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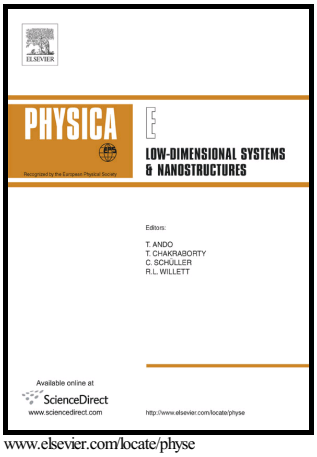

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Effect of intrinsic optical feedback on the intersubband optical properties of spherical Quantum Dots

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Optical feedback due to mutual relation between local field effect and intersubband transition in quantum dots is investigated for the first time. In this regard, dielectric function of quantum dots is considered up to the third order of nonlinearity. It is found that near the resonance, the intensity inside the dot is a function of frequency, which is determined by the optical feedback. This effect changes the magnitude of optical nonlinearity and its symmetry around the transition energy. The results indicate that the magnitude of the dielectric function decreases at frequencies below the transition frequency because of concentration of electric field inside the dot and vice versa. It is also shown that this effect is enhanced by increasing the intensity and resonance contribution in the dielectric function.

Keywords: Quantum dot, Nonlinear optic, Intrinsic optical feedback, Density matrix approach.

1. INTRODUCTION

Due to the potential application in all-optical signal processing in optoelectronic devices, optical bistability has attracted significant attention in last two decades [1, 2]. Optical bistable systems have two output states for identical value of input in definite range of input values [3]. This effect occurs in nonlinear media in the presence of an optical feedback process, which may be hybrid or intrinsic [4]. Intrinsic optical feedback defines a process in which optical intensity in the system depends on its optical parameters which in turn are functions of the intensity [3, 4].

Different effects can cause intrinsic optical feedback in optical nonlinear systems [4] among which is the Local Field Effect (LFE). Local field factor relates the electric field inside a small particle to the external field. Optical feedback

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