

## ASSESSMENT OF BACKGROUND IONIZING RADIATION OF ENGINEERING LABORATORIES OF FEDERAL POLYTECHNIC NEKEDÉ OWERRI, IMO STATE.

### Abstract

*An In-situ measurement of background ionizing radiation level of the Faculty of Engineering Technology (FET) in Federal Polytechnic Nekede, Owerri, Imo State has been carried out, using a well calibrated Radiation meters (Digilert-200). The Global Positioning System (Garmin 765) was utilized in measuring the coordinates of the sampling points. Four (4) engineering laboratories within Faculty of Engineering Technology (FET) were randomly selected. The outdoor exposure dose rate varies from 0.006 - 0.017 mR/hr, 0.006 - 0.015 mR/hr, 0.008 -0.015 mR/hr, 0.009 mR/hr with mean value of 0.011 mR/hr ,0.009 mR/hr,0.014 mR/hr, 0.014 mR/hr for Computer Engineering Laboratory, Mechatronics Laboratory, Mechanical Engineering Laboratory and Automatic Laboratory and the indoor exposure dose varies from 0.009 - 0.015 mR/hr, 0.009 – 0.019 mR/hr, 0.006 -0.015 mR/hr, with mean of 0.013 mR/hr,0.012 mR/hr,0.012 mR/hr. The outdoor absorbed dose rate varies from 52.2 -130.5 nGy/hr, 52.2-130.5 nGy/hr, 87-130.5 nGy/hr,78.3 -121.8 nGy/hr, with mean value of 96.76 nGy/hr, 79.75 nGy/hr,111.86 nGy/hr and 100.69 nGy/hr and indoor absorbed dose rate varies from 78.3-130.5, 78.3- 130.5 (nGy/hr) with mean 111.65 nGy/hr, 109.72 nGy/hr, 101.79 nGy/hr respectively. The absorbed dose rate varies from 52.2 -130.5 nGy/hr, 52.2-130.5 nGy/hr, 87-130.5 nGy/hr,78.3 -121.8 nGy/hr, with mean value of 96.76 nGy/hr, 79.75 nGy/hr,111.86 nGy/hr and 100.69 nGy/hr respectively. The results show that the estimated radiological parameters from the radiation exposure dose rate were all higher than their world standard values, except the annual effective doses and the outdoor and indoor exposure dose rate which were below their respective standard. This high value of Absorbed dose and excess life cancer risk (ELCR) may not constitute any immediate health effects on students and staff of federal polytechnic nekede but there is a potential health effects for a long term in the future such as development of cancer due to the accumulation of high doses.*

**KEYWORDS:** Background ionizing radiation, Excess Life Cancer Risk, Absorbed Dose Rate, Annual Effective Dose, and Faculty of Engineering Technology (FET).

## **Introduction**

The background ionizing radiation within the environment has been on the increase due to human activities here on earth and its health effects has become a huge concern for the public all over the world [1]. The sources of background radiation within the environment is of various sources, due to human activities such as medical research, scientific research or medical diagnoses, nuclear weapons testing and nuclear accidents or it may from both natural and artificial sources [2]. The present of the naturally occurring radioactive materials within research materials like, water, soil, food and even in air has also increased the quantity of naturally occurring radionuclides changes (NORM) within the environment [3]. The Naturally Occurring Radioactive Materials (NORMS) within the environment originate from terrestrial and extraterrestrial sources, and Man-made sources due to the various applications in research area, industrial area, medical area, and agriculture area [4]. Background ionizing radiation has been on the increase due to the consistent utilization of medical tool for medical diagnosis, therapy and also for scientific research work which involved ionizing. In most developed and developing countries with advanced health care system, medical exposures are now the most essential source of background ionizing radiation [5]. An excessive exposure to ionizing radiation sources have related health effects which might be due to the exposure to high dose of radiation which can cause illness in human body or lead to death [6]. The exposure to radiation sources (ionizing radiation) has some related health effects on human which includes skin cancers, kidney cancers, cancer of the lung, cataracts, leukemia and pancreas [7]. The associated health risks of background ionizing radiation on the immediate environment is of great concern, since human are exposure to radiation from different sources such as; research in science, therapeutic, manufacturing processes and application of X-ray diagnosis [8]. Radionuclide from Man-made sources have entered the environment due to human activities such

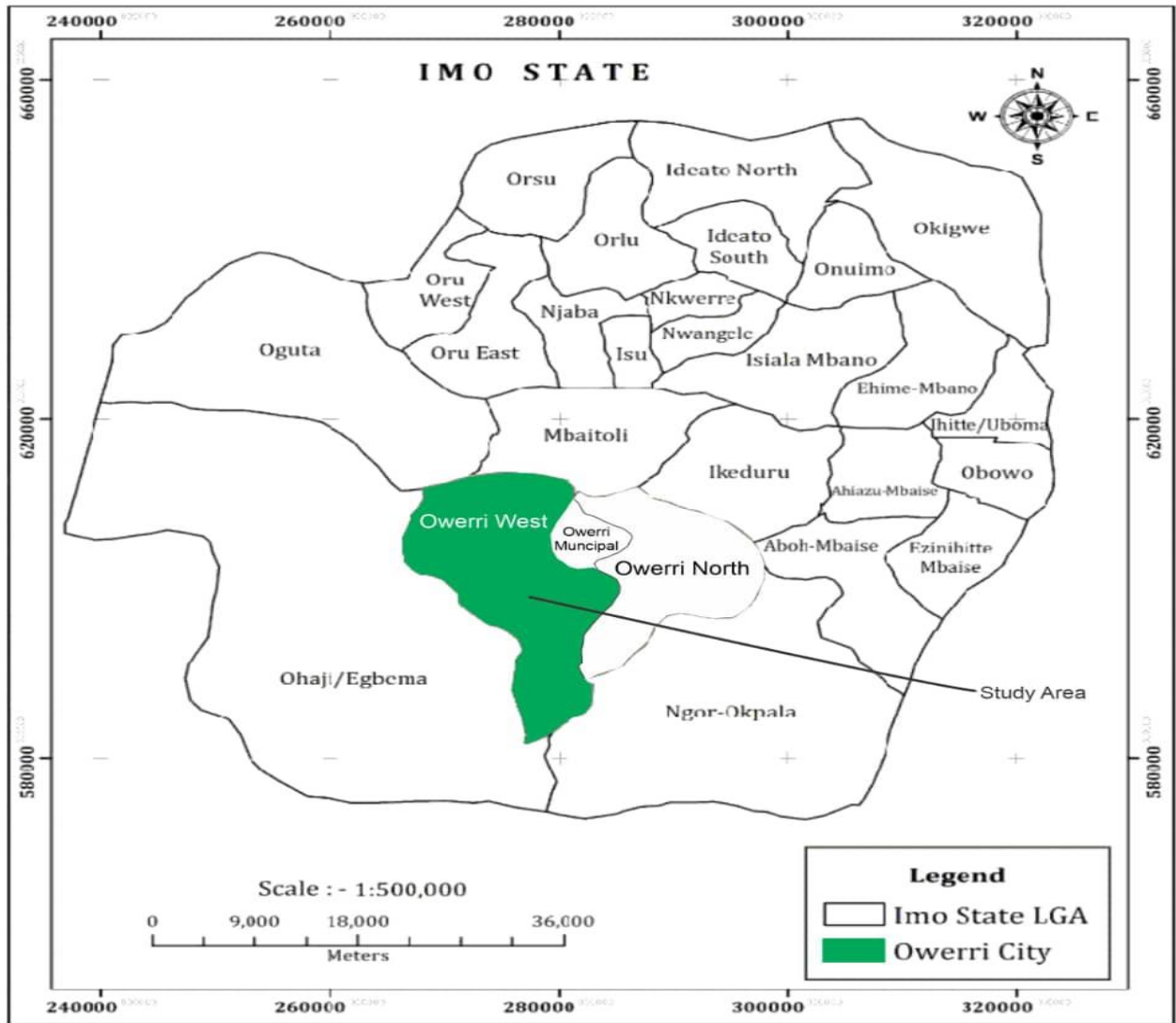
as medical research and medical procedures that use radionuclides to image the body, and electricity generation that uses radioactive uranium as fuel [8]. Building materials such as rock and soil are contributive sources of high radiation dose to the environment and human likewise a means sources of migration of radionuclides to the immediate environment. Naturally the concentration of radioactivity in soil is basically due to the present of  $^{40}\text{K}$ ,  $^{238}\text{U}$  and  $^{226}\text{Ra}$  which might lead to external and internal radiological hazards due to the emission of gamma rays [9].

