Aleksandr Rogachev

GRADUATED PHYSICIST

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| **Education** |  |  |
| **Lomonosov Moscow State University, department of Physics** | | *Moscow, Russia* |
| B.S. IN PHYSICS | | *Sep. 2012 – Sep. 2016* |

* #27 in World Ranking by subject (Physics) 2016 (www.topuniversities.com)
* Graduate Thesis: “The modulation of light by excitation of  magnetization rotation modes in magnetoplasmonic crystals”
* GPA: 3.4/4

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| **Math and Science Lyceum №1580 for Gifted Children** | *Moscow, Russia* |
| HIGH SCHOOL | *Sep. 2007 – Jun. 2012* |

* One of top 5 schools in Moscow
* Specialization: Physics and Mathematics
* Graduate Thesis: “Development of a speech recognition system based on artificial neural networks”

**Skills**

**Programming** C/C++, Java, Ruby

**Web** HTML5, CSS3, Javascript, jQuery, ReactJS, AngularJS, Ruby, Ruby on Rails

**Presentation** Microsoft Office, Origin

**Calculations** Wolfram Mathematica, MATLAB.

**Languages** English, Russian

**Projects**

**Ultrasensitive magnetic field sensors for magnetocardiography**

**(funded by Russian Science Foundation grant)** *Moscow, Russia*

Magneto-optics, Plasmonics and Nanophotonics group, Department of Photonics and Microwave Physics,

Faculty of Physics MSU 2014 - 2016

* Developed physical principles of ultrasensitive magnetoplasmonic magnetic field sensor and created experimental setup.
* Developed concept of the vector magneto-optical sensor, which allows simultaneous measurement of all three components of the magnetic field.
* Studied phenomenon of magnetization delay in epitaxial ferrite garnet films relative to the external rotating planar magnetic field depending on the field speed and the magnetic dissipation parameter.
* Developed methods of measuring the relaxation properties of magnetic nanoparticles. Created new magnteocardiographical biomedical measurement methods.

**The modulation of light by excitation of magnetization rotation modes in magnetoplasmonic crystals**

**(funded by Russian Science Foundation grant)**

*Moscow, Russia*

Magneto-optics, Plasmonics and Nanophotonics group, Department of Photonics and Microwave Physics,

Faculty of Physics MSU 2013 - 2016

The purpose of this project was to develop the physical principles of effective light modulation by excitation of magnetization rotation modes. By the end the following results were achieved:

* Developed program in **C++** for the study of the optical properties of plasmonic crystals. Implemented RCWA algorithm based on spatial Fourier transform for periodic structure (plasmonic crystal).
* Studied optical properties of the plasmonic crystal containing Fabry-Perot plasmonic resonator by implemented program. Detected new mode called “thin wall mode”. Found optimal conditions for efficient plasmonic modes excitation.
* Developed concept of the modulation of light in solitary magnetic films by excitation of rotational magnetization mode in the presence of strong magnetic cubic anisotropy. Achieved modulation of light equals to 2.5% by creating rotating magnetic field equals to 10 Oe.
* Developed concept of light modulation in magnetoplasmonic crystals by excitation of rotational magnetization mode. Longitudinal magnetophotonic intensity effect was used to create modulation. Achieved modulation of light equals to 10% by creating rotating magnetic field equals to 10 Oe.

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**Star Cluster** *Moscow, Russia*

2012 - 2013

* Developed program in **C++** for the numerical simulation of cluster containing arbitrary number of stars with different masses called “Star Cluster”
* This program implements the following algorithms: 1-st order Euler method, 2-nd order predictor-corrector Euler method, and 4-th order Runge-Kutta method. Also it uses adaptive time step approach for every star to avoid errors.
* In case of vast amount of stars implemented Barnes-Hut algorithm which significantly increases productivity.
* The program provides different tools to investigate important properties of star cluster systems. Among them checking Energies, Virial theorem, observing coordinates and velocities of stars. Also it provides default basic setups of stars such as strange attractors.

**Development of a speech recognition system based on artificial neural networks** *Moscow, Russia*

2011 - 2012

* Developed program in **C++** for the study of neural network algorithms and neural networks training for recognition of speech sounds "Voice Research".
* Investigated neural network algorithm based on multi-layered network of direct action. Studied several types of input data.
* Developed algorithm can successfully recognize resonant and vowel sounds in speech of several speakers.
* Proposed and investigated new type of neurons called “Smart Neurons” which give better results.
* Proposed new training of neural networks method – group "Search" method, characterized by a more stable operation.
* Developed program for a simple computer management by voice sounds "Voice Commander".

**Articles\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* Rogachev, A. E., et al. "Vector magneto-optical sensor based on transparent magnetic films with cubic crystallographic symmetry." Applied Physics Letters 109.16 (2016): 162403.
* A.E. Rogachev. The longitudinal magnetophotonic effect in magnetoplasmonic crystal for magnetic field sensing. International conference for students and young scientists “Lomonosov-2016”, Moscow, 11-15 April, 2016, book of abstracts, V. 2 , p. 85-oral.

**Honors & Awards**

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| 2016 | **Certificate**,International conference “Lomonosov-2016” | | *Moscow, Russia* |
| 2014 | **Winner**, | Student scientific research contest | *Moscow, Russia* |
| 2012 | **Winner**, | “Step to the Future” Olympiad on Physics | *Moscow, Russia* |
| 2012 | **Winner**, | “Hope of energy” Olympiad on Physics | *Moscow, Russia* |
| 2012 | **Certificate**,”Junior” All-Russian competition of scientific works of students (Intel ISEF) | | *Moscow, Russia* |
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