Course 12
Friday, October 11, 2019 12:00PM

I Acoustics

0. The sound parameters

0.1. The sound level

$I_0 = 10^{-12}\ \frac{W}{m^2} \in I \in 10^{12}\ \frac{W}{m^2}$ ⟶ the value of audibility limit

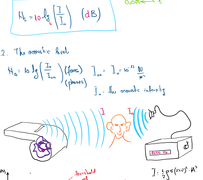
$$\boxed{L_I = 10 \lg\left(\frac{I}{I_0}\right)\ (dB)}$$

decibel

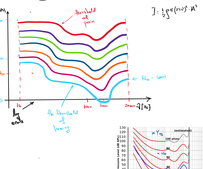
0.2. The acoustic level

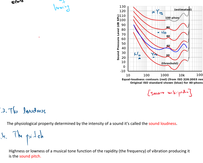
$L_p = 10 \lg\left(\frac{p}{p_0}\right)(dB)$ $\quad p_0 = 2 \cdot 10^{-5}\ \frac{N}{m^2}$

I. The acoustic intensity



$I = \frac{1}{2}\rho v (\omega p)^2$





0.3. The loudness

The physiological property determined by the intensity of a sound it's called the sound loudness.

0.4. The pitch

Highness or lowness of a musical tone function of the rapidity (the frequency) of vibration producing it is the sound pitch.

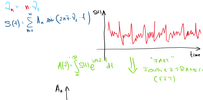
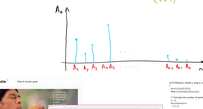
0.5. The timbre

The special composition of the sound represents the timbre of the sound

$S(t) = A_1 \sin(2\pi f_1 t) + A_2 \sin(2\pi f_2 t) + A_3 \sin(2\pi f_3 t) + \dots$

$f_1 = f_0$

$f_2 = 2f_0$

$S(t) = \sum_{n=1}^{\infty} A_n \sin(2\pi f_n t)$

$A(f) = \int_{-\infty}^{\infty} S(t) e^{-2\pi i f t}\, dt$ ⟹ "FAST FOURIER TRANSFORM (FFT)"