# IRAM Newsletter

Number 55 February 6th , 2003

## Contents



## Calendar

**March 3rd, 2003 17:00h (MET):**
Deadline for the submission of observing proposals for the period May 15, 2003 to Nov 15, 2003

**April 3/4, 2003** (provisional date)
IRAM Program Committee meeting

**June 26/27, 2003**
IRAM Executive Council Meeting in Paris, France

## Personnel Changes

IRAM Grenoble

The astronomer's group welcomes a new member: On January 1st 2003, Jan Martin WINTERS has joined IRAM Grenoble. Besides continuing his work on dust and circumstellar envelopes, he will observe occasionally as an astronomer on duty with the PdBI and participate in the atmospheric phase correction project.

*Michael BREMER*

## IRAM web pages

The IRAM web pages on observing schedules and project status are now edited directly on the new web site, and the facilities for proposal preparation and submission have been tested. The time estimator (Version 2.5) for the 30-m telescope runs independently on the Granada web pages (`http://www.iram.es/IRAMES`) and their Grenoble mirror (`http://www.iram.fr/IRAMES`), which will allow users to select the service closest to them. Please note that the proposal submission facility will operate *exclusively* over the IRAM Grenoble servers to avoid a double allocation of proposal numbers.

Our staff pages have become a bit less convenient for people who would like to send e-mails to IRAM by simply clicking on a name. We suspect that clear text e-mails in the html code of our web pages are seen as an invitation by SPAM senders. To counter automated web search and compilation programs, the text e-mails have been converted into graphics. Hopefully the level of unsolicited mails will decrease when the various search engines will update their databases, otherwise we will have to employ SPAM rejection software.

*The Web Group*

# Proposals for IRAM Telescopes

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

March 3rd, 2003 17:00h (MET)(UT + 1 hour)

The scheduling period extends from May 15, 2003 to Nov 15, 2003, covering roughly the summer period at our observatories.

Proposals are 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. Form pages and proposal preparation tools are available now.

Please avoid last minute submissions when the network could temporarily be 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. Proposals containing grey scale plots should exclusively be submitted through the web facility in order to avoid deterioration of image quality in the copying. 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 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, any longer proposals will be cut.

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

The cover page, in postscript or in LaTeX format, may be obtained by anonymous ftp from `iram.fr` in directory `dist/proposal`, as well as a Latex style file `proposal.sty`; or from the IRAM web page at URL `http://www.iram.fr/GENERAL/submission/-proposal.html`. In case of problems, contact the secretary, Cathy Berjaud (e–mail: `berjaud@iram.fr`). 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.

VLBI observations are now possible with both IRAM telescopes. At present, it is planned to allocate up to 14 days per year to this observing mode in which the PdB interferometer will operate as a phased array, thereby significantly improving the sensitivity as compared to previous experiments.

While IRAM has so far participated in observations at 3, 2 (PV only) and 1.3mm mostly on an experimental basis in order to demonstrate the feasibility of VLBI at these wavelengths, the participating institutes will set up during the next few months a framework that will allow the coordination of 3mm experiments amongst the interested European institutes (e.g. MPIfR, Onsala, IRAM) and with the NRAO for the VLBA. It is expected that there will be joint calls for proposals with commonly agreed deadlines and rules to be followed.

We will disseminate such information as soon as it becomes available. Scientists interested in VLBI observations at 3mm are invited to contact Michael BREMER (bremer@iram.fr) for details.

*Roberto NERI and Clemens THUM*

# Call for Observing Proposals on the 30m Telescope

## Summary

Proposals for three types of receivers will be considered for the coming summer 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 heterodyne receiver array, HERA, operating at 1.3 mm wavelength
3. a 1.2mm bolometer array with at least 37 pixels

Emphasis will be put on observations at the longer wavelengths (3 and 2 mm). In total, about 3000 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 full complement of **low resolution (4 MHz) filterbanks**, 9 units in total, is now at the telescope. Each of these units covers 1 GHz with 256 spectral channels. The nine units can be connected to HERA. A subset of 4 units can be connected to single pixel SIS receivers. The new filterbanks undergo extensive testing during January/February. Equipped with this spectrometer HERA will make 1.3mm mapping of broadband line sources very efficient.

HERA will be upgraded into a **dual polarization array** later this year. This probably means that the instrument will not be available in the second half of the summer semester. Accepted proposals will therefore likely be scheduled during spring.

