# Filters

The universe is a noisy place. The Sun generates a huge amount of electro-magnetic radiation, each of the other stars as well. Even the moon has its energy 'glow'. Then there is all the man-made noise. Your computer grinding away processing all the bits that come its way, the router your neighbor installed for his Wi-Fi. It’s a cacophony of RF noise.

The prime task for a SETI station is to sift through all that noise and isolate signals from any possible ET. Separating the wheat from the chaff is a full-time task of a SETI station. This is how it’s done by a station in the SETI Network:

## Assumptions

It’s been said that Assumptions make and Ass out of U and I and it’s true. But the simple fact is that you have to assume a great deal to construct a workable SETI station.

The first assumption you must arrive at is that you need to be able to build the entire station yourself. You must be ready to put the mechanical components together, write the control software and build the electronics. This primarily because you can’t open up EBay and search for SETI and then order anything off the shelf. You have to build it yourself. This also has the important advantage that you can repair it when it breaks and modify it when you realize you need to change the approach your using.

It’s true that many components can be bought but they nearly always require modification to fit your needs.

Then you must decide how and where you’re going to search. You quickly realize that you have to limit your ambitions to the capabilities you have at hand. You must go back over the inventory of skills you have, such as welding, software design, RF understanding and the equipment you have to support these skills.

As you think about this problem you quickly come to the conclusion that you must base your assumptions on the one model you have at hand for comparison – yourself. You must train yourself to think like the ET your attempting to detect. Not too smart, not too dumb. You must remember that you are constrained by you physical and well as mental capabilities. For example - there is no point in attempting to detect a signal sent by modulation of dark energy for the simple reason that we don’t have the knowledge work with dark energy. It may be that ET is using dark energy in a fervent hope that we will see his transmission but it is futile on our end so we don’t worry about it

These are the categories of assumptions that have made for the detection scenario in use at SETI Net.

### Beacon

Intentional - The beacon is sent to be found. It’s a directed transmission to our star or our planet by a civilization that wants to be recognized. It’s like a “Hello World” output when you’re learning a new programming language and need a test. It’s an indicator that you’re on the right track and it will not convey any more information than “Hello World – You are not alone”. The beacon does that by its simple presence.

It won’t be leakage from the transmission of the ET equivalent of I Love Lucy from 50 years ago. That level of RF transmission is not focused so that by now it will be so defuse as to be undetectable. The ET civilization my well broadcast TV like signals but they will be low level and local much like our current technology of fiber optics and cable transmissions. Our own radiated signature has gone down considerably with the introduction of modern communication techniques.

It’s not coded the way a TV transmission is encoded with synch signals indicating frame end and color. A beacon’s only task is to be recognized not to transmit information.

It’s also not an interplanetary RADAR of some sort. Transmissions of that type are only sent for a few seconds at a time so even if they were present they would not be detectable on our end.

The bandwidth of the beacon will be very narrow, on the order of Hz or fractions of a Hz. This is because of the assumption that the beacon needs to be transmitted for very long distances and that it must be recognizable against the background of natural signal sources like stars. The best way we know

The beacon will be transmitted in the waterhole part of the spectrum.

It will be a single, very narrow band pure RF signal in the Waterhole part of the spectrum.

### Physical Capabilities

I also assume that the ET that built this beacon and is now operating it is more like us than different from us. His/Her/Its thinking speed is on the order of our own; its ability to control its environment is more or less the same as ours; and it is part of an organized society that has he knowledge to scan the universe and the will to put itself out for inspection.

### Medium

The assumed medium of transmission is radio waves. This is because I do not have the ability to receive in any other medium. I understand a bit about electronics and communications using radio waves so that is the natural thing for me to use and becomes my assumption for the medium in use. It’s also a reasonable assumption regardless of the ET beacon builders knowledge and budget.

### Budget

If the laws of nature are constant throughout the universe, as modern cosmology tells us they are then it should be the case that the laws of economics are constant as well. In a paper written by TBD Bradford paper he calculated that a successful beacon might requires the resources of a good part of the civilizations output to build, power and support. If this is the case then the need or the desire to be heard must be strong

## Expected Results

It’s a lot of space.

Falsification

The theory of science from ???

Why you can only not find, never find

System false on hits

With the considerations of assumptions and expected results you’re ready to build the filter set needed.

## Filters in Use

The SETI Network stations are equipped with these filter capabilities.

### Hardware – Your display is a very noisy device but about the only thing you can do to reduce its noise is to ensure that you have a ferrite coil filter on the signal input cable.

### Band Pass Filter

You also need a BPF. This needs to be right at the head end of the electronics chain right after the Low Noise Amplifier. It’s an absolute must when there are other signal sources in the area even if they are out of the spectrum band you plan to search. A local FM station can overload the front end of a typical receive and produces images of its self all up and down the band.

### Low Noise Amplifier

The LNAs task is to set the noise floor of the system. Since it’s the first active element of the system any noise it introduces itself will be part of the signal stream from then on. When you amplify the ET beacon your also amplifying the noise introduced by the LNA with the result that you really haven’t improved anything.

### Narrow Band –

The noise from the stars is very wideband.

Locked signal reference, new GPS chips

### Chirp - Using the motion of the Earth as a filter

Comminutions with ExaTerrestrials (Sagan)

Doppler

Down in frequency,

receiver chirp,

effect on local signals,

### Maximum Signal – How much is too much

Limit adjustment, integration to achieve

### Integration – Pop a signal out of the mud

Add noise subtracts, raised a signal, too much integration,

### Antenna Movement – Off Axis test

Moving small amout gives large signal

### Time Movement

Az/El choice

DEC/Ra choice

# Conclusion

The possibility of detection of ET is remote to say the least, but the rewards are huge. The only think that could make detection less possible is not trying at all.

SETI Net is a learning tool for me personally. I enjoy thinking about the hardware and software needed to equip machine for a task that has never been successful before in the history of humanity and…