Doppler Institute

for Mathematical Physics and Applied Mathematics

2021 List of Publications

(a) Monographs, edited volumes, book chapters

1. Pavel Exner, Rupert L. Frank, Fritz Gesztesy, Helge Holden, Timo Weidl, *eds.*: *Partial Differential Equations, Spectral Theory, and Mathematical Physics. The Ari Laptev Anniversary Volume*, xii+481 p.; EMS Press, Berlin 2021.

(b) Research papers in journals

(b1) Papers accepted and published in 2021

1. Petr Ambrož, Zuzana Masáková, Edita Pelantová: Lattice bounded distance equivalence for 1D Delone sets with finite local complexity, *Journal of Geometry and Symmetry in Physics* **59** (2021), 1–29
2. Marzieh Baradaran, Pavel Exner, Miloš Tater: Ring chains with vertex coupling of a preferred orientation, *Rev. Math. Phys.* **33** (2021), 2060005
3. Jussi Behrndt, Andrii Khrabustovskyi: Singular Schrödinger operators with prescribed spectral properties, *J. Funct. Anal.* **282** (2022), 109252
4. Denis I. Borisov: Perturbations of the continuous spectrum of a certain nonlinear two-dimensional operator sheaf, *J. Math. Sci.* **252** (2021), 135–146
5. Denis I. Borisov: Quantum graphs with small edges: holomorphy of resolvents, *Doklady Math.* **103** (2021), 113–117
6. Denis I. Borisov: Spectra of elliptic operators on quantum graphs with small edges, *Mathematics* **9** (2021), 1874

7. Denis I. Borisov, Giuseppe Cardone, Gregory A. Chechkin, Yulia O. Koroleva: On elliptic operators with Steklov condition perturbed by Dirichlet condition on a small part of boundary, *Calc. Var. PDE* **60** (2021), 48
8. Denis I. Borisov, A.I. Mukhametrakhimova: Uniform convergence and asymptotics for problems in domains finely perforated along a prescribed manifold in the case of the homogenized Dirichlet condition, *Sbornik Math.* **212** (2021), 1068-1121
9. Denis I. Borisov, Dimitry A. Zezyulin, Miloslav Znojil: Bifurcations of thresholds in essential spectra of elliptic operators under localized non-Hermitian perturbations, *Studies in Applied Mathematics* **146** (2021), 834–880
10. Miguel Castillo-Celeita, Vít Jakubský: Reduction scheme for coupled Dirac systems, *J. Phys. A: Math. Theor.* **54** (2021), 455301
11. Dalibor Cimr, Filip Studnička, Hamido Fujita, Hana Tomášková, Richard Cimler, Jitka Kühnová, Jan Šlégr: Computer aided detection of breathing disorder from ballistocardiography signal using convolutional neural network, *Information Sciences* **541** (2020), 207-217
12. Dalibor Cimr, Filip Studnička, Hamido Fujita, Richard Cimler, Jan Šlégr: Application of mechanical trigger for unobtrusive detection of respiratory disorders from body recoil micro-movements, *Computer Methods and Programs in Biomedicine* **207** (2021), 106149
13. Monique Dauge, Michal Jex, Vladimir Lotoreichik: Trace Hardy inequality for the Euclidean space with a cut and its applications, *J. Math. Anal. Appl.* **500** (2021), 125124
14. Pavel Exner, Takashi Ichinose: Note on a product formula related to quantum Zeno dynamics, *Ann. H. Poincaré* **22** (2021), 1669–1697; correction 1699–1700
15. Pavel Exner, Vladimir Lotoreichik: Optimization of the lowest eigenvalue of a soft quantum ring, *Lett. Math. Phys.* **111** (2021), 28
16. Pavel Exner, Miloš Tater: Quantum graphs: self-adjoint, and yet exhibiting a nontrivial $\mathcal{PT}$-symmetry, *Phys. Lett.* **A416** (2021), 127669
17. Fatima Z. Goffi, Andrii Khrabustovskyi, Ramakrishna Venkitakrishnan, Carsten Rockstuhl, Michael Plum: Higher order constitutive relations and interface conditions for metamaterials with strong spatial dispersion, *Phys. Lett.* **A412** (2021), 127570

