

N.E.W.S. LETTER

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

July 2018

Volume 27

Issue 4

NEWS Group Annual Picnic! **Saturday July 14, 2018**

In This Issue

NEWS Group Picnic Details and Directions	page 2
NEWS Picnic MDS / ERP Testing	page 3
NEWS Meeting Minutes	page 4
Buy Sell & Trade	page 4
Mid-Atlantic States VHF Conference News	page 4
Phase Noise Measurements of Some Synthesizers, W1GHZ	page 5-10

MEMBERSHIP in the N.E.W.S Group is \$10 per year.

Apply to John Crawford, N2OY. E-mail: n2oy.vhf@gmail.com.

You may download an application from our web page: <http://www.newsvhf.com>

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Send articles by e-mail to George Collins, KC1V at news.kc1v@gmail.com

N.E.W.S. Group PICNIC-Rain or Shine

July 14, 2018 at the Knights of Columbus, Pavilion and Picnic Area,
371 Washington Rd., (aka George Washington Road) Enfield, CT 06082
(20 mi North of Hartford, 8 miles South of Springfield)

Social Gathering! Food! Swap-Sell-Tailgate

Everyone is Welcome!

MDS Testing for 10, 24, 47 and 78 GHz!

See Page 2 for Directions and More Details

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(See Page 3)

BARBECUE - Noon to 1:00pm

The club will be providing the burgers, hot dogs, chips, and cold drinks.
If anyone would like to bring a side dish, like a salad or dessert, please do!
(Please e-mail [Mark](#) what you are bringing - if possible)

Bring any items of VHF+ interest that you would like to sell, swap, or just show off.
Your stories and experiences - True or Not - are all welcome.

Show-Off Items with No VHF+ interest, but with Entertainment Value,
may also be appreciated or ridiculed - take your chances!

All members, spouses, guests and anyone interested in VHF+ operation,
are welcome to attend.

Here are the Directions

Knights of Columbus, Picnic Area
371 Washington Rd, Enfield, CT 06082
42.016N, 72.559W

From the South or North:

I-91 Exit 48 onto Rt 220 East (Elm St), then 9 lights.
Keep Left at light before Walgreens.
Left at 9th traffic light from Exit 48, on to Washington Rd.
K of C is 1 mile on left.

Lost going that way? Try this:

I-91 Exit 49, go south on Enfield St Rt.5
Drive 1/2 mile, take left on Brainard Rd.
(at North Thompsonville Fire Station)
Drive 2 miles, take right on Washington Rd.
K of C will be less than 1/2 mile on the right.

N.E.W.S. Picnic MDS / ERP Testing

Minimum Discernable Signal (MSD) and Effective Radiated Power (ERP) testing on 10 GHz, 24 GHz, 47 GHz and 78 GHz will be conducted at the picnic again this year.

To test for MDS, we set up a distant signal source. After everyone has a chance to peak up on the signal, the signal level is reduced one dB at a time until you can no longer hear it, then you have found the MDS for your system. You decide how well it works, and whether you can hear as well as Dale.



Finally, we also check relative ERP, transmitting one at a time and recording the relative power received at the distant point.

This isn't a competition, just a chance to check out our gear with friends around to help. Most folks have 10-GHz stations that worked pretty well, while a few will find problems to fix before the 10-GHz & Up contest in August. Not only do we know your equipment works, but also that there will be some other good stations to work.

This year we would like to do 47 GHz and 78 GHz before the meeting, fewer stations and should not take long.

Don W1FKF

Donw1fkf-news@yahoo.com

Conference NEWS Group Meeting Minutes

A brief meeting of the NEWS Group members in attendance was held during the conference:

NEWS Meeting 21 April 2018
at the 44th Eastern VHF/UHF Conference,
Baymont Hotel, Manchester, CT

Called to Order by Secretary, W1GHZ, at
1745
(President and VP both unable to attend)

TREASURERS REPORT
(None)

OLD BUSINESS
(None)

NEW BUSINESS
(None)

Adjourned 1746

Buy, Sell, Swap

Amplifiers - W1OUN

1 - ICOM PW-1 Solid-State Kilowatt (160-6 meters) in excellent condition; \$3K.
2 - A pair, 2-M and 70-CM, of LunarLink amplifiers (personally built by K1FO) with their common 3-kV power supply and the relays, etc. required to put them on the air. They easily deliver 1.5-kW output; \$4K for the lot. I prefer to sell the pair together with the power supply, rather than "orphan" one of them without a power supply. As they are too heavy for me to move into a car, it will be best if anyone interested in them drive up to Concord, MA and view them where they are stored at a local Ham's house. Please contact me, Gordon Pettengill, W1OUN, by e-mail at gpetten@comcast.net for more information.

