PHY114 S09 Problem Set 8

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1. How long does it take light to reach us from the Sun? The moon? Pluto?

2. Estimate the wavelength for 1.9 GHz cell phone reception. What is the wavelength of the waves on which the radio station WHAM1180 operates?

3. Typical sound waves are in the frequency range of 20 Hz - 20,000 Hz. Consider radio waves in the same frequency range. What is the range of their wavelengths?

4. Calculate the displacement current I_D between the square plates, 6.0 cm on a side, of a capacitor if the electric field is changing at a rate of $1.0 \times 106 V/m \cdot s$.

5. If the magnetic field in a traveling EM wave has a peak magnitude of 14.0nT, what is the peak magnitude of the electric field?

6. How much energy is transported across a $2.00 cm^2$ area per hour by an EM wave whose E field has an rms strength of 31.0mV/m?

7. A radio station is allowed to broadcast at an average power not to exceed 21 kW. If an electric field amplitude of $2.3 \times 10^{-2} V/m$ is considered to be acceptable for receiving the radio transmission, estimate how many kilometers away you might be able to hear this station.