

All observed transition frequencies to the five excited states of singlet and *ungerade* symmetry with rovibrational levels below the second dissociation limit of D₂ are listed in Tables I–V: Table I lists the transitions to

the $B^1\Sigma_u^+$ state, Table II to the $B'^1\Sigma_u^+$ state, Table III to the $C^1\Pi_u$ state, Table IV to the $D^1\Pi_u$ state, and Table V to the $B''^1\Sigma_u^+$ state.

TABLE I: Observed transition frequencies of the $B^1\Sigma_u^+-X^1\Sigma_g^+$ bands of D_2 . The values are in cm^{-1} and in superscript the estimated uncertainty is given. Blended lines are indicated with ^b.

J	$P(J)$	$R(J)$	$P(J)$	$R(J)$	$P(J)$	$R(J)$	$P(J)$	$R(J)$	$P(J)$	$R(J)$
0-0		1-0		2-0		3-0		4-0		
0		90653.18 ³		91594.78 ³		92517.03 ³		93421.10 ³		94307.66 ³
1	90573.69 ³	90632.74 ³	91516.00 ³	91572.90 ³	92438.88 ³	92493.90 ³	93343.52 ³	93396.84 ³	94230.61 ³	94282.37 ³
2	90474.11 ³	90572.25 ³	91415.72 ³	91510.26 ³	92337.96 ³	92429.39 ³	93242.03 ³	93330.64 ³	94128.60 ³	94214.63 ³
3		90471.83 ⁶	91275.39 ³	91407.10 ³	92196.36 ³	92323.76 ³	93099.31 ³	93222.83 ³	93984.82 ³	94104.81 ³
4			91095.59 ⁶	91263.90 ⁶	92014.73 ⁶	92177.62 ³	92915.99 ³	93073.93 ³	93799.97 ³	93953.39 ³
5-0		6-0		7-0		8-0		9-0		
0		95177.16 ³		96029.88 ³		96866.12 ^b		97685.98 ³		98489.67 ³
1	95100.59 ³	95150.90 ³	95953.76 ³	96002.72 ³	96790.41 ³	96838.11 ³	97610.68 ³	97657.15 ³	98414.76 ³	98460.06 ³
2	94998.10 ³	95081.76 ³	95850.81 ³	95932.22 ³	96687.04 ³	96766.33 ³	97506.90 ³	97584.17 ³	98310.59 ³	98385.90 ³
3	94853.37 ³	94970.03 ³	95705.20 ³	95818.73 ³	96540.56 ³	96651.15 ³	97359.61 ³	97467.36 ³	98162.51 ³	98267.57 ³
4	94667.09 ³	94816.31 ³	95517.60 ³	95662.80 ³	96351.70 ³	96493.13 ³	97169.51 ³	97307.37 ³	97971.24 ³	98105.67 ³
10-0		11-0		12-0		13-0		14-0		
0		99277.32 ³		100049.18 ³		100805.26 ³		101546.07 ³		102271.41 ³
1	99202.81 ³	99246.95 ³	99975.02 ³	100018.10 ³	100731.56 ³	100773.54 ³	101472.59 ³	101513.64 ³	102198.30 ³	102238.27 ³
2	99098.27 ³	99171.69 ³	99870.12 ³	99941.76 ³	100626.28 ³	100696.12 ³	101366.99 ³	101435.26 ³	102092.34 ³	102158.84 ³
3	98949.40 ³	99051.83 ³	99720.58 ³	99820.53 ³	100475.99 ³	100573.46 ³	101216.09 ³	101311.38 ³	101940.72 ³	102033.56 ³
4	98757.01 ³	98888.12 ³	99527.09 ³	99655.05 ³	100281.47 ³	100406.22 ³	101020.65 ³	101142.69 ³	101744.20 ³	101863.06 ³
5		98681.25 ⁶			100195.24 ⁶					
15-0		16-0		17-0		18-0		19-0		
0		102981.69 ³		103676.91 ³		104357.52 ³		105023.31 ³		
1	102908.85 ³	102948.01 ³	103604.44 ³	103642.53 ³	104285.20 ³	104322.80 ³	104951.40 ³	104987.75 ³	105603.14 ³	105636.08 ³
2	102802.62 ³	102867.83 ³	103497.83 ³	103561.23 ³	104178.45 ³	104241.31 ³	104844.24 ³	104904.70 ³	105497.31 ³	105553.10 ³
3	102650.47 ³	102741.61 ³	103344.93 ⁶	103433.46 ³	104024.82 ^b	104118.16 ³	104690.24 ⁶	104774.59 ³		105422.16 ³
4	102453.18 ⁶	102570.52 ³	103146.56 ³	103259.86 ³	103826.75 ³	103933.12 ³	104490.06 ⁶			105244.39 ³
5		102342.13 ⁶								
