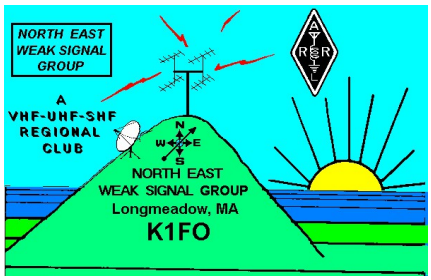


North East Weak Signal group

N.E.W.S. LETTER

The Official Publication of the North East Weak Signal Group – http://www.newsvhf.com/

September 2022 | Volume 30 | Issue 2

Next Meeting: Septrmber 24, 2022

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**.

NEWS Meeting 10 July 2022 Minutes:

- NEWS Picnic 10 July 2022
  at Knights of Columbus, Enfield, CT

  Called to Order by President W2AAU at 1331

  TREASURERS REPORT
  same as last momth6

  NEW BUSINESS
  MOTION by KC1V to reimburse W1JHR $138 for Mt Wachusett permits over several years
  UNANIMOUS

  K1MAP - working on conf & MUD in April

  ANNOUNCEMENTS

  N1JEZ - 47 GHz VUCC earned by W1GHZ & W1FKF
  and 78 GHz VUCC by KT1J

  ADJOURN 1338

Treasurer's Report September 1, 2022

Opening Balance 7-1-2022: $4111.18

Income 7-1-2022 to 8-31-2022:
Dues: $170.00
Donations: $35.00

Expenses 7-1-2022:

Picnic, VFW Rental: ($525.00)

Picnic, Food and Supplies: ($400.00)

Closing Balance 8-31-2022: $3391.18

Current Paid Members:

72 Regular
3 Life
12 Permanent

Submitted September 1, 2022
George Collins, KC1V
Treasurer, North East Weak Signal Group

For SALE:

Alcatel-Lucent MDR-8000 10.368 GHz AMPLIFIER
2 stage (3-5 watt)
100 mw input
3.8 watts out
$150.00 +shipping
Don W1FKF

donw1fkf-news@yahoo,com

For Sale:

30 Watt Class A Spectran Linear RF Amplifier 2304 MHz

With heatsink (tested)
$125.00 + shipping

Don W1FKF donw1fkf-news@yahoo,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

Calendar 2022

Sept. 17-18 ARRL 10G & up contest
Sept. 24 NEWS Meeting

Nov. 19 NEWS Meeting (tentative)
Nov. 24 Thanksgiving

SPRINTS

144MHz: 7PM to 11PM local time on Monday, September 19, 2022
. 222MHz: 7PM to 11PM local time on Tuesday, September 27, 2022
432MHz: 7PM to 11PM local time on Wednesday, October 5, 2022
Microwave 902MHz and up: 8AM to 2PM local time on Saturday, October 8, 2022

Officers:

President Dick Frey, WA2AAU, Delanson, NY
Vice Pres. Eric Mazur, KA1SUN, Savoy, MA
Secretary Paul Wade, W1GHZ, Cabot, VT

Treasurer George Collins, KC1V, Somers, CT

Board Of Directors:

