IRAM Newsletter

Number 16 July 20, 1994

Calendar 1994

Observing proposals: Proposals for the period *Nov. 15, 1994 to May 15, 1995* should be submitted before *Monday, September 12th 1994*

Contents

Interferometer

Next Deadline

Next deadline for Plateau de Bure proposals will be *Monday, September 12th 1994*, for the scheduling period *Nov. 15, 1994 to May 15, 1995*; please read the Call for Proposals, page 9 in this Newsletter. In view of the current extension of Plateau de Bure (baselines, receivers), we are currently revising the proposal form (old forms will be acceptable, however). Please check in the anonymous ftp area, or in the IRAM Mosaic information server.

Baseline extension

Most of the ground work for the baseline extension has been performed. Construction of the new tracks and station has begun and proceeds almost on schedule, although more concrete must be used than initially foreseen. We hope to complete at least the West extension (W20, W23 and W27) before this winter, and to make it partially available for specific projects. See the "Call for Proposals", page 9.

Optimum choice of the configurations is still under study.

Receivers

The installation of a dual channel receiver (3 and 1.3 mm bands) on Antenna 4 was delayed to August. A second one (presumably on Antenna 2) is foreseen for September. Work is in progress to upgrade all receivers to dual-channel systems by January 1995. The new receivers will have SSB tuning with 10 to 20 dB rejection, with the drawback that truly DSB tuning may not be possible at all frequencies. CO ($J = 1 - 0$) will be reachable in LSB, thus improving the sensitivity by a factor 2 as compared to the current system.

The upgrade plan also includes a complete replacement of the LO2 system, scheduled for September.

The 1.3 mm system will undergo tests during the next scheduling period, and if successful, will be made available for part time. See the "Call for Proposals", page 9, for details.

Antenna Maintenance

The first 3 antennas require major maintenance this summer. This maintenance is completed for Antenna 2, and Antenna 3 is now in the hall.

Documentation

All Plateau de Bure documentation is available through the NCSA-Mosaic WWW server. From the IRAM home page, click on item "Interferometer" and follow the links... Information on the on-going projects is also available.

Stéphane GUILLOTEAU

Software

The JUN94 software release was made available on June 3. Some bugs were discovered in CLIC and CLASS since that time and have been corrected as follows:

– June 7: CLIC updated

– June 30: CLASS updated (bug in frequency switching data)

Improvements have been made in CLIC (antenna based calibration), CLASS (commands MEMORIZE and RETRIEVE are back, command POPUP improved), MAPPING (a new program for deconvolution of Plateau de Bure images), ASTRO (ephemerides up to year 3000 and beyond), and documentation (usage of the Mosaic software under X-Windows).

The new release incorporates support for DEC-Alpha machines operating under OSF-1. Most major programs (not CLIC) have been successfully tested, but most tasks have just been "blindly" ported and not tested. Users should be aware of a major bug in the Alpha run-time library: the last line of a formatted file cannot be read in Fortran... This can be rather damaging in procedures. We hope DEC will cure this bug very quickly.

Stéphane GUILLOTEAU

Computers

Transporting data on tape cartridges

To transfer data between IRAM locations in France and in Spain or to any other places without going through a network, 9-track tapes may be used; but one would prefer to travel with smaller cartridges such as Exabyte or DAT tapes.

– At Pico Veleta and Granada, DAT drives are available on VAX/VMS systems. Save sets or archives may be performed with the backup and VMSTAR utilities.

– At Bure and Grenoble, both DAT and Exabyte drives are available:

  · At Bure the DAT is connected to the UNIX machine iraux3 (/dev/rmt/0mn,0m, 3mn, 3m) and the Exabyte is available on the VAX/VMS node bure02 (BUR02$MUB0:).

  · At Grenoble on VMS, an Exabyte (IRAM04$MUA0) and a DAT (IRAM04$MUA1) are connected to iram04 (VAX/VMS), while on UNIX there are 2 DAT drives, one on iraux1 (SCSI 3) and one on iraux4 (SCSI 2); there is one Exabyte on iraux2 (SCSI 1).

See table 1 for the capacity of those tapes.

The speed performances of tar, VMSTAR and BACKUP have been evaluated on HP 9000/735 and microVAX4000/300, and are given in table 1.

As UNIX work stations are unable to read tapes produced with the BACKUP utility on a VMS system, to transfer data from VMS systems which should be analysed on UNIX, it is better to archive directly the data files with VMSTAR without producing intermediate BACKUP save sets.

In summary: Table 2 indicates the ways to transfer data from our different sites with tapes or cartridges.

Please note that, although access to Internet is, in principle, available from all sites it is important that observers make sure they bring all computer files on media available at the site. *Do not depend on access to Internet!*

Walter BRUNSWIG and Alain PERRIGOUARD

Table 1: Cartridge recording devices available at IRAM:

Devices	Grenoble	Pl. de Bure	Granada	Pico Veleta
9-track /VMS	yes	yes	yes	yes
DAT/VMS	yes	no	yes	yes
Exabyte/VMS	yes	yes	no	no
DAT/Unix	yes	yes	no (1)	no (1)
Exabyte/Unix	yes	no	no	no

(1): DAT tapes can be written/read in Unix tar format on VMS machines with VMSTAR utility.
On Unix the device files are Xm, Xmn for medium density and Xhc, Xhcn for very high density: n means do not rewind on close and X is the drive SCSI Id number. As there is only one drive per station, the device files are also copied to 0m, 0mn, 0hc and 0hcn.

The capacities of those tapes (measured with standard files) are:

	DAT (60 min.)	Exabyte 8200 (60 min.)
VMSTAR on VMS or tar on UNIX (low/medium/high density)	1316 Mb	1010 Mb
tar (very high density)	2600 Mb	1010 Mb
BACKUP on VMS	1120 Mb	1375 Mb

With an Exabyte 8500 the capacities are double, using BACKUP on VMS.
Data transfer rates of tar, VMSTAR and BACKUP, in Mb/s (Exabyte model 8200 on UNIX, Exabyte model 8500 on VMS, and DAT multiple densities on UNIX and VMS):

Media	Op.	tar (low/medium/ high density)	tar (very high density)	VMSTAR	BACKUP
DAT	save	(tar c)	(tar c)	(VMSTAR C)	
		0.169	0.25	0.0736	0.142
	restore	(tar x)	(tar x)	(VMSTAR X)	
		0.165	0.25	0.020	0.056
Exabyte	save	(tar c)	(tar c)	(VMSTAR C)	
		0.160	0.160	0.067	0.191
	restore	(tar x)	(tar x)	(VMSTAR X)	
		0.080	0.080	0.018	0.059

Table 2: Preferred ways of transporting tape data between IRAM sites:

To: / From:	Gre/VMS	Gre/Unix	Bure/VMS	Bure/Unix	Gra/VMS	Veleta/VMS
Gre/VMS		3-6	1-5-6	3	1-2-3	1-2-3
Gre/Unix	4-7		7	4	4	4
Bure/VMS	1-5-6	6		-	1	1
Bure/Unix	4	4	-		4	4
Gra/VMS	1-2-3	3	1	3		1-2-3
Veleta/VMS	1-2-3	3	1	3	1-2-3	

Key:
1: use 9track   2: use DAT/VMS-Backup   3: use DAT/VMS-vmstar
4: use DAT/Unix-tar   5: use Exabyte/VMS-Backup   6: use Exabyte/VMS-vmstar
7: use Exabyte/Unix-tar

Call for Observing Proposals on the 30m Telescope

The *next deadline* for the submission of observing proposals for the IRAM 30 m telescope is *Monday, September 12th 1994*. The observing period will cover roughly the 'winter' period at Pico Veleta. Three types of proposals will be considered:

1. Proposals at 3 mm, 2 mm and 1.2–1.3 mm wavelength using heterodyne receivers (to be scheduled between November 15th, 1994 and May 15th, 1995),
2. Proposals at 0.8 mm wavelength using a heterodyne receiver (to be scheduled during a 2-week observing session in January 1995). The receiver will be the IRAM SIS 345 GHz receiver which was installed at the telescope during the January 1994 run. This receiver can be operated simultaneously with 230G1 and the 3mm SIS RX.
3. Proposals at 1.3 mm wavelength using a bolometer. The bolometer will be an array belonging to the MPIfR with 7 (or more) channels. It will be installed in January/February 1995 at the telescope and used during a $3-4$ week observing period.

Roughly 3000 h of observing time will be available during this 6 month period, which should allow scheduling of a few bigger (e.g. 90–120 h) programmes with emphasis on 1.3 mm heterodyne observations (see below). No new call for 'key programmes' is issued for this period. Please, find below some relevant information as well as a copy of the proposal form.

A quarter-wave plate polarimeter, allowing to switch between left and right circular polarizations, has been built for e.g. Zeeman splitting measurements. This polarimeter should be available for the November 1994 – May 1995 period (please indicate that you request it on the line 'special requirements' of the proposal form).

Applications

Your applications should be addressed as usual to

IRAM Scientific Secretariat,
300 rue de la piscine,
F-38406 St Martin d'Hères, France.

All proposals should have *reached* the Secretariat by *Monday, September 12th 1994*, midnight. (Proposals sent by Fax will be accepted, provided they arrive by that time in a readable form; Fax (33) 76 42 54 69). Except for a duplicate of the source list (see below), no proposal should be sent by e-mail. You (i.e. the Principal Investigator) will receive by return mail an acknowledgement of reception and a proposal number.

To avoid the allocation of several numbers per proposal, send *only one* copy of your proposal, either by mail or by fax. In case your fax reaches us in time incomplete or unreadable, we will try our best to contact you (your responsibility, however).

Your proposal will only be evaluated if submitted in the correct format (these forms are available by anonymous ftp from `iraux2.grenet.fr` in directory `dist/proposal`, together with the Latex style file). Do not use characters smaller than 11pt, which would make your proposal unreadable if we had to fax it, e.g. to the members of the P.C.

On the title page, you must fill out the line 'special requirements' if you request the polarimeter, 'service observing', or specific dates for time dependent observations (if there are periods when you cannot observe for personal reasons, please specify them here; beware, however, that they could be a motive for proposal rejection!).

We *insist* upon receiving with proposals for heterodyne receivers a complete list of frequencies *corrected* for source redshift (to 0.1 GHz, unless your frequencies are confidential). You should specify which receivers you plan to use. *Note that the use of the 2 mm receiver prevents the use of the second 1.3 mm receiver 230G2, which, otherwise, can be used in parallel with receiver 230G1 (see below).*

If your source list is long (e.g. more than 15 sources), we would appreciate if you could send us a duplicate by e-mail to one of the following addresses:

- berjaud@iram.grenet.fr
- psi%0208038022556::berjaud

this will help us to keep up a computerized source list.

The scientific aims of the proposed programme should be explained in 2 pages of text, maximum, plus one page of figures and tables. Proposals should be self-explanatory, clearly state these aims, and explain the need of the 30 m telescope. The amount of time requested should be carefully estimated and justified (see below); it should include pointing, focussing, and calibration checks and allow for receiver tunings (on average 20 min. per receiver).

A scientific project should not be artificially cut into several small projects but should rather be submitted as one bigger project, even if this means 100–150 hrs. This approach is all the more advisable now that we switch to 6-month summer/6-month winter sessions.

If time has already been given to one project but turned out to be insufficient, explain the reasons, e.g. indicate the amount of time lost due to bad weather or equipment failure; if the fraction of time lost is close to 100%, don't rewrite the proposal, except for an introductory paragraph. For continuation of proposals having led to publications, please give references to the latter. *In all cases, indicate on the first page form whether your proposal is (or is not) the resubmission or the continuation of a previously submitted 30 m telescope proposal.*

Observing time estimations

Most proposals submitted for the 30 m telescope underestimate the observing time needed to carry out the programme, even during excellent weather. Observing time estimates must take into account:

- receiver tunings (allow 20 min. per receiver)
- pointing, focus, receiver alignment, continuum and line calibrations,
- telescope motions when changing sources as well as dead time due to telescope motion and/or data writing between ON and OFF subscans (count 2 sec per degree for slew mode motions and an additional 8 sec for telescope acceleration and deceleration; count 8 sec of dead time between subscans),
- integration time on source and comparison field(s). The total integration time should be derived using the standard formula:

$$\Delta T_{MB} = \frac{\eta_{\rm F}}{\eta_{\rm B}} \frac{2T_{\rm sys}}{\sqrt{Bt}}$$

where $\eta_{\rm F}$ and $\eta_{\rm B}$ are the telescope forward and main beam efficiencies, $T_{\rm sys}$ is the system temperature above the atmosphere (in the antenna temperature scale), B the channel bandwidth, and t the total (ON + OFF) integration time. $T_{\rm sys}$ should be estimated for an 'average' winter humidity for 3mm, 2mm and 1.3mm observations (3mm of precipitable water, or $\tau_{\rm zenith} = 0.2$ at 230 GHz), and for dry weather conditions for the 0.8mm observations which will be scheduled in January (1.5mm of precipitable water, of $\tau_{\rm zenith} = 0.3$ at 350 GHz).

For additional help on this matter, please, contact IRAM Granada or IRAM Grenoble (Mrs. C. Berjaud). Several examples of observing time request estimates are at your disposal.

Long programmes

This observing session offers the opportunity to schedule a few bigger programmes (typically 90–120 h). These 'long' programmes should mostly be centered on 1.3 mm spectral observations and should use at least 10h/day; they should have a large astronomical interest and be well explained. Careful time estimates will be of crucial importance for their acceptance.

