

W4ATC EME Software Setup and Operating Procedures

By WY3O, Dan Stancil, August 2024

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Overview

The key pieces of equipment for earth-moon-earth (EME) communications are the following:

- IC-9700 UHF/VHF transceiver. The frequency of the transceiver is stabilized by a GPS-disciplined oscillator (the small box with the red LED mounted on the right side of the transceiver).
- Kuhne Electronic MKU LNA 132 AH low-noise preamplifier. This unit is mounted right at the feedhorn on the dish and is powered by DC sent up the RX coax. The noise figure of the preamp is 0.4 dB.
- BEKO HLV-523 1296 500 Watt 1296 MHz linear power amplifier. Taking into account the attenuation of the coax to the roof, the power at the feedhorn on the dish is probably about
- SPID PS-02 power supply and SPID MD-02 AZ/EL controller
- S2 EME sequencer. The sequencer controls the order of operations needed to switch between RX and TX so as not to damage the sensitive low-noise receive preamplifier. The steps to switch from RX to TX are as follows:
 - WSJT-X software signals the sequencer to begin RX->TX sequence, and starts a delay timer that must expire before sending an audio data signal over USB to the IC-9700 (no power is transmitted until this audio is sent)
 - Sequencer switches the Input of the preamp from the antenna to a 50 ohm termination
 - Sequencer enables the BEKO linear amplifier
 - Transmission begins when the WSJT-X timer expires.
 - These steps are reversed for the TX->RX transition.
- PC running Windows 10. All of the system operation is controlled by software, so it is possible to completely control the EME station remotely using a Remote Desktop Connection.

The key program for earth-moon-earth (EME) communications is WSJT-X. This is a suite of weak signal protocols and modulation/detection modes originally developed by [Joe Taylor K1JT](#). At 1296 MHz where our EME station operates, the prevailing modulation is Q65. More about this in the Operating section.

The complete list of software used is:

- PSTRotator: this program controls the pointing of the dish antenna, and can track both the moon and the sun. (Tracking the sun is useful to compare the noise level when pointing to the sun with that when pointing to cold space. This provides an indication of the gain of the dish antenna.)
- WSJT-X: Main program used to operate EME communications. It controls the TX/RX mode of the IC-9700.
- JTAAlert: Provides a link between WSJT-X and DXKeeper (the logging component of the DX Lab Suite).

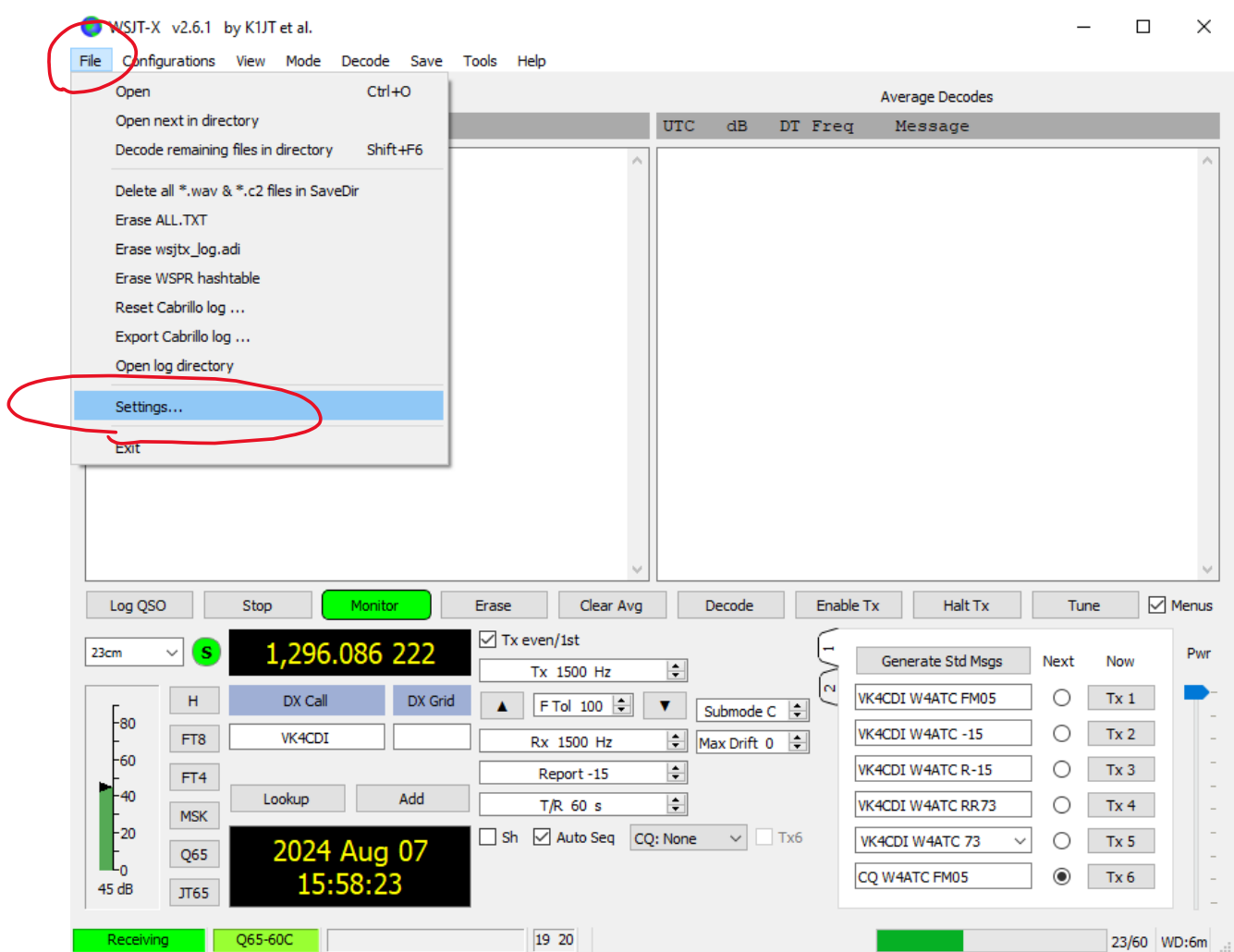
- DXKeeper: Logs all contacts. Upon completion of a QSO with WSJT-X, a log entry is automatically created using the time, signal report, frequency, mode, etc. from WSJT-X.

In the following sections we describe the setup of the various software programs. Note that shortcuts to these programs should already be on your desktop when you log on to Hammy, but each person will need to set up the software for themselves.

Software Setup

WSJT-X Setup

Open WSJT-X, open Settings, and set the options on the setting tabs as shown in the following.



General Radio Audio Tx Macros Reporting Frequencies Colors Advanced

Station Details

My Call: My Grid: AutoGrid IARU Region:
Message generation for type 2 compound callsign holders:

Display

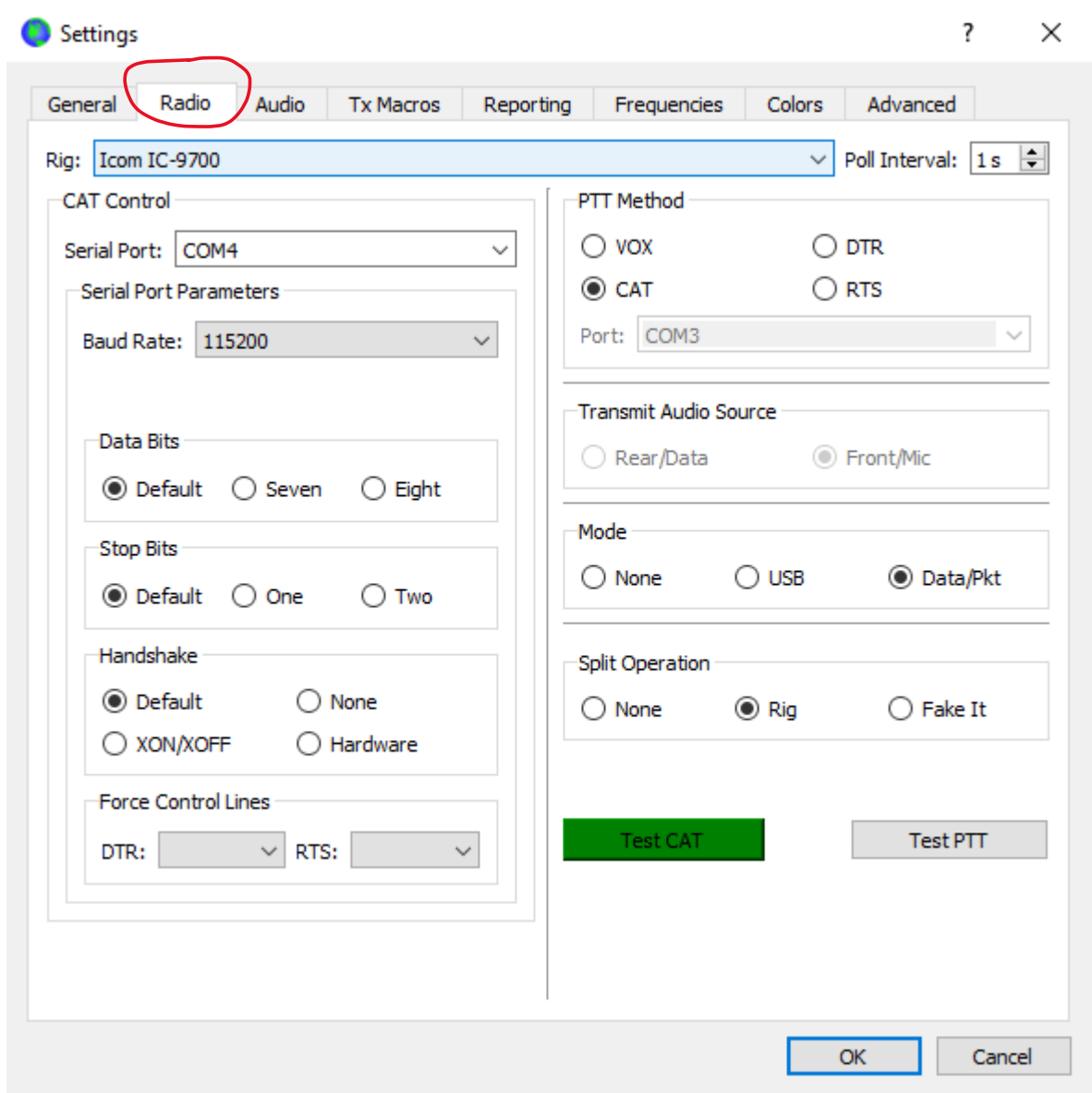
Start new period decodes at top
 Blank line between decoding periods
 Display distance in miles
 Tx messages to Rx frequency window
 Show DXCC, grid, and worked-before status Show principal prefix instead of country name
 Highlight DX Call in message Highlight DX Grid in message

Behavior

Monitor off at startup Enable VHF and submode features
 Monitor returns to last used frequency Allow Tx frequency changes while transmitting
 Double-click on call sets Tx enable Single decode
 Disable Tx after sending 73 Decode after EME delay
 Calling CQ forces Call 1st
 Alternate F1-F6 bindings Tx watchdog:
 CW ID after 73 Periodic CW ID Interval:

OK

Cancel



Pressing the Test CAT button will test the connection to the radio. It should turn green if all is working properly.

