Shanghai Station Report

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Abstract This report summarizes the observing activities at the Sheshan Station (SESHAN25) and the Tianma Station (TIANMA65) in 2023 and 2024. It includes the international VLBI observations for astrometry, geodesy, and astrophysics, as well as domestic observations for satellite tracking. The report also includes updates and development of the facilities at the two stations.

1 Introduction

The Sheshan Station ('SESHAN25') is located at Sheshan, China, 30 km west of Shanghai. It is hosted by Shanghai Astronomical Observatory (SHAO), Chinese Academy of Sciences (CAS). A 25-meter radio telescope is in operation at 3.6/13, 5, 6, and 18-cm wavelengths. The Sheshan VLBI Station is a member of the IVS and the EVN.

The Tianma Station ('TIANMA65') is located in the western suburbs of Shanghai, Sheshan town, Songjiang district. It is jointly funded by the Chinese Academy of Sciences (CAS), Shanghai Municipality, and the Chinese Lunar Exploration Program. The telescope construction started in early 2009, and the majority of the mechanical system was completed in October 2012. On December 2, 2013, the Tianma 65 telescope passed the acceptance evaluation. By design, the Tianma telescope, with a diameter of 65 meters, one of the largest steerable radio telescopes in the world, is a multifunction facility, conducting astrophysics, geodesy, astrometry, and space science. By the end of 2014, five cryogenic receiver systems (L,

Fig. 1 Images show the removal of the old drive device.

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Fig. 2 Images show the installation of the new drive device.

C, S/X, and Ku) had been installed at the Tianma 65 telescope, and another two high-frequency cryogenic receiver systems (Ka and Q) were finished in 2015. A K band cryogenic receiver system was installed at the end of 2016. CDAS and DBBC2 have also been installed in the Tianma 65 telescope's VLBI terminal.

The SESHAN25 and TIANMA65 telescopes take part in international VLBI experiments on astrometric, geodetic, and astrophysics research work. Apart from its international VLBI activities, the telescope spent a large amount of time on the Chinese Lunar Project, including the testing before the launch of the Chang'E test satellite, the tracking campaign after its launch, and other single dish observations.

2 Component Description

In 2023, the SESHAN25 telescope participated in seventeen IVS sessions, including ten INT3 Intensive sessions. TIANMA65 participated in three IVS sessions.

In 2024, the SESHAN25 telescope participated in nineteen IVS sessions, including twelve INT3 Intensive sessions. TIANMA65 participated in two IVS sessions.

Table 1 Statistics of experiments observed.

Session Name	2023(SH)	2024(SH)	2023(T6)	2024(T6)
AOV	3	1	1	0
APSG	0	1	0	0
IVS-R1	1	3	0	0
IVS-T2P	0	1	0	0
IVS-RDV	2	1	0	0
IVS-R&D	0	0	2	2
IVS-CRF	1	0	0	0
IVS-INT3	10	12	0	0

3 Current Status and Activities

3.1 Antenna Maintenance with SESHAN25

In August 2023, the 25-meter radio telescope in Sheshan, Shanghai, had its antenna completely unable to rotate due to the aging of the ACU internal board. Subsequently, the technical personnel from Shanghai Astronomical Observatory conducted a systematic inspection of the antenna system with technical personnel from the antenna manufacturer and confirmed a renovation plan to replace the servo system with a new one to maintain the mechanical structure. From May to July 2024, the antenna system was upgraded at the 25-meter site; then the control software was debugged, and the pointing model was optimized. In September 2024, the antenna resumed its observation capability, and all test indicators met the requirements. The VLBI observation fringe patterns were good.

3.2 Antenna Maintenance with TIANMA65

From September 6th to 14th, 2024, maintenance was carried out on the antenna system of the Tianma telescope, including inspection and testing of the servo control system, lubricating the center pivot bearing and pitch bearing with grease, lubricating the bearings for the azimuth and elevation drive with grease, lubricating the suspension wheel and guide wheel bearings of the pitch drive box with grease, replacing the gear oil of the azimuth and elevation drive gearbox, lubricating the upper and lower rotary bearings of the feed source rotating mechanism with grease, maintenance and upkeep of the secondary adjustment mechanism, restoring the pitch lock function, and replacement of a reducer. The maintenance work of the antenna system provides assurance for the normal operation of the telescope.

Fig. 3 Repairing the #2 reducer of elevation.

Table 2 The staff at the Shanghai VLBI Station. All e-mail addresses end with @shao.ac.cn

Name Email	**Background**	**Position & Duty**
Zhiqiang SHEN zshen	Astrophysics	Deputy Director
Qinghui LIU liugh	Radio technique	Chief Engineer
Bin LI libing	Microwave	Technical friend, Receiver
Bo XIA bxia	Electronics	VLBI friend, VLBI terminal
Jianing WANG jqwang	Electronics	Engineer, Antenna
Lingling WANG llwang	Software	Engineer, Timing system
Rongbing ZHAO zhaorb	Software	Engineer, Antenna software
Li FU fuli	Ant.mechanical	Engineer, Antenna
Qian YE yeqian	Active surface	Engineer, Antenna
Weiye ZHONG wyzhong	Microwave	Engineer, Receiver
Chao ZHANG zhangchao	Microwave	Engineer, Receiver
Linfeng YU lfyu	Electronics	Engineer
Yongbin JIANG jyb	Electronics	Engineer
Wen GUO gw	Electronics	Engineer
Yongchen JIANG yongchen	Electronics	Engineer, Disk shipping
Zhiqiang XU zqxu	Microwave	Engineer, Receiver
Zhang ZHAO zhaozhang	Electronics	Engineer
Yingao TANG tangyingao	Electronics	Engineer

3.3 Other Tasks

The current lunar mission is in the long-term management stage. The observing is performed one to two times per week.

4 The Staff of the Shanghai VLBI Station

Table 2 lists the group members at the Shanghai VLBI Station. The staff is involved in the VLBI program at the station with various responsibilities.

5 Future Plans

In 2025, the Sheshan radio telescope will take part in fifty-seven IVS sessions. The Tianma radio telescope will take part in two IVS sessions. The telescopes will regularly track the Chang'E and Tianwen-2 satellites in their lunar orbits.