Answer on Question 50580, Physics, Other

Question:

Bats chirp at high frequencies that humans cannot hear. They use echos to detect small object, such as insects as small as one wavelength. If a bat emits a chirp at a frequency of $60.0\ kHz$ and the speed of the sound waves in the air is $340\ \frac{m}{s}$ what is the size of the millimeters of the smallest insect the bat can detect?

Solution:

We can find the size of the millimeters of the smallest insect the bat can detect from the wave speed formula:

$$v = f\lambda,$$

where, v is the speed of the sound waves in the air, f is the frequency and λ is the wavelength.

So, we can obtain:

$$\lambda = \frac{v}{f} = \frac{340\,\frac{m}{s}}{60 \cdot 10^3 Hz} = 0.0057m = 5.7mm.$$

Answer:

The size of the millimeters of the smallest insect the bat can detect is $5.7mm$.