

# Portable 3 cm EME

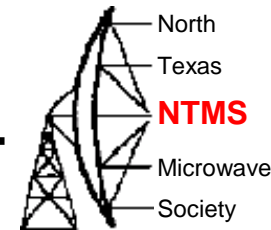
Al Ward

October 15, 2016

Microwave Update

St. Louis, MO

# 10 GHz EME in EM10cf – July 2014



W5LUA Portable 10 GHz Setup

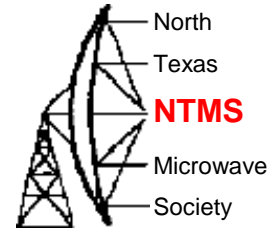


WA5YWC

W5LUA

WA5YWC built the dish mount and feed for the 35 inch (.89m) prime focus dish

# W5LUA Portable 10 GHz System



WB8BZK

WA8RJF



GR-1216 for measuring sun and moon noise

Flex1500 W1GHZ Mini-verter IcoTemp 10 MHz VCXO

1 W 24 GHz XVTR

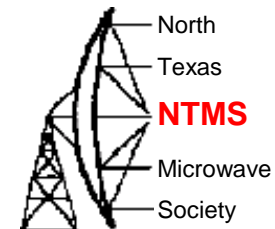
DEMI 10 GHz XVTR MFJ Keyer

WR-90 WG Relay ATF-36077 LNA

25 Watt TWT

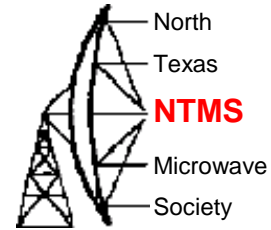
# WA5YWC / W5LUA

## Portable 3 cm EME Station



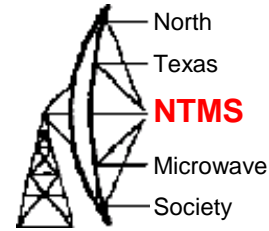
- W5LUA Rover Rig consisting of a 25 watt TWT and a system NF of 1 dB
- 2 m WR-90 Flexible waveguide with 0.5 dB loss, compare to 2m of flexible .25 inch cable which will have 2 to 3 dB loss!
- What really matters for EME is what is the performance at the feed.
- Measured performance at feed was 22 watts power and a noise figure of 1.5 dB
- Combined with WA5YWC's 35 inch prime focus dish with a VE4MA scalar feed resulted in 5 dB of sun noise.
- Moon noise = 0.2 to 0.25 dB, making it easy to track and or calibrate az/el by moon noise which is a plus.
- Net result was an easy JT-4F QSO with OK1KIR who was running a 4.6 m dish and 50 watts
- So what is next?

# Next Generation IF



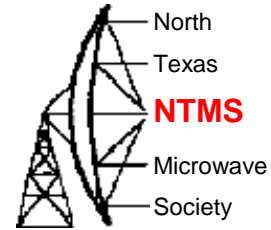
- The Flex-1500 provided excellent performance plus a built-in panadapter and software controlled VAC (virtual audio cable) and VCOM (virtual com port) to connect to WSJT
- The only downside was the whole system is tied to a computer.
- I decided to try the Elecraft KX-3 and PX-3 combination for a rover/portable EME IF
- Laptop only used for WSJT

# KX-3 & PX-3 as MW IF



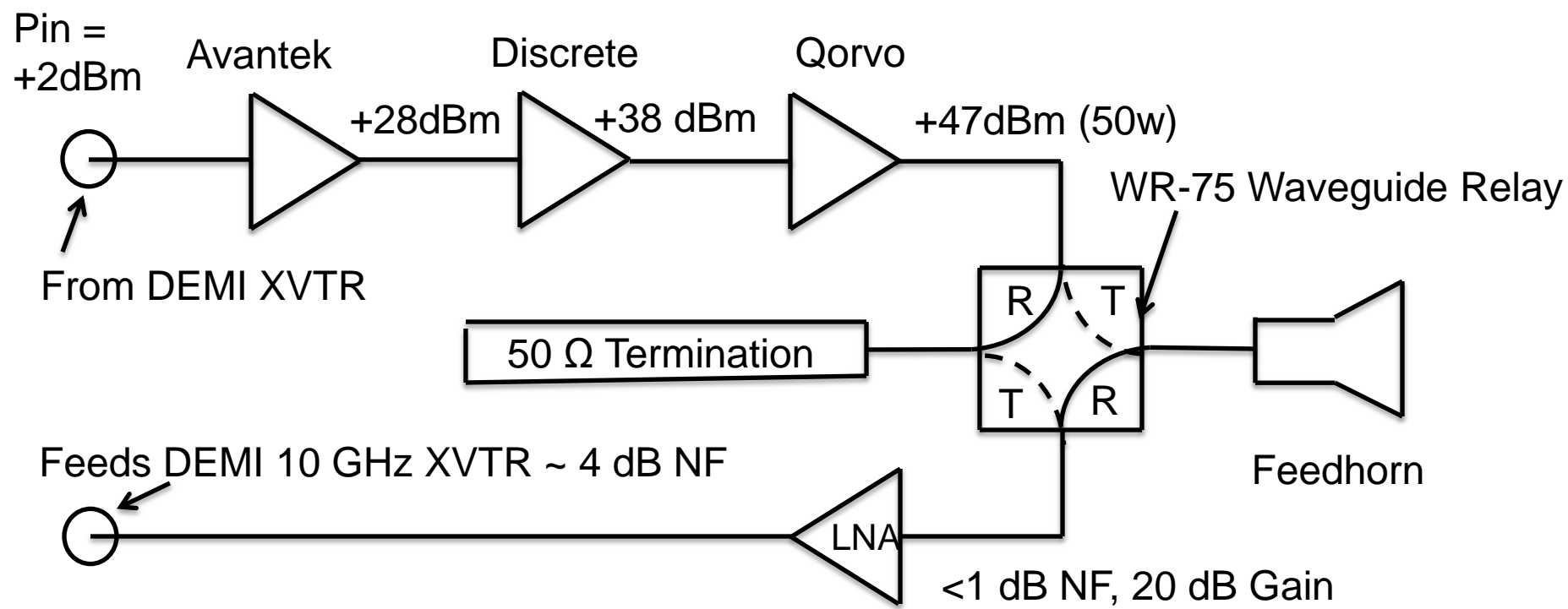
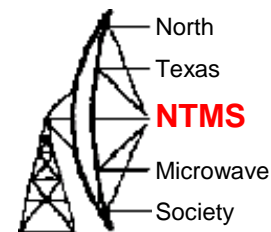
Connections to Computer Mic, rcve audio, and USB

# Next Generation EME Setup



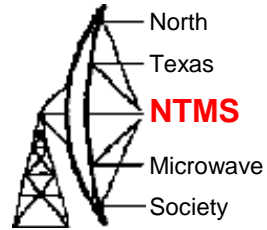
- No matter what size dish one uses for EME, there are a couple of things that should always be considered.
- Mounting the LNA at the feed is a major goal in building an EME station.
- Generating the most power possible at the feed is also important.
- I use TWTs at home in the shack but only so I can take advantage of having high power on both EME and tropo.
- Since my 25 watt rover TWT decided to “let the smoke out”, I figured it was time to try some “SSPA” power.....

