

THE BREAKTHROUGH LISTEN SEARCH FOR INTELLIGENT LIFE BEYOND EARTH

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The Breakthrough Listen (BL) Initiative was launched in July 2015 with a goal of conducting the most comprehensive, sensitive and intensive search for evidence of intelligent life beyond the Earth in humanity's history. BL has contracted significant amounts of primary user observing time on three world class telescopes, the Green Bank and Parkes radio telescopes and the Automated Planet Finder (APF) optical telescope, and has partnered with the National Observatories China / FAST Telescope and Jodrell Bank Observatory / University of Manchester to coordinate observations and software development.

The Breakthrough Listen observational program commenced in December 2015, when the Lick Observatory 2.4-m APF telescope embarked on optical SETI observations of 200 stars nearby to Earth. In January 2016, the 100-meter Green Bank Telescope (GBT) began radio-wavelength observations of hundreds of nearby stars and the nearest galaxies, and was joined starting October 2016 by the Parkes 64-meter radio telescope in Australia. Breakthrough Listen observations at the APF employ the Levy Spectrometer to conduct "spectroscopic optical SETI" observations, searching for artificially narrow spectral lines that are known only to arise from technological sources (lasers). At the GBT and Parkes, Breakthrough Listen is deploying state-of-the-art digital backends capable of searching for a wide variety of signals indicative of a technological source, across many GHz of instantaneous bandwidth

The current Breakthrough Listen target list includes a spectral-type complete sample of nearby stars, 100 nearby galaxies spread over all morphological types, a complete survey of the galactic plane and exotic objects and targets of opportunity (e.g. KIC 8462852, FRB121102).

Instrumentation for conducting wide-field surveys for artificially produced emission at both radio and optical wavelengths is under development. The Breakthrough Listen team is also exploring opportunities to engage in commensal SETI programs with the SKA and its precursors.

These potential extensions to the Breakthrough Listen program would allow significant expansion of the Breakthrough Listen target list and would lay the groundwork for extremely high sensitivity observations with the full SKA. These latter observations would be the first SETI ever conducted that would be sensitive to Earth-level leakage radiation from nearby stars

Here we will review the Breakthrough Listen program, current capabilities and latest results.