Critical Compilation of Atomic Wavelength and Energy Level Data

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Our past work on spectra of astrophysical interest has produced new critical energy-level compilations for some 350 spectra of the first 30 elements, including all spectra of Na through S (Z=11−16), the iron-group elements and Cu and Zn (Z=19−30). We have also published very complete new wavelength lists with energy-level classifications for all spectra of Mg, Al, S, and Sc [1]. In addition, the NIST Atomic Spectra Database [1] has fairly complete data for the C, N, and O spectra, including the extensive transition probability data compiled by Wiese, Fuhr, and Deters [1].

Our main goal is to carry out the additional compilations needed to have more complete energy-level and wavelength data for the first 30 elements. In our most recent and current work we are compiling complete new energy level and wavelength data, together, for each spectrum. Such tables have been published for Be I and O II [1] and will be submitted for all the Ar spectra this year. We have prepared at least preliminary tables for most spectra of Be, B, F, Ne, and Cl. Completion of these tables and of updated compilations for several other elements in the range up to P (Z=15) are an important part of our program.

Large extensions of energy level and wavelength data for important iron-group spectra have been produced in several laboratories during the past 10 years or so. We plan to edit, format, and incorporate these new results in our Atomic Spectroscopic Database to supplement the extensive Fe-group data already accesible there [1].

We are also making good progress on a special “handbook” compilation covering the neutral and singly-ionized atoms of all elements. In addition to wavelengths and relative intensities for some 10,000 lines, this compilation has separate tables of the persistent lines with their energy-level classifications and (where available) transition probabilities. Tables of selected energy levels, ionization energies, and basic nuclear data are being included.

References

[1] The list of references for this abstract is too long for inclusion here. These references and others are accessible through the Website http://physics.nist.gov.

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