Doppler Institute

for Mathematical Physics and Applied Mathematics

2015 List of Publications

(a) Monographs, edited volumes, book chapters

1. Pavel Exner, Hynek Kovařík: *Quantum Waveguides*, xxii+382 p.; Springer International, Heidelberg 2015 (ISBN: 978-3-319-18575-0).
2. F. Bagarello, J.-P. Gazeau, F.H. Szafraniec, and M. Znojil, eds.: *Non-Selfadjoint Operators in Quantum Physics: Mathematical Aspects*, 432p.; J. Wiley & Sons 2015 (ISBN: ISBN: 978-1-118-85528-7)
3. Pavel Exner: *Functional analysis*, in "Mathematical Tools for Physicists" (M. Grinfeld, ed.), Wiley Wiley, Weinheim 2015; pp. 449–474.
4. David Krejčiřík, Petr Siegl: *Elements of spectral theory without the spectral theorem*, in *op. cit.*, pp. 241–292.
5. Miloslav Znojil: *Non-selfadjoint operators in quantum physics: ideas, people and trends*, in *op. cit.*, pp. 1–57.

(b) Research papers in journals

(b1) Accepted and published in 2015

1. Bijan Bagchi, Subhrajit Modak, Prasanta K. Panigrahi, František Růžička, Miloslav Znojil: Exploring branched Hamiltonians for a class of nonlinear systems, *Mod. Phys. Lett.* **A30** (2015), 1550213
2. Diana Barseghyan, Andrii Khrabustovskyi: Spectral analysis of a class of Schrodinger operators exhibiting a parameter-dependent spectral transition, *J. Phys. A: Math. Theor.* **48** (2015), 255201

3. Pavel Bažant, Holger Frydrych, Gernot Alber, Igor Jex: Suppressing systematic control errors to high orders, *Phys. Rev.* **A92** (2015), 022325
4. Jussi Behrndt, Gerd Grubb, Matthias Langer, Vladimir Lotoreichik: Spectral asymptotics for resolvent differences of elliptic operators with delta and delta'-interactions on hypersurfaces, *J. Spect. Theory* **5** (2015), 697–729.
5. Vyacheslav B. Belyaev, Paolo Ricci, Fedor Šimkovic, Jiří Adam, Jr., Miloš Tater, Emil Truhlík: Consequence of total lepton number violation in strongly magnetized iron white dwarfs, *Nucl. Phys.* **B937** (2015), 17–43.
6. Iva Bezděková, Martin Štefaňák, Igor Jex: Suitable bases for quantum walks with Wigner coins, *Phys. Rev.* **A92** (2015), 022347
7. Denis I. Borisov: On the band spectrum of a Schrödinger operator in a periodic system of domains coupled by small windows, *Russ. J. Math. Phys.* **22** (2015), 153–160.
8. Denis I. Borisov: Perturbation of threshold of essential spectrum for waveguides with windows. II: Asymptotics, *J. Math. Sciences* **210** (2015), 590–621.
9. Denis I. Borisov: The emergence of eigenvalues of a PT-symmetric operator in a thin strip, *Math. Notes* **98** (2015), 872–883.
10. Denis I. Borisov, František Růžička, Miloslav Znojil: Multiply degenerate exceptional points and quantum phase transitions, *Int. J. Theor. Phys.* **54** (2015), 4293–4305.
11. Philippe Briet, Hiba Hammedi, David Krejčiřík: Hardy inequalities in globally twisted waveguides, *Lett. Math. Phys.* **105** (2015), 939–958.
12. Francisco Correa, Vít Jakubský, Mikhail S. Plyushchay: $\mathcal{PT}$-symmetric invisible defects and confluent Darboux-Crum transformations, *Phys. Rev.* **A92** (2015), 023839
13. Agnieszka Dołhanczuk-Środka, Zbigniew Ziembik, Jan Kříž, Lidmila Hyšplerová, Maria Wacławek: Pb-210 isotope as a polutant indicator, *Ecol. Chem. Eng.* **S22** (2015), 73–81.
14. Daniel Dombek, Zuzana Masáková, Tomáš Vávra: Confluent Parry numbers, integers in positive and negative non-integer base and conjugated morphisms, *J. Théorie Nombres de Bordeaux* **27** (2015), 745–768.
15. Pavel Exner, Andrii Krabustovskyi: On the spectrum of narrow Neumann waveguide with periodically distributed δ' traps, *J. Phys. A: Math. Theor.* **48** (2015), 315301

