IRAM Newsletter

Number 18 November 22, 1994

Calendar

Observing proposals: Proposals for the period *May 15, 1995 to Nov. 15, 1995* should be submitted before *Monday, February 27th 1995*

Contents

30m Telescope

VLBI test at 3 mm and 1.3 mm between Pico Veleta and Plateau de Bure

In the week from October 25th to 30th, the first VLBI test between the 30m telescope and one telescope on the Plateau de Bure was performed at 3 mm After a clear detection of fringes at 3 mm, an attempt was also made at 1.3 mm. Details are given on page 4.

Winter transport schedule

The winter has finally arrived at Pico Veleta. Due to the transport by cable car and ratrac the transport schedule for the winter is different from the summer schedule. In particular, the transport is less flexible than in summer. Visitors to the 30m telescope are kindly asked to plan their observing trip with enough margin to allow for bad weather conditions. The following table shows the winter transport schedule.

Transport to and from the observatory: Winter schedule

	Departure from:	
	Granada Office	Telescope
Monday	08:15	10:45
Tuesday	08:15	10:45 and 16:15
Wednesday	No transport*	No transport*
Thursday	10:00	16:00
Friday	08:15	10:45 and 16:15

* Person transport (morning hours) may be available after contact and agreement with IRAM Granada (Javier Lobato).

Line calibrator catalogues

There are several catalogues with spectral line calibrators available at the 30m telescope. These catalogues have been compiled using receivers with characteristics that differ from those of the present ones. In particular, the image band rejection is much higher with the present receivers (up to 30 dB for the 3 mm SIS, around 17 dB for the 230 G1 receiver). This means that a line presented in the catalogued spectra may not appear in a newly measured spectrum if the line lies in the image band (which is the upper sideband for the 30m receivers). This fact has recently led to some confusion at the telescope where observers suspected a wrong sky frequency after not having reproduced the calibration spectrum of the catalogue. We advise observers to take the high image sideband rejection into account when comparing new measurements with previous spectra. In order to make the comparison of spectra easier we are in the course of identifying and labelling the lines according to their appearance in the signal or image sideband.

A Unix workstation has been ordered and will be delivered and installed at the telescope before the end of the year. The workstation will mostly be available for fast data reduction.

Almost all of the observers now use DAT tapes to take their data home. We are still offering normal tapes as a backup medium for a limited amount of time. However, we do not plan to replace or repair the tape drive in case of failure.

The Internet connection worked quite reliably in the past few months. Unfortunately, sporadic down times still occur. However, these are not within the responsibility of IRAM Granada.

1 GHz backend in the future

Further results have been achieved towards an observing band width of 1 GHz. An IF processor which allows the use of the two 512 MHz filter banks as one unit of 1 GHz has been tested and installed. The system is not yet usable at 1 GHz for observations due to other restrictions (warm IF amplifier chain, down converters). The processor logically divides the two 512 MHz filter banks in 4 units of 256×1 MHz each. In the future the four units can be connected individually or in combinations to different receivers, or can be used as one backend with a 1 GHz bandwidth. At the moment the observers will not notice any difference with the old setup of two filter banks. The full flexibility of the system can be used once the software will be able to support all available options.

Wolfgang WILD

Efficiencies of the 30m Telescope

The table below summarizes efficiency data taken by the IRAM 30m staff in the period between March and August 1994. These data update and extend the comparable list of efficiencies presented in Newsletter No. 5 (September 1992). Measurements with the 1.3mm G2 SIS receiver are still pending.

While the forward efficiencies were deduced from skydips, the aperture and main beam efficiencies and the half power beam widths were derived from continuum cross scans on Mars and Uranus. The planetary diameters during this period ranged between 3.5″ and 5.5″. Beam and aperture efficiencies are corrected for the theoretical antenna gain-elevation dependence; this correction is at most 7% for this data set. The values for the continuum sensitivity are on the T_A^* scale (flux per Kelvin = $3.906 \times F_{eff}/A_{eff}$ for the 30m telescope).

From the scatter of the day-to-day measurements we estimate errors of the efficiencies to be about ±10 %. We will continue to monitor the efficiencies.

The product of measured beam widths and frequency is nearly constant for frequencies up to 270 GHz. This indicates a constant illumination of the subreflector independent of the receiver. The good agreement allows to give a formula which may be used to estimate the beam width to an accuracy of about 1″ between 90 and 270GHz:

$$\mathrm{HPBW} = \frac{2398}{\nu[\mathrm{GHz}]} \quad [\mathrm{arcsec}]$$

30m Telescope Efficiency Data (November 1994)

Receiver	Freq. [GHz]	Half power beam width [″]	Aperture efficiency A_{eff}	Main beam efficiency B_{eff}	Forward efficiency F_{eff}	Continuum sensitivity [Jy/K]
3mm SIS	90	27	0.60	0.75	0.92	6.0
	100	24	0.58	0.70	0.92	6.2
	110	22	0.57	0.68	0.92	6.3
2mm SIS	130	18	0.47	0.58	0.90	7.5
	150	16	0.43	0.52	0.90	8.2
	160	15	0.41	0.50	0.90	8.6
1.3mm G1 SIS	220	10.9	0.35	0.41	0.86	9.6
	230	10.4	0.32	0.39	0.86	10.5
	240	10.0	0.29	0.37	0.86	11.6

Note: The conversion from antenna temperatures T_A^* to main beam brightness temperatures T_{mb} can be done via $T_{mb} = (F_{eff}/B_{eff}) \times T_A^*$. We use the nomenclature of Downes, "Radio Astronomy Techniques", IRAM preprint 151 (also in *Evolution of Galaxies, Astronomical Observations*, Springer 1989).

