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Optical Bistability in a Defect Slab with Negative Refractive Quantum Dot Nanostructure

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We demonstrate optical bistability (OB) in a defect slab doped V-type four-level InGaN/GaN quantum dot nanostructure in the negative refraction frequency band. In this article, will be shown that the OB behavior of such a quantum dot nanostructure system can be controlled by the amplitude of the driving fields and a new parameter for controlling the OB behavior as thickness of the slab medium in the negative refraction band. Meanwhile, we show that the negative refraction frequency band can be controlled by tuning electric permittivity and magnetic permeability by the amplitude of the driving fields and electron concentration in the defect slab doped. Under the numerical simulations, due to the effect of quantum coherence and interference it is possible to switch bistability by adjusting the optimal conditions in the negative refraction frequency band which is more practical in all-optical switching or coding elements and technology based nanoscale devices.

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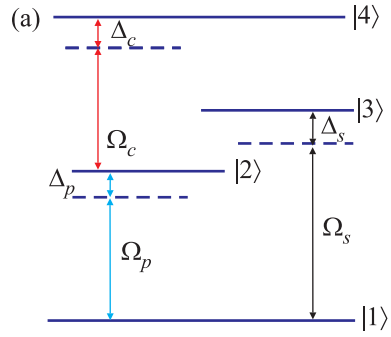

Fig. 1. (Color online) Schematic of the energy levels and transitions in the defect slab doped four-level InGaN/GaN quantum dot nanostructure system. This system interacting by coupling fields and with Rabi frequency Ω_c and detuning Δ_c, a weak probe field with Rabi frequency Ω_p and frequency detuning Δ_p and a strong pump field with Rabi frequency Ω_s and detuning Δ_s

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