IRAM Newsletter

Number 13 January 31, 1994

Calendar 1994

Observing proposals:
Proposals for the period:
May 15, 1994 to Nov. 15, 1994
should be submitted before:
Tuesday, March 1st 1994

IRAM S.A.C. Meeting:
April 20th,21st, 1994
Location: Grenoble

IRAM Council Meeting:
June 27,28th, 1994
Location: Bonn

Contents

IRAM building extension

All those of you who have visited IRAM recently must have noticed that in addition to installing four temporary offices in the library, we have given up the small seminar room in order to accomodate our new Ph.D. students, and we have even closed part of the corridor on the first floor to install one of our laboratories there.

These rather drastic measures became necessary after our plans for a building extension got stuck for almost a year in the local administration. Finally now, on December 15th, we obtained the official permit and construction work has started. The building extension will provide on the ground floor new laboratory space, about 100 m2, and office space directly connected to the lab, as well as new offices for astronomers on the first floor, including two for visiting astronomers.

After all the delays it seems difficult to quote a target date but early fall should be a good estimate.

Michael GREWING

IRAM User Meeting

On December 6th and 7th, 1993 an IRAM User Meeting took place. It was attended by roughly 30 guest observers at the IRAM telescopes and in addition by many of the local staff members. IRAM provided an update on the current telescope status and planned developments.

For the 30m telescope, W. Wild reported significant progress in the adjustment of the surface panels, resulting in a reduction of the rms-value by about 20% inferred from recent holography, reported by Dave Morris. Beam efficiency measurements are still pending, but expectations are that the performance of the telescope at 1mm and at 0.8 mm should significantly be improved. A key item of discussion in connection with the 30m telescope concerned the alignment of different receivers and the issue of remote tuning. Bernard Lazareff gave an outline of the mid-term instrumentation plans. James Lamb filled in details of the present receiver construction planning. Brief status reports were given by Karl Schuster and Roberto Neri on the multibeam heterodyne and bolometer array, respectively. As these two projects are still in an early stage, and as both will require substantial new software developments, an invitation was issued to other laboratories and research groups who want to participate. In connection with the development of arrays but also in connection with the extension plans for the Plateau de Bure interferometer (see below) the need for a new correlator development arises. Marc Torres briefed the audience on the current status of chip developments which will in the end determine what IRAM can do.

Stephane Guilloteau described in some detail the experience from more than 6 months of operations with four antennas on Plateau de Bure, and explained the status of preparations both for an extension of the tracks and for the number of antennas from 4 to 5. The latter is still only a hope which could, however, soon become reality. As part of the preparatory work, IRAM has developed in close cooperation with an industrial firm a new kind of all-aluminium panels, and Dietmar Plathner presented to the audience the second prototype that has been manufactured and is now undergoing detailed testing.

In his talk, Stephane Guilloteau had included some remarks about the status of data reduction and data reduction software. This triggered a rather intense discussion about IRAM's software support to outside groups. In particular, the issue of UNIX versus VMS as the operating system came up. A show of hands indicated that in the community VMS is still widely in use whereas both IRAM and the Grenoble Observatory have focussed their efforts on UNIX. Since this was not the first time that this issue came up, it is clear that the situation must carefully be reviewed, and IRAM agreed to do this in close collaboration with the Grenoble observatory.

In this context it is very important that members from the User Community make known to IRAM what *specific* software problems they encountered during observations or during data reduction. This is a standing invitation!

The second day of the User Meeting allowed for a fair number of short contributions from guest observers which highlighted the wide variety of topics that are tackled with the 30m telescope and with the interferometer, respectively. Prior to these contributions a whole session was devoted to a status report on the key project which is carried out at the 30m telescope since the fall of 1992. Edith Falgarone and Jürgen Stutzki briefed the audience on behalf of the key project team and showed that the observations have advanced well but certainly not at the speed that had originally been hoped for. Weather is the primary cause for delays. Given this learning experience and the actual state of the project, it is premature to reach any conclusions as to whether or not the scheme of key projects should be continued in the future or not.

