



The Effects of Wireless Radiation on Human Brain by Using TES 92 Electrosmog Meter

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ABSTRACT

In near by metal bodies such as cars, electromagnetic radiation by wireless telephone constitutes a modern health hazard caused by enhancement of concentration by reflection. New wireless devices like intimate frequency modulation transmitter (IFMT) more add to this intensity. This paper undertake to verify the actual Specific Absorption Rate (SAR) is the energy deposited in to tissues by RF pulses during an MRI scan and measured in watts per kilogram. value that can be reached when a human brain is exposed to radiation inside a car using IFMT and wireless telephone. Seven different scenarios of car trips were conducted and the electric field intensities were measured using a TES 92 meter. The measured values were used to estimate the specific absorption rate for person mind tissues. The results showed that FM transmitter used alone inside a car may not pose any threat to the driver because the SAR value produced by it was 99.99% below the limit set by FCC. However when this was combined with mobile phone radiation, the limit were exceeded. When driver's phone was used the percentage of lowest and highest SAR values for all scenarios were 99.19% and 74.95% lower than the limit of 1.6W/kg (FCC). When other 4 passengers use their phones together with the driver, the maximum and minimum percentage of SAR value obtained for all scenarios were 95.82% lower and 6.58% higher respectively than FCC limit.

1. Introduction

For the definition of the SAR which mean (Specific Absorption Rate) is the measure of the amount of Radio Frequency (RF) and Electromagnetic Field (EMF) absorbed by the human body at higher frequency when using an electronic device. This rate is measured as the power absorbed within a defined area of body tissue in a standard measurement of watts per kilogram (W/kg). The Specific Absorption Rate (SAR) can be an average measure over the entire

body [1]. figure 1. Shows the SAR requirements in 1993, which became adopted by the Federal Communications Commission (FCC) in 1996. Back then, only a small fraction of the population were using cell phones, and only for minutes of the day. United States SAR Limits. In the US, the Federal Communication Commission (FCC) requires that cell phones have a SAR level at or below 1.6 watts per kilogram (W/kg) taken over a volume containing a mass of 1 gram (g) of tissue.

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Figure 1. EMFs effectet on humen body

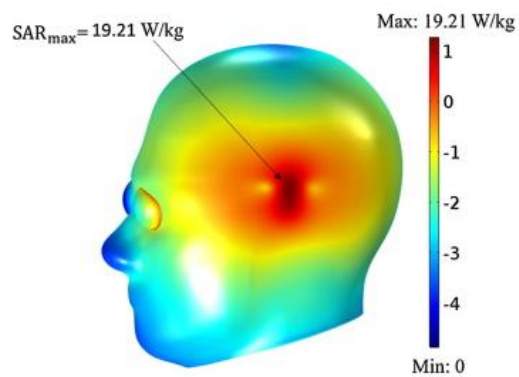


Figure 2. Specific absorption rate in the human head

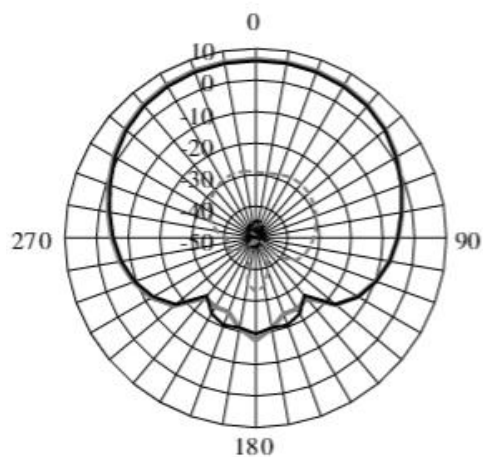


Figure 3. Radiation pattern for electromagnetic band-gap for X-Y plane

European Union SAR Limits. The EU has set SAR limits for mobile phones (and other such hand-held devices), to be less than or equal to 2 W/kg averaged over 10 g of tissue. It measures exposure within the frequency range of [1] in this section we will discuss some of related work in the recent years. The Specific Absorption Rate (SAR) value is established by selecting areas of the body to be measured and tested it, to find the highest absorption rate for a uniform area which near to the radiating source. The Federal Communication Commission (FCC), in the United States, requires that handset (wireless phone) sold must have a Specific Absorption Rate (SAR) smaller or equal to this value (1.6W/kg) over of 1 gram of tissue. While in Europe, the standard SAR should be lower or equal to 2 W/kg averaged over 10g of tissue [1]. In [2] Bolaji and et al at 2012 used TES-92 electrosmog meter to measure the RF and TX in BTS (base station transceiver) where in [2] the author chose the eastern part of Nigeria, which Bolaji and two others indicated that the values of the power density and electric field strength were less than the standards International Commission on Non Ionizing Radiation Protection (ICNIRP) occupational exposure [2]. In 2016 O.Rabin study the measurement of field strength EMF and power density too, by using TES-92 electrosmog meter and ELF detection meter. Where O.Rabin in [3] chose places one of these regions has been chosen in [2] with two other places were Oyo state and Ibadan metropolises. simulation result in [3] indicated that the energy absorption in the brain from mobile phone was higher than from BTS and large value of SAR standards. K H Chan and et al in [5] investigated SAR evaluation on human exposure from wireless communication devices inside a car. L Diao studied in [6] in 2014 Effects of Commercial Shielding Products Attached to Mobile Phone on Human Body with Implanted Medical Device. Results in [6] indicated that the SAR values, either with or not the shields have shown no particular impact, and the induced E-field on a human body with or not their implanted pacemaker are similar.

