

«Superconductivity in Nanostructures

SUPERNANO 2025»

September 22-26, Kazan

Links:

Abstract booklet



Conference website



Oral talk schedule



Poster talk schedule



Conference topics:

1. Highly disordered superconductors, topological insulators and superconductors, hybrid superconducting structures based on 2D layers
2. Charge and spin dynamics in superconducting hybrid structures
3. Superconducting quantum technologies
4. Superconducting radiation generators and detectors

Organizing Committee:

• Oleg Astafiev

*Skolkovo Institute of Science and Technology,
Moscow Institute of Physics and Technology*

• Valery Ryazanov

*Institute of Solid State Physics (Russian Academy of Sciences),
Moscow Institute of Physics and Technology,
National University of Science and Technology MISiS*

• Lenar Tagirov

*Zavoisky Physical-Technical Institute,
Federal Research Center «Kazan Scientific Center of Russian Academy of Sciences»*

Monday, September 22

Session 1, Chairman Yuriy Makhlin

10:00. Mikhail Skvortsov. Landau Inst. for Theor. Phys, Chernogolovka. Thermal phase slips in superconducting films

10:30. Alexander Mel'nikov. MIPT. Interplay of superconductivity and altermagnetism in hybrid systems

11:00. Vladimir Antonov. Skoltech. The synergy of the current quantization and Aharonov-Casher effect in Bloch transistor

11:30. Coffee-break

Session 2, Chairman Oleg Astafiev

12:00. Zhen Wang. School of Physics, Zhejiang University, China; Hangzhou Logical Qubit Technology Co., Ltd. Quantum simulation using Superconducting quantum processors

12:30. Andrey Lebedev. VNIIA, Moscow. Quantum Metrology by Superconducting Artificial Atoms

13:00. Shtefan Sanduleanu. MIPT. Single artificial atom phonon laser

13:30. Lunch

Session 3, Chairman Alexander Korneev

14:30. Igor Soloviev. Skobeltsyn Inst. of Nuclear Phys., MSU. Cryogenic integrated control system for superconducting qubits

15:00. Michael Tarkhov. INME RAS, Moscow. Radio Photonics generator for superconducting quantum circuits

15:30. Andrey Pankratov. Nizhny Novgorod State Technical University, IPM RAS. Detectors for radioastronomy and dark matter search

16:00. Coffee-break

Session 4, Chairman Mikhail Skvortsov

16:30. Igor Burmistrov. Landau Inst. for Theor. Phys, Chernogolovka. Bulk-edge correspondence at the spin-to-integer quantum Hall effect crossover in topological superconductors

17:00. Irina Bobkova. MIPT. Theory of hybrid collective excitations in topological superconductor/ferromagnetic insulator heterostructures

17:30. Dmitry Estyunin. St. Petersburg State Univ. Recent progress in the study of magnetic topological insulators of the MnBi₂Te₄-family by photoemission spectroscopy

19:00 Welcome party

21:00 Excursion "Night Kazan"

Tuesday, September 23

Session 5, Chairman Alexander Mel'nikov

10:00. Pavel Tsarev. Landau Inst. for Theor. Phys. All fractional Sapiro steps in the RSJ model with two Josephson harmonics

10:30. Yakov Fominov. Landau Inst. for Theor. Phys, Chernogolovka. Superconducting diode effect

11:00. Yuriy Makhlin. HSE Physics. Current-phase relation in planar topological Josephson junctions

11:30. Coffee-break

Session 6, Chairman Yakov Fominov

12:00. Alexander Bobkov. MIPT. Anomalous Josephson effect and superconducting diode effect in Josephson junctions via RET₂Si₂ intermetallic magnets

12:30. Andrei Kamashev. PTI RAS, Kazan. Experimental study of superconducting spin valves

13:00. Danila Arbuzov. PTI RAS, Kazan. Superconducting spin valve in solitary superconductivity mode

13:30. Lunch

Session 7, Chairman Valery Ryazanov

14:30. Grigorii Bobkov. MIPT. Gate-controlled proximity effects in superconductor/ferromagnet van der Waals heterostructures

15:00. Anastasiia Ianovskaia, MIPT. Spin-valve effect in ferromagnet/superconductor/ferromagnet van der Waals heterostructures

15:30. Sergey Bakurskiy. Skobeltsyn Inst. of Nuclear Phys., MSU. Study of the tunable multilayer superconducting-ferromagnetic resonators

