TENTATIVE PROGRAM (as of 21/06/2022)

JUNE 21-23 Barcelona (Spain)
QUANTUM MATTER 2022
International Quantum Matter Conference

P: Plenary / K: Keynote lecture / I: Invited Lecture / O: Oral contribution

Tuesday (21/06/2022)

08:45 – 09:15: Opening Ceremony

Chairperson: Leticia Tarruell (ICFO, Spain)

PLENARY

09:15 – 09:45: **Francesca Ferlaino** (University of Innsbruck & IQOQI, Austria) K
When the complex nature of atoms can really make a difference: ultracold erbium and dysprosium for quantum simulation
09:45 – 10:05: **Giulia Semeghini** (Harvard University, USA) I
Exploring new scientific frontiers using programmable atom arrays
10:05 – 10:20: **Michel Brune** (Laboratoire Kastler Brossel-CNRS, France) O
Quantum Simulation with Circular Rydberg Atoms

10:20– 11:30: Coffee Break / Poster Session / Exhibition

Chairperson: Stephan Roche (ICREA / ICN2, Spain)

11:30 – 12:00: **Cristiane Morais Smith** (Utrecht University, The Netherlands) K
Quantum Fractals
12:00 – 12:20: **Alexandre Jaoui** (ICFO, Spain) I
Plethora of Many-Body Ground States in Magic Angle Twisted Bilayer Graphene
12:20 – 12:40: **Joel Wang** (MIT, USA) I
Van der Waals Materials for Superconducting Quantum Technology
12:40 – 13:00: **Sergio O. Valenzuela** (ICREA/ICN2, Spain) I
Designer van der Waals Heterostructures by proximity phenomena
13:00 – 13:15: **Mark Hogg** (The University of Basel, Switzerland) O
Cavity-enhanced single-shot readout of a quantum dot spin state within 3 nanoseconds

13:15 – 14:30*: Cocktail Lunch*

14:30 – 15:00: *Poster Session 1*

Chairperson: Silvano de Franceschi (CEA/UGA, France)

PLENARY

15:00 – 15:45: **Charles Marcus** (Niels Bohr Institute, Denmark) P
A topological SNS junction
15:45 – 16:00: **Malcolm Connolly** (Imperial College London, UK) O
Integration of Topological Insulator Josephson Junctions in Superconducting Qubit Circuits
16:00 – 16:15: **Xiao Xue** (TU Delft, The Netherlands) O
Quantum logic with spin qubits crossing the surface code threshold
16:15 – 16:30: **Boris Brun** (CEA Grenoble, France) O
A single hole spin with enhanced coherence in natural silicon

16:30 – 17:30: *Coffee Break / Poster Session / Exhibition*

Chairperson: Juan Jose Garcia-Ripoll (IFF-CSIC, Spain)

17:30 – 17:45: **Lindsay Bassman** (Lawrence Berkeley National Laboratory, USA) O
Computing Free Energies with Fluctuation Relations on Quantum Computers

17:45 – 18:00: **Leandro Aolita** (Technology Innovation Institute, United Arab Emirates) O
Hybrid classical-quantum interfaces for circuit boosts
18:00 – 18:15: **Tommaso Roscilde** (Ecole Normale Supérieure, France) O
Generating massively entangled states with Rydberg-atom arrays

Wednesday (22/06/2022)

Chairperson: Sergio Valenzuela (ICN2, Spain)

PARALLEL SESSION QUANTUM MATTER
09:00 – 09:20: **Prineha Narang** (Harvard University, USA) I
Ab initio approaches to nonequilibrium interactions in quantum matter
09:20 – 09:40: **Mete Atature** (University of Cambridge, UK) I
Light-matter quantum interfaces: A tale of two materials
09:40 – 10:00: **Maia Vergniory** (DIPC, Spain) I
High through-put search of topological materials
10:00 – 10:15: **Athanasios Dimoulas** (NCSR DEMOKRITOS, Greece) O
Charge to spin conversion in epitaxial 2D CrTe2/Bi2Te3 grown by MBE
10:15 – 10:30: **Bent Weber** (Nanyang Technological University, Singapore) O
Tunable Many-body Interactions and Induced Superconductivity in a Helical Luttinger Liquid

10:30 – 11:30: *Coffee Break / Poster Session / Exhibition*

Chairperson: Ramon Aguado (ICMM/CSIC, Spain)

