Proposals for IRAM Telescopes

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

14 September 2010, 17:00 CEST (UT + 2 hours)

Please note that, departing from previous practice, the **current deadline is on a Tuesday.** The scheduling period extends from 01 December 2010 – 31 May 2011. 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 at this address:

http://www.iram-institute.org/EN/
content-page.php?ContentID=57&rub=7&srub=57

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. Proposals are evaluated on the basis of the paper copy. **If color is considered essential** for the understanding of a specific figure, a respective remark should be added in the figure caption. The referees may then consult the electronic version of proposal.

Soon after the deadline the IRAM Scientific Secretariat sends an acknowledgement of receipt to the Principal Investigator of each proposal correctly received, together with the proposal registration number. Note that the web facility allows cancellation and modification of proposals before the deadline. The facility also allows to view the proposal in its final form as it appears after re–compilation at IRAM. We urge proposers to make use of this feature as we always receive a number of corrupted proposals (figures missing, blank pages, etc.).

Valid proposals contain the official cover page, one or more pages of technical information, up to two pages of text describing the scientific aims, and up to two pages of figures, tables, and references. Normal proposals should *not exceed* 6 pages, except for additional technical pages. Longer proposals will be cut. We continue to call for **Large Observing Programmes** (see P. Cox in this Newsletter). The Large Programmes may have up to 4 pages for the scientific justification, plus cover page, the technical pages, and 2 pages for supporting material.

The current versions of the proposal templates for the 30m telescope `prop-30m.tex` and for the interferometer `prop-pdb.tex` must be used together with the current LaTeX style file `proposal.sty`. All three files may be downloaded from

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

Do not change the font type or size, and do not manipulate the style file. In case of problems, contact the IRAM secretary (e–mail: `berjaud@iram.fr`). Please, also 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).

Short spacing observations on the 30m telescope should directly be requested on the interferometer proposal form. A separate proposal for the 30m telescope is not required. The interferometer proposal form contains a bullet, labelled "30M short spacings" which should then be checked. The user will be prompted to fill in an additional paragraph in which the scientific need for the short spacings should be described. It is essential to give here all observational details, including size of map, sampling density and rms noise, spectral resolution, receiver configuration, and time requested.

A mailing list has been set up for astronomers interested in being notified about the availability of a new Call for Proposals. A link to this mailing list is on the IRAM web page. The list presently includes all principal investigators of proposals for IRAM telescopes during the last 2 years. Please verify that your email address in this list is correct.

J.M. Winters & C. Thum

Travel funds for European astronomers

Observations using IRAM telescopes continue to be supported by RadioNet under the European Framework Programme 7. A budget, somewhat reduced compared to the 2004 – 2008 period, is available for travel by European astronomers through the Trans National Access (TNA) Programme.

As before, travel may be supported to the 30m telescope for observation (contact: C. Thum) and to Grenoble for reduction of interferometer data (contact: R. Neri). Detailed information about the eligibility, policies, and travel claims can be found on the RadioNet home page at `http://www.radionet-eu.org`. The Principal Investigators of IRAM proposals eligible for TNA funding will be informed individually.

R. Neri & C. Thum

Call for Observing Proposals on the 30m Telescope

Summary

Proposals for three types of receivers will be considered for the coming winter semester (01 December 2010 – 31 May 2011):

1. the heterodyne receiver EMIR, consisting of dual-polarization mixers, operating in the four bands at 3, 2, 1.3, and 0.9 mm wavelengths.
2. the 9 pixel dual–polarization heterodyne receiver array, HERA, operating at 1.3 mm wavelength.
3. the MAMBO2 bolometer array with 117 pixels operating at 1.2 mm.

Emphasis will be put on observations at the shorter wavelengths, but 3mm proposals are also encouraged, particularly if they are suited for medium or low quality weather backup. The bulk of the observations at wavelengths $\leq$ 1.3 mm will be scheduled in pools which allow to optimize the observation queues according to weather conditions. During the last winter semester the pool structure was successfully improved by including a new queue for projects requiring the "best weather". Projects in this new queue are observed when the column of preciptable water vapor drops below 2mm and when other practical conditions (wind, atmospheric stability) are fulfilled.

We continue to call for Large Programmes using any of the three instruments.

Proposers are requested to use the time estimators which are available online via the IRAM 30m webpage.

What is new?

Fourier Transform Spectrometers. The implementation and commissioning of the new Fast Fourier Transform Spectrometers (FTS) is proceeding as planned. For the coming winter semester, two blocks of FTS will be available, each block covering a contiguous 4 GHz band. In this initial step, the spectral resolution of these FTS is fixed to 195 kHz. Assuming that further commissioning is successful, this new backend will be available for regular observations in all observing modes, except for polarimetry.

The new FTS backend provides a 16× larger bandwidth than VESPA at comparable resolution. Work is in progress (1) to increase the FTS bandwidth up to 32 GHz (at 195 kHz resolution) and (2) to provide higher spectral resolutions.

Time Estimator. For proposal preparation, the new online time estimators for EMIR, HERA and MAMBO2 should be used (see the 30m homepage). Note that the estimators assume typical observation overheads, and give an estimate of the *total* observing times. For the heterodyne receivers, the noise estimate is done per beam, and not per observed grid position, as had been done with the previous estimator.

The complete text of the Call for Proposals can be retrieved as a pdf file from the IRAM web site at

`http://www.iram.fr/GENERAL/calls/w10/w10.pdf`

C. Thum & C. Kramer

Applications

The official proposal cover page and the second page for the Technical Summary should be filled in with great care. All information on these pages is transferred to the IRAM proposal database. Attention should be given to *Scheduling constraints* where the proposer can enter dates where he/she is not available for observing. Proposers requesting observations which need atmospheric opacities better than typical for the semester (corresponding to 7mm pwv in summer and 4mm in winter) should give the maximum acceptable value of precipitable water vapor in the corresponding table of the Technical Summary.

In order to avoid duplication of observations and to protect already accepted proposals, we keep a computerized list of targets. We ask you to fill in carefully the source list in equatorial J2000 coordinates. This list *must contain all the sources* (and only those sources) for which you request observing time. Your list must adhere to the format indicated on the proposal form (sexagesimal notation). If your source list is longer than 15 sources that fit onto the cover page, please use the LaTeXmacro `\extendedsourcelist`.

