiated with the nuclear beams $^{7}Be, ^{10}C, ^{12}N$ 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.
- 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 processe, applied and educational programs at MARUSYA setup. Construction of electromagnetic detector of MARUSYA setup and test channel and corresponding electornics 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 2017)
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, A.V. Belyaev	
BLTP	V.D. Toneev	
DLNP	G.I. Lykasov	
2. **Experiment NA61/SHINE**	**A.I. Malakhov** **G.L. Melkumov**	Data taking Preparation Data analysis
VBLHEP	N. Agagabyan, B. Baatar, D.A. Artyemenkov + 2 pers, D.K. Dryablov, A.Yu. Isypov, V.I. Kolesnikov, M.A. Kozhin, D.O. Krivenkov	
DLNP	B.A. Popov, S.A. Bunyatov	
3. **Experiment BECQUEREL**	**P.I. Zarubin**	Data taking
VBLHEP	V.V. Rusakova, D.A. Artemenkov, V. Bradnova, N.O. Kornegrutsa, P.P Kattabekov, L.Z. Mamatkulov, P.A. Rukoyatkin	

4.	**Project FASA-3**	**V.A. Karnaukhov**	Preparation Data taking
	DLNP	S.P vdeev, 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 Nuclotron**	**S.V. Afanasiev** **G.A. Sokol**	Preparation Data taking Upgrade
	VBLHEP	S.V. Afanasiev + 4 students, Yu.S. Anisimov, A.S. Artemov, A.F. Elishev, A.Yu. Isypov, Z.A. Igamkulov, D.K. Dryablov, L.V. Kornyushina	
6.	**Search and investigation of new phenomena using information 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**	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	
7.	**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, A.Yu. Troyan, A.V. Shabunov, S.S. Shimansky, I.P udin, E.E. Perepelkin, I.G. Voloshina, T.V. Shavrina	.Y
	BLTP	V.V. Burov, S.G. Bondarenko	
8.	**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	Foundation ANSL
		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
	Constanţa	UOC
Russia	Moscow	SINP MSU
		LPI RAS
		ITEP
	Moscow, Troitsk	INR RAS
	Chernogolovka	ISMAN RAS
	Smolensk	SmolGU
	St. Petersburg	KRI
	Sarov	VNIIEF
Slovakia	Bratislava	IP SAS
	Košice	PJSU
Sweden	Lund	LU
Switzerland	Villigen	PSI
	Geneva	UniGe
	Zurich	ETH

Tajikistan	Dushanbe	TNU
		PHTI ASRT
USA	Berkeley, CA	Berkeley Lab
	Iowa City, IA	UIowa
	Norfolk, VA	NSU
	Upton, NY	BNL
	Williamsburg, VA	W&M
Uzbekistan	Tashkent	Assoc.“P.-S.” PTI
	Jizzakh	JSPI
	Samarkand	SSU

02–0–1066–2007/2015	Priority: 1

Status: Approved for completion in 2015

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

Leaders: R. Lednicky
Yu.A. Panebratsev

Participating Countries and International Organizations:

Armenia, Azerbaijan, Czech Republic, France, Germany, Kazakhstan, Russia, Slovakia, 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 2015:

- 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. Lednicky	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, S.V. Sergeev	

2. **Simulation of physical polarization processes of jet, direct photon and strange particle production in STAR experiment at RHIC** — **M.V. Tokarev** — Realization

   VBLHEP: V.V. Lyuboshits, T.G. Dedovich, A.A. Aparin

   LIT: Zh.Zh. Musulmanbekov

   BLTP: 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**, **Yu.A. Panebratsev** — Realization

   VBLHEP: 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, V.V. Lyuboshits, G.N. Agakishiev, A.A. Aparin

   LIT: G.A. Ososkov

4. **Participation in the heavy ion program in STAR experiment at RHIC** — **Yu.A. Panebratsev** — Data taking, Data processing, Data analysis

   VBLHEP: E.V. Potrebenikova, M.V. Tokarev, B.G. Shchinov

5. **Participation in JINR–BNL and JINR–CERN joint educational programs** — **Yu.A. Panebratsev**, **E.V. Potrebenikova** — Realization

   VBLHEP: 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

   UC: S.Z. Pakulyak, I.A. Smirnova

Collaboration

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

USA	Argonne, IL	ANL
	Berkeley, CA	Berkeley Lab
	Detroit, MI	WSU
	Los Angeles, CA	UCLA
	New Haven, CT	Yale Univ.
	University Park, PA	Penn State
	Upton, NY	BNL

02–1–1088–2009/2016	Priority: 1

Status: In-progress

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, Slovakia, 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 2015:

- 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 2019)
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, D.D. Emelyanov, S.S. Grigoryan, S.A. Zaporozhets, L.V. Malinina, P.V. Nomokonov, E.P Rogachya, A.V. Taranenko, A.G. Fedunov, K.P Mikhaylov, N.N. Zhigareva	
	DLNP	G.I. Lykasov	
	LIT	R.M. Yamaleev	
	BLTP	A.V. Sidorov	
3.	**ALICE Computing in the distributed environment– GRID**	**A.S. Vodopyanov**	Realization
	VBLHEP	B.V. Batyunya, S.A. Zaporozhets, A.O. Kondratiev, A.G. Fedunov, G.G. Stiforov	
	LIT	V.V. Mitsyn	
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	Foundation ANSL
Bulgaria	Sofia	SU
CERN	Geneva	CERN
China	Beijing	CIAE
	Wuhan	CCNU
Croatia	Zagreb	RBI
Czech Republic	Prague	IP ASCR
	Řež	UJV
Denmark	Copenhagen	NBI
France	Clermont-Ferrand	LPC
	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
Slovakia	Bratislava	CU
	Košice	PJSU
South Africa	Cape Town	UCT
Sweden	Lund	LU

Switzerland	Lausanne	EPFL
United Kingdom	Birmingham	Univ.
Ukraine	Kharkov	KFTI
	Kiev	BITP NASU
USA	Columbus, OH	OSU
	Oak Ridge, TN	ORNL

02–1–1107–2011/2016	Priority: 1

Status: In-progress

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, Moldova, Mongolia, Poland, Romania, Russia, Serbia, Slovakia, 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 2015:

- Completion of the development of a heavy ion beam spatial monitoring system; 0n–line operational test at the Nuclotron–M experiments.
- Development of detector for measuring the radiation dose rate based on diamond and silicon 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 $\sim$21 tonns.
- Investigation of the mechanism of the influence of coherent high power microwave radiation on the radioactive decay of nuclei.

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** **V.A. Panasik**	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** **S.V. Khabarov**	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** **Z.Ya. Sadygov**	Realization
4. **Development and production of the detectors for the ions energy measurement within the range E=0.1÷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. **The modernization of spectralanalitican complex for activation measurements**	**E.V. Strekalovskaya** **V.N. Shalyapin** **Yu.S. Kovalev**	Data taking
6. **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** **M. Paraipan** **I.V. Kudashkin**	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, A.I. Shafranovskaya	

DLNP	I. Adam, V.M. Tsupko–Sitnikov, A.A. Solnyshkin, Zh. Hushvaktov, V.I. Stegaylov, L. Zavortka	
FLNP	Yu.N. Kopach, V.I. Furman, N.A. Gundorin	
LIT	A. Polyanski, A. Voytsekhovsky	
LRB	V.Yu. Shchyegolev	
RFMD	B.A. Shestakov, N.N. Kalyakin + 2 pers.	
7. **Investigation of the mechanism of the influence of coherent high power microwave radiation on the radioactive decay of nuclei**	**S.N. Sedykh** **E.A. Perelshtein** **V.N. Shalyapin** **S.I. Tyutyunnikov** **I.A. Kryachko**	Realization
VBLHEP	A.K. Kamiksly, I.A. Kryachko, V.V. Efimov, Yu.S. Kovalev, V. Dzhavadova	
8. **Production of the monitoring elements for the superconducting systems**	**Yu.P. Filippov**	R&D
VBLHEP	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
		INP BSU
		SPMRC NASB
Bulgaria	Sofia	INRNE BAS
Czech Republic	Řež	UJV
	Brno	BUT
	Prague	CTU
Germany	Darmstadt	TU Darmstadt
	Marburg	Univ.
	Jülich	FZJ
Greece	Thessaloniki	AUTH
India	Mumbai	BARC
	Jaipur	Univ.
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
	Iaşi	UAIC
Serbia	Belgrade	INS “VINČA”
Slovakia	Bratislava	SOSMT
		CU
Ukraine	Kharkov	KFTI
	Uzhgorod	UNU

Nuclear Physics (03)

03–0–1095–2010/2016	Priority: 1

Status: Extended

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

Scientific Programme

Implementation of the DRIBs-III project, including development of the FLNR cyclotron complex, radical extension of the experimental base of the laboratory (new physical 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 to significantly increase the efficiency of the experiments on synthesis and the study of properties of new superheavy elements and extend the programme of the experiments with the use of beams of radioactive nuclides.

Expected results in 2015:

- Implementation of the programme of physical experiments with the beams of ^{48}Ca and ^{50}Ti at the U400 cyclotron.
- Implementation of the programme of physical experiments with the beam of light and heavy elements in the energy ranges 5-8 MeV/nucleon and 30-55 MeV/nucleon at the U400M cyclotron.
- Development of advanced methods and technology for high-efficient production of intense Gd beams from ion sources.
- Commissioning of a new DECRIS-SC2-18GGz ion source at the U400M cyclotron for the production of intense beams of highly charged Kr and Xe ion of the energy 30-40 MeV/nucleon.
- Conducting experiments with low-energy (6-25 MeV) electron beams at the MT25 microtron.
- Development and testing of new methods of beam energy diagnostics for stable and radioactive nuclides.
- Conducting experiments with radioactive beams at the U400M and MT-25 accelerators.
- Development of a a new high-current DC280 accelerator, beam transportation systems, and technical support systems of the new experimental building.
- Mounting the new fragment separator ACCULINNA-2 in the experimental area of the cyclotron U400M.
- Preparation of technical specification 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.B. Vorozhtsov	
VBLHEP	S.A. Kostromin	
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, M.S. Golovkov, P.G. Sharov, S.I. Sidorchuk, R.S. Slepnev, G. Kaminsky, A.G. Knyazev, V. Chudoba, R. Wolski	
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, V.M. Popov, A.N. Kuznetsov, E.A. Sokol, D.E. Katrasev, V.A. Sbitnev	

7. **Development of the gas catcher project** — **A.M. Rodin** — Preparation

FLNR: L. Krupa, A.V. Belozerov, S.A. Yukhimchuk, A.V. Guljaeva, V.S. Salamatin, I. Sivachek, S.V. Stepantsov

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

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, K.P Marinova

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
		CU
France	Caen	GANIL
	Grenoble	LPSC
	Orsay	IPN Orsay
	Vannes	SigmaPhi
Germany	Darmstadt	GSI
Italy	Catania	INFN LNS
Kazakhstan	Almaty	INP
	Astana	BA INP
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”
Slovakia	Bratislava	IMS SAS
		IP 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
CERN	Geneva	CERN

03–5–1094–2010/2016	Priority: 1

Status: Extended

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, Cuba, Czech Republic, Finland, France, Germany, Egypt, India, Italy, Japan, Kazakhstan, Mongolia, Poland, Romania, Russia, Slovakia, South Africa, Spain, Switzerland, Sweden, Ukraine, 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 2015:

- 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.
- Preparation and conducting experiments on the detailed spectroscopy of decay properties of the Rf and Db isotopes using the modernized separator VASSILISSA (SHELS) + GABRIELA.
- Preparation and conduction of experiments on the study of chemical properties of SHE.
- Direct identification of the isotope ^{283}Cn obtained in the ^{48}Ca + ^{242}Pu reaction at the MASHA separator.
- Reseach of shell effects in multinucleon transfer reactions in order to investigate the production of superheavy neutron-rich elements in collision of actinide nuclei (^{238}U+^{238}U, ^{136}Xe+^{248}Cm, ^{197}Au+^{238}U). Study of the multicluster decay of heavy nuclei.
- Study of the structure of light nuclei ^{5,7}H, ^{10,11}Li, ^{17}Ne using radioactive beams.
- Study of nuclear reactions induced by cluster nuclei (^{6}He,^{8}He,^{6,7,9}Li,^{8}B) at the energies near the Coulomb barrier. Measurements of cross-sections of the rections of multinucleon transfer with the beams of ^{18}O, ^{20}Ne,^{48}Ca used for the synthesis of nuclei near the drip-lineas. Design of a focal plane detector 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**	**V.K. Utyonkov**	Data taking
FLNR	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	
BLTP	V.V. Pashkevich	

2. **α-, β- and γ- spectroscopy of heavy nuclei at the separator VASSILISSA (SHELS)**

A.V. Yeremin | Data taking

FLNR

O.N. Malyshev, A.I. Svirikhin, I.N. Izosimov, V.I. Chepigin, M.L. Chelnokov, A.V. Isaev, Yu.A. Popov, A.N. Kuznetsov, A.A. Kuznetsova, A.G. Popeko, E.A. Sokol, D.E. Katrasev, V.M. Popov, V.A. Sbitnev

3. **Chemical properties of heavy nuclides**

S.N. Dmitriev | Data taking

FLNR

V.Ya. Lebedev, N.V. Aksenov, Yu.V. Albin, G.A. Bozhikov, V.I. Vakatov, M.G. Voronyuk, G.K. Vostokin, I. Zvara, E.V. Krasnoyarova, Ch.G. Kim, K.V. Lebedev, Z. Myanovska, O.V. Petrushkin, A.V. Rykhlyuk, A.V. Sabelnikov, G.Ya. Starodub, E.E. Tereshatov

4. **Experiments at the MASHA separator. Laser spectroscopy of nuclei**

A.M. Rodin | Data taking

FLNR

L. Krupa, A.V. Belozerov, E.V. Chernusheva, 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, A.S. Novoselov, S.A. Yukhimchuk, S.G. Zemlyanoy, V.I. Zhemenik, G.N. Myshinskiy, K P Marinova

5. **The study of the processes of fission, quasifission and multinucleon transfer reactions. CORSET-DEMON, CORSAR, MiniFOBOS**

M.G. Itkis | Data taking

FLNR

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, K.K. Limarev, 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, S.A. Baraeva, S.G. Belogurov, 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, E.A. Voskoboinik, V.A. Maslov, V.I. Smirnov, N.K. Skobelev, Yu.G. Sobolev, M.P vanov, Z.D. Pokrovskaya, R.V. Revenko, D.A. Testov

8. **Theoretical study of mechanisms of heavy ion induced reactions** — **V.I. Zagrebaev**

FLNR: A.V. Karpov, A.S. Denikin, V.V. Samarin, M.A. Naumenko, E.A. Cherepanov, Yu.A. Muzichka, V.A. Rachkov

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
Cuba	Havana	HITAS
Czech Republic	Prague	VP
		CTU
	Řež	NPI ASCR
Egypt	Giza	CU
Finland	Jyväskylä	UJ
France	Caen	GANIL
	Orsay	CSNSM
		IPN Orsay
	Saclay	SPhN CEA
	Strasbourg	DAPNIA
		CRN
		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
	Astana	ENU
Mongolia	Ulaanbaatar	NUM
Poland	Warsaw	UW
	Krakow	NINP PAS
	Poznan	AMU
Romania	Bucharest	IFIN-HH
		UB
Russia	Moscow	GEOKHI RAS
		IPCE RAS
		MSU
		NNRU “MEPhI”
		MUCTR
		NRC KI
		SINP MSU
	Moscow, Troitsk	INR RAS
	Moscow, Zelenograd	RIMST
	Cheboksary	ChSU
	Dimitrovgrad	RIAR
	Gatchina	PNPI
	Sarov	VNIIEF
	St. Petersburg	KRI
		IPTI RAS
		SPbSU
		ITMO
	Voronezh	VSU
Slovakia	Bratislava	CU
		IP SAS
South Africa	Stellenbosch	SU
	Cape Town	iThemba LABS
	Pretoria	Unisa
Spain	Huelva	UH
	Madrid	CSIC
Switzerland	Villigen	PSI
Sweden	Göteborg	Chalmers
Ukraine	Kiev	KINR NASU
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

03–2–1100–2010/2015	Priority: 1

Status: Approved for completion in 2015

Non-Accelerator Neutrino Physics and Astrophysics

Leaders: V.B. Brudanin
A. Kovalik
E.A. Yakushev

Participating Countries and International Organizations:

Armenia, Belarus, Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Kazakhstan, Mongolia, Poland, Romania, Russia, Slovakia, 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 Kalinin 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 2015:

- 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 $\sim 2 \cdot 10^{-11}$ μ_B
- Forty of FID800 detectors will cumulative fiducial mass 24 kg will be installed in the upgraded EDELWEISS setup. Data taking will be started in order to reach a WIMP-nucleon scattering cross-section sensitivity of $5 \cdot 10^{-45}$ cm^2
- 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
- Deployment of the first cluster "Dubna" at Baikal-GVD array Data taking and extraction of physical results with the detector.
- Investigation of KLL and KMM Auger electrons in ^{65}Zn, ^{67}Cu, ^{67}Ga and ^{152,154,155}Eu decays.
- Design and creation of the low-threshold (~ 200 eV) HPGe detector. Production of low-background plastic scintillators for the SuperNEMO experiment.
- Design and creation of the reactor antineutrino detector DANSS. Start of data taking.

