Extreme ultraviolet laser excitation of isotopic molecular nitrogen: The dipole-allowed spectrum of $^{15}N_2$ and $^{14}N^{15}N$

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Data archive

This supplementary data archive contains the rotational line assignments and wave numbers for the ionization spectra discussed in the above article in *The Journal of Chemical Physics*, hereafter called *I*. Recommended term values are also given for the excited states, leading to the spectroscopic parameters given in *I*. The term values of the $X\,^1\Sigma_g^+(v=0)$ ground states of $^{15}N_2$ and $^{14}N^{15}N$ are tabulated in Table I up to $J = 30$. The term values of the ground state are calculated using the rotational constants of Bendtsen [J. Ram. Spectrosc. **32**, 989 (2001)]. Line positions and term values of the excited states of $^{15}N_2$ and $^{14}N^{15}N$ studied are tabulated in Tables II– XXII and XXIII– XXVII, respectively. Wave numbers given to three decimal places are from narrow-bandwidth pulsed dye-laser (PDA) spectra, those to two decimal places are from pulsed dye-laser (PDL) spectra. Wavenumbers derived from blended lines are flagged with an asterisk (∗), those from shoulders in the spectra by s, those from weak features by w, and doubtful assignments by ?. Line positions and term values of $^{14}N^{15}N$ which are blended with a $^{14}N_2$ line are labeled with $*'$ (s′ for shoulder). Wave numbers from PDA data which are relatively broad due to lifetime broadening or Doppler broadening are indicated with b. However, these relatively broad lines from the PDA data are significantly narrower than the lines from the PDL data.

In some of the spectra recorded with the PDL source, line broadening associated with the AC-Stark effect was observed, sometimes yielding asymmetric line shapes. This phenomenon was not investigated in detail, but the AC-Stark-induced shifts were compensated for by comparison with spectra obtained using the PDA source. For several bands, low-J lines were recorded with the PDA, while the entire band was recorded using the PDL at high laser intensity. Line positions from the PDA source were systematically lower by $\Delta_{\mathrm{PDL-PDA}} \approx 0.05 - 0.20$ cm^{-1}. Based on the observations with both systems, the PDL data were corrected for the AC-Stark shift, for those bands where ultra-high resolution PDA data were available. The PDL shifts are given in the captions of the tables. Due to the uncertain Stark shifts, the absolute wave-number uncertainty for the lines recorded with the PDL-based XUV source is ± 0.2 cm^{-1}, significantly worse than the calibration uncertainty of ± 0.05 cm^{-1}. The absolute calibration uncertainty for the PDA source is ± 0.003 cm^{-1}. This value represents a lower limit to the uncertainty for the narrowest spectral lines recorded. For lines where lifetime and/or Doppler broadening is of importance, the uncertainty is ± 0.02 cm^{-1}.

TABLE I: Term values for the $X\,^1\Sigma_g^+(v=0)$ ground states of $^{15}N_2$ and $^{14}N^{15}N$. All values in cm^{-1}.

J	$T_e(J)$ $^{15}N_2$	$T_e(J)$ $^{14}N^{15}N$	J	$T_e(J)$ $^{15}N_2$	$T_e(J)$ $^{14}N^{15}N$
0	0	0	16	504.906	522.826
1	3.715	3.847	17	567.967	588.123
2	11.146	11.541	18	634.726	657.249
3	22.291	23.083	19	705.179	730.199
4	37.151	38.470	20	779.325	806.972
5	55.724	57.703	21	857.161	887.565
6	78.011	80.782	22	938.684	971.976
7	104.011	107.705	23	1023.893	1060.202
8	133.723	138.472	24	1112.784	1152.239
9	167.146	173.082	25	1205.354	1248.085
10	204.279	211.532	26	1301.601	1347.736
11	245.120	253.823	27	1401.521	1451.190
12	289.668	299.953	28	1505.111	1558.442
13	337.923	349.920	29	1612.367	1669.489
14	389.882	403.722	30	1723.288	1784.328
15	445.543	461.358			

TABLE II: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(0,0)$ band of $^{15}N_2$, together with $b\,^1\Pi_u(v=0)$ term values. PDL shift is -0.03 cm^{-1}.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	100 846.073					
1	100 847.751	100 842.31		1	100 846.073	100 846.02
2	100 848.380	100 840.31	100 834.88	2	100 851.466	100 851.46
3	100 848.021	100 837.23	100 829.12	3	100 859.526	100 859.52
4	100 846.65	100 833.18	100 822.16∗	4	100 870.312	100 870.33
5	100 844.11	100 828.02	100 814.62∗	5	100 883.74	100 883.74
6		100 822.16∗	100 805.68	6	100 899.89∗	100 900.17
7	100 836.06	100 814.62∗	100 795.94	7	100 918.90∗	100 918.63
8		100 806.30	100 785.18	8	100 940.07	100 940.03
9	100 823.77	100 797.10		9		100 964.25
10				10	100 990.92	
11		100 775.70w		11		101 020.82w

