mTEM heliborne system

mTEM system is a time-domain system designed for high resolution near surface electromagnetic investigations. Applicable for near surface sedimentology, hydrogeology, engineering geology, in mineral exploration for near surface fractures/structures mapping and for identifying weathered parts of kimberlites.

mTEM system advantages:

- Small footprint and high base frequency enable very high spatial resolution;
- Detail subsurface geoelectric characterization;
- Designed to work in areas with industrial electromagnetic noise (powerlines);
- Its light weight allows the mTEM system to deploy utilizing cost-effective light utility aircraft.

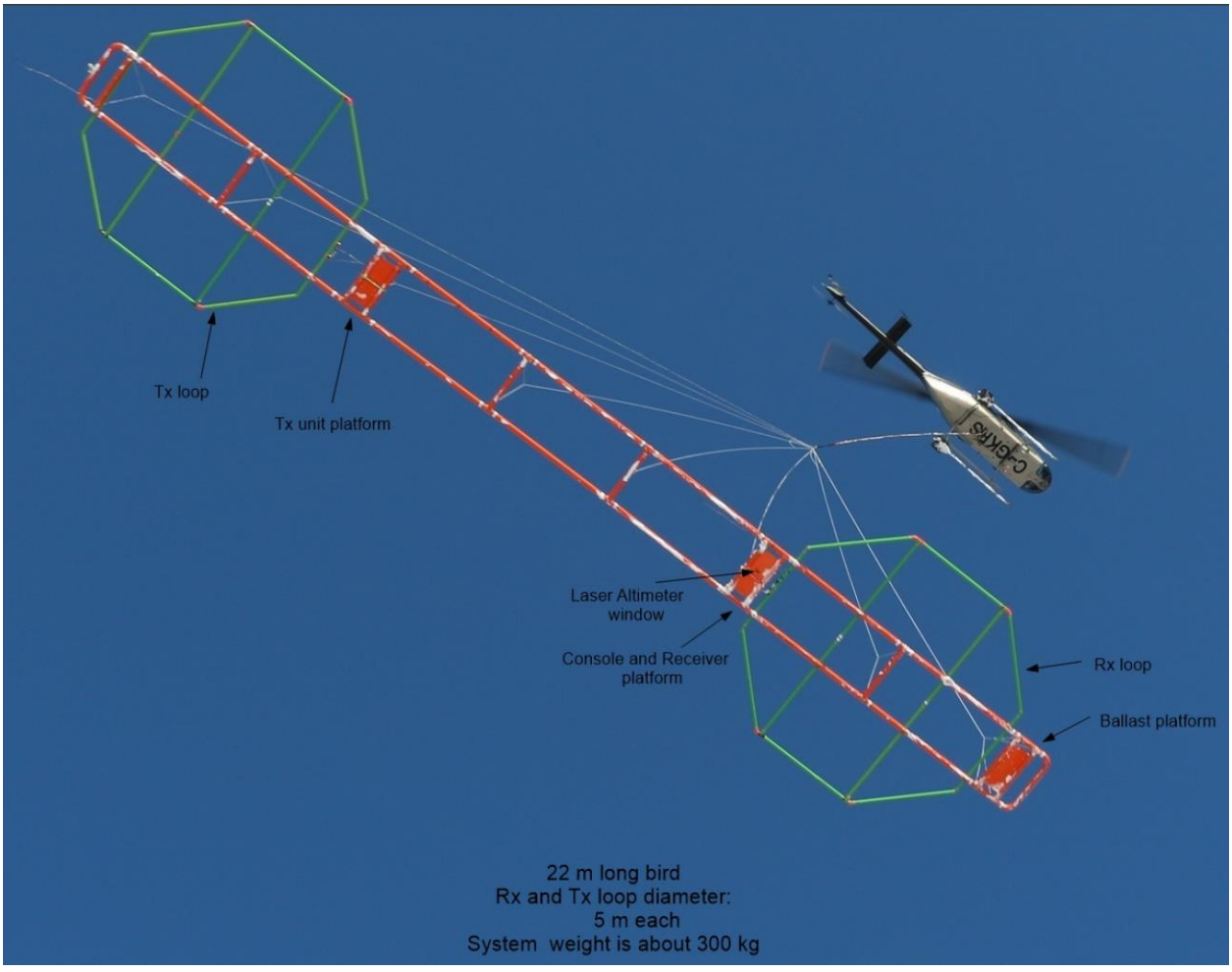

Figure 1- mTEM airborne EM system

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mTEM specifications

mTEM general specification.

