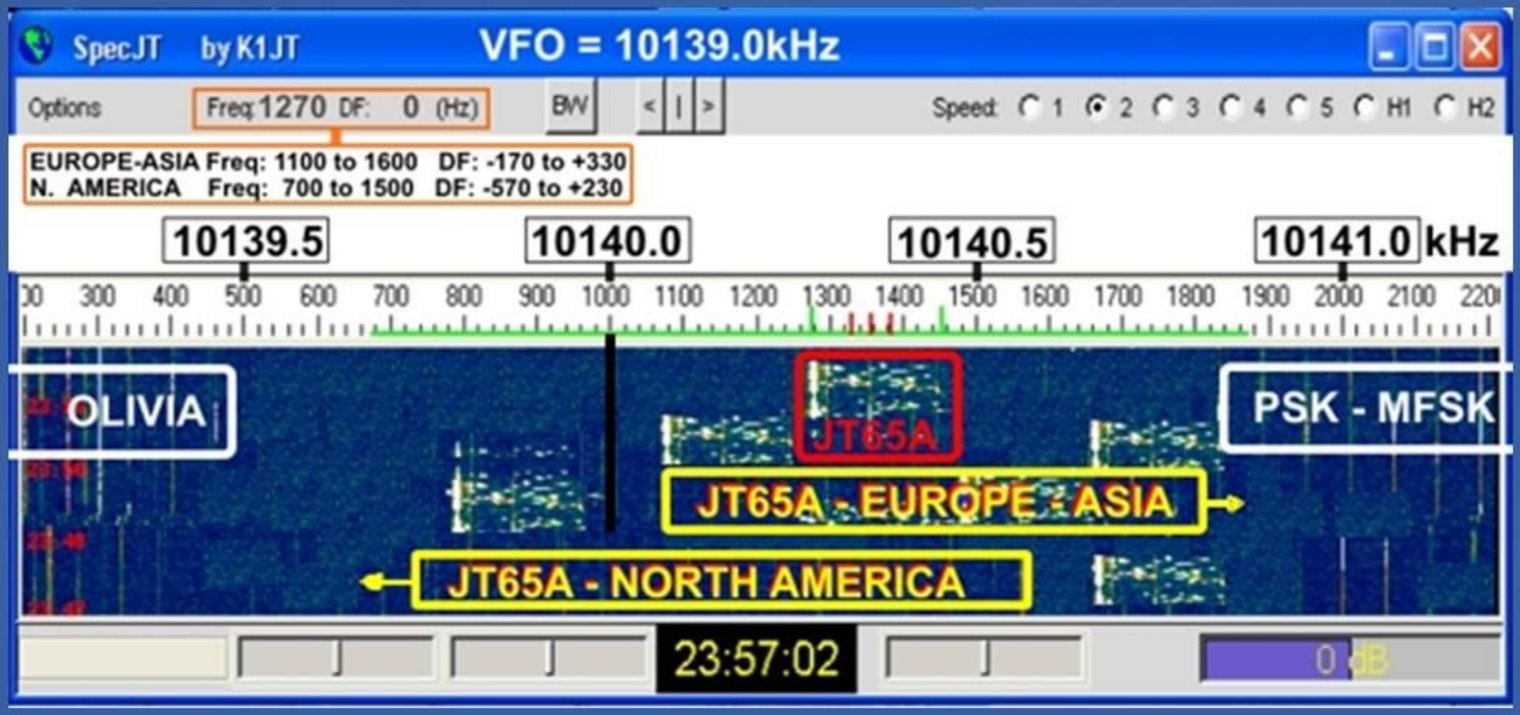

NRHARC
Group Participation Presentation
On Digital Communications Part 2

Unlock the Mystery of JT Communication

and more.....

