

Po 204 - Onde sonore dans l'air et dans l'eau

$$1. \quad I = \langle \vec{p} \cdot \vec{v} \rangle = \langle p_1 v_1 \rangle = \langle \rho_0 c v_1^2 \rangle = \frac{1}{\rho_0 c} \langle p^2 \rangle = \frac{1}{2 \rho_0 c} p_{1m}^2 = I$$

$$c = \sqrt{\frac{1}{\rho_0 \chi_s}} \rightarrow I = \frac{1}{2} \sqrt{\frac{\chi_s}{\rho_0}} \cdot p_{1m}^2 \quad p_{1m} = \sqrt{\frac{2 \rho_0 \chi_s I}{\chi_s}}$$

$$\frac{I_{\text{eau}}}{I_{\text{air}}} = 1 = \sqrt{\frac{\chi_{s,\text{eau}}}{\chi_{s,\text{air}}}} \cdot \frac{\rho_{0,\text{air}}}{\rho_{0,\text{eau}}} \left( \frac{p_{1m,\text{eau}}}{p_{1m,\text{air}}} \right)^2 \rightarrow \frac{p_{1m,\text{eau}}}{p_{1m,\text{air}}} = \left( \frac{\chi_{s,\text{air}} \cdot \rho_{0,\text{eau}}}{\chi_{s,\text{eau}} \cdot \rho_{0,\text{air}}} \right)^{1/4}$$

$$2. \quad \frac{p_{1m,\text{eau}}}{p_{1m,\text{air}}} = 1 = \frac{I_{\text{eau}}}{I_{\text{air}}} \cdot \sqrt{\frac{\chi_{s,\text{eau}}}{\chi_{s,\text{air}}}} \cdot \frac{\rho_{0,\text{air}}}{\rho_{0,\text{eau}}} \Rightarrow \frac{I_{\text{eau}}}{I_{\text{air}}} = \left( \frac{\chi_{s,\text{air}} \cdot \rho_{0,\text{eau}}}{\chi_{s,\text{eau}} \cdot \rho_{0,\text{air}}} \right)^{1/2}$$

$$\frac{p_{1m,\text{eau}}}{p_{1m,\text{air}}} = 68$$

$$\frac{I_{\text{eau}}}{I_{\text{air}}} = 4,6 \cdot 10^3$$

$$\frac{I_{\text{d'eau}}}{I_{\text{d'air}}} = 37 \text{ dB.}$$



Fénélon Sainte-Marie  
La Plaine Monceau

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