

HOSTED BY



ELSEVIER

Available online at www.sciencedirect.com

ScienceDirect

Journal of Radiation Research and Applied Sciences

journal homepage: <http://www.elsevier.com/locate/jrras>

Radiation leakage from electromagnetic oven

Abdurrahman Khalil ^a, Runak Tahir Ali ^{b,1}, Nabeel Abdulrazzaq Fattah ^{c,*}^a Nanoscience, Physics Department, College of Science, Salahaddin University, Erbil, Iraq^b Medical Physics, P.O. Box 178, College of Medicine, Hawler Medical University, Erbil, Iraq^c Biomedical Engineering, School of Electrical and Electronic Engineering, Newcastle University, Newcastle upon Tyne, NE1 7RU, United Kingdom

ARTICLE INFO

Article history:

Received 23 February 2015

Received in revised form

26 April 2015

Accepted 8 May 2015

Available online 23 May 2015

Keywords:

Microwave

Radiation leak

Radiation

ABSTRACT

Background: Microwaves are a form of electromagnetic energy, like light waves or radio waves, and occupy a part of the electromagnetic spectrum of power, or energy. Microwaves are very short waves of electromagnetic energy that travel at the speed of light (186,282 miles per second). In our modern technological age, microwaves are used to relay long distance telephone signals, television programs, and computer information across the earth or to a satellite in space. But the microwave is most familiar to us as an energy source for cooking food.

The aim: of this research is to measurement the radiation leak from different types of electromagnetic oven for some type oven in Erbil city can be measured, that affect to the human health.

Materials & methods: This study is performed for the first time in some houses in Erbil (the capital of Iraq Kurdistan region) using an Electromagnetic field strength meter device measuring electric field, magnetic field and radiation intensity in eight homes in Erbil.

Results & Discussions: The measurements have been done at some houses in Erbil city, according to the source of background radiation exist before measuring data. Our data compared with standard safe range of radiation data. Results showed that there is radiation leak form all type of electromagnetic oven and all at the order of safety compared with standard value.

Copyright © 2015, The Egyptian Society of Radiation Sciences and Applications. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

A structure of a microwave oven door screen which facilitates the observation of the inside of a heating cavity and enhances the safety against the electromagnetic wave leakage and durability (Chavan, Deshmukh, & Kulkarni, 2014). A door screen

of this type generally comprises a pair of transparent plates and an electromagnetic wave shielding material interposed there between. The present door screen uses a punched metal plate as the electromagnetic shielding material made of aluminum having a thickness of 0.1–0.35 mm, an aperture diameter of 1.2 mm or less and a ratio of the aperture diameter to a center-to-center distance of an aperture of 0.67–0.85, these parameters

* Corresponding author. Tel.: +44 7449328129.

E-mail addresses: alassafee@yahoo.com (A. Khalil), Runaksalan20@yahoo.com (R.T. Ali), n.fattah@newcastle.ac.uk (N.A. Fattah).

Peer review under responsibility of The Egyptian Society of Radiation Sciences and Applications.

¹ Tel.: +964 7705376331.

<http://dx.doi.org/10.1016/j.jrras.2015.05.004>

1687-8507/Copyright © 2015, The Egyptian Society of Radiation Sciences and Applications. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

being chosen such that an aperture rate of more than 40% is assured and the electromagnetic wave leakage through the door screen is effectively prevented (to meet the Regulations of U.S. Department of Health, Education, and Welfare) and a strain due to continuous mechanical treatment of the punched metal plate is minimized (Lassen & Ovesen, 1995).

Radiation, as defined by physics terminology, is “the electromagnetic waves emitted by the atoms and molecules of a radioactive substance as a result of nuclear decay.” Radiation causes ionization, which is what occurs when a neutral atom gains or losses electrons (Osinboyejo, Walker, Ogutu, & Verghese, 2003). In simpler terms, a microwave oven decays and changes the molecular structure of the food by the process of radiation. Non-ionizing Radiation can change the position of atoms but not alter their structure, composition, and properties. Examples are visible light, ultraviolet and infrared waves, waves from radio or television, cellular phones, microwaves, and electric blankets (Aizawa, Maruyama, Li, & de Silva, 2013).

