

N.E.W.S. LETTER

The Official Publication of the North East Weak Signal Group – [N.E.W.S. - Home \(newsvhf.com\)](http://newsvhf.com)

November

Volume 31

Issue 6

Next Meeting: November 18, 2023.

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GENERAL MEETING - STORRS LIBRARY -

1 PM to approximately 3:45 PM.

693 Longmeadow St, Longmeadow, MA 01106

<http://longmeadowlibrary.wordpress.com>

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>

DON'T FORGET

The North East Weak Signal Group 2 Meter Net

Every Thursday at 8:30 PM local 144.250 MHz

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>

The N.E.W.S. LETTER is the publication of the North East Weak Signal Group.

Articles may be reprinted with proper credit given to the author and the N.E.W.S. LETTER.

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

REMINDER: 222 MHz Activity Night Tuesdays 7 to 11 PM

**NEWS Meeting 9 September 2023
at Storrs Library, Longmeadow, MA
and by ZOOM**

Called to Order by President, W2AAU, at 1300

TREASURERS REPORT

Balance \$3824

Members:

85 Regular

3 Life

12 Permanent

7 New Members

Two new members attending: K1QK and KA1PGK

OLD BUSINESS

- K1MAP - Conference account has paid for picnic fee and food in past, ~\$1K total.

MOTION - K1MAP - pay for club picnic from Conference account

UNANIMOUS

NEW BUSINESS

- K1AEP suggests picnic MDS spend more time on 10 GHz to help newer operators

**- WZ1V - Club Trustee is now WZ1V. Must be control op for beacons (now on RR property). Is a younger person willing?
Renewal is next year.**

ANNOUNCEMENTS

K1NKR - NEWS was well represented at HamXposition2023. Thanks

ADJOURN 1405

PROGRAM:

Sharing summer VHF & Up activities

From Dick W2AAU Meeting Topic

Jeff Millar, WA1HCO who has been contesting with the RPI Greylock group since 1969. He noted we have been using pretty much the same kind of rules for the contests "forever" with minor variations on a theme. With modern digital communications all around us, maybe we should change the rules to reflect what's important in these new systems. He has some very interesting thought provoking ideas.

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

Tues. Activity Night 7:30pm 222.100 K1WHS +

Weds Activity Night 432 K1FMS (N1DPM) +

Thurs. NEWS net, 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, MA

Treasurer George Collins, KC1V, Somers, CT
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Tom Williams WA1MBA Orleans, MA

Bob Bownes KI2L, Troy, NY

Mark Casey K1MAP, Hampden, MA

5.7 GHz and 10 GHz

New Hampshire Mesh Network Expansion Continues

October 19, 2023 by [Rob Leiden](#)

The Merrimack Valley Amateur Radio Association has received a grant award of \$46,125 from Amateur Radio Digital Communication, a California-based foundation, to expand its current 7-node microwave network in southern New Hampshire. The project includes extending the New Hampshire network into northeastern Massachusetts and south-western Maine as a bridge between states towards to the larger goal of a New England-wide network.

The project is a collaboration with the New England Digital Emergency Communications Network to provide microwave radio backup to DMR repeaters in New Hampshire that rely on the internet for primary connectivity between sites. Collaborating on DMR sites also increases MVARA's capability to support local emergency management organizations with amateur radio operators and equipment.

The grant proposal was co-authored by Jay Taft K1EHZ, Bill Barber NE1B and Jennifer Herting KD2BEC. The microwave network is IP-based, so amateur radio operators can use applications that normally run on the internet such as email, file transfer, weather station data, voice over IP telephone, and video streaming.

Recently, two New Hampshire towns have expressed interest in having amateur radio microwave capability installed on municipal towers so amateur radio operators can backup town communications that normally rely on the internet. The project benefits DMR communications such as SkyWarn nets when the internet is disrupted, and allows siting DMR repeaters where no internet exists such as the current node on Crotched Mountain in Frankestown. The project also benefits amateur radio operators when backing up communications for various public and private organizations. Jay, K1EHZ is available to answer any questions about the expansion plan and is a valuable resource for anyone looking to support further expansion of mesh networking in New England.

