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New techniques to Search for wave-like dark matter and test fundamental physics using precision low-energy measurements.

Thursday, 19 September 2024 12:30 (20 minutes)

In this presentation I will provide an update on research at the Quantum Technologies and Dark Matter Laboratories at the University of Western Australia to develop new techniques to search for wave-like dark matter candidates and to test fundamental physics using precision low-energy metrology.

In particular we will focus on techniques which utilize low-loss and low-noise electromagnetic oscillators [1,2], that search for signs of axions, scalar dark matter, quantum gravity. And high frequency gravitational waves [3-8]

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[1] EN Ivanov, ME Tobar, Noise Suppression with Cryogenic Resonators, arXiv:2403.18427
[2] EN Ivanov, ME Tobar, Frequency Stable Microwave Sapphire Oscillators, arXiv:2403.18419
[3] JF Bourhill, ECI Paterson, M Goryachev, ME Tobar, Searching for Ultra-Light Axions with Twisted Cavity Resonators of Anyon Rotational Symmetry with Bulk Modes of Non-Zero Helicity, arXiv:2208.01640
[4] ME Tobar, AV Sokolov, A Ringwald, M Goryachev, Searching for GUT-scale QCD Axions and Monopoles with a High Voltage Capacitor, arXiv:2306.13320
[5] G Tobar, I Pikovski, ME Tobar, Detecting kHz gravitons from a neutron star merger with a multi-mode resonant bar, arXiv:2406.16898
[6] RY Chiao, NA Inan, M Scheibner, J Sharping, DA Singleton, ME Tobar, Gravitational Aharonov-Bohm Effect, arXiv:2311.07764
[7] WM Campbell, ME Tobar, S Galliou, M Goryachev, Improved constraints on minimum length models with a macroscopic low loss phonon cavity
[8] WM Campbell, M Goryachev, ME Tobar, The Multi-mode Acoustic Gravitational Wave Experiment: MAGE, arXiv:2307.00715

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