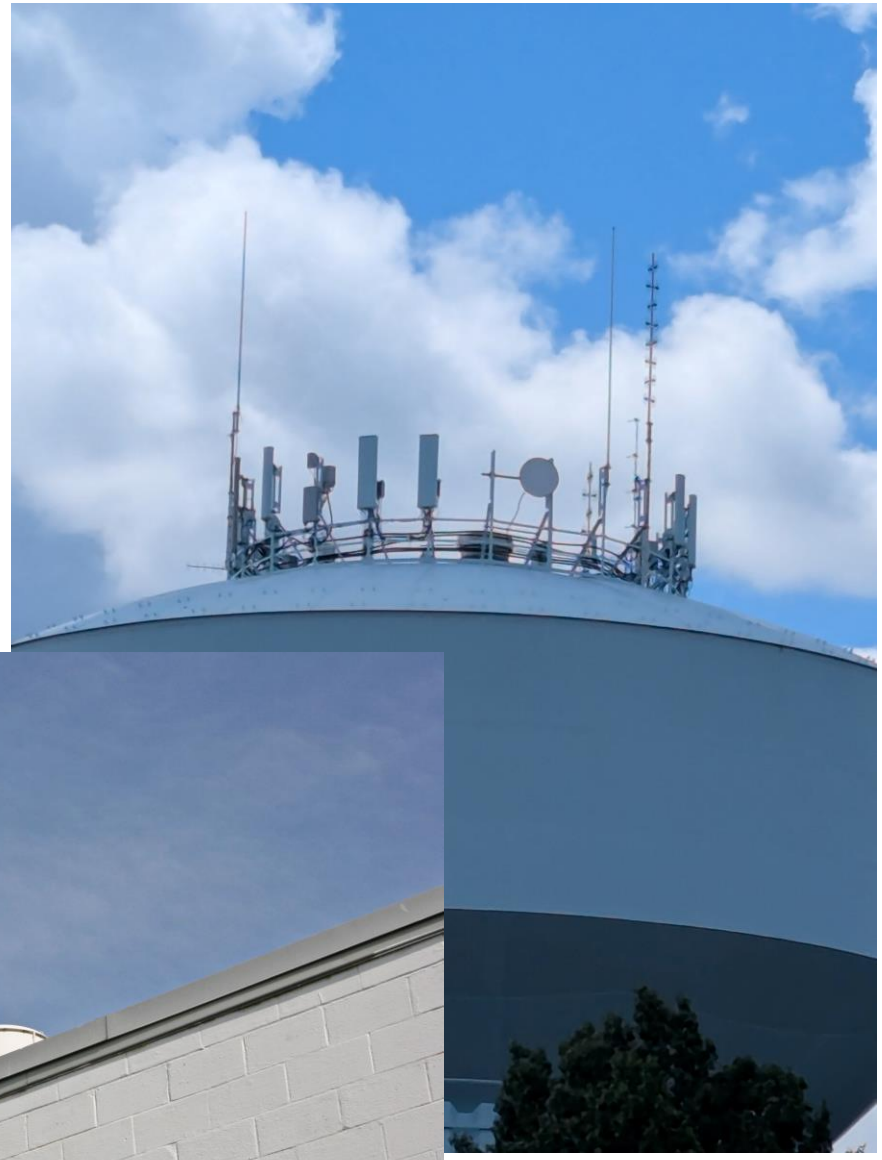
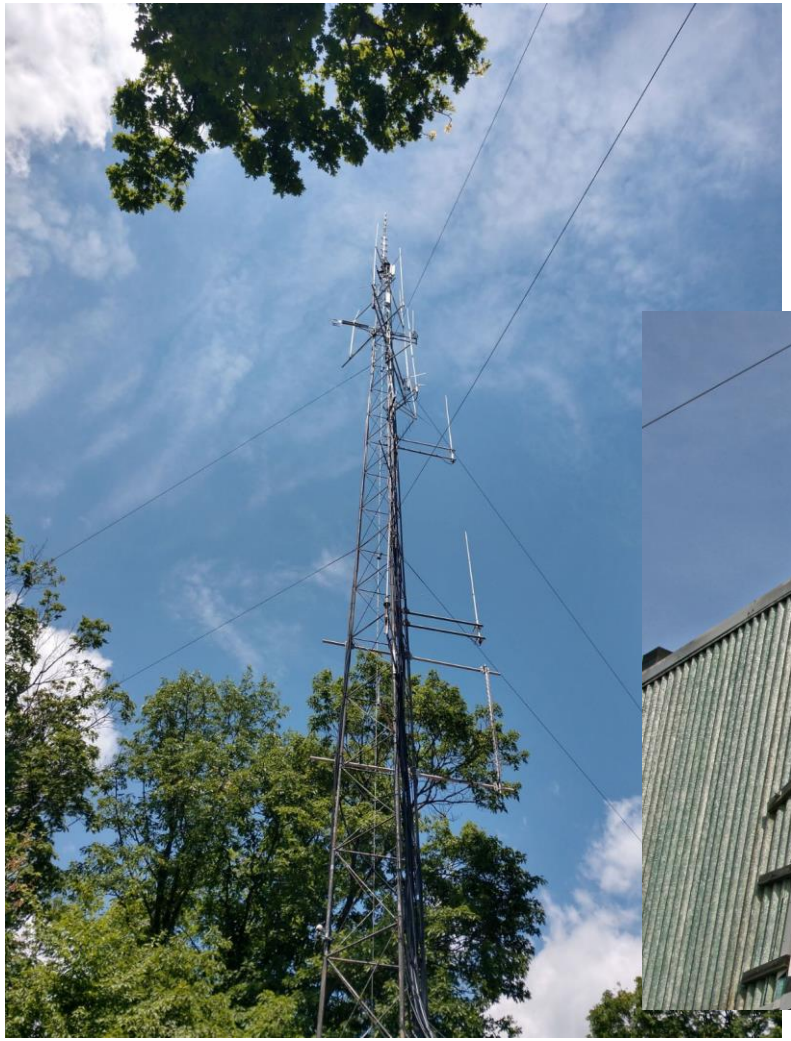
PackRat Beacons

