

Thermal effects on human body from mobile phones

Sumit Kumar Yadav^[1], Dr. Devesh Katiyar^[2]

^[1]Student of MCA, ^[2]Asst. Professor

Department of Computer Science and Information Technology
DSMNRU, LUCKNOW, UP

ABSTRACT

The principle of this research paper is the observing of thermal intuitus on human head from mobile phones. In the paper temperature circulation and SAR "Specific Absorption Rate" at the appear of creature head nearby to the supply of electromagnetic radiation are exposed.

I. Keyword

Non-ionizing energy, electromagnetic field, fixed element testing, thermal imaging camera.

II. INTRODUCTION

Along with the evolution of modern science, the thermal infrared imaging system is rapidly up-and-coming as associate degree ever power full resolution with sundry expertise to find temperature. Such dimensions were often executed using thermometers, thermocouples, and resistance warmth indicators (RTD). Such instruments, however, will only obtain temperatures at specific points and need contact with the target. an alternative, the thermal imager, alters the ultraviolet light radiated from the target into arithmetical data and therefore visualizes the complete warmth map through the infrared crucial flat array. The electromagnetic field is differently outside and inside a biological substance. Mathematical bio electromagnetic duplication skill for high-pitched electromagnetic fields aid the result of field parts in biological persons. Evaluating the energy engrossed in biological tissues from known cause, such as mobile phones when placed close the head, is a criterion for examining the biological influence of an electromagnetic field. Such research needs near anatomical mockups which are used to find out the field parts and wrapped up energy. so look at the biological outcomes in organs and tissues, it is necessary to form a bond between an anatomical model and the factual structure.

In this paper consequences are shown for temperature increasing for different period of conversation (5, 10 and 15 minutes). So to validation of these results, numerical calculation created on Fixed

Element Approach. For optimum space between mobile and base station but in an real case power of the mobile phone differs contingent on the indicator

III. ELECTROMAGNETIC PROPERTIES OF TISSUE

Explaining of EM puzzles is very often a tricky process which entails knowledge of plenty analytical systems. In order to describe the characteristics of biological tissue, it is necessary to create models whose features are as close as possible to the actual tissue [4, 5]. Because of that anthropoid head atypical with average electromagnetic assets of the tissues has been used. So to create this model, the special software bundle for 3D simulation has been utilized. It has been occupied into deliberation earlier electromagnetic factors given conductivity, permittivity, permeability and mass density.

IV. MODEL OF HUMAN HEAD

For generating the perfect and accomplishment imitation of disease and SAR transfer through the model, COMSOL Multi physics software package has been expended. Electromagnetic factors of biological nerves were formed with a volumetric outburst function that valuations evaluate the faces of a given tissue inward the human head as accurately as possible. This interpolation function was created from magnetic quality image. It was used for connecting electric parameters with certain biological body parts. The basis of electromagnetic radiation for the experimental part was a cell phone.

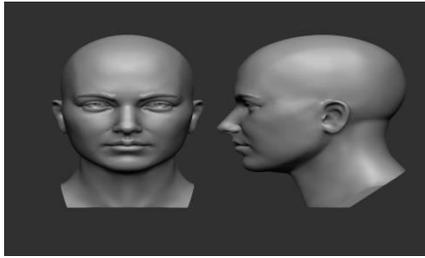


Fig.1. Human head model

In generally produced power of the mobile phone is about 0.25W for optimal distance between mobile and base station, but in an actual case power of the mobile phone varies depending on the signal power.

When using FEM evaluation software, the key phase before any computations is to create the mesh of portions. Finer mesh means the huge number of elements and thus the results will be more accurate finer mesh demands extremely strength hardware and computational time (that can last for days for some applications). In order it can be decided that it is essential to get the proper balance between result accuracy and time.

