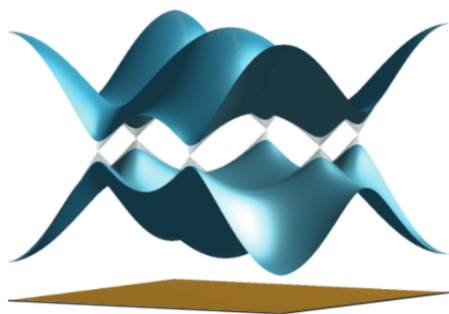


School for Master Students
18 - 22 September 2023

Fundamentals and Realizations

PROGRAM



Scientific coordinators:

Pieter Claeys • MPIPKS, Germany
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The program will be continuously updated during the event. This version was printed on September 19, 2023.

Welcome

Dear student,

welcome to the School for Master Students
Fundamentals and Realizations!

By now, almost all Covid-related restrictions for workshops at our institute are lifted, so that there is just one requirement left:

During lunch, tables are reserved for **quant23 participants** in our cafeteria. If weather permits, you are welcome to use the outside area.

Enjoy your stay at MPIPKS!

The scientific coordinators of the
quant23 School for Master Students

Program

School for Master Students

Monday, 18 September

- | | |
|---------------|---|
| 09:00 - 13:30 | Arrival and informal discussions |
| 13:30 - 14:00 | Opening |
| 14:00 - 16:00 | Pedram Roushan (Google)
Studying Novel Quantum Dynamics on A NISQ Processor |
| 16:00 - 16:30 | Coffee break |
| 16:30 - 17:30 | Annabelle Bohrdt (University of Regensburg)
How to Simulate the Dynamics of A Single Hole |
| 17:30 - 18:30 | Richard Fletcher (Massachusetts Institute of Technology)
Hall Physics in A Quantum Foucault Pendulum |
| 18:45 - 19:45 | Johannes Zeiher (Max Planck Institute for Quantum Optics)
Quantum Simulation and Quantum Computation with Atom Arrays |
| 19:45 - 20:45 | Dinner at PKS |
| 20:45 - 22:00 | Poster session 1 |

Tuesday, 19 September

- 09:30 - 10:20 **Matthew Eiles** (Max Planck Institute for the Physics of Complex Systems)
Rydberg Systems - Exciting Possibilities in Excited Atoms
- 10:20 - 11:00 Coffee break
- 11:00 - 12:00 **Roderich Moessner** (Max Planck Institute for the Physics of Complex Systems)
Dynamical Fractal in A Clean Topological Magnet
- 12:00 - 12:30 **Hongzheng Zhao** (Max Planck Institute for the Physics of Complex Systems)
Trotterization for Digital Quantum Simulation
- 12:30 - 13:30 Lunch
- 13:30 - 14:30 **Pieter Claeys** (Max Planck Institute for the Physics of Complex Systems)
Introduction to Unitary Circuit Dynamics
- 14:30 - 15:00 **Michael Rampp** (Max Planck Institute for the Physics of Complex Systems)
Information Scrambling
- 15:00 - 15:30 Coffee break
- 15:30 - 18:15 **Dominik Hahn & Ph.D. students** (Max Planck Institute for the Physics of Complex Systems)
Quantum Coding Challenge
- 18:15 - 18:45 Coffee break
- 18:45 - 19:45 **Maia G. Vergniory** (Max Planck Institute for the Chemical Physics of Solids)

Special lecture
The Tale of A Wave - The Birth and Death of Surfing-Waves

19:45 - 22:45 Free evening

Wednesday, 20 September

08:30 - 09:30 **Claire Donnelly** (Max Planck Institute for the Chemical Physics of Solids)
Unravelling Topological Textures in Three-Dimensional Magnets

09:30 - 10:20 **Matt Ferguson** (Max Planck Institute for the Chemical Physics of Solids)
Visualizing Electronic Transport in Quantum Materials

10:20 - 11:00 Coffee break

11:00 - 12:00 **Jan Budich** (Dresden University of Technology)
Dynamical Topological Quantum Matter

12:00 - 12:30 **Adam McRoberts** (Max Planck Institute for the Physics of Complex Systems)
Everything Is Quantum, Except When It's Not: A Quantum-Classical Correspondence

12:30 - 13:30 Lunch

13:30 - 18:30 Excursion to Saxon Switzerland

19:00 - 20:00 Barbecue at PKS

20:00 - 22:00 Poster session 2

Thursday, 21 September

- 08:30 - 09:30 **Silvia Pappalardi** (University of Cologne)
Introduction to the Eigenstate Thermalization Hypothesis and beyond
- 09:30 - 10:20 **Graham Baker** (Max Planck Institute for the Chemical Physics of Solids)
Non-Ohmic Electrical Transport in PdCoO₂
- 10:20 - 11:00 Coffee break
- 11:00 - 12:30 Discussion panel: Ask the experts
- 12:30 - 13:30 Lunch
- 13:30 - 15:30 Coding session with Alexander Wietek - Fun with Ginzburg-Landau Theory and Python
or
Lab tour at CPFS
- 15:30 - 16:00 Coffee break
- 16:00 - 17:00 **Paul McClarty** (Max Planck Institute for the Physics of Complex Systems)
Quantum Magnetism from The Perspective of Magnon Band Topology
- 17:00 - 17:30 **Suzy Zhang** (Max Planck Institute for the Physics of Complex Systems)
Magnon Kinetics: from Ballistic to Diffusive Transport
- 17:30 - 18:00 **Joe Winter** (Max Planck Institute for the Physics of Complex Systems)
How to Knit a Quantum Computer: Unraveling Topological Band Theory

