

VASILY KOZHEVNIKOV

Curriculum Vitae

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EDUCATION:

- | | |
|------|--|
| 2019 | Doctor of Sciences , Institute of High Current Electronics
Thesis title: “ <i>Theory of rapidly occurring processes of interaction of strong electric fields with nonequilibrium electron fluxes in dense gases, semiconductors and vacuum</i> ” |
| 2008 | Ph. D. in Physics , Tomsk State University
Thesis title: “ <i>Theoretical models of the electrical discharge in gas and interaction of pulsed magnetic fields with the electroconductive particle</i> ” |
| 2004 | M. Sc. in Physics , Tomsk State University |
| 2002 | B. Sc. in Physics , Tomsk State University |

PROFESSIONAL APPOINTMENTS:

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|----------------|---|
| 2010 — present | Leading research associate
Laboratory of Theoretical Physics,
Institute of High Current Electronics (Tomsk, Russian) |
| 2014 — 2019 | Senior research associate
Laboratory of Theoretical and Mathematical Physics,
Faculty of Physics, Tomsk State University (Tomsk, Russia) |
| 2014 — 2017 | Leading research associate
Laboratory of Low-Temperature Plasma,
Faculty of Physics, Tomsk State University (Tomsk, Russia) |
| 2009 — 2015 | Associate professor
Department of General and Experimental Physics,
Faculty of Physics, Tomsk State University (Tomsk, Russian) |
| 2008 — 2012 | Senior researcher |

Laboratory of Mathematical Physics,
Faculty of Physics, Tomsk State University (Tomsk, Russian)

2004 — 2010

Senior engineer

Laboratory of Theoretical Physics,
Institute of High Current Electronics (Tomsk, Russian)

2004 — 2008

Postgraduate student

Department of Quantum Field Theory,
Faculty of Physics, Tomsk State University (Tomsk, Russian)

PUBLICATIONS:

Referred journal articles:

- J. Yao, **V. Y. Kozhevnikov**, V. Igumnov, Z. Chu, C. Yuan, and Z. Zhou — The kinetic theory of cathode plasma expansion in a spatially non-uniform geometric configuration of a vacuum diode. // *Plasma Sources Science and Technology*, vol. 33, no. 3, p. 035006, 2024 <https://doi.org/10.1088/1361-6595/ad34f8>
- V. O. Oskirko, **V. Y. Kozhevnikov**, A. P. Pavlov, A. N. Zakharov, A. S. Grenadyorov, A. A. Solovyev — Effect of peak discharge current on the ion current density on the substrate in the short-pulse HiPIMS. // *Vacuum*, vol. 224, p. 113162, 2024 <https://doi.org/10.1016/j.vacuum.2024.113162>
- **V. Yu. Kozhevnikov**, A. V. Kozyrev, A. O. Kokovin, and N. S. Semenyuk — Kinetic Model of Vacuum Plasma Expansion in a Cylindrical Gap. // *Plasma Physics Reports*, vol. 49, no. 11, pp. 1350–1357, 2023 <https://doi.org/10.1134/S1063780X23601256>
- **V. Yu. Kozhevnikov**, A. V. Kozyrev, V. S. Igumnov, N. S. Semenyuk, and A. O. Kokovin — Kinetic Theory of Expansion of Two-Component Plasma in a Plane Vacuum Diode. // *Fluid Dynamics*, vol. 58, no. 6, pp. 1148–1155, 2023 <https://doi.org/10.1134/s0015462823601900>
- **Kozhevnikov V. Yu.**, Oskirko V. O., Rabotkin S. V., Pavlov A. P., Semenov V. A., Solovyev A. A., Grenadyorov A. S., Zakharov A. N. — Novel methods for synthesizing high-quality thin films through short and ultrashort high-power pulsed magnetron sputtering. // *St. Petersburg State Polytechnical University Journal. Physics and Mathematics*, vol. 16, no. 3.1, pp. 26–30, 2023 <https://doi.org/10.18721/JPM.163.104>
- A. Kozyrev, **V. Y. Kozhevnikov**, N. S. Semeniuk, and A. Kokovin — Initial kinetics of electrons, ions and electric field in planar vacuum diode with plasma cathode. // *Plasma Sources Science and Technology*, vol. 32, no. 10, p. 105010, 2023 <https://doi.org/10.1088/1361-6595/acfff1>
- V. O. Oskirko, A. N. Zakharov, A. S. Grenadyorov, A. P. Pavlov, V. A. Semenov, S. V. Rabotkin, **V. Yu. Kozhevnikov**, A. A. Solovyev — The influence of pulse duration and duty cycle on the energy flux to the substrate in high power impulse magnetron sputtering. // *Vacuum*, vol. 216, p. 112459, 2023 <https://doi.org/10.1016/j.vacuum.2023.112459>
- V. Oskirko, **V. Y. Kozhevnikov**, S. Rabotkin, A. Pavlov, V. Semenov, A. Solovyev — Ion current density on the substrate during short-pulse HiPIMS. // *Plasma Sources Science and Technology*, vol. 32, no. 7, p. 075007, 2023 <https://doi.org/10.1088/1361-6595/acdd95>