**VESPA** is now nearly fully operational in its many modes and configurations. The basic, parallel, multi–beam, and high resolution modes have already been heavily used. Only the polarimetry mode needs some more work, but it is expected to be also available in summer.

After the upgrades last summer **MAMBO–2**, the 117 pixel bolometer array, is now as sensitive as the older 37 pixel MAMBO–1. Both bolometers are provided by the MPIfR for the summer semester, although successful bolometer proposals will be scheduled in only one or two sessions.

## 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 upon receiving, with proposals for heterodyne receivers, a complete list of frequencies corrected for source redshift (to 0.1 GHz) and precise positions. 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. 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 your 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 be typed or printed following the format indicated on the proposal form (no hand writing, please). If your source list is long (e.g. more than 15 sources) you may print it on a separate page keeping the same format.

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. For continuation of proposals having led to publications, please give references to the latter.

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 30m telescope proposal. In both cases we request that you 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).

## Reminders

A handbook ("The 30m Manual") collecting most of the information necessary to plan 30m telescope observations is available [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 (http://www.iram.es/IRAMES/-otherDocuments/manuals). 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 here

The astronomer on duty (whose schedule can be found at URL http://www.iram.es/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 spectral baselines with HERA are among the best known in frequency switching. Certain limitations exist with respect to maximum frequency throw ($\leq$ 45 km/s), backends, phase times etc.; for a detailed report see [4].

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

## Observing time estimates

This matter needs special attention as a serious time underestimate may be considered as a sure sign of sloppy proposal preparation. We strongly recommend to use the web–based Time Estimator (URL: http://www.iram.es/IRAMES/obstime/-time_estimator.html), whenever applicable. A new version 2.5 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.es).

If very special observing modes are proposed which are not covered by the Time Estimator, proposers must give sufficient technical details so their time estimate can be *reproduced*. In particular, the proposal must give values for $T_{\rm sys}$, 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 modes of observation was published in the January 1995 issue[1] of the IRAM Newsletter [5]. It has been included in the 30m telescope Manual [6].

Proposers should base their time request on normal summer conditions, corresponding to 7mm of precipitable water vapor. Conditions during summer afternoons may be degraded due to anomalous refraction. The observing efficiency is then reduced and 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 near winter conditions, the proposers must clearly say so in their time estimate paragraph. Such proposals will however be particularly scrutinized.

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

## 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.

## 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 MPIfR in Bonn, from ENS in Paris, from 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 Dirk 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 D. Teyssier (teyssier@lra.ens.fr) for arrangements. Astronomers who want to use the Madrid station contact Javier Alcolea (j.alcolea@oan.es). Remote observers in or near Grenoble contact C. Thum or 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 available again next summer. The 9 pixels are arranged in the form of a center–filled square, and are separated by 24″. Each pixel has a diffraction limited (11″ at 230 GHz) and linearly polarized beam (horizontal in the Nasmyth cabin). A derotator optical assembly can be set to keep the 9 pixel pattern stationary in the equatorial or horizontal system. Receiver characteristics are listed in Tab. 1, and a detailed user manual is available on our web pages.

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), HERA proposals for any frequency within the nominal tuning range of 210 – 276 GHz are invited, 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 currently be connected to two 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 up to 4 individual bands per pixel 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 now available.

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 $2' - 10'$). Other observing modes are conceivable and/or under test, but they may not be ready for this semester. HERA proposers should use the web–based Time Estimator. For details about observing with HERA, contact Karl Schuster (schuster@iram.fr), the HERA project scientist, or Albrecht Sievers, the astronomer in charge of HERA (sievers@iram.es).

## *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 depicted in Tab. 1. Note that they cannot be combined with HERA nor with the bolometers. Also listed are typical system temperatures which apply to normal summer weather (7mm of precipitable water) 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 min to tune four such receivers.

### *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 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*

An IF polarimeter is available for observations of compact sources. The instrument is designed for narrowband (40 MHz) line and continuum polarimetry. It takes the IF signals from two orthogonally polarized receivers as input and generates 4 signals from which spectra of all four Stokes parameters can be derived. Data reduction software using CLASS enhanced with a graphical user interface is available (H. Wiesemeyer). Polarimetry proposals are invited with the restriction that the target sources be not larger than the main beam.

Broader bandwidths, up to 500 MHz, are now available with a variant of IF polarimetry where the IF signals from the orthogonal receivers are correlated digitally in VESPA. A few issues of calibration still need to be worked out. Contact C. Thum for the current status.

