

Programming Assignment 1

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- (1) Make 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.

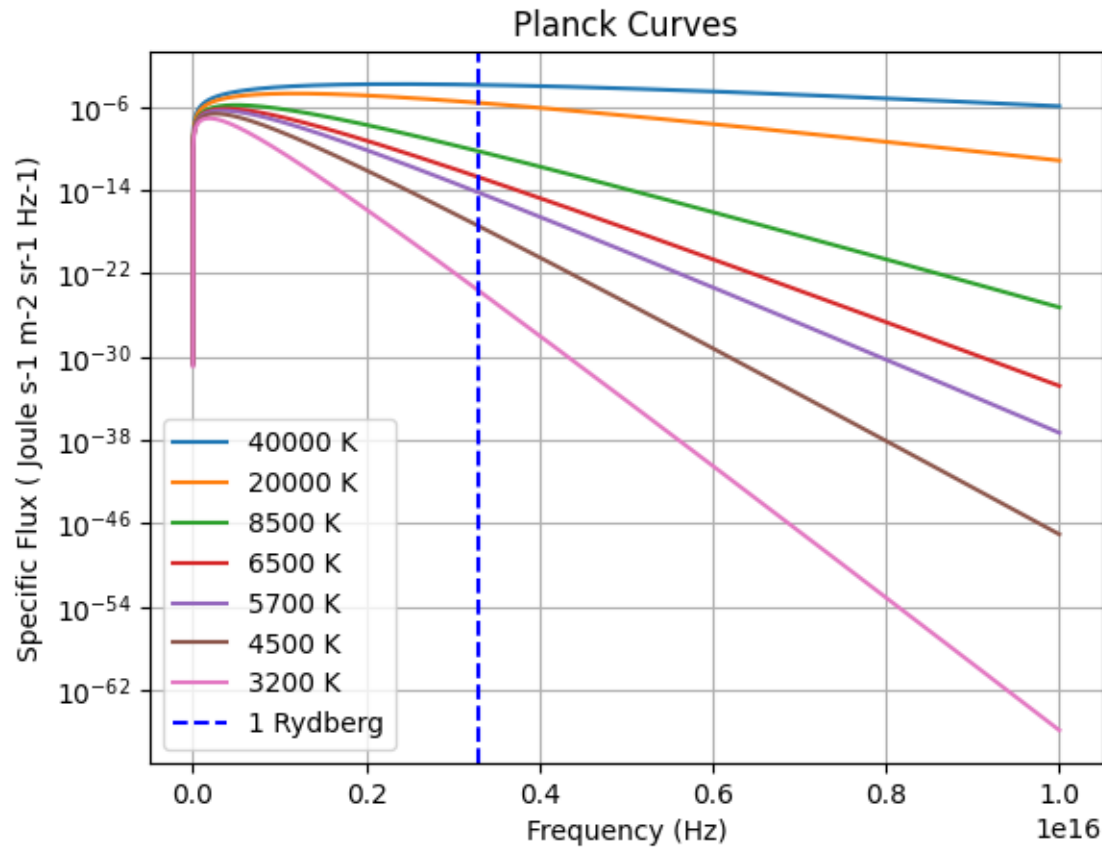


Figure 1: Synthetic Planck curves corresponding to stars of different Spectral Classes.

(2) Table of the required values:

Spectral Type	Photosphere Temperature (K)	Radius of Star (in solar radii)	Hydrogen ionizing photon flux (photons/s)	Strongen Radius (pc)
O	40000	10.0	6.144696e+50	4.702487e+00
B	20000	5.0	1.177641e+48	5.841150e-01
A	8500	1.7	1.259959e+42	5.974198e-03
F	6500	1.3	1.943414e+39	6.902650e-04
G	5700	1.0	3.462647e+37	1.802866e-04
K	4500	0.8	1.194886e+34	1.264551e-05
M	3200	0.3	9.554470e+26	5.447907e-08

(3) A histogram plot that shows the size of the H II region against stellar spectral type.

