

# Multi-step VLBI observations of weak extragalactic radio sources

Aligning the ICRF & the future Gaia frame

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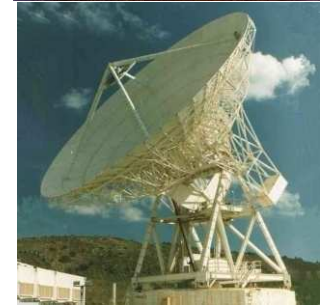


Consortium for Very Long Baseline  
Interferometry in Europe



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- ✓ 450 weak extragalactic radio sources (flux density  $\leq 100$  mJy)  
Never observed with VLBI before
  - ➔ Very high sensitivity necessary
  - ➔ Choice of the EVN (Effelsberg, 1Gb/s)



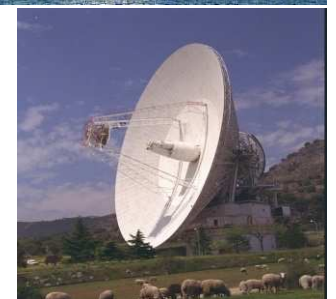
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**Dual-frequency S/X geodetic style @ 1Gb/s**
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- ✓ 4/5 antennas: Effelsberg, Medicina, Noto, Onsala & Robledo (only EC025B)



# II. Feedback summary

## Proposal process

Call

Writing

Submitting

Information

Review

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## Scheduling

- ✓ In practice, difficult to plan optimized 48-hrs observations of more than 200 sources: [Help from John Gipson](#) (NASA/GSFC)
  - Telescope sky coverage optimization (SCHED): not necessary;
  - Telescope slewing time optimization (SKED): required.
- ✓ Difficulties because of the recording @ 1 Gb/s @ Effelsberg: [Help from Dave Graham](#) (MPIfR, Bonn)
  - Specific frequency setup had to be implemented (geodetic-style).
- ✓ Lack of information about the possible bandwidth frequencies @ Robledo.
- ✓ EVN Status table (web) could be more pleasant to read.



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### Scientific goals met?

- ✓ Much more detections than expected, finally! ~90%

Thanks for your attention ...



## II. Sample

- 447 weak extragalactic radio sources
- To observe with S/X geodetic style directly in VLBI
- No published VLBI observations for most of them
- Sources from NVSS survey (NRAO VLA Sky Survey; Condon et al. 1998)

Optical counterpart /  $V \leq 18$

Observable with VLBI northern arrays:  $\delta \geq -10^\circ$

NVSS integrated flux density @ 1.4 GHz  $\geq 20$  mJy

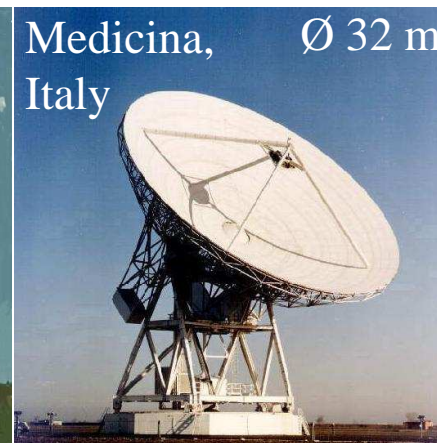
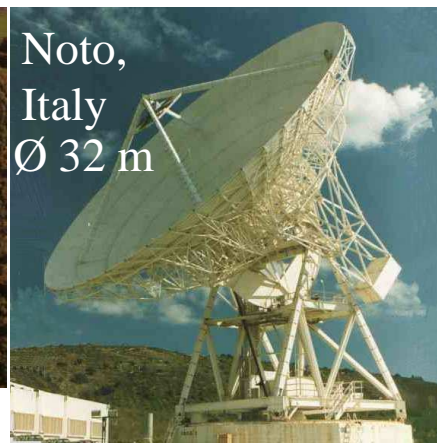
	SNR			
	Eb-Mc	Eb-Nt	Eb-On	Eb-VLBA
X band	49	32	22	50
S band	11	8	7	13

# III. Observations: First step = VLBI detectability

Two 48-hours experiments (dual-frequency S/X geodetic style @ 1Gb/s):

- EC025A: June 2007 → 224 sources observed
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European network: 4/5 antennas



