(7.6) What is the γ-ray flux from a 3.7 GBq ^{60}Co source at a distance of 3 m? Assume ψ_{sample}=1.

Note that each decay gives a cascade of two γ:s.

Begin as usual to define 1 Bq:

$Bq := sec^{-1}$

The decay rate (source strength) is given as:

$R_{source} := 3.7 \cdot 10^{9} \cdot Bq$ (=3.7 GBq)

and the γ emission rate is twice the decay rate (ψ_{sample}=1):

$I_{\gamma} := 2 \cdot R_{source}$ γ/s

The distance from the centre of the source is:

$r := 3 \cdot m$

As all emitted radiation has to pass through the surface of a surrounding sphere with a 3 m radius we get the average flux as the total number of emitted particles per unit time divided by the surface area:

$Area := 4 \cdot \pi \cdot r^{2}$

$\phi := \frac{I_{\gamma}}{Area}$ $\phi = 6.543 \cdot 10^{7} \cdot m^{-2} \cdot sec^{-1}$ or $\phi = 6.543 \cdot 10^{3} \cdot cm^{-2} \cdot sec^{-1}$