



Technique of detailed - level-by-level definition of soil moisture with TDR TRIME-FM3

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Accurate measurements of profile soil water content are essential to many areas of environmental and agricultural researches. Nowadays, Time Domain Reflectometry (TDR), is a widely used technique for soil moisture measurements. However, the design of probes doesn't allow effective using of these devices for monitoring vertical distribution of moisture in thin soil layers. Device TRIME-FM3 created by IMKO Company is based on TDR-technology and allows doing the rapid, routine and non-destructive measurements of water content profiles. The researches which have been carried out by the producing company have shown, that the geometrical body of measurement of this probe represents the cylinder with height about 15-16 cm and the basis in the form of an ellipse with the greatest radius about 40 sm. In this case, direct use of this probe to monitor water content of layers smaller than the cylinder of measurement is not possible. The aim of the study is to develop a method of detailed - level-by-level calculation of water content profiles scanning by TDR for boreholes such as TRIME-FM3. For achievement of the aim were solved the following tasks: 1) To carry out verification model TDR-probe of measurement through soil layers with different value of moisture; 2) To test a technique for detailed - level-by-level definition of results of soil moisture scanning. Verification of the additive model was carried out on the experimental data received on prepared in special capacity (with horizontal dimensions of 70x70 cm and height of 90 cm) an artificial monolith with soil layers with different moisture content. For exception of formation inside a monolith of significant air cavities and this soil material was exposed to preliminary processing. The plastic tube (1 m height) was installed in the middle of the box to measure the soil water content by TRIME tube probe. After the termination of a monolith, series of scanning measurements of volumetric humidity have been done at various position of

a probe on height of a monolith with step on 1 sm. With the purpose of reception of representative given measurements they were carried out several times during three days at four various horizontal positions of a TDR-probe. After the measurements the soil monolith has been disassembled, and from each created layer were selected samples for density and moisture definition by gravimetric method. The model simulate measurements of volumetric soil moisture, contained in volume of probe approbation, is based on a hypothesis of additivity of the moisture content of layers getting in this volume. On this model the program in language VBA was developed. This model provides us a curve of scanning with a set of entrance data and a step of scanning. Experimental values of volumetric and the density of soil layers received as a result of disassembly of a soil monolith, and also size of an active and inactive zone of a probe have been used as the entrance data for the developed program of calculations. Calculations have been carried out for various combinations of size of an active and inactive zone of a probe at a step of scanning 1 sm. As a result of comparison of modeling curves of scanning with experimental, it has been shown; that the best reproduction of first second (factor of pair correlation 0,994) corresponds (meets) to sizes of an active zone laying in a range 15-16 sm.