iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** VI **Month of publication:** June 2019

DOI: http://doi.org/10.22214/ijraset.2019.6024

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue VI, June 2019- Available at www.ijraset.com

Measurement of Indoor Radon Concentration in Bahraich and Barabanki District of Eastern U.P. using LR-115 Type II Plastic Track Detector (SSNTDS)

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Abstract: ***A study of indoor radon dwelling of Bahraich and Barabanki Uttar Pradesh, India. Radon is a colourlesss and odourless radioactive gas. Radon has been a natural component of the air we breathe. Radon is an invisible radioactive gas that occurs naturally in the indoor atmosphere. It comes from the naturally breakdown of uranium in soils and rocks. Lung cancer risk depends upon the concentration of radon, thoron and their decay product in air. Measurement of indoor radon concentration was carried out in the residential housdes, indoor environment of district Bahraich and Barabanki, Uttar Pradesh using solid state nuclear track detector (SSNTDs). Radon exists in soil gas, building materials, Indoor atmosphere etc. Solid state nuclear track detector using 25 dosimeters in summer, 25 dosimeter in winter and 25 dosimeter in rainy season, the radon concentration were measured in total 75 dwellings of Bahraich and 75 Barabanki district in the eastern U.P.in the winter, rainy and summer season and inhalation dose in (mSv/y). Significant variation of radon concentration were found in the different type of houses. A study of indoor radon dwelling of Bahrauich and Barabanki Uttar Pradesh, India. This paper presents the experimental calibration of LR-115 type II plastic track detectors for monitoring environmental radon. The indoor concentration however depends on various factors viz. ventilation condition, type of construction seasonal variation and geology of the area. Radon in dwellings originates from walls, floors and ceilings and also depends on the construction material. The conditions prevailing in India eastern region in the Utter Pradesh with respect to people's life-styles, building construction type, topography and meteorological parameters are greatly different. Concentration of Radon measured in different houses, SSNTDs technique is used for present work in selected indoor environments. Detector mounting for three months. Detector used in Bare on card mode and Dosimeter. Most of the houses in Bahraich and Barabanki district are houses with typical construction their dense population, different geological and environment conditions which provide a wide scope of radon studies in this area. A results of measurements of radon concentration in Bahraich and Barabanki (India) are presented.***

Keywords: SSNTDS, Dosimeter, Indoor Environment, Residential building.

I. INTRODUCTION

Radon is a colourlesss and odourless radioactive gas. Radon has been a natural component of the air we breathe. Natural radiation is present throughout the biosphere due to radioactive elements and their decay products in the earth. The monitoring of indoor radon levels has acquired a significant importance all over the world from the public health point of view. Radon in dwellings originates from walls, floors and ceilings and also depends on the construction material. The conditions prevailing in India eastern region in the Utter Pradesh with respect to people's life-styles, building construction type, topography and meteorological parameters are greatly different. I visited Bahraich and Barabanki district. I found the some specific reason of the eastern U.P. (Bahraich and Barabanki district) to measure the radon concentration level by using the method of LR-115 type II plastic track detector. In present investigation concentration of Radon measured in different houses, SSNTDs technique is used for Sample mounted in Bahraich and Barabanki district dividing it into five parts east, south, north, west and central region in winter ,rainy, summer season. 5 sample mounting in each region, five indoor environment. I visited saryu nehar office, pani tanki,hospital chowraha, ghantaghar ,kalpipara colony in Bahraich district and Vasudev nagar, Lakhpera bagh colony ,Sirsauli Gauspur Tickait Nagar, Behrela near Bhitriya Chauraha, Asandra near HaidarGarh in Barabanki district. I found the some specific reason of the eastern U.P.(Bahraich and Barabanki district) to measure the radon concentration level by using the method of LR-115 type II nuclear track detector for research work and I mounted the nuclear track detector in the we were choosing Bahraich and Barabanki district some specific

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reason. It is very useful for measurement of radon concentration. Area nam saryu nehar office, pani tanki,hospital chowraha, ghantaghar ,kalpipara colony in Bahraich district and area name Vasudev nagar, Lakhpera bagh colony ,Sirsauli Gauspur Tickait Nagar, Behrela near Bhitriya Chauraha, Asandra near HaidarGarh in Barabanki district. Detector mounting for three months. Detector used in Bare on card mode and Dosimeter. The sample exposure in this conditions: (a) ventilation rate~ 1 h-1, (b) ventilation rate>1 h-1, and(c) closed rooms. Most of the houses in (Bahraich and Barabanki district) are houses with typical construction their dense population, different geological and environment conditions which provide a wide scope of radon studies in this area