Carsten KRAMER and Wolfgang WILD

Interferometer

Baseline Extension

The October month has allowed to catch up the delay caused by the bad weather period at the beginning of September. The new East-West baselines will thus be tested this winter.

Receivers

First test observations have been done at 230 GHz with the new dual-frequency receiver installed on Antenna 4. Receiver temperature is about 70–80 K at 1.3 mm, and first pointing showed an offset of the 1.3 mm receiver by (-4,+8) arcseconds from the 3 mm receiver. No further attempt to align the receiver has been made, but the receiver has been used for a first VLBI experiment at 1.3mm (page 4).

Observations

Several days and nights have been used to prepare and perform a VLBI experiment with Pico Veleta (page 4). Nevertheless, there is no longer any significant backlog in the observing projects. Only the B2 configuration is missing so far.

Program Committee recommendations

The results from the last PC meeting were send to the P.I. and are summarized below. The A programs will be scheduled in priority. The A/B programs will also be scheduled if feasible. Further time, if it becomes available, will go to the B programs, taking into account scientific merit, crowding in certain right ascension ranges and general aspects of balance. B proposals will only be started in case of available observing time.

Projects are expected to start near November 15. Principal Investigators of accepted programs should **URGENTLY** contact S. Guilloteau to check their final setup. In particular, some frequency choices have to be made for proposals which require DSB tuning, because of the properties of the receiver of Antenna 4.

Stéphane GUILLOTEAU

Project Status

A: Accepted, B: Backup if time available, C: Rejected.

Project	Rate	Project	Rate	Project	Rate	Project	Rate	Project	Rate
B032	A	C013	C	C043	C	C061	A	D017	C
D044	C	D058	C	D072	A/B	E005	B	E010	C
E012	A/B	E014	A/B	E016	A	E026	C	E027	C
E028	A	E029	C	E030	C	E031	A	E032	A
E033	A	E034	C	E035	A	E036	C	E037	B
E038	C	E039	A/B	E040	B	E041	B	E042	C
E043	B	E044	A/B	E045	B	E046	C	E047	C
E048	A	E049	C	E050	C	E051	C	E052	C
E053	C	E054	A	E055	C	E056	A	E057	B
E058	C	E059	A	E060	C	E061	C	E062	A/B
E063	B	E064	A	E065	C	E066	C	E067	C

Software

We are not yet in a position to deliver a NOV94 release of the GILDAS software. Among the reasons for which this release had to be delayed is an anticipated change of syntax for the SIC command monitor.

Users of CLASS, GRAPHIC and CLIC, please note:
We would like to modify the rules for substituting character variables and symbols within character strings in command lines parsed by SIC. For example, if `HERE` is a character variable or symbol containing `"in this place"`, the old syntax was:

```
"a character string is substituted 'HERE'"
```

translated to:

```
a character string is substituted in this place
```

The proposed new syntax is:

```
"a character string is substituted "'HERE'
```

translated to:

```
a character string is substituted in this place
```

When compared to the old syntax, the new one brings several improvements, by allowing:

- string concatenations, which were not easily available before,
- easy mixing of upper and lower case letters,
- use of the single-quote character within character strings without ambiguity.

For example, it will simplify the handling of filenames by allowing syntax like

```
SYMBOL FILE "MY_file"
FILE IN "/users/me/"'FILE'".30m"
```

The drawback is that the new syntax is *not* compatible with the old one. A quick look into the $\simeq$ 100 distributed command procedures showed that only 3 procedures do need modifications.

Some users might have developed sets of procedures which could be affected by such a modification. Accordingly, we ask those users to send an e-mail to `guillote@iram.fr` in order to identify what will be the real impact of the proposed change. The final decision, whether to implement the change or not, will depend on the result of this enquiry. The deadline for receiving answers is December 15, 1994.

Stéphane GUILLOTEAU

VLBI Tests between Plateau de Bure and Pico Veleta

Since the first successful 'test' at 7 mm in 1991, the IRAM 30–m telescope has participated several times in internationally organised VLBI observing runs at 3 mm (typically 1 to 2 times per year). The VLBI equipment at Pico Veleta–Spain is installed there permanently, consisting of a GPS station, a H-maser (Neuchatel Observatory, Switzerland) and a VLBA terminal and tape unit (Interferometrics, USA). The observations are made with the standard 3mm SIS receiver(s), LSB tuned with approximately 10 dB rejection.

When it became clear that the first dual channel 3 mm + 1.3 mm SIS receiver would soon be ready and installed on Antenna 4 of the Plateau de Bure Interferometer, it was decided to perform an 'in-house' VLBI experiment between the two IRAM observatories in collaboration with the VLBI groups of the Max-Planck-Institute for Radioastronomy, Bonn, the VLBI group at the Yebes Observatory, and the VLBI group of the Bordeaux Observatory. For this experiment, a H-maser was borrowed from the CNRS (France), and Yebes provided a VLBA terminal and tape unit. The Bonn correlator was made available for analysing the data. The experiment started with VLBI observations at 3 mm between Pico Veleta and Plateau de Bure at the end of October, to be followed by 1.3 mm test observations as soon as possible thereafter.

The tasks were shared as follows: the VLBI team of the MPIfR-Bonn supported the Pico Veleta operations, and provided the correlator at Bonn for a quick correlation and first look at the data, the VLBI team of Yebes supported the Plateau de Bure operations, and CERGA and the Bordeaux Observatory supported the installation and supervision of the maser.

