Using the Plateau de Bure Interferometer

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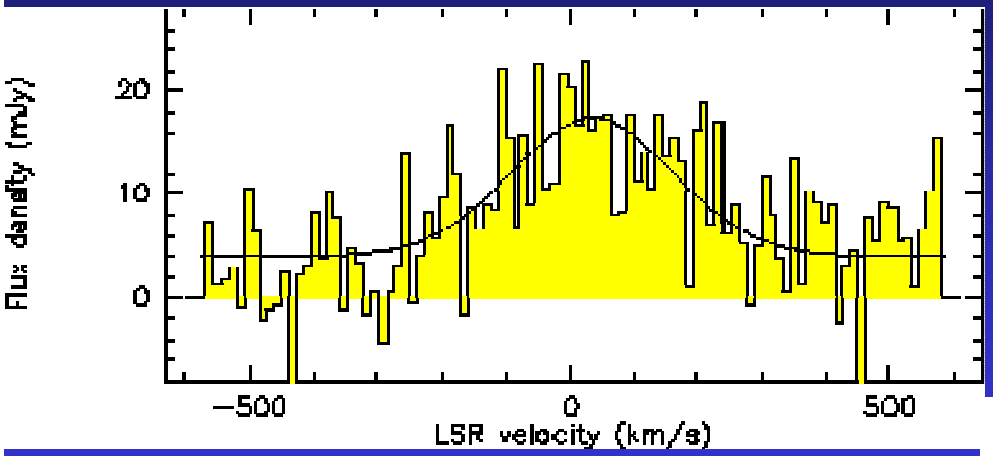
IRAM, Grenoble

Why should you use the Plateau de Bure Interferometer?

Because the signal is weak…
… and PdBI is sensitive!

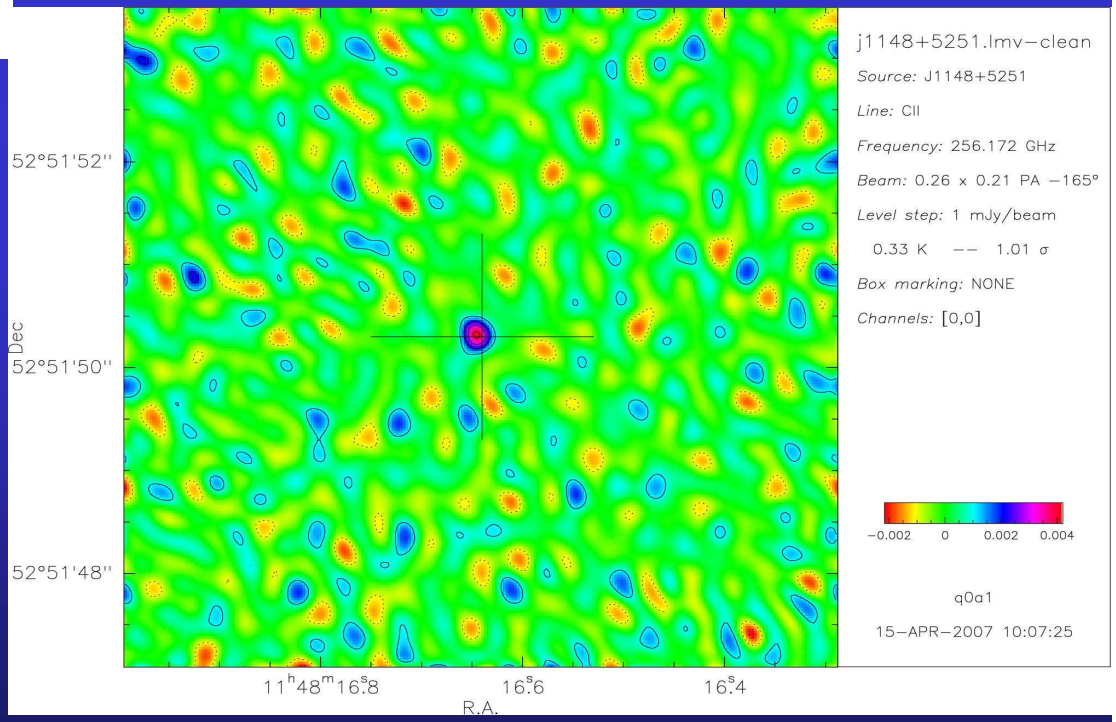
C^+ at 256.17GHz in J1148+5251 @ z = 6.42



Spectrum: 3.5hrs in D-configuration

Walter et al. in prep.

A-configuration: beam 0.26” x 0.21”



Sensitivity (I)

The point source sensitivity is given by

$$\delta S = \frac{2k}{\eta_a A \cdot \eta_j} \cdot \frac{\langle T_{sys} \rangle}{\eta_C \eta_p \sqrt{N(N-1)} \sqrt{\delta\nu \, t_{\rm on}}} \cdot \frac{1}{\sqrt{N_{\rm pol}}}$$

A	collecting area of a single antenna ($176.7\mathrm{m}^2$)
η_a	aperture efficiency (0.70 @ 3mm, 0.53 @ 2mm, 0.45 @ 1mm)
η_j	instrumental decorrelation $\eta_j = e^{-\sigma_j^2/2}$ (0.90 to 0.98)
k	Boltzmann constant
$\langle T_{sys} \rangle$	average system temperature [K]
η_C	correlator efficiency ($\eta_C = 0.88$)
η_p	atmospheric decorrelation $\eta_p = e^{-\sigma_p^2/2}$ (0.6 to 0.98)
N	Number of antennas (6)
$\delta\nu$	Spectral Bandwidth [Hz] (39 kHz to 2000 MHz)
$t_{\rm on}$	On-source integration time [s], $t_{\rm obs} = 1.6\, t_{\rm on}$
$N_{\rm pol}$	Number of polarizations (1 or 2)
$\frac{2k}{\eta_a A \cdot \eta_j}$	$= J_{pk}$: Conversion factor Kelvin to Jansky 22 Jy/K @ 3mm, 26 Jy/K @ 2mm, 35 Jy/K @ 1mm

Sensitivity (II)

Expected point source continuum sensitivities in one hour:

- @ 100 GHz in a FOV of 50"

$$\approx 22 \cdot \frac{90}{0.90 \cdot 0.88 \cdot \sqrt{30 \cdot 1000 \cdot 10^6 \cdot 3600}} \cdot \frac{1}{\sqrt{2}} \approx 0.17\,\mathrm{mJy/beam}$$

- @ 150 GHz in a FOV of 33"

$$\approx 26 \cdot \frac{130}{0.85 \cdot 0.88 \cdot \sqrt{30 \cdot 1000 \cdot 10^6 \cdot 3600}} \cdot \frac{1}{\sqrt{2}} \approx 0.31\,\mathrm{mJy/beam}$$

- @ 230 GHz in a FOV of 21"

$$\approx 35 \cdot \frac{160}{0.80 \cdot 0.88 \cdot \sqrt{30 \cdot 1000 \cdot 10^6 \cdot 3600}} \cdot \frac{1}{\sqrt{2}} \approx 0.54\,\mathrm{mJy/beam}$$

Sensitivity (III)

The brightness sensitivity is related to the point source sensitivity by

$$\delta T = \frac{\rho \lambda^2}{\Theta_1 \Theta_2} \cdot \delta S$$

δT	brightness sensitivity [K]
Θ_1, Θ_2	axes of synthesized beam [arcsec]
λ	observing wavelength [mm]
ρ	≈ 15 for untapered maps and natural weighting

Brightness sensitivity depends on angular resolution!

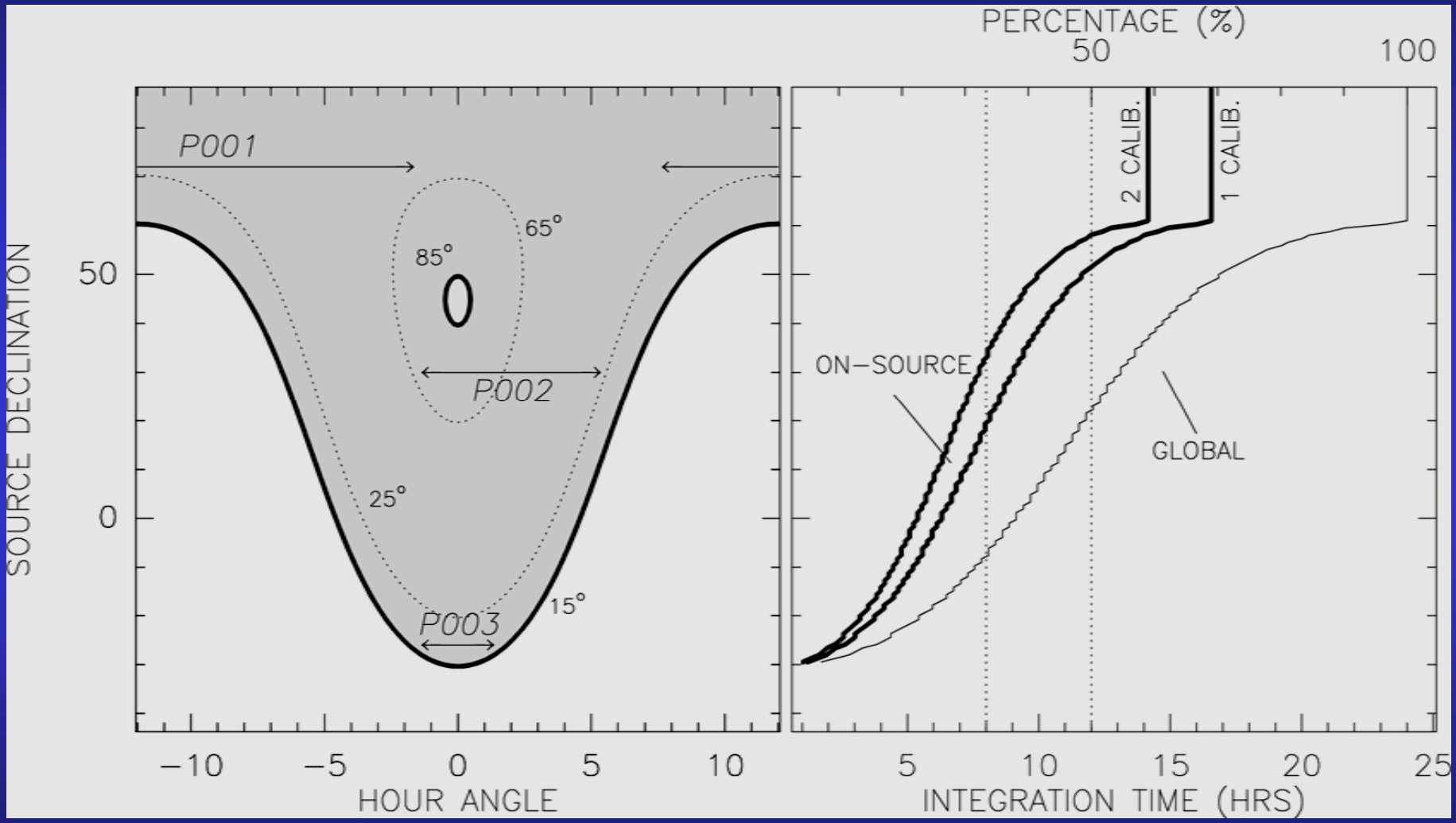
Sensitivity (IV)

Expected line brightness sensitivities in 8 hours (12h track)

1km/s bandwidth, dual polarization:

- @ 100 GHz in a beam of $1'' \times 1''$: $\delta T \approx 434\,\mathrm{mK}$
  $5'' \times 5''$: $\delta T \approx 17\,\mathrm{mK}$
- @ 150 GHz in a beam of $0.6'' \times 0.6''$: $\delta T \approx 916\,\mathrm{mK}$
  $3.3'' \times 3.3''$: $\delta T \approx 30\,\mathrm{mK}$
- @ 230 GHz in a beam of $0.3'' \times 0.3''$: $\delta T \approx 2000\,\mathrm{mK}$
  $2.2'' \times 2.2''$: $\delta T \approx 40\,\mathrm{mK}$

Observing time



When?

