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论文

五阶非线性光纤中连续谱相位扰动下的光传输与脉冲串产生

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摘要:

根据包含五阶非线性的扩展非线性薛定谔方程,数值研究了高斯型连续谱相位扰动而不是传统单色扰动下基于调制不稳定性的高重复率脉冲串产生.结果表明:脉冲串也能像传统情形那样形成,但却呈现出不同的特性.如脉冲数目有限,且各脉冲的高度、强度及间距不等.脉冲数目随传输距离增加而增加.而五阶非线性能使脉冲宽度和间距变小因而有利于高重复率脉冲串产生,负五阶非线性则相反.对脉冲串形成过程中演变啁啾的数值计算表明,啁啾及其随距离的变化都是高度非单调的,五阶非线性将改变啁啾的范围和量值.

关键词: 五阶非线性　调制不稳定性　脉冲串

Propagation of Optical Wave with Phase Perturbed by ContinuousSpectrum and Generation of Pulse Trains in Optical Fibers with Quintic Nonlinearity

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Abstract:

According to the extended nonlinear Schr dinger equation including quintic nonlinearity in optical fibers,modulation instability (MI) based generation of high-repetition-rate optical pulse trains is numerically demonstrated by using the optical wave with its phase perturbed by Gaussian-typed continuous spectrum instead of conventional monochromatic one.The results show that,the pulse trains can also be generated due to MI effect like the conventional case.However,being different from the conventional case,the generated pulse trains here consist of limited number of pulses which are generally not equal in width,intensity,and interval.And the pulse number increases with the propagation distance.Moreover,when the other parameters are the same,the positive quintic nonlinearity can make the pulse width and interval shorten,which means that the positive quintic nonlinearity is beneficial to generate higher repetition rate pulse trains.While the negative one takes the opposite.The numerically calculated chirps developed during the generation process of pulse trains indicate that,both the chirps and their variations with the distance are highly nonmonotonic,and the quintic nonlinearity will change both the chirp range and the chirp amount.

Keywords: Quintic nonlinearity　Modulation instability　Pulse trains

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