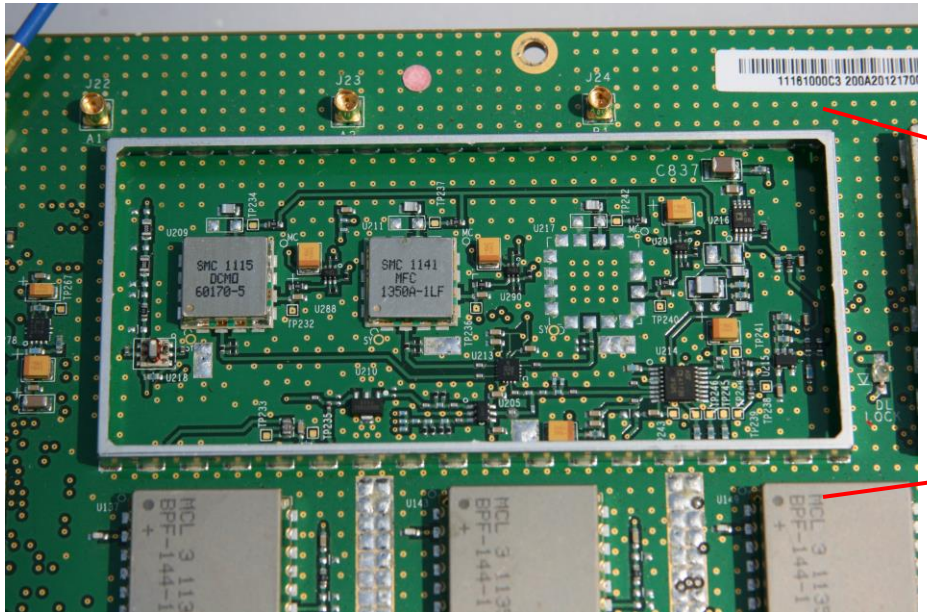




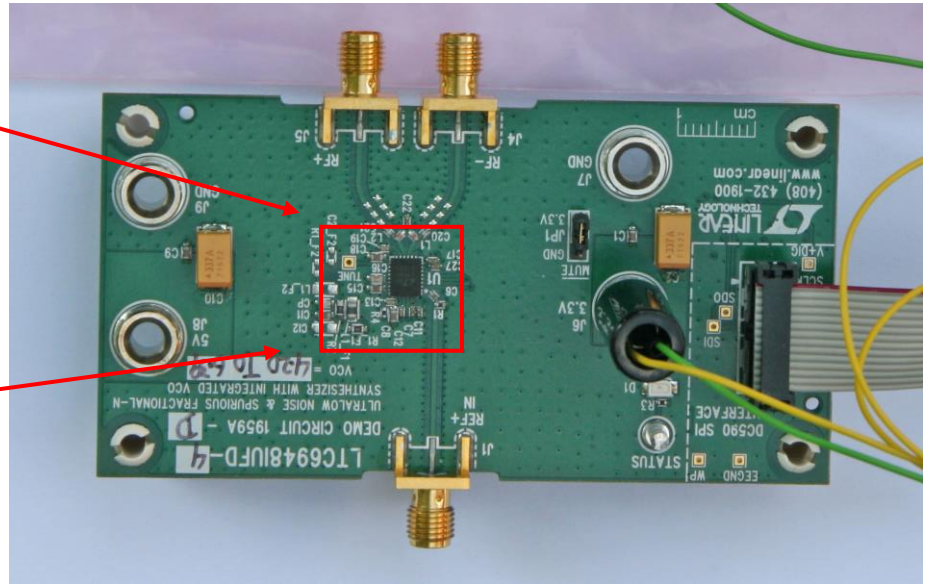
A brief History

- Ron, W3RJW built our 1st beacons in the early, to mid 80's. I don't know when the beacons were 1st installed. Legend has it Ron walked the Hamfests back in the day and bought things that he thought could be used to build beacons.
- Jack K3CX, put the beacons on top of the PECO building in Phila, this was a fantastic site, we had access, it was high in elevation and right in the middle of Packrat territory. The beacons served us well for a long time.
- I am not sure, of the date, it was about 2013 Jack had to remove the beacons from the top of the PECO building.

