

3.2.4.2.1 $c\text{-C}_3\text{H}$ Microwave data for $c\text{-}^{12}\text{C}_3^1\text{H}$

Transition			ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)} $F' - F''$		

State: electronic \tilde{X}^2B_2 ; vibrational zero-point level

$1_{10} \leftarrow 1_{11}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 1$	14 686.630(4) ^{b)}	92Lov
		$0 \leftarrow 1$	14 689.718(12)	
		$1 \leftarrow 0$	14 697.692(8)	
	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1 \leftarrow 2$	14 767.700(8)	
		$2 \leftarrow 1$	14 812.010(8)	
		$1 \leftarrow 0$	14 840.638(10)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	14 877.675(4)	
		$2 \leftarrow 2$	14 893.051(4)	
		$1 \leftarrow 1$	14 895.243(8)	
		$1 \leftarrow 2$	14 910.625(4)	
$2_{12} \leftarrow 1_{11}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 0$	91 692.752(10)	94Yam
		$2 \leftarrow 1$	91 699.471(10)	
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	91 497.608(10)	
		$3 \leftarrow 2$	91 494.349(10)	
$2_{11} \leftarrow 1_{10}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	121 213.226(10)	
		$3 \leftarrow 2$	121 213.226(10)	
$3_{13} \leftarrow 2_{12}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	133 186.451(10)	
		$3 \leftarrow 2$	133 187.717(10)	
	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3 \leftarrow 2$	132 994.679(10)	
		$4 \leftarrow 3$	132 993.978(10)	
$3_{12} \leftarrow 2_{11}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	174 177.381(10)	
		$3 \leftarrow 2$	174 187.262(10)	
	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3 \leftarrow 2$	174 078.745(10)	
		$4 \leftarrow 3$	174 086.112(10)	
$4_{14} \leftarrow 3_{13}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	172 463.542(10) ^{c)}	
		$5 \leftarrow 4$	172 463.542(10) ^{c)}	
$4_{13} \leftarrow 3_{12}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3 \leftarrow 2$	216 640.873(10)	
		$4 \leftarrow 3$	216 638.026(10)	
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	216 492.396(10)	
		$5 \leftarrow 4$	216 488.036(10)	
$4_{32} \leftarrow 3_{31}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3 \leftarrow 2$	223 439.668(10)	
		$4 \leftarrow 3$	223 444.640(10)	
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	223 304.238(10)	
		$5 \leftarrow 4$	223 301.273(10)	
$4_{31} \leftarrow 3_{30}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3 \leftarrow 2$	238 686.633(10)	
		$4 \leftarrow 3$	238 692.077(10)	
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	238 638.558(10)	
		$5 \leftarrow 4$	238 636.443(10)	
$5_{15} \leftarrow 4_{14}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	211 318.729(10) ^{c)}	
		$5 \leftarrow 4$	211 318.729(10) ^{c)}	
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5 \leftarrow 4$	211 117.775(10) ^{c)}	
		$6 \leftarrow 5$	211 117.775(10) ^{c)}	

$5_{14} \leftarrow 4_{13}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	252 881.129(10)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5 \leftarrow 4$	252 881.586(10)
$5_{33} \leftarrow 4_{32}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	252 698.281(10)
	$4\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	252 697.412(10)
	$5\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	274 905.086(10)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5 \leftarrow 4$	274 919.615(10)
	$5\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	274 791.279(10)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5 \leftarrow 4$	274 891.526(10)
$5_{32} \leftarrow 4_{31}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$6 \leftarrow 5$	274 763.215(10)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4 \leftarrow 3$	274 773.912(10)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4 \leftarrow 3$	307 025.516(10)
$6_{16} \leftarrow 5_{15}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5 \leftarrow 4$	307 027.730(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	307 006.648(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5 \leftarrow 4$	249 746.796(10) [°]
$6_{15} \leftarrow 5_{14}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	249 746.796(10) [°]
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	249 544.254(10) [°]
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$7 \leftarrow 6$	249 544.254(10) [°]
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5 \leftarrow 4$	289 462.091(10)
$6_{34} \leftarrow 5_{33}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	289 462.789(10)
	$5\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	289 272.451(10)
	$6\frac{1}{2} \leftarrow 4\frac{1}{2}$	$7 \leftarrow 6$	289 271.949(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5 \leftarrow 4$	321 548.862(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	321 541.139(10)
$6_{32} \leftarrow 5_{31}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	321 569.223(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	321 385.738(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	321 413.818(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7 \leftarrow 6$	321 403.877(10)
$6_{51} \leftarrow 5_{50}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5 \leftarrow 4$	341 796.639(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	341 800.430(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	341 673.725(10)
$7_{17} \leftarrow 6_{16}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$7 \leftarrow 6$	341 671.495(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5 \leftarrow 4$	344 896.799 (10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	344 892.969(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	344 791.832(10)
$7_{16} \leftarrow 6_{15}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7 \leftarrow 6$	344 789.616(10)
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$6 \leftarrow 5$	288 124.063(10) [°]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	288 124.063(10) [°]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	287 920.669(10) [°]
$7_{35} \leftarrow 6_{34}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$8 \leftarrow 7$	287 920.669(10) [°]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$6 \leftarrow 5$	327 190.024(10) [°]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	327 190.024(10) [°]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	326 996.775(10) [°]
$8_{18} \leftarrow 7_{17}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$8 \leftarrow 7$	326 996.775(10) [°]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$6 \leftarrow 5$	363 974.662(10) [°]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	363 974.662(10) [°]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	363 813.389(10)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	363 812.219(10)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7 \leftarrow 6$	326 490.831(10) [°]
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	326 490.831(10) [°]
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	326 286.929(10) [°]

		$9 \leftarrow 8$	326 286.929(10) ^{c)}
$8_{17} \leftarrow 7_{16}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	365 168.458(10) ^{c)}
		$9 \leftarrow 8$	365 168.458(10) ^{c)}
$8_{36} \leftarrow 8_{17}$	$7\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7 \leftarrow 7$	246 965.972(10)
	$8\frac{1}{2} \leftarrow 8\frac{1}{2}$	$8 \leftarrow 8$	246 954.933(10)
		$8 \leftarrow 8$	246 409.033(10)
		$9 \leftarrow 9$	246 410.942(10)
$9_{19} \leftarrow 8_{18}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	364 854.295(10) ^{c)}
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$9 \leftarrow 8$	364 854.295(10) ^{c)}
		$9 \leftarrow 8$	364 650.030(10) ^{c)}
		$10 \leftarrow 9$	364 650.030(10) ^{c)}
$9_{37} \leftarrow 8_{36}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	442 527.241(10) ^{c)}
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$9 \leftarrow 8$	442 527.241(10) ^{c)}
		$9 \leftarrow 8$	442 344.364(10) ^{c)}
		$10 \leftarrow 9$	442 344.364(10) ^{c)}
$9_{37} \leftarrow 9_{18}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 8$	285 821.649(10)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$9 \leftarrow 9$	285 819.741(10)
		$9 \leftarrow 9$	285 288.618(10)
		$10 \leftarrow 10$	285 290.332(10)
$9_{36} \leftarrow 9_{37}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 8$	240 923.312(10)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$9 \leftarrow 9$	240 922.045(10)
		$9 \leftarrow 9$	241 337.477(10)
		$10 \leftarrow 10$	241 339.224(10)
$10_{19} \leftarrow 9_{18}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$9 \leftarrow 8$	441 992.646(10) ^{c)}
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$10 \leftarrow 9$	441 992.646(10) ^{c)}
		$10 \leftarrow 9$	441 793.566(10) ^{c)}
$11_{1,11} \leftarrow 10_{1,10}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	441 793.566(10) ^{c)}
		$10 \leftarrow 9$	441 572.959(10) ^{c)}
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$11 \leftarrow 10$	441 572.959(10) ^{c)}
		$11 \leftarrow 10$	441 368.153(10) ^{c)}
		$12 \leftarrow 11$	441 368.153(10) ^{c)}
$11_{1,10} \leftarrow 10_{19}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$10 \leftarrow 9$	480 330.618(10) ^{c)}
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$11 \leftarrow 10$	480 330.618(10) ^{c)}
		$11 \leftarrow 10$	480 130.389(10) ^{c)}
		$12 \leftarrow 11$	480 130.389(10) ^{c)}
$12_{1,12} \leftarrow 11_{1,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$12 \leftarrow 11$	479 722.380(10) ^{c)}
		$13 \leftarrow 12$	479 722.380(10) ^{c)}

^{a)} Coupling scheme: $\mathbf{J} = \mathbf{N} + \mathbf{S}$; $\mathbf{F} = \mathbf{J} + \mathbf{I}$ where \mathbf{I} is the ^1H nuclear spin.

^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^{c)} ^1H hyperfine structure not resolved.

Microwave data for $c\text{-}^{12}\text{C}^{13}\text{C}^{12}\text{C}^1\text{H}$ (symmetric)

Transition				ν [MHz]	Ref.			
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}						
		$F'_1 - F''_1$	$F' - F''$					
State: electronic \tilde{X}^2B_2 ; vibrational zero-point level								
$4_{31} \leftarrow 3_{30}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	3 \leftarrow 2	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	228 602.465(10) ^{b)}	94Yam			
		4 \leftarrow 3	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	228 578.161(10)				
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	228 583.561(10)				
		4 $\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	228 524.850(10)				
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	228 522.888(10)				
		5 \leftarrow 4	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	228 536.037(10)				
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	228 534.002(10)				
		$5_{15} \leftarrow 4_{14}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	4 \leftarrow 3		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	207 017.422(10) ^{c)}	
						$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	207 017.422(10) ^{c)}	
				5 \leftarrow 4		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	207 018.529(10) ^{c)}	
						$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	207 018.529(10) ^{c)}	
				5 $\frac{1}{2} \leftarrow 4\frac{1}{2}$		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	206 821.696(10) ^{c)}	
						$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	206 821.696(10) ^{c)}	
				6 \leftarrow 5		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	206 820.285(10) ^{c)}	
						$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	206 820.285(10) ^{c)}	
$5_{14} \leftarrow 4_{13}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$			4 \leftarrow 3	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	248 535.279(10)		
					$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	248 535.970(10)		
				5 \leftarrow 4	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	248 542.935(10) ^{c)}		
					$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	248 542.935(10) ^{c)}		
				5 $\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	248 362.646(10) ^{c)}		
					$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	248 362.646(10) ^{c)}		
				6 \leftarrow 5	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	248 358.056(10)		
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	248 357.064(10)				
		$5_{33} \leftarrow 4_{32}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	4 \leftarrow 3	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	266 706.532(10)		
				5 \leftarrow 4	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	266 705.382(10)		
				5 $\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	266 564.051(10)		
				6 \leftarrow 5	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	266 578.318(10)		
				$5_{32} \leftarrow 4_{31}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	4 \leftarrow 3	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	294 967.094(10)
							$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	294 969.324(10)
						5 \leftarrow 4	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	294 958.989(10)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$					294 961.203(10)		
5 $\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$					294 944.476(10)		
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$					294 943.480(10)		
6 \leftarrow 5	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$					294 950.403(10)		
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$					294 949.408(10)		
$6_{16} \leftarrow 5_{15}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$					5 \leftarrow 4	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	244 702.176(10) ^{c)}
							$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	244 702.176(10) ^{c)}
						6 \leftarrow 5	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	244 702.990(10) ^{c)}
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$			244 702.990(10) ^{c)}		

	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	244 504.536(10) [°]
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	244 504.536(10) [°]
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	244 503.392(10) [°]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	244 503.392(10) [°]
$6_{15} \leftarrow 5_{14}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5 \leftarrow 4$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	284 061.983(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	284 062.713(10)
		$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	284 066.103(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	284 066.816(10)
$6_{34} \leftarrow 5_{33}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	283 875.408(10)
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	283 874.880(10)
		$5 \leftarrow 4$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	313 203.591(10)
		$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	313 202.337(10)
$6_{33} \leftarrow 5_{32}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	313 066.419(10)
		$7 \leftarrow 6$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	313 064.959(10)
		$5 \leftarrow 4$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	355 850.160(10) [°]
		$6 \leftarrow 5$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	355 850.160(10) [°]
$7_{17} \leftarrow 6_{16}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$5 \leftarrow 4$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	355 851.088(10)
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	282 114.463(10) [°]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	282 114.463(10) [°]
		$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	282 113.586(10) [°]
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	282 113.586(10) [°]
		$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	282 313.238(10) [°]
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	282 313.238(10) [°]
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	282 313.838(10) [°]
$7_{16} \leftarrow 6_{15}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	282 313.838(10) [°]
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	320 576.978(10) [°]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	320 576.978(10) [°]
		$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	320 574.991(10) [°]
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	320 574.991(10) [°]
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	320 767.279(10) [°]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	320 767.279(10) [°]
		$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	335 675.057(10) [°]
$7_{35} \leftarrow 6_{34}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	335 675.057(10) [°]
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	335 676.993(10) [°]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	335 676.993(10) [°]
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	335 520.708(10) [°]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	335 520.708(10) [°]
		$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	335 519.317(10)
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	335 519.317(10)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	319 907.802(10) [°]
$8_{18} \leftarrow 7_{17}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	319 907.802(10) [°]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	319 907.802(10) [°]
		$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	319 907.802(10) [°]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	319 907.802(10) [°]
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	319 708.098(10) [°]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	319 708.098(10) [°]
		$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	319 707.356(10) [°]
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	319 707.356(10) [°]

$8_{17} \leftarrow 7_{16}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	358 062.832(10) [∘]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	358 062.832(10) [∘]
		$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	358 064.616(10) [∘]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	358 064.616(10) [∘]
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	357 872.490(10) [∘]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	357 872.490(10) [∘]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	357 870.928(10) [∘]
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	357 870.928(10) [∘]
$8_{36} \leftarrow 7_{35}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	395 330.273(10) [∘]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	395 330.273(10) [∘]
		$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	395 332.558(10) [∘]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	395 332.558(10) [∘]
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	395 162.728(10) [∘]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	395 162.728(10) [∘]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	357 497.423(10) [∘]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	357 497.423(10) [∘]
$9_{19} \leftarrow 8_{18}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	357 497.423(10) [∘]
		$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	357 497.423(10) [∘]
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	357 497.423(10) [∘]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	357 297.021(10) [∘]
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	357 297.021(10) [∘]
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	357 297.021(10) [∘]
			$10 \leftarrow 9$	357 297.021(10) [∘]
			$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	357 297.021(10) [∘]
$9_{18} \leftarrow 8_{17}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	395 552.906(10) [∘]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	395 552.906(10) [∘]
		$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	395 554.305(10) [∘]
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	395 554.305(10) [∘]
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	395 360.479(10) [∘]
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	395 360.479(10) [∘]
			$10 \leftarrow 9$	395 359.205(10) [∘]
			$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	395 359.205(10) [∘]

^a) Coupling scheme: $J = N + S$; $F_1 = J + I_1$; $F = F_1 + I_2$ where I_1 is the ¹³C nuclear spin and I_2 is the ¹H nuclear spin.

^b) The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^c) ¹H hyperfine structure not resolved.

Microwave data for *c*-¹³C¹²C¹²H (asymmetric)

Transition			ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^a)		
		$F'_1 - F''_1$ $F' - F''$		

State: electronic \tilde{X}^2B_2 ; vibrational zero-point level

$4_{23} \leftarrow 3_{22}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	201 622.452(10) ^{b,c}	94Yam
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	201 622.452(10) ^c	
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	201 565.353(10)	
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	201 560.078(10)	
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	201 515.065(10)	
		$5 \leftarrow 4$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$		

			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	201 510.001(10)
$4_{22} \leftarrow 3_{21}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3 \leftarrow 2$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	240 074.740(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	240 076.551(10)
		$4 \leftarrow 3$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	240 057.450(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	240 056.505(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	240 052.337(10)
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	240 054.198(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	240 029.982(10)
		$5 \leftarrow 4$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	240 029.051(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	236 407.833(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	236 395.688(10)
$4_{31} \leftarrow 3_{30}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3 \leftarrow 2$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	236 397.365(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	236 387.044(10)
		$4 \leftarrow 3$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	236 388.601(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	236 364.611(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	236 362.498(10)
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	206 300.497(10) [∘]
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	206 300.497(10) [∘]
		$5 \leftarrow 4$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	206 284.995(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	206 286.582(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	206 119.428(10)
$5_{05} \leftarrow 4_{04}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	206 117.900(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	206 103.135(10) [∘]
		$5 \leftarrow 4$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	206 103.135(10) [∘]
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	206 180.989(10) [∘]
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	206 180.989(10) [∘]
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4 \leftarrow 3$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	206 165.614(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	206 167.248(10)
		$5 \leftarrow 4$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	206 000.554(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	205 999.026(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	205 984.301(10) [∘]
$5_{15} \leftarrow 4_{14}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	205 984.301(10) [∘]
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	246 242.790(10) [∘]
		$5 \leftarrow 4$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	246 242.790(10) [∘]
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	246 205.082(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	246 209.097(10)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4 \leftarrow 3$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	246 104.205(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	246 099.896(10)
		$5 \leftarrow 4$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	246 064.614(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	246 063.754(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	242 593.266(10)
$5_{14} \leftarrow 4_{13}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	242 594.200(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	242 559.674(10)
		$5 \leftarrow 4$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	242 559.734(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	242 460.964(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	242 456.804(10)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4 \leftarrow 3$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	242 593.266(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	242 594.200(10)
		$5 \leftarrow 4$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	242 559.674(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	242 559.734(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	242 460.964(10)
$5_{24} \leftarrow 4_{23}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	242 456.804(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	242 456.804(10)
		$5 \leftarrow 4$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	242 593.266(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	242 594.200(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	242 559.674(10)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4 \leftarrow 3$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	242 559.734(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	242 460.964(10)
		$5 \leftarrow 4$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	242 456.804(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	242 593.266(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	242 594.200(10)

		$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	242 423.686(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	242 422.648(10)
$5_{33} \leftarrow 4_{33}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	269 863.419(10)
		$5 \leftarrow 4$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	269 779.136(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	269 775.453(10)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	269 717.685(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	269 709.123(10)
$6_{06} \leftarrow 5_{05}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5 \leftarrow 4$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	243 677.315(10) [∘]
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	243 677.315(10) [∘]
		$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	243 666.499(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	243 667.550(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	243 490.630(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	243 489.620(10)
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	243 479.163(10) [∘]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	243 479.163(10) [∘]
$6_{16} \leftarrow 5_{15}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5 \leftarrow 4$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	243 656.593(10) [∘]
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	243 656.593(10) [∘]
		$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	243 645.807(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	243 646.854(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	243 470.066(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	243 469.055(10)
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	243 458.600(10) [∘]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	243 458.600(10) [∘]
$6_{15} \leftarrow 5_{14}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	282 147.270(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	282 150.098(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	282 012.022(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	282 009.254(10)
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	281 986.128(10) [∘]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	281 986.128(10) [∘]
$6_{25} \leftarrow 5_{24}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	281 178.939(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	281 181.800(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	281 045.991(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	281 043.265(10)
$6_{34} \leftarrow 5_{33}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	314 754.250(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	314 750.280(10)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	314 667.888(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	314 663.089(10)
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	314 602.687(10)
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	314 611.443(10)
$7_{07} \leftarrow 6_{06}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	281 098.313(10) [∘]
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	281 098.313(10) [∘]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	280 899.532(10) [∘]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	280 899.532(10) [∘]
$7_{17} \leftarrow 6_{16}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	281 094.951(10) [∘]
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	281 094.951(10) [∘]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	280 896.231(10) [∘]

			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	280 896.231(10) ^c
$7_{16} \leftarrow 6_{15}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	319 122.158(10) ^c
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	319 122.158(10) ^c
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	319 106.604(10)
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	319 108.456(10)
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	318 951.087(10)
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	318 949.365(10)
		$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	318 933.952(10) ^c
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	318 933.952(10) ^c
$7_{26} \leftarrow 6_{25}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	318 911.528(10) ^c
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	318 911.528(10) ^c
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	318 896.113(10)
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	318 897.964(10)
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	318 741.390(10)
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	318 739.659(10)
		$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	318 724.339(10) ^c
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	318 724.339(10) ^c
$7_{36} \leftarrow 6_{35}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	355 527.687(10)
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	355 531.035(10)
		$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	355 446.051(10)
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	355 441.940(10)
$8_{08} \leftarrow 7_{07}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	318 526.339(10) ^{c,d}
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	318 526.339(10) ^{c,d}
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	318 333.268(10) ^{c,d}
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	318 333.268(10) ^{c,d}
		$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	318 327.113(10) ^{c,d}
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	318 327.113(10) ^{c,d}
$8_{18} \leftarrow 7_{17}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	318 526.339(10) ^{c,d}
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	318 526.339(10) ^{c,d}
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	318 333.268(10) ^{c,d}
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	318 333.268(10) ^{c,d}
		$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	318 327.113(10) ^{c,d}
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	318 327.113(10) ^{c,d}
$8_{17} \leftarrow 7_{16}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	356 415.901(10) ^c
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	356 415.901(10) ^c
		$8 \leftarrow 7$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	356 406.524(10)
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	356 237.135(10)
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	356 235.874(10)
		$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	356 225.097(10) ^c
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	356 225.097(10) ^c
$8_{27} \leftarrow 7_{26}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	356 375.249(10) ^c
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	356 375.249(10) ^c
		$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	356 364.563(10)
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	356 365.912(10)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	356 195.455(10)
		$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	356 184.692(10) ^c

			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	356 184.692(10) ^{c)}
$9_{09} \leftarrow 8_{08}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	355 954.421(10) ^{c,d)}
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	355 954.421(10) ^{c,d)}
		$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	355 949.948(10) ^{c,d)}
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	355 949.948(10) ^{c,d)}
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	355 759.765(10) ^{c,d)}
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	355 759.765(10) ^{c,d)}
		$10 \leftarrow 9$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	355 754.926(10) ^{c,d)}
			$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	355 754.926(10) ^{c,d)}
$9_{19} \leftarrow 8_{18}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	355 954.421(10) ^{c,d)}
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	355 954.421(10) ^{c,d)}
		$9 \leftarrow 8$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	355 949.948(10) ^{c,d)}
			$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	355 949.948(10) ^{c,d)}

^{a)} Coupling scheme: $J = N + S$; $F_1 = J + I_1$; $F = F_1 + I_2$ where I_1 is the ^{13}C nuclear spin and I_2 is the ^1H nuclear spin.

^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^{c)} ^1H hyperfine structure not resolved.

^{d)} K_c -doubling not resolved.

Microwave data for $c\text{-}^{12}\text{C}_3\text{H}$ ($c\text{-C}_3\text{D}$)

Transition			ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)} $F' - F''$		

State: electronic \tilde{X}^2B_2 ; vibrational zero-point level

$1_{10} \leftarrow 1_{11}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	10 718.200(4) ^{b)}	92Lov
		$\frac{1}{2} \leftarrow 1\frac{1}{2}$	10 718.673(4)	
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	10 720.228(4)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	10 893.525(4)	
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	10 893.619(4)	90Yam
$3_{12} \leftarrow 2_{11}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	^{c)}	148 278.012(20)	
	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	148 211.775(20)	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	148 211.775(20)	
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	148 212.580(20)	
$4_{14} \leftarrow 3_{13}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	^{c)}	152 727.232(20)	
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	^{c)}	152 555.175(20)	
$4_{13} \leftarrow 3_{12}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	^{c)}	191 075.120(20)	
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	190 973.100(20)	
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	190 973.100(20)	
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	190 972.488(20)	
$4_{32} \leftarrow 3_{31}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	185 708.606(20)	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	185 709.517(20)	

		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	185 710.453(20)
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	185 567.358(20)
$4_{31} \leftarrow 3_{30}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	190 637.619(20)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	190 638.448(20)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	190 639.329(20)
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	190 543.420(20)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	190 543.420(20)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	190 542.914(20)
$5_{15} \leftarrow 4_{14}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	187 709.888(20)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	187 533.173(20)
$5_{14} \leftarrow 4_{13}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	227 864.552(20)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	227 714.279(20)
$5_{33} \leftarrow 4_{32}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	231 485.117(20)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	231 367.976(20)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	231 363.760(20)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	231 365.804(20)
$5_{32} \leftarrow 4_{31}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	245 375.936(20)
$6_{16} \leftarrow 5_{15}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	222 177.860(20)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	221 998.360(20)
$6_{15} \leftarrow 5_{14}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	260 652.615(20)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	260 477.432(20)
$6_{34} \leftarrow 5_{33}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	275 331.402(20)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	275 329.656(20)
$6_{33} \leftarrow 5_{32}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	301 492.120(20)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	301 485.029(20)
$7_{17} \leftarrow 6_{16}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	256 433.731(20)
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	256 252.816(20)
$7_{16} \leftarrow 6_{15}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	292 930.099(20)
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	292 751.010(20)
$7_{34} \leftarrow 6_{33}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	354 441.399(20)
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	354 415.364(20)
$8_{18} \leftarrow 7_{17}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	290 614.540(20)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	290 432.889(20)
$8_{17} \leftarrow 7_{16}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	325 993.497(20)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	325 815.413(20)
$8_{36} \leftarrow 7_{35}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	355 535.930(20)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	355 395.475(20)
$9_{19} \leftarrow 8_{18}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	324 771.040(20)

	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	^{c)}	324 588.976(20)
$9_{18} \leftarrow 8_{17}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	^{c)}	359 656.703(20)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	^{c)}	359 478.967(20)
$10_{1,10} \leftarrow 9_{19}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	^{c)}	358 919.534(20)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	^{c)}	358 737.193(20)

^{a)} Coupling scheme: $\mathbf{J} = \mathbf{N} + \mathbf{S}$; $\mathbf{F} = \mathbf{J} + \mathbf{I}$ where \mathbf{I} is the ^2H nuclear spin.

^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^{c)} ^2H hyperfine structure not resolved.

Molecular parameters for $c\text{-}^{12}\text{C}_3^1\text{H}$

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_2 ; vibrational zero-point level			
A	[MHz] 44 536.821(67) ^{a)}	MW	94Yam
B	[MHz] 34 016.341 2(88)		
C	[MHz] 19 188.853 0(55)		
Δ_K	[MHz] – 0.414 2(78)		
Δ_{NK}	[MHz] 0.590 21(145)		
Δ_N	[kHz] 54.93(42)		
δ_K	[MHz] 0.359 70(57)		
δ_N	[kHz] 20.64(21)		
ϕ_K	[kHz] 0.101(190)		
ϕ_{KN}	[kHz] 0.151(89)		
ϕ_N	[kHz] – 0.014 9(81)		
ϕ_K	[kHz] 0.063(24)		
ϕ_{NK}	[kHz] – 0.038 0(186)		
ϕ_N	[kHz] – 0.007 4(40)		
ε_{aa}	[MHz] 113.279(24)		
ε_{bb}	[MHz] 59.378(23)		
ε_{cc}	[MHz] – 205.773(21)		
Δ_K^s	[kHz] 12.0(30)		
Δ_{NK}^s	[kHz] – 15.96(154)		
δ_K^s	[kHz] – 7.10(132)		
$a_F(^1\text{H})$	[MHz] – 27.250 4(182)		
$T_{aa}(^1\text{H})$	[MHz] 16.985(44)		
$T_{bb}(^1\text{H})$	[MHz] – 1.039(37)		
$r_s(\text{C-H})$	[nm] 0.107 60		
$r_s(\text{C-C})$	[nm] 0.137 71		
$r_s(\text{C-CH})$	[nm] 0.137 39		
μ	[D] 7.7(3)		92Lov

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

Molecular parameters for $c\text{-}^{12}\text{C}^{13}\text{C}^{12}\text{C}^1\text{H}$ (symmetric)

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_2 ; vibrational zero-point level			
A	[MHz] 44 539.805(46) ^{a)}	MW	94Yam
B	[MHz] 32 821.104(69)		
C	[MHz] 18 801.807 1(115)		

Δ_K	[MHz]	– 0.400 8(81)
Δ_{NK}	[MHz]	0.580 75(179)
Δ_N	[kHz]	52.13(63)
δ_K	[MHz]	0.354 1(24)
δ_N	[kHz]	19.50(33)
ϕ_K	[kHz]	0.0 ^{b)}
ϕ_{KN}	[kHz]	0.0 ^{b)}
ϕ_N	[kHz]	0.0 ^{b)}
ϕ_K	[kHz]	0.0 ^{b)}
ϕ_{NK}	[kHz]	0.0 ^{b)}
ϕ_N	[kHz]	0.0 ^{b)}
\mathcal{E}_{aa}	[MHz]	113.46(30)
\mathcal{E}_{bb}	[MHz]	57.404(150)
\mathcal{E}_{cc}	[MHz]	– 201.764(64)
Δ_K^s	[kHz]	0.0 ^{b)}
Δ_{NK}^s	[kHz]	–2.7(46)
δ_K^s	[kHz]	0.0 ^{b)}
$a_F(^{13}\text{C})$	[MHz]	– 2.29(52)
$T_{aa}(^{13}\text{C})$	[MHz]	– 28.73(34)
$T_{bb}(^{13}\text{C})$	[MHz]	68.25(42)
$a_F(^1\text{H})$	[MHz]	– 26.98(40)
$T_{aa}(^1\text{H})$	[MHz]	17.14(34)
$T_{bb}(^1\text{H})$	[MHz]	– 1.039 ^{b)}

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to this value.

Molecular parameters for $c\text{-}^{13}\text{C}^{12}\text{C}^{12}\text{C}^1\text{H}$ (asymmetric)

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_2 ; vibrational zero-point level			
A	[MHz] 42 896.575(64) ^{a)}	MW	94Yam
B	[MHz] 33 514.672(34)		
C	[MHz] 18 720.937 8(43)		
Δ_K	[MHz] – 0.358 1(47)		
Δ_{NK}	[MHz] 0.526 39(194)		
Δ_{N}	[kHz] 56.72(71)		
δ_K	[MHz] 0.331 35(63)		
δ_{N}	[kHz] 21.86(37)		
ϕ_K	[kHz] 0.0 ^{b)}		
ϕ_{KN}	[kHz] – 0.034(61)		
ϕ_{N}	[kHz] 0.0 ^{b)}		
ϕ_K	[kHz] 0.0 ^{b)}		
ϕ_{NK}	[kHz] 0.0 ^{b)}		
ϕ_{N}	[kHz] 0.0 ^{b)}		
ε_{aa}	[MHz] 108.817(83)		
ε_{bb}	[MHz] 58.544(50)		
ε_{cc}	[MHz] – 200.727(41)		
Δ_K^s	[kHz] 0.0 ^{b)}		
Δ_{NK}^s	[kHz] – 5.1(34)		
δ_K^s	[kHz] 0.0 ^{b)}		
$a_{\text{F}}(^{13}\text{C})$	[MHz] 403.69(33)		
$T_{aa}(^{13}\text{C})$	[MHz] 33.14(22)		
$T_{bb}(^{13}\text{C})$	[MHz] – 4.99(28)		
$a_{\text{F}}(^1\text{H})$	[MHz] – 27.364(167)		
$T_{aa}(^1\text{H})$	[MHz] 16.99(30)		
$T_{bb}(^1\text{H})$	[MHz] – 1.039 ^{b)}		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.^{b)} Parameter constrained to this value.Molecular parameters for $c\text{-}^{12}\text{C}_3^2\text{H}$ ($c\text{-C}_3\text{D}$)

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_2 ; vibrational zero-point level			
A	[MHz] 44 517.224(58) ^{a)}	MW	94Yam
B	[MHz] 27 917.117 0(87)		
C	[MHz] 17 080.747 0(67)		
Δ_K	[MHz] – 0.218 4(54)		
Δ_{NK}	[MHz] 0.413 73(47)		
Δ_{N}	[kHz] 34.387(131)		
δ_K	[MHz] 0.252 98(72)		
δ_{N}	[kHz] 12.111(42)		
ϕ_K	[kHz] 0.0 ^{b)}		
ϕ_{KN}	[kHz] 0.0 ^{b)}		
ϕ_{N}	[kHz] – 0.62(60)		
ϕ_K	[kHz] 0.0 ^{b)}		
ϕ_{NK}	[kHz] 0.0 ^{b)}		
ϕ_{N}	[kHz] 0.0 ^{b)}		
ε_{aa}	[MHz] 113.32(41)		
ε_{bb}	[MHz] 48.476(50)		

\mathcal{E}_{cc}	[MHz]	– 183.452(43)		
Δ_K^s	[kHz]	22(44)		
Δ_{NK}^s	[kHz]	– 12.1(57)		
δ_K^s	[kHz]	– 4.4(42)		
$a_F(^2\text{H})$	[MHz]	– 4.156(64)	MW	92Lov
$T_{aa}(^2\text{H})$	[MHz]	2.719(65)		
$T_{bb}(^2\text{H})$	[MHz]	– 0.139(40)		
$\chi_{aa}(^2\text{H})$	[MHz]	0.246(174)		
$\chi_{bb}(^2\text{H})$	[MHz]	– 0.170(94)		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to this value.

References for *c*-C₃H

92Lov Lovas, F.J., Suenram, R.D., Ogata, T., Yamamoto, S. : Astrophys. J. **399** (1992) 325.
94Yam Yamamoto, S., Saito, S. : J. Chem. Phys. **101** (1994) 5484.
90Yam Yamamoto, S., Saito, S. :Astrophys.J.Letts. **363** (1990) L13.

3.2.4.2.2 CH₂F

Far-infrared data for ¹²C¹H₂¹⁹F

Laser			Rotational transition ^{a)}	Ref.
Gas	λ [μm]	ν [GHz]		

State: electronic \tilde{X}^2B_1 ; vibrational zero point level				
HCOOD	567.1	528.635 2	9 _{8'} ← 8 _{8'} ^{b)} 9 _{7'} ← 8 _{7'} 9 _{6'} ← 8 _{6'} 9 _{5'} ← 8 _{5'} 9 _{4'} ← 8 _{4'} 9 ₃₆ ← 8 ₃₅ 9 ₃₇ ← 8 ₃₆	99Nol
CH ₂ F ₂	567.5	528.239 2	9 _{8'} ← 8 _{8'} 9 _{7'} ← 8 _{7'} 9 _{6'} ← 8 _{6'} 9 _{5'} ← 8 _{5'} 9 _{4'} ← 8 _{4'}	
DCOOD	567.9	527.926 0	9 _{8'} ← 8 _{8'} 9 _{7'} ← 8 _{7'} 9 _{6'} ← 8 _{6'} 9 _{5'} ← 8 _{5'} 9 _{4'} ← 8 _{4'}	
C ₂ H ₃ Cl	567.9	527.854 1	9 _{8'} ← 8 _{8'} 9 _{7'} ← 8 _{7'} 9 _{6'} ← 8 _{6'}	
HCOOH	393.6	761.608 3	13 _{10'} ← 12 _{10'} 13 _{9'} ← 12 _{9'} 13 _{8'} ← 12 _{8'} 13 _{7'} ← 12 _{7'} 13 _{6'} ← 12 _{6'} 13 _{5'} ← 12 _{5'}	
HCOOH	302.3	991.777 8	17 _{2,16} ← 16 _{2,15}	

N ₂ H ₄	301.3	995.077 8	17 ₈ ← 16 ₈ 17 ₇ ← 16 ₇ 17 ₆ ← 16 ₆
-------------------------------	-------	-----------	---

^{a)} Electron spin components not identified.^{b)} *K*-type doubling not resolved in most of the transitions.

Laser			Rotational transition ^{a)}	Ref.
Gas	λ [μ m]	ν [GHz]		

State: electronic \tilde{X}^2B_1 ; vibrational $v_4 = 1$ level

HCOOD	567.1	528.635 2	9 ₇ ← 8 ₇ ^{b)} 9 ₆ ← 8 ₆ 9 ₅ ← 8 ₅ 9 ₄ ← 8 ₄	99Nol
CH ₂ F ₂	567.5	528.239 2	9 ₈ ← 8 ₈ 9 ₇ ← 8 ₇ 9 ₆ ← 8 ₆ 9 ₄ ← 8 ₄ 9 ₃₆ ← 8 ₃₅ 9 ₃₇ ← 8 ₃₆	
DCOOD	567.9	527.926 0	9 ₇ ← 8 ₇ 9 ₆ ← 8 ₆ 9 ₅ ← 8 ₅	
C ₂ H ₃ Cl	567.9	527.854 1	9 ₇ ← 8 ₇ 9 ₆ ← 8 ₆ 9 ₅ ← 8 ₅	
HCOOH	393.6	761.608 3	13 ₈ ← 12 ₈ 13 ₇ ← 12 ₇ 13 ₆ ← 12 ₆	
N ₂ H ₄	301.3	995.077 8	17 ₈ ← 16 ₈ 17 ₇ ← 16 ₇	

^{a)} Electron spin components not identified.^{b)} *K*-type doubling not resolved in most of the transitions.Molecular parameters for ¹²C¹H₂¹⁹F

Parameter	Value	Method	Ref.
-----------	-------	--------	------

State: electronic \tilde{X}^2B_1 ; vibrational zero point level

<i>A</i>	[MHz]	265 200.0 ^{a)}	MW	83End
<i>B</i>	[MHz]	30 948.301(25) ^{b)}	FIR	99Nol
<i>C</i>	[MHz]	27 727.805(25)		
Δ_K	[MHz]	19.424 ^{a)}	MW	83End
Δ_{NK}	[MHz]	1.133 2(14)	FIR	99Nol
Δ_N	[kHz]	78.45(19)		
δ_K	[MHz]	1.026 0 ^{a)}	MW	83End
δ_N	[kHz]	7.38(66)	FIR	99Nol
Φ_{NK}	[Hz]	10.8(54)		
ϵ_{aa}	[MHz]	− 1 076.25(14)		
ϵ_{bb}	[MHz]	− 185.78(18)		
ϵ_{cc}	[MHz]	− 1.14(18)		
Δ_K^s	[MHz]	0.092(11)		
$a_F(^{19}\text{F})$	[MHz]	184.17(10)		

$T_{aa}(^{19}\text{F})$	[MHz]	– 255.24(10)
$T_{bb}(^{19}\text{F})$	[MHz]	– 212.27(17)
$T_{cc}(^{19}\text{F})$	[MHz]	467.51 ^{c)}
$C_{aa}(^1\text{F})^e$	[MHz]	0.385(76)
$a_F(^1\text{H})$	[MHz]	– 60.736(57)
$T_{aa}(^1\text{H})$	[MHz]	– 25.682(67)
$T_{bb}(^1\text{H})$	[MHz]	23.6(44)
$T_{cc}(^1\text{H})$	[MHz]	2.0(45) ^{c)}
g_s^{aa}		– 2.004 349 ^{d)}
g_s^{bb}		– 2.005 321 ^{d)}
g_s^{cc}		– 2.002 345 ^{d)}
g_s^{aa}		– 0.655(43)×10 ^{–3}
$g_N(^{19}\text{F})$		5.257 6
$g_N(^1\text{H})$		5.585 6

^{a)} Parameter constrained to this value from [83End].

^{b)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

^{c)} Derived value.

^{d)} Value calculated from Curl's relationship [65Cur].

^{e)} Nuclear spin-rotation parameter

References for CH₂F

65Cur Curl, R.F. : Mol. Phys. **9** (1965) 585.

83End Endo, Y., Yamada, C., Saito, S., Hirota, E. : J. Chem. Phys. **79** (1983) 1605.

99Nol Nolte, J., Wagner, H.G., Sears, T.J., Temps, F. : J. Molec. Spectrosc. **195** (1999) 43.

3.2.4.2.3 CHF₂

Microwave data for ¹²C¹H¹⁹F₂

Rotational transition	ν [MHz] ^{a)}	Ref.
$N_{K_a K_c}$		
State: electronic \tilde{X}^2A' ; vibrational zero point level (0 ⁺)		
$4_{14} \leftarrow 3_{03}$	132 357.50	98Ina
$5_{15} \leftarrow 4_{04}$	149 585.58	
$6_{16} \leftarrow 5_{05}$	166 261.09	
$7_{17} \leftarrow 6_{06}$	182 489.49	
$7_{07} \leftarrow 6_{16}$	99 750.07	
$8_{08} \leftarrow 7_{17}$	123 542.82	
$9_{09} \leftarrow 8_{18}$	147 339.70	
$10_{0,10} \leftarrow 9_{19}$	171 011.33	
$10_{19} \leftarrow 10_{0,10}$	105 682.30	
$11_{1,10} \leftarrow 11_{0,11}$	117 231.23	
$12_{1,11} \leftarrow 12_{0,12}$	130 262.64	
$13_{1,12} \leftarrow 13_{0,13}$	144 751.01	
$14_{1,13} \leftarrow 14_{0,14}$	160 627.19	
$15_{1,14} \leftarrow 15_{0,15}$	177 779.68	
$11_{1,10} \leftarrow 10_{29}$	100 585.56	
$12_{1,11} \leftarrow 11_{2,10}$	128 510.62	
$13_{1,12} \leftarrow 12_{2,11}$	156 750.41	
$14_{1,13} \leftarrow 13_{2,12}$	185 214.41	
$4_{23} \leftarrow 4_{14}$	177 843.99	
$5_{24} \leftarrow 5_{15}$	181 490.37	

$6_{25} \leftarrow 6_{16}$	185 886.65	
$6_{24} \leftarrow 6_{15}$	157 652.92	
$7_{25} \leftarrow 7_{16}$	154 277.15	
$8_{26} \leftarrow 8_{17}$	151 047.60	
$9_{27} \leftarrow 9_{18}$	148 032.47	
$15_{2,13} \leftarrow 15_{1,14}$	146 728.17	
$16_{2,14} \leftarrow 16_{1,15}$	150 770.65	
$17_{2,15} \leftarrow 17_{1,16}$	156 350.82	
$18_{2,16} \leftarrow 18_{1,17}$	163 553.27	
$19_{2,17} \leftarrow 19_{1,18}$	172 443.17	
$20_{2,18} \leftarrow 20_{1,19}$	183 061.45	
<hr/>		
State: electronic \tilde{X}^2A' ; vibrational zero point level (0 ⁻)		
$3_{13} \leftarrow 2_{02}$	114 529.24	98Ina
$4_{14} \leftarrow 3_{03}$	132 365.13	
$5_{15} \leftarrow 4_{04}$	149 582.44	
$6_{16} \leftarrow 5_{05}$	166 257.95	
$7_{17} \leftarrow 6_{06}$	182 486.18	
$7_{07} \leftarrow 6_{16}$	99 750.48	
$8_{08} \leftarrow 7_{17}$	123 549.72	
$9_{09} \leftarrow 8_{18}$	147 344.67	
$10_{0,10} \leftarrow 9_{19}$	171 018.33	
$10_{19} \leftarrow 10_{0,10}$	105 674.62	
$11_{1,10} \leftarrow 11_{0,11}$	117 224.50	
$12_{1,11} \leftarrow 12_{0,12}$	130 255.42	
$13_{1,12} \leftarrow 13_{0,13}$	144 743.26	
$14_{1,13} \leftarrow 14_{0,14}$	160 619.01	
$15_{1,14} \leftarrow 15_{0,15}$	177 770.85	
$11_{1,10} \leftarrow 10_{29}$	100 600.64	
$12_{1,11} \leftarrow 11_{2,10}$	128 525.25	
$13_{1,12} \leftarrow 12_{2,11}$	156 764.46	
$14_{1,13} \leftarrow 13_{2,12}$	185 227.93	
$4_{23} \leftarrow 4_{14}$	177 843.50	
$5_{24} \leftarrow 5_{15}$	181 489.17	
$6_{25} \leftarrow 6_{16}$	185 885.76	
$6_{24} \leftarrow 6_{15}$	157 654.35	
$7_{25} \leftarrow 7_{16}$	154 290.69	
$8_{26} \leftarrow 8_{17}$	151 010.99	
$9_{27} \leftarrow 9_{18}$	148 014.95	
$15_{2,13} \leftarrow 15_{1,14}$	146 716.78	
$16_{2,14} \leftarrow 16_{1,15}$	150 759.48	
$17_{2,15} \leftarrow 17_{1,16}$	156 339.97	
$18_{2,16} \leftarrow 18_{1,17}$	163 542.44	
$19_{2,17} \leftarrow 19_{1,18}$	172 432.16	
$20_{2,18} \leftarrow 20_{1,19}$	183 051.26	

^a) These are hypothetical pure rotational line frequencies obtained from analyzing the fluorine and hydrogen hfs splitting of each transition. Their errors are estimated to be a few hundred kHz.

Molecular parameters for ¹²C¹H¹⁹F₂

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A' ; vibrational zero point level (0 ⁺)			
A	[MHz] 67 204.63(36) ^{a)}	MW	98Ina
B	[MHz] 11 043.301(35)		
C	[MHz] 9 607.475(47)		
Δ_K	[MHz] 1.833(77)		
Δ_{NK}	[MHz] − 0.127 4(51)		
Δ_N	[MHz] 0.011 06(30)		
δ_K	[MHz] 0.068(25)		
δ_N	[kHz] 0.002 129(50)		
ϕ_K	[kHz] 0.0 ^{b)}		
ϕ_{KN}	[kHz] 0.41(112)		
ϕ_{NK}	[kHz] 0.016(57)		
ϕ_N	[Hz] 1.79(115)		
ϕ_K	[kHz] 5.5(47)		
ϕ_{NK}	[kHz] 0.0 ^{b)}		
ϕ_N	[kHz] 0.0 ^{b)}		
State: electronic \tilde{X}^2A' ; vibrational zero point level (0 [−])			
A	[MHz] 67 201.08(35)	MW	98Ina
B	[MHz] 11 042.925(66)		
C	[MHz] 9 607.801(78)		
Δ_K	[MHz] 0.911(80)		
Δ_{NK}	[MHz] − 0.090 0(58)		
Δ_N	[MHz] 0.009 91(27)		
δ_K	[MHz] − 0.153(41)		
δ_N	[kHz] 0.002 29(43)		
ϕ_K	[kHz] 0.0 ^{b)}		
ϕ_{KN}	[kHz] − 4.71(136)		
ϕ_{NK}	[kHz] − 0.308(88)		
ϕ_N	[Hz] − 4.33(96)		
ϕ_K	[kHz] − 26.0(57)		
ϕ_{NK}	[kHz] − 0.132(32)		
ϕ_N	[kHz] 0.0 ^{b)}		

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.^{b)} Parameter constrained to this value.Reference for CHF₂98Ina Inada, N., Saito, K., Hayashi, M., Ozeki, H., Saito, S. : Chem. Phys. Letts. **284** (1998) 142.

3.2.4.2.4 CH₂ClFar-infrared data for ¹²C¹H₂³⁵Cl

Laser			Rotational transition ^{a)} $N_{K_a K_c}$	Ref.
Gas	λ [μm]	ν [GHz]		
State: electronic \tilde{X}^2B_1 ; vibrational zero point level				
HCOOH	744.1	402.919 6	$13_{2'} \leftarrow 12_{2'}$ ^{b)}	94Sea
			$13_{3'} \leftarrow 12_{3'}$	
			$13_{4'} \leftarrow 12_{4'}$	
			$13_{5'} \leftarrow 12_{5'}$	
			$13_{6'} \leftarrow 12_{6'}$	
HCOOH	742.6	403.721 7	$13_{2'} \leftarrow 12_{2'}$	
			$13_{3'} \leftarrow 12_{3'}$	
			$13_{4'} \leftarrow 12_{4'}$	
			$13_{5'} \leftarrow 12_{5'}$	
			$13_{6'} \leftarrow 12_{6'}$	
N ₂ H ₄	461.1	650.207 7	$21_{2'} \leftarrow 20_{2'}$	
			$21_{3'} \leftarrow 20_{3'}$	
			$21_{4'} \leftarrow 20_{4'}$	
			$21_{5'} \leftarrow 20_{5'}$	
			$21_{6'} \leftarrow 20_{6'}$	

^{a)} Electron spin components not identified. Assignments made using the parameters determined by Endo *et al.* [84End].^{b)} *K*-type doubling not resolved.References for CH₂Cl

- 84End Endo, Y., Saito, S., Hirota, E. : Can. J. Phys. **62** (1984) 1347.
94Sea Sears, T.J., Temps, F., Wagner, H.G., Wolf, M. : J. Molec. Spectrosc. **168** (1994) 136.

3.2.4.2.5 CH₂BrFar-infrared data for ¹²C¹H₂^{79,81}Br

Laser			Rotational transition ^{a)} $N_{K_a K_c}$	Ref.
Gas	λ [μm]	ν [GHz]		
State: electronic \tilde{X}^2B_1 ; vibrational zero point level				
CH ₃ OH	1 223.66	244.996 6	$11_K \leftarrow 10_K$ ^{b)}	93Dav
HCOOH	744.05	402.919 6	$18_K \leftarrow 17_K$	
C ₂ H ₃ Cl	704.92 ₅	425.282 7	$19_K \leftarrow 18_K$	
C ₂ H ₃ F	672.1	446.1 ^{c)}	$20_K \leftarrow 19_K$	
C ₂ H ₃ Cl	638.0	469.8 ^{c)}	$21_K \leftarrow 20_K$	
HCOOH	515.17	581.929 7	$26_K \leftarrow 25_K$	
C ₂ H ₃ F	447.3	670.3 ^{c)}	$30_K \leftarrow 29_K$	
CH ₃ I	447.14	670.463 0		
C ₂ H ₃ Cl	421.0	712.0 ^{c)}	$32_K \leftarrow 31_K$	
CH ₃ OH	386.34	775.982 4	$35_K \leftarrow 34_K$	
C ₂ H ₃ Cl	385.91	776.847 1		
C ₂ H ₃ F	336.0	892.2 ^{c)}	$40_K \leftarrow 39_K$	

^{a)} Electron spin components not identified.^{b)} *K*-type doubling not resolved. *K*-assignment not available.^{c)} The frequency of this laser line has not yet been measured.Far-infrared data for ¹²C²H₂^{79,81}Br (CD₂Br)

Laser			Rotational transition ^{a)}	Ref.
Gas	λ [μm]	ν [GHz]		
State: electronic \tilde{X}^3B_1 ; vibrational zero point level				
C ₂ H ₃ F	447.3	670.3 ^{b)}	$36_{K_c} \leftarrow 35_{K_c}^c$	93Dav

^{a)} Electron spin components not identified.^{b)} The frequency of this laser line has not yet been measured.^{c)} *K*-type doubling not resolved. *K*-assignment not available.Reference for CH₂Br93Dav Davies, P.B., Liu, Y., Liu, Z. : Chem. Phys. Letts. **214** (1993) 305.