2. Materials and Methods

TES 92 Electrosmog meter, transmitter, Mobile phones and an SantaFee 2017 model car. Where measuring Power density, Electric field and magnetic field intensities by TES 92 Electrosmog

meter device. The last instrument is used to show electromagnetic pollution generated unnaturally. The mobile-phones used were iPhone 6, Samsung Galaxy S7 Exynos, Sony Xperia Z3, which were used to investigate this paper. The SantaFee car, phones and FM transmitter were randomly selected depending upon their easy obtainability. At the number one display place of readings, power density, electric field and magnetic field intensity measurements were taken inside the car, proximate to the head of the driver without using handset and IFMT and the measured values were distinguished. At the set number two, the measuring values were taken inside the parked vehicle with the IFMT+ FMTR. The set number three of measuring data were taken inside the parked vehicle with IFMT+ FMTR and driver's handset. And at the last of measuring display like the third by adding other phones where used in the car. These data measurements to see the effect of all mixture of radiations on the driver's brain. The SAR values were evaluated using equation (1).

$$SAR = \frac{\sigma |E|^2}{\rho_m} \text{ (W/kg)} \quad \dots\dots\dots (1)$$

Where :

$|E|$: the maximum magnitude of electric field vector

σ : the Conductivity of the human brain tissue

ρ_m : the Mass density of the human brain tissue.

Whole the above measurements were distinguished for different position where the car window is opened or closed either for jam environment and in scheduled environment.

The percentage SAR is given by equation 2 :

$$SAR \% = \frac{\text{obtained value}}{\text{standard FCC value (1.6 W/kg)}} \times 100\% \quad \dots\dots (2)$$

Where the equation 3 and 4 display the SAR formula and Incident Power Density:

$$SAR = \frac{\sigma \times E^2}{m_d} \dots\dots\dots(3)$$

$$\text{Incident Power Density} = \frac{E^2}{377} \dots\dots\dots(4)$$

3. Simulation Results

The TES 92 electrosmog meter as shown in figure 1. The TES 92 meter gives the values of power

density, magnetic field and electric field at a particular instance. 50 MHz to 3.5 GHz frequency range. For isotropic measurements of electromagnetic fields. High dynamic range due to three-channel digital results processing. It is also used to measure wireless LAN, GSM or microwave radiation determination. With a frequency up to 3.5 GHz, it is possible to use the device. Measuring with the three-dimensional probe saves the calculation of individual axes. Small electro-smog meter with appropriate special properties is used in every area and industry, as well as in simple, fast and accurate labs.



Figure 4. TES 92 electrosmog meter

As shown From figure 2. There are some features for the TES 92 electrosmog meter at first The frequency range are between 50 MHz to 3.5 GHz For isotropic measurements of EMF. Second feature its include Isotropic measurement. third it have High dynamic range. before last it have Configurable alarm threshold and memory function. at last Easy to use. According to the application there are High RF

electromagnetic wave field strength measurement in Mobil phone base station antenna radiation power density measurement and Wireless communication applications and Wireless LAN (Wi-Fi) detection, installation. Used in Spy camera, wireless bug finder, Cellular/Cordless phone radiation safety level and Microwave oven, Personal living environment EMF safety at last RF power measurement for transmitters.



Figure 5. View of electro-smog measuring instrument TES-92.

Table 1. General specification for TES 92 electrosmog meter instrument.

	Atm +FM	Atm +FM +driver	Atm +FM +driver + others
Stationary Car Close To Mobile (Windows Closed)	0.00038 %	25.05 %	83.52 %
Stationary Car Close To Mobile (Windows Open)	0.00041 %	18.41 %	33.25 %
Car Trip (Windows Closed)	0.044 %	4.32 %	6.29 %
Car Trip (Windows Opened)	0.015 %	7.53 %	28.63 %
Stationary Car in Crowded Location (Windows Opened)	0.0048 %	1.22 %	9.94 %
Stationary Car in Isolated Location (Windows Opened)	0.022 %	7.31 %	21.53 %

Table 2. The Maximum value of SAR in human bodies

Frequency [MHz]	SAR _{max} [W/kg] for J (r=a,0)
5	$6.0333 \cdot 10^{-10}$
15	$9.0103 \cdot 10^{-8}$
20	$4.3463 \cdot 10^{-7}$
30	$1.6693 \cdot 10^{-5}$
35	$2.4612 \cdot 10^{-4}$
40	$2.4223 \cdot 10^{-3}$

As shown from above Table 2 provides the frequency by MHz of human tissues used to evaluate the SAR values. The result obtained from the evaluation of SAR at different scenarios is as shown in table 2.

4. Conclusion

This paper undertake to verify the actual Specific Absorption Rate (SAR) is the energy deposited in to tissues by RF pulses during an MRI scan and measured in watts per kilogram. value that can be reached when a human brain is exposed to radiation inside a car using IFMT and wireless telephone . Seven different scenarios of car trips were conducted and the electric field intensities were measured using a TES 92 meter. The measured values were used to estimate the specific absorption rate for person mind tissues. The results showed that FM transmitter used alone inside a car may not pose any threat to the driver because the SAR value produced by it was 99.99% below the limit set by FCC. However when this was combined with mobile phone radiation, the limit were exceeded. When driver's phone was used the percentage of lowest and highest SAR values for all scenarios were 99.19% and 74.95% lower than the limit of 1.6W/kg (FCC). When other 4 passengers use their phones together with the driver, the maximum and minimum percentage of SAR value obtained for all scenarios were 95.82% lower and 6.58% higher respectively than FCC limit. That is the reason for picking different phone models according to the goal of

the study. But showing the effect on each will be a beter investigation of this paper.

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