

Report on 10 GHz Tests from Mt Wellington QE37oc on 3 October

A successful QSO with Mirek OK2AQ between two small stations - the smallest I have worked to date. Averaging was required at the VK7MO end.

Decodes both ways with Toly UA4HTS but ran out of Moon before a QSO could be completed.

Equipment

VK7MO: 50 watts to a 77 cm dish - fully GPS locked

OK2AQ: 20 watts to a 1.8 m dish - transverter Rubidium locked but not FT817 IF which explains DF error of about 150 Hz.

UA4HTS: offset dish 2.4 × 2.7m 25 watt output power - transverter operates from an OCXO which explains initial difficulty in finding frequency.

Conditions

Conditions were about as good as they can get with the sked date chosen to optimise both degradation and spreading. The Table below compares the losses with those on 19 September when only single tones were seen each way with OK2AQ on the integrated Yellow line. Overall there was an improvement of 5 dB which no doubt made the difference.

Parameter	19 September	3 October
Spreading (Hz)	150	15
Spreading Loss (dB)	7.2	3.9
Degradation (dB)	2.2	0.5
Total Extra Losses	9.4	4.4

Conditions on Mt Wellington for Operator

Not pleasant, apparent temperature down to -4 degrees and wind gusting to 40 km/hr all at between 1:00 am and 3:00 am.

Date/Time EST	Temp °C	App Temp °C	Dew Point	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9 am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
04/03:00am	5.4	-2.5	-1.3	62	2.7	W	30	39	16	21	-	-	0.0
04/02:30am	5.7	-2.6	-1.4	60	2.9	W	32	39	17	21	-	-	0.0
04/02:00am	5.5	-3.0	-1.9	59	2.9	W	33	39	18	21	-	-	0.0
04/01:30am	5.2	-4.1	-2.4	58	3.0	W	37	43	20	23	-	-	0.0
04/01:00am	4.9	-4.1	-2.9	57	3.0	W	35	43	19	23	-	-	0.0

Moon Data for OK2AQ in Locator JN89eu on 10368 MHz with VK7MO in Locator QE37oc

Date	UTC	AZ	EL	POL	AZDX	ELDX	DGR	T Sky	Rge Km	Doppler	Echo Width
2014-10-03 Friday	13:40	114°	-0°	+10°	280°	+31°	0.5dB	3°K	367581	+1991 Hz	20 Hz
2014-10-03 Friday	13:50	116°	+1°	+11°	278°	+29°	0.5dB	3°K	367558	+1643 Hz	20 Hz
2014-10-03 Friday	14:00	117°	+3°	+12°	276°	+27°	0.5dB	3°K	367536	+1298 Hz	19 Hz
2014-10-03 Friday	14:10	119°	+4°	+13°	275°	+25°	0.5dB	3°K	367513	+955 Hz	18 Hz
2014-10-03 Friday	14:20	121°	+5°	+14°	273°	+24°	0.5dB	3°K	367491	+616 Hz	17 Hz
2014-10-03 Friday	14:30	123°	+7°	+15°	271°	+22°	0.5dB	3°K	367469	+279 Hz	16 Hz
2014-10-03 Friday	14:40	125°	+8°	+16°	270°	+20°	0.5dB	3°K	367447	-54 Hz	15 Hz
2014-10-03 Friday	14:50	127°	+9°	+17°	268°	+18°	0.5dB	3°K	367424	-382 Hz	14 Hz
2014-10-03 Friday	15:00	129°	+11°	+18°	267°	+17°	0.5dB	3°K	367402	-705 Hz	13 Hz
2014-10-03 Friday	15:10	131°	+12°	+18°	265°	+15°	0.5dB	3°K	367380	-1023 Hz	11 Hz
2014-10-03 Friday	15:20	133°	+13°	+19°	263°	+13°	0.5dB	3°K	367358	-1336 Hz	10 Hz
2014-10-03 Friday	15:30	135°	+14°	+20°	262°	+11°	0.5dB	3°K	367336	-1642 Hz	8 Hz
2014-10-03 Friday	15:40	137°	+15°	+21°	260°	+9°	0.5dB	3°K	367314	-1942 Hz	7 Hz
2014-10-03 Friday	15:50	140°	+16°	+22°	259°	+8°	0.5dB	3°K	367292	-2234 Hz	6 Hz
2014-10-03 Friday	16:00	142°	+17°	+23°	257°	+6°	0.5dB	3°K	367270	-2519 Hz	5 Hz
2014-10-03 Friday	16:10	144°	+18°	+24°	256°	+4°	0.5dB	3°K	367248	-2797 Hz	6 Hz
2014-10-03 Friday	16:20	146°	+19°	+25°	254°	+3°	0.5dB	3°K	367226	-3066 Hz	7 Hz
2014-10-03 Friday	16:30	149°	+20°	+26°	252°	+1°	0.5dB	3°K	367204	-3326 Hz	8 Hz