- About that time, the company that I was working at was looking into cost reduction of their products. One part of the product that could be reduced in cost and PC board space due to technology advancements was the local oscillator.
- Not going into details here, (it could be another program if there is interest), but we had a demonstration PC board from a vendor to show our engineers how the new part would work to replace several parts in our local oscillator design with one part.



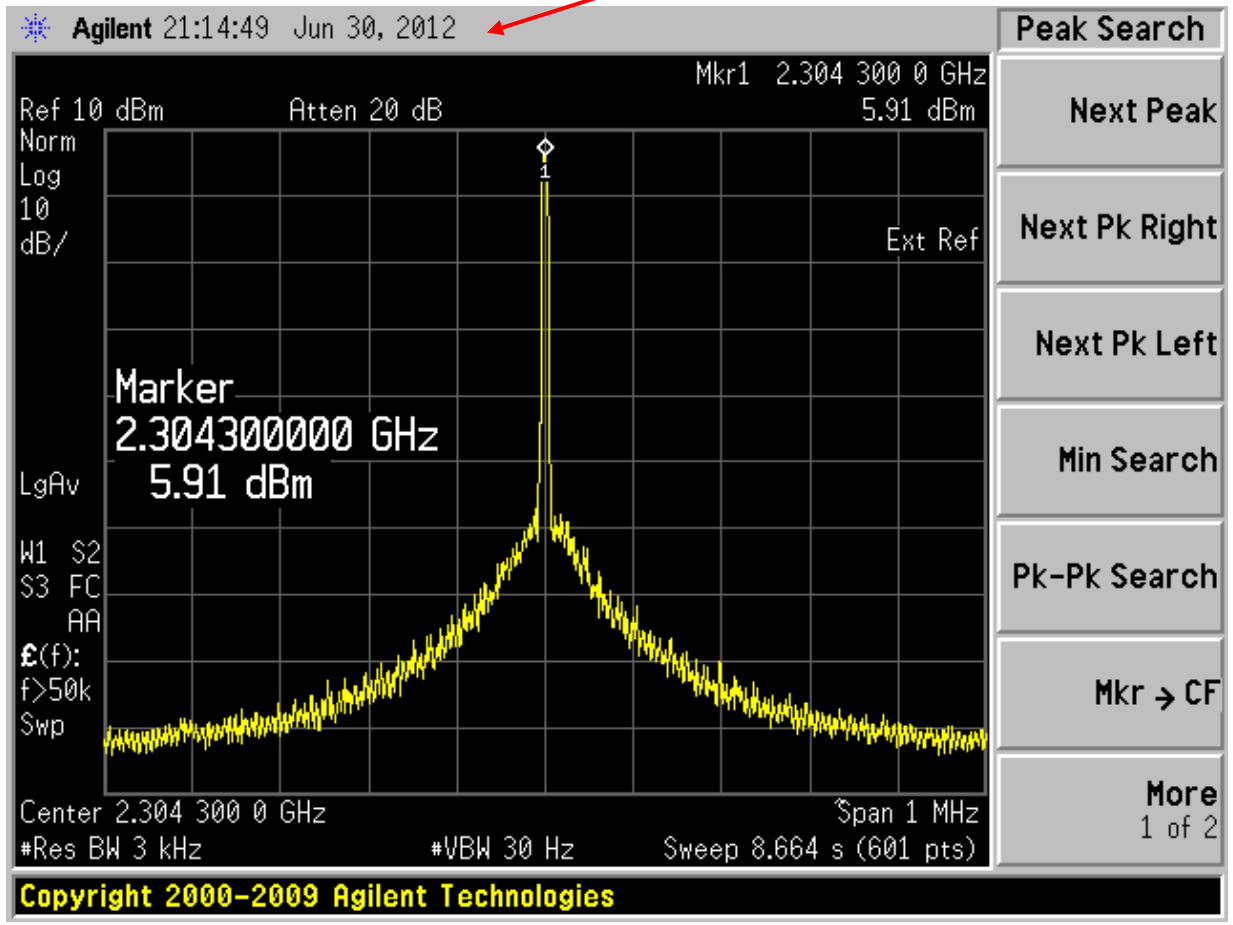
Demo board

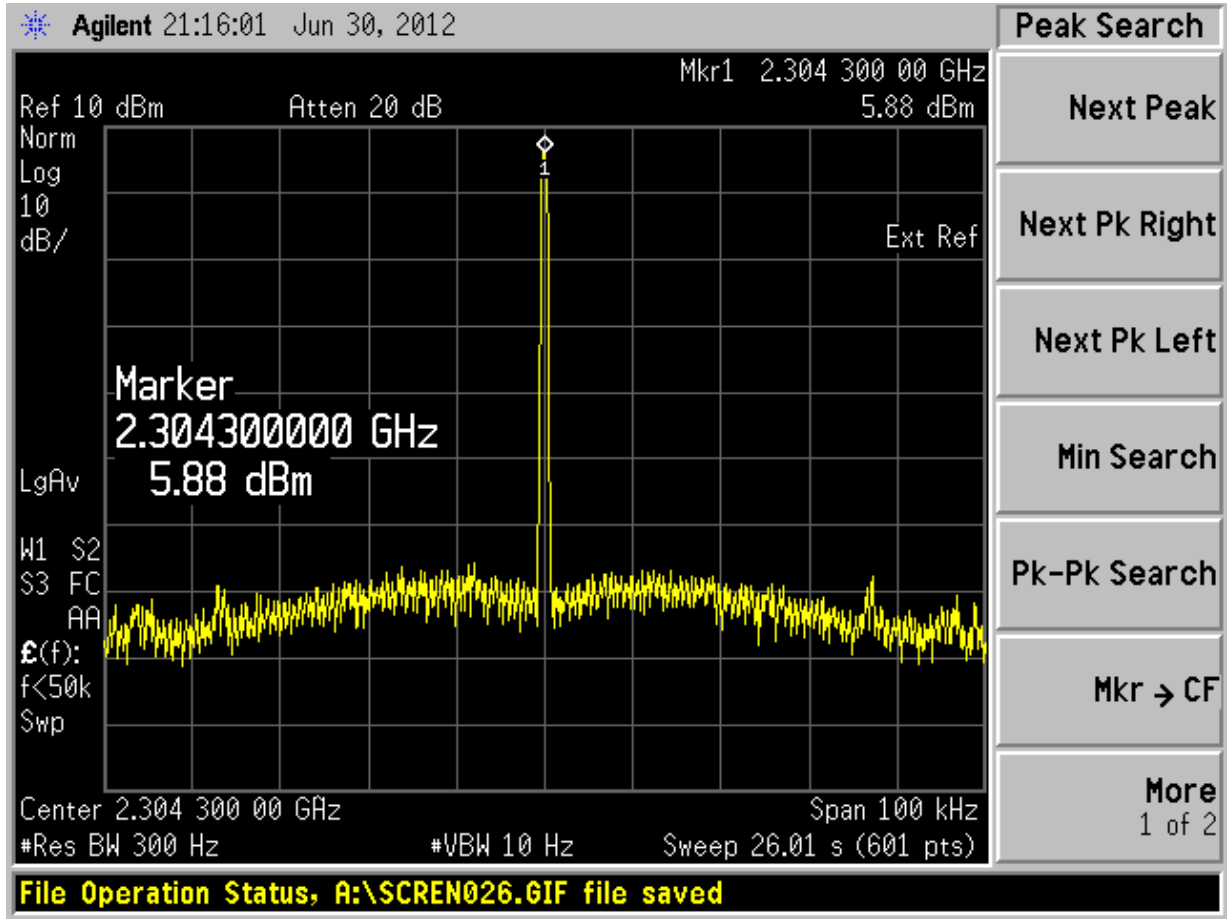


~ ¾”
square

Hmmm, ….I wonder what would happen if I typed into the demo software provided, 2304.300?

It worked!





Not bad for a small surface mount part, that costs about $20.00, and plug and play demonstration board available for $120.00.
Turns out this is the same technology used in the DEMI product the “Digi-LO”.

- It became clear right away, with this RF source board, and the GPS receiver used in our products, all we need is an amplifier and we have a GPS disciplined beacon at least the RF part.
- It was also clear that a controller would be required, the GPS board has a serial interface, the RF source has a SPI interface, and there needs to be a message sent.
- Describing to Bruce WA3YUE, what the requirements were, he said a Arduino would do all the above for a cost of about $20.00

- So, about 2014 constriction began on a 2304.300 beacon using these parts. 2304 MHz was chosen 1st because the 2304 beacon performance on the PECO building had been comprised for a while.

