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

Newsletter

Number 71 August 20, 2008

Contents

Calendar

September 18, 2008 17:00 MEST (UT+2h):
Deadline for the submission of IRAM observing proposals for the period from December 1, 2008 to May 31, 2009.

September 8th and 9th, 2008:
ALMA Simulation Meeting, IRAM, Grenoble

October 6th - October 10th, 2008
IRAM Interferometer School, IRAM, Grenoble

Change at the 30-meter telescope

As of July 31st, 2008, Rainer Mauersberger, who has been Station Manager of the 30-meter since March 1st, 1999, left Granada for Santiago (Chile) to work on the commissioning of ALMA.

Rainer Mauersberger has directed the 30-meter telescope over the last 9 years with seriousness. It should be stressed that he organized with perseverance the Schools for Millimeter Astronomy and that he attracted young and excellent students to Granada. This has clearly been a positive and visible asset for IRAM.

Carsten Kramer has taken over the position of Station Manager of the 30-meter telescope as of August 1st, 2008.

Carsten Kramer is well known from the IRAM community as he had a post-doctoral position at IRAM (Granada) from 1994 to 1997. Thereafter Carsten Kramer went to the University of Cologne where he has since then pursued a successful career in astronomy working on the calibration of HIFI and doing research on star formation and Photon Dominated Regions in nearby galaxies (such a M51 and M33) and large galactic star-forming complexes, using, in particular, HERA on the 30-meter telescope.

I would like to take the opportunity of this note to wish all the best to Rainer Mauersberger and his family for his new position in Chile and to welcome warmly Carsten Kramer as the new station manager of the 30-meter telescope.

Pierre COX

The IRAM node of the European ALMA Regional Center

IRAM has now established, and will further develop, a support center dedicated to the ALMA users, which forms a node of the European ALMA Regional Center (ARC).

ALMA Regional Centers – The ALMA Regional Centers (ARCs) are the main contact point between the ALMA observatory and the users, both before and after the observations (which will be performed in a service mode only). Each ALMA partner (Europe, North America, Eastern Asia, Chile) will run such a center for its own community. The European ARC is organized as a network consisting of a *core*, located at ESO Garching, and six *scientific support nodes* hosted by European institutes. The ESO ARC will be in charge of issuing the Call for Proposals, operating the ALMA archive, and distributing the final data and software. The ARC nodes will provide user support, including face-to-face help for data reduction and analysis, as well as a number of advanced services (e.g., support of special projects, improvement of data reduction procedures, developments of new tools, etc.).

The IRAM ARC node – The IRAM ARC node is based on the already existing support and expertise center on millimeter interferometry that was developed over the years for the Plateau de Bure, and on the deep involvement of IRAM in the ALMA construction (e.g., Band 7 cartridges, telescope calibration software,...). We expect that, having access to the ARC node and the Plateau de Bure interferometer, the IRAM user community will be put in the best possible position to obtain observing time on ALMA in the extremely competitive environment that can be expected for this unique instrument. Just like the IRAM telescopes are open to the whole astronomical community, the ARC node is a new service provided by IRAM, which is open to all interested scientists, with special emphasis on the German, French, and Spanish communities.

Tasks – The IRAM ARC node aims to provide *user support*, which includes training, help for the preparation of observations, and face-to-face support. The 6th IRAM millimeter interferometry school (October 6–10, 2008) is part of that effort. ALMA face-to-face support will be organized in a way similar to the current PdBI support, i.e. with a local contact assigned to each project. In addition, the IRAM ARC node is involved in a number of *projects* aimed at developing and optimizing software, observational techniques or data reduction procedures. The goal of these tasks is both to develop new tools for ALMA and the ALMA users, and to acquire the expertise on ALMA which will be neccessary to provide an efficient user support when ALMA will be in operation. Among the current projects are the development of the ALMA telescope calibration software, the On-The-Fly interferometry technique, and interfaces between GILDAS and CASA.

Web pages are now on-line to present the IRAM ARC node activities and projects in more detail, and to give access to a number of important information and tools: `http://www.iram.fr/IRAMFR/ARC`. Any questions or inquiries can be sent to `arc@iram.fr`.

Frédéric GUETH

Large observing programs

Starting with the upcoming winter observing period, IRAM offers the possibility to apply for observing time in the framework of a *Large Program* for the 30-meter telescope and the Plateau de Bure interferometer.

A Large Program should require a minimum of 100 hours of observing time, spread over a maximum of two years, i.e. 4 contiguous semesters. In the next two years, IRAM will accept a limited number of Large Programs to be carried out per semester and instrument (30-meter and Plateau de Bure interferometer), allocating a maximum of 30% of observing time to such projects.

The Large Program should address strategic scientific issues leading to a breakthrough in the field. Large Programs should be coherent science projects, not reproducible by a combination of smaller normal proposals.

The Large Program proposals should contain a solid management plan ensuring an efficient turnover, including data reduction, analysis, and organization of the efforts.

Because of the large investment in observing time, but also of the inherent support from IRAM, it is advised that Large Programs involve one or more IRAM internal collaborators.

During the execution period of the Large Programs (ideally before mid-term), the team leading the Large Program should report to IRAM about the preliminary results and possible technical difficulties, so that IRAM can assess the progress made, assist with any problems encountered in the course of the observations, and, if needed, adjust the program scheduling.

The proprietary period ends 18 months after the end of the last scheduling semester in which the Large Program was observed. The raw data and processed data then enter the public domain. An extension of this proprietary period may be granted in exceptional cases only. A corresponding request will have to be submitted to the IRAM director.

Because of the scope of the Large Programs and the need to explain the organization of the project, Large Program proposals will have a maximum length of 4 pages (not including figures, tables, or references), instead of the 2 pages for normal proposals. Large observing program proposals should be submitted using the standard proposal templates; just check the "Large Program" bullet on the cover page. The following sections should be included: i) Scientific Rationale, ii) Immediate Objective, iii) Feasibility and Technical Justification, and iv) Organizational Issues. For the Plateau de Bure interferometer, the latter section must include a consideration of sun avoidance constraints and configuration scheduling.

The scientific evaluation of the Large Program proposals will be done by the full Program Committee (all 12 members, except if there is a direct implication of one the members in the proposal). External reviewers will be asked to evaluate Large Programs, if needed. In addition to the scientific evaluation, there will be an assessment of the technical feasibility by IRAM staff.

For the upcoming winter semester 2008/2009 (September 2008 deadline), the call for Large Programs will be open for the Plateau de Bure interferometer, and only for HERA and MAMBO at the 30-meter telescope. This is because the implementation of the new single pixel receivers at the 30-meter (EMIR) will not take place before the beginning of the winter semester. A call for Large Programs using EMIR at the 30-meter telescope will be issued for the summer semester 2009.

Pierre COX

Proposals for IRAM Telescopes

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

September 18, 2008 17:00 MEST (UT+2h)

The scheduling period extends from December 1, 2008 to May 31, 2009. Proposals should be submitted through our web–based submission facility. Instructions can be found on our web page at URL:

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

Detailed information on time estimates, special observing modes, technical information and references for both the IRAM interferometer and the IRAM 30m telescope can be found on the above mentioned web page. The submission facility will be opened about three weeks before the proposal deadline. Proposal form pages and the 30m time estimator are available now.

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

– fax to number: (+33) 476 42 54 69 or by
– ordinary mail addressed to:

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

Proposals sent by e–mail are not accepted. Color plots will be printed/copied in grey scale. If color is considered essential for the understanding of a specific figure, a respective remark should be added in the figure caption. The color version may then be consulted in the electronic proposal by the referees.

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. Note that the web facility allows cancelation 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 feature as we always receive a number of corrupted proposals (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. The normal proposals should *not exceed these 5 pages*. Except for the technical pages for the interferometer, longer proposals will be cut. The new **Large Observing Programmes** (see the announcement by P. Cox elsewhere in this Newsletter) have up to 4 pages for the scientific justification, plus cover page and 2 pages for supporting material.

