

# 2023 Joint Review Meeting for the AFOSR Quantum Information Sciences & Atomic and Molecular Physics Portfolios

Drs. Boyan Tabakov/Grace Metcalfe | July 31 – August 4, 2023 | Arlington, VA

Basic Research Innovation Collaboration Center (BRICC)  
4100 N Fairfax Drive, Suite 450 | Arlington, VA 22203

## Agenda Day 1 | Monday, July 31, 2023

Time	Topic	Speaker
8:00	<b>CHECK IN / SIGN IN</b>	
8:15	Photon number state filters using precise positioning of quantum emitters along a waveguide	Daniel Campbell, Air Force Research Lab
8:35	Stabilizer-based Hamiltonian Engineering using Superconducting Qubits	Angela Kou, University of Illinois Urbana Champaign
8:55	Expanding scQubits: an open-source Python package for superconducting qubits	Jens Koch, Northwestern University
9:15	BE NON LINEAR: Bosonic Encodings in NOise-resilient circuits with strong Non-LINEARity	Machiel Blok, University of Rochester (YIP)
9:35	<b>BREAK</b>	
10:00	Encoding Bosonic Qubits in Long-Lived Phonons	Mohammad Mirhosseini, Caltech (YIP)
10:20	Suppressing quasiparticles in superconducting qubits	Eli Levenson-Falk, University of Southern California
10:40	Limiting phonon-induced decoherence in superconducting qubits	Zhiting Tian, Cornell University (YIP)
11:00	Long-coherence high-fidelity electron qubits on quantum solids	Dafei Jin, University of Notre Dame (Team)
11:20	Quantum Piezoacoustics	Andrew Cleland, University of Chicago
11:40	<b>LUNCH</b>	
13:00	MURI: High Coherence Quantum Phononic Circuits	Peter Rakich, Yale University
13:20	Quantum Phononics to Advance Quantum Information Processing	Konrad Lehnert, University of Colorado
13:40	Optimizing qubit performance in diamond with strain engineering	Alexander High, University of Chicago
14:00	Engineering Superconductivity in Germanium	Javad Shabani, New York University
14:20	Design and optimization of synthesizable materials with targeted quantum characteristics	Nikita Onizhuk for Giulia Galli, University of Chicago (Team)

<b>14:45</b>	<b>BREAK</b>	
<b>15:05</b>	Single phonon quantum acoustics	Jack Harris, Yale University
<b>15:25</b>	Optical Quantum Networks with Single Ytterbium Ions in YVO4	Andrei Faraon, Caltech
<b>15:45</b>	Programmable quantum spin dynamics with trapped atoms coupled to a nanophotonic microring resonator	Chen-Lung Hung, Purdue University
<b>16:05</b>	Quantum interconnects for neutral atoms	Alex Kuzmich, University of Michigan
<b>16:25</b>	Measurement of Entanglement by Quantum Interferometry	Mayukh Lahiri, Oklahoma State University
<b>16:45</b>	<b>END OF DAY</b>	

<b>Agenda Day 2   Tuesday, August 1, 2023</b>		
<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
<b>8:00</b>	<b>CHECK IN / SIGN IN</b>	
<b>8:15</b>	Counter-diabatic control as a universal quantum design tool	Dries Sels, New York University
<b>8:35</b>	Generating, Qualifying, and Quantifying Multi-Partite Entanglement for Quantum Networks	Kathy-Anne Soderberg, Air Force Research Lab
<b>8:55</b>	Entanglement Distribution among Six Remote Quantum Nodes through Cold Atomic Ensembles and Photon Polarizations	Shengwang Du, University of Texas Dallas
<b>9:15</b>	Optimizing Entanglement to attain Quantum Limit of Long-Baseline Imaging	Saikat Guha, University of Arizona
<b>9:35</b>	<b>BREAK</b>	
<b>10:00</b>	MURI: Towards Robust Scalable Quantum Random Access Memories	Liang Jiang, University of Chicago
<b>10:20</b>	Superconducting Reservoir Computers for Quantum Memory and Information Processing	Hakan Tureci, Princeton University
<b>10:40</b>	Practical Quantum Protocols	Gorjan Alagic, University of Maryland (Team)
<b>11:00</b>	Experimental Robustness vs. Computational Complexity in a Neutral Atom Based NISQ Information Processor	Grant Biedermann, University of Oklahoma (Team)