A scientific project should not be artificially cut into several small projects, but should rather be submitted as one bigger project, even if this means 100–150 hours of observing time. Note that large programs of particular scientific importance can be submitted in the "Large Programmes" category.

If time has already been given to a project but turned out to be insufficient, explain the reasons, e.g. indicate the amount of time lost due to bad weather or equipment failure; if the fraction of time lost is close to 100%, don't rewrite the proposal, except for an introductory paragraph. For continuation of proposals having led to publications, please give references to the latter.

EMIR

Overview

The spectral line receiver EMIR (**E**ight **MI**xer **R**eceiver) which was installed in spring 2009 is operational without any major complications. EMIR provides a minimum instantaneous bandwidth of 4 GHz in each of the two orthogonal linear polarizations for the 3, 2, 1.3 and 0.9 mm atmospheric windows (Fig. 1). In addition to the vast increase in bandwidth compared to the old single pixel receivers, EMIR offers significantly improved noise temperatures, a stable alignment between polarizations and bands, and other practical advantages.

The four EMIR bands are designated as E 090, E 150, E 230, and E 330 according to their approximate center frequencies in GHz. While the E 150 and E 230 bands have SSB mixers with a single sideband available at a time, the E 090 and E 330 bands are operated in 2SB mode where both sidebands are available for connection to backends. Furthermore, the E 090 band uses a technology that offers 8 GHz instantaneous bandwidth per sideband and polarization. Both polarizations of a given band will always be tuned to the same frequency as they share a single common local oscillator. The tuning ranges of the 4 bands, the typical receiver noise temperatures, and other parameters as measured in the lab are listed in Tab. 1. The values for band E 330 are still mostly based on lab measurements.

EMIR provides a permanently available high sensitivity E 330 band, opening this atmospheric window for regular use under very good weather conditions. The frequency range of this band (see Tab. 1), currently limited at the upper end by LO power, is planned to be extended up to 360 GHz. Since observations at these high frequencies are very weather dependent, all E 330 proposals will be scheduled in the bolometer or HERA pools where they will be given priority as soon as the precipitable water vapor falls below 2mm and other constraints (wind, scintillation) are met. About one week of E 330 time will be accepted which will be scheduled in autumn. The proposed targets should ideally be available during night time in autumn.

Selection of EMIR bands

Before reaching the Nasmyth mirrors, the four beams of the EMIR bands pass through warm optics that contain switchable mirrors and dichroic elements for redirection of the beams towards calibration loads and for combining beams. In its simplest mode, the warm optics unit selects one single EMIR band for observation. This mode avoids the use of the slightly lossy dichroic elements and therefore offers the best receiver noise temperatures.

The warm optics includes dichroic mirrors which combine the beams of two receivers in such a way that they look at the same position on the sky and have the same focus values within 0.3mm. The following band combinations are possible: E 090 and E 150, E 090 and E 230, or E 150 and E 330 (Tab. 1). The combination of bands is not polarization selective, i.e. the combined beams will stay dual polarization. The loss of these dichroics which is small over most of the accessible frequency range, increases however the receiver temperatures by 10 – 15 K. In a few particularly disadvantageous frequency combinations, the increase of receiver noise may be substantially higher (see the EMIR web site). The observer is therefore advised to carefully evaluate whether an observation involving two different bands is more efficiently made in parallel or in series.

Table 1: EMIR Frontend. Sky frequencies, F_{sky}, refer to the center of the IF band. 2SB – dual sideband mixers, SSB – single side band mixers, H/V – horizontal and vertical polarizations, T_{sb} is the SSB receiver temperature in single band observations (*left*). For dual–band observations, T_{db} includes a 15 K noise contribution from the dichroics (*right*).

EMIR band	F_{sky} GHz	mixer type	polarization	IF width GHz	T_{sb} K	G_{im} dB	combinations E 0/2	E 1/3	E 0/1	T_{db} K
E 090	83 – 117	2SB	H/V	8	50	> 13	X		X	65
E 150	129 – 174	SSB	H/V	4	50	> 10		X	X	65
E 230	200 – 267	SSB	H/V	4	50	> 13	X			65
E 330	260 – 350	2SB	H/V	4	70	> 10		X		85

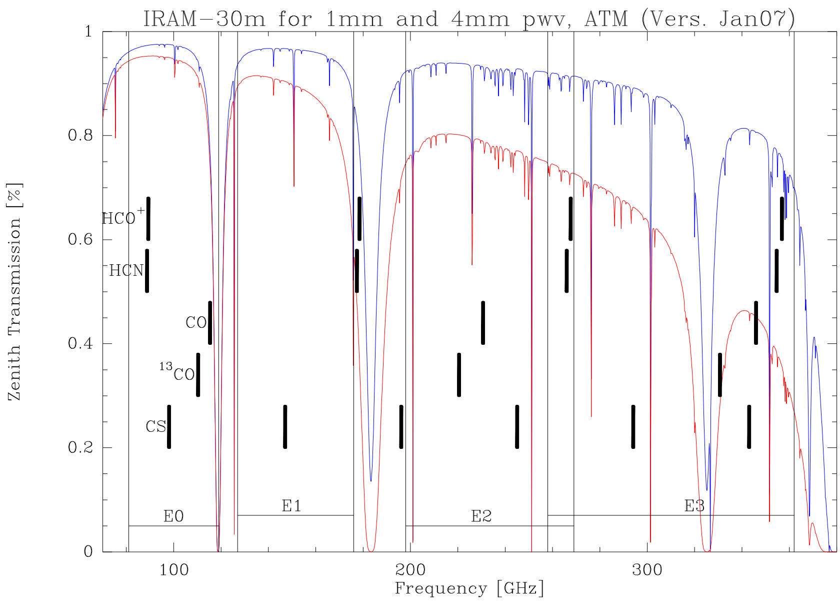

Figure 1: Atmospheric transmission at the 30m site between 60 and 400 GHz for 1 and 4mm of precipitable water vapor, derived from the ATM model. The EMIR bands are indicated and the frequencies of a few important molecular transitions are marked.

