Sergei Lepeshov *CURRICULUM VITAE*

Personal information

Date of birth: 02 / 15 /1995
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Research interests

My recent interests lie in the fields of *computational electromagnetics, nanophotonics, extreme light scattering* and *2D-semiconductor optoelectronics*. I have received B.S. and M.S. (both with honors) in ITMO University. I have authored 32 scientific contributions published in peer-reviewed journals such as *Nature Communications, Nature Nanotechnology, Physical Review Letters, Optica* and *ACS Photonics*. I have gotten traineeships in research groups in *Australia, the UK* and *Switzerland*.

Education

2017 - 2019:	Master of Science, Department of Nanophotonics and metamaterials, ITMO University, Saint-Petersburg, Russia Title of thesis: All-dielectric nanophotonics with 2D transition metal dichalcogenides Supervisor: Dr. Alex Krasnok
2013 - 2017:	Bachelor of Science, Department of Light-Guided Photonics, ITMO University, Saint-Petersburg, Russia Title of thesis: Reconfigurable hybrid metal-dielectric nanostructures Supervisor: Dr. Alex Krasnok

Work experience

2016 - Present time:	Junior Research Fellow, Department of Nanophotonics and Metamaterials, ITMO University, Saint-Petersburg, Russia
2021 - Present time:	Traineeship at ETH Zurich, Zurich, Switzerland Topic: Optical forces acting on resonant nanoparticles *I develop an approach theoretically and numerically to engineer optical response of a nanoparticle to boost back-action optical force.*
Feb – March 2018:	Traineeship at Australian National University, Canberra, Australia Topic: Near-field coupling in all-dielectric nanostructures *I numerically studied near-field effects in dimers, trimers, quadrumers and metasurfaces composed of high-index dielectric nanoparticles.*
December 2016:	Traineeship at Aston University, Birmingham, UK Topic: Terahertz time-domain spectroscopy *I carried out experimental investigations of THz photoconductive antennas modified by silver and silicon nanostructures using THz time-domain spectoscopy.*
August 2016:	Traineeship at Aston University, Birmingham, UK Topic: Terahertz science and technology *I learnt terahertz experimental techniques and conducted the characterization of THz photoconductive antenna samples.*

2015 - 2016: Engineer, Optimum-II, design optical communication company

Summary of research accomplishments

Analytical physics

- Investigation of BIC and high-Q Fano resonances in asymmetric all-dielectric metasurfaces;
- Theoretical study of anapole and superscattering states;
- Exploration of Purcell effect in metallic and dielectric nanostructures;
- Study of the strong coupling regime in silicon nanoparticle-monolayer TMDC nanostructures;
- Study of optical pulling forces of electromagnetic plane wave at complex frequencies in nanoparticles and resonators.

Computational electrodynamics

- Numerical studying of silver cluster nanostructures for SERS applications;
- Studying of multipolar effects in dielectric nanoparticles on a substrate;
- Near-field coupling effect investigation in Mie-resonant photonic structures and metasurfaces;
- Developing optically reconfigurable all-dielectric and hybrid metal-dielectric nanostructures;
- Metasurface design for TMDC-based photonic devices;
- Study of the enhanced excitation and emission extraction from monolayer TMDC by all-dielectric nanoantennas;
- Optimization of bow-tie photoconductive antenna for efficient terahertz radiation.

Experimental research

- Experimental investigations of nanoantenna-enhanced THz photoconductive antennas;
- Investigations of optical radiation absorption increase in THz photoconductive antennas by metallic and dielectric nanoantennas.

Awards and scholarships

1. SPIE Optics and Photonics Education Scholarship (2017, 2018, 2021)
2. Winner of «UMNIK» grant in «New devices and hardware complexes» section (2016)
3. State Scholarship for students (2016-2019)
4. Russian Government Scholarship for students (2017)
5. Scholarship of the President of the Russian Federation for students (2018-2019)
6. Best Student Award in Saint Petersburg (2018)
7. St. Petersburg Government Grant for young scientists (2018)
8. Optics Express “Editors’ Choice”, (2018)
9. 3 papers selected for the Cover image (2016-2019)
10. Best graduate student of the ITMO University (2019)
11. Grant of BASIS Foundation for theoretical research in physics (2019)

Skills

Programming: MATLAB, C#, C++, Java, Pascal, Python
Simulations: CST Microwave Studio, COMSOL
Graphics: Adobe Photoshop, Corel Draw, AutoCAD