General Radio **Audio** Tx Macros Reporting Frequencies Colors Advanced

Soundcard

Input: Microphone (3- USB Audio CODEC) Mono

Output: Speakers (3- USB Audio CODEC) Mono

Save Directory

Location: C:/Users/ddstanci/AppData/Local/WSJT-X/save Select

AzEl Directory

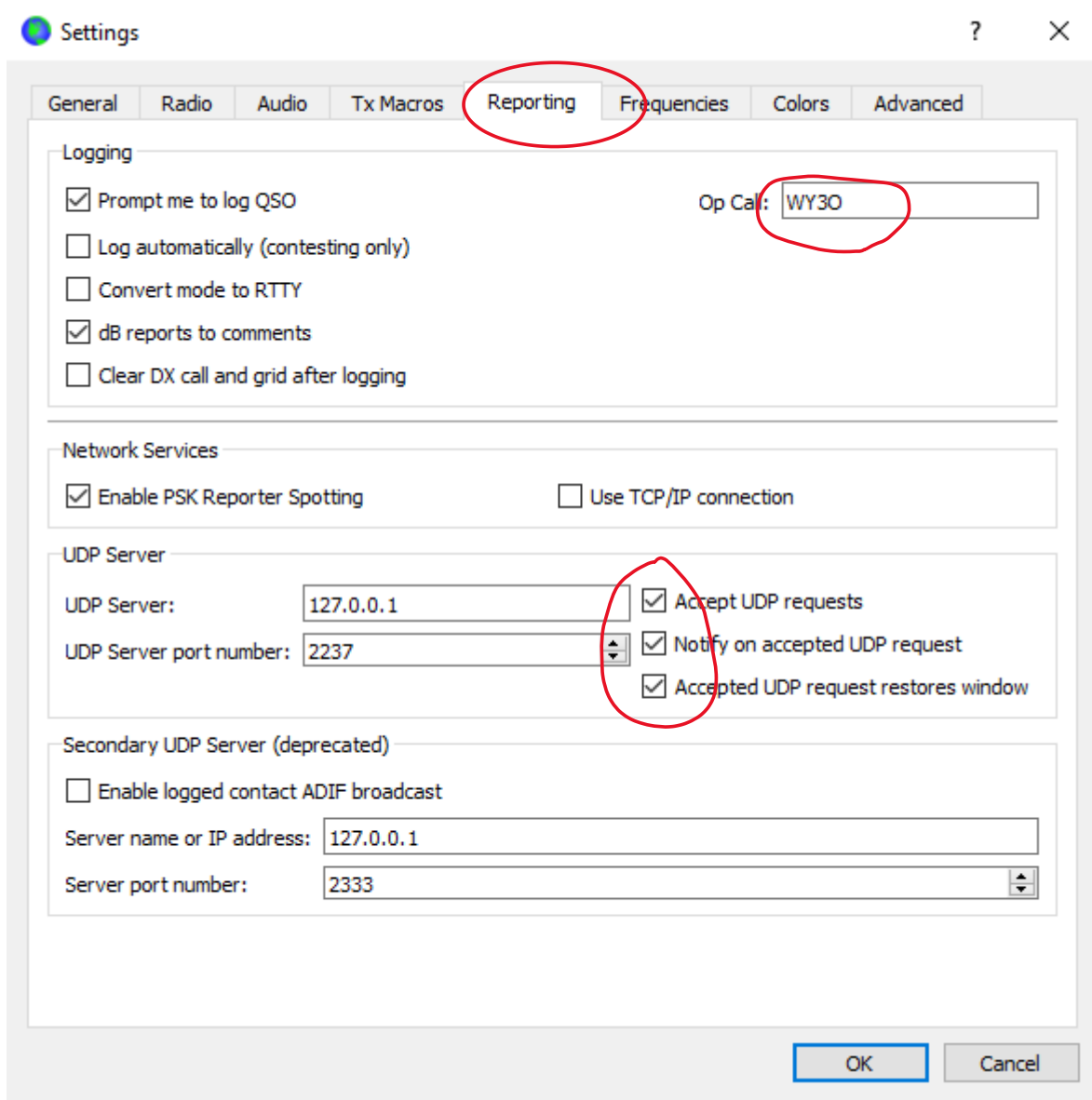
Location: C:/Users/ddstanci/AppData/Local/WSJT-X Select

Remember power settings by band

Transmit Tune

OK Cancel

On the Reporting tab, change the “Op Call:” to your callsign.



Add frequencies by right-clicking a row and selecting “insert.” Make sure to choose Q65 as the mode, and IARU Region can be set to “All.”

The screenshot shows the 'Settings' window with the 'Frequencies' tab selected. The 'Working Frequencies' table is visible, and a context menu is open over a row. The 'Insert ...' option is highlighted, and a red arrow points to it. The table contains the following data:

IARU Region	Mode	Frequency	Pref	Description	Start Date/Time	En
All	Q65	1,296.055 000 MHz (23cm)	<input type="checkbox"/>			
		1,296.060 000 MHz (23cm)	<input type="checkbox"/>			
		1,296.065 000 MHz (23cm)	<input type="checkbox"/>			
		1,296.065 000 MHz (23cm)	<input type="checkbox"/>			
		1,296.070 000 MHz (23cm)	<input type="checkbox"/>			
		1,296.075 000 MHz (23cm)	<input type="checkbox"/>			
All	Q65	1,296.080 000 MHz (23cm)	<input type="checkbox"/>			
All	Q65	1,296.085 000 MHz (23cm)	<input type="checkbox"/>			
All	Q65	1,296.090 000 MHz (23cm)	<input type="checkbox"/>			

Continue adding all of the frequencies shown below. These represent the most common frequencies used on 1296.

Settings

General Radio Audio Tx Macros Reporting **Frequencies** Colors Advanced

Frequency Calibration

Slope: 0.0000 ppm Intercept: 0.00 Hz

Working Frequencies

IARU Region	Mode	Frequency	Pref	Description	Start Date/Time	Er ^
All	Q65	1,296.055 000 MHz (23cm)	<input type="checkbox"/>			
All	Q65	1,296.060 000 MHz (23cm)	<input type="checkbox"/>			
All	Echo	1,296.065 000 MHz (23cm)	<input type="checkbox"/>			
All	JT65	1,296.065 000 MHz (23cm)	<input type="checkbox"/>			
All	Q65	1,296.065 000 MHz (23cm)	<input type="checkbox"/>			
All	Q65	1,296.070 000 MHz (23cm)	<input type="checkbox"/>			
All	Q65	1,296.075 000 MHz (23cm)	<input type="checkbox"/>			
All	Q65	1,296.080 000 MHz (23cm)	<input type="checkbox"/>			
All	Q65	1,296.085 000 MHz (23cm)	<input type="checkbox"/>			
All	Q65	1,296.090 000 MHz (23cm)	<input type="checkbox"/>			

General Radio Audio Tx Macros Reporting Frequencies Colors **Advanced**

JT65 VHF/UHF/Microwave decoding parameters

Random erasure patterns: 5
Aggressive decoding level: 0
 Two-pass decoding

Miscellaneous

Degrade S/N of .wav file: 0.0 dB
Receiver bandwidth: 2500 Hz
Tx delay: 0.1 s

Tone spacing

x 2 x 4

Waterfall spectra

Low sidelobes Most sensitive

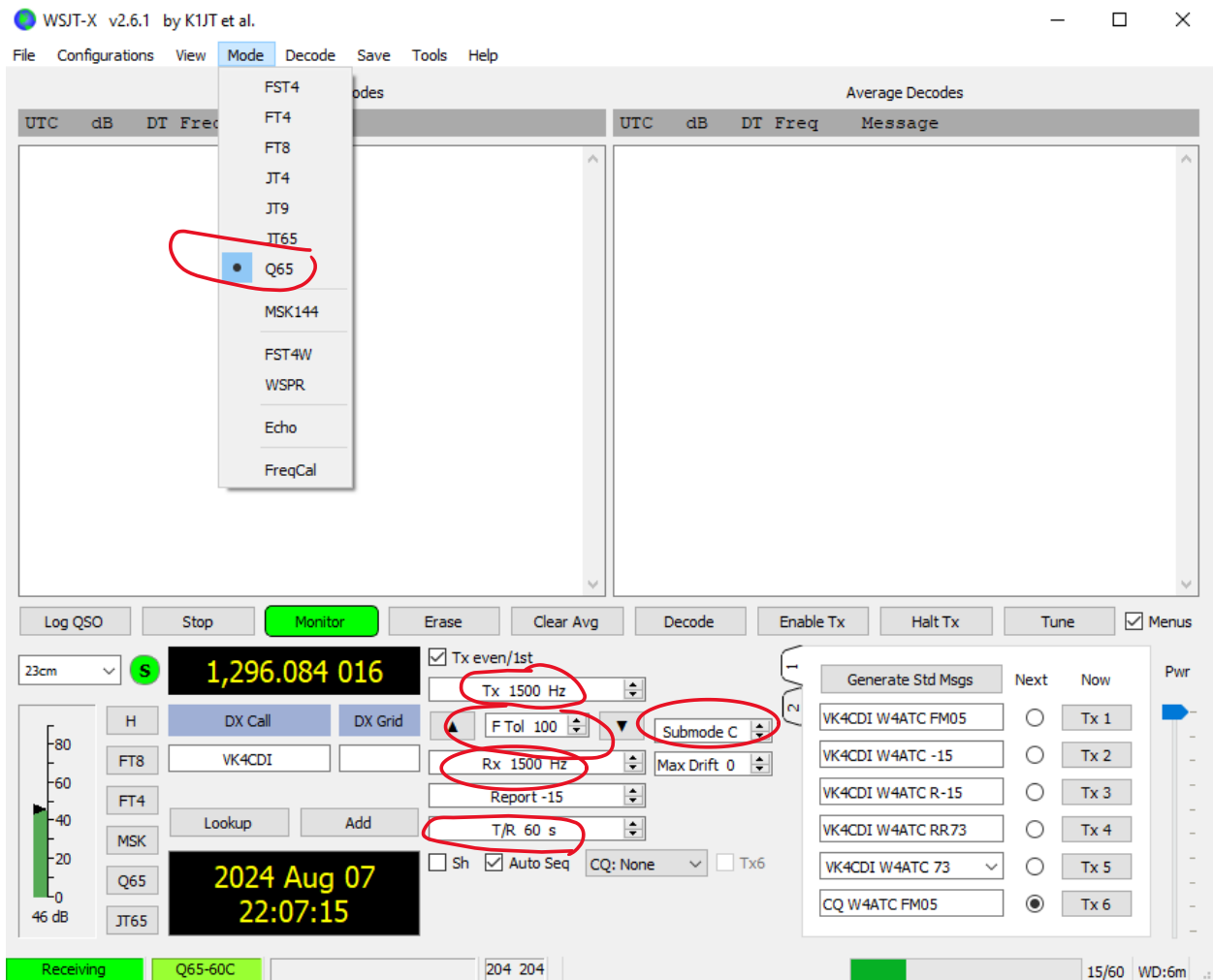
Special operating activity

Fox Hound
 NA VHF ARRL Field Day FD Exch:
 EU VHF Contest FT Roundup FT RU Exch:
 WW Digi Contest ARRL Digi Contest
 CQ with individual contest name Contest name: PACC

