Some consideration on AOV observations

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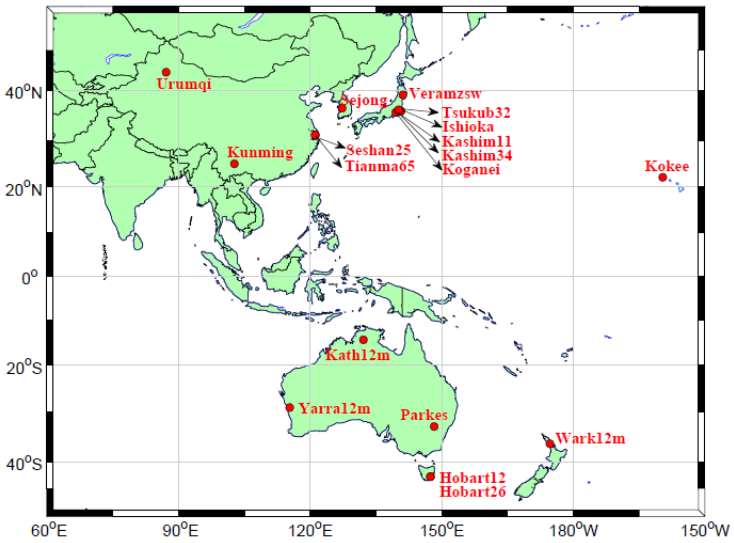
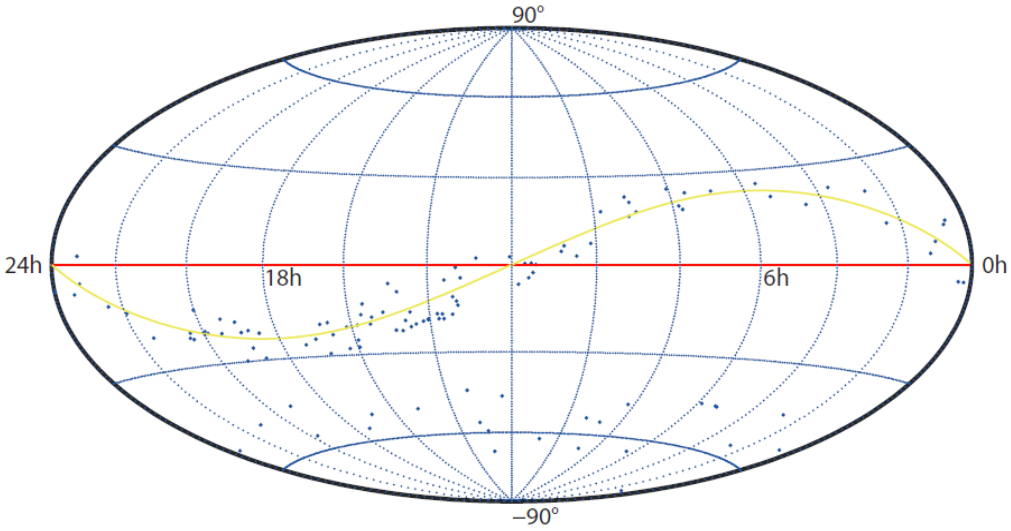
Many thanks

- Kb/Ho/Ww/Sv observations of the Chang'e 3 lander
- Yg/Ke participated in two Chinese geodetic sessions
- Kb/Ho/Sv supported the ecliptic sources survey

Observing new sources with the AOV

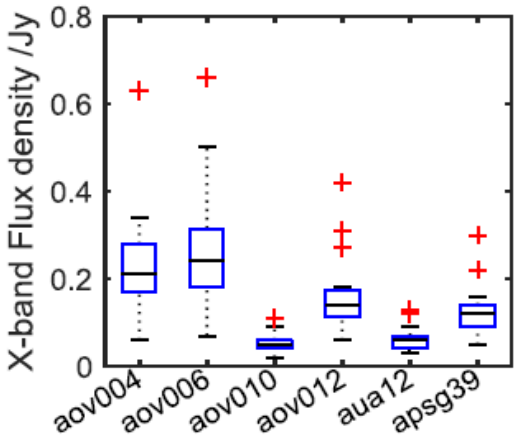
Date	Code	# Targets
2015-08-26	AOV004	10
2015-12-16	AOV006	29
2016-07-27	AOV010	30
2016-08-09	AUA012	26
2016-09-28	APSG39	20
2016-10-12	AOV012	27

