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BTS Radiation Performance Evaluation for Nahr Elnaeel State, Sudan

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Abstract: *The effect of electromagnetic radiation on human health is the subject of recent interest and study. ICNIRP (International Commission on Non-Ionizing Radiation Protection) study has concluded that the exposure levels due to cell phone base stations are generally around one-ten-thousand of the guideline levels. Moreover, the WHO has classified mobile phone radiation on the IARC (International Agency for Research on Cancer) scale into Group 2B - possibly carcinogenic to humans. That means that there could be some risk. On the other hand, telecom service providers are worried about QoS (quality of service) of mobile services after implementation of stricter norms regarding cell tower radiations. This paper presents the Comparative Analysis of Base Transceiver Station (BTS) Effects on the object Body in Nahr elnaeel, Sudan This was achieved using the measured and calculated values of power density.*
Keywords*: Cell tower radiation, Compliance Distance, ICNIRP, QoS*

I. Introduction

Cell phone technology has grown exponentially in the last decade. Large number of BTSs/towers is to be deployed to meet the communication demand. Presence of large number of cell phone towers in populated area starts the debate on biological impact of cell tower radiation. Most of the countries has adopted the radiation norms as suggested by the ICNIRP.As per the ICNIRP, the value of power density at general public exposure zone should be less then f/200 watt/m^A2 for 400-2000 MHz band. Here f is the frequency used by the mobile operator in Mhz. the next section handle methods, section three involved results and discussions and section 4 conclude the paper.

II. Electromagnetic field (EMF)

Radiation is the flow of photons through space. Each photon contains a certain amount of energy, and the different types of radiations are defined by the amount of energy found in the photons. The electromagnetic spectrum is the range of all types of EM radiation. X-rays used in hospitals or the radio waves from a radio station are all part of this spectrum.

2.1 Uses of Electromagnetic Radiation

Apart from the use in telephony, some other important uses of electromagnetic radiation as shown in figure 1 below, in our day to day life are as follows: Conversion of electromagnetic radiation from Sun (solar energy) to chemical energy (food) by plants through the process of photosynthesis. X-ray used for bone structure imaging at hospitals.

- X-ray used in Security Scanner at Airports and shopping malls
- Microwave used in microwave ovens and radars
- Radio waves used in radio and television broadcasts.
- Visible light used for normal vision.
- Infra-red waves used in night vision goggles and in TV remote controls.

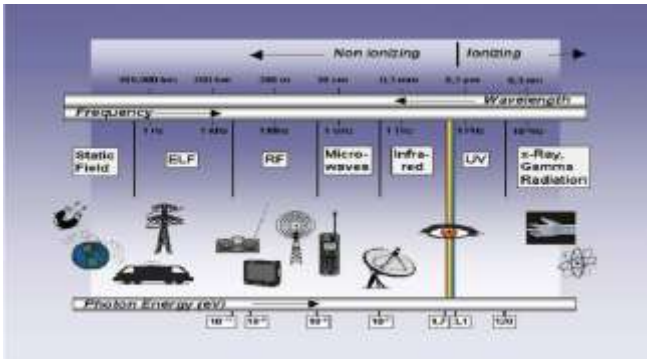

Figure1: Complete Electromagnetic Spectrum

The most common sources of exposure include the FM/AM radio, TV transmission, Cellular networks using GSM, CDMA, WLAN, Bluetooth, Zigbee1, WiFi and WiMax technologies, which occupy the VHF, UHF, L, and S band of frequencies. The effects due to FM, AM and TV transmissions are localized to the areas around the location of towers and the Bluetooth, Zigbee applications operate at low power levels.

Method

Power density is considered to evaluate the performance of BTS for three different area in Nahr elnaeel, Sudan through comparing calculated data and measured data using EMF Estimator and NADRA respectively the table which is shown below describe the difference also MATLAB programming language to show the result in graphical form

Table 1: Power density with respect to the distance from base station antenna for A area of Nahr alneel (W/m2)

Distance From Base Station Antenna (Metres)	**P=33W G=5dB Power Density for A service area (W/m^2)**	
	Measured	**Calculated**
10	2.032	0.0831
20	1.998	0.0207
30	1.265	0.0092
40	0.848	0.0052
50	1.479	0.0033

Table 2: Power density with respect to the distance from base station antenna for B area of Nahr alneel (W/m2)

