Proposals for IRAM Telescopes

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

12 March 2009, 17:00 CET (UT + 1 hour)

The scheduling period extends from 1 June – 30 Nov 2009. Proposals should be submitted through our web–based submission facility. Instructions can be found on our web page at URL:

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

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

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

- fax to number: (+33) 476 42 54 69 or by
- ordinary mail addressed to:
  IRAM Scientific Secretariat,
  300, rue de la piscine,
  F-38406 St. Martin d'Hères, France

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

Soon after the deadline the IRAM Scientific Secretariat sends an acknowledgement of receipt to the Principal Investigator of each proposal correctly received, together with the proposal registration number. Note that the web facility allows 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 more 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** as described by P. Cox in this Newsletter. The Large Programmes may have two additional pages for the scientific justification.

In view of new hardware, both proposal forms, for the 30m telescope and for the interferometer, have been changed considerably for the current deadline. In fact, we now have different template files for the two telescopes, `prop-pdb.tex` and `prop-30m.tex`. Please, **make absolutely sure to use the new template files** together with the **current version** of the common LaTeX style file `proposal.sty`. All three files may be downloaded from the IRAM web pages[1] 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 secretary. (e–mail: `berjaud@iram.fr`).

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).

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

A mailing list has been set up for astronomers interested in being notified about the availability of a new Call for Proposals. A link to this mailing list is on the IRAM web page. The list presently contains all recent users of IRAM telescopes.

J.M. Winters & C. Thum

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

Travel funds for European astronomers

The European Framework Programme 6 (FP 6) which includes the RadioNet initiative has come to an end in 2008. A successor programme (FP 7) has been set up which again includes funds for the RadioNet initiative. IRAM continues to participate in this initiative with its two Observatories. We therefore expect to have a budget similar to the 2004 – 2008 period available for supporting travel by European astronomers through the Trans National Access (TNA) Programme.

As before, travel may be supported to the 30m telescope and to Grenoble for reduction of interferometer data. Detailed information about the eligibility, TNA contacts, 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 contacted as soon as the new Radionet programme has officially started and the corresponding funds are available.

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 summer semester (1 June – 30 Nov 2009):

1. the new four band receiver EMIR consisting of dual–polarisation mixers operating at 3, 2, 1.3, and 0.9mm.
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.

Emphasis will be put on observations at the longer wavelengths. We plan to schedule 1mm observations with HERA and MAMBO in October/November, together with a limited number of 0.8mm projects with EMIR. About 2000 hours of observing time are expected to be available.

During the warmer months of the semester, emphasis will be put on observations at the longer wavelengths. We plan to schedule 1.3mm observations in October/November, together with a very small number (2) of 0.9mm projects using EMIR.

We continue the Call for Large Programmes started last semester. For the 30m telescope, two such proposals may be expected which may include request for EMIR.

What is new?

EMIR. The new generation single pixel heterodyne receiver for Pico Veleta, EMIR (**E**ight **MI**xer **R**eceiver), consisting of dual-polarization 4 GHz bandwidth mixers operating at 3, 2, 1.3, and 0.9mm, will be installed during March/April 2009. This will not affect HERA and the bolometers. During a large part of the four weeks installation and commissioning period, MAMBO pooled observations will be scheduled during night time.

EMIR not only provides large improvements in receiver noise temperature and bandwidth, it is also more complex than the old receivers. We therefore urge interested user to carefully study the detailed description below.

Observation time estimator We have prepared a new 30m time estimator for EMIR. Starting with the feb02b release, it is part of the GILDAS software and accessible via ASTRO. For download of the GILDAS package please go here and follow the instructions. For HERA and MAMBO, the old web based time estimator is still available here. Note that a web based estimator for EMIR will be made available only for the next deadline in September 09.

Proposal form. Motivated by the arrival of EMIR, the proposal form for the 30m telescope has been modified. It now collects the technical parameters of the requested observations on a separate *technical sheet* which is printed as the second page of the proposal. Note that we now have separate proposal templates for the the 30m telescope and the interferometer.

In the following, we present the new receiver EMIR. The bolometer and HERA, which continue to be operational as before, are presented in the long version of the Call for Proposals available on the IRAM web site.