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

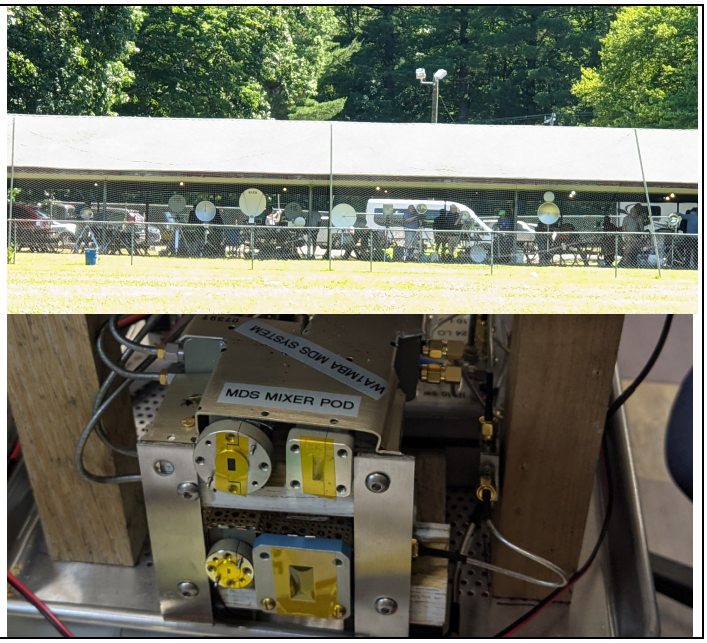
MDS Testing

July 10, 2022 NEWS GROUP PICNIC and ANNUAL METTING

Tom Williams WA1MBA

I had a fun time at the picnic this year, seeing people and finally getting back to fire cooked burgers and dogs along with all the great foods and drinks that folks brought for the event. I brought my MDS testing system and for the first time was successful at getting some results on 78 GHz. There was a problem with the MDS system listening to the tester's transmitters. It turns out that it was an operator error (me). I want to thank Don W1FKF, Lanette KA1NKD, and Tom W1WSO for all their help in setting up and operation. I apologize for not getting all the details of all the rigs.

Below are views from the "business end" of the test. The waveguide outputs from lower right, going counter-clockwise are 10GHz, 24 GHz, 47 GHZ, 78 GHz. Kapton tape over the otherwise open waveguides prevents dust, moisture and bugs from getting in, but doesn't affect the signal.



In the table below you can see the results for all the bands. This year we had 3 radios tied for first place on 10 GHz, most tied for best on 24, one best on 47, and both same on 78. This gives us an idea of what is possible and how far your radio is from that (shared) best mark. Our test does not measure the mathematically defined MDS because we also rely on the operator to determine when he/she loses the signal, and all our ears are different. People have described this quality as the trained ear's ability to narrow the effective bandwidth. The MDS we measure is the "radio with operator" MDS.

I have built the MDS system with computer control so that I could possibly operate it remotely (from the pavilion using Wi-Fi) and thereby actually test my own radios. For now, I am still getting some of the bugs out, so maybe I'll try that next year or the year after.

	MDS TESTING JULY 10, 2022. NEWS GROUP PICNIC							
	Call	**Dish Type**	**Dish Size**	**Power**	**MDS**	**TX**	**Comment**	**BAND**
					Lower=Better	Higher=Better	TX Test Fail*	**GHz**
1	KC0IYT	Offset	18"	8W	-76			10
2	K2AEP	Offset	22"	100 mW	-78			10
3	W2BYP	Prime	12"	3W	-65			10
4	K1OR	Offset	22"	6.5W	-84			10
5	N1DPM	Prime	30"	7W	-80			10
6	K1CA	Offset	30"	10W	-80			10
7	W1FKF	Offset	19"	7W	-84			10
8	W1GHZ	Offset	19"	3W	-80			10
9	AF1R	Offset	10"	200mW	-76			10
10	AF1T	Prime	24"	10W	-84			10
11	WW1Z	Horn	20dB?	1W	-60			10
12	KA1SUN	Prime	22"	1W	-72			10
13	KA1LEX	Offset	24"	8W	-72			10
14	AF1T	Prime	12”	2W	-68			24
15	W1GHZ	Prime	300mm		-68			24
16	W2BYP				-66			24
17	W1FKF	Offset	19"	500mW	-68			24
18	K1OR				-68			24
19	KC0IYT				-13			47
20	W1GHZ			30mW	-58			47
21	K1OR			80 mW	-60			47
22	W1FKF	Prime	12”	30 mW	-60			47
23	W2BYP				-60			47
24	AF1T			30 mW	-68			47
19	W1FKF	Prime	12"	~1 mW	-53			78
20	N1JEZ	Prime	10"	~1mW	-53			78
	*Note, XMT testing failed due to MDS Tester (WA1MBA) operator error							

A ¼ Watt No-tune Amplifier for Cheap and Simple Transverters

Paul Wade W1GHZ © 2022
w1ghz@arrl.net

I have described transverters for bands from 10 GHz down to 144 MHz (www.w1ghz.org), keeping them cheap and simple as well as easy to build. Most of them have an output power around 10 milliwatts, +10 dBm, or a few dB more with some of the newer MMICs. Higher power requires an external amplifier, but compatible ones are not readily available for some of the bands.