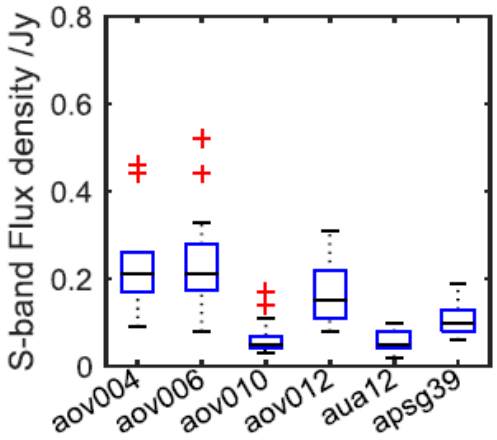




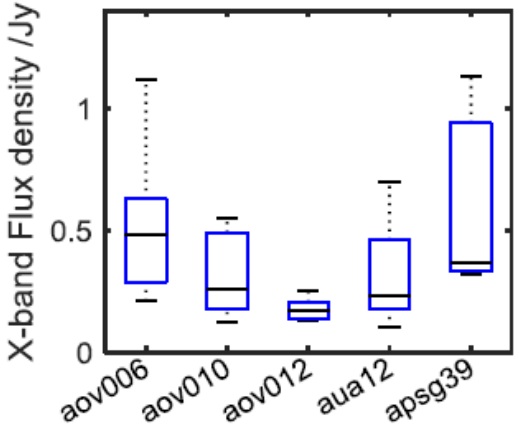
Averaged correlated flux densities

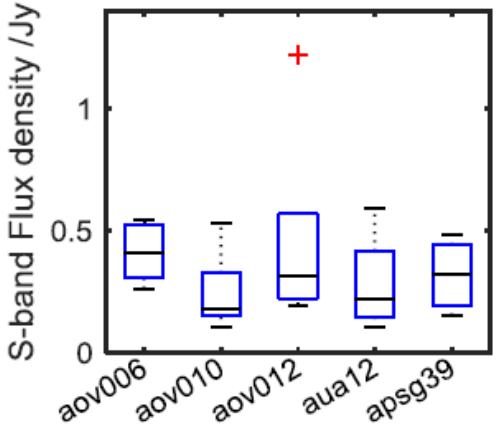
Ecliptic plane sources





sources below -40°





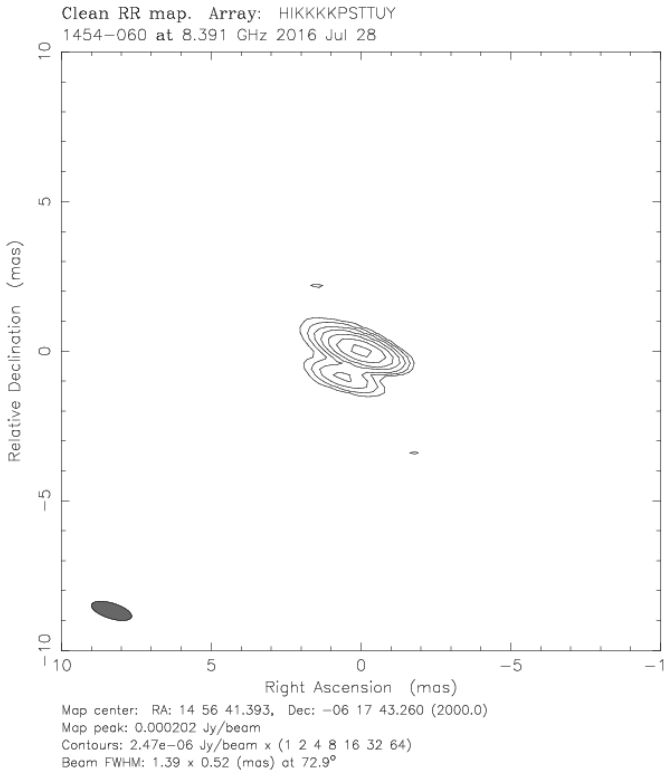
Preliminary results

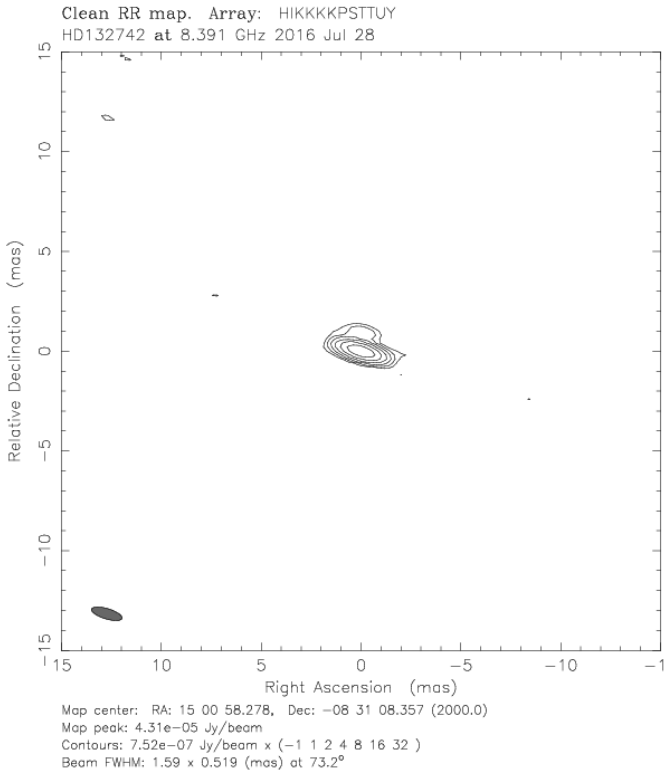
- 124 targets observed

- 4 sources not detected
- 8 only at single band
- 112 sources (90%) detected at S/X dual band

- 26 sources overlapped with VCS-II
- 9 sources observed by other IVS sessions
