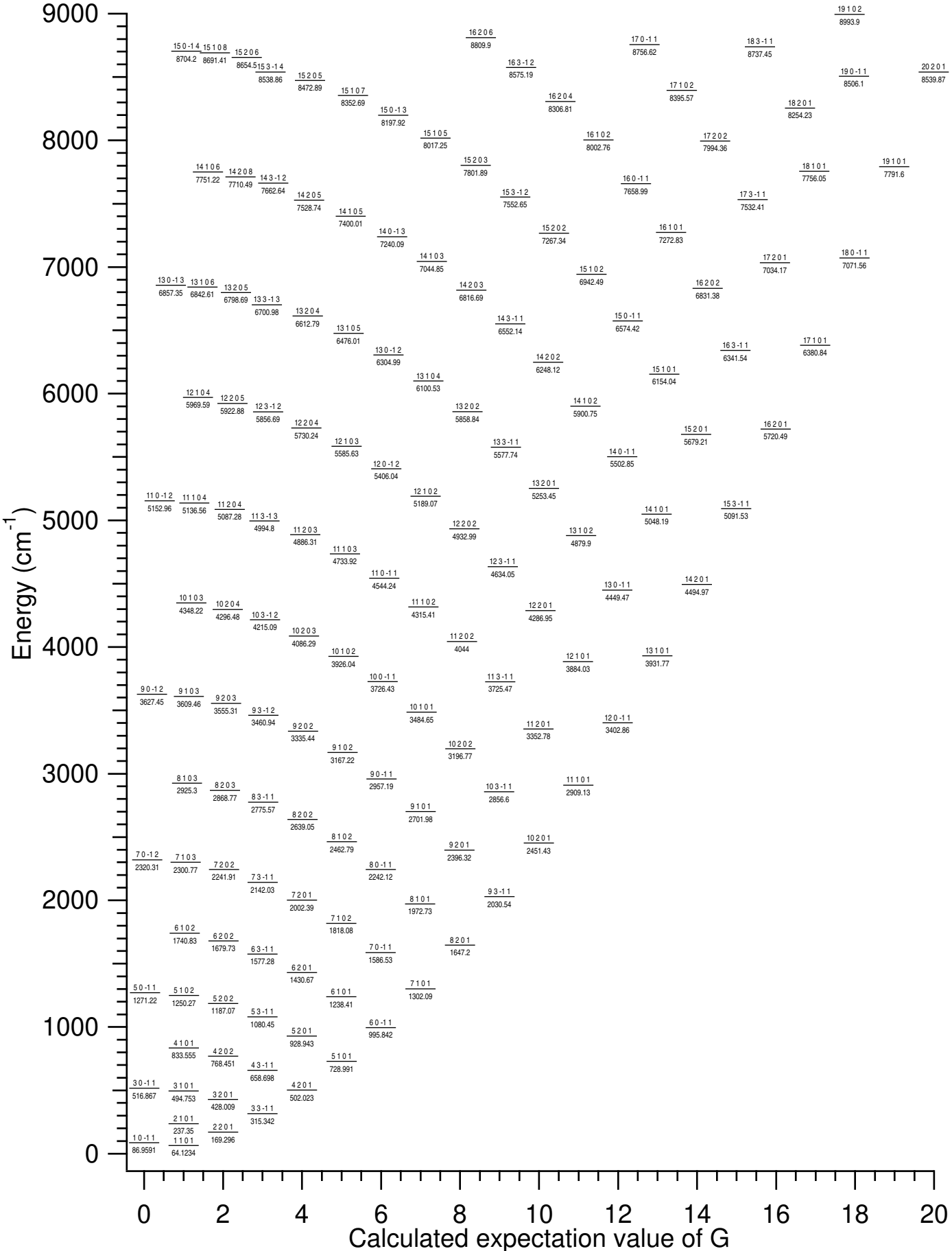
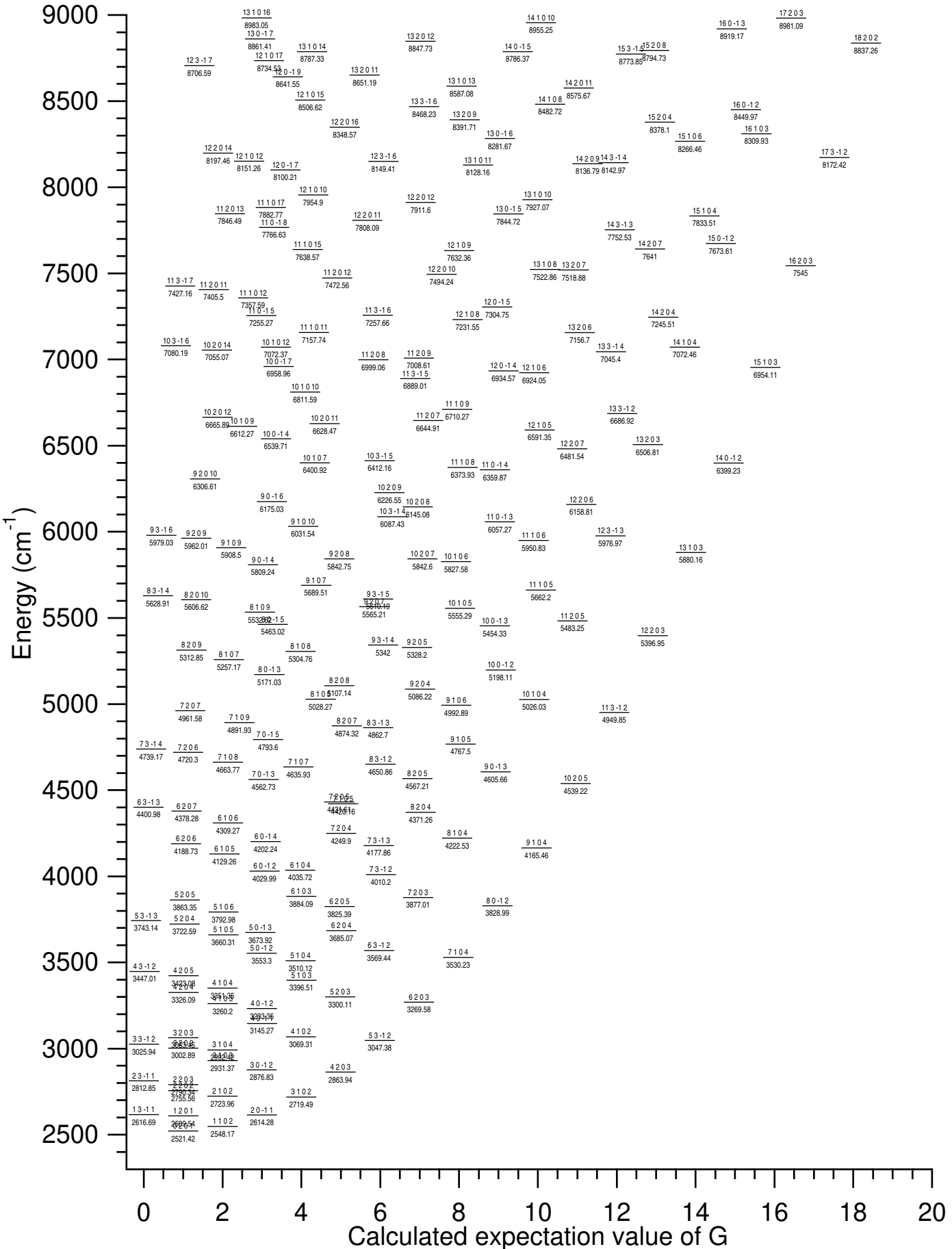
H_3^+ ENERGY LEVEL DIAGRAMS

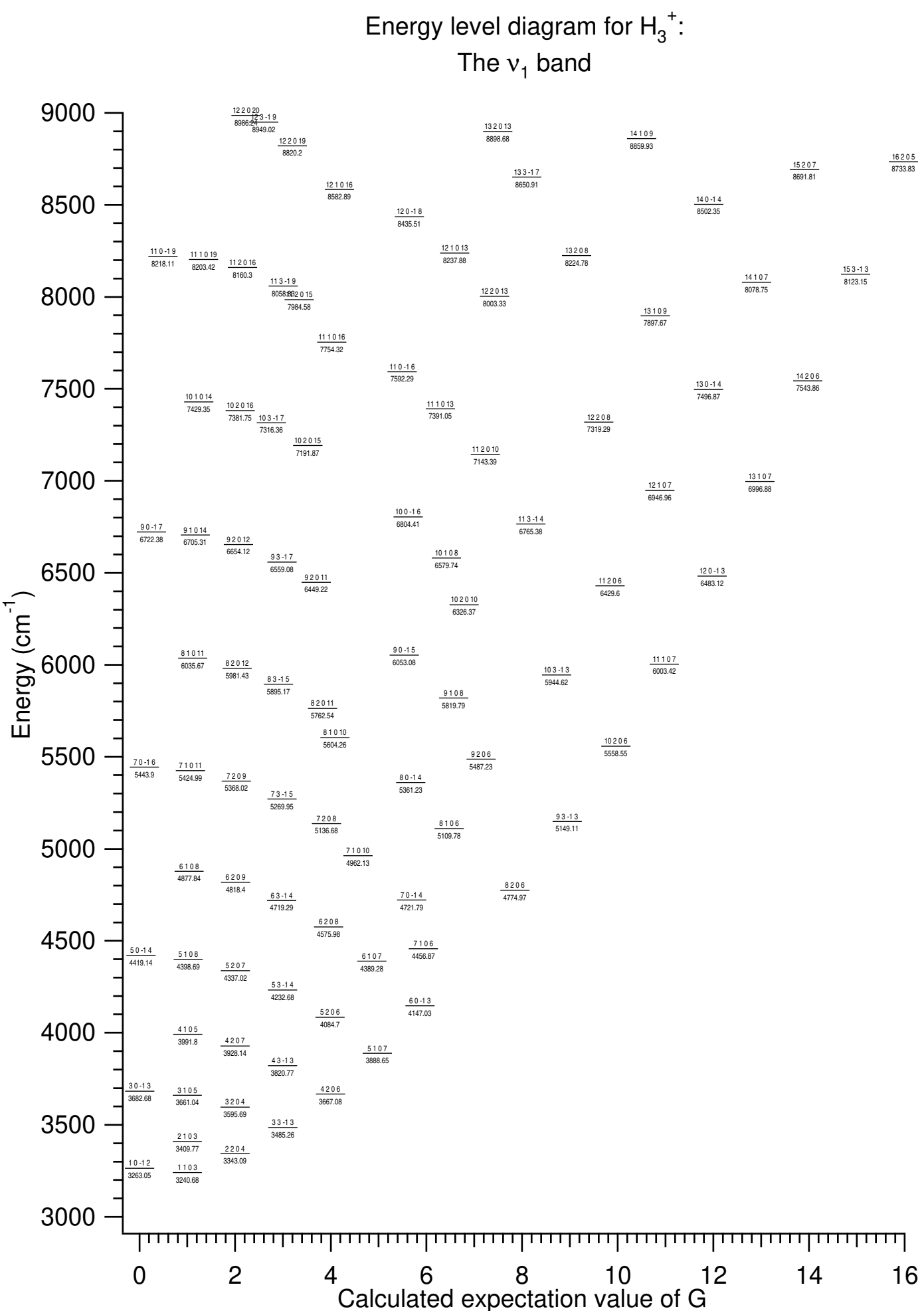
This postscript file contains the energy level diagrams for H_3^+ versus the approximate quantum number G. In the first 12 plots, the energy levels are separated into vibrational bands by rounding the expectation values of v_1, v_2, and ℓ and are plotted versus the expectation value of G. In the second set of plots, the energy levels are separated into the *ideal* bands and plotted versus the *ideal* value of G, each of which was assigned by the authors. See the text for a discussion of these assignments. It is easy to see from these diagrams that G is well behaved at lower energy. At higher energy, however, the states are heavily mixed, and it becomes difficult to identify the G of each level. The vibrational quantum numbers also begin to fail at higher energy as noted by some of the energy levels being assigned to new bands. All of the expectation values and energies used here are from the calculations of Watson. The four numbers above each energy level are the labels used by Watson: J, M, S, n—where J and n are the same as in the text. M and S are related to I and parity as follows:

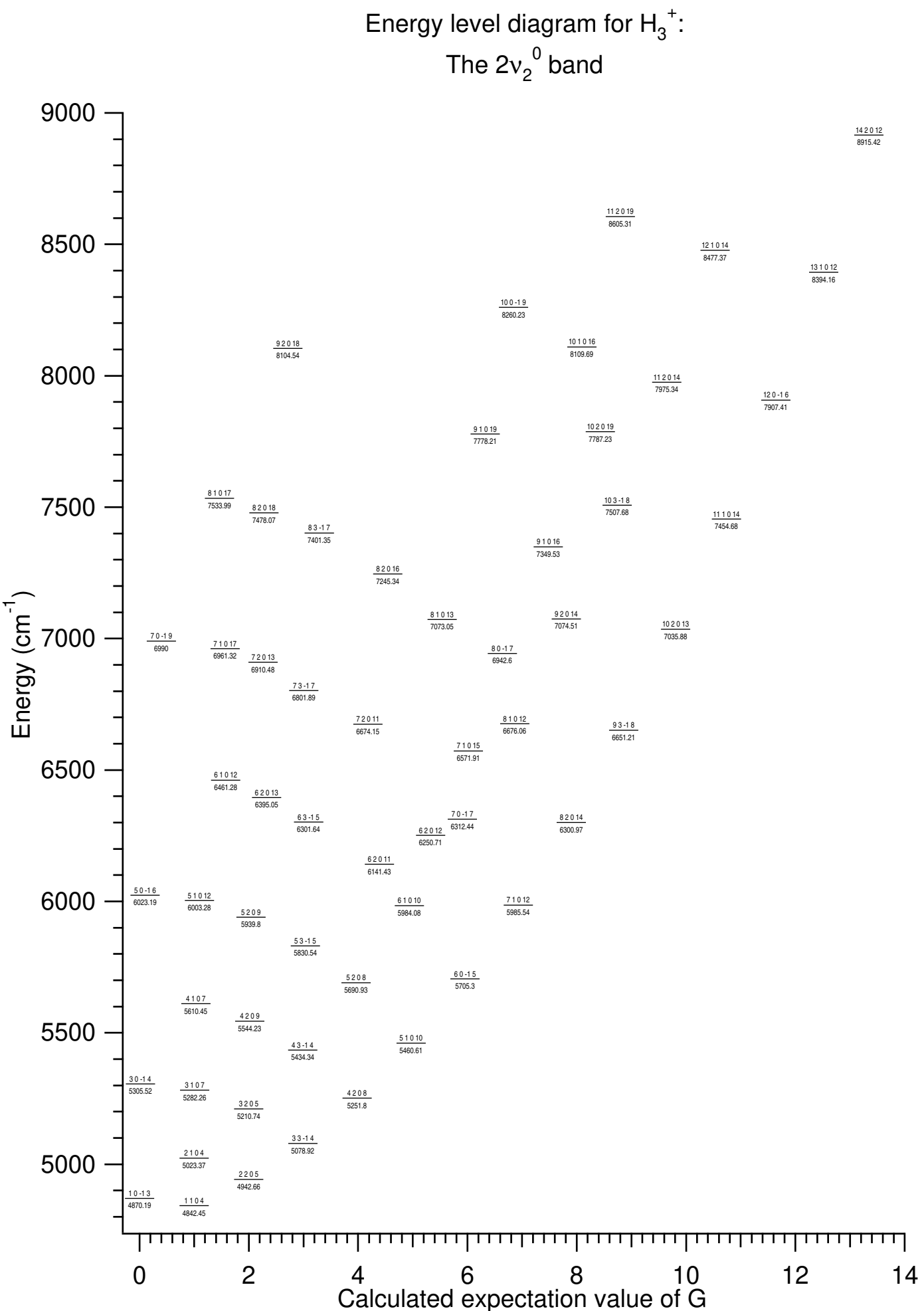
M	S	I	P
0	0	3/2	+1
1	-1	1/2	−1
2	-1	1/2	+1
3	0	3/2	−1


