

Optomechanical Sensing for Subatomic & Astroparticle Physics

Queen's University, Kingston · 23–25 September 2026

Wednesday 23 September

Time	Speaker	Title
Opening & Overview — Chair: Wouter Van De Pontseele (Colorado School of Mines)		
9:00–9:15	Art McDonald / Kyle Leach	Welcome
9:15–9:30	Wouter Van De Pontseele	Workshop logistics and practical information
9:30–10:30	Zhen Liu	Overview of broad scope and theory: motivation for optomechanical sensing across subatomic and astroparticle physics (30+15)
10:30–10:45	<i>Coffee break</i>	
Quantum Measurement, Gravity & Dark Matter — Chair: Wouter Van De Pontseele		
10:45–11:25	Vivishek Sudhir (MIT)	Quantum measurements of particles and of waves for probes of gravity: unconditional observation of quantum back-action on gravitational-wave detectors (20+10)
11:25–12:05	John Davis (Alberta)	Sensing gravitational waves and dark matter with superfluid helium: tunable acoustic Weber-bar resonators with cavity-electromechanical readout (20+10)
12:05–13:00	<i>Lunch</i>	
13:00–13:40	Tejas Deshpande (Northwestern)	Search for scalar ultralight dark matter using cryogenic optical cavities: first demonstration with two cryogenic sapphire Fabry–Pérot cavities (20+10) — attendance tentative
13:40–14:00	Andrew Buchanan (Queen's)	Looking for dark photons with two-photon atomic transitions: coherent parahydrogen ensembles and the CATCHY pathfinder (contributed, 15+5)
14:00–14:20	Samuele Sangiorgio (LLNL)	Heavy Neutrino Experiment Using Levitated Tritiated Nanoparticles (contributed, 15+5, abstract pending)
14:20–14:40	Lucas Darroch (Yale)	Trapping solid noble gases — contributed talk, abstract pending (15+5)
Free Discussion		
14:45 – 16:00	Free Discussion / Breakouts <i>Includes coffee break 14:45 – 15:15</i>	
Social Programme		
16:00–19:00	<i>Dinner on own</i>	
19:00	<i>Reception & drinks</i>	Donald Gordon Centre

Thursday 24 September

Time	Speaker	Title
Overview & Levitated Optomechanics I — Chair: Joseph Formaggio (MIT)		
9:00–10:00	Dave Moore (Yale)	Overview of modalities and experiments: the experimental landscape of optomechanical sensors for fundamental physics (30+15)
10:00–10:15	<i>Coffee break</i>	
10:15–10:55	Andrew Geraci (Northwestern)	Optomechanical sensors for gravity, dark matter, and axions: levitated tests of quantum gravity and high-frequency gravitational-wave searches (20+10)
10:55–11:35	Andrew Laeuger (Caltech)	Gravitational-wave response of optically levitated sensors in Fabry–Pérot cavities: relativistic derivation and the input-mirror asymmetry (20+10)
11:35–12:15	Massimiliano Rossi (TU Delft)	A quantum-limited levitated force and recoil sensor: minimum-uncertainty nanoparticle states and sub-zero-point recoil detection (20+10)
12:15–13:30	<i>Lunch</i>	
Levitated & Tethered Sensors, Particle Detection — Chair: Dave Moore (Yale)		
13:30 – 14:10	Thomas Penny (Chalmers)	Low-noise levitated oscillators and calorimetry with levitated superconductors: chip-based magnetic traps and single nuclear-decay energy measurement (20+10)
14:10 – 14:50	Mathieu Juan (Sherbrooke)	Magnetomechanics and levitation: laser-free Paul-trapped micromagnets coupled to superconducting circuits for quantum state preparation (20+10)
14:50 – 15:05	<i>Coffee break</i>	
15:05 – 15:45	Dalziel Wilson (Arizona)	The Invisible Drummer: membrane optomechanical accelerometer search for ultralight dark photon dark matter, and the transition to phase II (20+10)
Free Discussion		
15:45 – 17:00	Free Discussion / Breakouts	
Evening		
19:00	<i>Dinner</i>	Details to be confirmed

Friday 25 September

Time	Speaker	Title
Quantum Optomechanics & Particle Sensors — Chair: Daniel Carney (LBNL)		
9:00 – 9:40	Dan Kodroff (LBNL)	Quantum Invisible Particle Sensor (QuIPS): recoil reconstruction of nuclear decays in a trapped nanosphere for sterile-neutrino searches (20+10)
9:40 – 10:20	Jack Harris (Yale)	Thermal-limited motion and optomechanical control of a levitated superfluid drop (20+10)
10:20–10:35	<i>Coffee break</i>	

Time	Speaker	Title
Working Session & Closing — Chair: Daniel Carney (LBNL)		
10:35 – 10:50	Daniel Carney	Charge to the working groups: collaborative opportunities, outstanding challenges
10:50 – 11:50	Breakout groups	Small-group discussions on collaborative efforts and open challenges; each group prepares a short summary and candidate white-paper section: 1. Dark-matter targets and theory 2. Gravitational waves and tests of gravity 3. Nuclear decays, recoils and neutrinos 4. Readout, quantum control and shared technology
11:50–12:30	Breakout leads	Report-back and plenary discussion
12:30–12:45	Kyle Leach (Queen's)	Closing remarks and summary
12:45	<i>Workshop concludes</i>	Lunch provided before departure