KFUPM
Department of Physics
Phys412

Homework # 5

Due on Sunday, April 1, 2007

Problem 1

Use Eq. (3.2.15) to construct Fig. 3.15 a. You may use any software you like to do this.

Problem 2

For GaAr, $m_c = .067\ m_0$, $m_v = .0.46\ m_0$. Using T = 300 K, construct Fig. 3.15b and include the dashed line in your figure.

Problem 3

For the same parameters in problem 2, find the transparency condition for GaAs and compare it with the value obtained in Example 3.7.

Problem 4

Use Eq. (3.2.37) and the parameters in Example 3.6 to construct a figure similar to Fig. 3.18. Note you will not get the same values as that in the figure, because the figure is obtained using a real Lorentzian for $g(\nu-\nu_0)$ in Eq. (3.2.32) not a delta function.

Problem 5

From Fig. 3.18, find the start and end wavelengths in nm of the gain bandwidth for the injected carrier density 2.5×10^{18} cm^{-3}. What is the percentage of this bandwidth compared to the band gap of GaAr?