International Journal of Current Engineering and Technology
E-ISSN 2277 – 4106, P-ISSN 2347 - 5161

Available at http://inpressco.com/category/ijcet

Research Article

The Reduction of Electro-Magnetic Pollution in Cellure Network Via BTS Height Control

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Accepted 10 Oct 2014, Available online 20 Oct 2014, **Vol.4, No.5 (Oct 2014)**

Abstract

Electro-Magnetic Pollution is considered a result from Electro-Magnetic fields and the most critical problem faces us today, because there are many users for this techniques. This pollution causes many diseases such like lost of hearing and sight, cancer worm etc. These Electro-Magnetic waves resulting from many resources like Tower of the base stations and Radar stations and T.V and Broadcasting towers, and Mobile stations(Dr.Grossman,2014)This study addresses reducing the Electro-Magnetic Pollution resulting from the base stations towers. The study is tried in a Place in Omdurman the area about (63km^2).The existing stations are calculated upon this area the equation of Walfish-Ikegami and the table of the prescription of GSM system.After the calculation these existing stations depending on these areas that whenever the height antenna of the base station increase, the number of these station degrease. This plays an impact role in reducing Electro-Magnetic Pollution. It also lead to provide many station and reduce the cost.There is some aspects in this study explaining improving the coverage by using the smart antenna system (switching beam of antenna system).

Keywords: *Electro-Magnetic Pollution, Cellure Network etc.*

Introduction

The Electro-Magnetic Pollution is considered one of the most dangerous pollution which attracts attention in these days. It resulted from electro-magnetic waves produced by man such as radio-waves and T.V waves and radar systems, also the base stations and the mobile systems. All the recent research and studies conducted in world countries showed that we live in Pollution world. The Electro-Magnetic Pollution represents, has the largest ratio in affecting microorganism compared to other resources, this is because whenever the users increase, we are in need of more base stations in order to supply the largest coverage. This is turn negatively affects the environment. Most of the important studies explaining this is a joint study prepared by the British Institute of Cancer and the National American Institute for Cancer, and the Swedish Institute.

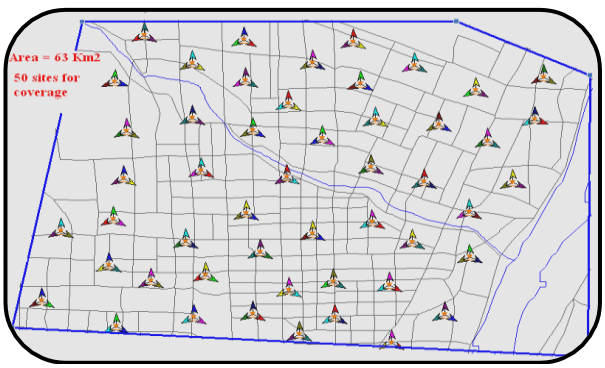
The study conclude with, there is a great danger to human being health who exposed to electro-magnetic waves as a result of dwelling near these towers, because it causes cancer worms and destruction of DNA and Al-Zahimar and insomnia, skin allergy, it also affect children behavior(McLean L. (2008).

Therefore reducing the base-stations is considered the most important things to be observed by the wireless grid with regard to health problem caused by a dangerous diseases recently appeared, because of the great increase in base stations responding the needs of great subscribers. From the material point of view the reduction of these stations reduces the cost for telecommunications companies.

This study aims at reducing the base-station in an area in Omdurman town. It can also be applicable to all the town or other town of Sudan and the outskirt.

Materials and Methods

The figure shows the area in which the study conducted. Thisarea is urban area and it is a part of Omdurman town. It's area is about 63km^2.



The base station which belong to MTN company calculate the base station in this area by using theWalfish-Ikegami equation and the table of the prescription of GSM according to following steps:

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1-The radius(d) should be used from the Walfish-Ikegamiequation.

$$Lpathmax = K + 38 \log d - 18 \log (h_B - 17) \quad (1)$$

$d = 10^{\alpha}$

$\alpha = [Lpathmax - K + 18\log(h_B - 17)]/38$

K=

142.4 for 850 MHz

143.2 for 900 MHz

153.2 for 1800 MHz

154.1 for 1900 MHz (Ericsson Radio Systems AB,1999)

To find the L path max and the height of the base station by using the prescription table of GSM.

Parameter	Mean	Value
Pout bal	BTS balanced transmitted power	47dBm
(Ldupl BTS)	External duplex loss at BTS	3dB
(Lf BTS)	Feeder and jumper loss at BTS	2dB
(GaBTS)	Antenna gain in BTS	17dBi
(MSsen)	Mobile sensitivity	-104 dBm
(Rfmarg)	Rayleigh fading margin	3dB
(BL)	Body Loss	5dB
(LNFmarg(o+i))	Outdoor +indoor log_normal fading margin	8dB
(hB)	Base station antenna height	22m
(BPLmean)	Mean building penetration loss	18dB

(Ericsson Radio Systems AB,1999)

The K value can be compensated (if gsm 900MHZ)by the value 143.2

$SS_{design} = Sbts - Lpathmax$

$$Lpathmax = Sbts - SS_{design} \quad (2)$$

$$Sbts = Pout_{bal} - Lf_{BTS} - (Ldupl_{BTS}) + Ga_{BTS} \quad (3)$$

$= 47-3-2+17 = 59$ dB

$$SS_{design} = SS_{req} + LNF_{marg(o+i)} + BPL_{mean} \quad (4)$$

$$SS_{req} = MS_{sens} + RF_{marg} + LF_{marg} + BL \quad (5)$$

$= -104+3+2+5 = -94$ dB

By compensating in the equation (4) can find SS_{design} .

