N.E.W.S. LETTER

The Publication of the North East Weak Signal Group

July 2009 | Volume Eighteen | Issue 4

Next Meeting July 11, 2009

Picnic

Election

MDS and ERP Testing 10 and 24 GHz

Don't Forget

The North East Weak Signal Group
2 Meter VHF and Above Net
Every Thursday at 8:30 PM Local 144.250

MEMBERSHIP in the N.E.W.S Group is $15 per year. Apply to Tom Williams, WA1MBA.

Email mw@wa1mba.org You may download an application from our web page http://www.newsvhf.com/

The President's Corner

The President's Corner 7/09

I'm writing this on the VHF contest weekend. I'm up at my camp in FN44ar. I've installed a new Yamaha 4500 watt inverter generator. This will be its test. I have to solve a small problem where the output from the generator wipes out 6M! It appears to all be coming from the AC feed so I'm in the process of installing an AC line filter. We'll see how well that works. The generator seems clean on 2/222/432. 4500 watts should be plenty for me to finally run my higher power amps.

Fast forward two days….

The contest was a blast! 6 Meters was open for a good bit of Saturday. I ended up working 78 grids on that band. Most were the usual suspects, EM, EN etc…. I was able to work the KT1J grid corner operation in FN55,56,65,66 although FN56 was the only one that counted for the contest. Activity seemed light on the higher bands, but that was probably due to 6 Meters. Don't forget to submit your log and note your club affiliation!

The national DTV transition happened on June 12th. Vermont was ahead of the curve having transitioned on the original date back in February. This week was an interesting one on Mt Mansfield (FN34om). Both WCAX, channel 3 and Vermont Public Television, channel 33 removed their analog TV antennas in keeping with the mountain consolidation plan. I was up there and took a few pictures as the systems were disassembled, cut up and carted off for scrap.

On the left is VPT's antenna being lifted off of its tower. On the right, the crane is picking off a section of the Channel 3 tower. For those of us who frequent the mountain not only for work, but contesting as well, it does change the landscape. One thing I plan to test is how well my microwave/liaison system will work from the top where the Channel 3 antenna used to be. You get a pretty good 360 view for the top. Liaison used to be an issue up there with all the intense RF. Hopefully

The July meeting is an important one this year. Not only is it the picnic, but we also have election of officers. This year, we have a full slate of officers to elect, from President right on through the BOD seats. I'd personally like to thank Mark, KA1OJ as Vice President, Tom, WA1MBA as Treasurer, Paul, W1GHZ as Secretary Don, W1FKF as NEWSLetter Editor and the BOD's - Bob, W1COT Art, W1TDS Ron, WZ1V and Mark, K1MAP for their service during my tenure. I'd also like to thank the membership for supporting me as President.

As for the picnic, we'll also be doing our usual MDS testing so bring the rigs to check them out! Ken, W1RIL Henry, KT1J and I will try to make contacts on 122 GHz. That should be fun. See you all there.

73,

Mike, N1JEZ

From our Treasurer

We have our annual meeting at the picnic, and this is when our club year ends and begins. Its also when dues are due. I will have a printed version of the database at the picnic, so you can see if you are already paid ahead or its time to reenlist. Dues remain $15 per year. You can make out a check to the NEWS Group, or bring cash. Also, you can check out the database and make corrections if they are needed. We decided a year ago that we will no longer be taking donations to cover the picnic costs, but instead the club is funding it as our annual meeting expense. Hats off to all those who cook, bring extra dishes, and clean up. Any questions? If you don't see me next to the dues/database table, just look for the guy trying to eat more than his share of the cheeseburgers.

Tom WA1MBA

From our Secretary

No Secretary's report from last meeting.

Paul W1GHZ

N.E.W.S. MDS and ERP Testing

At the annual N.E.W.S. picnic, we will do MDS (Minimum Discernable Signal) and ERP testing on 10 GHz and 24 GHz, and possibly higher bands someday.

