

INFN – BLTP – DIAS TH:
from 1995 to 2009 and
a hopeful glance to near future



Formal remarks and selected activities in 2007-2009

Collaboration between the Bogoliubov Laboratory of Theoretical Physics and Italian research organisations and Universities (Brief overview)

Within the **Topical Plan for JINR Research and International Cooperation** (themes “Fields and Particles”, “Nuclear Theory”, “Condensed Matter Theory” and “Modern Mathematical Physics”) the Laboratory of Theoretical Physics has established and maintains close cooperation with the following Italian research organisations and Universities: INFN (Bari, Catania, Frascati, Genova, Naples, Padua, Pavia, Parma, Perugia, Pisa, Turin), SISSA/ISAS (Trieste), Centro ENEA (Bologna), Universities of Padua, Parma, Turin, Messina, Catania, Salerno.

Note, especially, long term, close cooperation with Pisa, Torino, Padova, Frascati, Salerno...

The activity was **many-faced**, not only joint publications. There were workshops, e.g., 'Constrained dynamics and Q.G.' (1 in Dubna, 2 in Italy), participation in international research projects, informal exchange of ideas and results, esp., in the beginning of collaboration. Thus, the **results were really diverse**, not always in a material form that can be measured in the number of papers or mutual refs. Possibly, we should evaluate them at a much deeper level...

During recent years theoreticians from BLTP and Italian researchers jointly participated in several **topical working groups and experimental collaborations**:

1. Collaboration within "**Les Houches Physics at TeV Colliders 2005, Standard Model and Higgs working group**" and within "**Standard Model Handles and Candles Working Group: Tools and Jets Summary Report**" with G. Montagna, O. Nicrosini, F. Piccinini (*Dipartimento di Fisica Nucleare e Teorica, Universit`a di Pavia and INFN, Pavia, Italy*), A. Vicini (*Dipartimento di Fisica, Universita degli Studi di Milano and INFN, Milan, Italy*).
2. Collaboration within "**The TeV4LHC-Top and Electroweak Working Group**" with G. Montagna, O. Nicrosini (*Dipartimento di Fisica Nucleare e Teorica, Universit`a di Pavia and INFN, Pavia, Italy*), A. Vicini (*Dipartimento di Fisica, Universita degli Studi di Milano and INFN, Milan, Italy*).
3. A. Arbuzov (BLTP, JINR) participated as a section convener in the *International Workshop on e+e- collisions from Phi to Psi*, Laboratori Nazionali di Frascati, Italy, 7 - 10 April 2008; Report in the **Working Group on Radiative Corrections and Generators for Low Energy Hadronic Cross Section and Luminosity**, Laboratori Nazionali di Frascati, Italy, 11 April 2008

4. **A.V. Efremov and his group at BLTP (O. Teryaev, S. Goloskokov, *et al*) in cooperation with M. Anselmino, *et al* (Turin Uni. & INFN, Turin) contributed to the theoretical support of the nucleon spin physics program of COMPASS Collaboration at CERN, as well as to the physical program of Collaboration on J/Psi production at GLAS, INFN, Genova.**

[1] **The COMPASS experiment at CERN.**

By COMPASS Collaboration ([P. Abbon *et al.*](#)), *Nucl.Instrum.Meth.A577:455-518,2007.*

[2] **A New measurement of the Collins and Sivers asymmetries on a transversely polarised deuteron target.** By COMPASS Collaboration ([E.S. Ageev *et al.*](#)), *Nucl. Phys. B765:31-70, 2007.*

[3] **The Deuteron Spin-dependent Structure Function $g_1(d)$ and its First Moment.**

By COMPASS Collaboration ([V.Yu. Alexakhin *et al.*](#)), *Phys.Lett.B647:8-17,2007.*

[4] **"Transverse momentum dependence of the quark helicity distributions and the Cahn effect in double-spin asymmetry $A(LL)$ in Semi Inclusive DIS."**, M. Anselmino (Turin U. & INFN, Turin), A. Efremov (Dubna, JINR), A. Kotzinian (Dubna, JINR & Turin U. & INFN, Turin & Yerevan Phys. Inst.), B. Parsamyan (Turin U. & INFN, Turin), *Phys. Rev. D74 (2006) 074015*

The main topics of recent investigations relate to LHC physics, general problems of quantum field theory and QCD, hadron phenomenology, heavy quark physics, modern mathematical physics, as well as nuclear astrophysics and nuclear reactions.

Results of joint research projects are regularly published in leading scientific journals and Proceedings of International Conferences and Workshops (a representative selection of recent publications is given below).

