



飞秒脉冲在磷酸二氢钾晶体中的色散特性

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Dispersion Characteristics of Femtosecond Pulse in Monopotassium Phosphate Crystal

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摘要

探讨飞秒脉冲在单轴晶体中的色散特性, 根据主轴折射率色散方程, 在不考虑晶体吸收及其他非线性作用的情况下, 研究飞秒脉冲在磷酸二氢钾(monopotassium phosphate, KDP)晶体中的色散特性. 由于晶体的色散, 入射飞秒脉冲中不同频率的光波在晶体中传播时会引起不同的相位变化, 从而改变出射脉冲的波形. 通过数值计算得到飞秒脉冲在晶体中的传输特性, 发现输出脉冲的脉宽、光强、展宽会随输入脉冲的中心波长、晶体的长度及脉冲光波的偏振方式等因素的变化而变化. 所得到的结果, 对于倍频研究、脉冲整形以及光学晶体器件的研发等具有一定的参考价值.

关键词: 飞秒脉冲; 单轴晶体; 色散特性; 展宽

Abstract:

Based on the dispersion equation of principal-axis refraction index, regardless of crystal absorption and other nonlinear interactions, dispersion characteristics of femtosecond laser in monopotassium phosphate (KDP) crystal are studied. As a result of the crystal dispersion, light waves of different frequencies in the incident femtosecond laser pulse propagating in a crystal can result in different phase changes so that waveforms of resulting pulses are correspondingly changed. By numerical calculation, propagation properties of the input pulse in the crystal are obtained. It is found that the pulse width, intensity and expanding width of the output pulse depend on the crystal length, central wavelength and polarization direction of the input pulse. The results may be useful in frequency doubling, pulse shaping, development of optical crystal devices, etc.

Keywords: femtosecond pulse; uniaxial crystal; dispersion characteristics; broaden width

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