Complete experimental rovibrational eigenenergies of HCN up to 6880 cm^{-1} above the ground state

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The [H,C,N] molecular system is a very important model system to many fields of chemical physics and the experimental characterization of highly excited vibrational states of this molecular system is of special interest. This paper reports the experimental characterization of all 3822 eigenenergies up to 6880 cm^{-1} relative to the ground state in the HCN part of the potential surface using high temperature hot gas emission spectroscopy. The spectroscopic constants for the first 71 vibrational states including highly excited bending vibrations up to $v_2 = 10$ are reported. The perturbed eigenenergies for all 20 rotational perturbations in the reported eigenenergy range have been determined. The 11 070 eigenenergies up to $J = 90$ for the first 123 vibrational substates are included as supplement to this paper. We show that a complete *ab initio* rovibrational analysis for a polyatomic molecule is possible. Using such an analysis we can understand the molecular physics behind the Schrödinger equation for problems for which perturbation theoretical calculations are no more valid. We show that the vibrational structure of the linear HCN molecule persists approximately up to the isomerization barrier and only above the barrier the accommodation of the vibrational states to the double well structure of the potential takes place. © *2011 American Institute of Physics*. [doi:10.1063/1.3598942]

I. INTRODUCTION

The [H,C,N] molecular system is a very important model system to many fields of chemical physics and the experimental characterization of highly excited vibrational states of this molecular system is of special interest. The isomerization reaction HCN⇌HNC is one of the simplest models of a chemical reaction and one of the prototype model systems used for the study of unimolecular reactions.[1–15] This system is important because there is an overlap between the two basic scientific "tools"that we can use to gain a fundamental understanding on the isomerization process on a full quantum mechanical basis: It is possible to do high-level *ab initio* theoretical calculations (only 17 particles), and high resolution spectroscopic data can be obtained for highly excited vibrational states. Regarding the isomerization reaction one of the key questions is how the isomerization manifests itself in the vibration-rotation eigenenergy spectrum of the HCN and HNC molecules. The spectroscopic signature describes how the wave functions of the two isomers H-CN and CN-H located in two different minima merge step by step to a single delocalized wave function[16] corresponding to a single "combined"$H_{0.5}$-CN-$H_{0.5}$ molecule.

This work together with the previous papers[18–21,89] is the first step in elucidating the physics behind this fundamental process. We want to understand how the excitation of the vibrational angular momentum and/or excitation of the rotation of the polyatomic molecule interacts with the bending excitation along the isomerization[22] (for a comparison of the [H,C,N] molecular system to the other two major model molecules acetylene[23–29] and HCP[30–32] studied so far for the structure of the highly excited rovibrational states see Ref. 18).

This work completes the spectroscopy of the HCN molecule at low and medium rovibrational excitation. In contrast to HNC, for which only a few rovibrational states have been measured before, the analysis of the HCN eigenenergies presented here extends the work of many spectroscopists.[33–75]

The first infrared spectra of HCN were recorded by Burmeister[33] in 1913. He used a prism spectrometer equipped with mirrors which could resolve the P and R branch structure of the absorption bands. With three different types of prisms, he detected five different bands in the wavenumber region 1 μm to 22 μm. He assigned three of the five bands to HCN: the "twin bands"at 13.60 μm/14.33 μm (ν_2 at 700 cm^{-1}), the band at 3.04 μm (ν_1 at 3300 cm^{-1}) and finally the band at 4.77 μm (ν_3 at 2100 cm^{-1}). He mistakenly accredited the other two bands to impurities.

From the beginning, overtone spectroscopy played an important role in molecular spectroscopy. HCN was one of the six polyatomic molecules against which Hettner [34] could test his theory on molecular vibrations. In 1920 Kratzer [35] tried to interpret the rotationally resolved spectra of H_2O, HF, HCl, and HBr. He assigned the two unassigned bands of Burmeister as the third and forth ν_2 overtones. This wrong assignment was based on the accidental concurrence of $3\nu_2$ with ν_3 and $4\nu_2$ with $\nu_3+\nu_2$, respectively. Had the assignment of Kratzer been correct, HCN would have been the only molecule with a proven third and forth overtone at that time. For this reason there was an extraordinary interest in the HCN absorption spectra, and the spectra were remeasured 1924 by Barker.[36] He did not find any new bands but he could specify two band centers. He pointed out the probability that the bands assigned

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by Kratzer may be combination bands. The first rotationally resolved HCN spectra have been recorded in 1931 by Badger and Binder [37] in the wave number region between 14000 cm^{-1} and 10800 cm^{-1}. They showed for the first time that HCN is a linear molecule. They determined the three fundamental vibrational frequencies and assigned all of the eight known bands correctly. In the same year Brackett and Liddel [38] (and a year later Choi and Barker [39]) detected new combination bands. The amount of vibrational data available for HCN allowed Adel and Barker [40] to set up the dependence of the band centers on the vibrational quantum numbers for the 16 known bands. With the development of more sensitive infrared grating spectrometers and with the increase of the resolution of the recorded spectra, more and more HCN overtones and combination bands have been measured.[41–56] The work of Lehmann *et al.*[57] is the starting point for experiments designed to record spectra for the detection of the highly excited rovibrational states of the [H,C,N] molecular system.[58–74] Over time the number of the detected band centers increased steadily. The sensitivity of all these experiments regarding the detection of highly excited bending states and highly excited rotational states was relatively low so that each work described only a small part of the overall rovibrational eigenenergy structure. The hot gas molecular emission (HOTGAME) spectroscopy changed this situation and allowed to record transitions between highly excited bending states.[75] To allow the analysis of bands between even higher excited states in a dense emission spectrum the new interactive spectrum analysis program SyMath was implemented in the Mathematica™computer algebra system with an easy-to-use user interface system.[17] The analysis of the spectra reported in this paper has been done using the SyMath spectrum analysis program.

The main purpose of this work is not to report new vibrational subband centers but to close the gaps in the existing relative eigenenergy list of this molecular system up to excitation energies of 6880 cm^{-1}.

New rotational constants for the ground state and for all three fundamental vibrational states with $J_{max} = 81, 69, 77, 86$ are reported. The rotational constants reported previously[70,75] describe the rotational substates up to $J_{max} = 60, 60, 48, 49$. For the majority of polyatomic molecules it is not unusual to report high resolution spectra with rotational excitations of $J = 80$ or higher. Due to the high rotational constant of the relatively light HCN molecule, excitations with $J = 80$ reported here correspond to very high rotational excitation energies (ca. 10 000 cm^{-1}) of the same order of magnitude as chemical excitation energies. The $J(J+1)$ dependence of the rotational eigenenergies implies that for HCN at such high J even small improvements of the highest rotational eigenstate detected in the experiment J_{max} correspond to a significantly improved sensitivity of the experiment. Here an overall sensitivity must be considered: the interplay of gas temperature, sensitivity of the HOTGAME experimental setup, and the ability of the spectrum analysis program to identify the very weak peaks in the dense spectrum. On the energy scale the improvements in J_{max} reported here for the fundamental bands correspond to an excitation energy of 2000 cm^{-1}.

The last work reporting pure bending states was reported in Ref. 75 using the authors' first generation HOTGAME spectra. The analysis was done using peaklists with a relatively low precision resulting in less accurate highly excited states than reported in this work. The initial motivation for this work was the necessity to improve the spectroscopic constants reported in Ref. 75 for the bending states due to the overlap of $J > 50$ HCN bending transitions with the HNC bending transitions. The accuracy of the low J states reported previously should be similar to the accuracy of the states reported here, for the states with $J > 40$ the accuracy of the states reported in this work are substantially improved. New highly excited bending states reported here are the 09^30 and $0\ 10^0\ 0$ states. The analysis of the $v_2 = 10, 11, 12$ bending substates present in the HOTGAME spectrum is in progress.

Transitions regarding the $1v_20$ states have been reported up to $v_2 = 4$ by Maki *et al.*[70] The analysis has been extended up to $v_2 = 5$ including the 15^10, 15^30, 15^50 states and for the states up to $v_2 = 4$ the highly excited rovibrational states have been determined. For the $v_2 = 4$ the $l = 0, 2, 4$ substates, for example, the range of experimentally characterized states have been extended from $J_{max} = 20, 20, 13$ to $J_{max} = 74, 76, 78$.

Transitions regarding the $0v_21$ states have been reported by Maki *et al.*[75] up to $v_2 = 5$ with $J_{max} = 30$. All substates from $v_2 = 0$ up $v_2 = 5$ have been extended to higher J_{max} (e.g., $J_{max} = 50$ for the $v_2 = 5$ states). New vibrational states reported here are the four vibrational substates with $v_2 = 6$.

The $0v_22$ states up to $v_2 = 3$ reported in this work have been reported previously by Maki *et al.*[70] This work extends the previous results by reporting about twice as much experimentally characterized rovibrational states. Transitions regarding the $0v_23$ state have been assigned in the HOTGAME spectra; the fit results for these transitions do not improve the state constants published in the Ref. 70.

II. EXPERIMENTAL DETAILS

To record the emission spectra of small molecules, an emission experiment at the molecular spectroscopic laboratory of the Justus-Liebig-University in Giessen was designed. With the emission apparatus highly excited states of H_2O,[76–78] HCN,[79–81] and HNC[18,19] isotopologues have been successfully measured and analyzed. The implementation of the emission experiment is described in detail in a previous paper [17] to which the reader is referred for details.

This work reports the assignment of the HCN emission lines using the spectra reported in a previous work.[18] For the sake of completeness a brief description of the emission spectra follows (see Figure 1 for an overview of the measured spectra). To record the emission spectrum at 1576 K in the bending wavenumber region a 900 mm cell made of Al_2O_3 was used. The cell was fitted with CsI windows. The windows and the ends of the cell were kept at room temperature by water-cooled copper collars. 550 mm of the cell was placed in an oven that could be heated to 1600 K. The length of the cell outside the oven on the side where the molecular emission was collected was only 120 mm to minimize the self-absorption and temperature inhomogeneity effects on the

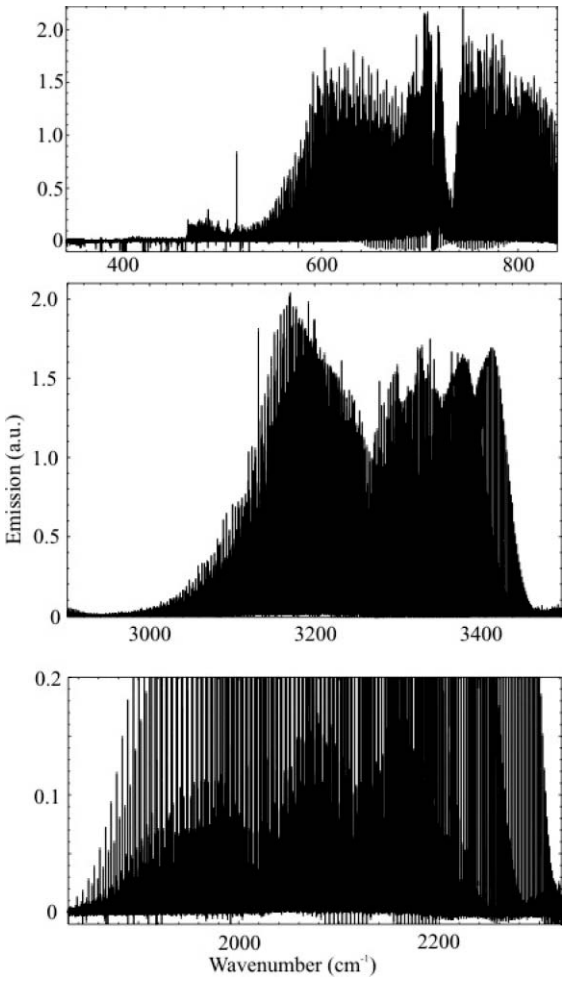

FIG. 1. Overview of the measured emission spectra.

emission line shapes. This is the minimum distance required by the cooling collars to lower the cell from 1600 K to room temperature. The resolution of the Bruker IFS 120 HR spectrometer was set to 0.005 cm^{-1} and the 3.5 μm Mylar beamsplitter with the liquid helium cooled Ge:Cu far infrared quantum detector was used. Unfortunately the continuous time to record the HCN/HNC emission spectra was limited because the cell was not completely vacuum tight and the HCN sample slowly decomposed in the alumina cell. The spectrum was recorded by averaging the scans from three different measurements. The emission cell was refilled for each measurement with 11, 11, and 10 Torr pure HCN, respectively. To record the emission spectra in the CN and HC stretching regions, respectively, a specially designed one-meter-long quartz cell with 50 mm inner diameter was used. The cell was fitted with CaF_2 windows. The windows were held at room temperature by water-cooled jackets at each end of the cell. The central part of the cell was enclosed in an electrically heated commercial furnace yielding a heated region of 600 mm in length at up to 1480 K. Both spectra were recorded using an InSb quantum detector. The spectrum recorded for the HC stretching region is the average of two measurements: 1120 scans recorded at 1423 K and 560 scans recorded at 1463 K. Background spectra recorded for each measurement were used to extract the Planck emission background from the single beam spectrum. The intensity of each spectrum has been corrected by dividing the background-corrected spectrum by the appropriate optical filter transmission curve.

III. DATA ANALYSIS

The linear HCN molecule has three normal modes $v = v_1, v_2, v_3$, two stretching vibrations of Σ^+ symmetry, and a bending mode of Π symmetry: v_1 is the HC stretch at 3311.47 cm^{-1}, v_3 is the CN stretch at 2096.84 cm^{-1}, and v_2 is the degenerate bending mode at 711.97 cm^{-1}. The rovibrational eigenstates are labeled using the quantum numbers of the Wang symmetrized basis functions $|v, l, J, (e/f)\rangle$: the vibrational quantum numbers $v = v_1, v_2, v_3$, the vibrational angular momentum quantum numbers l and e/f, and the end-over-end rotational quantum number J. We use the labels e and f as the possible values of a symbolic quantum number e/f labeling the eigenvalues. For a linear molecule the vibrational angular momentum l is the only contribution to the axial component of the angular momentum. The vibrational angular momentum is equal to the absolute value of the signed quantum number k in the symmetric top basis functions $l = |k|$.

In the analysis presented, rovibrational term values are given by the eigenvalues of the Hamiltonian matrices[70] defined in the symmetric top basis $|v_1, v_2, k, v_3, J\rangle$ with the diagonal matrix elements

$$\begin{aligned}\langle v_1, v_2, v_3, k, J \mid \frac{\mathbf{H}}{hc} \mid v_1, v_2, v_3, k, J\rangle \\ = G_{vz} + B_v[J(J+1) - k^2] - D_v[J(J+1) - k^2]^2 \\ + H_v[J(J+1) - k^2]^3 + L_v[J(J+1) - k^2]^4 \end{aligned} \quad (1)$$

and with off-diagonal matrix elements

$$\begin{aligned}\langle v_1, v_2, v_3, k, J \mid \frac{\mathbf{H}}{hc} \mid v_1, v_2, v_3, k \pm 2, J\rangle \\ = \frac{1}{4}(q_v - q_{vJ}J(J+1) + q_{vJJ}J^2(J+1)^2 \\ + q_{lv}(k \pm 1)^2)\sqrt{(v_2 \mp k)(v_2 \pm k + 2)} \\ \times\sqrt{[J(J+1) - k(k \pm 1)]} \\ \times\sqrt{[J(J+1) - (k \pm 1)(k \pm 2)]} \end{aligned} \quad (2)$$

and

$$\begin{aligned}\langle v_1, v_2, v_3, k, J \mid \frac{\mathbf{H}}{hc} \mid v_1, v_2, v_3, k \pm 4, J\rangle \\ = \frac{\rho_v}{16}\sqrt{(v_2 \mp k)(v_2 \pm k + 2)(v_2 \mp k - 2)} \\ \times\sqrt{(v_2 \pm k + 4)[J(J+1) - k(k \pm 1)]} \\ \times\sqrt{[J(J+1) - (k \pm 1)(k \pm 2)]} \\ \times\sqrt{[J(J+1) - (k \pm 2)(k \pm 3)]} \\ \times\sqrt{[J(J+1) - (k \pm 3)(k \pm 4)]}. \end{aligned} \quad (3)$$

The analysis program uses the Wang symmetrization to factorize the matrices in e and f matrices. The e and f matrices are diagonalized separately and the eigenvalues are labeled as $E(v_1, v_2, l, v_3, J, e)$ and $E(v_1, v_2, l, v_3, J, f)$, respectively.

The analysis of the spectra has been done in four main consecutive steps. First of all the rotational eigenenergies of the vibrationless state $E_{0,J}$ have been determined in a global fit of the three fundamental bands with the $000 - 200$ band.[17] In this fit both the lower and upper levels have been adjusted. For a few low J transitions badly disturbed by self-absorption effects the transition wavenumbers have been fixed to the values reported for absorption measurements.[75] The eigenenergies of the vibrationless state $E_{0,J}$ determined in this analysis have been fixed in all consecutive analysis steps.

It was necessary to include the L_v centrifugal distortion constant for all these states to reproduce the measured transitions. The analysis of the $000 - 200$ band was performed in a previous paper.[17] For the weakest 12 transitions with $J > 64$ detected in that near infrared emission spectrum was not possible to fit the line positions to a model using only the H_v centrifugal distortion constant. The difference between predicted and measured line positions was in the order of many linewidths. At that time it was not possible to improve the analysis using the L_v centrifugal distortion constant, the ground state eigenenergies fixed in the analysis were known only up to $J = 60$ and only R branch transitions have been assigned. A similar problem was observed during the analysis of each fundamental transition reported in this work. Including the L_v constant in the global fit of the three fundamental transitions with the $000 - 200$ band the fitted constants reproduced all transitions within the measurement accuracy. The fact that transitions from four different spectra were included in the fit and all four constants fitted to approximately -8×10^{-17} cm^{-1} convinced the author that the constants determined are not fitting artifacts. There are no previous reports regarding the L_v centrifugal distortion constant for HCN, the order of magnitude and the sign of the constant were unknown. Later in the analysis it was possible to fit the L_v centrifugal distortion constant for many combination bands; even a rough dependence of this constant with the vibrational quantum number could be determined: the constants magnitude is increasing slightly with the vibrational excitation. In the analysis of the highly excited vibrational states this parameter has not been fixed to the value that it can be calculated using the vibrational quantum number dependence, it was fixed to values having the order of magnitude of the constants determined for the fundamental states.

The second step was the global fit of the all far infrared transitions involving the first five bending excitations. From this fit resulted 77 highly accurate spectroscopic parameters for the HCN lower bending states describing the rotational structure with measurement accuracy up to $J = 70$.

The third step was the analysis in which the 060 rovibrational bending states have been determined. This was the most complicated step in the analysis, especially the deperturbation of the 06^00 state highly perturbed by a local Coriolis resonance. In this step not only the far infrared transitions but also all other transitions which involve the 060 sublevels have been included in a single global fit. The eigenenergies determined for the 060 sublevel reproduce the near infrared spectra with the measurement accuracy, for the far infrared spectra the accuracy is within a linewidth.

The last step was the analysis of all other transitions reported in this work. In each fit the eigenenergies of the lower levels have been fixed. Only the bands with the highest accuracy and J_{max} have been used in the fit. To include the transitions with the highest J it was necessary to deperturb many states perturbed by Coriolis resonances. In such cases up to five different bands have been used to determine the peaks corresponding to the perturbed states. This was very difficult in the case of weak transitions in spectral regions with high density of transitions. Different possible perturbed states have been considered until the transitions calculated for the selected perturbed state could be assigned in all bands. Such an analysis allowed the assignment of the high J peaks after the local perturbation.

Tables SI-SIX (see supplementary material[82]) list the transitions analyzed in this work. A large number of bands observed in the emission spectra are not listed in the tables. These bands have only been simulated in the analysis, and the predicted intensity and position values have been used to simulate the line shapes used in the deconvolution procedure described in Ref. 17. Through the deconvolution procedure the precision of the already analyzed bands increases as the analysis advances; only for a few bands the fits have been redone at the end of the analysis for the final results reported.

The analysis of the state 06^21 is not complete. For this band only the e components have been assigned in the far infrared spectrum at very low intensity level. The peaks form a series and the rotational constant is similar to the predicted one. It was not possible to confirm the assignment using the simulated very weak $\Delta v_2 = 3$ bending band or the $16^21 - 06^21$ combination band. For the f states local Coriolis perturbations are expected at low J; the assignment of the very weak peaks in the dense emission spectrum due to such perturbations may not be possible. For all other states assignment errors can be excluded due to interplay of the local perturbations on the energy scale. Many of the states have been fixed as lower states in the analysis of the $1v_20 - 0v_20$ band series up to $v_2 = 8$ and in the analysis of the $1v_21 - 0v_21$ band series up to $v_2 = 6$.[21]

IV. VIBRATIONAL AND ROTATIONAL CONSTANTS

In the analysis, the constants $G'_{v_z}(v, l)$, $B'_v(v, l)$, $D'_v(v, l)$, $H'_v(v, l)$, $L'_v(v, l)$, $q'_v(v)$, $q'_{vJ}(v)$, $q'_{vJJ}(v)$, $\rho'_v(v)$, and $q'_{lv}(v)$ of the Hamiltonian matrix (Eqs. (1)–(3)) have been fitted to the transition wavenumbers. The spectroscopic constants obtained for the first 71 vibrational states of HCN are given in Tables I and II and as supplementary material.[82] For the states with $v_2 = 2$ the constants $\rho_v(v)$ and $q_{lv}(v)$ have been estimated. For estimated constants the standard deviation is not given.

The HCN vibrational levels $G_{v_z}(v, l)$ fitted in the analysis are the vibrational term parameters relative to the ground state term value[17] $T_0 = 3479.23$ cm^{-1} of the diagonal matrix element

$$G_{v_z}(v, l) = G_v(v, l) - T_0.$$

TABLE I. State term value matrix constants in cm^{-1}. The uncertainty in the last digits (standard deviation) is given in parentheses. Values that do not have any uncertainty are calculated values and have been fixed in the fit.

Nr.	State	$T_{v(J=0)}$	$G_{vz}(v,l)$	B_v	$D_v 10^6$	$H_v 10^{12}$	$L_v 10^{17}$	$q_v 10^3$	$q_{vJ} 10^8$	$q_{vJJ} 10^{12}$	$\rho_v 10^8$	$q_{lv} 10^4$	J_m
1	00^00	0.00	0.000000(9)	1.478222943(43)	2.91132(14)	3.663(73)	−9.37(96)						81
2	01^10	711.97	713.461373(22)	1.481773413(51)	2.97808(2)	4.172(4)	−8.55(19)	7.4876209(430)	8.8480(32)	1.288(5)			77
3	02^00	1411.41	1411.413450(30)	1.485828689(84)	3.04790(5)	5.252(8)	−6.06(50)	7.5956814(188)	9.3201(26)	1.397(4)	−1.8400	0.08311(11)	69
4	02^20	1426.52	1432.469904(27)	1.484997857(68)	3.04137(3)	4.323(6)	−8.62(36)						70
5	00^01	2096.84	2096.845547(28)	1.468143474(71)	2.91776(4)	3.819(6)	−11.70(45)						69
6	03^10	2113.45	2114.940101(30)	1.489575692(81)	3.11494(9)	6.150(10)	−5.27(54)	7.7091638(243)	9.8695(22)	1.600(4)	−1.9000(50)	0.07746(43)	72
7	03^30	2143.75	2157.151668(32)	1.487869361(83)	3.10003(9)	3.999(8)	−9.02(51)						71
8	04^00	2802.95	2802.958744(43)	1.493867683(128)	3.18976(13)	9.713(20)	−30.91(166)	7.8242919(249)	10.3959(24)	1.743(5)	−1.9877(41)	0.08199(35)	63
9	01^11	2805.58	2807.053602(109)	1.471573442(205)	2.98254(10)	4.060(15)	−8.87(90)	7.4822590(1780)	8.9373(128)	1.488(21)			69
10	04^20	2818.17	2824.147565(32)	1.492986027(90)	3.17545(7)	6.062(14)	5.22(79)						70
11	04^40	2863.78	2887.627064(36)	1.490361234(98)	3.15496(13)	3.571(14)	−19.13(80)					0.08199(35)	68
12	10^00	3311.47	3311.477086(88)	1.467798587(117)	2.88581(4)	3.722(4)	−8.50(16)						86
13	05^10	3495.14	3496.611989(70)	1.497839553(453)	3.27252(132)	8.070(102)	−5.00	7.9431230(1360)	10.8073(118)	1.321(28)	−1.5133(290)	0.02980(252)	64
14	02^01	3502.12	3502.121103(85)	1.475491522(511)	3.05244(39)	7.070(74)	−39.24(433)	7.5753500(2610)	9.2198(210)	1.359(40)	−1.7900	0.08280	64
15	02^21	3516.87	3522.770697(68)	1.474677035(247)	3.04499(17)	4.514(31)	−12.68(228)						63
16	05^30	3525.64	3539.136969(55)	1.496029678(250)	3.23371(21)	3.837(105)	−10.00						61
17	05^50	3586.69	3624.011213(73)	1.492442059(302)	3.17334(134)	3.556(106)	−15.00						49
18	11^10	4004.16	4005.633722(31)	1.471560328(54)	2.95828(2)	4.554(2)	−9.37(12)	7.6066380(700)	9.5175(34)	1.609(4)			83
19	00^02	4173.07	4173.070913(183)	1.458004019(559)	2.92271(44)	3.432(96)	−11.70						57
20	06^00	4174.60	4174.608607(102)	1.502397631(707)	3.33640(139)	9.950(175)	−3.00	8.0694380(1390)	11.6050(118)	1.868(34)	−1.8501(172)	0.05592(146)	64
21	06^20	4189.97	4195.979578(75)	1.501468226(465)	3.32077(104)	8.109(113)	−5.00						61
22	03^11	4201.21	4202.684288(101)	1.479114052(450)	3.12473(79)	10.536(57)	−63.97(572)	7.6723010(2790)	9.3398(199)	0.959(35)	−1.8825(418)	0.07522(353)	62
23	03^31	4230.82	4244.134559(114)	1.477425273(438)	3.09952(71)	2.506(58)	12.60(452)						64
24	06^40	4236.01	4260.002988(65)	1.498682088(295)	3.28076(34)	4.200(108)	−9.00						59
25	06^60	4312.62	4366.411318(88)	1.494082018(364)	3.21742(126)	1.020(107)	−10.00						56
26	12^00	4684.30	4684.309975(60)	1.475839197(148)	3.04399(6)	6.217(7)	−10.41(36)	7.7264260(360)	9.9980(33)	1.724(3)	−1.0850	−0.00752(36)	82
27	12^20	4699.20	4705.109033(43)	1.474996635(95)	3.02240(4)	4.852(4)	−9.88(24)						83
28	07^10	4856.74	4858.194861(171)	1.506641159(1212)	3.33975(502)	−3.633(633)	−3.00	8.2019330(2470)	12.2850(362)	0.179(146)	−2.5475(530)	0.11383(448)	53
29	01^12	4878.29	4879.756212(129)	1.461318251(424)	2.98835(34)	4.026(74)	−8.87	7.4701850(5130)	8.6741(521)	0.938(123)			57
30	07^30	4887.52	4901.135690(174)	1.504726213(1086)	3.35666(192)	15.681(653)	−5.00						52
31	04^01	4888.03	4888.039808(274)	1.483249071(1132)	3.18691(165)	5.641(193)	−10.00	7.7780450(3940)	10.1423(347)	1.941(70)	−1.4768(544)	0.03949(451)	62
32	04^21	4902.93	4908.867050(199)	1.482394116(727)	3.18505(79)	7.175(157)	−10.00						63
33	04^41	4947.59	4971.276613(180)	1.479789260(712)	3.13782(152)	2.856(168)	−10.00						59
34	07^50	4949.31	4986.835387(230)	1.500903495(1051)	3.32805(152)	4.312(471)	−9.00						50
35	07^70	5041.65	5114.926881(193)	1.495249840(829)	3.30778(532)	−2.152(363)	−10.00						56

TABLE II. State term value matrix constants in cm^{-1}. The uncertainty in the last digits (standard deviation) is given in paranthesis. Values that do not have any uncertainty are calulated values and have been fixed in the fit.

Nr.	State	$T_{v(J=0)}$	$G_{vz}(v, l)$	B_v	$D_v 10^6$	$H_v 10^{12}$	$L_v 10^{17}$	$q_v 10^3$	$q_{vJ} 10^8$	$q_{vJJ} 10^{12}$	$\rho_v 10^8$	$q_{lv} 10^4$	J_m
36	$13^1 0$	5366.88	5368.355557(67)	1.47980851(18)	3.10470(20)	7.380(12)	−10.30(78)	7.851732(94)	10.7084(53)	1.996(7)	−2.2635(129)	0.0965(10)	76
37	$10^0 1$	5393.69	5393.697732(66)	1.45793456(23)	2.89396(18)	3.215(38)	1.21(283)						60
38	$13^3 0$	5396.69	5410.007200(62)	1.47808147(16)	3.09446(21)	4.806(12)	−13.65(64)						77
39	$08^0 0$	5525.81	5525.812840(287)	1.51154881(226)	3.46655(311)	22.940(1160)	−3.00	8.337108(356)	13.3808(511)	4.631(164)	−2.3805(343)	0.0900	45
40	$08^2 0$	5541.39	5547.421124(209)	1.51055404(140)	3.45427(221)	24.476(854)	−5.00						54
41	$02^0 2$	5571.73	5571.734305(303)	1.46509603(192)	3.04947(171)	4.662(400)	−10.00	7.554220(1160)	9.6020(1120)	2.669(263)	−1.7900	0.0828	53
42	$05^1 1$	5577.46	5578.932554(199)	1.48709044(128)	3.26840(330)	7.892(331)	−10.00	7.887950(411)	10.4561(451)	1.143(120)	−1.3742(692)	0.0153(59)	54
43	$02^2 2$	5586.06	5591.922535(188)	1.46430584(109)	3.05258(102)	5.099(244)	−10.00						53
44	$08^4 0$	5588.00	5612.149949(221)	1.50757055(132)	3.42331(193)	17.719(733)	−5.00						48
45	$05^3 1$	5607.38	5620.782328(170)	1.48530502(87)	3.23608(82)	4.434(261)	−10.00						54
46	$08^6 0$	5665.62	5719.726195(483)	1.50261898(202)	3.29228(225)	−24.290(739)	−9.00						52
47	$05^5 1$	5667.27	5704.315145(307)	1.48175379(113)	3.17217(323)	6.425(372)	−10.00						51
48	$08^8 0$	5773.90	5869.649636(258)	1.49590864(104)	3.29237(107)	−9.210(302)	−10.00						54
49	$14^0 0$	6036.96	6036.960114(199)	1.48433768(43)	3.19053(27)	12.954(29)	−52.51(161)	7.977867(76)	11.3093(45)	2.185(6)	−2.2727(53)	0.0939(4)	74
50	$14^2 0$	6051.91	6057.852111(69)	1.48344204(19)	3.17232(13)	7.471(16)	1.00(100)						76
51	$11^1 1$	6083.34	6084.809862(87)	1.46158874(17)	2.96869(8)	4.841(11)	−11.30(66)	7.671213(223)	9.8932(141)	1.852(20)			77
52	$14^4 0$	6096.73	6120.427404(72)	1.48078821(19)	3.15500(18)	4.190(17)	−22.97(96)						78
53	$09^1 0$	6197.44	6198.859269(349)	1.51614743(242)	3.57041(376)	4.662(795)	−3.00	8.483734(405)	14.6402(785)	3.818	−2.0717	0.0656	50
54	$09^3 0$	6228.58	6242.335538(321)	1.51404021(157)	3.48474(130)	24.894	−5.00						41
55	$00^0 3$	6228.59	6228.598299(62)	1.44780785(57)	2.92970(95)	3.160	0.00						28[a]
56	$06^0 1$	6254.41	6254.405902(1059)	1.4915359 (111)	3.86120(2320)	7.892	−10.00	7.921570(3210)	6.7080(2600)	1.816	−1.7360	0.0153	21
57	$03^1 2$	6267.67	6269.128532(817)	1.46861869(441)	3.16339(678)	22.350(3020)	−10.00	7.619843(577)	7.4905(524)	0.959	−1.8825		38
58	$06^2 1$	6269.51	6275.440607(1362)	1.4908316 (111)	3.40910(1230)	6.553	−10.00						27
59	$09^5 0$	6291.32	6329.080358(404)	1.50997765(219)	3.48916(291)	0.474	−7.00						27
60	$03^3 2$	6296.51	6309.718441(315)	1.46694424(174)	3.11847(243)	4.848(920)	−10.00						43
61	$06^4 1$	6314.71	6338.535154(468)	1.48782554(292)	3.23527(319)	3.033	0.00						42
62	$09^7 0$	6385.04	6458.737373(984)	1.50389380(252)	3.33665(170)	−3.414	−9.00						45
63	$06^6 1$	6389.94	6443.363348(1962)	1.48327193(562)	3.20861(492)	−21.18(163)	0.00						50
64	$09^9 0$	6509.47	6630.662222(358)	1.49602520(123)	3.24680(118)	−10.559(440)	−10.00						52
65	$20^0 0$	6519.61	6519.610486(47)	1.45707364(9)	2.86162(4)	3.960(5)	−10.23(36)						76
66	$15^1 0$	6709.52	6710.986224(157)	1.48854435(60)	3.28335(61)	13.302(52)	−48.62(320)	8.107049(164)	11.7996(98)	1.845(14)	−1.7885(122)	0.0419(9)	72
67	$15^3 0$	6739.46	6752.875726(134)	1.48671209(44)	3.24051(27)	6.926(53)	−40.74(286)						72
68	$12^0 1$	6760.70	6760.705136(132)	1.46574585(68)	3.04346(45)	6.744(76)	−46.44(474)	7.777441(352)	10.1893(244)	1.426(41)	−1.7900	0.0828	68
69	$12^2 1$	6775.38	6781.242116(95)	1.46491143(38)	3.03753(23)	4.236(37)	31.48(235)						69
70	$15^5 0$	6799.38	6836.462859(148)	1.48309075(42)	3.18570(53)	7.003(57)	−74.19(265)						73
71	$0\,10^0\,0$	6855.44	6855.443088(532)	1.52148167(346)	3.70826(403)	27.53(118)	−3.00	8.650000	16.0000	3.800	−2.0717	0.0656	50

[a]From absorption measurements (Ref. 70).

The rotationless term values $T_{v,(J=0)}$ are given in Tables I and II. They have been calculated by extrapolating to $J = 0$ the experimental eigenenergies up to $J = 30$ using Eq. (1) for the parity component having the lower eigenenergy value. For vibrational substates with $l > 0$ these term values represent eigenenergy values for the fictitious $J = 0$ state. The $T_{v,(J=0)}$ term values have been used to sort the states in Tables I and II. The $T_{v,(J=0)}$ term values are approximately equal to the rotationless term values predicted by the physical model defined by Eqs. (1)–(3) (denoted G_c or $T_{v,J=0}$). For the majority states reported here the difference between these two definitions is less than 0.01 cm^{-1}. The $T_{v,(J=0)}$ term values are used to compare the vibrational part of the experimental eigenenergies reported here to results obtained with a physical model approximated by Eq. (1) plus the analytical form of the l-doubling Eq. (2).

V. THE HCN RELATIVE ROVIBRONIC EIGENENERGIES

Tables IV–XIX list the complete experimental eigenenergies of the [H,C,N] molecular system up to 6880 cm^{-1} relative to the HCN ground state (the states are labeled as $v_1 v_2^l v_3 J^{e/f}$). The eigenenergies are relative values and represent only the values that result from the wave functions localized in the HCN part of the potential. All perturbed states below 6880 cm^{-1} have been determined and included in Tables IV–XIX so that the eigenenergy list is complete and accurate (see Sec. VI and Ref. 82). Only the last Table XIX has a few entries for the state $06^{2f}1$ which are unperturbed. The assignment of the very weak $06^{2e}1$ transitions in the ν_2 wavenumber region used to determine the eigenenergies could not be confirmed through other transitions. These eigenenergies have thus much lower accuracy than all other eigenenergies but still less than 1 cm^{-1}.

