IRAM Newsletter

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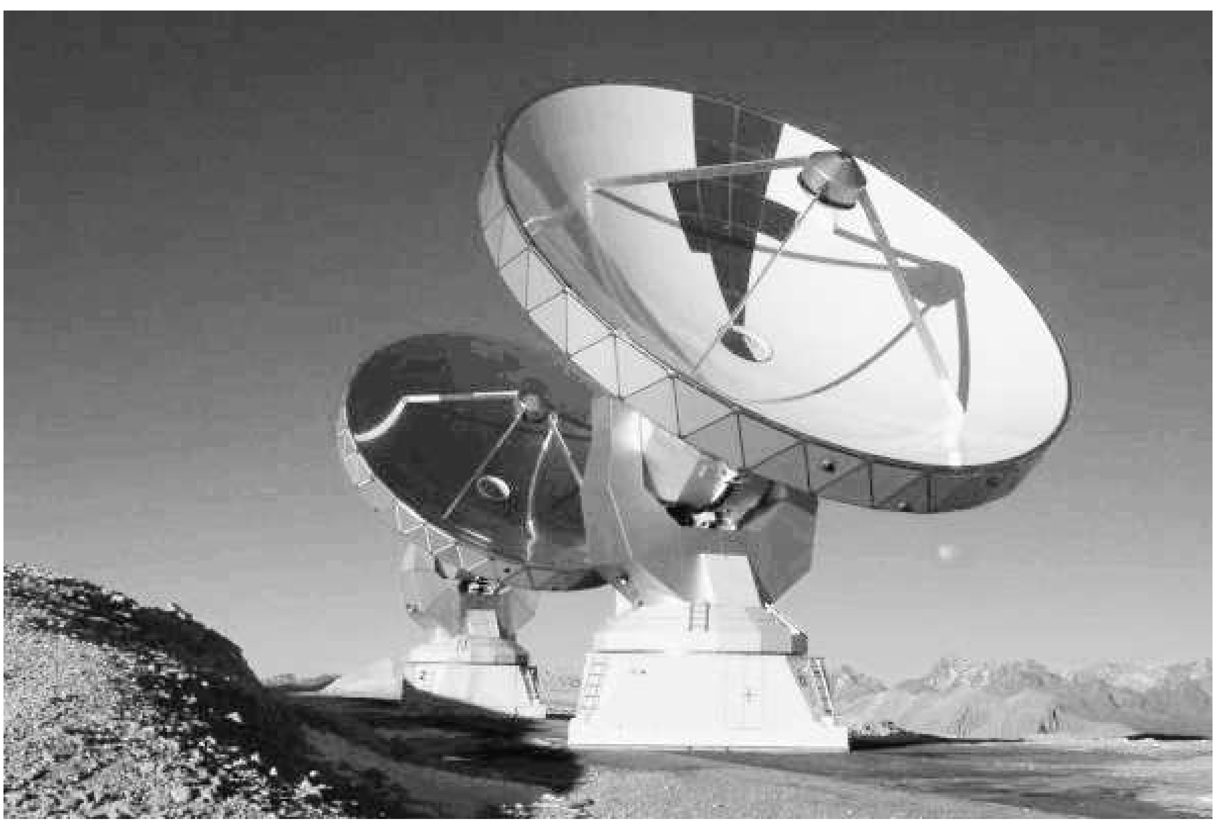
Cover Picture: Antenna Six



Third IRAM Millimeter Interferometry School

September 29 - October 6, 2002

A *Euro Lab Course* with support from the European Commission

First announcement

IRAM organizes in September/October its Third Interferometry School in the Grenoble area. This school, which is part of the Euro Lab Course "Millimeter Observing School", will be co-sponsored by IRAM and the European Commission. The school will take place from September 29 to October 6, 2002.

The school is intended for PhD students, post-docs and scientists who want to acquire a good knowledge of interferometry techniques at mm wavelengths. In the same spirit as the previous two interferometry schools, the courses will be focused on the Plateau de Bure interferometer, with an outlook to the next generation interferometer ALMA. Demonstration sessions will help the participants to become familiar with the reduction and imaging of Plateau de Bure data and the related technology. We would like to encourage participants to present posters related to their scientific work.

The number of participants will be limited to 40 persons. On the basis of their CV and references, young researchers are granted a financial support for travel and lodging expenses if they are nationals or long term residents of the European Union or an associated state.

More details and updates will be posted soon on the home page of the school (`http://iram.fr/IS/school.html`) where you can also find the proceedings of the previous summer school. A pre-registration form can be found in the appendix of this newsletter.

Please ask H. Wiesemeyer for further information (`wiesemey@iram.fr`).

Helmut WIESEMEYER

Ramon y Cajal Stipends at IRAM Spain

One or more "Ramon y Cajal Fellowships" might become available at IRAM Granada/ Pico Veleta Observatory. The candidates should possess a PhD in astronomy and have worked for at least 1 year outside Spain. Candidates will be considered regardless of their nationality or actual working place. The stipend is for five years with the possibility of extension into an IRAM contract as an astronomer.
The remuneration will be 28550 Euros per year. Information in Spanish can be found under `http://www.mcyt.es/cajal/default.htm`. Astronomers interested in this fellowship should send a letter of intent and their CV to Dr. Rainer Mauersberger at IRAM, Avenida Divina Pastora 7 NC, E-18012 Granada, Spain (`mauers@iram.es`).
The selection process will be as follows. After IRAM has been accepted by the Spanish Minister of Science and Technology as a host institute, we will select acceptable candidates among the applications that have reached us until March 15th. Then these candidates will have to apply for the stipend to the Ministry of Science and Technology, which will make a priority list of all the applicants in the fields of Physics and Space Science based on the reports of an international panel of referees. IRAM will assist in obtaining the necessary documentation and writing the applications. Candidates selected by the Ministry of Technology and Science will then obtain a contract by IRAM, probably starting in fall 2002.

Rainer MAUERSBERGER

Calendar

February 28th, 2002 16:00h (MET):
Deadline for the submission of observing proposals for the period May 15, 2002 to Nov 15, 2002

March 15th, 2002:
Deadline for applications for "Ramon y Cajal Fellowships" at IRAM Granada

April 15th – 16th, 2002:
Workshop on Broad Band Instrumentation for the 30m telescope. For details please contact Clemens Thum (`thum@iram.fr`)

April 16th – 17th, 2002:
Meeting of the Scientific Advisory Committee

April 23th – 28th, 2002:
ALMA week at IRAM Granada

June 27th – 28th, 2002:
Meeting of the IRAM Executive Council

September 29th - October 6th, 2002
Third IRAM Millimeter Interferometry School

The Plateau de Bure Interferometer : now a 6-element array

In December 2001, a new antenna became ready for integration into the Plateau de Bure Interferometer. The array has started with 3 elements in 1990. At that time it was already decided to add a fourth antenna. Serious discussions to go to six antennas, i.e. 15 simultaneous baselines, started in about 1993 but it was only after Antenna 5 had been finished in 1996 that a 'green light' was given to build the 6th antenna.

The first industrial contracts for Antenna 6 were signed in 1998, and in 1999 the assembly of the mount had started. This came to an abrupt stop after the two terrible accidents that hit the Plateau de Bure Observatory in the second half of 1999. The decision to restart work on Antenna 6 depended not only on the possibility to bring the necessary staff up to the Plateau de Bure but also on a solution for transporting the heaviest piece of the antenna, the central hub with a weight of 5.4 tons, to the mountain. A unique opportunity for this arose during the necessary testing of the future cable car system for the transport of materials under heavy load conditions.

