

论文

一种基于离散频谱校正的SPIDER信号处理改进方法

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摘要:

介绍了光谱相位相干电场重构法(SPIDER)信号处理的原理,提出一种基于离散频谱校正的SPIDER信号处理改进方法,该方法可克服采样速率不足带来的信号处理误差。试验发现:在无噪声情况下,当取的校正点数足够多,基本可以达到无偏校正;而在有噪声的情况下,应当选取校正的点数,来增强抗噪性能。该方法能在信噪比较差的情况下,得到时间延迟 $\tau$ 。经过仿真计算,在光谱仪最小分辨率和测量范围的限制情况下,该方法能够突破该限制在时谱上造成栅栏效应,大大提高SPIDER中时延参数的测量精度。该方法实现简单,精度高,抗噪性能好,无需改动设备就能提高系统精度,可广泛应用于SPIDER技术中。

关键词: SPIDER;离散频谱校正;飞秒激光脉冲;能量重心法

Improved SPIDER signal processing method based on discrete spectrum correction

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Abstract:

The principle of SPIDER signal processing is introduced. An improved SPIDER signal processing method based on discrete spectrum correction is put forward. The signal processing error caused by the inadequate velocity of signal sampling can be overcome by the method. It is found in the testing that in the case of noiselessness, as the adequate correcting points are selected, the agonic correction can be basically achieved; in the case of noise, suitable correcting points should be selected to enhance the noise immunity. The time delay  $\tau$  can be obtained by the method while the signal to-noise ratio is inferior. Through the simulation calculation, it can conquer the limit of the spectrometer minimum resolution and measurement range to bring about hurdle effect in the time spectrum, and to improve the measuring accuracy of the time-delay parameter of SPIDER. It is easy to realize the measurement, and can improve accuracy of the system without modification of the equipment. It can be used in the technology of SPIDER.

Keywords: SPIDER; discrete spectrum correction; femtosecond laser pulse; energy centroid correction method

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