

HOMEWORK SET 2

Due September 21, Monday

- (1) What is the wavelength of a 100 megahertz ('FM100') radio signal?
- (2) According to Wien's law, how many times hotter is an object whose Planck spectrum peaks in the ultraviolet, at a wavelength of 2000 \AA , than an object whose spectrum peaks in the red, at 6500 \AA ? According to Stefan's law, how much more energy does it radiate per area per second?
- (3) The average person has 1.4 m^2 of skin at a skin temperature of roughly 92°F . Consider the average person to be an ideal radiator standing in a room at a temperature of 68°F .
 - a. Determine the peak wavelength λ_{max} of the blackbody radiation emitted by the average person. In what region of the electromagnetic spectrum is this wavelength found?
 - b. Calculate the energy per second radiated by the average person in the form of blackbody radiation. Express your answer in watts.
- (4) Consider a model of the star Dschubba, the center star in the head of the constellation Scorpius. Assume that Dschubba is a spherical blackbody with a surface temperature of $28,000 \text{ K}$ and a radius of $5.16 \times 10^9 \text{ m}$. Let this model star be located at a distance of 123 pc from Earth. Determine the following for the star:
 - a. Luminosity.
 - b. Radiant flux at the star's surface.
 - c. Radiant flux at Earth's surface (compare this with the solar irradiance).
 - d. Peak wavelength λ_{max} . In what region of the electromagnetic spectrum is this wavelength found?