



CHEESE BITS

W3CCX
CLUB MEMORIAL CALL

ARRL
Affiliated
Club



Volume LVIII

December 2017

Number 12

PREZ SEZ:

Well, the holiday season has started. Thanksgiving was just the beginning! But before you start visiting friends and relatives, come to the December General meeting!

The December meeting is the **Annual Packrat Holiday Social**. Come and enjoy a relaxing evening of food and fellowship. We will start serving food from Giuseppe's at the Senior Center at 6:15. Be there at the usual 6PM time, but we will have plenty of food throughout the evening. Don't forget to bring that Packrat friend you haven't seen at the meetings for some time. One other thing, If you have a dish of cookies (are you reading this Joe, WA3SRU) you would like to bring too, feel free.

We will have a special Mario Table like last year. Now's the time to dig through items you bought at those Hamfests but never got to use. Bring "the good stuff" to the meeting, put them on the Mario table.

The January contest is right around the corner. January 20-22, 2018. The January meeting's will be on Contest Preparation by Bob, W2SJ and Bill, K3EGE. The use of Assistance and the W3SZ web site will also be discussed. Ben, WA3RLT will have some comments on what the Digital modes can do for your score.

I hope everyone has their antenna and tower work done by now. There's not much good weather between now and the contest. The nets

on Monday and Tuesday evening have been doing well. If you haven't been on the nets lately or have just repaired that balky transverter, now is the time to test it out. Need to borrow some equipment for the January contest? Call Bob or Bill now. Talking to them at the January meeting would probably be too late.

Last General Meeting's presentation was by Ray Golley N2RG. One of the things I found most interesting was the ability to increase your grid square count in the January contest by using FT8.

Ray showed how to set up FT8 and what your computer screen looks like as you select and collect contacts. Yes I said collect. In many cases it is just reading the screen and clicking the mouse on the desired station! It's easy to set up and operate - and it will increase your score, so it's hard to make an argument not to do it!

Things are slow at the KA3WXV ham shack this month but I've been reading a lot on the web. One interesting product I came across is Red Pitaya which is a software development platform consisting of a good size FPGA and microprocessor running on Linux. But the best part of this (if you're not into writing software for embedded systems) is you gain access to lots of free software which turns it into a 50 Mhz oscilloscope, signal generator, spectrum analyzer, VNA, Logic analyzer and other pieces of test equipment. Some of the software is basic, some very advanced. It has picked up a large following and is used by some of the STEM

Pack Rats **CHEESE BITS** is a monthly publication of the
Mt. AIRY VHF RADIO CLUB, INC. -Abington, PA.

We operate on a .PDF exchange basis with other non-commercial publications. Anything that is printed in CHEESE BITS may be reprinted in a not for profit publication, unless stated otherwise, provided proper credit is given. Deadline for articles and swap-shop is the monthly meeting date. Non-commercial swap-shop items free of charge.

Pack Rat Web Site: <http://www.packratvhf.com>

SUBSCRIPTION/ADVERTISING MANAGER:

Bob Fischer, W2SJ 23 Morning Glory Circle, Mullica Hill, NJ 08062
(609) 440-2916 bobw2sj@gmail.com

EDITOR:

Lenny Wintfeld W2BVH 709 Lincoln Av., Cranford NJ 07016
(908)-272-0559 lennyw@comcast.net

CLUB TREASURER:

Dave Mascaro, W3KM 1603 Mink Road Ottsville, PA 18942
(215)-795-2648 w3km@verizon.net

TRUSTEE OF CLUB CALL - W3CCX

Mike Gullo WB2RVX
(609)-743-6643 MGullo3@comcast.net

PACKRAT 222 MHz REPEATER - W3CCX/R

222.98/224.58 MHz (PL 136.5) Hilltown, PA

OFFICERS 2017-2018

PRESIDENT KA3WXV, George Altemus ka3wxv@yahoo.com
VICE PRES: WA3DRC, Ed Finn edfinn11@gmail.com
CORR. SEC: WA3EHD Jim Antonacci jjantonacci@verizon.net
REC SEC: KB1JEY Michael Davis kb1jey@arrl.net
TREAS: W3KM Dave Mascaro w3km@verizon.net

DIRECTORS:

K3JJZ Elliott Weisman (2019) k3jjz@aol.com
K0BAK Pete Kobak (2019) rxr978-vhf@yahoo.com
KB3MTW Michelle London (2018) mal61@comcast.net
W3SZ Roger Rehr (2018) w3sz73@gmail.com
Honorary Director K3TUF Phil Theis phil@k3tuf.com

COMMITTEE CHAIRMEN

January Contest Bill K3EGE billk3ege@gmail.com
Bob W2SJ bobw2sj@gmail.com
Phil K3TUF phil@k3tuf.com
June Contest: CoChairs
VHF Conference: Rick K1DS rick1ds@hotmail.com
Guy WA3JZN wa3jzn@gmail.com
Awards Chairman Joe WA3SRU wa3sru@verizon.net
Quartermaster: Bert K3IUV bsoltoff@comcast.net
Membership Chairmen: Rick K1DS rick1ds@hotmail.com
Griff NE3I signalnaut@aol.com
Michael KB1JEY kb1jey@arrl.net

PACKRAT BEACONS - W3CCX/B

FM29jw Philadelphia, PA
50.080 144.300 222.062 432.290 903.072 1296.264 **2304.043**
3456.200 **5760.195** 10,368.034 MHz (as of 1/17, **red = off the air**)

MONDAY / TUESDAY NIGHT NETS

VHF/UHF Monday:

<u>TIME</u>	<u>FREQUENCY</u>	<u>NET CONTROL</u>
7:00 PM	224.58R MHz	WR3P FN20kb Ralph
7:30 PM	50.145 MHz	N3RG FM29ki Ray
8:00 PM	144.150 MHz	K3GNC FN20ja Jerome
8:30 PM	222.125 MHz	KB1JEY FN20je Michael
9:00 PM	432.110 MHz	WB2RVX FM29mt Mike

Microwave Tuesday:

7:30 Coordinate QSO's on 144.260 for all Microwave bands you'd like to work. Also setup Q's at w4dex.com/uhfqso or **Packrat Chat Page W3SZ.COM**
Visit the Mt Airy VHF Radio Club at: www.packratvhf.com or www.w3ccx.com

school programs.

Prices for the hardware with lots of accessories (cables, test leads and clips) vary from \$400 to \$1000. This might sound steep until you try to buy all this capability and accessories separately.

With much of this newer equipment it seems to come down to how good is the SOFTWARE. But the software is upgradeable without spending lots of money. You will also need a separate computer running MS, Linux, IOS, or Android for some of the computation and display of the information. Red Pitaya is only one of several platforms out there.

If you find a new and interesting piece of test equipment, let your fellow Packrats know about it.

Bottom line, have some fun, learn more.

Build something

73, George KA3WXV



NOVEMBER MEETING PICTURES

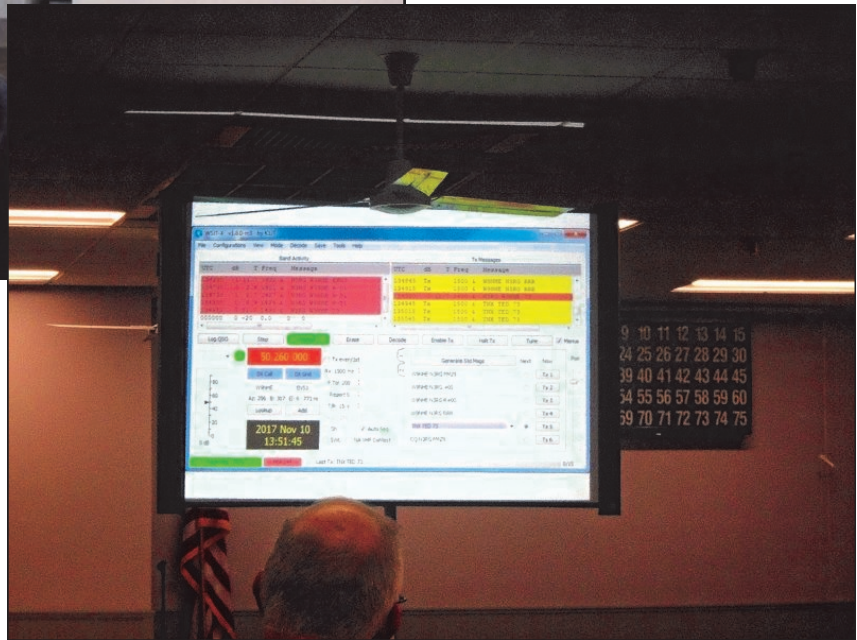


Jean-Robert HH2JR presented a harrowing description of the of the Haiti earthquake. Some very persistent, but ad hoc ham communication was able to facilitate emergency medical and humanitarian aid for Haiti in the immediate aftermath of the disaster. Though there were some significant screw-ups by external agencies.... Not surprising given the magnitude of the disaster.