$SS_{design} = -94+8+18 = -68$ dB

By compensating the equation (2) can find that.

Lpathmax = 59- (- 68) =127

Hence:

$\alpha = [127-143.2+18 \log(5)] / 38$

$= -3.619/38 = -0.0952$

From which can find the cell radius.

$$d = 0.803 \text{ Km} = 803 \text{ m} \quad (6)$$

2-The cell areas is calculated from equation (6).

$$\text{Area} = 9/8 * \sqrt{3} * d^2 = 1.256k \text{ m}^2 \quad (7)$$

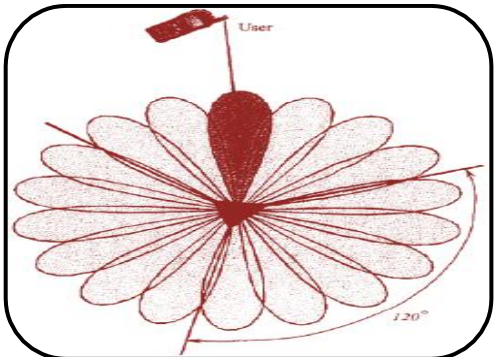
3- from equation (7) the number of the base stations is obtained by:

Number of the base stations = The total area of the place ÷ the area cell.

=63 /1.256

=50.2base station

By compensation in the Walfish-Ikegamiin different height it is found that whenever the high is increased the stations decreased. This in turn reduces the electro-magnetic pollution and the cost in same time. And therefore should be used in these base station an Antennas have good ability to exploit energy, so this study recommends the use of smart antenna systems such as antenna beam is variable because these antennas feature antennas traditionalexploitativeenergyTransmission, where is determined dimension and angle of the user and then focus the beam on the package that resides by the user, and all these packages with fixed characteristic (Gross, Frank B. (2005).



(David Hall,2011)

Results

This study reached that the height play an important role in increasing the coverage area, there is a direct correlation between the height and area coverage Figure 1, and there is also an inverse relationship between the height and the number of stations in Figure 2, whenever greater height of Antenna fewer base stations, this is a positive relationship could be clarified from both sides the first is most important to reduce the electromagnetic pollution and second Provide a number of stations, which reduces cost.

number of stations available	number of base stations	Cell area (km²)	cell radius (km)	Height (m)
9	81	0.7773	0.63	20
8	70	0.894	0.679	20.5
7	62	1.0174	0.7226	21
5	55	1.132	0.764	21.5
4	50	1.2564	0.803	22
4	46	1.369	0.84	22.5
3	42	1.493	0.875	23
3	39	1.606	0.909	23.5
2	36	1.7286	0.9418	24
2	34	1.844	0.974	24.5
.....	32	1.961	1.003	25

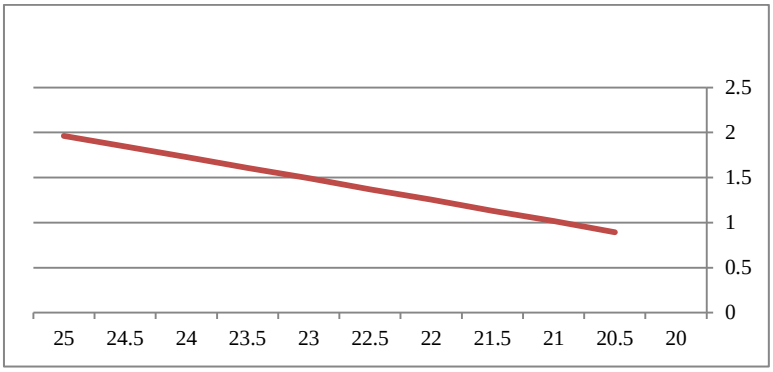


Figure 1: Relation between the height and area coverage.

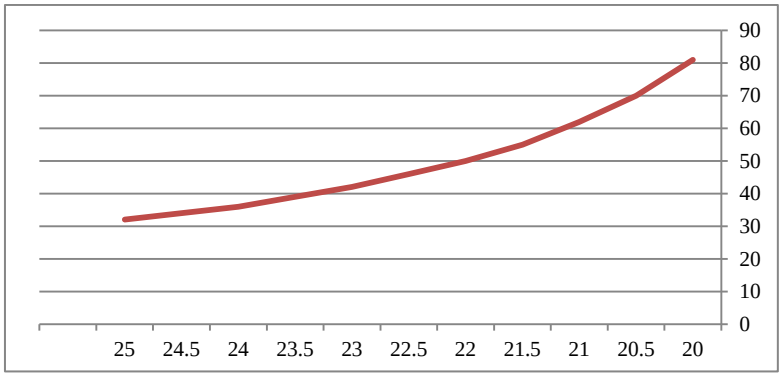


Figure 2: An inverse relationship between the height and the number of station

Discussions

This study proposes precautions markers on roofs and places where the base stations are placed. From previous studies of Electro-Magnetic Pollution: Electromagnetic pollution from phone masts, Effects on wildlife Electromagnetic Pollution of Environment.

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