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Controlling Chaos in a Semiconductor Laser via Weak Optical Positive Feedback and Modulating Amplitude

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Abstract: Numerical analysis of weak optical positive feedback (OPF) controlling chaos is studied in a semiconductor laser. The physical model of controlling chaos produced via modulating the current of semiconductor laser is presented under the condition of OPF. We find the physical mechanism that the nonlinear gain coefficient and linewidth enhancement factor of the laser are affected by OPF so that the dynamical behaviour of the system can be efficiently controlled. Chaos is controlled into a single-periodic state, a dual-periodic state, a tri-periodic state, a quadr-periodic state, a penta-periodic state, and the laser emitting powers are increased by OPF in simulations. Lastly, another chaos-control method with modulating the amplitude of the feedback light is presented and numerically simulated to control chaotic laser into multi-periodic states.

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Key words: chaos, control, positive feedback, period

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