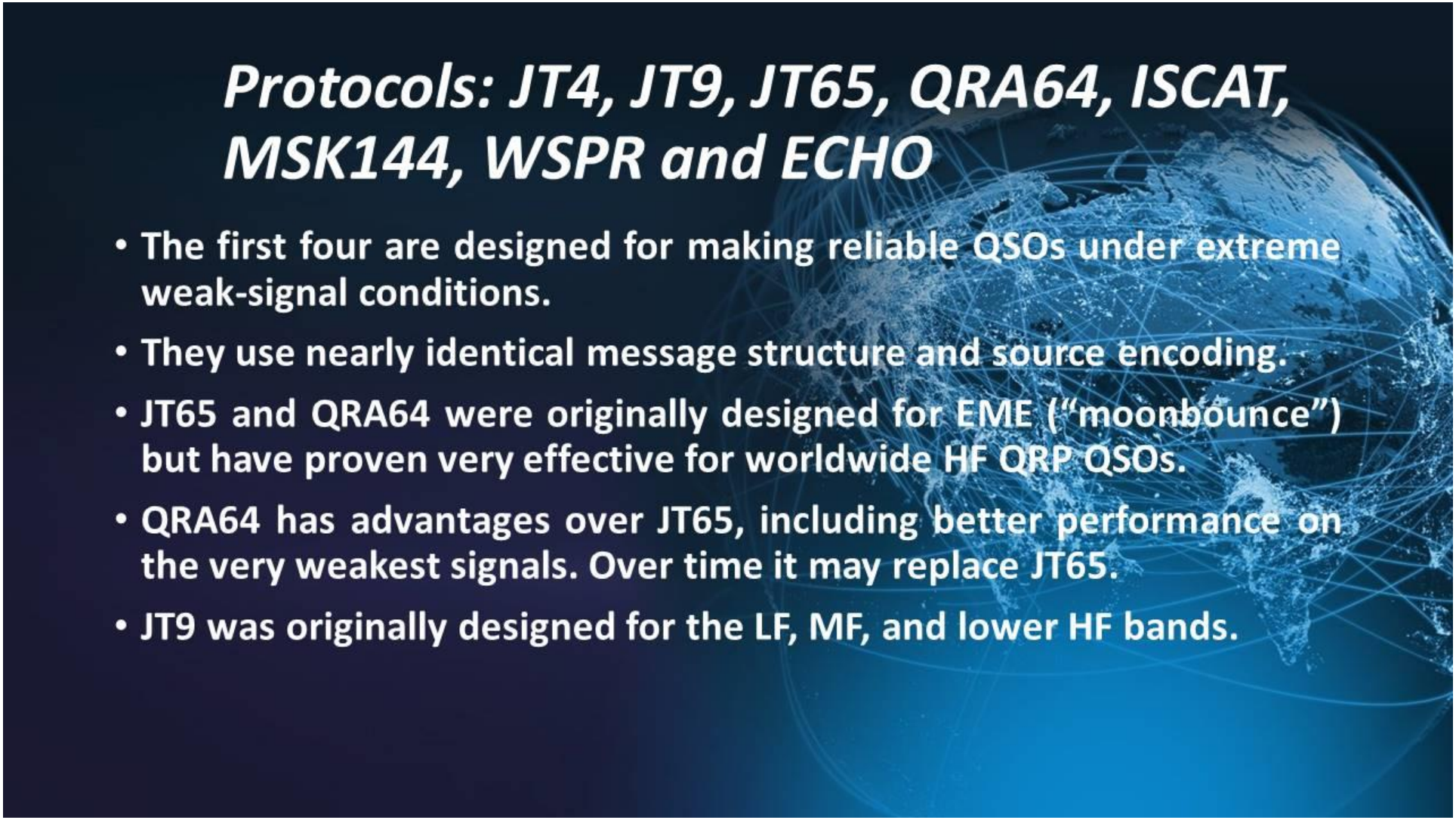


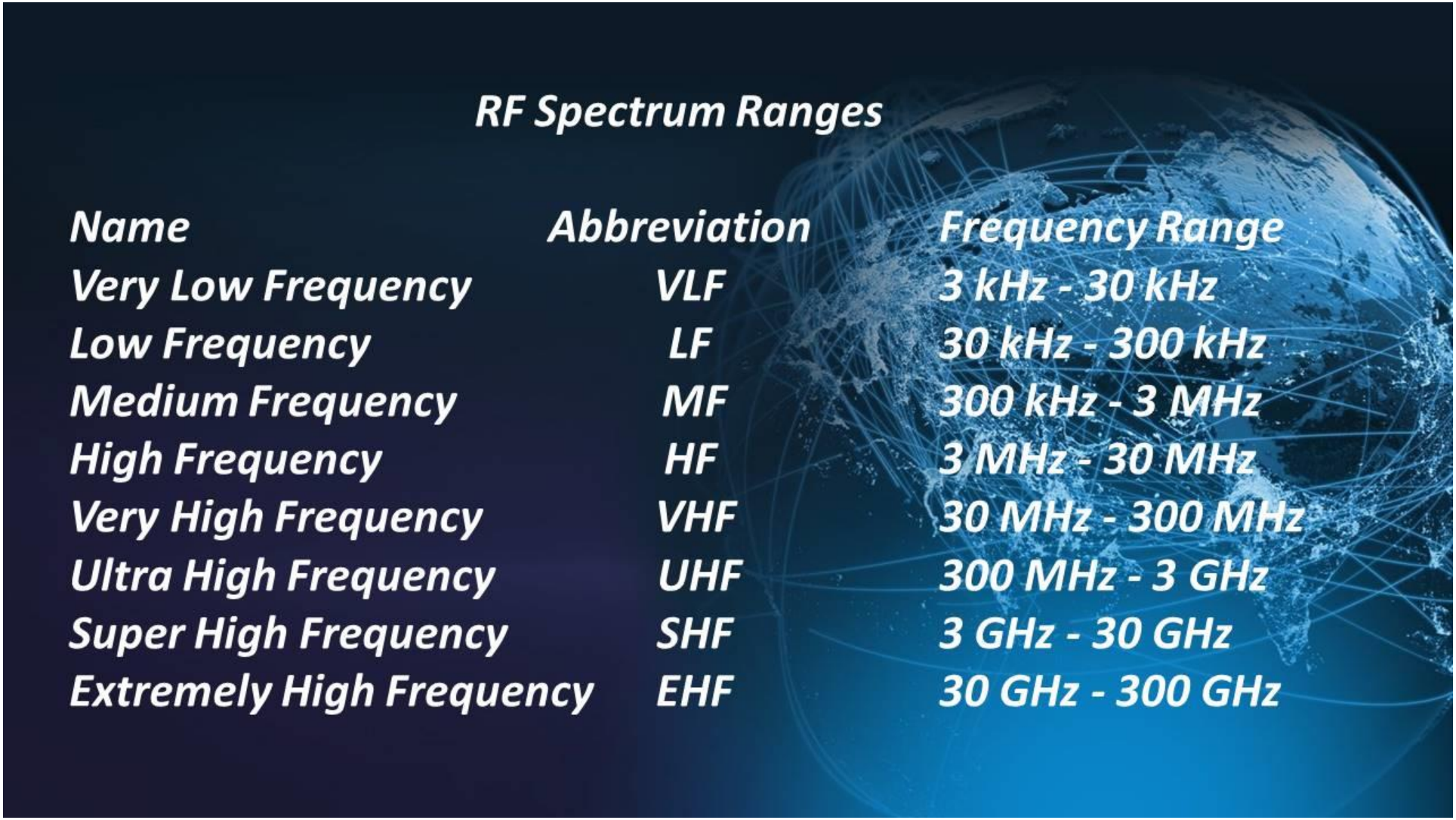
Background

- Computer-mediated communication (CMC) is defined as any human communication that occurs through the use of two or more electronic devices. The JT mode of communication is just one example of CMC.
- WSJT was/is a computer program designed to facilitate basic radio communication using very weak signals for Earth-Moon-Earth (EME) use.
  - The first four letters in the program name stand for "Weak Signal communication by K1JT," while the suffix "X" indicates that WSJT-X started as an extended branch of the program for the broader amateur community, i.e. HF.
- About the author: Dr. Joseph Hooton Taylor Jr., known to his friends as Joe Taylor, K1JT, won the Nobel Prize for Physics in 1993 for his work in astrophysics. He was a physics professor at Princeton, retiring in 2006.
- WSJT-X offers eight protocols:
  - JT4, JT9, JT65, QRA64, ISCAT, MSK144, WSPR, & ECHO.

Background (cont'd)

