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The Surevy on difference HP 4530S laptab with SONY Z2 smart phone in Meghnatic fileld

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Abstract: *Nowadays, exposure to electromagnetic fields emitted by electronic devices, especially smart cell phones and laptops, is inevitable. The World Health Organization has classified electromagnetic waves in class 2B (possibly carcinogenic) in terms of carcinogenesis. In this study, the magnetic field of laptop HP 4530S and smart cell phone SONY Z2 was measured using the portable measurement device of magnetic fields, model HI 3603. Then, the magnetic fields of the two devices were compared using the statistical test of independent sample T test. The mean magnetic field of smart cell phone SONY Z2 in the ringing mode and internet connected ringing mode is respectively equal to 0.34±0.0038 mG and 0.4±0.0049 mG. The mean magnetic field of laptop HP 4530S within a 40 cm distance is equal to 1.22±0.0113 mG. The mean magnetic fields of laptop HP 4530S and smart cell phone SONY Z2 is meaningfully less than standard limits. The magnetic field of laptop HP 4530S is meaningfully higher than smart cell phone SONY Z2 in the ringing mode and internet connected ringing mode.*
Key Words*: Magnetic Field, Laptop HP 4530S, Smart Cell Phone SONY Z2*

I. Introduction

Nowadays, exposure to electromagnetic fields emitted by cell phones, communication antennas, TVs, laptops, tablets, high voltage substations, electrical cables etc. is unavoidable[3-1]. Studies have shown that use of laptop and cell phone is increasingly day by day. Ownership of cell phones has reached from 12% in 1999 to 76% in 2009 [5 ,4]. Portability of laptops and cell phones has resulted in more concerns about the destructive effects of the emitted electromagnetic fields on human health because it paves the way for more connection of the body to these devices [7 ,6]. In spite of development of numerous international and national guidelines for exposure to electromagnetic fields, concerns about unknown effect of the field, even at the levels lower than the guidelines, is increasing yet [8]. The World Health Organization has classified electromagnetic waves in class 2 B (possibly carcinogenic) in terms of carcinogenesis [9]. Studies have shown that electromagnetic waves lead to intervention in the performance of heart batteries of people with heart disease (at a distance of lower than 15 cm) [8], reduction of sperm movement and increase of DNA failure in human [10], reproductive disorders in birds and mice [11], clinical diseases [12], behavioral effects [13], headache, decrease of concentration and memory, fatigue, and anger in human [15 ,14]. Thus, in this study, we have tried to compare the magnetic field of laptop HP 4530S and smart cell phone SONY Z2.

II. Materials And Methods

1.2. Measurement of magnetic field

Measurement of magnetic field was carried out by the device EMFs survey meter model HI 3603 (figure 1). Before the start of measurement, background electromagnetic fields that can result from other equipment such as communication antennas, substations, TVs etc. were measured. The electric and magnetic field of the cell phone was measured 12 times at a distance of 0.5 cm in the ringing mode and internet connected ringing mode. Also, the electric and magnetic field of laptop HP 4530S was measured 12 times at a distance of 40 cm in front of the screen.

Figure 1. The portable measurement device of magnetic field model HI-3603 VDT/VLF

2.2. Statistical analysis

In order to compare the mean electrical and magnetic difference of the laptop and the cell phone in the ringing mode and internet connected ringing mode, the independent sample t test as well as the statistical test of on sample t test with standard limits was used by the software SPSS 16. P value<0.05 was selected as the meaning level (α=0.05).

III. Results

The electric field was equal to 0.06 V/m in all conditions. The mean magnetic field of smart cell phone SONY Z2 in the ringing mode and internet connected ringing mode is respectively equal to 0.34±0.0038 mG and 0.4±0.0049 mG. The mean magnetic field of laptop HP 4530S within a 40 cm distance is equal to 1.22±0.0113 mG (Table 1).

Table 1. The magnetic field emitted by the smart cell phone SONY Z2 and laptop HP 4530S

	Smart Mobile phone (ringing)	Smart Mobile Phone (Ringing And Connected To Internet)	Laptab
1	0.34	0.40	1.20
2	0.34	0.40	1.20
3	0.34	0.39	1.22
4	0.33	0.40	1.22
5	0.34	0.39	1.23
6	0.34	0.39	1.22
7	0.33	0.40	1.23
8	0.34	0.40	1.23
9	0.34	0.39	1.23
10	0.34	0.40	1.23
11	0.34	0.40	1.23
12	0.34	0.40	1.23
Mean	0.34	0.40	1.22
SD	0.0038	0.0049	0.0113

IV. Discussion

The frequency of communication networks in Iran is equal to 900 and 1800 MHz. Therefore 1.38 mG and 1.95 mG has been considered as the standard limits of public exposure. The ratio of the mean magnetic field of cell phones in the ringing mode and internet connected ringing mode to the standard limit at the frequency of 900 MHz is equal to 24.63% and 28.98% and it is equal to 17.4% and 20.5% at the frequency of 1800 MHz , respectively (Table 2). The standard limit of magnetic field for LCD and laptop is equal to 270 mG. Thus, the ratio of the magnetic field of laptop HP 4530S to the standard limit is equal to 0.45% [16] (Table 2). In the study of Ghaffari et al., the magnetic field of smart cell phones at a distance of 5 cm is equal to 0.96 mG, which is higher than the result of our study [17].Since the measurement device was the same for both studies, the our lower obtained magnetic field than the study of Ghaffari et al., can be due to the difference in the phone brand, connection to internet, phone life time, phone mode (ringing, vibration mode or silent) [19 ,18]. The magnetic field of the study conducted on laptop HP NX9030 by Akinyemi and Usikalu was obtained as 0.6 mG (at a distance of 40 cm), which is lower than the result of our study [20].