II. EXPERIMENTAL DETAILS

Radon are invisible, odorless, heavy and radioactive gases which are present in dwellings and in the environment. LR-115, Type- II plastic track detectors commonly known as solid state nuclear track detectors (SSNTDs) used to measure the radon concentration. The measurements were carried out in the field of radon and the detectors were exposed for about 30 days. The passive time-integrating method of using a solid state nuclear track detector was employed for measuring the Potential Alpha Energy Concentration (PAEC) of radon daughters in Working Level (WL) units. The LR-115 type II track detector was used in bare mode. The piece of detector film (1 cm x 1 cm) fixed on a thick flat card was exposed for a period of 3 months. The tracks registered in the detector due to alpha particles .The detectors were placed in the room where the occupants of the house spent most of their time. The detectors were either hung in an interior surface or placed on a horizontal surface so that it was exposed to room air. To obtain the PAEC of radon daughters in WL, it is essential to calibrate the detectors with known radon daughter concentrations in a radon chamber under conditions almost similar to those which prevail in Indian dwellings. The calibration experiment was performed under controlled conditions and the details of the experiment are given elsewhere. The PAEC in WL of radon daughters was calculated by using the calibration factor. After the exposure, the detectors were brought back to the laboratory and chemically etched in 2.5N NaOH solution at 60±1°C for 2 hours in a constant temperature water bath. The resulting tracks due to alpha particles from radon progeny were counted by using a research microscope under magnification of 100 X.The results of these measurements are shown in tables. Present the measured radon concentration distributions and show that in all five places radon concentrations vary appreciably from dwelling to dwelling. The radon distributions in the present measurements are found to be approximately log-normal in Bahraich and Barabanki district (U.P.). Measurements to collect enough data to separate the houses with higher concentrations from those houses with lower concentrations to find features responsible for the difference. I used this type of LR-115 film, mounting nuclear track detectors in specific areas..

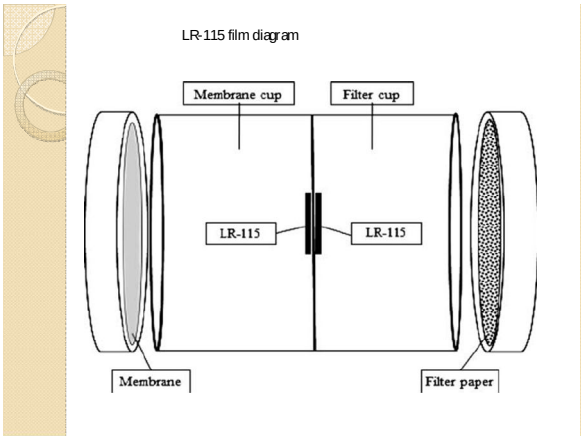


Fig :1

III. AREA OF STUDY

Bahraich district is situated in Eastern Uttar Pradesh state of India. Geographic coordinates of Bahraich, Coordinates: 27.575°N 81.594°E Coordinates: 27.575°N 81.594° covering an area of about 4696.8 Sq. Km Elevation 126 m (413 ft), Located on the banks of the Saryu River. Barabanki It is situated between 27°19' and 26°30' north latitude, and 80°05' and 81°51’ east longitude, covering an area of about 4,402 Sq. Km. Located on the banks of the Ghaghara and Gomti River. The ground of both district is almost plane, except for some elevations. The river water contains soil, silt, and sand in varying proportion. The soils of the Bahraich and Barabanki district consist broadly of soil is sandy,clay, Dumat or loam. The hard clay soil or Matiyar is ideal for paddy and sugur