- 77 sources are newly detected within the IVS. Among them, 42 are from VEPS-1 catalog.

Astrometry of radio stars HD132742





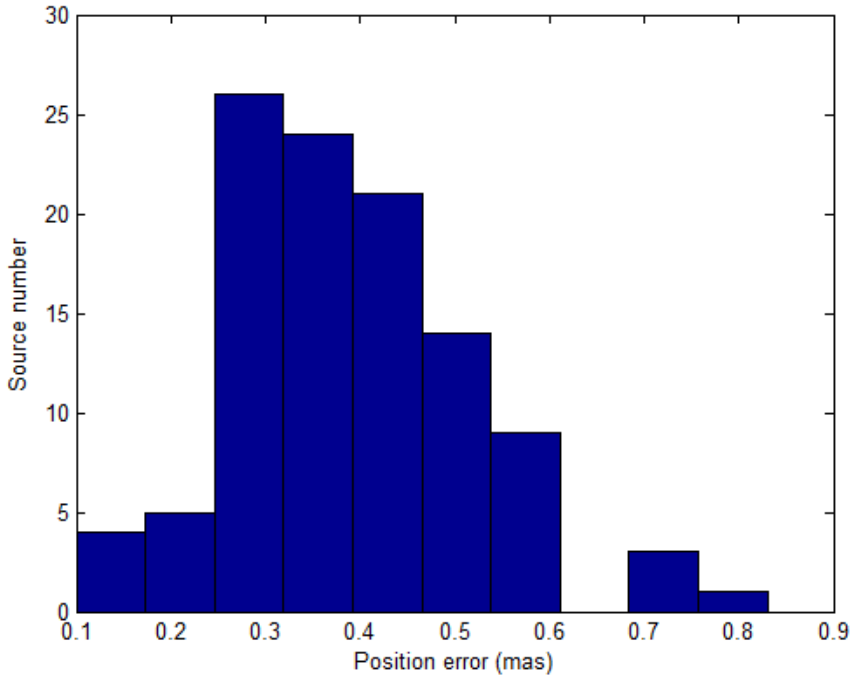
Astrometry of radio stars

- The position derived from phase referencing technique is consistent with that from geodetic solution.
- The positions of radio star and stations used for the data correlation have large offsets.
- We observed the target again in AOV016, but unfortunately Urumqi and Kashima34 have no good data.

