Oleh YERMAKOV

Research Interests

Near-field optics, plasmonics, metasurfaces, photonic crystal waveguides, all-dielectric photonics, hyperbolic metamaterials, hyperbolic plasmons, anisotropic media, homogenization, hybrid polarization, optical angular momentum, numerical methods.

Education

2016 – pres. **PhD Student**, *Optics*, St. Petersburg National Research University of Information Technologies, Mechanics and Optics (ITMO University), St. Petersburg, Russia.

2014 – 2016 **Master of Science**, *Photonics and Optical Information Technology*, St. Petersburg National Research University of Information Technologies, Mechanics and Optics (ITMO University), St. Petersburg, Russia.

Sept. 2015 – Jan. 2016 **Master of Science**, *Physics*, Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland.
1 semester as an exchange student

2014–2016 **Master of Science**, *Applied Physics*, V. N. Karazin Kharkiv National University, Kharkiv, Ukraine.

2010 – 2014 **Bachelor of Science**, *Applied Physics (cum laude)*, V.N. Karazin Kharkiv National University, Kharkiv, Ukraine.

Master Thesis

Title Hybrid surface plasmons on anisotropic metasurface
The best graduation research work among ITMO Univ. Masters 2016

Supervisor Andrey A. Bogdanov, PhD, Research Fellow, ITMO University, https://metalab.ifmo.ru/people/ bogdanov

Consultant Ivan V. Iorsh, PhD, Associate Professor, ITMO University `https://metalab.ifmo.ru/people/~iorsh`

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https://metalab.ifmo.ru/people/~yermakov

Articles

2019

7. O. Y. Yermakov, A. A. Bogdanov, and A. V. Lavrinenko, *Broadband polarization degeneracy of guided waves in subwavelength structured ZnO pattern*, **IEEE Journal of Selected Topics in Quantum Electronics** 25(3), 1 (2019).
DOI: 10.1109/JSTQE.2018.2886306
Comment: **Invited Paper**

2018

6. O. Y. Yermakov, A. A. Hurshkainen, D. A. Dobrykh, P. V. Kapitanova, I. V. Iorsh, S. B. Glybovski, and A. A. Bogdanov, *Experimental observation of hybrid TE-TM polarized surface waves supported by a hyperbolic metasurface*, **Physical Review B** 98(19), 195404 (2018).
DOI: https://doi.org/10.1103/PhysRevB.98.195404
Comment: **Kaleidoscope: November 2018**

5. O. Y. Yermakov, D. V. Permyakov, F. V. Porubaev, P. A. Dmitriev, A. K. Samusev, I. V. Iorsh, R. Malureanu, A. V. Lavrinenko, and A. A. Bogdanov, *Effective surface conductivity of optical hyperbolic metasurfaces: from far-field characterization to surface wave analysis*, **Scientific Reports** 8(1), 14135 (2018).
DOI: https://doi.org/10.1038/s41598-018-32479-y

4. O. Takayama, P. Dmitriev, E. Shkondin, O. Yermakov, M. Panah, K. Golenitskii, F. Jensen, A. Bogdanov, and A. Lavrinenko, *Experimental observation of Dyakonov plasmons in the mid-infrared*, **Semiconductors** 52(4), 442 (2018).
DOI: https://doi.org/10.1134/S1063782618040279

2017

3. A. Samusev, I. Mukhin, R. Malureanu, O. Takayama, D. V. Permyakov, I. S. Sinev, D. Baranov, O. Yermakov, I. V. Iorsh, A. A. Bogdanov, and A. V. Lavrinenko, *Polarization-resolved characterization of plasmon waves supported by an anisotropic metasurface*, **Optics Express** 25(26), 32631 (2017).
DOI: https://doi.org/10.1364/OE.25.032631

2016

2. O. Y. Yermakov, A. I. Ovcharenko, A. A. Bogdanov, I. V. Iorsh, K. Y. Bliokh, and Yu. S. Kivshar, *Spin control of light with hyperbolic metasurfaces*, **Physical Review B** 94(7), 075446 (2016).
DOI: https://doi.org/10.1103/PhysRevB.94.075446

2015

1. O. Y. Yermakov, A. I. Ovcharenko, M. Song, A. A. Bogdanov, I. V. Iorsh, and Yu. S. Kivshar, *Hybrid waves localized at hyperbolic metasurface*, **Physical Review B** 91(23), 235423 (2015).
DOI: https://doi.org/10.1103/PhysRevB.91.235423
Comment: **Editors' Suggestion**

Proceeedings (Scopus, WoS)