16:00. Coffee-break

Session 8, Chairman Alexander Bobkov

16:30. Denis Vodolazov. IPM RAS, Nizhny Novgorod. Vortex nucleation in type I superconducting layer covering type II superconductor

17:00. Aleksei Putilov. MIPT. Vortex structure and intervortex interaction in superconducting structures with intrinsic diode effect

17:30. Sergey Ustavschikov. IPM RAS, Nizhny Novgorod. Vortex jet to vortex chain transition in superconducting stripe with side slit

18:00 Poster session

Wednesday, September 24

Session 9, Chairman Tiefu Li

10:00. Yuxi Liu, Tsinghua Univ., China. Scalable Parameter Design for Superconducting Quantum Circuits with Graph Neural Networks

10:30. Gleb Fedorov. MIPT. Arrays of Josephson meta-atoms with topologically nontrivial band structure

11:00. Aleksei Dmitriev. MIPT. Coherent nonlinear optics with superconducting artificial atoms

11:30. Coffee-break

Session 10, Chairman Yuxi Liu

12:00. Tiefu Li, Tsinghua Univ., China. Microwave coherent storage based on the long lifetime cavity electromechanical system

12:30. Andrei Vassenin. MIPT. Evolution of Propagating Coherent Pulses Driving a Single Superconducting Artificial Atom

13:00. Walter Pogosov. VNIIA, Moscow. Nonclassical fingerprints in qubit-mediated wave mixing

13:30. Lunch

Session 11, Chairman Andrey Lebedev

14:30. Jian CHEN. Nanjing University, China. Quantum capacitance detectors with enhanced saturation power enabled by gate capacitance engineering

15:00. Daria Kalacheva. MIPT. Realising high-fidelity logical gates in kinemon-based superconducting qubit circuits with tunable coupling

15:30. Alena Kazmina. RQC, NUST "MISIS", Moscow. Experimental demonstration of a Quantum Error Detection Code with a Dynamically Reassigned Ancillary Qubit

16:00. Ilya Simakov NUST "MISIS", Moscow. Low-Overhead Multi-Qubit Gate Characterization via Single-Qubit XEB.

18:00 Conference dinner

Thursday, September 25

Session 12, Chairman Irina Bobkova

10:00. Qing-Yuan Zhao. Nanjing University, China. Reveal inhomogeneities in a superconducting nanowire by probing and mapping self-heating hotspots

10:30. Andrei Zaikin. Lebedev Phys.Inst. RAS. Absence of fractional ac Josephson effect in superconducting junctions

11:00. Andrew Semenov. Lebedev Phys.Inst. RAS. Fluxon cotunneling and quantum Coulomb drag effect

11:30. Coffee-break

Session 13, Chairman Andrei Zaikin

12:00. Pratap Raychaudhuri. Tata Inst. Fundamental Research, Mumbai, India. Visualising pinned vortex liquids and inverse melting in superconducting thin films

12:30. Alexander Semenov. Moscow Pedagogical State Univ., MIPT. Saddle state in 2D superconducting films

13:00. Evgeniy Tikhonov. ISSP RAS, Chernogolovka. Nonequilibrium superconductivity in hybrid semiconductor nanowire/superconductor structures

13:30. Lunch

Session 14, Chairman Sergey Bakurskiy

14:30. Yury Shukrinov. BLTP, JINR, Dubna. Peculiarities of resonance and locking features in anomalous Josephson junctions

15:00. Vlad Kharavinin. Landau Inst. for Theor. Phys, Chernogolovka. Subgap states and supercurrent in a curved STIS junction

15:30. Alexandre Karpov. NUST "MISIS", Moscow. Broad band microwave amplification in RF-squid array metamaterial

16:00. Coffee-break

Session 15, Chairman Michael Tarkhov

16:30. Alexander Korneev. INME RAS, Moscow. Practical ways to improve superconducting NbN films for applications

17:00. Elmira Baeva. Moscow Pedagogical State Univ. Flux-flow instability in superconducting single-crystal TiN films caused by heated electrons

17:30. Kira Khilay. Moscow Pedagogical State Univ. Modifying thermal coupling in superconducting nanowire single-photon detector by tuning amorphous sub-layer

18:00 Poster session

Friday, September 26

Session 16, Chairman Walter Pogosov

10:00. Andrey Zhukov. VNIIA, Moscow. Grover Search and Ising Models: A Quantum Algorithm for Finding Low-Energy States

