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Microwave Spectrum of Hydrazine

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The microwave spectrum of hydrazine N_2H_4 was observed in the frequency range from 4.7 to 30 kMc/sec. About two hundred lines were found, all exhibiting quadratic Stark effects. Their frequencies f and intensities I were listed in Table I. The spectrum is complicated by the internal rotation of one NH_2 group with respect to the other and further by the inversion of each NH_2 group similar to that occurring in ammonia and methylamine. For some lines the hyperfine structures due to the electric quadrupole coupling of two N nuclei with the overall and internal rotation of the molecule were found.

Stark effects were observed for stronger lines and the numbers of resolved components n are shown in the last column of Table I. Fairly large number of lines were found to show no splitting in spite of the Stark shift of about 10 Mc/sec at the electric field of 2000 volt/cm.

Table I. Microwave spectrum of hydrazine. (in Mc/sec)

f	I	n	f	I	n	f	I	n	f	I	n	f	I	n
4764.0	WW		13191.71			17077.2			19488.29	W		24285.79	MW	
4879.4	WW		13192.5	MW		17078.17	W		19505.92	W		24286.23		
5386.0	WW		13193.29			17078.73			19559.0	W		24377.18	W	
5562.53	W		13194.13			17079.32			19561.4			24824.59	M	
5568.98	W		13279.22			17079.94						24923.34	M	1
			13279.62	M	≧5	17080.5			19672.93	WW		24935.41	W	
5992	WW		13280.02						19804.8					
6144	WW		13291.33	WW		17092.35	W		19806.06	WW		25078.38	M	
6498.3	WW		13422.6	WW		17093.19			19874.46	W		25201.35	MW	
6575.71	MW		13542.53	WW		17103.84			19875.04			25213.53	M	
6588.6	WW					17104.58	M	2	19945.6	WW		26162.06	W	
			13557.30	WW		17105.42			20073.28	M		26346.36	W	
6759.91	W		13632.40	WW		17125.84	W		20073.78					
7444.9	WW		13988.41	WW		17326.69	W					26605.60	WW	
7977.76	MW	1?	14065.4	WW		17332.72	MW		20414.9	W		26872.2	WW	
8134.63	WW		14441.59	W					20797.01	MW		26874.2	WW	
8147.09	M	1				17797.71	WW		20950.65	MW		26883.58	MW	
			14475.4	WW		17865.95	W		21107.10			26895.45	S	1
8270.73	WW		14556.31	MW	≧4	18086.02	W	1?	21110.25	M				
8273.57	WW		14570.8	WW		18118.9	WW		21127.0	W		26934.06	M	1
8478.7	WW		14687.29	MW	1	18663.70	MW					26937.28	S	1
8824.0	WW		14700.4	WW					21153.63	M		26945.52	W	
9227.5	WW					18687.31	MW	1?	21165.43	W		26950.5	S	1
			14900.5	WW		18691.44	MW		21221.74	MS	1	26992.83		
9543.51	W		15062.1	WW		18781.43	W	1?	21233.40	MW		26995.23		
9555.23	S	1	15067.9	WW		18824.0	WW		21236.46	W		27027.4	W	
9689.62			15091.2	WW		18830.96	MS	≧5						
9689.72	MS	1	15099.30			18831.28			21239.52	W		27088.7	W	
9689.80			15099.86						21527.14	W		28002.87	W	
9697.59	WW		15100.72			18842.22	W		21661.71	W		28025.6	W	
			15101.32	MW		18940.14	WW		22235.35	M		28207.9	WW	
			15102.67			19088.39	WW		22413.3	W		28218.66	W	
11351.2			15103.40			19118.8	W							
11351.39	M		15104.37			19125.6			22516.50	W		28222.08	W	
11351.56						19126.2			22766.98	MS	1	28830.5	W	
11363.00	WW		15892.15	W		19126.93			22779.30	W		28844.4	W	
11388.0	WW		15921.66	WW		19127.65	M	≧5	22839.43	MW		28855.40	W	
11390.0	WW		16045.67	WW		19128.26			22839.91			28855.75		
11406.2	WW		16286.4	WW		19128.86			22902.87	MS	1	28933.1	W	
			16313.92	WW		19129.54								
11413.67	WW					19129.88			23119.2	W		29010.24	M	
12424.12	WW								23130.70	M	1	29011.74		
12772.8	WW		16376.94	W		19341.02	M	1?	23131.19			29012.73		
12946.29	M	≧3	16698.20	WW		19341.23			23230.27	MW		29199.6	W	
12946.61			16767.90	W		19341.5			23771.02	W		29240.5	W	
12946.99			17071.6			19352.35	W		24120.0	W		29251.64	M	1
13151.3	WW		17073.10	WW		19352.65						29252.01		
			17074.41			19353.0						29491.6	W	1