Published articles

[32] Sergey Lepeshov, Alex Krasnok, *Tunable phase-change metasurfaces*// Nature Nanotechnology, vol. 16, pp. 615-616, 2021 (IF: 31.538)

[31] Sergey Lepeshov, Alex Krasnok, *Virtual optical pulling force* // Optica, vol. 7, pp. 1024-1030, 2020 (IF: 9.778)

[30] Mingsong Wang, Alex Krasnok, Sergey Lepeshov, Guangwei Hu, Taizhi Jiang, Jie Fang, Brian A Korgel, Andrea Alù, Yuebing Zheng, *Suppressing material loss in the visible and near-infrared range for functional nanophotonics using bandgap engineering* // Nature communications, vol. 11, pp. 1-9, 2020 (IF: 12.121)

[29] Andrei Gorodetsky, Sergey Lepeshov, Alex Krasnok, Pavel Belov, *Optical nanoantennas for enhanced THz emission* // Nanoantennas and Plasmonics: Modelling, design and fabrication (Chapter), 2020

[28] Dzmitry V. Yakimchuk, Egor Yu Kaniukov, Sergey Lepeshov, Victoria D. Bundyukova, Sergey E. Demyanov, Grigory M. Arzumanyanm, Nelya V. Doroshkevich, Kahramon Z. Mamatkulov, Arne Bochmann, Martin Presselt, Ondrej Stranik, Soslan A. Khubezhov, Aleksander E. Krasnok, Andrea Alù, and Vladimir A. Sivakov, *Self-organized spatially separated silver 3D dendrites as efficient plasmonic nanostructures for surface-enhanced Raman spectroscopy applications* // Journal of Applied Physics, vol. 126, pp. 233105, 2019 (IF: 2.328)

[27] S. Lepeshov, A.Krasnok, A. Alu, *Nonscattering-to-Superscattering Switch with Phase-Change Materials* // ACS Photonics, vol. 6, pp. 2126-2132, 2019 (IF:7.14) **Selected for the cover page**

[26] L. Lin, S. Lepeshov, A. Krasnok, T. Jiang, X. Peng, B. Korgel, A. Alù, Y. Zheng, *All-optical reconfigurable chiral meta-molecules* // Materials Today, vol. 25, pp. 10-20, 2019 (IF:24.3) **Selected for the cover page**

[25] Y. Sun, I. Sinev, A. Zalogina, E. Ageev, H. Shamkhi, F. Komissarenko, I. Morozov, S. Lepeshov, V.A. Milichko, S.V. Makarov, I. Mukhin, D. Zuev, *Reconfigurable Near-field Enhancement with Hybrid Metal-dielectric Oligomers* // Laser & Photonics Reviews, vol. 13, pp. 1800274, 2019 (IF:8.434)

[24] S. Lepeshov, A.Krasnok, A. Alu, *Enhanced Excitation and Emission from 2D Transition Metal Dichalcogenides with All-Dielectric nanoantenna* // Nanotechnology, vol. 30, pp. 254004, 2019 (IF:3.4)

[23] K. Koshelev, S. Lepeshov, M. Liu, A. Bogdanov and Yu. Kivshar, *Asymmetric metasurfaces with high-Q resonances governed by bound states in the continuum* // Physical Review Letters, vol. 121, pp. 193903, 2018 (IF:8.462)

[22] S. Lepeshov and Yu. Kivshar, *Near-Field Coupling Effects in Mie-Resonant Photonic Structures and All-Dielectric Metasurfaces* // ACS Photonics, vol. 5, pp. 2888–2894, 2018 (IF:7.14)

[21] S. Lepeshov, M. Wang, A. Krasnok, O. Kotov, T. Zhang, H. Liu, T. Jiang, B. Korgel, M. Terrones, Y. Zheng and A. Alú, *Tunable Resonance Coupling in Single Si Nanoparticle-Monolayer WS2 Structures* // ACS Applied Materials and Interfaces, vol. 10, p. 16690–16697, 2018 (IF:7.504)

[20] S. Lepeshov, A. Gorodetsky, N. Toropov, T. Vartanyan, A. Krasnok, P. Belov, A. Alu and E. Rafailov, *Optimization of nanoantenna-enhanced terahertz emission from photoconductive antennas* // Scientific Reports, vol. 8, p. 6624, 2018 (IF:4.259)