- **Summer:**
  C and D configuration only
  Low resolution studies, detection experiments at 3mm and 2mm, only 5 antennas available from May to September/October (D-config)

- **Winter offer best observing conditions:**
  Best atmosphere (transparency, phase stability)
  All four configurations (compact to extended)
  All 6 antennas available

- **Observations at 1.3mm:**
  only possible from September to April

How?

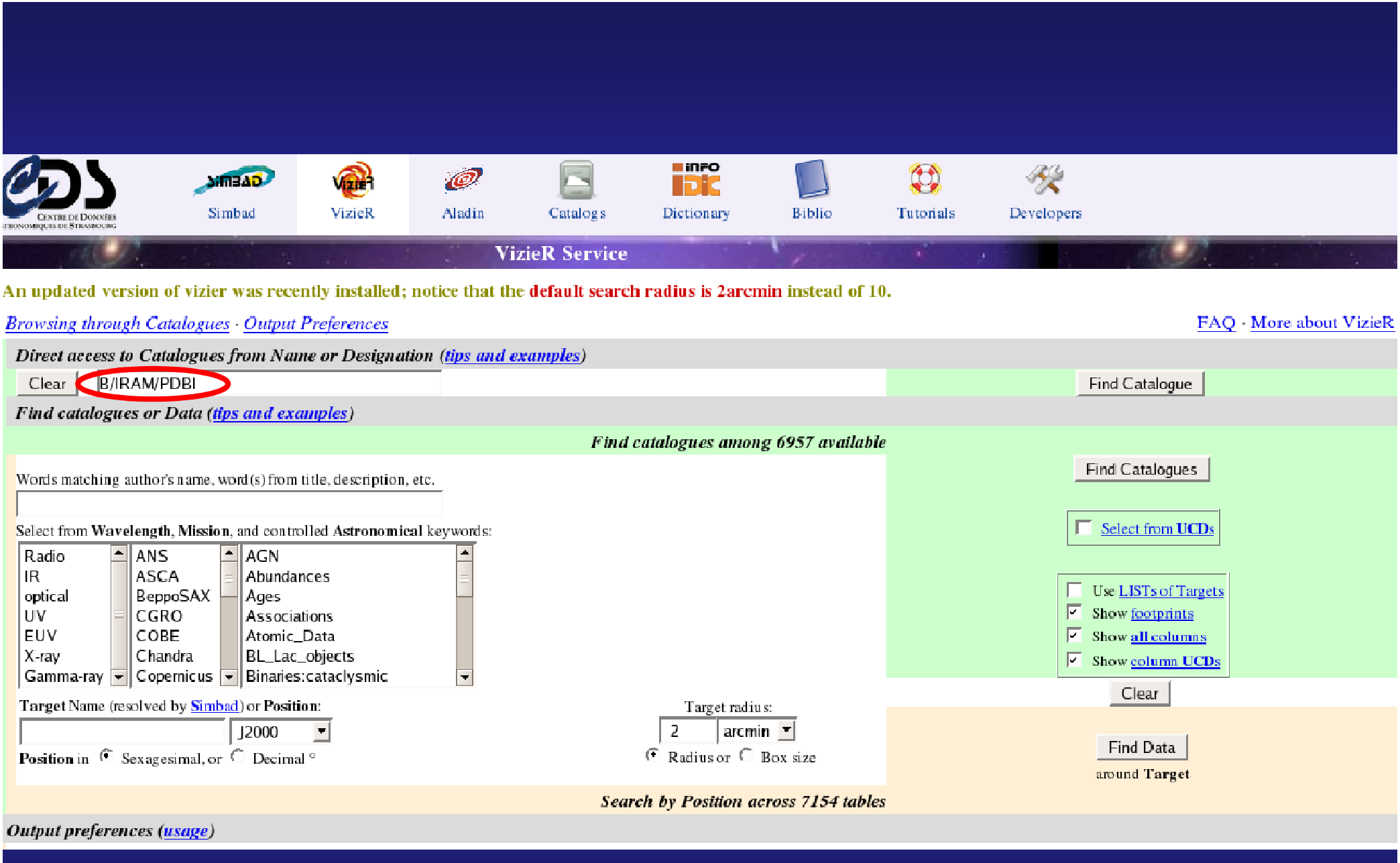
- **Caution:**
  At 115GHz the atmospheric O_2 line degrades sensitivity by more than a factor 2 already in good observing conditions

- **Request a point source sensitivity for detection**
  … but evaluate the integration time as well!

- **Request a configuration for mapping**
  e.g. AB configuration = 2 tracks (8hrs each)

Has my object already been observed?

- Consult the CDS (Strasbourg)
- Consult the Science Operation Group (SOG)
- The raw data archive is not (yet) public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Position in Sexagesimal, or Decimal °
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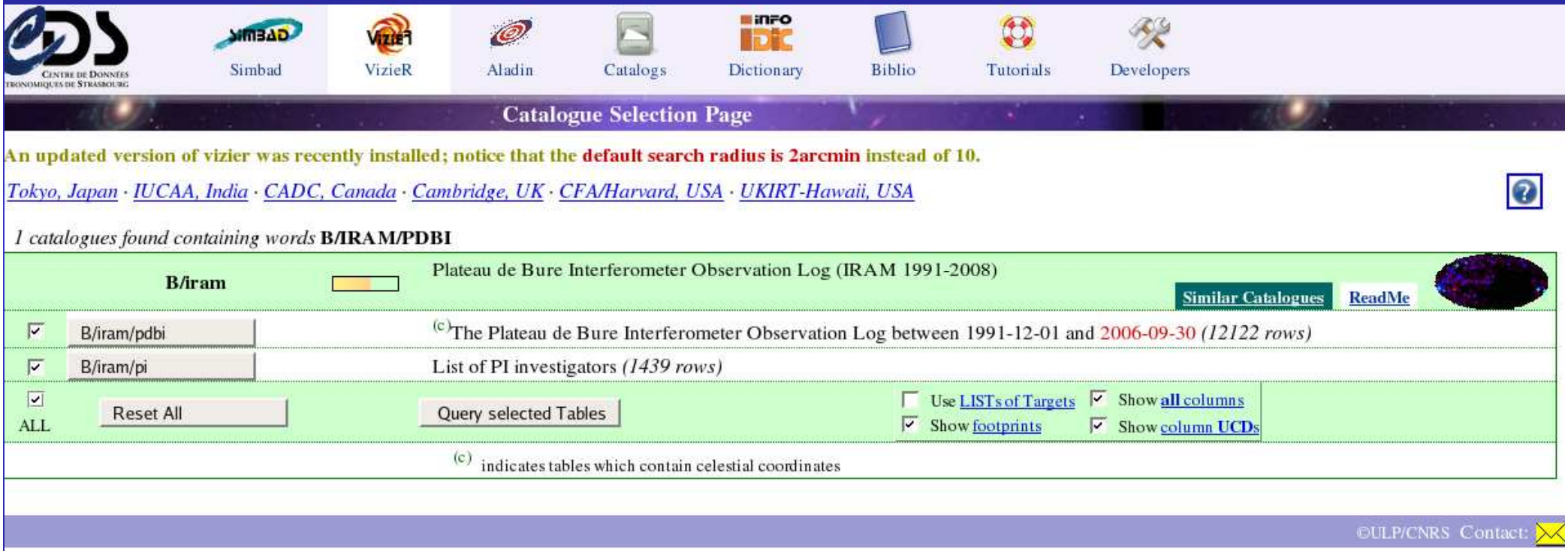
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List of PI investigators (1439 rows)
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Reset All
Query selected Tables
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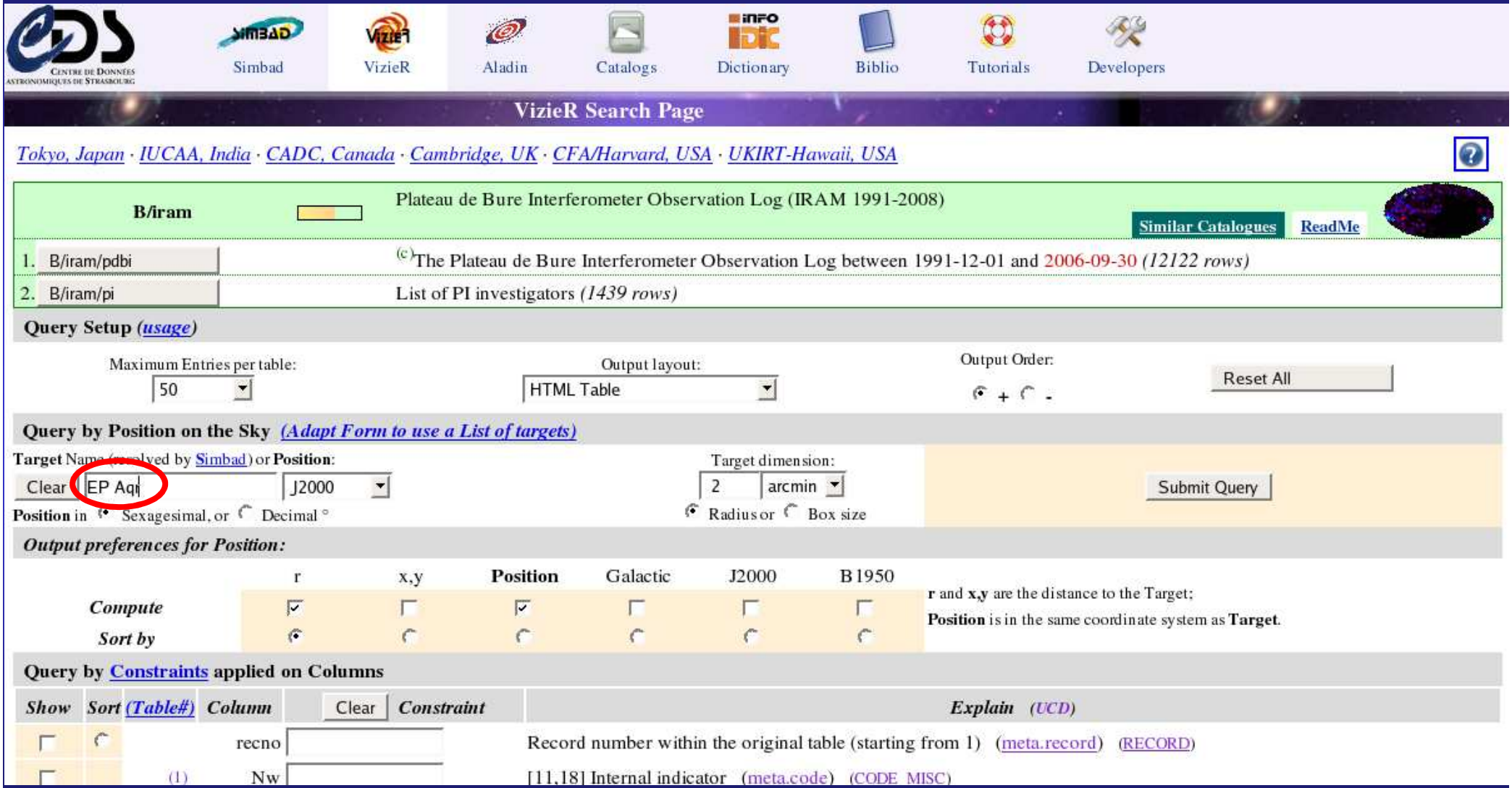
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2. B/iram/pi
List of PI investigators (1439 rows)
Query Setup (usage)
Maximum Entries per table:
50
Output layout:
HTML Table
Output Order:
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Reset All
Query by Position on the Sky (Adapt Form to use a List of targets)
Target Name (resolved by Simbad) or Position:
Clear
EP Aqr
J2000
Position in Sexagesimal, or Decimal °
Target dimension:
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arcmin
Radius or Box size
Submit Query
Output preferences for Position:
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Galactic
J2000
B1950
Compute
Sort by
r and x,y are the distance to the Target;
Position is in the same coordinate system as Target.
Query by Constraints applied on Columns
Show
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Clear
Constraint
Explain (UCD)
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Record number within the original table (starting from 1) (meta.record) (RECORD)
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Nw
[11,18] Internal indicator (meta.code) (CODE_MISC)