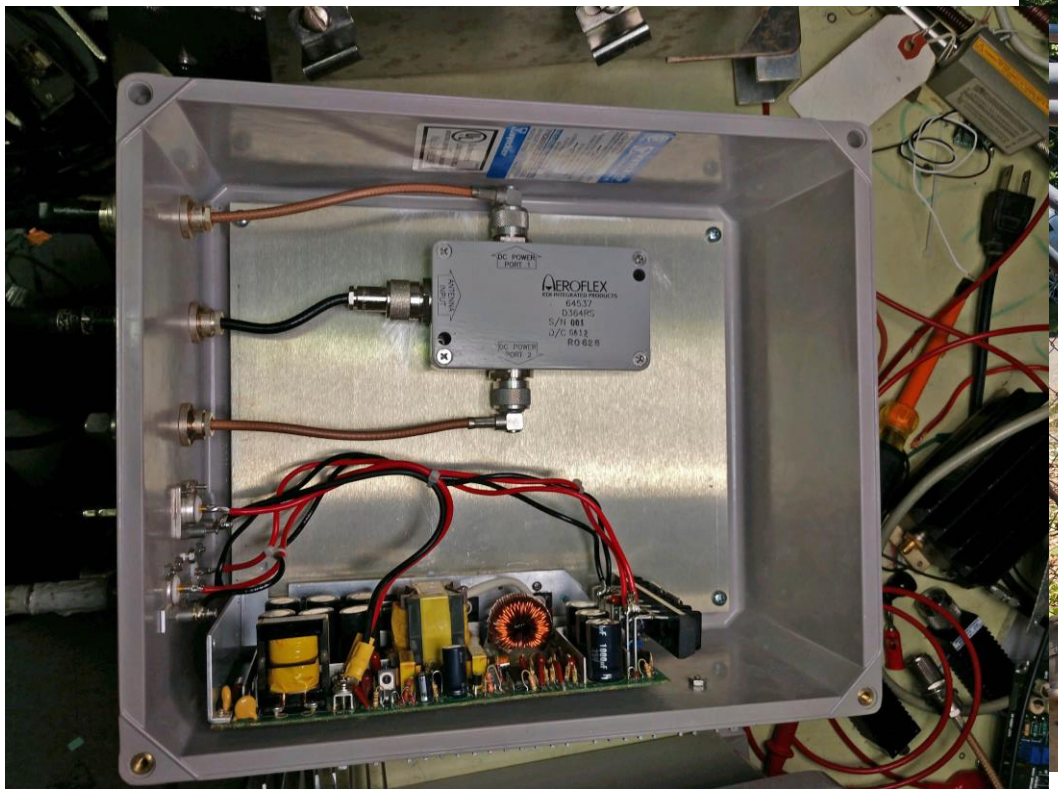
- Making a long and several year story short, we found finding a good location for Amateur Radio beacons is not easy. It was not until 2017 we finally had permission to install beacons on the tower used by the Pottstown Amateur Radio Club.

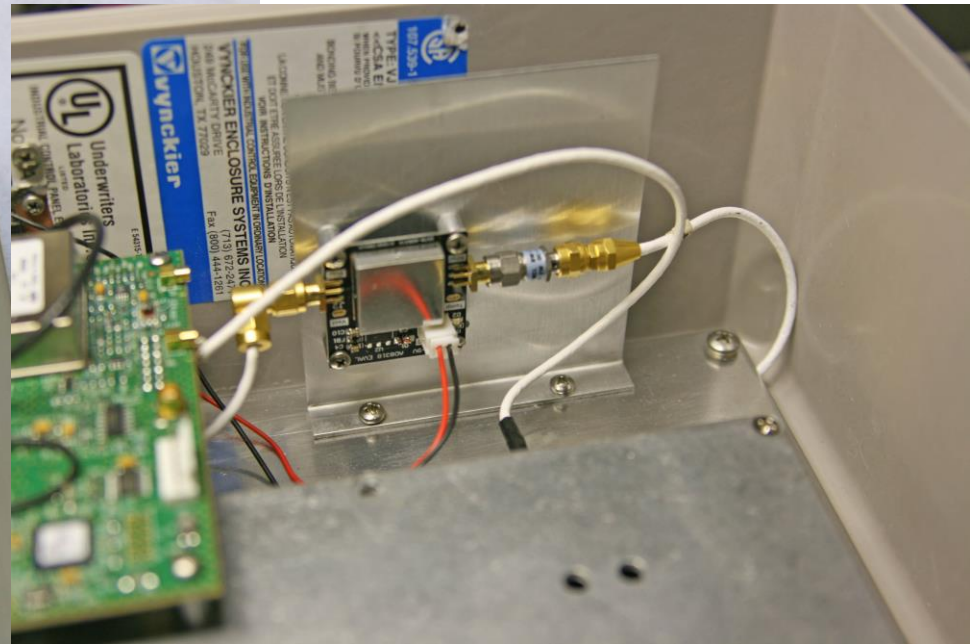
Pottstown Site

- After negotiations were complete with the Pottstown area Amateur Radio Club , we received permission to install beacons on their tower. After a site review, we decided not to install beacons operating on the lower VHF bands and risk interference with their repeaters operating in these bands.

- The 2304 beacon was 1st to install at this site, running 10W, and a stacked wheel antenna shown here. It worked well for a while.
- This antenna was provided by a Ham running a business called Old Antenna Lab, he was primarily making antennas for ATV, but made Omni antennas as well.

After the 2034 beacon had been running, (not sure of the timeframe, it was running for at least a year), we asked Pottstown for permission to install 1296. They agreed and asked us to install Mesh network hardware at the same time we added 1296. We agreed, and in 2021 we installed the 1296 beacon and a box that included a upgraded DC power supply and GPS splitter shown here.




Underwriters
vynckier
VYNCKIER ENCLOSURE SYSTEMS INC

Pottstown Pictures

- After a short time, the Mesh operators started complaining that the Mesh network node was not working as expected, it didn’t take long to figure out that the 2304 beacon was interfering with the receivers used in the Mesh network node.
- Len negotiated a fix, to allow us to reduce power on the 2034 beacon until it no longer de-sensed their receivers.
- It required near a 10 dB reduction in power to solve the problem, so we were left running about a Watt at the beacon output, less at the antenna. The 2304 beacon was left running this way. Most stations in the DE valley could still hear it, but it was very weak in SNJ.

