The Universe at Radio Wavelengths PHYS 6211.0

Assignment 1

Due: Tuesday, 27 October 2020, 10:30 am

1. Determine the temperature of the CMB radiation assuming that it is a black body. The basis of your determination is a set of measurements at different radio frequencies. List the measurements with their uncertainties as a function of frequency in GHz in a table. Fit the black body curve, $B_{y}(T)$ to the measurements. Do a weighted and an unweighted fit. Plot the weighted fit curve with the measurements as a function of frequency in GHz. Label the axes appropriately. To indicate the uncertainties of the measurements in the plot (not in your fit), you could for instance inflate all the uncertainties by an appropriate factor so that they are visible. Give the fit temperature values for the weighted and the unweighted fit together with their statistical errors. Shortly discuss the value of Chi-square per degree of freedom you get from the fits. Compare your result with that given in the literature. Give proper references in the text and list the references in the Reference section. Use the APA Citation Format. Your assignment should contain a short Abstract, a short Introduction, a Data and Results section, a Conclusion section and a References section. It should contain a Table and a Figure. Use size 10 for the Abstract and size 12 for the body of the text. Use as font "Times New Roman." Your assignment should be about three pages long.

The data are listed when you click on "Data for Assignment 1." The Table gives five columns. Only the first two columns have to be considered for the assignment. The first column gives the frequency a bit awkwardly in 1/cm. To get the frequency in Hz, you first have to convert the numbers to wavelengths by taking the inverse. So, for instance, a "frequency" of 5.45 (1/cm) corresponds to a wavelength of 0.183 cm. Now you have to convert that wavelength to a frequency. The measurements are given in the second column in MJy/sr. The uncertainties of the measurements are given in the fourth column in kJy/sr. The corresponding paper is Fixsen et al. (1996). The plot of the CMB spectrum is in Figure 4 on a lin-lin scale. Please give your plot in a log-log scale.