We used horizontal polarization on both ends. Spatial offset about 17 deg was compensated by OK2AQ.

Moon Data for UA4HTS in Locator LO43mo on 10368 MHz with VK7MO in Locator QE37oc

Date	UTC	AZ	EL	POL	AZDX	ELDX	DGR	TSky	Rge Km	Doppler	Echo Width
2014-10-03 Friday	15:00	160°	+19°	+37°	267°	+17°	0.5dB	3°K	367402	-5397 Hz	40 Hz
2014-10-03 Friday	15:10	163°	+20°	+38°	265°	+15°	0.5dB	3°K	367380	-5823 Hz	37 Hz
2014-10-03 Friday	15:20	165°	+20°	+39°	263°	+13°	0.5dB	3°K	367358	-6235 Hz	34 Hz
2014-10-03 Friday	15:30	168°	+21°	+41°	262°	+11°	0.5dB	3°K	367336	-6632 Hz	31 Hz
2014-10-03 Friday	15:40	170°	+21°	+42°	260°	+9°	0.5dB	3°K	367314	-7013 Hz	28 Hz
2014-10-03 Friday	15:50	173°	+21°	+43°	259°	+8°	0.5dB	3°K	367292	-7378 Hz	26 Hz
2014-10-03 Friday	16:00	175°	+21°	+44°	257°	+6°	0.5dB	3°K	367270	-7725 Hz	23 Hz
2014-10-03 Friday	16:10	178°	+21°	+45°	256°	+4°	0.5dB	3°K	367248	-8054 Hz	22 Hz
2014-10-03 Friday	16:20	180°	+21°	+48°	254°	+3°	0.5dB	3°K	367226	-8366 Hz	21 Hz
2014-10-03 Friday	16:30	183°	+21°	+49°	252°	+1°	0.5dB	3°K	367204	-8658 Hz	21 Hz

Results

Good DTs highlighted in **Green** and comments in **bold Red**.

ALL.TXT File VK7MO

UTC Date: 2014 Oct 03

150500 **Possible 1270 at 40% but 158 Hz low**

150600 Transmitting: JT4F @1270

150700 0 -20 3.6 -55 4 # **Marginal 1270 at 30% 150 Hz low**

150850 Transmitting: JT4F OK2AQ VK7MO QE37

150900 1 -20 -0.1 -20 4 * **Good 1270 at 80% 153 Hz low**

151100 1 -20 3.9 -190 4 * **1270 at 60% 148 Hz low**

151300 0 -20 0.4 -129 7 #

151500 0 -21 3.5 -160 4 *

151700 0 -21 -0.8 -63 4 #

151900 1 -20 4.2 -166 4 *

152100 0 -21 **2.5** -151 7 # **Good DT and DF**

152300 1 -19 **2.5** -151 7 # **Good DT and DF**

152300 2 2/2 VK7MO OK2AQ R-19 ? 0 2

Decode on average. After responding I did worry that the above was suspect (confidence only 2) as I had not TXed a report and thus did not expect an R response, however it is now confirmed that this is exactly what OK2AQ sent.