The assembly work for the reflector of antenna 6 as well as the remaining work on the thermal insulation was subcontracted to outside companies. Most other tasks, including electrical cabling, the outfit of the receiver cabin, and the installation of the control system and necessary software changes were executed by IRAM staff.

After initial tests inside the hangar, the antenna was rolled out, and first tests were made on the sky, including a holographic measurement of the surface. Details of this are reported elsewhere in this newsletter.

Having successfully completed the construction of this antenna before the end of 2001 despite the many times difficult circumstances is a remarkable achievement to which many people inside and outside IRAM have contributed. It is a pleasure to thank all of them!

Michael GREWING

First Observations with Antenna 6

The IRAM highlight of the year 2001 was the First Light on Antenna 6. As planned, the antenna was moved from the hangar to station N13 on December 11. After a few days of software debugging and troubleshooting, two days of adverse weather conditions, and three hours invested in a coarse alignment, André Rambaud and Yvan Mourier, operators at the Plateau de Bure observatory, started to scan the sky for Jupiter on a fine-meshed grid.

In the early morning of December 16th, a first single dish signal was detected on Jupiter, and a few hours later, the antenna and the five-element interferometer were ready for the crucial attempt to obtain first fringes. At 21:35 UT the interferometer captured fringes on all the baselines connected to Antenna 6 (Fig. 1). After a few days of testing during scheduled technical time, Antenna 6 became finally available early January for the execution of scientific projects. Since then all the antennas are up and running continuously, weather permitting.

Meanwhile, good progress was made to improve the overall efficiency of the antenna. The phase pattern of the antenna was measured in holography on several occasions and the surface adjusted accordingly to an accuracy of a few tens of microns. Today, after four iterations, the surface provides globally a 65μm rms accuracy and is comparable in precision with all five other antennas (Fig. 2). To improve on accuracy, further fine adjustments are foreseen in the weeks to come.

Substantial efforts have also been made to stabilize the tracking of the antenna in the presence of wind. Albeit a fine tuning is still required to meet the tracking specifications and reduce further antenna down-time, Antenna 6 has not shown any other significant problem. Today, antenna testing is still ongoing whenever there is a gap in the regular observing schedule.

After almost two years of delay, Antenna 6 has finally joined the five-element array in regular science operations,

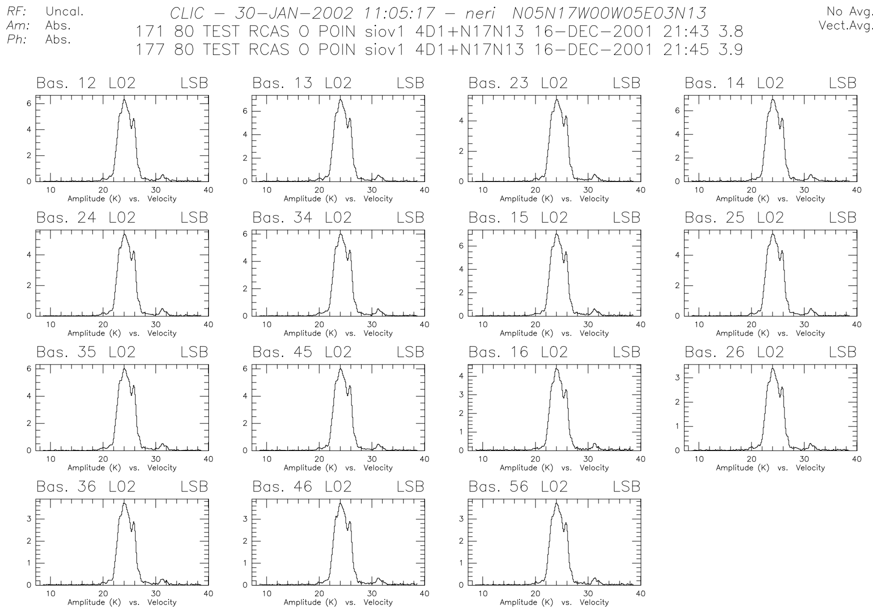


Figure 1: Cross-power profiles resulting from first observations with Antenna 6. These were made at a frequency of 86.243 GHz on the SiO $v = 1, J = 2 - 1$ masers in the circumstellar envelope of R Cas.

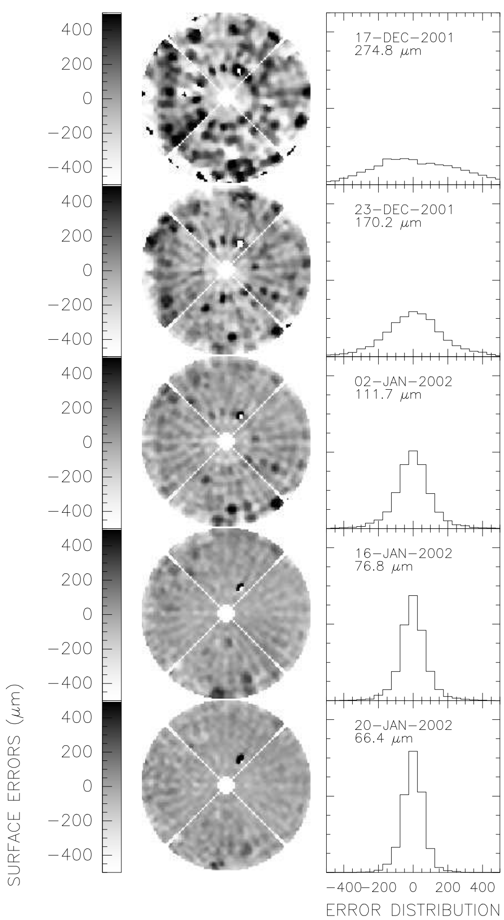


Figure 2: Surface accuracy achieved since December 17th after four holography iterations.

and provides now after just a few weeks of testing, an interferometer with an unprecedented sensitivity and a high quality mapping capability. More than a dozen galactic and extragalactic projects have already been observed with the interferometer since the beginning of January. Many excellent results have already been obtained, and we are confident that many more will follow in the months to come.

Roberto NERI and Robert LUCAS

Antenna 6 panels

The surface of Antenna 6 looks different than the other telescopes of the PdBI. Except for a few optically reflecting panels, which cover the surfaces of 3 other antennas entirely, and different from the aluminium-matte panels on 2 more antennas, the surface of this antenna is actually white.

The panels of this reflector are carbonfiber panels produced for the first generation Bure antennas. Because of the development of numerous pinholes in the backside aluminized Hostaflon layers with which these panels were delivered, the original surface layers have been removed without, however, destroying the definition of the high precision surface of these panels which results from a thin epoxy layer on top of the last carbonfiber layer.

Extensive tests have been performed to identify a two-layer surface coating with a conductive silver emulsion paint and a white paint for thermal reasons and as a protection against adverse meteorological conditions and the high UV flux levels at 2550 m altitude. IRAM was supported in this study by the Centre National d'Evaluation de Photoprotection (CNEP) in Clermont-Ferrand. A key criterion was, of course, the high reflectivity at 1mm- and 3mm-wavelengths of the conductive paint and minimal absorption in the protective layer. We also insisted on the possibility to remove the coating if necessary with solvents that will not attack the precious epoxy layer. The actual coating was done by the company SITEL in St. Martin d'Hères.

In the years to come, we intend to refurbish the surfaces of the remaining antennas with Hostaflon-sealed surfaces. In the meantime, we will build up experience with this new solution. Considering the performance of the new antenna which is practically already at the same efficiency at 1mm and 3mm wavelengths as the other antennas of the interferometer, we expect that re-painting the panels will provide a valuable way of maintaining the quality of the PdBI on the long term.

