iram

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

Newsletter

Number 70 February 21st, 2008

Contents

Calendar

March 13th, 2008 17:00h CET (UT+1 hour):
Deadline for the submission of IRAM observing proposals for the period from May 31, 2008 to December 1, 2008.

April 28/29, 2008:
Scientific Advisory Committee meeting in Grenoble.

Director's Note

The past year has been very productive at IRAM and we are pleased to announce two major achievements.

The New Generation Receivers operating at 2 mm was installed successfully at the end of 2007. The performances of these dual polarization, 4 GHz bandwidth receivers are excellent with SSB receiver temperatures of $30-40$ K over most of the frequency range (129 to 174 GHz). This opens the Plateau de Bure Interferometer to a new frequency window and allows observations at high spatial resolution in the 2 mm band, including the relatively unexplored $153-174$ GHz frequency range. In addition, the 1 mm receivers were upgraded with new triplers that extend the high frequency range to 267 GHz. Two results obtained during the commissioning of the 2 mm receivers and with the upgraded 1 mm receivers are presented later in this Newsletter, demonstrating what can be achieved using these new capabilities.

The next steps will be to equip all Plateau de Bure antennas with 350 GHz receivers and install a new broadband correlator (WIDEX), which will be available in early 2009. These upgrades will make the Plateau de Bure interferometer the world-leading facility of its kind and enable to conduct new scientific projects. The increased sensitivity of the receivers allows the detection of many weak lines in a single track, and the continuum detection of several source types so far considered weak (such as protoplanetary disks) in less than one track, enabling survey type studies at the interferometer.

On December 3rd, 2007, ESO and IRAM signed the Band 7 Cartridge production contract for 48 units. This is an important milestone for the overall ALMA project. During the pre-production contract, IRAM already delivered eight receivers with outstanding performances. The production contract includes the fabrication, assembly, test, and delivery of 48 field-replaceable front-end modules for the ALMA Band 7, covering $275-373$ GHz. The production team at IRAM, together with the ALMA Front End IPT, will do its best for this ambitious and challenging undertaking.

In 2008, a major upgrade is planned at the 30-meter telescope with the installation of a new series of dual polarization 4 GHz bandwidth receivers operating at 3, 2, 1, and 0.8 mm. The installation of these new receivers, which is planned for this fall, will provide a boost in sensitivity and observing capabilities at the 30-meter for the winter 2008/2009.

Finally, the weather conditions on the Plateau de Bure as of mid-February are exceptionally good and most of the numerous observing programs that requested the extended baseline configurations have now been completed.

Pierre COX

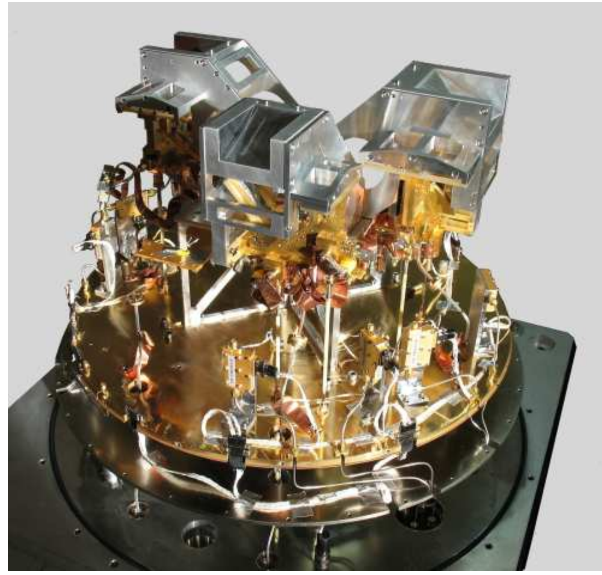

Figure 1: The cryostat interior of one of the heterodyne receivers installed in the cabins of the six Plateau de Bure antennas. All six receiver units are currently equipped with dual polarization mixers with an IF bandwidth of 4 GHz for operation in the $80-116$ GHz (3 mm band), $129-174$ GHz (2 mm band) and $201-267$ GHz (1.3 mm band). Work is underway to equip the units with a 0.8 mm RF channel. The channels are optically coupled to the antenna by reflection off two aluminium mirrors (the 2 mm band mirrors are at the top left, the 3 mm band mirrors at the top right). The corresponding beams are laterally displaced ($\sim 180''$ on the sky) from the radio axis of the antenna. The photo is courtesy of B.Pissard (IRAM).

The Plateau de Bure Interferometer: Gazing At New Spectral Horizons

We are pleased to announce first light in the frequency bands 129[1]–174 GHz (Band 2) and $250-267$ GHz (extended Band 3) with the Plateau de Bure interferometer. The two additional RF bands of the new generation receivers (Fig. 1) are now available for astronomical research.

First fringes were observed at 146 GHz with the six-element array on December 15, 2007 towards the high mass star forming region W3(OH) (Fig. 2). By opening Band 2 to astronomical research, the interferometer provides for the first time the opportunity to observe in the $153-174$ GHz frequency window, and this with excellent sensitivity, as apparent from the noise performance of Band 2 (Fig. 3).

Not much later, another milestone was reached. On January 07, 2008, the Plateau de Bure interferometer detected first fringes at 267 GHz on the circumbinary ring

[1] center of the 4 GHz wide passband.

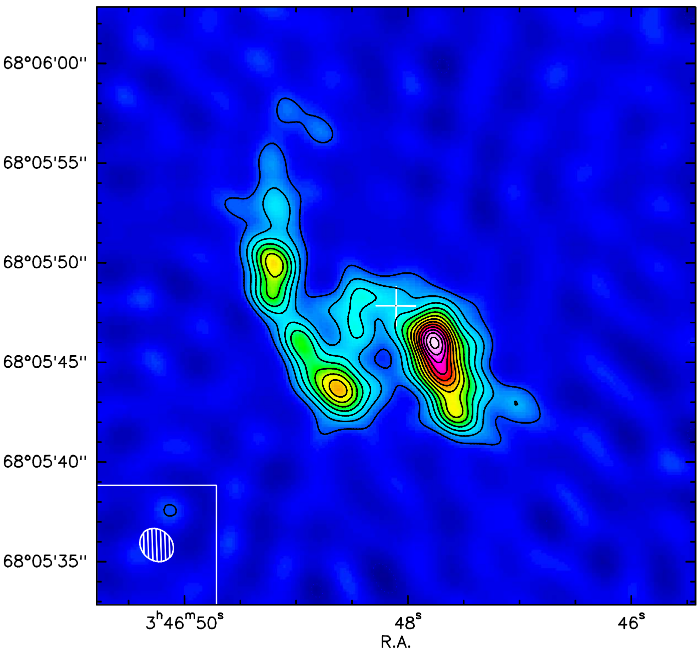

Figure 2: PdBI first light observations in the continuum at 145 GHz (Band 2) towards the center of IC342. The map at 2 mm shows the free-free radiation from ionized gas and dust emission in the mini-spiral at the center of this galaxy. Located at 1.8 Mpc, IC342 is a nearby galaxy of the northern sky and can be studied in great detail with an instrument such as the PdBI. These observations were made in configuration C in the nights of Dec 28 and Dec 31, 2007. The inset at the lower left shows the synthesized beam ($\sim 1.''7$). The image is courtesy of N.Rodriguez (IRAM).

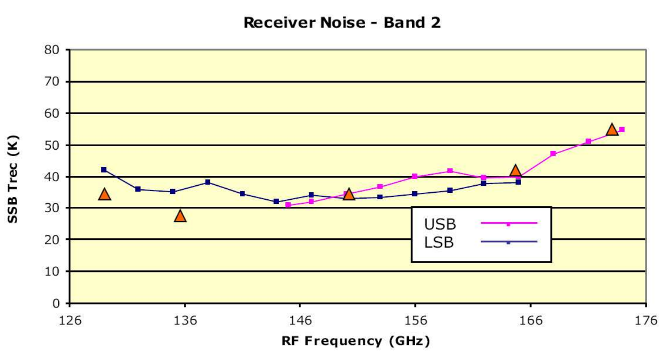

Figure 3: Median noise performance for the 12 mixers (six antennas, dual polarization) of the recently installed 2 mm band. The laboratory data for LSB and USB tuning, and first on-telescope receiver noise data (triangles) are plotted as a function of sky frequency. The data are courtesy of J-Y. Chenu and A. Castro-Carrizo (IRAM).

