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Education

2021 **Ph.D.** in Condensed Matter Physics, Department of General and Applied Physics, Moscow Institute of Physics and Technology (National Research University)
Supervisor: B.P. Gorshunov, *Thesis*: «Phase states of an electric dipole lattice of water molecules in a matrix of beryl and cordierite crystals»

2016 **M.S. *cum laude*** in Applied Mathematics and Physics, Department of General and Applied Physics, Moscow Institute of Physics and Technology (National Research University)
Supervisor: B.P. Gorshunov, *Thesis:* «Single-particle and collective states of water molecules in the matrix of beryl crystal lattice»

2014 **B.S.** in Applied Mathematics and Physics, Department of General and Applied Physics, Moscow Institute of Physics and Technology (National Research University)
Supervisor: V.Yu. Egorychev, *Thesis:* «Study of $B_s^0 \to \overline{K}^*(892)^0 K^*(892)^0$ decay cross section in the LHCb experiment»

Employment

2017-pres. **Assistant** at General Physics Department, Moscow Institute of Physics and Technology (National Research University), Moscow

2016-pres. **Research Fellow** at Laboratory of Terahertz Spectroscopy, Moscow Institute of Physics and Technology (National Research University), Moscow

2015 **Summer Student** at Los Alamos National Lab, Los Alamos, NM, USA

2014-2016 **Engineer** at Moscow Institute of Physics and Technology (National Research University), Moscow

2012-2014 **Laboratory Assistant** at Institute for Theoretical and Experimental Physics (ITEP), Moscow

Research Interests and expertise

- Novel phases of matter defined by dipolar interaction
- Ferroelectric materials, phases and phase transitions
- Low dimensional materials: graphene, carbon nanotubes, fullerenes
- Spectroscopy of electronic and lattice dynamic in solids
- Computational material science (DFT): electronic structure simulation, molecular dynamics, normal modes and phonon dispersion calculation

Practical Skills

- **Low temperature techniques:** operation and maintenance of He close-cycle (CryoMech) and He flow cryostats (homebrew), magnetic field cryostat (Spectromag)
- **Spectroscopy:** experienced operation and maintenance of TDS spectrometers (TeraView, Menlo), coherent source backward-wave oscillator spectrometer, FTIR spectrometer (Bruker IFS 113V, Vertex 80V+Hyperion 2000) and dielectric impedance spectroscopy setup
- **Optics:** basic experience with femtosecond lasers (Menlo T-Light, Menlo C-fiber 780) and relevant optics
- **Programming:** good skills in Python, Wolfram Mathematica; basic skills in ASM, C, LabView
- **Engineering:** development of high vacuum and cryogenic parts of setups; basic skills in CAD design (Autodesk Fusion 360) and production (3D printing, CNC milling)
- **Electronics:** operation of NI DAQ, SRS and Zurich Instruments lock-in amplifiers, PI stages; design and production of small-scale electronics devices
- **Russian** native, **English** fluent

Professional activities

- **Referee** of *Optics Communications* – Elsevier

Teaching

2017 –pres. **Assistant** at Moscow Institute of Physics and Technology, General Physics Department:
Mechanics, Thermodynamics, Electrodynamics, Optics: **TA**, 4 yr. experience

Grants

2018-2020 **PI** *Russian Foundation for Basic Research* (RFBR) **grant for young scientists** 18-32-00286, project «Optical spectroscopy of single-particle and collective excitations of water molecules localized within nanosize pores of crystal lattice of dielectrics»

2018-2021 **Co-Inv** *Russian Science Foundation* (RSF) **grant** 18-72-10118, project « Hybrid systems superconductor-ferromagnet as a key element of neural network and quantum computing»

2018-2021 **Co-Inv** *Russian Foundation for Basic Research* (RFBR) **grant** 18-29-20116, project «Active infrared plasmonics based on van der Waals heterostructures»

2017-2020 **Co-Inv** *Russian Science Foundation* (RSF) **grant** 17-79-20418, project «Creation of 3D chiral structures for controlling local optical fields using two-wavelength laser stereolithography»

2016-2017 **Co-Inv** *Russian Foundation for Basic Research* (RFBR) **grant** 16-32-00739, project «Terahertz spectroscopy of low-energy excitations in charge-ordered manganites»

2015-2017 **Co-Inv** *Russian Foundation for Basic Research* (RFBR) **grant** 15-02-02882, project « Dynamics of pseudoscalar modes in amino acid crystals»

Awards

2019 **Runner up** of best student presentation award, «44th International Conference on Infrared, Millimeter, and Terahertz Waves»

2017 **Winner** of best poster prize, «652. WE-Heraeus-Seminar: Ab-initio Electronic Structure Theory for Solids in the 21st Century»

2015 **Winner** of young scientist work competition, «58th MIPT Scientific Conference»

Selected publications

Google Scholar profile: 161 citations, **h-index 6**, i10-index 6. *Scopus*: **h-index 6**.

