IR-MICROWAVE DOUBLE RESONANCE STUDIES OF DIPOLE MOMENTS IN THE ν_1 and ν_3 STATES OF AMMONIA

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Infrared laser-microwave double resonance spectroscopy is used to observe the Stark effect of tunneling transitions within the ν_1 and ν_3 hydrogen stretching states of NH_3. Dipole moments for 11 J,K states of ν_1 and 3 J,K states of ν_3 are measured to high accuracy. These data, combined with previous measurements in the ground and excited bending states, give a dipole moment function of:

$$\mu_{v1v2v3v4} = 1.5610 + 7.2 \times 10^{-3}(v_1 + \tfrac{1}{2}) - 2.271 \times 10^{-1}(v_2 + \tfrac{1}{2}) + 3.75 \times 10^{-2}(v_3 + 1) - 1.65 \times 10^{-2}(v_4 + 1).$$

$\mu_e = 1.561$ D is the first experimental measurement of the NH_3 equilibrium moment. These results are also used to analyze and recalculate the dipole moment measured by Shimizu and coworkers [a] in a $v_{NH} = 5$ excited state of NH_3.

[a] K. Nakawa, Y. Moriwaki, and T. Shimizu, Opt. Lett. 14, 488 (1989).