



OPEN QUANTUM MATTER: CHARACTERIZATION AND CONTROL

Focused QOpen WG2–WG3 Workshop

COST Action CA24109 · Conference Booklet

Oslo, 7–9 October 2026

HOSTED BY

OSLOMET

OSLO METROPOLITAN UNIVERSITY
STORBYUNIVERSITETET



The OsloMet Quantum Hub



COST Action CA24109 – QOpen
European Cooperation in Science and Technology

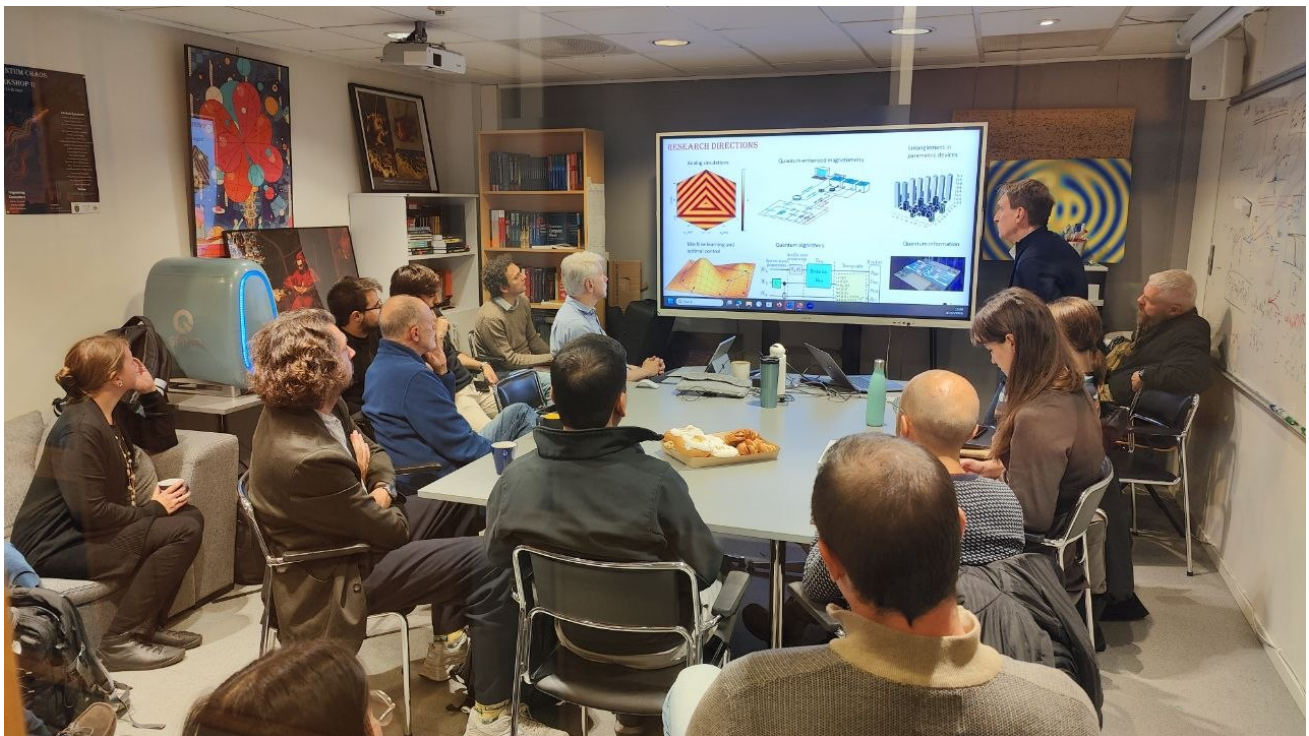


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The colloquium, Wednesday 7 October 2026, OsloMet.

1 Workshop Information

This focused workshop brings together researchers from QOpen Working Groups 2 and 3 for three days at OsloMet, from 7 to 9 October 2026. It addresses the interface between dissipative quantum matter and the characterization and control of open quantum platforms, with particular emphasis on non-equilibrium phases, driven and monitored quantum systems, dissipative stabilization, noisy quantum devices, and strategies for using dissipation as a resource.

The goal is to identify common challenges, benchmark problems, collaboration opportunities and possible joint outputs. The workshop is meant to strengthen the interaction between WG2 and WG3, to support young researchers, and to generate concrete follow-up activities such as STSMs, joint manuscripts, and a possible perspective or roadmap contribution.