Michael BREMER

Personnel changes

IRAM Granada

At the end of January, our cooperant Alexandre DUFLOS will leave IRAM. We wish him all the best for his future career. Frederic DAMOUR will start as a new telescope operator.

Ute LISENFELD will leave IRAM on February 1st and work for the Instituto de Astrofisica de Andalucia. We have appreciated her work as a friendly and competent astronomer, in particular her important work on flexible observing.

Rainer MAUERSBERGER

IRAM Grenoble

At the end of January, Virginie GUERARD will be leaving IRAM. She has done extensive work on the combined web site concept of IRAM Grenoble and IRAM Granada which will be implemented in the near future.

Michael BREMER

Colette Morris

We are sad to inform you that our former colleague, Colette Morris, has passed away on January 22. Our thoughts and sympathies are with David Morris, her husband, and a former colleague, too.

Colette has been working for IRAM from 1981 until 1996. As much as she will be remembered for her professional work, building up the IRAM library, we will remember her as a colleague who provided open ears and practical help to many people. She was ready to engage herself at any moment, and would not hesitate to clearly express her views and convictions on matters she felt concerned about in order to help improve them.

Michael GREWING

News from the 30-m telescope

Due to a change in the weekly working hours in Granada, our secretary Esther Franzin (`franzin@iram.es`) can be reached from 9:00 till 15:00 (Monday to Friday).

Winter Students: This winter several participants of our EuroLab Course "mm Observing techniques", which took place in September 2001, were invited to participate in pooled observing sessions of typically one week at the 30-m telescope. The goal was to allow them to gain experience in observing and to encourage them to become new users of the 30-m telescope. Most participants came from outside our traditional community. IRAM paid all the travel and lodging costs. We will continue this program throughout the next summer and winter. Interested persons should send a letter of intent to Rainer Mauersberger (`mauers@iram.es`) with possible dates and one or two references.

Rainer MAUERSBERGER

New office for remote observing in Granada

We now have an office for remote observing and visitors. The office provides a more quiet environment to work and even allows to look outside. The computer of the remote observing station has been replaced and it will now be used exclusively for remote observing. The office is located in the former backend lab, next door to the computer group staff.

The office also has the video conference equipment and a free-hand telephone. Printer (b/w and colour) and coffee machine are just a few steps away. A workplace for a visitor will be installed in the same office soon.

If you want to use the remote observing station, please contact the computer group (`brunswig@iram.es` or `munoz@iram.es`) well in advance (as soon as you know it yourself).

Walter BRUNSWIG

New data processing system at the 30-m

In November 2001, we installed a new data processing system at the MRT. The main features are:

- dual processor 800 MHz Pentium III
- 512 MByte Memory
- 280 GByte disks RAID system
- LTO tape drive, capacity 200 GByte
- server tower with 2 power supplies
- OS: Linux (SuSE 7.1)

The RAID disk system consist of five 73 GByte disks. The data records are written with redundancy such that the system can continue to work with one failing disk. In that case, a spare disk ("hot swap") is dynamically integrated into the RAID system without stopping the operation.

Antenna data files that were kept before on an HP/UX workstation (mrt-ux1) are now stored on the new Linux system (mrt-lx1). All the data processing that is used at the telescope is now available on mrt-lx1.

The system provides some fault tolerance: single disk failures can be handled by the RAID system, power supply and ventilator can keep the system running even if one unit fails. However, in order to handle other types of failure we plan to install in 2002 a second system that could replace the mrt-lx1 processor. In case of a failure of mrt-lx1 the disk drives will then be connected to the new backup system.

Walter BRUNSWIG, Rosa MONTALBÁN, Miguel MUÑOZ and Albrecht SIEVERS

The new 30-m control system

Project Documentation

We have have developed a concept for project documentation. It consists of:

- a set of keywords (tags) to describe items like planning, requirements, design units, implementation, and installation. The keywords can also have attributes like priorities of requirements, state, and date of last modification. The "language" is based on XML.
- two scripts in XSL that produce PDF and HTML versions of a project's documents.

The documentation on "Project Documentation" is written in projectDoc itself. PDF, HTML, and XML versions can be found in the subdirectory of the latest release at: `http://www.iram.es/IRAMES/documents/-ncs30mProjectDoc/`

Synchronisation of Switching Modes in the NCS

Version 1.1 of the document on the synchronisation of switching modes, e.g. wobble-, frequency-, beam-switching, has been released. It describes current features as well as new ideas, requirements like data readout per sub-scan segment and inside phases.

Features of a new phase switching system are listed. It will be based on VME/Linux and replace the current solution (VME/OS-9) .

Versions of the document in PDF, HTML and XML can be found in the subdirectory of the latest release at:

`http://www.iram.es/IRAMES/documents/-ncs30mSyncSwitching/`

Walter BRUNSWIG, Hans UNGERECHTS and Albrecht SIEVERS

Other news from the PdBI

Weather conditions and observations

The interferometer recorded a very high observing efficiency during the months of January: 50%, more than twice the efficiency of last year, with excellent prerequisites for 1.3mm observations with high phase stability, and with the sixth antenna almost fully operational since the begin of January.

As far as A-rated projects are concerned, we look forward to bring these to completion in the current winter semester. Moreover, we will make an extra effort to schedule a likewise important number of B-rated projects should these excellent January conditions last for another couple of weeks. Projects falling in a favorable LST range are likely to be observed.

The interferometer was moved to the B configuration – the most extended six antenna configuration planned for winter 2001/2002 – already at the beginning of January, two weeks ahead of schedule. We plan now to move early in February to the C configuration, but we will not change the interferometer configuration to D before the end of the month. So far, projects for the D configuration – the most compact – will not be worked off before mid March.

Investigators who wish to check the status of their project, may consult the interferometer schedule on the Web at http://iram.fr/PDBI/ongoing.html. The page is updated three times a day.

Roberto NERI

New phaser and Lo-Q racks for 6 antennas

With the preparations for the integration of 6th PdBI antenna into the array, a new phaser and Lo-Q system has been installed for all antennas (Fig. 3). These components are essential in the signal transport between the antennas and the correlator.

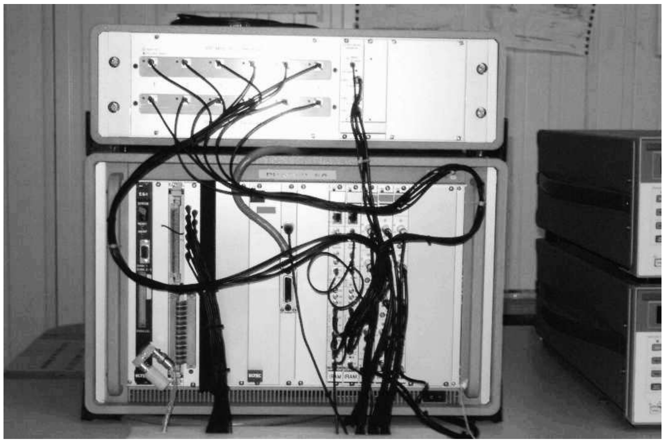


Figure 3: View of the new Phaser and Lo-Q racks, installed in the PdB coaxial cable terminal.

The phaser rack delivers reference signals to the LO1 for fringe stopping and to the LO3 for fringe offset correction. It also takes care of cable length correction, Walsh function phase switching and total power measurement. For the 6th antenna this rack has been entirely re-designed using DDS technology and integrated PLL assemblies. It has replaced the previous system which has operated for 15 years. The 100 MHz reference system was rebuilt too, with a low phase noise design.

