QCMC 2022

International Conference on Quantum Communication, Measurement and Computing

11-15 July 2022, Lisbon

PROGRAMME

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Invited Talks

Monday, 11 July 2022

14:30 Nicolas Gisin, *From Bell non-locality to quantum communication and back to Network non-locality*

15:15 Konrad Banaszek, *Why photon counting is great: Applications in imaging and communications*

From Bell non-locality to quantum communication and back to Network non-locality

Nicolas Gisin

Group of Applied Physics & Schaffhausen Institute of Technology – SIT
University of Geneva, Rue de l'Ecole de Médecine, 20, 1205 Geneva, Switzerland

Quantum information science emerged from studies on the foundations of quantum physics. I illustrate this, starting from Bell inequalities all the way to commercial Quantum Key Distribution and Quantum Random Number Generator chips. But the story doesn't stop here. Quantum information science, in turn, feeds back into the foundations, asking questions like, e.g., "how does non-locality manifest in quantum networks". Among the surprises, complex Hilbert space appear necessary in quantum networks, although real Hilbert spaces suffice in standard Bell tests.

Why photon counting is great: Applications in imaging and communications

Konrad Banaszek
Centre for Quantum Optical Technologies and the Faculty of Physics,
University of Warsaw, Poland

This talk will review several scenarios when very few photon counting events can carry plenty of information meant to be retrieved by the measurement. Examples include beating the Rayleigh limit by imaging a composite light source using spatial mode demultiplexing and two-photon interference; transmission of classical information in the photon-starved regime, when the power of the transmitted signal is severely limited but the modulation bandwidth can be high; and finally reducing the communication complexity of comparing large datasets using quantum fingerprinting with coherent states.

Tuesday, 12 July 2022

9:00 **Gerhard Rempe**, *Quantum networks for quantum computation and communication*

9:45 **Kae Nemoto**, *Quantum computation on scale-free networks in the Hilbert space*

11:00 **William John Munro**, *Designing Large Scale Quantum Networks*

11:45 **Elizabeth Goldschmidt**, *Quantum photonics with emitters in solid-state*

14:30 **Mikhail Lukin**, *Exploring new scientific frontiers using programmable atom arrays*

15:15 **Marissa Giustina**, *Building Google's Quantum Computer*

Quantum networks for quantum computation and communication

Gerhard Rempe
Max Planck Institute of Quantum Optics,
Hans-Kopfermann-Str. 1, 85748 Garching, Germany

Quantum networks are large artificial quantum systems with a promising potential for fundamental investigations and technological applications. They might provide new insights into open quantum systems, interconnect remote quantum computers, and communicate qubits over long distances, e.g., for entanglement distribution. Two efficiently scalable protocols involving light and matter qubits achieve the envisioned goals. One protocol uses photon reflection and has been employed, e.g., for teleporting qubits without the need of ex-ante entanglement, for implementing quantum logic between addressable qubit modules, and for detecting Bell states of distant memory qubits in a non-destructive way. The other protocol uses photon absorption and emission and has demonstrated a unique capability to serve as a random-access quantum memory, to implement a quantum-repeater node for unconditionally secure communication, and to generate entangled many-photon states such as cluster states with a rate orders of magnitude larger than any previous protocol. The talk puts these achievements into context.

Quantum computation on scale-free networks in the Hilbert space

Kae Nemoto
Quantum Information Science and Technology Unit, Okinawa Institute of Science and Technology Graduate University, Onna-son, Okinawa 904-0495, Japan National Institute of Informatics, 2-1-2 Hitotsubashi, Chiyoda-ku, Tokyo 101-8430, Japan

We have recently seen the emergence of quantum processors with more than 50 qubits which has initiated a huge world-wide effort to utilize this new computational power. However so far it has not been that easy to extract the computational power promised in those quantum processors. In this talk, we present a new quantum computational model which utilizes scale-free networks in the Hilbert space generated by the quantum processors. This quantum computational model is based on both reservoir computation and extreme machine learning and inherits their advantages. We discuss its potential and the advantages it provides.

