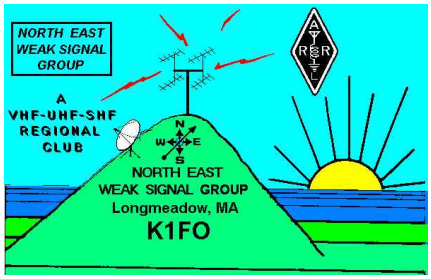


N.E.W.S. LETTER

The Official Publication of the North East Weak Signal Group – N.E.W.S. - Home (newsvhf.com)

JANUARY 2023	Volume 31	Issue 1

Next Meeting: January 7, 2023

.

In This Issue

BOARD MEETING - 11:00 AM at Lulu's, 151 Hazard Ave. Enfield, CT
Phone: (860) 763-2377 I-91 Exit 47 Rt. 190E 1 Mile on Left
http://luluspizzeria.com

GENERAL MEETING - STORRS LIBRARY - from 1 PM to approximately 3:45 PM.
693 Longmeadow St, Longmeadow, MA 01106
http://longmeadowlibrary.wordpress.com

DON'T FORGET

The North East Weak Signal Group 2 Meter Net
Every Thursday at 8:30 PM local 144.250 MHz
W1COT, WZ1V, or K1BXC Net Control

MEMBERSHIP in the N.E.W.S Group is $10 per 2 years.
Apply to George Collins, KC1V. E-mail: news.kc1v@gmail.com.
You may download an application from our web page: http://www.newsvhf.com

Send articles by e-mail to Don Twombly at donw1fkf-news@yahoo.com.

Treasurer's Report November 19, 2022

Opening Balance 11-1-2022:	$3422.88	
Income:	$10.00	Dues
Balance as of 11-19-2022:	$3432.88	

Current Paid Members:

One renewal in November

Totals are:

76 Regular
3 Life
12 Permanent

Submitted November 19, 2022
George Collins, KC1V
Treasurer, North East Weak Signal Group

NEWS Meeting 19 November 2022 at Storrs Library, Longmeadow, MA and by ZOOM

Called to Order by President, WA2AAU, at 1328
12 Members Present,19 by ZOOM
TREASURERS REPORT
Balance $3433
Members:
76 Regular
3 Life
12 Permanent

OLD BUSINESS - none

NEW BUSINESS

- K1MAP Microwave Update and Northeast VHF/UHF Conference will be at Hilton Garden Inn 555 Corporate Drive Windsor CT
- KV1J and W1FKF working on K1FO 10 GHz beacon in Maine. Probably spring
- KA1SUN has location for 432 beacon on Mt Equinox if someone can supply a beacon.
- W1FKF looking for another 10 GHz beacon for additional location in FN41 and Mt Equinox

MOTION - W1LE to purchase 2 Kuhne oscillators for 10 GHz beacons and other parts up to $1200. 24 YES 1 NO > Stan will place order. N1JEZ has GPS 10 MHz oscillator
Note: W1LE adds that there is no frequency allocation needed at this time.

ANNOUNCEMENTS:

- K1MAP - Has K1IIG 10GHz beacon - will put at his house
- Schedule for next meetings needed
- DataIO 29A or B programmer needed

Adjourned 1417

PRESENTATIONS:

- WA1MBA 47 GHz quadrupler - for beacon
- W1GHZ Sectoral horn antennas for beacons

- WA1ZMS (by ZOOM)- NEC 2022 (National Electrical Code) and impacts to ham radio (Or rewiring your shack)

Microwave Update 2023
plus Northeast VHF/UHF
46th Conference
April 13 to 16, 2023
Hilton Garden Inn @ Bradley Airport, Windsor, CT

Details for registration and hotel coming very soon at Microwave Update - Home

The North East Weak Signal Group would like to invite you to the annual Microwave Update Conference to be held April 14 and 15, 2023 (with additional activities April 13th and 16th at the Hilton Garden Inn at Bradley Airport, Windsor, CT

Microwave Update is the premier microwave conference of the year and was initially started by Don Hilliard W0PW (sk) back in 1985. This is the ideal conference to meet fellow microwave enthusiasts and share ideas and techniques that will help you conquer your next microwave band.