Free:

N1MUW wanted me to find homes for his old home brew tube amps. These are all free and arrangements can be made to pick them up in Westfield, MA by contacting me K1FMS. These were all in working order when put away 10 plus years ago.

6 Meter 4-1000A now set up grounded grid but was originally grid driven. Built by Dick Stevens W1QWJ (sk) and I believe appeared in an ARRL handbook I think in the 1980's. The power supply is separate 4kV supply with a 43lb Peter Dahl hypersil transformer. This amplifier ran about 1200w out with 100w drive and could have been driven much harder.

2 Meters 3CX800A7 in an old strip line circuit. The tube was always a bit soft but still made about 600w with 25 w drive. PS is separate and has a prototype transformer from Steve K1FO from his Lunar Link "leftovers".

222...Affectionately known as "The Stove" (because it's about that size) is an amp based on an RCA commercial high band VHF TV cavity using a 8792 tetrode. This is essentially a high linearity 7213 ..it's a 1.8kW plate dissipation. This amp will run 1500W 24/7/365! The tube in it was good when put away and i believe there may be a couple spares with it. All power supplies etc are included. HV supply has another large Peter Dahl hypersil transformer. This amp will require a truck and some muscle to move. It is on casters.

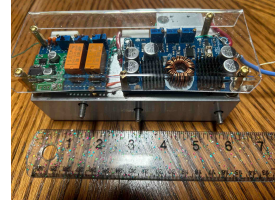
432. Single 4CX400A in a strip line rack mount RF deck with a separate power supply. This would do 400 to 500w output with fairly low drive.

These all may be anywhere from needing some work to plug and play. They were all functional when put away. There's no schematics or docs with any of them, but what do you expect for the price!

Contact Fred K1FMS at N1DPMFRED@GMAIL.COM

For Sale:

10 GHz 12 watt amplifier (sat14w) 75-100 mw drive, 12-30v input \$400
Don W1FKF
donw1fkf-news@yahoo.com



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For Sale From the estate of WZ8D:

2 - Hygain Tailtwister rotors with the newer control boxes with the 8 pin Jones connectors. Rotors were working when removed from his towers \$500 each
Used 8877 \$500
Very good condition Bird 43 wattmeter w/ UHF connectors and a genuine Bird 2500H slug \$250
Please contact me directly at [w8zn at arrl dot net](mailto:w8zn@arrl.net)

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For Sale:

FT736r Yaesu

144+222+432+1296

Late model. Bob, W1COT bought new about 1997. I bought from Bob about 10 years ago. Except for the typical flaky power supply issue that many of these have --I've been running it on an outboard 12v PS for several years--AFAIK the rest of the rig is in good working condition. Has Mike, Manual, and cord for outboard amps. The 220+ and 1240+ modules alone, ---around \$400 each asking price on ebay today. \$700 or offer.

IC-736 Icom

I bought this new around 1996. Good Solid HF+ 50MHz rig that has very good reviews. One of the display lamps is out. AFAIK it's in good working condition with Mike, manual. \$600 or offer

FT100 Yaesu

Some bands work, some intermittent.

\$200

About 30" oblong dishes. Light color. Dish only. Have at least 10 of these.

\$10 each

Can bring to NEWS meeting

CASH only

73 Mark K1MAP map92map@gmail.com

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Papers from Microwave Update 2023 and 46th Eastern VHF/UHF Conference,

including papers not in printed book and updated papers

are available at <http://www.microwaveupdate.org/conf2023/2023papers.html>

if you prefer a printed Proceedings book, they are available at [lulu.com](https://www.lulu.com)

search "Microwave Update 2023"

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Looking for new Club Trustee

Must be control op for beacons (now on RR property). Is a younger person willing?

Renewal is next year.

[for more info](#)

Contact Ron WZ1V wz1v@arrl.net

See if you recognize any of these guys?



WA1MBA

Club Commission Program

One of the benefits of being an ARRL Affiliated Club is having access to the Club Commission Program. Affiliated clubs can use this program to receive a commission for promoting membership in ARRL. When you sign a new member, the club gets \$15, and when a member renews through the club, you get \$5.

