IRAM

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

Newsletter

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Contents

Calendar

February 1st, 2004
Deadline for the submission of global VLBI proposals

March 4rd, 2004 16:00h (MET):
Deadline for the submission of observing proposals for the period May 15, 2004 to Nov 15, 2004

Plateau de Bure Cable Car Accident - Penal Procedure

After more than 4 years of investigations, the penal procedure in connection with the cable car accident that hit the Plateau de Bure Observatory on July 1st, 1999 and tragically took the lives of 20 people, had finally been scheduled for the period November 12th to November 28th, 2003 in the Court in Gap. A total of 9 parties have been put on trial, 5 individuals, including two former IRAM employees and 4 legal entities, the CNRS and IRAM as well as APAVE and CRAM ("caisse regional d'assurance maladie") as controlling organisations.

The accident itself was caused by a failure in the cable attachment system, which was supposed to be self-blocking and maintenance free. This failure caused the cable car to slide backwards just before reaching the Plateau, derail and crash.

This kind of failure was never anticipated; several elements have probably contributed to it. Which ones exactly have a direct or indirect causal relationship with the accident is a matter of debate, as are the responsibilities and legal consequences. This is for the Court to judge.

The President of the Court will announce his decision on February 26th, 2004.

For more details, please contact us by e-mail (genevieve.debouzy@cnes.fr or grewing@iram.fr).

Geneviève DEBOUZY and Michael GREWING

Personnel Changes

IRAM GRENOBLE

In the earlier 2003 Newsletter issues, we could mostly welcome new colleagues. The present issue, however, announces many departures to new horizons, be it towards other institutes or well-deserved retirement.

Sebastien MULLER has accomplished his thesis and works since August as a postdoc at the Institute of Astronomy and Astrophysics in Taipeh, Taiwan. Also in August, Melanie KRIPS has returned to the University of Köln. Raphaël MORENO has obtained a permanent position at the Observatoire de Paris, but was delegated to IRAM for a limited period to finish some work here.

At the end of December 2003, Albert GREVE has retired. Author and co-author of more than 115 scientific papers, he has worked on astronomical and instrumental topics which include observations in different parts of the electromagnetic spectrum from the radio to ultraviolet range, from the solar system to galactic and extragalactic astronomy, VLBI, water vapor radiometry and many more. He is also one of the rare experts on the thermal modeling and acceptance testing of telescopes, but above all a good scientist and a fine colleague.

On the Plateau de Bure, a major change has taken place this summer: Our cooks Marie-Jacqueline MINIERE et Eliane BARBAGIN have retired, and Nadine DURAND, our remaining full-time cook, has left IRAM. The cooking and houskeeping services are now sub-contracted to an external enterprise.

Finally, one of the staff changes announced in the last newsletter needs to be rectified (error of the editor!). Sebastién MOUGEL, who was announced as a new member of the receiver group, is in fact in the SIS group. Please excuse the confusion.

Michael BREMER

Newsletter News

Since last year, it is possible to subscribe to the IRAM Newsletter mailing list on a web-based facility (http://www.iram.fr/mailman/listinfo/newsletter). This list is password protected; random passwords have been generated for those of you who were already informed by e-mail about newly available IRAM Newsletters. To cancel the subscription, you can ask the facility to mail your password to you. Please send me a mail if you encounter a problem. The list itself is "hidden", i.e. members cannot retrieve the e-mail addresses of other members.

The previously available anonymous FTP account (which also allowed to retrieve back-issues of the Newsletter) has recently been disabled, together with TELNET as an access mode to the IRAM computers. This step has been necessary to improve the security of our system. Please use the web pages to study/retrieve copies in PS or HTML format.

Michael BREMER (Editor)

VLBI Observations and Call

INTRODUCTION

In October 2002 and April 2003, two global VLBI experiments at 3mm wavelength have taken place involving both IRAM instruments, with the 6-antenna Plateau de Bure in phased-array mode for the first time. The IRAM 30-m telescope has already prooved its value in global VLBI observations for many years, but these two experiments now have shown that also the Plateau de Bure can work reliably as a phased array VLBI station. Two times per year both instruments will be available for global VLBI experiments (see Call for Proposals below).

