

Exposure of Blood Tissues with Specific Absorption Rate (SAR) of Mobile Phone

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Abstract: *Mobile phone radiations are harmful for living being in world. In this work the effect of specific absorption rate (SAR) for blood tissues was done at 3G and 4G mobile phone frequencies. For this study the power of mobile phone handset is taken 1.5 W.*

Key words: SAR, Electromagnetic Waves, Mobile Phone Handset and Blood Tissues

1 Introduction

Generally mobile phone communication radiations are smoke less industry. The power absorbed by the tissue per unit mass is called SAR. It is measured in W/kg). SAR is usually averaged either over the whole body or over a body tissue. If we measure the specific absorption rate then handset should be near the head in a talk position [1]. SAR is measured at the top position of amalgamation rate in the whole head, for which handset is often as close to their receiver as feasible [2]. SAR decreases with the increase of relative permittivity and increase with the increase in conductivities of human body tissues. SAR explains the doable biological effects of radiofrequency fields. SAR can cause thermal

effect. The increase in temperature of human body while using mobile phone is due to SAR [3]. There is highest increase in temperature of human head while taking.

SAR values are dependent upon the size of the averaging volume. A number of countries have their own regulations of SAR for general public exposure to mobile phone radiations. Link between special measurements cannot be made exclusive of in order averaging volume used. There is misunderstanding and confusion regarding the SAR values for mobile phones and other wireless communication system. Specific Absorption Rate gives meaning for measuring the RF exposure of mobile phone radiations set by the FC Commission. The energy absorbed by the body can be measured by SAR. [4]. Actually SAR value is an important tool in checking the highest feasible disclosure to RF energy of mobile phone handset. Many people believe that using mobile phone handset with a higher value of SAR is dangerous than the handset having low SAR. [5].

2. Calculations of SAR

We can calculate SAR values by using Poynting vector

$$SAR = \frac{\sigma E_i^2}{\rho} \dots\dots\dots (1)$$

Where σ conductivity of the biological material and E_i is the field inside that material.

For 3G and 4G frequencies safe limit =0.4 W/kg [6].

3. Result and Discussion

SAR can be calculated for blood tissues at 3G (2100MHz) and 4G (2300MHz) by using above formula.

Table 1

Distance from phone in cm	3G (2100MHz) Specific Absorption Rate for blood in W/kg				
	0.1 mm	0.2 mm	0.3 mm	0.4 mm	0.5 mm
1	1722.812	1705.924	1689.202	1672.644	1656.248
2	430.703	426.481	422.3005	418.1609	414.062
3	191.343	189.4673	187.6101	185.7711	183.9501
4	107.6939	106.6382	105.5929	104.5578	103.5329
5	68.91247	68.23697	67.56808	66.90575	66.24991
6	47.85387	47.38479	46.9203	46.46037	46.00495
7	35.15721	34.81258	34.47133	34.13343	33.79884
8	26.91894	26.65507	26.39378	26.13506	25.87887
9	21.26704	21.05858	20.85215	20.64775	20.44535
10	17.22812	17.05924	16.89202	16.72644	16.56248
11	14.23692	14.09736	13.95917	13.82234	13.68685
12	11.96196	11.8447	11.72859	11.61363	11.49978
13	10.19222	10.09231	9.993385	9.895425	9.798426
14	8.788006	8.701863	8.616563	8.5321	8.448465
15	7.656136	7.581087	7.506774	7.43319	7.360327

SAR inside the blood tissues of human body at frequency 2100 MHz (3G)