# New LNA / SSPA Feed Assembly





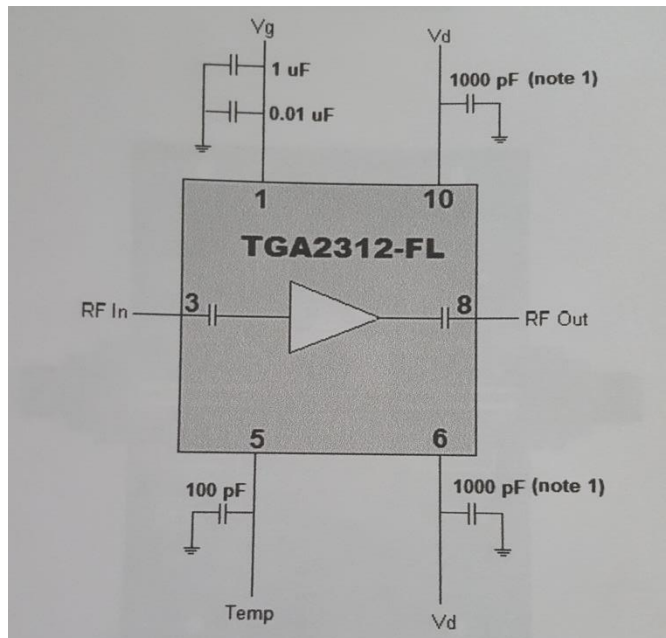
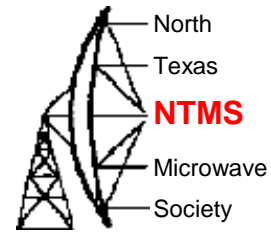
# GaN Power



- Triquent (Qorvo) has some rather nice but pricey parts for 10 GHz.
- Charlie G3WDG did a nice write-up in DUBUS on a 50 w part for 10 GHz- I decided to give this part a try in the rover set-up

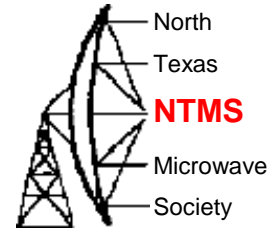


# TGA2312-FL chip temp vs R



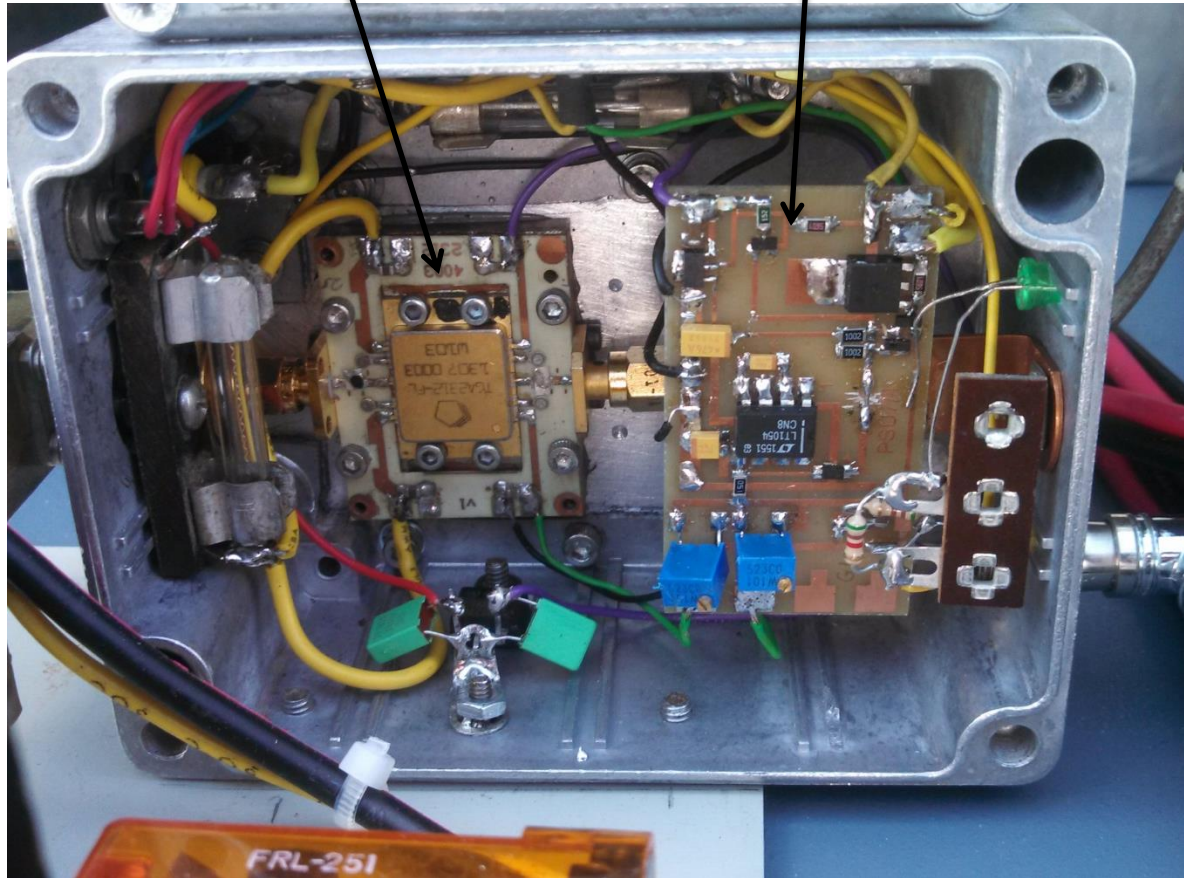
deg C	R (Kohm)	deg C	R (Kohm)
0	378.80	65	17.89
5	284.71	70	14.84
10	216.16	75	12.37
15	165.70	80	10.37
20	128.17	85	8.74
25	100.00	90	7.40
30	78.66	95	6.29
35	62.36	100	5.37
40	49.81	105	4.61
45	40.06	110	3.96
50	32.44	115	3.43
55	26.44	120	2.97
60	21.68	125	2.59