The proposal template `proposal.tex` and the LaTeX style file `proposal.sty` may be obtained from the IRAM web pages[1] at URL `../GENERAL/submission/-proposal.html`. In case of problems, contact the secretary, Fabienne Schicke, (e–mail: `berjaud@iram.fr`). Please, make sure that your proposals use the current form pages.

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

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

Applications for **short spacing observations** have been simplified. If the need for complementary 30m observations is evident already at the time when the PdB interferometer proposal is prepared, just note this need on the interferometer proposal. A separate proposal for the 30m telescope is not required. The blank form for interferometer proposals contains a bullet, labelled "short spacings" which should then be checked. The interferometer style file will prompt for an additional paragraph in which the scientific need for the short spacings should be described. It is essential to give here all observational details, including size of map, sampling density and rms noise, spectral resolution, receiver configuration and time requested.

A mailing list has been set up for astronomers interested in being notified about the availability of a new Call for Proposals. Our web-based mailing list management facility can be found under the URL (http://www.iram.fr/mailman/listinfo/). The "Call for Proposals" list presently contains all users of IRAM telescopes during the last 2 years; you can subscribe or unsubscribe as you see fit.

J.M. WINTERS & C. THUM

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

Travel funds for European astronomers

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

As the FP6 Programme comes to an end this year and the terms of its successor FP7 have not yet been finalized, the TNA support which IRAM can provide is uncertain after December 2008. This caveat therefore concerns the bulk of the coming winter semester. Eligible users will be contacted directly when the new terms are available.

Observers requesting TNA support will be asked to provide the necessary personal and professional information to IRAM. Funding through RadioNet should be acknowledged in publications resulting from TNA supported observations.

R. NERI & C. THUM

Call for Observing Proposals on the 30m Telescope

Summary

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

1. the observatory's set of four dual polarization heterodyne receivers centered at wavelengths of 3, 2, 1.3, and 1.1 mm.
2. the 9 pixel dual-polarization heterodyne receiver array, HERA, operating at 1.3 mm wavelength
3. The MAMBO–2 bolometer array with 117 pixels operating at 1.2 mm; the smaller MAMBO–1 array with 37 pixels is kept as a backup.

Emphasis will be put on observations at the shorter wavelengths, but 3mm proposals are also encouraged inasmuch as they are suited for medium or low quality weather backup observations. About 2000 hours of observing time are expected to be available.

The main news relevant for the coming winter semester are described here. Details of proposal formalities, instrumentation, observing modes, and estimation of observing time are described on the IRAM web site.

What is new?

In addition to the normal observing proposals, IRAM invites applications for special **Large Observing Programmes** (see the announcement by P. Cox elsewhere in this Newsletter). On the 30m telescope, these Large Observing Proposals are restricted for the coming winter semester to the bolometer and HERA instruments. The proposal cover page provides a checkbox for identifying a Large Programme.

The next generation single pixel heterodyne receiver for Pico Veleta, **EMIR** (Eight MIxer Receiver), consisting of dual-polarization 4 GHz bandwidth mixers operating at 3, 2, 1.3, and 0.9mm, will provide a boost in sensitivity and observing capabilities, fully justifying its installation as soon as possible during the coming winter semester. Installation and commissioning will take about 4 weeks. During installation, observation with HERA or MAMBO can still proceed during night time, since the Nasmyth cabin optics are not affected at this stage. In view of the uncertain time scale and our lack of experience with EMIR, we request 30m proposers to use the performance of the *current receivers* for their estimate of observing time. Proposals scheduled after the installation of EMIR may see their time allocation adjusted accordingly.

An effort was made with EMIR to keep as much as possible of the frequency range below 83 GHz. As the final outcome will not be known before the proposal deadline, we recommend to interested astronomers to consider applying for these low frequencies now.

Remote observing is available from the IRAM offices in Granada and Grenoble, and from the remote stations in Madrid and Bonn. A remote station in Paris may also become available soon.

Clemens THUM & Carsten KRAMER

News from the Plateau de Bure Interferometer

Weather conditions and observing

The end of the winter semester as well as the first two months of the current summer semester have been suffering from quite mediocre weather conditions on Plateau de Bure. We moved the array into its B configuration on March 10 after a two-weeks period in a configuration intermediate between A and B that still offered the longest baselines of the A configuration (up to 760m). Two projects requesting the A-configuration and three projects requesting the B configuration could not be finished and will be deferred to the upcoming winter semester. The C configuration was scheduled after March 29 and the interferometer was switched back to the most compact configuration D on May 1st. The spring VLBI session took place from May 8 to 13 with the interferometer working without technical problems and in good weather conditions. Since May 14th the array is observing with 5 antennas in D configuration. The current antenna maintenance period is foreseen to end in October. At the end of this period it is foreseen to equip the reflector of antenna 4 with new aluminum panels replacing the current mix of painted carbon fiber and Media Lario panels.

As far as A-rated projects are concerned, we still hope to bring many of these to completion before the end of the summer semester. B-rated projects are likely to be observed only if they fall in a favorable LST range. We remind users of the Plateau de Bure interferometer that B-rated proposals and A-rated time fillers which are not started before the end of the summer period have to be resubmitted.

Global VLBI observations, which include the array in the 3 mm phased-array mode, are planned from October 9 to 15.

Investigators who wish to check the status of their project may consult the interferometer schedule on the Web at ../PDBI/ongoing.html. This page is updated daily.

Jan Martin WINTERS

Call for Observing Proposals on the Plateau de Bure Interferometer

Important information

Please note that the proposal.sty file and the proposal.tex template have been changed considerably. We urge proposers to download the most recent version from our web page ../GENERAL/proposal/ . Proposals using older versions of the style/template files will not be accepted.

Conditions for the next winter session

Based on our experience in carrying out configuration changes in winter conditions with limited access to the observatory, we plan to schedule four configuration changes next winter. We therefore ask investigators to submit proposals for any of the 4 primary configurations of the six antenna array.

A preliminary configuration schedule for the winter period is outlined below. Adjustments to the provisional configuration planning will be made according to proposal pressure, weather conditions, and other contingencies. The configuration schedule given below should be taken as a guideline, in particular when the requested astronomical targets cannot be observed during the entire winter period (sun avoidance circle of radius 45°).

Conf	Scheduling Priority Winter 08/09
C	December
A	December – January
B	February – March
C	March – April
D	April – May

We strongly encourage observers to submit proposals for the set of AB configurations that include 730 and 760 meter baselines. For these proposals we ask to focus on bright compact sources, possibly at high declination.

We invite proposers to submit proposals also for observations at 3 mm. When the atmospheric conditions are not good enough at 1.3 mm or at 2 mm, 3 mm projects will be observed: in a typical winter, 20-30% of the time used for observations is found to be poor at 1.3 mm, but still excellent at 3 mm.

Proposal category

Proposals should be submitted for one of the six categories:

1.3MM: Proposals that ask for 1.3 mm data. 3 mm receivers can be used for pointing and calibration purposes, but cannot provide any imaging.

2MM: Proposals that ask for 2 mm data. 3 mm receivers can be used for pointing and calibration purposes, but cannot provide any imaging.

3MM: Proposals that ask for 3 mm data.

TIME FILLER: Proposals that have to be considered as background projects to fill in periods where the atmospheric conditions do not allow mapping, to fill in gaps in the scheduling, or even to fill in periods when only a subset of the standard 6-antenna configurations will be available. These proposals will be carried out on a "best effort" basis only.

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

LARGE PROGRAM: This category is offered for the first time on both IRAM instruments. See Sect. *Large Observing Programs* for a detailed explanation.