Service observing

To facilitate the execution of short ($\leq$10 h) programmes, we propose "service observing" for some easy to observe (e.g. single source) programmes *with only one set of tunings.* The observing will be made by the IRAM staff, according to a pre-submitted observing plan (forms will be given when proposals are accepted). Please, if you are interested by this mode of observing, specify it as a "special requirement" in the proposal form (IRAM will decide which proposals will actually go to that mode). If you are located in Spain, France, or Germany, we will try to e-mail you, via IBERPAC, TRANSPAC, etc..., the `spectra.30m` files in quasi real-time; this excludes any intervention in the execution of the programme (see below for more details, page 7).

Programmes for the May – November 1994 period

A total of 104 30m telescope proposals were submitted for the deadline of March 1994. 41 proposals were rated "A", 29 "B", the others "C" or "D". About half of which will actually get time on the telescope, some, however, with less time than requested. The telescope schedule until mid-August is made; the programme PIs have been or are being notified.

Principal Investigators of accepted proposals receive with the telescope schedule a *Confirmation of Observing Time* form which we ask you to return, properly filled, by Fax to IRAM Granada *and* IRAM Grenoble (Scientific Secretariat, Fax (33) 76 42 54 69, attention Mrs. C. Berjaud). The list of frequencies to be observed (normally, the same as in the proposal) should arrive in Granada at least two weeks in advance. It is also only after we receive your confirmation in Grenoble that we will send out duly signed mission forms to those of you entitled to travel reimbursement.

If you have questions, please contact Mrs. C. Berjaud at IRAM Grenoble.
Note that the telephone number and FAX number of the Pico Veleta Observatory (i.e. the telescope site) are:
Tel: (34) 58-48-02-11 – Fax: (34) 58-48-08-60.

Relevant Information about the 30 m Telescope

(Please, see additional information in the IRAM Newsletters and in the internal reports listed below).

Receivers

The IF bandwidth of all heterodyne receivers is 500 MHz. The following table lists the possible receiver combinations:

	Rx Combinations					
Receivers	3-Rx			2-Rx		1-Rx
3mm-SIS	*	*	*			
Cont-3mm				*	*	
2mm		*		*		
230G1	*	*	*			
230G2	*				*	
0.8mm-SIS			*			
Bolo						*

3 mm Continuum Receiver

This receiver, operating with a Millitech Schottky mixer, is installed in line with the 4th mirror, behind the polarization rotator. It can be used simultaneously with either the 2 mm (or 230G2) receiver or a guest receiver.

The Continuum receiver can only be used for pointing. Continuum sources of $\geq$ 0.8 Jy (at 86 GHz) can be used for pointing checks; there are approximately 120 continuum sources catalogued. The Continuum receiver is normally aligned within $2''$ of the other receivers.

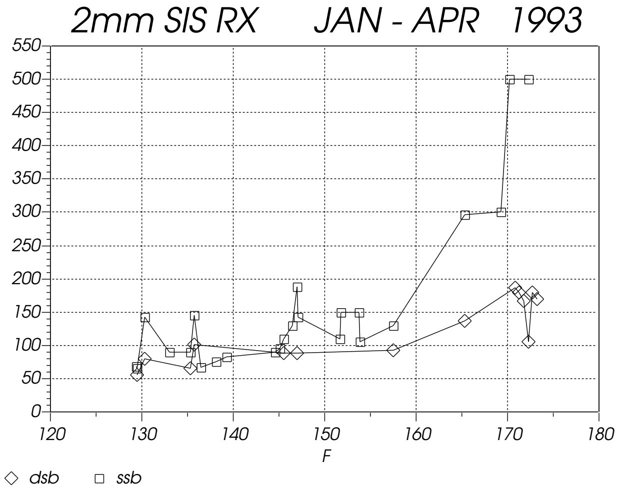

Figure 1: Performance of the 2mm SIS receiver

3 mm SIS receiver

(tuning band: 85 - 116 GHz).

This Nb junction mixer, installed in August 1992, will be replaced this summer. We expect improvement in the SSB receiver temperature (presently 130K at 115 GHz, and 70–140 K below 100 GHz), a better rejection of the upper side band, and improved stability around and below 100 GHz. *Note that the IF frequency of this receiver is 1.5 GHz, and not 3.9 GHz as for the 1.3 mm and 2 mm receivers.* When tuned to the CO 115.27 GHz line in the LSB, the oxygen 118.75 GHz line falls in the USB; this has two consequences for the observations: i) the sky seen in the USB is warm, leading to an increase of the system temperature, and ii) the atmospheric opacity in the LSB, calculated by OBS/ATM, can be quite wrong if the assumed gain in the USB (GAINi) is poorly known. It is therefore advantageous to use a large (> 10dB) USB rejection. The observation of continuum sources of known flux (e.g. planets, HII regions,...) is also recommended for calibrating your 115 GHz line observations. We intend to replace this summer the present mixer with a new one of comparable or better temperature and allowing higher USB rejections.

It is important to check your calibration on strong reference sources (see IRAM line catalog and updates [1, 10, 15]). Beware also of possible interference between the 'second' 1.3 mm receiver, 230G2, and this receiver when operating at harmonic frequencies (the two receivers receive the same polarization; the interference will be a strong and narrow line).

2 mm Receiver

Good and reliable performance over most of the band (see Fig. 1). Tunable from 130 GHz to 180 GHz with SSB receiver temperatures of 70 to 150 K (130 to 155 GHz), and 150 to 400 K (155 to 180 GHz).

1.3 mm heterodyne Receivers

– 230G1:

  Operating band: 203.4 – 250 GHz. Between 203 and 245 GHz, the SSB receiver temperature is 100 – 180 K in the standard reference plane.

– 230G2:

  This receiver has been equipped with a new mixer in February 1994. The SSB receiver temperature over the nominal tuning range (210–250 GHz) is 100–130 K in the standard reference plane. The upper side band can be rejected by typically $\gtrsim$ 16 dB over this range. This receiver can be tuned to 267 GHz, although with a higher noise temperature ($T_{\rm SSB} \sim$ 600 K). See the March 1994 Newsletter for more details.

The two 1.3 mm receivers and the 3 mm SIS receiver can be used simultaneously. Beware, however, of possible interference of 230G2's LO into the 3 mm receiver. *The 230G2 receiver cannot be operated with the 2 mm receiver*, since both receivers use the same control box. Switching from one receiver to the other is not straightforward and will not be made upon request in real time. Please specify in the proposal form whether you choose to use the 2 mm receiver or 230G2.

At 1.3 mm (and *a fortiori* at shorter wavelengths) a large fraction of the receiver radiation pattern is distributed in an error beam (which can be approximated by two Gaussians of HPW $\simeq 170''$ and $800''$ — see A&A 274, p.144-146 for more details). Astronomers should take into account this error beam when converting antenna temperatures into brightness temperatures.

0.8 mm Receiver

The IRAM 345 GHz SIS receiver will be made available for a couple of weeks. The performances measured last winter were:

- Operating band: 330 GHz - 360 GHz
- DSB receiver temperature= 100–120 K in the standard reference plane (up to 345 GHz), 130– 150 K above
- Feff = 0.8
- Beff = 0.17

Expected improvements for 1995 are a larger operating band (290–360 GHz), a 1 GHz IF bandwidth, and SSB operation.