<b>11:20</b>	Parallel gate operations in 3D optical lattice arrays of Cs atoms	David Weiss, Pennsylvania State University
<b>11:40</b>	<b>LUNCH</b>	
<b>13:00</b>	Large-scale entanglement via spin-exchange in a cryogenic ytterbium tweezer array	Peter Schauss, University of Virginia
<b>13:20</b>	Real-time feedback for Rydberg atom arrays	Jacob Covey, University of Illinois Urbana Champaign (YIP)
<b>13:40</b>	Novel photonic topology from two-photon driving: applications to quantum information processing	Aash Clerk, University of Chicago
<b>14:00</b>	Engineering pathways to state preparation in quantum systems	Anatoli Polkovnikov, Boston University
<b>14:20</b>	Superradiance, lasing, and dissipative generation of entanglement in ensembles of qubits	Ana Asenjo-Garcia, Columbia University (YIP)
<b>14:40</b>	<b>BREAK</b>	
<b>15:05</b>	Measurement and control in an open many-body quantum system	Dan Stamper-Kurn, University of California Berkeley
<b>15:25</b>	Quantum Optimization with Rydberg Atoms	Shankari Rajagopal for Monika Schleier-Smith, Stanford University (PECASE)
<b>15:45</b>	Tunable quantum dissipation using parametric interactions	Archana Kamal, University of Massachusetts Lowell (YIP)
<b>16:05</b>	Driven-dissipative architectures: New routes to quantum phases and technologies	Mohammad Maghrebi, Michigan State University (YIP)
<b>16:25</b>	Emergent phenomena in non-equilibrium quantum systems	Romain Vasseur, University of Massachusetts Amherst (YIP)
<b>16:45</b>	<b>END OF DAY</b>	

<b>Agenda Day 3   Wednesday, August 2, 2023</b>		
<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
<b>8:00</b>	<b>CHECK IN / SIGN IN</b>	
<b>8:15</b>	Dynamical optical lattices of dysprosium	Benjamin Lev, Stanford University

<b>8:35</b>	Fundamental speed limits on quantum information dynamics	Andrew Lucas, University of Colorado
<b>8:55</b>	Creation and control of large-scale entangled quantum matter	Ana Maria Rey, University of Colorado (Team)
<b>9:15</b>	MURI: Dissipatively Stabilized Qubits and Materials	Jonathan Simon, Stanford University
<b>9:35</b>	<b>BREAK</b>	
<b>10:00</b>	Improving Trapped Ion Quantum Information Processing Through Parametric Amplification	John Bollinger, University of Colorado
<b>10:20</b>	Experimental steps towards quantum information processing with trapped electrons	Hartmut Haeffner, University of California Berkeley (Team)
<b>10:40</b>	Fermionic Quantum Simulation and Computation	Ningyuan Jia for Martin Zwierlein, Massachusetts Institute of Technology
<b>11:00</b>	Quantum Simulation of Optical Conductivity	Joseph Thywissen, University of Toronto
<b>11:20</b>	<b>LUNCH</b>	
<b>12:40</b>	Cooling and Non-Destructive Detection for Magnetically Confined Atoms	Robert Leonard for Spencer Olson, Air Force Research Lab
<b>13:00</b>	Cold Atoms and Photonic Resonators	Chandra Raman, Georgia Tech
<b>13:20</b>	Quantum Correlated Four-Wave-Mixing: Cluster States and Cavities	Paul Lett, University of Maryland
<b>13:40</b>	Strongly driven ultracold atoms: new frontiers in nonequilibrium quantum control	David Weld, University of California Santa Barbara
<b>14:00</b>	Isomer Identification at the Single-Molecule Level	James Chou, NIST for Heather Lewandowski, University of Colorado
<b>14:20</b>	Quantum control and precision measurement of molecular vibrational states	Scott Diddams, University of Colorado
<b>14:40</b>	<b>BREAK</b>	
<b>15:05</b>	Direct test of the quantum statistics theorem using well-separated indistinguishable particles	Hartmut Haeffner, University of California Berkeley
<b>15:25</b>	Solving Problems in Atomic Superfluid Rotation Using Cavity Optomechanics	Mishkatul Bhattachariya, Rochester Institute of Technology
<b>15:45</b>	High-precision inertial sensing using levitated optomechanics	Maxwell Gregoire, Air Force Research Lab
<b>16:05</b>	Cavity Tweezers for Quantum Information Science and Simulation	Jonathan Simon, Stanford University

<b>16:25</b>	New Frontiers of Quantum Simulation with Alkaline Earth Atoms	Ana Maria Rey, University of Colorado
<b>16:45</b>	<b>END OF DAY COMMENTS</b>	

<b>Agenda Day 4   Thursday, August 3, 2023</b>		
<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
<b>8:00</b>	<b>CHECK IN / SIGN IN</b>	
<b>8:15</b>	Quantum Science with Hybrid Magnetic Lanthanide Molecules for Quantum Simulations and Precision Measurements	Svetlana Kotochigova, Temple University
<b>8:35</b>	Innovations for the Construction and Detection of Quantum Phases with Neutral Atoms	Vito Scarola, Virginia Tech
<b>8:55</b>	Coherent control of multimode quantum optical signals via atom-mediated nonlinear inter-actions	Irina Novikova, College of William & Mary
<b>9:15</b>	Correlated atomic fluids in two-dimensional synthetic lattices	Bryce Gadway, University of Illinois
<b>9:35</b>	Cluster-State Computing via Non-Destructive Imaging of Single Molecules	Brian DeMarco, University of Illinois
<b>9:55</b>	<b>BREAK</b>	
<b>10:15</b>	Probing Nonlocal Pair Correlations in a Quantum Gas using Ultra-long-range Rydberg Molecules	Thomas Killian, Rice University
<b>10:35</b>	Exploiting Strong Driving for Next Generation Quantum Devices	Anushya Chandran, Boston University
<b>10:55</b>	Repulsive multipole-multipole interactions	Jianing Han, University of South Alabama
<b>11:15</b>	Spectroscopy in a cold rovibrational molecular rubidium beam produced by broadband optical pumping	Luis Marcassa, University of São Paulo
<b>11:35</b>	Optical Control of Interactions in Fermi Gas Quantum Simulators	John Thomas, North Carolina State University
<b>11:55</b>	<b>LUNCH</b>	
<b>13:10</b>	Nonlinear Acoustics in Ultracold Fermi Fluids	Nir Navon, Yale University