OK

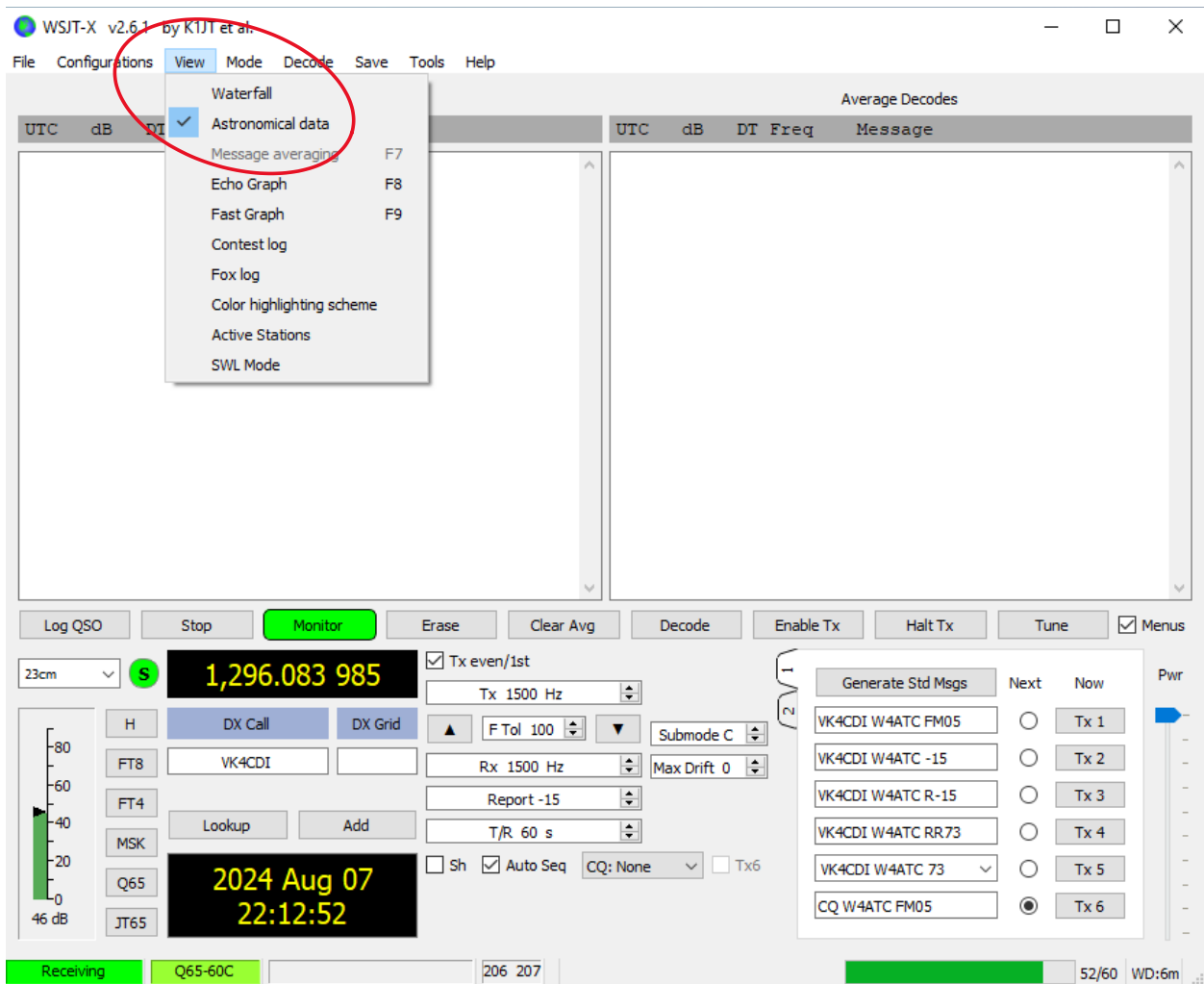
Cancel

Next, set the mode for Q65-60C:



Also set both the Tx and Rx frequencies to 1500 Hz, and the F Tol 100. The Tx and Rx frequencies are the bottom of the Q65 signal in the AF passband, and the F Tol 100 means WSJT-X will still find the signals if they are up to 100 Hz off. T/R 60 s indicates that each transmit and receive window will have a duration of 60 seconds. If the Tx even/1st box is checked, this means you will be transmitting on even numbered minutes and listening on odd numbered minutes.

Next open the Astronomical Data window:



This will open the window:



2024 Aug 07

UTC: 22:14:05
Az: 234.4
El: 42.6
SelfDop: -2043
Width: 33
Delay: 2.67
DxAz: 0.0
DxEl: 0.0
DxDop: 0
DxWid: 0
Dec: 2.8
SunAz: 274.0
SunEl: 22.6
Freq: 1296.1
Tsky: 3
Dpol: 32.8
MNR: 0.0
Dist: 400298
Dgrd: -2.1

Doppler tracking

Doppler tracking

Full Doppler to DX Grid
 Own Echo
 Constant frequency on Moon
 On DX Echo
 Call DX
 None

Sked frequency

Rx: 1,296.085 000
Tx: 1,296.085 000

Press and hold the CTRL key to adjust the sked frequency manually with the rig's VFO dial or enter frequency directly into the band entry field on the main window.

Echo Mode

Dither

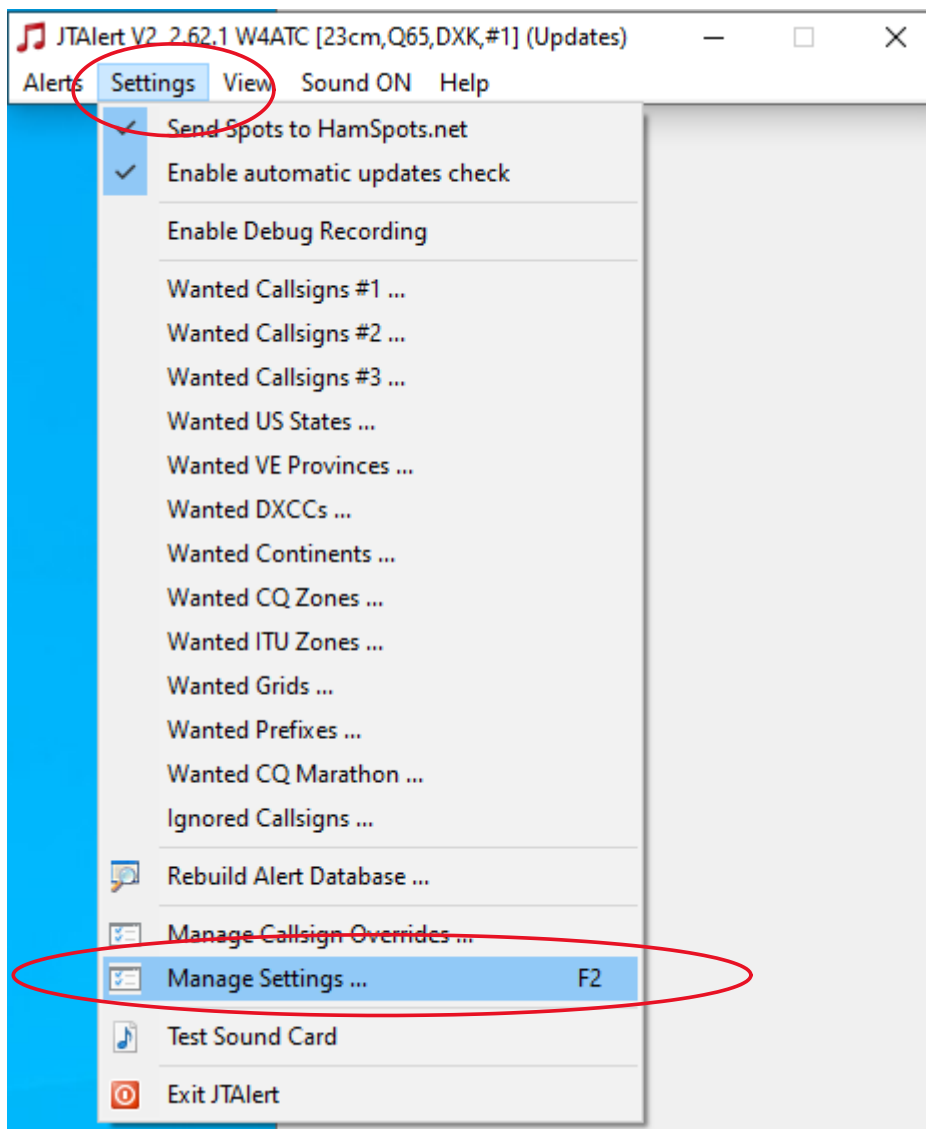
The settings on this window will be discussed in the Operating Procedures Section.

JTAlert Setup

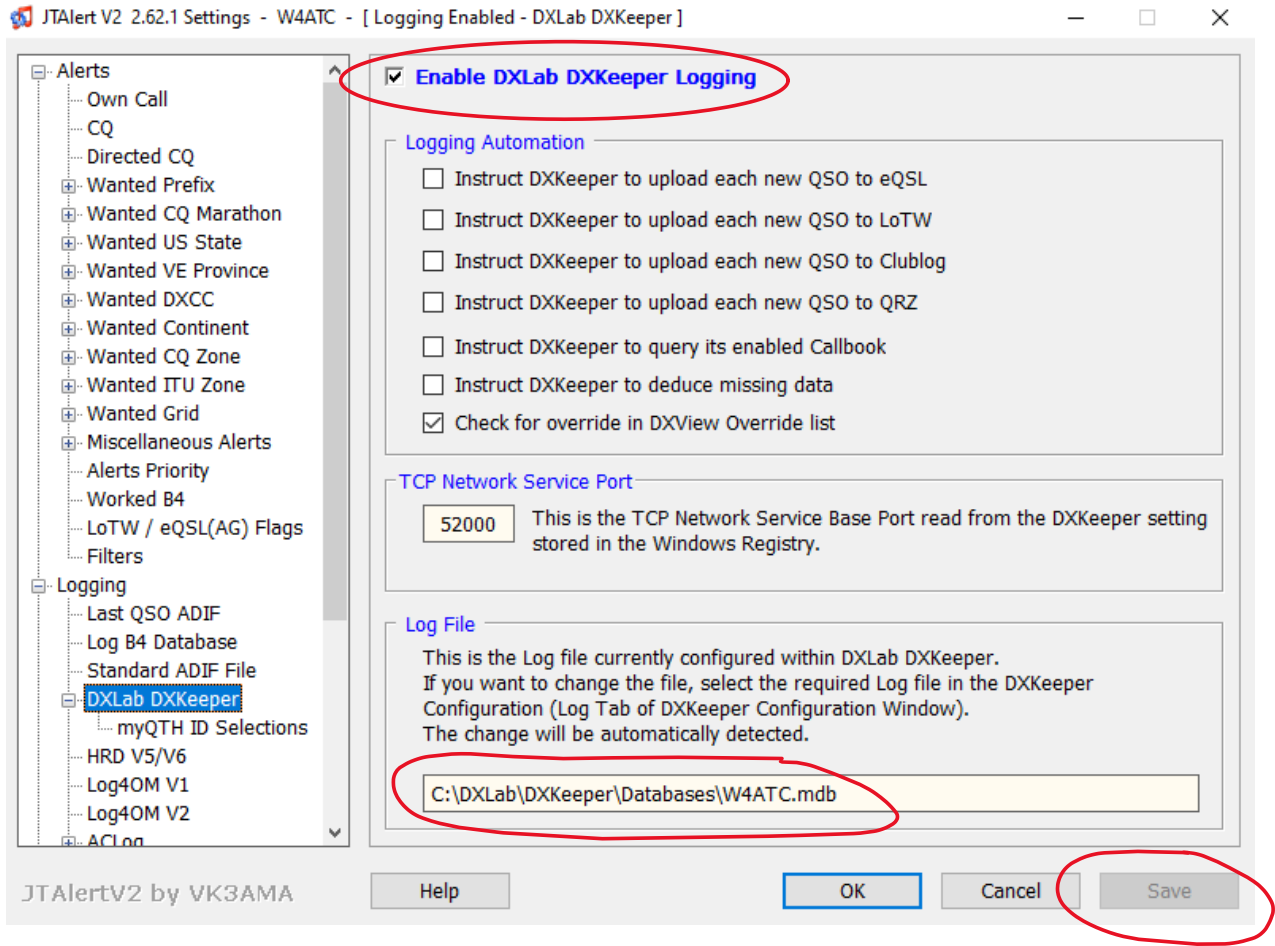
There are several versions of JTAlert that may be on your desktop. Launch the wone for WSJT-X:



Click on “Settings” in the small window and select “Manage Settings...”:



Go to “logging,” “DXLab DXKeeper” and check the “Enable DXLab DXKeeper Logging” box, verify that the Log File pointer is correct, and click “Save.”



DXKeeper Setup

Note that it is not necessary to launch DXLab Commander; in this setup, WSJT-X is controlling the transceiver directly. So it is only necessary to open DXKeeper. If you have already set up DXLabSuite for Satellites, then you should be good to go. If not, the steps are repeated here for convenience.

Callbook: You can use a free HamQTH account if you don't have a QRZ.com account.

DXKeeper Configuration

General Log Awards Reports **Callbook!** Contest User Items Defaults

Primary Callbook

None **Passwords specified in this panel will appear in generated errorlog.txt files when "Log debugging information" is enabled; do not employ passwords that you also use to secure valuable online accounts!**

RAC (PC) Browse
Folder containing callbook info

HamCall (PC) Browse
Folder containing callbook info

QRZ (PC) Browse
Folder containing callbook info

HamCall Online
Callsign Password HamCall Online timeout (seconds)

HamQTH
Callsign Password HamQTH timeout (seconds)

QRZ.com

XML Data
Callsign Password QRZ.com timeout (seconds)

QRZ.com via Pathfinder Pathfinder is not running Ignore geocoded grid squares, latitudes, and longitudes

Preferred Location Source

Imported or received QSO

Callbook

Secondary Callbook

Enable Callbook

Warn when the primary callbook can't be accessed

Automatically use callbook data to initialize new QSOs

Warn when a callbook lookup returns "callsign not found"

CBA generates a Callbook Lookup Actions Report

Help

Settings for the Defaults tab are shown below. Replace WY30 with your call:

The screenshot shows the 'Defaults' tab of the DXKeeper Configuration window. Several settings are circled in red:

- Default Callsigns:** Station callsign (W4ATC), Operator callsign (WY30), and Owner callsign (W4ATC).
- Default Transmit power by band:** The 'Enabled' checkbox and the power values for 2m (100), 70cm (75), and 23cm (350).
- Default Propagation Mode by band:** The 'Enabled' checkbox and the 'SAT' mode selected for VHF.

