

Doppler Institute

for Mathematical Physics and Applied Mathematics

2023 List of Publications

(a) Research papers in journals

(a1) Papers accepted and published in 2023

1. Adailton Azevedo Araújo Filho, Soroush Zare, Paulo Porfírio, Jan Kříž, Hassan Hassanabadi: Thermodynamics and evaporation of a modified Schwarzschild black hole in a non-commutative gauge theory, *Phys. Lett.* **B838** (2023), 137744
2. Marzieh Baradaran, Pavel Exner, Jiří Lipovský: Magnetic square lattice with vertex coupling of a preferred orientation, *Ann. Phys.* *454* (2023), 169339
3. Diana Barseghyan, Pavel Exner: Spectral estimates for Dirichlet Laplacian on spiral-shaped regions, *J. Spect. Theory* **13** (2023), 247–261
4. Diana Barseghyan, Baruch Schneider: Spectral convergence of the Laplace operator with Robin boundary conditions on a small hole, *Mediterranean Journal of Mathematics* **20** (2023), 204
5. Diana Barseghyan, Baruch Schneider, Swanhild Bernstein: Magnetic Neumann Laplacian on a domain with a hole, *Rep. Math. Phys.* **92** (2023), 259–278
6. Jussi Behrndt, Markus Holzmann, Matej Tušek: Spectral transition for Dirac operators with electrostatic δ -shell potentials supported on the straight line, *Int. Eqs Oper. Theory* **94** (2022), 33
7. Jussi Behrndt, Markus Holzmann, Matěj Tušek: Two-dimensional Dirac operators with general delta-shell interactions supported on a straight line, *J. Phys. A: Math. Theor.* **56** (2023), 045201
8. Petr Blaschke, František Štampach: Asymptotic root distribution of Charlier polynomials with large negative parameter, *J. Math. Anal. Appl.* **524** (2023), 1

9. Denis I. Borisov, Jan Kříž: Operator estimates for non-periodically perforated domains with Dirichlet and nonlinear Robin conditions: vanishing limit, *Anal. Math. Phys.* **13** (2023), 5
10. Giuseppe Cardone, Andrii Khrabustovskyi: Spectrum of the Laplacian on a domain perturbed by small resonators, *SIAM J. Math. Anal.* **55** (2023), 3677–3712
11. Goce Chadzitaskos, Jiří Hrivňák, Jan Thiele: Discrete even Fourier–Weyl transforms of $A1 \times A1$, *Analysis & Mathematical Physics* **13** (2023), 76
12. Émilie Charlier, Celia Cisternino, Zuzana Masáková, Edita Pelantová: Spectrum, algebraicity and normalization in alternate bases, *J. Number Theory* **249** (2023), 470–499
13. Won Sang Chung, Afsin Güngör, Jan Kříž, Bekir Can Lütfüoğlu, Hassan Hassanabadi: Conformable fractional heat equation with fractional translation symmetry in both time and space, *Chinese Physics* **B32** (2023), 040202
14. Won Sang Chung, Hassan Hassanabadi, Jan Kříž: The q -deformed heat equation and q -deformed diffusion equation with q -translation symmetry, *Revista Mexicana de Física* **68** (2022), 060602
15. Dalibor Cimr, Damián Bušovský, Hamido Fujita, Filip Studnička, Richard Cimler, Toshitaka Hayashi: Classification of health deterioration by geometric invariants, *Computer Methods and Programs in Biomedicine* **239** (2023), 107623
16. Izabella Ingrid Farkas, Edita Pelantová, Milena Svobodová: From positional representation of numbers to positional representation of vectors, *Acta Polytechnica* **63** (2023), 188–198
17. Jaroslav Hančl, Ondřej Turek: Continued fractions with bounded even-order partial quotients, *Ramanujan J.* **62** (2023), 69–110
18. Somayyeh Hassanabadi, Jan Kříž, Bekir Can Lütfüoğlu, Hassan Hassanabadi: Relativistic solutions of generalized-Dunkl harmonic and anharmonic oscillators, *Physica Scripta* **97** (2022), 125305
19. Somayyeh Hassanabadi, Parisa Sedaghatnia, Won Sang Chung, Bekir Can Lütfüoğlu, Jan Kříž, Hassan Hassanabadi: Exact solution to two dimensional Dunkl harmonic oscillator in the non-commutative phase-space, *Eur. J. Phys. Plus* **138** (2023), 331
20. Toshitaka Hayashi, Dalibor Cimr, Filip Studnička, Hamido Fujita, Damián Bušovský, Richard Cimler, Ali Selamat: Distance-based one-class