Michael GREWING

Meeting of the Scientific Advisory Committee (SAC)

In conjunction with the IRAM User Meeting (see above), the SAC met to review the outcome of the User Meeting and to discuss a few specific topics in more detail. This included the status of the 30m telescope, in particular the development of its pointing performance with time, the outcome of a recent AOS test, a repeat of which was strongly recommended, and an in-depth discussion of IRAM's development plans for the heterodyne and the bolometer array. The latter one is, as far as hardware is concerned, a collaborative effort with the MPIfR, Bonn and the Service d'Aéronomie, Verrieres le Buisson. The SAC stressed the need to reach as soon as possible similar agreements also for the software development. The SAC furthermore discussed upcoming replacements both for the Programme Committee and for the SAC. Proposals will be submitted to the Executive Council in due time. This meeting of the SAC was the last one under the Chairmanship of Rolf Guesten from the MPIfR, Bonn. As from next year, Claude Bertout from the Grenoble Observatory will take over. IRAM clearly owes a lot to Rolf Guesten for his thrust and efficiency in carrying out his task.

Michael GREWING

30-m Telescope

3 mm Continuum (Pointing) Receiver

During the technical time period at the beginning of November 1993, the LO coupler ring was repaired. The receiver is now tunable again from 77 to 99 GHz with its best receiver temperature of $\approx$ 250 K (DSB) at 86 GHz. Towards the band edges T_{rec} rises to about 350 K.

IRAM 230 GHz Bolometer IBOL-B

This single channel bolometer was made available during the period December 1 to 10. The installation went fairly smoothly, and some minor problems could be solved by the staff. The pointing of the telescope was very good, and the weather conditions were excellent during almost the entire observing run. The best achieved sensitivity on the sky was 70 mJy $\sqrt{s}$.

Receiver Alignment

We try to keep the receivers as well aligned as possible ($\sim 2''$). The last measurements indicate an alignment better than $2''$, but the alignment can change for unknown reasons. A new receiver mount which makes the alignment easier and quicker has been installed for the 2 mm receiver. Similar mounts for the 3 mm and G1 receivers are prepared and will be installed in the future.

Reflector Surface and Holography

An adjustment of the surface panels of the 30m telescope was initiated in the first week of November 1993. It was based on holography observations of the geostationary satellite ITALSAT at 39 GHz. These observations were made at 43 degrees elevation during several night time sessions during the summer months of 1993. They have the advantage over previous observations made at 11 degrees elevation, that no corrections for gravitational deformations are necessary to refer the results to the elevation at which the telescope performance is to be optimised. For the adjustment of the reflector about 500 screws with measured deviations of more than 50 microns had to be moved. Bad weather restricted the working time during the first week of November, and the adjustment was completed on the 7th of December. A very brief (due to bad weather) holography measurement made on the 10th of November (with 72% of the screws adjusted) suggests an improvement of the surface rms error. These results will be verified in a longer holography session.

Autocorrelators

Baselines from different subbands of the correlator often had different levels. The Granada backend group has significantly improved the platforming through modification of the samplers. This results in an improved performance for larger bandwidths.

Radio link Pico Veleta – Granada

The computer radio link between Pico Veleta and the Granada offices is working again. End of September 1993 one of the interface converters for the radio link failed. It took several weeks to get the repaired device back which caused some inconvenience to guest observers and the staff. As a consequence we will introduce more redundancy to keep the down time shorter in future cases of failure.

Telescope Down Time for the Period June – November 1993

Since June 1993 the telescope operators keep a computer log of the telescope status every two hours. Analysis of the data indicates that a low percentage of telescope time was lost due to technical failures. Most technical failures have occured when the expert was at the telescope, and the problem could be solved quickly. The time distribution for the 6 months period June to November 1993 was as follows:

- 63% of the telescope time were used for observations. This includes pointing runs, holography and receiver tuning for observations.
- 8% maintenance. This is the regular Tuesday and Friday maintenance and includes receiver filling and pretuning of observing frequencies.
- 10% technical time (holography not included).
- 11% stop due to wind.
- 7% stop due to bad weather.
- 1% stop due to technical problems.

It is worth emphasizing that this rather positive statistics has been reached during the last half year which could have been a “lucky” period. It reflects mostly longer interruptions. The actual time lost might be somewhat higher since lost periods of less than two hours (e.g. phase lock problems, reboot of computers, short wobbler problems etc.) are not included.

Transport

Since the beginning of December the transport to the telescope is done by Ratrac. The following table gives the transport schedule for the winter period:

	Departure from:	
	Granada Office	Telescope
Monday	08:15	10:45
Tuesday	08:15	10:45 and 16:30
Wednesday	No transport*	No transport*
Thursday	10:00	15:00
Friday	08:15	10:45 and 16:30

* IRAM-Granada will try to arrange the transport for people (morning hours only) if requested and agreed to beforehand. IRAM-Granada.

