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Author: Mr. Raffy Traas
Berkeley SETI Research Center, United States

GREEN BANK TELESCOPE TECHNOSIGNATURE SEARCH OF TESS TARGETS OF INTEREST

Abstract

Exoplanetary systems are prime targets for the Search for Extraterrestrial Intelligence (SETI). With the recent uptick in the identification of candidate and confirmed exoplanets through the work of missions like the Transiting Exoplanet Survey Satellite (TESS), we are beginning to understand that Earth-like planets are common.

The Breakthrough Listen (BL) search for extraterrestrial intelligence initial target list includes a stellar sample of 10^6 nearby stars, 123 nearby galaxies, and a smaller sample of exotica. While observations of the stellar and exotica samples are ongoing, the Robert C. Byrd Green Bank Observatory (GBT) has completed its observations of 97 galaxies (those above declination -20 degrees) at L-, S-, C-, and X-bands, and a paper is in preparation on the data analysis.

In this work, we extend the Breakthrough Listen (BL) search for extraterrestrial intelligence to include targeted searches of stars identified by TESS as potential exoplanet hosts.

We report on 113 30-min cadence observations collected for 28 targets selected from the TESS Input Catalog (TIC) from among those identified as containing signatures of transiting planets. The targets were searched for narrowband signals from 1 – 11 GHz using the turboSETI (Enriquez et al. 2017, Enriquez & Price 2019) pipeline architecture modified for compatibility with the Google Cloud environment. Data were searched for drift rates of ± 4 Hz$\cdot$s^{-1} above a minimum signal-to-noise threshold of 10, following the parameters of previous searches conducted by Price et al. (2020) and Enriquez et al. (2017). The observations presented in this work establish some of the deepest limits to date over such a wide band (1 – 11 GHz) for life beyond Earth. We determine that fewer than 12.72% of the observed targets possess transmitters operating at these frequencies with an Equivalent Isotropic Radiated Power (EIRP) greater than our derived threshold of 4.9×10^{14} W.