If you are interested in speaking, please let us know. PLEASE!

Topics will include small dish EME, microwave propagation, parabolic dish feedhorn design and construction, SSPAs, circuit design, latest microwave devices, software defined radios, digital modes just to name a few.

Topics for the Eastern VHF/UHF Conference sessions will include antennas, propagation, EME, roving, SDRs, SSPAs, circuit design, digital modes, and activity nights. On Thursday afternoon, we plan at least one tour to local attractions. Thursday evening will have an informal social gathering (BYOB due to hotel rules).

Of course, there will be the traditional Saturday night banquet.

On Sunday morning at the Vintage Radio Museum, Windsor, CT, there will be a tailgate swap meet. The museum will have reduced price admission.

There will be a Test Equipment workshop and noise figure testing available during the conference and a Vendor area.

We plan to have an informal program for the spouses on both Friday and Saturday.

Hope to see you in the soon once again!

73,
Mark Casey K1MAP Conference Co Chairman
Paul Wade W1GHZ Conference Co Chairman
November 3, 2023

CALL FOR PAPERS

Presentations and papers for PROCEEDINGS needed (you've had three years, so there must be some good stuff out there). more info: w1ghz@arrl.org

For Sale:

W1GHZ PC boards
Winter is a good time for club projects. To possibly promote more microwave activity and getting new folks on the bands, I will offer a 20% discount on my PC boards(W1GHZ PCB Projects) (www.w1ghz.org) thru January for club or group projects.
73,
paul W1GHZ

Ameritron AL80 HF amplifier (160-10)

This AL80 (s/n 551) is from the group described on the W8JI website as having all the original "flaws" for the AL80 corrected. It is a single Eimac 3-500Z tube will run about 800w output on 160/80/40 meters 750 on 20 meters 700 on 15 meters and 600 to 650 on 10 meters. Unit is in nice clean shape and works well. I can supply other photos and a couple of videos in operation if needed. I am located near Springfield MA and would rather have it picked up or meet someone at a "reasonable distance" than ship it. Asking $750 plus some gas money if I were to meet somewhere. I can bring it to the NEWS meeting for free.
email n1dpmfred@gmail.com or call or text to 413-519-3189

NEAR-FestXXXIII FOR IMMEDIATE RELEASE

NEAR-FestXXXIII will be held on April 28th and 29th 2023 and not on its traditional date which always has been the first weekend in May every year since 2007. NEAR-Fest XXXIV scheduled for October 13th and 14th 2023 is NOT affected.

Last month the Deerfield Fair Association informed me that they booked two events, the NH Farm, Forest and Garden Show and the NH Arabian Horse Ass'n Show at the Fairgrounds for May 5th and 6th 2023 which is the weekend before Mothers Day. We were told we were welcome to hold the NEAR-Fest at the same time with the two other shows but there would be a "few small changes" to the parts of the Fairgrounds that we would be allowed to use.

Mister **Mike** <w1rc@near-fest.com

Weekly Calendar

Mon. Packrats Nets start at 7:30pm on 6 meters, 8pm on 144.150, etc. Philadelphia area.
Tues. Mud Toads Net FM17, Virginia 8pm 144.250
Activity Night 7:30pm 222.100 K1WHS+
Weds Activity Night 432 N1DPM+
Thurs. NEWS net, W1COT (K1BXC alternate) 8:30pm 144.250
Sat. Chesapeake Net 144.205 W3BFC FM28 9pm
144.205 Mornings 8:30-9:30 AM -- 144.205 , 144.190, ME, Canada to NC and out to OH, WV

Officers:

President Dick Frey, WA2AAU, Delanson, NY
Vice Pres. Eric Mazur, KA1SUN, Savoy,

Treasurer George Collins, KC1V, Somers, CT
Secretary Paul Wade, W1GHZ, Cabot

Board Of Directors:

Don Twombly W1FKF, Loudon, NH
Dick Wilborg W1ZC, Mason, NH
Bob Bownes KI2L, Troy, NY
Mark Casey K1MAP, Hampden, MA

