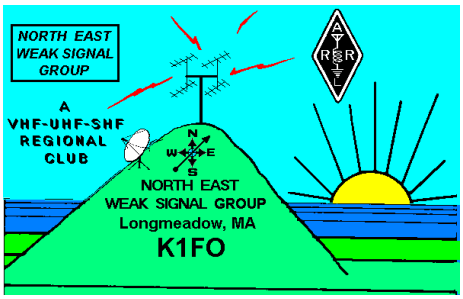


N.E.W.S. LETTER

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

September, 2014 | Volume 23 | Issue 4

NEXT MEETING: September 6th, 2014

BOARD MEETING - 11:15 AM at Lulu's, 151 Hazard Ave. Enfield, CT
phone: (860) 763-2377
I-91 exit 47 Rt.190E. 1 mile on left.

GENERAL MEETING - STORRS LIBRARY - from 1 PM to approximately 3:45 PM.
693 Longmeadow St, Longmeadow, MA 01http://www.luluspizzeria.com/106
http://longmeadowlibrary.wordpress.com/

DON'T FORGET
The North East Weak Signal Group
2 Meter VHF and Above Net
Every Thursday at 8:30 PM local 144.250 MHz.
W1COT, WZ1V or K1PXE Net Control

MEMBERSHIP in the N.E.W.S Group is $15 per year. Apply to Tom Williams, WA1MBA. Email tomw(at)wa1mba.org You may download an application from our web page:
http://www.newsvhf.com/

N.E.W.S. GROUP OFFICERS

PRESIDENT:
WA2AAU, Dick Frey
7262 Skyline Dr,
Delanson, NY 12053, FN22vs
Home: 518-895-2798
rlfbauer @ gmail.com
ACTIVE ON: 6, 2, 222, 432, 903, 1296, 2304, 3456, 5760, 10 GHz, 24 GHz.

VICE PRES:
N1JFU, Steve Meuse
80 Walnut St.
West Bridgewater, MA 02379 FN42la
Home: 508-345-3742
smeuse @ gmail.com
ACTIVE ON: 6, 2, 222, 432, 10 GHz.

SECRETARY:
W1GHZ, Paul Wade
PO Box 35
Cabot VT 05647, FN34uj
Home: 802-563-2110
Cell: 802-498-4797
w1ghz @ arrl.net
ACTIVE ON: 6, 2, 222, 432, 10GHz, more to come.

TREASURER:
WA1MBA, Tom Williams
POB 28,
Shutesbury, MA 01072, FN32sl
Home: 413-259-1921
tomw @ wa1mba.org
ACTIVE ON: 6, 2, 432, 903, 1296, 2304, 3456, 5760, 10, 24, 47 GHz.

EDITOR:
W1WSO, Tom Filecco
163 Bemis St.
Terryville, CT 06786, FN31lq
Home: 860-845-2205
Cell: 203-364-4225
w1wso @ comcast.net
ACTIVE ON: 6, 2, 10 GHz.

SPECTRUM MGR:
K1MAP, Mark Casey
303 Main Street,
Hampden, MA. 01036, FN3
Home: 413-566-2445
map @ mapinternet.com
ACTIVE ON:6, 2, 222, 432, 903, 1296, 2304, 3456, 5760, 10 GHz

BOARD OF DIRECTORS:
(All terms expire 2015)

K1MAP, Mark Casey
303 Main Street
Hampden, MA. 01036, FN32sb
Home: 413-566-2445
map@mapinternet.com
ACTIVE ON: 6, 2, 222, 432, 903, 1296, 2304, 3456, 5760, 10 GHz

K1WHS, Dave Olean
177 Dixon Rd.
Lebanon ME 04027, FN43mj
Home: 207-658-7758
k1whs@metrocast.net
ACTIVE ON: 6, 2, 222, 432, 903, 1296, 2304, 3456, 5760, 10 GHz, 24 GHz.