# TGA2312-FL @ 10 GHz



TGA2312-FL

G3WDG Power Supply Board



50 watt device at 9  
dB gain

$V_{dd} = 24V$

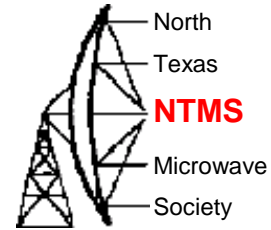
$I_{dq} \sim 2A$

$I_{d \text{ max}} = 4.5 \text{ to } 5A$

Device mounted to a  
copper or nickel plated  
aluminum block

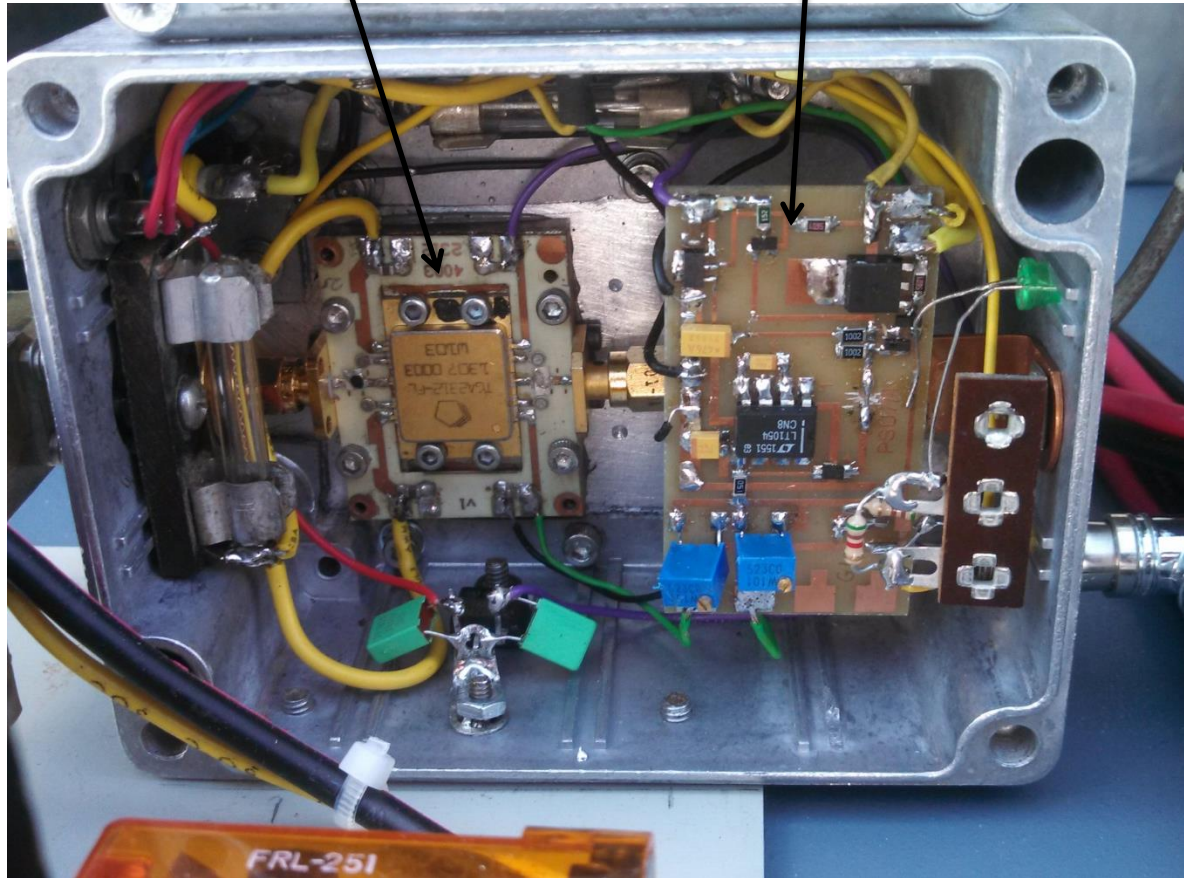
G3WDG can help with  
the PCB

# TGA2312-FL @ 10 GHz



TGA2312-FL

G3WDG Power Supply Board



50 watt device at 9  
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$V_{dd} = 24V$

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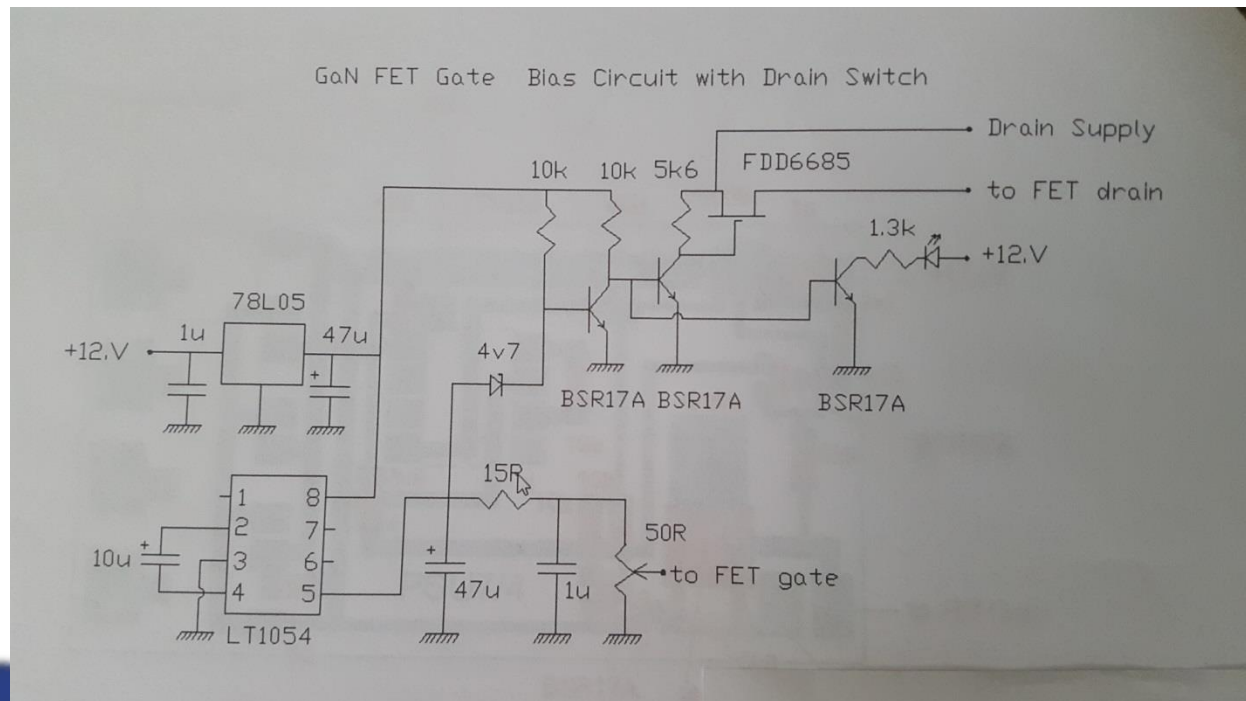
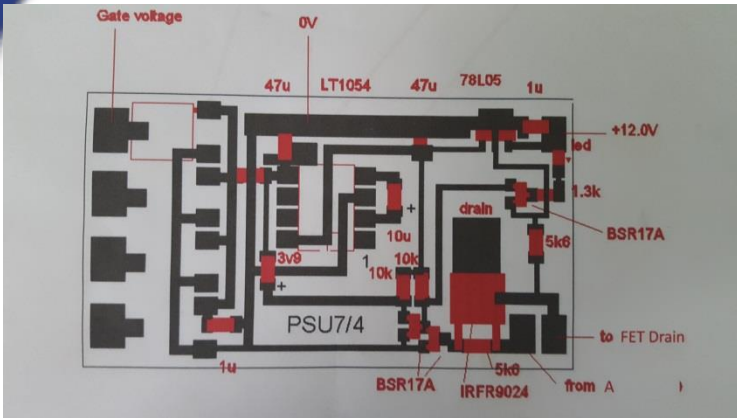
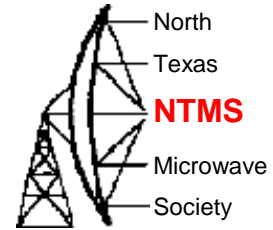
$I_{d \max} = 4.5 \text{ to } 5A$

Device mounted to a  
copper or nickel plated  
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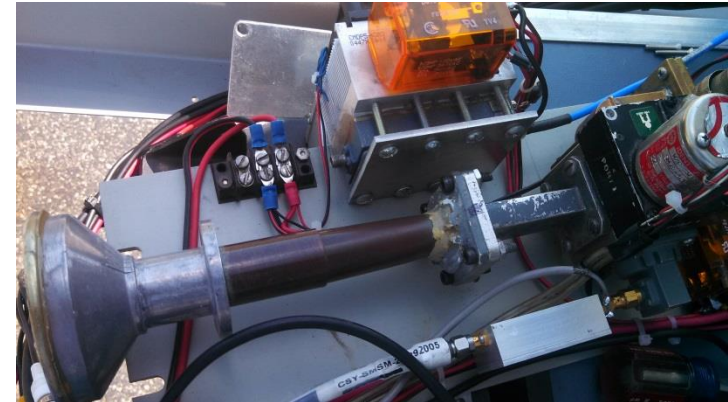
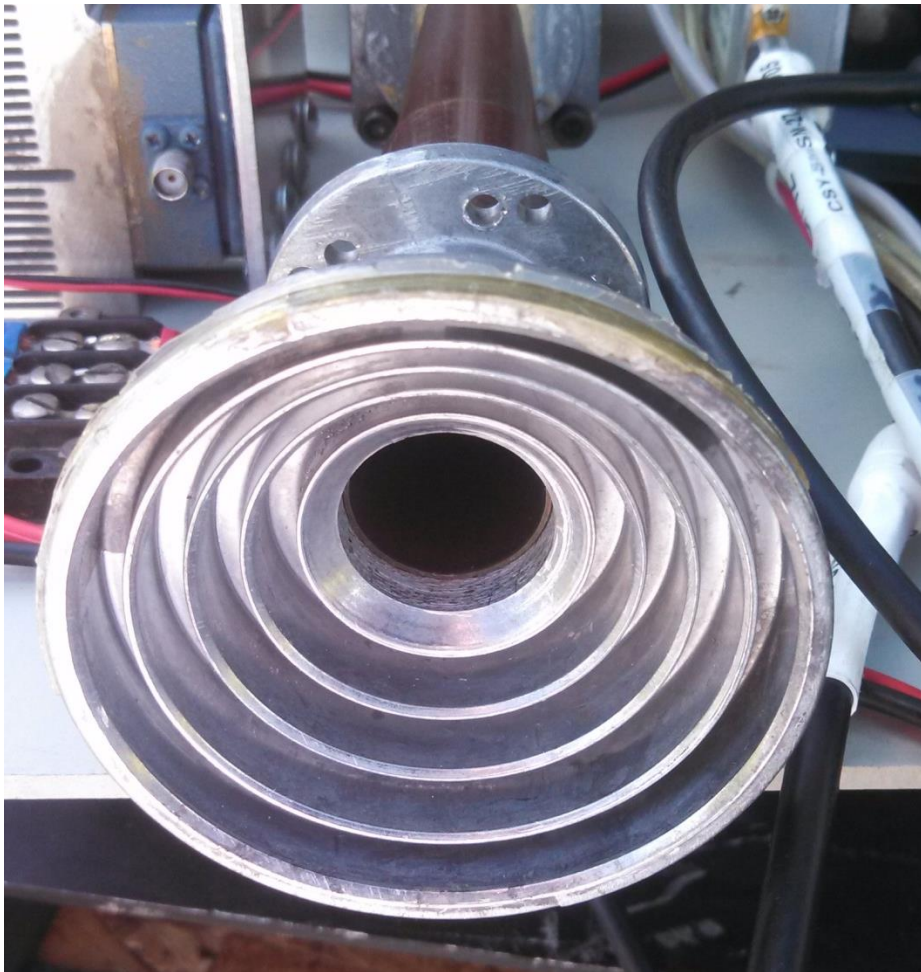
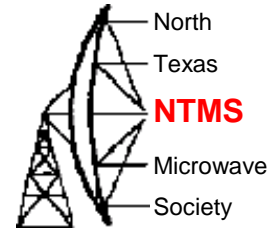
G3WDG can help with  
the PCB