Parameter	Value
System weight	300 kg
Receiver loop diameter	5 meters – 1 turn
Transmitter loop diameter	5 meters – 1 turn
Receiver – Transmitter coils separation	15 meters
Tow cable length	35 meters
Current	10 A
Base pulse repetition rate	5 kHz optimal for RF noise rejection
Waveform Digitising Frequency	40 Mhz
Pulse shape	Rectangular
Pulse length	50 microsec
Pulse turn-off	2.8 microsec
Receiver (Rx)	Z, vertical component
Sample rate	10 Hz with up to 30 time gates
Time gates range	1 – 40 microsec
Spheric and radio noise rejection	Digital
Industrial noise	Not sensitive
Flight Height	30-35m AGL
Operational temperature	-30°C to +45°C

mTEM time gates

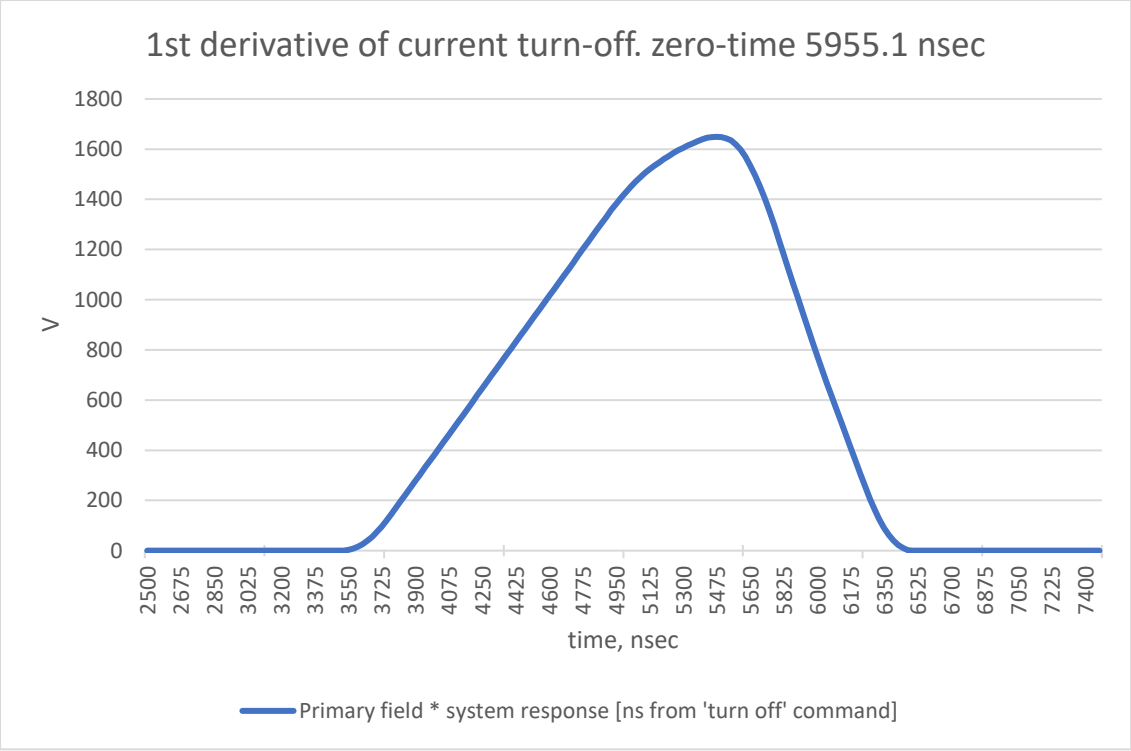
mTEM has a series of gates from 1 microsecond to 40 microseconds. These small gates allow to register with a high resolution the shallowest lithologies.

Off/time gates (nanosec from zero time)

Gate	Start	End	Center	Gate	Start	End	Center
15	1022	1271	1146.5	26	7732	9329	8530.5
16	1246	1545	1395.5	27	9179	11075	10127.0
17	1520	1870	1695.0	28	10900	13146	12023.0
18	1832	2256	2044.0	29	12946	15590	14268.0
19	2219	2718	2468.5	30	15353	18472	16912.5
20	2681	3254	2967.5	31	18185	21877	20031.0
21	3192	3890	3541.0	32	21540	25906	23723.0
22	3828	4651	4239.5	33	25507	30671	28089.0
23	4576	5549	5062.5	34	30209	36296	33252.5
24	5462	6610	6036.0	35	35566	43114	39340.0
25	6510	7857	7183.5				

