Comparison of Electromagnetic Wave Intensity from Different Type of Communication Towers in Kurdistan Region

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ABSTRACT

With increasing of the usage of the mobile communication devices and internet network information the electromagnetic pollution produced. the entry of private telecommunications companies in Iraq has been started since 2003, These companies began to build up cellular towers to accomplish the telecommunication works, but they ignore the safety conditions imposed for the health and environment as a result a health risk for life beings and environment. The aim of this work is to determine the safe and unsafe ranges. Discuss damage caused by radiation emitted from (Asia cell) and (Korek telecom) base stations in Erbil and Sulimania Cities, and compare it with international standard exposure limit. Practical measurements of power density around base stations has been accomplished by using Electromagnetic Field strength meter.

1. INTRODUCTION

Electromagnetic pollution which may be caused by cell tower, power lines, and Wi-Fi. etc, has received attention by scholar because it is role in causing health problem such as brain cancer & Brest cancer, blood pressure, etc (Wen and Huang, 2017, Runak et al., 2017, Kundj, 2009). The electromagnetic field background that can be found everywhere is about (800 micro Gauss) (Santini et al., 2002). It is important to know the safety exposure limit of radiation exposed of the human body and for Iraqi country the standard limit is \(400 \mu \text{W/cm}^2 = 0.13 \mu \text{tesla}\) (Schauer, 2009). So we are surrounded by electric, magnetic, fields from every were, but this work special doing on the cell tower radiation. Many of scholar are warned about the exposure to the
radiation of those towers for long period and it was appointed as one of the causes of many diseases (Pachuau. L and Pachuau. Z , 2014), so we cannot say that it is from a particular devise or sours, plus the fields from earth and Sun and the distribution produced from the changing of the weather (Santini et al., 2002). Three expert agencies that usually classify cancer-causing exposures (carcinogens) – the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), and the US Environmental Protection Agency (EPA) (Gonzalez and Pascual, 2002, Meena et al., 2016).

Wireless telecommunications rely on Cell phone towers consist of antennas and electronic equipment which serve as hubs for cell phones and local wireless networks (Volkow et al., 2011).

In this work, determine the safe and unsafe ranges radiation emitted from (Asia cell) base stations and (Korek) telecom base stations, and the best ways in which can be minimize its exposure level to avoid its negative health effects.

2. MATERIALS AND METHODS

The study was performed in Erbil and Sulimania cities, twelve regions are taken power density of cell tower, power density measures in many units such as, mwatt/meter², µicro tesla, and our measurement was in µtesla. Different type of towers are taken to measure it is power density such as; Asia and Korek, Nawroz, Fastlink, and TV towers. The measurement was done by using Electromagnetic Field strength meter model (Extech 480846 RF/EMF Strength Meter). Number of towers involved in these twelve regions for different communication company are: Three tower for Nawroz Telecom Network Company, Two tower for Asia cell, One for Fast Link Company, Three tower for Korek telecom.

3. RESULTS AND DISCUSSION

Power density (Pd) is the quantity of electromagnetic energy per unit area and second. In this study, Pd with the distance for Asia cell tower near Mozafaria quarter is measured as show in figure (1), from this figure, the maximum value of Pd measured at (80m) and it is (0.66 µtesla), other studies showed pd of Asia cell towers at same distance is [0.84µtesla] (Sivani and Sudarsanam, 2012). Our result Compare with the international reports at the distance of 80-m, power density having a minimum value [Pd=0.4µtesla at distance=100-m]. (Sivani and Sudarsanam, 2012).

![Figure 1: power density with distance at Mozafaria quarter, over Lassa hotel, Erbil.](image-url)
Other studies showed the power density have minimum value \((P_d=0.55 \text{ µtesla})\) at the distance near \((50-125\text{ meter})\) and a maximum value \((0.82 \text{ µtesla} =16\text{ mwatt/cm}^2)\) near \((200\text{m}).\) (Brnes and Greenebaum, 2007).

Fig (3), shows the power density of Nawroz network towers and it is fluctuated between \((0.6\text{ to }0.7\text{µtesla})\) these value was smaller than of the Korek mobile cell tower \((0.86\text{µtesla})\) as shown in figure(4), because for Korek Mobile cell tower a large number of antenna used for each tower.

From the international report, the high zone intensity of towers lies between \([50 \text{ to } 300\text{ meters}]\) far from the towers (Murthy et al, 2009).

