UNIVERSITÀ DEGLI STUDI DI MILANO

DIPARTIMENTO DI FISICA

Thu, 11 Dec 2014

Aula Polvani

feeding the future with quantum technology

Quantum EXPO

University of Milan - Department of Physics

Mauro Paternostro

Queen's University — Belfast

Non-interferometric test of collapse models in optomechanical systems

Scheduled at 11:00

Abstract: The test of modifications to quantum mechanics aimed at identifying the fundamental reasons behind the unobservability of quantum mechanical superpositions at the macro-scale is a crucial goal of modern quantum mechanics. Within the context of collapse models, current proposals based on interferometric techniques for their falsification are far from the experimental state-of-the-art. I will discuss an alternative approach to the testing of quantum collapse models that, by bypassing the need for the preparation of quantum superposition states might help us addressing non-linear stochastic mechanisms such as the one at the basis of the continuous spontaneous localisation model.

Matteo Bina

University of Milan

Scheduled at 11:50

Squeezing of mechanical motion via qubit-assisted control

Abstract: Hybrid architectures, such as quantum opto-mechanical systems combining effective spins and vibrating micro- or nano-mechanical oscillators, represent one of the most promising candidates for the emergence of quantum effects in the mesoscopic world. In this framework, we propose a feedback control mechanism for the squeezing of the phononic mode of a mechanical oscillator which, realistically, interacts with a thermal reservoir. We show how, under appropriate working conditions, a simple adiabatic approach is able to induce mechanical squeezing. Our non-adaptive feedback loop offers interesting possibilities for quantum state engineering and steering in open-system scenarios.

Vittorio Giovannetti

Scuola Normale Superiore — Pisa

Gaussian optimization conjectures: new results and proofs

Scheduled at 14:30

Abstract: Optical channels, such as fibers or free-space links, are ubiquitous in today's telecommunication networks. They rely on the electromagnetic field associated with photons to carry information from one point to another in space. As a result, a complete physical model of these channels must necessarily take quantum effects into account in order to determine their ultimate performances. Specifically, Gaussian photonic (or bosonic) quantum channels have been extensively studied over the past decades given their importance for practical purposes. In spite of this, a longstanding conjecture on the optimality of Gaussian encodings has yet prevented finding their communication capacity. In my talk I will report the solution of this conjecture by proving that the vacuum state achieves the minimum output entropy of a generic Gaussian bosonic channel. This establishes the ultimate achievable bit rate under an energy constraint, as well as the long awaited proof that the single-letter classical capacity of these channels is additive. Beyond capacities, it also has broad consequences in quantum information sciences allowing one to compute the entanglement of formation for some non-symmetric Gaussian states. I will also present a proof of the stronger version of the conjecture which establish the optimality of Gaussian encoding in terms of majorization. Finally I will briefly mention on a generalization of the entropy power inequality.