MID-ATLANTIC STATES VHF CONFERENCE Sept 28-30, 2018

Hosted by the Mt Airy VHF Radio Club

Holiday Inn-Bensalem-Philadelphia, 3327 Street Rd, Bensalem, PA (215) 639-9100

Special Conference Room Rate \$109/night + tax

Conference Early Bird Registration only \$40

Saturday Evening Early Bird Banquet \$40

Register on-line at www.packratvhf.com

Additional Speakers & Proceedings Papers Sought

Contact: Rick1ds@hotmail.com

Phase Noise Measurements of Some Synthesizers

Paul Wade W1GHZ ©2018

w1ghz@arrl.net

At the 44th Eastern VHF/UHF/Microwave Conference in April 2018, I got a chance to measure phase noise of some of the newer microwave synthesizers. Few hams have test equipment capable of making phase noise measurements of good oscillators, so we must rely on test equipment at various VHF and Microwave conferences. The excellent equipment at this conference was provided by Greg Bonaguide, WA1VUG, of Rohde & Schwarz.

A frequency synthesizer is an attractive way of generating a signal at a desired frequency, particularly since it has become very difficult to find quality crystals. A modern synthesizer may operate at a high enough frequency to provide the Local Oscillator for a microwave system, and the frequency may be locked to an accurate reference to provide frequency accuracy and stability.

Phase Noise

However, the phase noise generated by almost all synthesizers is significantly worse than a good crystal oscillator. For very weak signals, my experiments¹ in 2009 suggest that the difference in Minimum Detectable Signal is about 2 dB, between a multiplied crystal oscillator LO and a synthesizer LO. On the other hand, 10 GHz MDS tests at the NEWS (North East Weak Signal group – www.newsvhf.com) picnic over several years suggest that knowing the frequency of a very weak signal can improve the MDS by up to 5 dB, when listening by ear. The addition of an SDR waterfall display eliminates the unknown frequency problem – all signals appear on the screen – so minimizing phase noise can help to hear very weak signals.

In 2012, I developed a locked VCXO² which can provide the source for a microwave LO with phase noise very nearly as good as a crystal oscillator and that can also be locked to a reference source to provide frequency accuracy and stability. This might be an ideal solution, but there are few choices for available VCXO frequency. As part of the development, phase noise comparisons were made with the synthesizers available at that time, shown in Figure 1. The bottom three curves clearly show how phase noise increase with frequency multiplication, whether done by a classic frequency multiplier or in a phase-locked loop. Since all the synthesizers are operating at 1152 MHz and are referenced from the same 10 MHz TCXO, any phase noise greater than the multiplied VCXO is additional noise generated by the synthesizer.