+ Robledo, Spain (Ø 70 m)  
for EC025B

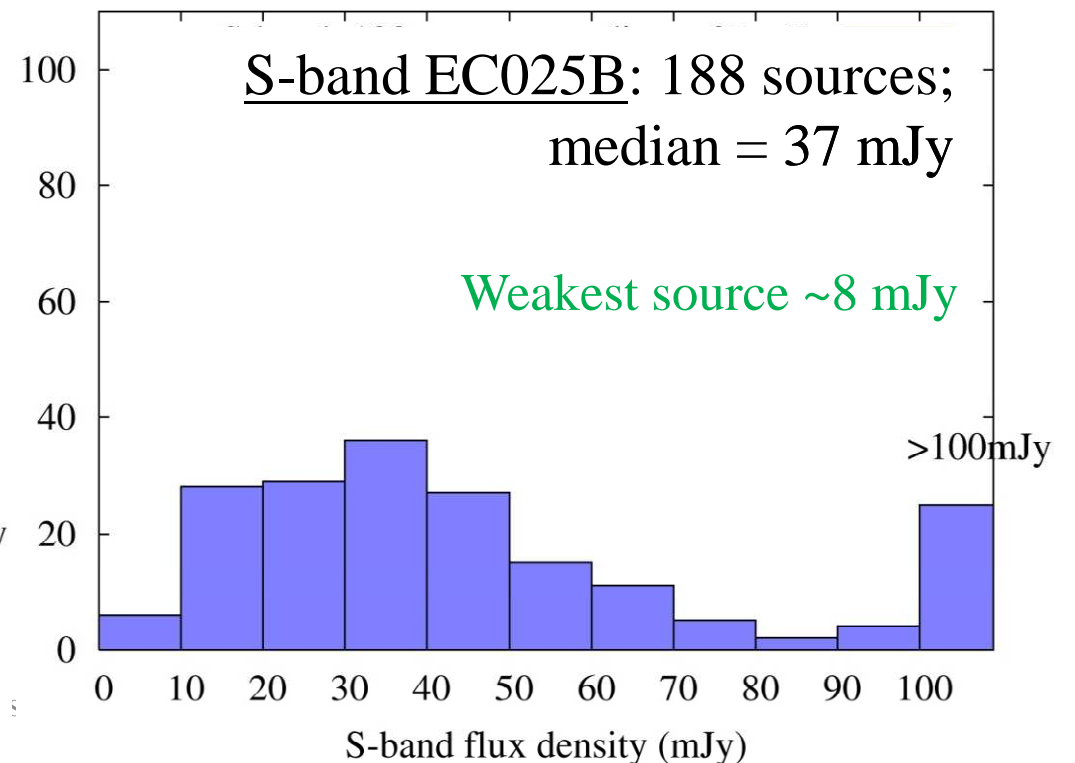
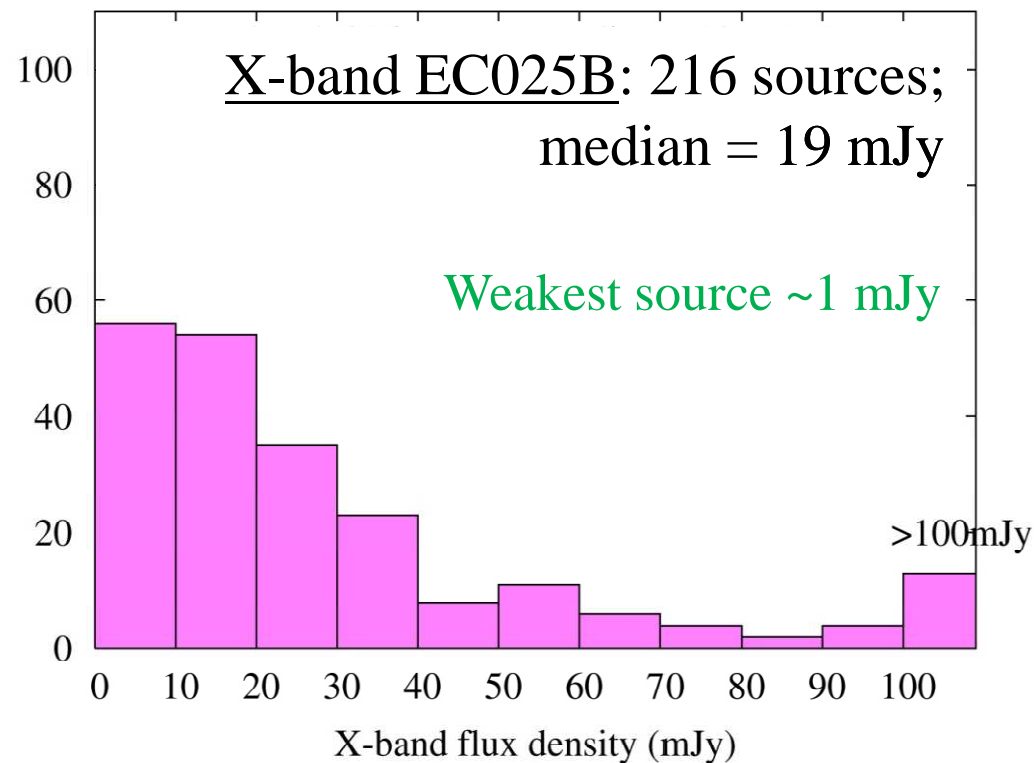