- **V. Y. Kozhevnikov**, A. V. Kozyrev, V. F. Tarasenko, A. O. Kokovin, E. K. Baksht, N. P. Vinogradov — Key Modes of Ignition and Maintenance of Corona Discharge in Air. // *Energies*, vol. 16, no. 13, p. 4861, 2023 <https://doi.org/10.3390/en16134861>
- A. V. Kozyrev, A. O. Kokovin, **V. Y. Kozhevnikov**, and V. F. Tarasenko — Change in Mechanism of Corona Discharge Formation in Atmospheric Air with a Negative Tip. // *Russian Physics Journal*, vol. 65, no. 10, pp. 1758–1761, 2023 <https://doi.org/10.1007/s11182-023-02827-1>
- **Kozhevnikov V. Yu.**, Kozyrev A. V., Kokovin A. O., Semeniuk N. S. — The kinetic simulation in vacuum electronics: uncovering the fundamental nature of non-Maxwellian distribution function effects. // *St. Petersburg State Polytechnical University Journal. Physics and Mathematics*, vol. 15, no. 3.3, pp. 76–81, 2022 <https://doi.org/10.18721/JPM.153.314>
- V. F. Tarasenko, E. K. Baksht, N. P. Vinogradov, A. V. Kozyrev, A. S. Kokovin, and **V. Y. Kozhevnikov** — On the Mechanism of Generation of Trichel Pulses in Atmospheric Air. // *JETP Letters*, vol. 115, no. 11, pp. 667–672, 2022 <https://doi.org/10.1134/s0021364022600689>
- **V. Yu. Kozhevnikov**, A. V. Kozyrev, A. O. Kokovin, N. S. Semeniuk — Kinetic simulation of vacuum plasma expansion beyond the “plasma approximation”. // *Vojnotekhnicki glasnik*, vol. 70, no. 3, pp. 650–663 <https://doi.org/10.5937/vojtehg70-37337>
- **V. Y. Kozhevnikov**, and A. V. Kozyrev — On the Physical Nature of “Anomalous” High Energy Electrons in Vacuum Diodes. // *Russian Physics Journal*, vol. 64, no. 12, pp. 2341–2349, 2022 <https://doi.org/10.1007/s11182-022-02595-4>
- **V. Yu. Kozhevnikov**, A. V. Kozyrev, V. Yu. Konev, A. I. Klimov — The phase stability of nanosecond gunn oscillators. // *Vojnotekhnicki glasnik*, vol. 70, no. 2, pp. 461–474, 2022 <https://doi.org/10.5937/vojtehg70-36094>
- A. V. Kozyrev, **V. Y. Kozhevnikov**, A. O. Kokovin, and S. Y. Medvedev — On Minimum Static Breakdown Voltage for a Gasfilled Gap. // *Russian Physics Journal*, vol. 64, no. 9, pp. 1649–1655, 2022 <https://doi.org/10.1007/s11182-022-02502-x>
- A. O. Kokovin, A. V. Kozyrev, and **V. Y. Kozhevnikov** — Simulation of negative corona discharge in atmospheric air: from mode of Trichel pulses to stationary discharge. // *Journal of Physics: Conference Series*, vol. 2064, p. 012024, 2021 <https://doi.org/10.1088/1742-6596/2064/1/012024>
- **V. Y. Kozhevnikov**, A. V. Kozyrev and A. O. Kokovin — The problem of "anomalous" ion transport in high-current vacuum discharges. // *Journal of Physics: Conference Series*, vol. 2064, p. 012025, 2021 <https://doi.org/10.1088/1742-6596/2064/1/012025>
- **V. Kozhevnikov**, A. Kozyrev, A. Kokovin, and N. Semeniuk — The Electrodynamic Mechanism of Collisionless Multicomponent Plasma Expansion in Vacuum Discharges: From Estimates to Kinetic Theory. // *Energies*, vol. 14, no. 22, p. 7608, 2021 <https://doi.org/10.3390/en14227608>
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- E. A. Sosnin, N. Yu. Babaeva, **V. Yu. Kozhevnikov**, A. V. Kozyrev, G. V. Naidis, V. A. Panarin, V. S. Skakun, V. F. Tarasenko — Modeling of transient luminous events in