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. Babin, V.A. Bednyakov, D. Filosofov, 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, S.L. Katulina	
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, A.V. Lubashevsky, D.R. Zinatulina, S.L. Katulina, N.S. Rumyantseva, 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, E.A. Yakushev	
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	V.B. Brudanin, V.G. Egorov, K.V. Konishev, E.N. Pliskovski, B.A. Shaibonov, M.V. Shirchenko, A.A. Klimenko, Z. Hons, I.E. Rozova, A.V. Salamatin, A.A. Smagina	
7. **DANSS Project**	**V.B. Brudanin** **V.G. Egorov**	Preparation Data taking

DLNP	D.R. Zinatulina, E.A. Shevchik, I.V. Zhitnikov, N.S. Rumyantseva, M.V Fomina, V Belov, A.S. Kuznetsov, I.E. Rozova, M.V. Shirchenko

Collaboration

Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	YSU
		Foundation ANSL
Belarus	Minsk	NC PHEP BSU
Belgium	Leuven	K.U.Leuven
Bulgaria	Sofia	INRNE BAS
	Plovdiv	PU
Czech Republic	Prague	CTU
	Řež	UJV
Finland	Jyväskylä	UJ
Germany	Heidelberg	MPIK
	Mainz	JGU
Kazakhstan	Almaty	INP
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
		SC “VNIINM”
		NNRU “MEPhI”
		LPI RAS
		ITEP
		SINP MSU
		INTRA
		RADON
	Sarov	VNIIEF
	St. Petersburg	SPbSU
		IPTI RAS
	Tomsk	NPI TPU
		IHCE SB RAS
Slovakia	Bratislava	CU
		IP SAS

Ukraine	Kiev	KINR NASU
	Kharkov	ISC NASU
USA	Irvine, CA	UCI
Uzbekistan	Tashkent	INP UAS
		IAP NUU
	Samarkand	SSU

03–2–1101–2010/2015	Priority: 1

Status: Approved for completion in 2015

Physics of Light Mesons

Leader: A.V. Kulikov

Participating Countries and International Organizations:

Belarus, Bulgaria, Croatia, Canada, Czech Republic, Georgia, Germany, Italy, Netherlands, Poland, Romania, Russia, Switzerland, USA, 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 2015:

- Processing of the experimental data for decays $\mu^+ \to e^+\gamma$ and $\pi \to e\nu$
- Measurements of spin observable at longitudinally and transversely polarized COSY beam.
- 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.
- Study of the dynamic behavior of magnetic nanoparticles at 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 $\pi^- p \to \omega(782)\eta$ and $\pi^- p \to \eta^{'}(958)$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)
5.	COMET	A.V. Kulikov Z. Tsamalaidze	1 (2014 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**	Data processing
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	
BLTP	Yu.M. Bystritsky	
2. **SPRING Project**	**A.V. Kulikov**	Data taking Data analysis
DLNP	V.I. Komarov, Yu.N. Uzikov, A.D. Volkov, G. Macharashvili, N. Kagaridze, 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, I.A. Belolaptikov, T.D. Blokhintseva, 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	
VBLHEP	P.N. Batyuk	
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. Balasoiu + 2 pers.	
5. **TRITON Project**	**D.L. Demin**	Data taking Data processing
DLNP	A.M. Artikov, N.A. Baranova, A.I. Boguslavsky, V.P olnykh, K.I. Gritsaj, V.N. Duginov, V.I. Kolomorets, .V A.D. Konin, A.P Kustov, N.N. Kashirina, 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. Kovalik**	Data 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. **COMET Project**	**A.V. Kulikov** **Z. Tsamalaidze**	R&D Realization
DLNP	P.G. Evtukhovich, A.S. Moiseenko, G. Macharashvili, V.G. Kalinnikov, E.P Velicheva, S.N. Dymov, V.V. Shmakova, A.D. Volkov, V.P Volnykh, B.M. Sabirov, N. Tsverava, T. Toriashvili, I.L. Evtukhovich, Kh. Khubashvili, E.M. Kulish, M.V. Nikitin, A.G. Samartsev, V.N. Duginov, K.I.Gritsai	
LIT	A. Khvedelidze	
FLNP	A.A. Kustov	
BLTP	G.A. Kozlov	
VBLHEP	S.A. Movchan, S.N. Shkarovsky, V.V. Elsha, T.L. Enik	

Collaboration

Country or International Organization	**City**	**Institute or Laboratory**
Belarus	Minsk	NC PHEP BSU
		BSU
		IP NASB
		INP BSU
Bulgaria	Sofia	SU
Czech Republic	Prague	CU
	Řež	UJV
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	TUDelft
Poland	Krakow	NINP PAS
	Otwock-Swierk	NCBJ
Romania	Bucharest	IFIN - HH
	Timişoara	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

03–2–1102–2010/2015	Priority: 1

Status: Approved for completion in 2015

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

Leaders: G.A. Karamysheva
S.L. Yakovenko
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 2015:

- Completion of the modernization of the automated beam channel control system of JINR Phasotron.
- Development of conceptual project of 230 MeV superconducting cyclotron for the proton therapy
- Study of nonscaling FFAG accelerator for obtaining high current beams for medical application.
- Carring 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
- Development of a project of superconducting synchrocyclotron for MTC JINR.

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**	**S.L. Yakovenko** **N.G. Shakun** **L.M. Onischenko**	Realization
DLNP	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	
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, 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

03-4-1104-2011/2016	Priority: 1

Status: In-progress

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, Croatia, Czech Republic, Egypt, Finland, France, Georgia, Germany, Hungary, Italy, Japan, Kazakhstan, Macedonia, Moldova, Mongolia, Norway, Poland, Republic of Korea, Romania, Russia, Serbia, Slovakia, Slovenia, South Africa, Switzerland, Thailand, Turkey, 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 evelopment and construction of detectors .D 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 2015:

Development of the IREN source:

- Installation of the second section of the LUE-200 with the modulator DAWONSYS. Testing and setting accelerator systems when working with two accelerating sections.
- Providing the neutron beam time of 1000 hours from IREN for physical experiments.
- Modernization of the experimental channel 3 (flight paths 60 and 120m), equipping of the experimental channel 5 of the IREN facility
- Measurement of the neutron yield for the IREN operation with a prototype of the natural uranium target.

Fundamental investigations of nuclear reactions with neutrons:

- Conducting test measurements of the T-odd effects in fission at beam N 1 of the IBR-2 facility and at the FRM-II reactor in Garching.
- Measurement of angular correlations of the gamma-ray emission in inelastic scattering of 14.1 MeV neutrons on carbon, in the framework of the TANGRA project.
- Investigation of reactions $^{56}Fe(n,\alpha)^{53}Cr$ and $^{144}Nd(n,\alpha)^{141}Ce$ for neutron energies E_n 5 –6 MeV at the facilities EG-5 (FLNP JINR) and EG-4.5 (Beijing University). Analysis of the experimental data for reactions $^{66}Zn(n,\alpha)^{63}Ni$, $^{144}Sm(n,\alpha)^{141}Nd$ in the energy region 4 6.5 MeV.
- Development of a 32-channel digital signal processing (DSP) system for position sensitive double ionization fission chamber combined with six fast neutron detectors. Performing measurements of the multiplicity and energy spectra of the prompt fission neutrons from the the ^{235}U(n,f) reaction.
- Evaluation of the experimental data on angular correlations in spontaneous fission of ^{252}Cf and search for quaternary fission using silicon pixel detectors.
- Measurement of the spin-lattice relaxation for the proton. Measurement of the neutron nuclear precession for the proton as a function of the neutron energy

- Accumulation of new experimental data on the two-step gamma-ray cascade intencities in neutron resonances. Determination of the parameters of the superfluid component of nuclear matter below the neutron binding energy
- Measurements of leakage neutron spectra from the massive target of natural uranium "QUINTA" irradiated by deuterons with energies of 1-8 GeV. Calibration of neutron detectors. Preparation of measurements with massive uranium targets at the beams of Phsotron (DLNP) and Nuclotron (BVLHEP).

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 characteristics of the resonance transitions between quantum states of neutrons in the gravitational field of the Earth on GRANIT spectrometer.
- Design substantiation of the project of the helium UCN source on the extracted beam of thermal neutrons.

Applied research:

- Analysis of the boron content in new composite materials by the method of neutron spectroscopy at the IREN facility
- Measurements of characteristic gamma-ray spectra for various elements in the framework of the TANGRA project. Creation of the database for element identification.
- Study of the atomic structures and properties of subsurface layers, prepared by Plasma Enhanced Chemical Vapor Deposition process, using Elastic Recoil Detection method and Rutherford Backscattering Spectrometry
- 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.
- Design and development of hardware and software for the automation of neutron activation analysis for the installation REGATA at the IBR-2 reactor. Creating a system for automatic spectra measurement, consisting of 3 sample changer devices with three gamma spectrometers. Development of a database to store information about all stages of the analysis of samples.
- Biomonitoring of atmospheric deposition of trace elements in some regions of Russia, Europe, Asia and Africa. Application of NAA in bionanotechnology, ecology, medicine and the development of new materials.

List of projects:

	Project	Leader	Priority (period of realization)
1.	TANGRA	Yu.N. Kopatch Deputy: V.M. Bystritsky (DLNP)	1 (2014 2016)

List of activities:

	Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1.	**Development of the IREN facility**	**V.N. Shvetsov**	Upgrade
	FLNP	V.G. Pjataev, V.A. Egorov, V.D. Denisov + 13 engineers	
	VBLHEP A.P umbaev	V.V. Kobets, V.F. Minashkin, V.G. Shabratov, V.N. Zamrij, A.N. Skrypnik, .$ Betscher	
	DLNP	I.N. Meshkov	

2.	**Development of the beam infrastructure of IREN**	**V.N. Shvetsov**	Upgrade
	FLNP	V.G. Pjataev, A.A. Belyakov, P.V. Sedyshev, V.A. Trepalin + 10 engineers	
3.	**Fundamental investigations of nuclear reactions with neutrons**	**Yu.N. Kopatch**	Upgrade Data taking Data analysis
	FLNP	G.S. Ahmedov, N.V. Bazjazjina, S.B. Borzakov, G.V. Daniljan, Ju.M. Gledenov, D.N. Grozdanov, N.A. Gundorin, Sh.S. Zeynalov, A.P obzev, D. Mahajdik, M. Kulik, 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 + 16 engineers, + 2 workers	
	LIT	O.V. Zeynalova	
	DLNP	V.A. Stolupin	
4.	**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, T.L. Enik, S.V. Gorunov + 1 engineer	
5.	**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, Doan Fan Thao Tien, G.S. Ahmedov, N.V. Bazjazjina, S.B. Borzakov, Ju.M. Gledenov, N.A. Gundorin, Sh.S. Zeynalov, A.P obzev, Yu.N. Kopatch, M. Kulik, 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, A Sijabekov, G.V. Daniljan + 24 engineers, + 5 workers	
6.	**Project TANGRA**	**Yu.N. Kopatch**	Upgrade Data taking Data analysis
	FLNP	S.B. Borzakov, N.A. Gundorin, P.A. Dubasov, Sh.S. Zeinalov, A.O. Zontikov, L.B. Pikelner, A.V. Rogachev, P.V. Sedyshev, U.R. Skoi, U.N. Shvetcov	
	VBLHEP	U.Yu. Aleksakhin, U.I. Zamjatin, E.U. Zubarev, U.L. Rapackii, Yu.N. Rogov, R.A. Salmin, M.G. Sapozhnikov, U.V. Slepnev, S.U. Khabarov	

DLNP	U.M. Bystritskii, A.U. Krasnoperov, A.U. Sadovskii, A.U. Salamatin
LRB	A.R. Krylov, G.N. Timoshenko

Collaboration

Country or International Organization	City	Institute or Laboratory
Albania	Tirana	UT
Australia	Melbourne	Univ.
Austria	Vienna	IAEA
	Innsbruck	Univ.
Belarus	Minsk	INP BSU
Belgium	Geel	IRMM
	Brussels	ULB
Bulgaria	Sofia	INRNE BAS
	Plovdiv	PU
		UFT
CERN	Geneva	CERN
China	Beijing	IHEP CAS
Croatia	Zagreb	RBI
Czech Republic	Prague	CEI
		CTU
	Ostrava	VSB-TUO
Egypt	Cairo	EAEA
Finland	Jyväskylä	UJ
France	Cadarache	CC CEA
	Grenoble	ILL
		LPSC
	Saclay	LLB
	Strasbourg	IPHC
Georgia	Tbilisi	AIP
Germany	Darmstadt	TU Darmstadt
	Dresden	HZDR
	Munich	TUM
	Tübingen	Univ
Hungary	Budapest	RKK OU
Italy	Rome	ENEA
Japan	Kyoto	KSU
	Tsukuba	KEK
Kazakhstan	Almaty	INP
	Ust-Kamenogorsk	TRCE
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
	Seoul	Dawonsys
	Taejon	KAERI
Romania	Bucharest	IFIN-HH
		ISS
		UB
	Baia Mare	NUBM
	Constanţa	NIMRD
		UOC
	Galaţi	UG
	Iaşi	UAIC
	Oradea	UO
	Piteşti	SCN
	Ramnicu Valcea	ICSI
	Targovişte	UVT
Russia	Moscow	Atomenergomach
		GIN RAS
		IKI RAS
		ITEP
		MSU
		NRC KI
		SINP MSU
		GPI RAS
	Moscow, Troitsk	INR RAS
	Borok	IBIW RAS
	Dubna	“Dubna” Univ.
	Gatchina	PNPI
	Irkutsk	LI SB RAS
	Ivanovo	ISUCT
	Izhevsk	UdSU
	Magnitogorsk	MagTU
	Obninsk	IPPE
	Snezhinsk	VNIITF
	St. Petersburg	FIP
		Hermitage
		KRI
	Sevastopol	IBSS

	Tomsk	NPI TPU
	Tula	TSPU
	Voronezh	VSU
	Yekaterinburg	UrFU
Serbia	Belgrade	IPB
		Univ.
	Novi Sad	UNS
Slovakia	Bratislava	IP SAS
		IEE SAS
		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
	Sumy	IAP NASU
	Uzhgorod	IEP NASU
	Kharkov	ISMA NASU
		KFTI
Vietnam	Hanoi	IOP VAST
		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)

04-4-1121-2015/2017	Priority: 1

Status: New

Investigations of Condensed Matter by Modern Neutron Scattering Methods

Leaders: D.P ozlenko .K
V.L. Aksenov
A.M. Balagurov

Participating Countries and International Organizations:

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

Scientific Programme

Investigations of structure, dynamics and microscopic properties of novel materials and nanosystems, 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 2015:

Realization of the scientific program:

- Determination of the parameters of atomic and magnetic structure of bulk and nanostructured functional materials, demonstrated interesting physical phenomena and prospective for technological application in wide range of thermodynamic parameters, exploring a role of cluster aggregation in formation of physical properties.
- Determination of microscopic mechanisms of magnetoelectric effect formation in complex multiferroic oxides.
- Determination of the electrode microstructure effects on charging/discharging processes realization in compact electric current sources.
- Clarification of proximity effects in magnetic layered nanostructures and analysis of their magnetic properties in permanent and varied magnetic fields.
- Comparative analysis of structural aspects of stabilization of disperse systems and complex liquids with nonmagnetic and magnetic nanoparticles in bulk and interface boundaries.
- Determination of the structural characteristics of nanosystems based on compositional C- and Si-containing materials.
- Determination of structural characteristics of magnetic elastomers and carbosilane dendrimers, prospective for technological applications.
- Determination of atomic structure and vibrational spectra of molecular complexes: ionic-molecular inclusive materials and complexes with electric charge transfer, structural and dynamical parameters of hydrogen bonding in bioactive materials.
- Determination of structural and functional characteristics of biological nanosystems.
- Determination of structural characteristics of lipid nanosystems modeling upper skin layer of human and mammal animals in the interests of the study of the transport of pharmacological drugs through the skin.

- Determination of the structural and dynamical characteristics of reactor materials at temperatures up to 2000 K.
- Determination of the regularities in appearance of instability of rocks under high temperatures and pressures, in particular, during the polymorphic phase transition for the development of the models of the processes in the earthquake focus
- Analysis of the metamorphic, geodynamic and evolution processes in litosphere using the data about texture of deep and near-surface earth rocks. Exploration of the seismic anisotropy origin.
- Development of the solid polycrystalline material models for prediction of their elastic, strength and thermal properties taking into account texture, inclusions, pores and microcracks.
- Determination of residual stresses in construction materials of nuclear reactors, industrial materials and products composites, reinforced systems, metalloceramicas, shape memory alloys.
- Elaboration of the radiation damage mechanisms of solid state materials, getting of resource data on radiation resistance of materials.

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

- Creation of the final configuration of the DN-6 diffractometer and relevant infrastructure (detector system, mechanical units, high pressure cells set, infrastructure for pressure cells loading).
- Creation of the final configuration of the multifunctional reflectometer GRAINS (polarizing system, mechanical part and sample unit.
- Modernization of the operational spectrometers if IBR-2 reactor (HRFD, YuMO, FSD, REFLEX, REMUR, NERA, SKAT, EPSILON, DIN-2PI) focused at improvement of their instrumental parameters (neutron counting rate, background conditions, and extension of experimental opportunities).
- Reconstruction of the high intensity DN-2 diffractometer into real-time diffractometer (RTD).
- Creation of the test configuration of the small angle spin echo spectrometer at beamline 9 of IBR-2.
- Creation of the basic configuration of the neutron radiography and tomography spectrometer at 14 beamline of IBR-2.
- Installation and adaptation of the correlation spectrometer FSS (transported from HZG. Germany via PNPI) to methodical and research activities at beamline 13 of IBR-2.
- Development and testing of neutron scattering methods for condensed matter research, including spin-echo, neutron standing waves, neutron magnetic resonance, radiography, tomography, etc.

List of projects:

	Project	Leader	Priority (period of realization)
1.	RTD Diffractometer	A.M. Balagurov	1 (2012 2015)
2.	IINR	Yu.V. Nikitenko Deputy: N.A. Gundorin	1 (2015 2018)

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1. **A Study of Structure and Properties of Novel Functional Materials**	**A.M. Balagurov** **D.P. Kozlenko**	Data taking
FLNP	A.I. Beskrovnyi, B.N. Savenko, E.B. Askerov, I.A. Bobrikov, N.O. Golosova, S.E. Kichanov, M.L. Craus, E.V. Lukin, A.I. Madadzada, G.M. Mironova, D.T. Neov, A. Pawlukojc, A.V. Rutkauskas, S.A. Samoilenko, N.Yu. Samoylova, S.G. Sheverev, V.A. Turchenko, U. Enhnaran	
2. **A study of structure and properties of materials under extreme conditions**	**D.P. Kozlenko**	Data taking
FLNP	S.E. Kichanov, B.N. Savenko, E.V. Lukin, A.V. Rutkauskas, S.A. Samoilenko	
3. **A study of fundamental regularities of real time processes in condensed matter**	**A.M. Balagurov**	Data taking
FLNP	A.I. Beskrovnyi, I.A. Bobrikov, O.Yu. Ivanshina, G.M. Mironova, N.Yu. Samoylova, V.G. Simkin, U. Einhnaran, S.G. Sheverev	
4. **A study of atomic dynamics of materials for nuclear energetics**	**A.V. Puchkov (IPPE, Obninsk)**	Data taking
IPPE, Obninsk	I.V. Kalinin, V.M. Morozov, A.G. Novikov, V.V. Savostin, V.A. Semenov	
5. **Computer modeling of physical and chemical properties of novel crystalline and nanostructured materials**	**A. Pawlukojc**	Data taking
FLNP	K.S. Druzbicki, V.Yu. Kazimirov, K.M. Luczynska, D.M. Chudoba	
6. **A study of magnetic properties of layered nanostructures**	**Yu.V. Nikitenko**	Data taking
FLNP	S.V. Kozhevnikov, E.B. Dokukin	
7. **A study of structural characteristics of carbon and silicon based nanomaterials**	**V.L. Aksenov**	Data taking
FLNP	T.V. Tropin, O.A. Kizima, A.A. Tomchuk, Zh. Narmandah	

8. **A study of molecular dynamics of nanomaterials** — **D.M. Chudoba** — Data taking

FLNP: K.S. Druzbicki, K.M. Luczynska, I. Natkaniec, M. Ordon, A. Pawlukojc, I.L. Sashin, A. Filarowski, L.R. Hetmanczyk, J. Hetmanczyk

9. **A study of dispersed systems and complex liquids in bulk and at interface boundaries** — **M.V. Avdeev** — Data taking

FLNP: V.I. Petrenko, A.V. Nagornyi, A.V. Tomchuk, I.V. Gapon

10. **Structural characterization of polymer nanodispersed materials** — **M. Balasoiu** — Data taking

FLNP: A.I. Kuklin, A.Kh. Islamov, O. Ivan'kov, D.V. Solovyev, A.V. Rogachev

11. **A study of supramolecular structure and functional characteristics of biological materials** — **A.I. Kuklin** — Data taking

