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Investigation of Radioactivity Contamination in Second-Hand Computer Monitors

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Abstract

The current survey was carried out to detect and identify any radioactivity contamination that might be present in imported second-hand computer monitors in Kosti Dray Port, Sudan. Handheld radiation survey meters, contamination detector and portable gamma-spectrometry were used.The result of this survey has revealed without doubt that the second hand computer monitors did not contain any radioactivity contamination. Because the level of radiation fall within the range of 0.1–0.9 μSv/h with an average value of 0.39 ± 0.27 μSv/h. From the obtained results the levels of radiation doses seems to be close the tobackground radiation Hence, the imported second-hand computer monitorsare radiologilly safe and free of any radioactivity contamination. The importance of this work highlights radiation monitoring over the border entrances and ports in Sudan as well as expand the concept of radiation protection and radiation safety culture among the public.

Keywords

Second-Hand Computer, Dose, Contamination and Radiation Detector

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1. Introduction

Radioactivity contamination occurs when radioactive material is deposited on an object or a person. Radioactive materials released into the environment can cause air, water, surfaces, soil, plants, buildings, people, or animals to become contaminated [1]. Radioactivity contamination can be evaluated by monitoring the radiations emitted during the nuclear decay process. In order to select appropriate monitoring equipment, it is necessary to know the types of radiations being emitted. Monitoring equipment must be suitable for measuring the particular type and energy of the principal radiations emitted by the radionuclide being monitored. The radiation detectors in the probes of most commercially available surface contamination monitors are one of three types scintillation detectors ,gaseous ionization detectors or solid state detectors [2].

Metal recycling has become an important industrial activity worldwide; it is seen as being socially and environmentally beneficial because it conserves natural ore resources and saves energy. However, there have been several accidents over the past decades involving orphan radioactive sources or other radioactive material that were inadvertently collected as scrap metal that was destined for recycling [11]. Recently, several severe radiation accidents related to recycling scraps

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have been occurring in different geographical regions [3]. Second hands electronic devices such as computer, television, laptop trading had become extremely popular and plays an important role in supplying computer labs for Schools, Internet cafes, Shops and Computer center in the Sudan. Four years ago or more, there had been a problem taken attention of public opinion and audio-visual media. The Sudanese public believes that some countries supplying electronic equipment and computers contaminated with radioactive material into the country. Radioactive. The current study is attempting to survey radioactive contamination in imported Second-hand computer monitors and highlights radiation monitoring over the border entrances and ports in Sudan as well as expand the concept of radiation protection and radiation safety among the populace.

2. Material and Method

In the current investigation 218 second-hand computer monitors atKostiDry Port warehouse in White Nile State, weresurveyed with the aid of portable gamma-spectrometry (identi FINDER-Ultra) based on NaI (Tl) detector used for radionuclide identification. The portable gamma-spectrometer has been calibrated in terms of energy and efficiency using ^{137}Cs and ^{40}K. Radiation survey meters Radiagem 4000 and RADOS-120 was used to measure radiation. These dose meters were previously calibrated at the Secondary Standard Dosimetry laboratory (SSDL) on Sudan atomic energy commission, calibration factor of Radiagem 4000 was 0.89 μSv/h and the calibration factor of RADOS-120 was 0. 88 μSv/h. Background radiations were measured in three different environments far from any artificial source found to be 0.1 μSv/h. Measurements of the dose were done at 0.3 cm from the screen of the monitors.

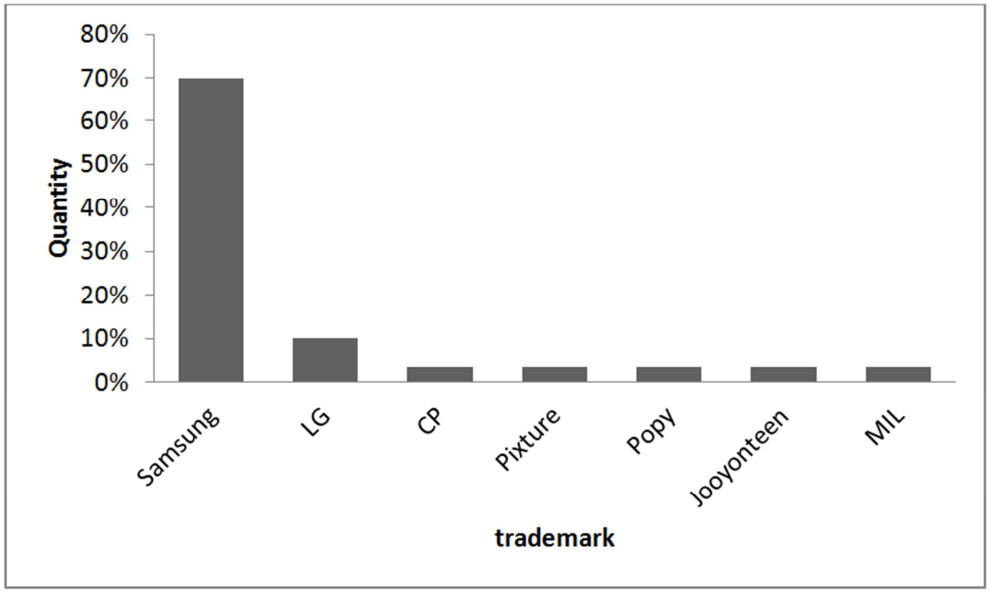

Figure 1. Classification and amountssecond hand computer monitors.

