

NYX Hotel Erfurt
Sep 24 – 26, 2025



CT.QMAT

Cluster Retreat 2025
on Complexity and Topology
in Quantum Matter

Conference Booklet

Valid as of August 22 – for all updates
please visit ctqmat.de/en/events/erfurt25 from September 22!



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
08:00 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 Mark Potts	09:40 Hanns Zimmermann
	10:00 Ludovica Zullo	10:00 Andreas Pfenning
		10:20 Dominik Horneber
		Check-out (until 12:00)
	☕ Coffee break	
	10:40 – 12:40 Social activity - guided city tour Erfurt	Session 6 – Dynamics
		11:20 Tatiana A. Uaman Svetikova
		11:40 Simon Widmann
	11:20 – 12:40 Steering committee meeting	12:00 Christian Mayer
		12:20 Coraline Bacq
	🍽️ 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 Manuel Weber
Session 1 – Transport	14:40 Susmita Changdar	14:40 Shuai Chen
13:30 Subhankar Khatua	15:00 Xiaochun Huang	15:00 Jonathan Karl
13:50 Lorenzo Del Re	15:20 Group foto & 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 Fabian Köhler	
	18:20 Tobias Müller	
	🍽️ Dinner	
20:10 Poster session I (continued)	20:10 Poster session II (continued)	

Program

Wednesday, Sep 23, 2025

08:00 – 12:00	Arrival
	Lunch
13:00 – 13:10	Welcome
13:10 – 13:30	WomenInQuantumTech – Martina Erlemann
13:30 – 15:10	TRANSPORT _____ Session 1
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 24, 2025

	Breakfast
09:00 – 10:20	FLAT BANDS _____ Session 2
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	Mark Potts Signatures of spinon dynamics and phase structure of dipolar-octupolar quantum spin ices in two-dimensional coherent spectroscopy
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 city tour Erfurt
11:20 – 12:40	Steering committee meeting
	Lunch
14:00 – 15:20	SUPERCONDUCTIVITY _____ Session 3
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 24, 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 foto & drone video
15:50 – 17:00	Poster session II
	Coffee break
17:00 – 18:40	MAGNETISM Session 4
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 characterisation 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	Fabian Köhler Frustration and spin liquids in classical hyperbolic antiferromagnets
18:20 – 18:40	Tobias Müller Computing dynamical responses in quantum antiferromagnets for generic spin models
	Dinner
20:10 – 00:00	Poster session II (continued)

Friday , Sep 25, 2025

	Breakfast
09:00 – 10:40	TOPOLOGY Session 5
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
10:40 – 11:10	Check-out (until 12:00)
11:20 – 12:40	DYNAMICS Session 6
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 Mayer Towards applicable topological vertical-cavity laser arrays
12:20 – 12:40	Coraline Bacq Realizing anti-de Sitter spacetime dynamics with optical waveguide arrays

Program

Friday , Sep 25, 2025



Lunch

14:00 – 15:20

CORRELATIONS _____ **Session 7**

14:00 – 14:20

Anika Götz

Hubbard and Heisenberg models on hyperbolic lattices

14:20 – 14:40

Manuel Weber

Retardation-induced intermediate phase and exotic criticality in the one-dimensional Hubbard-Holstein model

14:40 – 15:00

Shuai Chen

Generalized Peierls substitution for Wannier obstructions

15:00 – 15:20

Jonathan Karl

Discrete holography

15:20 – 15:40

Closing remarks & best poster award

15:40 – 16:30

Departure

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

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