3.2.4.2.6 H₂CNMicrowave data for ¹H₂¹²C¹⁴N

Transition				ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}			
		$F'_1 - F''_1$	$F' - F''$		
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level					
$1_{01} \leftarrow 0_{00}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	73 505.877(10) ^{b)}	92Yam
			$1\frac{1}{2} \leftarrow 2\frac{1}{2}$	73 510.462(10)	
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	73 465.480(10)	
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	73 464.764(10)	
			$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	73 444.240(10)	
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	73 355.762(10)	
			$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	73 369.366(10)	
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	73 392.507(10)	
			$1\frac{1}{2} \leftarrow \frac{1}{2}$	73 395.101(10)	
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	73 409.042(10)	
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	73 342.507(10)	
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	73 345.486(10)	
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	73 349.648(10)	
$2_{02} \leftarrow 1_{01}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	146 793.082(10)	
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	146 762.703(10)	
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	146 755.839(10)	
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	146 745.835(10)	
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	146 689.681(10)	
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	146 700.407(10)	
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	146 708.937(10)	
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	146 713.348(10)	
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	146 721.851(10)	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	146 672.825(10)	
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	146 674.203(10)	
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	146 675.065(10)	
$2_{12} \leftarrow 1_{11}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	)	$\frac{1}{2} \leftarrow \frac{1}{2}$	142 200.529(10)	
		)	$1\frac{1}{2} \leftarrow \frac{1}{2}$	142 206.300(10)	
		)	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	142 148.741(10)	
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	)	$1\frac{1}{2} \leftarrow \frac{1}{2}$	141 739.362(10)	
		)	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	141 735.737(10)	
		)	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	141 749.977(10)	
$2_{11} \leftarrow 1_{10}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	)	$1\frac{1}{2} \leftarrow \frac{1}{2}$	151 911.284(10)	
		)	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	151 907.029(10)	
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	)	$1\frac{1}{2} \leftarrow \frac{1}{2}$	151 598.099(10)	
		)	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	151 603.836(10)	
		)	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	151 611.899(10)	
$3_{03} \leftarrow 2_{02}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	219 962.480(10)	
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	219 963.925(10)	

			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	219 952.409(10)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	219 945.864(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	219 943.265(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	219 939.119(10)
	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	219 865.464(10)
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	219 868.253(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	219 869.529(10)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	219 876 647(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	219 880.253(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	219 885.860(10)
$3_{13} \leftarrow 2_{12}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	)	$1\frac{1}{2} \leftarrow \frac{1}{2}$	212 937.041(10)
		)	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	212 928.547(10)
		)	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	212 919.574(10)
	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	)	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	212 674.226(10)
$3_{12} \leftarrow 2_{11}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	)	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	227 589.148(10)
	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	)	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	227 431.094(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	227 437.004(10)
$3_{22} \leftarrow 2_{21}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	220 412.132(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	220 387.546(10)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	220 435.528(10) ^d
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	220 435.528(10) ^d
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	220 421.216(10)
	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	220 013.735(10)
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	220 015.860(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	220 018.865(10)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	219 997.393(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	220 002.527(10)
$3_{21} \leftarrow 2_{20}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	220 755.035(10)
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	220 722.366(10)
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	220 690.275(10)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	220 724.171(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	220 692.685(10)
	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	220 305.418(10)
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	220 307.709(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	220 310.914(10)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	220 286.398(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	220 289.787(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	220 295.142(10)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	220 245.841(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	220 250.898(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	220 260.004(10)
$4_{04} \leftarrow 3_{03}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	292 925.038(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	292 926.230(10)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	292 917.538(10)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	292 911.101(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	292 909.335(10)

			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	292 907.148(10)
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	292 815.481(10)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	292 823.184(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	292 825.591(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	292 828.963(10)
$4_{14} \leftarrow 3_{13}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	)	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	283 738.686(10)
		)	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	283 735.999(10)
		)	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	283 733.581(10)
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	283 523.214(10) ^d
		)	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	283 523.214(10) ^d
		)	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	283 523.214(10) ^d
$4_{13} \leftarrow 3_{12}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	)	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	303 299.544(10)
		)	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	303 298.188(10)
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	303 180.505(10)
		)	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	303 183.304(10)
$4_{23} \leftarrow 3_{22}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	293 647.663(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	293 633.867(10)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	293 524.602(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	293 532.327(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	293 542.405(10)
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	293 450.627(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	293 437.626(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	293 424.088(10)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	293 383.181(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	293 379.170(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	293 375.661(10)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	293 323.747(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	293 326.162(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	293 329.527(10)
$4_{22} \leftarrow 3_{21}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	294 368.599(10)
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	294 359.859(10)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	294 353.747(10)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	294 260.549(10)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	294 270.000(10)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	294 314.926(10) ^d
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	294 314.926(10) ^d
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	294 147.118(10)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	294 109.245(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	294 103.156(10)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	294 053.363(10)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	294 056.235(10)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	294 060.340(10)
$5_{05} \leftarrow 4_{04}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	365 590.508(20)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	365 578.952(20)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	365 577.982(20)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	365 576.981(20)

	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	365 471.154(20) ^d
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	365 471.154(20) ^d
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	365 475.441(20)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	365 476. 912(20)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	365 478. 693(20)
$5_{15} \leftarrow 4_{14}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	354 487.245(20)
		)	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	354 486.004(20)
		)	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	354 485.008(20)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	354 244.684(20)
$5_{14} \leftarrow 4_{13}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	378 941.131(20)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	378 838.881(20) ^d
		)	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	378 838.881(20) ^d
$5_{24} \leftarrow 4_{23}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	366 855.198(20)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	366 859.355(20)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	366 785.440(20)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	366 791.521(20)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	366 673.481(20)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	366 682.550(20)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	366 695.480(20)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	366 752.586(20)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	366 762.812(20)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	366 608.008(20)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	366 609.667(20)
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	366 613.060(20)
$5_{23} \leftarrow 4_{22}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	368 295.856(20)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	368 301.053(20)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	368 286.758(20)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	368 210.251(20)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	368 205.936(20)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	368 223.449(20)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	368 130.003(20)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	368 139.960(20)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	368 153.245(20)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	368 137.482(20)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	368 063.614(20)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	368 065.796(20)
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	368 069.488(20)
$5_{33} \leftarrow 4_{32}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	367 217.033(20)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	366 834.086(20)
		)	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	367 237.529(20)
$5_{32} \leftarrow 4_{31}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	367 244.684(20)
		)	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	367 237.529(20)
		)	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	367 230.813(20)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	368 848.204(20)
$5_{4*} \leftarrow 4_{4*}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	367 111.522(20)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	367 099.952(20)

	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	367 101.998(20)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	367 090.691(20)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	367 078.717(20)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	367 105.556(20)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	367 093.539(20)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	367 081.665(20)
$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	366 495.749(20)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	366 503.869(20)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	366 489.162(20)

^{a)} Coupling scheme: $J = N + S$; $F_1 = J + I_1$; $F = F_1 + I_2$ where I_1 is the resultant nuclear spin of the two H atoms ($I_1 = 0$ or 1) and I_2 is the ¹⁴N nuclear spin.

^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^{c)} *Para* levels with $I_1 = 0$.

^{d)} ¹⁴N hyperfine splitting not resolved.

Molecular parameters for ¹H₂¹²C¹⁴N

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level			
A [MHz]	284 336.1(72) ^{a)}	MW	92Yam
B [MHz]	39 158.379(46)		
C [MHz]	34 245.445(44)		
A_K [MHz]	19.412 ^{b)}	MW	80Cor
A_{NK} [MHz]	2.441 78(90)	MW	92Yam
A_N [kHz]	87.588(110)		
δ_K [MHz]	1.818(21)		
δ_N [kHz]	12.648(160)		
Φ_{KN} [kHz]	− 0.075(65)		
\mathcal{E}_{aa} [MHz]	631.884(95)		
\mathcal{E}_{bb} [MHz]	− 22.544(77)		
\mathcal{E}_{cc} [MHz]	− 208.366(71)		
Δ_K^s [MHz]	− 0.093 1(120)		
Δ_{NK}^s [kHz]	− 8.3(69)		
$a_F(^1H)$ [MHz]	233.152(74)		
$T_{aa}(^1H)$ [MHz]	8.294(57)		
$T_{bb}(^1H)$ [MHz]	− 2.07(126)		
$a_F(^{14}N)$ [MHz]	25.916(40)		
$T_{aa}(^{14}N)$ [MHz]	− 45.143(52)		
$T_{bb}(^{14}N)$ [MHz]	80.370(136)		
$\chi_{aa}(^{14}N)$ [MHz]	− 4.283(74)		
$\chi_{bb}(^{14}N)$ [MHz]	1.69(23)		
A_c [uÅ ²]	0.074 2		
$r_z(H-C)$ [nm]	0.111 ^{c)}		
$r_z(C-N)$ [nm]	0.124 7		
$\angle_z(H-C-H)$ [deg]	116.7		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to value of A_K for H₂CO from [80Cor].

^{c)} Parameter constrained to this value.

References for H₂CN

- 80Cor Cornet, R., Winnemisser, G. : J. Molec. Spectrosc. **80** (1980) 438.
 92Yam Yamamoto, S., Saito, S. : J. Chem. Phys. **96** (1992) 4157.

3.2.4.2.7 H₂CPMicrowave data for ¹H ¹²C ³¹P

Transition				ν [MHz]	Ref.			
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}						
		$F_1' - F_1''$	$F' - F''$					
State: electronic \tilde{X}^2B_2 ; vibrational zero-point level								
$8_{08} \leftarrow 7_{07}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$10 \leftarrow 9$	263 440.065(25) ^{b)}	99Sai			
			$9 \leftarrow 8$	263 441.486(25) ^{c)}				
			$8 \leftarrow 7$	263 441.486(25) ^{c)}				
		$8 \leftarrow 7$	$9 \leftarrow 8$	263 442.595(25) ^{c)}				
			$8 \leftarrow 7$	263 442.595(25) ^{c)}				
			$7 \leftarrow 6$	263 442.595(25) ^{c)}				
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8 \leftarrow 7$	$9 \leftarrow 8$		263 602.227(25)		
				$8 \leftarrow 7$		263 603.665(25)		
				$7 \leftarrow 6$		263 601.236(25)		
			$7 \leftarrow 6$	$8 \leftarrow 7$		263 599.525(25) ^{c)}		
				$7 \leftarrow 6$		263 599.525(25) ^{c)}		
				$6 \leftarrow 5$		263 599.525(25) ^{c)}		
				$8_{18} \leftarrow 7_{17}$		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	^{d)}	259 684.552(25)
		^{d)}	259 686.702(25)					
		^{d)}	259 973.031(25)					
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	^{d)}				259 976.377(25)	
$8_{17} \leftarrow 7_{16}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$		$9 \leftarrow 8$		^{d)}		267 436.866(25)	
					^{d)}		267 435.145(25)	
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	^{d)}		267 582.014(25)			
			^{d)}		267 580.262(25)			
		$8_{27} \leftarrow 7_{26}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$		$9 \leftarrow 8$		$10 \leftarrow 9$	263 453.332(25)
							$9 \leftarrow 8$	263 456.566(25) ^{c)}
							$8 \leftarrow 7$	263 456.566(25) ^{c)}
					$8 \leftarrow 7$		$9 \leftarrow 8$	263 451.552(25)
							$8 \leftarrow 7$	263 457.620(25)
							$7 \leftarrow 6$	263 458.927(25)
					$7\frac{1}{2} \leftarrow 6\frac{1}{2}$		$8 \leftarrow 7$	$9 \leftarrow 8$	263 860.527(25) ^{c)}
				$8 \leftarrow 7$		263 860.527(25) ^{c)}		
				$7 \leftarrow 6$		263 862.530(25)		
				$7 \leftarrow 6$		$8 \leftarrow 7$	263 862.483(25)	
$7 \leftarrow 6$	263 861.221(25)							
$6 \leftarrow 5$	263 868.229(25)							
$8_{26} \leftarrow 7_{25}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$			$9 \leftarrow 8$		$10 \leftarrow 9$	263 666.085(25)	
		$9 \leftarrow 8$	263 669.177(25) ^{c)}					
		$8 \leftarrow 7$	263 669.177(25) ^{c)}					
		$8 \leftarrow 7$	$9 \leftarrow 8$	263 662.633(25)				
			$8 \leftarrow 7$	263 668.053(25)				
			$7 \leftarrow 6$	263 669.177(25) ^{c)}				
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8 \leftarrow 7$	$9 \leftarrow 8$	264 061.082(25) ^{c)}			
				$8 \leftarrow 7$	264 061.082(25) ^{c)}			
				$7 \leftarrow 6$	264 063.329(25) ^{c)}			
			$7 \leftarrow 6$	$8 \leftarrow 7$	264 064.236(25)			
				$7 \leftarrow 6$	264 063.329(25) ^{c)}			
				$6 \leftarrow 5$	264 069.792(25)			

$8_{36} \leftarrow 7_{35}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$d)$	263 298.409(25)
		$8 \leftarrow 7$	$d)$	263 291.138(25)
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8 \leftarrow 7$	$d)$	264 038.928(25)
$8_{36} \leftarrow 7_{35}$		$7 \leftarrow 6$	$d)$	264 048.495(25)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$d)$	263 299.494(25)
		$8 \leftarrow 7$	$d)$	263 292.157(25)
$8_{36} \leftarrow 7_{35}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8 \leftarrow 7$	$d)$	264 039.923(25)
		$7 \leftarrow 6$	$d)$	264 049.479(25)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$10 \leftarrow 9$	262 977.672(25)
$8_4 \leftarrow 7_4$			$9 \leftarrow 8$	262 978.771(25) ^{c)}
			$8 \leftarrow 7$	262 978.771(25) ^{c)}
		$8 \leftarrow 7$	$9 \leftarrow 8$	262 965.037(25)
			$8 \leftarrow 7$	262 966.312(25) ^{c)}
			$7 \leftarrow 6$	262 966.312(25) ^{c)}
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8 \leftarrow 7$	$9 \leftarrow 8$	264 201.108(25) ^{c)}
			$8 \leftarrow 7$	264 201.108(25) ^{c)}
			$7 \leftarrow 6$	264 201.108(25) ^{c)}
		$7 \leftarrow 6$	$8 \leftarrow 7$	264 218.574(25) ^{c)}
			$7 \leftarrow 6$	264 218.574(25) ^{c)}
			$6 \leftarrow 5$	264 218.574(25) ^{c)}
		$10 \leftarrow 9$	$11 \leftarrow 10$	296 303.660(25)
			$10 \leftarrow 9$	296 304.864(25) ^{c)}
			$9 \leftarrow 8$	296 304.864(25) ^{c)}
		$9 \leftarrow 8$	$10 \leftarrow 9$	296 304.864(25) ^{c)}
$9_{09} \leftarrow 8_{08}$			$9 \leftarrow 8$	296 306.111(25) ^{c)}
			$8 \leftarrow 7$	296 306.111(25) ^{c)}
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$10 \leftarrow 9$	296 469.176(25) ^{c)}
			$9 \leftarrow 8$	296 469.176(25) ^{c)}
			$8 \leftarrow 7$	296 470.695(25)
		$8 \leftarrow 7$	$9 \leftarrow 8$	296 466.890(25) ^{c)}
			$8 \leftarrow 7$	296 466.890(25) ^{c)}
			$7 \leftarrow 6$	296 468.063(25)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	$d)$	292 141.452(25)
		$9 \leftarrow 8$	$d)$	292 143.034(25)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$d)$	292 417.747(25)
		$8 \leftarrow 7$	$d)$	292 419.957(25)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	$d)$	300 850.932(25)
		$9 \leftarrow 8$	$d)$	300 849.505(25)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$d)$	300 984.001(25)
$9_{28} \leftarrow 8_{27}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	$11 \leftarrow 10$	296 408.685(25)
			$10 \leftarrow 9$	296 414.594(25)
			$9 \leftarrow 8$	296 416.401(25)
		$9 \leftarrow 8$	$10 \leftarrow 9$	296 409.897(25)
			$9 \leftarrow 8$	296 431.569(25)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$10 \leftarrow 9$	296 756.598(25) ^{c)}
			$9 \leftarrow 8$	296 756.598(25) ^{c)}
			$8 \leftarrow 7$	296 753.301(25)
		$8 \leftarrow 7$	$9 \leftarrow 8$	296 747.913(25)
			$8 \leftarrow 7$	296 732.483(25)
			$7 \leftarrow 6$	296 767.853(25)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	$11 \leftarrow 10$	296 711.415(25)
			$10 \leftarrow 9$	296 716.284(25)
			$9 \leftarrow 8$	296 717.532(25)

		9 ← 8	10 ← 9	296 709.905(25)
			9 ← 8	296 727.076(25)
			8 ← 7	296 740.424(25)
	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	10 ← 9	297 045.487(25)
			9 ← 8	297 043.429(25)
			8 ← 7	297 047.468(25)
		8 ← 7	9 ← 8	297 040.131(25)
			8 ← 7	297 028.688(25)
			7 ← 6	297 056.264(25)
9 ₃₇ ← 8 ₃₆	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	^{d)}	296 300.236(25)
		9 ← 8	^{d)}	296 295.045(25)
	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	^{d)}	296 912.728(25)
		8 ← 7	^{d)}	296 919.347(25)
9 ₃₆ ← 8 ₃₅	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	^{d)}	296 302.054(25)
		9 ← 8	^{d)}	296 296.879(25)
	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	^{d)}	296 914.488(25)
		8 ← 7	^{d)}	296 921.044(25)
9 ₄ ← 8 ₄	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	11 ← 10	296 006.030(25)
			10 ← 9	296 007.058(25) ^{c)}
			9 ← 8	296 007.058(25) ^{c)}
		9 ← 8	10 ← 9	295 997.044(25)
			9 ← 8	295 998.141(25) ^{c)}
			8 ← 7	295 998.141(25) ^{c)}
	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	10 ← 9	296 993.367(25) ^{c)}
			9 ← 8	296 993.367(25) ^{c)}
			8 ← 7	296 993.367(25) ^{c)}
		8 ← 7	9 ← 8	297 005.218(25) ^{c)}
			8 ← 7	297 005.218(25) ^{c)}
			7 ← 6	297 005.218(25) ^{c)}
9 ₅ ← 8 ₅	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	^{d)}	295 635.098(25)
		9 ← 8	^{d)}	295 620.703(25)
	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	^{d)}	297 122.697(25)
		8 ← 7	^{d)}	297 142.417(25)
10 _{0,10} ← 9 ₀₉	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	12 ← 11	329 140.823(25)
			11 ← 10	329 141.778(25) ^{c)}
			10 ← 9	329 141.778(25) ^{c)}
		10 ← 9	11 ← 10	329 143.249(25) ^{c)}
			10 ← 9	329 143.249(25) ^{c)}
			9 ← 8	329 143.249(25) ^{c)}
	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	11 ← 10	329 310.328(25) ^{c)}
			10 ← 9	329 310.328(25) ^{c)}
			9 ← 8	329 311.573(25)
		9 ← 8	10 ← 9	329 308.002(25) ^{c)}
			9 ← 8	329 308.002(25) ^{c)}
			8 ← 7	329 308.999(25)
10 _{1,10} ← 9 ₁₉	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	^{d)}	324 587.474(25)
		10 ← 9	^{d)}	324 588.791(25)
	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	^{d)}	324 855.433(25)
		9 ← 8	^{d)}	324 856.820(25)
10 _{1,9} ← 9 ₁₈	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	^{d)}	334 253.326(25)
		10 ← 9	^{d)}	334 252.220(25)
	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	^{d)}	334 377.854(25)
		9 ← 8	^{d)}	334 376.194(25)

$10_{2,9} \leftarrow 9_{28}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$12 \leftarrow 11$	329 349.964(25)
			$11 \leftarrow 10$	329 372.065(25)
			$10 \leftarrow 9$	329 387.541(25)
			$10 \leftarrow 9$	329 364.339(25)
			$10 \leftarrow 9$	329 253.447(25)
$10_{2,8} \leftarrow 9_{27}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	$11 \leftarrow 10$	329 630.670(25)
			$10 \leftarrow 9$	329 662.933(25)
			$9 \leftarrow 8$	329 733.165(25)
			$9 \leftarrow 8$	329 735.961(25)
			$8 \leftarrow 7$	329 669.917(25)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$12 \leftarrow 11$	329 764.716(25)
			$11 \leftarrow 10$	329 778.133(25)
			$10 \leftarrow 9$	329 780.000(25)
			$10 \leftarrow 9$	329 769.920(25)
			$10 \leftarrow 9$	329 651.138(25)
$10_{38} \leftarrow 9_{37}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	$11 \leftarrow 10$	329 680.542(25)
			$11 \leftarrow 10$	330 041.919(25)
			$9 \leftarrow 8$	330 082.382(25)
			$10 \leftarrow 9$	330 139.348(25)
			$9 \leftarrow 8$	330 128.359(25)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$8 \leftarrow 7$	330 066.977(25)
			$11 \leftarrow 10$	329 285.531(25) ^{c)}
			$10 \leftarrow 9$	329 282.155(25)
			$10 \leftarrow 9$	329 807.974(25)
			$9 \leftarrow 8$	329 812.821(25)
$10_{37} \leftarrow 9_{36}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$11 \leftarrow 10$	329 289.136(25)
			$10 \leftarrow 9$	329 285.531(25) ^{c)}
			$10 \leftarrow 9$	329 810.857(25)
			$9 \leftarrow 8$	329 815.735(25)
			$11 \leftarrow 10$	329 004.629(25)
$10_4 \leftarrow 9_4$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$12 \leftarrow 11$	329 005.514(25) ^{c)}
			$11 \leftarrow 10$	329 005.514(25) ^{c)}
			$10 \leftarrow 9$	329 005.514(25) ^{c)}
			$10 \leftarrow 9$	328 997.948(25)
			$10 \leftarrow 9$	328 998.890(25) ^{c)}
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	$9 \leftarrow 8$	328 998.890(25) ^{c)}
			$11 \leftarrow 10$	329 826.839(25) ^{c)}
			$10 \leftarrow 9$	329 826.839(25) ^{c)}
			$9 \leftarrow 8$	329 826.839(25) ^{c)}
			$10 \leftarrow 9$	329 835.250(25) ^{c)}
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$9 \leftarrow 8$	329 835.250(25) ^{c)}
			$8 \leftarrow 7$	329 835.250(25) ^{c)}
			$11 \leftarrow 10$	328 657.331(25)
			$10 \leftarrow 9$	328 646.849(25)
			$10 \leftarrow 9$	329 876.733(25)
$10_5 \leftarrow 9_5$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$12 \leftarrow 11$	$13 \leftarrow 12$	361 948.859(25)
			$12 \leftarrow 11$	361 949.663(25) ^{c)}
			$11 \leftarrow 10$	361 949.663(25) ^{c)}
			$11 \leftarrow 10$	361 951.299(25) ^{c)}
			$11 \leftarrow 10$	361 951.299(25) ^{c)}
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$10 \leftarrow 9$	361 951.299(25) ^{c)}
			$12 \leftarrow 11$	362 122.537(25) ^{c)}
			$11 \leftarrow 10$	362 122.537(25) ^{c)}
$11_{0,11} \leftarrow 10_{0,10}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$12 \leftarrow 11$	361 948.859(25)
			$12 \leftarrow 11$	361 949.663(25) ^{c)}
			$11 \leftarrow 10$	361 949.663(25) ^{c)}
			$12 \leftarrow 11$	361 951.299(25) ^{c)}
			$11 \leftarrow 10$	361 951.299(25) ^{c)}
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$10 \leftarrow 9$	361 951.299(25) ^{c)}
			$12 \leftarrow 11$	362 122.537(25) ^{c)}
			$11 \leftarrow 10$	362 122.537(25) ^{c)}

			10 ← 9	362 123.533(25)
		10 ← 9	11 ← 10	362 120.109(25) °
			10 ← 9	362 120.109(25) °
			9 ← 8	362 120.944(25)
11 _{1,11} ← 10 _{1,10}	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	^{d)}	357 022.235(25)
		11 ← 10	^{d)}	357 023.304(25)
	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	^{d)}	357 284.146(25)
		10 ← 9	^{d)}	357 285.176(25)
11 _{1,10} ← 10 _{1,9}	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	^{d)}	367 643.180(25)
		11 ← 10	^{d)}	367 642.374(25)
	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	^{d)}	367 761.778(25)
		10 ← 9	^{d)}	367 760.248(25)
11 _{2,10} ← 10 _{2,9}	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	13 ← 12	362 278.403(25)
			12 ← 11	362 217.365(25)
			11 ← 10	362 209.135(25)
		11 ← 10	12 ← 11	362 238.520(25)
			11 ← 10	362 313.532(25)
			10 ← 9	362 292.276(25)
	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	12 ← 11	362 668.692(25)
			11 ← 10	362 622.431(25)
			10 ← 9	362 564.121(25)
		10 ← 9	11 ← 10	362 549.315(25)
			10 ← 9	362 559.652(25)
11 ₂₉ ← 10 ₂₈	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	9 ← 8	362 569.756(25)
			13 ← 12	362 829.584(25)
			12 ← 11	362 758.149(25)
			11 ← 10	362 774.433(25)
		11 ← 10	12 ← 11	362 792.924(25)
			11 ← 10	362 882.501(25)
			10 ← 9	362 846.059(25)
	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	12 ← 11	363 201.690(25) °
			11 ← 10	363 201.690(25) °
			10 ← 9	363 089.954(25)
		10 ← 9	11 ← 10	363 067.876(25)
			10 ← 9	367 086.823(25)
			9 ← 8	367 099.549(25)
11 ₃₉ ← 10 ₃₈	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	^{d)}	362 260.169(25)
		11 ← 10	^{d)}	362 257.340(25)
	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	^{d)}	362 715.725(25)
		10 ← 9	^{d)}	362 719.449(25)
11 ₃₈ ← 10 ₃₇	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	^{d)}	362 265.340(25)
		11 ← 10	^{d)}	362 262.482(25)
	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	^{d)}	362 720.561(25)
		10 ← 9	^{d)}	362 724.302(25)
11 ₄ ← 10 ₄	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	13 ← 12	361 983.137(25) °
			12 ← 11	361 983.137(25) °
			11 ← 10	361 983.137(25) °
		11 ← 10	12 ← 11	361 978.155(25) °
			11 ← 10	361 978.155(25) °
			10 ← 9	361 978.155(25) °
	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	12 ← 11	362 684.289(25) °
			11 ← 10	362 684.289(25) °
			10 ← 9	362 684.289(25) °

		10 ← 9	11 ← 10	362 690.489(25) [°]
			10 ← 9	362 690.489(25) [°]
			9 ← 8	362 690.489(25) [°]
11 ₅ ← 10 ₅	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	13 ← 12	361 646.821(25) [°]
			12 ← 11	361 646.821(25) [°]
			11 ← 10	361 646.821(25) [°]
		11 ← 10	12 ← 11	361 638.884(25) [°]
			11 ← 10	361 638.884(25) [°]
			10 ← 9	361 638.884(25) [°]
	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	12 ← 11	362 672.278(25) [°]
			11 ← 10	362 672.278(25) [°]
			10 ← 9	362 672.278(25) [°]
12 _{0,12} ← 11 _{0,11}	12 $\frac{1}{2}$ ← 11 $\frac{1}{2}$	13 ← 12	14 ← 13	394 725.551(25) [°]
			13 ← 12	394 725.551(25) [°]
			12 ← 11	394 725.551(25) [°]
		12 ← 11	13 ← 12	394 727.354(25) [°]
			12 ← 11	394 727.354(25) [°]
			11 ← 10	394 727.354(25) [°]
	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	13 ← 12	394 903.040(25) [°]
			12 ← 11	394 903.040(25) [°]
			11 ← 10	394 903.040(25) [°]
		11 ← 10	12 ← 11	394 900.473(25) [°]
			11 ← 10	394 900.473(25) [°]
			10 ← 9	394 900.473(25) [°]
12 _{1,12} ← 11 _{1,11}	12 $\frac{1}{2}$ ← 11 $\frac{1}{2}$	13 ← 12	^{d)}	389 445.035(25)
		12 ← 11	^{d)}	389 446.181(25)
	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	^{d)}	389 702.928(25) [°]
		11 ← 10	^{d)}	389 702.928(25) [°]
12 _{1,11} ← 11 _{1,10}	12 $\frac{1}{2}$ ← 11 $\frac{1}{2}$	13 ← 12	^{d)}	401 019.117(25) [°]
		12 ← 11	^{d)}	401 019.117(25) [°]
	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	^{d)}	401 134.100(25)
		11 ← 10	^{d)}	401 132.620(25)
12 _{2,11} ← 11 _{2,10}	12 $\frac{1}{2}$ ← 11 $\frac{1}{2}$	13 ← 12	13 ← 12	395 209.712(25)
		12 ← 11	13 ← 12	395 201.666(25) [°]
			12 ← 11	395 201.666(25) [°]
	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	13 ← 12	395 439.970(25)
			12 ← 11	395 451.800(25)
			11 ← 10	395 462.572(25)
		11 ← 10	12 ← 11	395 459.034(25)
			11 ← 10	395 460.754(25)
			10 ← 9	395 464.292(25)
12 _{2,10} ← 11 ₂₉	12 $\frac{1}{2}$ ← 11 $\frac{1}{2}$	13 ← 12	14 ← 13	395 908.662(25)
			12 ← 11	395 924.857(25)
		12 ← 11	13 ← 12	395 918.270(25)
			12 ← 11	395 915.391(25)
			11 ← 10	395 911.165(25)
	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	11 ← 10	396 149.126(25) [°]
		11 ← 10	12 ← 11	396 146.832(25)
			11 ← 10	396 149.126(25) [°]
12 _{3,10} ← 11 ₃₉	12 $\frac{1}{2}$ ← 11 $\frac{1}{2}$	13 ← 12	^{d)}	395 225.667(25)
		12 ← 11	^{d)}	395 223.468(25)
	11 $\frac{1}{2}$ ← 10 $\frac{1}{2}$	12 ← 11	^{d)}	395 630.546(25)
		11 ← 10	^{d)}	395 633.806(25)

$12_{39} \leftarrow 11_{38}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	^{d)}	395 233.610(25)
		$12 \leftarrow 11$	^{d)}	395 231.638(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$12 \leftarrow 11$	^{d)}	395 638.033(25)
		$11 \leftarrow 10$	^{d)}	395 641.278(25)
$12_4 \leftarrow 11_4$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	$14 \leftarrow 13$	394 945.499(25) ^{c)}
			$13 \leftarrow 12$	394 945.499(25) ^{c)}
			$12 \leftarrow 11$	394 945.499(25) ^{c)}
		$12 \leftarrow 11$	$13 \leftarrow 12$	394 941.548(25) ^{c)}
			$12 \leftarrow 11$	394 941.548(25) ^{c)}
			$11 \leftarrow 10$	394 941.548(25) ^{c)}
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$12 \leftarrow 11$	$13 \leftarrow 12$	395 556.089(25) ^{c)}
			$12 \leftarrow 11$	395 556.089(25) ^{c)}
			$11 \leftarrow 10$	395 556.089(25) ^{c)}
		$11 \leftarrow 10$	$12 \leftarrow 11$	395 560.826(25) ^{c)}
			$11 \leftarrow 10$	395 560.826(25) ^{c)}
			$10 \leftarrow 9$	395 560.826(25) ^{c)}
$12_5 \leftarrow 11_5$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	^{d)}	394 612.660(25)
		$12 \leftarrow 11$	^{d)}	394 606.619(25)

^{a)} Coupling scheme: $\mathbf{J} = \mathbf{N} + \mathbf{S}$; $\mathbf{F}_1 = \mathbf{J} + \mathbf{I}_1$; $\mathbf{F} = \mathbf{F}_1 + \mathbf{I}_2$ where \mathbf{I}_1 is the ³¹P nuclear spin and \mathbf{I}_2 is the ¹H total nuclear spin ($I_2 = 1$ or 0).

^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^{c)} ¹H hyperfine structure not resolved.

^{d)} $I_2 = 0$ levels.

^{e)} K-doubling not resolved.

Microwave data for ²H₂¹²C³¹P (D₂CP)

Transition			ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)} $F' - F''$		

State: electronic \tilde{X}^2B_2 ; vibrational zero-point level

$9_{09} \leftarrow 8_{08}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	244 721.285(40) ^{b)}	99Sai
		$9 \leftarrow 8$	244 725.413(40)	
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	244 880.845(40)	
		$8 \leftarrow 7$	244 875.377(40)	
$9_{19} \leftarrow 8_{18}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	239 707.660(40)	
		$9 \leftarrow 8$	239 709.880(40)	
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	239 923.144(40)	
		$8 \leftarrow 7$	239 924.581(40)	
$9_{18} \leftarrow 8_{17}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	251 504.329(40)	
		$8 \leftarrow 7$	251 501.133(40)	
$9_{28} \leftarrow 8_{27}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	245 598.720(40)	
		$9 \leftarrow 8$	245 615.570(40)	
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	245 812.601(40)	
		$8 \leftarrow 7$	245 833.546(40) ^{d)}	
$9_{27} \leftarrow 8_{26}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	246 725.315(40)	
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	246 928.576(40)	
$9_{37} \leftarrow 8_{36}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	245 813.799(40)	
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	246 167.283(40)	
		$8 \leftarrow 7$	246 174.998(40)	
$9_{36} \leftarrow 8_{35}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	245 833.546(40) ^{d)}	

		9 ← 8	245 828.460(40)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	9 ← 8	246 185.878(40)
		8 ← 7	246 193.837(40)
$9_4 \leftarrow 8_4$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	9 ← 8	245 600.529(40)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	9 ← 8	246 153.683(40)
		8 ← 7	246 166.274(40)
$10_{0,10} \leftarrow 9_{09}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	271 621.046(40)
		10 ← 9	271 625.566(40)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 ← 9	271 788.402(40)
		9 ← 8	271 782.542(40)
$10_{1,10} \leftarrow 9_{19}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	266 278.117(40)
		10 ← 9	266 280.159(40)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	9 ← 8	266 491.277(40)
$10_{19} \leftarrow 9_{18}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	279 253.506(40)°)
		10 ← 9	279 253.506(40)°)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 ← 9	279 350.231(40)
		9 ← 8	279 348.280(40)
$10_{29} \leftarrow 9_{28}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	272 849.196(40)
		10 ← 9	272 851.317(40)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	9 ← 8	273 064.305(40)
$10_{28} \leftarrow 9_{27}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 ← 9	274 555.508(40)
		9 ← 8	274 566.421(40)
$10_{38} \leftarrow 9_{37}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	273 185.866(40)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 ← 9	273 492.252(40)
$10_{37} \leftarrow 9_{36}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	273 219.408(40)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 ← 9	273 524.539(40)
		9 ← 8	273 531.229(40)
$10_4 \leftarrow 9_4$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	272 972.484(40)
		10 ← 9	272 965.278(40)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 ← 9	273 433.488(40)
		9 ← 8	273 442.654(40)
$11_{0,11} \leftarrow 10_{0,10}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	12 ← 11	298 432.325(40)
		11 ← 10	298 437.263(40)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	298 607.919(40)
		10 ← 9	298 601.158(40)
$11_{1,11} \leftarrow 10_{1,10}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	12 ← 11	292 825.424(40)
		11 ← 10	292 827.400(40)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	293 036.778(40)°)
		10 ← 9	293 036.778(40)°)
$11_{1,10} \leftarrow 10_{1,9}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	12 ← 11	307 072.304(40)°)
		11 ← 10	307 072.304(40)°)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	307 168.376(40)
		10 ← 9	307 165.895(40)
$11_{2,10} \leftarrow 10_{2,9}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	12 ← 11	300 078.436(40)
		11 ← 10	300 079.788(40)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	300 278.635(40)
		10 ← 9	300 280.337(40)
$11_{29} \leftarrow 10_{28}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	12 ← 11	302 112.223(40)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	302 264.637(40)
		10 ← 9	302 272.137(40)

$11_{39} \leftarrow 10_{38}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$12 \leftarrow 11$	300 558.105(40) ^{c)}
		$11 \leftarrow 10$	300 558.105(40) ^{c)}
$11_{38} \leftarrow 10_{37}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$12 \leftarrow 11$	300 612.775(40)
$11_{4^*} \leftarrow 10_4$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$12 \leftarrow 11$	300 329.232(40)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	300 323.842(40)
		$11 \leftarrow 10$	300 729.650(40)
		$10 \leftarrow 9$	300 736.610(40)
$12_{0,12} \leftarrow 11_{0,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	325 150.008(40)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$12 \leftarrow 11$	325 155.326(40)
		$12 \leftarrow 11$	325 334.207(40)
		$11 \leftarrow 10$	325 327.585(40)
$12_{1,12} \leftarrow 11_{1,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	319 348.091(40)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$12 \leftarrow 11$	319 350.007(40)
		$12 \leftarrow 11$	319 558.694(40) ^{c)}
		$11 \leftarrow 10$	319 558.694(40) ^{c)}
$12_{1,11} \leftarrow 11_{1,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	334 856.324(40) ^{c)}
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$12 \leftarrow 11$	334 856.324(40) ^{c)}
		$12 \leftarrow 11$	334 952.691(40)
		$11 \leftarrow 10$	334 950.081(40)
$12_{2,11} \leftarrow 11_{2,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	327 286.483(40) ^{c)}
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$12 \leftarrow 11$	327 286.483(40) ^{c)}
		$12 \leftarrow 11$	327 477.997(40) ^{c)}
		$11 \leftarrow 10$	327 477.997(40) ^{c)}
$12_{2,10} \leftarrow 11_{2,9}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	329 912.294(40)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	$12 \leftarrow 11$	329 907.254(40)
		$12 \leftarrow 11$	330 043.523(40)
		$11 \leftarrow 10$	330 050.143(40)
$13_{0,13} \leftarrow 12_{0,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	$14 \leftarrow 13$	351 770.748(40)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	351 776.476(40)
		$13 \leftarrow 12$	351 963.386(40)
		$12 \leftarrow 11$	351 956.828(40)
$13_{1,13} \leftarrow 12_{1,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	$14 \leftarrow 13$	345 844.914(40)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	345 846.862(40)
		$13 \leftarrow 12$	346 055.420(40) ^{c)}
		$12 \leftarrow 11$	346 055.420(40) ^{c)}
$13_{1,12} \leftarrow 12_{1,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	$14 \leftarrow 13$	362 601.361(40)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	362 602.285(40)
		$13 \leftarrow 12$	362 699.370(40)
		$12 \leftarrow 11$	362 696.661(40)
$13_{2,12} \leftarrow 12_{2,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	$14 \leftarrow 13$	354 471.074(40) ^{c)}
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	354 471.074(40) ^{c)}
		$13 \leftarrow 12$	354 655.822(40) ^{c)}
		$12 \leftarrow 11$	354 655.822(40) ^{c)}
$13_{2,11} \leftarrow 12_{2,10}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	$14 \leftarrow 13$	357 777.734(40)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	$13 \leftarrow 12$	357 772.276(40)
		$13 \leftarrow 12$	357 893.986(40)

^{a)} Coupling scheme: $J = N + S$; $F = J + I$ where I is the ³¹P nuclear spin.

^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1 σ).

^{c)} ³¹P hyperfine structure not resolved.

^{d)} Blended lines

Molecular parameters for ¹H₂¹²C³¹P

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_2 ; vibrational zero-point level			
<i>A</i>	[MHz] 296 178.1(68) ^{a)}	MW	99Sai
<i>B</i>	[MHz] 16 967.102 4(112)		
<i>C</i>	[MHz] 16 004.027 4(110)		
Δ_K	[MHz] 22.85 ^{b)}	IR	80Bed
Δ_{NK}	[MHz] 0.879 592(139)		
Δ_N	[kHz] 20.090 9(67)		
δ_K	[MHz] 0.622 5(48)		
δ_N	[kHz] 1.230 8(126)		
Φ_{KN}	[kHz] – 0.190 2(35)		
Φ_{NK}	[kHz] – 0.007 08(54)		
ϵ_{aa}	[MHz] 4 220.56(24)		
ϵ_{bb}	[MHz] – 8.334(51)		
ϵ_{cc}	[MHz] – 295.533(52)		
Δ_K^s	[MHz] – 0.588 5(178)		
Δ_{NK}^s	[MHz] – 0.049 9(26)		
Δ_N^s	[kHz] 0.740(67)		
$a_F(^{31}\text{P})$	[MHz] 177.263(58)		
$T_{aa}(^{31}\text{P})$	[MHz] – 341.77(21)		
$T_{bb}(^{31}\text{P})$	[MHz] 607.84(189)		
$C_{aa}(^{31}\text{P})^d)$	[MHz] 1.116(58)		
$C_{bb}(^{31}\text{P})^d)$	[MHz] 0.0 ^{c)}		
$C_{cc}(^{31}\text{P})^d)$	[MHz] 0.134 5(92)		
$a_F(^1\text{H})$	[MHz] 104.936(37)		
$T_{aa}(^1\text{H})$	[MHz] 3.677(176)		
$T_{bb}(^1\text{H})$	[MHz] – 7,69(135)		
$r_0(\text{C-P})$	[nm] 0.165 76(28)		
$r_0(\text{C-H})$	[nm] 0.109 12(61)		
$\angle_0(\text{HCH})$	[deg] 115.96(96)		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to value of Δ_K for H₂CS from [80Bed].

^{c)} Parameter constrained to this value.

^{d)} Nuclear spin-rotation parameter

Molecular parameters for ²H₂¹²C³¹P (D₂CP)

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_2 ; vibrational zero-point level			
<i>A</i>	[MHz] 148 439.3(39) ^{a)}	MW	99Sai
<i>B</i>	[MHz] 14 312.594 8(185)		
<i>C</i>	[MHz] 13 015.104 0(151)		

Δ_K	[MHz]	5.043 ^{b)}	IR	81Tur
Δ_{NK}	[MHz]	0.494 75(102)		
Δ_N	[kHz]	13.523 97(180)		
δ_K	[MHz]	0.350 4(55)		
δ_N	[kHz]	1.433 9(193)		
ϕ_{KN}	[kHz]	– 0.050(54)		
ϕ_{NK}	[kHz]	– 0.007 6(37)		
ε_{aa}	[MHz]	2 074.27(24)		
ε_{bb}	[MHz]	– 7.060(177)		
ε_{cc}	[MHz]	– 241.283(157)		
Δ_K^s	[MHz]	0.199(153)		
Δ_{NK}^s	[MHz]	– 0.017(23)		
Δ_N^s	[kHz]	0.23(32)		
$a_F(^{31}\text{P})$	[MHz]	173.08(149)		
$T_{aa}(^{31}\text{P})$	[MHz]	– 340.2(27)		
$T_{bb}(^{31}\text{P})$	[MHz]	601.3(37)		
$C_{aa}(^{31}\text{P})^d)$	[MHz]	0.18(48)		
$C_{bb}(^{31}\text{P})^d)$	[MHz]	0.0 ^{c)}		
$C_{cc}(^{31}\text{P})^d)$	[MHz]	– 0.035(61)		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to value of Δ_K for D₂CS from [81Tur].

^{c)} Parameter constrained to this value.

^{d)} Nuclear spin-rotation parameter

References for H₂CP

- 80 Bed Bedwell, D.J., Duxbury, G. : J. Mol. Spectrosc. **84** (1980) 531.
81 Tur Turner, P.H., Halonen, L., Mills, I.M. : J. Mol. Spectrosc. **88** (1981) 402.
99Sai Saito, S., Yamamoto, S. : J. Chem. Phys. **111** (1999) 7916.

3.2.4.2.8 H₂CCCH

Microwave data for ¹H₂¹²C¹²C¹²H (propargyl)

Transition				ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}			
		$F'_1 - F''_1$	$F' - F''$		
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level					
$1_{01} \leftarrow 0_{00}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$0 \leftarrow 1$	$1 \leftarrow 1$	18 712.237(5) ^{b)}	97Tan
		$2 \leftarrow 1$	$3 \leftarrow 2$	18 728.071(5)	
		$1 \leftarrow 0$	$0 \leftarrow 1$	18 728.355(5)	
		$1 \leftarrow 1$	$2 \leftarrow 1$	18 729.160(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 0$	$1 \leftarrow 1$	18 729.340(5)	
		$2 \leftarrow 1$	$2 \leftarrow 2$	18 729.543(5)	
		$1 \leftarrow 1$	$1 \leftarrow 1$	18 731.034(5)	
		$2 \leftarrow 1$	$1 \leftarrow 0$	18 731.586(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 0$	$2 \leftarrow 1$	18 732.163(5)	
		$0 \leftarrow 1$	$1 \leftarrow 2$	18 732.434(5)	
		$1 \leftarrow 1$	$0 \leftarrow 1$	18 747.167(5)	
			$1 \leftarrow 2$	18 751.240(5)	

$2_{02} \leftarrow 1_{01}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1 \leftarrow 1$	$2 \leftarrow 2$	37 443.868(5)
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2 \leftarrow 1$	$2 \leftarrow 1$	37 457.521(5)
	$2\frac{1}{2} \leftarrow \frac{1}{2}$	$3 \leftarrow 1$	$2 \leftarrow 1$	37 457.521(5)
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	$4 \leftarrow 3$	37 457.951(5)
		$2 \leftarrow 1$	$3 \leftarrow 2$	37 458.366(5)
		$3 \leftarrow 2$	$3 \leftarrow 2$	37 459.181(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	$2 \leftarrow 2$	37 459.364(5)
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2 \leftarrow 1$	$1 \leftarrow 0$	37 459.930(5)
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	$3 \leftarrow 3$	37 460.658(5)
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 0$	$2 \leftarrow 1$	37 460.811(5)
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	$2 \leftarrow 1$	37 461.075(5)
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2 \leftarrow 1$	$3 \leftarrow 2$	37 462.482(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1 \leftarrow 2$	$2 \leftarrow 2$	37 463.679(5)
			$2 \leftarrow 3$	37 465.149(5)
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 0$	$1 \leftarrow 1$	37 465.910(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1 \leftarrow 2$	$1 \leftarrow 2$	37 468.800(5)
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 0$	$0 \leftarrow 1$	37 470.585(5)
		$2 \leftarrow 1$	$1 \leftarrow 1$	37 476.063(5)
		$2 \leftarrow 0$	$2 \leftarrow 1$	37 476.329(5)
	$2\frac{1}{2} \leftarrow \frac{1}{2}$	$3 \leftarrow 0$	$2 \leftarrow 1$	37 476.329(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 2$	$2 \leftarrow 2$	37 479.206(5)
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	$2 \leftarrow 2$	37 479.206(5)
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 1$	$1 \leftarrow 1$	37 005.309(5)
		$1 \leftarrow 0$	$1 \leftarrow 0$	37 006.903(5)
		$2 \leftarrow 1$	$2 \leftarrow 1$	37 021.250(5)
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	$2 \leftarrow 1$	37 184.188(5)
		$3 \leftarrow 2$	$3 \leftarrow 2$	37 184.717(5)
		$2 \leftarrow 2$	$2 \leftarrow 2$	37 205.094(5)
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 1$	$1 \leftarrow 1$	37 633.477(5)
		$1 \leftarrow 0$	$1 \leftarrow 0$	37 646.224(5)
		$2 \leftarrow 1$	$2 \leftarrow 1$	37 655.894(5)
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	$3 \leftarrow 2$	37 813.927(5)
		$2 \leftarrow 1$	$2 \leftarrow 1$	37 814.231(5)
		$2 \leftarrow 2$	$2 \leftarrow 2$	37 837.571(5)
$2_{12} \leftarrow 1_{11}$				
$2_{11} \leftarrow 1_{10}$				

^{a)} Coupling scheme: $J = N + S$; $F_1 = J + I_1$; $F = F_1 + I_2$ where I_1 is the ^1H nuclear spin on the terminal atom and I_2 is the resultant nuclear spin of the two methylenic (CH_2) atoms.

^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Molecular parameters for $^1\text{H}_2\text{C}^{12}\text{C}^{12}\text{C}^1\text{H}$ (propargyl)

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level			
A	[MHz]	288 055.0 ^{a)}	IR
$\frac{1}{2} (B + C)$	[MHz]	9 365.279 0(48) ^{b)}	FTMW
$\frac{1}{2} (B - C)$	[MHz]	316.797 0(72)	
A_K	[MHz]	22.62 ^{a)}	IR
A_{NK}	[MHz]	0.375 3(28)	FTMW
A_N	[kHz]	3.44(63)	
δ_K	[MHz]	0.157 5 ^{a)}	IR
δ_N	[kHz]	0.103 ^{c)}	FTMW

\mathcal{E}_{aa}	[MHz]	– 529.386(60)
\mathcal{E}_{bb}	[MHz]	– 11.524(30)
\mathcal{E}_{cc}	[MHz]	– 0.520(30)
$a_F(^1\text{H})^d)$	[MHz]	– 36.323(24)
$T_{aa}(^1\text{H})$	[MHz]	17.400(24)
$T_{bb}(^1\text{H})$	[MHz]	–17.220(37)
$a_F(^1\text{H})^e)$	[MHz]	– 54.21(11)
$T_{aa}(^1\text{H})$	[MHz]	– 14.121(19)
$T_{bb}(^1\text{H})$	[MHz]	12.88 ^{f)}

^{a)} Parameter constrained to value determined from IR data [95Tan].

^{b)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{c)} Parameter constrained to estimated value.

^{d)} Hyperfine parameters for the acetylenic proton.

^{e)} Hyperfine parameters for the methylenic protons.

^{f)} Parameter constrained to value determined from ESR study [72Kas].

References for H₂CCCH

- 72Kas Kasai, P. H. : J. Am. Chem. Soc. **94** (1972) 5950.
 95Tan Tanaka, K., Harada, T., Sakaguchi, K., Harada, K. and Tanaka, T. : J. Chem. Phys. **103** (1995) 6450.
 97Tan Tanaka, K., Sumiyoshi, Y., Ohshima, Y., Endo, Y., Kawaguchi, K. : J. Chem. Phys. **107** (1997) 2728.

