SOI: 1.1/TAS DOI: 10.15863/TAS
International Scientific Journal
Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2016 **Issue:** 12 **Volume:** 44

Published: 30.12.2016 http://T-Science.org

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SECTION 3. Nanotechnology. Physics.

FIND A PLACE MUSALLA BURIED IN THE HOLY MOSQUE OF KUFA USED GPR

Abstract*: Ground Penetrating Radar (GPR) is frequently used in discovering the landmarks and under the rubble surface. Layers with 4m width of the holy mosque of kufa. In the present study, one antennas (250 MHz) were used This study was carried out through 4 profils in different sites inside the holy mosque to find any remaining of the landmarks and basis. one case studies are presented in one sites: the first was carried out through3 profils from east to west and the scond was carried out through one profils from south to north the coordinates of the area are (3543848N,4434505S) for holy mosque of kufa. This study was data processing using the rad explorer program as well as GPS*

Key words*: GPR, GPS, holy mosque, Rad Explorer, place Musalla*
Language*: English*
Citation: Al-Maqram NM (2016) FIND A PLACE MUSALLA BURIED IN THE HOLY MOSQUE OF KUFA USED GPR. ISJ Theoretical & Applied Science, 12 (44): 127-134.
Soi: http://s-o-i.org/1.1/TAS-12-44-24 ***Doi***: crossref http://dx.doi.org/10.15863/TAS.2016.12.44.24

Introduction

Ground Penetrating Radar it is technique that sends short pulses of electromagnetic energy with pulse duration (1-20) ns with high frequency range (10-2500) MHz to the ground by a transmitting antenna. The energy propagation by speed the ground rely dielectric constant of the medium[1], When the radar waves encounter an interface between two different materials (layers) with different refraction indicators, some of the transmitted wave energy is reflected return the surface. [2]

Theory of GPR

Ground penetrating radar (GPR) is a near the Earth′s surface geophysical technique that allows investigators of discover and map (depth and dimensions) burial features by new form of analysis methods impossible using traditional field methods. [3,4,5]

GPR systems are mainly used to detect and measure the depth of distortions (either defects or layers) in a dielectric medium. Revealing of could be achieved by comparing the power of the scattered EM waves produced by the contrast in the dielectric properties between medium and inhomogeneity to a preceded threshold above the receiver noise level [6].

In most GPR applications, differences in ε and σ are most important while variations in μ rarely of interests. Ground penetrating radar be more useful in low-electrical-loss materials. If $\sigma = 0$, GPR that see very broad use since signals would penetrate to very depth. In practice, low-electrical-loss conditions are not spread . Clay-rich environments or areas of saline groundwater it can create circumstances where it is GPR signal penetration is very limited[7]

The most common forms of GPR measurements deploys a transmitter and a receiver in a fixed geometry, which it is transferred above the surface to revealing of reflections from under the surface features. In some applications, transillumination of the volume under investigation is more useful. Both concepts are depicted in Figure (1). An example of GPR response is shown in Figure(2).[8]

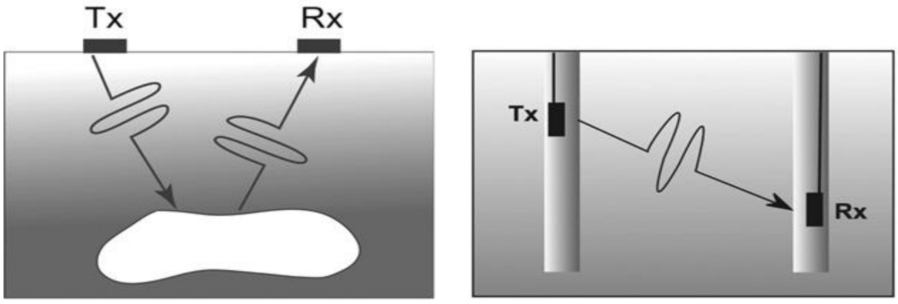


Figure 1 - The most common form of GPR measurements.

