

EMPIRICAL STUDIES ON THE EFFECT OF ELECTROMAGNETIC RADIATION (EMR) FROM VARIOUS SOURCES

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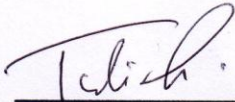
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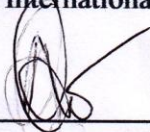
APPROVAL

This thesis titled “ **EMPIRICAL STUDIES ON THE EFFECT OF ELECTROMAGNETIC RADIATION(EMR) FROM VARIOUS SOURCES**” submitted by Md. Shohag Hossain and S.M.SahidurRahaman to the department of Electronics and Telecommunication Engineering, Daffodil International University, has been accepted as satisfactory for the partial fruition of the requirements for the degree of Bachelor of Science in Electronics and Telecommunication Engineering and approved as to its form and contents. The presentation was held on 7th January 2020.

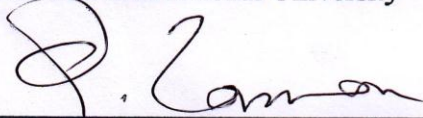
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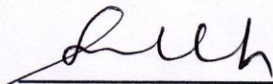
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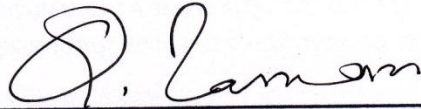


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DECLARATION

We hereby declare that, this thesis has been done by us under the supervision of **Professor Dr. Engr. Mohammad Quamruzzaman, Professor, Department of Electronics and Telecommunication Engineering Daffodil International University.** We also declare that neither this thesis nor any part of this thesis has been submitted elsewhere for award of any degree or diploma.

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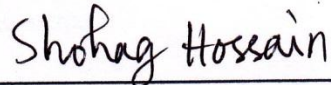
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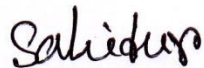


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ABSTRACT

Just after the invention of electricity by Michael Faraday, there has been a revolution in the communication technology, which list to the invention of radio, television, radar, satellite, mobile etc. While this device has made our lives richer, safer and easier, they have been accompanied by concerned possible health risks due to their electromagnetic radiation (EMR) emission. For sometime a number of individuals have reported a variety of health problems that they relate to exposure to electromagnetic field (EMF) and electromagnetic radiation (EMR). While some individual report mild symptoms and react by avoiding the field as much as they can, others are so severely affected that the survey work and change their entire lifestyle. In this paper, empirical survey study has been carried out in the laboratories of Daffodil International University (main and permanent campus). It was found that some of the instrument had higher electromagnetic field. A case study found that people (working near high frequency field) had various sufferings due to the exposure of electromagnetic field (EMF). The findings from this survey may be helpful for the students to take precautionary measurement who work for long duration in the various laboratories.

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CHAPTER 1

INTRODUCTION

There is no doubt that electricity is the more important things for our today's civilization. Now a days the power of electricity is the main basement of the universe. But at the same time, we should aware about the hostile effect of variation in the Electromagnetic field (EMF) which also known as non-ionizing radiation (NIR). It is narrative that high power transmission and extremely low power radiation frequency like computer, video display, light, laptop, fridge, router, transmission line and all the other home appliances and telecommunication equipment's also Laboratories equipment's in every School College and University. This high frequency (HF), low frequency (LF) and extremely low frequency (ELF) electromagnetic field instruments are very harmful for human living system and human body also effect lower level animals. The electromagnetic field is more dangerous than normal electric field. Because the electric field in human body discharge by the ground and other materials but the magnetic field not discharge from our body it's stays in our body and make difficulties in our body and health. We can call this electromagnetic field also silent killer. The elaborate use of electromagnetic field has been effects of the human health hazards. In the short-term process in very high electromagnetic field strength its cause of nerve muscle stimulation and also change cell foundation in central nerve system.

In the long term of process electromagnetic field is risk for childhood leukemia occurs average around 0.3 to 0.4 Micro Tesla (μT). This electromagnetic field also responsible for carcinogenic to human (WHO 2002). This is also including others like childhood cancer, cancer in adults, suicide cardiovascular disorders, reproductive dysfunction developmental disorders, Immunological modifications, neuro behaviors effects and neurodegenerative diseases.

At the same time lower level animals and sensitive animals are also affect by the electromagnetic field. It accomplishes that lower level animals like rats and bee when living around electromagnetic field are face hives and geniture problem.

The electromagnetic field also may cause of sudden infant death syndrome (SIDS). There is also report that biological effect like immune deficiency, sensitive lymphocytes, disrupting DNA, cellular breakdown is being affected by electromagnetic field.

This non-ionizing radiation (NIR) from various electromagnetic fields not only called health hazards but also causes various message in electronics equipment. Electromagnetic interference (EMI) is the reason of this problems. This EMI interfere electronic equipment frequency and destroy this process. All over the world the engineers and scientist are very much concern about EMI and try to find out the best way to overcome.

