Electromagnetic Spectrum Overview

Full Electromagnetic Spectrum

Radio | Microwave | IR | **Visible** | UV | X-ray | Gamma

← Lower Energy | λ: km → pm | Higher Energy →

Spectrum Range

Radio waves → Microwaves → IR → Visible → UV → X-rays → Gamma rays

Frequency: 10^3 Hz to 10^{20} Hz | Wavelength: km to pm

Biological Windows

Visible: 400-700 nm
Vision, photosynthesis
NIR: 700-1000 nm
Deep tissue penetration
UV-A: 320-400 nm
Minimal DNA damage

Atmospheric Transmission

Transparent: Visible light, radio waves
Absorbed: Most UV, IR, X-rays
Ozone layer: Blocks harmful UV-C radiation

Medical Imaging Regions

X-ray: 0.01-10 nm
Radiography, CT scanning
Gamma: <0.01 nm
PET, SPECT imaging
Optical: Microscopy, endoscopy

Interactive Applications

- Spectral databases for reference
- Wavelength calculators
- Interactive spectrum explorers
- Energy conversion tools