2018

10. O. Y. Yermakov, and A. A. Bogdanov, *Eigenmodes degeneracy with Huygens-like all-dielectric metasurface* // Journal of Physics: Conference Series, 1092, 012169 (2018).
DOI: 10.1088/1742-6596/1092/1/012169

9. O. Y. Yermakov, D. V. Permyakov, P. A. Dmitriev, A. K. Samusev, I. V. Iorsh, A. V. Lavrinenko, and A. A. Bogdanov, *Plasmonic anisotropic metasurfaces: from far-field measurements to near-field properties* // Proceedings SPIE, 10671, 1067118 (2018).
DOI: 10.1117/12.2306801

2017

8. O. Y. Yermakov, F. V. Porubaev, A. A. Bogdanov, A. K. Samusev, I. V. Iorsh, *Retrieval procedure of effective conductivity for plasmonic resonant anisotropic metasurface* // AIP Conference Proceedings, 1874, 030040 (2017).
DOI: 10.1063/1.4998069

7. O. Y. Yermakov, I. S. Mukhin, A. K. Samusev, A. A. Bogdanov, I. V. Iorsh, *Effective conductivity tensor of plasmonic anisotropic metasurface: Theory and experiment* // Progress In Electromagnetics Research Symposium-Spring (PIERS), IEEE, 1524 (2017).
DOI: 10.1109/PIERS.2017.8261988

6. O. Y. Yermakov, A. A. Bogdanov, I. V. Iorsh K. Y. Bliokh, and Yu. S. Kivshar, *Tunable spin-directional coupling for surface localized waves with anisotropic metasurface* // Proceedings SPIE, 10227, 1022703 (2017).
DOI: 10.1117/12.2261663
Comment: **Best Student Paper Award**

2016

5. O. Y. Yermakov, A. I. Ovcharenko, A. A. Bogdanov, I. V. Iorsh, A. H. Babaieva. *Hybrid surface plasmon polaritons localized at anisotropic metasurface* // II International Young Scientists Forum on Applied Physics and Engineering (YSF), IEEE, 73-76 (2016).
DOI: 10.1109/YSF.2016.7753804

4. O. Y. Yermakov, A. I. Ovcharenko, A. A. Bogdanov, I. V. Iorsh, A. V. Lavrinenko, A. H. Babaieva. *New degrees of freedom of spin-optronics implemented by using hybrid surface waves localized at hyperbolic metasurface* // Days on Diffraction (DD), IEEE, 449-454 (2016).
DOI: 10.1109/DD.2016.7756892

3. A. A. Bogdanov, O. Yermakov, A. Ovcharenko, M. Song, D. Baranov, I. Sinev, I. Mukhin, A. Samusev, I. Iorsh, A. Lavrinenko, Y. S. Kivshar. *Hybrid localized waves supported by resonant anisotropic metasurfaces* // CLEO: QELS Fundamental Science, IEEE, FM3D-6 (2016).

2015

2. O. Y. Yermakov, A. I. Ovcharenko, I. V. Iorsh, A. A. Bogdanov, Y. S. Kivshar. *New types of surface waves on hyperbolic metasurface* // Days on Diffraction (DD), IEEE, 371-376 (2015).
DOI: 10.1109/DD.2015.7354895

1. I. V. Iorsh, I. Trushkov, O. Yermakov, A. Ovcharenko, A. A. Bogdanov, P. A. Belov, and Yu. S. Kivshar. *Dyakonov-like plasmonic localized waves on graphene metasurfaces* // PIERS Proceedings, 2347-2351 (2015).

Conferences

2019

20. 10th International Conference on Materials for Advanced Technologies (ICMAT), Singapore, 23 – 28 June 2019. https://icmat2019.mrs.org.sg/
Poster: *All-dielectric metasurface supporting broadband polarization eigenmodes degeneracy*.

19. 9th International Conference on Surface Plasmon Photonics (SPP9), Copenhagen (Denmark), 26 – 31 May 2019. http://spp9.dk/
Poster: *Polarization degeneracy of guided modes in photonic crystal waveguide and its applications*.

2018

18. International Conference on Metamaterials and Nanophotonics "METANANO-2018", Sochi (Russia), 17 - 21 September 2018. https://metanano.ifmo.ru/2018/
Talk: *Eigenmodes degeneracy with Huygens-like all-dielectric metasurface*.

17. 3rd International Conference "NanoPlasm-2018", Cetraro (Italy), 10 - 15 June 2018. http://www.nanoplasmconference.com/
Poster: *Surface waves of mixed TE-TM polarization at anisotropic metasurface in microwaves: theory and experiment*.