FLNP: A.Kh. Islamov, T.N. Murugova, M. Balasoiu, A Raewska, Yu.E. Gorshkova, O. Ivan'kov, R.V. Erhan, D.V. Solovyev, Yu.S. Kovalev, A.V. Rogachev

LIT: D.V. Solovyev

12. **A study of structure and properties of lipid membranes and lipid complexes** — **M.A. Kiselev** — Data taking

FLNP: E.V. Ermakova

13. **A study of texture and physical properties of Earth's rocks, minerals, and constructional materials** — **Ch. Scheffzuek**, **D.I. Nikolaev** — Data taking

FLNP: R.N. Vasin, T.I. Ivankina, V.V. Sikolenko, T.A. Lychagina, I.Yu. Zel', A.A. Kruglov, B. Altangerel

14. **Non-destructive control of residual stresses in industrial products and constructional materials** — **G.D. Bokuchava** — Data taking

FLNP: V.V. Sumin, R.N. Vasin, I.V. Papushkin, A.A. Kruglov, A.V. Tamonov, D. Aznabaev, B. Muhametuly, Yu.V. Taran, D.M. Levin

15. **Neutron imaging of internal structure of industrial products, rocks and natural heritage objects** — **D.P. Kozlenko**, **G.D. Bokuchava** — Data taking

FLNP: B.N. Savenko, S.E. Kichanov, E.V. Lukin, A.V. Rutkauskas

16. **A study of radiation damage effects in condensed matter by X-ray spectroscopy** — **S.I. Tyutyunnikov (VBLHEP)** — Data taking

VBLHEP: V.N. Shalyapin, V.V. Efimov, E.A. Efimova, Yu.S. Kovalev, A.V. Rogachev, N.I. Zamyatin, I.A. Kryachko

17. **Development of neutron scattering methods for interdisciplinary studies of nanosystems and materials** — **V.I. Bodnarchuk, G.D. Bokuchava, D.P. Kozlenko** — Data taking

FLNP: S.V. Kozhevnikov, Yu.V. Nikitenko, S.P Yaradaikin, S.E. Kichanov, E.V. Lukin

18. **Development of the IBR-2 spectrometer complex** — **A.M. Balagurov, D.P. Kozlenko** — Realization

FLNP: M.V. Avdeev, A.I. Beskrovnyi, I.A. Bobrikov, A.I. Kuklin, V.I. Bodnarchuk, D.M. Chudoba, Yu.V. Nikitenko, A.V. Petrenko, B.N. Savenko, I.L. Sashin, V.G. Simkin, V.I. Sukhanov, G.D. Bokuchava, Ch. Scheffzuek

IPP, Obninsk: A.V. Puchkov

Collaboration

Country or International Organization	City	Institute or Laboratory
Argentina	Bariloche	CAB CNEA
Azerbaijan	Baku	IP ANAS
Belarus	Minsk	IAP NASB
		INP BSU
		NC PHEP BSU
		SPMRC NASB
		RI PCP BSU
Bulgaria	Sofia	IMS BAS
		IE BAS
		INRNE BAS
		ISSP BAS
Czech Republic	Prague	CTU
		IG ASCR
		IMC ASCR
		IP ASCR
	Řež	NPI ASCR
Egypt	Cairo	NRC
France	Saclay	LLB
Germany	Berlin	HZB
	Bayreuth	Univ.
	Bochum	RUB
	Darmstadt	TU Darmstadt
	Dortmund	TU Dortmund

	Dresden	TU Dresden
	Göttingen	Univ.
	Geesthacht	GKSS
	Halle	MLU
	Hamburg	DESY
	Freiberg	TUBAF
	Jülich	FZJ
	Karlsruhe	KIT
	Kiel	CAU
		IFM-GEOMAR
	Leipzig	UoC
	Potsdam	GFZ
	Rostock	Univ.
	Stuttgart	MPI-FKF
Hungary	Budapest	Wigner RCP
	Szeged	US
Japan	Nagano	Shinshu Univ
Latvia	Riga	ISSP UL
		IPE
Moldova	Chişinău	IC ASM
Kazakhstan	Rudny	RII
Mongolia	Ulaanbaatar	IPT MAS
		MUST
Norway	Trondheim	NGU
Poland	Warsaw	INCT
	Krakow	JU
		NINP PAS
	Lublin	MCSU
	Olsztyn	UWM
	Poznan	AMU
	Siedlce	UNSH
	Szczecin	WPUT
	Wroclaw	WUT
		UW
Romania	Bucharest	IFIN-HH
		INCDIE ICPE-CA
		NIMP
		ISS
		UB
		UPB
		UTM
	Constanţa	UOC
	Craiova	UC
	Cluj-Napoca	INCDTIM
		RA BC-N

		UBB
	Iaşi	NIRDTP
		UAI
		UAIC
	Piteşti	SCN
	Timişoara	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
		NIKIET
		NRC KI
		SINP MSU
		SC “VNIINM”
	Moscow, Troitsk	HPPI RAS
		ISAN
		INR RAS
	Belgorod	NRU BelSU
	Dolgoprudny	MIPT
	Chernogolovka	ISSP RAS
	Gatchina	PNPI
	Kazan	KNRTU
	Nizhny Novgorod	UNN
		IPM RAS
	Obninsk	IPPE
	Petrozavodsk	IG KRS RAS
	Podolsk	GIDROPRESS
	Rostov-on-Don	RIP SFU
	St. Petersburg	IPTI RAS
		SPbSU
	Sterlitamak	SSPA
	Tomsk	NPI TPU
	Tula	TSU

	Yekaterinburg	IMP UB RAS
		UrFU
Serbia	Belgrade	INS “VINČA”
	Novi Sad	UNS
Slovakia	Bratislava	CU
	Košice	IEP SAS
South Africa	Pretoria	Necsa
Switzerland	Villigen	PSI
	Zurich	ETH
Tajikistan	Dushanbe	IChem ASRT
Taiwan	Hsinchu	NSRRC
Ukraine	Kiev	IPMS NASU
		NUK
		ISC NASU
	Donetsk	DonNU
		DonIPE NASU
	Kharkov	IERT NASU
		KFTI
United Kingdom	Didcot	RAL
Uzbekistan	Tashkent	INP UAS
Vietnam	Hanoi	IOP VAST
	Da Nang	DTU

04-4-1105-2011/2016	Priority: 1

Status: In-progress

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, Czech Republic, Japan, Mongolia, 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 2015:

- Maintenance of the IBR-2 reactor operation for physics investigations.
- Development of a reserve movable reflector MR-3R
- Construction of a test stand of a cryogenic moderator CM 201 with extension of work in 2016.
- Step-by-step replacement and upgrading of the technological and electrical equipment in accordance with the Rostechnadzor 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**	**A.V. Dolgikh** **A.V. Vinogradov**	Realization
	FLNP	A.A. Belykov, S.A. Tsarenkov, V.G. Ermilov, S.V. Rudenko, Yu.N. Pepelyshev, V.A. Trepalin + 30 engineers, + 50 workers	
2.	**Maintenance of the program of physical investigations**	**V.D. Ananiev** **A.V. Vinogradov** **A.V. Dolgikh**	Realization
	FLNP	A.A. Belyakov, Yu.N. Pepelyshev, V.A. Trepalin, S.V. Rudenko + 30 engineers, + 50 workers	

3. **Construction of a stand of the cryogenic moderator CM201. Development of a project, production and installation of the 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	UJV
Japan	Sapporo	Hokkaido Univ.
	Osaka	ISIR
Mongolia	Ulaanbaatar	MUST
Poland	Krakow	AGH
Romania	Bucharest	IFIN-HH
Russia	Moscow	NIKIET
		Geliymash
		INEUM
		SYSTEMATOM
		SSDI
		ENES
		Profimontazhservis
Spain	Valencia	UPV
United Kingdom	Didcot	RAL
USA	Indianapolis, IN	IUPUI

04-4-1122-2015/2017	Priority: 1
	Status: New

Development of Experimental Facilities for Condensed Matter Investigations with Beams of the IBR-2 Facility

Leaders: S.A. Kulikov
V.I. Prikhodko

Participating Countries and International Organizations:

Belarus, Bulgaria, Czech Republic, France, Germany, Hungary, Romania, Russia, Slovakia, United Kingdom.

Scientific Programme

Development and construction of a control system of a cryogenic moderator CM-201 for IBR-2 beams № 1, 4, 5, 6, 9 Design of equipment, electronics and software for a complex of IBR-2 spectrometers; the development of the FLNP information and computing infrastructure according to the needs of the Laboratory and the development strategy of the JINR computer network.

Expected main results in 2015:

- Development and construction of a control system for the CM-201 moderator. Maintenance and development of the CM-202 cold moderator with the control systems. Carrying out experiments to study radiation resistance of materials.
- Development of mathematical models and programs for simulation of neutron scattering in samples, including multi-layered rough surface samples and magnetic scattering.
- Manufacturing, testing and putting into operation of the 4th section of the ASTRA detector at the FSD diffractometer. Development and construction of 2D PSD for the REMUR spectrometer.
- Engineering design of a horizontal/vertical cryostat with a superconducting magnet and a temperature range of 4-300 K. Units making.
- Modernization of a control system of motors of actuating mechanisms for the YuMO and REMUR spectrometers. Putting into service of a control system of the equipment on beam 14 of the IBR-2 reactor.
- Development of electronics and software for a interface USB-3.0-based unit for data acquisition systems of IBR-2 spectrometers. Development of the Sonix+ software package. Connecting up of eight IBR-2 spectrometers to the WebSonix service.
- Wi-Fi network expansion in FLNP (bldg. 44 and reactor rooms in bldg. 117). Upgrade of the routers of bldg. 117 and experimental hall № 1 to 10 Gbit/s data transfer rate. Development of the concept of using "cloud" services in FLNP

List of projects:

	Project	Leader	Priority (period of realization)
1.	Development of PTH sample environment sysrem for the DN-12 diffractometer at the IBR-2 facility	A.N. Chernikov	1 (2015 2017)

List of activities:

	Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1.	**Development of a control system of the CM-201 moderator for neutron beams № 1, 4, 5, 6, 9**	**S.A. Kulikov** **E.P. Shabalin**	Realization
	FLNP	M.V. Bulavin + 5 engineers, + 7 workers, A.S. Kirilov + 2 engineers, A.P Sirotin + 2 engineers	
2.	**Calculations and simulation of spectrometers' elements. Development of the VITESS software package**	**A.V. Belushkin**	Realization
	FLNP	E S.A. Manoshin, S.A. Kulikov + 2 engineers	
3.	**Completing the set of equipment of the test beam; carrying out of measurements**	**V.V. Zhuravlev**	Realization
	FLNP	A.N. Chernikov + 5 engineers, A.V. Churakov + 3 engineers	
4.	**Development and implementation of gas-filled and scintillation detectors at the IBR-2 spectrometers**	**A.V. Belushkin** **S.A. Kulikov**	Realization
	FLNP	M.V. Avdeev, G.D. Bokuchava, A.I. Kuklin + 2 engineers, A.V. Churakov + 3 engineers, A.A. Bogdzel + 4 engineers, V.V. Zhuravlev, V.V. Kruglov, A.S. Kirilov + 1 engineer	
5.	**Development of data acquisition, control and experiment automation systems, as well as of the Sonix+ software package at the IBR-2 spectrometers**	**V.I. Prikhodko** **A.P. Sirotin** **A.S. Kirilov**	Realization
	FLNP	A.A. Bogdzel + 2 engineers, F.V. Levtchanovski + 2 engineers, V.V. Zhuravlev + 3 engineers, S.M. Murashkevich + 2 engineers	
6.	**Creation of a cloud polygon "neutron physics" in cooperation with LIT; carrying out computations using IaaS and SaaS services. Development of the FLNP network infrastructure in accordance with the development strategy of the JINR computer network.**	**S.A. Kulikov** **V.I. Prikhodko**	Realization
	FLNP	G.A. Sukhomlinov + 2 engineers, A.S. Kirilov + 2 engineers, S.A. Manoshin + 1 engineer	
	LIT	V.V. Korenkov + 2 engineers	

Collaboration

Country or International Organization	City	Institute or Laboratory
Belarus	Minsk	BSUIR
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
	Targovişte	UVT
Russia	Moscow	NNRU "MEPhI"
		NRC KI
	Moscow, Troitsk	INR RAS
	Gatchina	PNPI
	Yekaterinburg	IMP UB RAS
	Nizhny Novgorod	IPM RAS
	Obninsk	Branch KIPC
Slovakia	Bratislava	IMS SAS
Ukraine	L'viv	LPNU
United Kingdom	Didcot	RAL

04–4–1111–2013/2017	Priority: 1

Status: Extended

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, Poland, Romania, Russia, France.

Scientific Programme

Experimental studies on optical analysis of condensed matter by Raman, CARS (coherent antiStokes Raman spectroscopy), and SERS (surface-enhanced Raman spectroscopy) spectroscopy and microscopy Research of structural and optical properties, surface morphology and other characteristics of condensed matter on the multimodal optical platform constructed on the basis of the confocal laser scanning microscope "CARS". Special attention will be given to the biological studies of membrane proteins using enhanced options of Raman scattering as well as to the development of new composites of glassceramics doped with different rare earth elements for efficient generation of up-conversion luminescence.

Expected main results in 2015:

- Up-conversion luminescence efficiency increase by a factor of 200 times in oxyfluoride nanoglasceramics codoped with Er3+ and Yb3+ ions.
- Participation in the development of optically transparent and chemically stable samples of sitalls based on nanoscale ZnO crystals in potassium-zinc-aluminum-silicate matrix (in cooperation with NITIOM, St. Petersburg).
- Highly selective spectral imaging of cells using Raman and CARS microscopy
- Start of the first experiments on surface-enhanced Raman scattering (SERS) studies of membrane proteins.

List of projects:

Project	Leader	Priority (period of realization)
1. Multimodal platform for Raman and nonlinear optical microscopy and microspectroscopy for condensed matter studies	N. Kučerka Deputy: V.I. Gordeliy	1 (2015 2017)

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1. **A comprehensive study of the structural and spectral properties of oxyfluoride glasses and nanoglassceramics doped with various rare earth elements (REE)**	**G.M. Arzumanyan**	Realization

FLNP	V. Vartic, A.V. Filippov, K. Mamatkulov, A.A. Kapitonova	
2. **Up-conversion luminescence studies of sittals based on nanoscale ZnO crystals**	**G.M. Arzumanyan**	Realization
FLNP	V. Vartic, A.V. Filippov, K. Mamatkulov	
3. **Development of methodology aimed at the visualization and enhancement of the Raman scattering signal from biomolecules using CARS and SERS spectroscopy**	**G.M. Arzumanyan** **N. Kučerka**	Data taking
FLNP	K.Sh. Voskanyan, K. Mamatkulov, A.V. Filippov, A.A. Kapitonova, M. Balasoiu + 1 engineer	
LIT	E.G. Nikonov + 1 pers	
4. **Creation of in meso crystallization concept based on the Raman, CARS and SANS investigations of the mechanisms of membrane proteins crystallization.**	**G.M. Arzumanyan** **N. Kučerka** **V.I. Gordeliy**	Realization
FLNP	K.Sh. Voskanyan, K. Mamatkulov, V. Vartic, A.V. Filippov, A.I. Kuklin + 1 engineer	
5. **Upgrade of the software and development of the instrumental infrastructure of the optical platform to expand its capabilities and an increase of measurement sensitivity.**	**G.M. Arzumanyan** **N. Kučerka**	Realization
FLNP	A.V. Filippov, K. Mamatkulov, A.A. Kapitonova	

Collaboration

Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	Inst. Physiology NAS RA
Belarus	Minsk	BSTU
		SOL instruments
Germany	Jülich	FZJ
Latvia	Riga	ISSP UL
Moldova	Chişinău	IEEN ASM
		MSU
		TUM
Poland	Lublin	MCSU
Russia	Moscow	PFUR
	Moscow, Zelenograd	NT-MDT Co.

	Dolgoprudny	MIPT
	St. Petersburg	NITIOM
Romania	Bucharest	IFIN-HH
		UPB
France	Grenoble	IBS

04-5-1076-2009/2016	Priority: 1

Status: Extended

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, Germany, Hungary, Kazakhstan, Moldova, Mongolia, Poland, Romania, Russia, Serbia, Slovakia, South Africa, Spain, Ukraine, United Kingdom, USA.

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 2015:

- Transmission electron microscopy studies of radiation damage morphology in tracks of high-energy heavy ions in Al_2O_3, $YAlO_3$ and $Y_2Al_5O_12$
- Study of structural changes in Y-Ti-O nanoparticles in oxide dispersion strengthened (ODS) alloys as a function of electron stopping power.
- The study of influence of high-power pulse high temperature plasma on first wall ITER materials using of "Plasma Focus" set-up.
- The studies of influence of high energy (10-23 MeV) gamma-quanta irradiation on the behavior of metals inside dense gases (H_2, D_2, He, Ne, Ar and Xe). The synthesis of new structures.
- Development of a procedure of radiation resistance tests for the microelectronics devices using the accelerated ion beams.
- Carring out the complex studies of micro- and nano-structred materials produced by the ion track etching method, including track-etch membranes, using the newly commissioned equipment of the Nanocentre.
- Development of the method for bactericidal track membranes manufacturing using chitosan and nano-silver for portable water treatment units.
- The development of methods used for the plasma treatment of membranes and deposition of polimer films onto track-etched membranes. The investigation of the structure, the adsorption and electrical properties of composite membranes.
- Development of new methods of separation and concentration of radioactive isotopes ^{195m}Pt, ^{117m}Sn, ^{227}Th, ^{225}Ac, ^{213}Bi for the use in nuclear medicine and environmental research.

List of activities:

Activity or experiment Laboratory or other Division of JINR	Leaders Main researchers	Status
1. **Investigations of radiation damages in solids and formation of nanostructures**	**V.A. Skuratov** **P.Yu. Apel**	Data taking
FLNR	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, V.A. Kuzmin, V.A. Altynov	
LIT	I.V. Amirhanov, I.V. Puzynin, V.N. Robuk, E.G. Nikonov	
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
		BSTU
		IOMR
	Gomel	GB NASB
		GSU
		GEI
Bulgaria	Plovdiv	PU
China	Beijing	Beijing Fert Co

Czech Republic	Řež	NPI ASCR
Germany	Darmstadt	GSI
	Quedlinburg	IST
		MiCryon Technik
Hungary	Budapest	ELTE
Kazakhstan	Almaty	INP
	Astana	ENU
		NU
Moldova	Chişinău	IAP ASM
Mongolia	Ulaanbaatar	NUM
		NRC NUM
Poland	Warsaw	INCT
		ITR
	Otwock-Swierk	NCBJ
	Lublin	MCSU
	Torun	NCU
Russia	Moscow	IC RAS
		ISPM RAS
		ITEP
		GPI RAS
		LPI RAS
		MATI
		SINP MSU
		TIPS RAS
	Dubna	Trackpore Technology "A-Track"
		IINC
	Novosibirsk	ISP SB RAS
	St. Petersburg	IPTI RAS
	Saratov	SSMU
Serbia	Belgrade	INS "VINČA"
Romania	Bucharest	INFLPR
Slovakia	Bratislava	BIONT
		CU
		IEE SAS
South Africa	Port Elizabeth	NMMU
	Bellville	UWC
	Pretoria	UP
Spain	Madrid	IA
	Valencia	UV
Ukraine	Kharkov	IERT NASU
United Kingdom	London	NPL
USA	Knoxville, TN	UTK
	Oak Ridge, TN	ORNL

04–9–1077–2015/2017	Priority: 1

Status: Extended

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, Bulgaria, Czech Republic, Egypt, Italy, Moldova, Mongolia, Poland, Romania, Russia, Slovakia.

