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Supplementary information

A radio technosignature search towards Proxima Centauri resulting in a signal of interest

In the format provided by the authors and unedited

Supplementary information

Filtered Events

Here, we provide examples of events which do not pass our search criteria after three rounds of analysis. Supplementary Fig. 1 shows a candidate signal at ∼749.326 MHz, which is narrowband and exhibits a variable drift rate. This candidate failed the first round of plotting tests with six cadence plots, as the signal is visible in the first OFF observation (toward PKS 1421-490). Supplementary Fig. 2 shows a candidate signal at ∼1000.151 MHz, which is consistent with a non-disciplined oscillator as used in consumer digital electronics. This signal failed the second round of plotting tests (with 12 cadence plots) because the signal is clearly visible in the earlier plots; however, the signal was not detected above the S/N threshold in the earlier cadence. Supplementary Fig. 3 passed two rounds of plotting tests, but is ultimately discarded as satellite RFI from the Global Navigation Satellite System (GNSS), which is known to operate at these frequencies.

Flare Searches

During the multi-telescope, wide-band radio monitoring of space weather on Proxima Centauri campaign[?], three different flare events were detected (AB1, AB2, and AB3) with the Australian Square Kilometre Array Pathfinder (ASKAP). The type IV flare AB3 occurred during the observation campaign (900–1200 MHz at MBJD 58605.5652), but a few hours before Parkes observations started. To search for flares on minute to hour timescales, we averaged our high frequency resolution Stokes-I data into ∼kHz resolution data products and subtracting the mean bandpass. No signs of flare activity was apparent. This is likely due to gain variations within the UWL receiver, which are difficult to discern from astrophysical variations. These gain variations can be compensated for using noise added radiometry techniques, whereby a calibrated and temperature-stabilised noise diode is injected into the UWL receiver path. However, the noise diode was not used as it corrupts the high time resolution (128 μs) data product. The high time resolution data was ultimately not analyzed for flare activity, as ASKAP and other telescopes used in the commensal campaign did not detect further flares.

