

## Measuring the intensity of the electromagnetic field near several electrical panels in an industrial company in Ahvaz city

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## Abstract

**Background:** Long term exposures to electromagnetic fields have some adverse health effects on exposed workers. Applications of equipment which creates electromagnetic field are increasingly high. Therefore, the current study was carried out to evaluate electromagnetic fields near several electrical panels in an industrial company in Ahvaz city.

**Methods :** In this cross-sectional study, the intensity of electromagnetic and electric fields was measured next to 5 electrical panels and at different points of them using ELF Magnetic field meter and Electrosmog meter devices and the results were compared with reference standards. The measurement was local and at the point of contact of the worker.

**Results:** In all measurement points, the electric and magnetic field intensity was lower than the standard. The average electric and magnetic fields measured at all points were equal to  $0.18 (K \frac{V}{m})$  and  $2.34 (\mu T)$  respectively.

**Conclusion:** The intensity of all the measured electric and magnetic fields was lower than the reference limits. According to these results, the workers are probably facing with the safe limits of electromagnetic and electric fields.

**Key words:** Electric field, magnetic field, Standard, Ahvaz.

## Introduction

Electromagnetic fields (EMF) are increasing day by day In work environments and have harmful effects on workers in the environment. Currently, all humans have different degrees of contact with EMF and the amount of contact is increasing with technological progress(1). Electromagnetic field formes from two parts of the field electric and magnetic fields .Both of them are produced by electric current. The electric field is produced where there is a potential difference,while the magnetic field is produced only by electric current(1). Allowable occupational contact values for exposure to permanent magnetic fields Presented by the American Conference of Industrial Health Professionals (ACGIH) is 60 mT for the whole body and 600 mT for hands and feet for 8 hours of work and 2 T and 20T for ceiling limit respectively is recommended for the whole body, hands and feet as the occupational exposure limit (OEL) of Iran has also been accepted. For electric fields, occupational radiation at zero Hz frequency DC up to 220 Hz should not be more than 25 m/kv field of intensity(2,3). International Agency for Research on Cancer (IARC) In its self-report of electromagnetic fields in terms of causing cancer has placed it in Group 2B In the sense that it is possible for humans carcinogenic(4).The study of Mortazavi and colleagues (2010) on the effect of magnetic fields caused by displays and computer on rats at 1.15 T $\mu$  showed that the increase in magnetic fields leads to a decrease in production and the movement of sperm (5) Also the study of Eyvazlou et al (2016) ,showed that excessive use of mobile phones puts affects the quality of students' sleep(6).The results of the epidemiological study in Switzerland: 74% of people's complaints were due to contact with antennas and the results of the study done in the radiation area are announced as follows: 49% sleep disorder, 17% headache,18% disturbance in thought concentration, fatigue 16%. The results of Saneini, based on the research done, the symptoms that appeared in the residents around the mobile phone antennas based on the location distance of desidence to the antenna is divided into three categories 100 m -1 for excitability, tendency to depression, memory loss, dizziness ,200m - headache, sleep disorder, discomfort and skin problems, 300m -3 to create fatigue(7,8).

#### Materials and methods:

In this cross-sectional study, the intensity of electromagnetic and electric fields was measured next to 5 electrical panels and at different points of them using ELF Magnetic field meter and Electrosmog meter devices and the results were compared with reference standard (OHSAS 18001:2007, ICN I RP) . These devices have the ability to measure electric fields and magnetism separately in different scales and units ,also have the ability to store measurement results. in this study of electric field was in terms of km/v and magnetic field was in terms of (  $\mu$ T )respectively. The measurement was local and at the point of contact of the worker.

**Table 1. ICN I RP values for frequency 50/60 HZ ( Allowed amount)**

	Electric field ( $K \frac{v}{m}$ )	Electromagnetic field( $\mu$ T )
Job limits: All day's work short time	10 30	0.5 5
Public places: up to 24 hours a day Some hours a day	5 10	0.1 1

**Results:** The results, are presented in the following tables.

**Table 2. Electric panel number 1**

Row	Location	Exposure Time(hr)	Magnetic flux density( $\mu T$ )			Electric field intensity( $K v/m$ )		
			Magnetic flux density	Standard	Result	Electric Field intensity	Standard	Result
1	Electric panel number 1 - point 1	Intermittent	10	500	OK	0.45	10	OK
2	Electrical panel number 1 - Point 2	Intermittent	9	500	OK	0.68	10	OK
3	Electrical panel number 1 - point 3	Intermittent	8	500	OK	0.60	10	OK
4	Electrical panel number 1 - point 4	Intermittent	12	500	OK	0.59	10	OK
5	Electrical panel number 1 - point 5	Intermittent	9	500	OK	0.61	10	OK
6	Electrical panel number 1 - point 6	Intermittent	11	500	OK	0.61	10	OK