Energy level diagram for H_3^+:
The ground state
Energy (cm^{-1})
Calculated expectation value of G
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
0
2
4
6
8
10
12
14
16
18
20
10-11 86.9591
11101 64.1234
21101 237.35
22101 169.296
30-11 516.867
31101 494.753
32101 428.009
33-11 315.342
41101 833.555
42202 768.451
43-11 658.698
42201 502.023
50-11 1271.22
51102 1250.27
52202 1187.07
53-11 1080.45
52201 928.943
51101 728.991
60-11 995.842
61102 1740.83
62202 1679.73
63-11 1577.28
62201 1430.67
61101 1238.41
70-12 2320.31
71103 2300.77
72202 2241.91
73-11 2142.03
72201 2002.39
71102 1818.08
70-11 1586.53
71101 1302.09
80-11 2242.12
81102 2462.79
82202 2639.05
81101 1972.73
82201 1647.2
90-12 3627.45
91103 3609.46
92203 3555.31
93-12 3460.94
92202 3335.44
91102 3167.22
90-11 2957.19
91101 2701.98
92201 2396.32
93-11 2030.54
81103 2925.3
82203 2868.77
83-11 2775.57
100-11 3726.43
101101 3484.65
102202 3196.77
103-11 2856.6
102201 2451.43
110-12 5152.96
111104 5136.56
112204 5087.28
113-13 4994.8
112203 4886.31
111103 4733.92
110-11 4544.24
111102 4315.41
112202 4044
113-11 3725.47
112201 4286.95
120-11 3402.86
121101 3884.03
120-12 5406.04
121102 5189.07
122202 4932.99
123-11 4634.05
122201 5253.45
131102 4879.9
130-11 4449.47
131101 3931.77
140-11 5502.85
141101 5048.19
142201 4494.97
133-11 5577.74
132202 5858.84
131102 6100.53
130-12 6304.99
131101 6154.04
142202 6248.12
143-11 6552.14
141102 5900.75
140-13 7240.09
141103 7044.85
142203 6816.69
143-12 7662.64
142205 7528.74
141105 7400.01
140-13 8197.92
151105 8017.25
152203 7801.89
153-12 7552.65
152202 7267.34
151102 6942.49
150-11 6574.42
151101 6154.04
152201 5679.21
153-11 5091.53
150-13 6857.35
131106 6842.61
132205 6798.69
133-13 6700.98
132204 6612.79
131105 6476.01
130-12 6304.99
131104 6100.53
132202 5858.84
133-11 5577.74
132201 5253.45
141102 5900.75
140-11 5502.85
141101 5048.19
142201 4494.97
143-11 6552.14
142202 6248.12
141103 7044.85
142203 6816.69
143-12 7662.64
142205 7528.74
141105 7400.01
140-13 8197.92
151105 8017.25
152203 7801.89
153-12 7552.65
152202 7267.34
151102 6942.49
150-11 6574.42
151101 6154.04
152201 5679.21
153-11 5091.53
150-14 8704.2
151108 8691.41
152206 8654.5
153-14 8538.86
152205 8472.89
151107 8352.69
150-13 8197.92
151105 8017.25
152203 7801.89
153-12 7552.65
152202 7267.34
151102 6942.49
150-11 6574.42
151101 6154.04
152201 5679.21
153-11 5091.53
160-11 7658.99
161101 7272.83
162202 6831.38
163-11 6341.54
161102 8002.76
162204 8306.81
163-12 8575.19
162206 8809.9
170-11 8756.62
171102 8395.57
172202 7994.36
173-11 7532.41
171101 7034.17
172201 6380.84
173-11 7532.41
171102 8395.57
172202 7994.36
173-11 7532.41
171101 7034.17
172201 6380.84
180-11 7071.56
181101 7756.05
182201 8254.23
183-11 8737.45
180-11 7071.56
181101 7756.05
182201 8254.23
183-11 8737.45
190-11 8506.1
191101 7791.6
190-11 8506.1
191102 8993.9
201101 8539.87

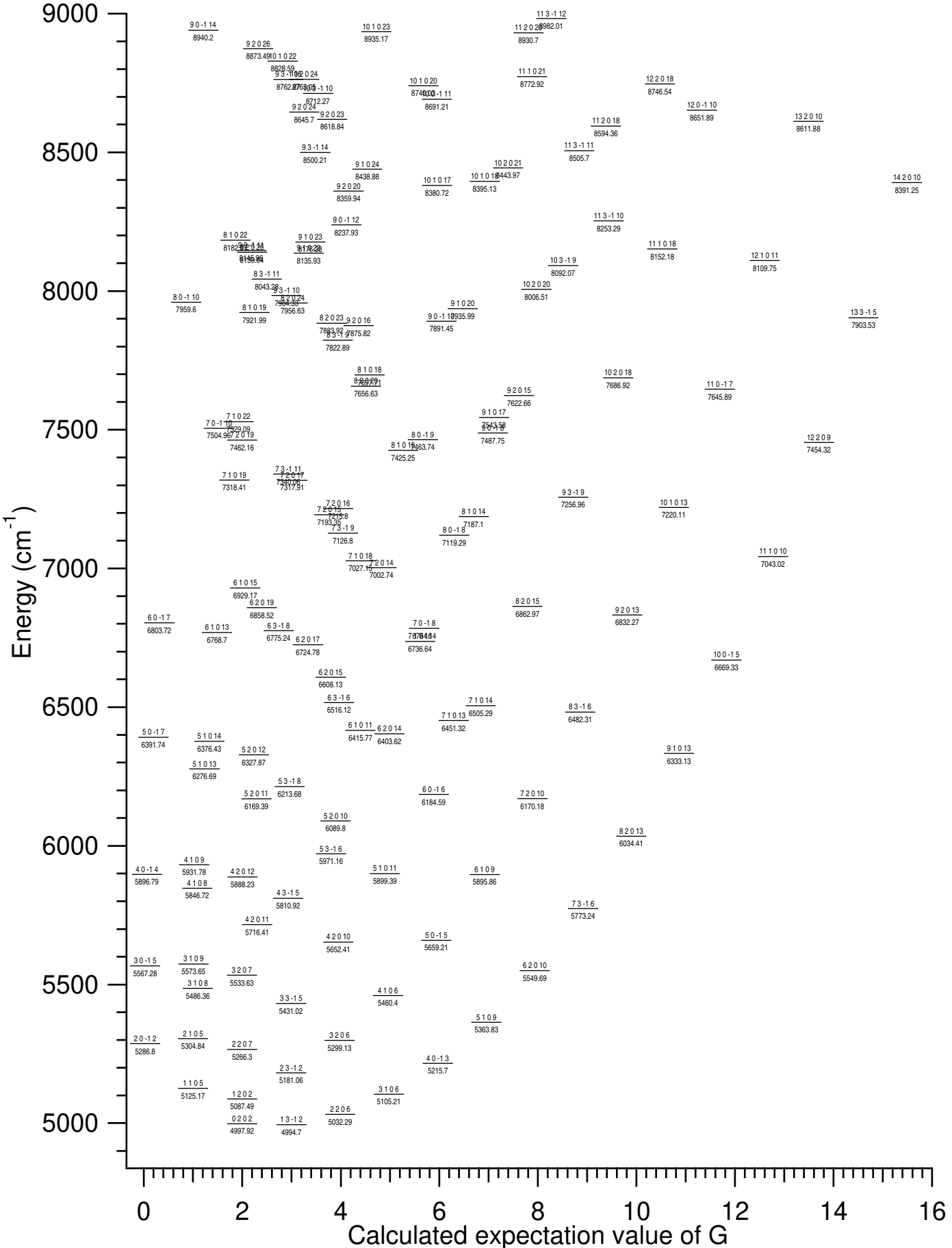
Energy level diagram for H_3^+: The ν_2 band

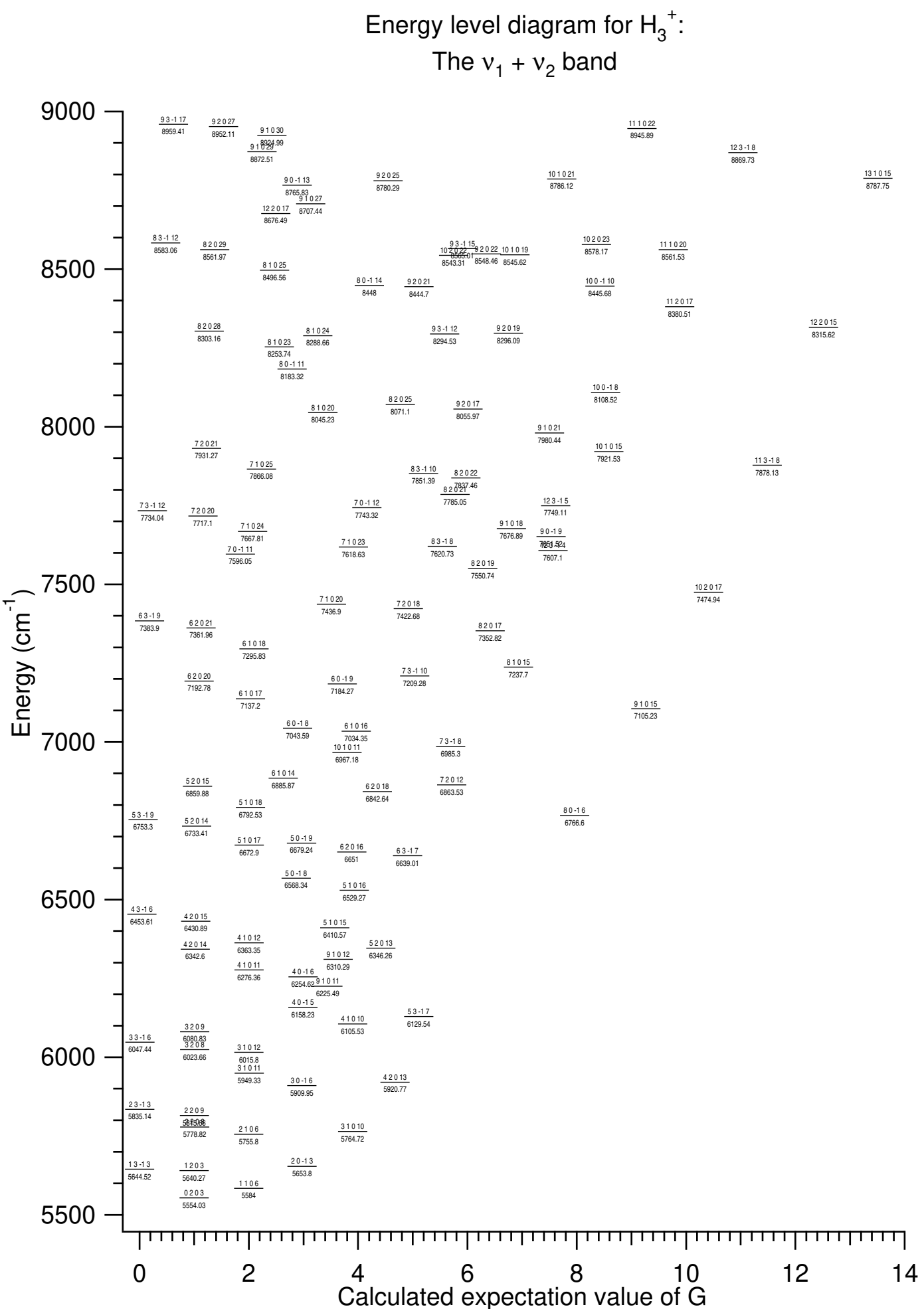



Energy level diagram for H_3^+:
The ν_1 band
Energy (cm^{-1})
Calculated expectation value of G
9000
8500
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
0
2
4
6
8
10
12
14
16
12 2 0 20
8986.24
12 3 -1 9
8949.02
12 2 0 19
8820.2
12 1 0 16
8582.89
12 0 -1 8
8435.51
11 0 -1 9
8218.11
11 1 0 19
8203.42
11 2 0 16
8160.3
11 3 -1 9
8058.82
11 2 0 15
7984.58
11 1 0 16
7754.32
11 0 -1 6
7592.29
10 1 0 14
7429.35
10 2 0 16
7381.75
10 3 -1 7
7316.36
10 2 0 15
7191.87
9 0 -1 7
6722.38
9 1 0 14
6705.31
9 2 0 12
6654.12
9 3 -1 7
6559.08
9 2 0 11
6449.22
8 1 0 11
6035.67
8 2 0 12
5981.43
8 3 -1 5
5895.17
8 2 0 11
5762.54
8 1 0 10
5604.26
7 0 -1 6
5443.9
7 1 0 11
5424.99
7 2 0 9
5368.02
7 3 -1 5
5269.95
7 2 0 8
5136.68
7 1 0 10
4962.13
6 1 0 8
4877.84
6 2 0 9
4818.4
6 3 -1 4
4719.29
6 2 0 8
4575.98
5 0 -1 4
4419.14
5 1 0 8
4398.69
5 2 0 7
4337.02
5 3 -1 4
4232.68
5 2 0 6
4084.7
4 1 0 5
3991.8
4 2 0 7
3928.14
4 3 -1 3
3820.77
4 2 0 6
3667.08
3 0 -1 3
3682.68
3 1 0 5
3661.04
3 2 0 4
3595.69
3 3 -1 3
3485.26
2 1 0 3
3409.77
2 2 0 4
3343.09
1 0 -1 2
3263.05
1 1 0 3
3240.68
13 2 0 13
8898.68
13 3 -1 7
8650.91
12 1 0 13
8237.88
12 2 0 13
8003.33
11 2 0 10
7143.39
10 1 0 8
6579.74
10 2 0 10
6326.37
9 0 -1 5
6053.08
9 1 0 8
5819.79
9 2 0 6
5487.23
8 0 -1 4
5361.23
8 1 0 6
5109.78
8 2 0 6
4774.97
7 0 -1 4
4721.79
7 1 0 6
4456.87
6 0 -1 3
4147.03
5 1 0 7
3888.65
14 1 0 9
8859.93
13 2 0 8
8224.78
13 1 0 9
7897.67
12 2 0 8
7319.29
12 1 0 7
6946.96
11 2 0 6
6429.6
11 1 0 7
6003.42
10 3 -1 3
5944.62
10 2 0 6
5558.55
9 3 -1 3
5149.11
16 2 0 5
8733.83
15 2 0 7
8691.81
14 0 -1 4
8502.35
15 3 -1 3
8123.15
14 1 0 7
8078.75
14 2 0 6
7543.86
13 0 -1 4
7496.87
13 1 0 7
6996.88
12 0 -1 3
6483.12

