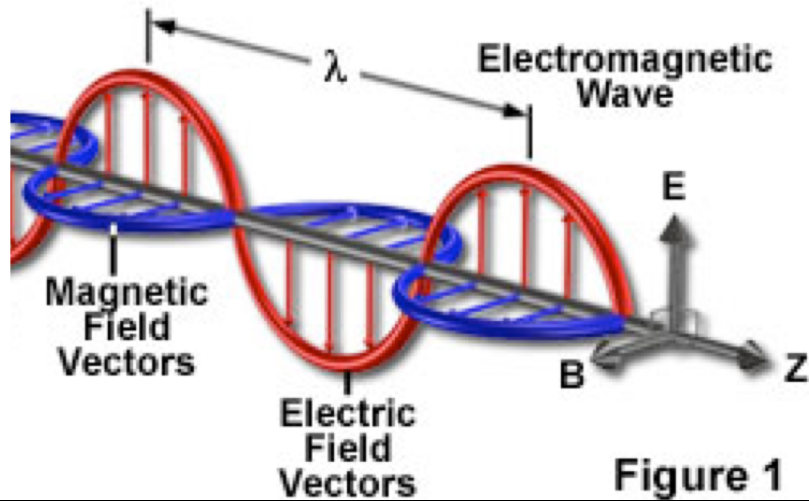
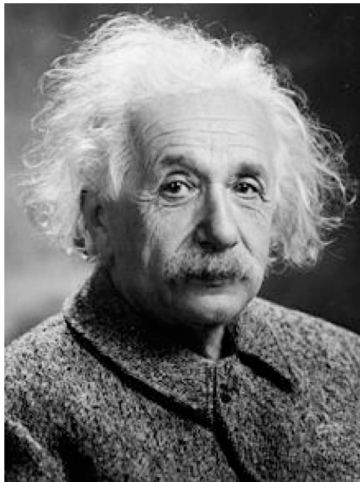
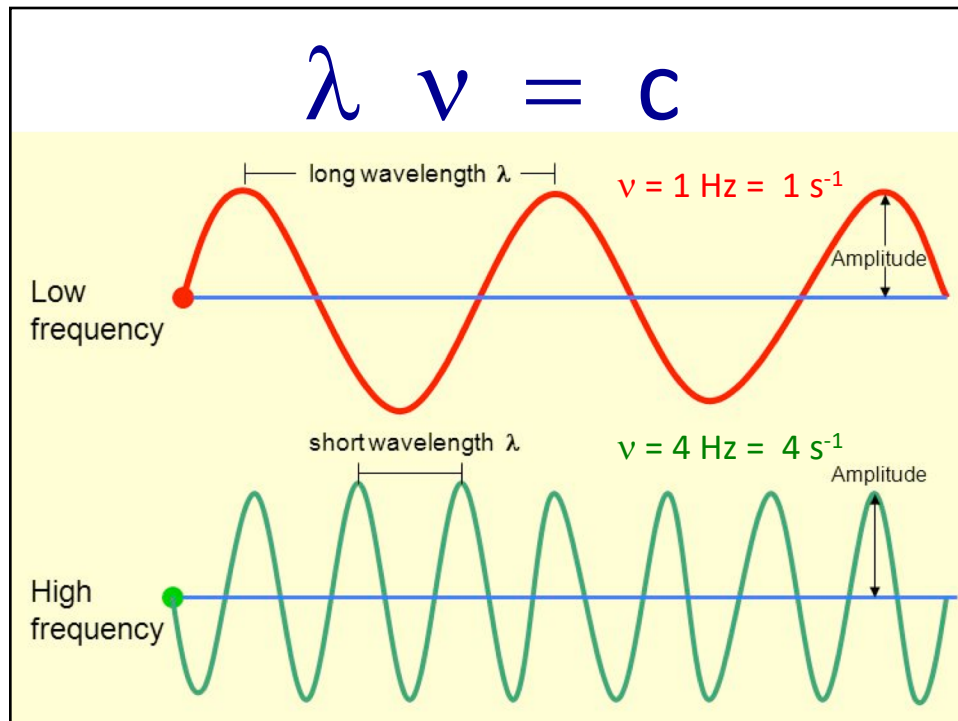


