

## ENEE 381 Problem Set #2

9/16/04 - due 9/28/04

(1) Calculate the electric field and magnetic field amplitudes produced 1km from a radio transmitter whose output is 4W at 100MHz. The waves coming from the transmitter are spherical, but to a good approximation they are plane far enough away from the transmitter. Compare these field amplitudes with those produced by a laser beam whose intensity is  $10\text{GW}/\text{cm}^2$  at a wavelength of  $1\mu\text{m}$ .

(2) Calculate the electric and magnetic field amplitudes produced 50mm from a cellular phone that is isotropically transmitting 1W at 850 MHz. Use a plane wave approximation to calculate the fields. If all this power is absorbed in a spherical region of radius 100mm whose specific heat is 1 calorie/gram, what is the rate of heating expected?

(3) RWD 3.13b

(4) RWD 3.17b

(5) RWD 3.18b

(6) RWD 3.19b

(7) RWD 3.20b

(8) Calculate the time it would take for a light sail powered space craft to accelerate to  $0.1 \times$  the velocity of light. Use a sail area of  $100\text{km}^2$ , a space craft mass of 10,000 kg, and a light intensity on the sail of  $1\text{W}/\text{m}^2$ .