W1COT, Bob Leiper
47 Diane Dr.
Vernon, CT 06066, FN31st
Home: 860-649-6690
releiper@ix.netcom.com
ACTIVE ON: 6, 2

W1ZC, Dick Wilborg
791 Brookline Rd.
Mason, NH. 03048, FN42dr
Home: 603-878-3680
w1zc@myfairpoint.net
ACTIVE ON: 6, 2, 432, 1296

2014 NEWS CALENDAR:

September 6, 1PM - 4PM - N.E.W.S. Group Meeting

September 13-15, 1800Z-0300Z - ARRL September VHF QSO Party

September 20-21, 6AM - 11:59:59PM - ARRL 10-GHz & up Cumulative Contest

September 22, 1900-2300 Local - 144 MHz Fall Sprint

September 26-28 - Mid-Atlantic VHF Conference

October 1, 1900-2300 Local - 222 MHz Fall Sprint

October 9, 1900-2300 Local - 432 MHz Fall Sprint

October 10-11 - New England Amateur Radio Festival - Deerfield, NH

October 11, 0700-1300 Local - Microwave Fall Sprint

October 12, 8AM-2PM - Nutmeg Hamfest & ARRL CT State Convention

October 17-18 - Microwave Update - Rochester, NY

November 16 - Leonids meteor shower

November 22, 1PM - 4PM - N.E.W.S. Group Meeting

December 11 - Geminids meteor shower

Secretary's Report

Minutes of NEWS meeting 12 July 2014 (Picnic)
at Knights of Columbus, Enfield, CT

President WA1AAU called meeting to order at 1330

Treasurers Report
-Dues are due in July - $15
-Balance $4970

ANNOUNCEMENTS
-ARRL Centennial Convention next week
  Booth voluteers needed
  Pictures & video needed

MOTION by K1MAP To increase funding for ARRL Centennial
Convention. Not to exceed $500. UNANIMOUS

- Help needed for Eastern VHF/UHF Conference in April

- VC1T Group in Nova Scotia for Brendan Trophy attempt.
  Transmissions have been decoded in UK by G4SWX.
  Today is last day of operation.

- MUD in Rochester, NY 10/24-25. Presentations are needed.

- Mt Wachusett permit for 10 GHz in process.

Check NEWS reflector for updates.

Adjourned 1348

Followed by MDS testing at 10, 24, and 78 GHz
Special thanks to K1MJM and KA1NKD for operating the equipment and
recording the results.

Treasurer Report

The treasury is doing OK, and Membership numbers are as expected for this time of year. I will be sending out dues reminders in the next few days to the many who are a bit tardy. That usually jostles memories and gets the first tranche (maybe a better word is "group") of post-picnic dues in.

I other news, Don W1FKF, Mike N1JEZ, Mark KA1OJ and I had some fun during the first weekend of the 10 GHz and up contest. We managed to extend the New England DX on 78 GHz from 43 km to 125 km. If there is time, we might be able to talk about it during the September meeting.

Tom WA1MBA

Simple Broadband Solid-State Power Amplifiers

Paul Wade W1GHZ ©2014
w1ghz@arrl.net

Recently, I was working on some VHF and UHF solid-state power amplifiers using LDMOS devices.
These devices only take a few watts of drive to produce several hundred watts output, but they are rather sensitive to overdrive. I hate to tear apart a working station to test a new amplifier until I am certain it is working satisfactorily, so I prefer to do the testing on my workbench.

My broadband test amplifier only produces about one watt, fine for some preliminary tests, but not for full output from the SSPA. I needed something to produce 5 to 10 watts, and preferred not to build one for each band. Then I noticed a bag with some 2 GHz, 10 watt LDMOS FETs sitting on my workbench, where they had been since I acquired them at the last NEWS picnic.

Some years ago, when I was working professionally with power GaAsFETs, I saw a presentation[1] at a conference about broadband feedback amplifiers, and was inspired to build one – as I recall, it used a ½ watt 8 GHz GaAsFET and gave about 6 dB gain from VHF to around 3 GHz, with about ¼ watt power output. The beauty of the technique is that broadband impedance matching is provided by a single feedback resistor. The basic schematic, shown in Figure 1, is really simple.

