IRAM

Institut de Radioastronomie Millimétrique
Institut für Radioastronomie im Millimeterbereich
Instituto de Radioastronomía Milimétrica

Newsletter

Number 60 July 30th , 2004

Contents

Calendar

September 9th, 2004:
Deadline for the submission of IRAM observing proposals for the period from 15 November 2004 to 15 May 2005.

November 1, 2004:
Deadline for the submission of VLBI observing proposals for the April 2005 session.

November 22-27, 2004:
4th IRAM Interferometry School

Meeting of IRAM's Executive Council

On June 28/29, 2004, the IRAM Executive Council held its annual meeting at the Max-Planck-Institut für Extraterrestrische Physik in Garching/Germany. The three most important points on the Agenda were

- the report from the Chairman of the Visiting Committee, Paul VandenBout, on IRAM's current role and future perspectives,
- the discussion of the future access to the Plateau de Bure, and
- a decision about the future IRAM management.

In addition, the Executive Council approved the IRAM budgets for 2004 and 2005, and it discussed the (planned) involvement of IRAM in ALMA tasks and in the EU-FP6 RadioNet programme.

The Report from the Visiting Committee which is co-signed by Paul VandenBout as the Chairman, and Chris Carilli, Ron Ekers, Richard Hills, Malcolm Longair, and Malcolm Walmsley as members, comments positively on IRAM's past, present and future role, its ongoing development plans, and its longer term options beyond 2009, the limiting date for the current CNRS/IGN/MPG partnership agreement. One of the key recommendations from the Committee is that the IRAM funding organizations should already now agree to extend their contract until 2014, i.e. for a period of 10 years as of today. The Committee felt that the options beyond 2014, i.e. the period when ALMA will be fully operational, should be the subject of another review in the 2009/10 timeframe.

Concerning the new access to the Plateau de Bure, the Technical Division of the CNRS together with the CNRS-INSU Administration has successfully completed all preparatory steps for building a horizontal tunnel and a vertical elevator to bridge the altitude range from about 2350m to 2550m, i.e. the last part of the access to the plateau. The lower part was supposed to be bridged by a telecabin system between the Superdévoluy ski station at about 1500m and the beginning of the tunnel. Given the fact that neither the financing nor the delay for building this system are clearly defined today, and considering that the total cost of this end-to-end solution will be very high, it was decided at the Council meeting to look into alternative solutions that could be build faster and at a lower total cost.

The members of the IRAM direction are appointed for periods of 5 years in accordance with the IRAM statutes. The current terms of office for both Michel Guélin et myself will end in the coming months. The Council has decided that Michel Guélin shall continue as IRAM's Deputy Director until the end of 2004, and that Pierre Cox will take this position as of 1.1.2005 for 1 year, before becoming the new IRAM Director on 1.1.2006. My own mandate has been extended by 1 year, i.e. until the 31st December 2005. This arrangement will give us the opportunity for a smooth hand-over of responsibilities.

Michael GREWING

Travel funds for European astronomers

IRAM is one of the organizations partipating in the RadioNet project, an initiative funded by the European Commission within the FP6 Programme to improve and encourage communication among astronomers of the European Community. Transnational access (TNA) is the largest RadioNet programme and provides funding for travel expenses incurred by eligible users for carrying out their observations or reducing their data. As a partner of RadioNet, IRAM has now TNA funds to pay travel expenses for European users. Detailed information about user eligibility, TNA contacts, policies and travel claims for the IRAM 30m telescope and Plateau de Bure Interferometer can be found on the RadioNet home page at `http://www.radionet-eu.org`.

Observers requesting TNA support will be asked to provide the necessary personal and professional information to IRAM.

Roberto NERI & Clemens THUM

Staff changes

IRAM GRENOBLE

The receiver group welcomes two new members: Magali PARIOLEAU and Amélie TELLIEZ have started work on June 1st, 2004.

Erratum: In the last Newsletter, Theo SCHERER was announced as a new member of the astronomy group. In fact, he has joined the IRAM SIS group as a physicist working on hot electron bolometers. Please excuse the confusion.

Michael BREMER

IRAM Annual Report 2003

The Annual Report for 2003 is now available both in printed and in electronic form. The latter can be retrieved from http://www.iram.fr/IRAMFR/ARN/-AnnualReports/IRAM_2003.pdf. As usual, many people have contributed to the writing of this report. They are mentioned in the document. I would like add here the name of Michael Bremer who played a crucial role during the final editing phase, and who prepared the electronic version.

Michael GREWING

The new GILDAS

During the last two years, the GILDAS package underwent important changes: the sources have been organised in a new, clearer tree; a new, simplified building mechanism has been developed; and many bugs have also been corrected. After extensive testing, this "new" GILDAS package is now mature enough to be distributed. A new GILDAS web page has thus been written and is now available at

`http://www.iram.fr/IRAMFR/GILDAS`

This page gives access to all GILDAS-related information (description, documentation, current status, supported systems, dependencies, distribution, etc). It enables direct download of the source code (the old ftp distribution area is now disconnected). A section devoted to linking programs against GILDAS is also available.

Please note that GILDAS **requires FORTRAN-90** to be compiled (i.e. g77 is not supported anymore). We have checked the installation on a variety of platforms, including most flavors of LINUX and MAC/OSX. A Microsoft Windows version is also available (but is maintained on a best effort basis only).

In addition to software developments, our goal is to improve service during the coming years. In this area, our most important task will be to fully update the documentation, which is currently lagging. Please check the GILDAS web page for further information. All comments, suggestions, questions should be sent to `gildas@iram.fr`.

Jérome PETY and Frédéric GUETH,
on behalf of the GILDAS team

IRAM web pages

Astronomers preparing their visit to IRAM Granada and the 30-m telescope are invited to use the web-based form which is now available on the visiting astronomer's web page http://www.iram.fr/IRAMFR/PV/visi_ast.html.

The data in this form is important for the reservation of your accomodation and the transport from and to the observatory; you can alternatively fill in a paper copy (a pdf file can be found on the visiting astronomer's page) and send it by fax.

If you have unusual frequencies in your observing run, please remember to send the corresponding form by fax to the Granada offices so that the receiver group can verify how to tune the 30-m receivers fast and easily when your observing time starts.

Cathy BERJAUD and Michael BREMER

Proposals for IRAM Telescopes

The next deadline for submission of observing proposals on IRAM telescopes, both the interferometer and the 30m, is

September 9th, 2004, 17:00 MEST (UT + 2 h.)

The scheduling period extends from 15 November 2004 to 15 May 2005, covering roughly the winter period at our observatories.

Proposals should be submitted through our web–based submission facility. Instructions are found on our web page at URL:

http://www.iram.fr/GENERAL/
submission/submission.html

The submission facility will be opened about three weeks before the proposal deadline. Proposal form pages and the 30m time estimator are available now.

Please avoid last minute submissions when the network could be temporarily congested. As an insurance against network congestion or failure, we still accept, in well justified cases, proposals submitted by:

- fax to number: (33/0) 476 42 54 69 or by
- ordinary mail addressed to:

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

Proposals sent by e–mail are not accepted. Color plots will be printed/copied in grey scale. If the proposers want their color plots to be passed on to the program committee, the **entire proposal** must be sent in by ordinary mail in **12 copies**.

Soon after the deadline the IRAM Scientific Secretariat sends an acknowledgement of receipt to the Principal Investigator of each proposal correctly received, together with the proposal registration number. To avoid the allocation of several numbers for the same proposal, send in your proposal *only once*. Note that the web facility allows cancellation and modification of proposals before the deadline. The facility also allows to view the proposal in its final form as it appears after re–compilation at IRAM. We urge proposers to make use of this facility as we always receive a number of proposals with serious formal defects (figures missing, blank pages, etc.).

Valid proposals contain the official cover page, up to two pages of text describing the scientific aims, and up to two more pages of figures, tables, and references. Proposals should *not exceed these 5 pages* of scientific material. Excepting the technical pages for the interferometer, longer proposals will be cut.

Proposals should be self-explanatory, clearly state the aims, and explain the need of the requested telescope. The amount of time requested should be carefully justified (see below).

The cover page, in postscript or in LaTeX format, and the LaTeX style file `proposal.sty` may be obtained from the IRAM web pages[1] at URL `./GENERAL/submission/-proposal.html`. In case of problems, contact the secretary, Cathy Berjaud (e–mail: `berjaud@iram.fr`). Please, make sure that your proposals use the current form pages. This is particularly important at the current deadline, since the style file has been modified at a number of places for facilitating a detailed computerized handling of the proposals.