Prior to the observations, we determined the position of Bure from GPS measurements; the drift of the maser was referenced to the 1 pulse per second signals of the GPS. With the limited and not crucially selected GPS data we obtained an accuracy in X, Y, Z of 40 m, the drift rate of the maser was $df/f < 8\ 10^{-13}$.

3 mm VLBI observations between Pico Veleta and Plateau de Bure were made on 25–27 October. It was decided to start by using antenna A3 which has the best pointing and tracking performance and a SIS receiver of good stability. The LO system was modified so that by simple switching of the 100 MHz reference signal the antenna could participate either in the interferometer mode for pointing and focusing or be separated for the VLBI measurements as a single antenna running exclusively on the maser-controlled LO system. We were able to make reliable pointing/focus determinations within the $\pm$10 minutes intervals between VLBI recordings. Recordings were made of 28 channels (14 LSB + 14 USB) of 4 MHz width each.

Although the weather varied enormously, from very bad to good, we were able to make several recordings during the first night that had been scheduled. Correlation at Bonn of these data gave high S/N fringes for the sources 0528+134 (SNR = 53 - 58), 2145+067 (SNR = 28 - 154) and 3C454.3 (SNR = 42 - 99) [The sun avoidance zone of the Bure telescopes did not allow the observation of 3C273 and 3C279].

On 29-31 October we switched to 1.3 mm using antenna 4 for 2 consecutive night sessions of 6 hours each. This antenna has a dual frequency SIS receiver for 3 mm and 1.3 mm. In order to check the system we made a few VLBI measurements at 3 mm, then turning the system alternatively to 1.3 mm VLBI observations and 3 mm pointing/focus determinations (which required considerable speed in changing connections and cables).

During these two periods weather conditions varied between reasonable and good. Two times 5 h recordings at 1.3 mm have been made. Fringes at 3mm, though very noisy, have been found for the start-up measurements with Antenna 4. Fringes at 1.3 mm are still being searched for.

A repetition of the 3 mm and 1.3 mm observations is envisaged for December.

The experiment would not have been possible without the help from many engineers of the backend and receiver groups, the operators at the telescopes and the astronomers who have participated in the preparation, execution and reduction of these observations.

IRAM - Plateau de Bure and Pico Veleta
MPIfR - Bonn and Yebes - Madrid
Observatoire de Bordeaux and CERGA.

Albert GREVE

Observation reports: Jupiter after the crash of comet Shoemaker-Levy 9

Interferometric Observations of HCN J=1-0 during the SL9 Crash on Jupiter

Report by: J. Wink, R. Lucas, S. Guilloteau and A. Dutrey
IRAM, Grenoble

We report here the detection of HCN $J = 1 - 0$ after the crash of the comet Shoemaker-Levy 9 on Jupiter. The observations were performed with the IRAM Interferometer from July 16th to July 24th. Since Jupiter was strongly resolved by the interferometer beam but not by the primary beam, we chose to observe the planet center and we applied a very specific data reduction method. First, Jupiter was used to calibrate the radio frequency passband and the relative phase. Then the amplitude was calibrated by fitting spline functions to Jupiter visibilities. The data phases were then corrected for the position offset from the planet center to the impact site. To correct for residual instrumental ripples in the phase passband of the system, we finally added to the impact data, the data corresponding to the symmetrical point with respect to the planet center.

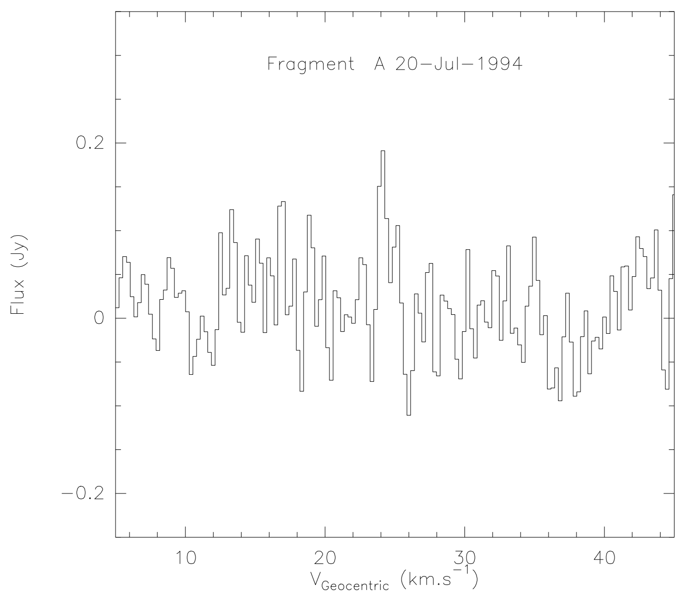

Figure 1: Plateau de Bure Interferometer $J = 1 - 0$ HCN emission (Jy) observed on Fragment A on July 20th 1994. The geocentric velocities are corrected from Jupiter rotation.

In fig. 1, we present some preliminary results concerning fragment A on July 20th. The HCN $J = 1-0$ line appears in emission and is particularly narrow: $\sim 2 - 3 \mathrm{km\,s}^{-1}$. Comparison with the HCN $J = 4 - 3$ emission observed at the JCMT implies an optically thin $J = 1 - 0$ line.