EMIR

Overview

The new receiver **EMIR** (Fig. 1) is scheduled for installation and commissioning at the 30m telescope

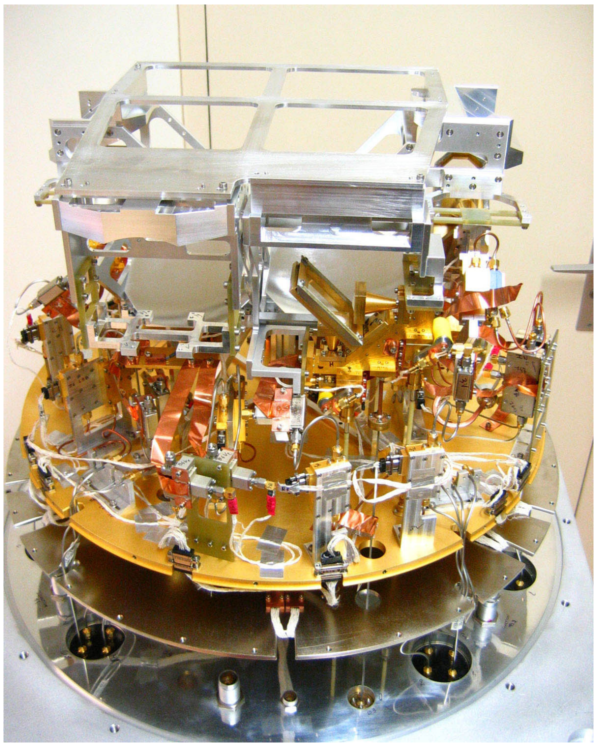

Figure 1: EMIR during final integration in the Grenoble receiver laboratory. One of the four dual–polarization mixer pairs is visible near the center of the photograph. The beams of the 4 mixer pairs leave the dewar through 4 separate windows towards the top of the figure. Warm optics (not shown) can combine some of the 4 beams for observation of the same position on the sky (see Tab. 1).

in March through April 2009. EMIR will replace the current single pixel heterodyne receivers A/B100, C/D150, A/B230, and C/D270. HERA, the bolometers, and the backends are unchanged. EMIR will provide 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. 2). In addition to the vast increase in bandwidth, the receiver is expected to offer considerably improved noise performance, a stable alignment between 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 is built in 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 are listed in Tab. 1.

EMIR will for the first time in the history of the 30m telescope provide a permanently available high sensitivity E 330 band, opening this atmospheric window for regular use under good weather conditions. As commissioning of this band will be difficult and time consuming during the summer semester, only a maximum of total 20 hours observing time will be available for regular proposals for this semester. The proposed targets should ideally be point–like and available during nighttime in fall. The observations will be made as service observing with shared risk.

At the time of writing, EMIR is undergoing final tests in the receiver laboratory. Precise figures of EMIR's performance at the telescope will not be known before the proposal deadline. The Observatory will nevertheless make an effort to publish the results of the commissoning available as soon as possible on the 30m web site. The interested astronomer may also find more detailed technical information on EMIR under this URL. IRAM staff is also available to help astronomers with the preparation of EMIR (and other) proposals.

Selection of EMIR bands

Before reaching the Nasmyth mirrors, the four beams of the EMIR bands pass through warm optics that contains 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.

Three dichroic mirrors are available for combining either the E 090 and E 150 beams, or the E 090 and E 230 beams, or the E 150 and E 330 beams (Tab. 1). The combination of bands is not polarization selective, i.e. the combined bands 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. The observer is therefore adviced to carefully evaluate whether an observation involving two different bands is more efficiently made in parallel or in series.

