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Measurement of Electromagnetic Radiations Emitted by 132 KV Transmission Extended in Kirkuk

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Abstract: Human is continuously exposed to electromagnetic fields (EMF) emitted from some sources such as electric transmission lines, telecommunication networks. Thus .EMFs of various frequencies are ubiquitous in our environment. Power transmission lines with very low frequency produce electromagnetic fields. Scientists have wondered for a long time about the health hazards resulting from these fields on peoples and the living organisms. The aim of this work is to investigate the levels of electromagnetic fields emitted from 132KV HV transmission lines extended In Kirkuk city .Research had been conducted in two parts, mathematical calculations and practical measurements and comparing these measurements with the standards reference values. result indicate that they fall within the safe limits recommended by the world Health organization, so there is no risk from exposure to these fields, if the exposure is for a short and discontinues periods.

Keywords: 132 KV transmission lines, electromagnetic field.

1. Introduction

With the appearance of the transmission lines more than one hundred years ago, immediately started discussion and public concerns. When the first transmission line was built, more electrocutions occurred because of people climbing up the towers. As the public became aware of the danger of electrocution the aesthetical effect of the transmission lines generated public discussion. The high voltage on the transmission line produces corona discharge that generates electromagnetic waves. Electromagnetic fields of various frequencies are ubiquitous in our environment. Power transmission lines and high voltage cables carrying electrical currents with very low frequency , so they generate an electromagnetic fields around them . Scientists have wondered for a long time about the health hazards resulting from these fields on the living organisms. So, a lot of researches have been conducted on this topic [1].

However, the results of researches, did not give any definitive conclusions for the development of clear rules and unambiguous of this issue. Based on the researches and studies , the World Health Organization classified electromagnetic fields as the fields which may be cause some disease .With the increasing awareness of people about the negative health effects caused by electromagnetic fields emitted from high power transmission lines, investigations on this issue had been raised day by day. Several research articles presented survey results showing that the exposure to magnetic fields increases that cancer occurrence [2].

2. Electromagnetic Fields Biological Effects

Scientists classified the Electromagnetic radiation into two types: ionizing radiation and non-ionizing radiation, based on its capability of ionizing atoms and breaking chemical bonds. Ultraviolet and higher frequencies, such as X-rays or gamma rays are ionizing, and these pose their own special hazards and Non-ionizing radiation. Most of the molecules in the human body interact weakly with electromagnetic fields in the radio frequency or extremely low frequency bands. One such interaction is absorption of energy from the fields, which can cause tissue to that up, more intense fields will produce greater heating. This can lead to biological effects ranging from muscle relaxation (as produced by a diathermy device) to burns [3].

3. Literature Review

Some large studies, including a large United Studies, have failed to find any link between living near power lines and developing any sickness or diseases such as cancer. One study from 1997 found that it did not matter how close you were to a power line or a sub-station, there was no increased risk of cancer or illness.

The mainstream scientific evidence suggests that low-power, low-frequency, electromagnetic radiation associated with household currents and high transmission power lines does not constitute a short or long term health hazard. Some studies, however, have found statistical correlation between various diseases and living or working near power lines.

With the increasing of the application of EHV transmission lines operation, electromagnetic pollution caused by power lines attract more people's attention, such as the commonwealth Associates Inc or(CAI),.These associates work on the measurement of the magnetic fields emitted from high voltage transmission and distribution power lines .Calculations are also done by theme to observe the changes in the magnetic field due to changes in the power lines and the substation.[4]

Another (RAPID) Risk Assessment Program project was to conduct a survey that gathers information about the personal exposure to electromagnetic fields for around a thousand people ,the activities that could increase or decrease the personal exposure(work and going to bed respectively),gender and age differences as well as sizes and mobility of residences differences[5].

Fei Wang, Weijie Wang ,Zhichao Jiang, Xuezeng Zhao were studied some helpful conclusions on the reduction of electromagnetic field intensity of EHV transmission lines and the estimation of the EHV transmission lines status according to the distributions of electric field by Analyzing of Electric Field Intensity around EHV Transmission line[6].

Guangwen pan and Jilin tan analyzed the radiation effect of micro strip transmission line [7].

Floderus et al .(1993) investigated sets of electromagnetic field measurements made at 1015 different workplaces. This study covered 169 different job categories, and participants wore the dosimeters for a mean duration of (6-8 h). The most common measurement was (0.05 uT) and measurements above (1 uT) were rare.[8]

4. Acceptable limits for exposure to EMF

There are established biological effects for a high level for a high level exposure to magnetic fields well above 100 uT (1000 mG). In a residential setting , there is "limited evidence of carcinogenicity in humans and less than sufficient evidence for carcinogenicity in experimental animals" ,in particular, childhood leukemia ,associated with average exposure to residential power-frequency magnetic field about 0.07 uT(0.7 mG)in Europe and 0.11 uT(101 mG)in North America [9].