TABLE III: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(1,0)$ band of $^{15}N_2$, together with $b\,^1\Pi_u(v=1)$ term values. PDL shift is -0.09 cm^{-1}.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	101 458.455b					
1	101 460.014sb	101 454.737b		1	101 458.455b	101 458.452b
2	101 460.465b	101 452.565b	101 447.17	2	101 463.729b	101 463.711b
3	101 459.890sb	101 449.310b	101 441.35	3	101 471.611b	101 471.601b
4	101 458.04	101 444.88	101 434.39	4	101 482.181b	101 482.03
5	101 455.336b	101 439.57	101 426.39	5	101 495.17	101 495.29
6	101 451.48	101 433.10∗	101 417.13s	6	101 511.060b	101 511.12∗
7	101 446.35	101 425.42	101 406.99∗	7	101 529.44	101 529.43
8	101 440.40	101 416.80s	101 395.66s	8	101 550.40	101 550.52s
9	101 433.10∗	101 406.99∗	101 383.30	9	101 574.21	101 574.13∗
10	101 424.96s	101 396.12s	101 370.02	10	101 600.27	101 600.40s
11	101 415.54	101 384.09	101 355.18	11	101 629.20	101 629.21
12	101 405.13	101 371.26	101 339.49	12	101 660.67	101 660.93
13	101 393.44	101 356.84	101 322.75	13	101 694.80	101 694.77
14	101 380.86	101 341.52	101 304.92	14	101 731.41	101 731.40
15	101 367.16	101 325.16	101 285.91	15	101 770.74	101 770.70
16	101 352.05	101 307.69	101 265.83	16	101 812.55	101 812.59
17	101 336.11	101 289.12	101 244.43	17	101 857.02	101 857.08
18	101 318.90	101 269.41	101 222.36	18	101 904.08	101 904.14
19	101 300.74	101 248.45	101 198.91	19	101 953.66	101 953.63
20	101 281.30	101 226.51	101 174.38w	20	102 005.87	102 005.84
21	101 260.79	101 203.34	101 148.66	21	102 060.63	102 060.51
22	101 239.04w	101 179.22w		22	102 117.93	102 117.90w
23	101 216.20	101 153.84	101 094.02w	23	102 177.73w	102 177.73
24		101 127.38w		24	102 240.09	102 240.17w
25	101 167.29w	101 099.78w		25		102 305.13w
26				26	102 372.64w	

TABLE IV: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(2,0)$ band of $^{15}N_2$, together with $b\,^1\Pi_u(v=2)$ term values. No PDL shift applied.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	102 131.34∗					
1	102 132.97∗	102 127.81∗		1	102 131.34∗	102 131.53∗
2	102 132.97∗	102 125.58		2	102 136.64	102 136.73
3	102 132.97∗	102 122.32	102 114.29	3	102 144.25	102 144.61
4	102 131.34∗	102 117.92∗	102 107.22	4	102 155.09	102 155.07∗
5	102 127.81∗	102 112.00∗	102 099.18	5	102 168.49∗	102 167.72∗
6	102 123.54s	102 105.58		6	102 183.54∗	102 183.59
7	102 117.92∗	102 097.50		7	102 201.55s	102 201.52
8	102 112.00∗	102 088.71		8	102 221.93∗	102 222.43
9	102 104.49s	102 078.83		9	102 245.72∗	102 245.97
10	102 095.75w	102 067.60		10	102 271.64s	102 271.88
11	102 085.88	102 055.13		11	102 300.02w	102 300.25
12	102 075.08w	102 041.47		12	102 331.00	102 331.14
13	102 062.87	102 026.52		13	102 364.74w	102 364.44
14	102 049.44w	102 010.70		14	102 400.79	102 400.58
15	102 035.36w	101 994.06		15	102 439.32w	102 439.60
16		101 975.81w		16	102 480.90w	102 480.72w
17	102 003.16w	101 956.50w		17		102 524.47w
18				18	102 571.12w	
19	101 965.86w			19		
20				20	102 671.03w	

TABLE V: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(3,0)$ band of $^{15}N_2$, together with $b\,^1\Pi_u(v=3)$ term values. No PDL shift applied.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	102 820.79s					
1	102 821.77∗	102 816.65∗		1	102 820.66s	102 820.37∗
2	102 821.77∗	102 814.45	102 809.38sw	2	102 825.56	102 825.60
3	102 821.77∗	102 811.10	102 803.34	3	102 833.17	102 833.39
4	102 819.60s	102 806.79∗	102 796.26	4	102 843.89	102 843.94∗
5	102 816.65∗	102 800.84	102 787.99	5	102 856.75	102 856.56
6	102 812.08s	102 794.22	102 778.74	6	102 872.20∗s	102 872.23
7	102 806.79∗	102 786.19	102 768.00s	7	102 890.07s	102 890.21
8		102 777.22	102 756.32s	8	102 910.80∗	102 910.95
9	102 792.71	102 766.83		9	102 933.79∗	102 933.97
10	102 783.88	102 755.47s	102 729.51∗	10	102 959.76	102 959.75s
11	102 773.82	102 743.19	102 714.54∗	11	102 988.16	102 988.31
12	102 762.71w	102 729.51∗	102 698.49∗	12	103 019.07	103 019.18∗
13	102 750.42	102 714.54∗	102 681.26∗	13	103 052.53w	103 052.46∗
14	102 736.95w	102 698.49∗	102 662.81∗w	14	103 088.54	103 088.37∗
15	102 722.25	102 681.26∗	102 643.19∗	15	103 126.83w	103 126.81∗
16		102 662.81∗w		16	103 167.80	103 167.71∗w
17	102 689.27w	102 643.19∗	102 599.84sw	17		103 211.16∗
18		102 623.10w		18	103 257.23w	103 257.83w
19	102 651.78w	102 601.07sw		19		103 306.24sw
20				20	103 356.96w	

