

Abstract Submitted
for the DAMOP05 Meeting of
The American Physical Society

Fine structure measurements in high-L, n=17 and 20 Rydberg states of barium: A re-determination of the dipole and quadrupole polarizabilities of Ba⁺ E.L. SNOW, S.R. LUNDEEN, Colorado State University — Two previous studies of Rydberg fine structure in barium have determined the dipole and quadrupole polarizabilities of Ba⁺[1,2]. The measured dipole polarizability appears to be in good agreement with theoretical calculations, but the quadrupole polarizability and the contribution to it from the single lowest D state are in very poor agreement with the most precise calculations [2]. In an effort to resolve this apparent discrepancy, microwave measurements of higher L fine structure intervals were conducted. RESIS microwave techniques [3,4] have been used to directly measure the fine structure intervals between several n=17 and 20 high-L states. It is hoped that the increased precision of these measurements and the access to higher L levels will clarify the comparison with theory. [1] T.F. Gallagher, R. Kachru, and N.H. Tran, Phys. Rev. A **26**, 2611 (1982) [2] E.L. Snow, M.A. Gearba, R.A. Komara, and S.R. Lundeen, (to be published) Phys. Rev. A (2005) [3] P.W. Arcuni, E.A. Hessels, and S.R. Lundeen, Phys. Rev. A **41**, 3648 (1990). [4] R.A. Komara, M.A. Gearba, C.W. Fehrenback and S.R. Lundeen, J. Phys. B: At. Mol. Opt. Phys. **38** S87 (2005).

¹Supported by the Chemical Sciences, Geosciences, and Biosciences Division of the Office of Basic Energy Sciences, Office of Science, U.S. Department of Energy

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Date submitted: 28 Jan 2005

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