ICAP2022

The 27th International Conference on Atomic Physics

JULY 17-22, 2022 • TORONTO, CANADA

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Programme

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Jessica Ward, Senior Project Manager
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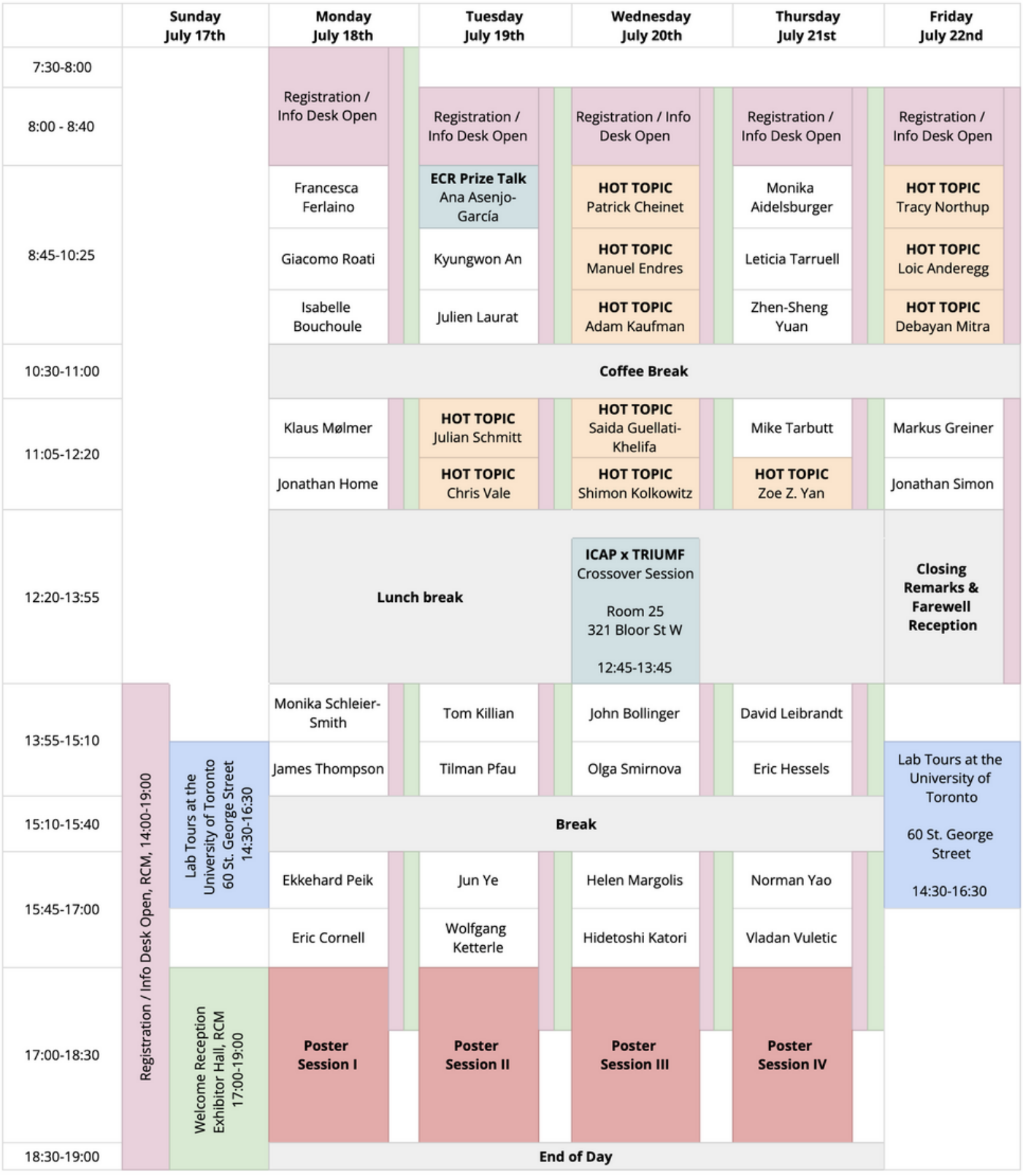
Schedule at-a-glance



If there is a discrepancy between this printed schedule and the online schedule, the online schedule should be taken as correct.