Here we give a selection of some recent work.

In addition, we mention the long term collaboration (with many papers) of : M.Volkov, V.Mitrjushkin, A.Dorokhov (Pisa), S.Bilenky, A.T.F. (To)

[2] "QCD coupling below 1 GeV from quarkonium spectrum",
M. Baldicchi, A.V. Nesterenko, G.M. Prospero, and C. Simolo,
Phys. Rev. D77, 034013 (2008)

[5] "Superfield Formulation of Nonlinear N=4 Supermultiplets",
S. Bellucci, S. Krivonos, O. Lechtenfeld, A. Shcherbakov.
Phys.Rev.D77:045026,2008.

[16] The arrow of time and the Weyl group: all supergravity billiards are integrable,
P. Fre, A. Sorin, arXiv:0710.1059, 2007, 1-73.

[19] "Electromagnetic shape resonances of a dielectric sphere and radiation of portable telephones,"

V.V. Nesterenko, A. Feoli, G. Lambiase, and G. Scarpetta,
Mod. Phys. Lett. B, Vol. 22, No. 10 (2008) 735.

[24] "Semileptonic decays of B(c) mesons into charmonium states in a relativistic quark model." Mikhail A. Ivanov (Dubna, JINR) , Juergen G. Korner (Mainz U., Inst. Phys.) , Pietro Santorelli (Naples U. & INFN, Naples), Phys.Rev.D71:094006,2005, Erratum-ibid.D75:019901,2007.

[33] «Peculiarities of nuclear fusion at synthesis of superheavy elements»,
A.K. Nasirov, G. Giardina, M. Mandaglio, A.I. Muminov, R.K. Utamuratov,
Journal of Nuclear and Radiochemical Sciences, (2007).

[30] "On the dependence of the wave function of a bound nucleon on its momentum and the EMC effect"

C. Ciofi degli Atti, L.L. Frankfurt, L.P. Kaptari, M.I. Strikman, Phys. Rev. C76 (2007) 055206-1
055206-12



Bogoliubov Laboratory of Theoretical Physics



Dubna International Advanced School of Theoretical Physics

Rector: A.T. Filippov
Leaders: A.S. Sorin, V.V. Voronov

There are several other members of the DIAS team working on all aspects of organizing the concrete schools. The program started in the beginning of 2000, It was completely formalized from 2004.

The more complete information can be found on the site of BLTP

In 2004-2009, the following activities in the framework of DIAS-TH were:

- Winter School on Theoretical Physics (2004--2009);
- International Summer School on Selected Topics in Nuclear Theory (2004);
- Advanced Summer School on Modern Mathematical Physics (2004--2009);
- Research Workshop "Nucleation Theory and Applications" (2004--2009);
- School on Hot Points in Astrophysics and Cosmology (2004);
- School on Heavy Quark Physics (2005, 2008);
- International School on Nuclear Theory and Astrophysical Applications (2005, 2007);
- School and Workshop on Calculations for Modern and Future Colliders (2006, 2009);
- School on Few-Body Problems in Physics (2006);
- School on Dense Matter in Heavy Ion Collisions and Astrophysics (2006, 2008)

Participants of the schools were students, post-graduates and young researches from JINR Member States and other countries. The Schools were supported by UNESCO-ROSTE (up to 2005), Helmholtz Association, the Heisenberg—Landau, Bogoliubov-Infeld and Votruba-Blokhintsev Programmes, RFBR, and Dinastiya Foundation **In 2008, we have received the grant in the framework of the UNESCO International Basic Science Programme.**

The main forms of DIAS-TH activities are:

- systematic organization of schools and workshops on the priority research themes of JINR for young scientists, post-graduate students and students from JINR Member States and other countries;
- cooperation with the JINR University Center in training students and postgraduates as well as in organizing schools for students;
- 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;
- organisation of the regular seminar on theoretical and mathematical physics for young scientists ;
- publication of lectures in different forms, in particular, with the use of modern electronic equipment;
- participation in the educational process at the Departments of Theoretical and Nuclear Physics of Dubna International University, as well as at the departments of Moscow State University and Moscow Physical Technical University based in Dubna;
- ensuring the up-to-date level of computer and demonstration equipment of the DIAS-TH lecture hall;
- administration of the WEB page of DIAS-TH which should become the organizing center of the programs related to DIAS-TH.