The elaborate use of frequency electromagnetic Radiation (EMR), the public is becoming increasingly aware of an concerned about its potential biohazards the continuing inequality in the safety standards worldwide and the lack of knowledge about

electromagnetic field non thermal mechanisms of interaction with biological systems bring this situation into focus. Even though knowledge in this area has

improved greatly in the last 10 to 12 years, it is still insufficient to set lawful safety standards.

The addition of electromagnetic radiation (EMR) to the human body is quite complex, as it depends on frequency, polarization, far-field versus near-field, corporeal posture etc. But the research in this field has generally been limited, which causes most of the studies to focus on subtle short-term expression levels.

So electromagnetic field all over around us and its causes of health hazard by various electronics equipment. So people should aware of this and it necessary to be informed the harmful effects of non-ionizing radiation on living system and also on the environment to find out the appropriate solutions for minimizing or controlling the hazards of non-ionizing radiation.

CHAPTER 2

LITERATURE REVIEWS

2.1 Introduction

In this chapter we will discuss about the health issue of electromagnetic radiation. There are several researches in electromagnetic radiation effect on living life. We will shortly show some of research main outline.

2.2 Research of Electromagnetic

In recent years a large number of researches on the result of electromagnetic radiation discharge by many sources had been carried out.

A research has been done by Carl Blackman that research shown that low electromagnetic field discharge calcium ions from cell membranes.

A research by David and his group in 1993 showed that the electrician who has exposures to highest electromagnetic field radiation died from brain cancer at 2.5 times the rate of others workers (Philip Haying 1995).

In France a study showed of tiredness among people living within 300m is increase from the base station of sleep disturbance, discomfort, within 200m and irritability, depression, dizziness, loss of memory, within 100m (Santini et al, 2002).

Near mobile phone BTS living are at risk for developing neuropsychiatric problems as prickle, headache, alter reflex, muscle pain, tremors, memory loss, numbness, dizziness, leg/foot pain, muscle and joint paint, (Abdel-Rassoul et al,2006).

There is a connection with Alzheimer's disease, motor neuron disease and Parkinson's disease with Exposure to electromagnetic field has shown (WHO,2007).

Russian Scientists had done studies on EMF for decades, and reported that electric fields cause high blood pressure, and white and red blood cell counts changes, immune system dysfunction, chronic stress effects, increased metabolism, chronic fatigue disorders, and headaches (Havas,2008).

A study was done Iran about the effect of electromagnetic radiation from high voltage transmission lines. It showed that living under these transmission lines was riskier than living near these transmission lines (Ahmadi H et al, 2010).

A study showed that a working near antennas their transmitting high microwave power effect of their thyroid gland processes (Gavriloaia et al 2010)

Exposure to extremely low frequency electromagnetic field from high voltage substations had a negative effect on people who is living near this substation, they suffer on sleeping problem (Tayebeh et al 2012).

A research has been studied by Tice and his team, an average specific absorption rate (SAR) of at least 5.0 w/kg under extend exposure condition are capable of damage in human lymphocytes.

Ham and his team showed that watching Television and using mobile phone during the first term pregnancy may increase risk of embryo growth ceasing.

A study was done by Lahham and Sarabati about the leakage from microwave ovens. The amount of microwave leakage from oven at a distance 1m vary from .43 to 16.4 $\mu\text{W}/\text{cm}^2$. They found a linear relation between the amount leakage and the age of oven and operating power.

2.3 Objective of The Study

The aims of this study are:

- To know the effect of electromagnetic radiation (EMR) from various sources on leaving system
- To measure the radiation from various sources and compare the data with ICNIRP/ITU approved standard values as maximum permissible dose (MPD), power and threshold distance.
- Prepared a survey report about effect of EMR especially from laboratories equipment of DIU
- To calculate the electric field, magnetic field and specific absorption rate (SAR)

CHAPTER 3

THEORITICAL MODEL

3.1 Introduction

This chapter discuss about electric field and magnetic field, how they work. It also discuss about electromagnetic radiation, threshold distance from any electronic/electrical devices/sources.

3.2 Radiation

Any form of energy that is propagated as rays, waves or as a stream of charged particle sound waves and the emission for radioactive substances is called radiation as (e.g. light, electromagnetic waves, electromagnetic radiation EMR). Energy that is radiated by a charge particle undergoing acceleration is called electromagnetic radiation. Transverse sinusoidal electric and magnetic field are the instantaneous value of the field's being related to equations defines the fields as electromagnetic waves. Just as moving charged particles have associated wave light propagate at right angles to each other and to the direction of motion charge and current density is determined by Maxwell's equations for electromagnetic waves (EMW) propagated through free space with a constant velocity ($C = 2.997 \times 10^8$ m/s) features. So electromagnetic radiation has a wave particle duality, it may also be considered as a stream of particles (photons) that move at the velocity of light and have a zero-rest mass $E = hf$ the total ranges of the possible frequencies are defined has the electromagnetic spectrum. Radio waves have the lowest spectrum frequency progressively higher frequencies are associated with the infra-red radiation, ultra violet (UV), X-rays through to Gama ray at the highest spectrum.

