Search and locate

UPEX® 745 DF

Advanced TDEM Pulse Induction System

- High detection range
- Signal-noise (S/N) ratio improved by up to 80%
- 8 measuring channels /5 time gates
- Substantially improved resolution
- Geometric separation of the receiver coils
- Optimized signal noise ratio

General

The UPEX® 745 DF is a deep, active search system, based on the electromagnetic pulse induction principle designed and produced by us in Germany. The system is used to detect ferromagnetic and non-ferrous metal objects, primarily in unexploded ordnance clearance and subsurface geophysical surveys.

With the UPEX® 745 DF, Ebinger completes its traditional range of pulse induction-biased measuring systems as far as resolution and detection depth are concerned. "German innovation from the Ebinger ideas laboratory".

Constructional Features

The circular coil arrangement substantially betters the signal-noise ratio (S/N) up to 50 % and thus allowing a significant increase in detection depth. The 5 time gates and a decoupling of the receiver coils substantially ameliorate detection and resolution. The dimensioning and the geometric arrangement of the inner receiver coils in conjunction with an early measurement also contribute to the enhanced performance and boost the resolution of small, nearsurface objects. The size and arrangement of the external receiver coils are adapted to the detection of larger and deeper buried targets.

The geometric dimensioning of the system implies a significant increase in productivity due to the large scan area covered.

Figure 1. Example use of the UPEX® 745 DF with GPS in difficult terrain

Application

One of the basic requirements when using electromagnetic methods to detect metallic anomaly masses is a high contrast in the electric parameters of the objects to be detected compared to the natural subsurface conductivity. Iron has an extremely high conductivity of 10^7 S/m respectively an electrical resistance of 10^{-7} Ωm. This corresponds to a difference of 7 orders in magnitude compared to the best conducting soils / rocks. The same applies to its magnetic permeability (magnetite μr =5, iron μr =120). This extremely high contrast with regard to electric conductivity and magnetic permeability relative to naturally occurring soils/rocks forms the basic requirement for detection when using electromagnetic methods.

This method of measurement belongs to the family of transient electromagnetic methods (TEM), which operate within the time range. Figure 2 outlines the measurement principle of metal detection using the transient electromagnetic method. A source field is used, which induces current systems into the subsoil, whose propagation depends on the conductivity distribution in the subsoil. In the case of inductive transmitter coupling a constant direct current flows in a horizontal transmitter coil.

The constant transmitter current is switched off or over as abruptly as possible and causes the constant primary magnetic field to collapse, which has almost the geometry of a vertical magnetic dipole (VMD). At the same the time-independent primary magnetic field generates a current system according to Ampere's law and Faraday's induction law. Depending on the subsoil, it propagates both vertically and laterally (diffusion) as time progresses inducing eddy currents into the conductive subsoil in accordance with Maxwell's equations. This current system decays due to ohmic losses, which in turn produces a secondary magnetic field, which also decays with time. The time depending changes in the magnetic field components induces a decay voltage (transient), which will be measured in the receiver coils (here the change in the vertical magnetic component over time). Figure 3 shows the transmitter current function in the top area and the change in voltage of the receiver signal in the bottom area.

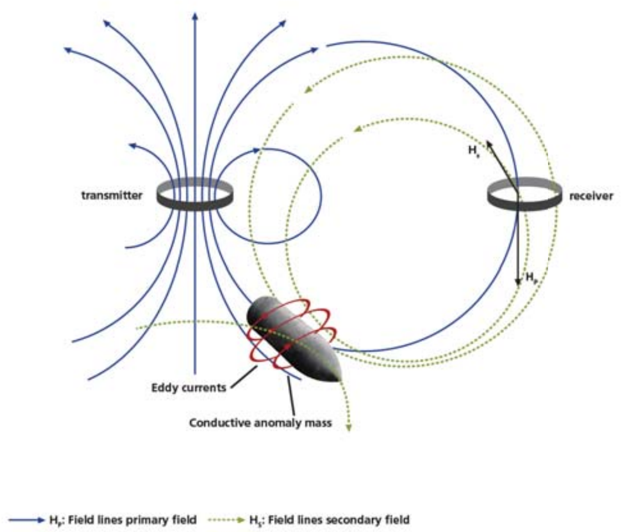

Figure 2. Schematic diagram of the electromagnetic measurement principle. ***For improved clarity the transmitter and receiver are shown spatially separated***