Update on parts for 10 GHz beacon on Cape and 432 MHz beacon on Mt Equinox

The 2 each microwave LOs Kuhn-Electronics model MKU LO 8-13 PLL-2 Oscillator Units have been ordered direct from Kuhne. Expected production may be in January 2023, then a week or 2 to get to me. A single Kuhne interface board was also ordered.
The plan is for 2 beacons one for 432 MHz on Mt Equinox and the second for 10 GHz at a location to be later decided upon.
The internal CW keyer built into the oscillator unit will be used, though I am considering an external keyer with a larger memory.
For the 432 /B, the CWID will initially be for the facility license holder at Mt Equinox. These people will be providing the AC power.
A GPS/DO has been committed to the 432 project, but an external OCXO 10 MHz reference may be more practical. The GPS antenna would require a hole in the roof or the siding for the antenna to see the satellites. Maybe a 6 month cycle of swapping out the OCXO ext ref with a freshly calibrated unit may be more practical in keeping with the KISS principal. That way only 2 lines/cables at the enclosure, AC power and RF output to the avaliable (already on site) 432 MHz omni horizontally polarized antenna.
Mitsubish brick type PA has been committed for the 432 beacon project at Mount Equinox.
NEMA 4X enclosure has been committed for the 432 MHz /B. NEMA 4X is outdoor rated and weather proof.
A similar enclosure for the 10 GHz /B is planned, but the box internal area needed, has not been fully defined.

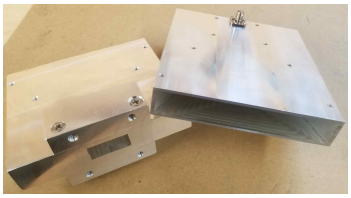
A 432 MHz low pass filter has been ordered from Ebay. Exact RF filtering requirements have yet to be identified. Worse case is a cavity type, which has been talked about.

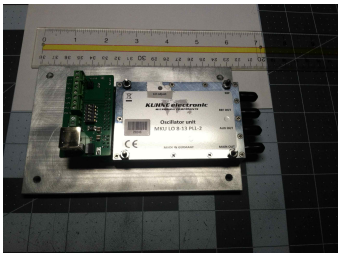
For an external CW keyer, I am looking at a very cost effective K1EL unit, but it can only be programmed at the factory. I would prefer to be able to program it myself, to retain flexibility. Still looking.

I looked into the ZL-PLL synthesizer that can have firmware for a CW Beacon key sequence, but I have not gotten any response from the source, ZL2BKC. Their website is: https://zl2bkc.com/category/zlpll/

A 10 GHz sector antenna has been committed.

The attached picture shows a typical Kuhne oscillator unit mounted on it's heat sinking plate. 4" x 6" x 1/4" AL





Progress is slow, but there is progress.

Stan, W1LE

.....

The North East Weak Signal [N.E.W.S.] Group was established to form a comradery amongst fellow VHF-UHF-SHF enthusiasts, and support a convenient means to exchange technical information

We are an ARRL affiliated regional club dedicated to the interests of "weak signal" work on the bands 50 MHz - Light. With over 100 members, we have a lot of technical expertise within our club which can help with about any question or problem conceivable on VHF and up.

Meetings are held 6 times per year at the Richard Salter Storrs Library, (ZOOM) in Longmeadow, MA on a Saturday from 1 - 3:45 pm. and will feature either a noted speaker or 'show & tell' presentation on a VHF-SHF related topic.

Our *"N.E.W.S. LETTER"* is mailed about 2 to 3 weeks prior to our meetings.

Sectoral Horn Antennas for Microwave Beacons

Paul Wade W1GHZ ©2022
w1ghz@arrl.net

Microwave beacons are really useful for monitoring propagation or just for reassurance that your gear is still operating. For rovers, they also provide an accurate heading and frequency. I monitor a 10 GHz beacon constantly so I am ready for any possible contacts.

Most beacons use omnidirectional antennas such as waveguide slot antennas to provide coverage in all directions. These antennas are omnidirectional, within a few dB, in the azimuth plane but have a narrower elevation pattern. The combination provides modest gain, typically 10 or 12 dB, around the azimuth.

The NEWS Group supports several beacons in New England. Recently, the 10 GHz beacon site on Mt. Washington, NH, FN44ig, was lost when the building housing it was removed. This beacon had excellent coverage and is a real loss. As a replacement site, Eric, KV1J, proposed a mountain in northwestern Maine to which he has access.

