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Research Article **Open Access**

Measuring the Permissible Limits of Radiation Doses and Their Impact on the Population of Al-Sadr City in Baghdad Governorate

Wisam I. Taher*, Iman T. Al-Alawy

Department of Physics College of Science, Mustansiriyah University, Baghdad, IRAQ.

*Correspondent contact: wesamtaher78@gmail.com

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ABSTRACT

In this research, the level of radiation doses and the amount of energy obtained by the human body and received by the individual were measured in Al-Sadr region, east of Baghdad Governorate, and because this region has a large population density and the presence of an industrial and commercial fields. So that the total areas on which the radiological survey was conducted reached 93 using the GPS, a radiological survey was conducted. 2790 readings were calculated for all areas and the average was 279 readings. The readings were taken by the inspector, and the highest reading was recorded in sector 26 by 0.135 msv/h and the lowest reading recorded in sector 72 was 0.071 msv/h. The results were compared with the decisions of the International Commission on Radiological Protection (ICRP).

KEYWORDS: Level of radiation doses; the population of al-Sadr City.

الخلاصة

في هذا البحث تم تحضير أغشية رقيقة من الهياكل النانويةلاوكسيد الغاليوم β-Ga_2O_3 عن طريق القشط بالليزر النبضي في الماء المقطر (PLAL) على ركيزة الكوارتز بطريقة الصب بالتنقيط عند 90 درجة مئوية. تم استخدام ليزر Nd-YAG بطول موجة 1064 نانومتر ومعدل تكرار 5 هرتز. تم فحص تأثير زيادة كثافة طاقة الليزر على الخصائص التركيبية والبصرية بواسطة ، المجهر الإلكتروني النافذ (TEM)، مجهر القوة الذرية (AFM)، حيود الأشعة السينية (XRD)، المجهر الإلكتروني الماسح (SEM) ومجهر المطياف الضوئي (UV-VIS). أزاد الحجم البلوري لجميع العينات مع زيادة كثافة طاقة الليزر باستثناء الطاقة 5.57 جول\سم^2 كانت 9.78 نانومتر. تم ملاحظة تكوين الجسيمات النانوية ، جسيمات شبيهة بالمغزل ، الورقة النانوية والقلب-قشرة لـ β-Ga_2O_3 بواسطة صور TEM عند طلاقة الليزر 4.77 و 5.57 و 5.97 و 6.36 جول\سم^2 ، على التوالي. يمكن رؤية العناقيد النانوية والقضبان النانوية لكل لأغشية الرقيقة β-Ga_2O_3 بواسطة صور SEM عند كثافة طاقة الليزر 4.77 و 5.97 و 6.36 و 5.57 جول\سم^2. أظهرت نتائج تحقيقات XRD أن نماذج الحيود لـ β-Ga_2O_3 تحولت من الطور أحادي الميل مع (-201) ، (-402) ، (-603) إلى طور تقويمي التركيب مع (002) ، (004) ، و (006) عند زيادة كثافة طاقة الليزر. انخفضت فجوة الطاقة مع زيادة كثافة طاقة الليزر ، وكانت ذروة الامتصاص تقع في منطقة الأشعة فوق البنفسجية

INTRODUCTION

Natural radiation comes from many sources. For the natural sources, which include cosmic rays and nuclides generated as a result of their interaction with some components of the air, radionuclides of ground origin such as potassium K-40, uranium U-238 series, thorium Th-232 series, and uranium U-235 series, or industrial, the most important of which are those arising from The nuclear fuel cycle and the remnants of the nuclear industry in the medical, agricultural and industrial fields, or by testing nuclear weapons such as cesium (Cs-137 and Cs-134), may constitute a significant source of radiation in the environment [1, 2]. Radiation is divided into two types: ionizing rays and non-ionizing rays. Radiation has an effect on the environment, its effect may remain for many years to affect the genetic makeup of humans and animals, leading to genetic defects whose effects appear in subsequent generations, and cell death is one of the most direct effects of radiation on cells, especially dangerous. When this death affects some irreplaceable cells in the body [3, 4], therefore, a field radioactive survey was conducted for the study area Figure 1 [5]. Several studies have measured the natural radioactivity of soil in the world [6-11].

