IRAM Newsletter

Number 34 January 30, 1998

Calendar

March 5th, 1998: Deadline for the submission of observing proposals for the period May 15, 1998 to Nov. 15, 1998.

May 11-12, 1998 IRAM SAC Meeting

June 18-19, 1998 IRAM Council Meeting

September 14-18, 1998 mm Interferometry Summer School in Grenoble.

Contents

New Task Assignments and Responsibilities

In connection with the changes reported in the previous Newsletter, and also because of new tasks that have arisen, a number of task assignments and responsibilities within IRAM have recently been changed. These are the following :

A: Plateau de Bure

Robert LUCAS has taken over from Stéphane GUILLOTEAU the responsibility for co-ordinating all activities connected to the long-term development of the Plateau de Bure Interferometer. This includes future technical developments as well as the development of software tools.

Roberto NERI has taken over the responsibility for the daily operations of the Plateau de Bure Interferometer. He has already assisted Stéphane GUILLOTEAU in this task before. His new assignment includes the handling of all incoming PdB proposals, their technical assessment, assistance to the Programme Committee, informing the proposers about the outcome of the evaluation process, and the scheduling of the accepted proposals. He is also responsible for following up on technical problems that were detected during the execution of projects or the data reduction phase. Roberto NERI will be helped by the astronomers who have been assigned to each accepted proposal as LOCAL CONTACTS (see below), and by the ASTRONOMERS-ON-DUTY, who's tasks remain unchanged.

Starting with the next observing period, a LOCAL CONTACT will be assigned to each of the accepted proposals. This will be one of the IRAM astronomers. Anne DUTREY will be responsible for organising this as well as for the co-ordination of all activities related to the data analysis and archiving.

The LOCAL CONTACTS will help to prepare the observations for the accepted projects, inform the Principal Investigators about the successful completion of the observations, and arrange the visits in

Grenoble for data reduction. If needed, they will provide help to get started with the data reduction process, and they will closely monitor it to verify the data quality, completeness etc. as well as the proper functioning of the data reduction tools. This feedback should help us to further improve the system.

B: Pico Veleta

All activities connected to the long-term development of the Pico Veleta Observatory, including future technical developments as well as the further development of software tools will be co-ordinated by Michel GUÉLIN.

Starting with the next observing period, Clemens THUM will take over from Michel GUÉLIN the responsibility for handling the observing proposals for the 30m telescope. This includes the handling of all incoming proposals, assistance to the Programme Committee, informing the proposers about the outcome of the evaluation process, scheduling of the accepted proposals, and the responsibility for following-up on technical problems that were detected during the execution of projects or during the data reduction phase and reported to IRAM. Clemens THUM will be assisted by the scientific secretariat, and by the Station Manager, Wolfgang WILD, who will prepare a technical evaluation of proposals and assist in the scheduling, particularly of those projects that have special technical requirements.

C. IRAM Newsletter

With the next issue, Michel GUÉLIN will take over from Robert LUCAS the responsibility of editing the IRAM Newsletter. He will be assisted by the scientific secretariat.

The Newsletter has so far mostly been a forum for IRAM to inform the User Community about recent scientific and technical developments, and to distribute the calls for new proposals. In the future, we would like to develop it into a communication link between the radioastronomical community, the astronomers who use the IRAM facilities already, and the wider astronomical community that works on the same or closely related scientific topics.

Michael GREWING

IRAM MM-Interferometry Summer School: First announcement

IRAM will be organizing a "mm Interferometry Summer School" in September 1998. The school will take place at the IRAM headquarters, in Grenoble, from Sep. 14th to Sep. 18th. The school is intended for PhD students and scientists with or without *a priori* knowledge of radio interferometry techniques. It will focus on special aspects of interferometry at millimeter wavelengths, using the Plateau de Bure interferometer as an example.

A preliminary program and schedule is given in Table 1. A visit to the Plateau de Bure interferometer is foreseen as an integral part of the school.

The number of participants will be limited to a maximum of 40 persons. Participation to the school will be free of charges, but participants are expected to pay their own travel and lodging expenses. Cheap hotel accommodation ($\sim$ 130 FF/night) is available on the University Campus. Lodging is also possible in Grenoble (transport time is about 15–20 min by public transportation). IRAM will provide information and assistance for hotel reservations. IRAM may be able to provide very limited financial support for a few participants.

Further information will be placed on the IRAM Web page (http://iram.fr/). Interested scientists should complete the pre-registration form at the end of this issue (page 35) and send it to

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Mrs A.Jost -- C.Berjaud
Scientific Secretariat
IRAM
300, Rue de la Piscine
F-38406 Saint Martin d'Heres Cedex
FRANCE
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or by E-Mail to berjaud@iram.fr (please specific "Summer School" in the topic field).

Table 1: mm Interferometry School: preliminary program and time table

	Monday 14	Tuesday 15	Wednesday 16	Thursday 17	Friday 18
		LO system & Signal transport *R. Lucas*			
9	Radio Astronomy Fundamentals *C. Thum*		Atmospheric Transmission *S. Guilloteau*	UV Plane Analysis *R. Lucas*	Using the PdB Why and How ? *S.Guilloteau*
10		PdB Operation *R. Neri*	Atmospheric Phase Fluctuations *M. Bremer*		
				Imaging & Deconvolution *S. Guilloteau*	Examples: – High S/N – Self Cal. – Mosaics – Snapshots – Weak Sources *(all)*
11	Interferometry and Aperture Synthesis *D. Downes*				
		Transport to Plateau de Bure			
			Bandpass & Phase Calibration *R. Lucas*	Other methods *K. Bouyoucef*	
12					
13		*Lunch*			
14	Antennas *A. Greve*	*Visit of PdB*		Mosaics *F.Gueth(*)*	Open Session
			Amplitude & Flux Calibration *A. Dutrey*		
15				Short Spacings *S.Guilloteau*	
16	Receivers *B. Lazareff*				
			Standard Calibration *A. Dutrey & R.Neri*	Astrometry *A. Baudry(*)*	
17	Correlators *H. Wiesemeyer*	*Descent from PdB*			
18		*Conference Dinner*			

30m Telescope

MPIfR 37-channel bolometer installed

Beginning of January 1998, the 1.3 mm 37-channel bolometer of the Max-Planck-Institut für Radioastronomie (MPIfR), Bonn, has been installed at the 30m telescope by the MPI team (E. Kreysa and co-workers) and IRAM staff. After a period of technical tests, the bolometer is now used for astronomical observations, and it is planned to use it throughout the bolometer period. The 19-channel bolometer which has been available in previous years is in stand-by and can be installed quickly in case of problems with the 37-channel bolometer.

Change of telephone and fax numbers in Spain

On 4 April 1998, 1:00 h, all telephone and fax numbers in Spain will change to nine digits. The former area code will become an integral part of fax and telephone numbers, i.e. from anywhere within Spain the same number has to be dialled (a system that is already in use in France for example). In the province of Granada, the present area code 958 will be added to all numbers. Also, telephone and fax numbers as dialled from outside Spain will change. After the country code (34 for Spain), the digit 9 has to be inserted. Please update your address books, telephone exchanges, fax machines etc. An information note will be sent in due time to astronomical institutes and Visiting Astronomers to the 30m telescope. The telephone and fax numbers of IRAM Granada and the 30m telescope will be the following.:

Telephone and fax numbers
after 4 April 1998, 1:00 h
(dialled from outside Spain, inside Spain drop the 34)

Granada office:
Tel +34-958 22 88 99 and +34-958 22 66 96
Fax +34-958 22 23 63

30m Telescope:
Tel +34-958 48 20 02
Fax +34-958 48 11 48

Wolfgang WILD

Interferometer

Winter conditions at Plateau de Bure

Snow storms, high wind and unseasonal temperatures have caused a severe delay in the observations. The interferometer records a mere 16% observing efficiency during December, roughly half the efficiency of the year before, and quite a substantial fraction of the time was still not good enough for observations at 1.3mm. The weather conditions being substantially worse than those from early last winter, the current backlog of the observations is severe. A drastic change in the weather conditions is now necessary if we wish to get through all the A-rated projects in the current observing period. IRAM will contact the PIs of the projects susceptible to be cut down in observing time. Please note that B-rated projects will have very little chance to be scheduled.

Receivers and Antennas

The replacement of the subreflector on antenna 3 with a new generation subreflector made from a solid block of aluminum, foreseen for October, had to be deferred until the end of the current observing period. Despite evident signs of surface delamination on the current subreflector, the antenna efficiency is still comparable to the efficiencies of the other antennas.

Because of the accumulated delay, we also deferred replacing the 3mm and 1.3mm receivers on antenna 1 until the end of the current observing period.

The 1.3mm receivers of all antennas have now been equipped with new generation LO2 systems to reduce the overall phase noise budget of the interferometer. Improvements in the antenna efficiency are expected at a level of 10%-20%. Surface adjustments and optimization of the receiver alignment have also been carried out on all antennas last autumn.

Summer maintenance at Plateau de Bure

Again, as last year, extensive maintenance work is foreseen during the summer period. For at least 4 months the array will be operated in the 4-antenna mode. We plan to start the maintenance by end of May, at the latest.

Roberto NERI

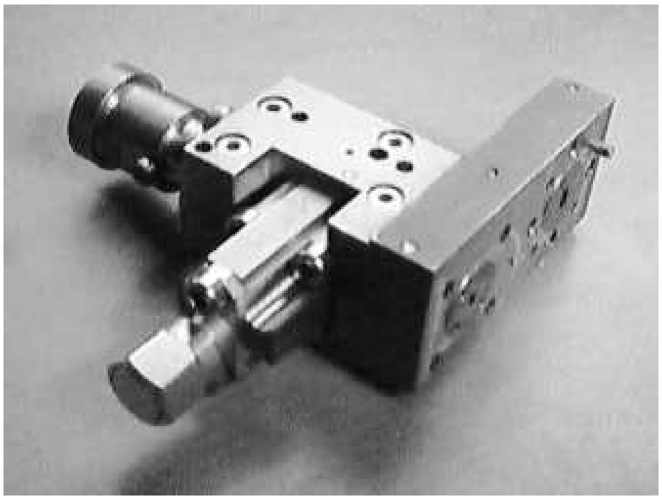

Figure 1: SIS receiver module with the mixer block, the waveguide coupler for local oscillator power injection and the mixer backshort drive.

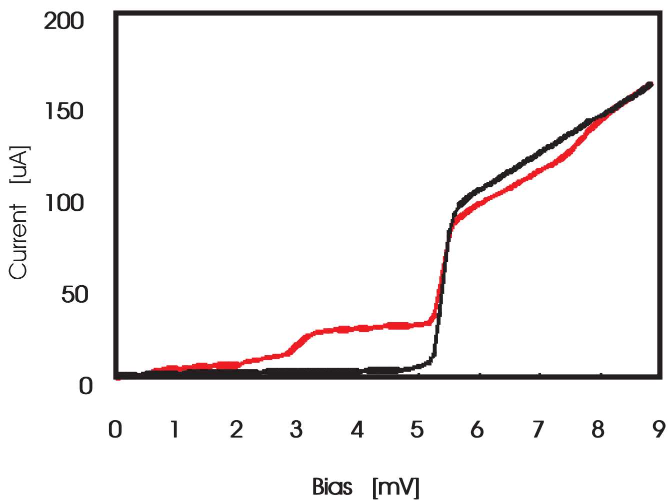

Figure 2: SIS junction Current - Voltage characteristics with and without LO power at 340 GHz.

A 0.8 mm SIS receiver with a $3h\nu/k$ noise at the 30m Telescope

We developed a single sideband SIS receiver for 0.85 mm wavelength and tested it on the 30m Telescope. The single sideband receiver noise of 48 K is only three times above the quantum limit of heterodyne receiver sensitivity. Spectral line observations are speeded up by a factor of two to three with the new receiver.

The receiver noise $T_{\rm rec}$ may be expressed as a number N of incident photons per second and unit bandwidth, doubling the output signal of the receiver [1]. N may be used to compare different low noise receivers operating in different bands. The same value is obtained by comparing the receiver noise with the quantum limit: $N = T_{\rm recSSB}/(h\nu/k)$. In our previous work we reported on a four photon noise double sideband SIS receiver with a broad band fixed-tuned SIS mixer [2] used at the 30m telescope in 1993-1995. The current $T_{\rm rec}$ is about a factor of three above the quantum limit.