## **2. MATERIALS AND METHODS**

### **2.1 Study Area**

The study was carried out within the engineering laboratories of Federal Polytechnic, Nekede as shown in picture;1. The Federal Polytechnic, Nekede is owned by the federal Government of Nigeria and it is situated at Nekede, in Owerri West Local Government Area of Imo State, South-Eastern Nigeria. The institution was established on a temporary site of Government Technical College Owerri in the year 1978 as College of Technology, Owerri. The Polytechnic was moved to its present location in Nekede. On the 7<sup>th</sup> day of April 1993, the polytechnic was changed to a Federal Government Institution and it was renamed, 'The Federal Polytechnic Nekede'. The Federal Polytechnic, Nekede offers courses at undergraduate level and award certificates in National Diploma (ND) and Higher National Diploma (HND) in the respective courses [10]. The Federal Polytechnic, Nekede has eight (8) faculties (schools) of study and the Faculty of Engineering Technology (FET) was considered for the purpose of the study.

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picture;1: Shows the Map of the Study Area

### 3.1 Materials

A well calibrated Radiation was utilized for the In-situ measurement of indoor and outdoor radiation exposure level of the selected engineering laboratories of federal polytechnic Nekede. The Radiation meter contains a Geiger-Muller tube which is capable of detecting the alpha, beta, and gamma radiation level within the study area.

Global Positioning System (GPS Map76) Garmin product was applied in estimating the geographical coordinates of the selected sample points within the study area.

### **3.2 Methods**

The in-situ measurement was carried out in the Faculty of Engineering Technology (FET) of Federal Polytechnic Nekede, Owerri in Imo state. Four (4) laboratories within the Faculty of Engineering Technology (FET) was considered for the purpose of the study. Maximum of ten (10) sampling points were arbitrarily selected within the selected engineering laboratories federal Polytechnic Nekede. The outdoor background ionizing radiation (BIR) were taken around the premises of the selected Engineering laboratories by placing the Radiation meter above the ground level, at a height of one meter (1m) from the Ground level. Three different readings were taken at each of the sampling points of the Engineering laboratories and the average was calculated to represent the exposure dose of the selected points and the exposure dose rate was measured in milli-Roetgen per hour (mR/hr). The geographical positioning system (GPS) was applied in measuring the precise coordinates of each of the selected sampling points within the selected engineering laboratories of federal Polytechnic Nekede, Owerri.

## **4. Health hazard indices**

### **4.1 Absorbed Dose (D)**

The physical dose quantity (D) represent the mean energy conveyed to matter per unit mass by ionizing radiation. The SI system of units, the unit of measurement is joules per kilogram (J/Kg).

Absorbed Dose = Exposure Dose Rate x 8.7 (nGy/hr) [11].

#### 4.2 Annual Effective Dose Equivalent (AEDE)

The annual effective dose equivalent (AEDE) received through the exposure to background ionizing radiation was calculated using the absorb dose, Dose conversion factor of 0.7Sv/Gy and the occupancy factor for indoor and outdoor was 0.70(18/24), and 0.2(6/24) respectively. The annual effective dose is determined using the following equations [12].

$$\text{AEDE (Outdoor) (mSv/yr)} = \text{Dose rate (nGy/h)} \times 8760\text{h} \times 0.75\text{Sv/Gy} \times 0.25$$

$$\text{AEDE (Indoor) (mSv/yr)} = \text{Dose rate (nGy/h)} \times 8760\text{h} \times 0.75\text{Sv/Gy} \times 0.25$$

#### 4.3 Equivalent Dose Rate (EDR)

The Equivalent dose is the product of the average absorbed dose of the radiation in tissue and the radiation weighting factor (WR). The equivalent dose is utilized in assessing the damage to biological from the absorbed dose of a certain type of radiation [13].

$$\text{Equivalent Dose} = 1\text{mR/hr} = \frac{0.96 \times 24 \times 365}{100} \quad (\text{mSv/yr})$$

#### 4.5 Excess Life Cancer Risk (ELCR)

Excess Lifetime Cancer Risk is the carcinogenic potential effects that are characterized by assessing the probability of developing cancer in the population of individuals for a specific lifetime from the exposure to ionizing radiation source and chemical specific dose-response data (i.e. slope factors) [11]. The excess lifetime cancer risk (ELCR) deals with the possibility of developing cancer over a lifetime at a certain exposure level.

$$\text{ELCR} = \text{AEDE} \times \text{Average Duration of Life (DL)} \times \text{RISK factor (RF)}$$

The Average duration of life is 70years while Risk factor for public exposure is 0.05.

## 5. RESULTS AND DISCUSSION

The results in-situ measurement of the background ionizing radiation of engineering laboratories of federal polytechnic Nekede and the calculated values of the health hazard indices are presented in Table 1 to Table 8. Table 1-4 shows outdoor background ionizing radiation whiles Table 5-7 shows indoor background ionizing radiation. The results of BIR

**Table 1: Radiation Exposure Level of Computer Engineering Laboratory (Outdoor)**

S/ N	Sampling Points	GPS Reading	Exposure Dose Rate (mR/hr)	Absorbed Dose Rate (nGy/hr)	AEDE Outdoor (mSv/y)	ELCR Outdoor $10^{-3}$
1	Entrance Lab	5.432757° 7.030902°	0.011	95.7	0.117	0.411
2	Window 1	5.432767° 7.030903°	0.008	69.6	0.085	0.299
3	Window 2	5.432773° 7.030878°	0.015	130.5	0.160	0.560
4	Right hand window 1	5.432738° 7.030755	0.008	69.6	0.085	0.299
5	Right hand window 2	5.432723° 7.030740°	0.011	95.7	0.117	0.411
6	lab toilet	5.43264° 7.030673°	0.013	113.1	0.139	0.485
7	Second entrance	5.432522° 7.030655°	0.006	52.2	0.064	0.224
8	Gpee tank	5.432637° 7.030688°	0.017	147.9	0.23	0.81
	<b>Average</b>		<b>0.011</b>	<b>96.79</b>	<b>0.125</b>	<b>0.437</b>
	<b>UNSCEAR (2002)</b>		<b>0.013</b>	<b>84.0</b>	<b>1.0</b>	<b>0.29x10<sup>-3</sup></b>

**Table 2: Radiation Exposure Level of Mechatronics Laboratory (Outdoor)**

S/N	Sampling Points	GPS Reading	Exposure Dose Rate (mR/hr)	Absorbed Dose Rate (nGy/hr)	AEDE Outdoor (mSv/y)	ELCR Outdoor $10^{-3}$
1	2m from Entrance	5.43327° 7.030855°	0.011	95.7	0.117	0.411
2	1m from Entrance	5.433327° 7.0308	0.009	78.3	0.096	0.336
3	Entrance Door	5.433328° 7.030884	0.008	69.6	0.085	0.299
4	Window 1	5.433361°	0.006	52.2	0.064	0.224

5	Window 2	7.030858° 5.43315°	0.006	52.2	0.064	0.224
6	Residential parts	7.03088° 5.433325°	0.015	130.5	0.160	0.560
	<b>Average UNSCEAR (2002)</b>		<b>0.009 0.013</b>	<b>79.75 84.0</b>	<b>0.0977 1.0</b>	<b>0.342 0.29x10<sup>-3</sup></b>

**Table 3: Radiation Exposure Level of Mechanical Engineering Laboratory (Outdoor)**

S/N	Sampling Points	GPS Reading	Exposure Dose Rate (mR/hr)	Absorbed Dose Rate (nGy/hr)	AEDE Outdoor (mSv/y)	ELCR Outdoor 10 <sup>-3</sup>
1	Somers	5.431283° 7.032702	0.015	130.5	0.160	0.560
2	1m from Somers	5.431285° 7.0326690°	0.008	69.6	0.085	0.299
3	Welding section	5.431245° 7.032690	0.024	147.9	0.265	0.931
4	Measurement section	5.431208° 7.032923	0.011	95.7	0.117	0.411
5	Production Section	5.431208° 7.032543	0.010	87.0	0.14	0.490
6	Quality control	5.431059° 7.032570°	0.014	121.8	0.149	0.523
7	Water Tank	5.431064 7.032553	0.015	130.5	0.160	0.560
	<b>Average UNSCEAR (2002)</b>		<b>0.014 0.013</b>	<b>111.86 84.0</b>	<b>0.153 1.0</b>	<b>0.539 0.29x10<sup>-3</sup></b>