There are European and U.S. standards. In these criteria ,the frequencies of different Electromagnetic fields have a "reference value" .In addition ,No reference to electromagnetic fields ,safe approach to high-voltage lines. It is therefore to "the list of power plants "approach to safety will be determined the safe distance of horizontal and vertical lines and allows for spaces to record the base line facility which must be taken .
At the international level in 1990, and the International Association for Radiation Protection Non-ionizing committee radiation -IRPA/INIRC) and the World Health organization (WHO) and the United Nations Environment Program (United Nations Environment program - UNEP)[10].

Table 1: Some limit levels for the fields electric and magnetic fields

Sources of the field	Electric field(v/m)	Magnetic fields (mG)
Building electrical systems	1-10	1-5
Electrical appliances	30-300	5-3000
Around substations	1-10	10-60
Near the power transmission line	5-3000	1000-7000

5. Methodology

The research has been conducted in two parts mathematical calculations and practical measurements. The process of measurement for detection the electromagnetic field is to make the most appropriate way or to establish an mathematical model. modeling process has shown thousands of different topics in the world and even the best model does not represent the real situation, and completely unpredictable. Therefore, the results of modeling can be contain margin of error. The magnitude of the field is the highest under the lines and decrease rapidly with the increasing of distance from the lines. From the point of view of human exposure the most critical point are those within or close to the right of way of the lines .So , magnetic field density is calculated at ground level under the high voltage channel(transmission lines). Finally, complete content and organizational editing before formatting. Please take note of the following items when proofreading spelling and grammar:

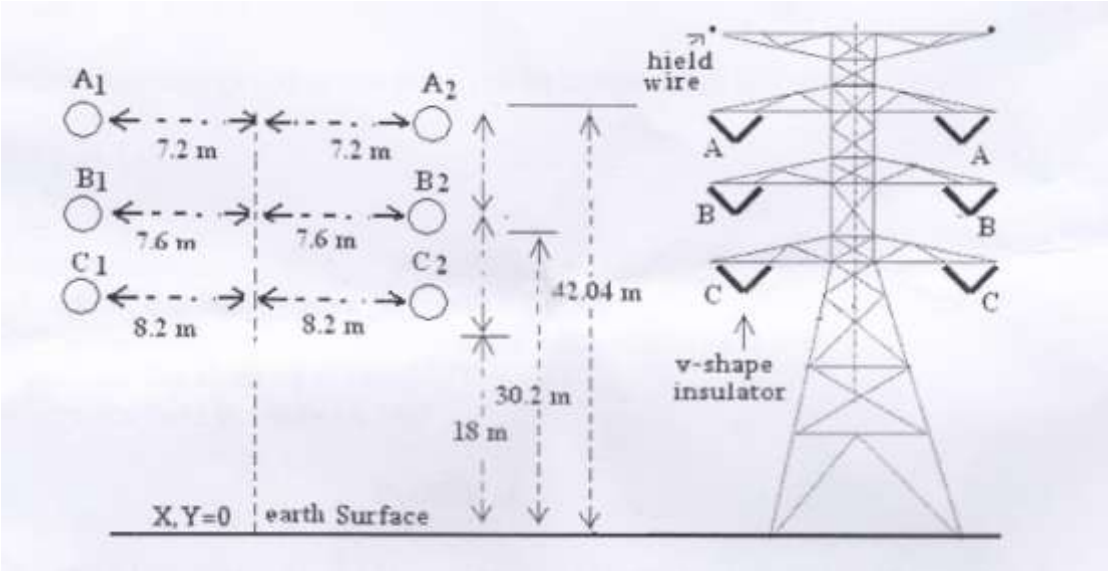

Figure 1. Transmission line with double vertical configuration

6. Mathematical Calculations

Magnetic field intensity can be evaluated using image and shadow method .So ,the quasi-static magnetic field of a line source in free space above earth is equivalent to the magnetic field of the line source plus a "complex image" in free space The magnetic field intensity at the point P is obtained by considering the contribution of all conductors, assuming parallel lines over a flat earth A line conductor is located at (xi;yi) with electric current of Ii .The intensity of the magnetic field due to a very long conductor can be calculated according to pew, Savart law as follows:[11]

$H=1/2\pi r(A/m)$ .....(1)

Where :

H : is The magnetic field intensity (A/m)