152400 Transmitting: JT4F OK2AQ VK7MO R-20

152500 0 -20 0.2 -199 4 # **Received RRR 70%**

152608 Transmitting: JT4F @1700 (73)

152700 0 -20 2.2 -158 4 * **Received RRR 75%**

152700 2 4/4 VK7MO OK2AQ R-19 ? 0 2

152900 1 -20 1.4 -188 4 * **Received 73 85%**

152900 2 5/5 VK7MO OK2AQ R-19 ? 0 2

153100 0 -20 1.7 -96 4 # **Received 73 70%**

153300 1 -19 -1.1 -140 4 *

Attempt with UA4HTS

153430 Transmitting: JT4F @1270

153500 0 -21 5.7 -120 7 * **Toly sorting out Freq**

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160300 0 -21 2.9 -733 7 # **Strong 1270 at 100% 650 Hz low, too low for my passband to RX the lower tones on JT4f**

160500 0 -21 2.5 -409 18 # **1270 100% 640 Hz low**

160700 0 -21 2.7 -280 7 * **Nil**

160900 2 -18 0.7 -440 4 * **Nil**

161100 0 -21 1.5 -372 7 # **1270 100% 600 Hz low**

161300 1 -20 4.5 -335 7 # **1270 100% spot on freq**
 161500 0 -21 3.6 241 4 # **1270 100% spot on freq**
 161700 0 -20 -0.6 -63 7 * **1270 100% spot on freq**
 161900 1 -19 2.5 20 13 * VK7MO UA4HTS LO43 0 12 C
 162000 Transmitting: JT4F UA4HTS VK7MO QE37
 162001 Transmitting: JT4F UA4HTS VK7MO -20
 162100 2 -18 2.5 24 15 #
 162300 1 -20 2.6 33 18 #
 162500 2 -19 2.6 50 22 # **Message changed see below so average would be corrupt**
 162700 2 -18 2.6 61 11 # **and as my call not TXed Correlation decoder would not work**
 162900 2 -19 2.6 72 11 # **Message corrected but again corrupted average**
 163100 2 -19 2.6 85 4 # **Too weak for single line decodes with low elevation & ground noise**
 163300 0 -21 2.6 90 13 #
 163500 1 -20 2.6 98 11 # **Still getting sync at 0.5 degrees**

ALL.TXT File as RXd by OK2AQ

150509 Transmitting: JT4F @1270
 150600 1 -20 3.7 578 4 *
 150600 0 -20 0.0 116 7 *
 150800 0 -21 1.9 164 4 *
 151000 0 -20 2.3 142 11 *
 151000 0 -21 2.5 13 4 *
 151200 1 -20 2.3 -15 9 #
 151300 Transmitting: JT4F VK7MO OK2AQ JN89
 151200 2 -19 2.3 142 7 * OK2AQ VK7MO QE37 ? 0 3 B
 151400 1 -20 2.4 142 9 * OK2AQ VK7MO QE37 0 7 B
 151400 1 12/12 OK2AQ VK7MO QE37 0 14
 151500 Transmitting: JT4F VK7MO OK2AQ -19
 151600 0 -21 2.4 144 9 * OK2AQ VK7MO QE37 ? 0 5 D
 151600 1 13/13 OK2AQ VK7MO QE37 0 21
 151700 Transmitting: JT4F VK7MO OK2AQ R-19
 151800 2 -19 2.4 147 9 * OK2AQ VK7MO QE37 0 14 C
 151800 1 14/14 OK2AQ VK7MO QE37 0 28
 152000 2 -18 2.4 147 9 *
 152000 1 15/15 OK2AQ VK7MO QE37 1 28
 152000 2 -18 2.4 147 9 *
 152000 1 16/16 OK2AQ VK7MO QE37 1 25
 152200 3 -17 2.4 149 9 * OK2AQ VK7MO QE37 0 11 D
 152200 1 17/17 OK2AQ VK7MO QE37 1 28
 152400 3 -17 2.4 149 9 # OK2AQ VK7MO R-20 0 13 B
 152400 1 18/18 OK2AQ VK7MO QE37 1 25
 152514 Transmitting: JT4F @1500 (RRR)
 152600 1 -20 4.7 571 4 *
 152600 1 19/19 OK2AQ VK7MO QE37 1 26
 152800 1 -20 3.1 343 4 *
 152800 1 20/20 OK2AQ VK7MO QE37 1 26
 152900 Transmitting: JT4F @1700 (73)
 153000 0 -21 1.3 346 7 #
 153000 1 21/21 OK2AQ VK7MO QE37 1 26