10:30. Aleksei Tolstobrov. MIPT, Skoltech. Quantum machine learning in arrays of superconducting qubits

11:00. Grigoriy Mazhorin. NUST "MISIS". Singleshot CCZ gate on fluxoniums

11:30. Coffee-break

Session 17, Chairman Andrey Pankratov

12:00. Nikolay Vovk. INME RAS, Moscow. Ultrafast NbN Superconducting Single-Photon Detector Integrated in a Parabolic Mirror

12:30 Renat Yusupov. IRE RAS, Moscow. Research and development of SINIS bolometers with a suspended normal metal absorber

13:00. Alexander Chiginev. Nizhny Novgorod State Technical University. Photon noise limited cold-electron bolometers

13:30. Lunch

Session 18, Chairman Julia Zotova

14:30. Dmitrii Pimanov. Nizhny Novgorod State Technical Univ. Multi-frequency receiving systems based on cold electron bolometers

15:00. Georgiy Khismatullin. RQC, Moscow. SQIF-magnetometer for navigation systems: experimental and theoretical study of base cells

15:30. Concluding Remarks. Closing of the Conference

16:00. Coffee-break

Poster session: Tuesday, September 23

Tu-1. V.A. Bobkov, G.A. Bobkov, I.V. Bobkova. MIPT. Electronic density of states in thin-film superconductor/ferromagnet heterostructures.

Tu-2. A.M. Chekushkin, M.A. Markina, M.A. Tarasov, M.Yu. Fominsky. IRE RAS, HSE Univ. Manufacturing of SINIS structures using modernized SNEAP method.

Tu-3. Yu. A. Dmitrievtsev, Ya. V. Fominov. Landau Inst.& MIPT. Superconducting orbital diode effect in SN bilayers.

Tu-4. N.V. Porokhov, M.A. Dryazgov, A.R. Shevchenko, A.M. Mumlyakov, Z. Enbaev, Yu.P. Korneeva, D.Yu. Vodolazov, A.A. Korneev, M. A. Tarkhov. INME RAS, MIPT, HSE Univ., Moscow, IPM RAS, Nizhny Novgorod, Superconducting properties of NbN thin films on ScN buffer layers.

Tu-5. V. Zhaketov, A. Zaky, E. Zaky, D. Norov. JINR&Univ., Dubna; MIPT, MSU, Moscow. Polarized neutron reflectometry for superconducting / ferromagnetic heterostructures.

Tu-6. I.A. Nazhestkin, T.E. Golikova, S.V. Egorov, I.E. Batov, V.V. Ryazanov. RQC, MIPT, ISSP RAS. Controllable supercurrent and $0-\pi$ transition via quasiparticle injection in mesoscopic multiterminal SNS Josephson junctions.

Tu-7. I. Pavlov, S. Svyatodukh, A. Lomakin, N. Titova, K. Khilay, E. Baeva, A. Semenov, A. Kolbatova, G. Goltsman. Moscow Pedagogical State Univ. Study of superconducting MoRe thin films as a candidate for single-photon detectors.

Tu-8. V. Safonova, A. Gordeeva, A. Blagodatkin, D. Pimanov, A. Pankratov. Nizhny Novgorod State Technical University, IPM RAS. Influence of substrate material on the characteristics of superconducting transition in TES microcalorimeters.

Tu-9. V.O. Sakhin, E.F. Kukovitsky, A.A. Kamashev, N.N. Garifyanov, Yu. I. Talanov. PTI RAS, Kazan. Magnetotransport in superconductor/ topological insulator heterostructure.

Tu-10. K. Shein, E. Zharkov, A. Lyubchak, I. Charaev, I. Gayduchenko, Goltsman, D.A. Bandurin. HSE Univ., Moscow Pedagogical State Univ., MIPT, RQC, Brain and Consciousness Research Center, Moscow, National Univ. of Singapore, Univ. of Zürich, Switzerland. 2D Niobium Diselenide: A Robust Superconductor for Wide-Range Detection.

Tu-11. M. Shibalov, G. Matveev, M. Tarkhov. INME RAS, Moscow. Superconducting tantalum nitride films obtained by atomic layer deposition with a high metallicity coefficient.

