RECENT DEVELOPMENTS IN CHINA

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abstract

We report the current active status of radio telescopes in China. There are two VLBI station near Shanghai and Urumqi (Sheshan 25m radio telescope and Nanshan 25m radio telescope), Qinghai 13.7m milli-wavelength radio telescope, and Miyun meter-wavelength radio array. A plan of FAST and a plan of 50 meters radio telescope are introduced in the presentation.

Sheshan 25m VLBI Station

The Seshan 25 meters radio telescope is an alt-az antenna run by Shanghai Astronomical Observatory (SHAO), Chinese Academy of Sciences (CAS). The telescope is located bout 30 km west of Shanghai. (Longitude: $121°11'59"$E, Latitude: $31°05'57"$N, height above sea level: 5 meters).

The VLBI station is a member of the EVN, APT and IVS. It participated international VLBI observation both for Astrophysics and Geodesy.

Five bands of VLBI observations are available at Sheshan Station. The parameters of the receivers are listed in Table .

Nanshan 25m Radio telescope

Nanshan 25m Radio telescope is run by Urumqi Astronomical Observatory (UAO) of CAS. It is located at south 70Km from Urumqi city (Longitude: $87°11'$ E, Latitude: $43°20'$ N, height above sea level: 2080 meters).

The 25m radio telescope of UAO was built in operation since 1993. It has been outfitted with receivers for six wavelength bands centered near 92, 18, 13/3.6, 6 and 1.3cm. Table summarizes the relevant information.

The antenna as an element of EVN is very important, because of its unique location in the middle of the Asian-European land mass and in an area with a very stable geological structure. It has served the VLBI schedule more than 40% of the time per year.

The major parts of the front and terminal system are designed and developed for the VLBI projects. The terminal system has been outfitted MKIV system. Frequency standard: Hydrogen masers.

Table 1. VLBI Receivers of Sheshan Station

Band (cm)	Bandwidth (MHz)	Efficiency (%)	Type	T_{system} (K)	Polarization
18	1620-1680	40	Room Temp	100	LCP, RCP
13	2150-2450	40	Room Temp	100	RCP
6	4700-5100	50	Cryogenic	45-50	LCP
3.6	8200-9000	45	Cryogenic	50-55	RCP
1.3	22100-22600	20	Cryogenic	110	LCP,RCP

Table 2. VLBI Receivers of Nanshan Station

Band (cm)	Band (MHz)	Bandwidth (MHz)	Efficiency (%)	Type	T_{system} (K)	Polarization
92	327	26	30	Room Temp	150	LCP
18	1650	150	52	Room Temp	70	L/RCP
13	2300	300	48	Room Temp	100	RCP
6	4950	400	55	Cryogenic	38	LCP
3.6	8400	400	50	Cryogenic	45	RCP
1.3	22000	2000	35	Cryogenic	180	LCP

As a single dish, there are several observing system and research groups: a). Pulsar arriving time observing system and research group; b). Multi frequencies pulsar monitoring system and research group; c). Multi-line interstellar molecular system and search group; d). AGN radio variation-monitoring group.

13.7m mmw radio telescope

The 13.7m mmw radio telescope of Purple Mountain Observatory is located at Delingha, Qinghai Province, in northwest of China (97°33′36"E, 37°22′24"N, 3200m above the sea level).

The frequency range of the receiver is between 85GHz and 115GHz. At 115GHz frequency, the half-power beamwidth is about 542. The front-end of the receiver is a cooled SIS mixer, which provide a single-side band (SSB) system temperature of about $T_{sys} = 300$ K. A 171MHz bandwidth AOS of 1024 channels serve as a back-end, which provide an effective resolution of 250kHz corresponding to 0.664 km s-1 at 115GHz frequency. The chopping-wave method is used to calibrate the data. The main-beam efficiency is 0.6. The pointing accuracy is better than 102. The spectrum is observed in the position-switching mode. The typical integration time of each spectrum is 2 minutes with typical r.m.s. noise of 0.2 K.

Miyun Radio Array

A compound interferometer was developed in 1999 with the exist 28 Antennas of the Miyun Synthesis Radio Telescope (MSRT). The new facility has effective receiving area of about 900 m^2. Its sensitivity is of about 3 Jy with 1.5 MHz bandwidth and 1 second integrate time.

The new compound interferometer is also named as IPS telescope, because it is mainly used to do interplanetary scintillation observations. The scintillation spectrum of this observation is obtained and the corresponding solar wind speed, 420 km/s, was obtained with this spectrum.

To extend observing duration of a source in one time observation, time-delay function has to be added to the IPS telescope channels for all the 28 antennae. The test of time-delay for one correlative channel has been finished in 2001. The test results show that correlative output of the channel under test, when the radio source is 4 hrs. far from the meridian plane, is almost as same as that when the radio source is near the meridian plane. Two curves show the comparison the correlative outputs of Cyg. A.

SKA Progress in China: feasibility study of FAST completed

There are two major achievements on FAST project. First, the actuated main reflector was tested successfully in Feb. 2001 in Shanghai by making a 1:3 scaled model. Four elementary panels can move up and down along the radius of a sphere to approach a parabolic surface. These feasibility studies were made by Tongji university in Shanghai, Nanjing astronomical instrument research institute under the contracts with the Beijing Astronomical Observatory (BAO, now the National Astronomical Observatories of China), with contributions by the NAOC. Some suggestions for modification were proposed by the experience from the Evaluating Committee and under serious consideration by our FAST Group. According to those suggestions, we started a new type design of the reflector element - pre-stressed back structure experiments on the reliability and life time of the main reflector.

Secondly, the cable-car focus driven system, one of the two key approaches for FAST feed supporting designs, reached its major goal by testing a scaled model of 1:25 in Tsinghua university. The trolly which carries the focus cabin is supported and driven by two cross sets of upward cables, and four down tied cables are applied

Table 3. The main parameters of 50 m dish

diameter	50 m
Bands	92 cm–3.6 cm
System temperature	35 K
reflector	mesh
Aperture efficiency	60%–35%

to increase the stiffness of the structure. Positional accuracy of 3 mm was achieved on this model. Meanwhile a model of 1:10 for the secondary adjustable system - Stewart stabilizer was manufactured to meet the final pointing and tracking requirement. The new combined model, including the two adjustable systems, starts to be built up according to the similarity law, one year contract is made between Tsinghua university and the NAOC.

Another approach on feed support design is completed in Xian by finalizing a whole system (cable support designed by Xidian university and a stewart platform produced by Beijing institute of science and technology).

Some other aspects: the Science Case written in Chinese has been finalized at NAOC, the site survey report is completed, therefore the feasibility study of FAST as a key project of the Chinese Academy of Sciences has been completed. The next is to modify FAST design by improving the models.

A new development plan of 50m radio telescope at Miyun

A new development plan of instruments at Miyun station is to build a telescope of 50 m in diameter. Table gives the main parameters of the telescope. It is expected that the telescope could be put into daily observation in 2005.