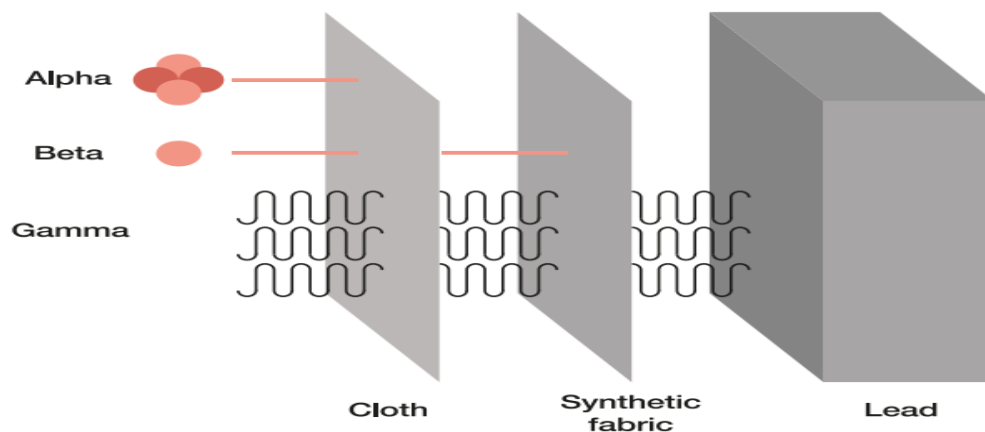


Figure 3.1: Indicator of the penetrating power of Alpha, Beta and Gama ray.

3.3 Static Electric Field

A field is spatial distribution of a scalar or vector quantity, may or may not be a function of time. Electric fields have their sources in electric charges (electrons and ions). Charge is the fundamental physical quantity involved in the study of electromagnetic fields.

Charge is a scalar quantity

Charge is quantized

Charge is conserved in a isolated system

Charge is of two kinds positive and negative

Unit of charge is coulomb

Nearly all electric fields vary to some extent with time but for many problems the time variation is slow and the field may be considered stationary in time over the interval of interest. For other importance cases (called quasi static) the spatial distribution is nearly the same as for the static field (do not change with time) even though may vary rapidly with time.

The development of electrostatic in elementary physics usually begins with the experimental “Coulomb’s Law” for the force between two-point charges. This law states that the force between two charge bodies q_1 and q_2 is proportional to the product of the charges and inversely proportional to the square of the distance, R_{12} . The charge bodies are very small in comparison to their distance.

3.4 Characteristics of Electromagnetic Fields

Electromagnetic fields propagate as waves and travel at the speed of light (C). The wavelength is proportional to the frequency.

$$\lambda (\text{wavelength}) = \frac{c(\text{speed of light})}{f(\text{frequency})}$$

Near-field is assumed if the distance to the field source is less than three wavelengths. For far-fields, the distance is more than three wavelengths. In the near-field, the ratio of electric field strength (E) and magnetic field strength (H) is not constant, so measure each separately. In the far-field, however, it is enough to measure one field quantity, and compare the other accordingly.

CHAPTER 4

EFFECT OF EMF ON BIOLOGICAL SYSTEM AND ENVIRONMENT

4.1 Introduction

In this chapter discussion have been done about bio-hazard of Electromagnetic radiation, which is more concern for human health.

4.2 Different Types of Health Hazard of EMF:

Some of the important facts regarding the effects of Non- Ionizing Radiation.

1. The risk of dying from acute myeloid leukemia (AMI) is 2.6 times more among the electrical/electronic/communications engineers/professionals.
2. Service personnel exposed to non-ionizing radiation when compared with their unexposed colleagues have seven times as likely to develop cancer of blood forming organs and lymphatic tissue and four times likely to develop thyroid tumors younger personnel between 20 and 29 has a 550% great risk stricken with CANCER.
3. 10 to 15% of all frequency fields in home for children who live close to high current and high frequency fields carrying wire the risk of being affected by childhood cancer is more than 5 times from those who do not. Houses with more than 300nT magnetic field strength at 60 Hz power frequency has the risk more double.
4. Significantly more miscarriages are reported by electric blanket and heated waterbed users.
5. 60Hz power line fields produce a large suppression of T-lymphocyte cells to mark and kill cancer cells.
6. 100 μ T 45Hz magnetic field exposure showed a rapid build-up of serum triglycerides, an accepted warning of likely HEART problems.
7. 100% increase in MISCARRIAGES have been reported when video terminal users wear compared with non-working pregnant women.
8. A very special disease called repetitive stress injuries (RSt) have reported to attack and estimated 185000 US office and factory workers a year due to personal computer (PC) use. The user losses their grip and trouble managing simple manual tasks. How ironic is that computers are causing such harm to human! (So, computer without KEYBOARD is the solution).

