

EX 3.15

Blackbody radiation filling space--- the cosmic microwave background-- is in equilibrium with a blackbody at 2.7K.

a) using Wien's displacement law

$$\lambda_m T = 2.898 \times 10^{-3} \text{ m-K}$$

$$\lambda_m = 0.00107 \text{ meters}$$

$$\lambda_m \approx 1 \text{ mm}$$

b) the frequency is given by  $c = \lambda f$

$$f = \frac{c}{\lambda} = 2.795 \times 10^{11} \text{ Hz}$$

$$f \approx 2.8 \times 10^{11} \text{ Hz}$$

c) the total power incident on earth is given by

$$\sigma T^4 \cdot \text{Area of earth} = \del{28.9 \text{ MWatts}}$$

$$= 1.54 \text{ Billion watts}$$