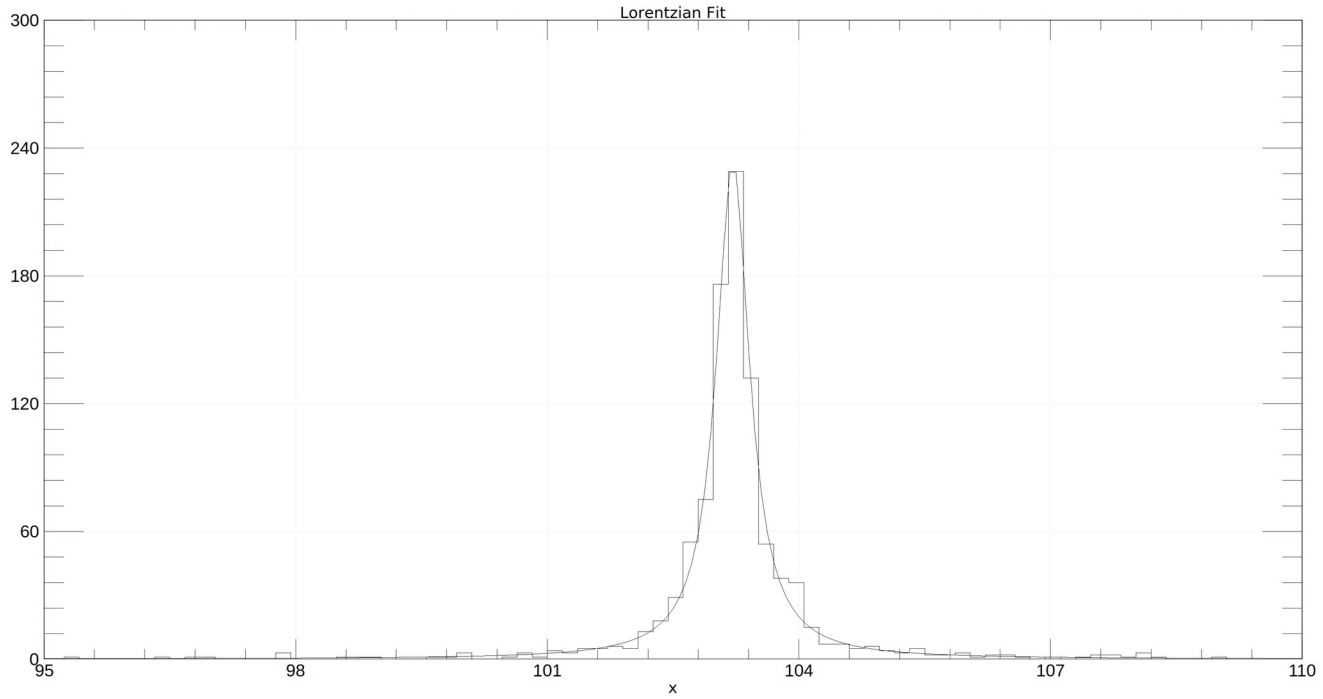
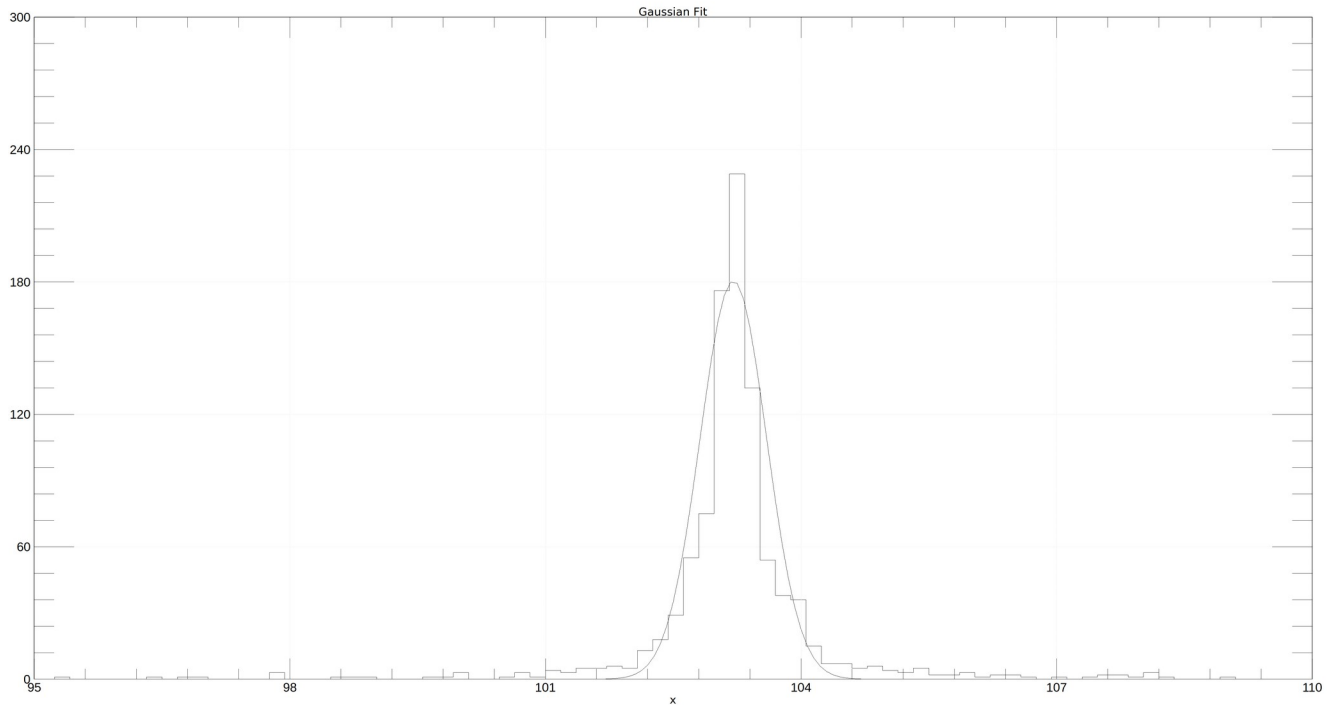
Assignment 12

