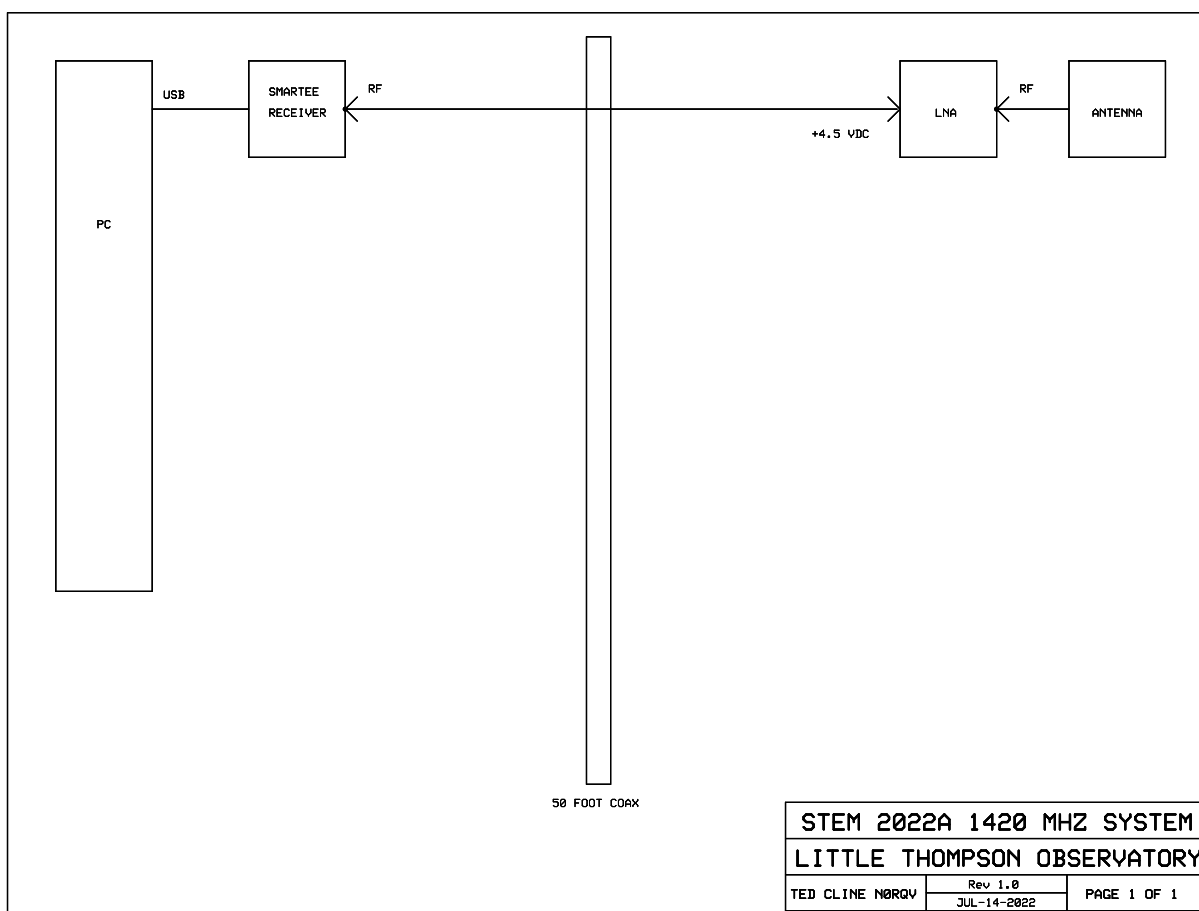


ezRA - Easy Radio Astronomy – Hardware 1

- Sep-30-2022

A radio antenna receives a signal from the sky, and a computer system collects and records the signal into data files. There are many choices of frequency, reflectors, antennas, polarization, amplifiers, filters, cable, power methods, receivers, bandwidths, precision, integration, temperature stabilization, frequency stabilization, etc.

