

Doppler's effect

If there is relative motion between source of sound and observer, then the apparent frequency heard by the observer will be different from the actual frequency of source. This effect is known as Doppler effect.

Doppler effect formula:

Let us define few parameters

f' = Observed frequency; f = Actual frequency

v = Velocity of sound waves; v_o = Velocity of sound waves;

v_s = Velocity of source.

$$f' = \frac{(v \pm v_o)}{(v \mp v_s)} f$$

Case: 1

Source moving towards observer at rest

$$f' = \frac{v}{(v - v_o)} f$$

Case: 2

Source moving away from observer at rest

$$f' = \frac{v}{(v + v_o)} f$$

case: 3

Observer moving towards the stationary source

$$f' = \frac{(v + v_o)}{v} f$$

Case: 4

Observer moving away from the stationary source

$$f' = \frac{(v - v_o)}{v} f$$

Case: 5

Both are moving towards each other

$$f' = \frac{(v + v_o)}{(v - v_s)} f$$

Case: 6

Both are moving away from each other

$$f' = \frac{(v - v_o)}{(v + v_s)} f$$