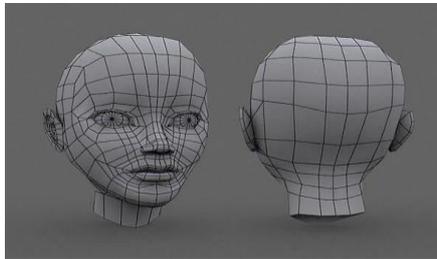


Fig. 2. Mesh of human head

V. SPECIFIC ABSORPTION RATE (SAR) CALCULATION

SAR is a amount of the ratio at which strength is learned by the creature body when unmasked to radio frequency electromagnetic field.

$$SAR = d/dt(\sim Q/M) \dots(1)$$

where Q is the mass of temperature, m is mass of tissue and the quotient Dq/dt represents Joule losses.

The SAR can also be calculated by the following expression:

$$SAR = P/m = \sigma E^2 V / \rho_m V = \sigma E^2 / \rho_m \dots(2)$$

Where: E is the electric area in [V/m], ρ_m density tissue mass in [kg/m³] and σ is the electrical behavior of tissue in [S/m].

REMEDIES

The native SAR rate in the human head which is calculated by using Eq. (2) for the frequency of 900MHz

Those outcomes were found for outcome strength of the cell phone P = 0.25W [9]. In the poorest case when the output power is P=1W.

VI. TEMPERATURE DISTRIBUTION WITHIN AND AT THE SURFACE OF HEAD

The access of the electric field through the biological tissue depends on the incidence of electromagnetic rays. The penetration deep is the space between surface of biological tissue and fact in which electric field power has e=2.7174 times lower values compared to initial values and can be defined by Eq.

$$\delta = 1/\omega(\epsilon\mu/2(\sqrt{1+(\sigma^2/\omega^2\epsilon^2)}-1))^{-1/2}$$

The penetration depth for the different tissues for the frequency 900MHz is shown in Table II.

TABLE II

THE PENETRATION DEPTH FOR f=900MHz

Tissue name	skin	Fat	Muscle	Skull	Brain ¹
δ [m]	0.0402	0.1645	0.0423	0.1318	0.0475

Tissue name Skin Fat Muscle Skull Brain1 δ [m] 0.0402 0.1645 0.0423 0.1318 0.0475 From the Table II it can be noted that the penetration depth within tissues varies for the different tissues. Electromagnetic wave propagation circulation in biological tissues expresses in the figure of absorbed energy. Most of this soak up energy is transformed into heat, which results to an mescal in temperature in biological tissues. Thermal outcome from the EM radiation from mobile usually grounds warming up at the shell of head on skin close to the ear skull region The temperature continuously increases at the surface to the certain level when the heat starts to be drained due to the blood flow in the particular tissue. . The temperature expands depends of physiological properties of tissues and can be evaluated by bio-heat equation, which takes high temperature loss due to blood flow into account was used.

It is Advantage of simulation compared to the thermal imaging camera is possibility to simulate temperature distribution through head (inside biological tissues). Temperature distribution at the surface of human head is in correlation with ambient temperature while the temperature inside biological tissues is not.

While the cell has become an additional appendage for most of us all this of course does not mean that we stop using cell phones. Just checkered you take insurances:

4. Use the speakerphone or restless and free or Bluetooth but keep the cell telephone at a least 12 inches from your body.
5. Use the land-line when unfilled.
6. Do not keep cell phone in your hand/pocket for long.
7. At home/office keep the phone away from you.

VII. CONCLUSION

The temperature distribution at the surface of head is obtained by using thermal imaging camera. It is evident that the higher temperature is in area near to source of EM radiation. A satisfactory agreement between outcome stain by simulation and outcome obtained by thermal imaging camera can be perceived. By the application of this model heating temperature of the surface areas of the body can be calculated, which is particularly important for occupational exposure in case when a worker situated in the vicinity of the electromagnetic source Applying a archetype that reveals the allotment of absorbed force into brain

1. Talk for short times.
2. If possible use short message service.
3. Use cell telephone with lower specific absorption value

structures would upgrade our understanding of the harmful effects of mobile. Intermixing these two tactics can be one of the advices of research of biological effects of tissues and organs that are near to the skin (ear, jaw, teeth, subcutaneous.

VIII. REFERENCES

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