

Getting the best out of QRA64 on 10 and 24GHz

G3WDG
V1.6

Agenda

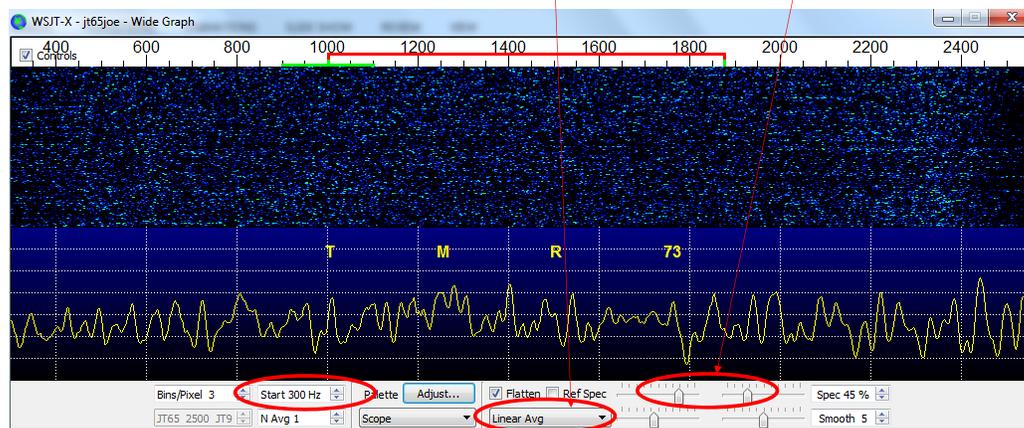
- System requirements
- Optimizing the waterfall settings
- Starting a QSO with 1000Hz tone using yellow average display
- Setting the RX frequency if you can see QRA64 tones
- Setting up to use AP on weak signals
- Using CFOM Doppler
- Choice of F Tol setting
- Choice of sub-modes according to spreading conditions
- Interpreting 'sync'
- Tips
- Introduction to auto-sequencing

System requirements

- Doppler tracking is highly desirable
- Recommended to use CFOM (see later) or have other station do 'Full Doppler' in which case **you** keep RX and TX frequencies the same and **do not** compensate for Doppler your end. Use Full Doppler to receive DLOSHF.
- GPS locking to better than 100Hz frequency accuracy is highly desirable
- Use the latest version of WSJT-X (currently 1.8.0 rc1) from K1JT's website

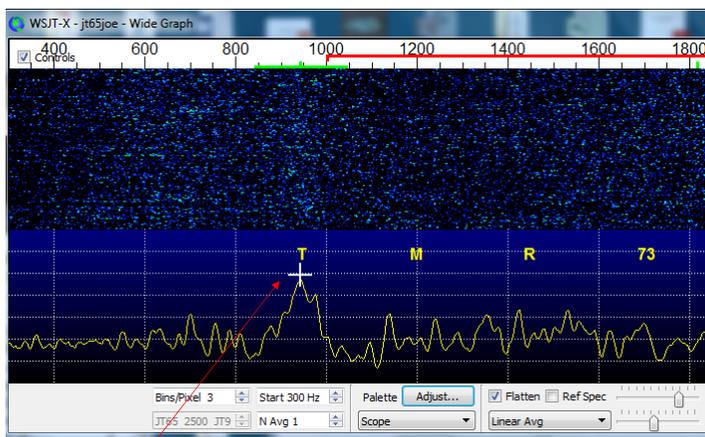
Optimising the waterfall

- After install, waterfall settings are **far from optimum** for our use. **Waterfall gain and zero** certainly need adjusting while monitoring band noise, and yellow **linear average** needs enabling. Suggest the settings below as a starting point. Controls are quite sensitive! Choice of N avg is a personal preference. Start of 300Hz is recommended.



Starting with a 1000Hz tone (file 0634)

0634 download <https://drive.google.com/file/d/0B116lwQIUFNTcGNIT2VWX2VwMGc/view?usp=sharing>



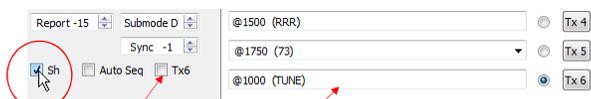
Move cursor to peak of 1000Hz tone and left mouse click on peak sets correct RX freq for subsequent decode attempts of messages. 'T M R and 73' move to correct positions for use later with single tone messages.



