NIST Atomic Databases and Online Tools for Plasma Physics

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The National Institute of Standards and Technology (NIST) provides a number of online standard reference databases of atomic properties [1]. The most widely used of them is the Atomic Spectra Database (ASD) containing data on energy levels, ionization energies, wavelengths, and transition probabilities of spectral lines. Among many other applications, these data are widely used in plasma modeling. In 2017, we introduced a new online interface for modeling and diagnostics of plasma pertinent to laser-induced breakdown spectroscopy (LIBS) [2]. This user-friendly interface allows generation of synthetic LIBS spectra for plasmas of arbitrary composition with specified rough initial estimates of observational parameters, such as electron temperature and density, wavelength range, and spectral resolution. Initial Saha-Boltzmann modeling is made on the server side, and all relevant data, such as spectral lines and energy levels data are transmitted to the user's computer, which plots the simulated spectrum. Then it is possible for the user to change the appearance of the plot by zooming in and out or selecting graphs for individual species and recalculate the simulated spectrum with modified parameters. In addition, the user can load an experimental spectrum into the same plot and compare it with the simulation. Besides that, NIST hosts other online computational tools, such as the plasma-kinetics code FLYCHK [3]. This code provides a capability to generate atomic level populations and charge state distributions for a wide range of elements under NLTE conditions.

References

[1] URL https://www.nist.gov/pml/atomic-spectroscopy-databases
[2] URL https://physics.nist.gov/LIBS
[3] URL https://nlte.nist.gov/FLY