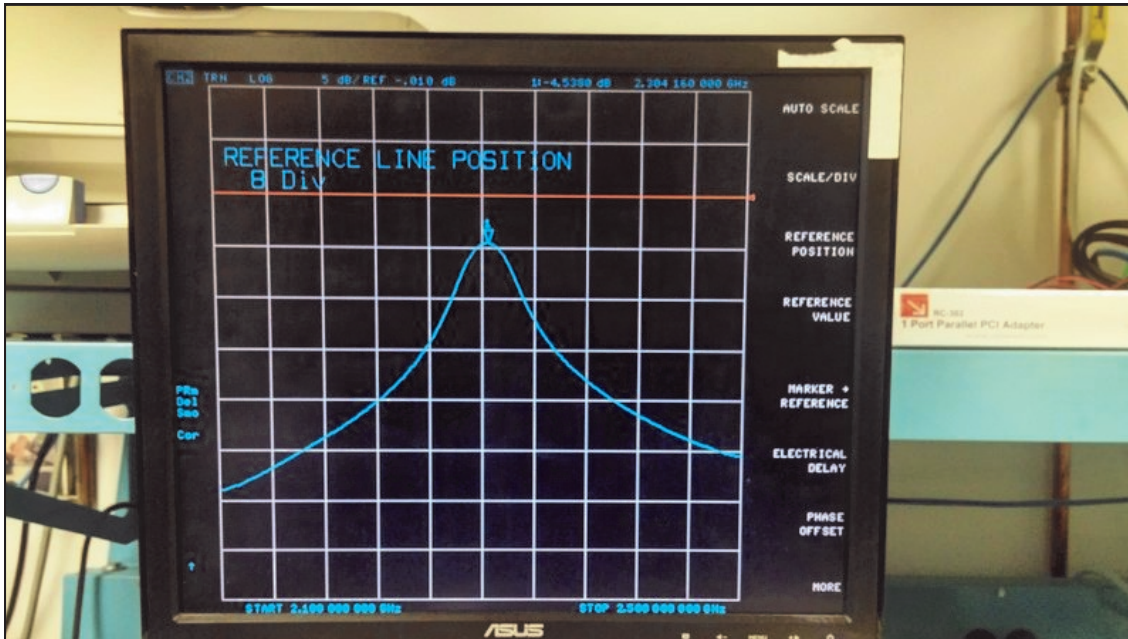
Presentation by Ray N3RG on WSJT-X operation. The MSK-144 and FT-8 modes are likely to supplement grid counts in the January contest if you use this digital mode. Download it and give it a try. The hardware you use for PSK-31 works just as well with WSSJT-X. Ray has his Power Point presentation available. Just email