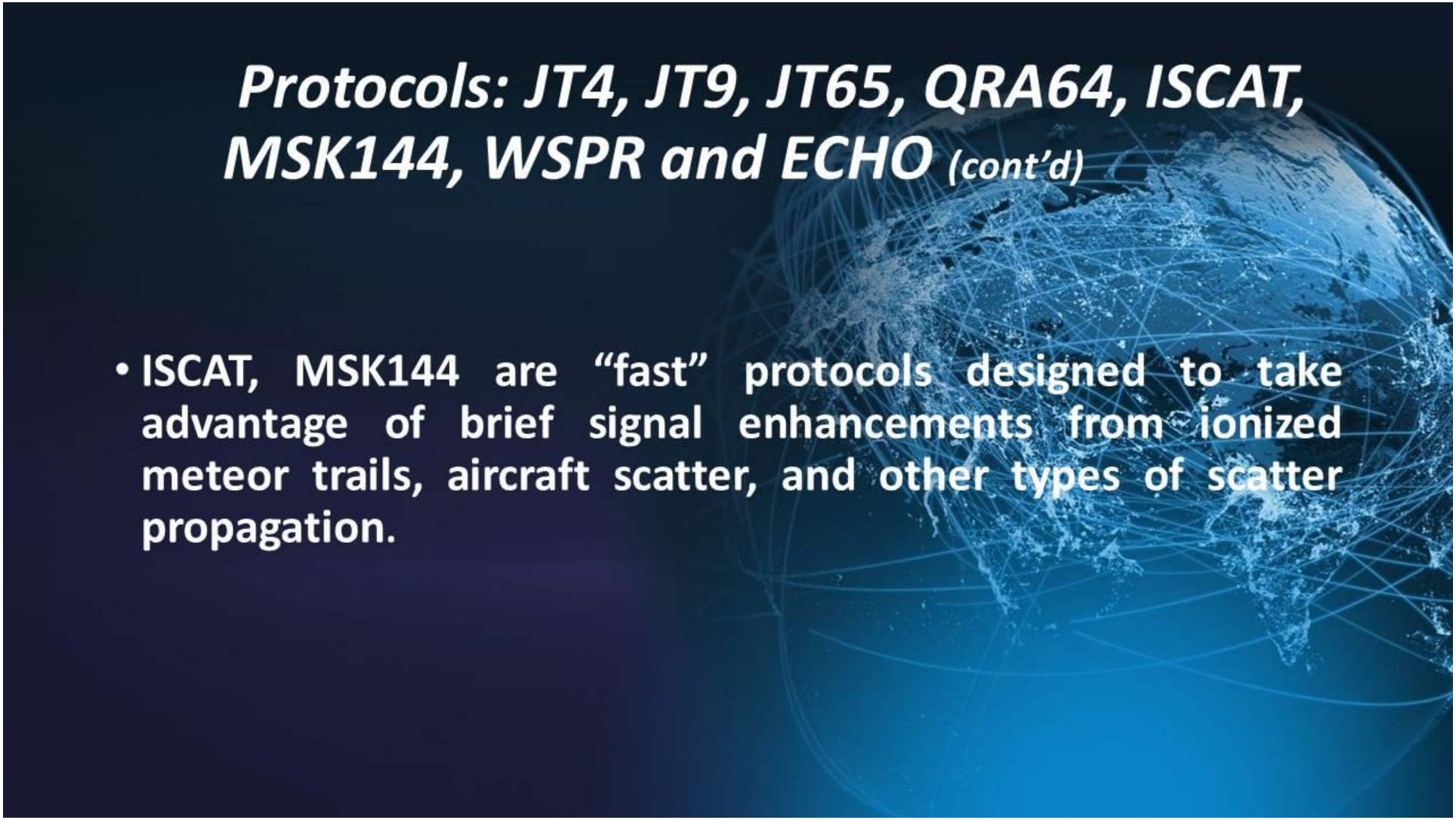
- *WSJT-X* provides spectral displays for receiver passbands as wide as 5 kHz.
- Flexible rig control for nearly all modern radios used by amateurs.
- The program runs on Windows, Macintosh, and Linux systems.
- There are now other applications that provide JT operation:
  - JT65-HF-Comfort by DL3CVO
  - JT65-HF-HB9HQX by HB9HQX
  - JT65-HF by W6CQZ (no longer supported)
  - JTDX by UA3DJY (more on this one later)