16. Annual International Conference "Days on Diffraction 2018", St. Petersburg (Russia), 4 - 8 June 2018. http://www.pdmi.ras.ru/~dd/
Talk: *Surface waves of mixed TE-TM polarization at Jerusalem-cross-based anisotropic metasurface in microwaves*.

15. SPIE Photonics Europe Symposium, Strasbourg (France), 22 - 26 April 2018. http://spie.org/conferences-and-exhibitions/past-conferences-and-exhibitions/photonics-europe-2018
Talk: *Plasmonic anisotropic metasurfaces: from far-field measurements to near-field properties*.

2017

14. International Conference on Metamaterials and Nanophotonics "METANANO-2017", Vladivostok (Russia), 18-22 September 2017. https://metanano.ifmo.ru/2017/
Talk: *Retrieval procedure of effective conductivity for plasmonic resonant anisotropic metasurface*.

13. PIERS 2017, St. Petersburg (Russia), 22-25 May 2017. http://www.piers.org/piers2017StPetersburg/
Talk: *Effective conductivity tensor of plasmonic anisotropic metasurface: theory and experiment*.

12. SPIE Optics+Optoelectronics 2017, Prague (Czech Republic), 24-27 April 2017. https://spie.org/conferences-and-exhibitions/past-conferences-and-exhibitions/optics-and-optoelectronics-2017
Talk: *Tunable spin-directional coupling for surface localized waves with anisotropic metasurface*.

11. 4th International School and Conference "Saint-Petersburg OPEN 2017", St. Petersburg (Russia), 3-6 April 2017. http://ru.spbopen.spbau.com/
Poster, pitch talk: *Spin control of light using hyperbolic plasmons*.

2016

10. II International Young Scientists Forum on Applied Physics and Engineering, Kharkiv (Ukraine), 10 - 14 October 2016. http://ysc.org.ua/2016/index.php
Invited talk: *Hybrid surface plasmon polaritons localized at anisotropic metasurface*.
Comment: **First prize in the "Nano and Metamaterials Section" for the presentation.**

9. II All-Russian Scientific Forum "The science of the future - the science of the youth", Kazan (Russia), 20-23 September 2016. https://www.sfy-conf.ru/
Poster, contest talk (in Russian): *Hybrid surface plasmons on anisotropic metasurface*.

8. International Conference on Metamaterials and Nanophotonics "METANANO-2016", Anapa (Russia), 5-9 September 2016. https://metanano.ifmo.ru/2016/
   Talk: *Full control of the spin angular momentum of light in the plane of anisotropic metasurface*.
7. Annual International Conference "Days On Diffraction 2016", St. Petersburg (Russia), 27 June - 01 July 2016. http://www.pdmi.ras.ru/~dd/
   Poster: *New degrees of freedom of spin-optronics implemented by using hybrid surface waves localized at hyperbolic metasurface*.

2015

6. IONS Valencia 2015, Valencia (Spain), 24-26 September 2015. https://www.osa.org/en-us/meetings/global_calendar/events/2015/international_osa_network_of_students_valencia_201/
   Talk: *Surface waves localized at hyperbolic metasurface*.
5. XV All-Russian School-Workshop "Physics and Application of Microwaves" named after A.P. Sukhorukov, Mozhaisk (Russia), 1 - 6 June 2015. http://waves.phys.msu.ru/
   Talk (in Russian): *Electromagnetic properties of surface modes propagating along anisotropic hyperbolic metasurface*.
4. Annual International Conference "Days On Diffraction 2015", St. Petersburg (Russia), 28-29 May 2015. http://www.pdmi.ras.ru/~dd/
   Poster: *New types of surface waves on hyperbolic metasurface*.
3. Young scientists of Russia - 2015, Moscow (Russia), 13 - 14 April 2015. http://www.dynastyfdn.com/news/1267
   Poster: *Hybrid waves localized at hyperbolic metasurface*.
2. IV international student conference "Academic and Scientific Challenges in the 21st Century", Kharkiv (Ukraine), 20 March 2015.
   Talk: *Construction of the anisotropic permittivity and conductivity tensors for uniaxial crystals*.

2014

1. Scientific and Technical Conference "Physical and Technical Problems of Energy and Their Solutions - 2014", Kharkiv (Ukraine), 25 - 26 June 2014.
   Talk: *Automatic solar tracking system*.