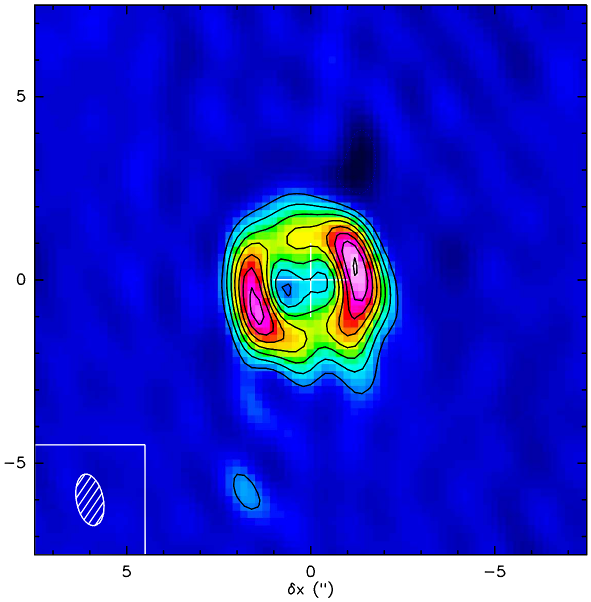

Figure 4: First interferometric observations at 267 GHz (Band 3) of the thermal dust emission in the ring surrounding GG Tau, a young binary system in Taurus. The deprojected map of GG Tau ($i = 37°$) shows a ring with an inner and outer radius of $\sim 1.''3$ and $\sim 1.''9$, and is in excellent agreement with earlier measurements at 220 GHz by Guilloteau et al. (1999). The data presented here were observed in the nights of Jan 7 and Jan 20, 2008, in the C-configuration and in a subarray of the PdBI. The figure is courtesy of V. Piétu (IRAM).

in the well-known T Tauri star GG Tau (Fig. 4). The very good sensitivity of Band 3 ($201 - 267$ GHz with a median SSB Trec of 70 K at 267 GHz) and the extended frequency coverage result from two major modifications: an improved noise performance of the IF amplifier circuitry and the transition to a new generation of frequency multipliers in the LO system. The enhanced capabilities of the PdBI receivers are particularly gratifying as they are likely to trigger a flood of exciting observations e.g. in the line transitions of $HCO^+(3-2)$ and $HCN(3-2)$, in the Milky Way and in nearby galaxies.

The analysis of recent test data, and of the few science programs that we have already observed, demonstrate the potential and the new capabilities of the Plateau de Bure interferometer at 2 mm and 1.1 mm, indicating that the performance goals were largely achieved in both frequency bands. The early results of two science demonstration programs are shown in Figure 2 and 4. They illustrate the good performance of the new system. These achievements are the result of years of work of the receiver group, the mechanical construction and workshop group, the SIS group, the computer group, the scientific software group, the science operation group and the telescope operators.

We are now on the way to reach the next two milestones: **(1)** complete the construction of WideX, a broadband correlator with 4 GHz frequency coverage in each polarization and a channel spacing of 2 MHz and **(2)**

Figure 5: Conference photo of the 2007 IRAM Observing School in Pradollano, Spain.

equip the cryostats with Band 4 for operations in the 277 – 371 GHz band. Both projects are progressing well, and we are confident to bring them to first light in 2009.

In closing, we would like to invite you to submit projects for the new bands at the March 13, 2008 deadline, and look forward to a year of smooth operations and exciting science results with the new capabilities of the Plateau de Bure array.

Roberto NERI

IRAM Observing school breaks record in national diversity

The 2007 IRAM Observing School, which was held between September 28th and October 5th in Pradollano broke an IRAM internal record in national diversity: The 45 participants of this event came from 21 different nationalities (Fig. 5). This shows the increasing awareness of mm-astronomy, which is due to the scientific capabilities of present instruments but also future observatories such as ALMA.

The students of the school participated in a series of lectures on mm-astronomy and its synergy with FIR astronomy, in tutorials and in observing small projects with the 30-m telescope. Highlight talks about the HERSCHEL observatory and ALMA were presented by Jesús Martín-Pintado from the IEM/CSIC (Madrid) and by Alison Peck, ALMA deputy project scientist, who had been a student at the first Observing School in Spain in 2001.

Since the lectures and also the result of the group work might be useful to students who could not participate, we have put them on our web: http://wwww.iram.fr/-IRAMES/events/summerschool2007/program.html

Rainer MAUERSBERGER

Sixth IRAM Millimeter Interferometry School – First Announcement

IRAM will organize this year its sixth millimeter-interferometry school. These schools are organized every two years since 1998. The school will take place at the

IRAM headquarters (Grenoble, France) on **October 6–10th, 2008**. It is intended for PhD students, post-docs and scientists who want to acquire a good knowledge of interferometry and data reduction techniques at millimeter wavelengths. The programme includes lectures on:

– fundamentals of millimeter interferometry
– atmopheric phase correction
– data calibration and imaging techniques
– the IRAM Plateau de Bure interferometer (PdBI)
– the Atacama Large Millimeter Array (ALMA)

Tutorials will also be organized to help participants to become familiar with the reduction of PdBI data.

This event is supported by RadioNet and is part of the activities of the ALMA Regional Center (ARC) node hosted by IRAM. Registration is free of charge but the school can accept only up to 60 participants. A limited budget will be available for travel support. The school web page –including the registation form– is available at:

http://www.iram.fr/IRAMFR/IS/school.htm

Please contact IRAM scientific secretary (Cathy Berjaud and Fabienne Schicke, berjaud@iram.fr) for any inquiries.

Frédéric GUETH

Proposals for IRAM Telescopes

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

March 13th, 2008 17:00h CET (UT+1 hour)

The scheduling period extends from May 31, 2008 to December 1, 2008. 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. To avoid the allocation of several numbers for the same proposal, send in your proposal *only once*. 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. Proposals should *not exceed these 5 pages* of scientific material. Except for the technical pages for the interferometer, longer proposals will be cut.

The cover page, in postscript or in LaTeX format, and the LaTeX style file `proposal.sty` may be obtained from the IRAM web pages[2] 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 **zero spacing observations** have been simplified. If the need for complementary 30m observations is evident already at the time when the PdB interferometer proposal is prepared, just note this need on the interferometer proposal. A separate proposal for the 30m

[2] 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.

telescope is not required. The blank form for interferometer proposals contains a bullet, labelled "zero spacing" which should then be checked. The interferometer style file will prompt for an additional paragraph in which the scientific need for the zero 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. A link to this mailing list is on the IRAM web page. The list presently contains all users of IRAM telescopes during the last 2 years. Please check that your email address in this list is correct, and point out the existence of this list to interested colleagues.

Jan Martin WINTERS & Clemens THUM

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`.

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.

Roberto NERI & Clemens THUM

Call for Observing Proposals on the 30m Telescope

Summary

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

1. the observatory's set of four dual polarization heterodyne receivers centered at wavelengths of 3, 2, 1.3, and 1.1 mm.
2. the 9 pixel 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 longer wavelengths. About 2100 hours of observing time will be available, considerably less than in previous summer semesters (see below).

The main news relevant for the coming summer 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?

The construction of the next generation heterodyne receivers for Pico Veleta (NGPV) is progressing well. Based on a recent in–depth evaluation, the installation is foreseen later this year. The arrival of the NGPV receiver implies a profound refurbishment of the Nasmyth cabin. Installation and commissioning of the NGPV receiver will take 4 weeks. The Nasmyth cabin optics and the other receivers, HERA and the bolometers, are not affected at this stage.

An effort was made with the NGPV receiver to keep the scientifically very interesting frequency range below 83 GHz. Due to uncertainties associated with local oscillator procurement, it is presently not clear how much of this range can be made available when operation with the NGPV receiver starts. We therefore recommend to astronomers to propose urgent low frequency programs now.

The telescope's new control system is by now well worn in and globally performs as well as the old control system. A host of new features are planned to be introduced this summer (see the NCS web site).

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.

The **full Call for Proposals** is available on the IRAM web site.

Clemens THUM & Rainer MAUERSBERGER

News from the Plateau de Bure Interferometer

System upgrades

During the last few month, all Bure antennas were equipped with dual polarization receivers operating in the 2 mm band from 129 GHz to 174 GHz (see also the contribution by Roberto Neri in this Newsletter). At the same time, the 1.3 mm receivers were upgraded with new triplers that now allow to observe up to a frequency of 267 GHz.

These upgrades came along with a complete exchange of the computer system on Plateau de Bure (real-time system, antenna control computers, ...) where the former HPUX and OS9 systems were replaced by 64-bit CPUs operated under LINUX. This hardware upgrade also required major modifications of the corresponding antenna control and data acquisition software in the real-time system. After some initial debugging, regular observing was resumed in December.

The new 2 mm receivers and the extended tuning range of the 1 mm band were successfully tested and commissioned during the Christmas period, the new frequency windows are offered to the community in the following Call for proposals.

Weather conditions and observing

The current winter semester has been suffering from extremely poor weather conditions until mid-February and only quite a limited number of 1 mm projects could be finished by now. We moved the array into its C-configuration on November 4 and switched to the A configuration (that provides baselines up to 760m) on January 28.

Fortunately, the weather improved in mid-February so that most of the A-rated projects requesting the A-configuration could be observed by now.

It is planned to move to the B configuration around end of February and again to the C configuration by end of March. The switch back to the most compact configuration D is foreseen before the end of April. According to these plans, it will not be possible to complete projects requesting deep integrations using the compact configurations before the end of the current observing period.

As far as A-rated projects are concerned, we still hope to bring many of these to completion before the end of the current winter 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 which are not started before the end of the winter period have to be resubmitted.

Global VLBI observations, which include the array in the 3 mm phased-array mode, are planned from May 8 to 13, 2008.

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

Conditions for the next summer period

As every year, we plan to carry out extensive technical work during the summer semester, including the regular maintenance of the antennas. Further work will also be done on the reduction of the sun avoidance circle. During this period, regular scientific observations will therefore mostly be carried out with the five element array. We plan to start the maintenance at the latest by the end of May and to schedule the D configuration between June and October.