Connection to backends

The remarkable bandwidth of EMIR of currently altogether 64 GHz faces 2 limitations of the existing 30m hardware: (1) the four IF cables can transport only 4 GHz each (the 4 × 4 GHz bottleneck) and (2) only at low spectral resolution are there enough backends to cover the 16 GHz which pass through the bottleneck.

A **IF switch box** in the receiver cabin allows to select 4 EMIR channels of 4 GHz bandwidth each from 16 inputs.[1] The box can handle all plausible single band observations as well as the band combinations indicated in Tab. 1. A full list of possible switch settings is available on the EMIR home page in Granada.

The selected 4 output channels are sent via the IF cables to a **backend distribution unit** which provides copies of these 4 channels to a range of backend processors which then prepare the IF signals for distribution to the spectrometers. The following three backend processors feed the 4 GHz wide IF channels to the backends:

▷ The **WILMA processor** rearranges the four incoming 4 GHz wide IF channels into 16 channels of 1 GHz width which can be processed by 16 WILMA autocorrelator units. Since each unit provides 512 spectral channels of 2 MHz, sufficient backend power is available at this low spectral resolution for full coverage of the 4 × 4

[1] The 4 channels of 8 GHz width available from E 090 are rearranged by the IF switch box into 4 pairs of inner and outer 4 GHz wide channels.

GHz bottleneck.

▷ The **4 MHz processor** rearranges any two incoming 4 GHz wide IF channels into 8 slices of 1 GHz width for processing in 8 units of the 4 MHz filter bank. 2×4 GHz of EMIR bandwidth are thus covered at 4 MHz resolution.

▷ The **"narrow band backends" processor** prepares the 4 incoming IF channels for input into VESPA. Only the central part of the 4 GHz IF channels is accessible to this backend. Inside the central part (640 MHz), VESPA can be configured as before. Note however that VESPA bands cannot be moved outside the ±250 MHz range around the band center. The VLBI terminal is also fed from this processor.

Calibration Issues

EMIR has its own calibration system. The external warm optics provides ambient temperature loads and mirrors reflecting the beams back onto the 15 K stage of the cryostat. This system is expected to be very reliable and constant over time. Absolute calibration accuracy will be better than 10% with EMIR when all details are well settled.

Bands E 150 and E 230 have backshort tuned single–sideband mixers; DSB tuning is not possible, but sidebands (USB or LSB) may be selectable within limitations. The image rejection is better than 10 dB for all frequencies. On–site measurements of the rejection is not longer straightforward for these mixers, since the Martin–Puplett interferometers are not available anymore for sideband separation. As the optimum way of calibrating the image rejection is still under study, users who propose observations which rely on an enhanced accuracy of calibration of image gains should mention this request in the proposal.

Bands E 090 and E 330 have tunerless sideband separation mixers, allowing simultaneous observations of both sidebands in separate IF bands. These mixers have been characterized in the laboratory for their image rejection and are expected to have the same performance on site ($>$ 10 dB). The default rejection for all EMIR receivers, is 13dB.

Velocity scales

It is common practice at radio observatories to correct the frequency of an observation for the strongly time variable velocity of the Observatory with respect to the solar system barycenter. This guarantees that lines observed near the Doppler–tracked frequency, usually the band center, always have the correct barycentric velocity, independent of the time of observation. However, the effect of the Observatory's motion on the velocity *scale* which affects most the velocity channels farthest away from the Doppler–tracked frequency, is usually ignored.

This effect which is of the order of 10^{-4} cannot be neglected anymore if large bandwidths are used, as with EMIR. The worst case occurs with band E 090 where channels as far away as 20 GHz need to be considered if a velocity channel in one of the sidebands is Doppler–tracked. In unfavorable but nevertheless frequent cases (target source not too far from the ecliptic, like the Galactic center), errors of up to ±2 MHz occur. Since the magnitude of the error changes with time, narrow spectral lines may be broadened after a few hours of observation, and spectra taken at different epochs may not align in frequency.

HERA

A full description of HERA **HE**terodyne **R**eceiver **A**rray and its observing modes is given in the HERA manual. Here we only give a short summary.

The 9 dual–polarization pixels are arranged in the form of a center–filled square and are separated by $24''$. Each beam is split into two linear polarizations which couple to separate SIS mixers. The 18 mixers feed 18 independent IF chains. Each set of 9 mixers is pumped by a separate local oscillator system. The same positions can thus be observed simultaneously at any two frequencies inside the HERA tuning range (210-276 GHz for the first polarization, and 210-242 for the second polarization).

A derotator optical assembly can be set to keep the 9 pixel pattern stationary in the equatorial or horizontal coordinates. Receiver characteristics are listed on the 30m web site.

Recent observations have shown that the noise temperature of the pixels of the second polarization array may vary across the 1 GHz IF band. The highest noise occurs towards the band edges which are, unfortunately, picked up when HERA is connected with VESPA whose narrow observing band is located close to the lower edge of the 1 GHz band. Therefore, while not as important for wide band observations with centered IF band, the system noise in narrow mode is higher (factor 1.5 – 2) as compared to the first polarization array. We do not recommend to use the second polarization for frequencies $>$ 241 GHz.

HERA can be connected to three sets of backends:

▷ VESPA with the following combinations of nominal resolution (kHz) and maximum bandwidth (MHz): 20/40, 40/80, 80/160, 320/320, 1250/640. The maximum bandwidth can actually be split into two individual bands for each of the 18 detectors at most resolutions. These individual bands can be shifted separately up to ±250 MHz offsets from the sky frequency (see also the sections on backends below).

- ▷ a low spectral resolution (4 MHz channel spacing) filter spectrometer covering the full IF bandwidth of 1 GHz. Nine units (one per HERA pixel) are available. Note that only one polarization of the full array is thus connectable to this filter bank.
- ▷ WILMA with a 1 GHz wide band for each of the 18 detectors. The bands have 512 spectral channels spaced out by 2 MHz.

HERA is operational in two basic spectroscopic observing modes: *(i)* raster maps[2] of areas typically not smaller than $1'$, in position, wobbler, or frequency switching modes, and *(ii)* on–the–fly maps of moderate size (typically $2' - 10'$). Extragalactic proposals should take into account the current limitations of OTF line maps, as described in the HERA User Manual, due to baseline instabilities induced by residual calibration errors. HERA proposers should use the web–based Time Estimator. For details about observing with HERA, consult the User Manual. The HERA project scientist, Karl Schuster (schuster@iram.fr), or Manuel Gonzalez (gonzalez@iram.fr), the HERA pool coordinator, may also be contacted.

