**Advancements and considerations for deeper penetration of Towed TEM instruments**

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The tTEM system is a multi-purpose towed transient electromagnetic (TEM) system, which can be operated on land, water and snow. The design of the system has been centered around resolution of shallow geological layers beginning at a depth of a few meters. The first version of the system from 2017 had a maximum depth of investigation of around 70 m. This was gradually increased to approx. 130 m by a redesign of the receiver system and better suppression of noise by using what is referred to as tapered gates. Here we present a new design of the transmitter coil where the depth of investigation has been further increased to 160 – 180 m with a slightly decreased resolution of the very shallow layers.

In technical details the tTEM system consists of a one-turn 3 m by 3 m transmitter coil mounted on a towable platform. The receiver coil is mounted on a towable platform 9 m behind the transmitter platform. The entire system is towed behind an ATV, which also carries the instrumentation and batteries. Usual driving speed is 15-20 km/h. The system operates at low and high transmitter moments to achieve both shallow and deep information. The low moment transmits 3.0 A with a turn-off time of 2.8 us and the first gate at ~4 us (times from beginning of ramp) while high moment transmits 30 A.

For applications where the depth penetration is insufficient, we have developed a new three-turn transmitter coil. The coil can be used on the existing transmitter platform, and can be switched out in a few minutes. In the three-turn coil, the HM current is lowered to 25 A, and LM current to 1 A. First gate in 12 us, and last gate in 1 ms or 3 ms, depending on the configuration of the transmitter. By almost tripling the magnetic moment of the transmitted signal and adapting processing settings and field procedures, we can increase the signal to noise ratio by a factor of 5 compared to the default 3x3 single turn coil.

We present the new coil and the design consideration. We also show results where the coil has been used in 3000 km large survey.