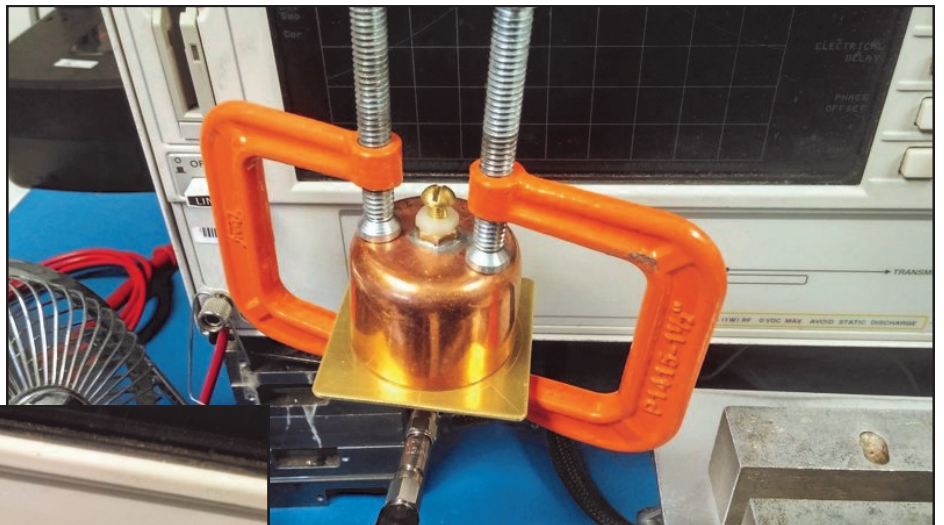


2304 PRESELECTOR FILTER

Our friend Doug WA2LTM put together this pipe cap filter for Packrat Jerome K3GNC. Jerome's new QTH has the advantage of a clear view of the horizon, but there's a cell tower not only in view but very close. Reception on 2304 is virtually impossible with the cell tower nearby. Interference is likely from primary overload, not just intermod. As you can see from the sweep, insertion loss is -4.5 dB and -30 dB bandwidth is around 170 MHz. Doug says if this is not good enough a second pipe cap can be put in series. --Lenny W2BVH



Temporary test setup for tuning the filter



As you can see, Doug includes real craftsmanship in his builds. The SMA connectors are the kind with Teflon sleeves (used to pass through machined housings). I wonder if the exposed nuts have any effect on the filter characteristics?

432 MHz EME Portable in EL96—Success!

It's been three years in the planning, and the stealth EME set-up worked so that I was able to make 9 digital JT65B QSOs during the ARRL EME Contest third weekend. In the first year, I inquired about potential antenna erection in our CCR community. Apparently there are some hams here that have been given permission for a small vertical antenna, but there do not appear to be any antennas or ham activity here. Even the 2m repeaters in the area are quiet all day long. Last year I started to watch where the moon was rising in relation to my condo here and what might work as an EME antenna. When I went to Hamcation in Orlando, I bought a 432MHz Yagi and a 144MHz Yagi from members of the Florida Weak Signal Society. I also picked up a military surplus set of fiberglass masts, a base and guys. With a few pieces of PVC plumbing, I had the makings of an antenna system that could be used vertically or horizontally and rotated and elevated by hand. This year I planned to bring my TS2000x and 432MHz amp, coax, cables, power meter, Rigblaster and power supply.

A week prior to the contest I started to assemble all the gear. The first problem encountered was that the balun on the 432 beam had a corroded and broken wire from the UT141 to the driven element. Packrats to the rescue—a quick text to K3TUF and a replacement was on its way and arrived in a timely manner. I also got out the steel wool pads and polished up the beam elements—as N4PZ advised us in his presentation at the Mid-Atlantic States VHF Conference. I laid out all the needed pieces and thought I needed one of the patch cords for the Rigblaster to the rig. Another Packrat to the rescue as I called my son, N1XKT to get it from the house and ship it down. I hooked up the rig and amplifier, power supply, wattmeter and dummy load. I was happy to see 150-160



watts output and then assembled the reg components on the patio where I would be operating. Next step was assembling the antenna, feedline and mast. It all fit together nicely. I would be doing the antenna pointing manually using a string on the ends of the Yagi. I tested everything by having a nice QSO with K3IPM, about 12 miles away in Boca Raton.

There's lots of social life here in Florida among us retirees, and the XYL had booked us for dinner with friends for Friday night. I thought I would miss the first 2 hours of moonrise, but as it turned out, the moon was actually blocked by the building next door for the first 2 hours. The antenna was positioned to point to the moon and I stepped back into the screened patio to the radio. I turned on the rig, plugged in the Rigblaster and checked the HB9Q logger to see who was on the air. I found NC1I's huge trace at -12, and called immediately upon decoding his CQ. Nothing was coming out of the computer to the rig. Another Packrat to the rescue to solve this problem—I called W3SZ who



walked me through the correct set-up of the Rigblaster and its COM port to be keying the PTT. Now I was on the air and calling NC1I for my first 432MHz single Yagi JT65B QSO. Frank has a huge antenna array and generates a whopper of an EME signal. At 01:46 he was first into my log. In the next hour I worked DL9APV and K2UYH. In my haste, I put FL96 as my grid, but I am actually in EL96, so I corrected that with my contacts and in the JT set up also. One thing that was a potential problem was that the elements closest to the U-bolt bracket were hitting the mast when I tried to elevate the antenna above 45 degrees. I corrected that the next day by turning the beam into a vertical polarization.

