

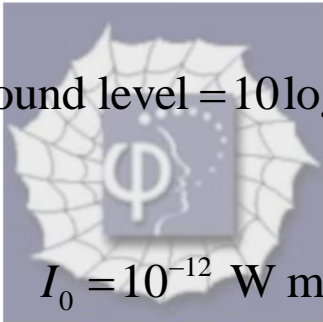
145.

Problem 20.27 (RHK)

Suppose that a rustling leaf generates 8.4 dB of sound. We have to find the sound level from a tree with 2.71×10^5 rustling leaves.

Solution:

Decibel definition of sound level is


$$\text{sound level} = 10 \log \frac{I}{I_0},$$

where

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

Sound level 8.4 dB corresponds to intensity I_1 ,

$$8.4 = 10 \log \frac{I_1}{I_0}.$$

Sound level due to 2.71×10^5 rustling leaves will be

$$\begin{aligned} SL &= 10 \log \left(\frac{2.71 \times 10^5 I_1}{I_0} \right) = 10 \left(\log(2.71 \times 10^5) + \log \frac{I_1}{I_0} \right), \\ &= 10(0.433 + 5) + 8.4, \\ &= 63 \text{ dB}. \end{aligned}$$