CALL FOR GLOBAL VLBI PROPOSALS AT 3MM WAVELENGTH

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

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

The Global 3mm VLBI Array basically supports the same observing modes as the VLBA. For standard continuum observations the VLBI recording will be done at

256 Mbit/s (corresponding to a bandwith of 128 MHz). Correlation will be performed in absentia at the MPIfR MK4 correlator in Bonn unless some technical reason for using another correlator is given in the proposal. The P.I. will receive the correlated data in uv-fits format.

Proposals for the October 2004 session should be prepared in a similar fashion as "normal cm-VLBI proposals", using the standard VLBI cover sheet and instructions available on the web under URL http://www.nrao.edu/administration/-directors_office/vlba-gvlbi.shtml and should be submitted electronically **as e-mail** before

February 1st 2004, the normal VLBI deadline

to the following two addresses (in copy):

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

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

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

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

The IRAM and MPIfR VLBI teams

Some useful web pages

VLBI observations allow unique insights in the astrophysics of compact and bright sources. Please prepare your proposals carefully, as they are equivalent to asking simultaneously for observing time on a large number of telescopes. Avoid last minute submissions: the e-mail submission may bounce large e-mails (critical limit about 5 Megabytes), returning them with details on how to submit via anonymous FTP. See http://www.nrao.edu/-administration/directors_office/vlba-gvlbi.shtml for more information.

- Technical details on VLBI observations: http://www.mpifr-bonn.mpg.de/div/vlbi/-globalmm/index.html
- Technical details on PdBI correlator in VLBI mode by Marc Torres: http://www.iram.fr-/IRAMFR/TA/backend/vlbi/index.html
- Very long baseline array observational status summary (J.M. Wrobel, April 5, 2002) http://www.aoc.nrao.edu/vlba/obstatus/obssum/-obssum.html
- CMVA Technical Information:
  Array sensitivity: http://web.haystack.mit.edu/-cmva/tech_1.html
  Field of view vs. Time averaging:
  http://web.haystack.mit.edu/cmva/tech_2.html

Michael BREMER

Scientific Results in Press

First detections of extragalactic SO_2, NS and NO

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Abstract:
We report the first detections of SO_2, NS and NO in an extragalactic source, the nucleus of the starburst galaxy NGC 253. Five SO_2 transitions, three groups of hyperfine components of NO and five of NS were detected. All three species show large abundances averaged over the inner 200 pc of NGC 253. With a relative abundance of a few 10^{-7}, the emission of the NO molecule is similar or even larger than that found in Galactic star forming regions. The derived relative molecular abundances for each molecule have been compared with those of prototypical Galactic molecular clouds. These results seem to confirm that large scale shocks dominate the chemistry of these molecules in the nucleus of NGC 253, ruling out a chemistry dominated by PDRs for the bulk of the gas.

Published in A&A 411, L465

From the AGB to the PN Phase with the Plateau de Bure Interferometer

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Abstract:
In order to understand the origin of the asymmetries and substructures observed in planetary nebulae, it is necessary to improve our knowledge on their progenitors, the circumstellar envelopes (CSEs) of asymptotic giant branch (AGB) stars and proto-planetary nebulae (PPNe). These nebulae are mainly composed of cool molecular gas and therefore they are accessible to mm-observations. The Plateau de Bure interferometer has played an important role in the advance of our understanding of these objects in the last 10 yrs.

To appear in: Asymmetric Planetary Nebulae III, ASP conf. Series, Edts. M. Meixner, J. Kastner, B.Balick and N. Soker

Molecular Gas in NUclei of GAlaxies (NUGA). I. The counter-rotating LINER NGC 4826

García-Burillo S.([1]), Combes F.([2]), Hunt L. K.([3]), Boone F.([4]), Baker A. J.([5]), Tacconi L. J.([5]), Eckart A.([6]), Neri R.([7]), Leon S.([8]), Schinnerer E.([9]) and Englmaier P.([10])
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Abstract:
We present new high-resolution observations of the nucleus of the counter-rotating LINER NGC 4826, made in the J=1-0 and J=2-1 lines of 12CO with the IRAM Plateau de Bure mm-interferometer(PdBI).The CO maps, which achieve 0.8arcsec (16 pc) resolution in the 2-1 line, fully resolve an inner molecular gas disk which is truncated at an outer radius of 700 pc. The total molecular gas mass ($3.1 \cdot 10^8 M_\odot$) is distributed in a lopsided nuclear disk of 40 pc radius, containing 15% of the total gas mass, and two one-arm spirals, which develop at different radii in the disk. The distribution and kinematics of molecular gas in the inner 1 kpc of NGC 4826 show the prevalence of different types of m=1 perturbations in the gas. Although dominated by rotation, the gas kinematics are perturbed by streaming motions related to the m=1 instabilities. The non-circular motions associated with the inner m=1 perturbations (lopsided instability and inner one-arm spiral) agree qualitatively with the pattern expected for a trailing wave developed outside corotation ("fast" wave). In contrast, the streaming motions in the outer m=1 spiral are better explained by a "slow" wave. A paradoxical consequence is that the inner m=1 perturbations would not favour AGN feeding. An independent confirmation that the AGN is not being generously fueled at present is found in the low values of the gravitational torques exerted by the stellar potential for $R< 530$ pc. The distribution of star formation in the disk of NGC 4826 is also strongly asymmetrical. The observed asymmetries, revealed by HST images of the inner disk, follow the scales of the various m=1 perturbations identified in the molecular gas disk. Massive star formation is still