**Table 2. Electric panel number 2**

Row	Location	Exposure Time(hr)	Magnetic flux density ( $\mu T$ )			Electric field intensity( $K v/m$ )		
			Magnetic flux density	Standard	Result	Electric Field intensity	Standard	Result
1	Electric panel number 2 - point 1	Intermittent	0.10	500	OK	0.010	10	OK
2	Electrical panel number. 2 - Point	Intermittent	0.21	500	OK	0.023	10	OK
3	Electrical panel number 2 - point 3	Intermittent	0.06	500	OK	0.020	10	OK
4	Electrical panel number 2 - point 4	Intermittent	0.19	500	OK	0.019	10	OK
5	Electrical panel number 2 - point 5	Intermittent	0.56	500	OK	0.013	10	OK

**Table 3. Electric panel number 3**

Row	Location	Exposure Time(hr)	Magnetic flux density ( $\mu T$ )			Electric field intensity( $K v/m$ )		
			Magnetic flux density	Standard	Result	Electric Field intensity	Standard	Result

			density			intensity		
1	Electric panel number 3 - point 1	Intermittent	0.75	500	OK	0.010	10	OK
2	Electrical panel number 3 - Point 2	Intermittent	0.12	500	OK	0.015	10	OK
3	Electrical panel number 3- point 3	Intermittent	0.95	500	OK	0.042	10	OK
4	Electrical panel number 3 - point 4	Intermittent	0.84	500	OK	0.023	10	OK
5	Electrical panel number 3 - point 5	Intermittent	0.29	500	OK	0.079	10	OK
6	Electrical panel number 3 - point 6	Intermittent	0.03	500	OK	0.031	10	OK
7	Electrical panel number 3- point 7	Intermittent	0.75	500	OK	0.016	10	OK
8	Electrical panel number 3 - point 8	Intermittent	0.03	500	OK	0.035	10	OK

**Table 4. Electric panel number 4**

Row	Location	Exposure Time(hr)	Magnetic flux density ( $\mu T$ )			Electric field intensity( $K v/m$ )		
			Magnetic flux density	Standard	Result	Electric Field intensity	Standard	Result
1	Electric panel number 4 - point 1	Intermittent	0.75	500	OK	0.030	10	OK
2	Electrical panel number 4- Point 2	Intermittent	0.69	500	OK	0.019	10	OK
3	Electrical panel number 4- point 3	Intermittent	0.43	500	OK	0.031	10	OK
4	Electrical panel number 4 - point 4	Intermittent	0.55	500	OK	0.049	10	OK
5	Electrical panel number 4 - point 5	Intermittent	0.39	500	OK	0.031	10	OK
6	Electrical panel number 4 - point 6	Intermittent	0.29	500	OK	0.072	10	OK
7	Electrical panel number 4- point 7	Intermittent	0.70	500	OK	0.064	10	OK

8	Electrical panel number 4 - point 8	Intermittent	0.25	500	OK	0.036	10	OK
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**Table 5. Electric panel number 5**

Row	Location	Exposure Time(hr)	Magnetic flux density ( $\mu T$ )			Electric field intensity( $K v/m$ )		
			Magnetic flux density	Standard	Result	Electric Field intensity	Standard	Result
1	Electric panel number 5 - point 1	Intermittent	1.01	500	OK	0.019	10	OK
2	Electrical panel number 5 - Point 2	Intermittent	1.42	500	OK	0.029	10	OK
3	Electrical panel number 5- point 3	Intermittent	1.36	500	OK	0.036	10	OK
4	Electrical panel number 5 - point 4	Intermittent	1.15	500	OK	0.059	10	OK
5	Electrical panel number 5 - point 5	Intermittent	0.72	500	OK	0.048	10	OK
6	Electrical panel number 5 - point 6	Intermittent	0.64	500	OK	0.086	10	OK
7	Electrical panel number 5- point 7	Intermittent	0.39	500	OK	0.020	10	OK
8	Electrical panel number 5 - point 8	Intermittent	0.68	500	OK	0.025	10	OK

### Discussion and Conclusion:

The intensity of all the measured electric and magnetic fields was lower than the reference limits. According to these results, the workers are probably facing with the safe limits of electromagnetic and electric fields. In the study of Sharififard and colleagues (2010), which conducted with the purpose of measuring the magnetic field in 230 KV substations In none of the stations, the field value wasn't higher than the standard of the International Commission on Protection against Non-Ionizing Radiations (9).

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