

HW 9/18

1.37)

a)  $\sqrt{c^2 \Delta t^2 - \Delta x^2}$  is the time between events in the frame of reference where the events happen at the same location.

b)  $\sqrt{\Delta x^2 - c \Delta t^2}$  is the distance between the events in the frame of reference where the events happen at the same time.

eps) a)  $c = f \lambda$   
 $\lambda = \frac{c}{f}$

FM radio wave:  $\lambda = \frac{c}{f} = \frac{c}{100 \cdot 10^6 \text{ Hz}} = 3 \text{ m}$

WiFi Signal:  $\lambda = \frac{c}{f} = \frac{c}{5 \cdot 10^9 \text{ Hz}} = 0.06 \text{ m}$

X-ray:  $\lambda = \frac{c}{f} = \frac{c}{10^{18} \text{ Hz}} = 3 \cdot 10^{-10} \text{ m}$

b)  $\vec{S} = \frac{1}{\mu_0} (\vec{E} \times \vec{B})$       $S = \frac{1}{\mu_0} EB = \frac{E^2}{\mu_0 c}$

The energy transported by an EM wave is proportional to the amplitude of the wave (E) squared.

ep9)

blue:  $\sim 6000 - 6500 \text{ K}$

yellow:  $\sim 4750 \text{ K}$

red:  $\sim 4100 \text{ K}$