Algorithm to Extract Information-containing Seti signals and Results from the Allen Telescope Array. G. R. Harp,[1] P. R. Backus, [1] T. N. Kilsdonk,[1] J. C. Jordan [1] J. C. Tarter[1]. SETI Institute, 515 N. Whisman Rd. Mountain View, CA, 94043.

Introduction: In the cm-wavelength range, an extraterrestrial electromagnetic sine wave beacon is an excellent choice for beacon signal type because 1) it is minimally affected by interstellar / interplanetary dispersion or scattering, 2) compared to other matched filter searches, searching for sine waves is among the most computationally efficient (scales as N log(N)). On the down side, sine wave beacons contain no information (Shannon entropy = 0) apart from their existence. Simple pulsed signals, with a bandwidth defined by the pulse duration are also detectable with relative ease beacons with low information content. We call these algorithms "conventional" SETI.

Here we present the details of an unconventional algorithm which looks for information containing signals through autocorrelation measurements. These signals can be detected with about the same sensitivity as narrowband searches but also have high information content (Shannon entropy ~ ½ maximum). Unlike a general information-containing signal (i.e. wide bandwidth signal), this signal class is resistant to interstellar dispersion and scattering during the voyage from transmitter to receiver. Here is one example: An arbitrary signal (e.g. encyclopedia galactica) is initiated, and after a relatively short delay, the same signal is sent again on the same channel. This beacon can be received with ¼ the sensitivity of that for a sine wave beacon (in some scenarios, sensitivity is equal).

Another advantage of this signal type is that we know exactly where to look for the information and indeed have two copies of it which can be used for error correction. A simple N log(N) implementation of the search algorithm is known, and takes less than 2x the compute time for a sine wave beacon search.

We prototype our unconventional search with strong masers, which could act as amplifiers for extraterrestrial signals. Presently we are expanding the range of targets to include many "oddballs" of the galaxy such as the Crab pulsar, and extragalactic oddballs with short time duration amplitude variations. Since "oddballs" are by definition rare or unique, we do not have a sufficient sampling of such sources to be fully confident that the physics of their origin is understood. This leaves open the possibility that these sources might be intelligently manipulated to send information.