Purple and green columns represent the opening hours of the Registration/Info Desk and Exhibition Hall, respectively. For example, on Monday July 18th the Registration/Info Desk and Exhibition Hall are open between 7:30 and 17:30.

Program

SUNDAY JULY 17th

14:00 - 19:00 Registration/Info Desk Open

14:30 - 16:30 **Lab Tours at the University of Toronto** Department of Physics, 60 St. George Street

17:00 - 19:00 Exhibition Hall Open

MONDAY JULY 18th

07:30 - 17:30 Registration/Info Desk Open

07:30 - 17:30 Exhibition Hall Open

08:40 - 10:30 **Plenary Session I - Quantum Fluid Dynamics** Chair: Ludwig Mathey, U Hamburg (Germany)

New paradigms with dipolar quantum gases: Vortices, two-dimensional supersolidity, and angular responses

Francesca Ferlaino, Innsbruck (Austria)

A quantum vortex collider

Giacomo Roati, LENS (Italy)

Generalized hydrodynamics in 1D Bose gases

Isabelle Bouchoule, Institut d'Optique (France)

10:30 - 11:00 Coffee Break

11:05 - 12:20 **Plenary Session II - Qubits** Chair: Rainer Blatt, U Innsbruck (Austria)

Interactions with pulses of quantum radiation

Klaus Mølmer, Copenhagen (Denmark)

Stabilisation of a logical grid-state qubit by laser cooling

Jonathan Home, ETHZ (Switzerland)

12:20 - 13:55 Lunch Break

13:55 - 15:10 **Plenary Session III - Cavity QED** Chair: Duncan O'Dell, McMaster U (Canada)

Atoms Interlinked by Light: Programming Interactions and Probing Entanglement

Monika Schleier-Smith, Stanford (US)

Entanglement-Enhanced Matter-Wave Interferometry in a High-Finesse Cavity

James Thompson, JILA (US)

15:10 - 15:40 Break

15:45 - 17:00 **Plenary Session IV - Precision Measurement I** Chair: Protik Majumder, Williams College (USA)

Atomic and nuclear clocks for testing fundamental physics

Ekkehard Peik, PTB (Germany)

An improved measurement of the electron's electric dipole moment

Eric Cornell, JILA (US)

17:00 - 18:30 **Poster Session I** Hart House, University of Toronto

TUESDAY JULY 19th

08:00 - 17:30 Registration/Info Desk Open

08:00 - 17:30 Exhibition Hall Open

08:40 - 10:30 **Plenary Session V - Quantum Optics** Chair: Michal Bajcsy, IQC Waterloo (Canada)

IUPAP C15 (AMO) 2022 ECR Prize talk: Many-body quantum optics in atomic arrays PRIZE TALK

Ana Asenjo-García, Columbia University (US)

Superradiance, Superabsorption and a Photonic Quantum Engine

Kyungwon An, Seoul National U (Korea)

Quantum optics with cold atoms trapped along nanowaveguides

Julien Laurat, LKB Paris (France)

10:30 - 11:00 Coffee Break

11:05 - 12:20 **Plenary Session VI - Fermi Gasses** Chair: Randy Hulet, Rice (USA)

Compressibility and the equation of state of an optical quantum gas in a box HOT TOPIC

Julian Schmitt, Bonn (Germany)

Higgs mode in a unitary Fermi gas HOT TOPIC

Chris Vale, Swinburne (Australia)

12:20 - 13:55 Lunch Break

13:55 - 15:10 **Plenary Session VII - New Directions** Chair: Wonho Jhe, Seoul (Korea)

Laser-driven and Magnetized Ultracold Neutral Plasmas

Tom Killian, Rice (US)

Quantum Optics based on dipolar interactions between hot atoms
Tilman Pfau, Stuttgart (Germany)

15:10 - 15:40 Break

15:45 - 17:00 **Plenary Session VIII - Quantum Simulation** Chair: Alan Jamison, IQC Waterloo (Canada)

A tunable spin Hamiltonian of dipolar molecules
Jun Ye, JILA / NIST Boulder (US)

Spin dynamics of ultracold atoms in optical lattices
Wolfgang Ketterle, MIT (US)