In all cases, indicate on the proposal cover page whether your proposal is (or is not) a *resubmission* of a previously rejected proposal or a *continuation* of a previously accepted interferometer or 30m proposal. In both cases we request that the proposers describe very briefly in the introductory paragraph (automatically generated header "Proposal history:") why the proposal is being resubmitted (e.g. improved scientific justification) or is proposed to be continued (e.g. last observations wiped out by bad weather).

Do not use characters smaller than 11pt. This could render your proposal illegible when copied or faxed. If we notice any formal problems sufficiently before the deadline, we will make an effort to contact the principal investigator and solve the problem together.

Applications for **zero spacing observations** have been simplified. If the need for complementary 30m observations is evident already at the time when the PdB interferometer proposal is prepared, just note this need on the interferometer proposal. A separate proposal for the 30m telescope is not required anymore.

The blank form for Interferometer proposals now contains a new bullet, labelled "zero spacing" which should be checked if 30m observations are requested to fill in the missing zero spacings. The interferometer style file will prompt for an additional paragraph in which the scientific need for the zero spacings and all observational details, like size of map, sampling density and rms noise, spectral resolution, receiver configuration and time requested, are described.

Roberto NERI & Clemens THUM

News from the 30m Telescope

LAPTOPS WITH WIRELESS NETWORK OR BLUETOOTH CONNECTION

The radiocommunication built into modern laptops (e.g. bluetooth used for wireless mouse devices etc.; WLAN) can seriously disturb observations with the 30-m telescope. Therefore all visitors to the observatory must ensure that all radio connections are switched off **before** getting to the telescope.

If you are not sure how to do that, please ask our computer staff. We remind you that also mobile telephones must be kept switched off all the time at the observatory. The negative impact of such interference is documented in the IRAM Newsletter 54 (December 2002).

Rainer MAUERSBERGER

[1] from here on we give only relative URL addresses. In the absolute address the leading dot (./) has to be replaced by the address of one of our mirror sites: http://www.iram.fr or http://www.iram.es.

Call for Observing Proposals on the 30m Telescope

SUMMARY

Proposals for three types of receivers will be considered for the coming winter semester:

1. the observatory's set of four dual polarization heterodyne receivers centered at wavelengths of 3, 2, 1.3, and 1.1 mm,
2. the 9 pixel dual–polarization heterodyne receiver array, HERA, operating at 1.3 mm wavelength,
3. a 1.2 mm bolometer array with at least 37 pixels.

Emphasis will be put on observations at the shorter wavelengths. In total, about 2800 hours of observing time will be available, which should allow scheduling of a few longer programmes (up to $\sim$ 150 hours).

The main news, proposal formalities, details of the various receivers, and observing modes are described below.

WHAT IS NEW ?

The **tuning range** of the 3mm receivers, nominally 80 – 115.5 GHz, has been slightly extended toward lower frequencies. Both 3mm receivers, A100 and B100, have now been tested. Both receivers work correctly in SSB and high USB rejection down to $\sim$ 77 GHz. A test report together with a collection of spectra is made available on our web pages

Applications for frequencies down to $\geq$ 72 GHz will be considered. Requests for frequencies below 77 GHz should describe the precision of the calibration needed. Due to the special LO hardware requirements observations below 80 GHz presently exclude the simultaneous use of A230 and B230. Proposers should enter "$<$ 80 GHz" as special requirements on the proposal cover sheet.

Proposers should use the time estimator which will include the correct receiver temperature at the low frequencies and an extra overhead for calibration.

The **second polarization module** of HERA has now been installed. With the exception of one pixel where one polarization is somewhat less sensitive, the upgrade was fully satisfactory. As many observational parameters are not yet precisely known for the full dual polarization array, we request HERA proposers to consult the time estimator when estimating integration times.

The new broadband **autocorrelator WILMA** (Wideband Line Multiple Autocorrelator) is now operational at Pico Veleta. Hardware for synchronization with the wobbler is also expected to be in place.

Zero spacing observations with the 30m telescope needed for a proposed PdB Interferometer observation do not need a parallel proposal for the 30m telescope. It is sufficient to mark "zero spacing" on the interferometer proposal form. All necessary scientific and technical information about the 30m observation must be given in an additional paragraph of the Bure proposal. We strongly recommend to use the 30m time estimator.

When an interferometer proposal had not originally requested zero spacing observations, but the need for such data becomes apparent after reduction of the interferometer data, we still request a separate and self–contained proposal for the 30m telescope.

The implementation of the **New Control System** is advancing. A beta test is planned for November this year. The test is designed to provide complete telescope control at least for bolometer observations. More comprehensive tests are envisaged toward the end of the winter semester. The bulk of the observations will however still be observed with the present VAX–based control system which will then be 20 years old.

Applications

On the official cover page, please fill in the line 'special requirements' if you request either polarimetric observations, service or remote observing. If the observations need or have to avoid specific dates, enter them here. If there are periods when you cannot observe for personal reasons, please specify them here.

We insist that the source positions and observing frequencies are correctly and completely entered on the proposal cover page. Proposals for heterodyne receivers are requested to give a complete list of frequencies corrected for source redshift (to 0.1 GHz). If in very special cases the proposers do not feel to be in a position to give this information, they should take up contact with the scheduler (thum@iram.fr). The proposers should also specify on the cover sheet which receivers they plan to use.

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 the source list in J2000 coordinates. This list *must 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 adhere to the format indicated on the proposal form (no hand writing, please). If your source list is longer (e.g. more than 15 sources) than what fits onto the cover page, please use the LaTeXmacro `\extendedsourcelist`.

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 hours.

If time has already been given to a 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. Information given in the *Observer's Comment Sheet* which we request to be filled in after each observation, is linked to the proposal data base and helps to reconstruct a proposal's history.

Reminders

A handbook ("The 30m Manual") collects most of the information necessary to plan 30m telescope observations[6]. The report entitled "Calibration of spectral line data at the IRAM 30m telescope" explains in detail the applied calibration procedure. Both documents can be retrieved from the URL /IRAMES/otherDocuments/manuals/index.html. A catalog of well calibrated spectra for a range of sources and transitions (Mauersberger et al. [9]) is very useful for monitoring spectral line calibration. A copy of the 30m file with the calibrated spectra can be downloaded from the Spanish web site.

The astronomer on duty (whose schedule can be found at URL /IRAMES/groups/astronomy/aodsched.html) should be contacted well in advance of an observing run for any special questions concerning the preparation of an observing run (e.g. setup of on-the-fly maps etc).

Frequency switching is available for both HERA and the observatory's standard SIS receivers. This observing mode is interesting for observations of narrow lines where flat baselines are not essential, although the HERA provides the flattest frequency switched baselines known at the 30m. Certain limitations exist with respect to maximum frequency throw ($\leq$ 45 km/s), backends, phase times etc.; for a detailed report see [4].

Observing time estimates

This matter needs special attention as a serious time underestimate may be considered as an indication of sloppy proposal preparation. We strongly recommend to use the web–based Time Estimator (URL: /IRAMES/obstime/-time_estimator.html), whenever applicable. It handles heterodyne (single pixel and HERA) as well as bolometer observations with updated instrumental parameters.

Suggestions and questions can be addressed to Axel Weiß (aweiss@iram.fr).

If very special observing modes are proposed which are not covered by the Time Estimator, proposers must give sufficient technical details so that their time estimate can be reproduced. In particular, the proposal must give values for T_{sys}, the spectral resolution, the expected antenna temperature of the signal, the signal/noise ratio which is aimed for, all overheads and dead times, and the resulting observing time. A technical report explaining how to estimate the telescope time needed to reach a given sensitivity level in various observing modes was published in the January 1995 issue[2] of the IRAM Newsletter [5]. It has been included in the 30m telescope Manual [6].

Proposers should base their time request on normal winter conditions, corresponding to 4mm of precipitable water vapor. Conditions during afternoons can be degraded due to anomalous refraction. The observing efficiency is then reduced and the temperature calibration is more uncertain than the typical 10 percent. If exceptionally good transmission or stability of the atmosphere is requested which may be reachable only in best winter conditions, the proposers must clearly say so in their time estimate paragraph. Such proposals will however be particularly scrutinized.

Pooled observing

As in the previous semesters, we plan to reserve a large fraction of the winter semester for pooled observing. The proposals participating in the pool are observed by Granada staff and cooperating external astronomers, coordinated by Axel Weiss. The participating proposals are grouped according to their demand on weather quality and will be observed following the priorities assigned by the program committee. The organization of the observing pool is described at /IRAMES/observing/flexible/flexible.html. Typically, the bolometer proposals are included in the pool, along with suitable heterodyne proposals. Participation in the pool is voluntary, and the respective box on the proposal form should be checked.