3.2.4.2.9 H₂CC₄H

Microwave data for ¹H₂¹²C¹²C¹²C¹²C¹²C¹H

Transition				ν [MHz]	Ref.	
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}				
		$F_1' - F_1''$	$F' - F''$			
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level						
$2_{02} \leftarrow 1_{01}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2 \leftarrow 1$	8 625.651(5) ^{b)}	98Che	
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 3$	8 625.756(5)		
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 0$	8 626.326(5)		
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 0$	8 627.601(5)		
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	8 627.637(5)		
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	8 627.828(5)		
			$3 \leftarrow 2$	8 628.012(5)		
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	8 628.165(5)		
	$2\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	8 628.234(5)		
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2 \leftarrow 1$	8 628.254(5)		
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	8 628.591(5)		
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 2$	8 629.908(5)		
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1 \leftarrow 1$	8 630.825(5)		
	$3_{03} \leftarrow 2_{02}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2 \leftarrow 1$		12 941.619(5)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$		12 941.805(5)
				$4 \leftarrow 3$		12 941.905(5)

4 ₀₄ ← 3 ₀₃	3 $\frac{1}{2}$ ← 1 $\frac{1}{2}$	3 $\frac{1}{2}$ ← 1 $\frac{1}{2}$	3 ← 2	12 941.922(5)
	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	2 $\frac{1}{2}$ ← 1 $\frac{1}{2}$	2 ← 1	12 942.042(5)
	3 $\frac{1}{2}$ ← 1 $\frac{1}{2}$	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	3 ← 2	12 942.197(5)
	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	4 ← 3	12 942.208(5)
	2 $\frac{1}{2}$ ← 1 $\frac{1}{2}$	1 $\frac{1}{2}$ ← $\frac{1}{2}$	2 ← 1	12 942.242(5)
	2 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	3 ← 2	12 942.391(5)
	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	2 $\frac{1}{2}$ ← 1 $\frac{1}{2}$	3 ← 2	12 942.406(5)
	2 $\frac{1}{2}$ ← 1 $\frac{1}{2}$	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	4 ← 3	12 942.712(5)
	4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	5 $\frac{1}{2}$ ← 4 $\frac{1}{2}$	6 ← 5	17 255.851(5)
			5 ← 4	17 255.914(5)
		3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	3 ← 2	17 256.189(5)
		4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	5 ← 4	17 256.242(5)
	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	4 ← 3	17 256.270(5)
			3 ← 2	17 256.327(5)
	4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	4 ← 3	17 256.369(5)
5 ₀₅ ← 4 ₀₄	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	4 ← 3	17 256.524(5)
	4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	4 ← 3	17 256.534(5)
	3 $\frac{1}{2}$ ← 2 $\frac{1}{2}$	2 $\frac{1}{2}$ ← 1 $\frac{1}{2}$	3 ← 2	17 256.810(5)
		4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	5 ← 4	17 256.825(5)
		2 $\frac{1}{2}$ ← 1 $\frac{1}{2}$	2 ← 1	17 256.895(5)
	5 $\frac{1}{2}$ ← 4 $\frac{1}{2}$	6 $\frac{1}{2}$ ← 5 $\frac{1}{2}$	7 ← 6	21 569.913(5)
			6 ← 5	21 569.959(5)
		5 $\frac{1}{2}$ ← 4 $\frac{1}{2}$	6 ← 5	21 570.290(5)
		4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	4 ← 3	21 570.310(5)
	4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	5 ← 4	21 570.426(5)
	5 $\frac{1}{2}$ ← 4 $\frac{1}{2}$	5 $\frac{1}{2}$ ← 4 $\frac{1}{2}$	5 ← 4	21 570.475(5)
	4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	4 ← 3	21 570.602(5)

^a) Coupling scheme: $\mathbf{J} = \mathbf{N} + \mathbf{S}$; $\mathbf{F}_1 = \mathbf{J} + \mathbf{I}_1$; $\mathbf{F} = \mathbf{F}_1 + \mathbf{I}_2$ where \mathbf{I}_1 is the resultant nuclear spin of the two methylenic (CH₂) atoms and \mathbf{I}_2 is the nuclear spin of the terminal (acetylenic) ¹H atom.

^b) The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Molecular parameters for ¹H₂¹²C¹²C¹²C¹²C¹²C¹H

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level			
$\frac{1}{2} (B + C)$ [MHz]	2 157.063 04(8) ^a)	FTMW	98Che
Δ_N [kHz]	0.121(2)		
$\frac{1}{2} (\epsilon_{bb} + \epsilon_{cc})$ [MHz]	- 1.460(7)		
$a_F(^1H_2)^b$ [MHz]	- 48.3(1)		
$\frac{1}{2} (T_{bb} + T_{cc})$ [MHz]	- 12.013(5)		
$a_F(^1H)^c$ [MHz]	- 20.35(2)		
$\frac{1}{2} (T_{bb} + T_{cc})$ [MHz]	9.660(7)		

^a) The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

^b) Hyperfine parameters for the methylenic protons.

^c) Hyperfine parameters for the acetylenic proton.

Reference for H₂CC₄H

98Che Chen, W., Novick, S.E., McCarthy, M.C., Thaddeus, P. : J. Chem. Phys. **109** (1998) 10190.

3.2.4.2.10 H₂CCNMicrowave data for ¹H₂¹²C¹³C¹⁴N

Transition				ν [MHz]	Ref.	
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}				
		$F_1' - F_1''$	$F' - F''$			
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level						
$1_{01} \leftarrow 0_{00}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	20 109.559(10) ^{b)}	84End	
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	20 115.801(10)		
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	20 117.441(10)		
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	20 118.021(10)		
		$\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	20 118.160(10)		
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	20 119.602(10)		
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	20 121.621(10)		
		$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	20 123.961(10)		
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	20 124.262(10) ^{c)}		
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	20 124.262(10) ^{c)}		
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	20 124.461(10)		
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	20 126.021(10)		
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	20 128.820(10)		
		$\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 2\frac{1}{2}$	20 139.783(10)		
	$2_{02} \leftarrow 1_{01}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 3\frac{1}{2}$		40 229.648(10)
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$		40 232.797(10)
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$		40 239.227(10)
				$3\frac{1}{2} \leftarrow 2\frac{1}{2}$		40 239.727(10)
				$4\frac{1}{2} \leftarrow 3\frac{1}{2}$		40 240.039(10)
			$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 3\frac{1}{2}$		40 240.555(10)
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$		40 241.387(10)
			$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$		40 242.070(10)
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$		40 242.258(10)
			$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$		40 243.254(10)
		$2\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$		40 244.375(10)
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$		40 245.871(10)
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$		40 247.615(10) ^{c)}
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$		40 247.615(10) ^{c)}
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$		40 247.887(10)
			$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$		40 248.219(10)
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$		40 248.613(10)
			$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$		40 249.383(10)
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$		40 250.484(10)
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$		40 251.918(10)
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$		40 253.953(10)
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$		40 256.285(10)
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$		40 256.824(10)
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$		40 258.180(10)

	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 2\frac{1}{2}$	$1\frac{1}{2} \leftarrow 2\frac{1}{2}$	40 259.781(10)	
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	40 260.281(10)	
$4_{04} \leftarrow 3_{03}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	80 480.384(25) °	97Sai
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	80 480.384(25) °	
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	80 480.384(25) °	
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	80 482.225(25) °	
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	80 482.225(25) °	
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	80 483.076(25) °	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	80 483.076(25) °	
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	80 483.850(25)	
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	80 484.898(25)	
	$3\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	80 487.270(25)	
	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	80 488.530(25)	
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	80 489.581(25)	
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	80 490.261(25) °	
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	80 490.261(25) °	
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	80 490.261(25) °	
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	80 491.263(25) °	
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	80 491.263(25) °	
			$1\frac{1}{2} \leftarrow \frac{1}{2}$	80 491.263(25) °	
$4_{14} \leftarrow 3_{13}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	^{a)}	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	79 722.726(25) °	
		^{a)}	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	79 721.785(25)	
		^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	79 722.726(25) °	
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	^{a)}	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	79 759.155(25)	
		^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	79 759.788(25)	
		^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	79 760.350(25)	
$4_{13} \leftarrow 3_{12}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	81 206.601(25)	
		^{a)}	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	81 207.379(25)	
		^{a)}	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	81 208.302(25)	
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	81 232.654(25) °	
		^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	81 232.654(25) °	
		^{a)}	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	81 232.654(25) °	
$5_{05} \leftarrow 4_{04}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	100 598.383(25) °	
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	100 598.383(25) °	
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	100 598.383(25) °	
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	100 599.499(25) °	
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	100 599.499(25) °	
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	100 600.602(25) °	
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	100 600.602(25) °	
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	100 602.459(25)	
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	100 608.257(25)	
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	100 608.832(25) °	
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	100 608.832(25) °	
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	100 609.663(25) °	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	100 609.663(25) °	
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	100 610.152(25) °	

			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	100 610.152(25) [°]
$5_{15} \leftarrow 4_{14}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	^{a)}	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	99 668.632(25) [°]
		^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	99 668.632(25) [°]
		^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	99 669.243(25)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	99 689.121(25)
		^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	99 689.833(25) [°]
		^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	99 689.833(25) [°]
$5_{14} \leftarrow 4_{13}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	^{a)}	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	101 523.657(25)
		^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	101 522.773(25) [°]
		^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	101 522.773(25) [°]
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	101 532.055(25) [°]
		^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	101 532.055(25) [°]
		^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	101 532.055(25) [°]
$5_{24} \leftarrow 4_{23}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	100 535.651(25) [°]
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	100 535.651(25) [°]
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	100 629.632(25) [°]
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	100 629.632(25) [°]
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	100 630.461(25)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	100 633.038(25)
$5_{23} \leftarrow 4_{22}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	100 543.214(25) [°]
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	100 543.214(25) [°]
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	100 545.107(25) [°]
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	100 545.107(25) [°]
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	100 545.107(25) [°]
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	100 637.773(25)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	100 639.043(25) [°]
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	100 639.043(25) [°]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	100 640.250(25)
$5_{3*} \leftarrow 4_{3*}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	100 435.054(25)
		^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	100 436.903(25)
		^{a)}	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	100 439.763(25)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	100 664.809(25)
		^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	100 665.340(25)
		^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	100 667.368(25)
$6_{06} \leftarrow 5_{05}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	120 714.093(25) [°]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	120 714.093(25) [°]
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	120 714.093(25) [°]
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	120 715.919(25)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	120 717.600(25)
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	120 722.841(25)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	120 723.753(25)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	120 725.060(25) [°]
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	120 725.060(25) [°]
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	120 726.176(25) [°]
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	120 726.176(25) [°]
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	120 726.176(25) [°]

$6_{16} \leftarrow 5_{15}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	119 608.993(25) [°]
		^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	119 608.993(25) [°]
		^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	119 608.993(25) [°]
$6_{15} \leftarrow 5_{14}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	^{a)}	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	121 832.829(25) [°]
		^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	121 832.829(25) [°]
		^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	121 832.829(25) [°]
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	121 832.829(25) [°]
$6_{25} \leftarrow 5_{24}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	120 734.872(25) [°]
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	120 734.872(25) [°]
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	120 734.872(25) [°]
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	120 736.599(25) [°]
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	120 736.599(25) [°]
$6_{3*} \leftarrow 5_{3*}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	^{a)}	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	120 597.866(25)
		^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	120 598.856(25)
		^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	120 600.422(25)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	120 752.446(25) [°]
		^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	120 752.446(25) [°]
		^{a)}	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	120 753.870(25)
$7_{07} \leftarrow 6_{06}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	140 827.026(25) [°]
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	140 827.026(25) [°]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	140 827.026(25) [°]
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	140 828.512(25) [°]
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	140 828.512(25) [°]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	140 829.950(25)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	140 836.482(25)
$7_{17} \leftarrow 6_{16}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	139 545.477(25) [°]
		^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	139 545.477(25) [°]
		^{a)}	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	139 545.477(25) [°]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	139 552.138(25) [°]
		^{a)}	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	139 552.138(25) [°]
		^{a)}	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	139 552.138(25) [°]
$7_{16} \leftarrow 6_{15}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	142 133.710(25) [°]
		^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	142 133.710(25) [°]
		^{a)}	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	142 133.710(25) [°]
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	142 138.399(25) [°]
		^{a)}	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	142 138.399(25) [°]
		^{a)}	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	142 138.399(25) [°]
$7_{26} \leftarrow 6_{25}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	140 845.054(25) [°]
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	140 845.054(25) [°]
$7_{3*} \leftarrow 6_{3*}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	^{a)}	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	140 741.544(25)
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	^{a)}	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	140 849.590(25) [°]
		^{a)}	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	140 849.590(25) [°]

^{a)} Coupling scheme: $\mathbf{J} = \mathbf{N} + \mathbf{S}$; $\mathbf{F}_1 = \mathbf{J} + \mathbf{I}_1$; $\mathbf{F} = \mathbf{F}_1 + \mathbf{I}_2$ where \mathbf{I}_1 is the ¹H total nuclear spin and \mathbf{I}_2 is the ¹⁴N nuclear spin.

^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^{c)} Hyperfine splittings not resolved.

^{d)} Para-levels with $I_1 = 0$.

Molecular parameters for ¹H₂¹²C¹²C¹⁴N

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level			
<i>A</i>	[MHz] 284 981(115) ^{a)}	MW	97Sai
<i>B</i>	[MHz] 10 426.765(64)		
<i>C</i>	[MHz] 9 876.035(65)		
Δ_K	[MHz] 23.536 ^{b)}	MW	72Joh
Δ_{NK}	[MHz] 0.415 73(57)	MW	97Sai
Δ_N	[kHz] 4.051 5(88)		
δ_K	[MHz] 0.263(33)		
δ_N	[kHz] 0.161 1(73)		
Φ_{KN}	[kHz] – 0.719(49)		
ϕ_K	[kHz] – 2.4(20)		
L_{NK}	[Hz] 0.115(109)		
L_{NNK}	[Hz] – 8.93(68)		
\mathcal{E}_{aa}	[MHz] – 661.54(30)		
\mathcal{E}_{bb}	[MHz] – 24.129(69)		
\mathcal{E}_{cc}	[MHz] – 2.056(67)		
Δ_K^s	[MHz] 0.140(32)		
Δ_{NK}^s	[kHz] 10.5(38)		
$a_F(^1H)$	[MHz] – 59.82(30)		
$T_{aa}(^1H)$	[MHz] – 15.891(70)		
$T_{bb}(^1H)$	[MHz] 10(24)		
$a_F(^{14}N)$	[MHz] 9.513(63)		
$T_{aa}(^{14}N)$	[MHz] – 15.671(98)		
$T_{bb}(^{14}N)$	[MHz] – 12.77(130)		
$\chi_{aa}(^{14}N)$	[MHz] – 4.182(98)		
$\chi_{bb}(^{14}N)$	[MHz] 2.1 ^{c)}		
Δ_c	[uÅ ²] 0.077 8(14)		
$r_0(C-N)$	[nm] 0.119 19(13)		
$r_0(C-C)$	[nm] 0.16 80 ^{c)}		
$r_0(C-H)$	[nm] 0.108 94(7)		
$\angle_0(H-C-H)$	[deg] 120.22 ^{c)}		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to value of Δ_K for H₂CCO from [72Joh].

^{c)} Parameter constrained to this value.

Microwave data for ²H₂¹²C¹²C¹⁴N (D₂CCN)

Transition	ν [MHz]	Ref.
rotational $N' - N''$		
fine structure $J' - J''$		

State: electronic \tilde{X}^2B_2 ; vibrational zero-point level

$11_{0,11} \leftarrow 10_{0,10}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	193 285.775(25) ^{a)}	97Sai
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	193 295.479(25)	
$11_{1,11} \leftarrow 10_{1,10}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	190 508.303(25)	
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	190 511.789(25)	
$11_{1,10} \leftarrow 10_{1,9}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	196 627.119(25)	
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	196 640.462(25)	
$11_{2,10} \leftarrow 10_{2,9}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	193 586.762(25)	

	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	193 587.726(25)
$11_{29} \leftarrow 10_{28}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	193 965.948(25)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	193 968.093(25)
$11_{39} \leftarrow 10_{38}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	193 669.848(25)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	193 657.697(25)
$11_{38} \leftarrow 10_{37}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	193 674.101(25)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	193 661.968(25)
$11_{4*} \leftarrow 10_{4*}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	193 614.265(25)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	193 583.425(25)
$12_{0,12} \leftarrow 11_{0,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	210 775.690(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	210 785.076(25)
$12_{1,12} \leftarrow 11_{1,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	207 805.253(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	207 809.086(25)
$12_{1,11} \leftarrow 11_{1,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	214 478.328(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	214 491.949(25)
$12_{2,11} \leftarrow 11_{2,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	211 168.669(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	211 170.901(25)
$12_{2,10} \leftarrow 11_{29}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	211 660.457(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	211 664.725(25)
$12_{3,10} \leftarrow 11_{39}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	211 279.808(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	211 271.512(25)
$12_{39} \leftarrow 11_{38}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	211 286.452(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	211 278.222(25)
$12_{4*} \leftarrow 11_{4*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	211 213.486(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	211 189.415(25)
$12_{4*} \leftarrow 11_{4*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	211 148.075(25)
$13_{0,13} \leftarrow 12_{0,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	228 244.650(25)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	228 253.661(25)
$13_{1,13} \leftarrow 12_{1,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	225 100.850(25)
$13_{1,12} \leftarrow 12_{1,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	232 322.889(25)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	232 336.831(25)
$13_{2,12} \leftarrow 12_{2,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	228 746.262(25)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	228 749.776(25)
$13_{2,11} \leftarrow 12_{2,10}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	229 371.067(25)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	229 377.024(25)
$13_{3,11} \leftarrow 12_{3,10}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	228 891.401(25)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	228 886.117(25)
$13_{3,10} \leftarrow 12_{39}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	228 901.395(25)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	228 896.207(25)
$13_{4*} \leftarrow 12_{4*}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	228 813.867(25)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	228 795.153(25)
$13_{5*} \leftarrow 12_{5*}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	228 738.733(25)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	228 702.872(25)
$14_{0,14} \leftarrow 13_{0,13}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	245 691.124(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	245 699.772(25)
$14_{1,14} \leftarrow 13_{1,13}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	242 384.413(25)

	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	242 386.775(25)
$14_{1,13} \leftarrow 13_{1,12}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	250 160.310(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	250 174.361(25)
$14_{2,13} \leftarrow 13_{2,12}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	246 319.276(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	246 323.766(25)
$14_{2,12} \leftarrow 13_{2,11}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	247 098.582(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	247 105.899(25)
$14_{3,12} \leftarrow 13_{3,11}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	246 504.547(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	246 501.698(25)
$14_{3,11} \leftarrow 13_{3,10}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	246 519.105(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	246 516.289(25)
$14_4 \leftarrow 13_4$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	246 415.308(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	246 400.792(25)
$14_5 \leftarrow 13_5$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	246 330.018(25)
$14_6 \leftarrow 13_6$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	246 238.391(25)
$14_7 \leftarrow 13_7$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	246 134.236(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	246 065.968(25)
$15_{0,15} \leftarrow 14_{0,14}$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	263 113.935(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	263 122.233(25)
$15_{1,15} \leftarrow 14_{1,14}$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	259 661.832(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	259 666.201(25)
$15_{1,14} \leftarrow 14_{1,13}$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	267 989.822(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	268 003.956(25)
$15_{2,14} \leftarrow 14_{2,13}$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	263 887.476(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	263 892.721(25)
$15_{2,13} \leftarrow 14_{2,12}$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	264 843.915(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	264 852.417(25)
$15_{3,13} \leftarrow 14_{3,12}$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	264 119.240(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	264 118.280(25)
$15_4 \leftarrow 14_4$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	264 017.688(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	264 006.591(25)
$15_5 \leftarrow 14_5$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	263 921.911(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	263 897.975(25)
$15_6 \leftarrow 14_6$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	263 820.517(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	263 780.994(25)
$16_{0,16} \leftarrow 15_{0,15}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	280 511.716(25)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	280 519.566(25)
$16_{1,16} \leftarrow 15_{1,15}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	276 939.152(25)
$16_{1,15} \leftarrow 15_{1,14}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	285 810.745(25)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	285 824.931(25)
$16_{2,15} \leftarrow 15_{2,14}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	281 456.262(25)
$16_{2,14} \leftarrow 15_{2,13}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	282 607.717(25)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	282 617.282(25)
$16_4 \leftarrow 15_4$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	281 621.068(25)
$16_5 \leftarrow 15_5$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	281 514.227(25)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1 σ).

Molecular parameters for ²H₂¹²C¹²C¹⁴N (D₂CCN)

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level			
<i>A</i>	[MHz] 142 957.5(44) ^{a)}	MW	97Sai
<i>B</i>	[MHz] 9 082.976 0(89)		
<i>C</i>	[MHz] 8 524.938 6(95)		
Δ_K	[MHz] 4.322 8 ^{b)}	MW	76Nem
Δ_{NK}	[MHz] 0.278 89(37)	MW	97Sai
Δ_N	[kHz] 3.143 3(52)		
δ_K	[MHz] 0.178 1(42)		
δ_N	[kHz] 0.232 7(55)		
Φ_{KN}	[kHz] – 0.169 1(194)		
ϕ_K	[kHz] – 0.78(29)		
L_{NK}	[Hz] 0.019(27)		
L_{NNK}	[Hz] – 0.44(21)		
\mathcal{E}_{aa}	[MHz] – 328.32(66)		
\mathcal{E}_{bb}	[MHz] – 21.391(56)		
\mathcal{E}_{cc}	[MHz] – 1.634(52)		
Δ_K^s	[MHz] 0.015(22)		
Δ_{NK}^s	[kHz] 0.0 ^{c)}		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.^{b)} Parameter constrained to value of Δ_K for D₂CCO from [76Nem].^{c)} Parameter constrained to this value.References for H₂CCN

- 72Joh Johns, J.W.C., Stone, J.M.R., Winnemisser, G. : J. Molec. Spectrosc. **42** (1972) 523.
 76Nem Nemes, L., Winnemisser, M. : Z. Naturforsch. **31A** (1976) 272.
 97Sai Saito, S., Yamamoto, S.: J. Chem. Phys. **107** (1997) 1732.

3.2.4.2.11 H₂CCCCNMicrowave data for ¹H₂¹²C¹²C¹²C¹⁴N

Transition		ν [MHz]	Ref.
rotational $N' - N''$	Fine and hyperfine ^{a)}		
	$F_1' - F_1''$ $F_2' - F_2''$ $F' - F''$		

State: electronic \tilde{X}^2B_1 ; vibrational zero-point level

$2_{02} \leftarrow 1_{01}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	8 742.859(5) ^{b)}	98Che
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	8 743.535(5)	
		$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 743.5467(5)	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	8 743.608(5)	
	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 743.840(5)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 744.367(5)	
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 745.204(5)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	8 745.204(5)	
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 745.290(5)	
	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 745.408(5)	

$3_{03} \leftarrow 2_{02}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	8 745.546(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 745.546(5)
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	8 745.572(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	8 745.777(5)
	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	8 746.016(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	8 746.224(5)
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	8 746.721(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	8 747.415(5)
	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 749.714(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 750.083(5)
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	8 751.850(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 4\frac{1}{2}$	13 112.123(5)
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	13 115.670(5)
		$3\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 3\frac{1}{2}$	13 116.395(5)
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	13 116.424(5)
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	13 117.335(5)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	13 117.564(5)
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	13 117.824(5)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	13 117.951(5)
		$3\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	13 118.001(5)
		$4\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	13 118.001(5)
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	13 118.132(5)
		$3\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	13 118.182(5)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	13 118.350(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	13 118.431(5)
			$1\frac{1}{2} \leftarrow \frac{1}{2}$	13 118.480(5)
		$3\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	13 118.530(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$4\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	13 118.569(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	13 118.605(5)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	13 118.886(5)
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	13 118.910(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	13 118.185(5)
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	13 119.745(5)
			$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	13 121.390(5)
$4_{04} \leftarrow 3_{03}$		$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 3\frac{1}{2}$	13 122.473(5)
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	13 124.283(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$4\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5\frac{1}{2} \leftarrow 5\frac{1}{2}$	17 485.533(5)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 4\frac{1}{2}$	17 489.032(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$3\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	17 489.492(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 3\frac{1}{2}$	17 489.702(5)
		$5\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	17 490.028(5)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	17 490.595(5)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	17 490.640(5)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	17 490.702(5)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	17 490.828(5)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	17 491.038(5)

		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	17 491.073(5)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	17 491.123(5)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	17 491.208(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	17 491.255(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	17 491.338(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	17 491.338(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	17 491.370(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	17 491.385(5)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	17 491.523(5)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	17 491.746(5)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	17 491.871(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$4\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	17 491.975(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	17 492.568(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$4\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	17 492.717(5)
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	17 495.824(5)
$5_{05} \leftarrow 4_{04}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	21 863.311(5)
			$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	21 863.311(5)
			$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	21 863.392(5)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	21 863.700(5)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	21 863.810(5)
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	21 864.012(5)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	21 864.087(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	21 864.102(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	21 864.102(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	21 864.137(5)
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	21 864.210(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	21 864.210(5)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	21 864.467(5)
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	21 864.502(5)
			$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	21 864.602(5)
			$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	21 864.762(5)
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	21 864.770(5)
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	21 864.850(5)

^a) Coupling scheme: $F_1 = S + I_1$; $F_2 = F_1 + N$; $F = F_2 + I_2$ where I_1 is the total ¹H nuclear spin and I_2 is the ¹⁴N nuclear spin.

^b) The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Microwave data for ¹H, ¹²C¹²C¹²C¹²C¹⁵N

Transition				ν [MHz]	Ref.
rotational $N' - N''$	Fine and hyperfine ^{a)}				
	$F_1' - F_1''$	$F_2' - F_2''$	$F' - F''$		
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level					
$2_{02} \leftarrow 1_{01}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	8 512.720(5) ^{b)}	98Che
			$3 \leftarrow 2$	8 513.045(5)	
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	8 513.240(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2 \leftarrow 1$	8 513.345(5)	
$3_{03} \leftarrow 2_{02}$	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	8 513.747(5)	
			$3 \leftarrow 2$	8 514.081(5)	
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	8 514.860(5)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	12 769.335(5)	
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	12 769.339(5)	
			$4 \leftarrow 3$	12 769.520(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	12 769.810(5)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	12 769.926(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	12 770.224(5)	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3 \leftarrow 2$	12 770.584(5)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2 \leftarrow 1$	12 770.600(5)	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3 \leftarrow 2$	12 770.600(5)	
$4_{04} \leftarrow 3_{03}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	12 770.841(5)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	17 026.052(5)	
			$5 \leftarrow 4$	17 026.149(5)	
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	17 026.635(5)	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	17 026.655(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3 \leftarrow 2$	17 026.717(5)	
			$4 \leftarrow 3$	17 027.011(5)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3 \leftarrow 2$	17 027.011(5)	
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	17 027.060(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	17 027.397(5)	
			$5 \leftarrow 4$	17 027.611(5)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	17 027.795(5)	
$5_{05} \leftarrow 4_{04}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7 \leftarrow 6$	21 282.770(5)	
			$6 \leftarrow 5$	21 282.837(5)	
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	21 283.334(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	21 283.523(5)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	21 283.574(5)	
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5 \leftarrow 4$	21 283.670(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	21 263.780(5)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4 \leftarrow 3$	21 283.903(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$5 \leftarrow 4$	21 284.179(5)	
			$6 \leftarrow 5$	21 284.365(5)	

^{a)} Coupling scheme: $F_1 = S + I_1$; $F_2 = F_1 + N$; $F = F_2 + I_2$ where I_1 is the total ¹H nuclear spin and I_2 is the ¹⁵N nuclear spin.

^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1 σ).

Molecular parameters for ¹H₂¹²C¹²C¹²C¹²C¹⁴N

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level			
$\frac{1}{2}(B+C)$	[MHz] 2 186.430(2) ^{a)}	FTMW	98Che
A_N	[kHz] 0.139(5)		
$\frac{1}{2}(\epsilon_{bb} + \epsilon_{cc})$	[MHz] - 2.316(1)		
$a_F(^1H)$	[MHz] - 50.6(1)		
$T_{bb}(^1H)$	[MHz] - 18.89(6)		
$a_F(^{14}N)$	[MHz] 5.162(3)		
$T_{bb}(^{14}N)$	[MHz] - 12.322(7)		
$\chi_{aa}(^{14}N)$	[MHz] - 4.148(4)		

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

Molecular parameters for ¹H₂¹²C¹²C¹²C¹²C¹⁵N

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level			
$\frac{1}{2}(B+C)$	[MHz] 2 128.388 8(2) ^{a)}	FTMW	98Che
A_N	[kHz] 0.130(5)		
$\frac{1}{2}(\epsilon_{bb} + \epsilon_{cc})$	[MHz] - 2.258(3)		
$a_F(^1H)$	[MHz] - 50.7(3)		
$T_{bb}(^1H)$	[MHz] - 18.95(5)		
$a_F(^{15}N)$	[MHz] - 7.21(5)		
$T_{bb}(^{15}N)$	[MHz] - 17.23(4)		

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

Reference for H₂CCCCN

98Che Chen, W., McCarthy, M.C., Travers, M.J., Gottlieb, E.W., Munrow, M.R., Novick, S.E., Gottlieb, C.A., Thaddeus, P. : *Astrophys. J.* **492** (1998) 849.

3.2.4.2.12 H₂CCPMicrowave data for ¹H₂¹²C¹³C³¹P

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		
State: electronic \tilde{X}^2B_2 ; vibrational zero-point level			
$28_{0,28} \leftarrow 27_{0,27}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	303 244.990(35) ^{a)}	98Ahm
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	303 269.455(35)	
$28_{1,28} \leftarrow 27_{1,27}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	301 840.609(35)	
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	301 850.134(35)	
$28_{1,27} \leftarrow 27_{1,26}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	304 798.999(35)	
$28_{2,27} \leftarrow 27_{2,26}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	303 310.536(35)	
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	303 318.195(35)	
$28_{2,26} \leftarrow 27_{2,25}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	303 417.255(35)	
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	303 427.452(35)	
$28_{4*} \leftarrow 27_{4*}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	303 255.082(35)	
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	303 206.941(35)	
$29_{0,29} \leftarrow 28_{0,28}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	314 060.325(35)	
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	314 084.492(35)	
$29_{1,28} \leftarrow 28_{1,27}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	315 675.465(35)	
$29_{2,28} \leftarrow 28_{2,27}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	314 134.293(35)	
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	314 143.071(35)	
$29_{2,27} \leftarrow 28_{2,26}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	314 252.746(35)	
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	314 264.371(35)	
$29_{4*} \leftarrow 28_{4*}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	314 075.845(35)	
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	314 032.758(35)	
$30_{0,30} \leftarrow 29_{0,29}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	324 874.240(35)	
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	324 898.307(35)	
$30_{1,30} \leftarrow 29_{1,29}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	323 381.803(35)	
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	323 391.883(35)	
$30_{1,29} \leftarrow 29_{1,28}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	326 551.158(35)	
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	326 585.290(35)	
$30_{2,29} \leftarrow 29_{2,28}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	324 957.025(35)	
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	324 967.013(35)	
$30_{2,28} \leftarrow 29_{2,27}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	325 088.295(35)	
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	325 101.320(35)	
$30_{4*} \leftarrow 29_{4*}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	324 896.201(35)	
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	324 857.719(35)	
$31_{0,31} \leftarrow 30_{0,30}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	335 686.462(35)	
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	335 710.156(35)	
$31_{1,31} \leftarrow 30_{1,30}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	334 151.059(35)	
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	334 161.393(35)	
$31_{2,30} \leftarrow 30_{2,29}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	335 778.943(35)	
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	335 790.002(35)	
$31_{2,29} \leftarrow 30_{2,28}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	335 923.761(35)	

	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	335 937.662(35)
$31_{3,29} \leftarrow 30_{3,28}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	335 781.658(35)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	335 774.098(35)
$31_{3,28} \leftarrow 30_{3,27}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	335 782.756(35)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	335 775.437(35)
$31_{4*} \leftarrow 30_{4*}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	335 716.201(35)
$31_{5*} \leftarrow 30_{5*}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	335 630.721(35)
$31_{6*} \leftarrow 30_{6*}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	335 512.614(35)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	335 402.789(35)
$32_{0,32} \leftarrow 31_{0,31}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	346 496.823(35)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	346 520.451(35)
$32_{1,32} \leftarrow 31_{1,31}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	344 919.338(35)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	344 929.732(35)
$32_{1,31} \leftarrow 31_{1,30}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	348 299.715(35)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	348 334.291(35)
$32_{2,31} \leftarrow 31_{2,30}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	346 599.956(35)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	346 611.919(35)
$32_{2,30} \leftarrow 31_{2,29}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	346 759.317(35)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	346 774.573(35)
$32_{3,30} \leftarrow 31_{3,29}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	346 604.664(35)
$32_{4*} \leftarrow 31_{4*}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	346 535.384(35)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	346 504.771(35)
$32_{5*} \leftarrow 31_{5*}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	346 445.612(35)
$32_{6*} \leftarrow 31_{6*}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	346 321.852(35)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	346 220.202(35)
$33_{0,33} \leftarrow 32_{0,32}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	357 305.640(35)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	357 328.459(35)
$33_{1,33} \leftarrow 32_{1,32}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	355 686.495(35)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	355 697.197(35)
$33_{2,32} \leftarrow 32_{2,31}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	357 420.051(35)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	357 432.674(35)
$33_{2,31} \leftarrow 32_{2,30}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	357 594.739(35)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	357 611.095(35)
$33_{3,31} \leftarrow 32_{3,30}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	357 427.173(35)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	357 423.651(35)
$33_{3,30} \leftarrow 32_{3,29}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	357 425.602(35)
$33_{4*} \leftarrow 32_{4*}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	357 354.118(35)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	357 326.685(35)
$33_{6*} \leftarrow 32_{6*}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	357 130.617(35)
$34_{0,34} \leftarrow 33_{0,33}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	368 112.303(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 135.458(35)
$34_{1,34} \leftarrow 33_{1,33}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	366 452.566(35)
$34_{1,33} \leftarrow 33_{1,32}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	370 043.778(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	370 078.763(35)
$34_{2,33} \leftarrow 33_{2,32}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	368 239.129(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 252.630(35)

$34_{2,32} \leftarrow 33_{2,31}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	368 447.576(35)
$34_{3,32} \leftarrow 33_{3,31}$	$34\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 247.206(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 249.068(35)
$34_{3,31} \leftarrow 33_{3,30}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 250.755(35)
$34_{4*} \leftarrow 33_{4*}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	368 172.119(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 147.975(35)
$34_{5*} \leftarrow 33_{5*}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 021.086(35)
$34_{6*} \leftarrow 33_{6*}$	$34\frac{1}{2} \leftarrow 32\frac{1}{2}$	367 938.753(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	367 851.611(35)
$35_{0,35} \leftarrow 34_{0,34}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	378 917.376(35)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	378 940.317(35)
$35_{1,35} \leftarrow 34_{1,34}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	377 217.451(35)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	377 228.474(35)
$35_{1,34} \leftarrow 34_{1,33}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	380 914.215(35)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	380 949.115(35)
$35_{2,34} \leftarrow 34_{2,33}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	379 057.340(35)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	379 071.504(35)
$35_{2,33} \leftarrow 34_{2,32}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	379 265.713(35)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	379 283.845(35)
$35_{3,33} \leftarrow 34_{3,32}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	379 069.872(35) ^{b)}
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	379 069.872(35) ^{b)}
$35_{3,32} \leftarrow 34_{3,31}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	379 071.504(35) ^{b)}
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	379 071.504(35) ^{b)}
$35_{4*} \leftarrow 34_{4*}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	378 989.538(35)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	378 968.274(35)
$35_{5*} \leftarrow 34_{5*}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	378 886.989(35)
$35_{6*} \leftarrow 34_{6*}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	378 746.717(35)
$34_{0,34} \leftarrow 33_{0,33}$	$34\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 112.303(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 135.458(35)
$34_{1,34} \leftarrow 33_{1,33}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	366 452.566(35)
$34_{1,33} \leftarrow 33_{1,32}$	$34\frac{1}{2} \leftarrow 32\frac{1}{2}$	370 043.778(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	370 078.763(35)
$34_{2,33} \leftarrow 33_{2,32}$	$34\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 239.129(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 252.630(35)
$34_{2,32} \leftarrow 33_{2,31}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	368 447.576(35)
$34_{3,32} \leftarrow 33_{3,31}$	$34\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 247.206(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 249.068(35)
$34_{3,31} \leftarrow 33_{3,30}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 250.755(35)
$34_{4*} \leftarrow 33_{4*}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	368 172.119(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 147.975(35)
$34_{5*} \leftarrow 33_{5*}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	368 021.086(35)
$34_{6*} \leftarrow 33_{6*}$	$34\frac{1}{2} \leftarrow 32\frac{1}{2}$	367 938.753(35)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	367 851.611(35)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1 σ).

^{b)} Spin-rotation splitting not resolved.

Molecular parameters for ¹ H ₂ ¹² C ¹² C ³¹ P				
Parameter		Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level				
<i>A</i>	[MHz]	288 810(85) ^{a)}	MW	98Ahm
<i>B</i>	[MHz]	5 472.319 0(141)		
<i>C</i>	[MHz]	5 365.571 0(132)		
Δ_K	[MHz]	22.52 ^{b)}	Theory	98Ahm
Δ_{NK}	[MHz]	0.151 51(33)	MW	98Ahm
Δ_N	[kHz]	1.090 08(101)		
δ_K	[MHz]	0.120 3(52)		
δ_N	[kHz]	0.025 35(173)		
Φ_{KN}	[kHz]	− 0.275(20)		
Φ_{NK}	[Hz]	0.892(94)		
L_{KKN}	[Hz]	− 11.61(38)		
\mathcal{E}_{aa}	[MHz]	− 3 268.44(196)		
\mathcal{E}_{bb}	[MHz]	− 51.16(114)		
\mathcal{E}_{cc}	[MHz]	− 2.874(102)		
$r_e(\text{C-H})$	[nm]	0.108 16(5)	Theory	98Ahm
$\angle_e(\text{HCH})$	[deg]	118.22(5)		
$r_e(\text{C-C})$	[nm]	0.134 18(10)		
$r_e(\text{C-P})$	[nm]	0.158 89(10)		
μ_e	[D]	1.15	Theory	98Ahm

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to value calculated by *ab initio* methods.

Reference for H₂CCP

98Ahm Ahmad, I.K., Ozeki, H., Saito, S., Botschwina, P. : J. Chem. Phys. **109** (1998) 4252.

3.2.4.2.13 H₂NSMicrowave data for ¹H₂¹⁴N³²S

Transition				ν [MHz]	Ref.		
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}					
		$F_1' - F_1''$	$F' - F''$				
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level							
$1_{01} \leftarrow 0_{00}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 2\frac{1}{2}$	31 597.311(5) ^{b)}	98Hab		
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	31 596.773(5)			
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	31 576.455(5)			
		$\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	31 459.427(5)			
			$1\frac{1}{2} \leftarrow \frac{1}{2}$	31 450.134(5)			
			$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	31 444.050(5)			
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	31 455.030(5)			
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	31 434.700(5)			
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	31 444.875(5)			
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	31 439.375(5)			
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	31 451.190(5)			
		$5_{05} \leftarrow 4_{04}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$)	157 383.342(25) ^{d)}
				$5\frac{1}{2} \leftarrow 4\frac{1}{2}$)	157 383.342(25) ^{d)}
				$6\frac{1}{2} \leftarrow 5\frac{1}{2}$)	157 383.342(25) ^{d)}
		$5_{15} \leftarrow 4_{14}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$)	154 270.283(25)
				$4\frac{1}{2} \leftarrow 3\frac{1}{2}$)	157 383.342(25) ^{d)}
				$5\frac{1}{2} \leftarrow 4\frac{1}{2}$)	157 383.342(25) ^{d)}
$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)			156 477.339(25)		
$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)			156 478.421(25) ^{d)}		
$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)			156 478.421(25) ^{d)}		
$5_{14} \leftarrow 4_{13}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	)	158 051.196(25)		
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	158 050.116(25)		
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	158 049.002(25)		
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	160 157.005(25) ^{d)}		
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	160 157.005(25) ^{d)}		
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	160 157.005(25) ^{d)}		
$5_{33} \leftarrow 4_{32}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	162 367.140(25)		
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	162 368.826(25)		
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	162 369.748(25)		
$6_{06} \leftarrow 5_{05}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	188 849.085(25) ^{d)}		
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	188 849.085(25) ^{d)}		
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	188 849.085(25) ^{d)}		
$6_{16} \leftarrow 5_{15}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	185 775.429(25) ^{d)}		
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	185 775.429(25) ^{d)}		
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	185 775.429(25) ^{d)}		
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	187 334.962(25)		
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	187 335.763(25) ^{d)}		
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	187 335.763(25) ^{d)}		

$6_{15} \leftarrow 5_{14}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	190 309.770(25)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	190 309.023(25)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	190 308.275(25)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	191 765.688(25) ^d
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	191 765.688(25) ^d
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	191 765.688(25) ^d
$6_{25} \leftarrow 5_{24}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	180 008.746(25)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	180 007.752(25)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	180 006.735(25)
$6_{24} \leftarrow 5_{23}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	186 054.862(25)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	186 053.916(25)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	186 052.966(25)
$6_{34} \leftarrow 5_{33}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	)	183 920.766(25)
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	183 919.610(25)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	183 918.085(25)
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	192 920.437(25)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	192 921.596(25)
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	192 922.335(25)
$7_{07} \leftarrow 6_{06}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	220 304.246(25) ^d
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	220 304.246(25) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	220 304.246(25) ^d
$7_{17} \leftarrow 6_{16}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	217 120.889(25) ^d
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	217 120.889(25) ^d
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	217 120.889(25) ^d
$7_{16} \leftarrow 6_{15}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	)	222 405.759(25)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	223 454.640(25) ^d
	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	223 454.640(25) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	223 454.640(25) ^d
$7_{3*} \leftarrow 6_{3*}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	223 678.886(25)
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	251 828.076(25) ^d
$8_{08} \leftarrow 7_{07}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	251 828.076(25) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	251 828.076(25) ^d
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	251 828.076(25) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	251 828.076(25) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	251 747.043(25) ^d
		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	251 747.043(25) ^d
$8_{18} \leftarrow 7_{17}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	)	248 375.815(25) ^d
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	248 375.815(25) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	248 375.815(25) ^d
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	249 260.123(25) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	249 260.123(25) ^d
		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	249 260.123(25) ^d
$8_{17} \leftarrow 7_{16}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	255 188.070(25) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	255 188.070(25) ^d
		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	255 188.070(25) ^d
$9_{09} \leftarrow 8_{08}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	)	283 255.504(25) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	283 255.504(25) ^d

		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	\circ	283 255.504(25) ^d
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	\circ	283 175.683(25) ^d
		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	\circ	283 175.683(25) ^d
		$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	\circ	283 175.683(25) ^d
$9_{19} \leftarrow 8_{18}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	\circ	279 574.430(25) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	\circ	279 574.430(25) ^d
		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	\circ	279 574.430(25) ^d
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	\circ	280 270.845(25) ^d
		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	\circ	280 270.845(25) ^d
		$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	\circ	280 270.845(25) ^d
$9_{18} \leftarrow 8_{17}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	\circ	286 355.477(25) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	\circ	286 355.477(25) ^d
		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	\circ	286 355.477(25) ^d
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	\circ	286 946.243(25) ^d
		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	\circ	286 946.243(25) ^d
		$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	\circ	286 946.243(25) ^d
$9_{3s} \leftarrow 8_{3s}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	\circ	285 624.064(25) ^d
		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	\circ	285 624.064(25) ^d
		$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	\circ	285 624.064(25) ^d

^a) Coupling scheme: $\mathbf{J} = \mathbf{N} + \mathbf{S}$; $\mathbf{F}_1 = \mathbf{J} + \mathbf{I}_1$; $\mathbf{F} = \mathbf{F}_1 + \mathbf{I}_2$ where \mathbf{I}_1 is the ¹⁴N nuclear spin and \mathbf{I}_2 is the ¹H total nuclear spin ($I_2 = 1$ or 0).

^b) The figures in parentheses are the authors' estimates of experimental uncertainty (1 σ).

^c) ¹H nuclear hyperfine splittings not resolved.

^d) ¹⁴N nuclear hyperfine splittings not resolved.

Molecular parameters for ¹H₂¹⁴N³²S

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level			
A	[MHz]	333 451(139) ^a	MW
B	[MHz]	16 121.37(27)	
C	[MHz]	15 370.89(27)	
A_K	[MHz]		MW
A_{NK}	[MHz]		MW
A_N	[kHz]		
δ_K	[MHz]		
δ_N	[kHz]	0.943(29)	
ε_{aa}	[MHz]	- 37 955.61(92)	
ε_{bb}	[MHz]	- 192.003(69)	
ε_{cc}	[MHz]	20.479(71)	
Δ_K^S	[MHz]	5.048(178)	
Δ_{NK}^S	[kHz]	92(21)	
$a_F(^{14}\text{N})$	[MHz]	18.779 8(88)	
$T_{aa}(^{14}\text{N})$	[MHz]	- 14.554 4(149)	
$T_{bb}(^{14}\text{N})$	[MHz]	- 15.53(150)	
$\chi_{aa}(^{14}\text{N})$	[MHz]	2.179(30)	
$\chi_{bb}(^{14}\text{N})$	[MHz]	0.65 ^c	
$a_F(^1\text{H})$	[MHz]	- 22.740 2(123)	
$T_{aa}(^1\text{H})$	[MHz]	- 5.484(30)	
$T_{bb}(^1\text{H})$	[MHz]	12.7 ^c	

Δ_c	[uÅ ²]	0.015 0(6)
$r_z(\text{N-H})$	[nm]	0.100 0(5)
$r_z(\text{N-S})$	[nm]	0.163 98(13)
$\angle_z(\text{H-N-H})$	[deg]	118.9(7)
$r_e(\text{N-H})$	[nm]	0.100 5(5)
$r_e(\text{N-S})$	[nm]	0.163 43(13)
$\angle_e(\text{H-N-H})$	[deg]	118.9(7)

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to value of Δ_k for H₂CS from [80Bed].

^{c)} Parameter constrained to this value.

Microwave data for ²H₂¹⁴N³²S (D₂NS)

Transition				ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}			
		$F_1' - F_1''$	$F' - F''$		
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level					
$1_{01} \leftarrow 0_{00}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	26 953.121(5) ^{b)}	98Hab
			$1\frac{1}{2} \leftarrow 2\frac{1}{2}$	26 956.401(5)	
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	26 958.514(5)	
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	26 958.693(5)	
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	26 933.857(5)	
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	26 937.815(5)	
			$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	26 936.190(5)	
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	26 946.696(5)	
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	26 821.848(5)	
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	26 840.099(5)	
			$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	26 838.387(5)	
			$2\frac{1}{2} \leftarrow 2\frac{1}{2}$	26 841.651(5)	
			$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	26 839.233(5)	
$9_{09} \leftarrow 8_{08}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	)	241 128.535(25)
$9_{19} \leftarrow 8_{18}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	)	236 662.676(25)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	)	236 947.199(25)
$9_{18} \leftarrow 8_{17}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	)	246 587.205(25)
$9_{28} \leftarrow 8_{27}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	)	242 210.164(25)
$9_{27} \leftarrow 8_{26}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	)	241 765.558(25)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	)	242 871.594(25)
$10_{0,10} \leftarrow 9_{09}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	)	267 798.155(25)
$10_{1,10} \leftarrow 9_{19}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	)	262 958.999(25)
$10_{19} \leftarrow 9_{18}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	273 894.591(25)
$10_{29} \leftarrow 9_{28}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	268 936.703(25)
$10_{28} \leftarrow 9_{27}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	)	268 956.679(25)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	269 845.543(25)
$10_{38} \leftarrow 9_{37}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	)	267 679.184(25)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	269 654.053(25)
$11_{0,11} \leftarrow 10_{0,10}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	294 349.839(25)

	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	)	294 295.257(25)
$11_{1,11} \leftarrow 10_{1,10}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	289 230.741(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	)	289 413.598(25)
$11_{1,10} \leftarrow 10_{19}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	301 096.396(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	)	301 189.206(25)
$11_{2,10} \leftarrow 10_{29}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	294 928.524(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	)	295 672.912(25)
$11_{29} \leftarrow 10_{28}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	296 157.629(25)
$11_{39} \leftarrow 10_{38}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	294 748.618(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	)	296 399.272(25)
$11_{38} \leftarrow 10_{37}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	294 772.045(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	)	296 422.205(25)
$11_{4*} \leftarrow 10_{4*}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	)	294 034.784(25)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	)	296 817.310(25)
$13_{1,13} \leftarrow 12_{1,12}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	)	296 817.310(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	341 706.877(25)
$13_{1,12} \leftarrow 12_{1,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	)	341 831.630(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	355 724.327(25)
$13_{2,12} \leftarrow 12_{2,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	)	348 621.170(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	349 146.280(25)
$13_{2,11} \leftarrow 12_{2,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	)	350 634.960(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	351 131.393(25)
$13_{3,11} \leftarrow 12_{3,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	)	348 784.889(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	349 977.437(25)
$13_{3,10} \leftarrow 12_{39}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	)	348 839.644(25)
$13_{4*} \leftarrow 12_{4*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	)	348 173.095(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	350 235.074(25)
$13_{5*} \leftarrow 12_{5*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	)	347 523.397(25)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	350 582.016(25)
$14_{0,14} \leftarrow 13_{0,13}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	373 621.711(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	)	)	373 580.272(25)
$14_{1,14} \leftarrow 13_{1,13}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	367 912.168(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	)	)	368 016.968(25)
$14_{1,13} \leftarrow 13_{1,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	382 942.548(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	)	)	382 958.026(25)
$14_{2,13} \leftarrow 13_{2,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	375 425.044(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	)	)	375 874.375(25)
$14_{2,12} \leftarrow 13_{2,11}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	)	)	378 340.609(25)
$14_{3,12} \leftarrow 13_{3,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	375 769.398(25)
$14_{5*} \leftarrow 13_{5*}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	)	374 577.120(25)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	)	)	377 267.276(25)

^a) Coupling scheme: $\mathbf{J} = \mathbf{N} + \mathbf{S}$; $\mathbf{F}_1 = \mathbf{J} + \mathbf{I}_1$; $\mathbf{F} = \mathbf{F}_1 + \mathbf{I}_2$ where \mathbf{I}_1 is the ¹⁴N nuclear spin and \mathbf{I}_2 is the ²H total nuclear spin ($I_2 = 2, 1$ or 0).

^b) The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

) Neither ¹⁴N nor ¹H nuclear hyperfine splittings are resolved.

