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非线性媒质中时空光孤子之间的能量交换

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Energy Exchange between Spatiotemporal Optical Solitons in Nonlinear Medium

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摘要 采用分裂步长傅立叶法研究了在色散立方-五次非线性媒质中碰撞的(3+1)维时空光孤子之间的能量交换.通过大量的数值模拟发现(3+1)维时空光孤子之间的能量交换对它们之间的相位差很敏感,两迎面相撞的时空孤子如果有相同的速率且它们之间的相位差在(0~ π)之间,那么能量从初始相位滞后的光子弹转移到初始相位领先的光子弹;如果它们之间的相位差在(π ~ 2π)之间,那么能量从初始相位领先的光子弹转移到初始相位滞后的光子弹.

关键词: 立方-五次方非线性 时空光孤子 能量交换

Abstract: Energy exchange between (3+1)D colliding spatiotemporal solitons (STSs) in dispersive media with the cubic-quintic (CQ) nonlinearity is studied by numerical simulations using the split-step Fourier method in the paper. Extensive simulations reveal that energy exchange between two (3+1)D colliding STSs is sensitive to their phase difference. When the phase difference between two colliding STSs of equal and opposite velocities varies from 0 to π , the light bullet leading in phase gains energy. When the phase difference varies from π to 2π , the one leading in phase loses energy.

Key words: cubic-quintic nonlinearity spatiotemporal optical solitons energy exchange

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