

NYX Hotel Erfurt
Sep 24 – 26, 2025



CT.QMAT

Cluster Retreat 2025
Complexity and Topology
in Quantum Matter

Conference booklet

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



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
		10:40 Group photo & drone video
	☕ Coffee break (Check-out by 12:00 latest)	
	10:40 – 12:40 Social activity – guided tour of Erfurt	Session 6: Dynamics
		11:40 Tatiana A. Uaman Svetikova
		12:00 Simon Widmann
	11:00 – 12:40 Steering Committee meeting	12:20 Sebastian Klemmt
		12:40 Tobias Müller
🍽 Lunch		
13:00 Welcome	Session 3: Superconductivity	Session 7: Correlations
13:10 WomenInQuantumTech Tamar Grosz	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 – 15:40 Closing remarks & best poster award
14:10 Pavlo Pyshkin	15:20 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 – Tamar Grosz
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 _____ Georgy Astakhov
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
11:00 – 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 – 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
10:40 – 11:10	Group photo & drone video ☕ Coffee break / hotel check-out (by 12:00 latest)
11:40 – 13:00	Session 6: Dynamics _____ Sven Höfling
11:40 – 12:00	Tatiana Aureliia Uaman Svetikova Nonlinear terahertz dynamics in Dirac materials
12:00 – 12:20	Simon Widmann Observation of Kardar-Parisi-Zhang universal scaling in two dimensions
12:20 – 12:40	Sebastian Klemmt Towards applicable topological vertical-cavity laser arrays
12:40 – 13:00	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

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		
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 ₃ AgI ₉
9	Victor Cozea	Topological insulator candidate Bi ₁₂ Rh ₃ Pb ₃ I ₈
10	Marco Dittmar	Growth and spectroscopy of altermagnetic MnTe
11	Johannes Dürerth	Realization of higher order topological insulators in hybrid dielectric-semiconductor microcavities
12	Matteo Dürrnagel	Altermagnetism beyond crystallographic space groups

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

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 ₃ Sb 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 ₂ Se ₂ O
19	Shiyu Huang Sander Scheel	Macroscopic monolayer WS ₂ 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 ₂ Se 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 Vasylykovskyi	EPR and magnetization studies of Fe ³⁺ -doped lead-free perovskites Cs ₂ AgBiX ₆ (X = Br, Cl)

List of posters

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 Nosrati 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

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

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 Socolan	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.



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.



Further information

Group photo

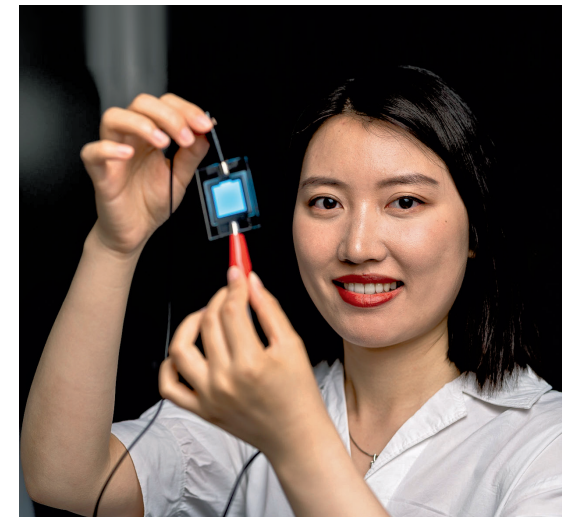
A group photo will be taken on Thursday, September 25.

► 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/WomenInQuantumTech2024-2027/index.html

