

Homework Solutions  
10/11/2007

Conceptual Questions

14. The faster the car is moving relative to the radar gun, the greater the phase shift in the radar wave and the larger the speed reading on the car. If the car is not moving relative to the gun there will be no phase shift and therefore speed will register as zero.

Problems

10.

$$I = \frac{E}{At}$$

$$P = \frac{E}{t}$$

$$\frac{E}{t} = I \bullet A$$

$$P = \left( 1.00 \bullet 10^{-12} \frac{W}{m^2} \right) (5.0 \bullet 10^{-5} m^2) = 5.0 \bullet 10^{-17} W$$

$$P = \left( 1.0 \frac{W}{m^2} \right) (5.0 \bullet 10^{-5} m^2) = 5.0 \bullet 10^{-5} W$$

11.

Will show in class.

21.

$$f_{O,approach} = f_s \left( \frac{v + v_0}{v - v_s} \right) = 320 Hz \left( \frac{340 \frac{m}{s} + 0 \frac{m}{s}}{340 \frac{m}{s} - 40 \frac{m}{s}} \right) = 362 Hz$$

$$f_{O, \text{recede}} = f_s \left( \frac{v + v_0}{v - v_s} \right) = 320 \text{ Hz} \left( \frac{340 \frac{m}{s} + 0 \frac{m}{s}}{340 \frac{m}{s} - \left( -40 \frac{m}{s} \right)} \right) = 286 \text{ Hz}$$

$$f_{\text{drop}} = 362 \text{ Hz} - 286 \text{ Hz} = 75.7 \text{ Hz}$$