

Preparation of KVN VLBI observation

Taehyun Jung

Updated on 31 Oct 2013

General Information

For the accepted proposals, users are requested to prepare the observing schedule file, usually two weeks before the observation. The observer who is not familiar with KVN system is recommended to consult a contact person in the KVN group (refer to a contact persons in the status report) to prepare schedules, especially for observations such as phase referencing, polarimetry, and/or spectral lines etc. The KVN group takes full responsibility for observation and correlation process.

Observation Strategy

The users are asked to submit a VEX or a key file two weeks before the observation to the email account of kvnobs@kasi.re.kr. The KVN AOC will check your schedule, and observations will be performed by the KVN operators so that users will not be asked to take part in observations.

Correlation Strategy

After the observation, the correlation process will be carried out by either Daejeon correlator (hardware correlator) or DiFX (software correlator) according to the requested parameters. The correlated data can be downloadable via FTP and its address will be given to the PI via email. Then, users are asked to examine the correlated data and if there is some problem, you can request re-correlation within a month after the correlation. In this case, you should provide the details of your problem clearly. In principle, the disk modules (raw data) used for observations will be recycled one month after the correlation.

Schedule Preparation

1. VEX Preparation

You can download the KVN VEX example files from http://kvn-web.kasi.re.kr/eng/data/KVN_VEX_Example.zip and modify them for your observation. The schedule submission should be done by a standalone vex file including calibration procedures.

2. SCHED preparation

It is recommended to use SCHED (<http://www.aoc.nrao.edu/~cwalker/sched/sched.html>) for your scheduling because SCHED provides useful information and many aspects of planning VLBI observations, and you can also avoid some mistakes arising from editing the VEX manually. You can install SCHED on your Unix/Linux machines. Since the KVN is not officially registered yet, the KVN catalog files for SCHED are not available. However, you can download these files including a KVN SCHED example key file from http://kvn-web.kasi.re.kr/eng/data/sched_example.zip. You will be able to use KVN catalog files when you place KVN station/location files under the *SCHED_root_directory/catalogs/*. In addition, please specify your calibration scheme (e.g. sky dipping, hot/cold calibration, focusing, pointing etc.) for the observation on the email when you submit your schedule to kvnobs@kasi.re.kr.

3. Antenna names

For scheduling with VEX or SCHED, you need two different types of name, which are station name and station code. Current names for KVN and associated stations are listed as follows.

Site Name	Station Name	Station Code
KVN Yonsei station	KVNYS	Ky
KVN Ulsan station	KVNUS	Ku
KVN Tamna station	KVNTN	Kt

4. Frequency Setup (DAS setup)

KVN DAS (Data Acquisition System) is a digital filter bank (DFB), which is configurable to various modes (see the "digital filter mode" in the status report). Therefore, we have the available filter

band (MHz) and the order of frequency (Normal and Reverse) as follows.

• 256MHz Bandwidth

Band	Frq. Order	Band	Frq. Order
0-256	Normal	256-512	Reverse

• 128MHz Bandwidth

Band	Frq. Order	Band	Frq. Order	Band	Frq. Order	Band	Frq. Order
0-128	Normal	128-256	Reverse	256-384	Normal	384-512	Reverse

• 64MHz Bandwidth

Band	Frq. Order	Band	Frq. Order	Band	Frq. Order	Band	Frq. Order
0-64	Normal	128-192	Normal	256-320	Normal	384-448	Normal
64-128	Reverse	192-256	Reverse	320-384	Reverse	448-512	Reverse

• 32MHz Bandwidth

Band	Frq. Order	Band	Frq. Order	Band	Frq. Order	Band	Frq. Order
0-32	Normal	128-160	Normal	256-288	Normal	384-416	Normal
32-64	Reverse	160-192	Reverse	288-320	Reverse	416-448	Reverse
64-96	Normal	192-224	Normal	320-352	Normal	448-480	Normal
96-128	Reverse	224-256	Reverse	352-384	Reverse	480-512	Reverse

• 16MHz Bandwidth

Band	Frq. Order	Band	Frq. Order	Band	Frq. Order	Band	Frq. Order
0-16	Normal	128-144	Normal	256-272	Normal	384-400	Normal
16-32	Reverse	144-160	Reverse	272-288	Reverse	400-416	Reverse
32-48	Normal	160-176	Normal	288-304	Normal	416-432	Normal
48-64	Reverse	176-192	Reverse	304-320	Reverse	432-448	Reverse
64-80	Normal	192-208	Normal	320-336	Normal	448-464	Normal
80-96	Reverse	208-224	Reverse	336-352	Reverse	464-480	Reverse
96-112	Normal	224-240	Normal	352-368	Normal	480-496	Normal
112-128	Reverse	240-256	Reverse	368-384	Reverse	496-512	Reverse

Therefore, the frequency spacing and the sideband (USB or LSB) selection have to satisfy the above table. At the moment, we do not provide the frequency catalog for SCHED, but you can find an example of frequency setting in SCHED from http://kvn-web.kasi.re.kr/eng/data/sched_example.zip. Please refer to "setinit" section in the sched_example.key file.

