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Author: Dr. Daniel Czech
University of California, Berkeley, United States

Mr. David MacMahon
Berkeley SETI Research Center, United States
Mr. Matt Lebofsky
U.C. Berkeley, United States
Dr. Cherry Ng
University of Toronto, Canada
Dr. Andrew Siemion
Berkeley SETI Research Center, United States

CLASSIFICATION TECHNIQUES FOR EXTRACTED CANDIDATE TECHNOSIGNATURE SIGNALS FROM RADIO TELESCOPE ARRAYS

Abstract

Most prior SETI surveys have been conducted with dedicated primary time on large, sensitive single dish telescopes. Radio telescope arrays, however, offer significant benefits and enable interesting new approaches to sky localisation, radio frequency interference (RFI) rejection and survey strategy. Breakthrough Listen has developed an automated commensal technosignature search pipeline at the MeerKAT radio telescope array in South Africa. The pipeline receives data simultaneously alongside primary observers and automatically conducts a technosignature search on objects of interest in the primary field of view. Both coherent and incoherent beams are formed.

The large quantity of incoming data from all the antennas at MeerKAT presents a challenge. When conducting surveys with single dish telescopes, it is often possible to record all the raw voltage data. At MeerKAT, such comprehensive recording is infeasible. Instead, when a signal is detected by the SETI search pipeline, the time-frequency region around the signal is extracted and recorded from the original raw data from each antenna, thus reducing storage requirements. These recordings are referred to as "stamp files".

In this talk, we present an offline procedure to analyse such stamp files to determine the likelihood that the signals contained within are RFI. We consider and evaluate several techniques and approaches, and apply them to real data recorded by the signal search pipeline. Finally, we make recommendations on how such techniques could be made more performant and included as part of our SETI pipeline.