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 regularities and mechanisms of the initiation of molecular disorders in the DNA structure and their repair; and radiation-induced apoptosis in human cells under exposure to 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 lower eukaryote cells by sparsely and densely ionizing radiations with different LET.
- Research on the mechanisms of the induction of retinal damage by heavy charged particles (HCP) and its repair.
- Research on the character of the HCP-induced damage of central nervous system (CNS) cells and regularities of their death. Identification of HCP-induced functional and morphological disorders in the CNS.
- Mathematical modeling of the effects induced by ionizing radiations with different LET at the molecular and cellular levels. Development and analysis of mathematical models of the molecular mechanisms of CNS structural and functional disorders induced by ionizing radiations.
- Calculation of the radiation shielding of new nuclear physics facilities; evaluation of the radiation environment and development of radiation safety systems.

Expected main results in 2015:

- To continue studying regularities in the induction, formation, and repair kinetics of HCP-induced clustered DNA double-strand breaks (DSBs) in human skin fibroblast nuclei.
- To study the expression of the genes that encode the proteins participating in HCP-induced damage repair in human fibroblasts.
- To continue studying radiation-induced apoptosis mechanisms and different ways of HCP-induced DNA damage repair. To study the expression of the genes that encode the proteins and caspases participating in apoptosis induction in human fibroblasts by HCP
- To continue studying regularities in the formation and repair of DNA DSBs and clustered damage using DNA foci. To study DNA DSB repair kinetics by the premature chromatin condensation method.
- To continue studying regularities in the induction of gene and structural mutations in yeast cells by radiations with different LET.

- To continue research on the mutagenic effect of sparsely and densely ionizing radiations on mammalian cells in the remote period after irradiation. To perofrm an analysis of the chromosome and genome instability of mutant subclones.
- To carry out experiments on retinal response to HCP exposure and combined irradiation with γ-rays and protons. To evaluate the retina's ability to recover after radiation exposure. To determine the mechanisms behind retina recovery: Mueller cell activation, expression of endogenous protectors in the retina, and expression of the oxidative stress proteins.
- To estimate the level of the apoptotic death of neurons (based on caspase-3 activity) in different sections of the rat and mouse brain at different times after exposure to radiations with different LET.
- To study disorders in the exchange of monoamines and their metabolites in the prefrontal cortex, hippocampus, striatum, adjoining nucleus, and hypothalamus of the rat brain under exposure to γ-rays, Bragg peak protons, and HCP
- In experiments on primates, to study HCP exposure effects on cognitive functions, electroencephalograms, and the content of monoamines and their metabolites in peripheral blood
- To continue the development of mathematical models of neurons' functional activity under exposure to radiations with different LET.
- To elaborate model approaches to the quantitative estimation of the relation between the plastic processes in neurons participating in the formation of the brain's functional networks.
- To work out methods of building volume models of nerve cells for microdosimetric calculations.
- To develop mathematical models of signal propagation in microtubes and action potential propagation in neurons; and a mathematical model of axon transport of signals and molecules.
- To perform mathematical modeling of functional changes in the mammalian retina under exposure to genotoxic factors of different nature.
- To continue the development of mathematical models of DNA DSB induction and repair in mammalian and human cells.
- To ensure the conduction of the radiobiological experiments at the Nuclotron (the Laboratory of High-Energy Physics), U-400M cyclotron (the Laboratory of Nuclear Reactions), and the medical beam of the Phasotron (the Laboratory of Nuclear Problems).

List of projects:

	Project	**Leader**	**Priority (period of realization)**
1.	Research on the biological effect of heavy charged particles with different energies	E.A. Krasavin G.N. Timoshenko	1 (2015 2017)

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	S.V. Aksenova, G.F. Aru, K.V. Belokopytova, O.V. Belov, P Blaha, A.V. Boreyko, A.N. Bugay, N.N. Budennaya, T.S. Bulanova, V.N. Chausov, E.B. Dushanov,D.V. Elsha, T.A. Fadeeva, R.D. Govorun, E.V. Ilyina, A.A. Ivanov, L. Jezkova, A.N. Kokoreva, E.A. Kolesnikova, N.A. Koltovaya, O.V. Komova, I.V. Koshlan, N.A. Koshlan, M.A. Kovalenko, A. Kowalska, E.A. Kuzmina, K.N. Lyakhova, M.S. Lyashko, B. Munkhbaatar, E.A. Nasonova, S.S. Negovelov, A.Yu. Parkhomenko, I.I. Ravnachka, A.V. Rzyanina, N.L. Shmakova, E.V. Smirnova, S.I. Tiunchik, M.A. Vasilyeva, S.V. Vorozhtsova, A.Kh. Yagova, M.G. Zadnepryanets, 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, P.V. Kutsalo, K.O. Muranov , Yu.S. Severyukhin, V.A. Tronov, D.M. Utina, Yu.V. Vinogradova + 1 worker	
4. **Training activity**	**E.A. Krasavin** **S.Z. Pakuliak**	
LRB	V.E. Aleinikov, O.A. Bakerin, O.V. Belov, A.V. Boreyko, N.N. Budennaya, T.B. Feldman, R.D. Govorun, A.A. Ivanov, N.A. Koltovaya, O.V. Komova, M.M. Komochkov, I.V. Koshlan, Yu.V. Mokrov, M.A. Ostrovsky, A.Yu. Parkhomenko, G.N. Timoshenko	
UC	S.Z. Pakuliak	

Collaboration

Country or International Organization	**City**	**Institute or Laboratory**
Armenia	Yerevan	YSU
		IMB NAS RA
Bulgaria	Sofia	IE BAS
		INRNE BAS
		NCRRP
Czech Republic	Brno	IBP ASCR
	Prague	CTU
	Řež	NPI ASCR
		UJV
Egypt	Giza	CU
Italy	Udine	UNIUD
Moldova	Chişinău	UnASM

Mongolia	Ulaanbaatar	NUM
Poland	Szczecin	US
Romania	Bucharest	UMF
		ISS
	Iaşi	UAIC
		IBR
Russia	Moscow	IBMP RAS
		IHNA Ph RAS
		SF IPh RAMS
		ITEP
		MSU
	Astrakhan	ASU
	Vladivostok	FEFU
Slovakia	Bratislava	CU

04–9–1112–2013/2015	Priority: 1

Status: Approved for completion in 2015

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 2015:

- Continuation of the detection and study of biofossils and organic matter in meteorites and the most ancient terrestrial rocks.
- Irradiation of formamide samples in the presence of catalysts from different meteorites at JINR's accelerators and reactor. Evaluation of the molecular composition of the mixtures after irradiation.

List of projects:

Project	Leader	Priority (period of realization)
1. Research on cosmic matter on the Earth and in nearby space; Research on the biological and geochemical specifics of the early Earth	E.A. Krasavin Scientific leader: A.YU. Rozanov	1 (2013 2015)

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 pers.	
2. **Biogeochemical and biological studies of cosmic dust**	**L.M. Gindilis**	Data taking Realization Simulation
LRB	I.A. Bobrikov + 2 pers.	
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

04–2–1103–2010/2015	Priority: 1

Status: Approved for completion in 2015

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 2015:

- 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**	**G.V. Mitsyn**	R&D
DLNP	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	UJV
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

04–2–1126–2015/2017	Priority: 1

Status: New

Novel Semiconductor Detectors for Fundamental and Applied Research

Leader: G.A. Shelkov
Deputy: A.S. Zhemchugov

Participating Countries and International Organizations:

Belarus, CERN, Czech Republic, Germany, New Zealand, Russia, Ukraine.

Scientific Programme

Generic R&D of semiconductor radiation-resistant detectors based on new materials and of hybrid pixel detectors with high resolution for nuclear and particle physics. Development of the research infrastructure for semiconductor detector R&D, coupled with beam tests at the JINR facilities, to be used by groups from JINR and from the Member States. Scientific collaboration with research groups from other fields in feasibility studies of application of the newly developed detectors in others areas of science and technology (primarily in medicine and geology).

Expected main results in 2015:

- Upgrade of the detector characterization setup. Cleanroom refurbishment. Preparing the workspace for measuring the irradiated samples.
- Systematic studies of radiation hardness and response of GaAs detectors in the beams of the JINR facilities.
- Production of prototypes of Timepix hybrid pixel detectors with GaAs sensor of thickness less than 1 mm. Study of their capabilities in detecting neutrons, fission fragments and charged tracks.
- Production of 50 pixel Hexa sensor ($28 \times 42 mm^2$) yo be used on the beamlines of XFEL and PETRA-III
- Production of a prototype of the low-background GaAs-based hybrid pixel detector for TGV-2.
- Study of X-ray contrast media identification by spectral data.
- MARS-CT calibration and image processing aimed at geophysics studies.
- Test of the block of registration for an electromagnetic calorimetry
- Project preparation about use of new semiconductor photodetectors in a calorimetry for high energy physics.

List of projects:

	Project	Leader	Priority (period of realization)
1.	Novel semiconductor detectors for fundamental and applied research	G.A. Shelkov	1 (2015 2017)

List of activities:

Activity or experiment Laboratory or other Division of JINR Responsible person	Leaders Main researchers	Status
1. **Project "Novel semiconductor detectors for fundamental and applied research"**	**G.A. Shelkov**	Realization
DLNP	A. Gongadze, M.I. Gostkin, A.V. Guskov, D.V. Dedovich, V.G. Elkin, S.A. Kotov, D.F. Kozhevnikov, V.G. Kruchonok, V.N. Pavlov, S.Yu. Porokhovoy, I.N. Potrap, L. Zavorka	
FLNP	Yu.N. Kopach, G. Akhmedov, S.Yu. Telezhnikov	
VBLHEP	J. Lukstins + 5 pers.	
2. **Use of new semiconductor photodetectors in a calorimetry for high energy physics**	**A.G. Olshevskiy**	Realization
DLNP	Z.V. Krumshteyn, A. Antoshkin, N.V. Anfimov, I.A. Orlov, T.V. Rezinko, A.V. Rybnikov, A.S. Selunin, V.V. Chalyshev, I.E. Chirikov-Zorin, D.V. Fedoseev	
VBLHEP	I.A. Tyapkin, Z.Ya. Sadygov, T.Yu. Bokova, B. Marinova	

Collaboration

Country or International Organization	City	Institute or Laboratory
Belarus	Minsk	JIPNR-Sosny NASB NC PHEP BSU
CERN	Geneva	CERN
Russia	Dubna	"Dubna" Univ.
	Moscow	MSU
		ITEP
	Moscow, Troitsk	INR RAS
	Tomsk	TSU
	St. Petersburg	SPbSPU
New Zealand	Christchurch	UC
Germany	Hamburg	DESY
Czech Republic	Prague	CTU
Ukraine	Kharkov	ISMA NASU

Networking, Computing, Computational Physics (05)

05–6–1118–2014/2016	Priority: 1

Status: In-progress

Information and Computing Infrastructure of JINR

Leader: V.V. Korenkov
Deputy: T.A. Strizh

Participating Countries and International Organizations:

Armenia, Azerbaijan, Belarus, Bulgaria, CERN, China, Czech Republic, Egypt, France, Georgia, Germany, Moldova, Mongolia, Poland, Romania, Russia, Slovakia, 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 2015:

- Provision of the reliable functioning of the main and backup dedicated fiber optic JINR-Moscow channels. Provision of the fail-safe work of the LHCOPN network for the operation of the JINR Tier-1 center. Modernization and reliability enhancement of the central telecommunication node of the Institute's IT-infrastructure as well as provision of the secure performance of the JINR LAN.
- Provision of the required operation of the Tier-1 center at JINR. Upgrade and commissioning of the mass data storage system of the Tier-1 center.
- Implementation of the first stage of the project for the multifunctional center of data storage, processing and analysis that includes a Tier-2 level JINR grid-site, a heterogeneous cluster and a cloud infrastructure. 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. Upgrade of the "HybriLIT" heterogeneous cluster. Provision of stable operation of the JINR grid site in frames of the regional, national and application-specific grid infrastructures. Cooperation with the JINR Member States within the currently operating and planned grid projects.
- Maintenance of the hardware and software environment for information, algorithmic and software support of the JINR activities. Support of the JINRLIB program library Maintenance of a specialized JINRLIB section for parallel programs. Development and support of the central information servers, participation in the development, creation and support of the information sites of conferences and workshops, including a hosting mode and a cloud platform. Continuation of work on the introduction of the 1C:Enterprise 8.2 unified system: realization of reports on vacations and other accounting and administrative reporting; automation of the annual changing of ranges of the official rates of pay in accordance with positions and staff categories, development and implementation of algorithms of resulting sheets of reports, realization of the scheme of accounting for international cooperation on the basis of the procedure developed by the Accounting Department; design and implementation of specialized reports for cross checks; optimization of the period closing procedure. Expansion of the operational possibilities of the management information system for the NICA project on the base of the ADB2 system: adding of the EV (earned value) index; trial operation within the NICA monitoring of the joint functioning of modules of the ADB2 system and the APT EVM subsystem developed with the participation of AIS specialists (CERN) and integration of the manuals on works breakdown structure (WBS) between systems ADB2 and 1C 8.2 Enterprise. The first stage development of the JINR corporate information system by integrating the JDS system and PIN.
- Modernization 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. Organization of tutorials on

the parallel programming technologies on the basis of the "HybriLIT" heterogeneous cluster. Realization of the first stage of the Helpdesk system 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, D.V. Belyakov, E.Yu. Bulaeva, A.I. Churin, S.V. Gavrilov, L.I. Gorodnicheva, N.M. Egoshina, M.F. Ermakova, V.A. Kapitonov, G.A. Korobova, E.Yu. Kulpin, N.N. Mischenko, M.S. Plyashkevich, L.A. Popov, Ya.I. Rozenberg, E.V. Toneeva, V.P heyko, A.Yu. Zakomoldin
DLNP V.A. Bednyakov	Yu.P vanov
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	B.G. Shchinov, Yu.P Minaev
FLNR V.I. Zagrebaev	S.V. Pashchenko, G.G. Gulbekyan
UC S.Z. Pakuliak	I.N. Semeniushkin
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.A. Balashov, A.V. Baranov, S.D. Belov, A.P avrish, A.O. Golunov, N.I. Gromova, N.N. Karpenko, I.A. Kashunin, N.A. Kutovskiy, E.A. Tikhonenko, V.V. Trofimov, N.N. Voitishin, A.S. Vorontsov, V.E. Zhiltsov
VBLHEP S.V. Shmatov	I.N. Gorbunov, A.O. Golunov, I.I. Belotelov, A.Yu. Kamenev

3.	**JINR Central Information and Computing Complex**	**V.V. Korenkov** **V.V. Mitsyn**
	LIT	N.S. Astakhov, S.D. Belov, D.V. Belyakov, N.V. Chuenkova, P.V. Dmitrienko, A.G. Dolbilov, V.V. Galaktionov, A.P avrish, N.I. Gromova, I.S. Kadochnikov, A.S. Kamensky, N.N. Karpenko, I.A. Kashunin, I.A. Krokhotina, I.A. Kudasova, O.N. Kudryashova, N.A. Kutovskiy, A.A. Lavrentiev, I.I. Lensky,S.B. Marchenko, M.A. Matveev, S.V. Mitsyn, Yu.A. Nazarov, A.V. Nechaevsky, I.K. Nekrasova, D.A. Oleynik, G.A. Ososkov, I.S. Pelevanyuk, A.Sh. Petrosyan, A.I. Radov, V.T. Razuvakina, T.F. Sapozhnikova, E.A. Tikhonenko, V.V. Trofimov, L. Valova, V.A. Vasiliev, A.S. Vorontsov, A.V. Uzhinskiy, S.E. Zhabkova, V.E. Zhiltsov
4.	**Information and software support of the research-and-production activity at JINR**	**P.V. Zrelov** **V.V. Korenkov** **M.V. Bashashin**
	LIT	T.O. Ablyazimov, N.A. Balashov, A.V. Baranov, D.V. Belyakov, A.A. Bogolubskaya, N.A. Davyudova, S.V. Duchits, V.P Gerdt, T.M. Goloskokova, D.S. Golub, N.V. Jerusalimova, I.A. Filozova, L.A. Kalmykova, A.A. Karlov, D.V. Kekelidze, S.A. Kretova, S.V. Kunyaev, G.A. Kurmaeva, N.A. Kutovskiy, A.A. Kutovskaya, L.A. Lukstinia, O.G. Melnikova, G.G. Musulmanbekov, S.A. Nechitailo, E.A. Paschenko, V.V. Pervushov, M.S. Plyashkevich, E.Yu. Polyakova, 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, A.V. Sheyko, G.V. Shestakova, 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
	VBLHEP Yu.K. Potrebenikov	A.V. Philippov, K.V. Turusina
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)**	**V.V. Korenkov** **T.A. Strizh**

LIT

K.N. Angelov, N.A. Balashov, A.V. Baranov, S.D. Belov, A.G. Dolbilov, V.V. Galaktionov, T.M. Goloskokova, N.I. Gromova, I.S. Kadochnikov, N.A. Kutovskiy, V.V. Mitsyn, S.V. Mitsyn, I.K. Nekrasova, A.V. Nechaevsky, D.A. Oleynik, A.Sh. Petrosyan, D.V. Podgainy, L.A. Popov, T.F. Sapozhnikova, R.N. Semenov, O.I. Streltsova, E.A. Tikhonenko, V.V. Trofimov, A.V. Uzhinskiy, V.A. Vasiliev, L. Valova, V.E. Zhiltsov, M.I. Zuev

UC

S.Z. Pakuliak

Collaboration

Country or International Organization	City	Institute or Laboratory
Armenia	Yerevan	Foundation ANSL
		IIAP NAS RA
		YSU
Azerbaijan	Baku	IP ANAS
Belarus	Minsk	NC PHEP BSU
		JIPNR-Sosny NASB
Bulgaria	Sofia	INRNE BAS
		SU
	Blagoevgrad	SWU
CERN	Geneva	CERN
China	Beijing	IHEP CAS
Czech Republic	Prague	IP ASCR
Egypt	Giza	CU
France	Marseille	CPPM
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
		NUM
Poland	Krakow	CYFRONET
	Poznan	AMU

	Wroclaw	WUT
Romania	Bucharest	IFA
		IFIN-HH
	Cluj-Napoca	INCDTIM
Russia	Moscow	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
		Tensor
		SEZ "Dubna"
		SCC "Dubna"
	Gatchina	PNPI
	Nizhny Novgorod	UNN
	Novosibirsk	BINP SB RAS
	Pereslavl-Zalesskiy	PSI RAS
	Protvino	IHEP
	Puschino	IMPB RAS
	St. Petersburg	FIP
		ITMO
		CC SPbSU
		SPbSU
		SPbSPU
Slovakia	Košice	IEP SAS
South Africa	Cape Town	UCT
Sweden	Lund	LU
USA	Arlington, TX	UTA

	Batavia, IL	Fermilab
	Chicago, IL	UChicago
	Pasadena, CA	Caltech
	Upton, NY	BNL
Ukraine	Kiev	BITP NASU
		NTUU KPI
	Kharkov	KFTI
Uzbekistan	Tashkent	IMIT UAS

05–6–1119–2014/2016	Priority: 1

Status: In-progress

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, Czech Republic, Egypt, France, Georgia, Germany, Greece, India, Italy, Japan, Kazakhstan, Moldova, Mongolia, Poland, Portugal, Romania, Russia, Slovakia, South Africa, 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 2015:

- Development of numerical and analytical methods of investigation of nonlinear models of physics and application of the obtained results to the study of the interaction of nanocluster beams with complex systems and to the characterization of the gradient optical waveguides.