Molecular parameters for ² H ₂ ¹⁴ N ³² S (D ₂ NS)				
Parameter		Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level				
<i>A</i>	[MHz]	168 048.2(37) ^{a)}	MW	98Hab
<i>B</i>	[MHz]	13 976.667 6(127)		
<i>C</i>	[MHz]	12 897.810 1(124)		
Δ_K	[MHz]	5.039 5 ^{b)}	MW	80Bed
Δ_{NK}	[MHz]	0.306 318(93)	MW	98Hab
Δ_N	[kHz]	13.2(97)		
δ_K	[MHz]	0.228 4(48)		
δ_N	[kHz]	1.098 8(121)		
ϵ_{aa}	[MHz]	− 18 916.63(151)		
ϵ_{bb}	[MHz]	− 163.563(85)		
ϵ_{cc}	[MHz]	17.035(84)		
Δ_K^s	[MHz]	1.159(107)		
Δ_{NK}^s	[kHz]	86.0(139)		
$a_F(^{14}\text{N})$	[MHz]	17.993 5(96)		
$T_{aa}(^{14}\text{N})$	[MHz]	− 14.695 1(144)		
$T_{bb}(^{14}\text{N})$	[MHz]	− 15.53 ^{c)}		
$\chi_{aa}(^{14}\text{N})$	[MHz]	2.188(35)		
$\chi_{bb}(^{14}\text{N})$	[MHz]	0.65 ^{c)}		
$a_F(^2\text{H})$	[MHz]	− 3.612 1(126)		
$T_{aa}(^2\text{H})$	[MHz]	− 0.845(28)		
$T_{bb}(^2\text{H})$	[MHz]	1.95 ^{c)}		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to value of Δ_K for D₂CS from [80Bed].

^{c)} Parameter constrained to this value.

References for H₂NS

80Bed Bedwell, D.J., Duxbury, G. : J. Molec. Spectrosc. **84** (1980) 531.
98Hab Habara, H., Yamamoto, S., Saito, S.: J. Chem. Phys. **109** (1998) 2700.

3.2.4.2.14 H₂PO

Microwave data for ¹H₂³¹P¹⁶O

Transition				ν [MHz]	Ref.	
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}				
		$F'_1 - F''_1$	$F' - F''$			
State: electronic \tilde{X}^2A' ; vibrational zero-point level						
$4_{04} \leftarrow 3_{03}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	$5 \leftarrow 4^b)$	147 199.529(30) ^{c,d)}	96Hir	
			$6 \leftarrow 5$	147 199.529(30) ^{d)}		
		$4 \leftarrow 3$	$5 \leftarrow 4$	147 203.725(30)		
			$4 \leftarrow 3$	147 202.978(30)		
			$4 \leftarrow 3$	147 229.797(30)		
			$4 \leftarrow 3$	147 234.618(30)		
			$4 \leftarrow 3$	147 230.108(30)		
			$3 \leftarrow 2$	147 225.742(30)		

$4_{14} \leftarrow 3_{13}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	$4 \leftarrow 3^b$	147 264.336(30)
		$4 \leftarrow 3$	$5 \leftarrow 4$	147 255.425(30)
			$4 \leftarrow 3$	147 269.085(30)
		$3 \leftarrow 2$	$3 \leftarrow 2^b$	147 295.057(30) ^d
		$3 \leftarrow 2$	$4 \leftarrow 3$	147 286.351(30)
			$3 \leftarrow 2$	147 289.368(30)
			$2 \leftarrow 1$	147 295.057(30) ^d
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	144 944.776(30) ^d
			$5 \leftarrow 4$	144 944.776(30) ^d
			$4 \leftarrow 3$	144 944.776(30) ^d
		$4 \leftarrow 3$	$4 \leftarrow 3^b$	144 938.981(30) ^d
		$4 \leftarrow 3$	$5 \leftarrow 4$	144 938.981(30) ^d
			$4 \leftarrow 3$	144 941.127(30) ^d
			$3 \leftarrow 2$	144 941.127(30) ^d
$4_{13} \leftarrow 3_{12}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	$4 \leftarrow 3^b$	144 902.645(30) ^d
		$4 \leftarrow 3$	$5 \leftarrow 4$	144 902.645(30) ^d
			$4 \leftarrow 3$	144 904.274(30) ^d
			$3 \leftarrow 2$	144 904.274(30) ^d
		$3 \leftarrow 2$	$3 \leftarrow 2^b$	144 899.086(30) ^d
		$3 \leftarrow 2$	$4 \leftarrow 3$	144 894.317(30)
			$3 \leftarrow 2$	144 895.067(30)
			$2 \leftarrow 1$	144 899.086(30) ^d
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	149 628.122(30) ^d
			$6 \leftarrow 5$	149 628.122(30) ^d
			$5 \leftarrow 4$	149 630.488(30) ^d
			$4 \leftarrow 3$	149 630.488(30) ^d
		$4 \leftarrow 3$	$4 \leftarrow 3^b$	149 649.107(30)
		$4 \leftarrow 3$	$5 \leftarrow 4$	149 652.479(30)
$5_{05} \leftarrow 4_{04}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$		$4 \leftarrow 3$	149 651.163(30)
			$3 \leftarrow 2$	149 648.163(30)
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	149 682.761(30)
		$4 \leftarrow 3$	$5 \leftarrow 4$	149 676.955(30)
			$4 \leftarrow 3$	149 685.512(30)
			$3 \leftarrow 2$	149 688.767(30)
		$3 \leftarrow 2$	$3 \leftarrow 2^b$	149 712.147(30) ^d
		$3 \leftarrow 2$	$4 \leftarrow 3$	149 704.442(30)
			$3 \leftarrow 2$	149 706.583(30)
			$2 \leftarrow 1$	149 712.147(30) ^d
		$6 \leftarrow 5$	$6 \leftarrow 5^b$	183 951.850(30) ^d
		$6 \leftarrow 5$	$7 \leftarrow 6$	183 951.850(30) ^d
			$6 \leftarrow 5$	183 954.910(30)
			$5 \leftarrow 4$	183 954.317(30)
$5_{15} \leftarrow 4_{14}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	$5 \leftarrow 4^b$	183 978.016(30) ^d
			$6 \leftarrow 5$	183 982.122 (30)
			$5 \leftarrow 4$	183 978.016(30) ^d
			$4 \leftarrow 3$	183 974.391(30)
		$5 \leftarrow 4$	$5 \leftarrow 4^b$	184 017.472(30)
			$6 \leftarrow 5$	184 010.192(30)
			$5 \leftarrow 4$	184 020.166(30)
			$4 \leftarrow 3$	184 024.451(30)
		$4 \leftarrow 3$	$4 \leftarrow 3^b$	184 044.840(30) ^d
		$4 \leftarrow 3$	$5 \leftarrow 4$	184 039.305(30)
			$4 \leftarrow 3$	184 041.075(30)
			$3 \leftarrow 2$	184 044.840(30) ^d
		$6 \leftarrow 5$	$6 \leftarrow 5^b$	181 149.420(30) ^d

		6 ← 5	7 ← 6	181 149.420(30) ^d
			6 ← 5	181 149.420(30) ^d
			5 ← 4	181 149.420(30) ^d
		5 ← 4	5 ← 4 ^b	181 149.420(30) ^d
			6 ← 5	181 149.420(30) ^d
			5 ← 4	181 149.420(30) ^d
			4 ← 3	181 149.420(30) ^d
	4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	5 ← 4	5 ← 4 ^b	181 135.246(30)
			6 ← 5	181 134.521(30)
			5 ← 4	181 136.395(30) ^d
			4 ← 3	181 137.039(30)
		4 ← 3	4 ← 3 ^b	181 136.395(30) ^d
		4 ← 3	5 ← 4	181 133.340(30)
			4 ← 3	181 133.857(30)
			3 ← 2	181 136.395(30) ^d
5 ₁₄ ← 4 ₁₃	5 $\frac{1}{2}$ ← 4 $\frac{1}{2}$	6 ← 5	6 ← 5 ^b	187 019.113(30) ^d
		6 ← 5	7 ← 6	187 019.113(30) ^d
			6 ← 5	187 020.872(30) ^d
			5 ← 4	187 020.872(30) ^d
		5 ← 4	5 ← 4 ^b	187 039.985(30)
			6 ← 5	187 043.251(30)
			5 ← 4	187 041.369(30)
			4 ← 3	187 038.490(30)
	4 $\frac{1}{2}$ ← 3 $\frac{1}{2}$	5 ← 4	5 ← 4 ^b	187 105.437(30)
			6 ← 5	187 100.352(30)
			5 ← 4	187 106.986(30)
			4 ← 3	187 110.286(30)
		4 ← 3	4 ← 3 ^b	187 130.624(30) ^d
		4 ← 3	5 ← 4	187 125.743(30)
			4 ← 3	187 127.123(30)
			3 ← 2	187 130.624(30) ^d
6 ₀₆ ← 5 ₀₅	6 $\frac{1}{2}$ ← 5 $\frac{1}{2}$	7 ← 6	7 ← 6 ^b	220 664.091(30) ^d
		7 ← 6	8 ← 7	220 664.091(30) ^d
			7 ← 6	220 666.228(30) ^d
			6 ← 5	220 666.228(30) ^d
		6 ← 5	6 ← 5 ^b	220 686.324(30) ^d
		6 ← 5	7 ← 6	220 689.896(30)
			6 ← 5	220 686.324(30) ^d
			5 ← 4	220 683.231(30)
	5 $\frac{1}{2}$ ← 4 $\frac{1}{2}$	6 ← 5	6 ← 5 ^b	220 729.507(30)
		6 ← 5	7 ← 6	220 723.521(30)
			6 ← 5	220 731.111(30)
			5 ← 4	220 734.967(30)
		5 ← 4	5 ← 4 ^b	220 753.888(30) ^d
			6 ← 5	220 750.075(30)
			5 ← 4	220 751.178(30)
			4 ← 3	220 753.888(30) ^d
6 ₁₆ ← 5 ₁₅	6 $\frac{1}{2}$ ← 5 $\frac{1}{2}$	7 ← 6	7 ← 6 ^b	217 347.344(30) ^d
		7 ← 6	8 ← 7	217 347.344(30) ^d
			7 ← 6	217 348.196(30) ^d
			6 ← 5	217 348.196(30) ^d
		6 ← 5	6 ← 5 ^b	217 350.242(30)
		6 ← 5	7 ← 6	217 351.095(30) ^d
			6 ← 5	217 351.095(30) ^d
			5 ← 4	217 347.344(30) ^d

$6_{15} \leftarrow 5_{14}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	$6 \leftarrow 5^b$	217 347.344(30) ^d
		$6 \leftarrow 5$	$7 \leftarrow 6$	217 345.693(30)
			$6 \leftarrow 5$	217 348.196(30) ^d
			$5 \leftarrow 4$	217 349.075(30) ^d
		$5 \leftarrow 4$	$5 \leftarrow 4^b$	217 351.095(30) ^d
			$6 \leftarrow 5$	217 349.075(30) ^d
			$5 \leftarrow 4$	217 349.075(30) ^d
			$4 \leftarrow 3$	217 351.095(30) ^d
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7 \leftarrow 6$	224 402.311(30) ^d
		$7 \leftarrow 6$	$8 \leftarrow 7$	224 402.311(30) ^d
			$7 \leftarrow 6$	224 403.672(30) ^d
			$6 \leftarrow 5$	224 403.672(30) ^d
		$6 \leftarrow 5$	$6 \leftarrow 5^b$	224 421.570(30)
		$6 \leftarrow 5$	$7 \leftarrow 6$	224 424.512(30)
$6_{25} \leftarrow 5_{24}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$		$6 \leftarrow 5$	224 422.646(30)
			$5 \leftarrow 4$	224 420.052(30)
		$6 \leftarrow 5$	$6 \leftarrow 5^b$	224 505.777(30)
		$6 \leftarrow 5$	$7 \leftarrow 6$	224 501.397(30)
			$6 \leftarrow 5$	224 506.662(30)
			$5 \leftarrow 4$	224 509.749(30)
		$5 \leftarrow 4$	$5 \leftarrow 4^b$	224 528.102(30) ^d
			$6 \leftarrow 5$	224 524.739(30)
			$5 \leftarrow 4$	224 525.514(30)
			$4 \leftarrow 3$	224 528.102(30) ^d
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7 \leftarrow 6$	220 928.803(30) ^d
		$7 \leftarrow 6$	$8 \leftarrow 7$	220 928.803(30) ^d
			$7 \leftarrow 6$	220 929.679(30) ^d
			$6 \leftarrow 5$	220 929.679(30) ^d
$6_{24} \leftarrow 5_{23}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	$6 \leftarrow 5^b$	220 928.803(30) ^d
		$6 \leftarrow 5$	$7 \leftarrow 6$	220 929.679(30) ^d
			$6 \leftarrow 5$	220 929.679(30) ^d
			$5 \leftarrow 4$	220 929.679(30) ^d
		$6 \leftarrow 5$	$6 \leftarrow 5^b$	220 883.237(30) ^d
		$6 \leftarrow 5$	$7 \leftarrow 6$	220 881.895(30)
			$6 \leftarrow 5$	220 883.237(30) ^d
			$5 \leftarrow 4$	220 884.400(30)
		$5 \leftarrow 4$	$5 \leftarrow 4^b$	220 890.367(30) ^d
			$6 \leftarrow 5$	220 888.367(30) ^d
			$5 \leftarrow 4$	220 888.367(30) ^d
			$4 \leftarrow 3$	220 890.367(30) ^d
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7 \leftarrow 6$	221 188.732(30) ^d
		$7 \leftarrow 6$	$8 \leftarrow 7$	221 188.732(30) ^d
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$		$7 \leftarrow 6$	221 189.795(30) ^d
			$6 \leftarrow 5$	221 189.795(30) ^d
		$6 \leftarrow 5$	$6 \leftarrow 5^b$	221 191.517(30)
		$6 \leftarrow 5$	$7 \leftarrow 6$	221 192.244(30) ^d
			$6 \leftarrow 5$	221 192.968(30)
			$5 \leftarrow 4$	221 192.244(30) ^d
		$6 \leftarrow 5$	$6 \leftarrow 5^b$	221 157.629(30) ^d
		$6 \leftarrow 5$	$7 \leftarrow 6$	221 156.187(30)
			$6 \leftarrow 5$	221 157.629(30) ^d
			$5 \leftarrow 4$	221 158.873(30)
		$5 \leftarrow 4$	$5 \leftarrow 4^b$	221 163.938(30) ^d
			$6 \leftarrow 5$	221 161.835(30) ^d
			$5 \leftarrow 4$	221 161.835(30) ^d

$6_{34} \leftarrow 5_{33}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7 \leftarrow 6$	$4 \leftarrow 3$	221 163.938(30) ^d
		$7 \leftarrow 6$	$7 \leftarrow 6^b$	221 047.588(30) ^d
		$7 \leftarrow 6$	$8 \leftarrow 7$	221 047.588(30) ^d
		$6 \leftarrow 5$	$6 \leftarrow 5^b$	221 041.884(30) ^d
		$6 \leftarrow 5$	$7 \leftarrow 6$	221 041.884(30) ^d
			$6 \leftarrow 5$	221 043.237(30) ^d
			$5 \leftarrow 4$	221 043.237(30) ^d
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	220 832.636(30) ^d
		$6 \leftarrow 5$	$7 \leftarrow 6$	220 830.877(30) ^d
			$6 \leftarrow 5$	220 830.877(30) ^d
$6_{33} \leftarrow 5_{32}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$		$5 \leftarrow 4$	220 832.636(30) ^d
		$5 \leftarrow 4$	$5 \leftarrow 4^b$	220 840.795(30) ^d
			$6 \leftarrow 5$	220 838.845(30) ^d
			$5 \leftarrow 4$	220 838.845(30) ^d
			$4 \leftarrow 3$	220 840.795(30) ^d
		$6 \leftarrow 5$	$6 \leftarrow 5^b$	221 043.237(30) ^d
		$6 \leftarrow 5$	$7 \leftarrow 6$	221 043.237(30) ^d
			$6 \leftarrow 5$	221 044.531(30) ^d
			$5 \leftarrow 4$	221 044.531(30) ^d
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	220 834.247(30) ^d
$6_{4\cdot} \leftarrow 5_{4\cdot}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6 \leftarrow 5$	$7 \leftarrow 6$	220 832.636(30) ^d
		$6 \leftarrow 5$	$6 \leftarrow 5$	220 832.636(30) ^d
			$5 \leftarrow 4$	220 834.247(30) ^d
		$5 \leftarrow 4$	$5 \leftarrow 4^b$	220 842.448(30) ^d
			$6 \leftarrow 5$	220 840.795(30) ^d
			$5 \leftarrow 4$	220 840.795(30) ^d
			$4 \leftarrow 3$	220 842.448(30) ^d
		$7 \leftarrow 6$	$7 \leftarrow 6^b$	221 094.314(30) ^d
		$7 \leftarrow 6$	$8 \leftarrow 7$	221 094.314(30) ^d
			$7 \leftarrow 6$	221 094.314(30) ^d
$7_{07} \leftarrow 6_{06}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$		$6 \leftarrow 5$	221 094.314(30) ^d
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	220 633.601(30)
		$6 \leftarrow 5$	$7 \leftarrow 6$	220 631.695(30)
			$6 \leftarrow 5$	220 632.858(30)
			$5 \leftarrow 4$	220 634.742(30)
		$5 \leftarrow 4$	$5 \leftarrow 4^b$	220 649.903(30)
			$6 \leftarrow 5$	220 647.393(30)
			$5 \leftarrow 4$	220 648.527(30)
			$4 \leftarrow 3$	220 650.948(30)
		$8 \leftarrow 7$	$8 \leftarrow 7^b$	257 328.343(30) ^d
$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$8 \leftarrow 7$	$9 \leftarrow 8$	257 328.343(30) ^d
			$8 \leftarrow 7$	257 329.984(30) ^d
			$7 \leftarrow 6$	257 329.984(30) ^d
		$7 \leftarrow 6$	$7 \leftarrow 6^b$	257 347.079(30) ^d
		$7 \leftarrow 6$	$8 \leftarrow 7$	257 350.123(30)
			$7 \leftarrow 6$	257 347.079(30) ^d
			$6 \leftarrow 5$	257 344.477(30)
		$7 \leftarrow 6$	$7 \leftarrow 6^b$	257 392.301(30)
		$7 \leftarrow 6$	$8 \leftarrow 7$	257 387.360(30)
			$7 \leftarrow 6$	257 393.237(30)
$6 \leftarrow 5$	$6 \leftarrow 5$		$6 \leftarrow 5$	257 396.649(30)
		$6 \leftarrow 5$	$6 \leftarrow 5^b$	257 413.794(30) ^d
		$6 \leftarrow 5$	$7 \leftarrow 6$	257 411.048(30)
			$6 \leftarrow 5$	257 411.745(30)
			$5 \leftarrow 4$	257 413.794(30) ^d

$7_{17} \leftarrow 6_{16}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	8 \leftarrow 7	8 \leftarrow 7 ^b)	253 534.459(30) ^d
		8 \leftarrow 7	9 \leftarrow 8	253 534.459(30) ^d
			8 \leftarrow 7	253 535.442(30) ^d
			7 \leftarrow 6	253 535.442(30) ^d
		7 \leftarrow 6	7 \leftarrow 6 ^b)	253 538.727(30) ^d
		7 \leftarrow 6	8 \leftarrow 7	253 539.932(30) ^d
			7 \leftarrow 6	253 539.932(30) ^d
			6 \leftarrow 5	253 538.727(30) ^d
		6 $\frac{1}{2} \leftarrow 5\frac{1}{2}$	7 \leftarrow 6 ^b)	253 535.080(30) ^d
		7 \leftarrow 6	8 \leftarrow 7	253 539.932(30) ^d
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$		7 \leftarrow 6	253 535.080(30) ^d
			6 \leftarrow 5	253 543.685(30)
		6 \leftarrow 5	6 \leftarrow 5 ^b)	253 547.592(30) ^d
		6 \leftarrow 5	7 \leftarrow 6	253 545.987(30) ^d
			6 \leftarrow 5	253 545.987(30) ^d
			5 \leftarrow 4	253 547.592(30) ^d
		$7_{16} \leftarrow 6_{15}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	261 772.613(30) ^d
				261 772.613(30) ^d
				261 773.845(30) ^d
				261 773.845(30) ^d
				261 789.941(30)
				261 792.518(30)
				261 790.835(30)
				261 788.514(30)
				261 886.926(30) ^d
				261 886.926(30) ^d
				261 883.024(30)
				261 889.865(30)
				261 905.990(30) ^d
				261 903.798(30) ^d
				261 903.798(30) ^d
				261 905.990(30) ^d
				257 707.506(30) ^d
$7_{26} \leftarrow 6_{25}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	8 \leftarrow 7	8 \leftarrow 7 ^b)	257 707.506(30) ^d
		8 \leftarrow 7	9 \leftarrow 8	257 707.506(30) ^d
			8 \leftarrow 7	257 708.300(30) ^d
			7 \leftarrow 6	257 708.300(30) ^d
		7 \leftarrow 6	7 \leftarrow 6 ^b)	257 710.423(30) ^d
		7 \leftarrow 6	8 \leftarrow 7	257 710.423(30) ^d
			7 \leftarrow 6	257 710.423(30) ^d
			6 \leftarrow 5	257 710.423(30) ^d
		6 $\frac{1}{2} \leftarrow 5\frac{1}{2}$	7 \leftarrow 6 ^b)	257 698.999(30) ^d
		7 \leftarrow 6	8 \leftarrow 7	257 698.999(30) ^d
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$		7 \leftarrow 6	257 697.639(30)
			6 \leftarrow 5	257 700.152(30)
		6 \leftarrow 5	6 \leftarrow 5 ^b)	257 705.977(30) ^d
		6 \leftarrow 5	7 \leftarrow 6	257 704.406(30) ^d
			6 \leftarrow 5	257 704.406(30) ^d
			5 \leftarrow 4	257 705.977(30) ^d
		$7_{25} \leftarrow 6_{24}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	258 126.532(30) ^d
				258 126.532(30) ^d
				258 127.302(30) ^d
				258 127.302(30) ^d
				258 127.302(30) ^d
				258 130.587(30) ^d
				258 131.514(30) ^d
				258 131.514(30) ^d
				258 131.514(30) ^d
				258 131.514(30) ^d

			6 ← 5	258 130.587(30) ^d
	6 $\frac{1}{2}$ ← 5 $\frac{1}{2}$	7 ← 6	7 ← 6 ^b	258 135.558(30) ^d
		7 ← 6	8 ← 7	258 133.952(30)
			7 ← 6	258 135.558(30) ^d
			6 ← 5	258 136.976(30)
		6 ← 5	6 ← 5 ^b	258 141.895(30) ^d
		6 ← 5	7 ← 6	258 140.205(30) ^d
			6 ← 5	258 140.205(30) ^d
			5 ← 4	258 141.895(30) ^d
7 ₃₅ ← 6 ₃₄	7 $\frac{1}{2}$ ← 6 $\frac{1}{2}$	8 ← 7	8 ← 7 ^b	257 847.865(30) ^d
		8 ← 7	9 ← 8	257 847.865(30) ^d
			8 ← 7	257 847.865(30) ^d
			7 ← 6	257 847.865(30) ^d
		7 ← 6	7 ← 6 ^b	257 844.494(30) ^d
		7 ← 6	8 ← 7	257 844.494(30) ^d
			7 ← 6	257 845.364(30) ^d
			6 ← 5	257 845.364(30) ^d
	6 $\frac{1}{2}$ ← 5 $\frac{1}{2}$	7 ← 6	7 ← 6 ^b	257 719.643(30) ^d
		7 ← 6	8 ← 7	257 718.484(30) ^d
			7 ← 6	257 718.484(30) ^d
			6 ← 5	257 719.643(30) ^d
		6 ← 5	6 ← 5 ^b	257 725.086(30) ^d
		6 ← 5	7 ← 6	257 723.467(30) ^d
			6 ← 5	257 723.467(30) ^d
			5 ← 4	257 725.086(30) ^d
7 ₃₄ ← 6 ₃₃	7 $\frac{1}{2}$ ← 6 $\frac{1}{2}$	8 ← 7	8 ← 7 ^b	257 851.438(30) ^d
		8 ← 7	9 ← 8	257 851.438(30) ^d
			8 ← 7	257 851.438(30) ^d
			7 ← 6	257 851.438(30) ^d
		7 ← 6	7 ← 6 ^b	257 847.865(30) ^d
		7 ← 6	8 ← 7	257 847.865(30) ^d
	6 $\frac{1}{2}$ ← 5 $\frac{1}{2}$	7 ← 6	7 ← 6 ^b	257 723.467(30) ^d
		7 ← 6	8 ← 7	257 722.250(30) ^d
			7 ← 6	257 722.250(30) ^d
			6 ← 5	257 723.467(30) ^d
		6 ← 5	6 ← 5 ^b	257 728.694(30) ^d
		6 ← 5	7 ← 6	257 727.175(30) ^d
			6 ← 5	257 727.175(30) ^d
			5 ← 4	257 728.694(30) ^d
7 ₄ ← 6 ₄	7 $\frac{1}{2}$ ← 6 $\frac{1}{2}$	8 ← 7	8 ← 7 ^b	257 854.355(30) ^d
		8 ← 7	9 ← 8	257 854.355(30) ^d
			8 ← 7	257 854.355(30) ^d
			7 ← 6	257 854.355(30) ^d
		7 ← 6	7 ← 6 ^b	257 847.865(30) ^d
		7 ← 6	8 ← 7	257 847.865(30) ^d
			7 ← 6	257 847.865(30) ^d
			6 ← 5	257 847.865(30) ^d
	6 $\frac{1}{2}$ ← 5 $\frac{1}{2}$	7 ← 6	7 ← 6 ^b	257 546.631(30) ^d
		7 ← 6	8 ← 7	257 545.090(30) ^d
			7 ← 6	257 545.090(30) ^d
			6 ← 5	257 546.631(30) ^d
		6 ← 5	6 ← 5 ^b	257 555.958(30) ^d
		6 ← 5	7 ← 6	257 554.083(30) ^d
			6 ← 5	257 554.083(30) ^d
			5 ← 4	257 555.958(30) ^d

$7_{5s} \leftarrow 6_{5s}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8 \leftarrow 7$	$8 \leftarrow 7^b$	257 880.265(30) ^d		
		$8 \leftarrow 7$	$9 \leftarrow 8$	257 880.265(30) ^d		
			$8 \leftarrow 7$	257 880.265(30) ^d		
			$7 \leftarrow 6$	257 880.265(30) ^d		
		$7 \leftarrow 6$	$7 \leftarrow 6^b$	257 871.364(30) ^d		
		$7 \leftarrow 6$	$8 \leftarrow 7$	257 871.364(30) ^d		
			$7 \leftarrow 6$	257 871.364(30) ^d		
			$6 \leftarrow 5$	257 871.364(30) ^d		
		$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	$7 \leftarrow 6$	$7 \leftarrow 6^b$	257 344.488(30) ^d	
		$7 \leftarrow 6$	$8 \leftarrow 7$	257 342.992(30)		
	$8_{08} \leftarrow 7_{07}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7 \leftarrow 6$	$7 \leftarrow 6$	257 344.488(30) ^d	
			$6 \leftarrow 5$	$6 \leftarrow 5$	257 345.653(30)	
			$6 \leftarrow 5$	$6 \leftarrow 5^b$	257 360.281(30)	
			$6 \leftarrow 5$	$7 \leftarrow 6$	257 358.184(30)	
				$6 \leftarrow 5$	257 359.199(30)	
				$5 \leftarrow 4$	257 361.188(30)	
			$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$9 \leftarrow 8^b$	293 936.913(30) ^d
			$9 \leftarrow 8$	$10 \leftarrow 9$	293 936.913(30) ^d	
				$9 \leftarrow 8$	293 938.240(30) ^d	
				$8 \leftarrow 7$	293 938.240(30) ^d	
$8_{18} \leftarrow 7_{17}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$8 \leftarrow 7$	$8 \leftarrow 7^b$	293 952.512(30) ^d		
		$8 \leftarrow 7$	$9 \leftarrow 8$	293 955.127(30)		
			$8 \leftarrow 7$	293 952.512(30) ^d		
			$7 \leftarrow 6$	293 950.334(30)		
		$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8 \leftarrow 7$	$8 \leftarrow 7^b$	293 998.537(30) ^d	
		$8 \leftarrow 7$	$9 \leftarrow 8$	293 994.189(30)		
			$8 \leftarrow 7$	293 998.537(30) ^d		
			$7 \leftarrow 6$	294 001.784(30)		
		$7 \leftarrow 6$	$7 \leftarrow 6^b$	294 017.902(30) ^d		
		$7 \leftarrow 6$	$8 \leftarrow 7$	294 016.143(30) ^d		
$8_{18} \leftarrow 7_{17}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$		$7 \leftarrow 6$	294 016.143(30) ^d		
			$6 \leftarrow 5$	294 017.902(30) ^d		
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$9 \leftarrow 8^b$	289 707.210(30) ^d	
		$9 \leftarrow 8$	$10 \leftarrow 9$	289 707.210(30) ^d		
			$9 \leftarrow 8$	289 708.286(30) ^d		
			$8 \leftarrow 7$	289 708.286(30) ^d		
		$8 \leftarrow 7$	$8 \leftarrow 7^b$	289 712.901(30) ^d		
		$8 \leftarrow 7$	$9 \leftarrow 8$	289 713.896(30)		
			$8 \leftarrow 7$	289 712.901(30) ^d		
			$7 \leftarrow 6$	289 712.024(30)		
$8_{17} \leftarrow 7_{16}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$7 \leftarrow 6$	$7 \leftarrow 6^b$	289 725.740(30) ^d	
		$7 \leftarrow 6$	$8 \leftarrow 7$	289 724.451(30) ^d		
			$7 \leftarrow 6$	289 724.451(30) ^d		
			$6 \leftarrow 5$	289 725.740(30) ^d		
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$9 \leftarrow 8^b$	299 126.504(30) ^d	
		$9 \leftarrow 8$	$10 \leftarrow 9$	299 126.504(30) ^d		
			$9 \leftarrow 8$	299 127.486(30) ^d		
			$8 \leftarrow 7$	299 127.486(30) ^d		
		$8 \leftarrow 7$	$8 \leftarrow 7^b$	299 141.812(30)		
		$8 \leftarrow 7$	$9 \leftarrow 8$	299 143.911(30)		
$7\frac{1}{2} \leftarrow 6\frac{1}{2}$		$8 \leftarrow 7$	299 142.419(30)			
		$7 \leftarrow 6$	299 140.462(30)			
	$8 \leftarrow 7$	$8 \leftarrow 7^b$	299 247.400(30) ^d			
	$8 \leftarrow 7$	$9 \leftarrow 8$	299 244.210(30)			
		$8 \leftarrow 7$	299 247.400(30) ^d			

			7 ← 6	299 249.826(30)
		7 ← 6	7 ← 6 ^b)	299 264.354(30) ^d
		7 ← 6	8 ← 7	299 262.702(30) ^d
			7 ← 6	299 262.702(30) ^d
			6 ← 5	299 264.354(30) ^d
8 ₂₇ ← 7 ₂₆	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b)	294 479.168(30) ^d
		9 ← 8	10 ← 9	294 479.168(30) ^d
			9 ← 8	294 479.708(30) ^d
			8 ← 7	294 479.708(30) ^d
		8 ← 7	8 ← 7 ^b)	294 482.785(30) ^d
		8 ← 7	9 ← 8	294 483.498(30) ^d
			8 ← 7	294 483.498(30) ^d
			7 ← 6	294 482.785(30) ^d
	7 $\frac{1}{2}$ ← 6 $\frac{1}{2}$	8 ← 7	8 ← 7 ^b)	294 493.792(30) ^d
		8 ← 7	9 ← 8	294 492.406(30)
			8 ← 7	294 493.792(30) ^d
			7 ← 6	294 495.012(30)
		7 ← 6	7 ← 6 ^b)	294 500.926(30) ^d
		7 ← 6	8 ← 7	294 499.644(30) ^d
			7 ← 6	294 499.644(30) ^d
			6 ← 5	294 500.926(30) ^d
8 ₂₆ ← 7 ₂₅	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b)	295 107.170(30) ^d
		9 ← 8	10 ← 9	295 107.170(30) ^d
			9 ← 8	295 107.768(30) ^d
			8 ← 7	295 107.768(30) ^d
		8 ← 7	8 ← 7 ^b)	295 113.645(30) ^d
		8 ← 7	9 ← 8	295 114.668(30) ^d
			8 ← 7	295 114.668(30) ^d
			7 ← 6	295 113.645(30) ^d
	7 $\frac{1}{2}$ ← 6 $\frac{1}{2}$	8 ← 7	8 ← 7 ^b)	295 145.575(30) ^d
		8 ← 7	9 ← 8	295 143.944(30)
			8 ← 7	295 145.575(30) ^d
			7 ← 6	295 146.987(30)
		7 ← 6	7 ← 6 ^b)	295 152.048(30) ^d
		7 ← 6	8 ← 7	295 150.683(30) ^d
			7 ← 6	295 150.683(30) ^d
			6 ← 5	295 152.048(30) ^d
8 ₃₆ ← 7 ₃₅	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b)	294 661.675(30) ^d
		9 ← 8	10 ← 9	294 661.675(30) ^d
			9 ← 8	294 661.675(30) ^d
			8 ← 7	294 661.675(30) ^d
		8 ← 7	8 ← 7 ^b)	294 660.228(30) ^d
		8 ← 7	9 ← 8	294 660.228(30) ^d
			8 ← 7	294 660.228(30) ^d
			7 ← 6	294 660.228(30) ^d
	7 $\frac{1}{2}$ ← 6 $\frac{1}{2}$	8 ← 7	8 ← 7 ^b)	294 589.116(30) ^d
		8 ← 7	9 ← 8	294 588.240(30) ^d
			8 ← 7	294 588.240(30) ^d
			7 ← 6	294 589.116(30) ^d
		7 ← 6	7 ← 6 ^b)	294 593.192(30) ^d
		7 ← 6	8 ← 7	294 592.009(30) ^d
			7 ← 6	294 592.009(30) ^d
			6 ← 5	294 593.192(30) ^d
8 ₃₅ ← 7 ₃₄	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b)	294 669.112(30) ^d
		9 ← 8	10 ← 9	294 669.112(30) ^d

			9 ← 8	294 669.112(30) ^d
			8 ← 7	294 669.112(30) ^d
		8 ← 7	8 ← 7 ^b	294 667.662(30) ^d
		8 ← 7	9 ← 8	294 667.662(30) ^d
			8 ← 7	294 667.662(30) ^d
			7 ← 6	294 667.662(30) ^d
	7 $\frac{1}{2}$ ← 6 $\frac{1}{2}$	8 ← 7	8 ← 7 ^b	294 597.030(30) ^d
		8 ← 7	9 ← 8	294 596.163(30) ^d
			8 ← 7	294 596.163(30) ^d
			7 ← 6	294 597.030(30) ^d
		7 ← 6	7 ← 6 ^b	294 601.080(30) ^d
		7 ← 6	8 ← 7	294 599.918(30) ^d
			7 ← 6	294 599.918(30) ^d
			6 ← 5	294 601.080(30) ^d
8 _{4*} ← 7 _{4*}	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b	294 633.895(30) ^d
		9 ← 8	10 ← 9	294 633.895(30) ^d
			9 ← 8	294 633.895(30) ^d
			8 ← 7	294 633.895(30) ^d
		8 ← 7	8 ← 7 ^b	294 629.295(30) ^d
		8 ← 7	9 ← 8	294 629.295(30) ^d
			8 ← 7	294 629.817(30) ^d
			7 ← 6	294 629.817(30) ^d
	7 $\frac{1}{2}$ ← 6 $\frac{1}{2}$	8 ← 7	8 ← 7 ^b	294 424.326(30) ^d
		8 ← 7	9 ← 8	294 423.306(30) ^d
			8 ← 7	294 423.306(30) ^d
			7 ← 6	294 424.326(30) ^d
		7 ← 6	7 ← 6 ^b	294 430.609(30) ^d
		7 ← 6	8 ← 7	294 428.855(30) ^d
			7 ← 6	294 428.855(30) ^d
			6 ← 5	294 430.609(30) ^d
8 _{5*} ← 7 _{5*}	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b	294 624.709(30) ^d
		9 ← 8	10 ← 9	294 624.709(30) ^d
			9 ← 8	294 624.709(30) ^d
			8 ← 7	294 624.709(30) ^d
		8 ← 7	8 ← 7 ^b	294 618.163(30) ^d
		8 ← 7	9 ← 8	294 618.163(30) ^d
			8 ← 7	294 618.163(30) ^d
			7 ← 6	294 618.163(30) ^d
	7 $\frac{1}{2}$ ← 6 $\frac{1}{2}$	8 ← 7	8 ← 7 ^b	294 240.001(30) ^d
		8 ← 7	9 ← 8	294 239.029(30)
			8 ← 7	294 240.001(30) ^d
			7 ← 6	294 240.758(30)
		7 ← 6	7 ← 6 ^b	294 250.162(30) ^d
		7 ← 6	8 ← 7	294 248.632(30) ^d
			7 ← 6	294 248.632(30) ^d
			6 ← 5	294 250.162(30) ^d
9 ₀₉ ← 8 ₀₈	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	330 482.506(30) ^d
		10 ← 9	11 ← 10	330 482.506(30) ^d
			10 ← 9	330 483.596(30) ^d
			9 ← 8	330 483.596(30) ^d
		9 ← 8	9 ← 8 ^b	330 495.407(30) ^d
		9 ← 8	10 ← 9	330 497.574(30)
			9 ← 8	330 495.407(30) ^d
			8 ← 7	330 493.595(30)
	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b	330 540.337(30) ^d

		9 ← 8	10 ← 9	330 536.822(30)
			9 ← 8	330 540.337(30) ^d
			8 ← 7	330 542.960(30)
		8 ← 7	8 ← 7 ^b	330 556.175(30) ^d
		8 ← 7	9 ← 8	330 554.717(30) ^d
			8 ← 7	330 554.717(30) ^d
			7 ← 6	330 556.175(30) ^d
9 ₁₉ ← 8 ₁₈	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	325 863.210(30) ^d
		10 ← 9	11 ← 10	325 863.210(30) ^d
			10 ← 9	325 864.340(30) ^d
			9 ← 8	325 864.340(30) ^d
		9 ← 8	9 ← 8 ^b	325 869.261(30) ^d
		9 ← 8	10 ← 9	325 870.370(30)
			9 ← 8	325 869.261(30) ^d
			8 ← 7	325 868.309(30)
	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b	325 877.916(30) ^d
		9 ← 8	10 ← 9	325 875.562(30)
			9 ← 8	325 877.916(30) ^d
			8 ← 7	325 879.552(30)
		8 ← 7	8 ← 7 ^b	325 884.930(30) ^d
		8 ← 7	9 ← 8	325 883.780(30) ^d
			8 ← 7	325 883.780(30) ^d
			7 ← 6	325 884.930(30) ^d
9 ₁₈ ← 8 ₁₇	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	336 460.529(30) ^d
		10 ← 9	11 ← 10	336 460.529(30) ^d
			10 ← 9	336 461.322(30) ^d
			9 ← 8	336 461.322(30) ^d
		9 ← 8	9 ← 8 ^b	336 473.888(30)
		9 ← 8	10 ← 9	336 475.710(30)
			9 ← 8	336 474.484(30)
			8 ← 7	336 472.848(30)
	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b	336 585.658(30) ^d
		9 ← 8	10 ← 9	336 583.045(30)
			9 ← 8	336 585.658(30) ^d
			8 ← 7	336 587.753(30)
		8 ← 7	8 ← 7 ^b	336 600.680(30) ^d
		8 ← 7	9 ← 8	336 599.356(30) ^d
			8 ← 7	336 599.356(30) ^d
			7 ← 6	336 600.680(30) ^d
9 ₂₈ ← 8 ₂₇	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	331 239.908(30) ^d
		10 ← 9	11 ← 10	331 239.908(30) ^d
			10 ← 9	331 240.451(30) ^d
			9 ← 8	331 240.451(30) ^d
		9 ← 8	9 ← 8 ^b	331 244.209(30) ^d
		9 ← 8	10 ← 9	331 245.054(30) ^d
			9 ← 8	331 245.054(30) ^d
			8 ← 7	331 244.209(30) ^d
	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b	331 270.028(30) ^d
		9 ← 8	10 ← 9	331 268.688(30)
			9 ← 8	331 270.028(30) ^d
			8 ← 7	331 271.166(30)
		8 ← 7	8 ← 7 ^b	331 277.152(30) ^d
		8 ← 7	9 ← 8	331 276.139(30) ^d
			8 ← 7	331 276.139(30) ^d
			7 ← 6	331 277.152(30) ^d

$9_{27} \leftarrow 8_{26}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 \leftarrow 9	10 \leftarrow 9 ^b)	332 136.580(30) ^d)
		10 \leftarrow 9	11 \leftarrow 10	332 136.580(30) ^d)
			10 \leftarrow 9	332 137.151(30) ^d)
			9 \leftarrow 8	332 137.151(30) ^d)
		9 \leftarrow 8	9 \leftarrow 8 ^b)	332 144.274(30) ^d)
		9 \leftarrow 8	10 \leftarrow 9	332 145.403(30) ^d)
			9 \leftarrow 8	332 145.403(30) ^d)
			8 \leftarrow 7	332 144.274(30) ^d)
		8 $\frac{1}{2} \leftarrow 7\frac{1}{2}$	9 \leftarrow 8 ^b)	332 196.568(30) ^d)
		9 \leftarrow 8	10 \leftarrow 9	332 194.924(30)
			9 \leftarrow 8	332 196.568(30) ^d)
			8 \leftarrow 7	332 197.969(30)
		8 \leftarrow 7	8 \leftarrow 7 ^b)	332 203.077(30) ^d)
		8 \leftarrow 7	9 \leftarrow 8	332 201.971(30) ^d)
			8 \leftarrow 7	332 201.971(30) ^d)
			7 \leftarrow 6	332 203.077(30) ^d)
$9_{37} \leftarrow 8_{36}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 \leftarrow 9	10 \leftarrow 9 ^b)	331 484.817(30) ^d)
		10 \leftarrow 9	11 \leftarrow 10	331 484.817(30) ^d)
			10 \leftarrow 9	331 484.817(30) ^d)
			9 \leftarrow 8	331 484.817(30) ^d)
		9 \leftarrow 8	9 \leftarrow 8 ^b)	331 484.817(30) ^d)
		9 \leftarrow 8	10 \leftarrow 9	331 484.817(30) ^d)
			9 \leftarrow 8	331 484.817(30) ^d)
			8 \leftarrow 7	331 484.817(30) ^d)
		8 $\frac{1}{2} \leftarrow 7\frac{1}{2}$	9 \leftarrow 8 ^b)	331 449.923(30) ^d)
		9 \leftarrow 8	10 \leftarrow 9	331 449.923(30) ^d)
			9 \leftarrow 8	331 449.923(30) ^d)
			8 \leftarrow 7	331 449.923(30) ^d)
		8 \leftarrow 7	8 \leftarrow 7 ^b)	331 453.827(30) ^d)
		8 \leftarrow 7	9 \leftarrow 8	331 452.788(30) ^d)
			8 \leftarrow 7	331 452.788(30) ^d)
			7 \leftarrow 6	331 453.827(30) ^d)
$9_{36} \leftarrow 8_{35}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 \leftarrow 9	10 \leftarrow 9 ^b)	331 498.559(30) ^d)
		10 \leftarrow 9	11 \leftarrow 10	331 498.559(30) ^d)
			10 \leftarrow 9	331 498.559(30) ^d)
			9 \leftarrow 8	331 498.559(30) ^d)
		9 \leftarrow 8	9 \leftarrow 8 ^b)	331 498.559(30) ^d)
		9 \leftarrow 8	10 \leftarrow 9	331 498.559(30) ^d)
			9 \leftarrow 8	331 498.559(30) ^d)
			8 \leftarrow 7	331 498.559(30) ^d)
		8 $\frac{1}{2} \leftarrow 7\frac{1}{2}$	9 \leftarrow 8 ^b)	331 464.317(30) ^d)
		9 \leftarrow 8	10 \leftarrow 9	331 464.317(30) ^d)
			9 \leftarrow 8	331 464.317(30) ^d)
			8 \leftarrow 7	331 464.317(30) ^d)
		8 \leftarrow 7	8 \leftarrow 7 ^b)	331 468.315(30) ^d)
		8 \leftarrow 7	9 \leftarrow 8	331 467.317(30) ^d)
			8 \leftarrow 7	331 467.317(30) ^d)
			7 \leftarrow 6	331 468.315(30) ^d)
$9_{4\cdot} \leftarrow 8_{4\cdot}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 \leftarrow 9	10 \leftarrow 9 ^b)	331 425.398(30) ^d)
		10 \leftarrow 9	11 \leftarrow 10	331 425.398(30) ^d)
			10 \leftarrow 9	331 425.398(30) ^d)
			9 \leftarrow 8	331 425.398(30) ^d)
		9 \leftarrow 8	9 \leftarrow 8 ^b)	331 422.426(30) ^d)
		9 \leftarrow 8	10 \leftarrow 9	331 422.426(30) ^d)
			9 \leftarrow 8	331 422.426(30) ^d)

			8 ← 7	331 422.426(30) ^d
	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b	331 282.826(30) ^d
		9 ← 8	10 ← 9	331 282.169(30) ^d
			9 ← 8	331 282.169(30) ^d
			8 ← 7	331 282.826(30) ^d
		8 ← 7	8 ← 7 ^b	331 286.927(30) ^d
		8 ← 7	9 ← 8	331 285.934(30) ^d
			8 ← 7	331 285.934(30) ^d
			7 ← 6	331 286.927(30) ^d
9 _{5s} ← 8 _{5s}	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	331 385.658(30) ^d
		10 ← 9	11 ← 10	331 385.658(30) ^d
			10 ← 9	331 385.658(30) ^d
			9 ← 8	331 385.658(30) ^d
		9 ← 8	9 ← 8 ^b	331 380.814(30) ^d
		9 ← 8	10 ← 9	331 380.814(30) ^d
			9 ← 8	331 380.814(30) ^d
			8 ← 7	331 380.814(30) ^d
	8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8	9 ← 8 ^b	331 104.857(30) ^d
		9 ← 8	10 ← 9	331 103.961(30) ^d
			9 ← 8	331 103.961(30) ^d
			8 ← 7	331 104.857(30) ^d
		8 ← 7	8 ← 7 ^b	331 111.334(30) ^d
		8 ← 7	9 ← 8	331 110.164(30) ^d
			8 ← 7	331 110.164(30) ^d
			7 ← 6	331 111.334(30) ^d
10 _{0,10} ← 9 ₀₉	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	11 ← 10 ^b	366 958.495(30) ^d
		11 ← 10	12 ← 11	366 958.495(30) ^d
			11 ← 10	366 959.296(30) ^d
			10 ← 9	366 959.296(30) ^d
		10 ← 9	10 ← 9 ^b	366 969.008(30) ^d
		10 ← 9	11 ← 10	366 970.668(30)
			10 ← 9	366 969.008(30) ^d
			9 ← 8	366 967.413(30)
	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	367 011.588(30) ^d
		10 ← 9	11 ← 10	367 008.739(30)
			10 ← 9	367 011.588(30) ^d
			9 ← 8	367 013.846(30)
		9 ← 8	9 ← 8 ^b	367 026.289(30) ^d
		9 ← 8	10 ← 9	367 025.208(30) ^d
			9 ← 8	367 025.208(30) ^d
			8 ← 7	367 026.289(30) ^d
10 _{1,10} ← 9 ₁₉	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	11 ← 10 ^b	362 000.444(30) ^d
		11 ← 10	12 ← 11	362 000.444(30) ^d
			11 ← 10	362 001.429(30) ^d
			10 ← 9	362 001.429(30) ^d
		10 ← 9	10 ← 9 ^b	362 006.490(30) ^d
		10 ← 9	11 ← 10	362 007.547(30)
			10 ← 9	362 006.490(30) ^d
			9 ← 8	362 005.559(30)
	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	362 016.646(30) ^d
		10 ← 9	11 ← 10	362 014.387(30)
			10 ← 9	362 016.646(30) ^d
			9 ← 8	362 018.275(30)
		9 ← 8	9 ← 8 ^b	362 023.795(30) ^d
		9 ← 8	10 ← 9	362 022.889(30) ^d

			9 ← 8	362 022.889(30) ^d
			8 ← 7	362 023.795(30) ^d
10 ₁₉ ← 9 ₁₈	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	11 ← 10 ^b	373 771.445(30) ^d
		11 ← 10	12 ← 11	373 771.445(30) ^d
			11 ← 10	373 772.088(30) ^d
			10 ← 9	373 772.088(30) ^d
		10 ← 9	10 ← 9 ^b	373 783.307(30) ^d
		10 ← 9	11 ← 10	373 784.562(30)
			10 ← 9	373 783.307(30) ^d
			9 ← 8	373 782.202(30)
	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	373 899.175(30) ^d
		10 ← 9	11 ← 10	373 896.973(30)
			10 ← 9	373 899.175(30) ^d
			9 ← 8	373 900.804(30)
		9 ← 8	9 ← 8 ^b	373 912.412(30) ^d
		9 ← 8	10 ← 9	373 911.366(30) ^d
			9 ← 8	373 911.366(30) ^d
			8 ← 7	373 912.412(30) ^d
10 ₂₉ ← 9 ₂₈	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	11 ← 10 ^b	367 986.957(30) ^d
		11 ← 10	12 ← 11	367 986.957(30) ^d
			11 ← 10	367 986.957(30) ^d
			10 ← 9	367 986.957(30) ^d
		10 ← 9	10 ← 9 ^b	367 991.623(30) ^d
		10 ← 9	11 ← 10	367 992.384(30) ^d
			10 ← 9	367 992.384(30) ^d
			9 ← 8	367 991.623(30) ^d
	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	368 027.539(30) ^d
		10 ← 9	11 ← 10	368 026.296(30)
			10 ← 9	368 027.539(30) ^d
			9 ← 8	368 028.567(30)
		9 ← 8	9 ← 8 ^b	368 034.825(30) ^d
		9 ← 8	10 ← 9	368 034.045(30) ^d
			9 ← 8	368 034.045(30) ^d
			8 ← 7	368 034.825(30) ^d
10 ₂₈ ← 9 ₂₇	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	11 ← 10 ^b	369 217.832(30) ^d
		11 ← 10	12 ← 11	369 217.832(30) ^d
			11 ← 10	369 217.832(30) ^d
			10 ← 9	369 217.832(30) ^d
		10 ← 9	10 ← 9 ^b	369 226.004(30) ^d
		10 ← 9	11 ← 10	369 227.215(30) ^d
			10 ← 9	369 227.215(30) ^d
			9 ← 8	369 226.004(30) ^d
	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	369 294.832(30) ^d
		10 ← 9	11 ← 10	369 293.346(30)
			10 ← 9	369 294.832(30) ^d
			9 ← 8	369 296.182(30)
		9 ← 8	9 ← 8 ^b	369 301.388(30) ^d
		9 ← 8	10 ← 9	369 300.492(30) ^d
			9 ← 8	369 300.492(30) ^d
			8 ← 7	369 301.388(30) ^d
10 ₃₈ ← 9 ₃₇	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	11 ← 10 ^b	368 314.562(30) ^d
		11 ← 10	12 ← 11	368 314.562(30) ^d
			11 ← 10	368 314.562(30) ^d
			10 ← 9	368 314.562(30) ^d
		10 ← 9	10 ← 9 ^b	368 315.653(30) ^d

$10_{37} \leftarrow 9_{36}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	$11 \leftarrow 10$	$368\ 315.653(30)^d$	
			$10 \leftarrow 9$	$368\ 315.653(30)^d$	
			$9 \leftarrow 8$	$368\ 315.653(30)^d$	
		$10 \leftarrow 9$	$10 \leftarrow 9^b$	$368\ 306.799(30)^d$	
		$10 \leftarrow 9$	$11 \leftarrow 10$	$368\ 306.799(30)^d$	
			$10 \leftarrow 9$	$368\ 306.799(30)^d$	
			$9 \leftarrow 8$	$368\ 306.799(30)^d$	
		$9 \leftarrow 8$	$9 \leftarrow 8^b$	$368\ 310.587(30)^d$	
		$9 \leftarrow 8$	$10 \leftarrow 9$	$368\ 309.922(30)^d$	
			$9 \leftarrow 8$	$368\ 309.922(30)^d$	
			$8 \leftarrow 7$	$368\ 310.587(30)^d$	
		$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$11 \leftarrow 10^b$	$368\ 338.185(30)^d$
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$11 \leftarrow 10$		$368\ 338.185(30)^d$	
			$12 \leftarrow 11$	$368\ 338.185(30)^d$	
			$11 \leftarrow 10$	$368\ 338.185(30)^d$	
			$10 \leftarrow 9$	$368\ 338.185(30)^d$	
		$10 \leftarrow 9$	$10 \leftarrow 9^b$	$368\ 339.399(30)^d$	
		$10 \leftarrow 9$	$11 \leftarrow 10$	$368\ 339.399(30)^d$	
			$10 \leftarrow 9$	$368\ 339.399(30)^d$	
			$9 \leftarrow 8$	$368\ 339.399(30)^d$	
		$10 \leftarrow 9$	$10 \leftarrow 9^b$	$368\ 331.684(30)^d$	
		$10 \leftarrow 9$	$11 \leftarrow 10$	$368\ 331.684(30)^d$	
			$10 \leftarrow 9$	$368\ 331.684(30)^d$	
			$9 \leftarrow 8$	$368\ 331.684(30)^d$	
$9 \leftarrow 8$		$9 \leftarrow 8^b$	$368\ 335.403(30)^d$		
$9 \leftarrow 8$		$10 \leftarrow 9$	$368\ 334.760(30)^d$		
		$9 \leftarrow 8$	$368\ 334.760(30)^d$		
		$8 \leftarrow 7$	$368\ 335.403(30)^d$		
$10_{34} \leftarrow 9_{34}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$11 \leftarrow 10^b$	$368\ 224.611(30)^d$	
		$11 \leftarrow 10$	$12 \leftarrow 11$	$368\ 224.611(30)^d$	
			$11 \leftarrow 10$	$368\ 224.611(30)^d$	
			$10 \leftarrow 9$	$368\ 224.611(30)^d$	
		$10 \leftarrow 9$	$10 \leftarrow 9^b$	$368\ 222.838(30)^d$	
		$10 \leftarrow 9$	$11 \leftarrow 10$	$368\ 222.838(30)^d$	
			$10 \leftarrow 9$	$368\ 222.838(30)^d$	
			$9 \leftarrow 8$	$368\ 222.838(30)^d$	
		$10 \leftarrow 9$	$10 \leftarrow 9^b$	$368\ 129.652(30)^d$	
		$10 \leftarrow 9$	$11 \leftarrow 10$	$368\ 129.652(30)^d$	
			$10 \leftarrow 9$	$368\ 129.652(30)^d$	
			$9 \leftarrow 8$	$368\ 129.652(30)^d$	
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$9 \leftarrow 8$	$9 \leftarrow 8^b$	$368\ 133.033(30)^d$	
		$9 \leftarrow 8$	$10 \leftarrow 9$	$368\ 132.366(30)^d$	
			$9 \leftarrow 8$	$368\ 132.366(30)^d$	
			$8 \leftarrow 7$	$368\ 133.033(30)^d$	
		$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	$11 \leftarrow 10$	$11 \leftarrow 10^b$	$368\ 156.654(30)^d$
			$11 \leftarrow 10$	$12 \leftarrow 11$	$368\ 156.654(30)^d$
				$11 \leftarrow 10$	$368\ 156.654(30)^d$
				$10 \leftarrow 9$	$368\ 156.654(30)^d$
			$10 \leftarrow 9$	$10 \leftarrow 9^b$	$368\ 153.080(30)^d$
			$10 \leftarrow 9$	$11 \leftarrow 10$	$368\ 153.080(30)^d$
				$10 \leftarrow 9$	$368\ 153.080(30)^d$
				$9 \leftarrow 8$	$368\ 153.080(30)^d$
$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$		$10 \leftarrow 9^b$	$367\ 949.470(30)^d$	
$10 \leftarrow 9$	$11 \leftarrow 10$		$367\ 949.470(30)^d$		
	$10 \leftarrow 9$		$367\ 949.470(30)^d$		
	$9 \leftarrow 8$		$367\ 949.470(30)^d$		

$9 \leftarrow 8$	$9 \leftarrow 8^b)$	$367\,954.340(30)^d)$
$9 \leftarrow 8$	$10 \leftarrow 9$	$367\,953.583(30)^d)$

^{a)} Coupling scheme: $\mathbf{J} = \mathbf{N} + \mathbf{S}$; $\mathbf{F}_1 = \mathbf{J} + \mathbf{I}_1$; $\mathbf{F} = \mathbf{F}_1 + \mathbf{I}_2$ where \mathbf{I}_1 is the ^{31}P nuclear spin and \mathbf{I}_2 is the resultant ^1H nuclear spin ($I_2 = 1$ or 0).