11:30 – 11:50: **Leni Bascones** (ICMM/CSIC, Spain) I
Moiré Heterostructures, the realm of Quantum Materials
11:50 – 12:05: **Julien Barrier** (University of Manchester, UK) O
Topological superconductivity in twisted bilayer graphene
12:05 – 12:20: **Fernando Peñaranda** (Instituto de Ciencia de Materiales ICMM-CSIC, Spain) O
Majorana bound states in encapsulated bilayer graphene
12:20 – 12:35: **Jukka Vayrynen** (Purdue University, USA) O
Influence of disorder on vortex Majorana states in 3D topological insulators
12:35 – 12:50: **Panaiot Zotev** (University of Sheffield, UK) O
Van-der-Waals nano-photonics
12:50 – 13:10: **Christoph Stampfer** (RWTH Aachen, Germany) I
Towards spin and valley qubits in graphene

Chairperson: Jordi Arbiol (ICREA/ICN2, Spain)

PARALLEL SESSION INDUSTRIAL FORUM
09:15 – 09:30: **Niccolo Somaschi** (Quandela, France) I
Optical quantum computing with solid-states quantum light emitters
09:30 – 09:45: **Matthieu Desjardins** (C12 Quantum Electronics, France) I
Carbon nanotube spin qubit
09:45 – 10:00: **Carmen Palacios-Berraquero** (Nu Quantum, UK) I
At the intersection between quantum networking and quantum computing
10:00 – 10:30: **Heike Riel** (IBM Research, Switzerland) K
Quantum Computing – Prospects and Challenges

10:30– 11:15: Coffee Break / Poster Session / Exhibition

Chairperson: John Calsamiglia Costa (Universidad Autónoma de Barcelona, Spain)

11:15 – 11:45: **Yonatan Cohen** (Quantum Machines, Israel) K
Accelerating the Expedition to our Quantum Future with Quantum-Classical Control
11:45 – 12:15: **Niels Bultink** (Qblox BV, The Netherlands) K
Fully-integrated control stacks for quantum computing in the NISQ era
12:15 – 12:45: **Marc Almendros** (Keysight Technologies, Spain) K
High-performance Control Systems for State-of-the-art Quantum Computing
12:45 – 13:00: **Sergio Boixo** (Google, USA) I
Quantum Computing at Google
13:00 – 13:15: **Daniel Szombati** (Qilimanjaro, Spain) I
Coherent Analogue Quantum Computing - beyond the paradigm of gate-based quantum computing
13:15 – 13:30: **Gianni Del Bimbo** (Multiverse Computing, Spain) I
Useful Quantum Software for Today's Processors

13:30 – 14:30*: Cocktail Lunch*

14:30 – 15:00: *Poster Session 2*

Chairperson: Alba Cervera Lierta (Barcelona Supercomputing Center, Spain)

PARALLEL SESSION INDUSTRIAL FORUM
14:30 – 14:45: **Jelmer Renema** (Quix Quantum, The Netherlands) I
Title to be defined
14:45 – 15:00: **Loïc Henriet** (Pasqal, France) I
Quantum evolution kernel: Machine learning on graphs with programmable arrays of qubits
15:00 – 15:15: **Michael Marthaler** (HQS Quantum Simulations, Germany) I
HPC use cases for quantum computing
15:15 – 15:30: **David Hayes** (Qantinuum, USA) I
A QCCD trapped-ion quantum computer: the early days
15:30 – 15:45: **Bob Coecke** (Cambridge Quantum / Quantinuum, UK) I
Quantum Natural Language Processing & Compositional Intelligence

15:45 – 16:45: **Round Table Industrial Forum**
Moderator: **Alba Cervera Lierta** (Barcelona Supercomputing Center, Spain)

Chairperson: Xavier Oriols (UAB, Spain)