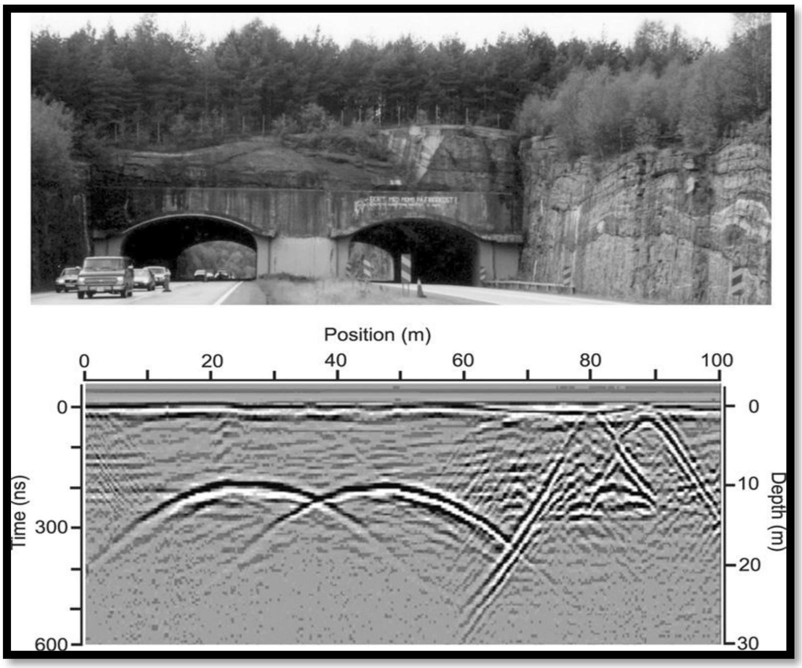


Figure 2 - An example of GPR response.

Ground penetrating radar (commonly called GPR) is a highresolution electromagnetic technique that is designed primary to investigate the shallow subsurface of the earth, building materials, roads and bridges [9]. GPR methods use electromagnetic energy at high frequencies (10 to 4000 MHz) to probe the subsurface, and the propagation of the radar signal depends on the electrical properties of the ground at the high frequency [10]Surface geophysical methods are generally non-intrusive and can be employed quickly to collect subsurface data. When performed properly and utilized early in the site characterization process, the methods can provide valuable information for placing monitoring wells and borings. They can be used later in the investigation to confirm and improve site characterization. Measurements are taken at or near the surface and are classified by the physical property being measured. The methods discussed here include ground penetrating radar, electromagnetics, resistivity, seismic, metal detection, magneto metric and gravimetric, and surface spontaneous potential (SP). however, each has limitations and may not be applicable in every situation [11]

Study Area

The study area is the holy mosque in Kufa and the coordinates first region (354848N,4434505S), a Musalla area. .Al-Kufa lies Iraq on the right bank of the middle Euphrates river to the east of Al-Najaf city about 16km and to the west of Baghdad the Capital about 165km . The height of Al-Kufa and its mosque is 22m from the sea level. It is know the Kufa area is Sedimentary which was formed by the Euphrates River . Its Climate of Iraq . It is rainy in winter and hot , dry in Summer.

Data Processing

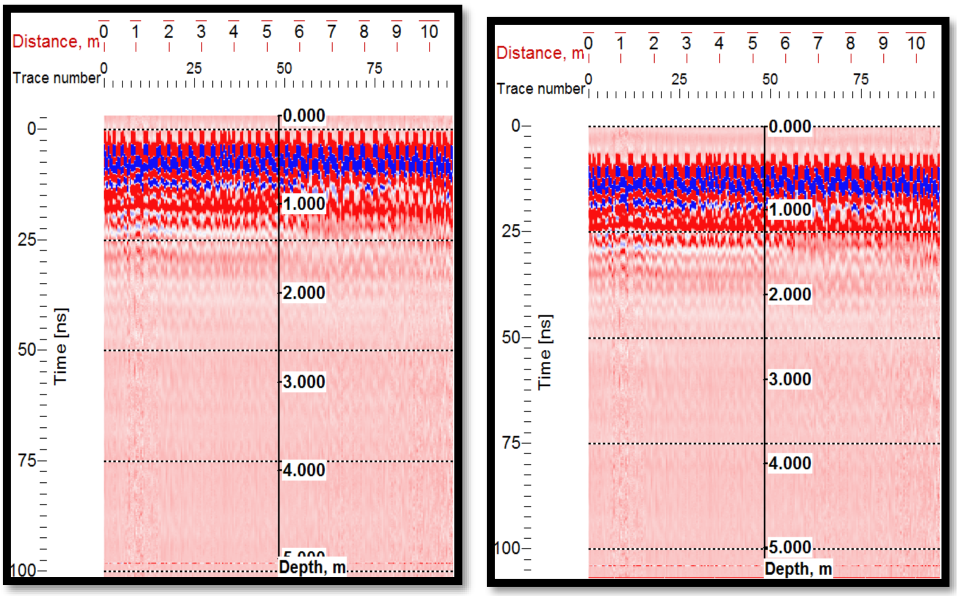
The surveying is done by 4 paths as it is explained the (1) table which explains the description of the profile by surveying by the antenna 250MHz.