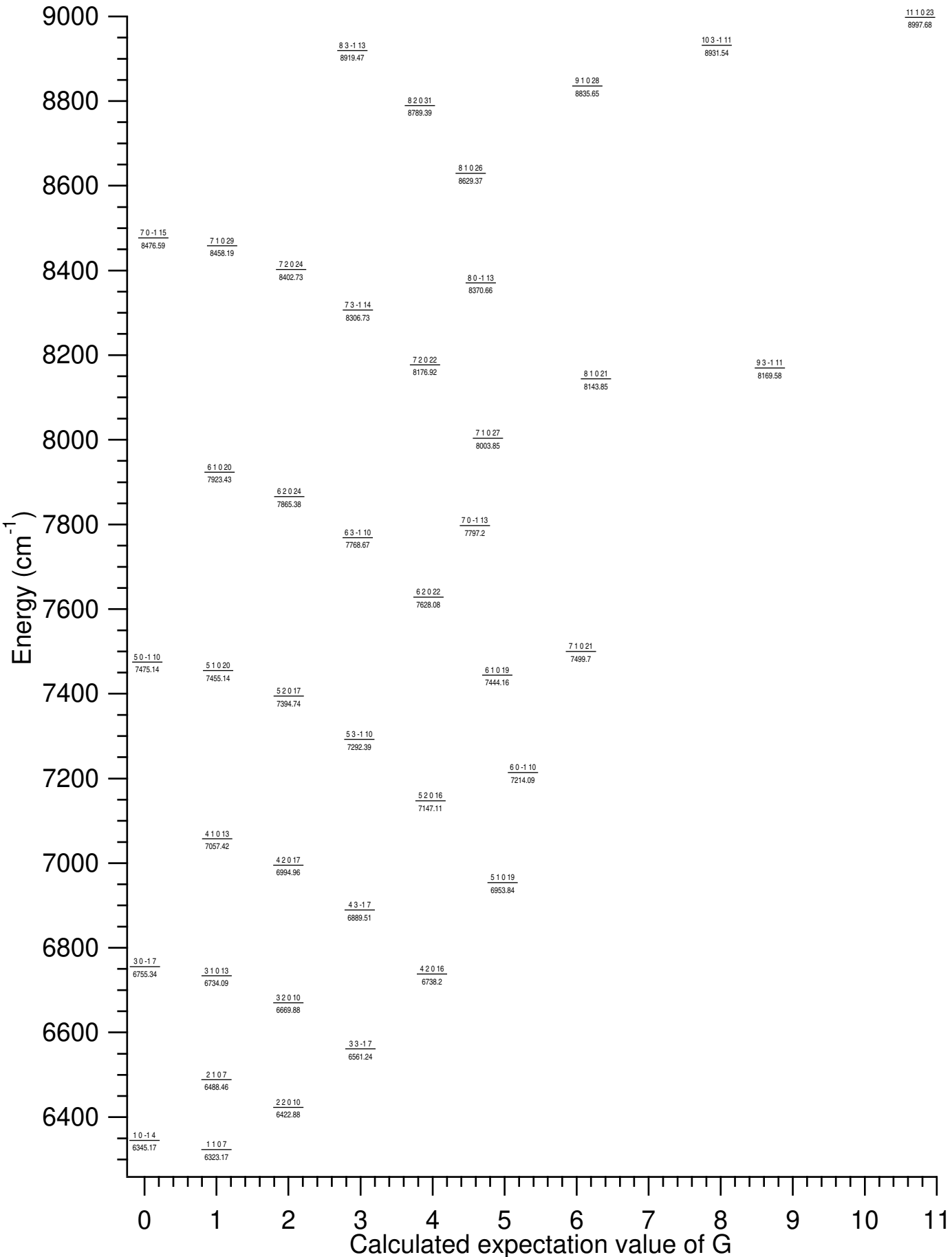

Energy level diagram for H_3^+:
The $2\nu_2{}^0$ band
Energy (cm^{-1})
Calculated expectation value of G
9000
8500
8000
7500
7000
6500
6000
5500
5000
0
2
4
6
8
10
12
14
14 2 0 12
8915.42
11 2 0 19
8605.31
12 1 0 14
8477.37
13 1 0 12
8394.16
10 0 -1 9
8260.23
9 2 0 18
8104.54
10 1 0 16
8109.69
11 2 0 14
7975.34
12 0 -1 6
7907.41
9 1 0 19
7778.21
10 2 0 19
7787.23
8 1 0 17
7533.99
8 2 0 18
7478.07
8 3 -1 7
7401.35
10 3 -1 8
7507.68
11 1 0 14
7454.68
9 1 0 16
7349.53
8 2 0 16
7245.34
8 1 0 13
7073.05
9 2 0 14
7074.51
10 2 0 13
7035.88
7 0 -1 9
6990
7 1 0 17
6961.32
7 2 0 13
6910.48
8 0 -1 7
6942.6
7 3 -1 7
6801.89
7 2 0 11
6674.15
8 1 0 12
6676.06
9 3 -1 8
6651.21
7 1 0 15
6571.91
6 1 0 12
6461.28
6 2 0 13
6395.05
6 3 -1 5
6301.64
7 0 -1 7
6312.44
6 2 0 12
6250.71
8 2 0 14
6300.97
6 2 0 11
6141.43
5 0 -1 6
6023.19
5 1 0 12
6003.28
5 2 0 9
5939.8
6 1 0 10
5984.08
7 1 0 12
5985.54
5 3 -1 5
5830.54
5 2 0 8
5690.93
6 0 -1 5
5705.3
4 1 0 7
5610.45
4 2 0 9
5544.23
5 1 0 10
5460.61
4 3 -1 4
5434.34
3 0 -1 4
5305.52
3 1 0 7
5282.26
4 2 0 8
5251.8
3 2 0 5
5210.74
3 3 -1 4
5078.92
2 1 0 4
5023.37
2 2 0 5
4942.66
1 0 -1 3
4870.19
1 1 0 4
4842.45

Energy level diagram for H_3^+: The $2\nu_2^2$ band

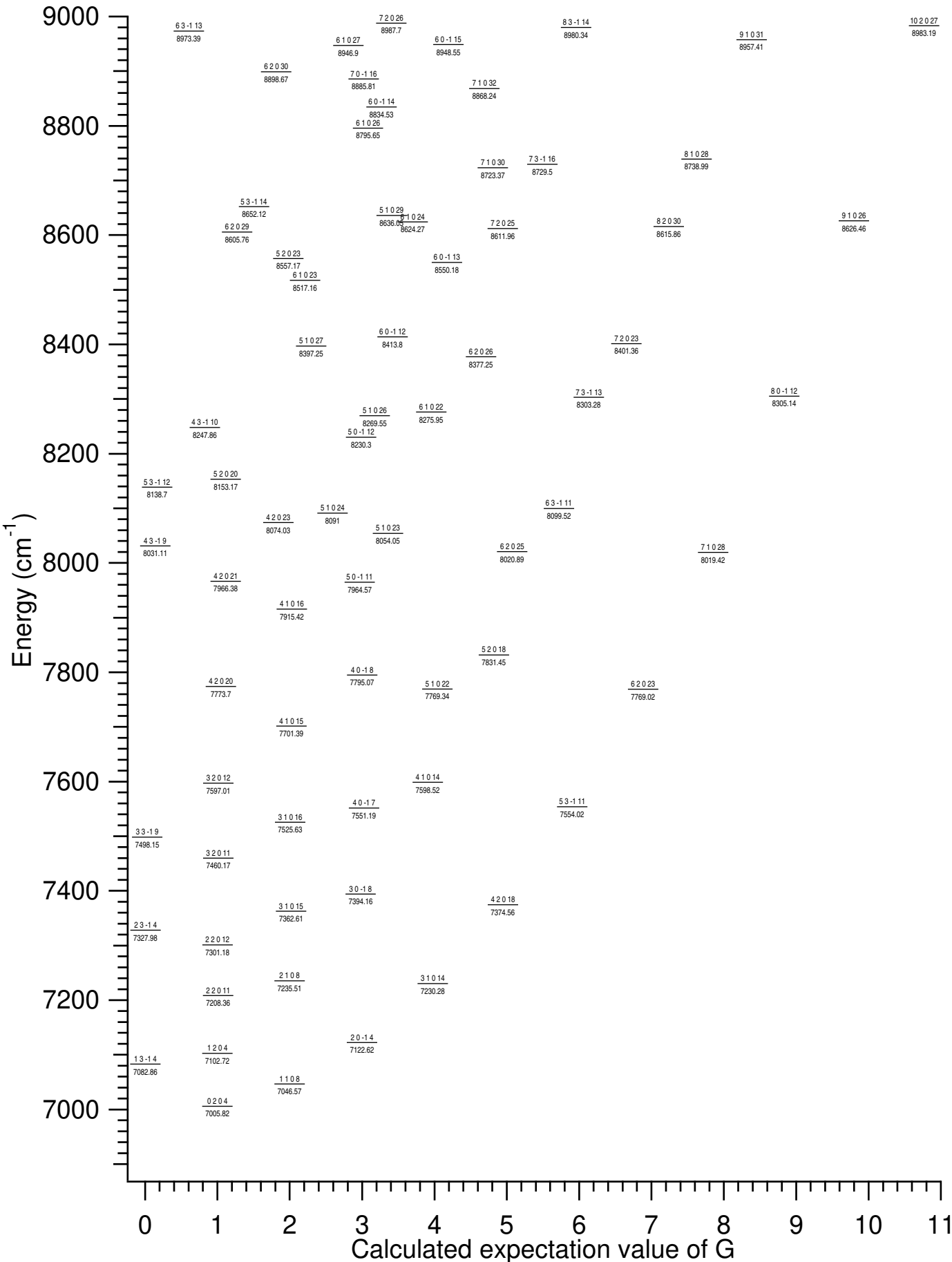


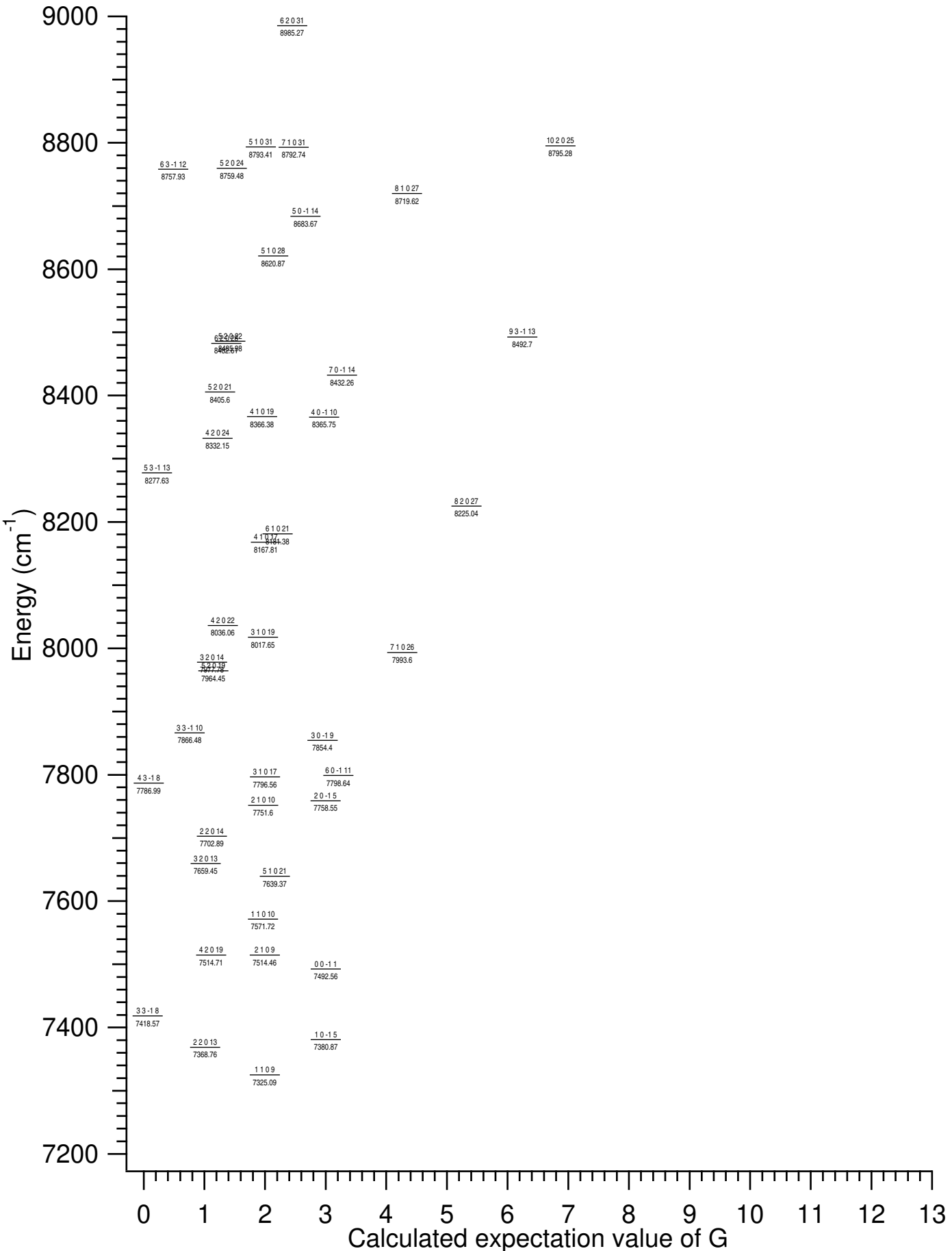

Energy level diagram for H_3^+:
The $\nu_1 + \nu_2$ band
Energy (cm^{-1})
Calculated expectation value of G
9000
8500
8000
7500
7000
6500
6000
5500
0
2
4
6
8
10
12
14
9 3 -1 17
8959.41
9 2 0 27
8952.11
9 1 0 30
8924.99
9 1 0 29
8872.51
9 0 -1 13
8765.83
9 1 0 27
8707.44
12 2 0 17
8676.49
9 2 0 25
8780.29
10 1 0 21
8786.12
11 1 0 22
8945.89
12 3 -1 8
8869.73
13 1 0 15
8787.75
8 3 -1 12
8583.06
8 2 0 29
8561.97
8 1 0 25
8496.56
8 0 -1 14
8448
9 2 0 21
8444.7
9 3 -1 15
8543.31
9 2 0 22
8548.46
10 1 0 19
8545.62
10 2 0 23
8578.17
11 1 0 20
8561.53
10 0 -1 10
8445.68
11 2 0 17
8380.51
8 2 0 28
8303.16
8 1 0 24
8288.66
8 1 0 23
8253.74
8 0 -1 11
8183.32
9 3 -1 12
8294.53
9 2 0 19
8296.09
12 2 0 15
8315.62
10 0 -1 8
8108.52
8 1 0 20
8045.23
8 2 0 25
8071.1
9 2 0 17
8055.97
9 1 0 21
7980.44
7 2 0 21
7931.27
10 1 0 15
7921.53
7 1 0 25
7866.08
8 3 -1 10
7851.39
8 2 0 22
7837.46
8 2 0 21
7785.05
11 3 -1 8
7878.13
7 3 -1 12
7734.04
7 2 0 20
7717.1
7 0 -1 12
7743.32
12 3 -1 5
7749.11
7 1 0 24
7667.81
9 1 0 18
7676.89
9 0 -1 9
7 0 -1 11
7596.05
7 1 0 23
7618.63
8 3 -1 8
7620.73
8 2 0 19
7550.74
7607.1
10 2 0 17
7474.94
7 1 0 20
7436.9
7 2 0 18
7422.68
6 3 -1 9
7383.9
6 2 0 21
7361.96
8 2 0 17
7352.82
6 1 0 18
7295.83
8 1 0 15
7237.7
6 2 0 20
7192.78
7 3 -1 10
7209.28
6 0 -1 9
7184.27
6 1 0 17
7137.2
9 1 0 15
7105.23
6 0 -1 8
7043.59
6 1 0 16
7034.35
10 1 0 11
6967.18
7 3 -1 8
6985.3
6 1 0 14
6885.87
5 2 0 15
6859.88
6 2 0 18
6842.64
7 2 0 12
6863.53
5 1 0 18
6792.53
8 0 -1 6
6766.6
5 3 -1 9
6753.3
5 2 0 14
6733.41
5 0 -1 9
6679.24
6 2 0 16
6651
6 3 -1 7
6639.01
5 1 0 17
6672.9
5 0 -1 8
6568.34
5 1 0 16
6529.27
4 3 -1 6
6453.61
4 2 0 15
6430.89
5 1 0 15
6410.57
4 2 0 14
6342.6
4 1 0 12
6363.35
5 2 0 13
6346.26
9 1 0 12
6310.29
4 1 0 11
6276.36
4 0 -1 6
6254.62
9 1 0 11
6225.49
4 0 -1 5
6158.23
5 3 -1 7
6129.54
4 1 0 10
6105.53
3 2 0 9
6080.83
3 3 -1 6
6047.44
3 2 0 8
6023.66
3 1 0 12
6015.8
3 1 0 11
5949.33
3 0 -1 6
5909.95
4 2 0 13
5920.77
2 3 -1 3
5835.14
2 2 0 9
2 2 0 8
5778.82
2 1 0 6
5755.8
3 1 0 10
5764.72
1 3 -1 3
5644.52
1 2 0 3
5640.27
2 0 -1 3
5653.8
1 1 0 6
5584
0 2 0 3
5554.03