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

Configurations of the six-antenna array

The six-element array can be arranged in the following configurations:

Conf	Stations					
A	W27	E68	N46	E04	E24	N29
B	W27	E23	N46	W12	E12	N20
C	W12	E10	N17	W09	E04	N11
D	W08	E03	N11	W05	N02	N07

The general properties of these configurations are:

- `A` alone is well suited for mapping or size measurements of very compact, strong sources. It provides a resolution of 0.8″ at 100 GHz, ∼0.35″ at 230 GHz.
- `B` alone yields ∼1.2″ at 100 GHz and, in combination with A provides an angular resolution of ∼1.0″ at 100 GHz. It is mainly used for relatively strong sources.
- `C` provides a fairly complete coverage of the uv-plane (low sidelobe level) and is well adapted to combine with D for low angular resolution studies (∼3.5″ at 100 GHz, ∼1.5″ at 230 GHz) and with B for higher resolution (∼1.7″ at 100 GHz, ∼0.7″ at 230 GHz). C alone is also well suited for snapshot and size measurement experiments.
- `D` alone is best suited for deep integration and coarse mapping experiments (resolution ∼ 5″ at 100 GHz). This configuration provides both the highest sensitivity and the lowest atmospheric phase noise.

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

Please consult the documentation *An Introduction to the IRAM interferometer* (../IRAMFR/PDB/docu.html) and the IRAM Newsletter No. 63 (August 4th., 2005, accessible on the web at `../IRAMFR/ARN/aug05/aug05.html`) for further details.

Receivers

All antennas are equipped with dual polarization receivers for the 3 mm, 2 mm, and 1.3 mm atmospheric windows.

The frequency range is 80 GHz to 116 GHz for the 3 mm band, 129 GHz to 174 GHz for the 2 mm band, and 201 to 267 GHz for the 1.3 mm band.

	Band 1	Band 2	Band 3
RF range*	80–116	129–174	201–267
T_{rec} LSB	40–55	30–50	40–60
T_{rec} USB	40–55	40–80	50–70
G_{im}/[dB]	-10	-12 ... -10	-12 ... -8
RF LSB	80–104	129–168	201–267
RF USB	104–116	147–174	

* center of the 4-8 GHz IF band

Each band of the receivers is dual-polarization with the two RF channels of one band observing at the same frequency. The different bands are not co-aligned in the focal plane (and therefore on the sky). Due to the pointing offsets between the different frequency bands, only one band can be observed at any time. One of the two other bands is in stand-by mode (power on and local oscillator phase-locked) and is available, e.g., for pointing. Time-shared observations between different RF bands are presently being tested. Please contact the Interferometer Science Operations Group (sog@iram.fr) to discuss the feasibility in case you are interested to use this mode.

The mixers are single-sideband, backshort-tuned; they will usually be tuned LSB, except for the upper part of the frequency range at 3 mm and 2 mm where the mixers will be tuned USB.

The typical image rejection is 10 dB. Each IF channel is 4 GHz wide (4-8 GHz). The two 4 GHz wide IF-channels (one per polarization) can be processed only partially by the existing correlator. A dedicated IF processor converts selected 1 GHz wide slices of the 4-8 GHz first IFs down to 0.1-1.1 GHz, the input range of the existing correlator. Further details are given in the section describing the correlator setup and the IF processor.

Signal to Noise

The rms noise can be computed from

$$\sigma = \frac{J_{\rm pK} T_{\rm sys}}{\eta\sqrt{N_{\rm a}(N_{\rm a}-1)N_{\rm c}T_{\rm ON}B}}\frac{1}{\sqrt{N_{\rm pol}}} \qquad (1)$$

where

- $J_{\rm pK}$ is the conversion factor from Kelvin to Jansky (22 Jy/K at 3 mm, 29 Jy/K at 2 mm, and 35 Jy/K at 1.3 mm)
- $T_{\rm sys}$ is the system temperature ($T_{\rm sys}$ = 100 K below 110 GHz, 170 K at 115 GHz, 150 K at 150 GHz, and 200 K at 230 GHz for sources at $\delta \geq 20°$ and for typical winter conditions).
- η is an efficiency factor due to atmospheric phase noise and instrumental phase jitter (0.9 at 3 mm, 0.85 at 2 mm, and 0.8 at 1.3 mm) in typical winter conditions.
- $N_{\rm a}$ is the number of antennas (6), and $N_{\rm c}$ is the number of configurations: 1 for D, 2 for CD, and so on.
- $T_{\rm ON}$ is the on-source integration time per configuration in seconds (2 to 8 hours, depending on source declination). Because of various calibration observations the total observing time is typically 1.6 $T_{\rm ON}$.
- B is the spectral bandwidth in Hz (up to 2 GHz for continuum, 40 kHz to 2.5 MHz for spectral line, according to the spectral correlator setup)
- $N_{\rm pol}$ is the number of polarizations: 1 for single polarization and 2 for dual polarization (see section *Correlator* for details).

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

Coordinates and Velocities

For best position accuracy, source coordinates must be in the J2000.0 system.

Please do not forget to specify LSR velocities for the sources. For pure continuum projects, the "special" velocity `NULL` (no Doppler tracking) can be used.

Correlator

IF processor

At any given time, only one frequency band can be observed, but with the two polarizations available. Each polarization delivers a 4 GHz bandwidth (from IF=4 to 8 GHz). The two 4-GHz bandwidths coincide in the sky frequency scale. The current correlator accepts as input two signals of 1 GHz bandwidth, that must be selected within the 4 GHz delivered by the receiver. In practice, the new IF processor splits the two input 4–8 GHz bands in four 1 GHz "quarters", labeled *Q1...Q4*. Two of these quarters must be selected as correlator inputs. The system allows the following choices:

- first correlator entry can only be Q1 HOR, or Q2 HOR, or Q3 VER, or Q4 VER
- second correlator entry can only be Q1 VER, or Q2 VER, or Q3 HOR, or Q4 HOR

where HOR and VER refer to the two polarizations:

Quarter	Q1	Q2	Q3	Q4
IF1 [GHz]	4.2-5.2	5-6	6-7	6.8-7.8
input 1	HOR	HOR	VER	VER
input 2	VER	VER	HOR	HOR

How to observe two polarizations? To observe simultaneously two polarizations at the same sky frequency, one must select the same quarter (Q1 or Q2 or Q3 or Q4) for the two correlator entries. This will necessarily result in each entry seeing a different polarization. The system thus give access to 1 GHz × 2 polarizations.

How to use the full 2 GHz bandwidth? If two different quarters are selected (any combination is possible), a bandwidth of 2 GHz can be analyzed by the correlator. But only one polarization per quarter is available in that case; this may or may not be the same polarization for the two chunks of 1 GHz.

Is there any overlap between the four quarters? In fact, the four available quarters are 1 GHz wide each, but with a small overlap between some of them: Q1 is 4.2 to 5.2 GHz, Q2 is 5 to 6 GHz, Q3 is 6 to 7 GHz, and Q4 is 6.8 to 7.8 GHz. This results from the combination of filters and LOs used in the IF processor.

Is the 2 GHz bandwidth necessarily continuous? No: any combination of two quarters can be selected. Adjacent quarters will result in a continuous 2 GHz band. Non-adjacent quarters will result in two independent 1 GHz bands.

Where is the selected sky frequency in the IF band? It would be natural to tune the receivers such that the selected sky frequency corresponds to the middle of the IF bandwidth, i.e. 6.0 GHz. However, this corresponds to the limit between Q2 and Q3. It is therefore highly recommended to center a line at the center of a quarter (see Section "ASTRO" below). In all three bands, 3 mm, 2 mm, and 1.3 mm the receivers offer best performance in terms of receiver noise and sideband rejection in Q3 (i.e. the line should be centered at an IF1 frequency of 6500 MHz).

Spectral units of the correlator

The correlator has 8 independent units, which can be placed anywhere in the 100–1100 MHz band (1 GHz bandwidth). 7 different modes of configuration are available, characterized in the following by couples of total bandwidth/number of channels. In the 3 DSB modes (320MHz/128, 160MHz/256, 80MHz/512 – see Table) the two central channels may be perturbed by the Gibbs phenomenon if the observed source has a strong continuum. When using these modes, it is recommended to avoid centering the most important part of the lines in the middle of the band of the correlator unit. In the remaining SSB modes (160MHz/128, 80MHz/256, 40MHz/512, 20MHz/512) the two central channels are not affected by the Gibbs phenomenon and, therefore, these modes may be preferable for some spectroscopic studies.