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- Advanced Summer School on Modern Mathematical Physics (2004–2008);
- Research Workshop "Nucleation Theory and Applications" (2004–2008);
- School on Modern Cosmology and Astrophysics (2004);
- School on Heavy Quark Physics (2005, 2008);
- Intern. School on Nuclear Theory and Astrophysical Applications (2005, 2007);
- School and Workshop on Calculations for Modern and Future Colliders (2006);
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Other activities:

- Lecture courses and review lectures on new trends in modern physics were given for students and post-graduates (A.Belavin, D. Blaschke, P. Fre, M. Lashkevich).
- Computer processing of video records of lectures was carried out.
- A new lecture hall for DIAS-TH was opened.
- Web-site of DIAS-TH was opened and supported
<http://theor.jinr.ru/~diastp/diasth>

Supported by



Supporting
up to 2005



In 2008, we have received the grant in the framework of the UNESCO International Basic Science Programme

**Joint Institute for Nuclear Research
Bogoliubov Laboratory of Theoretical Physics**



Dubna International Advanced
School of Theoretical Physics



2008

January 26 – February 5

VIth Winter School on Theoretical Physics



April 1 – 30

*XIIth Research Workshop
on Nucleation Theory and Applications*



July 14 – 26

*Helmholtz International Summer School
Dense Matter in Heavy Ion Collisions
and Astrophysics*

August 11 – 21

*Helmholtz International Summer School
on Heavy Quark Physics*



September 7 – 17

*Advanced Summer School
on Modern Mathematical Physics*

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DIAS-TH: Dubna International Advanced School of Theoretical Physics
Helmholtz International Summer School

Dense Matter in Heavy Ion Collisions and Astrophysics

Bogoliubov Laboratory of Theoretical Physics
JINR, Dubna, Russia, July 14-26, 2008

TOPICS:

- Hadrons in the Medium
- Equation of state and Phase Transitions
- Hadron Production and Heavy Ion Collisions
- Dense Matter in Compact Stars
- Future Experimental Facilities

ORGANIZERS:

- J. Wambach (GSI, TU Darmstadt)
- V. Voronov (JINR)
- D. Blaschke (JINR, U Wroclaw)

LOCAL ORGANIZERS:

- A. Sorin (JINR)
- J. Schmelzer (U Rostock, JINR)
- V. Zhuravlev (JINR)
- V. Skokov (sc. secretary, JINR)
- A. Dolya (secretary, JINR)

SUPPORTED BY:

- Helmholtz Association
- Helmholtz Centers DESY and GSI
- Joint Institute for Nuclear Research
- Russian Foundation for Basic Research

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VIIth Winter school on Theoretical Physics

Introduction to Theory of Nanostructures

Dubna, January 25 - February 5, 2009



Topics:

Physics of nanostructures

Carbon nanostructures and related applications

Methods of quantum field theory in problems of nanophysics

Lecturers 12

Helmholtz International Summer School
on

Modern Mathematical Physics

July 20 - 29, 2009, Dubna, Russia

Topics

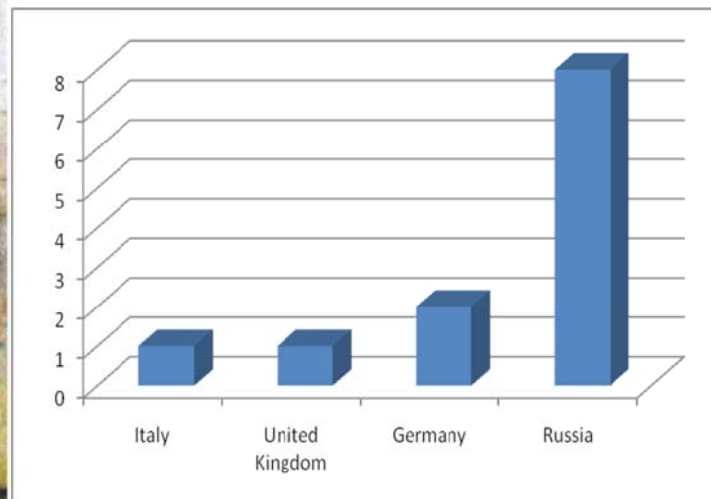
- Supersymmetry
- Superstrings
- Supergravity
- Selected problems of gravity and cosmology



