Astrometry at 24 and 43 GHz

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Abstract

- We describe the goals and initial results of a collaboration formed to survey extragalactic objects at radio frequencies of 24 and 43 GHz.

- This survey is for extending the International Celestial Reference Frame (ICRF) that is the current coordinate system for astrometry and which is the angular inertial frame of deep space navigation.

- In principle, the extension should lead to a more stable reference frame.

- We report upon our initial three 24-hour observing sessions involving about 100 radio sources at the VLBA.
Sub-team

- U.S. Naval Observatory: D. Boboltz, A. Fey
- Observatoire Bordeaux: P. Charlot
- National Radio Astronomy Obs.: E. Fomalont
- Goddard Space Flight Center: C. Ma, D. Gordon
- Jet Propulsion Laboratory: C. Jacobs, G. Lanyi, C. Naudet, L Zhang
- Remote Sensing Analysis Sys.: O. Sovers
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Atmospheric considerations

![Graph showing temperature in K vs. frequency in GHz, with peaks at H2O and O2]

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Observations

Ten VLBA stations: 45 baselines

3 x 24 h sessions per year, 60 sources per session

Astrometry and image survey

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Observation Geometry

Q123
Distribution of 108 Sources

Right Ascension (hours)

< 100 $\mu$as *
< 200 $\mu$as +
< 300 $\mu$as x
< 500 $\mu$as □
< 1000 $\mu$as △
> 1000 $\mu$as ◇

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Right Ascension Distribution of K-Q minus ICRF

K123_T3 - DDOR_2002

Median = -42.270 μas
Mean = -10.469 μas
wrms_μ = 293.600 μas

Entries / 59.017 μas

RA cos(dec) Difference (μas)
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Declination Distribution of K-Q minus ICRF

K123_T3 - DDOR_2002

Median = 241.565 μas
Mean = 157.285 μas
wrms_μ = 573.559 μas

DEC Difference (μas)
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Right Ascension Correlation

K123

Declination Separation
Fixed 1.5 sources

K123

Declination Separation
Fixed 4 sources
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Images of 0458-0220 at X and K bands

Clean RR map. Array: BFHKLVNOP
0458-020 at 8.646 GHz 2002 Jan 16

Map peak: 0.727 Jy/beam
Contours: 0.00158 Jy/beam x (-1 2 4 8 16 32 64)
Contours: 128 256
Beam FWHM: 1.8 x 0.719 (mas) at -5.72°

Clean RR map. Array: BFHKLVNOP
0458-020 at 24.439 GHz 2002 May 15

Map peak: 0.886 Jy/beam
Contours: 0.00664 Jy/beam x (-1 2 4 8 16 32 64)
Contours: 128 256
Beam FWHM: 0.655 x 0.269 (mas) at -1.46°