Radio Astronomy in China

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This review is only about the stations and laboratories of radio astronomy in China, many research works are not included.

1. Miyun Station The Miyun Synthesis Radio Telescope (MSRT) is a linear array of 28 elements, 9-meter aperture telescope working on 232 MHz. The MSRT was officially opened in 1984, and dedicated to a Northern Sky Survey for 10 years and the result of a 232 MHz radio map was published in 1996. And then, the MSRT was upgraded into an adding system with sensitivity equivalent to a 47-m single dish. Completed in 2000, the adding system has been used for the IPS obsevation. As the further development, a project is under going for the construction of a 50-m single dish, operated up to S band, but the central part of 30-m, can be used for X band. The 50-m telescope is of multi- purposes, among those, pulsar timing for gravitational wave detection, a powerful element for the Chinese VLBI network, and also, a data receiving ground station for space mission will be on the prior list.

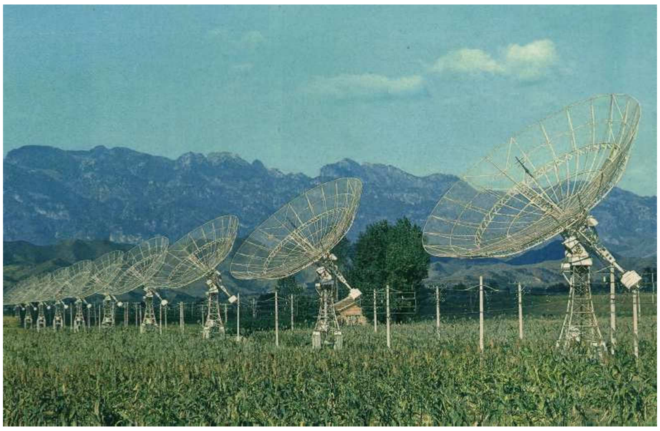

Fig. 1 MSRT in Beijing

2. The FAST Project The MSRT team has been involved in project SKA (Square Kilometer Array) since the very beginning of this huge international cooperation in 1993. Engineering conceptional investigation has been done under the support of the CAS since then. A proposal of a set of about 30 elements,large Arecibo-like spherical reflectors, each of which can be dynamically shaped to form local parabolic patches was set up by the team. In Guizhou province, near Guiyang city in the SW of China, there are hundreds of valleys can be used to accommodate such kind of ground fixed radio telescope and become one of the candidates of the SKA. As a pioneer project, the design of a single dish of Five hundred meter Aperture Spherical Telescope (FAST) has been carrying out. In very good cooperation with some 20 groups in the institutes and universities in China, FAST feasibility study has

been finished and approved by the CAS in 2001. In compare to the Arecibo telescope, a larger aparture, wider sky coverage, shorter wave length, faster motion, lighter weight radio telescope model is acceptable for further engineering design. The study is also highly marked by the SKA organization, and is accepted as one of the option of the SKA.

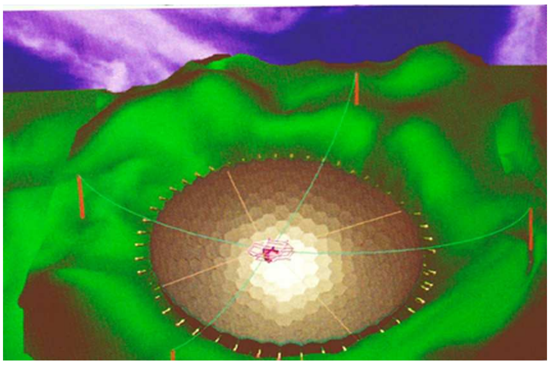

Fig. 2 The FAST

3. Large Radio Telescope Laboratory To fulfill the SKA and the FAST project, this Laboratory has been establish in the National Astronomical Observatory at its center in Beijing. To perform the feasibility study and engineering test of the key technology of the FAST and SKA, new concepts and many simulation studies have been done in this Laboratory. The conceptional design of the 50-m telescope has also been done in this Laboratory.