vigorous, fed by the significant molecular gas reservoir at R< 700 pc. There is supporting evidence for a recent large mass inflow episode in NGC 4826. The onset of m=1 instabilities of the type observed in NGC 4826 may be a consequence of secular evolution of disks with high gas mass contents.

These observations have been made in the context of the NUclei of GAlaxies (NUGA) project, aimed at the study of the different mechanisms for gas fueling of Active Galactic Nuclei (AGN).

Published in A&A 407, 485

Detection of an orbiting gas disk in the Red Rectangle

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Abstract:
We present interferometric maps of CO emission in the Red Rectangle, a well known protoplanetary nebula. The CO emission is found to arise from a relatively thin equatorial disk, extending about 5″ in the direction perpendicular to the symmetry axis of the optical nebula. The velocity dispersion of the emission clearly increases towards the center, in a pattern significantly coincident with that expected for a Keplerian velocity field. Modeling of the CO maps confirms that the emitting gas is probably rotating around the central star(s), with a Kepler-like velocity distribution (at least in the central regions) that would correspond to a central mass $\approx 0.9 M_\odot$. Other possible explanations to the observations are discussed, but are found to be unlikely. Our models also suggest that the density and temperature increase towards the center roughly proportionally to the inverse radius. The asymmetry observed in the line profile and intensity distribution (the red part being stronger) can be explained by self-absorption if, superimposed to the rotation velocity, there is a low radial expansion at a velocity of about 0.4 km s^{-1}, at least in the outer disk regions. This is the first probable detection of a gas disk in Kepler-like rotation around a post-AGB star.

Published in A&A 409, 573

High-excitation CO in a quasar host galaxy at z =6.42

Bertoldi F.(1), Cox P.(2), Neri R.(3), Carilli C. L.(4), Walter F.(4), Omont A. (5), Beelen A.(6), Henkel C.(1), Fan X.(7), Strauss Michael A.(8) and Menten K. M.(1)
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Abstract:
We report the detection of high excitation CO emission from the most distant quasar currently known, SDSS J114816.64+525150.3 (hereafter J1148+5251), at a redshift z=6.419. The CO (J=6-5) and (J=7-6) lines were detected using the IRAM Plateau de Bure interferometer, showing a width of $\approx$ 280 km s^{-1}. An upper flux limit for the CO (J=1-0) line was obtained from observations with the Effelsberg 100-meter telescope. Assuming no gravitational magnification, we estimate a molecular gas mass of $\approx 2 \times 10^{10} M_\odot$. Using the CO (3-2) observations by Walter et al. (2003), a comparison of the line flux ratios with predictions from a large velocity gradient model suggests that the gas is likely of high excitation, at densities $\approx$ 104.5 cm^{-3} and a temperature $\approx$ 100 K. Since in this case the CO lines appear to have moderate optical depths, the gas must be extended over a few kpc. The gas mass detected in J1148+5251 can fuel star formation at the rate implied by the far-infrared luminosity for less than 10 million years, a time comparable to the dynamical time scale of the region. The gas must therefore be replenished quickly, and metal and dust enrichment must occur fast. The strong dust emission and the massive, dense gas reservoir at z $\approx$ 6.4 provide further evidence that vigorous star formation is co-eval with the rapid growth of massive black holes at these early epochs of the Universe.

