Answer on Question 70517, Physics, Other

Question:

The intensity of a particular sound at a distance of 10 m from the source is $9.0 \cdot 10^{-5} W/m^2$. What is the intensity of the same sound if you are 30 m away from the source?

Solution:

As we know, the intensity of the sound obeys the inverse square law (it decreases inversely proportional to the squared distance):

$$I \propto \frac{1}{d^2}.$$

Then, we can express the intensity of the sound wave at reference distance d_2 from the source in terms of the intensity of the sound wave at reference distance d_1 from the source:

$$\frac{I_2}{I_1} = \left(\frac{d_1}{d_2}\right)^2$$
$$I_2 = I_1 \cdot \left(\frac{d_1}{d_2}\right)^2,$$
$$I_2 = I_1 \cdot \left(\frac{10 \ m}{30 \ m}\right)^2 = I_1 \cdot \left(\frac{1}{3}\right)^2 = \frac{1}{9} \cdot I_1$$

Finally, we get:

$$I_2 = \frac{1}{9} \cdot I_1 = \frac{1}{9} \cdot 9.0 \cdot 10^{-5} \ W/m^2 = 1.0 \cdot 10^{-5} \ \frac{W}{m^2}.$$

Answer:

$$I_2 = 1.0 \cdot 10^{-5} \ \frac{W}{m^2}.$$

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