An effective rotational Hamiltonian was used to analyze rotational transitions in the vibrational ground state of acetone. Microwave and mm-wave measurements from the literature were combined with new measurements between 260 and 350 GHz and with new FT microwave frequencies in a global fit of all four torsional substates. Over 500 frequencies between 8 and 350 GHz were fit for transitions involving energy levels with $J$ up to 34 and $K_a$ up to 10. In one (preliminary) fit, 31 spectroscopic parameters were used to fit 555 frequencies to a dimensionless standard deviation of 1.25. The parameters determined in the least-squares fit were: $\rho = 0.062175(64)$, $\beta = 25.8160(73)$ deg., parameters equivalent to the rotational, quartic and sextic distortion constants, the internal energy tunneling parameters $\epsilon_{01} = -763.436(83)$ MHz, $\epsilon_{1-1} = 0.1057(62)$ MHz, $\epsilon_{11} = 0.9913(34)$ MHz, $\epsilon_{02} = 0.5851(14)$ MHz and ten tunneling constants related to the rotational and distortion constants. This particular fit is not quite satisfactory because a number of transitions, including low $J$-transitions, had to be excluded from the fit.

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