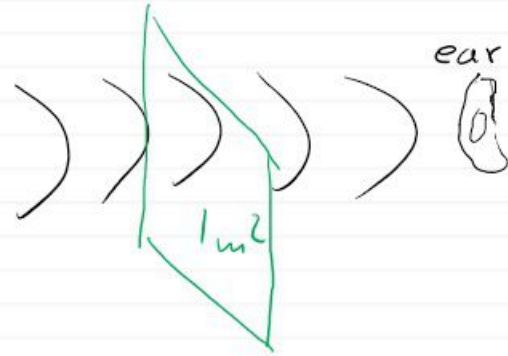


Ένταση Ηχού

Ένταση $I = \frac{P}{A} \frac{W}{m^2}$



Εύρος ανθρώπινου αυτί
 $f = 20 \text{ Hz} - 20 \text{ kHz}$

$I_{\text{min}} = 10^{-12} \text{ W/m}^2$
 $I_{\text{op.}} = 1 \text{ W/m}^2$

$P = 1 \text{ W} \rightarrow$

3 X Ένταση Γερμανίας

Value	Logarithmic Form	Log	Value
$0,0000000000001 \text{ W}$	10^{-12}	\log	-12
$0,00001$	10^{-5}	\log	-5
$0,001$	10^{-3}	\rightarrow	-3
1	10^0	\rightarrow	0
10000	10^4	\rightarrow	4
1000	10^3	\rightarrow	3

Αλγόριθμος log

$10^3 = 1000$

$\log_{10}(x) = y \sim 10^y = x$

$\log_{10}(1000) = 3$
 $10^3 = 1000$

$\log_2(4) = 2 \quad 2^2 = 4$

$\log(10^{-12}) = -12$

$\log(10^{-5}) = -5$

BEL

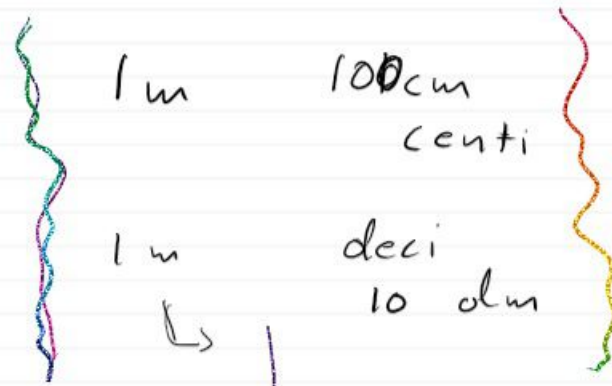
$$\log(10^{-5}) = -5$$

Ratio \rightarrow $\frac{P_s}{P_N} \frac{\lambda_1}{\lambda_2} = 5$
(ratio)

$$10^{-12} \text{ W/m}^2 = I_0 \quad I_1 / I_0 =$$

$$\log\left(\frac{I_1}{I_0}\right) \rightsquigarrow 1 \text{ Bel}$$

↓
↓
deciBel
(10) dB



DeciBel \rightarrow
dB

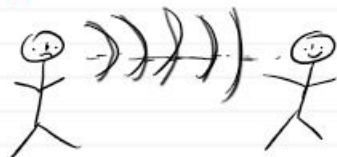
$$10 \cdot \log\left(\frac{I_1}{I_0}\right) \text{ dB}$$

Άσκηση 1

$$I_0 = 10^{-12} \text{ W/m}^2$$

↳ κατώφλι ακοής
min I

a) $I = 10^{-5} \text{ W/m}^2 \rightsquigarrow \text{dB}$



B) $I_0 \stackrel{?}{=} \text{dB}$

a) $10 \cdot \log \left(\frac{10^{-5} \text{ W/m}^2}{10^{-12} \text{ W/m}^2} \right) = 10 \cdot \log (10^7) = \underline{\underline{70 \text{ dB}}}$

B) $10 \cdot \log \left(\frac{10^{-12}}{10^{-12}} \right) = 10 \cdot \log (1) \rightsquigarrow \underline{\underline{0 \text{ dB}}}$