Wolfgang WILD

Interferometer

Observing Projects

The exceptionally bad weather period still continues on Plateau de Bure. Early January, major rain and snow falls in the French Alps resulted in several catastrophic events in the surroundings of the Plateau: electricity was down for several days, the two main roads accessing the Dévoluy were cut, and several people died. The cable car could not be operated for several days, and helicopter transport had to be arranged for the staff. The average amount of snow on the Plateau is about 2 meters.

The backlog of projects keeps increasing. For projects which should have been completed in 1993, on average two configurations are missing. This will result in very significant delays for the completion of some projects, since some sources are entering the sun avoidance period.

Data Reduction

Reminder: because of an offset in the phase lock loop which was not compensated for in the software, old spectral correlator data are shifted by 97.656 kHz. Velocities must be corrected downwards (blue-shifted) for the lower side band, upwards (red-shifted) for the upper side band.

Reminder: Improved computer facilities in Grenoble allow several data reductions to be carried out simultaneously. Investigators are requested to contact S.Guilloteau to schedule the data reduction in Grenoble. Because of unusual hardware problems mentioned above, **investigators should schedule a stay longer than 7 days in Grenoble for each project**, with ample time for discussion with IRAM astronomers.

CLIC: Users of CLIC who have a copy of the software at there home institute are warned that the UV table creation was bugged in the last release. They should contact S.Guilloteau or R.Lucas to obtain an up-to-date version.

Configurations

Projects are now routinely carried out with 4 antennas.

We use a total of 5 configurations (instead of 9 with 3 antennas): 2 "C" (intermediate length), 1 "D" (very compact array), 2 "B" (long baselines). The "BC" set has 24 baselines and provides a significantly better sensitivity than the previous 3-antenna choice. The "CD" set has 18 baselines. Projects can request the "BCD" combination (30 baselines) if needed; this choice must be justified.

As an indication, the sensitivity for a full synthesis with 4 antennas, 1 MHz effective resolution (0.625 MHz channel separation), 300 K system temperature is 0.4 K using the BC configuration set (0.15 K using CD).

The configurations are given in the following table (the beam sizes are for 100 GHz):

Antenna configurations:

Configuration	BC	CD	Stations			
B1	o		E24	E18	N11	N17
B2	o		E24	W12	W09	N20
C1	o	o	E10	W12	N05	N13
C2	o	o	E10	W09	N03	N15
D		o	E03	W05	W00	N05

Beam sizes (FWHM) and orientations:

	BC			CD		
Decl.	major	minor	P. A.	major	minor	P. A.
80°	2.21"	2.08"	82°	3.57"	3.36"	85°
60°	2.23"	2.02"	71°	3.59"	3.22"	77°
40°	2.40"	2.02"	48°	3.68"	3.33"	57°
20°	2.83"	2.01"	33°	4.09"	3.39"	28°
0°	3.79"	1.90"	24°	5.08"	3.19"	16°
-20°	5.73"	1.83"	14°	7.65"	3.11"	7°

Stéphane GUILLOTEAU

Software

A new release of the IRAM/Observatoire de Grenoble GILDAS software is scheduled for February 1st, 1994. As announced in the OCT93 release, the FEB94 release no longer provides support for the "old" versions of GreG, Class, Overlay and other programs based on the "old" graphic library. These versions have all been superseded by versions based on a multi-window graphic library.

Some significant improvements have also been made in the SIC command monitor, concerning the handling of mathematical expressions. This version will be considered as a major release.

Users of CLIC must plan to install the latest release when it becomes available, since many bugs have been corrected. This release incorporates experimental support for antenna based calibration.

Stéphane GUILLOTEAU

Computers

In order to match the address scheme of RENATER (the French Research network), we have recently changed our Internet network address. Our network which corresponds to a Class C Internet address format (`193.48.252.*`) has been split into 3 sub-networks, one for the Plateau de Bure and two for Grenoble. In such an operation, host addresses, which would have corresponded to the fourth subnet, cannot be used.

Subnets at Bure and at Grenoble are linked via routers, modems and a permanent line with a bandwidth of 19 kbps. The router at Grenoble also connects our subnets to the World Internet via the next node on `grenet.fr`. The next operation has been to install a name server and to obtain an internationally recognized domain name. The domain name of our network is `iram.fr` with a primary name server on `iraux2.iram.fr`. Any machine on our network can be called (e.g. with `ftp, telnet ...`) by either its Internet address number or its domain name (for instance `193.48.252.22` or `iraux2.iram.fr`).