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

- observations requesting the use of the 2 mm and 3 mm receivers
- circumpolar sources or sources transiting at night between June and September,
- observations that qualify for the 5D, 6D, and 6C configurations

Proposal category

Proposals should be submitted for one of the four 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. Proposals requesting the extended tuning range (256-267 GHz) will be carried out on a "best effort" basis only during the summer semester.

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 5-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.

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

As for the 30-m telescope, please refer to the **full Call for Proposals** on the IRAM web pages http://www.iram.fr/GENERAL/Proposals_observing.htm.

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

ASTRO

The software `ASTRO` has been updated to reflect these receiver/correlator setup possibilities. 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 5500

! choice of the correlator windows
narrow Q2 Q2

! 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
...
```

Ratings for Winter 2007/2008 Proposals

The IRAM program committee convened in Grenoble on October 18 and 19 to discuss the proposals submitted for the winter 2007/2008 scheduling period. The committee was chaired by Andrew Baker (Rutgers University, USA) together with Fabian Walter (MPIA, Heidelberg) as co-chair. The principal investigators of each proposal have been 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).

Plateau de Bure Interferometer

A total of 146 proposals were received for the interferometer (Tab. 1). 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.

30-m telescope

We received 127 proposals for the 30m telescope (see alphabetic list), requesting 4589 hours of telescope time. Another 30 hours were requested by 6 interferometer proposals for short spacing observations. The highest rating "A" was given to 26 proposals ; 68 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

Table 1: IRAM PdBI proposal ratings for winter 2007/2008. A: Accepted, B: Backup, C: Rejected.

Project	Rate	Project	Rate	Project	Rate	Project	Rate	Project	Rate	Project	Rate
R05B	B	R05C	C	R05D	B	R05E	C	R05F	C	R060	B
R061	C	R062	C	R063	B	R064	A	R065	C	R066	C
R067	B	R068	A	R069	C	R06A	C	R06B	C	R06C	C
R06D	A	R06E	B	R06F	Bϒ	R070	C	R071	C	R072	C
R073	A†	R074	C	R075	C	R076	B	R077	Bϒ	R078	C
R079	C	R07A	C	R07B	C	R07C	C	R07D	C	R07E	C
R07F	C	R080	C	R081	A	R082	B	R083	C	R084	B
R085	C	R086	C	R087	C	R088	C	R089	B	R08A	C
R08B	A	R08C	B	R08D	B	R08E	A	R08F	A†	R090	C
R091	B	R092	B	R093	B†	R094	C	R095	B	R096	A
R097	B	R098	C	R099	C	R09A	A†	R09B	C	R09C	C
R09D	C	R09E	C	R09F	B†	R0A0	C	R0A1	C	R0A2	C
R0A3	B	R0A4	C	R0A5	C	R0A6	B	R0A7	C	R0A8	B†
R0A9	B‡	R0AA	B	R0AB	A	R0AC	C	R0AD	C	R0AE	C
R0AF	A†	R0B0	A†	R0B1	B	R0B2	C	R0B3	C	R0B4	C
R0B5	C	R0B6	B	R0B7	B‡	R0B8	C	R0B9	B‡	R0BA	Bϒ
R0BB	C	R0BC	C	R0BD	C	R0BE	C	R0BF	A	R0C0	B†
R0C1	B	R0C2	C	R0C3	B†	R0C4	B	R0C5	C	R0C6	C
R0C7	A†	R0C8	C	R0C9	B	R0CA	B	R0CB	C	R0CC	C
R0CD	C	R0CE	C	R0CF	A†	R0D0	B†	R0D1	B	R0D2	B
R0D3	C	R0D4	C	R0D5	C	R0D6	B†	R0D7	B	R0D8	C
R0D9	C	R0DA	C	R0DB	B†	R0DC	–	R0DD	B†	R0DE	C
R0DF	B	R0E0	B†	R0E1	B	R0E2	B	R0E3	C	R0E4	C
R0E5	A‡	R0E6	B	R0E7	A†	R0E8	–	R0E9	A	R0EA	B
R0EB	B	R0EC	C								

† : 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 winter 2007/2008

A		B				C	
122-07[1]	123-07	119-07	125-07[1]	126-07[1]	127-07	120-07	121-07
132-07	147-07	129-07	133-07	134-07	136-07	124-07	128-07
148-07	151-07	138-07[1]	139-07	140-07	141-07	130-07	131-07
159-07	162-07	143-07	144-07[1]	152-07	153-07	135-07	137-07
168-07	169-07	154-07	160-07	163-07[1]	164-07[1]	142-07	145-07
173-07	175-07	165-07	166-07	167-07[1]	172-07	146-07	149-07
177-07	178-07	174-07	179-07	181-07[1]	183-07	150-07	155-07
182-07[1]	193-07	184-07[1]	185-07	186-07	187-07[1]	156-07	157-07
197-07	206-07	188-07	189-07	190-07	191-07[1]	158-07	161-07
210-07[2]	217-07	192-07[1]	195-07	198-07	199-07	170-07	171-07
219-07[2]	221-07	203-07	204-07	208-07[1]	209-07	176-07	180-07
230-07	237-07	211-07	212-07[1]	213-07[1]	214-07[1]	194-07	200-07
240-07	243-07	215-07	216-07	218-07[1]	220-07	201-07	202-07
		222-07[1]	224-07	225-07	226-07	205-07	207-07
		229-07	231-07	232-07	233-07	223-07	227-07
		234-07	235-07	236-07[1]	238-07	228-07	239-07
		241-07	242-07[1]	244-07[1]	246-07[1]	245-07	

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

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 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

Global VLBI session in October

The PdBI and the 30-m participated under good conditions in the GMVA October session. The analysis at the MPIfR correlator in Bonn, Germany, has confirmed excellent fringes to the Plateau de Bure. Fringes to Pico Veleta have not been found by conventional means, but an extended search with the new MPIfR software correlator is under way. Short test observations are planned well in advance of the next Global session.

Michael BREMER

30-m maser maintenance

Some weeks after the Global VLBI session, the frequency standard on Pico Veleta underwent a maintenance operation. The active hydrogen EFOS-10 maser has been in operation since 1991, and was showing signs of aging in some important components. Thanks to the efforts of Juan PENALVER and Salvador SANCHEZ, the maser was stable and running smoothly during the Global VLBI session, but it was clear that the inner vacuum parts would need expert maintenance before the end of the year. This service was provided by the Neuchatel-based T4Science company.

EFOS-10's Palladium hydrogen filter was exchanged against the more recent Nickel technology, the dissociator was replaced, two new ion pumps were installed, and various optimizing adjustments were performed. The maser now enjoys a fresh start into (as we hope) many more years of operation.

Michael BREMER

IRAM Granada News

25 years working for IRAM

In 2008, four staff members of IRAM will celebrate their 25th anniversary at IRAM: Maria LARA from the logistics group, our administrator Javier LOBATO, deputy station manager Juan PENALVER and chief operator Manolo RUIZ. IRAM, and also the user community, owe them their thanks for their important contribution to the success of the Pico Veleta observatory.

Rainer MAUERSBERGER

MAMBO and ABBA instrument scientist

In order to better coordinate the maintenance, scientific supervision and future developments for the MAMBO bolometers and the ABBA backend, Albrecht SIEVERS will from now on act as the "friend" of these two instruments. He will among others:

- coordinate and support any activities which go beyond normal observing or maintenance (tests, updates and improvements of hardware, software and observing modes) between the persons involved in Granada, Grenoble and Bonn
- maintain a WIKI page with the status of these instruments.

Rainer MAUERSBERGER

PhD about chemistry in dark clouds

We congratulate Nuria MARCELINO, who successfully defended her PhD work on "Chemistry in dark clouds" at the University of Granada. Her thesis work was conducted at Pico Veleta observatory making use of the VESPA correlator in order to obtain unbiased 3mm surveys of several dark clouds. Several follow up publications resulted from that work.

Rainer MAUERSBERGER

Flight connections

From November 2007 on, there are new international flight connections between Granada airport and Paris Orly (Transavia), Paris Charles de Gaulle (Vueling), and Rome (Vueling).

Rainer MAUERSBERGER

Remote observing from Madrid

Remote observing with the 30m telescope is now also possible for experienced observers from the OAN Madrid, besides the existing remote stations at IRAM Granada, the Grenoble Office, the MPifR Bonn.

Please contact your Astronomer on Duty (AoD) and/or the Granada informatics group (Granada), Dirk MUDERS (Bonn) or Jean Francois DESMURS (Madrid) well in advance of your observations and, as a safeguard, send macros and instructions to the AoD and/or telescope operator.

Walter BRUNSWIG and Rainer MAUERSBERGER

POM-2 takes off

With the dismounting of the POM-2 radio telescope and its astrodome in the afternoon of October 13th, 2007, a long chapter of Plateau de Bure history came to an end (Fig. 6). The building will be renovated and enlarged to accomodate a micro chip test facility.

Historical Background