**Table 4: Radiation Exposure Level of Automatic Laboratory (Outdoor)**

S/N	Sampling Points	GPS Reading	Exposure Dose Rate (mR/hr)	Absorbed Dose Rate (nGy/hr)	AEDE Outdoor (mSv/y)	ELCR Outdoor 10 <sup>-3</sup>
1	Entrance	5.432034° 7.032292°	0.011	95.7	0.117	0.411
2	1m from Entrance	5.432034° 7.032292°	0.009	78.3	0.096	0.336

3	2m from Entrance	5.432034° 7.032292°	0.013	113.1	0.139	0.485
4	Window 1	5.432034° 7.032292	0.014	121.8	0.149	0.523
5	Window 2	5.432034° 7.032292°	0.013	113.1	0.139	0.485
6	Entrance Behind Lab	5.432034° 7.032292	0.012	104.4	0.17	0.60
7	1m Entrance Behind Lab	5.432034° 7.032292	0.009	78.3	0.096	0.336
	<b>Average UNSCEAR (2002)</b>		<b>0.012</b>	<b>100.67</b>	<b>0.129</b>	<b>0.454</b>
			<b>0.013</b>	<b>84.0</b>	<b>1.0</b>	<b>0.29x10<sup>-3</sup></b>

**Table 5: Radiation Exposure Level of Air Conditioning Refrigerator Laboratory (indoor)**

S/N	Sampling Points	GPS Reading	Exposure Dose Rate (mR/hr)	Absorbed Dose Rate (nGy/hr)	AEDE Indoor (mSv/y)	ELCR Indoor 10 <sup>-3</sup>
1	Refrigerating equipment	5°43'.024" 7°03'2246"	0.015	130.5	0.160	0.560
2	2m from Refrigerating equipment	5°.432024" 7°03'2246"	0.014	121.8	0.149	0.523
3	Lab. Bench 1	5°43.'2024" 7°03'2246"	0.013	113.1	0.139	0.485
4	Lab. Bench 2	5°.432024" 7°03'2246"	0.009	78.3	0.096	0.336
5	Lab. Bench 3	5°.432024° 7°032246°	0.011	95.7	0.117	0.411
6	Entrance door	5°.432024° 7°032246°	0.015	130.5	0.160	0.560
	<b>Average UNSCEAR (2002)</b>		<b>0.013</b>	<b>111.65</b>	<b>0.137</b>	<b>0.479</b>
			<b>0.013</b>	<b>84.0</b>	<b>1.0</b>	<b>0.29x10<sup>-3</sup></b>

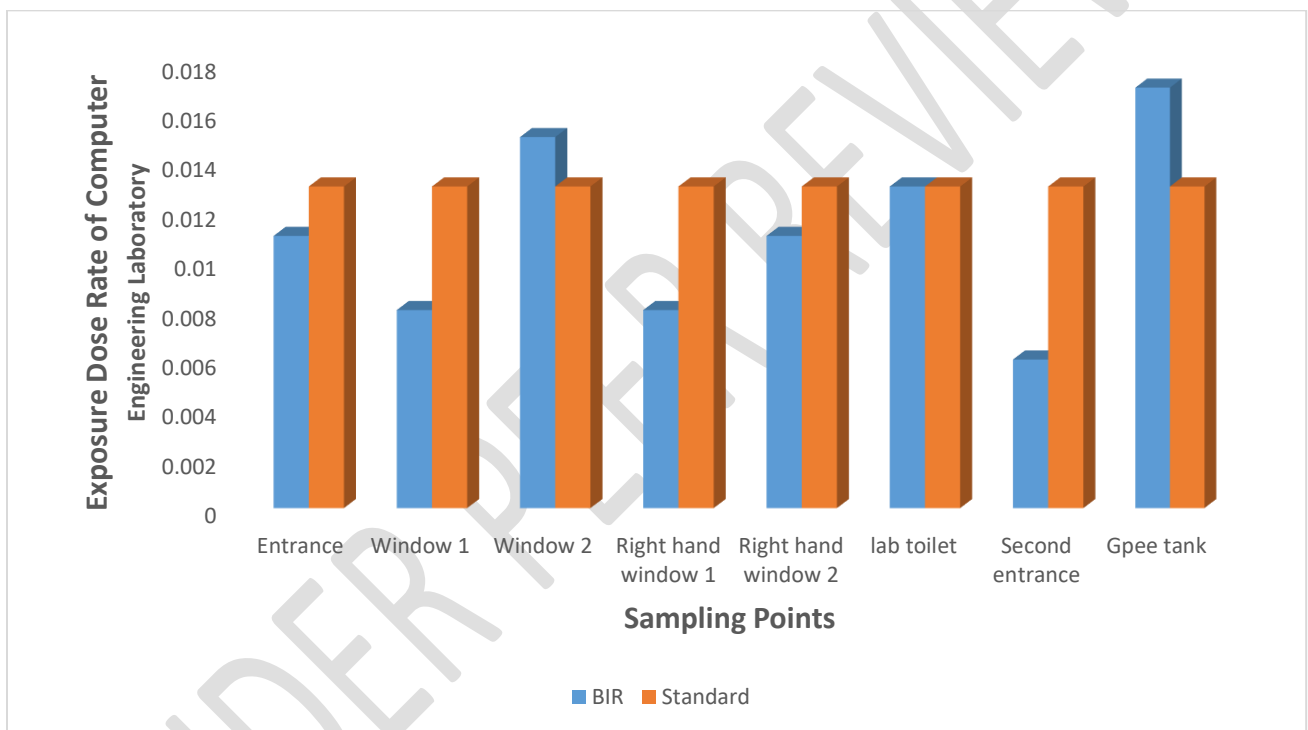
**Table 6: Radiation Exposure Level of Mechanical Engineering Laboratory (indoor)**

S/N	Sampling Points	GPS Reading	Exposure Dose Rate (mR/hr)	Absorbed Dose Rate (nGy/hr)	AEDE Indoor (mSv/y)	ELCR Indoor 10 <sup>-3</sup>
1	Entrance	5.4312720° 7.032644°	0.011	95.7	0.117	0.411
2	Door	5.432119° 7.032119°	0.013	113.1	0.139	0.485
3	Nip part	5.431320°	0.019	169.7	0.30	0.85

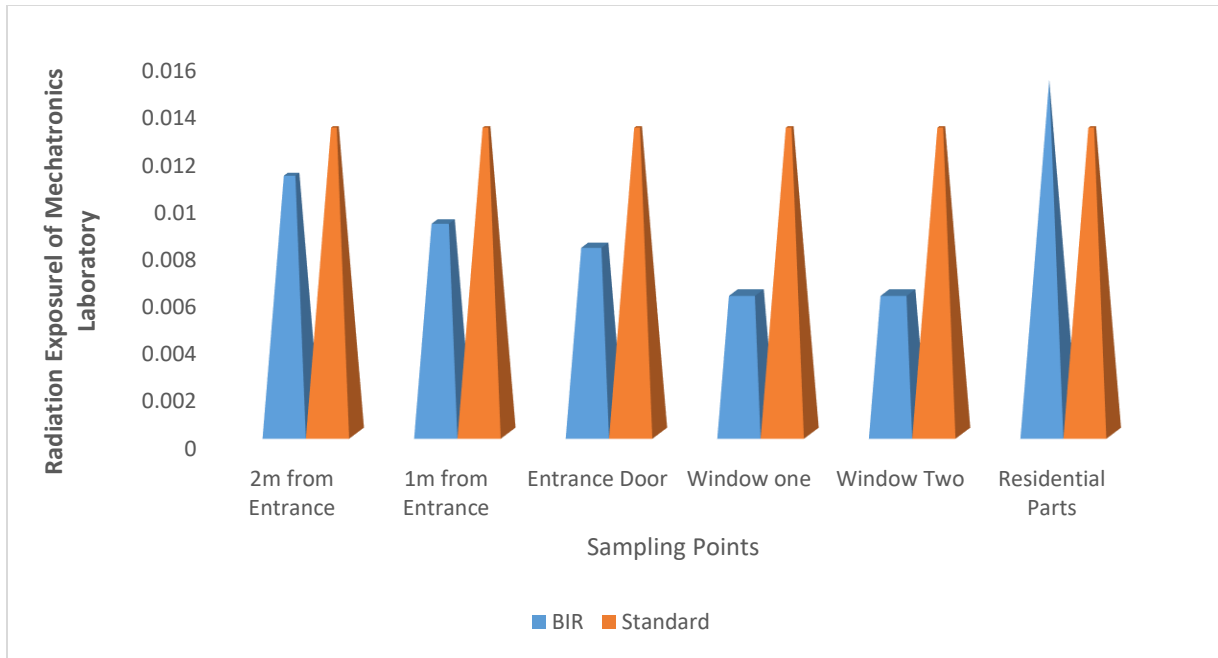
		7.032755°				
4	Milling machine 1	5.431343° 7.032690	0.013	113.1	0.139	0.485
5	Milling machine 1	5.431343° 7.032687°	0.009	78.3	0.096	0.336
6	Drilling machine 1	5.431266° 7.032666	0.013	113.1	0.139	0.485
7	Drilling machine 2	5.431273° 7.032570	0.015	130.5	0.160	0.560
8	Lathe machine	5.43136 7.032662	0.009	78.3	0.096	0.336
9	Hydraulic pressing machine	5.431361 7.0322662	0.011	95.7	0.117	0.411
	<b>Average</b>		<b>0.012</b>	<b>109.72</b>	<b>0.1448</b>	<b>0.484</b>
	<b>UNSCEAR (2002)</b>		<b>0.013</b>	<b>84.0</b>	<b>1.0</b>	<b>0.29x10<sup>-3</sup></b>