3 a) The lorentzian distribution is fitted to the input data shown below:



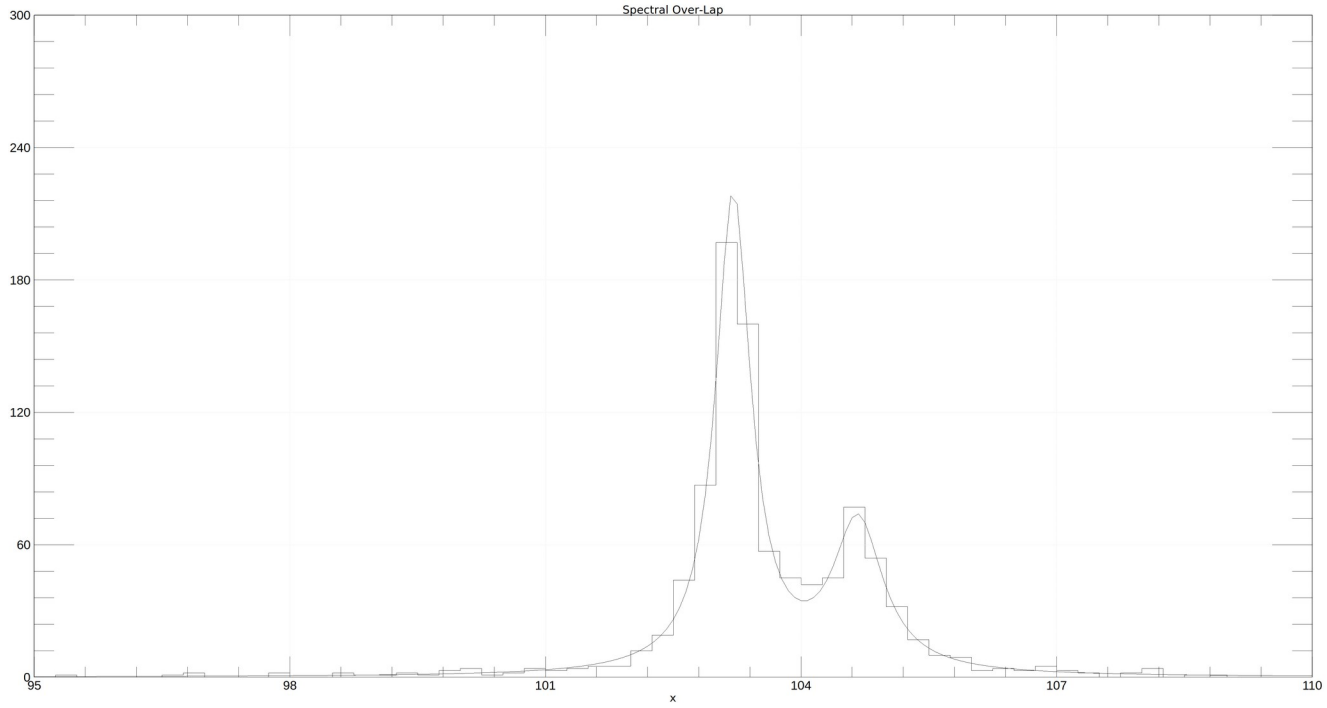
The Gaussian distribution is fitted to the input data as shown:



Just by looking at the data, it can be seen that Lorentzian distribution is a much better fit to the input data.

