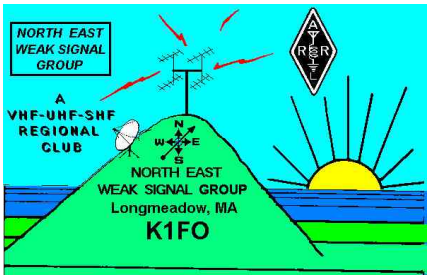


N.E.W.S. LETTER

The Official Publication of the North East Weak Signal Group – N.E.W.S. - Home (newsvhf.com)

March 2023	Volume 31	Issue 2

Next Meeting: March 25, 2023.

In This Issue

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

GENERAL MEETING - STORRS LIBRARY - from 1 PM to approximately 3:45 PM.
693 Longmeadow St, Longmeadow, MA 01106
http://longmeadowlibrary.wordpress.com

DON'T FORGET

The North East Weak Signal Group 2 Meter Net
Every Thursday at 8:30 PM local 144.250 MHz
W1COT, WZ1V, or 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.

Treasurer's Report January 7, 2023

Balance, Last Report 11-19-2022:	$3432.88	
Expenses:	($138.18)	Mt. Wachusett Special Event Use Permit for 2020, 2021, 2022
Balance as of 1-7-2023:	$3294.70	

Current Paid Members:

No new members or renewals for this reporting period.

Totals are:

75 Regular (correction from last report of 76)
3 Life
12 Permanent

On behalf of the club I would like to thanks George Vaccarco, W1JHR, for obtaining the Special Event Use Permit for the Mt. Wachusett site each year for the past several years for use by club members during the 10-GHz and Up weekends. George's efforts on behalf of the club are much appreciated.

Membership Expirations – Future Income

Of the 75 regular, paid memberships only one will become due during 2023. This may negatively impact the club's income for the coming year. The future due dates are:

Number of Members	Due Date
1	7-1-2023
47	1-1-2024
18	7-1-2024
7	1-1-2026
2	1-1-2028

Submitted January 7, 2023
George Collins, KC1V

.....

Secretary's Report North East Weak Signal Group

NEWS Meeting 7 January 2023
at Storrs Library, Longmeadow, MA
and by ZOOM

Treasurer's Report

OLD BUSINESS

- MOTION K1MAP - To pay for Beacon Project (approved last meeting) from Conference account UNANIMOUS
- W1LE - Parts for beacon on order from Kuhne. gathering small parts
- W1LE - working on Blue Hill Observatory as possible beacon site
- KV1J & W1FKF - 10 GHz beacon for FN44rc will be ready for spring

NEW BUSINESS

- Election - NEW OFFICERS:
  - President - W2AAU
  - VP - KA1SUN
  - Treasurer - KC1V
  - Secretary - W1GHZ
  - Board of Directors - KI2L, K1MAP, WA1MBA, W1EX
  - NEWSletter - W1FKF

- N1DPM - Suggestion that NEWS apply for 10GHz Contest Permits for Mt. Greylock and Mt. Sugarloaf (Sunderland) as well as Mt. Wachusett
- W2AAU - NEWS permit application should be kept separate from MGEF
- MOTION W1GHZ - Club to pay application fee ($45) for up to 3 sites UNANIMOUS

ANNOUNCEMENTS
- K1MAP - Conference hotel $139 includes two breakfasts per night
  Registration Code NEWEAK
- WA1MBA - Trivia contest will return Meter at following Eastern VHF/UHF Conference
ADJOURN 1357

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 (ARRL)

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
Activity Night 7:30pm 222.100 K1WHS+
Weds Activity Night 432 N1DPM+
Thurs. NEWS net, W1COT (K1BXC alternate) 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,

Treasurer George Collins, KC1V, Somers, CT
Secretary Paul Wade, W1GHZ, Cabot, VT

Board Of Directors:

Tom Cefalo W1EX N Reading MA

Tom Williams WA1MBA Orleans, MA
Bob Bownes KI2L, Troy, NY
Mark Casey K1MAP, Hampden, MA

NEAR-FestXXXIII

NEAR-FestXXXIII will be held on April 28th and 29th 2023 and not on its traditional date which always has been the first weekend in May every year since 2007. NEAR-Fest XXXIV scheduled for October 13th and 14th 2023 is NOT affected.

Last month the Deerfield Fair Association informed me that they booked two events, the NH Farm, Forest and Garden Show and the NH Arabian Horse Ass'n Show at the Fairgrounds for May 5th and 6th 2023 which is the weekend before Mothers Day. We were told we were welcome to hold the NEAR-Fest at the same time with the two other shows but there would be a "few small changes" to the parts of the Fairgrounds that we would be allowed to use. Mister **Mike** <w1rc@near-fest.com

For Sale:

W1GHZ PC boards
Winter is a good time for club projects. To possibly promote more microwave activity and getting new folks on the bands, I will offer a 20% discount on my PC boards(W1GHZ PCB Projects)
(www.w1ghz.org) thru March 2023 for club or group projects.
73,
paul W1GHZ

Microwave Update 2023
plus Northeast VHF/UHF
46th Conference
April 13 to 16, 2023
Hilton Garden Inn @ Bradley Airport, Windsor, CT

Microwave Update 2023 - Home

The North East Weak Signal Group would like to invite you to the annual Microwave Update Conference to be held April 14 and 15, 2023 (with additional activities April 13th and 16th at the Hilton Garden Inn at Bradley Airport, Windsor, CT

Microwave Update is the premier microwave conference of the year and was initially started by Don Hilliard W0PW (sk) back in 1985. This is the ideal conference to meet fellow microwave enthusiasts and share ideas and techniques that will help you conquer your next microwave band.