**Table 7: Radiation Exposure Level of Automatic Laboratory (Indoor)**

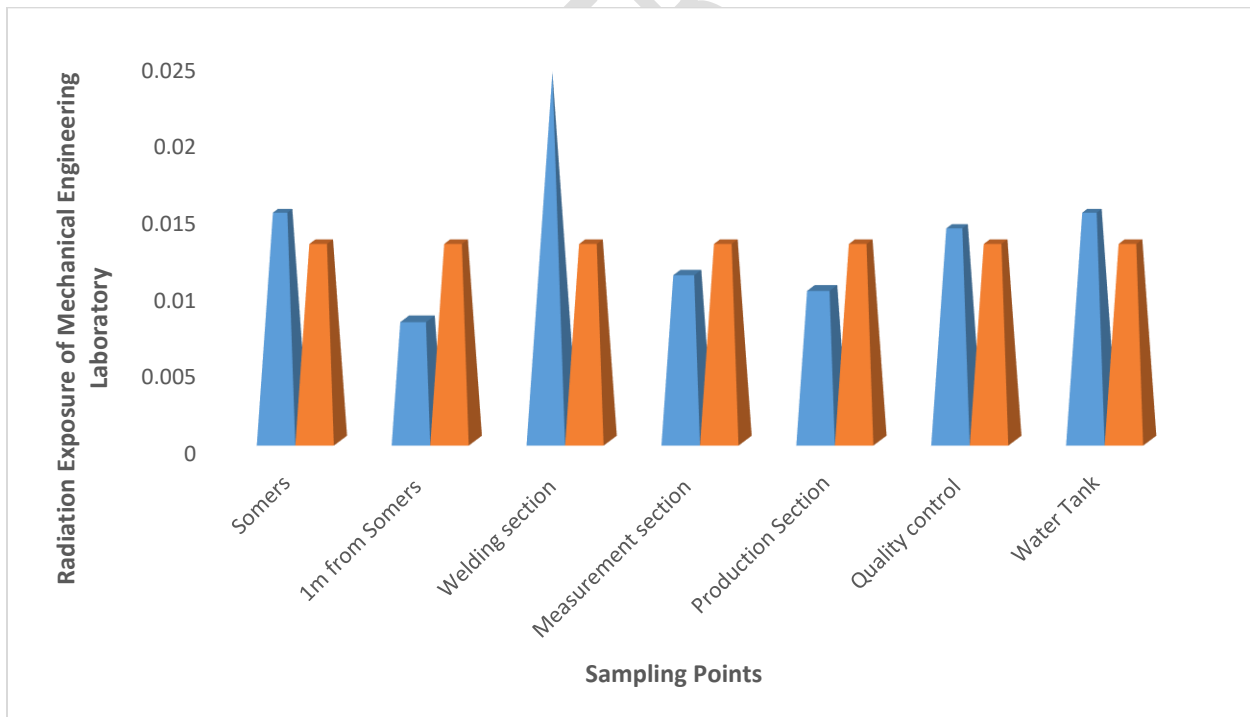
S/N	Sampling Points	GPS Reading	Exposure Dose Rate (mR/hr)	Absorbed Dose Rate (nGy/hr)	AEDE Indoor (mSv/y)	ELCR Indoor 10 <sup>-3</sup>
1	Automatic module 1	5.432034° 7.032292°	0.015	130.5	0.160	0.560
2	Automatic module 2	5.432034° 7.032292°	0.006	52.2	0.064	0.224
3	Automatic module 3	5.432034° 7.032292°	0.009	78.3	0.096	0.336
4	Automatic module 4	5.432034° 7.032292°	0.014	121.8	0.149	0.523
5	Automatic module 5	5.42034 7.032992	0.015	130.5	0.160	0.560
6	Automatic module 6	5.42034 7.032992	0.015	130.5	0.160	0.560
7	Bench 1	5.42034 7.032992	0.013	113.1	0.139	0.485
8	Bench 2	5.42034 7.032992	0.013	113.1	0.139	0.485
9	Store	5.42034 7.032992	0.009	78.3	0.096	0.336
10	Safety Stand	5.432034 7.035992	0.008	69.6	0.085	0.299
	<b>Average</b>		<b>0.012</b>	<b>101.79</b>	<b>0.1237</b>	<b>0.437</b>
	<b>UNSCEAR (2002)</b>		<b>0.013</b>	<b>84.0</b>	<b>1.0</b>	<b>0.29x10<sup>-3</sup></b>



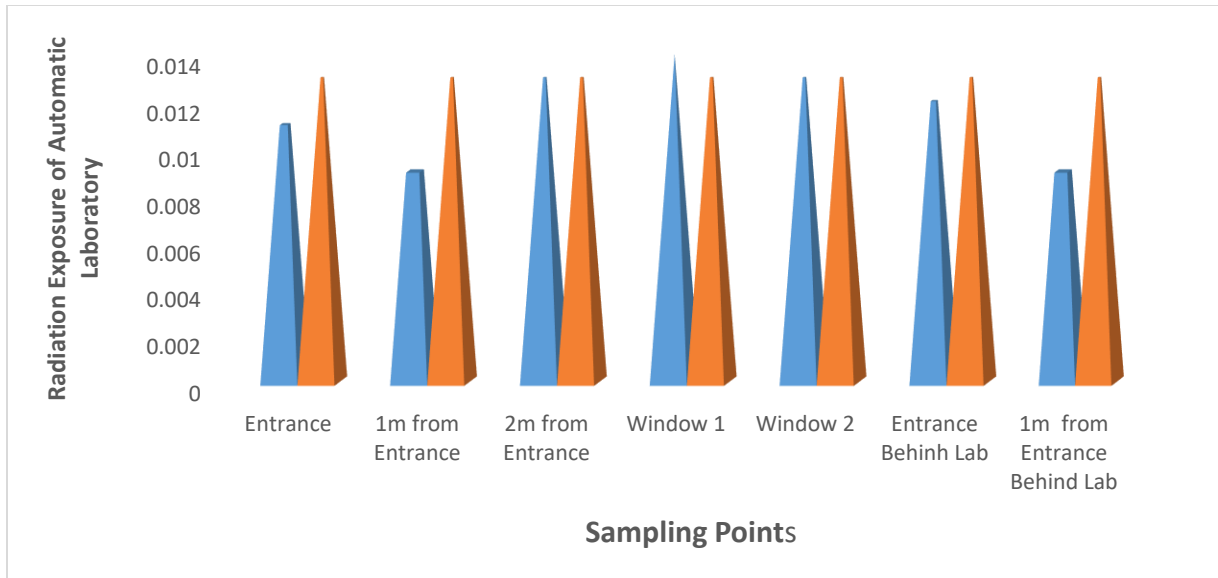
**Fig:1: Radiation Exposure Level of Computer Engineering Laboratory (Outdoor)**