Mail routing facilities have been installed on all UNIX workstations. Messages can be sent or received from any station. However we suggest to use the common mail address `iram.fr` to contact a person at Grenoble (the received mail message will be seen from any station at Grenoble). For the Plateau de Bure the address is `iraux3.iram.fr`.

With these new possibilities of connectivity we made available the Astrophysics Data System. Catalog services and abstract database are of great use for the scientists.

Mosaic, a user-friendly software distributed by the US National Center for Supercomputer Applications is now available. It is a distributed hypermedia system designed for information discovery and retrieval over Internet and in particular to the World-Wide Web (WWW), an information system based on hypertext. We have installed a WWW server on `iraux2.iram.fr` in order to test the potential possibilities of this new concept and to make available IRAM information, data and scientific results. For WWW experts the URL (Uniform Resource Locator) of this server is `http://iram.fr/www/iram.html`. I will be pleased to hear any comment about this attempt or to assist anyone in accessing this prototype server.

Alian PERRIGOUARD

Call for Observing Proposals for the 30-m Telescope

The *next deadline* for the submission of observing proposals for the IRAM 30 m telescope is *Tuesday, March 1st 1994*. Accepted programmes will be scheduled between May 15th and November 15th, 1994. Roughly 3000 h of observing time will be available during this 6 month session, which should allow an easier scheduling of time consuming (e.g. 90–150 h) programmes. No new call for 'key programmes' is issued for the session. Please find below some relevant information as well as a copy of the proposal form.

The observing session will cover roughly the 'summer' period at Pico Veleta. We do not plan to schedule bolometer or 0.8 mm heterodyne observations; therefore, only proposals for 3 mm, 2 mm and 1.2–1.3 mm wavelengths using heterodyne receivers will be considered. A bolometer array (most likely, a 37-channel array) and the 0.8 mm SIS receiver will be available during the next 'winter' observing session, which will extend from November 15th 1994 to May 15th 1995. Proposals for the winter session should be sent only *after* the next Call for Proposals, which will describe the performances of the instruments, has been issued (deadline September 15th, 1994). Please, note that we do not completely rule out the possibility to install and schedule for a short period of time during the summer session the IRAM single channel bolometer should a special event give scientific reason to do so.

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, now under test, should be available for the May–November 1994 session (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 *Tuesday, March 1st 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 (cf. model enclosed; these forms are also 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 (receiver performance is summarized 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.*

Long programmes

This observing session offers the opportunity to schedule several time consuming programmes (typically 100-150 h) observable in summer-like conditions (e.g. 6–10 mm of precipitable water) ; these should have a large astronomical interest and be well explained; they should also use at least 10h/day. 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 9).

Programmes for the May 15 – November 15 period

One hundred twelve 30m telescope proposals were submitted for the deadline of June 1993. 38 proposals were rated "A", 34 "B", the others "C" or "D". About half of them will actually get time on the telescope, some, however, with less time than requested. The telescope schedule until mid-March is made; the programme PIs have been or are being notified. The bolometer programmes will be scheduled between March 15th and April 12th.

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 complements 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 (note that neither the bolometer, nor the 0.8 mm receiver will be available during the 'summer' session).

	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.

3 mm SIS receiver

(tuning band: 85 - 116 GHz).

This receiver has been equipped with a new Nb junction mixer in August 1992. Its performance on the telescope is summarized in Fig. 1. The SSB receiver temperature is 110K at 115 GHz, and 70–140 K below 100 GHz with a few strong resonances towards the lower end of the tuning range. *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 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. We intend to replace 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,