The programme has 40-minute talks, a one-hour colloquium, and discussion sessions in which participants propose and address the open questions of the field.

Venue

Wednesday 7 Oct	Ellen Gleditschs hus, Pilestredet 35, 0166 Oslo. Room PI857 , 8th floor (registration from 08:45).
Thursday 8 Oct	Pilestredet 32, room N040.006 , 4th floor (look for the “OsloMet Quantum Hub” roll-up poster).
Friday 9 Oct	Room to be announced.

[Venue map \(Pilestredet 35\)](#)

Getting to the venue

From the airport, take the train to Oslo Central Station (Oslo S). From Oslo S, take the metro to Nationaltheatret. From Nationaltheatret it is about a five-minute walk to Pilestredet 35.

Where to stay

All within a few minutes’ walk of the venue.

Hotel	Address	Walk
Scandic Holberg	Holbergs plass 1	just across the street
Radisson Blu Scandinavia Hotel	Holbergs gate 30	1–2 minutes
Thon Hotel Europa	St. Olavs gate 31	3–4 minutes
Smarthotel Oslo	St. Olavs gate 26	about 5 minutes
Scandic St. Olavs plass	St. Olavs plass 1	6–7 minutes
Thon Hotel Slottsparken	Wergelandsveien 5	6–7 minutes

Local contact

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Organisers

Name	Role
Pedro Ribeiro	Action Chair, Instituto Superior Técnico, University of Lisbon
Sergiy Denysov	WG3 Leader, local host, OsloMet
Lucas Sá	Vice-Leader WG2

QOpen Action organisation

Role	Name
Action Chair	Pedro Ribeiro
Action Vice-Chair	Zala Lenarcic
Science Communication Coordinator	Federico Roccati
WG1 Leader	Katja Klobas
Vice-Leader WG1	Alberto Biella
WG2 Leader	Andrea De Luca
Vice-Leader WG2	Lucas Sá
WG3 Leader	Sergiy Denysov
Vice-Leader WG3	Nadir Samos Saenz De Buruaga
WG4 Leader	Brendon Lovett
Vice-Leader WG4	Alexander Schnell
Event Planning & Training - Coordinator	Masudul Haque
Event Planning & Training - Co-Coordinator	Ivana Vasic
Grant Awarding Coordinator	Paul McClarty
STSM Committee - Co-Coordinator	Jens Paaske
Inclusivity & Sustainability - Coordinator	Tony John George Apollaro

2 Schedule

	Wednesday, 7 October 2026	Thursday, 8 October 2026	Friday, 9 October 2026
08:45	Reception and registration 08:45–09:00		
09:00	Masud Haque TU Dresden 09:00–09:40	Nadir Samos Sáenz de Buruaga Universidad Autónoma de Madrid 09:00–09:40	Katja Klobas University of Birmingham 09:00–09:40
10:00	Jens Paaske Niels Bohr Institute 09:40–10:20	Gniewomir Sarbicki Nicolaus Copernicus University, Toruń, Poland 09:40–10:20	Ahsan Nazir University of Manchester 09:40–10:20
	Coffee break 10:20–10:50	Coffee break 10:20–10:50	Coffee break 10:20–10:50
11:00	Discussion Session 1 10:50–11:30	Discussion Session 2.1 10:50–11:30	Discussion Session 3.1 10:50–11:30
12:00	Khrystyna Gnatenko Ivan Franko National University of Lviv & Sof... 11:30–12:10	Dariusz Chruściński Nicolaus Copernicus University 11:30–12:10	Shovan Dutta Raman Research Institute, India 11:30–12:10
	Tiago Manuel de Carvalho Jorge CeFEMA-LaPMET, Instituto Superior Técnico, Un... 12:10–12:50	Ana Hudomal Institute of Physics Belgrade 12:10–12:50	Marco Pezzutto CeFEMA and Instituto Superior Técnico 12:10–12:50
13:00	Lunch 12:50–14:05	Lunch 12:50–14:05	Lunch 12:50–14:05
14:00	G.-S. Paraoanu (colloquium) Aalto University 14:05–15:05	Andrea De Luca CY Cergy Paris Université 14:05–14:45	Discussion Session 3.2 14:05–14:45
15:00	Adway Das Loughborough University, UK 15:05–15:45	Alexander Schnell TU Berlin 14:45–15:25	Discussion Session 3.3 14:45–15:25
	Coffee break 15:45–16:15	Coffee break 15:25–15:55	Coffee break 15:25–15:55
16:00	Riya Baruah Aalto University 16:15–16:55	Discussion Session 2.2 15:55–16:35	Discussion Session 3.4 15:55–16:35
17:00	Rafael Diogo Soares Max Planck Institute for the Physics of Compl... 16:55–17:35	Thibaut Lacroix Institute of Theoretical Physics, Ulm Univers... 16:35–17:15	Closing remarks and next steps 16:35–16:50
		Angelo Russotto SISSA 17:15–17:55	
18:00			