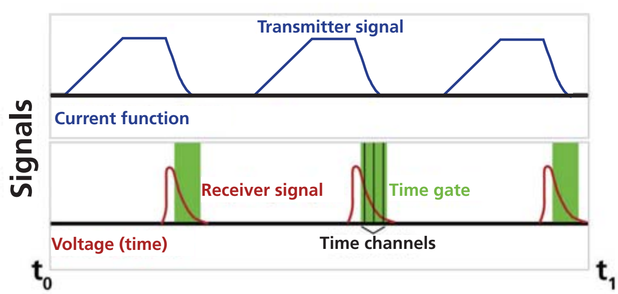

Figure 3. Schematic diagram of the transmitter-receiver signal

The system consists of following components:

Figure 4. Delivery content

1 Transmitter coil

2 Receiver coils

3 GPS bracket

4 Bag (electronic controller & power supply)

5 EPAD® data logger

6 EPAD®-S Bluetooth® sensor data module BTSDM

7 Standard wheeled frame (see figure 1)(several versions optionally available)

Optionally:

8 GPS-System

9 Software evaluation *without laptop

Technical Data

Detector	
Measurement principle	Time domain Transient electromagnetics (TDEM)
Time window	8 measuring channels/ 5 time gates
Transmitter signal	unipolar rectangular
EM transmitter	vertical dipoles, decoupled coil, Ø 1400 mm
EM receiver	4 decoupled coils 2 decoupled coils, Ø 1300 mm 2 decoupled coils, Ø 700 mm
Vertical spacing of receiver coils	800 mm
Transmitter current	≥ 22 A
Transmit moment	≥ 400 Am^2
Measurement range	± (0.1-5000)mV
Dynamic range	≥ 16 bits
Measurement frequency	90-130 Herz, selectable
Signal evaluation	Individually or at any difference required
Power supply	System-integrated or external Internal lithium battery 24 V (2 x 4 h operating time with 2 batteries) Charging time approx. 4 h for the internal batteries External power supply 24 V (e.g. car battery)
Electronic/control unit	System-integrated or separable
Startup time	approx. 5 min

Figure 5. Example of a standard wheeled frame with optional wheels

Data recording - EPAD	
Type of Device	Robust, mobile field computer
Operating system	Microsoft Windows Mobile 6.x
Processor	Marvell 806 MHz Xscale
Memory	128 MB DDR SDRAM, 512 MB Flash memory
External memory	SD card 8 GB
User interface	480 x 640 VGA TFT display with illuminated background Touchscreen with anti-glare protective sheets Numeric keyboard with background lighting Integrated loudspeaker
Data interface	Bluetooth 2.0, Class 1 Slot for Compact flash (CF type 2) Slot for SDIO cards USB host, USB client, RS232
Power supply	Li-Ion rechargeable battery 2,500 mAh for 15 hours operation Charger for 100-240V
ADC interface	Input voltage: ± 5 V Number of channels: 8 Bit width: 16 bit Scanning frequency per channel: 32 Hz
EMI / EMC	EU Declaration of Conformity