mTEM primary field system response

square pulse 50 microsec; turn-off 2.8 microsec



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mTEM field examples

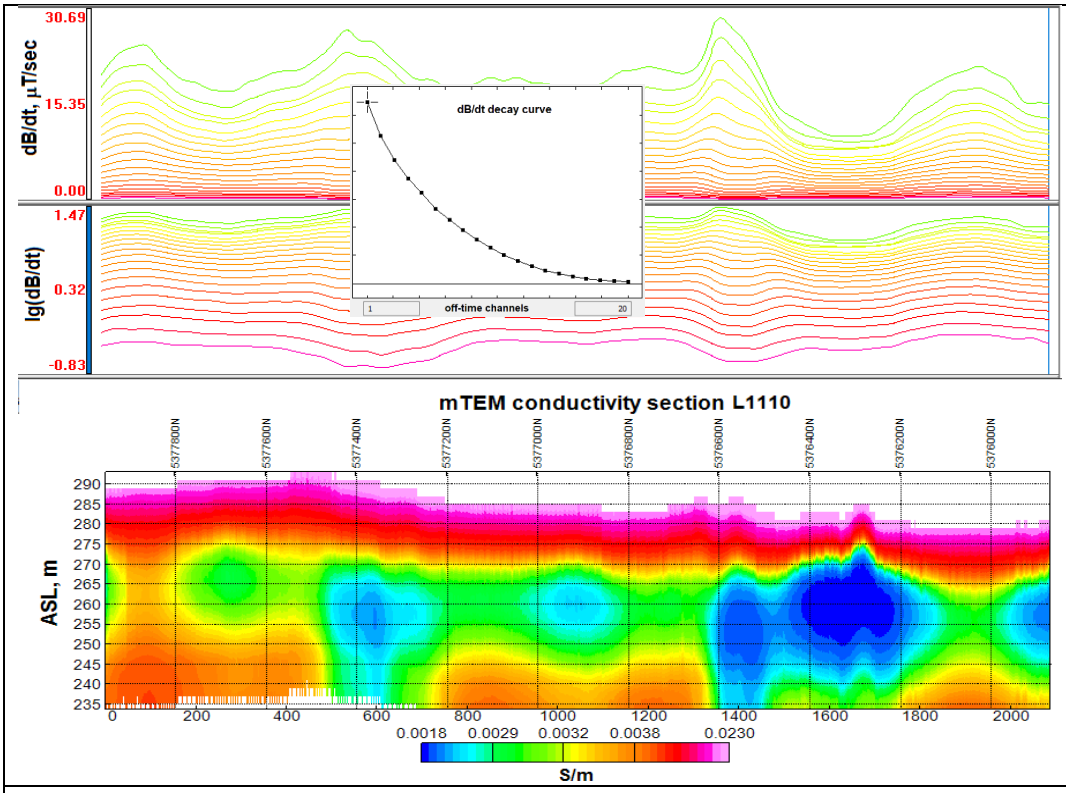

Figure 2 - Northern Ontario (near Lake Abitibi). mTEM dB/dt profiles with a signal decay example and inverted conductivity-depth section (eq-area color distribution).