Talks are 40 minutes including questions. The colloquium is one hour. Discussion sessions are 40 minutes.

3 Programme by Day

Wednesday, 7 October 2026

Time	Session
08:45–09:00	Reception and registration
09:00–09:40	Masud Haque , TU Dresden
09:40–10:20	Jens Paaske , Niels Bohr Institute
10:20–10:50	Coffee break
10:50–11:30	Discussion Session 1 : Characterization of open quantum systems and processes
11:30–12:10	Khrystyna Gnatenko , Ivan Franko National University of Lviv & SoftServe Inc., Ukraine
12:10–12:50	Tiago Manuel de Carvalho Jorge , CeFEMA-LaPMET, Instituto Superior Técnico, Universidade de Lisboa
12:50–14:05	Lunch
14:05–15:05	G.-S. Paraoanu (colloquium), Aalto University
15:05–15:45	Adway Das , Loughborough University, UK
15:45–16:15	Coffee break
16:15–16:55	Riya Baruah , Aalto University
16:55–17:35	Rafael Diogo Soares , Max Planck Institute for the Physics of Complex Systems

Thursday, 8 October 2026

Time	Session
09:00–09:40	Nadir Samos Sáenz de Buruaga , Universidad Autónoma de Madrid
09:40–10:20	Gniewomir Sarbicki , Nicolaus Copernicus University, Toruń, Poland
10:20–10:50	Coffee break
10:50–11:30	Discussion Session 2.1
11:30–12:10	Dariusz Chruściński , Nicolaus Copernicus University
12:10–12:50	Ana Hudomal , Institute of Physics Belgrade
12:50–14:05	Lunch
14:05–14:45	Andrea De Luca , CY Cergy Paris Université
14:45–15:25	Alexander Schnell , TU Berlin
15:25–15:55	Coffee break
15:55–16:35	Discussion Session 2.2
16:35–17:15	Thibaut Lacroix , Institute of Theoretical Physics, Ulm University
17:15–17:55	Angelo Russotto , SISSA

Friday, 9 October 2026

Time	Session
09:00–09:40	Katja Klobas , University of Birmingham
09:40–10:20	Ahsan Nazir , University of Manchester
10:20–10:50	Coffee break
10:50–11:30	Discussion Session 3.1
11:30–12:10	Shovan Dutta , Raman Research Institute, India
12:10–12:50	Marco Pezzutto , CeFEMA and Instituto Superior Técnico
12:50–14:05	Lunch
14:05–14:45	Discussion Session 3.2
14:45–15:25	Discussion Session 3.3
15:25–15:55	Coffee break
15:55–16:35	Discussion Session 3.4
16:35–16:50	Closing remarks and next steps

4 Speakers

Ordered by appearance in the workshop schedule.

Speaker	Institution	Day and time
Masud Haque	TU Dresden	Wed 7 Oct 09:00
Jens Paaske	Niels Bohr Institute	Wed 7 Oct 09:40
Khrystyna Gnatenko	Ivan Franko National University of Lviv & SoftServe Inc., Ukraine	Wed 7 Oct 11:30
Tiago Manuel de Carvalho Jorge	CeFEMA-LaPMET, Instituto Superior Técnico, Universidade de Lisboa	Wed 7 Oct 12:10
G.-S. Paraoanu	Aalto University	Wed 7 Oct 14:05
Adway Das	Loughborough University, UK	Wed 7 Oct 15:05
Riya Baruah	Aalto University	Wed 7 Oct 16:15
Rafael Diogo Soares	Max Planck Institute for the Physics of Complex Systems	Wed 7 Oct 16:55
Nadir Samos Sáenz de Buruaga	Universidad Autónoma de Madrid	Thu 8 Oct 09:00
Gniewomir Sarbicki	Nicolaus Copernicus University, Toruń, Poland	Thu 8 Oct 09:40
Dariusz Chruściński	Nicolaus Copernicus University	Thu 8 Oct 11:30
Ana Hudomal	Institute of Physics Belgrade	Thu 8 Oct 12:10
Andrea De Luca	CY Cergy Paris Université	Thu 8 Oct 14:05
Alexander Schnell	TU Berlin	Thu 8 Oct 14:45
Thibaut Lacroix	Institute of Theoretical Physics, Ulm University	Thu 8 Oct 16:35
Angelo Russotto	SISSA	Thu 8 Oct 17:15
Katja Klobas	University of Birmingham	Fri 9 Oct 09:00
Ahsan Nazir	University of Manchester	Fri 9 Oct 09:40
Shovan Dutta	Raman Research Institute, India	Fri 9 Oct 11:30
Marco Pezzutto	CeFEMA and Instituto Superior Técnico	Fri 9 Oct 12:10