As a backup for poor 1mm observing conditions, simple spectroscopic proposals at lower frequencies are often ideal. We therefore encourage submission of such proposals, essentially at frequencies below $\sim$ 105 GHz and including the newly opened range below 80 GHz. The "pool" box should be checked on the proposal cover sheet.

Service observing

To facilitate the execution of short ($\leq$8 h) programmes, we propose "service observing" for some easy to observe programmes *with only one set of tunings*. Observations are made by the local staff using precisely laid–out instructions by the principal investigator. For this type of observation, we request an acknowledgement of the IRAM staff member's help in the forthcoming publication. If you are interested by this mode of observing, specify it as a "special requirement" in the proposal form. IRAM will then decide which proposals can actually be accepted for this mode.

[2] electronically available on our web pages at `./IRAMFR/ARN/newsletter.html`

Remote observing

This observing mode where the remote observer actually controls the telescope very much like on Pico Veleta, is available from the downtown Granada office, from the MPIfR in Bonn, from the ENS in Paris, from the OAN in Madrid (near Parque de Retiro), and from IRAM in Grenoble. This observing mode is available to projects without any particular technical demands and to experienced 30m users. The prospective remote observer should note "remote observing" as a special requirement in the proposal cover sheet.

After time has been awarded to a proposal, the P.I. is requested to give sufficient detail to the secretary, Cathy Berjaud (berjaud@iram.fr) on how the remote observer can be contacted. Please note that IRAM is not responsible for the remote stations in Paris, Madrid, or Bonn.

Remote observers affiliated with the MPIfR or other institutes near Bonn should contact F. Bertoldi (bertoldi@mpifr-bonn.mpg.de) or D. Muders (dmuders@mpifr-bonn.mpg.de) at MPIfR for a short introduction to the remote observing station. Remote observers in the Paris area may contact M. Gerin (gerin@lra.ens.fr) for arrangements. Astronomers who want to use the Madrid station are requested to contact J. Alcolea (j.alcolea@oan.es). Remote observers in or near Grenoble please contact H. Wiesemeyer (wiesemey@iram.fr) at IRAM. Observers visiting the 30m might opt to do some of their observing from Granada if it eases their travel constraints. In this case, a Granada astronomer should be contacted as soon as possible, arrangements on very short notice may not always be possible.

Technical Information about the 30m Telescope

This section gives all the technical details of observations with the 30m telescope that the typical user will have to know. A concise summary of telescope characteristics is published on the IRAM web pages.

HERA

The **HE**terodyne **R**eceiver **A**rray is expected to be available for most of next winter. The 9 pixels are arranged in the form of a center–filled square and are separated by 24″. Each beam is split into two linear polarizations (after a successful upgrade in March) which couple to separate SIS mixers. The 18 mixers feed 18 independent IF chains. Each set of 9 mixers is pumped by a separate local oscillator system. The same positions can thus be observed simultaneously at any two frequencies inside the HERA tuning range (210-276 GHz).

A derotator optical assembly can be set to keep the 9 pixel pattern stationary in the equatorial or horizontal coordinates. Receiver characteristics (of the single polarization system) are listed in Tab. 1, and an updated user manual (version 1.7) is available on our web page.

Frequency tuning of HERA, although fully under remote control and automatic, is substantially more complicated than for the observatory's other SIS receivers. Although the tuning is still known for only a few frequencies, (the 3 CO isotopes at 230.5, 220.4, and 219.6 GHz; CS at 244.9 GHz; HCN at 265.9 GHz; HCO^+ at 267.6 GHz; DCN and $HC^{15}N$ at 217.2 and 259 GHz; H_2CO at 225.7 GHz; H30α at 231.9 GHz), HERA proposals for any frequency within the nominal tuning range of 210 – 276 GHz will be considered, but we cannot guarantee at this moment that these proposals can actually be done. In any case, HERA observers should send the list of their frequencies to Granada as early as possible.

HERA can be connected to three sets of backends:

- ▷ VESPA with the following combinations of nominal resolution (KHz) and maximum bandwidth (MHz): 20/40, 40/80, 80/160, 320/320, 1250/640. The maximum bandwidth can actually be split into two individual bands for each of the 18 detectors at most resolutions. These individual bands can be shifted separately up to ±200 MHz offsets from the sky frequency (see also the sections on backends below).

  a low spectral resolution (4 MHz channel spacing) filter spectrometer covering the full IF bandwidth of 1 GHz. Nine units (one per HERA pixel) are available. Note that only one polarization of the full array is thus connectable to these filter banks.

- ▷ WILMA with a 1 GHz wide band for each of the 18 detectors. The bands have 512 spectral channels spaced out by 2 MHz. WILMA will be available after successful completion of the current tests.

HERA is operational in two basic spectroscopic observing modes: *(i)* raster maps of areas typically not smaller than $1'$, in position, wobbler, or frequency switching modes, and *(ii)* on–the–fly maps of moderate size (typically $2' - 10'$). Extragalactic proposals should take into account the current limitations of OTF line maps, as described in the User Manual, due to baseline instabilities induced by residual calibration errors. HERA proposers should use the web–based Time Estimator. For details about observing with HERA, consult the User manual. The HERA project scientist Karl Schuster (schuster@iram.fr), or Albrecht Sievers (sievers@iram.es),the astronomer in charge of HERA, may also be contacted.

Given the risk involved in the upgrade and considering that some relevant observational parameters are not yet well known for the full array, we request HERA proposers to use the parameters of the present single polarization array when estimating integration times. As mentioned above, the times scheduled for the successful proposals may then be adjusted, once the parameters of the full array are known.

The single pixel heterodyne receivers

Four dual polarization SIS receivers are available at the telescope for the upcoming observing season. They are designated according to the dewar in which they are housed (A, B, C, or D), followed by the center frequency (in GHz) of their tuning range. Their main characteristics are summarised in Tab. 1. All receivers are linearly polarized with the E–vectors, before rotation in the Martin–Puplett interferometers, either horizontal or vertical in the Nasmyth cabin. Up to four of these eight receivers can be combined for simultaneous observations in the four ways designated as AB, CD, AD, and BC. These are the only valid combinations and they are depicted in Tab. 1. Note that single pixel receivers cannot be combined with HERA nor with the bolometers. Also listed are typical system temperatures which apply to normal winter weather (4mm) at the center of the tuning range and at 45° elevation. All receivers are tuned by the operators from the control room. Experience shows that it normally takes not more than 15 minutes to tune four such receivers.

Tuning range extended below 80 GHz

Several molecules of high astrophysical importance have transitions in the frequency band 66 – 80 GHz, i.e. between the atmospheric O_2 absorption band and the low frequency edge of the nominal 3mm tuning range (see Tab.1). Both 3mm receivers, A100 and B100, have now been tested below 80 GHz with partially encouraging results. Both receivers work correctly in SSB and high USB rejection down to 77 GHz when fed with a suitable foreign local oscillator. Below this frequency, the USB rejection progressively weakens, until the mixer becomes fully DSB near 72 GHz. At still lower frequencies, however, the tuning behavior is very irregular, and high USB gain ($g_i \gg 1$) makes the receivers very noisy and calibration difficult. A detailed test report is available on the IRAM web site (at /IRAMFR/PV/veleta.html) together with a sample of spectra.

Given the partially encouraging test results, applications for frequencies down to 72 GHz will be considered. Please enter a remark like "< 80 GHz" under *Special Requirements* on the proposal cover sheet. Requests for frequencies below 77 GHz should additionally describe the precision of the calibration needed.

Table 1: Heterodyne receivers available for the next winter observing season. Performance figures are based on recent measurements at the telescope. T^*_{sys} is the SSB system temperature in the T^*_A scale at the nominal center of the tuning range, assuming average winter conditions (4mm precipitable water vapor) and 45° elevation. g_i is the rejection factor of the image side band. ν_{IF} and $\Delta\nu_{IF}$ are the IF center frequency and width. Note that the 8 standard receivers can be combined in 4 different ways.

receiver	polar–ization	combinations AB	CD	AD	BC	tuning range GHz	T_{Rx}(SSB) K	g_i dB	ν_{IF} GHz	$\Delta\nu_{IF}$ GHz	T^*_{sys} K	remark
A 100	V	1		3		80 - 115.5	45 - 65	> 20	1.5	0.5	120	1
B 100	H	1			4	81 - 115.5	60 - 85	> 20	1.5	0.5	130	1
C 150	V		2		4	129 - 183	70 - 115	15 - 25	4.0	1.0	200	
D 150	H		2	3		129 - 183	60 - 150	8 - 17	4.0	1.0	200	
A 230	V	1		3		197 - 266	85 - 185	12 - 17	4.0	1.0	420	
B 230	H	1			4	197 - 266	95 - 160	12 - 17	4.0	1.0	420	
C 270	V		2		4	241 - 281	125 - 290	10 - 20	4.0	1.0	900	2
D 270	H		2	3		241 - 281	130 - 300	9 - 13	4.0	1.0	900	2
HERA	H,V					210 - 276	110 - 380	~ 10	4.0	1.0	400	3

1: tuning range extended to ≥ 72 GHz under special conditions (see text)
2: noise increasing with frequency
3: tuning parameters are not yet complete

Some of these low frequency proposals, particularly if they are not particularly sensitive to calibration errors and if they do not simultaneously request frequencies in the 1.3mm window, may be well suited as a mediocre weather backup in our pooled observing sessions. The "pool" box on the proposal cover sheet should then be checked.