A second list of relative eigenenergies is published in this work as supplementary material.[82] This list contains all 11 070 eigenenergies up to $J = 90$ for the 123 $(v_1, v_2, l, v_3, e/f)$ type vibrational states listed in Tables I and II. In this list the experimentally detected eigenenergies up to J_{max} are extended with calculated eigenenergies up to $J = 90$. For the perturbed states the experimentally detected or estimated eigenenergies of these perturbed states are given. Due to the high order centrifugal distortion constants determined in this work the predicted eigenenergies should be accurate to 1 cm^{-1} even at the highest J. This estimation is based on the changes in the eigenenergy list that one can observe if small changes in the assignments with the highest J assigned for a band series are made. If the fit is redone and the new set of eigenenergies is compared to the old ones one can estimate the accuracy of the values listed for $J = 90$. A small part of these eigenenergies is in the region of the potential barrier and thus the calculated eigenenergies are only approximate values.

Table III lists the standard deviations for the rovibrational states in each of the 71 vibrational levels based on the difference between the measured and calculated peak positions. These error values should be used to describe the rotational accuracy of the eigenenergies listed in Tables IV–XIX. The problems related the accuracy and precision of the analysis presented here was discussed in a previous paper.[18] The author excludes the possibility of assignment errors in the presented tables. To minimize the problem of possible transcription errors the original rovibrational energy lists from the SyMath user interface system have been included as supplementary material.[82]

TABLE III. Upper limit of the uncertainty in cm^{-1} (standard deviation) for the rovibrational levels listed in Table IV–V.

State	$\sigma_{\tilde{\nu}}$	*State*	$\sigma_{\tilde{\nu}}$	*State*	$\sigma_{\tilde{\nu}}$
00^00	0.00006	06^60	0.00090	14^00	0.00054
01^10	0.00006	12^00	0.00028	14^20	0.00046
02^00	0.00008	12^20	0.00028	11^11	0.00055
02^20	0.00008	07^10	0.00092	14^40	0.00047
00^01	0.00014	01^12	0.00057	09^10	0.00190
03^10	0.00015	07^30	0.00092	09^30	0.00147
03^30	0.00015	04^01	0.00073	00^03	0.00000
04^00	0.00019	04^21	0.00073	06^01	0.00186
01^11	0.00036	04^41	0.00073	03^12	0.00084
04^20	0.00019	07^50	0.00092	06^21	0.30000
04^40	0.00019	07^70	0.00092	09^50	0.00078
10^00	0.00020	13^10	0.00046	03^32	0.00084
05^10	0.00020	10^01	0.00027	06^41	0.00097
02^01	0.00039	13^30	0.00046	09^70	0.00082
02^21	0.00039	08^00	0.00113	06^61	0.00061
05^30	0.00020	08^20	0.00113	09^90	0.00027
05^50	0.00020	02^02	0.00057	20^00	0.00022
11^10	0.00023	05^11	0.00075	15^10	0.00091
00^02	0.00057	02^22	0.00057	15^30	0.00063
06^00	0.00029	08^40	0.00113	12^01	0.00056
06^20	0.00032	05^31	0.00075	12^21	0.00056
03^11	0.00063	08^60	0.00113	15^50	0.00075
03^31	0.00063	05^51	0.00075	010^00	0.00417
06^40	0.00026	08^80	0.00113		

VI. PERTURBED EIGENENERGIES

The model based on the matrix elements listed in Eqs. (1)–(3) with the spectroscopic constants from Tables I and II does not reproduce all experimental HCN eigenstates. A few eigenenergies are perturbed due to Coriolis-type resonances. All resonances observed in this work for HCN are local resonances. In the case of local resonances the rovibrational eigenenergies $T(v_1, v_2, l, v_3, J, e)$ or $T(v_1, v_2, l, v_3, J, f)$ are perturbed only in a well defined range of rotational quantum numbers J. The perturbed eigenenergies may be included in the analysis if additional matrix elements are considered in the physical model. In this work transitions between perturbed levels have been excluded from the analysis to get unperturbed spectroscopic constants. The perturbed transition wavenumbers have been collected in perturbation analysis tables. Using the unperturbed eigenenergies and the assigned perturbed transitions, the perturbed eigenenergies have been determined in a combination difference type analysis. In the perturbation analysis the accuracy of the different transitions from or to the perturbed level has been considered.

TABLE IV. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
1	$00^00\ 1^e$	2.95643	61	$01^10\ 17^f$	1166.26682	121	$02^20\ 13^e$	1696.82781	181	$03^30\ 4^f$	2173.51823
2	$00^00\ 2^e$	8.86923	62	$00^00\ 28^e$	1198.39938	122	$02^00\ 14^e$	1723.13685	182	$01^10\ 31^e$	2175.30712
3	$00^00\ 3^e$	17.73825	63	$01^10\ 18^e$	1217.12474	123	$02^20\ 14^f$	1738.25083	183	$03^10\ 6^e$	2175.68174
4	$00^00\ 4^e$	29.56329	64	$01^10\ 18^f$	1219.67521	124	$02^20\ 14^e$	1738.41629	184	$03^10\ 6^f$	2176.32892
5	$00^00\ 5^e$	44.34406	65	$01^10\ 19^e$	1273.20965	125	$01^10\ 26^e$	1748.11594	185	$02^20\ 22^f$	2177.17527
6	$00^00\ 6^e$	62.08022	66	$01^10\ 19^f$	1276.04224	126	$01^10\ 26^f$	1753.32909	186	$02^20\ 22^e$	2178.10190
7	$00^00\ 7^e$	82.77135	67	$00^00\ 29^e$	1283.85273	127	$00^00\ 34^e$	1754.96856	187	$00^01\ 7^e$	2179.05243
8	$00^00\ 8^e$	106.41696	68	$01^10\ 20^e$	1332.23725	128	$02^00\ 15^e$	1767.61997	188	$01^10\ 31^f$	2182.64903
9	$00^00\ 9^e$	133.01648	69	$01^10\ 20^f$	1335.36654	129	$02^20\ 15^f$	1782.76058	189	$00^00\ 38^e$	2184.34366
10	$00^00\ 10^e$	162.56930	70	$00^00\ 30^e$	1372.23221	130	$02^20\ 15^e$	1782.97641	190	$03^30\ 5^e$	2188.39654
11	$00^00\ 11^e$	195.07471	71	$01^10\ 21^e$	1394.20615	131	$02^00\ 16^e$	1815.05548	191	$03^30\ 5^f$	2188.39656
12	$00^00\ 12^e$	230.53194	72	$01^10\ 21^f$	1397.64667	132	$01^10\ 27^e$	1827.69916	192	$03^10\ 7^e$	2196.42198
13	$00^00\ 13^e$	268.94016	73	$02^00\ 0^e$	1411.41345	133	$02^20\ 16^f$	1830.23164	193	$03^10\ 7^f$	2197.28468
14	$00^00\ 14^e$	310.29846	74	$02^00\ 1^e$	1414.38509	134	$02^20\ 16^e$	1830.50826	194	$00^01\ 8^e$	2202.53675
15	$00^00\ 15^e$	354.60586	75	$02^00\ 2^e$	1420.32822	135	$01^10\ 27^f$	1833.30979	195	$03^30\ 6^e$	2206.25009
16	$00^00\ 16^e$	401.86132	76	$02^00\ 3^e$	1429.24249	136	$00^00\ 35^e$	1857.94598	196	$03^30\ 6^f$	2206.25014
17	$00^00\ 17^e$	452.06372	77	$02^20\ 2^f$	1435.43988	137	$02^00\ 17^e$	1865.44102	197	$03^10\ 8^e$	2220.12298
18	$00^00\ 18^e$	505.21187	78	$02^20\ 2^e$	1435.43997	138	$02^20\ 17^f$	1880.66284	198	$03^10\ 8^f$	2221.23183
19	$00^00\ 19^e$	561.30452	79	$02^00\ 4^e$	1441.12742	139	$02^20\ 17^e$	1881.01189	199	$03^30\ 7^e$	2227.07863
20	$00^00\ 20^e$	620.34034	80	$02^20\ 3^f$	1444.34969	140	$01^10\ 28^e$	1910.21189	200	$03^30\ 7^f$	2227.07874
21	$00^00\ 21^e$	682.31795	81	$02^20\ 3^e$	1444.35015	141	$01^10\ 28^f$	1916.23419	201	$00^01\ 9^e$	2228.95482
22	$01^10\ 1^e$	714.93565	82	$02^00\ 5^e$	1455.98235	142	$02^00\ 18^e$	1918.77413	202	$02^00\ 23^e$	2229.56469
23	$01^10\ 1^f$	714.95063	83	$02^20\ 4^f$	1456.22909	143	$02^20\ 18^f$	1934.05295	203	$02^20\ 23^f$	2245.33889
24	$01^10\ 2^e$	720.84770	84	$02^20\ 4^e$	1456.23046	144	$02^20\ 18^e$	1934.48726	204	$02^20\ 23^e$	2246.43166
25	$01^10\ 2^f$	720.89262	85	$01^10\ 22^e$	1459.11486	145	$00^00\ 36^e$	1963.83598	205	$03^10\ 9^e$	2246.78390
26	$01^10\ 3^e$	729.71560	86	$01^10\ 22^f$	1462.88111	146	$02^00\ 19^e$	1975.05230	206	$03^10\ 9^f$	2248.16945
27	$01^10\ 3^f$	729.80544	87	$00^00\ 31^e$	1463.53571	147	$02^20\ 19^f$	1990.40067	207	$03^30\ 8^e$	2250.88187
28	$01^10\ 4^e$	741.53913	88	$02^20\ 5^f$	1471.07780	148	$02^20\ 19^e$	1990.93424	208	$03^30\ 8^f$	2250.88212
29	$01^10\ 4^f$	741.68885	89	$02^20\ 5^e$	1471.08099	149	$01^10\ 29^e$	1995.65216	209	$00^01\ 10^e$	2258.30603
30	$00^00\ 22^e$	747.23587	90	$02^00\ 6^e$	1473.80644	150	$01^10\ 29^f$	2002.10027	210	$01^10\ 32^e$	2269.51754
31	$01^10\ 5^e$	756.31802	91	$02^20\ 6^f$	1488.89544	151	$02^00\ 20^e$	2034.27300	211	$03^10\ 10^e$	2276.40378
32	$01^10\ 5^f$	756.54257	92	$02^20\ 6^e$	1488.90184	152	$02^20\ 20^f$	2049.70460	212	$01^10\ 32^f$	2277.32731
33	$01^10\ 6^e$	774.05191	93	$02^00\ 7^e$	1494.59872	153	$02^20\ 20^e$	2050.35260	213	$03^30\ 9^e$	2277.65949
34	$01^10\ 6^f$	774.36623	94	$02^20\ 7^f$	1509.68159	154	$00^00\ 37^e$	2072.63606	214	$03^30\ 9^f$	2277.65998
35	$01^10\ 7^e$	794.74038	95	$02^20\ 7^e$	1509.69311	155	$01^10\ 30^e$	2084.01794	215	$03^10\ 10^f$	2278.09649
36	$01^10\ 7^f$	795.15941	96	$02^00\ 8^e$	1518.35802	156	$01^10\ 30^f$	2090.90594	216	$00^01\ 11^e$	2290.58965
37	$00^00\ 23^e$	815.09258	97	$01^10\ 23^e$	1526.96185	157	$02^00\ 21^e$	2096.43367	217	$00^00\ 39^e$	2298.95614
38	$01^10\ 8^e$	818.38294	98	$01^10\ 23^f$	1531.06827	158	$00^01\ 0^e$	2096.84554	218	$02^00\ 24^e$	2300.52999
39	$01^10\ 8^f$	818.92160	99	$02^20\ 8^f$	1533.43574	159	$00^01\ 1^e$	2099.78182	219	$03^30\ 10^e$	2307.41110
40	$01^10\ 9^e$	844.97903	100	$02^20\ 8^e$	1533.45494	160	$00^01\ 2^e$	2105.65430	220	$03^30\ 10^f$	2307.41202
41	$01^10\ 9^f$	845.65220	101	$02^00\ 9^e$	1545.08303	161	$02^20\ 21^f$	2111.96331	221	$03^10\ 11^e$	2308.98160
42	$01^10\ 10^e$	874.52801	102	$00^00\ 32^e$	1557.76110	162	$02^20\ 21^e$	2112.74199	222	$03^10\ 11^f$	2311.01177
43	$01^10\ 10^f$	875.35058	103	$02^20\ 9^f$	1560.15730	163	$00^01\ 3^e$	2114.46284	223	$02^20\ 24^f$	2316.45248
44	$00^00\ 24^e$	885.88646	104	$02^20\ 9^e$	1560.18746	164	$03^10\ 1^e$	2116.41425	224	$02^20\ 24^e$	2317.73043
45	$01^10\ 11^e$	907.02917	105	$02^00\ 10^e$	1574.77228	165	$03^10\ 1^f$	2116.44509	225	$00^01\ 12^e$	2325.80493
46	$01^10\ 11^f$	908.01600	106	$02^20\ 10^f$	1589.84561	166	$03^10\ 2^e$	2122.34165	226	$03^30\ 11^e$	2340.13628
47	$01^10\ 12^e$	942.48175	107	$02^20\ 10^e$	1589.89084	167	$03^10\ 2^f$	2122.43415	227	$03^30\ 11^f$	2340.13789
48	$01^10\ 12^f$	943.64767	108	$01^10\ 24^e$	1597.74549	168	$00^01\ 4^e$	2126.20725	228	$03^10\ 12^e$	2344.51621
49	$00^00\ 25^e$	959.61586	109	$01^10\ 24^f$	1602.20649	169	$03^10\ 3^e$	2131.23247	229	$03^10\ 12^f$	2346.91399
50	$01^10\ 13^e$	980.88490	110	$02^00\ 11^e$	1607.42413	170	$03^10\ 3^f$	2131.41746	230	$00^01\ 13^e$	2363.95103
51	$01^10\ 13^f$	982.24473	111	$02^20\ 11^f$	1622.49996	171	$00^01\ 5^e$	2140.88722	231	$01^10\ 33^e$	2366.64695
52	$01^10\ 14^e$	1022.23771	112	$02^20\ 11^e$	1622.56525	172	$03^10\ 4^e$	2143.08639	232	$02^00\ 25^e$	2374.42516
53	$01^10\ 14^f$	1023.80622	113	$02^00\ 12^e$	1643.03682	173	$03^10\ 4^f$	2143.39468	233	$01^10\ 33^f$	2374.93849
54	$00^00\ 26^e$	1036.27903	114	$00^00\ 33^e$	1654.90615	174	$03^10\ 5^e$	2157.90300	234	$03^30\ 12^e$	2375.83455
55	$01^10\ 15^e$	1066.53918	115	$02^20\ 12^f$	1658.11954	175	$03^10\ 5^f$	2158.36535	235	$03^30\ 12^f$	2375.83724
56	$01^10\ 15^f$	1068.33114	116	$02^20\ 12^e$	1658.21085	176	$00^01\ 6^e$	2158.50242	236	$03^10\ 13^e$	2383.00639
57	$01^10\ 16^e$	1113.78828	117	$01^10\ 25^e$	1671.46410	177	$02^00\ 22^e$	2161.53175	237	$03^10\ 13^f$	2385.80170
58	$01^10\ 16^f$	1115.81839	118	$01^10\ 25^f$	1676.29403	178	$03^30\ 3^f$	2161.61533	238	$02^20\ 25^f$	2390.51433
59	$00^00\ 27^e$	1115.87417	119	$02^00\ 13^e$	1681.60841	179	$03^30\ 3^e$	2161.61533	239	$02^20\ 25^e$	2391.99720
60	$01^10\ 17^e$	1163.98386	120	$02^20\ 13^f$	1696.70348	180	$03^30\ 4^e$	2173.51822	240	$00^01\ 14^e$	2405.02703

TABLE V. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
241	$03^30\ 13^e$	2414.50539	301	$02^00\ 30^e$	2787.76572	361	$00^00\ 44^e$	2915.49487	421	$02^20\ 33^e$	3092.79454
242	$03^30\ 13^f$	2414.50970	302	$01^10\ 37^f$	2794.66356	362	$04^20\ 8^f$	2925.65065	422	$04^40\ 12^f$	3096.24547
243	$00^00\ 40^e$	2416.47081	303	$03^10\ 21^e$	2797.15258	363	$04^20\ 8^e$	2925.71121	423	$04^40\ 12^e$	3096.24551
244	$03^10\ 14^e$	2424.45082	304	$04^00\ 0^e$	2802.95874	364	$04^40\ 6^e$	2926.37580	424	$03^30\ 25^e$	3110.13584
245	$03^10\ 14^f$	2427.67332	305	$03^10\ 21^f$	2804.16124	365	$04^40\ 6^f$	2926.37580	425	$03^30\ 25^f$	3110.33850
246	$00^01\ 15^e$	2449.03197	306	$02^20\ 30^f$	2804.98132	366	$03^10\ 23^e$	2930.13377	426	$01^11\ 14^e$	3113.69774
247	$02^00\ 26^e$	2451.24778	307	$04^00\ 1^e$	2805.94646	367	$04^00\ 9^e$	2937.28226	427	$01^11\ 14^f$	3115.26588
248	$03^30\ 14^e$	2456.14820	308	$02^20\ 30^e$	2807.80189	368	$01^11\ 9^e$	2937.66678	428	$04^00\ 14^e$	3116.01570
249	$03^30\ 14^f$	2456.15486	309	$01^11\ 1^e$	2808.51769	369	$01^11\ 9^f$	2938.33635	429	$00^01\ 26^e$	3126.04567
250	$01^10\ 34^e$	2466.69304	310	$01^11\ 1^f$	2808.53265	370	$03^10\ 23^f$	2938.46078	430	$01^10\ 40^e$	3128.08194
251	$02^20\ 26^f$	2467.52261	311	$04^00\ 2^e$	2811.92154	371	$04^40\ 7^e$	2947.23948	431	$04^20\ 14^f$	3131.51375
252	$03^10\ 15^e$	2468.84809	312	$01^11\ 2^e$	2814.38895	372	$04^40\ 7^f$	2947.23948	432	$04^20\ 14^e$	3132.02643
253	$02^20\ 26^e$	2469.23075	313	$01^11\ 2^f$	2814.43384	373	$04^20\ 9^f$	2952.51213	433	$04^40\ 13^f$	3134.98121
254	$03^10\ 15^f$	2472.52715	314	$04^00\ 3^e$	2820.88324	374	$04^20\ 9^e$	2952.60714	434	$04^40\ 13^e$	3134.98130
255	$01^10\ 34^f$	2475.48018	315	$01^11\ 3^e$	2823.19566	375	$03^30\ 23^e$	2964.54353	435	$01^10\ 40^f$	3140.12934
256	$00^01\ 16^e$	2495.96478	316	$01^11\ 3^f$	2823.28543	376	$03^30\ 23^f$	2964.66782	436	$03^10\ 26^e$	3151.62606
257	$03^30\ 15^e$	2500.76233	317	$04^20\ 2^f$	2827.13352	377	$01^11\ 10^e$	2966.99492	437	$01^11\ 15^e$	3157.69403
258	$03^30\ 15^f$	2500.77234	318	$04^20\ 2^e$	2827.13381	378	$04^00\ 10^e$	2967.11653	438	$01^11\ 15^f$	3159.48465
259	$03^10\ 16^e$	2516.19672	319	$03^30\ 21^e$	2830.80050	379	$01^11\ 10^f$	2967.83066	439	$04^00\ 15^e$	3160.63555
260	$03^10\ 16^f$	2520.36132	320	$03^30\ 21^f$	2830.87328	380	$04^40\ 8^e$	2971.08282	440	$03^10\ 26^f$	3162.09874
261	$02^00\ 27^e$	2530.99547	321	$04^00\ 4^e$	2832.83046	381	$04^40\ 8^f$	2971.08282	441	$02^00\ 34^e$	3170.93880
262	$00^00\ 41^e$	2536.88489	322	$01^11\ 4^e$	2834.93761	382	$02^00\ 32^e$	2973.52930	442	$04^20\ 15^f$	3176.24380
263	$00^01\ 17^e$	2545.82435	323	$01^11\ 4^f$	2835.08722	383	$00^01\ 24^e$	2976.68204	443	$04^40\ 14^f$	3176.69395
264	$02^20\ 27^f$	2547.47544	324	$04^20\ 3^f$	2836.09125	384	$04^20\ 10^f$	2982.35478	444	$04^40\ 14^e$	3176.69411
265	$03^30\ 16^e$	2548.34708	325	$04^20\ 3^e$	2836.09269	385	$04^20\ 10^e$	2982.49697	445	$04^20\ 15^e$	3176.90871
266	$03^30\ 16^f$	2548.36172	326	$00^01\ 22^e$	2838.97957	386	$02^20\ 32^f$	2991.33691	446	$00^00\ 46^e$	3182.34474
267	$02^20\ 27^e$	2549.42968	327	$04^00\ 5^e$	2847.76174	387	$02^20\ 32^e$	2994.84296	447	$03^30\ 26^e$	3187.37192
268	$03^10\ 17^e$	2566.49513	328	$04^20\ 4^f$	2848.03438	388	$04^40\ 9^e$	2997.90550	448	$03^30\ 26^f$	3187.62674
269	$01^10\ 35^e$	2569.65344	329	$04^20\ 4^e$	2848.03872	389	$04^40\ 9^f$	2997.90550	449	$02^20\ 34^f$	3189.41942
270	$03^10\ 17^f$	2571.17381	330	$01^11\ 5^e$	2849.61453	390	$01^11\ 11^e$	2999.28293	450	$02^20\ 34^e$	3193.69679
271	$01^10\ 35^f$	2578.94995	331	$01^11\ 5^f$	2849.83891	391	$04^00\ 11^e$	2999.89103	451	$01^11\ 16^e$	3204.61674
272	$00^01\ 18^e$	2598.60949	332	$03^10\ 22^e$	2862.17375	392	$01^11\ 11^f$	3000.27160	452	$00^01\ 27^e$	3205.09601
273	$03^30\ 17^e$	2598.90167	333	$04^20\ 5^f$	2862.96248	393	$03^10\ 24^e$	3001.03057	453	$01^11\ 16^f$	3206.64534
274	$03^30\ 17^f$	2598.92261	334	$04^20\ 5^e$	2862.97260	394	$03^10\ 24^f$	3010.05163	454	$04^00\ 16^e$	3208.20393
275	$02^00\ 28^e$	2613.66588	335	$04^00\ 6^e$	2865.67496	395	$01^10\ 39^e$	3010.58811	455	$04^40\ 15^f$	3221.38310
276	$03^10\ 18^e$	2619.74168	336	$01^11\ 6^e$	2867.22660	396	$04^20\ 11^f$	3015.17752	456	$04^40\ 15^e$	3221.38337
277	$03^10\ 18^f$	2624.96245	337	$01^11\ 6^f$	2867.54014	397	$04^20\ 11^e$	3015.38225	457	$04^20\ 16^f$	3223.94687
278	$02^20\ 28^f$	2630.37086	338	$03^10\ 22^f$	2869.82959	398	$01^10\ 39^f$	3022.05836	458	$04^20\ 16^e$	3224.79336
279	$02^20\ 28^e$	2632.59239	339	$02^00\ 31^e$	2879.19066	399	$04^40\ 10^f$	3027.70712	459	$03^10\ 27^e$	3231.32037
280	$03^30\ 18^e$	2652.42526	340	$04^20\ 6^f$	2880.87502	400	$04^40\ 10^e$	3027.70713	460	$03^10\ 27^f$	3242.54779
281	$03^30\ 18^f$	2652.45459	341	$04^20\ 6^e$	2880.89523	401	$01^11\ 12^e$	3034.49176	461	$01^10\ 41^e$	3248.47435
282	$00^01\ 19^e$	2654.31894	342	$04^00\ 7^e$	2886.56831	402	$04^00\ 12^e$	3035.63973	462	$01^11\ 17^e$	3254.46554
283	$00^00\ 42^e$	2660.19554	343	$01^11\ 7^e$	2887.77261	403	$01^11\ 12^f$	3035.65837	463	$01^11\ 17^f$	3256.74678
284	$01^10\ 36^e$	2675.52570	344	$01^11\ 7^f$	2888.19048	404	$03^30\ 24^e$	3035.85921	464	$04^00\ 17^e$	3258.71811
285	$03^10\ 19^e$	2675.93464	345	$04^40\ 4^e$	2893.58861	405	$03^30\ 24^f$	3036.01878	465	$01^10\ 41^f$	3261.11225
286	$03^10\ 19^f$	2681.72493	346	$04^40\ 4^f$	2893.58861	406	$00^00\ 45^e$	3047.47753	466	$03^30\ 27^e$	3267.56587
287	$01^10\ 36^f$	2685.34527	347	$01^10\ 38^e$	2895.99565	407	$00^01\ 25^e$	3049.90707	467	$03^30\ 27^f$	3267.88327
288	$02^00\ 29^e$	2699.25672	348	$03^30\ 22^e$	2896.19018	408	$04^20\ 12^f$	3050.97914	468	$04^40\ 16^f$	3269.04801
289	$03^30\ 19^e$	2708.91693	349	$03^30\ 22^f$	2896.28589	409	$04^20\ 12^e$	3051.26457	469	$04^40\ 16^e$	3269.04846
290	$03^30\ 19^f$	2708.95728	350	$02^20\ 31^f$	2896.69209	410	$04^40\ 11^f$	3060.48727	470	$02^00\ 35^e$	3274.00518
291	$00^01\ 20^e$	2712.95139	351	$02^20\ 31^e$	2899.84460	411	$04^40\ 11^e$	3060.48729	471	$04^20\ 17^f$	3274.62123
292	$02^20\ 29^f$	2716.20686	352	$04^20\ 7^f$	2901.77132	412	$02^00\ 33^e$	3070.77942	472	$04^20\ 17^e$	3275.68110
293	$02^20\ 29^e$	2718.71711	353	$04^20\ 7^e$	2901.80770	413	$01^11\ 13^e$	3072.63015	473	$00^01\ 28^e$	3287.05623
294	$03^10\ 20^e$	2735.07223	354	$00^01\ 23^e$	2906.37232	414	$01^11\ 13^f$	3073.99011	474	$02^20\ 35^f$	3292.85227
295	$03^10\ 20^f$	2741.45875	355	$01^10\ 38^f$	2906.90217	415	$04^00\ 13^e$	3074.34902	475	$02^20\ 35^e$	3297.54701
296	$03^30\ 20^e$	2768.37570	356	$04^40\ 5^e$	2908.49209	416	$03^10\ 25^e$	3074.86206	476	$01^11\ 18^e$	3307.23922
297	$03^30\ 20^f$	2768.43030	357	$04^40\ 5^f$	2908.49209	417	$03^10\ 25^f$	3084.59879	477	$01^11\ 18^f$	3309.78776
298	$00^01\ 21^e$	2774.50542	358	$04^00\ 8^e$	2910.43869	418	$02^20\ 33^f$	3088.91349	478	$10^00\ 0^e$	3311.47708
299	$01^10\ 37^e$	2784.30730	359	$01^11\ 8^e$	2911.25258	419	$04^20\ 13^f$	3089.75836	479	$04^00\ 18^e$	3312.17381
300	$00^00\ 43^e$	2786.39986	360	$01^11\ 8^f$	2911.78941	420	$04^20\ 13^e$	3090.14548	480	$03^10\ 28^e$	3313.94271

TABLE VI. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
481	$10^00\ 1^e$	3314.41267	541	$04^20\ 21^f$	3506.99312	601	$05^30\ 7^e$	3609.45187	661	$02^00\ 39^e$	3715.29451
482	$04^40\ 17^f$	3319.68800	542	$02^20\ 37^f$	3508.48850	602	$05^30\ 7^f$	3609.45235	662	$04^20\ 24^e$	3715.95470
483	$04^40\ 17^e$	3319.68874	543	$04^20\ 21^e$	3509.26327	603	$01^11\ 23^e$	3614.93412	663	$05^50\ 9^f$	3721.01347
484	$00^00\ 47^e$	3320.09331	544	$02^01\ 2^e$	3510.97384	604	$04^40\ 22^f$	3617.48748	664	$05^50\ 9^e$	3721.01347
485	$10^00\ 2^e$	3320.28377	545	$01^10\ 43^f$	3511.80201	605	$04^40\ 22^e$	3617.49319	665	$05^30\ 11^e$	3723.14671
486	$03^10\ 28^f$	3325.94209	546	$05^10\ 3^e$	3512.94454	606	$03^30\ 31^e$	3617.88539	666	$05^30\ 11^f$	3723.15364
487	$04^20\ 18^f$	3328.26504	547	$05^10\ 3^f$	3513.23045	607	$03^30\ 31^f$	3618.58773	667	$05^10\ 12^e$	3726.75335
488	$10^00\ 3^e$	3329.09025	548	$02^20\ 37^e$	3514.08012	608	$01^11\ 23^f$	3619.03735	668	$05^10\ 12^f$	3730.45139
489	$04^20\ 18^e$	3329.57227	549	$02^01\ 3^e$	3519.82609	609	$10^00\ 14^e$	3619.58755	669	$02^01\ 12^e$	3732.13002
490	$10^00\ 4^e$	3340.83190	550	$05^10\ 4^e$	3524.83041	610	$02^20\ 38^f$	3620.68663	670	$02^20\ 39^f$	3735.80113
491	$03^30\ 28^e$	3350.71601	551	$05^10\ 4^f$	3525.30687	611	$02^21\ 8^f$	3623.03470	671	$00^01\ 33^e$	3740.43460
492	$03^30\ 28^f$	3351.10788	552	$02^21\ 2^f$	3525.72003	612	$02^21\ 8^e$	3623.05427	672	$02^20\ 39^e$	3742.37030
493	$10^00\ 5^e$	3355.50844	553	$02^21\ 2^e$	3525.72013	613	$04^00\ 23^e$	3623.47036	673	$02^21\ 12^f$	3746.85148
494	$01^11\ 19^e$	3362.93652	554	$03^30\ 30^e$	3525.87769	614	$02^20\ 38^e$	3626.75710	674	$02^21\ 12^e$	3746.94455
495	$01^11\ 19^f$	3365.76695	555	$03^30\ 30^f$	3526.46038	615	$01^10\ 44^e$	3627.01416	675	$00^00\ 50^e$	3750.59440
496	$04^00\ 19^e$	3368.56760	556	$02^01\ 4^e$	3531.62830	616	$05^10\ 9^e$	3628.79312	676	$05^50\ 10^f$	3750.85725
497	$01^10\ 42^e$	3371.76249	557	$02^21\ 3^f$	3534.56791	617	$05^10\ 9^f$	3630.93306	677	$05^50\ 10^e$	3750.85725
498	$00^01\ 29^e$	3371.92436	558	$02^21\ 3^e$	3534.56838	618	$05^50\ 5^f$	3631.47318	678	$04^40\ 24^f$	3757.40410
499	$10^00\ 6^e$	3373.11953	559	$05^10\ 5^e$	3539.68646	619	$05^50\ 5^e$	3631.47318	679	$04^40\ 24^e$	3757.41552
500	$04^40\ 18^f$	3373.30237	560	$10^00\ 12^e$	3540.38345	620	$05^30\ 8^e$	3633.38837	680	$01^11\ 25^e$	3758.43655
501	$04^40\ 18^e$	3373.30352	561	$05^10\ 5^f$	3540.40101	621	$05^30\ 8^f$	3633.38944	681	$01^10\ 45^e$	3758.97162
502	$02^00\ 36^e$	3379.97629	562	$05^30\ 3^e$	3543.62490	622	$02^01\ 9^e$	3634.85972	682	$05^30\ 12^e$	3759.04819
503	$04^20\ 19^f$	3384.87634	563	$05^30\ 3^f$	3543.62491	623	$04^20\ 23^f$	3640.95390	683	$05^30\ 12^f$	3759.05974
504	$01^10\ 42^f$	3385.00414	564	$02^21\ 4^f$	3546.36475	624	$01^10\ 44^f$	3641.50277	684	$10^00\ 17^e$	3760.35334
505	$04^20\ 19^e$	3386.46679	565	$02^21\ 4^e$	3546.36615	625	$00^01\ 32^e$	3643.95570	685	$01^11\ 25^f$	3763.26267
506	$10^00\ 7^e$	3393.66475	566	$02^01\ 5^e$	3546.37982	626	$04^20\ 23^e$	3644.06067	686	$05^10\ 13^e$	3765.32783
507	$02^20\ 36^f$	3399.20949	567	$01^11\ 22^e$	3547.55641	627	$05^50\ 6^f$	3649.38231	687	$04^00\ 25^e$	3768.48404
508	$03^10\ 29^e$	3399.49077	568	$00^01\ 31^e$	3550.37622	628	$05^50\ 6^e$	3649.38231	688	$05^10\ 13^f$	3769.63568
509	$02^20\ 36^e$	3404.34242	569	$01^11\ 22^f$	3551.31975	629	$02^21\ 9^f$	3649.57047	689	$02^01\ 13^e$	3770.43218
510	$03^10\ 29^f$	3412.27766	570	$04^40\ 21^f$	3551.98377	630	$02^21\ 9^e$	3649.60122	690	$03^10\ 33^e$	3770.89213
511	$10^00\ 8^e$	3417.14362	571	$04^40\ 21^e$	3551.98771	631	$05^10\ 10^e$	3658.48425	691	$01^10\ 45^f$	3774.10329
512	$01^11\ 20^e$	3421.55610	572	$04^00\ 22^e$	3555.35084	632	$05^30\ 9^e$	3660.31650	692	$05^50\ 11^f$	3783.68370
513	$01^11\ 20^f$	3424.68300	573	$05^30\ 4^e$	3555.59360	633	$05^30\ 9^f$	3660.31863	693	$05^50\ 11^e$	3783.68370
514	$04^00\ 20^e$	3427.89703	574	$05^30\ 4^f$	3555.59361	634	$05^10\ 10^f$	3661.09767	694	$02^21\ 13^f$	3785.16705
515	$04^40\ 19^f$	3429.89033	575	$05^10\ 6^e$	3557.51184	635	$10^00\ 15^e$	3663.58257	695	$02^21\ 13^e$	3785.29377
516	$04^40\ 19^e$	3429.89211	576	$05^10\ 6^f$	3558.51194	636	$02^01\ 10^e$	3664.34192	696	$04^20\ 25^f$	3786.73943
517	$03^30\ 29^e$	3436.82057	577	$02^21\ 5^f$	3561.11024	637	$05^50\ 7^f$	3670.27562	697	$03^10\ 33^f$	3786.94903
518	$03^30\ 29^f$	3437.30033	578	$02^21\ 5^e$	3561.11351	638	$05^50\ 7^e$	3670.27562	698	$04^20\ 25^e$	3790.84213
519	$10^00\ 9^e$	3443.55558	579	$02^01\ 6^e$	3564.07980	639	$03^10\ 32^e$	3673.66535	699	$05^30\ 13^e$	3797.94005
520	$04^20\ 20^f$	3444.45309	580	$05^30\ 5^e$	3570.55437	640	$02^21\ 10^f$	3679.05236	700	$05^30\ 13^f$	3797.95854
521	$04^20\ 20^e$	3446.36412	581	$05^30\ 5^f$	3570.55443	641	$02^21\ 10^e$	3679.09847	701	$05^10\ 14^e$	3806.85978
522	$00^01\ 30^e$	3459.69838	582	$04^20\ 22^f$	3572.49418	642	$01^11\ 24^e$	3685.22806	702	$03^30\ 33^e$	3810.74425
523	$00^00\ 48^e$	3460.71999	583	$04^20\ 22^e$	3575.16275	643	$04^40\ 23^f$	3685.96126	703	$02^01\ 14^e$	3811.67037
524	$10^00\ 10^e$	3472.90001	584	$05^10\ 7^e$	3578.30554	644	$04^40\ 23^e$	3685.96940	704	$03^30\ 33^f$	3811.74275
525	$01^11\ 21^e$	3483.09656	585	$10^00\ 13^e$	3578.52086	645	$03^10\ 32^f$	3688.89037	705	$05^10\ 14^f$	3811.82124
526	$01^11\ 21^f$	3486.53443	586	$02^21\ 6^f$	3578.80404	646	$01^11\ 24^f$	3689.68556	706	$10^00\ 18^e$	3813.12681
527	$03^10\ 30^e$	3487.96218	587	$02^21\ 6^e$	3578.81056	647	$05^30\ 10^e$	3690.23604	707	$05^50\ 12^f$	3819.49233
528	$02^00\ 37^e$	3488.84980	588	$03^10\ 31^e$	3579.35453	648	$05^30\ 10^f$	3690.23999	708	$05^50\ 12^e$	3819.49233
529	$04^40\ 20^f$	3489.45109	589	$05^10\ 7^f$	3579.63852	649	$05^10\ 11^e$	3691.13822	709	$02^21\ 14^f$	3826.42537
530	$04^40\ 20^e$	3489.45376	590	$02^01\ 7^e$	3584.72725	650	$05^50\ 8^f$	3694.15279	710	$02^21\ 14^e$	3826.59399
531	$04^00\ 21^e$	3490.15896	591	$05^30\ 6^e$	3588.50716	651	$05^50\ 8^e$	3694.15279	711	$04^40\ 25^f$	3831.81494
532	$01^10\ 43^e$	3497.94343	592	$05^30\ 6^f$	3588.50735	652	$05^10\ 11^f$	3694.27121	712	$04^40\ 25^e$	3831.83076
533	$05^10\ 1^e$	3498.08590	593	$03^10\ 31^f$	3593.75605	653	$04^00\ 24^e$	3694.51541	713	$02^00\ 40^e$	3832.86081
534	$05^10\ 1^f$	3498.13356	594	$02^21\ 7^f$	3599.44569	654	$02^01\ 11^e$	3696.76595	714	$01^11\ 26^e$	3834.55783
535	$03^10\ 30^f$	3501.55038	595	$02^21\ 7^e$	3599.45744	655	$10^00\ 16^e$	3710.50487	715	$01^11\ 26^f$	3839.76684
536	$02^01\ 0^e$	3502.12110	596	$02^00\ 38^e$	3600.62335	656	$02^21\ 11^f$	3711.47963	716	$00^01\ 34^e$	3839.81063
537	$05^10\ 2^e$	3504.02953	597	$05^10\ 8^e$	3602.06640	657	$02^21\ 11^e$	3711.54618	717	$05^30\ 14^e$	3839.82181
538	$05^10\ 2^f$	3504.17250	598	$05^10\ 8^f$	3603.77942	658	$04^20\ 24^f$	3712.36984	718	$05^30\ 14^f$	3839.85038
539	$02^01\ 1^e$	3505.07207	599	$00^00\ 49^e$	3604.22149	659	$03^30\ 32^e$	3712.84164	719	$04^00\ 26^e$	3845.37440
540	$10^00\ 11^e$	3505.17622	600	$02^01\ 8^e$	3608.32100	660	$03^30\ 32^f$	3713.68201	720	$05^10\ 15^e$	3851.34710