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 - when 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 Don and Dale. As a doublecheck, the frequency is moved a few KHz, then the signal level is increased one dB at a time (this is the “backup” number. If you weren't kidding yourself, you should be able to find it at the same level as before. Usually, it takes a few more dB to find a signal.

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

Results in 2008 were pretty good, with participants on 10 GHz and 24 GHz, plus a couple of higher frequency stations for show. This isn't a competition, just a chance to check out the gear with friends around to help. Most folks had 10 GHz stations that worked pretty well, while a few found problems to fix before the 10 GHz & Up contest in August. Not only do we know our equipment works, but also that there will be some other good stations to work.

Ham Wedding

Congratulations to Mickey and Dale

W1ZC new antenna system FN42dr Mason NH

World Moon Bounce Day

June 27th 2009

This major event will add a new word to most people’s vocabulary - Moon Bounce. Also known technically as Earth-Moon-Earth transmissions (EME), it will be one of the highlights of our many events. It was the foundation event that inspired the whole Echoes of Apollo project.

On Saturday, June 27th, many of the world’s large parabolic antennas (sometimes called dishes) will stop their normal space work and swing around to track the moon when it rises. EOA volunteers will then use the EME or Moon Bounce transmissions to link up with other dishes worldwide via the moon. Signals are literally being bounced off the moon’s surface and back to other stations on earth where they are received some 2.5 seconds later.There has never been so many dishes pointed at the moon since the lunar landings and possibly this will even break that record.
http://echoesofapollo.com/moon-bounce/

ICOM IC-7200 HF and 6 meter transceiver user review
by Ron Klimas, WZ1V

After reading the ARRL Lab review of this radio in June 2009 QST, I decided to buy one based on it's measured receiver IMD dynamic range coming in at 101 dB at 6M. That much performance in a radio that retails for $1100, could it be true? After trying it out during the June VHF Contest on a crowded band filled with big signals, it's my opinion this is a top notch digital receiver. I found the twin passband tuning quite effective in knocking down adjacent signal bleed-over. No AGC pumping from strong signals either. The noise blanker noticeably reduces power line noise at my QTH . I found the digital Noise Reduction helps a lot on weak signals in the noise, once you get used to the "hollow" sound effect common to this feature. Compared to my Kenwood TS-60S, this is clearly a better receiver. One disappointment was the poor transmit audio reports when I first tried it. There are no menu settings for tailoring transmit audio tone. After some research on the internet, two things became apparent. Icom recently switched to a Chinese mfr. for the supplied HM-36 hand mic. which sounds awful compared to the original Japanese produced HM-36. There is a mod by AB5N who will change the electret for about $40, and there is a Do It Yourself mod by SE5X. There is also a mod by DG2IAQ that eliminates a low pass filter cap in the transmit audio circuit and raises the electret DC bias resistor value. These are on the radio's main board. I found this difficult to implement due to the tiny SMD parts. I've never seen chip resistors that small! So you can imagine my disappointment after sending my mic out for a $40 fix and doing the transceiver mods to discover my TX audio was still poor! After looking at the HM-36 mic circuit diagram / mod by SE5X, it hit me. The factory mistakenly put in a 22K electret bias resistor instead of a 2K. After correcting that and doing a variation of SE5X's mod, I finally got good audio reports. One more thing, the built-in VSWR protection did not like the input match of my 6M amplifier. I had to put a 6M antenna tuner between the two to prevent the drive from getting cut back. Bottom line: This is a great transceiver for the money. It's a ruggedly built, mid-sized radio with a decent knobs, and a good sounding front-firing speaker. It doesn't have a band scope or internal antenna tuner, and it doesn't have a transverter connection or seperate receive connector, but it's also under $1000 discounted. You'll probably want to buy a better mic for it, or you can go through what I did. Email me if you buy one and want further advice on recommended mods.
-73, Ron, wz1v@arrl.net

Mid Atlantic States VHF Conference

Saturday, September 26, 2009
East Norriton, PA

An informative and fun filled day of presentations, eyeball QSOs with VHF gurus and beginners, auctions of good "stuff" and a great door-prize table.

