

## 论文 同步三通道激光告警光学系统有效孔径的确定及截获能量的估算

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摘要:

为了确定一种同步三通道激光告警光学系统的有效孔径并估算截获能量,建立了激光辐照远场传输模型,仿真研究了远场光斑半径、单通道入瞳半径和通道间相对能量差之间的数值关系。仿真结果表明:各通道之间最大相对能量差与远场光斑中心能量密度的大小无关,在激光远场光斑边缘处各通道之间的相对能量差最大;最大相对能量差限定时,远场光斑半径越大,允许的单通道入瞳半径也越大,但相应系统截获的脉冲能量或脉冲功率却相对减小;最大能量差限定为1%,远场光斑半径分别为2.5m,4.0m和7.5m时,允许的最大单通道入瞳半径分别为3mm,5mm和10mm,相应系统截获的最大脉冲能量为 $1.14 \times 10^{-5} \text{J}$ , $7.54 \times 10^{-6} \text{J}$ 和 $2.68 \times 10^{-6} \text{J}$ ,最大脉冲功率为1.63W,1.08W和0.38W。

关键词: 同步三通道光学系统; 激光告警系统; 光学系统有效孔径; 截获能量估算

### Determination of effective aperture and estimation of truncation energy in synchronous three-channel optical system for laser warning

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Abstract:

The model for laser irradiation transmission in far-field was established to determine optical system effective aperture and estimate truncation energy for a synchronous three-channel laser warning system. The numerical relation of far-field spot radius, single channel entrance radius and relative energy difference in different channels was stimulated. The results reveal that the relative energy difference in different channel is independent of the energy density in the far-field spot center, in which the maximum ratio is located at the spot rim. When the maximum relative energy difference is limited, the allowable single channel radius is increased with the far field spot radius, but the truncation pulse energy or power is reduced. When the maximum relative energy difference is 1%, and the far-field spot radius is 2.5m,4.0m and 7.5m, the allowable single channel radius is 3mm, 5mm and 10mm, the biggest truncation pulse energy is  $1.14 \times 10^{-5} \text{J}$ ,  $7.54 \times 10^{-6} \text{J}$   $2.68 \times 10^{-6} \text{J}$ , and the biggest truncation pulse power is 1.63W,1.08W and 0.38W.

Keywords: synchronous three-channel optical system laser warning system optical system effective aperture estimation of truncation energy

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