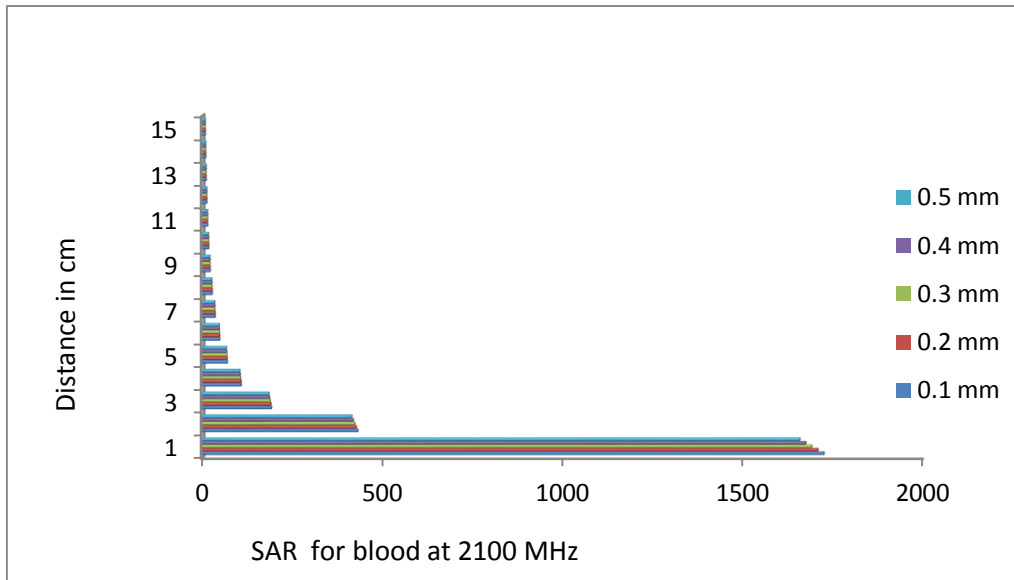


Fig. 1

The variation of SAR for blood tissues at frequency 2100 MHz(3G)

Table 2

Distance from phone in cm	4G (2300MHz) Specific Absorption Rate for blood in W/kg				
	0.1 mm	0.2 mm	0.3 mm	0.4 mm	0.5 mm
1	2139.969	2113.585	2087.527	2061.791	2036.371
2	534.9921	528.3963	521.8819	515.4477	509.0929
3	237.6742	234.744	231.8498	228.9914	226.1682
4	133.7706	132.1213	130.4924	128.8836	127.2947
5	85.59874	84.54342	83.5011	82.47163	81.45486
6	59.44107	58.70823	57.98443	57.26956	56.56349
7	43.67007	43.13167	42.59991	42.07471	41.55598
8	33.43701	33.02477	32.61762	32.21548	31.8183
9	26.41658	26.0909	25.76923	25.45153	25.13774
10	21.39969	21.13585	20.87527	20.61791	20.36371
11	17.6842	17.46618	17.25084	17.03816	16.8281
12	14.85839	14.6752	14.49428	14.31558	14.13909
13	12.66014	12.50405	12.34989	12.19763	12.04725
14	10.91591	10.78133	10.64841	10.51713	10.38746
15	9.50997	9.392724	9.276923	9.16255	9.049587

SAR inside the blood tissues of human body at frequency 2300 MHz (4G)

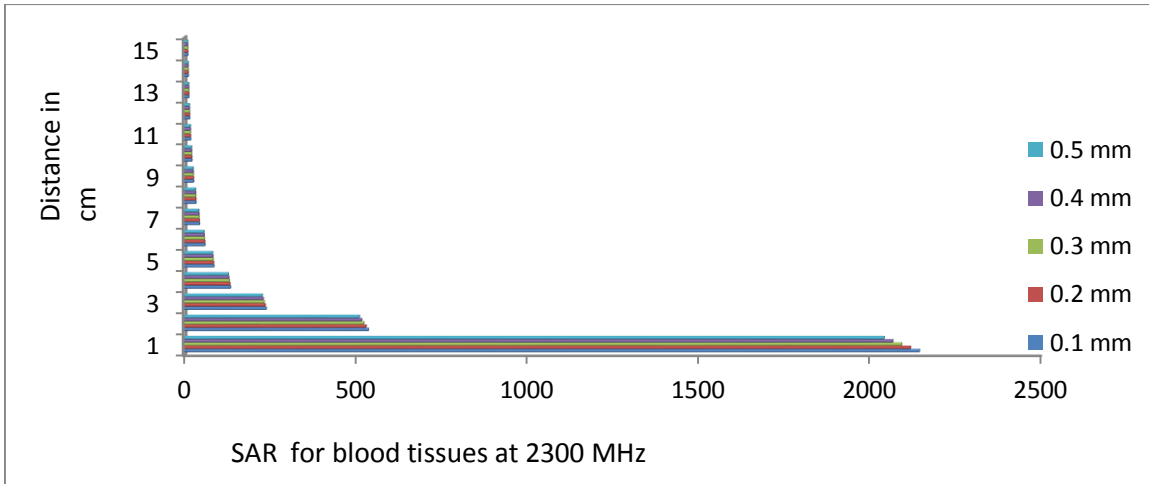


Fig.2

The variation of SAR for blood tissues at frequency 2300 MHz (4G).

4. Conclusions

According to World Health Organization and International Commission of Non-Ionizing Radiation Protection SAR becomes harmful after 0.4 W per kg of the body weight after which SAR become harmful for human body. Table 1 and table 2 shows that SAR is harmful beyond 15 cm distance from the body for 3G and 4G mobile phone communication network. Bold data in tables shows harmful effect. If a person having 75 kg weight than its safe limit of SAR is 119 W/kg. So always use mobile phone handset with low SAR value.

5. References

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