Accepted HERA proposals will be pooled together in order to make more efficient use of stable 1.3mm observing conditions. Questions concerning the HERA pool organization can be directed to the scheduler or the HERA pool coordinator.

MPIfR Bolometer array

The bolometer array MAMBO–2 (117 pixels) is provided by the Max–Planck–Institut für Radioastronomie. It consists of concentric hexagonal rings of horns centered on the central horn. Spacing between horns is $\simeq 20''$. Each pixel has a HPBW of $11''$.

The effective sensitivity of MAMBO–2 for onoff observations is ~ 40 mJy s$^{\frac{1}{2}}$ and ~ 45 mJy s$^{\frac{1}{2}}$ for mapping. The *rms*, in mJy, of a MAMBO–2 map is typically

$$rms = 0.4 f \sqrt{v_{scan} \Delta s}$$

where v_{scan}, in arc sec/sec, is the velocity in the scanning direction and Δs, in arc sec, is the step size in the orthogonal direction. The factor f is 1 (2) for sources of size $< 30''$ ($> 60''$). It is assumed that the map is made large enough that all beams cover the source. The sensitivities apply to bolometric conditions (stable atmosphere, τ(250GHz) $\sim$ 0.3, elevation 45 deg, and application of skynoise filtering algorithms). In cases where skynoise filtering algorithms are not or not fully effective (e.g. extended source structure, atmosphere not sufficiently stable), the effective sensitivity is typically about a factor of 2 worse. The principal investigators of accepted proposals will be requested to specify in the pool database which minimum atmospheric conditions their observations need.

The bolometer arrays are mostly used in two basic observing modes, ON/OFF and mapping. Previous experience with MAMBO–2 shows that the ON/OFF reaches typically an rms noise of ~ 2.3 mJy in 10 min of total observing time (about 200 sec of ON source, or about 400 sec on sky integration time) under stable conditions. Up to 30 percent lower noise may be obtained in perfect weather. In this observing mode, the noise integrates down with time t as $\sqrt{t}$ to rms noise levels below 0.4 mJy.

In the mapping mode, the telescope is scanning in the direction of the wobbler throw (default: azimuth) in such a way that all pixels see the source once. A typical single map[3] with MAMBO–2 covering a fully and homogeneously sampled area of $150'' \times 150''$ (scanning speed: $5''$per sec, raster step: $8''$) reaches an rms of 2.8 mJy/beam in 1.9 hours if skynoise filtering is effective. Much more time is needed (see Time Estimator) if sky noise filtering cannot be used. The area actually scanned in this typical map must be much larger, namely ($8.0' \times 6.5'$) if the EHK–algorithm is used to restore properly extended emission. This is because the wobbler throw, the array size ($4'$), the source extent, and some margin for baseline determination must be added. Shorter scans may lead to problems in restoring extended structure. Mosaicing is also possible to map larger areas. Under many circumstances, maps may be co–added to reach lower noise levels. If maps with an rms $\lesssim 1$ mJy are proposed, the proposers should contact Robert Zylka (zylka@iram.fr).

The bolometers are used with the wobbling secondary mirror (wobbling at a rate of 2 Hz). The

[2] As long as the NCS raster command is not operational, the raster pattern has to be traced out with the help of a SIC loop.

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

orientation of the beams on the sky changes with hour angle due to parallactic and Nasmyth rotations, as the array is fixed in Nasmyth coordinates and the wobbler direction is fixed with respect to azimuth during a scan. Bolometer proposals participating in the pool have their observations (maps and ONOFFs) pre-reduced by a data quality monitor which runs scripts in MOPSIC. This package, complete with all necessary scripts, is also installed for off-line data analysis in Granada and Grenoble. It is also available for distribution from the GILDAS web page[5].

Bolometer proposals will be pooled together like in previous semesters along with suitable heterodyne proposals as long as the respective PIs agree. The web–based time estimator handles well the usual bolometer observing modes, and its use is again strongly recommended. The time estimator uses rather precise estimates of the various overheads which will be applied to all bolometer proposals. If exceptionally low noise levels are requested which may be reachable only in a perfectly stable (quasi winter) atmosphere, the proposers must clearly say so in their time estimate paragraph. Such proposals will however be particularly scrutinized. On the other extreme, if only strong sources are observed and moderate weather conditions are sufficient, the proposal may be used as a backup in the observing pool. The proposal should point out this circumstance, as it affects positively the chance that the proposal is accepted and observed.

Questions concerning the MAMBO pool organization can be directed to the scheduler (thum@iram.fr) or to the MAMBO pool coordinator, Guillermo Quintana-Lacaci (quintana@iram.es).

The Telescope

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

Pointing and Focusing

With the systematic use of inclinometers the telescope pointing became much more stable. Pointing sessions are now scheduled at larger intervals. The fitted pointing parameters typically yield an absolute rms pointing accuracy of better than $3''$ [7]. However, larger deviations can occur around sunset or sunrise, in which case we recommend more frequent pointings (every 1 or 2 hours, depending on the beam size). The eight individual receivers of EMIR are very well aligned with each other. Offsets between polarizations of any one band are smaller than $1''$ and offsets between bands have been measured to be below $2''$. Checking the pointing, focus, and receiver alignment is the responsibility of the observers (use a planet for alignment checks). Systematic (up to 0.4 mm) differences between the foci of various receivers can occasionally occur. In such a case the foci should be carefully monitored and a compromise value be chosen. Not doing so may result in broadened and distorted beams [9].

Wobbling Secondary

- Beam–throw is $\leq 240''$ depending on wobbling frequency. At 2 Hz, the maximum throw is $90''$
- Standard phase duration: 2 sec for spectral line observations, 0.26 sec for continuum observations.

Unnecessarily large wobbler throws should be avoided, since they introduce a loss of gain, particularly at the higher frequencies, and imply a loss of observing efficiency (more dead time).

Beam widths and Efficiencies

See the summary of telescope parameters on the Granada web site for the current efficiencies between 70 and 270 GHz, and the predictions for the 345 GHz (0.9 mm) band.