Table 1

direction Profile	Profile length	number Profile
East - West	10m	323 -325
South - North	7m	326

When the 323 profile is processed by the filter Time – Zero we notice the penetration depth with depth of 5.3m before processing to be of 5m after processing as it explained in the (3) Fig.

When the 323 profile is processed Back ground Removal Filter we notice there a distort and revealing of hyperbola with a distance of 4m from the path beginning with a depth of 6.5m. when the features of the path with of 26.6cm/ns and isolation consonant of 1.3, we find hyperbola is an air gap which refers it is explained in the (4) fig.



before apply the Time-Zero(b)

After apply the Time-Zero(a)

Figure 3 - Profile No. 323.

When applying the Background Removal filter on the 324 profile , we notice there is a distort and hyperbola in the middle of the profile with depth of (4.2m) . When putting the curve on this hyperbola we notice appearance of the profile features with 20.3cm/ns vielocity and isolation constant of 2.2 explained in the (5) fig.

Also, we notice air gap in the 324 profile while processing with Trace Edit filter and that gap is in the middle of the path with depth of (4.45m) as it is explained in the (6) fig.

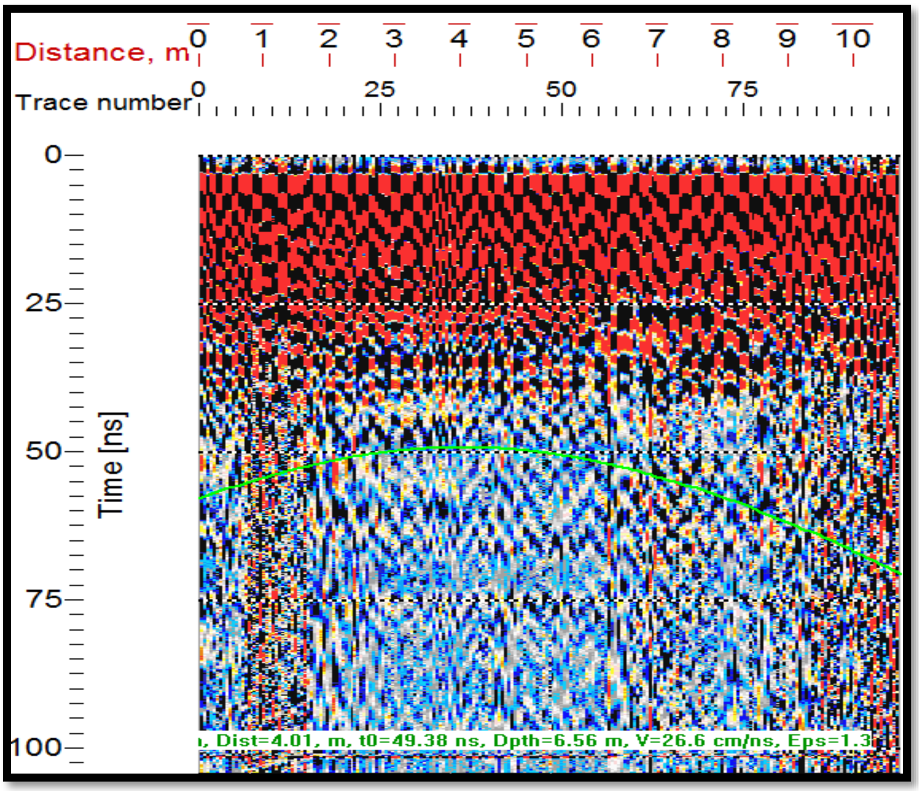


Figure 4 - Profile N0.323After the apply Background Removal.