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cane etc cultivation and very fertile. The Dumat or loam is also fertile soil, ideal for cultivation of various types of crops. This is the reason for high crop yields in the district. The soil cover is generally shallow and moderate in the northern part while in the southern part the soil cover is thick. In Bahraich district, Fruit trees grown here are mango and guava. The principal crops of the region are wheat, rice, sugarcane, pulse, and mustard. Sericulture is another occupation of the people of the region.The principal crops are in Barabanki, rice, wheat, pulse and other food grains and sugarcane. Ground water in the phereatic aquifer in general is colourless,odourless and slightly alkaline in nature. Specific Conductance (EC), which is a measure of total dissolved solids, indicates the ground water in the Bahraich and Barabanki district is fresh .The arsenic and fluoride value in the both district the ground water is suitable for drinking and domestic uses except at few places. The quality of ground water in deeper aquifer is also potable.The houses in study area are good and poorly ventilated. Buildings are constructed of concrete, cement, wood, mud, bricks, and blocks, some having glass doors and windows too. I visited Bahraich and Barabanki district for research work and I mounted the nuclear track detector in the Bahraich and Barabanki district we are choosing some specific reason. It is very useful for measurement of radon concentration. The main source of indoor radon are the soil, construction materials and natural gas used for cooking and other sources.The conditions for reducing radon concentration in houses and environment measured for establishing safety standards for human being. For example, the higher radon level in poor ventilation as the windows & doors of the room remain closed during night. Therefore, indoor radon concentration, the ventilation will have a stronger role to play.

Table. 1 :- Indoor radon levels in Bahraich district: *BAHRAICH DISTRICT*
Indoor radon concentration in different seasons:

Sr No.	Sample locations in Bahraich District	Detect-or code	Winter season			Rainy season			Summer season		
			Track density rate ($cm^{-2}d^{-1}$)	PAEC (mWL)	Concentra-tion of Radon Bq/m^3	Track density rate ($cm^{-2}d^{-1}$)	PAEC (m WL)	Concentra-tion of Radon Bq/m^3	Track density rate ($cm^{-2}d^{-1}$)	PAEC (mWL)	Concen-tration of Radon Bq/m^3
1	Saryunehar office	BH1	2.96	4.74	43.85	2.73	4.37	40.42	2.61	4.18	38.66
2		BH2	3.61	5.78	53.46	3.50	5.60	51.80	3.37	5.39	49.86
3		BH3	4.72	7.55	69.84	4.59	7.34	67.89	4.42	7.07	65.40
4		BH4	4.25	6.80	62.90	4.08	6.53	60.40	3.93	6.29	58.18
5		BH5	5.05	8.08	74.74	4.85	7.76	71.78	4.67	7.47	69.10
6	Pani tanki	BH6	3.05	4.48	45.14	2.90	4.64	42.92	2.77	4.43	40.98
7		BH7	4.19	6.70	61.97	3.99	6.38	59.01	3.86	6.18	57.17
8		BH8	4.30	6.88	63.64	4.15	6.64	61.42	4.01	6.42	59.39
9		BH9	5.36	8.58	79.36	5.18	8.29	76.68	4.98	7.97	73.72
10		BH10	5.44	8.70	80.47	5.22	8.35	77.24	5.09	8.14	75.30
11	Hospital chowraha	BH11	3.17	5.07	46.90	3.01	4.82	44.59	2.82	4.51	41.72
12		BH12	4.93	7.89	72.98	4.76	7.62	70.48	4.61	7.38	68.26
13		BH13	4.69	7.50	69.37	4.52	7.23	66.88	4.32	6.91	63.92
14		BH14	4.37	6.98	64.56	4.20	6.72	62.16	4.09	6.54	60.49
15		BH15	5.46	8.74	80.85	5.29	8.46	78.25	5.19	8.30	76.77
16	Ghantaghar	BH16	4.41	7.06	65.30	4.31	4.90	63.82	4.16	6.66	61.60
17		BH17	4.33	6.93	64.10	4.23	6.77	62.62	4.05	6.48	59.94
18		BH18	3.89	6.22	57.53	3.69	5.90	54.57	3.49	5.58	51.61
19		BH19	4.97	7.95	73.54	4.86	7.78	71.96	4.66	7.46	69.00
20		BH20	5.48	8.77	81.12	5.38	8.61	79.64	5.18	8.29	76.68
21	Kalpipara colony	BH21	3.11	4.98	46.06	3.01	4.82	44.58	2.18	4.50	41.62
22		BH22	3.20	5.12	47.36	3.10	4.96	45.88	2.89	4.62	42.73
23		BH23	4.12	6.59	60.96	3.89	6.22	57.53	3.69	5.90	54.57
24		BH24	4.21	6.74	62.35	4.00	6.40	59.20	3.87	6.19	57.26
25		BH25	4.43	7.09	65.58	4.23	6.77	62.62	4.11	6.58	60.86