9. Clinical depression and commitment to suicides are closely linked with people living near power lines.

10. Canada power development board, New York state power line, and nine other states, in U.S.A, New Zealand, Sweden have declared Right of Way (ROW) a law prohibiting building homes at a distance of 30-90m from the high voltage power lines. Other countries like Russia, Poland, China, India have made special laws for the protection.

11. SIDS sudden infant death syndromes have found closely linked with NIR. (There are other biological effects e.g. sensitive Disrupting DNA, Immune deficiency, cellular breakdown etc.)

12. New branches of science have been develop called Bio-Electromagnetism, Bio-Electronics, Electromedicine, Electro-healing etc.

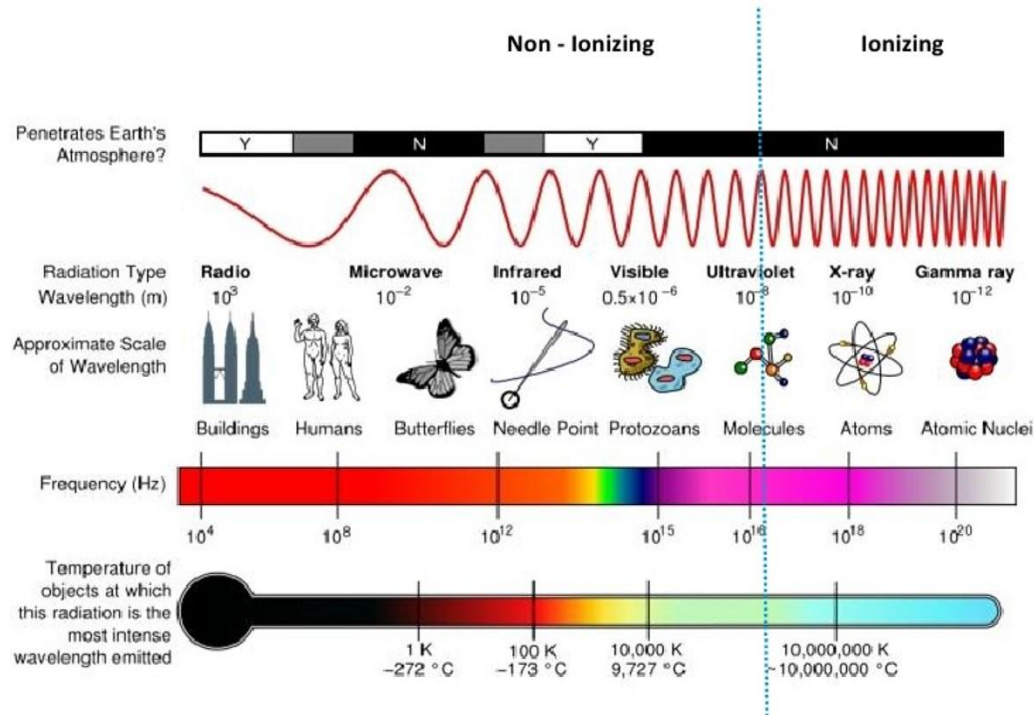


Figure 4.1: Electromagnetic Spectrum

13. A study conducted in 2009 by Dr. Dietrich Klinghardt on Autistic Children and their mother during Pregnancy shows significant results strongly suggesting that EMR in the sleeping environment of the mothers during pregnancy and as well as of children may be a key contributing factor if not a causative one in neurological impairment in children including autism.

14. Tamara Mariea found in her more than five years research on clients with autism that points to cell phone radiation stress as one the potentially major cause of the explosion of autistic cases in the past two decades.

15. Researcher Leeka Kheifeth and colleagues conducted a study in which they found a link between cell phone use in behavioral problems in children. A survey in 2008 with more than 13,000 children found that those whose mothers used cell phones during pregnancy were more likely to have behavioral problems like hyperactivity and trouble controlling emotions. It was also found that EMR from cell phones possess a hazard to a developing fetus. Studies have also shown that EMR in that frequency range can affect their liver, enzymes, glands, muscles, hormone balance, heart and bone marrow.



Figure 4.2: Radiation from various home appliances

CHAPTER 5

METHODOLOGY

5.1 Introduction

In this survey measurement of various Laboratories equipment's from Daffodil International University was carried out. Also, from various brands of mobile phone, home appliances. Measurements on Electric field, magnetic field and radiated power from every instrument were taken. The highest values as well as the threshold distance were noted down.

Measurements from various devices in the laboratories were also carried out where the students spend long time every day. Measurement was taken around the device (front, back, left, right, top and bottom).

