Frequently asked questions for the TOPS® code

Q1: I noticed that some of the multigroup opacities were all 10^{10} . Why did this happen?

A: The TOPS code calculates the plasma cutoff frequency for each temperature-density point. Any group that lies either partly or fully below that frequency has the opacity set to 10^{10} to indicate that photons at those frequencies cannot propagate in the plasma.

Q2: I want a table of opacities at 21.8 eV. The output shows the temperature as .02 keV which is 20 eV. Why did I not get the 21.8 eV temperature?

A: The TOPS code can only use tabulated temperature points for cross section data. It will not interpolate on temperature. If you choose a temperature that is not on the tabulated grid, the TOPS code will attempt to find the tabulated point nearest to the requested one and will use that tabulated point. The set of tabulated temperatures is listed under tabulated temperatures.

Q3: I asked for multigroup opacities for a density of 100 gm/cc for aluminum at a temperature of .001 keV. Every multigroup had the same opacity in it. Why doesn't it vary with photon energy?

A: When you ask for a temperature-density point, TOPS attempts to find cross section data for that point. At low temperatures there is no data available for high densities. Thus the TOPS code uses the cross sections for the highest density available, prints a warning message that this has occurred and uses the gray opacity from those cross sections for all the multigroup opacities.

Q4: When I specify multigroup opacity, it returns tables containing Rossland Mean and Planck Mean opacity. But I want to obtain opacity as function of energy (not the averaged opacity). Is there a way I can do this?

A: When you ask for multigroup opacities, you get the Rosseland and Planck mean as well as the multigroup opacities. The gray opacities appear in the output first. You may need to scroll down in the window to get to the part of the output containing the multigroup opacities. Of course, you must check the box requesting multigroup opacities as well as setting the group boundaries. It is possible to also obtain the monochromatic opacities for a limited number of temperature-density points. The monochromatic is tabulated on a grid of either 3000 or 3900 points depending on whether the old version or new version is used. The default is to use the new version where available. Because of the large number of points, we limit the requests to only four temperature-density points ie. you could choose two temperature and two density points for a total of four points, or one temperature with four densities etc. In the output file, the monochromatic data is listed before the gray opacities.

Q5: What is meant by "No. Free" in your tables ?

A: For a single element, the free electron number is the average number of free electrons per ion. It is obtained by multiplying the relative population of each ion stage by the number of free electrons for that stage, zero for the neutral, one for single ionized etc. For a mixture, it is a weighted average using the number fractions of each constituent of the mixture.

Q6: What is your meant by "Av Sq Free" in the output?

A: This is the average of the square of the number of free electrons over the ion stages of an element. It is obtained by summing the product of the relative abundance of each ion stage times the square of the number of free electrons for that ion stage, zero for neutral etc. For a mixture, it is a weigthed average over all constituents of the mixture.

Q7: I can't seem to find opacities for densities lower than 10^{-12} gm/cc.

A: All of the opacity data is generated assuming Local Thermodynamic Equilibrium (LTE) and this becomes very questionable below 10^{-6} to 10^{-7} gm/cc. At lower densities, one should use a nonLTE coronal model. Since the data on this web site assumes LTE, they do not go to such low densities.

Q8: I plan to use some of your opacities in a publication. What is the best reference to cite?

A: You can click on the Opacities methods and references for a list of refernces. The latest reference is

N. H. Magee, Jr., J. Abdallah, Jr., R. E. H. Clark, et al., "Atomic Structure Calculations and New Los Alamos Astrophysical Opacities", Astronomical Society of the Pacific Conference Series (Astrophysical Applications of Powerful New Databases, S. J. Adelman and W. L. Wiese eds.) 78, 51 (1995).

You may also refer to the web page:

http://t4.lanl.gov/opacity/tops.html

Please mail questions or comments to:
LANL T-4 Opacities <opacity@t4.lanl.gov>