

**A Brief Presentation on:  
“The Effect of Headset and Earphone on  
Reducing Electromagnetic Radiation from  
Mobile Phone toward Human Head”  
by ShadiDalirian**

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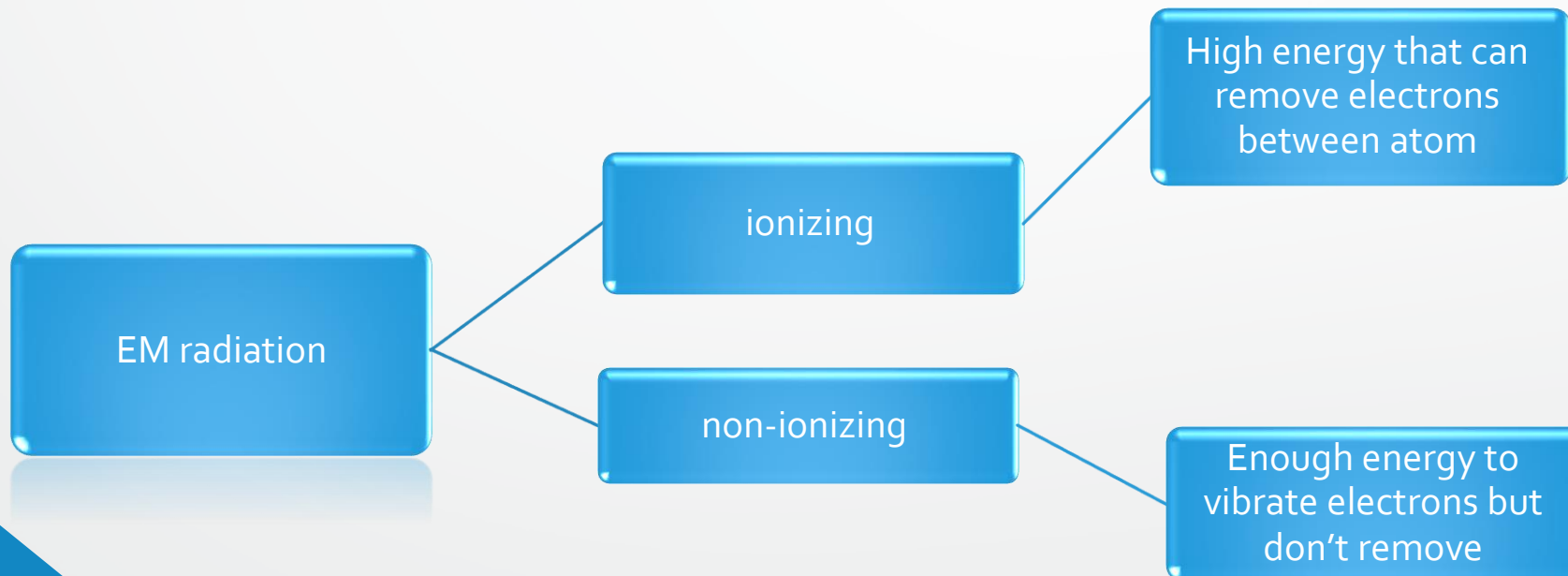
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# ***Abstract***

- exposure to the electromagnetic waves will lead to health problems
- Experiment details:
  - ✓ The period of operation
  - ✓ Thermal imaging technique
  - ✓ Analysis device
  - ✓ Repeat experiment using Devices such as Bluetooth headset and earphone

# I. Introduction

- Classify electromagnetic radiation



# I. Introduction

- sending radio signals to the closest radio base station antennas
- The power transmitted from a mobile is dependent on:  
received coverage level from the base station.
- Signal strength from the base station depending on:  
the distance of mobile phone from the base station.
- transmit the lowest amount of power that is depending on:  
the Effective Isotropic Radiated Power (EIRP) of the antenna.
- monopole antennas property
- Radio frequency ➡ ability to penetrate meet and living tissue ➡ can cause dielectric heating effect.

