

# Radiations Emitted by Mobile Phones and Brain Cancer

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**Abstract**—Mobile phones or cellular phones are two ways radio, low powered and single channeled, which consists of a transmitter and a receiver (antenna). When in use they emit radio frequency radiations in transmitting information to their base stations. These radio frequency radiation are generated from their transmitters and emitted through their antennas. The emitted radiations are non ionizing, and they do not have enough energy to cause ionization in any living matter. But nevertheless they can cause heating effect, by increasing the body temperature of a living matter, this is a process called Thermal effect. We are now in a radiation world, because we are everyday exposed to both natural and man-made radiation, which can affect living matter due to their emission. We often believe that using mobile phones can cause brain cancer, but how real true is this?. Scientific research and investigations up to date are yet to give any evidence of health risks, which can cause any disease to living matter because of using a mobile phone.

## 1. INTRODUCTION

A mobile phone is low-power, single channel two way radio, which consists of a transmitter and a receiver. A mobile phone emits radio frequency (RF) radiation to transmit information to its base station. Mobile phone is also a receiver of information. The battery of a mobile phone helps in reducing the power of radiation transmitted. Radiation transmitted by a mobile phone is generated in the transmitter, which is then emitted through its antenna.

Mobile phones emit non ionizing radiations which can cause malignant tumours in the brain of people who have used phones for at least 10 years and Young people who use mobile phones before the age of 10. This non ionizing radiations are form of Electromagnetic waves in nature, which are composed of electric and magnetic energy traveling together through space with the speed of light. We now live in a radiation world, Because statistics show that over 25% of children Under the age of 13 own their own mobile phones. And also an international survey shows that almost 58% of people have been using mobile phones for more than 10 years.

Exposure to radiation is highly dependent on the output power level. This exposure can be quantified using the specific absorption rate(SAR). The SAR is expressed in W/Kg, which

is the measurement of the electromagnetic radiation(W) that is absorbed by the human body in(Kg). But the 2W/Kg exposure limit recommended by the international commission on Non-Ionization Radiation Protection (ICNIRP) is usually exhausted by some mobile phones. The output power level can be measured by building a jig that can easily hold a mobile phone at a specific distance from the radio frequency(RF) meter.

## 2. METHODOLOGY

A T-track jig made up of wood and an acoustimeter were used to measure the power output level of a mobile phone from the front, back all other four sides of the mobile phone with the acoustimeter. Keeping the jig in one end and the RF meter on the other end. Holding the mobile phone without blocking the side to be measured and securing the RF meter without blocking the top and front of the meter. The mobile phone part of the jig should be able rotate so that all the sides can be measured. The top side of the RF meter point towards mobile phone antenna. The meter should be able to move to different distances. The distance of the mobile phone is measured with respect to the top of the meter. The following steps were taken to measure average power level.

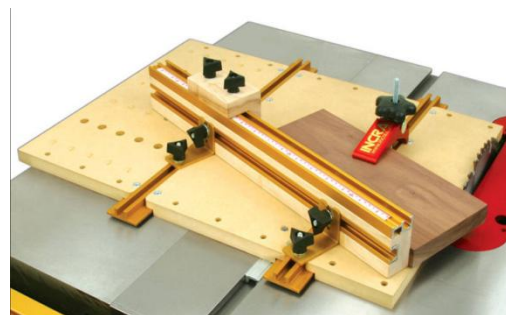


Fig. 1: T-track jig

### 2.1 Measurements

To measure the Call output power level of the mobile phone. The mobile phone and the RF meter were mounted on the jig.

Then use the mobile phone to call a number frequently and make sure the call is not picked up. Measure the power coming from the front of the mobile phone at a distance of 2cm, when the phone is ringing put the phone on speaker so that you can hear the ringing tone and then record the average power and end the call. Use the same method to measure the power coming from the back, bottom and the top of the mobile phone at a distance of 2cm from top of the RF meter. Repeat all the process for 5cm and 15cm and measure the output power coming out from the mobile phone.