PARALLEL SESSION STUDENTS TRACK 1 (topics: Advanced Quantum Communication protocols and Quantum internet / Quantum Computing and Technologies / Growth and Characterization of Quantum Materials / Quantum simulation of exotic states of matter
15:00 – 15:10: **Maria Balanzó-Juandó** (ICFO, Spain) O
Bell nonlocality is not sufficient for the security of standard device-independent quantum key distribution protocols
15:10 – 15:20: **Jan Lowinski** (ICFO, Spain) O
Low-noise quantum memory for quasi-deterministic single photons generated by Rydberg
15:20 – 15:30: **Fanmiao Kong** (University of Oxford, UK) O
Carbon Nanostructures as Quantum Units
15:30 – 15:40: **Giulia Venditti** (CNR-SPIN, Area di Ricerca di Tor Vergata, Italy) O
On the superconducting critical temperature in multiband disordered LaAlO_3/SrTiO_3 interfaces
15:40 – 15:50: **Noah Goss** (University of California, Berkeley, USA) O
Qutrit Entanglement with Differential AC Stark Shift
15:50 – 16:00: **Luciano Pereira** (Instituto de Física Fundamental IFF-CSIC, Spain) O
Complete device QND measurement tomography and applications to IBM-Q

16:00 – 16:10: **Stephan Philips** (TuDelft (QuTech), The Netherlands) O
Universal control of a six-qubit quantum processor in silicon
16:10 – 16:20: **Beatrice Polacchi** (Sapienza University of Rome, Italy) O
Experimental test of quantum causal influences
16:20 – 16:30: **Elena Redchenko** (IST Austria, Austria) O

Tunable unidirectional photon scattering from a pair of superconducting qubits
16:30 – 16:40: **Gonzalo Troncoso Fernández-Bada** (CEA-Grenoble, France) O
Towards Hole Spin Qubits in Strained Ge/SiGe Quantum-Well Heterostructures
16:30 – 16:50: **Léo Peyruchat** (Collège de France, France) O
Topological phenomena in Josephson tunnel junction circuits

Chairperson: Bruno Julia (Universidad de Barcelona, Spain)

PARALLEL SESSION STUDENTS TRACK 2 (Topics: Quantum Machine learning (ML) and Artificial Intelligence (AI) / Quantum materials for advanced photonics, spintronics / Quantum sensing and applications / Quantum softwares and algorithms / Topological quantum computing
15:00 – 15:10: **Dominik Koutny** (Palacky University Olomouc, Czech Republic) O
Deep Learning of Quantum Entanglement collective atomic excitations
15:10 – 15:20: **Rodrigo Martínez-Peña** (IFISC, Spain) O
Dynamical phase transitions in quantum reservoir computing
15:20 – 15:30: **Joaquín Medina Dueñas** (Institut Català de Nanociència i Nanotecnologia (ICN2), Spain) O
Topological protection of squeezed light in a topological photonic lattice
15:30 – 15:40: **Sam Randerson** (The University of Sheffield, UK) O
Enhancing Light Collection Efficiency due to WS2 Dielectric Nanoantennas on a Metallic Substrate
15:40 – 15:50: **Karen Yan** (University of Oxford, UK) O
The Quantum Coherence of Metal-functionalized Graphene Nanoribbons
15:50 – 16:00: **Viktoria Yurgens** (University of Basel, Switzerland) O
Cavity QED with diamond nitrogen-vacancy centers formed by carbon implantation
16:00 – 16:10: **Sabrina Patsch** (Freie Universität Berlin, Germany) O
Fast navigation of Rydberg atoms in Stark manifolds
16:10 – 16:20: **Joël Griesmar** (Ecole Polytechnique, France) O
Superconducting on-chip spectrometer for mesoscopic quantum system
16:20 – 16:30: **Hubert Souquet Basiege** (Ecole Normale Superieure de Lyon, France) O
Probing quantum electromagnetic magnetic fields with subnanosecond time resolution: the single electron radar
16:30 – 16:40: **Diego García-Martín** (Technology Innovation Institute, United Arab Emirates) O
Algebraic Bethe Circuits
16:30 – 16:50: **Susane Calegari** (Center for Theoretical Physics, PAS, Poland) O
Contextuality and memory cost of simulation of Majorana fermions

16:45 - 17:15: Coffee Break / Posters Session / Exhibition

Chairperson: Pablo Ordejon (ICN2, Spain)

PLENARY
17:15 - 17:45: **Tommaso Calarco** (Forschungszentrum Jülich, Germany) K
The European Quantum initiative: from a flagship to a fleet
17:45 - 18:05: **Neil Abroug** (National Innovation Council, France) I
French National Quantum Strategy
18:05 - 18:15: **Ricardo Diaz Muiño** (DIPC & CFM-CSIC, Spain) O
Spanish Complementary Plan on Quantum Communications
18:15 - 18:25: **Adolfo Morais Ezquerro** (Gobierno Vasco, Spain) O
IKUR Initiative
18:25 - 18:35: **Juan Jose Garcia-Ripoll** (IFF/CSIC, Spain) O
QTEP Initiative
18:35 - 18:45: **Alba Cervera Lierta** (Barcelona Supercomputing Center, Spain) O
Quantum Spain Initiative

