Heres a crude summary of the things I did while at Lake Yale.

1. 5 Laptops inventoried - document:

    https://docs.google.com/document/d/154OSSnlNwGmpuMRH6rBeAbmMYGplEz1xKSqRjEO_6t M/edit?usp=sharing

    Summary - 5 Windows 10 Pro Dell laptops i3-6006U 2Ghz / 4GB Ram Windows 10 Pro all built in September of 2020

2. Replaced the old Cisco Access Point that was only capable of WEP encryption: (We just don't need to make available resources that draws attention like this: "Weak Security").

PCC SSID on Cisco hardware has been retired.
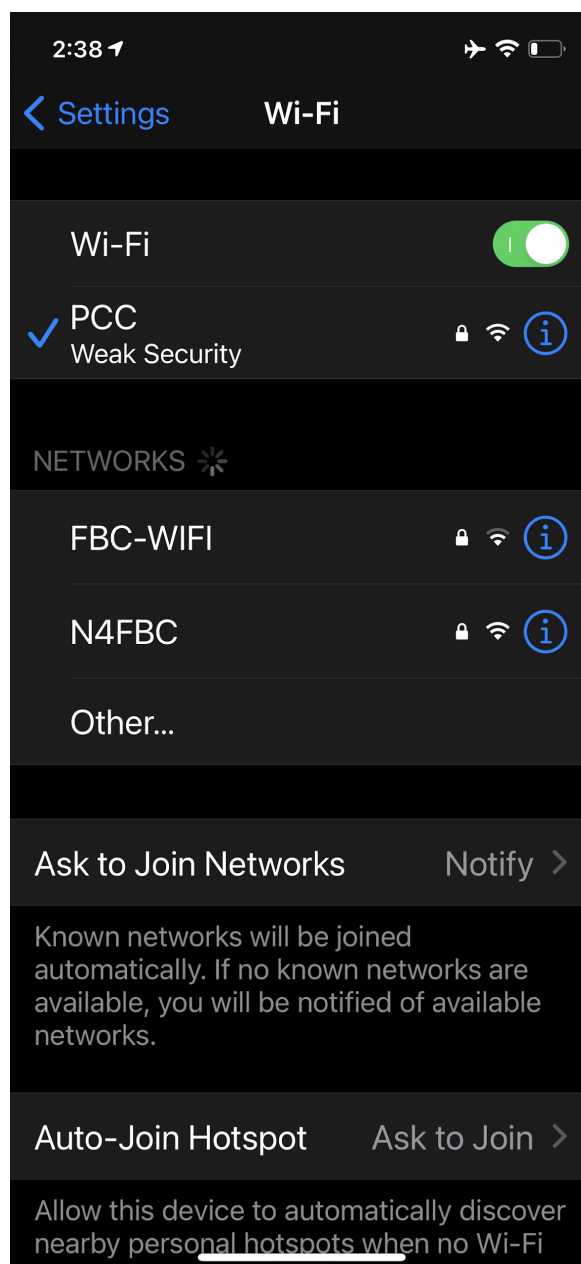