<b>13:30</b>	Probing the influence of anisotropic and disordered interactions on the dynamics of quantum information in a Rydberg tweezer array	Robert Lewis-Swan, University of Oklahoma
<b>13:50</b>		
<b>14:10</b>	Subwavelength-spaced atomic arrays as novel light-matter interfaces	Qiyu Liang, Purdue University
<b>14:30</b>	Entanglement control in alkaline-earth Rydberg arrays	Joonhee Choi for Manuel Endres, Caltech (YIP)
<b>14:50</b>	<b>BREAK</b>	
<b>15:10</b>	New quantum states in synthetic curved spaces and non-orientable manifolds	Qi Zhou, Purdue University
<b>15:30</b>	Exploring Ultra-Narrow Photon Emission in the keV regime	Giorgio Gratta, Stanford University
<b>15:50</b>	Exploring Many-body Quantum Chemistry with Molecular Bose-Einstein Condensates	Cheng Chin, University of Chicago
<b>16:10</b>	Coherent Control of Cold and Ultracold Bimolecular Reactions	Paul Brumer, University of Toronto
<b>16:30</b>	MURI: Ensembles of Molecules in Controlled Quantum States for Quantum Simulations, Ultracold Reactions, and Precision Metrology	John Doyle, Harvard for Tanya Zelevinsky, Columbia University
<b>16:50</b>	<b>END OF DAY</b>	

<b>Agenda Day 5   Friday, August 4, 2023</b>		
<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
<b>8:00</b>	<b>CHECK IN / SIGN IN</b>	
<b>8:15</b>	Thermal transport in ultracold topological quantum matter	Richard Fletcher, Massachusetts Institute of Technology (YIP)
<b>8:35</b>	New frontiers for quantum dynamics	Rahul Nandkishore, University of Colorado
<b>8:55</b>	Engineering many-body quantum states and dissipative dynamics in quantum simulators	Andrew Daley, University of Strathclyde
<b>9:15</b>	Cooperative radiation phenomena for Quantum information processing and metrology	Susanne Yelin, Harvard University

<b>9:35</b>	<b>BREAK</b>	
<b>10:00</b>	Emulating Twistronics and Beyond with Ultra-Cold Atoms	Jedediah Pixley, Rutgers University (YIP)
<b>10:20</b>	Engineering Spin Interactions in Circuit QED Lattices	Alicia Kollar, University of Maryland (YIP)
<b>10:40</b>	Spin susceptibility, spin exchange reactions, and Kondo effect with ultracold mixtures	Colin Parker, Georgia Tech
<b>11:00</b>	Many-body Dynamics of Quantum Gases in Time Varying Optical Lattices	Subhadeep Gupta, University of Washington
<b>11:20</b>	MURI: Reimagining Atoms and Photons in SYnthetic, DYnamical, and INteracting Quantum matter (RAPSYDY IN Q)	Mikael Rechtsman, Pennsylvania State University
<b>11:40</b>	<b>LUNCH</b>	
<b>13:00</b>	Quantum Simulation, Computation, and Metrology with Ultracold Atoms	Chuanwei Zhang, University of Texas Dallas
<b>13:20</b>	Theoretical Investigations of Ionization Processes in an Ultracold Quantum Rydberg Gas	Essaid Zerrad, Delaware State University
<b>13:40</b>		
<b>14:00</b>	Orbital Quantum Phases of Ultracold Atoms	Vincent Liu, University of Pittsburgh
<b>14:20</b>	Laser Cooling and Trapping of Asymmetric Top Molecules for Quantum Science	John Doyle, Harvard University
<b>14:40</b>	<b>BREAK</b>	
<b>15:05</b>	Controlled Organic Chemistry with Laser-Cooled CH Molecules	Daniel McCarron, University of Connecticut
<b>15:25</b>	Stability of ultracold polyatomic molecules	Jesus Perez Rios, Stony Brook University
<b>15:45</b>	Entangling ultracold molecules	Kang-Kuen Ni, Harvard University
<b>16:05</b>	MURI: New approaches to quantum control with individual molecule sensitivity	Kang-Kuen Ni, Harvard University
<b>16:25</b>	<b>END OF DAY</b>	