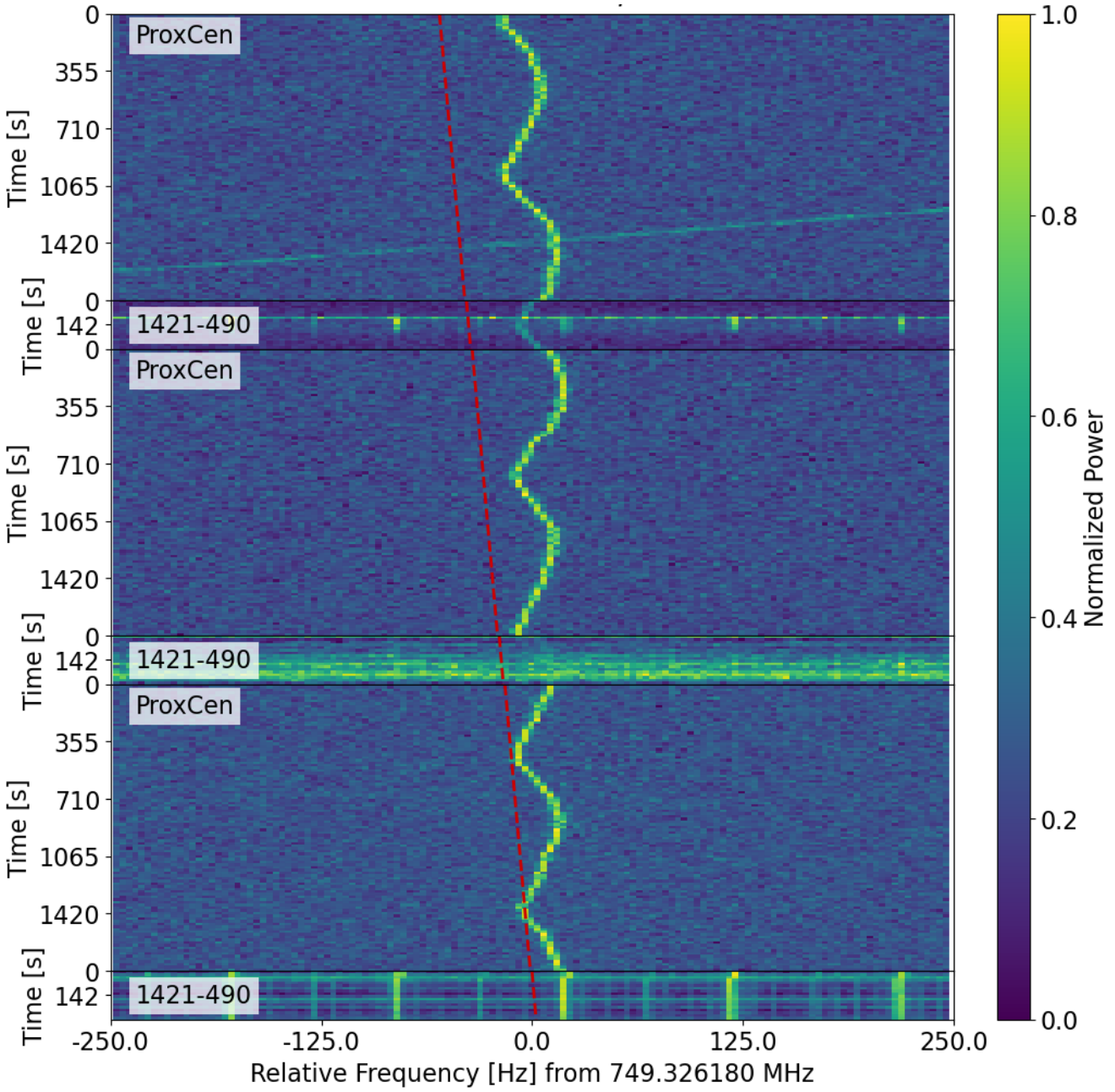

Figure (Supplementary) 1. An example of an event that fails the first round of plotting tests (cadence length of 6). All cadence plots, including this one, contain a red dashed line which represents a left-offset estimation of the calculated drift rate. This drift estimation represents only the relative angle of the drift rate which is calculated in the first observation. The signal is clearly seen by eye in the second OFF pointing but not detected by TURBOSETI above the required signal to noise ratio.

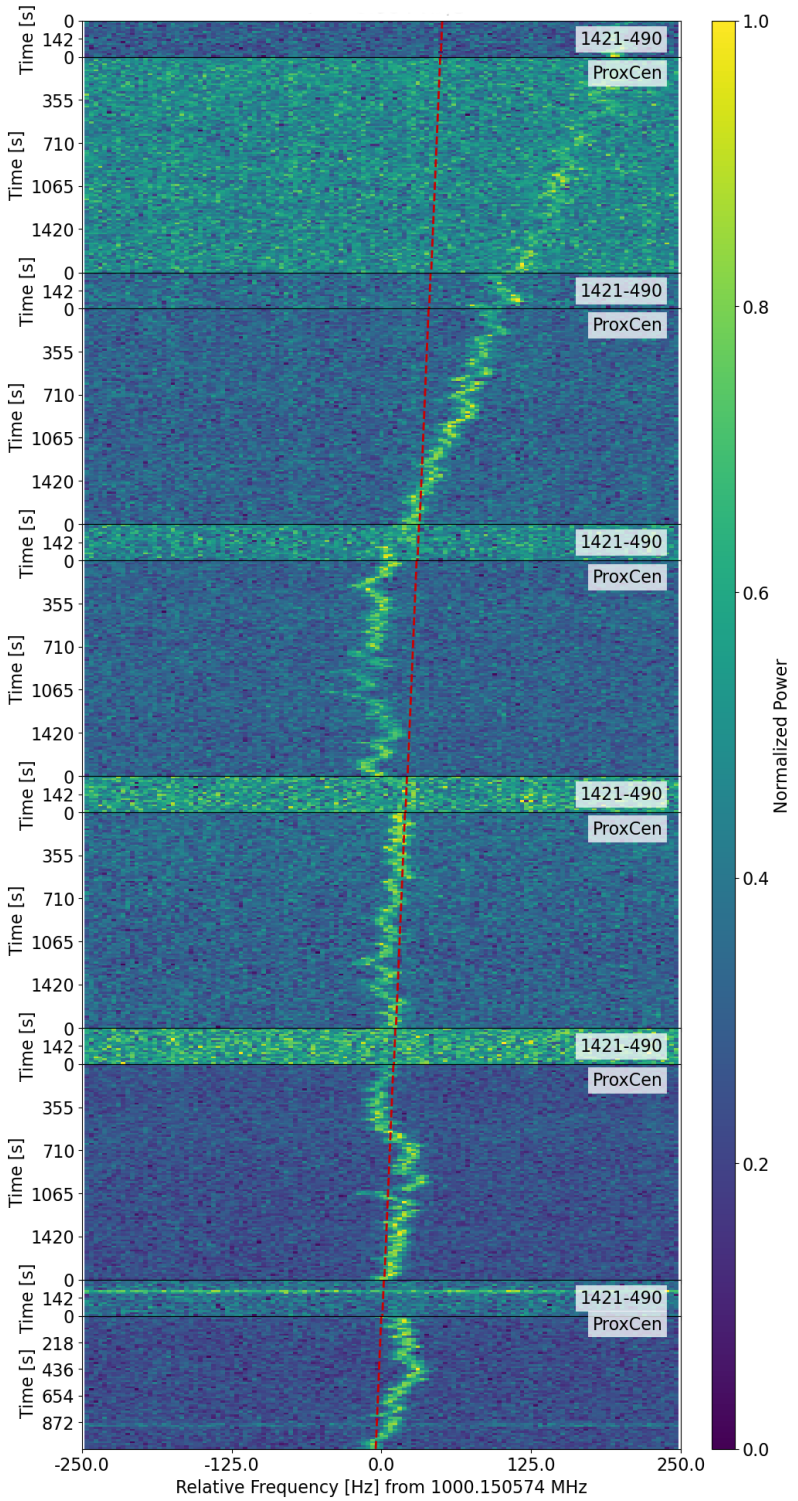

Figure (Supplementary) 2. An event that did not pass the second round of plotting (cadence length of 12). The signal was not visible in the off-source pointings for the first round of plotting (6th–11th pointings), but the signal is clearly visible in earlier off-source pointings that were not initially plotted.