Having a more current WiFi AP in a box, I got it out, wiped the configuration and installed this AP with a new SSID is N4FBC, intended audience is for our communications team and any devices inside the PCC that need WiFi access. Given the metal skin of the PCC - the RF coverage outside the PCC is poor. Next project is to add another Access point / SSID with external rooftop WiFi antenna for those we're supporting to use allowing us to scale our service based on infrastructure capability. Also helps us manage the network, whats available and who's on which WiFi.
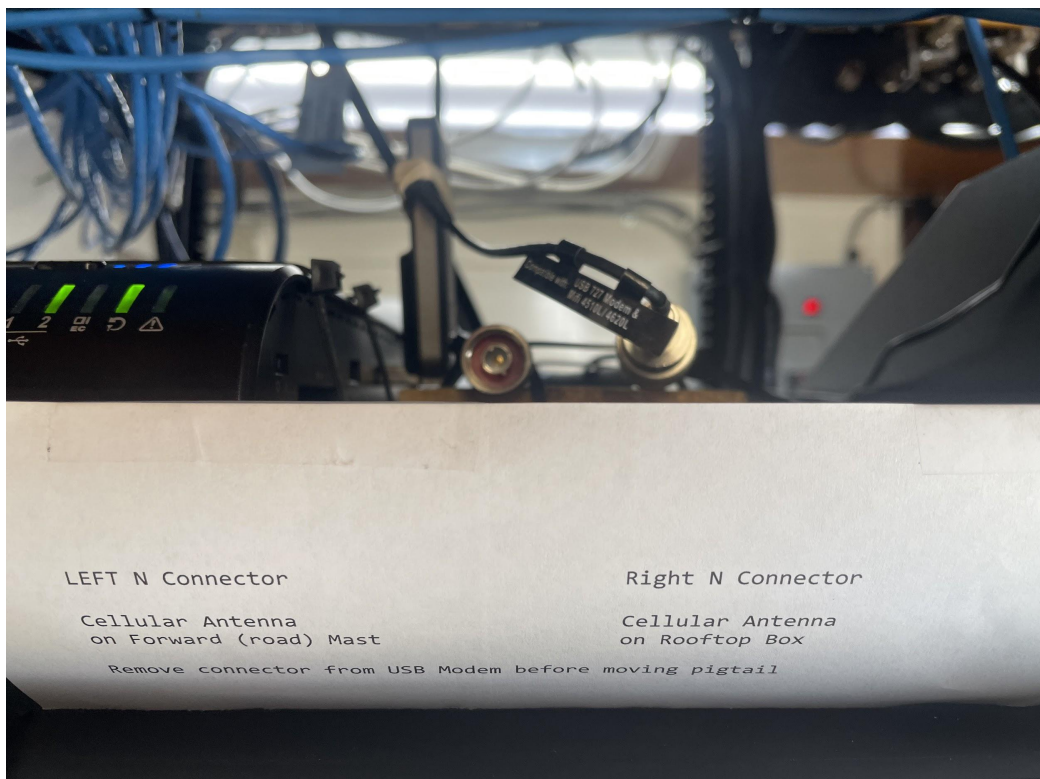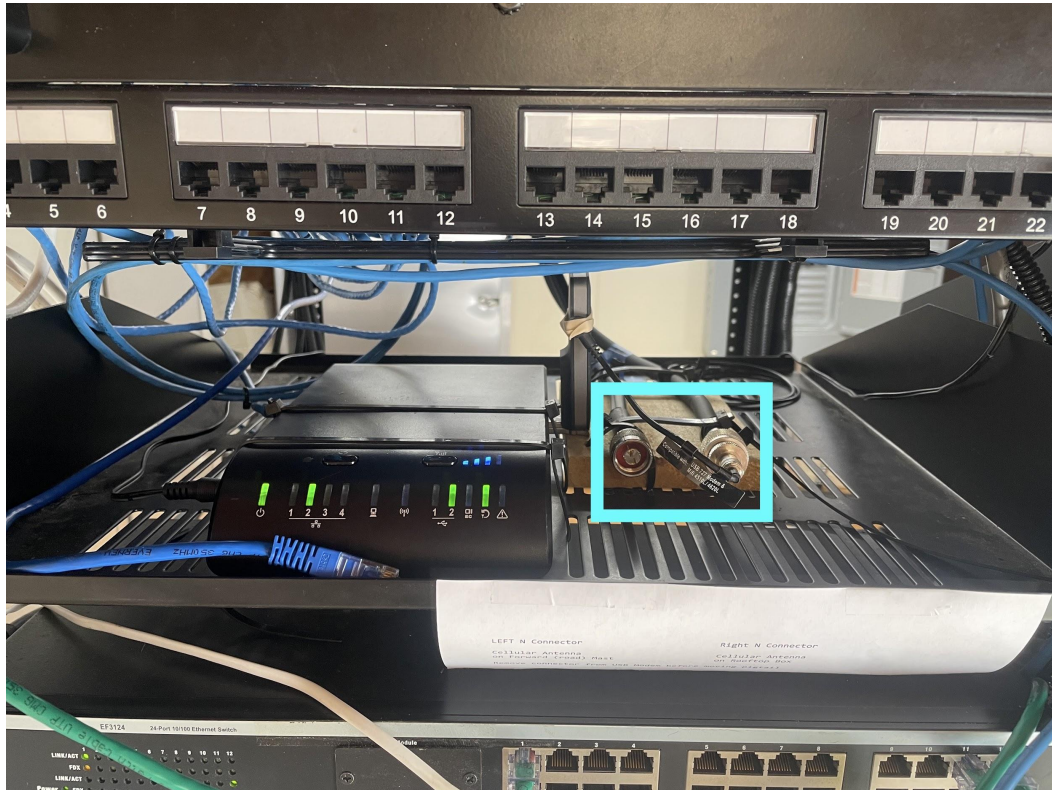
   I'll share the passwords separately.