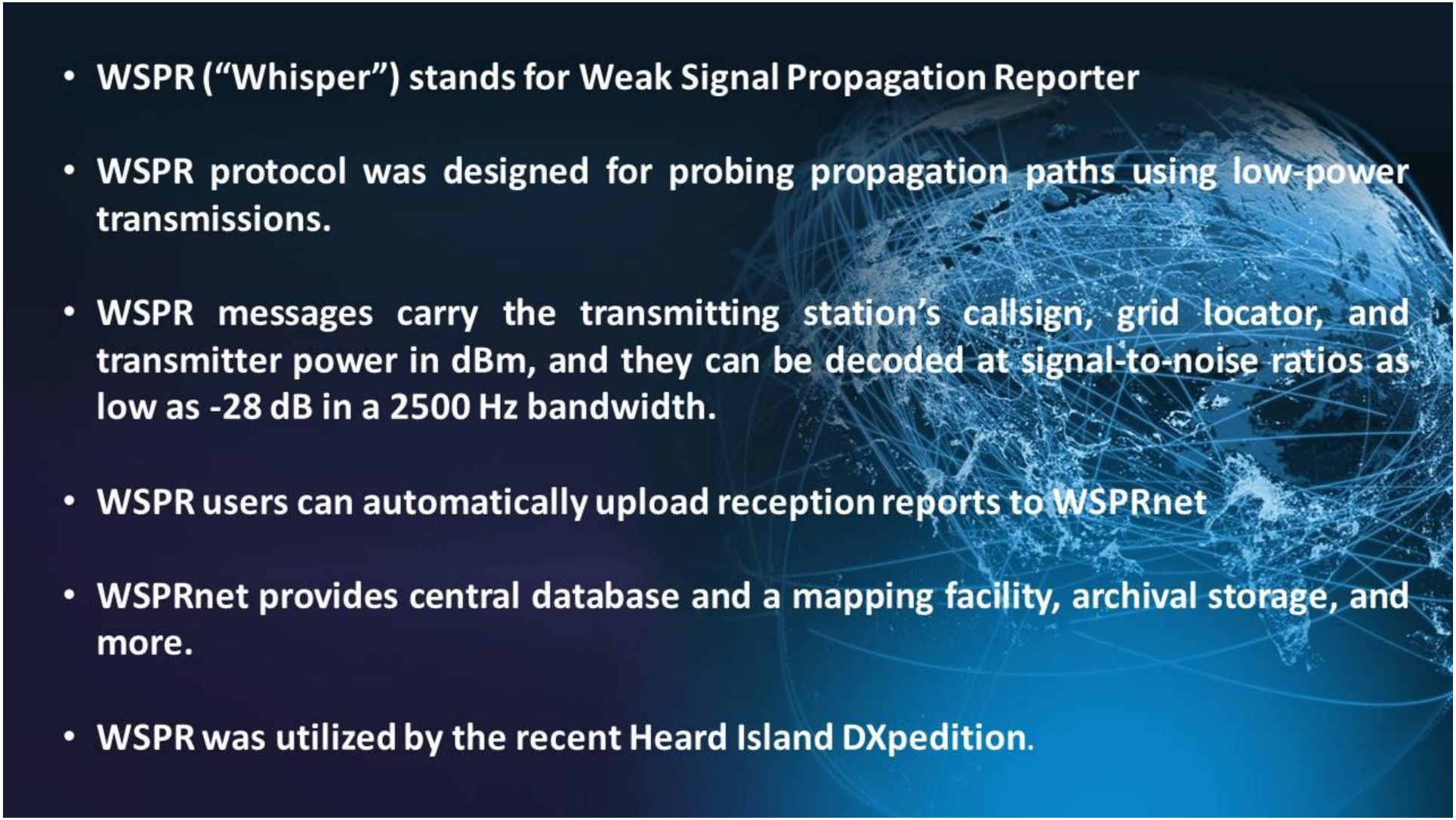

Protocols: JT4, JT9, JT65, QRA64, ISCAT, MSK144, WSPR and ECHO
• The first four are designed for making reliable QSOs under extreme weak-signal conditions.
• They use nearly identical message structure and source encoding.
• JT65 and QRA64 were originally designed for EME ("moonbounce") but have proven very effective for worldwide HF QRP QSOs.
• QRA64 has advantages over JT65, including better performance on the very weakest signals. Over time it may replace JT65.
• JT9 was originally designed for the LF, MF, and lower HF bands.


