Investigation of the characteristics of the Soil by means of TDR probes: preliminary work and future perspectives

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In this contribution, we propose a novel technique for the measurement of electromagnetic characteristics of soil by means of a transmission line probe. This approach involves placing a sample of material under test (MUT) inside a transmission line terminated by the short circuit from one end and excited by a VNA at the input end. Unlike the well-known transmission line technique, which requires a two-port connection to a Vector Network Analyser (VNA) to acquire the scattering parameters (S11 and S21), this method relies only on the measured S11 parameter which is then converted into the complex permittivity (dielectric properties) of the soil. Validation of the proposed transmission line model calculations was compared with numerical simulation data obtained with the CST Studio® software and measurement setup of the coax-line. The comparison shows that the dielectric and magnetic properties of a material may be precisely determined with the proposed technique. However, further studies need to be carried to extend this technique, such that a sample can be placed in contact with the probe rather than embedded in it.