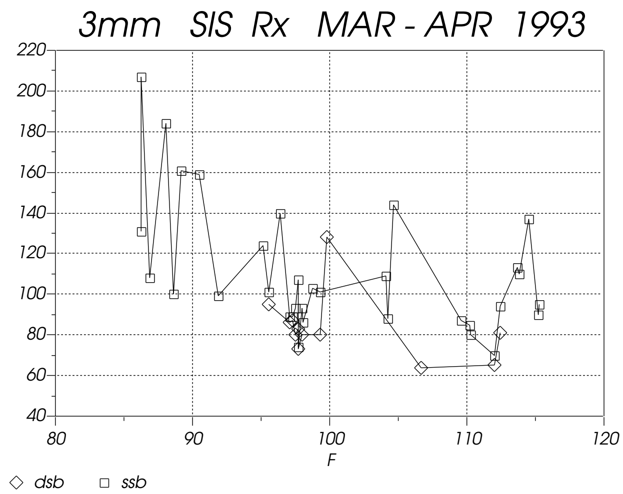

Figure 1: Performance of the 3mm SIS receiver

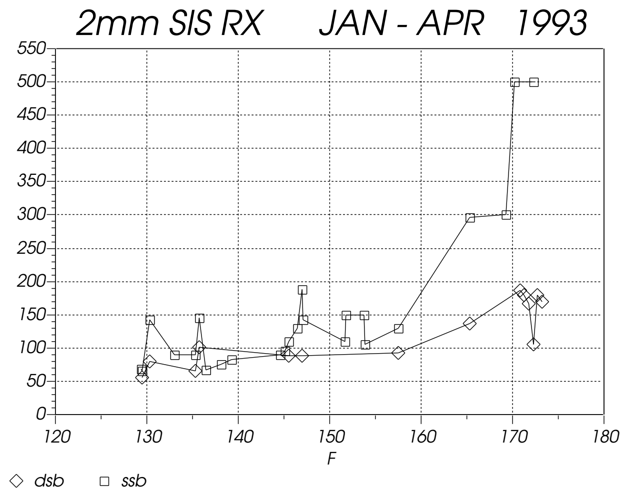

Figure 2: Performance of the 2mm SIS receiver

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. 2). 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 – 260 GHz. Between 203 and 245 GHz, the SSB receiver temperature is 100 – 180, between 245 and 260 GHz, it is 180 – 300 K.

– 230G2:

  This receiver, which was out of order for the last two months, will be repaired in February-March. It is planned to install a new mixer. We expect performances comparable to those of 230 G1 in the 210-255 GHz band.

The two 1.3 mm receivers and the 3 mm SIS RX can be used simultaneously. Beware, however, of possible interference of 230G2's LO into the 3 mm RX. *The 230G2 RX cannot be operated with the 2 mm receiver*, since both receivers use the same control box. Switching from one RX 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 RX 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.

Polarimeter

A polarimeter has been constructed by IRAM for measurements of *circular* polarization. It will be tested on the telescope in the period February 22–25, 1994. The results of the test will be made available promptly. 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 optimized 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 and from the result of the telescope tests to be performed in February.

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) 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* filterbank, consisting of 512 channels of 1 MHz (can be split into two halves and connected to two different receivers);
- The *2_1MHz* filterbank, 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 by unknown reason). 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]).

References

[1] Receiver tests of the December 1990 technical period
M. Guélin, H. Hein, S. Liechti, J. Cernicharo (Jan. 1991)

[2] Receiver tests during the April 1991 technical period
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
E. Kreysa, H. Steppe, C. Thum, J. Baars, R. Chini, A. Greve, G. Haslam, A. Sievers (Sept. 1991)

[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
S. Liechti, M. Guélin, M. Carter, H. Hein, S. Navarro, B. LeFloch, A. Greve (Feb 1992)

[11] Bolometer array test
E. Kreysa, G. Haslam (May 1992 Newsletter)

[12] A facility bolometer for the 30m telescope
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.

Call for Proposals for the Interferometer

Observing proposals are invited for the IRAM Plateau de Bure Interferometer (PdBI), for the period May 15, 1994 to November 15, 1994. The deadline for applications is *Tuesday, March 1st 1994*. The available frequency range will be 82 GHz to 116 GHz.

Details of PdBI and operations are given in the document "An Introduction to the IRAM Plateau de Bure Interferometer". 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 10 to 20 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.

From experience we know that 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!... Please, help to improve the **quality** of the proposals. 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 is willing to help in cases of doubt 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.

For this call for proposals, please note the following:

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").

Weather: During the next period "summer conditions" will prevail for most of the time. Accordingly, there are severe limitations on the feasibility of high frequency (100 GHz or above), high resolution (BC set) maps. The long baseline parts of such maps may become possible only in September or later. Possible conflicts with sun avoidance should be checked.

Antennas: Although we will in general carry out the projects with 4 antennas, only 3 antennas will be available during about 6 to 8 weeks in June and July for maintenance reasons.

