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## Evidence for anisotropic final state interactions in the two-photon ionization of rare gases

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**Synopsis** Anisotropic final state interactions are exhibited most clearly in the angular momentum dependent position of Cooper minima in the photoionization partial cross section and angular distribution asymmetry parameter. We show first indication of this effect in two-photon ionization of rare gases.

Cooper-Minima in the partial cross sections of single photoionization are known to arise from the decrease of the overlap integral of the two possible wave functions with different angular momentum of the outgoing electron[1]. Reflections of these intensity variations along photon energy are also exhibited in the angular distribution of the photoelectrons. Such radial integral effects should actually not show severe deviations for different angular momentum coupling multiplets of the same electron configuration. This is in fact the case for the single-photon ionization of all rare gases. However, open-shell atoms show such deviations due to so called anisotropic interactions of the outgoing electron and the ionic core in the final state. Up to now, little is known about the actual strength and behavior of these anisotropic final state interactions. The second step ionization of sequential two-photon ioniza-

tion can be regarded as the ionization of an open shell system, giving rise to a singly charged ion of the first ionization step. Hence, anisotropic final state interactions are expected to occur. Indeed some recent calculations predict large effects with respect to the higher order anisotropy parameter  $\beta_4$  showing completely different behaviour in the region of the Cooper minima for the different multiplets. Results of our recent angle resolved photoelectron spectroscopy measurements are presented and compared with corresponding calculations. Sequential two-photon ionization creates in first step a singly charged ion being an open shell system which will be further ionized by the second photon.

### References

- [1] J.W. Cooper *Phys. Rev* **128** 681.

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