Members can renew anytime without losing any of their membership time. Details and forms are available on the ARRL website, at www.arrl.org/affiliated-club-benefits. FAQs are also available to help explain the program. It does take some effort and a bit of paperwork, but the club reaps the reward in cash. If your affiliated club is not participating in this program, ask them to investigate it

Microwave Update 2024

British Columbia, Canada

October 3-5 2024

- Hosted by WCWSA and PNWVHFS
- Planned location is 10 miles south of Vancouver International Airport (YVR)
- New upscale Casino
- Lots of parking
- Co-sited with new Hotel

Phase Noise Measurements of Some Synthesizers

Paul Wade W1GHZ ©2018, updated ©2019 &2023
w1ghz@arri.net

At Microwave Update 2023 & the 46th Eastern VHF/UHF/Microwave Conference in April 2023, I got a chance to measure phase noise of a new microwave synthesizer, the MAX2870, at both 1152 MHz, for comparison with many other synthesizers, and at 5760 MHz. (results near end)

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.

More recently, at the VHF Super Conference in April 2019, I tested a new synthesizer, as well as one of the best previous ones for comparison. Since Greg provided different Rohde & Schwarz test equipment, the results are presented separately.

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 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.

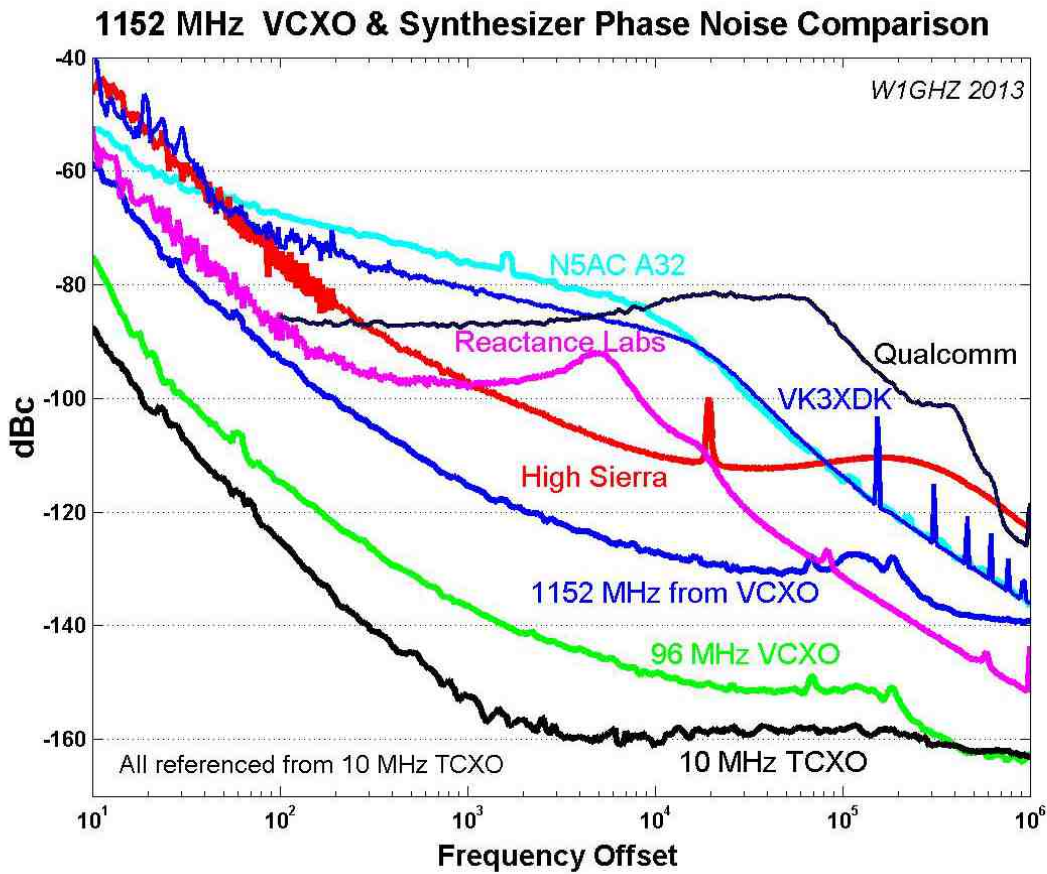


Figure 1 - Synthesizer Phase Noise measurements from 2012 and 2013

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 & Schwartz FSW-43 analyzer. Where possible, synthesizers were referenced to a 10 MHz TCXO, the same unit as 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 were 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.