Other participants

Pedro Ribeiro	CeFEMA-LaPMET, IST-ULisboa (organiser)
Sergiy Denysov	OsloMet (organiser)
Kristian Wold	OsloMet
Aleksandar Davidov	OsloMet
Maryam Lotfigolian	OsloMet
Heine Olsson Aabø	OsloMet

5 Discussion Sessions

Session	Time	Topic
Discussion Session 1	Wed 7 Oct 10:50–11:30	Characterization of open quantum systems and processes
Discussion Session 2.1	Thu 8 Oct 10:50–11:30	To be announced
Discussion Session 2.2	Thu 8 Oct 15:55–16:35	To be announced
Discussion Session 3.1	Fri 9 Oct 10:50–11:30	To be announced
Discussion Session 3.2	Fri 9 Oct 14:05–14:45	To be announced
Discussion Session 3.3	Fri 9 Oct 14:45–15:25	To be announced
Discussion Session 3.4	Fri 9 Oct 15:55–16:35	To be announced

6 Talks

6.1 Wednesday, 7 October 2026

09:00 – 09:40 Masud Haque

Title: *Spectra of (many-body) Lindbladians*

Institution: TU Dresden

Abstract:

We discuss some aspects of the spectra of (many-body) Lindbladians. We also discuss some fun examples.

09:40 – 10:20 Jens Paaske

Title: *Quantum Desynchronization of Limit Cycles*

Institution: Niels Bohr Institute

Abstract:

It is well known from classical physics that weakly coupled self-sustained oscillators may spontaneously lock their phases. Just like classical synchronization is known to break down due to noise induced phase slips, this talk addresses how the synchronization of continuous variable quantum systems breaks down by proliferation of quantum phase slips. The phase dynamics is analyzed within a Keldysh path integral formulation of limit cycles, and shows how, in spite of strong phase correlations, quantum phase slips degrade the actual phase locking. This approach also allows addressing non-Markovian effects on the synchronization of limit cycles, which is illustrated explicitly for oscillators coupled via a voltage biased double quantum dot.

11:30 – 12:10 Khrystyna Gnatenko

Title: *Properties of variational quantum states and their studies with quantum computing*

Institution: Ivan Franko National University of Lviv & SoftServe Inc., Ukraine

Abstract:

We investigate entanglement in multi-qubit quantum states prepared using variational quantum circuits with different architectures of entangling blocks. For states generated by circuits with RY rotations and CZ gates, we derive analytical expressions and recurrence relations for quantum correlators and obtain an expression for the entanglement distance [1]. For a closed one-dimensional chain of n qubits, we derive an analytical expression for the entanglement between a selected qubit and the rest of the system and show that it depends on the parameters of gates acting on the qubit and its nearest- and next-nearest neighbors [1]. We also study variational quantum states represented by graphs with weighted vertices and edges and prepared using RX rotations and RZZ gates. For quantum graph states of arbitrary topology, we derive analytical expressions for the geometric measure of entanglement and quantum correlators and establish their dependence on local vertex and edge weights [2]. We further show that qubit entanglement is determined by the weights of incoming and outgoing edges [3]. The analytical results are validated using the IBM Marrakesh and IBM Kingston quantum processors and Qiskit AerSimulator, including noisy simulations [1–3]. These findings provide insights into entanglement in variational and graph-based quantum states and are relevant to quantum machine learning, variational quantum algorithms, and quantum error correction. [1] Kh. P. Gnatenko, A. Kaczmarek, Properties of multi-qubit variational quantum states representing weighted graphs and their computing with quantum programming, arXiv:2604.00958 (2026). [2] Kh. P. Gnatenko, R. O. Hredil, V. Y. Pinchuk, M. Z. Seniak, Y. T. Shevchuk, Entanglement distance of two- and multi-qubit variational states and its quantification with quantum computing, arXiv:2605.00259 (2026). [3] Kh. P. Gnatenko Entanglement

of multi-qubit states representing directed networks and its detection with quantum computing Phys. Lett. A 521, 129815 [5 p.] (2024).

