

论文 线宽增强因子对外光注入半导体激光器非线性单周期振荡特性的影响

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摘要:

线宽增强因子是影响半导体激光器输出特性的一个重要参量,不同材料不同结构类型的半导体激光器的线宽增强因子有较大的差异.利用光注入半导体激光器的单模速率方程模型,数值研究了线宽增强因子对外光注入半导体激光器的非线性单周期振荡特性的影响.结果表明:外光注入半导体激光器的动态特性对线宽增强因子的变化极为敏感,随着线宽增强因子的增加,在负失谐注入范围内单周期振荡区域显著增大,同时注入锁定的稳态输出被大大抑制.分析了线宽增强因子对非线性单周期振荡光谱特性和振荡频率的影响,结果表明:随着半导体激光器线宽增强因子的增大,单周期振荡的频率越大|当线宽增强因子不变时,单周期振荡的频率随注入光强度和频率失谐的增加而增加.

关键词: 半导体激光器 非线性动力学 线宽增强因子 混沌 周期振荡

Effects of Linewidth Enhancement Factor on the Nonlinear Period-one Oscillation of a Semiconductor Laser with External Optical Injection

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Abstract:

The linewidth enhancement factor is one of the key parameters for semiconductor lasers.The value of linewidth enhancement factor is different in kinds of type semiconductor lasers.The dependency of the nonlinear period-one oscillation in optically injected semiconductor on the linewidth enhancement factor was numerically investigated,with the single-mode rate-equation of optical injection semiconductor laser.The results show that linewidth enhancement factor strongly affect the dynamical behavior of the system.As the linewidth enhancement factor increases,the range of the period-one oscillation and its frequency increase,and the injection locking stable state is suppressed greatly.Moreover,the optical spectrum and frequency of the period-one oscillation were investigated.The results reveal that the frequency of the period-one oscillation increases as the linewidth enhancement factor,injection strength and frequency detuning increasing.

Keywords: Semiconductor laser Nonlinear dynamics Linewidth enhancement factor Chaos Period oscillation

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