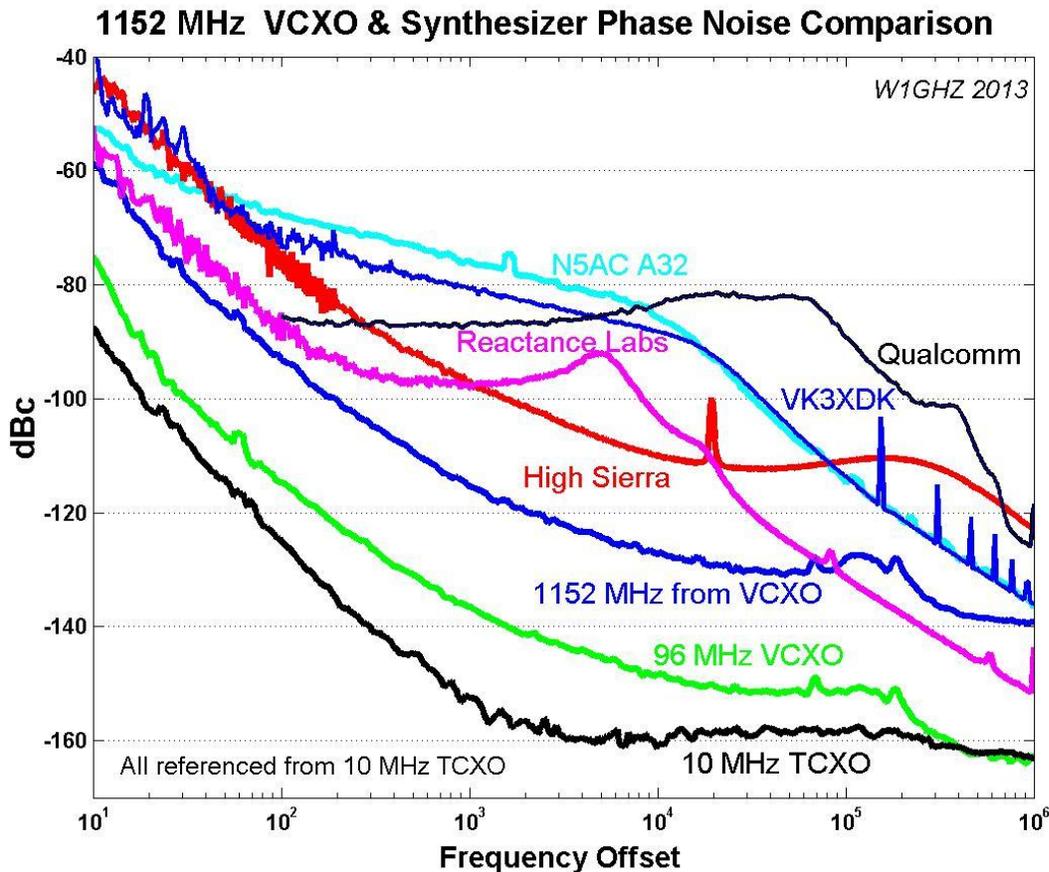


Figure 1 - Synthesizer Phase Noise measurements from 2012 and 2013

More recent synthesizers may have better phase noise characteristics than the N5AC A32 used for my 2009 experiments. Many of the synthesizers in Figure 1 are better, at least over part of the range of frequency offsets.

The measurements at the 44th Eastern VHF/UHF/Microwave Conference in April 2018 are shown in Figure 2. These were made with a Rohde & Schwarz FSW-43 analyzer. Where possible, synthesizers were referenced to a 10-MHz TCXO, the same unit as used for Figure 1. The VCXO system and several other synthesizers from Figure 1 are also included for comparison, including the N5AC A32. Some of the units were provided by conference attendees for a wider range of comparisons. Figure 3 includes a picture of each unit, and the Appendix provides more details.

Note that these are not definitive measurements, just what we able to accomplish during the lunch break at the conference. The measurements were made with 10X averaging, so they should be reasonably accurate. Better results might possibly be found with different programming of the synthesizer chips – for instance, for some New England beacons, W1EX found that an ADF4153 programmed for multiplication by four to 10368.320 or 10368.400 had fewer spurious outputs than at other nearby frequencies.