I: is current flowing through the conductor (A)

r: is the radial distance to the destination point (m)

In this work is used the help of the shadow method to determine the intensity of the magnetic field .Shadow method which states that if conductor on the earth's surface electrified ,then the magnet field will be resurrected the conductor.
Figure(1) shows a conductor which replaced by imaginary earth conductor. distance between the original conductor and the earth surface is Yi, so if there is a point P that is location at the earth surface, then the magnet field intensity at this point is the total magnet field intensity generated by each current in native, So, if current in the original conductor is Ii, then the magnetic field intensity at point p is:

$H=1/2\pi r[2Yi/(X^2i+y^2i)] * A/m$

Magnetic flux density (B) at that point can be calculated as follows:

$B=\mu 0\ H.(\mu T)$

Where :

I=current (ampere)

Y=height of conductor above the earth surface(m)

X=distance between the conductor and the reference point (m) with (permeability constant).

H= the magnetic field intensity (A/m)

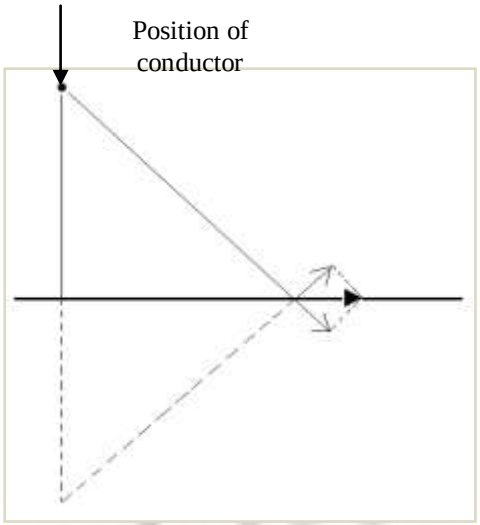

Figure 2: The magnetic field generated by current Ii and his shadow

7. Results of mathematical calculations:

Results of mathematical calculations are indicated in table (2) , and the graphical representation is indicated in figure(3).

Tabel (2): Mathematical calculations

Extending distance from X axis in (m)	M=Mathematical calculations of magnetic field density in *(mG)*	Standared value of the magnetic field density in(G)
-60	1.5	1.5
-50	1.7	1.7
-40	2	2.3
-30	2.2	3.1
-20	2.8	4.9
-10	4.8	7.8
0	9.9	12
10	10.2	14.2
20	6.3	10.4
30	3.9	6.3
40	2.3	4.1
50	1.9	2.1
60	2	2

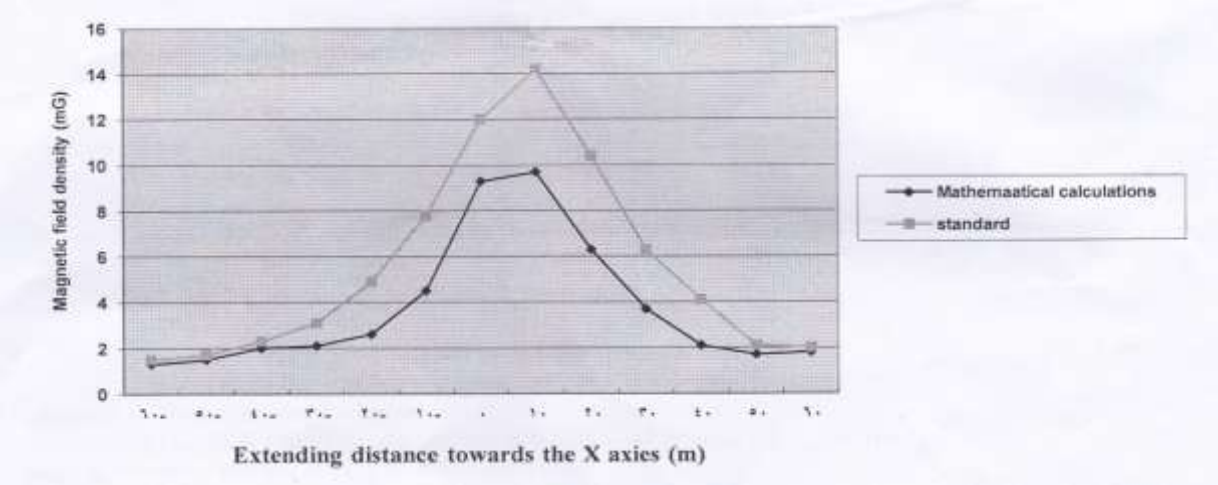

Figure 3: Graphical representation of mathematical calculations

8. Practical measurements

practical measurement are conducted by using the electromagnetic field tester(EMF 824) shown in figure (4) at one meter above the ground beginning from the center of the tower as shown in figure (5).