Chairperson: Mete Atature (University of Cambridge, UK) - TBC

PARALLEL SESSION INDUSTRIAL FORUM

17:15 - 17:25: **Andrea Barbiero** (Toshiba Europe Ltd, UK) O
Efficient generation of quantum light at telecom wavelength for long-distance secure communication and quantum network applications

17:25 - 17:35: **Steven Touzard** (National University of Singapore, Singapore) O
Building quantum networks of superconducting circuits mediated by telecom photons

17:35 - 17:45: **Daniel Perez** (KU Leuven-IMEC, Belgium) O
Foundry-compatible fabrication processes for superconducting circuits

17:45 - 17:55: **Barry DeWayne Reese** (Capgemini, Germany) O
Hybrid quantum algorithms in computer vision for automated quality assessments

17:55 - 18:15: **Oktay Goktas** (Agnostiq, Canada) I
Covalent: A tool for orchestrating large scale heterogeneous scientific workflows

18:15 - 18:25: **Ramon Szmuk** (Quantum Machines, Denmark) O
Integrated quantum control architecture for ultra-fast camera readout of neutral atom arrays

18:25 - 18:35: **David Muñoz Ramo** (Quantinuum, UK) O
Chemistry-aware noise mitigation on molecular simulations for NISQ hardware

18:35 - 18:45: **Wei Liu** (IQM Finland Oy, Finland) O
Development of the quantum processing units (QPUs) at IQM Finland Oy

21:00 **Conference Dinner** (Restaurant CAN CORTADA, Barcelona – Spain)

Thursday (23/06/2022)

Chairperson: Pol Forn-Díaz (IFAE, Spain)

PLENARY

09:00 – 09:20: **Fernando Brandão** (Amazon Web Services & CALTECH, USA) I
Fault tolerant quantum computing with bosonic qubits

09:20 – 09:40: **Jens Eisert** (Freie Universität Berlin, Germany) I
Addressing learning tasks with quantum devices

09:40 – 10:00: **Andreas Wallraff** (ETH Zurich, Switzerland) I
Realizing Repeated Quantum Error Correction in a Surface Code with Superconducting Circuits

10:00 – 10:30: **Antonio Acín** (ICREA/ICFO, Spain) K
Certification of quantum systems and technologies

10:30– 11:30: Coffee Break / Exhibition

Chairperson: Hugues de Riedmatten (ICFO, Spain)

11:30 – 12:00: **Jose Ignacio Latorre** (NUS, Singapore) K
Computing with photons

12:00 – 12:15: **Maximilian Zanner** (University of Innsbruck, Austria) O
Coherent control of a multi-qubit dark state in waveguide quantum electrodynamics

12:15 – 12:30: **Martin Hayhurst Appel** (University of Cambridge, UK) O
Entangling a Hole-Spin with a Time-Bin Photon: A Waveguide Approach to Cluster State Generation

12:30 – 12:45: **Tina Muller** (Toshiba Europe Ltd, UK) O
Indistinguishability of coherent photons from telecom-wavelength quantum dots

12:45 – 13:00: **Liang Zhai** (University of Basel, Switzerland) O
Quantum interference between identical photons from remote quantum dots

13:00 – 13:15: **Leon Zaporski** (University of Cambridge, UK) O
Witnessing Quantum Correlations in a Nuclear Spin Ensemble via a Proxy Qubit

13:15 – 13:30: **Aamir Ali** (Chalmers University of Technology, Sweden) O
Engineering symmetry-selective couplings of a superconducting artificial molecule to microwave waveguides

Chairperson: Francesc Perez-Murano (CNM / CSIC, Spain)

PARALLEL SESSION SEMICONDUCTOR DEVICES

09:00 – 09:10: Opening

09:10 – 09:25: **Luis Canonico** (ICN2, Spain) O
Nonlocal Signals of Orbital Angular Momentum Transport in Graphene

09:25 – 09:40: **Emilio Nogales** (Universidad Complutense de Madrid, Spain) O
Optical cavity modes in luminescent β-Ga2O3:Cr nanowires for thermometry