In the new receiver the upper sideband is rejected by the tuning of a single backshort in the SIS mixer. Compared to a quasi optical image band filter this technique allows one to reject the image band noise with a minimum increase in receiver noise. In order to simplify the sideband rejection we increased the IF band central frequency from 1.5 GHz to 4 GHz. The new 4 GHz IF amplifier has been developed by D. Gallego at the Centro Astronomico de Yebes (Spain). It has a 1 GHz bandwidth and 7 K noise temperature. In the SIS mixer we are using a two junction array with individual inductive tuning. The individual junction area is about 1 μm^2 and the critical current density is about 7 kA/cm^2. A general view of the SIS receiver is presented in Fig. 4.

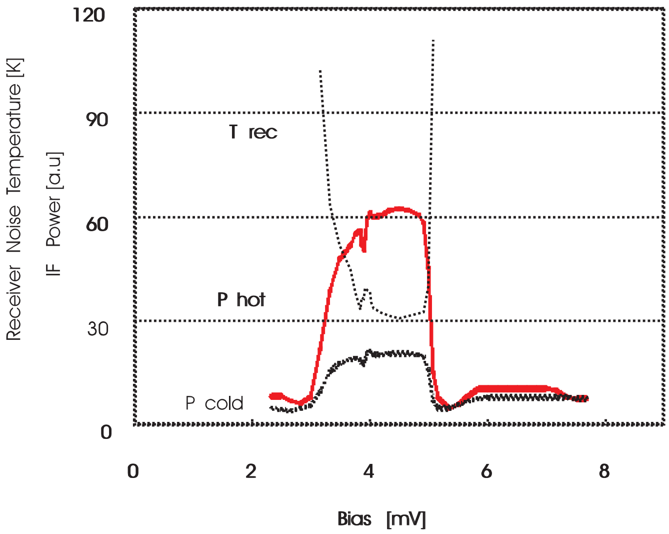

Figure 3: DSB receiver operation in the laboratory.

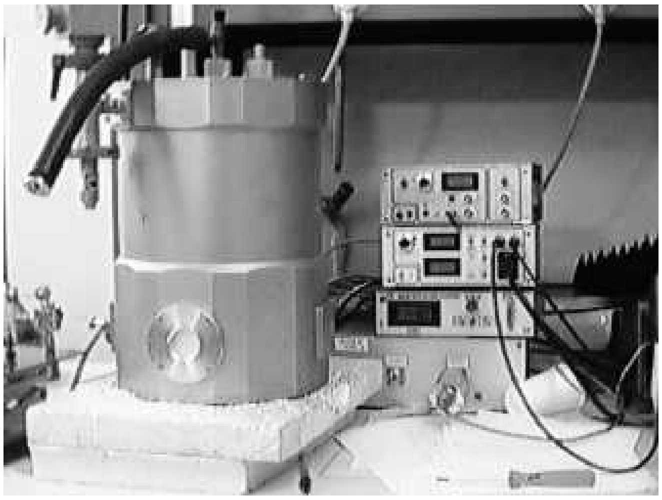

Figure 4: SIS receiver: general view

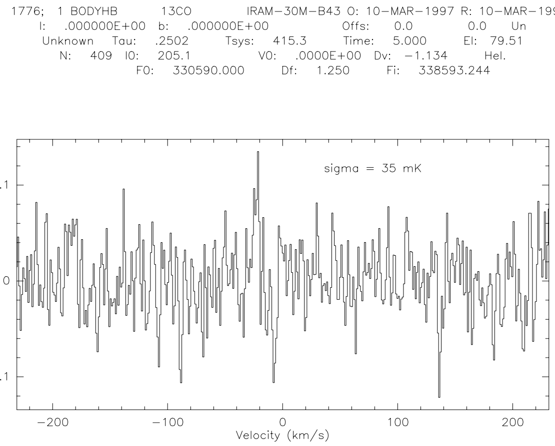

Figure 5: SSB receiver operation at the telescope. The system noise is 415 K (T_A^* scale). The peak-to-peak noise is 35 mK after 5 min of integration (spectrum kindly communicated by F. Combes)

The new receiver single sideband noise temperature is 48 K at 330 GHz while the double sideband noise is about 30 K around 320 - 340 GHz (Figs. 2, 3).

The receiver was used at the 30m telescope on March 4-11, 1997. With the new receiver the minimum radio telescope system noise in the reference plane out of atmosphere is about 400 K (Fig. 6). The receiver sideband rejection at 330 GHz was measured using the ^{13}CO(3-2) spectral line of Orion-IRC2 as a reference source (Fig. 6). The gain in observing time with the new receiver is a factor two or three, depending on the atmosphere.

[1]. M. J. Wengler, "Submillimeter-wave detection with superconducting tunnel diodes", Proc. IEEE, vol. 80, pp. 1810 - 1819, 1992.

[2]. A. Karpov, J. Blondel, M. Voss, K. H. Gundlach, "Four photons sensitivity heterodyne detection of submillimeter radiation with superconducting tunnel junctions",

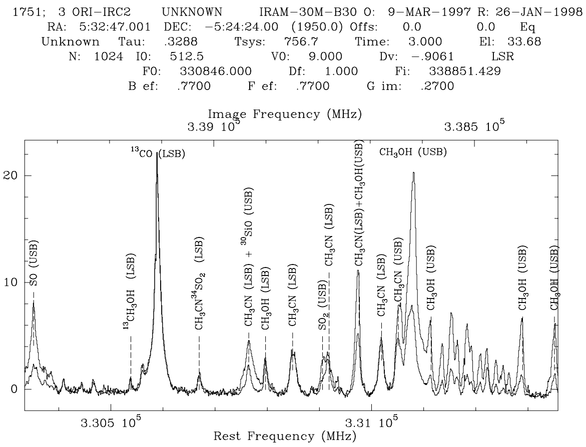

Figure 6: The receiver sideband rejection at 330 GHz, measured using the ^{13}CO(3-2) line in Orion-IRC2 as a reference. Two spectra were measured with and without upper sideband rejection. The spectral lines coming from the upper sideband, as CH_3OH at 338.4 GHz, are attenuated by about 7 dB (spectrum spectrum kindly communicated by F. Combes).

IEEE Transactions on Applied Superconductivity, Vol. 5, No. 2, pp. 3304-3307, 1995.

A. KARPOV

Software

A new release of the IRAM/Observatoire de Grenoble GILDAS software is foreseen for February 1st, 1998. Information on how to retrieve the latest distribution files can be found on the back of this issue.

NIC Software

Users of NIC, the continuum data reduction package for the MPIfR bolometers at the 30m telescope, must plan to use the latest release (FEB98) in view of some innovative change in the calibration procedure. Though most of the changes are in the pipeline, we are quite confident to release the software right in time for the beginning of the 1998 observing period.

For observers who would like to use NIC to reduce continuum data obtained with SHARC, the Submillimeter High Angular Resolution Camera installed at the Caltech Submillimeter Observatory, we provide a tool for the conversion of SHARC data to the format currently accepted by NIC. Interested users should get in touch with nic@iram.fr.

Roberto NERI

GILDAS on Windows 95

As an alternative to GILDAS on LINUX running on PC's, the " "Grenoble Image and Line Data Analysis System" is being ported to Windows 95 (WIN32). GREG, ASTRO, GRAPHIC, CLASS and NIC are already available and for CLIC, the availability of the Lapack library still has to be worked out. The Graphical User Interfaces tools, based on Motif for the UNIX version, have been completely rewritten for the Microsoft WIN32 environment. For the time being this WIN32 version is being tested on Windows 95 but later the package will be checked under Windows NT, a fast growing operating system, and maybe a competitor for UNIX in the future. A tested and unoptimized version of GILDAS/WIN32 will be released soon, and more information on its distribution will be found on http://iram.fr/GS/gildas.html.

Alain PERRIGOUARD

Call for Observing Proposals on the 30m Telescope

The *next deadline* for the submission of observing proposals for the IRAM 30 m telescope is March 5th, 1998, midnight (24 h). The observing session will extend from May 15, 1998 to Nov. 15, 1998 and cover roughly the 'summer' period at Pico Veleta. We do not plan any bolometer session and only proposals at $\lambda \leq 1.2$ mm using heterodyne receivers will be considered. A maximum of about 3000 hours could be available for scheduling which would allow to schedule some longer programs (e.g. 90–150 h) with emphasis on λ 3 mm observations. However, the current planning foresees that the telescope is taken out of operation for a period of about 2 months, for a complete refurbishment of the receiver cabin, in which case less time will be available. The Program Committee will be informed about the actual situation at the time of proposal evaluation.

Please, find below some relevant information.

News

The 3mm1 and 230G1 receivers will be replaced by a more sensitive dual frequency (86–116 GHz/200–250 GHz) receiver next spring. Since the new receiver performances are not precisely known, we ask you to use the current 3mm1 and 230G1 noise figures (see below) for the calculation of integration times. The 3mm and 1.3mm channels of the new receiver have the same polarizations as the current 3mm1 and 230G1, and, like the latter, will be usable simultaneously either with the 2mm receiver, or the 3mm2 and 230G2 receivers (see below).

For programmes which are carried out in "service observing" (see below) we offer the possibility to receive a copy of the data file online via Internet during observations. With the present software this mode requires an HP Unix workstation, but it could be prepared for other operating systems.

For simple and relatively short programs, we will try to offer the possibility of "remote observing" via a digital (ISDN) telephone line. The remote observer will receive several screens (analogous to the setup at the telescope) with information on the telescope status, calibration, frontent/backend setup, spectra, and a talk window. The hardware and software requirements for this mode at the remote location are given in the corresponding section below.

Remote observing is possible from the Granada office, and we offer now this possibility for experienced observers. This mode may be useful in special cases and needs to be announced to IRAM Granada in advance.

Reminders

The On-the-Fly observing mode (OTF) is implemented for heterodyne observations (with some limitations concerning data acquisition rate and reduction). In this mode, the telescope beam drifts continuously across the source, while data are dumped every 1s (or 2 s, depending on the number of frequency channels). Any scanning direction can be chosen and successive scans can be concatenated to make a map (like in the bolometer 'mapping' mode). Individual drift scans can have any length; they are interleaved with off source reference subscans of any duration. This mode ensures a better homogeneity of the data and can make much more efficient use of observing time, particularly for several arcmin-wide maps of lines stronger than 0.5 K. More (and up-to-date) information can be found on the OTF page of the IRAM Granada Web pages (http://www.iram.es, and following the links). In particular, a first version of an "OTF User's Guide"(postscript, 1.2 Mb) can be downloaded from this page. It describes the current status in detail and gives cookbook recipes for OTF observations and data reduction.

Up to 4 receivers can be used simultaneously for OTF observations, although the optimum scanning velocity usually depends on the observing frequency. The backends can be the filter banks and/or the autocorrelators. The large data acquisition rate causes data storage and handling problems and although a new version of CLASS has been developed, the software is not yet user-friendly. We recommend that you contact an astronomer with a demonstrated experience in OTF observations on the 30m Telescope prior to selecting this observing technique. Astronomers from the IRAM-Granada staff are willing to help you in the planning of your observations. Please contact Drs. H. Ungerechts (`ungerech@iram.es`) or W. Wild (`wild@iram.es`) at IRAM-Granada well before the deadline for more information.

Frequency switching is possible. It yields satisfactory baselines within certain limitations (maximum frequency throw of 45 km/s, backends, phase times etc.; for details see [8]). Up to 3 receivers (e.g. 3mm1, 230G1 and 2mm) can be frequency switched simultaneously. Baselines are ordinarily flatter when using one single receiver.

An instantaneous IF bandwidth of 1 GHz is available for the 230G2 receiver. The two 1 MHz filter banks (512 MHz each) can be combined to provide 1 GHz bandwidth. The use of the 1 GHz wide filter bank excludes the simultaneous use of any other backend with the 230G2 receiver (the other receivers are not affected).

Many proposals underestimate the observing time needed to carry out the programme, even under excellent weather conditions. We ask you to pay special attention to this matter *as time underestimation is now a major criterion for proposal rejection.*

A handbook ("The 30m Manual") which contains most of the information necessary to plan 30-m telescope observations is available [10]. The report *Calibration of spectral line data at the IRAM 30m telescope* explains in detail the applied calibration procedure. Both documents can be retrieved through the IRAM Granada web pages (http://www.iram.es).

Finally, to help us keeping up a computerized source list, we ask you to fill in your 'list of objects' as explained below.

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 must reach the Secretariat before March 5th, 1998, midnight. (Proposals sent by Fax will be accepted, provided they arrive by that time in a readable form; Fax (33/0) 476 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, but is 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 `iram.fr` in directory `dist/proposal`, as well as a Latex style file `proposal.sty`; or with the World Wide Web at URL `http://iram.fr/`). *Do not use characters smaller than 11pt*, which would make your proposal unreadable if we had to fax it to the members of the P.C.

