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SETI 1: SETI Science and Technology (1)

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ON THE SEARCH FOR ARTIFICIALLY DISPERSED SIGNALS TOWARDS THE GALACTIC CENTER AND NEARBY STARS WITH THE BREAKTHROUGH LISTEN PROGRAM

Abstract

Over the last decade, discoveries of numerous earth type exoplanets have extended the possibility of other life-bearing worlds. However, the question of the existence of intelligent life might remain elusive unless a dedicated attempt is made to extensively Search for Extra-Terrestrial Intelligence (SETI). So far, most of the SETI experiments have been focused on searching for narrow-band signals around 1420 MHz. The Breakthrough Listen (BL) program – one of the most comprehensive searches for intelligent life in the Universe – aims to search the entire terrestrial radio window along with extending the search

for a range of signal types from a wide range of targets. These include a detailed survey of the Galactic Center (GC). Studies that model long-term habitability suggest that even though stars in areas of high stellar density are more likely to be affected by nearby cataclysmic events, the sheer number of potential worlds should result in a higher propensity for intelligent life to emerge. As such, the GC is a compelling target for SETI observations. We will discuss our detailed search strategy towards the GC contiguously spanning from UHF(700 MHz) to W-band (93 GHz), which would be the largest fractional bandwidth search for radio signals towards any astrophysical source to date.

Siemion et al (2010) have proposed an interesting hypothesis that an advanced civilization might intentionally create a beacon of 'pulses' with artificial (nonphysical) dispersion. We developed a search tool called SPANDAK - optimizing high-performance graphics processing units assisted by state-of-the-art suites of convolution neural networks (CNNs) - in the quest for such artificially dispersed (i.e. negatively dispersed) transient signals. Here, we report a preliminary survey for such transient signals at frequencies across 0.7 GHz to 8 GHz from around 30 hours of observations with the BL program towards the GC from the GBT and Parkes telescope. We also report the first ever transient search across 3.8 to 11.5 GHz from 1000 hours observations from the GBT towards nearby stars. We show that the energy required for such a signal is relatively similar to the energy required for a persistent narrow-band signal, and thus providing a meaningful constraint on the possibility of ETI transmitting such artificially dispersed signals.