Light is a self-propagating
electromagnetic wave

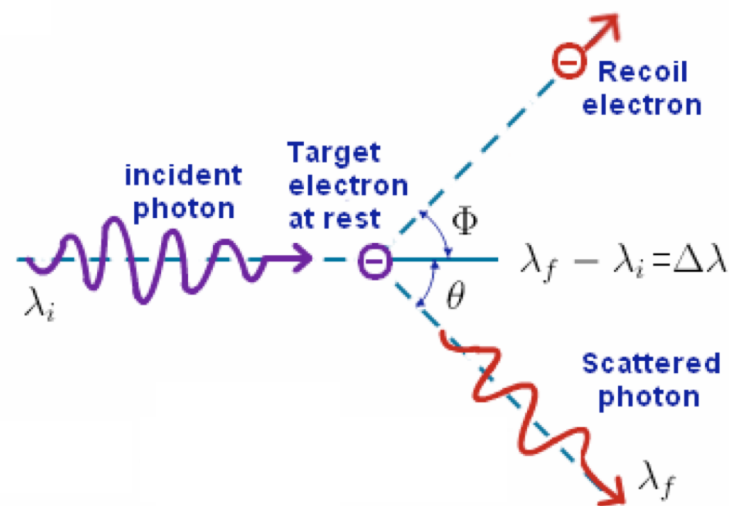


Speed of light is constant in all
reference frames in a vacuum





Photons also have properties of particles (Wave-Particle Duality)



Photon energy proportional to frequency

$$E = h \nu$$

$$\begin{aligned} h &= \text{Planck's constant} = 6.626 \times 10^{-27} \text{ erg s} \\ &= 6.626 \times 10^{-34} \text{ J s} \end{aligned}$$

