



Measurement of Radon Concentration in Random Samples from Liquefaction Water Network in Al-Kifl District of Babylon / Iraq

Musaab Khudhur Mohammed^{1*}, Maher Hassan Rashid²

Abstract

An estimate has been made in this research of radon (Rn) concentration level and the annual effective dose in rivulet and river in AL-Kifl District of Babylon Province-Iraq. In this article, a samples of the water from 10 regions have been used and probe it by the electronic radon detector (RADH₂O) to investigate the radon concentration. The highest measured value is about (2.64) Bq•L⁻¹ and the minimum measured rate is about (0.0362) Bq•L⁻¹. The effective dose for human exposure to radon rate was (2.43 μSv.y⁻¹). According to the results of radon (Rn) concentrations and annual effective, it was within permissible and non-dangerous limits in the reign study.

Key Words: Zn, Cigarette Smoking, Concentration in Random.

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Introduction

Radon is an inert gas, odorless, tasteless, colorless, radioactive elements, carcinogen by inhalation, very poisonous and non-flammable. The chemical symbol of Radon is (Rn) and it has for quite some time been perceived as a reason for lung malignant growth, and in 1988, the "International Agency for Research on Cancer (IARC)" and the "World Health Organization (WHO)" [1,2] grouped radon as a human lung cancer-causing agent. Also, various general wellbeing organizations rank private radon presentation as the subsequent driving reason for lung disease after cigarette smoking [2,3]. Radon is an honorable gas that is one of the characteristic radioactive rot results of radium coming about because of the deterioration of uranium. Radium is available in the earth at rates that can be viewed as fixed on account of its half-existence of (1600) y, and radon is transmitted from the dirt into the climate [4]. Radon has three significant isotopes. They are: (i) Radon (²²²Rn) which is a delivered

from (²³⁸U) arrangement, (ii) Theron (²²⁰Rn) which is a created from (²³²Th) arrangement and (iii) Actinon (²¹⁹Rn) which is a delivered from (²³⁵U) arrangement. Radon girls or radon rot items, or radon descendants are (²¹⁸Po), (²¹⁴Pb), (²¹⁴Bi), and (²¹⁴Po) [5]. (Rn) is found wherever in all stones and soils, outside and inside. Outside, radon and its rot items once in a while arrive at elevated levels as a result of consistent scattering and weakening. Though in inside, diminished ventilation may make radon and its rot items arrive at levels that are significant degrees over the open air levels [6]. Prosperity consequences of (Rn) in fixture water which insinuates ingestion of separated of (Rn) will achieve a radiation part to the covering of the stomach. Additionally, internal breath of (Rn) gas that has been released from spigot water will add to the (Rn) substance of indoor air and, at whatever point took in, will realize a radiation part to the lung.

Corresponding author: Musaab Khudhur Mohammed

Address: ¹Department of Physics, College of Education for Pure Science, University of Babylon, Iraq; ²Department of Physics, College of Basic Education, University of Babylon, Iraq.

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Long stretch prologue to high assemblies of radon gas in indoor air extends the peril of lung sickness [7].

In this Article, we show the results of (Rn) gas concentrations measurements in Al-Kifl District of Babylon / Iraq and calculation of the effective dose.

Region of the Examination District

Study position is the Al-Kifl, which is an Iraqi town located between Babylon, Najaf and Karbala provinces in southern Iraq near the Euphrates

River. The tomb of the prophet Ezekiel (Dhul-Kifl) is located in the town. As the Euphrates River passes on one side and is about 30 kilometers away from the province of Najaf with location coordination (32° 13' 28" North) and (44° 22' 1" East). The number residents in the town and near is about (15,000) as shown in Fig.(1) [6]. The district was divided into ten regions for water sampling, each of the ten regions has a symbol of st1, st2, st10 as shown in Fig. below.



Fig. 1. An Aerial Photograph of the Al-Kifl Region Showing the Sampling Areas

Measurement

A radon-in-air screen (RAD7) of “Durrige Organization of USA” was utilized for watching radon center in (10) water tests and interfacing domain utilizing the (RAD_{H2O}) framework [7]. (RAD H₂O) is a collaborator to the (RAD7) that gauges radon in water with tall precision, over a conventional scope of centers, fit for getting a examining for radon obsession in water interior an hour of taking the illustration [8] the (RAD H₂O) utilizes standard, pre-set traditions, joined with the (RAD7) which equip a provoke examining of the

radon center interior the water test, itself. The (RAD7) locator can conceivably find out the gathering of radon in water test by expanding the meeting of radon interior the discuss circle by an inflexible alter coefficient. Vial of water for a (250) mL test change sum of (4) has been gotten from the sum of the discuss circle, the sum of the case and thusly the adjust radon spread sum at temperature. The plan makes utilize of a closed circle air circulation plan in which the discuss volume and water volume are kept steady and are autonomous of the stream rate appears in Fig. (2).