A few newer MMICs offer higher power: the GVA-92+ for ~1/4 watt, the ADL5324 for ~1/2 watt, and the GVA-91+ offers nearly 1 watt. These are all specified for the wireless networking bands around 900 MHz or 2.4 GHz, and require external tuning for the specific frequency range. They will work at other frequencies, but the data sheets give no hints for tuning at other frequencies. I once played with a GVA-91+ at 144 MHz and saw lots of power before I let the smoke out – that's a lot of power in a tiny SOT-89 package, and heatsinking is definitely required.

Recently I saw a new MMIC from Minicircuits, the PHA-102+, rated at +24 dBm in a 50-ohm system (no tuning) with gain up to 6 GHz. I soldered one to a Universal MMIC PC board and fired it up. At the usual 5 volts, it showed the specified gain of about 13 dB, but output power was only about +21 dBm, around 120 mW. The higher power is specified at 9 volts, so I started cranking up the voltage; at 9 volts, output power at 902 MHz was 25.2 dBm with +13 dBm drive, all I had from the signal generator. Things were pretty warm to the touch.

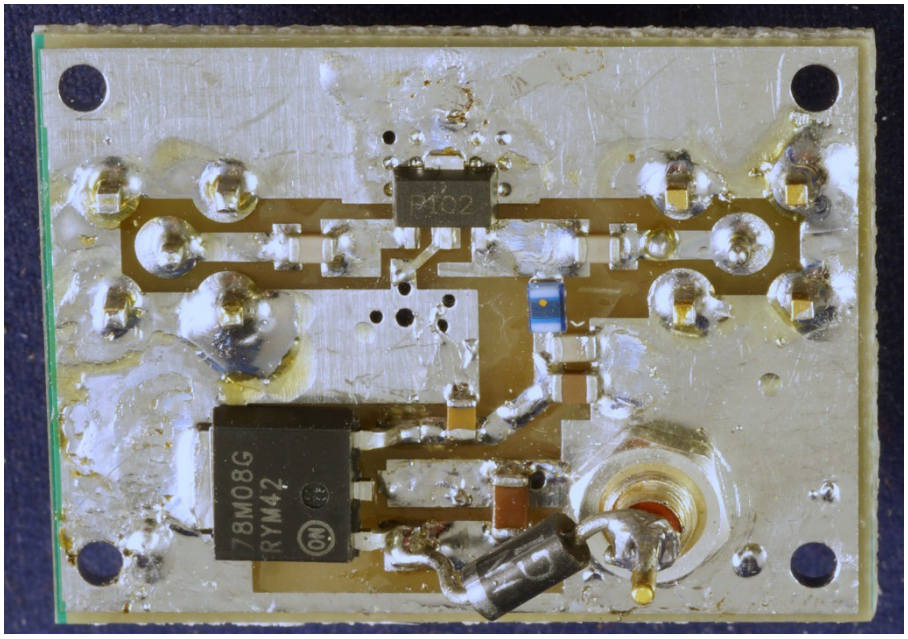


Figure 1 – Complete GVA-102 ¼ watt amplifier

The Universal MMIC PC board has a footprint for an SMT three-terminal regulator. I had some 8-volt 78M08 regulators on hand, but no 9-volt version. Since the output power at 8 volts was nearly as good, +24.9 dBm, with lower current, this seemed like a reasonable approach. Figure 1

is a photo of the finished amplifier prototype. I used 18 pf blocking capacitors and an 82 nh RF choke; the values are rather arbitrary and not optimized. They are rather small for VHF, which is why performance seen below drops off at lower frequencies. The other capacitors are bypassing for the MMIC and the voltage regulator.