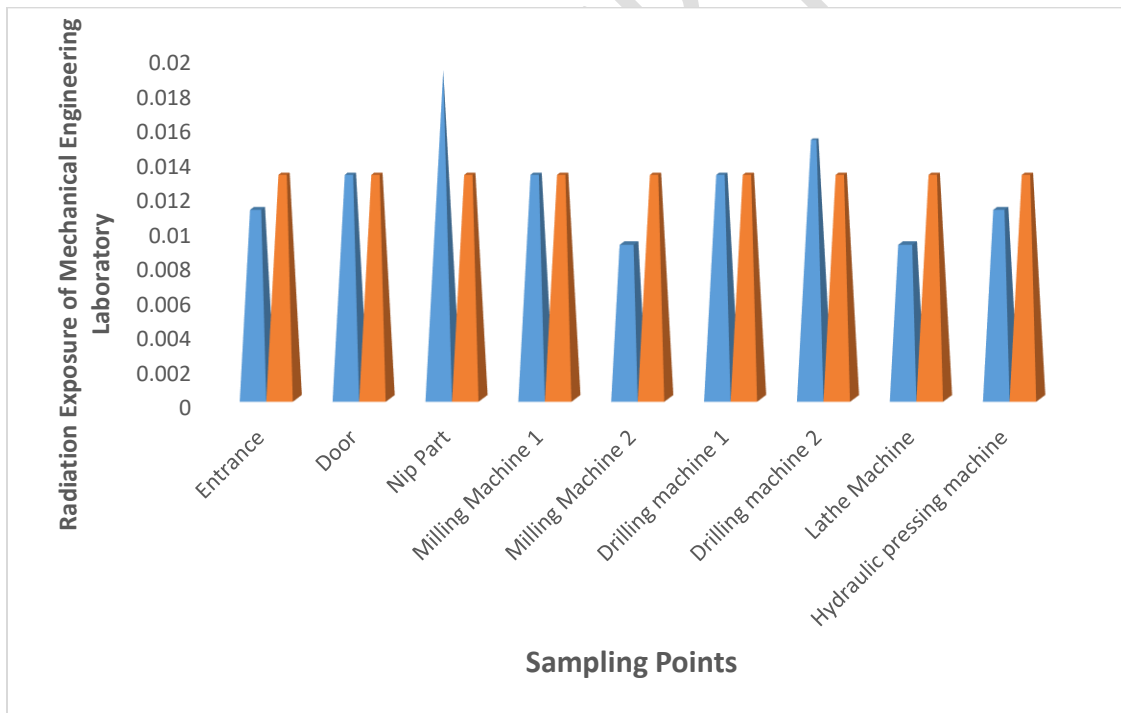
**Fig:2: Radiation Exposure Level of Mechatronics Laboratory (Outdoor)**



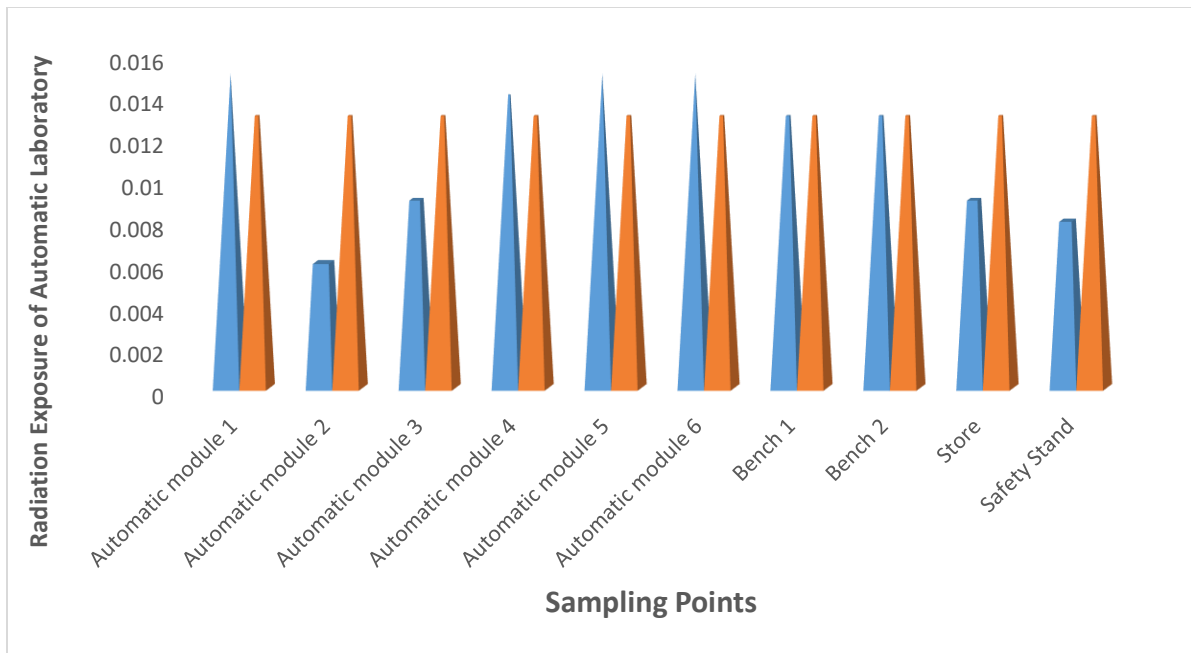
**Fig:3: Radiation Exposure Level of Mechanical Engineering Laboratory (Outdoor)**