Other visible settings include: RST sent & rcvd (59/599), QTH latitude (35 46' 15" N), QTH longitude (78 42' 30" W), Transmit power (100), and Network Service (port 52001) Listening (Base Port 52000).

Also, you may enable the default Transmit Power and Power by Mode block if you like (note that the IC-9700 covers only 2m, 70cm, and 23 cm). The 350W for 23 cm is an estimate for power at the feedhorn. The most likely mode for VHF is Satellite, since we will typically use the Yaesu for repeaters. However, UHF could be either SAT or EME, so I've left that blank.

On the QTH tab, enter the grid square, and the Lat and Long will automatically populate:

DXKeeper 17.3.5 [CC] - WY3O.mdb : 1 QSO (W4ATC)

Log QSOs QSL Check Progress **my QTHs** Import QSOs Export QSOs

ID: Main Rig: CQ: ITU: IOTA: PostCode: Grid: FM05ps

Email: Ant: Latitude: 35 46' 15" N

Name: Street: Longitude: 78 42' 30" W

Pri name: City: Raleigh

Sec name: Country name: USA

Sig: Sig Info: IOTA: **Lat/Lon**

LotW: DXCC code: VUCC: DMS

Pri code: Sec code: WAS: DD

Find myQTH ID: Update QSOs in Log Page Display

Set myQTH ID Clear myQTH ID

New Save Delete Filter Report Config Help

MYQTHID	City	Sec sub	Pri sub	Country	Grid	Latitude	Longitude
Main	Raleigh			USA	FM05ps	35 46' 15" N	78 42' 30" W

Add the fields Name, SAT_NAME (not needed for EME), Freq, FREQ_RX, GRIDSQUARE, and STATION_CALLSIGN as shown in the inset window, and click Save:

DXKeeper Configuration

General Log Awards Reports Callbook Contest User Items Defaults

Log file

C:\DXLab\DXKeeper\Databases\W4ATC.mdb Select Open
New Compact

Backup folder

C:\DXLab\DXKeeper\Backups Select Backup
Recover

Log Settings

Submission reminder DXCC account # default myQTH ID
 Partial DXCC Credit 1 EB2
 Include radio name in myQTH ID
 Update DXView on default myQTH change

Log Panels

Auxiliary QSL Online QSL Award Contest Propagation User-defined Details Fonts
 Club & QRZ

Log Page Display

Include Entity name with DXCC prefix
 Automatically update layout file
 Indicate LoW & eQSL AG status
 3 Frequency precision
 0 Power precision

Item	Caption	Align
Name	Name	Right
Operator	Operator Call	Right
SAT_NAME	Satellite	Right
Freq	TX freq	Right
FREQ_RX	RX freq	Right
GRIDSQUARE	Grid	Right
STATION_CALLSIGN	Callsign used for QSO	
*		

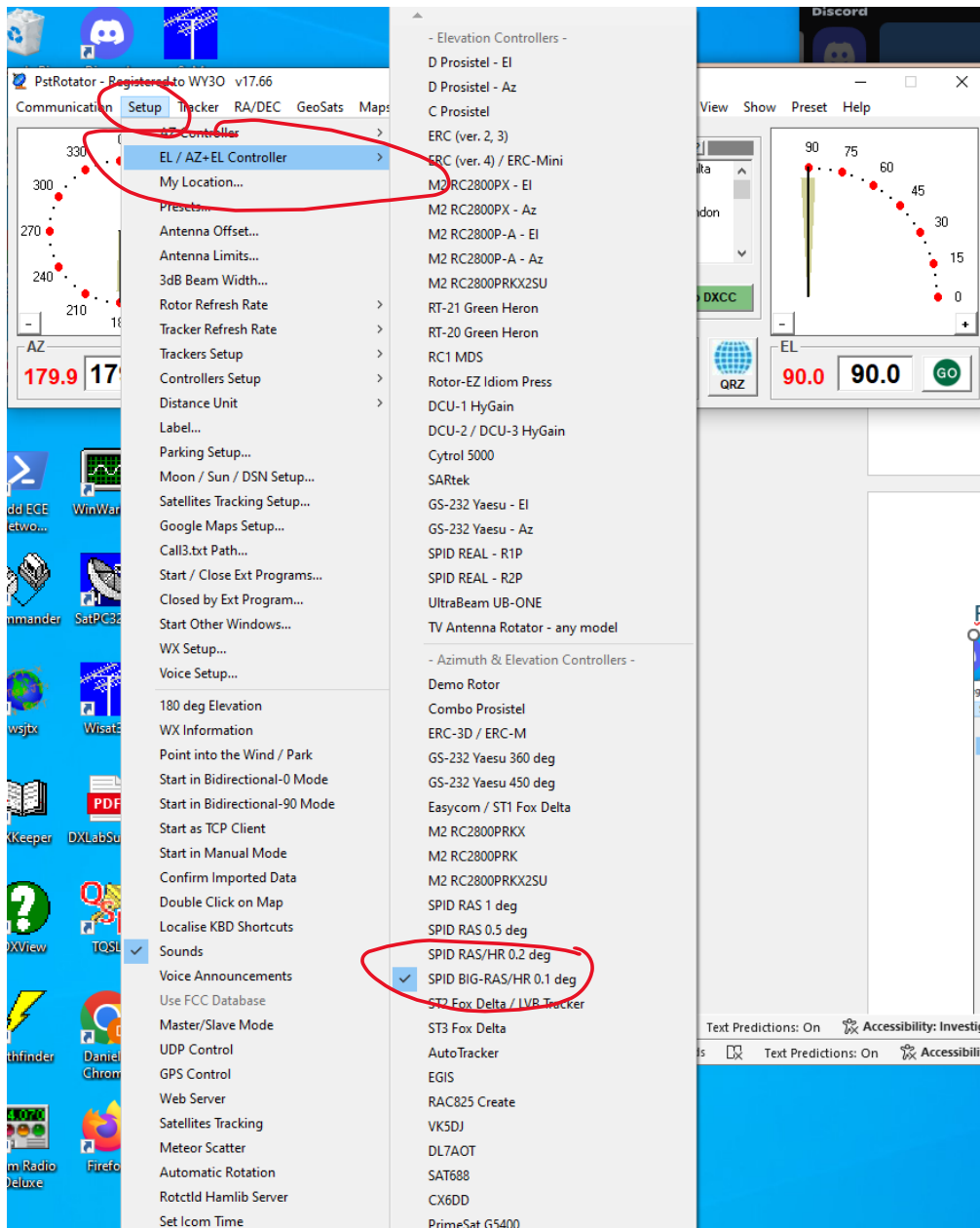
Colors Fonts Reset
Select Save

C:\DXLab\DXKeeper\Configurations\Default.txt
 Log Page Display layout file

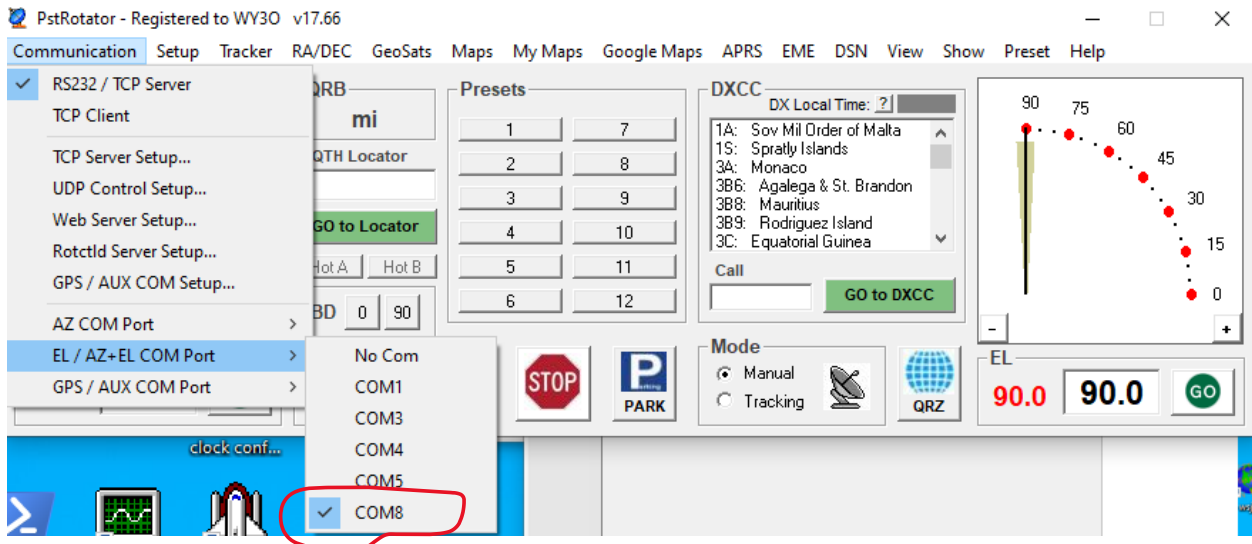
QSL Config Reset Unique #s Help

PSTRotator Setup

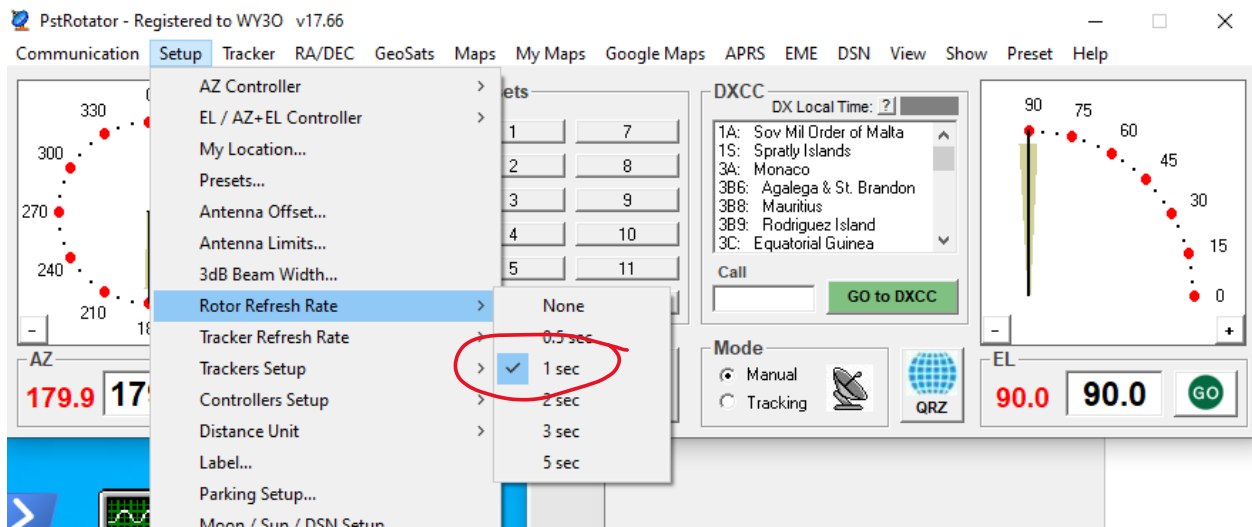
Setup > EL /AZ+EL Controller > SPID BIG-RAS/HR 0.1 deg