^{b)} This transition involves *para* levels ($I_2 = 0$).

^{c)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^{d)} Blended line; hyperfine splittings not (completely) resolved.

Molecular parameters for $^1\text{H}_2\text{}^{31}\text{P}^{16}\text{O}$

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level			
A [MHz]	156 124.2(30) ^{a)}	MW	96Hir
B [MHz]	19 010.160 9(103)		
C [MHz]	17 822.216 9(101)		
A_K [MHz]	29.1 ^{b)}	MW	86Sai
A_{NK} [MHz]	0.479 36(19)	MW	96Hir
A_N [kHz]	20.609 6(118)		
δ_K [MHz]	0.358 4(48)		
δ_N [kHz]	1.389 9(104)		
Φ_{KN} [Hz]	18.4(83)		
\mathcal{E}_{aa} [MHz]	− 1 321.889(106)		
\mathcal{E}_{bb} [MHz]	− 221.073(48)		
\mathcal{E}_{cc} [MHz]	13.087(43)		
$\frac{1}{2} |\mathcal{E}_{ac} + \mathcal{E}_{ca}|$ [MHz]	1.5(20) ^{c)}		
$a_F(^{31}\text{P})$ [MHz]	1 023.43(87)		
$T_{aa}(^{31}\text{P})$ [MHz]	− 109.14(27)		
$T_{bb}(^{31}\text{P})$ [MHz]	− 162.38(30)		
$\frac{1}{2} |T_{ac}(^{31}\text{P})|$ [MHz]	164.7(83) ^{c)}		
$a_F(^1\text{H})$ [MHz]	109.27(25)		
$T_{aa}(^1\text{H})$ [MHz]	− 6.06(22)		
$T_{bb}(^1\text{H})$ [MHz]	6.30(18)		
$r_0(\text{P-H})$ [nm]	0.142 87(14)		
$r_0(\text{P-O})$ [nm]	0.148 75(4)		
$\angle_0(\text{H-P-H})$ [deg]	102.56(14)		
$\angle_0(\text{H-N-O})$ [deg]	115.52(10)		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to value of A_K for HPO from [86Sai].

^{c)} These two parameters were determined to have the same sign in the least-squares fit.

Microwave data for ¹H₂³¹P¹⁸O

Transition				ν [MHz]	Ref.	
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}				
		$F_1' - F_1''$	$F' - F''$			
State: electronic \tilde{X}^2A' ; vibrational zero-point level						
$7_{07} \leftarrow 6_{06}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	8 \leftarrow 7	8 \leftarrow 7 ^{b)}	239 652.998(30) ^{c,d)}	96Hir	
		8 \leftarrow 7	9 \leftarrow 8	239 652.998(30) ^{d)}		
			8 \leftarrow 7	239 654.676(30) ^{d)}		
			7 \leftarrow 6	239 654.676(30) ^{d)}		
		7 \leftarrow 6	7 \leftarrow 6 ^{b)}	239 671.801(30) ^{d)}		
		7 \leftarrow 6	8 \leftarrow 7	239 674.911(30)		
			7 \leftarrow 6	239 671.801(30) ^{d)}		
			6 \leftarrow 5	239 669.198(30)		
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	7 \leftarrow 6	7 \leftarrow 6 ^{b)}	239 713.146(30)		
		7 \leftarrow 6	8 \leftarrow 7	239 708.178(30)		
			7 \leftarrow 6	239 714.234(30)		
			6 \leftarrow 5	239 717.667(30)		
		6 \leftarrow 5	6 \leftarrow 5 ^{b)}	239 734.381(30) ^{d)}		
		6 \leftarrow 5	7 \leftarrow 6	239 731.462(30)		
			6 \leftarrow 5	239 732.347(30)		
			5 \leftarrow 4	239 734.381(30) ^{d)}		
$7_{17} \leftarrow 6_{16}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	8 \leftarrow 7	8 \leftarrow 7 ^{b)}	236 329.698(30) ^{d)}		
		8 \leftarrow 7	9 \leftarrow 8	236 329.698(30) ^{d)}		
			8 \leftarrow 7	236 330.761(30) ^{d)}		
			7 \leftarrow 6	236 330.761(30) ^{d)}		
		7 \leftarrow 6	7 \leftarrow 6 ^{b)}	236 333.492(30) ^{d)}		
		7 \leftarrow 6	6 \leftarrow 5	236 333.492(30) ^{d)}		
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	7 \leftarrow 6	7 \leftarrow 6 ^{b)}	236 335.430(30) ^{d)}		
		7 \leftarrow 6	8 \leftarrow 7	236 333.492(30) ^{d)}		
			7 \leftarrow 6	236 335.430(30) ^{d)}		
			6 \leftarrow 5	236 336.911(30)		
		6 \leftarrow 5	6 \leftarrow 5 ^{b)}	236 340.253(30) ^{d)}		
		6 \leftarrow 5	7 \leftarrow 6	236 338.607(30) ^{d)}		
			6 \leftarrow 5	236 338.607(30) ^{d)}		
			5 \leftarrow 4	236 340.253(30) ^{d)}		
		$7_{16} \leftarrow 6_{15}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	8 \leftarrow 7	8 \leftarrow 7 ^{b)}	243 463.741(30) ^{d)}
				8 \leftarrow 7	9 \leftarrow 8	243 463.741(30) ^{d)}
	8 \leftarrow 7			243 464.926(30) ^{d)}		
	7 \leftarrow 6			243 464.926(30) ^{d)}		
7 \leftarrow 6	7 \leftarrow 6 ^{b)}			243 481.017(30)		
7 \leftarrow 6	8 \leftarrow 7			243 483.620(30)		
$6\frac{1}{2} \leftarrow 5\frac{1}{2}$			7 \leftarrow 6	243 481.849(30)		
			6 \leftarrow 5	243 479.556(30)		
	7 \leftarrow 6		7 \leftarrow 6 ^{b)}	243 567.108(30)		
	7 \leftarrow 6		8 \leftarrow 7	243 563.426(30)		
$8_{08} \leftarrow 7_{07}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$		7 \leftarrow 6	243 567.634(30)		
			6 \leftarrow 5	243 570.366(30)		
		6 \leftarrow 5	6 \leftarrow 5 ^{b)}	243 586.398(30) ^{d)}		
		6 \leftarrow 5	7 \leftarrow 6	243 584.062(30) ^{d)}		
			6 \leftarrow 5	243 584.062(30) ^{d)}		
			5 \leftarrow 4	243 586.398(30) ^{d)}		
			9 \leftarrow 8	273 775.446(30) ^{d)}		
			9 \leftarrow 8 ^{b)}			

		9 ← 8	10 ← 9	273 775.446(30) ^d
			9 ← 8	273 776.761(30) ^d
			8 ← 7	273 776.761(30) ^d
		8 ← 7	8 ← 7 ^b	273 791.445(30) ^d
		8 ← 7	9 ← 8	273 794.101(30)
			8 ← 7	273 791.445(30) ^d
			7 ← 6	273 789.232(30)
	7½ ← 6½	8 ← 7	8 ← 7 ^b	273 833.982(30)
		8 ← 7	9 ← 8	273 829.738(30)
			8 ← 7	273 834.574(30)
			7 ← 6	273 837.568(30)
		7 ← 6	7 ← 6 ^b	273 852.816(30) ^d
		7 ← 6	8 ← 7	273 850.865(30) ^d
			7 ← 6	273 850.865(30) ^d
			6 ← 5	273 852.816(30) ^d
8 ₁₈ ← 7 ₁₇	8½ ← 7½	9 ← 8	9 ← 8 ^b	270 054.627(30) ^d
		9 ← 8	10 ← 9	270 054.627(30) ^d
			9 ← 8	270 055.695(30) ^d
			8 ← 7	270 055.695(30) ^d
		8 ← 7	8 ← 7 ^b	270 059.874(30) ^d
		8 ← 7	9 ← 8	270 060.671(30)
			8 ← 7	270 059.874(30) ^d
			7 ← 6	270 059.088(30)
	7½ ← 6½	8 ← 7	8 ← 7 ^b	270 064.920(30) ^d
		8 ← 7	9 ← 8	270 062.688(30)
			8 ← 7	270 064.920(30) ^d
			7 ← 6	270 066.508(30)
		7 ← 6	7 ← 6 ^b	270 070.792(30) ^d
		7 ← 6	8 ← 7	270 069.493(30) ^d
			7 ← 6	270 069.493(30) ^d
			6 ← 5	270 070.792(30) ^d
8 ₁₇ ← 7 ₁₆	8½ ← 7½	9 ← 8	9 ← 8 ^b	278 212.872(30) ^d
		9 ← 8	10 ← 9	278 212.872(30) ^d
			9 ← 8	278 213.811(30) ^d
			8 ← 7	278 213.811(30) ^d
		8 ← 7	8 ← 7 ^b	278 228.204(30)
		8 ← 7	9 ← 8	278 230.497(30)
			8 ← 7	278 228.972(30)
			7 ← 6	278 226.990(30)
	7½ ← 6½	8 ← 7	8 ← 7 ^b	278 323.271(30) ^d
		8 ← 7	9 ← 8	278 319.957(30)
			8 ← 7	278 323.271(30) ^d
			7 ← 6	278 325.820(30)
		7 ← 6	7 ← 6 ^b	278 340.167(30) ^d
		7 ← 6	8 ← 7	278 338.461(30) ^d
			7 ← 6	278 338.461(30) ^d
			6 ← 5	278 340.167(30) ^d
8 ₂₇ ← 7 ₂₆	8½ ← 7½	9 ← 8	9 ← 8 ^b	274 183.726(30) ^d
		9 ← 8	10 ← 9	274 183.726(30) ^d
			9 ← 8	274 184.400(30) ^d
			8 ← 7	274 184.400(30) ^d
		8 ← 7	8 ← 7 ^b	274 186.927(30) ^d
		8 ← 7	9 ← 8	274 187.643(30) ^d
			8 ← 7	274 187.643(30) ^d
			7 ← 6	274 186.927(30) ^d

$8_{26} \leftarrow 7_{25}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$	$8 \leftarrow 7$	$8 \leftarrow 7^b$	274 191.939(30) ^d
		$8 \leftarrow 7$	$9 \leftarrow 8$	274 190.666(30)
			$8 \leftarrow 7$	274 191.939(30) ^d
			$7 \leftarrow 6$	274 193.062(30)
		$7 \leftarrow 6$	$7 \leftarrow 6^b$	274 198.404(30) ^d
		$7 \leftarrow 6$	$8 \leftarrow 7$	274 197.193(30) ^d
			$7 \leftarrow 6$	274 197.193(30) ^d
			$6 \leftarrow 5$	274 198.404(30) ^d
		$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	274 650.853(30) ^d
		$9 \leftarrow 8$	$10 \leftarrow 9$	274 650.853(30) ^d
			$9 \leftarrow 8$	274 651.486(30) ^d
			$8 \leftarrow 7$	274 651.486(30) ^d
		$8 \leftarrow 7$	$8 \leftarrow 7^b$	274 656.547(30) ^d
		$8 \leftarrow 7$	$9 \leftarrow 8$	274 657.424(30) ^d
			$8 \leftarrow 7$	274 657.424(30) ^d
$9_{09} \leftarrow 8_{08}$	$7\frac{1}{2} \leftarrow 6\frac{1}{2}$		$7 \leftarrow 6$	274 656.547(30) ^d
		$8 \leftarrow 7$	$8 \leftarrow 7^b$	274 678.095(30) ^d
		$8 \leftarrow 7$	$9 \leftarrow 8$	274 676.569(30)
			$8 \leftarrow 7$	274 678.095(30) ^d
			$7 \leftarrow 6$	274 679.321(30)
		$7 \leftarrow 6$	$7 \leftarrow 6^b$	274 683.961(30) ^d
		$7 \leftarrow 6$	$8 \leftarrow 7$	274 682.685(30) ^d
			$7 \leftarrow 6$	274 682.685(30) ^d
			$6 \leftarrow 5$	274 683.961(30) ^d
		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	307 850.378(30) ^d
		$10 \leftarrow 9$	$11 \leftarrow 10$	307 850.378(30) ^d
			$10 \leftarrow 9$	307 851.405(30) ^d
			$9 \leftarrow 8$	307 851.405(30) ^d
		$9 \leftarrow 8$	$9 \leftarrow 8^b$	307 863.878(30) ^d
		$9 \leftarrow 8$	$10 \leftarrow 9$	307 866.098(30)
$9_{19} \leftarrow 8_{18}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$		$9 \leftarrow 8$	307 863.878(30) ^d
			$8 \leftarrow 7$	307 861.895(30)
		$9 \leftarrow 8$	$9 \leftarrow 8^b$	307 906.383(30) ^d
		$9 \leftarrow 8$	$10 \leftarrow 9$	307 902.681(30)
			$9 \leftarrow 8$	307 906.383(30) ^d
			$8 \leftarrow 7$	307 909.161(30)
		$8 \leftarrow 7$	$8 \leftarrow 7^b$	307 923.098(30) ^d
		$8 \leftarrow 7$	$9 \leftarrow 8$	307 921.541(30) ^d
			$8 \leftarrow 7$	307 921.541(30) ^d
			$7 \leftarrow 6$	307 923.098(30) ^d
		$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	$10 \leftarrow 9$	303 766.717(30) ^d
		$10 \leftarrow 9$	$11 \leftarrow 10$	303 766.717(30) ^d
			$10 \leftarrow 9$	303 767.759(30) ^d
			$9 \leftarrow 8$	303 767.759(30) ^d
		$9 \leftarrow 8$	$9 \leftarrow 8^b$	303 772.266(30) ^d
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	$9 \leftarrow 8$	$10 \leftarrow 9$	303 772.266(30) ^d
			$9 \leftarrow 8$	303 772.266(30) ^d
			$8 \leftarrow 7$	303 772.266(30) ^d
		$9 \leftarrow 8$	$9 \leftarrow 8^b$	303 779.797(30) ^d
		$9 \leftarrow 8$	$10 \leftarrow 9$	303 777.487(30)
			$9 \leftarrow 8$	303 779.797(30) ^d
			$8 \leftarrow 7$	303 781.518(30)
		$8 \leftarrow 7$	$8 \leftarrow 7^b$	303 786.357(30) ^d
		$8 \leftarrow 7$	$9 \leftarrow 8$	303 785.202(30) ^d
			$8 \leftarrow 7$	303 785.202(30) ^d

			7 ← 6	303 786.357(30) ^d
9 ₁₈ ← 8 ₁₇	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	312 947.399(30) ^d
			11 ← 10	312 947.399(30) ^d
		10 ← 9	10 ← 9	312 947.399(30) ^d
			9 ← 8	312 947.399(30) ^d
		9 ← 8	9 ← 8 ^b	312 961.004(30) ^d
			10 ← 9	312 962.646(30)
		9 ← 8	9 ← 8	312 961.004(30) ^d
			8 ← 7	312 959.568(30)
		8 $\frac{1}{2}$ ← 7 $\frac{1}{2}$	9 ← 8 ^b	313 061.968(30) ^d
			10 ← 9	313 059.002(30)
		9 ← 8	9 ← 8	313 061.968(30) ^d
			8 ← 7	313 064.104(30)
		8 ← 7	8 ← 7 ^b	313 077.035(30) ^d
			9 ← 8	313 075.656(30) ^d
		8 ← 7	8 ← 7	313 075.656(30) ^d
			7 ← 6	313 077.035(30) ^d
10 _{0,10} ← 9 ₀₉	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10	11 ← 10 ^b	341 872.090(30) ^d
			12 ← 11	341 872.090(30) ^d
		11 ← 10	11 ← 10	341 873.032(30) ^d
			10 ← 9	341 873.032(30) ^d
		10 ← 9	10 ← 9 ^b	341 883.385(30) ^d
			11 ← 10	341 885.267(30)
		10 ← 9	10 ← 9	341 883.385(30) ^d
			9 ← 8	341 881.795(30)
		9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9 ^b	341 924.695(30) ^d
			11 ← 10	341 921.668(30)
	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	10 ← 9	10 ← 9	341 924.695(30) ^d
			9 ← 8	341 927.087(30)
		9 ← 8	9 ← 8 ^b	341 939.505(30) ^d
			10 ← 9	341 938.300(30) ^d
		9 ← 8	9 ← 8	341 938.300(30) ^d
			8 ← 7	341 939.505(30) ^d
		10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	11 ← 10 ^b	337 464.233(30) ^d
			12 ← 11	337 464.233(30) ^d
		11 ← 10	11 ← 10	337 465.317(30) ^d
			10 ← 9	337 465.317(30) ^d
10 _{1,10} ← 9 ₁₉	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	10 ← 9	10 ← 9 ^b	337 470.038(30) ^d
			10 ← 9	337 470.038(30) ^d
		9 ← 8	9 ← 8	337 469.115(30)
			10 ← 9 ^b	337 479.035(30) ^d
		10 ← 9	11 ← 10	337 476.813(30)
			10 ← 9	337 479.035(30) ^d
		9 ← 8	9 ← 8	337 480.639(30)
			9 ← 8 ^b	337 485.898(30) ^d
	9 $\frac{1}{2}$ ← 8 $\frac{1}{2}$	9 ← 8	10 ← 9	337 484.885(30) ^d
			9 ← 8	337 484.885(30) ^d
		8 ← 7	8 ← 7	337 485.898(30) ^d
			11 ← 10 ^b	347 663.732(30) ^d
		11 ← 10	12 ← 11	347 663.732(30) ^d
			11 ← 10	347 664.452(30) ^d
		10 ← 9	10 ← 9	347 664.452(30) ^d
			10 ← 9 ^b	347 675.748(30)
10 ₁₉ ← 9 ₁₈	10 $\frac{1}{2}$ ← 9 $\frac{1}{2}$	10 ← 9	11 ← 10	347 677.461(30)
			10 ← 9	347 676.255(30)

			9 ← 8	347 674.712(30)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 ← 9	10 ← 9 ^{b)}	347 781.722(30) ^{d)}
		10 ← 9	11 ← 10	347 779.334(30)
			10 ← 9	347 781.722(30) ^{d)}
			9 ← 8	347 783.462(30)
		9 ← 8	9 ← 8 ^{b)}	347 795.154(30) ^{d)}
		9 ← 8	10 ← 9	347 793.981(30) ^{d)}
			9 ← 8	347 793.981(30) ^{d)}
			8 ← 7	347 795.154(30) ^{d)}
$10_{29} \leftarrow 9_{28}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	11 ← 10 ^{b)}	342 639.825(30) ^{d)}
		11 ← 10	12 ← 11	342 639.825(30) ^{d)}
			11 ← 10	342 640.311(30) ^{d)}
			10 ← 9	342 640.311(30) ^{d)}
		10 ← 9	10 ← 9 ^{b)}	342 644.649(30) ^{d)}
		10 ← 9	11 ← 10	342 644.649(30) ^{d)}
			10 ← 9	342 644.649(30) ^{d)}
			9 ← 8	342 644.649(30) ^{d)}
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 ← 9	10 ← 9 ^{b)}	342 674.387(30) ^{d)}
		10 ← 9	11 ← 10	342 673.073(30)
			10 ← 9	342 674.387(30) ^{d)}
			9 ← 8	342 675.570(30)
		9 ← 8	9 ← 8 ^{b)}	342 681.000(30) ^{d)}
		9 ← 8	10 ← 9	342 680.223(30) ^{d)}
			9 ← 8	342 680.223(30) ^{d)}
			8 ← 7	342 681.000(30) ^{d)}
$10_{28} \leftarrow 9_{27}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	11 ← 10	11 ← 10 ^{b)}	343 556.874(30) ^{d)}
		11 ← 10	12 ← 11	343 556.874(30) ^{d)}
			11 ← 10	343 556.874(30) ^{d)}
			10 ← 9	343 556.874(30) ^{d)}
		10 ← 9	10 ← 9 ^{b)}	343 564.885(30) ^{d)}
		10 ← 9	11 ← 10	343 564.885(30) ^{d)}
			10 ← 9	343 564.885(30) ^{d)}
			9 ← 8	343 564.885(30) ^{d)}
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	10 ← 9	10 ← 9 ^{b)}	343 620.677(30) ^{d)}
		10 ← 9	11 ← 10	343 618.984(30)
			10 ← 9	343 620.677(30) ^{d)}
			9 ← 8	343 622.069(30)
		9 ← 8	9 ← 8 ^{b)}	343 626.853(30) ^{d)}
		9 ← 8	10 ← 9	343 625.915(30) ^{d)}
			9 ← 8	343 625.915(30) ^{d)}
			8 ← 7	343 626.853(30) ^{d)}

^{a)} Coupling scheme: $\mathbf{J} = \mathbf{N} + \mathbf{S}$; $\mathbf{F}_1 = \mathbf{J} + \mathbf{I}_1$; $\mathbf{F} = \mathbf{F}_1 + \mathbf{I}_2$ where \mathbf{I}_1 is the ³¹P nuclear spin and \mathbf{I}_2 is the resultant ¹H nuclear spin ($I_2 = 1$ or 0).

^{b)} This transition involves *para* levels ($I_2 = 0$).

^{c)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^{d)} Blended line; hyperfine splittings not (completely) resolved.

Molecular parameters for ¹ H ₂ ³¹ P ¹⁸ O				
Parameter		Value	Method	Ref.
State: electronic \tilde{X}^2B_1 ; vibrational zero-point level				
<i>A</i>	[MHz]	156 048.0(75) ^{a)}	MW	96Hir
<i>B</i>	[MHz]	17 660.014(21)		
<i>C</i>	[MHz]	16 630.892(20)		
Δ_K	[MHz]	29.1 ^{b)}	MW	86Sai
Δ_{NK}	[MHz]	0.420 22(61)	MW	96Hir
Δ_N	[kHz]	17.894(18)		
δ_K	[MHz]	0.309 8(96)		
δ_N	[kHz]	1.133(17)		
Φ_{KN}	[Hz]	0 ^{c)}		
ϵ_{aa}	[MHz]	− 1 318.69(91)		
ϵ_{bb}	[MHz]	− 205.225(75)		
ϵ_{cc}	[MHz]	12.205(56)		
$\frac{1}{2} |\epsilon_{ac} + \epsilon_{ca}|$	[MHz]	3.4(22) ^{d)}		
$a_F(^{31}\text{P})$	[MHz]	1 022.5(15)		
$T_{aa}(^{31}\text{P})$	[MHz]	− 107.7(26)		
$T_{bb}(^{31}\text{P})$	[MHz]	− 164.05(55)		
$\frac{1}{2} |T_{ac}(^{31}\text{P})|$	[MHz]	140(31) ^{d)}		
$a_F(^1\text{H})$	[MHz]	110.02(56)		
$T_{aa}(^1\text{H})$	[MHz]	− 6.2(18)		
$T_{bb}(^1\text{H})$	[MHz]	8.35(46)		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to value of Δ_K for HPO from [86Sai].

^{c)} Parameter constrained to this value.

^{d)} These two parameters were determined to have the same sign in the least-squares fit.

References for H₂PO

- 86Sai Saito, S., Endo, Y., Hirota, E. : J. Chem. Phys. **84** (1986) 1157.
 96Hir Hirao, T., Saito, S., Oseki, H. : J. Chem. Phys. **105** (1996) 3450.

3.2.4.2.15 HCCOMicrowave data for $^1\text{H}^{12}\text{C}^{12}\text{C}^{16}\text{O}$

Transition			ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}		
		$F' - F''$		
State: electronic \tilde{X}^2A'' ; vibrational zero-point level				
$1_{01} \leftarrow 0_{00}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 0$	21 616.427(3) ^{b)}	93Ohs
		$1 \leftarrow 1$	21 670.446(3)	
		$2 \leftarrow 1$	21 654.739(3)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$0 \leftarrow 1$	21 672.293(3)	
		$1 \leftarrow 0$	21 665.129(3)	
		$1 \leftarrow 1$	21 719.163(3)	
		)	324 874.777(25) ^{d)}	
$15_{0,15} \leftarrow 14_{0,14}$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	)	324 888.152(25)	
$16_{0,16} \leftarrow 15_{0,15}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	)	346 524.891(30)	
	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	346 538.094(30)	
$17_{0,17} \leftarrow 16_{0,16}$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	)	368 173.255(30)	
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	)	368 186.199(30)	
$18_{0,18} \leftarrow 17_{0,17}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	389 819.961(30)	
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	)	389 832.607(30)	
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$)		

^{a)} Coupling scheme: $J = N + S$; $F = J + I$ where I is the ^1H nuclear spin.^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1 σ).) ^1H hyperfine splitting not resolved.^{d)} Other mm wave transition frequencies by Endo *et al.* [87End] given in Landolt-Börnstein Series II Volume 19-D.Molecular parameters for $^1\text{H}^{12}\text{C}^{12}\text{C}^{16}\text{O}$

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A'' ; vibrational zero-point level			
B_{eff} [MHz]	10 831.371 2(24) ^{a)}	MW	93Ohs
D_{eff} [kHz]	4.418 6(42)		
γ_{eff} [MHz]	- 14.922(29)		
γ_{D} [kHz]	2.295(44)		
$b_{\text{F}}(^1\text{H})$ [MHz]	- 54.030(24)		
$c(^1\text{H})$ [MHz]	16.041(92)		

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

References for HCCO

- 87End Endo, Y., Hirota, E. : J. Chem. Phys. **86** (1987) 4319.
93Ohs Ohshima, Y., Endo, Y. : J. Mol. Spectrosc. **159** (1993) 458.

3.2.4.2.16 HCCCOMicrowave data for $^1\text{H}^{12}\text{C}^{12}\text{C}^{16}\text{O}$

Transition			ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}		
		$F' - F''$		
State: electronic \tilde{X}^2A' ; vibrational zero-point level				
$1_{01} \leftarrow 0_{00}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 0$	9 055.027(5) ^{b)}	96Che
		$2 \leftarrow 1$	9 062.205(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 0$	9 069.110(5)	
		$0 \leftarrow 1$	9 069.645(5)	
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 1$	9 070.085(5)	
	$\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 1$	9 084.175(5)	
$2_{02} \leftarrow 1_{01}$	$2\frac{1}{2} \leftarrow \frac{1}{2}$	$2 \leftarrow 1$	18 115.495(10)	
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 1$	18 124.625(10)	
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	18 128.940(10)	
		$2 \leftarrow 1$	18 129.585(10)	
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2 \leftarrow 1$	18 136.400(10)	
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 2$	18 137.465(10)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$1 \leftarrow 1$	18 138.725(10)	
	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$1 \leftarrow 1$	18 139.140(10)	
	$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 2$	18 158.370(10)	
$9_{19} \leftarrow 8_{18}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$)	81 186.708(120)	92Coo
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	81 254.728(120)
$9_{09} \leftarrow 8_{08}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	81 588.900(80)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	81 596.696(80)
$9_{18} \leftarrow 8_{17}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	81 987.703(80)
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	)	82 044.092(80)
$10_{1,10} \leftarrow 9_{19}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	90 214.366(80)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	90 271.900(80)
$10_{0,10} \leftarrow 9_{09}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	90 653.220(80)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	90 661.054(80)
$10_{19} \leftarrow 9_{18}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	91 103.606(80)
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	)	91 149.447(80)
$11_{1,11} \leftarrow 10_{1,10}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	99 240.632(80)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	99 290.407(80)
$11_{0,11} \leftarrow 10_{0,10}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	99 716.940(40)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	99 724.918(80)
$11_{2,10} \leftarrow 10_{29}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	99 752.428(80)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	99 905.044(80)
$11_{29} \leftarrow 10_{28}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	99 757.519(80)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	99 909.950(80)
$11_{1,10} \leftarrow 10_{19}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	)	100 217.991(80)
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	)	100 256.083(80)
$13_{1,13} \leftarrow 12_{1,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	117 290.097(40)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	117 329.466(40)

$13_{0,13} \leftarrow 12_{0,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	117 824.920(40)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	117 850.820(40)
$13_{2,12} \leftarrow 12_{2,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	117 917.084(80)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	118 027.547(80)
$13_{2,11} \leftarrow 12_{2,10}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	117 925.462(80)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	118 035.690(80)
$13_{3,11} \leftarrow 12_{3,10}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	117 994.213(80)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	118 231.807(80)
$13_{3,10} \leftarrow 12_{3,9}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	117 994.213(80)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	118 231.807(80)
$13_{1,12} \leftarrow 12_{1,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	)	118 443.488(40)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	)	118 471.231(40)
$16_{1,16} \leftarrow 15_{1,15}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	144 358.638(40)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	)	144 388.857(40)
$16_{0,16} \leftarrow 15_{0,15}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	144 026.870(80)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	)	145 034.800(80)
$16_{2,15} \leftarrow 15_{2,14}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	145 149.279(40)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	)	145 224.264(40)
$16_{2,14} \leftarrow 15_{2,13}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	145 164.884(40)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	)	145 239.495(40)
$16_{3,14} \leftarrow 15_{3,13}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	145 279.236(80)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	)	145 436.202(80)
$16_{3,13} \leftarrow 15_{3,12}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	145 279.236(80)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	)	145 436.202(80)
$17_{1,17} \leftarrow 16_{1,16}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	)	153 379.956(40)
	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	153 408.544(40)
$17_{0,17} \leftarrow 16_{0,16}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	)	154 086.612(40)
	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	154 094.743(40)
$17_{2,16} \leftarrow 16_{2,15}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	)	154 244.023(80)
	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	154 291.210(40)
$17_{2,15} \leftarrow 16_{2,14}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	)	154 242.724(40)
	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	)	154 309.528(80)
$19_{1,19} \leftarrow 18_{1,18}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	171 420.888(80)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	)	171 446.550(80)
$19_{0,19} \leftarrow 18_{0,18}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	172 203.822(80)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	)	172 211.880(80)
$19_{2,18} \leftarrow 18_{2,17}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	172 370.367(80)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	)	172 425.552(80)
$19_{2,17} \leftarrow 18_{2,16}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	172 396.422(80)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	)	172 451.104(80)
$19_{3,17} \leftarrow 18_{3,16}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	172 544.910(40)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	)	172 657.712(40)
$19_{3,16} \leftarrow 18_{3,15}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	172 544.910(40)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	)	172 657.712(40)
$19_{1,18} \leftarrow 18_{1,17}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	173 100.614(80)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	)	173 114.558(80)

$20_{1,20} \leftarrow 19_{1,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	)	180 440.585(40)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	180 464.791(40)
$20_{0,20} \leftarrow 19_{0,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	)	181 260.966(80)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	181 269.052(80)
$20_{2,19} \leftarrow 19_{2,18}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	)	181 442.102(40)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	181 492.624(40)
$20_{2,18} \leftarrow 19_{2,17}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	)	181 472.470(80)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	181 522.406(40)
$20_{3,18} \leftarrow 19_{3,17}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	)	181 630.979(40)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	181 733.081(40)
$20_{3,17} \leftarrow 19_{3,16}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	)	181 630.979(40)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	181 733.081(40)
$20_{1,19} \leftarrow 19_{1,18}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	)	182 207.583(40)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	)	182 220.268(40)
$22_{1,22} \leftarrow 21_{1,21}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	)	198 477.590(80)
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	)	198 500.208(80)
$22_{0,22} \leftarrow 21_{0,21}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	)	199 372.298(40)
$22_{3,20} \leftarrow 21_{3,19}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	)	199 799.286(40)
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	)	199 884.671(40)
$22_{3,19} \leftarrow 21_{3,18}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	)	199 799.286(40)
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	)	199 884.671(40)
$22_{1,21} \leftarrow 21_{1,20}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	)	200 419.182(40)
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	)	200 429.896(40)
$23_{1,23} \leftarrow 22_{1,22}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	)	207 495.134(80)
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	)	207 516.997(40)
$23_{0,23} \leftarrow 22_{0,22}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	)	208 426.369(80)
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	)	208 434.447(80)
$23_{2,22} \leftarrow 22_{2,21}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	)	208 652.002(40)
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	)	208 692.012(80)
$23_{2,21} \leftarrow 22_{2,20}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	)	208 698.030(40)
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	)	208 737.279(40)
$24_{1,24} \leftarrow 23_{1,23}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	)	216 511.970(40)
	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	)	216 533.181(40)
$24_{0,24} \leftarrow 23_{0,23}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	)	217 479.419(40)
	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	)	217 487.410(40)
$24_{2,23} \leftarrow 23_{2,22}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	)	217 720.270(40)
	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	)	217 757.600(80)
$24_{2,22} \leftarrow 23_{2,21}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	)	217 809.028(40)
$24_{3,22} \leftarrow 23_{3,21}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	)	217 936.636(80)
	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	)	218 036.384(80)
$24_{3,21} \leftarrow 23_{3,20}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	)	217 936.636(80)
	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	)	218 036.384(80)
$24_{1,23} \leftarrow 23_{1,22}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	)	218 627.604(40)
	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	)	218 636.680(40)
$25_{1,25} \leftarrow 24_{1,24}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	)	225 527.956(120)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	)	225 548.744(80)

$25_{0,25} \leftarrow 24_{0,24}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	)	226 531.234(120)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	)	226 539.105(120)
$26_{1,26} \leftarrow 25_{1,25}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	)	234 543.485(40)
$26_{0,26} \leftarrow 25_{0,25}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	)	235 581.870(120)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	)	235 589.442(120)
$26_{2,25} \leftarrow 25_{2,24}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	)	235 854.147(80)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	)	235 887.095(80)
$26_{2,24} \leftarrow 25_{2,23}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	)	235 920.310(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	)	235 952.342(40)
$28_{0,28} \leftarrow 27_{0,27}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	)	253 679.311(80)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	)	253 685.325(80)
$28_{1,27} \leftarrow 27_{1,26}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	)	255 039.123(80)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	)	255 040.548(80)
$29_{1,29} \leftarrow 28_{1,28}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	261 584.698(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	)	261 603.686(40)
$29_{0,29} \leftarrow 28_{0,28}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	262 726.161(80)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	)	262 728.579(80)
$29_{2,28} \leftarrow 28_{2,27}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	263 048.254(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	)	263 076.233(40)
$29_{2,27} \leftarrow 28_{2,26}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	263 139.707(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	)	263 166.526(40)
$29_{3,27} \leftarrow 28_{3,26}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	263 358.968(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	)	263 411.008(40)
$29_{3,26} \leftarrow 28_{3,25}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	263 358.968(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	)	263 411.008(40)
$29_{1,28} \leftarrow 28_{1,27}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	264 162.012(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	)	264 139.224(80)
$30_{1,30} \leftarrow 29_{1,29}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	)	270 596.539(80)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	270 750.235(40)
$30_{0,30} \leftarrow 29_{0,29}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	)	271 771.539(80)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	271 750.235(80)
$30_{2,29} \leftarrow 29_{2,28}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	)	272 111.069(80)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	272 137.833(80)
$30_{2,28} \leftarrow 29_{2,27}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	)	272 212.192(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	272 237.596(80)
$30_{3,28} \leftarrow 29_{3,27}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	272 484.285(120)
$30_{3,27} \leftarrow 29_{3,26}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	272 484.920(120)
$30_{1,29} \leftarrow 29_{1,28}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	)	273 127.602(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	)	273 236.845(40)
$31_{1,31} \leftarrow 30_{1,30}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	)	273 127.602(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	)	273 236.845(80)
$31_{0,31} \leftarrow 30_{0,30}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	)	280 815.467(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	)	280 926.782(40)
$31_{1,30} \leftarrow 30_{1,29}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	)	282 363.844(120)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	)	282 333.488(80)
$32_{1,32} \leftarrow 31_{1,31}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	288 618.355(120)

	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	)	288 636.508(120)
$32_{0,32} \leftarrow 31_{0,31}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	289 857.997(120)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	)	289 829.497(120)
$32_{3,30} \leftarrow 31_{3,29}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	290 585.498(120)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	)	290 629.402(120)
$32_{3,29} \leftarrow 31_{3,28}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	290 586.705(120)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	)	290 630.374(120)
$32_{1,31} \leftarrow 31_{1,30}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	291 429.482(80)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	)	291 429.482(80)
$33_{1,33} \leftarrow 32_{1,32}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	)	297 627.861(120)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	297 645.669(120)
$33_{0,33} \leftarrow 32_{0,32}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	)	298 898.878(80)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	298 901.024(80)
$33_{2,32} \leftarrow 32_{2,31}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	)	299 293.773(40)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	299 317.371(80)
$33_{2,31} \leftarrow 32_{2,30}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	)	299 427.706(40)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	299 449.763(80)
$33_{3,31} \leftarrow 32_{3,30}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	)	299 659.391(120)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	299 701.009(80)
$33_{3,30} \leftarrow 32_{3,29}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	)	299 660.604(120)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	299 702.281(80)
$33_{1,32} \leftarrow 32_{1,31}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	)	300 520.315(80)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	)	300 523.771(80)
$34_{0,34} \leftarrow 33_{0,33}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	)	307 938.394(80)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	)	307 944.730(80)
$35_{0,35} \leftarrow 34_{0,34}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	)	316 976.176(120)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	)	316 983.928(120)
$38_{1,38} \leftarrow 37_{1,37}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	342 660.162(40)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	)	342 677.154(40)
$38_{0,38} \leftarrow 37_{0,37}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	344 079.680(40)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	)	344 088.902(40)
$38_{2,37} \leftarrow 37_{2,36}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	344 577.675(120)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	)	344 597.313(80)
$38_{2,36} \leftarrow 37_{2,35}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	344 780.193(80)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	)	344 797.860(120)
$38_{3,36} \leftarrow 37_{3,35}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	345 048.987(120)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	)	345 048.244(80)
$38_{3,35} \leftarrow 37_{3,34}$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	)	345 050.648(80)
$38_{1,37} \leftarrow 37_{1,36}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	345 973.830(80)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	)	345 978.771(120)
$39_{1,39} \leftarrow 38_{1,38}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	351 663.517(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	351 680.337(40)
$39_{0,39} \leftarrow 38_{0,38}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	353 110.740(120)
$39_{2,38} \leftarrow 38_{2,37}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	353 631.136(80)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	353 650.177(80)
$39_{2,37} \leftarrow 38_{2,36}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	353 849.521(40)

	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	353 866.447(40)
$39_{3,37} \leftarrow 38_{3,36}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	354 083.404(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	354 115.225(40)
$39_{3,36} \leftarrow 38_{3,35}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	354 117.903(40)
$39_{1,38} \leftarrow 38_{1,37}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	355 060.969(120)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	)	355 066.047(120)
$40_{1,40} \leftarrow 39_{1,39}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	)	360 665.802(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	360 682.476(40)
$40_{0,40} \leftarrow 39_{0,39}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	)	362 139.947(120)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	362 149.594(120)
$40_{2,39} \leftarrow 39_{2,38}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	)	362 683.476(80)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	362 701.960(80)
$40_{2,38} \leftarrow 39_{2,37}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	)	362 918.281(120)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	362 934.925(120)
$40_{3,38} \leftarrow 39_{3,37}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	)	363 150.649(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	363 181.172(40)
$40_{3,37} \leftarrow 39_{3,36}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	)	363 153.985(120)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	363 184.234(80)
$40_{1,39} \leftarrow 39_{1,38}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	)	364 147.054(80)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	)	364 151.822(80)
$43_{1,43} \leftarrow 42_{1,42}$	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	)	387 665.749(80)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	)	387 682.189(80)
$43_{0,43} \leftarrow 42_{0,42}$	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	)	389 216.554(80)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	)	389 226.705(80)
$43_{2,42} \leftarrow 42_{2,41}$	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	)	389 832.778(40)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	)	389 850.041(80)
$43_{2,41} \leftarrow 42_{2,40}$	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	)	390 122.822(120)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	)	390 137.407(80)
$43_{3,41} \leftarrow 42_{3,40}$	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	)	390 346.339(80)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	)	390 373.709(80)
$43_{3,40} \leftarrow 42_{3,39}$	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	)	390 350.756(80)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	)	390 378.046(80)
$43_{1,42} \leftarrow 42_{1,41}$	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	)	391 396.375(120)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	)	391 401.727(80)
$44_{1,44} \leftarrow 43_{1,43}$	$44\frac{1}{2} \leftarrow 43\frac{1}{2}$	)	396 663.321(80)
	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	)	396 679.882(120)
$44_{0,44} \leftarrow 43_{0,43}$	$44\frac{1}{2} \leftarrow 43\frac{1}{2}$	)	398 238.291(80)
$44_{2,43} \leftarrow 43_{2,42}$	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	)	398 896.941(80)
$44_{2,42} \leftarrow 43_{2,41}$	$44\frac{1}{2} \leftarrow 43\frac{1}{2}$	)	399 190.142(80)
	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	)	399 204.284(80)
$44_{3,42} \leftarrow 43_{3,41}$	$44\frac{1}{2} \leftarrow 43\frac{1}{2}$	)	399 409.380(120)
	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	)	399 435.962(120)
$44_{3,41} \leftarrow 43_{3,40}$	$44\frac{1}{2} \leftarrow 43\frac{1}{2}$	)	399 414.399(120)

^a) Coupling scheme: $J = N + S$; $F = J + I_1$ where I_1 is the ^1H nuclear spin.

^b) The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^c) ^1H hyperfine splitting not resolved.

Molecular parameters for $^1\text{H}^{12}\text{C}^{12}\text{C}^{16}\text{O}$				
Parameter		Value	Method	Ref.
State: electronic \tilde{X}^2A' ; vibrational zero-point level				
A	[MHz]	261 076(63) ^{a)}	MW	92Coo
B	[MHz]	4 577.477 80(91)		
C	[MHz]	4 489.053 27(83)		
D_K	[MHz]	1 208(63)		
D_{NK}	[MHz]	− 1.138 80(57)		
D_N	[kHz]	1.090 32(74)		
d_1	[kHz]	− 0.114 55(15)		
d_2	[Hz]	− 8.70(35)		
H_{NKK}	[kHz]	− 10.47(15)		
H_{NNK}	[Hz]	− 2.311(31)		
H_N	[Hz]	$2.53(12) \times 10^{-3}$		
L_{KKN}	[Hz]	$0.168(11) \times 10^{-3}$		
ε_{aa}	[MHz]	11 058(12)		
ε_{bb}	[MHz]	3.864(36)		
ε_{cc}	[MHz]	− 19.126(30)		
$\frac{1}{2} (\varepsilon_{ab} + \varepsilon_{ba})$	[MHz]	41.081 1(71)		
D_K^s	[MHz]	86.5(14)		
$b_{\text{F}}(^1\text{H})$	[MHz]	− 15.060(4)	FTMW	96Che
$c(^1\text{H})$	[MHz]	13.774(13)		
$a_{\text{c}}(^1\text{H})$	[MHz]	− 11.593(41) ^{b)}	FTMW	94Coo
Δ_{c}	[uÅ ²]	0.244 3(13) ^{b)}		
$r(\text{H}-\text{C}_{\text{a}})$	[nm]	0.106 0(18) ^{c)}		
$r(\text{C}_{\text{a}}-\text{C}_{\text{b}})$	[nm]	0.121 9(3)		
$r(\text{C}_{\text{b}}-\text{C}_{\text{c}})$	[nm]	0.138 7(5)		
$r(\text{C}_{\text{c}}-\text{O})$	[nm]	0.119 2(2)		
$\angle(\text{H}-\text{C}-\text{C})$	[deg]	168(7)		
$\angle(\text{C}-\text{C}-\text{C})$	[deg]	163(2)		
$\angle(\text{C}-\text{C}-\text{O})$	[deg]	136.5(6)		

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter determined from $K = 0$ and 1 levels only.

^{c)} The molecule is planar with a *trans* arrangement of the HCCC chain.