TABLE VI: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(4,0)$ band of $^{15}N_2$, together with $b\,^1\Pi_u(v=4)$ term values. PDL shift is -0.18 cm^{-1}.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	103 488.08					
1	103 489.61	103 484.45∗		1	103 488.08	103 488.17∗
2	103 490.23s	103 482.26		2	103 493.34	103 493.41
3	103 489.29s	103 478.99	103 471.05	3	103 501.29s	103 501.28
4	103 487.75	103 474.60	103 464.05s	4	103 511.60s	103 511.75
5	103 484.90s∗	103 469.43	103 455.89s	5	103 524.90	103 525.15
6	103 481.27	103 462.84	103 446.65∗	6	103 540.69∗	103 540.85
7	103 476.26	103 455.31	103 436.75∗	7	103 559.28	103 559.32
8		103 446.65∗	103 425.25s	8	103 580.27	103 580.37∗
9	103 463.34s	103 436.75∗	103 413.21s	9	103 603.72	103 603.90∗
10	103 454.66s	103 425.97	103 399.44	10	103 630.20	103 630.25
11	103 445.32	103 414.03	103 385.08	11	103 658.96	103 659.15
12	103 434.82	103 400.86	103 369.30	12	103 690.54	103 690.53
13	103 423.17	103 386.87	103 352.69	13	103 724.57	103 724.79
14	103 411.57s	103 371.48	103 334.76	14	103 761.10	103 761.36
15	103 396.08∗	103 355.10	103 315.56	15	103 801.45s	103 800.64
16	103 380.88	103 337.05	103 296.55s	16	103 841.68	103 841.96
17	103 364.42	103 318.38	103 273.72	17	103 885.86	103 886.35
18	103 346.82s	103 298.41s	103 251.19w	18	103 932.54	103 933.14s
19	103 328.09	103 277.10	103 227.51	19	103 981.83ws	103 982.28
20	103 308.64w	103 254.82w	103 202.79w	20	104 033.41	104 034.15w
21	103 286.83s	103 231.08	103 176.37	21	104 087.53w	104 088.24
22		103 206.33w	103 148.74w	22	104 144.06	104 145.01w
23		103 180.28	103 120.17	23		104 204.17
25		103 123.61		25		104 328.96

TABLE VII: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(5,0)$ band of $^{15}N_2$, together with $b\,^1\Pi_u(v=5)$ term values. PDL shift is -0.20 cm^{-1}.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	104 615.82					
1	104 617.573	104 612.133		1	104 615.82	104 615.848
2	104 618.289	104 610.075	104 604.67	2	104 621.288	104 621.221
3	104 618.011	104 606.984	104 598.79s	3	104 629.435	104 629.275
4	104 616.82	104 602.88	104 592.13s	4	104 640.302	104 640.03
5	104 614.42	104 597.77	104 584.60*	5	104 653.92	104 653.49
6	104 611.31	104 591.60s	104 575.86	6	104 670.16	104 669.61s
7	104 607.092	104 584.60*	104 566.15	7	104 689.27	104 688.61*
8	104 601.94s	104 576.47	104 555.51	8	104 711.103	104 710.20
9	104 595.94	104 567.27	104 543.96	9	104 735.67	104 734.42
10	104 588.97	104 557.20	104 531.40	10	104 763.04	104 761.48
11	104 581.08	104 546.10	104 517.87	11	104 793.24	104 791.22
12	104 572.37	104 534.10	104 503.57	12	104 826.16	104 823.77
13	104 562.95	104 521.13	104 488.20	13	104 862.12	104 859.05
14	104 552.39	104 507.19	104 472.32	14	104 900.83	104 897.08
15	104 541.64	104 492.24	104 455.24	15	104 942.41	104 937.79
16		104 476.76	104 437.64	16	104 987.19	104 981.67
17		104 459.69		17		105 027.66
18		104 442.11		18		105 076.84

TABLE VIII: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(6,0)$ band of $^{15}N_2$, together with $b\,^1\Pi_u(v=6)$ term values. PDL shift is -0.13 cm^{-1}.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	105 237.202					
1	105 238.567	105 233.484		1	105 237.202	105 237.199
2	105 238.760	105 231.129	105 226.26	2	105 242.282	105 242.275
3	105 237.777	105 227.597	105 220.12	3	105 249.906	105 249.888
4	105 235.64	105 223.05	105 212.77	4	105 260.068	105 260.20
5	105 232.286	105 217.08	105 204.37	5	105 272.76	105 272.80
6	105 227.779	105 210.10	105 194.71	6	105 288.010	105 288.11
7	105 222.22	105 201.68	105 184.01	7	105 305.790	105 305.69
8	105 215.31	105 192.35	105 172.03	8	105 326.25	105 326.08
9	105 207.35	105 181.75	105 159.12	9	105 349.04	105 348.90
10	105 197.95	105 169.90	105 144.76	10	105 374.44	105 374.18
11	105 187.73	105 157.06	105 129.26	11	105 402.36	105 402.18
12	105 176.25	105 142.88	105 112.81	12	105 432.85	105 432.55
13	105 163.67	105 127.59		13	105 465.92	105 465.52
14	105 149.71	105 111.10		14	105 501.60	105 500.98
15	105 134.83			15	105 539.59	
16	105 118.35w			16	105 580.37	
17				17	105 623.25w	