Must be unchecked, as shown

For DLOSHF you can also click on the UPPER CW tone, which is at same 1000Hz frequency as the lowest QRA tone

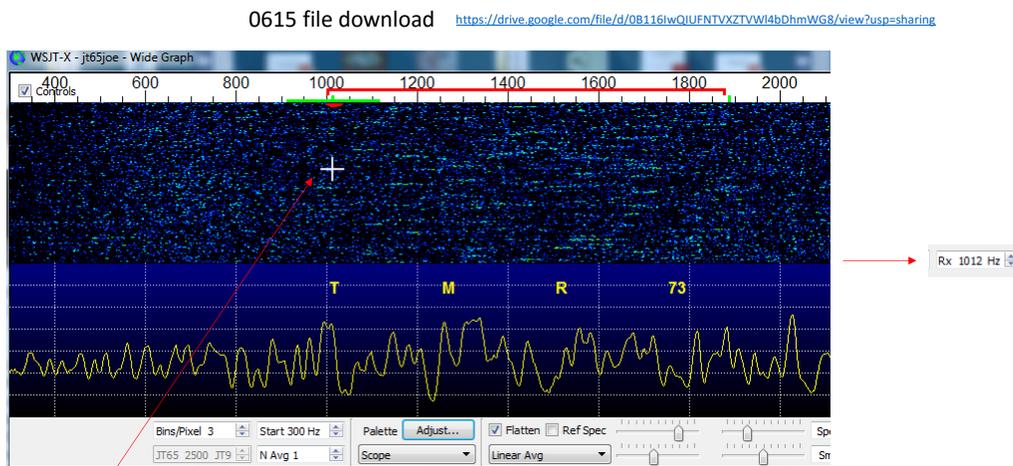
How to send a single tone message



Other frequencies can be entered by typing them in eg 2000Hz (QRT tone) is entered by typing in @2000
 TX6 toggles between 1000 (tuning tone) and 1250 (pse send messages) tones

Note: in 1.8.0 rc1 the Auto Seq box does not appear – this will be available in forthcoming rc2

Setting RX freq if you are lucky enough to see QRA64 tones



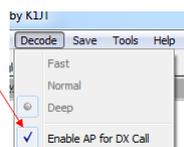
Using AP to help decode very weak signals

AP (short for 'A Priori') refers to the decoder's ability to use prior knowledge of your call, DX station's call and grid to assist in achieving a decode under marginal conditions. It does not use the call3.database.

For full AP to work, DX Call and DX Grid must be entered (and My Call must be correct of course!)

DX Call	DX Grid	Station Details	
VK7MO	OH90va	My Call:	G3WDG
		Message generation for type :	

- For receiving **DLOSHF** this setting is useful. For working **stations in skeds** we have seen it makes no difference, but may do for decoding CQ calls. This feature is not yet fully developed.



Example of AP helping a decode

File 0642 download

<https://drive.google.com/file/d/0B116lwQIUfNTsnNIZ252WG84VVU/view?usp=sharing>

The screenshot shows the WSJT-X software interface. At the top, there are two tables: 'Single-Period Decodes' and 'Average Decodes'. Both tables show a decoded message: '0642 -21 2.5 942 :* G3WDG VK7MO -23 3'. The number '3' in the 'Message' column is circled in red. Below the tables, there are various controls including 'Log QSO', 'Stop', 'Monitor', 'Erase', 'Decode', 'Enable Tx', 'Halt Tx', and 'Tune'. A frequency display shows '10,368.200 000'. There are also fields for 'DX Call', 'DX Grid', 'Tx 1000 Hz', 'Tx - Rx', 'Rx 942 Hz', 'Rx - Tx', 'F Tpl 100', 'Lock Tx=Rx', 'Report -15', 'Submode D', 'Sync -1', 'Sh', 'Auto Seq', and 'Tx6'. A date and time display shows '2017 Aug 23 10:22:07'. At the bottom, there are fields for 'JT4' and 'QRA64 D'.

In this case we know AP was used because the RC value shown in the decode of **3** is >0.

The higher the RC number the greater amount of AP was used. As signals become weaker higher RC numbers will be printed, until decodes eventually fail.

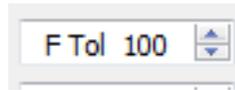
The easiest message to decode is a [call call grid] message. Messages containing a report require slightly better signal to noise.

Exercise for reader: determine whether AP for My Call or DX Call was used to achieve this decode

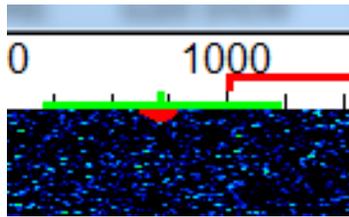
Using CFOM Doppler

- **C**onstant **F**req **O**n **M**oon Doppler shifts your radio's RX and TX frequencies by half your local two way Doppler shift.
- Enables all stations to hear each other independent of location, and own echoes for larger stations.
- Great for normal operation and even better for Dxpeditons
- Engaged via the Astro Window.
- QRA64 default frequency is 10368.200 and 24048.200. The program has been changed recently to give these defaults.