The MPIfR Bolometer array

A bolometer array with 7 or more channels, built by the MPIfR, will be made available around February 1995 to external users for a period of 3–4 weeks (see [11] for a description of the MPIfR 7-channel array used last year at the 30 m telescope). Each channel will have a sensitivity of $\simeq$ 90 mJy $s^{1/2}$ under very good weather conditions and a HPBW of 11'–12".

The bolometer will normally be operated by wobbling at 2 Hz the secondary mirror in azimuth. As the array is fixed in Nasmyth coordinates, the orientation of the 7 beams with respect to the sky and to the chopping direction changes with elevation. Software will be made available at the telescope and in Granada for data reduction.

The IRAM 1.2 mm single-channel bolometer will normally not be available during this session.

Polarimeter

A polarimeter has been constructed by IRAM for measurements of *circular* polarization. It has been tested on the telescope in February 1994. The results of the test are available in the March 1994 issue of this Newsletter. The main technical features of the polarimeter are briefly described below.

The polarimeter consists of a dielectric quarter-wave plate working in transmission. It is rotated between two positions at $\pm 45^o$ by a motor, the switching time is $\simeq 0.3s$, and the phase time is adjustable. From the point of view of data acquisition, it functions like other switching devices, i.e. the chopper or the wobbler, and the *difference* between the RCP and LCP intensities is acquired.

The present quarter-wave plate has been designed for 113.3 GHz. Its transmission loss is $\simeq$ 2%, and its cross-polarization below 20 dB. Similar plates could be fabricated for other frequencies if needed. Proposals for projects requiring the polarimeter can be submitted. They should state clearly the degree of performance that they demand from the technical side. Besides the scientific evaluation, the acceptance and scheduling of such proposals will depend on their feasibility as judged from their requirements.

General point about receiver operations

We urge observers to restrict their frequency lists as much as possible and to send them early to Granada and Grenoble. For late arrivals (less than 2 week in advance), or a large number of frequencies, there is no guarantee for a prior test of the requested tunings.

Remote observing / Service observing

The telescope is controlled by the operator, assisted by the astronomer-on-duty, in the local as well as in the remote observing modes. The operator tunes the receivers during night time and is in charge of the supervision of the telescope; he has to leave occasionally the control room. During this time the astronomer on duty takes over. Remote observations thus require two persons at the telescope and are only possible for a limited number of hours. For safety reasons, direct access to the OBS/OBSINP telescope control programmes from outside is not allowed, except from IRAM Granada.

Remote observing using OBS/OBSINP is possible from the downtown Granada IRAM office, while keeping close contact with the operator/astronomer-on-duty via e-phone or other means. The RED data are on display. Short (few hours) proposals can be carried out this way by *experienced* observers. This mode of observation should be requested at least 2 weeks in advance.

"Service observing", with the PI staying at his home institute, is also possible upon request for some programmes (of less than 8 hours, with only one set of tunings and few sources or positions to be observed). Observations are made by the local staff (operators helped by the astronomer-on-duty or by a member of the investigator's institute present at the telescope for his/her own observations). We will try to send you the `spectra.30m` data-files and the two pages of the OBS monitor if your computer allows it (Spain, France or Germany only, so far). This is a passive way of observing, no direct interaction with the telescope through OBS being possible. For this type of observation, we request an acknowledgement of the IRAM staff member's help in the forthcoming publication.

Backends

There are 6 backends which can be individually connected to any receiver.

- The *1_1MHz* filter bank, consisting of 512 channels of 1 MHz (can be split into two halves and connected to two different receivers);
- The *2_1MHz* filter bank, consisting of 512 channels of 1 MHz (not splittable);
- The *100kHz* backend, consisting of 256 channels of 100 kHz (splittable into two halves movable inside the

500 MHz instantaneous bandwidth, and connectable to two different receivers)

- The 500 channel *AOS*: bandwidth 500 MHz; actual spectral resolution 1.5 MHz. Using the AOS with the 3 mm SIS receiver results in higher noise at the band edges, so the combination 3 mm SIS + AOS is not recommended.
- The *1_AUTO* autocorrelator: Available resolutions are 10, 20, 40, 80, 320 and 1250 kHz. The bandwidth is between 20 MHz and 512 MHz, depending on resolution. The correlator can be split into 4 independent subbands, each of which can be configured individually and connected to the same or different receivers. For the larger bandwidths (i.e. more than one subband of 80 MHz) a problem of platforming may exist (i.e. baselines from the different subbands have slightly different levels).
- The *2_AUTO* autocorrelator, identical to *1_AUTO*.

Pointing / Focussing

Pointing sessions are made every one to two weeks; at present, the fitted pointing parameters yield an absolute pointing accuracy better than $3''$ (r.m.s.). We also try to keep the receivers as closely aligned as possible (to about $2''$, however, alignment can be lost occasionally). Checking the pointing and alignment is the responsibility of the observers (use a planet for alignment checks). Normally, the focus position can be monitored with the 3 mm Continuum receiver. Note that 230 G2 and 230 G1 have foci differing by 0.5 mm. Using both receivers, you should carefully monitor the focus and choose a compromise value. Not doing so may result in broadened beams (e.g. HPW $15''$ and non-gaussian beams on one receiver [15]).

Wobbler

- Beam-throw: from 0 to $240''$ on either side of the source (avoid small amplitudes for line work).
- Standard phase duration: 2 s for spectral line observations.

Calibrated spectral lines

We are continuing a number of line calibrations at the higher frequencies (2 mm and 1.3 mm, similar to the Mauersberger et al. catalog) and calibrations for redshifted CO lines. These calibrations are made with precisely known rejections (see e.g. [2,9,10]).

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S. Liechti, M. Guélin, H. Hein, A. Greve (June 1991)

3 Thermal effects on the azimuth and elevation encoders
J. Cernicharo, J. Penalver (Sept. 1991, IRAM report 232)

5 Antenna test measurements at 350 GHz with the MPIfR Bolometer
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6 Test of the 43 GHz receiver
H. Steppe, A. Greve, H. Hein, T. Kampf, C. Kompe, A. Schmidt (Sept. 1991)

7 Gain elevation curve and aperture efficiencies for the IRAM 30 m telescope
H. Steppe, R. Mauersberger, A. Greve, D. Morris (Sept. 91).