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue VI, June 2019- Available at www.ijraset.com

Table. 2 :- Indoor radon levels in Barabanki district: Barabanki District
Indoor radon concentration in different seasons:

Sr No.	Sample locations in Barabanki District	Detect-or code	Winter season			Rainy season			Summer season		
			Track density rate ($cm^{-2}d^{-1}$)	PAEC (mWL)	Concentra-tion of Radon Bq/m^3	Track density rate ($cm^{-2}d^{-1}$)	PAEC (m WL)	Concentra-tion of Radon Bq/m^3	Track density rate ($cm^{-2}d^{-1}$)	PAEC (mWL)	Concen-tration of Radon Bq/m^3
1	Vasudev nagar	BK1	3.22	5.15	47.64	3.03	4.85	44.86	2.83	4.59	42.46
2		BK2	3.47	5.55	51.34	3.28	5.25	48.56	3.08	4.93	45.60
3		BK3	4.15	6.64	61.42	3.96	6.34	58.64	3.76	6.02	55.68
4		BK4	5.11	8.17	75.57	4.99	7.98	73.82	4.79	7.66	70.85
5		BK5	5.52	8.83	81.67	5.32	8.51	78.72	5.12	8.19	75.76
6	Lakhpera bagh colony	BK6	3.56	5.70	52.72	3.36	5.38	49.76	3.16	5.07	46.90
7		BK7	4.84	7.68	71.04	4.65	7.44	68.82	4.45	7.12	65.86
8		BK8	4.17	6.67	61.70	3.98	6.37	58.92	3.78	6.05	55.96
9		BK9	4.29	6.86	63.45	4.09	6.54	60.49	4.79	7.66	70.85
10		BK10	4.44	7.10	65.67	4.24	6.78	62.71	4.04	6.46	59.75
11	Sirsauli	BK11	3.09	4.94	45.69	2.88	4.61	42.64	2.76	4.42	40.88
12	Gauspur	BK12	4.92	7.87	72.80	4.72	7.55	69.84	4.52	7.23	66.88
13	Tickait	BK13	4.85	7.76	71.78	4.64	7.42	68.63	4.44	7.10	65.67
14	Nagar	BK14	4.26	6.82	63.09	4.06	6.50	60.12	3.86	6.18	57.16
15		BK15	4.02	6.43	59.48	3.83	6.13	56.70	3.63	5.81	53.74
16	Behrela	BK16	3.50	5.60	51.80	3.30	5.28	48.84	3.10	4.96	45.88
17	near	BK17	4.06	6.50	60.12	3.86	6.18	57.16	3.66	5.86	54.20
18	Bhitriya	BK18	4.98	7.97	73.63	4.78	7.65	70.76	4.58	7.33	67.80
19	Chauraha	BK19	5.10	8.16	75.48	4.90	7.84	72.52	4.70	7.52	69.56
20		BK20	5.49	8.78	81.22	5.29	8.46	78.25	5.09	8.14	75.29
21	Asandra	BK21	3.97	6.35	58.74	3.77	6.03	55.78	3.57	5.71	52.82
22	near	BK22	3.24	5.18	47.91	3.04	4.86	44.95	2.84	4.54	41.99
23	HaidarGarh	BK23	4.38	7.01	64.84	4.18	6.69	61.88	4.98	7.97	73.72
24		BK24	4.75	7.60	70.30	4.55	7.28	67.34	4.35	6.96	64.38
25		BK25	4.94	7.90	73.07	4.74	7.58	70.11	4.54	7.26	67.15

The value of radon progeny (PAEC) in mWL for radon progeny was estimated by using the following equation

$$Cp\ (m\ WL) = \rho / K.\ t$$

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The SSNTDs Method is used for the measurement of Radon concentration α—sensitive plastic track detectors provide a very useful and less expensive, method for integrated radon measurements (Frank and Benton., 1977; Fleischer et al., 1980) Generally, two plastic track detectors have been used for this.The radon concentration, C, measured by α- sensitive plastic detector is related to the track density ρ and the time of exposure t by the formula (Abu-Jarad et al., 1980)