18. Somayyeh Hassanabadi, Jan Kříž, Won Sang Chung, Bekir Can Lüftüoglu, Ehsan Masgoodi, Hassan Hassanabadi: Thermodynamics of the Schwarzschild and Reissner-Nordstrom black holes under higher-order generalized uncertainty principle, *Eur. Phys. J. Plus* **136** (2021), 918
19. Hassan Hassanabadi, Soroush Zare, Jan Kříž, Bekir Can Lüftüoglu: Electric quadrupole moment of a neutral non-relativistic particle in the presence of screw dislocation, *EPL* **132** (2020), 60005
20. Somayyeh Hassanabadi, Soroush Zare, Bekir Can Lüftüoglu, Jan Kříž, Hassan Hassanabadi: Duffin-Kemmer-Petiau particles in the presence of the spiral dislocation, *Int. J. Mod. Phys.* **A36** (2021), 2150100
21. Mansoureh Hosseinpour, Hassan Hassanabadi, Jan Kříž, Somayyeh Hassanabadi, Bekir Can Lüftüoglu: Interaction of the generalized Duffin-Kemmer-Petiau equation with a non-minimal coupling under the cosmic rainbow gravity, *Int. J. Geom. Meth. Mod. Phys.* **18** (2021), 2150224
22. Andrii Khrabustovskyi, Olaf Post: A geometric approximation of delta-interactions by Neumann Laplacians, *J. Phys. A: Math. Theor.* **54** (2021), 465201
23. Tamás Kiss, Igor Jex: Photons walk on fractal graphs, *Nature Photonics* **25** (2021), 641–642
24. Sylwia Kondej, David Krejčiřík, Jan Kříž: Soft quantum waveguides with an explicit cut-locus, *J. Phys. A: Math. Theor.* **54** (2021), 30LT01
25. Norio Konno, Etsuo Segawa, Martin Štefanák: Relation between quantum walks with tails and quantum walks with sinks on finite graphs, *Symmetry* **13** (2021), 1169
26. Ondřej Kubů, Antonella Marchesiello, Libor Šnobl: Superintegrability of separable systems with magnetic field: the cylindrical case, *J. Phys. A: Math. Theor.* **54** (2021), 425204
27. Clément Lagisquet, Edita Pelantová, Sébastien Tavenas, Laurent Vuillon: On the Markov numbers: fixed numerator, denominator, and sum conjectures, *Adv. Appl. Math.* **130** (2021), 102227
28. Michal Ławniczak, Jiří Lipovský, Małgorzata Białous, Leszek Sirko: Application of topological resonances in experimental investigation of a Fermi golden rule in microwave networks, *Phys. Rev.* **E103** (2021), 032208
29. Bekir Can Lüftüoglu, Jan Kříž, Soroush Zare, Hassan Hassanabadi: Interaction of the magnetic quadrupole moment of a non-relativistic

particle with an electric field in the background of screw dislocations with a rotating frame, *Physica Scripta* **96** (2021), 015005

30. Zuzana Masáková, Élise Vandomme: Redundance in the signed m-bonacci numeration system, *J. of Integer Sequences* **24** (2021), 21.7.2
31. Arnošt Mládek, Václav Gerla, Petr Šeba, Vladimír Kolář, Petr Skalický, Helen Whitley, Lenka Lhotská, Vladimír Beneš, Ondřej Bradáč: From head micro-motions towards CSF dynamics and non-invasive intracranial pressure monitoring, *Scientific Reports* **11** (2021), 14349
32. Jaroslav Novotný, Angelo Mariano, Saverio Pascazio, Antonello Scardicchio, Igor Jex: Relaxation to equilibrium in a quantum network, *Phys. Rev.* **A103** (2021), 042218
33. Edita Pelantová, Štěpán Starosta: On Sturmian substitutions closed under derivation, *Theoretical Computer Science* **867** (2021), 128-139
34. Edita Pelantová, Tomáš Vávra: On positional representation of integer vectors, *Linear Algebra and its Applications* **633** (2021), 316–331
35. František Růžička, Kaustubh S. Agarwal, Yogesh N. Joglekar: Conserved quantities, exceptional points, and antilinear symmetries in non-Hermitian systems, *J. Phys.: Conf. Ser.* **2038** (2021), 012021
36. Boris Shapiro, Miloš Tater: On spectral asymptotic of quasi-exactly solvable quartic potential, *Analysis and Mathematical Physics* **12** (2022), 2
37. Stanislav Skoupý, Martin Štefanák: Quantum-walk-based state-transfer algorithms on the complete M-partite graph, *Phys. Rev.* **A103** (2021), 042222
38. František Štampach, Pavel Štovíček: New explicitly diagonalizable Hankel matrices related to the Stieltjes-Carlitz polynomials, *Integr. Eqs Oper. Theory* **93** (2021), 29
39. Daniel Uzcátegui Contrera, Dardo Goyeneche, Ondřej Turek, Zuzana Václavíková: Circulant matrices with orthogonal rows and off-diagonal entries of absolute value 1, *Comm. in Mathematics* **29** (2021), 15–34
40. Miloslav Znojil: Quantum phase transitions mediated by clustered non-Hermitian degeneracies, *Phys. Rev.* **E103** (2021), 032120
41. Miloslav Znojil: Paths of unitary access to exceptional points, *J. Phys.: Conf. Ser.* **2038** (2021), 012026
42. Miloslav Znojil: Exceptional points and domains of unitarity for a class of strongly non-Hermitian real-matrix Hamiltonians, *J. Math. Phys.* **62** (2021), 052103