DistanceFrom Base StationAntenna(Metres)	**P=66.7W G=5dB Power Density for B service provider (W/m^2)**	
	Measured	**Calculated**
10	1.616	0.009
20	1.059	0.0054
30	0.766	0.017
40	0.746	0.035
50	0.461	0.18

Table 3: Power density with respect to the distance from base station antenna for C area of Nahr alneel (W/m2)

Distance From Base Station Antenna (Metres)	**P=100WG=5dB Power Density for C area of Nahr alneel (W/m^2)**	
	Measured	**Calculated**
10	0.206	0.28
20	0.276	0.054
30	0.343	0.023
40	0.579	0.016
' 50	0.31	0.0091

III. Result and Discussion

Measured and calculated value of power density for three area in Nahr ALneel, Sudan is passed through MATLAB program to fetch the result and the result are shown in figure 2,3 and 4

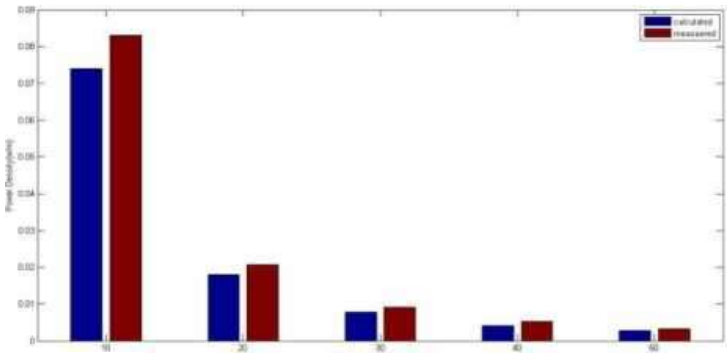

Figure 2: Power density for A area in Nahr ALneel, Sudanese

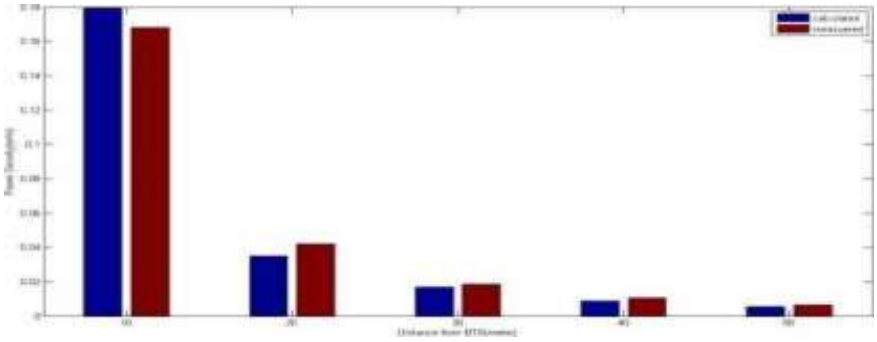

Figure 3: Power density for B area in Nahr ALneel, Sudanese

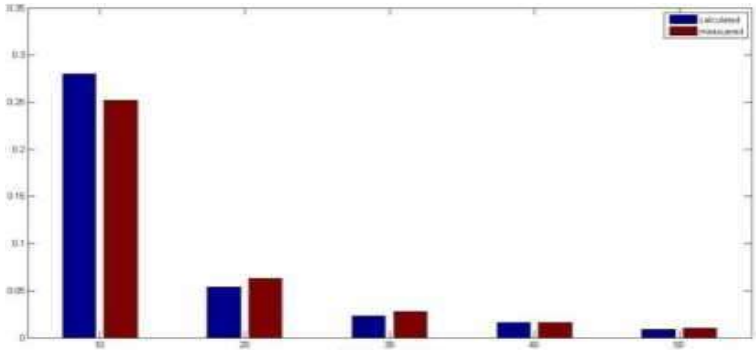

Figure 4: Power density for C area in Nahr ALneel, Sudanese

From the above figures we found that the amount of radiation in BTS is fewer than expected value and it make sense when the object's near from BTS the value of received radiation could be more than the radiation of the far one, result show that area C is the best one cause the measured value near to the calculated one.

IV. Conclusion

The maximum radiating power of base station antennas in Nahr ALneel, Sudan is in the region of 100Watts, and power density at the immediate vicinity of the antenna exceeds ICNIRP exposure guideline of 0.1w/m2. The performance Evaluation Of BTS Radiation For areas In Nahr ALneel, Sudan done through EMF estimator and NARDA instrument to calculate and measured the value of radiation from BTS respectively through power density at several distance from BTS for three areas A,B and C and we found that C is the best one from accuracy point of view.

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