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Collective state signatures in quantum correlations of Cavity QED[1] PABLO BARBERIS-BLOSTEIN, IIMAS- Universidad Nacional Autonoma de Mexico, HOWARD CARMICHAEL, University of Auckland, LUIS OROZCO, University of Maryland — The correlation function of spontaneous emission from of a continuously driven atomic ensemble inside a two-mode optical cavity (vertical and horizontal polarizations) exhibits a single atom contribution when one and the same atom executes Raman transitions to scatter two orthogonally polarized photons in sequence. This single-atom contribution can show photon anti-bunching, the widely understood non-classical signature of single-atom emission. If, on the other hand, there is more than one atom present at the moment the first photon is detected, the atomic ensemble must collapse to a collective state, since there is no way to know which atom emitted the photon. The collective state makes a new contribution to the correlation function and can generate collective photon anti-bunching (interference between anti-bunched probability amplitudes for a second photon emission). We discuss how to detect this collective state through measuring correlation functions and the decoherence mechanisms that transform the collective atomic state into a separable state.

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