POM-2 (Petite Operation Millimétrique 2) had its origin when one dish of the two-antenna test interferometer POM-1 at Bordeaux, France was moved to the Plateau de Bure, with the support of CNRS astrophysical group at the Observatoire de Grenoble. The instrument was commissioned in July 1986 when the PdBI was still under construction. The purpose of its 2.5m Cassegrain reflector was the large-scale mapping of molecular clouds in the 1 mm band. Later it served for tests of the Diabolo dual-channel bolometric photometer.

The parabola and its protecting astrodome were mounted on top of a ground floor with living quarters, and connected to the IRAM living quarters by an underground gallery. This allowed the staff of both observatories to visit each other when weather conditions made the 20 meter walk from one building to the other difficult. Sometimes IRAM staff would lend a hand to clear the ice from POM-2's four-meter cupola before observations, a task which could take several hours. A number of young astronomers got their first millimeter observing experience there, with the support of Bernard FOUILLEUX (LAOG).

As time went by POM-2 was used less, and in recent years the building served essentially as additional sleeping quarters for IRAM and experiments on the impact of high-energy cosmic particles (especially neutrons) on the operation of micro chips. The latter activity became more important in 2006 with the inauguration of ASTEP, the first European platform for radiative characterization (a collaboration of L2MP/CNRS, Universities Aix-Marseille 1 and 3, University of Toulon, and a large commercial microelectronics company).

Figure 6: Dismounting of the POM2 astrodome.

Michael BREMER

Refurbishment of POM-2

In order to provide space for new experiments from the L2MP (Laboratoire Matériaux et Microélectronique de Provence, CNRS), a refurbishment of the POM2 building is being done. The technical parts of the building will soon accommodate equipment dedicated to Single Event Effect testing on electronic components.

The waterproofing of the building has been renovated, walls have been painted, and the electrical system has been modernized.

The dismounted POM-2 reflector will be stored in Montmaur, and the dismantled dome will be replaced by an octagonal watertight structure that shall accommodate an atmospheric neutron detector.

Bertrand GAUTIER

Staff Changes

IRAM Granada

Since October 15th 2007, Ms. Denise RIQUELME is working on her PhD Thesis at IRAM Granada.

Rainer MAUERSBERGER

IRAM Grenoble

On August 31, Michel GUÉLIN has officially retired, but he will stay at IRAM as a consultant and AMSTAR++ coordinator. His long and successful career focused on astrochemistry and molecular spectroscopy. He is co-author of about 200 papers (one of his early papers is the very first paper published in A&A). We wish him all the best for an active retirement.

Aris KARASTERGIOU has left IRAM on July 31st to continue his astronomical career in Oxford. Edwige CHAPILLON has returned to Bordeaux to continue her thesis. The astronomer's group welcomes Jérémie BOISSIER, who has started work in the Science Operation Group on October 1st. Pierre HILY-BLANT has left IRAM on December 31st to join the Laboratoire d'Astrophysique de Grenoble (our neighbours).

On August 20th, Julien CHALAIN has joined the Grenoble frontend group as a technician.

Fabienne SCHICKE replaces Cathy BERJAUD since September 17th. Cathy is on leave to continue her master's degree on French as a foreign language.

As of February 20th, 2008 Dimitri MOCELLIN replaces Stefan MARCOUX in the services and logistics group. Stefan has obtained a special leave until February 2009.

Michael BREMER

Scientific Results in Press

Mass loss from dusty, low outflow-velocity AGB stars. II. The multiple wind of EP Aquarii

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Abstract:
CO rotational lines are frequently used to trace the outflows from AGB stars. Some profiles are composite, with a narrow component super-imposed on a broader one. These profiles have been interpreted in different ways, calling for episodic mass loss, a bipolar flow, or a circumstellar disk.

To investigate the structure of one of these outflows, we have obtained detailed ^{12}CO(2-1) and ^{12}CO(1-0) maps of EP Aqr, a prototypical source with composite CO profiles.

Interferometric data were acquired with the IRAM interferometer and combined with on-the-fly maps obtained at the IRAM 30-m. The resulting maps in ^{12}CO(2-1) and ^{12}CO(1-0) cover a field of $100'' \times 100''$ with a spectral resolution of $0.1\,\mathrm{km\,s^{-1}}$ and with beams of $1.7'' \times 1.0''$ and $3.5'' \times 1.8''$, respectively.

The source is clearly resolved with a size of about $15''$ (FWHM). We do not observe any obvious departure from circular symmetry, but there is evidence of a ringed structure in the CO(2-1) map with enhanced intensity at $\sim 3.5''$ and $7.5''$ from the central star. The continuum level at 1.3 and 2.6 mm is consistent with the star's photospheric emission. We modeled the spatio-kinematic structure with Monte-Carlo radiative transfer simulations assuming spherical symmetry. We reached a reasonable fit to the map-integrated spectra, but not to the imaging data, possibly because the circumstellar shell of EP Aqr presents inhomogeneities on a scale that is not, or is only barely, resolved in our maps. EP Aqr may be a proto-typical oxygen-rich source for the class of theoretical models exhibiting mass loss variations on a $\sim 100\,$yr timescale discovered by Winters et al. (2000), which show a layered structure in their extended circumstellar shells.

Appeared in: A&A 475, 559

The earliest phases of high-mass star formation: a 3 square degree millimeter continuum mapping of Cygnus X

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Abstract:
Aims. Our current knowledge of high-mass star formation is mainly based on follow-up studies of bright sources found by *IRAS*, and is thus biased against its earliest phases, inconspicuous at infrared wavelengths. We therefore started searching, in an unbiased way and in the closest high-mass star-forming complexes, for the high-mass analogs of low-mass pre-stellar cores and class 0 protostars. *Methods.* We have made an extensive 1.2 mm continuum mosaicing study of the Cygnus X molecular cloud complex using the MAMBO cameras at the IRAM 30 m telescope. The $\sim 3^{\circ 2}$ imaged areas cover all the high-column density ($A_{\rm V} \geq 15$ mag) clouds of this nearby ($\sim$ 1.7 kpc) cloud complex actively forming OB stars. We then compared our millimeter maps with mid-infrared images, and have made SiO(2-1) follow-up observations of the best candidate progenitors of high-mass stars. *Results.* Our complete study of Cygnus X with $\sim$ 0.09 pc resolution provides, for the first time, an unbiased census

of massive young stellar objects. We discover 129 massive dense cores (*FWHM* size ~ 0.1 pc, $M_{1.2\ \mathrm{mm}} = 4 - 950\ M_\odot$, volume-averaged density ~ 105 cm^{-3}), among which ~ 42 are probable precursors of high-mass stars. A large fraction of the Cygnus X dense cores (2/3 of the sample) remain undetected by the *MSX* satellite, regardless of the mass range considered. Among the most massive (≥ 40 M$_\odot$) cores, infrared-quiet objects are driving powerful outflows traced by SiO emission. Our study qualifies 17 cores as good candidates for hosting massive infrared-quiet protostars, while up to 25 cores potentially host high-luminosity infrared protostars. We fail to discover the high-mass analogs of pre-stellar dense cores (~ 0.1 pc, $> 10^4$ cm^{-3}) in Cygnus X, but find several massive starless clumps (~ 0.8 pc, 7×103 cm^{-3}) that might be gravitationally bound. *Conclusions.* Since our sample is derived from a single molecular complex and covers every embedded phase of high-mass star formation, it gives the first statistical estimates of their lifetime. In contrast to what is found for low-mass class 0 and class I phases, the infrared-quiet protostellar phase of high-mass stars may last as long as their better-known high-luminosity infrared phase. The statistical lifetimes of high-mass protostars and pre-stellar cores ($\sim 3 \times 10^4$ yr and $< 10^3$ yr) in Cygnus X are one and two order(s) of magnitude smaller, respectively, than what is found in nearby, low-mass star-forming regions. We therefore propose that high-mass pre-stellar and protostellar cores are in a highly dynamic state, as expected in a molecular cloud where turbulent processes dominate.

Appeared in A&A 476, 1243

The dark nature of GRB 051022 and its host galaxy

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Abstract:
Aims. We present multiwavelength (X-ray/ optical/ near-infrared/ millimetre) observations of GRB 051022 between 2.5 h and 1.15 yr after the event. It is the most intense gamma-ray burst ($\sim 10^{-4}$ erg cm^{-2}) detected by HETE-2, with the exception of the nearby GRB 030329.