17:00 - 18:30 **Poster Session II** Hart House, University of Toronto

WEDNESDAY JULY 20th

08:00 - 17:30 Registration/Info Desk Open

08:00 - 17:30 Exhibition Hall Open

08:40 - 10:30 **Plenary Session IX - Alkaline Earth Atoms** Chair: Gabriele Ferrari, U Trento (Italy)

Coherent Light Shift on Alkaline-Earth Rydberg Atoms HOT TOPIC
Patrick Cheinet, Aimee-Coton (France)

Probing Quantum Many-Body Dynamics with Tweezer Arrays HOT TOPIC
Manuel Endres, Caltech (US)

Quantum science with microscopically-controlled arrays of two-electron atoms HOT TOPIC
Adam Kaufman, JILA (US)

10:30 - 11:00 Coffee Break

11:05 - 12:20 **Plenary Session X - Precision Measurement II** Chair: Gordon Drake, U Windsor (Canada)

Accurate determination of the fine-structure constant using atom interferometry HOT TOPIC
Saïda Guellati-Khelifa, LKB Paris (France)

A precision laboratory test of the gravitational redshift at the sub-cm scale HOT TOPIC
Shimon Kolkowitz, U Wisconsin (US)

12:20 - 13:55 Lunch Break

Program Con't

12:45 - 13:45 **ICAP X TRIUMF Crossover Session** Room 25 in Woodsworth College Residences, 321 Bloor St W

Live streamed session showcasing achievements and opportunities for atomic and molecular physics pursued by the TRIUMF community. The Woodsworth College Residence building is less than 5 minutes' walk from the main ICAP venue, Koerner Hall.

Speakers:
Gerald Gwinner (UManitoba)
Takamasa Momose (UBC)
Ronald Garcia Ruiz (MIT)

13:55 - 15:10 **Plenary Session XI - Non-equilibrium Dynamics** Chair: Maciej Lewenstein, ICFO (Spain)

Ultrafast chirality: twisting light to twist electrons

Olga Smirnova, MBI Berlin (Germany)

Non-equilibrium dynamics and sensing with large trapped-ion crystals

John Bollinger, NIST Boulder (US)

15:10 - 15:40 Break

15:45 - 17:00 **Plenary Session XII - Optical Clocks** Chair: Piet Schmidt, PTB (Germany)

Optical atomic clocks – what challenges remain on the roadmap towards a redefinition of the SI second?

Helen Margolis, NPL (UK)

Making optical lattice clocks compact and useful for real-world applications

Hidetoshi Katori, Tokyo (Japan)

17:00 - 18:30 **Poster Session III** Hart House, University of Toronto

THURSDAY JULY 21st

08:00 - 17:30 Registration/Info Desk Open

08:00 - 17:30 Exhibition Hall Open

08:40 - 10:30 **Plenary Session XIII - Quantum Simulation of Gauge Theories**
Chair: Lindsay LeBlanc, U Alberta (Canada)

Towards quantum simulation of U(1) LGTs with alkaline-earth-like atoms

Monika Aidelsburger, LMU Munich (Germany)

Engineering a topological gauge theory in an optically dressed Bose-Einstein condensate

Leticia Tarruell, ICFO (Spain)

Simulating a Lattice Gauge Theory with Ultracold Atoms

Zhen-Sheng Yuan, USTC (China)

10:30 - 11:00 Coffee Break

11:05 - 12:20 **Plenary Session XIV - Molecules** Chair: Robin Coté, U Connecticut (USA)

Testing fundamental physics using laser cooled molecules

Mike Tarbutt, Imperial College (UK)

Quantum gas microscopy of polar molecules **HOT TOPIC**

Zoe Z. Yan, Princeton (US)

12:20 - 13:55 Lunch Break

13:55 - 15:10 **Plenary Session XV - Precision Measurement III** Chair: Zong Chao Yan, UNB (Canada)

Four-second optical coherence between different atomic species, and the search for new physics with atomic clocks

David Leibrandt, NIST Boulder (US)

The proton size, the fine-structure constant, and the electron electric dipole moment

Eric Hessels, York University (Canada)

15:10 - 15:40 Break

15:45 - 17:00 **Plenary Session XVI - Metrology** Chair: Aephraim Steinberg, U Toronto (Canada)

A Landau Theory for Spin Squeezing

Norman Yao, Berkeley (US)

Time-Reversal-Based Quantum Metrology beyond the Standard Quantum Limit

Vladan Vuletic, MIT (US)