Segmenting those we're serving onto a separate SSID allows us to more easily identify network utilization, especially when we'd be on limited bandwidth. The Enterprise router has a page that shows the utilization of each 'traffic flow' going through the network. Very helpful to managing network usage and corresponding performance:

3. Secured the cellular coax cables in the rack to make switching external antennas cleaner. There are two cell band antennas (mfr surecall) 1) roof mount, and 2) mast mount. Mast mount antenna RSSI (receive signal as reported by modem) declines somewhere between 5 and 10db (actual...not theoretical of 20dB) when in the stowed position.   Thus the rooftop antenna is better suited when the masts are in the stowed position.

Second photo shows labelling. Note that the rooftop antenna is fed by an RG-8 equivalent, the mast antenna is fed by an LMR400 equivalent.

LEFT N Connector

Cellular Antenna
on Forward (road) Mast

Right N Connector

Cellular Antenna
on Rooftop Box

Remove connector from USB Modem before moving pigtail

4. Got the printer working. Printed labels for two cell antenna N connectors in rack shown above. Printer needs Yellow Ink.

5   Exercised the Satellite Dish to get the IP addresses for the diagram, familiarizing myself with the system, confirming I can successfully deploy that equipment.
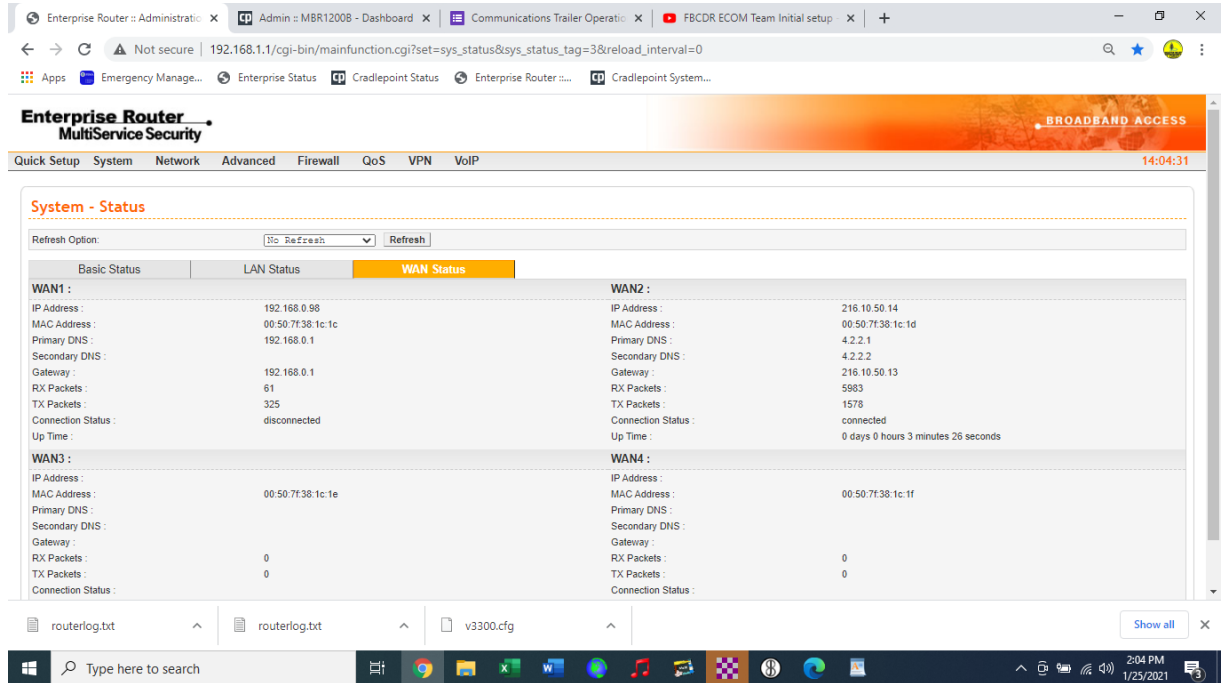
Have We considered that if the PCC is positioned with the gooseneck (front) of the trailer pointed at approximately 330 degrees magnetic azimuth, that the forward (curbside) mast is in the path of the dish being the mast is at 270deg to the dish with 0deg being the forward travel of the trailer ?