- time-series classification approach using local cluster balance, *Expert Systems with Applications* **235** (2024), 121201
21. Lukáš Heriban, Matěj Tušek: Non-self-adjoint relativistic point interaction in one dimension, *J. Math. Anal. Appl.* **516** (2022), 126535
 22. Md Fazlul Hoque, Ondrej Kubů, Antonella Marchesiello, Libor Šnobl: New classes of quadratically integrable systems with velocity dependent potentials: non-subgroup type cases, *Eur. Phys. J. Plus* **138** (2023), 845
 23. Md Fazlul Hoque, Libor Šnobl: Family of nonstandard integrable and superintegrable classical Hamiltonian systems in non-vanishing magnetic fields, *J. Phys. A: Math. Theor.* **56** (2023), 165203
 24. Vít Jakubský, Kevin Zelaya: Lieb lattices and pseudospin-1 dynamics under barrier- and well-like electrostatic interactions, *Physica* **E152** (2023), 115738
 25. Ayman Kachmar, Vladimir Lotoreichik: On the isoperimetric inequality for the magnetic Robin Laplacian with negative boundary parameter, *J. Geom. Anal.* **32** (2022), 182
 26. Andrii Khrabustovskyi: Operator estimates for Neumann sieve problem, *Annali di Matematica Pura ed Applicata* **202** (2023), 1955–1990
 27. Andrii Khrabustovskyi, Evgen Khruslov: Creating and controlling band gaps in periodic media with small resonators, *J. Math. Phys. Anal. Geom.* **19** (2023), 456–481
 28. Miroslav Korbelář, Jiří Tolar: Clifford group is not a semidirect product in dimensions N divisible by four, *J. Phys. A: Math. Theor.* **56** (2023), 275304
 29. David Krejčířík, Vladimir Lotoreichik, Tuyen Vu: Reverse isoperimetric inequality for the lowest Robin eigenvalue of a triangle, *Appl. Math. Optim.* **33** (2023), 63
 30. Ondrej Kubů, Antonella Marchesiello, Libor Šnobl: New classes of quadratically integrable systems in magnetic fields: The generalized cylindrical and spherical cases, *Ann. Phys.* **451** (2023), 169264
 31. Ondřej Kubů, Libor Šnobl: Cylindrical first order superintegrability with complex magnetic fields, *J. Math. Phys.* **64** (2023), 062101
 32. Jana Lepšová, Edita Pelantová, Štěpán Starosta: On a faithful representation of Sturmian morphisms, *Eur. J. Comb.* **110** (2023), 103707
 33. Jan Loskot, Daniel Jezbera, Roman Loskot, Damián Bušovský, Adrian Barylski, Karsten Glówka, Piotr Duda, Krysztof Aniolek, Kateřina Voglová, Maciej Zubko: Influence of print speed on the microstructure,