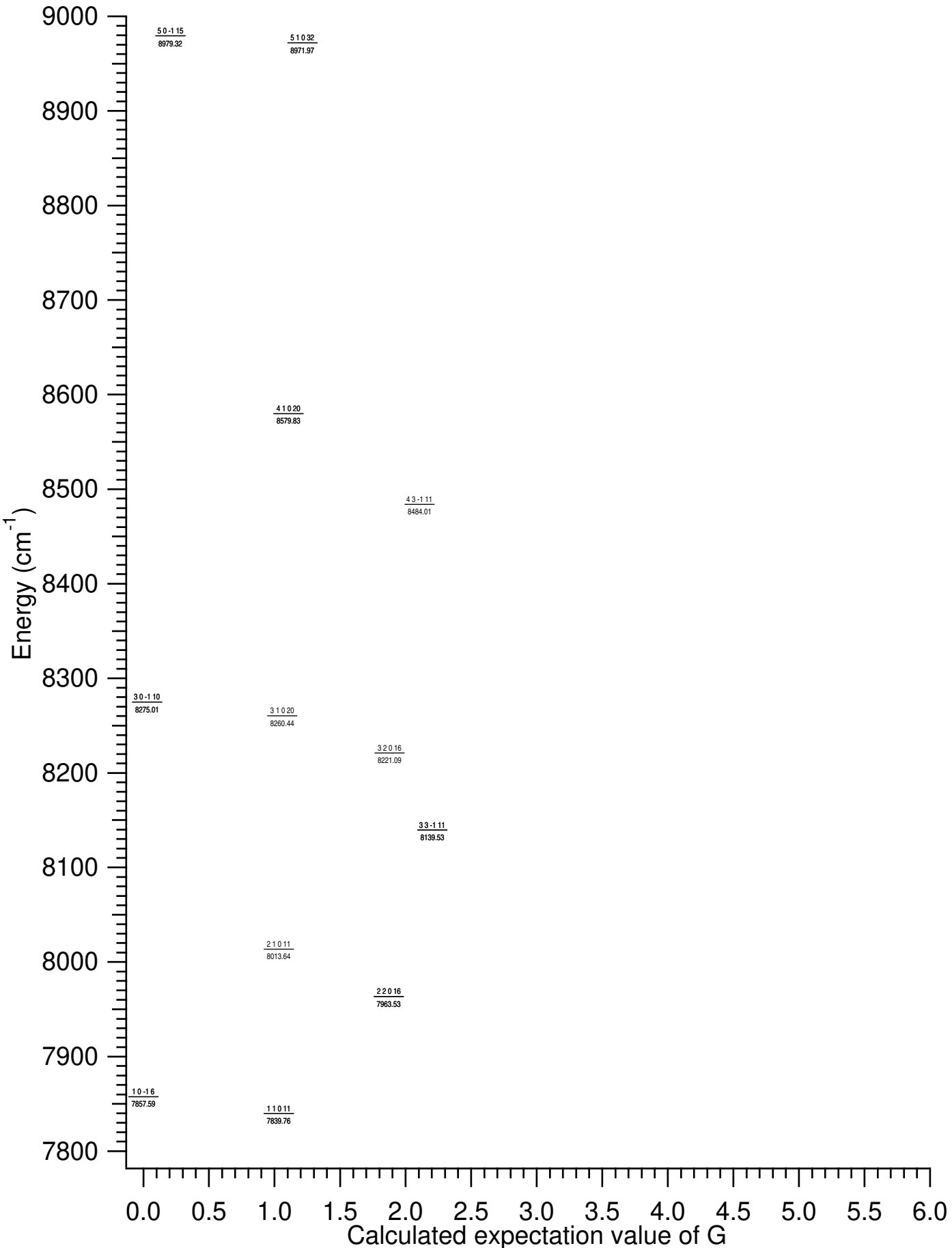
Energy level diagram for H_3^+: The $2\nu_1$ band

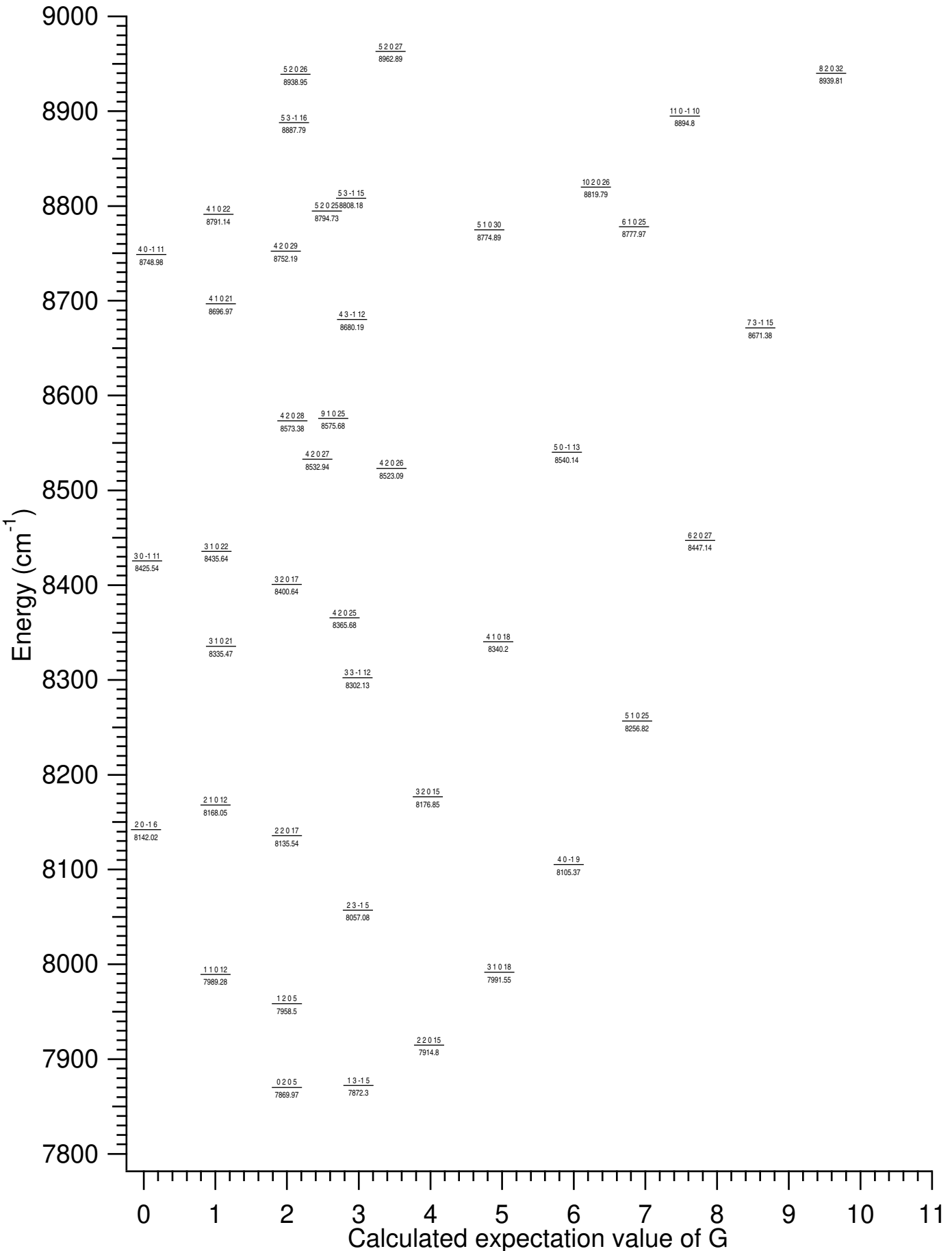


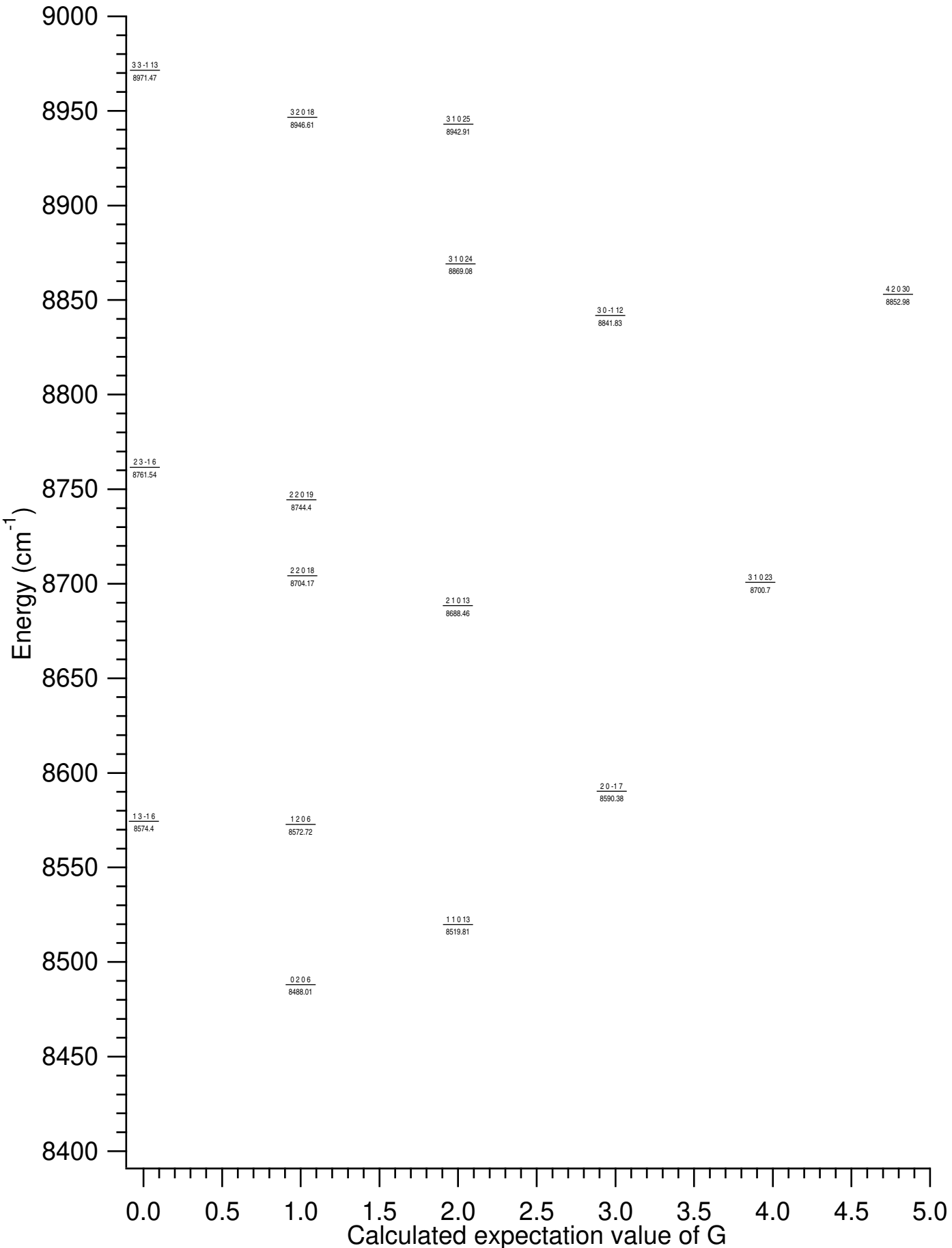
Energy level diagram for H_3^+: The $3\nu_2^1$ band

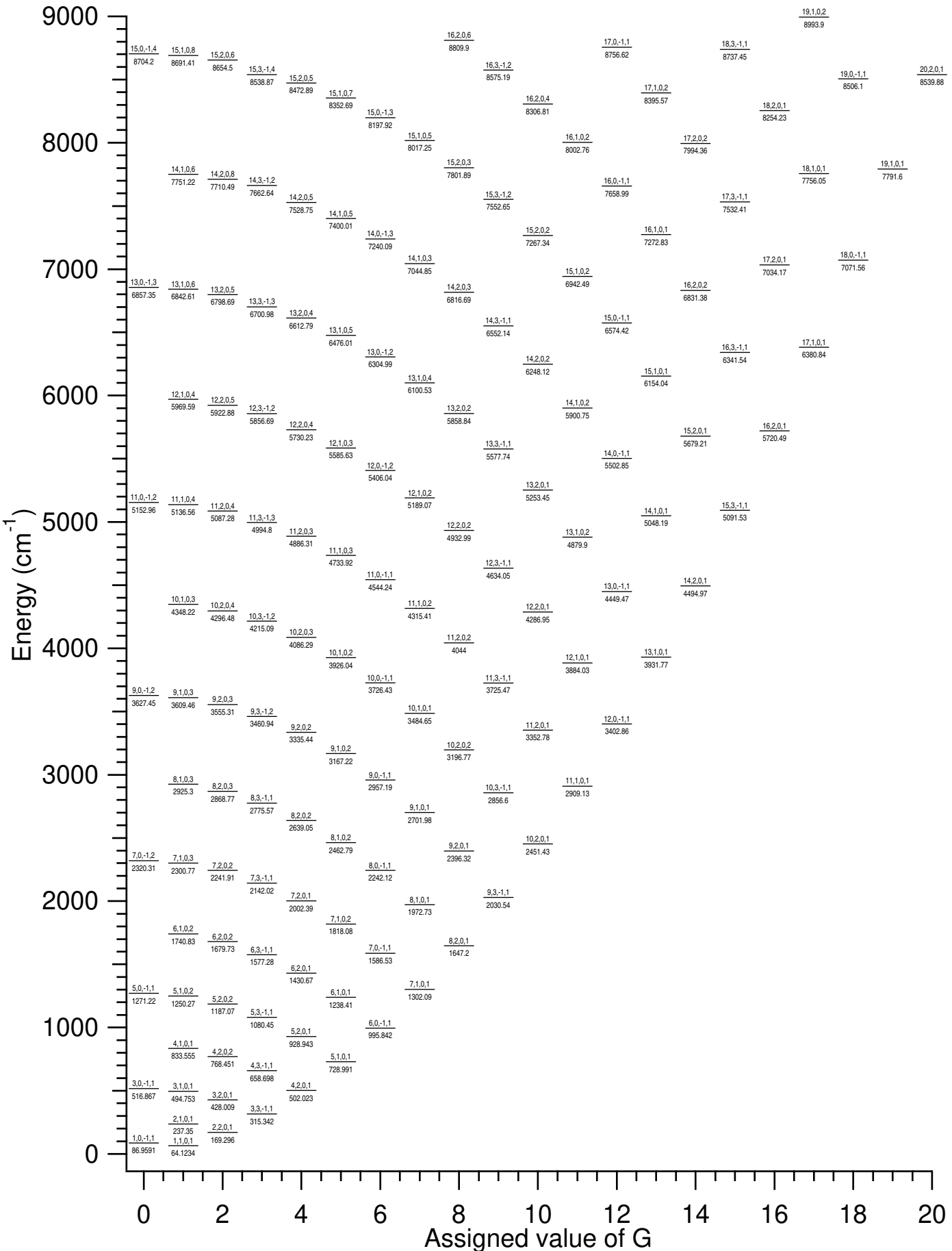



Energy level diagram for H_3^+:
The $3\nu_2{}^3$ band
Energy (cm^{-1})
9000
8800
8600
8400
8200
8000
7800
7600
7400
7200
Calculated expectation value of G
0
1
2
3
4
5
6
7
8
9
10
11
12
13
6 2 0 31
8985.27
5 1 0 31
8793.41
7 1 0 31
8792.74
10 2 0 25
8795.28
6 3 -1 12
8757.93
5 2 0 24
8759.48
8 1 0 27
8719.62
5 0 -1 14
8683.67
5 1 0 28
8620.87
9 3 -1 13
8492.7
7 0 -1 14
8432.26
5 2 0 21
8405.6
4 1 0 19
8366.38
4 0 -1 10
8365.75
4 2 0 24
8332.15
5 3 -1 13
8277.63
8 2 0 27
8225.04
6 1 0 21
8167.81
4 2 0 22
8036.06
3 1 0 19
8017.65
7 1 0 26
7993.6
3 2 0 14
7964.45
3 3 -1 10
7866.48
3 0 -1 9
7854.4
4 3 -1 8
7786.99
3 1 0 17
7796.56
6 0 -1 11
7798.64
2 1 0 10
7751.6
2 0 -1 5
7758.55
2 2 0 14
7702.89
3 2 0 13
7659.45
5 1 0 21
7639.37
1 1 0 10
7571.72
4 2 0 19
7514.71
2 1 0 9
7514.46
0 0 -1 1
7492.56
3 3 -1 8
7418.57
2 2 0 13
7368.76
1 0 -1 5
7380.87
1 1 0 9
7325.09