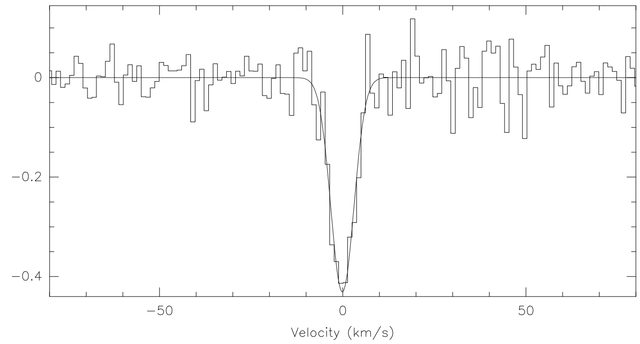

Figure 2: CS J=5-4 (244.9 GHz) observed in absorption on Aug. 12, 1994.

Heterodyne millimeter observations of Jupiter performed after the collision of comet SL9 with the planet

Report by: A. Marten(1), E. Lellouch(1). Moreno(2), G. Paubert(2), W. Wild(2)
(1) Obs. Paris-Meudon, France
(2) IRAM, Granada

Emission lines of CO, CS and OCS have been observed at 230, 245 and 219 GHz with the IRAM 30m Radiotelescope during the comet Shoemaker-Levy 9 collision with Jupiter at several impact locations (Lellouch *et al.*, B.A.A.S., 1994, **26**, 26th Annual Meeting of the Division for Planetary Sciences, October 31 – November 4, Washington DC,1994). For a few sites, the lines were monitored over several days, providing information on their temporal evolution.

The IRAM 30m has continued its monitoring of Jupiter at several fragment locations a long time after the last impacts, using the same observing procedure. We have performed new detections of CO and CS lines, unambiguously observed *in absorption* at the same frequencies. We have checked whether these features might be artefact effects in the observational procedure and conclude they are not.

During three months following the SL9 crash a lot of observations have thus been carried out and the significant aspects of the recorded spectra have been analysed in more detail, (Marten *et al.*, B.A.A.S., 1994, **26**, DPS Meeting, reference above). The line widths of absorption lines are about the same order than those of emission features indicating that the origin of the absorbers is purely stratospheric.

Recently, a program of observations of Jupiter in the HCN lines has been conducted with the JCMT in Hawaii. The similarity of measured features gives us complementary information for interpreting the CO and CS lines. It is worthwhile to note that both kinds of observations are effectively unique and of major interest. The Meudon scientists are, moreover, involved in the two sets of observations.

Since the spectral signatures of carbon compounds did not disappear rapidly, there is evidence of the presence of a cold molecular atmospheric layer resulting from the comet impacts. We have now to investigate the conditions of formation and destruction of the new species created in the stratosphere of Jupiter.

We are indebted to M. Grewing and M. Guélin for providing this unique opportunity of monitoring Jupiter during extra time periods of observations with the IRAM 30m Telescope.

Scientific Results

NUCLEOSYNTHESIS IN AGB STARS: OBSERVATION OF ^{25}MG AND ^{26}MG IN IRC+10216 AND POSSIBLE DETECTION OF ^{26}AL

M. Guélin[1], M. Forestini[2], P. Valiron[2], L. M. Ziurys[3], M.A. Anderson[3], J. Cernicharo[4], C. Kahane[2]
[1] IRAM, 300 rue de la piscine, F-38406 S^{t} Martin d'Hères, France
[2] Laboratoire d'Astrophysique, Observatoire de Grenoble, BP 53, F-38041 S^{t} Martin d'Hères Cedex 09, France
[3] Arizona State University, Dept. of Chemistry, Tempe, AZ 85287-1604, USA
[4] Centro Astronomico de Yebes, IGN, E-19080 Guadalajara, Spain

Abstract:

We report the detection in the circumstellar envelope IRC+10216 of millimeter lines of the rare isotopomers ^{25}MgNC and ^{26}MgNC, as well as of a line at 234433 MHz, which could be the J= 7–6 transition of ^{26}AlF (an alternate, although less likely identification would be the J= 9–8 transition of NaF). The derived ^{24}Mg:^{25}Mg:^{26}Mg isotopic abundance ratios ($78 : 11 \pm 1.5 : 11 \pm 1.5$) are consistent with the solar system values (78.7:10.1:11.2). According to new calculations of evolutionary models of $3\,M_{\odot}$ and $5\,M_{\odot}$ AGB stars, these ratios and the previously measured N, O and Si isotopic ratios imply that the central star had an initial mass $3\,M_{\odot} \leq M_{*,\rm ini} < 5\,M_{\odot}$ and has already experienced many 3rd dredge-up events. From this, it can be predicted that the ^{26}Al/^{27}Al isotopic ratio lies between 0.01 and 0.08; in fact, the value derived in the case U234433 arises from ^{26}AlF is ^{26}Al/^{27}Al= 0.04.

The identification of the ^{25}MgNC and ^{26}MgNC lines was made possible by *ab-initio* quantum mechanical calculations of the molecule geometrical structure. It was confirmed through millimeter-wave laboratory measurements. The quantum mechanical calculations are briefly described and the laboratory results presented in some detail. The rotation constants B, D, H and the spin-rotation constant γ of ^{25}MgNC and ^{26}MgNC, and the hyperfine constants b and eqQ of ^{25}MgNC are determined from a fit of laboratory and astronomical data.