8 Test of a 345 GHz open structure SIS receiver at the IRAM 30 m telescope
H. Rothermel, A. Greve, H.Hein, B. Lazareff (Nov 91)

9 Meteorological conditions measured at the IRAM 30-m telescope
A. Greve, J. Penalver, W. Brunswig, B. LeFloch (Dec 1991)

10 IRAM 30-m telescope receiver tests in December 1991
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11 Bolometer array test
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C. Thum, E. Kreysa, D. John, H.P. Gemuend, W. Brunswig, A. Greve, G. Haslam, R. Lemke, H.P. Reuter, M. Ruiz, A. Sievers, H. Steppe (Aug. 1992; see also May 1992 Newsletter)

13 Holography of the 30 m telescope in July 92
D. Morris, A. Barcia, J. Garrido, H. Hein, G. Butin, A. Greve (Sept 92)

14 Surface precision of the 30 m telescope
D Morris, A. Greve (Sept 92)

15 Receiver tests during the August 1992 period
M. Carter, J.Y. Chenu, H. Hein, S. Navarro, A. Greve, M. Guélin (Sept 92)

16 Appendix I: Error beam and side lobes of the 30 m telescope at 1.3 mm, 2 mm and 3 mm wavelength
in: Molecular Spiral Structure in Messier 51, S. Garcia-Burillo, M. Guélin, J. Cernicharo 1993 Astron. Astrophys. **274**, 144-146.

17 A Small Users' Guide to NOD2 at the 30m telescope
A. Sievers (Feb. 1993)

18 Thermal behaviour of mm-wavelength radio telescopes
A. Greve, M. Dan, J. Penalver 1992 (IRAM report 233)

19 Interferometric measurement of tropospheric phase fluctuations at 86 GHz
L. Olmi, D. Downes 1992 (IRAM report 238)

20 Thermal design and thermal behaviour of Radio Telescope structures
A. Greve 1992 (IRAM report 253)

21 Astigmatism in reflector antennas: measurement and correction
A. Greve, B. LeFloch, D. Morris, H. Hein, S. Navarro 1993 (IRAM report 289)

22 Design parameters and measured performance of the IRAM 30-m millimeter radio telescope
J. Baars, A. Greve, H. Hein, D. Morris, J. Penalver, C. Thum 1993 (IRAM report 298).

These reports are available upon request (see also previous Newsletters). Please write to Mrs. C. Berjaud, IRAM Grenoble.

Michel GUÉLIN, Wolfgang WILD

Call for Observing Proposals on the Plateau de Bure Interferometer

Observing proposals are invited for the IRAM Plateau de Bure Interferometer (PdBI), for *Nov. 15, 1994 to May 15, 1995*. The deadline for applications is *Monday, September 12th 1994*. The available frequency range will be 82 GHz to 116 GHz. We hope to be able to offer in addition two specific opportunities for a fraction of the time
- very long baselines (E24 to W27)
- 230 GHz band for a test and demonstration period
See below for details.

Details of PdBI and operations are given in the document "An Introduction to the IRAM Plateau de Bure Interferometer" (copies can be obtained from the address below, or from Internet via the World-Wide-Web and NCSA-Mosaic software; use IRAM home page `http://iram.fr/www/iram.html`). Proposers should read this document carefully before submitting any proposal.

Proposals should be sent to

IRAM Scientific Secretariat
Interferometer Observing Proposal
300 Rue de la Piscine
F-38406 Saint Martin d'Hères Cedex
FRANCE

IRAM expects to schedule and complete between 20 to 30 projects in this period, with an elapsed time of at least two months between start and end of any given project. Selection will be based on scientific merit, technical feasibility, and adequacy to the instrument.

For this call for proposals, please note the following opportunities:

Very long baselines We are have started the extension of the baselines of the interferometer, adding stations W20, W23, W27 and N29. We anticipate that only the West track extension (W20, W23 and W27) will be completed before the winter.

Proposals which could benefit from these long East-West baselines can be submitted with an explicit mention **"Long East-West baselines request"**. Only a very limited number of such proposals will be considered. Because the whole extension will not be complete, the exact configuration(s) offered is (are) not yet defined. Observers are welcome to make propositions, in particular about the number of extra configurations required (one or 2 ?), but the final choice will remain IRAM's responsibility.

230GHz receivers IRAM plans to equip 2 antennas with dual-frequency receivers by the end of September. The 4 antennas might be equipped with such receivers by January 1995. The new dual-frequency systems have the following capabilities:

- SSB tuning between 82 and 115 GHz. This brings a factor 2 improvement in sensitivity at 115 GHz when compared to the current system.
- DSB tuning between 210 and 240 GHz. Expected $T_{\rm rec}$ is about 80 K.
- Simultaneous observing at both frequencies. Each of the 6 units of the correlator can be connected to one or the other receiver.

Performances at 230 GHz will require some extensive testing. In order to benefit most from these added capabilities, and to perform the best tests, IRAM is calling for **"Tests or Demonstration projects for the 230 GHz system"**. The following restrictive conditions will apply for these projects:

- All projects should be suited for a test period: there is no implied guarantee of completion as for normal proposals.
- Test projects should be feasible with 2 or 3 antennas.
- Pointing accuracy is not expected to be better than $3''$.
- Test projects should clearly explain what aspect of the interferometer they will test, and what scientific result is expected in case of success.
- Proposals should mention "**Test project for the 230 GHz system**" or "**Demonstration project for the 230 GHz system**".
- Demonstration projects will be carried out only if all 4 antennas are equipped, and only if the previous tests were successful.
- IRAM may require either an in-house collaborator, or the presence of one of the investigators on the site during the test period, or quick data reduction of the project by the investigators in Grenoble, or any combination of the above requests depending on project complexity.
- All projects should have an associated 3mm project to be carried out simultaneously. The associated project will **not** benefit from the normal "guarantee of completion", unless specifically requested in the proposal. Only one proposal should be submitted for both projects.
- The tests will obviously start with short baselines (D configuration). Long baselines (B2 configuration) will be tested also, but use of the "very long" baselines is unlikely.

Other relevant information:

Change of scheduling periods: IRAM will now issue 2 calls for proposals per year, instead of 3. The two scheduling periods are 15-May to 15-Nov ("Summer Period"), and 15-Nov to 15-May ("Winter Period").

Configurations: The exact configuration scheme is given in the "Interferometer" section of this Newsletter. The "CD" (compact) array is obtained with 3 configurations, and the "BC" (high resolution) array with 4 configurations, with two configurations in common.

We insist that authors must specify and CAREFULLY justify the requested configuration choice.

Many proposals have been received with insufficient noise estimates. In many cases, a better result can be obtained using lower angular resolution. Combination of all configurations (BCD, 5 configurations in total), is possible, but must be justified even more carefully.

Coordinates and Velocities: The interferometer operates in the J2000.0 system. For best positioning accuracy, source coordinates MUST be in the J2000.0 system; position errors up to $0.3''$ may occur otherwise.

Please do not forget to specify LSR velocities for the sources. For pure continuum projects, the "special" velocity NULL (no Doppler tracking) can be used.

Correlator: The correlator has 6 independent units, each being tunable anywhere in the 130-610 MHz band, and providing 4 choices of bandwidth/channel configuration: 160 MHz/64, 80 MHz/128, 40 MHz/256 and 20 MHz/256. For the 40, 80 and 160 MHz bandwidths, the two central channels may be perturbed by the Gibbs phenomenon (depending on continuum strength): it is recommended to avoid centering the most important part of the lines in the middle of the band of the correlator unit.

