L1-2)

SAD

$D_f = 120\ cGy$

$d = 12\ cm$

Renormalizando o TPR p/ TMR

1,5cm: 1,291 — 1,0

12cm: 0,927 — x

$x = 0,718$

$$MU = \frac{120}{0,997 \times 0,718} = 167,6 \Rightarrow \boxed{168\ MU}$$

2 jeitos de resolver: renormalizando o TPR ou corrigindo a taxa de dose de referência de dmax para do.

Usando $d_o = 10cm$

$$D_o' = \frac{0,997}{1,291} = 0,772\ cGy/MU$$

$TPR = 0,927$

$$MU = \frac{120}{0,772 \times 0,927} = \boxed{168\ MU}$$

L1-3)

$d = 15\ cm \rightarrow r = 10,3cm \rightarrow \begin{cases} TPR(15, 10,3 \times 10,3) = 0,823 \\ \Rightarrow TMR = 0,637 \end{cases}$

$d = 18\ cm \rightarrow r = 10,6cm \rightarrow \begin{cases} TPR(18, 10.6 \times 10.6) = 0,729 \\ \Rightarrow TMR = 0,565 \end{cases}$

→ Dose máxima no OAR: $$168 = \frac{D}{0,997 \times 0,637 \times \left(\frac{98,5+1,5}{103}\right)^2} = \boxed{100,6\ cGy}$$

Dose mínima no OAR: $$168 = \frac{D}{0,997 \times 0,565 \times \left(\frac{98,5+1,5}{106}\right)^2} = \boxed{84,2\ cGy}$$

Resolvendo com $d_o = 10cm$:

$D_o' = 0,772\ cGy/MU$

$TPR(15, 10.3) = 0,823$

$$168 = \frac{D}{0,772 \times 0,823 \times \left(\frac{90+10}{100+3}\right)^2} = \boxed{100,6\ cGy}$$

$TPR(18, 10.6) = 0,729$

$$168 = \frac{D}{0,772 \times 0,729 \times \left(\frac{90+10}{106}\right)^2} = \boxed{84,1\ cGy}$$

L1_4)

$d = 8\,cm$

$D = 82\,cGy$

$D_{dm} = ?$

1,5 cm: 150,1% — x

8 cm: 110,9% — 82 cGy

$\Rightarrow \boxed{x = 110,9\,cGy}$

L1_5) $d = 10\,cm$

$D_{10} = ?$

110,9% — 82 cGy

100% — x

$\boxed{x = 73,9\,cGy}$

L1_7)

$d = 8\,cm \rightarrow D_8 = ?$

$SSD = 90\,cm$

Renormalizando para dmax

1,5 cm: 150,1% — 100%

8 cm: 110,9% — x

x = 73,9% em SSD = 100 cm

Para calcular PDP em SSD = 90 cm, usa-se Fator de Mayneord:

$$F = \left(\frac{f_2 + d_m}{f_1 + d_m}\right)^2 \cdot \left(\frac{f_1 + d}{f_2 + d}\right)^2 = \left(\frac{90 + 1,5}{100 + 1,5}\right)^2 \cdot \left(\frac{100 + 8}{90 + 8}\right)^2 = 0,98$$

$\Rightarrow PDP\,(8,10 \times 10,90) = 73,9\% \times 0,98 = 72,4\%$

Para 1 MU:

$$1 = \frac{D}{0,997 \times 72,4 \times \left(\frac{100 + 1,5}{90 + 1,5}\right)^2} \Rightarrow \boxed{D = 88,8\,cGy/MU}$$

L1_8)

$$\dot{D}_{Ref\ em\ SAD} = \dot{D}_{Ref\ em\ SSD} \cdot \left[\frac{100 + d_{max}}{100}\right]$$

L2_1) $C = 13 \times 9\ cm^2 \simeq \frac{4 \times (13 \times 9)}{(26 + 18)} = 10{,}6 \Rightarrow C_{eq} = 10{,}6 \times 10{,}6\ cm^2 \Rightarrow F_c = 1{,}003$

$DLL = 32\ cm \Rightarrow d = 16\ cm \Rightarrow PDP = 55{,}6\%$

$D = 100\ cGy/campo$

$$UM = \frac{100 \times 100\%}{0{,}993 \times 1{,}003 \times 55{,}6\%} = \boxed{181\ UM}$$

L1_2)

$C = 8 \times 10\ cm^2 = 8{,}9 \times 8{,}9\ cm^2 \Rightarrow F_c = 0{,}991$

$DLL = 32\ cm$ → $d_1 = 5{,}5\ cm \Rightarrow PDP = 89{,}8\%$

$DLL = 32\ cm$ → $d_2 = 26{,}5\ cm \Rightarrow PDP = 32{,}7\%$

$D = 100\ cGy/campo$

$$UM_1 = \frac{100 \times 100\%}{0{,}993 \times 0{,}991 \times 89{,}8\%} = \boxed{113\ UM}$$

$$UM_2 = \frac{100 \times 100\%}{0{,}993 \times 0{,}991 \times 32{,}7\%} = \boxed{331\ UM}$$

L2_3)