16. Pavel Exner, Sylwia Kondej: Gap asymptotics in a weakly bent leaky quantum wire, *J. Phys. A: Math. Theor.* **48** (2015), 495301
17. Pavel Exner, Stěpan Manko: Spectra of magnetic chain graphs: coupling constant perturbations, *J. Phys. A: Math. Theor.* **48** (2015), 125302
18. Pedro Freitas, David Krejčiřík: The first Robin eigenvalue with negative boundary parameter, *Adv. Math.* **280** (2015), 322–339.
19. Vít Jakubský: Spectrally isomorphic Dirac systems: graphene in electromagnetic field, *Phys. Rev.* **D91** (2015), 045039
20. Bálint Kollár, Tamás Kiss, Igor Jex: Strongly trapped two-dimensional quantum walks, *Phys. Rev.* **A91** (2015), 022308
21. David Krejčiřík: Waveguides with asymptotically diverging twisting, *Appl. Math. Lett.* **46** (2015), 7–10.
22. David Krejčiřík, Petr Siegl, Miloš Tater, Joe Viola: Pseudospectra in non-Hermitian quantum mechanics, *J. Math. Phys.* **56** (2015), 103513
23. Regina Kruse, Linda Sansoni, Sebastian Brauner, Raimund Ricken, Craig S. Hamilton, Igor Jex, Christine Silberhorn: Dual-path source engineering in integrated quantum optics, *Phys. Rev.* **A92** (2015), 053841
24. Vladimir Lotoreichik, Jonathan Rohleder: An eigenvalue inequality for Schrodinger operators with δ and δ'-interactions supported on hypersurfaces, *Oper. Theory Adv. Appl.* **247** (2015), 173–184.
25. Antonella Marchesiello, Sarah Post, Libor Šnobl: Third-order superintegrable systems with potentials satisfying only nonlinear equations, *J. Math. Phys.* **56** (2015), 102104
26. Antonella Marchesiello, Libor Šnobl, Pavel Winternitz: Three-dimensional superintegrable systems in a static electromagnetic field, *J. Phys. A: Math. Theor.* **48** (2015), 395206
27. Jiří Maryška, Jaroslav Novotný, Igor Jex : Dominant couplings in qubit networks with controlled interactions, *J. Phys. A: Math. Theor.* **48** (2015), 215301
28. Alexander Minakov: Riemann-Hilbert problem for Camassa-Holm equation with step-like initial data, *J. Math. Anal. Appl.* **429** (2015), 81—104.
29. Radek Novák: On the pseudospectrum of the harmonic oscillator with imaginary cubic potential, *Int. J. Theor. Phys.* **54** (2015), 4142–4153.
30. Satoshi Ohya: BPS monopole in the space of boundary conditions, *J. Phys. A: Math. Theor.* **48** (2015), 505401

31. František Štampach, Pavel Šťovíček: The Nevanlinna parametrization for q-Lommel polynomials in the indeterminate case, *J. Approx. Theory* **201** (2016), 48–72.
32. František Štampach, Pavel Šťovíček: Special functions and spectrum of Jacobi matrices, *Linear Alg. Appl.* **464** (2015), 38–61.
33. Ondřej Turek: Abelian complexity function of the Tribonacci word, *J. Integer Seq.* **18** (2015), 15.3.4
34. Miloslav Znojil: $\mathcal{PT}$-symmetric model with an interplay between kinematical and dynamical non-localities, *J. Phys. A: Math. Theor.* **48** (2015), 195303
35. Miloslav Znojil: Quantum control and the challenge of non-Hermitian model-building, *J. Phys.: Conf. Ser.* **624** (2015), 012011
36. Miloslav Znojil: Non-Hermitian Heisenberg representation, *Phys. Lett.* **A379** (2015), 2013–2017.
37. Miloslav Znojil: Solvable quantum lattices with nonlocal non-Hermitian endpoint interactions, *Ann. Phys.* **361** (2015), 226–246.