12:10–12:50 Tiago Manuel de Carvalho Jorge

Title: *From Effective Temperature to Non-Boltzmann State Selection in Driven-Dissipative Quantum Criticality*

Institution: CeFEMA-LaPMET, Instituto Superior Técnico, Universidade de Lisboa

Abstract:

Whether a nonequilibrium quantum-critical steady state can be described by an effective temperature remains an open question. We address it in a voltage-biased electronic Lipkin–Meshkov–Glick model, a minimal driven-dissipative model of a collective spin coupled to metallic leads. A controlled large- N treatment reveals an overdamped open quantum-critical regime distinct from the closed model. The surrounding quantum critical fan, organized by temperature and voltage, is explored and fluctuations are found to be governed by an effective temperature. At strong bias, the transition becomes first-order through a tricritical point. Remarkably, the same effective temperature governs the strongly driven regime, but now varies across the entire order-parameter landscape. The steady state is therefore selected by a non-Boltzmann rule, shifting the first-order transition away from the equal-depth point of a deterministic potential. Driven criticality thus remains organized by an effective temperature while revealing non-thermal state selection.

14:05–15:05 G.-S. Paraoanu (colloquium)

Title: *Controlling quantum systems through phase modulation: from fundamental quantum physics to sensing applications*

Institution: Aalto University

Abstract:

The traditional way of manipulating a quantum two-level system (qubit) is by employing Rabi oscillations: a pulse at a frequency resonant with the energy level separation can place the state of the qubit anywhere on the Bloch sphere.

We have recently shown that phase modulation provides an alternative very versatile tool of controlling quantum systems and explore driven quantum dynamics. In superconducting qubits, carefully designed protocols based on this concept can improve the fidelity and robustness of qubit operations such as population transfer and standard single-qubit gates even in the presence of certain experimental errors. Generalizing this approach to three-level systems allowed us to observe a novel two-photon LZSM process in a three-level system, achieving 98% population transfer and demonstrating that the LZSM transition velocity gets doubled. We have further systematically investigated pulse optimization, including Pareto-optimal control and continuous-time neural-network methods, enabling smooth, hardware-compatible pulses with high fidelity over substantial detuning range. Finally, we have applied neural-network-optimized control to dark photon sensing experiments, where robust qubit operations are used to perform high-fidelity measurements in the presence of frequency shifts.

Our results illustrate how driven quantum dynamics and modern control techniques can be combined to develop practical protocols for superconducting quantum devices, with applications ranging from quantum information processing to quantum sensing and searches for physics beyond the Standard Model.

References: M. P. Silveri et al., Rep. Prog. Phys. 80, 056002 (2017); J. J. McCord et al., EPJ Quantum Technol. 12, 121 (2025); M. Kuzmanovic et al., Phys. Rev. Research 6, 013188 (2024); Björkman et al., Phys. Rev. Lett. 134, 060602 (2025); M. Kuzmanovic et al., Phys. Rev. Applied, DOI 10.1103/4zzl-qbsf (2026); Yu-Han Chang et al., Physical Review D 114 (5), 052011 (2026).

15:05 – 15:45 Adway Das

Title: *Reducing dynamical fluctuations and enforcing self-averaging by opening many-body quantum systems*

Institution: Loughborough University, UK

Abstract:

We investigate how the dynamical fluctuations of many-body quantum systems out of equilibrium can be mitigated when they are opened to a dephasing environment. We consider the survival probability (spectral form factor with a filter) evolving under different kinds of random matrices and under a spin-1/2 model with weak and strong disorder. In isolated many-body quantum systems, the survival probability is non-self-averaging at any timescale, that is, the relative variance of its fluctuations does not decrease with system size. By opening the system, we find that the fluctuations are always reduced, but self-averaging can only be ensured away from critical points. Self-averaging is achieved for the long-time dynamics of full random matrices, power-law banded random matrices deep in the delocalized phase, and the Rosenzweig-Porter ensemble in all phases except at the localization transition point. For the spin model, the survival probability becomes self-averaging only in the chaotic regime provided the initial states are in the middle of the spectrum. Overall, a strongly non-self-averaging survival probability in open systems is an indicator of criticality.

