理论研究

级联介质的空间排布对光场特性的影响

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摘要　　基于菲涅尔衍射原理，应用傅里叶变换方法，
从理论上推导了高斯光束经级联非线性介质传输后任意位置处光场分布的解析表达式,研究了光场峰值强度、
峰值出现的位置以及光束的束宽和调制因子等参量在级联介质中的变化规律。结果表明：随着非线性效应的增强，
光场峰值强度逐渐增大，峰值距离逐渐缩短，
光束束宽不断减小而调制因子逐渐增大。在介质排布中要尽量错开光束峰值位置，
采用均匀排布方案虽然可以降低元件受损的风险，但还需对介质均匀配置的间距进行有效优化。

关键词　　非线性光学　　光束传播　　菲涅耳衍射　　非线性介质

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Effects of cascade nonlinear medium spatial configuration on optical field characteristics

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Abstract The expression of the optical field distribution in arbitrary location after Gaussian beam passes through cascade nonlinear mediums is derived with Fourier transform method and Fresnel diffraction principle. The variation relation of the optical field peak intensity, the peak power location, beam width and modulation factor in the cascade nonlinear mediums is investigated. The result shows that the optical field peak intensity increases gradually, the peak-to-peak amplitude becomes shorter, the beam width becomes narrower, and the modulation factor becomes bigger as the nonlinear effects enhance. The configuration of the nonlinear mediums should be located equidistantly, and kept away from the peak location of the optical beam by all means. The equidistance of the nonlinear mediums has to be optimized to reduce the risk of the optical element damage.

Key words nonlinear optics　beam propagation　Fresnel diffraction　nonlinear medium

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