- **M.A. Belyanchikov**, P.A. Abramov, A.L. Ragozin, D.A. Fursenko, B. Gorshunov & V.G. Thomas. Distribution of D2O molecules of the first and second type in hydrothermally grown beryl crystals. *Crystal Growth & Design* **21**, 2283 (2021).
- **M.A. Belyanchikov**, M. Savinov, Z.V. Bedran, P. Bednyakov, P. Proschek, J. Prokleska, J. Petzelt, E.S. Zhukova, V.G. Thomas, A. Dudka, A. Zhugayevych, A.S. Prokhorov, V.B. Anzin, R.K. Kremer, J.K.H. Fischer, P. Lunkenheimer, A. Loidl, E. Uykur, M. Dressel and B. Gorshunov. Dielectric ordering of water molecules arranged in a dipolar lattice. *Nature Communications* **11**, 3927 (2020).
- S.S. Zhukov, V. Balos, G. Hoffman, S. Alom, **M. Belyanchikov**, M. Nebioglu, S. Roh, A. Pronin, G.R. Bacanu, P. Abramov, M. Wolf, M. Dressel, M.H. Levitt, R.J. Whitby, B. Gorshunov & M. Sajadi. Rotational coherence of encapsulated ortho and para water in fullerene-C_{60} revealed by time-domain terahertz spectroscopy. *Scientific Reports* **10**, 18329 (2020).
- A.P. Dudka, **M.A. Belyanchikov**, Z.V. Bedran & B.P. Gorshunov. Localization of Small Impurities of Water and Carbon Dioxide in Channels of the Structure of Natural Cordierite. *Journal of Surface Investigation: X-ray, Synchrotron and Neutron Techniques* **14**, 718 (2020).
- E.S. Zhukova, B.P. Gorshunov, M. Dressel, G.A. Komandin, **M.A. Belyanchikov**, Z.V. Bedran, A.V. Muratov, Y.A. Aleshchenko, M.A. Anisimov, N.Yu. Shitsevalova, A.V. Dukhnenko, V.B. Filipov, V.V. Voronov & N.E. Sluchanko. Boron ^{10}B—^{11}B Isotope Substitution as a Probe of the Mechanism Responsible for the Record Thermionic Emission in LaB_6 with the Jahn—Teller Instability**,** *JETP Letters* **110**, 79 (2019).