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Designing Large Scale Quantum Networks

William John Munro
NTT Research Center for Theoretical Quantum Physics &
NTTBasic Research Laboratories, NTT Corporation,
3-1 Morinosato-Wakamiya, Atsugi, Kanagawa 243-0198, Japan

It is already well understood that the principles of quantum mechanics offer the promise of a future quantum internet able to connect a wide variety of quantum devices together in a coherent and secure fashion. However, we need to urgently establish how such a quantum internet will function including how we route information around it, as well as the core functionality quantum nodes will need to provide to enable that. We know that such an internet will be underpinned both by quantum repeaters but also an extremely efficient classical network. In this talk, we will discuss a number of key design principles required to ensure such large-scale quantum networks (and the quantum internet) function in a robust and reliable way for the wide variety of tasks they may be required for.

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Quantum photonics with emitters in solid-state

Elizabeth Goldschmidt
University of Illinois Urbana-Champaign

Optically active and highly coherent emitters in solids are a promising platform for a wide variety of quantum information applications, particularly quantum memory and other quantum networking tasks. Rare-earth atoms, in addition to having record long coherence times, have the added benefit that they can be hosted in a wide range of solid-state materials. We can thus target particular materials (and choose particular rare-earth species and isotopes) that enable certain application-specific functionalities. I will discuss several ongoing projects with rare-earth atoms in different host materials and configurations. This includes investigations of inhomogeneous broadening in rare-earth ensembles, which is highly host-dependent and plays an important role in which quantum memory protocols can be implemented in any given system. I will present results on our efforts to identify and grow new materials with rare-earth atoms at stoichiometric concentrations in order to reduce the disorder-induced inhomogeneous broadening. I will also discuss our work investigating photonic integration of rare-earth doped samples that aims to increase the light-atom interaction for practical quantum devices. I will show results from our work with rare-earth atom dopants in thin-film lithium niobate, which admits standard nanofabrication techniques, and show the suitability of this platform for quantum applications.

Exploring new scientific frontiers using programmable atom arrays

Mikhail Lukin
Physics Department, Harvard University

We will discuss the recent advances involving programmable, coherent manipulation of quantum many-body systems using neutral atom arrays excited into Rydberg states, allowing the control over 200 qubits in two dimensions. These systems can be used for realization and probing of exotic quantum phases of matter and exploration of their non-equilibrium dynamics. Recent advances involving the realization and probing of quantum spin liquid states - the exotic topological states of matter have thus far evaded direct experimental detection and the observation of quantum speedup for solving optimization problems will be described. In addition, the realization of novel quantum processing architecture based on dynamically reconfigurable entanglement and the steps towards quantum error correction will be discussed. Finally, we will discuss prospects for using these techniques for realization of large-scale quantum processors.

Building Google's Quantum Computer

Marissa Giustina
Google Quantum AI

The Google AI Quantum team develops chip-based circuitry that one can interact with (control and read out) and which behaves reliably according to a simple quantum model. Such quantum hardware holds promise as a platform for tackling problems intractable to classical computing hardware. While the demonstration of a universal, fault-tolerant, quantum computer remains a goal for the future, it has informed the design of a prototype with which we can control a quantum system of unprecedented scale to perform a computation beyond the reach of any classical machine. This talk introduces Google's quantum computing effort from both hardware and quantum-information perspectives, including a discussion of technical developments to achieve this result.

Wednesday, 13 July 2022

9:00 **Paola Cappellaro**, *Quantum-Enhanced Sensing of Magnetic Fields*

9:45 **Christine Silberhorn**, *Scaling Photonic systems for quantum technologies*

11:00 **Mary Jacquiline Romero**, *Hiding Ignorance and Finding Knowledge: Adventures Using the Shape of Light*

11:45 **André Carvalho**, *Boosting performance of quantum algorithms using autonomous error-suppression*

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Quantum-Enhanced Sensing of Magnetic Fields

Paola Cappellaro

Nuclear Science & Engineering Department, Physics Department
Massachusetts Institute of Technology, Cambridge, MA 02139, USA

Quantum sensors exploit the strong sensitivity of quantum systems to external disturbances to measure various signals in their environment with high precision. Nitrogen Vacancy color centers in diamond have in particular emerged as exquisite probes of magnetic fields.