Earth's middle atmosphere with apokamp discharge. // Physics — Uspekhi, no. 64, vol. 2, 2021 <https://doi.org/10.3367/ufne.2020.03.038735>

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- A. G. Sitnikov, A. V. Kozyrev, **V. Y. Kozhevnikov**, A. O. Kokovin, and N. S. Semeniuk — Simulation of high-pressure gas breakdown under conditions of spatially non-uniform initial ionization and temperature. // Journal of Physics: Conference Series, vol. 1393, p. 012028, 2019 <https://doi.org/10.1088/1742-6596/1393/1/012028>
- A. V. Kozyrev, **V. Y. Kozhevnikov**, A. O. Kokovin, V. A. Panarin, N. S. Semeniuk, and A. G. Sitnikov — Electric Field Mechanism of Thin Plasma Jet Formation in an Open Atmospheric Discharge. // Russian Physics Journal, vol. 62, no. 11, pp. 2020–2023, 2020 <https://doi.org/10.1007/s11182-020-01939-2>
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- **V. Y. Kozhevnikov**, A. V. Kozyrev, N. S. Semeniuk, and A. O. Kokovin — Influence of Runaway Electrons on the Formation Time of Nanosecond Discharge. // IEEE Transactions on Plasma Science, 2018, Vol. 46, Issue 10, pp. 3468–3472 <https://dx.doi.org/10.1109/TPS.2018.2866777>
- **V. Y. Kozhevnikov**, A. V. Kozyrev, N. S. Semeniuk, and A. O. Kokovin — Theory of a High-Voltage Pulse Discharge in a High-Pressure Gas: Hydrodynamic and Kinetic Approaches. // Russian Physics Journal, vol. 61, no. 4, pp. 603–610 <https://doi.org/10.1007/s11182-018-1439-x>
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- **V. Y. Kozhevnikov**, A. V. Kozyrev, and N. S. Semeniuk — Physical Kinetics of Electrons in a High-Voltage Pulsed High-Pressure Discharge with Cylindrical Geometry. // Russian Physics Journal, vol. 60, no. 8, pp. 1425-1436 <http://dx.doi.org/10.1007/s11182-017-1232-2>
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- V. Tarasenko, C. Zhang, A. Kozyrev, D. Sorokin, X. Hou, N. Semeniuk, A. Burachenko, P. Yan, **V. Kozhevnikov**, E. Baksht, M. Lomaev, T. Shao — Influence of the interelectrode distance and the gas pressure on parameters of a runaway electron beam generating during the nanosecond breakdown in SF₆ and nitrogen. // High Voltage, v. 2, no. 2, 2017, pp. 49-55 <http://dx.doi.org/10.1049/hve.2017.0014>
- **V. Yu. Kozhevnikov**, A. V. Kozyrev and N. S. Semeniuk — The Effect of the Mode of Gas Preionization on the Parameters of Runaway Electrons in High-Pressure Discharges. // Russian Physics Journal, vol. 59, no. 12, 2017, pp. 1981-1988 <http://dx.doi.org/10.1007/s11182-017-1004-z>
- A. V. Kozyrev, **V. Yu. Kozhevnikov**, and N. S. Semeniuk — Theoretical simulation of high-voltage discharge with runaway electrons in sulfur hexafluoride at atmospheric pressure. // Matter and Radiation at Extremes, vol. 1, no. 5, pp. 264-268 <http://dx.doi.org/10.1016/j.mre.2016.10.001>
- A. V. Kozyrev, **V. Yu. Kozhevnikov**, M. I. Lomaev, D. S. Sorokin, N. S. Semeniuk, and V. F. Tarasenko — Theoretical simulation of the picosecond runaway-electron beam in coaxial diode filled with SF₆ at atmospheric pressure. // EPL (Europhysics Letters), vol. 114, no. 4, p. 45001, 2016 <http://dx.doi.org/10.1209/0295-5075/114/45001>
- A. V. Kozyrev, **V. Y. Kozhevnikov**, and N. S. Semeniuk — Zero-Dimensional Theoretical Model of Subnanosecond High-Pressure Gas Discharge. // IEEE Transactions on Plasma Science, 2015, Vol. 43, Issue 12, pp. 4077–4080 <http://dx.doi.org/10.1109/TPS.2015.2496218>
- **V. Yu. Kozhevnikov**, A. V. Kozyrev, and N. S. Semeniuk — 1D simulation of runaway electrons generation in pulsed high-pressure gas discharge. // EPL (Europhysics Letters), vol. 112, no. 1, p. 15001, 2015 <http://dx.doi.org/10.1209/0295-5075/112/15001>
- A. V. Kozyrev, **V. Y. Kozhevnikov**, N. S. Semeniuk, and L. A. Zyulkova — Theoretical Simulation of a Gas Breakdown Initiated by External Plasma Source in the Gap With Combined Metal-Dielectric Electrodes. // IEEE Transactions on Plasma Science, 2015, Vol. 43, Issue 8, pp. 2294–2298 <http://dx.doi.org/10.1109/TPS.2015.2447032>
- A. V. Batrakov, and **V. Y. Kozhevnikov** — Guest Editorial Special Issue on Vacuum Discharge Plasmas (ISDEIV—PS) – 2015. // IEEE Transactions on Plasma Science, 2015, Vol. 43, Issue 8, pp. 2234–2235 <http://dx.doi.org/10.1109/TPS.2015.2457313>

