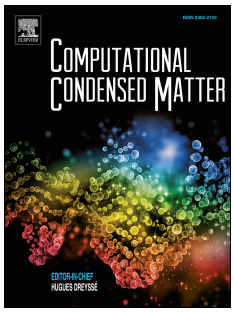
Accepted Manuscript



Laser cooling and trapping of polariton

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PII: S2352-2143(17)30071-0

DOI: 10.1016/j.cocom.2017.05.001

Reference: COCOM 75

To appear in: *Computational Condensed Matter*

Received Date: 6 April 2017

Revised Date: 10 May 2017

Accepted Date: 11 May 2017

Please cite this article as: S.C. Kenfack, C.M. Ekengoue, A. Fotue, F.C. Fobasso, G.N. Bawe Jr., L.C. Fai, Laser cooling and trapping of polariton, *Computational Condensed Matter* (2017), doi: 10.1016/j.cocom.2017.05.001.

LASER COOLING AND TRAPPING OF POLARITON

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Abstract

An interaction between electrons with photon is an important phenomenon in physics and, particularly, condensed matter and theoretical physics. The result of this interaction yields a quasi-particle called, polariton. In this study we investigated the role of polariton in cooling and trapping processes. We observed that the probability of finding cooled and trapped polariton in the excited state is controlled by the environment. Similar results are observed for other physical parameters. It is shown that the environment plays an important role in laser cooling and trapping of electrons.

Keywords: polariton, cooling, trapping, laser.

1. INTRODUCTION

A study of the behavior of a system of particles interacting with each other depends on the nature of particles. While exploring the nature of such particles, an induced polarization surrounding a charged particle gives birth to a polaron for the case of electron-phonon interaction [1], or polariton for the electron-photon interaction [2]. The understanding of the dynamics of these interactions has produced a wide range of nanotechnologies (see [3]), that has attracted a lot of research works and created opportunities for the fabrication of new nanoscale systems [4-9]. In quantum computation and communication, for instance, it is presented in [10, 11, 12] that scalabilities and decoherence issues remain the main difficulties which call for smart strategies that avoid very large complexities. Therefore, the target of quantum information processing and communication requires other efforts. Similarly, [13] showed additional efforts needed to master several difficulties in sensor imaging and remote detection. Anyway, the number of studies on the