17:00 - 18:30 **Poster Session IV** Hart House, University of Toronto

FRIDAY JULY 22nd

08:00 - 14:00 Registration/Info Desk Open

Program Con't

08:40 - 10:30 **Plenary Session XVII - Cooling Beyond Atoms** Chair: Amar Vutha, U Toronto (Canada)

Cooling nanoparticles in ion traps: a route to the quantum regime HOT TOPIC

Tracy Northup, Innsbruck (Austria)

Laser-cooled Molecules, from Controlled Collisions to Qbits HOT TOPIC

Loic Anderegg, Harvard (US)

Laser Cooling of Complex Polyatomic Molecules HOT TOPIC

Debayan Mitra, Columbia University (US)

10:30 - 11:00 Coffee Break

11:05 - 12:20 **Plenary Session XVIII - New Directions** Chair: Joseph Thywissen, U Toronto (Canada)

Quantum simulation of Fermi-Hubbard dynamics and bosonic Laughlin states

Markus Greiner, Harvard (US)

Cavity QED: from Many-body Physics to Transduction

Jonathan Simon, Stanford (US)

12:30 - 14:00 Closing Remarks & Farewell Reception

14:30 - 16:30 **Lab Tours at the University of Toronto** Department of Physics, 60 St. George Street

Sponsors & Exhibitors

EXHIBITORS

ALPhANOV aims to boost innovation through collaboration between research and industry. It offers multiple modes of action which enable it to act all along the value chain: collaborative projects, feasibility studies, access to shared technical facilities, dedicated resources for companies and laboratories, technical support of entrepreneurship.

Founded in 1899, the American Physical Society (APS) is a non-profit membership organization working to advance and diffuse the knowledge of physics. APS publishes the Physical Review collection, the world's most widely read physics research and review journals.

Azurlight Systems develops, produces, and commercializes innovative fiber laser technologies. Its patented design represents a real breakthrough on the laser market especially over other solid-state technologies. Our team strives to combine the most stringent fiber laser specifications: high power, single mode, single frequency, ultra-low noise, to enable the most demanding applications. The unique all-fibered architecture allows for reliability and robustness and enables efficient integration. Our products are intended for industrials and academics. Azurlight Systems is ISO 9001:2015 certified and relies on a well-trained global network of partners. Nevertheless, we are very close to our customers and always appreciate to provide deep understanding of our products performances and potential customization to the application.

ColdQuanta is a global quantum technology company solving the world's most challenging problems. The company harnesses quantum mechanics to build and integrate quantum computers, sensors, and networks. From fundamental physics to leading edge commercial products, ColdQuanta enables "quantum everywhere" through our ecosystem of devices and platforms. Founded in 2007, ColdQuanta grew from decades of research in atomic physics and work at JILA, with intellectual property licensed through the University of Colorado and University of Wisconsin. ColdQuanta's scalable and versatile cold atom technology is used by world-class organizations around the globe and deployed by NASA on the International Space Station. ColdQuanta is based in Boulder, CO, with offices in Chicago, IL; Madison, WI; and Oxford, UK. Find out how ColdQuanta is building the future at www.coldquanta.com.

IPG Photonics is the leading manufacturer of high-performance fiber lasers & systems that offer optimized laser welding, cutting and drilling for industrial applications. Headquartered in Oxford, MA, IPG is the global leader of fiber laser technology, enabling greater precision, higher productivity and more flexible production for diverse markets.

MPB Communications Inc. specializes in the development and manufacturing of innovative fiber laser and amplifier systems. At ICAP, we will be highlighting single frequency amplifiers – available with either a crystal base single pass SHG, or a Resonant SHG. Applications include atom cooling & trapping, atomic clock, and laser guide star. MPBC has received numerous awards including the Berthold Leibinger Innovationspreis Award. Incorporated in 1976, R&D & manufacturing are conducted in Montreal.

MOGLabs designs and manufactures precision lasers and optical instruments for quantum science and technology.

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The Transformative Quantum Technologies (TQT) program at the University of Waterloo aims to advance the use of quantum mechanics from laboratory curiosity to an impactful device. TQT builds upon the world- renowned strengths of the Institute for Quantum Computing and brings together quantum researchers across campus and beyond to accelerate quantum research excellence.

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