(b2) Accepted earlier, published in 2015, or shortly before

1. Adrian Arancibia, Francisco Correa, Vít Jakubský, Juan Mateos Guilarte, Mikhail S.Plyushchay: Soliton defects in one-gap periodic system and exotic supersymmetry, *Phys. Rev.* **D90** (2014), 125041
2. Martin Bureš, Petr Siegl: Hydrogen atom in space with a compactified extra dimension and potential defined by Gauss' law, *Ann. Phys.* **354** (2015), 316–327.
3. Francisco Correa, Vít Jakubský: Twisted kinks, Dirac transparent systems and Darboux transformations, *Phys. Rev.* **D90** (2014), 125003
4. Daniel Dombek, Zuzana Masáková, Volker Ziegler: On distinct unit generated fields that are totally complex, *J. Number Theory* **148** (2015), 311–327.
5. Pavel Exner, Ondřej Turek: Spectrum of a dilated honeycomb network, *Integral Equations and Operator Theory* **81** (2015), 535–557.
6. Francisco M. Fernández, Javier Garcia, Iveta Semorádová, Miloslav Znojil: Ad hoc physical Hilbert spaces in quantum mechanics, *Int. J. Theor. Phys.* **54** (2015), 4187–4203.
7. Pedro Freitas, David Krejčiřík: Alexandrov's isodiametric conjecture and the cut locus of a surface, *Tohoku Math. J.* **67** (2015), 405-417.

8. Amru Hussein, David Krejčiřík, Petr Siegl: Non-self-adjoint graphs, *Trans. AMS* **367** (2015), 2921–2957.
9. Vladimir Kotlyarov, Alexander Minakov: Modulated elliptic wave and asymptotic solitons in a shock problem to the modified Korteweg-de Vries equation, *J. Phys.A: Math. Theor.* **48** (2015), 305201
10. David Krejčiřík, Nicholas Raymond, Matěj Tušek: The magnetic Laplacian in shrinking tubular neighbourhoods of hypersurfaces, *J. Geom. Anal.* **25** (2015), 2546–2564.
11. David Krejčiřík, Matěj Tušek: Nodal sets of thin curved layers, *J. Diff. Eqs* **258** (2015), 281–301.
12. Zuzana Masáková, Kateřina Pastirčáková, Edita Pelantová: Description of spectra of quadratic Pisot units, *J. Number Theory* **150** (2015), 168–190.
13. Ondřej Turek: Abelian properties of Parry words, *Theor. Comput. Sci.* **566** (2015), 26–38.
14. Miloslav Znojil: Quantum star-graph analogues of PT-symmetric square wells. II: Spectra, *Can. J. Phys.* **93** (2015),765–768.

(c) Accepted for publication in 2015

1. Agata Bezubik, Jiří Hrivnák, Jiří Patera, Severín Pošta: Three-variable symmetric and antisymmetric exponential functions and orthogonal polynomials, *Math. Slovaca* **65** (2015), to appear
2. Jaroslav Dittrich, Pavel Exner, Christian Kühn, Konstantin Pankrashkin: On eigenvalue asymptotics for strong δ-interactions supported by surfaces with boundaries, *Asympt. Anal.*, to appear (`arXiv:1506.06583 [math-ph]`)
3. Ľubomíra Dvořáková, Josef Florian: On periodicity of generalized pseudostandard words, *El. J. Combinatorics*, to appear (`arXiv:1508.02020 [math.CO]`)
4. Fabian Elster, Sonja Barkhofen, Thomas Nitsche, Jan Novotný, Aurel Gábris, Igor Jex, Christine Silberhorn: Quantum walk coherences on a dynamical percolation graph, *Scientific Reports*, to appear
5. Pavel Exner, Sylwia Kondej: Strong coupling asymptotics for Schroedinger operators with an interaction supported by an open arc in three dimensions, *Rep. Math. Phys.*, to appear (`arXiv:1507.02123 [math-ph]`)