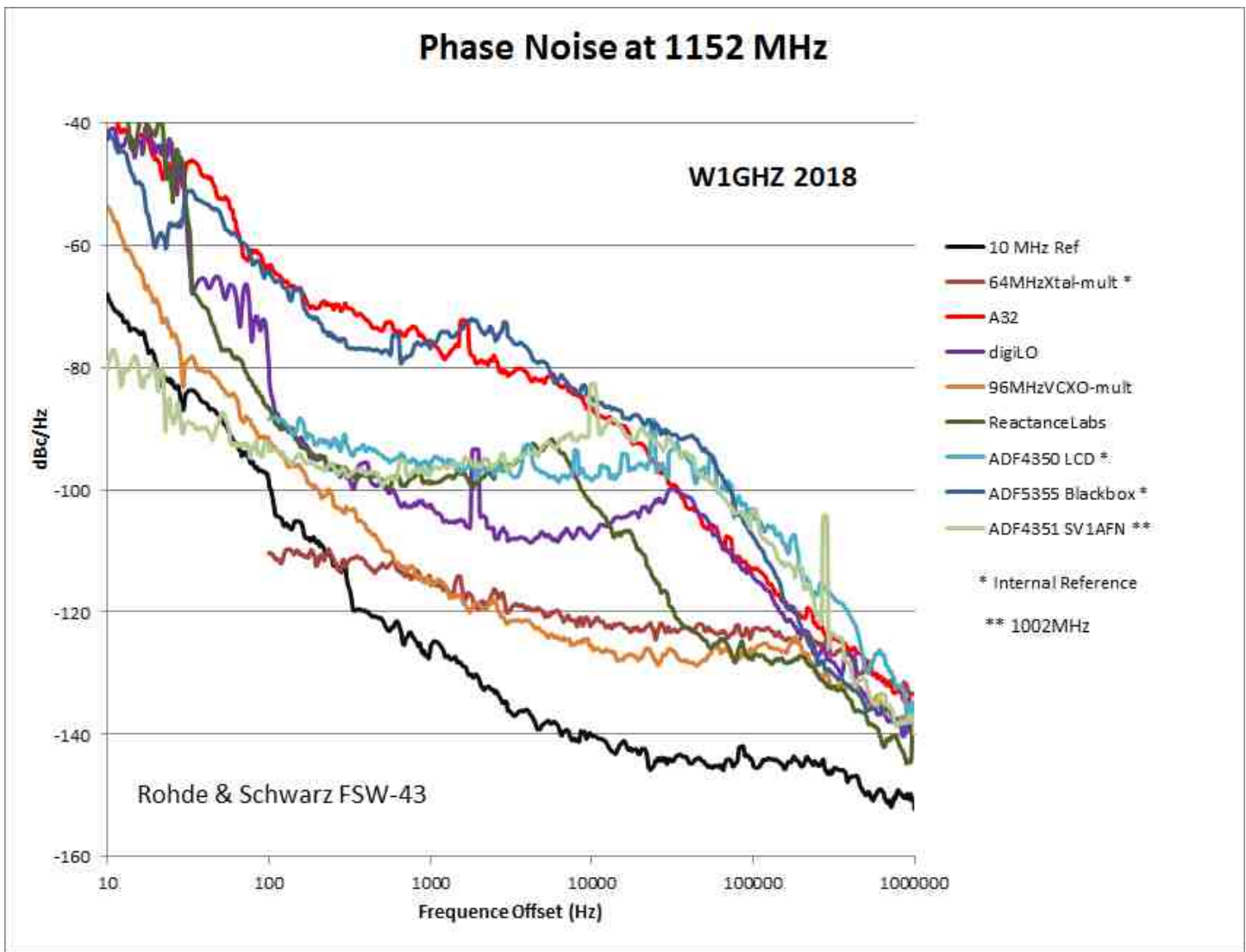


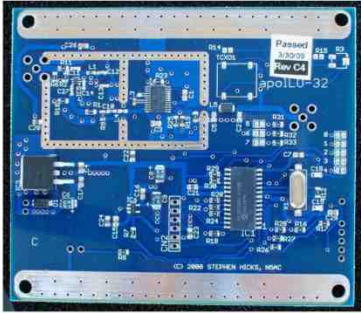
Figure 2 – 1152 MHz Phase Noise measurements at 2018 Eastern VHF Conference

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.

And 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.

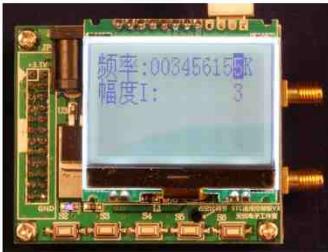
The ADF5355, available complete as shown or as a programmable board, operates up to 13.6 GHz. This one arrived just before the conference, so I didn't get a chance to check it out thoroughly.



A32 - N5AC



digiLO
q5signal.com

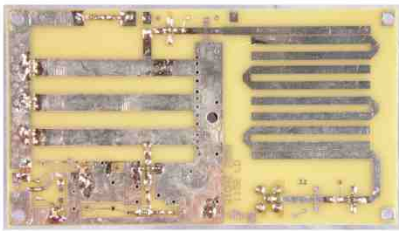


ADF4350



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

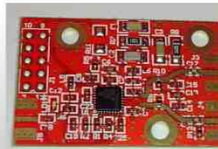


Figure 3 – 1152 MHz sources measured in Figure 2

MAX2870

The MAX2870 synthesizer board came from ebay for about \$40, not bad for a 6 GHz synthesizer. This version, shown in the Figure below, is programmable with on-board pushbuttons, and retains the frequency setting. The ad says serial control, “no control software provided.” If anyone has located working software, please let me know.

