Nanshan IVS Biennial Report for 2017 and 2018

Wenjun Yang, Hua Zhang, Peng Li, Guanghui Li, Ming Zhang, Lang Cui

Abstract This report briefly introduces the general information about the Nanshan 26-m Radio Telescope (NSRT) and the status of each system. The report also summarizes the IVS sessions with NSRT during 2017 and 2018.

1 General Information

The Nanshan 26-m Radio Telescope (NSRT) is situated in the Eurasia hinterland (about 70 km south of Urumqi) and operated by Xinjiang Astronomical Observatory (XAO), Chinese Academy of Sciences (CAS). Figure 1 gives a new picture of the NSRT. In 2017, there were 154 experiments conducted by the Nanshan 26-meter telescope, serving in EVN, IVS, EAVN, and CVN networks, with a total observing time of about 1,051 hours, including the lunar exploration observations. In 2018, 200 experiments were conducted, and the total observing time was about 1,500 hours.

Fig. 1 The Nanshan 26-m Radio Telescope (NSRT).

2 Antenna Systems

The Stewart platform for maneuvering the sub-reflector on the NSRT was upgraded in 2018. The incremental rotary encoder of the actuator motor has been replaced with the absolute one. So the position measurement for the actuators is now more accurate and repeatable, which is crucial for the sub-reflector to be stably repositioned during observing. The antenna roller bearings and motors were also replaced or maintained, see Figure 2.

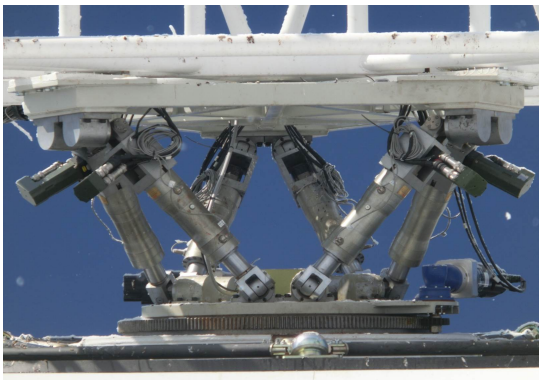

Fig. 2 The upgraded actuator motors on the Stewart platform of the NSRT.

Xinjiang Astronomical Observatory (XAO), CAS

XAO-Nanshan Network Station

3 Receiver Systems

The Q-band (7 mm) receiver was tested and mounted in the RF cabin on the NSRT. Currently the signal was only down-converted to 4-12 GHz, and a secondary down-converting mixer is being shipped from the manufacturer to meet our digital IF backends, see Figure 3. The Q-band system is expected to operate in late 2019.

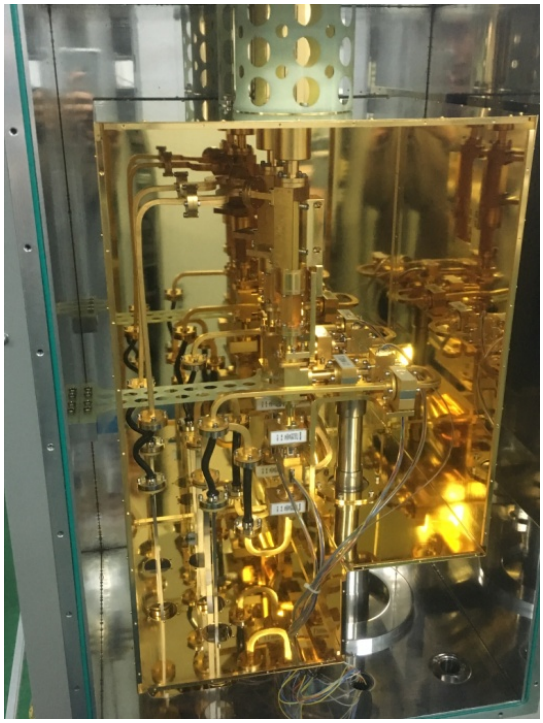

Fig. 3 The new Q-band receiver mounted on the NSRT.

4 Upgrade of VLBI Backend Systems

The installment of DBBC2 and CDAS2 and their system testing have been accomplished. They have been successfully used in the EVN, IVS, and CVN joint observing since 2017. So the VLBI backends at Nanshan station are now fully digitalized. We are now preparing a firmware upgrade on DBBC2 from V.105 to V.107 to meet the new requirement for coming EVN observations. We have ordered 12 diskpacks with 32 TB storage per pack to enhance our capacity to participate in high recording-rate EVN observations. The diskpacks will contribute to the circulation pool starting in late 2019.

5 Time-Frequency Systems

The old H-maser clock MHM2010 purchased from the U.S. has expired and stopped working in 2018. Thereupon, two new H-maser clocks made at the Shanghai Astronomical Observatory (ShAO) are now taking up the role of providing standard time-frequency service, the short-term frequency stability of which is now approaching 10^{-13}. See Figure 4.

Fig. 4 The new on-site H-maser clock made at the Shanghai Astronomical Observatory.

6 Geodetic VLBI Observations

In total, the NSRT participated in 27 24-hour regular IVS sessions during the years 2017 and 2018, as well as

EVN, Eastern Asia VLBI Network (EAVN), and Chinese VLBI Network (CVN) sessions. The detailed information about IVS sessions in which the NSRT was involved is listed in Table 1.

Table 1 IVS sessions at Nanshan Station during 2017 and 2018.

No.	Epoch	Code	Duration (hours)
1	2017-004 UT18:30	R4773	24
2	2017-016 UT16:30	Aov013	24
3	2017-080 UT17:30	Aov014	24
4	2017-082 UT18:30	R4784	24
5	2017-087 UT17:30	T2117	24
6	2017-089 UT18:30	R4785	24
7	2017-101 UT17:30	Aov015	24
8	2017-102 UT18:30	R4787	24
9	2017-110 UT18:30	R4788	24
10	2017-171 UT17:30	Aov016	24
11	2017-206 UT17:30	Apsg40	24
12	2017-208 UT18:30	R4802	24
13	2017-220 UT17:30	Aov017	24
14	2017-284 UT17:30	Apsg41	24
15	2017-318 UT17:30	T2122	24
16	2017-319 UT18:30	Aov018	24
17	2018-023 UT18:30	Aov019	24
18	2018-079 UT17:30	Aov021	24
19	2018-086 UT18:30	R4835	24
20	2018-095 UT18:30	R4836	24
21	2018-100 UT17:30	Apsg42	24
22	2018-179 UT18:30	R4848	24
23	2018-191 UT17:30	Apsg43	24
24	2018-205 UT17:30	Aov025	24
25	2018-219 UT17:30	Aov026	24
26	2018-317 UT17:30	T2128	24
27	2018-326 UT16:00	Aov029	24