

Answer on Question #69406 -Physics / Other

The intensity of sound at $r_1 = 1$ m from a blast is $I_1 = 9 \times 10^{-6}$ Wm⁻². The threshold of human hearing is $I_2 = 10^{-12}$ Wm⁻². If sound waves are assumed to spread out evenly in all directions, Calculate the distance r_2 from the source at which this sound can be heard.

Solution

In terms of the inverse square law the value of the sound intensity increases inversely squared.

$$I \sim \frac{1}{r^2}$$

Thus

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

Finally

$$r_2 = r_1 \sqrt{\frac{I_1}{I_2}} = 1 \times \sqrt{\frac{9 \times 10^{-6}}{10^{-12}}} = 3 \times 10^3 \text{ m} = 3 \text{ km.}$$

Answers: $r_2 = 3$ km.

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