Scientific Schools

6 PhD Summer School on nano-optics and plasmonics, Odense (Denmark), 23 - 26 May 2019. https://www.sdu.dk/en/om_sdu/institutter_centre/nanooptics/summer_school

5 International School on Plasmonics and Nano-Optics "Plasmonica - 2018", Cetraro (Italy), 15 - 18 June 2018. http://www.plasmonica.it/2018school/

4. Doctoral Summer School: Nanophotonics and Metamaterials, St. Petersburg (Russia). https://metalab.ifmo.ru/school/
   - 2016: XXXI EUPROMETA Summer School "Nanophotonics and Metamaterials", 21-24 June 2016. https://metalab.ifmo.ru/school/2016/
   - 2017: 28 May - 1 June 2017. https://metalab.ifmo.ru/school/2017/
   - 2018: May 28 - 1 June 2018. https://metalab.ifmo.ru/school/2018/
   - [tentative] 2019: Summer School on Topological Photonics, 8 - 12 July 2019. https://metalab.ifmo.ru/school

3. PICQUE Roma Scientific School 2015: "Integrated quantum photonics applications: from simulation to sensing", Rome (Italy), 6-10 July 2015. http://www.picque.eu/romaschool2015/

2. International Winter School on Physics of Semiconductors, Zelenogorsk (Russia). http://www.ioffe.ru/winter_school/index_en.html
   - 2015: Light, semiconductors and technologies, 27 February - 3 March 2015. http://www.ioffe.ru/winter_school/school2015.html
   - 2016: Advanced fabrication technologies of semiconductor nanoheterostructures and devices, 26 February - 1 March 2016. http://www.ioffe.ru/winter_school/school2016.html.
     Comment: **The best presentation (2nd prize) at the young scientists' section.**
   - 2017: Semiconductor nano- and optomechanics, 3 - 6 March 2017. http://www.ioffe.ru/winter_school/school2017.html
   - 2018: 2D semiconductor systems, 1 - 5 March 2018. http://www.ioffe.ru/winter_school/school2018.html
   - 2019: 100th anniversary of Ioffe Institute. Current research, 28 February - 3 March 2019. http://www.ioffe.ru/winter_school/school2019.html

1. European Summer School 2014: "From the Mystery of Mass to Nobel Prizes. The Physics of the Higgs Boson", Strasbourg (France), 7-12 July 2014. http://esc.u-strasbg.fr/2014/

Internships

1. Technical University of Denmark, DTU Fotonik, group of Prof. Andrei Lavrinenko, Kongens Lyngby, Denmark. http://www.fotonik.dtu.dk/english/research/nanophotonics/meta
   - 2018: 4-25 May.
   - 2018: 18 June - 8 July.

- 2019: 18 August - 10 September.

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https://metalab.ifmo.ru/people/∼yermakov

Scholarships and Awards

2019 SPIE Optics and Photonics Education Scholarship

2018 ITMO University grant for international academic mobility of postgraduate students

2017 Individual grant "PhD Student" from the Foundation for the Advancement of Theoretical Physics and Mathematics "BASIS" (selects 18 best PhD students in Theoretical Physics from Russia)

2017 Best Student Paper Award, SPIE Optics+Optoelectronics 2017, Prague, Czech Republic

2017 SPIE Travel Scholarship

2016 First prize in the "Nano and Metamaterials Section" for the presentation, II International Young Scientists Forum on Applied Physics and Engineering, Kharkiv, Ukraine

2016 The best presentation (2nd prize) at the young scientists' section, International Winter School on Physics of Semiconductors, Zelenogorsk, Russia

2016 The best graduation research work among ITMO University Masters 2016

2015 Award for students in Theoretical Physics from "Dynasty" Foundation

2014 Scholarship for research activity from ITMO University

2014 Scholarship of the International Research Centre for Nanophotonics and Metamaterials

2013 Scholarship of the President of Ukraine

2011 Scholarship of Kharkiv Mayor

Grants

Leader

1. *Surface waves at resonant anisotropic metasurface in the optical and microwave ranges: theory and experiment*, Russian Foundation for Basic Research (RFBR), 18-32-00739, 2018-2019.

Participant

3. *High quality microcavities based on optical bound states in the continuum*, Russian Science Foundation (RSF), 17-12-01581, 2017-2019.
2. *Surface optical states in dielectric and plasmonic nanostructures*, Russian Foundation for Basic Research (RFBR), 17-02-01234, 2017-2019.
1. *High-Q microcavities based on bound states in the continuum*, Ministry of Education and Science of the Russian Federation (GosZadanie), 3.1668.2017, 2017-2019.