Tu-12. M. Soldatenkova, A. Lomakin, N. Titova, S. Svyatodukh, A. Kolbatova, G. Goltsman. Moscow Pedagogical State Univ., HSE University. **Large-area and multi-element superconducting single-photon detector.**

Tu-13. L.R. Tagirov. *PTI RAS, Kazan.* **Asymptotically exact solution for the critical temperature of superconducting F/N/F/S spin-valve.**

Tu-14. I. Tarasova, A. Ionin, L. Karelina, N. Shuravin, F. Razorenov, V. Bolginov, Mikhail Khapaev. *ISSP RAS, MIPT, RQC, MSU.* **Application of the 3D-MLSI program for the design of Josephson interferometers.**

Tu-15. R.D. Yusupov, R.S. Tikhonov, S.A. Lisitsyn, I.A. Nazhestkin, M.M. Khrenov, I.E. Tarasova, S.V. Egorov, M.V. Zhdanova, V.N. Antonov, D.S. Baranov, V.V. Ryazanov, O.V. Tikhonova, N.A. Maleeva, N.V. Klenov, I.I. Soloviev, D.S. Yakovlev. *RQC, MSU, NUST "MISIS",* **Different coupling types for flip-chip quantum applications.**

Tu-16. D.E. Zhelezniakova, I.I. Gimazov, Y.I. Talanov. *PTI RAS, Kazan.* **Influence of Magnetic Correlations on Scattering of Current Carriers in Iron Arsenides.**

Tu-17. I. Zhuvagin, V. Vlasenko, B. Massalimov. Lebedev Phys.Inst. RAS. **Synthesis and properties of the van der Waals superconductor NaSn₂As₂.**

Tu-18. O. Astafiev. MIPT. **Quantum phase slip effect in superconducting systems.**

Tu-19. V.V. Ryazanov. *MIPT, ISSP RAS.* **Effect of Ferromagnets on Coherent Transport in Josephson Hybrid Nanostructures.**

Tu-20. E. Alekseeva, A. Bolgar, D. Kalacheva, V. Lubsanov, A. Dmitriev, E. Korostylev, O. Astafiev. *MIPT, Skoltech.* **Highly stable aluminum air-bridges with stiffeners.**

Poster session: Thursday, September 25

Th-1. Weijun Cheng. Tsinghua University, Beijing, China. **Controllable single-photon wave packet scattering in two-dimensional resonator array by a giant atom.**

Th-2. Da-Wei Wang. Tsinghua Univ., China. **Thermal noise-immunized quantum state transfer in microwave quantum networks.**

Th-3. Yu-Yuan Chen. Tsinghua Univ., China. **Manipulation of magnetic systems by quantized surface acoustic waves via the piezomagnetic effect.**

Th-4. N. Berezkin, I. Simakov, G. Mazhorin. *NUST "MISIS", RQC, MIPT.* **Simulation of the three-qubit repetition code on the chain of superconducting qubits with couplers.**

Th-5. S.A. Gunin, A.V. Vasenin, V.V. Voskresenskii, A.Yu. Dmitriev, D.A. Kalacheva, Ya.T. Shneidman, T.R. Sabirov, G.P. Fedorov, O.V. Astafiev. *MIPT, Skoltech, IRE RAS* **Resonance Fluorescence in a Three-Level Superconducting System with Resonant Bichromatic Pumping of Transitions.**

Th-6. T.A. Chudakova, I.A. Simakov, A.S. Kazmina, N.N. Abramov, M.A. Tarkhov, A.M. Mumlyakov, I.V. Trofimov, N.Yu. Rudenko, V.I. Chichkov, G. S. Mazhorin. *NUST "MISIS", RQC, INME RAS,* **Implementing fast single-qubit gates beyond 99.99% fidelity on fluxonium qubits.**

Th-7. P. Gladilovich, R. Migdisov, P. Burtsev, A. Sabluk, N. Maleeva. *NUST "MISIS", RQC.* **Long-range coupling between transmon qubits.**

Th-8. E.R. Khan, N.Yu. Rudenko, V.I. Chichkov, S.V. Shitov. *NUST "MISIS", IRE RAS.* **Superconducting RF Passing Power Detector.**

Th-9. A. Kirkouski, D.Kalacheva, A. Dmitriev, O. Astafiev. *MIPT & Skoltech.* **Minimization of dephasing in multiqubit superconducting quantum devices using three-sweet spot kinemon qubits.**

Th-10. E. Konopleva, G. Fedorov, O. Astafiev. *Skoltech, MIPT.* **Topological phases in "Zig-Zag" arrays of superconducting polarization transmons.**