These quantum sensors have the potential to be a revolutionary tool in material science, quantum information processing, and bioimaging. However, the same strong coupling to the environment also limits their sensitivity due to its decohering effects. Error correction strategies, including quantum error correction codes, robust many-body quantum phases, and dynamical decoupling, can help in fighting decoherence, but they incur the risk of also canceling the coupling to the signal to be measured.

Here I will show recent advances in tackling this challenge, including exploiting and improving control and the use of ancillary systems, that achieve an advantageous compromise between noise and signal cancellation. These strategies can not only improve the sensitivity of quantum sensors, but also yield new applications, via the transduction of biological signals of interest into quantum perturbations or the frequency up/down-conversion of signals of interest.

Scaling Photonic systems for quantum technologies

Christine Silberhorn
Integrated Quantum Optics, Department Physics, Paderborn University,
Warburger Str. 100, Paderborn 33098, Germany

Quantum photonics promise a change of paradigm for many fields with application, e.g. in communication systems, in high-performance computing and simulation of quantum systems, or sensor technology. They can shift the boundaries of today's systems and devices beyond classical limits and seemingly fundamental limitations. The use of complex photonic systems, which comprise multiple optical modes as well as nonclassical light, has been proposed for different quantum technologies over the last decades and illustrate the versatility of photonic systems. However, their implementation often requires advanced setups of high complexity, which poses considerable challenges on the experimental side. Here we review three differing approaches to advance current experimental approaches for multi-dimensional photonic quantum systems: non-linear integrated quantum optics, pulsed temporal modes and time-multiplexing.

Hiding Ignorance and Finding Knowledge: Adventures Using the Shape of Light

Mary Jacquiline Romero
School of Mathematics and Physics, University of Queensland, QLD Australia, and Australian Research Council Centre of Excellence for Engineered Quantum Systems (EQUS)

The transverse shape of light has emerged in recent years as a promising platform for encoding quantum information, for the multiple levels that it affords and the ease with which shape can be controlled. To demonstrate, I will discuss two recent experiments.
The first is on ignorance: One might ask if ignorance of a whole system implies ignorance of its parts. Our classical intuition tells us yes, however quantum theory tells us no: it is possible to encode information in a quantum system so that despite some ignorance of the whole, it is impossible to identify the unknown part. I will give an experimental evidence that supports this counterintuitive fact. The second is on learning: We used a tomographic technique inspired by machine learning to track a quantum state as the state changes. The method is computationally efficient and also robust—it converges to a good estimate even in the presence of strong noise. Developing techniques like this is especially important for systems that are of high dimensionality, where making tomographically complete measurements become impractical.

Boosting performance of quantum algorithms using autonomous error-suppression

André Carvalho
Q-CTRL

Excitement about the promise of quantum computers is tempered by the reality that the hardware remains exceptionally fragile and error-prone, forming a bottleneck in the development of novel applications. In this talk we show how quantum control delivered by software can improve hardware performance at various levels of the stack. At the physical layer, we will show how model-based and also fully automated closed-loop approaches can be used to design logical gates that are more stable over time and resilient to hardware noise. We will also show a protocol that allows for the autonomous gate tune up across the full device. At the circuit level, we will describe a pre-processing pipeline consisting of compilation, crosstalk mitigation, optimized gate replacement, as well as a novel measurement error mitigation protocol in post-processing after the execution on the quantum device. We demonstrate that combining all the above strategies leads to dramatic improvements on algorithm performance in current NISQ devices. We observe over 1000X improvement in the success probability of both deterministic algorithms, such as QFT and BV, and hybrid algorithms such as QAOA and VQE.

