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Dramatic quadrupole effects in the low-energy photoionization of the 3s subshell of atomic Mg[1] G. PRADHAN, J. JOSE, IIT-Madras, P.C. DESHMUKH, IIT-Madras and IIT-Mandi, S.T. MANSON, Ga. St. U., L.A. LAJOHN, R.H. PRATT, U. Pittsburgh — Calculations have been performed, at the relativistic-random-phase approximation (RRPA) level, of the dipole and quadrupole photoionization of Mg 3s in the threshold region, including interchannel coupling among channels arising from 1s, 2s, 2p and 3s ionization. In the vicinity of the Cooper minima in the 3s$\rightarrow \varepsilon p_{1/2,3/2}$ dipole channels, in the region of 10 eV photon energy, the results show that the quadrupole cross section is larger than the dipole cross section, the first known instance of such a phenomenon in a realistic calculation; one that includes both the relativistic splitting of the Cooper minima, along with interchannel coupling effects. As a result, the nondipole photoelectron angular distribution parameters are huge in this region and very energy-dependent. This leads to an angular distribution which is highly nondipole and changes dramatically with small changes in energy. This phenomenology, or something similar, should be exhibited in the threshold regions of the photoionization of ns states of low-Z atoms which manifest Cooper minima in the dipole channel. The predicted cross sections, although small, should be large enough for experimental scrutiny of the photoelectron angular distribution.

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