## *MPIfR Bolometer arrays*

The bolometer arrays consist of concentric hexagonal rings of horns centered on the central horn. Spacing between horns is $\simeq 20''$. Each pixel has a HPBW of 11″. Two arrays may be used this summer: MAMBO–1 with 37 pixels and MAMBO–2 with 117 pixels. The effective sensitivity of MAMBO–1 for onoff and mapping observations is 39 mJy $s^{\frac{1}{2}}$. For MAMBO–2 effective sensitivities of 46 mJy $s^{\frac{1}{2}}$ (ON/OFF mode) and 52 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 summer conditions ($\tau$(250GHz $\sim 0.4$, elevation 45

Table 1: Heterodyne receivers available for the summer 2003 observing semester. 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 summer conditions (pwv = 7mm) and 45° elevation. $g_i$ is the rejection factor of the image side band. $\nu_{IF}$ and $\Delta\nu_{IF}$ are the IF center frequency and width.

| receiver | polar–ization | combinations 1 | 2 | 3 | 4 | tuning range GHz | $T_{Rx}$(SSB) K | $g_i$ dB | $\nu_{IF}$ GHz | $\Delta\nu_{IF}$ GHz | $T^*_{sys}$ K | remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A 100 | V | 1 | | 3 | | 80 - 115.5 | 60 - 80 | > 20 | 1.5 | 0.5 | 120 | |
| B 100 | H | 1 | | | 4 | 81 - 115.5 | 60 - 80 | > 20 | 1.5 | 0.5 | 120 | |
| C 150 | V | | 2 | | 4 | 129 - 183 | 70 - 125 | 15 - 25 | 4.0 | 1.0 | 200 | |
| D 150 | H | | 2 | 3 | | 129 - 183 | 80 - 125 | 8 - 17 | 4.0 | 1.0 | 200 | |
| A 230 | V | 1 | | 3 | | 197 - 266 | 85 - 150 | 12 - 17 | 4.0 | 1.0 | 450 | 1 |
| B 230 | H | 1 | | | 4 | 197 - 266 | 95 - 160 | 12 - 17 | 4.0 | 1.0 | 450 | 1 |
| C 270 | V | | 2 | | 4 | 241 - 281 | 125 - 250 | 10 - 20 | 4.0 | 1.0 | 1000 | 2 |
| D 270 | H | | 2 | 3 | | 241 - 281 | 150 - 250 | 9 - 13 | 4.0 | 1.0 | 1000 | 2 |
| HERA | H | | | | | 210 - 276 | 110 - 380 | $\sim$ 10 | 4.0 | 1.0 | 400 | 1, 3 |

1: noise increasing with frequency
2: performance at $\nu < 275$ GHz; noisier above 275 GHz.
3: tuning parameters are not yet complete

deg, and application of skynoise reduction algorithms). In cases where skynoise reduction algorithms (simply the subtraction of correlated sky-noise) can not be applied (e.g. extended source structure), the effective sensitivity is typically about a factor of 2 worse. For those projects, only atmospheric conditions with low skynoise (i.e. stable atmosphere, no clouds, little turbulence) are recommened unless the expected signal is about 1 Jy/beam or stronger.

There is the possibility that MAMBO–2 will not be available throughout the entire summer semester for technical reasons. Proposals which cannot be done efficiently with MAMBO–1 (e.g. large mapping projects) should clearly say so in order to allow correct scheduling.

The 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 $\sim$ 3.3 mJy in 10 min of total observing time (about 200 sec of ON source integration time) under bolometric conditions in summer. 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 below 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[2] 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 1.3 hours. The area actually scanned ($7.3' \times 6.5'$) is larger than this by the wobbler throw and the array size. Maps may be co–added to reach lower noise levels. Mosaicing is also possible to map larger areas. Attempts to reach map noise levels below 1 mJy are still fraught with poorly understood problems and require sophisticated data reduction. If such observations are proposed, the proposers must indicate how they plan to reach this ambitious goal.

[2]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).

The bolometers are used with the wobbling (typically at a rate of 2 Hz in azimuth) secondary mirror. The orientation of the beams on the sky changes with hour angle due to parallactic and Nasmyth rotation, as the array is fixed in Nasmyth coordinates. Special software is made available at the telescope for data reduction (NIC [7] and MOPSI[8]). Time estimators for planning ON/OFF or mapping observations are also available [7, 13].