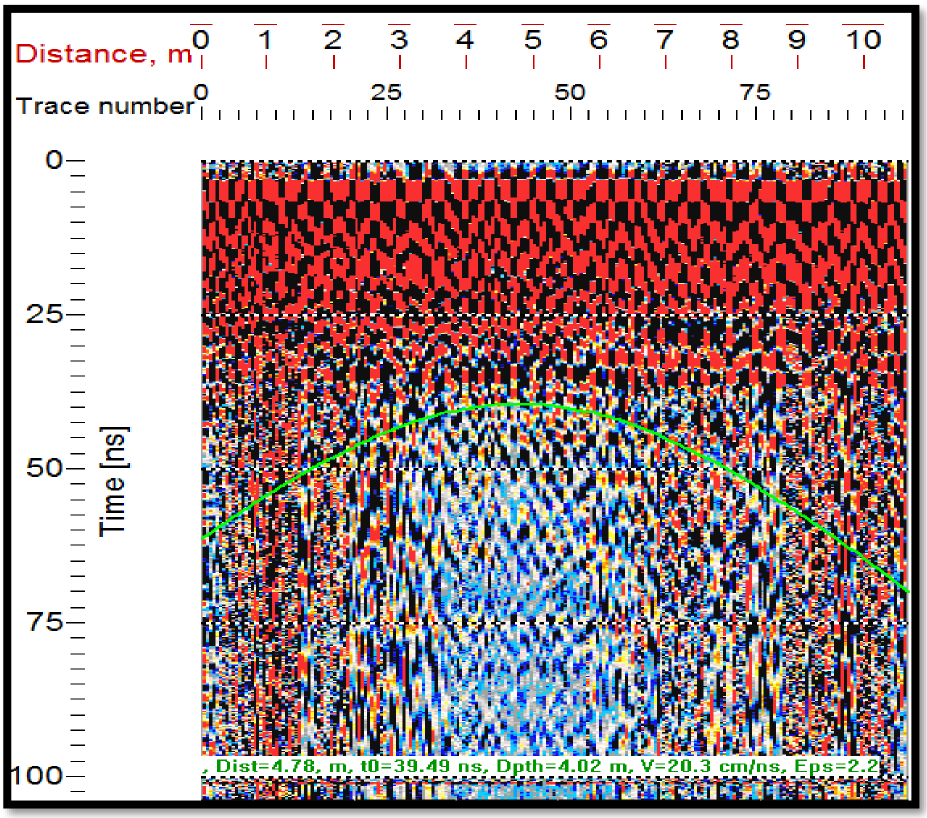


Figure 5 - Profile N0.324After the apply Background Removal.

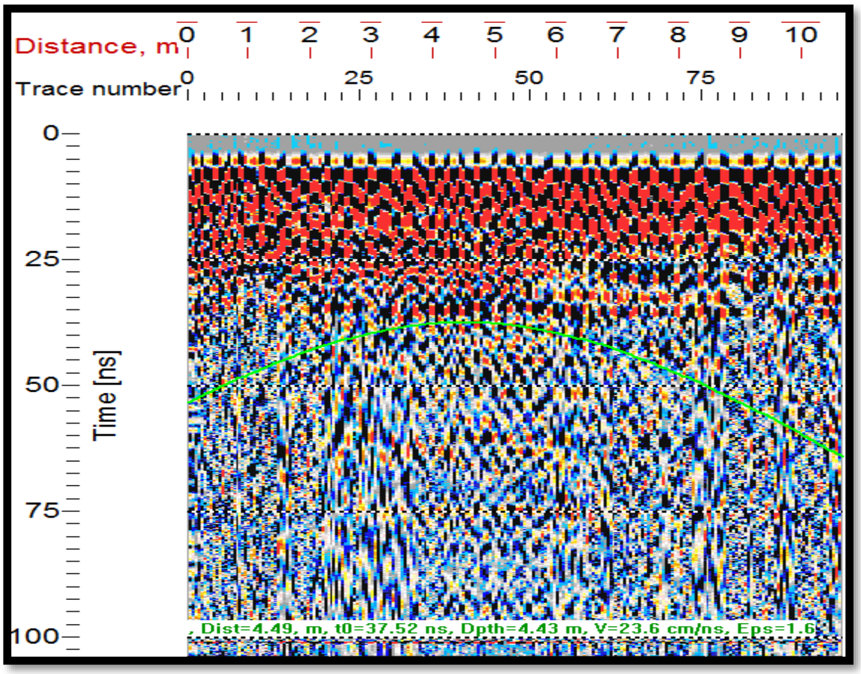


Figure 6 - Profile N0.324After the apply Trace Edi.

