

Accepted Manuscript

Damped Rabi oscillations produced by adiabatic pulses in atomic systems

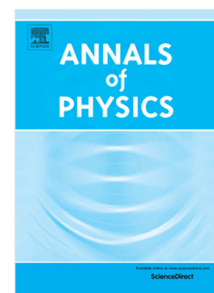
P.A. Brandão

PII: S0003-4916(17)30140-9
DOI: <http://dx.doi.org/10.1016/j.aop.2017.05.012>
Reference: YAPHY 67395

To appear in: *Annals of Physics*

Received date : 6 February 2017

Accepted date : 15 May 2017



Please cite this article as: P.A. Brandão, Damped Rabi oscillations produced by adiabatic pulses in atomic systems, *Annals of Physics* (2017), <http://dx.doi.org/10.1016/j.aop.2017.05.012>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Damped Rabi oscillations produced by adiabatic pulses in atomic systems

P. A. Brandão

Instituto de Física, UFAL, Cidade Universitária, Maceió-AL, 57072-970, Brazil

Abstract

Propagation of optical pulses in adiabatic conditions in two-level systems was reported to induce Rabi oscillations if the initial state has atomic coherence. This is a surprising result since in ordinary conditions the population dynamics follows the temporal field profile. In this paper we construct a simple two-level atom model and examine the role of Rabi oscillations in the presence of a damping γ term (decoherence). We have found that, depending on the time scale between $1/\gamma$ and the pulse, Rabi oscillations are still present. However, if the atom decays faster than when the interaction takes place, Rabi oscillations are suppressed. Analytical solutions are also provided for this general case.

Keywords: Quantum optics, Rabi oscillations, adiabatic pulses, atomic coherence

1. Introduction

A two level system is said to perform Rabi oscillations when the population dynamics, usually driven by an external applied field, varies in a periodic manner [1, 2]. This effect was first studied by I. Rabi eighty years ago, in the context of magnetic resonance, and its formalism can still be used to shed light into problems in several different contexts, not only in the atomic domain. In particular, Rabi-type oscillations were studied in the context of quantum dots [3], optical lattices [4, 5] and Bloch bands in a crystal [6], to cite a few. In the semiclassical approach, the field is treated classically and the atom (or a general two level system) is quantized. One then seeks a solution for the population

Download English Version:

<https://daneshyari.com/en/article/5495778>

Download Persian Version:

<https://daneshyari.com/article/5495778>

[Daneshyari.com](https://daneshyari.com)