- V. Yu. Konev, A. I. Klimov, O. B. Koval'chuk, V. P. Gubanov, **V. Yu. Kozhevnikov**, A. . Kozyrev — Phase stabilization of nanosecond microwave oscillations in Gunn-diode-based oscillators. // Technical Physics, 2015, vol. 60, no. 3, pp. 420-426 <http://dx.doi.org/10.1134/S1063784215030147>
- A. V. Kozyrev, **V. Yu. Kozhevnikov**, M. S. Vorobyov, E. Kh. Baksht, A. G. Burachenko, N. N. Koval, and V. F. Tarasenko — Reconstruction of electron beam energy spectra for vacuum and gas diodes. // Laser and Particle Beams, 2015, vol. 33, no. 2, pp. 183-192 <http://dx.doi.org/10.1017/S0263034615000324>
- **Kozhevnikov V. Yu.**, Kozyrev A. V., Semenyuk N. S. — Simulation of Initial Stage of Nanosecond Volume High Pressure Gas Discharge. // Plasma Physics and Technology Vol. 1, No 2, 2014, pp. 64-66
- V. Yu. Konev, A. I. Klimov, O. B. Koval'chuk, V. P. Gubanov, **V. Yu. Kozhevnikov**, A. V. Kozyrev, N. A. Torkhov — The effect of phase stabilization of microwave oscillations in nanosecond Gunn oscillators. // Technical Physics Letters, 2013, vol. 39, no. 11, pp. 957-959 <http://dx.doi.org/10.1134/S1063785013110072>
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- **V. Yu. Kozhevnikov**, A. V. Kozyrev and A. I. Klimov — Scattering of short electromagnetic radiation pulses on a corner reflector. // Russian Physics Journal, vol. 55, no. 5, 2012, pp. 532-535 <http://dx.doi.org/10.1007/s11182-012-9844-z>
- A. V. Kozyrev, **V. Yu. Kozhevnikov**, I. D. Kostyrya, D. V. Rybka, V. F. Tarasenko, D. V. Schitz — Radiation from a Diffuse Corona Discharge in Atmospheric Pressure Air. // Atmospheric and Oceanic Optics, 2012, vol. 25, no. 2, pp. 176–183 <http://dx.doi.org/10.1134/S102485601202008X>
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- D. V. Rybka, V. F. Tarasenko, C. Zhang, T. Shao, A. V. Kozyrev, I. D. Kostyrya, P. Yan, **V. Yu. Kozhevnikov** — Nanosecond Corona Discharge In Atmospheric Pressure Air: Runaway Electrons And X-Rays. // Russian Physics Journal, 2012, No. 11/3
- **V. Yu. Kozhevnikov**, A. V. Kozyrev and A. I. Klimov — Scattering of short electromagnetic radiation pulses on an infinitely long conductive cylinder. // Russian Physics Journal, vol. 54, no. 4, 2011, pp. 465-471 <http://dx.doi.org/10.1007/s11182-011-9640-1>
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- V. I. Dyadin, **V. Yu. Kozhevnikov**, A. V. Kozyrev, V. G. Podkovyrov and N. S. Sochugov — Impulse electrodynamic separation of small conducting particles. // Journal of Mining Science, vol. 44, no. 3, 2008, pp. 320-326 <http://dx.doi.org/10.1007/s10913-008-0023-0>
- **V. Yu. Kozhevnikov** and A. V. Kozyrev — Calculations of the current-voltage characteristic of a high-pressure space discharge with external gas ionization. // Russian Physics Journal, vol. 50, no. 8, 2007, pp. 783-787 <http://dx.doi.org/10.1007/s11182-007-0118-0>
- **V. Yu. Kozhevnikov**, A. V. Kozyrev, and Yu. D. Korolev — Theory of a normal high-pressure glow discharge. // Russian Physics Journal, vol. 49, no. 2, 2006 <http://dx.doi.org/10.1007/s11182-006-0087-8>
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Conference proceedings:

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- **V. Kozhevnikov**, V. Oskirko, A. Solovyev, S. Rabotkin, V. Semenov, and A. Pavlov — The Effects of Pulse Length Shortening on Average Substrate Current Density in High Power Impulse Magnetron Discharges. // 30th Telecommunications forum TELFOR 2022, 15-16 November 2022, Belgrade, Serbia, pp. 256-259 <https://doi.org/10.1109/TELFOR56187.2022.9983747>
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Space. // 2021 13th International Symposium on Antennas, Propagation and EM Theory (ISAPE), 1-4 December, 2021 <https://doi.org/10.1109/ISAPE54070.2021.9752849>

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GRANTS AND FELLOWSHIP:

- Russian Scientific Foundation (RSF) № 23-29-00239 “Kinetic theory of a multicomponent plasma expansion in a vacuum discharge” (2023-2024)
- Russian Foundation for Basic Research (RFBR) № 19-08-00286 “Theoretical modelling of a new form of high-pressure gas discharge: spatially oriented plasma jet in open atmosphere” (2019-2020)
- Russian Foundation for Basic Research (RFBR) № 18-52-53003 “Physics of the process of runaway electrons generation and X-ray emission in a nonuniform electric field during tens-hundreds nanosecond discharges” (2018-2019)
- Russian Foundation for Basic Research (RFBR) № 17-08-00932 “Theoretical simulation of high voltage gas discharge with runaway electrons in non-uniform gap geometry” (2017-2018)

- Russian Foundation for Basic Research (RFBR) № 15-58-53031 “Breakdown at high pressures of SF6 with runaway electrons and X-rays” (2015-2016)
- Russian Foundation for Basic Research (RFBR) № 12-08-31171 “Microwave source based on phase locked X-band Gunn oscillators” (2012)
- Russian Foundation for Basic Research (RFBR) № 12-08-00081 “Investigation of mechanisms which lead to restriction in X-ray pulse duration during the nanosecond corona discharge” (2012-2013)
- Russian Foundation for Basic Research (RFBR) № 10-08-00668 “Acceleration of small metal particle by nonuniform pulsed magnetic field” (2010-2011)
- Russian Foundation for Basic Research (RFBR) № 10-08-00916 “Search for means to control the parameters of the laser ablation plume at the liquid-metal target” (2010-2012)
- Russian Foundation for Basic Research (RFBR) № 14-08-00243 “Energy characteristics of high power microwave pulses” (2014-2016)

TECHICAL SKILLS:

SIMULATION	COMSOL Multiphysics (certified expert), LTspice IV, OpenFOAM, Remcom Xfdtd, Elmer FEM, NEC, KARAT, OOPIC Pro
PROGRAMMING	ANSI C, Mathworks MATLAB & Simulink, Haskell, Common LISP, Ruby

TEACHING EXPERIENCE:

2008 – 2015	Taught “General Physics: Experiment and Practice” for first and second year students (mathematicians, geologists, engineers), Faculty of Physics, Tomsk State University
2010 – 2011	Taught “Nonlinear Mathematical Physics” for third year students of the Faculty of Physics, Tomsk State University
2004 – 2009	Taught “Classical Electrodynamics: Practical Course” for third year students of the Faculty of Physics, Tomsk State University

PROFESSIONAL MEMBERSHIP AND VOLUNTEERING:

2021 – present	Guest Editor of MDPI Energies Special Issue “Vacuum Electronics and Plasma Diagnostics”
2019 – present	Regular Reviewer of IOPScience, IEEE & Springer Journals
2019 – present	European Physical Society Member
2013 – present	IEEE Senior Member (elected at 23 November 2013)
2014 – 2015	Guest Editor of IEEE Transactions on Plasma Science Special Issue “Vacuum Discharge Plasmas (ISDEIV – PS) 2015”

LEVELS OF LANGUAGE PROFICIENCY:

NATIVE/BILINGUAL	Russian, Gypsy (Russka Roma)
FLUENT	English

INTERMEDIATE

Italian, German