20-0		21-0		22-0		23-0		24-0		
0		106312.08 ³		106935.16 ³		107544.74 ³		108140.33 ³		108722.69 ³
1	106240.76 ³	106275.42 ³	106864.24 ³	106897.68 ³	107473.90 ³	107507.03 ³	108069.90 ³	108101.91 ³	108652.38 ³	108684.02 ³
2	106133.05 ³	106190.73 ³	106756.07 ³	106811.92 ³	107365.70 ³	107420.82 ³	107961.26 ³	108014.65 ³	108543.66 ³	108596.41 ³
3		106058.45 ³	106600.14 ³	106678.36 ^b	107209.41 ⁶	107286.52 ³	107804.37 ³	107879.03 ³	108386.49 ⁶	108460.45 ⁶
4				106497.64 ⁶		107599.95 ⁶	107695.73 ³	108181.79 ⁶		
25-0		26-0		27-0		28-0		29-0		
0		109291.46 ³		109847.39 ³		110389.92 ³		110920.19 ³		111436.88 ³
1	109221.50 ³	109252.10 ³	109777.46 ³	109807.90 ³	110320.40 ³	110349.60 ³	110850.47 ³	110881.05 ³	111367.81 ³	111395.68 ^b
2	109112.41 ³	109163.39 ³	109668.30 ³	109719.21 ³	110210.86 ³	110259.50 ³	110741.15 ³	110776.25 ³	111257.80 ³	111304.21 ³
3		109025.79 ³	109510.34 ⁶		110052.26 ⁶		110583.56 ³	110643.40 ³	111098.08 ⁶	111162.94 ⁶
4	108748.72 ⁶	108840.10 ⁶					110455.44 ⁶			
30-0		31-0		32-0		33-0		34-0		
0		111940.80 ³		112433.32 ³		112912.58 ³		113379.86 ³		113834.40 ³
1	111872.50 ³	111898.61 ³	112364.65 ³	112391.24 ³	112844.37 ³	112869.76 ³	113311.76 ^b	113336.98 ³	113766.50 ³	113790.75 ³
2	111761.75 ³	111806.12 ³	112254.22 ³	112298.50 ³	112733.52 ³	112775.96 ³	113200.80 ³	113243.00 ³	113655.30 ³	113695.73 ³
3		111663.72 ⁶	112093.66 ⁶	112155.59 ⁶		112631.73 ⁶		113098.60 ⁶		
4										
35-0		36-0		37-0		38-0		39-0		
0		114276.76 ³		114706.32 ³		115123.58 ³		115527.52 ³		115918.74 ³
1	114208.96 ³	114233.10 ³	114638.86 ³	114661.88 ³	115056.13 ³	115079.18 ³	115460.49 ³	115482.22 ³	115851.62 ³	115873.92 ³
2	114097.70 ³	114138.02 ³	114527.58 ^b	114565.58 ³	114944.50 ³	114983.31 ³	115348.44 ³	115384.61 ³	115739.67 ³	115788.17 ^b
3				114418.01 ⁶					115576.46 ⁶	115627.47 ^b
40-0		41-0		42-0		43-0		44-0		
0		116295.64 ³		116659.07 ³		117006.06 ³		117338.29 ³		117650.23 ³
1	116229.07 ³	116249.40 ³	116592.16 ³	116618.38 ^b	116940.00 ³	116958.81 ³	117271.44 ³	117283.73 ³	117584.80 ³	117601.79 ³
2	116116.55 ³	116150.42 ³	116480.00 ³	116506.22 ³	116826.98 ³	116858.28 ³	117159.23 ³	117184.84 ³	117471.17 ³	117499.40 ³
3		115999.12 ⁶	116320.99 ^b	116356.13 ^b				117030.91 ⁶		
45-0		46-0		47-0		48-0		49-0		
0		117943.79 ³		118212.04 ³		118453.82 ³		118660.52 ^b		118824.72 ³
1	117877.81 ³	117888.42 ³	118147.39 ³	118162.43 ^b	118389.16 ³	118405.55 ³	118597.08 ³	118608.22 ³	118762.65 ³	118770.94 ^b
2	117764.74 ³	117787.38 ³	118032.96 ³	118057.22 ³	118274.74 ³	118293.17 ³	118481.48 ³	118500.00 ³		118660.52 ^b
50-0		51-0								
0		118936.51 ³		118989.87 ³						
1	118874.79 ⁶	118880.51 ³	118929.17 ⁶	118931.96 ^b						
2		118766.75 ⁶								

TABLE II: Observed transition frequencies of the $B' {}^1\Sigma_u^+ - X {}^1\Sigma_g^+$ bands of D_2 . The values are in cm^{-1} and in superscript the estimated uncertainty is given. Blended lines are indicated with ^b.

