Raman Spectroscopy in the Astrophysical Laboratory

By

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Abstract

This project explores radio spectroscopy of atoms and molecules in the interstellar medium, and specifically aims to discover if Raman spectroscopy is possible in the astrophysical laboratory. Raman spectroscopy is common in ground laboratories, but its use in an astrophysical application is unproven due to the necessity of a high-intensity laser source. Our solution was to employ the water maser in W49N to search for Raman lines in a natural setting. This region was observed with the Green Bank Telescope in the K (18.0 —27.5 GHz), the Ka-band (26.0 —39.5 GHz), and the Q-band (38.2 —49.8 GHz) and the spectral lines of interest were the ones that could not be matched to an entry in the Splatalogue (National Radio Astronomy Observatory‘s spectral line database [splatalogue.net]), as Raman lines would not yet be in an astronomical catalog. This project analyzes 2,226 spectral lines and offers one strong Raman candidate, but is unable to confirm it through observations of the other Raman-shifted transitions of that molecule.

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Chapter 1

Introduction

Raman spectroscopy is a technique discovered in 1928 that allows the study of energy states of atoms and molecules using the frequency difference between incident photons and those scattered off of the material. Raman spectroscopy thus requires a monochromatic light source. This technique is very useful in ground-based laboratories because it allows materials to be studied using frequencies of light that are convenient to the lab equipment rather than to the energy levels of interest (Pleijel, 1930).

This project attempts to use Raman spectroscopy to study a space-based object for the first time. Astronomers have limited methods of studying their objects of interest compared to other sciences; almost all of the information that we know about the cosmos comes from the light that reaches us. Therefore, we need as many methods of using this light as we can get; Raman spectroscopy would be a welcome addition that would help us further our knowledge.

In order to build up a high enough signal, an astrophysical Raman spectrum would further require a high intensity light source. High intensity, monochromatic light is simple to manufacture, but is difficult to find naturally. Thus, an astrophysical Raman spectrum has yet to be measured. This project attempts to take advantage of a water maser in the HII (star-forming) region W49N to reveal the Raman transitions of the molecules in the region.

1.1 Spectroscopy

Every atom or molecule in our universe interacts with light. The energy from light can excite matter to a higher energy level (absorption), and matter de-exciting to a lower energy level will release that energy as light (emission). The unique configuration of these energy levels for each atom/molecule provides a spectrum, a 'fingerprint', for scientists who are observing the light to identify the molecules that it passed on its journey. This technique, spectroscopy, allows astronomers to coax vast amounts of information out of a universe that they cannot otherwise interact with. The most common type of spectroscopy uses an electronic transition – the electrons themselves moving to different energy levels. Spectroscopy can also deal in two more types of transitions: rotational and vibrational. Rotational energy levels refer to the rotation of the molecule about a fixed axis, while vibrational energy levels refer to the oscillation of the molecule's constituents along an fixed axis [Kitchin, 1995]. Rotational and vibrational transitions tend to occur together. Electronic transitions are by far the most energetic, with rotational being the least.

1.1.1 Raman Spectroscopy

Raman spectroscopy deals with 'virtual' transitions – transitions to energy levels that are not the established levels within a molecule but rather "stepping stone" levels whose presence we only infer – that are vibrational or rotational in nature. When light from a laser (in the scope of this project, a maser) with frequency ν_o strikes a material, it can excite the molecules within to these virtual energy levels. The molecule then drops down to a lower energy state, scattering the light. If the molecule de-excites to the original energy level, then a photon of the original frequency ν_o is re-emitted in a process known as Rayleigh Scattering, which is the most common outcome. However, as illustrated in Figure 1.1, the molecule can also drop down to a state higher than the original one to release a photon of lower frequency $\nu_o - \nu_s$, or it can drop to a state lower than the original one to release a higher frequency photon $\nu_o + \nu_s$; these transitions are known as Stokes and Anti-Stokes respectively [Ferraro et al., 2003]. Because molecules are most likely to be found in the ground state, Anti-Stokes transitions are far less likely than Stokes. Both Stokes

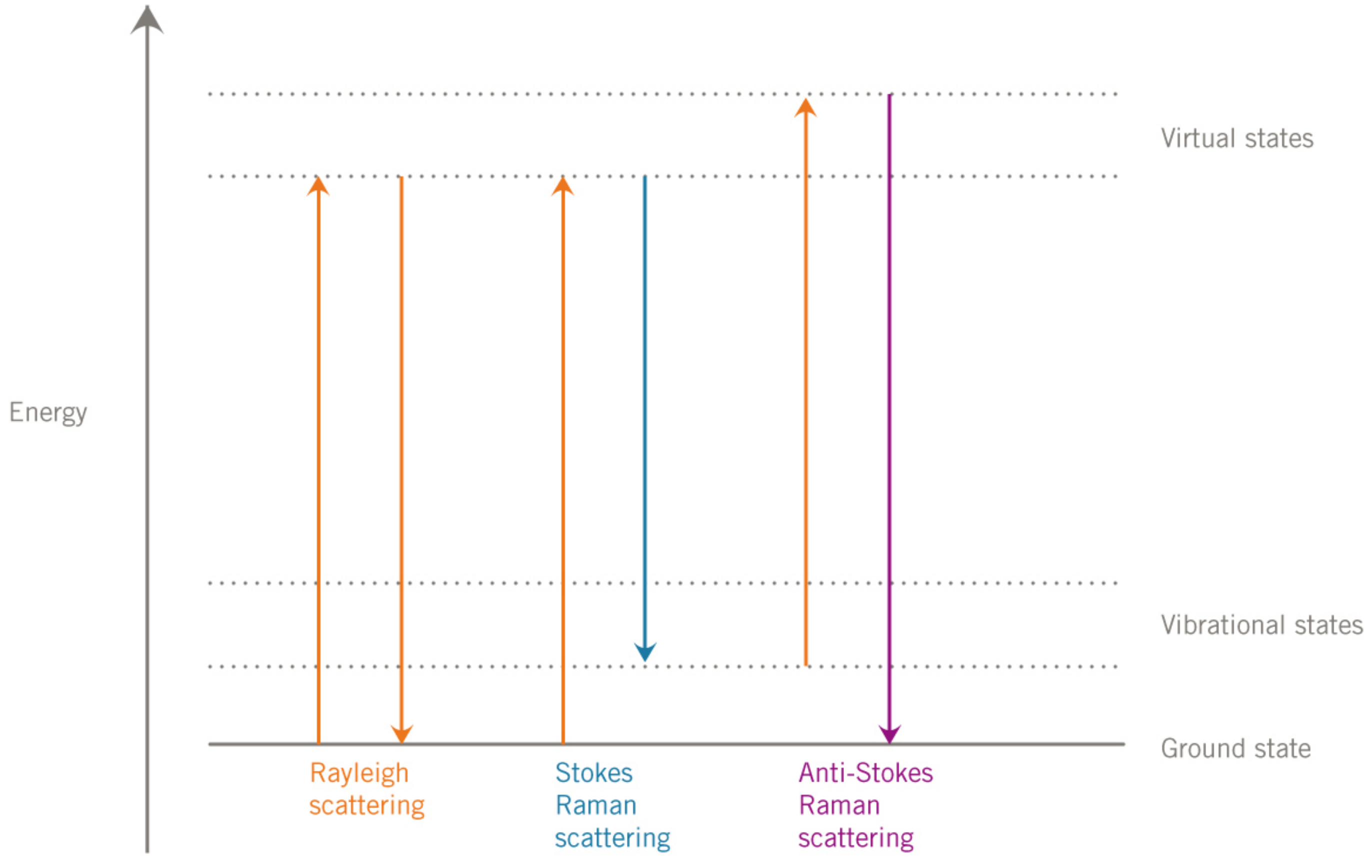

FIGURE 1.1. An illustration of the possibilities for a Raman scattered photon (figure from photonnano.com).

and Anti-Stokes transitions make up the Raman scattering for a given molecule.

Because Raman spectroscopy uses the difference in frequency between the two photons to identify a molecule, the technique requires monochromatic light to ensure the frequency difference is the same with every interaction. Any light can cause this effect, but for an astrophysical Raman spectrum we require high intensity light to cause enough Raman transitions to build up a signal. If Raman spectroscopy were to be proven possible as a result of ISM masers, it could provide identifications for previously discovered but unidentified spectral lines in these regions.

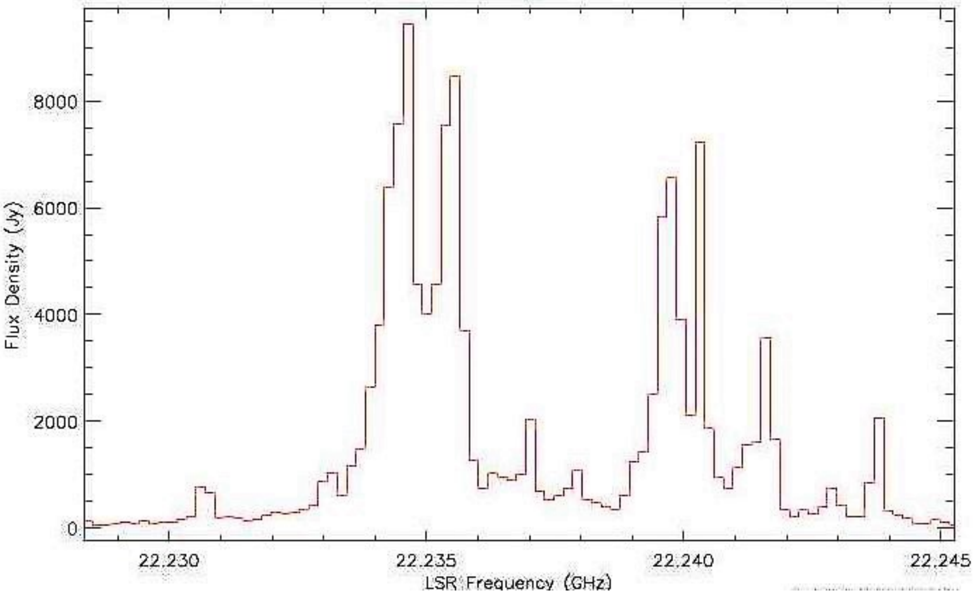

FIGURE 1.2. The water maser used to reveal the Raman Transitions. This spectrum is one from the GBT data used for this study. Note that this maser exceeds 9,000 Jy, far surpassing any other spectral line in the data set.

1.2 Masers

Atoms or molecules can experience population inversion (more molecules in excited states than ground states) through three means: collisions, radiation, or chemical reactions [Gray 1999]. Photons that pass through regions of population inversion can stimulate the emission of photons with the same frequency and direction, which in turn stimulate the emission of more photons resulting in a cascading effect that amplifies the original photon. These amplifiers, called "masers" (microwave amplification by stimulated emission of radiation), are thus an excellent source of high-intensity monochromatic light. W49N contains a water maser , which is almost always a result of collisional pumping [Gray 1999]. Figure 1.2 shows the spectrum for this water maser. The spread in maser peaks reflects the motions of the water within the region. Collisions that cause population inversion often come from shocks that travel through the Interstellar Medium.

1.3 The Interstellar Medium

The Interstellar Medium (ISM) refers to the material – gas and dust – that populates the space between stars within a galaxy. The ISM is generally quite cold (< 100 K) and is dominated by hydrogen, but more complex molecules are able to form. Turbulence is common in the ISM; supersonic shocks (a result of protostellar jets, ionization winds, or supernovae) travel through the gas and dust, disturbing and compressing the material as it goes. Compressed molecular clouds may in turn collapse to form more stars; these star-birth regions are known as HII regions. The young stars in these regions, which are generally much hotter than old stars, give off strong ultraviolet (UV) radiation, which ionizes the leftover gases surrounding them. One such HII region of interest is W49N.

1.3.1 W49N

Westerhout 49 is a radio source located 11.11 kpc away in the Aquila constellation that consists of an HII region (W49A) and a supernova remnant (W49B) [Wu et al, 2014]. W49N is one of two well-defined thermal peaks within W49A [De Pree et al., 2000]. As part of an HII region, it contains ionized material and also houses a water maser centered on 22.234 GHz with a flux density of 9450 Jy (a Jy is a unit of spectral flux density, defined as 1 Jy = $10^{-26}\frac{\mathrm{W}}{\mathrm{m}^2\cdot\mathrm{Hz}}$). Due to W49N's proximity to us, this maser is the brightest (though not most luminous) in the observable universe. Raman lines will be on the order of 10^6 times fainter than the maser that caused them; the Raman lines for this search will therefore be on the order of 10 mJy.

1.4 The Green Bank Telescope

The Green Bank Telescope (GBT) is a radio telescope in West Virginia with a dish measuring 100x110 meters, see in Figure 1.3. Its many receivers are capable of observing 0.290-49.8 GHz and 67-115.3 GHz; the former range is ideal for observing Raman-shifted transitions of the 22 GHz maser.

One of the instruments aboard GBT is the Versatile GBT Astronomical Spectrometer (VEGAS), which was used to collect data for this project. VEGAS contains eight spectrometers that can all

FIGURE 1.3. The Green Bank Telescope (also known as the Great Big Thing) is the largest moving object on land (photo from NRAO).

be used simultaneously and independently. Each VEGAS spectrometer is able to be centered on a different central frequency, with the possibility of covering up to a 6 GHz range at once.

1.5 Overview

This project uses GBT to observe W49N over the range 18.0 to 49.8 GHz (see Section 2.1). We obtain Gaussian fit parameters of each spectral line in the data (see Section 2.2) and use the Splatalogue to identify these lines(see section 3.1). We search the unidentified lines for matches to Raman shifts using the difference in frequency space from the main maser peak (see Section 3.2). The results of this search are unconfirmed Raman candidates (see Section 4.1) and a useful catalog of unidentified spectral lines for future work (see Section 4.2).

Chapter 2

Observations & Data Reduction

W49N was observed using GBT for 6 nights between December 7th, 2014 and February 6th, 2015 over the range of 18.0 to 49.8 GHz.

2.1 Observations

W49N was observed on the nights of December 7th, December 27th, January 22nd, February 3rd, February 4th, and February 6th. During these sessions, the opacity ranged from 0.019 to 0.276 Nep, with a typical value of 0.092 Nep.

The receivers used were the K-Band Focal Plane Array (covering (18.0 —27.5 GHz), the Ka-band (26.0 —39.5 GHz), and the Q-band (38.2 —49.8 GHz) in conjunction with the VEGAS instrument, with point and focus checks at the recommended 60 minute intervals as suggested for this frequency range. VEGAS introduces one-channel wide spurs into the data, though they occur at predictable channels and are easily interpolated out. These observations utilized the GBT nodding process (discussed below) to reduce noise.

The K-band was split into 5 sections labeled K1-K5, each with a bandwidth of 1.5 GHz; each subsection was then centered on one of two different intermediate frequencies (IF), a process which is described below, which allowed each subsection to cover an effective bandwidth of 2.05

GHz. The channel width for the K-band was 183.105 kHz. Exposure time was 1741.9 s for K1, 1739.8 s for K2, 1737.9 s for K3, 1736.7 s for K4, and 1736.3 s for K5.

The Ka-Band was also split into 5 subsections, each with a bandwidth of 1.5 GHz. The first two subsections were centered on one of two IFs, covering an effective bandwidth of 2.65 GHz each, while the latter 3 subsections were centered on of of three IFs, allowing for an effective bandwidth of 3.6 GHz. The Ka-Band used a channel width of 183.105 kHz. Exposure time was 2300.6 s for Ka1, 2747.1 s for Ka2, 1365.3 s for Ka3, 2476.0 s for Ka4, and 2252.9 s for Ka5.

The Q-Band was split into 3 subsections of bandwidth 1.5 GHz and centered on one of three IFs with an effective bandwidth of 3.9 GHz. The Q-Band used a channel width of 183.105 kHz. Exposure time was 5073.3 s for Q1, 6033.3s for Q2, and 6026.6 GHz for Q3.

In RF (radio frequency) circuits, it is very common to convert the sky frequency into a lower "intermediate" frequency (IF). This is done because instruments such as amplifiers or digitizers work much better with lower frequencies and to reduce power loss, which scales with frequency. This conversion takes advantage of the trigonometric identity

$$sin(\omega t)sin(\omega_o t) = \frac{1}{2}\Big(cos((\omega - \omega_o)t) + cos((\omega + \omega_o)t)\Big)$$

to multiply the RF with a frequency from a local oscillator (both represented by sine waves) to get a sum and a difference frequency. This difference frequency is the new, lower IF. Each spectrometer on VEGAS is capable of outputting multiple spectra that are each mixed with a different oscillator frequency.

2.1.1 The Nodding Process

The Green Bank Telescope employs a "nodding" process in taking data: one receiver points at the object of interest while the second receiver points at an empty patch of sky, then the receivers switch targets once data has been taken. The spectrum from the empty sky is subtracted from the spectrum of the object of observation; this removes any noise caused by the atmosphere or the equipment and leaves the observer with a spectrum of the object only. This process was used for the K-band; for the Q- and Ka- bands, a similar process that nods the sub-reflector instead

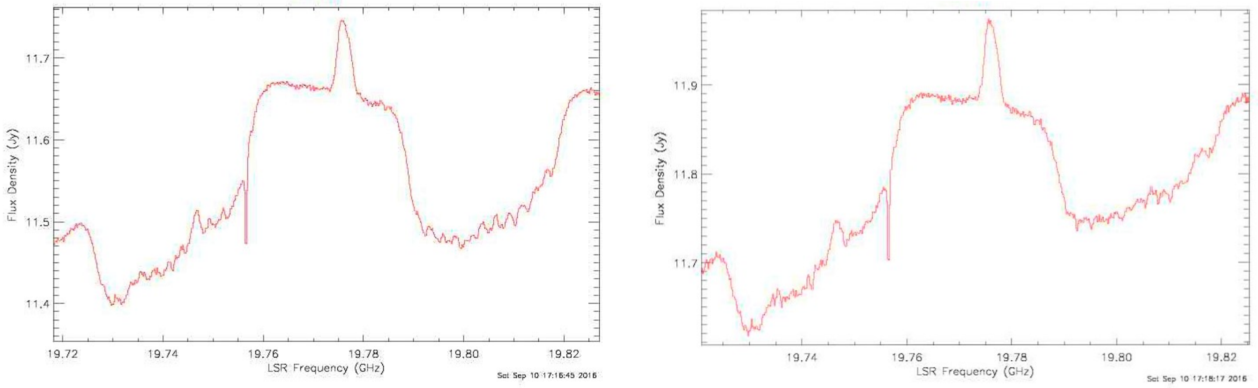

FIGURE 2.1. The K2 spectrum before (left) and after (right) discarding defective scans. Note the reduced saw-tooth pattern in the 19.74 GHz and 19.80 GHz regions.

was used. The method of nodding is advantageous because, rather than observing time being lost while the off-source spectrum is taken, it allows data to be taken almost continuously.

2.2 Data Reduction

2.2.1 Noise/Structure Reduction

Each complete "nod" of the telescope creates two scans which are combined (the off scan is subtracted from the object scan) to form a spectrum. Several scans were taken at each observing session and averaged to form a final spectrum of reduced noise.
However, this technique didn't always improve the spectrum. For the K2 sub-spectrum of the K band, we found that an artifact existed in a large number of the scans that decreased the quality of the final spectrum. Because of this, it was decided to discard several scans, which contained the artifact, and average the remaining to form a modified K2 spectrum that was cleaner (see figure 2.1). The origin of this artifact is uncertain, but it is likely that it is from the telescope's electronics.

2.2.2 Resulting Spectra

The resulting data consists of 32 spectra (an example of which is shown in Figure 2.2) spanning the desired frequency range, with an RMS value for the noise of 1 mJy on average; detection of

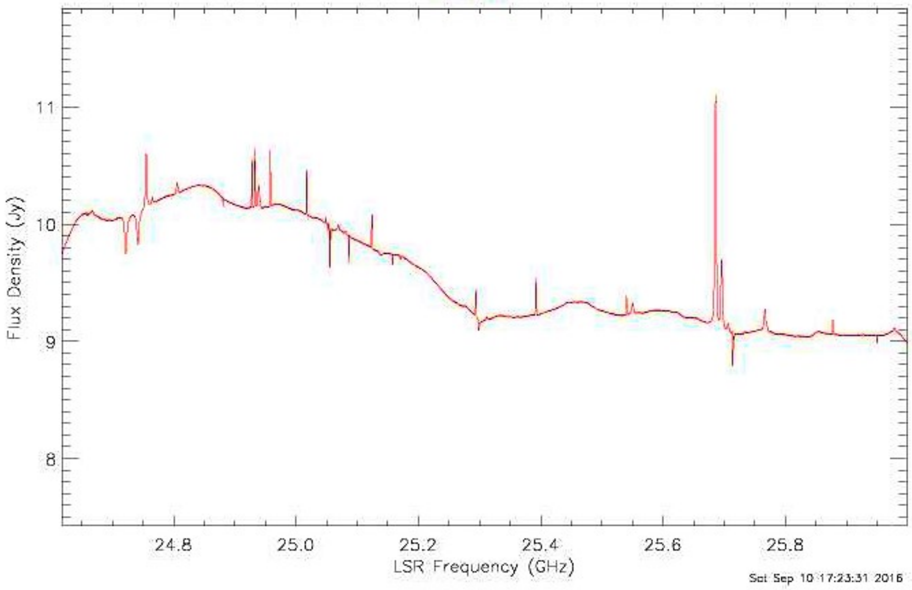

FIGURE 2.2. An example spectrum taken from the K-Band. Note that this spectrum does not yet have the continuum subtracted out; this was done only for individual lines.

the expected 10 mJy Raman lines is not a concern.

2.2.3 Gaussian Fits

Each spectral line is fit, with the continuum subtracted out, using GBTIDL's 'fitgauss' function, which returns the peak frequency, height, width, and uncertainties of a Gaussian that fits the spectral line most closely. Several times (although a small percentage of the total) the fitgauss function failed, returning uncertainties that were many orders of magnitude larger than the measurement though the measurements themselves were reasonable. In these cases, the uncertainties are calculated manually using the following methods.

The uncertainty in the peak frequency is given by

$$\sigma_{peak} = \frac{1}{2}\frac{W}{\frac{S}{N}}$$

where W is the full width at half maximum (FWHM) of the line and $\frac{S}{N}$ is the signal-to-noise ratio of the line [Darling 2015]. The uncertainty in the height of the spectral line comes from the noise in the spectrum; one isn't sure if noise has added or subtracted from the line. Therefore, σ_{height} is the same as the RMS value of the noise.

For σ_{width}, we consider the equation for a Gaussian function,

$$f(x) = Ae^{\frac{-(x-\mu)^2}{2\sigma^2}}$$

where A is the amplitude, μ is the center of the Gaussian, and σ is the standard deviation. We are interested in the width of this function (or FWHM), but as it is not normalized we cannot use the simple $FWHM = 2\sqrt{2ln(2)}\sigma$. Instead, we are interested in the frequency values that mark the FWHM, so we may solve

$$\frac{A}{2} \pm N = Ae^{\frac{-(x-\mu)^2}{2\sigma^2}} \qquad \Rightarrow \qquad x = \mu \pm \left(\frac{FWHM^2}{4ln(2)}\left|ln\left(\frac{1}{2}\frac{N}{A}\right)\right|\right)^{\frac{1}{2}}$$

where N is the noise, or the RMS value of the spectra. With this, we can easily find the uncertainty on the width by finding the uncertainty on the coordinates that mark the width, using normal error propagation, to be

$$\sigma_{width} = \left[\sigma_\mu^2 + \left(\frac{N(FWHM)ln\left(\frac{1}{2}+\frac{N}{A}\right)}{4A^2\sqrt{ln(2)}\left(\frac{1}{2}+\frac{N}{A}\right)\left|ln\left(\frac{1}{2}+\frac{N}{A}\right)\right|^{\frac{3}{2}}}\sigma_A\right)^2\right]^{\frac{1}{2}}$$

From this, we have a catalog of all spectral lines in the data that details their peak, center frequency, and line width to be used in identifications.

CHAPTER 3

Analysis

In this project, the spectral lines of interest are the ones that we cannot identify, as Raman transitions will not yet be cataloged for astronomical spectra. We employ a systematic exclusion of these lines using the Splatalogue (astronomical spectral line database) as a guide, and examine the remainders as possible candidates for Raman transitions.

3.1 Line Identification

The Splatalogue is an online astronomical spectral line database. Because it is specifically for astronomy, Raman transitions would not yet be contained within it. This allows us to use it to exclude spectral lines in our data from the pool of Raman candidates.

Each peak frequency is given a range of ± 4 MHz, as the Doppler Shift of the spectra is not yet known, and a list of possible matches is recorded. As the ISM is relatively cold, we expect the molecules within to be relatively low energy. Therefore, transitions between low quantum number (QN) states are considered for the list of molecule candidates. To narrow down which molecules are the correct matches, we focus on the most easily identifiable: ammonia (NH_3), as well as the very common ISM molecules formaldehyde (H_2CO), cyanoacetylene (HC_3N), and silicon monoxide (SiO). In addition to being a very common molecule in the ISM, ammonia exhibits a

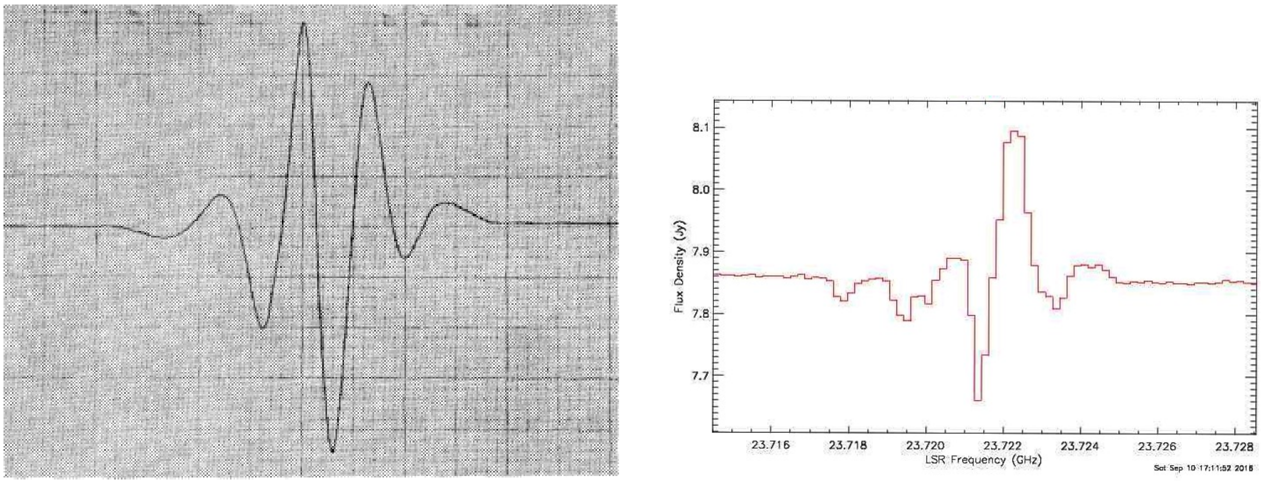

FIGURE 3.1. The hyperfine structure of ammonia taken from Kukolich, 1967 (left) and from our data (right).

characteristic hyperfine structure that appeared in our data, as shown in Figure 3.1 [Kukolich, 1967].

It was therefore safe to say that out of the list of possible molecule matches for these structures, ammonia is the best match. These matches give a velocity for the cloud of approximately 5±3 km/s (see Appendix A for exact velocities), and is further supported by matches to formaldehyde, cyanoacetylene, and silicon monoxide (see figure 3.2). This velocity dispersion is not unreasonable (see Larson 1981 for similar results), and therefore gives a fairly confident value for the velocity of the cloud and the corresponding Doppler Shift. The rest of the spectral lines are then matched with the molecules that put them in this velocity range.
Our spectra contain a rich diversity of molecules, some examples of which are shown in Figure 3.3. Our spectra also contain numerous Radio Recombination Lines (RRLs), which are caused by the recombination of an electron with an ion. RRLs have a distinctive shape, illustrated in Figure 3.4.

3.2 Raman Candidate Investigation

Many of the spectral lines either have no Splatalogue entries within the given frequency tolerance, or have no low-QN transitions that put them in the correct velocity range. These are considered

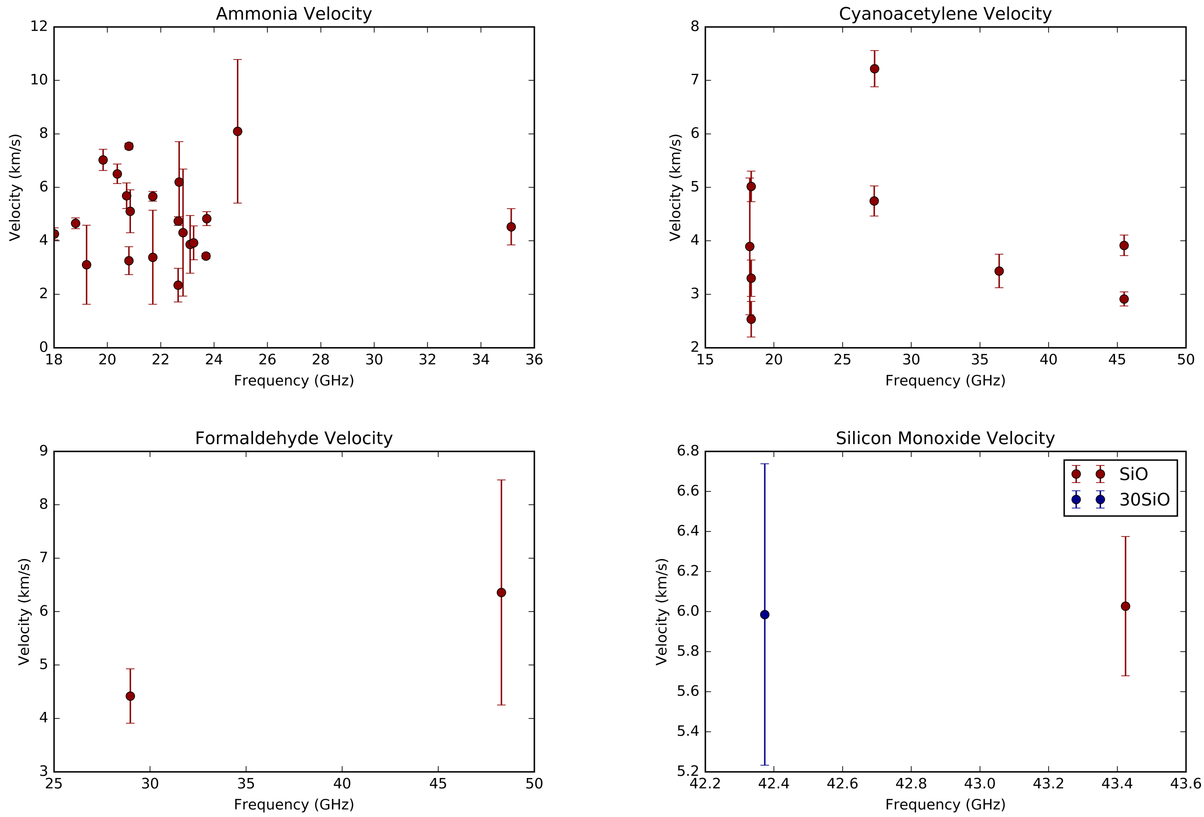

FIGURE 3.2. Velocity plots of common and easily identifiable molecules in the ISM. One can note that all plots give agreement to a velocity of ~5±3 km/s.

to be unidentified spectral lines and form the pool of lines to be examined as Raman transitions. The main peak of the maser is found at 22.2346 GHz; as discussed above, the frequency of a transition between the real energy levels within a molecule will be the difference of the scattered Raman photon frequency and the maser photon frequency. We therefore take the frequency of each unidentified spectral line and find the difference in frequency space between it and the main maser peak. This gives what would be the observed frequency of the real transition, and so we calculate the rest frequency that would give both the upper and lower limit on our velocity of the cloud: 8 and 2 km/s respectively. This gives a range of rest frequencies to search in the Splatalogue. Any low-QN matches that come up are Raman candidates.