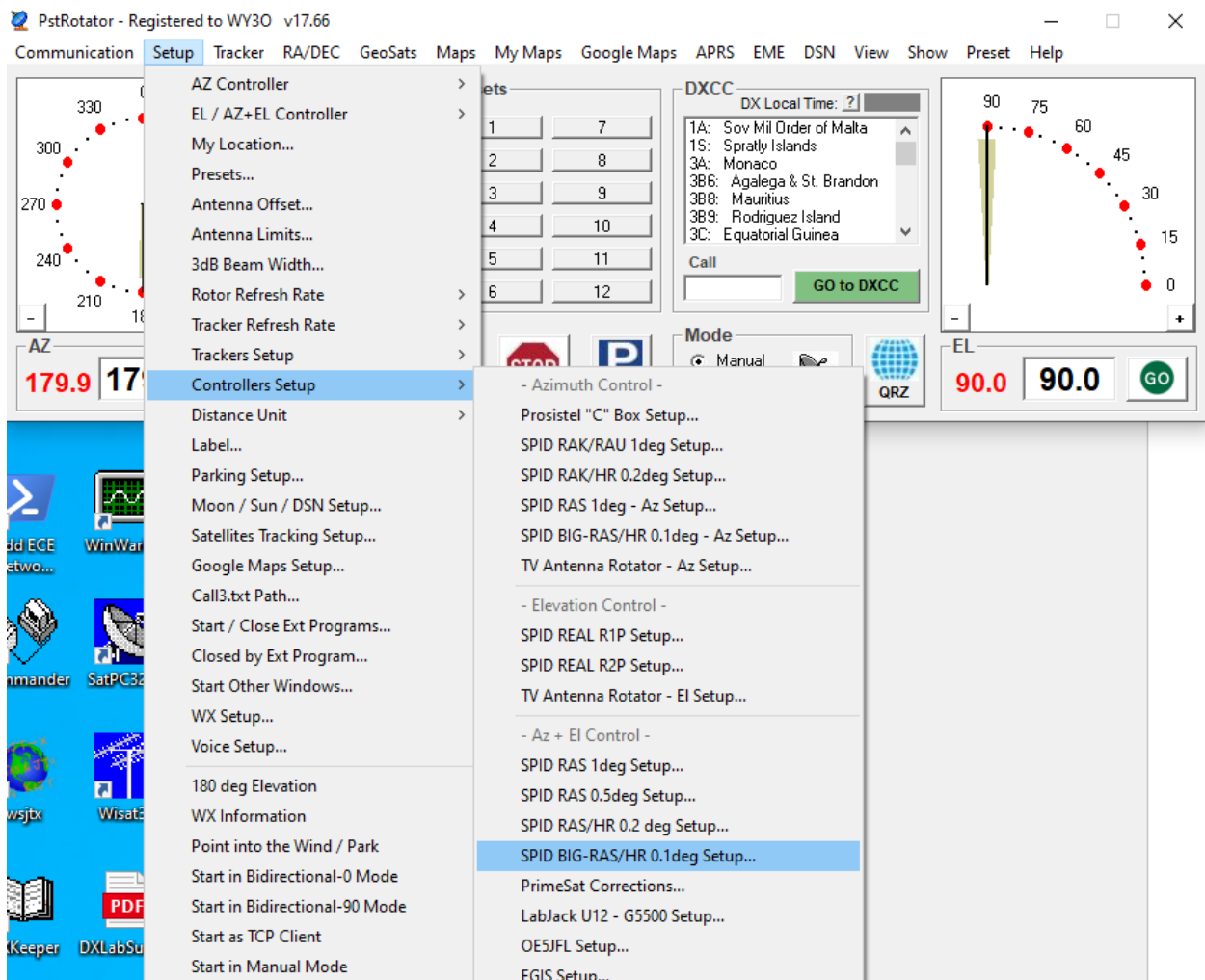
Next, select the COM port: Communication > EL / AZ+EL COM Port



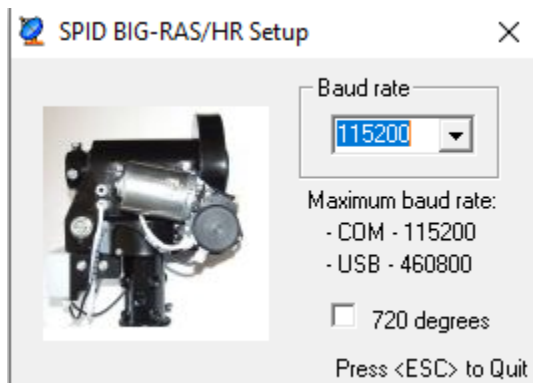
Set (or keep) the Rotor Refresh Rate at 1 sec:



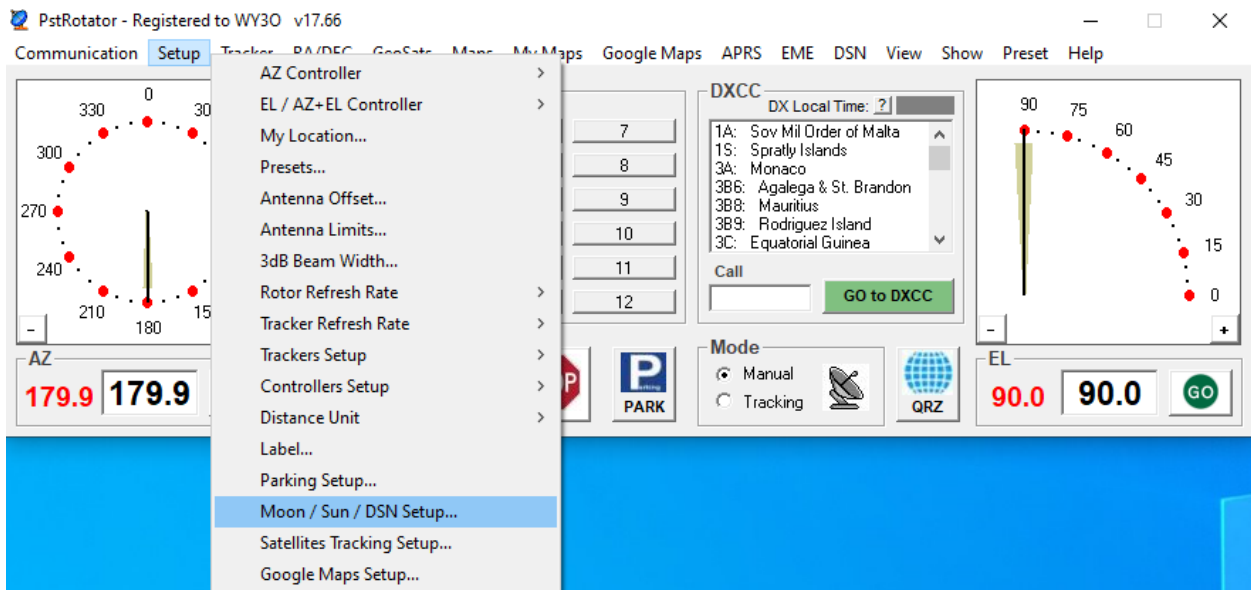
Open Setup > Controllers Setup > SPID BIG-RAS/HR 0.1 deg Setup:



Upon selecting this, set the Baud rate to 115200 in the window that opens:



Select Setup > Moon / Sun / DSN Setup:



In the window that opens, enable 0.1 deg in Position Change.



Operating Procedures

Plan the Operating Session

The first step is to plan your EME session. A website that is useful is <https://mmmonvhf.de/eme.php>. First consider the yellow “MoonDist” curve showing the distance to the moon. From apogee to perigee, the difference in signal strength is roughly $(403/366)^4 = 1.47$, or about 1.7 dB for the month shown. As indicated in the figure caption, this difference can be more than 2 dB.

Next, consider the blue curve that shows the moon’s declination. The declination is the angle between the moon and the earth’s equator projected onto the sky. The significance of this is that it determines how high the moon is in the sky. The projection of the equator onto the sky has a maximum elevation due south, and has an elevation above the horizon equal to $90 - \text{latitude (deg)}$. The maximum elevation of the moon will also occur due south, and will be equal to $90 - \text{latitude} + \text{declination}$. For example, on August 16, the declination is -28 deg. Consequently the maximum elevation of the moon on this date in Raleigh is $90 - 35.78 - 28.1 = 26.1$ deg. In contrast, the lunar declination on August 28 is about +28 degrees. The maximum elevation on that day is 82.2 degrees—almost directly overhead! Generally speaking, higher declinations give access to more of the earth’s surface between moonrise and moonset. Higher elevation angles also mean the signal is traversing less of the earth’s atmosphere which can be a source of signal absorption and noise. So putting it all together, the best conditions in this month will be around August 23 when the moon is nearest (perigee) and the declination is positive (about +10 deg).

However, our station is capable of receiving its own echoes at both apogee and perigee, and with both positive and negative declinations.

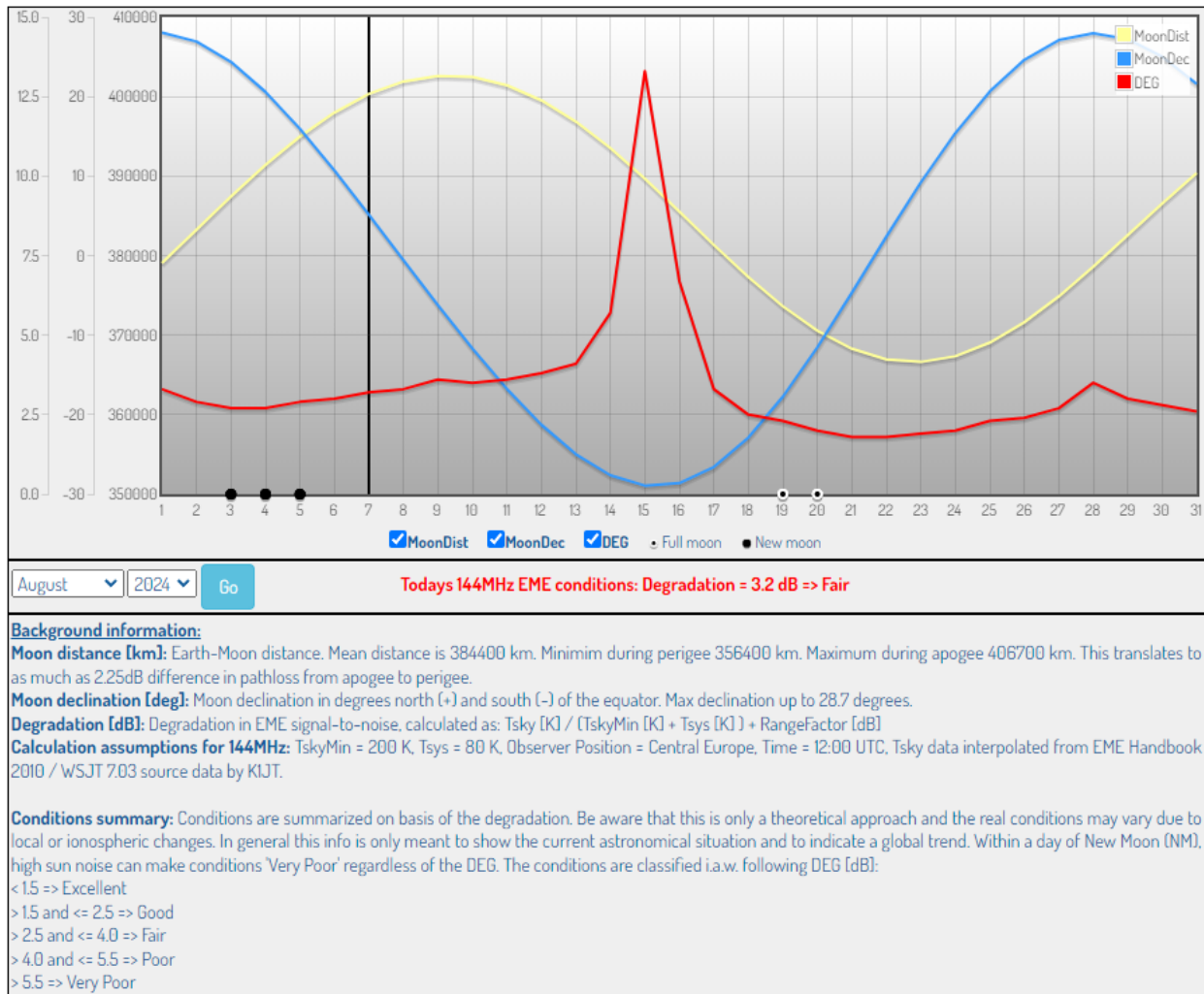
This site is specifically for 2m, and the DEG curve is not particularly accurate for 23 cm. Specifically, the big spike around the 15th is caused by the moon crossing the Milky Way. The galaxy is a source of significant noise at 2m, but the noise at 23cm is relatively small (sky noise goes from perhaps 3K to around 12K).