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VizieR Result Page

Result of VizieR Search within **2'** of **EP Aqr** (J2000=21:46:31.8-02:12:46) (no other constraint specified)
ordered by increasing **_r**

Modify the Query

Max. Entries: 50 | Output layout: HTML Table | **ALL** columns | ReSubmit B

B/iram/pdbi

Plateau de Bure Interferometer Observation Log (IRAM 1991-2008)
The Plateau de Bure Interferometer Observation Log between 1991-12-01 and 2006-09-30 *(12122 rows)*

ReadMe

To get all details for a row, just click on the row number in the leftmost 'Full' column.

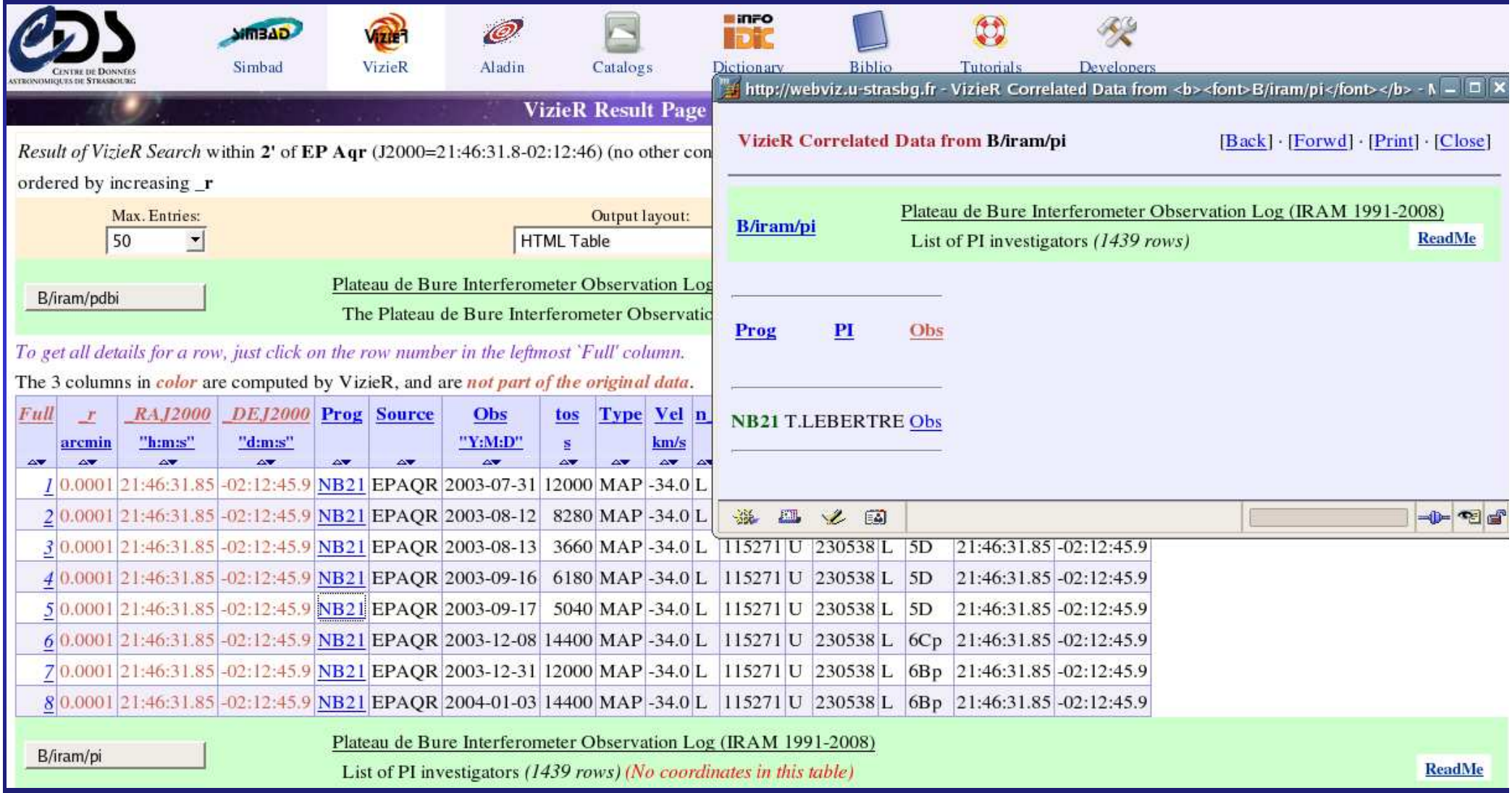
The 3 columns in *color* are computed by VizieR, and are *not part of the original data*.

Full	_r arcmin	_RAJ2000 "h:m:s"	_DEJ2000 "d:m:s"	Prog	Source	Obs "Y:M:D"	tos s	Type	Vel km/s	n_	Flow MHz	n_	Fhigh MHz	n_	Conf	RAJ2000 "h:m:s"	DEJ2000 "d:m:s"
1	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-07-31	12000	MAP	-34.0	L	115271	U	230538	L	5D	21:46:31.85	-02:12:45.9
2	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-08-12	8280	MAP	-34.0	L	115271	U	230538	L	5D	21:46:31.85	-02:12:45.9
3	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-08-13	3660	MAP	-34.0	L	115271	U	230538	L	5D	21:46:31.85	-02:12:45.9
4	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-09-16	6180	MAP	-34.0	L	115271	U	230538	L	5D	21:46:31.85	-02:12:45.9
5	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-09-17	5040	MAP	-34.0	L	115271	U	230538	L	5D	21:46:31.85	-02:12:45.9
6	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-12-08	14400	MAP	-34.0	L	115271	U	230538	L	6Cp	21:46:31.85	-02:12:45.9
7	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-12-31	12000	MAP	-34.0	L	115271	U	230538	L	6Bp	21:46:31.85	-02:12:45.9
8	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2004-01-03	14400	MAP	-34.0	L	115271	U	230538	L	6Bp	21:46:31.85	-02:12:45.9

B/iram/pi

Plateau de Bure Interferometer Observation Log (IRAM 1991-2008)
List of PI investigators *(1439 rows)* *(No coordinates in this table)*