Cost \$1050 from  
Mouser but compare  
at over \$3500 for  
German made  
amplifiers

# G3WDDG FET Sequencer Board



# Surplus Corrugated Feed Horn

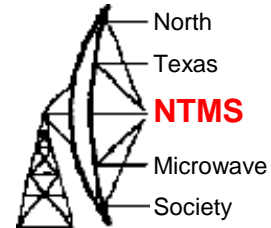


These are typically designed for 12 GHz

ID drilled out to .875 inch to accept the OD of standard .75 inch water pipe

.75 inch copper pipe can then be formed into WR-90 and then soldered to WR-90 flange

# New Portable Set-Up



Heavy duty manual AZ-EL mount built by TerraCom that was originally used for portable point to point microwave link with a 4 ft fiberglass dish

Mounted a 1 m Winegard off set fed dish to mount

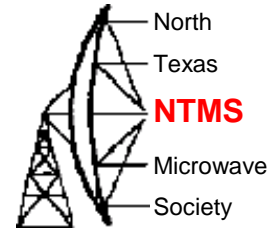
Gain ~ 37 to 38 dBi

3dB BW ~ 2.2 deg

First null at 2.8 deg

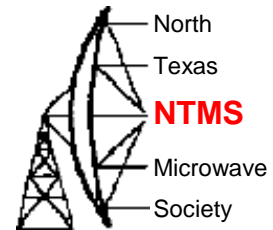
Extended and raised feed support arms to handle weight of new feed/wg relay/LNA/SSPS

# Improved Feed Platform & Relocation of Feed Support Arms



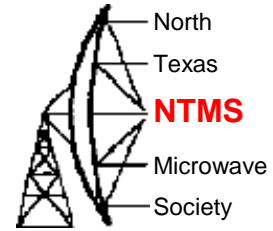


# Manual EL over EL over AZ Portable Mount

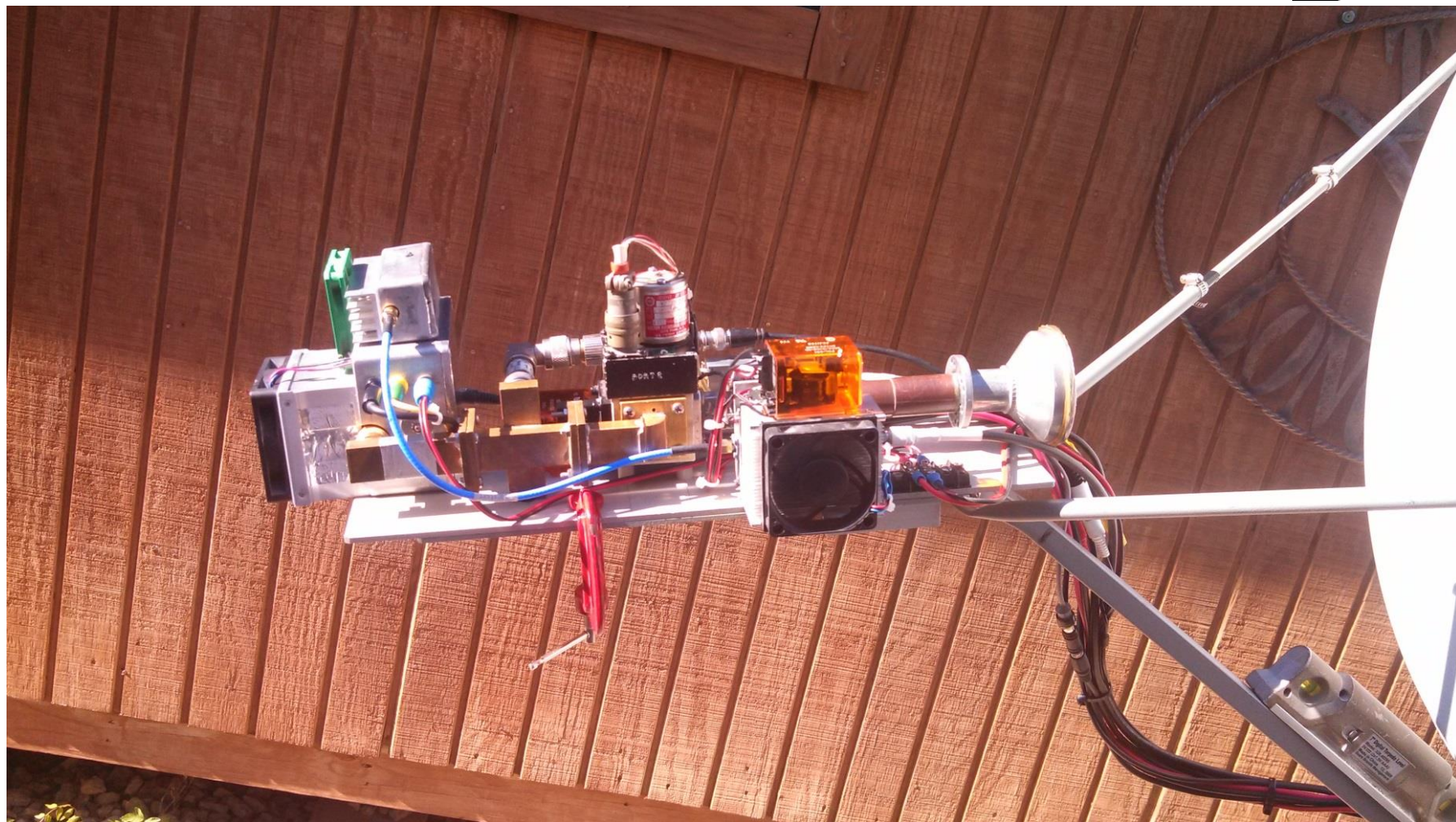
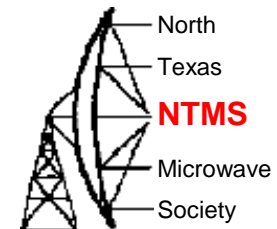