When applying the Amplitude Correction filter on the 325 profile , we notice there a distort and revealing of hyperbola with a distance of 4.78m from the path beginning with a depth of 5.30m. When putting is an air gap on this hyperbola we notice appearance of the profile features with 28.7cm/ns vielocity and isolation constant of 1.1 as it is explained in the (7) fig.

Impact Factor:

ISRA (India) = **1.344**	**SIS** (USA) = **0.912**	**ICV** (Poland) = **6.630**
ISI (Dubai, UAE) = **0.829**	**РИНЦ** (Russia) = **0.234**	**PIF** (India) = **1.940**
GIF (Australia) = **0.564**	**ESJI** (KZ) = **1.042**	**IBI** (India) = **4.260**
JIF = **1.500**	**SJIF** (Morocco) = **2.031**	

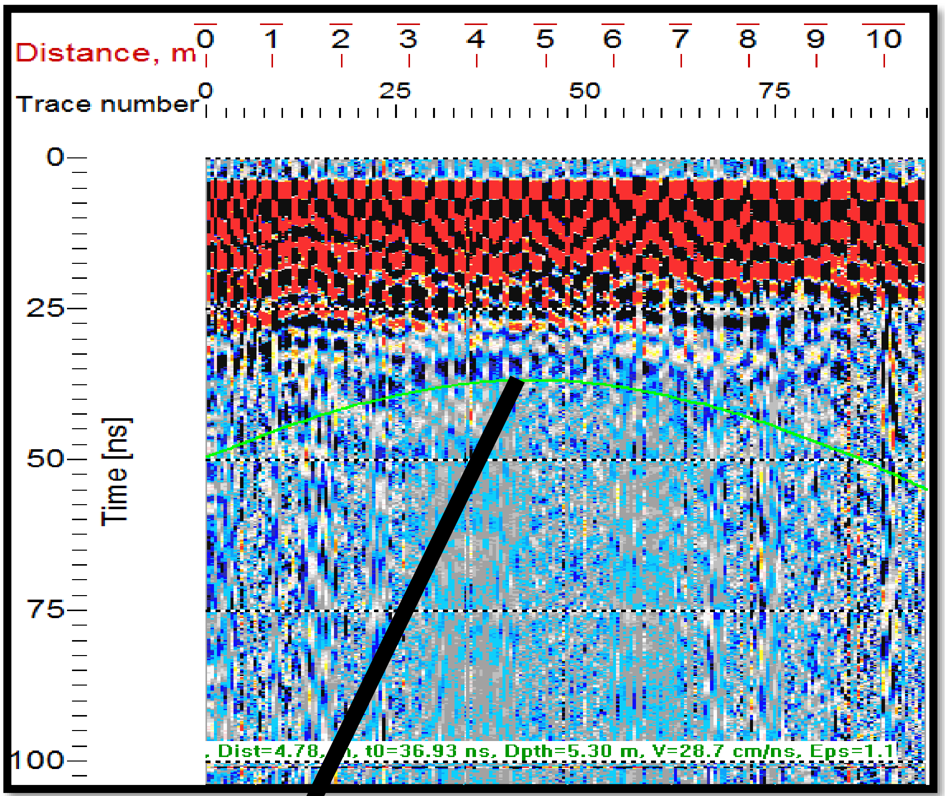
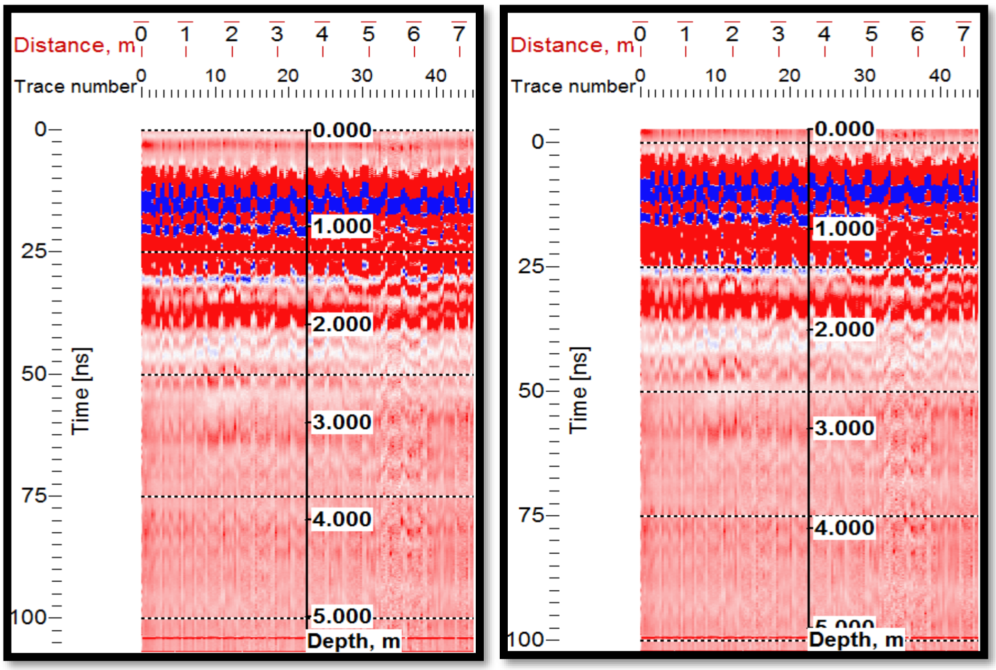


