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Effects on Testis of Human Being with Specific Absorption Rate (SAR) of Mobile Phone

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Abstract: Mobile phone radiations are harmful for all living things in the world. Different mobile handsets have different SAR. We have done theoretical study to find harm full effects on testis of human being. In this work the effect of specific absorption rate (SAR) on testis of human being was done at 3G and 4G mobile phone frequencies.
Keywords: SAR, Electromagnetic Waves, Mobile Phone Handset and Blood Tissues

INTRODUCTION

Generally mobile phone communication radiations are smoke less industry. Human being expose with large number of radiations per second. So effects of these radiations go on increasing. 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].

Calculations of SAR

We can calculate SAR values by using Poynting vector

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

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

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

RESULTS AND DISCUSSION

SAR can be calculated for testis of human being at 3G (2100MHz) and 4G (2300MHz) by using above formula (1).

The table-1 shows SAR at different depths varying from 0.1 mm to 0.5 mm at different distances from 1 cm to 15 cm.

The fig-1. represents variation of SAR with different distances in centimeters.

Table-1: **SAR inside the testis of human being at frequency 2100 MHz (3G)**

Distance from phone in cm	3G (2100MHz) Specific Absorption Rate for testis in W/kg				
	0.1 mm	0.2 mm	0.3 mm	0.4 mm	0.5 mm
1	1343.056	1332.033	1321.101	1310.259	1299.505
2	335.764	333.0083	330.2753	327.5647	324.8763
3	149.1656	147.9414	146.7272	145.523	144.3287
4	83.95514	83.26611	82.58273	81.90497	81.23277
5	53.72224	53.28133	52.84405	52.41035	51.98022
6	37.30554	36.99937	36.69571	36.39455	36.09585
7	27.40757	27.18264	26.95955	26.73829	26.51884
8	20.98525	20.81302	20.64221	20.47279	20.30477
9	16.57919	16.44313	16.30817	16.17433	16.04159
10	13.43056	13.32033	13.21101	13.10259	12.99505
11	11.0987	11.00761	10.91727	10.82767	10.73881
12	9.325207	9.248674	9.172769	9.097487	9.022823
13	7.945571	7.880361	7.815686	7.751542	7.687924
14	6.850884	6.794658	6.738893	6.683587	6.628734
15	5.968509	5.919525	5.870943	5.82276	5.774972

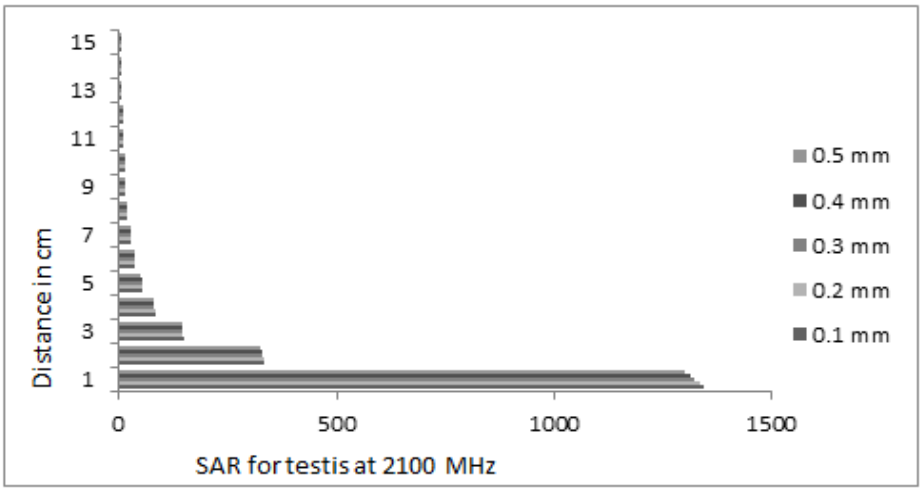

Fig-1: **The variation of SAR for testis at frequency 2100 MHz(3G)**

Table-2: **SAR inside the testis of human being at frequency 2300 MHz (4G)**

Distance from phone in cm	4G (2300MHz) Specific Absorption Rate for testis in W/kg				
	0.1 mm	0.2 mm	0.3 mm	0.4 mm	0.5 mm
1	1339.804	1325.591	1311.529	1297.616	1283.85
2	334.9511	331.3978	327.8823	324.404	320.9626
3	148.8045	147.2259	145.6641	144.1189	142.59
4	83.75188	82.86341	81.98437	81.11466	80.25417
5	53.59217	53.02365	52.46116	51.90464	51.35402
6	37.21522	36.82043	36.42983	36.04337	35.66101
7	27.34122	27.05118	26.76421	26.48029	26.19938
8	20.93444	20.71236	20.49264	20.27525	20.06016
9	16.53905	16.3636	16.19001	16.01826	15.84834
10	13.39804	13.25591	13.11529	12.97616	12.8385
11	11.07183	10.95438	10.83817	10.7232	10.60944
12	9.30263	9.203945	9.106307	9.009704	8.914127
13	7.926334	7.842249	7.759057	7.676746	7.595309
14	6.834297	6.761797	6.690066	6.619096	6.548879

15	5.954059	5.890897	5.828404	5.766575	5.705402

The table-2 shows SAR at different depths varying from 0.1 mm to 0.5 mm at different distances from 1 cm to 15 cm.

The fig-2. represents variation of SAR with different distances in centimeters.

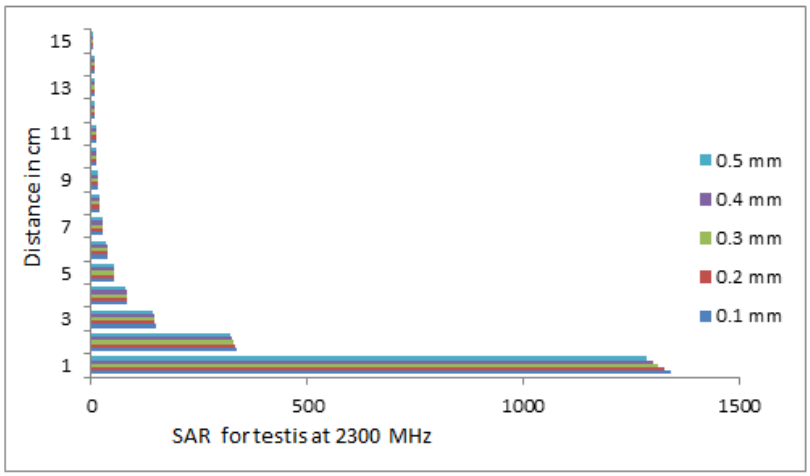

Fig-2: **The variation of SAR for testis at frequency 2300 MHz (4G).**

CONCLUSIONS

SAR is more harmful than penetrated electric field. Everybody did not know about effects of mobile phone radiations but some researchers have found theoretically as well practically the effects of SAR. 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. When mobile phone handset is bring from 15 cm towards our body then SAR value increases which become harmful for human testis. Table 1 and table 2 shows that SAR is harmful beyond 15 cm distance from the testis of human 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.

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