Since this location, FN44rq, is farther east than Mt. Washington, there is very little activity to the north and east. I suggested that we might consider a wide directional antenna that could mainly cover the parts of New England to the south and west where almost all activity occurs. In Figure 1, we can see that a 3 dB bandwidth of about 90° will cover most of the activity in New England. A second proposed 10 GHz beacon location on Cape Cod, in FN41, could also cover New England with a similar pattern, favoring the southern part of the region plus the New York, New Jersey, and Philadelphia metropolitan areas, without wasting power toward the ocean.

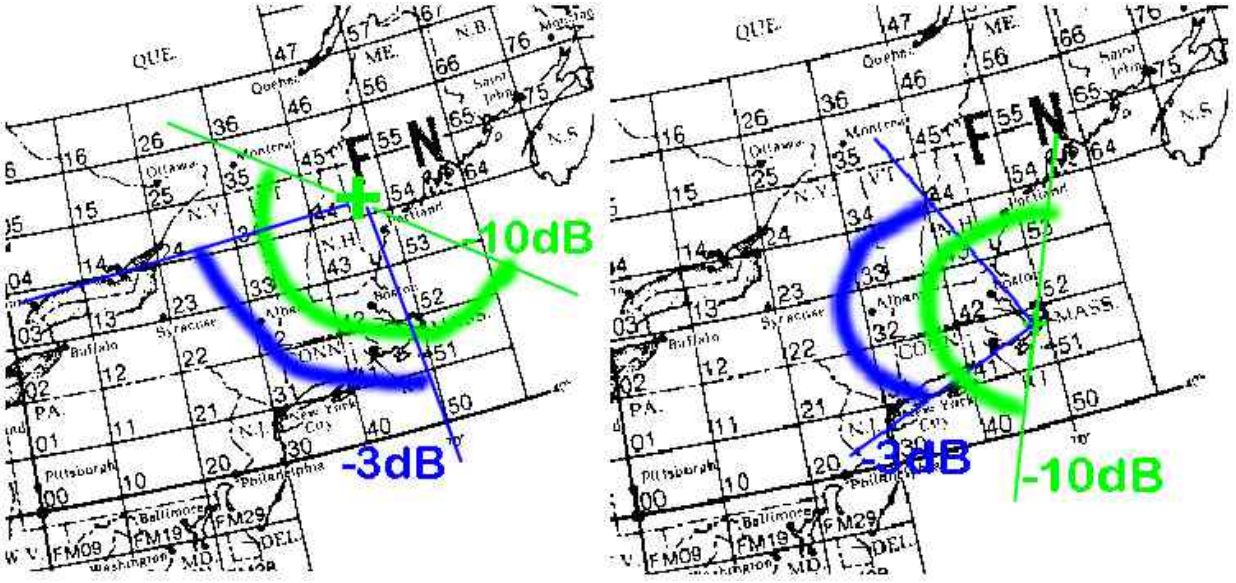


Figure 1 – An antenna pattern about 90° wide provides good coverage of New England from beacon locations in FN44, left, and FN41, right.

Sectoral Horn Antennas

The wide directional antenna I had in mind is a sectoral horn antenna, shaped to provide a wide azimuth pattern and a narrower elevation pattern. Kraus[1] gives these approximations for rectangular horn beamwidth, where A is the aperture dimension in wavelengths:

$$E_{plane} = \frac{56}{A_{e\lambda}} \text{ degrees}$$

$$H_{plane} = \frac{67}{A_{h\lambda}} \text{ degrees}$$

For horizontal polarization, the Eplane is azimuth and the Hplane is elevation. A 90° Eplane beamwidth needs as aperture width A_e of about 0.6λ. The Hplane aperture height can be as large as is convenient, to reduce the elevation beamwidth and reduce gain. Note that the beamwidth is inversely proportional to aperture size, so that a tall, narrow horn has a wide beamwidth and narrow vertical pattern. The flare length of a horn should be longer than the largest aperture dimension for a clean pattern.

