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Preliminary testing results of an equipment for Georadiolocation model studies

C. Tskhvediashvili

Supervisor - D. Odilavadze

Introduction

Georadiolocation is a non-invasive geophysical approach, which is underground, near subsurface (<50 m) is the electric heterogeneity study ([1], [3]). This is achieved at high and superhigh frequency (38MHz-2GHz) electromagnetic field generating discrete impulses (Zond 12e), radiation and reflected impulse registration (Prizm 2.5, [2], [4]). Georadiolocation found wide application in archeology, in geotechnics, road construction, glaciologyand in many other areas. [2]

As a rule, the dimensions and characteristics are unknown while working in field conditions and they are investigated according to their radio-type. The paper discusses radio-types of different, pre-selected set of objects and the straightforward task. Known objects are carefully studied and radio-type analysis allows us to discuss the size and characteristics of the object.

Description

Experiments were carried out on the device model (see Figure.1), which was filled with dry sand. Beach access relative dielectric ε = 5.0, which was determined as a result of the experiment. Measurements were used georadari Zond 12e (see Figure. 2).

Figure.1 Equipment for modeling (modeling facility)

size: 116 x 85 x 60 (centimetre)

Figure.2 GPR Zond 12e

Results

Experiment 1 - Results obtained by the method of parabola comparative method revealed that the relative dielectric penetration of the sand used in the experiment is 5.1, which corresponds to a clean, dry sand e (see Figure.3).

Experiment 2 - The case of a 3 ertnamet drive to imitate a stone foundation. Distance from the surface to the first stone is 6 cm. In order to eliminate external perturbation of the bottom we used zero amplification, and for visible presentation we amplified the upper side by 12db-up and twice used Fourier transform (see Figure.4).

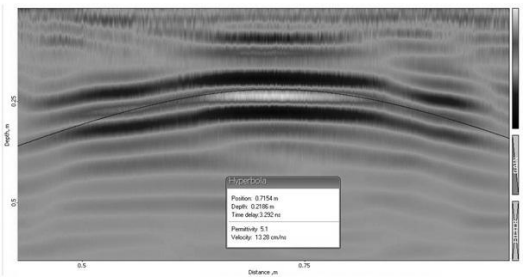

Figure.3 metallic inclusion

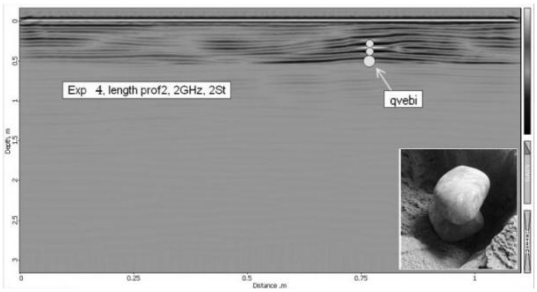

Figure.4 foundation imitation

Experiment 3 (see Figure.5) under 0,5 m depth the zero amplification is used, and the upper side is strengthened by 12db. 2 mil- radio-type is seen here and it is marked in the diagram, while in the middle the image resulted in waves interference appears as a "reflector".

Distance between tubes reducedby 10 cm, and the radiograms obtained by theExperiment 4 - (see Figure.6) shows that the equipment considered a powerful reflection as a whole body. In this diagram as well we used the zero amplification in order to eliminate the effect of the tank bottom, while the upper part was strengthened by 18db for better visualization

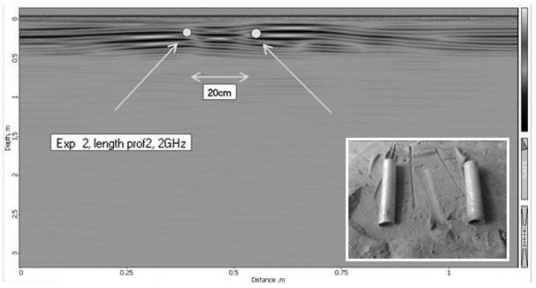

Figure.5 Two tube

Distance between opposite walls - 20centimetre. size: diameter - 6.5centimetre; length - 33.5centimetre; thickness - 0.5centimetre; depth - 13centimetre.

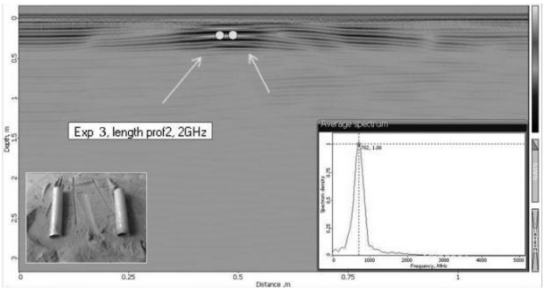

Figure.6 Two tube

Distance between opposite wall - 10centimetre. size: diameter - 6.5centimetre; length - 33.5centimetre; thickness - 0.5centimetre; depth - 13centimetre.

Conclusion

As a result of the investigation by means of the georadiolocation device, we determined the dielectric conductivity of the model environment (the sand from Sachkhere, the relative dielectric conductivity - 5, corresponds to the data base value), as well as for examined models (alluvial sediments, metallic, air containing cavity models) radio-types were obtained, as a result of which we determined their dimensions by the model device. On the basis of layout of similar models we verified resolvability of the device.

References:

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[4] Software “Prizm 2.5 User’s Manual” (2010)

სამოდელო დანადგარზე წინასწარი გეორადიოლოკაციური კვლევების შედეგები

გ. ცხვედიაშვილი

რეზიუმე

ჩატარებული კვლევებით გეორადიოლოკაციურ დანადგარზე, დადგენილ იქნა სამოდელო გარემოს დიელექტრიკული განვლადობა (საჩხერის ქვიშა, ფარდობითი დიელექტრიკული განვლადობა - 5, ემთხვევა პროგრამული უზრუნველყოფის ბაზაში მითითებულ მნიშვნელობას), ასევე გამოკვლეული მოდელებისათვის (ალუვიური ნალექის, მეტალური, ჰაერის შემცველი სიღრუვის მოდელები) მიღებულ იქნა რადიოსახეები, რის შედეგადაც დადგინდა მათი ზომები სამოდელო დანადგარზე. მსგავსი მოდელების ურთიერთგანლაგების მიხედვით შემოწმდა ხელსაწყოს გარჩევისუნარიანობა.