Table 2. Comparison of magnetic fields of smart cell phone SONY Z2 and laptop HP 4530S, standard limits

	Frequenc (MHz)	Mean	Std. Deviation	Std. Error Mean	P value	Standard (mG)
Ringing	900	0.33	0.0038	0.001	<0.001	1.38
Ringing And Connected To Internet		0.39	0.0049	0.001		
Ringing	1800	0.33	0.0038	0.001	<0.001	1.95
Ringing Andconnected To Internet		0.39	0.0049	0.001		
Laptab		1.22	0.0113	0.003	<0.001	270

As it is seen in Table 3, the magnetic field of smart cell phone SONY Z2 in the ringing mode and internet connected ringing mode is meaningfully less than the magnetic field of laptop HP 4530S (Table 3).

Table 3. Comparison of magnetic fields of smart cell phone SONY Z2 and laptop HP 4530S

	Mean	**Std. Deviation**	**Std. Error mean**	**P value**
Ringing	0.33	0.0038	0.001	<0.001
Labtob	1.22	0.0113	0.003	
Ring+connected to internet	0.39	0.0049	0.001	<0.001
Labtob	1.22	0.011	0.003	

V. Conclusions

The mean magnetic field of laptop HP 4530S and smart cell phone SONY Z2 is meaningfully less than standard limits. The magnetic field of laptop HP 4530S is meaningfully higher than smart cell phone SONY Z2 in the ringing mode and internet connected ringing mode. However, the difference was seen only for one model of laptop and smart cell phone and it is possible to get different results for other models. Despite obtaining magnetic fields of lower than standard limits for the laptop and smart cell phone in this study, many studies have shown that hazards of electromagnetic fields cannot be ignored even in circumstances of below standard limits.

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References

[1]. Nakatani-enomoto, s., et al., effects of electromagnetic fields emitted from w-cdma-like mobile phones on sleep in humans. Bioelectromagnetics, 2013. 34(8): p. 589-598.
[2]. Joseph, w., et al., comparison of personal radio frequency electromagnetic field exposure in different urban areas across europe. Environmental research, 2010. 110(7): p. 658-663.
[3]. Bellieni, c., et al., exposure to electromagnetic fields from laptop use of "laptop" computers. Archives of environmental & occupational health, 2012. 67(1): p. 31-36.
[4]. Hauri, d.d., et al., exposure to radio-frequency electromagnetic fields from broadcast transmitters and risk of childhood cancer: a census-based cohort study. American journal of epidemiology, 2014: p. Kwt442.
[5]. Organization, w.h., extremely low frequency fields environmental health criteria. World health organization, 2007. 238.
[6]. Silny, j., et al., health effects from radiofrequency electromagnetic fields of mobile phones and other new communication systems. Umwelt med forsch prax, 2004. 9(3): p. 127-136.
[7]. Pourlis, a.f., reproductive and developmental effects of emf in vertebrate animal models. Pathophysiology, 2009. 16(2): p. 179-189.
[8]. Masao, t. And s. Watanabe, biological and health effects of exposure to electromagnetic field from mobile communications systems. Iatss research, 2001. 25(2): p. 40-50.
[9]. Who, iarc classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans. 2011, press release n° 208.
[10]. Avendano, c., et al., use of laptop computers connected to internet through wi-fi decreases human sperm motility and increases sperm dna fragmentation. Fertility and sterility, 2012. 97(1): p. 39-45. E2.
[11]. Balmori, a., electromagnetic pollution from phone masts. Effects on wildlife. Pathophysiology, 2009. 16(2): p. 191-199.
[12]. Fujii, y., dental treatment for dizziness and joint mobility disorder caused by harmful electromagnetic waves. Open journal of antennas and propagation, 2015. 3(01): p. 1.
[13]. Thomas, s., et al., exposure to radio-frequency electromagnetic fields and behavioural problems in bavarian children and adolescents. European journal of epidemiology, 2010. 25(2): p. 135-141.
[14]. Sandström, m., et al., mobile phone use and subjective symptoms. Comparison of symptoms experienced by users of analogue and digital mobile phones. Occupational medicine, 2001. 51(1): p. 25-35.
[15]. Arnetz, b., et al., the effects of 884 mhz gsm wireless communication signals on self-reported symptoms and sleep—an experimental provocation study. Piers online, 2007. 3(7): p. 1148-1150.
[16]. Cleveland, r.f., d.m. Sylvar, and j.l. Ulcek, evaluating compliance with fcc guidelines for human exposure to radiofrequency electromagnetic fields. 1997: standards development branch, allocations and standards division, office of engineering and technology, federal communications commission.
[17]. Ghaffari, h.r., et al., human exposure assessment to electric and magnetic field emitted by mobile phones, television sets, and personal computers. Journal of chemical and pharmaceutical research, 2015. 7(5): p. 1310-1316.

[18]. Kühn, s., et al., assessment of the radio-frequency electromagnetic fields induced in the human body from mobile phones used with hands-free kits. Physics in medicine and biology, 2009. 54(18): p. 5493.
[19]. Micheli, d., et al., measurement of electromagnetic field attenuation by building walls in the mobile phone and satellite navigation frequency bands. Antennas and wireless propagation letters, ieee, 2015. 14: p. 698-702.
[20]. Akinyemi, m. And m. Usikalu, prudent avoidance in exposure to extremely low frequency (elf) fields. Scientific research and essays, 2010. 5(16): p. 2295-2298.