NYX Hotel Erfurt

Sep 24 – 26, 2025

ct.qmat
Complexity and Topology in Quantum Matter

CT.QMAT

Cluster Retreat 2025

Complexity and Topology in Quantum Matter

Conference booklet
For all updates, please see:
www.ctqmat.de/en/events/erfurt25

Julius-Maximilians-
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Preface

Dear Participants,

We welcome you to the Cluster Retreat 2025 in Erfurt. This year's retreat marks a special occasion: it's the final joint event of ct.qmat's very successful first funding period. Since 2019, we've accomplished a remarkable amount together – more than 1,600 publications, eight patents, and numerous pioneering findings that have advanced our understanding of quantum materials. These are achievements of which we can all be justly proud.

At the same time, this retreat opens a new chapter. With the renewal of our cluster under the new name ctd.qmat – Complexity, Topology and Dynamics in Quantum Matter, we're now embarking on a second funding period with an expanded focus on quantum dynamics and exciting challenges ahead.

The program before you combines inspiring scientific talks with the informal encounters – coffee breaks, poster Sessions, and evening events – that so often spark new ideas and collaborations. This week will also lay the organizational foundations for the coming years. On Wednesday, the members will elect the new spokespersons, the Steering Committee, and the Flex Fund Selection Committee. Meanwhile, the Quantum Matter Academy will vote for its two representatives on the Steering Committee, and two more on the Flex Fund Selection Committee. On Thursday, the newly elected Steering Committee will convene for the first time.

We look forward to stimulating discussions, fruitful networking, and a retreat that will energize our joint journey into the second funding period.

Ralph Claessen and Matthias Vojta
Spokespersons of the Cluster of Excellence ct.qmat

Program overview

Wednesday, Sep 24, 2025	Thursday, Sep 25, 2025	Friday, Sep 26, 2025
12:00 Arrival	Breakfast	
	Session 2: Flat bands	**Session 5: Topology**
	09:00 Bing Liu	09:00 Michael Ruck
	09:20 Lennart Klebl	09:20 Begmuhammet Geldiyev
	09:40 Shuai Chen	09:40 Hanns Zimmermann
	10:00 Ludovica Zullo	10:00 Andreas Pfenning
		10:20 Dominik Horneber
		Check-out (by 12:00 latest)
	Coffee break	
	10:40 – 12:40 Social activity – guided tour of Erfurt	**Session 6: Dynamics**
		11:20 Tatiana A. Uaman Svetikova
		11:40 Simon Widmann
	11:20 – 12:40 Steering Committee meeting	12:00 Christian G. Mayer
		12:20 Tobias Müller
	Lunch	
13:00 Welcome	**Session 3: Superconductivity**	**Session 7: Correlations**
13:10 WomenInQuantumTech Martina Erlemann	14:00 Fabian Jakubczyk	14:00 Anika Götz
	14:20 Kristian Mæland	14:20 Coraline Bacq
Session 1: Transport	14:40 Susmita Changdar	14:40 Manuel Weber
13:30 Subhankar Khatua	15:00 Xiaochun Huang	15:00 Mark Potts
13:50 Lorenzo Del Re	15:20 Group photo & drone video	15:20 – 15:40 Closing remarks & best poster award
14:10 Pavlo Pyshkin	15:50 Poster Session II & coffee	
14:30 Wouter Beugeling	**Session 4: Magnetism**	Departure
14:50 Nathaniel Gallop	17:00 Aparajita Singha	
15:10 Poster Session I & coffee	17:20 Olga Shevtsova	
16:20 – 18:40 Members' Assembly & QMA meeting	17:40 Ricardo J. P. Román	
	18:00 Jonathan Karl	
	18:20 Fabian Köhler	
	Dinner	
20:10 Poster Session I (continued)	20:10 Poster Session II (continued)	

