

# Methods Decrease Electric Field Computer The Using Size Anthropometric Distance Body User

I Ketut Wijaya

Faculty of Engineering, University of Udayana  
Faculty of Electrical Engineering,  
Bukit Jimbaran, Badung, Bali, Indonesia  
wijaya@ee.unud.ac.id

**Abstract—** Computers are used with different brands and sizes. Similarly, the bad consequences such as radiation generated is also very different. In this study was conducted to determine the level of radiation electric field is generated and influential man. The electric field is generated between 348.67 kV / m up to 725.32 kV / m at a distance of 45 cm. In this condition, the electric field is below 5 kV / m, which means it can not affect the body. In order to use the computer more comfortable then suggested eye distance to the computer 62.08 cm, 64.83 cm, or 67.58 cm with light intensity 301,8 lux. At a distance of 64.83 cm is a convenient distance to Indonesian people working on computers with of electric field between 166.00 kV / m up to 324.23 kV/m on of reviews ergonomics. At a distance of 67.58 cm is the furthest distance in this study with an electric field between 143 kV / m up to 242.67 kV / m and hands it difficult to reach the keyboard.

**Keyword-** electric power, efficiency, loss methods, intensity of illumination, and ability seeing from eye

## I. INTRODUCTION

Many electronic equipment sometimes is a way to show achievement and quality of life. All of these tools can help us to do many things, ranging from washing clothes, cooking, ironing, as well as for home entertainment such as television, radio, VCD players, mobile phones and laptops. Household electronic appliances suspected to have links with several health effects such as decreased immune system, headaches, sleep disturbances, decline in work performance, changes in behavior, depression, brain tumors and other tumors, and cancer.

Electronic devices are the most widely used today are mobile phones, televisions, and computer. Electronic devices emit electromagnetic fields is different, where the greater the voltage (volts per meter (V / m) or kilovolt per meter (kV / m)) is used, then the radiation is also greater [3]. Electronic devices which will be discussed in this study is about the danger of computers due to radiation which is issued. The dangers posed by the use of computers is due to low-frequency electromagnetic radiation, radiation which produced by computer monitors [4]. The radiation caused by the computer can result in a complaint to the eye, such as eye becomes red and watery, becoming dizzy head and neck became stiff [6], [7]. The use of computers has the potential to affect the productivity of the hormone melatonin in the body [6]. The hormone melatonin can affects the condition of sleep at night. Due to the influence of the terrain electro magnitik hormone melatonin will be reduced so that the potential to cause a variety of complaints such as fatigue and pain of insomnia [5]. The influence of computer use in the long term is can cause cataracts, dermatitis, and sexual disorders in men and women.

Need to do research to get the answers in penanggulangan resulting from computer radiation, so that computer users know the harmful effects of using a computer and can prevent it.

### 1.1 Problem Formulation

From the above description may be made formulation of the problem as follows:

- 1 What is the distance required for working comfort in using the computer?
- 2 How large the radiation of computer which affect human?
- 3 How large the intensity of light needed to work using computers?

### 1.2 Benefits Research

#### A. Benefits of theoretical

The benefits of this research is as a reference, way, knowing the risks, and troubleshooting to use the computer properly.

#### B. Benefits user

After done breakdown problem as above, expected computer users can work more comfortably.

## II. THE MATERIALS AND METHODS

The material in this study is the computer lab along with students of Electrical Engineering at the Department of Electrical Engineering, Udayana University Jimbaran Badung. The sample in this study of 30 people who are all students.

This research method is by writing in generally based on facts and the author's own experience. The author also takes on a variety of references, both from the review of literature in the form of internet media sources related to the effects of computer radiation. Data too obtained by measuring directly from the sample and also perform calculations.

## III. RESULTS AND DISCUSSION

### 3.1 Results

The level of radiation from the computer research results should be known and the cause of the radiation so that computer users can do repair working conditions in order to avoid radiation that affect the health of the body.

#### 3.1.1 Distance comfort in using computers

##### a. Anthropometric size

Anthropometric size is taken of the size of samples with straight forward clenched hands be measured directly on the sample in a sitting position.

