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含频率噪声信号对单模激光损失模型随机共振的影响

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The effects of signal with frequency noise on stochastic resonance for a noise-loss model of the single-mode laser

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摘要 采用抽运噪声和实虚部关联的量子噪声驱动的单模激光损失模型,运用线性化近似方法计算了频率有涨落的周期信号输入时激光系统的输出光强的相关函数、功率谱及信噪比.研究了信号的频率噪声强度D、振幅B和频率Ω对信噪比与噪声关联系数共振曲线的影响,结果发现:频率的强度D会减小输出光强的信噪比,使共振现象减弱.

关键词: 频率噪声   单模激光   信噪比   随机共振

Abstract: By adopting single-mode laser noise-loss model which is driven by signal with frequency noise,colored pump noise and quantum noise whose real part and imaginary part are cross-correlated,we have used linear approximation method to calculate the output power spectrum and the signal-to-noise ratio(SNR)of laser system,and then have discussed the effects on the curve of SNR versus cross-correlated coefficient between real part and imaginary part of pump noise through varying intensity of frequency noise D,amplitude B and frequency Ω of input signal respectively.The results show that the intensity of frequency noise D will reduce the SNR of the output power spectrum and weaken the resonance.

Key words: frequency noise   single-mode laser   signal-to-noise ratio   stochastic resonance

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