

Warm Ionized Medium Around Stars

In this assignment you will estimate the size of H II regions (also known as Strömgren Spheres) around main-sequence stars of spectral type O to M. Take characteristic values for effective temperature (i.e., photosphere temperature) and radius for stars of the different spectral type. **Your final submission should be a single PDF file with your name mentioned.** It should be uploaded to a **google drive**. The PDF file should have

(1) a plot with synthetic Planck curves showing the intensity of radiation emitted by stars of spectral type O, B, A, F, G, K, and M. The vertical axis should be the Planck function for black body in units of $\text{Joule s}^{-1} \text{m}^{-2} \text{sr}^{-1} \text{Hz}^{-1}$. The horizontal axis should be frequency of the electromagnetic radiation in units of Hz. You might want to plot the quantities along the axes in log units to accommodate the wide range of values.

Mark the location of 1 Rydberg in the plot by a dashed vertical line.

(2) A five-column table with the following values listed in the columns

Column 1: Spectral type

Column 2: Effective photosphere temperature assumed

Column 3: Radius of the star assumed (in units of solar radius)

Column 4: Hydrogen ionizing photon flux (in units of photons / sec)

Column 5: Size of the H II region (in units of parsec)

(3) A histogram plot that shows the size of the H II region against stellar spectral type. The horizontal axis should be O, B, A, F, G, K, M. The vertical axis should show the size of the H II region in units of parsec.

(4) Based on your analysis write answers to the following questions

(4a) Stars of which spectral type can produce large regions of warm ionized gas?

(4b) What will be the rough temperature of the warm ionized plasma, and why?

(4c) What does the presence of bright WIM tell us about star formation in a galaxy?