Moon data

📖 If you want to read more about the theory, practice, tools and so on please feel free to take a look at some articles in our [FORUM](#).

Next 30 days lowest degradation:

2024-08-21: (1.8) => Good
 2024-08-21: (1.8) => Good
 2024-08-22: (1.8) => Good
 2024-08-22: (1.8) => Good
 2024-08-23: (1.9) => Good



A better estimate of the degradation at 1296 MHz can be found at <https://dxmaps.com/moon.php> (see below). From the fields across the top, we see that the sky temperature is 3K (essentially the cosmic background radiation), and the degradation is only 1.1 dB. The point directly below the moon is shown as the white circle near the bottom of the map, and the latitude of this point is the declination of the moon. The light-colored K area shows the part of the world who can see the moon at this point in time. This is helpful in planning possible QSOs.

dxmaps.com/moon.php

Inbox (15) ★ Bookmarks Web Slice Gallery Imported From IE dstacil Gmail: Email from G... viewer RADAR NCSU Leave System MyPack Por

te Personal Radio Software DX maps DX news Search... Translate WY30

EME (Moon Bounce) calculator 1.2

Your callsign: Your locator (6 characters): Band:

DX callsign: DX locator (6 characters):

Tracking Ephemeris

2024-08-17 00:50:46z Range: 376,781 km / 234,121 mi (0.9 dB) Sky temp: 3° K (0.1 dB) Total DGRD: 1.1 dB

w4atc (FM05ps) Azimuth: 151.5° Elevation: 20.0° Echo doppler: +1,978 Hz Moonset at 07:37z

The next step is to plan the session time, by looking at the times for moonrise and moonset on the days of interest. This can be found at <https://www.timeanddate.com/moon/usa/raleigh>. For example, referring to the table below, on August 21 the moon will set at 8:40am, and rise that evening at 9:17pm. The earth rotates at about 15 degrees/hour, so the moon will be at an elevation of 25-30 degrees by 11:30pm or midnight. So this will be a late-night session!

On the other hand, from the chart above, August 4 will still be reasonably ok, and on August 4 the moon rises at 6:19am and sets at 8:46pm—a very comfortable time for people who want to work during the day!

Moonrise, Moonset, and Phase Calendar for Raleigh, August 2024

< July **August** September > Month: Year:

2024 Aug	Moonrise/Moonset			Meridian Passing		
	Moonrise	Moonset	Moonrise	Time	Distance (mi)	Illumination
1	3:11 am ↗ (54°)	6:48 pm ↘ (305°)	-	11:00 am (82.5°)	240,722	8.5%
2	4:11 am ↗ (55°)	7:35 pm ↘ (303°)	-	11:56 am (81.0°)	242,939	3.5%
3	5:15 am ↗ (59°)	8:14 pm ↘ (299°)	-	12:49 pm (78.0°)	245,080	0.8%
4	6:19 am ↗ (64°)	8:46 pm ↘ (293°)	-	1:37 pm (73.9°)	247,086	0.2%

:

○ 19 ▾	-	6:10 am ↙ (248°)	8:17 pm ↘ (108°)	12:52 am (34.6°)	225,933	99.4%
20 ▾	-	7:26 am ↙ (256°)	8:48 pm → (99°)	1:47 am (40.9°)	224,313	99.6%
21 ▾	-	8:40 am ← (265°)	9:17 pm → (90°)	2:39 am (48.1°)	223,818	96.6%
22 ▾	-	9:52 am ← (275°)	9:46 pm → (81°)	3:29 am (55.6°)	224,434	90.7%
23 ▾	-	11:05 am ↖ (283°)	10:16 pm ↗ (73°)	4:19 am (62.9°)	226,026	82.3%
24 ▾	-	12:17 pm ↖ (292°)	10:49 pm ↗ (66°)	5:11 am (69.6°)	228,370	72.1%
25 ▾	-	1:30 pm ↖ (298°)	11:28 pm ↗ (60°)	6:04 am (75.2°)	231,203	60.9%

Bring up the Station

Once the selected date and time has arrived, it is time to bring up the station. The first step is to turn on all of the equipment (we assume the computer is left on at all times).

1. Turn on the equipment:
 - a. IC-9700 VHF/UHF transceiver (make sure the red LED is lit on the small GPS-disciplined oscillator on the right side of the transceiver)
 - b. BEKO HLV-523 1296 500 Watt 1296 MHz linear power amplifier, also turn on the Preamp power supply on the BEKO.
 - c. SPID PS-02 power supply; wait for both the U1 and U2 LEDs to light.
 - d. SPID MD-02 AZ/EL controller
 - e. S2 EME Sequencer. The preamp supply on the S2 is not used, so it can remain off.
2. Launch the software:
 - a. WSJT-X
 - b. JTAlert V2 for WSJT-X
 - c. DXKeeper
 - d. PstRotator
3. Verify that WSJT-X is setup for Q65-60C as shown in the WSJT-X Setup section, and check the AZ-EL coordinates of the moon:



~~2024 Aug 07~~

UTC: 22:14:05
Az: 234.4
El: 42.6
SelfDop: -2043
Width: 33
Delay: 2.67
DxAz: 0.0
DxEl: 0.0
DxDop: 0
DxWid: 0
Dec: 2.8
SunAz: 274.0
SunEl: 22.6
Freq: 1296.1
Tsky: 3
Dpol: 32.8
MNR: 0.0
Dist: 400298
Dgrd: -2.1

Doppler tracking

Doppler tracking

- Full Doppler to DX Grid
- Own Echo
- Constant frequency on Moon
- On DX Echo
- Call DX
- None

Sked frequency

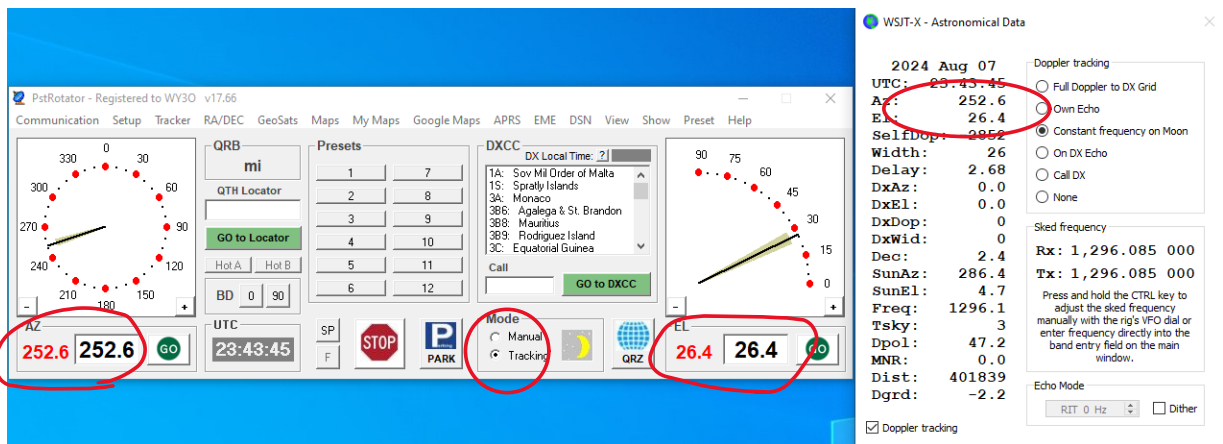
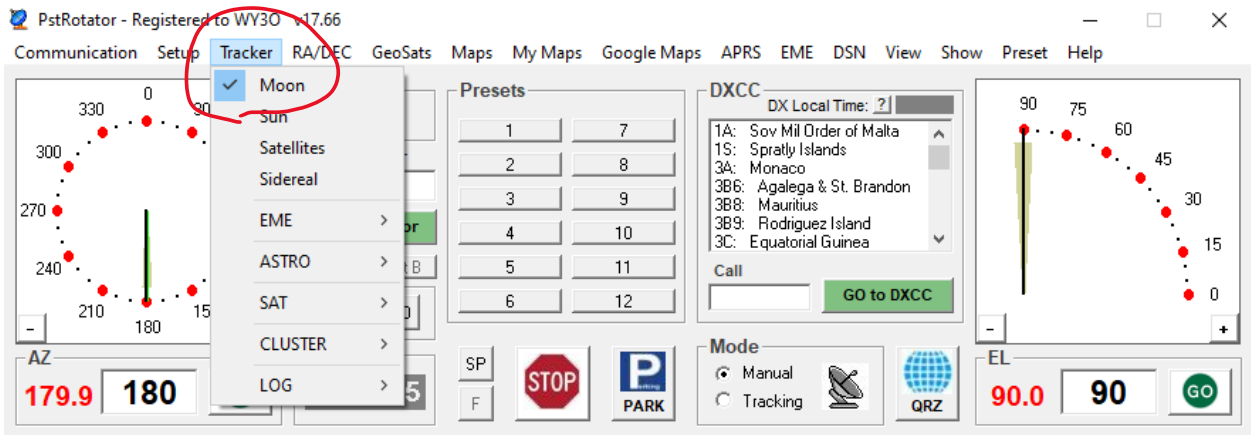
Rx: 1,296.085 000
Tx: 1,296.085 000

Press and hold the CTRL key to adjust the sked frequency manually with the rig's VFO dial or enter frequency directly into the band entry field on the main window.

Echo Mode

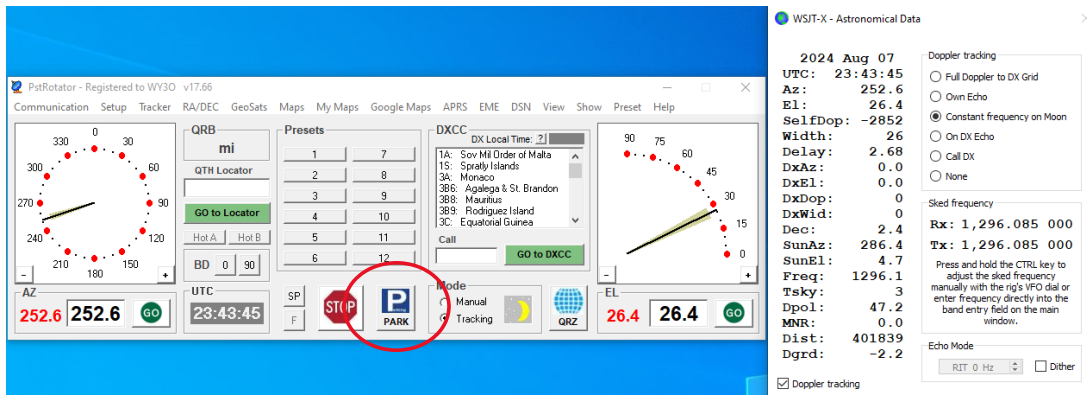
RIT 0 Hz Dither

- If the moon is at a reasonable elevation, set Tracker to track the moon, then start tracking the moon by clicking “tracking”:



The dish will start tracking the moon, with the AZ and EL in reasonable agreement with the WSJT-X Astronomical Data window. You're now set to send signals to the moon!

- When the session is completed, the dish is easily returned to the Stowed position by clicking the “Park” button.



Checking for Echoes

Once everything is set up, it can be helpful to check for your echoes off the moon. WSJT-X has a special echo mode for this. In addition to setting the WSJT-X mode to echo, “Own Echo” should be selected in the WSJT-X Astronomical Data window:

The screenshot shows the WSJT-X v2.6.1 interface. The Mode menu is open, and the 'Echo' option is selected and circled in red. The Astronomical Data window is also visible, with the 'Own Echo' radio button selected and circled in red. The table below shows the data from the main window.