Appeared in A&A 409, L47

Interferometric Observations of Powerful CO Emission from Three Submillimeter Galaxies at z=2.39, 2.51, and 3.35

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Abstract:
We report IRAM millimeter interferometry of three z$\approx$ $2.4-3.4$ Submillimeter Common-User Bolometric Array deep field galaxies. Our CO line observations confirm the rest-frame UV/optical redshifts, thus more than doubling the number of confirmed published redshifts of the faint submillimeter population and proving their high-z nature. In all three sources our measurements of the intrinsic gas and dynamical mass are large ($10^{10}-10^{11}\mathrm{M}_\odot$). In at least two cases the data show that the submillimeter sources are part of an interacting system. Together with recent information gathered in the X-ray, optical, and radio bands, our observations support the interpretation that the submillimeter population, at least the radio-detected ones, consists of gas-rich (gas-to-dynamical mass ratio ≈ 0.5) and massive interacting starburst/active galactic nucleus systems.

Appeared in : ApJ 597, L113

First Evidence of Dusty Disks around Herbig Be Stars

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Abstract:
We have carried out a high-sensitivity search for circumstellar disks around Herbig Be stars in the continuum at 1.4 and 2.7 mm using the IRAM interferometer at the Plateau de Bure. In this Letter, we report data on three well-studied B0 stars: MWC 1080, MWC 137, and R Mon. The two latter have also been observed in the continuum at 0.7 and 1.3 cm using the NRAO Very Large Array. We report the detection of circumstellar disks around MWC 1080 and R Mon with masses of $M_d \approx 0.003$ and $0.01\mathrm{M}_\odot$, respectively, while for MWC 137 we estimate a disk mass upper limit of $0.007\mathrm{M}_\odot$. Our results show that the ratio M_d/M_* is at least an order of magnitude lower in Herbig Be stars than in Herbig Ae and T Tauri stars.

Published in ApJ 598, L39

Gas and dust in the Cloverleaf quasar at redshift 2.5

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Abstract:
We observed the upper fine structure line of neutral carbon, $C_I(^3P_2 \rightarrow {}^3P_1)$) ($\nu_{rest}$ = 809GHz), the ^{12}CO($J = 3 \rightarrow 2$) line (ν_{rest} = 345 GHz) and the 1.2 mm continuum emission from H1413+117 (Cloverleaf quasar, z=2.5) using the IRAM interferometer. Together with the detection of the lower fine structure line (Barvainis et al. 1997), the Cloverleaf quasar is now only the second extragalactic system, besides M 82, where both carbon lines have convincingly been detected. Our analysis shows that the carbon lines are optically thin and have an excitation temperature of $T_{ex} \approx 30$ K. CO is subthermally excited and the observed line luminosity ratios are consistent with N(H_2) $\approx 10^{3-4}$ cm^{-3} at $T_{kin} = 30-50$ K. Using three independent methods (C_I, dust, CO) we derive a total molecular gas mass (corrected for magnification) of M(H_2) $\approx 1.2\pm0.3\times10^{10}\mathrm{M}_\odot$. Our observations suggest that the molecular disk extends beyond the region seen in CO(7-6) to a zone of more moderately excited molecular gas that dominates the global emission in C_I and the low J CO lines.

Appeared in: A&A 409, L41

New Preprints

572. FIRST DETECTIONS OF EXTRAGALACTIC SO_2, NS AND NO
S. Martin, R. Mauersberger, J. Martin-Pintado, S. Garcia-Burillo, C. Henkel
2003, *Astronomy and Astrophysics*

573. NON-GAUSSIAN VELOCITY SHEARS IN THE ENVIRONMENT OF LOW MASS DENSE CORES
J. Pety, E. Falgarone
2003, *Astronomy and Astrophysics*

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

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Please visit the web-based facility http://www.iram.fr/mailman/listinfo/newsletter for details. This facility is not mirrored on http://www.iram.es.

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

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Plateau de Bure	Institut de Radioastronomie Millimétrique, Observatoire du Plateau de Bure, 05250 St Etienne en Dévoluy, France		
	from abroad:	(33) 492 52 53 60	(33) 492 52 53 61
	from France:	0 492 52 53 60	0 492 52 53 61
Granada	Instituto de Radioastronomía Milimétrica, Avenida Divina Pastora 7, Núcleo Central, 18012 Granada, España	(34) 958 80 54 54	(34) 958 22 23 63
Pico Veleta	Instituto de Radioastronomía Milimétrica, Estación Radioastronómica IRAM-IGN del Pico Veleta, Sierra Nevada, 18012 Granada, España	(34) 958 48 20 02	(34) 958 48 11 48

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