The system was transported to the PdB on October 4th and installed as a "plug and play" device. Commissioning took longer than planned due to the manpower limitations on the site (and antenna 6 being in the final construction stage).

The whole system was eventually put into service, after a few hardware and software bugs were fixed. The performance was found substantially better than the previous system, essentially in the "cable phase vs. time" domain, (which was altered before by 0.05 degree oscillations), as shown in Fig. 4.

Marc TORRES

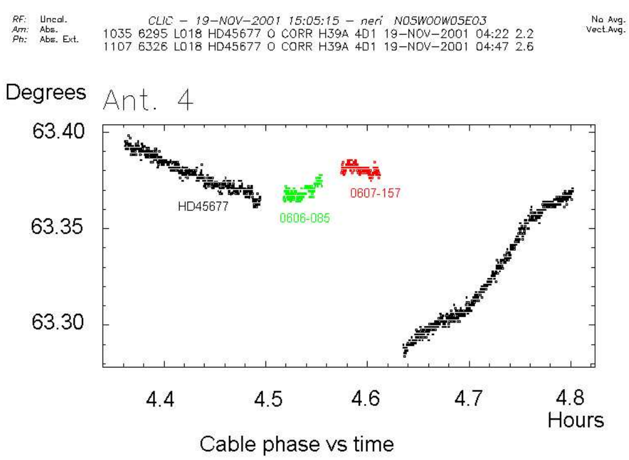


Figure 4: Actual length variations of a building-to-antenna coaxial cable. Vertical scale is 10 millidegrees per division @ 1875 MHz, equivalent to 1.8 micrometers on a 300-m length. Jumps are related to antenna motion. Quantisation steps of the digital phase meter can be seen at the ≈ 1 millidegree level.

Proposal Submission to IRAM Telescopes

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

February 28th, 2002 16:00h (MET).

The scheduling period extends from May 15, 2002 to Nov 15, 2002, covering roughly the summer period at our observatories.

Given the success of the web–based submission facility, we strongly suggest to use this medium. Instructions are found on our web page

`http://iram.fr/submission/submission.html`

The submission facility will be opened about three weeks before the proposal deadline.

As an insurance against network congestion or failure, we still accept proposals submitted by

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

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

Proposals sent by ordinary 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 reception to the Principal Investigator of each proposal correctly received, together with the proposal registration number. To avoid the allocation of several numbers per proposal, send *only one* copy of your proposal. Note that the web facility allows cancellation and modification of proposals before the deadline. Should we notice formal problems with a proposal sufficiently before the deadline, we will make an effort to contact the principal investigator and solve the problem together.

Roberto NERI and Clemens THUM

Call for Observing Proposals on the 30m Telescope

Summary

The following three types of proposals will be considered for the summer semester:

1. proposals requesting the observatory's heterodyne receivers at wavelengths of 3, 2, 1.3 and 1.1 mm.
2. proposals requesting the 1.3mm multibeam array HERA
3. proposals requesting a 1.2mm bolometer array

Emphasis will be put on observations at the longer wavelengths (3 amd 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 correlator upgrade project, VESPA (**VE**rsatile **SP**ectrometer **A**ssembly), is rapidly approaching completion. VESPA is expected to replace the present autocorrelator well before the beginning of the summer scheduling period. VESPA integrates into a new design components of the old 30m and interferometer correlators with the result that the number of available correlator channels is at least tripled. When connected to the backend distribution box VESPA provides up to 12 000 spectral channels (typically 3 000 per receiver). When connected to HERA, 18 000 channels can be used (nominally 2 000 per pixel). Spectral resolutions range from currently 10 kHz to 1.25 MHz. Bandwidths are in the range from 20 to 512 MHz.

Applications

Valid proposals consist of 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. The official 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 through the IRAM 30m web page at URL `http://iram.fr/PV/veleta.html`. In case of problems, contact the secretary, Cathy Berjaud (e–mail: `berjaud@iram.fr`). *Do not use characters smaller than 11pt*, which could make your proposal illegible when copied or faxed.

On the title page, you must fill in the line 'special requirements' if you request either polarimetric observations, service or remote observing, or specific dates for time dependent observations. If there are periods when you cannot observe for personal reasons, please specify them here; beware, however, that such additional restrictions could make your observations difficult or impossible to schedule.

We insist upon receiving, with proposals for heterodyne receivers, a complete list of frequencies corrected for source redshift (to 0.1 GHz). Also specify on the cover sheet which receivers you 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 in carefully your source list. 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.

The scientific aims of the proposed programme should be explained in 2 pages of text *maximum*, plus up to two pages of figures, tables, and references. Proposals should be self-explanatory, clearly state these aims, and explain the need of the 30m telescope. The amount of time requested should be carefully estimated and justified. It should include all overheads (see below).

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 first page whether your proposal is (or is not) the *resubmission* of a previously rejected proposal or the *continuation* of a previously accepted 30m telescope proposal. We strongly recommend to state very briefly in the introduction 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 [10]. 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 through the IRAM web pages in Granada (http://www.iram.es) and Grenoble (http://iram.fr/PV/veleta.html). A catalog of well calibrated spectra for a range of sources and transitions (Mauersberger et al. [13]) is very useful for monitoring spectral line calibration.

The On-the-Fly observing mode (OTF) is available for heterodyne observations. Considerable progress was made in making the control of the observations and the data reduction user friendly. Documentation is available on the Granada web page. Due to the complexity of the OTF observing mode we advise proposers without a demonstrated experience of this technique on the 30m telescope to contacta staff astronomer, e.g. Hans Ungerechts (`ungerechts@iram.es`) or Albrecht Sievers (`siever@iram.es`).

Frequency switching is available. It yields acceptable baselines only for sources with very narrow lines (2 km/s or less) within certain limitations (maximum frequency throw of 45 km/s, backends, phase times etc.; for details see [8]).

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. Observing time estimates must take into account:

- integration time on source and comparison field(s), including overheads for ON/OFF telescope motions, deadtime for device switching and data transfer.
- pointing, focus, continuum and/or line calibrations
- telescope slew motions
- receiver tunings (for heterodyne observations),

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 [9]. It has been included in the 30m telescope Manual [10].

In order to facilitate the rather complex calculation of observing time we strongly recommend the easy–to–use **Time Estimator** on our web pages. The tool gives sufficiently accurate estimates of the total observing time and handles the vast majority of both heterodyne and bolometer observing modes. Now in its version 2.4, it includes the new 4 MHz filterbanks and the multibeam array HERA. Extensive on–line help is provided. Questions can be addressed to Frederic Damour (damour@iram.es). *Proposers are asked to use this tool whenever applicable.*

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_{sys}, spectral resolution, antenna temperature of the signal, the signal/noise ratio which is aimed for, all overheads and dead times, and the resulting observing time.

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. 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.

Service observing

To facilitate the execution of short ($\leq$8 h) programmes, we propose "service observing" for some easy to observe (e.g. short, single source) programmes *with only one set of tunings.* This observing mode is well suited for projects without strong demand on weather quality (backup projects). 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 decide which proposals can actually go to that 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

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

in Bonn, from IRAM Grenoble and, with restrictions, from the Radioastronomy Lab at the ENS in Paris. This observing mode is limited to projects without particular technical demands and to experienced 30m users. The prospective remote observer should note "remote observing from Grenoble, Granada, Bonn or Paris " as a special requirement in the proposal cover sheet.

