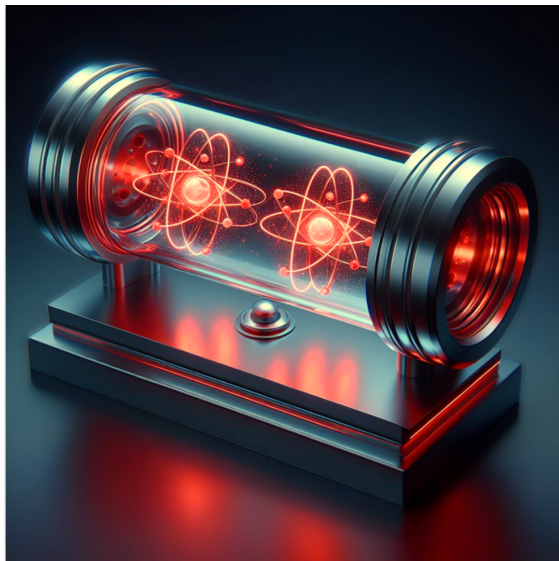


School for Master Students
09 - 13 September 2024

Collective Phenomena in Quantum Many-Body Physics: From Quantum Matter to Light

PROGRAMME



Scientific coordinators:

Pieter Claeys • MPIPKS, Germany
Marin Bukov • MPIPKS, Germany
Roderich Moessner • MPIPKS, Germany
Sabine Rockenstein • jDPG, Germany

Organisation:

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The program will be continuously updated during the event. This version is from September 6, 2024.

Program

Monday, 09 September

- 09:00 - 13:30 Arrival and informal discussions
- 13:30 - 13:50 Opening
- 13:50 - 14:50 **Sid Parameswaran** (University of Oxford/MPIPKS)
Moiré is Different: New Twists in the Tale of Strong Correlations
- 15:00 - 16:00 **Anushya Chandran** (Boston University)
Dissipative Cooling of Quantum Matter Using Light
- 16:00 - 16:30 Coffee break
- 16:30 - 17:30 **Florian Marquardt** (MPL)
Colloquium: Machine Learning Improves Quantum Technologies
- 17:40 - 18:10 **Nilotpal Chakraborty** (MPIPKS)
Can Qubits Go Silent? - Constructing Qubits Resilient to Noise
- 18:30 - 19:30 Dinner at PKS
- 19:30 - 22:00 Poster Session I

Tuesday, 10 September

- 09:00 - 10:00 **Antoine Browaeys** (Institut d'Optique)
Many-body Physics with Rydberg Atoms and Optical Dipoles
- 10:10 - 10:40 **Philippe Suchsland** (MPIPKS)
Quantum Devices - From Qubits to Quantum Simulation
- 10:40 - 11:00 Coffee break
- 11:00 - 12:00 **Roderich Moessner** (MPIPKS)
Fractionalisation and Fractals in a Topological Magnet
- 12:05 - 12:35 **Felix Fritsch** (MPIPKS)
Eigenstate Thermalization and Beyond
- 12:35 - 13:30 Lunch at PKS
- 13:30 - 14:30 **Julian Leonard** (TU Vienna)
Quantum Matter under the Microscope
- 14:40 - 15:40 **Francesco Piazza** (University of Augsburg)
Introduction to Cavity-Quantum-Materials (and their collective behavior)
- 15:40 - 16:00 Coffee break
- 16:00 - 18:00 **Markus Schmitt** (University of Regensburg)
Neural Quantum States to Simulate Non-equilibrium Matter
- 18:00 - 22:00 Informal discussions and free evening

Wednesday, 11 September

- 09:00 - 09:30 **Johannes Hofmann**
From Bloch's Theorem to Quantum Geometry
- 09:40 - 10:10 **Nan Tang** (University of Augsburg)
How to Probe Quantum Fluctuations by Experiments? Exploring the Magnetic Analogue of Ice: Quantum Spin Ice
- 10:10 - 10:40 Coffee break
- 10:40 - 11:40 **Andy Mackenzie** (MPICPfs)
How Physics Research *Really* Works: the Story of Unconventional Superconductivity in Sr₂RuO₄
- 11:45 - 12:35 **Uri Vool** (MPICPfs)
Hybrid Superconducting Quantum Circuits
- 12:35 - 13:30 Lunch at PKS
- 13:30 - 18:30 Excursion to Saxon Switzerland
- 19:00 - 20:00 Barbecue at PKS
- 20:00 - 22:00 Poster Session II

