Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Dramatic quadrupole effects in the low energy photoionization of the 4s subshell of free and confined Ca SINDHU KANNUR, GAGAN B. PRADHAN, JOBIN JOSE, HARI R. VARMA, IIT-Mandi, PRANAWA C. DESHMUKH, IIT-Madras, STEVEN T. MANSON, Georgia State University — The importance of first-order nondipole effects in low-energy photoionization is well known [1], and, the significance of second-order [O(k^2r^2), where k is the photon wave number] nondipole terms has been stressed even at photon energies as low as ∼11 eV [2]. In the present work, valence dipole and quadrupole photoionization of free atomic Ca and @Ca (Ca atom trapped in a C_{60} cage) are investigated using the relativistic random phase approximation (RRPA) [3]. In the vicinity of the 4s Cooper minimum (∼ 10 eV) [4], second-order nondipole terms are found to induce dramatic changes in the photoelectron angular distribution over a small energy range, primarily due to contributions from quadrupole-quadrupole interferences. Also, the calculation of the dipole angular distribution parameter β in the vicinity of the dipole Cooper minimum requires the inclusion of the quadrupole terms, as was found earlier [2]. Finally, the results show that confinement of the Ca atom in the fullerene cage augments the quadrupole effects still further.

[1] W. R. Johnson *et al*, Phys. Rev. A **59**, 3609 (1999). [2] G. B. Pradhan *et al*, J. Phys. B **44**, 201001 (2011). [3] W. R. Johnson and C.D Lin, Phys. Rev. A **20**, 978 (1979). [4] J. W. Cooper, Phys. Rev. **128**, 681 (1962). Lett. **105**, 233002 (2010). [5] C. H. Zhang and U. Thumm, Phys. Rev. A **82**, 043405 (2010). [6] W. R. Johnson and C. D. Lin, Phys. Rev. A **20**, 964 (1979). [7] J. W. Cooper, Phys. Rev. **128**, 681 (1962).

Steven T. Manson
Georgia State University

Date submitted: 27 Jan 2012 Electronic form version 1.4