



## **Inversion Technique to Derive Soil Moisture Profile from Overlapping Measurements with TDR TRIME-FM Tube Sensor Probe**

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Done at the experimental site in Saratov region of Russia, monitoring of temporal change of water content in soil profile during infiltration and following redistribution was a key task of field investigation of preferential flow occurring due to irrigation application. For this investigation a TDR tube sensor-probe TRIME FM3 was used which has vertical resolution of soil moisture measurement comparable with height of the soil sound cylinder of 15-16 cm (diameter about 40 cm).

Standard measurement techniques give only mean or punctual results. With aim to augment a vertical spatial resolution of a TDR tube sensor-probe TRIME FM3, a special method of overlapping measurements was proposed. Therefore a new inversion algorithm has been developed to derive moisture profiles along single TDR sensor-probe. This method is based on the model of linear contribution of horizontal layers forming soil sound cylinder to the overall measured value. This model was tested on artificial soil monolith assembled from 18 homogeneous horizontal discrete macro layers of 5 cm of height which had different predefined moisture and fabricated from dark-chestnut soil of experimental site. Firstly, using TDR device a series of overlapping measurements with step of 1cm was produced. This series was then compared to results based on proposed model. This model uses moisture values of discrete macro layers and parameters of soil sound cylinder as input values. At this stage the best agreement between measured by TDR values and proposed model was achieved using parameter of height of soil sound cylinder about 15-16 cm. Secondly, special calculations based on proposed model with height of soil sound cylinder of 15-16 cm were produced aiming to determine moisture of discrete macro layers from overlapping measurements. At this stage the best agreement was gained for height of 16cm, when comparing moisture values of discrete macro layers of artificial monolith - derived from overlapping measurements- and moisture values determined by conventional direct gravimetric method on samples - taken from the same layers.

Keywords: soil moisture, TDR measurement, soil water profile