ReadMe



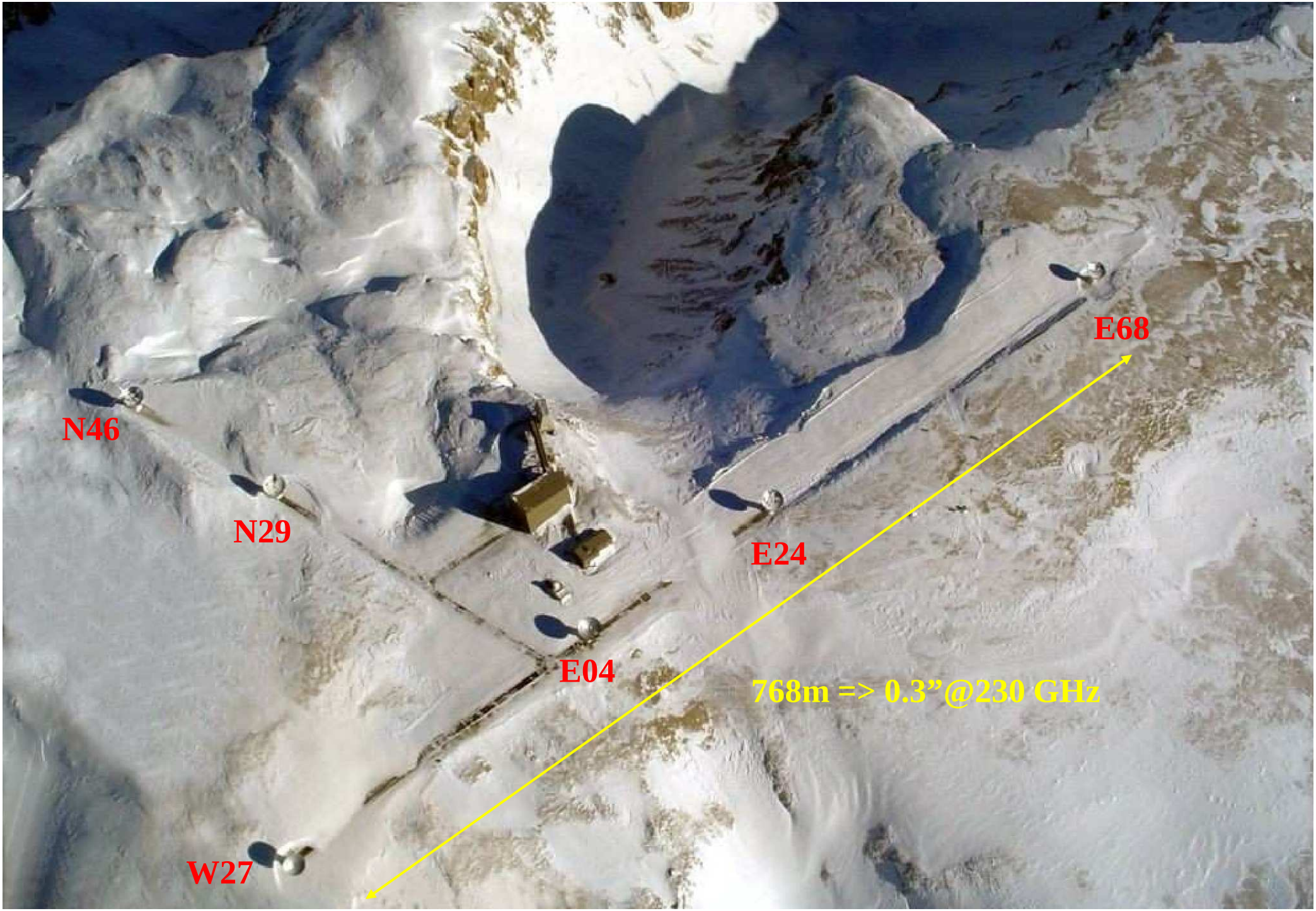
Full	_r arcmin	_RAJ2000 "h:m:s"	_DEJ2000 "d:m:s"	Prog	Source	Obs "Y:M:D"	tos s	Type	Vel km/s	n_									
1	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-07-31	12000	MAP	-34.0	L	115271	U	230538	L	5D	21:46:31.85	-02:12:45.9		
2	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-08-12	8280	MAP	-34.0	L	115271	U	230538	L	5D	21:46:31.85	-02:12:45.9		
3	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-08-13	3660	MAP	-34.0	L	115271	U	230538	L	5D	21:46:31.85	-02:12:45.9		
4	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-09-16	6180	MAP	-34.0	L	115271	U	230538	L	5D	21:46:31.85	-02:12:45.9		
5	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-09-17	5040	MAP	-34.0	L	115271	U	230538	L	5D	21:46:31.85	-02:12:45.9		
6	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-12-08	14400	MAP	-34.0	L	115271	U	230538	L	6Cp	21:46:31.85	-02:12:45.9		
7	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2003-12-31	12000	MAP	-34.0	L	115271	U	230538	L	6Bp	21:46:31.85	-02:12:45.9		
8	0.0001	21:46:31.85	-02:12:45.9	NB21	EPAQR	2004-01-03	14400	MAP	-34.0	L	115271	U	230538	L	6Bp	21:46:31.85	-02:12:45.9		

Configurations

- **Four configurations are needed to take properly into account baseline range and operation with 6 antennas**

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

- **The A and B configurations are scheduled during the winter period only**

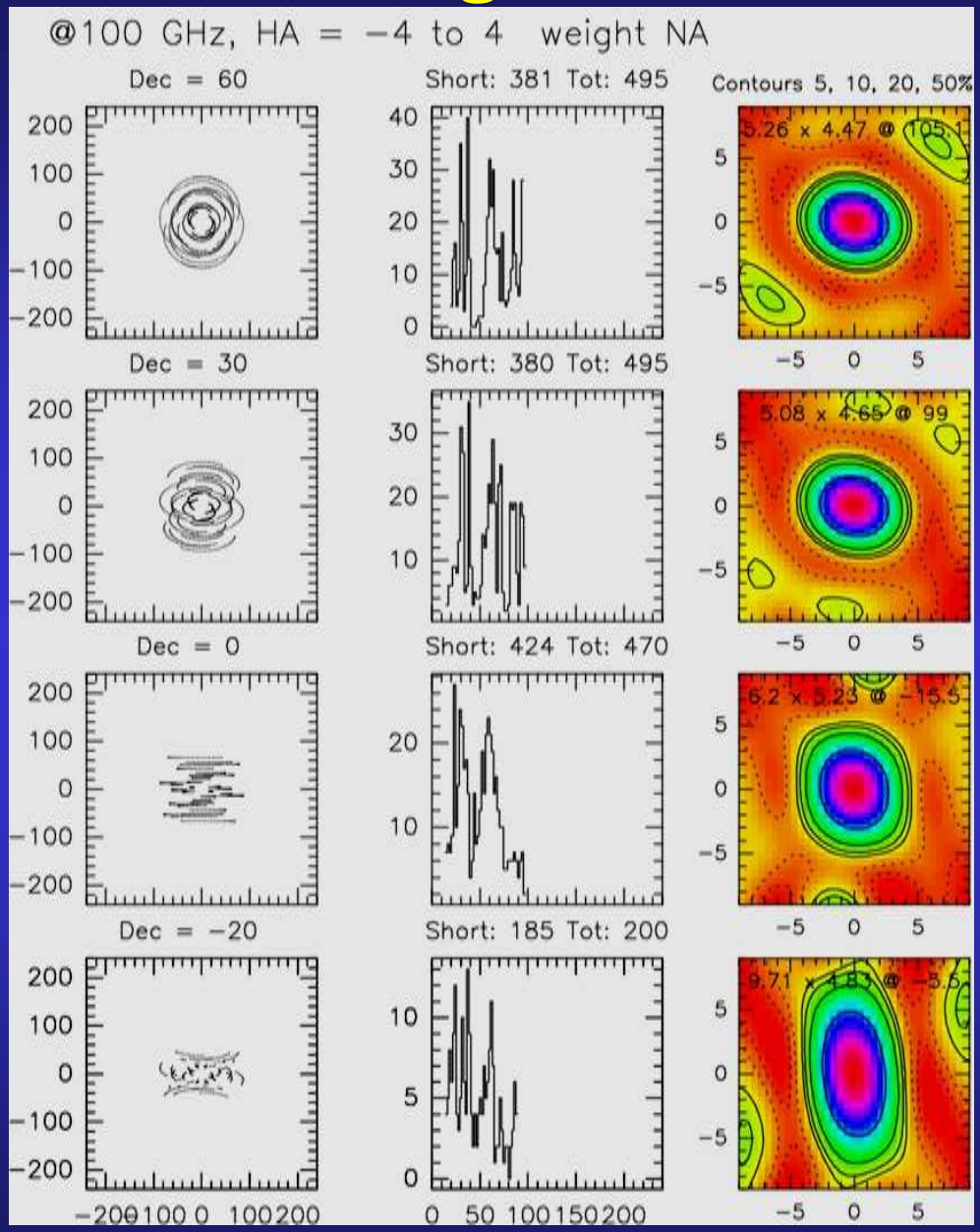

E68
N46
N29
E24
E04
768m => 0.3”@230 GHz
W27

Which configuration is appropriate?

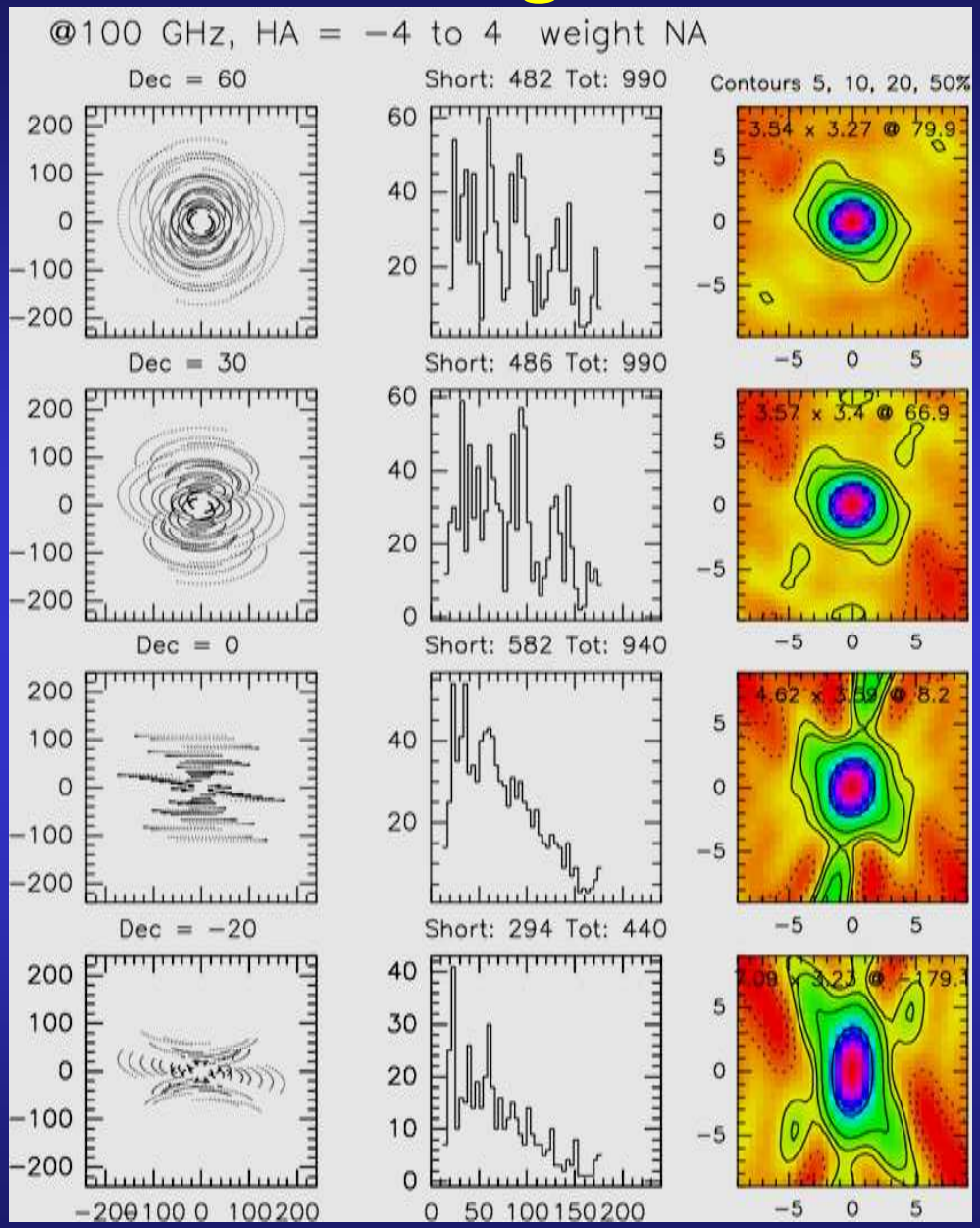
Standard sets of configurations are:

Set	Purpose
D	detection/lowest resolution
CD	3.5” @ 100 GHz
BC	1.7” @ 100 GHz
AB	0.95” @ 100 GHz
A	0.82” @ 100 GHz

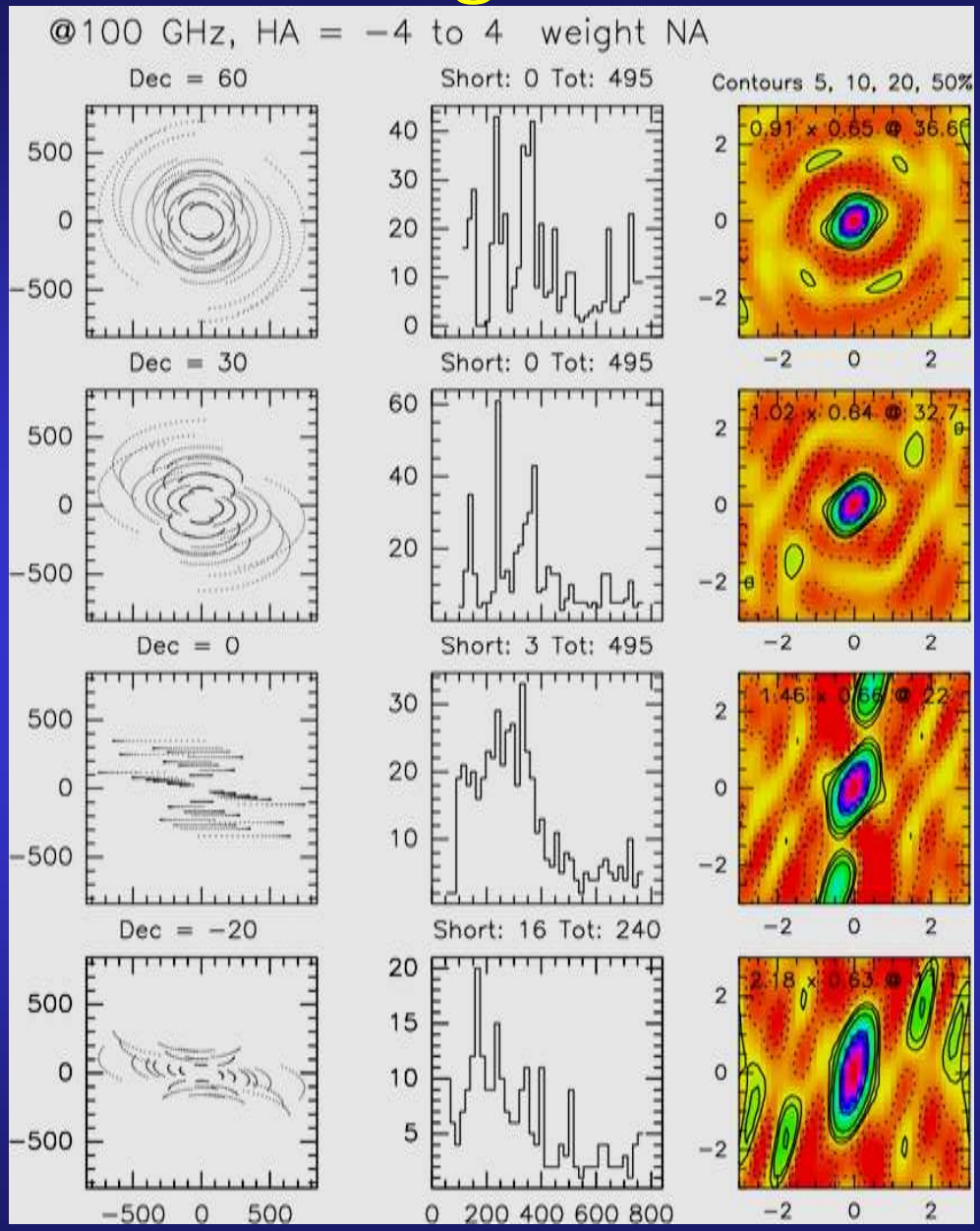
D configuration



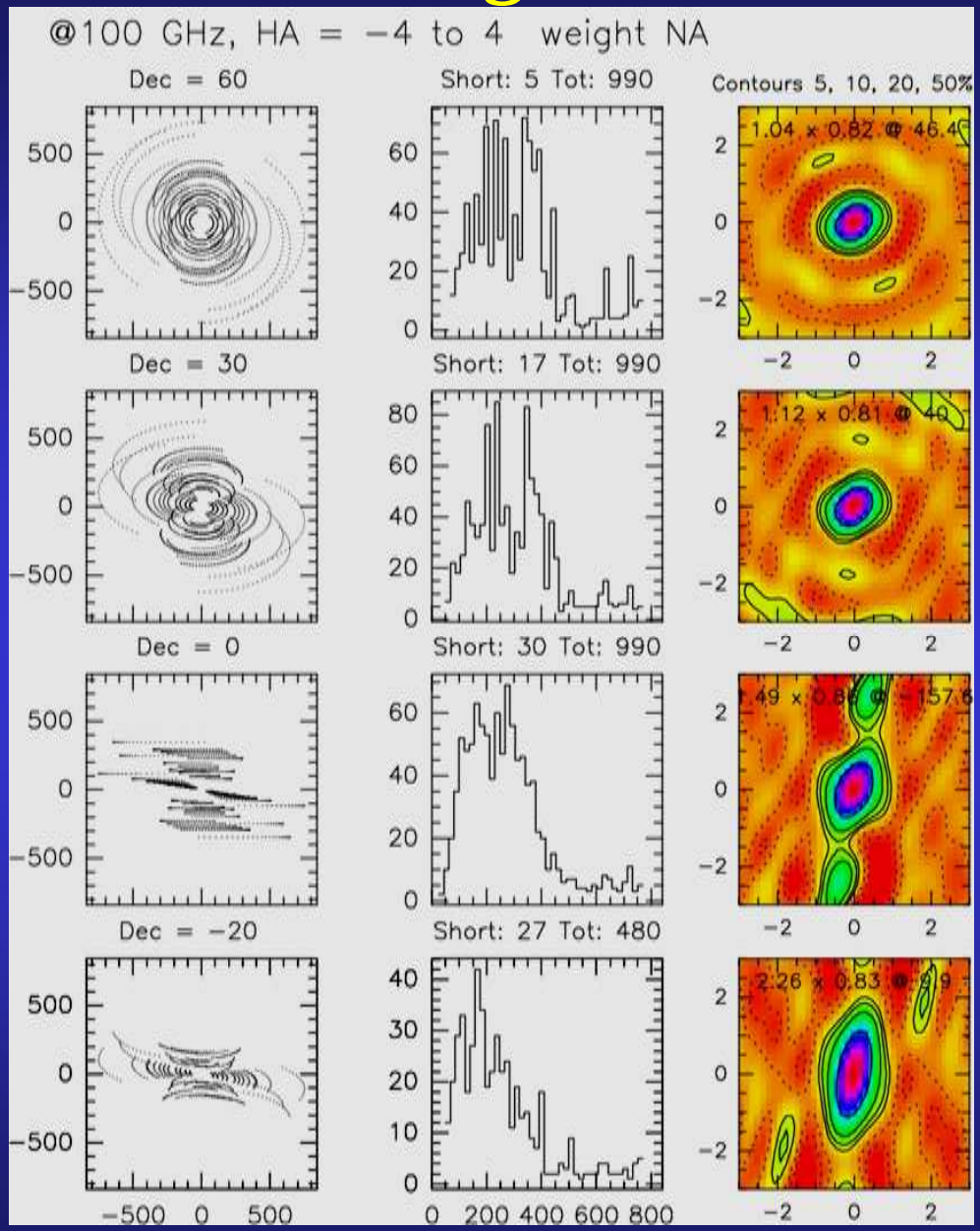
CD configuration