Friday Schedule of Presentations

Preliminary Schedule and Titles 26 February

Time	Call	Title
0815	**WELCOME**	
0830	KB1QV	Packing a Two Meter Bell
0845	K1WHS	222 MHz Larcan Amplifier
0930	W4ZST	Some Ideas for Microwave Contest Stations
1000	**BREAK**	
1015	WA1MBA	47 GHz Quadrupler
1035	WA1ZMS	47 GHz Beacon
1115	W1GHZ	Sectoral Horn Antennas for Microwave Beacons
1145	**LUNCH**	
1300	**AUCTION**	
1315	N1AC	IQ Quadrature Conundrums
1345	VE3CZO	Minimalist Transverter Sequencer for FT817
1415	WA4LPR	Interdigital Filters
1430	K3TUF	Remote Microwave Operation
1500	**BREAK**	
1515	K6JEY	Extending Frequency Range of Spectrum Analyzers
1545	WA5VJB	Care and Feeding of Yagi Antennas
1615	N0UK	Urban Microwave DXing
1630	K1UU	Building a VHF+ Station - with mistakes
1700	KD2TAI	SDR Rover Kit, an 8 Band Radio
1715	**DINNER**	On Your Own
1900	**SWAP MEET**	Indoor
2000	K2UA	VHF Contest Rules and VHF/UHF Advisory Committee

Saturday Schedule of Presentations

Preliminary Schedule and Titles 26 February

Time	Call	Title
0815	**WELCOME**	
0830	K1YBE	ARTEN - New England Mesh Networking
0900	W3CMP	6 Meter Yagis
0920	K1WHS	Dealing with RFI from TV stations
1000	**BREAK**	
1015	W1GHZ	Cassegrain Antenna Design and Feedhorns
1045	VE2UG	Cassegrain Antennas for 47, 78, & 122 GHz
1115	G4DBN	Lens
1145	**LUNCH**	
1300	**AUCTION**	
1315	K1NKR	VHF+ session at NE Convention
1330	KC6QHP	Building and Operating a 122GHz Station
1415	WA1MBA	MDS Measurement System
1500	**BREAK**	
1515	W9JJ	ARRL Contests Update Forum
1900	**BANQUET**	
2030	W1YW	RF Invisibility Cloak

Activities -

Thursday morning, there will be a tour of ARRL Headquarters

Thursday afternoon, a tour of the New England Air Museum in Windsor Locks, CT

Thursday evening will have an informal social gathering and swap (BYOB due to hotel rules).

Friday evening will have an indoor SWAP meet and informal social gathering (BYOB due to hotel rules).

Saturday night: Banquet, After Dinner Speaker, Awards, Prize drawing

Sunday morning at the Vintage Radio Museum, Windsor, CT, there will be a tail-gate swap meet. The museum will have reduced price admission.

There will be a **SUPER** Test Equipment Lab and noise figure testing available during the conference and a Vendor area.

Plus AUCTIONS of good stuff after Lunch each day
We plan to have an informal program for family on both Friday and Saturday.

Banquet Speaker will be Chip Cohen, W1YW talking about the *RF Invisibility Cloak*
Chip Cohen, W1YW, inventor and designer of Fractal Antennas, s a principal of Fractal Antenna Systems as well as a serious DXer.

His **professional and ham biographies may be found at these links**

.....

Looking for Conference volunteers to help out
- contact Mark K1MAP
map92map@gmail.com

.....

Prize and Auction contributions welcome! Please, ship items by UPS, FEDEX, or US Mail, no later than April 5 to:

Microwave Update
Don Twombly, W1FKF
32 Bumfagon Road
Loudon, NH 0330

Or bring to Conference

.....

.....

The hotel for Microwave Update and the 46th Eastern VHF/UHF Conference is sold out.

We have arranged for additional rooms

easily walkable. to Conference

Hyatt Hotel, 200 Corporate Drive, Windsor CT

The code is G-NEWS

Windsor, CT Hotel | Hyatt House Hartford North / Windsor

The conference rate for Wednesday, Thursday, Friday, Saturday and Sunday night is still $139 per night which includes breakfast for two. Available rooms are King or King with pullout bed.

73
Mark Casey K1MAP Conference Co Chairman
Paul Wade W1GHZ Conference Co Chairman

Dyneema non-stretch rope Stan, W1LE 1 March 2023

Ever need a extremely low stretch rope to support a long yagi ?

This super lightweight rope may be the answer.

Dyneema is a brand name for a ultra-high-molecular-weight polypropylene (UHMwPE) rope.

Original problem was using the supplied rope to support a long boom 222 MHz yagi.
In the good warm weather of summer, I could tension the rope to keep the yagi level.
But, when winter came along with snow and ice, the supplied rope stretched too much.

I came across this rope on Ebay and it is used in a winch and comes in a few grades of load limit.

I cut it to size with a hot knife and use shrink tube on the cut ends.

Yes, you might say it is significantly over strength. Use the smallest available, ~ 5mm or 3/16".
My criteria is the very low stretch factor. I am currently evaluating the effects of UV.