UPEX® 745 DF data examples

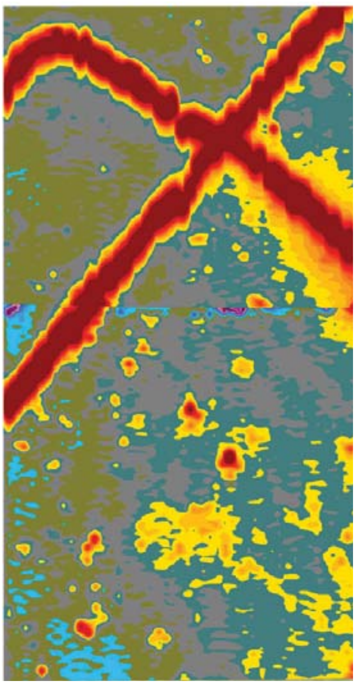

Figure 6. with GPS Gridbox optional

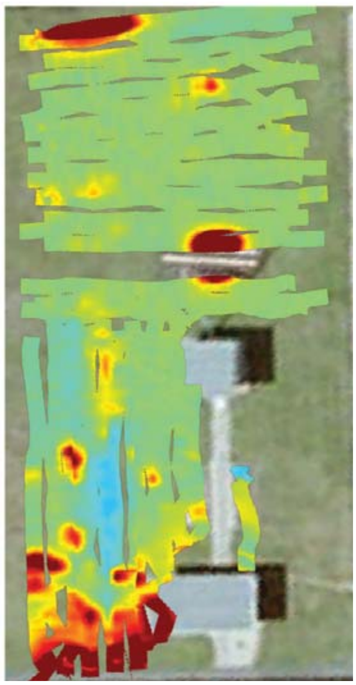

Figure 7. with GPS Tracking optional

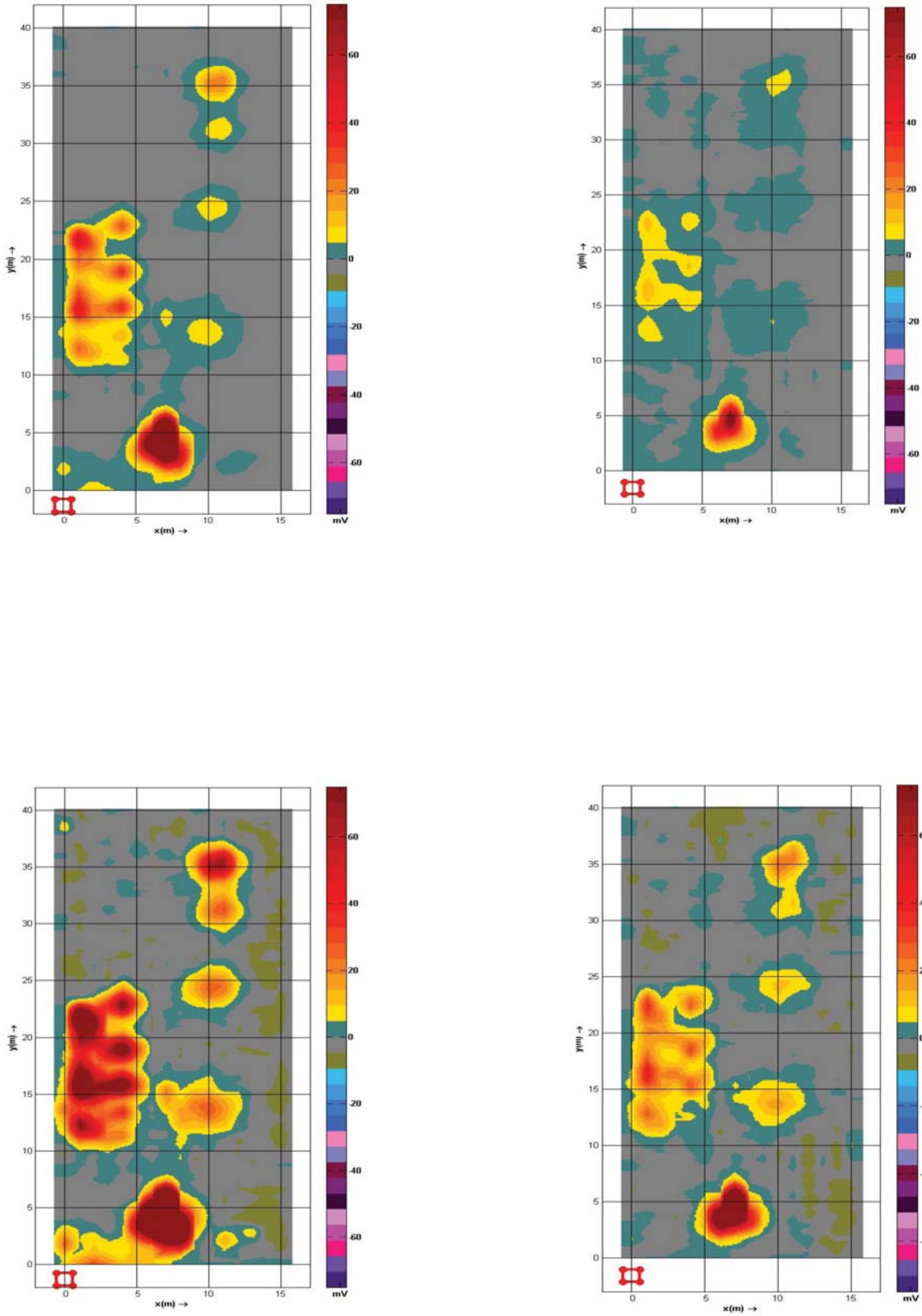

Figure 8. without GPS (different time gates)

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