Of course, the next night we had plans for dinner with friends and also a show. As we left the restaurant at 8PM, the XYL noted how beautiful the moon was on the horizon. I was anxious to get back to the radio for more EME, so the 3 of them went to the show and I went to the radio. The PI9CAM team at the Dwingeloo dish was active on 432 and I called them and we worked right away, followed by a QSO with HB9Q. I QSO'd DL7APV again with the corrected EL96 grid. The evening finished with contacts with UA3PTV, DK3WG and DF3RU. Each of the stations I worked are QRO with big antenna arrays. Thanks to them, a peanut whistle like mine can give me the excitement of moonbounce. I did notice that as the night wore on that the power output of my amplifier sagged down to 100W. Checking out the cause, I noted that the 35A Astron supply was getting hot and dropping voltage down to about 12V on transmit, rather than the 13.8V at idle. The TE amp was also a bit warm with those full duty cycles of JT65.



The future may hold an opportunity for me to up my output power; improve the preamp situation by placing it closer to the antenna, and increasing the P/S capabilities. I also have the 2m Yagi, a long 1296MHz Yagi and my 270W SSPA back in Blue Bell. They'll have to wait until next year. Many thanks to all who have helped me get this far, including K1JT for his great digital suite and K2UYH for infecting me with the EME bug. The mystique of EME is easily unclothed with JT65 once you try it with a decent preamp, aiming at the moon with a decent antenna and having at least 100W of power. **73, Rick, K1DS**

Microwave Update 2017 in Santa Clara, CA

From "Anomalous Propagation" the newsletter of the Mid-West VHF / UHF Society (MVUS)

by Mike Suhar, W8RKO

I attended MUD in Santa Clara, CA in October. This year it was sponsored by "The 50 MHz and UP" group. They had approximately 73 in attendance from what I could tell.

The day before the presentations started we had a tour of the Stanford Radio Club. This is on a mountain top overlooking Santa Clara. It is also the same property where the 150-foot Stanford dish is located. Very impressive layout of antennas from HF up to 10GHz EME. They had several operating positions in two separate buildings.

Also present at the conference were various items set up for demonstration. They had a room for testing various items people brought with them such as pre-amp noise figure. Some had items for sale and between presentations Kent Britain held an auction for various items donated for the cause.

The presentations and papers in the proceedings covered many topics related to VHF and higher equipment and operation. What I found most interesting was the presentation on improving the **10-GHz slot antenna** by Jeffrey Pawlan, WA6KBL. He did a lot of modeling and building of slot antennas based on his research. The typical slot 10-GHz antenna is omni coverage but the variation in the side lobes is high. His study was to reduce the variation in the omni pattern. His initial design worked very well but very expensive to have machined. He is working on a design that will still maintain the design goal but something he can fabricate in his well-equipped home shop.

Barry Malowanchuk, VE4MA, discussed automotive radar systems and their modules that are showing up in production cars. Typical automotive uses are lane change alerts, adaptive cruise control, collision avoidance braking, blind spot warning, and backup warning systems. These systems operate in the 24 and 76 GHz range. The 24 GHz range will be phased out as in favor of 76 to 81 GHz. Barry dissected a couple of the modules he was able to obtain and explained how they worked.

There were four SDR related topics in the proceedings. One from Mike Seguin, N1JEZ, talking about the LimeSDR unit. Our own **Jim Bacher, WB8VSU**, has been experimenting with this particular device.

The conference was very well done and all the topics very interesting. I am glad I had an opportunity to attend. I announced that MUD 2018 would be in Dayton, Ohio and invited everyone to Ohio in 2018 for the conference.

