

# ZADAC 1 AKU PROSTORA

1.

$$2 \times 4 \times 5$$

$$T_{60}$$

$$V = 60 \text{ m}^3$$

$$T = 4 \text{ s}$$

$$A = 2$$

$$T = 0,161 \cdot \frac{V}{A}$$

$$\Rightarrow A = 2,415$$

$$T_{0dB} = 20 \log \frac{P}{P_0}$$

$$P = 0,0632 \text{ W}$$

$$T_{max} = \sqrt{\frac{4 \cdot T \cdot S \cdot C}{A}}$$

$$P = \frac{4 \cdot T_{max}^2}{6 \cdot S \cdot C} = 5,82 \mu\text{W}$$

2.

$$4 \times 5 \times 8 \Rightarrow V = 160 \text{ m}^3$$

$$a) L = \frac{4V}{S_{nk}}$$

$$S = 2(4 \cdot 5) + 2(4 \cdot 8) + 2(5 \cdot 8) = 184 \text{ m}^2$$

$$L = 3,48 \text{ m}$$

b)

$$n = \frac{c}{L} = 32,6 = 33 \text{ reflekcija/sec}$$

c)

$$\bar{L} = 0,6 \quad D = - \frac{1,02 \cdot S \cdot \ln(1 - \bar{L})}{V} = 330 \text{ dB/s}$$

d)

$$T = 0,161 \cdot \frac{V}{S \cdot \ln(1 - \bar{L})} = 0,153 \text{ s}$$

3.

$$V = 25 \cdot 12 \cdot 6 = 1800 \text{ m}^3$$

$$f_c = 2000 \sqrt{\frac{I}{V}} = 57,73 \text{ Hz}$$

$$4) f_{xy,z} = \frac{c}{2} \sqrt{\left(\frac{n_x}{L_x}\right)^2 + \left(\frac{n_y}{L_y}\right)^2 + \left(\frac{n_z}{L_z}\right)^2}$$

in case 2a

1,0,0

0,1,0

0,0,1

$$f_{1,0,0} = \frac{300}{2} \sqrt{\left(\frac{1}{25}\right)^2} = 6,2 \text{ Hz}$$

$$f_{0,1,0} = 28,58 \text{ Hz}$$

$$f_{0,0,1} = 14,29 \text{ Hz}$$

5) slits 4.

6)

$$S = 400 \text{ m}^2 \quad \bar{I} = 0,2$$

$$R = \frac{S \cdot \bar{I}}{1 - \bar{I}} = 100 \text{ m}^2$$

$$\bar{I} = 0,8 \quad R = 1600 \text{ m}^2$$

7)

$$V = 86 \text{ m}^2$$

$$P = 10 \mu\text{W}$$

$$I = \frac{P}{A} \left( 1 - e^{-\frac{A \cdot c}{4 \cdot V} \cdot t} \right)$$

$$A = 10 \text{ solid}$$

$$t = 0,2 \text{ s}$$

$$a) I = \frac{10 \cdot 10^{-6}}{10} \left( 1 - e^{-\frac{10 \cdot 343 \cdot 0,2}{4 \cdot 86}} \right) = 86,5 \cdot 10^{-8} \text{ W/m}^2$$

$$= 10 \log \frac{I}{I_0} = 53,4 \text{ dB}$$

$$b) I_{\text{max}} = \frac{P}{A} = \frac{10 \cdot 10^{-6}}{10} = 10^{-6} \text{ W/m}^2$$

$$8) 5 \times 6 \times 8 \text{ m} \quad \bar{I} = 0,04 \quad P = 1 \mu\text{W}$$

$$P^2(t) = \frac{4 \cdot P \cdot S \cdot c}{A} \left( 1 - e^{-\frac{A \cdot c \cdot t}{4 \cdot V}} \right)$$

$$P_{\text{max}} = \sqrt{\frac{4 \cdot P \cdot S \cdot c}{A}}$$



$$A = 2 \cdot 25 = 0,04 [2(5 \cdot 6) + 2(5 \cdot 8) + 2(6 \cdot 8)] = 3,44 \text{ sabina}$$

$$p_{\text{max}} = 0,013 \text{ Pa}$$

$$\text{SPL}_{\text{max}} = 20 \log \frac{p_{\text{max}}}{p_0} = 56,44 \text{ dB}$$

b)

$$A = A_1 + A_2 = 3,44 + 3,44 = 6,88 \text{ Sab, -a}$$

$$p_{\text{max}} = 0,00339 \text{ Pa}$$

$$\text{SPL}_{\text{max}} = 53,44 \text{ dB}$$

9)

$$4 \times 6 \times 10 \text{ m} \quad T = 1,5 \text{ s}$$

a)

$$A = 0,161 \cdot \frac{V}{T} = 25,8 \text{ Sab, inas}$$

b)

$$T = 0,161 \cdot \frac{V}{A} \quad A = (25,8 + 40 \cdot 0,5)$$

$$= 0,25 \text{ s}$$

c)

