

The Effect of Headset and Earphone on Reducing Electromagnetic Radiation from Mobile Phone toward Human Head

Dayang Azra Awang Mat
Department of Electronics Engineering
Universiti Malaysia Sarawak
94300 Kota Samarahan, Sarawak.
amdazra@feng.unimas.my

Franky Kho, Annie Joseph, Kuryati Kipli, Shafrida
Sahrani, Kasumawati Lias & Ade Syaheda Wani
Marzuki
Department of Electronics Engineering
Universiti Malaysia Sarawak
94300 Kota Samarahan, Sarawak
jannie@feng.unimas.my, kkuryati @feng.unimas.my,
sshafrika@feng.unimas.my, lkasumawati@feng.unimas.my,
maswani@feng.unimas.my

Abstract- Studies show that exposure to the electromagnetic wave for a certain period of time will leads to health problem such as headaches, or even worse, brain cancer. Scientist have known that this radiation might cause human biological damage through heating effects since human body is made up of approximately 65-70% water, electrolytes and ions. Radio frequency radiation emitted from mobile phone will interact with human body and interfere with human body's natural healing resulted displacement of electrolytes and ions within the body. This paper discussed on the analysis conducted to study the effect of electromagnetic radiation (thermal radiation) of mobile phones with different frequencies via experimental works. The experiment was conducted in a laboratory using a volunteer (human). The period of operation is 45 minutes as the talking time on the phone. Thermal imaging technique is used to monitor and capture the temperature distribution during the experimental analysis for every 5 minutes interval. Images will be collected and analyzed using graphical plot. Devices such as Bluetooth headset and earphone are also used to study either this equipment are effective to reduce the effect of thermal radiation toward human head or not. The result shows that mobile phone serving GSM 900MHz has the highest temperature increment compare to mobile phone serving GSM 1800MHz. It is also shown that GSM 900MHz has greater thermal radiation effect or heating effect. By using Bluetooth headset and earphone device when talking via mobile phone, the result shows lower radiation since direct radiations from the mobile phone antenna was reduced.

Keywords-electromagnetic radiation, mobile phone, Bluetooth headset, earphone

I. INTRODUCTION

Mobile communication is currently the fastest growing communication system in the telecommunication industry. Due to the increased number of user using the mobile phone, the concern is now focusing on the electromagnetic wave

produced by the mobile phone itself. Electromagnetic radiation can be classified into ionizing and non-ionizing radiation. Ionizing radiation is the radiation with high energy which will remove tightly bound between electrons and atoms resulted tissue damage while non-ionizing radiation is the radiation that has enough energy to vibrate the atoms and molecule but do not remove the electrons in the molecule. This radiation is mainly occurred at low frequency range.

Mobile phone is designed with low power transceiver in order to transmit voice and data to a few kilometers to where the base station is located. When a call is established, the mobile phone will sends radio signals to the closest radio base station antennas which in turn is connected to a mobile switch. The power transmitted from a mobile is dependent on the received coverage level from the base station. Signal strength from the base station varied depending on the distance of mobile phone from the base station. When a mobile phone is near to the base station, the signal strength is higher and vice versa. Mobile phones and base stations are designed to transmit the lowest amount of power as required to sustain a call in order to minimize the possibility of interference to the system if excessive power is used. This value is depending on the Effective Isotropic Radiated Power (EIRP) of the antenna. This value is used to calculate the coverage area of particular base station site and expressed in watts or dBm.

Many portable phone terminals used monopole antennas. This type of antenna has approximately half a wavelength in length in order to increase the antenna gain with the actual length is $3/8\lambda$ or $5/8\lambda$. This is due to the impedance matching considerations at the antenna feed point. A monopole antenna is a type of radio antenna formed by replacing one half of a dipole antenna with a ground plane at right-angles to the remaining half [1].

Radio frequency used to communicate by mobile phone has the ability to penetrate through semi-solid substances like