On the title page, you must fill out the line 'special requirements' if you request spectral line on-the-fly observations, the polarimeter, 'service observing', remote 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 3mm2 and 230G2, which, otherwise, can be used in parallel with receiver 3mm1 and 230G1 (see below).*

In order to avoid useless duplication of observations and to protect already accepted proposals, we keep up a computerized list of targets. We ask you to fill out carefully your source list. This list must imperatively contain *all the sources (and only those sources)* for which you request observing time. To allow electronic scanning of your source parameters, your list must be typed or printed following the format indicated on the proposal form (please, *do not handwrite*). If your source list is long (e.g. more than 15 sources) you may print it on a separate page, *keeping the same format.*

If you have doubts whether the project sources you wish to propose have already be observed, you may contact Mrs. A. Jost or M. Guélin, well ahead of the deadline (please send your source list in the same format as in observing proposals).

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 scientific aims, and explain the need of the 30m telescope. Please do not attach pre- or reprints. The amount of time requested should be carefully estimated and justified (see below); it should include pointing, focusing, 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.

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 whether your proposal is (or is not) the re submission or the continuation of a previously submitted 30 m telescope proposal.*

Observing time estimates

Observing time estimates must take into account:

- receiver tunings (for heterodyne observations),
- pointing, focus, continuum and line calibrations (be aware that receiver alignment corrections, if needed, will eventually be counted against your observing time),
- telescope motions when changing sources as well as dead times due to telescope motion and/or data writing between ON and OFF 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 noise bandwidth, and t the total (ON + OFF) integration time. $T_{\rm sys}$ should be estimated for an 'average' summer humidity for 3mm, 2mm and 1.3mm observations (7 mm of precipitable water, or $\tau_{\rm zenith} = 0.22$ at 145 GHz and 0.5 at 230 GHz, see Table 4.2 of the 30-m telescope Manual [10]).

We ask you to specify in your proposal the parameter values ($T_{\rm sys}, \Delta T_{MB}, B$, total integration time, overheads and dead times) adopted in your calculation of the needed telescope time.

A technical report explaining how to estimate the telescope time needed to reach a given sensitivity level in various modes of observation was published in the January 1995 issue of the IRAM Newsletter [9] [1]. It has been included in the 30-m telescope Manual [10]. *You are asked to follow the guidelines given in this report (or to justify particular requirements) in your proposal.*

Service and remote observing

To facilitate the execution of short ($\leq$8 h) programmes, we propose "service observing" for some easy to observe (e.g. short, single source) programmes *with only one set of tunings.* Observations are made by the local staff. This is a passive way of observing, no direct interaction with the telescope through OBS being possible. During the observations, a copy of the *spectra.30m* file can be updated automatically at a remote computer via Internet using special IRAM software. This allows a remote observer to monitor the data as they are taken. At present software exists for HP Unix workstations. Versions for other operating systems could be prepared on request (please contact W. Wild (wild@iram.es) or W. Brunswig (brunswig@iram.es) in advance). If interested in service observing, specify it as a "special requirement" in the proposal form (IRAM will decide which proposals will actually go to that mode). For service observations, we request an acknowledgement of the IRAM staff member's help in the forthcoming publication.

Remote observing is possible from the IRAM Granada office. The observer will have all control and status screens as at the telescope. Communication with the operator is via typing on a split screen ("xhchat") or by telephone. This mode of observation can be used by experienced observers after previous agreement with IRAM Granada (Wolfgang WILD).

First tests of remote observing via a digital telephone line (ISDN) have been made from Grenoble, and IRAM will make every effort to make this mode available first from Grenoble, and then also from other locations. Status, data, and control screens are transferred from the telescope to the remote location via a dedicated ISDN line (which in principle has a speed of 64 kbyte/sec). The remote observer types the observing commands as usual, but for safety reasons no direct interaction with the telescope control program OBS is allowed, so that

[1] electronically available by anonymous ftp at `iram.fr`, directory `dist/newsletter/jan95`, or via the WWW at URL `http://iram.fr/newsletter/`

the OBS commands have to be loaded by the telescope operator. Because of the load on the telescope operator, we plan to open this mode *only to simple and relatively short programs* – typically for long integrations on a couple of sources. To use this mode, some technical requirements (hardware and software) have to be fulfilled (see the box below). If you apply for this observing mode, please specify it as "remote observing from ... (location)" in the "special requirement" section of the proposal form (here also, IRAM will decide which proposals will actually be executed in this mode). Before carrying out the observations, a previous test run needs to be arranged well in advance with the IRAM Granada staff.

Technical requirements for remote observing at the 30m telescope

- a dedicated digital (ISDN) telephone line connected to the TCP/IP router
- a HP Unix workstation (model 9000/715 or better) or a PC Linux system (Pentium 133 MHz, 32 Mb RAM, or better),
- at least 50 Mbyte of disk space
- installation of specific software (provided by IRAM) with the support of the local system manager,
- modification (adaptation) of the TCP/IP router configuration to allow ISDN communication with Granada,
- a telephone (voice) line which allows communication with the telescope for setting up the connection and in case of problems and a previous test run in collaboration with IRAM Granada.

Contact W. Brunswig (brunswig@iram.es) for further details.

Programmes accepted for the Nov. 1997 – May 1998 period

A total of 113 proposals were submitted for the deadline of Oct. 1997 (in addition to 15 short requests for discretionary time received between March and October 1997), 45 proposals were rated "A", 25 "B", the others "C" or "D". All the "A" and about half of the "B" programmes will actually get time on the telescope, some, however, with less time than requested. The telescope schedule is made until mid April; 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 (33/0) 476 42 54 69, attention Mrs. A. Jost). 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. A. Jost at IRAM Grenoble.

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, except for 230G2 which, coupled to the 1MHz filter bank, has a 1 GHz bandwidth. The following table lists the present possible receiver combinations:

	Receiver Combinations	
Receivers	4-rec	3-rec
3mm1	*	*
3mm2	*	
2mm		*
230G1	*	*
230G2	*	

The present 3mm1 and 230G1 H polarization receivers will be replaced next spring by two new systems located in a single dewar. Due to improvements in mixers, LO injection and optics, we expect significantly better system noise temperatures. As before, The V polarization 3 mm receiver (3mm2) *or* the V polarization 1.3mm receiver (230G2) will be usable with the new H polarization 3mm1 and 230G1 receivers with a high efficiency (in the latter case, at the request of the observer, a mirror will replace the dichroic mirror located on the V polarization ray path). Four receiver operation (3mm1+3mm2+230G1+230G2) using the dichroic mirror is possible, but will increase the noise temperature of 230G2 by about 30 K.

3 mm SIS receivers

The tuning band of the new 3mm1 (H polarization) receiver will remain 81 – 116 GHz; its receiver temperature will be better than 100 K over the entire band; the image side band rejection is expected to be at least 20 dB. The tuning band of the 3mm2 receiver is 82 – 116 GHz; its receiver temperature is between 70 and 90 K with image side band rejection between 25 and 30dB.

The high rejection of the USB improves the system temperature and the calibration accuracy, particularly for 115 GHz observations, for which the receiver image side band sees the bright oxygen 118.75 GHz atmospheric line.

It is important to check your calibration on strong reference sources (see IRAM line catalogue and updates). 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).

We expect to continue to use 3mm1 as the standard pointing receiver.

2 mm Receiver

Good and reliable performance over most of the band. Tunable from 129.0 GHz to 177 GHz in SSB; from 177 GHz to 183 GHz only in DSB (USB); receiver temperatures are 70 to 150 K (130 to 155 GHz), and 150 to 400 K (155 to 183 GHz).

1.3 mm Receivers

- new 230G1 (H-polar): Operating band: 203.4 – 246 GHz. The SSB receiver temperature is 100 – 180 K in the standard reference plane.
- 230G2: The SSB receiver temperature over the nominal tuning range (210–250 GHz) is 150–250 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).

Efficiencies, interferences, error beam

The telescope efficiencies (main beam and aperture efficiency) are given in Appendix A of *The 30m Manual*, the IRAM Newsletter Nr. 18 (November 1994) and a one-page *IRAM 30m Telescope System Summary* (available at http://www.iram.es/Telescope/systsumm.ps).

Beware of possible interference of the 230G2 LO into the 3 mm receivers. *The 230G2 receiver cannot be operated with the 2 mm receiver*, since both receivers use the same control box and polarization. Switching from one receiver to the other is not straightforward. 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.

Polarimeter

Quarter-wave plate polarimeters have been constructed by IRAM for measurements of *circular* polarization (see e.g. the March 1994 issue of the IRAM Newsletter). The main technical features of the polarimeters are briefly described below.

Each 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.

There are quarter-wave plates available for 113.3 GHz and 86.24 GHz. At 113.3 GHz the transmission loss is $\simeq 2\%$, and its cross-polarization below 20 dB. The quarter-wave plate for 86.24 GHz has a transmission loss of $\leq 2\%$, and the cross-polarization below 26 dB. Similar plates could be fabricated for other frequencies if needed. Proposals for projects requiring the polarimeter can be submitted. They should clearly state the degree of technical performance that they demand. 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 weeks in advance), or a large number of frequencies, there is no guarantee for a prior test of the requested tunings.

Backends

There are 3 types of spectral line backends which can be individually connected to any receiver.

- The 1 MHz filter bank, consisting of 4 units with 256 MHz each. The units can be connected to different or the same receivers (giving bandwidths between 256 MHz and 1024 MHz, the latter only usable with 230G2). For example, two receivers could use 512 MHz each, or four receivers 256 MHz each, or combinations. Each unit can be shifted by steps of 32 MHz relative to the center frequency of the connected receiver. If all four units are combined to 1024 MHz and connected to 230G2, no other backend can be connected to 230G2.
- The 100 kHz filter bank, 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 autocorrelator: The software treats the autocorrelator as one unit although physically it consists of two identical machines. The following numbers are to be understood for the complete autocorrelator setup. Available resolutions are 10, 20, 40, 80, 320 and 1250 kHz. The bandwidth is between 20 MHz and 2×512 MHz, depending on resolution. The correlator can be split into 8 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) usually a problem of platforming exists (i.e. baselines from the different subbands have slightly different levels). This makes the autocorrelator not adequate for observations of broad, weak lines (typically extragalactic sources).

Pointing / Focusing

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, focus, and receiver alignment is the responsibility of the observers (use a planet for alignment checks). Note that 230 G2 and 230 G1 have foci differing by 0.4 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 [1]).

Wobbler

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

References

[1] 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.

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

[3] Thermal behaviour of mm-wavelength radio telescopes A. Greve, M. Dan, J. Peñalver 1992 (IRAM report 233)

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

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

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

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

[8] Frequency switching at the 30m telescope C. Thum, A. Sievers, S. Navarro, W. Brunswig, J. Peñalver 1995, IRAM Tech. Report 228/95.

[9] Cookbook formulae for estimating observing times at the 30m telescope M. Guélin, C. Kramer, W. Wild (IRAM Newsletter January 1995)

[10] The 30m Manual: A Handbook for the 30m Telescope W. Wild 1995, IRAM Tech. Report 377/95, also available on WWW pages.

[11] NIC: Bolometer User's Guide D. Broguière, R. Neri, A. Sievers 1996, IRAM Tech. Report.

[12] Pocket Cookbook for MOPS software R. Zylka 1996.

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 the period May 15, 1998 to Nov. 15, 1998. The deadline for applications is March 5th, 1998. The available frequency range will be 82 GHz to 116 GHz for the 3mm band, and 210-245 GHz for the 1.3 mm band.

Details of the PdBI and the observing procedures 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; use IRAM's home page `http://iram.fr/`). 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 30 to 50 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:

Proposal Category: Proposals should be submitted for one of the 4 categories defined below:

Category 1: Proposals that ask for 3mm data ONLY. 1.3 mm receivers can still be used to provide either phase stability information or purely qualitative information such as the mere existence of fringes.

Category 2: Proposals that ask for 1.3mm data ONLY. 3mm receivers will be used for pointing and calibration purposes, but cannot provide any imaging.

Category 3: Proposals that ask for dual-frequency observations.

Category 4: Exploratory proposals: Proposals whose scientific interest justifies the attempt to use the PdB array beyond its guaranteed capabilities. This category includes for example observing at non-standard frequencies for which tuning cannot be guaranteed, time fillers projects requesting low atmospheric phase stability, and more generally all non-standard observations. These proposals will be carried out on a "best effort" basis.

The proposal category will have to be specified *on the proposal cover sheet*, and should be carefully considered by proposers.

Backup Projects for the May-Nov. 1998 period Because of heavy antenna maintenance, backup projects for the last period have not all been scheduled. We urge proposers to re-submit them unless they have explicitly been notified of their effective scheduling.