Thursday, 12 September

- 09:00 - 10:00 **Chris Hooley** (MPIPKS)
Quantum Magnetism: What and Why?
- 10:00 - 10:30 Coffee break
- 10:30 - 12:30 Discussion Panel: Ask the Experts
- 12:30 - 13:30 Lunch at PKS
- 13:30 - 15:30 Coding session with Alex Wietek / Lab Tour at
MPICPFS
- 15:30 - 16:00 Coffee break
- 16:00 - 17:00 **Linda Ye** (Caltech)
Lattice-driven Flat Bands in Quantum Materials
- 17:10 - 18:00 **Suzy Zhang** (MPIPKS)
Aspects of Magnetic Transport: Frustration, Topology, and Dissipation
- 18:00 - 19:00 Dinner at PKS
- 19:30 - 22:00 Informal discussions and social evening

Friday, 13 September

- 09:00 - 10:00 **Silvia Viola Kusminskiy** (RWTH Aachen)
Cavity Magnonics
- 10:10 - 11:00 **t.b.d.**
t.b.a.
- 11:00 - 11:30 Coffee break
- 11:30 - 12:30 **Hilary Noad** (MPICPFS)
Using Uniaxial Stress to Tune and Probe Quantum Materials
- 12:30 - 12:40 Closing
- 12:40 - 13:40 Lunch at PKS
- 13:40 - 16:00 Discussions and departure

List of poster presentations

- 1. Abreu, Mariana**
Relevance of electronic interactions at quasiperiodicity-driven localization transitions
- 2. Feng, Jiecheng**
Long-range correlation mediated by hyperbolic phonon polaritons in hBN
- 3. Ferrini, Riccardo**
Vortex crystals with empty and filled cores
- 4. Imos, Eryk**
Training an Oscillatory Neural Network via All-Optical Coupling Control In Polariton Condensate Lattices
- 5. Ippolito, Gabriele**
Phase in Bose Einstein Condensate Interference
- 6. Jazdzewska, Agnieszka**
Haldane phase in fermionic systems
- 7. Kontou, Klavdia**
Magic wavelength 1D lattice trap for ultracold strontium atoms
- 8. Kránitz, Péter**
Anderson's lower bound on ground state energy and sine-square deformation
- 9. Lu, Yunxuan**
Towards Ultracold ${}^6\text{Li}{}^{87}\text{Rb}$ Molecules: A Compact Platform for Investigating Dipolar BCS-BEC Crossover
- 10. Matysiak, Robert**
Simulation of Quantum States and Optical Properties in GaSb/AlGaSb Quantum Dots

11. **Mickiewicz, Konrad**
Dynamics of Driven Strongly Damped Open Quantum Systems Using Tensor Networks
12. **Pacella, Chiara**
Orbital Hall effect in a Weyl Semimetal
13. **Richter, Leonhard**
Error bounds for the rotating wave approximation of the dicke model
14. **Rudner, Lázló**
Formation of two-magnon bound states on frustrated triangular lattice
15. **Sanders, Julian**
Topology optimization techniques for semiconductor spin qubit devices
16. **Shah, Saumya Amit**
Towards a narrow-line magneto-optical trap for experiments with ultracold strontium atoms
17. **Török, Mátyás**
Interaction between magnetic skyrmions
18. **V, Keshav**
Adiabatic transitions beyond the Landau-Zener paradigm
19. **Wilhelm, Valentin**
Non-hermitian topology in multiterminal superconducting junctions
20. **Zhao, Mingrui**
Speed Limit on Entanglement Asymmetry

Frequently asked questions

- **REGISTRATION DESK:**

Main building, entrance hall
Monday, 08:00 - 14:00

- **WORKSHOP SECRETARIAT:**

Main building, first floor, office 1 A 03 (phone 1103)
Monday, 14:00 - 16:30, Tuesday - Thursday 08:00 - 16:30, Friday
08:00 - 15:30

- **SCIENTIFIC COORDINATORS' CONTACT:**

Marin Bukov, office 1 A 21 (main building, first floor), phone
1121. Pieter Claeys office 1 A 17 (main building, first floor),
phone 1117.

