MANY-ELECTRON EFFECTS ON THE XE 5S NONDIPOLE PHOTOELECTRON ASYMMETRY

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Photoionization of the Xe 5s subshell has been extensively studied because of its sensitivity to relativistic and many-electron interactions. Previous studies of the partial cross section σ and the photoelectron anisotropy parameter β are sensitive to the electric-dipole photoionization amplitudes. Recently, the *nondipole asymmetry parameter* γ has been calculated and is sensitive to both electric-dipole and electric-quadrupole photoexcitation channels [1,2]. We measured γ over the 26–140 eV photon energy range at the SRC and combined our results with measurements made over 80–197.5 eV at the ALS. Measurements over the 90–225 eV region were also reported in Ref [3]. In Fig. 1, the SRC and ALS results are compared with Hartree-Fock (HF) [1], random-phase approximation with exchange (RPAE) [1], and relativistic random-phase approximation (RRPA) [2] calculations. (The curves plotted in Fig. 1 are based on more accurate calculations than were originally reported in Refs. [1,2]; see Ref. [4].) The γ parameter varies rapidly near threshold and passes through a minimum near 35 eV. This is due to the 5s $\rightarrow$ εp (dipole) amplitude passing through a "Cooper minimum," and is essentially a one-electron effect but is modified by interchannel coupling with the 5p and 4d subshells and by ionic-state satellite channels. The broad maximum near 150 eV results mainly from interchannel coupling with the 4d subshell, which is included in the RPAE and RRPA calculations but not HF. The small feature measured near 160 eV and predicted by the RRPA calculation results from coupling of the 5s $\rightarrow$ εd (quadrupole) channels with the 4p $\rightarrow$ εf quadrupole shape resonances. A full report on this study is in Ref. [4].

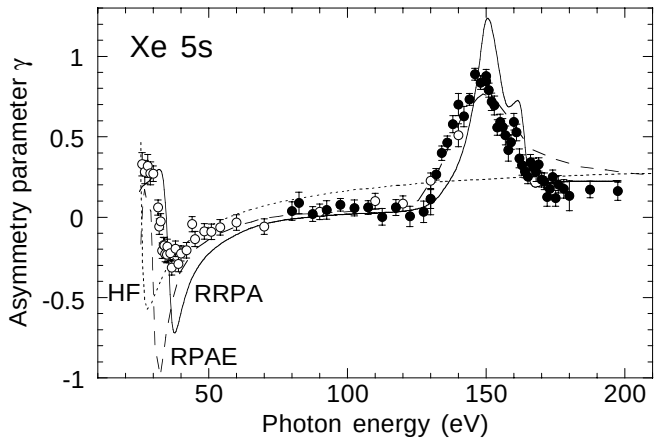

Fig. 1. Xe 5s nondipole asymmetry parameters γ measured at the SRC (open circles) and ALS (closed circles) compared with HF (dotted curve), RPAE (dashed curve), and RRPA (solid curve) calculations.

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