

Curriculum Vitae

Sergey Lepeshov

Personal information

Date of birth: 02 / 15 /1995
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Research interests

My recent interests lie in the fields of *all-dielectric and hybrid nanophotonics, terahertz photonics, tunable nanodevices* and *2D-TMDC optoelectronics*. I have authored 27 scientific contributions published in peer-reviewed journals such as *Physical Review Letters, Optica, Materials Today* and *ACS Photonics*. I have gotten traineeships in research groups in *Australia* and in *the UK*.

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: Research engineer, Department of Nanophotonics and Metamaterials, ITMO University, Saint-Petersburg, Russia

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 spectroscopy.

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

Nanoantennas and nanostructures

- Investigation of BIC and high-Q Fano resonances in asymmetric all-dielectric metasurfaces;
- Theoretical study of anapole and superscattering states;
- Developing optically reconfigurable all-dielectric and hybrid metal-dielectric nanostructures;
- Exploration of Purcell effect in metallic and dielectric nanostructures;
- Studying of multipolar effects in dielectric nanoparticles on a substrate;
- Near-field coupling effect investigation in Mie-resonant photonic structures and metasurfaces;
- Numerical studying of silver cluster nanostructures for SERS applications.

TMDC nanophotonics

- Study of the strong coupling regime in silicon nanoparticle-monolayer TMDC nanostructures;
- Metasurface design for TMDC-based photonic devices;
- Study of the enhanced excitation and emission extraction from monolayer TMDC by all-dielectric nanoantennas.

Terahertz sources

- Experimental investigations of nanoantenna-enhanced THz photoconductive antennas;
- Optimization of bow-tie photoconductive antenna for efficient terahertz radiation;
- 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)
2. Winner of «UMNIK» grant in «New devices and hardware complexes» section (2016)
3. State Scholarship for students (2016-2018)
4. Russian Government Scholarship for students (2017)
5. Scholarship of the President of the Russian Federation for students (2017)
6. Paper Enhancement of THz Photoconductive Antenna Operation by Optical Nanoantennas featured on the cover of Laser and Photonics Reviews

Skills

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

Published articles

- [27] S. Lepeshov, A.Krasnok, A. Alu, *Nonradiative to Superscattering Switch with Phase-Change Materials* // ACS Photonics, just accepted, 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. Tsyppkin, A. Krasnok, A. Gorodetsky, *All-dielectric metasurface for enhanced optical-to-terahertz conversion 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 Optics Letters, Optics Express, Optical Materials Express, IEEE Transactions on Terahertz Science and Technology and RSC Advances.