Dorothea Bahns

“Extension of distributions and symmetries”

Abstract:
TBA

Wojciech DeRoeck

Wojciech Dybalski

“Towards a consistent description of Coulomb scattering in QFT”

Abstract:
TBA

Jeremy Faupin

“On quantum electrodynamics of atomic resonances”

We consider a simple model of an atom interacting with the quantized electromagnetic field. The atom has a finite mass, finitely many excited states, and an electric dipole moment proportional to the elementary electric charge. We establish the existence of resonances associated to the excited states of the atom, and we prove that these resonances are analytic functions of the total momentum p and of the coupling constant, provided that |p| < mc (where m is the mass of the atom and c is the speed of light) and that the coupling constant is small enough.
The proof relies on a somewhat novel inductive construction involving a sequence of `smooth Feshbach-Schur maps' applied to a complex dilatation of the original Hamiltonian, which yields an algorithm for the calculation of resonance energies that converges super-exponentially fast.
Joint work with M. Ballesteros, J. Froehlich and B. Schubnel

Gian Michele Graf

“Friction and geometry in Lindbladian dynamics”

We study the adiabatic response of open systems governed by Lindblad evolutions (or Gorini-Kossakowski-Sudarshan) and hence affected by some form of friction. In particular, we present the analog of the Kubo formula for such systems. There is though an ambiguity in the definition of observables arising as fluxes (rates), such as velocities and currents. For a suitable notion of flux, the formulae for the transport coefficients are simple and explicit and are governed by the parallel transport on the manifold of instantaneous stationary states. Among our results we show that the response coefficients of open systems, whose stationary states are pure states, is given by the adiabatic curvature and may exhibit quantization, thus retaining features from the case without friction. Other notions of fluxes may lead to quantizations of inverse response coefficients, e.g. of resistances instead of conductances. (Joint work with Y. Avron, M. Fraas and O. Kenneth.)

Marcel Griesemer

“On the dynamics of Fröhlich Polarons”

Abstract:
The polaron model of H. Fröhlich describes an electron coupled to the quantized longitudinal optical modes of a polar crystal. In the strong coupling limit one expects that the phonon modes may be treated classically which leads to a coupled Schrödinger-Poisson system with memory. For the effective dynamics of the electron this amounts to a non-linear and non-local Schrödinger equation. We give two heuristic, but systematic derivations of this equation based on the Fröhlich model and we present a new result on the accuracy of some of its solutions for describing the motion of Fröhlich polarons in the strong coupling limit.

Christian Hainzl

Matthias Keller
“**Absolutely continuous spectrum of Galton-Watson trees**”

Abstract:
We study the discrete Laplace operator on multi-type Galton-Watson trees. We are interested in the case where the distribution of the branching lies in a neighborhood of a deterministic one.These deterministic trees are called trees of finite cone type and their spectrum consists of finitely many bands of purely absolutely continuous spectrum.So, whenever the distribution is not far from being deterministic and such that each vertex has at least one forward neighbor, the operators on the Galton-Watson trees inherit most of the absolutely continuous spectrum from the deterministic case.

Peter Müller

“Anderson’s orthogonality catastrophe”

Abstract:
We quantify the asymptotic vanishing of the ground-state overlap of two non-interacting Fermi gases in d-dimensional Euclidean space in the thermodynamic limit. Given two one-particle Schrödinger operators in finite volume which differ by a compactly supported bounded potential, we prove a power-law upper bound on the ground-state overlap of the corresponding non-interacting N-particle systems. We express the decay exponent in terms of the transition matrix from scattering theory. This exponent reduces to the one predicted by Anderson [Phys. Rev. 164, 352--359 (1967)] for the exact asymptotics in the special case of a point-like perturbation. We therefore expect our upper bound to coincide with the exact asymptotics of the overlap.
This is joint work with M. Gebert, H. Küttler and P. Otte.

Benjamin Schlein

„Fluctuations around Gross-Pitaevskii dynamics“

Abstract:
We study the time-evolution of initially trapped Bose-Einstein condensates. Starting from many-body quantum mechanics, we show that the dynamics can be approximated by a nonlinear Gross-Pitaevskii equation, giving a precise bound on the rate of the convergence. Furthermore, we prove that fluctuations around the solution of the Gross-Pitaevskii equation can be described by an appropriate time-dependent Bogoliubov transformation, which can be used to give a more precise approximation of the many body evolution.

Hermann Schulz-Baldes

“Invariants of disordered topological insulators”

Abstract:
TBA

Israel Michael Sigal

“Blowup Dynamics in the Keller-Segel Model of Chemotaxis”

Abstract:
The Keller-Segel equations model chemotaxis of bio-organisms. In a reduced form, considered in this talk, they are related to Vlasov equation for self-gravitating systems and are used in social sciences in description of crime patterns.
It is relatively easy to show that in the critical dimension 2 and for mass of the initial condition greater than 8 \pi, the solutions 'blowup' (or 'collapse') in finite time. This blowup is supposed to describe the chemotactic aggregation of the organisms and understanding its mechanism, especially its universal features, would allow to compare theoretical results with experimental observations. Understanding this mechanism turned out to be a very subtle problem defying solution for a long time.
In this talk I discuss recent results on dynamics of solutions of the (reduced) Keller-Segel equations in the critical dimension 2 which include a formal derivation and partial rigorous results on the blowup dynamics of solutions. The talk is based on the joint work with S. I. Dejak, D. Egli and P.M. Lushnikov.

Wolfgang Spitzer

“Entanglement entropy of free fermions”

Abstract:
In 2006, D. Gioev and I.Klich conjectured an explicit formula for the leading asymptotic growth of the spatially bi-partite von-Neumann entanglement entropy of noninteracting fermions in multi-dimensional Euclidean space at zero temperature. Based on recentprogress by one of us (A.V.S.) in semi-classical functional calculus for pseudo-differential operators with discontinuous symbols, we provide here a complete proof of that formula and of its generalization to Rényi entropies of all orders $\alpha>0$. This formula, exhibiting a "logarithmically enhanced area law'',has been used already in many publications.
This is joint work with Hajo Leschke and Alexander V. Sobolev and published in Phys. Rev. Lett. 112, 160403 (2014)

Peter Stollmann

“Positivity of Schrödinger operators on manifolds: the role of curvature”

Abstract:
TBA

Gerald Teschl

“Peakon asymptotics for the dispersionless Camassa-Holm equation”

Abstract:
We discuss direct and inverse spectral theory for the isospectral problem of the dispersionless Camassa-Holm equation, where the weight is allowed to be a finite signed measure. In particular, we prove that this weight is uniquely determined by the spectral data and solve the inverse spectral problem for the class of measures which are sign definite. The results are applied to deduce several facts for the dispersionless Camassa-Holm equation. In particular, we show that initial conditions with integrable momentum asymptotically split into a sum of peakons as conjectured by McKean.

Ivan Veselic

“Uncertainty principles applied to observation and reconstruction of functions”

Abstract:
In several areas of mathematics appears the task of reconstructing, or at least estimating, a function on the basis of partial data. Often the partial data contain information about the Fourier transform as well as about the function itself. In this case the reconstruction or observation can be facilitated by various forms of the uncertainty principle. We discuss several classical as well as recent instances of such results. Thereafter we focus on the case of solutions of partial differential equations, where the uncertainty relation takes the form of a unique continuation estimate. Finally, we formulare two recently obtaied results, and discuss their application to control theory, perturbation of eigenvalues, and random Schrödinger operators.”