HAMARAMA

Sunday, September 27, 2009

Microwave Update 2009
October 22-24, 2009
Dallas, Texas

Up Coming Contests

JUN 27-28 1800z-2100z ARRL Field Day
(not a contest) HF,VHF,UHF+

JUL 18-19 1800z-2100z CQ World-Wide VHF Contest 50MHz + 144MHz

AUG 1 - 2 1800z-1800z ARRL August UHF Contest 222MHz & up

AUG 15 - 16 6 AM-24PM l ARRL 10-GHz Cumulative Contest 10GHz & up

SEP 12-13 - 1800z-0300z ARRL September VHF QSO Party 50MHz & up

SEP 19-20 - 6 AM-24PM l ARRL 10-GHz Cumulative Contest 10GHz & up

MMIC Oscillator Experiments

Paul Wade W1GHZ ©2009

w1ghz@arrl.net

MMICs (Monolithic Microwave Integrated Circuits) are incredibly useful as amplifiers, but oscillate much less frequently than most other amplifiers. They are well-behaved enough to oscillate when desired. And they are predictable enough that I was able to build a wide-range VCO (Voltage Controlled Oscillator) that behaves nearly as simulated in software.

I have a fair amount of test equipment, but no signal generators that cover frequencies between 1300 and 2000 MHz, at least ones that I can lift. So, when I wanted to test some 1296 MHz filters, I had to come up with something. In the past, I have used a Minicircuits Frequency Doubler to cover this range, and I thought it might be easier if I could sweep the frequency with a VCO.

Some time ago, I played with a UHF VCO design from UHF Communications (I've lost the reference), but wasn't happy with the amplitude variation with frequency. At the time, it was a good lesson in why you shouldn't use a wide-range oscillator for a synthesized oscillator – small changes in tuning voltage cause large changes in frequency, so normal random noise results in a lot of phase noise. However, I recalled the technique used to vary the frequency and decided to try it with a MMIC.

Oscillator

One type of oscillator uses positive feedback – we apply feedback around an active device to form a loop. The Barkhausen criteria states that when the loop gain is greater than one and the phase shift around the loop is 360 degrees, it will oscillate. An inverting device like a transistor or MMIC has 180 degrees phase shift at low frequencies, so we must provide the other 180 degrees – for instance, a half-wave line. At higher frequencies, the time an electron takes to get through a transistor becomes significant, so the internal phase shift is greater than 180 degrees and less is required externally. Conceptually, it is easy to make a single frequency oscillator with a half-wavelength of coax.

MMIC VCO

Making the frequency variable and controllable is where the difficulty lies. We would like to vary the length of the line forming the feedback loop, to control the phase shift. Adding capacitance to a transmission line makes it electrically longer. In the circuit in Figure 1, a varactor diode at each end of the transmission line acts as a variable capacitor, so that the line length is tunable. Increasing the tuning voltage reduces the capacitance, increasing the frequency. The tuning voltage is connected in the center of the line, where it will have the least effect.