Setting F Tol

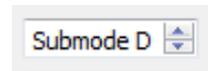


- Wider F Tol gives more margin to decode signals if frequency is not set accurately, but at a small expense of decoding sensitivity. Most times we use 100Hz, but lower values can sometimes decode when wider ones don't.



Only QRA64 signals with their lowest tone falling within the bounds of the green line will decode.

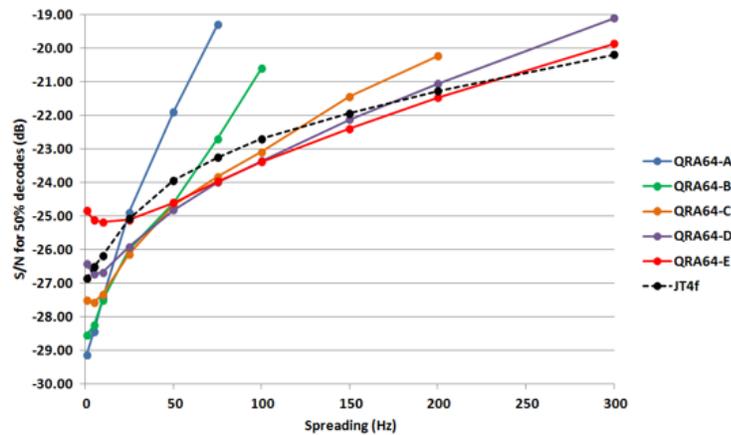
Choice of sub-mode



- Most of the time Submode D with TX and RX base freq of 1000Hz is used. TX freq should always be set to 1000, RX will vary according to where you actually find the station, as described earlier. Do not use 'Lock TX=RX'.
- Sub-mode D works well up to spreading of about 200Hz. With higher spreading submode E may be tried if D fails to work, and for most conventional ssb radios it is better to choose 600 or 700Hz as the base TX and RX frequencies, to avoid ssb filter rolloff affecting the wider signal of submode E. **Clearly the use of RX and TX frequencies in such cases need to be agreed with the other station beforehand.**
- For lower spreading, submodes A, B or C can be tried with some potential advantage in decoding threshold – see next page.

S/N for 50% decoding as function of spreading

For Calls and Report e.g. VK7MO G3WDG -24



Interpreting sync

- When signals are approaching, but not yet at the decode threshold, they will start to show 'sync'. This is interpreted by looking at the printed 'decode' text. Sync is indicated by operator's judgement from the DT and Freq values. If DT is close to moon delay time and if Freq is close to RX Freq then you *might* have a good sync. DT is perhaps the better parameter to judge, as the Freq will always lie within the bounds set by F Tol. If syncs are seen, some decodes may follow - particularly if propagation improves.

- Likely good sync:

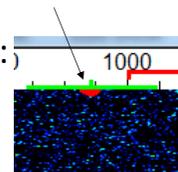
UTC	dB	DT	Freq	Message
0642	-22	2.5	942	.*

- Definite bad sync:

UTC	dB	DT	Freq	Message
0600	-23	-0.6	985	.*

Note: dB values here are meaningless until there is a successful decode.

- Good syncs are usually, but not always, indicated by a red mark:



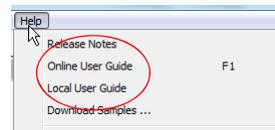
Tips

- If you fail to achieve a decode, it is possible to try decoding again with different settings eg F Tol, while you are transmitting, as the data is stored to allow this. up to the start of the next receive period. To try decoding again, press the decode button.



- Single tone messages can be used to save time under marginal conditions. The program does **not** decode these – it is up to the operator to interpret their meanings from the yellow average spectrum. The letters T, M, R and 73 signify **T**uning tone, please send **M**essages, **R**oger, and **73**.

- For further info, please refer to WSJT-X User Guide here:

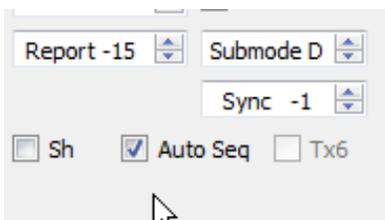
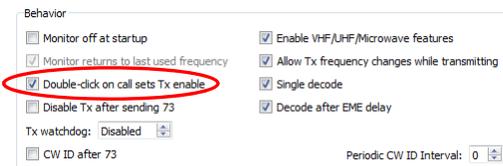


Auto-sequencing (will be available in 1.8.0 rc 2)

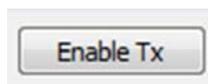
- Auto-sequencing allows program (optionally) to respond to an incoming message with the appropriate reply, automatically.
- Advantages are reduction of operator workload and reduced chance of replying late to an incoming message, or forgetting to increment the message.
- Beta testing of auto-sequencing with development builds of WSJT-X have proved successful.