All TXT as RXED by G3WDG from UA4HTS

161900	7	-13	3.0	37	53	*	VK7MO UA4HTS LO43	1	0	C
162100	8	-13	2.8	46	50	#	VK7MO UA4HTS R-16	1	0	C
162300	7	-13	3.0	55	50	#	VK7MO UA4HTS R-16	1	0	C
162500	7	-13	2.8	79	50	#	UA4HTS UA4HTS R-15	1	0	C
162700	8	-13	3.0	81	50	#	UA4HTS UA4HTS R-15	1	0	C
162900	7	-14	2.8	96	46	#	VK7MO UA4HTS R-20	1	0	C
163300	7	-13	2.8	114	50	#	VK7MO UA4HTS R-20	1	4	C
163500	8	-12	2.8	120	50	#	VK7MO UA4HTS R-20	1	0	C

Note changes of messages that prevent the use of averaging

Communication VK7MO (red) - OK2AQ (blue) chronologically:

UTC Date: 2014 Oct 03

150509 Transmitting: JT4F @1270
150500 **Possible 1270 at 40% but 158 Hz low**
150600 Transmitting: JT4F @1270
150600 1 -20 3.7 578 4 * **1270 80%**
150700 0 -20 3.6 -55 4 # **Marginal 1270 at 30% 150 Hz low**
150800 0 -21 1.9 164 4 * **1270 90%**
150850 Transmitting: JT4F OK2AQ VK7MO QE37
150900 1 -20 -0.1 -20 4 * **Good 1270 at 80% 153 Hz low**
151000 0 -20 2.3 142 11 *
151100 1 -20 3.9 -190 4 * **1270 at 60% 148 Hz low**
151200 2 -19 2.3 142 7 * OK2AQ VK7MO QE37 ? 0 3 B
151300 Transmitting: JT4F VK7MO OK2AQ JN89
151300 0 -20 0.4 -129 7 #
151400 1 -20 2.4 142 9 * OK2AQ VK7MO QE37 0 7 B
151500 Transmitting: JT4F VK7MO OK2AQ -19
151500 0 -21 3.5 -160 4 *
151600 0 -21 2.4 144 9 * OK2AQ VK7MO QE37 ? 0 5 D
151700 Transmitting: JT4F VK7MO OK2AQ R-19
151700 0 -21 -0.8 -63 4 #
151800 2 -19 2.4 147 9 * OK2AQ VK7MO QE37 0 14 C
151900 1 -20 4.2 -166 4 *
152000 2 -18 2.4 147 9 *
152100 0 -21 2.5 -151 7 # Good DT and DF
152200 3 -17 2.4 149 9 * OK2AQ VK7MO QE37 0 11 D
152300 1 -19 2.5 -151 7 # Good DT and DF
152300 2 2/2 VK7MO OK2AQ R-19 ? 0 2

Decode on average. After responding I did worry that the above was suspect (confidence only 2) as I had not TXed a report and thus did not expect an R response, however it is now confirmed that this is exactly what OK2AQ sent.

152400 Transmitting: JT4F OK2AQ VK7MO R-20
152400 3 -17 2.4 149 9 # OK2AQ VK7MO R-20 0 13 B
152514 Transmitting: JT4F @1500 (RRR)
152500 0 -20 0.2 -199 4 # **Received RRR 70%**
152608 Transmitting: JT4F @1700 (73)

