HIGH-RESOLUTION STUDIES OF OPEN SHELL ATOMS

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In the early years of the use of synchrotron radiation for atomic gas phase studies, measurements concentrated most heavily on the rare gases, and the results led to major advances in the theory of electron dynamics in highly-excited species. These theories were applied, however, only to these simple closed-shell systems. Effects of the anisotropic interactions characteristic of asymmetric open-shell atoms, particularly for the case of non-zero orbital angular momentum, have until now not been subjected to the same level of scrutiny, either experimentally or theoretically.

During the past few years we have been engaged in an extensive study of the dynamics of electron motion in atoms of nitrogen, oxygen, and the halogens. This has been possible due to the development of a source to generate adequate amounts of the atomic species and to the resolution attainable in current monochromator design, which is essential for isolation of the relevant transitions. In this report we will present a set of highlights of our results over a period of years for all the above species. Particular attention will be given to: (a) the effects of inner-channel mixing; (b) the widths of innershell transitions and levels; and (c) the details which appear when resolution at the fine-structure level is achieved.