This describes some simple some hardware to receive 1420 MHz radio signals from the sky,



Above shows the radio signal data flow, from the top right,
from a suitable antenna,
to a Low Noise Amplifier (LNA),
to a coaxial cable (coax),
to a USB Software Defined Radio (SDR) receiver,
by USB to a Windows or Linux PC.

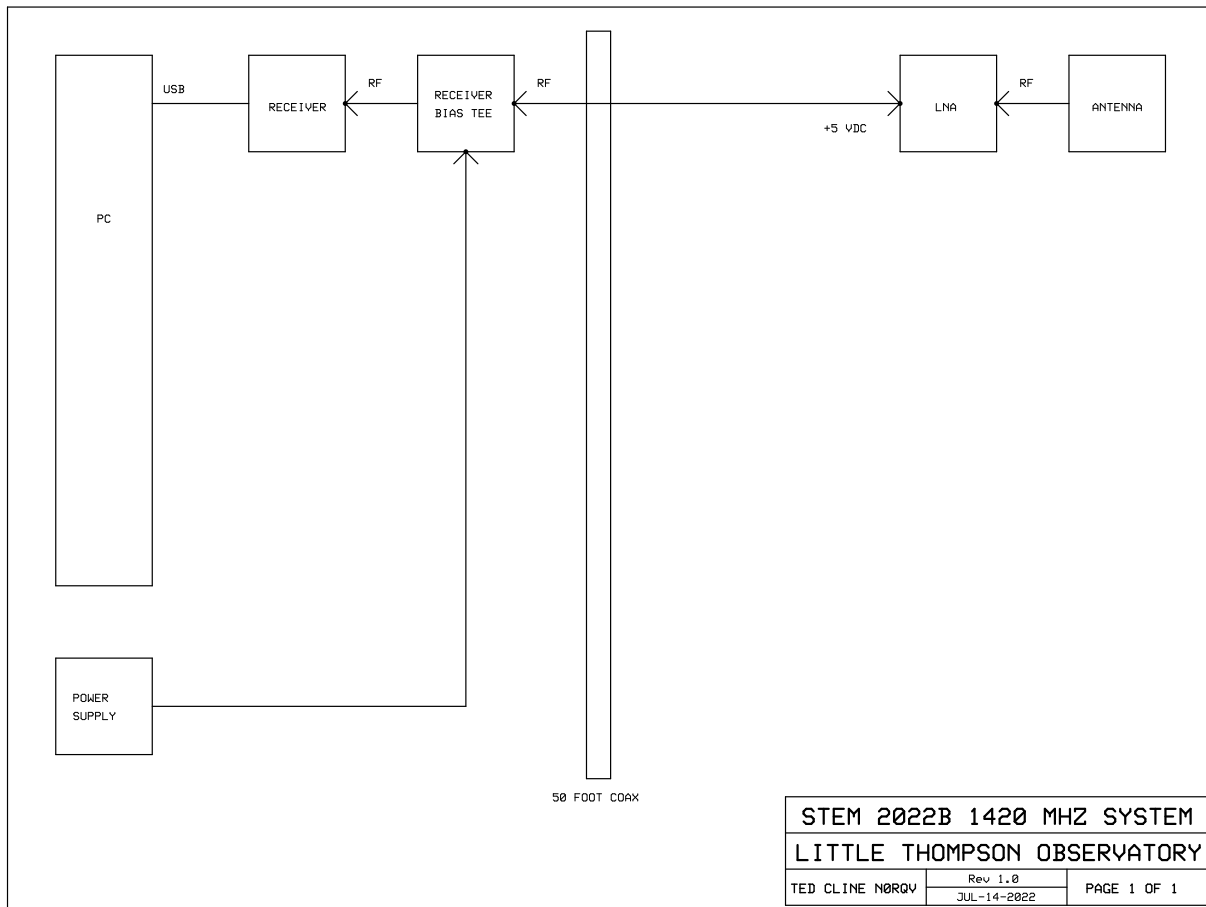
This LNA has the advantage of including a filter to pass primarily 1420 MHz signals,
<https://www.nooelec.com/store/sdr/sdr-addons/sawbird/sawbird-h1-barebones.html>

Simple TV RG-6 Coaxial Cable has worked well.