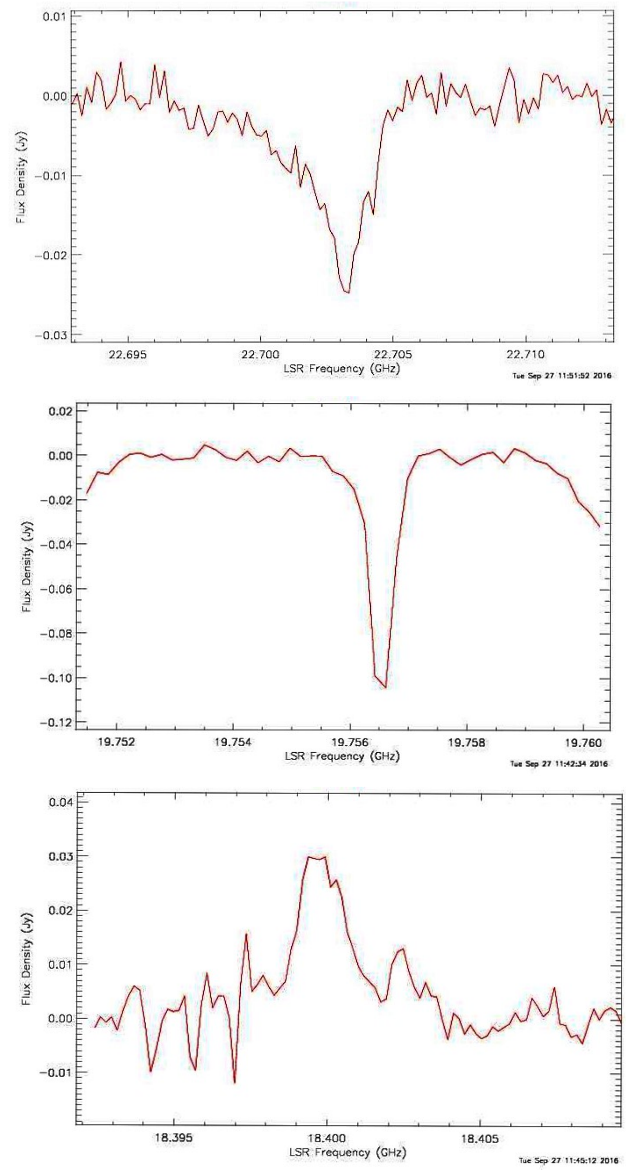

FIGURE 3.3. The diversity of the identified molecules includes the complex molecule $CH_3CH_2CH_2CN$ (top), the cyclic molecule $c{-}C_3D$ (middle), and the linear $l{-}C_5H_2$ (bottom)

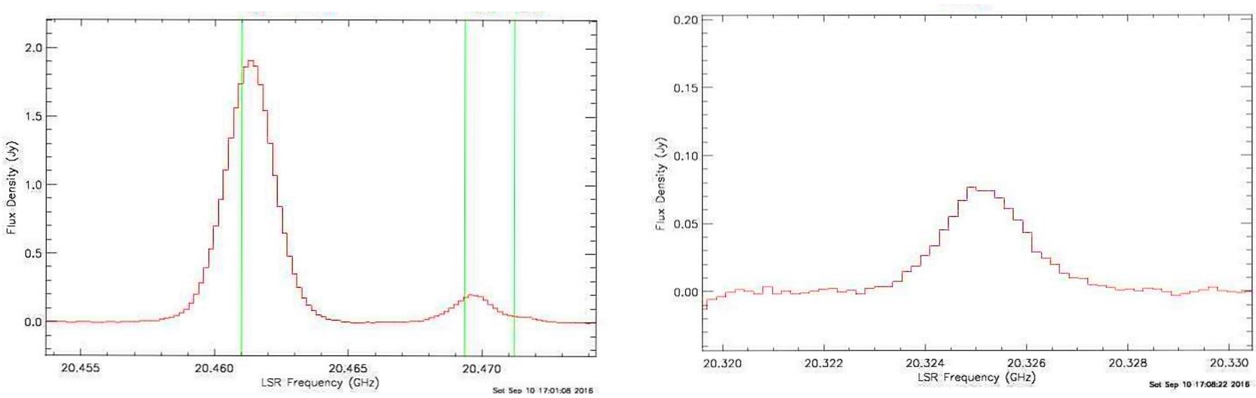

FIGURE 3.4. The distinctive shape of an RRL (left) shows the emission from a hydrogen recombination followed by that of a helium and carbon/higher elements recombination of decreasing intensity. The pictured RRL shows H68α, He68α, and C68α with vertical lines marking the rest frequency of those transitions. Also pictured is an example of a common molecular line from our data (right); this particular line is a match to NH_2D.

Chapter 4

Results & Discussion

This search successfully produces 28 low-QN Raman candidates, but is unable to confirm an astrophysical Raman transition. However, in the process of this search we compile a valuable list of unidentified ISM spectral lines to be further studied (see below).

4.1 Raman Candidates

This search yields 28 Raman matches, but only one of these remains a strong Raman candidate. A detailed table of these candidates can be found in Appendix A. Matches are discarded if they are absorption, as Raman transitions are emission, or if their $\frac{S}{N}$ was below 5. The remaining line corresponds to a Raman transition between the $J = 1(1,1)$ and the $J = 2(0,2)$ rotational energy levels of vinyl cyanide ($^{13}CH_2CHCN$) and is the leading Raman candidate from this search (see Figure 4.1).

If this were a correctly identified Raman transition, we would expect to see others corresponding to the different transitions of vinyl cyanide. However, no signs of spectral lines are found at those corresponding locations in frequency space, and so we are unable to confirm this as a Raman transition.

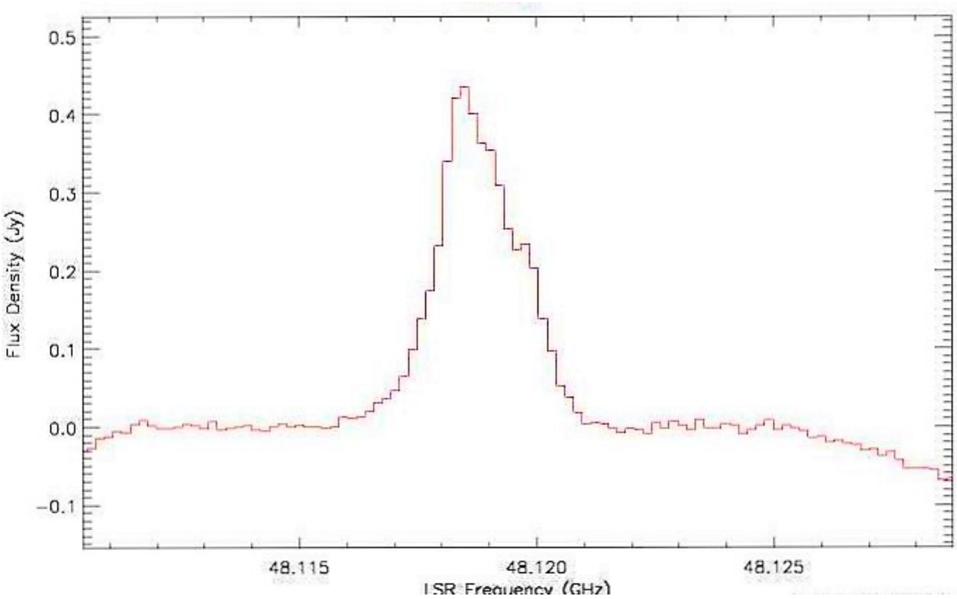

FIGURE 4.1. A promising Raman candidate corresponding to a low-QN transition of an isotopomer of vinyl cyanide.

4.2 Unidentified Spectral Lines

This project also produces as a result a large catalog of 1,518 as-of-yet unidentified spectral lines of the ISM. This is an exciting result that could potentially lead to the discovery of new ISM molecules and insights into the dynamics of these environments, and is surely of interest to astronomers or cosmochemists. A detailed table of these unidentified spectral lines can be found in Appendix A.

4.3 Considerations

This search was confined to low-QN transitions; for the non-excited molecules of the cold ISM, this is a reasonable constraint. While much of W49N, and all of the material along the line of sight, conforms to this assumption, it is not entirely valid. W49N is an active star-forming region and some of its material will be ionized by the young stars' UV radiation. Therefore, it is possible that some Splatalogue matches that were disregarded for having high QN were actually the correct match. If this is the case, the effect would be a smaller pool of Raman candidates. It would not mean that we should have considered high-QN Raman candidates because Raman scattering is still most likely to occur in the more plentiful low-energy molecules.

It is important to note that the strong Raman candidate from this search (discussed in Section 4.1) did have Splatalogue matches to high-QN transitions. One of these transitions was non-isotopomer form of vinyl cyanide (CH_2CHCN) between the J = 44(4, 40) and the J = 43(5, 39) levels. The non-isotopomer form would be much more common in the ISM and, perhaps, suggests that the high-QN transition is a better explanation for this line than the low-QN isotopomer Raman candidate.

It is also worth noting that 39 of the molecules identified in this search are fairly complex and have not been found as common ISM molecules by previous searches (Dworkin 2012, Endres et al. 2016, Belloche et al. 2016, Costagliola et al. 2015, Margules et al. 2016, McCarthy et al. 2016, Ohashi et al. 2015, Remijan et al. 2008, Rong et al. 2015). These molecules are marked with an "*" in Appendix A. It is possible that this search is the first to find them, but it is also possible that these are incorrect identifications. If this were the case, then our pool of Raman candidates would be larger and one of the new additions might have been able to be confirmed.

Finally, W49N contains more water maser emissions at frequencies other than the 22 GHz line, a notable transition being at 183 GHz (González, 1995). Unidentified spectral lines in this data set were assumed to be Raman shift of the 22 GHz transition, but it is possible that Raman shifts of other masers were present.

Chapter 5

Conclusion

Raman spectroscopy requires monochromatic light, with an astrophysical Raman spectrum requiring high intensity to ensure a signal. The rarity of such sources in natural settings makes this technique difficult to utilize for ISM research. This project takes advantage of the water maser in W49N in an attempt to reveal Raman transitions in the ISM. We take spectra spanning 18-50 GHz of this region and use an astronomical spectral line database (Splatalogue) to identify spectral lines found in the data. Because Raman spectroscopy has not been used in an astronomical sense before, we know that this database does not contain any Raman transitions. We can therefore eliminate all identified lines from being Raman candidates. The difference in frequency space between the remaining spectral lines and the 22 GHz maser would correspond to a real difference between molecular energy levels. We search the Splatalogue for matches to these frequencies; this would correspond to a Raman transition. Out of these Raman transition candidates, 28 spectral lines had Splatalogue matches to low-QN transitions. Out of these 28 transitions, 1 Raman candidate met the criteria discussed in Section 4.1. This transition would be an isotopomer of vinyl cyanide between the $J = 1(1,1)$ and the $J = 2(0,2)$ rotational energy levels, but the absence of Raman transitions between the other energy levels of this molecule prevents the confirmation of this Raman candidate.

While not conclusive, this search does not prove that astrophysical Raman spectroscopy is impossible. Below, we will discuss considerations for future attempts to measure this phenomena.

5.1 Future Work

Further work can be done to confirm the Raman candidate identified in this project. An observation would be taken in the same frequency range of an HII region that does not contain a maser. If this spectral line appears in this observation, then it was not caused by a maser. If this spectral line is absent, it would be evidence towards a Raman transition. It is possible that the confirmation sought in this study was found outside of the observed frequency range; another observation might look at W49N in frequency ranges outside of 18-50 GHz that cover Raman transitions between the isotopomer of vinyl cyanide's other energy levels.

With a range of 18 - 50 GHz, the data taken for this project covered a range that was mostly above the maser frequency of 22 GHz. Raman transitions in this range are of higher frequency than the maser - these correspond to Anti-Stokes transitions. Looking back to Figure 1.1, we see that these are the Raman transitions that are the most rare. This is because an Anti-Stokes transition can only occur if the molecule is in an excited state, but molecules are more likely to be found in the ground state. A future search would look to a wider range below 22 GHz, the domain of the more-common Stokes transitions.

The frequencies observed for this project would contain the Stokes transitions for the higher frequency masers previously mentioned, as it is a lower frequency range. Future work would examine the unidentified spectral lines of this project for Raman transitions of these higher frequency masers.

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APPENDIX A

Table 1 below contains the 707 identified spectral lines of this search, sorted by atomic mass, with the information that characterizes them. Table 2 contains the 1518 unidentified spectral lines of the search, sorted by observed frequency. Table 3 contains the 28 low-QN Raman candidates from this search, sorted by observed frequency, with information on the molecule that they would have been a transition for, as well as the reason for discarding them.
The quantum numbers listed in these tables are taken from the Splatalogue. The Splatalogue is a cooperative effort from many different teams and, as such, it contains varying notations for the quantum numbers. Below is a brief explanation of the notation that will be found:

N refers to the principal quantum number, and describes transitions between electron energy levels. J refers to the total angular momentum quantum number, and refers to transitions between rotational energy levels. F refers to the transitions between hyperfine structure energy levels. At times these will be labeled as such, but if an entry simply states '$3-4$', for example, it actually means $J = 3-4$. If an entry takes the form '$3(1,0)-3(1,1)$', the numbers outside of the parentheses refer to J, while those inside refer to changes in the molecules rotation about its principal axes.