TABLE 1. Size Anthropometric With A Sample 30 (N = 30)

<b>Size Hand straight Into Home</b>		
<i>N</i>	<i>The average (cm)</i>	<i>SD</i>
30	64.83	1.67
<i>percentile 5</i>	<i>percentile 50</i>	<i>percentile 95</i>
62.08	64.83	67.58

Results of Measurement Sample [8]

The mean size reach of hands in front of 30 people of sample, obtained by 64.83 cm with a standard deviation of 1.67.

##### b. Percentile size of anthropometric

Size anthropometry percentile sought was to obtain the shortest distance and the distance of farthest from eye to the computers which be permitted.

#### 3.1.2 The level of computer radiation

Computer radiation measurements obtained from measuring with the electric field measuring instrument. The results of measurements taken are as follows:

TABLE 2. Size Radiation Electric Field Computer

No.	Brand or type	Large (inc)	Level of Radiation Electric Field (V / m)				
			45 cm	50 cm	62,08 cm	64,83 cm	67,58 cm
1	Flatron W1953 SE	17 inn	710.33	390.33	254.33	233.67	170.00
2	Flatron W1953 SE	17 inn	348.67	296.00	248.00	201.67	172.00
3	Flatron W1953 SE	17 inn	576.00	372.33	271.00	166.00	143.00
4	Flatron W1953 SE	17 inn	657.34	432.45	289.23	171.00	156.23
5	Compaq W185q	17 inn	667.67	449.33	339.00	277.67	242.67
6	Compaq W185q	17 inn	687.34	509.23	453.12	324.23	201.54
7	Compaq W185q	17 inn	679.12	467.76	367.45	278.45	189.89
8	Compaq W185q	17 inn	725.32	467.34	387.36	285.54	201.76
9	Compaq W185q	17 inn	689.34	483.32	382.43	301.19	199.91
<b>The Average</b>			<b>637.90</b>	<b>429.79</b>	<b>332.44</b>	<b>248.82</b>	<b>186.33</b>

Results of Measurement Sample [8]

### 3.1.3 The intensity of light needed to work using computers

The room the research can use natural light, but because of the demands and eliminate glare then a fairly wide window covered with a green cloth drapery. The intensity of light in the room the research can be well controlled, only use general illumination which is the result of the calculation.

#### a. The average of light intensity

TABLE 3. Results Calculation And Result Measurement On The Every Corner Of The Room

No.	Measurement Place	The Intensity of Light
1	The right side	299.3
2	The right side	299.6
3	The right side	305.0
4	In The Middle	310.0
5	The Left side	300.0
6	The Left side	300.0
7	The Left side	299.4
The mean		301.9

Results of Measurement Sample [8]

After obtained many lights are used from the result calculation, then the light intensity is measured by lux meter at 7 vertex.

## 3.2 Discussion

### 3.2.1 Distance comfort in using computers

In a reviewed of ergonomics the distance of work being comfortable in the study was obtained from size of anthropometry a sample on condition sitting down raised his hand straight forward grasping. Anthropometric

size of sample used as a measure of distance eye to the computer in working using the computer. Distance of eyes to computers adjusted to the size antropometri between distance 62.08 cm, 64.83 cm, or 67.58 cm. This distance is the best distance from the research used in use of computer. This distance is based on a practical standpoint, and that recommendation standpoint is 45.7 to 71.1 cm which are recognized by the standards of ergonomics [9], [11]. Distance of eyes to the computer that is used in this research is the distance which adjusted to the size of the anthropometry of sample. Distance anthropometric measure suggested in this study is a distance with the influence of an electric field smallest.

Distance of results of research based on this antropotri size can be ensured be able to reduce the influence of the electric field of the computer screen according to the distance of the eye. Distance to the computer according to the results of this research will be able to reduce pain in the eye [14]. Computer users have to do reconditioning sit on the computer screen, if do not want to be sick due to the influence of the electric field of the komputer.