Backends

The following four spectral line backends are available which can be individually connected to any EMIR band and to HERA.

VESPA, the versatile spectrometric and polarimetric array, can be connected either to HERA or to a subset of 4 single pixel receivers, or to a pair of single pixel receivers for polarimetry. The many VESPA configurations and user modes are summarized in a Newsletter contribution [10] and in a user guide, but are best visualised on a demonstration program which can be downloaded from our web page at http://www.iram.fr/IRAMFR/PV/veleta.htm. Connected to a set of 4 IF schannels of EMIR, VESPA typically provides up to 12 000 spectral channels (on average 3 000 per receiver). Up to 18 000 channels are possible in special configurations. Nominal spectral resolutions range from 3.3 kHz to 1.25 MHz. Nominal bandwidths are in the range 10 — 512 MHz. VESPA basebands can be offset from band center up to ±250 MHz (outer edges of the baseband). When VESPA is connected to HERA, up to 18 000 spectral channels can be used with the following typical combinations of nominal resolution (kHz) and maximum bandwidth (MHz): 20/40, 40/80, 80/160, 320/320, 1250/640.

The 4 MHz filterbank consists of nine units. Each unit has 256 channels (spacing of 4 MHz, spectral resolution at 3 dB is 6.2 MHz) and thus covers a total bandwidth of 1 GHz. The 9 units are designed for connection to HERA, but a subset of 4 units can also be connected to EMIR.

The **wideband autocorrelator WILMA** consists of 18 units. They can be connected to the 18 detectors of HERA or to EMIR. Each unit provides 512 spectral channels, spaced out by 2 MHz and thus covering a total bandwidth of 1 GHz. Each band is sliced into two 500 MHz subbands which are digitized with 2 bit/1 GHz samplers. An informative technical overview of the architecture is available at URL[4] ../IRAMFR/TA/backend/veleta/wilma/index.htm.

A **Fast Fourier Transform Spectrometer** (FTS) is being implemented as a new backend for use with the heterodyne receivers. It consists of a series of FTS modules purchased from Radiometer Physics. Each module is currently configured to digitize an IF band of 1.5 GHz width and to give more than 8000 spectral channels. In the initial version operational in the coming winter semester, two FTS blocks will be available where each block combines 4 modules to give a contigueous 4 GHz band with a spacing between channels of 195 kHz. Each block can be connected to any of the 4 GHz IF signals of EMIR in parallel to the 4 MHz filterbank.

Polarimetry

Polarimetric observations can be made using a dual–polarization band of EMIR connected to VESPA in a setup designated as XPOL. The technical aspects of XPOL are described in detail for the previous generation of heterodyne receivers (Thum et al. [13]), together with its observing capabilities and limitations. Most notably, XPOL generates simultaneous spectra of all 4 Stokes parameters. The following combinations of spectral resolution (kHz) and bandwidth (MHz) are available: 40/120, 80/240, and 320/480. More complex observing modes where VESPA is split into two bands are also possible (see the VESPA user guide[10]).

XPOL has been tested for the EMIR bands E 090 and E 230. A test report will available a few weeks before the proposal deadline. XPOL profits from the improved performance of EMIR in several respects: smaller or negligible phase drifts, small and stable offsets between the two polarizations, and negligible decorrelation losses.

Polarization sidelobes, albeit smaller than typically observed with the previous receivers, are still complicating observations of extended sources. Current evidence indicates that the rotation of the sidelobeswith elevation is more complicated than with the previous receivers, possibly due to the off–axis installation of EMIR. Proposals for observation of extended sources should demonstrate that their observations are feasible in the presence of the known sidelobes.

Proposals for polarimetric observations may be submitted for any EMIR band. For the untested EMIR bands, E 150 and E 330, proposals are accepted on a shared risk basis. Astronomers interested in XPOL are invited to check with Helmut Wiesemeyer or Clemens Thum.

Observing time estimates

This matter needs special attention as a serious time underestimate may be considered as a sure sign of sloppy proposal preparation. We strongly recommend to use the current time estimator on–line at the Granada web site. which handles EMIR, HERA, and MAMBO2.

If very special observing modes are proposed which are not covered by the Time Estimator, proposers must give sufficient technical details so that their time estimate can be *reproduced*. In particular, the proposal must give values for $T_{\rm sys}$, the spectral resolution, the expected antenna temperature of the signal, the signal/noise ratio which is aimed for, all overheads and dead times, and the resulting observing time.

Proposers should base their time request on normal winter conditions, corresponding to 4 mm of precipitable water vapor (pwv). Conditions during afternoons can be degraded due to anomalous refraction. The observing efficiency is then reduced and the flux/temperature calibration is more uncertain than the typical 10 percent (possibly slightly more for bolometer observations).

Proposers requesting observations which need pwv values lower than 7mm should enter the maximum acceptable pwv value on the Technical summary page. Very demanding proposals, e.g. observations using E 330 above 300 GHz, or some very deep and/or high frequency continuum observations, may need pwv values $\leq$ 2mm. These observations will be

[4] URL addresses preceded by two dots (..) are relative to http://www.iram.fr/

scheduled in a pool.

Frequency switching

Frequency switching is available for both HERA polarizations as well as for EMIR. This observing mode is interesting for observations of narrow lines where flat baselines are not essential, although the spectral baselines with HERA are among the best known in frequency switching. Certain limitations exist with respect to maximum frequency throw ($\leq$ 45 km/s), backends, phase times etc.; for a detailed report see [2]. This report also explains how to identify mesospheric lines which may easily be confused in some cases with genuine astronomical lines from cold clouds.

Organizational aspects

Pooled observing

As in previous semesters, we plan to pool the bolometer with other suitable proposals into a bolometer pool. HERA projects will be pooled with other less demanding projects in a HERA pool. Both pools will be organized in several sessions, occupying a significant fraction of the totally available observing time. EMIR 0.9 mm observations will be included in these pools where they get precedence as soon as the precipitable water colums falls below 2mm and other conditions are fullfilled.

The proposals participating in the pools will be observed by the PIs and Co-PIs of participating projects, and IRAM staff. The pool observations will be organized by the pool coordinators, Guillermo Quintana-Lacaci (MAMBO2/1) and Manuel Gonzalez (HERA). The participating proposals are grouped according to their demand on weather quality, and they get observed following the priorities assigned by the program committee. The organization of the observing pools are described on the spanish web site.