43. Miloslav Znojil: Avoided level crossings in quasi-exact approach, *Nucl. Phys.* **B967** (2021), 115431
44. Miloslav Znojil: Bose-Einstein condensation processes with nontrivial geometric multiplicites realized via $\mathcal{PT}$-symmetric and exactly solvable linear-Bose-Hubbard building blocks, *Quantum Rep.* **3** (2021), 517–533
45. Miloslav Znojil: Quantum mechanics using two auxiliary inner products, *Phys. Lett.* **A421** (2021), 127792

(b2) Accepted earlier, published in 2021, or shortly before

1. Petr Ambrož, Zuzana Masáková: Description of Voronoi tiles in quasicrystals with 8-fold symmetry, *J. Phys.: Conf. Ser.* **1458** (2020), 012007
2. Pedro R.S. Antunes, Rafael D. Benguria, Vladimir Lotoreichik, Thomas Ourmieres-Bonafos: A variational formulation for Dirac operators in bounded domains. Applications to spectral geometric inequalities, *Commun. Math. Phys.* **386** (2021), 781–818
3. Diana Barseghyan, Pavel Exner: Magnetic field influence on the discrete spectrum of locally deformed leaky wires, *Rep. Math. Phys.* **87** (2021), 47–57
4. Denis I. Borisov, Pavel Exner: Gap opening in two-dimensional periodic systems, *Commun. Contemp. Math.* **23** (2021), 1950080
5. Denis I. Borisov, Maral N. Konyrkulzhaeva: On infinite system of resonances and eigenvalues with exponential asymptotics generated by distant perturbations, *Ufa Math. J.* **12** (2020), 3–18
6. Juan Bory Reyes, Diana Barseghyan, Baruch Schneider: Dirichlet-type problems for certain Beltrami equations, *Mediterranean Journal of Mathematics* **18** (2021), 1–15
7. Won Sang Chung, Hassan Hassanabadi, Jan Kříž: Newton equation and Schrodinger equation for the harmonic oscillator with probability distributions in frequency, *Physica* **A558** (2020), 124967
8. Won Sang Chung, Soroush Zare, Hassan Hassanabadi, Jan Kříž, Ehsan Masgoodi: The investigation of a classical particle in the presence of fractional calculus, *Revista Mexicana de Fisica* **66** (2020), 840–847
9. Rupert L. Frank, Dirk Hundertmark, Michal Jex, Phan Thanh Nam: The Lieb-Thirring inequality revisited *J. Eur. Math. Soc.* **23** (2021), 2583–2600

10. Andrii Khrabustovskyi: Periodic quantum graphs with predefined spectral gaps, *J. Phys. A: Math. Theor.* **53** (2020), 405202
11. Andrii Khrabustovskyi, Imen Rassas, Eric Soccorsi: The inverse problem of two-state quantum systems with non-adiabatic static linear coupling, *Comm. Contemp. Math.* **23** (2021), 2050002
12. David Krejčiřík, Vladimir Lotoreichik, Konstantin Pankrashkin, Matěj Tušek: Spectral analysis of the multi-dimensional diffusion operator with random jumps from the boundary, *Journal of Evolution Equations* **21** (2021), 1651–1675
13. Vladimir Lotoreichik, Alessandro Michelangeli: Faber-Krahn inequalities for Schrödinger operators with point and with Coulomb interactions, *J. Math. Phys.* **62** (2021), 012105
14. Zuzana Masáková, Jan Mazáč, Edita Pelantová: On generalized self-similarities of cut-and-project sets, *Linear Algebra and Applications* **625** (2021), 279–321
15. Miloslav Znojil, František Růžička: Multi-well log-anharmonic oscillators *Mod. Phys. Lett.* **A34** (2020), 1950085

(c) Accepted for publication in 2021

1. Diana Barseghyan, Baruch Schneider, Ly Hong Hai: Dirichlet-type problems for certain Beltrami equations, *Mediterranean Journal of Mathematics* (2022), to appear
2. Jussi Behrndt, Markus Holzmann, Vladimir Lotoreichik, Georgi Raikov: The fate of Landau levels under delta-interactions, *J. Spect. Theory*, to appear
3. Miguel Castillo-Celeita, Vít Jakubský, Kevin Zelaya: Confinement in bilayer graphene via intra- and inter-layer interactions, *J. Phys. A: Math. Theor.* **55** (2022), to appear
4. Vladimír Ježek, Jiří Lipovský: Application of quotient graph theory to three-edge star graphs, *Acta Phys. Polonica A*, to appear
5. Magda Khalile, Vladimir Lotoreichik: Spectral isoperimetric inequalities for Robin Laplacians on 2-manifolds and unbounded cones, *J. Spect. Theory*, to appear
6. Zuzana Masáková, Tomáš Vávra, Francesco Veneziano: Finiteness and periodicity of continued fractions over quadratic number fields, *Bull. Soc. Math. France* (2022), to appear

