QUANTUM WELL LASER: MODELLING OF OPTICAL TRANSITION IN QUANTUM WELL WITH VARIOUS BARRIER HEIGHTS

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ABSTRACT

QUANTUM WELL LASER: MODELLING OF OPTICAL TRANSITION IN QUANTUM WELL WITH VARIOUS BARRIER HEIGHTS

A quantum well is a potential well that refers to discrete units that assigns to certain physical quantities. This "well" is like a box in which particles can be trapped, in much the same way that light can be trapped between mirrors. This trapped particles is in quantum-confinement. The quantum confinement effects restrict what the carriers can do. In a quantum-well, they can move freely sideways in the plane of the layer, but are confined in the forwards-backwards direction. For any particular sideways speed, there could now be several different ways in which the carrier is confined in the layer. These quantum wells have many useful properties because we can engineer the forward-backward confinement exactly and they are relatively easy to make. An understanding of the physical properties of *heterostructures* is essential to their successful use in devices. As a result they are now widely used to make semiconductor lasers and other useful devices. The *heterostructures* provide a wealth of physical phenomena and design options which may be exploited in advanced semiconductor devices.

CHAPTER 1

INTRODUCTION

Particles can behave like waves and are described by wave functions. The particle in a well involves finding solutions of a fundamental equation called Schrödinger's equation. The Schrödinger's equation can solve energy levels and find the probabilities of a particle in various regions.

The situation that can be described as a 'particle in a box' is when a system consists of a particle confined between two rigid walls separated by a distance L. We assume that the particle with energy, E and momentum, P are constant. The particle moving always along the x-axis and the walls located at x=0 and x=L. The potential energy corresponding to the rigid walls is infinite and the particle cannot escape.

One of the fundamental and most important concepts of physics of solids is that electrons in crystals have available to them stationary-state energy levels which form quasi continuous bands. We have found that the particles sometimes behave like waves and they can be described by wave functions. A systematic analysis of particles in bound states is finding their possible wave functions and energy level.