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现代应用光学

由级联紫外电光开关控制准分子激光的自发辐射放大

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摘要: 考虑高功率准分子激光系统的自发辐射放大(ASE)会导致主脉冲信号对比度下降,引起波形展宽和畸变,本文开展了级联双电光开关的研究来抑制ASE的产生并提高激光脉冲信号的信号对比度。探讨了电光开关的级联工作模式,分析了影响电光开关削波对比度的因素,进而提出采用级联工作方式来大幅度地提高削波对比度。在单电光开关的基础上,设计了级联电光削波的光路布局。其中,前一级电光开关的检偏器作为后一级的起偏器,电路则采用分立式以避免相互之间的串扰。采用级联双电光开关对低占空比预放大器进行了ASE控制实验。实验结果显示,级联双电光开关的削波对比度达到了 10^4 量级,而预放大器的放大输出信号对比度提高到 10^6 量级,此结果有利于激光脉冲信号在系统中后续放大级的进一步放大。

关键词: 高功率激光 准分子激光 级联电光开关 自发辐射 对比度

Suppression of ASE from excimer laser using cascaded UV electro-optical switch

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Abstract: A cascaded electro-optical(E-O) switch was studied to suppress Amplified Spontaneous Emission (ASE) and promote the signal contrast of the laser pulse, because the ASE could decrease the signal contrast ratio and widen the waveform and distortion in a high power excimer laser severely. The cascaded mode of the E-O switch was explored, the factors that effect on signal contrast ratio of the E-O switch were analyzed, then the work mode using the E-O switch cascaded was proposed to promote the contrast ratio of the switch. On the basis of a single switch, the cascaded E-O switch layout was designed. The analyzer of the first switch was used as the polarizer of the following one, and the driving power supply was installed discretely to avoid the crosstalk. An experiment on ASE suppression for the low duty cycle of a pre-amplifier was performed using a cascaded double E-O switch. The results show that the contrast ratio of the cascaded switch reaches 10^4 level and the signal contrast ratio of the pre amplifier output pulse reaches 10^6 level, which is beneficial to the amplification of laser pulse signals in following amplifier stages of the system.

Keywords: high power laser excimer laser cascaded electro-optical switch spontaneous emission contrast ratio

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