Methods. Optical and near infrared observations did not detect the afterglow despite a strong afterglow at X-ray wavelengths. Millimetre observations at Plateau de Bure (PdB) detected a source and a flare, confirming the association of this event with a moderately bright ($R = 21.5$) galaxy.

Results. Spectroscopic observations of this galaxy show strong [O II], Hβ and [O III] emission lines at a redshift of 0.809. The spectral energy distribution (SED) of the galaxy implies A_V(restframe) = 1.0 and a starburst occuring ~ 25 Myr ago, during which the star-forming-rate reached ~ 50M$_\odot$/yr. In conjunction with the spatial extent ($1''$) it suggests a very luminous ($M_V = -21.8$) blue compact galaxy, for which we also find $Z \sim Z_\odot$. The X-ray spectrum shows evidence of considerable absorption by neutral gas with $N_{\mathrm{H,X-ray}} = 3.47^{+0.48}_{-0.47} \times 10^{22}$ cm^{-2} (rest frame). Absorption by dust in the host galaxy at $z = 0.809$ certainly cannot account for the non-detection of the optical afterglow, unless the dust-to-gas ratio is quite different than that seen in our Galaxy (i.e. large dust grains).

Conclusions. It is likely that the afterglow of the dark GRB 051022 was extinguished along the line of sight by an obscured, dense star forming region in a molecular cloud within the parent host galaxy. This galaxy is different from most GRB hosts being brighter than L^* by a factor of 3. We have also derived a $SFR \sim 50$M$_\odot$/yr and predict that this host galaxy will be detected at sub-mm wavelengths.

Appeared in: A&A 475, 101

Multifrequency Observations of the Blazar 3C 279 in January 2006

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Abstract:
We report first results of a multifrequency campaign from radio to hard X-ray energies of the prominent $\gamma-$ray blazar 3C 279, which was organised around an INTEGRAL ToO observation in January 2006, and triggered on its optical state. The variable blazar was observed at an intermediate optical state, and a well-covered multifrequency spectrum from radio to hard X-ray energies could be derived. The SED shows the typical two-hump shape, the signature of non-thermal synchrotron and inverse- Compton (IC) emission from a relativistic jet. By the significant exposure times of INTEGRAL and Chandra, the IC spectrum (0.3 - 100 keV) was most accurately measured, showing - for the first time - a possible bending. A comparison of this 2006 SED to the one observed in 2003, also centered on an INTEGRAL observation, during an optical low-state, reveals the surprising fact that ̌2013 despite a significant change at the high-energy synchrotron emission (near-IR/optical/UV) - the rest of the SED remains unchanged. In particular, the low-energy IC emission (X- and hard X-ray energies) remains the same as in 2003, proving that the two emission components do not vary simultaneously, and provides strong constraints on the modelling of the overall emission of 3C 279.

Appeared in Proc. of the 6th INTEGRAL workshop "The Obscured Universe" (Moscow, July 2-8, 2006), eds. S. Grebenev, R. Sunyaev, C. Winkler, ESA SP 622 (2006)

Molecular gas in QSO host galaxies at $z > 5$

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Abstract:
We present observations with the IRAM Plateau de Bure Interferometer of three QSOs at $z > 5$ aimed at detecting molecular gas in their host galaxies as traced by CO transitions. CO $(5-4)$ is detected in SDSS J033829.31+002156.3 at $z = 5.0267$, placing it amongst the most distant sources detected in CO. The CO emission is unresolved with a beam size of $\sim 1''$, implying that the molecular gas is contained within a compact region, less than $\sim$ 3 kpc in radius.We infer an upper limit on the dynamical mass of the CO emitting region of $\sim 3 \times 10^{10} \mathrm{M}_{\odot}/sin(i)^2$ The comparison with the Black Hole mass inferred from near-IR data suggests that the BH-to-bulge mass ratio in this galaxy is significantly higher than in local galaxies. From the CO luminosity we infer a mass reservoir of molecular gas as high as $M(\mathrm{H}_2) = 2.2 \times 10^{10} \mathrm{M}_{\odot}$, implying that the molecular gas accounts for a significant fraction of the dynamical mass.When compared to the star formation rate derived from the far-IR luminosity, we infer a very short gas exhaustion timescale ($\sim 10^7$ years), comparable to the dynamical timescale. CO is not detected in the other two QSOs (SDSS J083643.85+005453.3 and SDSS J163033.90+401209.6) and upper limits are given for their molecular gas content. When combined with CO observations of other type 1 AGNs, spanning a wide redshift range ($0 < z < 6.4$), we find that the host galaxy CO luminosity (hence molecular gas content) and the AGN optical luminosity (hence BH accretion rate) are correlated, but the relation is not linear: $L'_{\mathrm{CO}} \propto [\lambda L_\lambda(4400\AA)]^{0.72}$.Moreover, at high redshifts (and especially at $z > 5$) the CO luminosity appears to saturate. We discuss the implications of these findings in terms of black hole-galaxy co-evolution.

Appeared in: A&A 472, L33

New Plateau de Bure observations of M 1- 92; unveiling the core

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Abstract:
M 1-92 is a very well studied bipolar pPN that can be considered an archetype of this type of sources; it shows a clear axial symmetry, along with the kinematics characteristic of this class of envelopes around post-AGB stars. We performed sub-arcsecond resolution observations of the $J = 2-1$ rotational line of ^{13}CO in M 1-92 with the new extended configurations of the IRAM Plateau de Bure interferometer, for studying the morphology and velocity field of the molecular gas better in the nebula, particularly in its central parts. We found that the equatorial structure dividing the two lobes is a thin flat disk, which expands radially with a velocity proportional to the distance to the central stellar system. The kinetic age of this equatorial flow is very similar to that measured in the two lobes, suggesting that the whole structure was formed as a result of a single event some 1200 yr ago, after which the nebula reached an expansion velocity field with axial symmetry. The small widths and velocity dispersion in the gas forming the lobe walls confirm that the acceleration responsible for the nebular shape could not last more than $100-120$ yr. In view of the similarity to η Car, we speculate on the possibility that the whole nebula was formed as a result of a magneto-rotational explosion in a common-envelope system. The study of the possible importance of this mechanism in the context of global PNe and pPNe reshaping should be one on the fields in which future ALMA observations will make a crucial contribution.

Appeared in: Ap&SS, 383A

Detection of $1.6 \times 10^{10} M_\odot$ of Molecular Gas in the Host Galaxy of the $z = 5.77$ SDSS Quasar J0927+2001

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Abstract:
We have detected emission by the CO $5-4$ and $6-5$ rotational transitions at $z = 5.7722 \pm 0.0006$ from the host galaxy of the SDSS quasar J0927+2001 using the Plateau de Bure interferometer. The peak line flux density for the CO 5-4 line is 0.72 ± 0.09 mJy, with a line FWHM $= 610 \pm 110$ km s^{-1}. The implied molecular gas mass is $(1.6 \pm 0.3) \times 10^{10} M_\odot$. We also detect the 90 GHz continuum at 0.12 ± 0.03 mJy, consistent with a 47K dust spectrum extrapolated from higher frequencies. J0927+2001 is the second example of a huge molecular gas reservoir within the host galaxy of a quasar within 1 Gyr of the big bang. Observations of J0927+2001 are consistent with a massive starburst coeval with a bright quasar phase in the galaxy, suggesting the rapid formation of both a supermassive black hole through accretion, and the stellar host spheroid, at a time close to the end of cosmic reionization.

Appeared in: ApJ 666, L9

Differential Lensing Effects in High-z Sources: Constraining the Size and Shape of the Emitting Regions

Krips M., Neri R., Eckart A., Barvainis R., Peck A., Downes D., Planesas P., Martín-Pintado J., Iono D., Petitpas G.

Abstract:
One of the greatest obstacles in determining the physical parameters of galaxies in the early universe is our inability to accurately constrain the sizes of the sources detected. Current cutting-edge mm/submm interferometers such as the Submillimeter Array (SMA) and the Plateau de Bure Interferometer IRAM (PdBI) yield angular resolutions of about 1″, which is in most cases not sufficient to resolve the observed emission at high z. However, if the high-redshift source is gravitationally lensed by an intervening galaxy, the angular resolution can be improved by up to two orders of magnitude, as demonstrated in the case of the Cloverleaf galaxy. Light from extended regions is deflected in a different way than light from compact structures, so that the lensed images set tight constraints on their true sizes and shapes. We will discuss the use

of such differential lensing effects for three gravitationally lensed high-redshift quasars: Q0957+561 ($z = 1.41$), SBS1520+530 ($z = 1.86$), and APM08279+5255 ($z = 3.9$). We have recently detected molecular gas emission traced by CO in the first two sources, doubling the number of CO detections in this mostly unexplored redshift range of $z = 1 - 2$. We will be able to use this technique as well to place even tighter constraints on the size of the dust emission in APM08279+5255, using the new very extended configurations of the SMA and PdBI with their angular resolutions of 0.″30.″4.

Appeared in: From Z-Machines to ALMA: (Sub)Millimeter Spectroscopy of Galaxies ASP Conf. Series, Vol. 375, Edts. A.J. Baker, J. Glenn, A.I. Harris, J.G. Mangum and M.S. Yun., p.250

The clumpy structure of the chemically active L1157 outflow

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Abstract:
We present high spatial resolution maps, obtained with the Plateau de Bure Interferometer, of the blue lobe of the L1157 outflow. We observed four lines at 3 mm, namely CH_3OH ($2_K - 1_K$), HC_3N ($11 - 10$), HCN ($1 - 0$) and OCS ($7 - 6$). Moreover, the bright B1 clump has also been observed at better spatial resolution in CS ($2 - 1$), CH_3OH $(21 - 11)A^-$ and ^{34}SO ($32 - 21$). These high spatial resolution observations show a very rich structure in all the tracers, revealing a clumpy structure of the gas superimposed to an extended emission. In fact, the three clumps detected by previous IRAM 30-m single-dish observations have been resolved into several subclumps and new clumps have been detected in the outflow. The clumps are associated with the two cavities created by two shock episodes driven by the precessing jet. In particular, the clumps nearest the protostar are located at the wall of the younger cavity with a clear arch shape form while the farthest clumps have slightly different observational characteristics indicating that they are associated with the older shock episode. The emission of the observed species peaks in different part of the lobe: the eastern clumps are brighter in HC_3N ($11 - 10$), HCN ($1 - 0$) and CS ($2 - 1$) while the western clumps are brighter in CH_3OH ($2_K - 1_K$), OCS ($7 - 6$) and ^{34}SO ($32 - 21$). This peak displacement in the line emission suggests a variation of the physical conditions and/or the chemical composition along the lobe of the outflow at small scale, likely related to the shock activity and the precession of the outflow. In particular, we observe the decoupling of the silicon monoxide and methanol emission, common shock tracers, in the B1 clump located at the apex of the bow shock produced by the second shock episode.

Appeared in: MNRAS 381, 1127

The Variable Radio-to-X-Ray Spectrum of the Magnetar XTE J1810-197

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Abstract:
We have observed the 5.54 s anomalous X-ray pulsar XTE J1810-197 at radio, millimeter, and infrared (IR) wavelengths, with the aim of learning about its broadband spectrum. At the IRAM 30 m telescope, we have detected the magnetar at $\nu = 88$ and 144 GHz, the highest radio-frequency emission ever seen from a pulsar. At 88 GHz we detected numerous individual pulses, with typical widths ~ 2 ms and peak flux densities up to 45 Jy. Together with nearly contemporaneous observations with the Parkes, Nanay, and Green Bank telescopes, we find that in late 2006 July the spectral index of the pulsar was $-0.5 \lesssim \alpha \lesssim 0$ (with flux density $S_v \sim \nu^\alpha$) over the range 1.4-144 GHz. Nine dual-frequency Very Large Array and Australia Telescope Compact Array observations in 2006 May-September are consistent with this finding, while showing variability of α with time. We infer from the IRAM observations that XTE J1810-197 remains highly

linearly polarized at millimeter wavelengths. Also, toward this pulsar, the transition frequency between strong and weak scattering in the interstellar medium may be near 50 GHz. At Gemini, we detected the pulsar at 2.2μm in 2006 September, at the faintest level yet observed, $K_s = 21.89 \pm 0.15$. We have also analyzed four archival IR Very Large Telescope observations (two unpublished), finding that the brightness fluctuated within a factor of 2-3 over a span of 3 years, unlike the monotonic decay of the X-ray flux. Thus, there is no correlation between IR and X-ray flux, and it remains uncertain whether there is any correlation between IR and radio flux.

Appeared in: ApJ 669, 561

Particularly efficient star formation in M 33

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Abstract:
The Star Formation (SF) rate in galaxies is an important parameter at all redshifts and evolutionary stages of galaxies. In order to understand the increased SF rates in intermediate redshift galaxies one possibility is to study star formation in local galaxies with properties frequently found at this earlier epoch like low metallicity and small size. We present sensitive observations of the molecular gas in M 33, a small Local Group spiral at a distance of 840 kpc which shares many of the characteristics of the intermediate redshift galaxies. The observations were carried out in the CO(2-1) line with the HERA heterodyne array on the IRAM 30 m telescope. A $11' \times 22'$ region in the northern part of M 33 was observed, reaching a detection threshold of a few $10^3 M_\odot$. The correlation in this field between the CO emission and tracers of SF (8μm, 24μm, Hα, FUV) is excellent and CO is detected very far North, showing that molecular gas forms far out in the disk even in a small spiral with a subsolar metallicity. One major molecular cloud was discovered in an interarm region with no HI peak and little if any signs of SF - without a complete survey this cloud would never have been found. The radial dependence of the CO emission has a scale length similar to the dust emission, less extended than the Hα or FUV. If, however, the $N(H_2)/I_{CO}$ ratio varies inversely with metallicity, then the scale length of the H_2 becomes similar to that of the $H\alpha$ or FUV. Comparing the SF rate to the H_2 mass shows that M 33, like the intermediate redshift galaxies it resembles, has a significantly higher SF efficiency than large local universe spirals. The data presented here also provide an ideal test for theories of molecular cloud formation and cover a new region in parameter space, where $\sum_{\rm stars} < \sum_{\rm gas}$. We find that a simple pressure-based prescription for estimating the molecular to atomic gas fraction does not perform well for M 33, at least in the outer parts. On the other hand, we show that the molecular gas fraction is influenced by (i) the total Hydrogen column density, dominated in M 33 by the HI, and (ii) the galactocentric distance.

Appeared in: A&A 473, 91

Interferometric detections of GOODS 850-5 at 1 mm and 1.4 GHz

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Abstract:
We have obtained a position (at subarcsecond accuracy) of the submillimeter bright source GOODS 850-5 (also known as GN 10) in the GOODS-North field using the IRAM Plateau de Bure interferometer at 1.25 mm wavelengths (MM J123633+6214.1; flux density: $S(1.25\text{mm}) = 5.0 \pm 1.0$ mJy). This source has no optical counterpart in deep ACS imaging down to a limiting magnitude of $i(775) = 28.4$ mag and its position is coincident with the position found in recent submillimeter mapping obtained at the SMA. Using deep VLA imaging at 20 cm, we find a radio source ($S(20\text{cm}) = 34.4 \pm 4.2$ microJy) at the same position that is significantly brighter than reported by Wang and coworkers (but in agreement with a 3σ detection previously reported by Pope and coworkers). The source is detected by Spitzer in IRAC as well as at 24 mm. We apply different photometric redshift estimators using measurements of the dusty, mid/far-infrared part of the SED and derive a redshift $z \sim 4$. Given our detection in the millimeter and radio we consider a significantly higher redshift (e.g., $z \sim 6$ recently proposed by Wang and coworkers) unlikely. MM J123633+6214.1 alias GOODS 850-5 nevertheless constitutes a bright representative of the high-redshift tail of the submillimeter galaxy population that may contribute a significant fraction to the (sub)millimeter background.

