Sergey Efimov

Curriculum Vitae

Education

2016 – 2020 **PhD student in Theoretical Mechanics**, *Moscow Institute of Physics and Technology*, Dolgoprudny, Russia

Thesis: Long-term evolution of systems with transitions between different short-term regimes. Advisor: Sidorenko VV.

Derived a second-order approximation for a long-term orbital dynamics of a minor body in mean-motion resonance, obtained analytical expressions for the double-averaged Hamiltonian, described mathematical properties of its isoenergetic manifold, computed transition probabilities associated with the emerging adiabatic chaos, constructed a comprehensive phase-space map using exact numerical averaging of the system, validated the model by carrying out extensive numerical simulations based on real Kuiper belt objects

2015 – 2016 **Master of Applied Physics and Mathematics with honors**, *Moscow Institute of Physics and Technology*, Russia, GPA 4.9/5.0

Thesis: Dynamics of resonant Kuiper belt objects. Advisor: Sidorenko VV.

2008 – 2012 **Bachelor of Applied Physics and Mathematics**, *Moscow Institute of Physics and Technology*, Russia, GPA 4.9/5.0

Thesis: Dark matter dynamics. Advisor: Zybin KP.

Experience

2022 – 2024 **Researcher**, *R-sensors*, Dolgoprudny (Russia)

Atomic force microscope stabilization system: derived an analytical expression for the 6-DoF response function, programmed a parameterized mathematical model, optimized control parameters, ensured stability with semi-analytical criteria and numerical simulations, validated the model by filtering and fitting experimental data.

Hydraulic suspension system for scientific instruments: reduced an infinite-DoF system to a finite Laplace-domain matrix, found analytical solutions for special cases of the Navier–Stokes equations

2019 **Researcher**, *IMCCE and Université de Lille*, Lille (France)

Transitions from prograde to retrograde orbital motion in asteroid dynamics: derived an averaged Hamiltonian system, adapted the integration software to run on a compute cluster, carried out numerical experiments and processed the results

2016 **Researcher**, *Airbus S&D*, Large Space Debris Attitude Estimation, Moscow (Russia)

Developed an analytical model for conductive debris interaction with the geomagnetic field, derived the associated expressions for induced eddy currents and magnetic tensors, derived the averaged Hamiltonian for long-term attitude dynamics, integrated the averaged model numerically, found analytical solutions for stable regimes, adapted a low-level motion integrator to enable parallelized batch simulations

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Eltaurus-Lt

2014 – 2017 **Junior Researcher**, *Moscow Institute of Physics and Technology*, High-precision attitude control systems laboratory, Dolgoprudny (Russia)
Reaction wheel for microsatellites: derived a high-precision control method for a brushless electric motor, designed the winding and the permanent magnet for optimal flux linkage, developed a parametric model of the full reaction wheel design, obtained analytical estimates for eddy currents and natural frequencies, wrote a genetic algorithm for optimizing the torque-speed curve, carried out validation experiments and processed the results

2012 **Organizing committee member**, *Lebedev Physical Institute*, Ginzburg Conference on Physics, Moscow (Russia)

2011 **Assistant**, *Lebedev Physical Institute of the Russian Academy of Sciences*, Moscow (Russia)

2011 **Assistant**, *Special Astrophysical Observatory of the Russian Academy of Science*, Nizhny Arkhyz (Russia)

Teaching experience

2022 – 2025 **Course author**, *Scientific visualization and design*, MIPT
Program: https://eltaurus-lt.github.io/ChaosAndCats/en/program.html

2015 – 2021 **Teaching assistant**, *Theoretical mechanics*, MIPT

2017 **Academic committee member and Main problem author**, *18th Asian Physics Olympiad (APhO)*

2015 **Online course developer**, *Theoretical mechanics (MIPT)*, Coursera and OpenEdu

2009 **Academic committee member**, *All-russian physics contest*

Publications

[1] **Sergey Efimov** and Vladislav Sidorenko. An analytically treatable model of long-term dynamics in a mean motion resonance with coexisting resonant modes. *Celestial Mechanics and Dynamical Astronomy* 132:27, 2020.
DOI: 10.1007/s10569-020-09965-5

[2] **Efimov SS** and Sidorenko VV. Asymmetric Zeipel-Lidov-Kozai cycles in mean motion resonances. *Cosmic Research* 58(4):249-255, 2020.
DOI: 10.1134/S0010952520040097

[3] **Efimov S**, Pritykin D, and Sidorenko V. Long-term attitude dynamics of space debris in Sun-synchronous orbits: Cassini cycles and chaotic stabilization. *Celestial Mechanics and Dynamical Astronomy* 130(10):62, 2018.
DOI: 10.1007/s10569-018-9854-4

[4] Dmitry Pritykin, **Sergey Efimov**, and Vladislav Sidorenko. Defunct Satellites in Nearly Polar Orbits: Long-term Evolution of Attitude Motion. *Open Astronomy* 27(1):264-277, 2018.
DOI: 10.1515/astro-2018-0029

[5] **Efimov S**, Pritykin D, and Sidorenko V. Attitude Motion of Large Space Debris in Sun-Synchronous Orbits: Simulation of Long-Term Evolution. *Advances in the Astronautical Sciences* 161:131-142, 2017.

Reviewer — Astrophysics and space science (Springer Nature), Celestial mechanics & dynamical astronomy (Springer Nature)

Open Source Contributions

GitHub — https://github.com/Eltaurus-Lt/

2025 — **Contributor**, *Anki*
Credited as Eltaurus: https://github.com/ankitects/anki/blob/main/CONTRIBUTORS

2023 – 2025 — **Solo Developer**, *Anki templates*
Reviews: https://ankiweb.net/shared/info/510199145

2022 – 2025 — **Main Developer and Maintainer**, *Memrise Course Downloader (Google Chrome Extension)*
Feedback thread: https://forums.ankiweb.net/t/an-alternative-to-memrise2anki-support-thread/30084

Computer Skills

Programming — C, Fortran, JavaScript, Python, GLSL

Modeling — Wolfram Mathematica, MATLAB/Simulink, Modelica

Design & Visualisation — Blender 3D, Adobe Creative Suite, Unreal Engine, HTML + CSS

Other — Git, Diffusion algorithms, Large Language Models

Languages

English (Fluent), Russian (Native), Japanese (Intermediate), German (Basic)

Hardware and software patents

{1} Sivkov AS, Prodan DV, Sergeev RI, Ivlev NA, **Efimov SS**, Nozdrin AV, Popov AV. Reaction wheel control unit with redundant control channel. *RU 2627493*.

{2} **Efimov SS**, Ivlev NA, Nozdrin AV. Program for reaction wheel design optimization. *RU 2017610973*.

{3} **Efimov SS**, Nozdrin AV, Popov AV. Program for torque-speed characteristics computation of brushless DC motor with field-oriented control. *RU 2016611830*.

Other Achievements

1st place in VI International Engineering Mechanics Contest in Gomel, Belarus, 2010.

Honorable mention in 38th International Physics Olympiad (IPhO) in Isfahan, Iran, 2007.

Silver medal in 2nd International Junior Science Olympiad (IJSO) in Yogyakarta, Indonesia, 2005.