Address: eustis, fl
Latitude: 28.8528°
Longitude: -81.6854°
Satellite: 116.8W SATMEX 8
Elevation: 39.0°
Azimuth (true): 235.5°
Azimuth (magn.): 242.0°

In other words, if the PCC is positioned just right, the curbside (forward) antenna mast will align with the 116.8 Satellite and be in the path, which could affect performance, and cause a lot of STRAY RF around the trailer which is not desirable.

Maybe it's in the documents and I missed it...

6. Evaluated the Cradlepoint router, the LTE Verizon Service that uses the 730L Modem (it was not working on my arrival, upon my departure I had it working at an RSSI of -85dBM on departure giving 20mbps download and 10mbps upload).   This was a combination of improving connection on the side of the modem, and deploying the mast antenna, and restarting the modem until the errors disappeared and it connected to Verizon. The USB connection on the 730L modem may be in question in reviewing the modem failures in the logs.

Left a bookmark on the 'station' computer that allows review of the Cradlepoint logs to evaluate the RF Performance of the 730L modem to find these statistics in the cradlepoint logs:

Cp Cradlepoint System...

```
Wed Dec 31 20:02:40 1969|ERR|kernel|[ 260.685142] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:02:41 1969|ERR|kernel|[ 261.517311] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:02:42 1969|ERR|kernel|[ 262.370958] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:02:43 1969|ERR|kernel|[ 263.205143] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:02:43 1969|ERR|kernel|[ 263.205547] usb 1-1-port2: unable to enumerate USB device
Wed Dec 31 20:02:55 1969|ERR|kernel|[ 275.529142] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:02:56 1969|ERR|kernel|[ 276.377142] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:02:57 1969|ERR|kernel|[ 277.225312] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:02:58 1969|ERR|kernel|[ 278.075444] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:02:58 1969|ERR|kernel|[ 278.075968] usb 1-1-port2: unable to enumerate USB device
Wed Dec 31 20:03:16 1969|ERR|kernel|[ 296.265316] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:03:17 1969|ERR|kernel|[ 297.097144] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:03:18 1969|ERR|kernel|[ 297.945144] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:03:19 1969|ERR|kernel|[ 298.777454] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:03:19 1969|ERR|kernel|[ 298.777975] usb 1-1-port2: unable to enumerate USB device
Wed Dec 31 20:03:37 1969|ERR|kernel|[ 317.001144] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:03:38 1969|ERR|kernel|[ 317.833143] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:03:38 1969|ERR|kernel|[ 318.665144] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:03:39 1969|ERR|kernel|[ 319.498559] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:03:39 1969|ERR|kernel|[ 319.499104] usb 1-1-port2: unable to enumerate USB device
Wed Dec 31 20:03:58 1969|ERR|kernel|[ 337.993144] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:03:59 1969|ERR|kernel|[ 338.825144] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:03:59 1969|ERR|kernel|[ 339.657144] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:04:00 1969|ERR|kernel|[ 340.489144] usb 1-1-port2: Cannot enable. Maybe the USB cable is bad?
Wed Dec 31 20:04:00 1969|ERR|kernel|[ 340.489546] usb 1-1-port2: unable to enumerate USB device
Wed Dec 31 20:04:14 1969|INFO|kernel|[ 354.384403] usb 1-1.2: new high-speed USB device number 42 using ehci-platform
Wed Dec 31 20:04:15 1969|INFO|kernel|[ 354.952290] usb 1-1.2: USB disconnect, device number 42
```

Evaluated the failure modes of the Enterprise router. Tested POTS lines in the various failure modes, noted they are SIP lines that use whatever internet service is available.   The POTS lines worked on the Satellite, Cellular, and wired network.

There may be a need to evaluate who's using the network and consuming a significant portion of available bandwidth.

   You can see the flow rates on the enterprise router here with a speedtest running:
https://youtu.be/Cp-Snqt5Aws

Why do this ?   To manage the network - To figure out who's making the network 'really slow'. The video shows little happening, then start a speed test, and watch the download, then upload on the enterprise router to show the usage for the speed test.