The Wayback Machine **In CHEESE BITS, 50 Years Ago**

Nibbles from December 1967. Vol. X Nr. 10
de Bert, K3IUV
(author's comments in italics)

- **“Our Prez Sez”.** Dave, W3LHF (later W3ZD) discussed “the joys of home-brewing”, as a follow-up to last months’ homebrew night. Many projects follow: first, you build it; next, you de-bug it; then, you go looking for help when it doesn’t work! But when you are all done, you have something you can be proud of. He of course also reminded all to be ready for the “big contest”.
- **Membership.** New member, K3JJO, Wally Newell, in Willow Grove.
- **Power Transmission News.** The Canadian government announced that they have begun awarding contracts for “The highest voltage, long distance distribution system in the world”. The plan is to carry 900,000 volts dc, about 600 miles, from Hudson Bay to Winnipeg, Manitoba. When operational in the early 70’s this will provide Southern Canada with 5 million kilowatts of new power resources.
- **Did You Know?** The first “Packrat of the Year” award was given to W3CL, Harry, in 1965. This years’ award will be presented at the Ladies Night Banquet *(another “things that aren’t there anymore”)*. Also to be presented is the winner of the “Cheese Bits article” award, which provides free dues for a year to the winning author.
- **Two Meter Activity Report.** W3LHF, Dave (later W3ZD) stressed the importance of using CW for weak signal contacts, and reminded everyone to check out this mode in their rigs to prepare for the contest. It’s an easy way for low power stations to pick up some extra sections *(now grid squares)*. Members can polish their CW skills by listening to the W3CL code practice sessions every weekday evening from 7:00 – 7:30 on 50.2. *(I did, and that’s how I got my Extra Class license.)*
- **Book Review Net.** K3WEU, Paul, announced the start of a weekly net and round-table discussion on the topic of books. Sponsored by the EPA section of the ARRL, the reviews will include but not be limited to books of a technical nature. The first net will start on 11/28/67, and the first book to be reviewed will be “Extra Class Amateur Radio License Handbook.”
- **Contest Preparations.** K3HSS, Charley, gave some last minute encouragement and instructions to the membership on the contest planning. Coordinators are ready and willing to help out with any station problems. Your questionnaires should identify any equipment or other needed help. Check out your gear on the weekly nets.
- **Inserts.** Two inserts were included. The first was listing of the club Net frequencies, control stations, and times. It included a table of member groupings by general beam bearing from the net control stations. This technique was introduced by the club to avoid

confusion at (*think pileup*) check-on time. (*We used colorful names for the groups, intended to signify the location area. These included Red Coats, Hillbillies, Boulevarders, Sandpipers, Crawlers and Screamers. I'll leave it up to you to figure out where they were!*). The second was an updated membership list, useful as an aid to finding members in the Jan contest. It included 88 members, 28 retired members, and 1 student member.

- **Meeting Notice.** The December meeting will deal with “contest instructions”. “It will be a closed meeting, for members only – secret stuff.” (*Part of the club’s contest planning was to add a little “mystique”*).
- **Swap Shoppe.** For sale by W3ZTL, Myles (zebras, tigers and lions was his phonetic offering). A 220 beam, 38 elements for \$25 (can’t imagine that), and a 220 homebrew transmitter for \$15. Also, from K3GAS, Doc, “a pair of almost new 7.35 x 15 snow tires for \$20” (*how did that sneak in here?*).

Miscellany. Postage 5c (*a nice commemorative stamp*) this month (3 sheets 8-1/2” x 14 plus 2 at 8-1/2’ x 11). *As in previous editions, many “folksy” comments about members, their families, and activities were included in this edition of Cheese Bits. If interested, or for more detail on the above items, visit www.W3CCX.COM and read the full issue scanned by K3IUV, and posted there by our Webmaster, Bill, WS3O.*

thirty, de K3IUV



W/VE 78 GHz QSO's in November

I am pleased to report that several successful W/VE contacts were **made** yesterday 11/09/2017 on 78 GHz.

On the Canadian side were Rene, VE2UG and Ray, VE3FN. On the US side, Mike, N1JEZ and Henry, KT1J.

During the contacts, dewpoint was in the upper 20's.

The first contacts were between FN35ja and FN34jx - 5 km. This was primarily to test systems. Contacts were easily made in SSB with huge signals on both ends. Unfortunately, KT1J suffered an LO failure.

Next, N1JEZ and KT1J moved to FN34It. - 27 km. Contacts were again made. N1JEZ was 59 SSB to VE2UG and 599 CW to VE3FN. Signals at N1JEZ were VE2UG 59 SSB and VE3FN was 3x3 CW. Although, it should be noted that N1JEZ was seeing some sort of wideband signal that was affecting his 432 IF so his noise floor was at least 10 dB higher than usual. This site is the St Albans, VT FAA Radar Base. Possibly something at the site was causing the elevated noise floor.

