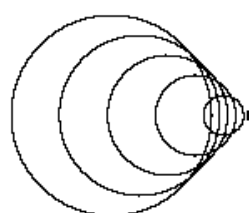
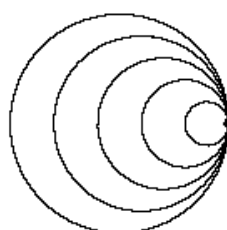
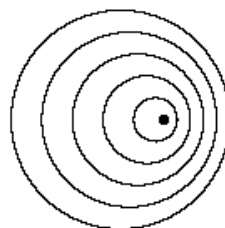
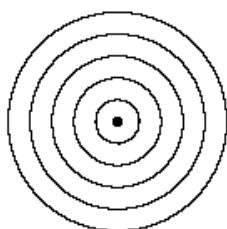


## Doppler Effect:

*Discuss the racetrack sound phenomenon as well as the passing by in a moving car...approaching train.*

The apparent change in frequency when the source is moving. To an observer in front of the moving sound source the frequency seems higher, while behind the source the frequency seems lower.



The equation for the Doppler Effect for Light ..

$$f_2 = f_1 \left( 1 \pm \frac{v_r}{c} \right)$$

$f_1$  - frequency emitted from the source

$f_2$  - frequency observed

$v_r$  - relative velocity between the source and the observer

$c$  - speed of light

*\* Use + when objects are approaching each other*

*Use - when objects are moving away from each other*

Radar Guns

$$v_r = \left( \frac{\Delta f}{2f_1} \right) c$$

Astronomy

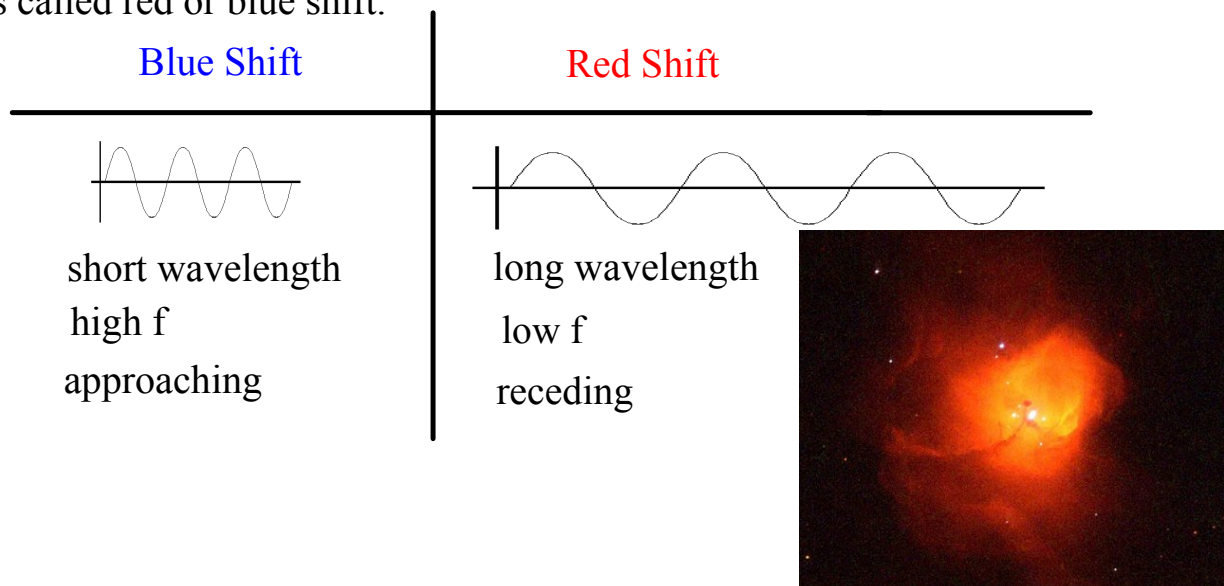
$$v_r = \left( \frac{\Delta \lambda}{\lambda} \right) c$$

Ex.1 A stationary police car aims a radar gun at an oncoming vehicle. If the gun emits  $9.0 \times 10^9$  Hz waves and detects waves 2000 Hz higher, what was the speed of the car?

Ex.2 A wavelength of 500 nm is seen as 530 nm when coming from a distant star.  
What is the speed of the star?

### Red Shift or Blue Shift...?

When a star approaches or moves away from us its light is seen as a slightly different frequency. This change in frequency is seen as a different color. This is called red or blue shift.



All major celestial bodies like galaxies, quasars and nebulae are red shifted so they are moving away from us.



[http://www.youtube.com/watch?v=Y5KaeCZ\\_AaY](http://www.youtube.com/watch?v=Y5KaeCZ_AaY)





## Attachments

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f-18flyby.mpeg

FS14ss.mpeg