General point about receiver operations

Tuning of the single pixel/dual polarization receivers is now considerably faster and more reproducible than before. Particular frequencies, like those below 80 GHz or near a limit of the tuning range, may still be problematic, and we recommend in such cases to check with a Granada receiver engineer at least two weeks before the observations. HERA observers, however, are requested to send their frequencies as soon as their project gets scheduled.

Polarimeter XPOL

An upgrade of the IF polarimeter [16] is now available, where the cross correlation between the IF signals from a pair of orthogonally polarized receivers is made digitally in VESPA. The new observing procedure XPOL generates simultaneous spectra of all 4 Stokes parameters. The following combinations of spectral resolution (KHz) and bandwidth (MHz) are available: 40/120, 80/240, 320/480, and 1250/640.

Although successful XPOL observations were made at several frequencies, experience is still limited, particularly with respect to long integrations and observations of extended sources. Data reduction software using CLASS enhanced with a graphical user interface is available (H. Wiesemeyer). A short guide (at /IRAMFR/PV/veleta.html) describes XPOL observations. Polarimetry proposals will be considered with the restriction that the target sources be not larger than the main beam.

MPIfR Bolometer arrays

The bolometer arrays, MAMBO–1 (37 pixels) and MAMBO–2 (117 pixels), are provided by the Max–Planck–Institut für Radioastronomie, Bonn. They consist of concentric hexagonal rings of horns centered on the central horn. Spacing between horns is $\simeq 23''$. Each pixel has a HPBW of $11''$. We expect that MAMBO–2 will be normally used, but MAMBO–1 is kept as a backup.

The effective sensitivity of MAMBO–1 for onoff and mapping observations is ~ 35 mJy s$^{\frac{1}{2}}$. For MAMBO–2 effective sensitivities of $\sim$40 mJy s$^{\frac{1}{2}}$ (ON/OFF mode) and $\sim$ 45 mJy s$^{\frac{1}{2}}$ (mapping mode) were measured. Since in the mapping mode all beams cover the inner region of the map area, MAMBO–2 turns out to be more sensitive if areas of $2'$ and larger are to be mapped (see the Time Estimator). The sensitivities apply to bolometric winter conditions (τ(250GHz) ~ 0.25, elevation 45 deg, and application of skynoise filtering algorithms). In cases where skynoise filtering algorithms are not or not fully effective (e.g. extended source structure, atmosphere not sufficiently stable), the effective sensitivity is typically about a factor of 2 worse. Such projects should only be observed under atmospheric conditions with low skynoise (i.e. stable atmosphere, no clouds, little turbulence), unless the expected signal is about 1 Jy/beam or stronger.

The bolometer arrays are mostly used in two basic observing modes, ON/OFF and mapping. Previous experience with MAMBO–2 shows that the ON/OFF reaches typically an rms noise of ~ 2.3 mJy in 10 min of total observing time (about 200 sec of ON source, or about 400 sec on sky integration time) under stable conditions. Up to 30 percent lower noise may be obtained in perfect weather. In this observing mode, the noise integrates down with time t as $\sqrt{t}$ to rms noise levels at least 0.5 mJy.

In the mapping mode, the telescope is scanned in azimuth (also the direction of the wobbler throw) in such a way that all pixels see the source once. A typical single map[3] with MAMBO–2 covering a fully and homogeneously sampled area of $150'' \times 150''$ (scanning speed: 5″per sec, raster step: 8″) reaches an rms of 2.8 mJy/beam in 1.9 hours if skynoise filtering is effective. If sky noise filtering is not effective (see Time Estimator), much more time may be needed. The area actually scanned ($7.3' \times 6.5'$) must be larger than the map size by the wobbler throw and the array size (4′) if extended emssion is to be properly restored. Shorter scans may lead to problems in restoring extended structure. Mosaicing is also possible to map larger areas. Under many circumstances, maps may be co–added to reach lower noise levels, but this may require vey sophisticated data reduction (please contact the experts). If maps with an rms $\lesssim 1$ mJy are proposed, the proposers must indicate how they plan to reach this ambitious goal.

The bolometers are used with the wobbling secondary mirror (wobbling at a rate of 2 Hz in azimuth). The orientation of the beams on the sky changes with hour angle due to parallactic and Nasmyth rotations, as the array is fixed in Nasmyth coordinates. Bolometer proposals participating in the pool have their observations (maps and ONOFFs) pre-reduced by a data quality monitor which runs scripts in the newly developed MOPSIC. This package, complete with all necessary scripts, is also installed for off-line data analysis in Granada and Grenoble. It is also available for distribution from the IRAM Data Base for Pooled Observations or directly from R. Zylka (zylka@iram.fr). The older software packages (NIC [7] and MOPSI[8]) are still available.

Bolometer proposals will be pooled together like in previous semesters along with suitable heterodyne proposals as long as the respective PIs agree. The web–based time estimator handles well the usual bolometer observing modes, and its use is again strongly recommended. The time estimator uses rather precise estimates of the various overheads which will be applied to all bolometer proposals. If exceptionally low noise levels are requested which may be reachable only in a perfectly stable perfect winter atmosphere, the proposers must clearly say so in their time estimate paragraph. Such proposals will however be particularly scrutinized. On the other extreme, if only strong sources are observed and moderate weather conditions are sufficient, the proposal may be used as a backup in the observing pool. The proposal should point out this circumstance, as it may affect the chance that the proposal is accepted and observed.

[3] see also the Technical report by D. Teyssier and A. Sievers on a special fast mapping mode (IRAM Newsletter No. 41, p. 12, Aug. 1999).

Table 2: Main observational parameters of 30m telescope.

frequency [GHz]	θ_b ["] (1)	η_F (2)	η_{mb} (3)	S_ν/T_A^* [Jy/K]
86	29	0.95	0.78	6.0
110	22	0.95	0.75	6.3
145	17	0.93	0.69	6.7
170	14.5	0.93	0.65	7.1
210	12	0.91	0.57	7.9
235	10.5	0.91	0.51	8.7
260	9.5	0.88	0.46	9.5
279	9	0.88	0.42	10.4

(1) beam width (FWHP). A fit to all data gives:
$$\theta_b\ ["] = 2460\ /\ \text{frequency [GHz]}$$
(2) forward efficiency (coupling efficiency to sky)
(3) main beam efficiency. Based on a fit of measured data to the Ruze formula:
$$\eta_{\rm mb} = 1.2\epsilon \exp(-(4\pi R\sigma/\lambda)^2)$$
with $\epsilon = 0.69$ and $R\sigma = 0.07$

THE TELESCOPE

Beam and Efficiencies

Table 2 lists the size of the telescope beam for the range of frequencies of interest. Forward and main beam efficiencies are also shown (see also the note by U. Lisenfeld and A. Sievers, IRAM Newsletter No. 47, Feb. 2001). The variation of the coupling efficiency to sources of different sizes can be estimated from plots in Greve et al. [12].

At 1.3 mm (and a fortiori at shorter wavelengths) a large fraction of the power pattern is distributed in an error beam which can be approximated by two Gaussians of FWHP $\simeq 170''$ and $800''$ (see [12] for details). Astronomers should take into account this error beam when converting antenna temperatures into brightness temperatures.

Variable and sometimes large astigmatism which deformed the telescope's main beam during many years[3] was shown to result from temperature differences between the telescope backup structure and the yoke. The recent installation of heaters in the yoke by J. Peñalver has nearly completely removed the astigmatism[15].

Pointing and Focusing

With the systematic use of inclinometers the telescope pointing became much more stable. Pointing sessions are now scheduled at larger intervals. The fitted pointing parameters typically yield an absolute rms pointing accuracy of better than $3''$ [10]. Receivers are closely aligned (within $\leq 2''$). Checking the pointing, focus, and receiver alignment is the responsibility of the observers (use a planet for alignment checks). Systematic (up to 0.4 mm) differences between the foci of various receivers can occasionally occur. In such a case the foci should be carefully monitored and a compromise value be chosen. Not doing so may result in broadened and distorted beams ([1]).