Remote observers affiliated with the MPIfR or other institutes near Bonn should contact F. Bertoldi (bertoldi@mpifr-bonn.mpg.de) or D. Muders (muders@mpifr-bonn.mpg.de) at MPIfR for a short introduction into the remote observing station. Remote observers from Paris should contact David Teyssier (teyssier@lra.ens.fr). The Bonn and Paris stations are not maintained by IRAM. It is therefore the responsibility of the observer to ensure with their local contact that the stations are tested sufficiently in advance, and they have access to the respective offices.

We recommend that remote observers leave their private and/or mobile phone numbers to the operator at Pico Veleta and prepare the catalogs in advance so that in the unlikely case of a failure, the observations can be performed by the astronomer on duty or the operator.

Remote observers in or near Grenoble contact C. Thum or H. Wiesemeyer 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.

Technical Information about the 30m Telescope

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

HERA

The 1.3mm **HE**terodyne **R**eceiver **A**rray is available again during the summer semester. The 9 pixels are arranged in the form of a center–filled square, and are separated by 24″. A derotator optical assembly can keep the 9 pixel pattern in any orientation stationary in the equatorial system on the sky, in the horizontal system, or in Nasmyth coordinates. Each pixel has a diffraction limited (11″ at 230 GHz) and linearly polarized beam. The main characteristics of the receivers, optics, backends, and observing modes are described in the HERA user documentation available on the IRAM 30m web page at URL `http://iram.fr/PV/veleta.html`.

A so far limited list of popular frequencies is available under automatic tuning. With the recent advent of a new LO injection and SSB measurement unit any frequency within HERA's nominal tuning range of 210 – 276 GHz can now be tuned and SSB calibrated.

A significant expansion of the autocorrelator is in progress (see the paragraph on VESPA in the backend section below) which is expected to vastly improve the backend options available with HERA, for both extragalactic and galactic applications. VESPA provides 18 000 spectral channels when connected to HERA, i.e. nominally 2000 channels per pixel. Spectral resolutions of 20, 40, 80, 320, and 1250 kHz are available.

HERA is now operational in two basic spectroscopic observing modes: *(i)* raster maps, typically fully sampled, of areas not smaller than 1′ in position, wobbler, or frequency switching modes, and *(ii)* simple on–the–fly maps of moderate size (typically $3' - 30'$). Other observing modes are conceivable and/or under tests, but they may not yet be ready. For details, please contact the project scientist, Karl Schuster (schuster@iram.fr), or Helmut Wiesemeyer (wiesemey@iram.fr).

As HERA commissioning is not yet completed, proposers are invited to check the 30m web page at Grenoble at URL http://iram.fr/PV/veleta.html for updated information on the progress of the commissioning work. In particular, HERA proposers should use the web–based time estimator (Granada web page at URL http://www.iram.es.

Heterodyne Receivers

Eight SIS receivers are available, covering virtually all of the frequency range from 80 to 281 GHz accessible with the 30m telescope. These single–beam receivers 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, being either horizontal or vertical in the Nasmyth cabin. Up to four of the receivers can be combined for simultaneous observations in the four ways depicted in Tab. 1. Also listed are typical system temperatures which apply to normal summer weather (7mm of water) at the center of the tuning range and 45° elevation. All heterodyne receivers are tuned entirely from the control room. Experience shows that it normally takes about 15 min to tune four such receivers.

General point about receiver operations

We recommend that observers send a list of their frequencies to Granada in time, in particular if frequencies near the edges of the tuning range are requested. For late arrivals (less than 2 weeks in advance), or a large number of frequencies, there is no guarantee for a prior test of the requested tunings.

Polarimeter

The IF polarimeter is available. The instrument is designed for narrowband (40 MHz) line and continuum

Table 1: Heterodyne receivers available for the summer 2002 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. ν_{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	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	4
B 100	H	1			4	81 - 115.5	60 - 85	> 20	1.5	0.5	120	
C 150	V		2		4	129 - 183	70 - 115	15 - 25	4.0	1.0	200	3
D 150	H		2	3		129 - 183	65 - 150	8 - 17	4.0	1.0	200	
A 230	V	1		3		197 - 266	85 - 185	12 - 17	4.0	1.0	450	1, 4
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 - 290	10 - 20	4.0	1.0	1000	2, 3
D 270	H		2	3		241 - 281	130 - 300	9 - 13	4.0	1.0	1000	2

1: noise increasing with frequency
2: performance at $\nu < 275$ GHz; noisier above 275 GHz.
3: noise temperatures are preliminary
4: these receivers will be replaced in March 2002 by new modules of very similar performance.

polarimetry in the 3, 2 and 1.3 mm atmospheric windows. It needs two orthogonally polarized receivers as input and it generates 4 signals from which spectra of all four Stokes parameters can be derived. A preliminary description of the instrument which includes a sensitivity estimate, is available on the web at URL `http://iram.fr/~thum.html`.

Polarimetry observations of extended sources need to take into account the polarization of the beam pattern which is presently known only at 3mm. Interested observers are invited to contact Helmut Wiesemeyer or Clemens Thum.

The RF polarimeter based on switching a quarter wave plate is still available. Interested observers please contact B. Lazareff) to discuss what might actually be possible this summer.

MPIfR Bolometer array

Two bolometers arrays were used and tested last winter, the "old" 37 pixel array MAMBO and the new 117 pixel array MAMBO-2. Both arrays have nearly equivalent point source sensitivity and beam sizes (HPBW of 11″). One of these arrays, possibly MAMBO, will be made available again for some period during the summer semester. During some additional time, the bolometer may be kept on standby for target–of–opportunity and other urgent projects.

In view of the less transparent and often considerably less stable atmosphere during summer, bolometer proposals should concentrate on observations requiring an rms noise not below 1 mJy. We also recommend to avoid sources which are visible only during daytime during the bolometer session, currently planned in October.

The arrays are mostly used in two basic observing modes, ON/OFF and mapping [2]. We expect that the ON/OFF typically reaches an rms noise of ∼ 3 mJy in 10 min of total observing time (about 200 sec of on source integration time) under "normal summer conditions" (pwv 7 mm and a stable atmosphere, i.e. no clouds, no turbulence). This corresponds to a nominal sensitivity of $\simeq 45\mathrm{mJy}/\sqrt{\mathrm{Hz}}$. It requires that skynoise can be subtracted, which is efficiently possible only for compact (< 20″) sources. For mapping more extended sources, where skynoise cannot be easily removed, the noise is twice as high, and, hence, the integration time must be quadrupled to reach the same signal–to–noise ratio. Please consult the Time Estimator on the Observatory's web page.

The minimum useful integration time per position should be 10 minutes plus an overhead of 10 minutes.

If noise levels below 1 mJy are requested which may be reachable only in exceptionally stable weather, the proposers must clearly say so in their time estimate paragraph. Such proposals will, however, be particularly scrutinized.

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 [11] and MOPSI[12]). Time estimators for planning ON/OFF or mapping observations are also available [11, 17].

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

Efficiencies and error beam

Extensive work during the last years in measuring and setting the telescope surface has resulted in significantly improved aperture and beam efficiencies which have increased nearly a factor 2 at the highest frequencies accessible to the telescope (see note by U. Lisenfeld and A. Sievers, Newsletter No. 47, Feb. 2001). The current numbers are shown in Table 2.

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 [16, 1] for details). Astronomers should take into account this error beam when converting antenna temperatures into brightness temperatures.

The aperture efficiency depends somewhat on the elevation, particularly at shorter wavelengths. This gain/elevation effect is evaluated in [15].