Table 1. Identified Spectral Lines of W49N

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
Hydrogen-Alpha-Recombination	H (71) α	17.992153(6)	17.99256 (0)	6.78(1)	1.274(8)	1.85(1)
Hydrogen-Alpha-Recombination	H (70) α	18.768738(8)	18.76916(0)	6.7(1)	1.74(1)	1.97(2)
Hydrogen-Alpha-Recombination	H (69) α	19.590664(8)	19.59111(0)	6.8(1)	1.91(2)	2.06(2)
Hydrogen-Alpha-Recombination	H (68) α	20.461311(6)	20.46177(0)	6.72(8)	1.96(1)	2.16(1)
Hydrogen-Alpha-Recombination	H (67) α	21.384289(9)	21.38479(0)	7.0(1)	1.80(1)	2.31(2)
Hydrogen-Alpha-Recombination	H (66) α	22.363605(9)	22.36417(0)	7.6(1)	1.50(1)	2.47(2)
Hydrogen-Alpha-Recombination	H (65) α	23.40367(1)	23.40428(0)	7.8(2)	1.49(2)	2.57(3)
Hydrogen-Alpha-Recombination	H (64) α	24.50929(1)	24.50990(0)	7.5(1)	1.49(1)	2.68(3)
Hydrogen-Alpha-Recombination	H (63) α	25.685658(8)	25.68628(0)	7.26(10)	1.88(1)	2.79(2)
Hydrogen-Alpha-Recombination	H (62) α	26.938536(9)	26.93916(0)	6.9(1)	1.71(1)	3.00(2)
Hydrogen-Alpha-Recombination	H (61) α	28.274185(6)	28.27487(0)	7.26(7)	1.766(7)	3.17(2)
Hydrogen-Alpha-Recombination	H (60) α	29.69968(5)	29.70036(0)	6.9(5)	1.3(3)	2.8(3)
Hydrogen-Alpha-Recombination	H (59) α	31.222546(8)	31.22331(0)	7.34(8)	1.915(9)	3.54(2)
Hydrogen-Alpha-Recombination	H (58) α	32.851368(9)	32.85220(0)	7.59(8)	1.917(9)	3.64(2)
Hydrogen-Alpha-Recombination	H (57) α	34.595509(10)	34.59638(0)	7.55(8)	1.96(1)	3.87(2)
Hydrogen-Alpha-Recombination	H (56) α	36.465458(9)	36.46626(0)	6.59(8)	2.054(9)	4.18(2)
Hydrogen-Alpha-Recombination	H (55) α	38.47236(1)	38.47336(0)	7.80(8)	1.191(6)	4.37(3)
Hydrogen-Alpha-Recombination	H (54) α	40.629448(8)	40.63050(0)	7.76(6)	2.149(8)	4.49(2)
Hydrogen-Alpha-Recombination	H (53) α	42.95081(1)	42.95197(0)	8.10(8)	1.305(6)	5.01(3)
Hydrogen-Alpha-Recombination	H (52) α	45.45248(1)	45.45372(0)	8.18(7)	0.1669(6)	5.60(2)
Hydrogen-Alpha-Recombination	H (51) α	48.152260(10)	48.15360(0)	8.34(6)	1.606(6)	5.49(2)
Hydrogen-Beta-Recombination	H (89) β	18.045476(9)	18.04589(0)	6.9(1)	0.276(3)	1.89(2)
Hydrogen-Beta-Recombination	H (88) β	18.660719(9)	18.66114(0)	6.8(1)	0.361(3)	1.97(2)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
Hydrogen-Beta-Recombination	H (87) β	19.304253(7)	19.30468(0)	6.6(1)	0.375(3)	2.04(2)
Hydrogen-Beta-Recombination	H (86) β	19.977728(5)	19.97816(0)	6.48(8)	0.418(2)	2.08(1)
Hydrogen-Beta-Recombination	H (85) β	20.682919(6)	20.68334(0)	6.10(8)	0.414(2)	2.12(1)
Hydrogen-Beta-Recombination	H (84) β	21.42157(1)	21.42210(0)	7.4(2)	0.388(4)	2.45(3)
Hydrogen-Beta-Recombination	H (83) β	22.19589(1)	22.19646(0)	7.7(1)	0.312(3)	2.51(3)
Hydrogen-Beta-Recombination	H (82) β	23.008024(5)	23.00861(0)	7.64(6)	0.274(1)	2.34(1)
Hydrogen-Beta-Recombination	H (81) β	23.86028(2)	23.86086(0)	7.3(3)	0.312(2)	2.48(1)
Hydrogen-Beta-Recombination	H (80) β	24.755127(8)	24.75574(0)	7.42(10)	0.321(2)	2.67(2)
Hydrogen-Beta-Recombination	H (78) β	26.68376(1)	26.68434(0)	6.5(1)	0.348(3)	2.98(3)
Hydrogen-Beta-Recombination	H (77) β	27.72343(2)	27.72410(0)	7.2(2)	0.383(4)	3.33(4)
Hydrogen-Beta-Recombination	H (76) β	28.817913(6)	28.81860(0)	7.15(7)	0.336(1)	3.08(2)
Hydrogen-Beta-Recombination	H (75) β	29.970730(10)	29.97148(0)	7.50(10)	0.350(2)	3.47(2)
Hydrogen-Beta-Recombination	H (74) β	31.185940(10)	31.18668(0)	7.11(9)	0.413(2)	3.52(2)
Hydrogen-Beta-Recombination	H (73) β	32.46764(1)	32.46848(0)	7.72(9)	0.404(2)	3.68(2)
Hydrogen-Beta-Recombination	H (72) β	33.82062(1)	33.82151(0)	7.9(1)	0.424(3)	4.01(3)
Hydrogen-Beta-Recombination	H (71) β	35.249886(9)	35.25077(0)	7.52(8)	0.426(2)	3.94(2)
Hydrogen-Beta-Recombination	H (70) β	36.760777(10)	36.76172(0)	7.69(8)	0.441(2)	4.17(2)
Hydrogen-Beta-Recombination	H (69) β	38.35945(2)	38.36027(0)	6.4(1)	0.260(2)	4.50(4)
Hydrogen-Beta-Recombination	H (68) β	40.05183(1)	40.05288(0)	7.86(9)	0.475(3)	4.43(3)
Hydrogen-Beta-Recombination	H (67) β	41.845436(8)	41.84655(0)	7.98(5)	0.1047(4)	4.61(2)
Hydrogen-Beta-Recombination	H (66) β	43.74775(1)	43.74895(0)	8.23(7)	0.273(1)	5.02(2)
Hydrogen-Beta-Recombination	H (65) β	45.76717(2)	45.76844(0)	8.3(1)	0.0328(2)	6.05(5)
Hydrogen-Gamma-Recombination	H (101) γ	18.32712(2)	18.32754(0)	6.9(4)	0.136(3)	2.11(6)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
Hydrogen-Gamma-Recombination	H (100) γ	18.87435(2)	18.87476(0)	6.4(2)	0.153(2)	2.15(4)
Hydrogen-Gamma-Recombination	H (99) γ	19.44355(1)	19.44398(0)	6.6(2)	0.163(2)	2.16(3)
Hydrogen-Gamma-Recombination	H (98) γ	20.03579(2)	20.03632(0)	8.0(2)	0.164(3)	1.79(4)
Hydrogen-Gamma-Recombination	H (97) γ	20.65257(2)	20.65297(0)	5.8(3)	0.239(3)	3.30(5)
Hydrogen-Gamma-Recombination	H (96) γ	21.294737(10)	21.29519(0)	6.4(1)	0.160(1)	2.37(2)
Hydrogen-Gamma-Recombination	H (95) γ	21.96375(2)	21.96432(0)	7.8(2)	0.117(2)	2.40(4)
Hydrogen-Gamma-Recombination	H (94) γ	22.661207(9)	22.66178(0)	7.6(1)	0.1037(8)	2.28(2)
Hydrogen-Gamma-Recombination	H (93) γ	23.38849(1)	23.38909(0)	7.7(2)	0.130(1)	2.63(3)
Hydrogen-Gamma-Recombination	H (92) γ	24.14720(1)	24.14785(0)	8.1(2)	0.122(1)	2.57(3)
Hydrogen-Gamma-Recombination	H (91) γ	24.939199(8)	24.93980(0)	7.22(10)	0.1499(10)	2.48(2)
Hydrogen-Gamma-Recombination	H (90) γ	25.76619(2)	25.76677(0)	6.7(3)	0.176(1)	3.05(5)
Hydrogen-Gamma-Recombination	H (89) γ	26.63004(3)	26.63071(0)	7.6(3)	0.135(2)	3.04(6)
Hydrogen-Gamma-Recombination	H (88) γ	27.53306(2)	27.53371(0)	7.0(2)	0.128(2)	3.01(5)
Hydrogen-Gamma-Recombination	H (87) γ	28.47727(2)	28.47800(0)	7.6(2)	0.144(2)	3.49(5)
Hydrogen-Gamma-Recombination	H (86) γ	29.46526(1)	29.46598(0)	7.3(1)	0.136(1)	3.38(3)
Hydrogen-Gamma-Recombination	H (85) γ	30.49933(2)	30.50020(0)	8.5(2)	0.135(2)	3.74(5)
Hydrogen-Gamma-Recombination	H (84) γ	31.58254(3)	31.58340(0)	8.2(2)	0.161(2)	3.84(6)
Hydrogen-Gamma-Recombination	H (83) γ	32.71773(2)	32.71850(0)	7.0(2)	0.125(1)	3.35(4)
Hydrogen-Gamma-Recombination	H (82) γ	33.90782(3)	33.90867(0)	7.5(2)	0.169(2)	4.27(6)
Hydrogen-Gamma-Recombination	H (81) γ	35.15636(2)	35.15727(0)	7.8(2)	0.158(2)	4.09(5)
Hydrogen-Gamma-Recombination	H (79) γ	37.84352(5)	37.84459(0)	8.5(4)	0.100(2)	4.3(1)
Hydrogen-Gamma-Recombination	H (77) γ	40.81187(1)	40.81295(0)	7.96(9)	0.199(1)	4.37(3)
Hydrogen-Gamma-Recombination	H (76) γ	42.41295(2)	42.41409(0)	8.1(1)	0.0422(3)	4.61(4)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
Hydrogen-Gamma-Recombination	H (75) γ	44.09887(4)	44.10009(0)	8.3(3)	0.118(1)	5.7(1)
Hydrogen-Gamma-Recombination	H (74) γ	45.87541(5)	45.87667(0)	8.2(3)	0.0117(2)	5.7(1)
Hydrogen-Gamma-Recombination	H (73) γ	47.74853(4)	47.74998(0)	9.1(2)	0.114(2)	5.13(9)
Hydrogen-Gamma-Recombination	H (72) γ	49.72547(4)	49.72670(0)	7.4(2)	0.137(2)	5.70(9)
Hydrogen-Delta-Recombination	H (110) δ	18.73452(1)	18.73490(0)	6.1(2)	0.0679(10)	1.75(3)
Hydrogen-Delta-Recombination	H (109) δ	19.24560(2)	19.24605(0)	6.9(3)	0.072(2)	1.83(5)
Hydrogen-Delta-Recombination	H (108) δ	19.77602(2)	19.77596(0)	-0.8(3)	0.096(1)	2.85(4)
Hydrogen-Delta-Recombination	H (106) δ	20.89516(2)	20.89562(0)	6.6(3)	0.091(2)	2.45(5)
Hydrogen-Delta-Recombination	H (105) δ	21.48677(2)	21.48724(0)	6.5(2)	0.077(1)	2.56(4)
Hydrogen-Delta-Recombination	H (104) δ	22.10088(2)	22.10142(0)	7.4(3)	0.064(1)	2.69(5)
Hydrogen-Delta-Recombination	H (103) δ	22.73861(2)	22.73923(0)	8.2(3)	0.0677(10)	2.81(5)
Hydrogen-Delta-Recombination	H (101) δ	24.08984(1)	24.09042(0)	7.2(2)	0.0656(7)	2.70(3)
Hydrogen-Delta-Recombination	H (100) δ	24.80571(1)	24.80630(0)	7.1(2)	0.0587(6)	2.60(3)
Hydrogen-Delta-Recombination	H (99) δ	25.55028(1)	25.55083(0)	6.5(2)	0.0800(8)	2.90(3)
Hydrogen-Delta-Recombination	H (98) δ	26.32510(5)	26.32546(0)	4.1(6)	0.047(2)	2.7(1)
Hydrogen-Delta-Recombination	H (97) δ	27.1314(1)	27.13173(0)	4(1)	0.069(6)	2.7(2)
Hydrogen-Delta-Recombination	H (95) δ	28.84522(2)	28.84580(0)	6.0(2)	0.096(1)	3.19(4)
Hydrogen-Delta-Recombination	H (94) δ	29.75645(3)	29.75719(0)	7.4(3)	0.062(1)	3.67(7)
Hydrogen-Delta-Recombination	H (93) δ	30.70665(2)	30.70738(0)	7.2(2)	0.0566(6)	3.18(4)
Hydrogen-Delta-Recombination	H (92) δ	31.69781(3)	31.69847(0)	6.2(3)	0.075(1)	3.29(7)
Hydrogen-Delta-Recombination	H (90) δ	33.81146(6)	33.81237(0)	8.1(6)	0.077(3)	3.6(1)
Hydrogen-Delta-Recombination	H (89) δ	34.93937(5)	34.94009(0)	6.2(4)	0.11(2)	4.7(2)
Hydrogen-Delta-Recombination	H (88) δ	36.11718(7)	36.11853(0)	11.2(6)	0.098(2)	7.7(2)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
Hydrogen-Delta-Recombination	H (85) δ	39.98714(3)	39.98802(0)	6.6(2)	0.097(1)	4.51(8)
Hydrogen-Delta-Recombination	H (84) δ	41.39906(3)	41.40026(0)	8.7(2)	0.089(1)	4.24(7)
Hydrogen-Delta-Recombination	H (83) δ	42.87883(3)	42.87980(0)	6.8(2)	0.111(2)	3.63(8)
Hydrogen-Delta-Recombination	H (81) δ	46.0560(1)	46.05733(0)	8.4(8)	0.0059(2)	6.8(3)
Hydrogen-Delta-Recombination	H (80) δ	47.76340(7)	47.76435(0)	6.0(4)	0.063(2)	5.3(2)
Hydrogen-Epsilon-Recombination	H (118) ϵ	18.80795(3)	18.80838(0)	6.9(5)	0.045(1)	1.99(6)
Hydrogen-Epsilon-Recombination	H (114) ϵ	20.81384(3)	20.81425(0)	5.9(4)	0.040(1)	1.95(7)
Hydrogen-Epsilon-Recombination	H (113) ϵ	21.35924(4)	21.35992(0)	9.6(6)	0.0312(10)	2.8(1)
Hydrogen-Epsilon-Recombination	H (111) ϵ	22.50934(2)	22.50984(0)	6.7(3)	0.0277(5)	2.22(5)
Hydrogen-Epsilon-Recombination	H (110) ϵ	23.11525(3)	23.11586(0)	7.9(4)	0.0250(7)	2.14(7)
Hydrogen-Epsilon-Recombination	H (109) ϵ	23.74331(2)	23.74383(0)	6.5(3)	0.0345(7)	2.41(6)
Hydrogen-Epsilon-Recombination	H (108) ϵ	24.39421(3)	24.39475(0)	6.6(3)	0.0370(7)	3.00(6)
Hydrogen-Epsilon-Recombination	H (107) ϵ	25.06920(3)	25.06970(0)	6.0(3)	0.0406(9)	2.32(6)
Hydrogen-Epsilon-Recombination	H (106) ϵ	25.76926(5)	25.76977(0)	5.9(5)	0.0408(10)	2.33(10)
Hydrogen-Epsilon-Recombination	H (105) ϵ	26.4956(1)	26.49617(0)	6(1)	0.047(3)	3.1(2)
Hydrogen-Epsilon-Recombination	H (104) ϵ	27.24951(8)	27.25012(0)	6.8(8)	0.042(2)	4.2(2)
Hydrogen-Epsilon-Recombination	H (103) ϵ	28.03215(4)	28.03297(0)	8.8(5)	0.041(1)	3.1(1)
Hydrogen-Epsilon-Recombination	H (101) ϵ	29.690(1)	29.69097(0)	5.8(5)	0.05(2)	7(3)
Hydrogen-Epsilon-Recombination	H (99) ϵ	31.48172(5)	31.48238(0)	6.3(5)	0.044(1)	3.6(1)
Hydrogen-Epsilon-Recombination	H (98) ϵ	32.43156(4)	32.43232(0)	7.0(4)	0.0476(10)	3.98(9)
Hydrogen-Epsilon-Recombination	H (96) ϵ	34.44946(4)	34.45003(0)	4.9(4)	0.039(1)	3.10(10)
Hydrogen-Epsilon-Recombination	H (95) ϵ	35.52117(4)	35.52188(0)	5.9(4)	0.047(1)	3.3(1)
Hydrogen-Epsilon-Recombination	H (93) ϵ	37.80206(10)	37.80279(0)	5.8(8)	0.052(2)	5.5(2)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
Hydrogen-Epsilon-Recombination	H (89) ϵ	42.9847(1)	42.98569(0)	6.7(7)	0.031(1)	5.1(2)
Hydrogen-Zeta-Recombination	H (125) ζ	18.83464(3)	18.83507(0)	6.8(5)	0.0281(8)	2.17(8)
Hydrogen-Zeta-Recombination	H (123) ζ	19.74656(4)	19.74698(0)	6.3(6)	0.032(1)	1.82(9)
Hydrogen-Zeta-Recombination	H (122) ζ	20.224649(3)	20.22508(0)	7.0(5)	0.034(1)	1.99(8)
Hydrogen-Zeta-Recombination	H (121) ζ	20.718151(7)	20.71874(0)	8.52(10)	-0.138(4)	0.50(2)
Hydrogen-Zeta-Recombination	H (119) ζ	21.75485(5)	21.75533(0)	6.6(7)	0.0203(9)	2.4(1)
Hydrogen-Zeta-Recombination	H (118) ζ	22.29914(5)	22.29964(0)	6.7(7)	0.0222(7)	3.1(1)
Hydrogen-Zeta-Recombination	H (114) ζ	24.66741(4)	24.66797(0)	6.8(4)	0.0197(6)	2.27(9)
Hydrogen-Zeta-Recombination	H (112) ζ	25.97819(4)	25.97871(0)	6.0(4)	0.0248(8)	2.38(9)
Hydrogen-Zeta-Recombination	H (109) ζ	28.12394(8)	28.12478(0)	9.0(8)	0.022(1)	2.6(2)
Hydrogen-Zeta-Recombination	H (104) ζ	32.25808(7)	32.25905(0)	9.0(7)	0.017(1)	2.0(2)
Hydrogen-Zeta-Recombination	H (102) ζ	34.13919(6)	34.13982(0)	5.5(6)	0.032(1)	3.9(1)
Hydrogen-Zeta-Recombination	H (96) ζ	40.73862(9)	40.73917(0)	4.0(6)	0.026(1)	3.4(2)
Hydrogen-Zeta-Recombination	H (95) ζ	41.99985(9)	42.00064(0)	5.7(6)	0.0073(2)	6.2(2)
Helium-Alpha-Recombination	He (71) α	17.999497(9)	17.99989(0)	6.5(2)	0.132(2)	1.47(2)
Helium-Alpha-Recombination	He (70) α	18.77639(1)	18.77681(0)	6.7(2)	0.176(2)	1.54(3)
Helium-Alpha-Recombination	He (69) α	19.59863(2)	19.59910(0)	7.2(4)	0.191(5)	1.77(6)
Helium-Alpha-Recombination	He (68) α	20.46965(1)	20.47010(0)	6.6(2)	0.191(2)	1.67(3)
Helium-Alpha-Recombination	He (67) α	21.39303(1)	21.39350(0)	6.6(2)	0.173(3)	1.81(4)
Helium-Alpha-Recombination	He (66) α	22.37274(1)	22.37328(0)	7.3(2)	0.149(2)	1.96(3)
Helium-Alpha-Recombination	He (65) α	23.4128(1)	23.41382(0)	13(2)	0.110(9)	1.8(2)
Helium-Alpha-Recombination	He (64) α	24.51931(1)	24.51989(0)	7.1(1)	0.152(1)	2.17(3)
Helium-Alpha-Recombination	He (63) α	25.695601(7)	25.69675(0)	13.40(8)	0.486(3)	2.47(2)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
Helium-Alpha-Recombination	He (62) α	26.94950(2)	26.95014(0)	7.1(3)	0.146(3)	2.06(5)
Helium-Alpha-Recombination	He (61) α	28.28576(6)	28.28639(0)	6.7(6)	0.177(8)	2.6(2)
Helium-Alpha-Recombination	He (60) α	29.71173(2)	29.71247(0)	7.5(2)	0.158(2)	2.77(4)
Helium-Alpha-Recombination	He (59) α	31.23529(8)	31.23604(0)	7.2(7)	0.19(1)	2.9(2)
Helium-Alpha-Recombination	He (58) α	32.86474(2)	32.86558(0)	7.6(2)	0.183(2)	3.04(5)
Helium-Alpha-Recombination	He (57) α	34.60964(2)	34.61048(0)	7.3(2)	0.182(2)	3.12(5)
Helium-Alpha-Recombination	He (56) α	36.48027(2)	36.48112(0)	7.0(2)	0.198(3)	3.23(5)
Helium-Alpha-Recombination	He (55) α	38.48811(4)	38.48904(0)	7.2(3)	0.108(2)	3.6(1)
Helium-Alpha-Recombination	He (54) α	40.64601(8)	40.64706(0)	7.7(6)	0.210(9)	3.6(2)
Helium-Alpha-Recombination	He (53) α	42.96828(2)	42.96947(0)	8.3(2)	0.119(2)	3.94(6)
Helium-Alpha-Recombination	He (52) α	45.47104(4)	45.47224(0)	7.9(3)	0.0116(2)	4.2(1)
Helium-Alpha-Recombination	He (51) α	48.17195(2)	48.17322(0)	7.9(1)	0.144(2)	3.95(5)
Helium-Beta-Recombination	He (89) β	18.05281(3)	18.05324(0)	7.1(6)	0.0280(8)	1.51(8)
Helium-Beta-Recombination	He (88) β	18.66838(3)	18.66874(0)	5.7(5)	0.033(1)	1.39(7)
Helium-Beta-Recombination	He (87) β	19.31216(2)	19.31255(0)	6.1(2)	0.0390(9)	1.37(4)
Helium-Beta-Recombination	He (86) β	19.98590(3)	19.98630(0)	6.0(4)	0.053(1)	1.94(7)
Helium-Beta-Recombination	He (85) β	20.69139(3)	20.69177(0)	5.5(5)	0.040(1)	1.57(8)
Helium-Beta-Recombination	He (84) β	21.43035(2)	21.43083(0)	6.8(3)	0.0370(7)	1.86(5)
Helium-Beta-Recombination	He (83) β	22.20487(3)	22.20551(0)	8.6(4)	0.0292(9)	2.16(8)
Helium-Beta-Recombination	He (82) β	23.01735(2)	23.01798(0)	8.2(3)	0.0297(8)	1.72(6)
Helium-Beta-Recombination	He (80) β	24.76527(3)	24.76583(0)	6.7(3)	0.0315(8)	2.11(7)
Helium-Beta-Recombination	He (78) β	26.69459(7)	26.69521(0)	6.9(8)	0.034(2)	2.4(2)
Helium-Beta-Recombination	He (77) β	27.73467(6)	27.73540(0)	7.8(7)	0.045(1)	3.1(2)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
Helium-Beta-Recombination	He (76) β	28.82966(6)	28.83034(0)	7.1(6)	0.033(1)	2.8(1)
Helium-Beta-Recombination	He (75) β	29.98290(7)	29.98369(0)	7.9(7)	0.020(2)	1.7(2)
Helium-Beta-Recombination	He (74) β	31.19863(5)	31.19939(0)	7.3(5)	0.038(1)	2.6(1)
Helium-Beta-Recombination	He (73) β	32.48115(4)	32.48172(0)	5.3(4)	0.043(1)	2.8(1)
Helium-Beta-Recombination	He (72) β	33.83447(6)	33.83529(0)	7.3(5)	0.039(1)	3.2(1)
Helium-Beta-Recombination	He (71) β	35.26402(4)	35.26514(0)	9.6(3)	0.062(1)	4.27(10)
Helium-Beta-Recombination	He (70) β	36.7758(1)	36.77670(0)	7.7(8)	0.034(3)	2.5(2)
Helium-Beta-Recombination	He (69) β	38.3761(2)	38.37591(0)	-1(1)	0.027(2)	4.3(4)
Helium-Beta-Recombination	He (68) β	40.06811(5)	40.06920(0)	8.2(4)	0.051(1)	4.2(1)
Helium-Beta-Recombination	He (67) β	41.86257(7)	41.86360(0)	7.4(5)	0.0104(4)	3.5(2)
Helium-Beta-Recombination	He (66) β	43.76584(9)	43.76678(0)	6.4(6)	0.027(1)	3.8(2)
Helium-Beta-Recombination	He (65) β	45.7856(2)	45.78710(0)	10(1)	0.0031(2)	6.3(5)
Helium-Beta-Recombination	He (64) β	47.9333(1)	47.93371(0)	2.6(9)	0.028(3)	1.6(3)
Helium-Gamma-Recombination	He (101) γ	18.33458(4)	18.33501(0)	7.1(6)	0.0108(7)	1.17(9)
Helium-Gamma-Recombination	He (100) γ	18.88209(9)	18.88245(0)	6(1)	0.014(2)	1.1(2)
Helium-Gamma-Recombination	He (99) γ	19.45147(7)	19.45190(0)	7(1)	0.0138(9)	1.8(2)
Helium-Gamma-Recombination	He (96) γ	21.30359(5)	21.30387(0)	3.9(7)	0.014(1)	1.3(1)
Helium-Gamma-Recombination	He (95) γ	21.97280(7)	21.97327(0)	6.5(10)	0.0192(8)	2.2(2)
Helium-Gamma-Recombination	He (94) γ	22.67063(8)	22.67101(0)	5(1)	0.0082(10)	1.4(2)
Helium-Gamma-Recombination	He (92) γ	24.15710(6)	24.15769(0)	7.3(8)	0.0107(8)	1.7(1)
Helium-Gamma-Recombination	He (91) γ	24.94957(5)	24.94997(0)	4.8(6)	0.0134(10)	1.5(1)
Helium-Gamma-Recombination	He (90) γ	25.77683(7)	25.77727(0)	5.1(9)	0.0121(9)	1.9(2)
Helium-Gamma-Recombination	He (88) γ	27.5446(1)	27.54493(0)	3(2)	0.031(2)	3.0(3)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
Helium-Gamma-Recombination	He (87) γ	28.4891(1)	28.48961(0)	6(2)	0.009(3)	0.9(4)
Helium-Gamma-Recombination	He (86) γ	29.47715(10)	29.47799(0)	9(1)	0.0137(9)	3.1(2)
Helium-Gamma-Recombination	He (85) γ	30.5124(5)	30.51263(0)	2(5)	0.037(7)	4.2(7)
Helium-Gamma-Recombination	He (84) γ	31.59498(8)	31.59627(0)	12.2(8)	0.026(1)	3.2(2)
Helium-Gamma-Recombination	He (83) γ	32.73174(2)	32.73184(0)	0.9(2)	0.096(1)	3.97(5)
Helium-Gamma-Recombination	He (82) γ	33.9208(1)	33.92249(0)	15.1(9)	0.031(1)	4.5(3)
Helium-Gamma-Recombination	He (81) γ	35.17109(8)	35.17160(0)	4.4(7)	0.023(1)	2.6(2)
Helium-Gamma-Recombination	He (77) γ	40.82887(8)	40.82959(0)	5.3(6)	0.024(1)	3.2(2)
Helium-Gamma-Recombination	He (76) γ	42.4300(1)	42.43137(0)	9.9(7)	0.0059(3)	3.8(2)
Helium-Gamma-Recombination	He (75) γ	44.1160(2)	44.11806(0)	14(1)	0.0220(8)	7.1(4)
Helium-Gamma-Recombination	He (74) γ	45.8931(2)	45.89536(0)	15(1)	0.0035(2)	8.3(5)
Helium-Gamma-Recombination	He (72) γ	49.7461(1)	49.74696(0)	5.1(9)	0.026(3)	3.0(3)
Helium-Delta-Recombination	He (110) δ	18.74241(7)	18.74254(0)	2(1)	0.0105(8)	1.9(2)
Helium-Delta-Recombination	He (109) δ	19.25060(6)	19.25389(0)	51.2(9)	0.011(1)	1.2(1)
Helium-Delta-Recombination	He (108) δ	19.7845(1)	19.78402(0)	-7(2)	0.0086(9)	2.7(3)
Helium-Delta-Recombination	He (106) δ	20.90356(6)	20.90413(0)	8.1(8)	0.009(1)	0.9(1)
Helium-Delta-Recombination	He (105) δ	21.49577(9)	21.49600(0)	3(1)	0.0065(10)	1.2(2)
Helium-Delta-Recombination	He (104) δ	22.1107(1)	22.11043(0)	-4(2)	0.0079(6)	3.1(3)
Helium-Delta-Recombination	He (103) δ	22.74805(5)	22.74850(0)	5.9(7)	0.008(1)	0.7(1)
Helium-Delta-Recombination	He (101) δ	24.0995(2)	24.10024(0)	9(2)	0.0041(7)	2.4(5)
Helium-Delta-Recombination	He (100) δ	24.8160(2)	24.81641(0)	5(2)	0.0049(7)	2.4(4)
Helium-Delta-Recombination	He (99) δ	25.5607(1)	25.56124(0)	6(1)	0.0066(7)	2.2(3)
Helium-Delta-Recombination	He (97) δ	27.14194(9)	27.14279(0)	9.4(10)	0.018(2)	1.4(2)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
Helium-Delta-Recombination	He (95) δ	28.85723(2)	28.85756(0)	3.4(2)	0.392(9)	1.47(4)
Helium-Delta-Recombination	He (88) δ	36.1317(2)	36.13325(0)	13(1)	0.028(3)	3.5(4)
Helium-Delta-Recombination	He (83) δ	42.8981(2)	42.89728(0)	-6(1)	0.0123(6)	8.0(4)
Helium-Delta-Recombination	He (80) δ	47.7816(2)	47.78381(0)	14(1)	0.014(2)	2.3(4)
Carbon-Alpha-Recombination	C (70) α	18.77826(5)	18.77853(0)	4.2(8)	0.030(3)	0.9(1)
Carbon-Alpha-Recombination	C (69) α	19.6006(1)	19.60089(0)	4(2)	0.023(7)	0.9(3)
Carbon-Alpha-Recombination	C (68) α	20.47152(6)	20.47197(0)	6.6(9)	0.024(3)	0.9(1)
Carbon-Alpha-Recombination	C (67) α	21.39510(8)	21.39546(0)	5(1)	0.023(3)	1.0(2)
Carbon-Alpha-Recombination	C (66) α	22.37491(7)	22.37533(0)	5.7(9)	0.019(2)	1.2(2)
Carbon-Alpha-Recombination	C (64) α	24.52175(5)	24.52213(0)	4.7(7)	0.025(2)	1.3(1)
Carbon-Alpha-Recombination	C (63) α	25.6988(3)	25.69910(0)	3(3)	0.005(8)	0.3(5)
Carbon-Alpha-Recombination	C (61) α	28.2886(3)	28.28898(0)	4(3)	0.02(1)	0.9(6)
Carbon-Alpha-Recombination	C (60) α	29.71484(8)	29.71518(0)	3.4(8)	0.019(3)	1.0(2)
Carbon-Alpha-Recombination	C (57) α	34.61316(9)	34.61364(0)	4.1(8)	0.022(3)	1.2(2)
Carbon-Alpha-Recombination	C (54) α	40.6507(4)	40.65077(0)	1(3)	0.03(1)	1.9(9)
Carbon-Beta-Recombination	C (88) β	18.6702(1)	18.67045(0)	4(2)	0.008(1)	1.1(3)
Carbon-Beta-Recombination	C (87) β	19.31395(9)	19.31432(0)	6(1)	0.006(1)	0.9(2)
Carbon-Beta-Recombination	C (86) β	19.98799(9)	19.98813(0)	2(1)	0.012(2)	1.2(2)
Carbon-Beta-Recombination	C (85) β	20.6932(1)	20.69366(0)	6(2)	0.009(1)	1.2(3)
Carbon-Beta-Recombination	C (84) β	21.43256(7)	21.43279(0)	3.2(10)	0.0070(10)	1.0(2)
Carbon-Beta-Recombination	C (83) β	22.20758(2)	22.20754(0)	-0.6(2)	0.023(2)	0.35(4)
Carbon-Beta-Recombination	C (82) β	23.02266(4)	23.02009(0)	-33.5(5)	0.006(1)	0.30(7)
Carbon-Beta-Recombination	C (80) β	24.7678(1)	24.76809(0)	3(1)	0.007(1)	1.3(2)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
Carbon-Beta-Recombination	C (77) β	27.73727(8)	27.73794(0)	7.2(9)	0.019(3)	1.2(2)
Carbon-Beta-Recombination	C (68) β	40(1)	40.07286(0)	9.41(8)	0.020(3)	0.11(4)
Carbon-Gamma-Recombination	C (90) γ	25.7793(1)	25.77963(0)	4(1)	0.006(1)	1.0(3)
Carbon-Gamma-Recombination	C (82) γ	33.9254(2)	33.92559(0)	1(2)	0.007(3)	1.1(5)
NH	N= 5- 5, J= 5- 4, F1=11/2-9/2, F=11/2-9/2	22.34256(7)	22.3428(1)	3(2)	-0.012(2)	1.1(2)
NH	N= 3- 3, J= 3- 2, F1=7/2-5/2, F=7/2-5/2	27.97074(3)	27.97123(8)	5.2(9)	0.070(1)	3.43(7)
OH	J=9/2, =3/2, F= 4– 4+	23.81717(2)	23.817610(2)	5.5(3)	-0.080(2)	1.84(5)
OH	J=9/2, =3/2, F= 5– 5+	23.82624(3)	23.826620(3)	4.8(4)	-0.108(3)	2.02(7)
OH	J=11/2, =3/2, F= 5+- 5-	36.98253(9)	36.98347(2)	7.6(8)	-0.040(3)	2.6(2)
OH	J=17/2, =1/2, F= 9+- 9-	42.31897(4)	42.3197(9)	5(6)	-0.0035(9)	0.34(9)
18OH	J=17/2, =1/2, F= 9– 8+	47.48266(6)	47.484(1)	7(8)	-0.028(5)	0.7(2)
OD	J=23/2, =3/2, F=21/2+-23/2-	45.99810(9)	45.9984(1)	2.2(9)	-0.0018(8)	0.5(3)
NH3	7(3)0a- 7(-3)0s, F=7-8	18.01634(1)	18.016600(5)	4.3(2)	-0.046(3)	0.38(3)
NH3	3(1, 3)0s- 3(0, 3)0a, F= 2- 2	18.807478(8)	18.80777(1)	4.7(2)	-0.058(3)	0.36(2)
NH3	7(4)0a- 7(4)0s	19.21827(9)	19.21847(1)	3(1)	0.007(2)	0.4(2)
NH3	5(1)0a - 5(1)0s	19.83788(3)	19.838350(5)	7.0(4)	0.011(4)	0.24(10)
NH3	5(1)0a - 5(1)0s	20.37101(2)	20.37145(1)	6.5(4)	0.011(4)	0.24(10)
NH3	7(5)0a- 7(5)0s, F=6-7	20.803747(6)	20.804270(5)	7.5(1)	-0.121(3)	0.53(1)
NH3	7(5)0a- 7(5)0s, F=7-6	20.80516(4)	20.805390(5)	3.3(5)	-0.027(2)	0.92(9)
NH3	8(6)0a- 8(-6)0s, F=8-7	20.71964(3)	20.720030(5)	5.7(5)	-0.022(2)	0.60(8)
NH3	10(8)0a-10(8)0s	20.85217(6)	20.85253(1)	5.1(8)	0.008(1)	0.6(1)
NH3	4(2)0a- 4(2)0s, F=4-3	21.70225(1)	21.702660(5)	5.7(2)	-0.10(2)	0.44(7)
NH3	4(2)0a- 4(2)0s	21.7031(1)	21.70336(1)	3(2)	0.03(3)	0.6(3)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
NH3	5(4)0a- 5(4)0s, F=4-5	22.65182(5)	22.65200(1)	2.3(6)	-0.164(9)	0.43(3)
NH3	5(4)0a- 5(4)0s	22.65266(1)	22.653020(5)	4.7(2)	-0.164(9)	0.43(3)
NH3	4(3)0a- 4(-3)0s, F=3-4	22.6872(1)	22.6877000(1)	6(2)	-0.279(6)	0.83(2)
NH3	3(2)0a- 3(2)0s	22.8339(2)	22.834190(5)	4(2)	0.06(2)	0.6(3)
NH3	2(1)0a- 2(1)0s	23.09852(8)	23.098820(5)	4(1)	-0.034(3)	2.2(3)
NH3	8(7)0a- 8(7)0s, F=8-8	23.23194(5)	23.2322400(1)	3.9(6)	0.009(2)	0.5(2)
NH3	1(1)0a- 1(1)0s	23.694229(6)	23.694500(5)	3.43(10)	0.26(1)	1.41(9)
NH3	2(2)0a - 2(2)0s	23.72225(1)	23.72263(2)	4.8(3)	0.27(5)	0.6(1)
NH3	11(10)0a-11(10)0s	24.8812(2)	24.88192(1)	8(3)	0.006(2)	0.7(6)
NH3	14(14)0a-14(14)0s	35.13377(8)	35.13430(1)	4.5(7)	0.029(2)	2.7(2)
NHD2	14(11, 4)0s- 15(8, 7)0s	19.20347(6)	19.204(10)	2.43(9)	0.0165(7)	2.7(1)
NHD2	14(7, 8)0a- 13(10, 4)0s	25.713913(8)	25.714(6)	4.04(8)	-0.282(7)	0.72(2)
NHD2	3(1, 3)0s- 3(0, 3)0a	18.807484(8)	18.80789(1)	6.5(2)	-0.056(2)	0.40(2)
NHD2	8(3, 6)0a- 8(2, 6)0s, F= 7- 8	29.3192(4)	29.31957(1)	4(4)	0.027(7)	1.2(6)
NHD2	8(3, 6)0a- 8(2, 6)0s	29.31976(1)	29.3201(1)	3(1)	-0.16(2)	0.35(3)
NHD2	14(3,12)-15(0,15) EE	43.2671(1)	43.26786(3)	5.0(8)	-0.007(1)	1.1(3)
NH2D	3(1, 3)0s- 3(0, 3)0a, F= 2- 2	18.807478(8)	18.80777(1)	4.7(2)	-0.058(3)	0.36(2)
NH2D	4(3, 1)0a- 4(3, 2)0a, F= 3- 4	20.32511(2)	20.32530(1)	2.8(3)	0.090(1)	2.23(4)
HD18O	7(1, 7)- 6(2, 4)	22.73271(4)	22.7332(2)	6(3)	-0.042(4)	1.0(1)
H2CO	3(1, 2)- 3(1, 3)	28.97437(5)	28.97480(1)	4.4(5)	-0.24(1)	0.88(8)
H2CO	4(1, 3)- 4(1, 4), F= 3- 3	48.2835(3)	48.2844900(2)	6(2)	0.06(2)	1.5(4)
HDCO	14(3,11)-14(3,12)	22.62420(5)	22.624570(5)	4.9(6)	0.015(2)	0.9(1)
CH2NH	1(1, 1)- 2(0, 2), F= 1- 2	33.703632(3)	33.70439(4)	6.7(4)	-0.043(1)	1.76(6)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
CH2NH	3(0, 3)- 2(1, 2), F= 2- 1	35.06449(5)	35.06509(4)	5.2(5)	0.03(1)	1.3(2)
CH2ND	8(2, 6)- 8(2, 7), F= 8- 8	34.96987(5)	34.97043(5)	4.8(6)	-0.018(4)	0.5(1)
CH3NH2	2(0)E2+1- 1(1)E2-1 , F= 1 - 0	18.34719(2)	18.34745000(8)	4.2(3)	0.0439(9)	1.79(4)
CH3NH2	6(1)B1 - 6(1)B2 , F= 6 - 6	18.49838(5)	18.49860(1)	3.6(9)	-0.060(5)	0.84(8)
CH3NH2	7(1)B2 - 7(1)B1 , F= 8 - 8	24.66056(4)	24.66114(2)	7.0(5)	-0.016(1)	0.95(8)
CH3NH2	10(2)E2-1- 9(3)E2+1	41.19616(1)	41.196820(8)	4.8(1)	-0.088(4)	0.60(3)
CH3NH2	11(4)E1-1- 12(3)E1-1	36.0657(1)	36.066770(9)	9.1(10)	-0.026(3)	1.3(3)
CH3OH	11(1,11)-10(2,8) ++	20.17070(9)	20.171090(2)	6(1)	0.007(2)	0.7(2)
CH3OH	3(2 , 1)- 3(1 , 2)	24.92818(3)	24.928710(7)	6.4(4)	0.164(5)	0.88(5)
CH3OH	4(2 , 2)- 4(1 , 3)	24.93322(2)	24.933470(2)	3.0(2)	0.380(6)	0.65(7)
CH3OH	2(2 , 0)- 2(1 , 1)	24.93401(6)	24.934380(5)	4.4(7)	0.088(7)	0.7(1)
CH3OH	8(2, 6)- 8(1, 7)	25.29395(3)	25.29440(2)	5.3(4)	0.097(3)	0.80(5)
CH3OH	10(2 , 8)- 10(1 , 9)	25.87783(2)	25.8782700(4)	5.1(3)	0.054(2)	0.73(5)
CH3OH	13(2,11)-13(1,12)	27.4722(2)	27.47250(3)	3(2)	0.029(6)	0.9(3)
CH3OH	4(0,4)-3(1,2)	28.31576(8)	28.31514(5)	-7(1)	0.016(6)	0.4(2)
CH3OH	4(-1, 4)- 3(0 , 3)	36.16859(4)	36.16927(3)	5.6(4)	0.23(1)	1.1(1)
CH3OH	1(0, 1)- 0(0, 0) + +	48.37163(3)	48.3724600(7)	5.1(2)	0.102(4)	1.24(7)
CH3OH	1(0, 1)- 0(0, 0)	48.37609(6)	48.37689(5)	5.0(5)	0.070(3)	1.8(1)
13CH3OH	6(2, 4)- 5(3, 3) + +	28.13688(5)	28.13725(5)	4.0(8)	-0.013(2)	0.6(1)
13CH3OH	1(0, 1)- 0(0, 0) + +	47.20436(7)	47.20521(5)	5.4(5)	0.014(2)	0.9(2)
SH	J=29/2, =3/2, F=14–15+	46.75044(7)	46.751(5)	3.4(7)	-0.014(6)	0.3(1)
NaC*	N= 1- 0, J=1/2–1/2	25.5636(2)	25.564(5)	4.1(1)	0.0031(10)	1.1(4)
HDS	9(8, 2)-10(7, 3)	25.7127(3)	25.713(8)	4.91(4)	0.011(2)	1.5(6)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
l-C3H+	2- 1	44.97863(5)	44.979540(3)	6.1(3)	-0.012(2)	0.7(1)
l-CC13CH	N= 2- 1, J=3/2-1/2, F1= 1- 1, F=1/2-3/2	43.5196(1)	43.520(2)	5.2(5)	-0.009(1)	2.0(3)
l-C13CCH	J=3/2-1/2, =1/2, F1= 1- 0, F=1/2-1/2, l=e	32.65805(7)	32.658(1)	3.7(8)	0.071(3)	1.7(2)
l-C13CCH	J=3/2-1/2, =1/2, F= 1- 0, l=e	32.6628(1)	32.66338(2)	5.4(10)	-0.049(2)	2.1(2)
l-C13CCH	J=3/2-1/2, =1/2, F1= 1- 1, F=1/2-1/2, l=e	32.66585(8)	32.667(2)	6.9(4)	-0.013(6)	0.3(2)
c-C3D	5(3, 2)- 5(3, 3), J=9/2-9/2, F=9/2-9/2	19.756542(7)	19.75693(3)	5.9(5)	-0.134(4)	0.43(2)
c-C3D	2(1, 1)- 2(1, 2), J=3/2-3/2, F=3/2-3/2	32.33127(7)	32.331680(7)	3.8(6)	-0.010(2)	0.7(2)
c-C3D	10(5, 5)-10(5, 6), J=19/2-21/2, F=21/2-21/2	47.60014(5)	47.601(2)	2.6(2)	-0.022(6)	0.29(9)
c-C3D	2(1, 1)- 2(1, 2), J=5/2-5/2, F=5/2-5/2	32.62064(4)	32.621410(8)	7.0(3)	-0.058(4)	0.61(8)
l-H2CCC	12(1,11)-12(1,12)	29.9955(3)	29.99575(7)	3(3)	-0.037(6)	0.6(1)
l-H2CCC	2(1, 2)- 1(1, 1)	41.19745(3)	41.19832(1)	6.4(3)	-0.036(4)	0.58(8)
l-H2CCC	2(0,2)-1(0,1)	41.58384(4)	41.584630(9)	5.7(3)	-0.024(4)	0.4(1)
l-H2CCC	2(1,1)-1(1,0)	41.96677(5)	41.96766(1)	6.4(4)	-0.006(1)	0.6(1)
c-HCCCH	3(3,0)-3(2,1)	27.08414(7)	27.084350(2)	2.3(8)	-0.10(2)	0.4(1)
c-HCCCH	2(1, 1)- 2(0, 2)	46.75489(8)	46.755610(2)	4.6(5)	-0.018(4)	0.7(2)
c-HCCCD	14(9, 5)-14(9, 6)	30.6809(2)	30.68166(2)	8(2)	0.0079(8)	3.4(3)
c-HC13CCH	2(2, 0)- 2(1, 1)	22.5504(3)	22.550810(5)	5(3)	-0.005(1)	0.9(5)
c-HCC13CH	4(4, 0)- 4(3, 1)	22.57561(3)	22.5758(1)	3(2)	-0.0458(7)	4.20(7)
c-HCC13CH	3(2, 1)- 3(1, 2)	44.1041(1)	44.104780(2)	4.9(9)	0.024(3)	1.1(2)
NaO*	J=13/2, =1/2, F= 5- 6, l=f	18.74423(4)	18.7447(7)	8.3(7)	0.015(1)	0.1114(2)
NaO*	J=15/2, =1/2, F= 6- 7, l=f	22.86191(5)	22.8622(6)	3(8)	0.0214(9)	2.7(1)
NaO*	J=17/2, =1/2, F=10- 9, l=f	25.7112(1)	25.7119(3)	7(4)	-0.014(3)	1.0(3)
NaO*	J=21/2, =1/2, F= 9- 9, l=f	34.25149(5)	34.2525(8)	9(7)	0.008(6)	0.3(2)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
NaO*	J=3/2-1/2, =1/2, F= 2- 1, l=e	35.78165(4)	35.7819(2)	2(2)	0.015(5)	0.3(1)
CCO*	N= 1- 0, J= 1- 1	32.62298(3)	32.623450(6)	4.4(3)	-0.048(5)	0.39(7)
CH2CN	J=2-1	40.23785(4)	40.2385600(7)	5.3(3)	-0.014(3)	0.34(10)
CH2CN	J=2-1	40.24244(4)	40.243220(2)	5.8(3)	-0.019(2)	0.75(10)
CH3CCH	2(1)-1(1)	34.18241(3)	34.18276(4)	3.0(5)	0.033(2)	1.39(8)
CH3CN	2(0)-1(0) , F=2-2	36.79362(5)	36.794200(1)	4.8(4)	0.033(2)	1.39(8)
CH3CN	2(1) - 1(1)	36.7940(4)	36.794770(2)	7(3)	0.05(3)	0.6(6)
CH3CN	2(0) - 1(0)	36.7949(1)	36.795480(3)	5(1)	0.028(5)	0.9(3)
CH3C13CH	2(1)-1(1)	33.16002(5)	33.16035(6)	3.0(7)	0.015(3)	0.7(1)
CH2CH15N	8-7	46.2466(2)	46.245620(5)	-6(1)	0.011(1)	1.4(3)
HNCO	2(0, 2)- 1(0, 1), F= 3- 2	43.96207(6)	43.96300(3)	6.4(5)	0.019(2)	0.9(1)
DNCO	2(0, 2)- 1(0, 1)	40.78565(6)	40.786590(2)	6.9(4)	-0.016(3)	0.7(1)
c-C2H4NH*	7(6, 1)- 7(5, 2), F= 7- 8	26.3126(1)	26.312870(2)	3(1)	0.045(5)	0.9(2)
CH3CHO	3(1, 3)- 4(0, 4) A++	18.12599(4)	18.1265(8)	8.1(6)	-0.016(2)	0.8(1)
CH3CHO	3(1, 3)- 4(0, 4) A++	20.54700(3)	20.54720(4)	2.9(7)	-0.016(2)	0.8(1)
CH3CHO	6(1, 5)- 6(1, 6) A	24.932350(9)	24.9326(2)	3(2)	0.484(7)	0.49(2)
CH3CHO	9(3, 6)- 10(2, 9) A–	21.19108(3)	21.19167(5)	8.4(8)	-0.64(1)	3.43(7)
CH3CHO	14(4,11)-15(3,13) E	37.8329(2)	37.83370(4)	7(2)	0.015(3)	2.5(5)