16:15 – 16:55 Riya Baruah

Title: *Temperature control and fluctuations in driven open quantum systems*

Institution: Aalto University

Abstract:

Many quantum technologies, including quantum computers, heat engines and sensors, operate in the subkelvin regime, which makes precise control of the temperature in nanoscale quantum systems highly desirable. In this talk, I will present a scheme for fast, accurate and local temperature control using qubits that regulate the flow of heat between a quantum system and its thermal environment. The qubits are kept in a thermal state whose temperature is controlled through an interplay between the work done on them, by changing their energy splittings, and the heat they exchange with the environment. Using only a few such qubits, the thermal environment of another quantum system can be engineered to heat or cool it. As an example, a quantum system at subkelvin temperatures can be accurately cooled on a nanosecond timescale. I will then apply the same idea to a quantum resonator, a natural working fluid for nanoscale heat engines, whose temperature is controlled by modulating its frequency. Besides the average work and heat, in linear response and beyond, I will discuss the full distribution of photons exchanged with the environment, which sheds light on the interplay between heat, work and fluctuations.

16:55 – 17:35 Rafael Diogo Soares

Title: *Dissipative Phase Transition of Interacting Nonreciprocal Fermions*

Institution: Max Planck Institute for the Physics of Complex Systems

Abstract:

While nonreciprocal couplings are ubiquitous in classical systems, their impact on quantum many-body criticality and entanglement remains largely unexplored. Using exact numerical simulations, we study an interacting fermionic chain subject to nonreciprocal gain and loss. We show that the interplay between dissipation and interactions drives a dissipative phase transition, marked by the opening of a many-body gap and a crossover from power law to exponential relaxation. The weakly interacting regime displays nonreciprocal signatures, including nonzero currents and directional charge accumulation reminiscent of the skin effect. Notably, despite this localization, quantum trajectories

exhibit volume-law entanglement. Finally, reciprocity is dynamically restored above a critical interaction strength.

6.2 Thursday, 8 October 2026

09:00–09:40 Nadir Samos Sáenz de Buruaga

Title: *Characterization of Open Quantum Systems with Diluted Unitaries*

Institution: Universidad Autónoma de Madrid

Abstract:

I will introduce diluted-unitary quantum maps, a family of channels that interpolates between unitary dynamics and fully dissipative evolution. These maps provide a simple model for the accumulation of errors in local random quantum circuits, and they allow us to study how the signatures of integrability gradually fade as the dissipation strength increases. Special emphasis will be placed on the role of the rank of the dissipative part.

09:40–10:20 Gniewomir Sarbicki

Title: *Optimal two photon absorbtion*

Institution: Nicolaus Copernicus University, Toruń, Poland

Abstract:

We present a collision-model approach to the interaction between few-level atoms and propagating quantum light fields. Starting from a repeated quantum interactions model derived within the Wigner–Weisskopf approximation, the field is represented as a sequence of temporal modes interacting successively with the atomic system. This formulation provides a description richer than the standard master-equation approach: it naturally retains information about the input quantum state and measurement record, allows conditional quantum trajectories to be obtained, and provides convenient access to memory and non-Markovian effects. We first illustrate the method for a two-level atom driven by a single-photon wave packet, deriving both conditional and unconditional evolution and the corresponding excitation probability, including the optimal temporal photon profile. We then extend the framework to two-photon excitation of a three-level atom in a ladder configuration. Two distinct configurations are considered: photons occupying spectrally separated modes, each coupled to one transition, and two photons propagating in a common mode coupled to both transitions. For both cases we derive explicit expressions for the two-photon absorption probability and identify the optimal two-photon wave packet maximizing excitation. Finally, we compare entangled and separable two-photon inputs, demonstrating the possible quantum advantage provided by temporal correlations and entanglement.