Table 2: Forward and main beam efficiencies, η_F and η_{mb}, and beam width θ_b.

frequency [GHz]	θ_b ["] [1])	η_F	η_{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: θ_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 $R\sigma = 0.07$

Backends

The following four spectral line backends are available which can be individually connected to any receiver.

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.

The 4 MHz filterbank currently consists of two units, each with 256 channels (spacing of 4 MHz, spectral resolution 6.2 MHz) covering a total bandwidth of 1 GHz. Each unit can be connected to any spectral line receiver with a bandwidth of 1 GHz (i.e. to all but the A100 and B100 receivers). At the present time, a 4 MHz filterbank cannot be used simultaneously with the autocorrelator or the 100 kHz filterbank on the same receiver.

The raw data from these filterbanks are written to a Linux workstation. An off–line calibration macro is available for the basic observing modes (PSWITCH, WSWITCH, RASTER), but automatic calibration is being prepared. Frequency switching is not possible with these low resolution backends.

The upgraded correlator VESPA, the new (**VE**rsatile **SP**ectrometer **A**ssembly) is rapidly approaching completion. It is expected to replace the present autocorrelator well before the beginning of the summer scheduling period. Connected to a set of 4 receivers it provides up to 12 000 spectral channels. Nominal spectral resolutions range from currently 10 kHz to 1.25 MHz. Nominal bandwidths are in the range 20 — 512 MHz. When VESPA is connected to HERA, up to 18 000 spectral channels can be used. The many configurations available in both connection modes are best visualised on a demonstration program which can be downloaded from the 30m web page at Grenoble at URL http://iram.fr/PV/veleta.html.

Pointing / Focusing

Pointing sessions are normally scheduled twice per week; at present, the fitted pointing parameters yield an absolute rms pointing accuracy of better than $3''$ [14]. Receivers are closely aligned (within $< 2''$. 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 were sometimes noted in the past and may well persist, even with the new generation receivers. 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.

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

Clemens THUM, Rainer MAUERSBERGER

Call for Observing Proposals on 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. This year, we will focus on the maintenance of the antennas and the observatory's buildings. Despite these technical activities, we intend to carry out regular scientific observations with at least five antennas during the whole period. The scheduling will be optimized according to experience gained last summer and take into account the efficiency of the five element array. So, unlike 2001, we expect to achieve a better sensitivity and mapping speed during the summer period. Taking these considerations into account, we are confident to be able to schedule about 20 to 30 projects, somewhat more than last summer.

We plan to start the maintenance not later than at the end of May, and plan to schedule two configurations (C and D) between June and October. For observers interested in high-angular resolution studies, we tentatively plan a switch back to the six element array and a move to an extended configuration (B) at the end of October, i.e. still during the summer period.

We strongly encourage observers to submit proposals that can be executed under summer period conditions. 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.

Details of the PdBI and the observing procedures are given in the document "The Plateau de Bure Interferometer (PdBI)". A copy can be obtained from the address below or from the World-Wide-Web at `http://iram.fr/PDBI/bure.html`). Proposers should read this document carefully before submitting any proposal.

Do not use characters smaller than 11pt, which could make your proposal illegible when duplicated or faxed. For the same reasons, also avoid sending figures with grey scale maps by fax. In case your proposal reaches us in time, but is incomplete or unreadable when copied, we will try our best to contact you. The Principal Investigator will receive by return mail an acknowledgement of receipt and the proposal number.

Proposal templates as well as the Latex style file proposal.sty may be retrieved by anonymous ftp from server iram.fr (in directory dist/proposal); or from the IRAM web pages under the link `http://iram.fr/proposal/proposal.html`. In case of problems, contact the secretary, Mrs Cathy Berjaud (`berjaud@iram.fr`).

The scientific aims of the proposed program should be explained in 2 pages of text maximum, plus up to two pages of figures, tables, and references. Proposals should be self-explanatory, clearly state their aims, and explain the need of the Plateau de Bure Interferometer.

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 the introduction why the proposal is being resubmitted (e.g. improved scientific justification, observational restrictions).

For this call for proposals, please note the following specificities (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):

Configurations

Standard configurations for the summer period are:

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 happen to be observed with four antennas only, will be adjusted in uv-coverage and observing time.

The following configuration sets are available:

Set	Main purpose
D	"Low" resolution at 1.3 mm
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.

Correlator

The correlator has 8 independent units, each being tunable anywhere in the 110-680 MHz band, and providing 7 different modes of configuration (characterized here as bandwidth/number of channels). In the first 3 modes (LSB+USB): 320MHz/128, 160MHz/256, 80MHz/512 the two central channels may be perturbed by the Gibbs phenomenon (depending on continuum strength) like in the old correlator. 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 modes (LSB or USB): 160MHz/128, 80MHz/256, 40MHz/512 and 20MHz/512 the two central channels are not affected by the Gibbs phenomenon and, therefore, these modes should be preferred for spectroscopic studies. The 8 units can be independently placed either on the IF1 (3mm receiver) or on the IF2 (1.3mm receiver). For more details, please refer to the Web page at `http://iram.fr/TA/backend/cor6A/`.

Roberto NERI

News from GILDAS

New release: JAN2002

A new release of the GILDAS package, dated JAN2002, is available. It can be downloaded from the IRAM ftp anonymous server, at `ftp://iram.fr/dist/soft/`. As for previous releases, we provide both the complete source codes – to be compiled –, and the binary executables for some platforms (including HPUX 10.2, Linux Red Hat 7.1, and Windows).

Important note: Fortran-90

Part of the GILDAS package is now written in Fortran-90. In particular, the MAPPING software is now only available if a Fortran-90 compiler is used (i.e. no Fortran-77 version of MAPPING is provided any more). GILDAS has been successfully compiled and tested using several Fortran-90 compilers, including HP F90 (under HP/UX), Compaq F90 (under Windows), Lahey F95 and Intel F90 (under Red-Hat 7.1). While most of these compilers have to be purchased, we note that the Intel F90 compiler is available freely from the Internet (`http://www.intel.com`). Using the binary files that are distributed might require the presence of Fortran-90 runtime libraries in the system.

> Most of the future developments in GILDAS will use Fortran-90.
> **Starting from the next GILDAS release, we will no longer support a Fortran-77 version of GILDAS.**
> A Fortran-90 compiler will therefore be necessary to compile the whole GILDAS package.

Contacting the GILDAS working group

Software	Help line
CLASS	`class@iram.fr`
CLIC	`clic@iram.fr`
GRAPHIC and tasks	`graphic@iram.fr`
MAPPING	`mapping@iram.fr`
NIC	`nic@iram.fr`

More general inquiries, including installation problems, can be reported to: `gildas@iram.fr`.

Frédéric GUETH and the GILDAS working group

An ALMA simulator in GILDAS

We have developed an imaging simulator for the ALMA project, which is distributed as part of the GILDAS software package. The simulator was developed to test the wide field imaging performances of ALMA, and in particular, the usefulness of an array of smaller dishes (12 antennas of 7-m, called ACA for Atacama Compact Array) to measure the short spacings in the UV plane. The simulator includes the following steps:

- Simple simulation of "on–the–fly" single–dish observations;
- Simulation of ALMA interferometric observations; Several different layouts of the array configurations can be selected;
- Simulation of ACA interferometric observations;
- Simulation of the atmosphere allowing a coherent modeling of atmospheric phase noise and anomalous refraction;
- Phase calibration;
- Detailed modeling of pointing errors and simple modeling of errors of amplitude calibration;
- CLEAN–based, joint deconvolution of data coming from both arrays (ALMA and/or ACA);
- Quantitative comparison of input (model) images with the deconvolved ones.