Time fillers: Because of the summer conditions mentioned above (weather and antennas), projects which can be carried out with 3 antennas (detections, snapshots, and in general all projects for which the UV coverage is not critical) are strongly encouraged. Projects for which self-calibration is possible will also be favored.

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. As a guideline, remember that above 113 GHz, no high resolution maps have yet been produced... Combination of all configurations (BCD, 5 configurations in total), is possible, but must be justified even more carefully.

Coordinates and Velocities: The interferometer will now operate 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.

New 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 at band center.

Receivers: All receivers can be tuned in lower sideband 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-sideband tuning (e.g. to observe one spectral line in each band), please specify it.

This LSB tuning is not possible above 113 GHz: these frequencies are available only in upper sideband.

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 (C1 and C2).
- CLIC has been modified to handle the new correlator data. The new version is upward compatible with the previous, but the reverse is not true. Observers wanting to finish data reduction at their home institute should obtain an updated version of CLIC, which is now available. 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 are analysed by the program committee with respect to their scientific merit **and** their technical feasibility. Please, help in this task by submitting technically precise proposals by giving exact positions, frequencies and velocities. Please, note that scientific justifications should be kept within 2 pages.

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

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"

Scientific Results

Plateau de Bure observations of mm-wave molecular absorption from ^{13}CO, HCO^+, and HCN

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([2])National Radio Astronomy Observatory, 520 Edgemont Road, Charlottesville, VA, USA 22903-2475

Abstract: We used the Plateau de Bure Interferometer to synthesize λ3mm absorption line profiles of ^{13}CO, HCO^+, and HCN in local gas seen toward the extragalactic continuum sources 0212+735, 0355+508 (NRAO150), and 2200+420 (BL Lac). The HCO^+ and HCN profiles are remarkable in having more and wider lines than CO seen in emission and absorption (Figs. 3 and 4). The relative molecular abundances vary widely. For 11 velocity components we find $<N(HCO^+)> = 1.3 \times 10^{12} cm^{-2}$; $<N(^{13}CO)/N(HCO^+)> \approx$ 200, ranging from $\leq$50 to 1400; $<N(^{13}CO)/N(HCN)> \approx$ 120, ranging from $\leq$50 to 300; $<N(HCN)/N(HCO^+)> \approx$ 1.9, ranging from 0.28 to 4.7.

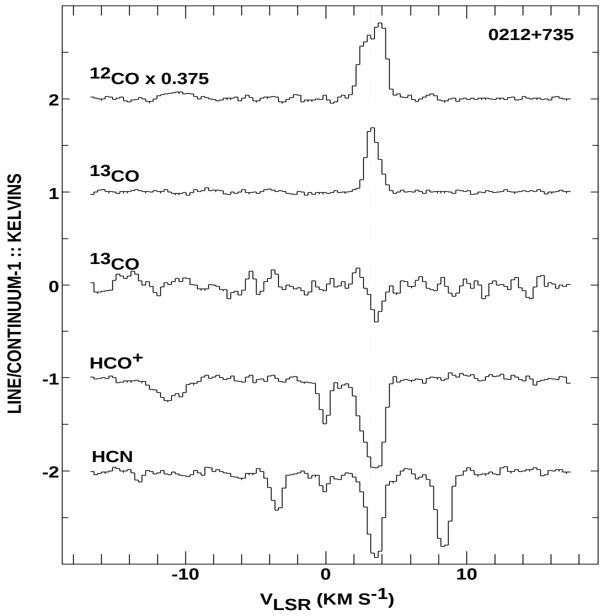

Figure 3: Emission and absorption profiles toward 0212+735 (see Section 2). The channel spacing is 0.26 $km\,s^{-1}$; the resolution of the absorption profiles is 0.47 $km\,s^{-1}$

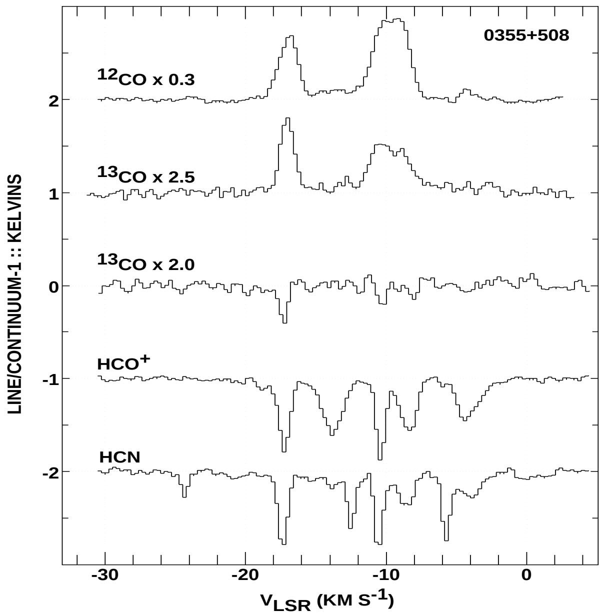

Figure 4: Profiles toward 0355+508, as in Figure 3.