Wobbling Secondary

- Beam–throw is $\leq 240''$ depending on wobbling frequency. At 2 Hz, the maximum throw is $90''$
- Standard phase duration: 2 sec for spectral line observations, 0.25 sec for continuum observations.

Throws of $120''$ should be avoided.

Backends

The following four spectral line backends are available which can be individually connected to any single pixel receiver and, if indicated, also to HERA.

The 1 MHz filterbank consists of 4 units. Each unit has 256 channels with 1 MHz spacing and can be connected to different or the same receivers giving bandwidths between 256 MHz and 1024 MHz. The maximum bandwidth is available for only one receiver, naturally one having a 1 GHz wide IF bandwidth. Connection of the filterbank in the 1 GHz mode presently excludes the use of any other backend with the same receiver.

Other configurations of the 1 MHz filterbank include a setup in 2 units of 512 MHz connected to two different receivers, or 4 units of 256 MHz width connected to up to four (not necessarily) different receivers. Each unit can be shifted in steps of 32 MHz relative to the center frequency of the connected receiver.

The 100 KHz filterbank consists of 256 channels of 100 KHz spacing. It can be split into two halves, each movable over a range of 500 MHz, and connectable to two different receivers.

VESPA, the VErsatile Spectrometric and Polarimetric Array correlator, can be connected either to HERA or to a subset of 4 single pixel receivers, or to a pair of single pixel receivers for polarimetry. The many VESPA configurations and user modes are summarized in a Newsletter contribution [14] and in a user guide, but are best visualised on a demonstration program which can be downloaded from our web page at URL /IRAMFR/PV/veleta.html. Connected to a set of 4 single pixel receivers VESPA typically provides up to 12 000 spectral channels (on average 3 000 per receiver). Up to 18 000 channels are possible in special configurations. Nominal spectral resolutions range from 3.3 KHz to 1.25 MHz. Nominal bandwidths are in the range 10 — 512 MHz. When VESPA is connected to HERA, up to 18 000 spectral channels can be used with the following typical combinations of nominal resolution (KHz) and maximum bandwidth (MHz): 20/40, 40/80, 80/160, 320/320, 1250/640.

The 4 MHz filterbank consists of nine units. Each unit has 256 channels (spacing of 4 MHz, spectral resolution at 3 dB is 6.2 MHz) and thus covers a total bandwidth of 1 GHz. The 9 units are designed for connection to HERA, but a subset of 4 units can also be connected to the backend distribution box which feeds the single pixel spectral line receivers. All these receivers have a 1 GHz RF bandwidth except for A100 and B100 (500 MHz only). At the present time, a 4 MHz filterbank cannot be used simultaneously with the autocorrelator or the 100 KHz filterbank on the same receiver.

An on–line calibration routine automatically writes calibrated spectrometer data, including the 4 MHz filterbanks, to the Linux machines. The routine, although still experimental, works for all observing modes. A logical link named "data.30m" pointing to this file of calibrated spectra is made available in all newly created project accounts.

The **new autocorrelator WILMA** consists of 18 units which connect to the 18 detectors of HERA. Each unit nominally provides 512 spectral channels, spaced out by 2 MHz and thus covering a total bandwidth of nominally 1 GHz of which 930 MHz are usable. Each band is sliced into two 500 MHz subbands which are digitized with 2 bit/1 GHz samplers. An informative technical overview of the architecture is available on the backend section (URL: ./IRAMFR/TA/backend/veleta/-wilma/index.html) of our web pages.

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M. Guélin, C. Kramer, and W. Wild (IRAM Newsletter January 1995)

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[7] NIC: Bolometer User's Guide D. Broguière, R. Neri, A. Sievers, and H. Wiesemeyer 2000, IRAM Technical Report (../IRAMFR/-GS/NIC/documentation.html); see also the NIC home page at ./IRAMFR/GS/-nic.html with further relevant technical reports.

[8] Pocket Cookbook for MOPSI software R. Zylka 1996, available at /IRAMES/-otherDocuments/manuals/Datared/pockcoo.ps.

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[14] VESPA is operational - G. Paubert & C. Thum 2002, IRAM Newsletter No. 54, 6 (/IRAMFR/PV/veleta.htm and /IRAMES-/otherDocuments/manuals/vespa_ug.ps)

[15] First results from the IRAM 30m telescope improved thermal control system J. Peñalver, A. Greve, and M. Bremer 2002, IRAM Newsletter No. 54, 8

[16] A Versatile IF Polarimeter at the IRAM 30m Telescope C. Thum, H. Wiesemeyer, D. Morris, S. Navarro, and M. Torres in "Polarimetry in Astronomy", Ed. S.Fineschi, Proc.of SPIE Vol.4843, 272–283 (2003)

These reports are available upon request (see also previous Newsletters). Please write to Mrs. C. Berjaud, IRAM Grenoble (e–mail: `berjaud@iram.fr`).

Clemens THUM & Rainer MAUERSBERGER

News from the Plateau de Bure Interferometer

Weather conditions and observations

The weather has not fully come up to expectations this winter at the Plateau de Bure: the observing conditions have been excellent in January and February but relatively poor in December, March and April when compared to the exceptional observing conditions we have been enjoying in the winter 2002/2003. Despite the difficult conditions, the observatory has brought to completion almost every A-rated project before the end of the winter period and has been able to invest observing time on many B projects, and even on a few targets of opportunity. Since last November, a total of 45 projects has successfully been scheduled for observations, and we are still confident to complete in the next few months a few projects that we have been able to start at the end of the winter period.

We would like to remind users of the Plateau de Bure Interferometer that B-rated winter proposals which were not started by May 15, have to be resubmitted. The daily status of all ongoing projects is accessible on the Internet at `./IRAMFR/PDB/ongoing.html`.

The eastern and northern track extension

In connection with the long-term plans to extend the capabilities of the Plateau de Bure Interferometer, work has started recently to extend the eastern track from now 408m to 800m. More than 13000 m^3 of rock will have to be removed to create a flat area of 3500 m^2 on which antennas will move to reach the extremity of the eastern track. According to current plans, the eastern track extension should get completed in time for the winter 2006/2007.

The northern track extension will not be available in the next winter scheduling period. The lifting system ("blondin") for the transport of heavy equipment and materials to the Plateau de Bure site has been stopped in May to meet the safety standards required for the regular maintenance program. As a consequence of the stop, work to complete the track extension from N29 to N46 has finally been deferred to the summer 2005.

Call for Observing Proposals for the Plateau de Bure Interferometer

Conditions for the next winter session

Based on our experience in carrying out configuration changes with limited access to the Observatory, we plan to schedule three configuration changes next winter. We therefore ask investigators to submit proposals for all four of the primary configurations of the six antenna array. A preliminary configuration schedule for the winter period is outlined below. Please note that the more compact configurations (C and D) will be available only at the end of January at the earliest. The scheduling priority will later be adapted according to pressure in right ascension ranges and may further be changed during the winter period depending on weather conditions. The configuration schedule should be taken as a guideline, in particular when astronomical targets are requested that cannot be observed during the entire winter period (45° sun avoidance circle).

Conf	Scheduling Priority Winter 2004/2005
B	November – December
A	December – January
C	February – March
D	March – April

When the atmospheric conditions are not good enough at 1.3mm, 3mm projects will be observed: in a typical winter, 20-30% of the time is found to be poor at 1.3mm, but still excellent at 3mm. We therefore invite proposers to submit proposals also for observations at 3mm.

Call for Proposals

Under normal operating conditions, IRAM schedules and completes between 40 to 60 projects during the winter period, with an average time delay of at least two months between the start and the end of a project. Selection is based on scientific merit, technical feasibility, and suitability for the instrument.

Details of the PdBI and the observing procedures are given in the document "An Introduction to the IRAM Plateau de Bure Interferometer". A copy can be obtained from the address below or from the World-Wide-Web at `./IRAMFR/PDB/docu.html`. Proposers should read this document carefully before submitting any proposal.

For this call for proposals, please note the following details.

Proposal category

Proposals should be submitted for one of the five following categories:

`dual freq.`: Proposals that ask simultaneously for observations at 3mm and 1.3mm.

`1.3mm`: Proposals that ask for 1.3mm data only. 3mm receivers will be used for pointing and calibration purposes, but the scientific goals of the proposal rely on the 1.3mm receivers.

`3mm`: 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.