Receivers: All receivers can be tuned in lower side band with USB rejection of 5-8 dB. In this mode system temperatures (T_r^*) below 150 K for A#2 and A#3, and 180 K for A#1 (Trec 45 and 55 K, respectively), are normally reached below 100 GHz. Higher rejections offer no gain in sensitivity. Accordingly, observations are preferentially done in LSB. If you want a double side band tuning (e.g. to observe one spectral line in each band), please specify it.

This LSB tuning will also be possible between 113 GHz and 115.3 GHz.

Sun Avoidance: For safety reasons, the sun avoidance circle has been extended to 45 degrees. Please take this into account for your sources AND for the calibrators.

Mosaics: The PdBI has mosaicing capabilities, but the pointing accuracy may be a limiting factor at the highest frequencies. Please contact S.Guilloteau in case you have questions.

Data reduction: Proposers should be aware of constraints for data reduction:

- In general, data will be reduced **in Grenoble**. Proposers will not come for the observations, but will have to come for the reduction.

- We keep the data reduction schedule very flexible, but wish to avoid the presence of more than 2 groups at the same time in Grenoble. Please contact us in advance.
- IRAM may consider splitting the data reduction in two phases: intermediate calibration and final mapping. Such a splitting is often absolutely necessary for the high resolution images. In such a case, the proposers must be ready to come to IRAM for fast data reduction of the "compact" configurations.
- New versions of CLIC are upward compatible with previous ones, but the reverse is not true. Observers wanting to finish data reduction at their home institute should obtain an up-to-date version of CLIC. Since CLIC maintenance is a heavy and tricky task, we insist that observers having a copy of CLIC take special care in maintaining it up-to-date.

Data reduction will be carried out on the dedicated HP workstation.

Local contact: Depending upon the program complexity, IRAM may suggest an in-house collaborator instead of the normal local contact.

Technical screening: All proposals will be reviewed for technical feasibility in parallel to being sent to the members of the program committee. Please help in this task by submitting technically precise proposals. Scientific justification should be kept within 2 pages. Note that your proposal must be complete and exact: velocities, position and frequency setup must be exactly specified.

Non-standard observations:
Please contact S.Guilloteau in case of doubt about non-standard program feasibility.

The documentation for the IRAM Plateau de Bure interferometer includes documents of general interest to potential users:

- An Introduction to the IRAM Plateau de Bure Interferometer.
- IRAM Plateau de Bure Interferometer: Calibration CookBook.
- IRAM Plateau de Bure Interferometer: Mapping CookBook.
- IRAM Plateau de Bure Interferometer: Frequency Setup.
- CLIC: Continuum and Line Interferometer Calibration.

More specialized documents are also available; they are intended to observers on the site (IRAM on-duty astronomers, operators, or observers with non-standard programs):

- IRAM Plateau de Bure Interferometer: OBS Users Guide.
- IRAM Plateau de Bure Interferometer: Amplitude Calibration.
- IRAM Plateau de Bure Interferometer: Flux Measurements.
- IRAM Plateau de Bure Interferometer: Pointing Parameters.
- IRAM Plateau de Bure Interferometer: Trouble Shooting Guide.

All documents can be retrieved on Internet via the World-Wide-Web and NCSA-Mosaic softwares. IRAM homepage is `http://iram.fr/www/iram.html`

Finally, we would like to stress again the importance of the quality of the observing proposal. The technical preparation of observing proposals is unfortunately often insufficient. In the past, proposals were received which did not even include exact observing frequencies or even source coordinates, or worse, with coordinates with the wrong epoch !... The IRAM interferometer is a powerful, but complex and unique instrument, and proposal preparation requires special care. Information is available in the documentation, and the IRAM staff can help in case of doubts if contacted well before the deadline. Note that the proposal should not only justify the scientific interest, but also demonstrate how the Plateau de Bure interferometer will bring new information.

Stéphane GUILLOTEAU

Call for "Letters of Intent"

Observations of high-redshift gravitationally lensed objects – Coordination of future observations – Call for "Letters of Intent" to participate

This Newsletter contains an abstract reporting a discovery of CO from the Cloverleaf, a gravitationally lensed quasar with a redshift of 2.6. The discovery, made with the IRAM interferometer, and confirmed at the 30m telescope, is likely to prompt further searches for mm-wave transitions in other gravitationally lensed objects.

Such observations are undoubtedly of high scientific interest. However, they are particularly delicate and require a lot of telescope time, especially if the redshifts at which the molecular transitions should occur are not well known. The only way to minimize this risk is to carefully prepare the observations, usually involving spectroscopic studies at other wavelengths (e.g. optical and/or infrared), as well as the choice of the best observing technique (30m telescope or interferometer).

Because of these special requirements, we would like to encourage coordination and cooperation among those users who have an interest in this particular kind of work. IRAM is willing to organize such collaborative effort.

I am therefore inviting "Letters of Intent" to participate in the study of high-redshift gravitationally lensed objects with the IRAM telescopes. The letters should be addressed to me and should contain information about the special contribution which the proposer wants to make to prepare and execute future observations at either the 30m telescope or the Plateau de Bure interferometer.

There will be no deadline for such "Letters of Intent" but IRAM will establish as quickly as possible a small advisory/steering group on an experimental basis for a limited period of time that will be charged with defining the best observing strategy and with selecting the most promising gravitationally lensed objects.

Michael GREWING

Scientific Results

Circumstellar CO around bright oxygen-rich semi-regulars

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Abstract: We report high signal to noise millimeter wave observations of 11 nearby Semi-Regular variables, most with periods between 89 and 160 days, in the transitions ^{12}CO ($J = 2-1$) and ($J = 1-0$) and ^{13}CO($J = 2-1$). The line profiles have been fitted by a model including molecular excitation and radiative transfer and the derived envelope properties (expansion velocity, mass loss rate, outer radius, kinetic temperature distribution) are compared to the predictions of theoretical models. The mass loss properties of this sample of Semi-Regulars appear to be very similar with those of longer period ($300 \leq$ P < 400 days) Miras, observed with the same telescope. This result is consistent with the view that the Semi-Regulars are overtone pulsators while the Miras are in the fundamental pulsational mode. The pulsational mode does not strongly affect the mass loss from the star.

The radial distribution of HC_3N molecules in IRC+10216

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([2])IRAM, 300, rue de la Piscine, Domaine Universitaire, 38406 Saint-Martin-d'Hères, France.

Abstract: We present sensitive, high resolution maps of HC_3N emission in the circumstellar envelope of IRC+10216. We have mapped the $J = 16-15$, $J = 18-17$ and $J = 24-23$ transitions at 1mm and 2mm wavelength. Contrary to previous maps of lower transitions, they show centrally peaked intensity distributions. We resolve this discrepancy by modelling the vibrational and rotational excitation of HC_3N, showing that it largely results from radiative and collisional excitation in the envelope inner layers. The HC_3N abundance is changed by this result in the sense that HC_3N is more abundant than previously thought. Our new results are compared with chemical models.

