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论文

电子倍增CCD(EMCCD)的噪声特性分析

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摘要：

介绍了EMCCD的结构原理,详细分析了EMCCD的噪声来源。利用在EMCCD芯片内嵌入独特的全固态电子倍增结构，实现放大信号，抑制噪声的功能。通过对几种主要噪声的数学模型进行分析，总结出EMCCD噪声的3点特性：EM增益有效抑制了读出噪声；EM增益过程产生的噪声因子对倍增结构之前的噪声有放大作用；时钟感生电荷（CIC）的影响在EMCCD中变得重要。提高增益、深度制冷、时钟波形优化等方法可有效抑制噪声。

关键词： 电子倍增CCD;噪声因子;时钟感生电荷（CIC）

Analysis of noise performance of EMCCD

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Abstract:

The structure of EMCCD is introduced. The functions of signal amplification and noise restraint were realized by inserting the all-solid-state electron multiplying structure in the EMCCD chip and amplifying the charge coming out in horizontal transfer before detection according to the noise resources of EMCCD. Through a theoretical analysis of mathematical models for the main noises of EMCCD, three characteristics of EMCCD noise were-summed up:the EM gain can effectively restrain the read out noise; the noise factor generated during the EM gain process has the function of amplifying the noise produced before the multiplying structure; the effect of CIC on the EMCCD performance is serious. It is pointed out that the improvement of EM gain, aggravation of cooling and optimization of clock wave form can effectively restrain the noise.

Keywords: electron multiplying CCD; noise factor; CIC

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