TABLE IX: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(7,0)$ band of $^{15}N_2$, together with $b\,^1\Pi_u(v=7)$ term values. PDL shift is -0.19 cm^{-1}.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	105 981.332					
1	105 982.652	105 977.619		1	105 981.332	105 981.334
2	105 982.782	105 975.231	105 970.16	2	105 986.367	105 986.377
3	105 981.722	105 971.55∗	105 964.06	3	105 993.927	105 993.84∗
4	105 979.473	105 966.90	105 956.84	4	106 004.131	106 004.05
5	105 976.033	105 960.93	105 948.25	5	106 016.624	106 016.65
6	105 971.55∗	105 953.80	105 938.60	6	106 031.758	106 031.81
7	105 965.63	105 945.40	105 927.76	7	106 049.43	106 049.41
8	105 958.74	105 936.00	105 915.71	8	106 069.59	106 069.72
9	105 950.56	105 925.44	105 902.40	9	106 092.41	106 092.59
10	105 941.28	105 913.54	105 888.07	10	106 117.72	106 117.82
11	105 930.99	105 900.54	105 872.61	11	106 145.56	106 145.66
12	105 919.72	105 886.60	105 855.91s∗	12	106 176.12	106 176.27
13	105 907.08	105 871.50	105 838.23∗	13	106 209.29	106 209.42
14	105 893.64	105 855.42s∗	105 819.31	14	106 245.05	106 245.30s∗
15	105 879.23	105 838.23∗	105 799.54	15	106 283.52	106 283.77∗
16	105 863.80	105 820.17	105 778.61∗	16	106 324.70	106 325.08
17	105 847.69	105 801.32	105 756.67	17	106 368.67	106 369.29
18	105 830.65	105 781.45	105 733.90	18	106 415.62	106 416.18
19	105 812.94	105 760.90	105 710.40	19	106 465.28	106 466.08
20	105 794.77	105 739.69	105 685.86	20	106 518.16	106 519.02
21	105 776.18	105 718.18	105 661.03	21	106 574.10	106 575.34
22	105 757.38	105 696.19	105 635.36∗	22	106 633.39	106 634.87
23	105 738.33	105 674.08	105 609.53	23	106 696.07	106 697.97
24	105 719.56s			24	106 762.21	
25	105 700.99		105 556.83	25	106 832.36s	
26				26	106 906.35	

TABLE X: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(8,0)$ band of $^{15}N_2$, together with $b\,^1\Pi_u(v=8)$ term values. No PDL shift applied.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
1	106 767.40	106 762.34s		1		106 766.06s
2	106 767.87s	106 760.01		2	106 771.12	106 771.16
3	106 766.84	106 756.58	106 748.98∗	3	106 778.82	106 778.87
4	106 764.89	106 752.07∗	106 741.67	4	106 789.12	106 789.22∗
5	106 761.80	106 746.26∗	106 733.39	5	106 802.03	106 801.98∗
6	106 757.58	106 739.05∗	106 724.01	6	106 817.52	106 817.06∗
7	106 752.38∗	106 731.20	106 713.44s	7	106 835.59	106 835.21
8	106 746.26∗	106 722.07∗	106 701.98∗	8	106 856.31∗	106 855.79∗
9	106 739.05∗	106 712.16∗	106 689.09∗	9	106 879.90s	106 879.31∗
10	106 730.87s	106 701.08	106 675.62s	10	106 906.15	106 905.36
11	106 722.07∗	106 689.09∗	106 661.03	11	106 935.28	106 934.21∗
12	106 712.16∗	106 676.30	106 645.62	12	106 967.23	106 965.97
13	106 701.98∗	106 662.54	106 629.30	13	107 002.07	107 000.46
14	106 691.03	106 648.21	106 612.19	14	107 040.07	107 038.09
15	106 679.76	106 633.13	106 594.53	15	107 081.01	107 078.67
16	106 667.92	106 617.60	106 576.20	16	107 125.27	107 122.51
17	106 656.11	106 601.57	106 557.28	17	107 172.83	107 169.54
18	106 644.24	106 585.05		18	107 224.06	107 219.78
19	106 632.04	106 568.48s∗	106 518.86	19	107 278.97	107 273.66s∗
20	106 620.09	106 551.81s	106 499.60s	20	107 337.23	107 331.14
21	106 608.16			21	107 399.42	
22				22	107 465.33	

TABLE XI: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(9,0)$ band of $^{15}N_2$, together with $b\,^1\Pi_u(v=9)$ term values. No PDL shift applied.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	107 446.19					
1	107 447.10∗	107 442.61		1	107 446.19	107 446.33
2	107 447.10∗	107 439.75		2	107 450.95	107 450.90
3	107 444.83	107 435.51	107 428.66	3	107 457.84	107 457.80
4	107 441.58	107 429.97	107 420.69	4	107 467.14	107 467.12
5	107 436.79	107 423.06∗	107 411.44	5	107 478.73	107 478.78∗
6	107 430.70	107 414.58∗	107 400.72	6	107 492.48	107 492.59∗
7	107 423.06∗	107 404.72	107 388.43	7	107 508.69	107 508.73
8	107 414.58∗	107 393.43	107 374.95	8	107 527.35	107 527.15
9	107 404.17s	107 380.99	107 360.21	9	107 548.15	107 548.14
10	107 392.48	107 366.96	107 343.87	10	107 571.18	107 571.24
11	107 379.54	107 351.73	107 326.06	11	107 596.75	107 596.85
12	107 365.02	107 334.90	107 307.08	12	107 624.67	107 624.57
13	107 349.46	107 316.71	107 286.73	13	107 654.69	107 654.63
14		107 297.26	107 264.80	14	107 687.25	107 687.14
15	107 313.47	107 276.27	107 241.57	15		107 721.81
16	107 293.52	107 254.15		16	107 759.01	107 759.06
17	107 272.35			17	107 798.43	
18				18	107 840.32	