Maintenance Heavy maintenance is foreseen for the antennas. Accordingly, the Plateau de Bure array will operate:
- in 4 antenna configurations for May to September.
- in 5 antenna configurations for October and November.

Configurations The available configurations include:

5 Antenna configurations	
Name	Stations
D	W05 W00 E03 N05 N09
C1	W05 W01 E10 N07 N13
C2	W12 W09 E10 N05 N15
B1	W12 E18 E23 N13 N20
B2	W23 W12 E12 N17 N29
A	W27 W23 E16 E24 N29

With 5 antennas, the following configuration sets are available:

Set	Configs	Main purpose
D	D	"Low" resolution at 1.3 mm
CD	D, C2 or C1	3.5″ resolution at 3mm, 1.8″ resolution at 1.3 mm
CC	C1, C2	Slightly higher resolution than CD.
BC	B1, C2	2″ resolution at 3 mm
BB	B1, B2, C2	Better sensitivity than BC
AB	A, B1, B2	1″ resolution at 3 mm, 0.5″ resolution at 1.3mm

There is a possibility of choice between CD and CC arrays when the C2 configuration has been performed for sources in which the resolution choice is unclear. At a higher resolution level, a similar choice between CC and BC or BB is possible.

1.3 mm band and dual-frequency observations All antennas are now equipped with fully operational dual frequency receivers. The 3mm and 1.3mm receivers are aligned to within about 2″, allowing proper dual frequency observations.

Experience based on the past years shows that 1.3 mm observations are seldom feasible in summer time, and that such observations are possible only for objects transiting during the night of the August to October period. Accordingly, 1.3mm or dual-frequency projects for other objects will be considered as "Category 4" proposals, i.e. will be carried out on a best effort basis only, weather permitting.

Atmospheric Phase Compensation Software is available to provide real-time atmospheric phase compensation on spectral and continuum data, as well as a-posteriori processing for continuum data. Experience shows that a final phase noise below 30 degrees at 230 GHz is obtained under good circumstances.

Very long baselines: configuration A Configuration A *will NOT be scheduled* for the next session.

Signal to Noise The rms noise can be computed from

$$\sigma = \frac{J_{\mathrm{pK}} T_{\mathrm{SYS}}}{\eta\sqrt{N_{\mathrm{a}}(N_{\mathrm{a}}-1)N_{\mathrm{c}}TB}} \qquad (1)$$

where

- T_{SYS} is the system temperature in T_r^* scale (150 K below 110 GHz, 300 K at 115 GHz, 500 K at 230 GHz)
- J_{pK} is the conversion factor from Kelvin to Jansky (22 at 3mm, 35 at 1.3mm)
- η is an efficiency factor due to atmospheric phase noise (0.9 at 3 mm, 0.6 at 1.3 mm)
- N_{a} is the number of antennas (4 or 5), and N_{c} is the basic number of configurations (with 5 antennas 1 for D, 2 for CD, 3 for BC)
- T is the integration time per configuration in seconds (3 to 8 hours, depending on source declination)
- B is the channel bandwidth in Hz (500 MHz for continuum, 40 kHz to 2.5 MHz for spectral line, according to spectral correlator setup)

Receivers Below 110 GHz, receivers offer best performance in LSB tuning with high rejection (20 dB): expected system temperatures are (in T_{R}^* scale) 150 to 200 K for the summer time. Above 110 GHz, best performance is obtained with USB tuning, low rejection (4 to 6 dB): expected system temperatures are 300 K at 115 GHz. DSB tuning is possible over the whole frequency range, but the system temperature may degrade significantly.

The 1.3 mm receivers give DSB tuning with typical $\mathrm{T_{REC}}$ below 50 K. Expected SSB system temperature are 400 to 500 K.

The guaranteed tuning range is 210-245 GHz, but it may be possible to reach lower frequencies for specific cases. Higher frequencies are not feasible because of limitations in the triplers.

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.

Coordinates and velocities in the proposal MUST BE CORRECT: A coordinate error is a potential cause for proposal rejection.

Correlator The correlator has 6 independent units, each being tunable anywhere in the 110-610 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 bandwidth, 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.

The 6 units can be independently placed either on IF1 (3 mm receiver) or on IF2 (1.3 mm receiver).

40 kHz resolution One (and *only one*) of the 6 units has been retrofitted to offer a higher frequency resolution (40 kHz instead of 80 kHz). This is obtained by operating at half clock speed and inserting an anti-aliasing filter of effective bandwidth 8 MHz. Because the filter reduces the input power to the sampler, this unit should be placed near the maximum amplitude of the IF bandpass: band edges must be avoided.

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 R. Neri in case of doubts.

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

- In general, data should 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 necessary for the high resolution images. In such a case, the proposers must be ready to come at IRAM for fast data reduction of the "compact" configurations.
- CLIC is still evolving fast to cope with the evolution of the PdBI array. The newer versions are upward compatible with the previous releases, 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. Because differences between CLIC versions may potentially result in imaging errors if new data is reduced with an old package, 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 workstations.

Local contact A Local Contact will be assigned to every proposal which does not involve an in-house collaborator. Depending upon the programme complexity, IRAM may require an in-house collaborator instead of the normal local contact.

Technical pre-screening All proposals will be reviewed for technical feasibility in parallel to being sent to the members of the Programme 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 R. Neri, R. Lucas, or 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 for observers on the site (IRAM on-duty astronomers, operators, or observers with non-standard programmes):

- 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. IRAM's home page is `http://iram.fr/`

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.

Roberto NERI

Scientific results

Millimeter continuum observations of X-ray selected T Tauri stars in Ophiuchus

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Abstract: We present the results of 1.3 mm dust continuum observations for a sample of 17 X-ray selected T Tauri stars in the Ophiuchus star forming region performed with the MPIfR 7-channel bolometer array mounted at the IRAM 30 m Millimeter Radio Telescope. We have detected cold dust emission from 3 of the objects and have derived 3σ upper limits ($\sim$ 21 mJy on average) for the remaining objects. These upper limits suggest that the disk masses (gas + dust) are less than $5 \cdot 10^{-3}$ $M_\odot$.

Combining our results with those obtained by André & Montmerle (1994) for a sample of 21 X-ray selected T Tauri stars (3 additional detections) we improve the statistical significance of our conclusions. As the frequency of circumstellar disks and the disk properties might depend on the selection criteria as well as local conditions, comparison is made with 1.3 mm surveys of Hα selected T Tauri stars in Chamaeleon, Lupus, Ophiuchus, and Taurus-Auriga.

In order to study the mass of cold dust in multiple systems we also observed a sample of 15 well known binaries, triples, and quadruples by 1.3 mm photometry. From these observations we report the 1.3 mm detection of 4 multiple systems. It seems that the measured 1.3 mm flux density increases slightly with increasing binary separation.

In addition, we have mapped the hierarchical triple SR 24 at $\lambda = 1.3$ mm with the 7-channel bolometer array (Figure **??**). We detected cold dust emission only from the southern component with a peak intensity of $\sim$ 230 mJy and a corresponding circumstellar disk mass of ~ 0.035 $M_\odot$ (gas + dust), while for the northern component we derived an upper limit of 10 % of the SR 24S peak flux density. The non-detection of 1.3 mm emission from SR 24N suggests a lack of cold circumstellar dust in the outer part of the disk, which might have been cleared by the close infrared companion 0.″2 away from SR 24N.

Astronomy & Astrophysics 330, 549 (1998)
Preprints are available at http://www.astro.uni-wuerzburg.de/~nurnberg/publications.html or from nurnberg@iram.fr upon request.

SiO shocks in the L 1157 molecular outflow

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Abstract: We report high angular resolution IRAM Plateau de Bure interferometric observations of the SiO $v = 0$ $J = 2 \to 1$ and $J = 5 \to 4$ transitions in the southern lobe of the young L 1157 molecular outflow. The resolution of these observations ($\sim 2.5''$) makes them directly comparable to available high-resolution CO maps of the flow. The known precession of the L 1157 flow is fully confirmed. We find a remarkable morphological agreement between the strong SiO shocks revealed by these observations and the two CO cavities of the southern lobe of the outflow (see Figure 8): the positions, shapes and opening angles are similar in both tracers, with the SiO emission ahead of or at the edges of the CO emission. Each CO cavity is associated with a shock which is placed exactly at its apex and exhibits a linear feature pointing exactly towards the protostellar position. The CO appears in the wake of these leading shocks. These coincidences, as well as the presence of two independent shock/cavity systems, strongly support shock-entrainment models for the formation of molecular outflows.
These observations also provide detailed information on the internal structure of the shocked regions. They confirm that a strong enhancement of the SiO abundance occurs within shocks. The comparison with high-angular resolution images of other shock-tracers (NH_3, H_2) shows that chemical and evolution effects play a crucial role in the observed brightness distributions. The SiO velocity distribution is mainly forward, but the kinematics seems to result from both the complex formation processes of SiO and the velocity field produced by bow-shocks. Finally, we briefly discuss the apparent density structure of the shocks, and especially the possible origin of the linear precursor seen downstream from the main bow-shock.
To be published in Astronomy & Astrophysics, main journal

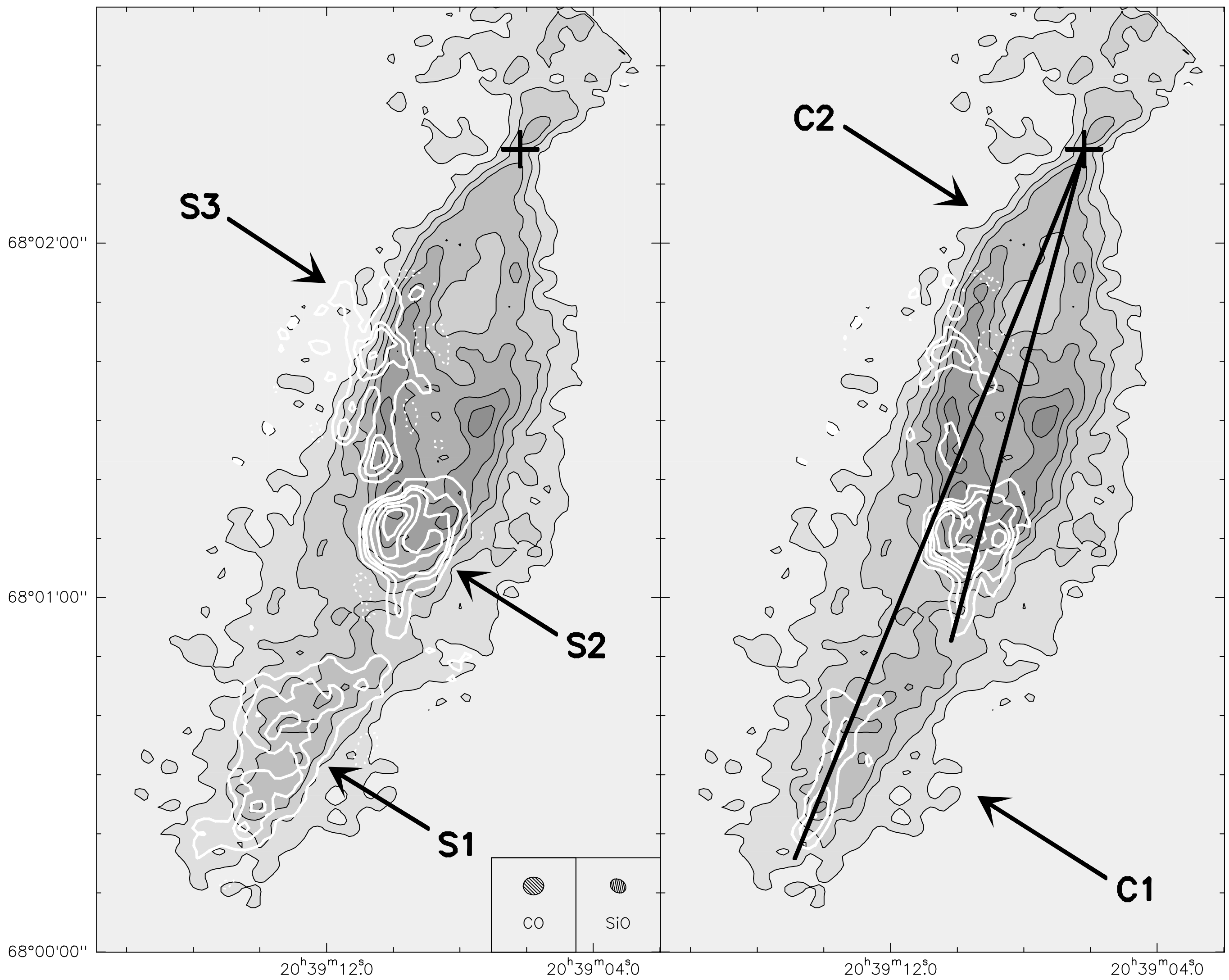

Figure 8: The L 1157 molecular outflow. *(Left)* Overlay of the integrated CO $J = 1 \rightarrow 0$(greyscale) and SiO $J = 2 \rightarrow 1$(white contours) emission. For the CO map, contours are -1.5 then 0.75 to 8.25 by 1.5 Jykm s^{-1}/beam, and the clean beam is $3.6'' \times 3''$ at PA 90 deg. For the SiO map, contours are $-0.4, 0.3, 0.8, 1.2, 2, 3, 4$ Jykm s^{-1}/beam, and the clean beam is $2.8'' \times 2.2''$ at PA 56 deg. *(Right)* Overlay of the integrated CO $J = 1 \rightarrow 0$ and the SiO $J = 2 \rightarrow 1$ emission at LSR velocity -2.8km s^{-1} (integrated over an interval of 2.6km s^{-1} wide). The SiO contour step is 55 mJy/beam. In both panels, the cross indicates the position of the protostar L1157-mm. For clarity, the outer regions of the SiO image, where the noise level is quite high, have been masked. Note that the northern part of the flow, near the protostar, has not been observed in the SiO line.