152600 1 -20 4.7 571 4 * **Received 73 90%**

152700 0 -20 2.2 -158 4 * **Received RRR 75%**

152700 2 4/4 VK7MO OK2AQ R-19 ? 0 2

152800 1 -20 3.1 343 4 * **Received 73 90%**

152900 Transmitting: JT4F @1700 (73)

152900 1 -20 1.4 -188 4 * **Received 73 85%**

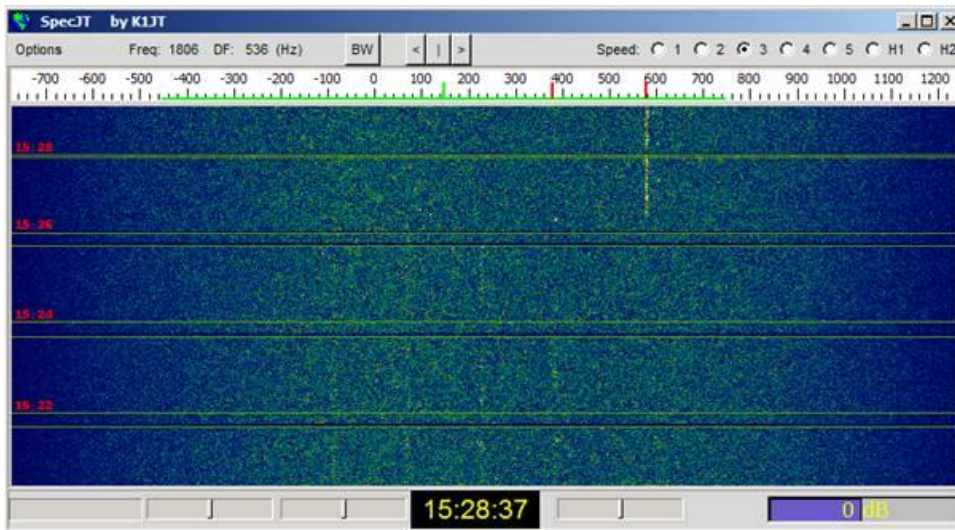
152900 2 5/5 VK7MO OK2AQ R-19 ? 0 2

153100 0 -20 1.7 -96 4 # **Received 73 70%**

153300 1 -19 -1.1 -140 4 *

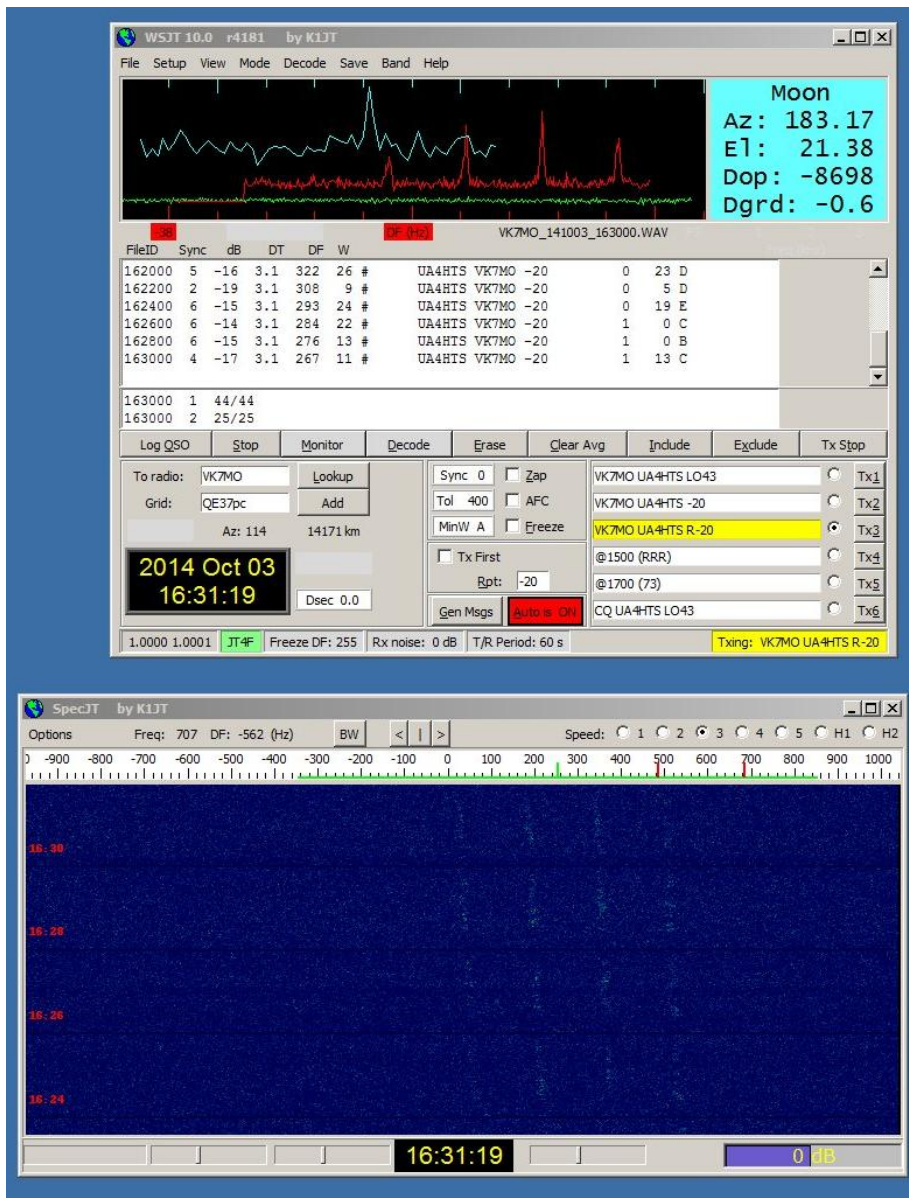
153430 Transmitting: JT4F @1270

Mirek commented: **Never seen so narrow sigs on 10 GHz EME!**



Decode Screen from UA4HTS

Toly, UA4HTS decoded Rex very well even at the Moon's elevation of only 1deg at VK7MO. It is likely that we can put down the lack of additional decodes at VK7MO to the 3 dB power difference plus additional ground noise at low elevations at the end, combined with the change of message that prevented the use of averaging.



General Comments from above Screens

OK2AQ had set Sync to 0, Tol 100, MinW to B and freeze was ticked in the signal center as recommended by VK7MO.

UA4HTS did not tick freeze and left the tolerance at 400. On weak signals we have found it best to set the tolerance to 100 and tick freeze to implement this as this can avoid gaining a false sync on a wider frequency. But this does mean that you must track any frequency variation by clicking on the waterfall to keep the vertical green tick within the centre two tones.

UA4HTS had MinW set to A. Our experience is that the A setting can be suspect and that it is best not to go below B. On wider spreading it is best to set the MinW one or two steps below the spreading based on B = 9 Hz, C = 18 Hz, D = 40 Hz, E = 79 Hz and F = 158 Hz. The spreading is reduced if one station has a beamwidth smaller than the moon - but not really an issue for most stations on 10 GHz.