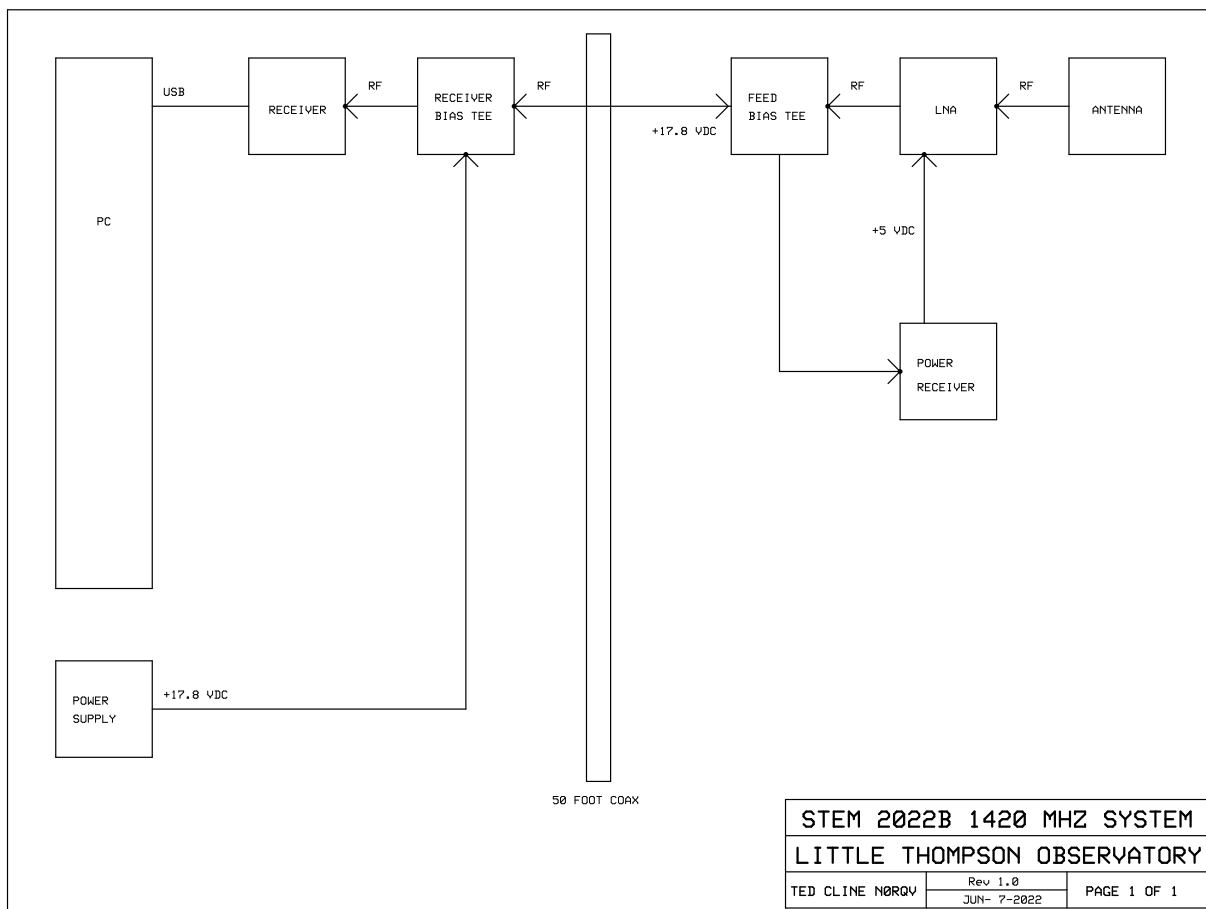
This “SMARtee” USB Software Defined Radio (SDR) receiver can provide 4.5 volts DC down the coax cable to power the LNA,
<https://www.nooelec.com/store/sdr/sdr-receivers/smart/nesdr-smartee-sdr.html>

But perhaps the receiver does not provide 4.5 volts down the coax, or the coax is long and has a large voltage drop. Consider providing the coax voltage with a “Bias Tee”, where the RF (Radio Frequency) signal passes between the coax connectors unaffected, and an inserted DC bias voltage exits only one coax connector. An example is the ZFBT-352-FT+ Bias Tee, <https://www.minicircuits.com/WebStore/dashboard.html?model=ZFBT-352-FT%2B> Similar, but less expensive alternatives are available from Amazon.com .

