KFUPM
Department of Physics
Phys412

Homework # 2

Due on Tuesday, March 6, 2007

Problem 1

For a blackbody at room temperature, find the wavelength at which the energy density per unit frequency, ρ_ν, is maximum. What is the average number of photons in a mode at this wavelength?

Problem 2

What is the ratio of $B\,\rho_\nu / A$ for a He-Ne laser and what does it represent? Here A and B are Einstein's A and B coefficients and ρ_ν is the energy density per unit frequency. Assume that the laser emission wavelength is 632.8 nm with a linewidth of 150 MHz. It has an output power of 1 mW with a 1-mm beam diameter. Assume also that one of the mirrors is perfectly reflecting mirror and the other reflects 99% of the power and transmits 1%. To simplify your calculations, assume that inside the laser cavity the beam diameter is also 1 mm and the power is uniform over the beam cross section.

Problem 3

What is the temperature for a blackbody for which $B\,\rho_\nu / A$, is similar to that you obtained in problem 2?

Problem 4

Plot normalized Lorentzian and Gaussian functions on the same graph. Use the same full-with-at-half-maximum (FWHM) for both functions.

Problem 5

Problem 2.5 from your text book.