$$\rho = K. C. t$$

K is the sensitivity factor with a value which depend on the configuration of the detector, viza-viz its surroundings, and also on the etching conditions used, Although the value of K can be calculated for different geometries (Fleischer et a., 1980). The calculation is not very straight forward except in the case of "BARE" detector mode (Abu— Jurad et al., 1980). It is always perferable to use the calibrated value of K obtained from laboratory calibration experiments using a standard radon chamber.Where ρ is corrected track density in tracks/cm², t is the exposure time and *K* is the calibration or sensitivity factor. The average calibration factor for LR-115 type II plastic in the BARE on card mode reaches 625 T $cm^{-2}d^{-1}$ WL. Calibration factor for LR-115 radon detectors in BARE on card mode. (D. S. SRIVASTAVA, P. SINGH, N. P. S. RANA, A. H. NAQVI, A. AZAM, T. V. RAMACHANDRAN and M. C. SUBBA RAMU *Nucl. Geo phys.* Vol. 9, No. 5, pp. 487-495, 1995, Copyright f 1995 Elsevier Science Ltd.) For the measurement of radon concentration (in Bq/m³).

C_{Rn} (Bq/m³) = WLconc. ×3700/ F_R

C_{Rn} (Bq/m³) = PAEC (mWL) × 3.7 / F_R

F_R = equilibrium factor (0.4)

C_{Rn} = radon concentration in Bq /m³.

PAEC(mWL) = potential a-particle energy concentration

ρ =corrected track density in tracks/cm²

K =sensitivity factor

t = time of exposure

Where F_R is the equilibrium factor for radon having the value 0.4 given by UNSCEAR [UNSCEAR, 2000]. The radon levels or PAEC values (in mWL) calculated by using the equations

PAEC (mWL)= $C_{Rn} \times F_R / 3.7$

The values of radon-thoron levels and their seasonal variation in the dwellings in Eastern U.P. The inhalation dose (in mSv/y) is calculated by using the following expression[UNSCEAR, 2000]

DRn = {(0.17+9FR) CR} x 0.007

Where, FR is equilibrium factors for radon and having the value of 0.4 [UNSCEAR, 2000].

Most of the houses in Bahraich and Barabanki district are houses with typical construction their dense population, different geological and environment conditions which provide a wide scope of radon studies in this area.

IV. RESULTS AND DISCUSSION

Table 1 and 2 gives the PAEC levels of radon daughters in WL and track production rate (tracks $cm^{-2}d^{-1}$per WL) along with the calibration factor (tracks T $cm^{-2}d^{-1}$/WL) for BARE on card mode and dosimeter. It is seen that the average calibration factor for LR-115 type II plastic in the BARE on card mode and dosimeters reaches 625 T $cm^{-2}d^{-1}$ per WL. It is seen that the values of calibration factor for a LR-115 detector are slightly more than those reported by Ramachandran *et. al.* (1988). This difference may be due to use of a different manufacturing batch and also due to differences in etching conditions. Hence, it is desirable to have detectors from each batch calibrated before using them for environmental radon measurements. The values of radon concentrations in typical ground floor rooms of Bahraich and Barabanki city are much less than those levels causing concern (150 Bq m^{-3}).

V. CONCLUSION

The radon concentrations were measured in 25 dwellings of Bahraich district of eastern U.P.in the winter season, 25 dwellings in rainy season and 25 dwellings in summer season and same measured in Barabanki district 25 dwelling in winter season, 25 dwelling in rainy season and 25 dwelling in summer season. Significant variations of radon concentrations were found in the different types of houses. The different types of houses show the maximum or minimum radon concentration and inhalation dose. These high values may be due to high emanation from the ground surface and from the building materials of the house. The minimum and maximum value of radon concentration and inhalation dose. The data in the tables (3),(4),(5) and (6) shows that the region is in safe limit from the radiation protection point of view.