Bolometer proposals will probably be pooled together like in previous semesters. Their time requests should be based on “bolometric conditions”, and the web–based time estimator is again strongly recommended. If exceptionally low noise levels are requested which may be reachable only in a perfectly stable (quasi winter) atmosphere, the proposers must clearly say so in their time estimate paragraph. Such proposals will however be particularly scrutinized.

## 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

Table 2: Forward and main beam efficiencies, $\eta_F$ and $\eta_{mb}$, and beam width $\theta_b$.

| frequency [GHz] | $\theta_b$ ["] [1]) | $\eta_F$ | $\eta_{mb}$ [2]) |
|---|---|---|---|
| 86 | 29 | 0.95 | 0.78 |
| 110 | 22 | 0.95 | 0.75 |
| 145 | 17 | 0.93 | 0.69 |
| 170 | 14.5 | 0.93 | 0.65 |
| 210 | 12 | 0.91 | 0.57 |
| 235 | 10.5 | 0.91 | 0.51 |
| 260 | 9.5 | 0.88 | 0.46 |
| 279 | 9 | 0.88 | 0.42 |

[1]) fit to all data: $\theta_b$ ["] = 2460 / frequency [GHz]
[2]) based on a fit of recently measured data to the Ruze formula: $\eta_{\rm F} = 1.2\epsilon \exp(-(4\pi R\sigma/\lambda)^2)$
with $\epsilon = 0.69$ and $R\sigma = 0.07$

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. A variable and sometimes large contribution to the error beam was known to come from telescope astigmatism[3]. Extensive work during the last years had shown that the astigmatism resulted 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*

Since the systematic use of inclinometers the telescope pointing became much more stable. Pointing sessions are now scheduled only once every 2 weeks. 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.

### 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 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 inside the 500 MHz IF bandwidth, and connectable to two different receivers.

**VESPA**, the versatile spectrometric and polarimetric array, 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 http://www.iram.fr/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.

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] Astigmatism in reflector antennas: measurement and correction A. Greve, B. Lefloch, D. Morris, H. Hein, S. Navarro 1994, IEEE Trans. Ant. Propag. AP–42, 1345

[4] Frequency switching at the 30m telescope C. Thum, A. Sievers, S. Navarro, W. Brunswig, J. Peñalver 1995, IRAM Tech. Report 228/95. (http://www.iram.es/IRAMES/otherDocuments/-manuals/Report/fsw_doc.ps)

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

[6] The 30m Manual: A Handbook for the 30m Telescope (version 2), W. Wild 1995 IRAM Tech. Report 377/95, also available on the web at http://www.iram.es/IRAMES/otherDocuments/-manuals/manual_v20.ps

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

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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 and Rainer MAUERSBERGER*

# News from the Plateau de Bure Interferometer

### Weather conditions and observations

Today, as of January 18, we have observed 14 out of 22 A-rated and 39 B-rated observing requests, and only 2 have been considered as successfully completed. Unusual temperatures, high winds and large amounts of snow, have indeed caused a considerable delay in the observations: the interferometer efficiency was averaging about 15% in November and December, less than half of the efficiency in the year before, and a substantial fraction of the time was still not good enough for observations at 1.3mm.

As far as A-rated projects are concerned, we look forward to bring these to completion in the current winter semester, but a drastic improvement in the weather conditions is now necessary if we wish to get through all the A-rated projects. IRAM will contact the PIs of projects that will not get their full observing time. B-rated projects are likely to be observed only if they fall in a favorable LST range.

To improve on the scheduling efficiency, the configuration schedule of the interferometer was adjusted to the requirements of A-rated projects. The interferometer was finally moved to the C configuration at the beginning of December and to the B configuration by the middle of January. Depending on the weather conditions, we plan to move in the first two weeks of February to the A configuration – the most extended six antenna configuration – and to switch the interferometer to the D configuration – the most compact – still before the end of March. According to this plan, projects aiming at deep integrations and low-resolution mapping in the D configuration will not be completed before mid April.

We will do our best to keep investigators informed about the execution of their projects all along the winter period. Investigators who wish to check the status of their project, may consult the interferometer schedule on the web at `http://www.iram.fr/IRAMFR/PDB/ongoing.html`. The page is updated twice a day.

