ELECTRON-IMPACT SPECTROSCOPY OF ATOMIC IONS:

SULFUR AND THE 10 TORUS

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Use of the electron energy-loss technique, when combined with merged or crossed electron and ion beams, is a powerful method for measuring excitation cross sections in singly- and multiply-charged positive ions. Transitions which are optically-forbidden (either by spin, symmetry, or both) or optically-allowed can be accessed. In the merged-beams geometry presented here, the kinematic advantage allows one to measure cross sections at each inelastic threshold, since an electron with zero residual (final) energy in the center-of-mass frame still has several tenths of an eV in the laboratory frame. Recent results in electron excitation of allowed and forbidden transitions in the ions *Mg II*, *Zn II*, *O II*, and C *II* will be presented. New experimental results in e—S *II* scattering, including resonance contributions, for the transitions $3s^2 3p^3\,{}^4S^o \rightarrow 3s^2 3p^3\,{}^2D^o$ (λ 6732 Å), ${}^4S^o \rightarrow {}^2p^o$ (λ 4076 Å), and ${}^4S^o \rightarrow 3s3p^4\,{}^4P$ (λ 1256 Å) will be discussed. The electron energy range is threshold to several times threshold, or about 2-40 eV. Near-term extensions of this work to the study of e—S *III-VI*, and e—O *III-VI* using the new multiply-charged ion (MCI) facility at JPL will be outlined. Relevance to the 10 torus will be given for excitation of the many charge states of O and S.

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