With 12 volts into the voltage regulator, even more heat is dissipated. I ran it overnight at full power to make sure the amplifier is viable – the PC board temperature was about 50°C, while the temperature of the top of the MMIC and IC packages was lower, showing that the packages are heat sunk to the PC board. I think a little better heatsink is needed, perhaps one of the stick-on variety used for chips like the Raspberry Pi.

While it was still hot, I connected a VNA to measure gain and input VSWR, with the results shown in Figure 2. Gain is about 13 dB with good VSWR up to 3.4 GHz, then rolling off but with a convenient peak around 5.7 GHz. This covers all the transverters except 10 GHz.

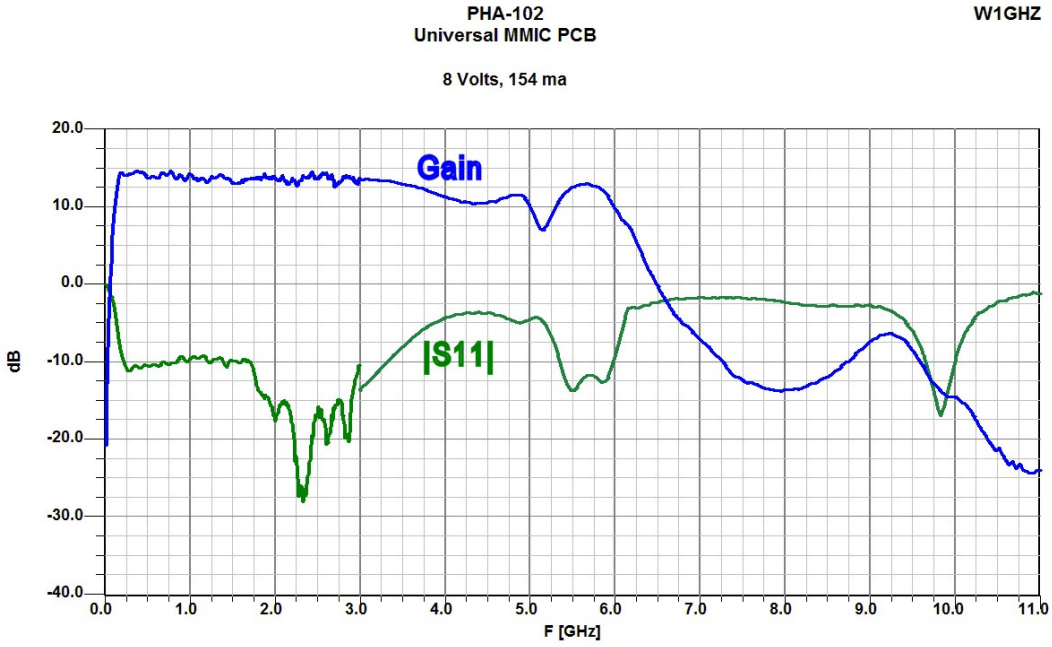


Figure 2 – PHA-102 amplifier small-signal performance

I measured output power at all the ham bands, although I didn't drive the amplifier to maximum; only +13 dBm was easily available up to 1 GHz, and +10 dBm above that, with only +7.4 dBm at 5760 MHz. Results are shown in Figure 3: even with the limited drive, +23 dBm is available up to 3400 and +17 dBm at 5760. With a bit more drive, the amplifier should easily provide ¼ watt or more up to 3400, which could provide a boost for a rover station without a lot of expense or power drain.