2. Materials & Methods

This study is performed in some houses in Erbil (the capital of Iraq Kurdistan region), with the help of Erbil environment administration using an Electromagnetic field strength meter device as shown in the Fig. 1, measuring electric field, and magnetic field and radiation intensity in eight homes in Erbil. Also EMF device measure the B.E and I with the change distance, (step by step by changing the distance from (0–200 cm)), till the intensity effect finish in the home kitchen. the measurements of EMF take in the kitchens, there was no source of radiation except in the oven but it has in some homes (Labuza & Meister, 1992; Quan et al., 1992).

2.1. Our measurement can take in two cases

- 1) While the door of the oven was closed, the oven was switched on.
- 2) While the door of the oven was opened, the oven was switched off.



Fig. 1 – GHP meter used to measure the power intensity, electric and magnetic fields in some House.

Table 1 – Background data taken from the GOSONG oven before the oven is on.

d/m	I ($\mu\text{W}/\text{m}^2$)	B (mV/m)	E ($\mu\text{A}/\text{m}$)
0.0	130.8	145.7	201.8
Case (1) Turn on oven close window of oven			
0	1.5	526	1.7
0.1	188	325	819
0.6	134	407	602
1	162	215	947
1.5	509	315	950
2	125	300	914
Case (2) Open window of oven			
0	0.1	6.5	20.1
0.1	0.1	6.1	13.4
0.6	0.1	4.3	15.1
1	0	6	15.9
1.5	0	5.7	15.9
2	0	5.8	17.6

3. Results & discussion

Microwave radiation is measured as power density in units of milliwatts per square centimeter (mW/cm^2) which is essentially the rate of energy flow per unit area. Table 1 and Fig. 2 showed the measurement of EMW oven with distance needs special equipment for the detection and measurement of the leakage (Nakamata, Asami, Wei, & Kawahara, 2014). Table 1 for $d = 0.6$ m the value of B is different as compared with I and E because of the properties of EMW. Typical levels of radiation leakage from microwave ovens is about $0.2 \text{ mW}/\text{cm}^2$ which is far below the limit set by the national safety standard Safety Code 6: Limits of Exposure to Radiofrequency Fields at Frequencies from 10 kHz to 300 GHz (1994, 60 p., Health Canada pub. 91-EHD-160). This level of leakage cannot be sensed by the body (Kawahara et al., 2013).

The power density of the microwave radiation decreases rapidly with increasing distance from the oven as shown in Fig. 2. This means that the farther away from the microwave you stand, the less radiation you will be exposed to. At one

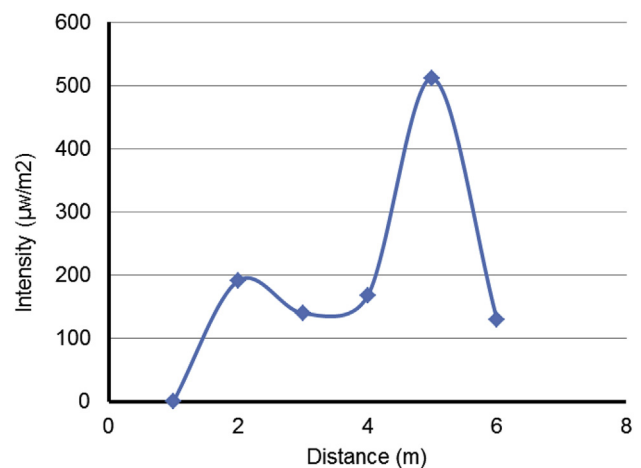


Fig. 2 – Relation between microwave Intensity and distance for GOSONG oven.

Download English Version:

<https://daneshyari.com/en/article/1570258>

Download Persian Version:

<https://daneshyari.com/article/1570258>

[Daneshyari.com](https://daneshyari.com)