Safety Facts Of Alpha Ionizer

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Alpha Ionizer

The Alpha Ionizer is a device used to neutralize static charge on any material. It uses a radioactive source called Polonium (Po-210) to produce ions (positively or negatively charged particles) in the surrounding air. These ions attract their counterparts in order to neutralize the charge on the material. Essentially, the exposure and health risk from the Alpha Ionizer is not measurable.

Radiation

Radiation is everywhere and is as old as the universe itself. Two types of radiation are: ionizing and non-ionizing. Non-ionizing radiation damages tissue through heating effects. Sun light and heat are non-ionizing radiation also described as ultraviolet (UV) and infrared (IR) radiation. Ionizing radiation (alpha and beta particles, neutrons, and x and gamma rays) causes damage by ionizing, i.e., stripping electrons off atoms. Ionizing radiation can be found in smoke detectors and sometimes emitted from color televisions. A radioactive source has an unstable nucleus. In order to achieve a stable state, it will emit radiation via the radioactive decay process. A radioactive atom gives off ionizing radiation in all directions in the form of fast flying particles or rays

Radiation Dose

Radiation is essentially movement of energetic particles or waves in space. These traveling particles interact with and deposit energy in any medium through which they pass. The amount of energy absorbed is called dose. Dose is usually measured in units of Roentgen (R), rad, or rem (when the dose is deposited in human tissue). The occupation dose limit for a radiation worker in the United States of America is 5000 mrem per year. To have a better perspective, it should be noted that the average background radiation from natural sources is about 300 mrem/yr. (~ 35 micro rem*/hr.). Following is the exposure received during various activities in the U.S.:

Chest X-ray	20 mrem
Dental X-ray	200-700 mrem
Cross-country jet fligh	5-10 mrem
Smoking cigarettes (1.5 packs/day)	8,000 mrem/yr
Pacemaker	700 mrem/yr

Health Risks

To estimate the health risk from radiation, it is very important to understand the nature of radiation. Knowledge of the type, energy, and amount of the exposure is required in order to determine the effect of radiation to the body. For example, alpha particles of the same energy and exposure do not have the same effect on the body as gamma rays. Alpha particles cannot penetrate even the outer layer of skin, but gamma rays penetrate human tissue and shielding. High-energy gammas are more penetrating than low energy. Exposure can be external or internal. External exposure is from any radioactive source external to the body. Internal exposure is the exposure caused by ingested or inhaled radioisotopes. The greater the exposure greater is the risk of biological effects. High levels of exposure to ionizing radiation will damage or kill the cells which makeup our bodies. Cancer can result from cells that are damaged but survive.

* millirem is 1000th of rem
* micro rem is 1000th of mrem

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Radiation Protection

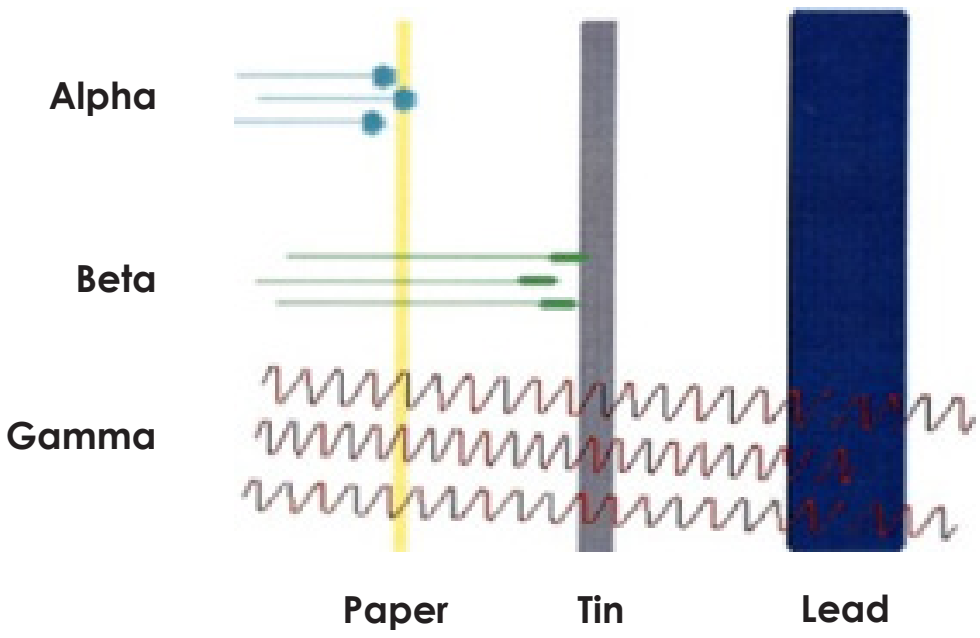
The exposure from any type of radiation can be limited by controlling the following factors: Time, Distance, and Shielding.

Time: The greater the time one is exposed to the radiation source, the greater the exposure (dose).

Distance: Doubling the distance from radiation source reduces the exposure four times.

Shielding: Any material placed in between the source of radiation and the occupied area will absorb some of the radiation and thus reduce the exposure. The more material used, and greater its density, the more radiation will be reduced.

Following is a profile of penetration levels of various radiation types



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Radiation In Alpha Ionizers

Polonium-210 is a naturally occurring radioisotope. It can be found throughout earth's crust. Polonium decays to a stable form of lead (Pb-206) by emitting alpha particles. A very small percentage of the time (0.0012%), 803 keV gamma rays are also generated in this decay.

Alpha particles travel only an inch or so in air and have little penetrating power. Alpha particles are not considered an external radiation hazard because the dead layer of skin easily stops them. The only way alphas can be harmful is by ingestion or inhalation of an alpha emitter (internal exposure). Internally, the source of alpha radiation can be in close contact with unprotected body tissue and can deposit a large amount of energy in small volume of body tissue.

Gamma rays are very penetrating. Their range in air is very long compared to alpha and beta radiation. Range also depends upon the energy associated with the gamma radiation. Gamma radiation is best shielded by dense materials such as lead or steel. Gamma rays are very similar to X-rays in nature.

The only difference is in their origin. Gamma radiation is emitted from the nucleus of an atom, whereas X-rays are produced by the rearrangement of electrons outside the nucleus.

The radioactive source (Po-210) in the Alpha Ionizer is encapsulated inside a solid metallic foil. It has been shown that there is no chance of ingesting particles from such encapsulated ionizing sources. Therefore, the Alpha Ionizer used under normal mounting and operating conditions (as specified in the instructional manual) creates no hazard from alpha radiation.

The small amount of 803 keV gamma radiation produced in the decay process will be further attenuated with the metallic foil structure and the steel frame of the ionizer. Under normal mounting conditions, the Ionizer is about two (2) feet away from the workspace. If a person were to work 8 hours a day for a whole year, the annual occupation dose would still be less than 2 mrem. Such a low amount of exposure is hard to measure against background radiation. The number cited here is the calculated number. The exposure from a single dental X-ray is at least 100 times higher than the dose from the Alpha Ionizer in a year.

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