Warren at work on the Pottstown tower.

The 1296 and 2304 beacons worked for a few years, Phil, K3TUF had expressed concern that the wheel antenna for 2034 was not going to stand up to the environment at the top of a tower in the woods. Turns out he was right, and the antenna failed a year or so later.
So, 2304 was turned off, 1296.300 was left running at 10W. 1296 can be heard by most stations in Packrat territory and has provided excellent service for a number of years now. It is still running today.

More about 2304 later.

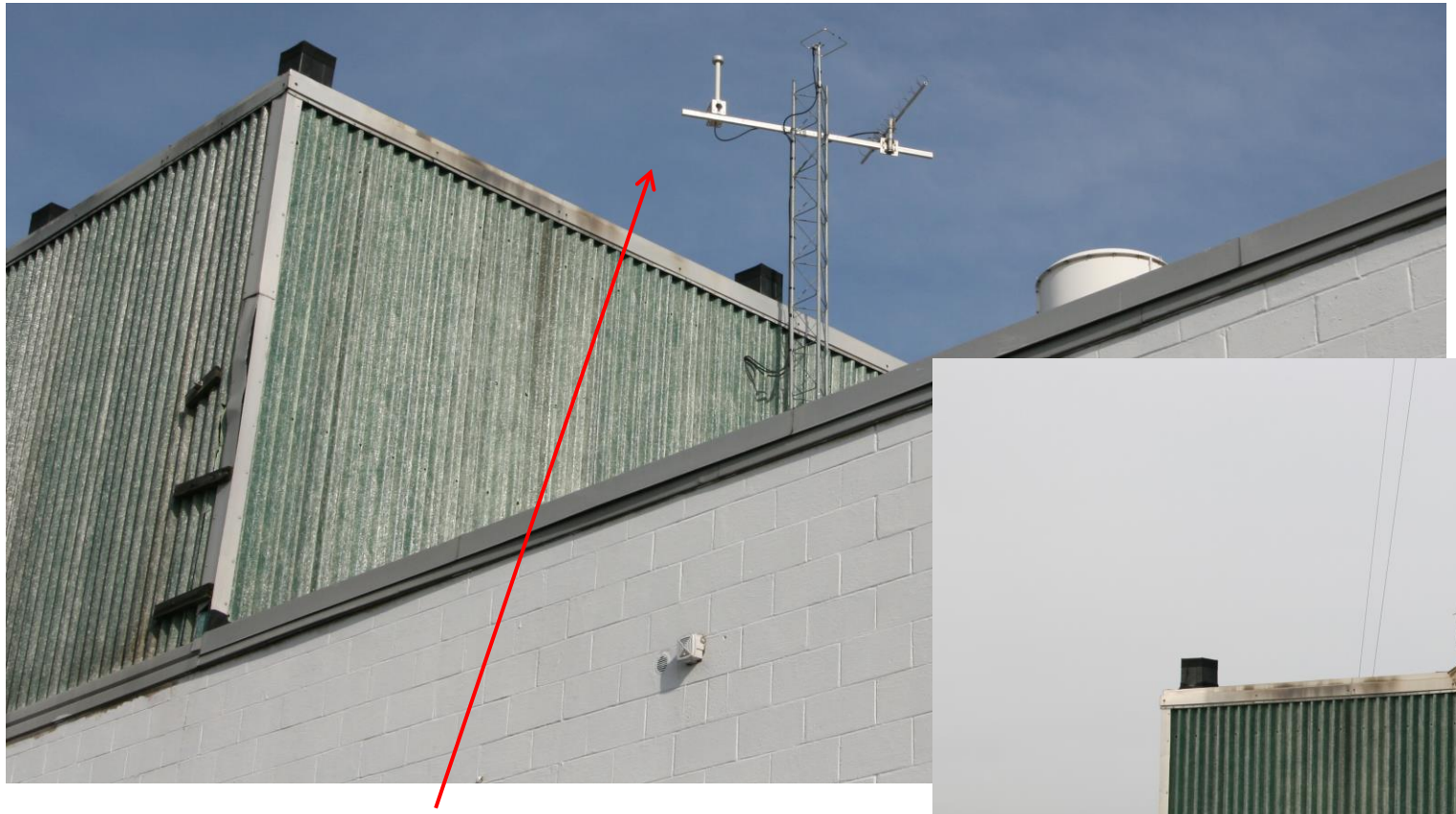
- During the time negotiations were being completed at Pottstown, another site was becoming available to us. This site was a de-commissioned TV station located near Mountain Top PA on the top of Penobscot Mtn.

Our beacons are located at the top of this tower, you believe that?

No? Good, because its not true.

- There is a building that housed the transmitters for the TV station on the top of the mountain, our 2M, 903 and 5760 beacon antennas are located on the roof of this building.
- Jim, WA3LBI had arranged access for Ham Radio use to this building. Phil, K3TUF worked with Jim to arrange for the Packrats to have limited access.
- The station owner even installed a short Rohn 25 tower for us to mount antennas on.
- The roof top is also used for microwave operations, for example the 10 GHz contest.