Plan to replace wrench with a small actuator

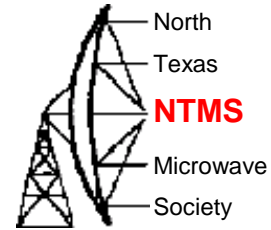
# Feed/LNA/50W SSPA



# Feed/LNA/50W SSPA

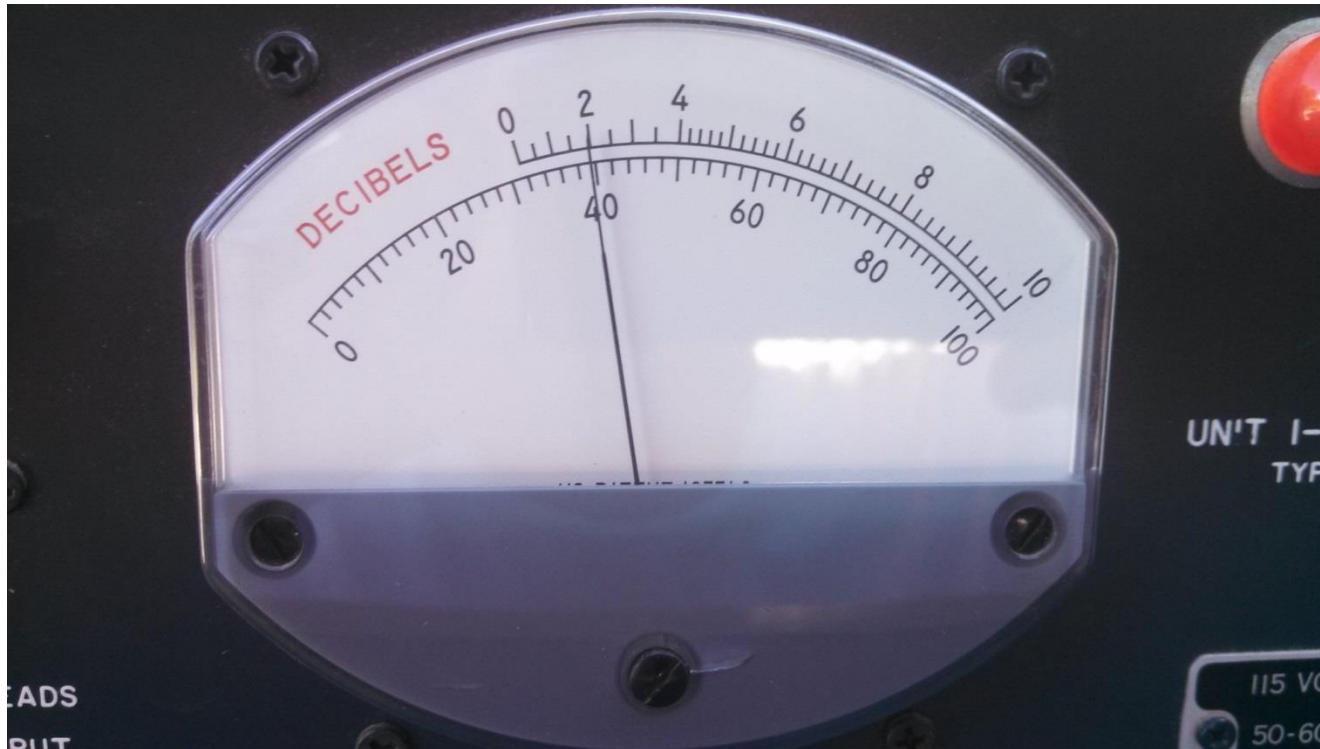
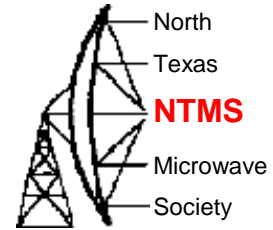


# So WHY all the wires?



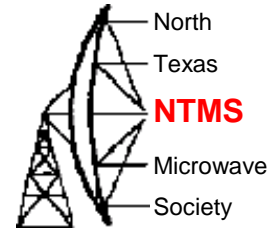
- Since the LNA and PA are remoted....
- LNA to xvtr receive line
- Sequenced 12V to LNA
- DEMI xvtr RF power to PA assembly
- Sequenced 12V and 24V to amplifier assemblies
- Waveguide relay control
- Power output monitor
- PA heatsink temperature monitor

# GR-1216 for Measuring Sun & Moon Noise



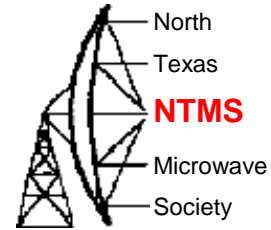
However, the only way (or the best way) to track the moon with a “field or portable setup” is by moon noise .....

# But hold on...



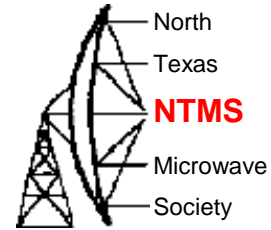
- In EM48ss we were having some interference issues, first thought to be caused by some commercial 10 GHz data links, now believe to be caused by the local 10 GHz beacon.
- But the beacon is operating at 10368.900 MHz!
- Was it the beacon's fault? Heck no!
- My GR IF amplifier is looking at a several MHz wide passband at the IF and it trying to average all the noise and everything else it sees! That is how we can see the several tenths of a dB of moon noise that we were going to peak on and get calibrated
- It did not effect the KX-3 down at 10368.050 because it has filtering
- Next time improve filtering
- But we needed plan B if this operation was going to be a success

# Sears Digital Level Used to Calibrate System Elevation



After calibrating elevation on “sun” noise, it was determined that the angle of the feed support arm was approximately 3 degrees below actual sun elevation on “my” offset fed dish – this value gets us close..

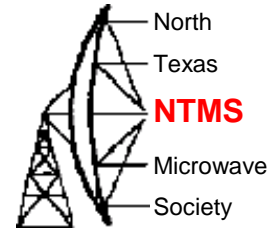
# Azimuth Calibration



- Get out the compass!
- Others had suggested doing our homework on Google Earth to gain a calibrated azimuth heading of our operating location – maybe next time!
- Last resort – Listen for a strong station and get calibrated on azimuth and elevation.
- With our 2 degree 3 dB beamwidth , we needed to be within plus or minus a degree or so.
- Once calibrated, we needed to update about once a minute on the rising moon



# K5GW DOS Tracking Program



C:\ KT12-21.EXE

TIME	DATE	TGT	A/T	AZ	EL	AZC	ELC	DEC	AZ ERROR	EL
04:20:15	07/22/16	MOON	OFF	116.42	16.64	5.9	0.1	-11.0	0.00	0.00

ANTENNA	AZIM	ELEV
1296	0.00	0.00
2304	0.00	0.00
3400	0.00	0.00
5760	0.00	0.00
10368	0.00	0.00
24048	0.00	0.00
47088	0.00	0.00
77184	0.00	0.00

Band: 10368MHZ  
 Doppler: 24796.1  
 Sky Tem: 2.7  
 Loss dB: 0.97  
 Tdeg dB: 0.97  
 Pol: 40  
 Lib: 111.3

JUL 22 2016 04:20:15

SUN	MON	TUE	WED	THU	FRI	SAT
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

FTRACK

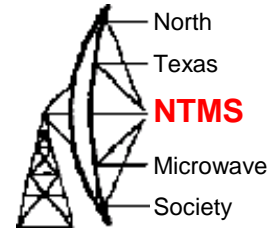
Rcvr freq:10368.132100  
 Xmtr freq:10368.107303

OPMODE:USB TMODE:1 H/P

<Q> <E> <B/b> <T> <A> <M> <U> <Z> <C> <F> <O> <L> <P> <←→> <--> -  
 qt exit bnd tgt a/t man pos a/z cal f/t stnB lib plan  
 a/tcom:off rx1:on rx2:off <D>opcor <X>mode <W>sjt <S>lave:off <R/r>it: 0

# HB9Q Logger



EME Logger - Mozilla Firefox  
www.hb9q.ch/hb9q/wf/logger.php?f=10000

## EME LOGGER (CW, SSB, JT)

50MHz 144MHz 222MHz 432MHz 902MHz 1296MHz 2300-5760MHz 10000MHz and up

Help Logout

Say:   « first < prev 1 2 ... 25 26 next > last » goto page:

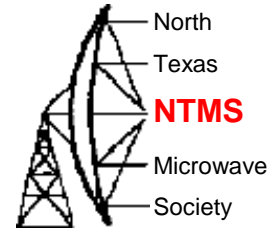
UTC	Callsign	Name	Comment
24-30/Change	<input type="text"/>	<input type="text"/>	<input type="text"/> <input type="button" value="Set"/> <input type="button" value="Reset"/>
07-30 15:03:30	W5LUA	Al	Thanks Peter! We did!
07-30 15:03:11	OZ1LPR	Peter	DL1YMK I be very interested in trying with you
07-30 15:03:09	K2UYH	Al	Al are you still QRV?
07-30 15:03:03	W5LUA	Al	We are now QRT from EN34. The conference attendees loved the EME demonstration the last 2 days. Thanks to everyone we worked could not remain QRV. I must attend conference and finish presentation. 73
07-30 15:02:30	OZ1LPR	Peter	Al welcome I thought you needed a strong signal again today
07-30 15:01:34	OK1DFC	Zdenek	GA all, sorry for delay, I was trugling with new elevation positel unit, expect to be QRV from Moonrise tomorrow
07-30 15:01:34	W5LUA	Al	Thanks to OZ1LPR, WA3LBI and OK1KIR for JT-4 QSOs today. I was also copied by PA3DZL on JT. I also copied SP6JLW very well on CW and called many times with no success.
07-30 15:00:26	OZ1LPR	Peter	What is your setup ?
07-30 15:00:02	OZ1LPR	Peter	Hi Michael will you Be QRV tomorrow again like to work youfrom JO78 ?
07-30 14:59:27	K2UYH	Al	I may go back to TWTA -- using SSPA today.
07-30 14:58:53	K2UYH	Al	Hi Peter plan to be on TM
07-30 14:58:01	K2UYH	Al	Mitsu RRR have conveter -- I have not tried with JT yet
07-30 14:57:59	OZ1LPR	Peter	K2UYH hi Al qrv tomorrow ?
07-30 14:56:56	JA1WQF	Mitsu	Go to bed tnx all.....gn

Who's online? ▲

- W5LUA (me)
- K2UYH
- OK1DFC
- OK2AQ
- OZ1LPR
- PE1LWT
- sp6jlw
- Wa3lbi
- WA3RGQ

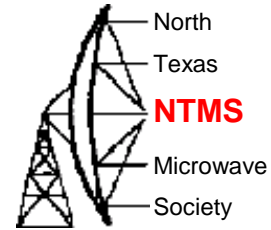
www.hb9q.ch/hb9q/index.php/help#how\_to\_use\_the\_logger Al

# Results in Rochester, MN in July 2016



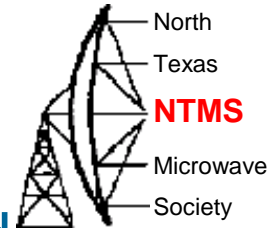
- 8 QSOS on JT-4F
- Worked OZ1LPR, HB9Q, G3WDG, OK1KIR, WA3LBI
- Heard and called SP6JLW on CW with no success. SP6JLW was armchair copy most of the time calling CQ
- Now on to results at MUD in St. Louis....

# Doppler Review

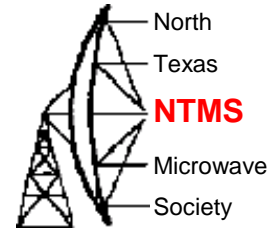


- Doppler scales with frequency
- Where doppler may be .3 kHz at 144 MHz, the equivalent doppler at 10368 MHz will be  $10368/144 = 72 \times .3 \text{ kHz} = 21.6 \text{ kHz}$  at 10368 MHz
- Plus there is your self doppler...where your echoes will be based on your transmit frequency
- And there is mutual doppler...where you will hear the other station based on your location and the other station's location

# Options for us in EM48ss

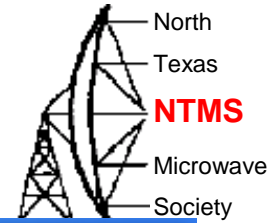


- First Choice - we transmit and receive on prearranged frequency of 10368.050 MHz – works well if station calling us has capability to offset their transmit and receive frequency based on mutual doppler between his 6 digit grid square and our EM48ss location
- Second option – we do the mutual doppler correction on both receive and transmit for the other station
- Third option - listen on my self doppler frequency, i.e 10368.075 MHz as an example...
- Fourth option - listen on our mutual doppler frequency, i.e. 10368.053 MHz based on location of the station calling
- Fifth option – Frequency on the moon – a topic for another day.....



Day 1  
Microwave Update Conference  
St. Louis, MO  
October 13<sup>th</sup>, 2016

# G3WDG at 2257Z



**SpecJT by K1JT**  
Options Freq: 2250 DF: 979 (Hz) BW Speed: 1 2 3 4  
22:58:15

**WSJT 10.0 r4181 by K1JT**  
File Setup View Mode Decode Save Band Help

**Moon**  
Az: 103.56  
El: 8.34  
Dop: 13347  
Dgrd: -0.6

FileID	Sync	dB	DT	DF	W		
225200	0	-20	4.6	-265	9	*	
225300	2	-19	3.8	-536	11	*	
225400	0	-21	-0.9	245	33	*	
225500	3	-17	1.6	28	24	*	
225700	7	-14	1.5	-7	31	*	WSLUA G3WDG IO92 1 29 D
225700	7	-14	1.5	-7	31	*	WSLUA G3WDG IO92 1 29 D

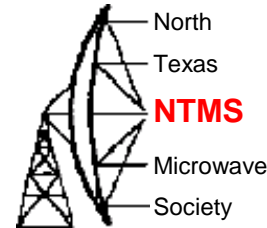
Log QSO Stop Monitor Decode Erase Clear Avg Include Exclude Tx Stop

To radio: G3WDG Lookup Sync -1 Zap G3WDG WSLUA EM48 Tx1  
 Grid: IO92rg Add Tol 50 AFC G3WDG WSLUA -14 Tx2  
 Az: 45 4175 mi MinW D Efreeze G3WDG WSLUA R-20 Tx3  
 Tx First @1500 (RRR) Tx4  
 Rpt: -20 @1700 (73) Tx5  
 Gen Msgs Auto is ON CQ WSLUA EM48 Tx6

1.0000 1.0000 JT4F Freeze DF: 0 Rx noise: 2 dB T/R Period: 60 s Txing: G3WDG WSLUA -14

2016 Oct 13 22:58:15

# OZ1LPR at 2305Z



WSJT 10.0 r4181 by K1JT

File Setup View Mode Decode Save Band Help

Options Freq: 1867 DF: 597 (Hz) BW Speed: 1 2 3 4

23:11:25

2016 Oct 13 23:11:25

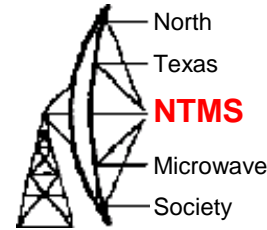
Auto is ON

Receiving

FileID	Sync	dB	DT	DF	W	Time (s)	Call	Mode	Rate	Band
225900	5	-16	1.5	-13	39	#	WSLUA G3WDG R-18	1	18	D
230100	0	-21	4.7	-44	4	*				
230300	0	-21	0.6	-18	7	*				
230500	6	-15	1.2	39	11	*	WSLUA OZ1LPR JO44	1	60	D
230700	5	-15	1.2	39	15	#	WSLUA OZ1LPR R-17	1	20	D
230900	7	-13	1.2	39	15	*	WSLUA OZ1LPR 73	1	32	D