Bolometer and heterodyne proposals which are particularly weather tolerant qualify as backup for the pools. Participation in the pools is voluntary, and the respective box on the proposal form should be checked.

Questions concerning the pool organization can be directed to the scheduler (thum@iram.fr) or the Pool Coordinators, Guillermo Quintana-Lacaci (quintana@iram.es) and Manuel Gonzalez (gonzalez@iram.es).

Service observing

To facilitate the execution of short ($\leq$8 h) programmes, we propose “service observing” for some easy to observe programmes *with only one set of tunings*. Observations are made by the local staff using precisely laid–out instructions by the principal investigator. For this type of observation, we request an acknowledgement of the IRAM staff member’s help in the forthcoming publication. If you are interested in this mode of observing, specify it as a “special requirement” in the proposal form. IRAM will then decide which proposals can actually be accepted for this mode.

Remote observing

This observing mode where the remote observer actually controls the telescope very much like on Pico Veleta, is available from the IRAM offices in Granada and Grenoble, and from the MPIfR Bonn, and from OAN in Madrid. If you are planning to use remote observing, please contact the Astronomer on Duty (for Granada), Clemens Thum (for Grenoble), J. Alcolea (for Madrid), or Dirk Muders (for Bonn) well in advance of your observing run. As a safeguard, please email observing instructions and macros to the AoD and/or operator.

In special cases, experienced observers may conduct remote observations from individual computers at their home institutes. Such observations need agreement by the station manager (kramer@iram.es) who must be contacted at least two weeks in advance.

Reminders

For any questions regarding the telescope and the control programs, we recommend to consult the summary of telescope parameters and the NCS web pages.

The applied calibration procedure is explained in depth in a special report entitled “Calibration of spectral line data”.

The astronomer on duty schedule is available at http://www.iram.es/IRAMES/mainWiki/AstronomerOnDutySchedule.
The AoD may be contacted for any special questions concerning the preparation of an observing run.

If your observations with the 30m telescope result in a publication, please acknowledge this in a footnote “Based on observations with the IRAM 30-m telescope. IRAM is supported by CNRS/INSU (France), the MPG (Germany) and the IGN (Spain)". A copy of the publication should be sent to M. Bremer (bremer@iram.fr).

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[10] Short guide to VESPA
G. Paubert
../IRAMES/otherDocuments/manuals/vespa_ug.ps

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[12] A Versatile IF Polarimeter at the IRAM 30m Telescope
C. Thum, H. Wiesemeyer, D. Morris, S. Navarro, and M. Torres
in "Polarimetry in Astronomy", Ed. S.Fineschi, Proc.of SPIE Vol.4843, 272–283 (2003)

[13] XPOL – the correlation polarimeter at the IRAM 30m telescope
Thum, C., Wiesemeyer, H., Paubert, G., Navarro, S., and Morris, D.
PASP 120, 777 (2008)

These reports are available upon request (see also previous Newsletters) from Mrs. C. Berjaud, IRAM Grenoble (e–mail: `berjaud@iram.fr`). Calibration related papers may also be found at ../IRAMES/IRAMES/mainWiki/CalibrationPapers

Clemens Thum & Carsten Kramer

News from the Plateau de Bure Interferometer

WideX is operational

In February, the remaining three units of the wideband correlator WideX ("Wideband Express") were installed in the correlator room on Plateau de Bure and subsequently commissioned by a team of IRAM astronomers. Since March 15, WideX is routinely used for the observation of user programs. WideX provides a contiguous frequency coverage of 3.6 GHz bandwidth in dual polarization with a fixed channel spacing of 1.95 MHz and is available in parallel to the narrow-band correlator. Even if not needed to reach the science goals of a program, WideX greatly facilitates calibration and pointing of the interferometer and is therefore always connected. All information presently available on WideX can be found at `http://www.iram.fr/IRAMFR/TA/backend/WideX`.

Aluminum panels for antennas 1 and 6

Following the reflector upgrades of antennas 4 (2008) and 2 (2009), this summer the reflectors of the last two antennas, 1 and 6, will be equipped with aluminum panels. Work on antenna 1 has already finished on June 28, and antenna 6 will follow in September. Both reflectors will be tuned to a surface accuracy below 50 μm rms by a series of holographic measurements and panel adjustments.

Installation of receiver band 4 and of the 3rd generation LO system

Band 4 mixers, covering the frequency range from 277 to 371 GHz, will be installed this summer in the remaining 4 antennas (antennas 4 and 5 were already equipped last year). This installation is planned to be done during the maintenance of each antenna concerned, so no additional loss in observing time will result from this operation. Testing of the 350 GHz mixers will however require some excellent observing conditions toward the end of the current summer semester. The installation of a new (3rd generation) LO system on Plateau de Bure, foreseen for the end of August and the first three weeks of September, will however require a shut down of the interferometer for regular observations for at least one week. This new LO system will significantly reduce the instrumental phase noise, a necessary prerequisite for observations in the 0.8 mm window.

Weather conditions and observing

Observing conditions this Spring were quite mediocre from May onward with some small improvement only toward the end of June. Typical summer conditions are prevailing now on Bure with a very unstable atmosphere and often thunderstorms in the afternoons. Reasonable 3 mm observing conditions are usually met only in the second half of the night and lasting until around noon.

We moved the array from its A configuration into the second most extended configuration B on February 21 and then C configuration was scheduled from March 21 to April 17, when the interferometer was moved back into the most compact D configuration. The Bure interferometer participated in the global spring 3 mm VLBI session from May 6 to 11 with the array observing in variable weather conditions. The 2010 antenna maintenance period started on May 21, when antenna 1 was brought into the maintenance hall and the array entered into the 5D configuration. The current antenna maintenance period is foreseen to end in October, when antenna 6 will leave the hangar with a newly equipped aluminum surface replacing the current carbon fiber panels.

Only two A-rated projects requesting the A-configuration and two requesting the B configuration could not be finished this year and will be deferred to the upcoming winter semester.

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

Global VLBI observations, which include the array in the 3 mm phased-array mode, are planned from October 7 to 12.

Investigators who wish to check the status of their project may consult the interferometer schedule on the Web at ../IRAMFR/PDB/ongoing.html[5]. This page is updated daily.