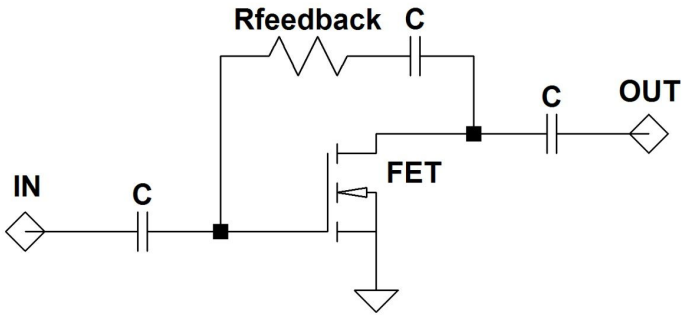


Figure 1

I couldn't find the original article conference Proceedings, but did find a more detailed paper[2] by the same author. This paper had the needed design equation for the feedback resistor, $\mathbf{R_{FB}}$:

For the BLF2043F LDMOS FETs in the bag, the transconductance $\mathbf{g_m}$ is 0.5 Siemens (or 500,000 µmho, in tube terms), so the needed feedback resistor is 1250 ohms. One consideration for the feedback amplifier is that the mimimum transconductance $\mathbf{g_m}$ needed for a a 50-ohm amplifier is 0.06 Siemens (or 60,000 µmho, in tube terms). This is a pretty big FET, so low-power FETs are not suitable, but power FETs are fine. I don't think any tube ever had a transconductance that high, so we can see why this technique was not popular with tubes.

Then the gain can be calculated:

For the BLF2043F the calculated gain is 27.6 dB.

Since this is a linear amplifier, we can simulate performance using S-parameters. I downloaded the S-parameters for the BLF2043F. Then I used Ansoft Designer SV (Student Version) to simulate the circuit of Figure 1 with the S-parameters for the device, starting with the calculated feedback resistance. The design equations above are a low-frequency approximation which does not account for the device capacitances, and it quickly became apparent that the approximation is inadequate. In the software, I varied the feedback resistance – a value of 160 ohms seemed to provide the best broadband performance, about 13 dB gain.

I found a small heatsink and a scrap of PC board with lines about the same width as the wide device leads – the line impedance is a bit lower than 50 ohms, but that shouldn't matter for short lines at these frequencies. The hardest part is drilling and tapping holes in the heatsink. Then the parts are soldered in – a common ¼ watt resistor and some chip capacitors. The capacitors are 1800 pf in parallel with 0.1 uF, since I wanted to be sure to provide a load at input and output at low frequencies to reduce the chance of oscillations.

The completed amplifier is shown in Figure 2. Note that the feedback resistor is two 330 ohm resistors in parallel, for 165 ohms. At 24 volts and about 200 mA idling current, gain is between 12 and 13 dB, pretty flat, from 36 to 490 MHz, with no tuning needed.. Power output saturates around 8 or 9 watts at 144, 222, and 432 MHz, falling off to around 5 watts at 50 MHz. Reducing the voltage to 13 volts narrows the bandwidth and lowers the output power to 1 to 2 watts.

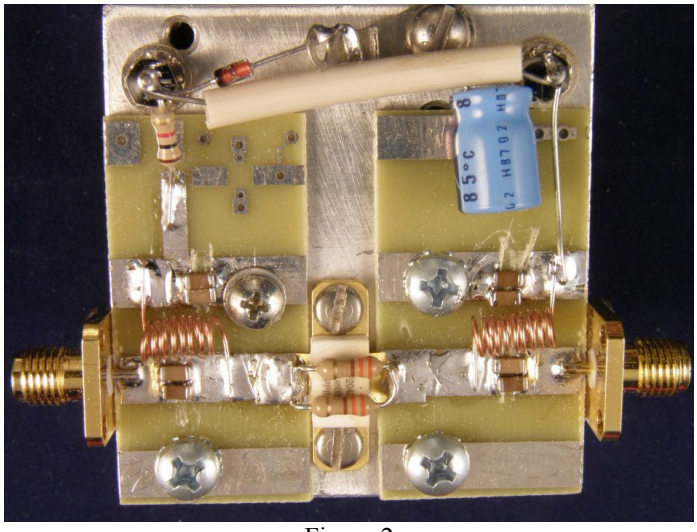
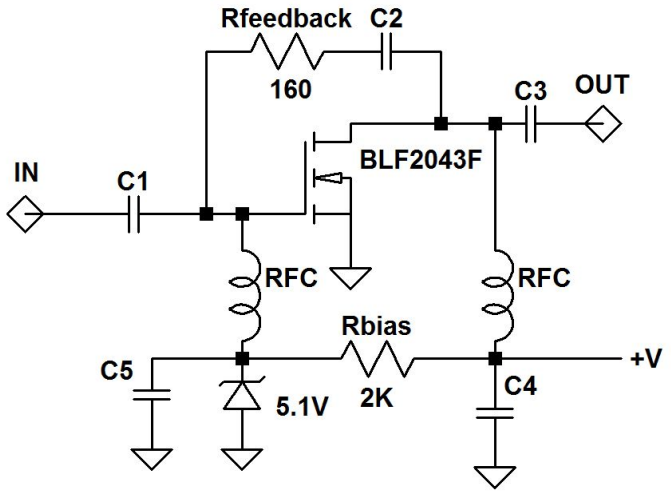