- 19:00 - 20:00 Dinner at PKS
- 20:00 - 22:00 Discussions and social evening

Friday, 22 September

- 08:30 - 09:30 **Martin Eckstein** (University of Hamburg)
Simulating the Non-Equilibrium Dynamics in Light-Driven Quantum Materials
- 09:30 - 10:30 **Claudia Felser** (Max Planck Institute for the Chemical Physics of Solids)
Chirality and Topology
- 10:30 - 11:00 Coffee break
- 11:00 - 12:00 **Bella Lake** (Helmholtz Centre Berlin)
Experimental Techniques for Investigation of Quantum Magnets
- 12:00 - 13:00 **Frank Pollmann** (Munich University of Technology)
Efficient Simulation of Quantum Dynamics using Matrix-Product States
- 13:00 - 13:10 Closing
- 13:15 - 14:15 Lunch
- 14:15 - 18:15 Discussions and departure

List of poster presentations

1. Optical Reflective Metasurfaces Based on Mirror-Coupled Slot-Antennas
2. Theory for Amorphous Topological Metals
3. Time-delayed Feedback Dynamics of Qubits
4. Many Body Localisation (MBL) in a Disorderless Model
5. Electron Emission from Superconducting Nanotips
6. Anderson Localization on a Network
7. Building a Low Temperature Scanning Tunneling Microscope
8. Coherent and Readout Errors in the Surface Code
9. Dip-stick Measurements: Elastoresistivity of Iron Pnictides Superconductors and Magnetic Heat Transport of Quantum Spin Systems
10. Quantum Machine Learning – Image Data Embedding and Classification
11. Towards Modelling of Photoelectron Spectra of Small Water Clusters
12. Low Energy Effective Models for QCD
13. Discovery of Negative Thermal Expansion Materials with Machine Learning Techniques
14. Scalar Field Theory - How Non-Gaussian Initial Conditions Affect Dynamics and Renormalization
15. Orbital and Spin Effects in Self-Consistent Theory of Superconductivity

16. Shape Optimization of Tree Tensor Networks for Disordered Spin Systems
17. Harnessing the Power of Quantum Computers Using Short Term Hamiltonian Dynamics
18. Bloch Oscillation and Wannier-Stark Ladder in Plasmonic Waveguide Arrays
19. Rapid Dilution Mass Photometry
20. The Logarithmic Phase Singularity in the Inverted Harmonic Oscillator
21. Dynamical Localization on IBMQ /or QCA and QFTs
22. The Bosonic Harper-Hofstadter Model in the Hard-core Limit
23. Photoassociation Spectroscopy of RbYb near the Yb Intercombination Line
24. Design and Simulation of Superconducting Qubits Coupled to Bulk Acoustic Wave Resonators
25. Raman Scattering on the Kitaev Honeycomb Modell
26. Quantum Simulations of Many-body Physics Based on Spins in Diamond

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Frequently asked questions

- **REGISTRATION DESK:**
Main building, entrance hall
Tuesday, 08:00 - 14:00
- **WORKSHOP SECRETARIAT:**
Main building, first floor, office 1 A 03 (phone 1103)
Tuesday, 14:00 - 16:30, Wednesday - 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 ACCOUNT:**
Please check the details on the information sheet included in your welcome folder.
- **COMPUTER SUPPORT:**
If you have any computer-related questions please contact the staff via email to support@pks.mpg.de (cc quant22@pks.mpg.de).
- **LIBRARY:**
Our library is located in guest house no. 4. It is a reference library 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/>, including 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 **Saturday** 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!

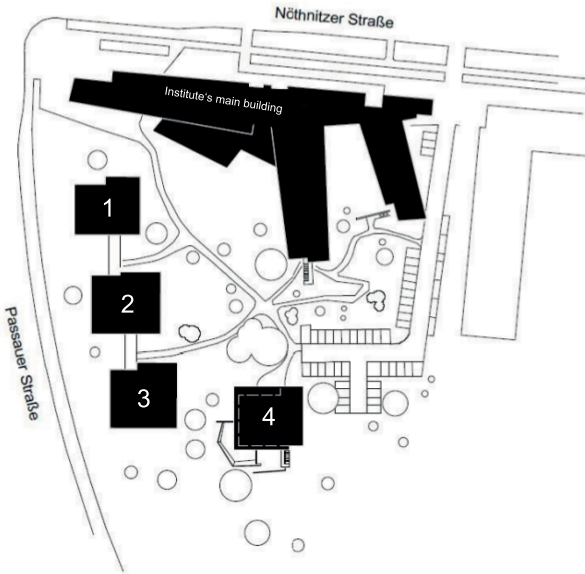
• **LAUNDRY:**

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 .

- **SECURITY:**
Due to the Corona pandemic the entrances of the institute should be locked. Please check after entering or leaving the institute that the door is correctly shut.
- IF YOU HAVE ANY QUESTIONS OR SUGGESTIONS PLEASE CONTACT US.

Maps



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

Notes