  Study of general properties of nucleus-nucleus interactions at energies planned by NICA/MPD, CBM and PANDA experiments using hadronic models of Geant4 package.

  3D modeling of the dipole, quadrupole and multipole magnets for the booster of NICA (JINR) and for SIS100 (FAIR, GSI, DARMSTADT).

  Study of nuclear physical processes of isotope accumulation and burnout in extended targets and subcritical fission systems; software maintenance of current experiments on target irradiation with protons and nuclei.

  Development of a new method for computing Coulomb corrections to the Migdal functions G(s) and F(s) of the quantum Landau-Pomeranchuk effect theory (DIRAC collaboration).

  Creation of new algorithms for computing unitarity and Coulomb corrections to observables of the Moliere-Fano multiple scattering theory (DIRAC collaboration).

  Development of methods and programs for microscopic potential calculations and their use to the analysis of experimental data on pion-nucleus, proton-nucleus, and nucleus-nucleus scattering, and other elastic and inelastic scattering reactions.

  Development of algorithms and software for the study of new types of nuclear collective motion, associated to the spin degrees of freedom.

  Transport approach modeling of peripheral reactions at the Fermi energy

  Development of methods for solving the Lorentz-Newton equation defining the new working modes of the multipurpose isochronous cyclotron DC-280 (FLNR, JINR).

  Numerical modeling of phase transitions and transient processes in physical systems encountered in studies conducted at JINR (graphite-diamond, high-temperature superconductors, Josephson transitions, thermal conductivity in technical installations).

Development of a software package for the calculation of the reflection and transmission matrices, and of the corresponding wave functions for multi-channel scattering problems.

Development of modeling methods and their use to the numerical investigation of localized patterns in dissipative and PT-symmetric discrete and continuous systems.

Study of the possibilities of the suppression of the Gribov noise when computing the ghost propagator in the Landau gauge of the Quantum gluodynamics.

Development of a new spinor field based approach for analytical and numerical investigation of actual problems of the modern cosmology

Inferences on the structure and properties of vesicular systems following from small-angle neutron and x-ray scattering data.

Development of a novel approach based on utility rate equations, for describing the evolution of complex systems.

- Development or updating of methods, algorithms and software for recording rare processes in different detectors of the CBM setup (STS, MuCh, TRD, MVD) using high-performance computing systems.

  Development of a database system for the CBM experiment (definition, agreement, and clarification of the general concepts, creation of a prototype database of the individual elements and detectors of the CBM setup).

  Development, testing and implementation of a new algorithm for constructing track-segments in the cathode strip chambers of the CMS setup.

  Software readiness for the front-end part of the CMS muon system to the LHC start in 2015.

  Support and upgrade of the ATLAS TDAQ components Resource Manager, Event Dump, Web Monitoring Interface.

  Solving tasks within the Control and Monitoring ATLAS TDAQ groups.

  Development of algorithms and software for the recognition of particle trajectories in the MPD and BM@N experiments.

  The use of robust methods for the detection of stochastic processes anomalies.

  Development of numerical methods, algorithms and software for metric analysis based reconstruction of nonlinear functional dependencies and for random processes forecasting.

  Creation and development of effective methods and algorithms for data processing based on approximation (extrapolation) by the basis element method.

  Extension of the capabilities for small-angle scattering data modeling (program "Fitter") and development, in the framework of the “SAS” program, of the primary data processing for multi-wire ring detectors for the YuMO spectrometer at the IBR-2 reactor.

  Refinement and improvement of the method of analysis of the sample temperature dependent phase transitions in spectra collected in experiments on HRFD at IBR-2.

- Creation of the information-computing environment of the heterogeneous cluster HybriLIT, which is the computational component of the Multifunctional center of storage, processing and analysis of data LIT JINR, with the aim at providing the users with opportunities to explore new approaches, technologies of parallel programming, as well as convenient tools for developing, debugging, and profiling parallel applications.

  Study of the performance capabilities of the HybriLIT with the aim at maximizing the throughput of the existing configuration and at optimizing its future extensions.

  Investigation of the conditions enabling reliable binary floating point arithmetic under the hardware and software environments of the HybriLIT.

  Development of numerical methods and algorithms for the investigation of physical processes in materials subject to irradiation by heavy ions and pulsed beams. Software implementation of the proposed algorithms for computing on HybriLIT.

Optimization of algorithms modeling thermal conductivity processes in three-dimensional structures for calculations on HybriLIT.

Adaptation of the software package MCTDHB for the study of the dynamics of interacting bosons in magneto-optical traps, for computations on systems with heterogeneous computing architecture (CPU + GPU + Intel Xeon Phi).

Development of the trigger software for the MuCh detector using the method of cellular automata and technologies of parallel computing.

Adaptation and optimization of algorithms for the search and reconstruction of the parameters of particle trajectories under simultaneous processing on multiple many-core CPU and GPU architectures.

Development of a software package on HybriLIT for the 3D modeling of spin glasses including relaxation environments in external fields.

Development of parallel programs for the calculation of the waveguide modes of multilayer waveguides, by implementing the method of sewing fields at the boundary layers of the waveguide and the pseudospectral method

The creation of projective-mesh methods and MPI algorithms with adaptive hp-approximation of high order for high-precision calculations of magnetic fields.

- Symbolic-numeric description of the entangled space for two-qubit mixed states.

  Application of computer algebra methods to the classification of entangled three-qubit pure states.

  Development of discrete combinatorial models for quantum systems with gauge structures and design of computer programs for the investigation of such models.

  Design of algorithms and programs to study resonant tunneling of composite systems through repulsive barriers.

  Partial implementation in Maple of the reduction algorithm for Feynman diagrams by means of generalized recurrence relations.

  Study of nonequilibrium behaviour of trapped atoms under strong alternating perturbations.

  Numerical investigation of spin dynamics of magnetic nanoclusters and development of models for quantum information processing.

List of activities:

Activity or experiment **Laboratory or other Division of JINR**	**Leaders** **Main researchers**
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, I.V. Barashenkov, I.L. Bogolubsky, A.M. Chervyakov, O. Chuluunbaatar, Yu.L. Kalinovsky, K.V. Lukyanov, A. Machavariani, N.V. Makhaldiani, 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, E.P ukalova, 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, D.A. Baranov, 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, M.A. Mineev, G.A. Ososkov, V.I. Palichik, A.M. Raportirenko, V.S. Shigaev, N.Yu. Shirikova, L.A. Siurakshina, A.G. Soloviev, A.N. Sosnin, V.V. Uzhinsky, N N oitishin, 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	T.O. Ablyazimov, E.I. Aleksandrov, A.S. Ayriyan, E.A. Ayrjan, O huluunbaatar, O.Yu. Derenovskaya, V.P Gerdt, A.A. Gusev, V.V. Ivanov, A.M. Khvedelidze, P.I. Kisel, Gh.E. Kozlov, A.A. Lebedev, S.A. Lebedev, Yu.G. Palii, D.V. Podgainy, O.I. Streltsova, O.I. Yuldashev, M.B. Yuldasheva, 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, E.P ukalova

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

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

05–8–1037–2001/2019	Priority: 1

Status: Extended

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 2015:

- 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 2016.
- 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. Etrial operation of the "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 **Laboratory or other Division of JINR**	**Leaders** **Main researchers**
1.	**Preparation for publication of the JINR Topical Plan for Research and International Cooperation for 2016**	**N.A. Russakovich**
	SOD	N.A. Boklagova, L.K. Ivanova, N.I. Sissakian

2.	**JINR internet-site activities maintenance**	**N.A. Russakovich**
	SOD	N.A. Boklagova, L.K. Ivanova, L.I. Kalinina, T.B. Ivashkevich, O.K. Kronshtadtov, K.P Moisenz, A.G. Nanev, N.I. Sissakian
	AMISD	V.F. Borisovskiy, S.V. Kunyaev, P.V. Ustenko
	Editorial office, weekly newspaper "Dubna: Science, Cooperation, Progress"	E.M. Molchanov
	LIT	P.V. Zrelov, L.A. Kalmykova, A.V. Prikhodko
3.	**Automation of scientific planning**	**N.A. Russakovich** **M.I. Gostkin**
	AMISD	V.F. Borisovskiy, S.V. Kunyaev
	LIT P.V. Zrelov	N.F. Davydova, L.A. Kalmykova, T.S. Syresina
4.	**International cooperation**	**N.A. Russakovich**
	IRD	D.V. Kamanin

Educational Programme (06)

06–0–1120–2014/2018	Priority: 1

Status: In-progress

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, Slovakia, South Africa, Ukraine, USA, Vietnam.

Scientific Programme

Support and development of the JINR Educational Programme in general (training of physicists and engineers in JINR 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 activities among the youth of the Member States including high school students.

Expected main results in 2015:

- Support and maintenance of the educational process at the UC. Preparation and publication - as tutorials - of lectures given to the UC students and postgraduates. Establishment of a system of assigning young researchers to JINR laboratories for preparation of a PhD thesis without mastering the academic programmes of PhD courses.
- Organization and holding of the Summer Student Practices in JINR fields of research for students of higher education institutions of JINR Member States. Participation in the organization and holding of international schools on nuclear physics and particle physics for young scientists. Expansion of the research projects of the Summer Student Programme at JINR.
- Formation of a UC-based scientific and engineering group for implementation of educational programmes on training engineering physicists for the needs of JINR and scientific centres of the Member States.
- Cooperation with international funds for organizing student and postgraduate exchange between the UC and foreign research centres regulated by special agreements.
- Development of the computer infrastructure for organizing and conducting training programmes for data analysis in high-energy physics experiments.
- Improvement of the training laboratory for the organization of lecture courses and practical classes in physics for high school students from Dubna and the Member States. Organization of scientific schools for teachers of physics from the Member States at CERN and JINR.
- Organization of excursions to JINR and video-conferences for high school students and teachers from the Member States. Development of the system of teaching English and French to JINR young staff.
- Development of training and educational programmes in relativistic nuclear physics and particle physics. Dissemination of information on the Virtual Laboratory of Nuclear Fission in the JINR Member States.
- Participation in the activities of the Academician Alexey Sissakian Education Centre.

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 Educational Process at JINR**	**V.A. Matveev** **S.Z. Pakuliak**
DLNP V.A. Bednyakov D.V. Naumov	G.A. Chelkov, A.G. Olshevskiy, V.V.Glagolev
BLTP V.V. Voronov A.P Isaev A.B. Arbuzov	D.I. Kazakov, A.V. Gladyshev, V.A. Osipov, S.N. Nedelko
FLNP V.N. Shvetsov E.V. Lychagin O.A. Culikov	B.N. Savenko, A.M. Balagurov, Yu.N. Kopach, A.V. Belushkin
VBLHEP R. Lednicky 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
Directorate G.V. Trubnikov G.D. Shirkov	A.V. Dudarev, E.D. Uglov
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
		ME RB
	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
Slovakia	Bratislava	CU
	Košice	PJSU
South Africa	Pretoria	Necsa
Ukraine	Kiev	BITP NASU
		NUK
USA	Upton, NY	BNL
Vietnam	Hanoi	VNU

Alphabetic List of Collaborators

Albania

Tirana

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

Argentina

Bariloche

CAB CNEA (Centro Atomico Bariliche National Atomic Energy Commission | http://www.cab.cnea.gov.ar/), 134

Buenos Aires

CNEA (National Atomic Energy Commission | http://www.cnea.gov.ar/), 139

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/), 169

Yerevan

Foundation ANSL (Alikhanian National Science Laboratory (Yerevan Physics Institute) Foundation | http://www.yerphi.am/), 11, 21, 40, 58, 64, 89, 93, 96, 114, 163

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/), 163, 169

IMB NAS RA (Institute of Molecular DBiology of the National Academy of Sciences of the Republic of Armenia | http://www.molbiol.sci.am/), 151

Inst. Physiology NAS RA (L.A.Orbeli Institute of Physiology of the National Academy of Sciences of the Republic of Armenia | http://www.physiol.sci.am/), 144

RAU (Russian-Armenian (Slavonic) University | http://www.rau.am/), 11, 169

YSU (Yerevan State University | http://www.ysu.am/), 21, 26, 77, 89, 101, 114, 151, 163, 169, 177

Australia

Melbourne

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

Sydney

Univ. (University of Sydney | http://sydney.edu.au/), 21, 26, 101, 169

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/), 58

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, 40, 77, 134, 163

IRP ANAS (Institute of Radiation Problems of the Azerbaijan National Academy of Sciences | http://www.science.gov.az/), 93, 139

Belarus

Gomel

BelSUT (Belarusian State University of Transport | http://www.belsut.gomel.by/), 11, 58

GB NASB (Gomel Branch of the National Academy of Sciences of Belarus | http://www.gbnas.by/), 147

GEI (Gomel Engineering Institute of the Ministry for Emergency Situations of the Republic of Belarus | http://gii.gomel.by/), 147

GSTU (Pavel Sukhoi State Technical University of Gomel | http://www.gstu.by/), 11, 41, 67, 77

GSU (Francisk Skorina Gomel State University | http://www.gsu.by/), 11, 35, 58, 67, 77, 147, 177

Minsk

BSTU (Belarusian State Technological University | http://www.bstu.unibel.by/), 21, 144, 147

BSU (Belarusian State University | http://www.bsu.by/), 35, 118, 147, 177

BSUIR (Belarusian State University of Informatics and Radioelectronics | http://www.bsuir.by/), 67, 77, 81, 142

IAP NASB (State Scientific Institution "Institute of Applier Physics of the National Academy of Sciences of Belarus | http://iaph.bas-net.by/), 134
ICE MES RB (Institute for Command Engineers of the Ministry for Emergecy 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/), 169
INP BSU (Research Institute for Nuclear Problems of the Belarusian State University | http://www.inp.bsu.by/), 11, 58, 81, 85, 101, 118, 125, 134
IOMR (N.N. Alexandrov National Cancer Centre of Belarus | http://omr.med.by/), 147
IP NASB (B.I.Stepanov Institute of Physics of the National Academy of Sciences of Belarus | http://ifanbel.bas-net.by/), 17, 21, 26, 40, 118
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, 41, 64, 77, 101, 139, 158, 163
ME RB (Ministry of Education of the Republic of Belarus | http://www.minedu.unibel.by/), 177
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, 41, 43, 48, 55, 58, 64, 67, 69, 77, 81, 89, 101, 114, 118, 134, 147, 158, 163, 177
PTI NASB (Physical Technical Institute of the National Academy of Sciences of Belarus | http://fiztech.basnet.by/), 81
RI PCP BSU (Research Institute for Physical Chemical Problems of the Belarusian State University | http://www.fhp.bsu.by/), 134
RIAPP BSU (Research Institute of Applied Physical Problems of the Belarusian State University | http://www.bsu.by/), 147
SOL instruments (SOL instruments | http://www.solinstruments.com/), 144
SPMRC NASB (Scientific-Practical Materials Research Centre of the National Academy of Sciences of Belarus | http://www.physics.by/), 81, 101, 134
"INTEGRAL" ("INTEGRAN" JSC | http://www.integral.by/), 43
"Planar" (Planar Corporation | http://www.planar.by/), 77

Belgium

Antwerp
UA (University of Antwerp | http://www.ua.ac.be/), 58
Brussels
ULB (Brussels Free University | http://www.ulb.ac.be/), 58, 110, 125, 169
VUB (Vrije University Brussels | http://www.vub.ac.be/), 17, 58
Geel
IRMM (European Commission Joint Research Centre Institute for Reference Materials and Measurements | http://irmm.jrc.ec.europa.eu/), 125
Leuven
K.U.Leuven (Catholic University of Leuven | http://www.kuleuven.ac.be/), 26, 106, 114
Liege
ULg (University of Liège | http://www.ulg.ac.be/), 169
Louvain-la-Neuve
IBA (Ion Beam Applications | http://iba-worldwide.com/), 106, 121
UCL (Catholic University of Louvain | http://www.uclouvain.be/), 22, 55, 58
Mons
UMONS (University of Mons | http://portail.umons.ac.be/), 58

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/), 58
UERJ (Rio de Janeiro State University | http://www.uerj.br/), 58
UFRJ (Federal University of Rio de Janeiro | http://www.ufrj.br/), 58
Sao Carlos, SP
IFSC USP (Institute of Physics of São Carlos of the University of São Paulo | http://www.ifsc.usp.br/), 169

Sao Paulo, SP
USP (University of São Paulo | http://www5.usp.br/), 22, 26, 30
Unesp (São Paulo State University | http://www.unesp.br/), 58

Bulgaria

Blagoevgrad
SWU (South-West University "Neofit Rilski" | http://www.swu.bg/), 55, 77, 163, 177
Plovdiv
PU (Plovdiv University "Paisii Hilendarski" | http://www.uni-plovdiv.bg/), 55, 69, 77, 114, 125, 147, 169
UFT (University of Food Technologies | http://uft-plovdiv.bg/), 125
Sofia
IE BAS (Academician Emil Djakov Institute of Electronics of the Bulgarian Academy of Sciences | http://ie-bas.dir.bg/), 134, 151
IMI BAS (Institute of Mathematics and Informatics of the Bulgarian Academy of Sciences | http://www.math.bas.bg/), 169
IMS BAS (Institute of Metal Science, Equipment end Technologies "Acad. A.Balevsci" with Hydroaerodynamics Centre of the Bulgarian Academy of Sciences | http://www.ims.bas.bg/), 134
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, 53, 58, 64, 77, 81, 89, 101, 106, 110, 114, 125, 134, 142, 151, 163, 169, 177
ISSP BAS (Georgi Nadjakov Institute of Solid State Physics of the Bulgarian Academy of Sciences | http://www.issp.bas.bg/), 22, 77, 134
LTD BAS (Laboratory for Technical Development of the Bulgarian Academy of Sciences | http://www.pronto.phys.bas.bg/), 77, 106
NCRRP (National Centre of Radiobiology and Radiation Protection | http://www.ncrrp.org/), 151
SU (Sofia University "St.Kliment Ohridski" | http://www.uni-sofia.bg/), 11, 22, 26, 30, 43, 55, 58, 64, 96, 118, 163, 169, 177
TU-Sofia (Technical University of Sofia | http://www.tu-sofia.bg/), 77
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, 169
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/), 169
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, 118

