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THE BREAKTHROUGH LISTEN SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE: OVERVIEW

Abstract

Breakthrough Listen (BL), the most comprehensive, intensive, and sensitive search for technosignatures to date, has deployed equipment at telescopes around the world. Powerful compute clusters, configured as spectrometers capable of digitizing billions of frequency channels across gigahertz of the radio band, are carrying out surveys of Solar System objects, nearby stars, the Galactic Center and Plane, and nearby galaxies.

BL operates on the largest steerable radio telescopes in the Northern and Southern Hemispheres (the Green Bank Telescope and the Parkes Telescope), using around 1/5 of the time on each telescope as primary user. BL is also deploying a cluster of 64 GPU-accelerated compute servers to the MeerKAT Telescope (the SKA-MID precursor) in South Africa. This equipment is tasked with performing a survey

of one million stars, by commensal beamforming within the primary field of view (in concert with the planned key science projects that dictate the pointing of the dishes).

As of 2020 March, BL has generated over 10 PB of archival data products. 2 PB are currently available in a publicly accessible archive, which continues to grow as data are transferred from the telescope sites. The open data strategy also includes a software suite which enables data to be ingested into Python programs, and a growing pilot program with the open-source GNU Radio collaboration.

In addition to the GBT, Parkes, and MeerKAT programs, BL has pilot programs and partnerships with other telescopes around the world, including commensal radio searches at the Murchison Widefield Array and LOFAR / NenuFAR. Complementing BL's optical technosignature program on the Automated Planet Finder, searches are also underway with VERITAS and with TESS.

We will describe the current status of the BL observing program, its data products, analysis pipeline, progress in deep learning, growing international collaborations, and planned next steps.