To make a narrow and tall horn for 10 GHz, it seemed easier to machine one at the local makerspace, TheFoundryVT, than to fold and solder sheet metal as one might for a more conventional pyramidal horn. I fiddled some numbers to fit the aluminum stock available online in reasonable quantities and settled on a horn with $A_e = 0.544\lambda$, $A_h = 3.33\lambda$, and flare length of 3.33λ, to be machined in two halves from ¾ x4 inch aluminum bar.

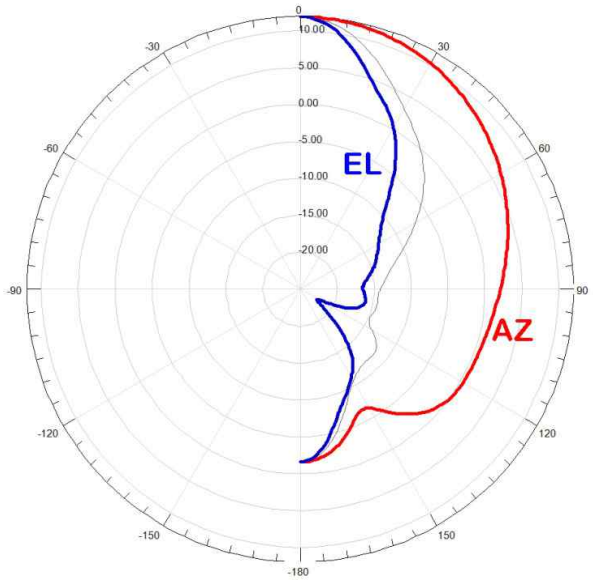


Figure 2 – Radiation patterns for a 10 GHz Sectoral Horn antenna

Simulations of these horn dimensions show a gain of about 12 dBi, with a -3dB beamwidth of 86° and a -10dB beamwidth of 180°. The elevation beamwidth is about 24 degrees, wide enough to fill in areas below the mountain and high enough for short rainscatter. An antenna pattern plot in Figure 2 shows a smooth azimuth pattern with no holes, so there is some signal available even for stations in unexpected directions, even off the back.

Figure 3 – Sectoral Horn half for 10 GHz being machined by CNC mill.

Figure 3 shows one half of a horn being machined. The horn has a compound flare: 2° in the Eplane is made by setting the stock on angle blocks while the wide Hplane flare is cut by the CNC milling machine. Then the WR-90 waveguide walls are cut square to the stock. A lot of metal is being removed, so milling time is about 1.5 hours. Two halves are screwed together to complete the horn – since they are made with the same CNC program, alignment is pretty good. Two finished horns are shown in Figure 4, one with WR-90 waveguide input and the other with an integral coax transition.