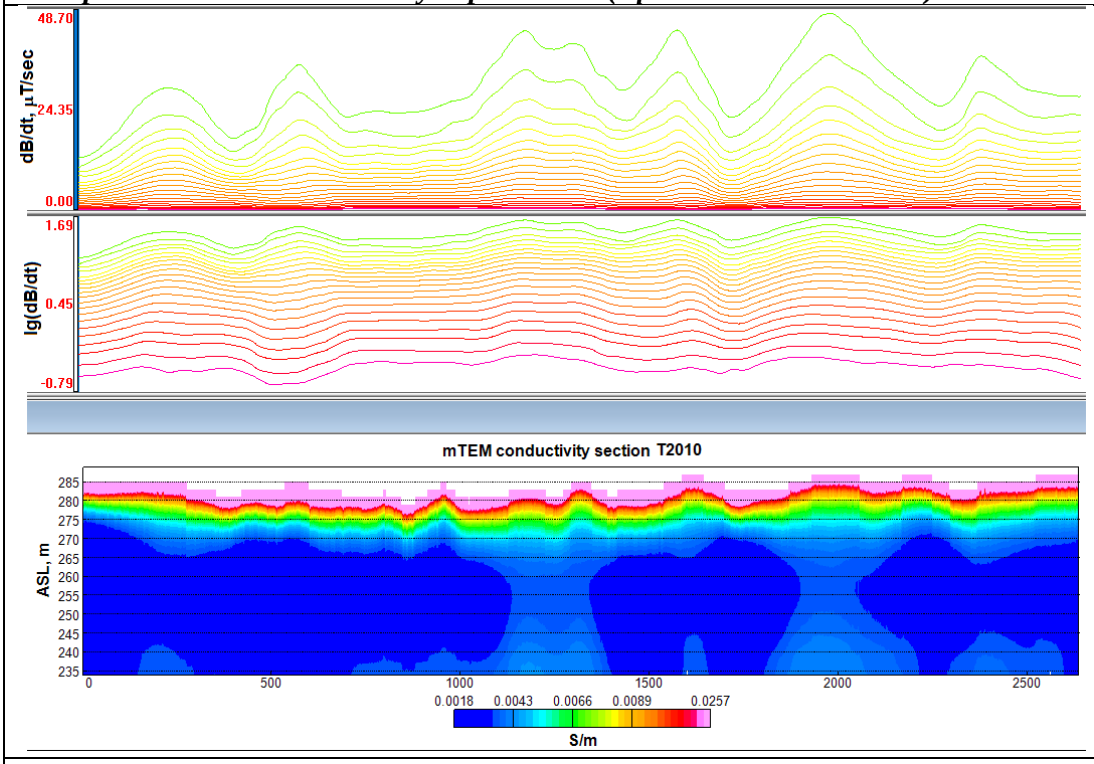

Figure 3 - Northern Ontario (near Lake Abitibi). mTEM dB/dt profiles with the inverted conductivity-depth section (linear color distribution).

mTEM near surface structures/fractures mapping (Scadding gold prospect, ***Figure 4***)

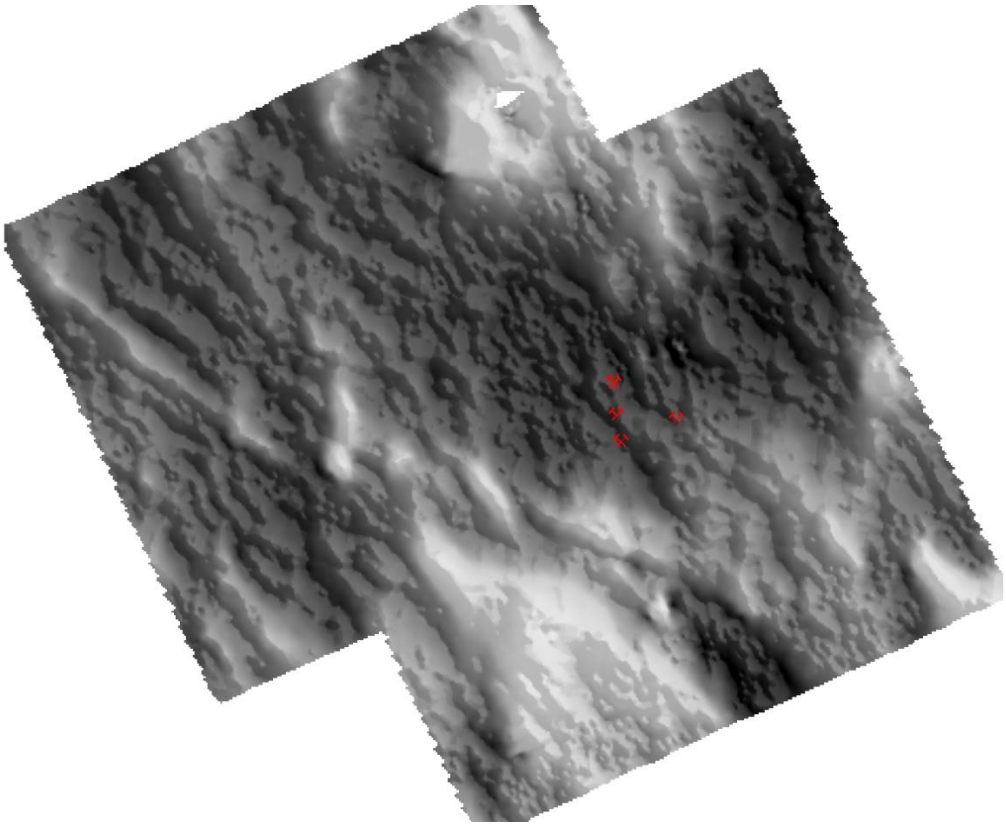

Figure 4- Sudbury – Wanapitei Lake area of Ontario

mTEM data example with powerlines from a survey near Sudbury.