Some examples on Ebay:

X-BULL 4 mm x 50' Synthetic Winch Rope Line Orange Recovery Cable 4WD 8000LBS
X-BULL 1/6"x50' Synthetic Winch Rope Line Orange Recovery Cable 4WD 8000LBS 840011463100 | eBay

1/4" x 50' Synthetic Winch Rope Cable Stopper Clevis Slip Hook ATV UTV 10000LBS
1/4" x 50' Synthetic Winch Rope Cable Stopper Clevis Slip Hook ATV UTV 10000LBS | eBay
Stan, W1LE

NEWS Group Beacon Project: Status as of 2 March 2023, Stan, W1LE

The purchase of PLL synthesized microwave oscillators has been completed and they are on my test bench. The models selected are from Kuhne-Electronics (DB6NT), model MKU LO 8-13 PLL-2.

This synthesizer can use either an internal TCXO xtal oscillator as a reference in the signal generating or it can use an external 10 MHz reference for greater accuracy and stability. We can choose between multiple RF outputs to include one used as a 2M transverter LO, programmable microwave output from 8.4 thru 13.6 GHz and a third auxiliary output for
54 thru 6,850 MHz. The synthesizer has a built in programmable CW keyer suitable for a basic CW ID.

The first beacon is planned to be located on Mount Equinox in Vermont and the frequency will be in the 432 MHz beacon band. A limited amount of 120 VAC power will be available.

Parts already on hand:

RF synthesizer with programmed CW ID,
NEMA 12 enclosure which will be located inside a unheated building, out of the weather,
Actual size is TBD, depending on all of the stuff we have to fit inside,
Antenna, A 70cm CC big wheel, omnidirectional, horizontally polarized,
Brick type RF power amplifier, 12 VDC, ~ 15-20 W RF output,
Heat plate for synthesizer mounting,
Single cavity bandpass filter, required in dense hilltop electromagnetic environments,
Small IPAs are on hand, but with unknown reliability.
Intermediate RF filtering (LPF/HPF/BPF) may be needed, TBD

Parts still needed:

GPS/DO with a single DC voltage requirement (12-15VDC), 10 MHz reference output, and antenna,
or a very stable OCXO, or a Rubidium (Rb) oscillator for a 10 MHz reference output,
Intermediate power amplifier(s), actual gain has yet to be determined,
13.5 VDC power supply with 120 VAC input, amps TBD,
A 120 VAC power strip, for inside the enclosure, as needed,
lightning suppression on the coaxial cables, input/output
EMI/RFI filtering on AC, to be a good hilltop neighbor, transient suppression on the AC side,
A ferrite RF circulator with load, would be nice, but they are rare. For protection of the RF amp if the antenna experiences a SWR problem due to weather or other calamity.

Other considerations:

If we use a GPS/DO, it will require an external GPS antenna. The building is of metal construction without any windows, so a hole would have to be bored in the roof or sidewall, to mount the gasketed puck type GPS antenna. A quality OCXO or Rb oscillator would eliminate this penetration requirement.

Thermal requirements: the initial installation is planned for below freezing to +100 degree temps.
a heat sink may be added to the outside of the metal enclosure to remove heat. No fans are anticipated.

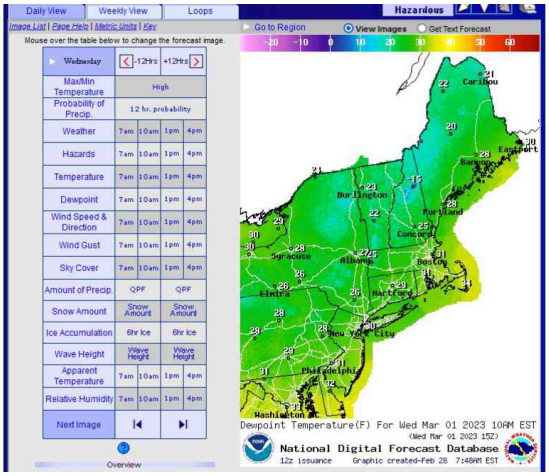
The second beacon is tentatively planned for 10,368 MHz, the 10 GHz band, using the second microwave synthesizer with a sector antenna or a omnidirectional H pol slotted waveguide.

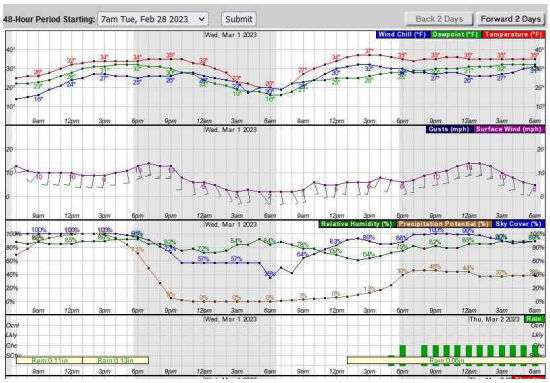
MICROWAVE ACTIVITY MARCH 1, 2023
N1JEZ

On Wednesday March 1, a group of 5 hams met at the QTH of Henry, KT1J in Addison, Vermont. Our goal was to try and make successful contacts on 134 GHz, 241 GHz, 322 GHz and possibly 403 GHz.

Operators included Brian, WA1ZMS Henry, KT1J Paul, W1GHZ Chip, W1AIM and Mike, N1JEZ.

The conditions were fair with average temps in the low 30's and a dewpoint in the low to mid 20's as the day progressed.