Thursday, 14 July 2022

9:45 **Quantum Award Winner Talk 1**

11:00 **Quantum Award Winner Talk 2**

11:45 **Lieven M.K. Vandersypen,** *Quantum Computation - Spins Inside*

14:30 Special Talk: **Henrique Leitão,** *The Science of Magellan's expedition (1519-22)*

15:15 **Yvonne Gao,** *Programmable Interactions between Multi-Photon Bosonic Qubits*

Quantum Computation - Spins Inside

Lieven M.K. Vandersypen
QuTech and Kavli Institute of Nanoscience, Delft University of Technology,
Delft, 2628CJ, the Netherlands

Quantum computation has captivated the minds of many for almost two decades. For much of that time, it was seen mostly as an extremely interesting scientific problem. In the last few years, we have entered a new phase as the belief has grown that a large-scale quantum computer can actually be built. Quantum bits encoded in the spin state of individual electrons in silicon quantum dot arrays, have emerged as a highly promising direction [1]. In this talk, I will present our vision of a large-scale spin-based quantum processor, and ongoing work to realize this vision.
First, we created local registers of spin qubits with sufficient control that we can program arbitrary sequences of operations, implement simple quantum algorithms [2], and achieve two-qubit gate fidelities of more than 99.5% [3]. In linear quantum dot arrays, we now achieve universal control of up to six qubits with respectable fidelities for initialization, readout, single- and two-qubit operations [4].
Second, we have explored coherent coupling of spin qubits at a distance via two routes. In the first approach, the electron spins remain in place and our coupled to each other via a microwave photon in a superconducting on-chip resonator [5,6]. In the second approach, spins are shuttled along a quantum dot array, preserving the spin state [7,8].
Third, in close collaboration with Intel, we have fabricated and measured quantum dots using all-optical lithography on 300 mm wafer, using industry-standard processing [9], demonstrating excellent qubit performance. We expect that this industrial approach to nanofabrication will be critical for achieving the extremely high yield necessary for devices containing thousands of qubits.
When combined, the progress along these various fronts can lead the way to scalable networks of high-fidelity spin qubit registers for computation and simulation.

[1] L.M.K. Vandersypen, et al., npj Quantum Information 3, 34 (2017).
[2] T. F. Watson, et al., Nature 555, 633 (2018).
[3] X. Xue et al., Nature 601, 343 (2022)
[4] S. Philips, M. Madzik et al, arXiv:2202.09252.
[5] N. Samkharadze, G. Zheng, et al., Science 359, 1123 (2018).
[6] P. Harvey-Collard, et al, Phys. Rev. X 12, 021026 (2022)
[7] T. A. Baart, et al., Nature Nanotechnology 11, 330 (2016).
[8] T. Fujita, et al., npj Quantum Information 3, 22 (2017).
[9] R. Pillarisetty, et al., 2019 IEEE IEDM San Francisco, pp. 31.5.1-31.5.4.
[10] A. M. J. Zwerver, et al., Nature Electronics 5, 184–190 (2022)
[11] L.M.K. Vandersypen, and M.A. Eriksson, Physics Today 72 (8), 38 (2019)

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Special Talk:
The Science of Magellan's expedition (1519-22)

Henrique Leitão
Faculty of Science, University of Lisbon

The voyage that was planned and started by Ferdinand Magellan in 1519 and ended in 1522 under the command of Juan Sebastian Elcano is well known as one of the most celebrated maritime adventures in history and the first circumnavigation of the Earth. It is less known, however, that scientific and technical issues played a crucial part in this story.
In its preparation and during its course the seaman of the expedition had to tackle new, and sometimes complex and subtle scientific issues. That they were able to solve some of them is not only part of the explanation for their success, but, perhaps more importantly, the most lasting legacy of the expedition.

Programmable Interactions between Multi-Photon Bosonic Qubits

Yvonne Gao
National University of Singapore and Centre for Quantum Technologies

The realisation of robust universal quantum computation with any platform ultimately requires both the coherent storage of quantum information and (at least) one entangling operation between individual elements. The use of multiphoton states encoded in superconducting microwave cavities as logical qubits is a promising route to preserve the coherence of quantum information against naturally-occurring errors. However, operations between such encoded qubits can be challenging due to the lack of intrinsic coupling between them.