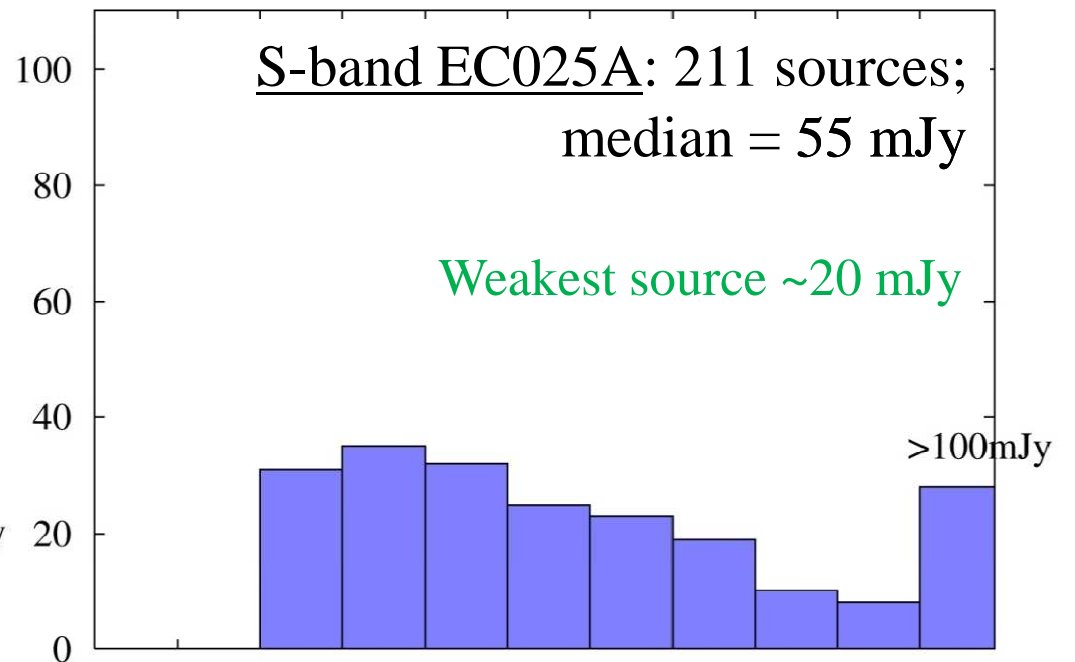
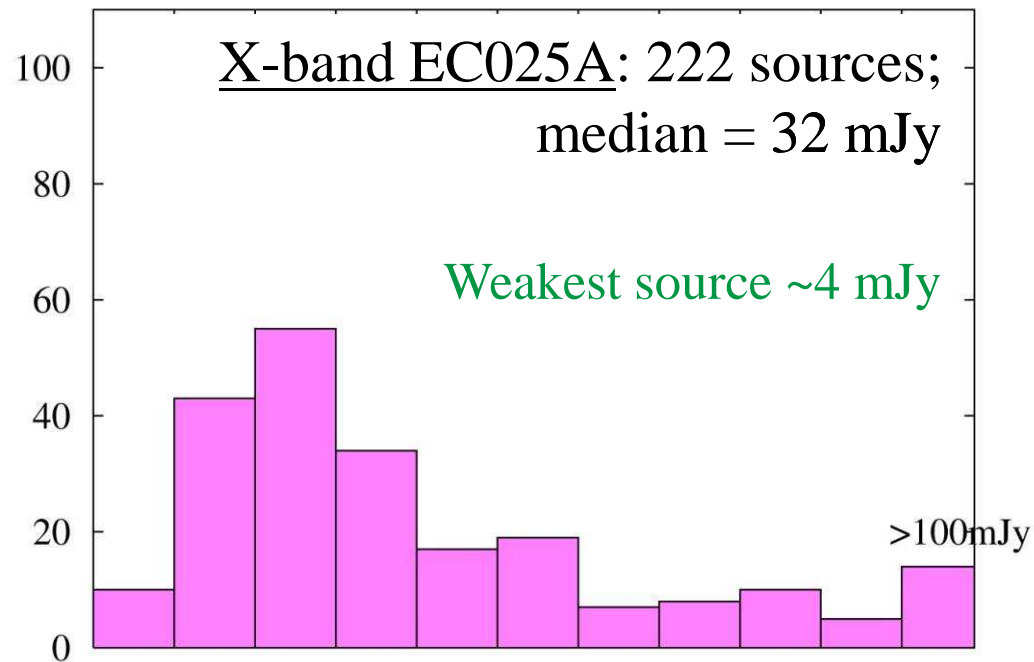
S/X detection rates:

- EC025A → ~ 94 %
- EC025B → ~ 82 %

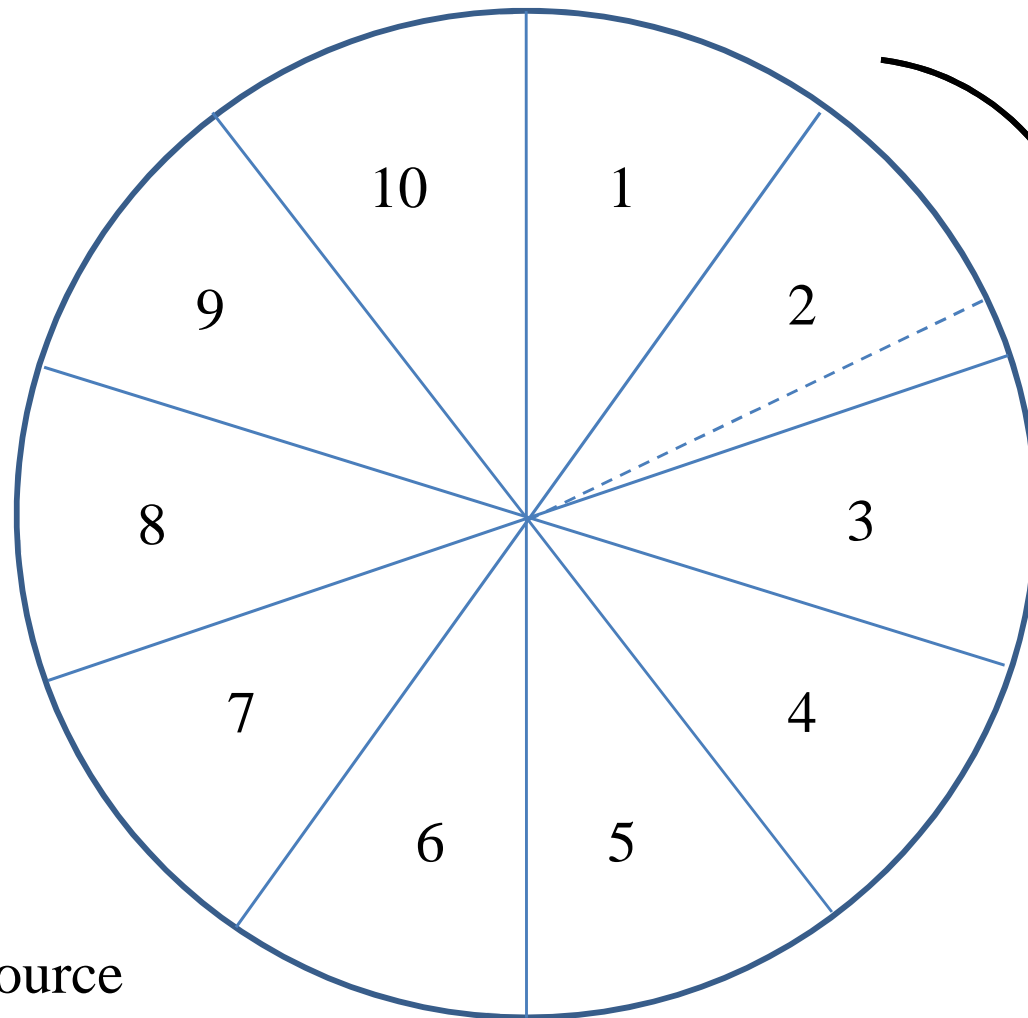
**Overall detection rate:  
~ 89 %**



# Flux density distributions



# 1-hour observations = 10 scans



**1 scan** =  
5-min obs.  
+ 1-min slewing

{ 447 sources  
2 scans 5-min / source  
2 experiments of 48-hrs

➔ Time recording @ each telescope ~80% of the total duration of each experiment

## Useful to other users:

- ✓ Request made to NASA/GSFC so that calibrators used here be observed during near RDV experiment (scheduled on July 10, 2007).
- ➡ Calibration of the visibility amplitudes.
- ➡ Accurate estimates of the flux density of the targets.
  
- ✓ No attempt made for optimizing sky coverage above each telescope (usually done with astrometry/geodetic-style experiments, in order to estimate tropospheric zenith delays)
- ➡ Because astrometric accuracy was not the motivation at this stage.