Enabling Auto-seq

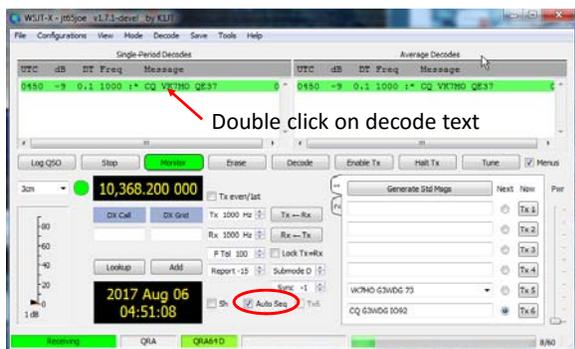
Settings -> General



Enable TX is not pressed



Answering a CQ



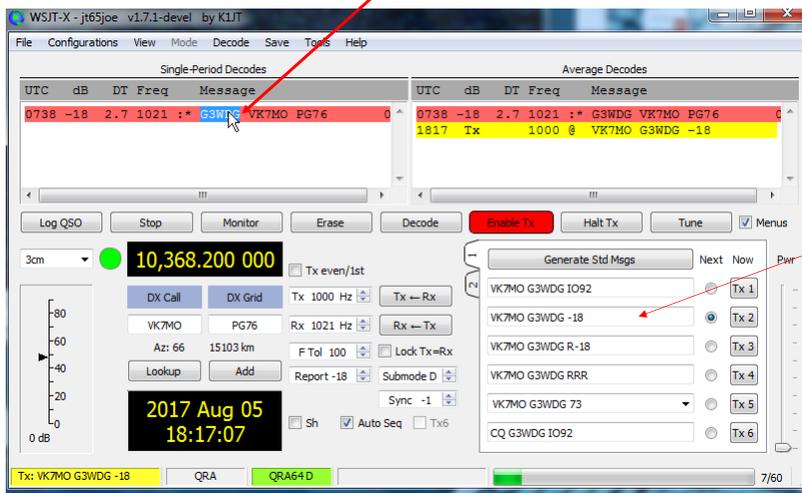
DX call and grid initially can be blank, or can contain info from previous QSO



Correct sequence selected, DX call, grid and report obtained from decode and starts sending TX1 message. QSO then proceeds automatically.

Answer a station calling you with your TX Enable not enabled

Double click the decoded text to start calling the station



Auto-seq goes to TX2 to send report, selects the correct period and enables TX, and should then proceed through the QSO with no operator intervention. Best to watch and check it performs as expected!

Running a sked, you are already Txing



You are already calling the station

When station is decoded, auto-seq replies with report. QSO then proceeds automatically. **If autoseq does not reply with report message (it happens occasionally) then double click the decoded text to start it off.**

Notes

- Note that this feature does not enable QSOs to be initiated automatically. Operator input is needed to start off a QSO.
- If Sh is selected at your station, but not at the other station, you will send appropriate single tones automatically.
- If Sh is selected both ends, the QSO will proceed automatically up to sending RRR, but you will have to initiate sending 73 manually as the incoming RRR tone is not be 'decoded' automatically.
- Currently, the report sent by auto-seq will correspond to the previous decode, and so may change for later messages. Receiving stations need to be aware of this, but can trust the report they receive, as false decodes containing a wrong report have never been seen during extensive testing. In due course a "sticky" report option may be introduced to enable the first sent report to be maintained throughout the QSO.

'CQ' files example using auto-seq

Note: My Call needs to be set to G3WDG for this to work!

Single-Period Decodes						Average Decodes					
UTC	dB	DT	Freq	Message		UTC	dB	DT	Freq	Message	
1238	-16	2.7	991	:* CQ VK7MO PH62	0	1238	-16	2.7	991	:* CQ VK7MO PH62	0
1240	-16	2.7	986	:* G3WDG VK7MO -14	0	0923	Tx	1000	@	VK7MO G3WDG IO92	
1246	-19	2.8	984	:* G3WDG VK7MO RRR	0	1240	-16	2.7	986	:* G3WDG VK7MO -14	0
1252	-16	2.8	984	:* G3WDG VK7MO 73	0	0925	Tx	1000	@	VK7MO G3WDG R-16	
						1246	-19	2.8	984	:* G3WDG VK7MO RRR	0
						0927	Tx	1000	@	VK7MO G3WDG 73	
						1252	-16	2.8	984	:* G3WDG VK7MO 73	0

Files here: <https://drive.google.com/drive/folders/0B116lwQlUFNTcktPdnBBMVfad00?usp=sharing>

Load file 1238, double click the decode text, wait for TX sequence to complete, F6 to load next file to get next decode, wait for TX to complete etc etc