Appeared in ApJL, 673, L127

Detection of amino acetonitrile in Sgr B2(N)

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Abstract:
Context. Amino acids are building blocks of proteins and therefore key ingredients for the origin of life. The simplest amino acid, glycine (NH_2CH_2COOH), has long been searched for in the interstellar medium but has not been unambiguously detected so far. At the same time, more and more complex molecules have been newly found toward the prolific Galactic center source Sagittarius B2.
Aims. Since the search for glycine has turned out to be extremely difficult, we aimed at detecting a chemically related species (possibly a direct precursor), amino acetonitrile (NH_2CH_2CN).
Methods. With the IRAM 30m telescope we carried out a complete line survey of the hot core regions Sgr B2(N) and (M) in the 3 mm range, plus partial surveys at 2 and 1.3 mm. We analyzed our 30m line survey in the LTE approximation and modeled the emission of all known molecules simultaneously. We identified spectral features at the frequencies predicted for amino acetonitrile lines having intensities compatible with a unique rotation temperature. We also used the Very Large Array to look for cold, extended emission from amino acetonitrile.
Results. We detected amino acetonitrile in Sgr B2(N) in our 30m telescope line survey and conducted confirmatory observations of selected lines with the IRAM Plateau de Bure and the Australia Telescope Compact Array interferometers. The emission arises from a known hot core, the Large Molecule Heimat, and is compact with a source diameter of 2″ (0.08 pc). We derived a column density of 2.8×10^{16} cm^{-2}, a temperature of 100 K, and a linewidth of 7 km s^{-1}. Based on the simultaneously observed continuum emission, we calculated a density of 1.7×10^8 cm^{-3}, a mass of 2340M$_\odot$, and an amino acetonitrile fractional abundance of 2.2×10^{-9}. The high abundance and temperature may indicate that amino acetonitrile is formed by grain surface chemistry. We did not detect any hot, compact amino acetonitrile emission toward Sgr B2(M) or any cold, extended emission toward Sgr B2, with column-density upper limits of 6×10^{15} and $3 \times 10^{12-14}$ cm^{-2}, respectively.
Conclusions. Based on our amino acetonitrile detection toward Sgr B2(N) and a comparison to the pair methylcyanide/acetic acid both detected in this source, we suggest that the column density of both glycine conformers in Sgr B2(N) is well below the best upper limits published recently by other authors, and probably below the confusion limit in the 1-3 mm range.

Accepted for publication in A&A

Superluminal non-ballistic jet swing in the quasar NRAO 150 revealed by mm-VLBI

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Abstract:
Context: NRAO 150, a compact and bright radio to mm source showing core/jet structure, has been recently identified as a quasar at redshift z = 1.52 through a near-IR spectral observation. *Aims:* To study the jet kinematics on the smallest accessible scales and to compute the first estimates of its basic physical properties. *Methods:* We have analysed the ultra-high-resolution images from a new monitoring program at 86 GHz and 43 GHz with the Global mm VLBI Array and the VLBA, respectively. An additional archival calibration VLBA data set, covering the period from 1997 to 2007, has been used. Results: Our data show an extreme projected counter-clockwise jet position angle swing at an angular rate of up to $\approx 11^\circ$ yr within the inner ≈ 3 pc of the jet, which is associated with a non-ballistic superluminal motion of the jet within this region. *Conclusions:* The results suggest that the magnetic field could 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. Tables 1-3 and the movie are only available in electronic form at http://www.aanda.org

Appeared in: A&A 476, L17

Detection of circumstellar CH_2CHCN, CH_2CN, CH_3CCH and H_2CS

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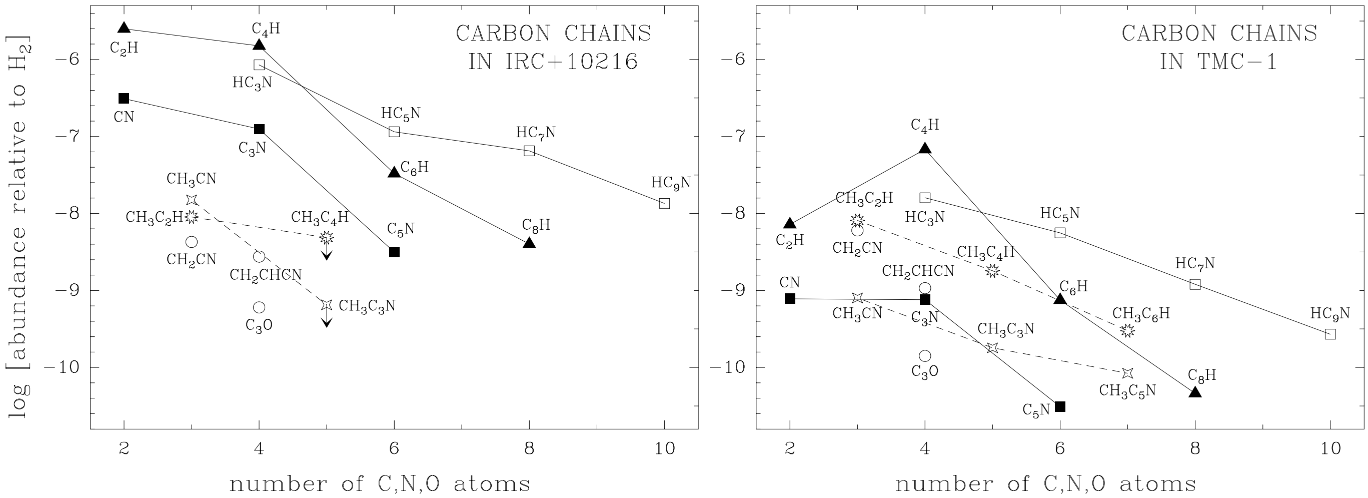

Figure 7: Abundances of carbon chain molecules in IRC +10216 and TMC-1. The diagram is an extension of a previous publication. The fractional abundances relative to H_2 are computed from the molecular column densities and the total H_2 column density. We use $N(H_2) = 10^{22}$ cm^{-2} in TMC-1 and $N(H_2) = 2 \times 10^{21}$ cm^{-2} in IRC +10216. The latter value corresponds to the total H_2 column density contained in an outer shell extending from 2×10^{16} cm to 7×10^{16} cm, where all the molecules considered in the diagram are most probably present.

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Abstract:
We report on the detection of vinyl cyanide (CH_2CHCN), cyanomethyl radical (CH_2CN), methylacetylene (CH_3CCH) and thioformaldehyde (H_2CS) in the C-rich star IRC +10216. These species, all of them known to exist in dark clouds, are detected for the first time in the circumstellar envelope around an AGB star. These molecules have been detected trough pure rotational transitions in the course of a λ 3 mm line survey carried out with the IRAM 30-m telescope. The molecular column densities are derived by constructing rotational temperature diagrams. A detailed chemical model of the circumstellar envelope is used to analyze the formation of these molecular species. We have found column densities in the range 5×10^{12} - 2×10^{13} cm^{-2}, which translates to abundances relative to H_2 of several 10^{-9}. The chemical model is reasonably successful in explaining the synthesis of these molecules in the cold outer envelope through gas phase reactions. We also found that these molecules are most probably excited trough infrared pumping to excited vibrational states. The detection of these species stresses the similarity between the molecular content of cold dark clouds and C-rich circumstellar envelopes. However, some differences in the chemistry are indicated by the fact that in IRC +10216 partially saturated carbon chains are present at a lower level than those which are highly unsaturated, while in TMC-1 both types of species have comparable abundances.

Appeared in A&A 479, 493

Laboratory and Astronomical Detection of the Negative Molecular Ion C_3N^-

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([1])Harvard-Smithsonian Center for Astrophysics, 60 Garden St., Cambridge, MA 02138, and Division of Engineering & Applied Sciences, Harvard University, 29 Oxford St., Cambridge, MA 02138, ([2])Also: Institute for Theoretical Chemistry, Departments of Chemistry and Biochemistry, The University of Texas at Austin, Austin, TX 78712, ([3])Department of Molecular and Infrared Astrophysics, Instituto de Estructura de la Materia, CSIC, Serrano 121, 28006 Madrid, Spain, ([4])Insitut de Radioastronomie Millimétrique, 300 rue de la Piscine, 38406 St. Martin d'Hères, France

Abstract:
The negative molecular ion C_3N^- has been detected at millimeter wavelengths in a low pressure laboratory discharge, and then with frequencies in hand in the molecular envelope of IRC+10216.

Spectroscopic constants derived from laboratory measurements of 12 transitions between 97 and 378 GHz allow the rotational spectrum to be calculated well into the submillimeter-wave band to 0.03 km s^{-1} or better in equivalent radial velocity. Four transitions of C_3N^- were detected in IRC+10216 with the IRAM 30 m telescope at precisely the frequencies calculated from the laboratory measurements (see Fig. 7). The detection of C_3N^- in IRC+10216 "rounds out" the work on the astronomical and subsequent laboratory detection of the isoelectronic pair of carbon chains C_3N and C_4H which began 30 years ago (Guélin & Thaddeus 1976, Ap.J., 212, L81).

The column density of C_3N^- is 0.5% that of C_3N, or approximately 20 times greater than that of C_4H^- relative to C_4H. The C_3N^- abundance in IRC+10216 is compared with a chemical model calculation by Petrie & Herbst (1997). An upper limit in TMC–1 for C_3N^- relative to C_3N (<0.8%), and a limit for C_4H^- relative to C_4H (< 0.004%) that is 5 times lower than that found in IRC+10216, were obtained from observations with the NRAO 100 m Green Bank Telescope (GBT). The fairly high concentration of C_3N^- achieved in the laboratory implies that other molecular anions containing the CN group may be within reach.