Accepted by Astronomy and Astrophysics
(For preprints, contact guelin@iram.fr*)*

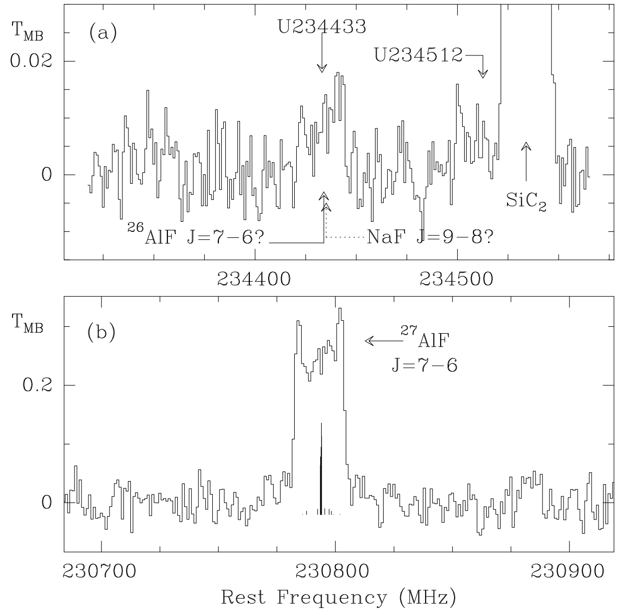

Figure 3: Two spectra, observed toward IRC+10216 with the IRAM 30-m telescope, and covering the frequencies of the J= 7–6 transitions of ^{26}AlF *(top)* and ^{27}AlF *(bottom)*. The channel width is 1 MHz. The position and strength of the ^{27}AlF line hyperfine components are denoted by vertical lines. U234433 lies only 0.9 MHz below the calculated frequency of ^{26}AlF (7–6) and could well be this line; an alternate, but less likely identification is the J= 9–8 line of NaF, the rest frequency of which is 234435.2 MHz.

CO IN THE MAGELLANIC TYPE IRREGULAR GALAXY NGC 4214

Becker, R.([1]), Henkel C.([2]), Bomans D.J.([3]), Wilson T.L.([2])
([1])GKSS Forschungszentrum, Institut für Physik, Maz-Plank-Strasse, D-21502 Geestacht, Germany
([2])Max Planck Institut für Radioastronomie, Auf dem Hügel 69, D-53121 Bonn, Germany
([3])Sternwarte der Universität Bonn, Auf dem Hügel 71, D-53121 Bonn, Germany

Abstract: High angular resolution CO (2-1) and (1-0) observations are reported from the central region of the Magellanic type irregular galaxy NGC 4214. CO(2-1) spectra were obtained with a beam size of 13$''$ (340 pc at $D = 5.4$ Mpc) toward 20 positions. At eight positions, emission was detected from a molecular cloud complex with a size of 1000 pc$\times$ 700 pc (at the 0.7 K km s^{-1}contour) and a mass of a few 10^{7}M$_{\odot}$. The $I_{\rm CO(2-1)}/I_{\rm CO(1-0)}$ line intensity ratio is 0.4, indicating emission from optically thick subthermally excited lines. Comparing virial masses with masses deduced from the integrated CO intensities yields a $N_{\rm H_2}/I_{\rm CO}$ conversion factor, which is a few times the standard Galactic value of $2.3 10^{20}$ (cm^2 K km s^{-1})$^{-1}$. On the basis of radial velocity, the huge CO complex is resolved into a western, a central, and an eastern component. The radial velocities, 298, 308, and 305 km s^{-1}, demonstrate that the E–W velocity change across the central bar is not smooth on linear scales < 1 kpc. A prominent loop of H$_{\alpha}$ emission (diameter : ~ 250 pc) is found at the interface between the western and eastern complex. A narrow linewidth and a lack of associated H$_{\alpha}$ emission indicates that the western CO complex is in a quiescent

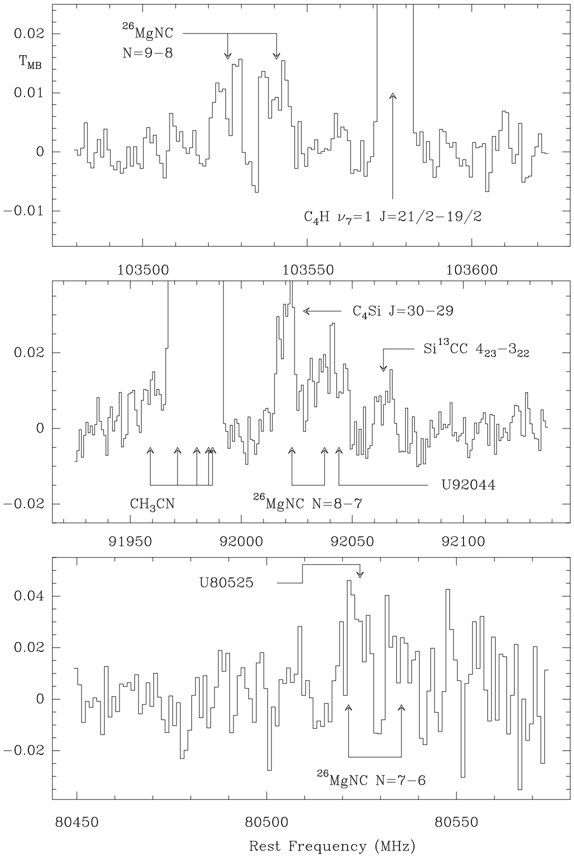

Figure 4: The N= 7–6 through N= 9–8 rotational lines of ^{26}MgNC in IRC+10216. The channel width is 1 MHz

state. The eastern region, being located close to the starburst knot at the optical center of the galaxy, exhibits broader CO lines and intense H_α emission and must form massive stars.

