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SETI 1: SETI Science and Technology (1)

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TIME MARKERS FOR SETI IN BINARY SYSTEMS

Abstract

Contemporary surveys in the search for extraterrestrial intelligence (SETI) typically make one-off "spot scans" across the sky to search planetary systems for narrow band radio signals that would indicate the presence of intelligent life. Spot scans may span a duration of seconds to minutes in order to observe a large number of targets with limited resources, but such a strategy does not necessarily consider the timing of exactly when to listen for extraterrestrial signals. Several ideas for possible time markers were suggested in the first few decades of SETI, such as the use of recurrent supernovae, gamma ray bursts, or pulsars as a way of establishing directionality and attracting attention toward an extraterrestrial beacon. Civilizations in binary systems might even choose the points of periastron and apastron in its host system to send transmissions to other single star civilizations. However, all of these timing considerations were developed prior to the age of exoplanets, which enables more detailed assessment of targets suitable for SETI.

This paper develops SETI strategies for circumbinary and circumprimary planets based upon the timing of orbital events in such systems. Events such as orbital extremes could represent a logical time marker for extraterrestrial civilizations to transmit, if they desire to be detected. Likewise, a transiting binary pair with inhabited planets around each star could yield maximum detectability of leakage radiation when both stars eclipse within our field of view. We present updated habitability calculations of planets in binary systems using a plausible range of orbital parameters, which narrows the scope of target selection for SETI. We then assess detectability constraints for time markers based on planetary and stellar orbits across a range of scenarios. We suggest that limited-duration SETI surveys should selectively target binary systems based upon the occurrence of reasonable time markers.