09:40 – 09:55: **Christophe Chaubet** (Montpellier University, France) O
Coulomb interactions and effective quantum inertia of charge carriers in a macroscopic conductor

09:55 – 10:10: **Xavier Oriols** (Universitat Autonoma de Barcelona, Spain) O
Novel high-frequency performance of nanodevices with coherent electron-photon interactions

10:10 – 10:20: **Olga Arroyo Gascón** (Instituto de Ciencia de Materiales de Madrid CSIC, Spain) O
Persistence of symmetry-protected Dirac points at the surface of the topological crystalline insulator SnTe upon doping

10:20 – 10:30: **Irene Mediavilla Martínez** (Universidad de Valladolid, Spain) O
Unveiling the light emission of InP-InGaP hetero-structured nanowires

10:30– 11:25: Coffee Break / Exhibition

Chairperson: Xavier Oriols (UAB, Spain)

11:25 – 11:40: **Maxim Ilyn** (Centro de Física de Materiales CSIC-UPV/EHU, Spain) O
Transition metal dihalides – van der Waals magnetic semiconductors for the superconducting spintronics and quantum technologies

11:40 – 11:50: **David Fernández** (Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC), Spain) O
Quantum control of two qubits spin hole gates

11:50 – 12:00: **Biel Martinez i Diaz** (CEA Grenoble, France) O
Electron and Hole Spin Qubits Variability in Si MOS Devices

12:00 – 12:10: **Ran Xue** (JARA-FIT Institute for Quantum Information, Germany) O
Single-electron-shuttling in Si/SiGe

12:10 – 12:20: **Noah Shofer** (University of Cambridge, UK) O
Over one hundred microsecond electron spin coherence in an optically active quantum dot

12:20 – 12:30: **Cécile Yu** (CEA Grenoble, France) O
Coherent interaction of a hole spin and a microwave photon

12:30 – 12:40: **Alisa Danilenko** (University of Copenhagen, Denmark) O
Quantum Dots as Probes of 2DEG-Based Superconductor-Semiconductor Hybrid Wires

12:40 – 12:50: **Vanessa Hinojosa** (Universidad de Valladolid, Spain) O
Tip-Enhanced Raman Spectroscopy of Semiconductor InP-InGaP hetero-structured Nanowires

12:50 – 13:00: **Yuriko Baba** (Universidad Complutense de Madrid, Spain) O
Impact of the electric field in high Chern number Quantum Anomalous Hall states

13:00 -13:30: **Round Table "Opportunities and challenges for the application of semiconductor devices in quantum technologies"**
Moderator: Ramon Aguado (ICMM - CSIC, Spain)
Francesc Perez Murano (IMB-CNM / CSIC, Spain) / Silvano De Franceschi (CEA, France) / Gloria Platero (ICMM-CSIC, Spain) / Xavier Oriols (UAB, Spain) / Ramiro Sagastizabal (Qilimanjaro Quantum Tech S.L. , Spain)

13:30 – 15:00*: Lunch Break*

Chairperson: Gloria Platero (ICMM-CSIC, Spain)

PLENARY

15:00 – 15:20: **Wolfgang Tittel** (TU Delft, The Netherlands) I
Quantum network technology – the second life of rare-earth crystals

15:20 – 15:40: **Peter Leek** (University of Oxford, UK) I
Tileable low-crosstalk 3D-integrated superconducting circuits

15:40 – 15:55: **Jelena Rakonjac** (ICFO, Spain) O
Storage and analysis of light-matter entanglement in a fibre-integrated system

15:55 – 16:10: **Emmanuel Flurin** (Quantronics - CEA, France) O
Detecting spins by their fluorescence with a microwave photon counter
16:10 – 16:25: **John Robinson** (JILA, University of Colorado Boulder, USA) O
Toward a spin-squeezed optical clock
16:25 – 16:40: **Alexei Ourjoumtsev** (CNRS / College de France, France) O
An Intracavity Rydberg Superatom for Quantum Engineering of Light
16:40 – 16:55: **Eran Ginossar** (University of Surrey, UK) O
Protection of Quantum Information in a Chain of Josephson Junctions
16:55 – 17:10: **Rodrigo Cortinas** (Yale University, USA) O
Engineering new types of Kerr-cat qubits

17:10 Closing remarks