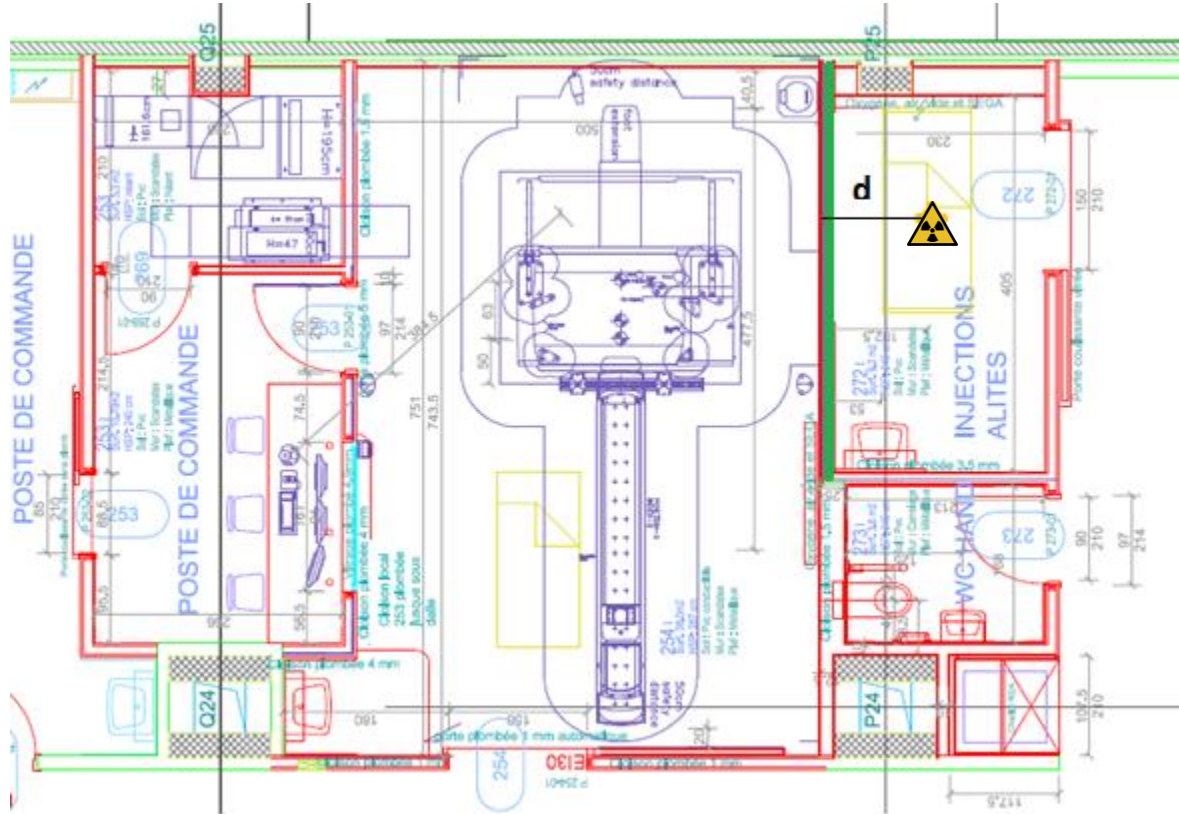


EPFL, 5th november 2018

Exercises

Shielding calculation around a PET-CT device



Knowing that $d = 110$ cm
and that the radioactive
source=patient =
F-18, 350 MBq,

...estimate the lead
shielding necessary
between «injection
alités» (with patient's
bed) and the PET-CT room
to agree with regulation
(ORaP).

(considering an
occupation of 40 hours a
week and a tenth value
layer (TVL) of 1.59 cm for
F-18 in lead)

Distance between the source and the area to protect :
110 cm

Isotope and source activity :
F-18, 350 MBq

Guidance values of dose rate in the PET-CT ward:
2.5 $\mu\text{Sv/h}$ (according to FOPH directive L-07-01)

TVL of F-18 in lead (according to FOPH directive L-07-01 et DIN) :
1.59 cm for 18 g/cm^2

Assesement quantities h10 for F-18 :
160 $\mu\text{Sv/h /GBq}$ @ 1m

Dose rate in the PET-CT ward without any shield
 $(0.35 \text{ GBq} * \text{h}10) / 1.10^2 = 46.3 \text{ } \mu\text{Sv/h}$

Minimum lead shield to respect the guidance values :

$$F = 46.3/2.5 = 18.52$$

$$\text{Log}(F) = 1.27$$

$$\text{Log}(F) * \text{TVL} = 1.27 * 1.59 = \mathbf{2.02 \text{ cm of lead}}$$