TABLE XII: Rotational line assignments and wave numbers for the $c_3\,^1\Pi_u - X\,^1\Sigma_g^+(0,0)$ band of $^{15}N_2$, together with $c_3\,^1\Pi_u(v=0)$ term values. PDL shift is -0.08 cm^{-1}.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	104 072.725b					
1	104 074.547b	104 069.052b∗		1	104 072.725b	104 072.767b∗
2	104 075.316b∗	104 067.199b	104 061.48s	2	104 078.262b	104 078.345b
3	104 075.316b∗	104 064.421b	104 056.07∗	3	104 086.462b	104 086.712b
4	104 074.306b	104 060.76∗	104 049.32	4	104 097.607b	104 097.91∗
5	104 072.224b	104 056.07∗	104 041.90	5	104 111.457b	104 111.79∗
6	104 069.17∗	104 050.54	104 033.40	6	104 127.948b	104 128.55
7	104 065.334b	104 044.06	104 023.90	7	104 147.22	104 148.07
8	104 060.76∗	104 036.61	104 013.53	8	104 169.345b	104 170.33
9	104 054.52	104 028.26	104 002.25	9	104 194.32	104 195.41
10	104 047.78	104 018.84	103 989.87	10	104 221.65	104 223.12
11	104 040.02	104 008.52	103 976.52	11	104 252.02	104 253.64
12	104 031.25	103 997.34	103 962.31	12	104 285.15	104 287.01
13	104 021.40	103 985.08	103 947.23	13	104 320.91	104 323.00
14	104 010.72	103 971.97∗	103 931.02	14	104 359.36	104 361.85∗
15	103 998.93	103 957.55∗	103 913.87	15	104 400.53	104 403.09∗
16		103 942.18	103 895.56	16	104 444.41	104 447.09
17	103 971.97∗	103 925.78	103 876.38	17	104 491.00	104 493.74
18	103 957.55∗	103 908.43	103 856.28	18	104 540.07	104 543.15
19	103 941.14	103 889.88	103 835.03	19	104 592.08	104 595.06
20	103 923.81	103 870.26	103 812.55w	20	104 646.35	104 649.58
21	103 905.65	103 849.48	103 789.21	21	104 703.21	104 706.64
22	103 886.08	103 827.62	103 764.60w	22	104 762.84	104 766.31
23	103 865.29	103 804.17	103 738.98w	23	104 824.76	104 828.07
24	103 843.62w	103 780.15w		24	104 889.29	104 892.94w
25	103 820.18	103 754.43	103 684.05w	25	104 956.41w	104 959.79
26	103 795.77w	103 727.53w		26	105 025.53	105 029.14w
27		103 699.30w		27	105 097.37w	105 100.82w

TABLE XIII: Rotational line assignments and wave numbers for the $c_3\,{}^1\Pi_u - X\,{}^1\Sigma_g^+(1,0)$ band of $^{15}N_2$, together with $c_3\,{}^1\Pi_u(v = 1)$ term values. No PDL shift applied.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	106 452.06					
1	106 454.66	106 448.34		1	106 452.06	106 452.06
2	106 456.59∗	106 447.13	106 441.04s	2	106 458.35	106 458.28
3	106 459.37∗	106 445.28	106 436.02	3	106 467.70	106 467.57
4	106 459.37∗	106 444.30s	106 430.55	4	106 481.56	106 481.45s
5	106 459.37∗	106 440.59	106 425.84	5	106 496.61	106 496.31
6		106 436.74	106 418.60	6	106 515.09∗	106 514.75
7	106 458.86s	106 431.85	106 411.08∗	7		106 535.86
8	106 456.59∗	106 429.21		8	106 562.98	106 562.93
9	106 453.06s	106 423.22	106 395.84	9	106 590.21	106 590.37
10	106 451.77s	106 416.52	106 385.93	10	106 620.28	106 620.80
11	106 445.98s	106 411.08∗	106 375.16	11	106 656.02s	106 656.20∗
12	106 439.61ws	106 402.73∗	106 366.33s	12	106 691.12	106 692.40∗
13	106 432.62	106 393.84	106 353.19	13	106 729.39	106 731.76
14	106 424.06	106 384.02	106 339.51	14	106 770.56	106 773.90
15	106 414.52	106 373.17	106 325.03	15	106 813.97	106 818.71
16	106 403.72	106 361.24	106 309.10s	16	106 860.10	106 866.15
17	106 391.87	106 347.92	106 292.17	17	106 908.61	106 915.89
18	106 379.15	106 333.27	106 273.86	18	106 959.87	106 968.00
19	106 365.47	106 317.11	106 254.71	19	107 013.93	107 022.29
20	106 350.56	106 299.10	106 234.66	20	107 070.68	107 078.43
21	106 334.16	106 279.51	106 213.53	21	107 129.89	107 136.67
22		106 258.11	106 191.36w	22	107 191.37	107 196.79
23		106 234.67∗	106 167.51	23	107 254.57w	107 258.56∗
24		106 209.50w	106 141.79w	24	107 319.98∗	107 322.28w
25		106 182.29	106 114.63∗	25	107 385.68w	107 387.64
26		106 153.37w	106 084.08w	26		107 454.97w
27		106 122.10w		27		107 523.62w

TABLE XIV: Rotational line assignments and wave numbers for the $o\,{}^1\Pi_u - X\,{}^1\Sigma_g^+(0,0)$ band of $^{15}N_2$, together with $o\,{}^1\Pi_u(v = 0)$ term values. PDL shift is -0.19 cm^{-1}.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	105 648.544					
1	105 651.206	105 644.602		1	105 648.543	105 648.317
2	105 653.434s	105 643.485	105 637.396	2	105 654.921	105 654.631
3	105 653.459s	105 641.820	105 632.630	3	105 664.579s	105 664.111
4	105 654.744	105 639.595w	105 627.424	4	105 675.751s	105 676.746
5	105 655.185w	105 636.805w	105 620.017s	5	105 691.895	105 692.529
6	105 654.946	105 633.444	105 613.875	6	105 710.910	105 711.455
7	105 654.072	105 629.507	105 606.889	7	105 732.961	105 733.518
8	105 652.574	105 624.985	105 599.240	8	105 758.088	105 758.708
9	105 650.364w	105 619.860s	105 590.946	9	105 786.302	105 787.006s
10	105 647.731w	105 613.963s	105 582.027	10	105 817.511w	105 818.242s
11	105 644.271	105 607.847	105 572.39	11	105 852.011w	105 852.967
12	105 640.217	105 600.828	105 562.33	12	105 889.392w	105 890.496
13	105 635.314	105 593.191	105 551.37	13	105 929.887	105 931.114
14		105 584.809	105 540.12w	14	105 973.239	105 974.691
15	105 623.275	105 575.686		15		106 021.229
16	105 615.86w	105 565.95		16	106 068.821	106 070.86
17	105 607.07s	105 555.54		17	106 120.77w	106 123.51
18	105 602.10			18	106 175.04s	
19	105 589.49			19	106 236.83	
20				20	106 294.68	
21	105 564.54			21		
22				22	106 421.71	