THE INITIAL CONDITIONS OF STAR FORMATION IN THE ρ OPHIUCHI MAIN CLOUD: WIDE-FIELD MILLIMETER CONTINUUM MAPPING

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Abstract: We present the results of an extensive 1.3 mm continuum mosaicing study of the ρ Ophiuchi central region obtained at the IRAM 30-m telescope with the MPIfR 19–channel bolometer array. The mosaiced field covers a total area of $\sim$ 480 arcmin^2, corresponding to $\sim$ 1 pc^2 at a distance of 160 pc, and includes the DCO$^+$dense cores Oph-A, Oph-B1, Oph-B2, Oph-C, Oph-D, Oph-E, and Oph-F. Our mosaic is sensitive to features down to $N_{\rm H_2} \sim 10^{22}$ cm^{-2} in column density.

It is consistent with, but goes significantly deeper than, previous dust continuum studies of the cloud. For the first time, compact circumstellar dusty structures around young stellar objects are detected simultaneously with more extended emission from the dense cores and the ambient cloud. Thus, it becomes possible to directly study the genetic link between dense cores and young stars.

The diffuse cloud emission is itself fragmented in at least 58 small-scale, starless clumps harboring no infrared or radio continuum sources in their centers. Most of these starless fragments are probably gravitationally bound and pre-stellar in nature. Several of them exhibit a relatively flat inner intensity profile, indicating they are not as centrally condensed as the envelopes seen around the embedded (Class I and Class 0) protostars of the cloud. Ten other clumps appear to be sharply peaked, however, and may represent candidate 'isothermal protostars', i.e., collapsing cloud fragments which have not yet developed a central hydrostatic core. The $\sim$ 6 000 AU fragmentation sizescale estimated from our ρ Oph 1.3 mm mosaic is consistent with the typical Jeans length in the DCO$^+$ cores and is at least five times smaller than the diameter of isolated dense cores in the Taurus cloud. In agreement with this short length scale for fragmentation, the circumstellar envelopes surrounding ρ Oph Class I and Class 0 protostars are observed to have finite sizes and to be significantly more compact than their Taurus counterparts.

The measured frequency distribution of pre-stellar clump masses is relatively shallow below $\sim$ 0.5 $M_\odot$, being consistent with $\Delta N/dm \propto m^{-1.5}$, but steepens to $\Delta N/dm \propto m^{-2.5}$ in the $\sim$ 0.5$-$2 $M_\odot$ mass range. This is reminiscent of the *stellar* initial mass function (IMF), suggesting the clumps we detect may be the *direct progenitors of individual stars*. Our observations therefore support theoretical scenarios in which gravitational fragmentation plays a key role in determining the stellar mass scale and the IMF.

Finally, the presence of several remarkable alignments of young stars and starless clumps in the 1.3 mm dust continuum mosaic supports the idea that various external agents, such as a slow shock wave originating in the Sco OB2 association, have induced core fragmentation and star formation in at least part of the cloud.

To appear in A&A. Preprints can be obtained from http://iram.fr/papers/papers.html

FIRST DETECTION OF A COUNTER-ROTATING MOLECULAR GAS DISK IN A SPIRAL GALAXY: NGC 3626

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Abstract: In this paper we report the detection of a massive counter-rotating molecular gas disk in the early–type spiral NGC 3626, observed in the 1–0 and 2–1 lines of ^{12}CO mapped with the 30m telescope and Bure interferometer.

^{12}CO emission is concentrated in a compact nuclear disk of average radius r$\sim$12$''$ (1.2kpc). In the outer disk, from r=20$''$ to r=100$''$ (2–10kpc), ^{12}CO is not detected and the neutral gas content is largely dominated by H*I*. The observed ^{12}CO velocity field pattern corresponds to a gaseous disk with a sense of rotation opposite to that of the stars. *Counter-rotation* is shared by molecular and ionized gas in the center. There is no strong evidence of ^{12}CO emission from gas in direct rotation. The estimated molecular mass in the ^{12}CO nuclear disk is M(H_2)$\sim$0.3$\times$10^{9}M$_\odot$, 3 times lower than the mass of the H*I* disk.

Within the nuclear disk, ^{12}CO is distributed in a central source of $\sim$1$''$ (100pc) radius where the derived ^{12}CO rotation curve reaches $\sim$240kms^{-1}, surrounded by a pseudo-ring of average radius $\sim$6$''$ (600pc) characterized by strong non-circular motions. Dynamics of molecular gas, characterized by a regular counter-rotating pattern, streaming motions typical of a steady density-wave driven flow and normal ^{12}CO line widths preclude the occurrence of violent large scale shocks or of a non-equilibrium dynamical state for the gas.

The available optical–(Hα, N[II] and S[II]) and radio–continuum data (at 12.6cm and 21cm) indicate that no violent burst of star formation is associated with the nuclear molecular gas. This is confirmed by the lack of IRAS flux record for the nucleus of NGC 3626. The present ^{12}CO observations suggest that we are probably seeing a late stage of a merger happened in NGC 3626.

Disks in the UY Aur Binary

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Abstract: We report interferometric images of the UY Aur binary in ^{13}CO $J = 1 \rightarrow 0$ and $J = 2 \rightarrow 1$ which reveal evidence for a large ($\geq 20''$) circumbinary disk around the two pre-main-sequence stars. This is the second detection of a circumbinary disk around T Tauri stars. A Keplerian rotation curve around a central mass of $\sim$1.2M$_\odot$ provides a good fit to the velocity data. However, ^{13}CO emission at a systemic velocity close to the binary limits the accuracy of our disk model and a precise assessment of the disk mass. This emission could be related to the "streamers" imaged with adaptive optics around UY Aur. The continuum emission detected at the location of the binary can be attributed to partially resolved circumstellar disks around each star, with some possible contribution of free-free emission.
To be published in A&A main Journal. Electronic version available at http://www-laog.obs.ujf-grenoble.fr/liens/starform/formation.html

Molecular gas in the barred spiral M 100: II. ^{12}CO(1–0) interferometer observations and numerical simulations

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Abstract: Using the IRAM interferometer we have mapped at high resolution ($2\farcs2 \times 1\farcs2$) the ^{12}CO(1–0) emission in the nucleus of the doubled barred SABbc spiral M 100. Our synthesized map includes the zero spacing flux of the single–dish 30m map (Sempere & García–Burillo, 1997, **paper I**). Molecular gas is distributed in a two spiral arm structure starting from the end points of the nuclear bar (r = 600 pc) up to r = 1.2 kpc, and a central source (r ∼100 pc). The kinematics of the gas indicates the existence of a steep rotation curve (v$_{rot}$=180 km s^{-1} at $r \sim$ 100 pc) and strong streaming motions characteristic of a trailing spiral wave inside corotation.

Interpretation of the CO observations and their relation with stellar and gaseous tracers (K, optical, Hα, HI and radiocontinuum maps) are made in the light of a numerical model of the clouds hydrodynamics. Gas flow simulations analyse the gas response to a gravitational potential derived from the K-band plate, including the two nested bars. We develop two families of models: first, a single pattern speed solution shared by the outer bar+spiral and by the nuclear bar, and secondly, a two independent bars solution, where the nuclear bar is dynamically decoupled and rotates faster than the primary bar.

We found the best fit solution consisting of a fast pattern (Ω_f=160 kms^{-1}kpc^{-1}) for the nuclear bar (with corotation at R$^F_{COR}$=1.2 kpc) decoupled from the slow pattern of the outer bar+spiral (Ω_f=23 kms^{-1}kpc^{-1}) (with corotation at R$^S_{COR}$=8-9 kpc). As required by nonlinear coupling of spirals (Tagger et al 1987), the corotation of the fast pattern falls in the ILR region of the slow pattern, allowing an efficient transfer of molecular gas towards the nuclear region. Solutions based on a single pattern hypothesis for the whole disk cannot fit the observed molecular gas response and fail to account for the relation between other stellar and gaseous tracers. In the two-bar solution, the gas morphology and kinematics are strongly varying in the rotating frame of the slow large-scale bar, and fit the data periodically during a short fraction (about 20%) of the relative nuclear bar period of 46 Myr (Fig. 10).

Millimetre detection of GRB 970508

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Abstract: The γ-ray burst source GRB 970508 has been detected as a continuum point source at 86.2 GHz with the IRAM Plateau de Bure Interferometer (PdBI). By

combining the UV tables of May 17th, 19th, 21st and 22nd, one obtains a point source flux of 1.62 ± 0.25 mJy, which amounts to a 6.5σ detection. Three individual tentative detections were made on May 19-22, and the source was only non-detected later with 3σ upper limits between 0.87 and 1.83 mJy. Observations at 232 GHz gave only upper limits. The lowest one from combined May 19 and 21 data is 4.5 mJy (3σ). No significant variation of the source during individual observing dates was seen in either frequency band. Comparing the May 17-22 detection with the later non-detections, we see a significant fading which is not well fitted with the $F \propto t^{-1.1 \pm 0.1}$ law found at higher frequencies.

We exclude that the 86.2 GHz fluxes have been modulated significantly by interstellar scintillation. This indicates that the millimetre characteristics of GRB 970508 provide a new aspect of the intrinsic development of the source.

New Preprints

456. The pivotal onset of protostellar collapse: ISO's view and complementary observations
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R. Neri, C. Kahane, R. Lucas, V. Bujarrabal, C. Loup
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461. The IRAM key project: small-scale structure of pre-star-forming regions: I - Observational results
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462. Millimeter continuum observations of X-ray selected T Tauri stars in Ophiuchus
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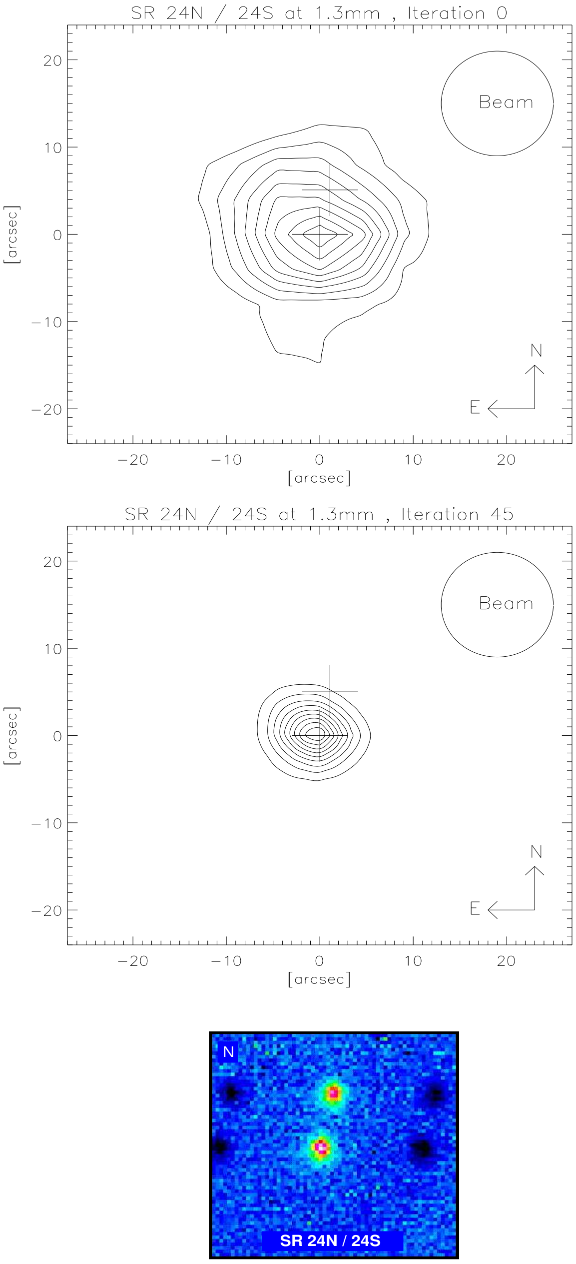

Figure 7: SR 24N/S mapped at λ = 1.3 mm with the MPIfR 7-channel bolometer array mounted at the IRAM 30 m MRT. Contour lines correspond to 10, 20, 30, . . ., 90 percent of peak intensity ($\approx$ 230 mJy) before (top) and after (center) deconvolution with a Gaussian maximum likelihood algorithm using maps of Uranus and Mars as point spread functions. Crosses mark the positions of the optical counterparts (V_{SR24N} = 16.0, V_{SR24S} = 15.9, ang. sep. = $5''\!.2$, pos. ang. = 348°). For comparison, the mid infrared (N-band) image of SR 24N/S obtained with TIMMI mounted at the ESO 3.6 m telescope on La Silla, Chile (pixel scaling $0''\!.34$/pix; Stanke & Zinnecker 1998) is given in the bottom panel. Both the northern and the southern component show roughly equal emission (F_{SR24N} = 1.3 Jy and F_{SR24N} = 1.6 Jy at 10 μm).