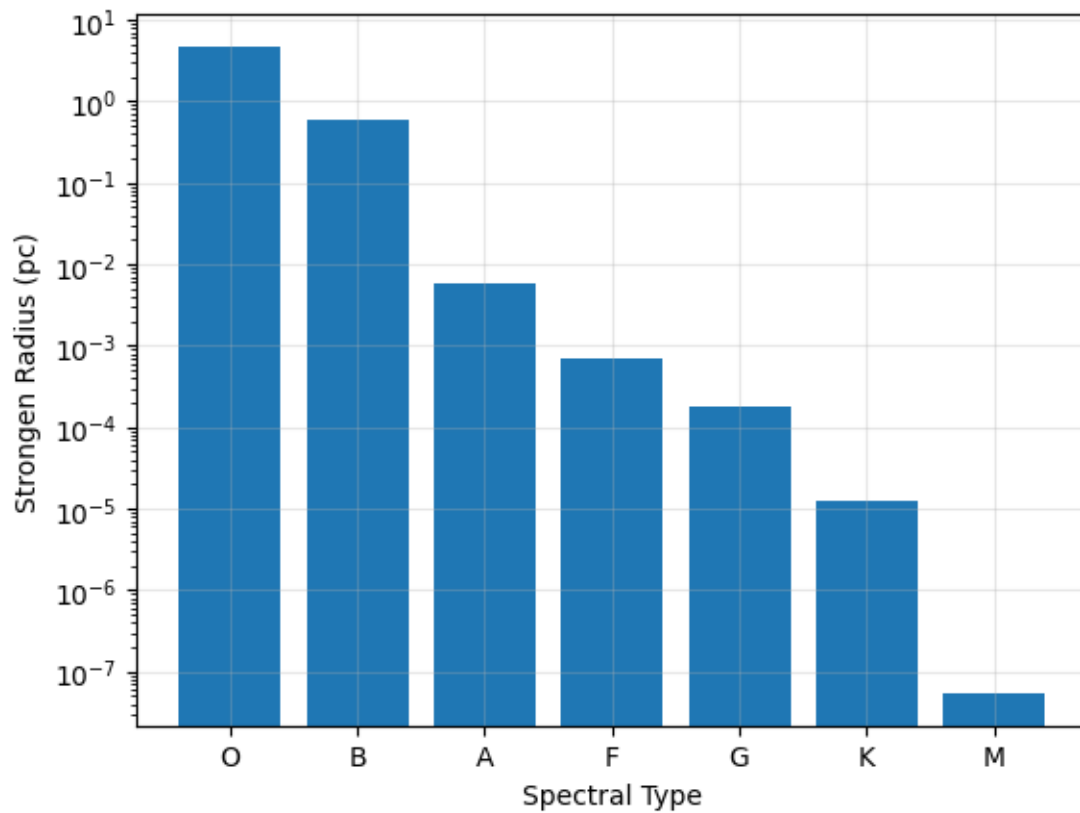


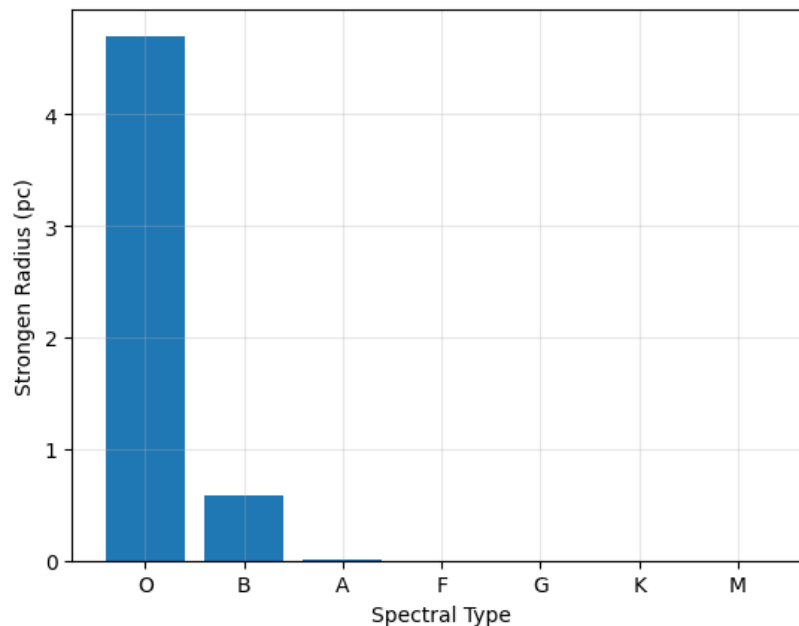
Figure 2: Histogram showing the size of the H II region against stellar spectral Type in log scale (y-axis).

(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?

Stars of spectral types O and B can produce large regions of warm ionized gas of sizes greater than 0.1 parsec and the rest of them can produce only below 0.001 parsec. If we look at the normal scale rather than the log scale we can tell the difference that it is prevalent only in the first two. Like the figure below: -

Figure 3: Histogram showing the size of the H II region against stellar spectral Type.



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

The rough temperature of the warm ionized plasma in O and B stars will be of the order of 10^4 K or lower as plasma can't be hotter than the temperature of the star.

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

WIM is made of the O and B-type stars as we saw above. Based on the lifespan of these stars which is a few million years, if we can find the traces of WIM then it tells us that the region has star formation, or it was taking place till few million years back in the the galaxy.