

## Accepted Manuscript

Title: Detecting anomaly targets using handheld frequency domain electromagnetic system

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PII: S0924-4247(17)30912-3  
DOI: <https://doi.org/10.1016/j.sna.2017.11.016>  
Reference: SNA 10445

To appear in: *Sensors and Actuators A*

Received date: 16-5-2017  
Revised date: 9-10-2017  
Accepted date: 6-11-2017

Please cite this article as: Qu Xiaodong, Chen Wang, Fang Guangyou, Yin Hejun, Detecting anomaly targets using handheld frequency domain electromagnetic system, *Sensors and Actuators: A Physical* <https://doi.org/10.1016/j.sna.2017.11.016>

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# Detecting anomaly targets using handheld frequency domain electromagnetic system

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## The HIGHLIGHTS of the paper are as follows:

- Firstly, the transmitter of CEM-2 system uses sinusoidal pulse width modulation (SPWM) technology to generate low total harmonic distortion (THD) and arbitrary digital signal waveform. It is convenient to match different transmitting coils using the same circuit and system.
- Secondly, the signal processing method can reduce some effects caused by unstable factors, such as the deformation of transmitter coil, the changes of transmitter current. Most operations are sum and product operation, contributing to high efficiency.
- Thirdly, the mounting positions of the metal items (a removable box, pre-amplifier) are selected according to the principle that primary magnetic field has minimum gradient.
- Fourth, experiments were conducted to study the effect of operation frequency and the effect of different orientation of the test targets relative to the CEM-2.

**Abstract:** In this paper, a handheld frequency domain electromagnetic system CEM-2 is presented for subsurface investigation (within less than 2m). CEM-2 system employs one set of 3 coplanar coils. The transmitter uses sinusoidal pulse width modulation technology to generate low total harmonic distortion and arbitrary digital signal waveform. It is convenient to match different transmitting coils using the same circuit and system. The signal processing method can reduce some effects caused by unstable factors. Most operations are sum and product operation, contributing to high efficiency. The mounting positions of the metal items (a removable box, pre-amplifier) are selected according to the principle that primary magnetic field has minimum gradient.

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