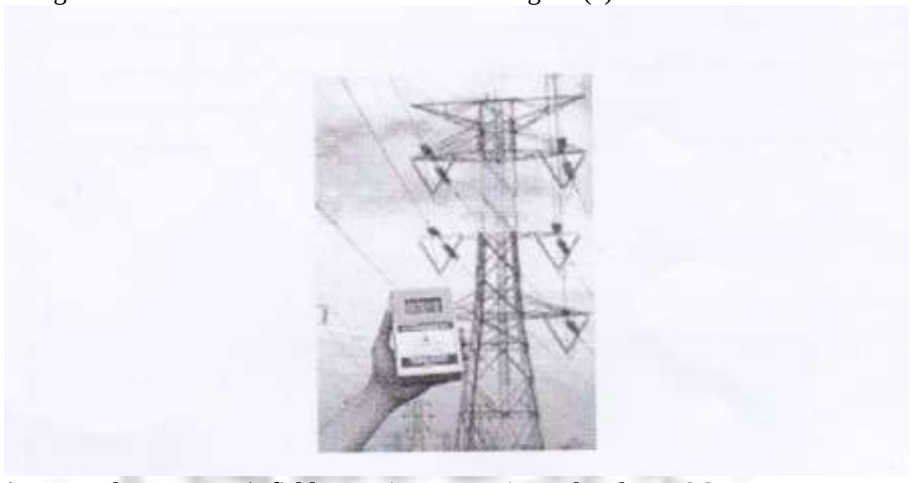

Figure 4. Electromagnetic field tester (EMF tester) type band pass AC gauss meter

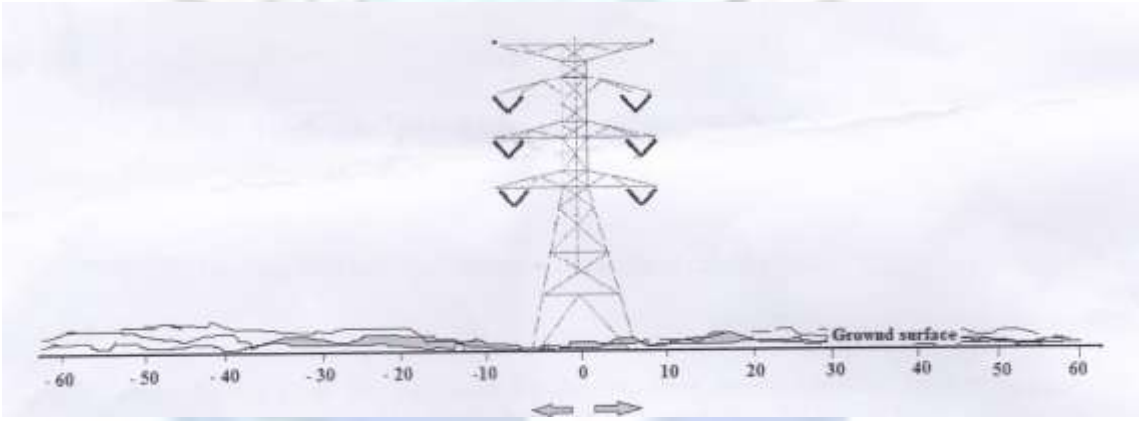

Figure 5. direction of (EMF) measurements

9. Results of practical measurements

Results of practical measurements are indicated in table (3), and the graphical representation is indicated in figure (5).

Table (3): practical measurements

Extending distance from X axis in (m)	Mathematical of magnetic field density in (mG)	Standard value of the magnetic field density in(mG)
-60	1.3	1.5
-50	1.5	1.7
-40	2	2.3
-30	2.1	3.9
-20	2.6	4.9
-10	4.5	7.9
0	9.6	12
10	10.1	14.2
20	6.3	10.4
30	3.7	6.3
40	2.1	4.1
50	1.7	2.1
40	1.8	2