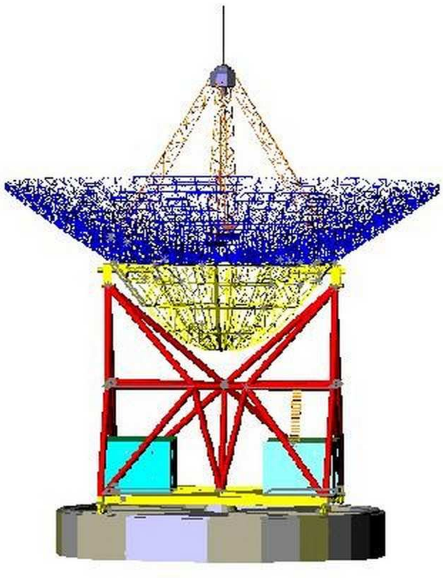

Fig. 3 The new 50 m

4. Delingha Station Being one branch of the Purple Mountain Observatory, the station

located in Qinghai province is the only site for millimeter wave observation in China. A mm-wave telescope of 13.7 m, protected by a radome, is situated near the Gobi, the wild desert in North-western China. Beginning from 13 mm, for water vapor sources detection, Delingha station has moved to 2.6 mm band with a cooled Schottky receiver and AOS (acoustic-optical spectrometer) system. Recently, an advanced 90—115 GHz super conducting SIS receiver has been developed and operated, and the sensitivity of the telescope improved immediately. CO line survey for about 2000 cold IRAS sources were observed, and many new CO sources were detected.

Fig. 4 Delingha station

5. Mm and Sub-mm Wave Laboratory This Laboratory is located in Purple Mountain Observatory in Nanjing. It supports the Delingha Station strongly with the research and development of mm wave technology, which also been applied to other fields besides radio astronomy. Most of the radio instruments used in the Delingha Station have been developed in this Laboratory, a 3-chennel receiver and back system to match the CO line observation around 115 GHz is under development recently. For sub-mm work, a 660— 720 GHz, with world standard performance high sensitivity SIS receiver has been built. This work offers the possibility of cooperation for receivers in the ALMA project and the SMA project. A portable sub-mm radio telescope POST, with aperture in 30 cm and working at 492 GHz has been developed jointly by the Laboratory with Japanese groups. The POST has been performed test observation in Delingha and Japan, and can be used for site selection and experimental observation.

6. Shanghai VLBI Station Located in Shanghai, at the suburb SW to Shanghai city, the VLBI station was established in 1987. The 25-m radio telescope equipped with receivers on 92,18,13.6,6,3.6 and 1.3 cm, and Mk4, S2 VLBI terminals. The station is mainly performing VLBI observations and is a member of EVN, IVS, and also joined heavily in the observation of VSOP. APSG and domestic geodetic VLBI observations have been done every year. Shanghai station has been participating in some experiments for the Mars, Venus studies, and will join in the SELENE, VERA projects.

7. Urumqi Station Located in Nanshan, at the suburb south to Urumqi city, this station was established in 1994. A 25-m telescope with receivers on 92, 18, 13, 13.6, 6, 3.6, 1.3 cm and Mk4, K4 VLBI terminals, the Nanshan station is a twin VLBI stations with the Sheshan station in Shanghai. Nanshan station being surrounded by mountains and forests, with small radio influence and good geographic distribution, this station has joined in many cooperative projects such as EVN, IVS, VSOP, APSG, and domestic geodetic VLBI experiments for

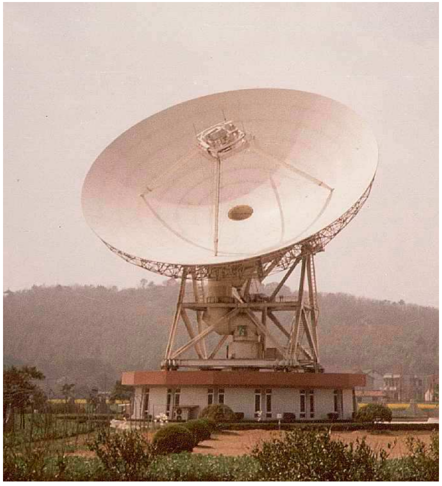

Fig. 5 Shanghai VLBI station

radio observation on space debris, low-frequency VLBI and the VERA, SELENE projects. Besides VLBI, the Nanshan station has doing successful pulsar observation in multi-band, cooperating with Australia colleagues and good results have been achieved.

Fig. 6 Urumqi VLBI station

8. VLBI Laboratory The Laboratory is located in Shanghai Observatory and supports VLBI technical developments for the Sheshan and Nanshan stations. Besides the VLBI terminals and receivers upgrading, now the laboratory is working on a 2-station VLBI correlator, planning for extending to a 4- station correlator as well as e-VLBI technique development.

9. Others A Mobile VLBI station of 3.5-m aperture, S-2 terminal 13.6/3.6 cm receiver, was completed in recent years, this mobile is being used for domestic geodetic VLBI, located in Kunming and got good observations. A 10-m redio telescope for solar observation is located in Kunming Observatory.