For Korek tower in Zelan quarter as shown in figure(5), the maximum value of \(P_d\) was \((1.3\text{µw/cm}^2=0.234 \text{ µtesla})\) at distance \((80\text{m}),\) and it is value is higher in the south side of towers because of the large number of antenna used in this side compared with the north side. The minimum value at zero distance for tower station is \([0.49 \text{µw/cm}^2 = 0.144 \text{µtesla}]\) and the maximum value of \(P_d\) is \([ 0.6 \text{µw/cm}^2 = 0.19 \text{µtesla}]\) at distance \(100\text{meter far from the tower}.

Power density as a function of distance of (Asia cell) telecom tower in Sulimania city was shown in table (1).
Table 1- Asia cell tower, Ibrahim Ahmad quarter, Sulimania. No. of GSM=6, NO. Antenna=3

| Distance (m) | Left side of tower power density (µw/cm²) | Right side of tower power density (µw/cm²) |
|--------------|-------------------------------------------|------------------------------------------|
| 0            | 0.84                                      | 0.63                                     |
| 25           | 0.80                                      | 0.12                                     |
| 50           | 0.30                                      | 0.16                                     |
| 75           | 0.35                                      | 0.24                                     |

From table (1), Power density have high value at zero distance under the towers, because at the region around this base station many towers located and it is region high than tower located region. Obtained value of Pd is hundred times smaller than that of Iraqi standard exposure limit (Schauer, and Linton, 2009).

Asia cell tower in Kazewa 2 quarter in Sulimania city shown in figure (6), the maximum value of Pd measured at zero distance \([pd=0.55\text{µtesla}]\) because tower located region is higher Asia cell tower base station region around it, (the nature of earth for base station place was high and low).

Figure 6: power density near Kazewa2 quarter, Sulimania.

the Pd data taken for Korek telecom tower in Erbil is higher than Korek telecom tower in Sulimania as shown in table (2), and these is because of the two reason; First in Sulimania earth surface was not smooth so the number of towers are large so they minimize the power of towers. Second, the number of Antenna of Asia towers and Fastlink towers is smaller (3-4) than Korek and Nawroz towers (having more than 6 antenna for each towers).

Table 2- Korek telecom tower cell, Sulimania, No. of GSM=9, High of tower=14m

| Distance (m) | Power density (µw/cm²) |
|--------------|------------------------|
| 0            | 0.34                   |
| 25           | 0.06                   |
| 50           | 0.28                   |
| 75           | 0.21                   |

The data and figures above showed that the minimum exposure limit was for Asia cell towers and the maximum exposure of Pd was for Korek Telecom towers especially in Erbil! Comparison with Iraq standard value \([400\text{µwatt/cm²}=0.13\text{ µtesla}]\) our result between \([(0.35\text{ to } 0.86)\text{ µwatt /cm²}]\) (Aghav 2014, IARC, 2011).

Figure (7) shows comparison power density of different communication cell tower [Korek, Asia and Zain] in Erbil city, where Korek cell tower power density higher than other type of towers.

Figure 7: Power density of different cell tower in Erbil.
3.1, Mental Health Studies

The power density absorbed by human body increase with increase the time of exposure radiation (Pathak et al 2003)

Two recent studies found that Wi-Fi could affect young child’s brain functions. There are recent Canadian news reports of Canadian schoolchildren getting sick from Wi-Fi routers installed within the schools. (Vesperman, 2013, Meena, 2016, Kumar N and Kumar. G. 2009)

Dr R RMohanty and KC Purohit surveyed 82 Undergraduate students between 20 and 30 on health effects from cell phone use, and found the complaints such as headaches, sleep disturbances, pain in the face, memory loss, and lack of concentration. This was published in 2011 in the Indian Journal of Community Medicine. (RMohanty and Purohit 2012).

From internal report of Rezgary hospital/Oncology departmental in Erbil city, the rate of Breast cancer from (2007 to 2013 ) years increased about three times as shown in figure (8), and electromagnetic pollution is Probably one of the reasons of these diseases (Rezgar. H ,2015).

![Figure 8: Rate of Breast cancer in Erbil city](image)

4. CONCLUSIONS

Power density of different types of cell tower can be measured. The minimum value of Pd is near towers (zero distance). Nawroz telecom towers have maximum value (0.72 μtesla), and maximum value of Korek telecom in Erbil is (1.26 μwatt/cm²), and in Sulimania max value is (0.34 μwatt/cm²), Asia Cell towers (0.84 μwatt/cm²). So the maximum power density is for Korek and Nawroz telecom because of the high power that these companies are used to send and receive from antenna towers.

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