

HIGH RESOLUTION NEAR SURFACE PROFILING BY SMALL SLINGRAM LOOP FOR TIME-DOMAIN ELECTROMAGNETIC METHOD

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Slingram or Horizontal Coplanar (HCP) loop is often used in frequency-domain electromagnetic method for near surface profiling. However, Slingram loop may be used in time-domain electromagnetic method to achieve larger penetrating depth, get more information about underground world, and avoid the problem of primary field with the same loop configuration. The time-domain Slingram measurement system used by us is adopted from CannyTEM. We used two identical high-frequency induction coils with resonance frequency as 1.2 MHz, physical area as 6 m² to construct a Slingram loop. Two induction coils are fixed on a frame with separation as 1.5 m, and one coil is used as transmitter loop, another coil is used as receiver loop. This configuration may achieve a maximum penetration depth as 6 m. The turn-off time is 2.5 us for 2.5 A injected current and the sample frequency is 1.2 MHz. The short turn-off time and high sample frequency are the keys for high resolution near surface profiling. We made two experiments in the main campus of Central South University, Changsha, China. The goal of the first experiment is to detect the Slingram response of floor drains on a football ground. We got high quality Slingram response of floor drains. The profiles show same shape determined by frequency domain Slingram configuration reported on literature. The second experiment is to detect underground small water pipe. We also got similar profiles determined by frequency domain Slingram configuration. These experiments show that time-domain electromagnetic method using customized Slingram configuration may solve many problems in engineering. It may offer a fast and high resolution way to image many underground targets.