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Mathematical Physics in the Heart of Germany II
Conference at TU Braunschweig
15-Dec-2023

**Venue: F 316a, Forumsgebäude,
Universitätsplatz 2, 38106 Braunschweig**

Programme:	
10:15 - 10:45	Arrival and Welcome
10:45 - 11:35	Miguel Ballesteros (UNAM) <i>Multi-Scale Analysis in QFT: Review and Applications</i>
11:45 - 12:35	Oliver Matte (U Aalborg) <i>Low energy spectrum of a polaron in a weak constant magnetic field</i>
12:45 - 14:15	– Lunch Break –
14:15 - 15:05	Benjamin Hinrichs (U Paderborn) <i>Feynman-Kac Formulas for Polaron-Type Semigroups & the Ultraviolet Problem</i>
15:15 - 15:45	Heinz Siedentop (LMU Munich) – TBA –
15:45 - 16:15	– Coffee Break –
16:45 - 17:35	Konstantin Merz (TU Braunschweig) <i>Hardy operators in angular momentum channels</i>
18:15	– Conference Dinner –

Abstracts

Miguel Ballesteros (UNAM)

Multi-Scale Analysis in QFT: Review and Applications

Oliver Matte (U Aalborg)

Low energy spectrum of a polaron in a weak constant magnetic field

We consider the Fröhlich Hamiltonian for a polaron in a constant magnetic field, which is translation invariant in the z-direction. For weak magnetic field strengths, we show that the low-lying spectrum of the corresponding fiber Hamiltonians for fixed total momentum in the z-direction approximately has a Landau level structure. The spacing of the Landau levels is determined by the renormalized polaron mass. A key technique in the proof, borrowed from the theory of periodic Schrödinger operators coupled to weak magnetic fields, is the construction of an effective Hamiltonian acting in the sub-Hilbert space generated by a system of magnetic quasi-Wannier functions for the polaron. The talk is based on joint work with Horia Cornean und Rohan Ghanta.

Benjamin Hinrichs (U Paderborn)

Feynman-Kac Formulas for Polaron-Type Semigroups & the Ultraviolet Problem

We present Feynman-Kac formulas for the semigroup generated by the Hamiltonian of a single particle linearly coupled to a bosonic quantum field, such as the spin-boson model, the Fröhlich polaron and the non- and semi-relativistic Nelson models. Based on concrete examples, we discuss how to obtain similar descriptions for the full semigroup of ultraviolet renormalized Hamiltonians and compare them to earlier path integral accesses to ultraviolet-singular models. We also give an overview of applications, in which such Feynman-Kac formulas have been put to use.

This talk is based on joint work with Oliver Matte.

Heinz Siedentop (LMU Munich)

– TBA –

Konstantin Merz (TU Braunschweig)

Hardy operators in angular momentum channels

We consider Hardy operators on euclidean space, i.e., ordinary or fractional Schrödinger operators with potentials given by the appropriate power of the distance to the origin. Using the spherical symmetry, we prove a ground state representation for each summand in the angular momentum decompositions of these operators. Time permitting, we outline applications in the context of large relativistic atoms.

Based on joint work with Krzysztof Bogdan.