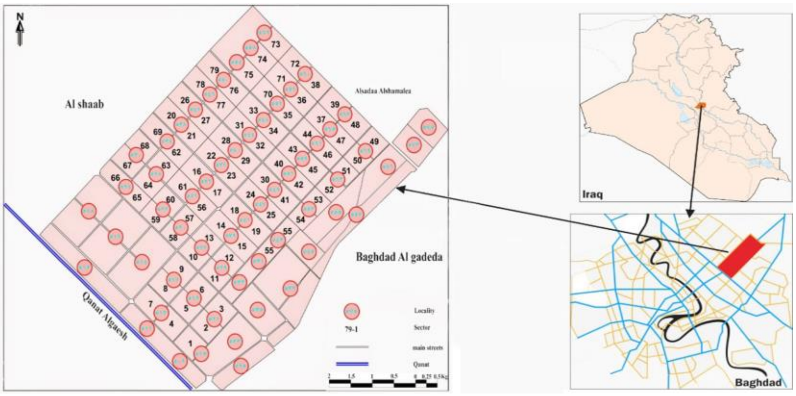

Figure 1. Al-Sadar City (Area of the study) [5].

MATERIAL AND METHOD

The process of radiological scanning and measuring the radiation dose received by the individual residing in the Sadr City area, east of Baghdad, was conducted using the Inspector device. It is an American-made device, SN # 21715. Specialists in the Ministry of Science and Technology in measuring radioactive contamination during field surveys rely upon it. It is characterized by ease of carrying and accurate reading. Figure 2, which is one of the accurate devices in calculating the readings. Accordingly, 93 sites were read in the study area, these sites are health, commercial and industrial activities, with 2790 readings for all regions, and the average is 279 readings.

Figure 2. Inspector device.

RESULTS AND DISCUSSION

Table 1 represents the measured values of the outdoor dose absorbed by humans in the study area, where the highest reading was recorded in sector 26 by 0.135 mSv/h and the lowest reading in sector 72 by 0.071 mSv/h per hour with an average value of 0.113 mSv/h per hour. Its reading contains large markets for the sale of used materials and shredded iron, such as the Maridi market in sectors 29, 30, 32 and 40, as well as a largely industrial neighborhood for car repair, which contains a large number of scrap iron in sector 75 in addition to many government departments with a crowded human nature, Thus the values calculated from the linear fitting equation y = 0.784 x - 49.628 represent the influence of the soil as well as the ambient external radiation at the place of measurement, such as the effects of industrial, agricultural and health activities. Summary of the correlation coefficient of the computed and measured readings of Al-Sadr City, east of the capital, Baghdad, where the measured reading is closely related to the computed reading at 100%, and the strong positive correlation coefficient between the two readings indicates a strong relationship between them.

Table 1. Measured out door-absorbed dose at Al-Sadr City sectors, using portable Inspector device.

No.	Name of Sector	Geographical Coordinates	Average Absorbed Dose (µSv/h)	Calculated Out Door Absorbed Dose (nGy/h)	Measured Out Door Absorbed Dose (nGy/h)
1	1	N=33.35.72.19 E= 44.44.32.16	0.114	99.18	31.14704
2	2	N=33.36.20.04 E= 44.44.51.92	0.115	100.05	31.82921
3	3	N=33.36.51.41 E= 44.44.81.89	0.115	100.05	31.82921
4	4	N=33.35.42.13 E= 44.44.51.92	0.117	101.79	33.19354

