Nonlinearities in He – Ne Lasers

C. A. Emshary

Physics Department, College of Education, University of Basrah, Basrah, Iraq

ABSTRACT

In a simple experiment pulsating and quasi-continuous to continuous emission were noticed in the output of He – Ne laser as input current (or voltage) in the laser tube was varied using a variable AC input voltage.

INTRODUCTION

Nonlinear optical resonators have attracted great interest in recent years. For the first time in 1979 Ikeda [1] showed that for an optically bistable ring resonator containing a two level system, when detuned with respect to the incident light frequency, the ordinary behaviour is drastically modified. In the stationary situation the transmitted field can then become a multiple valued function of the incident. As such a sufficiently strong C. W. input beam yields an oscillating output which period again and again as input becomes stronger which terminats at chaos. In lasers such effect was proved to occur easily in class C laser [2] where decay rates of electric field, population inversion, and polarization are equal. In class B laser the situation is difficult since the fast polarization being adiabatically eliminated from the complete set of Maxwell – Bloch equations. The third degree of freedom can be provided in several forms [3]. The situation is even more difficult in class A laser where two degrees of freedom are lost so that the system is left with one equation. He – Ne laser is one example of such class where no real experiment was published