Optical SETI, A Brief Introduction

Member Observatory

Global Network of Optical SETI Observatories www.metiinternational.org

The history of Optical SETI is thoroughly covered at many other websites and won't be labored over here. But, it is useful to build an introductory technical discussion for a few basic concepts of OSETI.

Here on earth, we have had the capability of high power radio transmission for less than a century, yet after such a small amount of time, high power transmissions in the radio spectrum are giving way to more efficient and effective means of communications, i.e., low power satellite transmissions, fiber optic cables, the Internet, etc. Thus, considering that the heyday of high power radio, radar and TV transmissions has lasted less than 20 billionths of our total history, we will soon become relatively radio quiet again. If other civilizations have followed a similar historical path, then signals from these civilizations would have been so fleeting as to be non-events. Certainly, nobody is ready to give up on radio searches, but it seems likely that there will be a swing in interest toward the optical spectrum.

Laser transmission methods. Continuous laser signals (cw) have the advantage of requiring much less powerful lasers to be detectable at interstellar distances. At the receiving end, employing large telescopes with high resolution spectrometers and long integration times, anomalous signals should stand out easily against well documented stellar spectra. Yet, given the enormous data base that has been collected over the past century, it may seem odd and disappointing that nothing has been found (Reines and Marcey, 2002[8]). However, if one assumes that there are many advanced civilizations in our neighborhood, the absence of signals detected by this means suggests that transmissions using cw laser beacons is not the preferred method. One reason for this might be that, at the receiving end, the integration time needed for high resolution spectroscopy is non-trivial. Thus, beacon like repetitive or long duration cw transmissions to any particular star would require too much dwell time for a strategy involving the targeting many thousands of stars.

Alternatively, lasers are capable of emitting very short duration (<nanosecond), very intense (megajoule) and very highly collimated pulses which can traverse interstellar distances. Even at our early stage of ultra high power laser development, current machines have the necessary pulse energy for interstellar transmissions.

A laser transmission site, using a large telescope for beam collimation, can confine a visible light pulse such that it can traverse a thousand light years with only minor signal losses due to extinction in the interstellar medium. For pulsed signal detection here on earth, it is necessary to optically collect a minimum of a few tens to a hundred or so photons from any single pulse. This fact helps to establish the characteristics necessary for a pulsed laser system intended for an interstellar beacon-like signal. More on this in the section *Looking for the Optical SETI "Sweet Spot".*

We can conclude that it is technically possible to transmit and receive pulsed laser visible light signals across vast regions of our galaxy with earth's existing technologies. The next step is to try and determine the most likely signal transmission parameters' ranges.