**Fig.4: Radiation Exposure Level of Automatic Laboratory (Outdoor)**

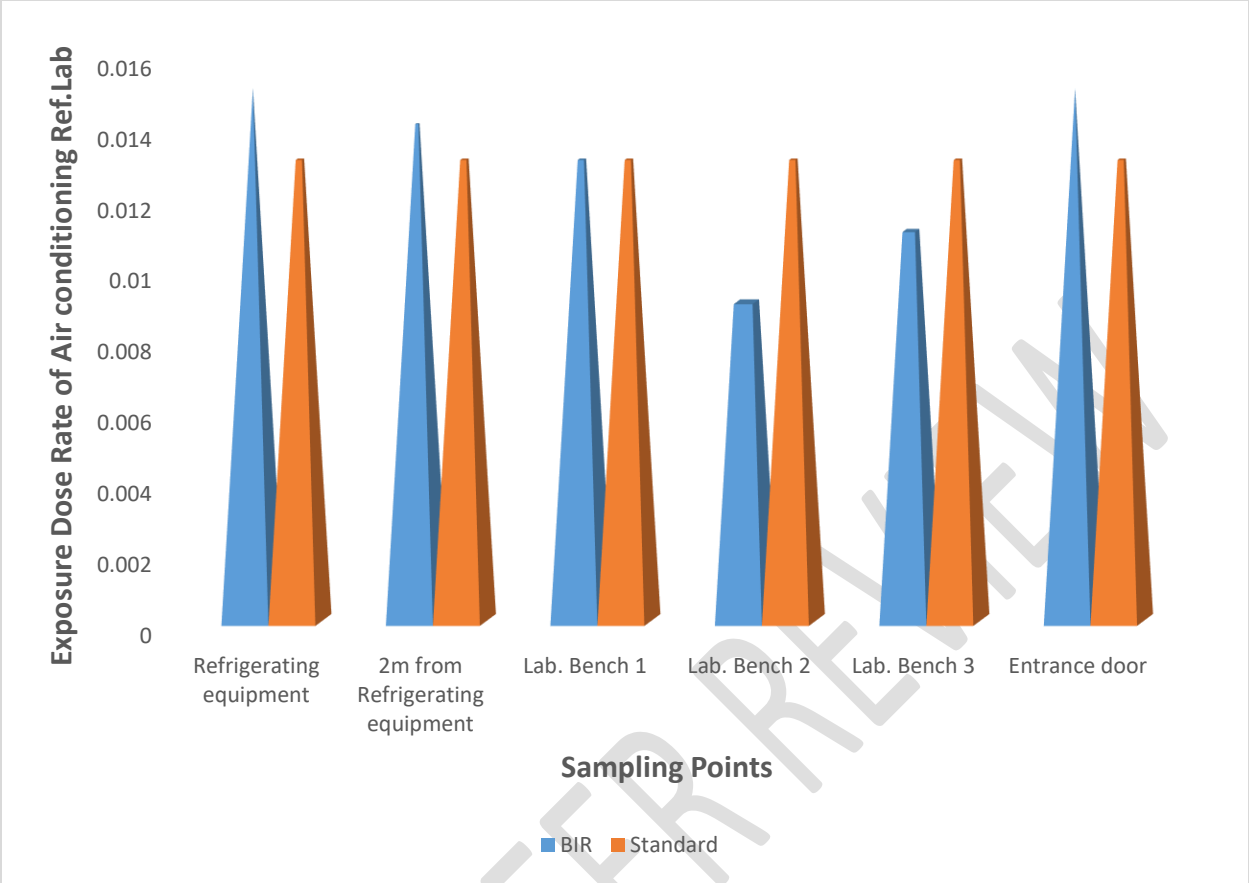


**Fig.5: Radiation Exposure Level of Mechanical Engineering Laboratory (indoor)**

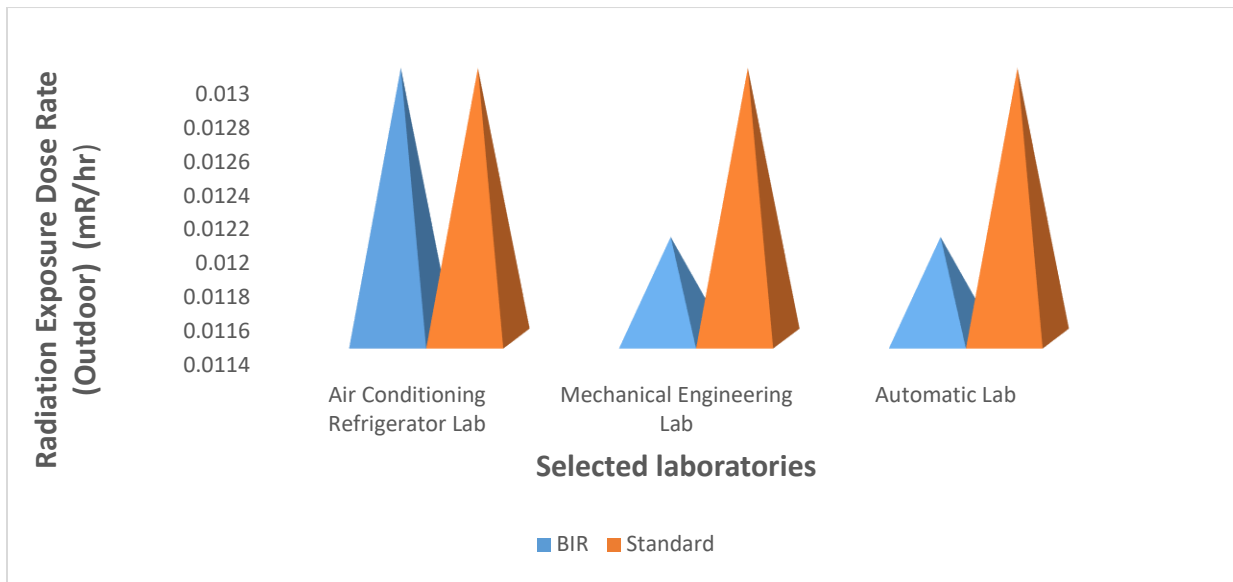


**Fig:6: Radiation Exposure level of Automatic Laboratory (Indoor)**

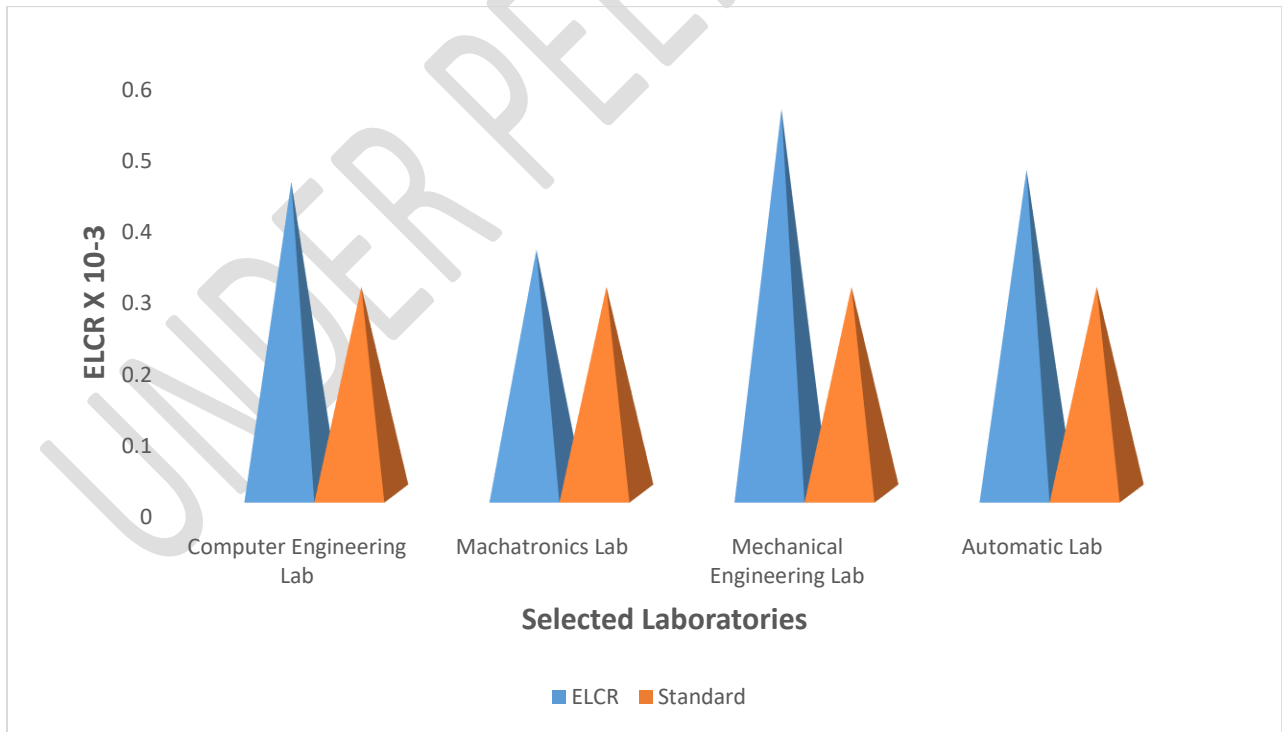
UNDER PEER REVIEW



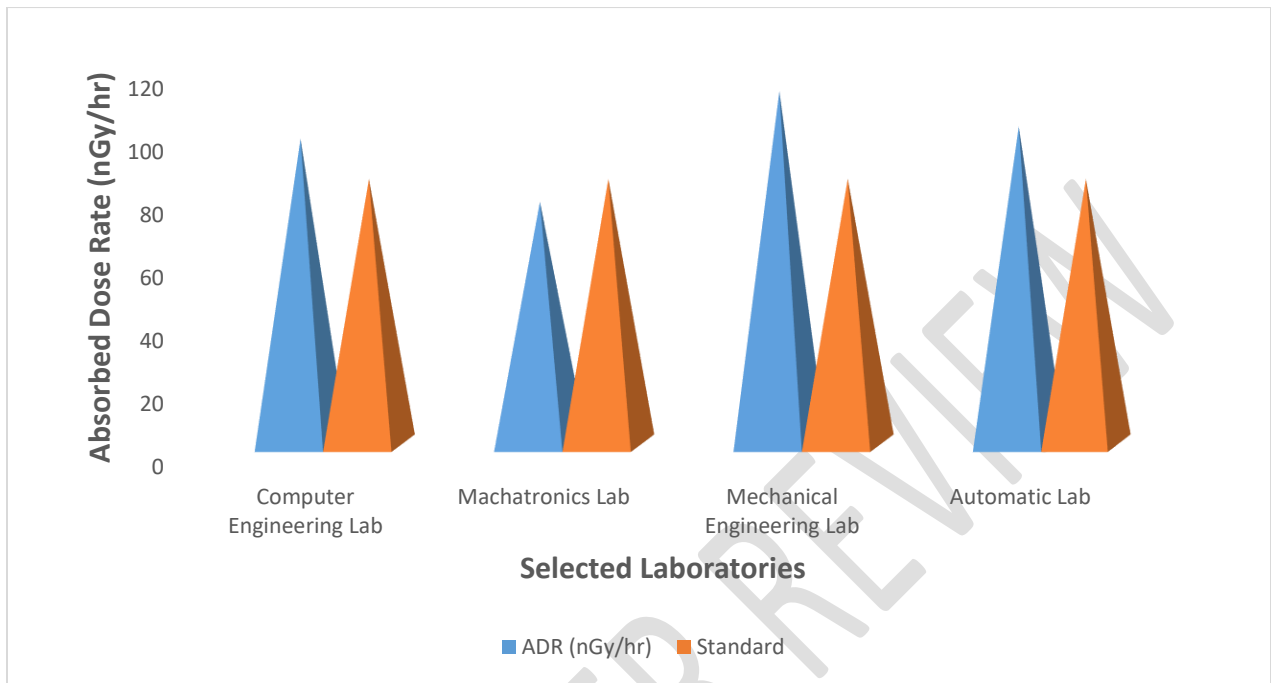
**Fig:7: Conditioning Refrigerator Laboratories with Standard (Indoor)**



