Converting cpm to µSv/h

The dose rate d_r is the quantity of radiation absorbed or delivered per unit time. It is often indicated in *micrograys per hour* $\left[\frac{\mu Gy}{h}\right]$ or as an equivalent dose rate in *rems per hour* $\frac{rem}{h}$ or *sieverts per hour* $\left[\frac{Sv}{h}\right]$.

From the data sheet of the LND712 Geiger tube we find the gamma sensitivity for ^{60}Co (a synthetic radioactive isotope of cobalt) of 18 $\left[\frac{cps}{\frac{mR}{h}}\right]$.

$\left[\frac{mR}{h}\right]$ (*milliRoentgen/hour*) is an obsolete unit for the dose rate. cps are clicks per second. Multiplying the term with 60 $\left[\frac{s}{min}\right]$ we get:

$$18\left[\frac{cps}{\frac{mR}{h}}\right]\cdot 60\left[\frac{s}{min}\right] = 1080\left[\frac{cpm}{\frac{mR}{h}}\right].$$

Now we convert $\frac{mR}{h}$ to $\frac{R}{h}$ by multiplying the term with $1000\left[\frac{mR}{R}\right]$:

$$1080\left[\frac{cpm}{\frac{mR}{h}}\right]\cdot 1000\left[\frac{mR}{R}\right] = 1080000\left[\frac{cpm}{\frac{R}{h}}\right].$$

We calculate the reciprocal of the term to obtain the dose rate at 1 $[cpm]$:

$$1\,[cpm] = \frac{1}{1080000}\left[\frac{R}{h}\right] = 0.000000\overline{925}\left[\frac{R}{h}\right].$$

The air-kerma K_a , which is the amount of energy given off by a radioactive substance is given by

$$K_a\,[Gy] = 0.00877\left[\frac{Gy}{R}\right]\cdot X\,[R].$$

X represents the exposure. 0.00877 is the coefficient of radiation dose absorption by the human body on the phantom model under the influence of photon energies of 100 $[keV]$ to 3 $[MeV]$ (*kilo/mega electronvolt*). Use of the values results in:

$$K_a\,[Gy] = 0.00877\left[\frac{Gy}{R}\right]\cdot 0.000000\overline{925}\,[R] = 0.00000000812\overline{037}\,[Gy].$$

As $1\,[Gy] = 1000000\,[\mu Sv]$,

$$K_a = 0.00812\overline{037}\,[\mu Sv].$$

So finally we can conclude that

$$\boxed{1\,[cpm] = 0.00812\overline{037}\left[\frac{\mu Sv}{h}\right]}.$$