Microwave data for $^1\text{H}^{13}\text{C}^{12}\text{C}^{16}\text{O}$

Transition				ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}			
		$F_1' - F_1''$	$F' - F''$		
State: electronic \tilde{X}^2A' ; vibrational zero-point level					
$18_{0,18} \leftarrow 17_{0,17}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	$19 \leftarrow 18$	^{d)}	$157\,957.538(80)^{b,c)}$	94Coo
		$18 \leftarrow 17$	^{d)}	$157\,957.538(80)^c)$	
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	$18 \leftarrow 17$	^{d)}	$157\,965.103(80)^c)$	
		$17 \leftarrow 16$	^{d)}	$157\,965.103(80)^c)$	
$18_{1,17} \leftarrow 17_{1,16}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	$19 \leftarrow 18$	^{d)}	$158\,753.858(80)^c)$	
		$18 \leftarrow 17$	^{d)}	$158\,753.858(80)^c)$	
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	$18 \leftarrow 17$	^{d)}	$158\,768.733(80)^c)$	
		$17 \leftarrow 16$	^{d)}	$158\,768.733(80)^c)$	
$19_{0,19} \leftarrow 18_{0,18}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$20 \leftarrow 19$	^{d)}	$166\,727.854(80)^c)$	
		$19 \leftarrow 18$	^{d)}	$166\,727.854(80)^c)$	

	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	$19 \leftarrow 18$	$d)$	$166\,735.499(80)^{c)}$
		$18 \leftarrow 17$	$d)$	$166\,735.499(80)^{c)}$
$19_{1,19} \leftarrow 18_{1,18}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$165\,991.358(120)$
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	$18 \leftarrow 17$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	$166\,015.359(120)$
			$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	$166\,016.531(120)$
$19_{1,18} \leftarrow 18_{1,17}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$20 \leftarrow 19$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$167\,570.785(80)^{c)}$
		$19 \leftarrow 18$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$167\,570.785(80)^{c)}$
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	$19 \leftarrow 18$	$d)$	$167\,584.400(80)^{c)}$
$20_{0,20} \leftarrow 19_{0,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$21 \leftarrow 20$	$d)$	$175\,497.415(80)^{c)}$
		$20 \leftarrow 19$	$d)$	$175\,497.415(80)^{c)}$
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$20 \leftarrow 19$	$d)$	$175\,504.991(80)^{c)}$
		$19 \leftarrow 18$	$d)$	$175\,504.991(80)^{c)}$
$20_{1,19} \leftarrow 19_{1,18}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$21 \leftarrow 20$	$d)$	$176\,387.020(80)^{c)}$
		$20 \leftarrow 19$	$d)$	$176\,387.020(80)^{c)}$
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$20 \leftarrow 19$	$d)$	$176\,399.366(80)^{c)}$
		$19 \leftarrow 18$	$d)$	$176\,399.366(80)^{c)}$
$21_{1,21} \leftarrow 20_{1,20}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$22 \leftarrow 21$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$183\,459.123(120)$
		$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$183\,460.290(120)$
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$183\,480.576(120)$
		$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$183\,481.806(120)$
$22_{1,22} \leftarrow 21_{1,21}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$23 \leftarrow 22$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	$192\,191.755(80)$
		$22 \leftarrow 21$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$192\,192.339(80)$
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$22 \leftarrow 21$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$192\,213.045(80)$
		$21 \leftarrow 20$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$192\,213.700(80)$

^{a)} Coupling scheme: $J = N + S$; $F_1 = J + I_1$; $F = F_1 + I_2$ where I_1 and I_2 are the ^{13}C and ^1H nuclear spins respectively.

^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^{c)} Neither ^{13}C nor ^1H hyperfine splitting resolved.

^{d)} ^1H hyperfine splitting not resolved.

Molecular parameters for $^1\text{H}^{13}\text{C}^{12}\text{C}^{13}\text{C}^{16}\text{O}$

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A' ; vibrational zero-point level			
A	[GHz]	258.8(64) ^{a,b)}	MW 94Coo
$\frac{1}{2}(B + C)$	[MHz]	4 389.027(10)	
$\frac{1}{4}(B - C)$	[MHz]	20.777 9(72)	
D_{NK}	[MHz]	- 1.084(12)	
D_N	[kHz]	1.013(13)	
d_1	[kHz]	- 0.101 3(92)	
\mathcal{E}_{aa}	[MHz]	10 300(160)	
\mathcal{E}_{bb}	[MHz]	3.80(13)	
\mathcal{E}_{cc}	[MHz]	- 18.502(86)	
D_K^s	[MHz]	- 23.6(15)	
$a_c(^{13}\text{C})$	[MHz]	35.8(14)	
Δ_c	[uÅ ²]	0.228(48)	

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter determined from $K = 0$ and 1 levels only.

Microwave data for $^1\text{H}^{12}\text{C}^{13}\text{C}^{12}\text{C}^{16}\text{O}$

Transition				ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}			
		$F'_1 - F''_1$	$F' - F''$		
State: electronic \tilde{X}^2A' ; vibrational zero-point level					
$18_{0,18} \leftarrow 17_{0,17}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	$19 \leftarrow 18$)	162 417.894(40) ^{b)}	94Coo
		$18 \leftarrow 17$	)	162 419.399 (40)
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	$18 \leftarrow 17$	)	162 424.513(40)
$19_{0,19} \leftarrow 18_{0,18}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$17 \leftarrow 16$)	162 425.957(40)	
		$20 \leftarrow 19$	)	171 435.650(80)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	$19 \leftarrow 18$	)	171 436.988(80)
		$19 \leftarrow 18$	)	171 442.391(80)
$20_{0,20} \leftarrow 19_{0,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$18 \leftarrow 17$)	171 443.703(120)	
		$21 \leftarrow 20$	)	180 452.461(80)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$20 \leftarrow 19$	)	180 453.734(80)
		$20 \leftarrow 19$	)	180 459.354(80)
$20_{1,20} \leftarrow 19_{1,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$19 \leftarrow 18$)	180 460.495(160)	
		$21 \leftarrow 20$	)	179 638.220(80)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$20 \leftarrow 19$	)	179 646.335(120)
		$20 \leftarrow 19$	)	179 654.011(80)
$20_{1,19} \leftarrow 19_{1,18}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$19 \leftarrow 18$)	179 662.392(80)	
		$21 \leftarrow 20$	)	181 391.506(80)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$20 \leftarrow 19$	)	181 393.399(80)
		$20 \leftarrow 19$	)	181 402.291(80)
		$19 \leftarrow 18$)	181 404.219(80)	

^{a)} Coupling scheme: $J = N + S$; $F_1 = J + I_1$; $F = F_1 + I_2$ where I_1 and I_2 are the ^{13}C and ^1H nuclear spins respectively.^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).) ^1H hyperfine splitting not resolved.Molecular parameters for $^1\text{H}^{12}\text{C}^{13}\text{C}^{12}\text{C}^{16}\text{O}$

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A' ; vibrational zero-point level			
A	[GHz] 259(20) ^{a,b)}	MW	94Coo
$\frac{1}{2}(B + C)$	[MHz] 4 513.036 0(74)		
$\frac{1}{4}(B - C)$	[MHz] 21.933 3(10)		
D_{NK}	[MHz] - 1.110(46)		
D_N	[kHz] 1.070 2(75)		
d_1	[kHz] 0.0 ^{c)}		
\mathcal{E}_{aa}	[MHz] 11 170(130)		
\mathcal{E}_{bb}	[MHz] 3.24(17)		
\mathcal{E}_{cc}	[MHz] - 18.62(14)		
D_K^s	[MHz] - 0.042 6(73)		
$a_c(^{13}\text{C})$	[MHz] 166.2(38)		
Δ_c	[uÅ ²] 0.22(15)		

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.^{b)} Parameter determined from $K = 0$ and 1 levels only.^{c)} Parameter constrained to this value in the least-squares fit.

Microwave data for $^1\text{H}^{12}\text{C}^{12}\text{C}^{13}\text{C}^{16}\text{O}$

Transition				ν [MHz]	Ref.	
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}				
		$F_1' - F_1''$	$F' - F''$			
State: electronic \tilde{X}^2A' ; vibrational zero-point level						
$19_{0,19} \leftarrow 18_{0,18}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	171 516.623(80) ^{b)}	94Coo	
		$19 \leftarrow 18$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	171 519.006(80)		
$19_{1,19} \leftarrow 18_{1,18}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	$19 \leftarrow 18$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	171 522.235(80)		
		$19 \leftarrow 18$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	170 703.368(160)		
		$19 \leftarrow 18$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	170 706.616(160)		
		$18 \leftarrow 17$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	170 716.269(160)		
			$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	170 716.920(80)		
$20_{0,20} \leftarrow 19_{0,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	180 537.233(80)		
		$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	180 537.233(80)		
		$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$		180 542.898(80)
		$19 \leftarrow 18$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	180 545.145(80)		
$20_{1,20} \leftarrow 19_{1,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	179 673.079(80)		
		$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	179 682.474(160)		
			$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	179 683.252(160)		
		$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	179 687.308(80) ^{c)}		
			$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	179 687.308(80) ^{c)}		
		$19 \leftarrow 18$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	179 696.998(80) ^{c)}		
			$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	179 696.998(80) ^{c)}		
$20_{1,19} \leftarrow 19_{1,18}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	181 526.256(80)		
		$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	181 529.773(80)		
		$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$		181 535.007(80)
		$19 \leftarrow 18$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	181 538.377(80)		
			$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	181 538.377(80)		
$21_{0,21} \leftarrow 20_{0,20}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$22 \leftarrow 21$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	189 556.835(80)		
		$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	189 559.069(80)		
		$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$		189 562.598(80)
		$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	189 564.702(80)		
$21_{1,21} \leftarrow 20_{1,20}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$22 \leftarrow 21$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	188 653.578(80) ^{c)}		
			$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	188 653.578(80) ^{c)}		
		$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$		188 667.943(80) ^{c)}
			$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	188 667.943(80) ^{c)}		
		$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	188 666.657(80) ^{c)}		
$21_{1,20} \leftarrow 20_{1,19}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$		$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	188 666.657(80) ^{c)}		
		$22 \leftarrow 21$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	190 598.314(80)		
		$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	190 601.669(80)		
		$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$		190 606.182(80)
		$20 \leftarrow 19$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	190 609.435(80)		
$22_{0,22} \leftarrow 21_{0,21}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$23 \leftarrow 22$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	198 575.245(80)		
		$22 \leftarrow 21$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	198 577.453(80)		
			$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	198 581.030(80)		
		$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$22 \leftarrow 21$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$		198 581.030(80)
		$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	198 583.080(80)		

$22_{1,22} \leftarrow 21_{1,21}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$23 \leftarrow 22$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	197 633.218(80) [°]
			$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	197 633.218(80) [°]
		$22 \leftarrow 21$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	197 640.733(160)
			$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	197 641.330(160)
		$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	197 647.647(80) [°]
			$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	197 647.647(80) [°]
		$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	197 655.519(80) [°]
			$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	197 655.519(80) [°]
			$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	199 669.649(80)
			$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	199 672.830(80)
$22_{1,21} \leftarrow 21_{1,20}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$23 \leftarrow 22$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	199 676.737(80)
		$22 \leftarrow 21$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	199 679.777(80)
		$21 \leftarrow 20$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	199 679.777(80)
$23_{1,23} \leftarrow 22_{1,22}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	$24 \leftarrow 23$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	206 612.314(80) [°]
			$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	206 612.314(80) [°]
		$23 \leftarrow 22$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	206 619.067(120)
			$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	206 619.615(120)
		$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	206 626.984(200) [°]
			$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	206 626.984(200) [°]
		$21 \leftarrow 20$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	206 633.915(80) [°]
			$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	206 633.915(80) [°]
			$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	224 568.411(80)
			$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	224 574.203(80)
$25_{1,25} \leftarrow 24_{1,24}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	$25 \leftarrow 24$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	224 583.087(80)
		$24 \leftarrow 23$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	224 588.893(80)
		$27 \leftarrow 26$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	233 545.428(200)
		$26 \leftarrow 25$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	233 550.644(120)
		$26 \leftarrow 25$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	233 559.984(80)
$26_{1,25} \leftarrow 25_{1,24}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	$25 \leftarrow 24$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	233 565.303(80)
		$30 \leftarrow 29$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	260 471.317(80)
		$29 \leftarrow 28$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	260 475.297(80)
		$29 \leftarrow 28$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	260 486.018(120)
		$28 \leftarrow 27$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	260 489.937(80)
$29_{1,29} \leftarrow 28_{1,28}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	$31 \leftarrow 30$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	269 444.967(80)
		$30 \leftarrow 29$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	269 448.613(80)
		$30 \leftarrow 29$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	269 459.684(80)
		$29 \leftarrow 28$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	269 463.251(120)
		$32 \leftarrow 31$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	278 417.733(200)
$30_{1,30} \leftarrow 29_{1,29}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	$31 \leftarrow 30$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	278 421.049(80)
		$31 \leftarrow 30$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	278 432.429(80)
		$30 \leftarrow 29$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	278 435.747(200)
		$33 \leftarrow 32$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	287 389.582(80)
		$32 \leftarrow 31$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	287 392.692(80)
$31_{1,31} \leftarrow 30_{1,30}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$32 \leftarrow 31$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	287 404.218(120)
		$31 \leftarrow 30$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	287 407.380(80)
		$39 \leftarrow 38$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	341 200.262(80)
		$38 \leftarrow 37$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	341 202.355(80)
$32_{1,32} \leftarrow 31_{1,31}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$			
$38_{1,38} \leftarrow 37_{1,37}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$			

	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	$38 \leftarrow 37$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	341 214.854(80)
		$37 \leftarrow 36$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	341 216.935(80)
$39_{0,39} \leftarrow 38_{0,38}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	$40 \leftarrow 39$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	351 676.747(160)
		$39 \leftarrow 38$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	351 678.536(160)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	$39 \leftarrow 38$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	351 685.090(160)
		$38 \leftarrow 37$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	351 686.944(160)
$39_{1,39} \leftarrow 38_{1,38}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	$40 \leftarrow 39$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	350 165.111(80)
		$39 \leftarrow 38$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	350 167.028(80)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	$39 \leftarrow 38$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	350 179.681(80)
		$38 \leftarrow 37$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	350 181.543(80)
$39_{1,38} \leftarrow 38_{1,37}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	$40 \leftarrow 39$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	353 728.929(120)
		$39 \leftarrow 38$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	353 731.473(160) ^{c)}
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	$39 \leftarrow 38$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	353 731.473(160) ^{c)}
		$38 \leftarrow 37$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	353 734.061(120)
$40_{0,40} \leftarrow 39_{0,39}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	$41 \leftarrow 40$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	360 667.631(160)
		$40 \leftarrow 39$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	360 669.452(160)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	$40 \leftarrow 39$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	360 676.325(160)
		$39 \leftarrow 38$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	360 677.787(160)
$40_{1,40} \leftarrow 39_{1,39}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	$41 \leftarrow 40$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	359 128.705(80)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	$40 \leftarrow 39$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	359 143.468(80)
		$39 \leftarrow 38$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	359 145.349(80)
$40_{1,40} \leftarrow 39_{1,39}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	$41 \leftarrow 40$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	359 128.623(160)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	$40 \leftarrow 39$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	359 143.381(120)
		$39 \leftarrow 38$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	359 145.252(120)
$40_{1,39} \leftarrow 39_{1,38}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	$41 \leftarrow 40$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	362 781.097(200)
		$40 \leftarrow 39$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	362 783.057(200) ^{c)}
			$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	362 783.057(200) ^{c)}
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	$40 \leftarrow 39$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	362 783.057(200) ^{c)}
		$39 \leftarrow 38$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	362 785.461(200)

^{a)} Coupling scheme: $\mathbf{J} = \mathbf{N} + \mathbf{S}$; $\mathbf{F}_1 = \mathbf{J} + \mathbf{I}_1$; $\mathbf{F} = \mathbf{F}_1 + \mathbf{I}_2$ where \mathbf{I}_1 and \mathbf{I}_2 are the ^{13}C and ^1H nuclear spins respectively.

^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

^{c)} Hyperfine splitting not resolved.

Molecular parameters for $^1\text{H}^{12}\text{C}^{12}\text{C}^{13}\text{C}^{16}\text{O}$				
Parameter		Value	Method	Ref.
State: electronic \tilde{X}^2A' ; vibrational zero-point level				
A	[MHz]	247 000(180) ^{a,b)}	MW	94Coo
$\frac{1}{2}(B+C)$	[MHz]	4 515.273 36(98)		
$\frac{1}{4}(B-C)$	[MHz]	23.183 40(65)		
D_{NK}	[MHz]	- 1.011 0(12)		
D_N	[kHz]	1.057 92(49)		
d_1	[kHz]	- 0.115 28(33)		
ϵ_{aa}	[MHz]	11 155(74)		
ϵ_{bb}	[MHz]	4.142(62)		
ϵ_{cc}	[MHz]	- 18.877(47)		
D_K^s	[MHz]	88.6(19)		
$a_s(^{13}\text{C})$	[MHz]	347.6(32)		
$T_0^2(^{13}\text{C})$	[MHz]	- 0.011 7(15)		
$T_2^2(^{13}\text{C})$	[MHz]	0.021 3(20)		
Δ_c	[uÅ ²]	0.252 9(15)		

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter determined from $K=0$ and 1 levels only.

Microwave data for $^1\text{H}^{12}\text{C}^{12}\text{C}^{12}\text{C}^{18}\text{O}$

Transition			ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}		
		$F' - F''$ ^{b)}		
State: electronic \tilde{X}^2A' ; vibrational zero-point level				
$20_{0,20} \leftarrow 19_{0,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	172 638.264(40) ^{c)}	94Coo
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	172 646.021(40)	
$20_{1,20} \leftarrow 19_{1,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	171 874.758(40)	
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	171 897.954(40)	
$20_{1,19} \leftarrow 19_{1,18}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	173 522.656(40)	
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	173 534.988(40)	
$22_{0,22} \leftarrow 21_{0,21}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	189 888.598(80)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	189 896.380(80)	
$22_{1,22} \leftarrow 21_{1,21}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	189 055.746(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	189 077.417(40)	
$22_{1,21} \leftarrow 21_{1,20}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	190 866.414(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	190 876.861(40)	
$23_{0,23} \leftarrow 22_{0,22}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	198 512.314(40)	
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	198 520.088(40)	
$23_{1,23} \leftarrow 22_{1,22}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	197 645.345(40)	
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	197 666.260(40)	
$23_{1,22} \leftarrow 22_{1,21}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	199 537.101(80)	
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	199 549.497(80)	

^{a)} Coupling scheme: $J = N + S$; $F = J + I$ where I is the ^1H nuclear spin.

^{b)} ^1H hyperfine splitting not resolved.

^{c)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Molecular parameters for $^1\text{H}^{12}\text{C}^{12}\text{C}^{12}\text{C}^{18}\text{O}$				
Parameter		Value	Method	Ref.
State: electronic \tilde{X}^2A' ; vibrational zero-point level				
A	[GHz]	256.13(87) ^{a,b)}	MW	94Coo
$\frac{1}{2}(B+C)$	[MHz]	4 317.556 78(10)		
$\frac{1}{4}(B-C)$	[MHz]	20.620 7(22)		
D_{NK}	[MHz]	- 1.120 5(22)		
D_N	[kHz]	1.026 3(32)		
d_1	[kHz]	- 0.112 3(24)		
ϵ_{aa}	[MHz]	10 560(110)		
ϵ_{bb}	[MHz]	3.378(72)		
ϵ_{cc}	[MHz]	- 18.209(59)		
D_K^s	[MHz]	130.3(77)		
Δ_c	[uÅ ²]	0.263 3(69)		

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter determined from $K = 0$ and 1 levels only.

Microwave data for $^2\text{H}^{12}\text{C}^{12}\text{C}^{12}\text{C}^{16}\text{O}$ (DC_3O)

Transition			ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)} $F' - F''$		

State: electronic \tilde{X}^2A' ; vibrational zero-point level

$14_{1,14} \leftarrow 13_{1,13}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	^{b)}	117 159.933(40) ^{c)}	92Coo
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	^{b)}	117 193.342(40)	
$14_{0,14} \leftarrow 13_{0,13}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	^{b)}	117 682.434(40)	
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	^{b)}	117 689.740(80)	
$14_{1,13} \leftarrow 13_{1,12}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	^{b)}	118 254.105(40)	
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	^{b)}	118 276.604(40)	
$16_{1,16} \leftarrow 15_{1,15}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	^{b)}	133 897.724(40)	
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	^{b)}	133 926.198(40)	
$16_{2,15} \leftarrow 15_{2,14}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	^{b)}	134 593.633(40)	
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	^{b)}	134 663.955(80)	
$16_{2,14} \leftarrow 15_{2,13}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	^{b)}	134 606.043(80)	
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	^{b)}	134 676.081(80)	
$18_{1,18} \leftarrow 17_{1,17}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	^{b)}	150 633.064(80)	
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	^{b)}	150 658.628(80)	
$18_{2,17} \leftarrow 17_{2,16}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	^{b)}	151 423.068(40)	
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	^{b)}	151 479.976(40)	
$18_{2,16} \leftarrow 17_{2,15}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	^{b)}	151 440.740(40)	
	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	^{b)}	151 497.218(40)	
$21_{1,21} \leftarrow 20_{1,20}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	^{b)}	175 732.541(40)	
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	^{b)}	175 754.412(40)	
$21_{0,21} \leftarrow 20_{0,20}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	^{b)}	176 491.234(40)	
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	^{b)}	176 498.672(40)	
$21_{2,20} \leftarrow 20_{2,19}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	^{b)}	176 660.755(40)	
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	^{b)}	176 704.263(40)	

$21_{2,19} \leftarrow 20_{2,18}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$b)$	176 668.720(40)
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$b)$	176 731.721(40)
$21_{3,19} \leftarrow 20_{3,18}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$b)$	176 838.951(80)
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$b)$	176 926.660(80)
$21_{3,18} \leftarrow 20_{3,17}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	$b)$	176 838.951(80)
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	$b)$	176 926.660(80)
$28_{0,28} \leftarrow 27_{0,27}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	$b)$	235 259.497(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	$b)$	235 266.218(40)
$28_{1,27} \leftarrow 27_{1,26}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	$b)$	236 449.559(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	$b)$	236 454.628(40)
$31_{1,31} \leftarrow 30_{1,30}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	259 358.162(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	$b)$	259 375.166(80)
$31_{2,30} \leftarrow 30_{2,29}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	260 737.697(80)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	$b)$	260 761.635(40)
$31_{2,29} \leftarrow 30_{2,28}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	260 826.566(80)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	$b)$	260 849.300(80)
$31_{3,29} \leftarrow 30_{3,28}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	261 035.353(80)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	$b)$	261 078.829(80)
$31_{3,28} \leftarrow 30_{3,27}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	261 035.353(80)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	$b)$	261 078.829(80)
$31_{1,30} \leftarrow 30_{1,29}$	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	261 911.955(200)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	$b)$	261 762.312(160)
$32_{1,32} \leftarrow 31_{1,31}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	267 716.933(80)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	267 733.797(80)
$32_{0,32} \leftarrow 31_{0,31}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	268 818.208(40)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	268 670.981(80)
$32_{2,31} \leftarrow 31_{2,30}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	269 141.178(80)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	269 164.113(40)
$32_{2,30} \leftarrow 31_{2,29}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	269 238.783(80)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	269 260.420(80)
$32_{3,30} \leftarrow 31_{3,29}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	269 450.534(120)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	269 491.898(120)
$32_{3,29} \leftarrow 31_{3,28}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	269 451.298(120)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	269 492.563(120)
$32_{1,31} \leftarrow 31_{1,30}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	269 978.738(40)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	$b)$	269 196.321(40)
$33_{1,33} \leftarrow 32_{1,32}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	$b)$	276 075.004(40)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	276 091.503(80)
$33_{0,33} \leftarrow 32_{0,32}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	$b)$	277 204.886(40)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	277 424.984(80)
$33_{2,32} \leftarrow 32_{2,31}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	$b)$	277 543.836(40)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	277 565.855(40)
$33_{2,31} \leftarrow 32_{2,30}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	$b)$	277 650.787(40)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	277 671.282(40)
$33_{1,32} \leftarrow 32_{1,31}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	$b)$	278 640.711(40)
	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	$b)$	278 629.638(80)

$34_{0,34} \leftarrow 33_{0,33}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	^{b)}	285 590.316(40)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	^{b)}	285 582.012(80)
$35_{0,35} \leftarrow 34_{0,34}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	^{b)}	293 974.472(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	^{b)}	293 977.887(40)
$35_{3,33} \leftarrow 34_{3,32}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	^{b)}	294 692.627(80)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	^{b)}	294 728.107(80)
$35_{3,32} \leftarrow 34_{3,31}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	^{b)}	294 693.913(80)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	^{b)}	294 729.358(80)
$35_{1,34} \leftarrow 34_{1,33}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	^{b)}	295 490.443(120)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	^{b)}	295 493.526(120)
$36_{0,36} \leftarrow 35_{0,35}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	^{b)}	302 357.234(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	^{b)}	302 363.458(40)
$36_{3,34} \leftarrow 35_{3,33}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	^{b)}	303 105.217(80)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	^{b)}	303 139.046(80)
$36_{3,33} \leftarrow 35_{3,32}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	^{b)}	303 106.588(80)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	^{b)}	303 140.453(80)
$36_{1,35} \leftarrow 35_{1,34}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	^{b)}	303 920.064(80)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	^{b)}	303 923.959(120)
$41_{1,41} \leftarrow 40_{1,40}$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	^{b)}	342 909.671(80)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	^{b)}	342 924.993(40)
$41_{2,40} \leftarrow 40_{2,39}$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	^{b)}	344 733.038(80)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	^{b)}	344 749.896(80)
$41_{2,39} \leftarrow 40_{2,38}$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	^{b)}	344 934.883(80)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	^{b)}	344 949.771(40)
$42_{1,42} \leftarrow 41_{1,41}$	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	^{b)}	351 259.974(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	^{b)}	351 275.188(80)
$42_{0,42} \leftarrow 41_{0,41}$	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	^{b)}	352 624.187(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	^{b)}	352 633.052(40)
$42_{2,41} \leftarrow 41_{2,40}$	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	^{b)}	353 127.390(80)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	^{b)}	353 143.787(40)
$42_{2,40} \leftarrow 41_{2,39}$	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	^{b)}	353 343.916(80)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	^{b)}	353 358.236(40)
$42_{3,40} \leftarrow 41_{3,39}$	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	^{b)}	353 563.360(120)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	^{b)}	353 590.038(120)
$42_{3,39} \leftarrow 41_{3,38}$	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	^{b)}	353 566.296(80)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	^{b)}	353 592.805(120)
$43_{1,43} \leftarrow 42_{1,42}$	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	^{b)}	359 609.270(80)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	^{b)}	359 624.440(80)
$43_{2,42} \leftarrow 42_{2,41}$	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	^{b)}	361 520.779(40)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	^{b)}	361 536.592(80)
$43_{2,41} \leftarrow 42_{2,40}$	$43\frac{1}{2} \leftarrow 42\frac{1}{2}$	^{b)}	361 752.526(80)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	^{b)}	361 766.360(40)
$46_{0,46} \leftarrow 45_{0,45}$	$46\frac{1}{2} \leftarrow 45\frac{1}{2}$	^{b)}	386 104.712(80)

^{a)} Coupling scheme: $J = N + S$; $F = J + I$ where I is the ^2H nuclear spin.

^{b)} ^2H hyperfine splitting not resolved.

^{c)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Molecular parameters for $^2\text{H}^{12}\text{C}^{12}\text{C}^{16}\text{O}$ (DC_2O)				
Parameter		Value	Method	Ref.
State: electronic \tilde{X}^2A' ; vibrational zero-point level				
A	[MHz]	254 469(85) ^{a)}	MW	92Coo
B	[MHz]	4 242.678 9(12)		
C	[MHz]	4 164.774 32(92)		
D_K	[MHz]	1 214(85)		
D_{NK}	[MHz]	− 1.002 77(59)		
D_N	[kHz]	0.896 38(77)		
d_1	[kHz]	− 0.092 07(19)		
d_2	[Hz]	− 7.57(39)		
H_{NKK}	[kHz]	− 8.09(16)		
H_{NNK}	[Hz]	− 2.029(43)		
H_N	[Hz]	$1.76(11) \times 10^{-3}$		
L_{KKN}	[Hz]	$0.111(11) \times 10^{-3}$		
ϵ_{aa}	[MHz]	6 791(18)		
ϵ_{bb}	[MHz]	3.792(39)		
ϵ_{cc}	[MHz]	− 17.866(33)		
$\frac{1}{2} (\epsilon_{ab} + \epsilon_{ba})$	[MHz]	39.043(19)		
D_K^s	[MHz]	− 81.5(26)		94Coo
Δ_c	[uÅ ²]	0.248(46) ^{b)}		

^{a)} The numbers in parenthesis represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter determined from $K = 0$ and 1 levels only.

References for HCCCO

- 92Coo Cooksy, A.L., Watson, J.K.G., Gottlieb, C.A., Thaddeus, P. : J. Mol. Spectrosc. **153** (1992) 610.
- 94Coo Cooksy, A.L., Watson, J.K.G., Gottlieb, C.A., Thaddeus, P. : J.Chem. Phys. **101** (1994) 178.
- 96Che Chen, W., Novick, S.E., McCarthy, M.C., Travers, M.J., Gottlieb, C.A., Cooksy, A.L., Thaddeus, P. : Astrophys. J. **462** (1996) 561.

3.2.4.2.17 HC₄O

Microwave data for ¹H¹²C¹²C¹²C¹²C¹⁶O

Transition			ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}		
		$F' - F''$		
State: electronic \tilde{X}^2A'' ; vibrational zero-point level				
$2_{02} \leftarrow 1_{01}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2 \leftarrow 1$	9 105.304(5) ^{b)}	94Koh
		$1 \leftarrow 0$	9 106.741(5)	
		$1 \leftarrow 1$	9 088.062(5)	
		$3 \leftarrow 2$	9 136.211(5)	
$3_{03} \leftarrow 2_{02}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2 \leftarrow 1$	9 133.958(5)	
		$2 \leftarrow 2$	9 160.307(5)	
		$3 \leftarrow 2$	13 663.741(5)	
		$2 \leftarrow 1$	13 663.252(5)	
$4_{04} \leftarrow 3_{03}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	13 696.177(5)	
		$3 \leftarrow 2$	13 695.076(5)	
		$4 \leftarrow 3$	18 222.881(5)	
		$3 \leftarrow 2$	18 222.470(5)	
$5_{05} \leftarrow 4_{04}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	18 256.034(5)	
		$4 \leftarrow 3$	18 256.395(5)	
		$5 \leftarrow 4$	22 782.212(5)	
		$4 \leftarrow 3$	22 781.903(5)	
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	22 815.812(5)	
		$5 \leftarrow 4$	22 815.395(5)	

^{a)} Coupling scheme: $J = N + S$; $F = J + I$ where I is the ¹H nuclear spin.
^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Molecular parameters for ¹H¹²C¹²C¹²C¹²C¹⁶O

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A'' ; vibrational zero-point level			
$\frac{1}{2} (B + C)$	[MHz] 2 279.914 5(4) ^{a)}	FTMW	94Koh
D_N	[kHz] 0.655(10)		
$\frac{1}{2} (\epsilon_{bb} + \epsilon_{cc})$	[MHz] 33.795(4)		
D_N^s	[kHz] 5.10(9)		
$b_F(^1H)$	[MHz] – 32.116(7)		
$c(^1H)$	[MHz] 24.219(14)		

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

Microwave data for ²H¹²C¹²C¹²C¹²C¹⁶O (DC₄O)

Transition			ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}		
		$F' - F''$		

State: electronic \tilde{X}^2A'' ; vibrational zero-point level

$2_{02} \leftarrow 1_{01}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$\frac{1}{2} \leftarrow \frac{1}{2}$	8 596.980(5) ^{b)}	94Koh
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	8 599.243(5)	
		$1\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 594.345(5)	
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 597.989(5)	
$3_{03} \leftarrow 2_{02}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	8 628.686(5)	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	8 629.334(5)	
		$1\frac{1}{2} \leftarrow \frac{1}{2}$	12 904.266(5) ^{°)}	
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	12 904. 507 (5)	
$4_{04} \leftarrow 3_{03}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	12 904.266(5) ^{°)}	
		$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	12 935.883(5)	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	12 935. 806(5)	
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	12 936. 082(5)	
$4_{04} \leftarrow 3_{03}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	17 210.676(5)	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	17 210.825(5)	
		$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	17 210.740(5)	
		$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	17 242.691(5)	
$4_{04} \leftarrow 3_{03}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	17 242.615(5)	
		$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	17 242.774(5)	

^{a)} Coupling scheme: $J = N + S$; $F = J + I$ where I is the ²H nuclear spin.^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1 σ). ^{°)} Blended line.Molecular parameters for ²H¹²C¹²C¹²C¹²C¹⁶O (DC₄O)

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A'' ; vibrational zero-point level			
$\frac{1}{2} (B + C)$	[MHz] 2 153.354 6(10) ^{a)}	FTMW	94Koh
D_N	[kHz] 0.52(4)		
$\frac{1}{2} (\epsilon_{bb} + \epsilon_{cc})$	[MHz] 32.044(9)		
D_N^s	[kHz] 4.3(3)		
$b_F(^2H)$	[MHz] - 4.94(3)		
$c(^2H)$	[MHz] 3.83(2)		
eQq_0	[MHz] 0.21(2)		

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

Microwave data for ¹H¹²C¹²C¹²C¹²C¹⁸O

Transition			ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$	Hyperfine ^{a)}		
		$F' - F''$		

State: electronic \tilde{X}^2A'' ; vibrational zero-point level

$2_{02} \leftarrow 1_{01}$	$1\frac{1}{2} \leftarrow \frac{1}{2}$	$2 \leftarrow 1$	8 683.975(5) ^{b)}	94Koh
		$1 \leftarrow 0$	8 685.420(5)	
$3_{03} \leftarrow 2_{02}$	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	8 713.815(5)	
		$2 \leftarrow 1$	8 711.543(5)	
	$2\frac{1}{2} \leftarrow 1\frac{1}{2}$	$3 \leftarrow 2$	13 031.498(5)	
		$2 \leftarrow 1$	13 030.999(5)	
$4_{04} \leftarrow 3_{03}$	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	13 062.842(5)	
		$3 \leftarrow 2$	13 061.723(5)	
	$3\frac{1}{2} \leftarrow 2\frac{1}{2}$	$4 \leftarrow 3$	17 379.731(5)	
		$3 \leftarrow 2$	17 379.308(5)	
$5_{05} \leftarrow 4_{04}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	17 411.763(5)	
		$4 \leftarrow 3$	17 411.103(5)	
	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	$5 \leftarrow 4$	21 728.170(5)	
		$4 \leftarrow 3$	21 727.860(5)	
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	$6 \leftarrow 5$	21 760.610(5)	
		$5 \leftarrow 4$	21 760.190(5)	

^{a)} Coupling scheme: $\mathbf{J} = \mathbf{N} + \mathbf{S}$; $\mathbf{F} = \mathbf{J} + \mathbf{I}$ where \mathbf{I} is the ¹H nuclear spin.^{b)} The figures in parentheses are the authors' estimates of experimental uncertainty (1 σ).Molecular parameters for ¹H¹²C¹²C¹²C¹²C¹⁸O

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A'' ; vibrational zero-point level			
$\frac{1}{2} (B + C)$	[MHz]	2 174.445 5(5) ^{a)}	FTMW 94Koh
D_N	[kHz]	0.532(12)	
$\frac{1}{2} (\epsilon_{bb} + \epsilon_{cc})$	[MHz]	32.749(9)	
D_N^s	[kHz]	3.64(14)	
$b_F(^1\text{H})$	[MHz]	- 32.12(5)	
$c(^1\text{H})$	[MHz]	24.31(4)	

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.Reference for HC₄O94Koh Kohguchi, H., Ohshima, Y., Endo, Y. : J. Chem. Phys. **101** (1994) 6463.

3.2.4.2.18 HOCOMicrowave data for $^1\text{H}^{16}\text{O}^{12}\text{C}^{16}\text{O}$

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		
State: electronic \tilde{X}^2A' ; vibrational zero-point level			
$11_{1,11} \leftarrow 10_{1,10}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	239 025.65(5) ^{a)}	92Rad
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	239 057.04(5)	
$11_{0,11} \leftarrow 10_{1,10}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	242 683.54(5)	
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	242 695.85(5)	
$11_{2,10} \leftarrow 10_{29}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	243 179.67(5)	
$11_{6*} \leftarrow 10_{6*}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	243 311.61(5)	
$11_{5*} \leftarrow 10_{5*}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	243 314.05(5)	
$11_{4*} \leftarrow 10_{4*}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	243 323.64(5)	
$11_{39} \leftarrow 10_{38}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	243 349.63(5)	
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	243 471.36(5)	
$11_{38} \leftarrow 10_{37}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	243 357.26(5)	
	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	243 478.96(5)	
$11_{5*} \leftarrow 10_{5*}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	243 639.85(10) ^{b)}	
		243 640.48(10) ^{b)}	
$11_{6*} \leftarrow 10_{6*}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	243 779.21(10) ^{b)}	
		243 780.31(10) ^{b)}	
$12_{1,12} \leftarrow 11_{1,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	260 719.85(5)	
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	260 749.44(5)	
$12_{0,12} \leftarrow 11_{0,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	264 615.88(5)	
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	264 628.85(5)	
$12_{2,11} \leftarrow 11_{2,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	265 262.60(5)	
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	265 314.45(5)	
$12_{4*} \leftarrow 11_{4*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	265 465.08(5)	
$12_{5*} \leftarrow 11_{5*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	265 465.08(5)	
$12_{6*} \leftarrow 11_{6*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	265 476.23(5)	
$12_{3,10} \leftarrow 11_{39}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	265 489.05(5)	
$12_{7*} \leftarrow 11_{7*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	265 494.12(5) ^{b)}	93Sea
		265 495.06(5) ^{b)}	
$12_{8*} \leftarrow 11_{8*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	265 515.95(5) ^{b)}	
		265 517.20(5) ^{b)}	
$12_{39} \leftarrow 11_{38}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	265 500.86(5)	92Rad
$12_{3,10} \leftarrow 11_{39}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	265 592.30(5)	
$12_{39} \leftarrow 11_{38}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	265 604.18(5)	
$12_{4*} \leftarrow 11_{4*}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	265 643.02(5)	
$12_{5*} \leftarrow 11_{5*}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	265 738.66(5)	
$12_{6*} \leftarrow 11_{6*}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	265 868.52(10) ^{b)}	
		265 869.28(10) ^{b)}	
$12_{2,10} \leftarrow 11_{29}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	266 019.68(5)	
$12_{7*} \leftarrow 11_{7*}$	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	266 027.65(10) ^{b)}	
		266 028.80(10) ^{b)}	

$12_{2,10} \leftarrow 11_{29}$	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	266 067.14(5)
$12_{8*} \leftarrow 11_{8*}$	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	266 214.20(10) ^{b)}
		266 215.62(10) ^{b)}
$12_{9*} \leftarrow 11_{9*}$	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	266 426.88(10) ^{b)}
		266 428.76(10) ^{b)}
$12_{1,11} \leftarrow 11_{1,10}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	269 658.07(5)
	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	269 669.44(5)
$13_{1,13} \leftarrow 12_{1,12}$	$13 \frac{1}{2} \leftarrow 12 \frac{1}{2}$	282 404.69(5)
	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	282 432.41(5)
$13_{3,11} \leftarrow 12_{3,10}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	287 716.28(5)
$13_{3,10} \leftarrow 12_{39}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	287 734.00(5)
$13_{4*} \leftarrow 12_{4*}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	287 755.74(5)
$13_{5*} \leftarrow 12_{5*}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	287 842.14(5)
$13_{6*} \leftarrow 12_{6*}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	287 966.59(5)
$13_{1,12} \leftarrow 12_{1,11}$	$13 \frac{1}{2} \leftarrow 12 \frac{1}{2}$	292 079.36(5)
	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	292 089.26(5)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1 σ).

^{b)} Two (unassigned) hyperfine components were observed for this transition.

Far-infrared data for $^1\text{H}^{16}\text{O}^{12}\text{C}^{16}\text{O}$

Laser			Rotational transition		Ref.
Gas	λ [μm]	ν [GHz]	$N_{K_a K_c}$	spin	
State: electronic \tilde{X}^2A' ; vibrational zero point level					
HCOOH	669.5	447.765 0	$11_{29} \leftarrow 11_{1,10}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	93Sea
CD ₃ I	556.9	538.347	$3_{21} \leftarrow 2_{12}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	
CH ₃ OD	515.1	582.026 4	$8_{36} \leftarrow 9_{27}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	93Sea
			$8_{35} \leftarrow 9_{28}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	
HCOOH	513.0	584.386 9	$8_{35} \leftarrow 9_{28}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	
			$5_{23} \leftarrow 4_{14}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	
HCOOD	461.3	649.941 0	$5_{23} \leftarrow 4_{14}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	93Sea
CD ₃ I	444.4	674.621	$10_{29} \leftarrow 9_{18}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	
CF ₂ CH ₂	407.3	736.060	$11_{29} \leftarrow 10_{1,10}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	93Sea
CH ₃ OD	305.7	980.591 6	$4_{4*} \leftarrow 5_{3*}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	
			$9_{37} \leftarrow 8_{26}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	
N ₂ H ₄	235.6	1 272.681 1	$8_{4*} \leftarrow 7_{3*}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	

Molecular parameters for $^1\text{H}^{16}\text{O}^{12}\text{C}^{16}\text{O}$			
Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A' ; vibrational zero-point level			
A	[GHz] 167.766 20(19) ^{a)}	MW, LMR	93Sea
B	[MHz] 11 433.485(63)		
C	[MHz] 10 686.522(63)		
Δ_K	[MHz] 23.590 4(99)		
Δ_{NK}	[MHz] -0.296 25 (33)		
Δ_N	[kHz] 9.093(54)		
δ_K	[MHz] 0.110(27)		
δ_N	[kHz] 1.229(33)		
Φ_{KN}	[kHz] -0.140 6(47)		
$\epsilon_{aa} + \epsilon_{bb} + \epsilon_{cc}$	[MHz] 1 530.94(81)		
$2\epsilon_{aa} - \epsilon_{bb} - \epsilon_{cc}$	[MHz] 3 115.4(16)		
$\epsilon_{bb} - \epsilon_{cc}$	[MHz] 36.99(50)		
Δ_K^s	[MHz] -0.540 2(21)		
$a_c(^1\text{H})$	[MHz] 6.8(21)		
$2(aa)_\text{H} - (bb)_\text{H} - (cc)_\text{H}$	[MHz] -68.5(20)		
g_{aa}^s	-1.997 70 ^{b)}		
g_{bb}^s	-2.001 91 ^{b)}		
g_{cc}^s	-2.003 59 ^{b)}		
Δ_c	[uÅ ²] 0.077 19		

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to this value in the least-squares fit.

Microwave data for $^2\text{H}^{16}\text{O}^{12}\text{C}^{16}\text{O}$ (DOCO)

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		

State: electronic \tilde{X}^2A' ; vibrational zero-point level			
$12_{2,11} \leftarrow 11_{2,10}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	247 840.16(5) ^{a)}	94Rad
	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	247 888.33(5)	
$12_{9,} \leftarrow 11_{9,}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	247 924.23(5)	
$12_{8,} \leftarrow 11_{8,}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	247 940.14(5)	
$12_{7,} \leftarrow 11_{7,}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	247 954.38(5)	
$12_{6,} \leftarrow 11_{6,}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	247 968.04(5)	
$12_{5,} \leftarrow 11_{5,}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	247 983.35(5)	
$12_{4,} \leftarrow 11_{4,}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	248 006.12(5)	
$12_{3,10} \leftarrow 11_{39}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	248 046.22(5)	
$12_{39} \leftarrow 11_{38}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	248 057.98(5)	
$12_{3,10} \leftarrow 11_{39}$	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	248 142.44(5)	
$12_{39} \leftarrow 11_{38}$	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	248 154.09(5)	
$12_{4,} \leftarrow 11_{4,}$	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	248 171.28(5)	
$12_{5,} \leftarrow 11_{5,}$	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	248 237.28(5)	
$12_{6,} \leftarrow 11_{6,}$	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	248 332.55(5)	
$12_{7,} \leftarrow 11_{7,}$	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	248 450.40(5)	
$12_{2,10} \leftarrow 11_{29}$	$12 \frac{1}{2} \leftarrow 11 \frac{1}{2}$	248 571.90(5)	
	$11 \frac{1}{2} \leftarrow 10 \frac{1}{2}$	248 616.14(5)	

$12_{1,11} \leftarrow 11_{1,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	251 993.71(5)
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	252 004.63(5)
$13_{1,13} \leftarrow 12_{1,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	263 817.46(5)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	263 843.79(5)
$13_{0,13} \leftarrow 12_{0,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	267 683.08(5)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	267 696.22(5)
$13_{2,12} \leftarrow 12_{2,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	268 466.02(5)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	268 508.48(5)
$13_{7*} \leftarrow 12_{7*}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	268 663.05(5)
$13_{6*} \leftarrow 12_{6*}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	268 664.74(5)
$13_{5*} \leftarrow 12_{5*}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	268 671.60(5)
$13_{4*} \leftarrow 12_{4*}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	268 690.28(5)
$13_{3,11} \leftarrow 12_{3,10}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	268 732.40(5)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	268 815.15(5)
$13_{4*} \leftarrow 12_{4*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	268 831.72(5)
$13_{3,10} \leftarrow 12_{3,9}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	268 832.70(5)
$13_{5*} \leftarrow 12_{5*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	268 888.80(5)
$13_{6*} \leftarrow 12_{6*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	268 974.90(5)
$13_{7*} \leftarrow 12_{7*}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	269 083.95(5)
$13_{2,12} \leftarrow 12_{2,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	269 394.14(5)
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	269 432.15(5)
$14_{0,14} \leftarrow 13_{0,13}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	288 107.22(5)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	288 121.12(5)
$14_{2,13} \leftarrow 13_{2,12}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	289 083.25(5)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	289 121.21(5)
$14_{5*} \leftarrow 13_{5*}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	289 355.25(5)
$14_{4*} \leftarrow 13_{4*}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	289 372.17(5)
$14_{3,12} \leftarrow 13_{3,11}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	289 418.01(5)
$14_{3,11} \leftarrow 13_{3,10}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	289 443.58(5)
$14_{3,12} \leftarrow 13_{3,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	289 490.24(5)
$14_{3,11} \leftarrow 13_{3,10}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	289 515.74(5)
$14_{4*} \leftarrow 13_{4*}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	289 494.94(5)
$14_{5*} \leftarrow 13_{5*}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	289 543.27(5)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Far-infrared data for $^2\text{H}^{16}\text{O}^{12}\text{C}^{16}\text{O}$ (DOCO)

Laser			Rotational transition		Ref.
Gas	λ [μm]	ν [GHz]	$N_{K_a K_c}$	spin	
State: electronic \tilde{X}^2A' ; vibrational zero point level					
CF ₂ CH ₂	662.8	462.301 5	$10_{29} \leftarrow 10_{1,10}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	94Rad
CH ₂ F ₂	657.2	456.139 1	$11_{2,10} \leftarrow 11_{1,11}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	
CH ₂ F ₂	556.9	540.785	$5_{23} \leftarrow 4_{14}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	
N ₂ H ₄	533.7	561.772 2	$6_{23} \leftarrow 5_{15}$	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$	

CH ₃ CN	494.6	606.074 8	9 ₂₈ ← 8 ₁₇	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$
CH ₃ OD	418.2	716.947 3	15 _{3,12} ← 15 _{2,13} 14 _{3,11} ← 14 _{2,12}	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$ $F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$
CD ₃ OD	410.7	729.932 8	23 _{3,21} ← 23 _{2,22}	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$
CH ₂ F ₂	382.6	783.486 0	3 ₃ ← 2 ₂	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$
CH ₂ DOH	374.1	801.399 5	9 ₄₆ ← 10 ₃₇ 9 ₄₅ ← 10 ₃₈	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$ $F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$
CD ₃ I	444.4	674.621	10 ₂₉ ← 9 ₁₈	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$
CF ₂ CH ₂	407.3	736.060	11 ₂₉ ← 10 _{1,10}	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$
CH ₃ OD	305.7	980.591 6	4 ₄ ← 5 ₃ 9 ₃₇ ← 8 ₂₆	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$ $F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$
¹³ CH ₃ OH	339.0	884.438 1	5 ₄ ← 6 ₃	$F_1 \leftarrow F_1$ $F_2 \leftarrow F_2$

Molecular parameters for ²H¹⁶O¹²C¹⁶O (DOCO)

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A' ; vibrational zero-point level			
<i>A</i>	[GHz]	154.685 85(21) ^{a)}	MW, LMR
<i>B</i>	[MHz]	10 685.830(20)	94Rad
<i>C</i>	[MHz]	9 981.673(20)	
Δ_K	[MHz]	16.141(13)	
Δ_{NK}	[MHz]	− 0.173 12 (25)	
Δ_N	[kHz]	7.066(33)	
δ_K	[MHz]	0.077 9(72)	
δ_N	[kHz]	0.653(29)	
Φ_{KN}	[kHz]	− 0.066 6(45)	
$\epsilon_{aa} + \epsilon_{bb} + \epsilon_{cc}$	[MHz]	1 414.7(12)	
$2\epsilon_{aa} - \epsilon_{bb} - \epsilon_{cc}$	[MHz]	2 882.3(23)	
$\epsilon_{bb} - \epsilon_{cc}$	[MHz]	31.26(50)	
Δ_K^s	[MHz]	− 0.366(27)	
g_{aa}^s		− 1.997 70 ^{b)}	
g_{bb}^s		− 2.001 91 ^{b)}	
g_{cc}^s		− 2.003 59 ^{b)}	
Δ_c	[uÅ ²]	0.069 27	

^{a)} The numbers in parentheses represent 1 standard deviation of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to this value in the least-squares fit.

References for HOCO

- 92Rad Radford, H.E., Wei, W., Sears, T.J. : J. Chem. Phys. **97** (1992) 3989.
 93Sea Sears, T.J., Radford, H.E., Moore, M.A.: J. Chem. Phys. **98** (1993) 6624.
 94Rad Radford, H.E., Moore, M.A., Sears, T.J., Grubndorf, J., Nolte, J., Temps, F.: J. Mol. Spectrosc. **165** (1994) 137.