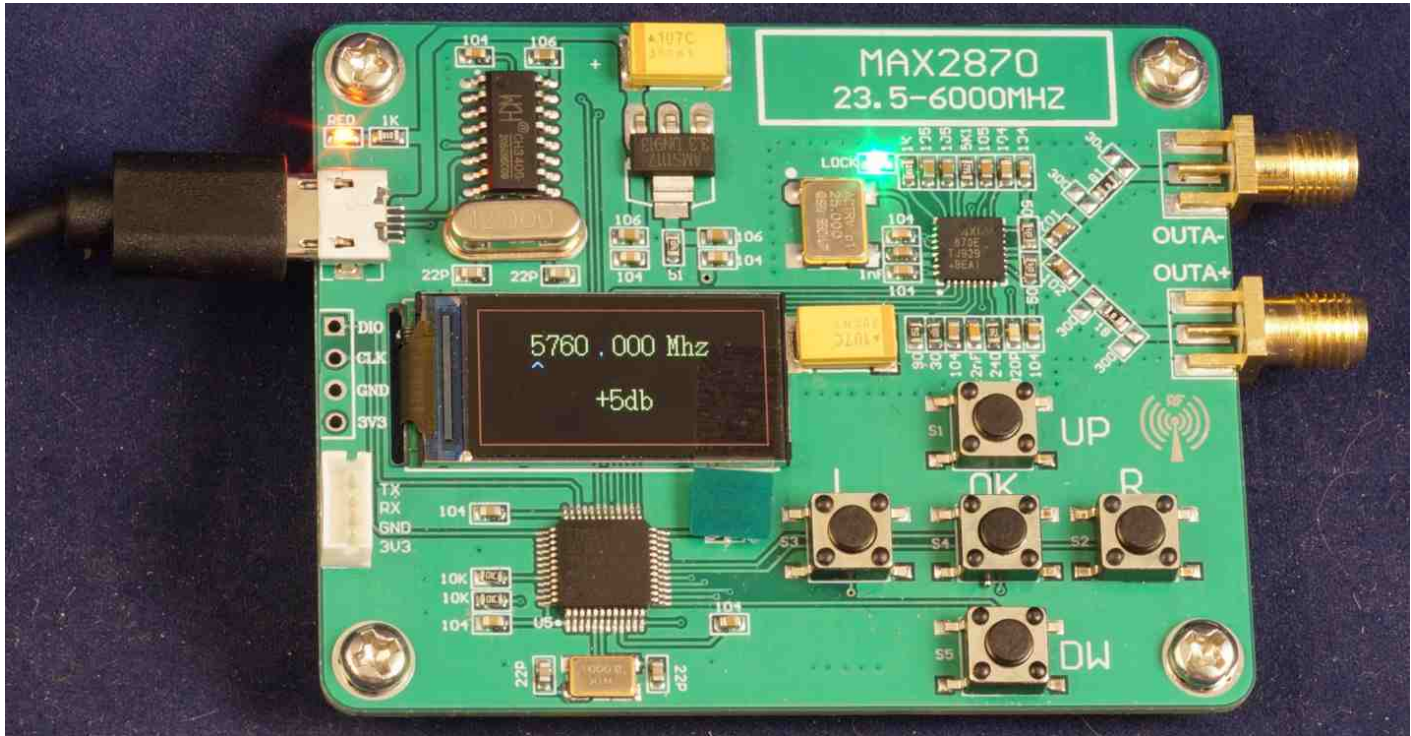


Figure new 2023 – MAX2870 Synthesizer

Power is through a USB-C; I powered it with a USB power pack battery to minimize USB noise.

Indicated power output is optimistic. At the +5dB setting shown, output was +1.5 dBm at 1152 MHz, -1 dBm at 3408 MHz, and -2 dBm at 5882 MHz. The frequency was about 100 KHz low at 5882 MHz.

Phase noise comparison is added to Figures 4 and 5. At 1152 MHz, the MAX2870 is a few dB worse than the DigiLO but significantly better than the VHF Design which uses the similar MAX2871. At 5760 MHz, phase noise is roughly comparable to the X-band units at higher frequencies, but it should be about 6 dB better since it is running a half the frequency.

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.