CO(1–0) observations of the cooling flow galaxy NGC 1275 with the IRAM Interferometer

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([3]) National Radio Astronomy Observatory, 949 N. Cherry Ave., Campus Building 65, Tucson, AZ 85721-0665, USA

Abstract: High resolution ^{12}CO ($J = 1-0$) interferometric observations are presented of NGC 1275 (3C84, Perseus A), which is the dominant galaxy of the Perseus cluster (Abell 426) and is believed to have a strong cooling flow. No CO absorption was detected towards the powerful point-like nucleus although CO emission may have been detected in an area surrounding the nucleus.

The constraints placed by these observations and existing data on the massive cooling flow scenario are examined. Contrary to some claims, the covering fraction of neutral gas has been found to be much less than unity in all cooling flows where the necessary data are available. As the cooling gas presumably forms low-mass stars or substellar objects, the possibility of large masses of neutral gas escaping detection is investigated in detail. The gas, with or without dust, should not cool down to $T_{\rm gas} \sim 3$ K as has been claimed but should remain $\gtrsim 8$ K through X-ray heating at column densities up to $N_{\rm H_2} \approx 5\,10^{22}\,{\rm cm^{-2}}$. Greater column densities may be physically reasonable if the magnetic field is strong enough to support the cloud against fragmentation. In this case, ambipolar diffusion or magnetic slip-ion heating becomes important and should maintain the temperature $T_{\rm gas} \gtrsim 10$ K. If the clouds contain dust, then although the dust radiates away most of the energy, the absorbed starlight keeps the temperature $T_{\rm dust} \gtrsim 10$ K. Lack of CO or very broad lines do not appear to be feasible means of reconciling large molecular (or atomic) gas masses with the global lack of detections and tight upper limits. The primary conclusion is that the real mass inflow rates must be much lower that frequently claimed. It should then be noted that present-day cooling flows, if not so massive, lose much of their cosmological importance.

The FIR and CO emission from NGC 1275 correspond exactly to what is found in gas-rich spirals. Rather than a massive cooling flow, the gas may come from accretion of one or more gas-rich galaxies. Since, however, at least 14 other central galaxies would have been detected in CO if they contained similar quantities of gas, such events must be quite rare, very roughly $1/15\,{\rm Gyr^{-1}}$ if the time required for a large fraction of the gas to disappear is 10^9 yr.

Accurate Radio Positions of SiO Masers

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Abstract: Highly accurate radio positions of the $v = 1, J = 2-1$ SiO maser sources observed with the IRAM interferometer toward 13 late-type stars and the infrared object IRc2 in Orion, are presented. The coordinates are directly derived in the J2000 system after the baseline vectors have been oriented with respect to the extragalactic frame formed by distant quasars. We estimate the final accuracy of our 'absolute' positions of SiO masers to lie in the range $0.1''$ to $0.2''$ in general. The optical and radio centers coincide within the uncertainties. However, in the complex supergiants VY CMa and VX Sgr there is a clear offset between the optical and radio positions. Spatial structure is present in our SiO data since we have observed in several stars relative position offsets larger than about 20-50 milliarcsec.

The radio and optical J2000 positions are compared and discussed, and we suggest that accurate position measurements of maser sources associated with stars may valuably contribute to the alignment of the fundamental optical and extragalactic reference frames.

Extremely strong CO emission from the Cloverleaf, a quasar at $z = 2.5$

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(3)Physics Department, University of California, Santa Barbara, California 93106, USA
(4)URA173 CNRS, Observatoire de Paris, F-92195 Meudon, France
(5)Kapteyn Astronomical Institute, Postbus 800, 9700 AV Groningen, The Netherlands

Abstract: Few tools are available to astronomers for observing galactic material in the early universe. Galaxies at high redshift are very faint and difficult to study in the optical and near-infrared wave bands. In 1991 a very luminous galaxy at redshift 2.3 was discovered in the far-infrared and subsequently detected in carbon monoxide emission at millimeter wavelengths, indicating the presence of a huge mass of dust and gas. This held out the possibility for a new observational handle on early galaxies, but the object, IRAS F10214+4724, has since remained unique. There exists however an enormous pool of potential targets for galactic studies at high redshift, namely the host galaxies of quasars. Using the Plateau de Bure Interferometer, we have detected strong CO(3-2) emission (Fig. 2) from the host galaxy of a quasar at $\mathbf{z = 2.56}$, increasing the highest known CO redshift in a quasar by nearly an order of magnitude.

The object, known as the Cloverleaf Quasar (H1413+117), is interesting in several respects. The name derives from its optical image, which is split into four spots within about 1 arcsecond as a result of gravitational lensing, presumably by an intervening galaxy (as yet undetected). The Cloverleaf is also a Broad Absorption Line Quasar (BALQ), and may be a member of the subset of low-ionization, or Mg II, BALQs. We selected the Cloverleaf for CO studies because of its strong far-IR/submm flux, which we measured as part of a program to examine the submm cutoffs in the spectra of normal and BAL quasars. We found the observed submm continuum strength and shape of the Cloverleaf to be nearly identical to that of IRAS F10214+4724. Since CO line emission and far-IR/submm continuum flux are correlated it seemed that the Cloverleaf should be a good candidate for detectable CO emission. We have recently confirmed the Plateau de Bure CO(3-2) measurement, and detected other transitions of CO as well as CI, using the 30m telescope at Pico Veleta.

The lensing amplification factor is not known, but if it is not too large the inferred gas mass of the Cloverleaf is consistent with the dynamical mass, and with the total baryonic mass of L* galaxies today, suggesting that either the host galaxy is in a primitive state or its gas content has been greatly enhanced by mergers with other gas-rich systems.

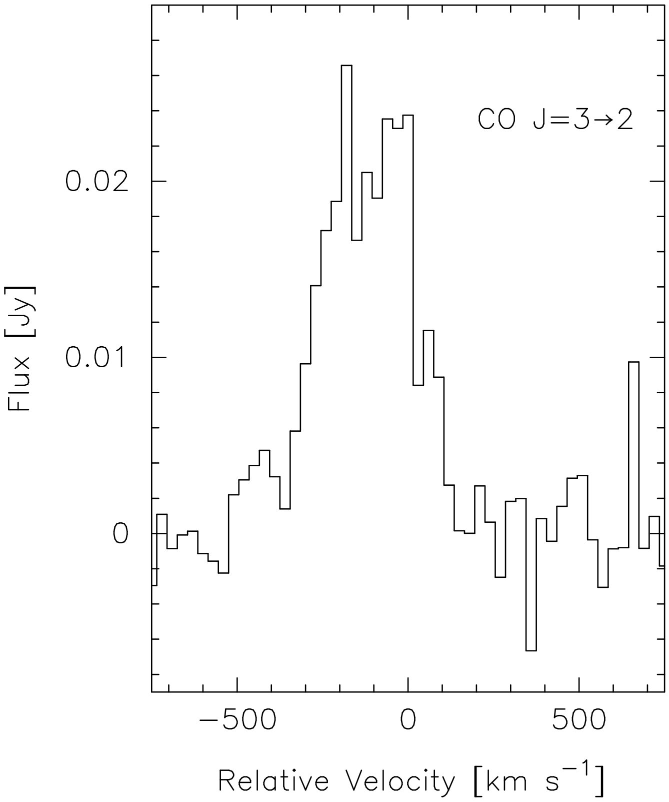

Figure 2: CO $J = 3-2$ (rest frequency 345.7 GHz) spectrum observed with the Plateau de Bure Interferometer. The velocity scale represents the offset relative to the central observed frequency of 97.134 GHz.

