IAF SYMPOSIUM ON FUTURE SPACE ASTRONOMY AND SPACE PHYSICS MISSIONS (A7)
Science Goals and Drivers for Future Exoplanet, Space Astronomy and Space Physics (2)

Author: Mr. Huang Fan
Shanghai Institute of Satellite Engineering, China

A CONCEPT DESIGN OF SPACE LOW FREQUENCY RADIO OBSERVATORY

Abstract

With the successive launch of the FAST 500-meter aperture telescope in China and the SKA (square-kilometer array) of international cooperation in science and technology, low-frequency radio astronomy is heading for a new round of vigorous development. Detection sensitivity and frequency coverage continue to create new records that offer humans new opportunities to explore the universe. While the ground radio interferometers and VLBI (Very Long Baseline Interferometry) networks have made great progress, the resolution of VLBI has reached the limit of observation due to the limitation of the earth's diameter. We need to further increase the baseline length to increase the resolution. In addition, radio observation in space has unique advantages. Compared with the earth's surface, there is no atmospheric interference in space. The electromagnetic environment is better. It has better observation conditions than the ground, which helps to reveal new phenomena and new laws. Therefore, the construction of a space radio astronomical observatory and further expansion of observation resolution have become the inevitable development direction in the future. In order to overcome the short baseline length of the ground VLBI detection and further improve the observation resolution, a preliminary idea of an ultra-large caliber (30m antenna) low-frequency radio astronomical observatory was introduced in this paper. This project plans to launch the first international low-frequency radio astronomical survey of space. In order to achieve high spatial resolution and high sensitivity of the antenna, an ultra-large-diameter antenna (30m) is required. The development of space low-frequency radio astronomical exploration urgently needs to break through core key technologies, such as super-large-caliber antenna deployment, large-flexible agile maneuvering, and ultra-high-sensitivity electromagnetic compatibility. In this paper, the concept of a low-frequency radio astronomy station is proposed for the first time in the world. By developing and launching two ultra-low-frequency VLBI satellites with ultra-large-diameter antennas, they will form the most powerful "space-ground" VLBI observation network with ground FAST and SKA telescopes. At the same time, it is of great significance to carry out cutting-edge scientific exploration of astrophysics such as cosmological exploration, gravitational wave radiation source detection, and exoplanet research.