Doppler Institute: Activities in 2005

Without being scared by the unlucky number, let us tell you what we did in our thirteenth year.

1 Basic information

1.1 Members to date

Č. Burdík, Dept of Mathematics, FNSPE, Czech Technical Univ, Prague
G. Chadzitaskos, Dept of Physics, FNSPE, Czech Technical Univ, Prague
J. Dittrich, Nuclear Physics Institute, AS, Prague/Rež
P. Exner, Nuclear Physics Institute, AS, Prague/Rež
M. Havlíček, Dept of Mathematics, FNSPE, Czech Technical Univ, Prague
L. Hlavatý, Dept of Physics, FNSPE, Czech Technical University, Prague
P. Šeba, Institute of Physics, AS, Prague
P. Štovíček, Dept of Mathematics, FNSPE, Czech Technical Univ, Prague
J. Tolar, Director, Dept of Phys, FNSPE, Czech Technical Univ, Prague
M. Znojil, Nuclear Physics Institute, AS, Prague/Rež

1.2 Advisory board

S.A. Albeverio, Universitä Bonn, Germany
J.E. Avron, Technion, Haifa, Israel
M.S. Birman, St. Petersburg University, Russia
J.-M. Combes, Université de Toulon et du Var, France
H.D. Doebner, Technische Universität Clausthal, Germany
J.R. Klauder, University of Florida, Gainesville, USA
S.T. Kuroda, Gakushuin University, Tokyo, Japan
E.H. Lieb, Princeton University, USA
L.A. Pastur, Centre de Physique Théorique, Marseille, France
J. Patera Université de Montréal, Canada
1.3 Current grant support

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1. AS CR Grant No. 100480501 **Solvable models of nanosystems.** J. Dittrich, P. Exner (responsible), H. Kovařík, D. Krejčiřík, J. Kříž, P. Šeba, M. Tater

2. AS CR Grant No. 1048302 **Quantum theory and pseudo-Hermitean Hamiltonians.** M. Znojil (responsible)

3. Ministry of Education Grant LS 527 **Particle Physics Center.** L. Hlavatý

2 Survey of activities

2.1 Edited volumes


2.2 Publications in journals


2.3 Proceedings, submitted papers, etc.


2.4 Seminars

2.4.1 Regular seminar

February 1
A. Tereskiewicz (Bialystok): Integrable Hamiltonians describing parametric conversion systems

February 1-2
Ray J. Rivers (Imperial College London): From point-particle Hamiltonians to field theories to non-linear Schrodinger equations I-III

March 22
A.P. Isaev (JINR): Multiloop Feynman integrals and conformal quantum mechanics

March 29
T. Langerová (CTU): Transfer functions for Bell inequalities

April 19
H. Lavička (CTU): Imitation structure in Minority Game on networks

April 26
M. Znojil: Hilbert spaces with unusual scalar products

May 3
V. Jakubský (NPI): $\mathcal{PT}$-invariant point interactions

May 10
S. Stenholm (KTH Stockholm): Entropy and time reversal in dynamical systems
May 17
P. Winternitz (CRM Montreal): Symmetries of linear and non-linear difference systems

May 24
M. Krbálek (CTU): Statistical distributions of traffic data and number variance of a Dyson gas

May 31
P. Soldán (CTU): Bose-Einstein condensation: from atoms to molecules

September 6
L. Šnobl (CTU): Surfaces associated with Grassmannian sigma models on Minkowski space

September 13
H. Toncrová (CTU): Simulation of a DNA damaging

September 13
M. Tušek (CTU): Singular perturbation of the free Hamiltonian in two dimensions

September 13
T. Kalvoda (CTU): A geometric interpretation of bound and free states

September 20
M. Gajdoš (CTU): Generalized perturbation series in quantum chromodynamics

September 20
J. Hýbl (CTU): Use of Baker-Campbell formulae for coordinate transformations in Drinfeld doubles

September 27
P. Lenhard (CTU): Deformations and contractions of Lie algebras

October 3-5
A. Vančura (Kaiserslautern): Einstein’s gravitation theory ideas – a small continuation

October 11
J. Lukierski (Wroclaw): Noncommutative space-time and quantum relativistic symmetries

October 18
L. Hlavatý: Poisson-Lie duality in action (an explicit determination of the sigma model in a curved spacetime)
October 25
Y. Miyamoto (Chofu): Generation and detection of optical beams with orbital angular momentum

November 1
M. Krbařek (CTU): Statistical variances of transport data and number variance of a Dyson gas

November 8
A. Sergeyev (Opava): Maximal superintegrability of Benenti systems

November 15
V. Rittenberg (Bonn): Stochastic models with conformal invariance

December 6
F. Slanina (IP AS): Brownian motors

2.4.2 The “Quantum Circle” seminar

March 1
Pavel Exner: Two-dimensional isoperimetric problems with singular interactions