`time filler`: Proposals that have to be considered as backup projects to fill in periods where the atmospheric conditions do not allow mapping, or eventually, to fill in gaps in the scheduling, or periods when only a subset of the standard configurations will be available. These proposals will be carried out on a "best effort" basis only.

`special`: Exploratory proposals: proposals whose scientific interest justifies the attempt to use the PdB array beyond its guaranteed capabilities. This category includes for example non-standard frequencies for which the tuning cannot be guaranteed, and more generally all non-standard observations. These proposals will be carried out on a "best effort" basis only.

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

Configurations of the six antennas array

The six antennas can be arranged in four primary configurations. The current configurations for the winter period are:

Conf	Stations					
D	W05	W00	E03	N05	N09	N13
C	W12	E10	E16	N02	N09	N20
B	W12	E04	E23	N07	N17	N29
A	W27	W23	E16	E23	N13	N29

- `D` alone is best suited for deep integration and coarse mapping experiments. This configuration provides both the highest sensitivity and the lowest atmospheric phase noise. It is slightly more extended than the 5-element D configuration: the beam is smaller ($\sim 5''$ at 100 GHz and $\delta = 45°$), but slightly more elliptical.
- `C` provides a fairly complete coverage of the uv-plane (low sidelobe level) and is well adapted to combine with D for low angular resolution studies ($\sim 3.5''$ at 100 GHz, $\sim 1.5''$ at 230 GHz) and with B for higher resolution ($\sim 2''$ at 100 GHz, $\sim 0.9''$ at 230 GHz). C alone is also well suited for snapshot and size measurement experiments.
- `B` in combination with A already provides slightly higher angular resolution ($\sim 1.5''$ at 100 GHz). Short baselines have been included to facilitate calibration and give some sensitivity to extended structure, although this is clearly not the primary goal of the AB configuration. It is mainly used for relatively strong sources.

- `A` alone is well suited for mapping or size measurements of very compact objects. It provides a resolution of 1.1″ at 100 GHz, ∼0.5″ at 230 GHz. In addition, because it contains long, intermediate and some short baselines, it could still be used in a tapered mode when a project is observed in marginal weather conditions despite some loss of sensitivity (for backup projects).

The four array configurations can be used in different combinations to improve on angular resolution and sensitivity. Mosaicing is usually done with D or CD, but the combination BCD can also be requested for high resolution mosaics. Enter ANY in the proposal form if the scientific goals can be reached with any of the four configurations or their subsets.

Please consult the documentation on the Plateau de Bure configurations for further details.

Receivers

All antennas are equipped with fully operational dual frequency receivers. The available frequency range will be 82 to 116 GHz for the 3mm band, and 205 to 245 GHz for the 1.3 mm band. The 3mm and 1.3mm receivers are aligned to within about 2″.

Below 105 GHz, receivers offer best performances in LSB tuning with high rejection (20 dB): expected system temperatures are 100 to 150 K for the winter time. Above 110 GHz, best performances are obtained with USB tuning, low rejection (4 to 6 dB): expected system temperatures are 250 K at 115 GHz.

The 1.3 mm receivers have DSB tuning with typical T_{REC} below 50 K. Expected SSB system temperature are 350 to 450 K. The guaranteed tuning range is 205–245 GHz, but it may be possible to reach some lower and higher frequencies. Higher frequencies are not feasible on all antennas because of limitations in the triplers, however. For details about observing at frequencies beyond the guaranteed tuning range of the 3mm and 1.3mm receivers, please get in touch with R.Neri.

Signal to Noise

The rms noise can be computed from

$$\sigma = \frac{J_{pK} T_{SYS}}{\eta \sqrt{N_a (N_a - 1) N_c T_{ON} B}} \quad (1)$$

where

- T_{SYS} is the system temperature (150 K below 110 GHz, 200 K at 115 GHz, 400 K at 230 GHz for sources at $\geq 20°$)
- J_{pK} is the conversion factor from Kelvin to Jansky (22 Jy/K at 3mm, 35 Jy/K at 1.3mm)
- η is an efficiency factor due to atmospheric phase noise (0.9 at 3 mm, 0.8 at 1.3 mm).
- N_a is the number of antennas (6), and N_c is the number of configurations: 1 for D, 2 for CD, 2 for BC, and so on.
- T_{ON} is the on-source integration time per configuration in seconds (2 to 8 hours, depending on source declination). Because of various calibration observations the total observing time is typically 1.4 T_{ON}.
- B is the spectral bandwidth in Hz (580 MHz for continuum, 40 kHz to 2.5 MHz for spectral line, according to the spectral correlator setup)

Investigators have to specify the 1σ noise level which is necessary to achieve each individual goal of a proposal, and particularly for projects aiming at deep integrations.

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 new correlator has 8 independent units, each of which can be placed anywhere in the 110–680 MHz band. 7 different modes of configuration are available, characterized in the following by couples of total bandwidth/number of channels. In the 3 DSB modes (320MHz/128, 160MHz/256, 80MHz/512 – see Table) the two central channels may be perturbed by the Gibbs phenomenon if the continuum is strong. When using these modes, it is recommended to avoid centering the most important part of the lines in the middle of the band of the correlator unit. In the remaining SSB modes 160MHz/128, 80MHz/256, 40MHz/512, 20MHz/512) the two central channels are not affected by the Gibbs phenomenon and, therefore, these modes may be preferable for some spectroscopic studies.

Spacing (MHz)	Channels	Bandwidth (MHz)	Mode
0.039	1×512	20	SSB
0.078	1×512	40	SSB
0.156	2×256	80	DSB
0.312	1×256	80	SSB
0.625	2×128	160	DSB
1.250	1×128	160	SSB
2.500	2×64	320	DSB

Note that 5% of the passband are left out at the low and the high frequency ends of each subband. The 8 units can be independently connected either with the 3mm or 1.3mm IFs.

Sun Avoidance

For safety reasons, a sun avoidance circle is enforced at 45 degrees. Please take this into account for your sources `AND` 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 may 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.
- In certain cases, proposers may have a look at the uv-tables as the observations progress. If necessary, and upon request, more information can be provided. Please contact us if you are interested in this.
- CLIC evolves to cope with upgrades of the PdBI array. The newer versions are downward compatible with the previous releases. Observers who wish to finish data reduction at their home institute should obtain the most recent version of CLIC. Because differences between CLIC versions may potentially result in imaging errors if new data are reduced with an old package, we advise observers having a copy of CLIC to take special care in maintaining it up-to-date.

Data reduction will be carried out on dedicated computers at IRAM. Remote data reduction is possible, especially for experienced users of the Plateau de Bure Interferometer. Please contact R.Neri if you're interested in this possibility.

Local contact

A local contact will be assigned to every A or B rated proposal which does not involve an in-house collaborator. He/she will assist you in the preparation of the observing procedures and provide help to reduce the data. Assistance is also provided before a deadline to help newcomers in the preparation of a proposal. 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 addition to the scientific review by the programme committee. Please help in this task by submitting technically precise proposals. Note that your proposal must be complete and exact: the source position and velocity as well as the requested frequency setup must be correctly given.

Non-standard observations

If you plan to execute a non-standard program, please contact R.Neri or R.Lucas to discuss the feasibility.

Documentation

The documentation for the IRAM Plateau de Bure Interferometer includes documents of general interest to potential users, and more specialized documents intended for observers on the site (IRAM on-duty astronomers, operators, or observers with non-standard programs). All documents can be retrieved on the Internet at `./IRAMFR/PDB/docu.html`

Finally, we would like to stress again the importance of the quality of the observing proposals. The IRAM interferometer is a powerful, but complex instrument, and proposal preparation requires special care. Information is available in the documentation and at `./IRAMFR/PDB/docu.html`. 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 the need for the Plateau de Bure Interferometer.

Roberto NERI (neri@iram.fr)

VLBI Observations and Call

News

IRAM has bought and installed two Mark5A terminals for its VLBI systems on Pico Veleta and Plateau de Bure in early 2004, which allow higher data rates and thus larger observing bandwidths than the previous Mark4 recorders. Plateau de Bure also received a new FS9 computer; the old one is kept operational for redundancy.

In April 2004 Pico Veleta successfully participated in the Global session, but Plateau de Bure encountered a problem with its maser 10 hours before the session started, resulting in a 100% loss of the station (the weather was quite bad, too). It is now sure that the maser can be repaired but that it will not be available for the October 2004 session. Fortunately we will have a replacement before the end of the summer: the geodetic station in Wettzell, Germany, has kindly agreed to lend IRAM a maser until May 2005. Chances are therefore good that both IRAM instruments will be able to participate in the next Global sessions in October 2004 and April 2005.