- When we 1st considered this site, there was a lot of skepticism about the location, concern was raised about the location being out of the DE valley and too far away. As most things in the engineering world, it is tradeoff.
- In the end we it was decided to put 2M at this site, and one microwave band. Since we were also working with Pottstown to install a 2304 beacon about this time, we decided 903 would be a good band to try.
- Again, - we also had decided not to attempt install or ask Pottstown to host any of our beacons on the lower 4 bands, since they had equipment running on 2 meters, 222, 432 etc.
- The 2M beacon has been performing well at this site, the beacon is weak to a station in the DE Valley with a average location and a single Yagi, but the tradeoff is, we have coverage and reports of the beacon being heard from Canada to VA. So, W3CCX is well known throughout the VHF community having a excellent beacon on 144.300 MHz.



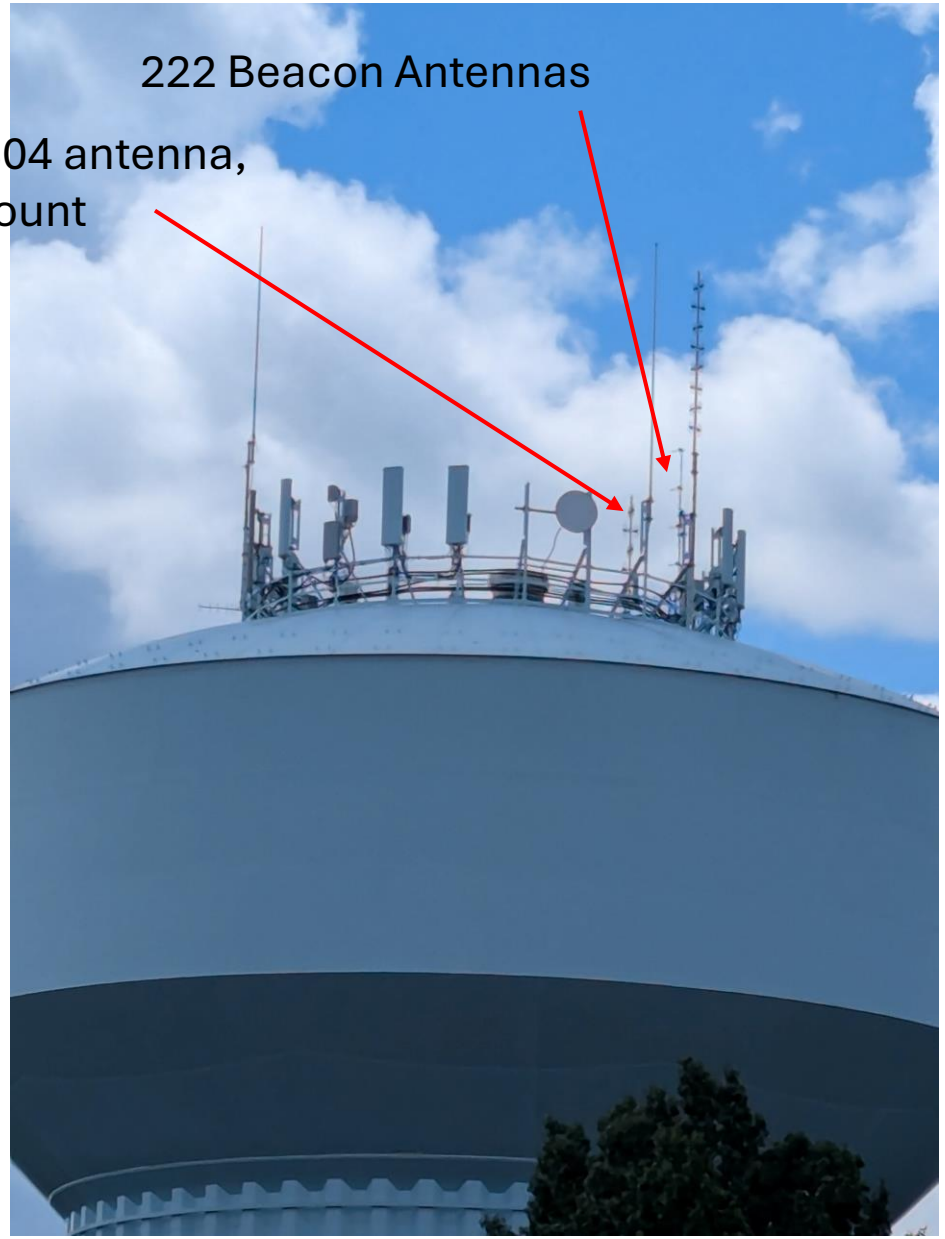
GPS antenna, 2 meter
Omni antenna and 902
Yagi pointed at Phila.

Shelter on top of the building,
houses 903 and 5.7 RF box.

A view inside the shelter on top of the roof at Mountain-Top.

Our 2M beacon is located on a shelf in a row of racks that used to house TV transmitters.
We don’t have pictures now, but the 903 amplifier that was in this box has been moved to the top shelter so just the low-level source is in this box now.

