

Answer on Question #50215, Physics, Other

A locomotive approach a crossing at a speed 20 m/s sound a whistle of frequency 640 Hz when 1 km from the crossing. There is no wind and the speed of sound in air 330 m/s. What frequency is heard by an observer 1.732 km on the straight road from the crossing at right angle...

Solution:

Given, velocity of source $v_x = 20$ m/s.

Velocity of sound $v = 330$ m/s

Velocity of the locomotive in the direction of motion of sound

$$v_x \cos \theta = 20 * \frac{1}{\sqrt{1 + 1.732^2}} = 10 \frac{\text{m}}{\text{s}}$$

Apparent frequency

$$f = \frac{v}{v - v_x \cos \theta} f_0 = \frac{330}{330 - 10} * 640 = 660 \text{ Hz}$$

Answer: 660 Hz.