We planned on working along a 1.12 km path on Town Line Road in Addison which is about 0.5 miles from Henry's QTH. It is a lightly traveled dirt road which allowed easy setup. The path is LOS.

Brian provided the rigs we used. Two for 134 GHz and two for 241/322/403 GHz. A quick overview of the rig design follows.

-A low phase noise 10 MHz OCXO drives a direct frequency synthesizer, whose output is used as the reference input for a Frequency West PLL.

-Both the VCO and step recovery diode outputs of the Frequency West PLL are used to phase lock a Gunn oscillator. The Gunn output then drives a GaAs Shotkey diode frequency multiplier.

-The multiplier's output is used as the TX signal and the antenna is a 30cm parabolic dish with a Cassegrain feed.

-For a given band, each station of the pair transmits on a slightly different frequency. Doing this allows for the TX diode multiplier to also serve as a receive mixer. (This is reminiscent of a Gunnplexer system, as the difference between the two transmit frequencies is the receiver IF frequency.)

-The 241 GHz stations also include variable attenuators and DC bias circuitry to intentionally shift the mode of operation of the power multiplier diodes from varactor-mode to varistor-mode to exploit higher harmonics such as 322 and 403 GHz.

-Contacts are made using FSK CW which is generated by slightly shifting the 10 MHz reference oscillators via their EFC pins.

Brian, WA1ZMS 134 GHz - Photo W1GHZ

Henry, KT1J Mike, N1JEZ Brian, WA1ZMS 241 GHz - Photo W1GHZ

We tried 134 GHz first. We set up the rigs about 15' apart to verify operation.

Initial rig set up and test - Photo W1GHZ

We ran into an issue with the N1JEZ rig where it didn't want to hold lock in the cold. After the application of a few hand warmers, some 'tweaking' by Brian and a power supply change, we were set to go.

PLL locking in the cold - Photo W1GHZ

Brian carefully placed his rig in the trunk of his car, with it still powered and slowly drove to the end of the 1.1km path. As soon as he got the rig on his tripod at the far end, I was able to see a trace in the waterfall on my SDR. The IF on 134 GHz works out to be 522.667 MHz. I used a Funcube Pro+ and HDSDR. Brian used AirSpy. Brian and Paul operated at one end and Henry, Chip and I were at the other end. Signals were easy copy about 30 dB+ out of the noise.

Contacts in the log:

1. KT1J WA1ZMS 17:13z FN34 134 GHz
2. W1AIM WA1ZMS 17:20z FN34 134 GHz
3. N1JEZ W1GHZ 17:26z FN34 134 GHz

Following these successful contacts Brian and Paul stowed the 134 GHz rig and drove back down to our end.

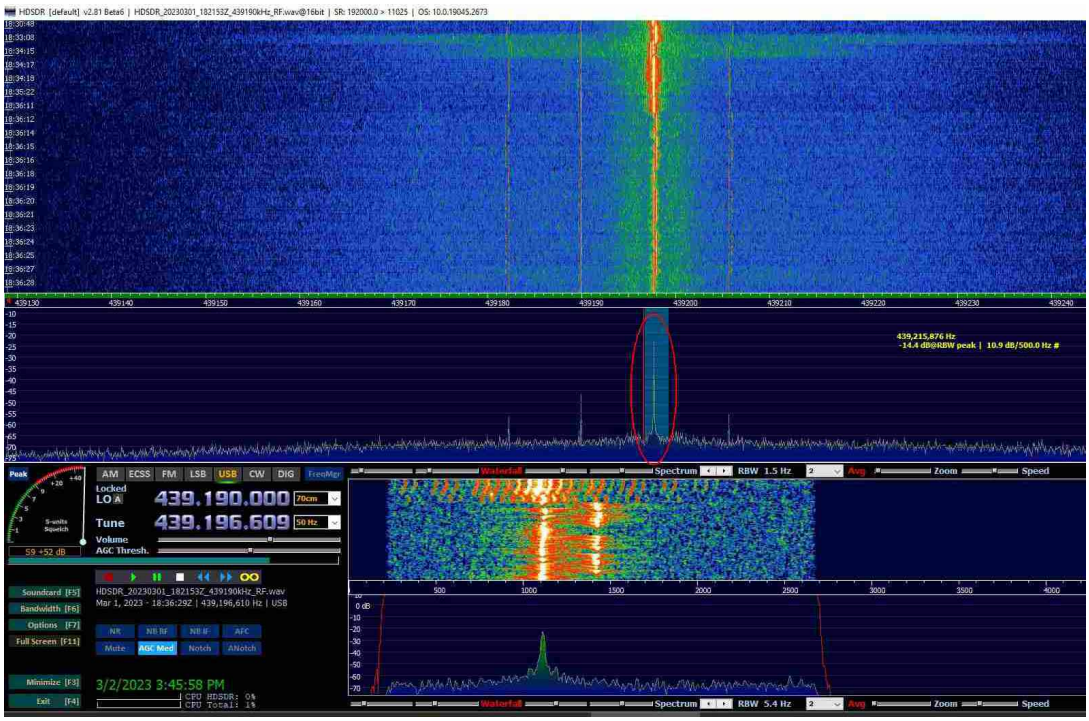
We repeated the same test procedure for 241 GHz setting up about 15' apart to verify operation. The 241 GHz signal was extremely loud! Brian then placed the 241 GHz rig in the trunk of his car, still powered with the trunk open. He slowly took off and headed to the other end of the 1.1 km path. I could still hear the rig as he was moving and was laughing as the signal doppler shifted all over. Wish I could have caught that on the SDR.