TABLE VII. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
721	$02^20\ 40^f$	3853.82920	781	$02^01\ 18^e$	4005.93988	841	$05^10\ 20^f$	4127.76283	901	$06^20\ 4^e$	4220.01096
722	$02^01\ 15^e$	3855.84280	782	$11^10\ 1^e$	4007.09767	842	$02^21\ 20^f$	4135.71229	902	$02^20\ 43^f$	4225.36565
723	$05^10\ 15^f$	3857.00493	783	$11^10\ 1^f$	4007.11288	843	$11^10\ 9^e$	4136.23724	903	$03^11\ 4^e$	4230.63254
724	$05^50\ 13^f$	3858.28260	784	$04^00\ 28^e$	4007.91333	844	$02^21\ 20^e$	4136.37084	904	$03^11\ 4^f$	4230.93935
725	$05^50\ 13^e$	3858.28260	785	$05^10\ 18^f$	4010.50873	845	$11^10\ 9^f$	4136.92107	905	$03^30\ 37^e$	4231.77202
726	$02^20\ 40^e$	3860.91654	786	$11^10\ 2^e$	4012.96863	846	$05^50\ 19^e$	4153.60389	906	$11^10\ 12^e$	4233.06235
727	$04^20\ 26^f$	3864.06005	787	$11^10\ 2^f$	4013.01426	847	$05^50\ 19^f$	4153.60395	907	$03^30\ 37^f$	4233.63535
728	$04^20\ 26^e$	3868.71993	788	$03^30\ 35^e$	4015.37952	848	$05^30\ 20^e$	4153.85850	908	$02^20\ 43^e$	4234.12083
729	$10^00\ 19^e$	3868.82404	789	$03^30\ 35^f$	4016.76099	849	$05^30\ 20^f$	4154.08883	909	$11^10\ 12^f$	4234.24668
730	$02^21\ 15^f$	3870.62545	790	$02^21\ 18^f$	4020.86487	850	$00^01\ 37^e$	4155.29748	910	$00^02\ 6^e$	4234.30192
731	$02^21\ 15^e$	3870.84537	791	$02^21\ 18^e$	4021.30717	851	$04^40\ 29^f$	4159.11493	911	$06^20\ 5^f$	4235.01400
732	$03^10\ 34^e$	3871.03232	792	$11^10\ 3^e$	4021.77489	852	$04^40\ 29^e$	4159.16659	912	$06^20\ 5^e$	4235.03529
733	$05^30\ 15^e$	3884.69286	793	$11^10\ 3^f$	4021.86616	853	$11^10\ 10^e$	4165.58086	913	$06^00\ 6^e$	4237.66070
734	$05^30\ 15^f$	3884.73569	794	$04^20\ 28^f$	4027.54333	854	$11^10\ 10^f$	4166.41644	914	$05^10\ 22^e$	4245.32292
735	$03^10\ 34^f$	3887.92766	795	$01^10\ 47^e$	4031.53411	855	$01^11\ 30^e$	4168.13326	915	$03^11\ 5^e$	4245.34488
736	$01^10\ 46^e$	3893.81267	796	$04^20\ 28^e$	4033.43292	856	$01^10\ 48^e$	4172.13267	916	$03^11\ 5^f$	4245.80503
737	$05^10\ 16^e$	3898.78726	797	$11^10\ 4^e$	4033.51625	857	$00^02\ 0^e$	4173.07091	917	$02^01\ 22^e$	4246.99907
738	$00^00\ 51^e$	3899.83529	798	$11^10\ 4^f$	4033.66834	858	$06^00\ 0^e$	4174.60860	918	$04^40\ 30^f$	4248.34768
739	$05^50\ 14^f$	3900.05395	799	$05^30\ 18^e$	4037.23411	859	$01^11\ 30^f$	4175.01566	919	$04^40\ 30^e$	4248.41536
740	$05^50\ 14^e$	3900.05395	800	$05^30\ 18^f$	4037.35875	860	$00^02\ 1^e$	4175.98690	920	$03^31\ 3^f$	4248.56689
741	$02^01\ 16^e$	3902.94676	801	$05^50\ 17^e$	4043.24810	861	$06^00\ 1^e$	4177.61338	921	$03^31\ 3^e$	4248.56689
742	$05^10\ 16^f$	3905.18331	802	$05^50\ 17^f$	4043.24811	862	$05^10\ 21^e$	4180.21028	922	$06^20\ 6^f$	4253.02679
743	$04^40\ 26^f$	3909.19265	803	$00^01\ 36^e$	4047.24454	863	$00^02\ 2^e$	4181.81883	923	$06^20\ 6^e$	4253.06933
744	$04^40\ 26^e$	3909.21428	804	$01^10\ 47^f$	4047.99066	864	$04^00\ 30^e$	4182.11843	924	$00^02\ 7^e$	4254.70997
745	$01^10\ 46^f$	3909.60035	805	$11^10\ 5^e$	4048.19242	865	$02^01\ 21^e$	4182.35496	925	$05^10\ 22^f$	4256.90635
746	$03^30\ 34^e$	3911.59100	806	$11^10\ 5^f$	4048.42054	866	$06^00\ 2^e$	4183.62226	926	$06^00\ 7^e$	4258.65563
747	$03^30\ 34^f$	3912.76933	807	$00^00\ 52^e$	4051.94064	867	$03^10\ 37^e$	4188.90705	927	$01^11\ 31^e$	4258.78970
748	$01^11\ 27^e$	3913.59007	808	$10^00\ 22^e$	4053.44477	868	$01^10\ 48^f$	4189.27086	928	$03^31\ 4^e$	4260.38623
749	$02^21\ 16^f$	3917.76618	809	$05^10\ 19^e$	4058.80506	869	$00^02\ 3^e$	4190.56654	929	$03^31\ 4^f$	4260.38624
750	$02^21\ 16^e$	3918.04801	810	$02^01\ 19^e$	4061.82411	870	$05^10\ 21^f$	4190.85113	930	$02^21\ 22^f$	4262.29557
751	$01^11\ 27^f$	3919.19622	811	$11^10\ 6^e$	4065.80306	871	$10^00\ 24^e$	4191.11813	931	$03^11\ 6^e$	4262.99849
752	$04^00\ 27^e$	3925.18473	812	$11^10\ 6^f$	4066.12237	872	$06^00\ 3^e$	4192.63384	932	$02^21\ 22^e$	4263.23660
753	$10^00\ 20^e$	3927.44370	813	$05^10\ 19^f$	4067.64695	873	$02^21\ 21^f$	4197.53766	933	$03^11\ 6^f$	4263.64259
754	$05^30\ 16^e$	3932.55249	814	$04^40\ 28^f$	4072.84392	874	$11^10\ 11^e$	4197.85615	934	$10^00\ 25^e$	4264.32791
755	$05^30\ 16^f$	3932.61504	815	$04^40\ 28^e$	4072.88299	875	$02^21\ 21^e$	4198.32870	935	$06^40\ 4^e$	4265.99806
756	$00^01\ 35^e$	3942.08142	816	$02^00\ 42^e$	4076.66854	876	$11^10\ 11^f$	4198.85857	936	$06^40\ 4^f$	4265.99806
757	$04^20\ 27^f$	3944.32895	817	$02^21\ 19^f$	4076.82114	877	$06^20\ 2^f$	4198.98250	937	$01^11\ 31^f$	4266.12560
758	$05^50\ 15^f$	3944.80576	818	$02^21\ 19^e$	4077.36354	878	$06^20\ 2^e$	4198.98311	938	$00^01\ 38^e$	4266.23768
759	$05^50\ 15^e$	3944.80576	819	$03^10\ 36^e$	4080.04246	879	$00^02\ 4^e$	4202.22982	939	$11^10\ 13^e$	4271.19861
760	$05^10\ 17^e$	3949.17884	820	$01^11\ 29^e$	4080.37979	880	$04^20\ 30^f$	4202.79682	940	$11^10\ 13^f$	4272.57988
761	$04^20\ 27^e$	3949.58473	821	$11^10\ 7^e$	4086.34775	881	$02^00\ 43^e$	4202.90466	941	$04^00\ 31^e$	4273.59142
762	$02^01\ 17^e$	3952.97964	822	$11^10\ 7^f$	4086.77342	882	$03^11\ 1^e$	4204.14805	942	$06^20\ 7^f$	4274.03922
763	$02^00\ 41^e$	3953.31969	823	$01^11\ 29^f$	4086.82269	883	$03^11\ 1^f$	4204.17874	943	$06^20\ 7^e$	4274.11566
764	$05^10\ 17^f$	3956.35261	824	$04^00\ 29^e$	4093.55848	884	$06^00\ 4^e$	4204.64605	944	$03^31\ 5^e$	4275.16012
765	$02^21\ 17^f$	3967.84640	825	$05^30\ 19^e$	4094.05406	885	$00^00\ 53^e$	4206.90687	945	$03^31\ 5^f$	4275.16014
766	$02^21\ 17^e$	3968.20195	826	$05^30\ 19^f$	4094.22495	886	$06^20\ 3^f$	4207.99111	946	$05^50\ 21^e$	4275.86677
767	$03^10\ 35^e$	3974.08331	827	$05^50\ 18^e$	4096.93720	887	$06^20\ 3^e$	4207.99416	947	$05^50\ 21^f$	4275.86692
768	$02^20\ 41^f$	3974.76796	828	$05^50\ 18^f$	4096.93723	888	$03^10\ 37^f$	4208.34057	948	$00^02\ 8^e$	4278.03205
769	$02^20\ 41^e$	3982.39259	829	$02^20\ 42^f$	4098.61445	889	$03^11\ 2^e$	4210.03375	949	$06^40\ 5^e$	4280.98544
770	$05^30\ 17^e$	3983.39990	830	$03^10\ 36^f$	4098.62766	890	$04^20\ 30^e$	4210.06369	950	$06^40\ 5^f$	4280.98544
771	$05^30\ 17^f$	3983.48911	831	$02^20\ 42^e$	4106.79515	891	$03^11\ 2^f$	4210.12581	951	$05^30\ 22^e$	4282.41517
772	$10^00\ 21^e$	3988.98443	832	$11^10\ 8^e$	4109.82600	892	$05^50\ 20^e$	4213.24737	952	$06^00\ 8^e$	4282.63630
773	$04^40\ 27^f$	3989.53606	833	$11^10\ 8^f$	4110.37318	893	$05^50\ 20^f$	4213.24746	953	$05^30\ 22^f$	4282.81488
774	$04^40\ 27^e$	3989.56529	834	$04^20\ 29^f$	4113.70027	894	$05^30\ 21^e$	4216.64605	954	$03^11\ 7^e$	4283.59275
775	$03^10\ 35^f$	3991.82196	835	$05^10\ 20^e$	4118.03634	895	$00^02\ 5^e$	4216.80840	955	$03^11\ 7^f$	4284.45134
776	$05^50\ 16^e$	3992.53737	836	$04^20\ 29^e$	4120.26061	896	$05^30\ 21^f$	4216.95167	956	$03^31\ 6^e$	4292.88836
777	$05^50\ 16^f$	3992.53738	837	$02^01\ 20^e$	4120.63008	897	$03^11\ 3^e$	4218.86202	957	$03^31\ 6^f$	4292.88840
778	$01^11\ 28^e$	3995.53138	838	$10^00\ 23^e$	4120.82320	898	$03^11\ 3^f$	4219.04612	958	$04^20\ 31^f$	4294.82992
779	$01^11\ 28^f$	4001.54884	839	$03^30\ 36^e$	4122.10737	899	$06^00\ 5^e$	4219.65615	959	$06^20\ 8^f$	4298.05014
780	$05^10\ 18^e$	4002.51763	840	$03^30\ 36^f$	4123.71673	900	$06^20\ 4^f$	4220.00183	960	$06^20\ 8^e$	4298.17721

TABLE VIII. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
961	$06^40\ 6^e$	4298.97002	1021	$06^60\ 6^e$	4375.37604	1081	$02^00\ 45^e$	4464.02759	1141	$01^11\ 34^f$	4556.93451
962	$06^40\ 6^f$	4298.97002	1022	$06^60\ 6^f$	4375.37604	1082	$04^00\ 33^e$	4465.26909	1142	$03^11\ 15^f$	4557.76068
963	$03^10\ 38^e$	4300.67435	1023	$00^01\ 39^e$	4380.06250	1083	$03^11\ 13^e$	4468.86270	1143	$11^10\ 19^e$	4561.49196
964	$04^20\ 31^e$	4302.83783	1024	$05^10\ 24^e$	4384.34995	1084	$06^40\ 12^f$	4469.80904	1144	$11^10\ 19^f$	4564.36883
965	$00^02\ 9^e$	4304.26760	1025	$02^01\ 24^e$	4385.03339	1085	$06^40\ 12^e$	4469.80929	1145	$04^00\ 34^e$	4565.46987
966	$03^11\ 8^e$	4307.12689	1026	$06^20\ 11^f$	4388.05978	1086	$03^11\ 13^f$	4471.64480	1146	$00^02\ 16^e$	4569.43184
967	$03^11\ 8^f$	4308.23047	1027	$06^20\ 11^e$	4388.48560	1087	$05^10\ 25^f$	4472.81114	1147	$05^30\ 26^e$	4575.27062
968	$06^00\ 9^e$	4309.59753	1028	$04^20\ 32^f$	4389.79646	1088	$02^21\ 25^f$	4474.15258	1148	$05^30\ 26^f$	4576.30121
969	$11^10\ 14^e$	4312.26404	1029	$03^31\ 10^e$	4393.33934	1089	$02^21\ 25^e$	4475.65280	1149	$03^30\ 40^e$	4578.35994
970	$05^10\ 23^e$	4313.37171	1030	$03^31\ 10^f$	4393.34029	1090	$06^60\ 10^e$	4476.96530	1150	$03^30\ 40^f$	4581.15222
971	$03^31\ 7^e$	4313.57070	1031	$03^11\ 11^e$	4395.35963	1091	$06^60\ 10^f$	4476.96530	1151	$06^00\ 16^e$	4581.30138
972	$03^31\ 7^f$	4313.57082	1032	$06^60\ 7^e$	4396.29290	1092	$00^02\ 14^e$	4479.12289	1152	$06^60\ 13^e$	4584.51139
973	$11^10\ 14^f$	4313.85725	1033	$06^60\ 7^f$	4396.29290	1093	$01^10\ 50^f$	4480.48717	1153	$06^60\ 13^f$	4584.51139
974	$02^01\ 23^e$	4314.55821	1034	$03^11\ 11^f$	4397.38021	1094	$05^50\ 24^e$	4481.57139	1154	$03^31\ 15^e$	4585.33360
975	$01^10\ 49^e$	4315.60501	1035	$05^10\ 24^f$	4397.89336	1095	$05^50\ 24^f$	4481.57195	1155	$03^31\ 15^f$	4585.34393
976	$06^40\ 7^e$	4319.95167	1036	$04^20\ 32^e$	4398.57851	1096	$02^20\ 45^f$	4487.56975	1156	$10^00\ 29^e$	4586.27998
977	$06^40\ 7^f$	4319.95167	1037	$00^02\ 12^e$	4400.44842	1097	$04^20\ 33^f$	4487.69326	1157	$04^20\ 34^f$	4588.51709
978	$03^10\ 38^f$	4320.95665	1038	$02^21\ 24^f$	4400.60410	1098	$06^00\ 14^e$	4488.91125	1158	$06^40\ 15^f$	4595.67352
979	$06^20\ 9^f$	4325.05822	1039	$06^40\ 10^f$	4400.87716	1099	$00^01\ 40^e$	4496.76922	1159	$06^40\ 15^e$	4595.67499
980	$06^20\ 9^e$	4325.25715	1040	$06^40\ 10^e$	4400.87722	1100	$04^20\ 33^e$	4497.28099	1160	$06^20\ 16^f$	4597.89023
981	$05^10\ 23^f$	4325.92276	1041	$02^21\ 24^e$	4401.89960	1101	$02^20\ 45^e$	4497.52773	1161	$02^00\ 46^e$	4598.90862
982	$02^21\ 23^f$	4329.98486	1042	$11^10\ 16^e$	4403.17840	1102	$05^30\ 25^e$	4497.59400	1162	$04^20\ 34^e$	4598.94034
983	$02^21\ 23^e$	4331.09385	1043	$11^10\ 16^f$	4405.24040	1103	$05^30\ 25^f$	4498.42166	1163	$06^20\ 16^e$	4599.59234
984	$02^00\ 44^e$	4332.02529	1044	$06^00\ 12^e$	4408.30771	1104	$03^31\ 13^e$	4499.68202	1164	$03^11\ 16^e$	4601.11360
985	$00^02\ 10^e$	4333.41599	1045	$05^50\ 23^e$	4410.02973	1105	$03^31\ 13^f$	4499.68647	1165	$03^11\ 16^f$	4605.25844
986	$01^10\ 49^f$	4333.43753	1046	$05^50\ 23^f$	4410.03010	1106	$10^00\ 28^e$	4501.42874	1166	$01^10\ 51^e$	4611.15731
987	$03^11\ 9^e$	4333.60006	1047	$03^10\ 39^e$	4415.34154	1107	$06^20\ 14^f$	4504.99846	1167	$02^01\ 27^e$	4613.84430
988	$03^11\ 9^f$	4334.97905	1048	$10^00\ 27^e$	4419.48505	1108	$11^10\ 18^e$	4505.79677	1168	$05^10\ 27^e$	4614.93284
989	$03^31\ 8^e$	4337.20687	1049	$06^60\ 8^e$	4420.19698	1109	$06^20\ 14^e$	4506.04657	1169	$00^01\ 41^e$	4616.35508
990	$03^31\ 8^f$	4337.20713	1050	$06^60\ 8^f$	4420.19698	1110	$11^10\ 18^f$	4508.38718	1170	$00^02\ 17^e$	4618.94656
991	$06^00\ 10^e$	4339.53376	1051	$05^30\ 24^e$	4422.89111	1111	$06^40\ 13^f$	4508.76863	1171	$11^10\ 20^e$	4620.10941
992	$10^00\ 26^e$	4340.45081	1052	$05^30\ 24^f$	4423.54837	1112	$06^40\ 13^e$	4508.76911	1172	$02^20\ 46^f$	4623.01626
993	$04^40\ 31^f$	4340.54074	1053	$06^20\ 12^f$	4424.04981	1113	$06^60\ 11^e$	4509.82867	1173	$11^10\ 20^f$	4623.28753
994	$04^40\ 31^e$	4340.62857	1054	$06^20\ 12^e$	4424.64066	1114	$06^60\ 11^f$	4509.82867	1174	$06^60\ 14^e$	4626.32961
995	$05^50\ 22^e$	4341.46120	1055	$03^31\ 11^e$	4425.83485	1115	$03^11\ 14^e$	4510.01491	1175	$06^60\ 14^f$	4626.32961
996	$05^50\ 22^f$	4341.46144	1056	$03^31\ 11^f$	4425.83651	1116	$03^11\ 14^f$	4513.22217	1176	$02^21\ 27^f$	4630.00770
997	$06^40\ 8^f$	4343.93021	1057	$03^11\ 12^e$	4430.64384	1117	$00^02\ 15^e$	4522.82357	1177	$01^10\ 51^f$	4630.41623
998	$06^40\ 8^e$	4343.93022	1058	$03^11\ 12^f$	4433.03028	1118	$00^00\ 55^e$	4525.40728	1178	$05^10\ 27^f$	4631.48667
999	$03^30\ 38^e$	4344.37082	1059	$06^40\ 11^f$	4433.84511	1119	$03^10\ 40^e$	4532.90577	1179	$06^00\ 17^e$	4631.90510
1000	$03^30\ 38^f$	4346.51536	1060	$06^40\ 11^e$	4433.84524	1120	$06^00\ 15^e$	4533.63540	1180	$02^21\ 27^e$	4631.99639
1001	$05^30\ 23^e$	4351.16415	1061	$04^40\ 32^f$	4435.69254	1121	$04^40\ 33^f$	4533.80148	1181	$03^31\ 16^e$	4632.58439
1002	$05^30\ 23^f$	4351.67994	1062	$04^40\ 32^e$	4435.80555	1122	$04^40\ 33^e$	4533.94569	1182	$03^31\ 16^f$	4632.59951
1003	$01^11\ 32^e$	4352.34692	1063	$03^10\ 39^f$	4436.47197	1123	$02^01\ 26^e$	4534.64232	1183	$05^50\ 26^e$	4633.57000
1004	$02^20\ 44^f$	4355.01847	1064	$00^02\ 13^e$	4438.33085	1124	$05^10\ 26^e$	4535.16880	1184	$05^50\ 26^f$	4633.57127
1005	$06^20\ 10^f$	4355.06198	1065	$06^60\ 9^e$	4447.08792	1125	$03^31\ 14^e$	4541.03257	1185	$02^20\ 46^e$	4633.60188
1006	$06^20\ 10^e$	4355.35883	1066	$06^60\ 9^f$	4447.08792	1126	$03^31\ 14^f$	4541.03945	1186	$04^40\ 34^f$	4634.86583
1007	$11^10\ 15^e$	4356.25765	1067	$06^00\ 13^e$	4447.13362	1127	$06^60\ 12^e$	4545.67755	1187	$04^40\ 34^e$	4635.04841
1008	$11^10\ 15^f$	4358.07778	1068	$01^11\ 33^e$	4448.80268	1128	$06^60\ 12^f$	4545.67755	1188	$06^40\ 16^f$	4643.61805
1009	$01^11\ 32^f$	4360.15027	1069	$11^10\ 17^e$	4453.02517	1129	$01^11\ 34^e$	4548.15467	1189	$06^40\ 16^e$	4643.62052
1010	$03^11\ 10^e$	4363.01133	1070	$11^10\ 17^f$	4455.34393	1130	$06^20\ 15^f$	4549.95266	1190	$06^20\ 17^f$	4648.80855
1011	$03^31\ 9^e$	4363.79654	1071	$01^11\ 33^f$	4457.08737	1131	$02^21\ 26^f$	4550.55402	1191	$01^11\ 35^e$	4650.40051
1012	$03^31\ 9^f$	4363.79705	1072	$05^10\ 25^e$	4458.21290	1132	$06^40\ 14^f$	4550.72358	1192	$06^20\ 17^e$	4650.91927
1013	$02^20\ 44^e$	4364.36619	1073	$02^01\ 25^e$	4458.46660	1133	$06^40\ 14^e$	4550.72443	1193	$03^11\ 17^e$	4651.05702
1014	$03^11\ 10^f$	4364.69603	1074	$03^30\ 39^e$	4459.90107	1134	$05^10\ 26^f$	4550.74500	1194	$03^10\ 41^e$	4653.36415
1015	$00^00\ 54^e$	4364.73032	1075	$03^31\ 12^e$	4461.28258	1135	$06^20\ 15^e$	4551.30144	1195	$03^11\ 17^f$	4655.71342
1016	$00^02\ 11^e$	4365.47652	1076	$03^31\ 12^f$	4461.28536	1136	$02^21\ 26^e$	4552.35220	1196	$05^30\ 27^e$	4655.91857
1017	$04^00\ 32^e$	4367.97561	1077	$01^10\ 50^e$	4461.94771	1137	$03^11\ 15^e$	4554.09904	1197	$05^30\ 27^f$	4657.18818
1018	$06^40\ 9^f$	4370.90544	1078	$03^30\ 39^f$	4462.35501	1138	$03^10\ 40^f$	4554.88276	1198	$01^11\ 35^f$	4659.68924
1019	$06^40\ 9^e$	4370.90547	1079	$06^20\ 13^f$	4463.03008	1139	$05^50\ 25^e$	4556.08516	1199	$04^00\ 35^e$	4668.57588
1020	$06^00\ 11^e$	4372.43913	1080	$06^20\ 13^e$	4463.82686	1140	$05^50\ 25^f$	4556.08602	1200	$06^60\ 15^e$	4671.13158

TABLE IX. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
1201	$06^{6}0\ 15^{f}$	4671.13158	1261	$03^{1}1\ 19^{e}$	4759.72372	1321	$07^{1}0\ 1^{e}$	4859.66869	1381	$12^{0}0\ 12^{e}$	4914.37078
1202	$00^{0}2\ 18^{e}$	4671.36657	1262	$12^{2}0\ 6^{f}$	4761.15455	1322	$07^{1}0\ 1^{f}$	4859.73430	1382	$02^{2}0\ 48^{e}$	4914.47344
1203	$10^{0}0\ 30^{e}$	4674.03676	1263	$12^{2}0\ 6^{e}$	4761.16126	1323	$12^{2}0\ 10^{f}$	4861.42478	1383	$05^{3}0\ 30^{e}$	4915.66400
1204	$03^{1}0\ 41^{f}$	4676.18542	1264	$02^{2}0\ 47^{f}$	4761.35469	1324	$12^{2}0\ 10^{e}$	4861.47225	1384	$07^{3}0\ 4^{e}$	4917.68933
1205	$11^{1}0\ 21^{e}$	4681.64772	1265	$06^{2}0\ 19^{e}$	4762.67668	1325	$01^{1}1\ 37^{e}$	4863.56383	1385	$07^{3}0\ 4^{f}$	4917.68937
1206	$03^{3}1\ 17^{e}$	4682.78418	1266	$01^{1}0\ 52^{e}$	4763.23026	1326	$06^{0}0\ 21^{e}$	4863.63618	1386	$04^{0}1\ 4^{e}$	4917.69870
1207	$03^{3}1\ 17^{f}$	4682.80580	1267	$10^{0}0\ 31^{e}$	4764.69700	1327	$00^{0}1\ 43^{e}$	4864.15275	1387	$05^{3}0\ 30^{f}$	4917.90005
1208	$12^{0}0\ 0^{e}$	4684.30997	1268	$01^{1}1\ 36^{f}$	4765.34905	1328	$06^{4}0\ 20^{f}$	4865.33296	1388	$01^{1}0\ 53^{e}$	4918.16294
1209	$11^{1}0\ 21^{f}$	4685.14183	1269	$03^{1}1\ 19^{f}$	4765.48615	1329	$06^{4}0\ 20^{e}$	4865.34750	1389	$07^{1}0\ 6^{e}$	4919.26136
1210	$06^{0}0\ 18^{e}$	4685.44310	1270	$12^{0}0\ 7^{e}$	4766.93530	1330	$07^{1}0\ 2^{e}$	4865.62956	1390	$07^{1}0\ 6^{f}$	4920.63790
1211	$12^{0}0\ 1^{e}$	4687.26164	1271	$06^{6}0\ 17^{e}$	4769.68409	1331	$07^{1}0\ 2^{f}$	4865.82639	1391	$04^{2}1\ 3^{f}$	4920.72609
1212	$00^{0}0\ 56^{e}$	4688.93396	1272	$06^{6}0\ 17^{f}$	4769.68409	1332	$02^{0}1\ 30^{e}$	4868.81498	1392	$04^{2}1\ 3^{e}$	4920.72755
1213	$04^{2}0\ 35^{f}$	4692.26467	1273	$02^{2}0\ 47^{e}$	4772.58501	1333	$05^{1}0\ 30^{e}$	4871.80219	1393	$04^{2}0\ 37^{e}$	4921.60738
1214	$12^{0}0\ 2^{e}$	4693.16480	1274	$04^{0}0\ 36^{e}$	4774.58493	1334	$01^{1}1\ 37^{f}$	4873.91135	1394	$01^{1}2\ 5^{e}$	4922.01991
1215	$06^{4}0\ 17^{f}$	4694.55676	1275	$03^{1}0\ 42^{e}$	4776.71371	1335	$07^{1}0\ 3^{e}$	4874.57020	1395	$01^{1}2\ 5^{f}$	4922.24394
1216	$06^{4}0\ 17^{e}$	4694.56077	1276	$02^{0}1\ 29^{e}$	4780.92710	1336	$07^{1}0\ 3^{f}$	4874.96382	1396	$03^{1}0\ 43^{f}$	4927.45272
1217	$02^{0}1\ 28^{e}$	4695.93776	1277	$12^{2}0\ 7^{f}$	4781.80070	1337	$02^{0}0\ 48^{e}$	4877.29481	1397	$06^{4}0\ 21^{f}$	4928.24311
1218	$05^{1}0\ 28^{e}$	4697.63149	1278	$12^{2}0\ 7^{e}$	4781.81279	1338	$12^{0}0\ 11^{e}$	4878.99903	1398	$06^{4}0\ 21^{e}$	4928.26453
1219	$03^{3}0\ 41^{e}$	4699.74452	1279	$01^{1}0\ 52^{f}$	4783.22106	1339	$03^{1}1\ 21^{e}$	4880.08503	1399	$06^{0}0\ 22^{e}$	4928.88686
1220	$12^{0}0\ 3^{e}$	4702.01912	1280	$05^{1}0\ 29^{e}$	4783.25649	1340	$06^{6}0\ 19^{f}$	4880.16308	1400	$12^{2}0\ 12^{f}$	4929.23884
1221	$06^{2}0\ 18^{f}$	4702.70487	1281	$00^{0}2\ 20^{e}$	4784.91728	1341	$06^{6}0\ 19^{e}$	4880.16309	1401	$12^{2}0\ 12^{e}$	4929.33463
1222	$03^{3}0\ 41^{f}$	4702.90463	1282	$12^{0}0\ 8^{e}$	4790.53441	1342	$01^{1}2\ 1^{e}$	4881.21005	1402	$04^{0}1\ 5^{e}$	4932.52380
1223	$04^{2}0\ 35^{e}$	4703.55144	1283	$03^{3}1\ 19^{e}$	4792.02731	1343	$01^{1}2\ 1^{f}$	4881.22499	1403	$04^{2}1\ 4^{f}$	4932.58447
1224	$03^{1}1\ 18^{e}$	4703.92763	1284	$03^{3}1\ 19^{f}$	4792.06896	1344	$06^{2}0\ 21^{f}$	4882.23224	1404	$04^{2}1\ 4^{e}$	4932.58884
1225	$06^{2}0\ 18^{e}$	4705.28131	1285	$05^{5}0\ 28^{e}$	4797.44851	1345	$04^{0}0\ 37^{e}$	4883.49477	1405	$07^{3}0\ 5^{e}$	4932.73831
1226	$12^{2}0\ 2^{f}$	4708.05901	1286	$05^{5}0\ 28^{f}$	4797.45120	1346	$11^{1}0\ 24^{e}$	4883.77285	1406	$07^{3}0\ 5^{f}$	4932.73848
1227	$12^{2}0\ 2^{e}$	4708.05911	1287	$02^{2}1\ 29^{f}$	4797.56554	1347	$05^{5}0\ 29^{e}$	4883.83989	1407	$01^{1}0\ 53^{f}$	4938.89797
1228	$03^{1}1\ 18^{f}$	4709.12343	1288	$04^{2}0\ 36^{f}$	4798.93265	1348	$05^{5}0\ 29^{f}$	4883.84373	1408	$01^{1}2\ 6^{e}$	4939.50844
1229	$02^{2}1\ 28^{f}$	4712.32747	1289	$02^{2}1\ 29^{e}$	4800.11240	1349	$02^{2}1\ 30^{f}$	4885.72098	1409	$01^{1}2\ 6^{f}$	4939.82203
1230	$12^{0}0\ 4^{e}$	4713.82409	1290	$03^{1}0\ 42^{f}$	4800.37650	1350	$07^{1}0\ 4^{e}$	4886.48979	1410	$06^{6}0\ 20^{e}$	4939.87301
1231	$05^{5}0\ 27^{e}$	4714.02483	1291	$06^{0}0\ 20^{e}$	4801.31083	1351	$06^{2}0\ 21^{e}$	4886.55620	1411	$06^{6}0\ 20^{f}$	4939.87301
1232	$05^{5}0\ 27^{f}$	4714.02669	1292	$05^{1}0\ 29^{f}$	4801.86942	1352	$01^{1}2\ 2^{e}$	4887.04032	1412	$07^{1}0\ 7^{e}$	4940.11049
1233	$02^{2}1\ 28^{e}$	4714.58372	1293	$12^{2}0\ 8^{f}$	4805.39485	1353	$03^{1}1\ 21^{f}$	4887.05943	1413	$07^{1}0\ 7^{f}$	4941.94488
1234	$05^{1}0\ 28^{f}$	4715.21471	1294	$06^{4}0\ 19^{f}$	4805.41477	1354	$01^{1}2\ 2^{f}$	4887.08513	1414	$03^{1}1\ 22^{e}$	4944.64647
1235	$12^{2}0\ 3^{f}$	4716.90881	1295	$12^{2}0\ 8^{e}$	4805.41500	1355	$07^{1}0\ 4^{f}$	4887.14571	1415	$04^{2}1\ 5^{f}$	4947.40663
1236	$12^{2}0\ 3^{e}$	4716.90929	1296	$06^{4}0\ 19^{e}$	4805.42445	1356	$04^{0}1\ 0^{e}$	4888.03928	1416	$04^{2}1\ 5^{e}$	4947.41684
1237	$06^{6}0\ 16^{e}$	4718.91665	1297	$04^{2}0\ 36^{e}$	4811.10895	1357	$11^{1}0\ 24^{f}$	4888.30292	1417	$06^{2}0\ 22^{f}$	4948.01030
1238	$06^{6}0\ 16^{f}$	4718.91665	1298	$11^{1}0\ 23^{e}$	4813.48101	1358	$02^{2}1\ 30^{e}$	4888.58044	1418	$04^{0}1\ 6^{e}$	4950.30985
1239	$00^{0}2\ 19^{e}$	4726.69058	1299	$12^{0}0\ 9^{e}$	4817.07910	1359	$04^{0}1\ 1^{e}$	4891.00577	1419	$07^{3}0\ 6^{e}$	4950.79738
1240	$12^{0}0\ 5^{e}$	4728.57904	1300	$11^{1}0\ 23^{f}$	4817.65114	1360	$05^{1}0\ 30^{f}$	4891.44330	1420	$07^{3}0\ 6^{f}$	4950.79790
1241	$12^{2}0\ 4^{f}$	4728.70820	1301	$03^{1}1\ 20^{e}$	4818.44347	1361	$12^{2}0\ 11^{f}$	4893.85918	1421	$03^{3}0\ 43^{e}$	4951.27876
1242	$12^{2}0\ 4^{e}$	4728.70964	1302	$06^{2}0\ 20^{f}$	4819.41982	1362	$12^{2}0\ 11^{e}$	4893.92769	1422	$03^{1}1\ 22^{f}$	4952.26446
1243	$03^{3}1\ 18^{e}$	4735.93213	1303	$06^{2}0\ 20^{e}$	4823.10276	1363	$01^{1}2\ 3^{e}$	4895.78553	1423	$12^{0}0\ 13^{e}$	4952.68114
1244	$03^{3}1\ 18^{f}$	4735.96241	1304	$06^{6}0\ 18^{e}$	4823.43317	1364	$01^{1}2\ 3^{f}$	4895.87516	1424	$06^{2}0\ 22^{e}$	4953.03299
1245	$02^{0}0\ 47^{e}$	4736.66538	1305	$06^{6}0\ 18^{f}$	4823.43317	1365	$04^{0}1\ 2^{e}$	4896.93840	1425	$10^{0}0\ 33^{e}$	4954.71931
1246	$00^{0}1\ 42^{e}$	4738.81722	1306	$03^{3}0\ 42^{e}$	4824.05182	1366	$07^{1}0\ 5^{e}$	4901.38728	1426	$03^{3}0\ 43^{f}$	4955.26404
1247	$04^{4}0\ 35^{f}$	4738.88378	1307	$03^{1}1\ 20^{f}$	4824.79904	1367	$07^{1}0\ 5^{f}$	4902.37090	1427	$04^{4}0\ 37^{f}$	4955.77274
1248	$04^{4}0\ 35^{e}$	4739.11322	1308	$05^{3}0\ 29^{e}$	4826.11806	1368	$02^{2}0\ 48^{f}$	4902.58166	1428	$04^{4}0\ 37^{e}$	4956.12738
1249	$05^{3}0\ 28^{e}$	4739.53529	1309	$03^{3}0\ 42^{f}$	4827.60956	1369	$03^{1}0\ 43^{e}$	4902.95143	1429	$11^{1}0\ 25^{e}$	4956.97929
1250	$05^{3}0\ 28^{f}$	4741.08343	1310	$05^{3}0\ 29^{f}$	4827.98741	1370	$07^{3}0\ 3^{f}$	4905.65033	1430	$02^{0}1\ 31^{e}$	4959.59643
1251	$06^{0}0\ 19^{e}$	4741.91248	1311	$12^{2}0\ 9^{f}$	4831.93643	1371	$07^{3}0\ 3^{e}$	4905.65033	1431	$01^{1}2\ 7^{e}$	4959.91064
1252	$12^{2}0\ 5^{f}$	4743.45690	1312	$12^{2}0\ 9^{e}$	4831.96809	1372	$04^{0}1\ 3^{e}$	4905.83641	1432	$01^{1}2\ 7^{f}$	4960.32870
1253	$12^{2}0\ 5^{e}$	4743.46026	1313	$04^{4}0\ 36^{f}$	4845.85342	1373	$01^{1}2\ 4^{e}$	4907.44549	1433	$11^{1}0\ 25^{f}$	4961.88384
1254	$11^{1}0\ 22^{e}$	4746.10543	1314	$00^{0}2\ 21^{e}$	4846.04526	1374	$01^{1}2\ 4^{f}$	4907.59486	1434	$05^{1}0\ 31^{e}$	4963.26658
1255	$12^{0}0\ 6^{e}$	4746.28311	1315	$04^{4}0\ 36^{e}$	4846.13967	1375	$04^{2}0\ 37^{f}$	4908.51765	1435	$07^{1}0\ 8^{e}$	4963.93293
1256	$06^{4}0\ 18^{f}$	4748.48918	1316	$12^{0}0\ 10^{e}$	4846.56787	1376	$00^{0}2\ 22^{e}$	4910.07306	1436	$04^{2}1\ 6^{f}$	4965.19202
1257	$06^{4}0\ 18^{e}$	4748.49548	1317	$03^{3}1\ 20^{e}$	4851.06876	1377	$04^{2}1\ 2^{f}$	4911.83192	1437	$04^{2}1\ 6^{e}$	4965.21243
1258	$11^{1}0\ 22^{f}$	4749.93023	1318	$03^{3}1\ 20^{f}$	4851.12511	1378	$04^{2}1\ 2^{e}$	4911.83222	1438	$07^{1}0\ 8^{f}$	4966.28968
1259	$01^{1}1\ 36^{e}$	4755.53773	1319	$00^{0}0\ 57^{e}$	4855.30651	1379	$03^{3}1\ 21^{e}$	4913.05539	1439	$12^{2}0\ 13^{f}$	4967.56287
1260	$06^{2}0\ 19^{f}$	4759.57631	1320	$10^{0}0\ 32^{e}$	4858.25859	1380	$03^{3}1\ 21^{f}$	4913.13052	1440	$12^{2}0\ 13^{e}$	4967.69329