Accepted by Astronomy and Astrophysics

The molecular cloud content of early-type galaxies. V. CO in elliptical galaxies

T. Wiklind([1]), F. Combes([2]), C. Henkel([3])
([1]) Onsala Space Observatory, S-43992 Onsala, Sweden
([2]) DEMIRM, Observatoire de Paris, 61 Av. de l'Observatoire, F-75014 Paris, France
([3]) Max Planck Institut für Radioastronomie, Auf dem Hügel 69, D-53121 Bonn, Germany

Abstract: A survey of CO emission in 29 far-IR selected elliptical galaxies resulted in 16 detections, of which 3 remain tentative. The molecular gas masses range from 2 $10^6 M_\odot$ to 1 $10^9 M_\odot$, and appear to be unrelated to the underlying stellar population. This suggests an external origin of the gas. Most of the elliptical galaxies with a molecular gas component have a gas-to-dust mass ratio of 700, where dust masses are derived from the IRAS fluxes, but some appear to have a ratio as low as 50. A small apparent gas-to-dust mass ratio is also found for some late-type galaxies, and is correlated with a low dust temperature. We suggest that a large part of the far-infrared emission from these galaxies (both early and late types) comes from dust associated with the atomic gas component rather than star forming regions associated with the molecular gas, and that they contain a cold dust component. Low excitation temperatures for CO transitions in galaxies with cold dust could lead to an underestimate of the molecular gas mass by a factor of 5. The average M_{H_2}/M_{HI} ratio for the elliptical galaxies is 2-5 times lower than for normal spiral galaxies. Field ellipticals appear more likely to contain an observable molecular gas component than those ellipticals residing in groups and clusters.

Accepted by Astronomy and Astrophysics

New Preprints

The following preprints are available from IRAM:

331. Dense gas in nearby galaxies VIII. The detection of OCS
R. Mauersberger, C. Henkel, Y.N. Chin
1994, *Astron. and Astrophys.*

332. A direct image of wind interaction in the post-AGB evolution : CO observations of M1-92
V. Bujarrabal, J. Alcolea, R. Neri, M. Grewing
1994, *Astrophys. Journal, Letters*

333. CO in the magellanic-type irregular galaxy NGC 4214
R. Becker, C. Henkel, D.J. Bomans, T.L. Wilson
1994, *Astron. and Astrophys.*

334. A keplerian disk around DM Tau ?
S. Guilloteau, A. Dutrey
1994, *Astron. and Astrophys.*

335. Three dimensional iterative deprojection of asymmetrical planetary nebulae
M. Bremer
1994, *in Asymmetrical Planetary Nebulae Annals of the Israel Physical Society, Vol. 11 eds. A. Harpaz, N. Soker*

336. Nucleosynthesis in AGB stars : observation of ^{25}Mg and ^{26}Mg in IRC+10216 and possible detection of ^{26}Al
M. Guélin, M. Forestini, P. Valiron, L.M. Ziurys, M.A. Anderson
J. Cernicharo, C. Kahane
1994, *Astron. and Astrophys.*

337. The molecular cloud content of early-type galaxies V. CO in elliptical galaxies
T. Wiklind, F. Combes, C. Henkel
1994, *Astron. and Astrophys.*

338. Submillimeter CO spectroscopy of low mass young stellar objects
K.F. Schuster, A.P.G. Russell, A.F. Harris
1994, *To appear in the Proceedings of the International Conference on Circumstellar Matter - Edinburgh, August 29th - September 2nd 1994*

339. Determination of the pattern speed in the grand design spiral galaxy NGC 4321
M.J. Sempere, S. Garcia-Burillo, F. Combes, J. Knapen
1994, *Astron. and Astrophys.*

Position open

IRAM — Institut de Radioastronomie Millimétrique

Post-Doctoral Astronomer in Grenoble

Applications are invited for a post-doctoral position at IRAM in Grenoble, starting in principle April 1, 1995. Applications from candidates who need to start earlier or later than April 1 will also be considered.

Post-doctoral positions at IRAM carry (like staff positions) the following tasks:

- participate in the service observing at the Plateau de Bure interferometer;
- assist visiting astronomer in calibration and reduction of interferometer data;
- take responsibility for one of several tasks related to the operation, quality assessment or improvement of the PdB interferometer, such as data archiving, pointing, surface adjustment, software development and/or maintenance, studies of atmospheric phase, etc ...

Post-doctoral astronomers are expected to pursue scientific projects

- either of their own;
- and/or in collaboration with other IRAM staff members;
- and/or in collaboration with outside institutes.

The initial appointment will be for a period of 2 years with the possibility of an extension by 1 year. The applicants should have a university degree in physics or astronomy. Experience in observational astronomy is required. The applicants will be evaluated primarily on their background in astronomy, but demonstrated capability and interest in instrumental physics will be a strong asset.
Applications should be submitted, no later than Dec 31, 1994, to:

Director
IRAM
300 rue de la Piscine
Domaine Universitaire
F-38406 St. Martin d'Hères Cedex, France