Useful Conversions

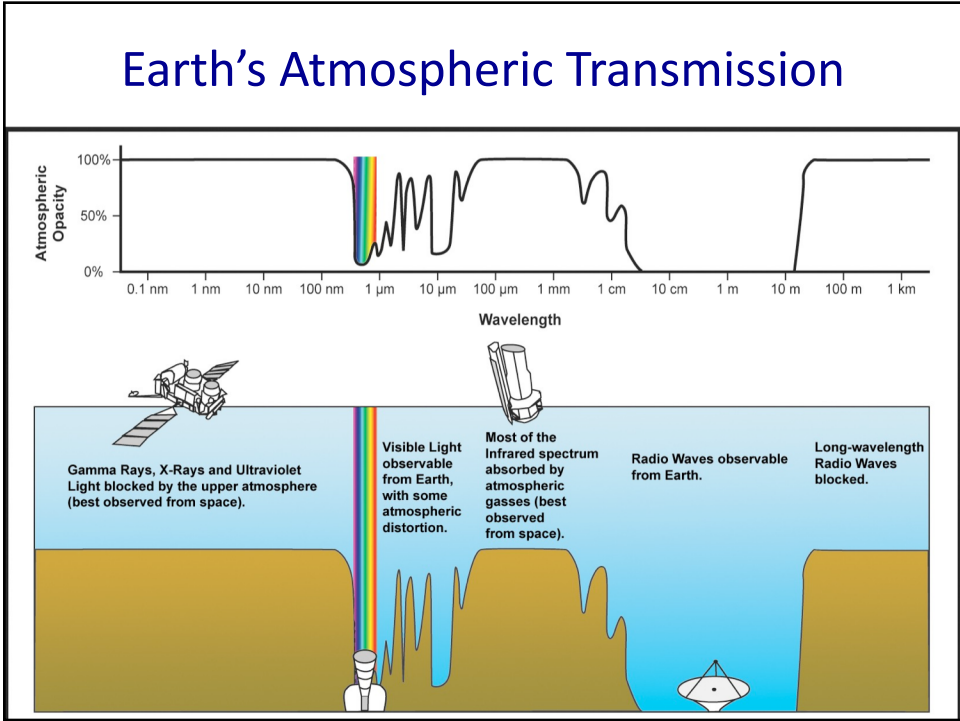
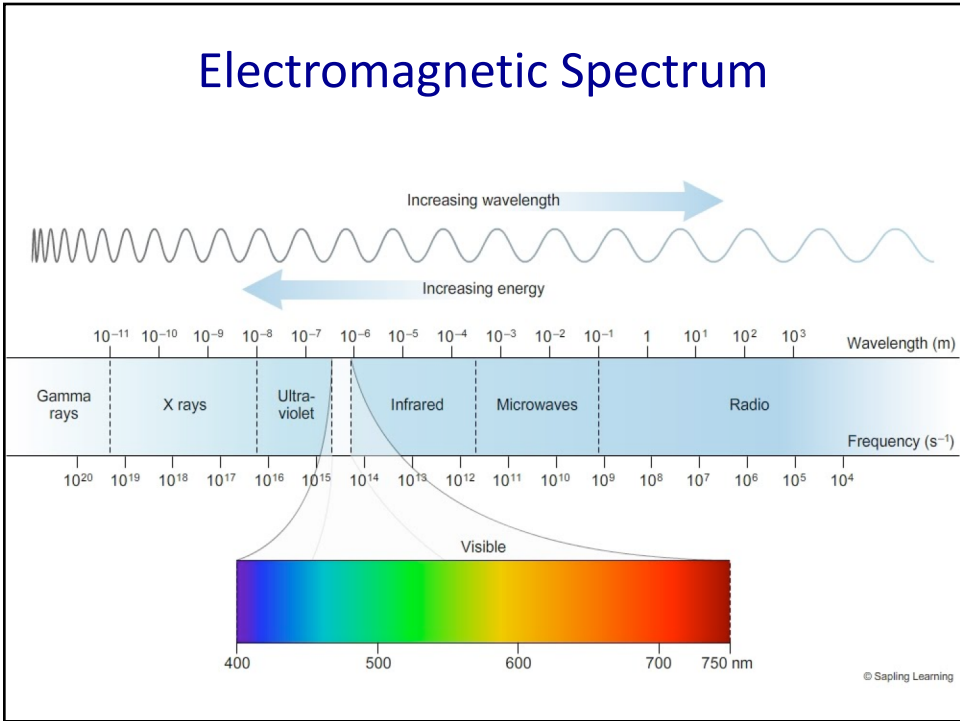
1 Å (Angstrom) = 1.0×10^{-8} cm = 0.1 nm
Yellow light (visible) is 5500 Å = 550 nm

$$E = h \nu$$

1 electron volt = 1.602×10^{-12} ergs

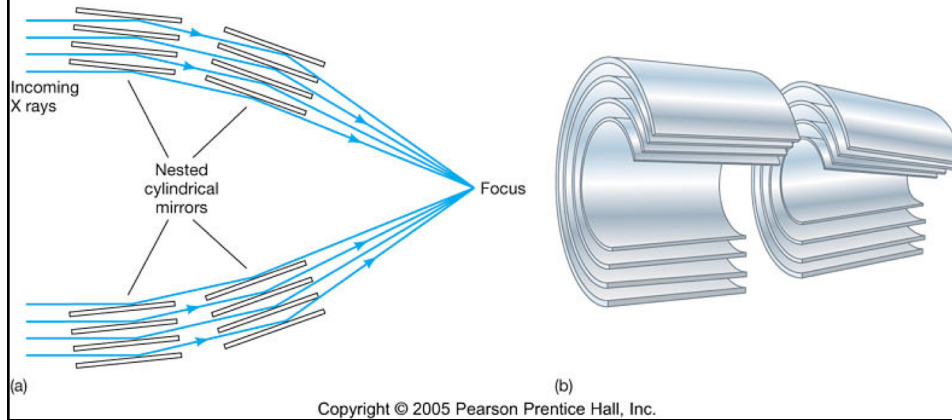
$$1 \text{ keV} = 2.4179 \times 10^{17} \text{ Hz}$$