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

Note that 5% of the passband is lost at the end of each subband. The 8 units can be independently connected to the first or the second correlator entry, as selected by the IF processor (see above). Please note that the center frequency is expressed in the frequency range seen by the correlator, i.e. 100 to 1100 MHz. The correspondence to the sky frequency depends on the parts of the 4 GHz bandwidth which have been selected as correlator inputs.

ASTRO

The software ASTRO can be used to simulate the receiver/correlator configuration. Astronomers are urged to download the most recent version of GILDAS at `../IRAMFR/GILDAS/` to prepare their proposals.

The previous `LINE` command has been replaced by several new commands (see internal help; the following description applies to the current receiver system). The behavior of the `LINE` command can be changed by the `SET PDBI 1995|2000|2006` command, that selects the PdBI frontend/backend status corresponding to years 1995 (old receivers, 500 MHz bandwidth), 2000 (580 MHz bandwidth), 2006 (new receivers and new IF processor, 1 GHz bandwidth). Default is 2006:

– `LINE`: receiver tuning
– `NARROW`: selection of the narrow-band correlator inputs
– `SPECTRAL`: spectral correlator unit tuning
– `PLOT`: control of the plot parameters.

A typical session would be:

```
! choice of receiver tuning
line xyz 230 lsb low 6500

! choice of the correlator windows
narrow Q3 Q3

! correlator unit #1, on entry 1
spectral 1  20 520 /narrow 1

! correlator unit #2, on entry 1
spectral 2 320 260 /narrow 1

! correlator unit #3, on entry 2
spectral 3  40 666 /narrow 2
...
```

Sun Avoidance

For safety reasons, a sun avoidance limit is enforced at 45 degrees from the sun. Please take this into account for your target sources.

Mosaics

The PdBI has mosaicing capabilities, but the pointing accuracy may be a limiting factor at the highest frequencies. Please contact the Science Operations Group (sog@iram.fr) in case of doubts.

Data reduction

Proposers should be aware of constraints for data reduction:

- In view of the new receiver system, we recommend that you reduce your data in Grenoble. Proposers will not come for the observations, but will have to come for the data reduction. For the time being, remote data reduction will only be offered in exceptional cases. Please contact your local contact if you're interested in this possibility.
- We keep the data reduction schedule very flexible, but wish to avoid the presence of more than 2 groups at the same time in Grenoble. Data reduction will be carried out on dedicated computers at IRAM. Please contact us in advance.
- In certain cases, proposers may have a look at the uv-tables as the observations progress. If necessary, and upon request, more information can be provided. Please contact your local contact or PdBI's Science Operations Group (sog@iram.fr) if you are interested in this.
- CLIC evolves to cope with upgrades of the PdBI array. The newer versions are downward compatible with the previous releases. Observers who wish to finish data reduction at their home institute should obtain the most recent version of CLIC. Because differences between CLIC versions may potentially result in imaging errors if new data are reduced with an old package, we advise observers having a copy of CLIC to take special care in maintaining it up-to-date. The recent upgrades of CLIC implied many modifications for which backward compatibility with old PdBI receiver data has not yet been fully checked. To calibrate data obtained with the "old" receiver system (up to September 2006), one has to use the January 2007 version of CLIC.

Local Contact

A local contact will be assigned to every A or B rated proposal which does not involve an in-house collaborator. He/she will assist you in the preparation of the observing procedures and provide help to reduce the data. Assistance is also provided before a deadline to help newcomers in the preparation of a proposal. Depending upon the program complexity, IRAM may require an in-house collaborator instead of the normal local contact.

Technical pre-screening

All proposals will be reviewed for technical feasibility in parallel to being sent to the members of the program committee. Please help in this task by submitting technically precise proposals. Note that your proposal must be complete and exact: the source position and velocity, as well as the requested frequency setup must be correctly given.

Non-standard observations

If you plan to execute a non-standard program, please contact the Interferometer Science Operations Group (sog@iram.fr) to discuss the feasibility.

Documentation

The documentation for the IRAM Plateau de Bure Interferometer includes documents of general interest to potential users, and more specialized documents intended for observers on the site (IRAM on-duty astronomers, operators, or observers with non-standard programs). All documents can be retrieved on the Internet at `../IRAMFR/PDB/docu.html`. Note however, that not all the documentation on the web has already been updated with respect to the current receivers. All information presently available on the current receiver system is given in the *Introduction to the IRAM Plateau de Bure Interferometer* at `../IRAMFR/GILDAS/doc/html/pdbi-intro-html` and in this call for proposals.

> Finally, we would like to stress again the importance of the quality of the observing proposal. The IRAM interferometer is a powerful, but complex instrument, and proposal preparation requires special care. Information is available in this call and at `../IRAMFR/PDB/docu.html`. The IRAM staff can help in case of doubts if contacted well before the deadline. Note that the proposal should not only justify the scientific interest, but also the need for the Plateau de Bure Interferometer.

Jan Martin WINTERS

Table 1: IRAM PdBI proposal ratings for summer 2008. A: Accepted, B: Backup, C: Rejected.

Project	Rate	Project	Rate	Project	Rate	Project	Rate	Project	Rate	Project	Rate
S001	C	S002	B	S003	B†	S004	A	S005	C	S006	B
S007	B	S008	A	S009	B	S00A	C	S00B	A	S00C	A
S00D	A	S00E	A	S00F	C	S010	C	S011	B	S012	A†
S013	B†	S014	BΥ	S015	–	S016	C	S017	BΥ	S018	C
S019	C	S01A	A	S01B	A†	S01C	B	S01D	A	S01E	B
S01F	B	S020	C	S021	B	S022	C	S023	B†	S024	B
S025	C	S026	B†	S027	C	S028	B‡	S029	B	S02A	A
S02B	B‡	S02C	B	S02D	C	S02E	C	S02F	C	S030	C
S031	BΥ	S032	A	S033	B†	S034	B‡	S035	B†	S036	C
S037	B†	S038	A†	S039	A†	S03A	A	S03B	A	S03C	B†
S03D	A‡	S03E	B†	S03F	A	S040	A‡	S041	B‡	S042	A†
S043	B	S044	A	S045	B†	S046	A	S047	A	S048	A
S049	C	S04A	B	S04B	C	S04C	B‡	S04D	B‡	S04E	B
S04F	C	S050	A†Υ	S051	A†	S052	B†	S053	A	S054	B

† : some parts of the program - others rated B or C. ‡ : with time restrictions. Υ : time filler. –: not rated.

Table 2: IRAM 30-m proposal ratings for summer 2008

A		B			C	
004-08[2]	005-08	001-08	003-08	006-08	002-08	017-08
010-08	012-08[2]	007-08	008-08	009-08	024-08	049-08
015-08[2]	018-08	011-08	013-08	014-08[1]	052-08	053-08
022-08[2]	029-08[2]	016-08	019-08	020-08	056-08	057-08
031-08[1]	034-08[1]	021-08	023-08	025-08[1]	060-08	071-08
035-08	036-08	026-08	027-08[1]	028-08	072-08	076-08
042-08	044-08	030-08	032-08	033-08[1]	077-08	080-08
045-08	061-08[2]	037-08[1]	038-08	039-08	082-08	093-08
063-08	064-08	040-08	041-08	043-08	094-08	095-08
066-08[2]	073-08	046-08	047-08[1]	048-08	096-08	101-08
074-08	084-08[1]	050-08	051-08	054-08	110-08	111-08
092-08[2]	097-08	055-08	058-08	059-08	112-08	115-08
099-08	102-08	062-08[1]	065-08	067-08	117-08	
103-08	104-08	068-08	069-08[1]	070-08		
105-08[1]	107-08	075-08	078-08	079-08[1]		
108-08	109-08	081-08	083-08	085-08		
113-08	114-08	086-08	087-08[1]	088-08		
116-08	118-08	089-08	090-08	091-08		
		098-08	100-08[1]	106-08		

[1] time reduced [2] part of time rated B

Summer 2008 proposal ratings

The IRAM program committee convened in Grenoble on April 14 and 15 to discuss the proposals submitted for the summer 2008 scheduling period. The committee was chaired by Asunción Fuente (OAN, Madrid) and Axel Weiss (MPIfR, Bonn). The principal investigators of each proposal were informed by letter which included comments issued by the committee (if there were any). As usual, the proposals were classified A (accepted), B (backup), and C (rejected).

