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激光材料和光学元件

Gaussian切趾体光栅在光谱合成中的应用研究

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摘要:

为了研究切趾技术对体光栅旁瓣的抑制效果及切趾体光栅的光谱合成特性,采用Gaussian切趾技术对体光栅旁瓣进行了抑制,并用传输矩阵法分析了Gaussian切趾体光栅的衍射特性,给出了Gaussian切趾体光栅光谱合成效率公式,分析了切趾光栅对光谱合成效率影响;切趾后体光栅旁瓣对应的前4级峰值衍射效率由73%,47%,31%,22%降低到11%,20%,10%,7%。合成路数和光束光谱宽度一定时,合成效率随衍射损耗的增大而减小。结果表明,Gaussian切趾技术能够有效抑制体光栅旁瓣,进而减小体光栅对相邻合成光束的衍射损耗,增大合成效率。

关键词: 光栅 谱合成 Gaussian切趾 衍射效率 谱合成效率

Study about spectral beam combining with volume Bragg grating by means of Gaussian apodization technique

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Abstract:

In order to study the suppression effect of side lobes of volume Bragg gratings(VBG) and the characteristics of the spectral beam combining with apodized VBG, the side-lobe of VBG was suppressed by means of Gaussian apodization. The diffraction characteristics of the Gaussian-apodized Bragg grating were analyzed based on the chain matrix method. Then the function of the combining efficiency with apodized grating was given, and the effect of apodized grating on the combining efficiency was analyzed. The results show that the peaks of the first four side-lobe are reduced from 73%,47%,31%,22% to 11%,20%,10%,7%, respectively. The combining efficiency decreases as the diffraction loss increases, when the number and the spectral width of combining beam are limited. Therefore, the diffraction loss between the combined beams is suppressed well after using the Gaussian-apodized grating that suppress the side-lobe of the VBG, and the combining efficiency increases.

Keywords: grating spectral beam combining Gaussian-apodized diffraction efficiency combining efficiency

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