Answer on Question #50241, Physics, Mechanics | Kinematics | Dynamics

Question:

a train blowing its whistle moves with constant speed on a straight track towards observer and then crossed him.if the ratio of different between actua. and apparent frequency be 3:2 in two cases then the speed of train ...

Answer:

The Doppler effect (or Doppler shift is the change in frequency of a wave for an observer moving relative to its source. In classical physics the relationship between observed frequency f and emitted frequency f_0 is given by:

$$f = \frac{c + v_r}{c + v_s} f_0$$

where *c* is the velocity of waves in the medium;

 v_r is the velocity of the receiver relative to the medium; positive if the receiver is moving towards the source (and negative in the other direction);

 v_s is the velocity of the source relative to the medium; positive if the source is moving away from the receiver (and negative in the other direction).

In this case $v_r = 0$, $v_s = \pm v$.

$$f_1 = \frac{c}{c+v} f_0$$

$$f_2 = \frac{c}{c-v} f_0$$

$$\frac{f_0 - f_1}{f_2 - f_0} = \frac{2}{3}$$

$$\frac{c-v}{c+v} = \frac{2}{3}$$

$$v = \frac{c}{5} = \frac{340}{5} \frac{m}{s} = 68\frac{m}{s}$$

Answer: $68\frac{m}{s}$

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