$$1 \text{ keV} = 12.3984 \text{ Å}$$

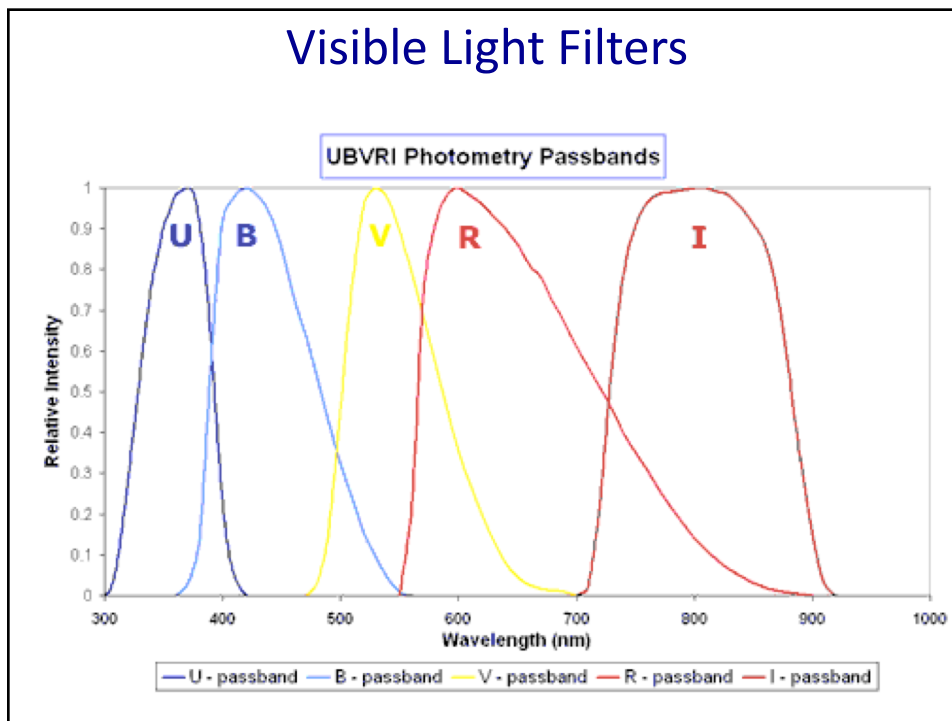