The area is in the highly resistive geological environment and any kind of noise, including industrial, is not obscured by strong inductive response background. The survey block is crossed by a road with the power line (**Figure 5**).

Figure 5- mTEM survey lines over a property with a powerline along the road

Electromagnetic influence of the powerline is not observed in the data since base frequency of the system is very high – 5 kHz. Only sometimes the powerline along the road has a signature in the late time gates (Figure 6). The signature is not continuous and very often is disappeared (Figure 7). Most likely this discontinued signal is not from the wire current but from metallic objects following the power line.

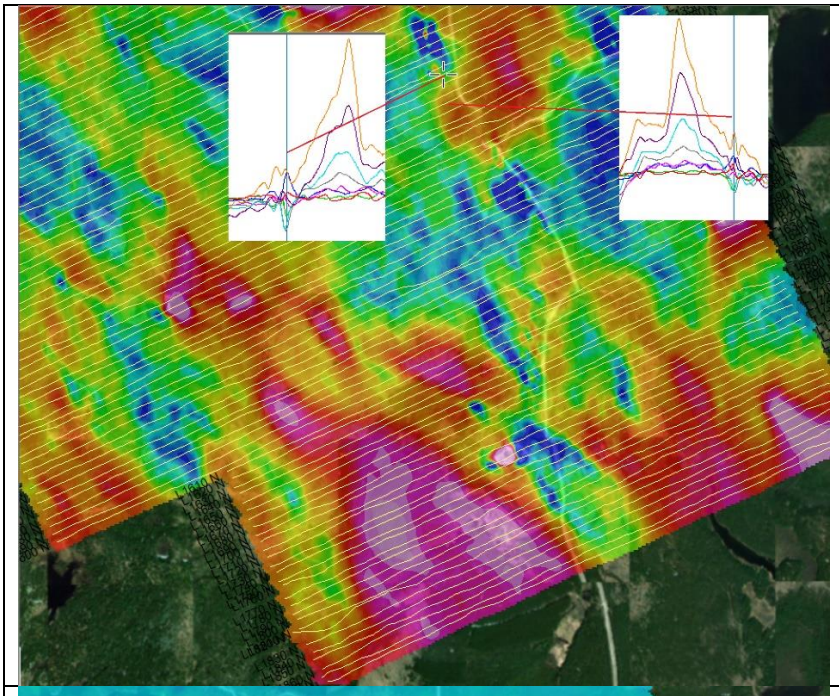

Figure 6- late mTEM time gates profiles over a color grid of ~4 usec response.

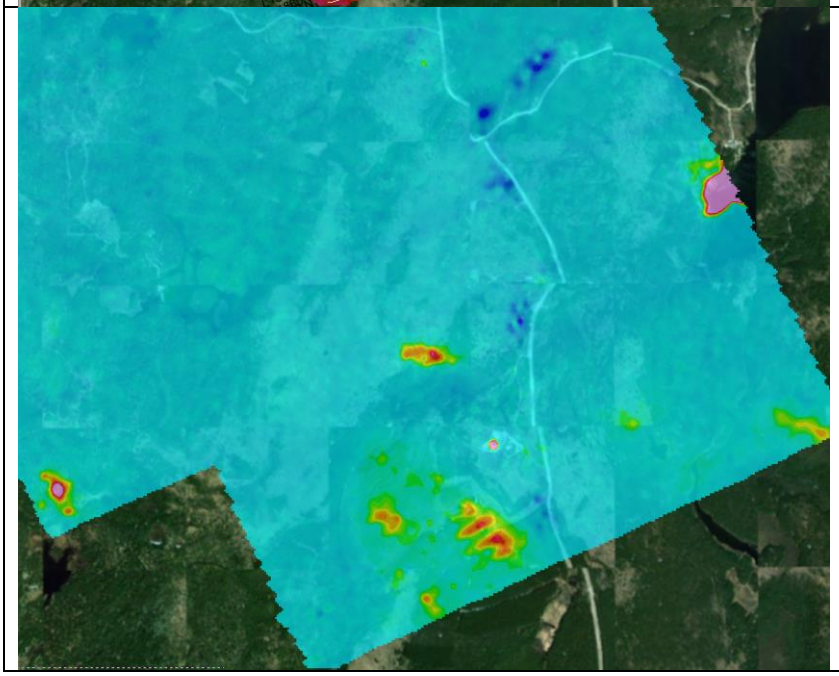

Figure 7 – mTEM late time color grid over the area with a power line