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UTILIZING INTERNATIONAL OBSERVATORIES IN THE BREAKTHROUGH LISTEN QUEST FOR EXTRATERRESTRIAL INTELLIGENCE

Abstract

Breakthrough Listen (BL) stands at the forefront of the quest for extraterrestrial intelligence, marking one of the most comprehensive endeavors ever embarked upon in the field. Two of the BL's goals are to meticulously survey over a million nearby stars and conduct a detailed examination of the Galactic Center, covering the entirety of the accessible electromagnetic spectrum with ground-based observatories. In this paper, I will delve into our current initiatives across a network of observatories, offering a broad perspective on the various technosignature detection efforts underway. Notably, with the Five-hundred-meter Aperture Spherical Telescope (FAST), we are exploring wideband periodic pulses—a novel class of signal that has remained unexplored until now. This venture represents a significant leap forward, introducing a new dimension to our search strategy and potentially uncovering signals that previous searches may have overlooked. Concurrently, our wide-field survey using the Low-Frequency Array (LOFAR) international stations is surveying millions of stars cataloged by the Gaia mission, constituting the largest technosignature search ever undertaken. With the Sardinia Radio Telescope (SRT) in Italy, we are conducting the highest frequency surveys of nearby stars and a deep survey of the Galactic Center. We are also exploring innovative signal search strategies, such as the Karhunen-Loève Transform (KLT), to look for potential signs of extraterrestrial intelligence.

Furthermore, the Giant Metrewave Radio Telescope (GMRT), with its unique capabilities as an interferometer, is implementing a commensal search backend designed to produce 2000 beams. This innovative approach enables us to conduct searches simultaneously with other observations, maximizing telescope time use and significantly expanding our search area. I will elaborate on how we plan to integrate our technosignature searches with this sophisticated system, thus enhancing our efficiency and breadth of coverage. Importantly, GMRT's focus on the 400 to 900 MHz frequency range addresses a gap in the current landscape of radio technosignature searches. This relatively underexplored range offers fresh potential for discovering signals indicative of extraterrestrial technologies. I will also discuss how we aim to leverage the flexible Allen Telescope Array (ATA) to develop and deploy various search strategies.