For any questions, please contact the support team at ao.ct.qmat@listserv.dfn.de

Program

Wednesday, Sep 24, 2025

08:00 – 12:00	Arrival
	Lunch
13:00 – 13:10	**Welcome**
13:10 – 13:30	**WomenInQuantumTech – Martina Erlemann**
13:30 – 15:10	**Session 1: Transport _____ Yana Vaynzof**
13:30 – 13:50	**Subhankar Khatua** Topological magnons in an altermagnet
13:50 – 14:10	**Lorenzo Del Re** Tunable spin transport in bilayer altermagnetic Mott insulators
14:10 – 14:30	**Pavlo Pyshkin** Modelling of (quasi-)ballistic transport in two-dimensional electron systems
14:30 – 14:50	**Wouter Beugeling** Transport signatures of parity symmetry breaking in a three-dimensional topological insulator
14:50 – 15:10	**Nathaniel Gallop** Phonon coherences and controlling electron-phonon coupling effects in two-dimensional hybrid perovskites
15:10 – 16:20	**Poster Session I** Coffee break / hotel check-in
16:20 – 18:40	**Members' Assembly & QMA meeting**
	Dinner
20:10 – 00:00	**Poster Session I (continued)**

Thursday, Sep 25, 2025

	Breakfast
09:00 – 10:20	**Session 2: Flat Bands _____ Ewelina Hankiewicz**
09:00 – 09:20	**Bing Liu** Substrate-engineered breathing instability in a monolayer Kagome lattice
09:20 – 09:40	**Lennart Klebl** Exact downfolding and its perturbative approximation
09:40 – 10:00	**Shuai Chen** Generalized Peierls substitution for Wannier obstructions: response to disorder and interactions
10:00 – 10:20	**Ludovica Zullo** Flat band evolution in multi-orbital charge-density-wave lattices
	Coffee break
10:40 – 12:40	**Social activity – guided tour of Erfurt**
11:20 – 12:40	**Steering Committee meeting**
	Lunch
14:00 – 15:20	**Session 3: Superconductivity _____ Carsten Timm**
14:00 – 14:20	**Fabian Jakubczyk** Composite superconducting orders and magnetism in $CeRh_2As_2$
14:20 – 14:40	**Kristian Mæland** Phonon-mediated intrinsic topological superconductivity in Fermi arcs

Program

Thursday, Sep 25, 2025

14:40 – 15:00 **Susmita Changdar**
Nodal superconductivity on the Fermi arcs of $PtBi_2$

15:00 – 15:20 **Xiaochun Huang**
Sizeable superconducting gap and anisotropic chiral topological superconductivity in the Weyl semimetal $PtBi_2$

15:20 – 15:50 **Group photo & drone video**

15:50 – 17:00 **Poster Session II** Coffee break

17:00 – 18:40 Session 4: Magnetism _____ Jochen Wosnitza

17:00 – 17:20 **Aparajita Singha**
Non-invasive NV magnetometry as a nanoscale spatially resolved technique: opportunities and challenges

17:20 – 17:40 **Olga Shevtsova**
On-surface spin characterization of isolated molecules using room-temperature NV magnetometry

17:40 – 18:00 **Ricardo Javier Peña Román**
Quantum sensing of a multilayered synthetic antiferromagnet

18:00 – 18:20 **Jonathan Karl**
Discrete holography

18:20 – 18:40 **Fabian Köhler**
Frustration and spin liquids in classical hyperbolic antiferromagnets

Dinner

20:10 – 00:00 **Poster Session II (continued)**

Friday, Sep 26, 2025

Breakfast

09:00 – 10:40 Session 5: Topology _____ Michael Sing

09:00 – 09:20 **Michael Ruck**
New weak topological insulators and semimetals

09:20 – 09:40 **Begmuhammet Geldiyev**
One-dimensional domain boundary states at tellurium-metal interfaces

09:40 – 10:00 **Hanns Zimmermann**
Exploring topological effects in thin-film X-ray cavities

10:00 – 10:20 **Andreas Pfenning**
Topological protection of quantum photonic states

10:20 – 10:40 **Dominik Horneber**
Organic microcavity systems

Coffee break / hotel check-out (by 12:00 latest)

11:20 – 12:40 Session 6: Dynamics _____ Sven Höfling

11:20 – 11:40 **Tatiana Aureliia Uaman Svetikova**
Nonlinear terahertz dynamics in Dirac materials

11:40 – 12:00 **Simon Widmann**
Observation of Kardar-Parisi-Zhang universal scaling in two dimensions

12:00 – 12:20 **Christian G. Mayer**
Towards applicable topological vertical-cavity laser arrays

12:20 – 12:40 **Tobias Müller**
Computing dynamical responses in quantum antiferromagnets for generic spin models