TABLE X. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
1441	$04^{0}1\ 7^{e}$	4971.05466	1501	$04^{4}1\ 7^{f}$	5030.46628	1561	$07^{3}0\ 11^{f}$	5086.26536	1621	$05^{5}0\ 32^{e}$	5160.80795
1442	$07^{3}0\ 7^{e}$	4971.86666	1502	$04^{4}1\ 7^{e}$	5030.46629	1562	$01^{1}1\ 39^{e}$	5088.27221	1622	$05^{5}0\ 32^{f}$	5160.81833
1443	$07^{3}0\ 7^{f}$	4971.86796	1503	$03^{1}0\ 44^{e}$	5032.07426	1563	$06^{2}0\ 24^{f}$	5088.44911	1623	$07^{3}0\ 13^{e}$	5161.49719
1444	$05^{5}0\ 30^{e}$	4973.19776	1504	$11^{1}0\ 26^{e}$	5033.09859	1564	$07^{1}0\ 12^{e}$	5088.91449	1624	$07^{3}0\ 13^{f}$	5161.54664
1445	$05^{5}0\ 30^{f}$	4973.20317	1505	$07^{5}0\ 7^{f}$	5033.36510	1565	$03^{1}1\ 24^{f}$	5091.49749	1625	$06^{2}0\ 25^{f}$	5163.10240
1446	$01^{1}1\ 38^{e}$	4974.47621	1506	$07^{5}0\ 7^{e}$	5033.36510	1566	$07^{1}0\ 12^{f}$	5093.98959	1626	$03^{1}0\ 45^{e}$	5164.07906
1447	$02^{2}1\ 31^{f}$	4976.79177	1507	$04^{2}0\ 38^{e}$	5035.04101	1567	$06^{2}0\ 24^{e}$	5095.03781	1627	$03^{1}1\ 25^{f}$	5165.51811
1448	$00^{0}2\ 23^{e}$	4976.99913	1508	$04^{2}1\ 9^{f}$	5036.32054	1568	$01^{1}0\ 54^{f}$	5097.44319	1628	$02^{0}0\ 50^{e}$	5167.15888
1449	$04^{4}1\ 4^{e}$	4977.19604	1509	$04^{2}1\ 9^{e}$	5036.41646	1569	$04^{2}1\ 11^{f}$	5098.54084	1629	$02^{2}1\ 33^{f}$	5167.67096
1450	$04^{4}1\ 4^{f}$	4977.19604	1510	$12^{0}0\ 15^{e}$	5038.10920	1570	$04^{2}1\ 11^{e}$	5098.74750	1630	$07^{1}0\ 14^{e}$	5169.18744
1451	$03^{3}1\ 22^{e}$	4977.98607	1511	$11^{1}0\ 26^{f}$	5038.39210	1571	$01^{1}1\ 39^{f}$	5099.73269	1631	$06^{2}0\ 25^{e}$	5170.55520
1452	$03^{3}1\ 22^{f}$	4978.08486	1512	$01^{1}2\ 10^{e}$	5038.59406	1572	$12^{2}0\ 16^{f}$	5100.19154	1632	$02^{2}1\ 33^{e}$	5171.59841
1453	$02^{2}1\ 31^{e}$	4979.98568	1513	$01^{1}2\ 10^{f}$	5039.41473	1573	$12^{2}0\ 16^{e}$	5100.48153	1633	$04^{2}1\ 13^{f}$	5172.59175
1454	$01^{1}2\ 8^{e}$	4983.22604	1514	$03^{3}1\ 23^{e}$	5045.85956	1574	$05^{3}0\ 32^{e}$	5103.63299	1634	$04^{2}1\ 13^{e}$	5172.98239
1455	$01^{1}2\ 8^{f}$	4983.76344	1515	$03^{3}1\ 23^{f}$	5045.98786	1575	$01^{1}2\ 12^{e}$	5105.60714	1635	$07^{1}0\ 14^{f}$	5175.97911
1456	$05^{1}0\ 31^{f}$	4983.93068	1516	$02^{2}0\ 49^{f}$	5046.69375	1576	$05^{3}0\ 32^{f}$	5106.74786	1636	$07^{7}0\ 9^{f}$	5176.23062
1457	$01^{1}1\ 38^{f}$	4985.37347	1517	$00^{0}2\ 24^{e}$	5046.82187	1577	$01^{1}2\ 12^{f}$	5106.77038	1637	$07^{7}0\ 9^{e}$	5176.23062
1458	$04^{2}1\ 7^{f}$	4985.94000	1518	$04^{0}1\ 10^{e}$	5051.01456	1578	$04^{0}0\ 39^{e}$	5110.00731	1638	$05^{1}0\ 33^{f}$	5177.62856
1459	$04^{2}1\ 7^{e}$	4985.97672	1519	$12^{2}0\ 15^{f}$	5053.04027	1579	$04^{4}1\ 10^{f}$	5110.36309	1639	$04^{4}1\ 12^{f}$	5178.41525
1460	$07^{1}0\ 9^{e}$	4990.72674	1520	$07^{3}0\ 10^{e}$	5053.13637	1580	$04^{4}1\ 10^{e}$	5110.36310	1640	$04^{4}1\ 12^{e}$	5178.41530
1461	$04^{4}1\ 5^{e}$	4991.99379	1521	$07^{3}0\ 10^{f}$	5053.14699	1581	$11^{1}0\ 27^{e}$	5112.12894	1641	$07^{5}0\ 12^{e}$	5183.44359
1462	$04^{4}1\ 5^{f}$	4991.99379	1522	$07^{1}0\ 11^{e}$	5053.21985	1582	$07^{5}0\ 10^{f}$	5114.41071	1642	$07^{5}0\ 12^{f}$	5183.44360
1463	$00^{0}1\ 44^{e}$	4992.35866	1523	$12^{2}0\ 15^{e}$	5053.26659	1583	$07^{5}0\ 10^{e}$	5114.41071	1643	$01^{1}2\ 14^{e}$	5184.25876
1464	$07^{1}0\ 9^{f}$	4993.66974	1524	$02^{0}1\ 32^{e}$	5053.27123	1584	$03^{3}1\ 24^{e}$	5116.67456	1644	$04^{4}0\ 39^{f}$	5184.45181
1465	$12^{0}0\ 14^{e}$	4993.92802	1525	$10^{0}0\ 34^{e}$	5054.07690	1585	$03^{3}1\ 24^{f}$	5116.83925	1645	$04^{4}0\ 39^{e}$	5184.98538
1466	$06^{4}0\ 22^{f}$	4994.14451	1526	$04^{4}1\ 8^{e}$	5054.14048	1586	$11^{1}0\ 27^{f}$	5117.82586	1646	$01^{1}2\ 14^{f}$	5185.82369
1467	$06^{4}0\ 22^{e}$	4994.17549	1527	$04^{4}1\ 8^{f}$	5054.14048	1587	$04^{0}1\ 12^{e}$	5119.06009	1647	$12^{0}0\ 18^{e}$	5188.23491
1468	$07^{5}0\ 5^{f}$	4994.34043	1528	$07^{5}0\ 8^{e}$	5057.37940	1588	$00^{0}2\ 25^{e}$	5119.53960	1648	$03^{1}0\ 45^{f}$	5190.24802
1469	$07^{5}0\ 5^{e}$	4994.34043	1529	$07^{5}0\ 8^{f}$	5057.37941	1589	$07^{3}0\ 12^{e}$	5122.36718	1649	$03^{3}1\ 25^{e}$	5190.42966
1470	$04^{0}1\ 8^{e}$	4994.75569	1530	$03^{1}0\ 44^{f}$	5057.41090	1590	$07^{3}0\ 12^{f}$	5122.39812	1650	$03^{3}1\ 25^{f}$	5190.63879
1471	$04^{0}0\ 38^{e}$	4995.30305	1531	$07^{1}0\ 11^{f}$	5057.52333	1591	$00^{0}1\ 45^{e}$	5123.43193	1651	$02^{2}0\ 50^{f}$	5193.68742
1472	$07^{3}0\ 8^{e}$	4995.94624	1532	$05^{1}0\ 32^{e}$	5057.64618	1592	$07^{7}0\ 7^{f}$	5125.39398	1652	$11^{1}0\ 28^{e}$	5194.06846
1473	$07^{3}0\ 8^{f}$	4995.94910	1533	$02^{2}0\ 49^{e}$	5059.26340	1593	$07^{7}0\ 7^{e}$	5125.39398	1653	$00^{0}2\ 26^{e}$	5195.15057
1474	$06^{0}0\ 23^{e}$	4997.06141	1534	$06^{4}0\ 23^{f}$	5063.03635	1594	$07^{1}0\ 13^{e}$	5127.57121	1654	$00^{0}0\ 59^{e}$	5196.57347
1475	$06^{6}0\ 21^{e}$	5002.56208	1535	$06^{4}0\ 23^{e}$	5063.08041	1595	$07^{1}0\ 13^{f}$	5133.47649	1655	$04^{0}1\ 14^{e}$	5198.86258
1476	$06^{6}0\ 21^{f}$	5002.56208	1536	$05^{5}0\ 31^{e}$	5065.52088	1596	$04^{2}1\ 12^{f}$	5134.08811	1656	$11^{1}0\ 28^{f}$	5200.18315
1477	$05^{3}0\ 31^{e}$	5008.17004	1537	$05^{5}0\ 31^{f}$	5065.52841	1597	$04^{2}1\ 12^{e}$	5134.37618	1657	$05^{3}0\ 33^{e}$	5202.04949
1478	$12^{2}0\ 14^{f}$	5008.83036	1538	$04^{2}1\ 10^{f}$	5065.95125	1598	$06^{4}0\ 24^{f}$	5134.91775	1658	$12^{2}0\ 18^{f}$	5203.31342
1479	$12^{2}0\ 14^{e}$	5009.00389	1539	$04^{2}1\ 10^{e}$	5066.09479	1599	$06^{4}0\ 24^{e}$	5134.97946	1659	$07^{3}0\ 14^{e}$	5203.63630
1480	$01^{1}2\ 9^{e}$	5009.45406	1540	$06^{0}0\ 24^{e}$	5068.15737	1600	$12^{0}0\ 17^{e}$	5135.26509	1660	$07^{3}0\ 14^{f}$	5203.71257
1481	$04^{2}1\ 8^{f}$	5009.64979	1541	$06^{6}0\ 22^{f}$	5068.22937	1601	$04^{2}0\ 39^{f}$	5136.42503	1661	$12^{2}0\ 18^{e}$	5203.76843
1482	$04^{2}1\ 8^{e}$	5009.71093	1542	$06^{6}0\ 22^{e}$	5068.22938	1602	$06^{6}0\ 23^{f}$	5136.87395	1662	$01^{1}1\ 40^{e}$	5204.94910
1483	$04^{4}1\ 6^{e}$	5009.75062	1543	$04^{4}0\ 38^{f}$	5068.63962	1603	$06^{6}0\ 23^{e}$	5136.87396	1663	$05^{3}0\ 33^{f}$	5205.67963
1484	$04^{4}1\ 6^{f}$	5009.75062	1544	$04^{4}0\ 38^{e}$	5069.07604	1604	$06^{0}0\ 25^{e}$	5142.17503	1664	$07^{7}0\ 10^{f}$	5206.13248
1485	$01^{1}2\ 9^{f}$	5010.12567	1545	$01^{1}2\ 11^{e}$	5070.64535	1605	$04^{4}1\ 11^{f}$	5142.91070	1665	$07^{7}0\ 10^{e}$	5206.13248
1486	$05^{3}0\ 31^{f}$	5010.82064	1546	$02^{2}1\ 32^{f}$	5070.77571	1606	$04^{4}1\ 11^{e}$	5142.91073	1666	$02^{2}0\ 50^{e}$	5206.95110
1487	$03^{1}1\ 23^{e}$	5012.12578	1547	$01^{1}2\ 11^{f}$	5071.62990	1607	$01^{1}2\ 13^{e}$	5143.47858	1667	$06^{6}0\ 24^{f}$	5208.49482
1488	$07^{5}0\ 6^{f}$	5012.35204	1548	$02^{2}1\ 32^{e}$	5074.32582	1608	$01^{1}2\ 13^{f}$	5144.83529	1668	$06^{6}0\ 24^{e}$	5208.49484
1489	$07^{5}0\ 6^{e}$	5012.35204	1549	$01^{1}0\ 54^{e}$	5075.95167	1609	$07^{5}0\ 11^{f}$	5147.42712	1669	$06^{4}0\ 25^{f}$	5209.78770
1490	$06^{2}0\ 23^{f}$	5016.75015	1550	$05^{1}0\ 32^{f}$	5079.32732	1610	$07^{5}0\ 11^{e}$	5147.42712	1670	$06^{4}0\ 25^{e}$	5209.87290
1491	$03^{1}1\ 23^{f}$	5020.41139	1551	$04^{4}1\ 9^{e}$	5080.77288	1611	$07^{7}0\ 8^{f}$	5149.31765	1671	$07^{1}0\ 15^{e}$	5213.76052
1492	$07^{1}0\ 10^{e}$	5020.48981	1552	$04^{4}1\ 9^{f}$	5080.77288	1612	$07^{7}0\ 8^{e}$	5149.31765	1672	$04^{2}1\ 14^{f}$	5214.05035
1493	$02^{0}0\ 49^{e}$	5020.79372	1553	$03^{3}0\ 44^{e}$	5081.42217	1613	$02^{0}1\ 33^{e}$	5149.83710	1673	$03^{3}0\ 45^{e}$	5214.47880
1494	$04^{2}0\ 38^{f}$	5021.01626	1554	$03^{1}1\ 24^{e}$	5082.52121	1614	$12^{2}0\ 17^{f}$	5150.28300	1674	$04^{2}1\ 14^{e}$	5214.56758
1495	$04^{0}1\ 9^{e}$	5021.41004	1555	$04^{0}1\ 11^{e}$	5083.56579	1615	$12^{2}0\ 17^{e}$	5150.64881	1675	$04^{4}1\ 13^{f}$	5216.87623
1496	$06^{2}0\ 23^{e}$	5022.52856	1556	$07^{5}0\ 9^{f}$	5084.39470	1616	$04^{2}0\ 39^{e}$	5151.40398	1676	$04^{4}1\ 13^{e}$	5216.87632
1497	$07^{3}0\ 9^{e}$	5023.03615	1557	$07^{5}0\ 9^{e}$	5084.39470	1617	$05^{1}0\ 33^{e}$	5154.93949	1677	$01^{1}1\ 40^{f}$	5216.98619
1498	$07^{3}0\ 9^{f}$	5023.04186	1558	$12^{0}0\ 16^{e}$	5085.22236	1618	$03^{1}1\ 25^{e}$	5155.83010	1678	$06^{0}0\ 26^{e}$	5219.11306
1499	$07^{1}0\ 10^{f}$	5024.08209	1559	$03^{3}0\ 44^{f}$	5085.86481	1619	$10^{0}0\ 35^{e}$	5156.32901	1679	$03^{3}0\ 45^{f}$	5219.40836
1500	$00^{0}0\ 58^{e}$	5024.52101	1560	$07^{3}0\ 11^{e}$	5086.24679	1620	$04^{0}1\ 13^{e}$	5157.49365	1680	$07^{1}0\ 15^{f}$	5221.49196

TABLE XI. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
1681	$07^{5}0\ 13^{f}$	5222.45978	1741	$05^{3}0\ 34^{e}$	5303.41604	1801	$13^{1}0\ 2^{e}$	5375.70741	1861	$13^{3}0\ 5^{e}$	5441.04659
1682	$07^{5}0\ 13^{e}$	5222.45978	1742	$04^{4}0\ 40^{e}$	5303.85516	1802	$13^{1}0\ 2^{f}$	5375.80162	1862	$13^{3}0\ 5^{f}$	5441.04660
1683	$04^{0}0\ 40^{e}$	5227.60502	1743	$04^{2}1\ 16^{f}$	5305.82619	1803	$04^{2}0\ 41^{f}$	5375.95907	1863	$06^{6}0\ 27^{f}$	5441.20482
1684	$01^{1}2\ 15^{e}$	5227.94670	1744	$04^{2}1\ 16^{e}$	5306.67976	1804	$07^{1}0\ 18^{f}$	5376.02815	1864	$06^{6}0\ 27^{e}$	5441.20491
1685	$01^{1}2\ 15^{f}$	5229.73456	1745	$05^{3}0\ 34^{f}$	5307.61319	1805	$01^{1}2\ 18^{e}$	5376.44605	1865	$12^{2}0\ 22^{f}$	5444.79767
1686	$03^{1}1\ 26^{e}$	5232.05076	1746	$07^{5}0\ 15^{e}$	5309.48964	1806	$01^{1}2\ 18^{f}$	5378.99075	1866	$12^{2}0\ 22^{e}$	5445.76669
1687	$01^{1}0\ 55^{e}$	5236.59271	1747	$07^{5}0\ 15^{f}$	5309.48968	1807	$12^{2}0\ 21^{f}$	5380.02511	1867	$01^{1}1\ 42^{e}$	5446.93429
1688	$07^{7}0\ 11^{f}$	5239.02278	1748	$03^{1}1\ 27^{e}$	5311.18104	1808	$12^{2}0\ 21^{e}$	5380.83985	1868	$07^{7}0\ 16^{f}$	5448.28198
1689	$07^{7}0\ 11^{e}$	5239.02278	1749	$07^{1}0\ 17^{e}$	5311.76652	1809	$06^{0}0\ 28^{e}$	5381.74309	1869	$07^{7}0\ 16^{e}$	5448.28198
1690	$06^{2}0\ 26^{f}$	5240.70772	1750	$07^{7}0\ 13^{f}$	5313.76667	1810	$05^{1}0\ 35^{f}$	5382.92977	1870	$13^{1}0\ 7^{e}$	5449.29210
1691	$03^{1}1\ 26^{f}$	5242.46979	1751	$07^{7}0\ 13^{e}$	5313.76667	1811	$13^{1}0\ 3^{e}$	5384.53877	1871	$04^{0}1\ 19^{e}$	5449.60479
1692	$04^{0}1\ 15^{e}$	5243.16298	1752	$02^{0}0\ 51^{e}$	5316.38697	1812	$13^{1}0\ 3^{f}$	5384.72718	1872	$13^{1}0\ 7^{f}$	5450.17070
1693	$12^{0}0\ 19^{e}$	5244.12930	1753	$12^{2}0\ 20^{f}$	5318.18588	1813	$04^{2}0\ 41^{e}$	5392.89365	1873	$06^{4}0\ 28^{f}$	5452.31705
1694	$07^{3}0\ 15^{e}$	5248.78380	1754	$12^{2}0\ 20^{e}$	5318.86422	1814	$03^{1}1\ 28^{e}$	5393.21887	1874	$06^{4}0\ 28^{e}$	5452.52475
1695	$07^{3}0\ 15^{f}$	5248.89789	1755	$06^{2}0\ 27^{f}$	5321.25965	1815	$04^{0}1\ 18^{e}$	5393.61531	1875	$04^{4}1\ 18^{f}$	5453.50706
1696	$06^{2}0\ 26^{e}$	5249.07476	1756	$07^{1}0\ 17^{f}$	5321.52344	1816	$10^{0}1\ 0^{e}$	5393.69773	1876	$04^{4}1\ 18^{e}$	5453.50826
1697	$02^{0}1\ 34^{e}$	5249.29100	1757	$03^{1}1\ 27^{f}$	5322.35073	1817	$00^{0}1\ 47^{e}$	5394.16797	1877	$10^{0}1\ 6^{e}$	5454.92587
1698	$04^{2}0\ 40^{f}$	5254.74047	1758	$01^{1}2\ 17^{e}$	5324.04151	1818	$13^{1}0\ 4^{e}$	5396.31341	1878	$02^{0}1\ 36^{e}$	5456.85619
1699	$05^{1}0\ 34^{e}$	5255.14276	1759	$01^{1}1\ 41^{e}$	5324.50408	1819	$10^{0}1\ 1^{e}$	5396.61358	1879	$11^{1}0\ 31^{e}$	5457.32222
1700	$00^{0}1\ 46^{e}$	5257.36943	1760	$03^{1}0\ 46^{f}$	5325.96112	1820	$13^{1}0\ 4^{f}$	5396.62739	1880	$13^{3}0\ 6^{e}$	5458.78275
1701	$04^{4}1\ 14^{f}$	5258.29310	1761	$01^{1}2\ 17^{f}$	5326.31929	1821	$01^{1}0\ 56^{e}$	5400.08223	1881	$13^{3}0\ 6^{f}$	5458.78280
1702	$04^{4}1\ 14^{e}$	5258.29326	1762	$06^{2}0\ 27^{e}$	5330.59012	1822	$04^{4}1\ 17^{f}$	5400.27294	1882	$07^{3}0\ 19^{e}$	5459.43617
1703	$04^{2}1\ 15^{f}$	5258.46237	1763	$01^{1}1\ 41^{f}$	5337.13112	1823	$04^{4}1\ 17^{e}$	5400.27370	1883	$07^{3}0\ 19^{f}$	5459.88413
1704	$01^{1}0\ 55^{f}$	5258.85288	1764	$04^{0}1\ 17^{e}$	5340.54296	1824	$07^{7}0\ 15^{f}$	5400.45779	1884	$01^{1}1\ 42^{f}$	5460.16452
1705	$05^{5}0\ 33^{e}$	5259.05763	1765	$02^{2}0\ 51^{f}$	5343.55911	1825	$07^{7}0\ 15^{e}$	5400.45779	1885	$07^{5}0\ 18^{e}$	5462.52151
1706	$05^{5}0\ 33^{f}$	5259.07181	1766	$03^{3}1\ 27^{e}$	5346.75407	1826	$07^{3}0\ 18^{e}$	5402.26647	1886	$07^{5}0\ 18^{f}$	5462.52172
1707	$04^{2}1\ 15^{e}$	5259.13303	1767	$03^{3}1\ 27^{f}$	5347.08152	1827	$10^{0}1\ 2^{e}$	5402.44523	1887	$05^{1}0\ 36^{e}$	5464.26978
1708	$12^{2}0\ 19^{f}$	5259.28150	1768	$04^{0}0\ 41^{e}$	5348.09354	1828	$07^{3}0\ 18^{f}$	5402.59492	1888	$05^{5}0\ 35^{e}$	5464.43929
1709	$12^{2}0\ 19^{e}$	5259.84030	1769	$07^{3}0\ 17^{e}$	5348.10013	1829	$06^{2}0\ 28^{f}$	5404.75069	1889	$05^{5}0\ 35^{f}$	5464.46501
1710	$07^{1}0\ 16^{e}$	5261.28779	1770	$07^{3}0\ 17^{f}$	5348.33626	1830	$03^{1}1\ 28^{f}$	5405.16072	1890	$03^{1}0\ 47^{f}$	5464.54733
1711	$10^{0}0\ 36^{e}$	5261.47325	1771	$04^{4}1\ 16^{f}$	5349.99210	1831	$05^{3}0\ 35^{e}$	5407.72900	1891	$11^{1}0\ 31^{f}$	5464.77591
1712	$07^{5}0\ 14^{e}$	5264.47527	1772	$04^{4}1\ 16^{e}$	5349.99257	1832	$07^{5}0\ 17^{e}$	5408.51325	1892	$04^{2}1\ 19^{f}$	5465.61045
1713	$07^{5}0\ 14^{f}$	5264.47528	1773	$03^{3}0\ 46^{e}$	5350.44531	1833	$07^{5}0\ 17^{f}$	5408.51337	1893	$04^{2}1\ 19^{e}$	5467.21254
1714	$03^{3}1\ 26^{e}$	5267.12336	1774	$02^{0}1\ 35^{e}$	5351.63180	1834	$04^{2}1\ 18^{f}$	5409.40213	1894	$06^{0}0\ 29^{e}$	5467.43244
1715	$03^{3}1\ 26^{f}$	5267.38628	1775	$00^{0}2\ 28^{e}$	5355.04489	1835	$04^{2}1\ 18^{e}$	5410.71942	1895	$02^{0}0\ 52^{e}$	5468.47459
1716	$02^{2}1\ 34^{f}$	5267.47451	1776	$07^{7}0\ 14^{f}$	5355.61914	1836	$13^{1}0\ 5^{e}$	5411.03089	1896	$04^{0}0\ 42^{e}$	5471.47015
1717	$07^{1}0\ 16^{f}$	5270.00896	1777	$07^{7}0\ 14^{e}$	5355.61914	1837	$10^{0}1\ 3^{e}$	5411.19253	1897	$13^{1}0\ 8^{e}$	5472.83443
1718	$04^{2}0\ 40^{e}$	5270.69025	1778	$03^{3}0\ 46^{f}$	5355.89094	1838	$13^{1}0\ 5^{f}$	5411.50178	1898	$13^{1}0\ 8^{f}$	5473.96370
1719	$02^{2}1\ 34^{e}$	5271.80087	1779	$04^{2}1\ 17^{f}$	5356.14006	1839	$05^{3}0\ 35^{f}$	5412.54508	1899	$10^{0}1\ 7^{e}$	5475.33299
1720	$00^{0}2\ 27^{e}$	5273.65296	1780	$04^{2}1\ 17^{e}$	5357.20845	1840	$13^{3}0\ 3^{f}$	5414.44151	1900	$02^{2}1\ 36^{f}$	5475.79772
1721	$01^{1}2\ 16^{e}$	5274.54132	1781	$07^{5}0\ 16^{e}$	5357.50247	1841	$13^{3}0\ 3^{e}$	5414.44151	1901	$03^{1}1\ 29^{e}$	5478.16075
1722	$07^{7}0\ 12^{f}$	5274.90102	1782	$07^{5}0\ 16^{f}$	5357.50253	1842	$06^{2}0\ 28^{e}$	5415.09454	1902	$13^{3}0\ 7^{e}$	5479.47436
1723	$07^{7}0\ 12^{e}$	5274.90102	1783	$02^{2}0\ 51^{e}$	5357.53267	1843	$07^{1}0\ 19^{e}$	5421.56756	1903	$13^{3}0\ 7^{f}$	5479.47448
1724	$01^{1}2\ 16^{f}$	5276.56681	1784	$05^{1}0\ 35^{e}$	5358.25396	1844	$10^{0}1\ 4^{e}$	5422.85526	1904	$10^{0}0\ 38^{e}$	5480.42811
1725	$05^{1}0\ 34^{f}$	5278.83016	1785	$05^{5}0\ 34^{e}$	5360.26856	1845	$01^{1}0\ 56^{f}$	5423.12312	1905	$07^{1}0\ 20^{e}$	5480.88449
1726	$11^{1}0\ 29^{e}$	5278.91520	1786	$05^{5}0\ 34^{f}$	5360.28774	1846	$04^{4}0\ 41^{f}$	5424.90267	1906	$02^{2}1\ 36^{e}$	5480.98448
1727	$06^{6}0\ 25^{f}$	5283.09097	1787	$06^{6}0\ 26^{f}$	5360.66133	1847	$04^{4}0\ 41^{e}$	5425.68514	1907	$03^{3}0\ 47^{e}$	5489.31829
1728	$06^{6}0\ 25^{e}$	5283.09100	1788	$06^{6}0\ 26^{e}$	5360.66139	1848	$13^{3}0\ 4^{f}$	5426.26611	1908	$05^{1}0\ 36^{f}$	5489.92376
1729	$11^{1}0\ 29^{f}$	5285.46199	1789	$12^{0}0\ 21^{e}$	5364.68152	1849	$13^{3}0\ 4^{e}$	5426.26611	1909	$01^{1}2\ 20^{e}$	5489.96309
1730	$06^{4}0\ 26^{f}$	5287.64510	1790	$07^{1}0\ 18^{e}$	5365.19401	1850	$13^{1}0\ 6^{e}$	5428.69067	1910	$03^{1}1\ 29^{f}$	5490.86132
1731	$06^{4}0\ 26^{e}$	5287.76116	1791	$11^{1}0\ 30^{e}$	5366.66714	1851	$03^{3}1\ 28^{e}$	5429.32012	1911	$06^{2}0\ 29^{f}$	5491.21050
1732	$04^{0}1\ 16^{e}$	5290.39101	1792	$06^{4}0\ 27^{f}$	5368.48868	1852	$12^{0}0\ 22^{e}$	5429.33425	1912	$01^{1}2\ 20^{f}$	5493.08533
1733	$07^{3}0\ 16^{e}$	5296.93878	1793	$06^{4}0\ 27^{e}$	5368.64485	1853	$13^{1}0\ 6^{f}$	5429.34979	1913	$07^{1}0\ 20^{f}$	5493.97651
1734	$07^{3}0\ 16^{f}$	5297.10491	1794	$10^{0}0\ 37^{e}$	5369.50712	1854	$03^{3}1\ 28^{f}$	5429.72431	1914	$03^{3}0\ 47^{f}$	5495.30859
1735	$03^{1}0\ 46^{e}$	5298.96264	1795	$13^{1}0\ 1^{e}$	5369.81966	1855	$01^{1}2\ 19^{e}$	5431.75369	1915	$02^{2}0\ 52^{f}$	5496.30515
1736	$06^{0}0\ 27^{e}$	5298.96929	1796	$13^{1}0\ 1^{f}$	5369.85106	1856	$07^{1}0\ 19^{f}$	5433.51526	1916	$12^{0}0\ 23^{e}$	5496.90133
1737	$04^{4}1\ 15^{f}$	5302.66526	1797	$02^{2}1\ 35^{f}$	5370.18427	1857	$01^{1}2\ 19^{f}$	5434.57989	1917	$10^{0}1\ 8^{e}$	5498.65401
1738	$04^{4}1\ 15^{e}$	5302.66554	1798	$00^{0}0\ 60^{e}$	5371.45983	1858	$03^{1}0\ 47^{e}$	5436.72177	1918	$07^{7}0\ 17^{f}$	5499.09098
1739	$12^{0}0\ 20^{e}$	5302.94569	1799	$11^{1}0\ 30^{f}$	5373.66030	1859	$10^{0}1\ 5^{e}$	5437.43316	1919	$07^{7}0\ 17^{e}$	5499.09098
1740	$04^{0}0\ 40^{f}$	5303.20699	1800	$02^{2}1\ 35^{e}$	5374.93050	1860	$00^{0}2\ 29^{e}$	5439.32440	1920	$13^{1}0\ 9^{e}$	5499.31680