J	$P(J)$	$R(J)$	$P(J)$	$R(J)$	$P(J)$	$R(J)$	$P(J)$	$R(J)$	$P(J)$	$R(J)$				
		0-0			1-0			2-0			3-0			4-0
0		110841.93 ³			112205.74 ³			113490.86 ³			114690.73 ³			115800.42 ³
1		110834.61 ³	112121.09 ³		112195.62 ³	113407.26 ³		113478.67 ³	114609.61 ³		114673.86 ³	115720.04 ³		115781.77 ³
2	110662.79 ³	110793.64 ³	112026.67 ³		112150.61 ³	113311.76 ^b		113430.64 ³	114511.68 ³		114619.28 ³	115621.35 ³		115724.02 ³
3					112070.98 ³	113181.14 ³		113347.12 ³	114376.30 ³		114527.58 ^b	115484.23 ³		115627.47 ^b
4					111957.17 ⁶						114399.27 ³			115492.65 ^b
		5-0			6-0			7-0			8-0			9-0
0		116803.71 ³			117675.40 ³			118371.08 ³			118761.30 ³			118842.95 ³
1	116724.70 ³	116782.31 ³	117599.50 ³		117648.04 ³	118297.53 ³		118338.63 ³	118695.04 ³		118713.99 ^b	118778.74 ³		118792.43 ³
2	116624.63 ³	116720.42 ³	117496.32 ³		117577.68 ³	118192.01 ³		118259.91 ³	118582.23 ³		118611.96 ³	118663.87 ³		118684.60 ³
3	116484.76 ³	116618.38 ^b	117350.49 ³		117464.67 ³	118041.11 ³		118134.87 ³	118416.38 ⁶			118494.91 ⁶		118523.74 ³
4	116305.77 ³	116476.80 ³	117162.98 ⁶		117309.45 ³	117845.28 ⁶		117963.59 ⁶						
		10-0			11-0			12-0			13-0			
0		118916.30 ³			118968.98 ³			119005.19 ³			119028.13 ³			
1	118853.33 ³	118862.83 ³	118906.88 ³		118913.78 ³	118943.69 ³		118948.71 ³	118967.48 ³		118969.84 ³			
2	118737.22 ³	118752.93 ³	118789.90 ³		118801.23 ³	118826.11 ³		118833.90 ³	118849.08 ³					
3		118586.92 ⁶												

TABLE III: Observed transition frequencies of the $C^1\Pi_u-X^1\Sigma_g^+$ bands of D_2 . The values are in cm^{-1} and in superscript the estimated uncertainty is given. Blended lines are indicated with ^b.