In this talk, I will discuss the recent experimental work on engineering a coherent and tunable bilinear coupling between two otherwise isolated microwave quantum memories in a three-dimensional circuit QED architecture. Building upon this coupling, we also demonstrate programmable interference between stationary quantum modes and realise robust entangling operations between two encoded qubits. Our results provide a crucial primitive for universal quantum computation using bosonic modes.

Friday, 15 July 2022

9:00 Markus Müller, *Fault-Tolerant Quantum Error Correction and Computing: From Concepts to Experiments*

9:45 Marcus Huber, *High-dimensional entanglement for quantum communication*

11:00 Best Poster Talk 1

11:15 Best Poster Talk 2

11:30 Best Poster Talk 3

11:45 Ana Maria Rey, *Advances in Quantum Simulation and Sensing with Two-Dimensional Crystals of Ions*

Fault-Tolerant Quantum Error Correction and Computing: From Concepts to Experiments

Markus Müller
RWTH Aachen University and Forschungszentrum Jülich, Germany

To date, the construction of a scalable fault-tolerant quantum computer remains a fundamental scientific and technological challenge, due to the influence of unavoidable noise. In my talk, I will first introduce basic concepts of topological quantum error correction codes. These allow one to protect quantum information during storage and processing by redundant encoding of information in logical qubits formed of multiple physical qubits. When manipulating logical quantum states, it is imperative that errors caused by imperfect operations do not spread uncontrollably through the quantum register, requiring so-called fault-tolerant quantum circuit designs. I will discuss recent theory work, perspectives and recent collaborative experimental breakthroughs towards fault-tolerant quantum error correction on various physical quantum computing platforms. This includes the first realisation of repeated, fast and high-performance quantum error-correction cycles on a surface code with 17 superconducting qubits [1]. In complementary efforts with trapped ions, fault-tolerant stabilizer measurements [2] and a logical two-qubit controlled-NOT gate between two instances of seven-qubit topological colour code was achieved. Together with a fault-tolerant preparation and subsequent injection of a logical magic state by teleportation from one logical qubit to the other, this enabled the first demonstration of a universal and fault-tolerant logical gate set [3].

[1] S. Krinner *et al.*, Realizing Repeated Quantum Error Correction in a Distance-Three Surface Code, Nature 605, 669 (2022)
[2] J. Hilder *et al.*, Fault-tolerant parity readout on a shuttling-based trapped-ion quantum computer, Physical Review X 12, 011032 (2022)

[3] L. Postler *et al.,* Demonstration of fault-tolerant universal quantum gate operations, Nature 605, 675 (2022)

High-dimensional entanglement for quantum communication

Marcus Huber
TU Wien

Entanglement unlocks many applications in quantum communication, such as the highest possible level of security in quantum key distribution. As photons are inevitably lost or decohered over longer distances, it seems obvious that using the full spectrum of photonic degrees of freedom is desirable. In addition to more encodable bits per photon, entanglement in high dimensions also yields a surprising resistance to noise. This comes at the expense of more complicated measurements that in themselves can contribute to the overall noise in the data, leading to an interesting optimisation. While random, noisy entanglement may not always be useful or need unrealistic control to be harnessed, I will also present a protocol that can be used in high-dimensional systems, even with restricted measurement possibilities, which has recently been successfully employed in path, OAM and energy-time experiments.

