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

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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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Social Gathering! Food! Swap-Sell-Tailgate
Everyone is Welcome!
MDS Testing for 10, 24, 47 and 78 GHz!!!
(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.
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 experiments\(^1\) 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 VCXO\(^2\) 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.
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.
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 buttons, 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.
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.

![X-band Synthesizer Phase Noise](image)

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:
## Appendix

### Phase Noise Test Hardware

<table>
<thead>
<tr>
<th>Unit</th>
<th>Frequency</th>
<th>Reference</th>
<th>Owner</th>
<th>Manufacturer or source</th>
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</thead>
<tbody>
<tr>
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<td>W1GHZ</td>
<td>Microsonics TK84/099</td>
<td></td>
</tr>
<tr>
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<td>64 MHz xtal</td>
<td>W1GHZ</td>
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<td>TCXO</td>
<td>W1GHZ</td>
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</tr>
<tr>
<td>N5AC A32</td>
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<td>TCXO</td>
<td>W1GHZ</td>
<td><a href="http://www.downeastmicrowave.com">www.downeastmicrowave.com</a></td>
</tr>
<tr>
<td>digiLO</td>
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<td>TCXO</td>
<td>W1GHZ</td>
<td><a href="http://www.q5signal.com">www.q5signal.com</a></td>
</tr>
<tr>
<td>Reactance Labs</td>
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<td>TCXO</td>
<td>W1GHZ</td>
<td><a href="http://www.reactancelabs.com">www.reactancelabs.com</a></td>
</tr>
<tr>
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<td>W1GHZ</td>
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<td>HP OCXO</td>
<td>KV1J</td>
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</tr>
<tr>
<td>ZL-PLL 14G</td>
<td>9216 MHz</td>
<td>ZL 10 MHz</td>
<td>N1JEZ</td>
<td><a href="https://zl2bkc.com/projects/zlpll/">https://zl2bkc.com/projects/zlpll/</a></td>
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<td>ZL-PLL 14G</td>
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<td>ZL 10 MHz</td>
<td>N1JEZ</td>
<td><a href="https://zl2bkc.com/projects/zlpll/">https://zl2bkc.com/projects/zlpll/</a></td>
</tr>
</tbody>
</table>
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.

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Check your membership
Expiration date on your mailing label!