

论文

色散和非线性效应对高斯脉冲综合影响的理论分析

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摘要:

从光孤子传输所满足的非线性薛定谔方程出发,采用单独分析和综合分析对比,分析了影响高斯脉冲传输的色散、非线性等因素,结果表明:二阶色散参量只会影响脉冲的幅值,对脉冲形状影响不大,而输入脉冲的啁啾则是使脉冲发生形变的主要原因|在啁啾、三阶色散和五阶非线性的共同作用下,它们对脉冲都会产生较大的影响,且存在相互影响和制约作用,在某一临界值,对脉冲存在着较高的压缩增益效应和“整形”作用.从理论上提出了改善高斯光脉冲在光纤中传输特性的解决方案,这对光纤孤子通信的实践过程具有一定的理论借鉴意义.

关键词: 啁啾 高阶色散 高阶非线性 对称分步傅里叶法 光孤子

Theoretical Analysis on Dispersion and Non-linearity Affecting Gauss Pulse Propagation

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Abstract:

By properly choosing the parameters of the non-linear Schrödinger equation which satisfies the optical soliton propagation,and by using independent analysis and the comprehensive analysis for the factors such as dispersion and non-linearity which influences Gauss pulses propagation,two conclusions are obtained.The second-order dispersion mainly influences the pulse amplitude but the pulse shape,and the chirp effect is the key factor for the pulse distortion.The chirp,the third-order dispersion and the fifth-order nonlinearity simultaneously influence the pulse propagation,and they also influence and interact with each other.As they approach a certain parameter,the high gain effect and the reshape effect occur in the propagation of the pulse.The improvement method for the characteristics of pulse propagation is theoretically proposed based on the analysis and simulation results,which has theoretical importance for the practice of soliton optical fiber communication.

Keywords: Chirp High-order dispersion High-order non-linearity Symmetry split-step Fourier transform method Optical soliton

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