Magnetic Meter from Magnetic Sciences International (MSI) was used to measure magnetic field. Then threshold distance of the radiation was measured by Coghill field mouse. Also, the measurement of the Electric field, Magnetic field and Power was done by Electro-smog Meter.

5.2 DESCRIPTION OF INSTRUMENT

(A)ELECTROSMOG METER

ELECTROSMOG METER is a dual-mode device for quick measurement of both high and frequency RF electromagnetic wave field strength /power density level, and low frequency (LF) magnetic field level (Guess, Tesla) for living environments. It is an excellent device for individual or company with electromagnetic wave safety concerns. It has RF bandwidth of 100MHz to 8 GHz with high sensitivity (up to 1.8w/m²) and LF bandwidth of 50Hz to 10KHz with sensitivity of 0.1 μ T to 60 μ T.



Figure 5.1: ELECTROSMOG METER

Applications

- High frequency RF Electromagnetic wave field strength, power density and frequency measurement.
- Low frequency Magnetic field measurement (Guess meter function)
- Mobile phone base station antenna radiation power density measurement
- Wireless communications, analog and digital RF (AM/FM, TDMA, GSM, CDMA, 3G, 4G)
- Radio frequency (RF) power measurement for transmitters
- AC power line, power transformer, motors and small appliance EMF
- Personal living environment EMF safety evaluation

(B)The Coghill Field Mouse

A Coghill field mouse for biohazards awareness was used for measuring the threshold values for both electric field and magnetic field around the instrument. The threshold voltage setup inside the Coghill Field Mouse is according to ICNIRP. The readings were taken to cover all around the equipment.



Figure 5.2: Coghill Field Mouse

(C) Magnetic Science International

The Magnetic Science International use for measuring the electromagnetic field and radiation which approximately measure the highest value of the radiation.



Figure 5.3: Magnetic Field International Meter

(D) Digital EMF Meter

This meter simultaneously measures and displays Magnetic field, Electric field and RF strength. The unit of measurement and measurement types are expressed in units of electrical and magnetic field strength and power density.



Figure 5.4: Digital EMF Meter

This meter is ideal for EMF measurement of power lines, electrical appliances, industrial devices, cell phones, base stations and microwave leakage. This device is shipped fully tested and calibrated and, with proper use, will provide years of reliable service.

CHAPTER 6

DATA COLLECTION

6.1 Introduction

This chapter was talked about our experimental methods.

6.2 Data Collection procedure

The present work mainly involves with the measurement of electric field (EF), magnetic field (MF), signal power and threshold distance from cell phone also various electrical and electronics devices in **Laboratories equipment's** of Daffodil International University.

1. For cell phone: The data has taken from various branded cell phone to measure the electric field, magnetic field, signal power and threshold distance.
2. Home appliances: The data has collected from various branded home appliances like Light, Fan, Router, Fridge, laptop, AC, etc. Also, measurement the nearest distance radiation for highest value. From all side measurement has taken.
3. Laboratories equipment: The electric field, magnetic field, signal power has collected from various laboratories equipment's of Daffodil International University.

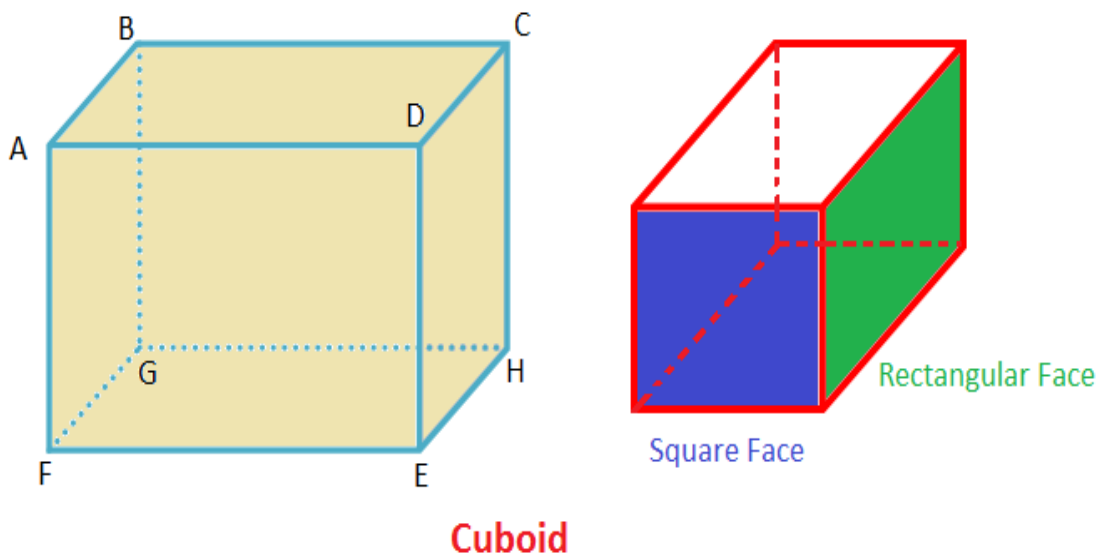


Figure 6.1: Indications of all the side of instrument which we have measured.