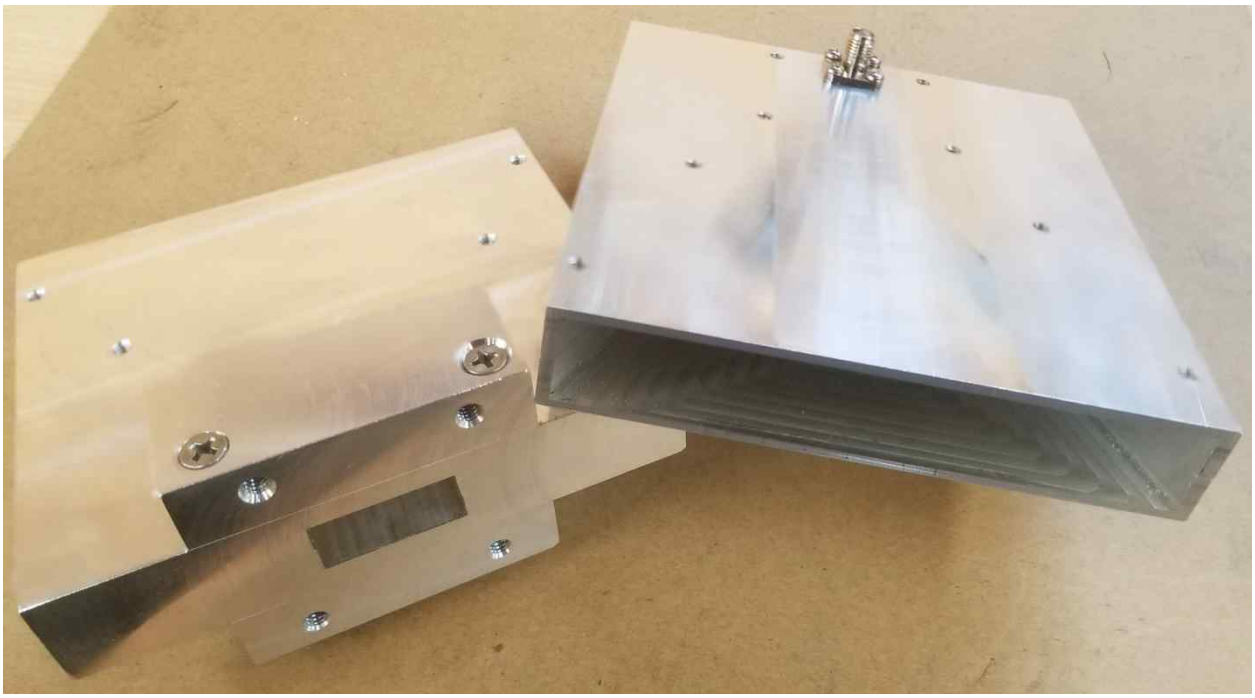


Figure 4 – Sectoral Horns for 10 GHz with WR-90 Waveguide input, left, and integral coax transition, right.

24 and 47 GHz

A threat to the amateur 47 GHz allocation several years ago led to an effort to put some 47 GHz beacons on the air. Tom, WA1MBA, started an effort to build some 47 GHz quadruplers to provide the beacon signals. He recently unveiled the results at the November 2022 NEWS meeting and will have them available at Microwave Update 2023.

Tom asked me if I could make a waveguide slot antenna for 47 GHz. NO! The slots would be too narrow (~0.012" wide) and too critical – beyond my skills. I mentioned my prototype sectoral horn for 10 GHz and suggested something similar would work for 47 GHz. I made a sketch and a CAD model for a smaller version of the 10 GHz horn for WR-19 waveguide, also requiring angle machining. While reviewing it prior to machining, I realized that the Eplane aperture dimension was close to the Eplane dimension of WR-28 waveguide, which some hams use on 47 GHz since it is more available. A horn with the same Eplane dimension at both ends would not require angle machining, so I changed the design to WR-28 waveguide with an Eplane aperture of 0.140 inches, about 0.56λ. The Hplane dimension was chosen to fit in 2 inch wide aluminum bar stock, about 7λ. Figure 5 shows the simulated radiation pattern at 47.1 GHz: about 14.5 dBi gain with a -3dB beamwidth of 82° and a -10dB beamwidth of 170°. The elevation pattern is narrow with lots of unimportant sidelobes.

