

激光控制平地系统激光接收器设计与试验 Laser Receiver Used for Laser-controlled Land Leveling System

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关键词: 激光平地 激光接收器 前置放大电路 整形电路 展宽电路

摘要: 激光接收器是激光控制平地系统的关键部分。为了更有效地检测激光信号, 扩大接收范围, 增加接收距离, 提高稳定性和抗干扰性, 设计了一种基于集成IC的新型激光接收器。其原理是以红色有机玻璃作为透光窗口, 并采用干涉型滤光片来滤除背景光; 以硅光电池作为光电探测器, 将激光信号转换为电信号; 然后采用集成运算放大器设计低噪声前置放大器和主放大器对微弱电信号进行放大; 最后, 脉冲整形和展宽电路实现脉冲信号到TTL数字信号的转换, 以方便后续电路的处理。田间试验结果表明, 激光接收器在150 m范围内可实现360°全方位稳定工作, 垂直工作范围为28.4cm左右, 将其用于平地作业时农田的平整误差小于2cm。Laser receiver was a key component of the laser-controlled land leveling system. In order to improve the quality of the laser signal, extend the operating range, and reduce the noise, a novel laser receiver based on integrated IC was developed. Red polymethyl methacrylate was used as the material of the in-light window to reduce the background light into the laser receiver. Interference filters were used at the laser receiver to further reduce the background light. Photoelectric cells were used to transform light signal into electrical signal. Integrated operational amplifiers were used in low-noise pre-amplifier and main amplifier to amplify the weak electrical signal effectively. The wave shaping circuit and the widening circuit were employed to make the signal conditioning better and perform the signal transformation from spike pulse signal to digital TTL signal. The results of the field experiments show that the receiver works stable within 150 m for all directions. The vertical workable ranger is 28.4cm which allows the 2cm of accuracy in land leveling.

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