BiCoQ **SEMINAR**

Dipartimento di Fisica
Università di Milano-Bicocca

"Precision Metrology with Photons, Phonons and Spins: Answering Major Unsolved Problems in Physics and Advancing Translational Science"

Professor Michael Tobar
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30 June 2023, 11:00
Edificio U1, Aula Marchetti
Università degli Studi di Milano-Bicocca

The Quantum Technologies and Dark Matter research laboratory has a rich history of developing precision tools, including the development and application of novel low-loss and highly sensitive resonant photonic and phononic cavities, such as whispering gallery and re-entrant cavities, as well as photonic band gap and bulk acoustic wave structures. These cavities have been used in a range of applications, including highly stable low noise classical and atomic oscillators, low noise measurement systems, highly sensitivity displacement sensors, high precision electron spin resonance and spin-wave spectroscopy, high precision measurement of material properties and applications of low-loss quantum hybrid systems, which are strongly coupled to form polaritons or quasi-particles. Translational applications have included the realization of the lowest noise oscillators and systems for advance radar, the enabling of high accuracy atomic clocks and sensitive transducers for precision measurements.

Meanwhile, there is currently a world-wide renascence to adapt precision and quantum measurement techniques to major unsolved problems in physics and discover "Beyond Standard Model" physics. Our technology has been adapted to realize precision measurement tools and techniques to test some of these core aspects of fundamental physics, such as low energy searches for wave-like dark matter, test of quantum gravity from the possible modification of the Heisenberg uncertainty principle, the search for high frequency gravitational waves, Lorentz invariance violations in the photon, phonon and gravity sectors and possible variations in fundamental constants. An overview of our current experimental program will be presented, including status, recent experiments, and future directions.

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