Equipment used:

N1JEZ: 0.25m Procom dish with LX1DU feed. DL2AM mixer feeding a WA1MBA LNA/AMP. FT-817 432 MHz IF with Panadapter.

VE2UG: 30 cm MTI 71-86 GHz dish. Homebrew mixer. PCOM 39G multiplier. DB6NT synthesized MKU LO. FT-817 for IF.

VE3FN: 30 cm dish. Axtal OCXO at 101.25 MHz driving a PLL brick to 12960 MHz. Sub-harmonic mixer based on a DB6NT board. IF is an Icom IC-402A. (continued p. 12)

Events

For inclusion, please direct event notices to the editor.

ARRL January VHF - Contest - January 20-22, 2018. See <http://www.arrl.org/january-vhf> for rules and details. Lots of info will be presented at Packrat meetings and on the reflector.

Winter Hamfest - Hamfest - February 24, 2018. Big Flats NY. Sponsored by LIM Contest Group. See <http://www.ka2lim.com/7.html> for details

HRAC Firecracker Hamfest - Hamfest - June 30, 2018. Harrisburg Area Community College, Harrisburg PA. See <http://www.w3uu.org/> for details.

Murgas ARC Hamfest & Computerfest - Hamfest - July 1, 2018. Polish American Veterans Club, Plains PA. See <http://hamfest.murgasarc.org/> for details.

Sussex (NJ) Hamfest - Hamfest - July 15, 2018. Sussex County Fairgrounds, Augusta NJ. See <http://scarcnj.org/> for details.

... W/VE 78 GHz con'd

Several pictures here:

VE3FN/VE2UG at FN35ja

<https://www.dropbox.com/sh/8mf56n8g56agqgwz/AACli4RGfazp3ljw6dDouxkPa?dl=0>

N1JEZ/KT1J at FN34It

<https://drive.google.com/file/d/1Fwvtp2i60bnn7-PrkXC7K1g9z5bKj2ep/view?usp=sharing>

https://drive.google.com/file/d/1yQ7_7oviNlufk_-Pbb5OSwu0oozkzxPe/view?usp=sharing

We believe these contacts may be the first W/VE on 78 GHz? We hope to extend distances before winter sets in here in the Northeast and Mountain top access is limited.

Reported by **Mike N1JEZ**

CQ WW DX CW Results at K3TUF

Had a great 44.65 hours of contesting. Great way to keep your CW skills up.

Band	QSOs	Pts	ZN	Cty	Pt/Q
1.8	40	101	12	34	2.5
3.5	174	475	20	73	2.7
7	800	2259	32	112	2.8
14	426	1209	28	105	2.8
21	306	878	23	89	2.9
28	8	22	5	6	2.8
Total	1754	4944	120	419	2.8

Score : 2,664,816

73, Phil K3TUF

CQ WW DX CW Results at K3MD

Band	QSOs	Zones	Countries
160:	64	13	36
80:	190	16	64
40:	418	27	99
20:	798	30	116
15:	331	22	96
10:	24	8	11
Total:	1825	116	422
Total Score		2,781,460	

So much for the predictions of poor conditions.

AA2UK / KU8Y 222 MHz QSO

(11/12/17) I just got done working KU8Y (in MI) on 222mhz using MSK144. The contact took 1 hour and 36 minutes from start to finish. We were both running MSK144 with SH and Contest modes on. Shown below are decodes of KU8Y here. As we get closer to the Leonids we're going to try 432mhz using the same settings and mode.

163700 12 23.8 1436 & AA2UK KU8Y EN61 1 10 -0.8
170100 4 28.2 1421 & AA2UK KU8Y EN61 1 1 -0.0
171400 4 28.4 1512 & <AA2UK KU8Y> RRR 1

Congrats Bill !

Lunar-Link International

VHF & UHF amplifiers
for demanding modes

50 - 144 - 222 - 432 MHz

EME - Digital - Contesting



www.lunarlink.com

info@lunarlink.com

33 Ball Pond Road Danbury, CT

Cape Hatteras 10 GHz Beacon

Mark K1MAP reported to Warren WB2ONA that the Cape Hatteras 10 GHz beacon is back on the air.

