# Expression for apparent frequency due to Doppler Effect

| Case No. | Position of source and listener | Note | Expression for apparent frequency |
|---|---|---|---|
| 1 | ❖ Both source and listener move<br>❖ They move towards each other | a) Distance between source and listener decreases.<br>b) Apparent frequency is more than actual frequency. | $n' = \left(\frac{v + v_L}{v - v_s}\right) n$ |
| 2 | ❖ Both source and listener move<br>❖ They move away from each other | a) Distance between source and listener increases.<br>b) Apparent frequency is less than actual frequency.<br>c) $v_S$ and $v_L$ become opposite to that in case-1. | $n' = \left(\frac{v - v_L}{v + v_s}\right) n$ |
| 3 | ❖ Both source and listener move<br>❖ They move one behind the other<br>❖ Source follows the listener | a) Apparent frequency depends on the velocities of the source and the listener.<br>b) $v_S$ becomes opposite to that in case-2. | $n' = \left(\frac{v - v_L}{v - v_s}\right) n$ |
| 4 | ❖ Both source and listener move<br>❖ They move one behind the other<br>❖ Listener follows the source | a) Apparent frequency depends on the velocities of the source and the listener.<br>b) $v_S$ and $v_L$ become opposite to that in case-3. | $n' = \left(\frac{v + v_L}{v + v_s}\right) n$ |
| 5 | ❖ Source at rest<br>❖ Listener moves towards the source | a) Distance between source and listener decreases.<br>b) Apparent frequency is more than actual frequency.<br>c) $v_S = 0$ in case-1. | $n' = \left(\frac{v + v_L}{v}\right) n$ |
| 6 | ❖ Source at rest<br>❖ Listener moves away from the source | a) Distance between source and listener increases.<br>b) Apparent frequency is less than actual frequency.<br>c) $v_S = 0$ in case-2. | $n' = \left(\frac{v - v_L}{v}\right) n$ |
| 7 | ❖ Listener at rest<br>❖ Source moves towards the listener | a) Distance between source and listener decreases.<br>b) Apparent frequency is more than actual frequency.<br>c) $v_L = 0$ in case-1. | $n' = \left(\frac{v}{v - v_s}\right) n$ |
| 8 | ❖ Listener at rest<br>❖ Source moves away from the listener | a) Distance between source and listener increases.<br>b) Apparent frequency is less than actual frequency.<br>c) $v_L = 0$ in case-2. | $n' = \left(\frac{v}{v + v_s}\right) n$ |