# Call for observing proposals for the Plateau de Bure Interferometer

### Conditions for the next summer period

As every year, we plan to carry out extensive technical work during the summer period. Besides the usual maintenance of the antennas we will focus on the completion of the northern track extension should the cable car for the transport of materials become available. Despite these technical activities, we plan to carry out regular scientific observations with at least five antennas during the whole period. The scheduling will take into account the efficiency of the five element array. We expect to achieve a sensitivity and mapping speed comparable to summer 2002 during the coming summer period. Taking these considerations into account, we are confident to be able to schedule about 20 to 30 projects.

We plan to start the maintenance at the latest by the end of May and to schedule two configurations (C and D) between May and October. For observers interested in high-angular resolution studies, we tentatively plan a switch-back to the six element array and move to an extended configuration (B) by the end of October, i.e. before the end of the period.

| Conf | Scheduling Order Summer 2003 |
|---|---|
| CD | May – October |
| B | October – November |

We strongly encourage observers to submit proposals that can be executed during the summer period. To keep the procedure as simple as possible, we ask to focus on:

- observations requesting the use of the 3mm receivers
- circumpolar sources or sources transiting at night between June and September,
- observations that qualify for the CD configuration with 5 antennas.

We urge proposers to resubmit B-rated proposals unless they have been explicitely notified of their effective scheduling.

### Applications

Details of the PdBI and the observing procedures are given in the document `"An Introduction to the IRAM interferometer"`. A copy can be obtained from the address below or from the web at `http://www.iram.fr/IRAMFR/PDB/docu.html`. Proposers should read this document carefully before submitting any proposal.

In all cases, indicate on the first page whether your proposal is the resubmission of a proposal or the continuation of a previously accepted proposal. In case of a resubmission, state very briefly in an introductory paragraph (LaTeX generated header "Proposal history") why the proposal is being resubmitted (e.g. improved scientific justification, observational restrictions).

Details on receivers, signal to noise, atmospheric phase compensation, observing modes, data reduction and local contacts have not changed, and can be found in the January 1999 issue of the IRAM Newsletter; details on the correlator can be found in the August 2002 issue.

### *Configurations*

| 5 antenna configurations | |
|---|---|
| Name | Stations |
| D | W05 W00 E03 N05 N09 |
| C | W12 W09 E10 N05 N15 |
| B | W12 E18 E23 N13 N20 |

Part of the projects will have to be scheduled at the end of the summer period when the six-element array is expected to be back in operation. Projects that get observed with four antennas only will be adjusted in uv-coverage and observing time.

The following configuration sets are available:

| Set | Main purpose |
|---|---|
| D | Detection and low resolution mapping |
| CD | $3.5''$ resolution at 3mm |
| BC | $2''$ resolution at 3 mm |

Finally, enter ANY in the proposal form if your project doesn't need any particular configuration.

### *Archive*

Efforts are made in collaboration with the Centre de Données Stellaires (CDS, Strasbourg) to make the data headers available as listings on the web for all projects observed since 1990. The plan for now is to release the header information, not the raw data. The format will be very similar to that provided by the NRAO VLA archiving facility. A first release of the 1990 – 2000 scheduling periods is planned soon, and regular updates will be released thereafter.

To preserve the confidentiality of some information in the data in newly submitted proposals, such as frequencies or coordinates, the principal investigators should indicate on the proposal form which information needs to be kept confidential and for which period of time (max. 1 year).

*Roberto NERI*

# Ongoing modernization of GILDAS software

The **G**renoble **I**mage and **L**ine **D**ata **A**nalysis **S**oftware (GILDAS) architecture and distribution are undergoing important changes. The main underlying idea is to use standard, powerful and free tools to simplify the maintenance and installation of the software:

- The old home-made pre-processor (named "fpre") has been replaced by the standard C pre-processor.
- *GNU make* is used as the building tool. This choice considerably simplified the new makefile writing but it imposes the user to install *GNU make*. This limitation should be relaxed in the medium term as we go to the usual "configure/make/make install" scheme.
- CVS has been chosen as the GILDAS new control version system.

We used the opportunity of those changes to clean the sources:

- Hardware (especially the access to binary files) dependencies have mostly been grouped into a dedicated library.
- Another library is dedicated to operating system and compiler dependencies.
- A new architecture for the whole GILDAS tree has been chosen and is being implemented, with the aim of increasing the clarity and the modularity.

These changes are in the testing phase and will become permanent in the next few months. In this modernization process, it has been decided to:

- Definitely drop the VAX-VMS support. The main target system of GILDAS is now LINUX.
- To allow FORTRAN-90 developments. For the time being, we provide the possibility to compile all the GILDAS software (with the note-worthy exception of MAPPING) with the GNU FORTRAN-77. But there is absolutely no warranty that this possibility will be supported in the future. Please note that a non-commercial version of the Intel FORTRAN-90 compiler for LINUX is currently available for academic institutions.