Once set up, contacts were easily made.

- KT1J WA1ZMS 18:27z FN34 241 GHz
- W1AIM WA1ZMS 18:32z FN34 241GHz
- W1GHZ N1JEZ 18:38z FN34 241 GHz

Here is a screen shot of the signal at 241 GHz at the N1JEZ end. Peaking about -23 and the noise floor ~ -65.

In the bottom 'audio' waterfall, you can see the FSK.



Following this success, we tried 322 GHz. The first contact between Brian and myself was quite weak. I started with headphones, but after I made a slight bias adjustment to the mixer, Henry and Chip were able to copy by ear without headphones as the signals improved.

During our 322 GHz contacts, Dick, W2AAU accidentally showed up. He was out scouting a Rover site for W2SZ and noticed the dishes and stopped only to find Henry, Chip and I. He then traveled up to the far end where Brian and Paul set up and worked W1AIM on 322 GHz.

- N1JEZ WA1ZMS 18:54z FN34 322 GHz
- N1JEZ W1GHZ 19:00z FN34 322 GHz
- KT1J WA1ZMS 19:08z FN34 322 GHz
- W1AIM W2AAU 19:16z FN34 322 GHz

We did try 403 GHz, but we saw nothing in our waterfalls. We knew conditions were not favorable (dewpoint) as the best Brian has done on 403 GHz is 1.4 km. But you never know unless you try!

Here's the setup at Brian and Paul's end on 241 GHz. The rifle scopes were spot on for alignment.

241GHz set up - Photo W1GHZ

Through the Rifle Scope looking towards N1JEZ on 241GHz - Photo W1GHZ

W1GHZ gives the "thumbs up QSL" to the camera while completing a QSO with N1JEZ on 241GHz - Photo WA1ZMS

While we had very good success on Wednesday, this was preceded by dismal failure only a few days before. On the previous Saturday, we set up 134 GHz and could not get one rig to lock. The temps and wind were producing windchill in the negative numbers. We struggled to get the gear working in the cold, but threw in the towel after many hours of trying. We were all chilled to the bone.

We did not give up. Brian spent a lot of time tweaking/checking the rigs so they would operate reliably within the expected temperature range in advance of our second attempt and Wednesday was a very successful day!

New All Band Power Meter

Paul Wade W1GHZ ©2023
w1ghz@arrl.net

In the April QST *Microwavelengths* column, I discussed microwave power detector ICs that work up to 10 GHz. Included was a picture of a simple microwave power meter that works from 1 MHz to 10 GHz. Most of the hams I have shown it to said something like "I want one. More details, please." Since then, I have found an even easier way to build one, with just a little soldering required.

In recent years, sensitive logarithmic power detector ICs have become available, starting with the Analog Devices AD8307, good to 500 MHz and providing linear-in-dB output voltage. An RF power meter using this chip was described by Wes Hayward, W7ZOI, in June 2001 QST, with a measurement range of -70 dBm to >0 dBm, nanowatts to milliwatts. A more recent digital digital QRP Wattmeter using the same IC and an Arduino was described by Phil Sittner, KD6RM, in QST October 2022. I find analog meters more useful for tuning up projects, and simple bargraph displays handy for quick tests.

Until recently, the only power detector IC readily available that works at 10 GHz was the LTC5508, a temperature compensated Schottky diode detector. Although only rated to 7 GHz, it still detects RF at 10 GHz. The tiny 1x2 mm package with six leads is about as small as a human can solder by hand. I used this chip, paired with an AD8307 for lower frequencies, in a design that became the ABPM (All Band Power Meter) from Down East Microwave (no longer available). The new version covers the whole range with one IC and requires much easier soldering.

Figure 1 – Simple RF power meter covering 1 MHz to 10 GHz with LED bargraph displaying -30 dBm (1μwatt)

Newer logarithmic power detector ICs rated to higher frequencies, up to 10 GHz, come in tiny surface-mount packages with even tinier contacts.

Fortunately, some of them are available on Amazon or ebay as small assembled modules, at prices not much higher than the IC alone from a distributor. For 10 GHz, the AD8317 is offered in several different modules.

I have tried the three versions shown in Figure 2 and all have similar performance.

They are very sensitive with large dynamic range, with output voltage linear-in-dB (about -22 millivolts per dB), from approximately -55 dBm (0.003 microwatts) to -5 dBm (0.3 milliwatts). This means that, once calibrated at one power level, the difference in output voltage can be converted to dB difference and the measured power calculated within a couple of dB – adequate for most ham projects.

