

#### IV. MICROWAVE SPECTROSCOPY

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##### A. INTERACTIONS BETWEEN TORSIONAL AND OVER-ALL ROTATIONS IN SYMMETRIC TOP MOLECULES

The work described in the Quarterly Progress Report, July 15, 1955, has been continued. The following  $J = 0 \rightarrow 1$  transitions were observed for methyl silane in its various torsional states. Assignments of the torsional states were based on relative intensity measurements.

n	k	Observed (Mc/sec)
0	0, 1	21,937.84
1	3	21,873.00
1	2	21,872.33
2	4	21,814.29
2	3	21,808.81
3	6	21,768.68
3	5	21,758.38
4	6	21,737.9
4	7	21,706.5

These data were compared with the results of Kivelson's theoretical treatment (1), and good agreement was found on all except the  $n = 4, k = 7$  line. The torsional energy of this state, however, is close to a nontorsional vibrational frequency of the molecule, so that breakdown of the theory might be expected.

Some measurements were also made on the  $J = 1 \rightarrow 2$  transitions with a harmonic obtained from a crystal doubler driven by a 2K33 klystron. Agreement between these data and Kivelson's work was indicated, although frequency-measurement difficulties and the limited power available did not warrant giving any definite conclusions. It is planned to repeat these measurements with the fundamental frequency obtained from a Raytheon QK294 klystron.

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##### References

1. D. Kivelson, J. Chem. Phys. 22, 1733 (1954).

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##### B. PARAMAGNETIC RESONANCE

The paramagnetic resonance spectrograph is being adapted for high-frequency magnetic modulation. The resonant microwave cavity has been fitted with modulation coils for magnetic field modulation within the cavity.

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