TABLE XII. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
1921	$04^{2}0\ 42^{f}$	5500.07728	1981	$03^{1}1\ 30^{e}$	5566.00558	2041	$05^{1}1\ 4^{e}$	5606.94850	2101	$08^{2}0\ 8^{e}$	5650.31820
1922	$13^{1}0\ 9^{f}$	5500.72784	1982	$01^{1}0\ 57^{e}$	5566.41636	2042	$05^{1}1\ 4^{f}$	5607.42179	2102	$08^{4}0\ 6^{e}$	5651.35098
1923	$06^{2}0\ 29^{e}$	5502.58088	1983	$12^{0}0\ 24^{e}$	5567.38028	2043	$07^{1}0\ 22^{e}$	5608.33787	2103	$08^{4}0\ 6^{f}$	5651.35098
1924	$13^{3}0\ 8^{e}$	5503.12116	1984	$04^{4}1\ 20^{f}$	5568.83207	2044	$07^{7}0\ 19^{f}$	5609.66037	2104	$04^{2}1\ 22^{f}$	5651.89177
1925	$13^{3}0\ 8^{f}$	5503.12143	1985	$04^{4}1\ 20^{e}$	5568.83485	2045	$07^{7}0\ 19^{e}$	5609.66037	2105	$02^{2}0\ 53^{f}$	5651.92183
1926	$04^{0}1\ 20^{e}$	5508.50838	1986	$04^{0}1\ 21^{e}$	5570.32332	2046	$08^{0}0\ 7^{e}$	5610.31421	2106	$05^{3}1\ 5^{e}$	5651.97416
1927	$04^{4}1\ 19^{f}$	5509.69370	1987	$08^{0}0\ 5^{e}$	5571.11864	2047	$06^{6}0\ 29^{f}$	5611.20663	2107	$05^{3}1\ 5^{f}$	5651.97423
1928	$04^{4}1\ 19^{e}$	5509.69555	1988	$05^{5}0\ 36^{e}$	5571.56833	2048	$06^{6}0\ 29^{e}$	5611.20684	2108	$02^{0}2\ 7^{e}$	5653.75804
1929	$02^{2}0\ 52^{e}$	5511.00418	1989	$08^{2}0\ 4^{f}$	5571.58838	2049	$01^{1}2\ 22^{e}$	5615.08142	2109	$04^{2}1\ 22^{e}$	5654.57654
1930	$12^{2}0\ 23^{f}$	5512.50198	1990	$05^{5}0\ 36^{f}$	5571.60253	2050	$02^{2}2\ 4^{f}$	5615.35065	2110	$11^{1}0\ 33^{f}$	5655.75016
1931	$12^{2}0\ 23^{e}$	5513.64408	1991	$08^{2}0\ 4^{e}$	5571.60439	2051	$02^{2}2\ 4^{e}$	5615.35208	2111	$12^{2}0\ 25^{f}$	5656.69913
1932	$03^{3}1\ 29^{e}$	5514.81973	1992	$02^{0}2\ 0^{e}$	5571.73430	2052	$02^{0}2\ 5^{e}$	5615.68108	2112	$03^{1}1\ 31^{e}$	5656.75036
1933	$05^{3}0\ 36^{e}$	5514.98461	1993	$01^{1}1\ 43^{e}$	5572.23679	2053	$00^{0}2\ 31^{e}$	5616.53800	2113	$12^{2}0\ 25^{e}$	5658.24696
1934	$03^{3}1\ 29^{f}$	5515.31445	1994	$05^{1}0\ 37^{e}$	5573.18834	2054	$08^{4}0\ 4^{e}$	5618.18094	2114	$10^{0}1\ 13^{e}$	5658.94598
1935	$04^{2}0\ 42^{e}$	5518.00790	1995	$02^{0}2\ 1^{e}$	5574.66448	2055	$08^{4}0\ 4^{f}$	5618.18094	2115	$05^{1}1\ 7^{e}$	5660.03928
1936	$07^{5}0\ 19^{e}$	5519.52671	1996	$03^{1}0\ 48^{e}$	5577.35314	2056	$01^{1}2\ 22^{f}$	5618.83925	2116	$05^{1}1\ 7^{f}$	5661.36340
1937	$07^{5}0\ 19^{f}$	5519.52707	1997	$03^{1}1\ 30^{f}$	5579.50757	2057	$10^{0}1\ 12^{e}$	5621.06510	2117	$08^{0}0\ 9^{e}$	5661.47584
1938	$07^{3}0\ 20^{e}$	5519.60735	1998	$07^{5}0\ 20^{e}$	5579.52830	2058	$05^{1}1\ 5^{e}$	5621.69779	2118	$13^{3}0\ 13^{e}$	5665.67024
1939	$07^{3}0\ 20^{f}$	5520.20746	1999	$07^{5}0\ 20^{f}$	5579.52890	2059	$05^{1}1\ 5^{f}$	5622.40758	2119	$13^{3}0\ 13^{f}$	5665.67494
1940	$05^{3}0\ 36^{f}$	5520.47119	2000	$05^{1}1\ 1^{e}$	5580.39615	2060	$02^{0}0\ 53^{e}$	5623.41825	2120	$02^{2}0\ 53^{e}$	5667.36165
1941	$06^{6}0\ 28^{f}$	5524.72031	2001	$05^{1}1\ 1^{f}$	5580.44349	2061	$07^{1}0\ 22^{f}$	5623.78667	2121	$02^{2}2\ 7^{f}$	5668.05821
1942	$06^{6}0\ 28^{e}$	5524.72045	2002	$02^{0}2\ 2^{e}$	5580.52467	2062	$05^{3}0\ 37^{e}$	5625.17899	2122	$02^{2}2\ 7^{e}$	5668.07023
1943	$04^{2}1\ 20^{f}$	5524.76295	2003	$06^{2}0\ 30^{f}$	5580.57698	2063	$05^{3}1\ 3^{f}$	5625.23770	2123	$07^{7}0\ 20^{f}$	5669.41914
1944	$10^{0}1\ 9^{e}$	5524.88840	2004	$07^{3}0\ 21^{e}$	5582.77785	2064	$05^{3}1\ 3^{e}$	5625.23770	2124	$07^{7}0\ 20^{e}$	5669.41914
1945	$08^{0}0\ 0^{e}$	5525.81284	2005	$12^{2}0\ 24^{f}$	5583.13638	2065	$08^{2}0\ 7^{f}$	5625.94589	2125	$05^{3}1\ 6^{e}$	5669.79829
1946	$00^{0}2\ 30^{e}$	5526.48947	2006	$07^{3}0\ 21^{f}$	5583.56668	2066	$08^{2}0\ 7^{e}$	5626.07965	2126	$05^{3}1\ 6^{f}$	5669.79848
1947	$04^{2}1\ 20^{e}$	5526.68722	2007	$02^{2}1\ 37^{f}$	5584.31226	2067	$04^{2}0\ 43^{f}$	5627.09156	2127	$03^{1}1\ 31^{f}$	5671.06053
1948	$13^{1}0\ 10^{e}$	5528.73826	2008	$12^{2}0\ 24^{e}$	5584.47119	2068	$13^{3}0\ 12^{e}$	5627.25320	2128	$08^{4}0\ 7^{f}$	5672.45925
1949	$08^{0}0\ 1^{e}$	5528.83592	2009	$01^{1}1\ 43^{f}$	5586.08338	2069	$13^{3}0\ 12^{f}$	5627.25613	2129	$08^{4}0\ 7^{e}$	5672.45926
1950	$13^{3}0\ 9^{e}$	5529.72283	2010	$10^{0}1\ 11^{e}$	5586.09467	2070	$06^{4}0\ 30^{f}$	5628.92176	2130	$06^{2}0\ 31^{f}$	5672.88089
1951	$13^{3}0\ 9^{f}$	5529.72337	2011	$05^{1}1\ 2^{e}$	5586.29708	2071	$06^{4}0\ 30^{e}$	5629.27731	2131	$13^{1}0\ 14^{e}$	5675.79257
1952	$13^{1}0\ 10^{f}$	5530.46206	2012	$05^{1}1\ 2^{f}$	5586.43910	2072	$02^{2}2\ 5^{f}$	5629.99243	2132	$02^{0}1\ 38^{e}$	5675.94842
1953	$00^{0}1\ 48^{e}$	5533.82431	2013	$08^{2}0\ 5^{f}$	5586.69033	2073	$02^{2}2\ 5^{e}$	5629.99577	2133	$00^{0}1\ 49^{e}$	5676.33512
1954	$08^{0}0\ 2^{e}$	5534.88093	2014	$08^{2}0\ 5^{e}$	5586.72767	2074	$04^{4}1\ 21^{f}$	5630.92131	2134	$07^{1}0\ 23^{e}$	5676.46910
1955	$06^{4}0\ 29^{f}$	5539.12865	2015	$04^{2}1\ 21^{f}$	5586.85748	2075	$04^{4}1\ 21^{e}$	5630.92541	2135	$04^{4}0\ 43^{f}$	5677.10508
1956	$06^{4}0\ 29^{e}$	5539.40183	2016	$04^{2}1\ 21^{e}$	5589.14239	2076	$03^{3}0\ 48^{e}$	5631.09423	2136	$02^{0}2\ 8^{e}$	5677.18528
1957	$07^{1}0\ 21^{e}$	5543.14213	2017	$08^{0}0\ 6^{e}$	5589.21683	2077	$05^{3}0\ 37^{f}$	5631.38683	2137	$08^{2}0\ 9^{f}$	5677.25930
1958	$08^{0}0\ 3^{e}$	5543.94555	2018	$02^{0}2\ 3^{e}$	5589.31453	2078	$02^{0}2\ 6^{e}$	5633.25625	2138	$08^{2}0\ 9^{e}$	5677.60566
1959	$00^{0}0\ 61^{e}$	5549.17597	2019	$02^{2}1\ 37^{e}$	5589.95991	2079	$08^{4}0\ 5^{e}$	5633.25822	2139	$04^{4}0\ 43^{e}$	5678.22465
1960	$04^{4}0\ 42^{f}$	5549.53627	2020	$01^{1}0\ 57^{f}$	5590.24995	2080	$08^{4}0\ 5^{f}$	5633.25822	2140	$13^{1}0\ 14^{f}$	5679.07362
1961	$08^{2}0\ 2^{f}$	5550.44222	2021	$13^{3}0\ 11^{e}$	5591.78928	2081	$08^{0}0\ 8^{e}$	5634.40327	2141	$05^{5}0\ 37^{e}$	5681.65414
1962	$08^{2}0\ 2^{e}$	5550.44328	2022	$13^{3}0\ 11^{f}$	5591.79104	2082	$13^{1}0\ 13^{e}$	5634.62621	2142	$05^{5}0\ 37^{f}$	5681.69924
1963	$04^{4}0\ 42^{e}$	5550.47508	2023	$06^{2}0\ 30^{e}$	5593.04160	2083	$04^{0}1\ 22^{e}$	5635.04711	2143	$01^{1}2\ 23^{e}$	5681.98733
1964	$11^{1}0\ 32^{e}$	5550.87826	2024	$10^{0}0\ 39^{e}$	5594.23358	2084	$05^{3}1\ 4^{e}$	5637.12061	2144	$05^{1}1\ 8^{e}$	5683.62931
1965	$01^{1}2\ 21^{e}$	5551.07282	2025	$02^{2}2\ 2^{f}$	5594.85113	2085	$05^{3}1\ 4^{f}$	5637.12063	2145	$05^{1}0\ 38^{e}$	5685.00592
1966	$07^{7}0\ 18^{f}$	5552.88404	2026	$02^{2}2\ 2^{e}$	5594.85123	2086	$13^{1}0\ 13^{f}$	5637.47247	2146	$05^{1}1\ 8^{f}$	5685.33094
1967	$07^{7}0\ 18^{e}$	5552.88404	2027	$05^{1}1\ 3^{e}$	5595.14803	2087	$03^{3}0\ 48^{f}$	5637.65717	2147	$01^{1}2\ 23^{f}$	5686.08460
1968	$10^{0}1\ 10^{e}$	5554.03552	2028	$05^{1}1\ 3^{f}$	5595.43204	2088	$05^{1}1\ 6^{e}$	5639.39505	2148	$06^{2}0\ 31^{e}$	5686.46826
1969	$01^{1}2\ 21^{f}$	5554.50563	2029	$13^{1}0\ 12^{e}$	5596.39416	2089	$05^{1}1\ 6^{f}$	5640.38850	2149	$05^{3}1\ 7^{e}$	5690.59289
1970	$08^{0}0\ 4^{e}$	5556.02632	2030	$04^{0}0\ 43^{e}$	5597.73205	2090	$12^{0}0\ 25^{e}$	5640.76865	2150	$05^{3}1\ 7^{f}$	5690.59338
1971	$06^{0}0\ 30^{e}$	5556.03589	2031	$13^{1}0\ 12^{f}$	5598.83577	2091	$07^{5}0\ 21^{e}$	5642.52569	2151	$02^{2}2\ 8^{f}$	5691.48126
1972	$07^{1}0\ 21^{f}$	5557.40325	2032	$05^{1}0\ 37^{f}$	5599.80947	2092	$07^{5}0\ 21^{f}$	5642.52668	2152	$02^{2}2\ 8^{e}$	5691.50130
1973	$11^{1}0\ 32^{f}$	5558.80663	2033	$02^{0}2\ 4^{e}$	5601.03356	2093	$04^{2}0\ 43^{e}$	5646.02665	2153	$08^{0}0\ 10^{e}$	5691.52343
1974	$13^{3}0\ 10^{e}$	5559.27900	2034	$03^{3}1\ 30^{e}$	5603.25133	2094	$11^{1}0\ 33^{e}$	5647.33305	2154	$07^{1}0\ 23^{f}$	5693.11791
1975	$13^{3}0\ 10^{f}$	5559.28001	2035	$02^{2}2\ 3^{f}$	5603.63678	2095	$06^{0}0\ 31^{e}$	5647.55127	2155	$03^{3}1\ 31^{e}$	5694.61282
1976	$08^{2}0\ 3^{f}$	5559.50534	2036	$02^{2}2\ 3^{e}$	5603.63726	2096	$02^{2}2\ 6^{f}$	5647.56176	2156	$03^{3}1\ 31^{f}$	5695.33583
1977	$08^{2}0\ 3^{e}$	5559.51069	2037	$03^{3}1\ 30^{f}$	5603.85172	2097	$02^{2}2\ 6^{e}$	5647.56844	2157	$02^{2}1\ 38^{f}$	5695.72520
1978	$13^{1}0\ 11^{e}$	5561.09777	2038	$08^{2}0\ 6^{f}$	5604.80999	2098	$07^{3}0\ 22^{e}$	5648.94523	2158	$04^{4}1\ 22^{f}$	5695.96051
1979	$13^{1}0\ 11^{f}$	5563.16515	2039	$08^{2}0\ 6^{e}$	5604.88453	2099	$07^{3}0\ 22^{f}$	5649.96769	2159	$04^{4}1\ 22^{e}$	5695.96646
1980	$02^{0}1\ 37^{e}$	5564.96246	2040	$03^{1}0\ 48^{f}$	5606.00379	2100	$08^{2}0\ 8^{f}$	5650.09631	2160	$08^{4}0\ 8^{f}$	5696.58304

TABLE XIII. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
2161	$08^{4}0\ 8^{e}$	5696.58307	2221	$05^{3}0\ 38^{f}$	5745.28674	2281	$04^{2}1\ 24^{e}$	5794.37350	2341	$04^{0}1\ 25^{e}$	5846.64991
2162	$10^{0}1\ 14^{e}$	5699.73639	2222	$11^{1}0\ 34^{e}$	5746.68430	2282	$05^{5}0\ 38^{e}$	5794.69509	2342	$03^{1}1\ 33^{e}$	5846.93082
2163	$01^{1}1\ 44^{e}$	5700.40858	2223	$02^{2}2\ 10^{f}$	5747.10476	2283	$05^{5}0\ 38^{f}$	5794.75413	2343	$13^{3}0\ 17^{e}$	5848.85743
2164	$06^{6}0\ 30^{f}$	5700.66259	2224	$02^{2}2\ 10^{e}$	5747.15195	2284	$12^{0}0\ 27^{e}$	5796.26417	2344	$13^{3}0\ 17^{f}$	5848.88025
2165	$06^{6}0\ 30^{e}$	5700.66291	2225	$07^{1}0\ 24^{e}$	5747.53326	2285	$07^{7}0\ 22^{f}$	5797.88045	2345	$11^{1}0\ 35^{e}$	5848.92966
2166	$02^{2}1\ 38^{e}$	5701.85378	2226	$08^{6}0\ 7^{e}$	5749.79423	2286	$07^{7}0\ 22^{e}$	5797.88045	2346	$07^{5}0\ 24^{e}$	5849.48654
2167	$04^{0}1\ 23^{e}$	5702.67750	2227	$08^{6}0\ 7^{f}$	5749.79423	2287	$13^{3}0\ 16^{e}$	5798.63416	2347	$07^{5}0\ 24^{f}$	5849.49032
2168	$02^{0}2\ 9^{e}$	5703.53663	2228	$05^{5}1\ 7^{f}$	5750.24779	2288	$13^{3}0\ 16^{f}$	5798.65012	2348	$05^{1}1\ 13^{f}$	5849.99519
2169	$13^{3}0\ 14^{e}$	5707.03984	2229	$05^{5}1\ 7^{e}$	5750.24779	2289	$08^{0}0\ 13^{e}$	5799.43335	2349	$02^{2}2\ 13^{f}$	5852.47258
2170	$13^{3}0\ 14^{f}$	5707.04711	2230	$03^{1}0\ 49^{f}$	5750.32768	2290	$05^{1}0\ 39^{e}$	5799.72055	2350	$02^{2}2\ 13^{e}$	5852.60221
2171	$08^{2}0\ 10^{f}$	5707.43265	2231	$03^{1}1\ 32^{e}$	5750.39291	2291	$02^{0}2\ 12^{e}$	5800.11943	2351	$05^{3}0\ 39^{e}$	5854.36789
2172	$08^{2}0\ 10^{e}$	5707.94749	2232	$13^{3}0\ 15^{e}$	5751.36138	2292	$05^{5}1\ 9^{f}$	5800.62222	2352	$08^{2}0\ 14^{f}$	5858.17736
2173	$07^{5}0\ 22^{e}$	5708.51830	2233	$13^{3}0\ 15^{f}$	5751.37229	2293	$05^{5}1\ 9^{e}$	5800.62222	2353	$11^{1}0\ 35^{f}$	5858.36614
2174	$07^{5}0\ 22^{f}$	5708.51987	2234	$01^{1}2\ 24^{e}$	5751.78893	2294	$08^{6}0\ 9^{e}$	5800.86007	2354	$04^{0}0\ 45^{e}$	5858.90003
2175	$00^{0}2\ 32^{e}$	5709.46783	2235	$08^{4}0\ 10^{f}$	5753.87728	2295	$08^{6}0\ 9^{f}$	5800.86007	2355	$08^{2}0\ 14^{e}$	5859.94856
2176	$05^{1}1\ 9^{e}$	5710.16384	2236	$08^{4}0\ 10^{e}$	5753.87747	2296	$05^{3}1\ 11^{e}$	5803.47292	2356	$05^{3}0\ 39^{f}$	5862.16525
2177	$10^{0}0\ 40^{e}$	5710.92088	2237	$11^{1}0\ 34^{f}$	5755.60414	2297	$05^{3}1\ 11^{f}$	5803.47997	2357	$08^{4}0\ 13^{f}$	5862.43554
2178	$05^{5}1\ 5^{f}$	5711.72326	2238	$01^{1}2\ 24^{f}$	5756.24001	2298	$00^{0}2\ 33^{e}$	5805.27673	2358	$08^{4}0\ 13^{e}$	5862.43709
2179	$05^{5}1\ 5^{e}$	5711.72326	2239	$04^{2}0\ 44^{f}$	5756.99831	2299	$05^{1}1\ 12^{e}$	5807.41937	2359	$05^{5}1\ 11^{f}$	5862.84355
2180	$05^{1}1\ 9^{f}$	5712.28955	2240	$01^{1}0\ 58^{f}$	5760.22932	2300	$04^{4}0\ 44^{f}$	5807.60627	2360	$05^{5}1\ 11^{e}$	5862.84355
2181	$05^{1}0\ 38^{f}$	5712.58453	2241	$08^{0}0\ 12^{e}$	5760.51000	2301	$04^{4}0\ 44^{e}$	5808.93341	2361	$03^{1}1\ 33^{f}$	5862.87935
2182	$05^{3}1\ 8^{e}$	5714.35785	2242	$04^{4}1\ 23^{f}$	5763.94874	2302	$02^{2}1\ 39^{f}$	5810.03382	2362	$08^{6}0\ 11^{e}$	5863.97541
2183	$05^{3}1\ 8^{f}$	5714.35893	2243	$04^{4}1\ 23^{e}$	5763.95723	2303	$02^{2}0\ 54^{f}$	5810.40535	2363	$08^{6}0\ 11^{f}$	5863.97541
2184	$01^{1}1\ 44^{f}$	5714.88463	2244	$02^{0}2\ 11^{e}$	5765.00544	2304	$05^{1}1\ 12^{f}$	5811.09269	2364	$04^{2}1\ 25^{f}$	5864.60908
2185	$12^{0}0\ 26^{e}$	5717.06406	2245	$07^{1}0\ 24^{f}$	5765.38835	2305	$12^{2}0\ 27^{f}$	5812.60244	2365	$07^{3}0\ 25^{e}$	5865.40022
2186	$02^{2}2\ 9^{f}$	5717.83033	2246	$03^{1}1\ 32^{f}$	5765.51828	2306	$02^{2}2\ 12^{f}$	5814.42673	2366	$06^{2}0\ 33^{f}$	5866.27467
2187	$02^{2}2\ 9^{e}$	5717.86181	2247	$13^{1}0\ 16^{e}$	5766.92252	2307	$02^{2}2\ 12^{e}$	5814.52195	2367	$07^{7}0\ 23^{f}$	5866.58113
2188	$07^{3}0\ 23^{e}$	5718.10678	2248	$06^{2}0\ 32^{f}$	5768.11585	2308	$12^{2}0\ 27^{e}$	5814.63939	2368	$07^{7}0\ 23^{e}$	5866.58113
2189	$07^{3}0\ 23^{f}$	5719.40595	2249	$05^{3}1\ 10^{e}$	5770.79810	2309	$08^{2}0\ 13^{f}$	5815.98931	2369	$03^{1}0\ 50^{e}$	5867.21906
2190	$04^{2}1\ 23^{f}$	5719.86346	2250	$05^{3}1\ 10^{f}$	5770.80213	2310	$02^{2}1\ 39^{e}$	5816.66300	2370	$07^{3}0\ 25^{f}$	5867.45242
2191	$13^{1}0\ 15^{e}$	5719.89184	2251	$13^{1}0\ 16^{f}$	5771.16213	2311	$13^{1}0\ 17^{e}$	5816.88301	2371	$04^{2}1\ 25^{e}$	5868.73118
2192	$03^{1}0\ 49^{e}$	5720.85338	2252	$05^{1}1\ 11^{e}$	5772.06050	2312	$08^{2}0\ 13^{e}$	5817.34665	2372	$13^{1}0\ 18^{e}$	5869.77168
2193	$06^{4}0\ 31^{f}$	5721.69446	2253	$04^{0}1\ 24^{e}$	5773.21241	2313	$06^{4}0\ 32^{f}$	5817.44465	2373	$13^{1}0\ 18^{f}$	5875.08541
2194	$06^{4}0\ 31^{e}$	5722.15257	2254	$08^{6}0\ 8^{e}$	5773.85275	2314	$06^{4}0\ 32^{e}$	5818.02922	2374	$05^{3}1\ 13^{e}$	5877.73022
2195	$04^{2}1\ 23^{e}$	5722.98770	2255	$08^{6}0\ 8^{f}$	5773.85275	2315	$07^{1}0\ 25^{e}$	5821.52781	2375	$05^{3}1\ 13^{f}$	5877.74904
2196	$13^{1}0\ 15^{f}$	5723.63748	2256	$05^{5}1\ 8^{f}$	5773.95394	2316	$13^{1}0\ 17^{f}$	5821.64552	2376	$12^{0}0\ 28^{e}$	5878.36669
2197	$08^{4}0\ 9^{f}$	5723.72238	2257	$05^{5}1\ 8^{e}$	5773.95394	2317	$00^{0}1\ 50^{e}$	5821.69702	2377	$02^{0}2\ 14^{e}$	5879.09678
2198	$08^{4}0\ 9^{e}$	5723.72246	2258	$05^{1}1\ 11^{f}$	5775.17259	2318	$08^{4}0\ 12^{f}$	5823.23385	2378	$08^{8}0\ 8^{e}$	5881.61737
2199	$08^{0}0\ 11^{e}$	5724.53753	2259	$03^{3}0\ 49^{e}$	5775.76955	2319	$08^{4}0\ 12^{e}$	5823.23467	2379	$08^{8}0\ 8^{f}$	5881.61737
2200	$04^{0}0\ 44^{e}$	5726.87633	2260	$08^{2}0\ 12^{f}$	5776.80045	2320	$01^{1}2\ 25^{e}$	5824.48453	2380	$06^{2}0\ 33^{e}$	5882.18690
2201	$08^{6}0\ 6^{e}$	5728.75048	2261	$04^{2}0\ 44^{e}$	5776.94354	2321	$02^{2}0\ 54^{e}$	5826.60101	2381	$08^{0}0\ 15^{e}$	5886.10758
2202	$08^{6}0\ 6^{f}$	5728.75048	2262	$07^{5}0\ 23^{e}$	5777.50547	2322	$05^{1}0\ 39^{f}$	5828.24673	2382	$03^{3}1\ 33^{e}$	5886.11673
2203	$05^{5}1\ 6^{f}$	5729.50412	2263	$07^{5}0\ 23^{f}$	5777.50793	2323	$01^{1}2\ 25^{f}$	5829.30375	2383	$05^{1}1\ 14^{e}$	5886.94922
2204	$05^{5}1\ 6^{e}$	5729.50412	2264	$08^{2}0\ 12^{e}$	5777.81409	2324	$05^{5}1\ 10^{f}$	5830.25224	2384	$03^{3}1\ 33^{f}$	5887.14299
2205	$00^{0}0\ 62^{e}$	5729.71772	2265	$02^{2}2\ 11^{f}$	5779.30383	2325	$05^{5}1\ 10^{e}$	5830.25224	2385	$06^{6}0\ 32^{f}$	5888.47849
2206	$07^{7}0\ 21^{f}$	5732.15947	2266	$02^{2}2\ 11^{e}$	5779.37193	2326	$10^{0}0\ 41^{e}$	5830.48725	2386	$06^{6}0\ 32^{e}$	5888.47922
2207	$07^{7}0\ 21^{e}$	5732.15947	2267	$02^{0}0\ 54^{e}$	5781.21440	2327	$08^{6}0\ 10^{e}$	5830.91949	2387	$04^{2}0\ 45^{f}$	5889.79393
2208	$02^{0}2\ 10^{e}$	5732.81057	2268	$06^{2}0\ 32^{e}$	5782.85322	2328	$08^{6}0\ 10^{f}$	5830.91949	2388	$05^{1}1\ 14^{f}$	5891.87725
2209	$12^{2}0\ 26^{f}$	5733.18845	2269	$03^{3}0\ 49^{f}$	5782.93237	2329	$01^{1}1\ 45^{e}$	5831.44658	2389	$10^{0}1\ 18^{e}$	5891.97299
2210	$12^{2}0\ 26^{e}$	5734.97017	2270	$08^{4}0\ 11^{f}$	5787.04777	2330	$04^{4}1\ 24^{f}$	5834.88499	2390	$02^{2}2\ 14^{f}$	5893.44305
2211	$01^{1}0\ 58^{e}$	5735.59114	2271	$08^{4}0\ 11^{e}$	5787.04818	2331	$04^{4}1\ 24^{e}$	5834.89690	2391	$02^{2}2\ 14^{e}$	5893.61290
2212	$05^{3}0\ 38^{e}$	5738.30811	2272	$03^{3}1\ 32^{e}$	5788.90197	2332	$02^{0}2\ 13^{e}$	5838.15057	2392	$12^{2}0\ 28^{f}$	5894.93918
2213	$05^{1}1\ 10^{e}$	5739.64143	2273	$03^{3}1\ 32^{f}$	5789.76641	2333	$05^{3}1\ 12^{e}$	5839.11710	2393	$12^{2}0\ 28^{e}$	5897.25300
2214	$08^{2}0\ 11^{f}$	5740.61393	2274	$02^{0}1\ 39^{e}$	5789.81128	2334	$05^{3}1\ 12^{f}$	5839.12885	2394	$03^{1}0\ 50^{f}$	5897.51616
2215	$05^{3}1\ 9^{e}$	5741.09299	2275	$10^{0}1\ 16^{e}$	5790.04189	2335	$06^{0}0\ 33^{e}$	5839.31105	2395	$05^{5}1\ 12^{f}$	5898.39566
2216	$05^{3}1\ 9^{f}$	5741.09515	2276	$07^{3}0\ 24^{e}$	5790.25953	2336	$10^{0}1\ 17^{e}$	5839.55482	2396	$05^{5}1\ 12^{e}$	5898.39566
2217	$08^{2}0\ 11^{e}$	5741.34883	2277	$04^{2}1\ 24^{f}$	5790.77008	2337	$07^{1}0\ 25^{f}$	5840.58980	2397	$07^{1}0\ 26^{e}$	5898.45022
2218	$06^{0}0\ 32^{e}$	5741.97710	2278	$07^{3}0\ 24^{f}$	5791.91148	2338	$08^{0}0\ 14^{e}$	5841.30103	2398	$08^{6}0\ 12^{e}$	5900.03365
2219	$05^{1}1\ 10^{f}$	5742.23745	2279	$06^{6}0\ 31^{f}$	5793.08696	2339	$05^{1}1\ 13^{e}$	5845.71624	2399	$08^{6}0\ 12^{f}$	5900.03365
2220	$10^{0}1\ 15^{e}$	5743.43537	2280	$06^{6}0\ 31^{e}$	5793.08745	2340	$01^{1}1\ 45^{f}$	5846.56511	2400	$01^{1}2\ 26^{e}$	5900.07236