China

Beijing
Beijing Fert Co (Beijing Fert Medical Instruments Technology Co., Ltd. | http://www.china-fert.com/), 147
CIAE (China Institute of Atomic Energy | http://www.ciae.ac.cn/), 90, 96
IHEP CAS (Institute of High Energy Physics of the Chinese Academy of Sciences | http://www.ihep.ac.cn/), 34, 58, 90, 125, 163
ITP CAS (Institute of Theoretical Physics of the Chinese Academy of Sciences | http://englich.itp.cas.cn/), 17
PKU (Peking University | http://www.pku.edu.cn/), 17, 58, 110
"Tsinghua" (Tsinghua University | http://www.tsinghua.edu.cn/), 77

Hefei
USTC (University of Science and Technology of China | http://www.ustc.edu.cn/), 58
Lanzhou
IMP CAS (Institute of Modern Physics of the Chinese Academy of Sciences | http://www.impcas.ac.cn/), 106, 121
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/), 58
Zagreb
RBI (Rudjer Boskovic Institute | http://www.irb.hr/), 96, 118, 125

Cuba
Havana
HITAS (Higher Institute of Technologies and Applied Sciences), 110

Cyprus
Nicosia
UCY (University of Cyprus | http://www.ucy.ac.cy/), 58

Czech Republic
Brno
BUT (Brno University of Thechnology | 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/), 151
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/), 77, 85
Ostrava
VSB-TUO (Technical University of Ostrava | http://www.vsb.cz/), 125
Prague
CEI (Czech Environmental Institute | http://www.ceu.cz/), 125
CTU (Czech Technical University in Prague | http://www.cvut.cz/), 11, 26, 30, 38, 64, 67, 85, 101, 110, 114, 125, 134, 151, 158, 178
CU (Charles University in Prague | http://www.cuni.cz/), 11, 17, 26, 41, 46, 48, 50, 55, 58, 77, 85, 93, 106, 118, 178
IG ASCR (Institute of Geology of the Academy of Sciences of the Czech Republic, v.v.i. | http://www.gli.cas.cz/), 134
IMC ASCR (Institute of Macromolecular Chemistry of the Academy of Sciences of the Czech Republic, v.v.i. | http://www.imc.cas.cz/), 90, 134
IP ASCR (Institute of Physics of the Academy of Sciences of the Czech Republic, v.v.i. | http://www.fzu.cz/), 11, 30, 38, 96, 134, 163
VP (Vacuum PRAGUE | http://www.vakuum.cz/), 106, 110
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, 38, 67, 85, 90, 106, 110, 134, 142, 148, 151, 170, 178
UJV ("UJV Řež, a.s." | http://www.ujv.cz/), 67, 93, 96, 101, 114, 118, 139, 151, 156

Democratic People's Republic of Korea
Pyongyang
IFR SCNR (Institute of Fundamental Research of the Yongbyon Nuclear Scientific Research Centre), 106

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/), 106
ASRT (Academy of Scientific Research and Technology | http://www.asrt.sci.eg/), 178
CU (Cairo University | http://cu.edu.eg/), 106
EAEA (Egyptian Atomic Energy Authority | http://www.eaea.org.eg/), 17, 125
NRC (National Research Centre | http://www.nrc.sci.eg/), 134
TIMS (Tabbin Institute for Metallurgical Studies | http://www.tins.gov.eg/), 170
Giza
CU (Cairo University | http://cuportal.cu.edu.eg/), 17, 110, 151, 163

Estonia
Tallinn
NICPB (National Institute of Chemical Physics and Biophysics | http://www.kbfi.ee/), 58

Finland

Helsinki
- HIP (Helsinki Institute of Physics | http://www.hip.fi/), 58
- UH (University of Helsinki | http://www.helsinki.fi/university), 11, 58

Jyväskylä
- UJ (University of Jyväskylä | http://www.jyu.fi/), 58, 110, 114, 125

Oulu
- UO (University of Oulu; Microelectronics Instrumentation Laboratory | http://www.oulu.fi/), 58

Tampere
- TUT (Tampere University of Technology; Digital and Computer Systems Laboratory | http://www.tut.fi/), 58

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, 58
- 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 (Centre de Recherche du Commissariat à l'Energie Atomique et aux Energies Alternatives Cadarache | http://www-cadarache.cea.fr/), 125

Caen
- GANIL (Grand National Heavy Ion Accelerator | http://www.ganil-spiral2.eu/), 17, 106, 110

Clermont-Ferrand
- LPC (Corpuscular Physics Laboratory Clermont-Ferrand of the Blaise Pascal University | http://clrwww.in2p3.fr/), 41, 96

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

Grenoble
- IBS (Institute of Structural Biology | http://www.ibs.fr/), 145
- ILL (Institute Laue-Langevin | http://www.ill.eu/), 125, 142
- LPSC (Laboratore de Physique Subatomique et de Cosmologie | http://lpscwww.in2p3.fr/), 106, 125

Lyon
- ENS Lyon (Ecole Normale Superieure de Lyon; Physics Laboratory | http://www.ens-lyon.eu/), 26, 30
- IPNL (Institute of Nuclear Physics of Lyon | http://www.ipnl.in2p3.fr/), 58
- UCBL (Claude Bernard University Lyon 1 | http://www.univ-lyon1.fr/), 11, 96

Marseille
- CPPM (Centre de Physique des Particules de Marselle | http://marwww.in2p3.fr/), 163
- CPT (Centre of Theoretical Physics | http://www.cpt.univ-mrs.fr/), 26, 30
- UPC (University Paul Cezanne - Aix-Marseille III | http://www.univ-cezanne.fr/), 22

Metz
- UPV-M (Paul-Verlaine University of Metz | http://www.univ-metz.fr/), 11, 170

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

Nantes
- SUBATECH (Subatomic Physics Laboratory and Associated Technologies; UMR/EMN/IN2P3/CNRS/University of Nantes | http://www-subatech.in2p3.fr/), 26, 30, 77, 93, 96, 170

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

Orsay
- CSNSM (Center for Nuclear and Mass Spectrometry- IN2P3/CNRS | http://www-csnsm.in2p3.fr/), 17, 110
- IPN Orsay (Institute of Nuclear Physics Orsay - IN2P3/CNRS | http://ipnweb.in2p3.fr/), 17, 90, 96, 106, 110
- LAL (Linear Accelerator Laboratory of the University of Paris-Sid 11 - IN2P3/CNRS | http://www.lal.in2p3.fr/), 41

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

Paris
- ENS (Ecole Normale Superieure Paris | http://www.ens.fr/), 26, 30
- LPTHE (Laboratiry of Teoretical Physics and High Energy of the Pierre et Marie Curie - IN2P3/CNRS | http://parthe.lpthe.jussieu.fr/), 26, 30
- UPMC (Pierre et Marie Curie Unuvtrsity Henri Poincare Institute Paris 6 | http://www.upmc.fr/), 22, 30

Saclay
IRFU (Institute of Research into the Fundamental Laws of the Universe | http://irfu.cea.fr/), 11, 58, 64, 85, 96, 118
LLB (Leon Brillouin Laboratory CEA-CNRS | http://www-llb.cea.fr/), 125, 134, 142
SPhN CEA DAPNIA (Nuclear Physics Division of the Commissariat for Atomic Energy | http://irtu.cea.fr/Sphn), 11, 110
Strasbourg
CRN (Centre of Nuclear Research - IN2P3/CNRS | http://ireswww.in2p3.fr/), 96, 110
IPHC (Hubert Curien Multidisciplinary Institute of the University of Strasburg - IN2P3/CNRS | http://www.iphc.cnrs.fr/), 58, 110, 125
Valenciennes
UVHC (University of Valenciennes and Hainaut-Combresis | http://www.univ-valenciennes.fr/), 22, 26, 30
Vannes
SigmaPhi (Company SigmaPhi Accelerator Technologies | http://www.sigmaphi.fr/), 106

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Tbilisi
AIP (Elevter Andronikashvili Institute of Physics of the Ivane Javakhishvili Tbilisi State University | http://aiphysics.ge/), 58, 78, 125
GRENA (Georgian Research and Educational Networking Association | http://grena.ge/), 163
GTU (Georgia Tecnical University | http://www.gtu.ge/), 170
HEPI-TSU (High Energy Physics Institute of Ivane Javakhishvili Tbilisi State University | http://www.hepi.edu.ge/), 41, 43, 58, 118
RMI TSU (Andrea Razmadze Mathematical Institute of the Ivane Javakhishvili Tbilisi State University | http://www.rmi.ge/), 11, 170
TSU (Ivane Javakhishvili Tbilisi State University | http://www.tsu.ge/), 69, 163, 170
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FU Berlin (Free University of Berlin | http://www.fu-berlin.de/), 11, 26
HUB (Humboldt University of Berlin | http://www.hu-berlin.de/), 11, 26, 30, 58
HZB (Helmholtz Zentrum Berlin of the Helmholtz Association | http://www.helmholtz-berlin.de/), 110, 134, 142
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GSI (Helmholtz-Centre for Heavy Ion Research of the Helmholtz Association | http://www.gsi.de/), 17, 22, 48, 53, 69, 77, 81, 90, 96, 106, 110, 148, 163, 170
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Dortmund
TU Dortmund (Technical University of Dortmund | http://www.uni-dortmund.de/), 12, 22, 26, 134
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HZDR (Dresden-Rossendorf Helmholtz Centre | http://www.hzdr.de/), 17, 53, 90, 118, 125
IFW (Leibniz Institute for Solid State and Materials Research Dresden | http://www.ifw-dresden.de/), 22, 170
ILK (Institute of Air Handling and Refrigeration | http://www.ilkdresden.de/), 77

MPI PkS (Max Planck Institute for the Physics of Complex Systems | http://www.mpipks-dresden.mpg.de/), 22
TU Dresden (Technical University of Dresden | http://tu-dresden.de/), 22, 85, 135
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UDE (University of Duisburg-Essen | http://www.uni-due.de/), 22
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FAU (Friedrich Alexander University of Erlangen-Nuremberg | http://www.uni-erlangen.org/), 12, 17, 64, 77
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JLU (Justus Liebig University Giessen | http://www.uni-giessen.de/), 17, 77, 90, 170
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MLU (Martin-Luther University of Halle-Wittenberg | http://www.uni-halle.de/), 135
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LUH (Leibniz University of Hannover | http://www.uni-hannover.de/), 26, 31
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MPIK (Max Planck Institute for Nuclear Physics | http://www.mpi-hd.mpg.de/), 64, 81, 114
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Univ. (Friedrich-Schiller University of Jena | http://www.uni-jena.de/), 12, 26, 31
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TU (Technical University of Kaiserslautern | http://www.uni-kl.de/), 12
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JGU (Johannes Gutenberg University of Mainz | http://www.uni-mainz.de/), 12, 17, 55, 64, 77, 114
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Univ. (Philipps University of Marburg | http://www.uni-marburg.de/), 97, 101, 170
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LMU (Ludwig Maximilians University of Munich | http://www.uni-muenchen.de/), 12, 64, 163, 170
MPI-P (Max Planck Institute for Physics of Munich | http://www.mpp.mpg.de/), 27, 31, 41, 50
TUM (Technical University of Munich | http://portal.mytum.de/), 64, 90, 125, 142
Potsdam
AEI (Max Planck Institute for Gravitational Physics (Albert Einstein Institute) | http://www.aei-potsdam.mpg.de/), 27, 31

GFZ (Helmholtz Centre Potsdam GeoForschungsZentrum German Research Centre for Geosciences of the Helmholtz Association | http://www.gfz-potsdam.de/), 135
IASS (Institute for Advanced Sustainability Studies e.V. | http://www.iass-potsdam.de/), 170
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AUTH (Aristotle University of Thessaloniki | http://www.auth.gr/), 17, 101, 170

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RKK OU (Rejto Sándor Faculty of Light Industry and Enviromental Engineering of the Obuda Univesity | http://rkk.uni-obuda.hu/), 125
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IOP (Institute of Physics of Bhubaneshwar | http://www.iopb.res.in/), 59, 97
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BNC (S.N.Bose National Centre for Basic Sciences | http://www.bose.res.in/), 27, 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.veccal.ernet.in/), 97
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PU (Panjab University | http://www.puchd.ac.in/), 59, 97
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MU (Manipal University | http://www.manipal.edu/), 110

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IUCAA (Inter-University Centre for Astronomy and Astrophysics | http://www.iucaa.ernet.in/), 170

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IPM (Institute for Studies in Theoretical Physics and Mathematics of the Institute for Research Fundamental Sciences | http://www.ipm.ac.ir/IPM/), 59

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IOE (Institute of Evolution of the University of Haifa | http://evolution.haifa.ac.il/), 156
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INFN (National Institute for Nuclear Physics, Section of Bari | http://www.ba.infn.it/), 12, 27, 59, 97
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INFN (National Institute for Nuclear Physics, Section of Florence | http://www.fi.infn.it/), 55, 59
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INFN (National Institute for Nuclear Physics, Section of Pisa | http://www.pi.infn.it/), 12, 27, 31, 41, 55, 59, 81
UniPi (University of Pisa | http://www.unipi.it/), 43

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ENEA (Italian National Agency for New Technologies, Energy and Environment | http://www.enea.it/), 125
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INFN (National Institute for Nuclear Physics, Section of Naples | http://www.sa.infn.it/), 46, 97
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INFN (National Institute for Nuclear Physics, Section of Trieste | http://www.ts.infn.it/), 38, 64
SISSA/ISAS (International School for Advanced Studies | http://www.sissa.it/), 12, 27, 31
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INFN (National Institute for Nuclear Physics, Section of Turin | http://www.to.infn.it/), 27, 31, 55, 59, 64, 78, 97, 119, 170
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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
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ISIR (Institute of Scientific and Industrial Research of Osaka University | http://www.sanken.osaka-u.ac.jp/), 139
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TMU (Tokyo Metropolitan University | http://www.tmu-u.ac.jp/), 38

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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, 18, 85, 90
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APHI (Fesenkov Astrophysical Institute of the National Centre of Space Researches and Technologies | http://aphi.kz/), 12
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IPT ("Institute of Physics and Technology" LLC "National Scientific-Technology Holding "Parasat" Joint Stock Company of the Ministry of Education and Sciences of the Republic of Kazakhstan | http://www.sci.kz/), 90, 93, 170
KNU (Al-Farabi Kazakh National University | http://www.kaznu.kz/), 18, 178
Astana
BA INP (Branch of the Astana Institute of Nuclear Physics of the Kazakhstan Atomic Energy Committeee | http://www.inp.kz/), 12, 106
ENU (L.N.Gumilyov Eurasian National University | http://www.enu.kz/), 111, 148
NU (Nazarbayev University | http://nu.edu.kz/), 148
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TRCE (Training and Research Centre of Ecology of the Sarsen Amanzholov East Kazakhstan State University | http://www.vkgu.kz/), 125

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ASM (Academy of Sciences of Moldova | http://www.asm.md/), 163, 178
IAP ASM (Institute of Applied Physics of the Academy of Sciences of Moldova | http://www.phys.asm.md/), 18, 23, 78, 101, 148, 163, 170
IC ASM (Institute of Chemistry of the Academy of Sciences of Moldova | http://chem.asm.md/), 135
IEEN ASM (Chitu Institute of the Eltctronic Engenering and Nanotechnologies of the Academy of Sciences of Moldova | http://nano.asm.md/), 144
IMB ASM (Institute of Microbiology and Biotechnology of the Academy of Sciences of Moldova | http://www.imb.asm.md/), 125
IMCS ASM (Institute of Mathematics and Computer Science of the Academy of Sciences of Moldova | http://www.math.md/), 163
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RENAM (Research and Educational Networking Association of Moldova | http://www.renam.md/), 163
TUM (Technical University of Moldova | http://www.utm.md/), 144
UnASM (University of Academy of Sciences of Moldova | http://www.edu.asm.md/), 151

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CGL (Central Geological Laboratory | http://www.cengeolab.com/), 125
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NUM (National University of Mongolia | http://www.num.edu.mn/), 12, 23, 111, 125, 148, 152, 163, 170

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NINP PAS (Henryk Niewodniczanski Institute of Nuclear Physics of the Polish Academy of Sciences | http://www.ifj.edu.pl/), 12, 18, 27, 81, 90, 97, 101, 106, 111, 114, 119, 121, 126, 135, 156
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UL (University of Łódz | http://www.uni.lodz.pl/), 12, 27, 90, 126, 178
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AMU (Adam Mickiewicz University in Poznan | http://www.guide.amu.edu.pl/), 22, 111, 126, 135, 154, 163, 178
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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/), 78, 97
INCT (Institute of Nuclear Chemistry and Technology | http://www.ichtj.waw.pl/), 135, 148
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/), 148
UW (University of Warsaw | http://www.uw.edu.pl/), 18, 27, 31, 59, 106, 111
WUT (Warsaw University of Technology | http://www.pw.edu.pl/), 18, 22, 53, 64, 78, 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/), 78
UW (University of Wrocław | http://www.uni.wroc.pl/), 27, 31, 135, 170
WUT (Wrocław University of Technology | http://www.pwr.wroc.pl/), 135, 164

Portugal
Coimbra
UC (University of Coimbra | http://www.uc.pt/), 170

Republic of Korea
Chongju
CBNU (Chungbuk National University | http://www.chungbuk.ac.kr/), 36, 59
Daejeon
IBS (Institute for Basie 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/), 59
Naju
DU (Dongshin University; Laboratory for High Energy Physics | http://www.dsu.ac.kr/), 59
Namwon
SU (Seonam University | http://www.seonam.ac.kr/), 59
Pohang
PAL (Pohang Accelerator Laboratory | http://pal.postech.ac.kr/), 126
Pusan
PNU (Pusan National University | http://www.pusan.ac.kr/), 36
Seoul
Dawonsys (Company "Dawonsys 'o., Ltd" | http: //www.dawonsys.co.kr/), 126
EWU (Ewha Womans University | http: //www.ewha.ac.kr/), 51
KU (Korea University | http://www.korea.ac.kr/), 59
Konkuk Univ. (Konkuk University | http://www.kku.ac.kr/), 59
SNU (Seoul National University | http://www.snu.ac.kr/), 13, 18, 36
SNUE (Seoul National University of Education | http://www.snue.ac.kr/), 59