6. Raphael Henry, David Krejčiřík: Pseudospectra of the Schrödinger operator with a discontinuous complex potential, *J. Spect. Theory*, to appear (arXiv:1503.02478 [math.SP])
7. Orif O. Ibrogimov, Petr Siegl, Christiane Tretter: Analysis of the essential spectrum of singular matrix differential operators, *J. Diff. Eqs*, to appear (arXiv:1512.00759 [math.SP])
8. Michal Jex, Vladimir Lotoreichik: On absence of bound states for weakly attractive δ'-interactions supported on non-closed curves in $\mathbb{R}^2$, *J. Math. Phys.*, to appear (arXiv:1508.04577 [math-ph])
9. Karel Klouda, Kateřina Medková: Synchronizing delay for binary uniform morphisms, *Theor. Comp. Science*, to appear (arXiv:1507.05223 [math.CO])
10. Jiří Lipovský: Pseudo orbit expansion for the resonance condition on quantum graphs and the resonance asymptotics, *Acta Phys. Polonica A*, to appear (arXiv: 1507.06845 [math-ph])
11. Radek Novák: Bound states in waveguides with complex Robin boundary conditions, *Asympt. Anal.*, to appear (arXiv:1409.0626 [math-ph])
12. Jaroslav Novotný, Gernot Alber, Igor Jex : Universality in random quantum networks, *Phys. Rev.* A (2015), to appear
13. Edita Pelantová, Štěpán Starosta, Miloslav Znojil: Markov constant and quantum instabilities, *J. Phys. A: Math. Theor.*, to appear (arXiv:1510.02407 [math-ph])
14. Pavel Šťovíček, Tomáš Kalvoda: A family of explicitly diagonalizable weighted Hankel matrices generalizing the Hilbert matrix, *Lin. Multilin. Algebra* (2016), to appear (arXiv:1506.01064 [math.SP])

(d) Other papers, published and accepted in 2015, or shortly before

1. Jan Hlubík, Lenka Lhotská, Jan Kříž: Correctness of bioimpedance data for body composition obtained by BIA approach in various external conditions, in *IMBE Proceedings* **51** (2015), 1317–1320.
2. Rostyslav Hryniv, Stepan Manko: Inverse scattering for energy-dependent Schrödinger equations, in *Proceedings of the "Inverse Problems from Theory to Applications" Conference* (A. Louis, S. Arridge and B. Rundell, eds.), IOP Publishing 2014; pp. 57–61.

3. Michal Jex: Spectral asymptotics for a δ' interaction supported by an infinite curve, in *Mathematical Results in Quantum Mechanics: Proceedings of the QMath12 Conference* (P. Exner, H. Neidhardt, W. König, eds.), World Scientific, Singapore 2015; pp. 259–265.
4. Vladimir Lotoreichik, Hagen Neidhardt, Igor Yu. Popov: Point contacts and boundary triples, in *Mathematical Results in Quantum Mechanics: Proceedings of the QMath12 Conference* (P. Exner, H. Neidhardt, W. König, eds.), World Scientific, Singapore 2015; pp. 283-293
5. Stěpan Manko: On δ'-couplings at graph vertices, in *Mathematical Results in Quantum Mechanics: Proceedings of the QMath12 Conference* (P. Exner, H. Neidhardt, W. König, eds.), World Scientific, Singapore 2015; pp. 305–313.
6. Zuzana Masáková, Edita Pelantová, Štěpán Starosta: Interval exchange words and the question of Hof, Knill, and Simon, in *Proceedings of DLT 2015, Liverpool*, LNCS **9168** (2015), 377–388 (`arXiv:1503.03376 [math.CO]`)
7. Miloslav Znojil: Quantization of Big Bang in crypto-Hermitian Heisenberg picture, to appear in "Pseudo-Hermitian Operators in Quantum Physics", *Proceedings of PHHQP XIII* (F. Bagarello et al, eds.), Springer (`arXiv:1511.07610 [quant-ph]`)