Advances in Quantum Simulation and Sensing with Two-Dimensional Crystals of Ions

Ana Maria Rey

JILA, NIST and University of Colorado, Boulder, Colorado 80309, USA

In this talk I will discuss recent progress on the use of a two dimensional crystal with hundreds of ions in a Penning trap as a platform for quantum simulation of spin and spin-boson models, and for quantum sensing applications. In this system interactions are generated by laser beams that couple two internal levels of the ions (spin) to the vibrational modes (phonons) of the crystal. In the regime when phonons actively participate, we have been able to simulate the Dicke model, an iconic model in quantum optics which describes the coupling of a (large) spin to an oscillator. Recently we used the Dicke model to realize a many-body quantum-enhanced sensor that can detect weak displacements and electric fields. By entangling the oscillator and collective spin and controlling the coherent dynamics via a many-body echo, a displacement was mapped into a spin rotation while avoiding quantum back-action and thermal noise. We achieved a sensitivity to displacements of 8.8 ± 0.4 decibels below the standard quantum limit and a sensitivity for measuring electric fields of 240 ± 10 nanovolts per meter in 1 second. Feasible improvements should enable the use of trapped ions in searches for dark matter.

Poster Session 1
Monday, 11 July 2022

Room “Sala do Foyer”

Alastair Abbott	Device-Independent Quantification of Quantum Resources
Beate E. Asenbeck	Qubit encoding converter for quantum interconnects
Debjyoti Biswas	Channel-adapted recovery circuits for amplitude damping noise
Álvaro Cuevas	Enhanced phase imaging by multipass photon detection
Carlos de Gois	Classicality and nonclassicality in the prepare and measure scenario
Benjamin Desef	Optimizing quantum codes with an application to the loss channel with partial erasure information
Alexander Gresch	Efficient energy estimation of variational quantum algorithms using ShadowGrouping
Antoine Henry	Efficient and broadband Thin Film Lithium Niobate telecom photon pair source and frequency-domain applications
Antoine Henry	Parallelization of independently addressable frequency domain quantum gates for measurement and distribution of spectrally entangled photons pairs
Anaelle Hertz	Nonclassicality gain/loss through photon-addition/subtraction on Multi-Mode Gaussian States
Alessandro Laneve	Quantum state discrimination through experimental time-binning dynamics
Auxiliadora Padrón	Storage of quasi-deterministic single photons generated by collective Rydberg excitations in a low-noise Raman quantum memory
Carola Purser	Towards quantum-confined spin-qubits in monolayer, semiconducting WSe2
Chithra Raj	Quantum Monogamy Relations using Information Causality

Aron Rozgonyi	Repetition phase-flip code under realistic noise
Adam Rutkowski	Separability of symmetric states and moment problem
Davide Scalcon	Time-bin quantum key distribution exploiting the conversion from and to polarization states, with qubits based temporal syncronization
Alexander Stramma	Towards Optical Polarization of Nuclear Spins via the negatively charged Tin-Vacancy Center in Diamond
Alban Urvoy	Towards strong photon-photon interactions via cold atoms trapped near a slow-mode photonic crystal waveguide
Dominik Vašinka	Bidirectional optimal quantum control boosted by deep learning: A use case of polarization in liquid crystals
Christoph Wildfeuer	First demonstration of a post-quantum key-exchange with a nano satellite

Room "Sala 2"

Felix Ahnefeld	On the Role of Coherence in Shor's Algorithm
Ghofrane Bel Hadij Aissa	Quantum correlations and quantum entanglement measures based on a geometric approach
Gabriel Alves	Any pair of incompatible rank-one projective measurements is optimal for some non-trivial Bell inequality
Daniel Bhatti	Entanglement generation and non-adaptive measurement-based quantum computation on IBM Q
Gianni Buser	Single-Photon Storage in a Ground-State Vapor Cell Quantum Memory
David Collins	Qubit channel parameter estimation with suboptimal resources
Radim Filip	Quantum non-Gaussian hierarchy for photons and phonons
Dario Fioretto	Direct observation of Larmor precession of a single spin in a quantum dot through phonon-assisted excitation
Giulio Foletto	Experimental Studies of Sequential Quantum Information Protocols
Nicolas Gigena	Maximal quantum value for a family of I_{3322}-like Bell functionals
Suraj Goel	Efficiently sorting overlapping quantum states of light
Kiara Hansenne	Symmetries in Quantum Networks
Ho-Joon Kim	Relation between Quantum Coherence and Quantum Entanglement in Quantum Measurements
Jeong San Kim	Annihilating and creating nonlocality without entanglement by postmeasurement information
Walter O Krawec	Mutually unbiased bases in 3, 4 dimensions semi-quantum key distribution protocol
My Duy Hoang Long	Achieving fault tolerance against amplitude-damping noise
Giovanni Spaventa	A resource-theoretical analysis of molecular switches
Kowei Tseng	Quantum state classification using SWAP test
Andrew White	Rise of the Machines: Making better photons by getting rid of experimentalists