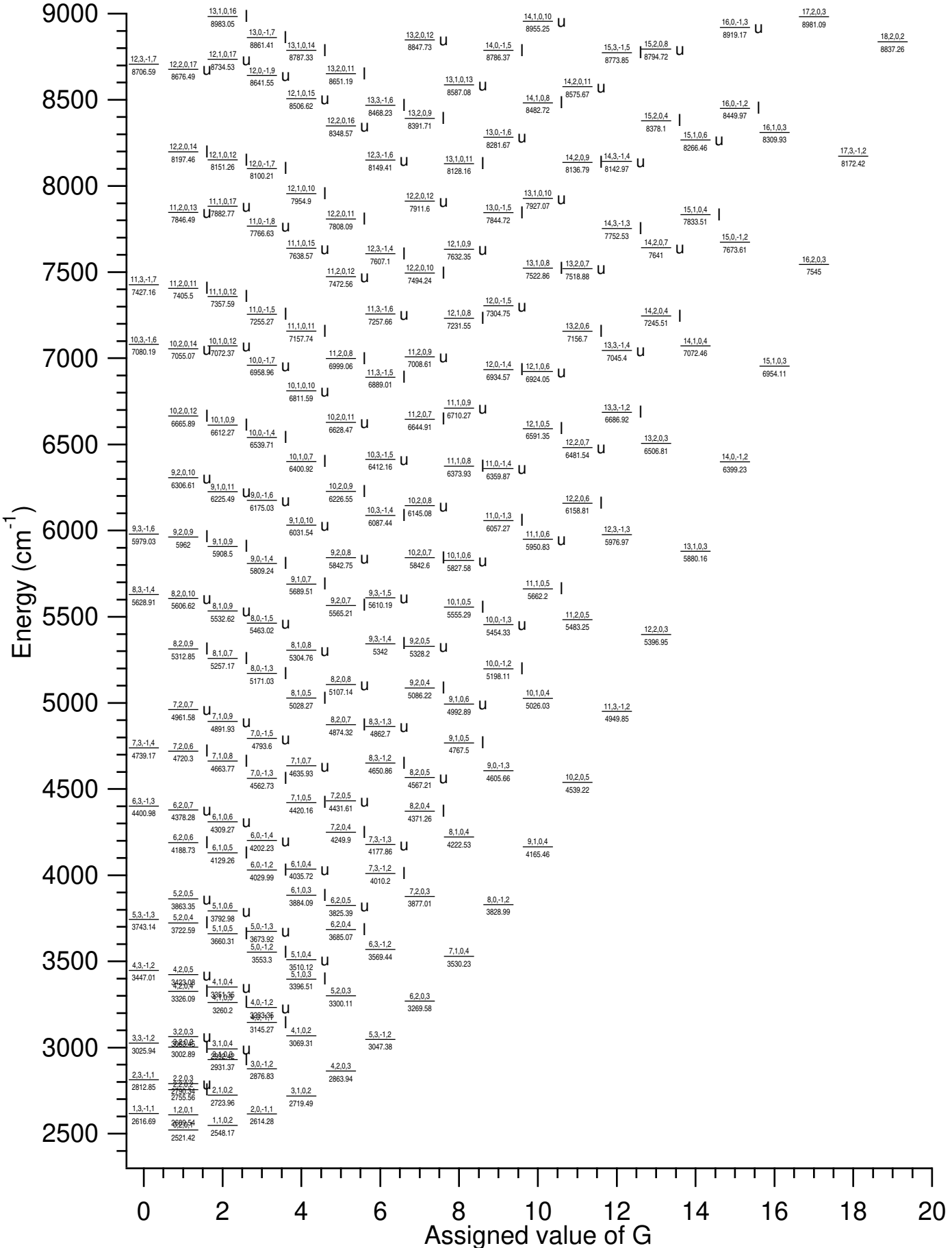

Energy level diagram for H_3^+:
The $\nu_1 + 2\nu_2^0$ band
Energy (cm^{-1})
9000
8900
8800
8700
8600
8500
8400
8300
8200
8100
8000
7900
7800
5 0 -1 15
8979.32
5 1 0 32
8971.97
4 1 0 20
8579.83
4 3 -1 11
8484.01
3 0 -1 10
8275.01
3 1 0 20
8260.44
3 2 0 16
8221.09
3 3 -1 11
8139.53
2 1 0 11
8013.64
2 2 0 16
7963.53
1 0 -1 6
7857.59
1 1 0 11
7839.76
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
Calculated expectation value of G


Energy level diagram for H_3^+:
The $\nu_1 + 2\nu_2^2$ band
Energy (cm^{-1})
Calculated expectation value of G
9000
8900
8800
8700
8600
8500
8400
8300
8200
8100
8000
7900
7800
0
1
2
3
4
5
6
7
8
9
10
11
5 2 0 27
8962.89
5 2 0 26
8938.95
8 2 0 32
8939.81
5 3 -1 16
8887.79
11 0 -1 10
8894.8
10 2 0 26
8819.79
5 3 -1 15
8808.18
5 2 0 25
8794.73
4 1 0 22
8791.14
5 1 0 30
8774.89
6 1 0 25
8777.97
4 0 -1 11
8748.98
4 2 0 29
8752.19
4 1 0 21
8696.97
4 3 -1 12
8680.19
7 3 -1 15
8671.38
4 2 0 28
8573.38
9 1 0 25
8575.68
5 0 -1 13
8540.14
4 2 0 27
8532.94
4 2 0 26
8523.09
6 2 0 27
8447.14
3 0 -1 11
8425.54
3 1 0 22
8435.64
3 2 0 17
8400.64
4 2 0 25
8365.68
4 1 0 18
8340.2
3 1 0 21
8335.47
3 3 -1 12
8302.13
5 1 0 25
8256.82
3 2 0 15
8176.85
2 1 0 12
8168.05
2 0 -1 6
8142.02
2 2 0 17
8135.54
4 0 -1 9
8105.37
2 3 -1 5
8057.08
1 1 0 12
7989.28
3 1 0 18
7991.55
1 2 0 5
7958.5
2 2 0 15
7914.8
0 2 0 5
7869.97
1 3 -1 5
7872.3

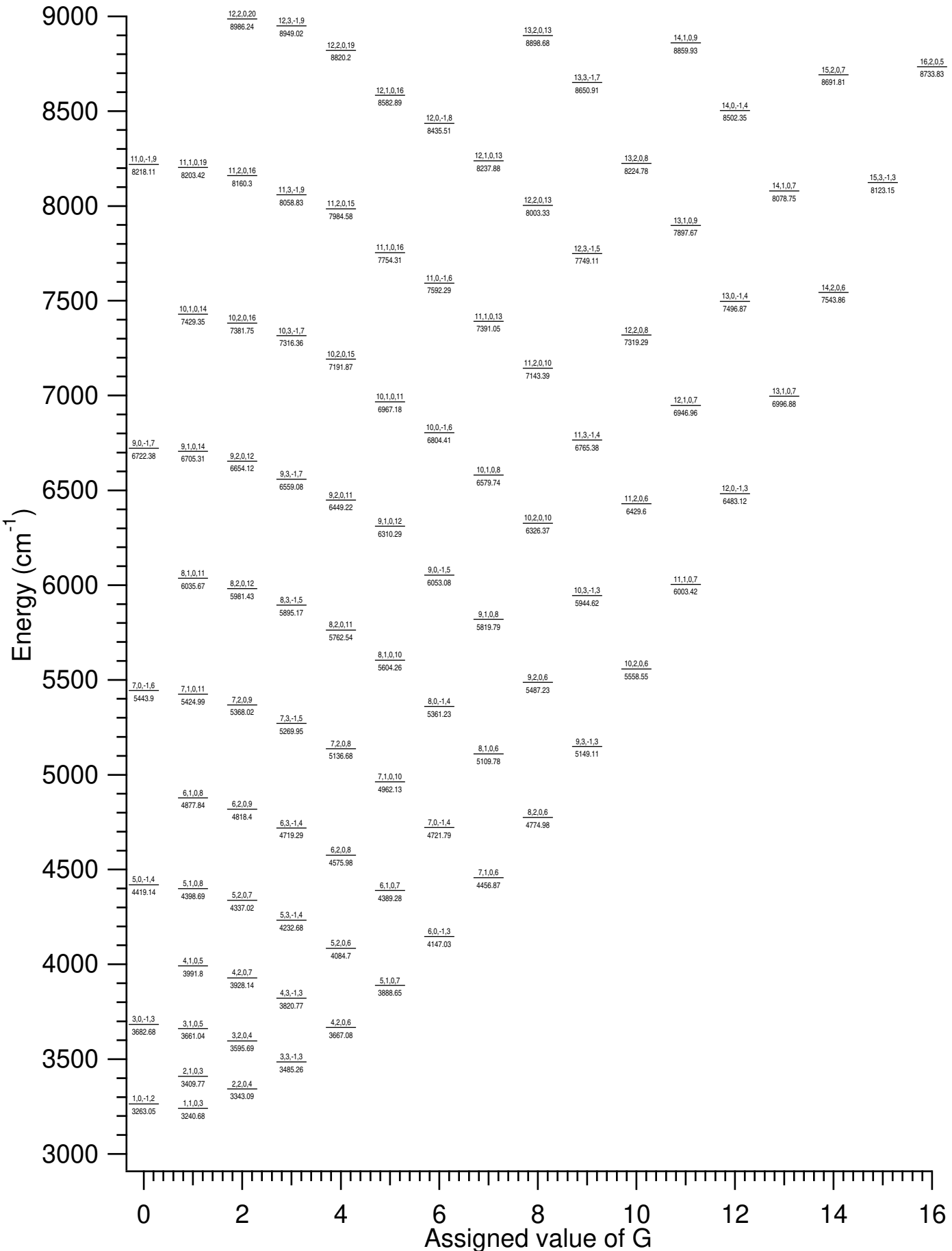

Energy level diagram for H_3^+:
The $2\nu_1 + \nu_2$ band
Energy (cm^{-1})
9000
8950
8900
8850
8800
8750
8700
8650
8600
8550
8500
8450
8400
3 3 -1 13
8971.47
3 2 0 18
8946.61
3 1 0 25
8942.91
3 1 0 24
8869.08
4 2 0 30
8852.98
3 0 -1 12
8841.83
2 3 -1 6
8761.54
2 2 0 19
8744.4
2 2 0 18
8704.17
3 1 0 23
8700.7
2 1 0 13
8688.46
2 0 -1 7
8590.38
1 3 -1 6
8574.4
1 2 0 6
8572.72
1 1 0 13
8519.81
0 2 0 6
8488.01
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Calculated expectation value of G