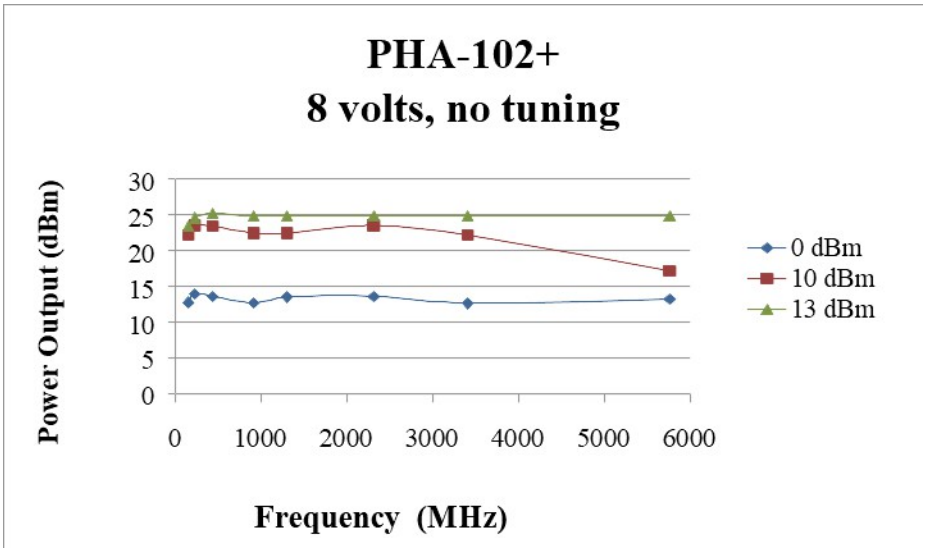


Figure 3 – PHA-102 amplifier power output

The amplifier looks to be pretty linear up to about ¼ watt out, as shown in Figure 4. An interesting thing about this MMIC is that the supply current is constant until the output power approaches the 1-dB compression point – then the current *decreases*. At this point the output harmonic levels increase dramatically. And the harmonic levels are fairly high even below this power level, as one might expect from such a broadband amplifier. With low-power transverters, we don't worry too much about harmonics and spurious responses, but ¼ watt is getting to the point where we might cause interference in some circumstances.

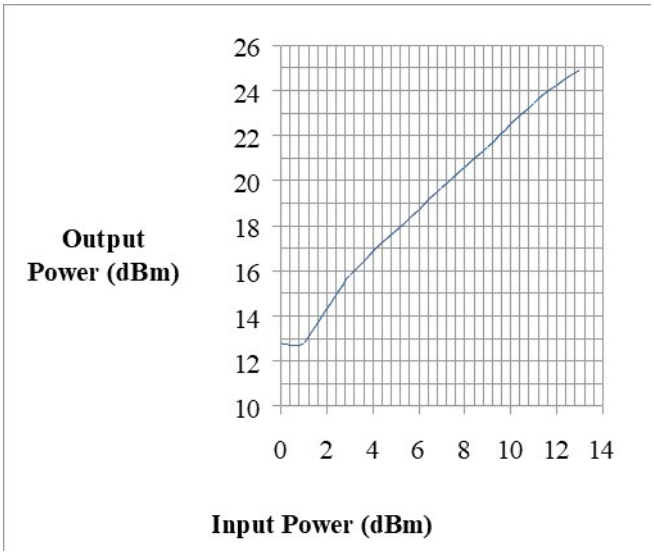


Figure 4 – PHA-102 Output power vs input power

The PC boards are available, and the PHA-102+ is available from Mouser, or Minicircuits is pretty good about providing free samples to hams. Assenbly is pretty straightforward, and no tuning is needed. This should be an easy way to enhance the cheap and simple transverters, or just a handy amplifier for the test bench.