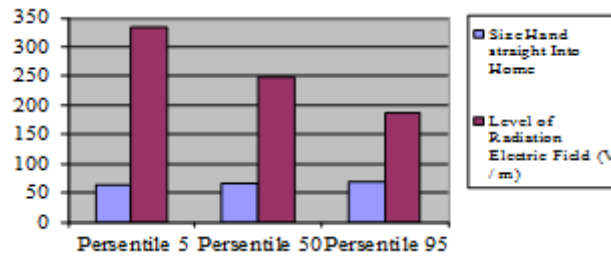


Table 1. Distance comfortable to the Use Pesentil Anthropometrics

### 3.2.2 Radiation of computer

Level of radiation waves micro emitted by monitor screen of computer, is waves electro magnetic which have long of waves between 0.3 to 30 cm and large of frekwesi the wave electro magnetic between 1-100 gigahertz. Microwaves, infrared waves and radio waves do not have a clear difference on the conditions and nature of the wave [2]. To reduce the wave effect of microwaves namely on electro-magnetic waves, the distance between the eyes with the computer should be more than 30 cm [5]. Results of research conducted , produce some results in accordance with anthropometric measure distance. Average of electric field at a distance of 45 cm generates the magnetic field at 689.34 kV / m, at a distance of 50 generating 483.32 kV / m, at a distance of 62.08 cm generates 382.43 kV / m, at a distance of 64.83 cm generates 301.19 kV / m, and at a distance of 67.58 cm generates 199.91 kV / m. Results measuring obtained is the average of radiation within safe levels namely are below 5 kV / m [10], this matter may imply the use of the computer is still in safe condition. Impact of electric field radiation in above or below 5 kV / m, or directly, and prolonged exposure may affect the health of computer user [5].

The greater of electric power used by the computer, the greater the electric field that is issued by the monitor with unit V / m. The strength of the electric field can be avoided by adjusting the distance between the monitor with eye. Although it has been done adjusting spacing, but also must to do a short rest break to avoid yestrain.

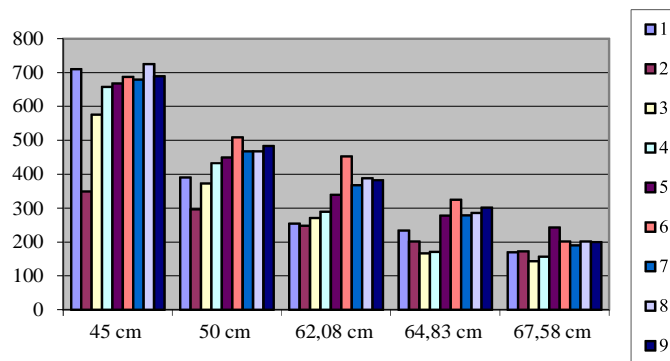


Table 2. The level of computer radiation

### 3.2.3 The intensity of light suggested

Large the light intensity obtained from the calculation is equal to 301.9 lux, is sufficient to provide lighting in the reading room. The greater the intensity of light will give a reading ability of the eye to see of the letter without adding eye accommodation. On light intensity 301.9 lux, as the eye can see the letter with a height of

2.1 cm x 1.1 cm at a distance of 4.21 meters. The result of calculation reinforced by the opinions Ankrum (2008) states, the lighting design is often focused on size which customized with job specifications, so the recommended light intensity between 200-500 lux [2].

The light intensity based the research Wijaya (2014, 2015) by lowering the light point based on anthropometric student standing upright hand lifted up to above grasping will get light intensity which enough to read [14].

Working with computers should be with certain requirements, namely the requirement of lighting and temperature to make workers comfortable with no complaints. Working with lighting shall be in accordance with the requirements of the required light intensity and temperature shall be in accordance with cold temperatures of people Indonesia. This provision emphasizes that the of electricity power should is used efficiently and meet the requirement of use.

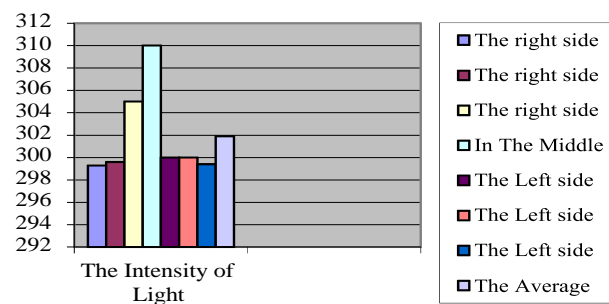


Table 3. The Intensity Of Light Suggested

#### IV. CONCLUSIONS

From the above description can be concluded as follows:

Computers in this study had radiation of the electric field of less than 5 kV/m, are still considered safe in the work using computers. But many the experts which say that a computer can cause illness such as stiffness in the hands, pain in the eyes, dizziness, and headaches for no apparent reason. If the computer is used for a long time every day, preferably know how to use a computer such as: break moment, the distance of eye on to computer, and with adequate lighting intensity ie 250-500 lux.