Programs Scheduled on the 30-m Telescope in 1994

January 4 - February 1

Ident.	Title	Freq. (GHz)	Authors
259.93	A gravitational telescope to probe the gas content of distant normal galaxies	133, 102	Casoli, Fort, Boissé, Encrenaz, Horellou
258.93	CO emission primordial galaxies at $z = 3.2, 3.6$ and 4.4	85,99,107,149	Casoli, Gerin, Andreani
159.93	Search for CO in high redshift, dusty, radio quiet QSOs	101, 109,137, 141	Omont, Solomon, Radford, Downes, Mac Mahon
251.93	CO distribution in the anemic galaxy NGC 4579	114, 220	Boselli, Casoli, Combes, Lequeux, Gavazzi
151.93	Search for LiH primordial lines	219,220,222,223	De Bernardis, Dubrowich, Melchiorri, Encrenaz, Signore, Maoli
235.93	^{12}CO observations of molecular complexes in the nearby spiral M33	115, 230	Viallefond, Boulanger, Cox, Guélin
196.93	A search for broad SiO maser emission wings in O-rich evolved stars	86, 129, 230	Cernicharo
264.93	Is SO^+ a tracer of dissociative shocks ?	115, 162, 208, 99	Fuente, Cernicharo
288.93	A study of the para-water vapor emission at 183 and 325 GHz	183, 325 MHz	Cernicharo, John
204.93	CO emission in distant radio galaxies	88, 98, 103, 138, 157	Miley, van Ojik, van der Werf
294.93	Investigation of the streaming motions in the SW part of M31	115, 230	Neininger, Guélin, Wielebinski
211.93	Molecular gas in the halo of spiral galaxies : NGC4013	115, 230	Garcia-Burillo, Gomez de Castro, Combes
287.93	CO line observations of molecular gas in mid- and high-redshift galaxies	89, 149, 163, 244	Sams, Genzel, Brandl, Schuster
286.93	Investigation of molecular envelopes around T-Tauri stars and their relation to disk/wind activities	219, 220	Schuster, Anderson, Harris
177.93	CO observations of HD 98800 : molecular gas in a protoplanetary disk ?	110, 115, 230	Zuckerman, Kastner, Forveille, Kahane
246.93	A comparison of CN and FIR emission in galactic sources and isotopic variation studies of ^{13}CN and $C^{15}N$ in the peak CN emission ridge north of IRC-2 in Orion A	109, 113, 217, 226	Simon, Saleck, Stutzki, Winnewisser
219.93	Observations of CH_3CCH and search for CH_3OH on Titan	136, 222, 229	Bézard, Marten, Paubert

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Ident.	Title	Freq. (GHz)	Authors
288.93	A study of the para-water vapor emission at 183 and 325 GHz	183, 325 MHz	Cernicharo, John
197.93	Search for redshifted CII 158μm emission from high redshift QSOs	85, 87,333, 341, 359	Van der Werf
215.93	Probing the different molecular gas components in the nucleus of IC 342	330, 354, 265, 241	Krause, Schulz, Stutzki, Guesten
K003	Small scale structure of pre-star forming clouds		Falgarone et al.
268.93	CO excitation and H_2 masses of IR luminous galaxies : a proposal to observe the CO(3-2) lines	316,331,338,339	Solomon, Downes, Radford
224.93	Search for high frequency hydrogen recombination lines in active galaxies	91,92,135,133,231	Strelnitski, Thum, Smith, Matthews, Martin-Pintado
260.93	H masers from massive young stars	92, 135, 231	Thum, Martin-Pintado
195.93	Molecular clouds in radio loud quasars	94,107,110,214,223	Wiklind, Combes, Leon

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Ident.	Title	Freq. (GHz)	Authors
K003	Small scale structure of pre-star forming clouds		Falgarone et al.
257.93	Observational tests of chemical bistability in interstellar clouds	97,99,109,138,219	Gerin, Falgarone, Roueff
221.93	Multichannel bolometer observations of stellar disks at 250 GHz	Bolometer	Altenhoff, Quirrenbach, Wendker
243.93	Deep survey of distant galaxies at 1.3mm	Bolometer	Desert, Bernard, Bourhis, Cesarsky, Maffei, Puget
279.93	The mm continuum emission from QSO's with $z > 4$	Bolometer	Omont, McMahon, Bergeron, Cox, Kreysa
284.93	Bolometer observations of Asteroids II	Bolometer	Altenhoff, Johnston, Stumpff, Webster
267.93	The IR jet in IC348 : a young molecular outflow	115, 230	Guilloteau, Zinnecker, Dutrey, McCaughrean
273.93	H recombination line observations of ultracompact HII regions : galactic electron temperature and density gradient	99,135,231	Acord, Walmsley, Afflerbach, Churchwell
290.93	Simultaneous daily mm-γ ray intensity measurement of a complete sample of active galactic nuclei	3mm	Schalinski, Witzel, Krichbaum, Kanbach, Lichti, Rothermel, Wagner
37.94	Absorption lines in Q1413+135	92,142,213,157,235	Wiklind, Combes
251.93	CO distribution in the anemic galaxy NGC 4579	114, 220	Boselli, Balkowski, Cayatte, Casoli, Combes, Lequeux, Gavazzi
228.93	Successive ejection events in the L1551 outflow	115, 230	Bachiller, Cernicharo, Tafalla
231.93	Schock chemistry in the L1157 molecular outflow	90,113,168,215,267	Bachiller, Martin-Pintado, Fuente
244.93	Zero spacing measurement of ^{13}CO 1-0 and C^{18}O 1-0 in the S140 HII region/molecular cloud interface	110,109,217,144	Corneliussen, Stutzki
K003	Small scale structure of pre-star forming clouds		Falgarone et al.