# OK1KIR at 0033Z



**WSJT 10.0 r4181 by K1JT**

File Setup View Mode Decode Save Band Help

Options Freq: 1025 DF: -244 (Hz) BW: |<|> Speed: 1 2 3 4

9.9 Time (s) OK1KIR\_161014\_003700.WA

FileID	Sync	dB	DT	DF	W	1	2	3
003000	0	-20	-0.9	-140	7 #			
003100	0	-21	5.6	-147	11 #			
003300	6	-15	0.7	-182	42 *	WSLUA	<b>OK1KIR</b>	JN79 1 13 D
003500	0	-20	0.7	-129	13 *			
003500	4	-17	0.7	-284	28 #			
003700	9	-12	0.7	-289	35 #	WSLUA	OK1KIR	R-14 1 18 D

Log QSO Stop Monitor Decode Erase Clear Avg Include Exclude Tx Stop

To radio: OK1KIR Lookup Sync -1 Zap OK1KIR WSLUA EM48 Tx1  
 Grid: JN79mm Add Tol 50 AFC OK1KIR WSLUA -15 Tx2  
 Az: 42 4853 mi MinW D Freeze OK1KIR WSLUA R-15 Tx3  
 Tx First OK1KIR WSLUA RRR Tx4  
 Bpt: -20 OK1KIR WSLUA 73 Tx5  
 Gen Msgs Auto is ON CQ WSLUA EM48 Tx6

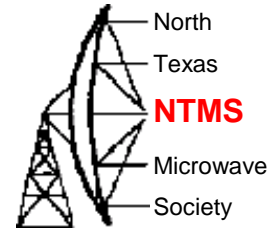
2016 Oct 14 00:38:03 Dsec 0.0

1.0000 1.0000 JT4F Freeze DF:-288 Rx noise: 1 dB T/R Period: 60 s Txing: OK1KIR WSLUA RRR

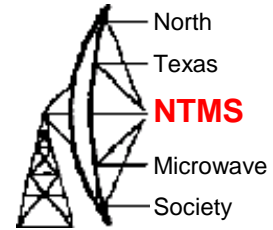
PowerSDR v2.7.2 Spectrum Lab Command Prompt Microsoft Outlook 2010 NaP3\_5-1-... PM.xml SpecV2PX.dll NaP3\_11-2... AM.xml PowerSDR... AM.xml  
 EMECalc JTSDK-PY JTSDK-QT LP\_BRIDGE NaP3\_5-1-... PM.xml NaP3\_11-2... AM.xml NaP3\_11-2... AM.xml VNWA  
 Default.htm SDRSharp.exe - Shortcut WSJT-X Control panel TurboTax Business PowerSDR mRX PS HP Print and Scan Doctor PowerSDR... PM.xml Setup

7:38 PM 10/13/2016

# CW with K5GW

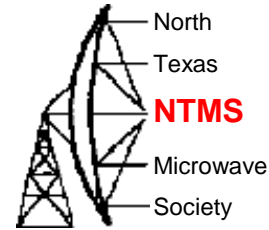


- Gerald K5GW provided us with some listening enjoyment by calling us multiple times on CW
- But it seemed that he was not going to copy our 30 watts which was 10 dB down from his 300 watts so we decided to try a JT-4F sked the following day.
- We also learned from the HB9Q logger that other stations were seeing us including WA3LBI and G4CBW, plus OK1KIR had been calling us on CW



Day 2  
Microwave Update Conference  
St. Louis, MO  
October 14<sup>th</sup>, 2016

# Second QSO with G3WDDG



**WSJT 9.7 r3639 by K1JT**

File Setup View Mode Decode Save Band Help

**Moon**  
Az: 99.20  
El: 10.69  
Dop: 173  
Dgrd: -1.4

FileID	Sync	dB	DT	DF	W					
234104	4	-16	-1.0	-2	22	*	WSLUA	G3WDDG	IO92	0 10 D
234104	4	-16	-1.0	-2	24	*	WSLUA	G3WDDG	IO92	0 10 D
234300	6	-14	3.0	-4	26	#	WSLUA	G3WDDG	R-20	1 23 C
234300	6	-14	3.0	-4	26	#	WSLUA	G3WDDG	R-20	1 23 C
234500	1	-20	0.7	-22	4	#				
234700	5	-15	3.1	0	28	*	73	TO ALL	GL	1 0 C

234700 2 6/6 WSLUA G3WDDG R-20 1 7

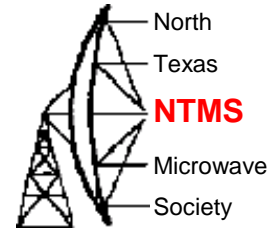
Log QSO Stop Monitor Decode Erase Clear Avg Include Exclude TxStp

To radio: G3WDDG    LookUp    Sync 1    Zap    G3WDDG WSLUA EM48    Tx1  
 Grid: IO92rg    Add    Tol 50    AFC    G3WDDG WSLUA -16    Tx2  
 Az: 45    4175 mi    MinW A    Efreeze    G3WDDG WSLUA R-16    Tx3  
 2016 Oct 14    Dsec 0.0    Tx First    G3WDDG WSLUA RRR    Tx4  
 23:48:07    Rpt: -20    G3WDDG WSLUA 73    Tx5  
 Gen Msgs    Auto is ON    CQ WSLUA EM48    Tx6

1.0000 1.0000 JT4F Freeze DF: 2 Rx noise: 0 dB T/R Period: 60 s Txing: CQ WSLUA EM48

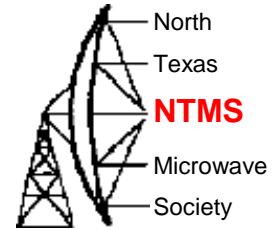
Taskbar: 6:48 PM 10/14/2016

# WA3LBI at 0023Z



The screenshot shows a Windows desktop environment with several applications open. The primary application is WSJT-X, which is displaying a spectrum plot and a waterfall plot. The spectrum plot shows a signal at approximately 1500 Hz. The waterfall plot shows a signal at 1500 Hz for a duration of 00:36:01. The WSJT-X interface includes a menu bar (File, Setup, View, Mode, Decode, Save, Band, Help), a status bar (0.9998 0.9998 JT4F Freeze DF: -16 Rx noise: 0 dB T/R Period: 60 s Receiving), and a control panel with buttons for Log QSO, Stop, Monitor, Decode, Erase, Clear Avg, Include, Exclude, and TxStp. The control panel also includes fields for To radio (WA3LBI), Grid (FN20ji), Az (78), and 821 mi. The status bar shows the date and time: 2016 Oct 15 00:36:01. The desktop background is blue and features icons for Recycle Bin, TeamViewer 10, Garmin Express, HP Photo Creations, Microsoft PowerPoint, NaP3\_5-1-... AM.xml, ve7cc, KISS Konsol, WSJT9, arrl\_qst\_20, Adobe Reader X, Elecraft KK Utility, EZNEC-v 5.0, PowerSDR v2.7.2, EMECALC, and Default.htm. The taskbar at the bottom shows the Start button and several pinned applications including Internet Explorer, Firefox, and WSJT-X. The system tray in the bottom right corner shows the date and time: 7:36 PM 10/14/2016.

