THE DIPOLE MOMENT DISTRIBUTION OF HIGHLY EXCITED VIBRATIONAL STATES OF PROPYN-1-OL

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The dipole moment distribution of highly excited molecules can be obtained from the rotational spectrum of single molecular eigenstates. These eigenstates have complicated vibrational wavefunctions that can be expressed as linear combinations of the interacting normal mode vibrational states. The rotational spectrum of these eigenstates differs from rotational spectroscopy at low energy in that a set of rotational transitions, instead of a single transition, is observed. These transitions can be characterized as rotational or vibrational transitions by making reference to an average configuration of the molecule in the energy region being studied. By measuring the total rotational transition moment for a set of molecular eigenstates, it is possible to obtain the distribution of the dipole moment for the coupled normal mode vibrational states. Rotational spectra of several low-J molecular eigenstates of propyn-1-ol were measured using infrared-microwave double-resonance and infrared-microwave-microwave triple-resonance spectroscopy methods. The triple-resonance technique allows us to directly measure the transition moment using the AC Stark effect (or Autler-Townes splitting of states).