J	$P(J)$	$Q(J)$	$R(J)$	$P(J)$	$Q(J)$	$R(J)$	$P(J)$	$Q(J)$	$R(J)$
0-0			1-0			2-0			
0			99424.97 ³			101085.37 ^b		102677.96 ³	
1		99364.90 ³	99427.14 ³		101025.27 ³	101085.37 ^b		102675.80 ³	
2	99245.89 ³	99307.05 ³	99400.50 ³	100906.38 ^b	100965.18 ³	101055.48 ³	102498.88 ³	102555.55 ³	
3	99129.63 ³	99220.64 ³	99345.17 ³	100787.88 ^b	100875.41 ³	100995.74 ³	102378.25 ³	102462.48 ³	
4	98985.85 ³	99106.07 ³	99261.43 ³	100640.82 ³	100756.44 ³	100906.38 ^b	102227.92 ³	102339.11 ³	
5					100608.74 ⁶	100787.88 ^b		102186.10 ³	
3-0			4-0			5-0			
0			104203.85 ³			105662.54 ³		107059.40 ³	
1		104143.77 ³	104199.30 ³		105603.94 ³	105660.43 ³		107051.09 ³	
2	104024.82 ^b	104079.27 ³	104162.25 ³	105483.49 ³	105537.34 ³	105619.88 ³	106880.30 ³	106931.79 ^b	
3	103901.77 ³	103982.97 ³	104088.99 ³	105362.82 ³	105437.82 ³	105547.12 ³	106753.52 ³	106827.61 ³	
4	103747.61 ³	103855.29 ³	103998.54 ³	105205.23 ³	105305.87 ³	105441.77 ³	106593.88 ³	106691.41 ³	
5					105142.02 ⁶			106522.37 ³	
6-0			7-0			8-0			
0			108389.69 ³			109655.36 ³		110855.96 ³	
1		108329.47 ³	108379.08 ³		109595.27 ³	109642.39 ³		110839.51 ³	
2	108210.59 ³	108258.63 ³	108333.13 ³	109476.28 ³	109522.28 ³	109592.74 ³	110676.89 ³	110721.08 ³	
3	108081.53 ³	108152.72 ³	108251.86 ³	109344.87 ³	109413.22 ³	109505.61 ³	110541.94 ³	110608.83 ³	
4	107918.49 ³	108012.30 ³	108135.19 ³	109178.09 ³	109268.61 ³	109371.58 ³	110386.60 ⁶	110459.95 ³	
5		107838.06 ³			109089.06 ⁶			110576.50 ³	
9-0			10-0			11-0			
0			111992.30 ³			113060.71 ³		114061.24 ³	
1		111931.61 ³	111975.68 ³		113000.46 ³	113041.56 ³		114039.57 ³	
2	111813.20 ³	111854.34 ³	111920.38 ³	112881.66 ³	112920.98 ³	112982.71 ³	113882.18 ³	113919.39 ³	
3	111678.18 ³	111738.85 ³	111826.59 ³	112744.09 ⁶	112802.20 ³	112884.22 ³	113742.04 ⁶	113797.21 ³	
4	111505.76 ⁶	111585.67 ³	111694.64 ³		112644.67 ³			113873.24 ³	
5		111395.68 ^b							
12-0			13-0			14-0			
0			114991.35 ³			115847.97 ³		116626.95 ³	
1		114931.37 ³	114967.02 ³		115788.17 ^b	115820.62 ³		116595.07 ³	
2	114812.28 ³	114847.28 ³	114900.24 ³	115668.89 ³	115701.61 ³	115747.64 ³	116447.88 ³	116478.28 ³	
3	114669.45 ⁶	114721.50 ³	114789.43 ³	115523.05 ⁶	115572.17 ³			116344.91 ³	
15-0			16-0			17-0			
0			117322.91 ³			117929.64 ³		118437.02 ³	
1		117263.98 ³	117297.52 ³		117870.57 ³	117900.48 ³		118395.12 ³	
2	117143.82 ³	117171.92 ³	117216.86 ³	117750.54 ^b	117775.32 ³	117814.99 ³	118257.93 ³	118278.69 ³	
3		117034.22 ³	117092.23 ⁶		117632.91 ⁶	117684.02 ⁶		118130.83 ⁶	
4		116851.28 ³							
18-0			19-0			20-0			
0			118831.41 ³			119085.89 ³			
1		118770.94 ^b	118787.30 ³		119026.04 ³	119035.99 ³		119097.21 ⁶	
2	118652.35 ³	118667.84 ³	118693.43 ⁶	118906.88 ³		118931.96 ^b			
3		118513.44 ⁶							

TABLE IV: Observed transition frequencies of the $D^1\Pi_u-X^1\Sigma_g^+$ bands of D_2 . The values are in cm^{-1} and in superscript the estimated uncertainty is given. Blended lines are indicated with ^b.

J	$P(J)$	$Q(J)$	$R(J)$	$P(J)$	$Q(J)$	$R(J)$	$P(J)$	$Q(J)$	$R(J)$
0-0				1-0			2-0		
0			113222.93 ³			114825.05 ³			116359.52 ³
1		113162.64 ³	113223.62 ³		114763.65 ³	114825.35 ³		116299.04 ³	116356.13 ^b
2	113043.89 ³	113102.85 ³	113194.62 ³	114646.00 ³	114701.66 ³	114795.50 ³	116180.43 ³	116234.88 ³	116320.99 ^b
3	112926.05 ⁶	113013.54 ³	113135.86 ⁶	114527.58 ^b	114609.05 ³	114734.97 ³	116058.59 ³	116139.03 ³	116254.02 ³
4		112895.16 ⁶		114380.80 ⁶		114645.53 ³	115906.31 ⁶	116012.02 ³	116155.25 ⁶
3-0									
0			117831.41 ³						
1		117770.25 ³	117827.01 ³						
2	117652.34 ³	117703.98 ³	117789.82 ³						
3	117529.47 ³	117604.96 ³	117719.59 ³						
4	117375.17 ³	117473.72 ³	117616.27 ³						

TABLE V: Observed transition frequencies of the $B''^1\Sigma_u^+-X^1\Sigma_g^+$ bands of D_2 . The values are in cm^{-1} and in superscript the estimated uncertainty is given. Blended lines are indicated with ^b.

J	$P(J)$	$R(J)$	$P(J)$	$R(J)$
		0-0		1-0
0		117224.14 ³		118714.41 ^b
1	117137.39 ³	117218.25 ³	118628.24 ³	118707.31 ³
2	117045.07 ³	117179.62 ³	118535.34 ³	118666.92 ³
3		117108.55 ⁶	118409.77 ³	118593.50 ³