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发射电流波形对瞬变电磁响应的影响

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Effect of transmitter current waveform on TEM response

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摘要

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摘要 本文研究了不同发射电流波形对瞬变电磁(TEM)响应的影响,利用自由空间中回线作为目标体,推导出方波、梯形波、半正弦波、三角波激励的响应.研究表明:对于低电导率目标体,同种波形激励的响应在有发射电流期间(on-time)与无发射电流期间(off-time)的幅度相近,四种波形中方波激励响应最强.由于off-time采集可以获得更高的信噪比,因而探测低电导率目标体时一般采用方波激励,采集off-time信号.对于高电导率目标体,off-time响应幅度随电导率增加而迅速下降,而半正弦与三角波激励的on-time响应幅度基本不随电导率变化,因而航空TEM可以采用半正弦与三角波进行on-time采集,并通过适当地提高激励电流的基频,以提高信噪比与空间分辨率.

关键词 瞬变电磁, 发射电流波形, 有发射电流期间, 无发射电流期间, 航空电磁

Abstract: This paper investigates the effect of different transmitter waveforms on the transient electromagnetic (TEM) system response. For a loop target in free space, the voltage response is derived for waveforms of square, trapezoidal, half-sine and triangular shape. It is found that, for lower conductivity object, every waveform excites almost the same response during on-time and off-time, respectively. Among all waveforms, the maximum response is generated by a square pulse. For low signal to noise ratio (SNR) during off-time, square pulse is usually used for lower conductivity object detection. For higher conductivity object, response sharply decreased with the increase of the conductivity during off-time. While the responses of half-sine and triangular shapes are constant with the increase of conductivity. So we concluded that half-sine and triangular shapes are suitable for on-time detection. By properly increasing the base frequency, high SNR and high space resolution can be obtained.

Keywords Transient electromagnetic (TEM), Transmitter current waveform, On-time, Off-time, Airborne electromagnetic (AEM)

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