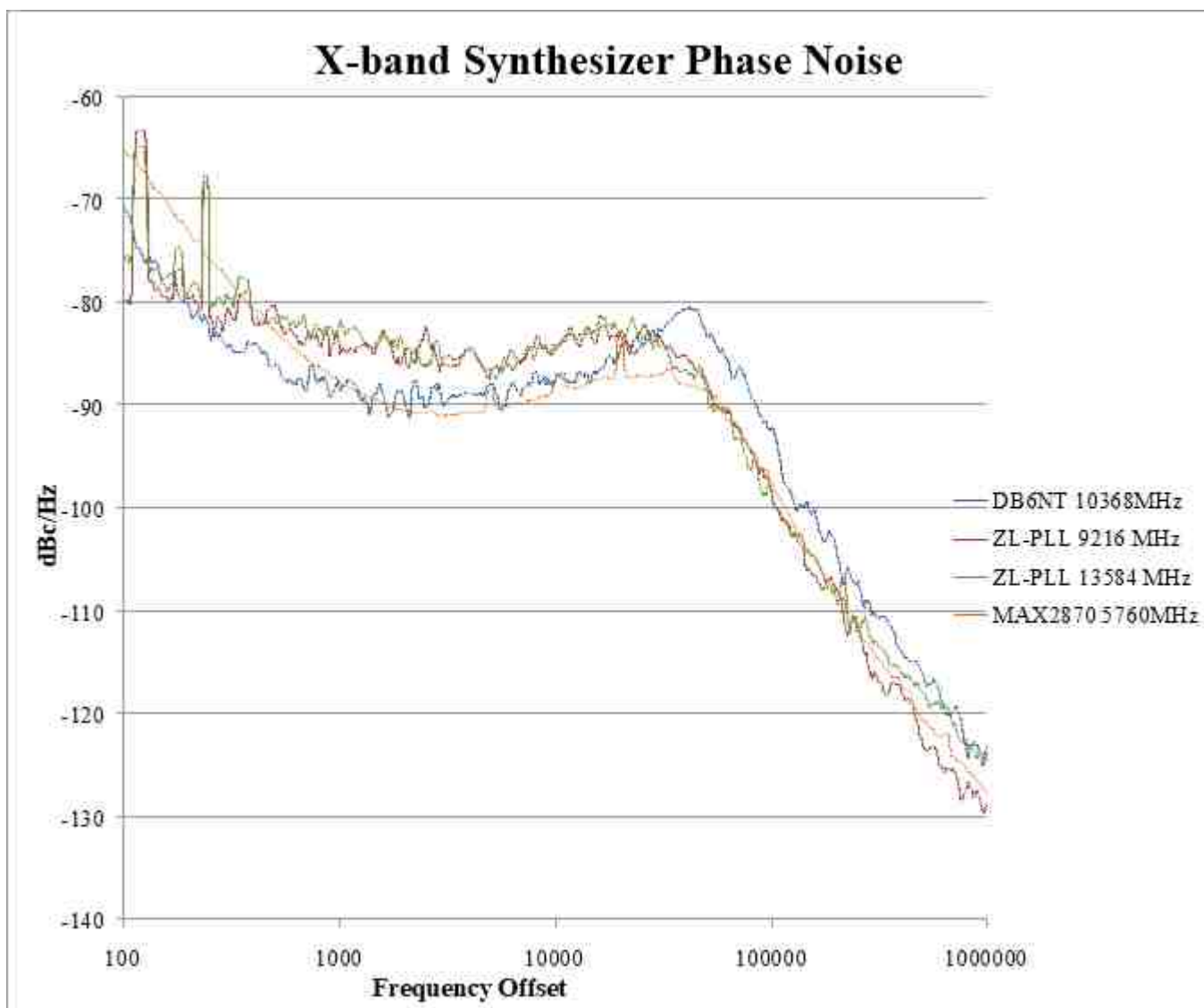


Figure 4 – X-band Phase Noise measurements at 2018 Eastern VHF Conference

MAX2870 added - MUD2023

DB6NT = MKU LO 8-13 (kuhne-electronic.de)

ZL-PLL = ZL-PLL 14G (zl2bkc.com)

2019 Measurements + 2023

Since the previous measurements, a new synthesizer has become available from VHFDesign.com, the **LO-PLL-USB-MAX2871-SHF-PCB**. This unit has attractive features: it is programmable from 1 to 6000 MHz, and includes a programmable beacon mode. The phase noise results at 1152 MHz are shown in Figure 5. Compared to the **DigiLO**, the best synthesizer measured so far, this unit is almost 20 dB worse, or comparable to some of the inexpensive synthesizers in Figures 2 and 3.