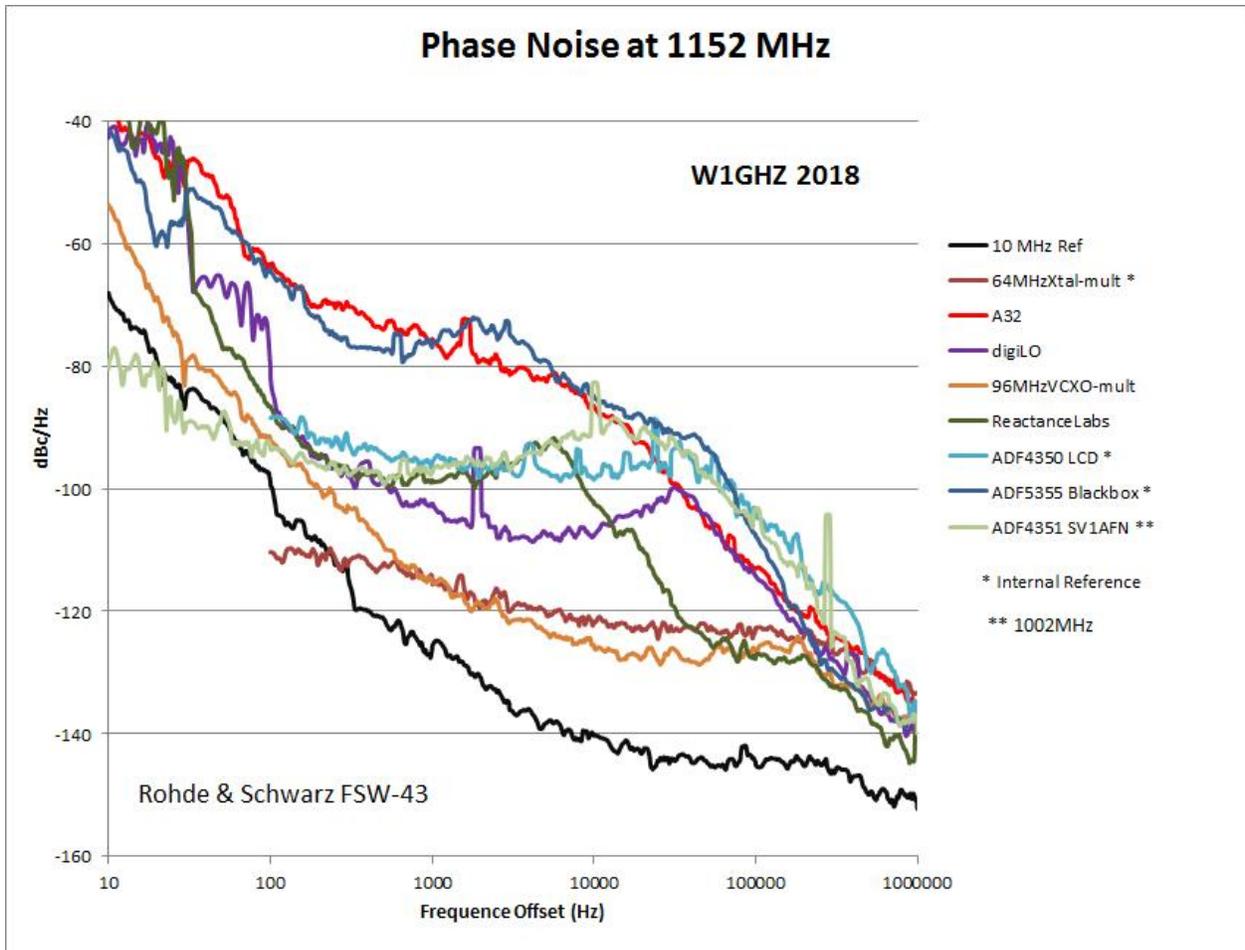


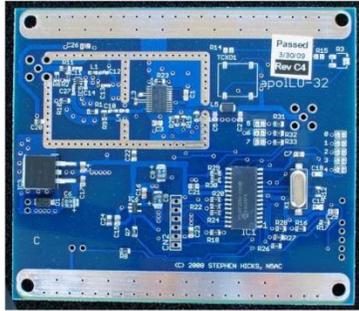
Figure 2 – 1152 MHz Phase Noise measurements at 2018 Eastern VHF Conference

Several of the newer synthesizers have pretty good performance. The digiLO from Q5 Signal (q5signal.com) has the best phase noise at 1152 MHz except for a spike at 2 KHz; it can be easily programmed with jumpers to popular ham frequencies from 23.5 MHz to 6 GHz.

A surprisingly good one is the ADF4350 with the LCD display and programming buttons³, available from China on eBay, which goes up to 4 GHz. The buttons make it able to run standalone – with a USB battery, it makes a handy signal source.

A good, cost-effective one is the SV1AFN ADF4351 (www.sv1afn.com/adf4351m.html), which requires something like an Arduino for programming, to frequencies anywhere between 35 and 4400 MHz.

The ADF5355, available complete as shown or as a programmable board, operates up to 13.6 GHz. This one arrived just before the conference, so I didn't get a chance to check it out thoroughly.