CH3CHO	9(1, 8)- 9(1, 9) A-+	47.73008(8)	47.73100(1)	5.8(5)	-0.015(3)	0.9(2)
CH3CHO	7(0, 7)- 6(1, 6) A++	48.20595(6)	48.2067(7)	4(5)	0.188(6)	2.04(9)
a-H2CCHOH	14(2,12)- 14(2,13)	47.56416(3)	47.56500(2)	5.3(2)	-0.049(5)	0.62(7)
s-H2CCHOH	2(0, 2)- 1(0, 1)	39.0155(1)	39.01631(7)	6.0(10)	0.052(3)	2.4(3)
CH3OCH3	3(2, 1)- 4(1, 4) AE	18.28441(3)	18.284810(8)	6.5(5)	-0.020(2)	0.50(6)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
CH3OCH3	6(1, 5)- 5(2, 4) EE	37.5355(1)	37.53580(3)	2.5(10)	-0.020(2)	0.50(6)
CH3OCH3	15(3,13)-16(0,16) AE	37.64509(5)	37.64561(4)	4.2(5)	0.030(5)	0.7(1)
CH3OCH3	13(3,11)- 12(4, 8) AA	42.3650(1)	42.36567(1)	5.0(8)	-0.0042(4)	2.2(3)
SiO	1- 0	43.422977(6)	43.42385(5)	6.0(3)	0.931(6)	1.83(1)
30SiO	1-0	42.37244(4)	42.3733(1)	6.0(8)	0.0119(5)	1.84(9)
15NNO	1 - 0	24.27414(2)	24.274610(1)	5.8(2)	-0.046(2)	0.17(2)
NH2CHO	4(0, 4)- 3(1, 3) , F= 3- 3	26.92126(9)	26.921410(7)	2(1)	-0.014(2)	1.2(2)
NH2CHO	8(2, 6)- 9(1, 9) , F= 9- 9	37.25865(5)	37.25948(1)	6.7(4)	-0.024(7)	0.4(1)
CH3COD*	6(1, 5)- 5(2, 4) A	20.77157(4)	20.77195(2)	5.5(6)	-0.019(3)	0.51(9)
CH3COD*	6(1, 5)- 6(1, 6) A	29.93028(9)	29.93084(2)	5.6(9)	0.0186(8)	4.1(2)
CH3COD*	6(3, 3)- 7(2, 6) A	33.76991(8)	33.77109(2)	10.4(7)	-0.027(1)	4.0(2)
CH3COD*	12(2,11)-11(3, 8) A	36.52095(7)	36.52140(1)	3.7(6)	0.020(5)	0.6(2)
CH3COD*	9(1, 9)- 8(2, 7) E	37.04592(8)	37.04671(6)	6.4(8)	-0.022(3)	1.0(2)
CH3COD*	12(2,10)- 13(-3,11) E	41.60413(4)	41.605(7)	5.1(6)	0.054(1)	3.60(9)
13C33S	J= 1 - 0, F=5/2-3/2	45.84148(4)	45.8424300(9)	6.2(2)	0.054(1)	3.60(9)
c-HCOOH	10(1, 9)- 9(2, 8)	30.36099(6)	30.36159(4)	6.0(7)	0.010(2)	0.7(1)
c-HCOOH	15(2,13)-15(2,14)	41.48626(6)	41.48735(1)	7.9(4)	-0.008(4)	0.3(2)
c-DCOOH	10(3, 7)-11(2,10)	32.03548(4)	32.03595(5)	4.4(6)	0.015(3)	0.29(6)
c-H13COOH	7(1, 6)- 7(1, 7)	40.20507(3)	40.205740(10)	5.0(2)	-0.012(3)	0.4(1)
t-DCOOH	14(2,12)-15(1,15)	35.96444(9)	35.96503(1)	4.9(7)	0.010(3)	0.5(2)
t-HCOOD	8(2, 6)- 9(0, 9)	46.6365(2)	46.637020(8)	3(1)	0.012(2)	3.0(5)
g-CH3CH2OH	6(3, 4)- 6(2, 4), vt= 0- 1	27.35922(3)	27.35981(2)	6.5(4)	0.051(8)	0.37(7)
g-CH3CH2OH	3(0, 3)- 2(1, 2), vt= 0- 0	27.9406(2)	27.941230(1)	7(2)	0.011(1)	3.2(4)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
g-CH3CH2OH	7(3, 5)- 6(4, 3), vt= 1- 0	43.17755(6)	43.178270(6)	5.0(4)	0.101(5)	1.18(9)
Ga-n-C3H7OH*	7(2, 5)- 7(1, 6)	24.033543(3)	24.034050(1)	6.32(4)	0.0031(10)	1.1(4)
Ga-n-C3H7OH*	8(3, 6)- 8(2, 6)	41.95925(4)	41.959740(2)	3.5(3)	-0.0106(7)	1.2(1)
SO	2(3)- 2(2)	36.20105(1)	36.2018(1)	6(1)	0.419(7)	1.17(3)
33SO	2(3)- 2(2), F=5/2-5/2	35.5108(1)	35.51102(6)	2(1)	0.011(2)	1.1(3)
34SO	2(3)- 2(2)	34.85665(6)	34.8572(2)	4(2)	0.028(3)	1.1(2)
CH3SH	14(0) - 14(1) E	32.0706(1)	32.0709(4)	3(3)	-0.019(2)	2.6(2)
C4H	N= 2 - 1 , J=5/2-3/2, F=3-2	19.01480(5)	19.015140(2)	5.3(8)	-0.010(3)	0.3(1)
C4H	N= 3- 2, J=7/2-5/2, F= 3- 2	28.53177(3)	28.53231(1)	5.7(4)	-0.010(3)	0.3(1)
C4H	N= 5 - 4, J=11/2-9/2	47.56594(8)	47.566770(1)	5.2(5)	-0.019(4)	0.9(2)
CC13CCH	N= 3- 2, J=5/2-5/2, F1=3/2-3/2, F=5/2-5/2	28.5677(2)	28.56787(1)	2(2)	-0.026(3)	0.68(9)
CC13CCH	N= 3- 2, J=5/2-3/2, F= 3- 2	28.56984(1)	28.57137(1)	16.1(2)	-0.052(4)	0.41(4)
13CCCCH	N= 4- 3, J=7/2-5/2, F1=5/2-5/2, F=5/2-5/2	36.79069(4)	36.79147(2)	6.4(4)	-0.052(4)	0.41(4)
C13CCCH	N= 3- 2, J=5/2-3/2, F1=3/2-1/2, F=5/2-3/2	28.4264(1)	28.427000(4)	7(1)	0.014(1)	3.3(3)
MgCN	J=5/2, =1/2-3/2, l=f	36.31611(2)	36.3170(1)	7(1)	0.014(1)	3.3(3)
MgCN	N=4-3 ,J=9/2-7/2	40.76464(4)	40.76522(3)	4.3(3)	-0.021(3)	0.59(9)
13CCCN	N= 3- 2, J=7/2-5/2, F1= 3- 2, F= 2- 1	28.6259(1)	28.626570(3)	7(1)	0.012(1)	2.3(3)
CC13CN	N= 3- 2, J=5/2-3/2, F1= 2- 1, F= 2- 1	29.58299(4)	29.583670(5)	6.9(5)	-0.024(3)	0.8(1)
HCCNC	J= 3- 2, l=1e	29.85665(4)	29.857210(3)	5.6(4)	0.011(2)	0.38(9)
HC3N	J= 3- 2, l=1e	27.32707(3)	27.327730(2)	7.2(3)	-0.014(7)	0.0(1)
HC3N	J= 2- 1, F= 3- 2, l= 1e	18.24097(8)	18.241210(7)	4(1)	0.068(3)	3.3(2)
HC3N	J= 2- 1, F= 3- 2, l= 1e	18.341205(4)	18.34136(2)	2.5(3)	0.068(3)	3.3(2)
HC3N	J= 2- 1, l= 1e	18.342133(4)	18.34244(2)	5.0(3)	0.068(3)	3.3(2)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
HC3N	J= 2- 1, F= 3- 2, l= 1e	18.342498(6)	18.34270(2)	3.3(3)	0.068(3)	3.3(2)
HC3N	J= 3- 2	27.29386(2)	27.29429(1)	4.7(3)	0.056(3)	0.78(6)
HC3N	J= 4 - 3, F= 3-2	36.39182(4)	36.392240(1)	3.4(3)	0.164(6)	1.01(8)
HC3N	J= 5- 4, F= 5- 5	45.48839(2)	45.4888300(9)	2.9(1)	0.059(2)	0.72(4)
HC3N	J= 5- 4, F= 4- 3	45.48967(3)	45.4902600(3)	3.9(2)	0.0577(10)	1.45(8)
AlNC	N= 3- 2, J=7/2-9/2, F=9/2-9/2	35.90138(6)	35.9020900(7)	5.9(5)	0.014(4)	0.5(2)
29SiC2	8(2, 6)- 8(2, 7)	23.656176(6)	23.657(4)	6.1(3)	-0.099(5)	0.41(2)
t-HC3O*	4(1, 4)- 3(1, 3), J=7/2-5/2, F= 3- 2	36.2948(2)	36.29539(8)	4(1)	0.022(3)	2.2(4)
CH2CHCN	2(1, 2)- 1(1, 1)	18.59967(6)	18.60006(1)	6.4(9)	-0.081(3)	2.7(1)
CH2CHCN	3(1, 3)- 2(1, 2)	27.81299(9)	27.8135(1)	5(1)	-0.081(3)	2.7(1)
CH2CHCN	3(1, 2)- 3(0, 3)	46.49456(6)	46.49495(1)	2.5(4)	-0.0036(8)	0.5(1)
CH2CHCN	3(0, 3)- 2(0, 2)	28.603178(5)	28.60378(2)	6.3(2)	-0.161(4)	0.53(1)
CH2CHCN	J= 8(0, 8)- 7(1, 7) , F= 8- 8	36.53272(3)	36.53378(2)	8.7(3)	-0.161(4)	0.53(1)
CH2CHCN	4(2, 2)- 3(2, 1)	38.0864(4)	38.087030(4)	5(3)	-0.0(1)	0(1)
CH2CHCN	3(1, 2)- 3(0, 3)	46.49456(6)	46.49495(1)	2.5(4)	-0.0036(8)	0.5(1)
13CH2CHCN	J= 2(1, 1)- 2(0, 2) , F= 1- 2	45.23828(4)	45.23872(2)	2.9(3)	-0.0036(8)	0.5(1)
13CH2CHCN	J= 5(0, 5)- 4(0, 4) , F= 4- 4	46.11415(4)	46.114750(9)	3.9(2)	0.018(3)	0.53(9)
CH2CH13CN	3(0, 3)- 2(0, 2)	28.31473(4)	28.31514(5)	4.4(6)	0.036(6)	0.41(8)
CH2CHC15N	5(2, 4)- 4(2, 3)	46.0280(1)	46.0289300(7)	6.0(9)	0.013(2)	1.3(3)
CH2CDCN	7(2, 6)- 8(1, 7)	22.40667(2)	22.40700(2)	4.4(3)	0.0058(5)	0.38(4)
CH213CHCN	J= 1(1, 1)- 2(0, 2) , F= 1- 2	24.82412(3)	24.82465(1)	6.4(3)	-0.068(3)	0.16(2)
CH213CHCN	15(1,14)- 14(2,13)	36.1995(2)	36.2002(4)	6(4)	0.07(1)	1.1(4)
CH213CHCN	J= 6(1, 5)- 6(0, 6) , F= 6- 5	48.988335(5)	48.98947(8)	6.9(5)	-2.0(3)	0.51(3)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
CH213CHCN	6(1, 5)- 6(0, 6)	48.99005(6)	48.990880(8)	5.1(4)	2.65(9)	2.01(7)
c-H2C3O	7(1, 6)- 7(1, 7)	42.80708(6)	42.80810(3)	7.2(5)	0.0021(5)	0.6(2)
E-HNCHCN	1(1, 1)- 2(0, 2), I= 2- 1, F= 1- 1	38.5831(2)	38.58387(2)	6(1)	0.025(3)	2.6(4)
Z-HNCHCN	3(0, 3)- 2(0, 2), I= 2- 2, F= 3- 4	29.10384(6)	29.104110(2)	2.8(6)	-0.008(2)	0.5(1)
Z-HNCHCN	5(2, 3)- 4(2, 2), I= 2- 2, F= 4- 4	48.5872(1)	48.587570(3)	2.2(6)	0.049(4)	2.6(3)
CNCHO	4(2, 3)- 3(2, 2), F= 3- 2	38.66991(5)	38.670310(3)	3.1(4)	-0.026(7)	0.4(1)
CH3CH2CN	4(2, 2)- 5(1, 5) , F= 5- 5	28.56572(3)	28.566430(4)	7.5(3)	-0.024(2)	0.68(7)
CH3CH2CN	6(1, 5)- 6(0, 6), F= 5- 6	28.5681(1)	28.568880(2)	8(1)	-0.01(3)	0(2)
CH3CH2CN	12(1,11)-12(1,12)	36.98229(8)	36.98264(5)	2.8(8)	-0.035(3)	2.3(2)
CH3CH2CN	11(1,10)- 11(0,11)	42.67390(5)	42.674200(4)	2.1(4)	0.0042(7)	0.6(1)
CH3CH213CN	5(0, 5)- 4(0, 4), F= 6- 5	43.3051(4)	43.30573(9)	5(3)	-0.009(4)	1.5(5)
CH3CH2C15N	7(3, 4)- 8(2, 7)	46.72191(4)	46.723(1)	7(7)	0.020(3)	0.45(9)
CH313CH2CN	4(2, 3)- 5(1, 4) , F= 5- 5	19.62142(8)	19.621720(6)	5(1)	0.022(1)	2.4(2)
13CH3CH2CN	5(0, 5)- 4(1, 4), F= 5- 4	22.77481(6)	22.7751(4)	3(6)	0.0116(7)	2.0(1)
13CH3CH2CN	6(1, 5)- 6(0, 6), F= 6- 7	28.23272(9)	28.2333(3)	6(3)	-0.012(3)	0.9(2)
13CH3CH2CN	4(2, 2)- 5(1, 5) , F= 5- 5	28.56572(3)	28.566430(4)	7.5(3)	-0.024(2)	0.68(7)
13CH3CH2CN	3(2, 1)- 4(1, 4), F= 3- 4	36.37338(8)	36.372220(6)	-9.6(6)	0.021(4)	0.7(2)
HCCCH2OH*	6(1, 5)- 6(0, 6), vt= 0- 0	33.29402(6)	33.294770(2)	6.7(5)	0.012(2)	0.8(1)
HCCCH2OH*	4(3, 2)- 3(3, 1), vt= 1- 1	35.6628(1)	35.66352(2)	6.3(10)	-0.012(2)	1.3(3)
HCCCH2OH*	4(2, 2)- 3(2, 1), vt= 0- 0	35.78461(7)	35.78489(2)	2.4(6)	0.013(2)	0.8(2)
HCCCH2OH*	9(9, 0)-10(10, 0), vt= 1- 0	42.67943(5)	42.6800(1)	3.9(8)	0.008(2)	0.9(3)
HCCCH2OD*	3(2, 1)- 2(2, 0), vt= 1- 1	26.21454(5)	26.2148(1)	3(1)	-0.029(6)	0.5(1)
HCCCH2OD*	5(3, 2)- 5(4, 2), vt= 1- 0	37.05151(6)	37.0519(2)	4(1)	-0.019(4)	0.5(1)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
gauche-CH2DCH2CN	9(1, 8)- 8(2, 7), F= 9- 8	26.4103(1)	26.4107(4)	5(5)	-0.006(1)	1.1(2)
gauche-CH2DCH2CN	1(1, 1)- 0(0, 0), F= 1- 1	29.13272(8)	29.13314(5)	4.4(10)	0.0151(7)	3.5(2)
CCS	4,3-3,2	45.3782(1)	45.379030(2)	5.6(9)	0.0018(6)	0.8(5)
C13CS	N= 3- 0, J= 2- 1, F=5/2-3/2	29.32185(7)	29.3225(1)	7(1)	-0.035(7)	0.6(2)
HOCH2CN*	7(1, 7)- 7(2, 5)	18.498751(9)	18.499230(4)	7.8(2)	0.14(1)	0.25(2)
NCS*	J=7/2-5/2, =1/2, F=7/2-7/2, l=e	42.66548(5)	42.666310(2)	5.8(3)	-0.0052(9)	0.7(1)
(CH3)2CO	3(3, 1)- 3(2, 2) AA	18.5807(8)	18.58100(2)	4.8(7)	0.005(1)	0.5(2)
(CH3)2CO	3(3, 1)- 3(2, 2) AA	18.58066(7)	18.58100(2)	6(1)	0.006(1)	0.8(2)
(CH3)2CO	9(7, 2)- 9(6, 3) AA	27.0208(2)	27.02109(2)	3(2)	0.014(2)	2.6(4)
(CH3)2CO	6(6, 0)- 6(5, 1) AA	30.000019(2)	30.00064(5)	6.2(5)	-0.3(5)	0.84(9)
(CH3)2CO	7(7, 1)- 7(6, 2) EA	36.33665(3)	36.33738(6)	6.0(6)	0.04(1)	0.3(1)
(CH3)2CO	8(5, 4)- 8(4, 5) AE	38.50403(5)	38.504440(6)	3.2(4)	-0.038(9)	0.4(1)
(CH3)2CO	11(9, 2)- 11(8, 3) AE	41.48541(6)	41.4862(1)	6.1(9)	-0.010(3)	0.5(2)
(CH3)2CO	7(3, 5)- 6(4, 2) AA	48.10197(9)	48.10238(1)	2.5(5)	0.019(2)	1.9(2)
CaC*	N= 1- 0, J= 1- 1	23.09654(8)	23.10(2)	5.6(9)	-0.021(4)	0.4(2)
CH3CH2CHO	3(1, 2)- 2(1, 1)	33.34635(9)	33.346900(2)	4.9(8)	0.012(3)	0.8(2)
HNCS	4(1, 4)- 3(1, 3), F= 3- 3	46.8458(1)	46.846710(2)	6.1(7)	0.032(1)	7.0(3)
MgCl*	N= 3- 2, J=7/2-5/2, F= 3- 3	44.0515(7)	44.052490(5)	7(5)	0.10(6)	3.4(3)
MgCl*	N= 3- 2, J=7/2-5/2, F= 3- 3	44.05161(6)	44.052490(5)	6.0(4)	-0.18(9)	1.4(7)
MgCl*	N= 3- 2, J=7/2-5/2, F= 3- 2	44.067429(1)	44.068070(5)	4.36(3)	2.49(8)	0.51(2)
CH3COOH	3(1, 2)- 3(0, 3) -+ v=1	21.06959(1)	21.069840(1)	3.5(2)	-0.056(3)	0.50(3)
CH3COOH	8(8, 0)- 8(7, 1) +- v=1	22.7887(5)	22.789220(7)	7(6)	0.007(4)	1.1(5)
CH3COOH	7(-6, 2)- 7(-5, 3) v=1	37.9717(2)	37.972050(6)	3(2)	0.027(2)	4.9(5)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
CH3COOH	4(1, 4)- 3(1, 3) ++ v=0	47.60292(3)	47.604140(1)	7.7(2)	-0.041(6)	0.46(7)
cis-CH2OHCHO	5(2, 3)- 5(1, 4)	31.72641(7)	31.72707(8)	6(1)	-0.015(2)	1.3(2)
cis-CH2OHCHO	6(2, 4)- 6(1, 5)	31.8811(1)	31.882030(2)	8(1)	-0.007(4)	0.8(4)
cis-CH2OHCHO	6(2, 4)- 6(1, 5)	32.13490(9)	32.13530(1)	3.7(9)	-0.011(2)	1.0(2)
cis-CH2OHCHO	9(2, 7)- 9(1, 8)	41.57639(5)	41.576990(7)	4.3(3)	-0.034(2)	1.4(1)
cis-CH2OHCHO	9(2, 7)- 9(1, 8)	41.57639(5)	41.576990(7)	4.3(3)	-0.034(2)	1.4(1)
cis-CH2OHCHO	4(2, 2)- 3(2, 1)	46.8720(1)	46.872940(4)	5.9(9)	0.016(1)	3.6(3)
13CH2OHCHO	13(3,10)-13(3,11)	36.20014(2)	36.20055(1)	3.4(2)	-0.20(2)	0.67(7)
CH2OH13CHO	12(4, 9)-11(5, 6)	27.56588(6)	27.566600(1)	7.9(6)	0.014(2)	0.7(1)
CH2OH13CHO	J=13-14	39.18851(3)	39.188860(2)	2.7(2)	0.014(2)	0.7(1)
CH2OH13CHO	4(1, 4)- 3(1, 3)	42.2288(2)	42.2296200(3)	6(1)	0.0037(2)	6.0(4)
CH3OCHO	6(1, 5)- 6(0, 6) E	36.9271(1)	36.92785(5)	6.5(10)	0.022(4)	1.1(3)
OCS	2-1	24.32556(4)	24.325930(1)	4.5(5)	0.010(1)	0.56(9)
SiS	1- 0	17.97800(3)	17.978210(2)	3.5(4)	0.0220(7)	1.63(6)
CH3O13CHO (TopModel)*	3 (3 , 1)- 4 (2, 2) + + vt=1 -1	19.1240(3)	19.124490(7)	7(4)	0.0220(7)	1.63(6)
CH3O13CHO (TopModel)*	7 (5 , 3)- 8 (4, 5) vt=0 -0	24.95828(2)	24.958730(4)	5.5(2)	0.261(8)	1.08(2)
CH3O13CHO (TopModel)*	9 (2 , 8)- 8 (3, 5) - - vt=1 -1	27.93197(6)	27.932410(5)	4.8(6)	0.088(5)	0.86(9)
CH3O13CHO (TopModel)*	6 (2 , 4)- 6 (1, 5) vt=1 -1	35.8438(1)	35.84407(1)	2.4(9)	0.013(2)	1.2(3)
CH3O13CHO (TopModel)*	15 (5 , 11)-14 (6, 8) + + vt=0 -0	37.1437(1)	37.144280(3)	4.9(9)	0.024(2)	2.4(3)
CH3O13CHO (TopModel)*	J=8-9	40.41579(6)	40.416740(3)	7.0(5)	-0.014(3)	0.6(1)
CH3O13CHO (TopModel)*	4 (-1 , 4)- 3 (-1, 3) vt=1 -1	44.8735(7)	44.874220(1)	5(5)	-0.04(2)	0.7(2)
CH3O13CHO (TopModel)*	3 (1 , 3)- 2 (0, 2) + + vt=1 -1	45.2398(1)	45.240570(1)	5.1(7)	-0.0026(3)	1.6(3)
NH2CH2CH2OH*	10(4, 6)-11(1,10)	18.79882(10)	18.799050(10)	4(2)	-0.013(2)	1.8(2)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
NH2CH2CH2OH*	10(4, 6)-11(1,10)	19.26407(2)	19.26453(2)	7.2(4)	-0.013(2)	1.8(2)
NH2CH2CH2OH*	10(4, 6)-11(1,10)	18.79890(6)	18.799050(10)	2(1)	-0.017(2)	2.0(1)
NH2CH2CH2OH*	12(5, 7)-11(6, 5)	19.37373(4)	19.374050(9)	4.9(6)	0.0185(8)	1.78(9)
NH2CH2CH2OH*	6(1, 6)- 5(2, 4)	20.78852(3)	20.788690(6)	2.4(5)	-0.027(2)	0.81(8)
NH2CH2CH2OH*	9(7, 3)-10(6, 4)	20.85275(6)	20.85321(1)	6.6(9)	-0.027(2)	0.81(8)
NH2CH2CH2OH*	4(2, 3)- 4(1, 3)	23.62454(5)	23.624860(2)	4.1(7)	-0.058(2)	3.0(1)
NH2CH2CH2OH*	5(5, 1)- 6(4, 2)	23.92100(4)	23.921370(8)	4.7(5)	-0.012(2)	0.60(9)
NH2CH2CH2OH*	4(2, 3)- 4(1, 3)	24.40433(10)	24.40504(5)	9(1)	0.0056(9)	1.2(2)
NH2CH2CH2OH*	4(2, 2)- 4(1, 3)	25.1704(3)	25.170610(2)	3(4)	0.03(4)	0(1)
NH2CH2CH2OH*	3(1, 3)- 2(1, 2)	28.52871(2)	28.529300(3)	6.2(2)	-0.035(5)	0.8(2)
NH2CH2CH2OH*	8(4, 5)- 9(2, 8)	28.90470(5)	28.90532(10)	6(1)	0.023(2)	1.4(1)
NH2CH2CH2OH*	11(5, 7)-12(3,10)	29.0340(1)	29.03424(1)	3(1)	0.0127(7)	4.6(3)
NH2CH2CH2OH*	7(2, 5)- 6(3, 3)	29.42662(4)	29.427250(7)	6.5(4)	0.010(2)	0.33(8)
NH2CH2CH2OH*	5(3, 2)- 6(0, 6)	29.6107(1)	29.611400(8)	7(1)	0.007(1)	1.1(3)
NH2CH2CH2OH*	13(5, 8)-12(6, 7)	30.12071(9)	30.12099(1)	2.8(9)	-0.008(1)	1.4(2)
NH2CH2CH2OH*	11(2, 9)-11(2,10)	30.30692(10)	30.30720(4)	3(1)	0.011(1)	1.8(2)
NH2CH2CH2OH*	3(2, 1)- 2(2, 0)	30.64900(6)	30.6495(1)	5(1)	-0.008(1)	0.7(2)
NH2CH2CH2OH*	11(2, 9)-11(1,10)	36.33724(4)	36.33798(3)	6.1(4)	0.075(4)	1.50(9)
NH2CH2CH2OH*	12(3, 9)-12(2,10)	35.99628(7)	35.996730(3)	3.7(6)	0.02(5)	0.2(5)
NH2CH2CH2OH*	5(2, 3)- 5(1, 5)	38.50992(6)	38.510840(5)	7.2(5)	-0.033(8)	0.5(1)
NH2CH2CH2OH*	J=3-4	40.53365(7)	40.530500(3)	-23.3(5)	-0.014(4)	0.6(2)
NH2CH2CH2OH*	10(5, 6)-11(3, 9)	43.014423(10)	43.0147(7)	2(5)	0.095(5)	0.36(2)
NH2CH2CH2OH*	13(2,11)-13(2,12)	44.069702(7)	44.07075(2)	7.1(1)	-0.43(4)	0.39(4)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
NH2CH2CH2OH*	13(6, 7)-14(4,10)	44.7217(1)	44.723(2)	5.5(7)	0.008(1)	2.1(3)
NH2CH2CH2OH*	6(3, 3)- 6(2, 4)	45.6258(2)	45.626260(7)	3.0(10)	0.0021(4)	1.7(4)
NH2CH2CH2OH*	15(5,11)-14(6, 9)	46.3628(1)	46.36361(1)	5.2(8)	-0.020(1)	4.0(3)
NH2CH2CH2OH*	5(3, 2)- 5(2, 3)	46.9140(1)	46.914820(7)	5.0(8)	0.011(2)	1.2(3)
NH2CH2CH2OH*	3(3, 1)- 3(2, 2)	47.24255(8)	47.243260(5)	4.5(5)	0.014(3)	0.8(2)
NH2CH2CH2OH*	5(0, 5)- 4(0, 4)	48.92950(7)	48.929950(4)	2.8(4)	0.021(2)	1.2(2)
NH2CH2CH2OH*	7(1, 6)- 6(2, 4)	49.3837(3)	49.384280(5)	4(2)	0.010(3)	1.3(7)
NH2CH2CH2OH*	2(2, 1)- 1(1, 1)	49.55542(9)	49.556360(5)	5.7(6)	0.068(2)	6.9(2)
NH2CH2CH2OH*	6(6, 0)- 7(5, 3)	32.62132(6)	32.62190(1)	5.3(6)	-0.029(5)	0.5(1)
HSiS*	3(1, 3)- 2(1, 2), J=7/2-5/2, F= 4- 3	48.9874(5)	48.98799(5)	4(3)	0.11(6)	1.1(7)
l-C5D	J=21/2-19/2, =3/2, F=21/2-19/2, l=e	47.6562(1)	47.65693(2)	4.5(7)	-0.020(2)	1.7(3)
l-C5H2	4(1, 3)- 3(1, 2)	18.39980(5)	18.399920(2)	2.0(8)	0.029(1)	2.0(1)
l-C5H2	10(1, 9)- 9(1, 8)	45.9985(5)	45.99941(2)	6(3)	-0.0009(5)	3(1)
g'Gg-(CH2OH)2	14(3,11) v= 0 - 14(3,12) v= 1	20.17015(5)	20.170600(3)	6.7(7)	-0.0009(5)	3(1)
g'Gg-(CH2OH)2	9(1, 8) v= 0 - 9(0, 9) v= 0	41.1347(7)	41.135330(2)	4.1(4)	-0.028(2)	1.0(2)
g'Gg-(CH2OH)2	10(0,10) v= 1 - 9(2, 8) v= 1	41.6127(1)	41.613540(3)	6.3(10)	0.014(1)	2.8(3)
g'Gg-(CH2OH)2	10(1, 9) v= 0 - 10(1,10) v= 1	46.24573(2)	46.246080(3)	2.3(1)	0.036(4)	0.72(5)
g'Gg-(CH2OH)2	15(3,12) v= 0 - 15(3,13) v= 1	23.0994(4)	23.099670(3)	3(5)	-0(8)	1(2)
g'Gg-(CH2OH)2	5(1, 4) v= 0 - 4(2, 3) v= 0	27.03726(8)	27.037980(1)	7.9(9)	0.016(5)	0.5(2)
g'Gg-(CH2OH)2	2(1, 1) v= 1 - 1(1, 0) v= 0	28.33093(7)	28.3314(1)	5(1)	0.021(1)	3.1(2)
g'Gg-(CH2OH)2	15(4,12) v= 0 - 15(3,12) v= 1	41.19371(3)	41.194480(3)	5.6(2)	-0.037(5)	0.45(7)
ScF*	J= 2- 1, F1=7/2-5/2, F= 3- 2	47.20521(5)	47.240720(1)	225.3(3)	-0.037(5)	0.45(7)
C4O*	6(5)- 5(4)	23.73225(3)	23.732450(2)	2.6(4)	0.021(1)	1.13(7)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
l-SiC3	5(5)- 4(4)	27.47643(2)	27.477010(2)	6.3(2)	-0.10(3)	0.45(7)
l-SiC3	5(6)- 4(5)	32.0034(1)	32.003860(5)	5(1)	-0.013(1)	2.3(3)
CH3C4H	9(4)- 8(4)	36.63660(9)	36.6374800(1)	7.2(7)	0.064(2)	6.2(2)
SO2	12(3, 9)-13(2,12)	20.335133(7)	20.33540(2)	3.9(3)	-0.22(5)	0.31(6)
SO2	5(2, 4)- 6(1, 5)	23.41392(2)	23.4142500(4)	4.2(3)	-0.26(2)	0.61(6)
SO2	8(1, 7)- 7(2, 6)	25.392311(9)	25.39278(2)	5.5(3)	0.321(6)	1.05(2)
34SO2	4(0,4)-3(1,3)	31.01037(2)	31.01118(5)	7.8(5)	0.030(5)	0.34(7)
34SO2	10(3,7)-11(2,10)	44.22564(9)	44.2262(1)	4.1(9)	0.030(5)	0.34(7)
H35ClCO*	3(1, 2)- 2(1, 1), F=3/2-3/2	36.16819(7)	36.168470(10)	2.3(6)	0.24(2)	1.62(9)
H35ClCO*	9(0, 9)- 8(1, 8), F=15/2-17/2	41.96545(4)	41.96617(2)	5.2(3)	-0.0(4)	0.7(7)
H35ClCO*	4(3, 1)- 3(3, 0), F=5/2-5/2	47.30445(5)	47.3054600(7)	6.4(3)	-0.017(5)	0.3(1)
H35ClCO*	1(1, 1)- 2(0, 2), F=3/2-3/2	48.1832(2)	48.184200(8)	6(1)	0.012(3)	1.5(4)
OS17O*	5(2, 4)- 6(1, 5) , F=5/2-7/2	25.54093(2)	25.5414(1)	6(1)	0.075(2)	0.86(4)
CH3C3N	10(3) - 9(3)	41.31046(9)	41.310810(6)	2.5(7)	-0.009(2)	0.7(2)
H2CCCHCN*	4(1, 4)- 3(1, 3)	20.22457(3)	20.22499(5)	6.3(9)	0.0328(8)	2.44(7)
H2CCCHCN*	5(1, 4)- 5(0, 5)	25.04847(2)	25.0487(2)	3(3)	0.031(6)	0.39(8)
H2CCCHCN*	5(1, 4)- 5(0, 5), F= 5- 5	25.04887(7)	25.04905(2)	2.2(9)	0.034(4)	1.17(9)
H2CCCHCN*	5(2, 3)- 4(2, 4), F= 4- 4	25.84932(4)	25.849970(7)	7.5(5)	-0.054(3)	1.9(1)
H2CCCHCN*	6(5, 1)- 5(5, 5), F= 5- 5	31.0106(3)	31.01143(1)	8(2)	-0.012(6)	2.1(6)
H2CCCHCN*	3(1, 2)- 2(1, 1), F=3/2-3/2	36.16819(4)	36.16911(1)	7.6(4)	0.24(2)	1.62(9)
H2CCCHCN*	6(2, 4)- 7(1, 7), F= 6- 6	37.16161(5)	37.162(1)	7(8)	-0.017(5)	0.4(1)
H2CCCHCN*	5(2, 3)- 6(1, 6)	41.50885(8)	41.510(1)	8(7)	-0.011(2)	1.1(2)
H2CCCHCN*	9(3, 7)- 8(3, 6)	46.5090(1)	46.51011(1)	6.9(8)	-0.015(2)	1.9(3)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
H2CCCHCN*	7(0, 7)- 6(0, 6)	36.06360(1)	36.06469(7)	9.0(6)	-0.146(3)	0.96(3)
H2CCCHCN*	7(0, 7)- 6(0, 6), F= 6- 6	36.06469(3)	36.06577(2)	9.0(3)	-0.053(6)	0.52(7)
HS2*	3(2, 2)- 2(2, 1), J=5/2-3/2, F= 3- 2	41.9622(9)	41.96251(1)	2(6)	-0.0128(7)	0.156(4)
HS2*	3(2, 1)- 2(2, 0), J=5/2-3/2, F= 3- 2	41.96283(6)	41.96328(1)	3.2(4)	-0.005(1)	0.4(1)
CaNC*	N= 3- 2, J=5/2-5/2, F=3/2-3/2	24.2499(1)	24.250190(10)	4(2)	-0.0101(5)	5.7(3)
CaNC*	N= 4- 3, J=9/2-7/2, F=7/2-7/2	32.39228(4)	32.392960(9)	6.3(4)	0.025(1)	4.7(2)
CaNC*	N= 4- 3, J=9/2-7/2	32.39684(8)	32.39767(4)	7.7(8)	0.011(2)	0.9(2)
CaNC*	N= 6- 5, J=13/2-11/2, F=11/2-11/2	48.58418(6)	48.58495(2)	4.7(4)	0.063(5)	1.4(1)
CaNC*	N= 6- 5, J=13/2-11/2, F=13/2-13/2	48.5818(1)	48.58270(1)	5.3(7)	0.044(3)	2.3(3)
CaNC*	N= 6- 5, J=13/2-11/2, F=11/2-11/2	48.58402(5)	48.58495(2)	5.7(3)	0.071(4)	1.3(1)
NCHCCO*	4(0, 4)- 3(0, 3), F= 3- 3	21.48656(5)	21.48697(1)	5.7(6)	0.043(2)	1.9(1)
NCHCCO*	4(1, 4)- 3(0, 3)	47.17699(7)	47.177980(9)	6.3(5)	-0.012(4)	0.5(2)
c-C3H5CN*	9(5, 4)-10(4, 6)	44.1258(2)	44.126660(1)	6(1)	0.0210(9)	6.5(4)
c-C3H5CN*	7(5, 2)- 6(5, 1)	47.2637(1)	47.2646800(4)	6.2(7)	0.024(2)	3.1(2)
CCCS	8-7	46.24573(2)	46.245620(5)	-0.7(1)	0.036(4)	0.72(5)
CH3CH2CH2CN-anti	13(2,11)-14(0,14)	25.31156(3)	25.312190(5)	7.5(4)	0.0275(8)	2.27(8)
CH3CH2CH2CN-anti	12(0,12)-11(1,11)	35.00674(8)	35.007480(5)	6.3(7)	0.010(2)	0.9(2)
CH3CH2CH2CN-anti	10(8, 2)- 9(8, 1)	44.22502(2)	44.225400(7)	2.6(2)	0.024(5)	0.36(7)
CH3CH2CH2CN-gauche	4(1, 4)- 3(1, 3)	22.70291(8)	22.7044(2)	20(3)	-0.020(1)	2.9(2)
CH3CH2CH2CN-gauche	5(0, 5)- 4(1, 4)	24.55373(9)	24.553950(5)	3(1)	0.0092(7)	2.2(2)
CH3CH2CH2CN-gauche	5(3, 3)- 6(1, 6)	27.29318(4)	27.29381(1)	6.9(5)	0.0092(7)	2.2(2)
CH3CH2CH2CN-gauche	15(3,12)-15(2,13)	28.12584(5)	28.126210(6)	4.0(5)	0.012(4)	0.3(1)
CH3CH2CH2CN-gauche	10(4, 7)-10(3, 8)	49.38440(5)	49.38529(1)	5.4(3)	0.019(8)	0.5(2)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
NCC(O)NH2*	7(6, 2)- 8(5, 3), F1= 7- 8, F= 6- 7	23.8425(1)	23.84294(4)	5(1)	0.0139(6)	5.0(3)
NCC(O)NH2*	6(1, 5)- 6(0, 6), F1= 6- 5, F= 6- 5	25.293230(10)	25.29346(7)	2.7(9)	0.208(5)	0.60(2)
NCC(O)NH2*	3(1, 3)- 2(0, 2), F1= 2- 2, F= 2- 2	26.3119(2)	26.31236(9)	5(2)	0.070(2)	0.68(3)
NCC(O)NH2*	9(3, 6)- 9(2, 7), F1= 8- 9, F= 7- 8	28.83281(8)	28.83327(7)	5(1)	0.009(4)	0.3(2)
NCC(O)NH2*	7(1, 6)- 7(1, 7), F1= 7- 6, F= 7- 7	31.08852(2)	31.08923(5)	6.8(5)	-0.081(7)	0.72(5)
NCC(O)NH2*	7(1, 6)- 7(1, 7)	31.08945(5)	31.09012(5)	6.4(7)	-0.081(7)	0.72(5)
NCC(O)NH2*	5(1, 5)- 4(1, 4), F1= 4- 4, F= 5- 5	33.47581(8)	33.47629(8)	4.3(10)	0.013(3)	0.6(2)
NCC(O)NH2*	5(2, 3)- 4(2, 2), F1= 5- 4, F= 4- 3	38.90800(6)	38.90880(1)	6.2(5)	0.042(6)	0.8(1)
NCC(O)NH2*	J=7-7	40.28252(4)	40.28297(8)	3.3(7)	0.062(1)	4.52(10)
NCC(O)NH2*	7(0, 7)- 6(1, 6), F1= 8- 7, F= 8- 8	45.51184(8)	45.51250(7)	4.4(7)	-0.0021(5)	0.7(2)
NCC(O)NH2*	3(2, 2)- 3(1, 3), F1= 3- 2, F= 2- 2	26.51969(5)	26.52051(7)	9.3(10)	-0.023(2)	1.0(1)
CoC*	J= 1- 0, F1=3/2-1/2, F= 2- 3	41.00184(6)	41.0025(3)	5(2)	-0.010(2)	0.5(1)
C13CC4H	J=15/2-13/2, =1/2, F1= 8- 7, F=17/2-15/2, l=f	20.69863(7)	20.699170(6)	8(1)	-0.008(2)	0.7(2)
C413CCH	J=15/2-13/2, =1/2, F1= 8- 7, F=17/2-15/2, l=e	20.74981(8)	20.750210(6)	6(1)	0.0098(9)	1.8(2)
13CC5H	J=15/2-13/2, =1/2, F1= 8- 7, F=17/2-15/2, l=f	20.335(3)	20.335100(6)	7.1(3)	-0(4)	0(4)
C313CC2H	J=19/2-17/2, =1/2, F1= 9- 8, F=19/2-17/2, l=e	26.51759(1)	26.51779(1)	2.3(2)	-0.17(2)	0.57(4)
C5N	N=13-12, J=25/2-25/2, F=23/2-23/2	36.62192(5)	36.62227(6)	2.9(6)	-0.017(3)	0.5(1)
C5N	J=27/2-25/2	39.29011(5)	39.29101(6)	6.9(6)	0.122(3)	4.6(1)
C3H6O2*	3(2, 1)- 2(2, 0) A	20.43398(5)	20.4341400(5)	2.4(7)	0.006(1)	0.5(1)
C3H6O2*	14(5, 9)-13(6, 7) E	20.71945(6)	20.71991(4)	7(1)	-0.029(2)	1.5(2)
C3H6O2*	4(2, 3)- 4(1, 4) A	25.9273(1)	25.9275600(8)	3(2)	0.0069(8)	2.2(3)
C3H6O2*	8(3, 6)- 8(2, 7) E	29.64836(3)	29.648600(3)	2.5(3)	0.0510(10)	3.16(7)
C3H6O2*	8(1, 7)- 8(1, 8) E	31.7686(1)	31.769410(5)	8(1)	0.013(1)	2.7(3)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
C3H6O2*	3(2, 1)- 3(1, 3) E	34.8144(2)	34.815120(3)	6(1)	0.013(2)	2.7(4)
C3H6O2*	7(0, 7)- 6(1, 6) A	41.57919(3)	41.580120(1)	6.7(3)	-0.028(4)	0.51(9)
C3H6O2*	7(4, 3)- 6(4, 2) A	47.29130(8)	47.292040(1)	4.7(5)	0.019(3)	1.0(2)
C3H6O2*	11(3, 9)-11(2,10) A	47.59591(7)	47.596750(1)	5.3(5)	-0.031(3)	1.5(2)
C2H5OOCH-gauche*	3(2, 2)- 3(1, 3)	21.2851(5)	21.2853(1)	3(7)	0.02(5)	0(1)
C2H5OOCH-gauche*	12(4, 9)-11(5, 6)	27.9037(4)	27.90387(8)	2(4)	0.006(3)	1.6(8)
C2H5OOCH-gauche*	12(1,11)-12(1,12)	41.17552(1)	41.17662(8)	8.0(6)	-0.084(2)	1.02(4)
C2H5OOCH-trans*	8(3, 5)- 9(2, 8)	26.08825(9)	26.0889(1)	8(2)	0.0093(9)	1.9(2)
C2H5OOCH-trans*	7(3, 4)- 8(2, 7)	31.40610(5)	31.4063(1)	2(1)	-0.014(3)	0.6(1)
C2H5OOCH-trans*	7(2, 5)- 7(1, 6)	41.18994(5)	41.19054(9)	4.4(8)	-0.051(3)	1.4(1)
C2H5OOCH-trans*	8(4, 5)- 7(4, 4)	43.906742(7)	43.907760(8)	6.95(7)	1.6(1)	0.138(7)
C2H5OOCH-trans*	8(4, 4)- 7(4, 3)	43.907246(5)	43.907910(8)	4.53(7)	-0.094(7)	0.24(2)
C2H5OOCH-trans*	12(1,11)-11(2,10)	32.62554(3)	32.6265(1)	8.9(10)	-0.09(4)	0.5(1)
KCl	3 - 2	22.92530(3)	22.92546(2)	2.1(5)	-0.040(2)	1.20(8)
KCl	5 - 4	37.97290(6)	37.97324(4)	2.7(6)	0.025(9)	0.4(2)
K37Cl	5- 4	37.35052(4)	37.35098(3)	3.7(4)	0.209(7)	2.26(8)
aa-(C2H5)2O*	4(2, 2)- 4(1, 3)	46.6516(1)	46.652490(2)	5.6(9)	0.021(1)	4.9(3)
aa-(C2H5)2O*	2(2, 1)- 2(1, 2)	47.56148(5)	47.561860(2)	2.4(3)	-0.023(6)	0.4(1)
HC5N	J= 9- 8, F= 8- 8	23.96512(4)	23.9656000(2)	6.0(6)	-0.005(1)	0.4(1)
HC5N	J=16-15, l=1e	42.67191(2)	42.672570(2)	4.7(1)	-0.017(3)	0.54(6)
NH2CO2CH3*	3(2, 1)- 3(1, 2) E	18.01872(8)	18.0190200(6)	5(1)	0.009(1)	1.1(2)
NH2CO2CH3*	5(1, 4)- 4(2, 3) E	25.08179(5)	25.0823500(7)	6.6(6)	0.0159(8)	2.0(1)
NH2CO2CH3*	4(2, 3)- 4(1, 4) E	25.29923(3)	25.299590(2)	4.2(4)	-0.067(3)	1.44(8)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
NH2CO2CH3*	8(3, 5)- 8(2, 6) A	26.3587(1)	26.3593000(8)	7(2)	0.008(5)	0.2(2)
NH2CO2CH3*	15(3,13)-14(4,10) E	27.73940(10)	27.740090(4)	7(1)	0.015(2)	1.4(2)
NH2CO2CH3*	5(3, 3)- 5(2, 3) E	31.01121(6)	31.011930(1)	7.0(6)	0.017(6)	0.6(2)
NH2CO2CH3*	15(5,11)-15(4,11) E	33.72419(7)	33.724980(2)	7.1(6)	0.017(6)	0.6(2)
NH2CO2CH3*	6(1, 5)- 5(2, 4) E	35.02449(6)	35.0253500(7)	7.3(5)	-0.011(2)	0.7(1)
NH2CO2CH3*	6(1, 6)- 5(0, 5) E	42.4497(1)	42.450480(1)	5.8(8)	0.0030(4)	1.4(3)
NH2CO2CH3*	10(4, 7)-10(3, 8) E	47.01522(8)	47.016170(2)	6.1(5)	-0.019(3)	1.1(2)
NH2CO2CH3*	9(8, 1)-10(7, 3) E	26.65339(2)	26.653780(2)	4.4(3)	-0.052(5)	0.49(6)
NH2CO2CH3*	7(2, 5)- 6(3, 4) E	28.55793(5)	28.558280(1)	3.7(5)	-0.011(2)	0.6(1)
NH2CO2CH3*	4(2, 2)- 4(1, 4) E	31.8426(2)	31.842970(3)	3(1)	-0.015(3)	0.9(3)
NH2CO2CH3*	12(10, 2)-13(9, 4) E	32.5603(1)	32.560540(4)	2(1)	-0.015(3)	0.9(3)
NH2CO2CH3*	12(3,10)-11(4, 7) A	33.40701(7)	33.407460(1)	4.0(6)	0.037(1)	4.5(2)
NH2CO2CH3*	12(3,10)-11(4, 7) E	33.42239(9)	33.423000(1)	5.5(8)	0.037(1)	4.5(2)
NH2CO2CH3*	10(9, 1)-11(8, 3) E	34.38844(6)	34.388820(3)	3.4(5)	0.007(2)	0.5(1)
NH2CO2CH3*	2(2, 1)- 1(1, 1) E	36.48805(4)	36.488810(1)	6.3(3)	0.045(2)	1.42(9)
NH2CO2CH3*	5(1, 5)- 4(0, 4) A	36.9956(2)	36.9961400(5)	4(1)	-0.018(3)	1.6(4)
NH2CO2CH3*	9(3, 7)- 9(2, 8) E	44.68355(10)	44.6843500(7)	5.4(7)	0.026(1)	5.0(2)
NH2CO2CH3*	4(4, 0)- 4(3, 1) E	48.200584(5)	48.2014300(8)	5.26(3)	-0.36(3)	0.23(2)
NH2CO2CH3*	7(1, 7)- 6(0, 6) A	48.37056(2)	48.3711300(6)	3.5(1)	0.092(6)	0.53(4)
NH2CO2CH3*	5(0, 5)- 4(1, 4) A	32.61524(5)	32.616300(1)	9.8(5)	-0.020(5)	0.4(1)
NH2CO2CH3*	5(0, 5)- 4(1, 4) E	32.66156(4)	32.6620100(8)	4.1(4)	-0.048(7)	0.6(1)
H2NCH2COOH - I*	5(0, 5)- 4(1, 4) E	19.61197(3)	19.612250(6)	4.4(5)	0.010(2)	0.32(7)
H2NCH2COOH - I*	7(6, 1)- 8(5, 4), F= 7- 8	20.734316(6)	20.735(2)	3.3(4)	-0.067(2)	0.40(1)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
H2NCH2COOH - I*	7(1, 6)- 7(1, 7), F= 7- 7	25.7154(1)	25.71584(5)	5(2)	-0.057(6)	1.8(2)
H2NCH2COOH - I*	4(0, 4)- 3(0, 3), F= 3- 4	26.2130(1)	26.213480(3)	6(1)	0.0090(8)	2.7(3)
H2NCH2COOH - I*	5(1, 5)- 4(1, 4), F= 4- 4	31.15852(6)	31.159160(8)	6.2(6)	-0.011(2)	0.8(1)
H2NCH2COOH - I*	13(3,11)-12(4, 8), F=13-12	32.2712(1)	32.2719(1)	7(2)	-0.035(9)	1.2(2)
H2NCH2COOH - I*	13(4, 9)-12(5, 8), F=13-12	35.13130(6)	35.132(2)	6.0(9)	0.017(4)	0.5(1)
H2NCH2COOH - I*	6(0, 6)- 5(0, 5)	38.01651(5)	38.0169(5)	3(4)	-0.019(6)	1.6(2)
H2NCH2COOH - I*	15(2,13)-16(1,16), F=15-16	38.08095(10)	38.082(3)	5.1(4)	-0.03(5)	1(2)
H2NCH2COOH - I*	2(1, 1)- 2(0, 2)	46.75489(8)	46.755820(2)	5.9(5)	-0.018(4)	0.7(2)
H2NCH2COOH - I*	7(7, 0)- 8(6, 3), F= 7- 8	35.35940(5)	35.3602(5)	7(5)	-0.017(4)	0.5(1)
H2NCH2COOH - II*	15(4,12)-16(2,15), F=14-15	23.44380(4)	23.4441(8)	4.1(4)	0.062(3)	1.61(9)
H2NCH2COOH - II*	3(1, 3)- 2(1, 2), F= 2- 2	19.5654(1)	19.565630(3)	4(2)	0.007(1)	2.0(3)
H2NCH2COOH - II*	9(2, 7)- 9(1, 8), F= 8- 8	26.79094(5)	26.79166(1)	8.0(6)	-0.014(3)	0.4(1)
H2NCH2COOH - II*	12(4, 9)-11(5, 6), F=12-11	28.17795(4)	28.1785(3)	5(3)	-0.026(3)	0.77(9)
H2NCH2COOH - II*	6(3, 3)- 6(2, 4)	28.6044(1)	28.604710(7)	3(1)	-0.026(5)	2.3(3)
H2NCH2COOH - II*	13(2,11)-14(1,14), F=13-14	30.73902(5)	30.7394(8)	4(8)	-0.010(2)	0.6(1)
H2NCH2COOH - II*	6(4, 2)- 6(3, 3), F= 6- 6	45.07789(4)	45.0787(1)	5.6(8)	0.024(2)	1.4(1)
CaCl*	N= 2- 1, J=3/2-3/2	18.12304(5)	18.123160(1)	2.0(8)	0.014(1)	1.3(1)
CaCl*	N= 2- 1, J=3/2-1/2, F= 1- 1	18.19596(2)	18.196260(5)	4.9(3)	0.013(1)	0.34(4)
CaCl*	N= 4- 3, J=7/2-5/2	36.39182(3)	36.392480(2)	5.4(2)	0.164(6)	1.01(8)
CaCl*	N= 4- 3, J=7/2-5/2, F= 2- 3	36.4091(1)	36.409650(3)	4.2(9)	0.027(4)	1.5(3)
DCCCCCN*	8- 7, F= 8- 8	20.33511(3)	20.3353600(5)	3.7(4)	-0.32(1)	0.70(6)
c-C6H4*	11(7, 4)-11(6, 5)	19.05075(6)	19.051000(1)	4.0(9)	-0.010(2)	0.5(1)
c-C6H4*	J=21/2-19/2 , =1/2, l=e	29.33261(6)	29.33323(7)	6.4(10)	0.013(3)	0.6(1)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
c-C6H4*	14(9, 6)-14(8, 7)	38.98452(4)	38.98536(4)	6.5(5)	-0.033(8)	0.4(1)
TiO2	2(1, 1)- 2(0, 2)	25.877043(10)	25.877300(2)	3.0(1)	0.118(2)	0.65(2)
TiO2	2(2, 0)- 3(1, 3)	29.42306(7)	29.423370(2)	3.1(7)	-0.006(2)	0.5(2)
C4S*	N=14-13, J=15-14	44.428570(3)	44.42985(3)	8.6(2)	0.0763(8)	6.27(8)
ScCl*	2- 1, F1=7/2-7/2, F= 3- 4	20.60477(9)	20.6051200(7)	5(1)	0.010(1)	1.3(2)
l-HC6N*	N= 7- 6, J= 6- 7, F1= 6- 7, F=13/2-15/2	18.9860(1)	18.9864(1)	6(3)	0.007(1)	1.3(3)
l-HC6N*	N=11-10, J=11-11, F1=11-11, F=23/2-23/2	31.62518(3)	31.6257(1)	5(1)	-0.015(3)	0.30(7)
C6O*	2(3)- 1(2)	37.09542(5)	37.0958(2)	3(2)	-0.027(2)	4.9(4)
CH3C5N	14(9)-13(9), F=13-12	21.77576(9)	21.77514(2)	-9(1)	0.011(1)	1.9(2)
CH3C5N	16(10)-15(10), F=16-15	24.88224(6)	24.88289(2)	7.9(8)	-0.010(2)	0.5(1)
CH3CHNH2COOH - I*	5(2, 3)- 5(1, 5), F= 5- 5	19.01125(5)	19.011540(2)	4.6(7)	-0.024(2)	1.1(1)
CH3CHNH2COOH - I*	4(4, 1)- 4(2, 2), F= 4- 4	26.33192(3)	26.332590(2)	7.6(4)	-0.80(5)	14.7(2)
CH3CHNH2COOH - I*	5(3, 3)- 4(3, 2), F= 4- 3	27.26756(8)	27.2681000(5)	5.9(9)	-0.80(5)	14.7(2)
CH3CHNH2COOH - I*	11(3, 9)-11(2,10)	27.47860(4)	27.478790(4)	2.1(4)	-0.035(3)	0.95(9)
CH3CHNH2COOH - I*	3(3, 0)- 2(2, 1), F= 2- 2	28.16838(5)	28.168570(1)	2.0(5)	0.037(2)	2.0(1)
CH3CHNH2COOH - I*	14(8, 7)-14(7, 8)	33.42054(6)	33.420920(8)	3.4(5)	0.046(1)	3.6(1)
CH3CHNH2COOH - I*	3(3, 1)- 2(0, 2), F= 4- 3	37.88302(5)	37.883750(1)	5.8(4)	0.022(5)	0.5(1)
CH3CHNH2COOH - I*	14(9, 6)-14(8, 7)	38.64256(5)	38.643450(7)	6.9(4)	0.021(5)	0.4(1)
CH3CHNH2COOH - I*	11(10, 1)-11(9, 2)	44.37307(8)	44.374010(5)	6.3(6)	0.0163(8)	3.6(2)
CH3CHNH2COOH - II*	3(1, 3)- 2(1, 2), F= 2- 2	19.5654(1)	19.565630(3)	4(2)	0.007(1)	2.0(3)
CH3CHNH2COOH - II*	8(2, 7)- 8(0, 8)	22.92377(6)	22.924230(7)	6.0(7)	-0.232(4)	0.60(1)
CH3CHNH2COOH - II*	14(3,11)-14(3,12)	33.749500(4)	33.75003(1)	4.7(1)	-0.027(7)	0.4(1)
CH3CHNH2COOH - II*	5(2, 4)- 4(1, 4), F= 5- 4	38.64328(5)	38.644130(2)	6.6(4)	0.023(8)	0.2(1)