# I. Introduction

- The origin of thermal radiation
- The nearer distances of the radiation source to the human head, the higher the SAR(Specific Absorption Rate)values.
- Global System for Mobile Communication (GSM):  
GSM 900 and GSM 1800 standard are the most common

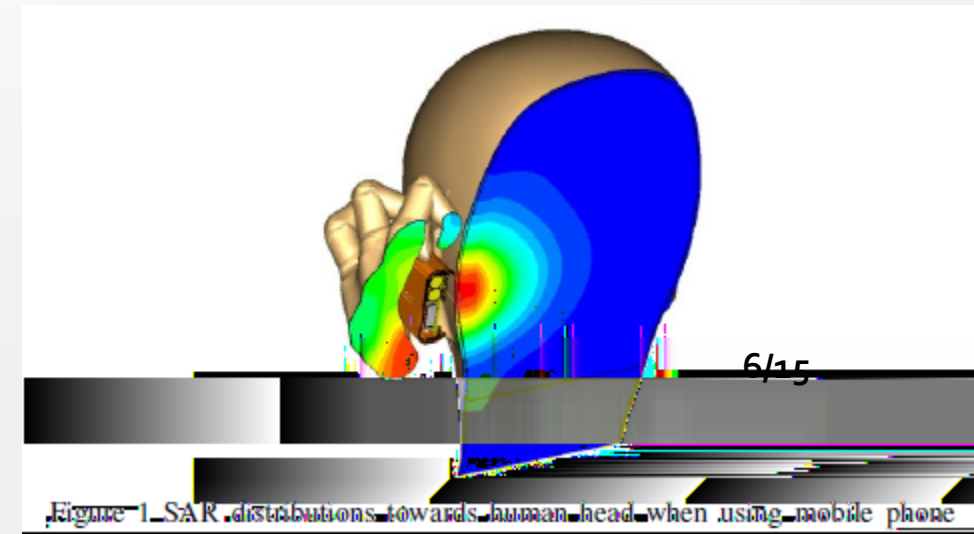
## II. LITERATURE REVIEW

- SAR is the time rate of energy absorption per gram of tissue from non-ionizing electromagnetic radiation.
- As the distance of the body and mobile phones is closed, the SAR values will be higher and vice versa.

$$SAR = \sigma \frac{|E|^2}{2\rho} = c \frac{\Delta T}{\Delta t} [W/kg]$$

TABLE 2 ELECTRICAL PARAMETERS OF VARIOUS TISSUES AT 900MHZ OPERATING FREQUENCIES [12]

	Tissue	Cells	$\rho$ [kg/m <sup>3</sup> ]	$\epsilon_r$	$\sigma$ [S/m]
1.	Brain	4066	1030	55.00	1.23
2.	Bone	2188	1850	8.00	0.11



## B. Electromagnetic radiation

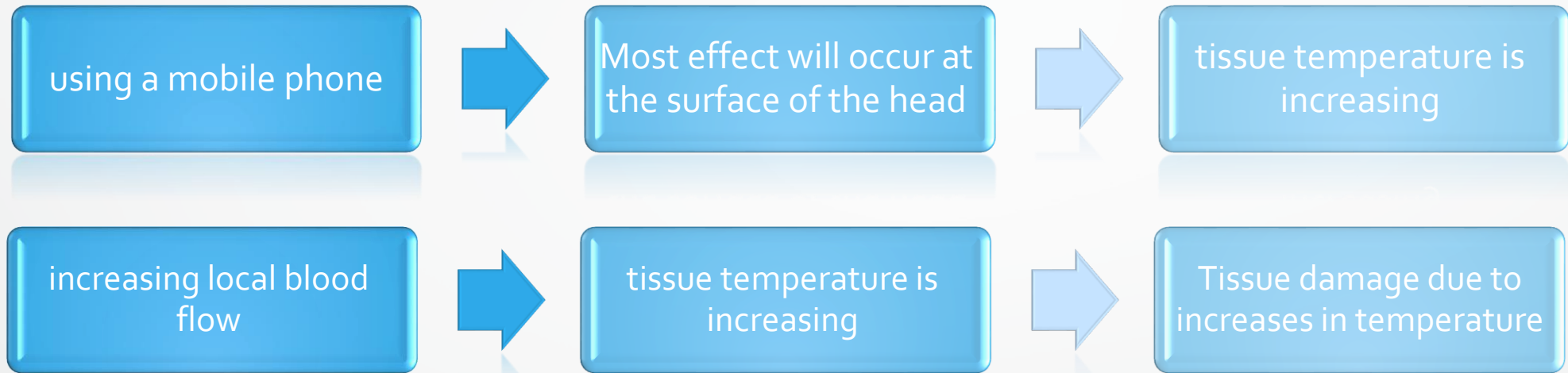
- human body is made up of 65\_70% water, electrolytes and ions
- water molecule is a polar molecule and Human body has its own weak electromagnetic field and each of cells has its own electromagnetic field.
- Weak electromagnetic fields such as RF radiation
- RF radiation is cause different symptoms ...