Here, an appropriate constant DC voltage is provided by a power supply, through the Bias Tee, through the coax, to power the LNA,



Perhaps better to increase the power supply DC voltage, and provide a local voltage regulator near the LNA ?



To remove local interference, try a VBF-1445+ LTCC Band Pass Filter, 1420 - 1470 MHz ?

<https://www.minicircuits.com/WebStore/dashboard.html?model=VBF-1445%2B>

Maybe better?: SHP-1000+ Lumped LC High Pass Filter, 1000 - 3000 MHz

<https://www.minicircuits.com/WebStore/dashboard.html?model=SHP-1000%2B>

DC block coax adapters exist.

The SDR receiver can be hose-clamped to a junk box metal heatsink and somewhat temperature isolated in a cardboard or foam box. Temperature control inside an active refrigerator can vary greatly.

The earth rotates slowly, so old slow PCs are fast enough.

Python3 comes pre-installed on many free Linux systems (Ubuntu).



PVC Pipe StrawYagi, Loveland Colorado USA,
N0RQV



4 foot 3-Sided Corner Reflector, Berthoud Colorado USA,
Little Thompson Observatory (LTO)
<https://www.starkids.org/visit/>



4-Sided Pyramidal Horn, Berthoud Colorado USA
Berthoud High School Ham Radio Club

(see <https://wvurail.org/dspira-lessons/>)



DirectTV dish with dipole, Loveland Colorado USA,
N0RQV



2.4 GHz WiFi Parabolic Grid Dish

<https://www.rtl-sdr.com/cheap-and-easy-hydrogen-line-radio-astronomy-with-a-rtl-sdr-wifi-parabolic-grid-dish-lna-and-sdrsharp/>

(see Society of Amateur Radio Astronomers (SARA),
“Scope in a Box”,

<https://www.radio-astronomy.org/store/projects/scope-in-a-box>)



8 foot dish, Loveland Colorado USA,
N0RQV



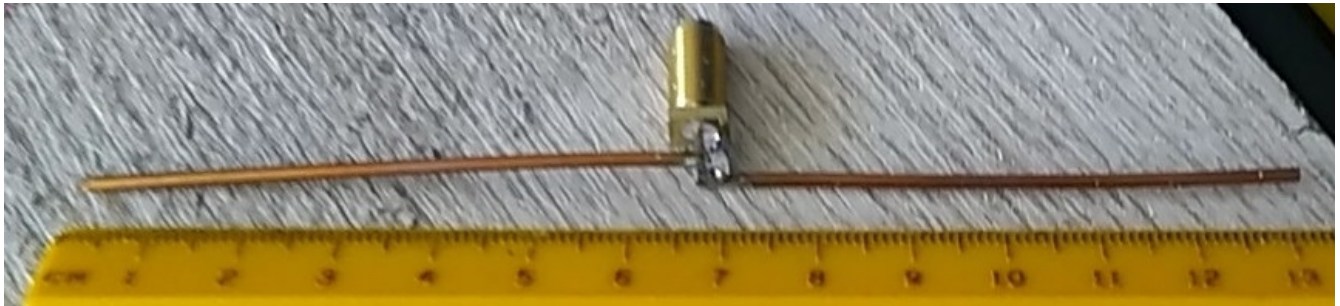
10 foot dish, Estes Park Colorado USA,
Estes Park Memorial Observatory
<https://www.angelsabove.org/our-projects/>



15 foot (near) and 16 foot dishes, Berthoud Colorado USA,
Little Thompson Observatory (LTO)
<https://www.starkids.org/visit/>



60-foot dish, 5 miles south of Haswell Colorado USA,
Deep-Space Exploration Society (DSSES)
<http://dses.science/>



SMA Connector 1420 MHz Dipole Antenna