Figure 2

The feedback resistor was initially a single 160 ohm resistor. The first time I drove it up to full power, I smelled something burning – it was the feedback resistor. With 13 dB of feedback and 9 watts out, the resistor is dissipating nearly ½ watt, so it was cooking. The parallel resistors in Figure 2 cured the overheating.

Once the amplifier was working, I measured the gate bias voltage – about 5.1 volts on my unit. A 5.1 volt zener diode is an easy solution, powered through a 2K resistor, which provides a few milliamps for the diode at 12 volts without overheating at 24 volts. Figure 3 adds all the bias components to the circuit.



This is a really simple way to build a broadband medium-power amplifier useful for testing. Since the maximum power output is proportional to the supply voltage, the voltage can be set to limit the output power and avoid overdriving an expensive SSPA.

For NEWS members who would like to build one, I have a few extra BLF2043F devices at a very reasonable price. Other devices would also work with the appropriate feedback resistor.

References

1. Niclas, K., Wilser, W., Gold, R., Hitchens, W., "A 350MHz-14GHz GaAs MESFET amplifier using feedback," *1980 IEEE International Solid-State Circuits Conference Digest of Technical Papers*, IEEE, 1980, pp. 164-165.
2. Niclas, K.B., Wilser, W.T., Gold, R.B., Hitchens, W.R., "The Matched Feedback Amplifier: Ultrawide-Band Microwave Amplification with GaAs MESFET's," *IEEE Transactions on Microwave Theory and Techniques*, Volume 28, Issue 4 , April 1980, pp. 285–294.

W7GJ Sends:

I am back from my 6m EME DXpedition to KH8. All the information and some photos are on my DXpedition web page:

http://www.bigskyspaces.com/w7gj/AmericanSamoa2014.htm

Here is the summary from the bottom of my web page. I thought that KH8 was pretty rare for W1 stations, but I didn't work ANY stations in New England! Either I failed to get the word out well enough, or all the W1 stations had already worked KH8 years ago when there was F2. I will try to pick a more rare DXCC for next year's 6m EME DXpedition! GL and VY 73, Lance

In the end, there were 73 contacts made with 26 DXCC, with 40 other stations in 9 additional DXCC copied but not worked on 6m EME. 68 of the contacts, in 24 different DXCC were worked on 6m EME; the other 5 stations in 2 DXCC were contacted via ionospheric modes, presumably involving the E layer. The summary is shown below, with all stations listed in alphabetic order. Signal strengths shown for stations worked are the values during the contact. Often Faraday rotation made the polarity quite different at both ends of the contact, so larger stations may appear to have been weaker when worked. Signal strengths shown for stations copied but not worked are the best values copied from them over the course of the DXpedition. Some stations were copied many different times during the operation, and a number of those stations were called for extended periods of time without success. May the tones be with you!