Most of the others changes should be fully transparent for the normal users. However they affect the GILDAS software developments. Please contact us for more details to adapt you own software developments in GILDAS to the new system (`gildas@iram.fr`).

*Jerôme PETY, Frédéric GUETH and Stéphane GUILLOTEAU*

# Scientific Results in Press

## Shocked gas around CepA: evidence for multiple outflows from $H_2S$ and $SO_2$ observations

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*Abstract:*
The Cepheus A star forming region has been investigated through a multiline $H_2S$ and $SO_2$ survey at mm-wavelengths. Large scale maps and high-resolution line profiles reveal the occurrence of several outflows. CepA-East is associated with multiple mass loss processes: in particular, we detect a 0.6 pc jet-like structure which shows for the first time that the CepA-East YSOs are driving a collimated outflow moving towards the south.

The observed outflows show different clumps associated with definitely different $H_2S/SO_2$ integrated emission ratios indicating that the gas chemistry in Cepheus A has been altered by the passage of shocks. $H_2S$ appears to be more abundant than $SO_2$ in high velocity clumps, in agreement with chemical models. However, we also find quite narrow $H_2S$ linewidths, suggesting of regions where the evaporated $H_2S$ molecules had enough time to slow down but not to freeze out onto dust grains. Finally, the comparison between the line profiles indicates that the excitation conditions increase with the velocity, as expected for a propagation of collimated bow shocks.

*MNRAS, in press*

## CO Emission from z> 3 Radio Galaxies

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*Abstract:*
We report on the detection of the CO(4−3) line with the IRAM Plateau de Bure Interferometer in two $z > 3$ radio galaxies, doubling the number of successful detections in such objects. A comparison of the CO and Ly$\alpha$ velocity profiles indicates that in at least half of the cases, the CO is coincident in velocity with associated HI absorption seen against the Ly$\alpha$ emission. This strongly suggests that the CO and HI originate from the same gas reservoir, and could explain the observed redshift differences between the optical narrow emission lines and the CO. The CO emission traces a mass of $H_2$ 100−1000 times larger than the HI and HII mass traced by Ly$\alpha$, providing sufficient gas to supply the massive starbursts suggested by their strong thermal dust emission.

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The IRAM Newsletter is edited by Michael Bremer at IRAM-Grenoble (e-mail address: `bremer@iram.fr`). In order to reduce costs we are now sending paper copies of this Newsletter to astronomical libraries only. The IRAM Newsletter is available in electronic form:

- by using the World Wide Web: from the IRAM home pages (`http://www.iram.fr/` or `http://www.iram.es/`), click on item "Newsletter" and follow the links...
- by means of an anonymous `ftp` account, opened at IRAM for Internet users. To access those files, please connect through `ftp` to `iram.fr` (or `193.48.252.22`) and read the `README` file. Several subdirectories are available:

| Directory | Contents |
|---|---|
| `/dist/newsletter` | Recent issues of this Newsletter (one subdirectory per issue) |
| e.g. `/dist/newsletter/jul95` | jul95.ps is the Postscript file for the July 1995 issue. |
| `/dist/doc` | Documentation on IRAM telescopes and software |
| `/dist/proposal` | Proposal forms and Latex files to aid proposal preparation |
| `/dist/soft` | distribution files for reduction software |

- by means of an electronic mail file server installed at IRAM (on iraux2). This file server is a file distribution service that uses electronic mail facilities to deliver files. To communicate with it you should send a message to the electronic address:

  `listserv@iram.fr`

  On the first time you should send a message: `SUBSCRIBE IRAMNEWS` *your name*

  in order to subscribe to the mailing list IRAMNEWS. You will then receive an acknowledgement from the server. Then, for instance, to obtain a copy of the January 1999 issue, just send the one line message:

  `GET IRAMNEWS JAN99.PS`

  to the above electronic address. You will receive later a mail message containing the IRAM Newsletter in Postscript code. Please discard all the e-mail header information with a text editor, and send the file to a Postscript printer. More information may be obtained by sending the one line message:

  `HELP`

  Note that this file server also contains the proposal forms.

The e-mail list IRAMNEWS is used to send warning messages when the Newsletter is available, but also to provide fast information, if needed.
Please keep M. Bremer informed of any problem you may encounter.

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