[19] A. Krasnok, S. Lepeshov and A. Alú, *Nanophotonics with 2D Transition Metal Dichalcogenides* // Optics Express, vol. 26, p. 15972-15994, 2018 (IF:3.307)

[18] A. Krasnok, S. Li, S. Lepeshov, R. Savelev, D. Baranov, A. Alu, *All-optical switching and unidirectional plasmon launching with electron-hole plasma driven silicon nanoantenna* // Physical Review Applied, vol. 9, p. 014015, 2018 (IF:4.808)

[17] S. Lepeshov, A. Krasnok and A. Miroshnichenko, *Hybrid nanophotonics* // Physics Uspekhi, vol. 61, 2018 (IF:2.301)

[16] S. Lepeshov, A. Gorodetsky, A. Krasnok, E. Rafailov and P. Belov, *Enhancement of terahertz photoconductive antenna operation by optical nanoantennas* // Laser & Photonics Reviews, vol. 11, p. 1600199, 2017 (IF:8.434) **Selected for the cover page**

[15] S. Lepeshov, A. Krasnok, I. Mukhin, D. Zuev, A. Gudovskikh, V. Milichko, P. Belov and A. Miroshnichenko, *Fine-tuning of the magnetic Fano resonance in hybrid oligomers via fs-laser induced reshaping* // ACS Photonics, vol. 4, p. 536-543, 2017 (IF:7.14)

[14] D. Baranov, D. Zuev, S. Lepeshov, O. Kotov, A. Krasnok, A. Evlyukhin and B. Chichkov, *All-dielectric nanophotonics: the quest for better materials and fabrication techniques* // Optica, vol. 4, p. 814-825, 2017 (IF:7.727)

[13] Y. Sun, S. Kolodny, S. Lepeshov, D. Zuev, L. Huang, P. Belov and A. Krasnok, *Approach for fine-tuning of hybrid dimer antenna via laser melting at the nanoscale* // Annalen der Physik, vol. 529, p. 1600272, 2017 (IF:3.443)

[12] K. Ullah, B. Garcia-Camara, M. Habib, X. Liu, A. Krasnok, S. Lepeshov, J. Hao, J. Liu, N.P. Yadav, *Chiral all-dielectric trimer nanoantenna* // Journal of Quantitative Spectroscopy and Radiative Transfer, vol. 208, p. 71-77, 2017 (IF:2.4)

[11] S. Lepeshov, A. Gorodetsky, N. Toropov, T. Vartanyan, A. Krasnok, P. Belov and E. Rafailov, *Novel optimized hybrid terahertz photoconductive antennas* // Journal of Physics: Conference Series, vol. 1092, pp. 012076, 2018 (IF:0.36)

[10] S. Lepeshov, A. Krasnok, O. Kotov, A. Alu, *Strong coupling in Si nanoparticle core – 2D WS2 shell structure* // Journal of Physics: Conference Series, vol. 1092, pp. 012077, 2018 (IF:0.36)

[9] S. Lepeshov, V. Mikhailovskii, D. Elets, A. Tsypkin, A. Krasnok, A. Gorodetsky, *All-dielectric metasurface for enhanced optical-to-terahertz convertion efficiency in photoconductive antenna* // IEEE Xplore, 2018 International Conference LO (ICLO), pp. 304-304, 2018

[8] S. Lepeshov, A. Krasnok, O. Kotov, A. Alu, *Strong Coupling in Core-Shell Nanostructure Based on Silicon Nanoparticle and TMDC Monolayer* // IEEE Xplore, 2018 International Conference LO (ICLO), pp. 388-388, 2018

[7] S. Lepeshov, A. Gorodetsky, N. Toropov, T. Vartanyan, E. Rafailov, A. Krasnok and P. Belov, *Optimization of NA-enhanced terahertz emission from photoconductive antennas* // Journal of Physics: Conference Series, vol. 917, p. 062060, 2017 (IF:0.36)

[6] S. Li, S. Lepeshov, R. Savelev, D. Baranov, P. Belov and A. Krasnok, *Dielectric Yagi-Uda nanoantenna driven by electron-hole plasma photoexcitation* // Journal of Physics: Conference Series, vol. 917, p. 062054, 2017 (IF:0.36)

[5] S. Lepeshov, A. Krasnok, I. Mukhin, D. Zuev, A. Gudovskikh, V. Milichko, P. Belov and A. Miroshnichenko, *Experimental demonstration of a reconfigurable magnetic Fano resonance in hybrid oligomers* // IEEE Xplore, Days on Diffraction (DD), p. 210-213, 2017