Table 1—Continued

Molecule Name	Quantum Numbers	Observed Frequency (GHz)	Rest Frequency (GHz)	Velocity (km/s)	Peak (Jy)	Width (MHz)
CH2OHCOCH2OH*	2(2, 1)- 2(1, 2)	24.08376(4)	24.084370(3)	7.6(4)	-0.043(4)	0.48(8)
CH2OHCOCH2OH*	8(0, 8)- 7(1, 7)	25.17065(4)	25.171300(1)	7.8(5)	-0.043(4)	0.48(8)
CH2OHCOCH2OH*	A0(27,73)-A1(26,76)	29.67731(3)	29.67797(4)	6.7(5)	-0.020(9)	0.2(1)
CH2OHCOCH2OH*	14(3,12)-15(0,15)	30.5260(1)	30.52645(3)	5(1)	0.0121(6)	5.1(3)
CH2OHCOCH2OH*	2(2, 1)- 1(1, 0)	30.72537(6)	30.725630(8)	2.5(5)	-0.011(4)	0.3(1)
CH2OHCOCH2OH*	B0(25,85)-A9(26,84)	30.9759(1)	30.976(1)	4.4(7)	0.010(2)	1.1(3)
CH2OHCOCH2OH*	A5(11,95)-A4(12,92)	33.85484(7)	33.85515(10)	3(1)	0.014(3)	0.6(2)
CH2OHCOCH2OH*	9(1, 9)- 8(0, 8)	36.08758(5)	36.088550(7)	8.0(4)	-0.016(5)	0.3(1)
CH2OHCOCH2OH*	A5(23,82)-A4(24,81)	38.51786(6)	38.5189(3)	8(2)	-0.091(5)	1.5(1)
CH2OHCOCH2OH*	J=6-6	39.52717(7)	39.527710(5)	4.1(6)	0.044(1)	5.9(2)
CH2OHCOCH2OH*	A7(30,77)-A8(29,80)	44.90645(5)	44.908(1)	8(7)	-0.014(2)	0.8(1)
CH2OHCOCH2OH*	12(1,12)-11(0,11)	44.97001(3)	44.970370(2)	2.4(2)	-0.017(4)	0.24(6)
CH2OHCOCH2OH*	B0(24,86)-A9(25,85)	45.66582(3)	45.6664(8)	4(5)	-0.0051(9)	0.34(7)
CH2OHCOCH2OH*	B0(24,86)-A9(25,85)	47.65797(4)	47.65878(2)	5.1(3)	-0.06(1)	0.7(1)
H2CCHCCH(C4H4)*	5(4, 2)- 4(4, 1)	45.39189(6)	45.3922600(3)	2.5(4)	-0.0030(5)	0.6(1)
Unidentified*	U-30857.16	30.85665(8)	30.8572(1)	5(1)	0.019(1)	2.4(2)