3.2.4.2.19 HNCNMicrowave data for $^1\text{H}^{14}\text{N}^{12}\text{C}^{14}\text{N}$

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		
State: electronic \tilde{X}^2A'' ; vibrational zero-point level			
$12_{0,12} \leftarrow 11_{0,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	263 573.622(50) ^{a)}	94Yam
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	263 605.652(50)	
$12_{1,12} \leftarrow 11_{1,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	262 402.183(50)	
$12_{1,11} \leftarrow 11_{1,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	264 858.288(50)	
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	264 764.149(50)	
$12_{2,11} \leftarrow 11_{2,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	263 759.501(50)	
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	263 242.883(50)	
$12_{2,10} \leftarrow 11_{2,9}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	263 773.619(50)	
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	263 257.392(50)	
$12_{3,} \leftarrow 11_{3,}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	263 947.667(50)	
$13_{0,13} \leftarrow 12_{0,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	285 531.004(50)	
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	285 563.045(50)	
$13_{1,13} \leftarrow 12_{1,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	284 248.637(50)	
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	284 143.774(50)	
$13_{1,12} \leftarrow 12_{1,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	286 910.733(50)	
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	286 837.563(50)	
$13_{2,12} \leftarrow 12_{2,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	285 241.084(50)	
$13_{2,11} \leftarrow 12_{2,10}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	285 696.583(50)	
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	285 259.505(50)	
$13_{3,} \leftarrow 12_{3,}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	285 822.841(50)	
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	284 854.674(50)	
$16_{0,16} \leftarrow 15_{0,15}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	351 390.602(50)	
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	351 422.234(50)	
$16_{1,16} \leftarrow 15_{1,15}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	349 788.291(50)	
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	349 724.646(50)	
$16_{2,14} \leftarrow 15_{2,13}$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	351 215.220(50)	
$16_{3,} \leftarrow 15_{3,}$	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	350 866.265(50)	
$17_{0,17} \leftarrow 16_{0,16}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	373 339.058(50)	
	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	373 370.600(50)	
$17_{1,17} \leftarrow 16_{1,16}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	371 633.371(50)	
$17_{1,16} \leftarrow 16_{1,15}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	375 118.228(50)	
	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	375 095.139(50)	
$17_{2,16} \leftarrow 16_{2,15}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	373 147.627(50)	
	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	372 847.758(50)	
$18_{0,18} \leftarrow 17_{0,17}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	395 284.891(50)	
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	395 316.252(50)	
$18_{1,18} \leftarrow 17_{1,17}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	393 477.069(50)	
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	393 430.174(50)	
$18_{1,17} \leftarrow 17_{1,16}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	397 167.581(50)	

$18_{2,17} \leftarrow 17_{2,16}$	$17 \frac{1}{2} \leftarrow 16 \frac{1}{2}$	395 109.462(50)
$18_{2,16} \leftarrow 17_{2,15}$	$18 \frac{1}{2} \leftarrow 17 \frac{1}{2}$	395 373.288(50)
	$17 \frac{1}{2} \leftarrow 16 \frac{1}{2}$	395 158.342(50)
$18_{3,} \leftarrow 17_{3,}$	$17 \frac{1}{2} \leftarrow 16 \frac{1}{2}$	394 821.346(50)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Molecular parameters for $^1\text{H}^{14}\text{N}^{12}\text{C}^{14}\text{N}$

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A'' ; vibrational zero-point level			
A	[GHz] 634.9(31) ^{a)}	MW	94Yam
B	[MHz] 11 087.813 4(98)		
C	[MHz] 10 881.713 5(101)		
D_K	[MHz] 375 ^{b)}	Opt	93Wu
D_{NK}	[MHz] 0.819 1 (23)	MW	94Yam
D_N	[kHz] 4.340 1(60)		
d_1	[kHz] -0.078 0(88)		
d_2	[kHz] -0.025 9(64)		
H_{KN}	[kHz] -0.86(21)		
ϵ_{aa}	[MHz] -15 366.5(77)		
ϵ_{bb}	[MHz] -64.99(49)		
ϵ_{cc}	[MHz] -0.51(52)		
$\frac{1}{2}(\epsilon_{ab} + \epsilon_{ba})$	[MHz] 82.7(182)		
D_K^s	[MHz] 42.55(69)		
D_{NK}^s	[MHz] 0.064(35)		
d_1^s	[kHz] 0.37(37)		
μ	[D] 2.873	Theory	94Tao

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to this value from the electronic spectrum [93Wu] in the least-squares fit.

References for HNCN

- 93Wu Wu, M., Hall, G., Sears, T.J. : J. Chem. Soc. Faraday Trans. **89** (1993) 615.
 94Tao Tao, F.-M., Klemperer, W., McCarthy, M., Gottlieb, C.A., Thaddeus, P.: J. Chem. Phys. **100** (1994) 3 691.
 94Yam Yamamoto, S., Saito, S. : J. Chem. Phys. **101** (1994) 10 350.

3.2.4.2.20 MgNH₂Microwave data for ²⁴Mg ¹⁴N ¹H₂

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		
State: electronic \tilde{X}^2A_1 ; vibrational zero-point level			
$5_{15} \leftarrow 4_{14}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	129 529.697(40) ^{a)}	00She
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	129 568.688(40)	
$5_{14} \leftarrow 4_{13}$	$4\frac{1}{2} \leftarrow 3\frac{1}{2}$	131 906.673(40)	
	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	131 946.543(40)	
$6_{16} \leftarrow 5_{15}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	155 432.918(40)	
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	155 471.705(40)	
$6_{15} \leftarrow 5_{14}$	$5\frac{1}{2} \leftarrow 4\frac{1}{2}$	158 284.859(40)	
	$6\frac{1}{2} \leftarrow 5\frac{1}{2}$	158 324.558(40)	
$9_{19} \leftarrow 8_{18}$	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	233 117.964(40)	
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	233 156.535(40)	
$9_{28} \leftarrow 8_{27}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	235 199.672(40)	
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	235 214.423(40)	
$9_{27} \leftarrow 8_{26}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	235 254.050(40)	
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	235 247.037(40)	
$9_{09} \leftarrow 8_{08}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	235 285.788(40)	
	$8\frac{1}{2} \leftarrow 7\frac{1}{2}$	237 393.209(40)	
$9_{19} \leftarrow 8_{18}$	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	237 432.665(40)	
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	259 002.845(40)	
$10_{1,10} \leftarrow 9_{19}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	259 041.445(40)	
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	261 272.533(40)	
$10_{29} \leftarrow 9_{28}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	261 312.022(40)	
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	261 347.326(40)	
$10_{28} \leftarrow 9_{27}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	261 386.849(40)	
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	261 356.691(40)	
$10_{0,10} \leftarrow 9_{09}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	261 395.576(40)	
	$9\frac{1}{2} \leftarrow 8\frac{1}{2}$	263 751.622(40)	
$10_{19} \leftarrow 9_{18}$	$10\frac{1}{2} \leftarrow 9\frac{1}{2}$	263 791.167(40)	
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	310 753.521(40)	
$12_{1,12} \leftarrow 11_{1,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	310 792.130(40)	
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	313 479.463(40)	
$12_{2,11} \leftarrow 11_{2,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	313 518.722(40)	
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	313 545.675(40)	
$12_{0,12} \leftarrow 11_{0,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	313 584.492(40)	
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	313 608.988(40)	
$12_{2,10} \leftarrow 11_{2,9}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	313 648.368(40)	
	$11\frac{1}{2} \leftarrow 10\frac{1}{2}$	316 448.287(40)	
$12_{1,11} \leftarrow 11_{1,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	316 487.734(40)	
	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	336 618.274(40)	
$13_{1,13} \leftarrow 12_{1,12}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	336 618.274(40)	
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	336 656.836(40)	

$13_{2,12} \leftarrow 12_{2,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	339 572.649(40)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	339 611.841(40)
$13_{0,13} \leftarrow 12_{0,12}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	339 623.100(40)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	339 661.899(40)
$13_{2,11} \leftarrow 12_{2,10}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	339 737.470(40)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	339 776.741(40)
$13_{1,12} \leftarrow 12_{1,11}$	$12\frac{1}{2} \leftarrow 11\frac{1}{2}$	342 785.091(40)
	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	342 824.527(40)
$14_{1,14} \leftarrow 13_{1,13}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	362 475.169(40)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	362 513.656(40)
$14_{2,13} \leftarrow 13_{2,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	365 658.156(40)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	365 697.346(40)
$14_{0,14} \leftarrow 13_{0,13}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	365 687.742(40)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	365 726.581(40)
$14_{2,12} \leftarrow 13_{2,11}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	365 864.039(40)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	365 903.280(40)
$14_{1,13} \leftarrow 13_{1,12}$	$13\frac{1}{2} \leftarrow 12\frac{1}{2}$	369 113.383(40)
	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	369 152.807(40)
$15_{1,15} \leftarrow 14_{1,14}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	388 323.508(40)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	388 361.975(40)
$15_{2,14} \leftarrow 14_{2,13}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	391 735.441(40)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	391 774.575(40)
$15_{0,15} \leftarrow 14_{0,14}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	391 738.824(40)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	391 777.601(40)
$15_{2,13} \leftarrow 14_{2,12}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	391 988.697(40)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	392 027.889(40)
$15_{1,14} \leftarrow 14_{1,13}$	$14\frac{1}{2} \leftarrow 13\frac{1}{2}$	395 432.510(40)
	$15\frac{1}{2} \leftarrow 14\frac{1}{2}$	395 471.847(40)
$17_{1,17} \leftarrow 16_{1,16}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	439 992.323(40)
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	440 030.728(40)
$17_{0,17} \leftarrow 16_{0,16}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	443 796.197(40)
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	443 834.896(40)
$17_{2,16} \leftarrow 16_{2,15}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	443 863.067(40)
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	443 902.148(40)
$17_{2,15} \leftarrow 16_{2,14}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	444 231.476(40)
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	444 270.608(40)
$17_{1,16} \leftarrow 16_{1,15}$	$16\frac{1}{2} \leftarrow 15\frac{1}{2}$	448 040.351(40)
	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	448 079.702(40)
$18_{1,18} \leftarrow 17_{1,17}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	465 811.623(40)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	465 849.949(40)
$18_{0,18} \leftarrow 17_{0,17}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	469 800.629(40)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	469 839.285(40)
$18_{2,17} \leftarrow 17_{2,16}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	469 912.317(40)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	469 951.199(40)
$18_{2,16} \leftarrow 17_{2,15}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	470 349.284(40)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	470 388.269(40)

$18_{1,17} \leftarrow 17_{1,16}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	474 327.816(40)
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	474 367.134(40)
$19_{1,19} \leftarrow 18_{1,18}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	491 620.034(40)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	491 658.388(40)
$19_{0,19} \leftarrow 18_{0,18}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	495 787.733(40)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	495 826.273(40)
$19_{2,18} \leftarrow 18_{2,17}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	495 950.841(40)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	495 989.785(40)
$19_{2,17} \leftarrow 18_{2,16}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	496 464.383(40)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	496 505.481(40)
$19_{1,18} \leftarrow 18_{1,17}$	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	500 603.453(40)
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	500 642.704(40)
$20_{1,20} \leftarrow 19_{1,19}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	517 417.008(40)
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	517 455.315(40)
$20_{0,20} \leftarrow 19_{0,19}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	521 756.320(40)
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	521 794.944(40)
$20_{2,19} \leftarrow 19_{2,18}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	521 978.335(40)
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	522 017.138(40)
$20_{2,18} \leftarrow 19_{2,17}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	522 576.656(40)
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	522 615.781(40)
$20_{1,19} \leftarrow 19_{1,18}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	526 866.469(40)
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	526 905.752(40)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Molecular parameters for $^{24}\text{Mg}^{14}\text{N}^1\text{H}$,

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A_1 ; vibrational zero-point level			
A	[MHz] 378 525(42) ^{a)}	MW	00She
B	[MHz] 13 314.771 8(47)		
C	[MHz] 12 839.116 6(46)		
D_K	[MHz] 0.0 ^{b)}		
D_{NK}	[MHz] 1.868 05(29)		
D_N	[kHz] 21.574 9(28)		
d_1	[kHz] -0.881 1(37)		
d_2	[kHz] -0.207 6(17)		
H_{KN}	[kHz] -1.184(11)		
H_{NK}	[Hz] 0.288 6(32)		
L_{KN}	[Hz] -0.899 2(30)		
L_{NKK}	[Hz] 3.60(14)×10 ⁻³		
\mathcal{E}_{aa}	[MHz] 24.49(33)		
\mathcal{E}_{bb}	[MHz] 39.743(90)		
\mathcal{E}_{cc}	[MHz] 37.923(88)		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to this value in the least-squares fit.

Reference for MgNH₂

00She Sheridan, P.M., Ziurys, L.M. : *Astrophys. J. Letts.* **540** (2000) L61.

3.2.4.2.21 CaNH_2 Microwave data for $^{40}\text{Ca}^{14}\text{N}^1\text{H}_2$

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		
State: electronic \tilde{X}^2A_1 ; vibrational zero-point level			
$18_{1,17} \leftarrow 17_{1,16}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	312 931.373(40) ^{a)}	00Bre
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	321 965.764(40)	
$20_{2,19} \leftarrow 19_{2,18}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	355 168.456(40)	
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	355 204.948(40)	
$20_{2,18} \leftarrow 19_{2,17}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	355 294.287(40)	
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	355 330.468(40)	
$20_{0,20} \leftarrow 19_{0,19}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	355 352.916(40)	
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	355 389.880(40)	
$20_{1,19} \leftarrow 19_{1,18}$	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	357 632.140(40)	
	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	357 666.491(40)	
$21_{7,14} \leftarrow 20_{7,13}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	368 186.676(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	368 221.873(40)	
$21_{7,15} \leftarrow 20_{7,14}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	368 186.676(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	368 221.873(40)	
$21_{1,21} \leftarrow 20_{1,20}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	370 744.985(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	370 783.919(40)	
$21_{5,16} \leftarrow 20_{5,15}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	371 072.119(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	371 108.092(40)	
$21_{5,17} \leftarrow 20_{5,16}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	371 072.119(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	371 108.092(40)	
$21_{4,17} \leftarrow 20_{4,16}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	371 915.973(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	371 952.086(40)	
$21_{4,18} \leftarrow 20_{4,17}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	371 915.973(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	371 952.086(40)	
$21_{3,18} \leftarrow 20_{3,17}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	372 524.948(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	372 561.185(40)	
$21_{3,19} \leftarrow 20_{3,18}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	372 525.171(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	372 561.396(40)	
$21_{2,20} \leftarrow 20_{2,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	372 890.530(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	372 927.106(40)	
$21_{2,19} \leftarrow 20_{2,18}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	373 036.125(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	373 072.173(40)	
$21_{0,21} \leftarrow 20_{0,20}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	373 071.649(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	373 108.547(40)	
$21_{1,19} \leftarrow 20_{1,18}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	375 474.163(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	375 508.558(40)	
$22_{1,22} \leftarrow 21_{1,21}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	388 358.671(40)	
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	388 397.624(40)	
$22_{2,21} \leftarrow 21_{2,20}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	390 607.203(40)	

	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	390 643.760(40)
$22_{2,20} \leftarrow 21_{2,19}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	390 774.538(40)
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	390 810.600(40)
$22_{0,22} \leftarrow 21_{0,21}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	390 782.842(40)
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	390 819.831(40)
$24_{1,24} \leftarrow 23_{1,23}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	423 568.487(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	423 607.455(40)
$24_{5,19} \leftarrow 23_{5,18}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	423 967.803(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	424 003.796(40)
$24_{5,20} \leftarrow 23_{5,19}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	423 967.803(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	424 003.796(40)
$24_{4,20} \leftarrow 23_{4,19}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	424 927.080(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	424 963.201(40)
$24_{4,21} \leftarrow 23_{4,20}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	424 927.080(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	424 963.201(40)
$24_{3,22} \leftarrow 23_{3,21}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	425 621.273(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	425 657.665(40)
$24_{3,21} \leftarrow 23_{3,20}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	425 622.957(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	425 659.217(40)
$24_{2,23} \leftarrow 23_{2,22}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	426 023.097(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	426 059.693(40)
$24_{0,24} \leftarrow 23_{0,23}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	426 182.100(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	426 219.306(40)
$24_{2,22} \leftarrow 23_{2,21}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	426 240.169(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	426 276.136(40)
$24_{1,23} \leftarrow 23_{1,22}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	428 963.680(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	428 998.121(40)
$25_{1,25} \leftarrow 24_{1,24}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	441 164.010(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	441 202.987(40)
$25_{5,20} \leftarrow 24_{5,19}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	441 589.544(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	441 625.547(40)
$25_{5,21} \leftarrow 24_{5,20}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	441 589.544(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	441 625.547(40)
$25_{4,21} \leftarrow 24_{4,20}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	442 586.802(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	442 622.964(40)
$25_{4,22} \leftarrow 24_{4,21}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	442 586.802(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	442 622.964(40)
$25_{3,23} \leftarrow 24_{3,22}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	443 309.452(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	443 345.832(40)
$25_{3,22} \leftarrow 24_{3,21}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	443 311.487(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	443 347.803(40)
$25_{2,24} \leftarrow 24_{2,23}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	443 721.911(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	443 758.401(40)
$25_{0,25} \leftarrow 24_{0,24}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	443 869.484(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	443 906.688(40)
$25_{2,23} \leftarrow 24_{2,22}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	443 966.981(40)

	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	444 002.957(40)
$25_{1,24} \leftarrow 24_{1,23}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	446 780.397(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	446 814.818(40)
$26_{7,20} \leftarrow 25_{7,19}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	455 695.628(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	455 730.989(40)
$26_{7,19} \leftarrow 25_{7,18}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	455 695.628(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	455 730.989(40)
$26_{1,26} \leftarrow 25_{1,25}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	458 752.962(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	458 791.946(40)
$26_{5,21} \leftarrow 25_{5,20}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	459 205.801(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	459 241.790(40)
$26_{5,22} \leftarrow 25_{5,21}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	459 205.801(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	459 241.790(40)
$26_{4,22} \leftarrow 25_{4,21}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	460 240.882(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	460 277.071(40)
$26_{4,23} \leftarrow 25_{4,22}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	460 240.882(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	460 277.071(40)
$26_{3,24} \leftarrow 25_{3,23}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	460 992.029(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	461 028.325(40)
$26_{3,23} \leftarrow 25_{3,22}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	460 994.311(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	461 030.593(40)
$26_{2,25} \leftarrow 25_{2,24}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	461 414.139(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	461 450.618(40)
$26_{0,26} \leftarrow 25_{0,25}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	461 548.199(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	461 585.443(40)
$26_{2,24} \leftarrow 25_{2,23}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	461 689.675(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	461 725.609(40)
$26_{1,27} \leftarrow 25_{1,26}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	464 590.004(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	464 624.545(40)
$27_{7,20} \leftarrow 26_{7,19}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	473 185.559(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	473 220.907(40)
$27_{7,21} \leftarrow 26_{7,20}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	473 185.559(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	473 220.907(40)
$27_{1,27} \leftarrow 26_{1,26}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	476 335.062(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	476 374.066(40)
$27_{5,22} \leftarrow 26_{5,21}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	476 816.349(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	476 852.341(40)
$27_{5,23} \leftarrow 26_{5,22}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	476 816.349(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	476 852.341(40)
$27_{4,24} \leftarrow 26_{4,23}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	477 889.080(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	477 925.248(40)
$27_{4,23} \leftarrow 26_{4,22}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	477 889.080(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	477 925.248(40)
$27_{3,25} \leftarrow 26_{3,24}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	478 668.498(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	478 704.824(40)
$27_{3,24} \leftarrow 26_{3,23}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	478 671.216(40)

	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	478 707.490(40)
$27_{2,26} \leftarrow 26_{2,25}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	479 099.568(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	479 136.188(40)
$27_{1,27} \leftarrow 26_{1,26}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	479 217.916(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	479 255.216(40)
$27_{2,25} \leftarrow 26_{2,24}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	479 407.968(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	479 443.884(40)
$27_{1,26} \leftarrow 26_{1,25}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	482 392.327(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	482 426.787(40)
$28_{7,21} \leftarrow 27_{7,20}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	490 671.053(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	490 706.401(40)
$28_{7,22} \leftarrow 27_{7,21}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	490 671.053(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	490 706.401(40)
$28_{1,28} \leftarrow 27_{1,27}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	493 910.017(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	493 949.044(40)
$28_{5,23} \leftarrow 27_{5,22}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	494 421.031(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	494 457.036(40)
$28_{5,24} \leftarrow 27_{5,23}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	494 421.031(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	494 457.036(40)
$28_{4,24} \leftarrow 27_{4,23}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	495 531.136(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	495 567.299(40)
$28_{4,25} \leftarrow 27_{4,24}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	495 531.136(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	495 567.299(40)
$28_{3,26} \leftarrow 27_{3,25}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	496 338.803(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	496 375.061(40)
$28_{3,25} \leftarrow 27_{3,24}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	496 342.014(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	496 378.290(40)
$28_{2,27} \leftarrow 27_{2,26}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	496 778.103(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	496 814.694(40)
$28_{0,28} \leftarrow 27_{0,27}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	496 878.375(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	496 915.736(40)
$28_{2,26} \leftarrow 27_{2,25}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	497 121.575(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	497 157.562(40)
$28_{1,27} \leftarrow 27_{1,26}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	500 186.995(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	500 221.507(40)
$29_{7,22} \leftarrow 28_{7,21}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	508 151.991(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	508 187.350(40)
$29_{7,23} \leftarrow 28_{7,22}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	508 151.991(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	508 187.350(40)
$29_{1,29} \leftarrow 28_{1,28}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	511 477.609(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	511 516.667(40)
$29_{5,25} \leftarrow 28_{5,24}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	512 019.522(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	512 055.542(40)
$29_{5,24} \leftarrow 28_{5,23}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	512 019.522(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	512 055.542(40)
$29_{4,26} \leftarrow 28_{4,25}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	513 166.838(40)

	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	513 202.988(40)
$29_{4,25} \leftarrow 28_{4,24}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	513 166.838(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	513 202.988(40)
$29_{3,27} \leftarrow 28_{3,26}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	514 002.548(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	514 038.850(40)
$29_{3,26} \leftarrow 28_{3,25}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	514 006.468(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	514 042.746(40)
$29_{2,28} \leftarrow 28_{2,27}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	514 449.336(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	514 485.893(40)
$29_{0,29} \leftarrow 28_{0,28}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	514 529.082(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	514 566.467(40)
$29_{2,27} \leftarrow 28_{2,26}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	514 830.730(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	514 866.537(40)
$29_{1,28} \leftarrow 28_{1,27}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	517 973.798(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	518 008.287(40)
$30_{1,30} \leftarrow 29_{1,29}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	529 037.563(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	529 076.632(40)
$30_{5,25} \leftarrow 29_{5,24}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	529 611.725(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	529 647.703(40)
$30_{5,26} \leftarrow 29_{5,25}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	529 611.725(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	529 647.703(40)
$30_{3,28} \leftarrow 29_{3,27}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	531 659.643(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	531 695.995(40)
$30_{3,27} \leftarrow 29_{3,26}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	531 664.276(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	531 700.563(40)
$30_{0,30} \leftarrow 29_{0,29}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	532 169.870(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	532 207.312(40)
$30_{1,29} \leftarrow 29_{1,28}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	535 752.388(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	535 786.948(40)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Microwave data for $^{40}\text{Ca}^{14}\text{N}^1\text{H}_2$

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		

State: electronic \tilde{X}^2A_1 ; vibrational $v_3 = 1$ level

$21_{1,20} \leftarrow 20_{1,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	380 771.921(40) ^{a)}	00Bre
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	380 805.499(40)	
$21_{1,21} \leftarrow 20_{1,20}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	374 484.473(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	374 521.746(40)	
$24_{3,21} \leftarrow 23_{3,20}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	430 781.401(40)	
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	430 816.632(40)	
$24_{3,22} \leftarrow 23_{3,21}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	430 776.420(40)	
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	430 811.688(40)	
$24_{1,24} \leftarrow 23_{1,23}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	427 835.328(40)	
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	427 872.632(40)	

$25_{3,22} \leftarrow 24_{3,21}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	448 690.175(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	448 725.468(40)
$25_{3,23} \leftarrow 24_{3,22}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	448 684.050(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	448 719.320(40)
$25_{1,25} \leftarrow 24_{1,24}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	445 606.014(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	445 643.331(40)
$25_{1,24} \leftarrow 24_{1,23}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	453 070.855(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	453 104.582(40)
$26_{2,25} \leftarrow 25_{2,24}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	466 970.799(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	467 006.227(40)
$26_{0,26} \leftarrow 25_{0,25}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	466 936.483(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	466 972.752(40)
$26_{3,23} \leftarrow 25_{3,22}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	466 593.730(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	466 628.987(40)
$26_{3,24} \leftarrow 25_{3,23}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	466 586.367(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	466 621.584(40)
$26_{1,25} \leftarrow 25_{1,24}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	471 126.937(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	471 160.726(40)
$26_{1,26} \leftarrow 25_{1,25}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	463 369.744(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	463 407.112(40)
$26_{2,24} \leftarrow 25_{2,23}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	467 553.460(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	467 588.018(40)
$27_{3,24} \leftarrow 26_{3,23}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	484 491.823(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	484 527.117(40)
$27_{3,25} \leftarrow 26_{3,24}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	484 482.851(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	484 518.093(40)
$27_{1,26} \leftarrow 26_{1,25}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	489 174.893(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	489 208.633(40)
$27_{1,27} \leftarrow 26_{1,26}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	481 126.192(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	481 163.618(40)
$27_{0,27} \leftarrow 26_{0,26}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	484 792.274(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	484 828.509(40)
$28_{3,25} \leftarrow 27_{3,24}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	502 384.160(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	502 419.467(40)
$28_{3,26} \leftarrow 27_{3,25}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	502 373.395(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	502 408.661(40)
$28_{1,28} \leftarrow 27_{1,27}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	498 875.253(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	498 912.635(40)
$28_{1,27} \leftarrow 27_{1,26}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	507 214.122(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	507 247.826(40)
$29_{3,26} \leftarrow 28_{3,25}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	520 270.591(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	520 305.848(40)
$29_{3,27} \leftarrow 28_{3,26}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	520 257.680(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	520 292.973(40)
$29_{1,29} \leftarrow 28_{1,28}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	516 616.589(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	516 653.980(40)

$29_{1,28} \leftarrow 28_{1,27}$	$28_{\frac{1}{2}} \leftarrow 27_{\frac{1}{2}}$	525 244.398(40)
	$29_{\frac{1}{2}} \leftarrow 28_{\frac{1}{2}}$	525 278.185(40)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Microwave data for $^{40}\text{Ca}^{14}\text{N}^1\text{H}_2$

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		

State: electronic \tilde{X}^2A_1 ; vibrational $v_4 = 1$ level

$21_{0,21} \leftarrow 20_{0,20}$	$20_{\frac{1}{2}} \leftarrow 19_{\frac{1}{2}}$	372 552.055(40) ^{a)}	00Bre
	$21_{\frac{1}{2}} \leftarrow 20_{\frac{1}{2}}$	372 589.216(40)	
$21_{2,20} \leftarrow 20_{2,19}$	$20_{\frac{1}{2}} \leftarrow 19_{\frac{1}{2}}$	372 377.132(40)	
	$21_{\frac{1}{2}} \leftarrow 20_{\frac{1}{2}}$	372 413.884(40)	
$21_{4,17} \leftarrow 20_{4,16}$	$20_{\frac{1}{2}} \leftarrow 19_{\frac{1}{2}}$	371 860.405(40)	
	$21_{\frac{1}{2}} \leftarrow 20_{\frac{1}{2}}$	371 897.046(40)	
$21_{4,18} \leftarrow 20_{4,17}$	$20_{\frac{1}{2}} \leftarrow 19_{\frac{1}{2}}$	371 860.405(40)	
	$21_{\frac{1}{2}} \leftarrow 20_{\frac{1}{2}}$	371 897.046(40)	
$24_{0,24} \leftarrow 23_{0,23}$	$23_{\frac{1}{2}} \leftarrow 22_{\frac{1}{2}}$	425 604.249(40)	
	$24_{\frac{1}{2}} \leftarrow 23_{\frac{1}{2}}$	425 641.519(40)	
$24_{1,23} \leftarrow 23_{1,22}$	$23_{\frac{1}{2}} \leftarrow 22_{\frac{1}{2}}$	428 007.746(40)	
	$24_{\frac{1}{2}} \leftarrow 23_{\frac{1}{2}}$	428 042.632(40)	
$24_{1,24} \leftarrow 23_{1,23}$	$23_{\frac{1}{2}} \leftarrow 22_{\frac{1}{2}}$	423 299.049(40)	
	$24_{\frac{1}{2}} \leftarrow 23_{\frac{1}{2}}$	423 338.169(40)	
$24_{2,23} \leftarrow 23_{2,22}$	$23_{\frac{1}{2}} \leftarrow 22_{\frac{1}{2}}$	425 441.575(40)	
	$24_{\frac{1}{2}} \leftarrow 23_{\frac{1}{2}}$	425 478.301(40)	
$24_{2,22} \leftarrow 23_{2,21}$	$23_{\frac{1}{2}} \leftarrow 22_{\frac{1}{2}}$	425 596.643(40)	
	$24_{\frac{1}{2}} \leftarrow 23_{\frac{1}{2}}$	425 632.951(40)	
$24_{4,20} \leftarrow 23_{4,19}$	$23_{\frac{1}{2}} \leftarrow 22_{\frac{1}{2}}$	424 849.606(40)	
	$24_{\frac{1}{2}} \leftarrow 23_{\frac{1}{2}}$	424 886.182(40)	
$24_{4,21} \leftarrow 23_{4,20}$	$23_{\frac{1}{2}} \leftarrow 22_{\frac{1}{2}}$	424 849.606(40)	
	$24_{\frac{1}{2}} \leftarrow 23_{\frac{1}{2}}$	424 886.182(40)	
$25_{1,24} \leftarrow 24_{1,23}$	$24_{\frac{1}{2}} \leftarrow 23_{\frac{1}{2}}$	445 786.617(40)	
	$25_{\frac{1}{2}} \leftarrow 24_{\frac{1}{2}}$	445 821.295(40)	
$25_{2,23} \leftarrow 24_{2,22}$	$24_{\frac{1}{2}} \leftarrow 23_{\frac{1}{2}}$	443 293.293(40)	
	$25_{\frac{1}{2}} \leftarrow 24_{\frac{1}{2}}$	443 329.429(40)	
$25_{4,21} \leftarrow 24_{4,20}$	$24_{\frac{1}{2}} \leftarrow 23_{\frac{1}{2}}$	442 500.970(40)	
	$25_{\frac{1}{2}} \leftarrow 24_{\frac{1}{2}}$	442 537.569(40)	
$25_{4,22} \leftarrow 24_{4,21}$	$24_{\frac{1}{2}} \leftarrow 23_{\frac{1}{2}}$	442 500.970(40)	
	$25_{\frac{1}{2}} \leftarrow 24_{\frac{1}{2}}$	442 537.569(40)	
$26_{0,26} \leftarrow 25_{0,25}$	$25_{\frac{1}{2}} \leftarrow 24_{\frac{1}{2}}$	460 934.748(40)	
	$26_{\frac{1}{2}} \leftarrow 25_{\frac{1}{2}}$	460 972.133(40)	
$26_{1,26} \leftarrow 25_{1,25}$	$25_{\frac{1}{2}} \leftarrow 24_{\frac{1}{2}}$	458 463.296(40)	
	$26_{\frac{1}{2}} \leftarrow 25_{\frac{1}{2}}$	458 502.354(40)	
$26_{1,25} \leftarrow 25_{1,24}$	$25_{\frac{1}{2}} \leftarrow 24_{\frac{1}{2}}$	463 558.308(40)	
	$26_{\frac{1}{2}} \leftarrow 25_{\frac{1}{2}}$	463 593.106(40)	

$26_{2,25} \leftarrow 25_{2,24}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	460 788.550(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	460 825.203(40)
$26_{2,24} \leftarrow 25_{2,23}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	460 985.217(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	461 021.468(40)
$26_{4,22} \leftarrow 25_{4,21}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	460 146.168(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	460 182.633(40)
$26_{4,23} \leftarrow 25_{4,22}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	460 146.168(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	460 182.633(40)
$27_{0,27} \leftarrow 26_{0,26}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	478 587.755(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	478 625.150(40)
$27_{1,26} \leftarrow 26_{1,25}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	481 323.092(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	481 357.835(40)
$27_{2,26} \leftarrow 26_{2,25}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	478 452.406(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	478 489.134(40)
$27_{2,25} \leftarrow 26_{2,24}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	478 672.707(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	478 708.797(40)
$27_{4,23} \leftarrow 26_{4,22}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	477 784.752(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	477 821.284(40)
$27_{4,24} \leftarrow 26_{4,23}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	477 784.752(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	477 821.284(40)
$28_{0,28} \leftarrow 27_{0,27}$	$27\frac{1}{2} \leftarrow 25\frac{1}{2}$	496 232.308(40)
	$28\frac{1}{2} \leftarrow 26\frac{1}{2}$	496 292.644(40)
$28_{1,27} \leftarrow 27_{1,26}$	$27\frac{1}{2} \leftarrow 25\frac{1}{2}$	499 080.370(40)
	$28\frac{1}{2} \leftarrow 26\frac{1}{2}$	499 115.279(40)
$28_{1,28} \leftarrow 27_{1,27}$	$27\frac{1}{2} \leftarrow 25\frac{1}{2}$	493 600.479(40)
	$28\frac{1}{2} \leftarrow 26\frac{1}{2}$	493 639.608(40)
$28_{2,27} \leftarrow 27_{2,26}$	$27\frac{1}{2} \leftarrow 25\frac{1}{2}$	496 109.688(40)
	$28\frac{1}{2} \leftarrow 26\frac{1}{2}$	496 146.428(40)
$28_{2,26} \leftarrow 27_{2,25}$	$27\frac{1}{2} \leftarrow 25\frac{1}{2}$	496 354.948(40)
	$28\frac{1}{2} \leftarrow 26\frac{1}{2}$	496 390.988(40)
$28_{4,24} \leftarrow 27_{4,23}$	$27\frac{1}{2} \leftarrow 25\frac{1}{2}$	495 416.685(40)
	$28\frac{1}{2} \leftarrow 26\frac{1}{2}$	495 453.226(40)
$28_{4,25} \leftarrow 27_{4,24}$	$27\frac{1}{2} \leftarrow 25\frac{1}{2}$	495 416.685(40)
	$28\frac{1}{2} \leftarrow 26\frac{1}{2}$	495 453.226(40)
$29_{0,29} \leftarrow 28_{0,28}$	$28\frac{1}{2} \leftarrow 25\frac{1}{2}$	513 867.871(40)
	$29\frac{1}{2} \leftarrow 26\frac{1}{2}$	513 905.422(40)
$29_{1,29} \leftarrow 28_{1,28}$	$28\frac{1}{2} \leftarrow 25\frac{1}{2}$	511 158.364(40)
	$29\frac{1}{2} \leftarrow 26\frac{1}{2}$	511 197.559(40)
$29_{1,28} \leftarrow 28_{1,27}$	$28\frac{1}{2} \leftarrow 25\frac{1}{2}$	516 829.988(40)
	$29\frac{1}{2} \leftarrow 26\frac{1}{2}$	516 864.876(40)
$29_{2,28} \leftarrow 28_{2,27}$	$28\frac{1}{2} \leftarrow 25\frac{1}{2}$	513 760.142(40)
	$29\frac{1}{2} \leftarrow 26\frac{1}{2}$	513 796.856(40)
$29_{2,27} \leftarrow 28_{2,26}$	$28\frac{1}{2} \leftarrow 25\frac{1}{2}$	514 032.122(40)
	$29\frac{1}{2} \leftarrow 26\frac{1}{2}$	514 068.236(40)
$29_{4,25} \leftarrow 28_{4,24}$	$28\frac{1}{2} \leftarrow 25\frac{1}{2}$	513 041.696(40)
	$29\frac{1}{2} \leftarrow 26\frac{1}{2}$	513 078.259(40)

$29_{4,26} \leftarrow 28_{4,25}$	$28\frac{1}{2} \leftarrow 25\frac{1}{2}$	513 041.696(40)
	$29\frac{1}{2} \leftarrow 26\frac{1}{2}$	513 078.259(40)
$30_{0,30} \leftarrow 29_{0,29}$	$29\frac{1}{2} \leftarrow 25\frac{1}{2}$	531 494.257(40)
	$30\frac{1}{2} \leftarrow 26\frac{1}{2}$	531 531.806(40)
$30_{1,30} \leftarrow 29_{1,29}$	$29\frac{1}{2} \leftarrow 25\frac{1}{2}$	528 708.775(40)
	$30\frac{1}{2} \leftarrow 26\frac{1}{2}$	528 747.973(40)
$30_{1,29} \leftarrow 29_{1,28}$	$29\frac{1}{2} \leftarrow 25\frac{1}{2}$	534 571.750(40)
	$30\frac{1}{2} \leftarrow 26\frac{1}{2}$	534 606.696(40)
$30_{2,29} \leftarrow 29_{2,28}$	$29\frac{1}{2} \leftarrow 25\frac{1}{2}$	531 403.465(40)
	$30\frac{1}{2} \leftarrow 26\frac{1}{2}$	531 440.165(40)
$30_{2,28} \leftarrow 29_{2,27}$	$29\frac{1}{2} \leftarrow 25\frac{1}{2}$	531 704.131(40)
	$30\frac{1}{2} \leftarrow 26\frac{1}{2}$	531 740.213(40)
$30_{4,26} \leftarrow 29_{4,25}$	$29\frac{1}{2} \leftarrow 25\frac{1}{2}$	530 659.461(40)
	$30\frac{1}{2} \leftarrow 26\frac{1}{2}$	530 695.844(40)
$30_{4,27} \leftarrow 29_{4,26}$	$29\frac{1}{2} \leftarrow 25\frac{1}{2}$	530 659.461(40)
	$30\frac{1}{2} \leftarrow 26\frac{1}{2}$	530 695.844(40)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Microwave data for $^{40}\text{Ca}^{14}\text{N}^1\text{H}_2$

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		

State: electronic \tilde{X}^2A_1 ; vibrational $v_6 = 1$ level

$18_{0,18} \leftarrow 17_{0,17}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	322 304.021(40) ^{a)}	00Bre
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	322 340.241(40)	
$18_{2,16} \leftarrow 17_{2,15}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	322 272.515(40)	
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	322 307.998(40)	
$18_{2,17} \leftarrow 17_{2,16}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	322 131.091(40)	
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	322 166.919(40)	
$18_{4,14} \leftarrow 17_{4,13}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	321 348.759(40)	
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	321 384.459(40)	
$18_{4,15} \leftarrow 17_{4,14}$	$17\frac{1}{2} \leftarrow 16\frac{1}{2}$	321 348.759(40)	
	$18\frac{1}{2} \leftarrow 17\frac{1}{2}$	321 384.459(40)	
$20_{0,20} \leftarrow 19_{0,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	358 013.329(40)	
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	358 049.614(40)	
$20_{2,18} \leftarrow 19_{2,17}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	358 047.853(40)	
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	358 083.315(40)	
$20_{2,19} \leftarrow 19_{2,18}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	357 854.181(40)	
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	357 890.020(40)	
$20_{4,16} \leftarrow 19_{4,15}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	356 992.246(40)	
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	357 027.945(40)	
$20_{4,17} \leftarrow 19_{4,16}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	356 992.246(40)	
	$19\frac{1}{2} \leftarrow 18\frac{1}{2}$	357 027.945(40)	
$21_{0,21} \leftarrow 20_{0,20}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	375 855.767(40)	
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	375 892.184(40)	
$21_{1,20} \leftarrow 20_{1,19}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	378 771.206(40)	

	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	378 737.311(40)
$21_{1,21} \leftarrow 20_{1,20}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	373 147.723(40)
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	373 185.748(40)
$21_{2,19} \leftarrow 20_{2,18}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	375 931.480(40)
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	375 966.856(40)
$21_{4,17} \leftarrow 20_{4,16}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	374 806.474(40)
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	374 842.095(40)
$21_{4,18} \leftarrow 20_{4,17}$	$20\frac{1}{2} \leftarrow 19\frac{1}{2}$	374 806.474(40)
	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	374 842.095(40)
$22_{1,21} \leftarrow 21_{1,20}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	396 724.074(40)
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	396 757.980(40)
$22_{1,22} \leftarrow 21_{1,21}$	$21\frac{1}{2} \leftarrow 20\frac{1}{2}$	390 872.816(40)
	$22\frac{1}{2} \leftarrow 21\frac{1}{2}$	390 910.810(40)
$24_{0,24} \leftarrow 23_{0,23}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	429 330.311(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	429 366.800(40)
$24_{2,22} \leftarrow 23_{2,21}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	429 564.266(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	429 599.495(40)
$24_{2,23} \leftarrow 23_{2,22}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	429 230.464(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	429 266.374(40)
$24_{4,20} \leftarrow 23_{4,19}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	428 216.097(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	428 241.811(40)
$24_{4,21} \leftarrow 23_{4,20}$	$23\frac{1}{2} \leftarrow 22\frac{1}{2}$	428 216.097(40)
	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	428 241.811(40)
$25_{0,25} \leftarrow 24_{0,24}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	447 136.148(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	447 172.711(40)
$25_{1,24} \leftarrow 24_{1,23}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	450 641.706(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	450 675.553(40)
$25_{2,23} \leftarrow 24_{2,22}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	447 435.303(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	447 470.531(40)
$25_{2,24} \leftarrow 24_{2,23}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	447 058.408(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	447 094.346(40)
$25_{3,22} \leftarrow 24_{3,21}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	446 677.043(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	446 673.435(40)
$25_{3,23} \leftarrow 24_{3,22}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	446 673.435(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	446 709.111(40)
$25_{4,21} \leftarrow 24_{4,20}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	446 007.368(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	446 043.072(40)
$25_{4,22} \leftarrow 24_{4,21}$	$24\frac{1}{2} \leftarrow 23\frac{1}{2}$	446 007.368(40)
	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	446 043.072(40)
$26_{0,26} \leftarrow 25_{0,25}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	464 931.847(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	464 968.461(40)
$26_{1,25} \leftarrow 25_{1,24}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	468 599.021(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	468 633.088(40)
$26_{1,26} \leftarrow 25_{1,25}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	461 708.146(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	461 746.315(40)
$26_{2,24} \leftarrow 25_{2,23}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	465 302.830(40)

	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	465 337.973(40)
$26_{2,25} \leftarrow 25_{2,24}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	464 879.328(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	464 915.273(40)
$26_{3,23} \leftarrow 25_{3,22}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	464 491.986(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	464 527.666(40)
$26_{3,24} \leftarrow 25_{3,23}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	464 487.552(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	464 523.201(40)
$26_{4,22} \leftarrow 25_{4,21}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	463 792.266(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	463 827.967(40)
$26_{4,23} \leftarrow 25_{4,22}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	463 792.266(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	463 827.967(40)
$26_{6,20} \leftarrow 25_{6,19}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	462 259.708 (40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	462 295.220(40)
$26_{6,21} \leftarrow 25_{6,20}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	462 259.708 (40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	462 295.220(40)
$27_{0,27} \leftarrow 26_{0,26}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	482 717.011(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	482 753.683(40)
$27_{1,26} \leftarrow 26_{1,25}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	486 548.256(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	486 582.327(40)
$27_{1,27} \leftarrow 26_{1,26}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	479 399.443(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	479 437.465(40)
$27_{2,25} \leftarrow 26_{2,24}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	483 166.601(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	483 201.702(40)
$27_{2,26} \leftarrow 26_{2,25}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	482 692.953(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	482 728.872(40)
$27_{3,24} \leftarrow 26_{3,23}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	482 300.647(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	482 336.293(40)
$27_{3,25} \leftarrow 26_{3,24}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	482 295.274(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	482 330.973(40)
$27_{4,23} \leftarrow 26_{4,22}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	481 570.467(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	481 606.202(40)
$27_{4,24} \leftarrow 26_{4,23}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	481 570.467(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	481 606.202(40)
$28_{0,28} \leftarrow 27_{0,27}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	500 491.271(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	500 527.993(40)
$28_{2,26} \leftarrow 27_{2,25}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	501 026.536(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	501 061.625(40)
$28_{2,27} \leftarrow 27_{2,26}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	500 499.010(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	500 534.938(40)
$28_{3,25} \leftarrow 27_{3,24}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	500 102.862(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	500 138.428(40)
$28_{3,26} \leftarrow 27_{3,25}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	500 096.467(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	500 132.063(40)
$28_{4,24} \leftarrow 27_{4,23}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	499 341.663(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	499 377.441(40)
$28_{4,25} \leftarrow 27_{4,24}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	499 341.663(40)

	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	499 377.441(40)
$29_{0,29} \leftarrow 28_{0,28}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	518 254.273(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	518 291.071(40)
$29_{2,27} \leftarrow 28_{2,26}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	518 882.420(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	518 917.450(40)
$29_{2,28} \leftarrow 28_{2,27}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	518 297.162(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	518 333.142(40)
$29_{4,25} \leftarrow 28_{4,24}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	517 105.732(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	517 141.466(40)
$29_{4,26} \leftarrow 28_{4,25}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	517 105.732(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	517 141.466(40)
$30_{0,30} \leftarrow 29_{0,29}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	536 005.608(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	536 042.479(40)
$30_{2,28} \leftarrow 29_{2,27}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	536 734.172(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	536 769.150(40)
$30_{2,29} \leftarrow 29_{2,28}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	536 087.199(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	536 123.197(40)
$30_{4,26} \leftarrow 29_{4,25}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	534 862.203(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	534 897.984(40)
$30_{4,27} \leftarrow 29_{4,26}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	534 862.203(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	534 897.984(40)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Molecular parameters for $^{40}\text{Ca}^{14}\text{N}^1\text{H}_2$

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A_1 ; vibrational zero-point level			
A	[MHz]	392 127(89) ^{a)}	MW
B	[MHz]	9 009.064 9(47)	00Bre
C	[MHz]	8 782.755 9(49)	
D_K	[MHz]	0.0 ^{b)}	
D_{NK}	[MHz]	1.874 04(78)	
D_N	[kHz]	10.383 3(14)	
d_1	[kHz]	− 0.335 0(15)	
d_2	[kHz]	− 0.112 1(23)	
H_{KN}	[kHz]	− 6.701(11)	
H_{NK}	[Hz]	39.17(48)	
H_N	[Hz]	0.0 ^{b)}	
h_1	[kHz]	0.0 ^{b)}	
h_2	[Hz]	$3.3(21) \times 10^{-3}$	
h_3	[Hz]	$0.78(29) \times 10^{-3}$	
L_{KKN}	[Hz]	− 52.8 (26)	
L_{NK}	[Hz]	$− 94(35) \times 10^{-3}$	
L_{NNK}	[Hz]	0.0 ^{b)}	
P_{KN}	[Hz]	− 1.637(31)	
P_{NKK}	[Hz]	$20.12(45) \times 10^{-3}$	
P_{NNK}	[Hz]	$− 62.7(73) \times 10^{-6}$	

ε_{aa}	[MHz]	45.7(18)		
ε_{bb}	[MHz]	32.063(99)		
ε_{cc}	[MHz]	41.110(96)		
D_{NK}^S	[Hz]	− 5.1(14)		
μ	[D]	1.74(3)	MODR	95Mar
State: electronic \tilde{X}^2A_1 ; vibrational $v_3 = 1$ level				
A	[MHz]	354 053(1431) ^{a)}	MW	00Bre
B	[MHz]	9 154.777(50)		
C	[MHz]	8 854.055(49)		
D_K	[MHz]	0.0 ^{b)}		
D_{NK}	[MHz]	2.410(44)		
D_N	[kHz]	9.872(29)		
d_1	[kHz]	− 0.304(24)		
d_2	[kHz]	− 0.088(17)		
H_{KN}	[kHz]	75.5(96)		
H_{NK}	[Hz]	96.3(48)		
H_N	[Hz]	− 0.154(14)		
h_1	[Hz]	− 0.085(12)		
h_2	[Hz]	0.0 ^{b)}		
h_3	[Hz]	− 7.77(57)×10 ^{−3}		
L_{KKN}	[kHz]	−6.11(99)		
L_{NK}	[Hz]	0.0 ^{b)}		
L_{NNK}	[Hz]	13.0(38)×10 ^{−3}		
P_{KN}	[Hz]	0.0 ^{b)}		
P_{NKK}	[Hz]	0.0 ^{b)}		
P_{NNK}	[Hz]	0.0 ^{b)}		
ε_{aa}	[MHz]	34.1(28)		
ε_{bb}	[MHz]	31.68(13)		
ε_{cc}	[MHz]	39.01(12)		
D_{NK}^S	[Hz]	0.0 ^{b)}		
State: electronic \tilde{X}^2A_1 ; vibrational $v_4 = 1$ level				
A	[MHz]	479 141(1509) ^{a)}	MW	00Bre
B	[MHz]	8 981.140 7(92)		
C	[MHz]	8 783.772 4(86)		
D_K	[MHz]	0.0 ^{b)}		
D_{NK}	[MHz]	1.424 2(71)		
D_N	[kHz]	10.727 3(71)		
d_1	[kHz]	− 0.263 3(26)		
d_2	[kHz]	− 0.1122 8(49)		
H_{KN}	[kHz]	− 90.6(20)		
H_{NK}	[kHz]	0.283 9(35)		
H_N	[Hz]	0.0 ^{b)}		
h_1	[kHz]	0.0 ^{b)}		
h_2	[Hz]	− 6.3(22)×10 ^{−3}		
h_3	[Hz]	0.0 ^{b)}		
L_{KKN}	[kHz]	−6.618(99)		
L_{NK}	[Hz]	− 18.07(18)		
L_{NNK}	[Hz]	4.51(53)×10 ^{−3}		
P_{KN}	[Hz]	0.0 ^{b)}		
P_{NKK}	[Hz]	0.0 ^{b)}		
P_{NNK}	[Hz]	0.0 ^{b)}		

ϵ_{aa}	[MHz]	45.7(21)		
ϵ_{bb}	[MHz]	32.43(13)		
ϵ_{cc}	[MHz]	41.14(13)		
D_{NK}^S	[Hz]	0.0 ^{b)}		
State: electronic \tilde{X}^2A_1 ; vibrational $v_6 = 1$ level				
A	[MHz]	360 362(204) ^{a)}	MW	00Bre
B	[MHz]	9 098.572(10)		
C	[MHz]	8 830.511 0(94)		
D_K	[MHz]	0.0 ^{b)}		
D_{NK}	[MHz]	2.167 7(17)		
D_N	[kHz]	10.871 6(84)		
d_1	[kHz]	− 0.543 1(32)		
d_2	[kHz]	− 0.144 1(27)		
H_{KN}	[kHz]	20.19(42)		
H_{NK}	[kHz]	0.197(16)		
H_N	[Hz]	9.3(46)×10 ^{−3}		
h_1	[kHz]	0.0 ^{b)}		
h_2	[Hz]	6.6(18)×10 ^{−3}		
h_3	[Hz]	0.0 ^{b)}		
L_{KKN}	[kHz]	− 0.506(28)		
L_{NK}	[Hz]	− 1.14(12)		
L_{NNK}	[Hz]	0.0 ^{b)}		
P_{KN}	[Hz]	10.10(45)		
P_{NKK}	[Hz]	0.0 ^{b)}		
P_{NNK}	[Hz]	− 3.42(36)×10 ^{−4}		
ϵ_{aa}	[MHz]	39.5(19)		
ϵ_{bb}	[MHz]	31.73(13)		
ϵ_{cc}	[MHz]	39.94(13)		
D_{NK}^S	[Hz]	0.0 ^{b)}		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to this value in the least-squares fit.