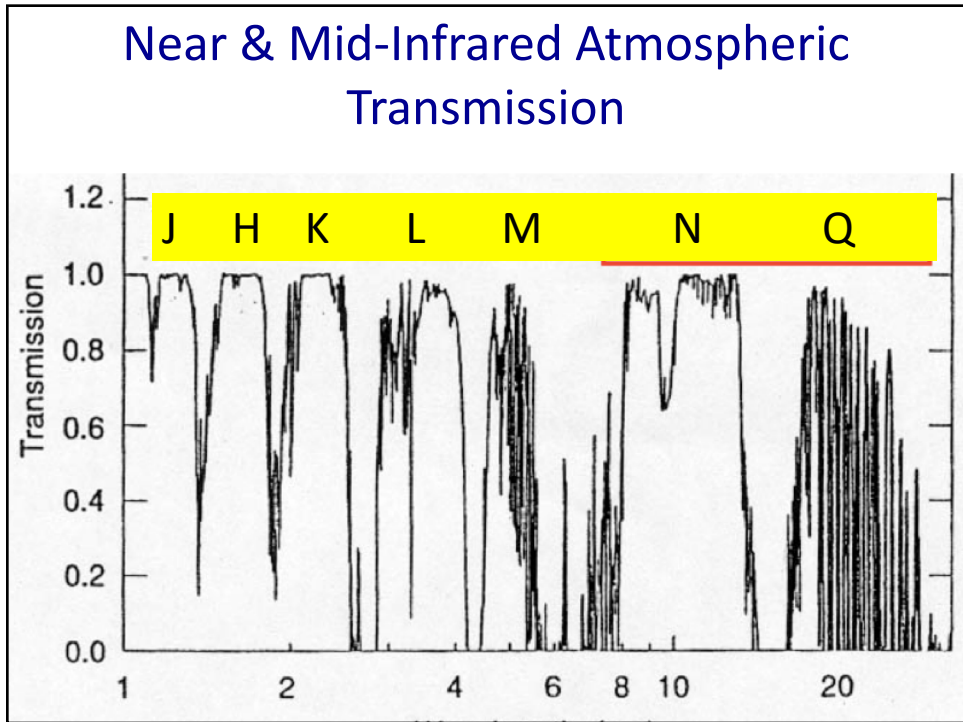
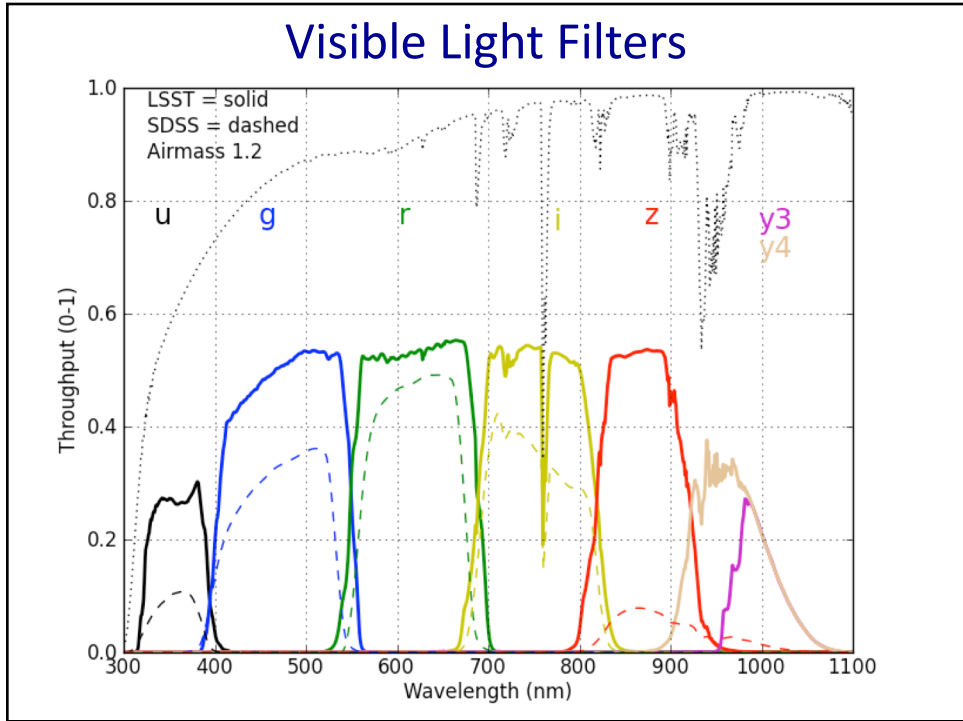
Gamma Rays and Xrays

