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Editor's Focus

Exploring the radio sky in a new era

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The past few years have witnessed various fascinating discoveries in radio astronomy, such as the first imaging of the shadow of a supermassive black hole in 2019 [1]. A must for these discoveries is the very long baseline interferometry (VLBI) technology invented over 50 years ago. Along with continuous development and improvement, the VLBI technology has ultimately enabled remarkable scientific achievements. Today, more exciting discoveries are expectable with the advent of new radio telescopes, especially the Five Hundred Meter Aperture Spherical Telescope (FAST) [2] and the Square Kilometer Array (SKA) [3], both possessing unprecedented sensitivities and capabilities. As evidenced extensively, the long-term research on technology lays a foundation for sustainable progress in radio astronomy.

The Tianlai project [4] is a relatively small pilot experiment, but the importance of such explorations should not be overlooked. In the presence of strong foreground radiation, surveying the neutral hydrogen at high and mid-redshifts remains a great challenge. To solve this problem, researchers are seeking experience from the analysis of real data. In a recently published original report [4], the Tianlai collaboration introduces the system design and calibration procedure for the cylinder array, and derives some basic system parameters from observations, including the beam profile, bandpass response, and system temperature, taking the first step in their long pursuit of interferometer array technology. The work shows that although the array is generally working as expected, the data presents great complexity that needs to be taken care of in order to achieve the sensitivity for detecting the neutral hydrogen signal.

With accumulated experience for data reduction and improved data analysis methods, the Tianlai array will likely help to make breakthroughs in the HI observations and fast radio burst detection, while serving as an experimental platform for Chinese scientists to participate in the SKA project.

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