53rd IAA SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) –
The Next Steps (A4)
SETI 1: SETI Science and Technology (1)

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SEARCHING FOR ETI WITH FAST: THE CURRENT STATUS AND THE FUTURE

Abstract

The Five-hundred-meter Aperture Spherical Radio Telescope (FAST), as one of the world's most advanced radio telescopes, is particularly suited for the Search for Extraterrestrial Intelligence (SETI) research and experiments due to its exceptional sensitivity. In 2019, we conducted our initial experimental observations with FAST, subsequently collaborating with the SETI@home and Breakthrough Listen teams for joint observations and data analysis. This included re-observing candidate sky regions identified by the SETI@home project through 14 years of commensal observations with the Arecibo telescope, and observing new wide-band periodic signals in collaboration with the Breakthrough Listen initiative. We have made continuous progress in exploring new observational modes with FAST and expanding the search for different signal categories. Utilizing FAST's multibeam receiver, we first replaced the traditional ON-OFF observation mode with the Multibeam coincidence matching (MBCM) method, significantly enhancing observational efficiency in SETI research. This advancement allowed us to monitor more targets in a shorter time frame. Furthermore, we developed a Multibeam point-source scanning (MBPS) observation mode specifically for SETI, enabling more precise differentiation of signals from interference in a novel multi-parameter space. This method has almost entirely eliminated continuous Radio Frequency Interference (RFI), markedly reducing the false positive rate. Through the series of surveys that we have conducted, we have found no signals capable of passing our signal identification pipeline; therefore, we have eliminated the possibility that these signals were transmitted by extraterrestrial intelligence (ETI). In the summer of 2023, we officially launched the Far Neighbor Project, aimed at conducting systematic and comprehensive SETI research within an integrated framework. This initiative seeks to update our understanding of the distribution of ETI and to attempt receiving messages from such civilizations. The project emphasizes leveraging the latest scientific discoveries and theories to guide our regular observations of high-potential sky regions and to expand our search areas, thereby enhancing our prospects of detecting signals from extraterrestrial intelligence.