7. Evaluated the RF performance of the cellular system & LTE modem taking RSSI measurements, evaluating antenna bands used and performance with spectrum analyzer.   Note that the wired connection from the cradlepoint to the DR Logistics building must be disconnected for the modem to be activated.

Left a bookmark on the 'station' computer that allows review of the Cradlepoint logs to evaluate the RF Performance of the 730L modem to find these statistics in the cradlepoint logs:
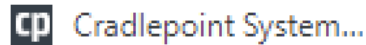

Determined that at the LY location, which is Rural, that 20mbps download and 10mbps upload can be achieved with an RSSI of -85dBM with the mast upright. With antenna in the stowed position, the signal is down to -95dBM, and the upload speed cannot be determined.   (When I arrived, the modem was reporting -99dBM, which was unusable) I could not tell which antenna was connected, added a rubber band to the external modem antenna connector and removed the 'cover' for the connector on the modem as the position of this connector matters to signal strength and system performance).

   RSSI (Signal) of -85dBM on the Cradlepoint Dashboard Web Page (best available at LY)
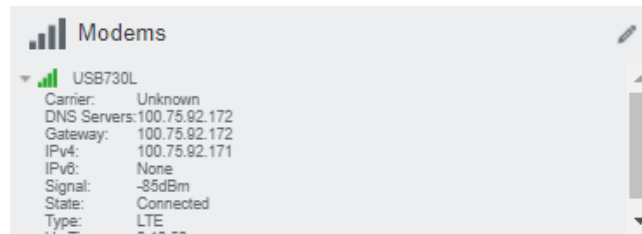
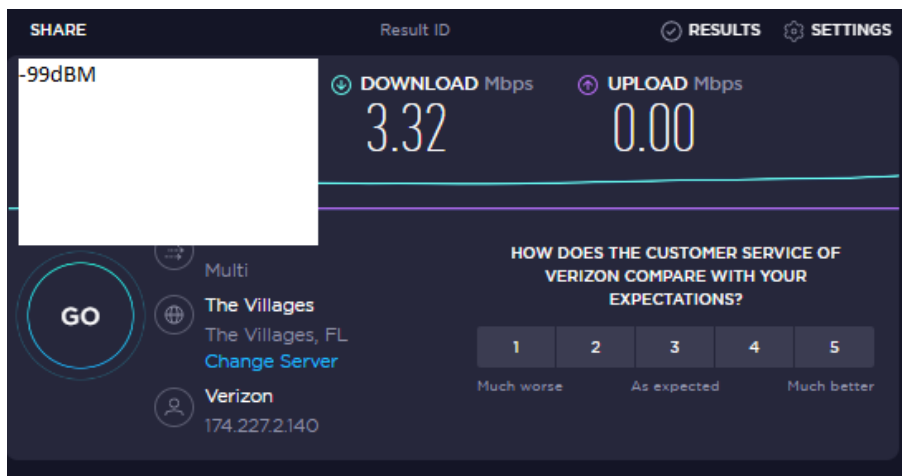
             (I cannot find a screenshot of a speedtest where I repeatedly got
                  20mbps/10mbps speedtests)

Speed Test at RSSI (Receive sig) of 95dBM and RSRQ (Sig Quality) of -15db
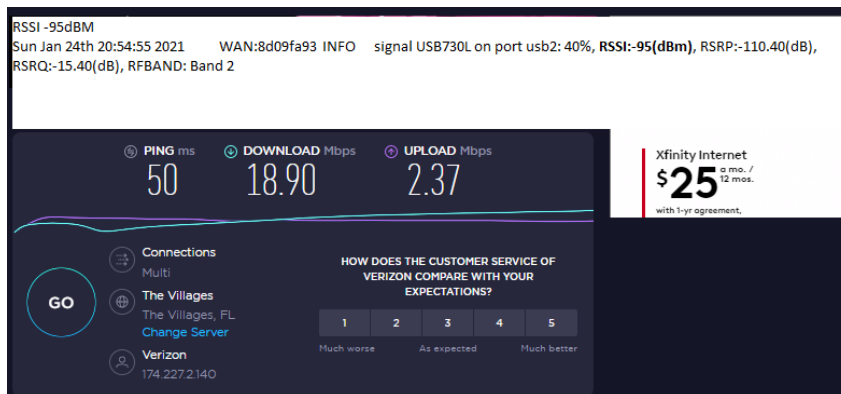
Network Performance speedtest with RSSI of -99dBM (not good)

Confirmed that the 700, 850, and 1900 mhz cell bands are being used from the 730L modem.