- morphology, and mechanical properties of 3D-printed PETG products, *Polymer Testing* **123** (2023), 108055
34. Vladimir Lotoreichik: An isoperimetric inequality for the perturbed Robin bi-Laplacian in a planar exterior domain, *J. Diff. Eqs* **335** (2023), 285–313
 35. Parisa Sedaghatnia, Hassan Hassanabadi, Gary Junker, Jan Kříž, Somayyeh Hassanabadi, Won Sang Chung: Investigation of the generalised Wigner-Dunkl harmonic oscillator and its coherent states, *Ann. Phys.* **458** (2023), 169445
 36. Etsuo Segawa, Shoko Koyama, Norio Konno, Martin Štefaňák: Survival probability of the Grover walk on the ladder graph, *J. Phys. A: Math. Theor.* **56** (2023), 215301
 37. Shivani Singh, Craig S. Hamilton, Igor Jex: Phase estimation in driven discrete-time quantum walks, *Phys. Rev.* **A108** (2023), 042607
 38. Martin Štefaňák: Monitored recurrence of a one-parameter family of three-state quantum walks, *Phys. Scripta* **98** (2023), 064001
 39. Martin Štefaňák, Stanislav Skoupý: Quantum walk state transfer on a hypercube, *Phys. Scripta* **98** (2023), 104003
 40. Daniel Štěrba, Jaroslav Novotný, Igor Jex: Asymptotic phase-locking and synchronization in two-qubit systems, *J. Phys. Commun.* **7** (2023), 047003
 41. Roman Svoboda, Jana Machotová, Miloš Krbal, Daniel Jezbera, Martina Nalezinková, Jan Loskot, Aleš Berouk: Complex thermokinetic characterization of polydioxanone for medical applications: Conditions for material processing, *Polymer* **277** (2023), 125978
 42. Miloslav Znojil: Systematics of quasi-Hermitian representations of non-Hermitian quantum models, *Ann. Phys.* **448** (2023), 169198
 43. Miloslav Znojil: Three alternative model-building strategies using quasi-Hermitian time-dependent observables, *Symmetry* **15** (2023), 1596
 44. Miloslav Znojil: Zig-zag-matrix algebras and solvable quasi-Hermitian quantum models, *J. Phys. A: Math. Theor.* **56** (2023), 335301
 45. Miloslav Znojil: Quasi-Hermitian formulation of quantum mechanics using two conjugate Schrödinger equations, *Axioms* **12** (2023), 644
 46. Miloslav Znojil: Composite quantum Coriolis forces, *Mathematics* **11** (2023), 1375

47. Miloslav Znojil: Non-stationary non-Hermitian “wrong-sign” quantum oscillators and their meaningful physical interpretation, *Entropy* **25** (2023), 692

(a2) Accepted earlier, published in 2023, or shortly before

1. Jussi Behrndt, Markus Holzmann, Vladimir Lotoreichik, Georgi Raikov: The fate of Landau levels under δ -interactions, *J. Spect. Theory* **12** (2022), 1203–1234
2. Michael Bush, Dale Frymark, Constanze Liaw: Singular boundary conditions of Sturm-Liouville operators via perturbation theory, *Canadian J. Math.* **75** (2023), 1110–1146
3. Biagio Cassano, Vladimir Lotoreichik, Albert Mas, Matej Tušek: General δ -shell interactions for the two-dimensional Dirac operator: self-adjointness and approximation, *Rev. Math. Iberoam.* **39** (2023), 1443–1492
4. Goce Chadzitaskos, Miloslav Havlíček, Jiří Patera: Orthonormal bases on $L^2(\mathbb{R}^+)$, *J. Adv. Math. Comp. Sci.* **38** (2023), 95–102
5. Jaroslav Dittrich: Measurement of a quantum particle position at two distant locations, *Acta Polytechnica* **62** (2022), 445–450
6. Ľubomíra Dvořáková, Daniela Opočenská, Edita Pelantová: On minimal critical exponent of balanced sequences, *Mathematics in Computation* **92** (2023), 1403–1429
7. Dale Frymark, Vladimir Lotoreichik: Self-adjointness of the 2D Dirac operator with singular interactions supported on star-graphs, *Ann. H. Poincaré* **23** (2023), 179–221
8. Toshitaka Hayashi, Dalibor Címr, Filip Studnička, Hamido Fujita, Damián Bušovský, Richard Cimler: OCSTN: One-class time-series classification approach using a signal transformation network into a goal signal, *Information Science* **614** (2022), 81–86
9. Dirk Hundertmark, Michal Jex, Markus Lange: Quantum systems at the brink: existence of bound states, critical potentials and dimensionality, *Forum of Mathematics, Sigma* **11** (2023), E61
10. Michal Jex, Mathiew Lewin, Peter S. Madsen: Classical density functional theory: representability and universal bounds, *J. Stat. Phys.* **190** (2023), 73