MODE	STATION WORKED	SIGNAL STRENGTH	DXCC
6M EME	9A8A	-28	1
6M EME	CT1HZE	-25	2
6M EME	EA8DBM	-25	3
6M EME	ES6RQ	-25	4
6M EME	F6BKI	-18	5
6M EME	G3WOS	-22	6
6M EME	G4FUF	-23	
6M EME	G4IGO	-26	
6M EME	G5WQ	-23	
6M EME	G8BCG	-27	
6M EME	GM4WJA	-23	7
6M EME	HA0DU	-26	8
6M EME	HA7TM	-20	
6M EME	IW5DHN	-24	9

6M EME JG2BRI -29 10
6M EME JR6EXN -29
6M EME K2ZD -20 11
6M EME K4RX -27
6M EME K4ZOT -20
6M EME K6MYC -25
6M EME K7CW -21
6M EME K7RWT -26
6M EME K8WW -26
6M EME KB8RQ -26
6M EME KD3UY -27
6M EME KG7H -22
6M EME LA8AJA -24 12
6M EME LY2BAW -20 13
6M EME N3CXV -20
6M EME N3XX -20
6M EME N6BBS -21
6M EME N6RMJ -25
6M EME N7NW -23
6M EME N8GTI -23
6M EME N8JX -26
6M EME NN7J -26
6M EME OA4TT -26 14
6M EME OH2BC -26 15
6M EME OH6MIK -20
6M EME ON4AOI -25 16
6M EME ON4GG -18
6M EME ON4IQ -22
6M EME OZ1DJJ -28 17
6M EME OZ4VV -29
6M EME PA3HP -30 18
6M EME S51V -19 19
6M EME S57RR -25
6M EME S59A -25
6M EME SM7AED -21 20
6M EME SM7FJE -22
6M EME UT7QF -27 21
6M EME UZ5DZ -17
6M EME VE1JF -28 22
6M EME VE3KH -28
6M EME VE3MMQ -25
6M EME VE5UF -27
6M EME W3UUM -25
6M EME W6BBS -21
6M EME W6XU -24
6M EME W7GJ -20
6M EME W7IUV -25
6M EME W7JW -27
6M EME W7MEM -25
6M EME W8PAT -24
6M EME WA4NJP -20
6M EME YT1AR -24 23
6M EME YU7EF -21
6M EME ZL3NW -28 24

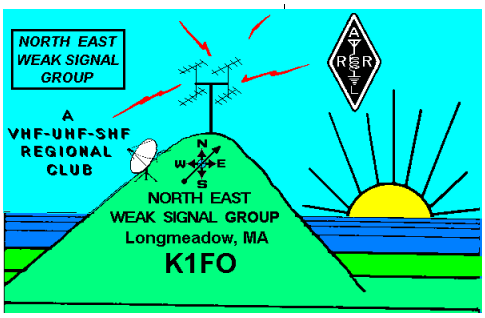
6M ES ? E51WL -21
25
6M ES ? KH6/KB6EGA 59 26
6M ES ? KH7Y 599

6M ES ? WH6XM 51

6M ES ? WH7FC 59

BEST DB

STATION SIGNAL
MODE COPIED STRENGTH DXCC
6M EME EA3AKY -24 27
6M EME EA7KW -30
6M EME EI4DQ -28 28
6M EME G8VR -24
6M EME HB9Q -21 29
6M EME JR1LZK -27
6M EME K4PI -27
6M EME K5RK -26
6M EME K6EME -23
6M EME K7MAC -25
6M EME KD7YZ -27
6M EME KF8MY -24
6M EME LZ2WO -19 30
6M EME N0KE -24
6M EME N5DG -27
6M EME N8OC -23
6M EME N9FTC -23
6M EME OH7TE -29
6M EME OK1RD -23 31
6M EME OZ7OX -26
6M EME PE1L -21
6M EME S51DI -25
6M EME S51DI -25
6M EME SP3RNZ -24 32
6M EME SV1DH -30 33
6M EME SV8CS -30
6M EME UR5LAK -27
6M EME UR7DWW -25
6M EME VK5PO -24 34
6M EME VK7JG -29
6M EME W3XO/5 -27
6M EME W4CSW -24
6M EME W4IMD -25
6M EME W5UN -28
6M EME W7EW -22
6M EME W7EW -22
6M EME W7UT -28
6M EME W9GA -23
6M EME W9JN -26
6M EME YO9HP -22 35



North East Weak Signal group

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 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: Tom Filecco, W1WSO via email – w1wso@comcast.net. 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

W2PED
Specializing in 24 GHz. and above.
pdrexler@hotmail.com

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!