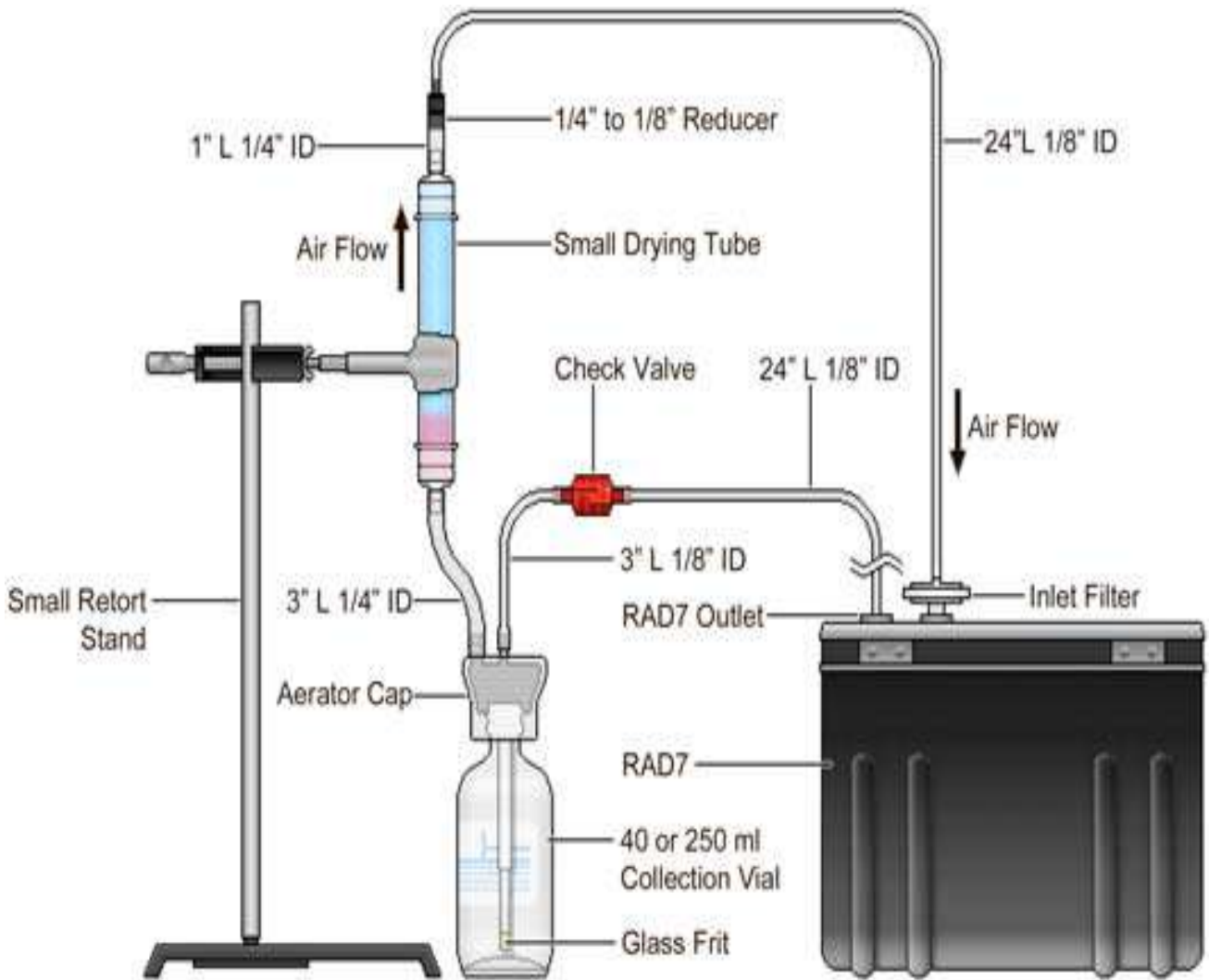


Fig. 2. Diagram Outline of RAD7, Strong State, Particle Embedded, Planar Silicon Alpha Finder with RAD H₂O Gathering [8]

Effective dose is measure of radon in water of drinking has been using the following [9]

$$ED = k \times c_{Rn} \times t \quad (1)$$

where: *ED*: effective dose, *k*: coefficient of inhalation and transformation defined by the international organization of Atomic Energy and the value of (10⁻⁸), *t*: is exposure time take its value (360), *c_{Rn}*: radon concentration rate, *km*: private water plants and its value (2).