(d) Other papers, published and accepted in 2021, or shortly before

1. Pavel Exner: Leaky quantum structures, *Trudy MIAN* **311** (2020), 123–139; *Proc. Steklov Inst.* **311** (2020), 114–128
2. Pavel Exner: Quantum graphs with vertices violating the time reversal symmetry (in Russian), *Phys. Elem. Part. Atom. Nucl.* **52** (2021), 645–657; English version **52** (2021), 330–336
3. Vladimir Lotoreichik: Spectral isoperimetric inequality for the δ'-interaction on a contour, in *Mathematical Challenges of Zero-Range Physics* (A.Michelangeli, ed.), Springer INdAM Series, vol. 42, 2021; pp. 3–15

(e) Submitted in 2021, not yet accepted

1. Marzieh Baradaran, Pavel Exner: Kagome network with vertex coupling of a preferred orientation, `arXiv:2106.16019 [math-ph]`
2. Marzieh Baradaran, Pavel Exner, Miloš Tater: Spectrum of periodic chain graphs with time-reversal non-invariant vertex coupling, `arXiv:2012.14344 [math-ph]`
3. Jussi Behrndt, Vladimir Lotoreichik, Peter Schlosser: Optimization of the lowest eigenvalue for the Schrödinger operator with a δ-potential supported on a hyperplane, `arXiv:2105.05579 [math.SP]`
4. Biagio Cassano, Vladimir Lotoreichik, Albert Mas, Matěj Tušek: General δ-shell interactions for the two-dimensional Dirac operator: self-adjointness and approximation, `arXiv:2102.09988 [math.AP]`
5. Goce Chadzitaskos: On the influence of rings on orbital velocities, `arXiv:2106.07325 [astro-ph]`
6. Jaroslav Dittrich: Measurement of a quantum particle position at two distant locations, *submitted*
7. Francesco Dolce, Ľubomira Dvořáková, Edita Pelantová: On balanced sequences and their critical exponent, `arXiv:2103.02599 [math.NT]`
8. Ľubomira Dvořáková, Daniela Opočenská, Edita Pelantová, Arseny M. Shur.: On minimal critical exponent of balanced sequences, `arXiv:2112.02854 [math.CO]`
9. Pavel Exner: Soft quantum waveguides in three dimensions, `arXiv:13142 [math.SP]`

10. Pavel Exner, Markus Holzmann: Dirac operator spectrum in tubes and layers with a zigzag type boundary, arXiv:2112.08109 [math.SP]
11. Pavel Exner, Jiří Lipovský: Spectral transition model with the general contact interaction, *submitted*
12. Dale Frymark, Vladimir Lotoreichik: Self-adjointness of the 2D Dirac operator with singular interactions supported on star-graphs, arXiv:2111.09617 [math.SP]
13. Craig S. Hamilton, Regina Kruse, Sonja Barkhofen, Stephen M. Barnett, Igor Jex, Christine Silberhorn: Quantum state creation in nonlinear waveguide arrays, *submitted*
14. Dirk Hundertmark, Michal Jex, Markus Lange: Quantum systems at the brink. Existence and decay rates of bound states at thresholds; Critical potentials and dimensionality, arXiv:1908.05016 [math-ph]
15. Vít Jakubský, Sengul Kuru, Javier Negro: Dirac fermions in armchair graphene nanoribbons trapped by electric quantum dots, arXiv:2111.10829 [cond-mat]
16. Ayman Kachmar, Vladimir Lotoreichik: On the isoperimetric inequality for the magnetic Robin Laplacian with negative boundary parameter, arXiv:2108.05256 [math.SP]
17. Andrii Khrabustovskyi, Michael Plum: Operator estimates for homogenization of the Robin Laplacian in a perforated domain, arXiv:2106.10216 [math.AP]
18. Atilla Portik, Orsolya Kálmán, Igor Jex, Tamás Kiss: Iterated nth order nonlinear quantum dynamics with mixed initial states, *submitted*
19. Kyle Scarbrough: Canonical systems and quantum graphs, arXiv:2112.09558 [math.SP]
20. Iveta Semorádová, Petr Siegl: Diverging eigenvalues in domain truncations of Schrödinger operators with complex potentials, arXiv:2107.10557 [math.SP]