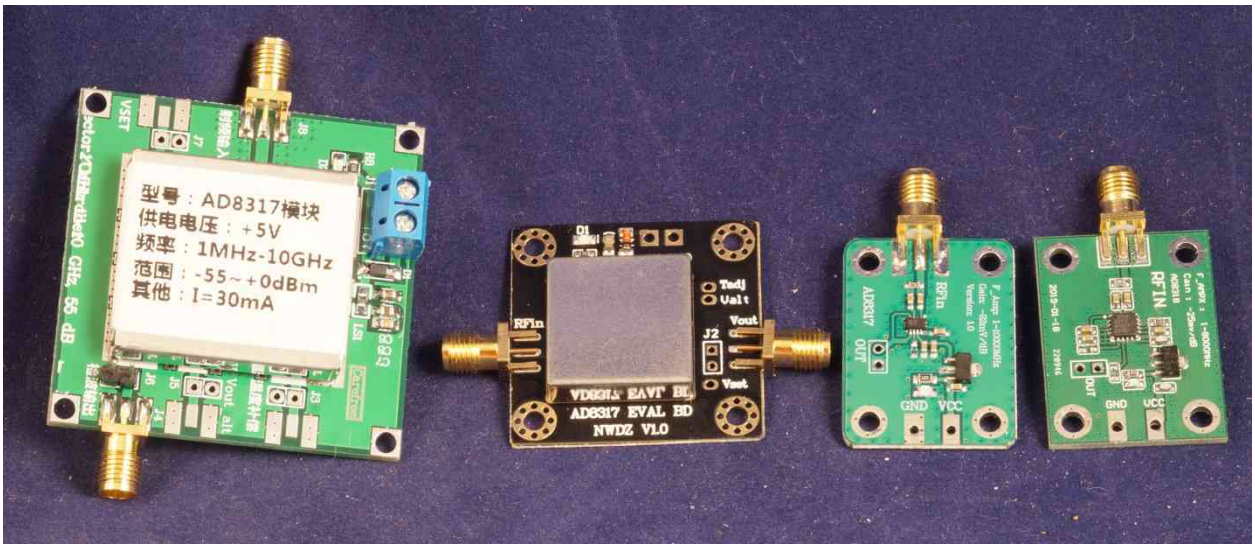


Figure 2 – RF power detector modules using the AD8317 and AD8318 (far right) found on ebay or Amazon

I measured the performance curves in Figure 3, which show only small variation at frequencies from <144 MHz up to at least 5760 MHz – the curves for different frequencies are nearly on top of each other. A quick test showed similar performance down to 1 MHz. However, at 10,368 GHz, the detector is about 20 dB less sensitive and the dynamic range is reduced, but it is still quite usable and will detect power down to less than a microwatt. The AD8317 data sheet does say that it is accurate up to 8 GHz with useful operation to 10 GHz , but no data shown above 8 GHz.

A similar IC, the AD8318, in a module also shown in Figure 2, is only rated to 8 GHz, but shows the same 20 dB reduction in sensitivity at 10 GHz. An AD8318 module including an Analog-to-Digital converter, ideal for building a digital power meter, is offered at SV1AFN.com.

Figure 3 – Measured performance of AD8317 module shows consistent performance from 144 to 5760 MHz, somewhat reduced at 10.368 GHz. Note: Output voltage decreases with increasing power.

An AD8317 module paired with an LED bargraph display is all that is needed to make a sensitive RF power meter good from 1 MHz to 10 GHz, covering 15 ham bands. Figure 4 shows one packaged in an Altoids tin with a 9-volt battery to make a compact portable microwave power detector, with the LED display showing -30 dBm (one microwatt) at 3.4 GHz. This is sensitive enough to monitor output from an antenna without being directly on front of it.

I made two versions of the compact portable power meter; the insides are shown in Figure 4.

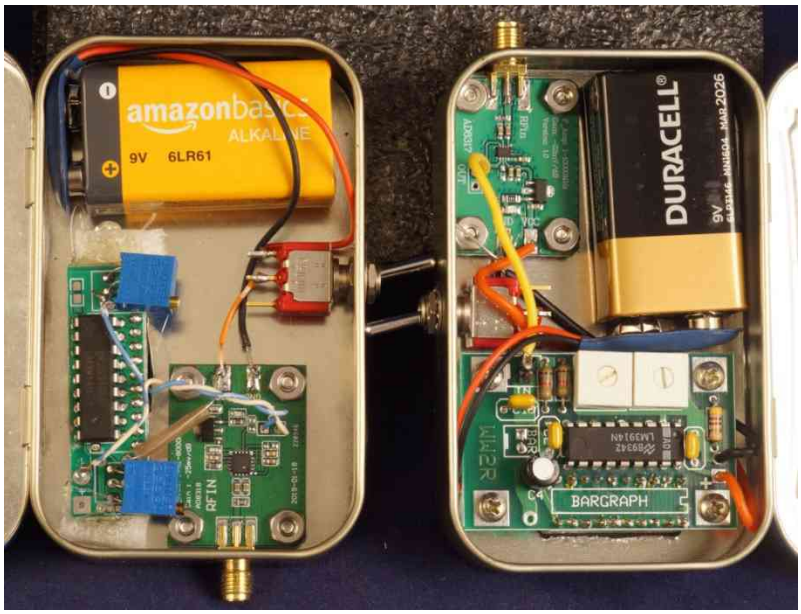


Figure 4 – Two versions of the simple RF power meter in Altoids tin

The first version, on the right, uses an LED bargraph circuit on PC board I made adapting a design by Dave, WW2R. PC boards are available.

The circuit in Figure 5 is simple, with the LED bargraph driven by an LM3914, an IC made for this purpose that has been around for about 50 years. Two trimpots set the high and low voltages of the display range.