High sensitivity astrometry with VLBA

- Target sources
  - 111 ecliptic plane sources with correlated X-band flux densities [30, 60] mJy and large position uncertainties
  - 36 ecliptic sources were newly detected from the VEPS-1 (VLBI Ecliptic Plane Survey) coarse search observations
- Observations
  - 2Gbps at S/X band
  - Four 8-hour blocks

Source position estimates



median position error 0.37mas

Histogram of position errors of 107 target sources derived from the VLBA observations.

Sample VLBA images of ecliptic plane sources

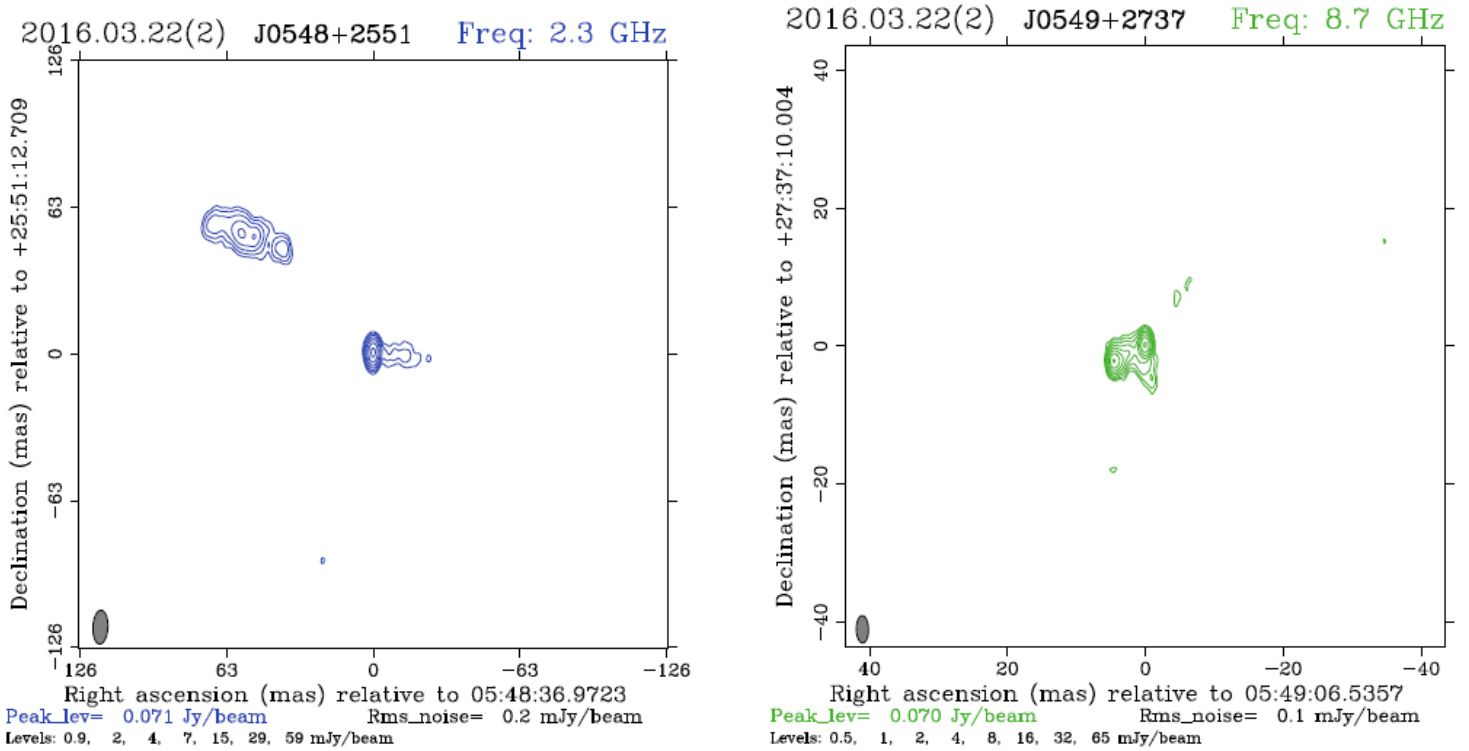
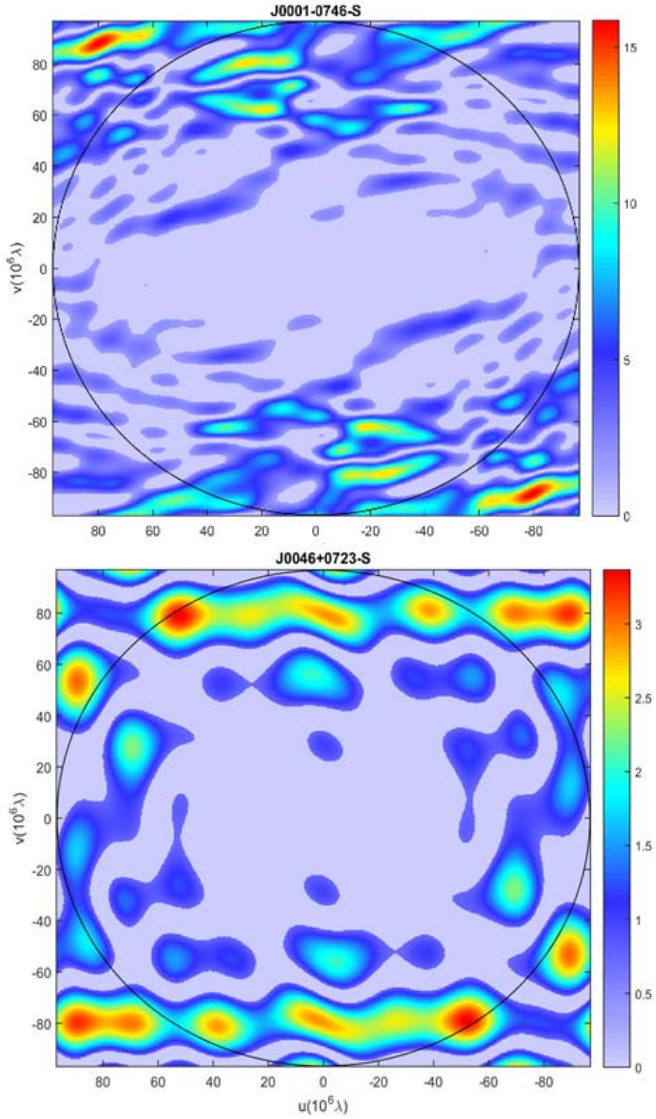
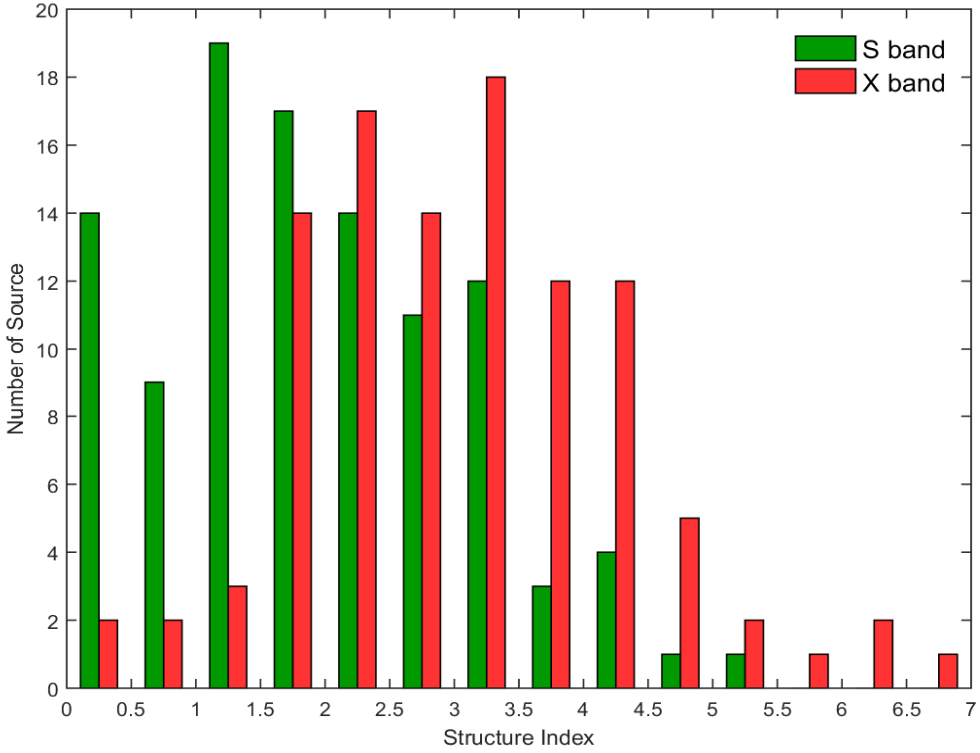