Program

Friday, Sep 26, 2025

	Lunch
14:00 – 15:20	**Session 7: Correlations _____ Fakher Assaad**
14:00 – 14:20	**Anika Götz** Hubbard and Heisenberg models on hyperbolic lattices
14:20 – 14:40	**Coraline Bacq** Realizing Anti-de Sitter spacetime dynamics with optical waveguide arrays
14:40 – 15:00	**Manuel Weber** Retardation-induced intermediate phase and exotic criticality in the one-dimensional Hubbard-Holstein model
15:00 – 15:20	**Mark Potts** Signatures of spinon dynamics and phase structure of dipolar-octupolar quantum spin ices in two-dimensional coherent spectroscopy
15:20 – 15:40	**Closing remarks & best poster award**
15:40	Departure

Quantum scribbles

List of posters

Odd-numbered posters will be presented on Wednesday, September 24, and even-numbered on Thursday, September 25.

No.	Name	Title
1	**Martina Erlemann** **Tamar Grosz**	WomenInQuantumTech: In/visibility of Women in Quantum Technologies – Development of effective strategies for better participation
2	**Nico Albert**	Quantum Mpemba effect enhanced by Stark localization
3	**Ankur Arora**	Manipulation of hybrid interlayer excitons in homobilayer MoS_2
4	**Masoud Bahari**	Spin-orbit coupling in crystalline with P31m space group
5	**Sameran Banerjee**	Light-induced enhancement of superconductivity at oxide interfaces probed by low-T STM
6	**Selena Barragán**	Advancing topological electronics with quantum spin Hall devices based on III-V semiconductors
7	**Gastón Blatter**	Symmetry-breaking-induced DC photocurrents in insulating collinear altermagnets
8	**Eduardo Carrillo**	Low-dimensional transport channels in the WTI $Bi_{12}Rh_3Ag_6I_9$
9	**Victor Cozea**	Topological insulator candidate $Bi_{12}Rh_3Pb_3I_8$
10	**Marco Dittmar**	Growth and spectroscopy of altermagnetic MnTe
11	**Johannes Düreth**	Realization of higher order topological insulators in hybrid dielectric-semiconductor microcavities
12	**Matteo Dürrnagel**	Altermagnetism beyond crystallographic space groups

No.	Name	Title
13	**Liwen Feng**	Phase-resolved Higgs spectroscopy on the interplay of superconductivity and charge density wave
14	**Max Fischer**	Kondo effect with singular baths: the role of electron-phonon interaction
15	**Niccolò Francini**	Ferrimagnetism from quantum fluctuations in Kitaev materials
16	**Jochen Geck**	Strain-control of electronic superlattice domains in CsV_3Sb_5
17	**Patrick Härtl**	Structural, electronic and magnetic properties of Europium on W(110)
18	**Andreas Hausoel**	Local spin dynamics of the metallic room-temperature altermagnet KV_2Se_2O
19	**Shiyu Huang** **Sander Scheel**	Macroscopic monolayer WS2 for robust room-temperature exciton-polariton in open cavities
20	**Dmytro Inosov**	Multi-q instability and the temperature dependence of the pseudo-Goldstone gap in $ZnCr_2Se_4$
21	**Lukas Janssen**	Dirac quantum criticality in moiré materials
22	**Volodymyr Kravchuk**	Magnetic excitations and domain textures of g-wave altermagnets
23	**Shreya Kumbhakar**	Amplitude and Higgs response in $NbSe_2$–from bulk to few layers
24	**Anastasiia Kultaeva** **Volodymyr Vasylkovskyi**	EPR and magnetization studies of Fe^{3+}-doped lead-free perovskites Cs_2AgBiX_6 (X = Br, Cl)

List of posters

Odd-numbered posters will be presented on Wednesday, September 24, and even-numbered on Thursday, September 25.

No.	Name	Title
25	**Jakob Lindenthal**	Engineering optical confinement in 2.5D photonic crystals
26	**Stefano Lionetti**	Anomalies and parity-odd interactions: insights from CFT and beyond
27	**Fang Liu**	Tracing magnetic dynamics in a reversibly switchable metal–organic framework
28	**Daniel Lozano Gómez**	Fragmented spin liquid and shadow pinch points in dipole-octupole pyrochlore spin systems
29	**Shoubhik Mandal**	Klein tunneling effect in Fabry–Pérot interferometer based on zero-gap HgTe quantum wells
30	**Sandip Maity**	Development of an ultra high vacuum and low temperature scanning NV magnetometer
31	**Muthu Masilamani**	Utilizing matrix element effects to study the orbital texture of Dirac surface state in $PtTe_2$
32	**René Meyer**	Torsional Hall viscosity in massive Chern insulators
33	**Anjan Kumar Naralapura Manohara**	Capturing the signatures of population inversion and the excitonic instability in the Dirac and Weyl semimetals using time resolved experiments
34	**Daryoush Nosraty Alamdary**	Work function engineering of the superconducting Nb(110) surface, by epitaxial growth of ultra-thin Ir film
35	**Artem Odobesko**	Probing chiral symmetry with a topological domain wall sensor
36	**Gaopei Pan**	Quantum Monte Carlo simulation of a U(1) Gauge field model for Kondo breakdown