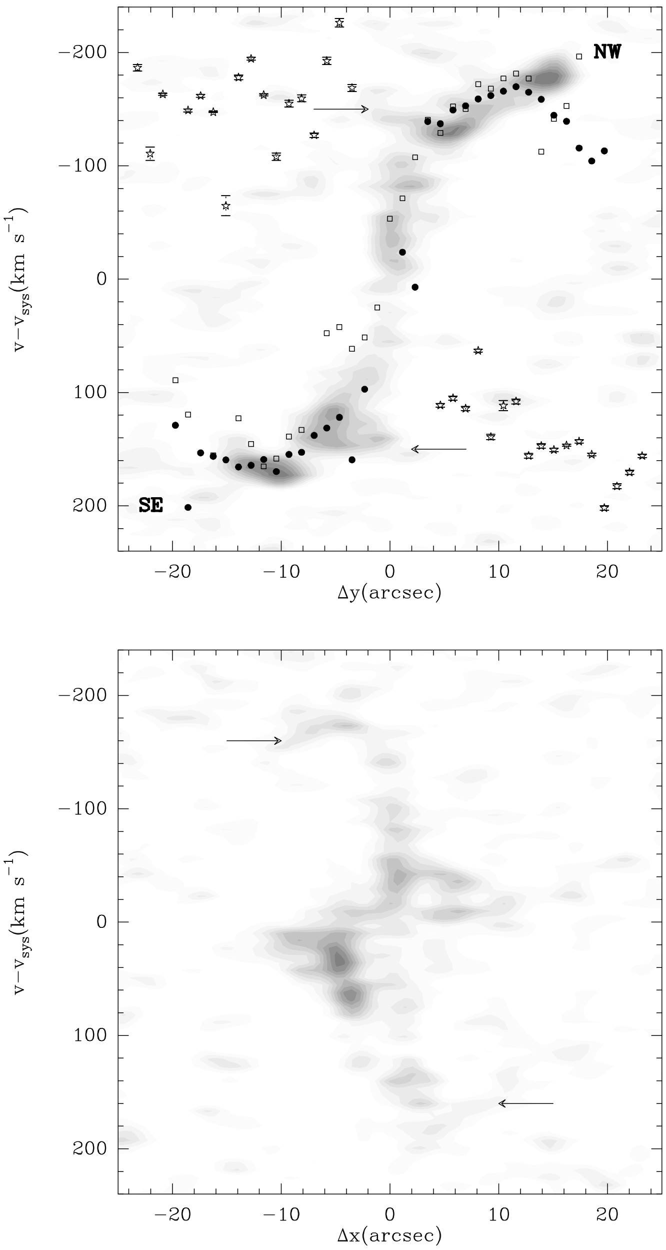

Figure 9: **a(top)** The ^{12}CO(1–0) position-velocity plot (grey scale) taken along the major axis of NGC 3626, showing counter-rotation with respect to the stars. Stars kinematics is derived from Hα absorption lines (star like markers). Superposed are the radial velocities of ionized gas observed using several tracers: Hα(filled circles) and N[II](open squares). The *anomalous* ^{12}CO component (see text) is indicated by the arrows. **b(bottom)** The ^{12}CO(1–0) position-velocity diagram along the minor axis of NGC 3626. Emission at *anomalous* velocities is indicated by the arrows.

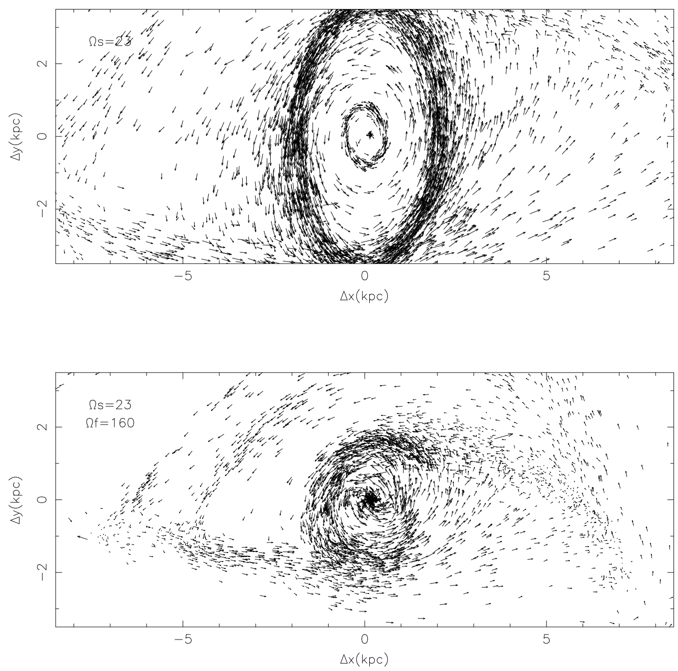

Figure 10: We display the particle orbits for molecular clouds in the region where the bar instability develops, as they are seen, firstly, **a(top):** from the frame rotating at Ω=23 kms^{-1}kpc^{-1}, for the solution of a single slow pattern and **b(bottom):** from the frame rotating at Ω=23 kms^{-1}kpc^{-1} for the best-fit solution of a double pattern (Ω_f=160 kms^{-1}kpc^{-1} (from r=0$''$ to 10$''$), Ω_s=23 kms^{-1}kpc^{-1}(for r>10$''$). The length of the arrows is proportional to the particle speed in the rotating frame. These simulations illustrate the efficiency of fast nuclear bars, dynamically decoupled form the outer bar+spiral structure, in driving the gas towards the nucleus, hence accounting for the observations.

Programmes Scheduled on the 30-m Telescope in 1997

DEC 31 - JAN 14

Ident.	Title	Freq. (GHz)	Authors
141.96	Time delay measurements in the gravitational lens PDS 1830-211	94	Combes, Wiklind, Kramer
206.96	Molecular gas in faint blue galaxies at intermediate red shifts	153, 158, 160, 151	Wilson-C, Combes
262.96	The spatial extent and abundance of water vapor in mol. clouds	183, 230, 204	Cernicharo, Gonzalez-Alfonso, Cox
136.96	High density gas in megamaser galaxies	88, 89, 110, 244	Baudry, Baan, Henkel
164.96	CO multi line OTF mapping of the S106 molecular cloud	89, 109, 115	Schneider, Kramer, Simon, Stutzki
205.96	Densities and kinetics temperatures in Orion north	91, 147, 220, 224	Wilson, Gensheimer, Martin-Pintado, de Vicente
229.96	Chemistry of protoplanetary disks IV	113, 145	Dutrey, Guilloteau, Guélin
189.96	Probing the different mol. gas components in the nucleus of IC 342	177, 241, 259, 354	Schulz, Guesten
δ23.96	Search for the primordial molecule LiH in a dense molecular cloud		Combes, Wiklind
141.96	Time-delay measurements in the gravitational lens PDS 1830-211	94	Combes, Wiklind, Kramer
237.96	CO in the halo of the magellanic irregular galaxy NGC 4449	115, 230	Kohle, Henkel, Klein

JAN 14-JAN 28

Ident.	Title	Freq. (GHz)	Authors
189.96	Probing the different mol. gas components in the nucleus of IC 342	117, 241, 259, 354	Schulz, Guesten
141.96	Time-delay measurements in the gravitational lens PDS 1830-211	94	Combes, Wiklind, Kramer
214.96	A deep search for redshifted (NII) 205 micron emission from BR1202-0725	256	Van der Werf, Yun, Scoville
177.96	Fractional ionization in the collapsing starless core L1544	86, 89, 109, 216	Caselli, Myers, Tafalla, Williams, Walmsley, Guélin
δ21.96	OTF CS survey of a galactic center cloud		Kramer
178.96	Complex O-bearing and N-bearing molecules in hot cores	91, 98, 161, 171	Caselli, Cesaroni, Felli, Walmsley

JAN 28-FEB 11

Ident.	Title	Freq. (GHz)	Authors
Guarant. Time			Kreysa
257.96	A 1.3mm search for extremely embedded objects in nearby young clusters	Bolometer	Bachiller, Mardones, Tafalla, Myers
222.96	Cold dust in four giant cloud associations of M33	Bolometer	Guélin, Viallefond, Neininger, Zylka, Mezger
217.96	Cold dust in M51 and M100	Bolometer	Zylka, Guélin, Garcia-Burillo, Neininger, Mezger
239.96	Search for small anisotropy of the cosmic microwave background	Bolometer	Kreysa, Bierman, Chini, Haslam, Zylka
171.96	large scale mapping of the galactic center	Bolometer	Zylka, Mezger, Duschl

FEB 11 - FEB 25

Ident.	Title	Freq. (GHz)	Authors
197.96	Continuum emission in young outflows	Bolometer	Gueth, Neri, Guilloteau, Dutrey, Bachiller
183.96	A systematic study of the environment of Herbig Ae-Be stars	Bolometer	Fuente, Martin-Pintado, Bachiller, Palla, Neri
198.96	Mm emission from dust envelopes around post-AGB stars	Bolometer	Alcolea, Bujarrabal, Contreras, Cernicharo, Cox, Neri
231.96	Dust to gas ratio in the envelope of T-Tau	Bolometer	Schuster, Neri, Russell
226.96	Probing fragmen. in a region of multiple star form.	Bolometer	Andre, Motte, Neri, Abergel, Ward-Thompson
234.96	Mapping the cold dust emission from HI warps	Bolometer	Neininger, Guélin, Dumke, Zylka, Wielebinski
251.96	Dust in a future dwarf galaxy ?	Bolometer	Henkel, Braine, Brouillet
δ02.97	Systematic study of 1.25mm emission of radio quiet QSOs with z¿4		Omont
243.96	Bolometer 1.3mm observation of symbiotic stars	Bolometer	Mikolajewska, Omont, Friedjung

FEB 25 - MAR 11

Ident.	Title	Freq. (GHz)	Authors
200.96	1mm search for primeval quasars or galaxies	Bolometer	Barvainis, Antonucci, Hurt
212.96	Survey for circumstellar disks in cluster environments	Bolometer	Lada-E, Beckwith
163.96	FIR/mm properties of extragalactic radio sources	Bolometer	Fosbury, Andreani, Wehrle, Freudling, Cimatti
187.96	The planets at 350 GHz	345	Greve, Kramer
142.96	Search for ortho-water fundamental transition in a single molecular cloud	108, 225	Combes, Wiklind
δ03.97	Confirmation of tentative detection of H_2C_6 and search for C_5N in IRC+10216		Guélin, Cernicharo
208.96	Tomography of the magnetic field in the disk of MWC349	125, 231	Thum, Morris-D

Mar 11 - Mar 25

Ident.	Title	Freq. (GHz)	Authors
187.96	The planets at 350 GHz	345	Greve, Kramer
155.96	Protoplanetary disks around solar type stars	Bolometer	Kruegel, Chini, Kreysa, Siebenmorgen, Sievers
153.96	HH energy sources, deeply embedded stars and protostellars condensations	Bolometer	Chini, Reipurth, Sievers, Ward-Thompson
δ01.97	QSOs and high z radio galaxies		Chini
169.96	Simult. multifreq. obs of Comet C/1995 01	Bolometer	Altenhoff, Kreysa, Schmidt, et al.
180.96	is there cold dust in the halo of M82 ?	Bolometer	Klein, Wielebinski, Neininger, Reuter
250.96	Dust emission from pre-stellar cores in Bok globules	Bolometer	Launhardt, Henning, Osterloh, Zylka
223.96	Mm dust continuum from the Cepheus-B molecular cloud	Bolometer	Ungerechts, Sievers, Kramer, Wild, Guélin, Neininger, Cernicharo
234.96	Mapping the cold dust emission from HI warps	Bolometer	Neininger, Guélin, Dumke, Zylka, Wielebinski
156.96	Mass determination for proto-planetary disks	Bolometer	Natta, Grinin, Mannings, Testi, Ungerechts