Table 2. Unidentified Spectral Lines of W49N

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
17.96986(6)	-0.012(2)	0.8(1)
17.97800(3)	0.0220(7)	1.63(6)
17.992153(6)	1.274(8)	1.85(1)
17.999497(9)	0.132(2)	1.47(2)
18.00121(4)	0.023(2)	0.9(1)
18.01634(1)	-0.046(3)	0.38(3)
18.01872(8)	0.009(1)	1.1(2)
18.045476(9)	0.276(3)	1.89(2)
18.05281(3)	0.0280(8)	1.51(8)
18.0546(1)	0.0086(8)	1.4(2)
18.09990(3)	0.009(1)	0.47(7)
18.10068(4)	0.006(1)	0.40(9)
18.12304(5)	0.014(1)	1.3(1)
18.12599(4)	-0.016(2)	0.8(1)
18.16134(2)	-0.016(2)	0.46(6)
18.19596(2)	0.013(1)	0.34(4)
18.24097(8)	0.068(3)	3.3(2)
18.28441(3)	-0.020(2)	0.50(6)
18.32712(2)	0.136(3)	2.11(6)
18.33458(4)	0.0108(7)	1.17(9)
18.33947(2)	-0.50(3)	0.67(5)
18.34078(2)	-0.45(2)	0.37(3)
18.3421(6)	-0.475(7)	0.0810(6)
18.342(1)	0.382(7)	0.130(1)
18.34304(2)	0.18(1)	0.40(4)
18.34719(2)	0.0439(9)	1.79(4)
18.39980(5)	0.029(1)	2.0(1)
18.45868(2)	-0.081(3)	0.17(2)
18.49943(4)	0.02(2)	0.2(3)
18.50187(3)	-0.304(7)	2.13(6)
18.57808(6)	0.006(1)	0.5(1)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
18.58070(8)	0.005(1)	0.5(2)
18.58066(7)	0.006(1)	0.8(2)
18.59967(6)	-0.081(3)	2.7(1)
18.660719(9)	0.361(3)	1.97(2)
18.66838(3)	0.033(1)	1.39(7)
18.73452(1)	0.0679(10)	1.75(3)
18.74241(7)	0.0105(8)	1.9(2)
18.7442(2)	0.015(1)	0.1114(2)
18.768738(8)	1.74(1)	1.97(2)
18.77639(1)	0.176(2)	1.54(3)
18.77826(5)	0.030(3)	0.9(1)
18.79882(10)	-0.013(2)	1.8(2)
18.80795(3)	0.045(1)	1.99(6)
18.807478(8)	-0.058(3)	0.36(2)
18.83464(3)	0.0281(8)	2.17(8)
18.85875(7)	0.0112(8)	1.9(2)
18.87435(2)	0.153(2)	2.15(4)
18.88209(9)	0.014(2)	1.1(2)
18.88368(3)	-0.040(6)	0.33(6)
18.88772(7)	0.006(1)	0.8(2)
18.94443(3)	0.0214(7)	2.02(8)
18.9860(1)	0.007(1)	1.3(3)
19.01125(5)	-0.024(2)	1.1(1)
19.01269(8)	-0.023(4)	0.8(1)
19.01409(4)	-0.026(3)	0.4(1)
19.01480(5)	-0.010(3)	0.3(1)
19.05075(6)	-0.010(2)	0.5(1)
19.05208(5)	-0.012(2)	0.6(1)
19.05344(3)	-0.019(3)	0.23(6)
19.1148(1)	0.0099(6)	4.2(3)
19.1236(2)	0.0071(6)	4.2(4)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
19.20347(6)	0.0165(7)	2.7(1)
19.20896(6)	0.006(2)	0.3(2)
19.217434(4)	-0.075(1)	0.419(10)
19.21827(9)	0.007(2)	0.4(2)
19.21868(9)	-0.006(3)	0.3(2)
19.24560(2)	0.072(2)	1.83(5)
19.25060(6)	0.011(1)	1.2(1)
19.26115(2)	-0.033(5)	0.31(6)
19.28386(2)	0.096(1)	2.87(4)
19.304253(7)	0.375(3)	2.04(2)
19.31216(2)	0.0390(9)	1.37(4)
19.31395(9)	0.006(1)	0.9(2)
18.49838(5)	-0.060(5)	0.84(8)
18.498751(9)	0.14(1)	0.25(2)
18.499(6)	0.05(8)	0(8)
18.50189(1)	-0.278(4)	1.75(3)
18.52770(5)	0.0187(10)	1.7(1)
18.5293(2)	0.003(2)	0.7(5)
18.660713(8)	0.364(3)	1.94(2)
18.66834(3)	0.039(1)	1.56(7)
18.6702(1)	0.008(1)	1.1(3)
18.73451(2)	0.074(1)	1.97(5)
18.74233(9)	0.0110(8)	2.6(2)
18.75915(5)	-0.005(1)	0.4(1)
18.768736(8)	1.77(1)	1.99(2)
18.776390(8)	0.176(2)	1.50(2)
18.77824(4)	0.028(2)	0.84(9)
18.79890(6)	-0.017(2)	2.0(1)
18.807484(7)	-0.056(2)	0.40(2)
18.80797(2)	0.044(1)	1.83(4)
18.83462(4)	0.029(1)	2.21(9)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
18.85874(8)	0.0121(9)	2.1(2)
18.87436(1)	0.154(2)	2.06(3)
18.88205(4)	0.0177(8)	1.63(9)
18.88368(2)	-0.042(7)	0.32(8)
18.8946(2)	0.0052(5)	4.8(6)
18.9035(1)	0.0094(7)	4.3(4)
18.94442(4)	0.0216(10)	2.1(1)
18.98604(9)	0.0076(9)	1.5(2)
19.01123(4)	-0.025(2)	1.1(1)
19.01263(3)	-0.025(2)	0.79(8)
19.01362(5)	-0.016(3)	0.24(6)
19.01410(2)	-0.028(3)	0.38(6)
19.01477(4)	-0.012(4)	0.28(10)
19.05015(4)	0.007(2)	0.3(1)
19.0507(1)	-0.005(3)	0.3(3)
19.052(3)	0.01(6)	1(3)
19.0520(3)	-0.0(1)	1(1)
19.0530(3)	0.010(2)	1.1(4)
19.05341(2)	-0.017(3)	0.27(9)
19.14950(3)	-0.074(3)	1.55(6)
19.20337(5)	0.0176(8)	2.2(1)
19.217436(7)	-0.080(3)	0.42(2)
19.21876(7)	-0.007(5)	0.3(2)
19.24561(2)	0.075(2)	1.83(5)
19.25065(6)	0.010(1)	1.2(1)
19.25835(9)	-0.014(3)	0.7(2)
19.26113(4)	-0.036(8)	0.25(9)
19.26409(5)	-0.020(5)	0.24(7)
19.28392(2)	0.068(1)	2.33(5)
19.304243(10)	0.389(4)	2.04(2)
19.31216(2)	0.0419(7)	1.41(4)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
19.31389(6)	0.0102(7)	1.3(1)
19.37373(4)	0.0185(8)	1.78(9)
19.44355(1)	0.163(2)	2.16(3)
19.45147(7)	0.0138(9)	1.8(2)
19.4535(8)	0.0011(10)	1(2)
19.52765(8)	0.0080(7)	1.8(2)
19.5654(1)	0.007(1)	2.0(3)
19.590664(8)	1.91(2)	2.06(2)
19.59863(2)	0.191(5)	1.77(6)
19.6006(1)	0.023(7)	0.9(3)
19.62119(6)	0.0257(8)	3.1(2)
19.65344(9)	0.0129(9)	2.5(2)
19.74656(4)	0.032(1)	1.82(9)
19.756542(7)	-0.134(4)	0.43(2)
19.77602(2)	0.096(1)	2.85(4)
19.7845(1)	0.0086(9)	2.7(3)
19.81592(7)	0.019(2)	1.5(2)
19.83727(1)	-0.027(1)	0.44(3)
19.83788(3)	0.011(4)	0.24(10)
19.590685(5)	1.839(10)	2.07(1)
19.59868(1)	0.188(3)	1.69(3)
19.60070(5)	0.034(3)	0.9(1)
19.60608(8)	0.011(2)	1.1(2)
19.60861(4)	0.013(2)	0.54(9)
19.61197(3)	0.010(2)	0.32(7)
19.62142(8)	0.022(1)	2.4(2)
19.63632(4)	-0.038(3)	0.86(9)
19.70296(5)	-0.020(3)	0.04(3)
19.70399(7)	-0.01(2)	0.2(2)
19.71725(1)	-0.086(3)	0.17(1)
19.74647(3)	0.040(1)	1.94(8)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
19.756535(7)	-0.113(4)	0.45(2)
19.77605(2)	0.094(1)	2.68(5)
19.83724(2)	-0.029(2)	0.42(4)
19.96647(1)	-0.059(5)	0.43(3)
19.96676(7)	0.025(4)	1.06(9)
19.977728(5)	0.418(2)	2.08(1)
19.98590(3)	0.053(1)	1.94(7)
19.98799(9)	0.012(2)	1.2(2)
20.03579(2)	0.164(3)	1.79(4)
20.05137(5)	0.019(1)	1.9(1)
20.06828(7)	0.0171(8)	2.8(1)
20.07(6)	0.0368(9)	0.105(2)
20.17016(3)	0.014(5)	0.3(1)
20.17070(9)	0.007(2)	0.7(2)
20.18033(3)	-0.014(2)	0.46(8)
20.18163(3)	-0.019(2)	0.57(6)
20.22461(3)	0.034(1)	1.99(8)
20.22465(3)	0.0312(8)	2.10(6)
20.26336(3)	-0.028(2)	0.80(6)
20.27439(3)	-0.095(4)	1.49(7)
20.28665(3)	0.053(1)	2.45(6)
20.32511(2)	0.090(1)	2.23(4)
20.33454(4)	-0.24(7)	0.54(7)
20.3352(2)	-0.15(5)	1.0(2)
20.335133(7)	-0.22(5)	0.31(6)
20.370373(8)	-0.075(3)	0.43(2)
20.37176(5)	-0.011(3)	0.4(1)
20.43109(1)	-0.049(3)	0.37(3)
20.43398(5)	0.006(1)	0.5(1)
20.461311(6)	1.96(1)	2.16(1)
20.46965(1)	0.191(2)	1.67(3)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
20.47152(6)	0.024(3)	0.9(1)
20.49412(5)	0.035(2)	1.9(1)
20.547(3)	-0.0(4)	0(3)
20.5478(1)	-0.022(4)	0.5(2)
20.60477(9)	0.010(1)	1.3(2)
20.65511(5)	-0.68(1)	13.2(1)
20.65257(2)	0.239(3)	3.30(5)
20.6504(3)	-0.24(1)	20.5(2)
20.682919(6)	0.414(2)	2.12(1)
20.69139(3)	0.040(1)	1.57(8)
20.6932(1)	0.009(1)	1.2(3)
20.69863(7)	-0.008(2)	0.7(2)
20.718151(7)	-0.138(4)	0.50(2)
20.71945(6)	-0.029(2)	1.5(2)
20.734316(6)	-0.067(2)	0.40(1)
20.74981(8)	0.0098(9)	1.8(2)
20.77157(4)	-0.019(3)	0.51(9)
20.78852(3)	-0.027(2)	0.81(8)
20.79012(4)	-0.019(2)	0.8(1)
20.79150(2)	-0.033(3)	0.41(4)
20.803747(6)	-0.121(3)	0.53(1)
20.80516(4)	-0.027(2)	0.92(9)
20.81384(3)	0.040(1)	1.95(7)
20.85138(1)	-0.047(3)	0.38(2)
20.8527(3)	-0.007(2)	0.1774(3)
20.89516(2)	0.091(2)	2.45(5)
20.90356(6)	0.009(1)	0.9(1)
20.93240(8)	0.0185(8)	3.9(2)
20.95000(8)	0.0221(8)	4.5(2)
20.99346(3)	-0.094(6)	0.33(6)
20.17018(2)	0.013(3)	0.31(6)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
20.1708(1)	0.007(1)	1.1(3)
20.18025(3)	-0.010(2)	0.45(8)
20.18165(3)	-0.017(1)	0.75(6)
20.22457(3)	0.0328(8)	2.44(7)
20.2332(1)	0.0058(9)	1.7(3)
20.26331(2)	-0.038(2)	0.80(4)
20.27206(5)	0.020(1)	1.8(1)
20.28665(2)	0.042(1)	1.82(5)
20.32512(2)	0.087(1)	2.31(4)
20.33258(3)	0.008(1)	0.46(7)
20.334(3)	-0(3)	0(2)
20.335(3)	-0(4)	0(4)
20.33511(3)	-0.32(1)	0.70(6)
20.370371(9)	-0.071(3)	0.39(2)
20.43110(1)	-0.062(3)	0.40(2)
20.44559(7)	-0.007(1)	0.9(2)
20.461306(7)	1.90(1)	2.17(2)
20.469654(8)	0.187(2)	1.72(2)
20.47161(5)	0.025(2)	0.9(1)
20.49406(4)	0.033(1)	2.19(10)
20.54726(3)	-0.035(4)	0.50(5)
20.54787(7)	-0.023(2)	0.7(1)
20.60487(8)	0.008(1)	1.2(2)
20.682907(5)	0.393(2)	2.07(1)
20.69126(8)	0.029(8)	1.3(1)
20.6925(7)	0.009(3)	2.0(10)
20.69863(6)	-0.009(1)	0.9(1)
20.71814(1)	-0.139(6)	0.49(2)
20.71964(3)	-0.022(2)	0.60(8)
20.734325(6)	-0.070(2)	0.41(1)
20.74210(6)	0.0108(9)	1.6(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
20.75009(8)	0.0075(9)	1.4(2)
20.78851(4)	-0.023(2)	0.81(9)
20.79012(4)	-0.019(2)	0.8(1)
20.79152(2)	-0.028(3)	0.45(5)
20.803738(7)	-0.128(3)	0.52(2)
20.80510(5)	-0.027(2)	1.3(1)
20.81387(2)	0.0457(8)	2.08(4)
20.82448(4)	-0.067(4)	1.55(10)
20.851377(8)	-0.043(2)	0.35(2)
20.85217(6)	0.008(1)	0.6(1)
20.8774(2)	0.0050(6)	3.4(5)
20.89518(2)	0.086(1)	2.47(4)
20.90360(8)	0.007(1)	0.8(2)
20.93246(6)	0.0141(6)	2.8(2)
20.93551(8)	0.006(1)	0.9(2)
20.95018(7)	0.0171(7)	3.4(2)
20.993477(10)	-0.107(3)	0.39(2)
20.99388(1)	0.050(4)	0.30(5)
20.99427(6)	-0.027(2)	2.3(1)
21.06959(1)	-0.056(3)	0.50(3)
21.0709(1)	-0.012(1)	1.6(3)
21.133165(9)	-0.051(2)	0.45(2)
21.19108(3)	-0.64(1)	3.43(7)
21.22769(3)	0.0395(7)	2.93(6)
21.284204(6)	-0.193(4)	0.58(1)
21.28565(6)	-0.023(3)	0.9(1)
21.294737(10)	0.160(1)	2.37(2)
21.30359(5)	0.014(1)	1.3(1)
21.35953(2)	0.0464(8)	2.25(5)
21.384289(9)	1.80(1)	2.31(2)
21.39303(1)	0.173(3)	1.81(4)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
21.39510(8)	0.023(3)	1.0(2)
21.42157(1)	0.388(4)	2.45(3)
21.43035(2)	0.0370(7)	1.86(5)
21.43256(7)	0.0070(10)	1.0(2)
21.48677(2)	0.077(1)	2.56(4)
21.49577(9)	0.0065(10)	1.2(2)
21.28422(4)	-0.21(4)	0.5(1)
21.2851(5)	0.02(5)	0(1)
21.29472(1)	0.103(1)	1.80(4)
21.30065(1)	0.046(3)	0.33(2)
21.30159(2)	0.033(4)	0.24(4)
21.35924(4)	0.0312(10)	2.8(1)
21.37264(5)	0.022(1)	1.8(1)
21.38425(1)	1.46(1)	2.39(2)
21.39218(2)	-0.078(5)	0.21(2)
21.39296(2)	0.143(2)	2.00(4)
21.39521(7)	0.023(3)	1.0(2)
21.42153(1)	0.303(3)	2.44(3)
21.43033(2)	0.0280(8)	1.66(6)
21.43233(9)	0.005(1)	0.7(2)
21.48656(5)	0.043(2)	1.9(1)
21.58309(3)	-0.033(3)	0.78(7)
21.58468(4)	-0.025(3)	0.70(9)
21.586512(6)	-0.306(4)	0.50(1)
21.63671(4)	-0.009(2)	0.44(9)
21.66910(6)	0.009(2)	0.6(1)
21.67019(4)	0.014(2)	0.64(10)
21.70225(2)	-0.10(2)	0.44(7)
21.7031(1)	0.03(3)	0.6(3)
21.7026(1)	-0.04(3)	1.6(3)
21.70916(2)	-0.016(2)	0.31(4)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
21.72660(6)	0.0107(8)	1.6(1)
21.73521(5)	0.007(2)	0.4(1)
21.75485(5)	0.0203(9)	2.4(1)
21.77031(7)	0.011(1)	1.5(2)
21.77576(9)	0.011(1)	1.9(2)
21.92441(4)	0.020(1)	1.7(1)
21.94967(8)	-0.147(7)	3.6(2)
21.96375(2)	0.117(2)	2.40(4)
21.97280(7)	0.0192(8)	2.2(2)
21.9751(2)	0.0067(10)	1.6(4)
22.10088(2)	0.064(1)	2.60(5)
22.19589(1)	0.312(3)	2.51(3)
22.20490(3)	0.0304(9)	2.22(7)
22.20758(2)	0.023(2)	0.35(4)
22.29933(5)	0.0235(8)	3.4(1)
22.32433(8)	0.0129(5)	4.4(2)
22.34107(2)	-0.024(3)	0.34(5)
22.34256(7)	-0.012(2)	1.1(2)
22.35255(3)	-0.009(1)	0.54(8)
22.363605(9)	1.50(1)	2.47(2)
22.37274(1)	0.149(2)	1.96(3)
22.37491(7)	0.019(2)	1.2(2)
22.40135(8)	0.0109(7)	2.5(2)
22.40667(2)	0.0058(5)	0.38(4)
22.48198(1)	0.160(4)	1.08(3)
22.4854(2)	-0.01(1)	0.6(5)
22.4863(2)	0.01(2)	0.6(5)
22.487(2)	-0.01(2)	2(2)
22.48796(10)	0.009(3)	0.5(3)
22.4886(2)	-0.014(4)	0.3(3)
22.50943(2)	0.0316(6)	2.25(5)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
22.54989(2)	-0.012(3)	0.34(9)
22.5504(3)	-0.005(1)	0.9(5)
22.57561(3)	-0.0458(7)	4.20(7)
22.62420(5)	0.015(2)	0.9(1)
22.64868(2)	-0.022(2)	0.54(5)
22.65182(1)	-0.164(9)	0.43(3)
22.661207(9)	0.1037(8)	2.28(2)
21.8464(1)	0.0061(9)	1.5(2)
21.96376(2)	0.121(2)	2.58(4)
21.9726(1)	0.014(1)	1.7(2)
21.9748(4)	0.0058(9)	2.4(8)
22.10088(2)	0.064(1)	2.69(5)
22.1107(1)	0.0079(6)	3.1(3)
22.19589(1)	0.307(3)	2.52(3)
22.20487(3)	0.0292(9)	2.16(8)
22.20758(2)	0.018(2)	0.38(5)
22.26285(3)	0.017(2)	0.40(7)
22.26383(4)	0.018(2)	0.75(9)
22.29914(5)	0.0222(7)	3.1(1)
22.3244(2)	0.0053(6)	2.7(4)
22.34107(2)	-0.026(4)	0.32(6)
22.35251(4)	-0.007(1)	0.5(1)
22.358541(9)	-0.116(3)	0.138(7)
22.363607(9)	1.48(1)	2.45(2)
22.37274(1)	0.148(1)	1.97(3)
22.37493(6)	0.021(2)	1.2(1)
22.40140(7)	0.0116(6)	2.7(2)
22.4112(1)	0.0033(7)	1.2(3)
22.41334(8)	0.0057(6)	1.5(2)
22.48197(1)	0.158(4)	1.07(3)
22.4854(1)	-0.017(2)	0.9(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
22.487(1)	-0.01(1)	1(1)
22.48860(4)	-0.013(3)	0.30(9)
22.49940(4)	-0.091(4)	1.80(10)
22.50934(2)	0.0277(5)	2.22(5)
22.55003(6)	-0.012(1)	1.4(2)
22.62422(4)	0.014(1)	0.92(10)
22.64870(4)	-0.024(2)	0.74(10)
22.651815(5)	-0.155(4)	0.41(2)
22.65255(5)	-0.047(4)	2.7(1)
22.66117(1)	0.113(1)	2.50(3)
22.67063(8)	0.0082(10)	1.4(2)
22.6727(2)	0.002(1)	0.7(5)
22.68723(1)	-0.279(6)	0.83(2)
22.6887(1)	-0.044(4)	1.5(2)
22.70291(8)	-0.020(1)	2.9(2)
22.731272(7)	-0.209(5)	0.58(2)
22.73271(4)	-0.042(4)	1.0(1)
22.73861(2)	0.0677(10)	2.81(5)
22.74805(5)	0.008(1)	0.7(1)
22.77481(6)	0.0116(7)	2.0(1)
22.78815(3)	-0.020(8)	0.6(1)
22.7887(5)	0.007(4)	1.1(5)
22.81554(10)	0.0078(7)	2.2(2)
22.83305(2)	-0.164(6)	0.56(4)
22.8339(1)	0.06(2)	0.6(3)
22.8346(8)	-0.01(1)	1(1)
22.86191(5)	0.0214(9)	2.7(1)
22.87519(2)	-0.076(2)	2.00(6)
22.90376(4)	-0.008(1)	0.51(9)
22.923775(6)	-0.232(4)	0.60(1)
22.92532(4)	-0.047(3)	1.3(1)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
22.96468(5)	0.0085(9)	0.9(1)
23.008024(5)	0.274(1)	2.34(1)
23.01738(2)	0.0277(8)	1.77(6)
23.02266(4)	0.006(1)	0.30(7)
23.03399(4)	0.018(2)	0.8(1)
23.04460(5)	-0.011(2)	0.7(1)
23.0976(4)	-0.07(7)	0.7(6)
23.0975(2)	-0.08(4)	1.6(6)
23.0994(4)	-0(8)	1(2)
23.11525(3)	0.0250(7)	2.14(7)
23.11987(1)	-0.030(2)	0.45(3)
23.14918(2)	-0.068(4)	0.16(2)
23.222(1)	-0.430(7)	0.106(1)
22.923775(5)	-0.193(3)	0.60(1)
22.92530(3)	-0.040(2)	1.20(8)
22.99848(3)	0.1068(10)	6.13(7)
23.008066(4)	0.305(1)	2.260(9)
23.01735(2)	0.0297(8)	1.72(6)
23.03401(4)	0.017(1)	1.2(1)
23.0435(1)	0.005(1)	1.0(3)
23.09654(8)	-0.021(4)	0.4(2)
23.097654(9)	-0.108(7)	0.59(3)
23.0985(2)	-0.034(3)	2.2(3)
23.11523(2)	0.0385(8)	2.38(5)
23.11986(1)	-0.026(2)	0.43(3)
23.230982(3)	-0.136(2)	0.471(7)
23.23194(8)	0.009(2)	0.5(2)
23.23261(6)	-0.015(2)	0.7(1)
23.25302(3)	-0.0212(8)	1.81(8)
23.3210(1)	0.0079(7)	2.1(3)
23.32380(8)	0.0139(7)	2.2(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
23.34589(4)	0.009(2)	0.37(9)
23.38849(1)	0.130(1)	2.63(3)
23.40367(1)	1.49(2)	2.57(3)
23.4128(1)	0.110(9)	1.8(2)
23.41344(7)	-0.15(5)	0.3(2)
23.4132(1)	-0.2(1)	0.4(1)
23.41392(2)	-0.26(2)	0.61(6)
23.41555(10)	0.020(3)	1.0(2)
23.44380(4)	0.062(3)	1.61(9)
23.48348(2)	-0.079(3)	0.15(1)
23.5178(1)	0.0090(5)	4.4(3)
23.62454(5)	-0.058(2)	3.0(1)
23.656176(6)	-0.099(5)	0.41(2)
23.6575(1)	-0.014(2)	2.0(3)
23.68981(3)	-0.08(1)	0.30(6)
23.69138(1)	-0.17(2)	0.28(4)
23.6923(7)	0.04(4)	0.4(9)
23.69423(5)	0.26(1)	1.41(9)
23.69584(8)	0.04(1)	0.5(2)
23.71786(3)	-0.040(5)	0.52(8)
23.7193(1)	-0.04(3)	0.4(2)
23.71976(7)	-0.1(3)	0.6(6)
23.721(1)	0.04(6)	1(2)
23.72136(1)	-0.19(4)	0.35(3)
23.72225(5)	0.27(5)	0.6(1)
23.72344(3)	-0.04(1)	0.3(3)
23.72420(9)	0.027(4)	0.9(2)
23.72954(8)	0.004(2)	0.3(2)
23.73225(3)	0.021(1)	1.13(7)
23.74331(2)	0.0345(7)	2.41(6)
23.81717(2)	-0.080(2)	1.84(5)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
23.82624(3)	-0.108(3)	2.02(7)
23.8425(1)	0.0139(6)	5.0(3)
23.860277(6)	0.312(2)	2.48(1)
23.86532(7)	-0.04(1)	0.5(2)
23.86659(8)	-0.05(2)	0.3(2)
23.86719(8)	-0.05(2)	0.3(2)
23.86795(5)	0.069(10)	0.8(2)
23.86915(1)	0.52(8)	0.38(3)
23.8703(1)	-4.97(4)	0.8(5)
23.8707(6)	-8.37(3)	1.1(5)
23.8705(3)	11.84(6)	1.2(2)
23.89121(7)	0.0147(8)	2.5(2)
23.92100(4)	-0.012(2)	0.60(9)
23.99047(7)	0.0105(6)	2.5(2)
24.03848(2)	-0.11(3)	0.52(8)
24.03905(7)	-0.17(2)	1.15(7)
24.04498(4)	0.0236(8)	2.7(1)
24.06735(3)	0.009(1)	0.58(8)
24.08281(2)	-29.01(3)	1(1)
24.08281(2)	28.860(9)	1(1)
24.08376(4)	-0.043(4)	0.48(8)
24.08984(1)	0.0656(7)	2.70(3)
24.0995(2)	0.0041(7)	2.4(5)
24.1345(2)	-0.017(5)	0.7(5)
24.1(7)	-0.12(7)	0.117(4)
24.1361(5)	-0.04(3)	0.8(6)
24.138287(6)	-0.313(5)	0.72(1)
24.14010(5)	-0.093(4)	1.3(1)
24.14720(1)	0.122(1)	2.57(3)
24.15710(6)	0.0107(8)	1.7(1)
24.203991(5)	-0.124(2)	0.54(1)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
24.20569(5)	-0.020(1)	1.3(1)
24.2499(1)	-0.0101(5)	5.7(3)
24.27414(2)	-0.046(2)	0.17(2)
24.31853(2)	-0.022(1)	0.73(4)
24.32556(4)	0.010(1)	0.56(9)
23.656181(5)	-0.113(4)	0.45(2)
23.65719(9)	-0.027(7)	2.1(2)
23.66395(9)	-0.005(1)	0.7(2)
23.689781(9)	-0.079(5)	0.27(2)
23.69153(4)	-0.16(3)	0.36(9)
23.6933(4)	-0.086(3)	0.1009(4)
23.69411(3)	0.27(2)	0.87(8)
23.69549(4)	0.056(4)	1.2(1)
23.71786(3)	-0.039(5)	0.53(8)
23.71942(2)	-0.073(5)	0.50(5)
23.7204(4)	0.04(9)	0.4(9)
23.7209(4)	0.040(8)	1(1)
23.72138(2)	-0.22(4)	0.39(5)
23.722275(8)	0.265(5)	0.65(2)
23.7234(2)	-0.06(9)	0.8(4)
23.724(1)	0.04(5)	1.1(10)
23.73227(4)	0.018(1)	1.11(10)
23.74330(2)	0.0377(6)	2.46(5)
23.81722(3)	-0.082(2)	1.98(6)
23.82623(3)	-0.110(3)	1.99(7)
23.8417(1)	0.0115(9)	2.6(2)
23.860254(6)	0.296(1)	2.38(1)
23.86533(9)	-0.04(2)	0.4(2)
23.8666(9)	-0.0(5)	0(1)
23.867(4)	-0.1(8)	0.61(1)
23.86773(9)	0.04(2)	0.4(3)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
23.86952(3)	0.325(5)	0.01(9)
23.86953(2)	0.85(1)	1.41(8)
23.8711(1)	-0.11(9)	0.6(5)
23.872(1)	0.04(3)	1(2)
23.89133(8)	0.0151(8)	3.1(2)
23.92098(3)	-0.013(1)	0.53(7)
23.96512(4)	-0.005(1)	0.4(1)
23.9676(1)	0.0037(6)	1.5(3)
23.99056(7)	0.0107(6)	2.5(2)
24.03848(2)	-0.11(2)	0.51(9)
24.03905(6)	-0.17(1)	1.25(6)
24.04490(4)	0.0249(9)	2.44(10)
24.06736(6)	0.006(2)	0.5(1)
24.08241(2)	-0.19(1)	0.52(4)
24.08314(3)	-0.207(8)	0.79(6)
24.08987(1)	0.0532(7)	2.24(3)
24.0994(1)	0.0065(6)	2.7(3)
24.1345(5)	-0.016(7)	0.6(9)
24.1361(4)	-0.04(2)	0.6(6)
24.13831(1)	-0.35(2)	0.79(4)
24.1400(1)	-0.14(6)	1.4(3)
24.147255(9)	0.1315(9)	2.63(2)
24.15697(7)	0.0125(8)	2.3(2)
24.17439(5)	-0.048(2)	2.3(1)
24.203989(5)	-0.127(3)	0.53(1)
24.20569(6)	-0.020(2)	1.5(1)
24.31853(2)	-0.023(1)	0.78(5)
24.32555(4)	0.010(2)	0.54(9)
24.3784(1)	0.0076(7)	2.5(3)
24.39421(3)	0.0370(7)	3.00(6)
24.40433(10)	0.0056(9)	1.2(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
24.47685(6)	0.0154(6)	2.9(1)
24.50929(1)	1.49(1)	2.68(3)
24.51931(1)	0.152(1)	2.17(3)
24.52175(5)	0.025(2)	1.3(1)
24.52931(5)	-0.019(2)	0.8(1)
24.53182(1)	-0.288(4)	0.81(3)
24.53369(3)	-0.065(3)	1.22(7)
24.5501(2)	0.0041(6)	2.8(6)
24.55373(9)	0.0092(7)	2.2(2)
24.559443(1)	-1.6(2)	0.17(1)
24.65890(2)	-0.017(2)	0.50(6)
24.66056(4)	-0.016(1)	0.95(8)
24.66741(4)	0.0197(6)	2.27(9)
24.72233(3)	-0.163(3)	4.06(8)
24.74176(2)	-0.136(1)	4.06(5)
24.755127(8)	0.321(2)	2.67(2)
24.76527(3)	0.0315(8)	2.11(7)
24.7678(1)	0.007(1)	1.3(2)
24.80571(1)	0.0587(6)	2.60(3)
24.8160(2)	0.0049(7)	2.4(4)
24.82412(3)	-0.068(3)	0.16(2)
24.880545(9)	-0.054(2)	0.46(2)
24.65890(2)	-0.021(2)	0.54(5)
24.66054(3)	-0.020(1)	1.02(7)
24.66747(4)	0.0317(7)	2.60(9)
24.66914(8)	0.005(2)	0.5(2)
24.72186(2)	-0.281(3)	4.14(6)
24.74157(3)	-0.216(3)	4.61(7)
24.755135(6)	0.417(2)	2.56(1)
24.76523(2)	0.0435(8)	2.15(5)
24.7679(1)	0.005(1)	1.0(3)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
24.80577(1)	0.0813(9)	2.68(3)
24.81606(7)	0.0083(9)	1.4(2)
24.88054(1)	-0.073(3)	0.49(3)
24.8812(2)	0.006(2)	0.7(6)
24.88224(6)	-0.010(2)	0.5(1)
24.927586(6)	0.37(1)	0.54(1)
24.92818(3)	0.164(5)	0.88(5)
24.932350(9)	0.484(7)	0.49(2)
24.93322(2)	0.380(6)	0.65(7)
24.93401(6)	0.088(7)	0.7(1)
24.939199(8)	0.1499(10)	2.48(2)
24.94957(5)	0.0134(10)	1.5(1)
24.957918(6)	0.28(1)	0.37(2)
24.95828(2)	0.261(8)	1.08(2)
25.016945(7)	0.23(1)	0.40(2)
25.01732(2)	0.233(8)	1.08(3)
25.04847(2)	0.031(6)	0.39(8)
25.04887(7)	0.034(4)	1.17(9)
25.0522(2)	-0.03(7)	1(1)
25.0546(9)	0.03(1)	3.8(10)
25.054853(7)	-0.39(1)	0.83(3)
25.05671(5)	-0.11(2)	1.3(2)
25.06920(3)	0.0406(9)	2.32(6)
25.08179(5)	0.0159(8)	2.0(1)
25.086926(6)	-0.36(9)	0.20(5)
25.12406(2)	0.26(1)	1.01(6)
25.15843(2)	-0.086(2)	0.15(2)
25.1698(4)	-0.02(5)	0.4(4)
25.1704(3)	0.03(4)	0(1)
25.1704(6)	-0.04(8)	0.8(4)
25.293230(10)	0.208(5)	0.60(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
25.29395(3)	0.097(3)	0.80(5)
25.29923(3)	-0.067(3)	1.44(8)
25.31156(3)	0.0275(8)	2.27(8)
25.39088(8)	0.027(8)	0.6(2)
25.392311(9)	0.321(6)	1.05(2)
25.540169(10)	0.148(5)	0.61(2)
25.54089(3)	0.073(2)	0.93(6)
25.55028(1)	0.0800(8)	2.90(3)
25.5607(1)	0.0066(7)	2.2(3)
25.5636(2)	0.0031(10)	1.1(4)
25.6094(2)	0.0050(6)	3.0(4)
25.685658(8)	1.88(1)	2.79(2)
25.695601(7)	0.486(3)	2.47(2)
25.6988(3)	0.005(8)	0.3(5)
25.70631(3)	0.063(1)	3.24(7)
25.7127(3)	0.011(2)	1.5(6)
25.713913(8)	-0.282(7)	0.72(2)
25.7154(1)	-0.057(6)	1.8(2)
25.73372(8)	0.0138(8)	2.9(2)
25.76618(1)	0.1530(9)	2.72(3)
25.76926(5)	0.0408(10)	2.33(10)
25.77679(6)	0.0122(9)	1.8(2)
25.7793(1)	0.005(1)	0.9(3)
25.877043(10)	0.118(2)	0.65(2)
25.87783(2)	0.054(2)	0.73(5)
25.97819(4)	0.0248(8)	2.38(9)
25.17019(6)	-0.032(3)	1.2(1)
25.29321(1)	0.14(1)	0.46(3)
25.29364(4)	0.119(7)	1.21(5)
25.31161(4)	0.0305(9)	2.70(9)
25.39105(8)	0.03(3)	0.2(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
25.392313(10)	0.333(6)	1.05(2)
25.5011(1)	0.0085(7)	2.5(2)
25.540174(7)	0.159(3)	0.62(1)
25.54093(2)	0.075(2)	0.86(4)
25.55028(1)	0.0782(8)	2.76(3)
25.5609(1)	0.0080(7)	2.2(3)
25.5636(2)	0.0054(8)	1.9(4)
25.685667(5)	1.894(7)	2.69(1)
25.695589(9)	0.553(4)	2.71(2)
25.70618(4)	0.040(2)	2.51(10)
25.7112(1)	-0.014(3)	1.0(3)
25.713898(6)	-0.28(1)	0.68(2)
25.71507(10)	-0.09(1)	2.3(1)
25.73367(9)	0.0145(8)	3.4(2)
25.76619(2)	0.176(1)	3.05(5)
25.76945(7)	0.053(2)	2.4(1)
25.77683(7)	0.0121(9)	1.9(2)
25.7793(1)	0.006(1)	1.0(3)
25.84932(4)	-0.054(3)	1.9(1)
25.87704(1)	0.122(2)	0.68(2)
25.87785(2)	0.056(2)	0.71(5)
25.9273(1)	0.0069(8)	2.2(3)
25.97817(3)	0.0287(7)	2.71(8)
26.03632(5)	-0.017(5)	1.1(2)
26.0370(2)	0.014(4)	2.1(2)
26.08825(9)	0.0093(9)	1.9(2)
26.1611(1)	0.0087(8)	3.1(3)
26.2130(1)	0.0090(8)	2.7(3)
26.31189(2)	0.070(2)	0.68(3)
26.31267(3)	0.035(1)	0.72(6)
26.33192(3)	-0.80(5)	14.7(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
26.3587(1)	0.008(5)	0.2(2)
26.3590(4)	0.004(5)	0(1)
26.4103(1)	-0.006(1)	1.1(2)
26.4956(1)	0.047(3)	3.1(2)
26.51759(1)	-0.17(2)	0.57(4)
26.51969(5)	-0.023(2)	1.0(1)
25.96935(6)	0.030(8)	0.5(2)
25.9709(3)	0.016(3)	2.4(8)
25.9779(2)	0.017(5)	1.4(4)
25.98795(8)	-0.021(7)	0.5(2)
26.06902(5)	-0.021(4)	0.5(1)
26.1274(1)	0.016(4)	1.2(3)
26.15376(4)	-0.028(5)	0.48(9)
26.21454(5)	-0.029(6)	0.5(1)
26.26133(4)	0.023(6)	0.31(9)
26.31182(4)	0.072(10)	0.58(8)
26.3126(1)	0.045(5)	0.9(2)
26.32510(5)	0.047(2)	2.7(1)
26.3521(1)	0.024(2)	4.2(3)
26.4866(3)	-0.011(3)	2.6(6)
26.4957(1)	0.029(3)	2.4(2)
26.51456(10)	-0.019(7)	0.8(3)
26.51753(2)	-0.14(4)	0.52(7)
26.51950(5)	-0.059(3)	1.5(1)
26.63004(3)	0.135(2)	3.04(6)
26.65339(2)	-0.052(5)	0.49(6)
26.6687(1)	0.027(2)	2.3(2)
26.68376(1)	0.348(3)	2.98(3)
26.69459(7)	0.034(2)	2.4(2)
26.77598(2)	0.132(4)	1.18(4)
26.79094(5)	-0.014(3)	0.4(1)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
26.8238(2)	0.014(3)	2.1(5)
26.84586(4)	0.039(7)	0.6(1)
26.84634(8)	0.046(5)	1.8(1)
26.89172(5)	0.016(4)	0.4(1)
26.92126(9)	-0.014(2)	1.2(2)
26.938536(9)	1.71(1)	3.00(2)
26.94950(2)	0.146(3)	2.06(5)
27.0208(2)	0.014(2)	2.6(4)
27.03726(8)	0.016(5)	0.5(2)
27.08326(1)	-0.218(6)	0.56(3)
27.08414(7)	-0.10(2)	0.4(1)
27.13175(6)	0.071(2)	3.8(1)
27.24951(8)	0.042(2)	4.2(2)
27.29301(4)	0.024(4)	0.38(9)
27.29386(2)	0.056(3)	0.78(6)
27.29801(10)	0.013(4)	0.6(2)
27.31448(5)	0.016(4)	0.5(1)
27.32707(3)	-0.014(7)	0.0(1)
27.35922(3)	0.051(8)	0.37(7)
27.08325(2)	-0.219(6)	0.56(3)
27.084(1)	-0.112(5)	0.62(5)
27.12142(7)	0.016(3)	0.8(2)
27.1314(1)	0.069(6)	2.7(2)
27.1340(7)	0.018(4)	3.2(9)
27.14194(9)	0.018(2)	1.4(2)
27.24958(7)	0.042(1)	4.1(2)
27.25966(6)	-0.013(3)	0.5(1)
27.29304(4)	0.021(3)	0.43(10)
27.29388(3)	0.056(5)	0.70(7)
27.29723(6)	-0.024(9)	0.7(2)
27.29728(7)	0.034(9)	2.0(3)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
27.38387(7)	0.029(1)	3.2(2)
27.45116(10)	0.014(2)	1.0(2)
27.4529(2)	0.013(2)	1.7(4)
27.47129(9)	0.054(5)	1.0(2)
27.4722(2)	0.029(6)	0.9(3)
27.4733(4)	-0.016(2)	4.2(8)
27.47643(2)	-0.10(3)	0.45(7)
27.47860(4)	-0.035(3)	0.95(9)
27.53306(2)	0.128(2)	3.01(5)