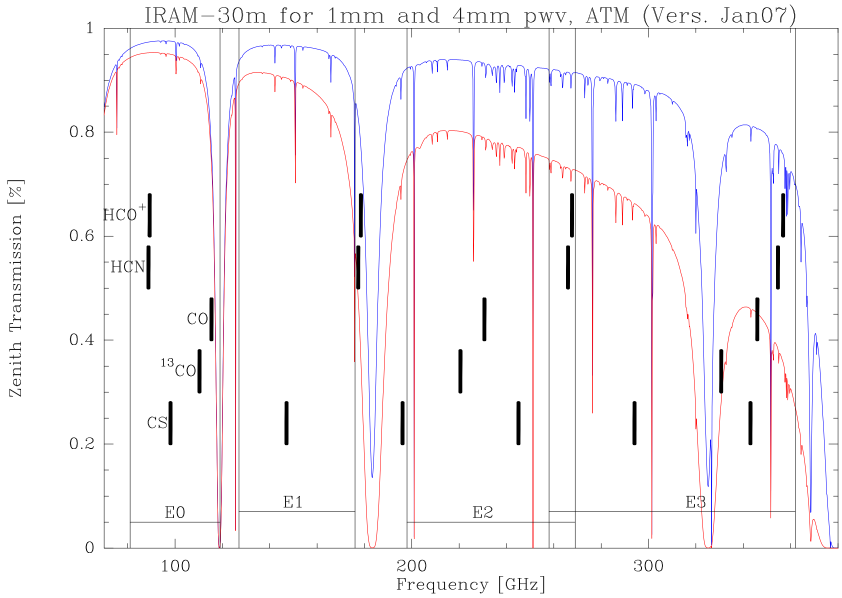

Figure 2: Atmospheric transmission at the 30m site between 60 and 400 GHz for 1 and 4mm of precipitable water vapor, derived from the ATM model. The EMIR bands are indicated and the frequencies of a few important molecular transitions are marked.

Connection to backends

The remarkable bandwidth of EMIR of 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 new **IF switch box** in the receiver cabin allows to select 4 EMIR channels of 4 GHz bandwidth each from 16 inputs.[2] 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 30m web site.

The selected 4 output channels are sent via the IF cables to a new **backend distribution unit** which provides copies of these 4 channels to a range of backends processors which then prepare the IF signals for distribution to the spectrometers. Three new backend processors have been build to feed the new 4 GHz wide IF channels to the existing 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 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 backends" processor** prepares the 4 incoming IF channels for input into the 1 MHz filterbank and VESPA. Only the central part of the 4 GHz IF channels is accessible to these "narrow" backends. Inside this central part (1 GHz for the filterbank and 640 MHz for VESPA), these backends can be configured as before. The VLBI terminal is also fed from this processor.

[2] 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.

Calibration Issues

EMIR comes with a new 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, and the absolute calibration accuracy should improve accordingly 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. As the optimum way of calibrating the image rejection is still under exploration, 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 (> 13 dB).

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 frequency 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.

Observers concerned by this complication may consult the 30m web site for further details and solutions.

Update of PaKo

The observer interface program PaKo has been adapted for EMIR. In particular, the receiver and backend commands have been updated. The updated documentation will be available from the 30m web site in time for the preparation of observations with EMIR.

Observation time estimator

The GILDAS group has prepared a new 30m time estimator for EMIR. It is now part of the GILDAS software package and accessible via ASTRO. For download of the GILDAS package please connect to the GILDAS home page and follow the instructions. For HERA and MAMBO2, the old web based time estimator is still available from the 30m web site. Note that a web based version of the estimator for EMIR will be made available for the next deadline. As commissioning of EMIR has not yet started at the time of writing, the new time estimator is based on the laboratory performance of EMIR and the *expected* losses at the telescope.

Receivers

This section gives all the technical details of observations with the bolometer and the multi–beam receiver HERA. The new single pixel spectroscopic receiver EMIR is described in section .

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 ±200 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 these filter banks.
- ▷ 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[3] 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 Albrecht Sievers (sievers@iram.es), the astronomer in charge of HERA, may also be contacted.

Accepted HERA proposals will be pooled together in order to make more efficient use of stable 1.3mm observing conditions (see section . Questions concerning the HERA pool organization can be directed to the scheduler (thum@iram.fr) or the HERA Pool Coordinator, Helmut Wiesemeyer (wiesemeyer@iram.es).

MPIfR Bolometer arrays

The bolometer arrays, MAMBO–1 (37 pixels) and MAMBO–2 (117 pixels), are provided by the Max–Planck–Institut für Radioastronomie. They consist of concentric hexagonal rings of horns centered on the central horn. Spacing between horns is $\simeq 20''$. Each pixel has a HPBW of $11''$. We expect that MAMBO–2 will be normally used, but MAMBO–1 is kept as a backup.

The effective sensitivity of both bolometers for onoff observations is ~ 40 mJy $\mathrm{s}^{\frac{1}{2}}$ and ~ 45 mJy $\mathrm{s}^{\frac{1}{2}}$ 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 arcsec/sec, is the velocity in the scanning direction and Δs, in arcsec, 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 $\sim$ 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[4] 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 ($8.0' \times 6.5'$) must be larger than the map size (add the wobbler throw and the array size ($4'$), the source extent, and some allowance for baseline determination) if the EHK–algorithm is used to restore properly extended emission. Shorter scans may lead to problems in restoring extended structure. Mosaicing is also possible to map larger areas. Under many

[3] 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.

[4] 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).

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 R. Zylka (zylka@iram.fr).

The bolometers are used with the wobbling secondary mirror (wobbling at a rate of 2 Hz). The 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 IRAM Data Base for Pooled Observations or directly from R. Zylka (zylka@iram.fr). The older software packages (NIC [7] and MOPSI [8]) are still available, but cannot process data obtained with the NCS.

