

Solar System SETI Using Radio Telescope Arrays

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Abstract

The search for extraterrestrial intelligence must include complementary observing programs that investigate our solar system and near Earth. Solar system observing strategies involve a search for energy (e.g., artificial microwaves) or physical manifestations (e.g., exploratory robotic probes) that may be present. Artificial electromagnetic emissions from robotic probes may be detectable using existing ground-based radio-telescope observatories like Arecibo, or those undergoing construction such as the Allen Telescope Array (ATA). Future systems like the SETI League's Array2k and the SETI Institute's ATA are well suited to the task of searching the solar system for anomalous microwave phenomena. Steerable phased arrays have the unique ability to produce multiple beams, and shaped antenna patterns to target and track specific planet-moon systems or regions of deep space. At distances less than 50 AU, large SETI arrays can detect electromagnetic emissions much fainter than those from light years away. Lower free space attenuation (i.e., higher signal-to-noise ratios), a reduced amount of scintillation from the interstellar medium, and other factors improve system performance. Solar System SETI is a search for active exploratory robotic probes within the solar system. These probes can possibly be discovered if they emit secondary or leakage microwave energy. The radial velocity, range and location of these emissions can be estimated from analysis of measured one-way doppler drifts and data from a synthesized quad-beam monopulse antenna array configuration.