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DEVELOPMENT OF NEW OBSERVATIONAL AND SIGNAL-PROCESSING METHODOLOGIES FOR SETI

Abstract

With the discovery of more and more potentially habitable planets, coupled with the construction of better and more sensitive telescopes, the question of extraterrestrial life and how we search for those unpredictable signals have started to move from the dark corners of research to become a new emerging science field. One of the science cases for the SKA project is harnessing its potential to search for non-natural radio emission from astronomical sources, possibly originating from extra-terrestrial civilizations. Up until recently, such searches were conducted "blind" in the sense that no one knew which stars harboured planets. However, with advances in the techniques of both ground-based optical astronomy and space-based telescopes, such as the Kepler mission, there are now hundreds of known, confirmed extrasolar planets. We also know the sizes of these planets and their distances from their parent stars, which makes it possible to draw conclusions about which of these might be more likely to harbour life, and possibly radio-emitting civilizations.

Detecting directly beamed transmissions from transient beacons is extremely difficult, but the high sensitivity of the SKA may make it feasible to detect radio leakage similar to that produced by our own civilization, which would be detectable as "non-natural" emission. Such signals would be extremely weak and difficult to detect. Fortunately, we now have a substantial sample of hundreds of stars with known planets for which we can do long-duration pointed observations.

"Nonnatural" signals include both terrestrial interference from communications broadcasts and potentially ETI signals. To enable detection, and to be able to locate possible signals of interest, the processing, at a minimum, needs to be able to identify and classify all RFI. It should be emphasized that even a null result from such a future survey with the SKA would be of great interest as it would set observational constraints on the product of two factors in the Drake equation, fc , the fraction of civilizations that release detectable radio into space, and L, the length of time over which such civilizations release detectable signals.

However, much work needs to be done to characterise the expected detection thresholds for such signals, and to develop the target selection procedures, observation strategies and signal processing methodologies for such a project. This project aims to address these questions in order to provide a basis for developing new frontier in making SETI observation.