TERAHERTZ VIBRATION-ROTATION-TUNNELING SPECTROSCOPY OF THE WATER TETRAMER-d_8: THE COMBINED ANALYSIS OF THE VIBRATIONAL BANDS AT 4.13THz AND 2.03THz

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We report the measurement of terahertz vibration-rotation-tunneling spectra of $(D_2O)_4$ in the spectral region near 4.13 THz. The characterization of this perpendicular band extends the previously reported study [J. Chem. Phys. 111, 7801 (1999)]. We observed 239 new transitions. Each transition splits into a doublet with constant ca. 192 MHz spacing. These are included in a combined fit with previously measured 113 transitions of the 2.03 THz parallel band using an effective Hamiltonian similar to that used in the global fit of water trimer. The detailed understanding of the water tetramer evolving from this work underlies our efforts to quantify the contribution of many-body forces in condense phase water.