The Sun

Image of sun taken on Jan. 19, 2005, at 2:19 p.m. EST

From the European Space Agency-NASA
Radiation: Waves

\[ \lambda \text{ (lambda)} \]

wavelength

\[ c = 3 \times 10^8 \text{ m/s} \]

Amplitude

light speed:

Frequency: how often does wave swing?

vibrations per second

unit: hertz = 1/s

\[ f = \frac{c}{\lambda} \]

Energy of a wave is inversely proportional to wavelength:

\[ E = \frac{\text{constant}}{\lambda} \]
Wavelengths vary over many orders of magnitude

http://www.nrao.edu/whatisra/mechanisms.shtml
Visible Radiation Spectrum

Visible light (0.3 – 0.7 μm)

Ultraviolet
0.1 – 0.3 μm

Infrared
0.7 - 100μm

λ (μm)
Stephan-Boltzmann Law

Emitted radiation (W/m²)

Temperature (K)

0 1000 2000 3000 4000 5000 6000

0 50 100 150 200 250 300

Emitted radiation (W/m²)
Wien’s Law
Blackbody radiation spectrum

Most solids emit like a blackbody
Examples of Blackbody Radiators

- **Sun**
  - 6000K
  - Visible light

- **Earth**
  - 255K
  - Infrared light
The earth from space

Earth is approximately in Thermal/Radiative Equilibrium

Net solar radiation → Heat → Terrestrial infrared out

6000K Solar Source
255K Earth Temperature

Atmosphere
Earth’s radiation budget

http://calipsooutreach.hamptonu.edu/aeroclouds-graphics/radiation_budget.jpg