[4] S. Li, S. Lepeshov, R. Savelev, A. Krasnok and D. Baranov, *Dielectric chain driven by electron-hole plasma photoexcitation* // IEEE Xplore, Days on Diffraction (DD), p. 214-218, 2017

[3] S. Lepeshov, D. Zuev, S. Makarov, V. Milichko, I. Mukhin, A. Krasnok and P. Belov, *Manipulating Fano resonance via fs-laser melting of hybrid oligomers at nanoscale* // Journal of Physics: Conference Series, vol. 741, p. 012140, 2016 (IF:0.36)

[2] S. Lepeshov, D. Zuev, S. Makarov, V. Milichko, I. Mukhin, A. Krasnok and P. Belov, *Tuning of hybrid nanostructures via fs-laser reshaping at nanoscale* // IEEE Xplore, 2016 International Conference on LO, p. 6, 2016

[1] S. Lepeshov, D. Zuev, A. Krasnok, P. Belov and A. Miroshnichenko, *Tuning of hybrid oligomers via fs-laser reshaping at nanoscale* // IEEE Xplore, Days on Diffraction (DD), p. 277-280, 2016

Peer-review activities

I am a reviewer of several scientific journals such as ACS Photonics, Scientific Reports, Optics Letters, Optics Express, Optical Materials Express, IEEE Transactions on Terahertz Science and Technology and RSC Advances.

List of conference presentations

[17] *Pulling electromagnetic force induced by virtual excitation*, Metamaterials 2021, New York, USA, September 2021

[16] *Bound states in the continuum-induced enhancement of evanescent field confinement*, Metanano 2021, Tbilisi, Georgia, September 2021

[15] *Enhanced Evanescent Field Confinement Driven by Bound States in the Continuum*, Meta 2021, Warsaw, Poland, July 2021

[14] *All-Dielectric Metasurface for Narrowband Terahertz Phase and Amplitude Modulation,* Metanano 2019, Saint Petersburg, July 2019

[13] *From Nonradiative State to Superscattering with Hybrid Nanoantenna Comprising Phase-Change Materials,* International Conference on Materials for Advanced Technologies (ICMAT), Singapore, June 2019

[12] *Strong Coupling between Silicon Spherical Nanoparticle and Monolayer WS_2*, Days on Diffraction 2018, Saint Petersburg, Russia, June 2018

[11] *Strong Coupling in Core-Shell Nanostructure Based on Silicon Nanoparticle and Monolayer TMDC*, Laser Optics 2018, Saint Petersburg, Russia, June 2018

[10] *Nanoantenna-Enhanced Hybrid Photoconductive Antenna Operation Optimization*, PhysicA.SPb/2017, Saint Petersburg, Russia, October 2017

[9] *Experimental demonstration of a reconfigurable magnetic Fano resonance in hybrid oligomers*, Days on Diffraction 2017, Saint Petersburg, Russia, June 2017

[8] *Enhancement of terahertz generation in log-periodic photoconductive antenna by silver nanoantennas*, Photonics & Electromagnetics Research Symposium (PIERS), Saint Petersburg, Russia, May 2017

[7] *Optimization of Nanoantenna-Enhanced Terahertz Emission from Photoconductive Antennas*, 4th International School and Conference Saint Petersburg OPEN 2017, Saint Petersburg, Russia, April 2017

[6] *Control of Magnetic Fano resonance of Hybrid Oligomers via Femtosecond Laser Modification at Nanoscale*, PhysicA.SPb/2016, Saint Petersburg, Russia, November 2016

[5] *Tuning of the Fano resonance in hybrid oligomers via fs-laser reshaping at nanoscale*, ICONO/LAT 2016, Minsk, Belarus, September 2016

[4] *Tuning of hybrid oligomers via fs-laser melting at nanoscale*, Metanano 2016, Anapa, Russia, September 2016

[3] *Tuning of hybrid nanostructures via fs-laser reshaping at nanoscale*, Laser Optics 2016, Saint Petersburg, Russia, June 2016

[2] *Tuning of hybrid oligomers via fs-laser reshaping at nanoscale*, Days on Diffraction 2016, Saint Petersburg, Russia, June 2016

[1] *Manipulating Fano resonance via fs–laser melting of hybrid oligomers at nanoscale*, 4th International School and Conference Saint Petersburg OPEN 2016, Saint Petersburg, Russia, March 2016