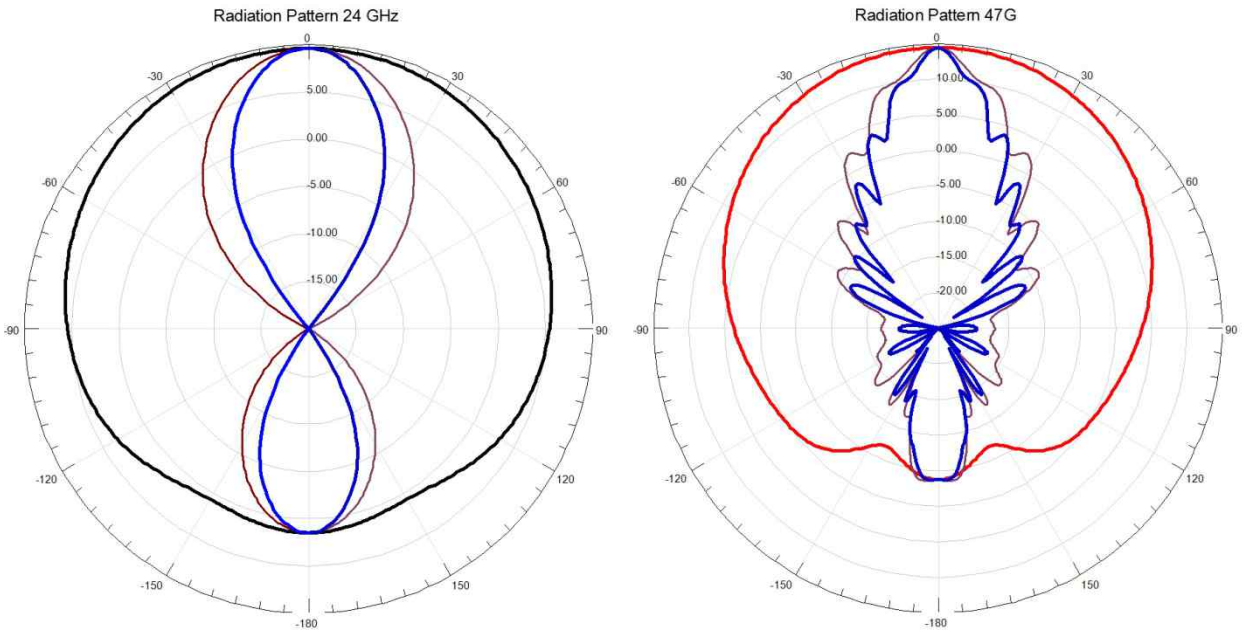


Figure 5 – Radiation patterns for WR-28 sectoral horn at 24 GHz and 47 GHz

I discussed the change to WR-28 with Tom, and he agreed, since he had chosen WR-22 waveguide for the quadruplers – only a small mismatch for either WR-28 or WR-19. It also occurred to us that WR-28 waveguide also works at 24 GHz (hams can ignore official waveguide frequency ranges within reason), so this could be a dual-band horn. Another simulation yielded the 24 GHz radiation pattern shown in Figure 5 – lower gain of about 9.6 dBi, since the Hplane aperture is only about 3.7λ at the lower frequency. The azimuth radiation pattern is even more broad, since the Eplane aperture is only 0.28λ, with a -3dB beamwidth of 142° and a -10dB beamwidth of 360° – the gain never drops below the -10dB level.

With simpler machining and much less metal being removed, the CNC milling time for each half is reduced to under 20 minutes. My first prototype, shown on the left in Figure 6, used a rectangular

waveguide flange pattern compatible with WR-28, WR-22, and WR-19. When I showed it Tom, he said that he used the circular flange pattern, preferred for instrumentation, compatible with all three waveguide sizes. This required thicker aluminum stock to accommodate the circular flange pattern, shown on the right in Figure 6. In the middle is a horn showing the aperture. I also made one with both the rectangular and circular flange hole patterns after breaking a tiny center drill ruining a hole.

