

Sheshan VLBI Station Report for 2008

Xiaoyu Hong, Qingyuan Fan, Tao An

Abstract

This report summarizes the observing activities at the Sheshan station (SESHAN25) in 2008. The Sheshan radio telescope participated in nineteen 24-hour VLBI sessions organized by the IVS and in thirty-seven traditional VLBI experiments, as well as in a number of e-VLBI sessions and formatter tests organized by the EVN. Apart from the international VLBI activities, the telescope was involved in 125 monitoring experiments of the Chinese Chang'E-1 lunar satellite, and in nine observations of the Japanese SELENE lunar satellite. We also report on updates to and development of the facilities at the station.

1. General Information

The Sheshan VLBI station (also named SESHAN25 in the geodetic community) is hosted by the Shanghai Astronomical Observatory (SHAO), Chinese Academy of Sciences (CAS). A 25-meter radio telescope is in operation at 1.3, 3.6, 13, 6, and 18 cm wavelengths. The Sheshan VLBI station is a member of the IVS, EVN and APT, and the major observing duties of the telescope include international VLBI experiments for astrometric, geodetic, and astrophysical research. In recent years, the Sheshan radio telescope has been involved in the VLBI tracking of spacecraft, including the Chinese Chang'E-1 and the Japanese SELENE V-star and R-star spacecraft.

2. VLBI Observations in 2008

In 2008, the Sheshan radio telescope participated in eighteen 24-hour IVS sessions. A conflict happened between an urgent Chinese Chang'E-1 observation and IVS-T2054; as a result the Sheshan telescope only participated in the first six hours of the IVS-T2054 experiment. The S-band system worked normally throughout the whole year. However some IVS sessions (e.g., R1358 and R1359) were subject to bad pointing at X-band. The bad pointing was also the most likely cause of the failure that happened during the EVN K-band observations in November 2008.

The Chinese Chang'E-1 satellite was launched on October 24, 2007 and entered into its lunar orbit in November 2007. After that the Sheshan radio telescope, along with three other Chinese radio telescopes, conducted intense VLBI tracking of the Chang'E-1 satellite for more than 900 hours in 2008. A five station correlator (Section 4) at Shanghai Astronomical Observatory performed the VLBI data processing.

The Sheshan radio telescope participated for ~ 100 hours in the VLBI observations of V-star and R-star, sub-satellites of the Japanese SELENE lunar satellite.

3. Development and Maintenance of Sheshan Telescope in 2008

After the observing problems in the November EVN sessions and the December IVS sessions, we stopped running the antenna, checked the mechanical system, and found that the screws in the elevation encoder were loose. The loose screws were relaxing the elevation encoder and leading to bad pointing, especially at X- and K-bands. From December 3-10, 2008 and again on January 3, 2009, we repaired the elevation encoder, and then we rebuilt the pointing model.



Figure 1. The Sheshan 25m radio telescope.



Figure 2. Fastening the elevation encoder screw in December 2008.

The S/X receivers, the VLBI terminal, the FS, and the H-maser ran normally in 2008. The current FS version at the Sheshan station is 9.10.4. We are developing a remote-monitoring program that is to be installed at the Sheshan station. This program will automate the experiment preparation from fetching the schedule files to creating antenna control files. There are currently two Mark 5A machines at the Sheshan station. The OS system of one machine has been upgraded to Debian 2.6.18.dfsg.1-23etch1, and its Mark 5A software version is 2007y222d02h. The OS system and Mark 5A version of the other machine are RedHat 2.4.20-31.9 and 2007y222d02h, respectively. We are preparing to upgrade the Mark 5A to Mark 5B next year.

The Sheshan radio telescope successfully conducted 512 Mbps e-VLBI tests with Australian and Japanese radio telescopes in June 2008. On June 17, 2008 a trans-continent e-VLBI demo was successfully made at 512 Mbps among Chinese (Sheshan), Australian, and Japanese radio telescopes. Since September 2008 the Sheshan telescope has participated in scientific e-VLBI observations organized by the EVN. On January 15 and 16, 2009, the Sheshan radio telescope participated in the 33-hour continuous 'marathon' e-VLBI session demonstrated live in the opening ceremony of the International Year of Astronomy 2009 in Paris.

