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Accurate determination of the electric-dipole matrix elements in K and Rb from the Stark shift measurements MARIANNA SAFRONOVA, BINDIYA ARORA, University of Delaware, CHARLES W. CLARK, National Institute of Standards and Technology, Gaithersburg — Stark shifts of the rubidium and potassium D1 lines have been measured with high precision by Miller *et al* [1]. In this work, we combine these measurements with our all-order calculations to determine the values of the electric-dipole matrix elements for the $4p_j - 3d_{j'}$ transitions in K and for the $5p_j - 4d_{j'}$ transitions in Rb to high precision. These transitions contribute on the order of 90% to the respective polarizabilities of the $np_{1/2}$ states in K and Rb, and the remaining 10% can be accurately calculated using the relativistic all-order method. Therefore, the combination of the experimental data and theoretical calculations allows to determine the $np - (n-1)d$ matrix elements and their uncertainties. We also compare these values with our all-order calculations for a benchmark test of the accuracy of the all-order method for transitions involving nd states. Such matrix elements are of special interest for many applications, such as determination of the "magic" wavelengths in alkali-metal atoms for state- insensitive cooling and trapping and determination of blackbody radiation shifts in optical frequency standards with ions.

[1] K. E. Miller and D. Krause and L. R. Hunter, Phys. Rev. A 49, 5128 (1994)

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