

论文

啁啾脉冲堆积宽带激光的时间与频谱特性分析

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摘要:

啁啾脉冲堆积形成的宽带激光, 能够任意时间整形及预补偿传输放大过程所造成的波形畸变, 是目前惯性约束聚变激光驱动器前端系统拟采用的技术路线。子脉冲参量对堆积宽带激光的时间与频谱特性有重要影响。理论研究了啁啾堆积脉冲宽带激光时间与频谱特性与子脉冲参量的关系。结果表明, 变换极限子脉冲堆积所得的脉冲平滑, 频率啁啾型与时间啁啾型子脉冲堆积所得脉冲出现时间调制, 平滑性变差, 从频谱上看, 前者出现单一谱线, 而后者可看到多条谱线; 随着子脉冲间延迟的增加, 堆积脉冲由脉冲间干涉引起的时间调制增多, 但幅度减弱, 而频谱的谱线数量增加。所得结果可为适当地选择堆积脉冲参量以获得所需的时间与频谱形状的宽带激光提供参考。

关键词: 啁啾脉冲, 宽带激光, 频谱特性, 时间调制

Characteristics of temporal wave-form and frequency spectrum of broad-band lasers stacked by chirped pulses

Abstract:

Due to the broad-band lasers stacked by chirped pulses can be shaped at will and pre-compensate the wave-form aberrations during propagation, it is the preferred candidate for the front end of the current Inertial Confinement Fusion (ICF) laser driver. The parameters of the sub-pulses will impose remarkable impact on the temporal wave-form and frequency spectrum of the broad-band lasers stacked by chirped pulses. In this paper, the dependence of the temporal wave and frequency spectrum of the broad-band lasers stacked by chirped pulses on the parameters of the sub-pulses is investigated theoretically. It is shown that, the temporal wave-form of the broad-band lasers stacked by the transform-limited pulses is usually smoothing, while that of the broad-band lasers stacked by chirped pulses takes temporal modulation, on the other hand, the former has one spectrum line, in contrast, the latter possesses multiple spectrum lines. In addition, with the delay-time between neighboring sub-pulses increasing, the quantity of modulation increase, its magnitude weakens and the spectrum lines increases. The results can help in obtaining broad-band lasers of specific temporal wave-form and frequency spectrum by choosing appropriate parameters of the sub-pulses.

Keywords: Chirped pulses, broad-band lasers, characteristics of temporal frequency spectrum, temporal modulations.

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