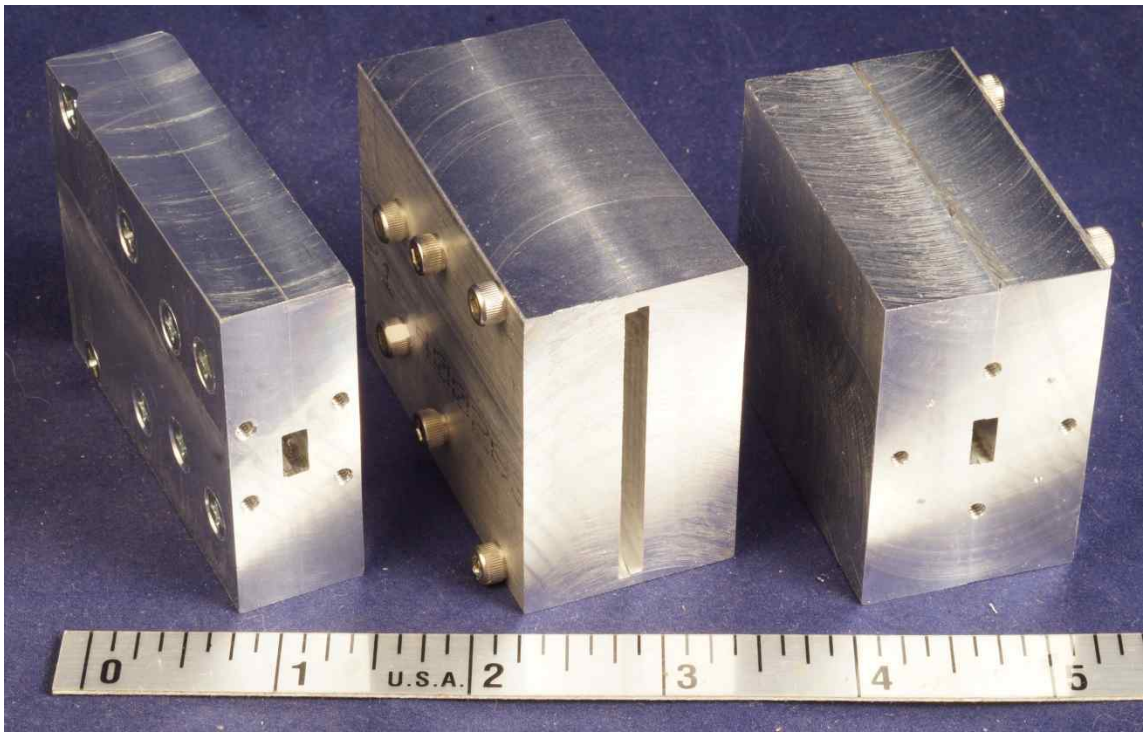


Figure 6 – Sectoral horns for 24 & 47 GHz with WR-28 waveguide input

Lower Frequencies

Sectoral horn antennas for lower frequencies would not be so narrow, so easier fabrication techniques would be possible, like soldering thin metal or PC board stock. I've been considering one for 3.4 GHz using foil-coated 2-inch thick Styrofoam (transparent to RF), leaving the aperture end uncovered.

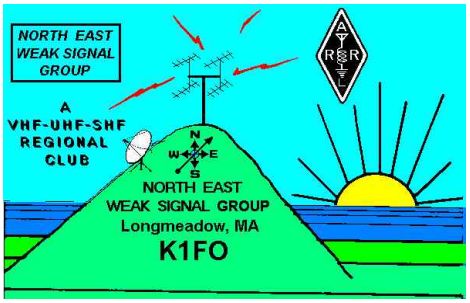
The Eplane aperture dimension of a sectoral horn can be chosen for the desired coverage – it doesn't have to be as broad – and the Hplane aperture dimension can be as large as is convenient to provide gain. The flare length should be longer than the larger aperture for a clean pattern.

Summary

The sectoral horn antenna can provide broad coverage in a desired direction with reasonable gain. Dimensions are not critical, so they may be built with a variety of techniques. They are tall and thin so could be mounted on the side of a tower or mast – for a rover operation, several could be stacked side-by-side on a mast for multiple bands with easy antenna aiming.

If vertical polarization is required, simply reverse the aperture dimensions and mount the horn horizontally.

Note: 1. J. Kraus, *Antennas, Second Edition*, McGraw Hill, 1988.



North East Weak Signal group

MEMBERSHIP APPLICATION

Date: _____

Name: _____

Call sign: _____ Grid: _____

Street: _____

City: _____ State: _____Zip: ___-_____

Phone (home) _____ Optional (work) _____-___

Email _____

ARRL member: Y N

Electronic Newsletter Delivery: Y N

Operational Bands (circle)

50 MHz	144 MHz	222 MHz	432 MHz	903 MHz	1.2 GHz
2.3 GHz	3.4 GHz	5.6 GHz	10 GHz	24 GHz	47 GHz
76 GHz	Light	Other (list)			

The North East Weak Signal [N.E.W.S.] Group is being established to form a camaraderie among fellow VHF-UHF-SHF enthusiasts and support a convenient means to exchange technical information. We currently have six meetings per year, held at a centrally located facility and provide a “NEWSLETTER” that is distributed two weeks prior to each meeting. Any contributions to this publication are appreciated and can be sent to: Don Twombly, W1FKF by e-mail to donw1fkf-news@yahoo.com. Dues are $10/2 years. Remember, this group is formed by VHF’ers for VHF’ers. E-mail: news.kc1v@gmail.com.

Mail to:

North East Weak Signal Group
c/o George Collins
105 Ninth District Road
Somers, CT 0607

NEWSLetter

North East Weak Signal Group

c/o Don Twombly, W1FKF
32 Bumfagon Road
Loudon, NH 03307