Jan Martin WINTERS

[5] from here on we give only relative URL addresses. In the absolute address the leading two dots (..) should be replaced by `http://www.iram.fr`

Call for Observing Proposals on the Plateau de Bure Interferometer

Important information

Please note that the proposal.sty file and the LaTeX template have been changed considerably for the upcoming September deadline. Two different template files for the two telescopes, prop-pdb.tex and prop-30m.tex, are available. Please, make sure to use the current version of these files and the common LaTeX style file proposal.sty. All three files may be downloaded from the IRAM web pages at URL ../GENERAL/submission/proposal.html.
Do not change the font type or size, and do not manipulate the style file. In case of problems, contact the IRAM scientific secretary (e-mail: berjaud@iram.fr). Proposals using older versions of the style or template files will not be accepted.

Conditions for the next winter session

Based on our experience in carrying out configuration changes in winter conditions with limited access to the observatory, we plan again to schedule four configuration changes during the upcoming winter semester. We therefore accept proposals for any of the 4 primary configurations of the six antenna array.

A preliminary configuration schedule for the winter period is outlined below. Adjustments to the provisional configuration planning will be made according to proposal pressure, weather conditions, availability of band 4, and other contingencies. The configuration schedule given below should be taken as a guideline, in particular when the requested astronomical targets cannot be observed during the entire winter period (sun avoidance circle of radius **35**°).

Conf	Scheduling Priority Winter 10/11
C	December
A	December – January
B	February – March
C	March – April
D	April – May

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

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

Proposal category

Proposals should be submitted for one of the seven categories:

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

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

3MM: Proposals that ask for 3 mm data.

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

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

LARGE PROGRAM: This category is offered on both IRAM instruments since the winter 2008/2009 observing period. See Section *Large Observing Programs* for a detailed explanation.

BAND4: If your proposal requests observations using the new band 4 (277 to 371 GHz) receivers, please check this bullet. *Any observations requesting band 4 can not be guaranteed and will be offered on a best effort basis for the upcoming winter semester 2010/2011.*

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

Configurations of the six-antenna array

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

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

The general properties of these configurations are:

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

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

Please consult the documentation *An Introduction to the IRAM interferometer*, accessible at `../IRAMFR/PDB/docu.html` for further details.

Receivers

All antennas are equipped with dual polarization receivers for the 3 mm, 2 mm, and 1.3 mm atmospheric windows, 0.8 mm receivers are presently being installed. The frequency ranges are 80 GHz to 116 GHz for the 3 mm band, 129 GHz to 174 GHz for the 2 mm band, and 201 to 267 GHz for the 1.3 mm band. *Below we give preliminary characteristics for the 0.8 mm receivers (band 4); the actual performance of the 0.8 mm mixers will have to be determined once the receivers are installed on the antennas.*

Each band of the receivers is dual-polarization (H and V) with the two RF channels of one band observing at the same frequency. The different bands are not co-aligned in the focal plane (and therefore on the sky). Due to the pointing offsets between the frequency bands, only one band can be observed at any time. One of the two other bands is in stand-by mode (power on and local oscillator phase-locked) and is available, e.g., for pointing. Time-shared observations between different RF bands (e.g. band 1 and band 3) are possible in well justified cases, they are however not very efficient. Please contact the Interferometer Science Operations Group (sog@iram.fr) to discuss the feasibility in case you are interested to use this mode. The mixers are single-sideband, backshort-tuned; they will usually be tuned LSB, except for the upper part of the frequency range in all bands where the mixers will be tuned USB. The typical image rejection is 10 dB. Each IF channel is 3.6 GHz wide (4.2-7.8 GHz).

The new wide-band correlator WideX is able to process both 3.6 GHz wide IFs simultaneously with a fixed resolution of about 2 MHz. The narrow-band correlator can process the two 3.6 GHz wide IF-channels (one per polarization) only partially. A dedicated IF processor converts selected 1 GHz wide slices of the 4.2-7.8 GHz first IFs down to 0.1-1.1 GHz, the input range of the narrow-band correlator. Further details are given in the section describing the correlator setup and the IF processor.

Signal to Noise

The rms noise can be computed from

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

where

- $J_{\rm pK}$ is the conversion factor from Kelvin to Jansky (22 Jy/K at 3 mm, 29 Jy/K at 2 mm, and 35 Jy/K at 1.3 mm. *Use 45 Jy/K at 0.8 mm.*)
- $T_{\rm sys}$ is the system temperature ($T_{\rm sys}$ = 100 K below 110 GHz, 170 K at 115 GHz, 150 K at 150 GHz, and 200 K at 230 GHz for sources at

	Band 1	Band 2	Band 3	*Band 4***
RF range*/[GHz]	80–116	129–174	201–267	*277–371*
T_{rec}/[K] LSB	40–55	30–50	40–60	*60–80*
T_{rec}/[K] USB	40–55	40–80	50–70	*80–100*
G_{im}/[dB]	-10	-12 ... -10	-12 ... -8	*-10*
RF LSB/[GHz]	80–104	129–165	201–264	*tbd*
RF USB/[GHz]	104–116	164–174	264–267	*tbd*

* center of the 4-8 GHz IF band; ** preliminary values

$\delta \geq 20°$ and for typical winter conditions. *Use $T_{sys} = 500\,K$ at 350 GHz.*)

- η is an efficiency factor due to atmospheric phase noise and instrumental phase jitter (0.9 at 3 mm, 0.85 at 2 mm, and 0.8 at 1.3 mm in typical winter conditions. *Use η =0.70 at 0.8 mm.*)
- N_a is the number of antennas (6), and N_c is the number of configurations: 1 for D, 2 for CD, and so on.
- T_{ON} is the on-source integration time per configuration in seconds (2 to 8 hours, depending on source declination). Because of various calibration observations the total observing time is typically 1.6 T_{ON}.
- B is the spectral bandwidth in Hz (up to 2 GHz for continuum, 40 kHz to 2.5 MHz for spectral line, according to the spectral setup of the narrow-band correlator, and from 2 MHz for line projects up to 3.6 GHz for continuum projects using WideX).
- N_{pol} is the number of polarizations: 1 for single polarization and 2 for dual polarization (see section *Correlator* for details).