5	5	N= 33 37 21 03 E= 44 45 09 31	0.120	104.4	35.24004
6	6	N=33.36.65.75 E= 44.44.93.26	0.116	100.92	32.51137
7	7	N=33.21.58.98 E= 44.25.58.83	0.12	104.4	35.24004
8	8	N=33.22.09.37 E= 44.26.09.93	0.115	100.05	31.82921
9	9	N=33.22.19.18 E= 44.26.21.28	0.115	100.05	31.82921
10	10	N=33.22.24.80 E= 44.26.38.99	0.113	98.31	30.46487
11	11	N=33.36.87.22 E= 44.45.15.31	0.114	99.18	31.14704
12	12	N= 33 37 21 03 E= 44 45 09 31	0.115	100.05	31.82921
13	13	N=33.22.34.66 E= 44.26.52.48	0.114	99.18	31.14704
14	14	N=33.22.43.80 E= 44.27.02.67	0.112	97.44	29.7827
15	15	N=33.37.36.82 E= 44.45.72.05	0.127	110.49	40.01521
16	16	N=33.23.16.88 E= 44.26.53.51	0.126	109.62	39.33304
17	17	N=33.23.02.14 E= 44.27.07.96	0.117	101.79	33.19354
18	18	N=33.22.55.77 E= 44.27.09.74	0.114	99.18	31.14704
19	19	N=33.35.42.13 E= 44.44.51.92	0.118	102.66	33.87571
20	20	N= 33 39 74 87 E= 44 43 81 60	0.114	99.18	31.14704
21	21	N=33.23.40.99 E= 44.26.24.56	0.113	98.31	30.46487
22	22	N=33.23.37.32 E= 44.27.16.44	0.123	107.01	37.28654
23	23	N=33.23.16.90 E= 44.27.19.26	0.117	101.79	33.19354
24	24	N=33.23.09.38 E= 44.27.17.14	0.117	101.79	33.19354
25	25	N=33.37.89.04 E= 44.46.30.57	0.101	87.87	22.27887
26	26	N=33.23.52.97 E= 44.26.35.04	0.135	117.45	45.47255
27	27	N=33.23.57.23 E= 44.26.41.27	0.117	101.79	33.19354
28	28	N=33.23.37.32 E= 44.27.16.44	0.115	100.05	31.82921
29	29	N=33.23.24.64 E= 44.27.19.31	0.109	94.83	27.7362
30	30	N= 33 38 76 32 E= 44 45 85 23	0.112	97.44	29.7827
31	31	N=33.23.44.35 E= 44.27.24.49	0.113	98.31	30.46487

32	32	N=33.23.46.19 E= 44.27.27.79	0.111	96.57	29.10054
33	33	N=33.23.56.34 E= 44.27.37.54	0.113	98.31	30.46487
34	34	N= 33 39 59 42 E= 44 46 31 61	0.110	95.7	28.41837
35	35	N=33.23.51.16 E= 44.28.03.15	0.104	90.48	24-32537
36	36	N=33.24.11.05 E= 44.27.24.02	0.115	100.05	31.82921
37	37	N= 33 23 59 92 E= 44 28 21 38	0.118	102.66	33.87571
38	38	N= 33 24 09 36 E= 44 28 16 58	0.112	97.44	29.7827
39	39	N= 33 24 06 59 E= 44 28 20 34	0.105	91.35	25.00754
40	40	N= 33 32 23 80 E= 44 27 43 98	0.111	96.57	29.10054
41	41	N=33.38.15.99 E= 44.46.57.88	0.118	102.66	33.87571
42	42	N= 33 23 09 64 E= 44 28 01 94	0.109	94.83	27.7362
43	43	N=33.23.38.23 E= 44.27.48.74	0.116	100.92	32.51137
44	44	N= 33 24 06 59 E= 44 28 20 34	0.098	85.26	20.23237
45	45	N=33.38.94.39 E= 44.47.26.75	0.119	103.53	34-55787
46	46	N= 33 23 32 83 E= 44 28 20 75	0.113	98.31	30.46487
47	47	N= 33 23 44 47 E= 44 28 28 35	0.104	90.48	24-32537
48	48	N= 33 23 55 56 E= 44 28 36 62	0.101	87.87	22.27887
49	49	N= 33 23 30 21 E= 44 28 59 28	0.094	81.78	17.5037
50	50	N= 33 37 81 37 E= 44 46 40 21	0.103	89.61	23.6432
51	51	N= 33 23 18 02 E= 44 28 41 07	0.103	89.61	23.6432
52	52	N=33.38.71.85 E= 44.47.26.45	0.118	102.66	33.87571
53	53	N=33.38.47.43 E= 44.46.96.82	0.119	103.53	34-55787
54	54	N=33.38.09.05 E= 44.46.77.10	0.119	103.53	34-55787
55	55	N= 33 37 81 37 E= 44 46 40 21	0.104	90.48	24-32537
56	56	N= 33 22 53 88 E= 44 26 46 15	0.104	90.48	24-32537
57	57	N= 33 24 27 39 E= 44 26 46 26	0.093	80.91	16.82153
58	58	N=33.22.50.27 E= 44.26.25.00	0.112	97.44	29.7827

