

## 非线性光学

### 基于分布增益非线性光纤环镜的弱脉冲放大与压缩

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#### 摘要:

已有研究发现, 用分布增益非线性光纤环镜放大和压缩超短光孤子不仅能避免常规掺铒光纤放大器中由于非线性效应引起的孤子畸变, 而且可克服绝热放大技术放大器长度随输入脉宽增大而指数规律增大的困难。我们进一步计算了弱脉冲在分布增益非线性光纤环镜中的放大和压缩过程。结果表明, 对于峰值功率比基阶孤子低得多的弱脉冲输入, 用分布增益非线性光纤环镜同样可实现无畸变的脉冲能量放大和脉宽压缩; 而且, 经环镜放大输出的脉冲也接近基阶孤子。然而, 输入脉冲峰值功率越低, 实现最佳放大所需的环境总增益越大, 高阶效应对放大结果的影响越显著。

**关键词:** 非线性光学 光脉冲放大与压缩 数值计算 光孤子 分布增益 非线性光纤环镜

### Amplification and compression of weak optical pulses using gain-distributed nonlinear fiber loop mirror

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#### Abstract:

Recent work have shown that amplification and compression of ultrashort fundamental solitons in a gain-distributed nonlinear fiber loop mirror can not only avoid pulse distortion caused by nonlinear effects such as self-phase modulation etc., but also overcome the difficulty of adiabatic amplification that the amplifier length must increase exponentially with the input pulse-width. We study weak pulse amplification and compression in the gain-distributed nonlinear fiber loop mirror. Numerical results show that, as in the cases where the input pulses are fundamental solitons, distortion-free amplification and compression can also be realized when the input pulses have peak powers much lower than those of fundamental solitons, and that the amplified pulses are also close to fundamental solitons. The weaker the input pulse is, the larger the optimum gain of the loop mirror should be, and the higher-order effects have larger influences on the amplified pulses.

**Keywords:** nonlinear optics optical pulse amplification and compression numerical simulation optical solitons distributed gain nonlinear fiber loop mirror

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