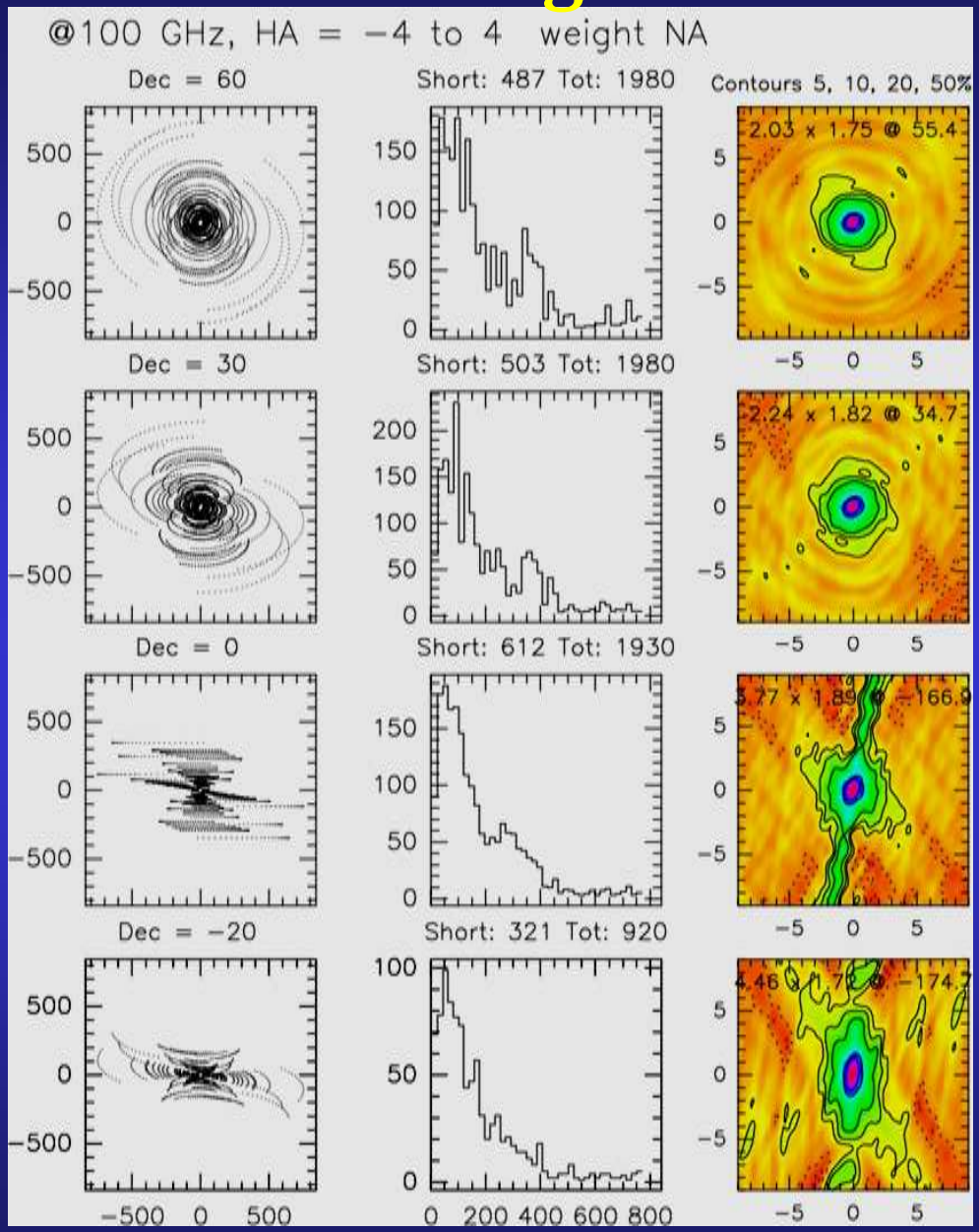
A configuration



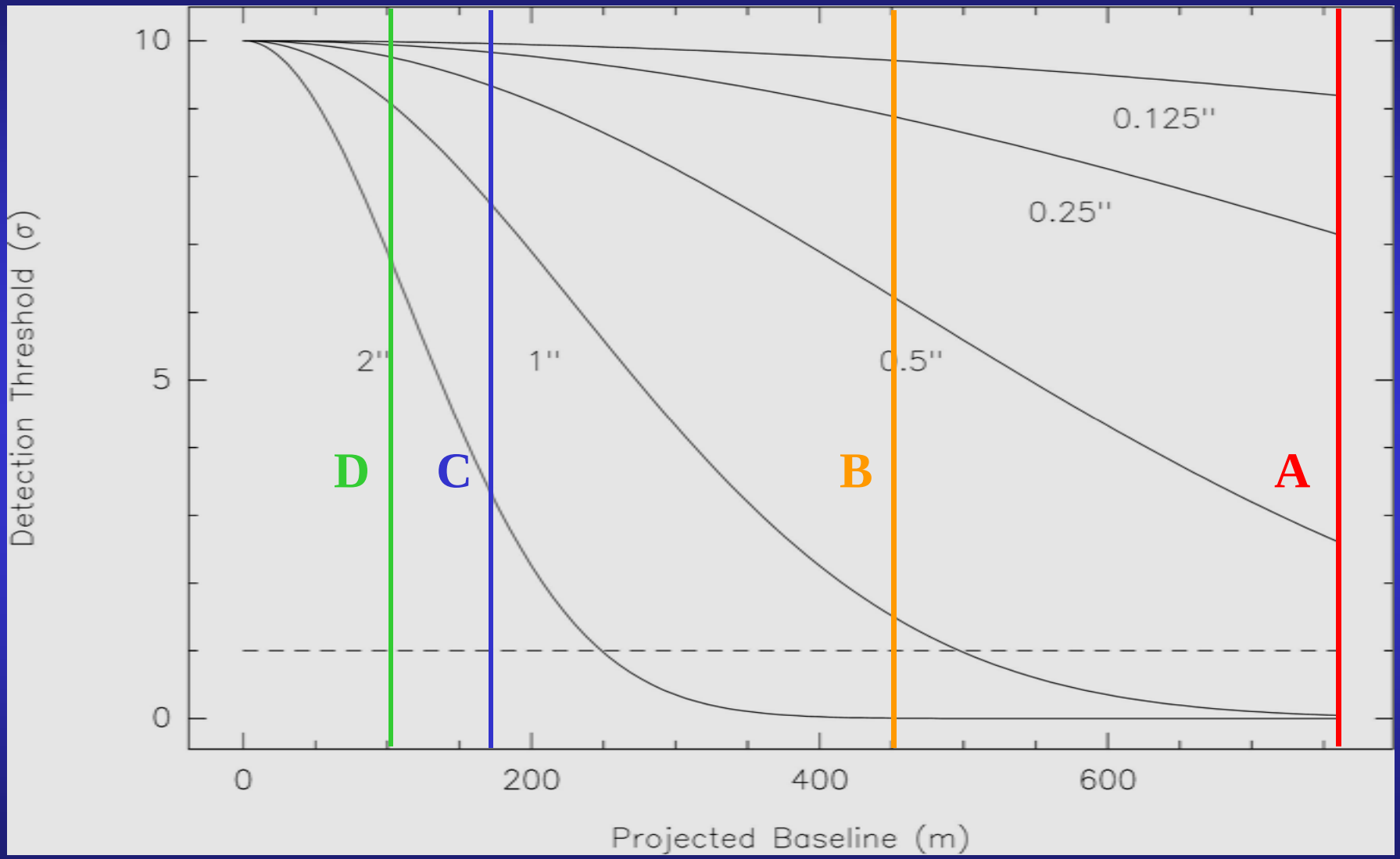
AB configuration



ABCD configuration



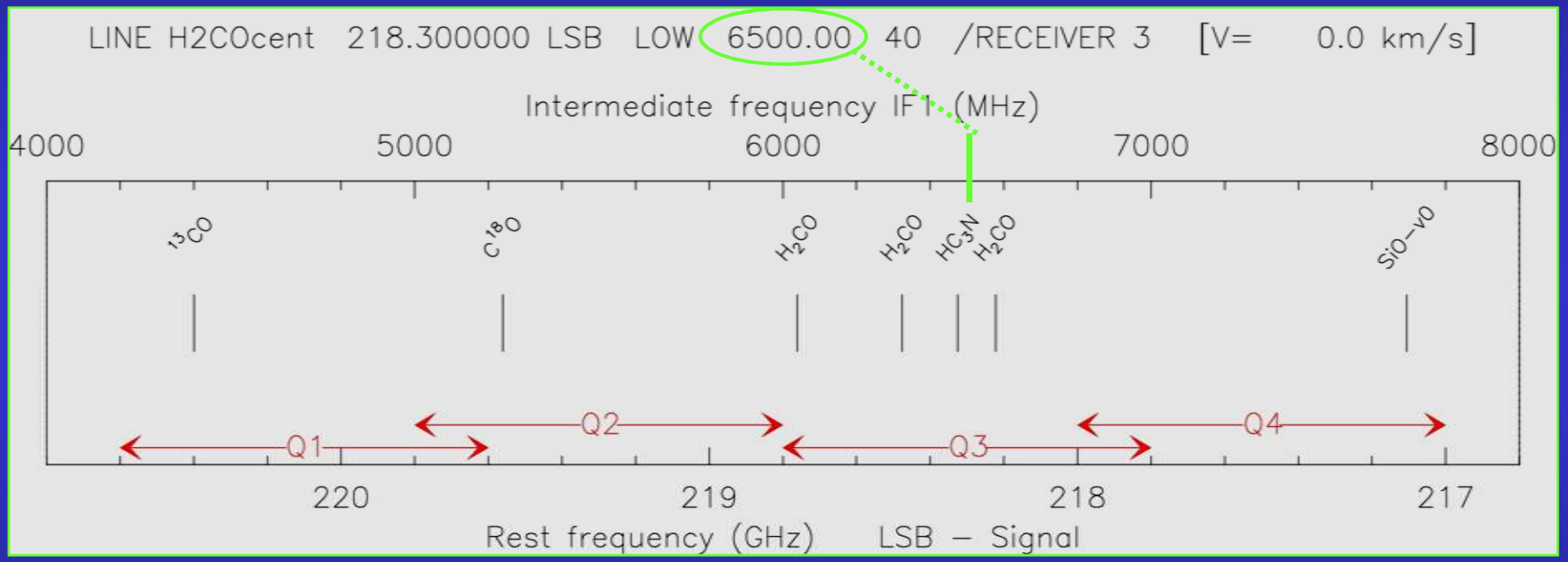
Resolution effect



Spectral settings (I)

•Use the ASTRO command LINE:

ASTRO> LINE H2COcent 218.3 LSB

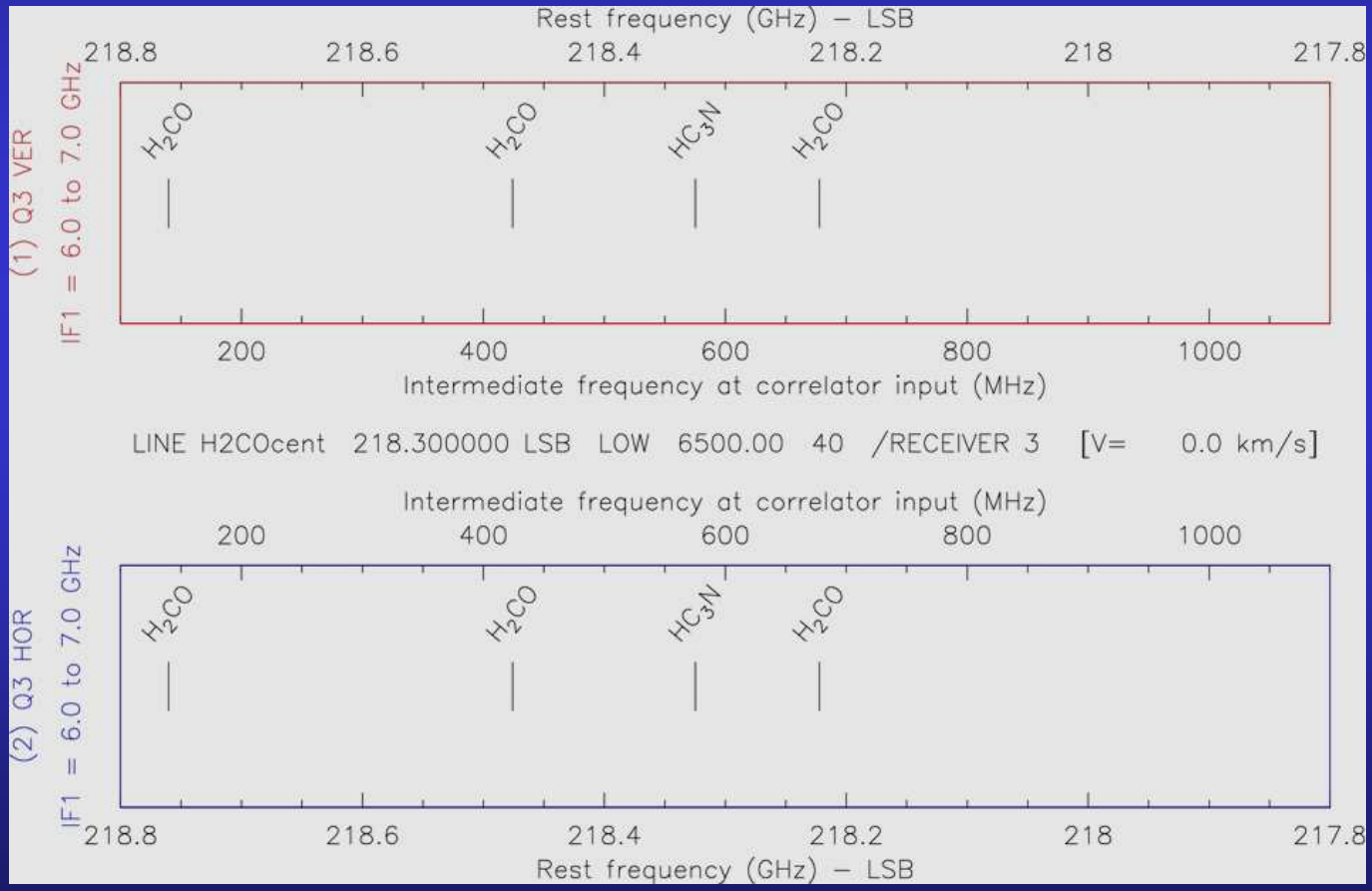


Quarter	Q1	Q2	Q3	Q4
IF1 [GHz]	4.2 - 5.2	5 - 6	6 - 7	6.8 - 7.8
input 1	HOR	HOR	VER	VER
input 2	VER	VER	HOR	HOR

Spectral settings (II)

- **Make use of IF processor and correlator flexibility**
  - **Correlator can process 2 x 1GHz (100MHz to 1100MHz)**

ASTRO> NARROW Q3 Q3



Correlator Modes

http://www.iram.fr/IRAMFR/TA/backend/cor6A/index.html

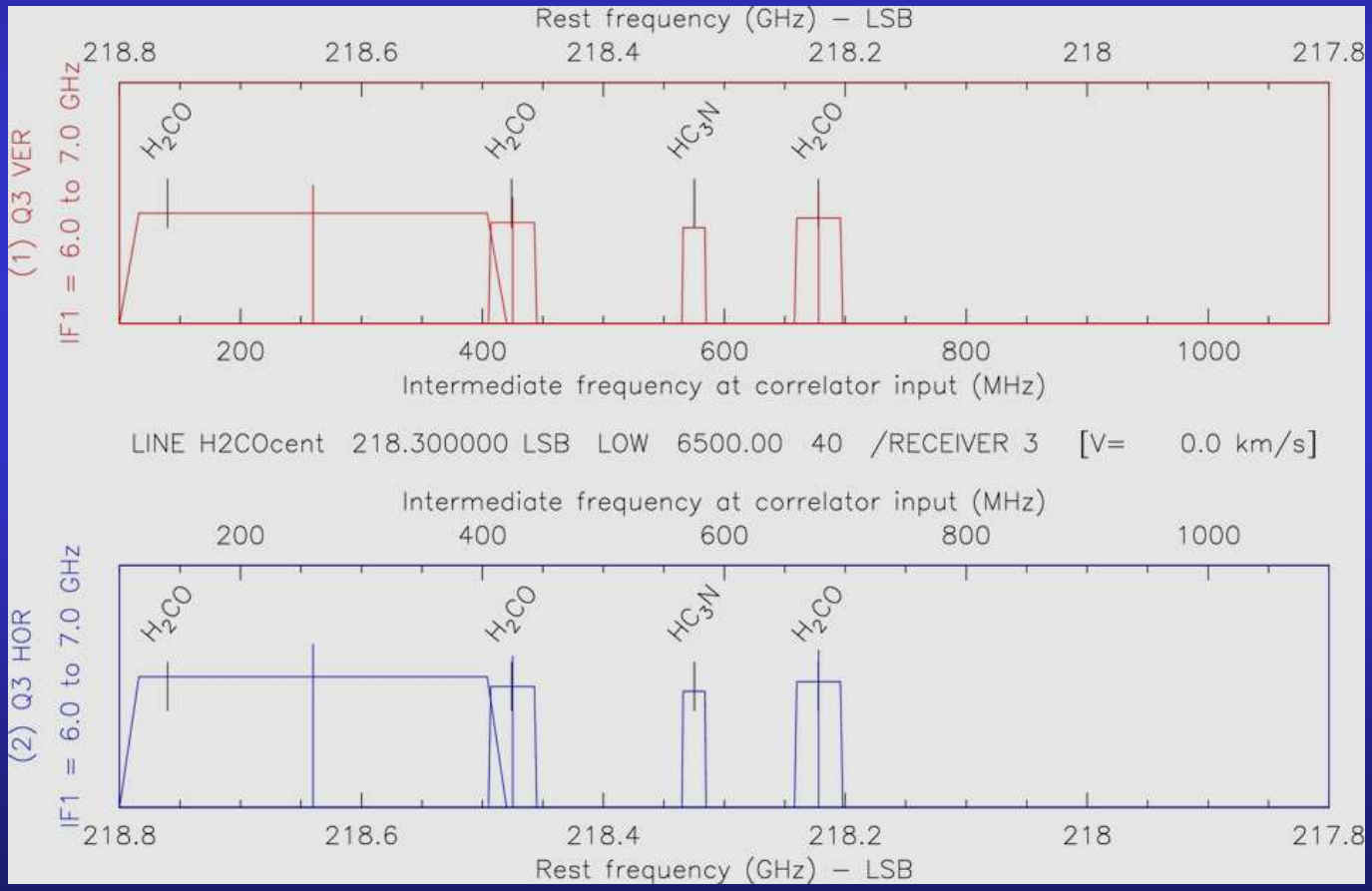
- **Beware of Gibbs phenomenon:**

Avoid line in subband center (320, 160, 80)

Bandwidth	Subband	Channels	Spacing
320 MHz	DSB	2 x 64	2.5 MHz
160 MHz	SSB	1 x 128	1.25 MHz
160 MHz	DSB	2 x 128	0.625 MHz
80 MHz	SSB	1 x 256	0.312 MHz
80 MHz	DSB	2 x 256	0.156 MHz
40 MHz	SSB	1 x 512	0.078 MHz
20 MHz	SSB	1 x 512	0.039 MHz

Spectral settings (III)

	unit	BW	cent_IF	correlator input
Astro> SPECTRAL 1		20	575	/NARROW 1
Astro> SPECTRAL 2		40	425	/NARROW 1
Astro> SPECTRAL 3		40	680	/NARROW 1
Astro> SPECTRAL 4		320	260	/NARROW 1



Can my object be observed at any time? (I)

- **Watch the IRAM Web or Newsletter for the submission deadlines**

  - March deadline: June 1 to November 30
  Committee meets 2nd half of April

  - September deadline: December 1 to May 31
  Committee meets 2nd half of October

  - Urgent? Submit ToO/DDT proposal

  - Interested in global 3mm-VLBI observations?
  Two sessions per year:
  1 week in May, 1 week in October

Can my object be observed at any time? (II)

- **Watch out for sun avoidance period (45^0)**

  ASTRO> catalogue mysource.sou
  ASTRO> horizon /sou
  IRC+10216 : Sun distance 47.6 ; avoidance 30-JUN-2009 to 03-OCT-2009

- **Check declination of the object:**
  Galactic center is at the very limit

- **Self-calibration on strong (300mJy and more) continuum feasible? Ideal time filler for periods where the atmospheric phase stability is poor!**

Detection

- **Choose compact configuration**

  - lower phase noise
  - source is unresolved: no flux is lost, all baselines are used

  - if you have a detection, do not over-interpret it. A 5σ detection is not a map; CLEANing is not helpful

Mapping/Imaging

- **Single field:**
  - **Do not forget to correct for primary beam attenuation when comparing maps**

- **Mosaics:**
  - **Fully sample the mosaic to be sensitive to large scales**

- **Adding short spacings:**
  - **good calibration required at single dish**
  - **good sensitivity**
  - **should cover at least the field mapped by the interferometer**

Other observations

- **Size measurements:**
  - **Requires good SNR, not a 5σ detection**
  - **Compare to point source (calibrator)**

- **Position measurements:**
  - **absolute astrometric precision < 0.3”**

GILDAS
Home Page

- Documentation (09-apr-08)
- Current Status (30-jul-07)
- News (09-jun-08)
- Supported systems (30-jul-07)
- Dependencies (30-jul-07)
- Download (09-apr-08)
- Developers' corner (30-jul-07)
- Credits/Responsibilities (31-jan-08)
- Copyright (23-may-04)

DOWNLOAD

Windows binaries

A self-extracting binary distribution (including documentation) of the whole GILDAS package is available in the download area for Windows 1998, 2000, xp, NT. Just pick the last release named:

```
gildas-win-mmmyya.msi (Sources and documentation)
```

where *mmm* are the 3 first letters of the current month, *yy* are the last two digits of the current year and *a* a letter defining the minor version of the monthly release: *a* for the initial monthly release, *b* for the monthly release with the first bug fix, *c* for the monthly release with the second bug fix, and so on.

Then follow this guide to install it. This version is supported on a best effort basis only.