5. Check list of scheduling

Scheduling is the most important work in VLBI observation. Following items are the check list for the success of VLBI observation.

► Fringe Finder

- Good fringe finders are essential to remove large delay errors between the real observation

and the correlation model. At least two fringe finder scans must be scheduled at the beginning and the end of your observation. The scan length of fringe finder should be longer than 5 minutes for a successful fringe search in the correlator. It is also recommended to observe fringe finder sources every 1~2 hours.

- Compact and strong source are suitable for fringe finders with well-known source positions at your observing frequency. If your target sources are quite strong, you may not need to observe a fringe finder. Following sources are recommended.

- 22GHz (> 2Jy):

NRAO150, 0420-014, 4C39.25, 3C273, 3C279, NRAO530, 2145+067, 3C454.3, 3C84

- 43GHz (> 4Jy)

NRAO150, 3C279, 3C345

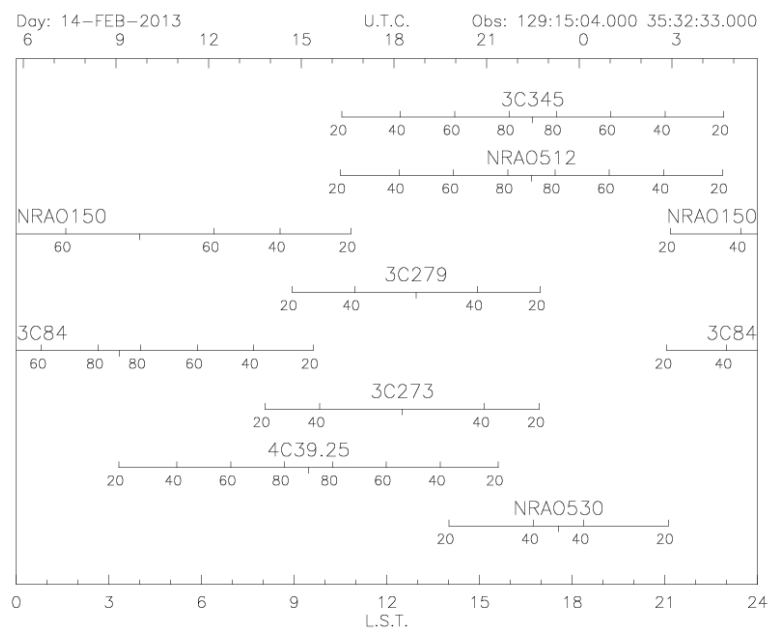


Figure. Source-Elevation plot of several fringe finders

► Phase Calibrator

- For a phase referencing observation or calibration purposes, a phase calibrator close to your target source is necessary. List of VLBI calibrators are available as follows.

- The VLBA Calibrator List: <http://www.vlba.nrao.edu/astro/calib/vlbaCalib.txt>

- Astrogeo Center: <http://astrogeo.org>

▶ Polarization observation

- For your scheduling of dual polarization observation, the different BBC and IF channel should be used for specifying LCP and RCP.

▶ Continuous recording

- It is recommended to use a "continuous recording" mode for some observations because too short scan length and gaps can cause problems on recording with Mark5 systems or correlation.
- Current setting in the KVN field system is that the continuous recording mode is automatically setup when the scan gap (the time interval between each scan) is longer than 5 seconds. Otherwise the recording with Mark5B is automatically start and stop. If you want to change this setup, please give a notice when you submit your schedule to kvnoobs@kasi.re.kr.

Useful Resources

- The SCHED User Manual
 - <http://www.aoc.nrao.edu/software/sched/index.html>
- Very Long Baseline Array Observational Status Summary
 - <https://science.nrao.edu/facilities/vlba/docs/manuals/oss2013a>
- The VLBA Calibrator List
 - <http://www.vlba.nrao.edu/astro/calib/>
- Astrogeo Center
 - <http://astrogeo.org/>
- GSFC VLBI Data and Results
 - http://vlbi.gsfc.nasa.gov/dataresults_main.htm
- MOJAVE Program Homepage
 - <http://www.physics.purdue.edu/MOJAVE/>
- VLA/VLBA Polarization Calibration Page
 - <http://www.aoc.nrao.edu/~smyers/calibration/>