A thorough description of this simulator can be found in the ALMA memo #398 available at `http://www.eso.org/projects/alma/`. Compared to the previous release (see IRAM Newsletter 48), we improved *i)* the treatment of atmospheric phase errors (we thank F. Viallefond of LERMA for useful discussions on this point), *ii)* the robustness of the deconvolution step and *iii)* the comparison of the model image with simulated output. The next foreseen improvements are a more realistic simulation of single–dish observations and a web interface.

The simulator has been extensively used for the evaluation of the ACA, which was found to improve significantly wide field imaging precision. A similar conclusion was reached from independent studies, based on Maximum Entropy deconvolutions, performed at NRAO and in Japan. Following these studies, the ALMA Scientific Advisory Committee has recommended ACA as a first priority enhancement to the baseline ALMA project. Although developed with a specific goal, the simulator can be applied to ALMA as specified in the baseline project.

The most recent version of the simulator can be obtained upon request. Please feel free to contact us at `alma-simulation@iram.fr` for any comments, questions or suggestions.

Jérôme PETY, Frédéric GUETH and Stéphane GUILLOTEAU

Scientific Results in Press

M 82's stellar bar

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Abstract:
The fueling of the starburst in M 82 may be related to a stellar bar which pushes gas towards the center where it forms stars. The observation by McKeith et al. (1993) of the near-IR Ca II photospheric absorption line allows a direct velocity measurement of the stars in M 82, and provides by this a confirmation of the predicted x_1 and x_2-orbits of the bar in M 82. From this and other observations we find that the mass of the x_2-orbit stars is $\sim 15\,\%$

of the mass of the bar, and that the mass of the bar of 2×10^9 M$_\odot$ is 20 – 40 % of M 82's mass. This mass concentration of $\sim$ 1 kpc extent at the center of M 82 underlines the dynamic importance of the bar.

A&A, in print

Radio-millimetre investigation of galactic infrared dark clouds

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Abstract:
We present follow-up observations of the mid-Infrared dark clouds selected from the ISOGAL inner Galaxy sample. On-the-fly maps of ^{13}CO, C^{18}O and the 1.2 mm continuum emission were conducted at the IRAM 30-m telescope, showing spectacular correlation with the mid-IR absorption. The dark clouds are distributed as far as the prominent molecular ring at a distance of 3 to 7 kpc from the Sun. The clouds exhibit shapes ranging from globules to thin filaments down to ≤ 1 pc in size. The on-the-fly images obtained in ^{13}CO and C^{18}O confirmed that the cores are dense, compact molecular emitters, significantly more massive than local dark clouds (more than 1000 M$_\odot$) and lie within low activity Giant Molecular Clouds (GMC's). Ratios of the emission in the $J = (2-1)$ and $(1-0)$ transitions of ^{13}CO and C^{18}O show a remarkable uniformity within each cloud, with a significant portion of the sample represented well by a ratio of 0.67±0.12. Preliminary analysis of temperature and density measurements reveals that most of the cores have densities above 10^5 cm^{-3} and temperatures between 8 and 25 K, these latter clouds being associated with young embedded stars. Despite the high extinction inferred from mid-IR ($A_{\rm v} > 50$), the molecular lines are surprisingly weak, indicating likely depletion onto cold grains.

Accepted for publication in A&A

SO and SiO emission around the young cluster in the CB34 globule

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Abstract:
The globule CB34, which harbors a cluster of Class 0 YSOs protostars, has been investigated through a multiline SO and SiO survey at mm-wavelengths. The SO data reveal that the globule consists of three quiescent high-density ($\sim 10^5$ cm^{-3}) clumps, labeled A, B, and C, with sizes of $\sim$ 0.2-0.3 pc. The SiO data provide evidence for high-velocity gas across the globule. Most likely, the high-velocity gas is distributed in three distinct high-velocity outflows associated with the YSOs in each of the three clumps. High-velocity SO features have been detected only towards the two brightest SiO outflows. These broad SO components exhibit spatial and spectral distributions which are consistent with those of the SiO emission, so they can also be used as tracers of the outflows.

The comparison between the spatial and spectral properties of the SO and SiO emissions in the three clumps suggests different evolutionary stages for the relative embedded YSOs. In particular, the YSO associated with clump C exhibits some peculiarities, namely: smaller SiO linewidths, lower SiO column densities, lack of extended SiO structure and of SO wings, and presence of a SO spatial distribution which is displaced with respect to the location of the YSO. This behaviour is well explained if the SiO and SO molecules which were produced at high-velocities in the shocked region have been destroyed or slowed down because of the interaction with the ambient medium and the chemistry is dominated again by low-temperature reactions. Thus, our observations strongly suggest that the YSO in clump C is in a more evolved phase than the other members of the cluster.

Accepted for publication in MNRAS.
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(Sub)millimetre emission from NGC 1569: an abundance of very small grains

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Abstract:
We present new data of the dwarf galaxy NGC 1569 at 450 μm, 850 μm and 1200μm taken with SCUBA at the JCMT and the bolometer array at the IRAM 30m telescope. After including data from IRAS at 12, 25, 60 and 100 μm, we have successfully fitted the dust grain population model of Désert et al. (1990) to the observed midinfrared-to-millimeter spectrum. The fit requires a combination of both large and very small grains exposed to a strong radiation field as well as an enhancement of the number of very small grains relative to the number of large grains. We interpret this as the consequence of large grain destruction due to shocks in the turbulent interstellar medium of NGC 1569. The contribution of polyaromatic hydrocarbons (PAH's) is found to be negligible. Comparison of the dust emission maps with an HI map of similar resolution shows that both dust and molecular gas distributions

peak close to the radio continuum maximum and at a minimum in the HI distribution. From a comparison of these three maps and assuming that the gas-to-dust mass ratio is the same everywhere, we estimate the ratio of molecular hydrogen column density to integrated CO intensity to be about 25 – 30 times the local Galactic value. The gas-to-dust ratio is 1500 – 2900, about an order of magnitude higher than in the Solar Neighbourhood.

Accepted for publication in A&A

A CO Survey of Gravitationally Lensed Quasars with the IRAM Interferometer

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Abstract:
We present the results of a CO survey of gravitationally lensed quasars, conducted with the Plateau de Bure Interferometer over the last three years. Among the 18 objects surveyed, one was detected in CO line emission, while six were detected in the continuum at 3mm and three in the continuum at 1mm. The low CO detection rate may at least in part be due to uncertainties in the redshifts derived from quasar broad emission lines. The detected CO source, the $z = 3.2$ radio quiet quasar MG0751+2716, is quite strong in the CO(4−3) line and in the millimeter/submillimeter continuum, the latter being emission from cool dust. The integrated CO line flux is 5.96 ± 0.45 Jy·kms^{-1}, and the total molecular gas mass is estimated to be in the range $M_{H_2} = 1.6 - 3.1 \times 10^9 M_\odot$.