SHF 3456K “No-Tune” Transverter Conversion Notes
Dale Clement, AF1T 10 May 2022

In the June 1989 issue of QST, WA8LNC described a practical circuit board transverter for 3456 MHz. This board was paired with a local oscillator (LO) as described by KK7B’s in the July 1989 issue of QST. Some time later SHF Systems of Nashua, NH made available boards and parts for the above in kit form. I have built dozens of these units for various people and suspect some units may still exist. The recent loss of 3456 MHz band segment has prompted conversations about moving operating activities elsewhere within the band. Based on these discussions I have successfully converted four of the above transverters successfully to 3400 MHz: One incorporating a DIGI-LO synthesizer, and three using a crystal-based oscillator and multiplier circuits. The following article presents comments I believe are important to the conversion process. I hope others will find them useful. Be sure that you have converted your transverter according to the 2304 and 3456 No?Tune Transverter Updates by Steve Kostro, N2CEI, of Down East Microwave, Inc. The older MAR-series MMIC devices could not provide sufficient stability for 3456 MHz use so they were replaced with the newer ERA-series devices. Additionally, the x6 diode multiplier was replaced with a ERA-3 harmonic generator, which requires much less 552 MHz drive from the LO board. This allows elimination of the MAV-11 power stage. The MMICs in my units receive power from an +8 voltage regulators. Good voltage regulation keeps the output level constant when operating from battery supply. For each ERA-1 and ERA-2 stage, I used a 120 Ω, ¼-watt carbon resistor; for the ERA-3 stage I used a 150 Ω resistor. For 9-volt regulator use, the corresponding value for the ERA-1 and ERA-2 stages is 150 Ω. For the ERA-3 stage the value is 180 Ω. In the Down East Microwave Design Notes, dated March 20, 2021 and April 1, 2021, DEMI suggests replacing the multiplier and oscillator circuits with a DIGI-LO synthesizer unit, which can be configured for 3256 MHz output (note 3256 MHz + 144 MHz = 3400 MHz). I did this in one transverter with excellent results. To replace the multiplier and oscillator circuits with a DIGI-LO, I added a 60-mil (0.060 in) wide soldered copper micro strip line for all the 552 MHz to 3312 MHz x6 multiplier parts. I found the DIGI-LO delivered plenty of drive (-2 dBm) with up to 6 dB additional attenuation. The attenuator didn’t offer noticeable improvement so I left it out. The DIGI-LO can be reused for many other programmed frequencies for possible future use, a definite advantage. The remaining three transverters used 90.44444 MHz crystals. One crystal, now unobtainable, is a HY-Q fifth-overtone unit with a 60° C heater. The other two HC-49/U (wire lead) fifth-overtone, ±3 ppm, 0 to 50° C types came from Krystaly located in the Czech Republic (www.krystaly.cz). Cost was very reasonable, US $15 each, plus $8 shipping. The HY-Q crystal netted right on frequency, but the Krystaly crystals were high in frequency, meaning that the 144 MHz IF must be tuned lower by 20 to 30 KHz. This a minor inconvenience for a loaner rig—I attached a frequency offset label for operator convenience. In general, I found attempting to net the Krystaly crystals to the proper frequency sacrificed stability. Note the crystal frequency multiplication factor of 36. The DEMI transverters use 184 MHz crystals and Micro LO oscillators. This requires a crystal change to 180.88888 MHz to provide the needed 3256 MHz local oscillator frequency. Making these adjustments can be difficult and may lead to unreliable oscillation. The DIGI-LO route is the way to go, all things considered. An HP 8595E spectrum analyzer provided by KB1QV simplified the conversion. Be sure to note the various spurious responses, LO feed-through, IF image levels, etc. before starting the conversion process. Comparing this information with the converted transverter (3400 MHz) will help determine the new unit’s overall performance. The overall frequency shift is about -1.6%. The KK7B 552 MHz local oscillator board will probably work well at 542.6666 MHz without modification, other than removing the MAV-11 stage. If the local oscillator board will not produce approximately 0 dBm (1 mW), try placing a few copper “snowflakes” on the filter lines. This may increase gain by a couple dB. Some 5-pole hairpin