New Brunswick Water Tank



Warren, WB2ONA wanted to try beacons at a site he had access to, and thought 222 and 432 were the bands to try. This site was somewhat easier to build the RF box for since the RF hardware would be in a shelter and a rack, not outside. The club inherited some Omni antennas from a silent key, so everybody agreed and wanted to try this new site near New Brunswick NJ.

2304 RF source box, low level out.

432 amplifier

222 Beacon RF box

432 RF source box

2304 at New Brunswick

The New Brunswick water tower has also proven to be a excellent site for our beacons. 222 and 432 beacons are heard up through New England and down to MD.

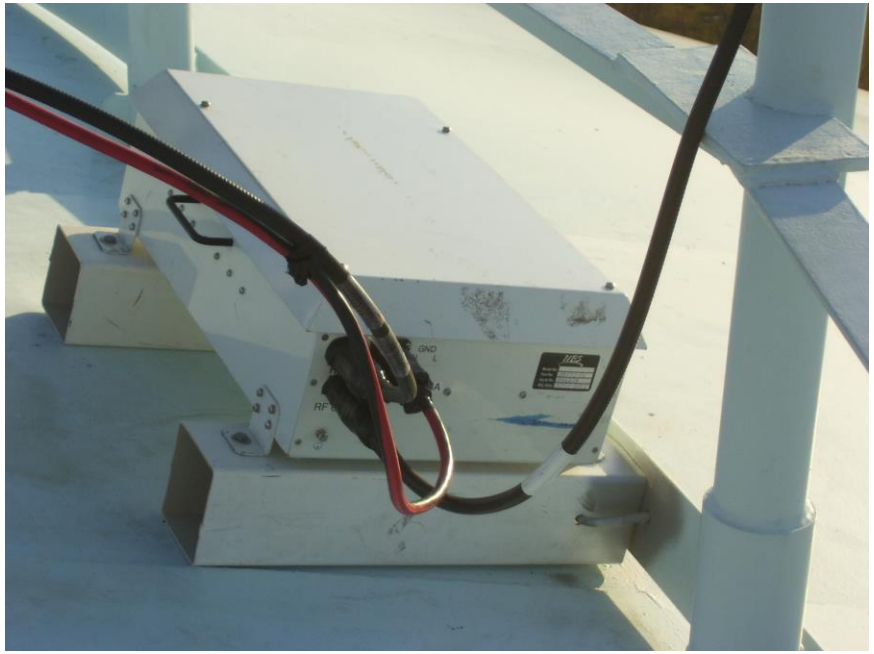
After success on the VHF bands, Warren said, why not put 2304 on the water tank we can run more power!

Again, after some skepticism we agreed to try it, how much power can we run?

Warren didn't know of a limit, but the water tank is in a populated area, so we thought 25 W would be a good place to start, and that is lot considering we can place the amplifier at the antenna.

2304 slot, donated by a club member

High power 2034 amplifier on top of water tank, also member donation.



Warrens assistant installing the 2304 antenna on the water tank.

Summary

- It took some getting used to having beacons out of our local area. But beacons can be more useful if weak in the receiver than +10 or more on the S meter. We don't use the beacons as often to make contacts like we did in the past due to technical improvements in our stations. Remember 10 KHz below the beacon!! Most everybody on microwaves is locked to a stable reference now compared to the 80's.

- Send signal reports once and while to the Packrat reflector or to a club BOD member. At times we hear no reports until a beacon goes off the air then the discussion board lights up!!

- Beacon hardware is a on-going project, improvements are always in process. For example, as of now, we have new antennas ready for install on 432. A 10 GHz beacon is in process of construction. 3400 MHz beacon is ready for install, waiting for a date in the next 2 weeks to install. New amplifiers for 222 and 432 are possible.

- The 5760 beacon has not been reliable, we are going to re-start it soon and work on other attempts to fix it.

- If the membership would like a technical program on exactly how t he beacon hardware works, just send request to a BOD member. It is somewhat low cost for anybody to construct a GPS disciplined beacon on just about any frequency.

The Future?

Even in today's world of digital communications, there is still a use at most times to have a RF carrier available, in band, at a known level and frequency.

However.....

Some beacons are being deployed by other groups and operators that use have digital modes.
Some alternate at intervals from CW to digital.

Modules and PC board radios are available to do this, any member would be welcome to start experimenting with these boards and build beacon hardware !!!

We have access to our sites, these radios can be deployed and experimented with and tested.

The beacon hardware, software, access to sites, locations, and installation has been the result of many member contributions, this includes lots of time and money.

The Packrats have W3CCX well represented on all bands, VHF through Microwaves.

Questions, Comments?

Recognition Page

A number of people continue to contribute and support the Pack Rat Beacons project. Their contributions range from financial and material donations, machining, assembly, tower installation, and time / labor.

The beacon project would not be possible without the support of these individuals:

Warren WB2ONA	Bill AA2UK
Bruce WA3YUE	Tom KA3FQS
Phil K3TUF	Al W9KXI
Len N3NGE	Jeff WN3A
Ray N3RG	
George KA3WXV	
Gary WA2OMY	