#### ACKNOWLEDGMENTS

I am grateful to Prof. I Made Sutajaya and Prof. I Dewa Putu Sutjana above guidance and enter the given. Hopefully we can cooperate well.

#### REFERENCES

- [1] Alexander Juswan, 2003. Study powerful calculations of electric and magnetic fields below 150 KV transmission line. Accessed May 9, 2015.
- [2] Ankrum, 2008. Ankrum, DR 2008. New Visual Consideration at Computer Workstasions. Available from URL: [http://www.google.com/ergonomics booklet.html](http://www.google.com/ergonomics%20booklet.html). Accessed March 1, 2014.
- [3] Antox, 2009. The influence of electromagnetic waves on health. Accessed 11 April 2015.
- [4] NN, 2012. Dangers arising from the Computer / Laptop And Tips On How To Prevent. Accessed 24 April 2015.
- [5] NN, 2013. 2013. Effect tool elektronik of Household Can Cause Cancer and Chronic Disease. Accessed 21 April 2015.
- [6] Tiyas Sulistyaningsih, 2013. Radiation laptop / computer. Accessed 21 April 2015.
- [7] Ramdani Sofhan, 2014. The Negative Effects of Radiation Computer / Laptop. Accessed, 11 April 2015.
- [8] Wijaya, 2015. Results of Measurement. Data Taken on 3 April 2015.
- [9] Sweere, H. C. 2007. Ergonomic Factors Involved in Optimum Computer Workstation Design a Pragmatic Approach. Available from URL=[http://www.ergotron.com/5\\_support/literature/PDF/ERGONOMIC\\_FACTORS.pdf](http://www.ergotron.com/5_support/literature/PDF/ERGONOMIC_FACTORS.pdf). Accessed, 6 April 2008.
- [10] WHO and IRPA, 1990. Recommendation international of radiation, protection and association (IRPA) and WHO in 1990 to limit exposure Electric Field and Magnetic Field 50-60 Hz. Accessed, 11 April 2015.
- [11] Wilkinson, B. 2006. The Relationship Between Computers and Your Health. Available from: URL:[http://www.sccsc.com/bkk/computer % Use%20and%20Your%20Health.pdf](http://www.sccsc.com/bkk/computer%20Use%20and%20Your%20Health.pdf). Accessed, 26 April 2008.
- [12] Wijaya, 2015. Method of Minimizing Electric Field Computer by Fitted Earthing (Grounding) on the Stop Contacts to Safety and Comfort Work
- [13] Wijaya. K. 2015. Lowering Location Of Lights, Repair Of Temperature, Repair Tables-Chairs, Seting Distance Eyes To Computer, And Adjustment Using Mouse To Improve Performance (Decrease Fatigue, Complaints And Pain Carpal Tunnel Syndrome (CTS)) On Computer Users In Company X. International Journal of Engineering and Innovative Technology (IJEIT) Volume 4, Issue 11, May 2015.
- [14] Wijaya, 2015. Method Enlarge Intensity Illumination Without Adding Power Electricity. International Journal Of Engineering And Tecknology. Volume: 7, Issue: 2.

1. First author : I Ketut Wijaya.



I was born : in Padangbai, Karangasem, Bali, Indonesia

Date: October 12, 1959

Education :

1. Education Strata 1: Institute of Technology Surabaya in Surabaya, Indonesia and Acquired degree which is Ir, 1986
2. Education Strata 2: Ergonomics of Work Physiology Udayana University in Denpasar, Bali, Indonesia, and degree which obtained is M.Erg (Master Ergonomics), 2007
3. Education Strata 3: Ergonomics of Work Physiology Udayana University in Denpasar, Bali, Indonesia, and degree which obtained is Dr (Doctor), in 2011

Often participated in the training, the writing and research national nor international.

Worked as a lecturer at the Faculty of Electrical Engineering University of Udayana Badung, Indonesia from 1987 to the present.