**Nonlinear dynamics of quantum dots lasers under the influence of double cavity external feedback**

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This paper reports results on investigations of the dynamical behavior of a semiconductor laser with quantum dots active medium under the influence of a feedback from double external cavity. This configuration is treated in the framework of Lang-Kobayashi equations. The locus of external cavity modes is found to be elliptic, as in case of conventional optical feedback, but also represents different shapes, even with possible satellite bubbles. The nature of bifurcations and the stability of steady state solutions are analyzed in dependence on different parameters. A bifurcation analysis is carried out revealing the points of saddle-node and Hopf bifurcations. The effect of the different parameters on the stabilization and destabilization of laser emission is investigated. Finally,

the possibility of application of quantum dots lasers under the influence of feedback from double cavity as a key element in chaos based communications system is discussed.

During recent years, the phenomena of control and stabilization, as well as the destabilization and chaos of laser emission by external cavities have received considerable attention due to its fundamental and applied interests. The main aim of technological progress is the production of structures with stable properties and the possibility of their application in different areas.

Stabilization of laser emission by external cavities has a long history [1] and is still of continuous interest. Another well-known method of control is due to Pyragas [2] applied successfully to different systems. These control techniques found certain applications in information transmission systems.

On the other hand, different dynamical behaviors have been obtained for lasers under the influence of feedback from external cavities, including periodic and quasi-periodic pulsations, low frequency fluctuations, coherent collapse, optical turbulence, chaos (for more details, see [3]). The chaotic waveform is suitable for chaos-based communications. Recently, chaotic communications have become an option to improve privacy and security in date transmission, especially after the recent field demonstration of the metropolitan fiber networks of Athens [4]. In optical chaos-based communications, the chaotic waveform is generated by using semiconductor lasers with either all-optical or electro-optical feedback loops. In particular, synchronized chaotic waveforms have found applications in chaos based communication systems.

References:

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