11. P.V. Pyshkin, Aurél Gábris, Da-Wei Luo, Jian-Qiang You, Lian-Ao Wu: Tunable trade-off between quantum and classical computation via non-unitary Zeno-like dynamics, *Phys. Rev. Applied* **18** (2022), 044060
12. Iveta Semorádová, Petr Siegl: Diverging eigenvalues in domain truncations of Schrödinger operators with complex potentials, *SIAM J. Math. Anal.* **54** (2022), 5064–5101
13. Boris Shapiro, Miloš Tater: On spectral asymptotic of quasi-exactly solvable quartic potential, *Anal. Math. Phys.* **12** (2022), 2

(b) Accepted for publication in 2023

1. Ľubomíra Dvořáková: String attractors of episturmian sequences, *Theor. Comp. Sci.*, to appear
2. Pavel Exner: Geometry effects in quantum dot families, *Pure Appl. Funct. Anal.*, to appear
3. Pavel Exner: Geometrically induced spectral properties of soft quantum waveguides and layers, *Rev. Math. Phys.*, to appear
4. Pavel Exner, Sylwia Kondej, Vladimir Lotoreichik: Bound states of weakly deformed soft waveguides, *Asympt. Anal.* to appear
5. Pavel Exner, Semjon Vugalter: Bound states in bent soft waveguides, *J. Spect. Theory*, to appear
6. David Krejčířík, Vladimir Lotoreichik: Quasi-conical domains with embedded eigenvalues, *Math. Nachr.*, to appear
7. Olaf Lechtenfeld, Miloslav Znojil: Quasi-hermitian quantum mechanics and a new class of user-friendly matrix Hamiltonians, *J. Phys.: Conf. Ser.*, to appear
8. Vladimir Lotoreichik: Improved inequalities between Dirichlet and Neumann eigenvalues of the biharmonic operator, *Proc. Amer. Math. Soc.*, to appear

(c) Other papers, published and accepted in 2023, or shortly before

1. Jussi Behrndt, Vladimir Lotoreichik, Peter Schlosser: Schrödinger operators with delta-potentials supported on unbounded Lipschitz hypersurfaces, in *From Complex Analysis to Operator Theory: A Panorama*.

- In Memory of Sergey Naboko* (M. Brown, F. Gesztesy, P. Kurasov, A. Laptev, B. Simon, G. Stolz, and I. Wood, eds.), *Operator Theory: Advances and Applications*, vol.291, Birkhäuser 2023; pp. 123–150
2. Goce Chadzitaskos: An asymmetric harmonic oscillator, in *Geometric Methods in Physics XXXIX* (P. Kielanowski, A. Dobrogowska, A., G.A. Goldin, T. Golinski, eds.), *Trends in Mathematics*, Birkhäuser, Cham 2023; pp. 47–55
 3. Lubomíra Dvořáková, Jana Lepšová: Critical exponents of regular Arnoux-Rauzy sequences, in *Proceedings of Combinatorics on Words* (A.E. Frid, R. Mercas, eds.), *Lecture Notes in Computer Science 13911*, Springer 2023, pp. 130–142
 4. Lubomíra Dvořáková, Martin Mašek, Edita Pelantovová: On a class of 2-balanced sequence, in *Proceedings of Combinatorics on Words* (A.E. Frid, R. Mercas, eds.) *Lecture Notes in Computer Science 13911*, Springer 2023, pp. 143–154
 5. Pavel Exner, Jiří Lipovský: Spectral transition model with the general contact interaction, in *From Complex Analysis to Operator Theory: A Panorama. In Memory of Sergey Naboko* (M. Brown, F. Gesztesy, P. Kurasov, A. Laptev, B. Simon, G. Stolz, and I. Wood, eds.), *Operator Theory: Advances and Applications*, vol.291, Birkhäuser 2023; pp. 523–547
 6. Dirk Hundertmark, Michal Jex, Markus Lange: Quantum systems at the brink, in *Quantum Mathematics I* (M. Correggi, M. Falconi, eds.), *Springer INdAM Series*, vol. 57, Springer 2023; pp. 259–263
 7. Zuzana Masáková, Edita Pelantová, Katarína Studeničová: Rewriting rules for arithmetics in alternate base systems, in *Proceedings of Developments in Language Theory* (M. Volkov, F. Drewes, eds.), *Lecture Notes in Computer Science 13899*, Springer 2023, pp. 195–207
 8. Pierre-Adrien Tahay: Characteristic sequences of the sets of sums of squares as columns of cellular automata, in *Proceedings of Combinatorics on Words* (A.E. Frid, R. Mercas, eds.) *Lecture Notes in Computer Science 13911*, Springer 2023, pp. 288–300

