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THE ALLEN TELESCOPE ARRAY: COMMENSAL AND EFFICIENT SETI

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The Allen Telescope Array (ATA) currently under construction affords the possibility of a dedicated and highly efficient SETI program that may be done commensally with other radio astronomy programs. This symbiosis is important in order to maintain and sustain the long-term effort that may be required in order to achieve success as a positive or null result. The technology that is being exploited is the construction of many small elements that allow large fields-of-view at high sensitivity, the use of ultra-wideband front-ends, and the use of flexible digital "intermediate frequency (IF)" systems. The project is under construction in phases, with the first 32 antennas expected to be functional in the fall of 2004, the next 173 dishes operational early 2006, with plans for 350 antennas total within this decade.

The Allen Telescope Array is a joint project between the SETI Institute and the University of California at Berkeley and is funded by the Paul G. Allen Foundations and other private donors. It is under construction at the University's Hat Creek Radio Observatory in northern California, which sits in a radio-quiet valley within the Cascade mountain range. The dishes are 6.1-meter hydroformed aluminium offset Gregorian surfaces supported by a lightweight mount. The entire analog dual-polarization 0.5 - 11.2 GHz bandwidth is transported to a processing building, allowing four concurrent tunings anywhere within that band. Each tuning then has the ability to point to four independent positions in the sky. This yields 32 linear polarization beams on the sky at one of four frequencies. In addition, two of the tunings feed an imaging correlator that may concurrently image the entire field-of-view.

Given the large field-of-view, every pointing of the primary antennas contains several stars of interest for the SETI Institute, which may then use multiple beams and one or more tunings to conduct concurrent experiments with real-time follow up on multiple stars. At the same time, astronomers at the University of California and elsewhere will be conducting large sky imaging surveys completely independently. Given the abundance of beams, additional observers may simultaneously use the telescope for other single-pixel observations.

Given that the receiver system is continuously sensitive to more than a decade of spectrum, the issue of radio-frequency interference (RFI) mitigation has been considered at the very initial stages of the design of this instrument. The large number of dishes provides many degrees of freedom for placing nulls on the sky and for excising interference. The best mitigation plan however is to manage the use and proliferation of radiating devices in the very limited areas used for these types of scientific experiments.