TABLE XV: Rotational line assignments and wave numbers for the $o\,^1\Pi_u - X\,^1\Sigma_g^+(1,0)$ band of $^{15}N_2$, together with $o\,^1\Pi_u(v=1)$ term values. No PDL shift applied.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	107 579.76					
1	107 582.59	107 575.99		1	107 579.76	107 579.71
2	107 584.81	107 575.08	107 568.66s	2	107 586.30	107 586.23
3	107 586.61	107 573.62	107 564.00	3	107 595.96	107 595.91
4	107 587.92ws*	107 571.75	107 558.82s	4	107 608.95	107 608.90
5	107 588.81*	107 569.41	107 553.28	5	107 625.11	107 625.13
6	107 589.24s*	107 566.62	107 547.10	6	107 644.50	107 644.63
7	107 588.81*	107 563.22	107 540.49	7	107 667.10*	107 667.23
8	107 588.42*	107 559.36	107 533.23*	8	107 692.93	107 693.08
9	107 587.28s	107 555.15	107 525.79	9	107 722.04	107 722.30
10		107 550.34	107 517.76	10	107 754.45	107 754.62
11	107 583.59s	107 545.07	107 509.33	11	107 789.95	107 790.19
12	107 580.94*	107 539.27s	107 500.29	12	107 828.81	107 828.94s
13	107 577.83	107 533.23*	107 490.88	13	107 870.66	107 871.15*
14		107 526.30s	107 480.83	14	107 915.89	107 916.18s
15	107 570.25s	107 519.17	107 470.35	15	107 964.31	107 964.71
16		107 511.59	107 459.41	16	108 015.82s	108 016.50
17	107 560.64s	107 503.48	107 447.89s	17		108 071.45
18		107 494.90		18	108 128.61s	108 129.63
19	107 548.66	107 485.77		19	108 189.77	108 190.95
20		107 476.18s*	107 410.45s	20	108 253.88	108 255.51s*
21		107 466.05	107 396.74	21		108 323.21
22		107 455.46		22		108 394.14

TABLE XVI: Rotational line assignments and wave numbers for the $b'\,^1\Sigma_u^+ - X\,^1\Sigma_g^+(1,0)$ band of $^{15}N_2$, together with $b'\,^1\Sigma_u^+(v=1)$ term values. PDL shift is -0.08 cm^{-1}.

J''	$R(J'')$	$P(J'')$	J	$T_e(J)$
0	104 422.045		0	104 419.90
1	104 422.626	104 416.18	1	104 422.045
2	104 421.637		2	104 426.341
3	104 419.27∗	104 404.17	3	104 432.783
4	104 414.98	104 395.67	4	104 441.50
5	104 409.31	104 385.71	5	104 452.13
6	104 402.05		6	104 465.03
7	104 393.38		7	104 480.06
8	104 383.00		8	104 497.39
9			9	104 516.72

TABLE XVII: Rotational line assignments and wave numbers for the $b'\,^1\Sigma_u^+ - X\,^1\Sigma_g^+(3,0)$ band of $^{15}N_2$, together with $b'\,^1\Sigma_u^+(v=3)$ term values. PDL shift is -0.19 cm^{-1}.

J''	$R(J'')$	$P(J'')$	J	$T_e(J)$
0	105 826.41s∗		0	105 824.43sw
1	105 827.06	105 820.71sw	1	105 826.48
2	105 826.17s∗	105 815.33	2	105 830.83
3	105 823.67	105 808.59	3	105 837.42s
4	105 819.30∗	105 800.27sw	4	105 845.98
5	105 813.90	105 790.27	5	
6	105 806.92	105 778.62∗	6	105 869.66
7	105 798.07	105 765.68	7	105 884.91
8	105 787.80	105 751.17	8	105 902.03
9	105 775.71s	105 734.84	9	105 921.46
10	105 762.34s	105 717.14	10	105 943.05
11	105 747.25	105 697.93	11	105 966.53
12	105 730.67	105 676.87	12	105 992.40
13	105 712.31	105 654.480w	13	106 020.33
14	105 692.61w	105 630.430w	14	106 050.23
15	105 671.11?	105 604.68	15	106 082.52
16		105 577.65	16	106 116.77
17	105 624.210w	105 548.81	17	
18	105 593.569		18	106 192.181w
19	105 568.08		19	106 228.298
20			20	106 273.27

TABLE XVIII: Rotational line assignments and wave numbers for the $b'\,^1\Sigma_u^+ - X\,^1\Sigma_g^+(4,0)$ band of $^{15}N_2$, together with $b'\,^1\Sigma_u^+(v=4)$ term values. No PDL shift applied.

