

New Trends in First Quantisation: Field Theory, Gravity and Quantum Computing

831. WE-Heraeus-Seminar

13 – 17 April 2025

at the Physikzentrum Bad Honnef, Germany

**WILHELM UND ELSE
HERAEUS-STIFTUNG**



Program

Sunday, 13 April 2025

17:00 – 21:00 Registration

18:00 *BUFFET SUPPER and informal get-together*

Monday, 14 April 2025

08:00 *BREAKFAST*

08:50 Scientific organizers **Welcome words**

09:00 – 09:45 Christian Schubert **History and state-of-the-art of the worldline formalism**

09:45 – 10:30 Olindo Corradini **One-particle reducible contributions to Heisenberg-Euler effective Lagrangians**

10:30 – 11:00 *COFFEE BREAK*

11:00 – 11:30 **Discussion I**

11:30 – 11:50 Patrick Copinger **Strong field QED in-in worldline formalism**

11:50 – 12:35 Anton Ilderton **QFT in strong fields: applications of first-quantised methods**

12:45 *LUNCH*

Program

Monday, 14 April 2025

14:30 – 15:15	Naser Ahmadinia	Off-shell gluon amplitudes from the worldline formalism
15:15 – 15:35	Karthik Rajeev	Tunnelling in Lorentzian worldline path integrals
15:35 – 16:00	Discussion II	
16:00 – 16:30	<i>COFFEE BREAK</i>	
16:30 – 16:50	Rashid Shaisultanov	The worldline approach to strong-field QED and N-photon amplitudes
16:50 – 17:10	Roberto Bonezzi	Worldline approach to Yang-Mills theory
17:10 – 17:30	Azadeh Maleknejad (online)	Weyl fermion creation by cosmological gravitational wave background at 1-loop
17:30 – 17:40	Scientific organizers	About the WE-Heraeus-Foundation
17:40 – 18:30	Networking	
18:30	<i>DINNER</i>	

Program

Tuesday, 15 April 2025

08:00	<i>BREAKFAST</i>	
09:00 – 09:45	Rafael Porto	Bootstrapping the two-body problem
09:45 – 10:05	Paolo Di Vecchia	The soft part of the gravitational waveform from scattering amplitudes
10:05 – 10:25	Tianheng Wang	Kerr black hole dynamics from an extended Polyakov action
10:30 – 11:00	<i>COFFEE BREAK</i>	
11:00 – 11:30	Discussion III	
11:30 – 11:50	Ginevra Braga	Proper time path integrals for gravitational waves
11:50 – 12:35	Jan Steinhoff	1st quantization of worldline EFT for black holes and neutron stars
12:45	<i>LUNCH</i>	
14:30 – 15:15	Fiorenzo Bastianelli	First quantisation and one-loop divergences in quantum gravity
15:15 – 15:35	Domenico Bonocore	Generalized Wilson lines, from QCD to gravity
15:35 – 16:00	Discussion IV	
16:00 – 16:30	<i>COFFEE BREAK</i>	
16:30 – 16:50	Jan Willem Van Holten	Classical dynamics of particles with non-abelian charges
16:50 – 17:20	Flash talks I	
17:20 – 18:30	Posters I	
18:30	<i>DINNER</i>	

Program

Wednesday, 16 April 2025

08:00	<i>BREAKFAST</i>	
09:00 – 09:45	Jose M Muñoz-Castañeda	High temperature quantum fluctuations
09:45 – 10:30	Greger Torgrimsson	Worldline instantons for the momentum spectrum of strong-field-QED processes in space-time dependent fields
10:30 – 11:00	<i>COFFEE BREAK</i>	
11:00 – 11:30	Discussion V	
11:30 – 11:50	Stefano Lionetti	Anomalies and parity-odd interactions: Insights from CFT and beyond
11:50 – 12:35	Silvia Pla Garcia	Instantons in finite volume, quantum tunnelling, and cosmic bounce
12:45	<i>LUNCH</i>	
14:30 – 15:15	Renata Ferrero (online)	Background independent renormalization techniques
15:15 – 15:35	Predag Cvitanovic	Is QED finite?
15:35 – 16:00	Discussion VI	
16:00 – 16:30	<i>COFFEE BREAK</i>	
16:30 – 16:50	Viola Gattus	A geometric perspective on heat Kernel techniques in field space
16:50 – 17:20	Flash talks II	
17:20 – 18:30	Posters II	
18:30	<i>HERAEUS DINNER</i> (social event with cold & warm buffet with complimentary drinks)	

Program

Thursday, 17 April 2025

08:00	<i>BREAKFAST</i>	
09:00 – 09:45	Jan Plefka	High-precision gravitational wave physics from worldline quantum field theory
09:45 – 10:05	Michael Florian Wondrak	Particle production in electric and gravitational fields
10:05 – 10:25	Lucas Manzo	Worldline formalism in manifolds with boundaries
10:30 – 11:00	<i>COFFEE BREAK</i>	
11:00 – 11:30	Discussion VII	
11:30 – 11:50	Olaf Lechtenfeld	The Nicolai map in supersymmetric quantum mechanics
11:50 – 12:35	Gerald Dunne	Resurgence and high-intensity QFT
12:35 – 12:45	Scientific organizers	Closing words
12:45	<i>LUNCH</i>	

End of the seminar

Departure

NO DINNER for participants leaving on Friday; however, a self-service breakfast will be provided on Friday morning