(e) Submitted in 2015, not yet accepted

1. Jiří Adam, Jr., Vyacheslav B. Belyaev, Paolo Ricci, Fedor Šimkovic, Miloš Tater, Emil Truhlík: SMWDs as SGRs/AXPs and the lepton number violation, to appear in AIP Conf. Proc. (`arXiv:1512.01564 [astro-ph.SR]`)
2. Diana Barseghyan, Pavel Exner, Andrii Khrabustovskyi, Miloš Tater: Spectral analysis of a class of Schrödinger operators exhibiting a parameter-dependent spectral transition, *J. Phys. A: Math. Theor.*, submitted (`arXiv:1511.00097 [math-ph]`)
3. Diana Barseghyan, Pavel Exner, Hynek Kovařík, Timo Weidl: Semiclassical bounds in magnetic bottles *Rev. Math. Phys.*, submitted (`arXiv:1501.02950 [math-ph]`)
4. Jussi Behrndt, Matthias Langer, Vladimir Lotoriechik, Jonathan Rohleder: Quasi boundary triples and semibounded self-adjoint extensi-

ons, submitted
(arXiv:1504.03885 [math.SP])

5. Sabine Bögli, Petr Siegl, Christiane Tretter: Approximations of spectra of Schrödinger operators with complex potentials on $\mathbb{R}^d$, submitted (arXiv:1512.01826 [math.SP])
6. Marta Brzicová, Christiane Frougny, Edita Pelantová, Milena Svobodová: On-line multiplication and division in real and complex bases, *IEEE Arith.*, submitted
7. Goce Chadzitaskos, Lenka Háková, Ondrej Kájínek: Orbit functions and convolutions in image processing, *IEEE Trans.*, submitted
8. Goce Chadzitaskos, Marzena Szajewska, Jiří Patera: Vibration of polytopes, *Eur. J. Phys. B*, submitted
9. Tomáš Dohnal, Petr Siegl: Analysis of the essential spectrum of singular matrix differential operators, submitted (arXiv:1504.00054 [math.SP])
10. Pavel Exner, Vladimir Lotoreichik: A spectral isoperimetric inequality for cones, *Lett. Math. Phys.*, submitted (arXiv:1512.01970 [math.SP])
11. Pavel Exner, Stěpan Manko: Spectral properties of magnetic chain graphs, *Ann. H. Poincaré*, submitted (arXiv:1507.00608 [math-ph])
12. Pavel Exner, Jonathan Rohleder: Generalized interactions supported on hypersurfaces, *J. Math. Phys.*, submitted (arXiv:1511.06903[math-ph])
13. Pavel Exner, Semjon Vugalter: On the existence of bound states in asymmetric leaky wires, *J. Math. Phys.*, submitted (arXiv:1505.02347 [math-ph])
14. Luca Fanelli, David Krejčiřík, Luis Vega: Spectral stability of Schrödinger operators with subordinated complex potentials, submitted (arXiv:1506.01617 [math.SP])
15. Christiane Frougny, Edita Pelantová: β-representations of 0 and Pisot numbers, submitted
16. András Gilyén, Tamás Kiss, Igor Jex: Exponential sensitivity and its cost in quantum physics, *Sci. Rep.*, submitted (arXiv:1508.03191 [quant-ph])
17. Tomáš Hejda: Multiple tilings associated to d-Bonacci β-expansions, submitted (arXiv:1503.07744 [math.CO])
18. Martin Kolb, David Krejčiřík: Spectral analysis of the diffusion operator with random jumps from the boundary, submitted (arXiv:1507.08487 [math.SP])

19. Jiří Kracík, Hynek Lavička: Fluctuation analysis of high frequency power load in the Czech Republic, *Physica A*, submitted
20. David Krejčiřík: The Hardy inequality and the heat flow in curved wedges, submitted (`arXiv:1507.03627 [math.SP]`)
21. Jiří Lipovský: On the effective size of a non-Weyl graph, submitted (`arXiv: 1507.04176 [math-ph]`)
22. Vladimir Lotoreichik, Thomas Ourmières-Bonafos: On the bound states of Schrodinger operators with δ-interactions on conical surfaces, submitted (`arXiv:1510.05623 [math.SP]`)
23. Zuzana Masáková, Edita Pelantová, Štěpán Starosta: Exchange of three intervals: itineraries, substitutions and palindromicity, submitted
24. Tomáš Vávra, Francesco Veneziano: Number fields generated by Pisot units, submitted