

## The Exposure unit X

Exposure to radiation protection has two different meanings:

The first: is exposure to ionizing radiation

Second: It expresses a certain physical quantity.

Exposure: is the exposure of dry air under standard conditions (i.e. at zero degrees Celsius and at a pressure equal to 760 millimeters of mercury) to a quantity of x-rays or low-energy gamma rays up to 3MeV.

Exposure is measured by the amount of positive or negative electric charge resulting from ionization in the volumes unit of dry air under these conditions.

$$X = \frac{dQ}{dm}$$

**X: Exposure**

**dQ: The charge (positive, Negative).**

**dm: mass**

Exposure is measured in a unit known as **Runniken is** defined: The process of exposure to a quantity of x-rays or low-energy gamma radiation leads to the generation of an electrical charge (negative or positive) amounting to  $(2.5 \cdot 10^4)$  coulombs in one kg of dry air and under standard conditions, i.e:

$$1R = 2.58 \cdot 10^4 \text{ C/kg air.}$$

**The absorbed dose unit (D)**

It is the product of dividing the average deposited energy(dE) deposited by the particles (ionized photons) in an element of the substance whose mass is (dm), meaning that the absorbed dose D is:

$$D=dE/dm$$

It should be noted that the absorbed dose is used for all types of ionizing radiation, whether they are charged or not charged, and for all energies, .as well as for all materials that fall on the ionizing radiation.

The unit of measurement for absorbed dose in the international regime is Cray (Gy)

The traditional unit of radiation absorbed dose is still the rad used in some references and devices related to radioactivity, where the **rad** is defined as the energy absorbed and equal to (100ARC) by one gram of the material exposed to radiation.

$$Gy=100 \text{ rad}$$

**The equivalent dose(H)**

**Relative biological effectiveness(RBE)**

It is called the rem, where **the rem** is defined as the amount of energy absorbed by the material exposed to radiation multiplied by the relative **biological effect**: that means the effect that occurs when the material is exposed to different radiation, where this effect is not equal in intensity depending on the type of material.

**Equivalent dose unit = Biological effect \* the dose in rad**

When the absorbed dose is expressed in the International system of units system with Gray (Gy), the dose is expressed in Sv that is, the **Seivert** is

the unit of measurement for the equivalent dose in the International  
System of Units.

As for the expression of the absorbed dose by rad, the equivalent dose is  
expressed in the rem:

$$1\text{Seivert}=100 \text{ Rem}$$