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

All values given for the 0.8 mm band are rough estimates, the actual performance of the band 4 receiver system remains to be evaluated on site.

Correlator

At any given time, only one frequency band can be observed, but with the two polarizations available. Each polarization delivers a 3.6 GHz bandwidth (from IF=4.2 to 7.8 GHz). The two 3.6-GHz bandwidths coincide in the sky frequency scale.

The new wide-band correlator WideX gives access to the two 3.6 GHz wide IF bands simultaneously. WideX provides a fixed spectral resolution of 1.95 MHz over the full bandwidth and is available in parallel to the narrow-band correlator.

IF processor and narrow-band correlator

The narrow-band correlator accepts as input two signals of 1 GHz bandwidth, that must be selected within the 3.6 GHz delivered by the receiver. In practice, the IF processor splits the two input 4.2–7.8 GHz bands in four 1 GHz wide “quarters”, labeled *Q1...Q4*. Two of these quarters must be selected as narrow-band correlator inputs. The system allows the following choices:

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

where HOR and VER refer to the two polarizations:

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

The combination VER VER is not allowed.

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

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

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

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

Where is the selected sky frequency in the IF band? It would be natural to tune the receivers such that the selected sky frequency corresponds to the middle of the IF bandwidth, i.e. 6.0 GHz. However, this corresponds to the limit between Q2 and Q3. It is therefore highly recommended to center a line at the center of a quarter (see Section "ASTRO" below). In all three bands, 3 mm, 2 mm, and 1.3 mm the receivers offer best performance in terms of receiver noise and sideband rejection in Q3 (i.e. the line should be centered at an IF1 frequency of 6500 MHz). *The optimum performance of the 0.8 mm mixers still has to be evaluated.*

Spectral units of the narrow-band correlator

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

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

Note that 5% of the passband is lost at the end of each subband. The 8 units can be independently connected to the first or the second correlator entry, as selected by the IF processor (see above). Please note that the center frequency is expressed in the frequency range seen by the narrow-band correlator, i.e. 100 to 1100 MHz. The correspondence to the sky frequency depends on the parts of the 3.6 GHz bandwidth which have been selected as correlator inputs and on the selected side band (LSB or USB).

ASTRO

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

The previous `LINE` command has been replaced by several new commands (see internal help; the following description applies to the current receiver system). The behavior of the `LINE` command can be changed by the `SET PDBI 1995|2000|2006` command, that selects the PdBI frontend/backend status corresponding to years 1995 (old receivers, 500 MHz bandwidth), 2000 (580 MHz bandwidth), 2006 (new receivers and new IF processor, 3.6 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 93.2 lsb low 6500

! choice of the narrow-band
! correlator inputs
narrow Q3 Q3
```

```
! correlator unit #1, on entry 1
spectral 1  20 600 /narrow 1

! correlator unit #2, on entry 1
spectral 2  20 735 /narrow 1

! correlator unit #3, on entry 1
spectral 3 320 300 /narrow 1

! correlator unit #4, on entry 2
spectral 4 320 666 /narrow 2
...
```

The first step above:

```
! choice of receiver tuning
line xyz 93.2 lsb low 6500
```

would produce a plot showing the full 3.6 GHz bandwidth delivered by the receivers that are accessible to WideX in dual polarization.

Coordinates and Velocities

The interferometer operates in the equatorial J2000.0 coordinate system.

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

Any later request for a swap of targets has to be submitted for approval to the IRAM Director and to be justified by new evidence or exceptional circumstances.

Sun Avoidance

For safety reasons, a sun avoidance limit is enforced at **35 degrees from the sun**. Please take this limit into account for the source and the calibrators. We are working to further reduce the sun avoidance limit for forthcoming semesters.

Mosaics

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

Local Contact

A local contact will be assigned to every A or B rated proposal which does not involve an in-house collaborator. He/she will assist you in the preparation of the observing procedures and provide help to reduce the data.

Assistance (write to sog@iram.fr) is also provided before a deadline to help newcomers in the preparation of a proposal. Depending upon the program complexity, IRAM may require an in-house collaborator instead of the normal local contact.

Data reduction

Proposers should be aware of constraints for data reduction:

- We recommend that proposers reduce their data in Grenoble. For the time being, remote data reduction will only be offered in exceptional cases. Please contact your local contact if you're interested in this possibility.
- We keep the data reduction schedule very flexible, but wish to avoid the presence of more than 2 groups at the same time in Grenoble. Data reduction will be carried out on dedicated computers at IRAM. Please contact us in advance.
- In certain cases, proposers may have a look at the uv-tables as the observations progress. If necessary, and upon request, more information can be provided. Please contact your local contact or PdBI's Science Operations Group (sog@iram.fr) if you are interested in this.
- Observers who wish to finish data reduction at their home institute should obtain the most recent version of CLIC. Because differences between CLIC versions may potentially result in imaging errors if new data are calibrated with an old package, we advise observers having a copy of CLIC to take special care in maintaining it up-to-date. The newer versions are in general downward compatible with the previous releases. The recent upgrades of CLIC however implied many modifications for which backward compatibility with old PdBI receiver data is not yet fully established. To calibrate data obtained with the "old" receiver system (up to September 2006), we therefore still recommend to use the January 2007 version of CLIC. Starting with the August 2009 release of GILDAS, this CLIC version is included in the general GILDAS package, accessible as "clic07".

Technical pre-screening

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

Non-standard observations

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

Documentation

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

Publication

If your observations with the Plateau de Bure interferometer result in a publication, please acknowledge this in a footnote "Based on observations carried out with the IRAM Plateau de Bure Interferometer. IRAM is supported by INSU/CNRS (France), MPG (Germany) and IGN (Spain)". Please send a copy of the paper to Michael Bremer (bremer@iram.fr).

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

Large observing programs

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

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

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

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

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

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

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

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

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

Note that a Large Program will either be accepted in its entirety or rejected, there will be no B–rating ("backup status") nor a partial acceptance/rejection of the proposal.

For the winter semester 2010/2011, the call for Large Programs will be open for the 30m telescope and the Plateau de Bure interferometer. For the 30m telescope, Large Programs may consider using HERA and MAMBO, as well as EMIR. On the Plateau de Bure, band 4 is not offered in the frame of a Large Program.

Pierre Cox