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.

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 $3''$ [10]. 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). An effort is made that receivers are closely (usually $\lesssim 2''$) aligned. 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 ([1]).

Wobbling Secondary

– Beam–throw is $\leq 240''$ depending on wobbling frequency. At 2 Hz, the maximum throw is $90''$

– Standard phase duration: 2 sec for spectral line observations, 0.25 sec for continuum observations.

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 and Efficiencies

See the summary of telescope parameters for the current efficiencies between 70 and 270 GHz, and the predictions for the 345 GHz (0.8 mm) band.

Backends

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

The 1 MHz filterbank consists of 4 units. Each unit has 256 channels with 1 MHz spacing and can be connected to different or the same receivers giving bandwidths between 256 MHz and 1024 MHz. The maximum bandwidth is available for only one receiver, naturally one having a 1 GHz wide IF bandwidth. Connection of the filterbank in the 1 GHz mode presently excludes the use of any other backend with the same receiver.

Other configurations of the 1 MHz filterbank include a setup in 2 units of 512 MHz connected to two different receivers, or 4 units of 256 MHz width connected to up to four (not necessarily) different receivers. Each unit can be shifted in steps of 32 MHz relative to the center frequency of the connected receiver.

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 [14] and in a user guide, but are best visualised on a demonstration program which can be downloaded from our web page at URL /IRAMFR/PV/veleta.htm. Connected to a set of 4 single pixel receivers, 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. 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 the backend distribution box which feeds the single pixel spectral line receivers. All these receivers have a 1 GHz RF bandwidth except for A100 and B100 (500 MHz only).

The **wideband autocorrelator WILMA** consists of 18 units. They can be connected to the 18 detectors of HERA. 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 ../IRAMFR/TA/backend/veleta/wilma/index.htm.

Organizational aspects

The official proposal cover page should be filled in with great care. All information on this page gets directly transferred into the IRAM proposal database. Attention should be given to *Special requirements* and *Scheduling constraints* where the proposer can enter dates where he/she is not available for observing.

In order to avoid useless 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. 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 Programs" 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.

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 report entitled Calibration of spectral line data explains in detail the applied calibration procedure.

The astronomer of duty (see the schedule here: /IRAMES/mainWiki/AstronomerOnDutySchedule) should be contacted well in advance for any special questions concerning the preparation of an observing run.

Frequency switching is available for both HERA and shall also be available 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 [4]. This report also explains how to identify mesospheric lines which may easily be confused in some cases with genuine astronomical lines from cold clouds.

If your observations with the 30m telescope results 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). Please email a copy of the publication to Dennis

Downes (downes@iram.fr).

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 a new version of ASTRO/GILDAS for time estimates for EMIR, as detailed above, and the old web–based Time Estimator for 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_{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. The details of the procedures on which our time estimator is based are explained in a technical report published in the January 1995 issue[5] of the IRAM Newsletter [5].

Proposers should base their time request on normal summer conditions, corresponding to 7 mm of precipitable water vapor. 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). If exceptionally good transmission or stability of the atmosphere is requested which may be reachable only in best summer conditions, the proposers must clearly say so in their time estimate paragraph. Such proposals will however be particularly scrutinized.

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 project into a HERA pool. Both pools will be organized in several sessions, occupying a significant fraction of the totally available observing time. We plan to include EMIR 0.8 mm observations in these pools. 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 Helmut Wiesemeyer (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 bolometer and the HERA observing pools are described at ../IRAMES/mainWiki/PoolObserving.

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 Helmut Wiesemeyer (wiesemeyer@iram.es).

[5] electronically available at URL `../IRAMFR/ARN/-newsletter.html`

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 Madrid. If you are planning to use remote observing, please contact the Astronomer on Duty (for Granada), or Dirk Muders, muders@mpifr-bonn.mpg.de for Bonn well in advance of your observing run. As a safeguard, please email observing instructions and macros to the AoD and/or operator. A dedicated phone line to the control desk for voice mail is available for remote observers: +34 958 482009.

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

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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_{rx} is the SSB receiver temperature in single band observations (*left*). For dual–band observations, T_{rx} includes a 15 K noise contribution from the dichroics (*right*).

EMIR band	F_{sky} GHz	mixer type	polari- zation	IF width GHz	T_{rx} K	G_{im} dB	combinations			T_{rx} K
							E 0/2	E 1/3	E 0/1	
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 – 360	2SB	H/V	4	70	> 10		X		85