

Study on Radioactivity in Fallout Dust Over Alexandria City

Abdallah Karama

Department of Oil, Gas and Chemicals, Bechtel Corporation, Alexandria, Egypt

Corresponding Author: Abdallah Karama, Department of Oil, Gas and Chemicals, Bechtel Corporation, Alexandria, Egypt, Email: abdallahkaramahse@yahoo.com

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Abstract

Natural radioactivity is wide spread in the earths' environment and it exists in various geological formations in soil, rocks, plants, water and air. The main radioactive materials are long-lived radionuclides such as ^{238}U known as norms naturally occurring radionuclides materials.

Keywords: Radioactivity, Ionizing, Radiation

Introduction

Natural radioactivity is wide spread in the earths' environment and it exists in various geological formations in soil, rocks, plants, water and air. The main radioactive materials are long-lived radionuclides such as ^{238}U known as norms naturally occurring radionuclides materials. Human beings can be exposed to ionizing radiation through external sources (e.g. Terrestrial radiation and cosmic radiation).which irradiate the body with gamma photos, Where as the internal hazard requires the incorporation of radioactive materials into the body through ingestion or inhalation [1].

The ground fallout dust samples were collected from 33 flat undisturbed ground sites from different regions over Alexandria city. The dust deposition rate was determined in five sites by dust collectors. The period of samples collection was from 20 October 2014 to 20 January 2015 that aim to assess radioactivity levels in fallout dust over Alexandria City.

The collected samples were measured by high resolution gamma rays spectroscopy system equipped with hyper pure germanium detector [2-4].

The ground fallout dust samples results analysis for ^{238}U -Decay Series, ^{232}Th - Decay Series, ^{40}K , ^7Be and ^{137}Cs as below:

Results show that distribution of ^{238}U over Alexandria, show activity for 8 regions exceeds limit, according to The world's average documented in the UNSCEAR report 2000 which is 35 Bqkg^{-1} ,with activity(88.16, 38.84, 48.55, 37.24, 99.64, 86.99, 60.68, 55.96) measured in Gate ,El Senaat Saghera School, Fouad. St, El Azareta, Suez Canal Road, Faculty of Engineering, respectively. Average Concentration of ^{238}U in fallout dust over Alexandria Region is 38.5174 Bqkg^{-1} [5-7].

Distribution of ^{226}Ra over Alexandria, show activity for 14 regions exceeds limit, according to The world's average documented in the UNSCEAR report 2000 which is 35 Bqkg^{-1} ,with activity(88.11, 58.27, 46.41, 66.44, 36.47, 251.8, 47.91, 39.37, 50.63, 77.22, 72.07, 46.25, 51.1, 102.8) El Senaat Saghera School, Wadi El Kamar, Masr Station.1, Masr Station., Fouad .St, Faculty of Engineering, Faculty of Engineering, Sedi Gaber, Mostafa Kamel, Roushdy, Bolkley, Gleem, Janaklees, Victoria, respectively. Average Concentration of ^{226}Ra in fallout dust over Alexandria Region is 47.789 Bqkg^{-1} [8].

Distribution of ^{228}Ra over Alexandria, show activity for 3 region exceeds limit, According to The world's average documented

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in the UNSCEAR report 2000 which is 30 Bqkg^{-1} , with activity (57.29, 35.37, 69.38) Gate 8, Smouha, and Bokly, respectively. Average Concentration of ^{228}Ra in fallout dust over Alexandria Region is 19.99 Bqkg^{-1} .

Distribution of ^{40}K over Alexandria, show no activity exceeds limit for any region, According to The world's average documented in the UNSCEAR report 2000 which is 400 Bqkg^{-1} . Found highest 3 regions activity (288.7, 288.3, 303) for Smouha, Victoria and El Mamora Balad [9].

Average Concentration of ^{40}K in fallout dust over Alexandria Region is $184.765 \text{ Bqkg}^{-1}$. Distribution of ^7Be over Alexandria region show maximum concentration at Faculty of Engineering 1= 142 Bqkg^{-1} and at Bolkley= 135.5 Bqkg^{-1} . Average Concentration of ^7Be in fallout dust over Alexandria Region is 39.852 Bqkg^{-1} .

Distribution of ^{137}Cs over Alexandria region show maximum concentration for Shoban Moslmin= 3.44 Bqkg^{-1} . Average Concentration of ^{137}Cs in fallout dust over Alexandria Region is 1.1789 Bqkg^{-1} .

Analysis of ^7Be activity in deposition dust

It show relative high levels for Abo keer, EL Mandara and IGSR, as (4833.9, 1304.42 and 3405.1 Bqkg^{-1}), respectively. Comparing with study done at the Czech Republic, where The ^7Be values ranged from 147.0 to 279.6 Bqkg^{-1} , from 48.7 to 740.8 Bqkg^{-1} , from 2.1 to 8.7 Bqkg^{-1} , and from 0.6 to 1.9 Bqkg^{-1} in birch-tree leaves, grass samples, soils and rainwater, respectively [10-12].

Assessment of radionuclides in ground fallout dust

-Radium equivalent activity didn't exceed limit which is 370 Bqkg^{-1} for all locations, highest levels in 3 regions (362.3775, 265.923, 230.546) for Faculty of Engineering 1, Bolkley and Victoria, respectively.

Comparing Absorbed Dose Rate with the global average values ranging from 10-200 nGyh^{-1} , found that, for all locations highest values (160.71, 122.09597, 105.154) in faculty of engineering 1, Bokly, and Victoria, respectively. Which consider within global average values range.

Annual effective dose equivalent didn't exceed limit for all locations, highest values (197.0957, 149.7385, 128.9609 μSvy^{-1}) in faculty of engineering 1, Bokly and Victoria, respectively, which less than, an allowable limit for public which is 0.001 Svy^{-1} .

External Hazard Index Rate didn't exceed limit for all locations, highest values (0.9791, 0.718187 and 0.622752) in Faculty of Engineering 1, Bolkley and Victoria, respectively, less than the permissible dose equivalent limit of ≤ 1 . Internal Hazard Index exceed limit for 1 location, which is faculty of engineering 1= 1.659641 . highest values (0.912971, 0.90059) for Bolkley and Victoria, respectively, Less than the permissible dose equivalent limit of ≤ 1 . Cancer Risk has been assessed, results show that, highest levels (0.009855, 0.007487, 0.006448 mSv) at Faculty of Engineering 1, Bolkley, and Victoria, respectively.

Conclusion

According to the world average ELCR ($0.29 \times 10^{-3} \text{ Sv}$). excess lifetime cancer risk exceeds limit for 12 locations over Alexandria region (0.404622837, 0.378361565, 0.346334226, 0.68983478, 0.339038536, 0.302525588, 0.372309349, 0.356787396, 0.524084742, 0.323286527, 0.334464512, 0.451363279 mSv) for Gate 8, El ,Senaat Saghera School, Masr Station 2, Faculty of Engineering 1, Faculty of Engineering, Smouha, Mostafa Kamel, Roushdy, Bolkley, Gleem, Janaklees, Victoria, respectively.

-Average excess lifetime cancer risk over Alexandria is about 0.2509 mSv , Alexandria Population is 4.778 million 74. So we conclude that about 1199 of Alexandria City population may catch cancer.

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