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探地雷达地面以上物体反射干扰特征模拟和分析

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Simulation and analysis reflections interference from above surface objects of ground penetrating radar

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摘要 地面以上物体产生的反射是探地雷达探测工作面临的主要干扰之一.地面以上物体干扰源的空间位置分布具有随机性,识别和去除这些干扰首先需要了解干扰波的传播特征.为达到这一目的,进而为干扰压制研究提供理论依据,本文首先通过对地面以上物体建立抽象模型并进行正演模拟,求解出电磁波在不同观测系统中受点、线、面干扰源影响的波场分布特征;其次,根据射线理论推导出点、线、面干扰源产生的干扰波时距曲线的一般表达式,并对时距曲线特征进行分析和归纳.

关键词: 探地雷达 反射干扰 时域有限差分 射线理论

Abstract: The reflection from above surface objects is one of the main problems in the ground penetrating radar exploration work. With the random spatial distribution of above surface objects, we need to understand the wave propagation characteristics of interference before identification and removal. This article will achieve this objective and provide theoretical support to the method of interference suppression. We made the FDTD forward modeling first. Some abstract models could be produced by simplifying and summarized. And wave field distributions of the point, line, plane interference sources are simulated in different observing systems. Then, the general expression of time-distance curves of the three different interference sources was derived by using ray theory. The characteristics of these time-distance curves were summarized and analyzed.

Keywords: GPR Reflection interference FDTD Ray theory

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