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Table. 3:- Variations of indoor radon concentration in different seasons: Bahraich District

Sr. no.	Sample Locations in Bahraich District	Detector Code	Environmental Indoor Radon Concentration (Bq /m³)		
			Winter Season	Rainy Season	Summer Season
1	Saryunehar office	BH1	43.85	40.42	38.66
2		BH2	53.46	51.80	49.86
3		BH3	69.84	67.89	65.40
4		BH4	62.90	60.40	58.18
5		BH5	74.74	71.78	69.10
6	Pani tanki	BH6	45.14	42.92	40.98
7		BH7	61.97	59.01	57.17
8		BH8	63.64	61.42	59.39
9		BH9	79.36	76.68	73.72
10		BH10	80.47	77.24	75.30
11	Hospital chowraha	BH11	46.90	44.59	41.72
12		BH12	72.98	70.48	68.26
13		BH13	69.37	66.88	63.92
14		BH14	64.56	62.16	60.49
15		BH15	80.85	78.25	76.77
16	Ghantaghar	BH16	65.30	63.82	61.60
17		BH17	64.10	62.62	59.94
18		BH18	57.53	54.57	51.61
19		BH19	73.54	71.96	69.00
20		BH20	81.12	79.64	76.68
21	Kalpipara colony	BH21	46.06	44.58	41.62
22		BH22	47.36	45.88	42.73
23		BH23	60.96	57.53	54.57
24		BH24	62.35	59.20	57.26
25		BH25	65.58	62.62	60.86
Minimum Concentration			43.85 Bq/m³	40.42 Bq/m³	38.66 Bq/m³
Maximum Concentration			81.12 Bq/m³	79.64 Bq/m³	76.77 Bq/m³
Average Concentration			67.76 Bq/m³	61.37 Bq/m³	58.99 Bq/m³

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Table. 4:- Variations of indoor radon concentration in different seasons: Barabanki District

Sr. no.	Sample Locations in Barabanki District	Detector Code	Environmental Indoor Radon Concentration (Bq /m³)		
			Winter Season	Rainy Season	Summer Season
1	Vasudev nagar	BK1	47.64	44.86	42.46
2		BK2	51.34	48.56	45.60
3		BK3	61.42	58.64	55.68
4		BK4	75.57	73.82	70.85
5		BK5	81.67	78.72	75.76
6	Lakhpera bagh colony	BK6	52.72	49.76	46.90
7		BK7	71.04	68.82	65.86
8		BK8	61.70	58.92	55.96
9		BK9	63.45	60.49	70.85
10		BK10	65.67	62.71	59.75
11	Sirsauli Gauspur Tickait Nagar	BK11	45.69	42.64	40.88
12		BK12	72.80	69.84	66.88
13		BK13	71.78	68.63	65.67
14		BK14	63.09	60.12	57.16
15		BK15	59.48	56.70	53.74
16	Behrela near Bhitriya Chauraha	BK16	51.80	48.84	45.88
17		BK17	60.12	57.16	54.20
18		BK18	73.63	70.76	67.80
19		BK19	75.48	72.52	69.56
20		BK20	81.22	78.25	75.29
21	Asandra near HaidarGarh	BK21	58.74	55.78	52.82
22		BK22	47.91	44.95	41.99
23		BK23	64.84	61.88	73.72
24		BK24	70.30	67.34	64.38
25		BK25	73.07	70.11	67.15
Minimum Concentration			45.69 Bq/m³	42.64 Bq/m³	40.88 Bq/m³
Maximum Concentration			81.67 Bq/m³	78.72 Bq/m³	75.76 Bq/m³
Average Concentration			64.09 Bq/m³	61.23 Bq/m³	59.47 Bq/m³

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Table. 5:- Variations of inhalation dose (mSv/y) in different seasons: Bahraich District

Sr. no.	Sample Locations in Bahraich District	Detector Code	Environmental Inhalation dose in (mSv/y) [D]		
			Winter Season	Rainy Season	Summer Season
1	Saryunehar office	BH1	1.1	1.0	1.0
2		BH2	1.4	1.3	1.3
3		BH3	1.8	1.7	1.7
4		BH4	1.6	1.5	1.5
5		BH5	1.9	1.8	1.8
6	Pani tanki	BH6	1.1	1.3	1.5
7		BH7	1.6	1.5	1.5
8		BH8	1.6	1.6	1.5
9		BH9	2.0	2.0	1.9
10		BH10	2.1	2.0	1.9
11	Hospital chowraha	BH11	1.1	1.1	1.1
12		BH12	1.9	1.8	1.8
13		BH13	1.8	1.7	1.6
14		BH14	1.6	1.6	1.5
15		BH15	2.1	2.0	2.0
16	Ghantaghar	BH16	1.7	1.6	1.6
17		BH17	1.6	1.6	1.5
18		BH18	1.5	1.4	1.3
19		BH19	1.9	1.8	1.8
20		BH20	2.1	2.1	2.0
21	Kalpipara colony	BH21	1.2	1.1	1.0
22		BH22	1.2	1.2	1.1
23		BH23	1.6	1.5	1.4
24		BH24	1.6	1.5	1.5
25		BH25	1.7	1.6	1.6
Average			1.6 mSv/y	1.5 mSv/y	1.5 mSv/y