Sabine Wollmann	Optimal fidelity estimation of quantum states on a silicon photonic chip
Tham Guo Yao	Single-photon entangled states for quantum-optimal target detection

Poster Session 2
Tuesday, 12 July 2022

Room “Sala do Foyer”

Lorena Ballesteros	Geometrical interpretation of the argument of weak values of general observables in N-level quantum systems
Junior R. Gonzales	Device-independent quantum key distribution based on Bell inequalities with more than two inputs and two outputs
Lena Hansen	Highly efficient solid-state multi-photon source
Rojkov Ivan	Bias in error-corrected quantum sensing
Ilya Karuseichyk	Exploiting separation-dependent coherence to boost optical resolution
Jan Kolodynski	Quantum metrology with imperfect measurements
Ilse Maillette	Coherence-powered energy exchanges between a solid-state qubit and light fields
Mehul Malik	Transport and Manipulation of High-Dimensional Entanglement through a Complex Medium
Levente Máthé	Majorana induced phonon-assisted transport in asymmetrically coupled quantum dot nanodevices
Hannah McAleese	Engineering nonlinear boson-boson interactions
Larisa Pioras-Timbo	Qubits based on the fluxonium architecture
José Polo-Gómez	A detector-based measurement theory for quantum field theory
Lukas Postler	Demonstration of fault-tolerant universal quantum gate operations
Jelena V. Rakonjac	Storage and analysis of light-matter entanglement in a fibre-integrated system
Markus Rambach	Robust And Efficient High-Dimensional Quantum State Tomography

Jelmer Renema	Quantum photo-thermodynamics on a programmable photonic quantum processor
Henk Snijders	A universal 20-mode Quantum Photonic Processor
Lara Stroh	Non-interactive XOR quantum oblivious transfer protocol
Kishore Thapliyal	Photon pair generation in Raman process and applications in quantum communication
Rafael Wagner	Inequalities Bounding Coherence, Contextuality and Nonlocality
Hailin Wang	Real-time learning of magnetic environment in diamond via coherent population trapping
Iskender Yalçınkaya	Disorder-free localization in quantum walks

Room “Sala 2”

Marco Avesani	Semi-Device-Independent Quantum Random Number Generators
Matthias Bayerbach	Improved Bellstate Measurements with linear optics
Manish Chaudhary	Stroboscopic quantum nondemolition measurements for enhanced entanglement generation between atomic ensembles
Nathan Coste	High rate spin-photon entanglement with a semiconductor quantum dot
Manuel Gundin	Measuring single spin noise with single detected photons.
Majid Hassani	Secure sensing for multiparameter function evaluation
Natalia Herrera V	Platforms for high-dimensional photonic entanglement
Mikhail Kolobov	Quantum temporal imaging of antibunched light
Marion Mallweger	Coherent control of ion motion via Rydberg excitation
Petr Marek	Optimal estimation of conjugate shifts in position and momentum by classically correlated probes and measurements
István Márton	Cyclic Einstein-Podolsky-Rosen steering
Michele Masini	Photon loss attacks on receiver-device-independent QKD
Francesco Mazzoncin	Hybrid Key Distribution from Quantum Communication Complexity
Matteo Padovan	Sequential weak measurements for certified quantum randomness extraction
Palash Pandya	Distance between Bound Entangled States from Unextendible Product Bases and Separable States
Peter Sidajaya	Simulation of Non-Maximally Entangled States Using One Bit of Communication
Maximilian Tippmann	A reconfigurable scalable network for entanglement-based multi-user QKD
Noah Van Horne	Coupling the motional quantum states of spatially distant ions using a conducting wire
Noah Van Horne	Single-atom energy-conversion device with a quantum load
Paolo Villoresi	Light degrees of freedom combined for the Starshot sail transmitters
Paolo Villoresi	Advancements in qubit generation and synchronization for QKD