J''	$R(J'')$	$P(J'')$	J	$T_e(J)$
0	106 570.47∗		0	
1	106 571.31s∗		1	106 570.47∗
2	106 570.47∗		2	106 574.92s∗
3	106 568.92s∗	106 552.51s∗	3	106 581.83
4	106 565.79	106 544.68	4	106 591.21∗
5	106 561.51	106 535.49∗	5	106 603.03
6	106 555.97	106 525.11	6	106 617.27
7	106 549.24	106 513.30	7	106 634.00
8	106 541.33w	106 500.30	8	106 653.21
9	106 532.45	106 486.03	9	106 675.03
10	106 522.81	106 470.75	10	106 699.59
11	106 512.36s		11	106 727.09
12	106 501.47s		12	106 757.49s
13	106 490.34		13	106 791.17
14	106 478.96s	106 401.29	14	106 828.24
15		106 382.66	15	106 868.82
16		106 363.92	16	106 912.80
17		106 344.84	17	106 960.94s
18		106 326.21s	18	107 012.52
19		106 307.34	19	107 067.75sw
20		106 288.43s∗	20	107 126.63
21	106 398.55∗	106 269.47	21	107 189.09w
22		106 250.41w	22	107 255.70
23	106 377.02sw	106 231.81	23	
24			24	107 400.84
25	106 356.88w	106 195.49	25	107 479.63
26		106 178.03	26	107 562.14w
27		106 160.53w	27	

TABLE XIX: Rotational line assignments and wave numbers for the $b'\,^1\Sigma_u^+ - X\,^1\Sigma_g^+(5,0)$ band of $^{15}N_2$, together with $b'\,^1\Sigma_u^+(v=5)$ term values. No PDL shift applied.

J''	$R(J'')$	$P(J'')$	J	$T_e(J)$
0			0	107 227.44
1	107 230.24	107 223.72	1	107 229.73
2	107 229.43s	107 218.58s	2	107 234.00
3	107 226.74	107 211.74	3	107 240.56
4	107 222.86s	107 203.41	4	107 249.10
5	107 217.33	107 193.45	5	107 260.06
6	107 210.30	107 182.05	6	107 272.99
7	107 201.59	107 168.91	7	107 288.31
8	107 191.28		8	107 305.60
9	107 179.67		9	107 325.00
10	107 166.16		10	107 346.81
11			11	107 370.44
17			17	107 558.95
18		106 924.22	18	107 597.92
19		106 892.74	19	107 639.04
20		106 859.72	20	107 682.31
21	106 918.59	106 825.15	21	107 727.87
22	106 887.15	106 789.19	22	107 775.76
23	106 854.45	106 751.75s	23	107 825.84
24	106 820.31	106 712.89s∗	24	107 878.28
25	106 785.10	106 672.85	25	107 933.11
26			26	107 990.49
27		106 589.01w	27	

TABLE XX: Rotational line assignments and wave numbers for the $b'\,^1\Sigma_u^+ - X\,^1\Sigma_g^+(6,0)$ band of $^{15}N_2$, together with $b'\,^1\Sigma_u^+(v=6)$ term values. No PDL shift applied.

J''	$R(J'')$	$P(J'')$	J	$T_e(J)$
0	107 877.12s∗		0	107 875.00s∗
1	107 878.02	107 871.28s∗	1	107 877.15s
2	107 877.36s∗	107 866.00s	2	107 881.76
3	107 875.38	107 859.49	3	107 888.47s
4	107 871.84s∗	107 851.32s	4	107 897.64
5	107 866.63	107 841.88	5	107 908.96s∗
6	107 860.10s	107 830.92s∗	6	107 922.40
7	107 852.02	107 818.43	7	107 938.11s
8	107 842.60s	107 804.66∗	8	107 956.04
9	107 831.47s∗	107 788.91∗	9	107 976.32s
10	107 818.94s	107 771.97∗	10	107 998.54
11	107 804.66∗	107 753.42∗	11	108 023.09s
12	107 788.91∗	107 733.29s	12	108 049.90
13	107 771.97∗	107 711.97	13	108 078.88
14	107 753.42∗	107 689.00	14	108 109.69
15	107 732.69	107 664.15	15	108 142.96
16	107 710.56s	107 638.06	16	108 178.27
17	107 687.54	107 610.36	17	108 215.59s
18	107 662.59s	107 580.97ws	18	108 255.51
19	107 635.93		19	108 297.31s
20	107 607.98		20	108 341.12
21			21	108 387.31

TABLE XXI: Rotational line assignments and wave numbers for the $c_4'\,^1\Sigma_u^+ - X\,^1\Sigma_g^+(0,0)$ band of $^{15}N_2$, together with $c_4'\,^1\Sigma_u^+(v=0)$ term values.

J''	$R(J'')$	J	$T_e(J)$
0	104 329.845	0	
1	104 333.285	1	104 329.845
2	104 336.581	2	104 337.000
3	104 339.730	3	104 347.727
4		4	104 362.021

TABLE XXII: Rotational line assignments and wave numbers for the $c_4'\,^1\Sigma_u^+ - X\,^1\Sigma_g^+(1,0)$ band of $^{15}N_2$, together with $c_4'\,^1\Sigma_u^+(v=1)$ term values. No PDL shift applied.

J''	$R(J'')$	$P(J'')$	J	$T_e(J)$
0	106 311.13		0	106 307.90
1	106 313.86	106 304.18	1	106 311.10
2	106 316.16	106 299.92	2	106 317.60
3	106 317.85∗	106 295.32	3	106 327.35
4	106 319.00∗	106 290.24	4	106 340.09
5	106 319.65∗	106 284.37	5	106 356.21
6	106 319.65∗	106 278.20	6	106 375.34
7	106 319.00∗	106 271.33	7	106 397.79
8	106 317.85∗	106 264.07	8	106 423.04
9	106 315.60	106 255.90	9	106 451.47
10	106 312.58	106 247.19	10	106 482.73
11	106 308.65	106 237.60	11	106 516.87
12	106 303.47s	106 227.21	12	106 553.78
13	106 296.82	106 215.85	13	106 593.04
14	106 288.78	106 203.16	14	106 634.81
15	106 278.59s	106 189.32	15	106 678.64
16	106 266.34w	106 173.72	16	106 724.22
17	106 251.71w	106 156.26	17	106 771.19
18	106 234.65∗	106 136.40	18	106 819.68w
19	106 214.50ws	106 114.63∗	19	106 869.17
20	106 191.34w	106 089.85	20	106 919.79
21	106 166.38	106 062.63	21	106 970.67w
22	106 138.28		22	107 023.54
23	106 108.07		23	107 076.96
24			24	107 131.96