## *C. Other Devices*

- absorb 80% of electromagnetic radiation
- How can Bluetooth headset and earphone absorb EM adiation

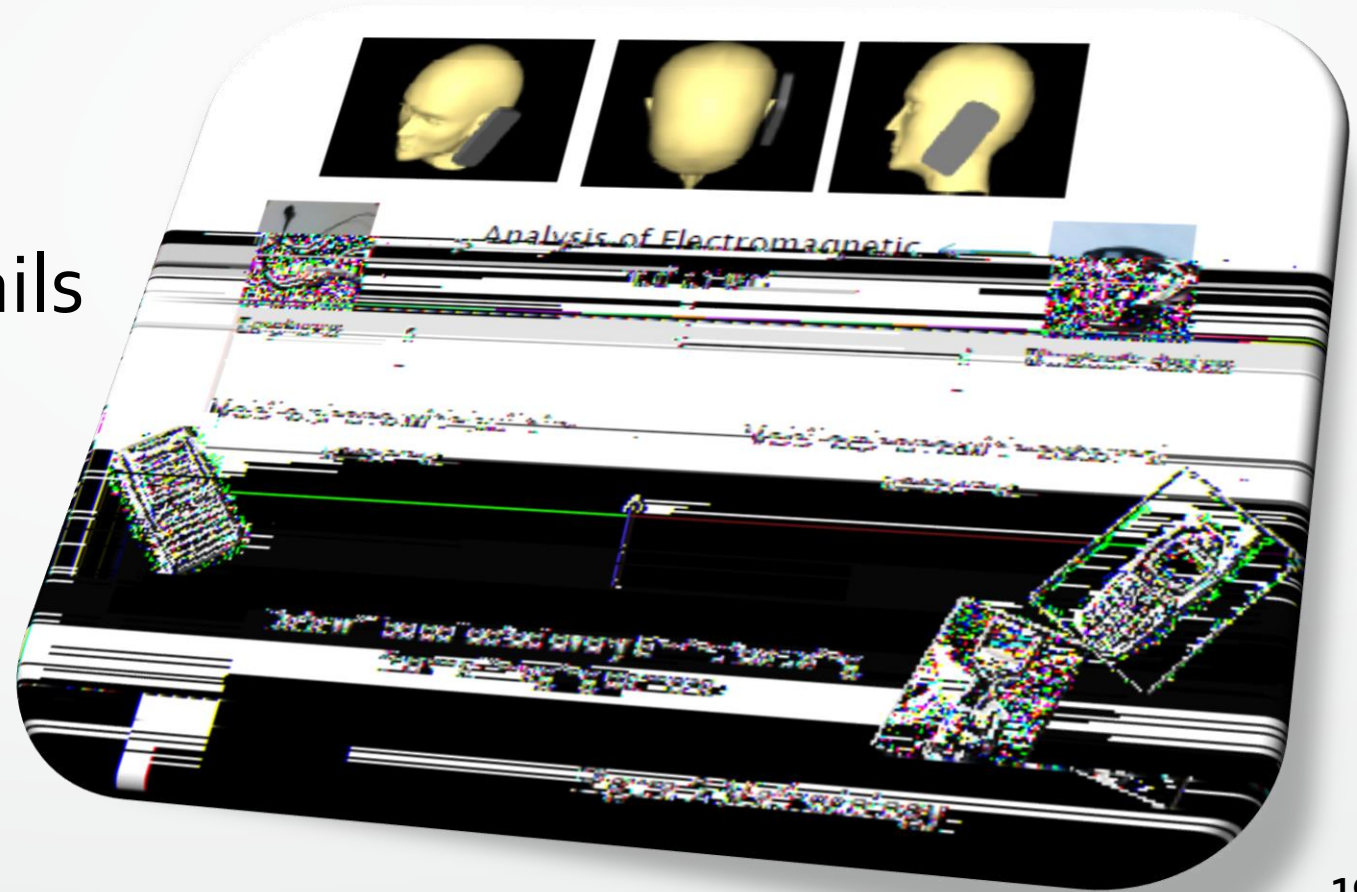


## D. Thermal and Nonthermal radiation



# III. METHODOLOGY

- Experiment details



## IV. RESULT AND DISCUSSION

- The result is shown in Fig. 3 and 4.
- This shows that the radiation for mobile phone operating at 1800MHz is lower compare to mobile phone operating at 900MHz.

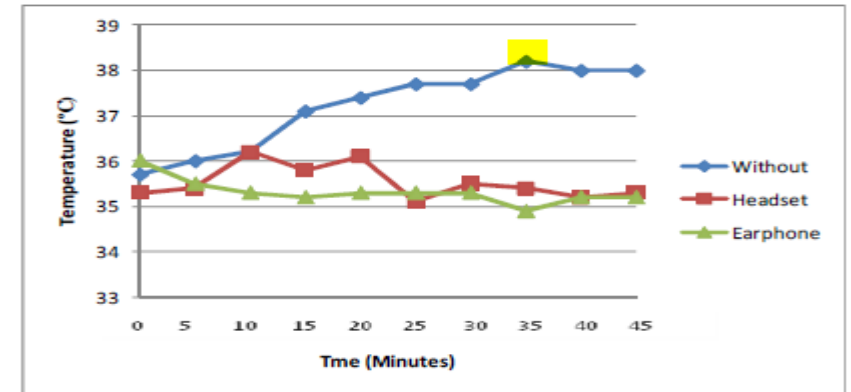


Figure 3 comparison of thermal radiation without and with the used of headset and earphone using mobile phone operating at 900MHz

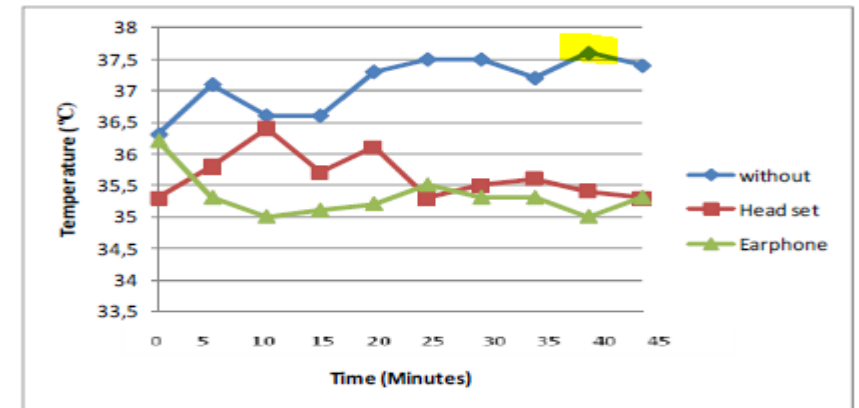


Figure 4 comparison of thermal radiation without and with the used of headset and earphone using mobile phone operating at 1800MHz

## Iv. Result And Discussion

- Some factor which may effect:
  1. human temperature always varies with time
  2. Thermoregulatory system is a mechanism to keep body temperature constant
  3. unavoidable movements on posture and gesture during the phone conversation.

## V. Conclusion

- Throughout the project, it can be concluded that the higher the frequency of mobile phone will produce more electromagnetic radiation (thermal radiation) towards human head when compare to mobile phone serving the lower frequency. Although the effect of thermal radiation is very low to lead to the possibility of having brain cancer, but it might cause other non-specific symptoms as headache, heating, fuzziness, itchy for long-term period..

Any question?





Thank you for attention.