4. Indications of all the side a cubic shape to compare the electronic/electrical equipment's like ABCD Top side, EFGH bottom side, ADFE Front side, BGCH Back side, ABFG Left side, CDEH

CHAPTER 7 RESULTS

Table7.1: Results from ETE laboratory.

SL. No.	Lab. Name	Instrument Name	Mfg. Date	Measured Value			Threshold Distance	
				EF V/m	MF μ T	power mW/cm ²	EF	MF
1	ETE lab	PC	April 2017	.1595	.60	1.2504	E V E R Y W H E R E	2.10fit
2	ETE lab	PC	April 2017	.1792	1.7	1.2450		2.1fit
3	ETE lab	UPS	April 2017	.2380	60+	1.230		2.11fit
4	ETE lab	Voltage stabilizer	April 2017	.662	29.6	.0150		3.1fit
5	ETE lab	UPS	April 2017	.1876	60+	.1806		2.18fit
6	ETE lab	Digital storage oscilloscope	April 2017	.1813	2.20	.5034		17inch
7	ETE lab	Transducer	April 2017	.2180	12.90	.3326		17inches
8	ETE lab	Digital trainer board	April 2017	.1290	.30	.2580		2.1fit
9	ETE lab	Digital biscuit trainer board	April 2017	.1200	.30	.0200		1.4Fit
10	ETE lab	projector	April 2017	.1081	7.90	.0072		3 inches
11	ETE lab	Function Generator	July 2016	.1280	6.04	.120		6 inches
12	ETE lab	DC power supply	July 2016	.0588	28.6	.0017		3.2fit
13	CIS lab	Analog oscilloscope	July 2016	.406	.40	.0135		3inches

Table7.2: Results from CIS Laboratory

SL. No.	Lab. Name	Instrument Name	Mfg. Date	Measured Value			Threshold Distance	
				EF V/m	MF μ T	power mW/cm ²	EF	MF
1	CIS lab	PC	Jan 2014	1.41	.60	.694	E V E R Y W H E R E	2.10fit
2	CIS lab	PC	Jan 2014	.900	3.00	.1051		2.1fit
3	CIS lab	UPS	Jan 2014	1.159	34.30	3.564		2.11fit
4	CIS lab	Voltage stabilizer	Jan 2014	.2844	11.30	2.050		3.1fit
5	CIS lab	UPS	Jan 2014	2.248	60.00	13.86		2.18fit
6	CIS lab	PC	Jan 2014	.931	3.40	2.301		2.8fit
7	CIS lab	UPS	Jan 2014	.541	53.30	2.391		2.10fit
8	CIS lab	PC	Jan 2014	.900	3.80	.797		2.11fit
9	CIS lab	UPS	Jan 2014	10.27	31.50	1.965		2.8fit
10	CIS lab	PC	Jan 2014	1.242	4.20	4.092		2.11fit
11	CIS lab	PC	Jan 2014	1.614	.6	8.74		3fit
12	CIS lab	UPS	Jan 2014	1.858	60.00	9.16		3.2fit
13	CIS lab	PC	Jan 2014	1.214	4.20	2.004		2.6fit

Table7.3: Results from EEE Laboratory.

SL. No.	Lab. Name	Instrument Name	Mfg. Date	Measured Value			Threshold Distance	
				(EF) V/m	(MF) μ T	power mW/cm^2	EF	MF
1	EEE LAB	Trainer board	August 2019	674	13.42	3177	E V E R Y	24 inches
2	EEE lab	Digital oscilloscope	August 2019	278	1.01	58.4		24 inches
3	EEE lab	Power supply	August 2019	188	148.7	85.6		24 inches
4	EEE lab	Induction motor	August 2019	44	7.15	41.4		24 inches
5	EEE lab	Transformer over heated protection	August 2019	50	15	41.4		24 inches
6	EEE lab	Power supplied spilt phase motor	August 2019	35	127.1	41.4	W H E R E	24 inches
7	EEE lab	Electrodyna mo meter	August 2019	402	5.55	39.6		24 inches
8	EEE lab	Single Phase Transformer	August 2019	94	23.8	41.4		24 inches
9	EEE lab	Resistive load	August 2019	70	10.88	41.4		24 inches
10	EEE lab	Inductive load	August 2019	152	10.23	41.4		24 inches
11	EEE lab	System power	August 2019	1635	201.1	71.4		3 Fit