A32 - N5AC



digiLO
q5signal.com

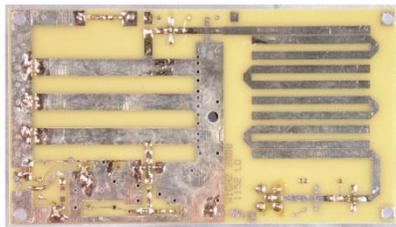


ADF4350

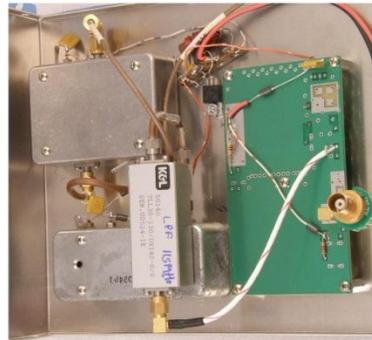


1152 MHz
Sources

OLED digital ADF5355 54M-13.6...
ADF5355



64 MHz Oscillator & Multiplier



96 MHz VCXO & Multiplier



Reactance Labs

Floating-Ground by SV1AFN

ADF4351 PLL
Synthesizer Module

35MHz to 4400 MHz
with ext. REF input - Simple SPI interface

Make a VFO, Clock Gen etc. fast



Figure 3 – 1152-MHz sources measured in Figure 2

X-Band Synthesizers

Conference attendees also brought several synthesizers that work directly at X-band, good for 10 GHz or higher bands. The phase noise of these units is comparable to what we would expect from the other synthesizers after frequency multiplication. The 120 Hz spike on the ZL-PLL curves are hum from a crappy power supply – a clean power supply makes a difference.

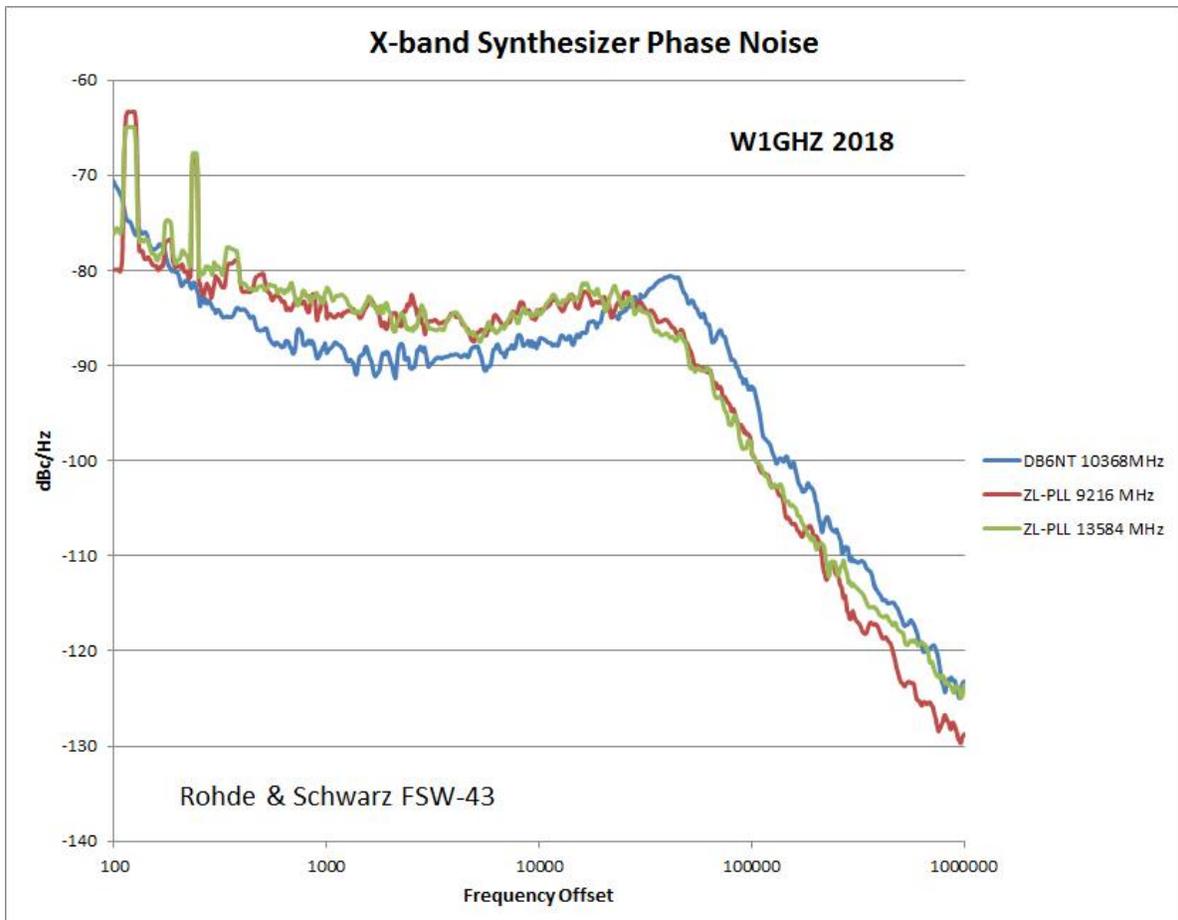


Figure 4 – X-band Phase Noise measurements at 2018 Eastern VHF Conference
DB6NT = MKU LO 8-13 (kuhne-electronic.de)
ZL-PLL = ZL-PLL 14G (zl2bkc.com)