Figure 2. Left: the image of J0548+2551 at S-band. There is a counter-jet and some extended emission far away from the central core. Right: the image of J0549 +2737 at X-band. This CSO (Compact Symmetric Object) has a significant structure effect. The lowest counter was set at three times the root mean square (rms) noise of the residual image.

Shu et al. 2017, ApJS

Calculation of structure index for target sources



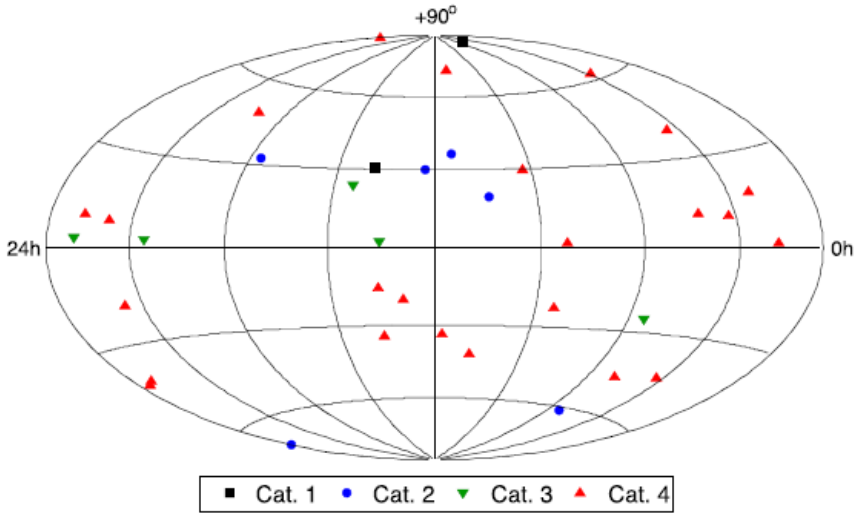


Histogram of structure index of target sources.

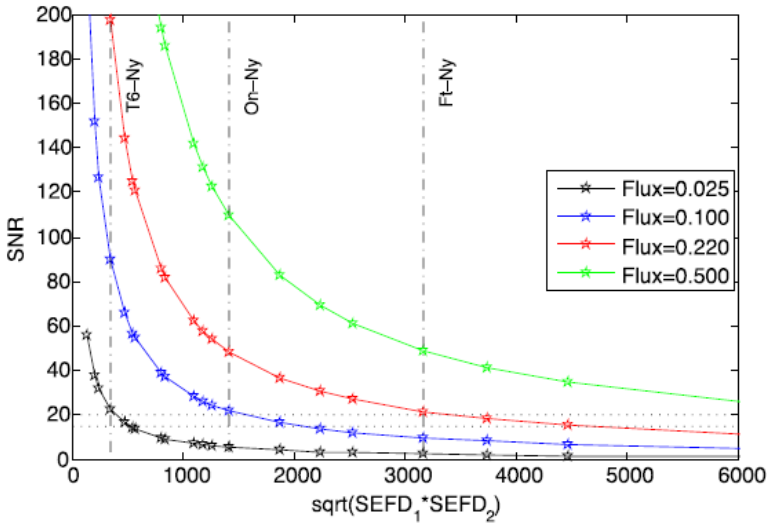
Left: examples of source structure correction maps

Tianma65 for Radio-optical reference frame connection

- Tianma65 has been observing 37 GAIA transfer sources in some IVS-RD sessions since 2014
- The goal is to improving the position uncertainties to better than 200 μas for both R.A. and decl.