TABLE XIV. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
2401	$13^30\ 18^e$	5902.03036	2461	$08^40\ 15^e$	5949.89045	2521	$05^31\ 16^f$	6011.44145	2581	$12^20\ 30^f$	6068.37274
2402	$13^30\ 18^f$	5902.06233	2462	$08^20\ 16^f$	5951.53739	2522	$07^70\ 25^f$	6012.91761	2582	$14^20\ 3^f$	6069.71944
2403	$08^20\ 15^f$	5903.36124	2463	$10^00\ 42^e$	5952.92987	2523	$07^70\ 25^e$	6012.91761	2583	$14^20\ 3^e$	6069.72097
2404	$00^02\ 34^e$	5903.96239	2464	$11^10\ 36^e$	5954.06668	2524	$03^10\ 51^e$	6016.44669	2584	$05^51\ 16^e$	6070.20095
2405	$08^40\ 14^f$	5904.65281	2465	$08^20\ 16^e$	5954.36129	2525	$13^30\ 20^e$	6017.22158	2585	$05^51\ 16^f$	6070.20096
2406	$08^40\ 14^e$	5904.65560	2466	$13^30\ 19^e$	5958.15207	2526	$13^30\ 20^f$	6017.28105	2586	$12^20\ 30^e$	6071.30596
2407	$01^12\ 26^f$	5905.27401	2467	$13^30\ 19^f$	5958.19603	2527	$06^40\ 34^f$	6017.86797	2587	$06^20\ 35^f$	6071.35352
2408	$08^20\ 15^e$	5905.62042	2468	$03^11\ 34^f$	5963.13904	2528	$06^40\ 34^e$	6018.79372	2588	$02^02\ 18^e$	6071.98663
2409	$02^01\ 40^e$	5906.54849	2469	$12^00\ 29^e$	5963.36937	2529	$02^02\ 17^e$	6019.40320	2589	$11^10\ 37^f$	6072.60414
2410	$01^10\ 59^e$	5907.60256	2470	$05^31\ 15^e$	5963.86123	2530	$04^21\ 27^f$	6021.07353	2590	$03^30\ 51^e$	6073.80365
2411	$08^80\ 9^e$	5908.54336	2471	$05^31\ 15^f$	5963.90482	2531	$05^51\ 15^e$	6022.81132	2591	$08^60\ 16^e$	6074.29267
2412	$08^80\ 9^f$	5908.54336	2472	$11^10\ 36^f$	5964.03366	2532	$05^51\ 15^f$	6022.81133	2592	$08^60\ 16^f$	6074.29267
2413	$04^41\ 25^f$	5908.76820	2473	$01^11\ 46^e$	5965.34765	2533	$07^30\ 27^e$	6024.63113	2593	$04^40\ 46^f$	6077.39382
2414	$04^41\ 25^e$	5908.78470	2474	$06^20\ 34^f$	5967.35574	2534	$04^20\ 46^f$	6025.47479	2594	$10^00\ 43^e$	6078.24588
2415	$05^50\ 39^e$	5910.68951	2475	$02^02\ 16^e$	5969.72545	2535	$02^01\ 41^e$	6026.15775	2595	$04^40\ 46^e$	6079.22588
2416	$04^20\ 45^e$	5910.75225	2476	$00^01\ 51^e$	5969.90654	2536	$08^60\ 15^e$	6026.22493	2596	$13^30\ 21^e$	6079.23784
2417	$05^50\ 39^f$	5910.76623	2477	$08^80\ 11^e$	5971.36597	2537	$08^60\ 15^f$	6026.22493	2597	$13^30\ 21^f$	6079.31711
2418	$00^00\ 63^e$	5913.08080	2478	$08^80\ 11^f$	5971.36597	2538	$04^21\ 27^e$	6026.34956	2598	$05^11\ 18^e$	6081.20144
2419	$06^40\ 33^f$	5916.16999	2479	$02^20\ 55^f$	5971.75185	2539	$07^30\ 27^f$	6027.68383	2599	$14^00\ 5^e$	6081.47662
2420	$06^40\ 33^e$	5916.90899	2480	$05^30\ 40^e$	5973.35412	2540	$05^11\ 17^e$	6028.24459	2600	$14^20\ 4^f$	6081.58622
2421	$05^10\ 40^e$	5917.32905	2481	$05^11\ 16^e$	5978.21549	2541	$05^50\ 40^e$	6029.63565	2601	$14^20\ 4^e$	6081.59080
2422	$07^10\ 26^f$	5918.71470	2482	$07^10\ 27^e$	5978.29800	2542	$05^50\ 40^f$	6029.73464	2602	$03^30\ 51^f$	6082.24479
2423	$05^31\ 14^e$	5919.31180	2483	$05^51\ 14^f$	5978.38014	2543	$02^22\ 17^f$	6033.86005	2603	$01^10\ 60^e$	6082.44651
2424	$05^31\ 14^f$	5919.34088	2484	$05^51\ 14^e$	5978.38014	2544	$02^22\ 17^e$	6034.22888	2604	$07^50\ 27^e$	6083.38597
2425	$02^02\ 15^e$	5922.95584	2485	$01^12\ 27^e$	5978.55061	2545	$05^11\ 17^f$	6035.36775	2605	$07^50\ 27^f$	6083.39832
2426	$04^01\ 26^e$	5922.98822	2486	$12^20\ 29^f$	5980.19664	2546	$14^00\ 0^e$	6036.96011	2606	$07^10\ 28^f$	6083.70889
2427	$03^30\ 50^e$	5923.34060	2487	$01^11\ 46^f$	5981.12159	2547	$05^10\ 41^e$	6037.82845	2607	$04^01\ 28^e$	6084.36032
2428	$07^50\ 25^e$	5924.46081	2488	$08^60\ 14^e$	5981.15886	2548	$08^00\ 18^e$	6038.12173	2608	$11^11\ 1^e$	6086.26377
2429	$07^50\ 25^f$	5924.46651	2489	$08^60\ 14^f$	5981.15886	2549	$14^00\ 1^e$	6039.92877	2609	$11^11\ 1^f$	6086.27911
2430	$13^10\ 19^e$	5925.58678	2490	$05^30\ 40^f$	5982.01622	2550	$06^00\ 35^e$	6042.69578	2610	$02^22\ 18^f$	6086.50840
2431	$02^21\ 40^f$	5927.23530	2491	$12^20\ 29^e$	5982.80918	2551	$14^00\ 2^e$	6045.86571	2611	$02^22\ 18^e$	6086.96234
2432	$05^11\ 15^e$	5931.11632	2492	$02^22\ 16^f$	5984.12159	2552	$13^10\ 21^e$	6045.98903	2612	$08^80\ 14^e$	6088.01915
2433	$03^30\ 50^f$	5931.12976	2493	$01^12\ 27^f$	5984.14890	2553	$08^80\ 13^e$	6046.14624	2613	$08^80\ 14^f$	6088.01915
2434	$13^10\ 19^f$	5931.47943	2494	$13^10\ 20^e$	5984.32652	2554	$08^80\ 13^f$	6046.14624	2614	$06^60\ 34^f$	6088.15784
2435	$01^10\ 59^f$	5933.05711	2495	$02^22\ 16^e$	5984.42614	2555	$02^21\ 41^f$	6047.32675	2615	$06^60\ 34^e$	6088.15936
2436	$08^00\ 16^e$	5933.84864	2496	$06^20\ 34^e$	5984.46027	2556	$04^20\ 46^e$	6047.44653	2616	$05^11\ 18^f$	6089.13338
2437	$02^21\ 40^e$	5934.38441	2497	$08^00\ 17^e$	5984.52085	2557	$03^10\ 51^f$	6047.56637	2617	$03^31\ 35^e$	6089.28298
2438	$05^11\ 15^f$	5936.73572	2498	$05^11\ 16^f$	5984.56715	2558	$03^11\ 35^e$	6048.68195	2618	$06^20\ 35^e$	6089.70079
2439	$05^51\ 13^f$	5936.90804	2499	$04^41\ 26^f$	5985.59725	2559	$08^40\ 17^f$	6049.39750	2619	$07^70\ 26^f$	6090.55132
2440	$05^51\ 13^e$	5936.90804	2500	$04^41\ 26^e$	5985.61982	2560	$08^40\ 17^e$	6049.41056	2620	$07^70\ 26^e$	6090.55132
2441	$02^22\ 15^f$	5937.33779	2501	$03^31\ 34^e$	5986.25502	2561	$12^00\ 30^e$	6051.27001	2621	$03^31\ 35^f$	6090.73150
2442	$02^22\ 15^e$	5937.55417	2502	$06^60\ 33^f$	5986.83589	2562	$13^10\ 21^f$	6053.11945	2622	$11^11\ 2^e$	6092.09472
2443	$07^70\ 24^f$	5938.26053	2503	$06^60\ 33^e$	5986.83695	2563	$14^00\ 3^e$	6054.77017	2623	$11^11\ 2^f$	6092.14074
2444	$07^70\ 24^e$	5938.26053	2504	$03^31\ 34^f$	5987.46496	2564	$02^21\ 41^e$	6055.01477	2624	$08^00\ 19^e$	6094.64947
2445	$08^80\ 10^e$	5938.45971	2505	$02^20\ 55^e$	5988.71818	2565	$08^20\ 18^f$	6056.85122	2625	$05^30\ 41^e$	6095.26251
2446	$08^80\ 10^f$	5938.45971	2506	$13^10\ 20^f$	5990.82502	2566	$01^12\ 28^e$	6059.91737	2626	$14^20\ 5^f$	6096.41886
2447	$08^60\ 13^e$	5939.09495	2507	$04^00\ 46^e$	5993.80007	2567	$14^20\ 2^f$	6060.81898	2627	$14^20\ 5^e$	6096.42955
2448	$08^60\ 13^f$	5939.09495	2508	$08^40\ 16^f$	5998.13389	2568	$14^20\ 2^e$	6060.81928	2628	$00^00\ 64^e$	6099.26089
2449	$06^00\ 34^e$	5939.55213	2509	$08^40\ 16^e$	5998.14197	2569	$08^20\ 18^e$	6061.03925	2629	$14^00\ 6^e$	6099.27517
2450	$04^40\ 45^f$	5941.03688	2510	$07^10\ 27^f$	5999.75634	2570	$07^10\ 28^e$	6061.06866	2630	$11^11\ 3^e$	6100.84095
2451	$04^21\ 26^f$	5941.37781	2511	$04^01\ 27^e$	6002.22559	2571	$05^31\ 17^e$	6061.86067	2631	$11^11\ 3^f$	6100.93299
2452	$02^00\ 55^e$	5941.85939	2512	$07^50\ 26^e$	6002.42755	2572	$05^31\ 17^f$	6061.95148	2632	$01^11\ 47^e$	6102.10858
2453	$04^40\ 45^e$	5942.60076	2513	$07^50\ 26^f$	6002.43600	2573	$11^10\ 37^e$	6062.09288	2633	$08^40\ 18^f$	6103.67625
2454	$07^30\ 26^e$	5943.52534	2514	$08^20\ 17^f$	6002.70203	2574	$04^41\ 27^f$	6065.37098	2634	$04^21\ 28^f$	6103.69344
2455	$07^30\ 26^f$	5946.04326	2515	$10^01\ 20^e$	6005.51999	2575	$04^41\ 27^e$	6065.40148	2635	$08^40\ 18^e$	6103.69679
2456	$04^21\ 26^e$	5946.05767	2516	$00^02\ 35^e$	6005.52245	2576	$01^12\ 28^f$	6065.92647	2636	$05^30\ 41^f$	6104.83320
2457	$03^11\ 34^e$	5946.36108	2517	$08^20\ 17^e$	6006.16881	2577	$03^11\ 35^f$	6066.29260	2637	$02^00\ 56^e$	6105.34952
2458	$05^10\ 40^f$	5946.79399	2518	$08^80\ 12^e$	6007.26166	2578	$14^00\ 4^e$	6066.64098	2638	$07^30\ 28^e$	6108.71259
2459	$10^01\ 19^e$	5947.29515	2519	$08^80\ 12^f$	6007.26166	2579	$10^01\ 21^e$	6066.64611	2639	$01^10\ 60^f$	6108.72914
2460	$08^40\ 15^f$	5949.88562	2520	$05^31\ 16^e$	6011.37779	2580	$05^10\ 41^f$	6068.22430	2640	$04^21\ 28^e$	6109.60320

TABLE XV. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
2641	$00^{0}2\ 36^{e}$	6109.95446	2701	$14^{4}0\ 6^{f}$	6158.92733	2761	$02^{2}2\ 20^{e}$	6201.22088	2821	$14^{2}0\ 11^{f}$	6247.65931
2642	$13^{1}0\ 22^{e}$	6110.57238	2702	$12^{2}0\ 31^{f}$	6159.46532	2762	$14^{4}0\ 8^{e}$	6203.34740	2822	$14^{2}0\ 11^{e}$	6247.87561
2643	$07^{3}0\ 28^{f}$	6112.37183	2703	$08^{4}0\ 19^{f}$	6160.96986	2763	$14^{4}0\ 8^{f}$	6203.34740	2823	$13^{1}0\ 24^{e}$	6248.49358
2644	$11^{1}1\ 4^{e}$	6112.50228	2704	$08^{4}0\ 19^{e}$	6161.00136	2764	$05^{1}1\ 20^{f}$	6205.54149	2824	$12^{2}0\ 32^{f}$	6253.47215
2645	$11^{1}1\ 4^{f}$	6112.65566	2705	$05^{1}0\ 42^{e}$	6161.21578	2765	$09^{1}0\ 2^{e}$	6206.31267	2825	$07^{5}0\ 29^{e}$	6254.27448
2646	$08^{2}0\ 19^{f}$	6113.98084	2706	$12^{2}0\ 31^{e}$	6162.74117	2766	$10^{0}0\ 44^{e}$	6206.43232	2826	$07^{5}0\ 29^{f}$	6254.29979
2647	$14^{2}0\ 6^{f}$	6114.21681	2707	$04^{2}0\ 47^{f}$	6164.03725	2767	$09^{1}0\ 2^{f}$	6206.56716	2827	$06^{0}1\ 0^{e}$	6254.40590
2648	$14^{2}0\ 6^{e}$	6114.23819	2708	$11^{1}1\ 7^{e}$	6164.97362	2768	$13^{3}0\ 23^{e}$	6212.10603	2828	$07^{7}0\ 28^{f}$	6254.74420
2649	$05^{3}1\ 18^{e}$	6115.30891	2709	$11^{1}1\ 7^{f}$	6165.40290	2769	$13^{3}0\ 23^{f}$	6212.24132	2829	$07^{7}0\ 28^{e}$	6254.74420
2650	$05^{3}1\ 18^{f}$	6115.43577	2710	$07^{5}0\ 28^{e}$	6167.33524	2770	$11^{1}1\ 9^{e}$	6214.52294	2830	$12^{2}0\ 32^{e}$	6257.11251
2651	$13^{1}0\ 22^{f}$	6118.35981	2711	$07^{5}0\ 28^{f}$	6167.35304	2771	$14^{2}0\ 10^{f}$	6215.04691	2831	$04^{0}1\ 30^{e}$	6257.31504
2652	$01^{1}1\ 47^{f}$	6118.55078	2712	$03^{1}0\ 52^{e}$	6168.53271	2772	$14^{2}0\ 10^{e}$	6215.19717	2832	$06^{0}1\ 1^{e}$	6257.38895
2653	$08^{2}0\ 19^{e}$	6118.96773	2713	$04^{0}1\ 29^{e}$	6169.39071	2773	$11^{1}1\ 9^{f}$	6215.21255	2833	$00^{0}3\ 4^{e}$	6257.55328
2654	$14^{0}0\ 7^{e}$	6120.03435	2714	$02^{2}1\ 42^{f}$	6170.30522	2774	$09^{1}0\ 3^{e}$	6215.28117	2834	$05^{1}1\ 21^{e}$	6257.61599
2655	$05^{5}1\ 17^{e}$	6120.54833	2715	$14^{0}0\ 9^{e}$	6170.42369	2775	$09^{1}0\ 3^{f}$	6215.79008	2835	$13^{1}0\ 24^{f}$	6257.66580
2656	$05^{5}1\ 17^{f}$	6120.54835	2716	$07^{1}0\ 29^{f}$	6170.56746	2776	$08^{0}0\ 21^{e}$	6216.48044	2836	$06^{0}0\ 37^{e}$	6257.68653
2657	$00^{0}1\ 52^{e}$	6120.96017	2717	$07^{7}0\ 27^{f}$	6171.16056	2777	$04^{4}0\ 47^{f}$	6216.67389	2837	$01^{1}1\ 48^{f}$	6258.84933
2658	$06^{4}0\ 35^{f}$	6122.53582	2718	$07^{7}0\ 27^{e}$	6171.16056	2778	$00^{0}2\ 37^{e}$	6217.25593	2838	$09^{3}0\ 4^{e}$	6258.99300
2659	$06^{4}0\ 35^{e}$	6123.68525	2719	$05^{3}1\ 19^{e}$	6171.72141	2779	$04^{4}0\ 47^{e}$	6218.80762	2839	$09^{3}0\ 4^{f}$	6258.99309
2660	$08^{6}0\ 17^{e}$	6125.36155	2720	$05^{3}1\ 19^{f}$	6171.89533	2780	$05^{3}0\ 42^{e}$	6220.08869	2840	$14^{4}0\ 10^{f}$	6259.60844
2661	$08^{6}0\ 17^{f}$	6125.36155	2721	$03^{1}1\ 36^{f}$	6172.33591	2781	$08^{4}0\ 20^{f}$	6221.27795	2841	$14^{4}0\ 10^{e}$	6259.60846
2662	$14^{4}0\ 4^{e}$	6126.35066	2722	$11^{1}0\ 38^{e}$	6173.00569	2782	$08^{4}0\ 20^{e}$	6221.32518	2842	$09^{1}0\ 6^{e}$	6260.10574
2663	$14^{4}0\ 4^{f}$	6126.35066	2723	$05^{5}1\ 18^{e}$	6173.85272	2783	$03^{3}0\ 52^{e}$	6227.15489	2843	$01^{1}0\ 61^{e}$	6260.11885
2664	$11^{1}1\ 5^{e}$	6127.07841	2724	$05^{5}1\ 18^{f}$	6173.85276	2784	$09^{1}0\ 4^{e}$	6227.23729	2844	$07^{1}0\ 30^{f}$	6260.32810
2665	$11^{1}1\ 5^{f}$	6127.30846	2725	$08^{2}0\ 20^{f}$	6174.08663	2785	$09^{1}0\ 4^{f}$	6228.08528	2845	$09^{1}0\ 6^{f}$	6261.88492
2666	$02^{0}2\ 19^{e}$	6127.47323	2726	$13^{1}0\ 23^{e}$	6178.07458	2786	$00^{0}3\ 0^{e}$	6228.59829	2846	$02^{2}2\ 21^{f}$	6261.93668
2667	$10^{0}1\ 22^{e}$	6130.67207	2727	$06^{2}0\ 36^{f}$	6178.26522	2787	$14^{4}0\ 9^{e}$	6229.99798	2847	$03^{1}1\ 37^{e}$	6261.98330
2668	$04^{0}0\ 47^{e}$	6131.57333	2728	$02^{2}1\ 42^{e}$	6178.55076	2788	$14^{4}0\ 9^{f}$	6229.99798	2848	$02^{2}2\ 21^{e}$	6262.74533
2669	$08^{8}0\ 15^{e}$	6132.87976	2729	$08^{6}0\ 18^{f}$	6179.43102	2789	$05^{5}1\ 19^{e}$	6230.11336	2849	$06^{0}1\ 2^{e}$	6263.35437
2670	$08^{8}0\ 15^{f}$	6132.87976	2730	$08^{6}0\ 18^{e}$	6179.43103	2790	$05^{5}1\ 19^{f}$	6230.11341	2850	$10^{0}1\ 24^{e}$	6267.41733
2671	$14^{2}0\ 7^{f}$	6134.97942	2731	$14^{4}0\ 7^{e}$	6179.65708	2791	$06^{4}0\ 36^{f}$	6230.17056	2851	$14^{0}0\ 12^{e}$	6268.13606
2672	$14^{2}0\ 7^{e}$	6135.01788	2732	$14^{4}0\ 7^{f}$	6179.65708	2792	$05^{3}0\ 42^{f}$	6230.60939	2852	$05^{1}1\ 21^{f}$	6268.17398
2673	$02^{2}0\ 56^{f}$	6135.95741	2733	$08^{2}0\ 20^{e}$	6179.94839	2793	$05^{3}1\ 20^{e}$	6231.09693	2853	$03^{1}2\ 1^{e}$	6270.58190
2674	$05^{1}1\ 19^{e}$	6137.08382	2734	$08^{8}0\ 16^{e}$	6180.72741	2794	$01^{1}2\ 30^{e}$	6231.30845	2854	$03^{1}2\ 1^{f}$	6270.61238
2675	$14^{4}0\ 5^{e}$	6141.15844	2735	$08^{8}0\ 16^{f}$	6180.72741	2795	$05^{3}1\ 20^{f}$	6231.33132	2855	$02^{0}0\ 57^{e}$	6271.68100
2676	$14^{4}0\ 5^{f}$	6141.15844	2736	$11^{1}0\ 38^{f}$	6184.07493	2796	$00^{0}3\ 1^{e}$	6231.49390	2856	$00^{0}3\ 5^{e}$	6272.02989
2677	$12^{0}0\ 31^{e}$	6142.06643	2737	$14^{2}0\ 9^{f}$	6185.39541	2797	$08^{8}0\ 17^{e}$	6231.56141	2857	$04^{0}0\ 48^{e}$	6272.21656
2678	$02^{2}2\ 19^{f}$	6142.07152	2738	$14^{2}0\ 9^{e}$	6185.49584	2798	$08^{8}0\ 17^{f}$	6231.56141	2858	$06^{0}1\ 3^{e}$	6272.30077
2679	$02^{2}2\ 19^{e}$	6142.62642	2739	$02^{0}2\ 20^{e}$	6185.86046	2799	$06^{4}0\ 36^{e}$	6231.58533	2859	$02^{0}1\ 43^{e}$	6273.98185
2680	$14^{0}0\ 8^{e}$	6143.75152	2740	$13^{1}0\ 23^{f}$	6186.54301	2800	$14^{0}0\ 11^{e}$	6232.61962	2860	$09^{3}0\ 5^{e}$	6274.13686
2681	$01^{1}2\ 29^{e}$	6144.17066	2741	$04^{2}0\ 47^{e}$	6187.02031	2801	$04^{4}1\ 29^{f}$	6233.74743	2861	$09^{3}0\ 5^{f}$	6274.13723
2682	$13^{3}0\ 22^{e}$	6144.19973	2742	$11^{1}1\ 8^{e}$	6188.29179	2802	$04^{4}1\ 29^{e}$	6233.80133	2862	$00^{0}1\ 53^{e}$	6274.85431
2683	$13^{3}0\ 22^{f}$	6144.30394	2743	$11^{1}1\ 8^{f}$	6188.84360	2803	$07^{1}0\ 30^{e}$	6235.36862	2863	$11^{1}1\ 11^{e}$	6275.72161
2684	$11^{1}1\ 6^{e}$	6144.56900	2744	$04^{2}1\ 29^{f}$	6189.23462	2804	$12^{0}0\ 32^{e}$	6235.75645	2864	$05^{5}0\ 42^{e}$	6276.37558
2685	$11^{1}1\ 6^{f}$	6144.89101	2745	$06^{6}0\ 35^{f}$	6192.44298	2805	$03^{3}0\ 52^{f}$	6236.27281	2865	$03^{1}2\ 2^{e}$	6276.42583
2686	$05^{1}1\ 19^{f}$	6145.85956	2746	$06^{6}0\ 35^{e}$	6192.44516	2806	$08^{6}0\ 19^{f}$	6236.50051	2866	$03^{1}2\ 2^{f}$	6276.51726
2687	$07^{1}0\ 29^{e}$	6146.75970	2747	$05^{1}0\ 42^{f}$	6192.53564	2807	$08^{6}0\ 19^{e}$	6236.50052	2867	$05^{5}0\ 42^{f}$	6276.53711
2688	$04^{4}1\ 28^{f}$	6148.08815	2748	$03^{3}1\ 36^{e}$	6195.28235	2808	$08^{2}0\ 21^{f}$	6237.16420	2868	$11^{1}1\ 11^{f}$	6276.73249
2689	$04^{4}1\ 28^{e}$	6148.12890	2749	$07^{3}0\ 29^{e}$	6195.75023	2809	$00^{0}3\ 2^{e}$	6237.28504	2869	$04^{2}1\ 30^{f}$	6277.69410
2690	$02^{0}1\ 42^{e}$	6148.63644	2750	$04^{2}1\ 29^{e}$	6195.81466	2810	$01^{1}2\ 30^{f}$	6238.18146	2870	$06^{2}1\ 2^{f}$	6278.42225
2691	$06^{0}0\ 36^{e}$	6148.74194	2751	$05^{1}1\ 20^{e}$	6195.88944	2811	$01^{1}1\ 48^{e}$	6241.72609	2871	$06^{2}1\ 2^{e}$	6278.42285
2692	$01^{1}2\ 29^{f}$	6150.60468	2752	$03^{3}1\ 36^{f}$	6196.94161	2812	$09^{1}0\ 5^{e}$	6242.17945	2872	$09^{1}0\ 7^{e}$	6281.01391
2693	$05^{5}0\ 41^{e}$	6151.53165	2753	$10^{0}1\ 23^{e}$	6197.59635	2813	$09^{1}0\ 5^{f}$	6243.45098	2873	$03^{1}1\ 37^{f}$	6281.26514
2694	$05^{5}0\ 41^{f}$	6151.65851	2754	$06^{2}0\ 36^{e}$	6197.80886	2814	$11^{1}1\ 10^{e}$	6243.66645	2874	$08^{0}0\ 22^{e}$	6281.78171
2695	$02^{2}0\ 56^{e}$	6153.70897	2755	$14^{0}0\ 10^{e}$	6200.04758	2815	$08^{2}0\ 21^{e}$	6243.97448	2875	$13^{3}0\ 24^{e}$	6282.95544
2696	$03^{1}1\ 36^{e}$	6153.88988	2756	$07^{3}0\ 29^{f}$	6200.10670	2816	$11^{1}1\ 10^{f}$	6244.50909	2876	$13^{3}0\ 24^{f}$	6283.12906
2697	$08^{0}0\ 20^{e}$	6154.10273	2757	$09^{1}0\ 1^{e}$	6200.33299	2817	$00^{0}3\ 3^{e}$	6245.97157	2877	$14^{2}0\ 12^{f}$	6283.23140
2698	$14^{2}0\ 8^{f}$	6158.70592	2758	$09^{1}0\ 1^{f}$	6200.41783	2818	$09^{3}0\ 3^{e}$	6246.87845	2878	$09^{1}0\ 7^{f}$	6283.38427
2699	$14^{2}0\ 8^{e}$	6158.76994	2759	$03^{1}0\ 52^{f}$	6200.47540	2819	$09^{3}0\ 3^{f}$	6246.87846	2879	$14^{2}0\ 12^{e}$	6283.53284
2700	$14^{4}0\ 6^{e}$	6158.92733	2760	$02^{2}2\ 20^{f}$	6200.54743	2820	$02^{0}2\ 21^{e}$	6247.14577	2880	$06^{0}1\ 4^{e}$	6284.22606

TABLE XVI. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
2881	$08^40\ 21^f$	6284.60001	2941	$05^10\ 43^f$	6319.72595	3001	$05^51\ 21^e$	6351.50006	3061	$03^30\ 53^f$	6393.20911
2882	$08^40\ 21^e$	6284.66940	2942	$01^12\ 31^e$	6321.32863	3002	$05^51\ 21^f$	6351.50021	3062	$02^22\ 23^f$	6393.44898
2883	$04^21\ 30^e$	6284.97983	2943	$02^20\ 57^e$	6321.56915	3003	$06^21\ 7^f$	6352.94700	3063	$09^10\ 11^e$	6394.41158
2884	$03^12\ 3^e$	6285.19143	2944	$14^20\ 13^f$	6321.76185	3004	$07^10\ 31^f$	6352.98764	3064	$02^22\ 23^e$	6394.58191
2885	$03^12\ 3^f$	6285.37429	2945	$13^10\ 25^e$	6321.82728	3005	$06^21\ 7^e$	6353.02215	3065	$09^30\ 10^e$	6395.30834
2886	$08^80\ 18^e$	6285.38101	2946	$14^20\ 13^e$	6322.17050	3006	$12^20\ 33^e$	6354.41752	3066	$09^30\ 10^f$	6395.33111
2887	$08^80\ 18^f$	6285.38101	2947	$05^11\ 22^e$	6322.26115	3007	$09^50\ 6^f$	6354.75305	3067	$06^41\ 7^e$	6398.04955
2888	$07^30\ 30^e$	6285.79277	2948	$04^41\ 30^f$	6322.34746	3008	$09^50\ 6^e$	6354.75305	3068	$06^41\ 7^f$	6398.04955
2889	$11^10\ 39^e$	6286.80249	2949	$04^41\ 30^e$	6322.41806	3009	$03^10\ 53^f$	6356.24026	3069	$13^10\ 26^e$	6398.07352
2890	$01^10\ 61^f$	6287.24117	2950	$03^10\ 53^e$	6323.47351	3010	$13^30\ 25^e$	6356.74657	3070	$03^12\ 9^e$	6399.11435
2891	$06^21\ 3^f$	6287.36704	2951	$03^32\ 4^f$	6325.85483	3011	$13^30\ 25^f$	6356.96699	3071	$09^10\ 11^f$	6399.95833
2892	$06^21\ 3^e$	6287.37004	2952	$03^32\ 4^e$	6325.85483	3012	$03^32\ 6^e$	6358.12637	3072	$09^50\ 8^e$	6400.05683
2893	$05^10\ 43^e$	6287.48801	2953	$02^22\ 22^f$	6326.23773	3013	$03^32\ 6^f$	6358.12642	3073	$09^50\ 8^f$	6400.05684
2894	$06^20\ 37^f$	6288.08660	2954	$07^10\ 31^e$	6326.89291	3014	$05^31\ 22^e$	6358.73130	3074	$03^12\ 9^f$	6400.48418
2895	$00^00\ 65^e$	6288.25361	2955	$02^22\ 22^e$	6327.19925	3015	$04^40\ 48^f$	6358.87376	3075	$06^20\ 38^f$	6400.81395
2896	$05^51\ 20^e$	6289.32942	2956	$00^02\ 38^e$	6327.42426	3016	$00^03\ 9^e$	6358.87727	3076	$08^80\ 20^e$	6401.97385
2897	$05^51\ 20^f$	6289.32951	2957	$14^40\ 12^f$	6327.70738	3017	$05^31\ 22^f$	6359.13794	3077	$08^80\ 20^f$	6401.97385
2898	$00^03\ 6^e$	6289.40106	2958	$14^40\ 12^e$	6327.70743	3018	$05^30\ 43^f$	6359.33774	3078	$01^11\ 49^f$	6402.01380
2899	$07^30\ 30^f$	6290.88320	2959	$01^12\ 31^f$	6328.65461	3019	$06^41\ 5^e$	6359.36560	3079	$03^32\ 8^e$	6402.13046
2900	$14^40\ 11^f$	6292.17839	2960	$03^12\ 6^e$	6329.01451	3020	$06^41\ 5^f$	6359.36560	3080	$03^32\ 8^f$	6402.13073
2901	$14^40\ 11^e$	6292.17842	2961	$04^20\ 48^e$	6329.46772	3021	$08^60\ 21^f$	6359.63705	3081	$02^01\ 44^e$	6402.19122
2902	$09^30\ 6^e$	6292.31040	2962	$03^12\ 6^f$	6329.65426	3022	$08^60\ 21^e$	6359.63708	3082	$05^11\ 23^f$	6402.26846
2903	$09^30\ 6^f$	6292.31152	2963	$13^10\ 25^f$	6331.72472	3023	$04^40\ 48^e$	6361.34451	3083	$11^10\ 40^e$	6403.48056
2904	$05^31\ 21^e$	6293.43408	2964	$09^10\ 9^e$	6331.76556	3024	$09^10\ 10^e$	6361.60332	3084	$06^21\ 9^f$	6403.60410
2905	$05^31\ 21^f$	6293.74505	2965	$06^21\ 6^f$	6332.08355	3025	$06^01\ 8^e$	6361.65102	3085	$06^21\ 9^e$	6403.79964
2906	$02^21\ 43^f$	6296.16768	2966	$06^21\ 6^e$	6332.12537	3026	$14^20\ 14^f$	6363.24922	3086	$05^50\ 43^e$	6404.16542
2907	$08^60\ 20^f$	6296.56940	2967	$12^00\ 33^e$	6332.33791	3027	$14^20\ 14^e$	6363.79014	3087	$05^50\ 43^f$	6404.36976
2908	$08^60\ 20^e$	6296.56941	2968	$00^03\ 8^e$	6332.82527	3028	$09^30\ 9^e$	6365.01275	3088	$14^40\ 14^f$	6407.64048
2909	$03^12\ 4^e$	6296.87839	2969	$05^11\ 22^f$	6333.75156	3029	$09^30\ 9^f$	6365.02502	3089	$14^40\ 14^e$	6407.64066
2910	$03^12\ 4^f$	6297.18312	2970	$09^10\ 9^f$	6335.56505	3030	$14^40\ 13^f$	6366.19491	3090	$14^20\ 15^f$	6407.69198
2911	$11^10\ 39^f$	6298.44333	2971	$09^50\ 5^f$	6336.63127	3031	$14^40\ 13^e$	6366.19501	3091	$14^20\ 15^e$	6408.39308
2912	$06^01\ 5^e$	6299.12748	2972	$09^50\ 5^e$	6336.63127	3032	$09^10\ 10^f$	6366.23776	3092	$13^10\ 26^f$	6408.71616
2913	$06^21\ 4^f$	6299.29266	2973	$10^00\ 45^e$	6337.48618	3033	$04^21\ 31^f$	6369.06883	3093	$06^60\ 37^f$	6409.89730
2914	$06^21\ 4^e$	6299.30163	2974	$09^30\ 8^e$	6337.74803	3034	$06^00\ 38^e$	6369.52712	3094	$06^60\ 37^e$	6409.90163
2915	$06^60\ 36^f$	6299.68994	2975	$09^30\ 8^f$	6337.75416	3035	$08^20\ 23^f$	6372.21670	3095	$04^41\ 31^f$	6413.88678
2916	$06^60\ 36^e$	6299.69303	2976	$06^01\ 7^e$	6337.84434	3036	$03^12\ 8^e$	6372.82936	3096	$04^41\ 31^e$	6413.97839
2917	$02^20\ 57^f$	6303.01801	2977	$10^01\ 25^e$	6340.13338	3037	$03^11\ 38^e$	6372.95915	3097	$01^12\ 32^e$	6414.22902
2918	$08^20\ 22^f$	6303.20908	2978	$03^32\ 5^e$	6340.52391	3038	$03^12\ 8^f$	6373.92558	3098	$11^10\ 40^f$	6415.70656
2919	$03^31\ 37^e$	6304.17706	2979	$03^32\ 5^f$	6340.52392	3039	$09^50\ 7^f$	6375.89494	3099	$04^00\ 49^e$	6415.72649
2920	$09^10\ 8^e$	6304.90144	2980	$06^40\ 37^f$	6340.76898	3040	$09^50\ 7^e$	6375.89494	3100	$10^01\ 26^e$	6415.74275
2921	$02^21\ 43^e$	6304.98901	2981	$07^70\ 29^e$	6341.30107	3041	$06^21\ 8^f$	6376.78763	3101	$03^31\ 38^e$	6415.98340
2922	$04^20\ 48^f$	6305.47765	2982	$07^70\ 29^f$	6341.30108	3042	$06^21\ 8^e$	6376.91254	3102	$05^51\ 22^e$	6416.62438
2923	$03^31\ 37^f$	6306.09401	2983	$08^80\ 19^e$	6342.18543	3043	$04^21\ 31^e$	6377.09433	3103	$05^51\ 22^f$	6416.62463
2924	$14^00\ 13^e$	6306.59297	2984	$08^80\ 19^f$	6342.18543	3044	$06^41\ 6^e$	6377.21990	3104	$05^10\ 44^e$	6416.64206
2925	$09^10\ 8^f$	6307.94565	2985	$06^40\ 37^e$	6342.49544	3045	$06^41\ 6^f$	6377.21990	3105	$06^01\ 10^e$	6418.13510
2926	$06^20\ 37^e$	6308.85059	2986	$07^50\ 30^e$	6344.20274	3046	$02^02\ 23^e$	6378.40053	3106	$03^31\ 38^f$	6418.18717
2927	$00^03\ 7^e$	6309.66635	2987	$07^50\ 30^f$	6344.23829	3047	$03^32\ 7^e$	6378.66198	3107	$00^03\ 11^e$	6419.65789
2928	$11^11\ 12^e$	6310.68765	2988	$06^41\ 4^e$	6344.48680	3048	$03^32\ 7^f$	6378.66210	3108	$08^40\ 23^f$	6420.28322
2929	$08^20\ 22^e$	6311.03850	2989	$06^41\ 4^f$	6344.48680	3049	$07^30\ 31^e$	6378.77875	3109	$08^40\ 23^e$	6420.42368
2930	$02^02\ 22^e$	6311.32663	2990	$05^30\ 43^e$	6347.82822	3050	$08^20\ 23^e$	6381.13224	3110	$08^00\ 24^e$	6421.15137
2931	$03^12\ 5^e$	6311.48627	2991	$14^00\ 14^e$	6347.98637	3051	$03^30\ 53^e$	6383.39042	3111	$07^10\ 32^e$	6421.33005
2932	$11^11\ 12^f$	6311.88196	2992	$04^01\ 31^e$	6348.13152	3052	$01^11\ 49^e$	6384.19683	3112	$06^41\ 8^f$	6421.85438
2933	$03^12\ 5^f$	6311.94331	2993	$11^11\ 13^e$	6348.56374	3053	$07^30\ 31^f$	6384.69616	3113	$06^41\ 8^e$	6421.85439
2934	$09^30\ 7^e$	6313.51401	2994	$03^12\ 7^e$	6349.46246	3054	$00^03\ 10^e$	6387.82171	3114	$01^12\ 32^f$	6422.02191
2935	$09^30\ 7^f$	6313.51679	2995	$11^11\ 13^f$	6349.95664	3055	$06^01\ 9^e$	6388.41647	3115	$06^20\ 38^e$	6422.79933
2936	$03^32\ 3^f$	6314.11933	2996	$08^00\ 23^e$	6350.00566	3056	$11^11\ 14^e$	6389.34897	3116	$02^21\ 44^f$	6424.91104
2937	$03^32\ 3^e$	6314.11933	2997	$03^12\ 7^f$	6350.31529	3057	$05^11\ 23^e$	6389.82255	3117	$08^60\ 22^f$	6425.70281
2938	$06^21\ 5^f$	6314.19844	2998	$12^20\ 33^f$	6350.39094	3058	$11^11\ 14^f$	6390.95558	3118	$08^60\ 22^e$	6425.70286
2939	$06^21\ 5^e$	6314.21937	2999	$08^40\ 22^f$	6350.93538	3059	$14^00\ 15^e$	6392.31225	3119	$05^31\ 23^e$	6426.98688
2940	$06^01\ 6^e$	6317.00160	3000	$08^40\ 22^e$	6351.03543	3060	$03^11\ 38^f$	6393.07629	3120	$09^50\ 9^f$	6427.23865

