

## **LOUPE, A NEW PORTABLE TIME-DOMAIN EM PROFILING SYSTEM**

*Andrew Duncan, Angre Pty Ltd; Gregory Street*

Current electromagnetic (EM) instruments for near-surface (0-30m) investigations are dominantly frequency-domain and deeper-penetrating instruments mostly operate in the time-domain. The limited frequency content of frequency-domain EM equipment makes it virtually impossible to define shallow conductivity variations in three dimensions. Thus, most investigations in the near-surface use multi-dipole resistivity systems. While these systems can be very effective there are many occasions when EM would be more appropriate and cost-effective to use.

This project has focussed on whether it is possible to develop a time-domain system that can be operated in a similar way to the many frequency-domain systems i.e. in a continuously-profiling mode, measuring electrical conductivity effectively in the top 30m.

Four years of research and development have resulted in creation of a two-man carried time-domain EM geophysical system called Loupe. It is a new generation instrument incorporating rapid sampling, high-bandwidth transmitter and 3-component receiver, easily carried on backpacks with integrated RTK GPS.

The transmitter antenna is a rigid, light-weight vertical-axis multi-turn loop carried behind one operator, along with the required electronics, GPS system and battery. The transmitter is designed to generate a high magnetic moment using a clean square-wave of current that is switched off in 10 microseconds or less. Most applications will use transmitter base frequencies in the range 10 – 100 Hz.

The Loupe receiver antenna is a 3-component coil sensor carried behind the other operator. Receiver electronics processes the 3-component data in real-time and presents it to the receiver operator.

This paper will show the results of trials completed to date and planned for late 2017 and early 2018. These trials will be carried out in a number of near-surface applications – mineral exploration, engineering assessment and mining – to contrast the performance of the time-domain system with results from frequency-domain instruments.