The rotational lines of methanol in comets Austin 1990 V and Levy 1990 XX

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Abstract: We have observed rotational lines of methanol in comets Austin (1990 V) and Levy (1990 XX) with the IRAM 30-m millimeter radio telescope. On comet Austin, several $J = 3 - 2$ transitions around 145 GHz were detected and two $J = 2 - 1$ lines near 97 GHz were marginally detected on May 25, 1990. On comet Levy, observed in the August 26–31, 1990 period, 12 lines were detected among 21 lines observed near 97, 145, 165 and 218 GHz.

In a first step, the observations are interpreted using the rotational diagram method commonly used for interstellar molecular line studies. The methanol rotational distribution is best described by temperatures in the range 20 to 40 K. The corresponding column densities and methanol production rates are derived. In a second step, an out-of-equilibrium model is used where the methanol rotational distribution is governed by collisions, spontaneous relaxation, and excitation of the fundamental vibrational bands by solar radiation. This model shows that the observed distribution is sensitive to the coma kinetic temperature, and suggests that the collisional region is underestimated when taking into account only collisions with water: collisions with electrons may play a major role in the excitation of methanol.

The retrieved methanol production rates are 2.0 and 2.2 10^{27} s^{-1}, corresponding to relative abundances of 5 and 0.9% with respect to water, for comets Austin and Levy, respectively. These abundances are in agreement with independent infrared observations of cometary methanol in the same comets. They show that methanol is indeed an important cometary volatile, and that its abundance may vary from comet to comet. Since methanol is also found to be an abundant constituent of interstellar grains, its presence in comets is consistent with the scenario of formation of comets from unaltered interstellar matter.

The photolytic decay products of methanol, such as CH_3O, should be important in cometary atmospheres, but they cannot account for the suspected distributed sources of CO or H_2CO.

(accepted for publication in Astronomy and Astrophysics, Main Journal)

New Preprints

The following preprints are available from IRAM:

303. *CO absorption in the outer Galaxy*
J. Lequeux, R.J. Allen, S. Guilloteau
1993 Astron. and Astrophys.

304. *Molecular observations of O- and C-rich circumstellar envelopes*
V. Bujarrabal, A. Fuente, A. Omont
1993 Astron. and Astrophys.

305. *Dense molecular gas in ultraluminous and high redshift galaxies*
S.J.E. Radford
1993 Astron. and Astrophys.

306. *The discrimination between O- and C-rich circumstellar envelopes from molecular observations*
V. Bujarrabal, A. Fuente, A. Omont
1993 Astrophysical Journal. Letters

307. *New radio recombination maser features and CO observations in MWC349*
1993 Astron. and Astrophys.

308. *The spatial size of the SiO masers in R Leo derived from lunar occultations*
J. Cernicharo, W. Brunswig, G. Paubert, S. Liechti
1993 Astrophysical Journal. Letters

309. *Plateau de Bure observations of mm-wave molecular absorption from ^{13}CO, HCO^+, and HCN*
R. Lucas, H. Liszt
1993 Astron. and Astrophys.

310. *Images of the GG Tau rotating ring*
A. Dutrey, S. Guilloteau, M. Simon
1993 Astron. and Astrophys.

311. *Observations of protostars and protostellar stages*
P. André
1993 Proceedings of the XIIth Rencontres de Moriond, The Cold Universe

312. *Gas response at the resonances in the grand design spiral NGC 4321*
S. Garcia-Burillo, M.J. Sempere, F. Combes
1993 Astron. and Astrophys.

313. *1.25mm continuum observations of very high redshift QSOs ; Dust at $z = 4.69$?*
R.G. McMahon, A. Omont, J. Bergeron, E. Kreysa, C.G.T. Haslam
1993 Mon. Not. R. Astron. Soc.