Table7.4: Results from SWE Laboratory

SL. No.	Lab. Name	Instrument Name	Mfg. Date	Measured Value			Threshold Distance	
				(EF) V/m	(MF) μT	power mW/cm ²	EF	MF
1	SWE lab	UPS	July 2011	.0964	60+	.0246	E V E R Y W H E R E	1Fit
2	SWE lab	PC	July 2011	.1081	1.3	.0310		5 inch
3	SWE lab	UPS	July 2011	.1021	60+	.0276		1Fit
4	SWE lab	PC	July 2011	.2256	3.4	.1355		5 inch
5	SWE lab	UPS	July 2011	.2088	60+	.1520		1Fit
6	SWE lab	PC	July 2011	.1831	1.10	.0797		5 inch
7	SWE lab	UPS	July 2011	.1813	23.8	.0874		1 Fit
8	SWE lab	PC	July 2011	.0964	4.5	.0246		5 inch
9	SWE lab	UPS	July 2011	.1300	60+	.0448		1Fit
10	SWE lab	PC	July 2011	.1360	1.80	.0491		5 inch
11	SWE lab	PC	July 2011	.2082	4.70	.1153		5 inch

Table7.5: Results from CE Laboratory

SL. No.	Lab. Name	Instrument Name	Mfg. Date	Measured Value			Threshold Distance	
				(EF) V/m	(MF) μ T	power mW/cm^2	EF	MF
1	Civil lab	Hot Air Oven	Sep 2019	411	9.28	4.8	E V E R Y W H E R E	26 inch
2	Civil lab	Incubator	Sep 2019	814	0.11	27.4		24 inch
3	Civil lab	Universal testing machine		26	12.53	31.7		21 inch
4	Civil lab	Concrete Core Cutter		55	43.5	36.4		31 inch
5	Civil lab	Loss Angelesabrasion machine		179	13.74	41.4		3 inch
6	Civil lab	Concrete mixture machine		29	31.3	31.7		3 inch
7	Civil lab	Cement testing machine		111	1.90	31.7		8 inch
8	Civil lab	UPS		285	110.0	85.6		1 Fit
9	Civil lab	PC		155	16.31	36.4		5 inch

Table7.6: Results from CSE Laboratory

SL. No.	Lab. Name	Instrument Name	Mfg. Date	Measured Value			Threshold Distance	
				(EF) V/m	(MF) μT	power mW/cm ²	EF	MF
1	CSE lab	UPS	July 2016	.3907	23.7	.3836	E V E R Y W H E R E	10 inch
2	CSE lab	PC	July 2016	.895	1.20	.581		5 inch
3	CSE lab	UPS	July 2016	.2875	60+	.1665		10 inch
4	CSE lab	PC	July 2016	30.302	1.30	.2136		5 inch
5	CSE lab	UPS	July 2016	.2505	60+	.0874		10 inch
6	CSE lab	PC	July 2016	.3115	11.60	.1754		5 inch
7	CSE lab	UPS	August 2014	.690	60+	.5394		1 Fit
8	CSE lab	PC	August 2014	.588	1.0	.4486		2 inch
9	CSE lab	UPS	August 2014	.4959	60+	.5394		1 Fit
10	CSE lab	PC	August 2014	.467	1.40	.4092		2 inch
11	CSE lab	UPS	August 2014	.4610	60+	.5271		1 Fit

Table7.7: Results of Textile Laboratory

SL. No.	Lab. Name	Instrument Name	Mfg. Date	Measured Value			Threshold Distance	
				(EF) V/m	(MF) μ T	power mW/cm^2	EF	MF
1	Textile	Continuous posing machine	2014	8	35.5	64.8	E V E R Y W H E R E	30.6 6 inch
2	Textile	Sewing machine	2014	11	627.1	93.3		29 inch
3	Textile	PMD chain Switch sewing machine	2014	590	200	145.7		29 inch
4	Textile	Lock switch button hole	2014	213	1244	71.4		25 inch
5	Textile	Button attaching machine	2014	650	1507	71.4		30.6 6 inch
6	Textile	Color matching cabinet	2006	296	169.0	118.0	14 inch	1 inch
7	Textile	Electric balance	2014	207	20.2	46.8	14 inch	1 inch
8	Textile	Oven	2014	1263	58.5	85.6		1 inch

Table7.8: Result of epidemiological survey of mobile phone user

SI No.	Username	Age	Brand or Model	Usages Years	Usages H/D	Measured Value			Health symptoms
						EF V/M	MF μ T	Power mW/cm^2	
1	Anaet Ullah	26	Asus	10	4	1.00	2.27	13.55	Insomnia
2	Asduzzaman	23	Samsung	7	10	.740	.70	1.07	Headache
3	Mohyminul Islam	25	Nakia	11	6	1.44	.10	3.033	Insomnia
4	Choyan Das	26	Huawei	10	7	1.09	.30	3.17	No
5	Ahsanul Haque	23	iPhone	8	10	1.83	.30	8.94	Insomnia
6	Md. Kefayet Ullah	21	Xiaomi	8	10	2.38	.40	9.16	No
7	Shamim	35	6s+	14	2	4.108	17.5	3.483	No
8	Farhad	23	Oppo	9	7	4.016	.20	3.25	No
9	Muradul Islam	23	Stylish	6	10	.659	.30	.159	Insomnia
10	Imran	26	Samsung	9	8	.349	2.40	.079	Headache
11	Emon	21	Xiaomi	10	5	.766	.30	1.555	Headache

Table7.9: Results from Air-condition.