It seems that UA4HTS did not implement "Plot average JT4 Spectrum" which produces the whole period integration and gives best detection of single tones such as 1270 Hz and 1500 Hz for RRR and 1700 Hz for 73. This is useful on very weak signals. Single tones can be set in the set-up menu as @XXXX where XXXX is the frequency of the tone in Hz or by typing @XXXX in any TX box.

Single tone Messages: These are 1270 for tuning, 1500 for RRR, 1700 for 73. Also 1000 Hz for "please send messages" and 2000 Hz for QRT which are useful if not on the internet. Single tones and Intergration on the Yellow graph can give around 6 dB advantage over full messages on the correlation decoder.

Decoder: Use "Include average in aggressive Deep Search" as this allows the use of the more sensitive correlation decoder providing standard messages are used and gives about 3 dB advantage over the convolutional decoder.

Averaging: Not sure if stations are experienced in averaging. But the key things are:

1. Exclude from the average any bad syncs. Good syncs are indicated by consistent DT or if stations have good time keeping by return time based on Moon distance +/- 0.5 seconds.
2. Clear the average when the ther station moves from 1270 to messages and also when there is a change of message as indicated by a change from * to # in the 7th column - but providing you are confident that the sync is good.
3. Averaging can pick up about 2 dB for an average over 4 periods and can be useful up to about 6 periods. But be careful you don't include a bad sync in the average.
4. Averaging only works if the transmitted message is the same - but if you follow the standard procedure this is not an issue (but for example do not change the report once sent).