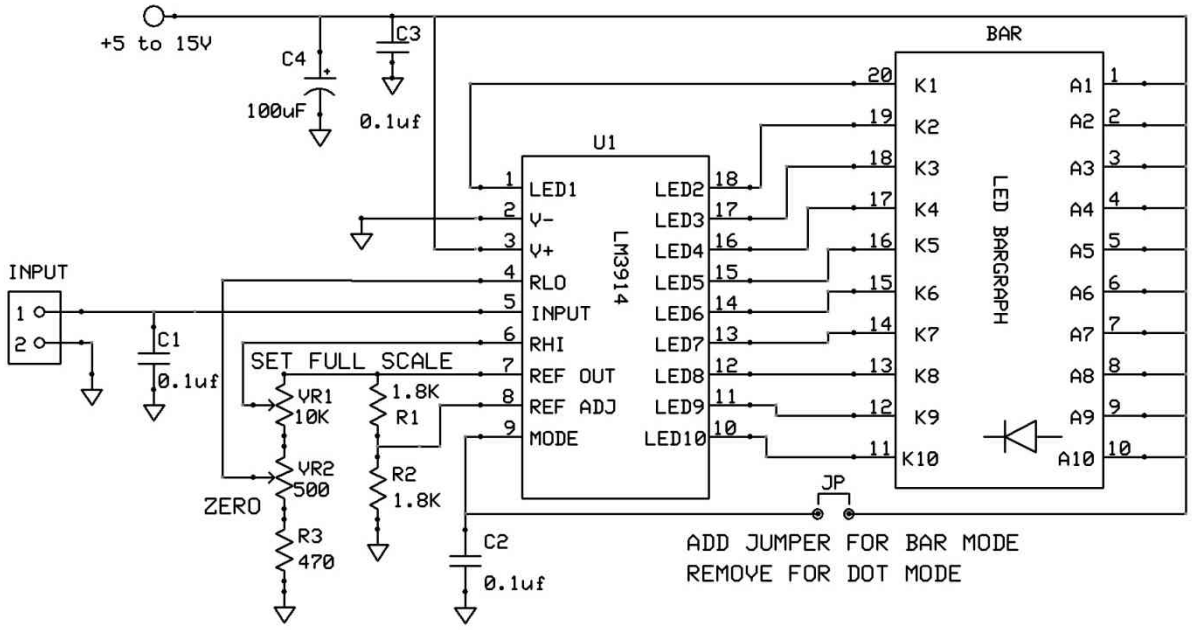


Figure 5 – Schematic diagram of the LED bargraph PC board

The PC board is easy to assemble, and the parts are available on Amazon or ebay (cheaper), but not as a kit. Looking for a more readily available alternative on those sources, I found the module shown in Figure 6, sold as a "Battery Indicator Module" kit for displaying the charge level of a battery (search for LM3914). The circuit is a stripped-down version of Figure 5. With a simple modification, it works fine as an RF power indicator: the trimpot lead marked "INPUT from AD8317" is not connected to the PC board but instead lifted up and connected to the output of the AD8317 module. An optional modification is to omit the momentary switch in the kit and use a separate switch for both the bargraph module and the AD8317 module, so you don't have to hold the switch to make measurements. The positive voltage then connects to the terminal marked "V+" and the negative (-) terminal on the PC board and the AD8317 both connect to the battery. The connections can be seen in the left-hand version of the RF power meter in Figure 4.

Those with sharp eyes will note that the left-hand version in Figure 4 uses an AD8318 module, the right-hand one in Figure 2. The output voltages to the LED display are slightly different, but RF performance is about the same.

