PHYS239 Homwork 4

Dino Chih-Chun Hsu

(a) Star light

The distance for M82 D = 3.63 Mpc (Freedman et al. 1994). I adopt α = 2.35 (Salpeter 1955) in the initial mass function (IMF), $Z \approx Z_0$= 0.0134 (Forster-Schreiber et al. 2001), and ≈ 400 Myr (Hutton et al. 2014). A violent star formation episode is proposed (Mayya et al. 2006). Therefore, I choose the data (fig7c) on the stardust99 dataset. The range of the dust emission range is from 0.2 μm to 50 μm, as I refer to Hutton et al. 2014. The dominant wavelength ranges from 0.1 to 10 μm.

(b) Dust emission

I choose the $M_{dust} = 7.5 \times 10^6$ M_{sun} (Thuma et al. 2000), T_{dust} = 30 K (Chini et al. 1989), and $a_{eff} \leq 0.11$ μm (Kawabata et al. 2014). The parameters we need to model the spectra are M_{dust}, T_{dust} and κ_ν. The dominant range for the dust emission is from 10 to 1000 μm.

(c) Synchrotron radiation

Referred to Lacki et al. 2011, I choose B = 200 μG, $\alpha = 45°$. The power law I want to assign is: p = 2.25 (p = 2.0-2.5). Synchrotron radiation dominates in the range of 1000 to 3000 μm.

(d) Thermal free-free emission

For the thermal free-free emission, I refer to eq 5.14a and Fig 5.2 to determine which function I am going to use Large-angle region, Gaunt factor ≈ 1. According to Carlstrom and Kronberg 1991, $T_e = 10^4$ K, and n_e = 210 cm^{-3}. I assume $n_i = n_e$ and Z = 1 for ionized hydrogen environments. The dominant wavelength for thermal free-free emission ranges from 1000 to 30000 μm.

The final spectra remains problems that I have not fixed yet. In the model I use scaling factor to fit the model with the data better.