

Optical bistability and multi-stability in a four-level atomic scheme

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Abstract We investigate the optical bistability (OB) and optical multi-stability (OM) in a four-level Y-type atomic system. It is found that the optical bistability can strongly be affected by intensity and frequency detuning of coupling and probe fields. The effect of spontaneously generated coherence on phase control of the OB and OM is then discussed. It has also been shown that the optical bistability can be switched to optical multi-stability just by the quantum interference mechanism and relative phase of applied fields.

Keywords Optical bistability · Optical multi-stability · Spontaneously generated coherence

1 Introduction

Recently, there has been more interest in nonlinear optical properties of materials. Materials exhibiting nonlinear optical properties are of great technological important for use in feature applications in electronics and photonics (Prasad and Williams 1991; Jortner and Ratner 1997). The discovery of electromagnetically induced transparency (EIT) (Harris 1997) has led to many interesting nonlinear optical phenomena such as Kerr nonlinearity (Asadpour et al. 2012) and optical bistability (OB) (Lugiato 1984). Optical bistability has been developed due to its potential applications in various areas of research. Optical memories are optical bistable and multi-stable systems whose states can be switched all optically. Optical bistability and Optical multi-stability (OM) are also interesting for applications in telecommunication systems, since they have an important role in processing a large number

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