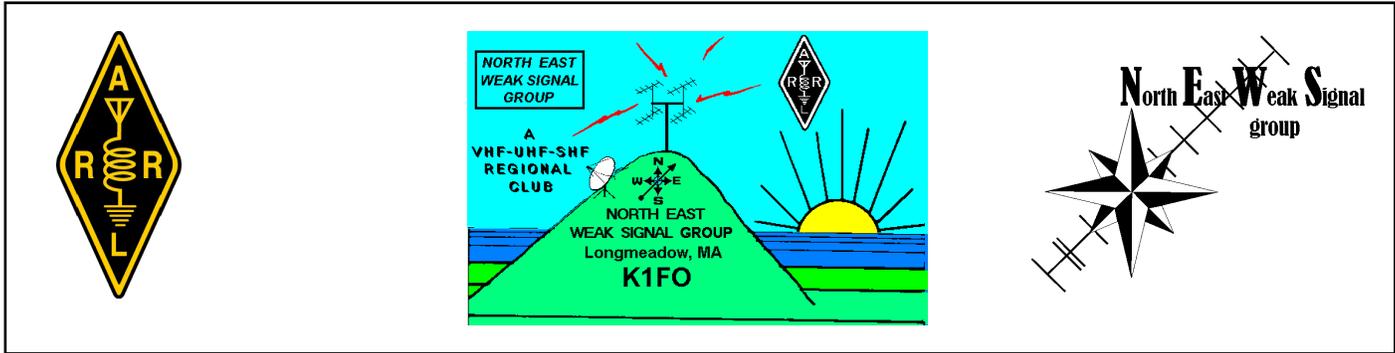
Notes:

1. Paul Wade, W1GHZ, "Phase Noise and MDS," *Proceedings of Microwave Update 2009*, ARRL, 2009, pp. 193-196.
2. Paul Wade, W1GHZ, "A Flexible VCXO Locking Board," *Proceedings of Microwave Update 2012*, ARRL, 2012, pp. 101-113.
3. Paul Wade, W1GHZ, "Synthesized Signal Source from China," *44th Eastern VHF/UHF/Microwave Conference*, 2018.

Appendix

Phase Noise Test Hardware

<u>Unit</u>	<u>Frequency</u>	<u>Reference</u>	<u>Owner</u>	<u>Manufacturer or source</u>
TCXO	10.000 MHz		W1GHZ	Microsonics TK84/099
Crystal	1152 MHz	64 MHz xtal	W1GHZ	http://www.w1ghz.org/MBT/1296MHz_Transverter-Right_Side_Up.pdf
VCXO	1152 MHz	TCXO	W1GHZ	http://www.w1ghz.org/small_proj/VCXO_for_Microwave_LO_update2.pdf
N5AC A32	1152 MHz	TCXO	W1GHZ	www.downeastmicrowave.com
digiLO	1152 MHz	TCXO	W1GHZ	www.q5signal.com
Reactance Labs	1152 MHz	TCXO	W1GHZ	www.reactancelabs.com
ADF4350 LCD	1152 MHz	int 25 MHz	W1GHZ	eBay - ADF4350 board
ADF5355	1152 MHz	internal	W1GHZ	eBay -OLEDDigitalADF5355
SV1AFN ADF4351	1152 MHz	HP OCXO	KV1J	www.sv1afn.com/adf4351m.html
ZL-PLL 14G	9216 MHz	ZL 10 MHz	N1JEZ	https://zl2bkc.com/projects/zlpll/
ZL-PLL 14G	13584 MHz	ZL 10 MHz	N1JEZ	https://zl2bkc.com/projects/zlpll/
DB6NT MKU LO 8-13	10368 MHz	internal	KA1LEX	http://shop.kuhne-electronic.de/kuhne/en/shop/signal-sources/oscillators/



MEMBERSHIP APPLICATION

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: George Collins, KC1V by e-mail to news.kc1v@gmail.com. Dues are \$10/year. Remember, this group is formed by VHF'ers for VHF'ers.

Mail to:

North East Weak Signal Group
 c/o N2OY, John Crawford
 PO Box 1112
 Latham, NY 12110

North East Weak Signal Group

c/o N2OY John Crawford, PO Box 1112, Latham, NY 12110

Check your membership
Expiration date on your mailing label!