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ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue VI, June 2019- Available at www.ijraset.com

Table. 6:- Variations of inhalation dose (mSv/y) in different seasons:*BARABANKI DISTRICT*

Sr. no.	Sample Locations in Barabanki District	Detector Code	Environmental Inhalation dose in (mSv/y) [D]		
			Winter Season	Rainy Season	Summer Season
1	Vasudev nagar	BK1	1.2	1.1	1.1
2		BK2	1.3	1.2	1.2
3		BK3	1.6	1.5	1.4
4		BK4	1.9	1.9	1.8
5		BK5	2.1	2.0	1.9
6	Lakhpera bagh colony	BK6	1.3	1.3	1.2
7		BK7	1.8	1.8	1.7
8		BK8	1.6	1.5	1.4
9		BK9	1.6	1.5	1.8
10		BK10	1.7	1.6	1.5
11	Sirsauli Gauspur	BK11	1.2	1.2	1.0
12	Tickait Nagar	BK12	1.9	1.8	1.7
13		BK13	1.8	1.8	1.7
14		BK14	1.6	1.5	1.5
15		BK15	1.5	1.4	1.4
16	Behrela near Bhitriya	BK16	1.3	1.2	1.2
17	Chauraha	BK17	1.5	1.5	1.4
18		BK18	1.9	1.8	1.7
19		BK19	1.9	1.9	1.8
20		BK20	2.1	2.0	1.9
21	Asandra near	BK21	1.5	1.4	1.3
22	HaidarGarh	BK22	1.2	1.1	1.1
23		BK23	1.7	1.6	1.9
24		BK24	1.8	1.7	1.6
25		BK25	1.9	1.8	1.7
Average			1.6 mSv/y	1.5 mSv/y	1.5 mS/y

Significant variations of radon concentrations were found in the different types of houses. The different types of houses show the maximum or minimum radon concentration.Inhalation dose varies form 1.6 mSv/y to 1.5 mSv/y. so no action required. The values of inhalation dose are also found lower than the worldwide average background radiation dose [UNSCEAR,2000]of 2.4 mSv/y.These high values may be due to high emanation from the ground surface and from the building materials of the house. This difference may be due to use of a different manufacturing batch and also due to differences in etching conditions. Hence, it is desirable to have detectors from each batch calibrated before using them for Environmental radon measurements. The primary source of radon and its progeny in the dwellings are the soil adjacent to the building material. The indoor concentration however depends on various factors viz. ventilation condition, type of construction seasonal variation and geology of the area. We were choosing the some-specific reason of the eastern U.P. to calculate the radon concentration level by using the method of LR 115 type-II plastic track detector. Shravasti district is the dense forest region we would like to check the radon level in environment of certain areas. Bahraich and Barabanki district was selected for our study because of their dense population different geological conditions and environment. We studied radon concentration in different houses, environment, mud houses in these district.The residential buildings, selected for installing dosimeters, are both new and old (Kumar et al., 2014). They are mainly made of bricks along with cement and concrete. The selection of these houses for dosimeters installation took the degree of ventilation, floor types, and number of windows and doors into account as they are all responsible for variations in indoor radon concentration. All the measurements took place at noon/night in winter seasons. However, the recorded values of radon the resulting gases fall well below the internationally-recommended levels, which clearly indicates that the houses in Bahraich ab Barabanki Eastern Uttar Pradesh are

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quite safe in terms of protection from any radiation (Rawat et al., 2011). Building materials can influence the indoor radon concentrations slightly. Brick and concrete houses show higher radon levels, while wood and adobe houses present lower ones. The concentration maximum in winter, in the winter the doors closed for long hours since in summer, the houses' doors are open for a long time, which in turn increases the rate of air exchange. This is the possible cause for radon variation. The results of Radon concentration and its progeny will help the scientists and environment a lists to establish the radiation and safety standards for human beings.The LR-115 type II plastic tracks detectors provide a very useful and less expensive, method for integrated radon measurements.