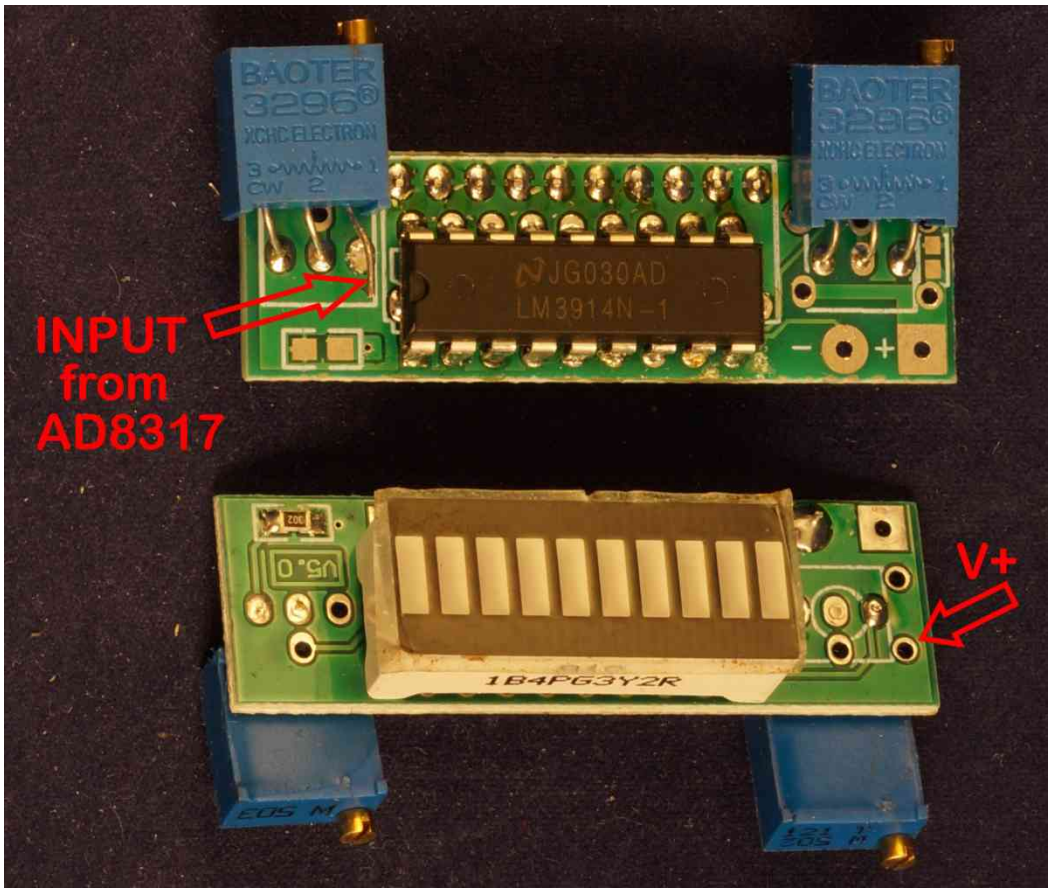


Figure 6 – Bargraph display from kit showing modifications

The kit is easy to assemble, if you solder the LED bargraph first, trim the leads, then install the LM3914 IC. Some of the IC leads must be soldered from the top side since they are under the bargraph. Then add the trimpots, with the indicated lead on the 50K pot left floating, and one surface mount resistor. If you are uncomfortable with surface mount soldering, simply short those pads together with a blob of solder – it will still work.

Adjusting the bargraph before assembly will make final RF adjustment easier. A variable power supply is needed, connected to the input pin, with the bargraph module powered up. Set the power supply to about 1.5 volts and adjust the 50K pot so that one LED bar is lit at the other end of the bargraph. Then lower the voltage to about 0.6 volts and adjust the 5K pot so one bar at the other end of the bargraph is lit. Varying the voltage from 0.6 to 1.5 volts should make the intermediate bars light sequentially.

Both versions of the simple RF power meter use the smaller modules on the right in Figure 2, which have an on-board voltage regulator to operate over a range of voltage from about 7 to 15V. The other two AD8317 boards operate from 5 volts or less. The bargraph displays will also operate on 5 volts. A good 5-volt power source might be a small USB power pack instead of a 9 volt battery.

Assembly

The hardest part of assembly is cutting the rectangular hole in the Altoids tin. I recommend starting with two tins – I did better on the second try. I scribed around the LED bargraph (before soldering to the board), then drilled a series of holes inside the scribe lines, shown in Figure 7.

(Brad-point drills, if you have them, make cleaner holes in thin metal.) Then I nibbled away at the edges with flush-cutting pliers until the bargraph fit through the hole.

Figure 7 – Drilling holes for square cutout

Drill holes for the SMA connector, switch, and mounting holes for the AD8317 module. For the AD8317 module, I use hex nuts under the board as short standoffs. I cut pieces of packing foam to hold the bargraph level with the tin, then used a hot-glue gun to hold everything together. The battery is held in place with double-sided tape. A battery connector might be found in a piece of defunct consumer electronics.

A possible enhancement would be to bring the output of the AD8317 module to a connector so that the voltage can be measured with a digital volt meter for more accurate measurements.

Test

A quick test is to put a thin wire an inch or so long into the SMA connector as an antenna, turn it on, and hold it near your wireless router. Some of the LED bars should flicker as data packets go by. Put a mobile phone near the antenna and make a call. Higher bars should flicker.

If you have a calibrated signal generator, the bargraph can be calibrated better. With no RF applied, I adjust the 50K trimpot (or VR1 on my PC board) so only the first bar is lit. Then a signal of -5 dBm is applied and the 5K trimpot (VR2) adjusted so the bar at the far end is on. A final adjustment is with -50 dBm applied; the 50K trimpot is tweaked until the second bar lights. The ten bars now cover a range of -55 dBm to -5dBm in ten steps, so that each step differs by roughly 5 dB, close to an S-unit. Of course, you can adjust for a smaller range with smaller steps if desired.

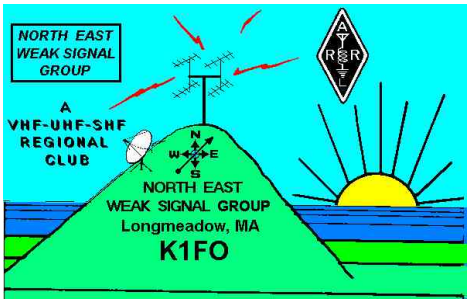
Summary

A sensitive RF power meter can be used to detect small signals, through coax, or radiated signals with an appropriate antenna. A simple whip antenna can provide reassurance that a QRP station is transmitting. Inexpensive printed log-periodic antennas for UHF and up available from WA5VJB.com are great for microwave rover stations, which are usually QRP.

Another use is to track down unwanted or interfering signals – there are many out there. And you can check for leakage from your microwave oven. And it should be possible to make crude antenna patterns at safe power levels.

You can build this simple, useful project in a couple of yours, and the two modules total about $25 on Amazon, or less if you are willing to wait for ebay delivery from China.

QRPmePO Box 160Limerick, Maine04048 http://www.qrpme.com/?p=contact



North East Weak Signal group

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 3.3 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: Don Twombly, W1FKF by e-mail to donw1fkf-news@yahoo.com. Dues are $10/2 years. Remember, this group is formed by VHF'ers for VHF'ers. E-mail: **news.kc1v@gmail.com**.

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NEWSLetter

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