Figure 7 - Profile N0.325After the apply Amplitude Correction.

When the 326 profile is processed by the filter Time – Zero we notice the penetration depth with depth of 5.3m before processing to be of 5m after processing as it explained in the (8) Fig.



before apply the Time-Zero(b) After apply the Time-Zero(a)

Figure 8 - Profile No. 326.

When applying the Amplitut Correction filter on the 326 profile , we notice there a distort and revealing of hyperbola with a distance of 3.06m from the path beginning with a depth of 3.5m. When putting the curve on this hyperbola we notice appearance of the profile features with 11.2cm/ns vielocity and isolation constant of 7.2 and with a depth of 4.33m as it is explained in the (9) fig.

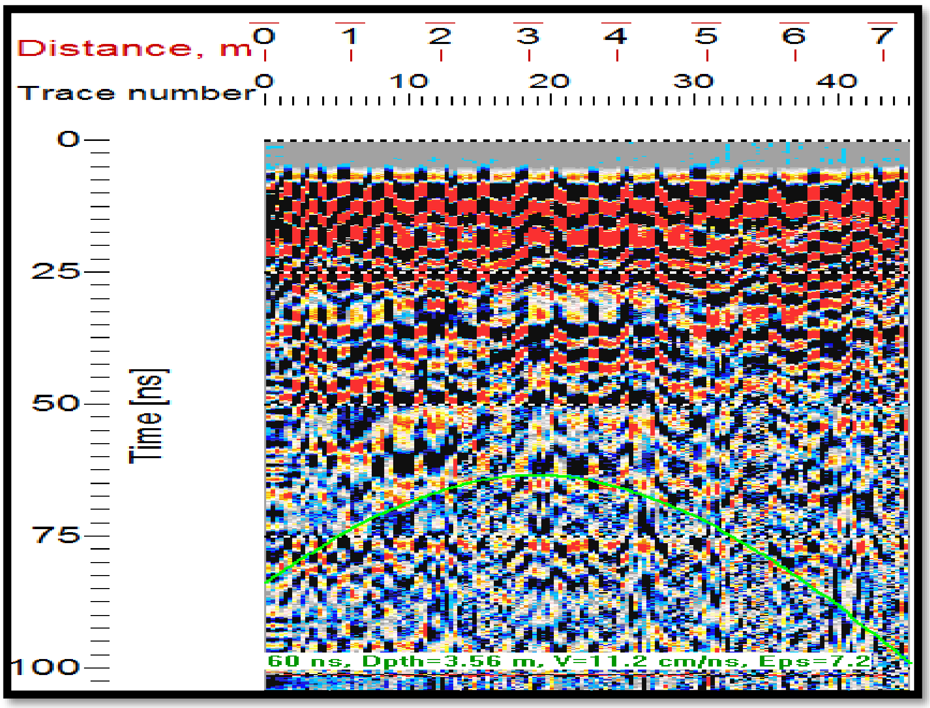


Figure 9 - Profile N0.326After the apply Amplitude Correction.