PdBI Proposals

A total of 84 proposals were received for the interferometer. Proposals rated A will be scheduled in priority. Further time, if it becomes available, will go to the B programs, taking into account scientific merit, crowding in certain right ascension ranges and general aspects of balance.

For proposals rated A or B which do not have an IRAM internal collaborator, please consult the list of local contacts.

30m telescope

We received 118 proposals for the 30m telescope (see alphabetic list), requesting 4068 hours of telescope time. Another 22 hours were requested by 5 interferometer proposals for zero spacing observations. The highest rating "A" was given to 36 proposals; 57 proposals were rated "B", i.e. were given backup status. The remaining proposals, although scientifically valuable in most cases, were rated "C". The individual ratings are listed in the attached table. All A-rated proposals will be scheduled on the telescope, although some with less time than requested. We expect that about half of the B-rated programs will actually be scheduled. The selection will take into account scientific merit, crowding in certain right ascension ranges, and general aspects of balance. Proposals rated "C" will not get telescope time.

The committee accepted more time in "B" than usual in order to facilitate the telescope scheduling during the extensive technical work expected this fall when a completely new set of 8 single pixel heterodyne receivers is planned to be installed and commissioned.

The zero spacing proposals are not listed here. They will be scheduled on the 30m if they get observed at Bure.

Jan Martin WINTERS and Clemens THUM

VLBI News

GMVA session

Both IRAM instruments participated in the Global 3mm session from May 8-13. The favourable Plateau de Bure meteo conditions allowed to observe nearly 100% of the scheduled scans, while Pico Veleta suffered a loss of about 50% due to snow fall.

Some weeks before the Global session, Bure and Pico Veleta conducted a two-station fringe test to verify if the fringe loss problem at Pico Veleta in October 2007 had been solved, and if the rennovated EFOS-10 maser was working fine. The excellent test fringes showed that both observatories were fully operational.

EFOS-38 ballistic tuning

Since its installation in a thermally controlled rack, the EFOS-38 hydrogen maser on the Plateau de Bure is sufficiently stabilized to study its long-term drift in detail. The analysis of more than 5 months of maser-GPS difference logfiles revealed a tiny but regular drift acceleration of 42.6 picosec/day^2, an effect which is expected due to the slow atom-by-atom erosion of the maser resonance cavity wall coating during normal operation.

In a re-tuning of EFOS-38 on August 16th, we have taken this acceleration into account to aim for a minimum maser-GPS drift on Plateau de Bure during the forthcoming October GMVA session.

Michael BREMER

Staff Changes

IRAM Granada

After two years working as a telescope operator, Santiago Navarro junior will leave IRAM and continue his studies. We wish him all the best for his career.

Rainer MAUERSBERGER

IRAM Grenoble

On March 1st, Beatrice MAIRE has taken over the duties as secretary of the administration which were fulfilled before by Edel CLEMENT, who has retired on March 31st. We thank Edel for more than 20 years of service and good work at the institute (she joined IRAM in October 1987), and wish her a happy and active retirement.

On March 10th, Karin ZACHER has started work as press relations officer, to improve the visibility of IRAM activities and achievements.

Anne-Carole LARDEMELLE has started as receptionist on March 17.

On April 21, Laurent PALARIC has joined IRAM as head of the accountancy group.

The receiver group welcomes two new members: Guillaume PERRIN and Fabrice LASLAZ have started work as technicians on July 7th and July 28th, respectively.

In the astronomer's group, Robert LUCAS has left IRAM to work on the commissioning of ALMA antennas in Chile. Robert has been with IRAM Grenoble since the early days of the institute. Besides his astronomical work, he has been for many years a key person for the GILDAS software and the Plateau de Bure data reduction tools.

After pursuing her astronomical career for several years in Germany and the United States, Melanie KRIPS has returned to IRAM Grenoble on August 1st.

Michael BREMER

Scientific Results in Press

The chemical composition of the circumstellar envelopes around yellow hypergiant stars

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Abstract:
Context. The yellow hypergiant stars (YHGs) are extremely luminous and massive objects whose general properties are poorly known. Only two of this kind of star show massive circumstellar envelopes, IRC +10420 and AFGL 2343.
Aims. We aim to study the chemistry of the circumstellar envelopes around these two sources, by comparison with well known AGB stars and protoplanetary nebulae. We also estimate the abundances of the observed molecular species.
Methods. We have performed single-dish observations of different transitions for twelve molecular species. We have compared the ratio of the intensities of the molecular transitions and of the estimated abundances in AFGL2343 and IRC+10420 with those in O-rich and C-rich AGB stars and protoplanetary nebulae.
Results. Both YHGs, AFGL2343, and IRC+10420, have been found to have an O-rich chemistry similar to that in O-rich AGB stars, though for AFGL 2343 the emission of most molecules compared with ^{13}CO lines is relatively weak. Clear differences with the other evolved sources appear when we compare the line intensity corrected for distance and the profile widths which are, respectively, very intense and very wide in YHGs. The abundances obtained for IRC +10420 agree with those found in AGB stars, but in general those found in AFGL 2343, except for ^{13}CO, are too low. This apparently low molecular abundance in AFGL 2343 could be due to the fact that these molecules are present only in an inner region of the shell where the mass is relatively low.

Appeared in: A&A 471, 551

Formaldehyde as a Tracer of Extragalactic Molecular Gas. I. Para-H_2CO Emission from M82

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Abstract:
Using the IRAM 30 m telescope and the 15 m JCMT, we explore the value of paraformaldehyde (p-H_2CO) as a tracer of density and temperature of the molecular gas in external galaxies. The target of our observations are the lobes of the molecular ring around the center of the nearby prototypical starburst galaxy M82. It is shown that p-H_2CO provides one of the rare direct molecular thermometers. Reproducing the measured line intensities with a large velocity gradient (LVG) model, we find densities of $n_{H_2} \sim 7 \times 10^3$ cm^{-3} and kinetic temperatures of $T_{kin} \sim 200$ K. The derived kinetic temperature is significantly higher than the dust temperature or the temperature deduced from ammonia (NH_3) lines, but our results agree well with the properties of the high-excitation component seen in CO. We also present the serendipitous discovery of the $4_2 \rightarrow 3_1$ line of methanol (CH_3OH) in the northeastern lobe, which shows – unlike CO and H_2CO – significantly different line intensities in the two lobes.

Appeared in: ApJ 671, 1579

The structure and chemistry of the massive shell around AFGL 2343: ^{29}SiO and HCN as tracers of high-excitation regions

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Abstract:
The yellow hypergiant stars (YHGs) are very massive objects that are expected to pass through periods of intense mass loss during their evolution. Despite of this,

massive circumstellar envelopes have been found only in two of them, IRC+10420 and AFGL 2343. The envelopes around these objects and the processes that form them are poorly known. We aim to study the structure, dynamics and chemistry of the envelope around AFGL 2343. We have obtained interferometric maps of the rotational lines ^{29}SiO $J = 2 - 1$, HCN $J = 1 - 0$ and SO $J_K = 2_2 - 1_1$ towards AFGL 2343. We have used an LVG excitation model to analyze the new observations and some previously published line profiles of AFGL 2343. The analysis of the observational data and the fitting results show the presence of a thin, hot and dense component within the previously identified CO shell. This component can be associated with recently shocked gas, but it could also be due to a phase of extremely copious mass loss. We suggest that this shell is the responsible for the whole ^{29}SiO emission and significantly contributes to the HCN emission. The presence of such a dense shell rich in SiO can be related with that previously found for IRC+10420, which was also suggested to result from a shock. This may be a common feature in the evolution of these stars, as a consequence of the episodic mass loss periods that they pass during their evolution. We present new results for the mass loss pattern, the total mass of the circumstellar envelope and the molecular abundances of some species in AFGL 2343.