Results & Discussion

Table (1) shows, the outcomes were gotten in this investigation where (S) is a sample of liquefied water, (Mean) represents to the average value of (Rn) concentration and (V) refers to Rivulet, (R) refers to River measured in(Bq. L⁻¹).

Table 1. Concentrations of Radioactive (Rn Gas) in Samples from Rivulet and River in Al-Kifl

Samples		Mean (Bq.L ⁻¹)	Effective dose (mSv.y ⁻¹)
S ₁	V	0.253	0.00000184
	R	0.072	0.000000525
S ₂	V	0.398	0.0000029
	R	0.235	0.00000171
S ₃	V	0.09	0.00000065
	R	0.162	0.00000118
S ₄	V	0.162	0.00000118
	R	0.036	0.000000262
S ₅	V	0.29	0.0000021
	R	0.145	0.00000105
S ₆	V	0.47	0.0000034
	R	0.126	0.000000919
S ₇	V	0.379	0.0000027
	R	0.09	0.00000065
S ₈	V	0.145	0.00000105
	R	0.072	0.000000525
S ₉		0.289	0.0000021
S ₁₀		2.64	0.000019



The results of the sampling of liquefied water shown in Table (1), which were taken from different places in the study area in Al-Kifl town, indicated that the radon concentration range in the study places between (0.3-0.04) Bq. L⁻¹ a variance in the measurement results of water samples agreeing to their location as appear in Fig. (1), This samples are considered liquid water supplied to the residential areas. According to the main study results, it was noted that all wells and springs readings were below the (MCL) of (11.1) Bq. L⁻¹ [10, 11]. The low concentration levels of (Rn) in water spigots could be obtained, because the public network water reservation for a period of time for processing, storage and distribution, so it's time enough for its slimming radon in water before it reaches the buildings [10]., the effective dose of exposure to (Rn) in drinking water samples is 0.00000292. mSv.y⁻¹.

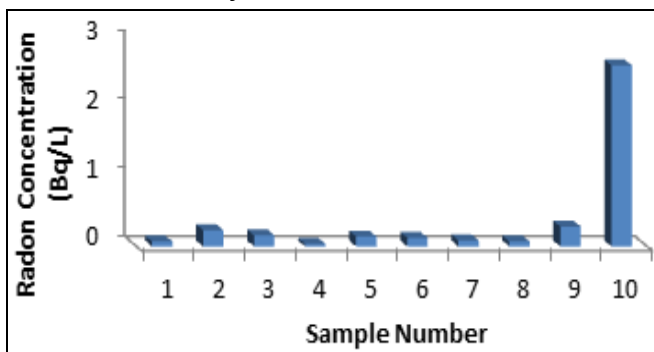


Fig. 3. Diagram Illustrating a Variation in Radon Concentration of Water in the Rivulet and River Samples

According to the spectrum that shown in Fig. (3) for the upper and lower limits of the sample of the study site, the relationship between the count rate and which consist of Radon progeny in A(²¹⁸po), B(²¹⁴po) and Thoron progeny D(²¹⁶po), E(²¹²po) can be observed. [8]

As there has been no specific safe limit value for radon until now in Babel province or in Iraq generally, the results obtained can only be compared with the safe limit values for the World Health Organization (WHO).

Conclusion

1. Contrasted and the worldwide locations, our discoveries demonstrated that there was no expanding in the introduction of Radon in the diverse consumption liquid bases in AL-Kifl Area. A few elements may clarify the finding of radon rot and Radon air circulation, blend of liquid from various bases beforehand siphoning, and the

movement separation and time.

2. All outcomes for tests were not exactly the permitted fixation level of (11.1) Bq.L⁻¹ (As characterized by the Natural Insurance Organization EPA), and the compelling portion (1.74) mSv.y⁻¹ was not exactly the (UNSCEAR) and (WHO) prescribed farthest point for individuals from general society of (1) mSv.y⁻¹[2,3].

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