Spectral properties of a thresholdless dressed-atom laser

Min Luo, Gao-xiang Li, Zbigniew Ficek

(Submitted on 2 Feb 2010)

We investigate spectral properties of the atomic fluorescence and the output field of the cavity-mode of a single-atom dressed-state laser in a photonic crystal. We pay a particular attention t the behavior of the spectra in the presence of the frequency dependent reservoir and search for signatures of the thresholdless lasing. Although the thresholdless behavior has been predict by analyzing the photon statistics of the cavity field, we find that the threshold behavior still exists in the spectrum of the cavity field. We find that the structure of cavity field spectrum depends strongly on the strange of the pumping rate. For low pumping rates, the spectrum is not monochromatic, it is composed of a set of discrete lines reveling the discrete (quantum) structure of th combined dressed-atom plus the cavity field system. We find that for a certain value of the pumping rate, the multi-peak structure converts into a single very narrow line centered at the cavity field frequency. A physical explanation of the behavior of the spectra is provided in terms of dressed states of the system.

Comments: Special Issue of Journal Modern Optics - Fetschrift in honour of Lorenzo Narducci
Subjects: **Quantum Physics (quant-ph)**; Optics (physics.optics)
Cite as: **arXiv:1002.0400v1 [quant-ph]**

Submission history

From: Zbigniew Ficek [view email]
[v1] Tue, 2 Feb 2010 06:15:03 GMT (1070kb)

Which authors of this paper are endorsers?