

防御电子技术

新型超宽带脉冲探地雷达接收机的设计与研制

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摘要:

基于等效时间采样原理, 提出了一种新型超宽带脉冲探地雷达接收机的设计方法, 并研制了实用的超宽带接收机模块, 其关键电路包括皮秒级采样脉冲产生电路、肖特基二极管平衡取样门、信号保持与放大电路以及微带魔T结构。该接收机的采样带宽为4 GHz, 与理论计算值相一致, 采样效率高达40%。实验测试表明, 接收机等效采样后重建的基带信号波形与原始微波信号形状吻合度好, 证明该接收机具有良好的超宽带特性, 满足脉冲探地雷达回波信号接收要求。

关键词: 探地雷达 超宽带接收机 采样电路 毫微秒脉冲 超宽带系统

Design and realization of a novel ultra-wideband receiver for impulse ground penetrating radar systems

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Abstract:

The design method of a novel ultra-wideband (UWB) receiver for impulse ground penetrating radar systems is described, and the practical circuit of the UWB receiver is implemented. The basic principle of the receiving signal is equivalent-time sampling. The key circuits of the receiver include the pulse generator on a picosecond level, the Schottky diode balanced sampling gate, holding and amplifier circuit and the magic-T hybrid. The sampling bandwidth of the receiver is 4 GHz, which agrees with the calculated value, and the sampling efficiency is as high as 40%. The experimental results show that the shape of the base band signal after equivalent-time sampling agrees very well with the original microwave signal, thus validating the good performance of the ultra-wideband receiver. Therefore, the UWB receiver meets the requirements to receive the echo signal of the ultra-wideband impulse ground penetrating radar.

Keywords: ground penetrating radar ultra-wideband receiver sampling circuit nanosecond pulse ultra-wideband system

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