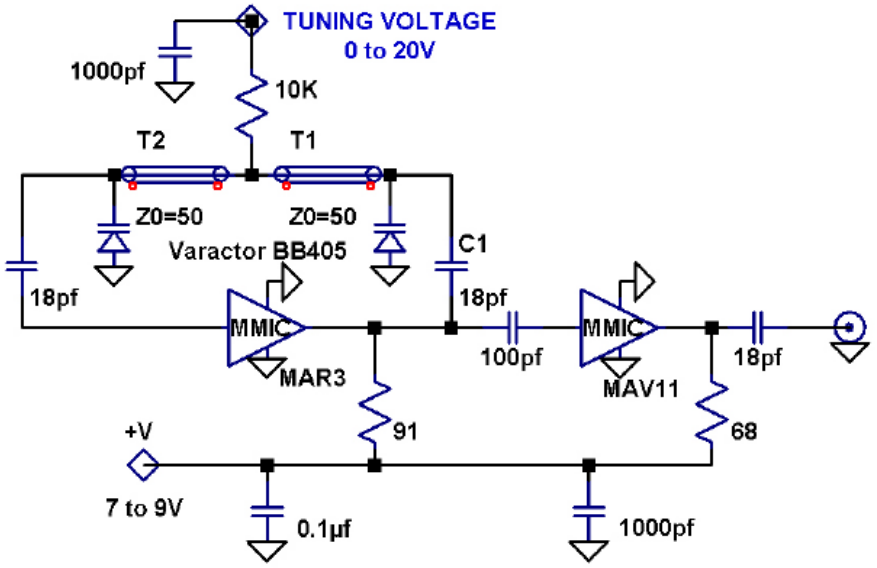


Figure 1 – Schematic of UHF MMIC VCO

The buffer amplifier allows the oscillator to work into a relatively constant load, so that the frequency is less affected by whatever is attached to the output.

Simulation

The circuit was simulated using the free Ansoft Designer SV software (www.ansoft.com). Since our primary concern is loop gain and phase shift, we break the loop and look at it as an amplifier, as shown in Figure 2. The loop is the gain from Port1 to Port 2; we plot both gain and phase, looking at the gain where the phase shift is 360 degrees. The varactor tuning is approximated by changing the value of $Ctune – for the BB405 diode, the range is 2 to 11 pf. With ¾ inches of transmission line, it should tune from about 500 to 800 MHz. The simulation files

One key to good VCO operation is that there is only one frequency with gain greater than 1 and 360 degrees phase shift. The MAR3 MMIC is a good choice for this frequency range – the gain drops off enough at the third harmonic so that loop gain is less than one, so the oscillator will only operate at one frequency. A hotter microwave device would have enough gain at higher harmonics to potentially oscillate at the third harmonic, where the transmission line is 3/2 wavelengths. While tuning, the oscillator might jump between fundamental and harmonic frequencies.

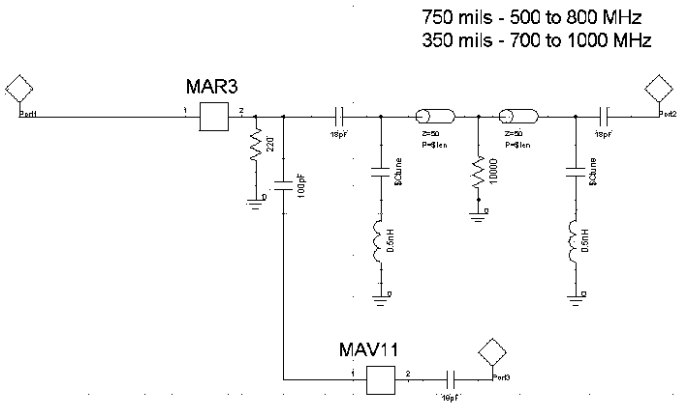


Figure 2 – Schematic used for circuit simulation

Test Results

I kludged a couple of these oscillators together on scraps of PC board cut from transverter prototypes (too ugly for photos!), using 0.141" semi-rigid coax for the transmission line.

With about ¾ inch of transmission line, the VCO tuned from about 375 to 650 MHz, with about +19 dBm out of the buffer amplifier. A shorter transmission line, about ½ inch, tuned from about 380 to 700 MHz, with about +16 dBm output.

The output level is plenty to drive a surplus broadband doubler module – after a filter, an output power of 0 to +2 dBm was available at twice the frequency.

