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Multi-length probes in GPR and TDR data

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I will expose some possibilities regarding the use of metallic probes of different lengths in GPR and TDR prospecting. With regard to GPR, multi-length probes are dipole-like antennas whose length can be changed by means of switches. The switches can be implemented with PIN diodes, and can act as electronic “knives”. Therefore, they allow to cut (switched off) or prolong (switched on) the branches of a couple of antennas, and this allows to have more couples of equivalent antennas making use of a unique physical couple of antennas. This allows to contain the size of the system. In particular, a reconfigurable prototypal stepped frequency GPR system was developed within the project AITECH (<http://www.aitech.net.com/ibam.html>) and was tested in several cases histories [1-3]. Within this reconfigurable GPR, it is also possible to reconfigure vs. the frequency the integration times of the harmonic tones constituting the radiated signal. This feature allows to reject external electromagnetic interferences without filtering the spectrum of the received signal [4] and without increasing the radiated power.

With regard to TDR measurements, a multi-length probe consists of a TDR device where the rods (in multi-wire version) or the length of internal and external conductor (in coaxial version) can be changed. This can be useful for the measurements of electromagnetic characteristics of a material under test (MUT), in particular its dielectric permittivity and magnetic permeability, both meant in general as complex quantities. Multi-length TDR measurements allow to acquire independent information on the MUT even at single frequency, and this can be of interest in the case of dispersive materials [5-6].

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