Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Analysis of resonances for the inner-shell 2p photoionization of Mg PRABHA PADUKKA, HSIAO-LING ZHOU, STEVEN T. MANSON, Georgia State University — The photoionization cross section of the inner-shell 2p of Mg has been calculated using the R-matrix method with LS coupling. The discrete Mg^+ orbitals are generated using Hartree-Fock (HF) and multiconfiguration HF (MCHF) programs. Based on the photoionization cross section calculation, an eigenphase derivative technique, the QB method [1], along with quantum defect theory were employed to obtain the resonance positions and effective quantum numbers (quantum defects) of the lower members of various autoionizing series including $2p^5 3s^2 nl$ converging to the $2p^5 3s^2$ threshold, and $2p^5 3snln'l'$ above the $2p^5 3s^2$ threshold over the 55 eV to 70 eV photon energy range. Among the resonances, most are relatively narrow, except for the $2p^5 3s3p^2$ which are far broader, indicating a much more rapid decay rate. This phenomenology is traced to the fact that the wide resonances occur for states in which the two excited electrons are in the same subshell so that they are physically close together and, thus, the repulsion between them is significantly larger than for resonance states with excited electrons in differing subshells. Reasonably good agreement is obtained between our calculations and the few available NIST values. This work was supported by DOE and NSF.

[1] L. Quigley, K. Berrington and J. Palen, Computer Phys. Commun. **114,** 225 (1998).

Steven Manson
Georgia State University

Date submitted: 24 Jan 2013 Electronic form version 1.4