March 8
Hynek Kovařík (Stuttgart): Stability of Schroedinger operator in twisted tubes

March 15
Olaf Post (RWTH Aachen): Branched quantum waveguides with Dirichlet boundary conditions: the decoupling case

March 22
David Krejčiřík (NPI): Nodal set of the Laplacian

March 24
Fredéric Klopp (Université Paris 13): Exponential sums related to the Kronig-Penney model in a constant electric field

April 19
Rupert Frank (KTH Stockholm): On the absolute continuity of the spectrum of partially periodic operators

April 26
Martin Fraas (Charles University): Properties of δ-sphere interactions

May 3
Petr Šeba: Mechanical manifestations of human haemodynamics

May 16
Sylwia Kondej (TU Chemnitz): On quantum dynamics in a leaky graph decay model
May 17
Natasha Orlova (Laboratory of Theoretical Physics, JINR): Kirchhoff’s theorem and correlation functions in the Abelian sandpile model

May 24
Taksu Cheon (Kochi University of Technology): Classical and quantum in solvable Hilbert-space game theory

May 31
Ondřej Turek (CTU): The meaning of quantum graph vertices

June 14
John Klauder (University of Florida, Gainesville): Projection operator approach to quantum constraints

August 23
Leszek Sirko (Polish Academy of Sciences, Warsaw): Investigation of the distributions of Wigner’s reaction matrix for irregular graphs with absorption

September 5
Timo Weidl (Mathematisches Institut, Universität Stuttgart):

October 25
Saverio Pascazio (Bari): Interference of mesoscopic particles: quantum-classical transition

November 1
Pierre Duclos (UTV Toulon): Three quantum charged particles interacting through delta potentials

November 29
Norbert Röhl (Universität Stuttgart): Numerical results on eigenvalues of curved waveguides in magnetic fields

December 6
David Krejčířík (NPI): Hardy inequalities in strips on ruled surfaces

December 13
Jaroslav Novotný (CTU): CP universal processes for two qubits and the UNOT

2.5 Meetings

The 14th Student Winter School (Horní Poľubný, January 24–30) organized by G. Chadzitaskos


The 3rd and 4th workshop “Pseudo-Hermitian Hamiltonians in Quantum Physics” in Koc University, Istanbul (June 20-22) and Stellenbosch, South Africa (November 22-25), respectively, were co-organized by M. Znojil

2.6 Students

Graduate:
H. Bíla (Charles U., supervised by M. Znojil); “Pseudo-Hermitean Hamiltonians in quantum theory”
M. Fraas (Charles U., supervised by P. Exner); “Solvable models of quantum systems with contact interactions”
P. Hejčík (University of Hradec Králové, supervised by P. Šeba, in collaboration with T. Cheon from Kochi University of Technology); “Quantum chaotic systems and associated time series”
I. Hradecký (CTU, supervised by P. Štovíček); “Adiabatic analysis of a model with time-dependent Aharonov-Bohm fluxes”
J. Hrivnák (CTU, supervised by J. Tolar); “Graded contractions of Lie algebras”
V. Jakubský (CTU, supervised by M. Znojil); “Pseudo-Hermitean quantum physics”
O. Lev (CTU, supervised by P. Štovíček); “Semiclassical analysis of quantum operator matrix elements”
P. Luft (CTU, supervised by G. Chadzitaskos); “Quantization and coherent states”
P. Novotný (CTU, supervised by J. Tolar); “Graded contractions of Lie algebras”
M. Turek (CTU, supervised by L. Hlavatý); “Geometric properties of dual sigma models”
P. Vytřas (CTU, supervised by P. Štovíček); “A many-body system in a strong magnetic field”

5th course:

J. Hýbl (CTU, supervised by L. Hlavatý); “Use of Baker-Hausdorff-Campbell formula for coordinate transforms in Drinfeld doubles”
T. Kalvoda (CTU, supervised by P. Štovíček); “Geometric interpretation of bound and free states”
S. Petrás (CTU, supervised by J. Tolar); “Quantum systems on 2-dimensional configuration manifolds with magnetic fields”
O. Turek (CTU, supervised by P. Exner); “Approximations of quantum graph vertices”

4rd course:

A. Černý (CTU, supervised by L. Hlavatý); “Classification of the Lie algebras and its application for solving the Einstein equations”
3rd course:

J. Lipovský (CTU, supervised by P. Exner); “Resonances in quantum graphs”

P. Siegl (CTU, supervised by M. Znojil); “$\mathcal{PT}$-symmetric version of supersymmetric quantum mechanics”