TABLE XVII. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
3121	$09^{5}0\ 9^{e}$	6427.23865	3181	$09^{3}0\ 12^{e}$	6464.99199	3241	$09^{3}0\ 13^{f}$	6504.48496	3301	$06^{2}0\ 39^{e}$	6539.64430
3122	$05^{3}1\ 23^{f}$	6427.51151	3182	$09^{3}0\ 12^{f}$	6465.05817	3242	$14^{2}0\ 17^{f}$	6505.43691	3302	$06^{2}1\ 13^{f}$	6540.59596
3123	$03^{1}2\ 10^{e}$	6428.31647	3183	$06^{2}1\ 11^{f}$	6466.15842	3243	$14^{2}0\ 17^{e}$	6506.55276	3303	$06^{2}1\ 13^{e}$	6541.37853
3124	$03^{3}2\ 9^{e}$	6428.53148	3184	$06^{2}1\ 11^{e}$	6466.57683	3244	$04^{4}0\ 49^{e}$	6506.83466	3304	$03^{3}0\ 54^{e}$	6542.50630
3125	$03^{3}2\ 9^{f}$	6428.53201	3185	$01^{1}0\ 62^{f}$	6468.58888	3245	$03^{1}1\ 39^{f}$	6507.76551	3305	$14^{0}0\ 18^{e}$	6542.84665
3126	$09^{3}0\ 11^{e}$	6428.63481	3186	$09^{1}0\ 13^{e}$	6468.92661	3246	$04^{4}1\ 32^{f}$	6508.36383	3306	$09^{3}0\ 14^{e}$	6546.79639
3127	$09^{3}0\ 11^{f}$	6428.67461	3187	$09^{7}0\ 7^{f}$	6469.26565	3247	$04^{4}1\ 32^{e}$	6508.48170	3307	$06^{4}1\ 12^{f}$	6546.82136
3128	$03^{1}2\ 10^{f}$	6429.99004	3188	$09^{7}0\ 7^{e}$	6469.26565	3248	$01^{1}2\ 33^{e}$	6510.00737	3308	$06^{4}1\ 12^{e}$	6546.82161
3129	$09^{1}0\ 12^{e}$	6430.18711	3189	$10^{0}0\ 46^{e}$	6471.40438	3249	$09^{1}0\ 14^{e}$	6510.62674	3309	$09^{3}0\ 14^{f}$	6546.95876
3130	$07^{7}0\ 30^{e}$	6430.82998	3190	$04^{2}1\ 32^{e}$	6472.15360	3250	$06^{4}1\ 11^{f}$	6511.11794	3310	$07^{1}0\ 33^{f}$	6546.99394
3131	$07^{7}0\ 30^{f}$	6430.83000	3191	$02^{2}0\ 58^{f}$	6472.92960	3251	$06^{4}1\ 11^{e}$	6511.11807	3311	$01^{1}1\ 50^{f}$	6548.04069
3132	$00^{0}1\ 54^{e}$	6431.58530	3192	$06^{6}1\ 7^{e}$	6473.02873	3252	$13^{3}0\ 27^{e}$	6513.14798	3312	$05^{1}1\ 25^{f}$	6548.09609
3133	$12^{0}0\ 34^{e}$	6431.80862	3193	$06^{6}1\ 7^{f}$	6473.02873	3253	$13^{3}0\ 27^{f}$	6513.49287	3313	$05^{1}0\ 45^{e}$	6548.67479
3134	$11^{1}1\ 15^{e}$	6433.04235	3194	$05^{1}1\ 24^{f}$	6473.71869	3254	$03^{1}0\ 54^{f}$	6514.85790	3314	$20^{0}0\ 4^{e}$	6548.75078
3135	$06^{2}1\ 10^{f}$	6433.39492	3195	$07^{3}0\ 32^{e}$	6474.72291	3255	$06^{2}0\ 39^{f}$	6516.44360	3315	$14^{4}0\ 17^{f}$	6549.71949
3136	$13^{3}0\ 26^{e}$	6433.47794	3196	$04^{2}0\ 49^{e}$	6474.78317	3256	$01^{1}2\ 33^{f}$	6518.28105	3316	$14^{4}0\ 17^{e}$	6549.72032
3137	$06^{2}1\ 10^{e}$	6433.68666	3197	$09^{1}0\ 13^{f}$	6476.51711	3257	$07^{1}0\ 33^{e}$	6518.67747	3317	$09^{7}0\ 10^{f}$	6550.47724
3138	$13^{3}0\ 26^{f}$	6433.75497	3198	$13^{1}0\ 27^{e}$	6477.23009	3258	$08^{2}0\ 25^{f}$	6519.10167	3318	$09^{7}0\ 10^{e}$	6550.47724
3139	$02^{2}1\ 44^{e}$	6434.32608	3199	$06^{4}1\ 10^{f}$	6478.38880	3259	$09^{1}0\ 14^{f}$	6519.34012	3319	$12^{2}0\ 35^{f}$	6552.95482
3140	$11^{1}1\ 15^{f}$	6434.87777	3200	$06^{4}1\ 10^{e}$	6478.38886	3260	$20^{0}0\ 0^{e}$	6519.61045	3320	$03^{3}0\ 54^{f}$	6553.04889
3141	$09^{1}0\ 12^{f}$	6436.72049	3201	$05^{3}0\ 44^{e}$	6478.47661	3261	$09^{7}0\ 9^{f}$	6520.39990	3321	$06^{6}1\ 10^{e}$	6553.11742
3142	$07^{5}0\ 31^{e}$	6437.11898	3202	$11^{1}1\ 16^{e}$	6479.64284	3262	$09^{7}0\ 9^{e}$	6520.39990	3322	$06^{6}1\ 10^{f}$	6553.11742
3143	$07^{5}0\ 31^{f}$	6437.16836	3203	$00^{0}0\ 66^{e}$	6480.05450	3263	$02^{0}2\ 25^{e}$	6521.21763	3323	$09^{1}0\ 15^{e}$	6555.28418
3144	$14^{0}0\ 16^{e}$	6439.56673	3204	$03^{1}0\ 54^{e}$	6481.26539	3264	$20^{0}0\ 1^{e}$	6522.52459	3324	$05^{5}1\ 24^{e}$	6555.73035
3145	$00^{0}2\ 39^{e}$	6440.45681	3205	$07^{3}0\ 32^{f}$	6481.53934	3265	$11^{1}0\ 41^{e}$	6523.03714	3325	$05^{5}1\ 24^{f}$	6555.73094
3146	$01^{1}0\ 62^{e}$	6440.61536	3206	$11^{1}1\ 16^{f}$	6481.72212	3266	$06^{6}0\ 38^{f}$	6523.06362	3326	$00^{0}2\ 40^{e}$	6556.35087
3147	$02^{0}0\ 58^{e}$	6440.84995	3207	$06^{6}0\ 39^{e}$	6484.25973	3267	$06^{6}0\ 38^{e}$	6523.06964	3327	$02^{2}1\ 45^{f}$	6556.53213
3148	$04^{0}1\ 32^{e}$	6441.83832	3208	$05^{5}1\ 23^{e}$	6484.70147	3268	$07^{7}0\ 31^{e}$	6523.32970	3328	$12^{2}0\ 35^{e}$	6557.81812
3149	$08^{2}0\ 24^{f}$	6444.18244	3209	$05^{5}1\ 23^{f}$	6484.70185	3269	$07^{7}0\ 31^{f}$	6523.32973	3329	$14^{2}0\ 18^{f}$	6558.73545
3150	$02^{0}2\ 24^{e}$	6448.36501	3210	$06^{0}1\ 12^{e}$	6486.40836	3270	$06^{6}1\ 9^{e}$	6523.45622	3330	$13^{1}0\ 28^{e}$	6559.29474
3151	$07^{1}0\ 32^{f}$	6448.54358	3211	$03^{1}1\ 39^{e}$	6486.81725	3271	$06^{6}1\ 9^{f}$	6523.45622	3331	$14^{2}0\ 18^{e}$	6560.11049
3152	$06^{4}1\ 9^{f}$	6448.63420	3212	$13^{1}0\ 27^{f}$	6488.63634	3272	$06^{0}1\ 13^{e}$	6524.95114	3332	$04^{2}1\ 33^{f}$	6560.55155
3153	$06^{4}1\ 9^{e}$	6448.63423	3213	$14^{0}0\ 17^{e}$	6489.74604	3273	$03^{3}2\ 12^{e}$	6525.32579	3333	$04^{0}0\ 50^{e}$	6562.09972
3154	$04^{2}0\ 49^{f}$	6449.79228	3214	$03^{3}2\ 11^{e}$	6490.12959	3274	$03^{3}2\ 12^{f}$	6525.32866	3334	$20^{0}0\ 5^{e}$	6563.32009
3155	$05^{1}0\ 44^{f}$	6449.79309	3215	$03^{3}2\ 11^{f}$	6490.13131	3275	$09^{5}0\ 12^{e}$	6526.90240	3335	$03^{3}2\ 13^{e}$	6563.45272
3156	$12^{2}0\ 34^{f}$	6450.21931	3216	$09^{5}0\ 11^{e}$	6490.66155	3276	$09^{5}0\ 12^{f}$	6526.90241	3336	$03^{3}2\ 13^{f}$	6563.45732
3157	$06^{0}1\ 11^{e}$	6450.80106	3217	$09^{5}0\ 11^{f}$	6490.66156	3277	$20^{0}0\ 2^{e}$	6528.35279	3337	$09^{1}0\ 15^{f}$	6565.18056
3158	$14^{4}0\ 15^{f}$	6452.04351	3218	$05^{3}0\ 44^{f}$	6491.01091	3278	$11^{1}1\ 17^{e}$	6529.14931	3338	$09^{5}0\ 13^{e}$	6566.16265
3159	$14^{4}0\ 15^{e}$	6452.04381	3219	$00^{0}3\ 13^{e}$	6492.00230	3279	$01^{1}1\ 50^{e}$	6529.51739	3339	$09^{5}0\ 13^{f}$	6566.16269
3160	$06^{6}1\ 6^{e}$	6452.26321	3220	$02^{2}0\ 58^{e}$	6492.29445	3280	$08^{2}0\ 25^{e}$	6530.37116	3340	$06^{0}1\ 14^{e}$	6566.42373
3161	$06^{6}1\ 6^{f}$	6452.26321	3221	$08^{4}0\ 24^{f}$	6492.64152	3281	$08^{8}0\ 22^{e}$	6530.49917	3341	$02^{2}1\ 45^{e}$	6566.55845
3162	$08^{2}0\ 24^{e}$	6454.24686	3222	$08^{4}0\ 24^{e}$	6492.83818	3282	$08^{8}0\ 22^{f}$	6530.49917	3342	$08^{6}0\ 24^{f}$	6566.82582
3163	$06^{4}0\ 38^{f}$	6454.32764	3223	$09^{7}0\ 8^{f}$	6493.32926	3283	$03^{3}1\ 39^{e}$	6530.70019	3343	$08^{6}0\ 24^{e}$	6566.82599
3164	$00^{0}3\ 12^{e}$	6454.38503	3224	$09^{7}0\ 8^{e}$	6493.32926	3284	$11^{1}1\ 17^{f}$	6531.48749	3344	$08^{4}0\ 25^{f}$	6568.01047
3165	$12^{2}0\ 34^{e}$	6454.65363	3225	$10^{0}1\ 27^{e}$	6494.24365	3285	$00^{0}3\ 14^{e}$	6532.50877	3345	$08^{4}0\ 25^{e}$	6568.28025
3166	$14^{2}0\ 16^{f}$	6455.08847	3226	$08^{6}0\ 23^{f}$	6494.76597	3286	$07^{5}0\ 32^{e}$	6533.02211	3346	$04^{2}1\ 33^{e}$	6570.15289
3167	$14^{2}0\ 16^{e}$	6455.98039	3227	$08^{6}0\ 23^{e}$	6494.76607	3287	$07^{5}0\ 32^{f}$	6533.08994	3347	$06^{4}0\ 39^{f}$	6570.84286
3168	$06^{4}0\ 38^{e}$	6456.41670	3228	$08^{0}0\ 25^{e}$	6495.21782	3288	$03^{3}1\ 39^{f}$	6533.21927	3348	$13^{1}0\ 28^{f}$	6571.48133
3169	$09^{5}0\ 10^{f}$	6457.44026	3229	$03^{1}2\ 12^{e}$	6495.46771	3289	$02^{0}1\ 45^{e}$	6533.26169	3349	$08^{0}0\ 26^{e}$	6572.20387
3170	$09^{5}0\ 10^{e}$	6457.44026	3230	$06^{6}1\ 8^{e}$	6496.75986	3290	$03^{1}2\ 13^{e}$	6533.41443	3350	$05^{3}1\ 25^{e}$	6572.36538
3171	$03^{3}2\ 10^{e}$	6457.86467	3231	$06^{6}1\ 8^{f}$	6496.75986	3291	$05^{1}1\ 25^{e}$	6533.68456	3351	$05^{3}1\ 25^{f}$	6573.20680
3172	$03^{3}2\ 10^{f}$	6457.86565	3232	$03^{1}2\ 12^{f}$	6497.83859	3292	$12^{0}0\ 35^{e}$	6534.16639	3352	$06^{4}0\ 39^{e}$	6573.34963
3173	$05^{1}1\ 24^{e}$	6460.29782	3233	$05^{3}1\ 24^{e}$	6498.19892	3293	$05^{5}0\ 44^{e}$	6534.89904	3353	$07^{3}0\ 33^{e}$	6573.62163
3174	$03^{1}2\ 11^{e}$	6460.43464	3234	$05^{3}1\ 24^{f}$	6498.86730	3294	$05^{5}0\ 44^{f}$	6535.15594	3354	$03^{1}2\ 14^{e}$	6574.27345
3175	$03^{1}2\ 11^{f}$	6462.44195	3235	$14^{4}0\ 16^{f}$	6499.40339	3295	$11^{1}0\ 41^{f}$	6535.86177	3355	$10^{0}1\ 28^{e}$	6575.63420
3176	$04^{2}1\ 32^{f}$	6463.35571	3236	$14^{4}0\ 16^{e}$	6499.40391	3296	$03^{1}2\ 13^{f}$	6536.17850	3356	$00^{0}3\ 15^{e}$	6575.90347
3177	$02^{2}2\ 24^{f}$	6463.56877	3237	$06^{2}1\ 12^{f}$	6501.89277	3297	$02^{2}2\ 25^{f}$	6536.59535	3357	$03^{1}2\ 14^{f}$	6577.46008
3178	$08^{8}0\ 21^{e}$	6464.74539	3238	$06^{2}1\ 12^{e}$	6502.47322	3298	$20^{0}0\ 3^{e}$	6537.09492	3358	$20^{0}0\ 6^{e}$	6580.80250
3179	$08^{8}0\ 21^{f}$	6464.74539	3239	$04^{4}0\ 49^{f}$	6503.98997	3299	$02^{2}2\ 25^{e}$	6538.12976	3359	$07^{3}0\ 33^{f}$	6581.40555
3180	$02^{2}2\ 24^{e}$	6464.89245	3240	$09^{3}0\ 13^{e}$	6504.37942	3300	$04^{0}1\ 33^{e}$	6538.43353	3360	$11^{1}1\ 18^{e}$	6581.56058

TABLE XVIII. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
3361	$06^{2}1\ 14^{f}$	6582.26584	3421	$05^{1}1\ 26^{f}$	6625.39441	3481	$09^{1}0\ 17^{f}$	6665.87318	3541	$06^{0}1\ 17^{e}$	6708.37053
3362	$05^{1}0\ 45^{f}$	6582.73486	3422	$05^{3}0\ 45^{f}$	6625.62131	3482	$02^{2}0\ 59^{e}$	6665.88049	3542	$01^{1}2\ 35^{e}$	6710.18862
3363	$06^{2}1\ 14^{e}$	6583.29496	3423	$06^{2}1\ 15^{f}$	6626.90007	3483	$02^{0}1\ 46^{e}$	6667.19032	3543	$04^{0}0\ 51^{e}$	6711.33280
3364	$09^{7}0\ 11^{f}$	6583.56092	3424	$06^{4}1\ 14^{f}$	6627.14985	3484	$05^{5}0\ 45^{e}$	6668.57418	3544	$20^{0}0\ 11^{e}$	6711.89433
3365	$09^{7}0\ 11^{e}$	6583.56092	3425	$06^{4}1\ 14^{e}$	6627.15070	3485	$03^{1}2\ 16^{f}$	6668.84108	3545	$15^{1}0\ 1^{e}$	6712.45044
3366	$11^{1}1\ 18^{f}$	6584.17264	3426	$06^{2}1\ 15^{e}$	6628.22399	3486	$05^{5}0\ 45^{f}$	6668.89519	3546	$15^{1}0\ 1^{f}$	6712.49908
3367	$06^{4}1\ 13^{f}$	6585.49877	3427	$05^{5}1\ 25^{e}$	6629.71003	3487	$08^{8}0\ 24^{e}$	6670.94961	3547	$03^{1}2\ 17^{e}$	6714.30959
3368	$06^{4}1\ 13^{e}$	6585.49924	3428	$05^{5}1\ 25^{f}$	6629.71092	3488	$08^{8}0\ 24^{f}$	6670.94961	3548	$03^{3}0\ 55^{f}$	6715.78730
3369	$06^{6}1\ 11^{e}$	6585.74300	3429	$07^{5}0\ 33^{e}$	6631.91089	3489	$04^{2}1\ 34^{e}$	6671.08724	3549	$07^{7}0\ 33^{e}$	6717.23650
3370	$06^{6}1\ 11^{f}$	6585.74300	3430	$07^{5}0\ 33^{f}$	6632.00311	3490	$00^{0}3\ 17^{e}$	6671.35326	3550	$07^{7}0\ 33^{f}$	6717.23657
3371	$00^{0}1\ 55^{e}$	6591.14942	3431	$06^{2}0\ 40^{f}$	6634.97191	3491	$06^{4}1\ 15^{f}$	6671.77427	3551	$15^{1}0\ 2^{e}$	6718.35590
3372	$09^{3}0\ 15^{e}$	6592.24185	3432	$11^{1}1\ 19^{e}$	6636.87539	3492	$06^{4}1\ 15^{e}$	6671.77574	3552	$14^{4}0\ 20^{f}$	6718.39792
3373	$09^{3}0\ 15^{f}$	6592.48392	3433	$04^{0}1\ 34^{e}$	6637.91515	3493	$09^{9}0\ 10^{f}$	6674.04717	3553	$14^{4}0\ 20^{e}$	6718.40096
3374	$13^{3}0\ 28^{e}$	6595.75502	3434	$06^{6}0\ 39^{f}$	6639.18743	3494	$09^{9}0\ 10^{e}$	6674.04717	3554	$15^{1}0\ 2^{f}$	6718.50182
3375	$13^{3}0\ 28^{f}$	6596.18058	3435	$06^{6}0\ 39^{e}$	6639.19573	3495	$14^{2}0\ 20^{f}$	6674.17477	3555	$05^{1}0\ 46^{f}$	6718.54889
3376	$02^{0}2\ 26^{e}$	6596.95602	3436	$12^{0}0\ 36^{e}$	6639.40897	3496	$06^{2}1\ 16^{f}$	6674.49617	3556	$03^{1}2\ 17^{f}$	6718.93657
3377	$08^{2}0\ 26^{f}$	6596.96977	3437	$11^{1}1\ 19^{f}$	6639.77627	3497	$00^{0}0\ 67^{e}$	6674.65903	3557	$06^{4}1\ 16^{f}$	6719.37164
3378	$04^{2}0\ 50^{f}$	6596.97744	3438	$09^{3}0\ 16^{e}$	6640.71438	3498	$00^{0}2\ 41^{e}$	6675.10366	3558	$06^{4}1\ 16^{e}$	6719.37411
3379	$14^{0}0\ 19^{e}$	6598.86527	3439	$09^{3}0\ 16^{f}$	6641.06536	3499	$07^{3}0\ 34^{e}$	6675.46898	3559	$01^{1}2\ 35^{f}$	6719.46522
3380	$08^{8}0\ 23^{e}$	6599.23423	3440	$08^{6}0\ 25^{f}$	6641.88163	3500	$02^{0}2\ 27^{e}$	6675.57787	3560	$14^{0}0\ 21^{e}$	6719.64485
3381	$08^{8}0\ 23^{f}$	6599.23423	3441	$08^{6}0\ 25^{e}$	6641.88190	3501	$06^{2}1\ 16^{e}$	6676.16635	3561	$08^{6}0\ 26^{f}$	6719.93261
3382	$20^{0}0\ 7^{e}$	6601.19760	3442	$03^{1}0\ 55^{e}$	6641.90461	3502	$14^{2}0\ 20^{e}$	6676.18092	3562	$08^{6}0\ 26^{e}$	6719.93305
3383	$06^{0}0\ 40^{e}$	6601.87800	3443	$09^{9}0\ 9^{f}$	6644.12706	3503	$03^{1}0\ 55^{f}$	6676.32520	3563	$09^{1}0\ 18^{f}$	6720.70315
3384	$09^{1}0\ 16^{e}$	6602.89562	3444	$09^{9}0\ 9^{e}$	6644.12706	3504	$01^{1}1\ 51^{e}$	6677.68428	3564	$07^{1}0\ 35^{e}$	6722.09276
3385	$14^{4}0\ 18^{f}$	6602.99110	3445	$13^{1}0\ 29^{e}$	6644.26516	3505	$08^{2}0\ 27^{f}$	6677.78212	3565	$06^{0}0\ 41^{e}$	6722.35721
3386	$14^{4}0\ 18^{e}$	6602.99241	3446	$11^{1}0\ 42^{e}$	6645.46940	3506	$20^{0}0\ 10^{e}$	6679.85394	3566	$03^{1}1\ 41^{e}$	6723.19775
3387	$03^{1}1\ 40^{e}$	6603.55697	3447	$02^{2}0\ 59^{f}$	6645.68803	3507	$13^{3}0\ 29^{e}$	6681.29730	3567	$00^{0}3\ 18^{e}$	6723.40604
3388	$03^{3}2\ 14^{e}$	6604.50981	3448	$08^{4}0\ 26^{f}$	6646.38853	3508	$13^{3}0\ 29^{f}$	6681.81795	3568	$06^{2}1\ 17^{f}$	6725.05147
3389	$03^{3}2\ 14^{f}$	6604.51693	3449	$08^{4}0\ 26^{e}$	6646.75036	3509	$05^{1}0\ 46^{e}$	6683.58299	3569	$06^{2}1\ 17^{e}$	6727.12183
3390	$04^{4}1\ 33^{f}$	6605.77700	3450	$03^{3}1\ 40^{e}$	6648.32479	3510	$07^{3}0\ 34^{f}$	6684.28676	3570	$15^{1}0\ 3^{e}$	6727.21365
3391	$04^{4}1\ 33^{e}$	6605.92739	3451	$07^{1}0\ 34^{f}$	6648.33711	3511	$05^{1}1\ 27^{e}$	6689.18280	3571	$15^{1}0\ 3^{f}$	6727.50545
3392	$10^{0}0\ 47^{e}$	6608.18377	3452	$03^{3}2\ 15^{e}$	6648.49641	3512	$06^{4}0\ 40^{f}$	6690.31075	3572	$08^{4}0\ 27^{f}$	6727.77089
3393	$09^{5}0\ 14^{e}$	6608.44217	3453	$03^{3}2\ 15^{f}$	6648.50711	3513	$02^{2}1\ 46^{f}$	6691.02771	3573	$08^{4}0\ 27^{e}$	6728.24468
3394	$09^{5}0\ 14^{f}$	6608.44224	3454	$05^{3}1\ 26^{e}$	6649.48401	3514	$02^{2}2\ 27^{f}$	6691.36152	3574	$05^{3}1\ 27^{e}$	6729.55243
3395	$01^{1}2\ 34^{e}$	6608.66137	3455	$05^{3}1\ 26^{f}$	6650.53140	3515	$08^{2}0\ 27^{e}$	6691.62058	3575	$05^{3}1\ 27^{f}$	6730.84226
3396	$08^{2}0\ 26^{e}$	6609.48853	3456	$20^{0}0\ 9^{e}$	6650.72391	3516	$09^{3}0\ 17^{e}$	6692.21219	3576	$13^{1}0\ 30^{e}$	6732.13900
3397	$05^{1}1\ 26^{e}$	6609.98037	3457	$03^{3}1\ 40^{f}$	6651.18816	3517	$09^{3}0\ 17^{f}$	6692.70853	3577	$07^{5}0\ 34^{e}$	6733.78401
3398	$06^{0}1\ 15^{e}$	6610.82089	3458	$04^{4}0\ 50^{f}$	6652.01896	3518	$06^{4}0\ 40^{e}$	6693.29404	3578	$07^{5}0\ 34^{f}$	6733.90814
3399	$05^{3}0\ 45^{e}$	6612.02932	3459	$08^{0}0\ 27^{e}$	6652.10824	3519	$02^{2}2\ 27^{e}$	6693.37945	3579	$08^{0}0\ 28^{e}$	6734.92948
3400	$02^{2}2\ 26^{f}$	6612.52689	3460	$01^{1}0\ 63^{f}$	6652.76788	3520	$11^{1}1\ 20^{e}$	6695.09241	3580	$14^{2}0\ 21^{f}$	6736.31128
3401	$02^{0}0\ 59^{e}$	6612.85243	3461	$09^{1}0\ 17^{e}$	6653.45785	3521	$03^{3}2\ 16^{e}$	6695.41181	3581	$14^{2}0\ 21^{e}$	6738.69183
3402	$09^{1}0\ 16^{f}$	6614.02849	3462	$09^{5}0\ 15^{e}$	6653.74080	3522	$03^{3}2\ 16^{f}$	6695.42747	3582	$15^{1}0\ 4^{e}$	6739.02314
3403	$02^{2}2\ 26^{e}$	6614.29259	3463	$09^{5}0\ 15^{f}$	6653.74093	3523	$01^{1}1\ 51^{f}$	6696.92643	3583	$15^{1}0\ 4^{f}$	6739.50940
3404	$14^{2}0\ 19^{f}$	6614.98209	3464	$04^{4}0\ 50^{e}$	6655.27574	3524	$11^{1}1\ 20^{f}$	6698.29701	3584	$04^{0}1\ 35^{e}$	6740.28109
3405	$14^{2}0\ 19^{e}$	6616.65343	3465	$13^{1}0\ 29^{f}$	6657.24705	3525	$09^{7}0\ 14^{f}$	6700.84589	3585	$09^{9}0\ 12^{f}$	6742.85794
3406	$01^{1}2\ 34^{f}$	6617.42963	3466	$14^{0}0\ 20^{e}$	6657.79891	3526	$09^{7}0\ 14^{e}$	6700.84589	3586	$09^{9}0\ 12^{e}$	6742.85794
3407	$03^{1}2\ 15^{e}$	6618.04335	3467	$06^{0}1\ 16^{e}$	6658.13787	3527	$06^{6}1\ 14^{e}$	6701.40087	3587	$03^{3}2\ 17^{e}$	6745.25524
3408	$07^{7}0\ 32^{e}$	6618.79897	3468	$12^{2}0\ 36^{f}$	6658.59497	3528	$06^{6}1\ 14^{f}$	6701.40087	3588	$03^{3}2\ 17^{f}$	6745.27763
3409	$07^{7}0\ 32^{f}$	6618.79901	3469	$09^{7}0\ 13^{f}$	6658.74569	3529	$02^{2}1\ 46^{e}$	6701.68257	3589	$08^{8}0\ 25^{e}$	6745.64428
3410	$07^{1}0\ 34^{e}$	6618.93258	3470	$09^{7}0\ 13^{e}$	6658.74569	3530	$09^{5}0\ 16^{e}$	6702.05838	3590	$08^{8}0\ 25^{f}$	6745.64428
3411	$09^{7}0\ 12^{f}$	6619.65055	3471	$11^{1}0\ 42^{f}$	6658.90604	3531	$09^{5}0\ 16^{f}$	6702.05863	3591	$03^{1}1\ 41^{f}$	6745.76353
3412	$09^{7}0\ 12^{e}$	6619.65055	3472	$14^{4}0\ 19^{f}$	6659.21751	3532	$03^{3}0\ 55^{e}$	6704.49847	3592	$06^{6}1\ 15^{e}$	6745.87861
3413	$06^{6}1\ 12^{e}$	6621.33246	3473	$14^{4}0\ 19^{e}$	6659.21952	3533	$05^{1}1\ 27^{f}$	6705.60744	3593	$06^{6}1\ 15^{f}$	6745.87861
3414	$06^{6}1\ 12^{f}$	6621.33246	3474	$06^{2}0\ 40^{e}$	6659.37770	3534	$04^{4}1\ 34^{f}$	6706.12457	3594	$13^{1}0\ 30^{f}$	6745.92933
3415	$03^{1}2\ 15^{f}$	6621.68157	3475	$06^{6}1\ 13^{e}$	6659.88528	3535	$04^{4}1\ 34^{e}$	6706.31496	3595	$09^{7}0\ 15^{f}$	6745.95065
3416	$00^{0}3\ 16^{e}$	6622.18534	3476	$06^{6}1\ 13^{f}$	6659.88528	3536	$05^{5}1\ 26^{e}$	6706.63946	3596	$09^{7}0\ 15^{e}$	6745.95065
3417	$04^{2}0\ 50^{e}$	6622.96137	3477	$10^{0}1\ 29^{e}$	6659.91248	3537	$05^{5}1\ 26^{f}$	6706.64078	3597	$09^{3}0\ 18^{e}$	6746.73310
3418	$01^{1}0\ 63^{e}$	6623.93174	3478	$04^{2}1\ 34^{f}$	6660.65313	3538	$09^{9}0\ 11^{f}$	6706.95762	3598	$20^{0}0\ 12^{e}$	6746.84432
3419	$20^{0}0\ 8^{e}$	6624.50492	3479	$12^{2}0\ 36^{e}$	6663.90819	3539	$09^{9}0\ 11^{e}$	6706.95762	3599	$04^{2}0\ 51^{f}$	6747.02938
3420	$03^{1}1\ 40^{f}$	6625.32909	3480	$03^{1}2\ 16^{e}$	6664.72259	3540	$09^{1}0\ 18^{e}$	6706.96772	3600	$10^{0}1\ 30^{e}$	6747.07648

TABLE XIX. The $H^{12}C^{14}N$ rovibrational levels in cm^{-1}.

Nr.	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*	*Nr.*	*State*	*T*
3601	$09^30\ 18^f$	6747.41918	3661	$12^21\ 2^f$	6784.17192	3721	$02^20\ 60^f$	6821.28910	3781	$12^21\ 7^f$	6857.40932
3602	$12^00\ 37^e$	6747.53409	3662	$12^21\ 2^e$	6784.17202	3722	$05^10\ 47^e$	6821.36338	3782	$12^21\ 7^e$	6857.42176
3603	$10^00\ 48^e$	6747.82113	3663	$14^00\ 22^e$	6784.40064	3723	$03^12\ 19^e$	6822.20007	3783	$02^22\ 29^f$	6857.73211
3604	$05^30\ 46^e$	6748.48178	3664	$20^00\ 13^e$	6784.70310	3724	$12^01\ 6^e$	6822.25415	3784	$010^00\ 1^e$	6858.48603
3605	$07^10\ 35^f$	6752.57167	3665	$11^10\ 43^f$	6784.83639	3725	$15^30\ 7^e$	6822.75346	3785	$12^00\ 38^e$	6858.53941
3606	$09^50\ 17^e$	6753.39472	3666	$05^51\ 27^e$	6786.51756	3726	$15^30\ 7^f$	6822.75399	3786	$07^10\ 36^f$	6859.69631
3607	$09^50\ 17^f$	6753.39519	3667	$05^51\ 27^f$	6786.51950	3727	$09^10\ 20^e$	6822.81825	3787	$02^22\ 29^e$	6860.31845
3608	$00^01\ 56^e$	6753.54287	3668	$02^00\ 60^e$	6787.68442	3728	$13^10\ 31^e$	6822.91387	3788	$13^30\ 31^e$	6861.18002
3609	$15^10\ 5^e$	6753.78366	3669	$05^11\ 28^f$	6788.72906	3729	$08^80\ 26^e$	6823.31720	3789	$15^50\ 6^f$	6861.67540
3610	$15^10\ 5^f$	6754.51291	3670	$12^01\ 4^e$	6790.01734	3730	$08^80\ 26^f$	6823.31720	3790	$15^50\ 6^e$	6861.67540
3611	$11^11\ 21^e$	6756.21025	3671	$07^30\ 35^f$	6790.17423	3731	$06^41\ 18^f$	6823.48359	3791	$13^30\ 31^f$	6861.94099
3612	$06^20\ 41^f$	6756.39525	3672	$15^10\ 7^e$	6792.15415	3732	$06^41\ 18^e$	6823.48988	3792	$04^00\ 52^e$	6863.42220
3613	$02^02\ 28^e$	6757.08089	3673	$12^21\ 3^f$	6792.96121	3733	$09^90\ 14^f$	6823.62607	3793	$010^00\ 2^e$	6864.57014
3614	$15^30\ 3^f$	6757.33609	3674	$12^21\ 3^e$	6792.96170	3734	$09^90\ 14^e$	6823.62607	3794	$08^20\ 29^e$	6864.77914
3615	$15^30\ 3^e$	6757.33609	3675	$06^61\ 16^e$	6793.31783	3735	$11^11\ 22^f$	6824.08397	3795	$09^30\ 20^e$	6864.83332
3616	$06^60\ 40^f$	6758.26721	3676	$06^61\ 16^f$	6793.31783	3736	$01^12\ 36^f$	6824.38527	3796	$09^50\ 19^e$	6865.12301
3617	$06^60\ 40^e$	6758.27855	3677	$15^10\ 7^f$	6793.51450	3737	$20^00\ 14^e$	6825.46976	3797	$09^50\ 19^f$	6865.12442
3618	$11^11\ 21^f$	6759.73341	3678	$09^70\ 16^f$	6794.05945	3738	$03^12\ 19^f$	6827.92647	3798	$09^30\ 20^f$	6866.06622
3619	$12^01\ 0^e$	6760.70513	3679	$09^70\ 16^e$	6794.05945	3739	$07^10\ 36^e$	6828.15532	3799	$12^01\ 8^e$	6866.20223
3620	$06^01\ 18^e$	6761.51529	3680	$00^02\ 42^e$	6796.71233	3740	$02^21\ 47^f$	6828.39447	3800	$09^90\ 15^f$	6868.49273
3621	$08^20\ 28^f$	6761.53417	3681	$03^32\ 18^e$	6798.02586	3741	$01^11\ 52^e$	6828.69395	3801	$09^90\ 15^e$	6868.49273
3622	$05^30\ 46^f$	6763.16116	3682	$03^32\ 18^f$	6798.05723	3742	$06^21\ 19^f$	6835.02835	3802	$03^11\ 42^f$	6869.06544
3623	$09^10\ 19^e$	6763.42217	3683	$08^60\ 27^f$	6800.97797	3743	$00^03\ 20^e$	6836.16103	3803	$20^00\ 15^e$	6869.14336
3624	$12^01\ 1^e$	6763.63661	3684	$08^60\ 27^e$	6800.97868	3744	$12^21\ 6^f$	6836.90437	3804	$05^51\ 28^e$	6869.34323
3625	$04^21\ 35^f$	6763.65716	3685	$14^20\ 22^f$	6801.38934	3745	$12^21\ 6^e$	6836.91129	3805	$05^51\ 28^f$	6869.34603
3626	$03^12\ 18^e$	6766.80266	3686	$15^30\ 6^e$	6801.93901	3746	$10^01\ 31^e$	6837.12412	3806	$03^30\ 56^e$	6869.36285
3627	$12^20\ 37^f$	6767.13717	3687	$15^30\ 6^f$	6801.93922	3747	$13^10\ 31^f$	6837.52388	3807	$14^20\ 23^f$	6869.40655
3628	$03^31\ 41^e$	6768.85405	3688	$04^40\ 51^f$	6802.95704	3748	$06^21\ 19^e$	6838.06702	3808	$04^21\ 36^f$	6869.56031
3629	$15^30\ 4^e$	6769.23026	3689	$02^01\ 47^e$	6803.97411	3749	$07^50\ 35^e$	6838.63999	3809	$15^10\ 10^e$	6871.81560
3630	$15^30\ 4^f$	6769.23028	3690	$14^20\ 22^e$	6804.18455	3750	$07^50\ 35^f$	6838.80552	3810	$00^00\ 68^e$	6872.06262
3631	$12^01\ 2^e$	6769.49940	3691	$09^30\ 19^e$	6804.27448	3751	$09^10\ 20^f$	6839.27111	3811	$14^20\ 23^e$	6872.65702
3632	$13^30\ 30^e$	6769.77295	3692	$12^01\ 5^e$	6804.67130	3752	$02^21\ 47^e$	6839.69480	3812	$15^30\ 9^e$	6873.30196
3633	$06^41\ 17^f$	6769.94157	3693	$12^21\ 4^f$	6804.67992	3753	$01^10\ 64^f$	6839.77371	3813	$15^30\ 9^f$	6873.30431
3634	$06^41\ 17^e$	6769.94556	3694	$12^21\ 4^e$	6804.68140	3754	$03^10\ 56^f$	6840.63891	3814	$010^00\ 3^e$	6873.69181
3635	$13^30\ 30^f$	6770.40483	3695	$05^50\ 46^e$	6805.18847	3755	$02^02\ 29^e$	6841.46286	3815	$15^10\ 10^f$	6874.48229
3636	$11^10\ 43^e$	6770.77443	3696	$09^30\ 19^f$	6805.20320	3756	$15^10\ 9^e$	6842.31619	3816	$05^11\ 29^f$	6874.75341
3637	$05^11\ 28^e$	6771.28943	3697	$03^10\ 56^e$	6805.38733	3757	$02^20\ 60^e$	6842.32287	3817	$06^01\ 20^e$	6876.52948
3638	$15^10\ 6^e$	6771.49435	3698	$05^50\ 46^f$	6805.58894	3758	$12^01\ 7^e$	6842.76486	3818	$12^20\ 38^f$	6878.57876
3639	$03^12\ 18^f$	6771.96582	3699	$04^40\ 51^e$	6806.66495	3759	$06^61\ 17^e$	6843.71782	3819	$06^41\ 19^f$	6879.99721
3640	$03^31\ 41^f$	6772.09140	3700	$09^50\ 18^e$	6807.74967	3760	$06^61\ 17^f$	6843.71782	3820	$06^41\ 19^e$	6880.00689
3641	$15^10\ 6^f$	6772.51500	3701	$09^50\ 18^f$	6807.75049	3761	$15^50\ 5^f$	6843.87848	3821	$06^60\ 41^f$	6880.30142
3642	$12^20\ 37^e$	6772.92093	3702	$04^41\ 35^f$	6809.40472	3762	$15^50\ 5^e$	6843.87848	3822	$06^60\ 41^e$	6880.31681
3643	$02^22\ 28^f$	6773.09727	3703	$04^41\ 35^e$	6809.64394	3763	$15^10\ 9^f$	6844.49989	3823	$010^20\ 2^f$	6880.43372
3644	$04^20\ 51^e$	6773.99737	3704	$01^10\ 64^e$	6810.06363	3764	$09^70\ 17^f$	6845.17172	3824	$010^20\ 2^e$	6880.43542
3645	$04^21\ 35^e$	6774.95147	3705	$08^40\ 28^f$	6812.15421	3765	$09^70\ 17^e$	6845.17172	3825	$03^12\ 20^e$	6880.49999
3646	$02^22\ 28^e$	6775.38868	3706	$05^31\ 28^e$	6812.56806	3766	$03^11\ 42^e$	6845.44884	3826	$06^20\ 42^f$	6880.71004
3647	$08^20\ 28^e$	6776.71486	3707	$06^40\ 41^f$	6812.72719	3767	$04^01\ 36^e$	6845.52918	3827	$12^21\ 8^f$	6880.84209
3648	$12^01\ 3^e$	6778.29315	3708	$08^40\ 28^e$	6812.73607	3768	$14^40\ 22^f$	6845.61747	3828	$12^21\ 8^e$	6880.86283
3649	$00^03\ 19^e$	6778.34240	3709	$05^31\ 28^f$	6814.14020	3769	$14^40\ 22^e$	6845.62395	3829	$03^30\ 56^f$	6881.41946
3650	$09^10\ 19^f$	6778.50649	3710	$01^12\ 36^e$	6814.58666	3770	$06^00\ 42^e$	6845.98315	3830	$04^21\ 36^e$	6881.74023
3651	$06^21\ 18^f$	6778.56318	3711	$15^10\ 8^e$	6815.76188	3771	$15^30\ 8^e$	6846.54115	3831	$15^50\ 7^f$	6882.43782
3652	$07^30\ 35^e$	6780.25978	3712	$06^40\ 41^e$	6816.24886	3772	$15^30\ 8^f$	6846.54233	3832	$15^50\ 7^e$	6882.43782
3653	$14^40\ 21^f$	6780.53153	3713	$15^10\ 8^f$	6817.51000	3773	$08^20\ 29^f$	6848.22143	3833	$12^20\ 38^e$	6884.85334
3654	$14^40\ 21^e$	6780.53601	3714	$06^01\ 19^e$	6817.56912	3774	$01^11\ 52^f$	6848.66738	3834	$08^60\ 28^f$	6885.01690
3655	$06^21\ 18^e$	6781.08938	3715	$07^70\ 34^e$	6818.64098	3775	$14^00\ 23^e$	6852.06406	3835	$08^60\ 28^e$	6885.01801
3656	$09^90\ 13^f$	6781.74761	3716	$07^70\ 34^f$	6818.64108	3776	$03^32\ 19^e$	6853.72275	3836	$09^10\ 21^e$	6885.15309
3657	$09^90\ 13^e$	6781.74761	3717	$12^21\ 5^f$	6819.32776	3777	$03^32\ 19^f$	6853.76591	3837	$010^00\ 4^e$	6885.84570
3658	$06^20\ 41^e$	6781.99189	3718	$12^21\ 5^e$	6819.33122	3778	$010^00\ 0^e$	6855.44308	3838	$03^12\ 20^f$	6886.81596
3659	$15^30\ 5^e$	6784.09792	3719	$11^11\ 22^e$	6820.22743	3779	$05^11\ 29^e$	6856.29778	3839	$11^11\ 23^e$	6887.14242
3660	$15^30\ 5^f$	6784.09799	3720	$08^00\ 29^e$	6820.66601	3780	$05^10\ 47^f$	6857.23274	3840	$05^30\ 47^e$	6887.82937

TABLE XX. Interactions observed or expected for $H^{12}C^{14}N$.