27.5446(1)	0.031(2)	3.0(3)
27.55436(5)	-0.021(3)	0.6(1)
27.56588(6)	0.014(2)	0.7(1)
27.62285(4)	-0.015(3)	0.39(8)
27.72343(2)	0.383(4)	3.33(4)
27.73467(6)	0.045(1)	3.1(2)
27.73727(8)	0.019(3)	1.2(2)
27.73940(10)	0.015(2)	1.4(2)
27.8124(2)	0.010(1)	3.7(5)
27.8718(1)	0.010(2)	1.3(3)
27.87990(6)	0.010(3)	0.4(1)
27.88115(6)	-0.011(3)	0.4(1)
27.9037(4)	0.006(3)	1.6(8)
27.9058(2)	0.016(1)	2.4(5)
27.93123(3)	0.137(9)	0.68(4)
27.93197(6)	0.088(5)	0.86(9)
27.9406(2)	0.011(1)	3.2(4)
27.97074(3)	0.070(1)	3.43(7)
28.03215(4)	0.041(1)	3.1(1)
28.12394(8)	0.022(1)	2.6(2)
28.12584(5)	0.012(4)	0.3(1)
28.13688(5)	-0.013(2)	0.6(1)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
28.16838(5)	0.037(2)	2.0(1)
28.17795(4)	-0.026(3)	0.77(9)
28.23272(9)	-0.012(3)	0.9(2)
28.274185(6)	1.766(7)	3.17(2)
28.28576(6)	0.177(8)	2.6(2)
28.2886(3)	0.02(1)	0.9(6)
28.31473(4)	0.036(6)	0.41(8)
28.31576(8)	0.016(6)	0.4(2)
28.32334(5)	-0.010(1)	0.7(1)
28.33093(7)	0.021(1)	3.1(2)
28.4264(1)	0.014(1)	3.3(3)
28.47727(2)	0.144(2)	3.49(5)
28.4891(1)	0.009(3)	0.9(4)
28.274166(7)	1.660(7)	3.17(2)
28.28570(7)	0.160(8)	2.6(2)
28.2885(6)	0.01(1)	1(1)
28.31472(2)	0.045(4)	0.38(4)
28.31578(5)	0.017(4)	0.4(1)
28.47734(2)	0.124(1)	2.97(4)
28.4887(1)	0.016(1)	2.9(2)
28.52660(2)	-0.040(7)	0.816(4)
28.52871(6)	-0.035(5)	0.8(2)
28.53084(3)	-0.065(9)	0.39(6)
28.53180(3)	-0.029(5)	0.37(8)
28.55793(5)	-0.011(2)	0.6(1)
28.56572(3)	-0.024(2)	0.68(7)
28.56766(4)	-0.026(3)	0.68(9)
28.568(1)	-0.01(3)	0(2)
28.56984(1)	-0.052(4)	0.41(4)
28.57082(3)	-0.027(5)	0.5(1)
28.603178(5)	-0.161(4)	0.53(1)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
28.6044(1)	-0.026(5)	2.3(3)
28.6259(1)	0.012(1)	2.3(3)
28.817913(6)	0.336(1)	3.08(2)
28.82966(6)	0.033(1)	2.8(1)
28.83281(8)	0.009(4)	0.3(2)
28.84522(2)	0.096(1)	3.19(4)
28.85723(2)	0.392(9)	1.47(4)
28.89221(9)	0.014(1)	2.2(2)
28.90470(5)	0.023(2)	1.4(1)
28.96855(2)	-0.059(4)	0.57(5)
28.97361(1)	-0.68(2)	0.70(2)
28.97437(5)	-0.24(1)	0.88(8)
29.0340(1)	0.0127(7)	4.6(3)
29.10384(6)	-0.008(2)	0.5(1)
29.13272(8)	0.0151(7)	3.5(2)
29.3192(4)	0.027(7)	1.2(6)
29.31976(1)	-0.16(2)	0.35(3)
29.32053(3)	0.269(7)	1.22(8)
29.32185(7)	-0.035(7)	0.6(2)
29.33261(6)	0.013(3)	0.6(1)
29.42216(4)	-0.008(2)	0.3(1)
29.42306(7)	-0.006(2)	0.5(2)
29.46526(1)	0.136(1)	3.38(3)
29.47715(10)	0.0137(9)	3.1(2)
29.58299(4)	-0.024(3)	0.8(1)
29.58525(7)	-0.023(2)	1.9(2)
29.63579(5)	0.017(1)	1.4(1)
29.64836(3)	0.0510(10)	3.16(7)
29.42662(4)	0.010(2)	0.33(8)
29.46528(1)	0.1375(9)	3.39(3)
29.4767(3)	0.012(2)	3.1(6)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
29.5398(1)	0.0095(10)	3.0(4)
29.58300(4)	-0.022(2)	0.71(8)
29.58509(5)	-0.019(2)	1.0(1)
29.6107(1)	0.007(1)	1.1(3)
29.6122(2)	0.004(1)	1.1(6)
29.63587(8)	0.012(2)	1.1(2)
29.67731(3)	-0.020(9)	0.2(1)
29.67796(4)	0.029(2)	0.9(1)
29.67881(7)	0.006(7)	0.3(4)
29.690(1)	0.05(2)	7(3)
29.69968(5)	1.3(3)	2.8(3)
29.71173(2)	0.158(2)	2.77(4)
29.71484(8)	0.019(3)	1.0(2)
29.75645(3)	0.062(1)	3.67(7)
29.85665(4)	0.011(2)	0.38(9)
29.86396(7)	-0.011(3)	0.5(2)
29.912848(6)	-0.116(3)	0.53(2)
29.91495(5)	-0.013(4)	0.4(1)
29.93028(9)	0.0186(8)	4.1(2)
29.970730(10)	0.350(2)	3.47(2)
29.98290(7)	0.020(2)	1.7(2)
29.99546(5)	-0.037(6)	0.6(1)
29.99758(3)	-0.18(6)	0.23(10)
30.00002(1)	-0.3(5)	0.84(9)
30.00069(2)	0.39(2)	0.79(6)
30.0023(2)	-0.04(2)	0.8(4)
30.0193(1)	0.010(1)	2.2(3)
30.12071(9)	-0.008(1)	1.4(2)
30.20424(3)	-0.147(10)	0.74(4)
30.20512(2)	-0.08(3)	0.49(8)
30.23523(7)	0.007(2)	0.6(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
30.30692(10)	0.011(1)	1.8(2)
30.36099(6)	0.010(2)	0.7(1)
30.36274(10)	0.006(1)	0.9(2)
30.3844(1)	0.005(2)	0.6(2)
30.41001(4)	0.011(2)	0.46(9)
30.49933(2)	0.135(2)	3.74(5)
30.5124(5)	0.037(7)	4.2(7)
30.516(3)	0.007(7)	4(3)
30.5260(1)	0.0121(6)	5.1(3)
30.53569(3)	-0.013(2)	0.35(6)
30.56853(5)	0.0295(8)	3.6(1)
30.64900(6)	-0.008(1)	0.7(2)
30.67999(5)	0.007(2)	0.4(1)
30.6809(2)	0.0079(8)	3.4(3)
30.70665(2)	0.0566(6)	3.18(4)
30.73902(5)	-0.010(2)	0.6(1)
30.7405(1)	-0.007(1)	1.3(3)
30.7652(1)	0.033(2)	3.3(3)
30.49948(2)	0.163(1)	3.62(4)
30.51264(6)	0.051(1)	3.9(2)
30.5154(2)	0.008(3)	0.7(4)
30.56884(6)	0.039(1)	4.2(1)
30.70660(3)	0.067(1)	3.71(8)
30.72537(6)	-0.011(4)	0.3(1)
30.80787(6)	-0.010(1)	0.8(1)
30.85665(8)	0.019(1)	2.4(2)
30.8760(1)	-0.0086(10)	2.5(3)
30.9759(1)	0.010(2)	1.1(3)
31.00898(3)	0.017(4)	0.32(10)
31.0106(3)	-0.012(6)	2.1(6)
31.01037(2)	0.030(5)	0.34(7)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
31.01121(6)	0.017(6)	0.6(2)
31.05073(7)	0.011(4)	0.4(2)
31.08852(2)	-0.081(7)	0.72(5)
31.08942(5)	-0.03(1)	0.36(8)
31.15852(6)	-0.011(2)	0.8(1)
31.185940(10)	0.413(2)	3.52(2)
31.19863(5)	0.038(1)	2.6(1)
31.222546(8)	1.915(9)	3.54(2)
31.23529(8)	0.19(1)	2.9(2)
31.3396(1)	0.011(2)	1.6(3)
31.40420(4)	-0.014(5)	0.3(1)
31.40610(5)	-0.014(3)	0.6(1)
31.423229(8)	-0.115(4)	0.55(2)
31.4264(2)	-0.010(2)	2.0(5)
31.48172(5)	0.044(1)	3.6(1)
31.58254(3)	0.161(2)	3.84(6)
31.59498(8)	0.026(1)	3.2(2)
31.62518(3)	-0.015(3)	0.30(7)
31.65487(4)	-0.014(3)	0.42(10)
31.69781(3)	0.075(1)	3.29(7)
31.7218(1)	0.008(3)	0.9(3)
31.75185(4)	-0.013(2)	0.7(1)
31.7686(1)	0.013(1)	2.7(3)
31.80839(7)	-0.016(2)	1.1(2)
31.8426(1)	-0.015(3)	0.9(3)
31.8445(2)	-0.014(2)	2.2(5)
31.48163(5)	0.044(1)	3.4(1)
31.58259(2)	0.166(2)	3.94(6)
31.59528(7)	0.024(1)	2.9(2)
31.62514(3)	-0.019(4)	0.32(9)
31.65483(4)	-0.017(2)	0.65(9)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
31.69789(4)	0.091(2)	4.13(8)
31.72641(7)	-0.015(2)	1.3(2)
31.75183(8)	-0.012(2)	1.3(2)
31.88001(5)	-0.012(3)	0.4(1)
31.8811(1)	-0.007(4)	0.8(4)
31.92059(2)	-0.17(1)	0.46(3)
31.92140(7)	-29.66(4)	1(1)
31.9263(2)	-0.009(2)	1.8(5)
32.0034(1)	-0.013(1)	2.3(3)
32.03548(4)	0.015(3)	0.29(6)
32.0706(1)	-0.019(2)	2.6(2)
32.13490(9)	-0.011(2)	1.0(2)
32.1373(1)	-0.018(1)	2.8(3)
32.19373(4)	-0.015(2)	0.8(1)
32.19819(7)	0.014(1)	1.8(2)
32.25808(7)	0.017(1)	2.0(2)
32.2712(1)	-0.035(9)	1.2(2)
32.273(2)	-0.004(2)	2(3)
32.33127(7)	-0.010(2)	0.7(2)
32.39228(10)	0.025(1)	4.7(2)
32.39684(10)	0.011(2)	0.9(2)
32.43156(4)	0.0476(10)	3.98(9)
32.46764(1)	0.404(2)	3.68(2)
32.48115(4)	0.043(1)	2.8(1)
32.4839(1)	0.008(2)	1.2(3)
32.5615(2)	-0.010(2)	1.7(4)
32.61524(5)	-0.020(5)	0.4(1)
32.62064(4)	-0.058(4)	0.61(8)
32.62132(6)	-0.029(5)	0.5(1)
32.62298(3)	-0.048(5)	0.39(7)
32.62351(6)	-0.032(5)	0.5(1)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
32.62554(3)	-0.09(4)	0.5(1)
32.63260(4)	-0.027(5)	0.39(8)
32.65398(3)	-0.046(4)	0.62(7)
32.65557(5)	0.035(4)	0.9(1)
32.65805(7)	0.071(3)	1.7(2)
32.65892(4)	-0.07(2)	0.36(9)
32.6594(1)	0.036(7)	0.6(2)
32.66156(4)	-0.048(7)	0.6(1)
32.6628(1)	-0.049(2)	2.1(2)
32.66585(8)	-0.013(6)	0.3(2)
32.71769(5)	0.152(3)	5.0(1)
32.73174(2)	0.096(1)	3.97(5)
32.7640(1)	0.018(1)	3.6(3)
32.81456(10)	0.019(1)	2.6(2)
32.851368(9)	1.917(9)	3.64(2)
32.86474(2)	0.183(2)	3.04(5)
32.61524(5)	-0.020(5)	0.4(1)
32.62064(4)	-0.058(4)	0.61(8)
32.62132(6)	-0.029(5)	0.5(1)
32.62298(3)	-0.048(5)	0.39(7)
32.62351(6)	-0.032(5)	0.5(1)
32.62554(3)	-0.09(4)	0.5(1)
32.63260(4)	-0.027(5)	0.39(8)
32.65398(3)	-0.046(4)	0.62(7)
32.65557(5)	0.035(4)	0.9(1)
32.65805(7)	0.071(3)	1.7(2)
32.65892(4)	-0.07(2)	0.36(9)
32.6594(1)	0.036(7)	0.6(2)
32.66156(4)	-0.048(7)	0.6(1)
32.6628(1)	-0.049(2)	2.1(2)
32.66585(8)	-0.013(6)	0.3(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
32.6837(1)	-0.012(2)	1.9(3)
32.71773(2)	0.125(1)	3.35(4)
32.73167(3)	0.089(1)	3.69(6)
32.81457(9)	0.018(1)	2.2(2)
32.851368(8)	1.933(9)	3.63(2)
32.86474(1)	0.188(2)	2.98(4)
32.8685(1)	0.020(2)	1.7(2)
32.93652(6)	0.014(4)	0.4(1)
32.99427(5)	0.016(4)	0.4(1)
33.15505(3)	-0.040(3)	0.74(7)
33.16002(5)	0.015(3)	0.7(1)
33.1996(1)	-0.013(1)	2.7(3)
33.21159(4)	0.035(3)	1.06(9)
33.29402(6)	0.012(2)	0.8(1)
33.34635(9)	0.012(3)	0.8(2)
33.40701(7)	0.037(1)	4.5(2)
33.42054(6)	0.046(1)	3.6(1)
33.47581(8)	0.013(3)	0.6(2)
33.5319(1)	-0.032(1)	4.9(3)
33.70338(6)	-0.059(3)	2.5(1)
33.74950(4)	-0.027(7)	0.4(1)
33.76991(8)	-0.027(1)	4.0(2)
33.81146(6)	0.077(3)	3.6(1)
33.82062(1)	0.424(3)	4.01(3)
33.83447(6)	0.039(1)	3.2(1)
33.85484(7)	0.014(3)	0.6(2)
33.90782(3)	0.169(2)	4.27(6)
33.9208(1)	0.031(1)	4.5(3)
33.9254(2)	0.007(3)	1.1(5)
33.58746(6)	0.009(3)	0.4(1)
33.58905(7)	-0.008(3)	0.4(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
33.70363(3)	-0.043(1)	1.76(6)
33.72330(6)	0.009(2)	0.5(1)
33.74446(7)	-0.013(3)	0.7(2)
33.74692(1)	-0.044(5)	0.28(4)
33.74809(8)	0.009(4)	0.2(1)
33.7496(1)	-0.03(9)	0.5(4)
33.7499(7)	0.03(7)	0.7(3)
33.81140(5)	0.062(2)	3.6(1)
33.820702(7)	0.435(2)	3.70(2)
33.83443(3)	0.043(1)	2.56(8)
33.90782(2)	0.176(1)	4.07(4)
33.92123(8)	0.0239(8)	4.6(2)
33.98811(7)	-0.008(1)	0.8(2)
34.02233(4)	0.011(2)	0.30(7)
34.09600(4)	-0.15(1)	0.52(8)
34.09643(5)	-0.08(2)	0.37(8)
34.13919(6)	0.032(1)	3.9(1)
34.18241(3)	0.033(2)	1.39(8)
34.25149(5)	0.008(6)	0.3(2)
34.35024(3)	0.031(3)	0.71(8)
34.37243(8)	-0.009(2)	0.6(2)
34.38367(2)	0.019(5)	0.27(9)
34.38844(6)	0.007(2)	0.5(1)
34.44946(4)	0.039(1)	3.10(10)
34.46800(6)	-0.010(2)	0.6(1)
34.595509(10)	1.96(1)	3.87(2)
34.60964(2)	0.182(2)	3.12(5)
34.61316(9)	0.022(3)	1.2(2)
34.66013(6)	-0.013(2)	0.9(2)
34.8144(2)	0.013(2)	2.7(4)
34.85665(6)	0.028(3)	1.1(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
34.92811(8)	-0.011(2)	1.0(2)
34.93937(3)	0.099(1)	3.82(6)
34.95189(4)	-0.022(2)	0.95(9)
34.96987(5)	-0.018(4)	0.5(1)
34.59550(2)	1.84(1)	3.98(4)
34.60965(2)	0.168(2)	2.95(5)
34.61309(10)	0.018(4)	0.9(2)
34.66016(6)	-0.010(2)	0.5(1)
34.83728(7)	0.009(3)	0.5(2)
34.85671(5)	0.032(3)	1.2(1)
34.8774(1)	0.009(2)	1.5(3)
34.9190(1)	0.017(2)	2.9(3)
34.93922(3)	0.091(1)	3.78(7)
34.95173(6)	-0.022(3)	0.9(1)
34.96987(7)	-0.015(4)	0.6(2)
35.00674(8)	0.010(2)	0.9(2)
35.02449(6)	-0.011(2)	0.7(1)
35.02574(5)	-0.011(2)	0.5(1)
35.06447(5)	-0.02(1)	0.5(2)
35.06449(5)	0.03(1)	1.3(2)
35.13130(6)	0.017(4)	0.5(1)
35.13377(8)	0.029(2)	2.7(2)
35.15636(2)	0.158(2)	4.09(5)
35.17109(8)	0.023(1)	2.6(2)
35.17348(7)	0.013(3)	0.7(2)
35.249886(9)	0.426(2)	3.94(2)
35.26402(4)	0.062(1)	4.27(10)
35.26796(6)	0.013(4)	0.4(1)
35.29442(8)	0.015(2)	1.5(2)
35.31108(6)	0.013(2)	0.7(1)
35.32334(7)	0.018(3)	1.1(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
35.35940(5)	-0.017(4)	0.5(1)
35.3714(1)	-0.012(3)	1.2(3)
35.40458(5)	-0.014(2)	0.6(1)
35.5084(1)	0.019(1)	2.7(3)
35.5108(1)	0.011(2)	1.1(3)
35.52117(4)	0.047(1)	3.3(1)
35.61066(7)	0.011(3)	0.6(2)
35.6628(1)	-0.012(2)	1.3(3)
35.78165(4)	0.015(5)	0.3(1)
35.78461(7)	0.013(2)	0.8(2)
35.8438(1)	0.013(2)	1.2(3)
35.93148(8)	-0.011(2)	0.9(2)
35.96444(9)	0.010(3)	0.5(2)
36.0086(2)	-0.012(2)	2.1(4)
35.78163(6)	0.017(4)	0.5(1)
35.7841(1)	0.015(2)	2.0(3)
35.80930(3)	0.190(2)	6.94(7)
36.465458(9)	2.054(9)	4.18(2)
36.39068(3)	0.099(6)	0.69(7)
36.39175(2)	0.161(5)	1.02(6)
36.48805(4)	0.045(2)	1.42(9)
36.62192(5)	-0.017(3)	0.5(1)
36.7940(4)	0.05(3)	0.6(6)
36.7949(1)	0.028(5)	0.9(3)
35.90138(6)	0.014(4)	0.5(2)
35.93147(9)	-0.011(2)	0.9(2)
36.06360(1)	-0.146(3)	0.96(3)
36.06469(3)	-0.053(6)	0.52(7)
36.0657(1)	-0.026(3)	1.3(3)
36.08758(5)	-0.016(5)	0.3(1)
36.11718(7)	0.098(2)	7.7(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
36.1317(2)	0.028(3)	3.5(4)
36.167641(5)	1.09(3)	0.61(2)
36.16819(7)	0.24(2)	1.62(9)
36.1995(2)	0.07(1)	1.1(4)
36.20105(1)	0.419(7)	1.17(3)
36.2948(2)	0.022(3)	2.2(4)
36.31486(8)	0.019(3)	1.0(2)
36.31607(2)	0.031(5)	0.27(5)
36.33724(4)	0.075(4)	1.50(9)
36.37338(8)	0.021(4)	0.7(2)
36.48027(2)	0.198(3)	3.23(5)
36.50303(6)	-0.035(5)	0.8(1)
36.63660(9)	0.064(2)	6.2(2)
36.7075(1)	-0.017(2)	2.3(3)
36.760777(10)	0.441(2)	4.17(2)
36.7758(1)	0.034(3)	2.5(2)
36.8627(1)	-0.015(3)	1.1(2)
36.98229(8)	-0.035(3)	2.3(2)
36.99312(7)	-0.043(3)	1.7(2)
36.9956(2)	-0.018(3)	1.6(4)
37.05151(6)	-0.019(4)	0.5(1)
36.465431(9)	1.177(5)	4.16(2)
36.39078(3)	0.187(8)	0.79(5)
36.39182(4)	0.164(6)	1.01(8)
36.4884(1)	0.035(3)	2.2(3)
36.79440(5)	0.044(4)	1.3(1)
35.9058(1)	-0.019(4)	1.0(3)
35.9957(3)	0.009(2)	2.9(6)
35.99628(7)	0.02(5)	0.2(5)
36.06344(3)	-0.06(1)	0.5(1)
36.06400(5)	-0.08(1)	1.8(1)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
36.11000(6)	0.025(7)	0.4(1)
36.167641(5)	1.48(2)	0.612(10)
36.16859(5)	0.23(1)	1.1(1)
36.20014(2)	-0.20(2)	0.67(7)
36.20076(5)	0.29(1)	1.64(6)
36.33665(3)	0.04(1)	0.3(1)
36.3374(2)	0.026(5)	1.1(4)
36.4091(1)	0.027(4)	1.5(3)
36.48066(5)	0.099(3)	3.6(1)
36.4882(2)	0.026(4)	2.2(4)
36.52095(7)	0.020(5)	0.6(2)
36.53272(3)	-0.030(9)	0.3(1)
36.64845(5)	-0.023(6)	0.4(1)
36.76078(2)	0.225(2)	3.94(5)
36.7760(1)	0.027(3)	2.5(3)
36.7784(1)	0.016(6)	0.7(3)
36.98253(9)	-0.040(3)	2.6(2)
36.9933(1)	-0.036(3)	2.0(3)
36.9957(2)	-0.023(4)	1.7(4)
37.04592(8)	-0.022(3)	1.0(2)
37.1437(1)	0.024(2)	2.4(3)
37.25777(6)	-0.022(8)	0.4(1)
37.25865(5)	-0.024(7)	0.4(1)
37.35052(4)	0.209(7)	2.26(8)
36.9271(1)	0.022(4)	1.1(3)
36.9286(1)	0.017(4)	1.0(3)
36.9459(1)	0.020(4)	1.2(3)
36.98215(8)	-0.048(3)	3.0(2)
36.9889(2)	-0.022(3)	2.4(4)
36.9935(1)	-0.053(2)	4.3(3)
37.09558(5)	-0.022(6)	0.3(1)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
37.0954(1)	-0.027(2)	4.9(4)
37.16161(5)	-0.017(5)	0.4(1)
37.27436(6)	-0.016(5)	0.4(2)
37.35064(2)	0.173(8)	1.63(8)
37.35024(9)	0.081(8)	5.0(3)
37.3587(2)	0.025(3)	3.3(5)
37.39604(6)	-0.019(6)	0.4(1)
37.6266(1)	-0.018(4)	0.9(2)
37.64509(5)	0.030(5)	0.7(1)
37.70198(1)	-0.185(6)	0.77(3)
37.7564(1)	-0.021(4)	1.2(2)
37.80206(10)	0.052(2)	5.5(2)
37.8329(2)	0.015(3)	2.5(5)
37.84352(5)	0.100(2)	4.3(1)
37.88302(5)	0.022(5)	0.5(1)
37.9717(2)	0.027(2)	4.9(5)
38.0(2)	-0.019(6)	1.6(2)
38.0(3)	-0.023(6)	2.7(3)
38.0475(4)	-0.04(9)	0.4(10)
38.0484(6)	0.0(2)	0(2)
38.0809(10)	-0.03(5)	1(2)
38.0864(4)	-0.0(1)	0(1)
38.12991(9)	-0.032(2)	3.4(2)
38.47236(1)	1.191(6)	4.37(3)
37.84377(5)	0.108(3)	4.4(1)
37.9715(2)	0.027(3)	4.3(5)
37.97290(6)	0.025(9)	0.4(2)
38.00326(6)	0.026(6)	0.5(1)
38.04751(5)	-0.037(9)	0.4(1)
38.04830(6)	0.028(9)	0.4(2)
38(2)	1.297(3)	0.098(9)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
38.08095(8)	-0.030(4)	1.2(2)
38.08635(3)	-0.040(9)	0.3(1)
38.08701(7)	0.026(7)	0.5(2)
38.35945(2)	0.260(2)	4.50(4)
38.3761(2)	0.027(2)	4.3(4)
38.41737(5)	-0.018(5)	0.4(1)
38.45085(5)	-0.027(5)	0.6(1)
38.48811(4)	0.108(2)	3.6(1)
38.4919(1)	0.027(3)	1.6(3)
38.50403(5)	-0.038(9)	0.4(1)
38.50992(6)	-0.033(8)	0.5(1)
38.51643(2)	-0.167(7)	0.84(5)
38.51786(6)	-0.091(5)	1.5(1)
38.5831(2)	0.025(3)	2.6(4)
38.6074(2)	-0.025(3)	3.6(4)
38.64256(5)	0.021(5)	0.4(1)
38.64328(5)	0.023(8)	0.2(1)
38.64999(4)	0.024(5)	0.37(10)
38.66991(5)	-0.026(7)	0.4(1)
38.7097(1)	0.017(3)	1.3(3)
38.90800(6)	0.042(6)	0.8(1)
38.98452(4)	-0.033(8)	0.4(1)
39.0155(1)	0.052(3)	2.4(3)
39.01765(9)	0.039(5)	1.2(2)
39.0461(1)	0.037(4)	1.6(3)
39.0482(2)	0.029(3)	2.0(5)
39.0512(1)	0.020(4)	1.2(3)
39.1206(2)	-0.022(4)	1.8(4)
39.29011(5)	0.122(3)	4.6(1)
39.14851(3)	-0.30(3)	0.15(3)
39.29006(3)	0.203(2)	4.88(7)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
39.44523(4)	0.031(3)	0.76(10)
39.52717(7)	0.044(1)	5.9(2)
39.59224(4)	-0.022(5)	0.41(10)
39.98714(3)	0.097(1)	4.51(8)
40.0279(2)	0.016(1)	3.4(4)
40.03373(4)	-0.020(6)	0.3(1)
40.037(1)	-0.024(6)	0.4(1)
40.05183(5)	0.475(3)	4.43(3)
40.06811(5)	0.051(1)	4.2(1)
40.1152(1)	0.021(2)	1.7(3)
40.1171(2)	0.010(2)	1.5(5)
40.20507(6)	-0.012(3)	0.4(1)
40.23785(4)	-0.014(3)	0.34(10)
40.24244(4)	-0.019(2)	0.75(10)
40.24548(4)	-0.014(3)	0.41(9)
40.28252(4)	0.062(1)	4.52(10)
40.31094(5)	-0.015(2)	0.8(1)
40.32531(6)	-0.011(2)	0.5(1)
40.4041(1)	0.019(1)	2.9(3)
40.42844(8)	0.027(1)	3.4(2)
40.53365(7)	-0.014(4)	0.6(2)
40.629448(8)	2.149(8)	4.49(2)
40.64601(8)	0.210(9)	3.6(2)
40.6507(4)	0.03(1)	1.9(9)
41.39906(3)	0.089(1)	4.24(7)
40.28258(4)	0.062(1)	4.44(9)
40.31091(4)	-0.018(2)	0.84(10)
40.40415(8)	0.024(1)	2.9(2)
40.41579(6)	-0.014(3)	0.6(1)
40.42817(8)	0.028(1)	3.8(2)
40.73862(9)	0.026(1)	3.4(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
40.76464(4)	-0.021(3)	0.59(9)
40.78565(6)	-0.016(3)	0.7(1)
40.79161(3)	-0.024(3)	0.52(8)
40.81187(1)	0.199(1)	4.37(3)
40.82887(8)	0.024(1)	3.2(2)
41.00184(6)	-0.010(2)	0.5(1)
41.05010(4)	-0.010(3)	0.30(9)
41.05110(4)	-0.012(2)	0.6(1)
41.10820(8)	0.014(2)	1.2(2)
41.13328(3)	-0.060(2)	0.84(7)
41.13476(7)	-0.028(2)	1.0(2)
41.1714(1)	-0.010(2)	1.1(3)
41.17552(1)	-0.084(2)	1.02(4)
41.17675(4)	-0.023(3)	0.62(10)
41.1779(8)	-0.0(1)	0(3)
41.18994(5)	-0.051(3)	1.4(1)
41.19093(5)	-0.019(6)	0.4(1)
41.19293(3)	-0.039(5)	0.52(8)
41.19371(3)	-0.037(5)	0.45(7)
41.19616(1)	-0.088(4)	0.60(3)
41.19745(3)	-0.036(4)	0.58(8)
41.2755(1)	0.014(1)	3.1(3)
41.31046(9)	-0.009(2)	0.7(2)
41.48541(6)	-0.010(3)	0.5(2)
41.48626(6)	-0.008(4)	0.3(2)
41.50885(8)	-0.011(2)	1.1(2)
41.5392(1)	0.016(2)	1.1(3)
41.5402(1)	0.009(3)	0.7(3)
41.57639(5)	-0.034(2)	1.4(1)
41.57919(3)	-0.028(4)	0.51(9)
41.58002(3)	-0.031(4)	0.5(1)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
41.58248(2)	-0.061(4)	0.62(5)
41.58384(4)	-0.024(4)	0.4(1)
41.60413(4)	0.054(1)	3.60(9)
41.6127(1)	0.014(1)	2.8(3)
42.3650(1)	-0.0042(4)	2.2(3)
42.37244(4)	0.0119(5)	1.84(9)
42.87877(4)	0.0344(7)	4.2(1)
41.53930(8)	0.0041(4)	2.0(2)
41.57639(5)	-0.034(2)	1.4(1)
41.57919(3)	-0.028(4)	0.51(9)
41.58002(3)	-0.031(4)	0.5(1)
41.58248(2)	-0.061(4)	0.62(5)
41.58384(4)	-0.024(4)	0.4(1)
41.60413(4)	0.0113(3)	4.0(1)
41.6130(2)	0.0024(3)	2.4(4)
41.62885(3)	-0.0029(5)	0.35(6)
41.845436(8)	0.1047(4)	4.61(2)
41.86257(7)	0.0104(4)	3.5(2)
41.87310(5)	-0.0037(10)	0.32(10)
41.8740(2)	-0.0018(7)	0.8(4)
41.95925(4)	-0.0106(7)	1.2(1)
41.962(4)	-0.0128(7)	0.156(4)
41.96283(6)	-0.005(1)	0.4(1)
41.96545(4)	-0.0(4)	0.7(7)
41.96677(5)	-0.006(1)	0.6(1)
41.99985(9)	0.0073(2)	6.2(2)
42.2288(2)	0.0037(2)	6.0(4)
42.31897(4)	-0.0035(9)	0.34(9)
42.31997(7)	-0.0025(7)	0.5(2)
42.38340(2)	0.0034(4)	0.32(4)
42.41295(2)	0.0422(3)	4.61(4)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
42.4300(1)	0.0059(3)	3.8(2)
42.4471(2)	0.0023(4)	2.0(4)
42.4497(1)	0.0030(4)	1.4(3)
42.66548(5)	-0.0052(9)	0.7(1)
42.66858(3)	-0.0068(9)	0.39(6)
42.66938(4)	-0.004(1)	0.31(9)
42.67191(2)	-0.017(3)	0.54(6)
42.6724(1)	0.011(1)	1.2(1)
42.67390(5)	0.0042(7)	0.6(1)
42.80490(6)	0.0031(3)	1.2(1)
42.80708(6)	0.0021(5)	0.6(2)
42.8630(1)	-0.0032(3)	2.1(2)
42.95081(1)	1.305(6)	5.01(3)
43.4153(1)	-0.057(6)	2.0(2)
43.41842(7)	-0.069(7)	1.4(2)
43.422977(6)	0.931(6)	1.83(1)
42.663162(8)	0.070(9)	0.25(4)
42.67194(2)	-0.05(1)	0.60(9)
42.6724(1)	0.049(8)	1.1(1)
42.67374(5)	0.013(2)	0.5(1)
42.67831(5)	0.014(2)	0.6(1)
42.6794(1)	0.008(2)	0.9(3)
42.68632(5)	0.010(3)	0.4(1)
42.7684(1)	-0.03(2)	2.8(6)
42.7703(10)	0.03(1)	4.5(8)
42.87883(3)	0.111(2)	3.63(8)
42.8981(2)	0.0123(6)	8.0(4)
42.96828(2)	0.119(2)	3.94(6)
42.9847(1)	0.031(1)	5.1(2)
43.014423(10)	0.095(5)	0.36(2)
43.014908(8)	0.303(3)	2.10(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
43.17641(3)	0.202(6)	1.09(4)
43.17755(6)	0.101(5)	1.18(9)
43.2671(1)	-0.007(1)	1.1(3)
43.3051(4)	-0.009(4)	1.5(5)
43.3066(7)	-0.007(2)	1.8(10)
43.5196(1)	-0.009(1)	2.0(3)
43.74775(1)	0.273(1)	5.02(2)
43.76584(9)	0.027(1)	3.8(2)
43.8536(1)	0.007(1)	1.2(3)
43.96207(6)	0.019(2)	0.9(1)
44.0515(7)	0.10(6)	3.4(3)
44.05055(2)	-0.08(2)	0.48(6)
44.05167(1)	0.19(8)	0.62(8)
44.05161(6)	-0.18(9)	1.4(7)
44.05335(6)	-0.014(6)	0.3(2)
44.067123(1)	3.10(7)	0.276(4)
44.06824(5)	0.267(9)	2.12(8)
44.069687(7)	-0.41(1)	0.43(2)
44.09890(3)	0.111(1)	5.38(8)
44.1041(1)	0.024(3)	1.1(2)
43.96202(7)	0.016(2)	1.2(2)
43.965(2)	-0(3)	0(3)
43.906742(7)	1.6(1)	0.138(7)
43.907246(4)	-0.094(7)	0.24(2)
44.05(2)	0.07(5)	1.6(4)
44.05069(9)	-0.10(5)	0.8(3)
44.05173(9)	0.08(6)	0.4(1)
44.0521(2)	-0.2(3)	1.4(8)
44.05338(4)	-0.03(1)	0.5(1)
44.07(2)	4.691(3)	0.89(2)
44.06743(1)	2.49(8)	0.51(2)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
44.06802(9)	0.30(2)	2.2(2)
44.06970(2)	-0.43(4)	0.39(4)
44.09887(4)	0.118(1)	5.7(1)
44.1040(2)	0.04(9)	1.3(6)
44.1160(2)	0.0220(8)	7.1(4)
44.1258(2)	0.0210(9)	6.5(4)
44.2083(1)	0.012(1)	2.5(2)
44.22293(9)	0.009(2)	0.8(2)
44.2247(2)	-0.013(3)	1.5(3)
44.22502(2)	0.024(5)	0.36(7)
44.37307(8)	0.0163(8)	3.6(2)
44.42857(3)	0.0763(8)	6.27(8)
44.4460(2)	0.0137(9)	5.0(4)
44.68355(10)	0.026(1)	5.0(2)
44.7217(1)	0.008(1)	2.1(3)
44.87350(7)	-0.04(2)	0.7(2)
44.8743(6)	-0.016(6)	1.2(8)
44.90645(5)	-0.014(2)	0.8(1)
44.97001(3)	-0.017(4)	0.24(6)
44.97062(8)	-0.016(1)	1.2(2)
44.97365(4)	-0.019(2)	0.66(10)
44.97445(3)	-0.022(2)	0.43(6)
44.97706(3)	-0.025(2)	0.73(6)
44.97863(5)	-0.012(2)	0.7(1)
44.9930(1)	0.011(2)	1.6(3)
45.07789(5)	0.024(2)	1.4(1)
45.1860(2)	-0.015(1)	3.9(4)
45.45248(1)	0.1669(6)	5.60(2)
45.48839(2)	0.059(2)	0.72(4)
45.48967(3)	0.0577(10)	1.45(8)
45.49048(1)	-0.028(3)	0.52(6)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
45.60044(4)	-0.0051(9)	0.40(9)
45.66582(3)	-0.0051(9)	0.34(7)
46.24573(2)	0.036(4)	0.72(5)
46.2466(2)	0.011(1)	1.4(3)
45.39189(5)	-0.0030(5)	0.6(1)
45.07795(6)	0.0040(7)	0.7(2)
45.12849(4)	0.0038(7)	0.40(8)
45.2398(1)	-0.0026(3)	1.6(3)
45.37728(5)	0.0060(7)	0.6(1)
45.3782(2)	0.0018(6)	0.8(5)
45.39188(6)	-0.0035(6)	0.6(1)
45.47104(4)	0.0116(2)	4.2(1)
45.51184(8)	-0.0021(5)	0.7(2)
45.55313(4)	0.0029(5)	0.41(9)
45.55393(3)	-0.0029(6)	0.37(9)
45.6258(2)	0.0021(4)	1.7(4)
45.76717(2)	0.0328(2)	6.05(5)
45.7856(2)	0.0031(2)	6.3(5)
45.84129(4)	-0.0082(7)	0.90(9)
45.87541(5)	0.0117(2)	5.7(1)
45.8931(2)	0.0035(2)	8.3(5)
45.99810(9)	-0.0018(8)	0.5(3)
45.9985(5)	-0.0009(5)	3(1)
46.0560(1)	0.0059(2)	6.8(3)
46.49456(6)	-0.0036(8)	0.5(1)
46.24573(2)	0.20(1)	0.87(4)
46.2468(1)	0.068(4)	1.4(2)
46.6365(2)	0.012(2)	3.0(5)
46.6516(1)	0.021(1)	4.9(3)
46.74619(7)	-0.030(3)	1.6(2)
46.7495(2)	-0.019(2)	1.9(3)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
46.75044(7)	-0.014(6)	0.3(1)
46.75354(3)	-0.072(3)	1.14(7)
46.75489(8)	-0.018(4)	0.7(2)
47.48266(6)	-0.028(5)	0.7(2)
46.0280(1)	0.013(2)	1.3(3)
46.05598(4)	0.069(1)	4.88(10)
46.11415(4)	0.018(3)	0.53(9)
46.12033(7)	0.025(2)	1.5(2)
46.3628(1)	-0.020(1)	4.0(3)
46.5090(1)	-0.015(2)	1.9(3)
46.72191(4)	0.020(3)	0.45(9)
46.8458(1)	0.032(1)	7.0(3)
46.86939(5)	0.014(3)	0.5(1)
46.8720(1)	0.016(1)	3.6(3)
46.9140(1)	0.011(2)	1.2(3)
47.00074(8)	0.030(2)	2.7(2)
47.01522(8)	-0.019(3)	1.1(2)
47.02053(7)	-0.025(2)	1.4(2)
47.17699(7)	-0.012(4)	0.5(2)
47.20436(7)	0.014(2)	0.9(2)
47.23975(5)	0.017(4)	0.5(1)
47.24255(8)	0.014(3)	0.8(2)
47.2637(1)	0.024(2)	3.1(2)
47.29130(8)	0.019(3)	1.0(2)
47.30445(5)	-0.017(5)	0.3(1)
48.152260(10)	1.606(6)	5.49(2)
48.28236(6)	-0.24(3)	1.18(7)
48.2835(3)	0.06(2)	1.5(4)
48.58418(6)	0.063(5)	1.4(1)
48.5872(1)	0.049(4)	2.6(3)
48.37056(2)	0.092(6)	0.53(4)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
48.37163(3)	0.102(4)	1.24(7)
48.37494(3)	0.055(7)	0.50(8)
48.37609(6)	0.070(3)	1.8(1)
47.5035(2)	0.016(2)	3.1(5)
47.50977(9)	0.066(1)	6.6(2)
48.10197(9)	0.019(2)	1.9(2)
47.55730(8)	-0.028(3)	1.6(2)
47.56044(7)	-0.021(4)	0.7(2)
47.56148(5)	-0.023(6)	0.4(1)
47.56416(3)	-0.049(5)	0.62(7)
47.56594(8)	-0.019(4)	0.9(2)
47.59591(7)	-0.031(3)	1.5(2)
47.59922(4)	-0.031(6)	0.28(6)
47.60014(5)	-0.022(6)	0.29(9)
47.60292(3)	-0.041(6)	0.46(7)
47.23980(4)	0.018(4)	0.39(10)
47.29125(6)	0.019(2)	1.0(1)
47.6562(1)	-0.020(2)	1.7(3)
47.65797(4)	-0.06(1)	0.7(1)
47.65905(8)	0.064(3)	1.6(4)
47.66031(5)	0.041(9)	0.7(1)
47.73008(8)	-0.015(3)	0.9(2)
47.74853(4)	0.114(2)	5.13(9)
47.76340(7)	0.063(2)	5.3(2)
47.7816(2)	0.014(2)	2.3(4)
47.84184(4)	-0.021(3)	0.63(10)
47.91217(3)	0.75(1)	3.72(7)
47.9314(3)	0.015(2)	1.8(5)
47.9333(1)	0.028(3)	1.6(3)
48.11860(4)	0.437(8)	1.85(8)
48.11986(6)	0.13(2)	1.0(1)