11:30–12:10 Dariusz Chruściński

Title: *Non-Markovian dynamics: Schrödinger vs Heisenberg picture*

Institution: Nicolaus Copernicus University

Abstract:

Divisibility of dynamical maps is a central notion in the study of quantum non-Markovianity, providing a natural framework to characterize memory effects via time-local master equations. In this talk we discuss the notion of divisibility of quantum dynamical maps from the Schrödinger to the Heisenberg picture. While the two pictures are equivalent at the level of physical predictions, we show that the divisibility properties of the corresponding dual maps are, in general, not equivalent. This inequivalence originates from the distinction between left and right generators of time-local master equations, which interchange roles under duality. We demonstrate that Schrödinger and Heisenberg divisibility are distinct concepts by constructing explicit dynamics divisible only in one picture. Furthermore, we

introduce a quantifier for the violation of Heisenberg divisibility, analogous to the trace-distance-based measure of non-Markovianity, and provide it with an operational interpretation in terms of the guessing probability between effects. Interestingly, we show that if memory effects allow for revivals in time of nonlocality of bipartite states, then the dynamics must be non-Markovian in both pictures.

12:10–12:50 Ana Hudomal

Title: *Ergodicity breaking meets quantum criticality in a programmable Rydberg atom array*

Institution: Institute of Physics Belgrade

Abstract:

Recent advances in quantum simulators have opened a new window into the behavior of complex quantum systems far from equilibrium. Using QuEra's programmable Rydberg atom arrays, we investigate how quantum criticality influences thermalization and ergodicity by simulating a one-dimensional model with kinetic constraints. We map out the dynamical phase diagram of this model and reveal a tunable regime of ergodicity breaking due to quantum many-body scars, a set of atypical eigenstates that prevent the system from rapidly reaching thermal equilibrium. Remarkably, these nonthermalizing dynamics, manifested as long-lived coherent oscillations, persist across a much broader range of parameters than previously observed, including at the quantum critical point. We further analyze the defects generated during state preparation via the Kibble-Zurek mechanism, which strongly affect the subsequent dynamics. Our results provide new insights into the interplay between ergodicity breaking and quantum criticality and establish Rydberg atom arrays as a powerful platform for probing such phenomena.

14:05–14:45 Andrea De Luca

Title: *Universal overlap distributions from generic many-body dynamics: from Porter–Thomas to noisy quantum processors*

Institution: CY Cergy Paris Université

Abstract:

In chaotic systems, the overlaps of a quantum state with a reference basis follow the Porter–Thomas distribution, the hallmark of random-matrix behaviour. How does this universality emerge in spatially extended many-body systems evolving for a finite time under local dynamics? Using random quantum circuits, we show that at logarithmic depth the overlap distribution converges to a universal form — Porter–Thomas random variable multiplied by a log-normal — that depends only on the spatial dimension, on the boundary conditions, and on a single Thouless length tied to the decay of the purity. A mapping onto a dilute gas of domain walls in permutation space makes this picture transparent and explains why anticoncentration sets in long before entanglement saturates. Weak noise acts as a field favouring the identity permutation, giving a two-parameter family of distributions. Finally, we test these predictions on bitstring samples from Google's Willow processor, from which we extract the Thouless length and the error rate without simulating the circuit classically.

14:45–15:25 Alexander Schnell

Title: *Quantum simulation of open systems with ultracold atoms*

Institution: TU Berlin

Abstract:

We will discuss what happens when a quantum simulator is coupled to external reservoirs. Usually, the presence of unwanted dissipation leads to the washing out of interesting quantum effects of the coherent dynamics. Here, we will however discuss, how the interplay of the (time-periodic) driving

and an engineered bosonic bath can be used to stabilise low-entropy states of ultracold fermions giving rise to effective Floquet topological insulators. Also, we will discuss novel ideas how Floquet heating can be tackled by coupling the quantum simulator to artificial reservoirs.

16:35–17:15 Thibaut Lacroix

Title: *Thermalization of open quantum systems with pseudomodes*

Institution: Institute of Theoretical Physics, Ulm University

Abstract:

Pseudomode approaches allow for an exact and unapproximated description of a quantum system interacting arbitrarily strongly with a bath. In general, a system coupled to pseudomodes will not thermalize to the system's Gibbs state: This is to be expected when the system–bath coupling is non-perturbative, but conflicts with common thermodynamic intuition when the system–bath coupling is asymptotically weak. After introducing the concept of pseudomodes, we will explore under which circumstances pseudomode models satisfy detailed balance (and subsequently thermalize to the system Gibbs state) and how specific choices of parameters can force “weak” detailed balance that is restricted to a limited frequency range. We will also show how a combination of Hermitian and non-Hermitian pseudomodes can yield a flat effective-temperature profile.