Accepted for publication in A&A

CN in prestellar cores

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Abstract:
Context. Determining the structure of and the velocity field in prestellar cores is essential to understanding protostellar evolution.
Aims. We have observed the dense prestellar cores L 1544 and L 183 in the $N = 1 \rightarrow 0$ rotational transition of CN and ^{13}CN in order to test whether CN is depleted in the highdensity nuclei of these cores.
Methods. We have used the IRAM 30 m telescope to observe along the major and minor axes of these cores. We compare these observations with the 1 mm dust emission, which serves as a proxy for the hydrogen column density.
Results. We find that while CN$(1 - 0)$ is optically thick, the distribution of ^{13}CN$(1 - 0)$ intensity follows the dust emission well, implying that the CN abundance does not vary greatly with density. We derive an abundance ratio of $[CN]/[H2] = 10^{-9}$ in L 183 and $1 - 3 \times 10^{-9}$ in L 1544, which, in the case of L 183, is similar to previous estimates obtained by sampling lower-density regions of the core.
Conclusions. We conclude that CN is not depleted towards the high-density peaks of these cores and thus behaves like the N-containing molecules N_2H^+ and NH_3. CN is, to our knowledge, the first C-containing molecule to exhibit this characteristic.

Appeared in A&A 480, L5

Dissipative structures of diffuse molecular gas III. Small-scale intermittency of intense velocity-shears

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Abstract:
Aims. We further characterize the structures tentatively identified on thermal and chemical grounds as the sites of dissipation of turbulence in molecular clouds (Papers I and II).
Methods. Our study is based on two-point statistics of line centroid velocities (CV), computed from three large ^{12}CO maps of two fields. We build the probability density functions (PDF) of the CO line centroid velocity increments (CVI) over lags varying by an order of magnitude. Structure functions of the line CV are computed up to the 6th order.We compare these statistical properties in two translucent parsec-scale fields embedded in different large-scale environments, one far from virial balance and the other virialized. We also address their scale dependence in the former, more turbulent, field.
Results. The statistical properties of the line CV bear the three signatures of intermittency in a turbulent velocity field: (1) the non- Gaussian tails in the CVI PDF grow as the lag decreases, (2) the departure from Kolmogorov scaling of the high-order structure functions is more pronounced in the more turbulent field, (3) the positions contributing to the CVI PDF tails delineate narrow filamentary structures (thickness ~ 0.02 pc), uncorrelated to dense gas structures and spatially coherent with thicker ones (~ 0.18 pc) observed on larger scales. We show that the largest CVI trace sharp variations of the extreme CO linewings and that they actually capture properties of the underlying velocity field, uncontaminated by density fluctuations. The confrontation with theoretical predictions leads us to identify these small-scale filamentary structures with extrema of velocity-shears. We estimate that viscous dissipation at the 0.02 pc-scale *in these structures* is up to 10 times higher than average, consistent with

their being associated with gas warmer than the bulk. Last, their average direction is parallel (or close) to that of the local magnetic field projection.
Conclusions. Turbulence in these translucent fields exhibits the statistical and structural signatures of small-scale and inertial-range intermittency. The more turbulent field on the 30 pc-scale is also the more intermittent on small scales. The small-scale intermittent structures coincide with those formerly identified as sites of enhanced dissipation. They are organized into parsec-scale coherent structures, coupling a broad range of scales.

Appeared in: A&A 481,367

Dust-driven winds and mass loss of C-rich AGB stars with subsolar metallicities

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Abstract:
Aims. We investigate the mass loss of highly evolved, low- and intermediate mass stars and stellar samples with subsolar metallicity. We give a qualitative as well as quantitative description which can be applied to LMC/SMC-type stellar populations.
Methods. For that purpose we apply the same approach as we did for solar metallicity stars and calculate hydrodynamical wind models including dust formation with LMC and SMC abundances under consideration of an adapted model assumption. In particular, we improved the treatment of the radiative transfer problem in order to accommodate larger non-local contributions occurring with smaller opacities. For each wind model we determine an averaged mass-loss rate. The resulting, approximate mass-loss formulae are then applied to well-tested and calibrated stellar evolution calculations in order to quantify the stellar mass loss.
Results. The dynamical models for LMC and SMC metallicity result in mass-loss rates of the same order of magnitude as the solar metallicity models which is in this basic approach in agreement with observations. The hydrodynamical properties like e.g. the outflow velocity differ (for fixed C/O abundance ratio) noticeably, though. While critical luminosities of LMC and solar metallicity models fairly coincide, the SMC models need higher luminosities to develop dust-driven winds.

Appeared in: A&A 486, 497

XPOL - the Correlation Polarimeter at the IRAM 30-m Telescope

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Abstract:
XPOL, the first correlation polarimeter at a large-millimeter telescope, uses a flexible digital correlator to measure all four Stokes parameters simultaneously, i.e., the total power I, the linear polarization components Q and U, and the circular polarization V. The versatility of the back end provides adequate bandwidth for efficient continuum observations as well as sufficient spectral resolution (40 kHz) for observations of narrow lines. We demonstrate that the polarimetry-specific calibrations are handled with sufficient precision, in particular the relative phase between the Observatory's two orthogonally linearly polarized receivers. The many facets of instrumental polarization are studied at 3 mm wavelength in all Stokes parameters: on-axis with point sources and off-axis with beam maps. Stokes Q, which is measured as the power difference between the receivers, is affected by instrumental polarization at the 1.5% level. Stokes U and V, which are measured as cross-correlations, are very minimally affected (maximum sidelobes 0.6% [U] and 0.3% [V]). These levels critically depend on the precision of the receiver alignment. They reach these minimum levels set by small ellipticities of the feed horns when alignment is optimum ($\leq 0\farcs3$). A second critical prerequisite for low polarization sidelobes turned out to be the correct orientation of the polarization splitter grid. Its cross-polarization properties are modeled in detail. XPOL observations are therefore limited only by receiver noise in Stokes U and V even for extended sources. Systematic effects set in at the 1.5% level in observations of Stokes Q. With proper precautions, this limitation can be overcome for point sources. Stokes Q observations of extended sources are the most difficult with XPOL.

Appeared in PASP 120, 777

NRAO 150: A Recently Identified Quasar Revealing Extreme Non-Ballistic Motion

Agudo I., Bach U., Krichbaum T. P., Marscher A. P., Gonidakis I., Diamond P.J., Alef W., Graham D., Witzel A., Zensus J.A., Bremer M., Acosta-Pulido J.A., Barrena, R.

Abstract:
NRAO 150 - a compact and bright radio to mm source showing core/jet structure - has been recently identified as a quasar at redshift 1.52 through a near-IR spectral observation. To compute quantitative estimates of the basic physical properties of the jet in the source, we have

analysed the ultra-high-resolution images from a new sub-milliarcsecond-scale monitoring program of its structure at 86 GHz and 43 GHz with the GMVA and the VLBA, respectively. An additional archival and calibration 43 GHz-VLBA data set, covering from 1997 to 2007, has been used. Our data shows an extreme projected counter-clockwise jet swing of up to $\sim 11°/\text{yr}$ within the inner ~ 61 pc of the jet, which is associated with a non-ballistic superluminal motion of the jet within this region. We argue that the magnetic field might play an important role in the dynamics of the jet in NRAO 150, which is supported by the large values of the magnetic field strength obtained from our first estimates. The extreme characteristics of the jet swing make NRAO 150 a prime source to study the jet wobbling phenomenon.