Th-11. E. Matrozova, A.V. Chiginev, L.S. Revin, A.L. Pankratov. *Nizhny Novgorod St. Tech. Univ., IPM RAS.* **Investigation of receiving systems with cold electron bolometers for broadband signal reception.**

Th-12. R.A. Migdisov, P.A. Gladilovich, A.V. Sabluk, N.A. Maleeva. *NUST "MISIS".* **Nonlinear Purcell filter from granular aluminum.**

Th-13. **D. Pashin**, M. Bastrakova, I. Soloviev. *Lobachevsky State Univ., Nizhni Novgorod, RQC, MSU. Digital SFQ-Based Control of a Fluxonium Qubit.*

Th-14. I. Solovykh, **A. Pashchenko**, N. Maleeva, N. Klenov, O. Tikhonova, I. Soloviev. *MSU, VNIIA, MTUCI, NUST "MISIS", IRE RAS. Superconducting transmon-based qudit control using few-photon microwave fields.*

Th-15. **T. Sabirov**, A. Dmitriev, S. Gunin, A. Vasenin, O. Astafiev. *MIPT, Skoltech. Wave mixing of classical signal and non-classical pulses of single-photon and two-photon generation on a qubit.*

Th-16. **S.S. Samarin**, M.A. Sergeev, A.E. Tolstobrov, Sh.V. Sanduleanu, A.V. Vasenin, G.P. Fedorov, D.A. Kalacheva, A.N. Bolgar, O.V. Astafiev. *Skoltech, MIPT, IRE RAS. Problems of experimental discrete-continuum optimization of quantum circuits in Josephson integrated circuits.*

Th-17. **J. Zotova**, E. Lavrina, G. Fedorov, E. Korostylev, D. Kalacheva, A. Bolgar, V. Lubsanov, O. Astafiev. *Skoltech, MIPT. Straddling regime of a transmon qubit at high photon population in a readout resonator.*

Th-18. O. Astafiev, **P. Shlykov**, Sh. Sanduleanu, A. Bolgar, A. Vasenin. *Skoltech, MIPT. Single artificial atom SASER.*

Th-19. **V.V. Voskresenskii**, A.V. Vasenin, A.Yu. Dmitriev, A.N. Bolgar, D.A. Kalacheva, V.B. Lubsanov, M.-T. Deng, O.V. Astafiev. *MIPT, Skoltech, National University of Defense Technology, Changsha, China. Superconducting Single-Photon Source with Tunable Decay Rate for Photon Shaping.*

Th-20. **A. Yeremeyev**, A. Tolstobrov, Gleb Fedorov, Sh. Sanduleanu, Sh. Kadyrmetov, A. Bolgar, D. Kalacheva, O. Astafiev. *MIPT, Skoltech. Preparation of entangled states of superconducting qubits via variational quantum algorithms and violation of the CHSH inequality.*

Th-21. **A. Bolgar. MIPT Superconducting quantum acoustic devices.**

Th-22. **Ya. Shneidman**, S. Gunin, A. Dmitriev, O. Astafiev. *Skoltech&MIPT. Cross-correlations in the inelastically scattered light on the three-level system.*

Th-23. **V. Lubsanov. MIPT. Improving coherent system statistics.**

Th-24. A. Tolstobrov, **Sh. Kadyrmetov**, G. Fedorov, D. Kalacheva. *MIPT. Integrated Circuits for Quantum Machine Learning Based on Superconducting Artificial Atoms and Their Control.*

Th-25. **E. Rosnovskaya**, J. Zotova, G. Fedorov, O. Astafiev. *MIPT, Skoltech. Investigation of a transmon in a regime at high resonator population.*

	Monday, 22	Tuesday, 23	Wednesday, 24	Thursday, 25	Friday, 26
9:00 – 9:50	Registration				
9:50 – 10:00	Opening				
10:00 – 11:30	Session 1	Session 5	Session 9	Session 12	Session 16
11:30 – 12:00	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
12:00 – 13:30	Session 2	Session 6	Session 10	Session 13	Session 17
13:30 – 14:30	Lunch	Lunch	Lunch	Lunch	Lunch
14:30 – 16:00	Session 3	Session 7	Session 11	Session 14	Session 18
16:00 – 16:30	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
16:30 – 18:00	Session 4	Session 8		Session 15	
18:00 –		Poster Session	Conference Dinner	Poster Session	
19:00 – 21:00	Welcome party				
21:00 –	Excursion				