Mar 25 - Apr 8

Ident.	Title	Freq. (GHz)	Authors
168.96	The recent mass loss rate history of highly evolved stars	Bolometer	Groenewegen, van der Veen, Loup, Habing, Omont
223.96	Mm dust continuum from the Cepheus-B molecular cloud	Bolometer	Ungerechts, Sievers, Kramer, Wild, Guélin, Neininger, Cernicharo
169.96	Simult. multifreq. obs of Comet C/1995 01	Bolometer	Altenhoff, Kreysa, Schmidt, et al.
240.96	A thorough radio spectroscopic investigation of comet Hale-Bopp	88, 96, 115, 147	Crovisier, Biver, Bockelee-Morvan et al.
141.96	Time-delay measurements in the gravitational lens PDS 1830-211	94	Combes, Wiklind, Kramer
133.96	CO observations of two red carbon stars in the galactic halo	115, 230	Groenewegen, Oudmaijer
209.96	A study of the Martian atmosphere near aphelion from HDO and CO transitions	115, 143, 225, 251	Encrenaz-Th, Lellouch, Paubert, Gulkis

Apr 8 - Apr 22

Ident.	Title	Freq. (GHz)	Authors
209.96	A study of the Martian atmosphere near aphelion from HDO and CO transitions	115, 143, 225, 251	Encrenaz-Th, Lellouch, Paubert, Gulkis
240.96	A thorough radio spectroscopic investigation of comet Hale-Bopp	88, 96, 115, 147	Crovisier, Biver, Bockelee-Morvan et al.
141.96	Time-delay measurements in the gravitational lens PDS 1830-211	94	Combes, Wiklind, Kramer
VLBI OBS.			IRAM/MPIfR
214.96	A deep search for redshifted (NII) 205 micron emission from BR1202-0725	256	Van der Werf, Yun, Scoville
13.97	GRS 1915+105 : A runaway black hole ?	89, 230	Mirabel, Chaty, Rodriguez
233.96	CN and HCO^+ in the butterfly NGC 2346	89, 226	Bremer, Neri

Apr 22 - May 6

Ident.	Title	Freq. (GHz)	Authors
13.97	GRS 1915+105 : A runaway black hole ?	89, 230	Mirabel, Chaty, Rodriguez
88.96	An absorption line search toward active galactic nuclei		Crosas, Menten
192.96	$^{12}C^{13}CS$ observations of rho Ophiuchus	109, 110, 220, 230	Palla
Bolo (37-ch)			MPIfR

May 6 - May 20

Ident.	Title	Freq. (GHz)	Authors
167.96	CO observations of ultra luminous IR galaxies	91, 100, 206, 212	Raluy, Colina, Planesas
199.96	Structure and kinematics of two prestellar cores in Ophiuchus	86, 109, 144, 147	Andre, Bacmann, Despois, Ward-Thompson
261.96	The spatial extent and abundance of water vapor in molecular clouds	183, 86, 230, 204	Cox, Young, Huggins, Forveille, Bachiller
184.96	A search for interstellar/circumstellar FeC	160, 200, 240	Ziurys, Apponi, Pesch, Guélin
87.97	The post-perihelion evolution of comet Hale-Bopp	88, 90, 96, 220	Crovisier, Biver, Bockelee-Morvan et al.
AOS Test			U Koeln- IRAM
77.97	Confirmation of H_2C_6 and search for C_5N and C_5H_2	84, 86, 89, 230	Guélin, Cernicharo, Travers, Thaddeus
79.97	OTF mapping of M31, the closest spiral galaxy	115, 230	Neininger, Guélin, Lucas, Wielebinski et al.
185.96	Is ethanol in the galactic center molecular clouds ?	90, 142, 234	de Vicente, Martin-Pintado

May 20 - June 3

Ident.	Title	Freq. (GHz)	Authors
184.96	A search for interstellar/circumstellar FeC	160, 200, 240	Ziurys, Apponi, Pesch, Guélin
185.96	Is ethanol in the galactic center molecular clouds ?	90, 142, 234	de Vicente, Martin-Pintado
79.97	OTF mapping of M31, the closest spiral galaxy	115, 230	Neininger, Guélin, Lucas, Wielebinski et al.
87.97	The post-perihelion evolution of comet Hale-Bopp	88, 90, 96, 220	Crovisier, Biver, Bockelee-Morvan et al.
22.97	Time-delay measurements in the gravitational lens PKS1830-211	94	Combes, Wiklind, Kramer,
208.96	Tomography of the magnetic field in the disk of MWC349	125, 231	Thum, Morris-D
δ17.97	Comet HB		
δ17.97	Comet HB		
66.97	Heating of the galactic center GMCs: large scale shocks or intermediate mass stars	86, 90, 130, 145, 217	Martin-Pintado, de Vincente, Wilson, Fuente, Huettemeister, Rodriguez
42.97	Is SiO emission in external galaxies associated to star formation?	86, 130, 216, 217	Martin-Pintado, Garcia-Burillo, Fuente

June 3 - June 17

Ident.	Title	Freq. (GHz)	Authors
66.97	Heating of the galactic center GMCs: large scale shocks or intermediate mass stars	86, 90, 130, 145, 217	Martin-Pintado, de Vincente, Wilson, Fuente, Huettemeister, Rodriguez
56.97	SiO emission in low velocity outflows from low-luminosity YSOs	86, 130, 217	Ceccarelli, Castets
9.97	OH emitting protoplanetary nebulae	88, 115, 130, 147, 230	Contrereas, Colomer, Bujjarabal, Alcolea
165.96	CO in the crab nebula	115	Henkel, Gredel
39.97	CO OTF mapping of the S106 molecular cloud	89, 109, 115	Schneider, Kramer, Stutzki, Ungerechts
38.97	Density and velocity struc. of the mol. gas in the Rosette Molecular cloud	109, 115	Schneider, Bertoldi, Williams, Stutzki
87.97	The post-perihelion evolution of comet Hale-Bopp	88, 90, 96, 220	Crovisier, Biver, Bockelee-Morvan et al.
22.97	Time-delay measurements in the gravitational lens PKS1830-211	94	Combes, Wiklind, Kramer,
139.96	Oxygen in molecular clouds	88, 89, 97, 110, 244	Lis, Schilke, Phillips, Keene

June 17 - July 1

Ident.	Title	Freq. (GHz)	Authors
VLBI obs			IRAM/MPIfR
57.97	OTF mapping of the Cepheus-B molecular cloud	109, 110, 115, 220, 230	Ungerechts, Guélin, Sievers, Wild, Kramer, Cernicharo
26.97	IVC135+54 as probe of the ISM between galactic halo and plane	110, 115, 220, 230	Heithausen, Weiss, Mebold
δ19.97			Combes
20.97	Molecular gas in faint blue galaxies as intermediate red shifts	153, 23	C-Wilson, Combes
24.97	Deriving an upper limit to Tcmb at z=0.25	94, 98, 103, 129, 138	Wiklind, Combes
23.97 (cond)	Search for z=3.4 molecular absorption lines	81, 105, 210, 223	Combes, Wiklind

July 1 - July 15

Ident.	Title	Freq. (GHz)	Authors
99.97	Monitoring of Jupiter after the comet SL9 collision	88, 115, 146, 230, 244	Marten, Moreno, Paubert
8.97	Molecul gas in the chemically young galaxy Mrk 109	111, 115	Frayer, Sauvage, Thuan, Seaquist
29.97	CO observations of ultra luminous infrared galaxies		Raluy, Colina, Planesas
100.97	Observation of the HC15N (3-2) line on Titan	88, 115, 220, 258	Marten, Hidayat, Paubert, Bezard
δ9.97	Ser. Observation		Israel
T.T.	A.O.S.		Paubert
22.97	Time-delay measurements in the gravitational lens PKS1830-211	94	Combes, Wiklind, Kramer,
40.97	Ancient planetary nebulae in interaction with the interstellar medium	115, 230	Bujarrabal, Contreras, Colomer, Alcolea
58.97	SiO masers from extragalactic evolved stars		Alcolea, Bujarrabal, Colomer, Zijltra

JULY 15 - JULY 29

Ident.	Title	Freq. (GHz)	Authors
86.97	Triggered star form, in mass, photoevap. clumps: C34S and C18S study of NGC281 mol. cloud	109, 219, 96, 144, 241	Wilson, Megeath
3.97	Densities and kinetic temperatures in Orion North: Struct. and Chem. of a radical center	91, 112, 147, 220	Wilson, Gensheimer, Martin-Pintado, de Vincente
4.97	Depletion in molecular clouds: Mapping H2CO in NGC2024	225, 216, 217	Wilson, Wink, Gensheimer, Mauersberger, Walmsley
5.97	A new type of interstellar maser	91, 147, 220	Wilson, Gensheimer, Martin-Pintado, de Vincente
6.97	Physics and chemistry of a newly discovered molecular core in the SgrB2 region	91, 112, 147, 220	Wilson, Gensheimer, Martin-Pintado, de Vincente
22.97	Time-delay measurements in the gravitational lens PKS1830-211	94	Combes, Wiklind, Kramer,
59.97	Probing the nuclear molecular gas in the Seyfert 1 NGC 3227	88, 97, 109, 114, 229	Schinnerer, Eckart, Tacconi, Tacconi-Garman
80.97	A study of the Trifid nebula at optical, infrared and radio wavelengths	115, 89, 130, 144, 93	Cernicharo, Lefloch, Gonzalez-Alphonso, Cox
74.97	A molecular survey of CRL618: from mm waves to the near infrared	82, 105	Cernicharo, Guélin, Cox, Maillard, Moutou, Neri

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Ident.	Title	Freq. (GHz)	Authors
44.97	IC1396E revisited - an excitation study using C170	112, 109, 224, 219, 96	Klein, Guesten, Stark, Zylka
22.97	Time-delay measurements in the gravitational lens PKS1830-211	94	Combes, Wiklind, Kramer,
61.97	Dust and gas in IC5146: depletion of CO in a cold quiescent core ?	85, 112, 222, 224	Kramer, Walmsley, Ungerechts, Sievers, C-Lada, E-Lada
87.97	The post-perihelion evolution of comet Hale-Bopp	88, 90, 96, 220	Crovisier, Biver, Bockelee-Morvan et al.
67.97	The physical conditions in the core and in the bow shocks of CepE	89, 96, 102, 138, 145	Lefloch, Lazareff, Eisloeffel
81.97	Is the annihilator 1E1740 associated with a molecular cloud ?	89, 113, 226	Lefloch, Duchouroux, Henry
16.97	Chemical bistability in dark clouds: the diagnostic of deuterium fractionation	89, 90, 109, 152, 219	Gerin, Falgarone, Roueff, Le Bourlot, Pineau des Forets, Irvine
71.97	Selective search for mol. species tracing the role of grains in cold mol. cloud chemistry	86, 102, 145, 218, 244	Dartois, Boulanger, Gerin, d Hendecourt, Pineau des Forets

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Ident.	Title	Freq. (GHz)	Authors
32.97	The chemical signatures of the dissipative structures of molecular clouds turbulence	89, 88, 87, 174, 267	Falgarone, Joulain, Puget, Panis, Pineau des Forets
33.97	Dense core form: the small-scale struct. of the env. of low-mass dense core	96, 147, 244	Falgarone, Gerin, Panis, Perrault
12.97	OTF spectroscopy to study the kinematics of the central galaxy	98, 219, 220	Zylka, Guesten, Ungerechts, Duschl
73.97	Depletion of sulfur-bearing molecules in low-mass cores	86, 93, 96, 97, 244, 260	Tafalla, Bergin, Plume, Myers
83.97	An unusual cluster of mm-continuum sources in Cepheus	115, 213	Tafalla, Bachiller, Mardones, Myers
17.97	Complex molecules keystones for understanding hot core excitation	98, 104, 11, 147, 173	Caselli, Cesaroni, Felli, Walmsley, Schilke, Wyrowski
18.97	Fractional ionization in the collapsing starless core L1544	86, 109, 144, 216, 85	Caselli, Myers, Tafalla, Williams, Guélin
19.97	Sequential massive star formation in G35.20-1.74: effects on the parent mol.cloud	97, 146, 244, 102, 222	Caselli, Felli, Testi
22.97	Time-delay measurements in the gravitational lens PKS1830-211	94	Combes, Wiklind, Kramer,
T.T.	Freq.Switch		Thum et al.

