

Quantum characterization and control of quantum complex systems

Lake Como School of Advanced Studies, September 19-23, 2022

[Home](#) [Application](#) [Contacts](#) [Course Material](#) [Lecturers](#) [Posters](#) [Programme](#) [Registration](#) [Scientific Committee](#)

[Venue and Accommodation](#)



Home

The study of quantum networks and, more generally, of complex quantum systems arises from the need to understand the impact of the complexity and of the structure of networks on the performance of quantum communication, quantum computing and quantum metrology protocols. As it happens in the "classical framework", the study of the laws that regulate the dynamics of quantum networks and the consequent design of control protocols are crucial for both predicting non-trivial behaviors and non-classical enhancements, and to maintain them also in the presence of noise and decoherence.

The proposed school has its scientific genesis in several European projects, whose common denominator is to develop and consolidate new interdisciplinary approaches for the characterization and control of complex quantum systems.

The school aims to connect participants, in particular PhD students and young researchers, with leading experts in these new fields at the frontier of interdisciplinary research. The declared objective is to contribute to training a new generation of researchers ready to successfully respond to the new fundamental and technological challenges connected to the development of quantum technologies, and able to contribute personally to the success of the European Flagship dedicated to these issues.



Quantum characterization and control of quantum complex systems

Lake Como School of Advanced Studies, September 19-23, 2022


[Home](#) [Application](#) [Contacts](#) [Course Material](#) [Lecturers](#) [Posters](#) [Programme](#) [Registration](#) [Scientific Committee](#)

[Venue and Accommodation](#)



Course Material



CIQC Spring School 2022 
Christiane Koch: Control of Open Quantum Systems
Problem Set

- [Serafini](#)
- [Klaus Mølmer](#)
- [Christiane P. Koch – 1](#)
- [Christiane P. Koch – 2](#)

Quantum characterization and control of quantum complex systems

Lake Como School of Advanced Studies, September 19-23, 2022

[Home](#) [Application](#) [Contacts](#) [Course Material](#) [Lecturers](#) [Posters](#) [Programme](#) [Registration](#) [Scientific Committee](#)

[Venue and Accommodation](#)



Lecturers

Prof. Christiane Koch, (Freie University of Berlin, DE)

Title: Introduction to Quantum Control

Prof. Sabrina Maniscalco, (University of Helsinki, FI)

Title: TBA

Prof. Klaus Molmer, (Aarhus University, DK)

Title: TBA

Prof. Pierre Rouchon, (Mines Paris Tech, FR)

Title: Quantum Stochastic Master Equation in Discrete and Continuous Time

Prof. Alessio Serafini, (UCL, London, UK)

Title: The limits of coherent feedback control

Prof. Roberta Zambrini, (IFISC Mallorca, ES)

Title: Quantum complex systems for machine learning

Quantum characterization and control of quantum complex systems

Lake Como School of Advanced Studies, September 19-23, 2022

[Home](#) [Application](#) [Contacts](#) [Course Material](#) [Lecturers](#) [Posters](#) [Programme](#) [Registration](#) [Scientific Committee](#)

[Venue and Accommodation](#)



Posters

QCQC Lake Como School 2022

List of Posters A (to be displayed on Tuesday 20th September)

1. Elahe Abdiha (Freie Universitaet Berlin),
Avoiding dark states in the laser cooling of TIF using additional external fields
2. Byron Alexander (Stellenbosch University),
Quantum trajectory method for projected squeezed states with decoherence
3. Julia Amoros Binefa (University of Warsaw),
Noisy Atomic Magnetometry in Real Time
4. Jessica Barr (Queen's University Belfast),
Machine Learning-Enhanced Diagnostics of Open Quantum Networks
5. Laetitia Paula Bettmann (Trinity College Dublin),
Understanding the role of quantum measurement in thermodynamic uncertainty relations
6. Matias Bilkis (Autonomous University of Barcelona),
Machine learning & parameter estimation in continuously monitored systems
7. Sheron Blair (Queen's University Belfast),
Universal gate sets for continuous-variable quantum computation imply faulttolerance
8. Jonathon Brown (Queen's University Belfast),
Quantum control of high-dimensional systems via evolutionary algorithms
9. Alessandro Candeloro (University of Milan),
Feedback-assisted quantum search by continuous-time quantum walks
10. Eoin Carolan (University College Dublin),
Counterdiabatic control in the impulse regime
11. Simone Cavazzoni (Università degli Studi di Modena e Reggio Emilia),
Optimal Transport Efficiency on graphs through symmetry breaking procedure
12. Teerawat Chalermputarak (Griffith University),
Frame-Based Filter-Function Formalism for Quantum Characterization and Control
13. Grazia Di Bello (Università di Napoli Federico II),
Dissipative Quantum Rabi Model: to the strong coupling regime and beyond
14. David Fainsin (Sorbonne University),
Quantum routing in multipartite complex networks
15. Donato Farina (ICFO),
Noise-assisted and monitoring-enhanced quantum bath tagging
16. Wojciech Górecki (University of Warsaw),
Heisenberg Limit beyond Quantum Fisher Information

List of Posters B (to be displayed on Wednesday 21th September)