Details:

Frequency - 10.368.130

Location - FM25fg

Mid-Atlantic VHF Conference Discs Available

MASVHF 2017 Proceedings Discs are available for \$5 per disc + \$2.50 shipping (for 1-3 discs) and handling Send PayPal payment to W3KM@verizon.net.

Special offer: Get a VHF SuperConference 2016 disc ****AND**** a MASVHF 2017 disc for \$10 (includes shipping).

TNX es 73, Rick, K1DS

G AND G ELECTRONICS OF MARYLAND

JEFF GOLDMAN, K3DUA

PO Box 222

Lisbon, MD 21765-0222

(301)258-7373

EMAIL: k3dua@erols.com

-Dealers in New and used electronics-



Bob Fischer Company, Inc

Eastern Van Ladder Sales Representative

*Ask Me: "How can I reach
45ft high from my Van"?*

283-B Egg Harbor Rd. #125

Sewell, NJ 08080

(800) 852-0120

Cell: (609) 440-2916

bobfischercompany@gmail.com

Bob Fischer

DESTINATIONS TRAVEL

A Full Service Travel Agency

HARRIET SOLTOFF

Travel Consultant

XYL, K3IUW

229 Fairway Dr

Warminster, PA 18974-3797

Phone: 215-957-6084

Fax: 215-957-6085

E-Mail: BSoltoff@Comcast.net



Joel Knoblock W3RFC

www.therfc.com

The R.F.Connection

213 N. Frederick Ave. #11WWW

Gaithersburg, MD 20877 USA

World wide shipping via FED-EX or US Post Office

Tech Line 301/840-5477 Order Line 800/783-2666

Fax Line 301/869-3680

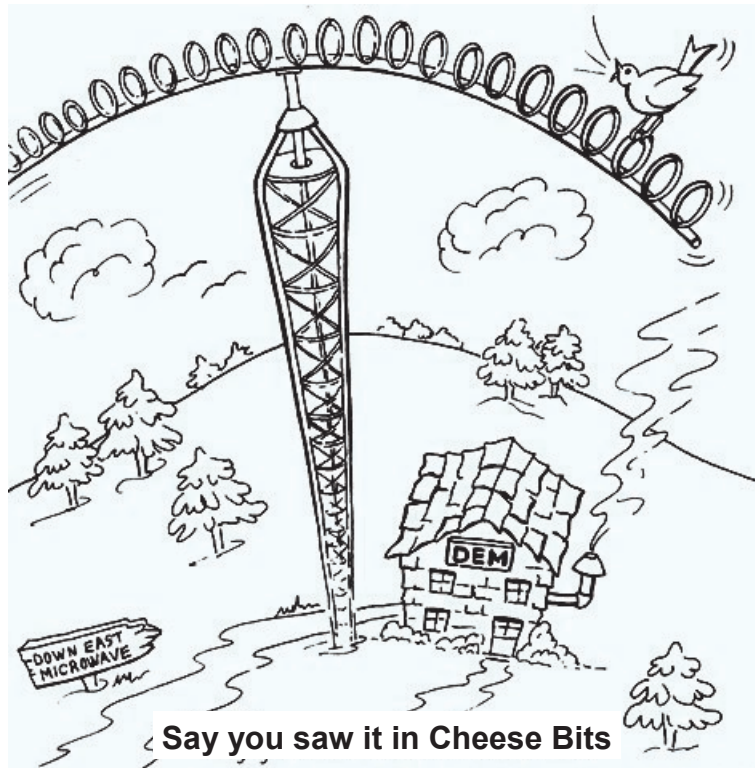
Hours: Monday-Friday 9:30am-5:30pm Eastern
All major credit cards accepted

Cheese Bits
709 Lincoln Avenue
Cranford NJ 07016



TO:

MT. AIRY VHF RADIO CLUB, INC.



DOWN EAST MICROWAVE

Manufacturers and Distributors
Of VHF/UHF/SHF Equipment and Parts
50 to 10,368 MHz

- No-Tune Linear Transverters
- Linear Power Amplifiers
- Low Noise Preamps
- Coax Relays, Coax Cable, Connectors
- Crystals, Chip Capacitors, MMICs, Transistors, RF Modules

For All Equipment
Steve Kostro, N2CEI

<http://www.downeastmicrowave.com>

19519 78th Ter.
Live Oak FL 32060
Tel. 386-364-5529 (Voice)