SI No.	Instrument Name	Location	Manufacturing Date	Measured Value			Company
				EF V/M	MF μ T	Power mW/cm^2	
1	AC	EEE lab	July 2016	.3046	.60	.2465	Gree
2	AC	EEE Lab	July 2016	.2594	.60	.1520	Gree
3	AC	ETE lab	July 2016	.3330	2.6	2.24	General
5	AC	ETE lab	July 2016	.2844	2.80	.1904	General
6	AC	CSE lab	March 2016	.674	1.20	1.207	Primax
7	AC	CSE lab	March 2016	.1286	3.60	.0438	Primax
8	AC	CSE lab	July 2017	.4253	3.90	.4807	Gree
9	AC	CSE lab	May 2016	.674	2.30	.3999	Gree
10	AC	CIS lab	May 2016	.892	4.312	.6420	General

Table 7.10: Results from Switch board

SL. No.	Lab. Name	Instrument Name	Mfg. Date	Measured value			Threshold Distance	
				EF(V/M)	MF (μ T)	Power mW/cm^2	EF	MF
1	DOL	Switchboard	March 2014	11.33	3.80	340.3	E V E R Y W H E R E	2 Fit
2	CSE	Switch Board	March 2016	4.503	1.20	.3647		1 Fit
3	CSE	Switch board	March 2016	.714	2.60	1.355		1 Fit
4	CSE	Switch board	July 2017	.5480	.5394	.5394		1 Fit
5	CSE	Switch board	Jan 2015	.931	3.90	2.66		1 Fit
6	CSE	Switch board	May 2016	.588	5.30	.679		1Fit
7	SWE	Switch board	July 2017	.581	8.50	.854		10inch
8	SWE	Switch box	July 2017	.859	60+	5648		

DISCUSSION

From the Electromagnetic Radiation (EMR) measurement studies given in table 7.1-7.10, it was found from the results that the magnetic field values are much higher than the threshold level. Because of the nature of the wiring both in the ceiling and floor, all the rooms had higher electric field than threshold value. Students works in the laboratory rooms an average of 2- 5 hours. So, we have in minds to include other regions for the study to continue.

From the observations and empirical studies on mobile phone users given in table number It was found that Electro Magnetic Radiation (EMR) has adverse effect on living systems, especially people working/living near/under high frequency like laboratories and electrical industries. Most of the people were suffering from various diseases the common disease found insomnia, headache, eye-problem. It was found that longer the exposure time sufferings more and acute some of them complained about their sufferings in their conjugal life.

Electro Magnetic Radiation (EMR) are capable are causing effects in biological systems. Everybody is exposed to various forms of EMR in everyday life, but this alone would not justify the introduction and administrative measures to control the production, distribution and application of EMR for telecommunications as well as the Laboratories, scientific, medical, industrial, commercial and domestic purpose and the multiplicity of radiation emitting devices and installations, certain regulations are necessary.

CHAPTER 9

CONCLUSION

From the above survey results, it was found that in most cases the magnetic field has crossed threshold value. The electric field and signal power also have a higher threshold value in some of the laboratory's equipment. Also, the magnetic field maximum exposure was nearly 200 mG in many cases. Wiring must be done according to the building code 2012. It is hope that this survey will be helpful as a preventive measure for our honorable Teachers, Lab assistants, and students who might be affected tomorrow.

The health hazards caused by all those systems, people should be aware of them and accordingly precautionary measures should be taken. It is necessary to be acquainted with the harmful effects of electromagnetic radiations (EMR) on living systems and also on the environment that we are living in and to find appropriate corrective measures for minimizing the hazards of EMR as far as practicable.

Magnetic field is more harmful than electric field, there must be a limit both in the residential and occupational levels between 0.2 to 0.3 μ T This value is internationally recognized as standard limit in many countries.

More studies and through observations for a longer period are required to learn more about the field which could led to acceptable solutions of the various problems arising from the EMF radiation.

The World Health Organization (WHO) has formed an International Committee for Non-Ionizing Radiation Protection (ICNIRP) in 1996 of 54 countries have become members. Bangladesh has Ionizing Radiation Protection Act effective from 1994, which have been implemented by Bangladesh Atomic Energy Commission (BAEC). But till now there is no NIR regulatory Act in Bangladesh which should be implemented as early as possible.

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