

Today Ch 24 The Nature of Electromagnetic Waves 1st 1/2
 Wednesday Ch 24 2nd 1/2

HW21

- Introduction / Transition
 - Old
 - New Fundamental Interactions.
 - New Concept: Fields.
 - Circuitry.
 - New: E & M Waves
 - Transition: Backing out of Circuitry & Launching into E&M Waves
- Antenna
 - Dipole Antenna
 - Electric Field – through space, through time
 - Transverse Wave
 - Magnetic Field
 - Transverse Wave
 - Rabbit Ears (dipole) Vs. Loop Antennas

24.2 The Electromagnetic Spectrum

- Electric Field Wave
- Magnetic Field Wave
- Frequency
 - Charge oscillation frequency = field oscillation frequency
 - Spectrum of Frequencies possible
- Light
 - Human perception & Beyond
- Light Sources

24.3 The Speed of Light

- A historic connection
- Speed of Light in Astronomy. (A long time ago, in a galaxy far, far away...)
 - Light Years
 - Example 1: How long does it take for light to travel from the sun to the Earth?

24.4 The Energy Carried by electromagnetic waves

- Intensity = S:
 - Electric Field
 - Magnetic Field
 - Total
 - Example 2 The (rms) average intensity of sunlight at the top of the Earth's atmosphere is 1390 W/m^2 . What is the (rms) average strength of the associated electric field? If the Earth is, on average, $1.50 \times 10^{11} \text{ m}$ from the sun, what is the average intensity of sunlight at the surface of the sun, $6.96 \times 10^8 \text{ m}$ from the center?
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HW 21

8. TV channel 3 (VHF) broadcasts at a frequency of 63.0 MHz. TV channel 23 (UHF) broadcasts at a frequency of 527 MHz. Find the ratio (VHF/UHF) of the wavelengths for these channels.

16. A communication satellite is in a synchronous orbit that is 3.6×10^7 m directly above the equator. The satellite is located midway between Quito, Ecuador, and Belem, Brazil, two cities almost on the equator that are separated by a distance of 3.5×10^6 m. Find the time it takes for a telephone call to go by way of satellite between these cities. Ignore the curvature of the Earth.

26. The intensity of sunlight at the top of the Earth's atmosphere is about 1390 W/m^2 . The distance between the Sun and the Earth is 1.50×10^{11} m, while that between the Sun and Mars is 2.28×10^{11} m. What is the intensity of sunlight at the surface of Mars?