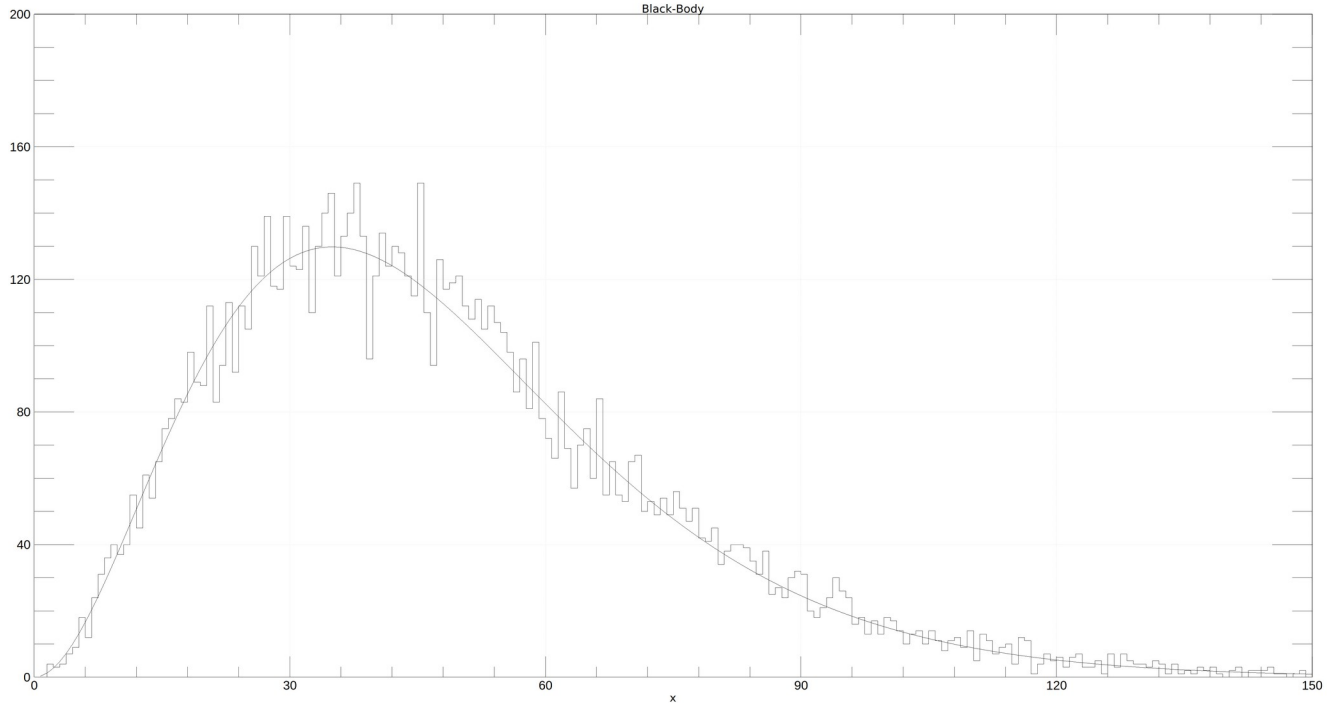
From the Lorentzian distribution plotted above, the natural line width is 1.05 eV. Using Heisenberg's uncertainty principle, the lifetime is given as t= hbar/natural line width. Hence, t= 6.26e-16s

3 b) The relative fraction of the first distribution to the second is determined as 0.69 using Minuit minimizer. The fraction function simulates the data accurately as shown:



From the plot, the peak value of the first line is 103.1 eV and the second line is 104.7 eV.

(d) The Bose-Einstein probability density function for black-body radiation was used to fit the data. The PDF was simplified for ease of computation. The data and the fit agree and can be seen below:



From the results generated by the Minuit Minimizer, the Planck's temperature is calculated as 12.3949 eV with error of 0.66 on either side.

(e) Code was written for the problem but could not find the right combination of minimizer parameters to achieve an optimum solution