Appeared in: ASPC 386, 249

A Global 86 GHZ VLBI Survey of Compact Radio Sources

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Abstract:
We present results from a large 86 GHz global very long baseline interferometry (VLBI) survey of compact radio sources. The main goal of the survey is to increase by factors of $3-5$ the total number of objects accessible for future 3 mm VLBI imaging. The survey observations reach a baseline sensitivity of 0.1 Jy and an image sensitivity of better than 10 mJy beam^{-1}. A total of 127 compact radio sources have been observed. The observations have yielded images for 109 sources, extending the database of the sources imaged at 86 GHz with VLBI observation by a factor of 5, and only six sources have not been detected. The remaining 12 objects have been detected but could not be imaged due to insufficient closure phase information. Radio galaxies are less compact than quasars and BL Lac objects on the sub-milliarcsecond scale. The flux densities and sizes of the core and jet components of all imaged sources have been estimated using Gaussian model fitting. From these measurements, brightness temperatures have been calculated, taking into account the resolution limits of the data. The cores of 70% of the imaged sources are resolved. The core brightness temperatures of the sources peak at $\sim 10^{11}$ K and only 1% have brightness temperatures higher than 10^{12} K. The cores of intraday variable (IDV) sources are smaller in angular size than those of non-IDV sources, and so yield higher brightness temperatures.

Appeared in : Astronomical Journal 136, 159

Molecular Gas in NUclei of GAlaxies (NUGA). IX. The decoupled bars and gas inflow in NGC 2782

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Abstract:
We present $CO(1-0)$ and $CO(2-1)$ maps of the starburst/Seyfert 1 galaxy NGC 2782 obtained with the IRAM interferometer, at $2''.1\times1''.5$ and $0''.7\times0''.6$ resolution respectively. The CO emission is aligned along the stellar nuclear bar of radius ~ 1 kpc, configured in an elongated structure with two spiral arms at high pitch angle $\sim 90°$. At the extremity of the nuclear bar, the CO changes direction to trace two more extended spiral features at a lower pitch angle. These are the beginning of two straight dust lanes, which are aligned parallel to an oval distortion, reminiscent of a primary bar, almost perpendicular to the nuclear one. The two embedded bars appear in Spitzer IRAC near-infrared images, and HST color images, although highly obscured by dust in the latter. We compute the torques exerted by the stellar bars on the gas, and find systematically negative average torques down to the resolution limit of the images, providing evidence of gas inflow tantalizingly close to the nucleus of NGC 2782. We propose a dynamical scenario based on numerical simulations to interpret coherently the radio, optical, and molecular gas features in the center of the galaxy. Star formation is occurring in a partial ring at ~ 1.3 kpc radius corresponding to the Inner Lindblad Resonance (ILR) of the primary bar; this ring-like structure encircles the nuclear bar, and is studded with Hα emission. The gas traced by CO emission is driven inward by the gravity torques of the decoupled nuclear bar, since most of it is inside its corotation. N-body simulations, including gas dissipation, predict the secondary bar decoupling, the formation of the elongated ring at the ~ 1 kpc-radius ILR of the primary bar, and the gas inflow to the ILR of the nuclear bar at a radius of $\sim 200-300$ pc. The presence of molecular

gas inside the ILR of the primary bar, transported by a second nuclear bar, is a potential "smoking gun"; the gas there is certainly fueling the central starburst, and in a second step could fuel directly the AGN.

Appeared in: A&A 482, 133

A Multi-transition HCN and HCO+ Study of 12 Nearby Active Galaxies: Active Galactic Nucleus versus Starburst Environments

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Abstract:
Recent studies have indicated that the HCN - to - CO($J = 1-0$) and HCO$^+$ - to - HCN($J = 1-0$) ratios are significantly different between galaxies with AGN (active galactic nucleus) and SB (starburst) signatures. In order to study the molecular gas properties in active galaxies and search for differences between AGN and SB environments, we observed the HCN($J = 1-0$), ($J = 2-1$), ($J = 3-2$), HCO$^+$($J = 1-0$), and HCO$^+$($J = 3-2$) emission with the IRAM 30 m in the center of 12 nearby active galaxies which either exhibit nuclear SB and/or AGN signatures. Consistent with previous results, we find a significant difference of the HCN($J = 2-1$)- to- HCN($J = 1-0$), HCN($J = 3-2$)- to- HCN($J = 1-0$), HCO$^+$($J = 3-2$)- to –HCO$^+$($J = 1-0$), and HCO$^+$- to - HCN intensity ratios between the sources dominated by an AGN and those with an additional or pure central SB: the HCN, HCO$^+$, and HCO$^+$ - to - HCN intensity ratios tend to be higher in the galaxies of our sample with a central SB as opposed to the pure AGN cases, which show rather low intensity ratios. Based on an LVG analysis of these data, i.e., assuming purely collisional excitation, the (average) molecular gas densities in the SB-dominated sources of our sample seem to be systematically higher than in the AGN sources. The LVG analysis seems to further support systematically higher HCN and/or lower HCO$^+$ abundances as well as similar or higher gas temperatures in AGNs compared to the SB sources of our sample. In addition, we find that the HCN- to- CO ratios decrease with increasing rotational number J for the AGNs while they stay mostly constant for the SB sources.

Appeared in: ApJ 677, 262

Submillimeter Galaxies at $z \sim 2$: Evidence for Major Mergers and Constraints on Lifetimes, IMF, and CO-H_2 Conversion Factor

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Abstract:
We report subarcsecond resolution IRAM PdBI millimeter CO interferometry of four $z \sim 2$ submillimeter galaxies (SMGs), and sensitive CO($3-2$) flux limits toward three $z \sim 2$ UV/optically selected star-forming galaxies. The new data reveal for the first time spatially resolved CO gas kinematics in the observed SMGs. Two of the SMGs show double or multiple morphologies, with complex, disturbed gas motions. The other two SMGs exhibit CO velocity gradients of ~ 500 km s^{-1} across $\leq 0''.2$ (1.6 kpc) diameter regions, suggesting that the star-forming gas is in compact, rotating disks. Our data provide compelling evidence that these SMGs represent extreme, short-lived "maximum" star-forming events in highly dissipative mergers of gas-rich galaxies. The resulting high-mass surface and volume densities of SMGs are similar to those of compact quiescent galaxies in the same redshift range and much higher than those in local spheroids. From the ratio of the comoving volume densities of SMGs and quiescent galaxies in the same mass

and redshift ranges, and from the comparison of gas exhaustion timescales and stellar ages, we estimate that the SMG phase duration is about 100 Myr. Our analysis of SMGs and optically/UV selected high-redshift star-forming galaxies supports a "universal" Chabrier IMF as being valid over the star-forming history of these galaxies. We find that the ^{12}CO luminosity to total gas mass conversion factors at $z \sim 2-3$ are probably similar to those assumed at $z \sim 0$. The implied gas fractions in our sample galaxies range from 20% to 50%.