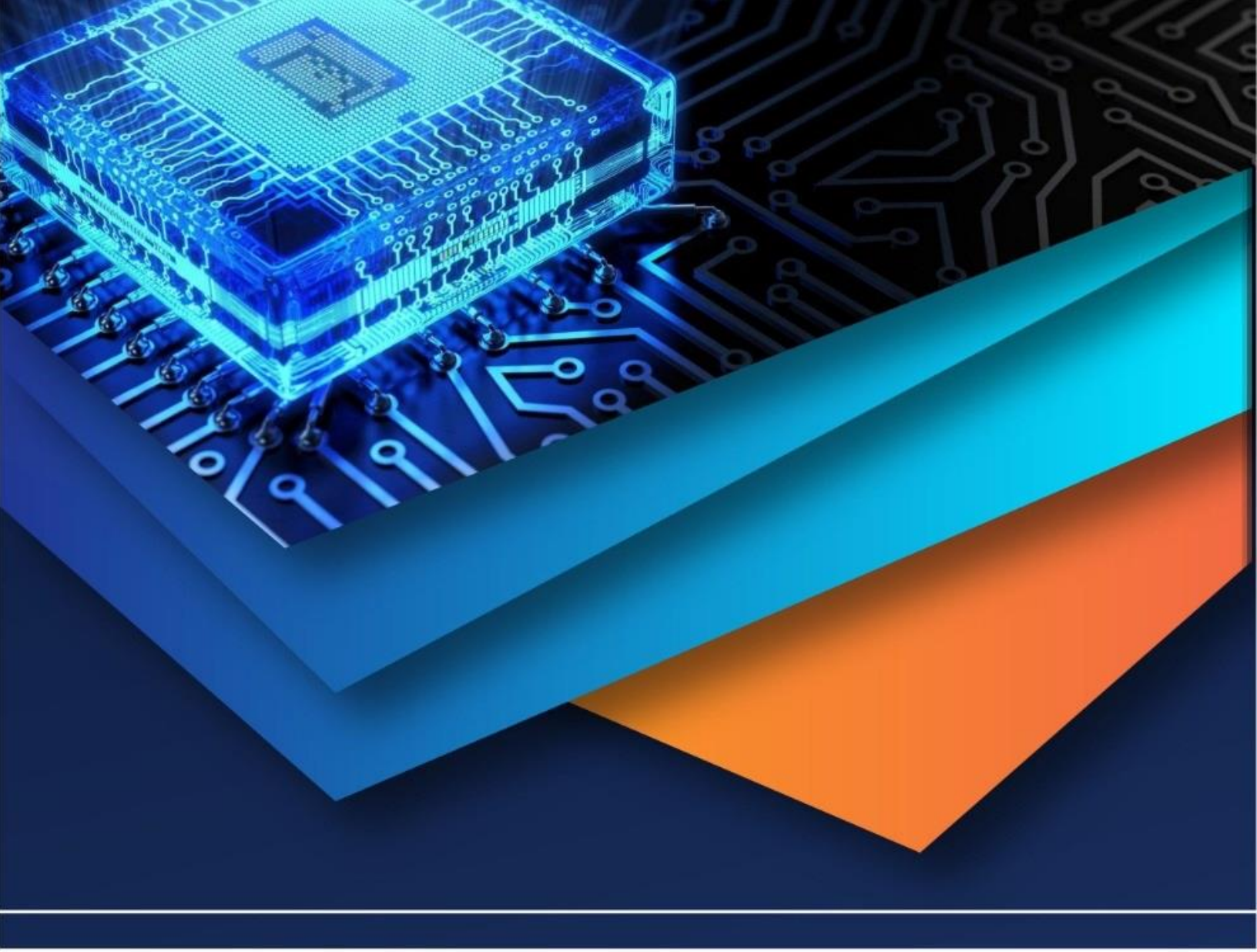
VI. ACKNOWLEDGEMENTS

The authors are thankful to the residents of dwellings in District Bahraich and Barabanki (Uttar Pradesh) for allowing the detectors to be placed in their living rooms. The experimental support received from Software engineer A. K. Verma in Bahraich District, Satyavart Tripathi in government college in Lakhpera bagh Barabanki district and Dr.Padam Singh (Associate professor) in Chhatrapati Sahuji Maharaj University Kanpur is thankfully acknowledged.

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