Call for Proposals on Global VLBI Observations at 3mm wavelength

We announce the opportunity for coordinated, high angular resolution and high sensitivity GLOBAL VLBI observations in the 3mm band (85 - 95 GHz), complementing existing stand-alone VLBA observations at these frequencies. The Global 3mm VLBI Array consists at present of 8 VLBA antennas equipped with 3mm receivers, plus the IRAM 30-m telescope on Pico Veleta (Spain), the IRAM phased 6-element interferometer on Plateau de Bure (France), the 20-m radio telescope in Onsala (Sweden) the 14-m telescope in Metsähovi (Finland) and the MPIfR 100-m radio telescope in Effelsberg (Germany).

The Global 3mm VLBI Array offers 3 to 4 times more sensitivity than the stand-alone VLBA. Observations with the Global 3mm VLBI array will be scheduled in time blocks in special observing sessions, performed twice per year. The next two sessions are planned for October 8-13, 2004 and April 16-21, 2005. The observing date in April is still tentative. As in the past, the actual duration of each session will depend on proposal pressure.

The Global 3mm VLBI Array basically supports the same observing modes as the VLBA. For standard continuum observations the VLBI recording will be done at 256 Mbit/s (corresponding to a bandwith of 128 MHz). Depending on resources, a limited amount of observing time may be used to record with 512 Mbit/s, but no more than two tapes in 24 hrs. Proposers who wish to observe at 512 Mbit/s should explicitly justify this in their proposal. Correlation will be performed in absentia at the MPIfR MK4 correlator in Bonn unless some technical reason for using another correlator is given in the proposal. The P.I. will receive the correlated data in uv-fits format.

Proposals for the April 2005 session should be prepared in a similar fashion as "normal cm-VLBI proposals", using the standard VLBI cover sheet and instructions available on the web under URL http://www.nrao.edu/-administration/directors_office/vlba-gvlbi.shtml and should be submitted electronically **as e-mail** before

October 1st 2004 (the normal VLBI deadline),
17:00 Eastern Standard Daylight time (UT-4h)

to the following two addresses (**in copy**):

propsoc@nrao.edu
and propvlbi@mpifr-bonn.mpg.de

Proposals will be reviewed by NRAO and the participating European Observatories.

The European Schedule Coordinator, Dr. R. Porcas (MPIfR), will forward proposal copies to the participating European Institutes and ensure the scientific evaluation of the proposals by the respective local committees. Finally, the referee ratings of these observatories and the NRAO will be combined.

Global VLBI observations at 3mm are subject to some technical restrictions, which are summarized on the following web-page (http://www.mpifr-bonn.mpg.de/div/-vlbi/globalmm/index.html).

The IRAM and MPIfR VLBI teams

Some useful web pages

VLBI observations allow unique insights in the astrophysics of compact and bright sources. Please prepare your proposals carefully, as they are equivalent to asking simultaneously for observing time on a large number of telescopes. Avoid last minute submissions: the e-mail submission may bounce large e-mails, returning them with details on how to submit via anonymous FTP. See http://www.nrao.edu/administration/-directors_office/vlba-gvlbi.shtml for more information.

- Technical details on VLBI observations: http://www.mpifr-bonn.mpg.de/div/vlbi/-globalmm/index.html
- Technical details on PdBI correlator in VLBI mode by Marc Torres: http://www.iram.fr-/IRAMFR/TA/backend/vlbi/index.html
- Very long baseline array observational status summary (J.M. Wrobel, April 5, 2002) http://www.aoc.nrao.edu/vlba/obstatus/obssum/-obssum.html
- CMVA Technical Information (this reference is for an overview of the physics involved): http://web.haystack.mit.edu/cmva/

Michael BREMER

ALMA Band 7 cartridge: status report

The ALMA front end is designed for ten frequency bands, spanning all atmospheric windows from 31 GHz up to 950 GHz. The electronics, as well as part or all of the optics, for each individual band, fits inside a field-replaceable cartridge, and the ten cartridges are housed in a respectable (1m diameter) cryostat. The initial budget allows the implementation of four bands (3mm, 1.3mm, 0.9mm, 0.45mm).

IRAM has been contracted by the ALMA project to perform the development and detailed design of the band 7 (275 - 373 GHz) cartridge, and the production of a pre-series of eight cartridges. This work has started Januray 2003, and should be completed until December 2005.

The band 7 cartridges implements a dual-polarization, sideband separating frontend; the IF band being 4 - 8 GHz, this means that for, e.g., an LO frequency of 338 GHz, the sky frequency ranges 330 - 334 GHz (lower sideband) and 342 - 346 GHz (upper sideband) are available on separate IF outputs, and that the cartridge delivers four IF outputs for a total of 16 GHz bandwidth.

The "blank" cartridge (Rutherford Appleton Laboratories) is a fiberglass/metal tubular structure inside which four main subsystems are mounted:

- the cold optics, comprising three elliptical mirrors, a polarization - diplexing grid, and two corrugated horns;
- two sideband separating mixer assemblies, each comprising:
  - a quadrature 3 dB signal hybrid;
  - an in - phase LO power splitter;
  - two -17 dB LO injection couplers;
  - two DSB mixer units
- four cryogenic IF amplifiers (Yebes Observatory)
- the LO subsystem, including two cryogenic frequency triplers (Virginia Diodes, Inc.)

The development of the optics, mixers, superconducting junctions, and global cartridge configuration, has resulted in a prototype cartridge (figure 1) that, in the tests performed so far, meets the ALMA technical specifications. Figure 2 shows the noise and image rejection of recently produced DSB and 2SB (sideband-separating) mixers. The band 7 project recently underwent a Preliminary Design Review, and the response of the review board to the technical achievements seems to have been positive; the formal review report has not yet been finalized.

Figure 1: A view of the upper part of the prototype cartridge, comprising the cold optics and two 2SB assemblies. The two horns are staring into two elliptical mirrors machined into the roof of the assembly, while a third mirror, partly hidden at the right, couples the cartridge to the telescope optics. The polarization diplexing grid (round frame) can also be seen.

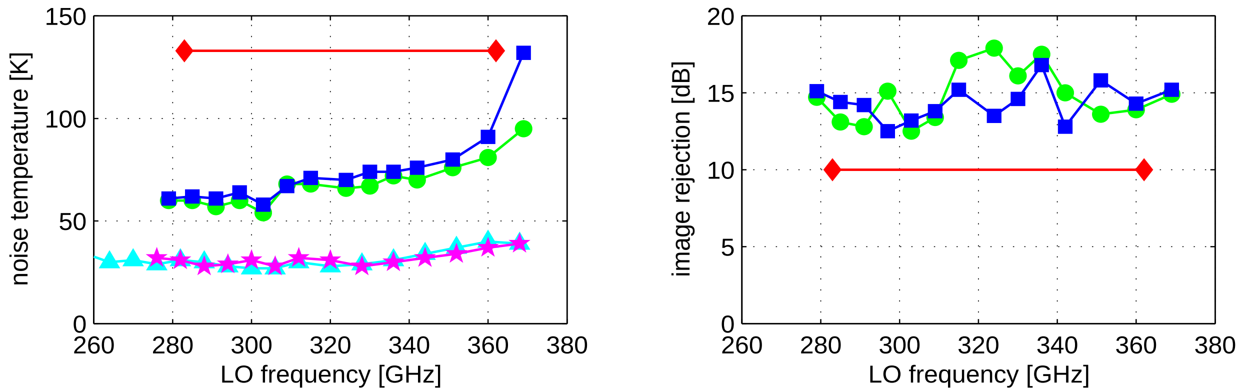

Figure 2: Recent results of mixer characterization. Left: noise temperature (uncorrected) versus LO frequency, for DSB unit mixers (lower two curves), and for a 2SB assembly (upper two curves, for the LSB and USB channels); the horizontal bar is the ALMA noise specification. Right: image band rejection versus LO frequency for the LSB and USB channels; the ALMA specification is 10 dB minimum.

Besides the undersigned, members of the IRAM receiver and mechanical groups, too numerous to be all listed, have contributed to the results reported here through their work or advice.

M.Carter, S.Claude (now at HIA), A.L.Fontana, S.Halleguen, B.Lazareff, S.Mahieu, D.Maier, F.Mattiocco, P.Serres, K.Schuster and the SIS group.