Poster Session 3
Thursday, 14 July 2022

Room “Sala do Foyer”

Tanja Behrle	A dissipative quantum simulator of lasing dynamics at the few quanta level
Luís Bugalho	Distributing Multipartite Entanglement over Noisy Quantum Networks
Huang Ruo Cheng	Work extraction from quantum systems with complex temporal correlations
Diogo Cruz	Super-resolution of Green's functions on noisy quantum computers
Ray Ganardi	Hierarchy of correlation quantifiers comparable to negativity
Adam Glos	Optimal QAOA design for the Traveling Salesman Problem
Sascha Heußen	Fault-tolerant universal gates in a trapped ion quantum processor
Theodoros Ilias	Criticality-Enhanced Quantum Sensing via Continuous Measurement
Theodoros Kapourniotis	Plugging Leaks in Fault-Tolerant Quantum Computation and Verification
Duarte Magano	Quantum speedup for track reconstruction in particle accelerators
Stephanie Matern	Metastability and quantum coherence assisted sensing in interacting parallel quantum dots
Tomasz Młynik	Transformation of an unknown unitary operation: complex conjugation
Roberto Mottola	Atomic quantum memory in the Paschen-Back regime
João Moutinho	Quantum Link Prediction in Complex Networks
Thomas Nieddu	Photonic Entanglement Transfer Into And Out Of Cold-Atom-Based Quantum Memories With Near-Unity Efficiency
Tales Rick Perche	The Geometry of Spacetime from Quantum measurements

Sagar Pratapsi	Classical half-adder using trapped ions: towards energy-efficient computation
Tommaso Roscilde	Generating massively entangled states with Rydberg-atom arrays
Shivani Singh	Universal quantum computing using single-particle discrete-time quantum walk
Shivang Srivastava	Making photons indistinguishable by means of a time lens
Robin Thomm	Non-destructive detection of phonon number states using the Autler-Townes effect
Till Weinhold	Demonstration of an efficient scale-ready quantum memory

Room “Sala 2”

Valentina M. Acosta	Analysis of satellite-to-ground QKD links corrected with adaptiveoptics
Marcelo de Almeida	Engineering classes of two photon states using linear interactions and nonclassical interference
Rafael Barros	Observation of the quantum Gouy phase
Julia Amoros Binefa	Noisy Atomic Magnetometry in Real-Time
Lewis Clark	Exploiting non-linear effects in optomechanical sensors with continuous photon-counting
Chandan Datta	Entanglement catalysis for quantum states and noisy channels
Klaudia Dilcher	Atomic magnetometry with Kalman Filters
Samuel Elman	A Unified Graph-Theoretic Framework for Free-Fermion Solvability
Ernesto Galvão	Measuring relational information between quantum states, and applications
Urs Haeusler	Optimal purification of a spin ensemble by quantum-algorithmic feedback
Vojtech Kala	Cubic nonlinear squeezing under decoherence
Marcin Kozbial	Quantum-enhanced interferometry with realistic states of finite photon number
Wieslaw Laskowski	Cooperation and dependencies in multipartite systems
Uta Isabella Meyer	Self-Testing Graph States Permitting Bounded Classical Communication
Javid Naikoo	Multiparameter estimation perspective on non-Hermitian sensing
Filipa Cavaco Peres	Circuit compilation and hybrid computation using Pauli-based computation
Manfredi Scalici	Preserving quantum correlations and coherence with non-Markovianity
Zoltán Udvarnoki	Hardware requirements for option pricing with the quantum Monte Carlo method
Chrysoula Vlachou	Analytic quantum weak coin flipping protocols with arbitrarily small bias
Verena Yacoub	Experimental demonstration of quantum advantage in transmitted information for Euclidean distance estimation
Piétri Yoann	A versatile CV-QKD system with a PIC-based receiver