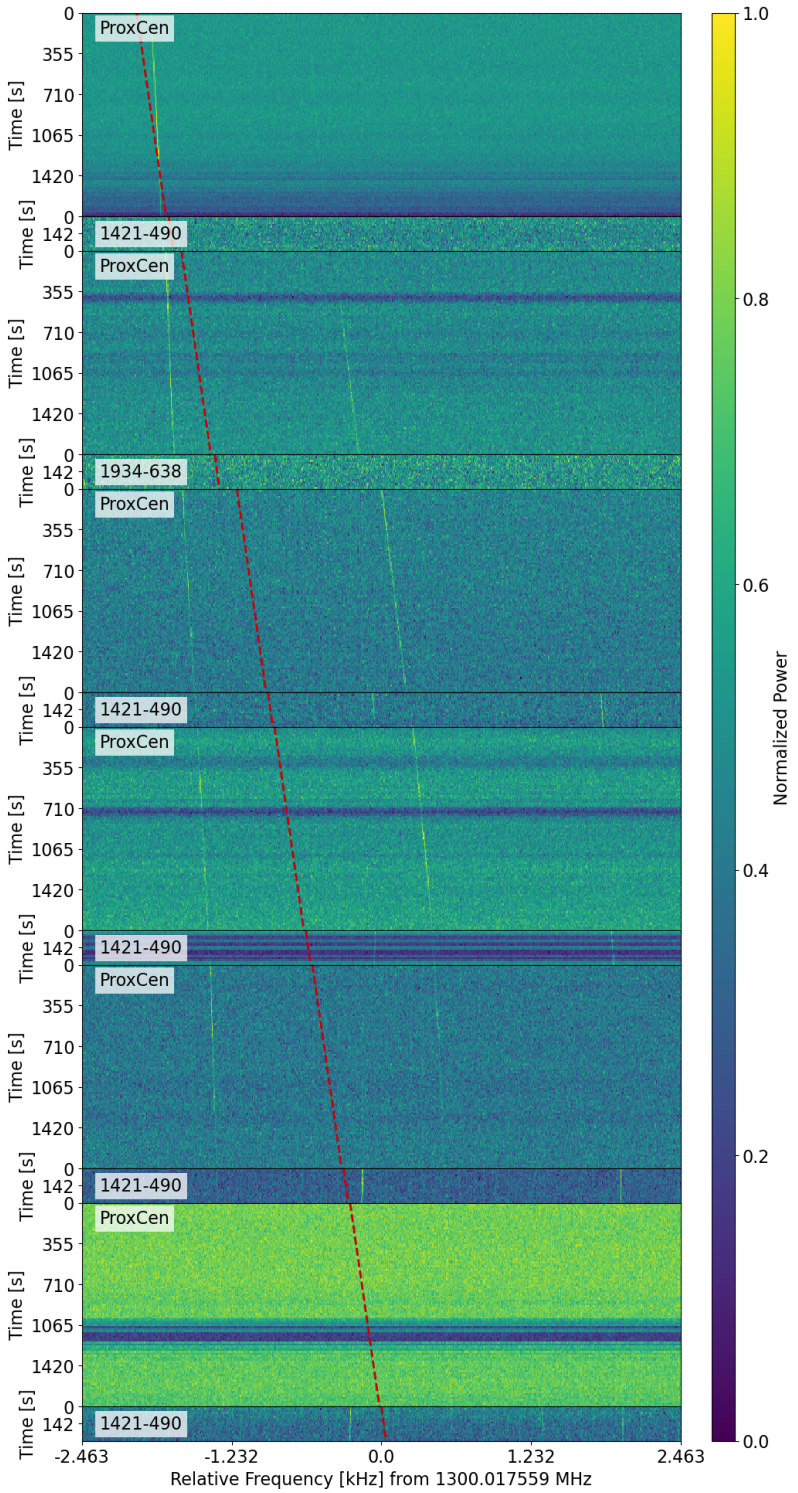

Figure (Supplementary) 3. Example of an event that passed two rounds of plotting, but was flagged as satellite RFI. The Global Navigation Satellite Service (GNSS) emits in the $1238 - 1318$ MHz range. In addition to the two events visible in a majority of the on-source pointings, two similar events are visible in some of the off-source pointings. This is likely due to another GNSS satellite that is close to our pointing of PKS 1421-490.