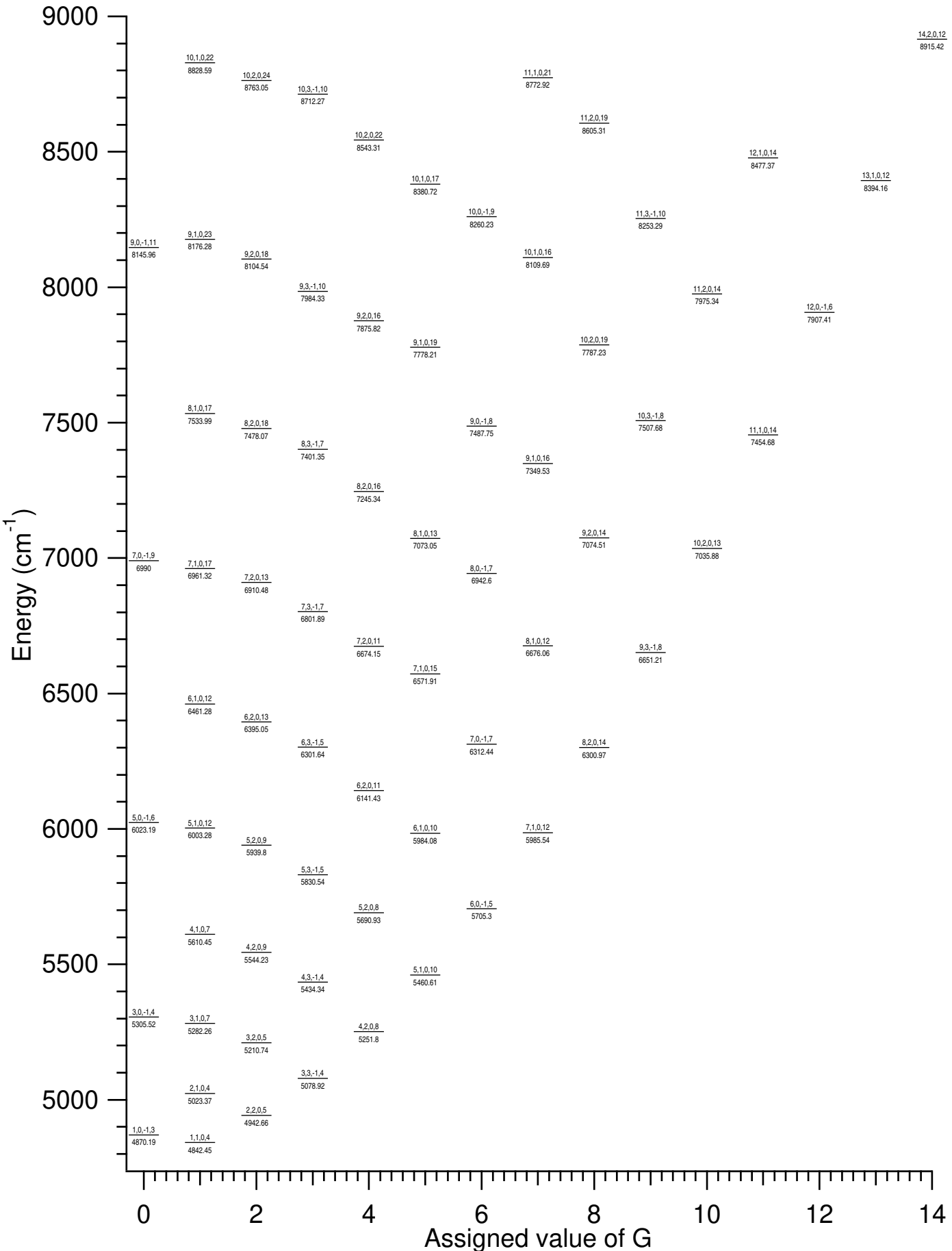

Energy level diagram for H_3^+:
The ground state
Energy (cm^{-1})
Assigned value of G
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
0
2
4
6
8
10
12
14
16
18
20
1,0,-1,1 86.9591
1,1,0,1 64.1234
2,1,0,1 237.35
2,2,0,1 169.296
3,0,-1,1 516.867
3,1,0,1 494.753
3,2,0,1 428.009
3,3,-1,1 315.342
4,1,0,1 833.555
4,2,0,2 768.451
4,3,-1,1 658.698
4,2,0,1 502.023
5,0,-1,1 1271.22
5,1,0,2 1250.27
5,2,0,2 1187.07
5,3,-1,1 1080.45
5,2,0,1 928.943
5,1,0,1 728.991
6,1,0,2 1740.83
6,2,0,2 1679.73
6,3,-1,1 1577.28
6,2,0,1 1430.67
6,1,0,1 1238.41
6,0,-1,1 995.842
7,0,-1,2 2320.31
7,1,0,3 2300.77
7,2,0,2 2241.91
7,3,-1,1 2142.02
7,2,0,1 2002.39
7,1,0,2 1818.08
7,0,-1,1 1586.53
7,1,0,1 1302.09
8,1,0,3 2925.3
8,2,0,3 2868.77
8,3,-1,1 2775.57
8,2,0,2 2639.05
8,1,0,2 2462.79
8,0,-1,1 2242.12
8,1,0,1 1972.73
8,2,0,1 1647.2
9,0,-1,2 3627.45
9,1,0,3 3609.46
9,2,0,3 3555.31
9,3,-1,2 3460.94
9,2,0,2 3335.44
9,1,0,2 3167.22
9,0,-1,1 2957.19
9,1,0,1 2701.98
9,2,0,1 2396.32
9,3,-1,1 2030.54
10,1,0,3 4348.22
10,2,0,4 4296.48
10,3,-1,2 4215.09
10,2,0,3 4086.29
10,1,0,2 3926.04
10,0,-1,1 3726.43
10,1,0,1 3484.65
10,2,0,2 3196.77
10,3,-1,1 2856.6
11,0,-1,2 5152.96
11,1,0,4 5136.56
11,2,0,4 5087.28
11,3,-1,3 4994.8
11,2,0,3 4886.31
11,1,0,3 4733.92
11,0,-1,1 4544.24
11,1,0,2 4315.41
11,2,0,2 4044
11,3,-1,1 3725.47
12,1,0,4 5969.59
12,2,0,5 5922.88
12,3,-1,2 5856.69
12,2,0,4 5730.23
12,1,0,3 5585.63
12,0,-1,2 5406.04
12,1,0,2 5189.07
12,2,0,2 4932.99
12,3,-1,1 4634.05
12,2,0,1 4286.95
12,1,0,1 3884.03
12,0,-1,1 3402.86
13,0,-1,3 6857.35
13,1,0,6 6842.61
13,2,0,5 6798.69
13,3,-1,3 6700.98
13,2,0,4 6612.79
13,1,0,5 6476.01
13,0,-1,2 6304.99
13,1,0,4 6100.53
13,2,0,2 5858.84
13,3,-1,1 5577.74
13,2,0,1 5253.45
13,1,0,2 4879.9
13,1,0,1 3931.77
14,1,0,6 7751.22
14,2,0,8 7710.49
14,3,-1,2 7662.64
14,2,0,5 7528.75
14,1,0,5 7400.01
14,0,-1,3 7240.09
14,1,0,3 7044.85
14,2,0,3 6816.69
14,3,-1,1 6552.14
14,2,0,2 6248.12
14,1,0,2 5900.75
14,0,-1,1 5502.85
14,1,0,1 5048.19
14,2,0,1 4494.97
15,0,-1,4 8704.2
15,1,0,8 8691.41
15,2,0,6 8654.5
15,3,-1,4 8538.87
15,2,0,5 8472.89
15,1,0,7 8352.69
15,0,-1,3 8197.92
15,1,0,5 8017.25
15,2,0,3 7801.89
15,3,-1,2 7552.65
15,2,0,2 7267.34
15,1,0,2 6942.49
15,0,-1,1 6574.42
15,1,0,1 6154.04
15,2,0,1 5679.21
15,3,-1,1 5091.53
16,2,0,6 8809.9
16,3,-1,2 8575.19
16,2,0,4 8306.81
16,1,0,2 8002.76
16,0,-1,1 7658.99
16,1,0,1 7272.83
16,2,0,2 6831.38
16,3,-1,1 6341.54
16,2,0,1 5720.49
17,0,-1,1 8756.62
17,1,0,2 8395.57
17,2,0,2 7994.36
17,3,-1,1 7532.41
17,2,0,1 7034.17
17,1,0,1 6380.84
18,3,-1,1 8737.45
18,2,0,1 8254.23
18,1,0,1 7756.05
18,0,-1,1 7071.56
19,1,0,2 8993.9
19,0,-1,1 8506.1
19,1,0,1 7791.6
20,2,0,1 8539.88