17:15–17:55 Angelo Russotto

Title: *Gaussian Scrooge Ensemble from Deep Thermalization in Free-Fermions*

Institution: SISSA

Abstract:

Deep thermalization concerns the emergence of universal ensembles of pure states in a subsystem after measuring its environment. We investigate this phenomenon in an free-fermion chain using local measurements that preserve Gaussianity and break particle-number conservation. Although the measurement outcomes provide partial information about local conserved charges within a finite subsystem, we argue that this information becomes negligible in the thermodynamic limit. This effective non-revelation underlies the emergence of a fermionic Gaussian Scrooge ensemble, determined by the subsystem's generalized Gibbs ensemble. We construct this universal ensemble directly at the subsystem level and provide numerical evidence that it describes the late-time projected ensemble at finite temperature. Our results extend the description of thermalization in integrable systems beyond the reduced density matrix to universal statistics of conditional pure states.

6.3 Friday, 9 October 2026

09:00–09:40 Katja Klobas

Institution: University of Birmingham

Title and abstract to be added.

09:40–10:20 Ahsan Nazir

Title: *Numerically exact open quantum system work statistics with process tensors*

Institution: University of Manchester

Abstract:

Accurately quantifying the thermodynamic work costs of quantum operations is essential for the continued development and optimisation of emerging quantum technologies. This present a significant

challenge in regimes of rapid control within complex, non-equilibrium environments - conditions under which many contemporary quantum devices operate and conventional approximations break down. Here, we introduce a process tensor framework that enables the computation of the full numerically exact quantum work statistics of driven open quantum systems. We demonstrate the utility of our approach by applying it to a Landauer erasure protocol operating beyond the weak-coupling, Markovian, and slow-driving limits. The resulting work probability distributions reveal distinct quantum signatures that are missed by low-order moments yet significantly impact the erasure fidelity of the protocol. Our framework delivers non-perturbative accuracy and detail in characterising energy-exchange fluctuations in driven open quantum systems, establishing a powerful and versatile tool for exploring thermodynamics and control in the operating regimes of both near-term and future quantum devices.

11:30 – 12:10 Shovan Dutta

Title: *Long-range multipartite entanglement from local dissipative drive*

Institution: Raman Research Institute, India

Abstract:

I will talk about how one can harness a star-shaped local connectivity among qubits and a single incoherent pump at the center to prepare and stabilize a broad class of long-range multipartite entangled states, including rainbow states of Bell pairs, W states, and exact matrix product states (MPS) of a given uniform bond dimension. The construction works for any number of legs of the star and any number of qubits per leg, as long as the legs are identical. The core mechanism is based on free-fermion physics and survives in the presence of interactions that preserve the occupation of the rotationally symmetric fermion mode. We show how the star geometry allows one to locally simulate this fermionic physics with the help of one or more ancilla qubits that mediate the interactions at the center of the star. By varying the initial state of the ancilla and the number of legs, one can control the steady state. I will also discuss how one may realize the ancilla-mediated coupling by periodically modulating two-qubit interactions, which allows one to realize the steady states on experimentally accessible timescales.

12:10 – 12:50 Marco Pezzutto

Title: *Nonclassical energy-change distribution as a witness of non-Markovian quantum dynamics*

Institution: CeFEMA and Instituto Superior Técnico

Abstract:

We address the problem of identifying anomalous energy fluxes due to non-Markovian quantum time evolutions of an open quantum system by only performing measurements of the system's energy. We demonstrate that non-positive values of the energy-change Kirkwood-Dirac quasiprobability distribution associated with the Hamiltonian and reduced dynamics of the system act as witnesses to violations of CP-divisibility in terms of a sufficient condition. The link between non-positivity of the system's energy-change distribution and non CP-divisibility is stronger when the system-environment interactions are energy-preserving. For fixed-point thermalizing qubit maps, energy-preservation allows also to directly infer the non-Markovianity of thermalization processes exhibiting anomalous energy fluxes, through local measurements of the system's average energy-change. Anomalous fluxes are also detected by the non-Markovianity measure built over the quantum mutual information between the states of the open system and of a quantum correlated reference.