

Bogoliubov Laboratory of Theoretical Physics

Theory of Hadron Matter under Extreme Conditions

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International cooperation

Cooperation with a number of groups in different countries supported by joint publications: ITP of Giessen Univ. (Giessen, Germany); FIAS (Frankfurt, Germany); ITP of Heidelberg Univ. (Heidelberg, Germany); GSI (Darmstadt, Germany); IHEP (Protvino, Russia); ITEP (Moscow, Russia); FEFU (Vladivostok, Russia), BITP (Kiev, Ukraine); MEPhI (Moscow, Russia); Seoul National Univ. (South Korea); Inst. Modern Phys. (Lanzhou, China); Pisa Univ. and INFN Pisa (Italy); HZDR (Dresden, Germany); Indian Inst. Technology (Kanpur, India); Institute of Physics Bhubaneswar (Bhubaneswar, India), etc.

- Lattice QCD;
- Models of confinement, chiral symmetry breaking and hadronization in QCD;
- EoS for hadronic matter at nonzero temperature and baryon density;
- QCD phase diagram;
- Strong electromagnetic fields in relativistic heavy ion collisions;
- Hydrodynamical and kinetic approaches to nuclear collisions.

The whole project consists of subprojects (about 20) grouped into four parts:

I. Lattice QCD and *ab initio* functional methods

II. Collision dynamics

III. QCD motivated models

IV. Analogue statistical systems

Both hot problems and development of the toolbox are in focus.

Conveners of subprojects: E.-M. Ilgenfritz (BLTP JINR), V. Braguta (ITEP&BLTP JINR), J.M. Pawłowski (ITP Heidelberg Uni.), L. Kaptari (BLTP JINR), V.D. Toneev (BLTP JINR), E. Bratkovskaya (ITP Uni. Frankfurt & GSI, Germany), B. Tomášik (Uni. Mateja Bela, Banská Bystrica & FNSPE Czech TU), E.E. Kolomeitsev (Uni. Mateja Bela, Banská Bystrica & BLTP JINR), D. Blaschke (Uni. of Wrocław & BLTP JINR), Yu. Ivanov (NRC KI & BLTP JINR), O. Rogachevsky (VBLHEP JINR), K. Bugaev (BITP), G.M. Zinoviev (BITP & JINR), S.A. Smolyansky (Saratov Uni.), N. Kochelev (BLTP JINR), Yu. L. Kalinovsky (LIT JINR), A.M. Snigirev (SINP MSU), S.N. Nedelko (BLTP JINR), M.A. Ivanov (BLTP JINR), M. Bordag (ITP Leipzig Uni.), I.Ya.Aref'eva (Steklov MI RAS, Moscow), M. Hnatic (BLTP JINR & P.J. Safarik University, Kosice), V. Melezhik (BLTP JINR)

Meetings

Meeting of the working group on theory of hadronic matter under extreme conditions, Dubna, October 31-November 3, 2016

Mini-Workshop on **Simulations of HIC for NICA energies**, Dubna, April 10 - April 12, 2017 & April 16 - 18, 2018

Mini-Workshop on **”Lattice and Functional Techniques for Exploration of Phase Structure and Transport Properties in Quantum Chromodynamics”**, in Dubna, July 10 - 14, 2017 & September 4 - 6, 2018

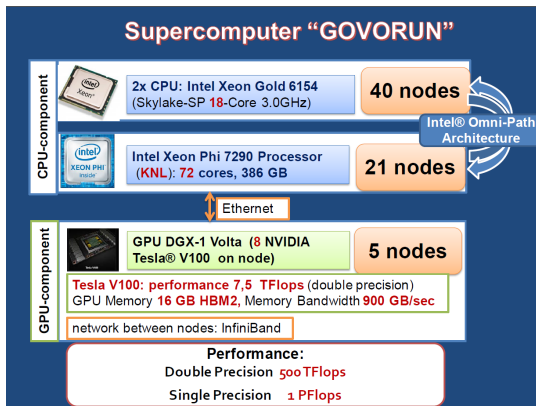
Helmholtz & DIAS-TH International Summer Schools 2017, 2018

Tool box: hardware

High performance computing at JINR dedicated to the theoretical support of mega-science project NICA and other RHI experiments

Lattice QCD, functional RG, statistical and hydrodynamical models of HIC, sophisticated models of QCD vacuum

May 2018 - new supercomputer Govorun at LIT JINR



Site of the Collider construction



Collider Western half-ring and the building for the electron cooling system



Monday, 18 June 2018

N.Agapov, PAC PP

Reinforced concrete work at SPD



Monday, 18 June 2018

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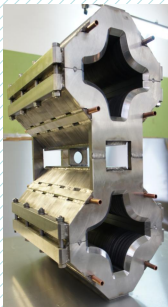
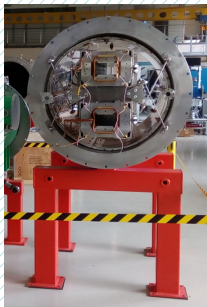
Development of the facility for assembling and cryogenic tests of the superconducting magnets for NICA



Monday, 18 June 2018

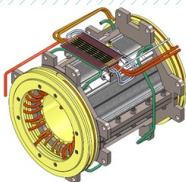
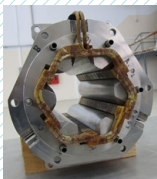
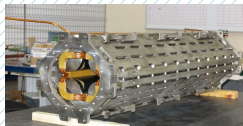
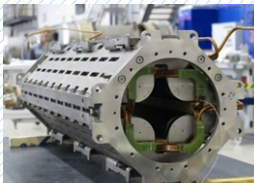
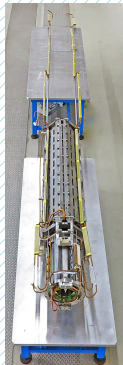
N.Agapov, PAC PP

For the NICA Collider, the creation and testing of prototypes of the magnets was completed in 2017



- ✓ Serial production of the superconducting two-aperture magnets and cryostats is going
- ✓ The production of a superconducting wire for magnets and bellows for cryostats has been finished.

Superconducting magnets for SIS100



- **Two magnet units have been assembled and successfully tested at liquid helium temperature**
- **Serial production of SIS100 magnets will be started in nearest future**

Commissioning and successful test of the 1000 l/h helium liquefier



The largest Russian helium liquefier was installed and successfully launched at JINR



Monday, 18 June 2018

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Online real time webcam:

<http://nucloweb.jinr.ru/nucloserv/205corp.htm>
<http://nucloweb.jinr.ru/nucloserv/205corp.htm>