Ap.J. Letters 2008, in press

Search for anions in molecular sources: C_4H^- detection in L1527

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Abstract:
Aiming at exploring how ubiquitous and abundant are molecular anions in the interstellar medium we have embarked on a search for C_4H^- with the IRAM-30m telescope toward various dark clouds, low mass star-forming regions and PDRs. We have also searched for CN^-, C_2H^- and C_6H^- in some of the sources. The Letter presents the first results of these searches. We have succeeded in detecting C_4H^-, through the $J = 9-8$ and $J = 10-9$ rotational transitions, in the low mass star-forming region L1527, confirming the tentative detection of the $J = 9-8$ line recently reported toward this source (see Fig. 8). The $[C_4H^-]/[C_4H]$ ratio found is 0.011 %, which is slightly lower than the value observed in IRC +10216, 0.024 %, but above the 3σ upper limit we have derived in TMC-1, < 0.0052 %. We have also derived an upper limit for the $[C_6H^-]/[C_6H]$ ratio in the Horsehead Nebula, and for various anion-to-neutral ratios in the observed sources. These results are compared with recent chemical models.

Appeared in: A&A 478, L19

Laboratory and Astronomical Detection of the Negative Molecular Ion C_3N^-

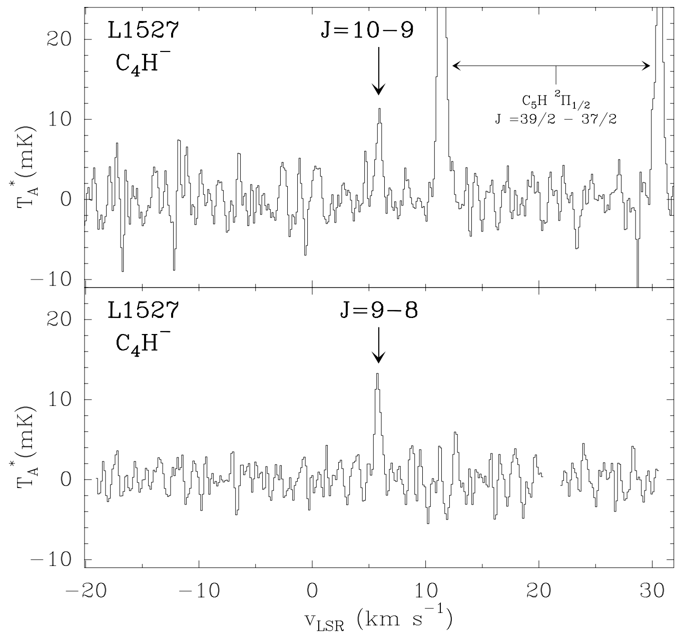

Figure 8: $J = 9-8$ and $J = 10-9$ transitions of C_4H^- observed toward L1527. The spectra were acquired in 13.8 h (83.8 GHz) and 22.1 h (93.1 GHz) of integration time.

P. Thaddeus,[1] C. A. Gottlieb,[1] H. Gupta,[1,2] S. Brünken,[1] M. C. McCarthy,[1],M. Agúndez,[3], M. Guélin,[4] and J. Cernicharo,[3]
[1]Harvard-Smithsonian Center for Astrophysics, 60 Garden St., Cambridge, MA 02138, and Division of Engineering & Applied Sciences, Harvard University, 29 Oxford St., Cambridge, MA 02138, [2]Institute for Theoretical Chemistry, Departments of Chemistry and Biochemistry, The University of Texas at Austin, Austin, TX 78712, [3]Department of Molecular and Infrared Astrophysics, Instituto de Estructura de la Materia, CSIC, Serrano 121, 28006 Madrid, Spain, [4]Insitut de Radioastronomie Millimétrique, 300 rue de la Piscine, 38406 St. Martin d'Hères, France

Abstract:
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The column density of C_3N^- is 0.5% that of C_3N, or

approximately 20 times greater than that of C_4H^- relative to C_4H. The C_3N^- abundance in IRC+10216 is compared with a chemical model calculation by Petrie & Herbst (1997). An upper limit in TMC–1 for C_3N^- relative to C_3N (<0.8%), and a limit for C_4H^- relative to C_4H (< 0.004%) that is 5 times lower than that found in IRC+10216, were obtained from observations with the NRAO 100 m Green Bank Telescope (GBT). The fairly high concentration of C_3N^- achieved in the laboratory implies that other molecular anions containing the CN group may be within reach.

Accepted for publication in ApJ Letters)

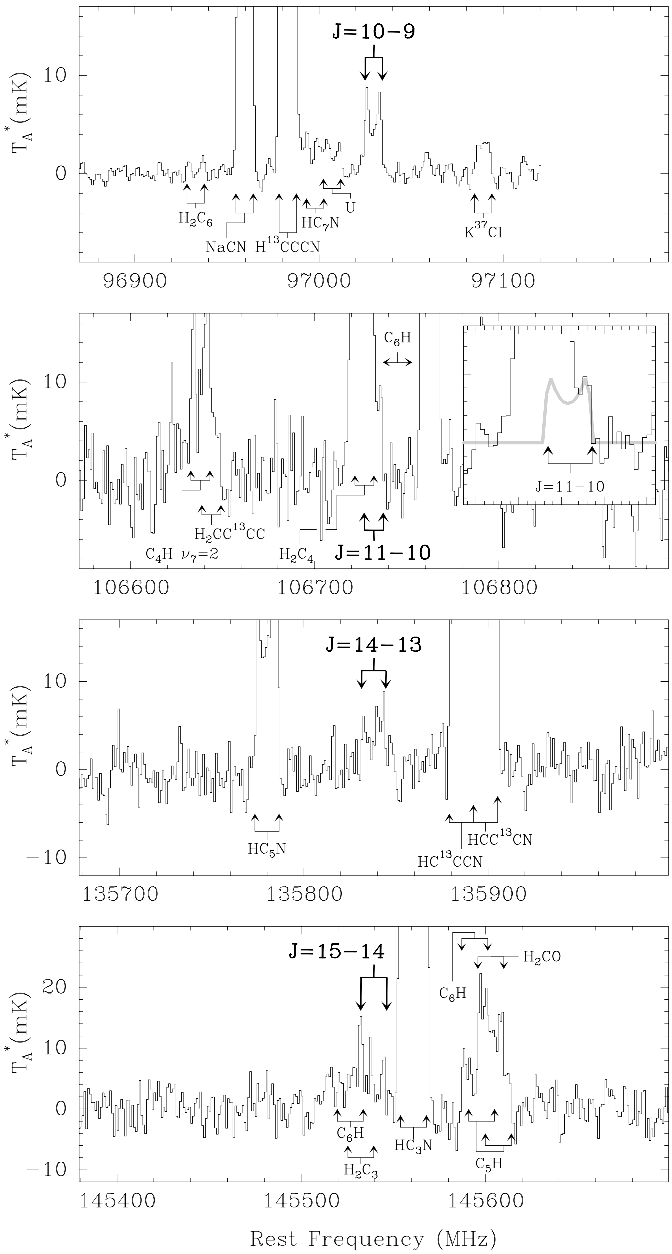

Figure 9: Four transitions of C_3N^- observed towards IRC+10216 with the IRAM 30 m telescope. The spectral resolution is 1 MHz and the frequency scale (in the rest frame) is relative to a systemic velocity of -26.5 km s^{-1}. The positions of the C_3N^- lines are indicated by arrows. The line at 106.7 GHz is blended with the intense line of C_6H (see simulated profile in the insert), but the blue horn (visible on the shoulder of the intense background lines) is within 0.5 MHz of the precise laboratory determined frequency.

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

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Abstract:
We report sub-arcsecond 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 $\sim$ 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 time scales and stellar ages, we estimate that the SMG phase duration is about 100 Myrs. 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 12CO 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%.

Accepted for publication in ApJ; available as arXiv:0801.3650v1 [astro-ph]

Molecular gas in NUclei of GAlaxies (NUGA). VIII. The Seyfert 2 NGC 6574

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Abstract:
Within the frame of the NUclei of GAlaxies (NUGA) project, we have determined the distribution and kinematics of the molecular gas within the central kpc with high spatial resolution ($100-150$ pc), for a sample of active galaxies. The goal is to study the gas-fueling mechanisms in AGN. We present interferometric observations of ^{12}CO$(1-0)$ and ^{12}CO$(2-1)$ line emission from the Seyfert 2 galaxy NGC 6574, obtained with the IRAM Plateau de Bure Interferometer (PdBI). These data have been combined with 30-m mapping data in these lines to correct for the flux resolved by the interferometer. At an angular resolution of 0.″7 ($\equiv$ 110 pc), the ^{12}CO$(2-1)$ emission is resolved into an inner disk with a radius of 300 pc. The molecular gas in NGC 6574 is primarily distributed in four components: nucleus, bar, spiral arms - winding up into a pseudo-ring - and an extended underlying disk component. For the overall galaxy host, we find a ^{12}CO$(2-1)$ to ^{12}CO$(1-0)$ line ratio of ~ 0.3 indicative of cold or sub-thermally excited gas. For the nucleus, this ratio is close to unity, indicating emission from dense and warm molecular gas. Modeling the gas kinematics with elliptical orbits shows that the molecular gas in the differentially rotating disk of NGC 6574 is strongly influenced by the presence of a stellar bar. The nuclear component shows an extension toward the southeast that may be an indication of the lopsidedness of the nuclear gas distribution. We computed the gravity torques exerted from the stellar bar on the gas, deriving the gravitational potential from near-infrared images, and weighting the torques by the CO distribution. We find negative torques for the gas inside the ring, since the gas aligned with the bar has a slight advance phase shift, leading the bar. This means that gas is flowing in towards the center, at least down to 400 pc in radius, which can explain the observed high nuclear gas concentration. This concentration corresponds to a possible inner Lindblad resonance of the bar, according to the measured rotation curve. The gas has been piling up in this location quite recently, since no startburst has been observed yet.

Appeared in: A&A 479, 377

New Preprints

584. PLATEAU DE BURE INTERFEROMETER OBSERVATIONS OF THE DISK AND OUTFLOW OF HH30
J. Pety, F. Gueth, S. Guilloteau, A.Dutrey
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585. TTHE EARLIEST PHASES OF HIGH-MASS STAR FORMATION: A 3 square Degrees Millimeter Continuum Mapping of Cygnus X
F. Motte, S. Bontemps, P. Schilke, N. Schneider, K.M.Menten, D. Broguière
2007, *Astronomy and Astrophysics*

Announcement: 38th SAAS-FEE Advanced Course on Millimeter Astronomy

For the last 37 years, the Swiss Society for Astrophysics and Astronomy has organized its "Saas-Fee Advanced Course". This course has been continuously sponsored by the Swiss Academy of Sciences.

This 38th edition will be held in Les Diablerets, in the Swiss Alps. The course will start on Monday 3 March and will end on Saturday 8 March 2008. It consists of 28 lectures of 50 minutes each. The daily schedule leaves free afternoons for informal discussions and/or outdoor activities.

The topic of the Saas-Fee Advance Course 2008 will be dedicated to:

MILLIMETER ASTRONOMY

Invited Lecturers:
- Pierre Cox, IRAM/France
- Stéphane Guilloteau, Bordeaux Observatory/France
- Thomas L. Wilson, ESO/Munich

Organizers:
- Dr. Miroslava Dessauges-Zavadsky
- Prof. Daniel Pfenniger with the help of Mrs Myriam Burgener Frick (Geneva Observatory/Switzerland)

Publication:
The Lecture book will be published by Springer-Verlag in it's Saas-Fee series.

Website:
The conference's website can be found unter the URL
http://obswww.unige.ch/saas-fee2008/.

Important Dates:

3 Sep 2007:	First Announcement
8 Oct 2007:	Opening of Registration
7 Jan 2008:	Registration Deadline (Limited number of participants)
2 Mar 2008:	Welcome Reception starting at 6:30 pm
3 Mar 2008:	Start of the Course at 8:30 am
8 Mar 2008:	End of the Course at 12:00 am
2009:	Publication of the Manuscripts

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

In order to reduce costs we are now sending paper copies of this Newsletter to astronomical libraries only. The IRAM Newsletter is available in electronic form by using the World Wide Web: from the IRAM home pages (`http://www.iram.fr/` or `http://www.iram.es/`), click on item "Events & News" and follow the links...

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