MICROWAVE AND MMWAVE STUDY OF CH_3SiH_3 INCLUDING THE PERTURBATION-ALLOWED TORSION-VIBRATION DIFFERENCE BAND $(v_{12} = 0, v_6 = 3) \leftrightarrow (v_{12} = 1, v_6 = 0)$

I. OZIER, *Department of Physics and Astronomy, University of British Columbia, Vancouver, BC, Canada V6T 1Z1; and Laboratorium für Physikalische Chemie, Eidgenössische Technische Hochschule, CH-8093 Zürich, Switzerland*; A. BAUDER, *Laboratorium für Physikalische Chemie, Eidgenössische Technische Hochschule, CH-8093 Zürich, Switzerland*; W. L. MEERTS, *Department of Molecular and Laser Physics, NSRIM, University of Nijmegen, NL-6500 GL Nijmegen, The Netherlands*; N. MOAZZEN-AHMADI, *Department of Physics and Astronomy, University of Calgary, Calgary, AB, Canada T2N 1N4*; J. SCHRODERUS, *Department of Physical Sciences, University of Oulu, FIN-90014, Linnanmaa, Finland.*

The vibration-torsion-rotation Hamiltonian in CH_3SiH_3 has been investigated using Fourier transform microwave methods and tunable sideband far-infrared spectroscopy. Four different studies have been carried out. First, the Q-branch of the torsion-vibration difference band $(v_{12} = 0, v_6 = 3) \leftrightarrow (v_{12} = 1, v_6 = 0)$ has been measured between 17.8 and 26.6 GHz. When three quanta of the torsional mode ν_6 are excited in the ground vibrational state (gs) for $(\sigma = -1)$ torsional sublevels with $K = 6$, these transitions become allowed through resonant Coriolis-like coupling to the lowest lying degenerate mode ν_{12} with no quanta of ν_6 excited. Second, direct l-doubling transitions in the state $(v_{12} = 1, v_6 = 0)$ have been observed between 8.3 and 17.5 GHz for both $\sigma = 0$ and $\sigma = \pm 1$. In the limit that the intervibrational interactions vanish, the σ-splitting between lines of the same J would be difficult to resolve, but frequency differences of more than 1 GHz due to these interactions have been determined. Third, the $(J = 1 \leftarrow 0)$ spectrum just below 22 GHz has been re-measured with higher resolution for $0 \leq v_6 \leq 4$ in the gs and for $(v_6 = 0)$ in ν_{12}. Finally, the $(J = 45 \leftarrow 44)$ spectrum near 1 THz has been obtained for $0 \leq v_6 \leq 2$ in the gs. A global data set of 3423 frequencies has been formed by merging the present 123 measurements with the data set used recently in the simultaneous analysis of the ν_{12} and ν_5 bands. By refining the (gs/ν_{12}/ν_5) Hamiltonian developed in this earlier work, a good fit to within experimental error has been obtained by varying 45 parameters. The grouping of the torsional motion with rotational rather than vibrational degrees of freedom will be discussed.