

Quantum correlations in cold atomic clouds driven by dissipative cavities

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Our research group at the Instituto de Física de São Carlos, SP, Brazil, is mounting an experimental platform on which ultracold strontium atoms, resonantly driven on a very narrow transition, interact strongly with the counter-propagating modes of a laser-pumped optical ring cavity. The recent observation of non-linear bistable behavior in a quantum regime dominated by atomic saturation, opens new avenues for realizing weakly entangled states with potential applications in enhanced quantum sensing. The bistability indicates the presence of a superradiant laser phase transition in a driven-dissipative system. Just below the phase transition spin-squeezed atomic states are expected to represent the steady state of the coupled atom-cavity system accompanied by quadrature squeezing of the cavity mode. We will discuss possible ways to detect this quadrature squeezing and use it as a spin-squeezing witness.