Energy level diagram for H_3^+: The ν_2 band

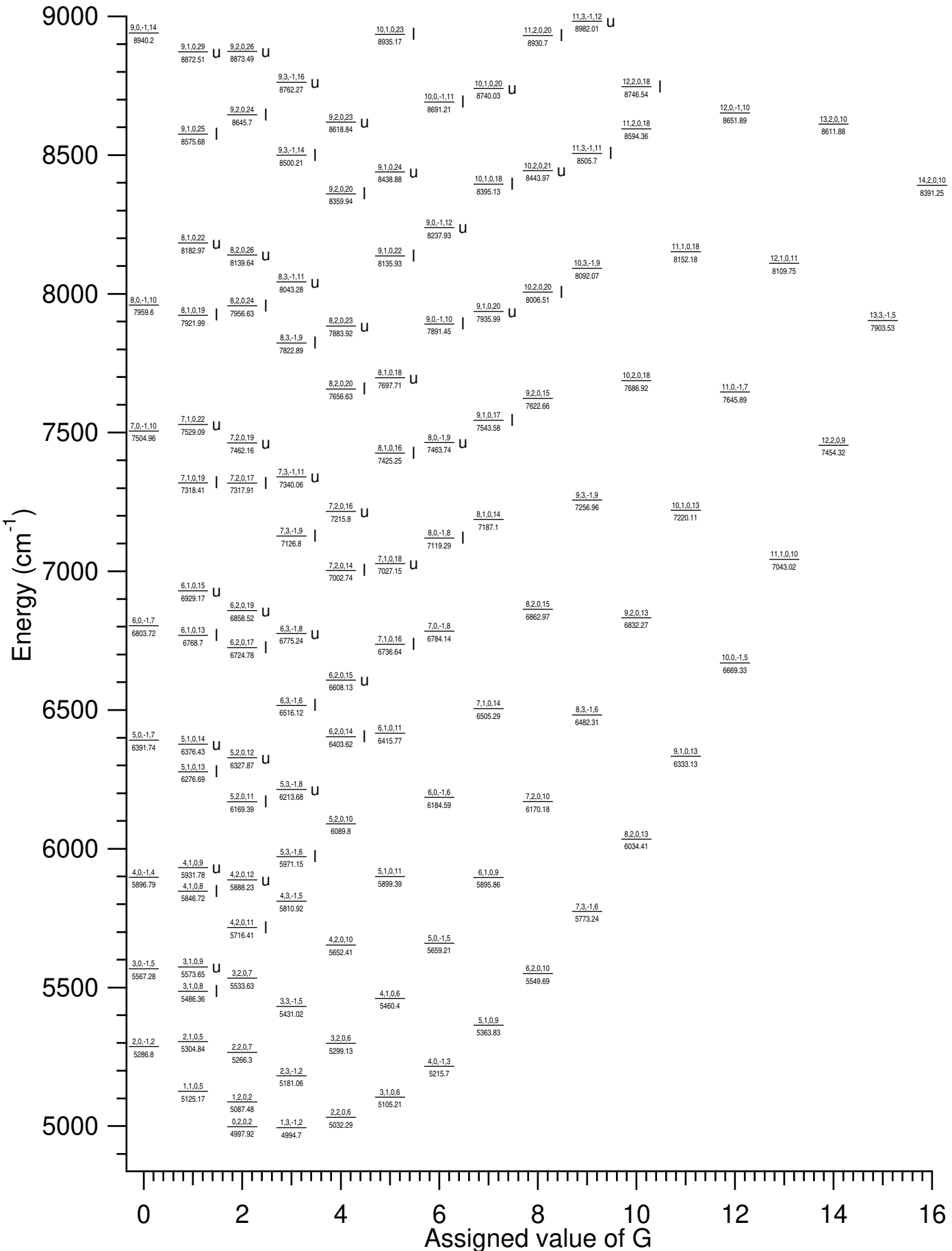


Energy level diagram for H_3^+: The ν_1 band

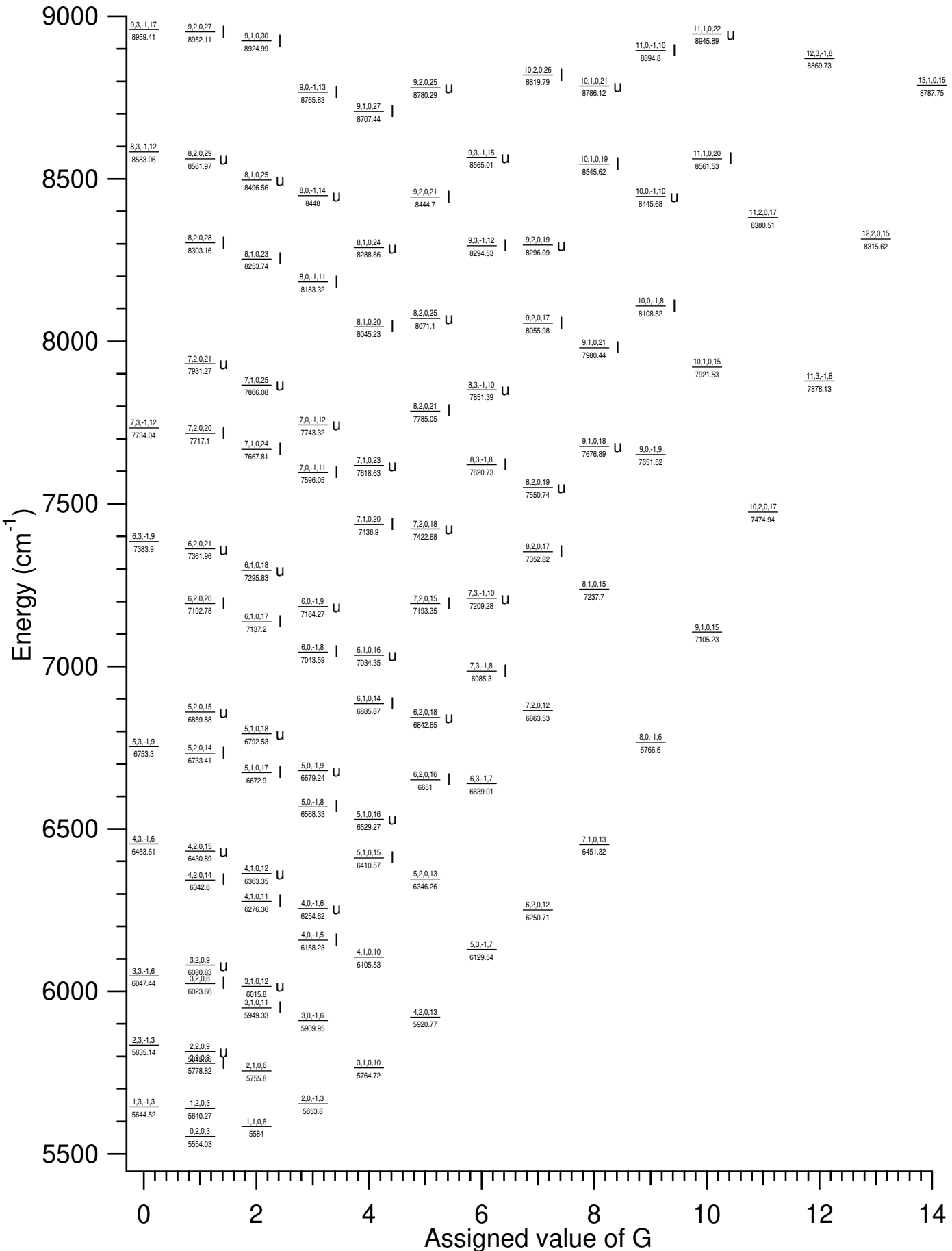


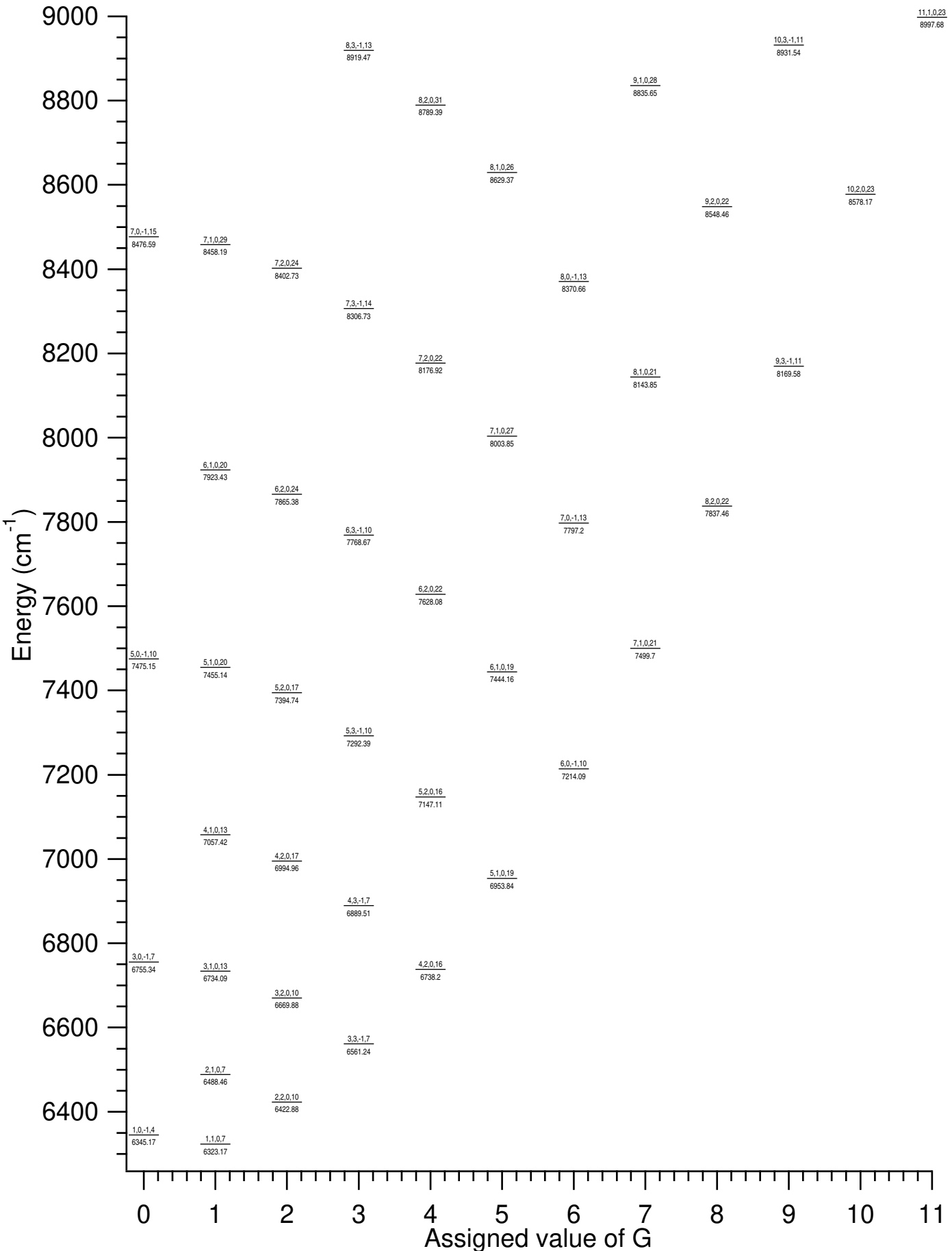

Energy level diagram for H_3^+:
The $2\nu_2^0$ band
Energy (cm^{-1})
Assigned value of G
9000
8500
8000
7500
7000
6500
6000
5500
5000
0
2
4
6
8
10
12
14
14,2,0,12 8915.42
10,1,0,22 8828.59
10,2,0,24 8763.05
10,3,-1,10 8712.27
11,1,0,21 8772.92
11,2,0,19 8605.31
10,2,0,22 8543.31
12,1,0,14 8477.37
10,1,0,17 8380.72
13,1,0,12 8394.16
10,0,-1,9 8260.23
11,3,-1,10 8253.29
9,0,-1,11 8145.96
9,1,0,23 8176.28
9,2,0,18 8104.54
10,1,0,16 8109.69
9,3,-1,10 7984.33
11,2,0,14 7975.34
9,2,0,16 7875.82
12,0,-1,6 7907.41
9,1,0,19 7778.21
10,2,0,19 7787.23
8,1,0,17 7533.99
8,2,0,18 7478.07
9,0,-1,8 7487.75
10,3,-1,8 7507.68
8,3,-1,7 7401.35
11,1,0,14 7454.68
9,1,0,16 7349.53
8,2,0,16 7245.34
8,1,0,13 7073.05
9,2,0,14 7074.51
7,0,-1,9 6990
7,1,0,17 6961.32
7,2,0,13 6910.48
10,2,0,13 7035.88
8,0,-1,7 6942.6
7,3,-1,7 6801.89
7,2,0,11 6674.15
8,1,0,12 6676.06
9,3,-1,8 6651.21
7,1,0,15 6571.91
6,1,0,12 6461.28
6,2,0,13 6395.05
7,0,-1,7 6312.44
6,3,-1,5 6301.64
8,2,0,14 6300.97
6,2,0,11 6141.43
5,0,-1,6 6023.19
5,1,0,12 6003.28
6,1,0,10 5984.08
7,1,0,12 5985.54
5,2,0,9 5939.8
5,3,-1,5 5830.54
6,0,-1,5 5705.3
5,2,0,8 5690.93
4,1,0,7 5610.45
4,2,0,9 5544.23
5,1,0,10 5460.61
4,3,-1,4 5434.34
3,0,-1,4 5305.52
3,1,0,7 5282.26
4,2,0,8 5251.8
3,2,0,5 5210.74
3,3,-1,4 5078.92
2,1,0,4 5023.37
2,2,0,5 4942.66
1,0,-1,3 4870.19
1,1,0,4 4842.45

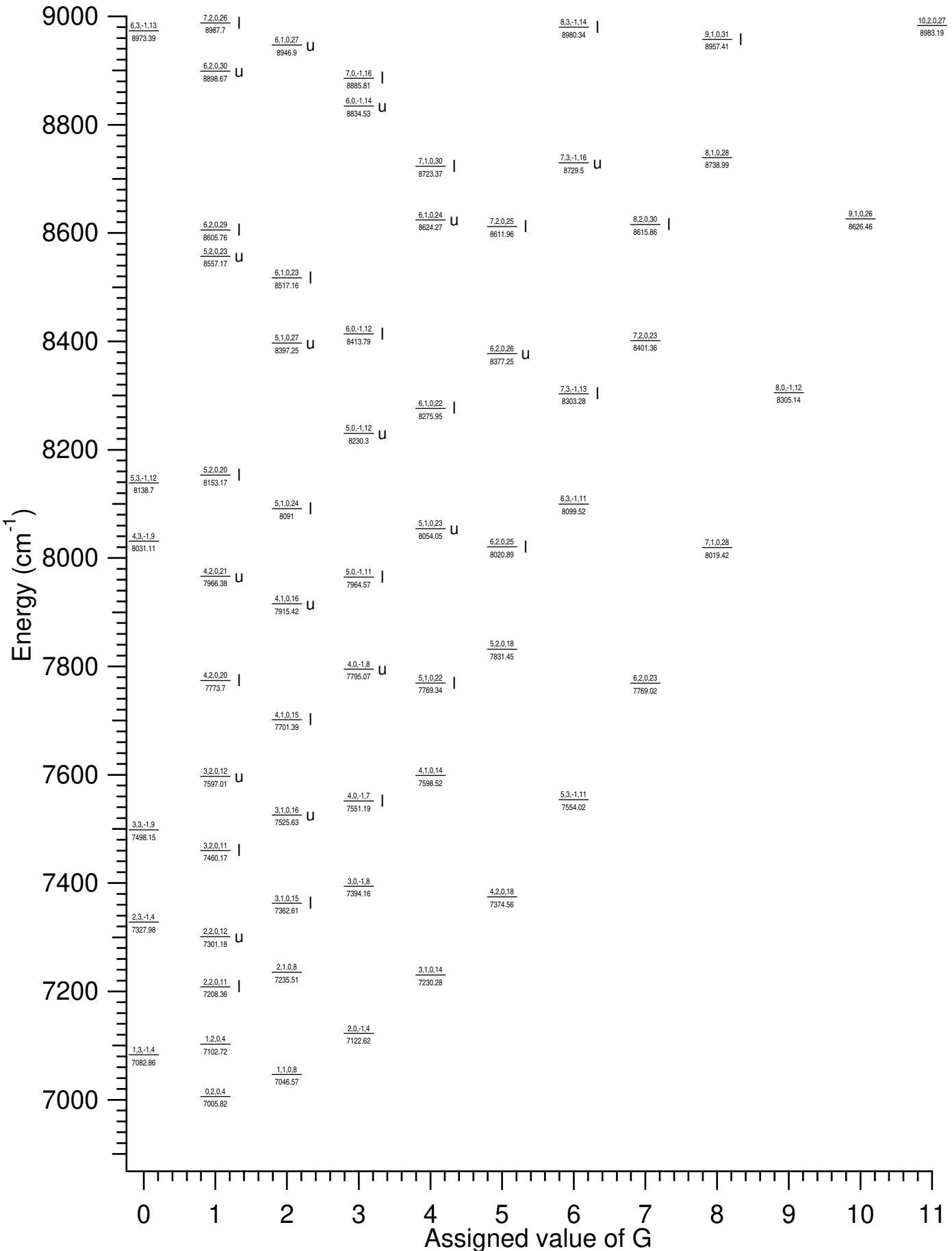
Energy level diagram for H_3^+: The $2\nu_2^2$ band

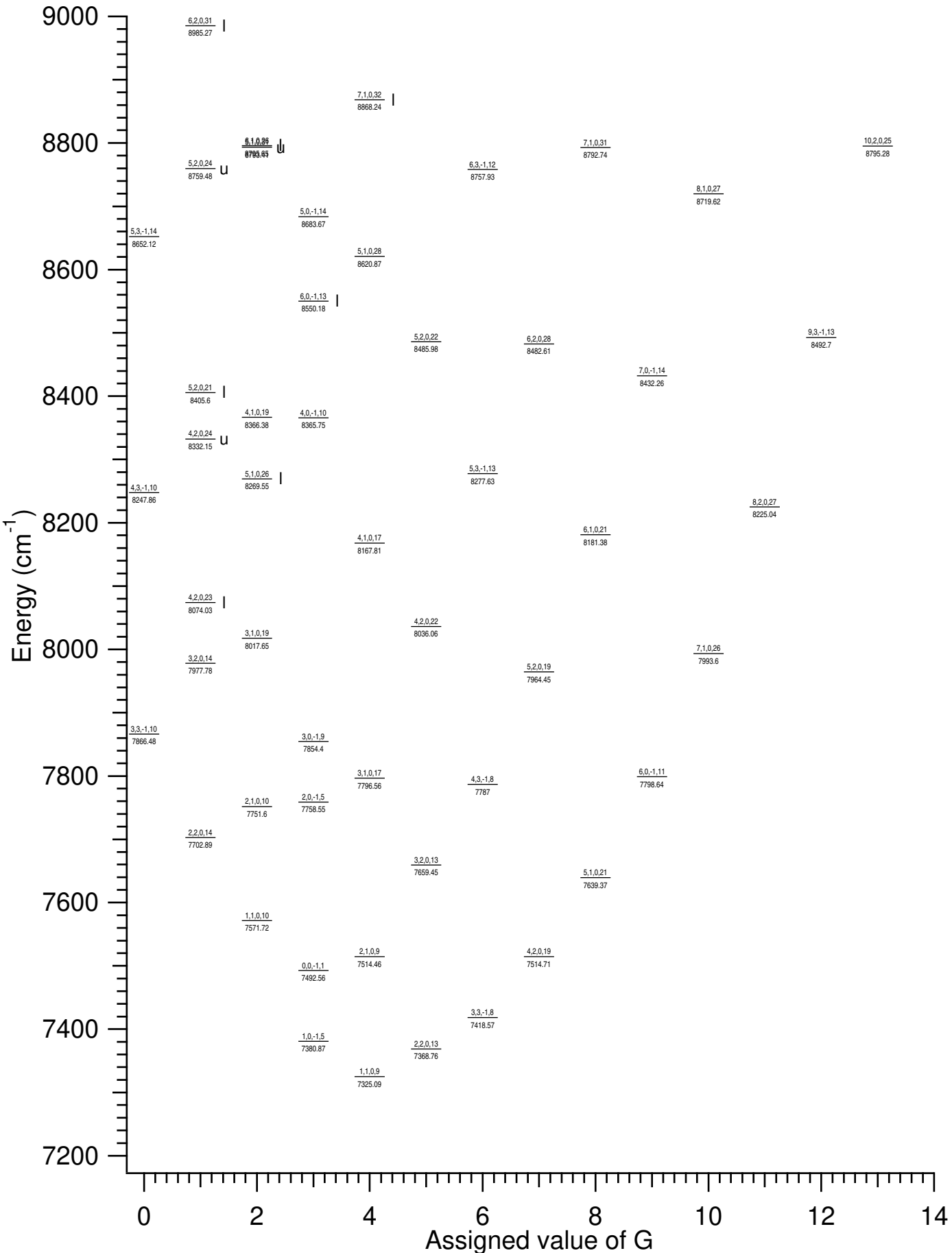


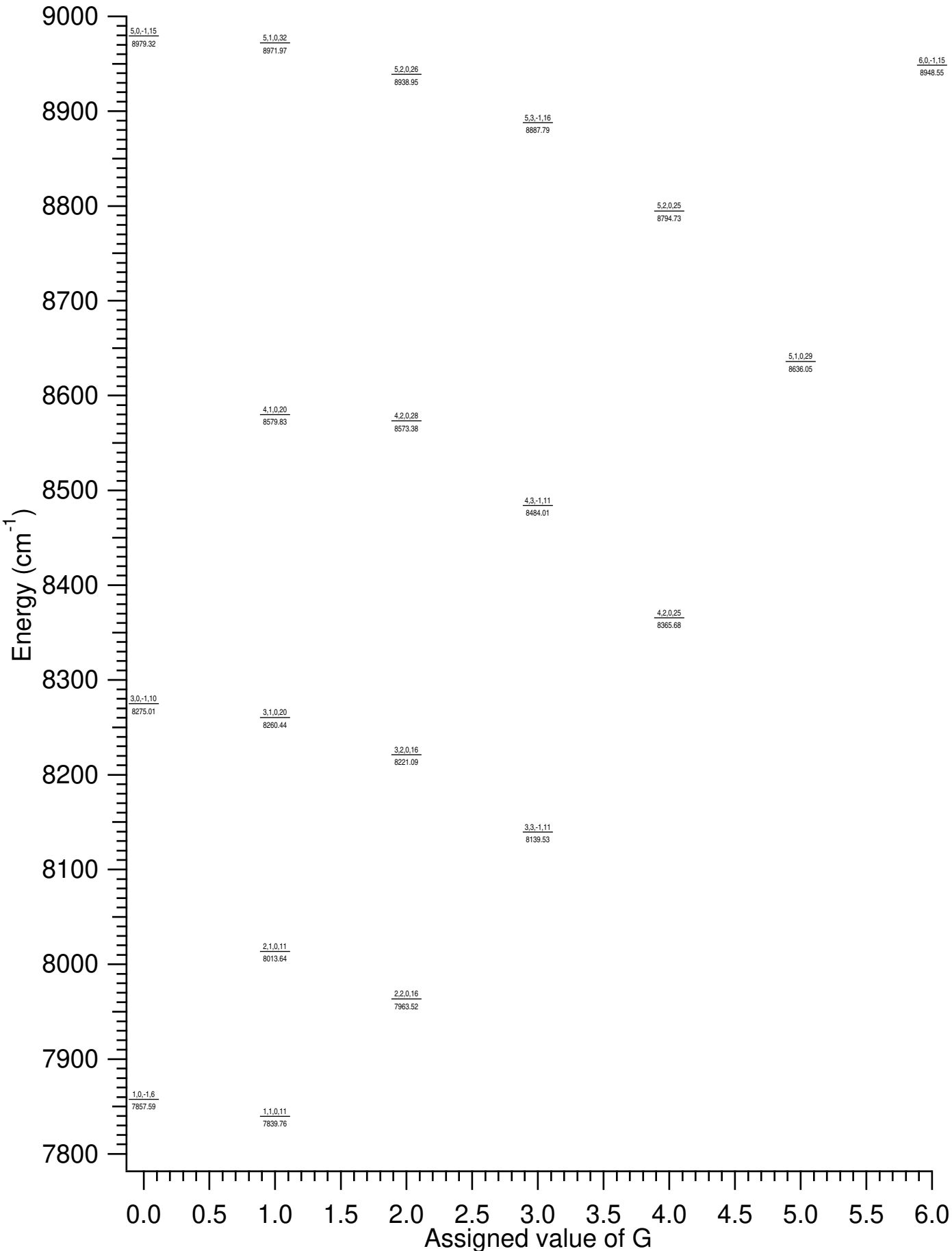
Energy level diagram for H_3^+: The $\nu_1 + \nu_2$ band