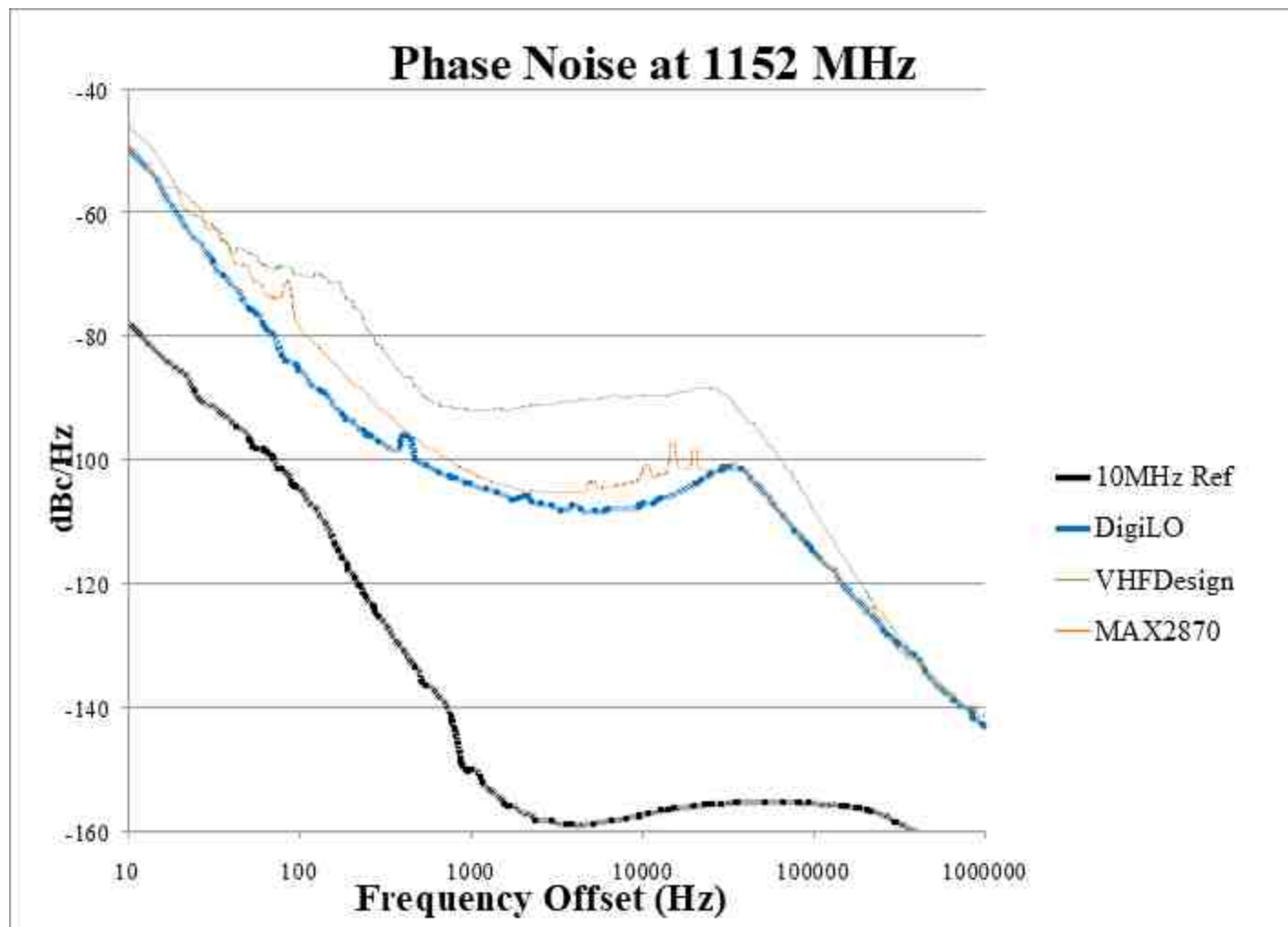


Figure 5 - 1152 MHz Phase Noise measurements at 2019 VHF Super Conference

MAX2870 added - MUD2023

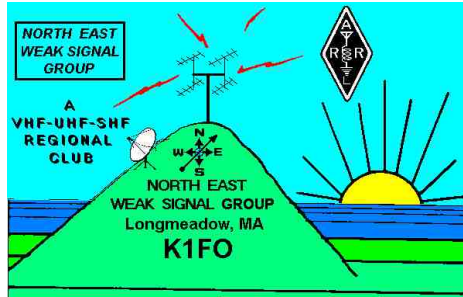
Notes:

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.



α ALPHA ANTENNA®





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 was established in 1993 to form a camaraderie among fellow VHF-UHF-Microwave enthusiasts and support a convenient means to exchange technical information. We currently have six meetings per year, 4 are held on at the Storrs Library on Rt. 5 in Longmeadow, Mass., 1 at our annual Conference in April, and 1 at our Annual Picnic in July. We provide a "NEWSLETTER" that is distributed via email 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 for 2 years. Please contact or mail application to: NEWS Treasurer, George Collins, KC1V, 105 Ninth District Rd., Somers, CT 06071 or E-mail: news.kc1v@gmail.com

Mail to

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NEWSLetter

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