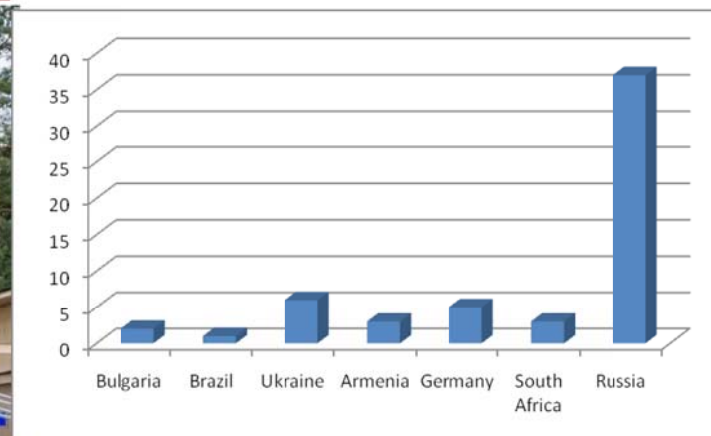
Address for contacts:
Prof. A.T. Filippov
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<http://theor.jinr.ru/~diastp/summer09/main.html>



Joint Institute for Nuclear Research / Bogoliubov Laboratory of Theoretical Physics



Students 57



Research and education project "Dubna International Advanced School of Theoretical Physics (DIAS-TH)"

Proposal to 2010-2016

The overall objective of the permanently running BLTP project «Dubna International School of Theoretical Physics (DIAS-TH) » is a promotion of educational and training programs at JINR in the field of theoretical physics. The unique feature of DIAS-TH is its coherent integration into the current scientific life of BLTP which ensures regular and natural participation of the leading scientists in the education and training activities.

**This is the formal proposal for prolonging the DIAS project
that was approved by the JINR Scientific Council**

The main DIAS activities will be centered around the most important directions of research at BLTP: Particles and Fields; Nuclear Theory; Theory of Condensed Matter; Modern Mathematical Physics.

An important condition for the success of the project is cooperation with international and Russian Foundations (UNESCO, DAAD, DFG, RFBR, Dynasty, etc.) and government organizations (BMBF, INFN, CNRS).

Accordingly, in the years 2010-2016 the following activities are planned:

- two traditional schools will be organized annually: Winter School on Theoretical Physics and Summer School on Modern Mathematical Physics, the program of the schools will be related to the main directions of research at BLTP;
- Two schools devoted to LHC physics and to the physical program of the NICA/MPD project will be organized;
- Research Workshop on Nucleation Theory and Applications will be organized annually;
- every two years the school «Dense Matter in Heavy Ion Collisions and Astrophysics» is scheduled to hold;
- during this period two schools on Heavy Quark Physics and a school on Few Body systems will be conducted;
- regular seminars for young scientists and lectures on topical areas of modern theoretical and mathematical physics will be carried out systematically ;
- video archive at the Web-site of DIAS-TH will be maintained and replenished with new lectures.

2010

• *Dense Matter in Heavy Ion Collisions and Astrophysics*

Organizers: J. Wambach (GSI, TU Darmstadt), A. Sorin (JINR), D. Blaschke (JINR&U. Wroclaw)

2011

• *Lattice Gauge Theories*

Organizers: R. Sommer (DESY-Zeuthen), M. Mueller-Preussker (Humboldt Univ.), M. Polikarpov (ITEP, Moscow), V. Mitryushkin (JINR)

• *Nuclear Theory and Astrophysical Applications*

Organizers: K. Langanke (GSI, Darmstadt), V. Voronov (JINR)

• *Cosmology, Strings and New Physics*

Organizers: V. Schomerus (DESY, Hamburg), V. Rubakov (INR, Moscow), A. Starobinsky (Landau Inst. and JINR), A. Filippov (JINR),

2012

• *Heavy Quark Physics*

Organizers: A. Ali (DESY), M. Ivanov (JINR)

• *Dense Matter in Heavy Ion Collisions and Astrophysics*

Organizers: J. Wambach (GSI, TU Darmstadt), A. Sorin (JINR), D. Blaschke (JINR&U. Wroclaw)

In 2012 (possibly, in 2013) there must be also

the school of T.Riemann and D.Kazakov *Calculations for colliders*

It is supposed that a school on the **CERN results** will be organized In 2012 or 2013.

Appendix: in 2010 there will be the school (not included in the list)

Modern Mathematical Physics: Superstrings and Cosmology

Organizers: O. Lechtenfeld (ITP, Hannover U) A.Starobinsky (Landau Inst. and JINR), A. Filippov (JINR), V.Schomerus (not yet approved) V.A. Rubakov (INR, Moscow)

**This is the list of proposed
Helmholtz – DIAS schools**

**A common pinion is that
Italian physicists should
lecture and participate**

PROPOSAL

Our proposal is that the INFN – BLTP collaboration (in the frame of the INFN – JINR cooperation) should be extended to the bilateral supporting of Italian physicists to lecture at DIAS schools and Italian students to participate in them.

Organizing a common INFN - JINR school (supported by Russia and other interested countries) may be a good goal.

I hope that many physicists will support this idea.