- Soft Xrays 0.1 keV - ~10 keV
- Hard Xrays > ~10 keV
- Gamma Rays > ~100 keV

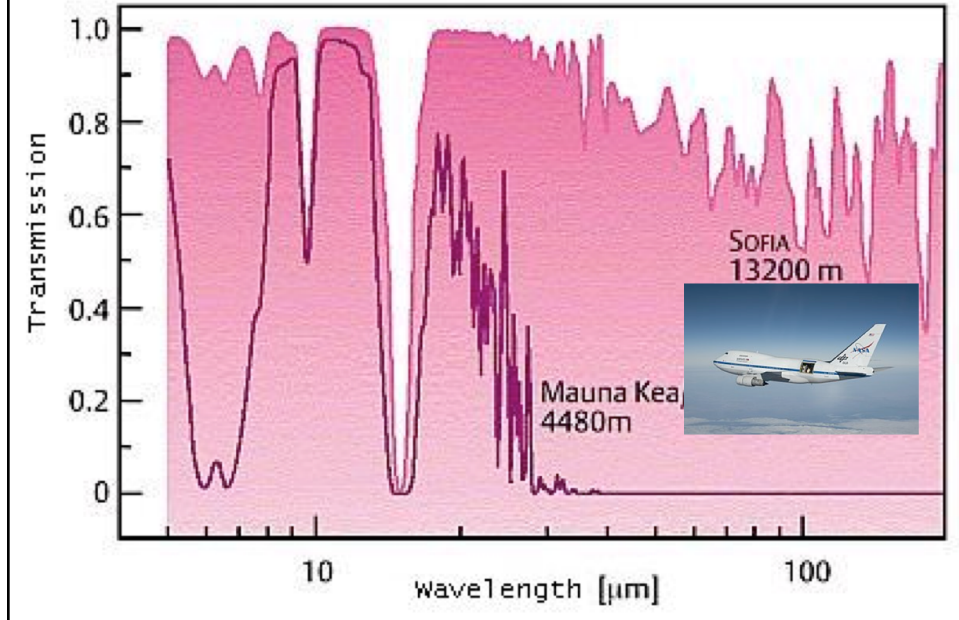


Visible Light Filters

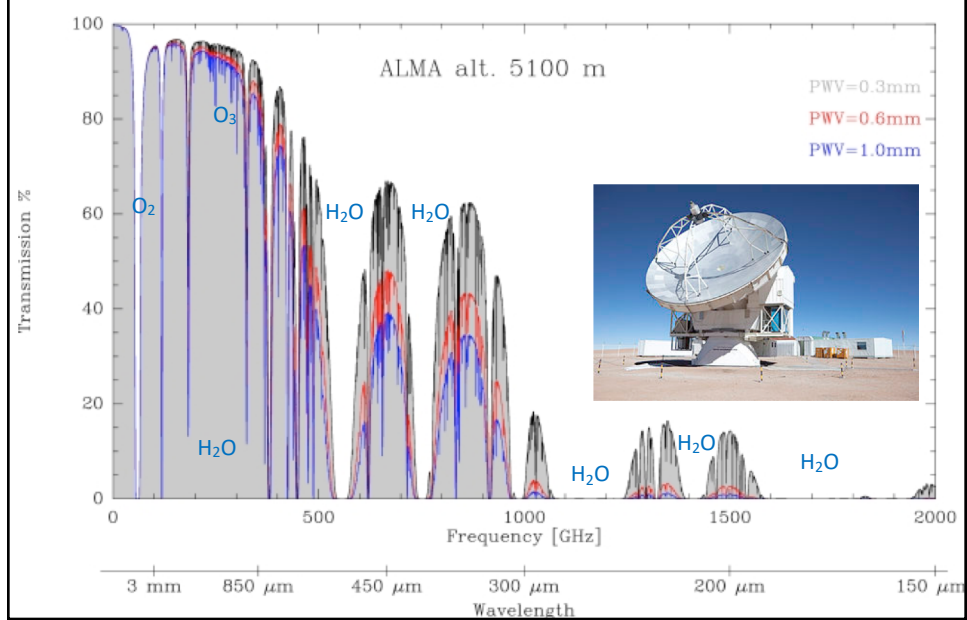




Far-Infrared Atmospheric Transmission



Submillimeter Atmospheric Transmission



Radio Astronomy Bands