TABLE XXIII: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(5,0)$ band of $^{14}N^{15}N$, together with $b\,^1\Pi_u(v=5)$ term values. PDL shift is -0.14 cm^{-1}.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	104 659.674					
1	104 661.418	104 655.805		1	104 659.674	104 659.652
2	104 662.110	104 653.661	104 648.17w	2	104 665.265	104 665.202
3	104 661.760	104 650.51*′	104 642.07	3	104 673.651	104 673.59*′
4	104 660.371	104 646.18	104 635.23	4	104 684.843	104 684.65
5	104 657.91	104 640.70	104 627.00**′	5	104 698.841	104 698.40
6	104 654.44s	104 634.44	104 618.45*	6	104 715.67	104 715.23
7	104 649.79s*′	104 627.00**′	104 608.02	7	104 735.18ss′	104 734.71**′
8	104 644.54w	104 618.45*	104 596.66s′	8	104 757.60s′s*′	104 756.92*
9		104 609.02	104 584.62s′	9	104 783.10	104 782.10
10		104 598.28s′	104 571.66	10	104 811.26	104 809.81s′
11		104 586.71	104 557.43	11	104 842.44	104 840.54
12		104 574.09	104 542.48	12	104 876.25s′	104 874.04
13		104 560.59	104 526.33s′	13	104 913.10	104 910.51
14			104 509.38	14	104 952.95s′w	
15		104 530.50s′w	104 491.59s′w	15	104 995.78s′w	104 991.86s′w
16		104 513.88s′	104 472.95s′w	16	105 041.60w	105 036.71s′
17		104 496.39w	104 453.47w	17	105 090.73w	105 084.51w
18			104 433.48w	18		
19		104 458.88w		19		105 189.08w
20		104 438.56w		20		105 245.53w

TABLE XXIV: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(6,0)$ band of $^{14}N^{15}N$, together with $b\,^1\Pi_u(v=6)$ term values. PDL shift is -0.16 cm^{-1}.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	105 293.848					
1	105 295.267	105 289.997		1	105 293.848	105 293.844
2	105 295.472	105 287.567	105 282.35w	2	105 299.114	105 299.108
3	105 294.461	105 283.95s′*		3	105 307.013	105 307.04s′*
4	105 292.13*′	105 279.13*′	105 268.57w	4	105 317.544	105 317.60*′
5	105 288.73ss′	105 273.03	105 259.88w	5	105 330.60*′	105 330.74
6	105 283.95s′*	105 265.62*′		6	105 346.44ss′	105 346.41*′
7	105 278.26s	105 257.11		7	105 364.74s′*	105 364.82
8	105 271.20w			8	105 385.97s	
9		105 236.43w		9	105 409.68w	105 409.51w
10		105 224.33w		10		105 435.86w

TABLE XXV: Rotational line assignments and wave numbers for the $b\,^1\Pi_u - X\,^1\Sigma_g^+(7,0)$ band of $^{14}N^{15}N$, together with $b\,^1\Pi_u(v=7)$ term values. No PDL shift applied.

J''	$R(J'')$	$Q(J'')$	$P(J'')$	J	$T_e(J)$	$T_f(J)$
0	106 047.77∗					
1	106 048.93∗	106 043.72		1	106 047.71	106 047.57
2	106 048.93∗	106 041.289bs′	106 036.11	2	106 052.77	106 052.830bs′
3	106 047.77∗	106 037.51	106 029.68	3	106 060.52	106 060.60
4	106 045.46	106 032.47	106 022.09	4	106 070.89	106 070.94
5	106 041.81s	106 026.21	106 013.22	5	106 083.94	106 083.91
6	106 036.91s	106 018.66	106 003.17	6	106 099.53	106 099.44
7	106 030.73	106 010.04	105 991.84	7	106 117.66	106 117.74
8	106 023.38	106 000.14	105 979.16	8	106 138.43	106 138.61
9	106 014.71	105 988.85	105 965.34	9	106 161.86	106 161.94
10		105 976.35	105 950.35	10	106 187.67	106 187.88
11		105 962.72	105 933.74	11	106 216.52	106 216.54
12		105 947.81	105 916.56	12		106 247.76
13		105 931.70		13		106 281.62
14		105 914.58		14		106 318.30

TABLE XXVI: Rotational line assignments and wave numbers for the $c_3\,^1\Pi_u - X\,^1\Sigma_g^+(0,0)$ band of $^{14}N^{15}N$, together with $c_3\,^1\Pi_u(v=0)$ term values.

J''	$R(J'')$	$Q(J'')$	J	$T_e(J)$	$T_f(J)$
0	104 107.794b				
1	104 109.669b	104 103.991b	1	104 107.794b	104 107.838b
2	104 110.521b∗	104 102.099b	2	104 113.516b	104 113.640b
3	104 110.521b∗		3	104 122.062b∗	
4	104 109.396b		4	104 133.604b∗	
5	104 107.335b		5	104 147.866b	
6	104 104.274b		6	104 165.038b	
7	104 100.269b		7	104 185.056b	
8			8	104 207.974b	

TABLE XXVII: Rotational line assignments and wave numbers for the $b'\,^1\Sigma_u^+ - X\,^1\Sigma_g^+(1,0)$ band of $^{14}N^{15}N$, together with $b'\,^1\Sigma_u^+(v=1)$ term values.

J''	$R(J'')$	$P(J'')$	J	$T_e(J)$
0	104 421.228s′		0	
1	104 421.840		1	104 421.233
2	104 420.817	104 409.696	2	104 425.687
3	104 418.177		3	104 432.358
4	104 413.916		4	104 441.260
5	104 408.039		5	104 452.386
6			6	104 465.742