Scientific Results in Press

The composition of ices in comet C/1995 O1 (Hale-Bopp) from radio spectroscopy. Further results and upper limits on undetected species

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Abstract:
From radio spectroscopic observations of comets, more than 22 molecules, radicals and ions, plus several isotopologues, were detected, the majority of them being recently revealed in comets C/1996 B2 (Hyakutake) and C/1995 O1 (Hale-Bopp). Among them, 6 molecules were detected for the first time (Bockeée-Morvan et al. 2000) in the course of a spectral survey conducted at radio wavelengths in comet Hale-Bopp with the CSO, the IRAM 30-m telescope and Plateau de Bure interferometer. In addition, many species were searched for unsuccessfully, some of them with stringent upper limits. We present here a review of these observations and further analysis of their results. This include: (i) confirmed detection of acetaldehyde (CH_3CHO); (ii) limits on small molecules such as ketene (H_2CCO) or methanimine (CH_2NH); (iii) limits on the abundance ratios in homologous series such as HC_5N/HC_3N, ethanol/methanol, acetic acid/formic acid; (iv) searches for precursors of key cometary species such as atomic Na and HNC; (v) constraints on more exotic species ranging from water dimer $(H_2O)_2$ to glycine; (vi) detection of the $H_2^{34}S$ isotopic species and independent observations of HDO and DCN; (vii) limits on several other deuterated species; (viii) limits on several radicals and ions and a tentative detection of the C_2H radical; (ix) the presence of unidentified lines. Typical abundance upper limits of $2-5\times10^{-4}$ relative to water are achieved for many species. Better upper limits are obtained for some linear molecules with high dipole moments. But more complex molecules such as dimethyl ether or glycine are poorly constrained. These results should give important clues to the chemical composition of cometary ices, to the formation mechanisms of cometary material, and to the chemical processes which occur in the inner coma.

Appeared in:Astronomy and Astrophysics, 418, 1141

The abundance of ^{36}S in IRC+10216 and its production in the Galaxy

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Abstract:
The $J = 2-1$ and $3-2$ rotational lines of the rare isotopomer $C^{36}S$ and the $J = 5-4$ and $6-5$ transitions of $Si^{36}S$ were detected in the carbon star IRC+10216 (CW Leo). These are the first detections of ^{36}S bearing molecules in a star and the first spectroscopic detection of $Si^{36}S$. From a comparison of ^{34}S and ^{36}S bearing isotopomers, the $^{34}S/^{36}S$ isotopic ratio is 107(±15). This value is comparable to values in the interstellar medium of the inner Galactic disk (115) but is smaller than the solar value of 288 (Ding et al. 2001). The increase of the ^{36}S abundance relative to ^{34}S only qualitatively follows model predictions of a low mass AGB star. Quantitative agreement of the observed $^{34}S/^{36}S$ ratio with the stellar models can be reached if the age of IRC+10216 and Galactic chemical evolution are taken into account. Other less likely possibilities are the presence of considerable inhomogeneities in the interstellar medium and either IRC+10216 or the Sun started with a peculiar ^{36}S abundance. Other production mechanisms potentially capable of enhancing the Galactic interstellar medium are discussed. From the observed line density toward IRC+10216 and toward Galactic star forming regions, we estimate the confusion limit toward those sources.

Accepted for publication in A&A

Molecular Clouds and their Structures in the Andromeda Galaxy

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Abstract:
We present the distribution and physical properties of the giant molecular clouds in the Andromeda galaxy (M31) as derived from observations of the CO molecule emission with the IRAM 30m telescope (Pico Veleta, Spain) and the Plateau de Bure Interferometer (PdBI, France). Not only is M31 the closest spiral galaxy, which allows to study the interstellar medium at molecular clouds scale with current mm interferometers ($1''$corresponds to 4 pc), but its distance is also very accurately known ($D = 780 \pm 17$ kpc, that is to say 5% uncertainty !) which allows reliable measurements of physical properties such as sizes and luminosities. Adding to this, and unlike in the case of Galactic molecular clouds, there are no distance ambiguities, and the line of sight is free from intervening material. We therefore have access to both global and local views, which is essential in interstellar medium studies from large scales (spiral pattern) down to the small scales of star formation sites (molecular clouds).

To appear in the Conference Proceedings of "The Young Local Universe", Rencontres de Moriond, held in La Thuile, Italy, March 21st-28th 2004

Disappearance of N_2H^+ from the Gas Phase in the Class 0 Protostar IRAM 04191

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Abstract:
We present a high-resolution millimeter study of the very young Class 0 protostar IRAM 04191+1522 in the Taurus molecular cloud. N_2H^+(1-0) observations with the IRAM Plateau de Bure Interferometer and 30m telescope demonstrate that the molecular ion N_2H^+ disappears from the gas phase in the inner part of the protostellar envelope ($r < 1600$ AU, $n_{H_2} > 5 \times 10^5$ cm^{-3}). This result departs from the predictions of current chemical models. It suggests either that N_2 is more depleted than the models predict, owing to a higher binding energy on polar ice or an enhanced grain chemistry transforming N_2 to less volatile species, or that strong deuterium fractionation enhances N_2D^+ to the detriment of N_2H^+.

Appeared in A&A, 419, L35 (May 2004)

Improvements of the IRAM 30-m telescope from temperature measurements and finite element calculations

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Abstract:
Millimeter wavelength radio telescopes built in a conventional way from steel and aluminum require elaborate

thermal control to guarantee small structural deformations and good observing performance. We describe the temperature monitoring system of the IRAM 30-m telescope and the use of temperature measurements in finite element calculations of structural deformations. These calculations reproduce with good precision the measured thermal deformations of the telescope and allow the investigation and localization of thermally important elements in the telescope structure. The data are used for calculation of temperature induced main reflector surface deformations and of the associated actual beam pattern, and for prediction and real-time correction of the focus. The pointing cannot be fully predicted since the available finite element model does not include the Nasmyth focus cabin (and the concrete pedestal). The long-term investigation of the telescope's thermal behaviour led to an improvement of the thermal control system and to a better performance of the telescope.

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New light on the S235A-B star forming region

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Abstract:
The S235A-B star forming region has been extensively observed in the past from the radio to the near IR, but what was happening in the immediate surroundings of the water maser, placed in between the two nebulosities, was still unclear because of insufficient resolution especially in the spectral range from the Far IR to the mm, even though there were sound indications that new young stellar objects (YSOs) are being formed there. We present here new high resolution maps at mm wavelengths in different molecules (HCO^+, $C^{34}S$, H_2CS, SO_2 and CH_3CN), as well as in the 1.2 and 3.3 mm continuum obtained with the Plateau de Bure interferometer, and JCMT observations at 450 μm and 850 μm that unambiguously reveal the presence of new YSOs placed in between the two HII regions S235A and S235B and associated with the water maser. A molecular core and an unresolved source in the mm and in the sub-mm are centred on the maser, with indication of mass infall onto the core. Two molecular bipolar outflows and a jet originate from the same position. Weak evidence is found for a molecular rotating disk perpendicular to the direction of the main bipolar outflow. The derived parameters indicate that one of the YSOs is an intermediate luminosity object ($L \approx 10^3$ $L_\odot$) in a very early evolutionary phase, embedded in a molecular core of ≈ 100 $M_\odot$, with a temperature of 30 K. The main source of energy for the YSO could come from gravitational infall, thus making of this YSO a rare example of intermediate luminosity protostar representing a link between the earliest evolutionary phases of massive stars and low mass protostars of class 0-I.

Appeared in A&A 420, 553 (2004)

Massive Molecular Outflows at High Spatial Resolution

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Abstract:
We present high spatial resolution Plateau de Bure Interferometer CO(2-1) and SiO(2-1) observations of one intermediate-mass and one high-mass star-forming region. The intermediate-mass region IRAS 20293+3952 exhibits four molecular outflows, one being as collimated as the highly collimated jetlike outflows observed in low-mass star formation sources. Furthermore, comparing the data with additional infrared H_2 and centimeter observations, we see indications that the nearby ultracompact H II region triggers a shock wave interacting with the outflow. The high-mass region IRAS 19217+1651 exhibits a bipolar outflow as well, and the region is dominated by the central driving source. Adding two more sources from the literature, we compare position-velocity diagrams of the intermediate-to-high-mass sources with previous studies in the low-mass regime. We find similar kinematic signatures; some sources can be explained by jet-driven outflows, whereas others are better constrained by wind-driven models. The data also allow us to estimate accretion rates varying from a few times $10^{-5} M_\odot yr^{-1}$ for the intermediate-mass sources to a few times $10^{-4} M_\odot yr^{-1}$ for the high-mass source, consistent with models explaining star formation of all masses via accretion processes.

Appeared in: The Astrophysical Journal, 608, 330

The IRAM Newsletter is edited by Michael Bremer at IRAM-Grenoble (e-mail address: `bremer@iram.fr`).

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Please keep M. Bremer informed of any problem you may encounter.

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