1. Charlotte Hogg (University of Exter),
Three-Dimensional Quantum Spin Dynamics and Mean Force Gibbs States
2. Marcelo Janovitch (University of Basel),
Breakdown of wave-particle duality in the classical limit of a quantum heat engine
3. Lydia Kanari Naish (Imperial College London),
Two-mode Schrödinger-cat states with nonlinear optomechanics: generation and verification of non-Gaussian mechanical entanglement
4. Michael Kewming (Trinity College Dublin),
Entropy Production at Zero Temperature and Current Fluctuations in Quantum Phase Transitions
5. Adrià Labay-Mora (IFISC Mallorca),
Quantum associative memory with a single driven-dissipative oscillator
6. Josias Langbehn (Freie Universitaet Berlin),
Markovian master equations beyond the adiabatic and inertial limit
7. Alexander Moller (Freie Universitaet Berlin),
Optimising gate performance of transmon qubits coupled by a tunable bus
8. Daniele Morrone (University of Milan),
Charging a quantum battery in a non-Markovian environment: a collisional model approach
1. Charlotte Hogg (University of Exter),
Three-Dimensional Quantum Spin Dynamics and Mean Force Gibbs States
2. Marcelo Janovitch (University of Basel),
Breakdown of wave-particle duality in the classical limit of a quantum heat engine
3. Lydia Kanari Naish (Imperial College London),
Two-mode Schrödinger-cat states with nonlinear optomechanics: generation and verification of non-Gaussian mechanical entanglement
4. Michael Kewming (Trinity College Dublin),
Entropy Production at Zero Temperature and Current Fluctuations in Quantum Phase Transitions
5. Adrià Labay-Mora (IFISC Mallorca),
Quantum associative memory with a single driven-dissipative oscillator
6. Josias Langbehn (Freie Universitaet Berlin),
Markovian master equations beyond the adiabatic and inertial limit
7. Alexander Moller (Freie Universitaet Berlin),
Optimising gate performance of transmon qubits coupled by a tunable bus
8. Daniele Morrone (University of Milan),
Charging a quantum battery in a non-Markovian environment: a collisional model approach
9. Ivan Palmisano (Queen's University Belfast),
Potential and limitations of quantum extreme learning machines
10. Adi Pick (Hebrew University Jerusalem),
Inertial protocols for quantum computation
11. Marco Radaelli (Trinity College Dublin),
Precision scaling in correlated stochastic processes

Quantum characterization and control of quantum complex systems

Lake Como School of Advanced Studies, September 19-23, 2022

[Home](#) [Application](#) [Contacts](#) [Course Material](#) [Lecturers](#) [Posters](#) [Programme](#) [Registration](#) [Scientific Committee](#)

[Venue and Accommodation](#)



Programme

The School will last from Monday to Friday, with 5 hours per day dedicated to the following lectures and activities:

- 6 courses of 3 hours each by invited lecturers.
- 1 afternoon dedicated to a 5-minutes-talk session for the presentation of selected posters by the participants.
- 1 afternoon dedicated to a poster session by the participants.
- 1 free afternoon

Ample time for discussions and scientific exchanges will be dedicated throughout the whole week.

Lecturers

Prof. Christiane Koch (Freie University of Berlin, DE)

Title: Introduction to Quantum Control

Prof. Sabrina Maniscalco (University of Helsinki, FI)

Title: Handling noise in near-term quantum computers: what can we *actually* do?

Prof. Klaus Molmer (Aarhus University, DK)

Title: From quantum optics to bits and pieces

Prof. Pierre Rouchon (Mines Paris Tech, FR)

Title: Quantum Stochastic Master Equation in Discrete and Continuous Time

Prof. Alessio Serafini (UCL, London, UK)

Title: Coherent quantum feedback

Prof. Roberta Zambrini (IFISC Mallorca, ES)

Title: Quantum complex systems for machine learning

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
9:30-10:30	10:00 Opening Remarks	SERAFINI	KOCH	MANISCALCO	FREE
10:30-11:30	MOLMER	KOCH	KOCH	MANISCALCO	ROUCHON
11:30-12:00	coffee break	coffee break	coffee break	coffee break	coffee break
12:00-13:00	MOLMER	MOLMER	MANISCALCO	ROUCHON	ROUCHON
13:00-15:00	LUNCH	LUNCH	LUNCH (13:00 / 14:30)	LUNCH	LUNCH
15:00-16:00	SERAFINI	POSTER SESSION & Happy Hour	ZAMBRINI (14:30 / 15:30)	ZAMBRINI	FREE
16:00-17:00	SERAFINI	POSTER SESSION & Happy Hour	POSTER SESSION (from 15:30) & Happy Hour	ZAMBRINI	FREE
17:00-17:30	coffee break discussions	Aperitivo (4:30- 6:30pm)	Aperitivo (4:30- 6:30pm)	coffee break discussions	FREE



Quantum characterization and control of quantum complex systems

Lake Como School of Advanced Studies, September 19-23, 2022

[Home](#) [Application](#) [Contacts](#) [Course Material](#) [Lecturers](#) [Posters](#) [Programme](#) [Registration](#) [Scientific Committee](#)

[Venue and Accommodation](#)



Scientific Committee

- Dr. Claudia Benedetti, University of Milan (T)
- Prof. Marco G. Genoni, University of Milan (IT)
- Prof. Myungshik Kim, Imperial College London (UK)
- Prof. Matteo Paris, University of Milan (IT)

