particle leads to the formation of a dynamical steady state which is characterized by an effective temperature above the temperature of the environment [1]. The average steady state energy of the system has a higher value than expected from the environmental properties. The system experiences repeatedly a non-Markovian behavior - as a consequence the corresponding effective decay for long evolution times is always on average stronger than the Markovian one. We also highlight the consequences of the scheme to the Zeno - anti-Zeno crossover [2] which depends, in addition to the periodicity, also on the total evolution time of the system. Moreover, we discuss how an earlier proposal to use single trapped ions as quantum simulators for open systems [3] has to be modified to implement the scheme presented here.

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[2] S. Maniscalco, J. Piilo, and K.-A. Suominen, Phys. Rev. Lett. 97, 130402 (2006).
[3] J. Piilo and S. Maniscalco, Phys. Rev. A 74, 032303 (2006)

PLASTINA Francesco *Talk*

Critical properties of entanglement and Berry's phase in the superradiant phase transition

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By employing the adiabatic approximation, we discuss the thermodynamic-limit and finite-size scaling properties of both quantum correlations (entanglement) and of the geometric (Berry's) phase in the Dicke model. In the thermodynamic limit, we entanglement shows a non-analytic behavior at the super-radiant transition point and at the same time a nonzero Berry phase is obtained only if a path in parameter space is followed that encircles this critical point. Precursors of the critical behavior are present for a system with finite size. To show this, we evaluate the leading orders in the 1/N expansion to obtain analytically various bipartite entanglement measures and the Berry phase, together with their critical exponents.

POLETTI Dario *Poster*

BEC induced quantum ratchet

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We study the dynamics of a dilute Bose-Einstein condensate (BEC) in the mean-field limit. We show that in presence of BEC it is possible to have directed transport when forbidden for cold-atoms.

POPOV Alexander *Talk*

Quantum switching in negative-index metamaterials

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Quantum switching from strong absorption to transparency and amplification by two control lasers in solids doped by resonant impurities is studied. The results are discussed in the context of compensation of losses in negative-index metamaterials (NIMs), which is recognized now as one of the most challenging

problems that needs to be addressed for numerous applications of these revolutionary artificial electromagnetic materials. Counter-intuitive features of nonlinear-optical coupling in NIMs are shown that originate from opposite directions of the energy flows of the coupled waves. The opportunities offered by coherent quantum control in such scheme are illustrated by the numerical experiments.

PRVANOVIC Slobodan *Poster*

Transfer of angular momentum from vortex beams to optically induced copropagating and counterpropagating trigonal photonic lattices

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Angular momentum transfer from vortex beams to optically induced photonic lattices is demonstrated and essential difference between counterpropagating and copropagating cases is stressed. In the case of interacting incoherent counterpropagating beams it is found that the sum of angular momentum is not conserved, whereas their difference is. The sum of angular momenta of copropagating interacting beams is strictly conserved. It is also found that the transfer of angular momentum in counterpropagating interacting beams is minimal, amounting to few percent, while the transfer in copropagating interacting beams is substantial, amounting to tens of percent. Our results suggest that the difference of angular momenta is conserved in all physical systems where interaction occurs between counterpropagating incoherent beams.

PUDDU Emiliano *Talk*

Ghost imaging with intense entangled fields from PDC seeded by a thermal field

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We present a ghost imaging experiment performed by using, in the Test and Reference arms, the intense fields generated by a parametric downconversion (PDC) seeded with multi-mode chaotic light. A beta-Barium-Borate crystal is pumped by the second-harmonic output of an amplified Q-switched Nd-YAG laser and allows non-collinear type I phase-matching at frequency degeneracy. The seed field, from the laser fundamental output, is made pseudo-thermal by two rotating ground-glass plates and, after parametric amplification, hits the object-mask in the Test arm, where the bucket detector is located. The idler field travels in the Reference arm, where the "imaging lens" (focal length f) is located, and is finally mapped by a position-sensitive detector, which is a CCD camera. The distances of object and lens from the crystal and that of lens from CCD sensor obey the thin lens equation. The object, a hole of 1.6 mm diameter crossed by a straight wire of 0.5 mm caliber, results to be illuminated by a "spatially incoherent" field with $\sim$320 m speckle size. Thus $\sim$25 coherence areas cover the object area. We use the experimental data, maps produced by the CCD camera and energy values measured by the bucket detector over a series of laser shots, to calculate the fourth-order correlation function, which, as in the case of PDC from vacuum, is point by point proportional to the object transmittance. Studying the local visibility of the ghost images demonstrates that our results are rather consistent with the statistical properties of the multi-mode chaotic light that we measured independently. In addition, we notice that our seeded PDC source as compared to spontaneous PDC sources would make it easier to optimize the number and diameter of the speckles with respect to the size of the object details. Moreover recording