CAVITY SOLITON MOBILITY IN SEMICONDUCTOR MICRORESONATORS ABOVE LASER THRESHOLD

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We consider a broad area vertical-cavity driven semiconductor laser (VCSEL) that includes the multiple quantum well structures. The semiconductor microresonator is of the Fabry-Perot type that provides the longitudinal single mode operation. The dynamical behavior of these nonlinear systems is described by Maxwell-Bloch equations. The standard adiabatic elimination of polarization which leads the Maxwell-Bloch equations to the rate equations cannot be used for femtosecond time scales response. Hence, for this case optical gain and refractive index could not be defined since we must assume that gain width is infinite [1-3]. Density matrix formalism is the suitable method to overcome this problem [3], According this formalism for two levels Atomic system density matrix method reach to full set of Maxwell-Bloch equations which has been provided more realistic and complete model to treat semiconductor laser dynamical. In this paper, we applied the complete Maxwell – Bloch coupled equations [3]:

The cavity solitons have been written by injecting a writing beam which has a same phase with holding beam and CSs persist when the WB blocked, with changing the phase of the writing beam by π we injected a beam with the opposite phase as (HB) thus cavity solitons have been erased. The numerical results illustrated existence of stable cavity soliton in the upper branch of stationary. As it has shown in the following figure, the created solitons started to move in a random direction.

References

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