Mac OSX binaries

A self-extracting binary distribution is available here. Gildas is now also available in Fink. This package is updated more regularly than the binary version, and users who need the latest functionalities in Gildas are therefore encouraged to use it. It is available for Mac OS 10.4 and 10.5, and both Intel and PPC architectures.

Please note that this distribution is packaged on a best-effort basis only by S. Maret. Bug reports should still be submitted to the GILDAS team but there is currently no mechanism that ensure that the bug fixes will go quickly in the binary distribution. If you need a bug fix that is not yet in the binary distribution, just compile the sources by yourself (cf. next section).

UNIX/Linux/OSX sources

UNIX/Linux version of GILDAS are distributed only as sources because binaries are not portable (due to the many different possible combinations of processors, operating system and compilers). We thus tried to ease building as much as possible: If GILDAS dependencies are correctly installed, building the binaries should just need the following sequence of commands

The Plateau de Bure Interferometer (PDBI)

Call for Proposals | Proposal Submission | Program Committee Recommendations | Local Contacts | Travel to Grenoble | Data Reduction | Consult the Archive | Publication of PdBI data | Documentation

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The deadline for the submission of observing proposals for the December 01, 2008 to May 31, 2009 period:

- Call for Proposals: deadline is on September 18, 2008, 17:00 MEST (UT + 2 hours)

- Safety issues (local access only).
- Some pictures of the Plateau de Bure Observatory and Interferometer
- List of recently scheduled projects, and a complete overview by semester
- Consult the visitors schedule

People to contact in case of problems or questions:

- Roberto Neri is the Project Scientist
- Jan Martin Winters is the Scientific Coordinator

Proposals for observation with the IRAM telescopes may be submitted twice per year to the

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

Submission can be made through letter, fax (+33-476-425469), or electronically through the Electronic proposal submission facility. The facility is opened about three weeks before a deadline. Submission deadlines are currently at the beginning of March and September each year for the summer (01 June - 30 November) and winter (01 December - 31 May) scheduling periods. Exact dates and all other relevant information are given in a separate Call for proposals published on the web and in the IRAM Newsletter usually about a month ahead of the deadline.

CALENDAR	
Semester:	01 December 2008 - 31 May 2009
Submission deadline	September 18, 2008 17:00 CEST (UT + 2 hour)
Opening of proposal submission facility	Closed now
Program committee meeting	20/21 October 2008
Publication of PC grades	early November 2008

Submission by ordinary mail or by fax is still possible under certain circumstances, but generally non-electronic submission is discouraged. Submission by Email is not possible. Shortly after a submission deadline the scientific secretariat sends acknowledgements of receipt to the principal investigators of all proposals received. These receipts are sent by Email and contain the reference number of the proposal.

Proposals are evaluated at the next meeting of the IRAM program committee and recommendations are made to the IRAM Direction. Proposals are rated A (accepted), B (backup, scheduled under certain favourable conditions), or C (rejected). The program committee has twelve non-IRAM members plus the ex-officio members: IRAM direction, 30m station manager and 30m scheduler and the coordinator of the interferometer.

Electronic Proposal Submission

Electronic submission of proposal requesting observing time at IRAM telescopes for the period of 01 December 2008 - 31 May 2009 has to be made prior to the submission deadline:

18 September 2008 17:00 CET (UT + 2 hour)

Authors who wish to submit a proposal by the electronic facility should read the following general information:

- Preparation of proposal submission
- Read our response and check your submission
- Modify a proposal already submitted

Proposal Forms

A LaTeX style file, proposal.sty, is provided in this directory for preparing IRAM proposals, both for the 30m telescope and the interferometer. To get and save this file, first click on the link, then click "File" and "Save As..." on your browser. A template file, proposal.tex, is available as a starting point for writing your 30m or interferometer proposals. For the preparation of your proposal, we ask you to follow the guidelines for the electronic proposal submission.

NOTE: These files have been updated for the next deadline (September 18, 2008 at 17:00 CEST (UT+2 hour) for the observing period December 01, 2008 - May 31, 2009); please use the new versions of proposal.sty AND proposal.tex. Do not mix them with older versions.

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S02C	Schinnerer	Winters		CD	07-aug / 06-oct	B	
SA31	Muller		D	Any	23-mar / 18-jun	B	Started
SB31	Muller		D		23-mar / 18-jun	A	Reduced
SC31	Muller		D		23-mar / 18-jun	A	Completed
S032	Boulanger		D		18-oct / 07-dec	A	Completed
SB33	Boulanger		D	Any	11-oct / 17-nov	B	Started
SE33	Boulanger		D		27-dec / 17-mar	A	Completed
SF33	Boulanger		D		26-jan / 21-mar	A	Completed
S034	Papadopoulos	Neri		C	MS	B	
SA35	Geach	Salome	D		17-feb / 18-may	A	Completed
SB35	Geach	Salome	D		17-feb / 18-may	A	Completed
SB37	Bouche	Boissier		Any	30-jun / 03-oct	B	
SA38	Dannerbauer	Castro-Carrizo		D		B	
SB38	Dannerbauer	Castro-Carrizo	D			A	Reduced

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Local Contacts

An IRAM staff astronomer is appointed as Local Contact to every A and B rated project without IRAM internal collaborator. He/she will assist you from the beginning to the end of your project should no IRAM astronomer be collaborating with you. Feel free to contact him after you get the project report with the recommendations of the program committee.

The role of the local contact is to help you set up the observing procedures. You should check the source coordinates and offsets for mosaics, the source velocity, the spectral configuration of the correlator and the observing frequencies. The local contact also helps you to arrange your stay in Grenoble and get started with data reduction. He will keep an eye on the data reduction and verify the data quality. His and your feedback are very important to improve on the system.

Note also, that the IRAM interferometer is operated as a service instrument by the IRAM staff. Observations are in general carried out without your presence on the site (in absentee).

Local contacts for the current and previous periods are:

- June 2008 - November 2008
- December 2007 - May 2008

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Publication of PdBI data

The following footnote should appear on the first page of papers based on observations made with the PdBI:

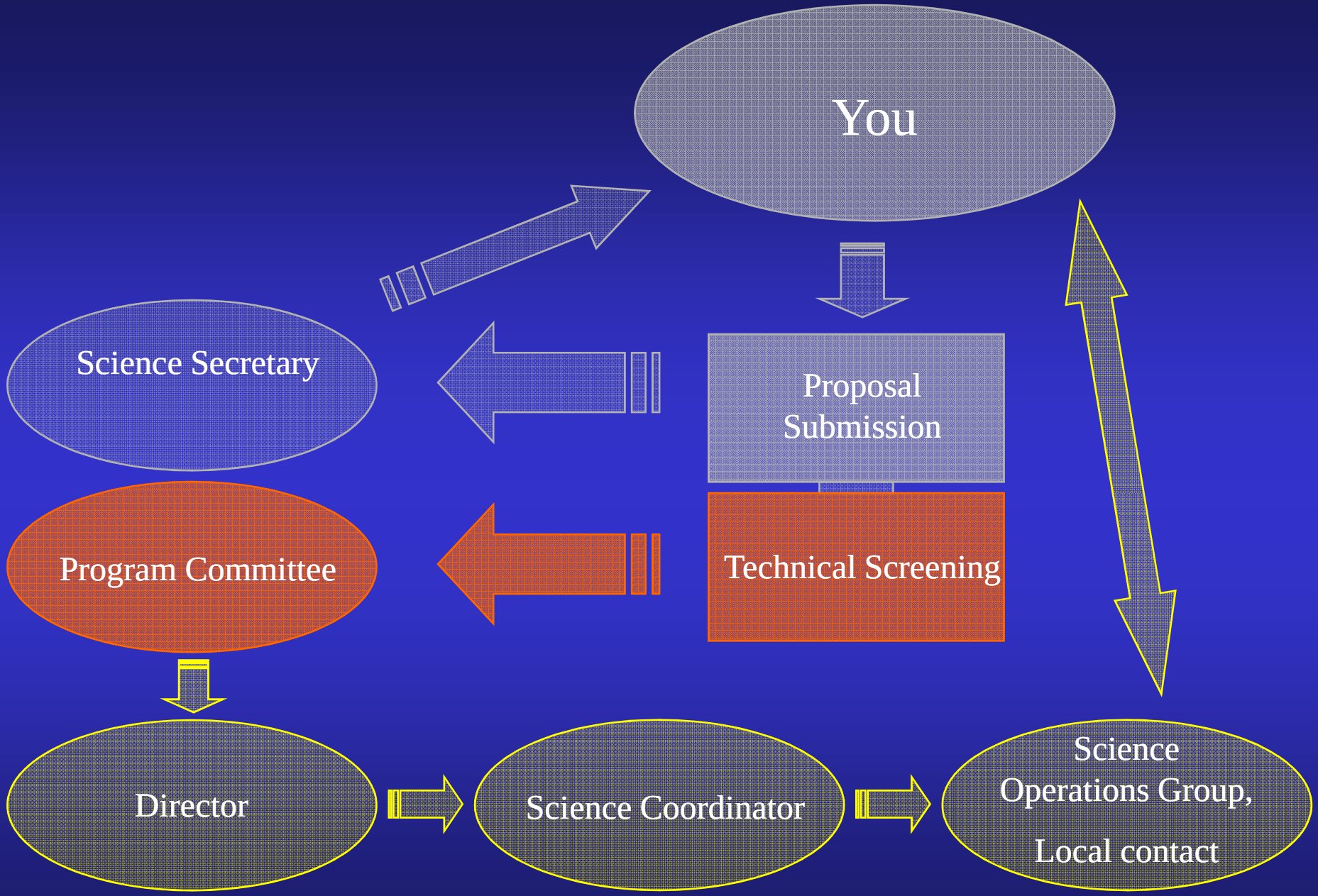
"Based on observations carried out with the IRAM Plateau de Bure Interferometer. IRAM is supported by INSU/CNRS (France), MPG (Germany) and IGN (Spain)."

In addition, publications that arise from work supported by the European Community funded RadioNet project should include the following acknowledgement:

"This work has benefited from research funding from the European Community's Sixth Framework Programme."

IRAM welcomes an acknowledgement to the IRAM staff for help provided during the observations and for data reduction.

IRAM provides preprints free of charge for publication based on IRAM observations. Papers which are accepted in refereed journals and addressed to the IRAM librarian will be published as IRAM preprints.


You
Science Secretary
Proposal Submission
Program Committee
Technical Screening
Director
Science Coordinator
Science Operations Group,
Local contact

Any questions on how to request time for the Plateau de Bure array?

- **Check the IRAM Web pages**
- **Ask the Science Operations Group (sog@iram.fr)**


Looking forward to YOUR proposals next March!