4. Development and Maintenance of the Shanghai Correlator in 2008

The Shanghai VLBI correlator system consists of a software correlator and a hardware correlator, which are the central data processing equipment of the VLBI Tracking Chang'E-1 Satellite, Telemetry & Control Subsystem. The five station hardware correlator currently works at 16 Mbps per station in real-time mode and at 256 Mbps per station in post-processing mode. An e-VLBI system consisting of four Chinese radio telescopes (in Shanghai, Urumqi, Beijing, and Kunming) and a software correlator is being developed. A new hardware correlator intended mainly for the geometric project of the Crustal Movement Observation Network of China (CMONC) is also under development.

In December 2008, the Chang'E-1 explorer achieved an orbit transfer, and the orbit altitude was changed from 200 km to 100 km. Benefitting from the upgraded fringe search module, the software correlator successfully fulfilled all the VLBI data correlation in near real-time mode.

In 2009, on the baseline of Shanghai-Urumqi, the first CVN two station high-speed e-VLBI (256 Mbps/station) experiment was processed by a high-speed ten station software correlator prototype running on a computer cluster.

5. Shanghai Observatory Hosts 7th International e-VLBI Workshop

The 7th International e-VLBI Workshop was held in Shanghai, China, on June 16-17, 2008 (<http://www.shao.ac.cn/eVLBI2008>). 87 attendees from 11 countries enjoyed a good time in the workshop. 27 oral presentations and six posters were presented on topics covering the status of e-VLBI, on-going projects in e-VLBI facilities around the world, the latest scientific outcomes using a high data rate, and e-VLBI technology development. Two live demos of e-VLBI experiments were conducted. One demonstrated e-VLBI applications to scientific research, and the other demonstrated space exploration. The international cooperation in e-VLBI science and technology was enthusiastically discussed in the meeting. A working group was set up to draft standards for an e-VLBI data format and transfer protocols.

Table 1. The staff at the Sheshan VLBI Station.

Name	Background	Position & Duty	Contact
Xiaoyu HONG	Astrophysics	Director, Astrophysics	xhong@shao.ac.cn
Qingyuan FAN	Ant. Control	Chief Engineer, Antenna	qyfan@shao.ac.cn
Zhuhe XUE	Software	Professor, FS	zhxue@shao.ac.cn
Quanbao LING	Electronics	Senior Engineer, VLBI terminal	qling@shao.ac.cn
Tao AN	Astrophysics	VLBI friend, Astrophysics	antao@shao.ac.cn
Weihua WANG	Astrophysics	Associated Professor, Astrophysics	whwang@shao.ac.cn
Hong YU	Ant. Control	Associated Professor, Antenna	yuhong@shao.ac.cn
Bin LI	Microwave	Technical friend, receiver	bing@shao.ac.cn
Jinqing WANG	Electronics	Engineer, Antenna	jqwang@shao.ac.cn
Lingling WANG	Software	Engineer, VLBI terminal	llwang@shao.ac.cn
Rongbing ZHAO	Software	Engineer, VLBI terminal	rbzhao@shao.ac.cn
Bo XIA	Electronics	Operator	bxia@shao.ac.cn
Wei GOU	Electronics	Operator	gouwei@shao.ac.cn
Linfeng YU		Operator	lfyu@shao.ac.cn
Yongbin JIANG		Operator	jyb@shao.ac.cn

6. The Staff and Personnel Changes of Sheshan VLBI Station

Table 1 lists the group members who operate and maintain the Sheshan radio telescope. Linfeng Yu and Yongbin Jiang joined the group in July 2008.

7. Prospects

In 2009 the Sheshan radio telescope will take part in 19 IVS sessions.

A project to build a new 65 m radio telescope was funded in 2008. The new telescope will be built ~4 km west of the current site of the Sheshan 25 m radio telescope. It is planned to be completed in 2012.