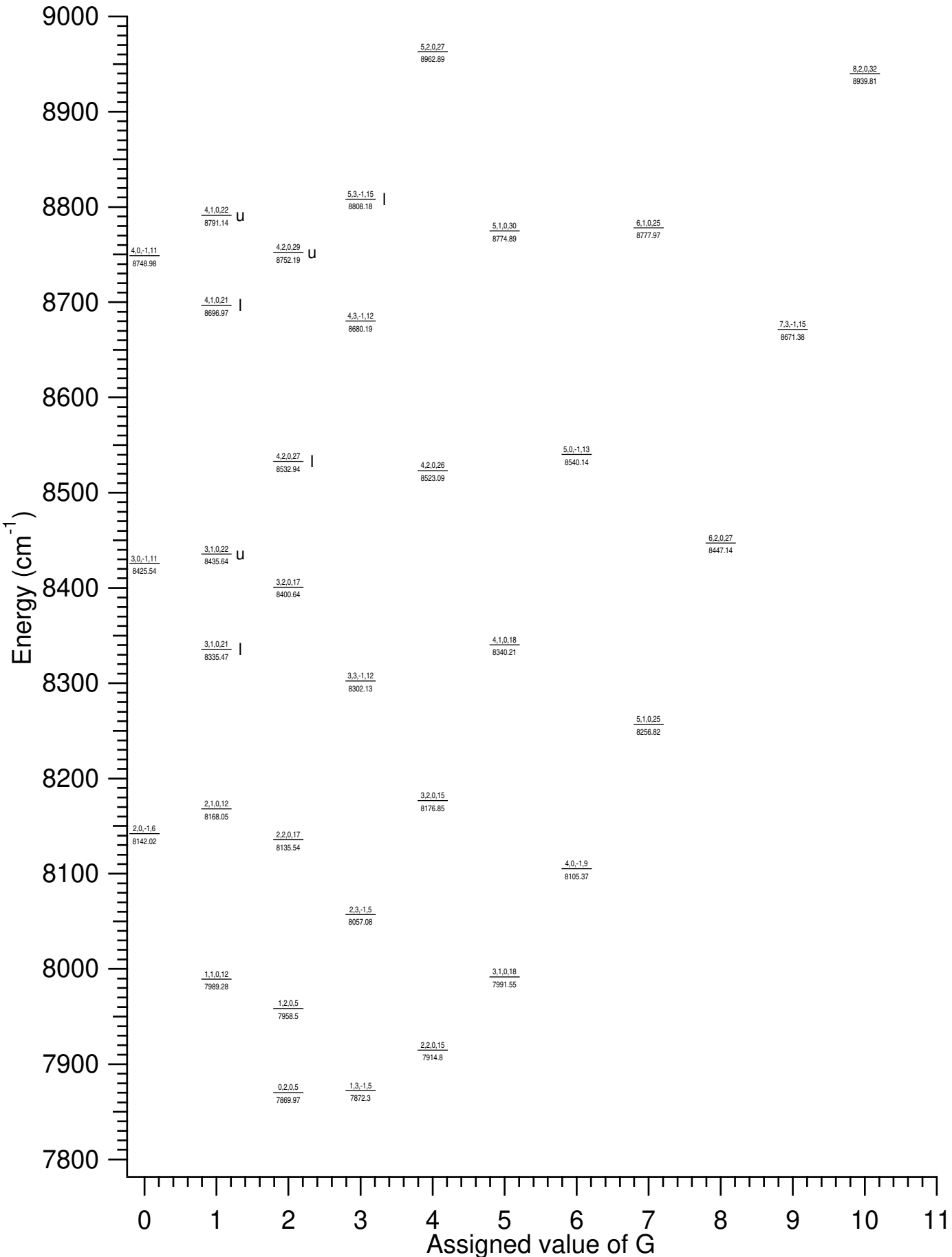


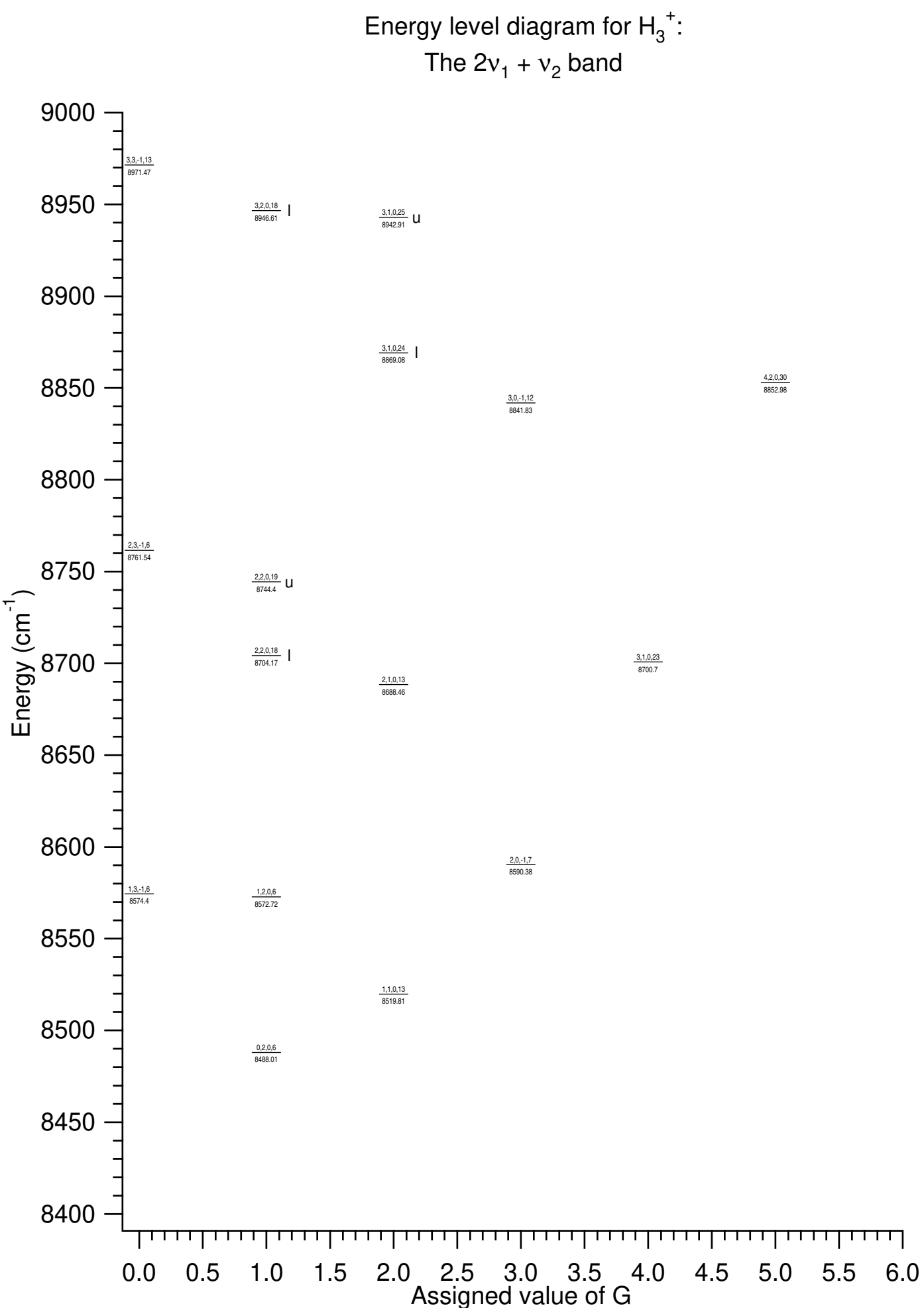

Energy level diagram for H_3^+:
The $2\nu_1$ band
Energy (cm^{-1})
Assigned value of G
9000
8800
8600
8400
8200
8000
7800
7600
7400
7200
7000
6800
6600
6400
0
1
2
3
4
5
6
7
8
9
10
11
11,1,0,23 8997.68
10,3,-1,11 8931.54
8,3,-1,13 8919.47
9,1,0,28 8835.65
8,2,0,31 8789.39
8,1,0,26 8629.37
10,2,0,23 8578.17
9,2,0,22 8548.46
7,0,-1,15 8476.59
7,1,0,29 8458.19
7,2,0,24 8402.73
8,0,-1,13 8370.66
7,3,-1,14 8306.73
7,2,0,22 8176.92
9,3,-1,11 8169.58
8,1,0,21 8143.85
7,1,0,27 8003.85
6,1,0,20 7923.43
6,2,0,24 7865.38
8,2,0,22 7837.46
7,0,-1,13 7797.2
6,3,-1,10 7768.67
6,2,0,22 7628.08
7,1,0,21 7499.7
5,0,-1,10 7475.15
5,1,0,20 7455.14
6,1,0,19 7444.16
5,2,0,17 7394.74
5,3,-1,10 7292.39
6,0,-1,10 7214.09
5,2,0,16 7147.11
4,1,0,13 7057.42
4,2,0,17 6994.96
5,1,0,19 6953.84
4,3,-1,7 6889.51
3,0,-1,7 6755.34
3,1,0,13 6734.09
4,2,0,16 6738.2
3,2,0,10 6669.88
3,3,-1,7 6561.24
2,1,0,7 6488.46
2,2,0,10 6422.88
1,0,-1,4 6345.17
1,1,0,7 6323.17


Energy level diagram for H_3^+:
The $3\nu_2^1$ band
Energy (cm^{-1})
Assigned value of G
9000
8800
8600
8400
8200
8000
7800
7600
7400
7200
7000
0
1
2
3
4
5
6
7
8
9
10
11
6,3,-1,13 8973.39
7,2,0,26 8987.7 l
6,1,0,27 8946.9 u
6,2,0,30 8898.67 u
7,0,-1,16 8885.81 l
6,0,-1,14 8834.53 u
8,3,-1,14 8980.34 l
9,1,0,31 8957.41 l
10,2,0,27 8983.19
7,1,0,30 8723.37 l
7,3,-1,16 8729.5 u
8,1,0,28 8738.99
6,2,0,29 8605.76 l
5,2,0,23 8557.17 u
6,1,0,24 8624.27 u
7,2,0,25 8611.96 l
8,2,0,30 8615.86 l
9,1,0,26 8626.46
6,1,0,23 8517.16 l
5,1,0,27 8397.25 u
6,0,-1,12 8413.79 l
6,2,0,26 8377.25 u
7,2,0,23 8401.36
7,3,-1,13 8303.28 l
8,0,-1,12 8305.14
6,1,0,22 8275.95 l
5,0,-1,12 8230.3 u
5,3,-1,12 8138.7
5,2,0,20 8153.17 l
5,1,0,24 8091 l
6,3,-1,11 8099.52
4,3,-1,9 8031.11
5,1,0,23 8054.05 u
6,2,0,25 8020.89 l
7,1,0,28 8019.42
4,2,0,21 7966.38 u
5,0,-1,11 7964.57 l
4,1,0,16 7915.42 u
5,2,0,18 7831.45
4,0,-1,8 7795.07 u
4,2,0,20 7773.7 l
5,1,0,22 7769.34 l
6,2,0,23 7769.02
4,1,0,15 7701.39 l
3,2,0,12 7597.01 u
4,1,0,14 7598.52
4,0,-1,7 7551.19 l
5,3,-1,11 7554.02
3,1,0,16 7525.63 u
3,3,-1,9 7498.15
3,2,0,11 7460.17 l
3,0,-1,8 7394.16
3,1,0,15 7362.61 l
4,2,0,18 7374.56
2,3,-1,4 7327.98
2,2,0,12 7301.18 u
2,1,0,8 7235.51
2,2,0,11 7208.36 l
3,1,0,14 7230.28
2,0,-1,4 7122.62
1,2,0,4 7102.72
1,3,-1,4 7082.86
1,1,0,8 7046.57
0,2,0,4 7005.82


Energy level diagram for H_3^+:
The $3\nu_2{}^3$ band
Energy (cm^{-1})
Assigned value of G
9000
8800
8600
8400
8200
8000
7800
7600
7400
7200
0
2
4
6
8
10
12
14
6,2,0,31
8985.27
7,1,0,32
8868.24
7,1,0,31
8792.74
10,2,0,25
8795.28
5,2,0,24
8759.48
6,3,-1,12
8757.93
8,1,0,27
8719.62
5,0,-1,14
8683.67
5,3,-1,14
8652.12
5,1,0,28
8620.87
6,0,-1,13
8550.18
9,3,-1,13
8492.7
5,2,0,22
8485.98
6,2,0,28
8482.61
7,0,-1,14
8432.26
5,2,0,21
8405.6
4,1,0,19
8366.38
4,0,-1,10
8365.75
4,2,0,24
8332.15
5,3,-1,13
8277.63
5,1,0,26
8269.55
4,3,-1,10
8247.86
8,2,0,27
8225.04
6,1,0,21
8181.38
4,1,0,17
8167.81
4,2,0,23
8074.03
4,2,0,22
8036.06
3,1,0,19
8017.65
7,1,0,26
7993.6
3,2,0,14
7977.78
5,2,0,19
7964.45
3,3,-1,10
7866.48
3,0,-1,9
7854.4
3,1,0,17
7796.56
4,3,-1,8
7787
6,0,-1,11
7798.64
2,1,0,10
7751.6
2,0,-1,5
7758.55
2,2,0,14
7702.89
3,2,0,13
7659.45
5,1,0,21
7639.37
1,1,0,10
7571.72
2,1,0,9
7514.46
4,2,0,19
7514.71
0,0,-1,1
7492.56
3,3,-1,8
7418.57
1,0,-1,5
7380.87
2,2,0,13
7368.76
1,1,0,9
7325.09


Energy level diagram for H_3^+:
The $\nu_2 + 2\nu_2^0$ band
Energy (cm^{-1})
Assigned value of G
9000
8900
8800
8700
8600
8500
8400
8300
8200
8100
8000
7900
7800
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
5,0,-1,15
8979.32
5,1,0,32
8971.97
5,2,0,26
8938.95
5,3,-1,16
8887.79
5,2,0,25
8794.73
6,0,-1,15
8948.55
5,1,0,29
8636.05
4,1,0,20
8579.83
4,2,0,28
8573.38
4,3,-1,11
8484.01
4,2,0,25
8365.68
3,0,-1,10
8275.01
3,1,0,20
8260.44
3,2,0,16
8221.09
3,3,-1,11
8139.53
2,1,0,11
8013.64
2,2,0,16
7963.52
1,0,-1,6
7857.59
1,1,0,11
7839.76


Energy level diagram for H_3^+:
The $\nu_1+2\nu_2^2$ band
Energy (cm^{-1})
Assigned value of G
9000
8900
8800
8700
8600
8500
8400
8300
8200
8100
8000
7900
7800
0
1
2
3
4
5
6
7
8
9
10
11
5,2,0,27
8962.89
8,2,0,32
8939.81
5,3,-1,15
8808.18
l
4,1,0,22
8791.14
u
5,1,0,30
8774.89
6,1,0,25
8777.97
4,0,-1,11
8748.98
4,2,0,29
8752.19
u
4,1,0,21
8696.97
l
4,3,-1,12
8680.19
7,3,-1,15
8671.38
5,0,-1,13
8540.14
4,2,0,27
8532.94
l
4,2,0,26
8523.09
6,2,0,27
8447.14
3,0,-1,11
8425.54
3,1,0,22
8435.64
u
3,2,0,17
8400.64
4,1,0,18
8340.21
3,1,0,21
8335.47
l
3,3,-1,12
8302.13
5,1,0,25
8256.82
3,2,0,15
8176.85
2,1,0,12
8168.05
2,0,-1,6
8142.02
2,2,0,17
8135.54
4,0,-1,9
8105.37
2,3,-1,5
8057.08
1,1,0,12
7989.28
3,1,0,18
7991.55
1,2,0,5
7958.5
2,2,0,15
7914.8
0,2,0,5
7869.97
1,3,-1,5
7872.3


Energy level diagram for H_3^+:
The $2\nu_1 + \nu_2$ band
Energy (cm^{-1})
9000
8950
8900
8850
8800
8750
8700
8650
8600
8550
8500
8450
8400
3,3,-1,13
8971.47
3,2,0,18
8946.61
l
3,1,0,25
8942.91
u
3,1,0,24
8869.08
l
4,2,0,30
8852.98
3,0,-1,12
8841.83
2,3,-1,6
8761.54
2,2,0,19
8744.4
u
2,2,0,18
8704.17
l
3,1,0,23
8700.7
2,1,0,13
8688.46
2,0,-1,7
8590.38
1,3,-1,6
8574.4
1,2,0,6
8572.72
1,1,0,13
8519.81
0,2,0,6
8488.01
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
Assigned value of G