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A Multiwavelength Study of the S106 Region I. Structure and dynamics of the molecular gas

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Abstract:
The molecular cloud associated with Sharpless 106 has been studied in a variety of (sub)millimeter CO rotational lines on angular resolution scales from 11″ to 80″. We used the KOSMA 3m telescope to obtain an extended ^{12}CO J=3→2 map, from which we calculate a total mass of 2000 $M_\odot$ and an average density of 1.4×10^3 cm^{-3} for the molecular cloud. The peak intensity region around the massive young star S106 IR was observed in ^{13}CO J=6→5 and 3→2 with KOSMA and in isotopomeric low-J CO lines with the IRAM 30m telescope. A clump decomposition made for several lines yields a common clump-mass spectral index of α=1.7, illustrating the self-similarity of the detected structures for length-scales from 0.06 to 0.9 parsec.
All ^{12}CO and ^{13}CO line profiles within approximately 2′ around S106 IR show blue wing emission and less prominent red wing emission, partly affected by self-absorption in colder foreground material. We attribute this high-velocity emission to the ionized wind of S106 IR driving a shock into the inhomogeneous molecular cloud. We do not find evidence for a smooth or fragmented disk around S106 IR and/or an *expanding* ring in the observed CO emission distribution.
The excitation conditions along a cut through the molecular cloud/HII region are studied with an LTE analysis (and an Escape Probability model at the position of S106 IR), using the observed CO line intensities and ratios. The kinetic gas temperature is typically 40 K, the average density of the cloud in the core region is 9×10^3 cm^{-3}, and the local density within the clumps is 9×10^4 cm^{-3}. The ^{13}CO/C^{18}O line and column density ratios away from S106 IR reflect the natural isotopic abundance but towards the optical lobes and the cavity walls, we see enhanced ^{13}CO emission and abundance with respect to C^{18}O. This shows that selective photo-dissociation is only important close to S106 IR and in a thin layer of the cavity walls. In combination with the results from the excitation analysis we conclude that the molecular line emission arises from two different gas phases: (i) rather homogeneous, low- to medium-density, spatially extended clumps and (ii) embedded, small ($\ll$0.2 pc), high-density clumps with a low volume filling factor.

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Mass, linear momentum and kinetic energy of bipolar flows in protoplanetary nebulae.

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Abstract:
We have studied the CO emission from protoplanetary nebulae (PPNe). Our sample is composed of 37 objects and includes, we think, all well identified PPNe detected in CO, together with the two yellow hypergiants emitting in CO and one young PN. We present a summary of the existing CO data, including accurate new observations of the ^{12}CO and ^{13}CO J=1–0 and J=2–1 lines in 16 objects. We identify in the nebulae a slowly expanding shell (represented in the spectra by a central core) and a fast outflow

(corresponding to the line wings), that in the well studied PPNe is known to be bipolar. Excluding poor data, we end up with a sample of 32 sources (including the 16 observed by us); fast flows are detected in 28 of these nebulae, being absent in only 4. We present a method to estimate from these data the mass, 'scalar' momentum and kinetic energy of the different components of the molecular outflows. We argue that the uncertainties of our method can hardly lead to significant overestimates of these parameters, although underestimates may be present in not well studied objects. The total nebular mass is often as high as $\sim$1 $M_\odot$, and the mass-loss rate, that (presumably during the last stages of the AGB phase) originated the nebula, had typical values $\sim 10^{-4}$ $M_\odot$ yr^{-1}. The momentum corresponding to this mass ejection process in most studied nebulae is accurately coincident with the maximum momentum that radiation pressure, acting through absorption by dust grains, is able to supply (under expected conditions). We estimate that this high-efficiency process lasts about 1000 – 10000 yr, after which the star has ejected a good fraction of its mass and the AGB phase ends. On the other hand, the fast molecular outflows, that have probably been accelerated by shock interaction with axial post-AGB jets, carry a significant fraction of the nebular mass, with a very high momentum (in most cases between 10^{37} and 10^{40} g cm s^{-1}) and very high kinetic energy (usually between 10^{44} and 10^{47} erg). In general, yellow hypergiants and post-AGB objects with low initial mass show nebular masses and momenta that are, respectively, higher and lower than these values. We compare the momenta of the fast outflows with those that can be supplied by radiation pressure, taking into account the expected short acceleration times and some effects that can increase the momentum transfer. We find that in about 80% of PPNe, the fast molecular flows have too high momenta to be powered by radiation pressure. In some cases the momentum of the outflow is $\sim$1000 larger than that carried by radiation pressure; such high factors are difficult to explain even under exceptional conditions. Wind interaction is the basic phenomenon in the PN shaping from the former AGB envelopes; we conclude that this interaction systematically takes place along a dominant direction and that this process is not powered by radiation pressure. Due to the lack of theoretical studies, the possible momentum source remains a matter of speculation.

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SiO Chimneys and Supershells in M82

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Abstract:
In this Letter we present the first images of the emission of SiO and $H^{13}CO+$ in the nucleus of the starburst galaxy M82. Contrary to other molecular species that mainly trace the distribution of the star-forming molecular gas within the disk, the SiO emission extends noticeably out of the galaxy plane. The bulk of the SiO emission is restricted to two major features. The first feature, referred to as the SiO supershell, is an open shell of 150 pc diameter, located 120 pc west from the galaxy center. The SiO supershell represents the inner front of a molecular shell expanding at $\sim$ 40 km s^{-1}, produced by mass ejection around a supercluster of young stars containing supernova remnant SNR 41.95+57.5. The second feature is a vertical filament, referred to as the SiO chimney, emanating from the disk at 200 pc east from the galaxy center. The SiO chimney reaches a 500 pc vertical height, and it is associated with the most prominent chimney identified in radio continuum maps. The kinematics, morphology, and fractional abundances of the SiO gas features in M82 can be explained in the framework of shocked chemistry driven by local episodes of gas ejection from the starburst disk. The SiO emission stands out as a privileged tracer of the disk-halo interface in M82. We speculate that the chimney and the supershell, each injecting $\sim 10^7$ $M_\odot$ of molecular gas, are two different evolutionary stages in the outflow phenomenon building up the gaseous halo.

Appeared in ApJ **563**, *27*

New Preprints

562. INFRARED OBSERVATIONS OF NGC 3603
I. New constraints on cluster radius and
K_s–band luminosity function
D.E.A. Nürnberger, M. G. Petr-Gotzens
2001, *Astronomy and Astrophysics*

563. RADIO-MILLIMETRE INVESTIGATION
OF GALACTIC INFRARED DARK CLOUDS
D. Teyssier, P. Hennebelle, P. Pérault
2001, *Astronomy and Astrophysics*

564. M 82's STELLAR BAR
A. Greve, K.A. Wills,
N. Neininger, A. Pedlar
2001, *Astronomy and Astrophysics*

565. (SUB)MILLIMETRE EMISSION FROM NGC 1569:
AN ABUNDANCE OF VERY SMALL GRAINS
U. Lisenfeld, F.P. Israel, J.M. Stil, A. Sievers
2001, *Astronomy and Astrophysics*

Appendix: Pre-Registration Form for the IRAM Interferometry School

(Grenoble area, September 29th to October 6th, 2002)

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Scientific Secretariat
IRAM
300, rue de la Piscine
F-38406 Saint Martin d'Hères
France
FAX: +33 476 51 59 38

You may also register by E-Mail to `berjaud@iram.fr`.
Please specify "Interferometry School 2002" in the subject field.

Name:
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- I am interested in the IRAM Interferometry School 2002 and wish to receive further information: YES ○ NO ○
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Abstract (not more than 10 lines, please):

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	from France:	0 476 82 49 00	0 476 51 59 38
Plateau de Bure	Institut de Radioastronomie Millimétrique, Observatoire du Plateau de Bure, 05250 St Etienne en Dévoluy, France		
	from abroad:	(33) 492 52 53 60	(33) 492 52 53 61
	from France:	0 492 52 53 60	0 492 52 53 61
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Pico Veleta	Instituto de Radioastronomía Milimétrica, Estación Radioastronómica IRAM-IGN del Pico Veleta, Sierra Nevada, 18012 Granada, España	(34) 958 48 20 02	(34) 958 48 11 48

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