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Systematic study of zeros in bound-free matrix elements L.A. LA-JOHN, R.H. PRATT, University of Pittsburgh, S.T. MANSON, Georgia State University — We extend the systematic study of the positions in photon energy at which radial matrix elements are zero, well known for dipole matrix elements, to quadrupole matrix elements, considering the full range of the periodic table. For nonrelativistic dipole matrix elements there are zeros (Cooper minima)(CM) only for screened (not pure point Coulomb) potentials, at energies of a few of tens of eV. There are relativistic zeros (RC) that are independent of potential at much higher energies, around 100 keV or higher. For the case of quadrupole matrix elements, CM and RC zeros are again found in certain channels, but there is also a third class of zeros in an intermediate energy regime (order of 10 keV), already present in the point Coulomb potential (NRC), but modified by screening. These quadrupole zeros have important consequences, particularly for photoelectron angular distributions. Zeros occur in sequences, of one type for CM and NRC, and of another for RC.

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