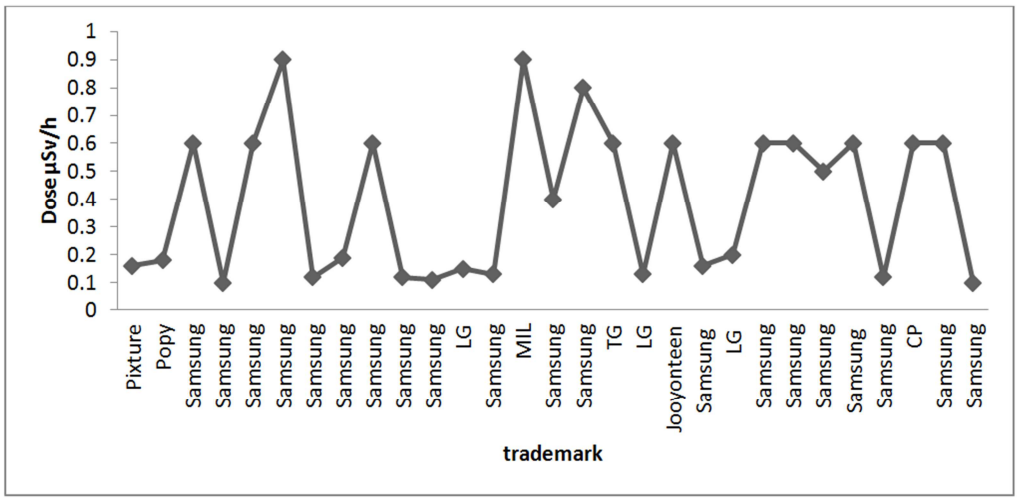

Figure 2. Distribution of the radiation dose measured second hand computer monitors.

3. Result and Discussion

In recent years, it has become widely recognized that there are a large number of sites incountries around the world which have become radioactively contaminated as a result of nuclear fuel cycle activities; nuclear weapons programmes; the use of radioisotopes in medicine, research, industry; accidents; and so on [4]. There have been many incidents worldwide radioactively contaminated material becoming incorporated into the scrap metal chain reported by numerous investigater [5, 6, 7, 8, 9]. Surveyed Second-hand Computer Monitors were classified according to its trademark and their amounts are shown in Fig. 1. Samsung constitute 70% followed by metals LG 10%, CP 3.33% and the rest is, Pixture, Popy, Jooyonteen and MIL monitors fig (1). The radiation dose from the surface of the Second-hand Computer Monitors fall within the range of 0.1–0.9 μSv/h with an average value of 0.39±0.27 μSv/h fig (2). The radiation dose it seems to be close to the background radiation level of 0.1 μSv/h. From the obtained result no evidence of any contamination associated with the second -hand computer monitors.Sudan shares borders with seven countries,knowing that Sudanese borders are open, which makes it difficult to control, so we need to setting up an early warning system for bordermontoring. The protection of the public and the environment is important for the well-being of present and future generations and for equitable and sustainable development [12, 13, 14]. Therefore, construct detection system for radioactivity monitoring at borders is an essential component of an overall strategy to insure that contaminated materials by radioactive source do not come into the country; many countries around the world have monitoring system [4]. Because the Sudanese people know many reported cases of radioactive contamination being detected in watches were imported from Hong Kong, where they had been assembled. The source of contamination was later traced to a small plant in China that had provided steel for the bracelet pins. It is thought that a teletherapy head, a device used in radiation treatment of cancer patients had been inadvertently melted down as scrap at this plant. There have been many instances world-wide of industrial radioactive sources being accidentally smelted, contaminating the smelters, and puttingradioactive metals into commercial and consumer products [10]. In France, the watches were sold through a large, international department store, raising fears that the watches could also have been on sale in Europe, Asia, and South America. Fortunately, an investigation by regulatory authorities around the globe, did not find any further watches in distribution. But had one contaminated watch not been detected at the French nuclear plant, many people might have been exposed to low doses of radiation. The one hundred kilograms of contaminated steel found at the plant in China might never have been discovered and could have been used to make other consumer products [4, 5]. Radionuclide releases can also affect people and the environment outside the state in which the discharging facility is located–for this reason a number of legally binding international treaties addressing these issues have been ratified. In a global and long term perspective, the and the environment is important for the well-being of present and future generations and for equitable and sustainable development [14].

4. Conclusion

Based on these results of investigation of cadioactivite contamination in second-hand computer monitors in kosti province, the following can be drawn

1. The monitoring of commodities, including second-hand materials, as they are transported across national borders, since such monitoring is normally undertaken for the purposes of national security. Nevertheless, it is noted that such border monitoring will contribute to preventing radioactive material from being inadvertently processed within the metal recycling and production industries and should be regarded as an important component part of the overall system of control of radioactive material within any country.
2. There has been no radioactive contamination detected in Second hand Computer Monitors.
3. The radiation dose within the background radiation level
4. It is very important for any country to build up a program for radiation monitoring of imported material.
5. It is necessary to develop national or local emergency response plans that may be called into play as a consequence of the discovery of radioactive material in imported materials, scrap metal, metal products or wastes from metal processing facilities.

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