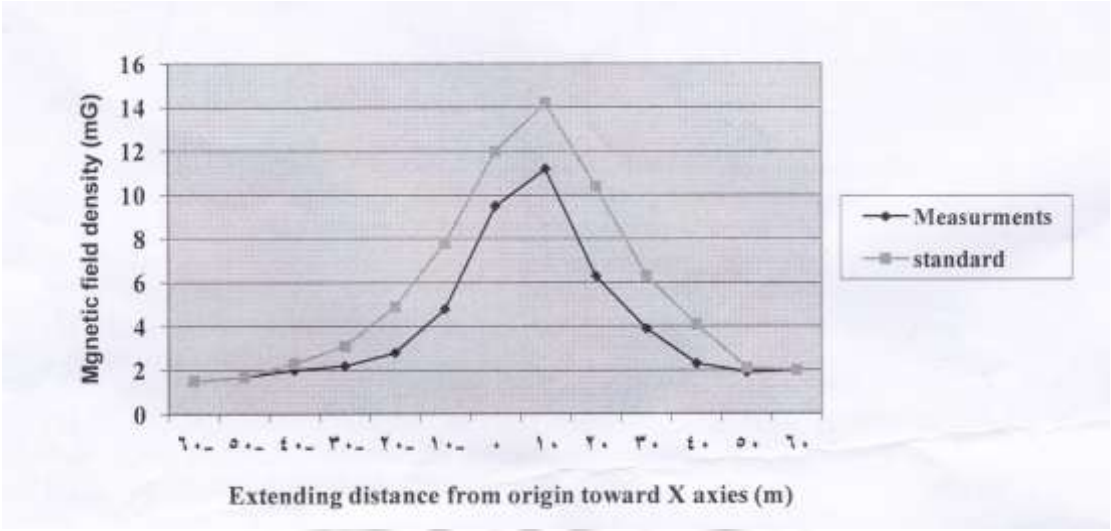

Figure 6. Graphical representation of practical calculation

10. Discussion

From figure (3,6) we may note the measurement results obtained by the comparison with modeling results .From results we can see the model used ,is very well represent the measurements with an acceptable margin of error in the nature of the actual situation .Modeling result obtained in this research represent the highest levels measured. Modeling the difference between the measurement (such as direction of the measurement point ,and the present circumstance of meteorology ,buildings ,trees, metal reflectors ,the sensitivity of the measuring tool ,etc) are not included in the modeling because of exactly the lack of compatible. even the best model cannot represent the real situation, and predict exactly. Therefore, the model may share the results of a particular error.

11. Conclusion

The measurement of the magnetic field and implementation of new techniques that enhance the reduction of the exposure to this field which include by the power lines have been the concern of many engineers for the past years ;this lead to the publication of many studies and development researches in this subject .High values of electromagnetic field (EMF) can cause negative health effects foe peoples who have been exposed to these field due to working in substations or living close to high power transmission lines ,so there is a need and obligation according to WHO to calculate and measure the fields. In this research a mathematical model for calculations of magnetic field density (B) in a high voltage power transmission line 132KV has been conducted, By comparing the resulting values of measurements with the values of international standards reference electromagnetic fields arising from the extension of high-tension transmission lines 132 KV in Iraq, we can see that they agree with the standard levels , so , there is no negative health effects due to exposure to electromagnetic.

12. References

[1]. Shafer, D. Evolution of electric and magnetic fields {EMF}. Systems Studies and Transmission 2000. PP, 3 - (2004)
[2]. American Journal of Epidemiology, 131 (9), 923-937, November (1992).
[3]. U.S Environmental Protection Agency, Evaluation of the potential carcinogenicity of electro 90 = 005B , October 1990.
[4]. Shafer, D. {2004} Evaluation of electric and magnetic fields {EMF} . Systems studies and Transmission 2000. PP .3.
[5]. Gailey , P.(April 1998) Symposium :introduction and context .EMF engineering Review Symposium . PP . (1-8).
[6]. International Conference on Electrical and Control Engineering By Fei Wang Weijie Wang , Zhichao Jiang , Xuezeng Zhao Issue : June 2010 . pp 3343-3346.
[7]. The and Full - wave analysis of radiation effect of micro Number 1,, PP.77-85, DOI: 10.1007/BF016739081-A.
[8]. Floderus .B et al. Occupayional exposure to ekectromagnetic fields in relation to leukemia and brain tumors: acae - controk study in sweden. Canser Causes Control 4 (5) : PP .465-476. (1993).
[9]. "Electromagnetic fields and public health". Fact sheet No.322 world health organization .June 2007. http://www.who.int/mediacenter/factsheets/fs322/en/index.html.Retrieved 2008-01-23.
[10]."Electric and magnetic Fields Associated with the use of power "(PDF).National Institute of Environmental Health Sciences . 2002-06. http://www.niehs.nih.gov/health/docs/emf-02.pdf Retrieved 2008-01-29.
[11]. Amiri R.,Hadi H., Marich M. The influence of sag in the electric field calculation around high voltage overhead transmission lines, Electrical insulation and dielectric Phenomena EEE conference. PP. 206-209-(2009).