- **COMPUTER SUPPORT:**

If you have any computer-related questions please contact the
staff via email to support@pks.mpg.de (cc quant24@pks.mpg.de).

- **LIBRARY:**

Our library is located in guest house no. 4. It is a reference li-
brary which means that books must remain in the institute. You
are allowed to check out books. Journals should not be taken
out of the library. Information concerning the library is available
at <https://www.pks.mpg.de/institute/infrastructure/library/>, includ-
ing an on-line catalogue.

- **OFFICE SUPPLIES:**

Please contact our receptionist at the institute's reception desk.

- **INFORMATION DESK:**

For information about train schedules, public transportation in Dresden, tourist information about Dresden and ordering taxis please contact the institute's reception desk.

- **MAIL:**

Internal and external outgoing mail can be left at the institute's reception desk. There are also stamps available upon request.

- **PRIVATE CAR:**

You need a special permit to park your car at the institute's parking lots as well as the guest houses' parking lots, the permit is available upon request at the institute's reception desk.

- **SHOPPING:**

The shops in the city center are open Monday - Saturday from 09:00 - 20:00.

- The closest shopping area "Prager Strasse" starts behind the Main Railway Station. Take tram no. 3 (direction "Wilder Mann") to the stop "Walpurgisstrasse" and keep to the left. You will find a shopping mall, a large department store as well as many other shops on "Prager Strasse". If you walk in direction of the "Altmarkt" you will find another shopping mall.
- Food and beverages: after 5 minutes walk along the tram tracks towards the city centre you will find the bakery "Laube" and a general food store (Konsum) on the left hand side of the street (on Würzburger Strasse).
- Every Wednesday there is a small market at Münchner Platz from 8 a.m. to 1 p.m.

• **INFORMATION ON YOUR ACCOMMODATION IN THE GUEST HOUSES:**

- Breakfast is served **weekdays between 07:30 and 09:30** in our institute's cafeteria.
For **the weekend** the following places can be recommended:
 - ✱ the bakery Möbius on Münchner Platz 1
 - ✱ the bakery Laube on Würzburger Str. 66
- Guest house keys: you can open each entrance of the institute as well as the library with your guest house key or with the attached chip. Move it along the little grey box at each entrance, after a beep you can open the door.
When leaving please drop the guest house keys into the box in the entrance hall of your guest house.

• **FOR THOSE ACCOMMODATED IN A HOTEL:**

- Breakfast is served in the hotel.

• **ORANGE CHIP:**

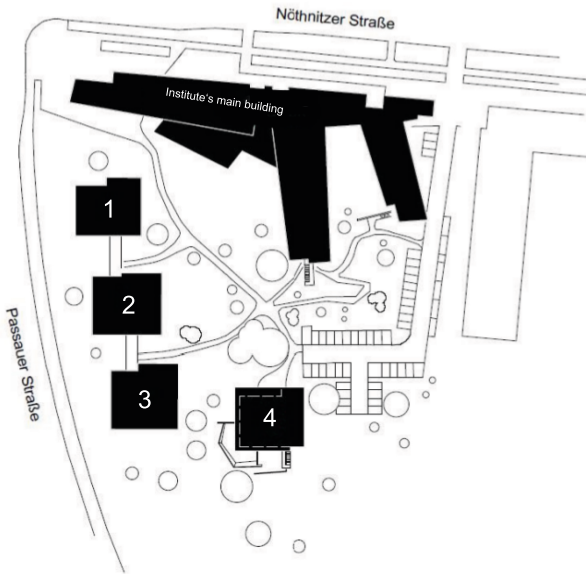
When leaving, please drop the orange chip into the box at the reception in the institute's main building or return it directly to the workshop assistant. Thank you!

• **LAUNDRY:**

Washing machines and tumble dryers can be found in the basement of guest house no. 2. They are operated with token coins. These coins can be bought at the institute's reception desk (main entrance) from Monday to Friday between 07:30 a.m. and 07:00 p.m. One token coin is worth 2 Euro and valid for one washing/drying process. Please do not dry your laundry in your room!

- **LUGGAGE:** If you would like to store your luggage in a secure place on your departure day, please use room 2 C 25 on the second floor. You have to dial the following code to open the door **7273**.

Maps



1. guest house 1
2. guest house 2
3. guest house 3
4. guest house 4
library