Nr	T[a]	$\|\rangle_1$	$\|\rangle_2$	J_p[b]	J_c[c]	$(T_1^m - T_2^m)$[d]	$(T_1^m - T_1^c)$[e]
1	2967.05	$01^{1e}1$	$04^{0e}0$	6–16	10	−0.1216	−0.0137
2	4458.34	$02^{0e}1$	$05^{1e}0$	15–38	25	+0.2536	+0.0778
3	4550.65	$02^{2f}1$	$05^{1f}0$	19–32	26	−0.1909	−0.0636
4	5491.03	$03^{1f}1$	$06^{2f}0$	23–34	29	−0.3491	−0.0119
5	5719.63	$04^{2f}1$	$07^{3f}0$	20–27	23	+0.4662	+0.0081
6	5773.88	$05^{5e}1$	$08^{6e}0$	06–10	8	+0.1297	+0.0278
7	5773.88	$05^{5f}1$	$08^{6f}0$	06–10	8	+0.1297	+0.0278
8	5984.35	$02^{2f}2$	$05^{1f}1$	14–18	16	−0.4622	−0.0164
9	6089.49	$03^{3e}1$	$06^{2e}0$	30–41	35	−0.4178	−0.0275
10	6195.79	$04^{2e}1$	$07^{3e}0$	28–31	29	+0.0828	+0.0182
11	6609.74	$05^{1e}1$	$08^{2e}0$	24–27	26	+0.5060	+0.0113
12	6812.69	$05^{3e}1$	$08^{4e}0$	23–36	28	−0.0916	+0.0761
13	6845.72	$03^{1e}1$	$06^{0e}0$	24–51	42	−0.5343	−0.1435
14	6989.82	$05^{3f}1$	$08^{4f}0$	24–34	30	+0.0251	+0.1334
15	7614.51	$04^{4f}1$	$07^{3f}0$	40–45	42	−0.4552	−0.0206
16	7820.62	$04^{2f}1$	$07^{1f}0$	38–51	44	+0.3508	+0.0845
17	8668.13	$10^{0e}1$	$13^{1e}0$	43–53	47	+0.4342	+0.0229
18	9103.72	$11^{1f}1$	$14^{2f}0$	43–50	45	+0.3799	+0.0050
19	9142.91	$05^{5e}1$	$08^{4e}0$	48–48	48	−0.4629	−0.0235
20	9230.00	$04^{0e}1$	$07^{1e}0$	45–60	54	−0.7343	−0.1704

[a]Term value in cm^{-1} of the crossing point.
[b]Range of rotational quantum numbers J with perturbed eigenenergies.
[c]J at the crossing point.
[d]Perturbed separation between $|\rangle_1$ and $|\rangle_2$ in cm^{-1} at the crossing point J_c.
[e]Displacement in cm^{-1} at the crossing point J_c of the perturbed $|\rangle_1$ eigenstate term value relative to the eigenstate term value calculated without interaction matrix elements.

We expect Coriolis-type resonances for a linear triatomic molecule between rotational manifolds of two vibrational states with similar eigenenergies having the same e/f quantum number if the difference between the eigenenergy of two eigenstates with the same rotational quantum number J is very small. The states for which such resonances can be observed depend on the values of fundamental vibrations. For HCN we have $\nu_3 = 2096\ cm^{-1} \approx 3 \times \nu_2 = 2136\ cm^{-1}$ and the vibrational states of the type (v_1, v_2, v_3) and $(v_1, v_2 + 3 \times n, v_3 - n)$ have nearly equal energies. The J for which the eigenenergies are nearly equal depends on the difference between the rotational constants of the two vibrational states. Table XX lists the observed Coriolis-type resonances for $H^{12}C^{14}N$.

This work reports the lowest 20 Coriolis-type resonances on the eigenenergy scale. Six resonances have been reported previously by Maki *et al.*,[70] two by Maki *et al.*[75] and four by Mellau *et al.*[17] In Ref. 17, only upper states have been analyzed, the term values of the lower bending states for these four resonances have been improved in the present work. From the analysis of the HOTGAME spectra, 58 Coriolis-type resonances have been found. Some of the 71 vibrational states reported in this paper are involved in the 38 resonances not reported in this paper, all of them with perturbed states above the 6880 cm^{-1}.

The transition wavenumbers for states in resonance are listed in the perturbation analysis tables.[82] These tables list the term values for the perturbed eigenenergies determined from the assignment of the perturbed transitions. For all these states it was possible to determine accurate unperturbed spectroscopic constants. At first sight, this deperturbation procedure looks straightforward but one of the major difficulties of the analysis presented here was the accurate deperturbation of the perturbed states. In all cases the perturbed eigenenergies have been cross checked through as many transitions as possible. The full analysis of all perturbations observed in the [H,C,N] molecular system will be published in a separate paper.

VII. ROTATIONALLY ASSIGNED *AB INITIO* EIGENENERGIES

Over the last years many global potential surfaces for the [H,C,N] molecular system have been published. Figure 2 shows the vibrational angular momentum dependence of the difference between the experimental and *ab initio* vibrational eigenenergies $\Delta E_{vib} = T_{v,(J=0)meas} - T_{v,(J=0)abinitio}$ for the potential surface calculated by Tennyson and co-workers.[83–85] The error plot shows a strong vibrational angular momentum dependence. For high l, the *ab initio* vibrational eigenenergies agree better with the experimental data than for low l. For the HNC eigenenergies the error plot shows a similar dependence[18] but for HNC the error is smaller for the low l states. From this comparison it is important to note that for any vibrational analysis based on these *ab initio* data we expect l dependent errors.

The eigenenergies from the experimental study presented here do not reach up to the barrier of isomerization. If we want to use HOTGAME spectroscopy to climb the ladder of bending states up to the isomerization barrier we have to know roughly which spectroscopic effects we have to expect. Without such knowledge, it is not possible to assign the peaks in a dense HOTGAME spectrum. To understand the eigenenergy structure we can use rovibrational eigenenergy values from *ab initio* calculations. All 45 000 rovibrational eigenval-

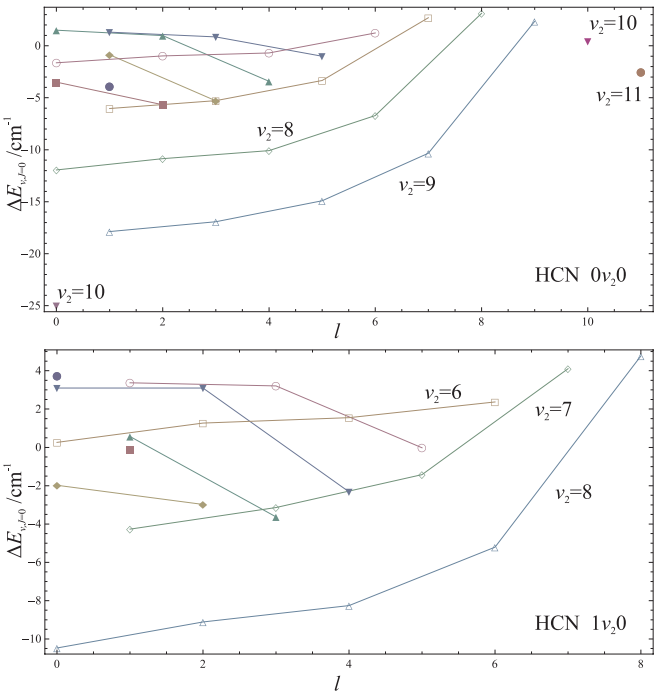

FIG. 2. $\Delta E_{vib} = T_{v,(J=0)meas} - T_{v,(J=0)abinitio}$ difference between the experimental and *ab-initio* HCN bending vibrational term values.

ues up to the isomerization barrier have already been calculated by Tennyson and coworkers.[85] For the [H,C,N] molecular system only parity and total angular momentum are exact quantum numbers, and the eigenenergies have to be labeled with vibrational quantum numbers in an assignment procedure. The vibrational assignment can be done using either the wave functions[86] or the rotational structure of the eigenenergies as assignment information. The assignment reported here is based on the rotational structure; the assignment procedure is similar to the spectroscopic techniques used to assign high resolution spectra.

This work presents the first results from the rotational assignment of all rovibrational eigenenergies up to the isomerization barrier. The eigenenergies published in Ref. 85 have been used for this analysis; Harris *et al.*[85] rotationally assigned only the first 500 vibrational states up to 10 000 cm^{-1} relative to the HCN ground state. The rotational assignment of the eigenenergies was given up and restarted many times over the last years. When the assignment work was started there was no reason to try to construct a better PES and to recalculate the rovibrational eigenenergies. The HOTGAME results show[18] that for the HNC part of the potential the vibrational *ab initio* eigenenergies are much less accurate as for the HCN part. For HNC, the conclusions obtained from this study may differ from the results which we may obtain for a more accurate PES (for example, an accurate global PES was necessary[30–32] to interpret the HCP experimental eigenenergies). For the HCN part of the potential and for the very basic features of the eigenenergy structure around the isomerization barrier this eigenenergy list should give us definitive results.

We first describe the procedure used to assign the eigenenergies. First of all the eigenenergy list has been transformed to a format where the eigenenergies can be sorted both manually and by a computer program. The assignment up to $J = 10$ has been done by manual sorting of the eigenenergy entries. The entries for $J > 10$ have been assigned in a first step using a computer program. The automatic assignment was done by assuming that the eigenenergies are described by spectroscopic constants up to the isomerization and that the eigenenergy structure is not disturbed by quantum monodromy.[87] The eigenenergies the program failed to assign have been assigned manually. A data visualization system was implemented for the assignment program, and all assignment decisions have been made by the visual inspection of the eigenenergy structure. With the assignment of increasingly excited rotational levels the rotational structure emerged; the assignment procedure was accompanied by a learning process about the rotational structure. This knowledge was integrated in the further assignment of the states. As the analysis evolved the number of misassignments done by the computer program increased, and it was more and more laborious to progress. At some stages all vibrational states have been checked by the visual inspection and errors corrected. The major problems of the assignment are related to strong local resonances where the automatic procedure jumps to the other state in resonance. The second major problem is related to states that are not in resonance but are separated at a given J by less than 1 cm^{-1} and have similar rotational constants. In such a case the assignment can again jump from one vibrational state to another. It was important to learn to identify these possible errors using the visual system. The assignment of the first 500 vibrational states with vibrational excitations up to 10 000 cm^{-1} relative to the HCN ground state and with J up to 60 as done by Harris *et al.*[85] was straightforward. The eigenenergies have been assigned by the computer program, only a few manual corrections have been made during the assignment. The assignment of the next 500 vibrational states up to 12 200 cm^{-1} and with J up to 60 was much more complicated, and many time consuming manual corrections were necessary. At the end of the assignments some low l states with $50 < J < 60$ above the barrier remained unassigned; they did not match any of the vibrational states. The assignments of all low l states have been changed until none of the eigenenergy values remained unassigned. The changes have been made using the visual interpretation to get a similar eigenenergy structure for all states. The author believes that all these states are still error free up to $J = 60$. The rotational assignment of the next 500 vibrational states up to 13500 cm^{-1} is completed, all eigenenergy values have been assigned. For these states additional tests are necessary; from a visual inspection they all seem to be error free. The rotational states for the next 500 vibrational states up to 14 600 cm^{-1} have been assigned only up to $J = 40$. This assignment should have no significant errors. For many vibrational states in this energy range the analysis for $J > 40$ is finalized. Around 15 250 cm^{-1} the first isomerization states with low J emerge. Even if the number of such states is relatively low for the states above this eigenenergy only a computer aided manual assignment is possible. During the analysis the transition intensities calculated for all pairs of levels have not been used to verify the rotational assignment. The vibrational assignment was done only after all 2400 rotational structures

have been determined. This way it can be ascertained that the assignments are error free both via the vibrational dependence of the rotational constants and through the simulation of the rovibrational bands.

The PES is imperfect; this imperfection transferred to the vibrational eigenenergy gives errors in the order of 0–25 cm^{-1} compared with the real molecule as shown in Fig. 2. The "effective"internal consistency of the vibrational states is much better, for the bending states it is within 1–2 cm^{-1}. The vibrational eigenenergies from the PES are consistent with the vibrational structure of a fictitious linear molecule slightly different from HCN.

Using the *ab initio* data we can now make some important predictions, we can give a qualitative and quantitative answer to some still open questions regarding the [H,C,N] molecular system; the qualitative results may be already known either from simple molecular models or from theoretical and experimental work on similar molecules. In this paper, we want to give an answer to the following question: How high can the excitation of pure bending vibration be before the anharmonic force field of the linear molecule ceases to be a valid model? The answer to this question is related to the form of the PES and the width of the barrier.[88] We define the validity of the anharmonic force field from a practical point of view: The anharmonic force field model will be considered valid as long as the vibrational eigenenergies for each substate of a given v_2 can be predicted from a Dunham-type analysis of all substates up to $v_2 - 1$ with a given accuracy. To give an answer to the question stated above the vibrational energies of the different l sublevels have been determined in this work up to the isomerization barrier for the $0v_20$ bending states. The general Dunham-type power series expansion[70] of the $G_{vz}(v_1, v_2, l, v_3)$ vibrational constants in the (v_1, v_2, v_3) vibrational quantum number is

$$
\begin{aligned}
&G_{vz}(v_1, v_2, l, v_3)\\
&= \sum_{i=1}^{3}\left(\frac{d_i}{2}+v_i\right)\omega_i - \sum_{i=1}^{3}\frac{d_i}{2}\omega_i + \sum_{i=1}^{3}\sum_{j=i}^{3}\left(\frac{d_i}{2}+v_i\right)\\
&\times\left(\frac{d_j}{2}+v_j\right)x_{ij} - \sum_{i=1}^{3}\sum_{j=i}^{3}\frac{d_i d_j}{4}x_{ij} + \sum_{i=1}^{3}\sum_{j=i}^{3}\sum_{k=j}^{3}\left(\frac{d_i}{2}+v_i\right)\\
&\times\left(\frac{d_j}{2}+v_j\right)\left(\frac{d_k}{2}+v_k\right)y_{ijk} - \sum_{i=1}^{3}\sum_{j=i}^{3}\sum_{k=j}^{3}\frac{d_i d_j d_k}{8}y_{ijk}\\
&+\sum_{i=1}^{3}\sum_{j=i}^{3}\sum_{k=j}^{3}\sum_{h=k}^{3}\left(\frac{d_i}{2}+v_i\right)\left(\frac{d_j}{2}+v_j\right)\left(\frac{d_k}{2}+v_k\right)\\
&\times\left(\frac{d_h}{2}+v_h\right)z_{ijkh} - \sum_{i=1}^{3}\sum_{j=i}^{3}\sum_{k=j}^{3}\sum_{h=k}^{3}\frac{d_h d_i d_j d_k}{16}z_{ijkh}\\
&+l^2 g_{22} + l^4 z_{llll} + \sum_{i=1}^{3}\left(\frac{d_i}{2}+v_i\right)l^2 y_{ill}\\
&+\sum_{i=1}^{3}\sum_{j=i}^{3}\left(\frac{d_i}{2}+v_i\right)\left(\frac{d_j}{2}+v_j\right)l^2 z_{ijll}. \qquad (4)
\end{aligned}
$$

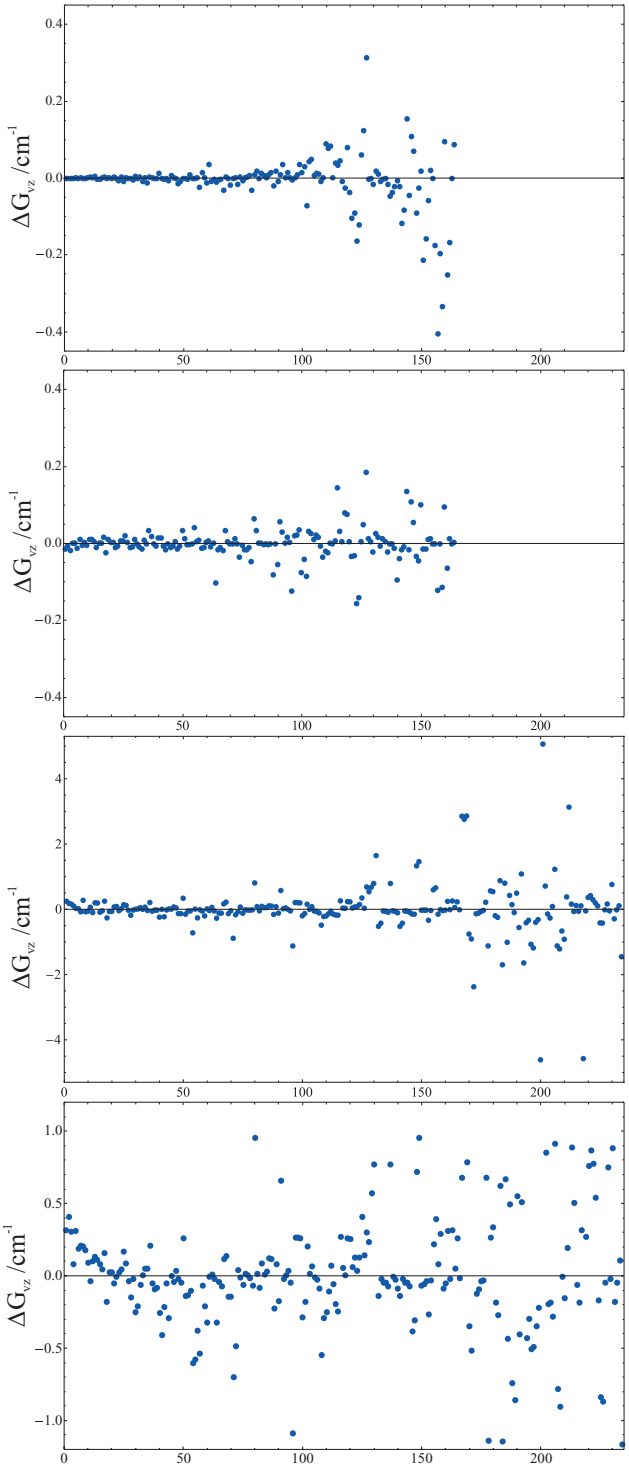

FIG. 3. Upper two panels: The error plot for the power series expansion fit of the 164 G_{vz} vibrational constants determined by FTIR and and laser photoacoustic measurements. The first panel shows the error plot for a weighted fit. The standard deviation of the first 71 vibrational constants decrease from 0.0020 cm^{-1} to 0.008 cm^{-1} in the weighted fit. Lower two panels: The error plot for the power series expansion fit of the 234 G_{vz} vibrational constants determined by FTIR, and laser photoacoustic, SEP and VMP measurements using the same set of parameters. The third panel shows the error plot for a weighted fit.

Despite the fact that for HCN one of the largest sets of vibrational constants has been determined, it is not possible to give a conclusive answer to the question stated above using experimental results. The upper two panels of Figure 3

shows the error plot for the fit of 164 $G_{vz}(v_1, v_2, l, v_3)$ vibrational constants to the Eq. (4) using 47 selected parameters. In this fit only constants determined by accurate FTIR and laser photoacoustic measurements have been included,[17,58,61,62,65–67,70,72,75] the majority of these constants have been determined from HOTGAME measurements. None of the vibrational constants have been corrected for vibrational resonances; the first 71 constants are from this work. The first panel shows the error plot for a weighted fit. The standard deviation for the first 71 vibrational constants decrease from 0.0020 cm^{-1} to 0.008 cm^{-1} in the weighted fit. The lower two panels shows the error plot for the same model with the same set of parameters for 234 vibrational constants including the vibrational constants of highly excited vibrational states from the SEP measurements of Yang *et al.* [63,66] and the results of Martinez *et al.*[73,74] The third panel shows the error plot for a $1/\sigma_i^2$ weighted fit. The σ_i was set to the standard deviation of the vibrational constants, for the first 164 states it was set to the 0.05 cm^{-1} model error. The σ_i standard deviation of the SEP measurements is in the range of 0.1–1 cm^{-1}, the accuracy including calibration errors is ca. 2 cm^{-1}. Due to this much lower accuracy of the SEP vibrational constants, it is not possible to quantify the model errors for Eq. (4) at very high vibrational excitations using experimental data. At this moment there is no overlap between the HOTGAME and SEP measurements so that it is not possible to confirm the SEP results using the HOTGAME spectra.

The power series expansion for the rotational constants[70] is

$$B_v(v_1, v_2, l, v_3) = B_e - \sum_{i=1}^{3}\left(\frac{d_i}{2}+v_i\right)\alpha_i + \sum_{i=1}^{3}\sum_{j=i}^{3}\left(\frac{d_i}{2}+v_i\right) \times \left(\frac{d_j}{2}+v_j\right)\gamma_{ij} + \sum_{i=1}^{3}\sum_{j=i}^{3}\sum_{k=j}^{3}\left(\frac{d_i}{2}+v_i\right) \times \left(\frac{d_j}{2}+v_j\right)\left(\frac{d_k}{2}+v_k\right)\gamma_{ijk} + \gamma_{ll}l^2 + \sum_{i=1}^{3}\left(\frac{d_i}{2}+v_i\right)l^2\gamma_{i,l,l}. \quad (5)$$

An approximate power series expansion of the rotationless vibrational eigenenergies $T_{v,(J=0)}$ is given by Eq. (4) minus equation (5) times l^2. This is equivalent to the Eq. (4) where the parameters multiplied by powers of l^2 change their meaning. In a similar way we can incorporate the effect of the higher order rotational constants in the power series expansion of the $T_{v,(J=0)}$ term values. If high angular momentum states are included in the fit there will be a slight difference between the fit of the $T_{v,(J=0)}(v_1, v_2, l, v_3)$ and $G_{vz}(v_1, v_2, l, v_3)$ vibrational constants if the same power series expansion parameters are fitted. We are interested here only in the bending excitation, and use the multidimensional Eq. (4) with $v_1 = 0$ and $v_3 = 0$ fixed.[17] The rotationless *ab initio* vibrational term values $T_{v,(J=0)}$ up to $v_2 = 20$ are given by the following expansion formula:

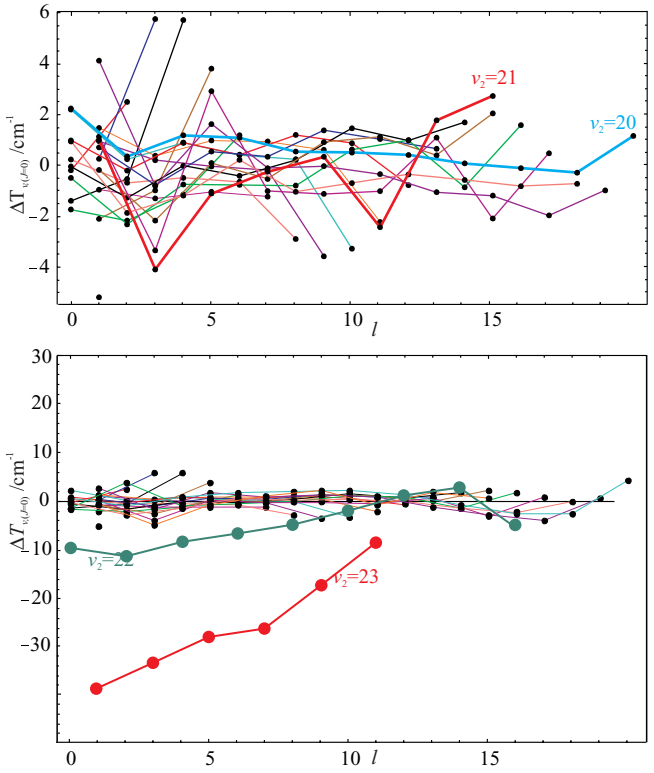

FIG. 4. Upper panel: The error plot for the power series expansion fit of the $T_{v,(J=0)}$ *ab initio* vibrational eigenenergies up to $v_2 = 21$. The vibrational substates up to $v_2 = 21$ correspond to the HCN anharmonic force field. Lower panel: The vibrational angular momentum dependence of the vibrational delocalization for the $v_2 = 22$ and $v_2 = 23$ vibrational substates. The onset of the accommodation of vibrational substates due to the double well potential starts at low vibrational angular momentum states.

$$E_{v_2,l,(J=0)} = 17.474 + 700.879v_2 - 0.936v_2^2 - 0.0466v_2^3 - 0.000773v_2^4 + 3.601l^2 + 0.0412v_2l^2 - 0.00219v_2^2l^2 + 0.000132v_2^3l^2 - 0.00675l^4 + 0.000654v_2l^4 - 0.000019v_2^2l^4 + 0.0000011l^6 \quad (6)$$

with a standard deviation of 1.6 cm^{-1}. Without the additional constant term introduced in Eq. (6) the standard deviation of the fit increases significantly to 2.1 cm^{-1}; the constant term included in the fit simulates a ground state shift in the power series expansion of the *ab initio* data. The prediction errors using this formula for the $v_2 = 21, l = 1 - 15$ subbands are: $+1, -4, -1, 0, 0, -2, +2, +3\,cm^{-1}$. The prediction errors for $v_2 = 21$ are already slightly larger than the standard deviation of the fit. The upper panel in Figure 4 shows the error plot $\Delta T_{v,J=0}$ for the power series expansion fit of the $T_{v,J=0}$ *ab initio* vibrational eigenenergies up to $v_2 = 21$. The $v_2 = 21$ vibrational substates still match the HCN vibrations in an anharmonic force field.

The lower panel in Figure 4 shows the prediction errors for the $v_2 = 22$ and $v_2 = 23$ vibrational substates. From this figure we see that beginning with $v_2 = 22$ the low l vibrational substates do not match the vibrations corresponding to the HCN anharmonic force field: the prediction errors for low l states increase above the expected limit. For $v_2 = 22$ the first

four states with low l show barrier effects, the upper eight still corresponds to the linear molecule. The vibrational eigenenergies of the $v_2 = 23$ vibrational substates are already shifted by up to 40 cm^{-1} from the values predicted for the linear HCN. The assignments for $v_2 = 23$ substates were possible due to the fact that by coincidence for the 023^70 state no other vibrational states with the expected angular momentum around the predicted wavenumber region exist, the confirmation of these assignments by the exclusion principle (assign all other combination bands and the remaining states are the corresponding delocalized states) is in work. All possible vibrational assignments for the $v_2 = 23$ substates that match the vibrational dependence of the rotational constants would give prediction errors in order of 40 cm^{-1}.

The l dependence of the first isomerization states shown in the lower panel of Figure 4 qualitatively matches the results of Ref. 87. We expect that the barrier-related effects first appear in the low l states. The high l states remain HCN states even at high vibrational excitation. The curve of the prediction errors from high l to low l is a smooth curve connecting the quantum states with increasingly delocalized character as predicted in Ref. 87. This means that in an experimental spectrum in the bending wavenumber region the subbands corresponding to $v_2 > 21$ states will not obey the power series expansion formula; we expect a smooth departure of the band centers with l beginning from the high l states to low l states from the values predicted by the the power series expansion formula. The $v_2 = 24$ states can be assigned only through such an exclusion principle but we can assume that the low l $v_2 = 24$ states correspond to the states with predominant isomerization character.

The predicted $l = 0$ state for $v_2 = 24$ lies 130 cm^{-1} above the isomerization states. The first isomerization state is a state with $l = 0$ and $J = 0$ at 15268 cm^{-1} matching well the 15205.2 cm^{-1} reported by Bowman *et al.*[12] It is possible to assign the isomerization states up $l = 8$ as $v_2 = 24$ states, the assigned states have nonzero transition intensities to the $v_2 = 23$ states. Once the manual assignment of the rotational states in this wavenumber region is completed, it will be possible to extract the rotational structure of these states.

Our first conclusion from the study presented above is that the bending vibrational structure of the linear HCN molecule persists approximately up to the bending excitation $v_2 = 21$. For vibrational states with $v_2 > 21$ only for the low angular momentum substates the accommodation of the vibrational eigenergies to the double well structure of the potential begins to take place. The effect of the double well barrier on the rotational structure of these vibrational states is presented in a second paper.[20]

VIII. CONCLUSION AND OUTLOOK

The [H,C,N] molecule system models a fundamental case of an asymmetric double well potential. This system involves relatively high energies[83] of 5281 cm^{-1} (the position of the second minimum relative to the first one) and 16 798 cm^{-1} (barrier height measured relative to the HCN well) for the heights in a double well potential. An interesting question of molecular physics is how the spectroscopic constants change when the two isomer molecules are excited from their ground states in the two potential wells up to isomerization energies. An even more important task is to find out up to which excitation levels the model used to describe the molecules in the anharmonic force field around their ground state holds. The manifold of the experimental rotational states for each vibrational excitation localized in the HCN minimum of the potential surface up to $v_2 = 10$ studied in this work do not show any irregularities from the rovibrational level structure expected for the anharmonic level structure of a linear molecule. We define the rotational states as "regular"when the spectroscopic parameters defined in the matrix elements (Eqs. (1)–(3) describe with the experimental accuracy the measured eigenenergies. Here we allow for each band to accommodate the spectroscopic parameters without imposing any correlation between the spectroscopic parameters corresponding to different vibrational states. If we impose such correlations and fit all transitions in a global fit the correlations between the high order parameters are better resolved. We do not use this type of analysis; we hope to extend the validity of the model for highly excited states by fitting the spectroscopic constants for each vibrational level. This analysis procedure may allow us to detect the signatures due to the double well structure of the PES encoded in the spectroscopic parameters. This type of analysis will be published in a following paper.

This work shows again that high temperature hot gas emission spectroscopy is a very sensitive experimental method for the investigation of transitions between highly excited bending rovibrational states of triatomic molecules and that the concepts behind the SyMath spectroscopic analysis program allow the analysis of very dense emission spectra in a systematic way.

In this work new important experimental data are published to support the theoretical description of many basic questions of molecular physics like large amplitude vibrations, molecular double well potentials or unimolecular reactions. This paper reports the experimental characterization of all 3822 eigenenergies up to 6880 cm^{-1} relative to the ground state in the HCN part of the potential surface, the spectroscopic constants for the first 71 vibrational states including highly excited bending vibrations up to $v_2 = 10$, perturbed eigenenergies for 20 rotational perturbations, and the list of 11 070 eigenenergies up to $J = 90$ for the first 123 vibrational substates. The energy range relative to the isomerization path of the HCN/HNC potential where now a complete list of all eigenvalues of the [H,C,N] molecular system with spectroscopic accuracy exists is shown in Figure 5. The eigenenergies above these limits for some highly excited HCN and HNC combination bands have been published up to now in separate papers.[19,21] The eigenenergies reported in this work together with the eigenenergies reported in the previous papers represent one of the most complete sets of experimental data describing a polyatomic molecule in the frequency domain. The spectroscopic parameters reported in these papers represent a very detailed indirect description of the PES for the [H,C,N] molecular system.

Using high resolution spectroscopy we can detect the relative eigenenergies of the molecular system directly. To get

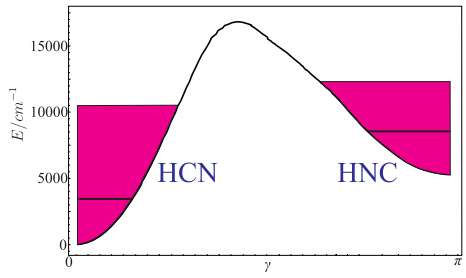

FIG. 5. The range of HCN rovibrational eigenenergies relative to the isomerization path characterised in this paper.

indirect information about the wave functions we have to record and interpret the information encoded in the intensity of the transitions recorded. As the rotational eigenenergies begin to deviate from the structure typical for a linear molecule when the rovibrational excitation increases, the intensity of the transitions also changes from the values expected for a linear molecule. We are working on the methods to extract accurate intensity information from emission experiments and thus have experimental data regarding the wave functions of the highly excited states of the [H,C,N] molecular system.

We have shown that a detailed *ab initio* rovibrational analysis for a polyatomic molecule is possible. Using such an analysis we can understand the molecular physics behind the Schrödinger equation for problems for which perturbation theoretical calculations are no more valid. We have shown that the vibrational structure of the linear HCN molecule persists approximately up to the isomerization barrier and only above the barrier the accommodation of the vibrational states to the double well structure of the potential takes place. The results regarding the rotational structure of the vibrational states have been published in a separate paper.[20]

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