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59	59	N=33.22.50.17 E= 44.26.17.92	0.118	102.66	33.87571
60	60	N=33.22.59.82 E= 44.26.18.75	0.118	102.66	33.87571
61	61	N=33.23.04.52 E= 44.26.40.23	0.115	100.05	31.82921
62	62	N=33.23.30.73 E= 44.26.26.06	0.118	102.66	33.87571
63	63	N=33.23.29.07 E= 44.26.01.54	0.111	96.57	29.10054
64	64	N=33.23.19.55 E= 44.25.59.42	0.113	98.31	30.46487
65	65	N=33.23.10.44 E= 44.25.51.14	0.116	100.92	32.51137
66	66	N=33.23.10.54 E= 44.25.49.55	0.118	102.66	33.87571
67	67	N= 33 24 27 39 E= 44 26 46 26	0.11	95.7	28.41837
68	68	N=33.23.29.08 E= 44.26.08.60	0.126	109.62	39.33304
69	69	N=33.23.37.19 E= 44.26.16.78	0.115	100.05	31.82921
70	70	N=33 24 03 38 E= 44 27 45 97	0.093	80.91	16.82153
71	71	N=33.24.11.06 E= 44.27.54.02	0.100	87	21.5967
72	72	N=33.24.20.19 E= 44.28 04.35	0.071	99.18	31.14704
73	73	N= 33 24 35 79 E= 44 27 52 70	0.118	102.66	33.87571
74	74	N=33.24.31.99 E= 44.27.19.37	0.097	84.39	19.5502
75	75	N=33.24.21.27 E= 44.27.07.57	0.113	98.31	30.46487
76	76	N=33.24.14.63 E= 44.27.00.17	0.121	104.4	35.24004
77	77	N=33.24.01.21 E= 44.26.44.41	0.117	101.79	33.19354
78	78	N=33.24.09.45 E= 44.26.53.56	0.121	105.27	35.92221
79	79	N= 33 24 27 39 E= 44 26 46 26	0.120	104.4	35.24004
80	sifer	N=33.35.42.13 E= 44.44.51.92	0.114	99.18	31.14704
81	Jamila neighborhood near Square 83	N=33.23.01.57 E= 44.25.40.89	0.121	105.27	35.92221
82	Jamila Vegetable Market	N=33.22.44.07 E= 44.26.04.52	0.109	94.83	27.7362
83	Jamila near the Stores of Commerce	N=33.22.20.75 E= 44.26.18.61	0.106	92.22	25.6897

84	Jamila neighborhood near town council	N=33.21.56.75 E= 44.25.52.90	0.118	102.66	33.87571
85	Jamila neighborhood near Al-Sadr City Court	N=33.21.52.90 E= 44.25.48.52	0.118	102.66	33.87571
86	Canal Street near Muzaffar Square	N=33.21. 51.66 E= 44.25.54.13	0.120	104.4	35.24004
87	Al-Amana neighborhood near the Traffic Directorate	N= 33 21 01 28 E= 44 26 42 52	0.118	102.66	33.87571
88	Canal Street near Wahran Square	N= 33 21 44 78 E= 44 25 46 48	0.104	90.48	24-32537
89	Canal Street near Talbieh	N= 33 24 50 42 E= 44 27 33 16	0.099	86.13	20.91453
90	Kasaruh Waeatsh	N= 33 24 38 25 E= 44 26 5483	0.111	96.57	29.10054
91	Kasaruh Waeatsh Industrial district	N= 33 24 50 42 E= 44 27 33 16	0.112	97.44	29.7827
92	Al Habibiah	N= 33 36 56 18 E= 44 44 27 39	0.106	92.22	25.6897
93	Jamila Industrial District	N= 33 37 57 08 E= 44 42 58 40	0.118	102.66	33.87571
Max.				117.45	45.47
Min.				80.91	16.28
Average				98.35	30.501

CONCLUSIONS

In 1991, the International Commission on Radiological Protection (ICRP) [6] [12] recommended to the general public limits for radiation doses, not to exceed the following limits:

1. Effective dose limits are 1 mSv per year
2. The annual limit of the equivalent dose for the eye lens for the general human being is 15 mSv and for hands and feet 50 mSv.

Therefore, we can say that all the readings that were taken from the sites of the study area are within the permissible limits.

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