UTC	Hour	FST4	Doppler	Width	N
013930	1.658333	FST4	1467	23.7	
013936	1.660000	FT4	1466	23.7	
013942	1.661667	FT8	1465	23.7	
013948	1.663333	JT4	1464	23.7	
013954	1.665000	JT9	1462	23.7	
014000	1.666667	JT65	1461	23.7	
014006	1.668333	JT65	1460	23.7	
014012	1.670000	Q65	1459	23.7	
014018	1.671667	MSK144	1458	23.7	
014024	1.673333	MSK144	1457	23.7	
014030	1.675000	FST4W	1456	23.7	
014036	1.676667	FST4W	1455	23.7	
014042	1.678333	WSPR	1454	23.7	
014048	1.680000	WSPR	1452	23.7	
014054	1.681667	Echo	1451	23.7	
014100	1.683333	FreqCal	1450	23.7	
014106	1.685000	63.40	1449	23.7	
014112	1.686667	63.17	1448	23.7	
014118	1.688333	63.45	1447	23.7	
014124	1.690000	63.15	1446	23.7	
014130	1.691667	63.33	1445	23.7	
014136	1.693333	63.42	1444	23.8	
014142	1.695000	63.20	1442	23.8	
014148	1.696667	63.41	1441	23.8	

The Astronomical Data window shows the following information:

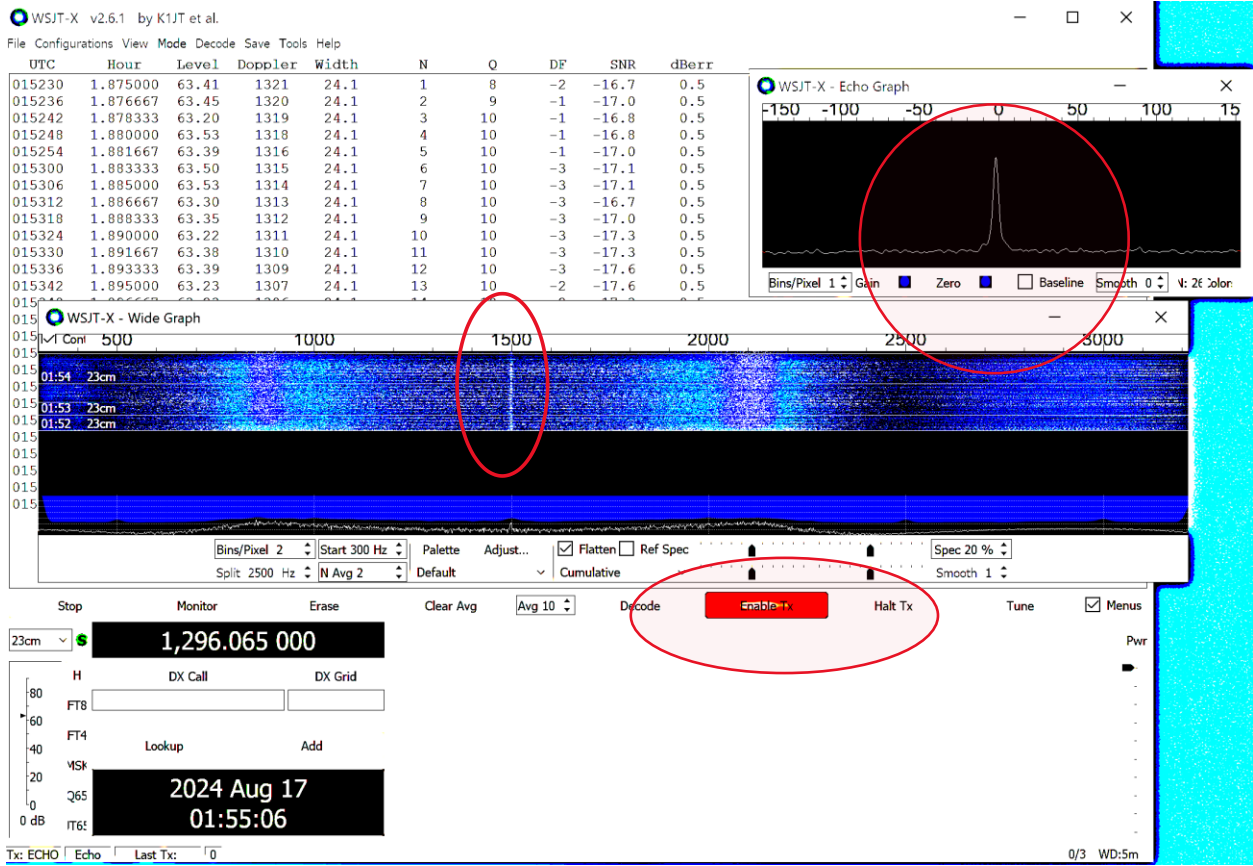
2024 Aug 17
UTC: 01:47:23
Az: 163.9
El: 24.2
SelfDop: 1380
Width: 24
Delay: 2.47
DxAz: 0.0
DxEl: 0.0
DxDop: 0
DxWid: 0
Dec: -28.1
SunAz: 304.3
SunEl: -20.0
Freq: 1296.1
Tsky: 5
Dpol: -31.0
MNR: 0.0
Dist: 370833
Dgrd: -0.9

Doppler tracking options:
 Full Doppler to DX Grid
 Own Echo
 Constant frequency on Moon
 On DX Echo
 Call DX
 None

Sked frequency:
Rx: 1,296.065 000
Tx: 1,296.065 000
Press and hold the CTRL key to adjust the sked frequency manually with the rig's VFO dial or enter frequency directly into the band entry field on the main window.

Echo Mode: RIT 0 | Dith
 Doppler tracking

Clicking the Tx Enable button (it turns red) will initiate a sequence of pulses followed by listening for the echo. In cases with sufficiently strong echoes, it will be possible to actually see the echoes on the waterfall display. In addition, an Echo Graph (View -> Echo Graph, or F8) shows a composite averaged spectrum from several pulses (see below—colors and contrast have been enhanced to make it easier to see the spectrum plots). In the table, Q is a measure of confidence (0-10), and SNR gives the effective SNR in a 2500 Hz bandwidth.



Making EME QSOs

1. HB9Q sponsors a website that is very helpful in setting up QSOs: <https://logger.hb9q.ch/>. W4ATC has an account, with password NCSUStars1930. Since we are a club station, the name associated with the login is "Team." However, you can indicate who is the current operator by adding your name to any posts. **Note: While there is generally no problem with using your personal call sign when using the W4ATC station, please always use W4ATC on EME. The reason is that equipment configurations are more tightly associated with callsigns on EME, and we want to make a name for W4ATC!**
2. When you log on to the HB9Q logger page, note that you must agree to the rules:



Welcome to HB9Q EME Logger

Purpose

This EME logger is a meeting place for HAMs interested in Moonbounce, Earth Moon Earth communication. It provides a platform and tools to exchange online information about activity, operating, general EME know-how, technical information, skeds and any other EME related topic.

Rules

All users must follow this rules:

1. Language for messages is English, please do not use other languages.
2. Only topics related directly to Moonbounce (EME) may be posted.
3. Decent and well manared messages only.
4. Do NOT post information about ongoing QSOs! This is MOST important. It is ok to exchange information about a QSO after finishing it or after aborting the sked. If information about the QSO is exchanged during the ongoing QSO, this QSO is NOT valid!
5. YOU accept, that YOUR personal information (your call, name, QTH-locator, e-mail address, equipment) is used for the logger only and it is visible to all other registered users.
6. If someone is not following above rules, his account will be deleted and his call blocked.

Login

Callsign

Password

Yes - I accept the rules

Forgot your password?
Register

New New New New New New New New

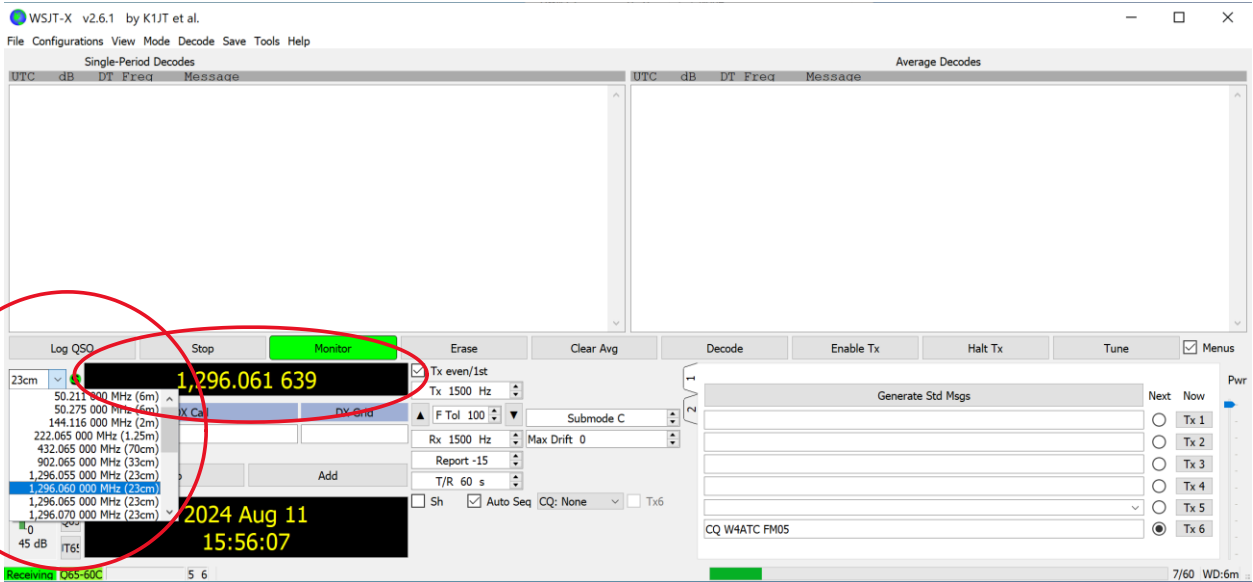
EME Conference 2024 in Trenton, NJ
The EME community is looking forward to the next global EME conferenece. K2UYH and his support-team are preparing for a great event in August 2024. Please have a look at the official web-page at <http://EME2024Trenton.org>

3. After logging in, the current stations online are listed on the right, and posted messages are listed on the left. As an example, note that PA3EXV has announced that he will be calling CQ on 1296.060 MHz for the next 10 minutes. He will be calling on the 1st (even minute) interval, Constant Frequency on Moon (CFOM), with an audio frequency lower edge of 1500 Hz.

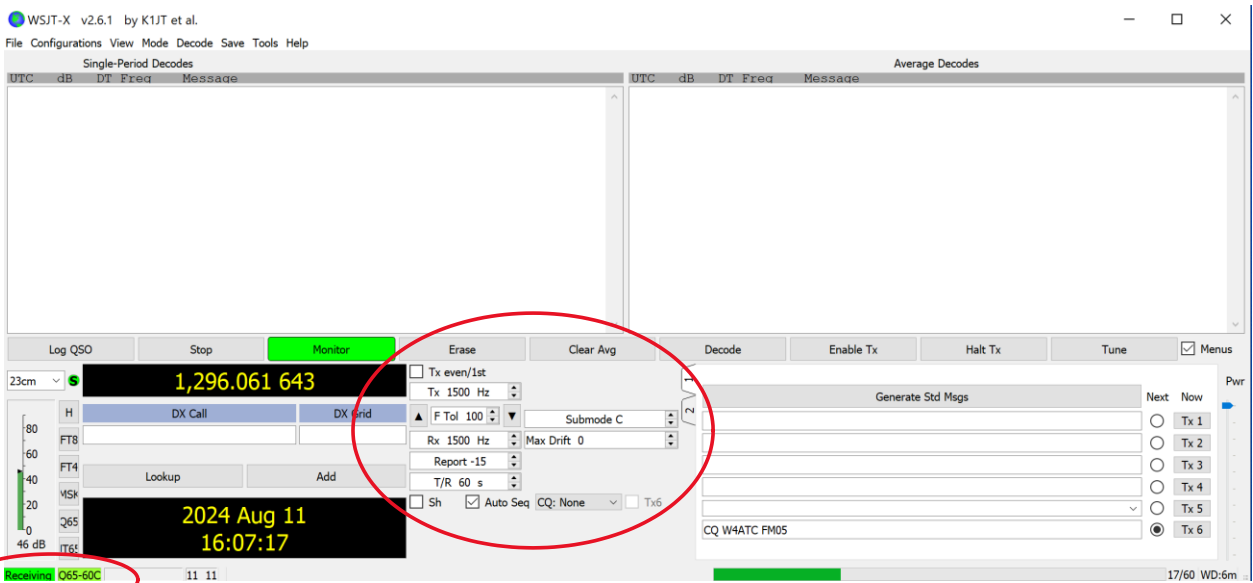
The screenshot shows the HB9Q EME Logger interface. The top bar displays the frequency 1296. The message log on the left shows a message from PA3EXV at 15:07: "***** CQ 1296.060 1st Q65-60C CFOM 1500Hz 10 minutes *****". The 'Who is online' list on the right shows several stations, with PA3EXV - Gerrie and PE1LWT - Jurgen circled in red.