The frequency range is somewhat lower than simulated, probably because the capacitance added by the PC board raises the minimum tuning capacitance. Dead-bug construction should have less stray capacitance and might work better. For lower frequency operation, longer lines and varactors with higher capacitance will do the job.

Microwave Oscillators

The same techniques could be used to make a loop oscillator for higher frequencies, by replacing the feedback loop with a pipe-cap filter. At resonance, phase changes very quickly, so there will be some frequency very close to resonance with the right phase shift and low enough loss to permit oscillation.

The MMIC should be placed between the two pipe-cap probes so that lead length is minimized. No blocking capacitors are needed since the probes provide DC isolation.

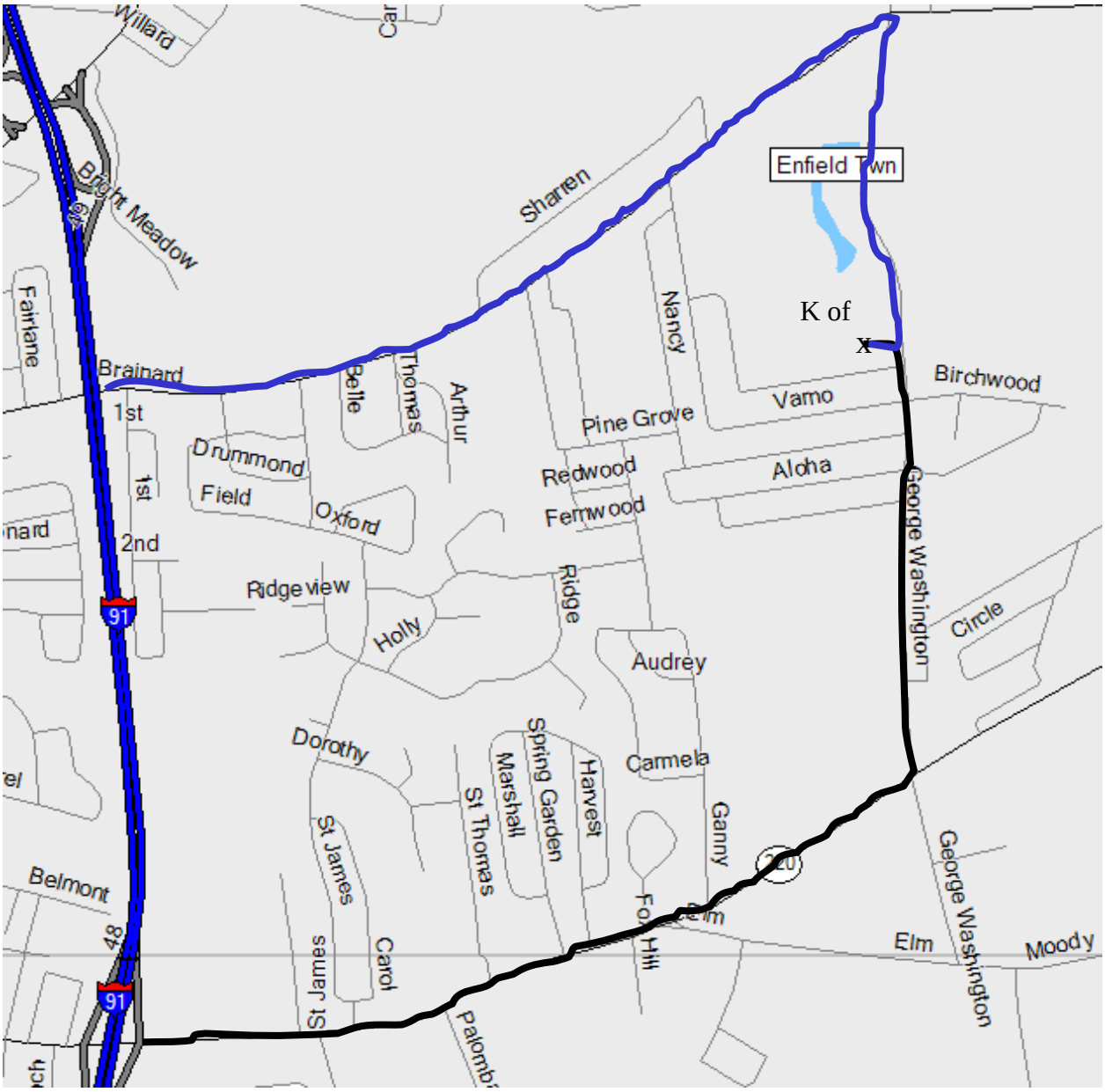
For a given probe length, filter coupling is reduced at lower frequencies. However, MMIC gain is higher at lower frequencies. Thus, it should be possible to find a probe length that works over the wide tuning range of the pipe-cap. My initial attempt was not quite right – it oscillates around 4 GHz but not at lower frequencies.