$C_1 = C_2 = 10 \times 14\,cm^2 \simeq 11{,}7 \times 11{,}7\,cm^2 \Rightarrow F_c = 1{,}009$

$C_3 = 12 \times 14\,cm^2$ com blindagem $\Rightarrow C_{eq} = \dfrac{4\,(168-40)}{[(6{,}4\times4)+2\times(4\times2)]} = 12{,}3 \times 12{,}3\,cm^2 \Rightarrow F_c = 1{,}012$

$DL = 32\,cm \Rightarrow d_1 = d_2 = 16\,cm \Rightarrow PDP = 55{,}9\%$

$DAP = 28\,cm \Rightarrow d_3 = 14\,cm \Rightarrow PDP = 61{,}5\%$

$D = 60\,cGy$/campo

$$UM_{1e2} = \frac{60 \times 100\%}{0{,}993 \times 1{,}009 \times 55{,}9\%} = \boxed{107\ UM}$$

$$UM_3 = \frac{60 \times 100\%}{0{,}993 \times 1{,}012 \times 61{,}5\%} = \boxed{97\ UM}$$

L2_4)

$C_1 = C_2 \simeq 11{,}7 \times 11{,}7\,cm^2 \Rightarrow F_c = 1{,}009$

$C_3 = 12 \times 14\,cm^2$ c/ blindagem $\Rightarrow C_{eq} \simeq 12{,}3 \times 12{,}3\,cm^2 \Rightarrow F_c = 1{,}012$

$d_1 = d_2 = 16\,cm \Rightarrow PDP = 55{,}9\%$

$d_3 = 14\,cm \Rightarrow PDP = 61{,}5\%$

$D_{1e2} = 60\,cGy$

$D_3 = 30\,cGy$

$$UM_{1e2} = \frac{60 \times 100\%}{0{,}993 \times 1{,}009 \times 55{,}9\%} = \boxed{107\ UM}$$

$$UM_3 = \frac{30 \times 100\%}{0{,}993 \times 1{,}012 \times 61{,}5\%} = \boxed{49\ UM}$$

L2_3)

$C_1 = C_2 = 12 \times 15\ cm^2 \simeq 13,3 \times 13,3\ cm^2 \Rightarrow F_c = 1,015$

$C_3 = C_4 = 15 \times 15\ cm^2$ c/ blind $\Rightarrow C_{eq} = \dfrac{4.(225-10-22,5)}{(15+7,5+9,6+5+6,4+10)} = 14,4 \times 14,4\ cm^2 \Rightarrow F_c = 1,019$

$DLL = 42\,cm \Rightarrow d_1 = d_2 = 21\,cm \Rightarrow PDP = 44,5\,\%$

$DAP = 30\,cm \Rightarrow d_3 = d_4 = 15\,cm \Rightarrow PDP = 59,4\,\%$

$D = 50\,cGy/compo$

$$UM_{1\&2} = \frac{50 \times 100\,\%}{9993 \times 1,015 \times 44,5\,\%} = \boxed{112\ UM}$$

$$UM_{3\&4} = \frac{50 \times 100\,\%}{9993 \times 1,019 \times 59,4} = \boxed{83\ UM}$$

L3_1)

$d = 0,6\,cm \longrightarrow$ faisceau d'électrons 3 MeV

$C = 6 \times 4\ cm^2 \Rightarrow F_c = \sqrt{F_c(6\times6) \cdot F_c(4\times4)} = \sqrt{0,96 \times 0,94} = 0,95$

$$UM = \frac{100 \times 100\,\%}{1 \times 0,95 \times 85\,\%} = \boxed{124\ UM}$$

L3_2) $d = 3\,cm \longrightarrow e^-$ 11 MeV

$C = 12 \times 12\ cm^2 \Rightarrow F_c = 1,008$

$$UM = \frac{120 \times 100\,\%}{1 \times 1,008 \times 85\,\%} = \boxed{140\ UM}$$

L3_3)

$d = 1\,cm \longrightarrow$ Rx $120\,kV_p$

$C = 8 \times 13\,cm^2 \simeq \sqrt{8 \times 13}^2 = 10{,}2 \times 10{,}2\,cm^2 \Rightarrow FRD = 1{,}316$

$$t = \frac{100}{63{,}52 \times 1{,}316} = 1{,}20\,min \Rightarrow \boxed{1\,min\ 12\,s}$$

L3_4)

$d = 2\,cm \rightarrow e^- 7\,MeV$

$C = 6 \times 6\,cm^2 \Rightarrow F_c = 1{,}005$

$$UM = \frac{120 \times 100\,\%}{1 \times 1{,}005 \times 85\,\%} = \boxed{141\,UM}$$

L3_5)

$d = 3\,cm \longrightarrow e^- 11\,MeV$

$C = 12 \times 8\,cm^2 \Rightarrow F_c = \sqrt{1{,}005 \times 0{,}96} = 0{,}982$

$SSD = 105\,cm$

$SSD_{ef} = 87{,}3\,cm$

$$UM = \frac{100 \times 100\,\%}{1 \times 0{,}982 \times 85\,\% \left(\frac{87{,}3 + 2{,}4}{87{,}3 + 2{,}4 + 5}\right)^2} = \boxed{134\,MU}$$