4. To set up to respond to the CQ, first set the frequency using the drop-down menu and select the appropriate choice (recall that we entered commonly-used frequencies when

setting up WSJT-X). Note that the resulting frequency in the larger field to the right with the dark background is slightly different. This is because of Doppler shift corrections.



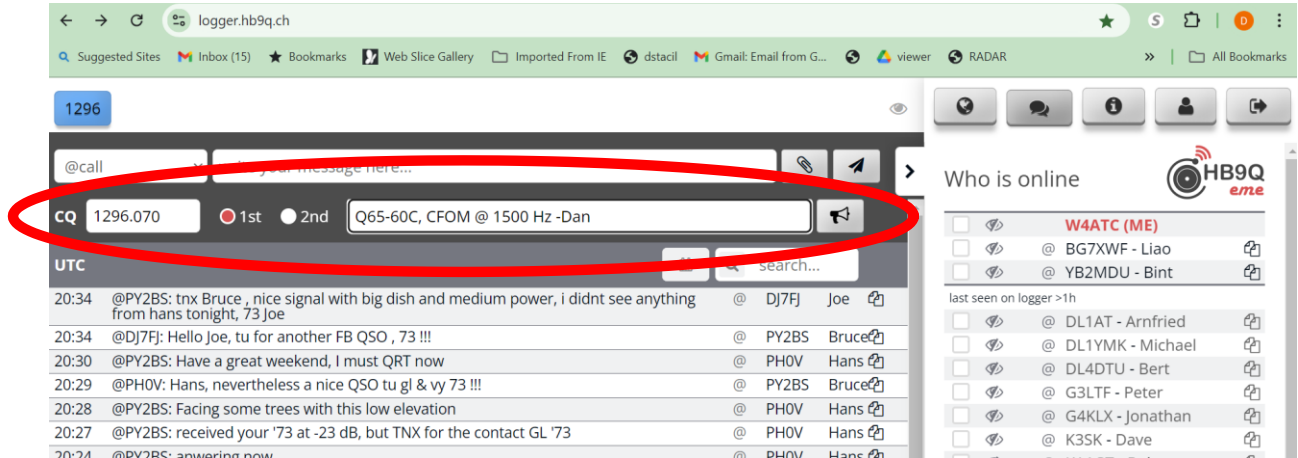
- Next, set the mode to match the CQ parameters. Note that since the CQ is being transmitted during the even/1st interval, you want to respond on the odd/2nd interval, so the “TX even/1st” box should be unchecked.



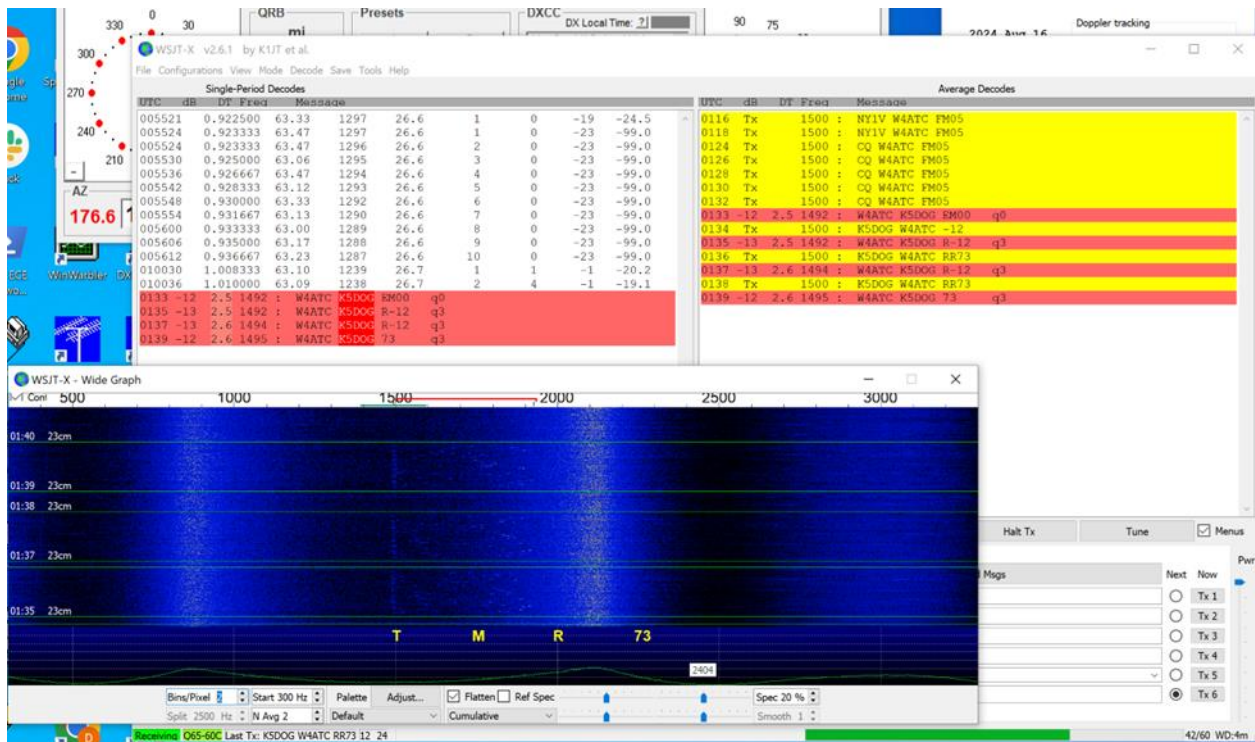
- When you successfully decode the CQ, it will show up in the left, top window. To answer the CQ, double click on the entry in the top left window. The “Enable Tx” button will turn red, the complete list of exchanges—including your responses—will appear in the top right window, and the automated sequence of messages will be generated and displayed on the lower right. Each time an expected response is successfully decoded, the “Next” radio button will advance. When the final response is received, a window will open giving you the

option to log the contact. When you log the contact, an entry will be automatically made in DXKeeper with time, frequency, mode, signal level, etc.

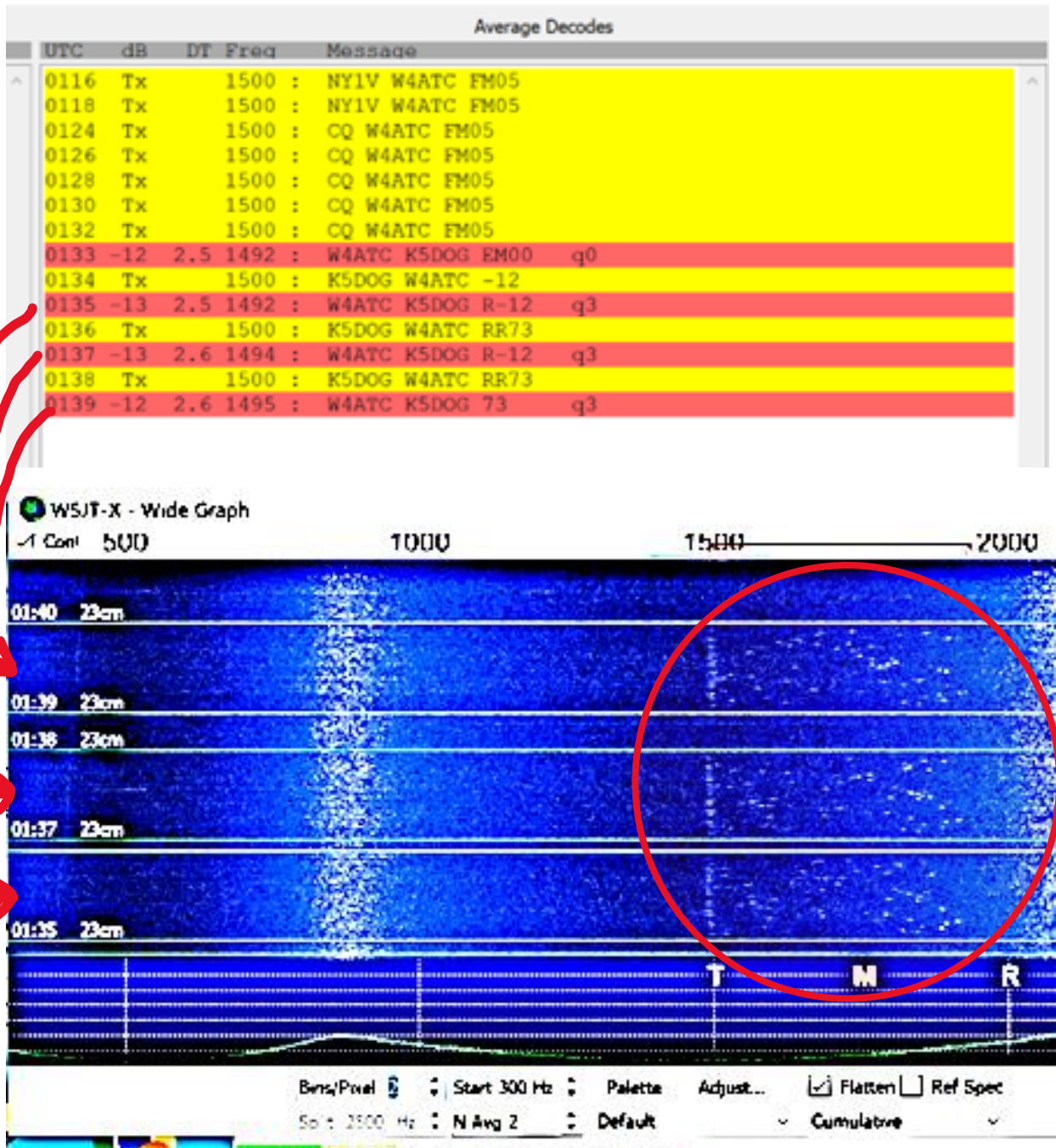
7. After a successful QSO, it is common practice to thank the other station on the HB9Q logger.
8. This completes your first EME QSO!
9. Note that you can announce your intention to call CQ by filling in the fields at the top, and clicking the “megaphone” button:



10. Below are screenshots from an actual EME QSO between W4ATC and K5DOG. A complete screen shot is followed by close-ups of the decode window and the spectrum waterfall. Note that decodes containing your call (W4ATC) are highlighted red, and your transmissions are highlighted yellow.



Below is a closeup of upper right window, followed by a closeup and color enhanced spectrum waterfall showing the signature of the received signal:



Note that K5DOG is transmitting in the 2nd (odd) minute interval, so his signal can be seen in the waterfall during the odd minutes, and the red-highlighted decoded messages from K5DOG also appear in the odd minutes.

CQ announcement and friendly exchange after the QSO:

The screenshot shows a web browser window with the address bar displaying "logger.hb9q.ch". The browser's address bar and tabs are visible at the top. Below the browser, the HB9Q | LOGGER interface is shown. It features a search bar with "1296" entered, a message input field with "@call" selected, and a "write your message here..." placeholder. Below the input fields, there are controls for "CQ" (set to "1296.070"), "1st" and "2nd" buttons, and a text field containing "Q65-60C, CFOM @ 1500 Hz -Dan". A "UTC" section includes a calendar icon and a "search..." field. The chat log shows three messages:

- 01:41 @K5DOG: Thanks for the QSO Steve! Great to talk with you again. Dan @ W4ATC Team
- 01:40 @W4ATC: Dan, trx for the QSO. Looks like it is -12 all around. D4 corrected my clock at 0136, so I missed a decode. Sorry for the confusion. 73's @ K5DOG Stevedog
- 01:23 ***** CQ 1296.070 1st Q65-60C, CFOM @ 1500 Hz -Dan ***** @ W4ATC Team

On the right side, there is a "Who is online" section with the HB9Q logo and a list of users:

- W4ATC (ME)
- @ BG7XWF - Liao
- @ K5DOG - Stevedog
- @ NY1V - Rick
- @ VK3KN - David
- @ VK4CDI - Phil

At the bottom of the online list, it says "last seen on logger >1h".