Study on Computer Generated Electromagnetic Effects on Computer Users

Jagdev Singh¹, Dr. Tripatdeep Singh Dua²
¹Research Scholar, Career Point University, Kota, INDIA
²Dr. Tripatdeep Singh Dua, Career Point University, Kota, INDIA

ABSTRACT

A computer is a general purpose machine that can be programmed to carry out a set of arithmetic or logical operations automatically. Since a sequence of operations can be readily changed, the computer can solve more than one or many kind of problem. But in any case computer requires Electricity to run or in other word electricity is the basic or essential requirement to run a computer (Till date).

Electromagnetic radiation (EMR) is energy in waves form emitted from electrical sources. It travels at the speed of light, this energy is both electrical and magnetic. This paper describes electromagnetic effects especially generated by the computers and computer related devices. It is interesting to investigate computer generated electromagnetic effects both on computing and on user health.

Keywords--- EMR, EMF, Hz, mG, Gy, Tesla, Gauss, ELF, VLF, LWR, LHWP, LSRP, LC, LACP

I. INTRODUCTION

A computer is a general purpose machine that can be programmed to carry out a set of arithmetic or logical operations automatically. Since a sequence of operations can be readily changed, the computer can solve more than one or many kind of problem. But in any case computer requires Electricity to run or in other word electricity is the basic or essential requirement to run a computer (Till date).

Electricity is the set of physical phenomena associated with the presence and flow of electric charge. Electricity gives a wide variety of well-known effects, such as lightning, static electricity, electromagnetic induction and electrical current. In addition, electricity permits the creation and reception of electromagnetic radiation such as radio waves. Flow (Moving) of Electron from one terminal to another is known as current and Moving charges produce a magnetic field. Electrical currents generate magnetic fields, and changing magnetic fields generate electrical currents.

II. ELECTROMAGNETIC FIELD

The electromagnetic field extends indefinitely throughout space and describes the electromagnetic interaction. It is one of the four fundamental forces of nature:

{1 Electromagnetic Field 2) Gravitation Force 3) Weak interaction 4) Strong interaction}

An electromagnetic field (EMF) is a physical field produced by electrically charged objects. It affects the behavior of charged objects in the vicinity (Surrounding Area) of the field. Electromagnetic radiation (EMR) is energy in waves form emitted from electrical source. It travels at the speed of light. This energy is both electrical and magnetic. The energy travels in waves form alternatively from positive to negative in electrical terms. It travels from North Pole to South Pole.

Electromagnetic radiation from a source penetrates surrounding area, creating an electromagnetic field (EMF). This EMF is strongest at the source and weakens with increasing distance until it becomes too small to measure. A strong EMF can be due to powerful source of radiation far away or a weak radiation source very close by. That is by the EMF produced by Cell phone is stronger than the produced by the cell tower. Or EMF produced by Laptop is more strong than the EMF produced by desktop computer because both are away from the human body.

The electric fields and magnetic field component of the EMF can be separately measured. The electrical field strength can be measured in Volts per meter (V/m) or as power density in milliwatts per square centimeter (mW/cm)
The Magnetic fields can be quantified in milligauss (mG) or microTesla (1 micro Tesla = 10 milligauss).

The atomic energy or ionized radiation is often quantified in electron Volts (eV) but the absorbed radiation dose is measured in grays (Gy).

### III. ELECTROMAGNETIC SPECTRUM

In the electromagnetic spectrum, frequencies range from less than 20 Hz to $10^{24}$ Hz. The visible light spectrum is portion of electromagnetic spectrum.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Type of Radiation</th>
<th>Frequency Range in Hertz (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>1</td>
<td>Extremely Low Frequency (ELF)</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Very Low Frequency (VLF)</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>Radio Frequency (RF)</td>
<td>$10^{6}$</td>
</tr>
<tr>
<td>4</td>
<td>Microwaves (MW)</td>
<td>$3 \times 10^{3}$</td>
</tr>
<tr>
<td>5</td>
<td>Infrared (IR)</td>
<td>$10^{12}$</td>
</tr>
<tr>
<td>6</td>
<td>Visible light</td>
<td>$10^{14}$</td>
</tr>
<tr>
<td>7</td>
<td>Ultra violet (UV)</td>
<td>$10^{15}$</td>
</tr>
<tr>
<td>8</td>
<td>X-Rays</td>
<td>$10^{17}$</td>
</tr>
<tr>
<td>9</td>
<td>Gamma Rays</td>
<td>$10^{20}$</td>
</tr>
</tbody>
</table>

Table: Showing Electromagnetic spectrum in Hertz

### IV. COMPUTER GENERATED ELECTROMAGNETIC FIELDS

Computer generated electromagnetic radiation is a real health hazard. Many of us spend our working days in front of computer monitors, surrounded by electromagnetic equipment, each item emitting radiation because of duration of exposure – many hours every days (As shown in practical)

This type of radiation, known as Extremely Low Frequency (ELF) is also emitted from power lines, electrical substation, TV and other electrical and electronic appliances. Another type of electromagnetic radiation found near computers is microwave radiation. Microwaves are used to provide radio communication between wireless networked equipment including computers, Printers, Modems, Routers and other cordless or Wi-Fi devices.