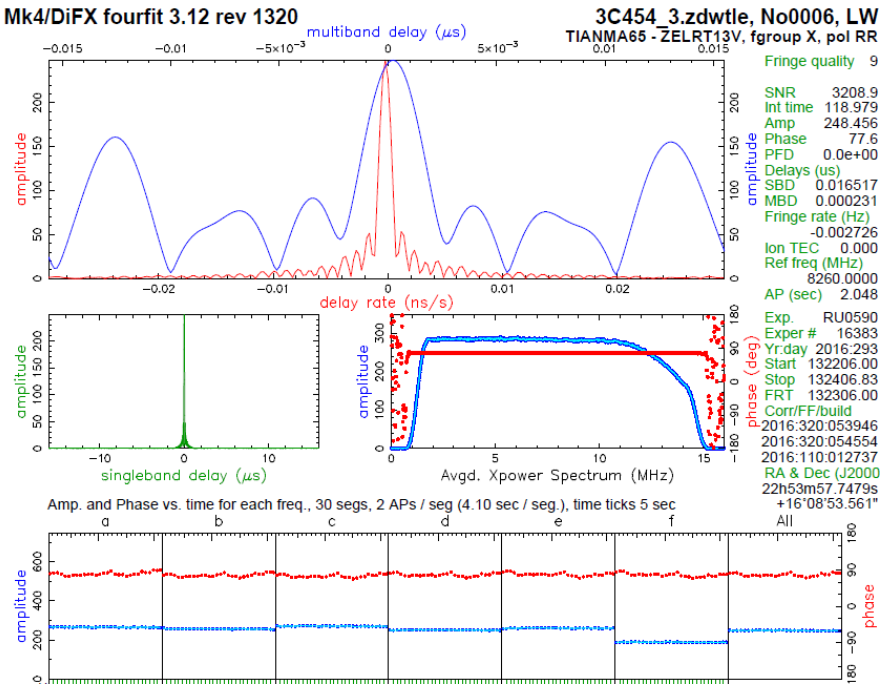
37 GAIA transfer sources

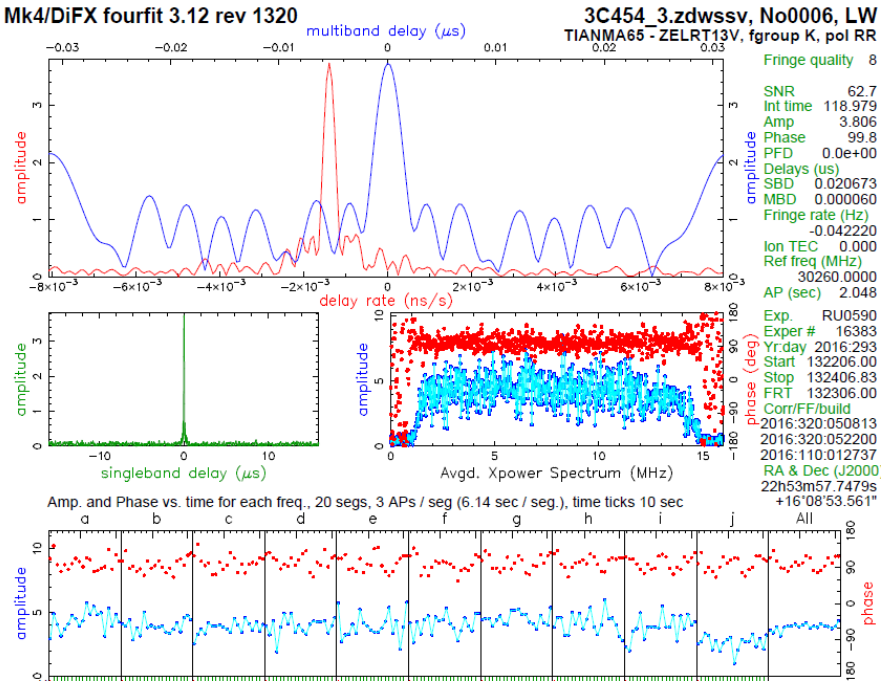


Baseline SNR vs. SFED

Le bail et al. AJ, 2016

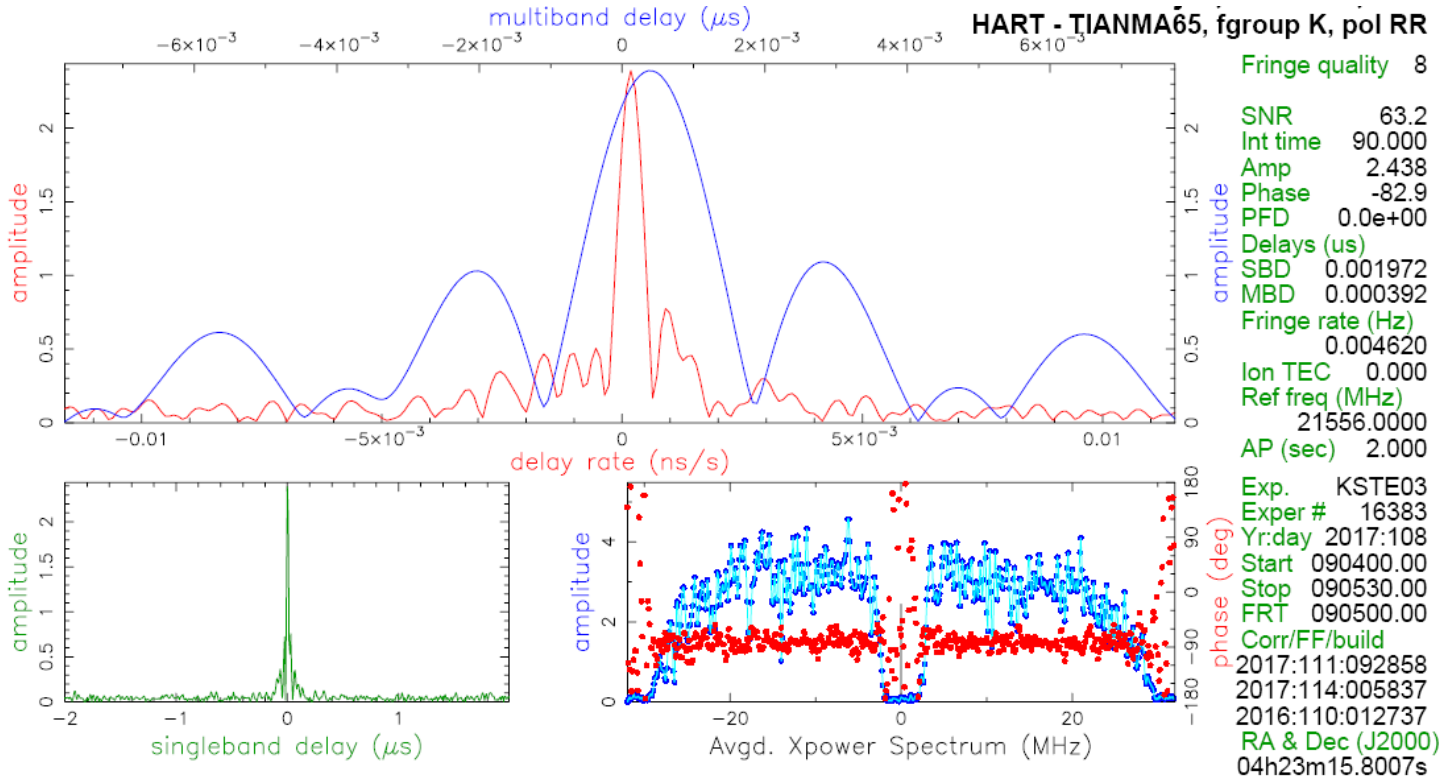
Tianma65 fringes at X/Ka





6X+10Ka channels in geo mode at 1Gbps
on 2016 October 19

Tianma65 fringes at K-band



2Gbps K-band fringe test on 2017 April 18

Some ideas

- In addition to regular geodesy, we plan to continue astrometric work with the AOV, and explore its imaging capability.
- With inclusion of Kunming, Tianma65 and Kashima34, the AOV can observe many weak sources in the ecliptic plane, and middle south hemisphere (> -50deg) which are invisible with the VLBA.
- Tianma65 has been operational at K, Q, or X/Ka band. It can contribute to high frequency geodesy and astrometry.