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BREAKTHROUGH LISTEN SEARCH FOR INTELLIGENT LIFE TOWARDS THE GALACTIC CENTER AND PLANE

Abstract

The discovery of nearly 6000 exoplanets over the last decade has increased the possibility of life beyond Earth and motivated the continued Search for Extra-Terrestrial Intelligence (SETI). Breakthrough Listen (BL) is a 10-yr initiative conducting the most sensitive and comprehensive search for advanced civilizations to date, with the Galactic Center (GC) and Galactic Plane (GP) as two primary observational targets to search for artificial signals from ETIs. The GC has the highest number density of stars within the Galaxy and its line-of-sight offers the largest integrated Galactic star count of any direction in the sky. Additionally, it is widely cited as a possible location for a beacon built by advanced intelligence, and is the Milky Way's most energetic region. Likewise, the GP is an ideal direction to search for such signals due to the increased likelihood that transmitters would emit toward this region as opposed to random directions. Given the potential for discovery in the GC region, the BLGC survey is covering 700 MHz to 93 GHz using the Parkes Telescope, Green Bank Telescope (GBT), and the Sardinia Radio Telescope (SRT). In total, we will conduct 350 hours with the Parkes, 267 hours with the GBT, and 150 hours with the SRT; to date, 33% of these observations have been completed and 13% analyzed. This is the most extensive SETI survey of the GC to date. In addition to the search for technosignatures, the GC is a rich target for natural astrophysical phenomena, such as pulsars orbiting the central super-massive black hole, Sgr A*, and exotic systems like millisecond pulsars in binaries with black holes. Following Phase I of the BLGC survey (Gajjar et al. 2021), I will present updates on our progress, current coverage, projected timelines, and ongoing analysis for various kinds of narrowband and broadband signals, including channel-wide periodic signals with BLIPPS (Suresh et al. 2023) and artificially dispersed broadband bursts using SPANDAK (Gajjar et al. 2022). Notably, our 1-hour scans represent the longest continuous integrations ever used for SETI. This GC survey complements and extends the BL GP survey conducted with the Parkes Telescope 21cm Multibeam receiver, which covered roughly 3000 square degrees during 1200 hours, and will also be briefly discussed here (Perez et al. 2025, in prep.).