During the practical following observations are founds in Computer Lab:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>No. of Printers</th>
<th>Monitor 15”</th>
<th>Electromagnetic Force Found in (Gauss)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>CRT</td>
<td>700 - 900 MicroGauss</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>LCD</td>
<td>200 - 250 Micro Gauss</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>CRT</td>
<td>1800 - 2000 MicroGauss</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>LCD</td>
<td>550 - 700 Micro Gauss</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>CRT</td>
<td>2200 - 2800 Micro Gauss</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>LCD</td>
<td>800 - 900 Micro Gauss</td>
</tr>
<tr>
<td>7</td>
<td>100</td>
<td>CRT</td>
<td>2800 - 3500 Micro Gauss</td>
</tr>
<tr>
<td>8</td>
<td>100</td>
<td>LCD</td>
<td>900 - 1000 Micro Gauss</td>
</tr>
</tbody>
</table>

Table 2: Showing EMF produced by the Computers in Micro Gauss

### V. THE DANGERS TO THE COMPUTER USER HEALTH

Effect on Computer Users at the distance around 3-5 feet of monitors...
VI. EXTREMELY LOW FREQUENCY (ELF) EFFECTS

ELF for many years it has been known that ELF radiation can cause or contribute to various health problems such as:
- Sleep disorder
- Allergic reaction
- Hypertension
- Alzheimer
- Brain Tumor

Most of people would not want to sit under high voltage power lines. But they will happily sit a foot away from computer screen, with a computer, printer and UPS on a desk next to them. And they will work like this for several hours a day, for many years, absorbing as much Extremely Low Frequency (ELF) radiation than if their desk was close to high voltage power line.

Some General effects of Computer
1. Loss of Concentration
2. Loss of spelling remembering Power
3. Loss of Writing Power
4. Loss of manual arithmetic calculation Power

VII. HARMFUL HEALTH EFFECTS OF EMF RADIATION (AS PUBLISHED IN VARIOUS JOURNALS)

1. Protein Changes in Skin (New Scientist 23rd February 2008)
2. Excited Brain Cells (The Health 24th June 2006)
3. DNA Damage (USA Today 21st December 2004)
5. Aggressive Growth in Leukemia Cells (New Scientist 24th October 2002)
7. Brain Tumor (The News 3rd October 2007)
8. Miscarriage (Epidemiology January 2012)
9. Asthma (15% asthma cases are found who living near to the high power transmission than others. (Achieves of Pediatrics and Adolescent Medicine August 2011
10. Low sperm count (Journal of Human Reproduction)

VIII. LAPTOP RADIATION & MALE INFERTILITY

The use of laptops (especially when situated on the lap near the reproductive organs) has been connected to male infertility. (Journal of Human Reproduction)
Theories why include the heat from the machine itself on the scrotum, or radiation from the EMF at such a close distance. Also published in various newspapers some of them are as follows:-

Table 3: Shows study on Students / employee in different organization

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Operation Time</th>
<th>Effects</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 – 30 minutes</td>
<td>No effects are found till date</td>
<td>Study on Students in Computer Labs</td>
</tr>
<tr>
<td>2</td>
<td>½ - 1 hour</td>
<td>Eye irritation</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1 - 2 hours</td>
<td>Eye irritation &amp; headache</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2 - 3 hours</td>
<td>Eye irritation and headache</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3 - 4 hours</td>
<td>Eye irritation, headache, undated</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4-5 hours</td>
<td>Imitation, Loss of Concentration, Eyesight weak</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5-6 hours</td>
<td>Imitation, Loss of Concentration, Sleeplessness,</td>
<td>Computer users in different organization</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>“ “</td>
</tr>
<tr>
<td>8</td>
<td>6-7 hours</td>
<td>Imitation, Loss of Concentration, Sleeplessness, indigestion (stomach related problem)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>7-8 hours</td>
<td>Imitation, Loss of Concentration, Sleeplessness, indigestion (stomach related problem)</td>
<td></td>
</tr>
</tbody>
</table>

This study conducted on 200 students during the academic year 2012-13, 2013 -14 in different colleges Computer Labs (Containing around 30 – 100 computer in a lab area around 70 sq mt to 200 sq mt ) and around 100 computer users in different organization (area around 5 sq. mt to 30 sq.mt working hours around 6 - 8 hours a day)
IX. EMF RADIATION & BRAIN TUMOR

Computer Generated EMF effects are easily avoidable / controlled.

1. The distance between monitor and users eyes must around 3 to 4 feet
2. CPU / Cabinet must be on the floor or floor level
3. Display unit must be LCD / LED
4. Avoid wireless mouse and any wireless internet connection
5. Use wired internet connection
6. Computer and printer must be connected through wired only
7. Position your UPS at least 1.5 meter away from your working chair
8. If possible you landline networking instead of Wi – Fi
9. If you can’t avoid the EMF exposure try to keep it short
10. Keep distance at least 400 meter from high power transmission & cell phone Tower for living near to power lines
11. Keep distance about 10 meter from electrical transformer
12. Today cell phone is the need of hours please use for short time as possible it is too harmful than any other EMF exposure because it is near to the brain and heart always

X. CONCLUSION

The objective of this paper is to identify the electromagnetic effects on computer user. Electromagnetic radiation (EMR) is energy in waves forms emitted from electrical sources. It is interesting to investigate computer generated electromagnetic effects both on computing and on user health. Computer generated electromagnetic radiation is a real health hazard. Many of us spend our working days in front of computer monitors, surrounded by electromagnetic equipment, each item emitting radiation because of duration of exposure – many hours every day’s.

Most of people would not want to sit under high voltage power lines. But they will happily sit a foot away from computer screen, with a computer, printer and UPS on a desk next to them. And they will work like this for several hours a day, for many years, absorbing as much Extremely Low Frequency (ELF) radiation as if their desk was close to high voltage power line.

REFERENCES

[12] USA Today 21st December 2004