

Frontiers of Quantum Gas Microscopy

727. WE-Heraeus-Seminar

03 Apr - 08 Apr 2022

Hybrid
at the Physikzentrum Bad Honnef/Germany

**WILHELM UND ELSE
HERAEUS-STIFTUNG**



Program

Sunday, 3 April 2022

17:00 – 21:00 Registration

From 18:30 *BUFFET SUPPER / Informal get together*

Monday, 4 April 2022

07:30 – 08:45 *BREAKFAST*

08:45 – 09:00 Scientific Organizers

Welcome and opening

09:00 – 09:45 Zoe Yan

**Microscopy of quantum correlations
in an ultracold molecular gas**

09:45 – 10:30 Corinna Kollath

**Driven or dissipative impurities in
fermionic quantum gases**

10:30 – 11:00 *COFFEE BREAK*

11:00 – 11:45 Tommaso Calarco

**Quantum firmware: optimal control
for quantum simulators**

11:45 – 12:15 Annabelle Bohrdt

**A microscopic view on the Fermi-
Hubbard model: from artificial
intelligence to strong pairing**

12:15 *LUNCH*

Program

Monday, 4 April 2022

14:00 – 14:45	Eun-Ah Kim (online)	Machine Learning for Quantum Simulation
14:45 – 15:30	Immanuel Bloch	From Polaronic Metals to Hole Pairing - Exploring Fermi-Hubbard Systems using Quantum Gas Microscopy
15:30 – 16:00	Andrea Bergschneider	From correlations in a bilayer Hubbard model to polarons in atomically thin semiconductors
16:00 – 16:30	<i>COFFEE BREAK</i>	
16:30 – 17:15	Norman Yao (online)	A Landau Theory for Spin Squeezing
17:15 – 18:00	Christian Gross	The low-temperature challenge in optical lattices
18:00 – 18:15	Stefan Jorda	About the Wilhelm and Else Heraeus Foundation
18:15	<i>HERAEUS DINNER at the Physikzentrum (cold & warm buffet, with complimentary drinks)</i>	
20:30 – 21:30	Eugene Demler	Quantum simulations: from the Fermi Hubbard model to quantum magnetism

Program

Tuesday, 5 April 2022

08:00 – 09:00	<i>BREAKFAST</i>	
09:00 – 09:45	Jens Eisert	Quantum readout using quantum gas microscopes
09:45 – 10:30	Giacomo Roati	Tunneling transport of strongly interacting Fermi gases across the superfluid transition
10:30 – 11:00	<i>COFFEE BREAK</i>	
11:00 – 11:45	Hannes Bernien	A dual-element atom array
11:45 – 12:15	Jad Halimeh (online)	Enhancing disorder-free localization through dynamically emergent local symmetries
12:15	<i>LUNCH</i>	
14:00 – 14:45	Mikhail Lukin (online)	Exploring quantum matter using programmable atom arrays
14:45 – 15:30	Cindy Regal (online)	Time-of-flight quantum tomography of single atom motion in an optical tweezer
15:30 – 16:00	Daniel González Cuadra	Co-designed quantum simulation of non-abelian gauge theories with Rydberg qudits
16:00 – 16:30	<i>COFFEE BREAK</i>	
16:30 – 17:15	Adam Kaufmann (online)	New frontiers in atom arrays and quantum gas microscopes using alkaline-earth atoms
17:15 – 18:00	Poster flash	
18:00	DINNER	
20:30 – 21:30	Poster session I	

Program

Wednesday, 6 April 2022

08:00 – 09:00	<i>BREAKFAST</i>	
09:00 – 09:45	Markus Oberthaler	Quantum Field Simulator –Universal Time Dynamics & Relativistic Fields in Ultracold Gases
09:45 – 10:30	Jörg Schmiedmayer	Emergent Quantum Simulators
10:30 – 11:00	<i>COFFEE BREAK</i>	
11:00 – 11:45	Jessie Zhang	Optical tweezer arrays of polar molecules from the bottom-up
11:45 – 12:15	Waseem Bakr (online)	New directions with fermionic quantum gas microscopes: non-local interactions and programmable geometries
12:15	<i>LUNCH</i>	
14:00 – 18:00	Excursion	
18:00	<i>DINNER</i>	
20:30 – 21:30	Antoine Browaeys	Many-body physics with arrays of Rydberg atoms in resonant interaction

Program

Thursday, 7 April 2022

08:00 – 09:00	<i>BREAKFAST</i>	
09:00 – 09:45	Henning Moritz	Fermionic superfluids in two and three dimensions
09:45 – 10:30	Tilman Esslinger	Self-oscillating and Floquet-driven quantum pumps
10:30 – 11:00	<i>COFFEE BREAK</i>	
11:00 – 11:45	Selim Jochim	Emergence of many body physics, atom by atom
11:45 – 12:15	Luca Asteria	Microscopy of ultracold atoms in optical lattice via quantum gas magnification
12:15	<i>LUNCH</i>	
14:00 – 14:45	Markus Greiner	Ultracold Atom Quantum Simulations: From Fermi-Hubbard to Fractional Quantum Hall Physics
14:45 – 15:30	Nathan Goldman	Orbital order and chiral currents of interacting bosons with π-flux
15:30 – 16:00	Torsten Zache	Entanglement Spectroscopy and probing the Li-Haldane Conjecture in Topological Quantum Matter
16:00 – 16:30	<i>COFFEE BREAK</i>	
16:30 – 17:15	Dries Sels (online)	Tba
17:15 – 18:00	Ana Maria Rey (online)	Observation and control of elastic p-wave interactions between fermions in an optical lattice
18:00	<i>DINNER</i>	
20:30 – 21:30	Poster session II	

Program

Friday, 8 April 2022

08:00 – 09:00	<i>BREAKFAST</i>	
09:00 – 09:45	Päivi Törmä	Quantum geometry and superfluidity in moiré superlattices and ultracold gas systems
09:45 – 10:30	Hannes Pichler	Quantum Optimization with Rydberg Atom Arrays
10:30 – 11:00	<i>COFFEE BREAK</i>	
11:00 – 11:45	Martin Zwierlein	Quantum Register of Fermion Pairs and Crystallization of Bosonic Quantum Hall States
11:45 – 12:15	Martin Gärttner	Scalable quantum state tomography with artificial neural networks
12:15 – 12:30	Scientific organizers	Closing remarks and poster prize
12:30	<i>LUNCH</i>	

End of Seminar / Departure