# Working K5GW



**WSJT 9.7 r3639 by K1JT**

FileID Sync dB DT DF W File WSLUA K5GW 1 0 A

FileID	Sync	dB	DT	DF	W	File	W	SLUA	K5GW	1	0	A
010300	8	-13	3.1	-22	28	*	WSLUA	K5GW	1	0	A	
010500	7	-13	3.3	-22	31	*	WSLUA	K5GW	1	0	A	
010700	7	-13	3.3	-20	28	*	WSLUA	K5GW	1	0	A	
010900	7	-13	3.3	-20	28	*	WSLUA	K5GW	1	0	A	
010900	7	-13	3.3	-20	28	*	WSLUA	K5GW	1	0	A	
011100	7	-14	3.3	-15	28	*	WSLUA	K5GW	1	0	A	

011100 2 1/1 WSLUA K5GW 1 0

Log QSO Stop Monitor Decode Erase Clear Avg Include Exclude TxStp

To radio: K5GW Lookup Sync -2 Zap K5GW WSLUA EM48 Tx1

Grid: EM13pa Add Tol 50 AFC K5GW WSLUA -14 Tx2

Az: 223 529 mi MinW A Efreeze K5GW WSLUA R-20 Tx3

2016 Oct 15 01:13:02 Dsec 0.0 Tx First @1500 (RRR) Tx4

Gen Msgs Rpt -20 @1700 (73) Tx5

0.9999 0.9999 JT4F Freeze DF: -27 Rx noise: 0 dB T/R Period: 60 s CQ WSLUA EM48 Tx6

Receiving

SpecJT by K1JT

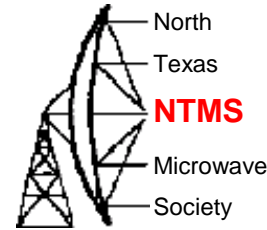
Options Freq: 352 DF: -918 (Hz) BW Speed: 1 2 3 4 5 H1 H2

00 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200

01:13:02 0 dB

8:13 PM 10/14/2016

# K5GW QSO completed!



The screenshot shows a Windows desktop with several applications open. The primary application is WSJT-X, displaying a QSO log and moon data. The moon data is as follows:

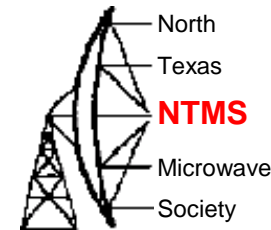
- Moon
- Az: 116.58
- El: 29.08
- Dop: 326
- Dgrd: -1.6

The QSO log table is as follows:

FileID	Sync	dB	DT	DF	W	Time (s)	QSO	TX
011700	8	-13	3.1	-11	28	*	GD SIG	1 0 A
011900	7	-13	3.3	-9	28	#	W5LUA K5GW -20	1 9 A
012100	8	-13	3.1	-7	31	*	R-14	1 0 A
012300	7	-13	3.3	-7	28	*	73	1 0 A
012500	8	-12	3.1	-4	31	*	73	1 0 A
012700	8	-13	3.3	-2	33	*	QSL TNX	1 0 A

Additional information from the interface includes a date and time stamp: "2016 Oct 15 01:29:19". The software is running on a system with a taskbar showing various icons and a system tray with the time "8:29 PM 10/14/2016".

# Big surprise – G4CBW called us!



**WSJT 9.7 r3639 by K1JT**

File Setup View Mode Decode Save Band Help

**Moon**  
 Az: 118.78  
 El: 30.95  
 Dop: 85  
 Dgrd: -1.7

FileID	Sync	dB	DT	DF	W				
012900	7	-14	3.1	0	33	*			
013100	0	-21	3.1	24	4	#			
013300	0	-20	2.7	-42	7	*			
013500	5	-16	3.0	-9	26	*	WSLUA	G4CBW	I083
013700	0	-21	3.0	-13	4	#	WSLUA	G4CBW	R-15
013900	3	-17	2.9	-9	26	*	WSLUA	G4CBW	73

013900 2 1/1 WSLUA G4CBW 73 0 11

Log QSO Stop Monitor Decode Erase Clear Avg Include Exclude TxStop

To radio: G4CBW     Zap  AFC  Freeze

Grid: I083ub Az: 45 4085 mi

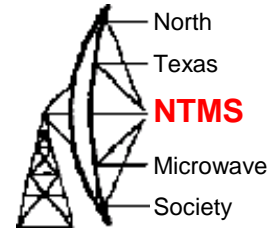
**2016 Oct 15 01:40:17** Dsec 0.0

Tx First Rpt: -20 Gen Msgs  CQ WSLUA EM48

1.0000 1.0000 JT4F Freeze DF: 2 Rx noise: 0 dB T/R Period: 60 s Txing: G4CBW WSLUA 73



# Screen at G4CBW – 1.5m dish/75W



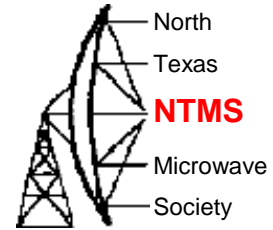
The screenshot displays a software interface for radio reception, likely SDR#, with several windows and controls:

- Single-Period Decodes:** A table of decoded messages with columns for UTC, dB, DT, Freq, and Message.
 

UTC	dB	DT	Freq	Message
0131	-19.0	80	901	*
0132	-18.1	88	987	* CQ WSLUA EM48
0133	-19.0	29	1404	#
0134	-15.1	91	987	* CQ WSLUA EM48
0136	-16.1	71	982	# G4CBW WSLUA -16
0138	-16.2	06	978	# G4CBW WSLUA RRR
0140	-15.1	86	987	* G4CBW WSLUA 73
0141	-20.0	84	991	#
0142	-18.1	91	993	* CQ WSLUA EM48
0143	-18.1	87	910	*
0144	-17.1	91	989	* CQ WSLUA EM48
0145	-20.2	06	932	*
0146	-15.1	91	987	* CQ WSLUA EM48
- Average Decodes:** A similar table showing averaged decoded messages.
- Wide Graph:** A spectrum plot showing a peak at 10,368,055.714 Hz. The frequency axis ranges from 500 to 3000 kHz.
- WSIT-X - Astronomical Data:** A window displaying astronomical data for 2016 Oct 15 at 01:47:05 UTC.
 

Parameter	Value
UTC	01:47:05
Az	228.4
El	26.4
SelfDop	-9322
Width	44
Delay	2.39
DxAz	120.2
DxE1	32.1
DxDop	5714
DxWid	52
Dec	-0.2
SunAz	37.4
SunE1	-40.1
Freq	10368
TeKy	3
MNR	2.6
Dgard	-0.2
- Control Panel:** Includes buttons for 'Log QSO', 'Stop', 'Monitor', 'Erase', 'Clear Avg', 'Decode', 'Enable Tx', 'Halt Tx', and 'Tune'. It also shows a frequency display of 10,368,055.714 and a 'Receiving' status indicator.

# OK1CA QSO



**WSJT 9.7 r3639 by K1JT**

File Setup View Mode Decode Save Band Help

**Moon**  
Az: 122.97  
El: 34.22  
Dop: 38  
Dgrd: -1.7

FileID	Sync	dB	DT	DF	W				
015500	3	-18	3.1	-11	37	#			
015500	4	-16	3.1	127	26	*	WSLUA	OK1CA	JO70
015700	0	-21	3.1	160	7	*			
015700	5	-16	3.1	13	42	#	WSLUA	OK1CA	R-15
015900	0	-20	3.1	44	4	#			
015900	5	-16	3.1	-96	44	*	RRR	73	

015900 2 4/4

Log QSO Stop Monitor Decode Erase Clear Avg Include Exclude TxStp

To radio: OK1CA Lookup  
Grid: JO70gm Add  
Az: 41 4794 mi  
Dsec: 0.0

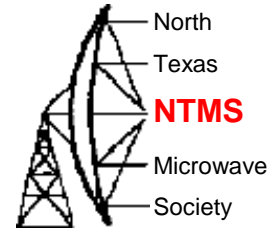
2016 Oct 15 02:00:04

0.9999 1.0000 JT4F Freeze DF: -91 Rx noise: 0 dB T/R Period: 60 s Txing: OK1CA WSLUA 73

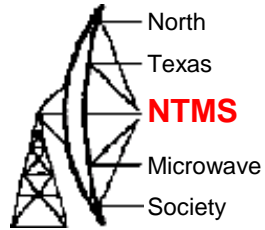
Re Moon-N...  
D: ...  
HP OfficeJet 4650 series

9:00 PM 10/14/2016

# Results in EM48ss



- 8 QSOs on JT-4F
- Worked G3WDG twice, OZ1LPR, OK1KIR, WA3LBI, K5GW, G4CBW, and OK1CA
- Highlight was working G4CBW who was running a 1.5 m dish and 75 watts
- CW provided by K5GW was copied by many in the audience



- Any questions?
- I hope to put a pdf up on our [www.ntms.org](http://www.ntms.org) web site when I return.
- My email is [w5lua@sbcglobal.net](mailto:w5lua@sbcglobal.net)
- 73 and see you on the moon!