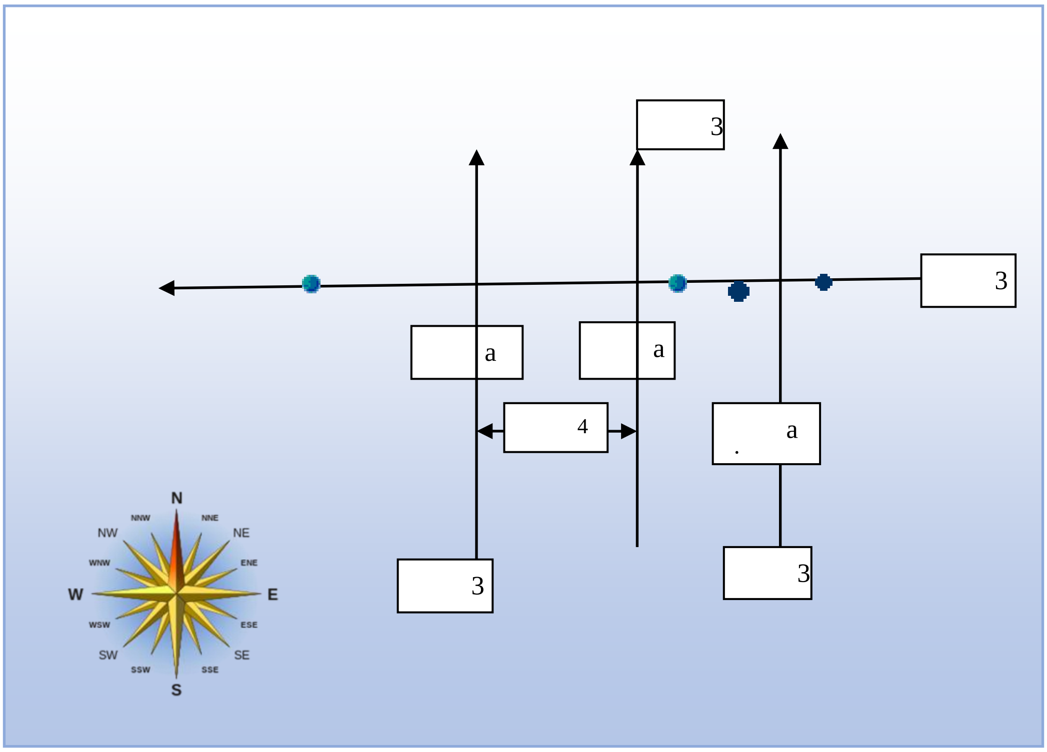


Figure 10 - Field work space scheme using GPR.

Conclusions Remarks

1- Detecting air gaps depth of 5 meters below ground level used GPR, which confirms the existence of an old Musalla.

2- Prove the quality of the antenna 250 to depths ranging from (2-6) meters.

References:

1. Sushil Sheena Suvarna (2004) Reconstruction of ground penetrating radar images using techniques based on optimization. a thesis submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the Degree of Master of Science, p.1-4.
2. Hannu Luodes (2008) Natural stone assessment with ground penetrating radar. Estonian Journal of Earth Sciences, 57, 3, 149-155.
3. Millsom J (1996) Field Geophysics, 2nd edition. (published book).
4. Conyers LB, Goodman D (1997) Ground-Penetrating Radar, an Introduction for Archaeologists, AltaMira Press, Walnut Creek, California, USA.
5. Conyers LB (2009) Ground-penetrating radar for landscape archaeology: Method and applications, Department of Anthropology, University of Denver, Colorado, USA.
6. Lahouar S (2003) Development of Data Analysis Algorithms for Interpretation of Ground Penetrating Radar Data, Dissertation submitted to the Faculty of the Virginia Polytechnic Institute and State University in Electrical Engineering in partial fulfillment of the requirements for the degree of Doctor of Philosophy.
7. Harry M. Jolt (2009) Ground penetrating radar (GPR): theory and Applications, First edition, Elsevier's Science and Technology, Amsterdam, p. 4-7.
8. El Said, M.A.H.(1956) Geophysical prospection of underground water in the desert by means of electromagnetic interference fringes, Proc. I.R.E., Vol. 44, p. 24–30 and 940.
9. Daniels JJ (2000) Ground Penetrating Radar Fundamentals, published report, Department of Geological sciences, Ohio State University,Region V, p. 1-21.
10. Davis JL, Annan AP (1989) Ground penetrating radar for high- resolution mapping of soil and rock stratigraphy. Geophysical prospecting. Vol. 37, p. 531-551.
11. Korleski C (2008) Application of Geophysical Methods for Site Characterization. Ohio Environmental Protection Agency Division of Drinking and Ground Waters, 23 p.