No.	Name	Title
37	**Eric Petermann**	Spin-resolved quasiparticle interference patterns on altermagnets via non-spin-resolved scanning tunneling microscopy
38	**Yasser Saleem**	Engineering biquadratic spin interactions in nanographenes forming one-dimensional spin-1 chains
39	**Jonas Schwab**	ct.qmat collaborative research data infrastructure
40	**Ivan Scolan**	Simulating the Schrödinger equation in anti-hermitian electrical circuits
41	**Aisel Shiralieva**	Multi-block exceptional points in open quantum systems
42	**Harman Singh**	Engineering topological lasers in organic microcavities
43	**Merit Spring**	Oxide membranes: a new platform for emergent quantum effects like charge transfer and Mott transitions
44	**Jonathan Sturm**	Topological quantum optics in atomic emitter arrays
45	**Abdul-Vakhab Tcakaev**	Element-specific magnetism in high-entropy oxides
46	**Shuhan Wang**	2D terahertz (THz) spectroscopy
47	**Indra Yudhistira**	Variational auxiliary field quantum Monte Carlo study of Hubbard model
48	**Disha Hou**	Quantum Monte Carlo study of the SSH model on a triangular lattice

Hotel & guided tour

Hotel

Our cluster retreat takes us to Erfurt, a city whose medieval streets, cathedral, and iconic Krämerbrücke (Merchants' Bridge) radiate history while remaining vibrant and full of life. At the city's tallest building, the NYX Hotel, we'll enjoy not only the best views of Erfurt, but also a welcoming setting to come together and look ahead to our second funding period.


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Full details on how to reach the venue can be found under
www.nyx-hotels.de/erfurt/nyx-hotel-erfurt

NYX Hotel Erfurt
Juri-Gagarin-Ring 127
99084 Erfurt

Guided tour of Erfurt

To join the guided tour on Thursday, September 25, please sign up in advance on the lists provided by the admin team, indicating your preferred group. On the day of the tour, please meet in the coffee break area by 10:40.


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Further information

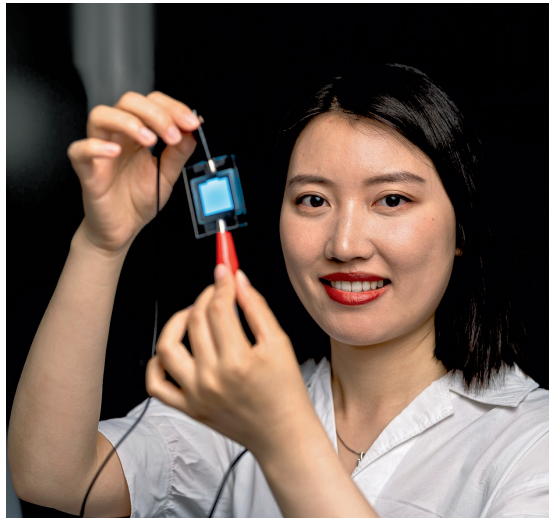
Group photo

A group photo will be taken on Thursday, September 25.

Please note
During the retreat, video recordings will be made in connection with the cluster being renamed. A drone will also be used for the group photo. These video recordings may be used in online communications. We're delighted that this will allow us to include more participants than ever in our coverage.

WomenInQuantumTech

We are proud to partner with the WomenInQuantumTech project, which addresses the underrepresentation and limited visibility of women in quantum technologies. By exploring pathways to greater visibility and developing practical strategies, the project aims to strengthen women's presence in science, society, and politics. At our event, you can learn more in a short talk, examine a poster, and speak directly with the project leader and a research associate.



More about WomenInQuantumTech
www.physik.fu-berlin.de/einrichtungen/ag/ag-erlemann/ projekte/WomenIn-QuantumTech2024-2027/index.html