Taejon
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/), 38, 164, 170
IFIN-HH (Horia Hulubei National Institute of Physics and Nuclear Engineering | http://www.nipne.ro/), 18, 22, 27, 31, 53, 55, 78, 90, 106, 111, 114, 119, 126, 135, 139, 142, 145, 164, 170
INCDIE ICPE-CA (National Institute of Research and Development in Electrical Engineering ICPE-CA | Institutul National de Cercetare pentu Inginerie Electrica ICPE-CA | http://www.icpe-ca.ro/), 78, 86, 90, 102, 135, 142
INFLPR (National Institute for Laser, Plasma and Radiation Physics | http://www.inflpr.ro/), 148
INOE2000 (National Institute for Research and Development in Optoelectronics | http://inoe.inoe.ro/), 78
ISS (Institute for Space Sciences | http://www2.spacescience.ro/), 51, 90, 97, 102, 126, 135, 152, 170
NIMP (National Institute of Materials Physics | http://www.infim.ro/), 135
N&V (http://www.nuclearvacuum.ro/), 106
UB (University of Bucharest | http://www.unibuc.ro/), 18, 90, 111, 114, 126, 135, 154, 156, 170, 178
UMF (Carol Davila University of Medicine | http://www.unf.ro/), 102, 152, 156
UPB (University Politehnica of Bucharest | http://www.upb.ro/), 135, 145
UTM (Titu Maiorescu University | http://www.utm.ro/), 135
Cluj-Napoca
INCDTIM (National Institute for Research and Development of Isotopic and Molecular Technologies | http://www.itim-cj.ro/), 135, 164, 170
RA BC-N (Romanian Academy Cluj-Napoca Branch | http://www.acad-cluj.ro/), 135
UBB (Babeş-Bolyai University | http://www.ubbcluj.ro/), 136
Constanţa
NIMRD (National Institute for Marine Research and Development "Grigore Antipa" | http://www.rmri.ro/), 126
UOC ("Ovidius" University of Constanta | http://www.univ-ovidius.ro/), 90, 126, 135
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UC (University of Craiova | http://www.ucv.ro/), 135
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UG (University of Galaţi | http://www.ugal.ro/), 126
Iaşi
IBR (Institute of Biological Research Iaşi of the National Institute of Research and Development for Biological Sciences | http://www.dbioro.eu/), 152
NIRDTP (National Institute of Research and Development for Technical Physics | http://www.phys-iasi.ro/), 136
UAI (University "Apollonia" of Iaşi | http://www.univapollonia.ro/), 136
UAIC (Alexandru Ioan Cuza University of Iaşi | http://www.uaic.ro/), 102, 126, 136, 152
Oradea
UO (University of Oradea Romania | http://www.uoradea.ro/), 126
Piteşti
SCN (Institute for Nuclear Research - Piteşti | http://www.nuclear.ro/), 126, 136
Râmnicu Vâlcea
ICSI (National Research and Development Institute for Cryogenics and Isotopic Technologies | http://www.icsi.ro/), 126
Târgovişte
UVT (VALAHIA University of Targovişte | http://www.valahia.ro/), 126, 142
Timişoara
CFATR (Center for Fundamental and Advanced Technical Research of the Romanian Academy, Branch Timişoara Filiala Timişoara | http://acad-tim.tm.edu.ro/cctfa), 119
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), 136
UVT (West University of Timişoara | http://www.uvt.ro/), 22, 136

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Alexandrov
VNIISIMS (Russian Research Institute for the Synthesis of Minerals | http://vniisims.da.ru/), 119
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ASU (Astrakhan State University | http://asu.edu.ru/), 152

Belgorod
NRU BelSU (National Research University "Belgorod State University" | http://www.bsu.edu.ru/), 13, 23, 78, 136, 171
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/), 126
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/), 154
Cheboksary
ChSU (Chuvash State University | http://www.chuvsu.ru/), 111
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NCSHTA (North-Caucasian State Humanitarian Technological Academy | http://www.kchgta.ru/), 164
Chernogolovka
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/), 90
ISSP RAS (Federal State Budgetary Institution of Science "Institute of Solid State Physics of the Russian Academy of Sciences" | http://issp3.issp.ac.ru/), 136
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/), 13, 27, 31, 164
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/), 164
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/), 111
Dolgoprudny
MIPT (Moscow Institute of Physics and Technology (State University) | http://mipt.ru/), 136, 145, 178
Dubna
Adm. of Dubna (Administration of Dubna | http://naukograd-dubna.ru/), 164
BMSUT MIREA (Branch of the Moscow State University of Technology of Radioengineering, Electronics and Automation | http://www.mirea.ru/), 23, 178
BSINP MSU (Branch of the Skobeltsyn Institute of Nuclear Physics of the Lomonosov Moscow State University | http://www.msu.dubna.ru/), 48, 102, 164, 178
IAS "Omega" (Institute for Advanced Studies "Omega" | http://dubna-oez.ru/), 102
IINC (Closed Joint Stock Company "International Innovation Nanotechnological Center" | http://www.nanonewsnet.ru/), 148
RDH-9 (Radiological Department of Hospital № 9), 156
Raduga (Open Joint Stock Company "Raduga" State Machine-Building Design Bureau" | http://www.ktrv.ru/), 164
SCC "Dubna" ("Dubna" Satellite Communication Centre, Branch of the Federal State Unitary Enterprise "Russian Satellite Communication Company" | http://www.rscc.ru/), 164
SEZ "Dubna" (Special Economic Zone in Dubna | http://dubna.rosoez.ru/), 164
Tensor (Open Joint Stock Company "Instrumental Plant "Tensor" | http://www.tenzor.ru/), 164
Trackpore Technology (Closed Joint Stock Company "Trackpore Technology " Membrne Technologies and the Future Branch of the Dubna | http://www.trackpore.ru/), 148
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"Dubna" Univ. (International University "Dubna" | http://www.uni-dubna.ru/), 126, 158, 164, 178
Fryazino
ISTOK (Federal State Unitary Enterprise "Scientific Industrial Enterprise "ISTOK" | http://www.istokmw.ru/), 78
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/), 13, 18, 23, 31,

34, 43, 59, 65, 86, 97, 111, 114, 119, 126, 136, 142, 154, 164
Irkutsk
ISU (Irkutsk State University | http://www.isu.su/), 13, 18, 34, 51
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/), 126
Ivanovo
ISU (Ivanovo State University | http://www.ivanovo.ac.ru/), 13
ISUCT (Ivanovo State University of Chemistry and Technology | http://main.isuct.ru/), 126
Izhevsk
UdSU (Udmurtia State University | http://www.udsu.ru/), 126
Kazan
Compressormash (Open Joint Stock Company "Kazancompressormash" | http://compressormash.ru/), 78
KFU (Kazan (Volga Region) Federal University | http://www.kpfu.ru/), 13, 23
KNRTU (Kazan National Research Technological University | http://www.kstu.ru/), 136
Korolev
RSC "Energia" (Open Joint Stock Company " "S.P.Korolev Rocket and Space Corporation "Energia" | http://www.energia.ru/), 51
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KSU (Kostroma State University | http://ksu.edu.ru/), 178
Magnitogorsk
MagTU (Magnitogorsk State Technical University named after G.I.Nosov | http://www.magtu.ru/), 126
Moscow
ARRICT (Open Joint Stock Company "Leading Research Institute of Chemical Technology" | http://www.vniiht.ru/), 36
Atomenergomach ("Atomenergomach" | http://www.cftp-aem.ru/), 101, 126
Cryogenmash (Open Joint Stock Company "Cryogenmash" | http://www.cryogenmash.ru/), 78
ENES (LLC "Engineering Center of Niclear Equipment Strength" | http://www.icpmae.ru/), 139
GC RAS (Federal State Budgetary Institution of Science "Geophysical Center of the Russian Academy of Sciences" | http://www.gcras.ru/), 136
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/), 111
GIN RAS (Federal State Budgetary Institution of Science "Geological Institute of the Russian Academy of Sciences" | http://www.ginras.ru/), 126
GPI RAS (Federal State Budgetary Institution of Science "General Physics Institute of the Russian Academy of Sciences" | http://www.gpi.ru/), 36, 106, 119, 126, 148, 171
Geliymash (Open Joint Stock Company "Researching and Production Association of Helium Engineering" | http://geliymash.ru/), 78, 139
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/), 136
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/), 78, 152, 156
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/), 136, 148
ICS RAS (Federal State Budgetary Institute of Science "V.A. Trapeznikov Institute of Control Sciences of the Russian Academy of Sciences" | http://www.iitp.ru/), 170
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/), 136, 154
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/), 136
IHNA Ph RAS (Federal State Budgetary Institution of Science "Institute of Higher Nervous Activity and Neurophysiology of the Russian Academy of Sciences" | http://www.ihna.ru/), 152

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/), 164
IKI RAS (Federal State Budgetary Institution of Science "Space Research Institute of the Russian Academy of Sciences" | http://www.iki.rssi.ru/), 126, 154
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/), 136
IMM RAS (Federal State Budgetary Institution of Science "Institute for Mathematical Modeling of the Russian Academy of Sciences" | http://www.imamod.ru/), 13
INEUM (Open Joint Stock Company "Institute of Electronic Control Computes named after I.S.Bruk" | http://www.ineum.ru/), 139
INMI RAS (Federal State Budgetary Institution of Science "Winogradsky Institute of Microbiology of the Russian Academy of Sciences" | http://www.inmi.ru/), 136
INTRA (Closed Joint Stock Company "INTRA" | http://www.intra-zao.ru/), 114
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/), 164
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/), 111, 136
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/), 136
IPI RAN (Federal State Budgetary Institution of Science "Institute of Informatics Problems of the Russian Academy of Sciences" | http://www.ipiran.ru/), 164
ISP RAS (Federal State Budgetary Institution of Science "Institute for System Programming of the Russian Academy of Sciences" | http://www.ispras.ru/), 164
ISPM RAS (Federal State Budgetary Institution of Science "Enikolopov Institute of Synthetic Polymeric Materials of the Russian Academy of Sciences" | http://www.ispm.ru/), 136, 148
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/), 13, 18, 27, 31, 41, 53, 59, 78, 90, 93, 97, 106, 114, 119, 126, 136, 148, 152, 158, 164, 170
JSCC RAS (Federal State Budgetary Institution of Science "Joint Supercomputer Centre of the Russian Academy of Sciences" | http://www.jscc.ru/), 164
KIAM RAS (Federal State Budgetary Institution of Science "Keldysh Institute of Applied Mathematics of the Russian Academy of Sciences" | http://www.keldysh.ru/), 164, 171
LPI RAS (Federal State Budgetary Institution of Science "P.N.Lebedev Physical Institute of the Russian Academy of Sciences" | http://www.lebedev.ru/), 13, 27, 31, 41, 59, 64, 69, 78, 86, 90, 114, 148
MATI (Russian State Technological University | http://www2.mati.ru/), 148
MGTU MIREA (Moscow State Technical Unuversity of Radioengineering, Electronics and Automation | http://www.mirea.ru/), 22, 178
MI RAS (Federal State Budgetary Institution of Science "Steklov Mathematical Institute of the Russian Academy of Sciences" | http://www.mi.ras.ru/), 13, 23, 27, 31
MIET (National Research University of Electronic Technology | http://www.miet.ru/), 136
MITHT (Lomonosov Moscow University of Fine Chemical Technology | http://www.mitht.ru/), 136
MPEI (National Research University Moscow Power Engineering Institute | http://www.mpei.ru/), 164
MSU (Lomonosov Moscow State University | http://www.msu.ru/), 13, 18, 23, 27, 31, 41, 78, 111, 119, 126, 136, 152, 154, 158, 164, 171
MUCTR (Mendeleev University of Chemical Technology of Russia | http://www.muctr.ru/), 111
NIKIET (Open Joint Stock Company "A.N.Dollezhal Research and Development Institute of Power Engineering" | http://www.nikiet.ru/), 59, 136, 139

NNRU "MEPhI" (National Nuclear Research University "MEPhI" | http://www.mephi.ru/), 18, 23, 51, 93, 97, 111, 114, 136, 142, 170, 178
NRC KI (National Research Centre "Kurchatov Institute" | http://www.nrcki.ru/), 18, 23, 78, 86, 97, 111, 114, 119, 126, 136, 142, 164
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, 144, 171
PIN RAS (of the Russian Academy of Sciences | http://www.paleo.ru/), 154
Profimontazhservis (Open Joint Stock Company "PROFIMONTAZHSERVISP"), 139
RADON (State Unitary Enterprise "RADON" | http://www.radon.ru/), 114
RCC MSU (Research Computer Centre of the M.V.Lomonosov Moscow State University | http://www.srcc.msu.ru/), 164
RIPN (Russian Institute for Public Networks | http://www.ripn.net/), 164
RSCC (Federal State Unitary Enterprise "Russian Satellite Communications Company" | http://www.rscc.ru/), 164
SAI MSU (Sternberg Astronomical Institute of the M.V.Lomonosov Moscow State University | http://www.sai.msu.ru/), 154
SC "VNIINM" (Stock Company "A.A.Bochvar High-Technology Research Institute of Inorganic Materials" | http://www.bochvar.ru/), 78, 114, 136
SCC RAS (Scientific Council for Cybernetics of the Russian Academy of Sciences | http://www.ras.ru/), 13, 31
SF IPh RAMS (Federal State Budgetary Institution of Science "State Foundation Institute of Pharmacology Russian Academy of Medical Sciences" | http://www.academpharm.ru/), 152
SINP MSU (Skobeltsyn Institute of Nuclear Physics of the M.V.Lomonosov Moscow State University | http://www.sinp.msu.ru/), 13, 18, 23, 31, 36, 38, 51, 53, 59, 64, 68, 69, 90, 97, 111, 114, 119, 126, 136, 148, 164, 171, 178
SRI "Voskhod" (Scientific research institute "Voskhod" | http://www.voskhod.ru/), 164
SSDI (Open Joint Stock Company "State Specialized Design Institute" | http://oaogspi.ru/), 81, 139
SYSTEMATOM (Closed Joint Stock Company "Nuclear and Radiation Safety Systems" | http://www.systematom.ru/), 139
TIPS RAS (Federal State Budgetary Institution of Science "A.V.Topchiev Institute of Petrochemical Synthesis of the Russian Academy of Sciences" | http://www.ips.ac.ru/), 148
VIGG RAS (Federal State Budgetary Institution of Science "Vavilov Institute of General Genetics of the Russian Academy of Sciences" | http://www.vigg.ru/), 156, 171
VNIIEM Corporation (Research and Production Corporation "Space Monitoring Systems, Information & Control and Electromechanical Complexes named after A.G.Iosifian" | http://www.vniiem.ru/), 51
VNIIMS (Federal State Unitary Enterprise "All-Russian Scientific Research Institute of Metrological Service" | http://www.vniims.ru/), 27, 31

Moscow, Troitsk

HPPI RAS (Federal State Budgetary Institution of Science "Institute for High Pressure Physics of the Russian Academy of Sciences" | http://www.hppi.troitsk.ru/), 23, 136
INR RAS (Federal State Budgetary Institution of Science "Institute for Nuclear Research of the Russian Academy of Sciences" | http://www.inr.ac.ru/), 13, 18, 23, 27, 31, 43, 51, 53, 55, 59, 64, 69, 78, 82, 86, 90, 97, 111, 114, 119, 126, 136, 142, 158, 164
ISAN (Federal State Budgetary Institution of Science "Institute of Spectroscopy of the Russian Academy of Sciences" | http://www.isan.troitsk.ru/), 136

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NT-MDT Co. (Closed Joint Stock Company "NT-MDT Co." | http://www.ntmdt.ru/), 144
RIMST (Closed Joint Stock Company "Research Institute of Material Science and Technology" | http://www.niimv.ru/), 111

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, 106
IPM RAS (Federal State Budgetary Institution of Science "Institute for Physics of Microstructures of the Russian Academy of Sciences" | http://ipmras.ru/), 136, 142

UNN (N.I.Lobachevsky State University of Nizhny Novgorod (National Research University) | http://www.unn.ru/), 136, 164
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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/), 154
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, 34, 78, 82, 97, 107, 164
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/), 148
Obninsk
Branch KIPC (Obninsk branch of the Karpov Institute of Physical Chemistry | http://www.karpovipc.ru/), 142
IPPE (State Scientific Centre of the Russian Federation - Institute of Physics and Power Engineering | http://www.ippe.ru/), 18, 102, 126, 136
MRRC (Institution of the Russian Academy of Medices Sciences "Medical Radiological Research Centre" | http://www.mrrc.obninsk.ru/), 102, 156
Omsk
OmSU (F.V. Dostoevsky Omsk State University | http://www.omsu.ru/), 18
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PSI RAS (Federal State Budgetary Institution of Science "Program Systems Institute of the Russian Academy of Sciences" | http://www.botik.ru/PSI), 164
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PSNRU (Perm State National Research University | http://www.psu.ru/), 13, 171
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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/), 136
PetrSU (Petrozavodsk State University | http://petrsu.karelia.ru/), 27, 31
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GIDROPRESS (Open Joint Stock Company "Experimental & Desingn Organization "GIDROPRESS" | http://www.gidropress.podolsk.ru/), 136
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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, 31, 38, 41, 48, 53, 55, 59, 65, 68, 69, 78, 93, 97, 164, 171
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IMPB RAS (Federal State Budgetary Institution of Science "Institute of Mathematical Problems of Biology of the Russian Academy of Sciences" | http://www.impb.ru/), 164, 171
IPR RAS (Federal State Budgetary Institution of Science "Institute of Protein Research of the Russian Academy of Sciences" | http://www.protres.ru/), 171
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/), 171
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RIP SFU (Research Institute of Physics of the Southern Federal University | http://ip.sfedu.ru/), 136
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RSU (S.A.Esenin Ryazan State University | http://www.rsu.edu.ru/), 82
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SSU (Samara State University | http://www.samsu.ru/), 13
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SSMU (Saratov State Medical University named after V.I.Razumovsky | http://www.sgmu.ru/), 148
SSU (Saratov State University named after N.G.Chernyshevsky | http://www.sgu.ru/), 13, 18, 23, 171
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VNIIEF (Russian Federal Nuclear Centre - All-Russian Research "Institute of Experimental Physics" | http://www.vniief.ru/), 13, 82, 90, 97, 107, 111, 114, 119

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IBSS (Institute for Biology of the Southern Seas | http://www.ibss.nas.gov.ua/), 126
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SmolGU (Smolensk State University | http://www.smolgu.ru/), 90
Snezhinsk
VNIITF (Russian Federal Nuclear Centre - All-Russian Scientific Research Institute of Technical Physics | http://www.vniitf.ru/), 59, 126
St. Petersburg
CC SPbSU (Computer Center of the Saint Petersburg State University | http://www.cc.spbu.ru/), 164
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/), 59
FIP (V.F.Fock Institute of Physics of the Saint Petersburg State University | http://www.niif.spbu.ru/), 126, 164, 171
Hermitage (State Hermitage Museum | http://www.hermitagemuseum.org/), 126
IPTI RAS (Federal State Budgetary Institution of Science "Ioffe Physic ¤ Technical Institute of the Russian Academy of Sciences" | http://www.ioffe.ru/), 23, 111, 114, 136, 148
ITMO (National Research University of Information Technologies, Mechanics and Optics | http://www.ifmo.ru/), 111, 164
KB "Arsenal" (Federal State Unitary Enterprise "Arsenal" Desing Bureau named after M.V.Frunze" | http://kbarsenal.ru/), 51
KRI (V.G.Khlopin Radium Institute | http://www.khlopin.ru/), 90, 102, 111, 126
NIIEFA (D.V.Efremov Scientific Research Institute of Electrophysical Apparatus | http://www.niiefa.spb.su/), 107, 171
NITIOM (Research and Technology Institute of Optical Materials | http://www.goi.ru/), 145
Neva-Magnet (Neva-Magnit S&E, Ltd | http://www.magnet.spb.su/prd2.html/), 78
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, 31
SPbSPU (St. Petersburg State Polytehnical University | http://www.spbstu.ru/), 13, 158, 164
SPbSU (Saint Petersburg State University | http://www.spbu.ru/), 13, 18, 23, 27, 93, 97, 111, 114, 136, 164
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SSPA (Sterlitamak State Pedagogical Akademy | http://www.sspa.edu.ru/), 136
Syktyvkar
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/), 68, 78
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, 114
NPI TPU (Nuclear Physics Institute of the National Research Tomsk Polytechnic University | http://past.tpu.ru/html/nii-yf.htm), 78, 114, 127, 136
TPU (National Research Tomsk Polytechnic University | http://tpu.ru/), 27, 102
TSU (National Research Tomsk State University | http://www.tsu.ru/), 13, 31, 158, 171
Tula
TSPU (Tula State Pedagogical University | http://tsput.ru/), 127
TSU (Tula State University | http://tsu.tula.ru/), 136, 178
Tver
TvSU (Tver State University | http://www.university.tversu.ru/), 13, 171, 178
Vladimir
ELMAG ("ELMAG Ltd" | http://www2.vtsnet.ru/elmag/about.htm/), 107
Vladivostok
FEFU (Far Eastern Federal University | http://dvfu.ru/), 18, 152
Voronezh
VSU (Voronezh State University | http://www.vsu.ru/), 23, 111, 114, 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/), 137, 142
UrFU (Urals Federal University named after the First President of Russie B.N.Yeltsin | http://www.urfu.ru/), 127, 137
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/), 59