Appeared in ApJ 680, 246

Testing the evolutionary link between submillimetre galaxies and quasars: CO observations of QSOs at $z \sim 2$

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Abstract:
We have used the IRAM Plateau de Bure millimetre interferometer and the UKIRT $1-5\mu$m Imager Spectrometer (UIST) to test the connection between the major phases of spheroid growth and nuclear accretion by mapping CO emission in nine submillimetre-detected QSOs at $z = 1.7-2.6$ with black hole (BH) masses derived from near-infrared spectroscopy. When combined with one QSO obtained from the literature, we present sensitive CO$(3-2)$ or CO$(2-1)$ observations of 10 submillimetre-detected QSOs selected at the epoch of peak activity in both QSOs and submillimetre (submm) galaxies (SMGs). CO is detected in 5/6 very optically luminous ($M_B \sim -28$) submm-detected QSOs with BH masses $M_{BH} \simeq 10^9-10^{10}M_\odot$, confirming the presence of large gas reservoirs of $M_{gas} \simeq 3.4 \times 10^{10}M_\odot$. Our BH masses and dynamical mass constraints on the host spheroids suggest, at face value, that these optically luminous QSOs at $z = 2$ lie about an order of magnitude above the local BH - spheroid relation, M_{BH}/M_{sph}, although this result is dependent on the size and inclination of the CO-emitting region. However, we find that their BH masses are ~ 30 times too large and their surface density is ~ 300 times too small to be related to typical SMGs in an evolutionary sequence. Conversely, we measure weaker CO emission in four fainter ($M_B \sim -25$) submm-detected QSOs with properties, BH masses ($M_{BH} \simeq 5 \times 10^8M_\odot$), and surface densities similar to SMGs. These QSOs appear to lie near the local M_{BH}/M_{sph} relation, making them plausible "transition objects" in the proposed evolutionary sequence linking QSOs to the formation of massive young galaxies and BHs at high redshift. We show that SMGs have a higher incidence of bimodal CO line profiles than seen in our QSO sample, which we interpret as an effect of their relative inclinations, with the QSOs seen more face-on. Finally, we find that the gas masses of the four fainter submm-detected QSOs imply that their star formation episodes could be sustained for ~ 10 Myr, and are consistent with representing a phase in the formation of massive galaxies which overlaps a preceding SMG starburst phase, before subsequently evolving into a population of present-day massive ellipticals.

Appeared in: MNRAS 389, 45

The Dusty Disk around VV Serpens

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Abstract:
We have carried out observations at millimeter and centimeter wavelengths toward VV Ser using the Plateau de Bure Interferometer and the Very Large Array. This allows us to compute the SED from near infrared to centimeter wavelengths. The modeling of the full SED has provided insight into the dust properties and a more accurate value of the disk mass. The mass of dust in the disk around VV Ser is found to be about 4×10^{-5}M$_\odot$, i.e., 400 times larger than previous estimates. Moreover, the SED can only be accounted for assuming dust stratification in the vertical direction across the disk. The existence of small grains ($0.25-1\mu$m) in the disk surface is required to explain the emission at near- and mid-infrared wavelengths. The fluxes measured at millimeter wavelengths imply that the dust grains in the midplane have grown up to very large sizes, at least to some centimeters.

Appeared in: ApJ 680, 1289

Tentative detection of phosphine in IRC +10216

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Abstract:
Aims. The $J_K = 1_0 - 0_0$ rotational transition of phosphine (PH_3) at 267 GHz has been tentatively identified with a $T_{MB} \sim 40$ mK spectral line observed with the IRAM 30-m telescope in the C-star envelope IRC +10216.
Methods. A radiative transfer model was used to fit the observed line profile.
Results. The derived PH3 abundance relative to H_2 is 6×10^{-9}, although it may have a large uncertainty due to the lack of knowledge about the spatial distribution of this species. If our identification is correct, it implies that PH_3 has a similar abundance to what is reported for HCP in this source and that these two molecules (HCP and PH_3) together take up about 5% of phosphorus in IRC +10216. The abundance of PH_3, like that of other hydrides in this source, is not well explained by conventional gas-phase LTE and non-LTE chemical models, and may imply formation on grain surfaces.

Appeared in A&A 485, L33

Observations of CO in the eastern filaments of NGC1275

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Abstract:
We recently found extended $CO(2-1)$ emission from cold molecular gas embedded in the network of Hα filaments surrounding the galaxy NGC 1275 (Salome et al. 2006). We now present $CO(2-1)$ interferometer maps of the eastern filaments, at high spatial and spectral resolutions. The cold molecular gas is detected by the Plateau de Bure Interferometer along the eastern filaments over an extent of 15″, or with a projected length of 5 kpc. In our 2″.5 beam, the main CO filament is mostly unresolved along its minor axis. The multiple peaks along the CO filaments and the low values of the observed CO brightness temperatures imply further unresolved structures that may be giant molecular clouds. These clouds have very narrow linewidth emission lines (~ 30 km s^{-1}). The CO emission is optically thick. It very likely traces cold clouds bound under their own self-gravity that may be falling back in the gravitational potential well of the galaxy. Such a picture would agree with current models of "positive feedback" in which some of the hot gas around NGC1275 (a) is trapped by buoyantly rising bubbles inflated by the energy input of the 3C 84 AGN, (b) subsequently cools efficiently at a larger radius around the edges of the hot bubbles, and (c) then falls back in self-gravitating clouds of molecular gas toward the center of the galaxy.

Appeared in: A&A 383, 793

Cold gas in the Perseus cluster core: excitation of molecular gas in filaments

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Abstract:
We have recently detected CO lines in the well-known filaments around NGC 1275, the galaxy at the centre of the Perseus cluster of galaxies. These previous observations, with the HERA multi-beam array at the IRAM 30 m telescope enabled us to make a large map of the $CO(2-1)$ line and to see hints of molecular gas far away from the cluster centre. To confirm the presence of CO emission lines in the outer filaments and to study the $CO(2-1)/CO(1-0)$ line ratio, we observed seven regions of interest again with the 30 m telescope in both $CO(1-0)$ and $CO(2-1)$. The regions we observed were: the eastern filament, the horseshoe, the northern filament and a southern extension, all selected from Hα emission line mapping. Molecular gas is detected in all the observed regions. This result confirms the large extent of the cold molecular gas filaments. We discuss the $CO(2-1)/CO(1-0)$ ratios in the filaments. The eastern filament has optically thick gas, whereas further away, the line ratio increases close to values expected for a warmer optically thin medium. We also show $CO(1-0)$ and $CO(2-1)$ lines in 9 regions closer to the centre. The kinematics of the CO is studied here in more detail and confirms that it follows the motions of the warm H_2 gas found in the near-infrared. Finally, we searched for dense gas tracers around 3C 84 and claim here the first detection of $HCN(3-2)$.

Appeared in A&A 484, 317

IRAM Astronomy Postdoctoral Position in Granada, Spain

Institut de Radio Astronomie Millimétrique
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Email submission and inquiries: cox@iram.fr
Pierre Cox, Director

Posting date: August 2008
Closing date: September 20, 2008

Applications are invited for a post-doctoral astronomer at IRAM Granada/Spain, starting as soon as possible.

IRAM is an international research organisation for millimeter/submillimeter astronomy supported by the CNRS (France), the Max-Planck Gesellschaft (Germany) and the IGN (Spain). IRAM operates two of the largest and most technologically advanced instruments in the world, a 30-meter single-dish telescope located 50 km from Granada in the Sierra Nevada at an altitude of 2900 m, and an interferometer of six 15-meter antennas located at Plateau de Bure in the French Alps near Grenoble.

We are seeking for candidates with a PhD in astronomy and preferably demonstrated observational experience with millimeter / submillimeter astronomical facilities using bolometers and heterodyne receivers. Knowledge in some areas related to software or hardware of a millimeter telescope is of advantage. The successful candidate is expected to participate in the astronomical operations of the 30m and to conduct his own research objectives, also in collaboration with IRAM astronomers and/or outside groups. Priority will be given to candidates whose interests cover current areas of research at IRAM.

The successful candidate will be expected to contribute 50% of the time to

- play a leading role in programming and managing pooled observations, in particular those done using the bolometer camera, and the associated data bases and web pages. Knowledge of MySQL data base programming using Python or PHP is an asset.
- participation in the astronomer-on-duty service.Staff astronomers typically spend about one week every two months at the observatory aiding visiting astronomers to conduct the observations and providing expertise in the analysis and interpretation of 30m data.

The appointment is initially for two years with the possibility of extension, and could start as early as October 1st, 2008. To apply, please send curriculum vitae, bibliography, and statement of research interests, and arrange for three letters of reference. Applications should be submitted no later than September 20, 2008 for full consideration.

Carsten KRAMER

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

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