AUG 26 - SEPT 9

Ident.	Title	Freq. (GHz)	Authors
17.97	Complex molecules keystones for understanding hot core excitation	98, 104, 11, 147, 173	Caselli, Cesaroni, Felli, Walmsley, Schilke, Wyrowski
18.97	Fractional ionization in the collapsing starless core L1544	86, 109, 144, 216, 85	Caselli, Myers, Tafalla, Williams, Guélin
19.97	Sequential massive star formation in G35.20-1.74: effects on the parent mol.cloud	97, 146, 244, 102, 222	Caselli, Felli, Testi
22.97	Time-delay measurements in the gravitational lens PKS1830-211	94	Combes, Wiklind, Kramer
87.97	The post-perihelion evolution of comet Hale-Bopp	88, 90, 96, 220	Crovisier, Biver, Bockelee-Morvan et al.
55.97	The physics of the NGC1333/IRAS2 eastern and western shocks	86, 109, 130, 147, 220	Castets, Lefloch, Langer
48.97	CO in the halo of magellanic irregular galaxy NGC 4449	115, 230	Khole, Henkel, Klein, Greve
30.97	Molecular gas in bipolar planetary nebulae	115, 230	Manchado, Guerrero, Bachiller
11.97	The chemistry of sulfur in star-forming regions	86, 138, 219, 168, 244	Codella, Bachiller
94.97	Distribution of SiO jets in star forming regions	86	Gueth, Dutrey, Guilloteau, Ungerechts
68.97	Stellar SiO masers in the galactic bulge	86, 212	Levine, Omont, M-Morris, Price, Menten
36 - (Serv. Obs.)	CO observations of UV Aur	115, 230	Jura, Kahane (Serv. Obs.)

SEPT 9 - SEPT 23

Ident.	Title	Freq. (GHz)	Authors
94.97	Distribution of SiO jets in star forming regions	86	Gueth, Dutrey, Guilloteau, Ungerechts
87.97	The post-perihelion evolution of comet Hale-Bopp	88, 90, 96, 220	Crovisier, Biver, Bockelee-Morvan et al.
68.97	Stellar SiO masers in the galactic bulge	86, 212	Levine, Omont, M-Morris, Price, Menten
49.97	Massive carbon stars with high expansion velocity: a new class of carbon stars ?	115, 110, 220, 230, 90	Fuente, Cernicharo
65.97	The latest stages of the evolution of a bipolar outflow: NGC7023 (Follow-up)	110, 146, 230	Fuenet, Martin-Pintado, Cernicharo, Rogers, Rodriguez-Franco
62.97	The origin of the mono polar high velocity gas in Orion A	86, 90, 99, 129, 217, 220	Rodrigez-Franco, Martin-Pintado, Fuente
34.97	Excitation of a molecular cloud by the W44 supernova	98, 147, 244, 230	Reach, Rho
69.97	Nature and kinematics of a bolometer-discovered protostellar clump	86, 109, 144, 219, 230	Andre, Motte, Bacmann, Despois
T.T.	Holography		IRAM Staff

SEPT 23 - OCT 7

Ident.	Title	Freq. (GHz)	Authors
T.T.	Holography		IRAM Staff
98.97	The dynamical behaviour of infrared carbon stars	88, 130, 230	Groenewegen, Omont, Habing, Sevenster
91.97	CO emission at the owl nebula's rim	88, 115, 230	Bremer
97.97	M17-North: Molecular line observations of a proto-stellar core	86, 98, 147, 219, 230	R-Klein, Launhardt, Henning
64.97	12 CO(2-1) OTF map of HST field of the Helix nebula	115, 230	Cox, Forveille, Young, Huggins, Bachiller, Lefloch, Lucas, Tielens
96.97	OTF mapping of the isolated star forming cloud NGC1788	110, 115, 220, 230	Sterzik, Dougados, Lefloch, Schuster
52.97	A CO map of the double-barred galaxy NGC5850	114, 228	Leon, Combes, Friedli
22.97	Time-delay measurements in the gravitational lens PKS1830-211	94	Combes, Wiklind, Kramer

Oct 7 - Oct 21

Ident.	Title	Freq. (GHz)	Authors
96.97	OTF mapping of the isolated star forming cloud NGC1788	110, 115, 220, 230	Sterzik, Dougados, Lefloch, Schuster
52.97	A CO map of the double-barred galaxy NGC5850	114, 228	Leon, Combes, Friedli
64.97	12 CO(2-1) OTF map of HST field of the Helix nebula	115, 230	Cox, Forveille, Young, Huggins, Bachiller, Lefloch, Lucas, Tielens
31.97	An HCO^+, CS, and 13CO study of high mass protostellar candidates	86, 98, 144, 219, 220	Cesaroni, Molinari, Brand, Palla
46.97	Observations of HCS^+ and c-C3H2 in NGC253 and M82	85, 82	Oike, Kawaguchi, Nakai, Takano
47.97	Molecular gas in Elephant trunks of M16 - OTF maps	98, 110, 220	Ungerechts, Sievers, Wild, Kramer
11.97	The chemistry of sulfur in star-forming regions	86, 138, 219, 168, 244	Codella, Bachiller
22.97	Time-delay measurements in the gravitational lens PKS1830-211	94	Combes, Wiklind, Kramer
98.97	The dynamical behaviour of infrared carbon stars	88, 130, 230	Groenewegen, Omont, Habing, Sevenster

Oct 21 - November 4

Ident.	Title	Freq. (GHz)	Authors
98.97	The dynamical behaviour of infrared carbon stars	88, 130, 230	Groenewegen, Omont, Habing, Sevenster
76.97	Chemistry of protoplanetary disks: V	87, 113, 140, 145, 210	Dutrey, Guilloteau, Guélin, Richer
VLBI			IRAM/MPIfR
T.T.	Beam Sq.		IRAM Staff
T.T.	Freq. Switch		IRAM Staff
δ23.97			Castets et al.
43.97	CN Zeeman observations: Magnetic fields in molecular clouds	113	Crutcher, Troland, Lazareff, Kazes

Oct 21 - November 4

Ident.	Title	Freq. (GHz)	Authors
δ23.97			Castets et al.
13.97	GRS 1915+105 : A runaway black hole ?	89, 230	Mirabel, Chaty, Rodriguez
76.97	Chemistry of protoplanetary disks: V	87, 113, 140, 145, 210	Dutrey, Guilloteau, Guélin, Richer
77.97	Confirmation of H_2C_6 and search for C_5N and C_5H_2	84, 86, 89, 230	Guélin, Cernicharo, Travers, Thaddeus
79.97	OTF mapping of M31, the closest spiral galaxy	115, 230	Neininger, Guélin, Lucas, Wielebinski et al.
74.97	A molecular survey of CRL618: from mm waves to the near infrared	82, 105	Cernicharo, Guélin, Cox, Maillard, Moutou, Neri
78.97	Missing spacings correction for interferometer maps of M82	110, 115, 220, 230	Neininger, Klein, Schilke
66.97	Heating of the galactic center GMCs: large scale shocks or intermediate mass stars	86, 90, 130, 145, 217	Martin-Pintado, de Vincente, Wilson, Fuente, Huettemeister, Rodriguez
82.97	How "coherent" are dense cores ?	93, 112, 144, 216, 224	Goodman, Caselli, Heyer, Wilner, Arce
63.97	Circumstellar carbon monoxyde around two key stellar objects	115, 110, 230, 220	M-Morris, Forveille, Barnbaum
149.97	Completion of a deep survey of SiO in star-forming regions	86, 130, 217	Codella, Bachiller, Reipurth

November 4 - Nov 18

Ident.	Title	Freq. (GHz)	Authors
δ23.97			Castets et al.
13.97	GRS 1915+105 : A runaway black hole ?	89, 230	Mirabel, Chaty, Rodriguez
76.97	Chemistry of protoplanetary disks: V	87, 113, 140, 145, 210	Dutrey, Guilloteau, Guélin, Richer
77.97	Confirmation of H_2C_6 and search for C_5N and C_5H_2	84, 86, 89, 230	Guélin, Cernicharo, Travers, Thaddeus
79.97	OTF mapping of M31, the closest spiral galaxy	115, 230	Neininger, Guélin, Lucas, Wielebinski et al.
74.97	A molecular survey of CRL618: from mm waves to the near infrared	82, 105	Cernicharo, Guélin, Cox, Maillard, Moutou, Neri
78.97	Missing spacings correction for interferometer maps of M82	110, 115, 220, 230	Neininger, Klein, Schilke
66.97	Heating of the galactic center GMCs: large scale shocks or intermediate mass stars	86, 90, 130, 145, 217	Martin-Pintado, de Vincente, Wilson, Fuente, Huettemeister, Rodriguez
82.97	How "coherent" are dense cores ?	93, 112, 144, 216, 224	Goodman, Caselli, Heyer, Wilner, Arce
63.97	Circumstellar carbon monoxyde around two key stellar objects	115, 110, 230, 220	M.Morris, Forveille, Barnbaum
149.97	Completion of a deep survey of SiO in star-forming regions	86, 130, 217	Codella, Bachiller, Reipurth

NOVEMBER 18 - DEC 2

Ident.	Title	Freq. (GHz)	Authors
149.97	Completion of a deep survey of SiO in star-forming regions	86, 130, 217	Codella, Bachiller, Reipurth
157.97	Spectroscopic study of recently discovered intermediate mass protostars candidates	86, 89, 144, 216, 267	Fuente, Martin-Pintado, Bachiller, Palla, Neri
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118.97	Search for a new molecule in Titan's atmosphere: HC5N	109, 143, 218	Marten, Hidayat, Moreno, Paubert, Bezard
150.97	CO in long-lived circumstellar disks	115, 230	Jura, Kahane
154.97	Isotopic ratios of heavy elements in evolved stars	89, 144, 157, 163, 170	Kahane, Forestini, Guélin, Cernicharo
137.97	Large-scale lobes in the Micro quasar GRS 1915+105	89, 230	Mirabel, Chaty, Rodriguez
δ25.97			Castets et al.

DEC 2 - DEC 16

Ident.	Title	Freq. (GHz)	Authors
137.97	Large-scale lobes in the Micro quasar GRS 1915+105	89, 230	Mirabel, Chaty, Rodriguez
δ25.97			Castets et al.
192.97	Mapping decrements in teh cosmic microwave background at 1.2 and 2.1mm with Diabolo	Bolometer	Desert, Aghanim, Bernard, Delabrouille, Lamarre, Pajot, Puget, Giard, Serra
193.97	Observations of the hot gas in clusters of galaxies with Diabolo through the Sunyaev-Zel'dovich effect	Bolometer	Desert, Bernard, Delabrouille, Lamarre, Pajot, Puget, Giard, Gaertner, Serra
195.97	Investigating the gas properties in protoplanetary disks of intermediate mass stars	89, 88, 97, 113, 146, 226	Wiesemeyer, Dutrey, Guélin, Guilloteau
175.97	Searching for molecular absorption lines in new gravitation lenses	111, 108, 87, 144, 223	Xanthopoulos, Polatidis, Browne, Wiklind, Combes
122.97	Search for new high red shift molecular absorption line systems	106, 111, 207, 218, 87	Combes, Wiklind
123.97	Search for the primordial molecule LiH in a dense molecular cloud	85	Combes, Wiklind

DEC 16 - DEC 30

Ident.	Title	Freq. (GHz)	Authors
122.97	Search for new high red shift molecular absorption line systems	106, 111, 207, 218, 87	Combes, Wiklind
123.97	Search for the primordial molecule LiH in a dense molecular cloud	85	Combes, Wiklind
213.97	The darkest clouds in the galaxy: follow-up of ISO discoveries	220, 219, 109, 97	Perault, Omont, Hennebelle, Ungerechts, Teyssier
171.97	The spatial extent and abundance of water vapor in molecular clouds	183, 86, 230, 80, 204	Cernicharo, Gonzalez-Alfonso, Cox, Lefloch
187.97	AINC in IRC+10216	143, 155, 215, 227	Guélin, Ziurys, Apponi, Cernicharo
75.97	Search for C_2HD^+ in dark clouds: a molecular ion related to acetylene	85, 135, 243, 87, 144, 262	Gerin, Cernicharo, Cox
214.97	Mapping of a active barred galaxy: NGC 6951	114	Leon, Combes, Friedli
203.97	A search for extragalactic 183 GHz water masers near OH megamaser activity	170, 175, 180, 80, 83	Lonsdale, Doeleman, Barvainis

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