Serbia

Belgrade
INS "VINČA" ("Vinča" Institute of Nuclear Sciences | http://www.vin.bg.ac.rs/), 23, 59, 102, 107, 137, 148
IPB (Institute of Physics Belgrade of the University of Belgrade | http://www.phy.bg.ac.rs/), 27, 31, 127
Univ. (University of Belgrade | http://www.bg.ac.rs/), 13, 27, 31, 127
Novi Sad
UNS (University of Novi Sad | http://www.uns.ac.rs/), 127, 137

Slovakia

Bratislava
BIONT (Bratislava Ionic Technologies Co. | http://www.biont.sk/), 148
CU (Comenius University in Bratislava | http://www.uniba.sk/), 13, 18, 41, 43, 53, 55, 97, 102, 111, 114, 127, 137, 148, 152, 178
IEE SAS (Institute of Electrical Engineering of the Slovak Academy of Sciences | http://www.elu.sav.sk/), 82, 127, 148
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/), 78, 107, 142
IP SAS (Institute of Physics of the Slovak Academy of Sciences | http://www.fu.sav.sk/), 13, 18, 23, 41, 43, 53, 86, 90, 107, 111, 114, 127
SOSMT (Slovak Office of Standards, Metrology and Testing | http://www.unms.sk/), 102
STU (Slovak University of Technology in Bratislava | http://www.stuba.sk/), 59
Košice
IEP SAS (Institute of Experimental Physics of the Slovak Academy of Sciences in Košice | http://uef.saske.sk/), 13, 23, 36, 86, 137, 164, 171
PJSU (Pavol Jozef Šafárik University in Košice | http://www.upjs.sk/), 78, 86, 90, 93, 97, 171, 178
TUKE (Technical University of Košice | http://www.tuke.sk/), 23, 171
Prešov
PU (University of Presov | http://www.unipo.sk/), 171
Žilina
UŽ (University of Žilina | http://www.uniza.sk/), 78

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

Bellville
UWC (University of the Western Cape | http://www.uwc.ac.za/), 148
Cape Town
UCT (University of Cape Town | http://www.uct.ac.za/), 31, 78, 97, 164, 171
iThemba LABS (iThemba Laboratory for Accelerator Based Sciences | http://www.tlabs.ac.za/), 19, 107, 111
Johannesburg
UJ (University of Johannesburg | http://www.uj.ac.za/), 78
Port Elizabeth
NMMU (Nelson Mandela Metropolitan University | http://www.nmmu.ac.za/), 148
Pretoria
Necsa (South African Nuclear Energy Corporation | http://www.necsa.co.za/), 127, 137, 178
UP (University of Pretoria | http://web.up.ac.za/), 148, 171
Unisa (University of South Africa | http://www.unisa.ac.za/), 18, 111, 127
Stellenbosch
SU (Stellenbosch University | http://www.sun.ac.za/), 18, 111

Spain

Barcelona
IFAE (Institute for High Energy Physics | http://www.ifae.es/), 41
Huelva
UH (University of Huelva | http://www.uhu.es/), 111

Madrid
CIEMAT (Research Centre for Energy, Environment and Technology | http://www.ciemat.es/), 60
CSIC (Spanish National Research Council | http://www.csic.es/), 111
IA (Institute of Acoustics of the Spanish National Research Council | http://www.ia.csic.es/), 148
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/), 60
Oviedo
Uniovi (University of Oviedo | http://www.uniovi.es/), 60
Palma
UIB (Illes Baleares University | http://www.uib.es/), 19
Santander
IFCA (Institute of Physics of Cantabria of the University of Cantabria | http://www.ifca.unican.es/), 60
Santiago de Compostela
USC (University of Santiago de Compostela | http://www.usc.es/), 13, 38
Valencia
UPV (Polytechnic University of Valencia | http://www.upv.es/), 139
UV (University of Valencia | http://www.uv.es/), 13, 148

Sweden
Göteborg
Chalmers (Chalmers University of Technology | http://www.chalmers.se/), 19, 111
Lund
LU (Lund University | http://www.lu.se/), 13, 19, 90, 97, 164
Stockholm
SU (Stockholm University | http://www.su.se/), 78
Uppsala
TSL (Svedberg Laboratory of the Uppsala University | http://www4.tsl.uu.se/tsl/), 78, 86

Switzerland
Basel
Uni Basel (University of Basel | http://www.unibas.ch/), 60
Bern
Uni Bern (University of Bern | http://www.unibe.ch/), 13, 19, 38
Geneva
UniGe (University of Geneva | http://www.unige.ch/), 86, 90
Lausanne
EPFL (Ecole Polytechnique Federale de Lausanne | http://www.epfl.ch/), 98
Villigen
PSI (Paul Scherrer Institute | http://www.psi.ch/), 13, 23, 60, 86, 90, 111, 119, 127, 137
Zurich
ETH (Swiss federal Institute of Technology Zurich | http://www.ethz.ch/), 23, 60, 90, 137, 171
UZH (University of Zurich | http://www.uzh.ch/), 38, 60, 65, 119

Taiwan
Chung-Li
NCU (National Central University | http://www.ncu.edu.tw/), 60
Hsinchu
NSRRC (National Synchrotron Radiation Research Center | http://www.srrc.gov.tw/), 137
Taipei
AS (Academia Sinica | http://www.sinica.edu.tw/), 171
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/), 19, 36, 60

Tajikistan
Dushanbe
IChem ASRT (V.I.Nikitin Institute of Chemistry of the Academy of Sciences of the Republic of Tajikistan | http://www.phti.tj/), 137
PHTI ASRT (S.U.Umarov Physical-Technical Institute of the Academy of Sciences of the Republic of Tajikistan | http://www.phti.tj/), 91, 171
TNU (Tajik State University | http://tnu.tj/), 91, 171
Khujent
KSU (Khujent State University | http://www.hgu.tj/), 171

Thailand
Hat Yai
PSU (Prince of Songkla University | http://www.psu.ac.th/), 127

Turkey

Adana
CU (Çukurova University | http://www.cu.edu.tr/), 60

Ankara
METU (Middle East Technical University | http://www.metu.edu.tr/), 46, 60

Istanbul
BU (Boğaziçi University | http://www.boun.edu.tr/), 28, 31

Izmir
IYTE (Izmir Institute of Technology | http://www.iyte.edu.tr/), 28

Çanakkale
ÇOMU (Çanakkale Onsekiz Mart University | http://www.comu.edu.tr/), 127

USA

Ames, IA
ISU (Iowa State University | http://www.iastate.edu/), 60

Argonne, IL
ANL (Argonne National Laboratory | http://www.anl.gov/), 14, 19, 41, 94, 111, 171

Arlington, TX
UTA (University of Texas Arlington | http://www.uta.edu/), 164

Athens, AL
ASU (Athens State University | http://www.athens.edu/), 154

Baltimore, MD
JHU (Johns Hopkins University | http://www.jhu.edu/), 28, 32, 60

Batavia, IL
Fermilab (Fermi National Accelerator Laboratory | http://www.fnal.gov/), 43, 46, 60, 78, 82, 165

Berkeley, CA
Berkeley Lab (Lawrence Berkeley National Laboratory of the University of California | http://www.lbl.gov/), 91, 94, 111

Blacksburg, VA
Virginia Tech. (Virginia Polytechnic Institute and State University; Institute for High Energy Physics | http://www.vt.edu/), 60

Boston, MA
BU (Boston University | http://web.bu.edu/), 55, 60
NU (Northeastern University | http://www.northeastern.edu/), 60

Cambridge, MA
Harvard Univ. (Harvard University | http://www.harvard.edu/), 46
MIT (Massachusetts Institute of Technology | http://web.mit.edu/), 60

Charlottesville, VA
UVa (University of Virginia | http://www.virginia.edu/), 43, 119

Chicago, IL
UChicago (University of Chicago | http://www.uchicago.edu/), 36, 55, 165
UIC (University of Illinois at Chicago | http://www.uic.edu/), 60

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/), 14, 28, 32, 60

College Station, TX
Texas A&M (Texas A&M University | http://www.tamu.edu/), 107, 111

Columbus, OH
OSU (Ohio State University | http://www.osu.edu/), 60, 98

Coral Gables, FL
UM (University of Miami | http://www.miami.edu/), 28, 32

Davis, CA
UCDavis (University of California | http://www.ucdavis.edu/), 60

Detroit, MI
WSU (Wayne State University | http://wayne.edu/), 94

Durham, NC
Duke (Duke University | http://www.duke.edu/), 127

East Lansing, MI
MSU (Michigan State University | http://www.msu.edu/), 36, 111

Evanston, IL
NU (Northwestern University | http://www.northwestern.edu/), 60

Fairfax, VA
GMU (George Mason University | http://www.gmu.edu/), 55

Gainesville, FL
UF (University of Florida | http://www.ufl.edu/), 60

Gettysburg, PA
GC (Gettysburg College | http://www.gettysburg.edu/), 127

Houston, TX
Rice Univ. (Rice University | http://www.rice.edu/), 60

Indianapolis, IN
IUPUI (Indiana University - Purdue University iindianapolis | http://www.iupui.edu/), 46, 139
Iowa City, IA
UIowa (University of Iowa | http://www.uiowa.edu/), 60, 91
Irvine, CA
UCI (University of California, Irvine | http://www.uci.edu/), 115
Kingston, RI
URI (University of Rhode Island | http://ww2.uri.edu/), 127
Knoxville, TN
UTK (University of Tennessee of Knoxville | http://www.utk.edu/), 148
Lexington, KY
UK (University of Kentucky | http://www.uky.edu/), 43
Lincoln, NE
UNL (University of Nebraska-Lincoln | http://www.unl.edu/), 60
Livermore, CA
LLNL (Lawrence Livermore National Laboratory | http://www.llnl.gov/), 60, 107, 111
Los Alamos, NM
LANL (Los Alamos National Laboratory; Meson Physics Facility (LAMPF) | http://www.lanl.gov/), 19, 60, 127
Los Angeles, CA
UCLA (University of California, Los Angeles | http://www.ucla.edu/), 60, 94
Louisville, KY
UofL (University of Louisville | http://lousville.edu/), 23
Lubbock, TX
TTU (Texas Tech University | http://www.ttu.edu/), 60
Madison, WI
UW-Madison (University of Wisconsin-Madison | http://www.wisc.edu/), 60
Menlo Park, CA
SLAC (SLAC National Accelerator Laboratory is operated by Stanford University | http://www.slac.stanford.edu/), 55
Merced, CA
UC Merced (University of California, Mersed Madison | http://www.ucmerced.edu/), 55
Minneapolis, MN
UofM (University of Minnesota | http://www1.umn.edu/), 14, 28, 32, 60
Nashville, TN
VU (Vanderbilt University | http://www.vanderbilt.edu/), 107, 111
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/), 14, 23, 28, 32
RU (Rockefeller University | http://www.rockefeller.edu/), 14, 28
SUNY (State University of New York | http://www.suny.edu/), 28, 32
Newport News, VA
JLab (Thomas Jefferson National Accelerator Facility; Southeastern Universities Research Association (SURA) | http://www.jlab.org/), 14, 32, 86
Norfolk, VA
NSU (Norfolk State University | http://www.nsu.edu/), 86, 91
Norman, OK
UO (University of Oklahoma | http://www.ou.edu/), 14, 28
Notre Dame, IN
ND (University of Notre Dame | http://www.nd.edu/), 19, 60
Oak Ridge, TN
ORNL (Oak Ridge National Laboratory | http://www.ornl.gov/), 98, 107, 111, 127, 148
Oxford, MS
UM (University of Mississippi | http://www.olemiss.edu/), 60
Pasadena, CA
Caltech (California Institute of Technology | http://www.caltech.edu/), 60, 165
Philadelphia, PA
Penn (University of Pennsylvania | http://www.upenn.edu/), 14, 28, 32
Piscataway, NJ
Rutgers (State University of New Jersey | http://www.rutgers.edu/), 28, 32, 60
Pittsburgh, PA
Pitt (University of Pittsburgh | http://www.pitt.edu/), 60, 119
Princeton, NJ
PU (Princeton University; Joseph Henry Laboratories of Physics | http://www.princeton.edu/), 61
Riverside, CA
UCR (University of California, Riverside | http://www.ucr.edu/), 61

Rochester, NY
UR (University of Rochester | http://www.rochester.edu/), 23, 28, 32, 61
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/), 78
Tallahassee, FL
FSU (Florida State University | http://www.fsu.edu/), 23, 61
Tempe, AZ
ASU (Arizona State University | http://www.asu.edu/), 36
Tucson, AZ
UA (University of Arizona | http://www.arizona.edu/), 119
Tuscaloosa, AA
UA (University of Alabama | http://www.ua.edu/), 61
University Park, PA
Penn State (Pennsylvania State University | http://www.psu.edu/), 14, 19, 94
Upton, NY
BNL (Brookhaven National Laboratory | http://www.bnl.gov/), 78, 82, 86, 91, 94, 165, 178
Urbana, IL
UIUC (University of Illinois at Urbana-Champaign), 65
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/), 127, 137
DonNU (Donetsk National University | http://www.donnu.edu.ua/), 137
Kharkov
IERT NASU (Institute of Electrophysics and Radiation Technology of the National Academy of Sciences of Ukraine | http://www.iert.kharkov.ua/), 82, 137, 148, 171
ISC NASU (Institute for Single Crystals of the National Academy of Sciences of Ukraine | http://www.isc.kharkov.ua/), 60, 115
ISMA NASU (Institute for Scintillation Materials of the National Academy of Sciences of Ukraine | http://www.isma.kharkov.ua/), 43, 48, 51, 65, 127, 158
KFTI (National Science Centre - Kharkov Institute of Physics and Technology | http://www.kipt.kharkov.ua/), 14, 23, 28, 32, 36, 60, 78, 86, 98, 102, 127, 137, 165, 171
KhNU (V.N.Karasin Kharkov National University | http://www.univer.kharkov.ua/), 60, 78
Kiev
BITP NASU (M.M.Boholubov Institute for Theoretical Physics of the National Academy of Sciences of Ukraine | http://www.bitp.kiev.ua/), 13, 19, 28, 31, 53, 68, 78, 98, 165, 171, 178
IM NASU (Institute of Mathematics of the National Academy of Sciences of Ukraine | http://www.imath.kiev.ua/), 171
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/), 137
ISC NASU (Chuiko Institute of Surface Chemistry of the National Academy of Sciences of Ukraine | http://www.isc.gov.ua/), 137
KINR NASU (Kiev Institute for Nuclear Research of the National Academy of Sciences of Ukraine | http://www.kinr.kiev.ua/), 19, 107, 111, 115, 127
NTUU KPI (National Technical University of Ukraine "Kyiv Polytechnic Institute" | http://kpi.ua/), 165
NUK (Taras Shevchenko National University of Kyiv | http://univ.kiev.ua/), 23, 51, 127, 137, 178
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/), 14

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://lnu.edu.ua/), 14
LPNU (L'viv Politechnic National University | http://lp.edu.ua/), 142
Lutsk
VNU (Volyn National University of Lesya Ukrainka | http://www.vnu.edu.ua/), 14
Sumy
IAP NASU (Institute of Applied Physics of the National Academy of Sciences of Ukraine | http://iap.sumy.org/), 127
SumSU (Sumy State University | http://sumdu.edu.ua/), 14
Uzhgorod
IEP NASU (Institute of Electron Physics of the National Academy of Sciences of Ukraine | http://www.iep.uzhgorod.ua/), 127
UNU (Uzhgorod National University | http://www.uzhnu.edu.ua/), 102

United Kingdom

Birmingham
Univ. (University of Birmingham | http://www.birmingham.ac.uk/), 55, 98
Bristol
Univ. (University of Bristol | http://www.bris.ac.uk/), 55, 60
Buckingham
UB (University of Buckingham | http://www.buckingham.uk/), 154
Cambridge
Univ. (University of Cambridge | http://www.cam.ac.uk/), 28, 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/), 60, 137, 139, 142
Durham
Univ. (Durham University | http://www.dur.ac.uk/), 28, 32
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US (University of Strathclyde | http://www.strath.ac.uk/index.html), 55
Liverpool
Univ. (University of Liverpool | http://www.liv.ac.uk/), 28, 55, 65
London
Imperial College (Imperial College London | http://www3.imperial.ac.uk/), 13, 28, 32, 60
NPL (National Physical Laboratory | http://www.npl.co.uk/), 148
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
Southampton
Univ. (University of Southampton | http://www.soton.ac.uk/), 28, 32
York
Univ. (University of York | http://www.york.ac.uk/), 28, 32

Uzbekistan

Jizzakh
JSPI (Jizzakh State Pedagogical Institute named after Abdulla Qodiriy | http://www.jspi.uz/), 53, 91
Samarkand
SSU (Samarkand State University named after Alisher Navoi | http://www.samdu.uz/), 41, 53, 91, 107, 115
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, 115
IMIT UAS (Institute of Mathematics and Information Technology of the Uzbekistan Academy of Sciences | http://www.mathinst.uzsci.net/), 165
INP UAS (Institute of Nuclear Physics of the Uzbekistan Academy of Sciences | http://www.inp.uz/), 19, 61, 86, 115, 121, 137
NUU (National University of Uzbekistan named after Mirzo Ulugbek | http://www.nuu.uz/), 14

Vietnam

Da Nang
DTU (Duy Tan University | http://www.dtu.edu.vn/), 137
Hanoi
IMS VAST (Institute of Material Science of the Vietnam Academy of Science and Technology | http://www.ims.vast.ac.vn/), 23

IOP VAST (Institute of Physics of the Vietnam Academy of Science and Technology | http://www.iop.vast.ac.vn/), 14, 32, 127, 137
VNU (Vietnam National University Hanoi | http://www.vnu.edu.vn/), 127, 171, 178

CERN

Geneva

CERN (European Organization for Nuclear Research (Switzerland) | http://public.web.cern.ch/), 11, 26, 30, 38, 41, 48, 55, 58, 64, 77, 81, 85, 89, 96, 107, 125, 158, 163, 170, 177

ICTP

Trieste

ICTP (Abdus Salam International Centre for Theoretical Physics (Italy) | http://www.ictp.it/), 12, 27