900MHz and 1800MHz Mobile Phone Effect Towards Adult Head in SAR Distribution and SAR in Weight

Kasumawati Bt Lias
Electronics Engineering Department
Universiti Malaysia Sarawak
Sarawak, Malaysia
lkasumawati@feng.unimas.my

Wan Azlan Wan Zainal Abidin, Thelaha Masri, Al-Khalid Bin Othman, Ade Syaheda Wani Marzuki, Dayang Azra Awang Mat, Kuryati Kipli
Electronics Engineering Department
Universiti Malaysia Sarawak
Sarawak, Malaysia

***Abstract*—The investigation on the effect of mobile phone towards adult head in Specific Absorption Rate (SAR) Distribution and SAR in Weight is presented in this paper. Finite Different Time-Domain (FDTD) was used to construct adult head modeling with the attachment of monopole antenna and also to do a simulation in obtaining the SAR Distribution and SAR in Weight either 1g or 10g weight value, respectively. From the simulation, the results show that the values of both SAR are small and do not exceed 4W/kg stated by International Commission on Non-Ionizing Radiation Protection (ICNIRP), National Council on Radiation Protection and Measurement (NCRP) and Institute of Electrical and Electronics Engineers (IEEE). The simulation covered 900MHz and 1800MHz frequency with 0.6W radiated power.**

***Keywords*—adult head, SAR Distribution, SAR in Weight, Finite Different Time-Domain, monopole antenna**

I. INTRODUCTION

Nowadays, wireless communication operators use more and more systems due to the increase in public demand on wireless communication devices especially mobile phones. According to International Telecommunication Union (ITU), mobile phone users worldwide increase to approximately 4.6 billion at the end of year 2009 [1]. In addition, ITU also estimates that mobile phone or cell phone users around the globe will hit 5 billion sometime in 2010 [1]. This situation contributes to health issues anxiety among the public especially on the biological effects associated to the electromagnetic waves of mobile phones. Therefore, it is of interest to investigate on SAR distribution and SAR in weight in adult head. Extensive researches and studies carried out onto the biological effects of electromagnetic radiation exposure of mobile phones towards adult health [2-5]. Also, there are several papers have been published on this issue to date [6-7]. When electromagnetic fields (EMF) interact with adult body, it may produce biological effects which may sometimes, but not always, lead to adverse health effects. The biological effects may not necessarily be harmful to adult health especially the biological effects associated with non-thermal exposure. While, adverse health effects may cause impairment of the health of the exposed adult.

II. METHODOLOGY

The main objective of this paper is to investigate the effects of 900MHz and 1800MHz mobile phone towards adult health in SAR distribution, SAR 1g and 10g weight. FDTD is employed to construct the adult head modeling with the attachment of monopole antenna and to obtain the SAR result. SAR is a measurement of the Radio Frequency (RF) or Electromagnetic (EM) energy absorbed by the head within the exposure to radio or electromagnetic wave over a given period of time. It can be also defined through mathematical approach as equation 1 [8, 9].

$$SAR = \sigma E^2 / \rho \qquad \text{W/kg} \qquad (1)$$

where σ is the conductivity of the tissue, E is the electric field density in the tissue and ρ is the density of the tissue. Figure 1 shows the flow chart of work processes to obtain the SAR absorbed into adult head brain tissue. This paper concentrated on adult head brain tissue with relative permittivity of 45.8055 F/m. The radiated power of monopole antenna was set to 0.6W.

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