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Ident.	Title	Freq. (GHz)	Authors
214.93	Small scale anisotropy of the cosmic microwave background at 230 GHz	Bolometer	Kreysa, Chini, Biermann
293.93	High resolution imaging of cold dust emission from the Cygnus loop	Bolometer	Haslam, Tuffs, Kreysa, Sievers, Lemke
263.93	Cold dust in NGC891, M51 and IC342 : a key to the molecular gas content of spiral galaxies	Bolometer	Zylka, Guélin, Mezger, Kreysa, Haslam, Lemke, Sievers, Garcia-Burillo
202.93	An expanded survey to search for cold dust disks around main sequence IR excess stars	Bolometer	Stern, Festou, Weintraub
229.93	Cold dust in starburst environments	Bolometer	Reuter, Lesch
198.93	The 230GHz continuum dust emission of N2146	Bolometer	Greve, Sievers
295.93	Observation of the λ1.3mm emission in the edge-on galaxy NGC4565	Bolometer	Neininger, Zylka, Guélin, Dumke, Wielebinski
279.93	The mm continuum emission from QSO's with $z > 4$	Bolometer	Omont, McMahon, Bergeron, Cox, Kreysa
297.93	The first high resolution maps of the Cas A and Crab SNRs at 1.3mm	Bolometer	Holland, Greaves
299.93	The youngest stellar cores in Bok globules - 1.3mm continuum mapping	Bolometer	Launhardt, Zylka
292.93	Dust environment of Herbig Ae/Be stars : LKHα 198 and AB Aur	Bolometer	Cabrit, André, Thum, Ménard

Ident.	Title	Freq. (GHz)	Authors
283.93	Diameter determination of 2060 Chiron with the 7-channel bolometer	Bolometer	Altenhoff, Stumpff
243.93	Deep survey of distant galaxies at 1.3mm	Bolometer	Desert, Bernard, Bourhis, Cesarsky, Franceschini, Maffei, Puget
223.93	Dust emission in three edge-on galaxies	Bolometer	Wielebinski, Braine, Golla, Kruegel, Reuter, Sievers
210.93	Cold dust around high redshift quasars	Bolometer	Andreani, Casoli, Gerin, Cristiani, La Franca
271.93	Size and density structure of low mass protostellar envelopes	Bolometer	André, Bontemps, Bourhis, Cabrit, Terebey
272.93	Size and density structure of pre-protostellar cores	Bolometer	André, Ward-Thompson
261.93	Thermal dust emission from elliptical galaxies ?	Bolometer	Wiklind, Henkel, Chini, Haslam
234.93	Continuum mapping of the NGC 7538 cluster at 1.3mm	Bolometer	Sandell, Baas
270.93	Continuum observations of dust disks around main sequence stars	Bolometer	Bockelée-Morvan, Andé, Colas, Despois, Crovisier, Colom, Jorda
236.93	Molecular line observations of high mass star forming GMC cores	96,110,144,147,220	Mooney, Mauersberger, Mezger, Zylka
269.93	Molecules and dust : their spatial distribution at the 10 arcsec scale	115, 230	Boissé, Duvert, Thoraval
208.93	The atmosphere of Io	214,224,143,104,158	Lellouch, Belton, de Pater, Gulkis, Encrenaz, Paubert
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254.93	Nitrogen and oxygen isotopes in the molecular envelopes of evolved stars	86,219,220,224	Kahane, Forestini, Forveille, Guélin, Cernicharo
253.93	Carbon isotopes in the molecular envelopes of evolved stars	86,219,220,224	Kahane, Forestini, Guélin, Cernicharo
242.93	Service observing to detect extremely broad RRLS in G25.5+0.2	85	Walmsley, Churchwell, Goss, Shepherd
192.93	Rapid variability in ^{28}SiO maser emission	86,129,177	Alcolea, Cernicharo, Bujarrabal
230.93	SiO masers as tracers of the chemical composition of circumstellar grains	86, 129, 215	Alcolea, Bujarrabal

Ident.	Title	Freq. (GHz)	Authors
37.94	Absorption lines in Q1413+135	92,142,213,235	Wiklind, Combes
38.94	Search for molecular absorption lines in intermediate and high redshift galaxies	96,105,158,226,257	Wiklind, Combes
84.94	CO in early type galaxies with luminous X-ray halos	115, 230	Henkel, Braine, Wiklind
27.94	^{12}CO observations of molecular complexes in the nearby spiral M33	115, 230	Viallefond, Boulanger, Cox, Guélin
226.93	Molecular line observations of cold compact dust cores in the galactic center	96,110,147,241	Zylka, Lis, Morris
206.93	A search for circumstellar MgCN	101, 132,142	Ziurys, Apponi, Anderson, Steimle, Guélin
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15.94	CO distribution in the anemic galaxies NGC4579 and NGC4548	115,230	Boselli, Balkowski, Cayatte, Casoli, Combes, Lequeux, Gavazzi
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The IRAM Newsletter is edited by Robert LUCAS at IRAM-Grenoble (e-mail address: lucas@iram.fr).

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	Address:	Telephone:	Fax:
Grenoble	Institut de Radioastronomie Millimétrique, 300 rue de la Piscine, Domaine Universitaire, 38406 St Martin d'Hères Cedex, France	(33) 76 82 49 00	(33) 76 51 59 38
Plateau de Bure	Institut de Radioastronomie Millimétrique, Observatoire du Plateau de Bure, 05250 St Etienne en Dévoluy, France	(33) 92 52 53 60	(33) 92 52 53 61
Granada	Instituto de Radioastronomía Milimétrica, Avenida Divina Pastora 7, Núcleo Central, 18012 Granada, España	(34) 58 27 95 08	(34) 58 20 76 62
Pico Veleta	Instituto de Radioastronomía Milimétrica, Estación Radioastronómica IRAM-IGN del Pico Veleta, Sierra Nevada, 18012 Granada, España	(34) 58 48 02 11	(34) 58 48 08 60

E-Mail Addresses:

– IRAM-Grenoble: username@iram.fr, or through PSI: PSI%0208038080590::username

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