Table 2—Continued

Observed Frequency (GHz)	Peak (Jy)	Width (MHz)
48.17195(2)	0.144(2)	3.95(5)
48.1832(2)	0.012(3)	1.5(4)
48.200584(5)	-0.36(3)	0.23(2)
48.205013(7)	0.41(1)	0.75(3)
48.20595(6)	0.188(6)	2.04(9)
48.65027(5)	0.069(3)	2.0(1)
48.98072(1)	-0.41(7)	0.27(8)
48.9813(2)	-0.15(5)	1.5(3)
48.9845(3)	-3(2)	0.3(3)
48.98547(2)	-0.26(4)	0.35(7)
48.9874(5)	0.11(6)	1.1(7)
48.988335(5)	-2.0(3)	0.51(3)
48.98883(5)	2.4(2)	1.2(1)
48.99005(6)	2.65(9)	2.01(7)
49.55542(9)	0.068(2)	6.9(2)
48.5818(1)	0.044(3)	2.3(3)
48.58402(5)	0.071(4)	1.3(1)
48.58720(6)	0.031(4)	0.8(1)
48.65020(5)	0.070(3)	2.2(1)
48.67128(8)	0.016(3)	0.9(2)
48.8529(1)	0.032(2)	3.7(2)
48.92950(7)	0.021(2)	1.2(2)
48.95405(6)	0.028(2)	1.4(1)
49.0607(1)	0.027(2)	4.1(4)
49.3837(4)	0.010(3)	1.3(7)
49.38440(5)	0.019(8)	0.5(2)
49.60972(8)	0.038(2)	3.5(2)
49.7010(1)	-0.022(4)	1.2(3)
49.72547(4)	0.137(2)	5.70(9)
49.7461(1)	0.026(3)	3.0(3)

Table 3. Raman Transition Candidates

Observed Frequency (GHz)	Raman Transition Match(es) (Formula, Rest Frequency (GHz), Quantum Numbers)	Reason for Discarding
20.33258(5)	17OH, 1.90209(5), J=3/2, =3/2, F1= 1- 2, F=3/2-5/2	Low $\frac{S}{N}$ (0.007)
21.37264(4)	HNC18O, 0.86199(6), 3(1, 2)- 3(1, 3) , F= 4- 4	Low $\frac{S}{N}$ (2.00)
22.4853(1)	H(427)γ, 0.25075 0)	Absorption
22.4890(3)	C(425)γ, 0.25443(0)	Absorption
26.352053	C8H, 4.11749(1), J=7/2-5/2, =1/2, F= 3- 3, l=f	Low $\frac{S}{N}$ (2.14)
27.55435(4)	HCC13CCCN, 5.31981(1), 2-1	Absorption
28.32333(4)	CH3COOH, 6.08881(0), 1(1, 0)- 1(0, 1) -+ v=0	Absorption
28.8922(1)	H(178)ζ, 6.65768(0)	Low $\frac{S}{N}$ (2.33)
30.80786(5)	H2C4N, 8.57335(7), 2(1, 2)- 1(1, 1), J=3/2-1/2	Absorption
31.0507(4)	He(142)δ, 8.81628 (0)	Low $\frac{S}{N}$ (1.57)
31.75185(4)	NHD2, 9.51730(5), 4(1, 4)0a- 4(0, 4)0s	Absorption
	NHD2, 9.51747(1), 4(1, 4)0a- 4(0, 4)0s, F= 3- 3	
32.62351(5)	HCCCCC15N, 10.38911(6), 4-3	Absorption
32.65397(5)	NCHCCO, 10.41948(6), 2(1, 2)- 3(0, 3), F= 1- 2	Absorption
34.09643(5)	CH3CHNH2COOH - I, 11.86205(6), 4(2, 2)- 3(3, 1), F= 4- 3	Absorption
35.32333(3)	H(79)α, 13.08885(0)	Low $\frac{S}{N}$ (1.11)
36.9459(1)	MgCl, 14.71145(6), N= 1- 0, J=3/2-1/2	Low $\frac{S}{N}$ (1.77)
	NH2D, 14.71170(1), 19(1,18)0a-19(2,18)0s	
38.00326(5)	t-HC3O, 15.76876(9), 2(1, 2)- 1(1, 1), J=3/2-3/2, F= 1- 1	Low $\frac{S}{N}$ (0.023)
38.0475(4)	H2CCCHCN, 15.81322(5), 3(1, 2)- 2(1, 1), F= 3- 2	Absorption
39.1205(1)	NH2CH2CH2OH, 16.886(2), 60(31,30)-59(32,27)	Absorption
	DC3N, 16.88631(7), J= 2- 1	
39.5301(2)	g-CH3CH2OH, 17.29579(5), 1(0, 1)- 0(0, 0), vt= 1- 1	Absorption
40.036934	CH3CH213CN, 17.80266(6), 2(0, 2)- 1(0, 1) , F= 1- 2	Absorption
41.2595(3)	C4H, 19.02511(6), N= 2- 1, J=5/2-3/2, F= 2- 2	Low $\frac{S}{N}$ (2.32)
42.668(1)	C3H6O2, 20.43414(7), 3(2, 1)- 2(2, 0) A	Absorption
43.8536(1)	NCC(O)NH2, 21.61935(5), 3(0, 3)- 2(0, 2), F1= 2- 1, F= 1- 2	Low $\frac{S}{N}$ (1.46)
43.9649(4)	NH2CO2CH3 v=1, 21.73081(6), 2(2, 0)- 2(1, 1) E	Low $\frac{S}{N}$ (2.02)
43.965(2)	NH2CO2CH3, 21.73081(6), 2(2, 0)- 2(1, 1) E	Absorption
48.11923(5)	13CH2CHCN, 25.88501(5), J= 1(1, 1)- 2(0, 2) , F= 0- 1	None
48.9813(1)	cis-CH2OHCHO, 26.74704(5), 35(6,29)-36(5,32)	Absorption

Table 3—Continued

Observed Frequency (GHz)	Raman Transition Match(es) (Formula, Rest Frequency (GHz), Quantum Numbers)	Reason for Discarding
	CH313CH2CN, 26.74706(6), 3(2, 1)- 2(2, 0), F= 2- 2	