Summary

MMIC oscillators work without much difficulty, and are easy and cheap to build. For those who like to experiment, these should be fun to tinker with.

Directions to Picnic

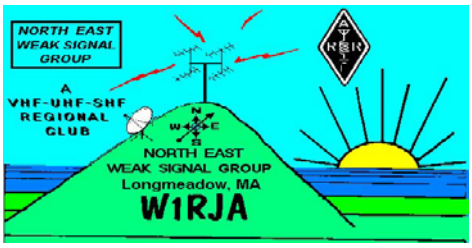
371 Washington Rd
Enfield, CT 06082



I-91 exit 48 on to Route 220 East (Elm St). Bear left at the fork onto Shaker Rd. At the 9th traffic light from exit 48, turn left on to George Washington Rd., K of C is 1 mile on the left.

Lost going that way? Try this:

I-91 exit 49, go south on Enfield St Rt.5. Drive 1/2 mile, take a left on Brainard Rd. Drive 2 miles, take a right on to George Washington Rd. K of C will be on the right.GPS: 42.015805 -72.560183



N.E.W.S. Group 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 comradely among fellow VHF-UHF-SHF enthusiasts, and support a convenient means to exchange technical information. We currently have 6 meetings per year, held at a centrally located facility, and provide a "NEWSLETTER" that is distributed 2 weeks prior to each meeting. Any contributions to this publication are appreciated and can be sent to: Don Twombly, W 1FKF 23 Maura Dr. Woburn, MA 01801 Email: donw1fkf-news (at) yahoo (dot) com. Dues are $15/year. Remember, this group is formed by VHF'ers for VHF'ers.

Mail to:

North East Weak Signal Group

c/o WA1MBA Tom Williams PO Box 28

Shutesbury, MA 01072

Email: tomw (at) wa1mba (dot) org **ARRL Affiliated**

For sale

For sale at the Picnic:
Transco 919C70100 SMA relays 18 GHz. One tested at 10 GHz with 0.2 dB loss.

Specs: http://www.dowkey.com/product/0/1/919c70100.php
Power Chart: http://www.dowkey.com/_upload/01_DKcat_Intro_Section.pdf
Narda SEM123N N Relay M/A type in-line Hi power 12.4 GHz. Specs: www.nardamicrowave.com/east/index.php?m=Products&e=details&id=1501
John, K1AE
john@pcsupportsolutions.com
cell 508 361 6229

Next Meeting July 11, 2009

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Election

and

MDS and ERP Testing 10 and 24 GHz

N.E.W.S Hats will be available at the next meeting!
$12 each - cash (bring some singles please) or check.
See Mark, KA1OJ

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The North East Weak Signal Group
2 Meter VHF and Above Net
Every Thursday at 8:30 PM Local 144.250
W1COT, WZ1V or K1PXE Net Control

North East Weak Signal Group

c/o WA1MBA Tom Williams PO Box 28 Shutesbury, MA 01072

Check your membership
expiration date on your mailing label!