- A. Bylinkin, E. Titova, V. Mikheev, E. Zhukova, S. Zhukov, **M. Belyanchikov**, M. Kashchenko, A. Miakonkikh, & D. Svintsov. Tight-Binding Terahertz Plasmons in Chemical-Vapor-Deposited Graphene. *Physical Review Applied* **11**, 054017 (2019).
- V.S. Stolyarov, A. Casano, **M.A. Belyanchikov**, A.S. Astrakhantseva, S.Yu. Grebenchuk, D.S. Baranov, I.A. Golovchanskiy, I. Voloshenko, E.S. Zhukova, B.P. Gorshunov, A.V. Muratov, V.V. Dremov, L.Ya. Vinnikov, D. Roditchev, Y. Liu, G.-H. Cao, M. Dressel, & E. Uykur. Unique interplay between superconducting and ferromagnetic orders in $EuRbFe_4As_4$. *Physical Review B* **98**, 140506(R) (2018).
- B.P. Gorshunov, E.S.Zhukova, Ju.S. Starovatykh, **M.A. Belyanchikov**, A.K. Grebenko, A.V. Bubis, V.I. Tsebro, A.A. Tonkikh, D.V. Rybkovskiy, A.G. Nasibulin, E.I. Kauppinen & E.D. Obraztsova. Terahertz spectroscopy of charge transport in films of pristine and doped single-wall carbon nanotubes. *Carbon* **126**, 544 (2018).
- **M.A. Belyanchikov**, E.S. Zhukova, S. Tretiak, A. Zhugayevych, M. Dressel, F. Uhlig, J. Smiatek, M. Fyta, V.G. Thomas & B.P. Gorshunov. Vibrational states of nano-confined water molecules in beryl investigated by first-principles calculations and optical experiments. *Physical Chemistry Chemical Physics* **19**, 30740 (2017).
- E.S. Zhukova, A.K. Grebenko, A.V. Bubis, A.S. Prokhorov, **M.A. Belyanchikov**, A.P. Tsapenko, E.P. Gilshteyn, D.S. Kopylova, Yu.G. Gladush, A.S. Anisimov, V.B. Anzin, A.G. Nasibulin, & B.P. Gorshunov. Terahertz-infrared electrodynamics of single-wall carbon nanotube films. *Nanotechnology* **28**, 445204 (2017).
- **M.A. Belyanchikov**, V.S. Gorelik, B.P. Gorshunov & A.Yu. Pyatyshev. Laser spectroscopy and dynamics of crystal lattices of chirally pure and racemic phases of amino acids. *Crystallography Reports* **62**, 290 (2017).
- **M.A. Belyanchikov**, V.S. Gorelik, B.P. Gorshunov & A.Yu. Pyatyshev. Lattice modes of the chirally pure and racemic phases of tyrosine crystals. *Journal of Experimental and Theoretical Physics* **124**, 77 (2017).
- B.P. Gorshunov, V.I. Torgashev, E.S. Zhukova, V.G. Thomas, **M.A. Belyanchikov**, C. Kadlec, F. Kadlec, M. Savinov, T. Ostapchuk, J. Petzelt, J. Prokleška, P.V. Thomas, E.V. Pestrjakov, D.A. Fursenko, G.S. Shakurov, A.S. Prokhorov, V.S. Gorelik, L.S. Kadyrov, V.V. Uskov, R. Kremer & M. Dressel. Incipient ferroelectricity of water molecules confined to nano-channels of beryl, *Nature Communications* **7**, 12842 (2016).
- V.S. Gorelik, A.Yu. Pyatyshev, **M.A. Belyanchikov** & B.P. Gorshunov. Dispersion relations of hybrid waves in dielectric media. *Physics of Wave Phenomena* **24**, 87 (2016).

Selected conferences

- **Keynote talk**: «Hertz-to-terahertz dielectric response of nanoconfined water molecules»**,** 44th International Conference on Infrared, Millimeter, and Terahertz Waves (IRMMW-THz), September 1-6, 2019 Maison de la Chimie, Paris, France.
- **Talk:** «Terahertz dynamics of a network of nanoconfined electric dipoles», *8th Russia-Japan-USA-Europe Symposium on Fundamental & Applied Problems of Terahertz Devices & Technologies*, July 8-11, 2019 IPM RAS, Nizhny Novgorod, Russia.
- **Talk**: «Ferroelectricity of nanoconfined water molecules. Novel type of ferroelectric relaxors», *International Workshop WaterX: exotic properties of water under extreme conditions*, June 3-8, 2018 La Maddalena Island, Italy.
- **Poster**: «Ferroelectricity of nanoconfined water molecules», *2018 ISAF-FMA-AMF-AMEC-PFM Joint Conference (IFAAP)*, May 27- June 1, 2018 Hiroshima, Japan.
- **Poster**: «Single-particle and collective states of water molecules in the matrix of beryl crystal lattice», *652. WE-Heraeus-Seminar: Ab-initio Electronic Structure Theory for Solids in the 21st Century*, October 30- November 03, 2017 Physikzentrum, Bad Honnef, Germany.
- **Talk:** «Single-particle and collective states of water molecules in the matrix of beryl crystal lattice: experiment and theory», *XXII Polish-Czech Seminar Structural and Ferroelectric Phase Transitions*, May 16-20, 2016 Hucisko, Poland.
- **Talk:** «Incipient ferroelectricity of H2O molecules located within Beryl nano-pores», *58th MIPT Scientific Conference*, November 23-28, 2015 MIPT, Dolgoprudny, Russia.
- **Talk:** «Terahertz dynamics of pseudoscalar modes in low-symmetry ferroelectrics and amino acids», *4th Russia-Japan-USA Symposium on Fundamental & Applied Problems of Terahertz Devices & Technologies*, June 9-12, 2015 IMT, ISSP, Chernogolovka, Russia.