We thank S. Guilloteau for scheduling the observations, and D. Downes for assistance with the data reduction.

New Preprints

The following preprints are available from IRAM:

321. Zernike polynomial deformations of homologous radio reflector surfaces
A. Greve
1994, *IEEE Trans. Antennas Propagation*

322. Detection of H21α maser emission at 662 GHz in MWC349
C. Thum, H.E. Matthews, A.I. Harris, L.J. Tacconi, K.F. Schuster, J. Martin-Pintado
1994, *Astron. and Astrophysics, Letters*

323. CO(1-0) observations of the cooling flow galaxy NGC 1275 with the IRAM interferometer
J. Braine, F. Wyrowski, S.J.E. Radford, C. Henkel, H. Lesch
1994, *Astron. and Astrophysics*

Programs Scheduled on the 30-m Telescope in 1993

Oct 12 - 26

Ident.	Title	Freq. (GHz)	Authors
113.93	Molecular gas in the central region of NGC253: A starburst environment with an active nucleus	115,146,230	Wielebinski, Von Linden, Henkel, Mauersberger, Wiklind
150.93	Calibrating the CO Tully-Fisher relation in Hercules		Kazes, Dickey, Sofue
132.93	Investigation in the clump-interclump structure in the Rosette molecular cloud with high angular resolution CO observations	110,115,220,230	Schneider, Stutzki
111.93	Solving the nitrogen isotope puzzle	86,88	Henkel, Chin, Mauersberger, Wilson, Dahmen, Langer
122.93	Molecular clouds beyond the optical disk of the Galaxy	110,115,230,98	Henkel, Digel, De Geus, Thaddesu, Huettemeister
110.93	A high resolution study of the possible molecular counterpart to the galaxy center filament G359.54+0.18	230,220,97	Uchida, Guesten, Yusef-Zadeh

Oct 26 - Nov 9

Ident.	Title	Freq. (GHz)	Authors
122.93	Molecular clouds beyond the optical disk of the galaxy	110,115,230,98	Henkel, Digel, De Geus, Thaddeus, Huettemeister
126.93	Sulfur nucleosynthesis : a critical check on oxygen burning in massive stars	98,144,145,230	Chin, Mauersberger,Langer,Henkel
110.93	A high resolution study of the possible molecular counterpart to the galaxy center filament G359.54+0.18	230,220,97	Uchida, Guesten, Yusef-Zadeh
KOO3	Small scale structure of pre-star forming clouds		Falgarone, et al

Nov 9 - 23

Ident.	Title	Freq. (GHz)	Authors
123.93	Search for redshifted CO emission from damped Lyman alpha absorbers	95,103,131,279	Van der Werf
133.93	A search for dense clumps in molecular outflows	97,146,220	Tafalla, Bachiller, Welch
144.93	A search for CO emission towards neutron stars interacting with the interstellar medium: the Guitar nebula	115, 230	Cernicharo, Gonzalez-Alfonso, Gomez-Gonzalez
107.93	A search for SO maser emission in O-rich evolved stars		Cernicharo, Alcolea, Bujarrabal
177.93	CO observations of HD 98800 : molecular gas in a protoplanetary disk ?	110,115,230	Zuckerman, Kastner, Forveille, Kahane

Nov 23 - Dec 7

Ident.	Title	Freq. (GHz)	Authors
177.93	CO observations of HD 98800 : molecular gas in protoplanetary disk ?	110,115,230	Zuckerman, Kastner, Forveille, Kahane
147.93	Study of the photodissociation region in NGC 7027: ^{13}CO and HCN single dish maps	88,110,220	Cox, Guilloteau, Omont, Bachiller, Huggins, Forveille
148.93	Further study of the carbon rich TMC-1 filament	97,135,237	Cox, Cernicharo
159.93	Search for CO in high redshift, dusty, radio quiet QSOs	101,109,137,141	Omont, Solomon, Radford, Downes, McMahon
103.93	Search for continuum mm dust emission from QSOs with z>4	Bolometer	Doyle, Griffin
51.93	Bolometer service observations of the cloverleaf	Bolometer	Barvainis, Coleman, Antonucci
176.93	The evolution of mass in circumstellar disks	Bolometer	Beckwith, Sargent, Osterloh

Dec 7 - 21

Ident.	Title	Freq. (GHz)	Authors
173.93	The spectral energy distribution of Vega-like stars	Bolometer	Butner, Walker, Beckwith, Lada
169.93	Continuum observations of dust disks around main sequence stars	Bolometer	Bockelée-Morvan, André, Colas, Despois, Crovisier, Colom, Jorda
161.93	Measurement of the extent of 9 red giant envelopes from ^{13}CO emission	110, 220	Kahane, Guélin, Neri, et al
162.93	HC_3N (24-23) mapping of the circumstellar envelope IRC+10216	85,218,259	Audinos, Kahane, Lucas, Guélin
183.93	Mg isotopes: a key to the synthesis of 25<A<27 nuclei in AGB stars	95,97,131,143	Guélin, Forestini, Cernicharo
178.93	Search for high velocity winds in proto-planetary nebulae	88,146,230	Neri, Bujarrabal, Bremer, Grewing, Guélin
182.93	Investigation of the molecular component of the edge-on galaxy NGC 4565		Neininger, Dumke, Guélin, Wielebinski, Garcia-Burillo
172.93	Dense molecular gas in rings and tails of luminous IR mergers	86,142	Gao, Solomon, Radford, Downes

Dec 21 - Jan 4

Ident.	Title	Freq. (GHz)	Authors
182.93	Investigation of the molecular component of the edge-on galaxy NGC 4565		Neininger, Dumke, Guélin, Wielebinski, Garcia-Burillo
K003	Small scale structure of pre-star forming clouds		Falgarone, et al
128.93	CO measurements in a massive cold cloud very close to the Sun	115,230,110,220	Sempere, Trapero, Beckman, Davies, Combes
149.93	Search for methylenimine in Titan's and Neptune atmospheres	226,146,89,109	Lellouch, Romani, Bezard, Marten, Rosenqvist, Paubert