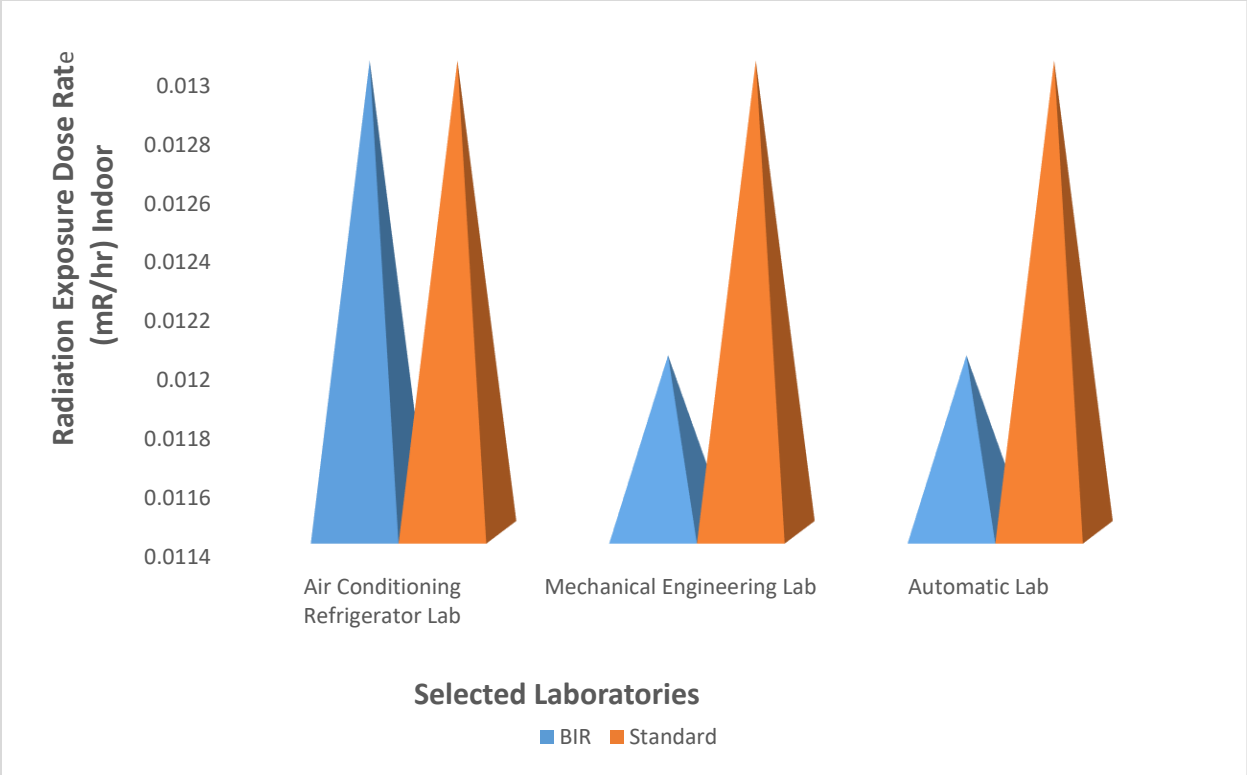
**Fig:8: Comparison of the mean of Outdoor Radiation exposure of the Selected Laboratories with Standard**



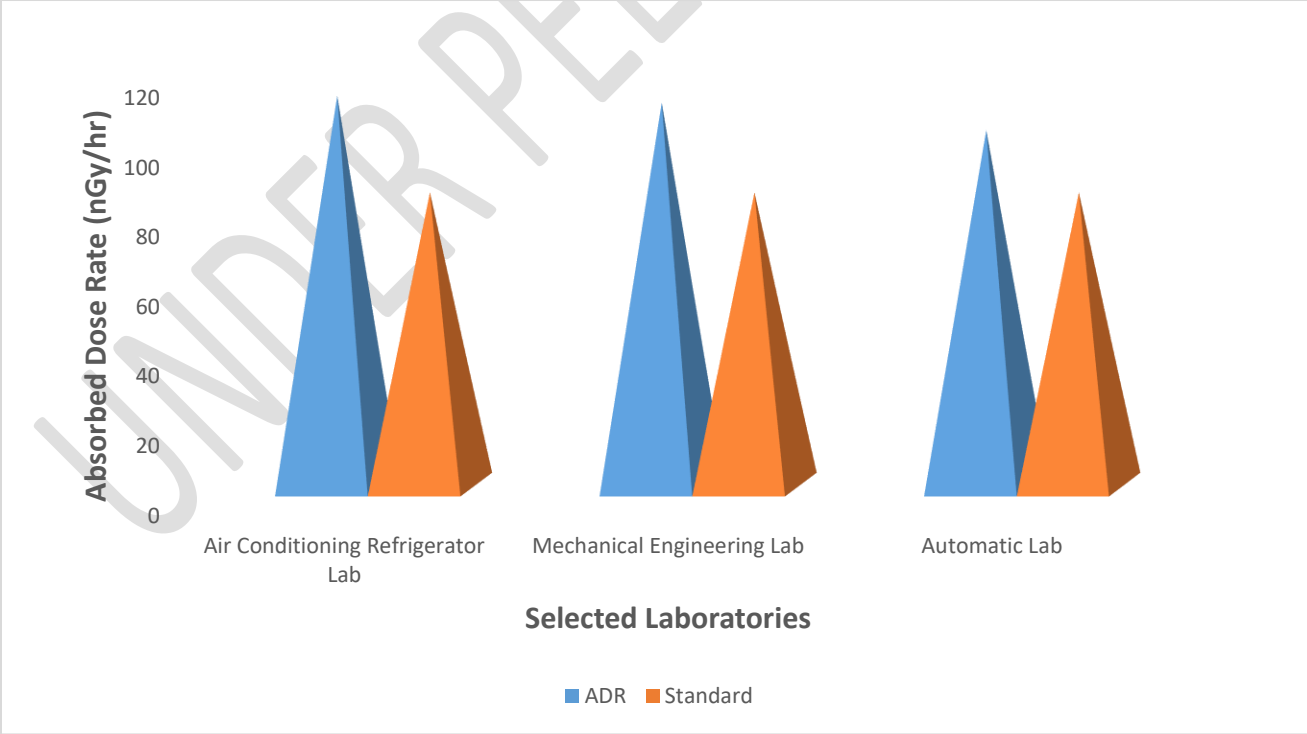
**Fig:9: Comparison of the mean of ELCR of the Selected Laboratories with Standard**