Microwave data for $^{40}\text{Ca}^{14}\text{N}^2\text{H}_2$ (CaND_2)

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		

State: electronic \tilde{X}^2A_1 ; vibrational zero-point level

$28_{0,28} \leftarrow 27_{0,27}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	426 070.079(40) ^{a)}	00Bre
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	426 103.489(40)	
$28_{2,26} \leftarrow 27_{2,25}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	428 489.442(40)	
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	428 519.664(40)	
$28_{2,27} \leftarrow 27_{2,26}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	427 042.946(40)	
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	427 074.865(40)	
$29_{0,29} \leftarrow 28_{0,28}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	441 135.532(40)	
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	441 169.065(40)	
$29_{1,28} \leftarrow 28_{1,27}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	446 902.383(40)	
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	446 932.773(40)	
$29_{1,29} \leftarrow 28_{1,28}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	437 664.071(40)	
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	437 698.050(40)	

$29_{3,26} \leftarrow 28_{3,26}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	442 372.215(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	442 403.522(40)
$29_{3,27} \leftarrow 28_{3,27}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	442 320.020(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	442 351.557(40)
$29_{5,24} \leftarrow 28_{5,23}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	441 019.501(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	441 051.206(40)
$29_{5,25} \leftarrow 28_{5,24}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	441 019.501(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	441 051.206(40)
$29_{6,24} \leftarrow 28_{6,23}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	440 140.597(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	440 172.359(40)
$29_{6,23} \leftarrow 28_{6,22}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	440 140.597(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	440 172.359(40)
$29_{7,22} \leftarrow 28_{7,21}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	439 060.618(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	439 092.532(40)
$29_{7,23} \leftarrow 28_{7,22}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	439 060.618(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	439 092.532(40)
$30_{0,30} \leftarrow 29_{0,29}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	456 186.229(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	456 219.952(40)
$30_{1,29} \leftarrow 29_{1,28}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	462 226.370(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	462 256.737(40)
$30_{1,30} \leftarrow 29_{1,29}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	452 682.928(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	452 716.958(40)
$30_{2,29} \leftarrow 29_{2,29}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	459 178.142(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	459 208.113(40)
$30_{2,28} \leftarrow 29_{2,27}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	457 413.133(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	457 445.121(40)
$30_{6,24} \leftarrow 29_{6,23}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	455 279.575(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	455 311.183(40)
$30_{6,25} \leftarrow 29_{6,24}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	455 279.575(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	455 311.183(40)
$30_{7,23} \leftarrow 29_{7,22}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	454 164.624(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	454 196.418(40)
$30_{7,24} \leftarrow 29_{7,23}$	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	454 164.624(40)
	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	454 196.418(40)
$31_{0,31} \leftarrow 30_{0,30}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	471 222.064(40)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	471 255.857(40)
$31_{1,30} \leftarrow 30_{1,29}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	477 541.259(40)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	477 571.664(40)
$31_{1,31} \leftarrow 30_{1,30}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	467 694.581(40)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	467 728.625(40)
$31_{2,29} \leftarrow 30_{2,28}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	474 526.502(40)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	474 556.386(40)
$31_{2,30} \leftarrow 30_{2,29}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	472 587.924(40)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	472 619.960(40)
$31_{3,28} \leftarrow 30_{3,27}$	$30\frac{1}{2} \leftarrow 29\frac{1}{2}$	472 821.058(40)
	$31\frac{1}{2} \leftarrow 30\frac{1}{2}$	472 852.330(40)

$31_{3,28} \leftarrow 30_{3,27}$	$30_{\frac{1}{2}} \leftarrow 29_{\frac{1}{2}}$	472 748.277(40)
	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	472 779.621(40)
$31_{5,26} \leftarrow 30_{5,25}$	$30_{\frac{1}{2}} \leftarrow 29_{\frac{1}{2}}$	471 351.925(40)
	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	471 383.522(40)
$31_{5,27} \leftarrow 30_{5,26}$	$30_{\frac{1}{2}} \leftarrow 29_{\frac{1}{2}}$	471 351.925(40)
	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	471 383.522(40)
$31_{6,25} \leftarrow 30_{6,24}$	$30_{\frac{1}{2}} \leftarrow 29_{\frac{1}{2}}$	470 414.376(40)
	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	470 446.047(40)
$31_{6,26} \leftarrow 30_{6,25}$	$30_{\frac{1}{2}} \leftarrow 29_{\frac{1}{2}}$	470 414.376(40)
	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	470 446.047(40)
$31_{7,24} \leftarrow 30_{7,23}$	$30_{\frac{1}{2}} \leftarrow 29_{\frac{1}{2}}$	469 264.735(40)
	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	469 296.442(40)
$31_{7,25} \leftarrow 30_{7,24}$	$30_{\frac{1}{2}} \leftarrow 29_{\frac{1}{2}}$	469 264.735(40)
	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	469 296.442(40)
$32_{0,32} \leftarrow 31_{0,31}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	486 242.862(40)
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	486 276.815(40)
$32_{1,31} \leftarrow 31_{1,30}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	492 846.591(40)
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	492 877.057(40)
$32_{1,32} \leftarrow 31_{1,31}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	482 698.865(40)
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	482 732.855(40)
$32_{2,30} \leftarrow 31_{2,29}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	489 877.244(40)
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	489 907.135(40)
$32_{2,31} \leftarrow 31_{2,30}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	487 755.622(40)
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	487 787.657(40)
$32_{6,26} \leftarrow 31_{6,25}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	485 545.069(40)
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	485 576.672(40)
$32_{6,27} \leftarrow 31_{6,26}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	485 545.069(40)
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	485 576.672(40)
$32_{7,25} \leftarrow 31_{7,24}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	484 360.859(40)
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	484 392.556(40)
$32_{7,26} \leftarrow 31_{7,25}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	484 360.859(40)
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	484 392.556(40)
$33_{0,33} \leftarrow 32_{0,32}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	501 248.355(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	501 282.338(40)
$33_{1,32} \leftarrow 32_{1,31}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	508 142.151(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	508 172.673(40)
$33_{1,33} \leftarrow 32_{1,31}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	497 695.551(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	497 729.593(40)
$33_{2,31} \leftarrow 32_{2,30}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	505 230.147(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	505 259.826(40)
$33_{2,32} \leftarrow 32_{2,32}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	502 915.984(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	502 947.930(40)
$33_{3,30} \leftarrow 32_{3,29}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	503 258.959(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	503 290.221(40)
$33_{3,31} \leftarrow 32_{3,30}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	503 159.540(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	503 190.944(40)

$33_{4,29} \leftarrow 32_{4,28}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	502 489.606(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	502 521.072(40)
$33_{4,30} \leftarrow 32_{4,29}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	502 487.978(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	502 519.471(40)
$33_{5,28} \leftarrow 32_{5,27}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	501 667.376(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	501 698.924(40)
$33_{5,29} \leftarrow 32_{5,28}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	501 667.376(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	501 698.924(40)
$33_{6,27} \leftarrow 32_{6,26}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	500 671.500(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	500 703.059(40)
$33_{6,28} \leftarrow 32_{6,27}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	500 671.500(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	500 703.059(40)
$33_{7,26} \leftarrow 32_{7,25}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	499 452.877(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	499 484.606(40)
$33_{7,27} \leftarrow 32_{7,26}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	499 452.877(40)
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	499 484.606(40)
$34_{0,34} \leftarrow 33_{0,33}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	516 238.554(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	516 272.686(40)
$34_{1,33} \leftarrow 33_{1,32}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	523 427.507(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	523 458.101(40)
$34_{1,34} \leftarrow 33_{1,33}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	512 684.330(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	512 718.475(40)
$34_{2,32} \leftarrow 33_{2,31}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	520 584.771(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	520 614.400(40)
$34_{2,33} \leftarrow 33_{2,32}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	518 068.533(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	518 100.652(40)
$34_{3,31} \leftarrow 33_{3,31}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	518 473.769(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	518 504.915(40)
$34_{3,32} \leftarrow 33_{3,30}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	518 358.375(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	518 389.794(40)
$34_{4,30} \leftarrow 33_{4,29}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	517 667.232(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	517 698.639(40)
$34_{4,31} \leftarrow 33_{4,30}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	517 665.262(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	517 696.718(40)
$34_{5,29} \leftarrow 33_{5,28}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	516 818.429(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	516 849.926(40)
$34_{5,30} \leftarrow 33_{5,29}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	516 818.429(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	516 849.926(40)
$34_{6,28} \leftarrow 33_{6,27}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	515 793.442(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	515 825.040(40)
$34_{6,29} \leftarrow 33_{6,28}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	515 793.442(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	515 825.040(40)
$34_{7,27} \leftarrow 33_{7,26}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	514 540.714(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	514 572.231(40)
$34_{7,28} \leftarrow 33_{7,27}$	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	514 540.714(40)
	$34_{\frac{1}{2}} \leftarrow 33_{\frac{1}{2}}$	514 572.231(40)

$35_{0,35} \leftarrow 34_{0,34}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	531 213.386(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	531 247.625(40)
$35_{1,34} \leftarrow 34_{1,33}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	538 702.311(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	538 732.875(40)
$35_{1,35} \leftarrow 34_{1,34}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	527 665.318(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	527 699.408(40)
$35_{2,33} \leftarrow 34_{2,32}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	535 940.862(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	535 970.451(40)
$35_{2,34} \leftarrow 34_{2,33}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	533 213.433(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	533 245.493(40)
$35_{3,32} \leftarrow 34_{3,31}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	533 685.709(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	533 716.782(40)
$35_{3,33} \leftarrow 34_{3,32}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	533 552.450(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	533 583.828(40)
$35_{4,31} \leftarrow 34_{4,30}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	532 840.298(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	532 871.727(40)
$35_{4,32} \leftarrow 34_{4,31}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	532 838.030(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	532 869.464(40)
$35_{5,30} \leftarrow 34_{5,29}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	531 964.759(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	531 996.260(40)
$35_{5,31} \leftarrow 34_{5,30}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	531 964.759(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	531 996.260(40)
$35_{6,29} \leftarrow 34_{6,28}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	530 910.837(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	530 942.367(40)
$35_{6,30} \leftarrow 34_{6,29}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	530 910.837(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	530 942.367(40)
$35_{7,28} \leftarrow 34_{7,27}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	529 624.081(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	529 655.624(40)
$35_{7,29} \leftarrow 34_{7,28}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	529 624.081(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	529 655.624(40)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1σ).

Molecular parameters for $^{40}\text{Ca}^{14}\text{N}^2\text{H}_2$ (CaND_2)

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A_1 ; vibrational zero-point level			
A	[MHz] 195 668.8(66) ^{a)}	MW	00Bre
B	[MHz] 7 807.632 9(74)		
C	[MHz] 7 484.685 0(64)		
D_K	[MHz] 0.0 ^{b)}		
D_{NK}	[MHz] 1.251 64(43)		
D_N	[kHz] 7.053 6(12)		
d_1	[kHz] -0.396 2(15)		
d_2	[kHz] -0.192 6(18)		
H_{KN}	[kHz] -2.130(29)		
H_{NK}	[Hz] 25.20(15)		
H_N	[Hz] 0.0 ^{b)}		
h_1	[kHz] 0.0 ^{b)}		
h_2	[Hz] $5.8(11) \times 10^{-3}$		
h_3	[kHz] $1.76(29) \times 10^{-3}$		

L_{KKN}	[kHz]	– 2.80(83)
L_{NK}	[Hz]	0.193(12)
L_{NNK}	[Hz]	0.0 ^{b)}
P_{KN}	[Hz]	– 0.101 5(82)
P_{NKK}	[Hz]	0.0 ^{b)}
P_{NNK}	[Hz]	– 0.282(37)×10 ^{–4}
ϵ_{aa}	[MHz]	22.5(23)
ϵ_{bb}	[MHz]	27.886(88)
ϵ_{cc}	[MHz]	35.376(76)
D_{NK}^S	[Hz]	– 2.24(80)

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to this value in the least-squares fit.

References for CaNH_2

- 95Mar Marr, A.J., Tanimoto, M., Goodridge, D.M., Steimle, T.C. :
J. Chem.Phys. **103** (1995) 4466.
00Bre Brewster, M.A., Ziurys, L.M. : J. Chem. Phys. **113** (2000) 3141.

3.2.4.2.22 SrNH_2

Microwave data for $^{88}\text{Sr}^{14}\text{N}^1\text{H}_2$

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		

State: electronic \tilde{X}^2A_1 ; vibrational zero-point level

$17_{1,17} \leftarrow 16_{1,16}$	$16_{\frac{1}{2}} \leftarrow 15_{\frac{1}{2}}$	227 325.149(40) ^{a)}	00Tho
	$17_{\frac{1}{2}} \leftarrow 16_{\frac{1}{2}}$	227 407.200(40)	
$17_{3,15} \leftarrow 16_{3,14}$	$16_{\frac{1}{2}} \leftarrow 15_{\frac{1}{2}}$	228 063.034(40)	
	$17_{\frac{1}{2}} \leftarrow 16_{\frac{1}{2}}$	228 135.067(40)	
$17_{3,15} \leftarrow 16_{3,14}$	$16_{\frac{1}{2}} \leftarrow 15_{\frac{1}{2}}$	228 063.034(40)	
	$17_{\frac{1}{2}} \leftarrow 16_{\frac{1}{2}}$	228 135.067(40)	
$17_{1,16} \leftarrow 16_{1,15}$	$16_{\frac{1}{2}} \leftarrow 15_{\frac{1}{2}}$	229 549.898(40)	
	$17_{\frac{1}{2}} \leftarrow 16_{\frac{1}{2}}$	229 616.847(40)	
$18_{1,18} \leftarrow 17_{1,17}$	$17_{\frac{1}{2}} \leftarrow 16_{\frac{1}{2}}$	240 683.871(40)	
	$18_{\frac{1}{2}} \leftarrow 17_{\frac{1}{2}}$	240 765.975(40)	
$18_{1,17} \leftarrow 17_{1,16}$	$17_{\frac{1}{2}} \leftarrow 16_{\frac{1}{2}}$	243 038.275(40)	
	$18_{\frac{1}{2}} \leftarrow 17_{\frac{1}{2}}$	243 105.303(40)	
$26_{1,26} \leftarrow 25_{1,25}$	$25_{\frac{1}{2}} \leftarrow 24_{\frac{1}{2}}$	347 444.373(40)	
	$26_{\frac{1}{2}} \leftarrow 25_{\frac{1}{2}}$	347 526.640(40)	
$26_{3,24} \leftarrow 25_{3,23}$	$25_{\frac{1}{2}} \leftarrow 24_{\frac{1}{2}}$	348 591.439(40)	
	$26_{\frac{1}{2}} \leftarrow 25_{\frac{1}{2}}$	348 664.608(40)	
$26_{3,23} \leftarrow 25_{3,22}$	$25_{\frac{1}{2}} \leftarrow 24_{\frac{1}{2}}$	348 591.755(40)	
	$26_{\frac{1}{2}} \leftarrow 25_{\frac{1}{2}}$	348 665.013(40)	
$26_{2,24} \leftarrow 25_{2,23}$	$26_{\frac{1}{2}} \leftarrow 25_{\frac{1}{2}}$	349 099.594(40)	
$26_{0,26} \leftarrow 25_{0,25}$	$25_{\frac{1}{2}} \leftarrow 24_{\frac{1}{2}}$	349 133.784(40)	

	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	349 209.657(40)
$26_{1,25} \leftarrow 25_{1,24}$	$25\frac{1}{2} \leftarrow 24\frac{1}{2}$	350 830.108(40)
	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	350 897.382(40)
$27_{5,22} \leftarrow 26_{5,21}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	360 548.455(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	360 619.926(40)
$27_{5,23} \leftarrow 26_{5,22}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	360 548.455(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	360 619.926(40)
$27_{1,27} \leftarrow 26_{1,26}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	360 773.464(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	360 855.787(40)
$27_{4,24} \leftarrow 26_{4,23}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	361 383.592(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	361 456.191(40)
$27_{4,23} \leftarrow 26_{4,22}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	361 383.592(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	361 456.191(40)
$27_{3,25} \leftarrow 26_{3,24}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	361 967.630(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	362 040.798(40)
$27_{3,24} \leftarrow 26_{3,23}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	361 967.992(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	362 041.228(40)
$27_{2,26} \leftarrow 26_{2,25}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	362 323.244(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	362 397.581(40)
$27_{2,25} \leftarrow 26_{2,24}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	362 424.028(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	362 497.030(40)
$27_{0,27} \leftarrow 26_{0,26}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	362 520.860(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	362 596.848(40)
$27_{1,26} \leftarrow 26_{1,25}$	$26\frac{1}{2} \leftarrow 25\frac{1}{2}$	364 287.356(40)
	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	364 354.663(40)
$28_{5,23} \leftarrow 27_{5,22}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	373 871.796(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	373 943.386(40)
$28_{5,24} \leftarrow 27_{5,23}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	373 871.796(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	373 943.386(40)
$28_{1,28} \leftarrow 27_{1,27}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	374 098.585(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	374 180.918(40)
$28_{4,25} \leftarrow 27_{4,24}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	374 735.178(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	374 807.838(40)
$28_{4,24} \leftarrow 27_{4,23}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	374 735.178(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	374 807.838(40)
$28_{3,26} \leftarrow 27_{3,25}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	375 339.976(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	375 340.381(40)
$28_{3,25} \leftarrow 27_{3,24}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	375 413.417(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	375 413.834(40)
$28_{2,27} \leftarrow 27_{2,26}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	375 706.080(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	375 780.402(40)
$28_{2,26} \leftarrow 27_{2,25}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	375 818.323(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	375 891.258(40)
$28_{0,28} \leftarrow 27_{0,27}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	375 903.139(40)
	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	375 979.245(40)
$28_{1,28} \leftarrow 27_{1,27}$	$27\frac{1}{2} \leftarrow 26\frac{1}{2}$	377 740.326(40)

	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	377 807.690(40)
$29_{5,24} \leftarrow 28_{5,23}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	387 191.863(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	387 263.546(40)
$29_{5,25} \leftarrow 28_{5,24}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	387 191.863(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	387 263.546(40)
$29_{1,29} \leftarrow 28_{1,28}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	387 419.519(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	387 501.885(40)
$29_{4,26} \leftarrow 28_{4,25}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	388 082.992(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	388 155.746(40)
$29_{4,25} \leftarrow 28_{4,24}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	388 082.992(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	388 155.746(40)
$29_{3,27} \leftarrow 28_{3,26}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	388 708.664(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	388 782.077(40)
$29_{3,26} \leftarrow 28_{3,25}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	388 709.234(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	388 782.640(40)
$29_{2,28} \leftarrow 28_{2,27}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	389 084.607(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	389 159.042(40)
$29_{2,27} \leftarrow 28_{2,26}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	389 209.312(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	389 282.199(40)
$29_{0,29} \leftarrow 28_{0,28}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	389 280.444(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	389 356.659(40)
$29_{1,28} \leftarrow 28_{1,27}$	$28\frac{1}{2} \leftarrow 27\frac{1}{2}$	391 188.901(40)
	$29\frac{1}{2} \leftarrow 28\frac{1}{2}$	391 256.327(40)
$33_{1,33} \leftarrow 32_{1,32}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	440 658.322(40)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	440 740.880(40)
$33_{4,30} \leftarrow 32_{4,29}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	441 434.099(40)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	441 507.074(40)
$33_{4,29} \leftarrow 32_{4,28}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	441 434.099(40)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	441 507.074(40)
$33_{3,31} \leftarrow 32_{3,30}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	442 141.702(40)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	442 215.265(40)
$33_{3,30} \leftarrow 32_{3,29}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	442 143.149(40)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	442 216.696(40)
$33_{2,32} \leftarrow 32_{2,31}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	442 554.612(40)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	442 629.225(40)
$33_{2,31} \leftarrow 32_{2,30}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	442 737.826(40)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	442 810.399(40)
$33_{0,33} \leftarrow 32_{0,32}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	442 736.271(40)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	442 812.892(40)
$33_{1,32} \leftarrow 32_{1,31}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	444 936.027(40)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	445 003.655(40)
$34_{1,34} \leftarrow 33_{1,33}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	453 956.064(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	454 038.714(40)
$34_{4,31} \leftarrow 33_{4,30}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	454 761.198(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	454 761.198(40)
$34_{3,32} \leftarrow 33_{3,31}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	455 489.057(40)

	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	455 562.643(40)
$34_{3,31} \leftarrow 33_{3,30}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	455 490.679(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	455 564.239(40)
$34_{2,33} \leftarrow 33_{2,32}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	455 910.276(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	455 984.940(40)
$34_{0,34} \leftarrow 33_{0,33}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	456 086.011(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	456 162.890(40)
$34_{2,32} \leftarrow 33_{2,31}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	456 110.482(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	456 183.016(40)
$34_{1,33} \leftarrow 33_{1,32}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	458 360.213(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	458 427.912(40)
$35_{1,35} \leftarrow 34_{1,34}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	467 248.750(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	467 331.414(40)
$35_{4,32} \leftarrow 34_{4,31}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	468 083.633(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	468 156.730(40)
$35_{4,31} \leftarrow 34_{4,30}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	468 083.633(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	468 156.730(40)
$35_{3,33} \leftarrow 34_{3,32}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	468 831.739(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	468 905.332(40)
$35_{3,32} \leftarrow 34_{3,31}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	468 833.549(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	468 907.106(40)
$35_{2,34} \leftarrow 34_{2,33}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	469 260.888(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	469 335.598(40)
$35_{0,35} \leftarrow 34_{0,34}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	469 429.731(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	469 506.753(40)
$35_{2,33} \leftarrow 34_{2,32}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	469 479.107(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	469 551.571(40)
$35_{1,34} \leftarrow 34_{1,33}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	471 779.049(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	471 846.813(40)
$36_{1,36} \leftarrow 35_{1,35}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	480 536.220(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	480 618.918(40)
$36_{4,33} \leftarrow 35_{4,32}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	481 401.411(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	481 474.485(40)
$36_{4,34} \leftarrow 35_{4,33}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	481 401.411(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	481 474.485(40)
$36_{3,34} \leftarrow 35_{3,33}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	482 169.560(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	482 243.157(40)
$36_{3,33} \leftarrow 35_{3,32}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	482 171.681(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	482 245.226(40)
$36_{2,35} \leftarrow 35_{2,34}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	482 606.320(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	482 681.067(40)
$36_{0,36} \leftarrow 35_{0,35}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	482 767.244(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	482 844.432(40)
$36_{2,34} \leftarrow 35_{2,33}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	482 843.561(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	482 915.975(40)
$36_{1,35} \leftarrow 35_{1,34}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	485 192.391(40)

	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	485 260.207(40)
$37_{1,37} \leftarrow 36_{1,36}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	493 818.293(40)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	493 901.044(40)
$37_{4,34} \leftarrow 36_{4,33}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	494 714.320(40)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	494 787.442(40)
$37_{4,33} \leftarrow 36_{4,32}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	494 714.320(40)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	494 787.442(40)
$37_{3,35} \leftarrow 36_{3,34}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	495 502.415(40)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	495 576.055(40)
$37_{3,34} \leftarrow 36_{3,33}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	495 504.861(40)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	495 578.469(40)
$37_{2,36} \leftarrow 36_{2,35}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	495 946.427(40)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	496 021.227(40)
$37_{0,37} \leftarrow 36_{0,36}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	496 098.367(40)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	496 175.713(40)
$37_{2,35} \leftarrow 36_{2,34}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	496 203.779(40)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	496 276.066(40)
$37_{1,36} \leftarrow 36_{1,35}$	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	498 600.058(40)
	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	498 667.955(40)
$38_{1,38} \leftarrow 37_{1,37}$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	507 094.875(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	507 177.667(40)
$38_{4,35} \leftarrow 37_{4,34}$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	508 022.314(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	508 095.426(40)
$38_{4,34} \leftarrow 37_{4,33}$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	508 022.314(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	508 095.426(40)
$38_{3,36} \leftarrow 37_{3,35}$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	508 830.216(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	508 903.895(40)
$38_{3,35} \leftarrow 37_{3,34}$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	508 833.022(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	508 906.610(40)
$38_{2,37} \leftarrow 37_{2,36}$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	509 281.052(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	509 355.887(40)
$38_{0,38} \leftarrow 37_{0,37}$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	509 422.968(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	509 500.457(40)
$38_{2,36} \leftarrow 37_{2,35}$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	509 559.561(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	509 631.797(40)
$38_{1,37} \leftarrow 37_{1,36}$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	512 001.926(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	512 069.872(40)
$39_{1,39} \leftarrow 38_{1,38}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	520 365.758(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	520 448.607(40)
$39_{4,36} \leftarrow 38_{4,35}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	521 325.144(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	521 398.298(40)
$39_{4,35} \leftarrow 38_{4,34}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	521 325.144(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	521 398.298(40)
$39_{3,37} \leftarrow 38_{3,36}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	522 152.754(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	522 226.412(40)
$39_{3,36} \leftarrow 38_{3,35}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	522 155.936(40)

	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	522 229.578(40)
$39_{2,38} \leftarrow 38_{2,37}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	522 610.032(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	522 684.946(40)
$39_{0,39} \leftarrow 38_{0,38}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	522 740.837(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	522 818.524(40)
$39_{2,37} \leftarrow 38_{2,36}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	522 910.859(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	522 982.953(40)
$38_{1,37} \leftarrow 37_{1,36}$	$37\frac{1}{2} \leftarrow 36\frac{1}{2}$	525 397.784(40)
	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	525 465.782(40)
$40_{1,40} \leftarrow 39_{1,39}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	533 630.868(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	533 713.743(40)
$40_{4,36} \leftarrow 39_{4,35}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	534 622.704(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	534 695.931(40)
$40_{4,37} \leftarrow 39_{4,36}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	534 622.704(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	534 695.931(40)
$40_{3,38} \leftarrow 39_{3,37}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	535 469.938(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	535 543.825(40)
$40_{3,37} \leftarrow 39_{3,36}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	535 473.551(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	535 547.193(40)
$40_{2,39} \leftarrow 39_{2,38}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	535 933.301(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	536 008.198(40)
$40_{0,40} \leftarrow 39_{0,39}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	536 051.892(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	536 129.636(40)
$40_{2,38} \leftarrow 39_{2,37}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	536 257.468(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	536 329.514(40)
$40_{1,39} \leftarrow 39_{1,38}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	538 787.509(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	538 855.606(40)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1 σ).

Molecular parameters for ⁸⁸Sr¹⁴N¹H₅

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A_1 ; vibrational zero-point level			
<i>A</i>	[MHz]	394 340(140) ^{a)}	MW
<i>B</i>	[MHz]	6 790.296 1(27)	
<i>C</i>	[MHz]	6 659.515 9(26)	
<i>D_K</i>	[MHz]	0.0 ^{b)}	
<i>D_{NK}</i>	[MHz]	1.359 5(14)	
<i>D_N</i>	[kHz]	6.075 34(75)	
<i>d₁</i>	[kHz]	− 0.153 94(46)	
<i>d₂</i>	[Hz]	− 49.43(83)	
<i>H_{KN}</i>	[kHz]	− 6.20(18)	
<i>H_{NK}</i>	[Hz]	23.1(13)	
<i>H_N</i>	[Hz]	0.0 ^{b)}	
<i>h₁</i>	[kHz]	0.0 ^{b)}	
<i>h₂</i>	[Hz]	− 1.31(38)×10 ^{−3}	
<i>h₃</i>	[Hz]	− 0.293(62)×10 ^{−3}	
<i>L_{KKN}</i>	[kHz]	− 0.138 3 (45)	
<i>L_{NK}</i>	[Hz]	1.6(13)	
<i>L_{NNK}</i>	[Hz]	− 0.89(60)×10 ^{−3}	
<i>P_{KN}</i>	[Hz]	0.0 ^{b)}	

P_{NKK}	[Hz]	$22.6(29) \times 10^{-3}$
P_{NNK}	[Hz]	$-0.100(22) \times 10^{-3}$
P_{NK}	[Hz]	$20.12(45) \times 10^{-3}$
\mathcal{E}_{aa}	[MHz]	160.4(23)
\mathcal{E}_{bb}	[MHz]	59.740(86)
\mathcal{E}_{cc}	[MHz]	89.657(81)
D_{NK}^s	[Hz]	$-5.5(12)$
Δ_c	[uÅ ²]	0.180
$r(\text{N-H})$	[nm]	0.102 1
$r(\text{Sr-H})$	[nm]	0.225 6
$\angle(\text{H-Sr-H})$	[deg]	105.4

^a) The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place. ^b) Parameter constrained to this value in the least-squares fit.

Microwave data for ⁸⁸Sr ¹⁴N²H₂ (SrND₂)

Transition		ν [MHz]	Ref.
rotational $N' - N''$	fine structure $J' - J''$		

State: electronic \tilde{X}^2A_1 ; vibrational zero-point level

$31_{6,25} \leftarrow 30_{6,24}$	$30_{\frac{1}{2}} \leftarrow 29_{\frac{1}{2}}$	352 281.782(40) ^a)	00Tho
	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	352 344.764(40)	
$31_{6,26} \leftarrow 30_{6,25}$	$30_{\frac{1}{2}} \leftarrow 29_{\frac{1}{2}}$	352 281.782(40)	
	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	352 344.764(40)	
$32_{6,27} \leftarrow 31_{6,26}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	363 620.374(40)	
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	363 683.362(40)	
$32_{6,26} \leftarrow 31_{6,25}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	363 620.374(40)	
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	363 683.362(40)	
$32_{5,28} \leftarrow 31_{5,27}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	364 351.033(40)	
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	364 414.280(40)	
$32_{5,27} \leftarrow 31_{5,26}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	364 351.033(40)	
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	364 414.280(40)	
$32_{4,29} \leftarrow 31_{4,28}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	364 927.557(40)	
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	364 990.887(40)	
$32_{4,28} \leftarrow 31_{4,27}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	364 927.557(40)	
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	364 990.887(40)	
$32_{2,31} \leftarrow 31_{2,30}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	365 479.587(40)	
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	365 544.460(40)	
$32_{2,30} \leftarrow 31_{2,29}$	$31_{\frac{1}{2}} \leftarrow 30_{\frac{1}{2}}$	366 162.405(40)	
	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	366 222.641(40)	
$33_{6,27} \leftarrow 32_{6,26}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	374 956.416(40)	
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	375 019.356(40)	
$33_{6,28} \leftarrow 32_{6,26}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	374 956.416(40)	
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	375 019.356(40)	
$33_{4,29} \leftarrow 32_{4,28}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	376 302.617(40)	
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	376 366.004(40)	
$33_{4,30} \leftarrow 32_{4,29}$	$32_{\frac{1}{2}} \leftarrow 31_{\frac{1}{2}}$	376 302.617(40)	
	$33_{\frac{1}{2}} \leftarrow 32_{\frac{1}{2}}$	376 366.004(40)	

$33_{2,31} \leftarrow 32_{2,30}$	$32\frac{1}{2} \leftarrow 31\frac{1}{2}$	377 607.401(40)
	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	377 667.436(40)
$34_{1,34} \leftarrow 33_{1,33}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	385 267.076(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	385 338.623(40)
$34_{6,28} \leftarrow 33_{6,27}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	386 289.837(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	386 352.796(40)
$34_{6,29} \leftarrow 33_{6,28}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	386 289.837(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	386 352.796(40)
$34_{4,30} \leftarrow 33_{4,29}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	387 675.026(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	387 738.359(40)
$34_{4,31} \leftarrow 33_{4,30}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	387 675.026(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	387 738.359(40)
$34_{0,34} \leftarrow 33_{0,33}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	387 766.045(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	387 835.323(40)
$34_{3,32} \leftarrow 33_{3,31}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	388 156.559(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	388 219.872(40)
$34_{3,31} \leftarrow 33_{3,30}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	388 176.524(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	388 239.542(40)
$34_{2,33} \leftarrow 33_{2,32}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	388 236.656(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	388 301.517(40)
$34_{2,32} \leftarrow 33_{2,31}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	389 052.114(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	389 112.114(40)
$34_{1,33} \leftarrow 33_{1,32}$	$33\frac{1}{2} \leftarrow 32\frac{1}{2}$	391 400.004(40)
	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	391 459.132(40)
$35_{1,35} \leftarrow 34_{1,34}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	396 549.787(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	396 621.539(40)
$35_{6,29} \leftarrow 34_{6,28}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	397 620.540(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	397 683.510(40)
$35_{6,30} \leftarrow 34_{6,29}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	397 620.540(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	397 683.510(40)
$35_{5,30} \leftarrow 34_{5,29}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	398 415.019(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	398 478.235(40)
$35_{5,31} \leftarrow 34_{5,30}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	398 415.019(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	398 478.235(40)
$35_{2,34} \leftarrow 34_{2,33}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	399 609.273(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	399 674.171(40)
$35_{0,35} \leftarrow 34_{0,34}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	399 082.698(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	399 152.159(40)
$35_{2,33} \leftarrow 34_{2,32}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	400 496.944(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	400 556.495(40)
$35_{1,34} \leftarrow 34_{1,33}$	$34\frac{1}{2} \leftarrow 33\frac{1}{2}$	402 857.100(40)
	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	402 916.305(40)
$36_{6,30} \leftarrow 35_{6,29}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	408 948.432(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	409 011.401(40)
$36_{6,31} \leftarrow 35_{6,30}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	408 948.432(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	409 011.401(40)

$36_{5,32} \leftarrow 35_{5,31}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	409 763.978(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	409 827.179(40)
$36_{5,31} \leftarrow 35_{5,30}$	$35\frac{1}{2} \leftarrow 34\frac{1}{2}$	409 763.978(40)
	$36\frac{1}{2} \leftarrow 35\frac{1}{2}$	409 827.179(40)
$39_{1,39} \leftarrow 38_{1,38}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	441 637.468(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	441 709.431(40)
$39_{6,34} \leftarrow 38_{6,33}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	442 914.572(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	442 977.520(40)
$39_{6,33} \leftarrow 38_{6,32}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	442 914.572(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	442 977.520(40)
$39_{5,35} \leftarrow 38_{5,34}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	443 792.391(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	443 855.502(40)
$39_{5,34} \leftarrow 38_{5,33}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	443 792.391(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	443 855.502(40)
$39_{4,36} \leftarrow 38_{4,35}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	444 492.233(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	444 555.485(40)
$39_{4,35} \leftarrow 38_{4,34}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	444 492.233(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	444 555.485(40)
$39_{3,37} \leftarrow 38_{3,36}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	445 047.596(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	445 110.800(40)
$39_{3,36} \leftarrow 38_{3,35}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	445 086.908(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	445 149.762(40)
$39_{0,39} \leftarrow 38_{0,38}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	444 273.899(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	444 344.548(40)
$39_{2,38} \leftarrow 38_{2,37}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	445 057.748(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	445 122.905(40)
$39_{2,37} \leftarrow 38_{2,36}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	446 272.059(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	446 330.866(40)
$39_{1,38} \leftarrow 38_{1,37}$	$38\frac{1}{2} \leftarrow 37\frac{1}{2}$	448 634.882(40)
	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	448 694.576(40)
$40_{1,40} \leftarrow 39_{1,39}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	452 897.952(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	452 970.035(40)
$40_{6,34} \leftarrow 39_{6,33}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	454 230.515(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	454 293.433(40)
$40_{6,35} \leftarrow 39_{6,34}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	454 230.515(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	454 293.433(40)
$40_{5,35} \leftarrow 39_{5,34}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	455 128.800(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	455 191.965(40)
$40_{5,36} \leftarrow 39_{5,35}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	455 128.800(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	455 191.965(40)
$40_{4,36} \leftarrow 39_{4,35}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	455 846.180(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	455 909.407(40)
$40_{4,37} \leftarrow 39_{4,36}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	455 846.180(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	455 909.407(40)
$40_{3,38} \leftarrow 39_{3,37}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	456 416.111(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	456 479.328(40)

$40_{3,37} \leftarrow 39_{3,36}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	456 460.708(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	456 523.535(40)
$40_{2,39} \leftarrow 39_{2,38}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	456 408.744(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	456 473.983(40)
$40_{0,40} \leftarrow 39_{0,39}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	455 552.165(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	455 623.133(40)
$40_{2,38} \leftarrow 39_{2,37}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	457 714.563(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	457 773.074(40)
$40_{1,39} \leftarrow 39_{1,38}$	$39\frac{1}{2} \leftarrow 38\frac{1}{2}$	460 065.916(40)
	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	460 125.894(40)
$41_{1,41} \leftarrow 40_{1,40}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	464 153.684(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	464 225.832(40)
$41_{6,36} \leftarrow 40_{6,35}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	465 543.086(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	465 606.021(40)
$41_{6,35} \leftarrow 40_{6,34}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	465 543.086(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	465 606.021(40)
$41_{5,37} \leftarrow 40_{5,36}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	466 461.823(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	466 525.039(40)
$41_{5,36} \leftarrow 40_{5,35}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	466 461.823(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	466 525.039(40)
$41_{4,38} \leftarrow 40_{4,37}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	467 196.707(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	467 259.956(40)
$41_{4,37} \leftarrow 40_{4,36}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	467 196.707(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	467 259.956(40)
$41_{0,41} \leftarrow 40_{0,40}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	466 822.376(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	466 893.655(40)
$41_{3,39} \leftarrow 40_{3,38}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	467 781.174(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	467 844.397(40)
$41_{3,38} \leftarrow 40_{3,37}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	467 831.646(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	467 894.412(40)
$41_{2,40} \leftarrow 40_{2,39}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	467 755.078(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	467 820.402(40)
$41_{2,39} \leftarrow 40_{2,38}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	469 156.334(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	469 214.640(40)
$41_{1,40} \leftarrow 40_{1,39}$	$40\frac{1}{2} \leftarrow 39\frac{1}{2}$	471 491.346(40)
	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	471 551.307(40)
$42_{1,42} \leftarrow 41_{1,41}$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	475 404.526(40)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	475 476.775(40)
$42_{6,37} \leftarrow 41_{6,36}$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	476 852.359(40)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	476 915.563(40)
$42_{6,36} \leftarrow 41_{6,35}$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	476 852.359(40)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	476 915.563(40)
$42_{5,38} \leftarrow 41_{5,37}$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	477 791.143(40)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	477 854.619(40)
$42_{5,37} \leftarrow 41_{5,36}$	$41\frac{1}{2} \leftarrow 40\frac{1}{2}$	477 791.143(40)
	$42\frac{1}{2} \leftarrow 41\frac{1}{2}$	477 854.619(40)

$42_{0,42} \leftarrow 41_{0,41}$	$41_{\frac{1}{2}} \leftarrow 40_{\frac{1}{2}}$	478 084.051(40)
	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	478 156.080(40)
$42_{4,39} \leftarrow 41_{4,38}$	$41_{\frac{1}{2}} \leftarrow 40_{\frac{1}{2}}$	478 543.861(40)
	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	478 607.027(40)
$42_{4,38} \leftarrow 41_{4,37}$	$41_{\frac{1}{2}} \leftarrow 40_{\frac{1}{2}}$	478 543.861(40)
	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	478 607.027(40)
$42_{2,41} \leftarrow 41_{2,40}$	$41_{\frac{1}{2}} \leftarrow 40_{\frac{1}{2}}$	479 096.641(40)
	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	479 162.033(40)
$42_{2,40} \leftarrow 41_{2,39}$	$41_{\frac{1}{2}} \leftarrow 40_{\frac{1}{2}}$	480 597.233(40)
	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	480 655.344(40)
$42_{1,41} \leftarrow 41_{1,40}$	$41_{\frac{1}{2}} \leftarrow 40_{\frac{1}{2}}$	482 910.932(40)
	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	482 971.038(40)
$43_{1,43} \leftarrow 42_{1,42}$	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	486 650.391(40)
	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	486 722.702(40)
$43_{6,38} \leftarrow 42_{6,37}$	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	488 158.358(40)
	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	488 221.296(40)
$43_{6,37} \leftarrow 42_{6,36}$	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	488 158.358(40)
	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	488 221.296(40)
$43_{5,39} \leftarrow 42_{5,38}$	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	489 117.547(40)
	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	489 180.624(40)
$43_{5,38} \leftarrow 42_{5,37}$	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	489 117.547(40)
	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	489 180.624(40)
$43_{0,43} \leftarrow 42_{0,42}$	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	489 338.396(40)
	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	489 410.290(40)
$43_{4,40} \leftarrow 42_{4,39}$	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	489 886.921(40)
	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	489 950.111(40)
$43_{4,39} \leftarrow 42_{4,38}$	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	489 887.528(40)
	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	489 950.861(40)
$43_{2,42} \leftarrow 42_{2,41}$	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	490 433.258(40)
	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	490 498.737(40)
$43_{2,41} \leftarrow 42_{2,40}$	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	492 037.234(40)
	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	492 095.129(40)
$43_{1,42} \leftarrow 42_{1,41}$	$42_{\frac{1}{2}} \leftarrow 41_{\frac{1}{2}}$	494 324.534(40)
	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	494 384.784(40)
$44_{1,44} \leftarrow 43_{1,43}$	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	497 891.101(40)
	$44_{\frac{1}{2}} \leftarrow 43_{\frac{1}{2}}$	497 963.532(40)
$44_{6,39} \leftarrow 43_{6,38}$	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	499 460.813(40)
	$44_{\frac{1}{2}} \leftarrow 43_{\frac{1}{2}}$	499 523.794(40)
$44_{6,38} \leftarrow 43_{6,37}$	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	499 460.813(40)
	$44_{\frac{1}{2}} \leftarrow 43_{\frac{1}{2}}$	499 523.794(40)
$44_{5,40} \leftarrow 43_{5,39}$	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	500 439.813(40)
	$44_{\frac{1}{2}} \leftarrow 43_{\frac{1}{2}}$	500 503.101(40)
$44_{5,39} \leftarrow 43_{5,38}$	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	500 439.813(40)
	$44_{\frac{1}{2}} \leftarrow 43_{\frac{1}{2}}$	500 503.101(40)
$44_{0,44} \leftarrow 43_{0,43}$	$43_{\frac{1}{2}} \leftarrow 42_{\frac{1}{2}}$	500 583.903(40)
	$44_{\frac{1}{2}} \leftarrow 43_{\frac{1}{2}}$	500 656.100(40)

$44_{2,43} \leftarrow 43_{2,42}$	$43 \frac{1}{2} \leftarrow 42 \frac{1}{2}$	501 764.875(40)
	$44 \frac{1}{2} \leftarrow 43 \frac{1}{2}$	501 830.423(40)
$44_{3,42} \leftarrow 43_{3,41}$	$43 \frac{1}{2} \leftarrow 42 \frac{1}{2}$	501 855.222(40)
	$44 \frac{1}{2} \leftarrow 43 \frac{1}{2}$	501 918.222(40)
$44_{3,42} \leftarrow 43_{3,41}$	$44 \frac{1}{2} \leftarrow 43 \frac{1}{2}$	501 989.020(40)
$44_{2,42} \leftarrow 43_{2,41}$	$43 \frac{1}{2} \leftarrow 42 \frac{1}{2}$	503 476.055(40)
	$44 \frac{1}{2} \leftarrow 43 \frac{1}{2}$	503 533.729(40)
$45_{6,40} \leftarrow 44_{6,39}$	$44 \frac{1}{2} \leftarrow 43 \frac{1}{2}$	510 759.680(40)
	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	510 822.668(40)
$45_{6,39} \leftarrow 44_{6,38}$	$44 \frac{1}{2} \leftarrow 43 \frac{1}{2}$	510 759.680(40)
	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	510 822.668(40)
$45_{5,41} \leftarrow 44_{5,40}$	$44 \frac{1}{2} \leftarrow 43 \frac{1}{2}$	511 758.054(40)
$45_{5,40} \leftarrow 44_{5,39}$	$44 \frac{1}{2} \leftarrow 43 \frac{1}{2}$	511 758.054(40)
$45_{0,45} \leftarrow 44_{0,44}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	511 893.535(40)
$45_{2,44} \leftarrow 44_{2,43}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	513 156.953(40)
$45_{2,44} \leftarrow 44_{2,43}$	$44 \frac{1}{2} \leftarrow 43 \frac{1}{2}$	514 913.660(40)
	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	514 971.165(40)
$46_{1,46} \leftarrow 45_{1,45}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	520 356.902(40)
	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	520 429.448(40)
$46_{6,41} \leftarrow 45_{6,40}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	522 054.939(40)
	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	522 117.919(40)
$46_{6,40} \leftarrow 45_{6,39}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	522 054.939(40)
	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	522 117.919(40)
$46_{5,42} \leftarrow 45_{5,41}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	523 073.565(40)
	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	523 136.702(40)
$46_{5,41} \leftarrow 45_{5,40}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	523 073.565(40)
	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	523 136.702(40)
$46_{0,46} \leftarrow 45_{0,45}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	523 049.757(40)
	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	523 122.613(40)
$46_{2,45} \leftarrow 45_{2,44}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	524 413.130(40)
	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	524 478.717(40)
$46_{2,44} \leftarrow 45_{2,43}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	526 349.806(40)
	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	526 407.079(40)
$46_{4,43} \leftarrow 45_{4,42}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	523 895.018(40)
	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	523 958.188(40)
$46_{4,42} \leftarrow 45_{4,41}$	$45 \frac{1}{2} \leftarrow 44 \frac{1}{2}$	523 896.534(40)
	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	523 959.707(40)
$47_{6,42} \leftarrow 46_{6,41}$	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	533 346.393(40)
	$47 \frac{1}{2} \leftarrow 46 \frac{1}{2}$	533 409.347(40)
$47_{6,41} \leftarrow 46_{6,40}$	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	533 346.393(40)
	$47 \frac{1}{2} \leftarrow 46 \frac{1}{2}$	533 409.347(40)
$47_{5,43} \leftarrow 46_{5,42}$	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	534 384.659(40)
	$47 \frac{1}{2} \leftarrow 46 \frac{1}{2}$	534 447.855(40)
$47_{5,42} \leftarrow 46_{5,41}$	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	534 384.659(40)
	$47 \frac{1}{2} \leftarrow 46 \frac{1}{2}$	534 447.855(40)
$47_{4,44} \leftarrow 46_{4,43}$	$46 \frac{1}{2} \leftarrow 45 \frac{1}{2}$	535 223.325(40)

$47_{4,43} \leftarrow 46_{4,42}$	$46\frac{1}{2} \leftarrow 45\frac{1}{2}$	535 225.072(40)
$47_{2,45} \leftarrow 46_{2,44}$	$46\frac{1}{2} \leftarrow 45\frac{1}{2}$	537 784.368(40)
	$47\frac{1}{2} \leftarrow 46\frac{1}{2}$	537 841.554(40)

^{a)} The figures in parentheses are the authors' estimates of experimental uncertainty (1 σ).

Molecular parameters for ⁸⁸Sr¹⁴N³H₂ (SrND₂)

Parameter	Value	Method	Ref.
State: electronic \tilde{X}^2A_1 ; vibrational zero-point level			
<i>A</i>	[MHz] 196 565(12) ^{a)}	MW	00Tho
<i>B</i>	[MHz] 5 815.970 4(49)		
<i>C</i>	[MHz] 5 633.568 6(36)		
<i>D_K</i>	[MHz] 0.0 ^{b)}		
<i>D_{NK}</i>	[MHz] 0.914 01(90)		
<i>D_N</i>	[kHz] 4.108 38(60)		
<i>d₁</i>	[kHz] – 0.176 65(60)		
<i>d₂</i>	[Hz] – 80.25(56)		
<i>H_{KN}</i>	[kHz] – 2.087(63)		
<i>H_{NK}</i>	[Hz] 16.41(42)		
<i>H_N</i>	[Hz] 0.0 ^{b)}		
<i>h₁</i>	[kHz] 0.0 ^{b)}		
<i>h₂</i>	[Hz] 1.52(20)×10 ^{–3}		
<i>h₃</i>	[kHz] 0.462(53)×10 ^{–3}		
<i>L_{KKN}</i>	[kHz] – 5.5(22)		
<i>L_{NK}</i>	[Hz] 0.085(18)		
<i>L_{NNK}</i>	[Hz] – 0.282(79)×10 ^{–3}		
<i>P_{KN}</i>	[Hz] – 0.124(31)		
<i>P_{NKK}</i>	[Hz] – 0.73(25)×10 ^{–3}		
<i>P_{NNK}</i>	[Hz] – 5.1(25)×10 ^{–6}		
<i>P_{NK}</i>	[Hz] 0.0 ^{b)}		
<i>ε_{aa}</i>	[MHz] 91.3(23)		
<i>ε_{bb}</i>	[MHz] 51.526(79)		
<i>ε_{cc}</i>	[MHz] 76.841(69)		
<i>D_{NK}^s</i>	[Hz] – 1.84(42)		

^{a)} The numbers in parentheses represent 3 standard deviations of the least-squares fit, in units of the last quoted decimal place.

^{b)} Parameter constrained to this value in the least-squares fit.

Reference for SrNH₂

00Tho Thompsen, J.M., Sheridan, P.M., Ziurys, L.M. : Chem.Phys.Letts. **330** (2000) 373.