SETI Searches for Radio Transients from Kepler Field Planets and Astropulse Candidates

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We present a search for fast radio transients in targeted observations of planet candidates in the Kepler Field and candidate Astropulse sources.

Kepler Field observations were conducted in the band 1.1 and 1.9 GHz using the Green Bank Telescope in Green Bank, West Virginia and are centered on 86 stars hosting candidate planets identified by the Kepler spacecraft. These stars were chosen based on the properties of their putative planetary system thought to be conducive to the development of advanced life, including all systems known (as of May 2011) hosting a Kepler Object of Interest (KOI) with a calculated equilibrium temperature between 230 and 380 K, at least 4 KOIs or a KOI with an inferred radius $< 3.0\ r_{\oplus}$ and a period > 50 d. The Kepler Field is centered at an intermediate galactic latitude, $b = 13.5^{\circ}$, which presents an additional opportunity to detect signals from the older population of millisecond and recycled pulsars located above the galactic plane.

The Astropulse radio survey searches for brief wide-band pulses in a 2.5 MHz band centered at 1420 MHz using commensal data recorded from the Arecibo ALFA receiver. In early Astropulse analysis, 108 candidate sources were identified that passed a series of tests designed to eliminate potential sources of radio frequency interference (RFI). We have performed targeted re-observations of these sources at Arecibo over the full (1214–1536 MHz) ALFA band.

We have developed a software pipeline to locate fast dispersed transients in these observations, leveraging components of the PRESTO software library. This pipeline consists of finding and removing RFI, conducting de-dispersion to remove the effects of dispersion from the interstellar medium (ISM) on the signal and identifying over-threshold events. We also perform de-dispersion at negative dispersion measures, proposed to be a potential technique for intelligent civilizations to distinguish their emission from natural sources. We carry out both a periodicity and single-pulse search on de-dispersed time series. The outputs from these steps are examined to look for both technological and astrophysical sources of impulsive radio emission.