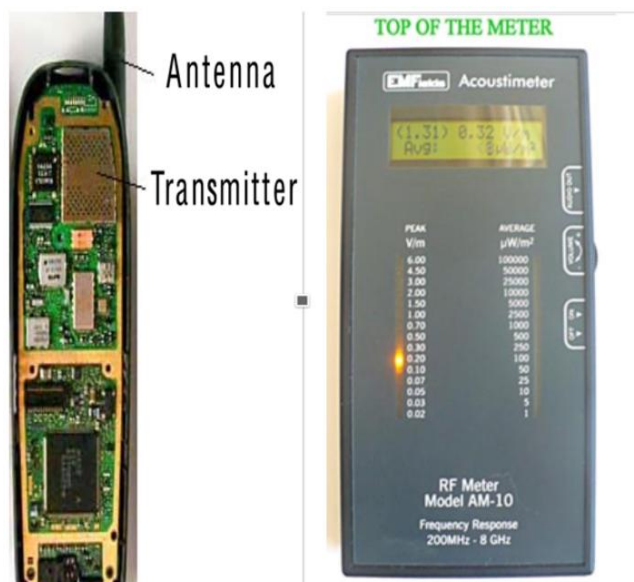


Fig. 2: (a) Mobile phone and 2(b) Acoustimeter

### 3. RESULTS

The data table below shows the the average measured power of call mode of a mobile at different distances. The power is expressed in W/Kg for each measurement.

Table 1: Average power(w/kg) vs distance(cm)

Disnce(cm)	Front	Back	Bottom	Top
2cm	2.20	1.82	0.52	2.80
5cm	1.14	1.30	0.21	2.00
15cm	0.86	0.43	0.10	1.52

The two bar charts 2(a) and 2(b) belowshows the level of the output power of a mobile phone. The Y-axis represents the power level in W/Kg and X-axis distance in cm for each respective point measured.

Table 2: (a) Bar chart

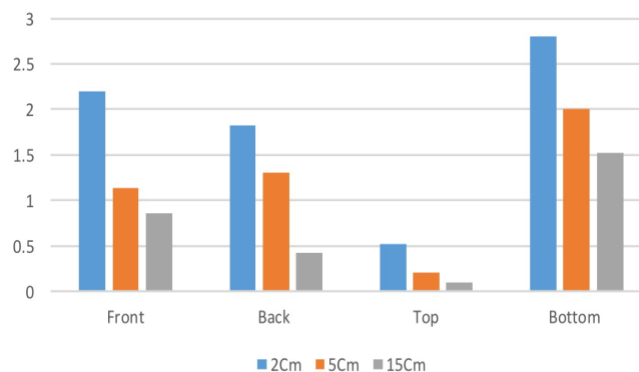
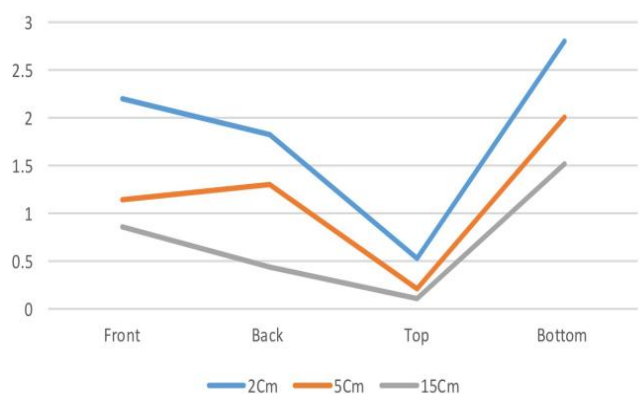


Table 2: (b) Bar chart



### 4. DISCUSSION

Exposure to radiation when using mobile phones depends usually upon the output power level of the mobile phones. The radiation can be reduced or minimised by increasing the distance between the mobile phone and users, that is why it is good to use headphones or hands free when making calls with mobile phones. Mobile phones quality of connection is also very important, because the frequency at which the signal travels when connecting from one network to another when in call mode also contribute to the level of the mobile phone output power. Each brand of mobile phone version have it's own specific level of output power, mostly 3G, 4G and 5G mobile phones transmit their signals at a high output power levels and their signals relatively reduce with respect to the distance between the mobile phone and the user. The table below shows the comparison and reduction in the electro magnetic radiation with good signal quality.

**Table 3: Comparison of the signal quality**

Comparison	Reduction in output power
outdoors vs. indoors	68 %
urban vs. rural	10 %
stationary vs. moving	45 %

## 5. CONCLUSION

Even though that the radiations emitted by current mobile phones are weak, but some of the mobile phone version emits radiation which are higher than the specific absorption rate (SAR) radiation. So such types of mobile phones can be able to activate the human brain and nerve impulsion velocity most especially children and those who have used mobile phones for more than 10 years. This research also shows that children are at the greatest risk to radiation damage, because their brains are still developing and their skull is very thin.

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