Aufgabe 2

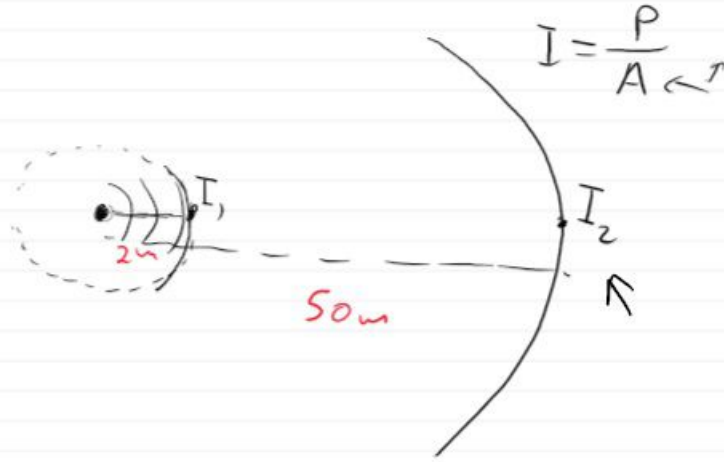
$$I_1 = 2 \text{ W/m}^2 \rightarrow 2 \text{ m}$$

a) dB ;

b) I_2 ; 50 m

γ) I_2 dB ;

$$I_0 = 10^{-12} \text{ W/m}^2$$



$$a) I_{1, \text{dB}} = 10 \cdot \log\left(\frac{2}{10^{-12}}\right) = 10 \cdot \log(2 \cdot 10^{12}) = 123 \text{ dB}$$

$$b) \frac{I_1}{I_2} = \frac{\frac{P}{A_1}}{\frac{P}{A_2}} \Rightarrow \frac{I_1}{I_2} = \frac{A_2}{A_1}$$

$$V = \frac{4}{3} \pi r^3$$

$$A = 4 \pi r^2$$

$$\frac{I_1}{I_2} = \frac{4 \pi r_2^2}{4 \pi r_1^2} = \frac{r_2^2}{r_1^2} \Rightarrow$$

$$\Rightarrow I_2 = \frac{I_1 \cdot r_1^2}{r_2^2} = \frac{2 \frac{\text{W}}{\text{m}^2} \cdot 2^2 \text{ m}^2}{50^2 \text{ m}^2} = \frac{8}{2500} \text{ W/m}^2$$

$$\Rightarrow I_2 = 3,2 \cdot 10^{-3} \text{ W/m}^2$$

$$\gamma) 10 \cdot \log \frac{I_2}{I_0} = 10 \cdot \log \frac{3,2 \cdot 10^{-3}}{10^{-12}} =$$

$$= 10 \cdot \log 3,2 \cdot 10^9 = 95 \text{ dB}$$

Επιδείξεις Κυμαίων

$$y_1, y_2 \rightsquigarrow y = y_1 + y_2 \begin{cases} \text{Στάσιμο} \\ \text{Συμβολή} \end{cases}$$



$$(kx - \omega t + \varphi)$$

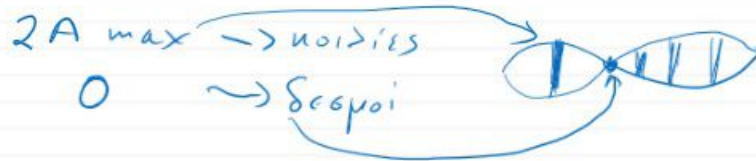
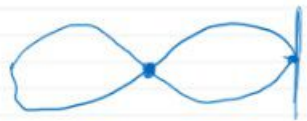
Στάσιμο Κύμα

$$\begin{cases} y_1 = A \sin(kx - \omega t) \\ y_2 = A \sin(kx + \omega t) \end{cases}$$

$$y = y_1 + y_2 \Rightarrow y = 2A \sin(kx) \cdot \cos(\omega t)$$

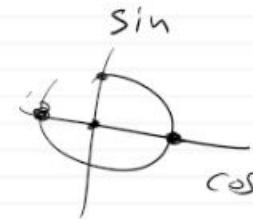
↑ ηλίκος

→ Ταλαντώση



Συμβολή

$$\begin{cases} y_1 = A \sin(kx - \omega t) \\ y_2 = A \sin(kx - \omega t + \varphi) \end{cases} \Rightarrow y = \underline{2A \cos(\varphi/2)} \cdot \underline{\sin(kx - \omega t + \varphi/2)}$$



Ενίσχυση

Καταστροφή

$$\varphi = 2n\pi, n = 0, 1, 2, \dots$$

$$\varphi = (2n+1)\pi, n = 0, 1, 2, \dots$$