(d) Submitted in 2023, not yet accepted

1. Marzieh Baradaran, Pavel Exner: Cairo lattice with time-reversal non-invariant vertex couplings, [arXiv:2312.13827](https://arxiv.org/abs/2312.13827) [math.SP]

2. Jussi Behrndt, Pavel Exner, Markus Holzmann, Matej Tušek: On two-dimensional Dirac operators with delta-shell interactions supported on unbounded curves with straight ends, [arXiv:2312.00181](#) [math.SP]
3. Jussi Behrndt, Iveta Semorádová, Petr Siegl: The imaginary Airy operator with a one-center δ -interaction, *Pure Appl. Funct. Anal.*, to appear
4. James Currie, Ľubomíra Dvořáková, Pascal Ochem, Daniela Opočenská, Narad Rampersad, Jeffrey Shallit: Complement avoidance in binary words, [arXiv:2209.09598](#) [math.CO]
5. Charlotte Dietze, Ayman Kachmar, Vladimir Lotoreichik: Isoperimetric inequalities for inner parallel curves, [arXiv63:2311.18413](#) [math.SP]
6. Ľubomíra Dvořáková, Veronika Hendrychová: String attractors of Rote sequences, [arXiv:2308.00850](#) [math.CO]
7. Ľubomíra Dvořáková, Pascal Ochem, Daniela Opočenská: Critical exponent of binary words with few distinct palindromes, [arXiv:2311.13003](#) [math.CO]
8. Ľubomíra Dvořáková, Edita Pelantová: The repetition threshold of episturmian sequences, [arXiv:2309.00988](#) [math.CO]
9. Pavel Exner, David Spitzkopf: Tunneling in soft waveguides: closing a book, [arXiv:2307.01536](#) [math.SP]
10. Dale Frymark, Markus Holzmann, Vladimir Lotoreichik: Spectral analysis of the Dirac operator with a singular interaction on a broken line, [arXiv63:2306.04976](#) [math.SP]
11. Lukáš Heriban, Matěj Tušek: Non-local relativistic δ -shell interactions, [arXiv:2311.02638](#) [math-ph]
12. Michal Jex, Mathieu Lewin, Peter S. Madsen: Classical density functional theory: the local density approximation, [arXiv:2310.18028](#) [math-ph]
13. David Krejčířík, Vladimir Lotoreichik: Optimisation and monotonicity of the second Robin eigenvalue on a planar exterior domain, [arXiv:230714286](#) [math.SP]
14. Jiří Lipovský, Tomáš Macháček: The role of the branch cut of the logarithm in the definition of the spectral determinant for non-selfadjoint operators, *Acta Physica Polonica A*, to appear
15. Zuzana Masáková, Edita Pelantová, Katarína Studeničová: Finiteness property in Cantor real numeration systems with alternate base, submitted

16. Jaroslav Novotný, Jirí Maryška, Igor Jex: Jaynes principle for quantum Markov processes: Generalized Gibbs–von Neumann states rule, [arXiv:2307.14695](#) [quant-ph]
17. Miloslav Znojil: Discrete-coordinate crypto-Hermitian quantum system controlled by time-dependent Robin boundary conditions, submitted
18. Miloslav Znojil: Calogero model without rearrangement symmetry, [arXiv:2312.13667](#) [nlin.SI]