Seminars

4. ITMO University, Physics and Engineering Department, Theoretical Seminar, St. Petersburg (Russia), 13 February 2019.
3. Technical University of Denmark, DTU Fotonik, Plasmonics and Metamaterials Group (Prof. Lavrinenko's group), Kongens Lyngby (Denmark), 8 May 2018.
2. Institut d'Optique, Charles Fabry Laboratory, Palaiseau (France), 27 April 2018.
1. O. Ya. Usikov Institute for Radiophysics and Electronics of the National Academy of Sciences of Ukraine (IRE NASU), Radiospectroscopy Department (Prof. Tarapov's group), Kharkiv (Ukraine), 11 January 2017.

Popular Science Lectures

6. (1) "Game of Thrones" from the point of view of Physics, (2) Sweaty electrons, cocktail of light with matter and ultrathin iPhones - why do we need Photonics? [in Russian] (for high school students), St. Petersburg, Russia, 4 June 2019.
5. "Game of Thrones" from the point of view of Physics [in Russian] (open lecture), St. Petersburg, Russia, 23 April 2019.
4. Sweaty electrons, cocktail of light with matter and ultrathin iPhones - why do we need Photonics? [in Russian] (open lecture), ITMO University, St. Petersburg, Russia, 19 April 2019.
3. Photonics and light control at nanoscale [in Russian] (open lecture), V. N. Karazin Kharkiv National University, Kharkiv, Ukraine, 5 January 2019.
2. Introduction to Metamaterials [in Russian] (for high school students), ITMO University, St. Petersburg, Russia, 8 June 2018.
1. How to write a scientific article and be proud of it? [in Russian] (for students), ITMO University, St. Petersburg, Russia, 24 November 2017.

Reviewer

Journals: Optics Letters (2018-19), Journal of Optics (2019), Applied Optics (2017), Journal of Physics D: Applied Physics (2019), Physica Scripta (2018-19), AIP Advances (2018)

Conferences: Days on Diffraction (2017-18), METANANO (2018).

Organization

4. **Technical Committee**: Summer School on Topological Photonics, 8 - 12 July 2019. `https://metalab.ifmo.ru/school`

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https://metalab.ifmo.ru/people/~yermakov

3. **Organizing and Program Committees**: VIII Young Scientists Congress (in Russian), Section: Photonics, 15 - 19 April 2019. `https://kmu.itmo.ru/`
2. **Technical Committee**: Doctoral Summer School: Nanophotonics and Metamaterials, May 28 - 1 June 2018. `https://metalab.ifmo.ru/school/2018/`
1. **Technical Committee**: Doctoral Summer School: Nanophotonics and Metamaterials, 28 May - 1 June 2017. `https://metalab.ifmo.ru/school/2017/`

Teaching

2018 – present *Supervisor*, Master international educational program "Nanophotonics and Metamaterials", Physics and Technology Department, ITMO University.

2019 *Teaching Assistant*, "Nanoplasmonics" course for 1st year Master students, ITMO University, spring semester 2019. Lecturers: Dr. Mihail Petrov and Dr. Andrey Bogdanov. Duties: seminars, homeworks, tests.

2018 *Teaching Assistant*, "Metamaterials" course for 2nd year Master students, ITMO University, autumn semester 2018. Lecturer: Prof. Pavel Belov. Duties: seminars, labs on CST.

2017 *Teaching Assistant*, "Mathematical Methods in Physics" course for 1st year Master students, ITMO University, autumn semester 2017. Lecturer: Dr. Andrey Bogdanov. Duties: seminars, homeworks, tests.

Professional Memberships

5. IEEE Photonics, March 2018 – present.
4. METAMORPHOSE VI AISBL, November 2016 – present.
3. IEEE, ID: 94033466, September 2016 – present.
2. OSA, ID: 1166491, December 2014 – present.
1. SPIE, ID: 3651284, October 2014 – present.

Computer Skills

Basic C/C++, Python, OriginLab, Proteus, CodeVisionAVR.

Intermediate COMSOL Multiphysics, Wolfram Mathematica, POV-Ray, Corel Draw.

Advanced LaTeX, MatLab, CST Microwave Studio, Adobe Illustrator.

Languages

- English *Advanced*
- French *Intermediate*
- Russian *Mother tongue*
- Ukrainian *Mother tongue*

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My Profiles

My work profile	http://metalab.ifmo.ru/people/~yermakov
ORCID	0000-0001-9446-0670
Researcher ID	M-3969-2016
Scopus ID	56709555600
Google Scholar	https://scholar.google.com/citations?user=VDeJOhUAAAAJ&hl=en
ResearchGate	https://www.researchgate.net/profile/Oleh_Yermakov
Publons	https://publons.com/researcher/1611687/oleh-yermakov/

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