Ran an ookla speed test that you can watch how the speed test looks on the spectrum analyzer watching the 1900 Mhz band.

Video of the Spectrum Analysis - you will see mostly 'ack's of the download in the first 20 seconds of the video, then when the upload starts in the second half, that more bandwidth is taken for the upload. Approximate throughput was 20mb/s download, 10mb/s upload.

https://youtu.be/A67RiNeTLOs

This information will help us determine which Yagi / LPDA antenna we will be recommending to add to our capability.

Here are the key metrics of Cellular:

RSSI – Received Signal Strength Indicator:

RSRP – Reference Signal Received Power: RSRP is a RSSI type of measurement, as follows there are some definition of it and some details as well. It is the power of the LTE Reference Signals spread over the full bandwidth and narrowband. *A minimum of -20 dB SINR (of the S-Synch channel) is needed to detect RSRP/RSRQ*

RSRQ – *Reference Signal Received Quality: Quality considering also RSSI and the number of used Resource Blocks (N) RSRQ = (N * RSRP) / RSSI measured over the same bandwidth. RSRQ is a C/I type of measurement and it indicates the quality of the received reference signal. The RSRQ measurement provides additional information when RSRP is not sufficient to make a reliable handover or cell reselection decision.*

Here's what those logs looked like when I first looked (-95 dBM) is not usable, -85 dBM is the best performance I could achieve on the system… with corresponding RSRQ of -11(db). (Ignore the december date and time, they correspond to my work on Sunday Jan 24th, it was an NTP thing)
Wed Dec 31 20:05:33 1969|INFO|WAN:8d09fa93|signal USB730L on port usb2: 40%, **RSSI**:-95(dBm), **RSRP**:-110.30(dB), **RSRQ**:-14.00(dB), RFBAND: Band 13

Wed Dec 31 20:05:44 1969|INFO|WAN:8d09fa93|signal USB730L on port usb2: 40%, **RSSI**:-95(dBm), **RSRP**:-110.00(dB), **RSRQ**:-13.40(dB), RFBAND: Band 2

Sun Jan 24 21:05:01 2021|INFO|WAN:8d09fa93|signal USB730L on port usb2: 64%, **RSSI**:-89(dBm), RSRP:-89.40(dB), RSRQ:-11.60(dB), RFBAND: Band 13
Sun Jan 24 21:05:06 2021|INFO|WAN:8d09fa93|signal USB730L on port usb2: 24%, **RSSI**:-99(dBm), **RSRP**:-109.90(dB), **RSRQ**:-17.20(dB), RFBAND: Band 2

Sun Jan 24 21:05:12 2021|INFO|WAN:8d09fa93|signal USB730L on port usb2: 24%, **RSSI**:-99(dBm), **RSRP**:-120.00(dB), **RSRQ**:-16.80(dB), RFBAND: Band 4

Note that Band 13 is 750 Mhz Band 2 is 1900 Mh.   Band 4 is LTE 850

This **video** shows **spectrum analysis** of traffic on both ~750 and ~1900 bands as received by the rooftop antenna   while the 730L modem used the mast mount antenna:

https://youtu.be/voJp8mDDy90

Why does this matter ?

We may have to use directional antennas for internet acquisition by cellular, this information will allow us to aim the antenna for best performance

8. Opened rooftop cable entrance and verified which Cellular Antenna is connected to which cable so that its easily determined which antenna is in service.

> **Need to weatherproof the feedthrough** into the rooftop box for the coax entering the curbside of that box, else water incursion into the roof will happen.

10. Ran the generator successfully with Mike as his assistant for many things, moving some winlink messages with my callsign on the PCC laptop. Also worked with Mike to stow the end fed antenna, grounding project, hurry up mast project, and fuel tank project.

11. Verified the rooftop broadcast antenna works, watched the Chiefs play the Browns after our Buccaneers beat the Packers.

12. Swept the PCC out till it was looking good and stowed the ladder in the aft room of the PCC

Had a great time the 24 hours I was there...weather was **beautiful** and enjoyed the visit & hospitality with Mike and Nancy. Mike and I got a lot done thats on his list, generator tanks, ground rods, stowing the end fed HF antenna, and the Hurry Up Mast (is amazing):