$$P = 10 \text{ W}$$

$$p_{\text{max}} = \sqrt{\frac{4 \cdot P \cdot \rho \cdot c}{A}}$$

$$A_1 = 25,8 \rightarrow p_1 = 0,0254 \text{ Pa}$$

$$\text{SPL}_1 = 62,12 \text{ dB}$$

$$A_2 = 40,8 \text{ Sabina} \rightarrow p_2 = 0,0167 \text{ Pa}$$

$$\text{SPL}_2 = 58,46 \text{ dB}$$

10)

$$2 \times 5 \times 7 \text{ m}$$

$$T_1 = 5 \text{ s}$$

$$T_2 = 1 \text{ s}$$

$$V = 105 \text{ m}^3$$

$$S = 2 \cdot 5 \cdot 5 + 2 \cdot 5 \cdot 7 + 2 \cdot 5 \cdot 7$$

$$T = 0,161 \frac{V}{A} \quad A \cdot \bar{I} \cdot S$$

$$\bar{I}_1 = 0,161 \cdot \frac{V}{T_1 \cdot S} = 0,023$$

$$S_1 + S_2 = 142 \text{ m}^2$$

$$T_2 = 0,161 \cdot \frac{V}{S_1 \cdot \bar{I}_1 + S_2 \cdot \bar{I}_2}$$

$$S_1 = 142 - S_2$$

$$S_1 = 107 \text{ m}^2$$

$$T_2 (107 \cdot \bar{I}_1 + 35 \cdot \bar{I}_2) = 0,161 V$$

11)  $V = 1600 \text{ m}^3 \quad A_1 = 80 \text{ sabitua} \quad T_2 = 1,2 \text{ s}$

$$T = 0,161 \frac{V}{A} = 3,72 \text{ s}$$

$$A_2 = 0,161 \frac{V}{T} \Rightarrow A_2 = 216 \text{ sabitua}$$

$$A = A_2 - A_1 = 216 - 80 = 136 \text{ sabitua}$$

12)  $10 \text{ sabitua} \quad p = 10 \mu\text{W} \quad p \text{ sabitua} \quad A = 0,975 \text{ sabitua}$

$$p_{\text{ref}} = \sqrt{\frac{p \cdot S \cdot c \cdot \rho}{A}} = 0,411 \text{ Pa} \quad 10 \cdot 10 \mu\text{W}$$

$$SPL_{\text{ref}} = 86,4 \text{ dB} \quad \text{same } 10 \mu\text{W}$$

$$p_{\text{dir}} = \sqrt{\frac{p \cdot S \cdot c}{4\pi r^2}} = 0,061 \text{ Pa}$$

$$SPL_{\text{dir}} = 69,6 \text{ dB}$$

$$r = 0,3 \text{ m}$$

13)  $V = 324 \text{ m}^3 \quad S_1 = 122 \text{ m}^2 \quad \bar{I}_1 = 0,03 \quad S_2 = 98 \text{ m}^2 \quad \bar{I}_2 = 0,8 \quad \bar{I}_3 = 0,06$

$$A = \bar{I}_1 S_1 + \bar{I}_2 S_2 + \bar{I}_3 S_3 = 88 \text{ sabitua}$$

$$T = \frac{0,161 V}{A} = 0,6 \text{ s}$$



14.

$$R = 10 \log \frac{1}{\tau}$$

$$20 = 10 \log \frac{1}{\tau_{vrata}}$$

$$\tau_{vrata} = 0,01$$

$$30 = 10 \log \frac{1}{\tau_{zid}}$$

$$\tau_{zid} = 0,001$$

$$TL = 10 \log \left( \frac{\Sigma S}{\Sigma S_r} \right) = 10 \log \frac{4 \cdot 7}{(2,5 \cdot 1) \tau_{vrata} + (4 \cdot 7 - 2,5) \cdot \tau_{zid}} = 27,47 \text{ dB}$$

15.

$$R = 40 \quad \tau_{zid} = 0,0001$$

$$R = 30 \quad \tau_{vrat} = 0,001$$

$$TL = 10 \log \frac{100}{2,5 \tau_{vrat} + (100 - 2,5) \tau_{zid}} = 39,1 \text{ dB}$$

$$75 - TL = 35,9 \text{ dB}$$

otvoren

$$TL = 10 \log \frac{100}{2,5 + (100 - 2,5) \tau_{zid}} = TL = 16,5 \text{ dB}$$

$\tau$  za otvorenu površinu, id

$$\tau = 1$$

$$75 - 16,5 \text{ dB} = 58,5 \text{ dB}$$

16.

$$A_2 = 50 \text{ m}^2 \text{ sabin}$$

$$A_1 = 15$$

$$= 65 \text{ sabin}$$

$$I_1 = \frac{P}{A_1}$$

$$I_2 = \frac{P}{A_2} = \frac{I_1 A_1}{A_2}$$

$$IL_1 = 70 \text{ dB} = 10 \log \frac{I_1}{I_0}$$

$$I_1 = I_0 \cdot 10^7$$

$$IL_2 = 10 \log \frac{10^7 \cdot A_1}{A_2} = 10 \cdot 7 + 10 \log \frac{A_1}{A_2}$$

$$IL_2 = 70 + 10 \log \frac{15}{65} = 63,63 \text{ dB}$$