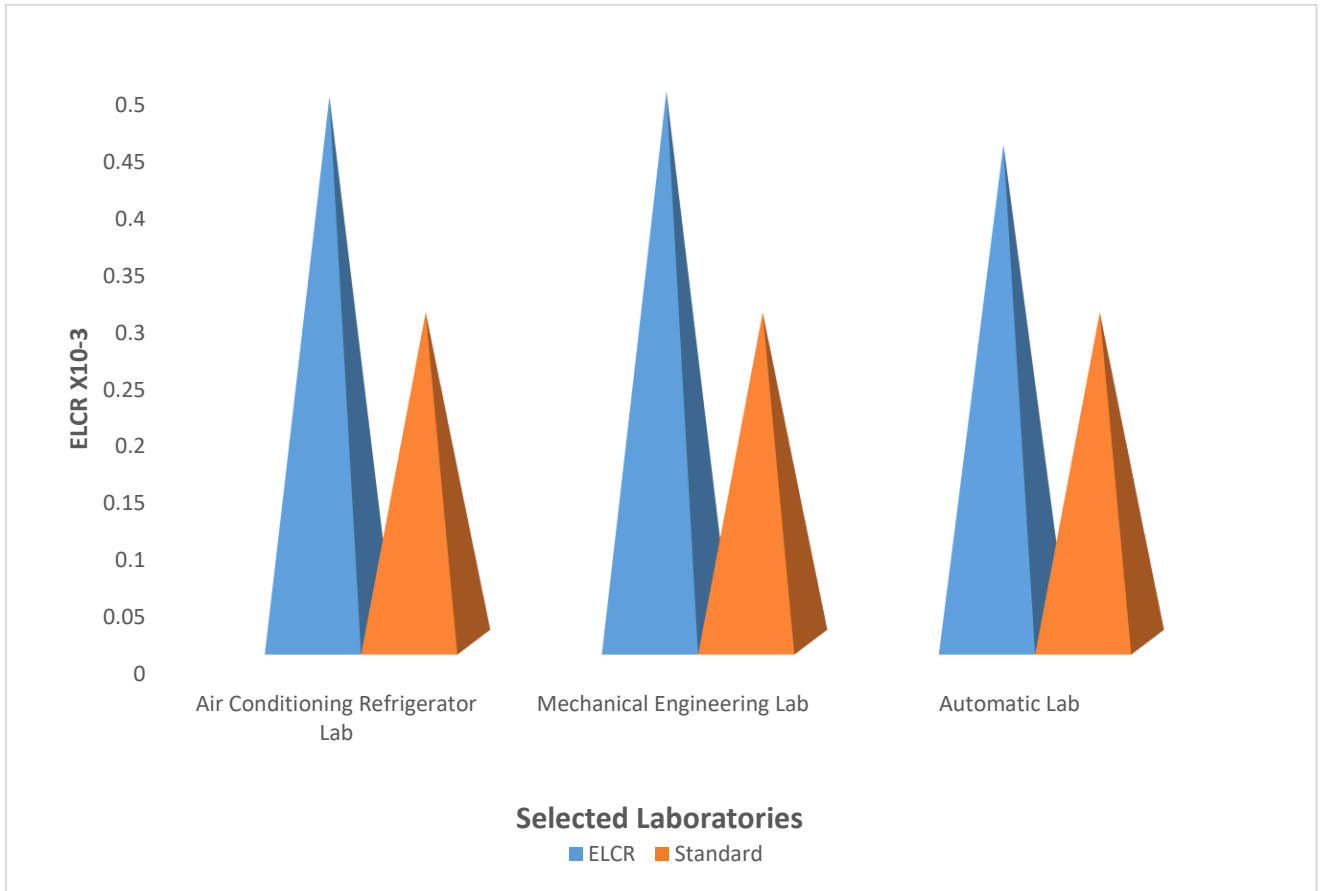
**Fig:10: Comparison of the mean of Outdoor Absorbed Dose Rate of the Selected Laboratories with Standard**



**Fig:11: Comparison of the mean of Indoor Radiation exposure of the Selected Laboratories with Standard**



**Fig:12: Comparison of Indoor Absorbed Dose Rate of the Selected Laboratories with Standard**



**Fig:13: Comparison of ELCR (Indoor) of the Selected Laboratories with Standard**

## 5.1 Discussion

The result of the background ionizing radiation (BIR) obtained from the study area are presented in Table 1 to 7. The Outdoor background ionizing radiation of the selected laboratories within the study area. The BIR value varies from 0.006 - 0.017 mR/hr, 0.006 - 0.015 mR/hr, 0.008 - 0.015 mR/hr, 0.009 mR/hr with mean value of 0.011 mR/hr, 0.009 mR/hr, 0.014 mR/hr, 0.014 mR/hr for Computer Engineering Laboratory, Mechatronics Laboratory, Mechanical Engineering Laboratory and Automatic Laboratory respectively. The exposure dose rate mean value of Computer Engineering Laboratory and Mechatronics Laboratory are below the recommended safe limit of 0.013 mR/h, stipulated by international committee of Radiological protection [14]. while Mechanical Engineering and Automatic Laboratories are higher than the stipulated value of 0.013 mR/h. The result obtained was lower than the reported work by [16] [17]. The background ionizing radiation variation within engineering laboratories might be due to the present of radionuclide within the environment. Fig: 1- 4 shows the background ionizing radiation of the sampling points of the selected laboratories. The absorbed dose rate varies from 52.2 -130.5 nGy/hr, 52.2-130.5 nGy/hr, 87-130.5 nGy/hr, 78.3 -121.8 nGy/hr, with mean value of 96.76 nGy/hr, 79.75 nGy/hr, 111.86 nGy/hr and 100.69 nGy/hr respectively.

The mean value of absorbed dose rate of the selected engineering laboratories was higher than the standard stipulated value of 84.0 nGy/hr [19]. and lower than the reported work of [16]. The mean value of Computer Engineering Laboratory is lower than the reported works of [18]. The annual effective dose equivalent (AEDE) of the selected laboratories varies from 0.064 - 0.160 mSv/y, 0.064-0.117 mSv/y, 0.085-0.160 mSv/y, 0.096-0.149 mSv/y, with mean value of 0.125mSv/y, 0.098 mSv/y, 0.153 mSv/y and 0.129 mSv/y respectively. The result of AEDE of study are below the stipulated value [19]. and within the reported range [21]. The Excess life cancer

risks of the (ELCR) varies from 0.224-0.81, 0.224-0.41, 0.299-0.560, and 0.336-0.411 with mean value of 0.437, 0.342, 0.539 and 0.454 respectively. The result of the Excess life cancer risks of the studies area are higher than the standard value of  $0.29 \times 10^{-3}$  and lower than the reported work of [20]. The variation in the ELCR within the study area may be due to the alteration of the concentration of radionuclide within the study area and also due to the laboratories activities.

The indoor background ionizing radiation of the selected laboratories varies from 0.009 - 0.015 mR/hr, 0.009 – 0.019 mR/hr, 0.006 -0.015 mR/hr, with mean of 0.013 mR/hr, 0.012 mR/hr, 0.012 mR/hr, for Air Conditioning Refrigerator Laboratory, Automatic Laboratory and Mechanical Engineering Laboratory respectively. The mean value of the indoor background ionizing radiation exposure are within the recommended safe limit of 0.013 mR/hr, [14]. Fig: 5- 7 shows the background ionizing radiation of the sampling points of the selected laboratories. The indoor absorbed dose rate varies from 78.3-130.5, 78.3- 130.5 (nGy/hr) with mean 111.65 nGy/hr, 109.72 nGy/hr, 101.79 nGy/hr respectively. The indoor absorbed dose of the selected laboratories is higher than recommended safe limit of 84 nGy/hr and lower than the reported work [17]. The annual effective dose equivalent (AEDE) of the selected laboratories varies from 0.096-0.160, 0.096-0.160, 0.064 -0.16 (mSv/y), with mean value of 0.14, 0.145, 0.124 (mSv/y) respectively. The result of AEDE of the laboratories are below the stipulated value of [19]. The Excess life cancer risks of the (ELCR) varies from 0.336- 0.560, 0.336-0.485 and 0.299-0.560 with mean 0.48, 0.484, 0.437. The indoor ELCR of the laboratories are all higher than the stipulated standard value of  $0.29 \times 10^{-3}$  and lower than the reported work [20]. The variation in the ELCR within the study area may be due to the alteration of the concentration of radionuclide within the laboratories environment through the exposure to radiation emitting sources.

## 5.2 CONCLUSION

The *in-situ* measurement of Background ionizing radiation of the Engineering laboratories of Federal Polytechnic Nekede has been carried out, using a well calibrated radiation metre. The results have revealed that the outdoor Background ionizing radiation (BIR) of the selected laboratories are within the recommended safe limit while Mechanical Engineering Laboratory has higher value than the standard value of 0.013 mR/hr. Though some of the sampling points within the laboratories were higher than the stipulated value. The indoor Background ionizing radiation (BIR) were all within the stipulated value of 0.013 mR/hr. The mean value of the absorbed dose rate of engineering laboratories both outdoor and indoor of the engineering laboratories are above the standard value of 84.0 nGy/hr. The obtained mean of excess life Cancer risk (ELCR) for both indoor and outdoor obtained of the selected laboratories were all higher than the recommended safe limit of  $0.29 \times 10^{-3}$ . The variation in the radiation value may be due to the presence of radionuclide within the laboratories environment or due to research waste materials which is capable of emitting gamma radiation within the environment. The obtained values of radiation exposure and other related parameters may not pose any immediate health effects on students and staff of the Federal Polytechnic Nekede but there may be long term, future health effects on the general population of the studied area.

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