filters had to be lowered in frequency to work well at 3400 MHz. The DEMI Design Notes describes “snowflake” tuning, but that I found dielectric loading is an easier approach to lowering the microstrip’s frequency response. For this I used 1 inch wide, 2 mil (0.020 in) thick orange Kapton tape cut into 1⅛ in x ¾ in rectangles placed on the filters. This size will cover each filter completely. Add or remove tape as required to peak the filter’s response. Scotch transparent tape will work as well, but it is harder to remove. Since no separate port to test the 3256 MHz local oscillator exists, I looked at it though the powered transmit chain and electrically peaked the LO filters for maximum LO signal on the spectrum analyzer. That completed, I applied 0 dBm (1 mW) 144 MHz drive to the transmit mixer port and peaked the transmit filters for maximum 3400 MHz output. The goal here was to place the desired 3400 MHz signal barely into the low?frequency part of the pass band of each filter while attenuating the 3256 MHz local oscillator and 3112 MHz image signals as much as possible. Adding too much dielectric will lower the filter pass band range excessively, thus allowing undesired frequencies to leak through. The actual transmit output level at 3400 MHz differed between transverters since the MMIC lineup was not identical across units. The transverters drive amplifiers, which require only -10 dBm to 0 dBm input. The receive chain incorporates (unfortunately) only one filter, which is preceded by one or more RF stages. I gained several more dB of noise (and weak 3400.1 MHz signal) with a single layer of added Kapton tape. In all cases, loading the three hairpin filters nearest the mixers and power divider increased performance significantly at 3400 MHz. The transmit output and local oscillator input filters benefited much less. I hope you are able to resurrect some of these old transverters.

73, Dale, AF1T

SHF 3456 K "No-Tuned" 3400 MHz Conversion Comments from AF1T. 27 June, 2022.

This conversion article was inspired by the Down East Microwave Design Notes # 39 (March 20, 2021) and # 40 (April 1, 2021). My transverters are all 1989 vintage from SHF Systems (WA3ETD) of Nashua, NH. These are older than the DEMI versions. These old units had unstable MAR-series MMICs, which must be replaced with ERA-series MMICs (these did not exist in 1989), as per the "2304 and 3456 No-Tune Transverter Updates" by Steve Kostro, N2CEI, in the 1996 Microwave Update Proceedings. The Local Oscillator chain should use an ERA-2 driving an ERA-1 between the two hair-pin filters. The MMICs needed for the Received chain will depend on whether you use an external pre-amplifier. The MMICs needed for the Transmit chain will depend on how much RF power you need out of the transverter. Please read these articles!

My main unit replaces the KK7B Local Oscillator and XVTR x 6 multiplier with a DIGI-LO. This is the best and easiest route to go. Since I didn't want to spend much on the loaner rigs, the other units use relatively inexpensive 90.44444 MHz crystals.

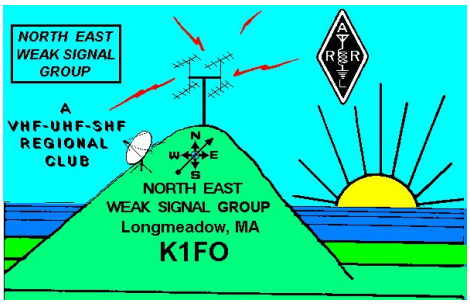
Jim Davey, WA8NLC, (now, K8RZ), is responsible for the original hair-pin filter design (my article and one of the references has his call wrong). Rick Campbell, KK7B, came up with the 540-580 MHz Local Oscillator, as well as many other projects. Their work made it feasible for many of us to get on some of the exotic bands!

So, how did my 3400 MHz efforts pay off? In the June, 2022, VHF Contest, I made 11 contacts in 6 grids from FN43, in New Hampshire. The best DX was W3CCX in FN21.

73,

Dale, AF1T

603-428-3840



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.

Mail to:

North East Weak Signal Group
c/o George Collins
105 Ninth District Road
Somers, CT 06071

NEWSLetter

North East Weak Signal Group

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Loudon, NH 03307