RF Spectrum Ranges
Name
Abbreviation
Frequency Range
Very Low Frequency
VLF
3 kHz - 30 kHz
Low Frequency
LF
30 kHz - 300 kHz
Medium Frequency
MF
300 kHz - 3 MHz
High Frequency
HF
3 MHz - 30 MHz
Very High Frequency
VHF
30 MHz - 300 MHz
Ultra High Frequency
UHF
300 MHz - 3 GHz
Super High Frequency
SHF
3 GHz - 30 GHz
Extremely High Frequency
EHF
30 GHz - 300 GHz

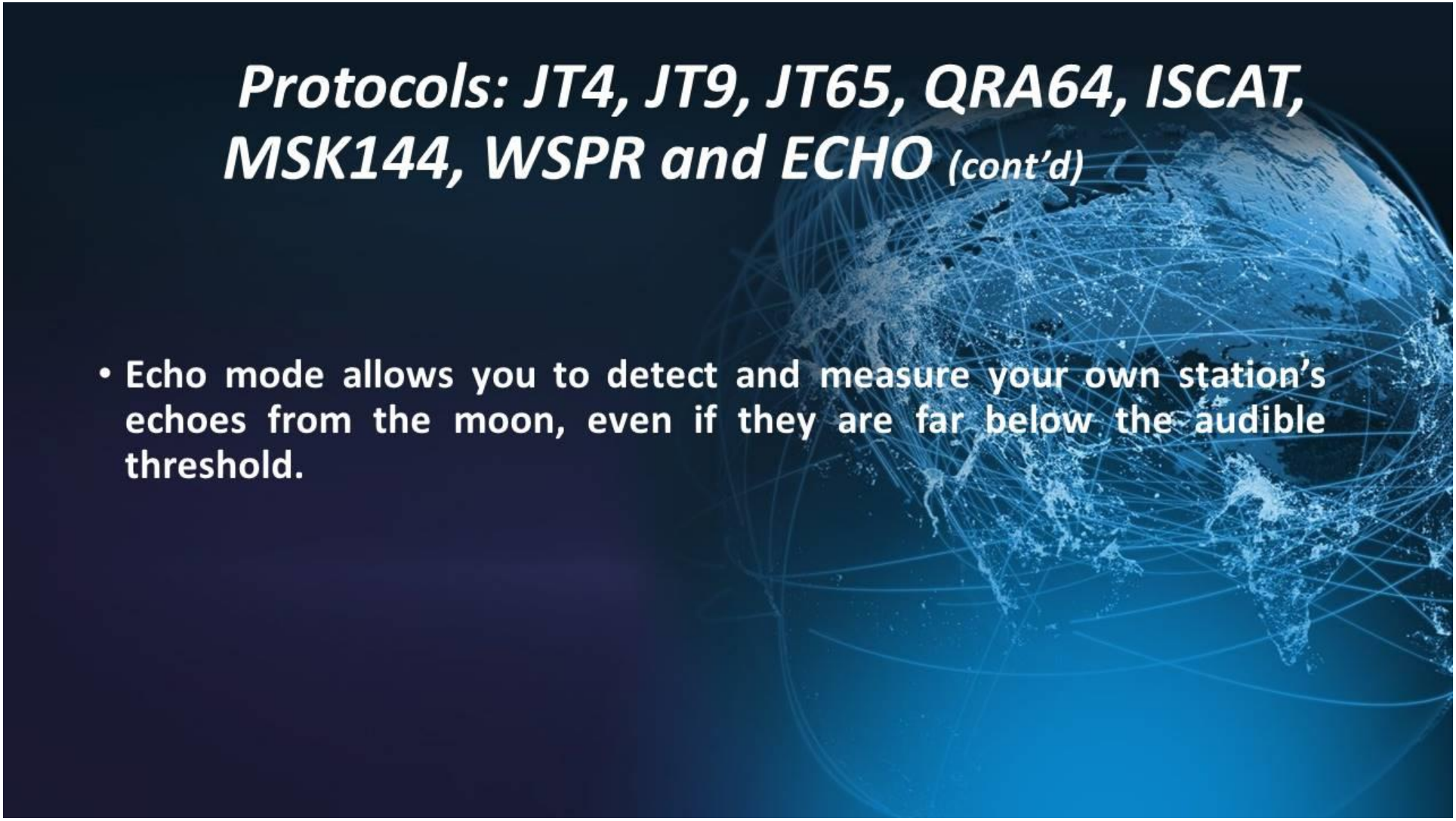
Protocols: JT4, JT9, JT65, QRA64, ISCAT, MSK144, WSPR and ECHO (cont'd)

- All of these "slow" modes use one-minute timed sequences of alternating transmission and reception, so a minimal QSO takes four to six minutes.
- On the HF bands, world-wide QSOs are possible using power levels of a few watts and modest antennas.
- QSOs are possible at signal levels 10 to 15 dB below those required for CW.

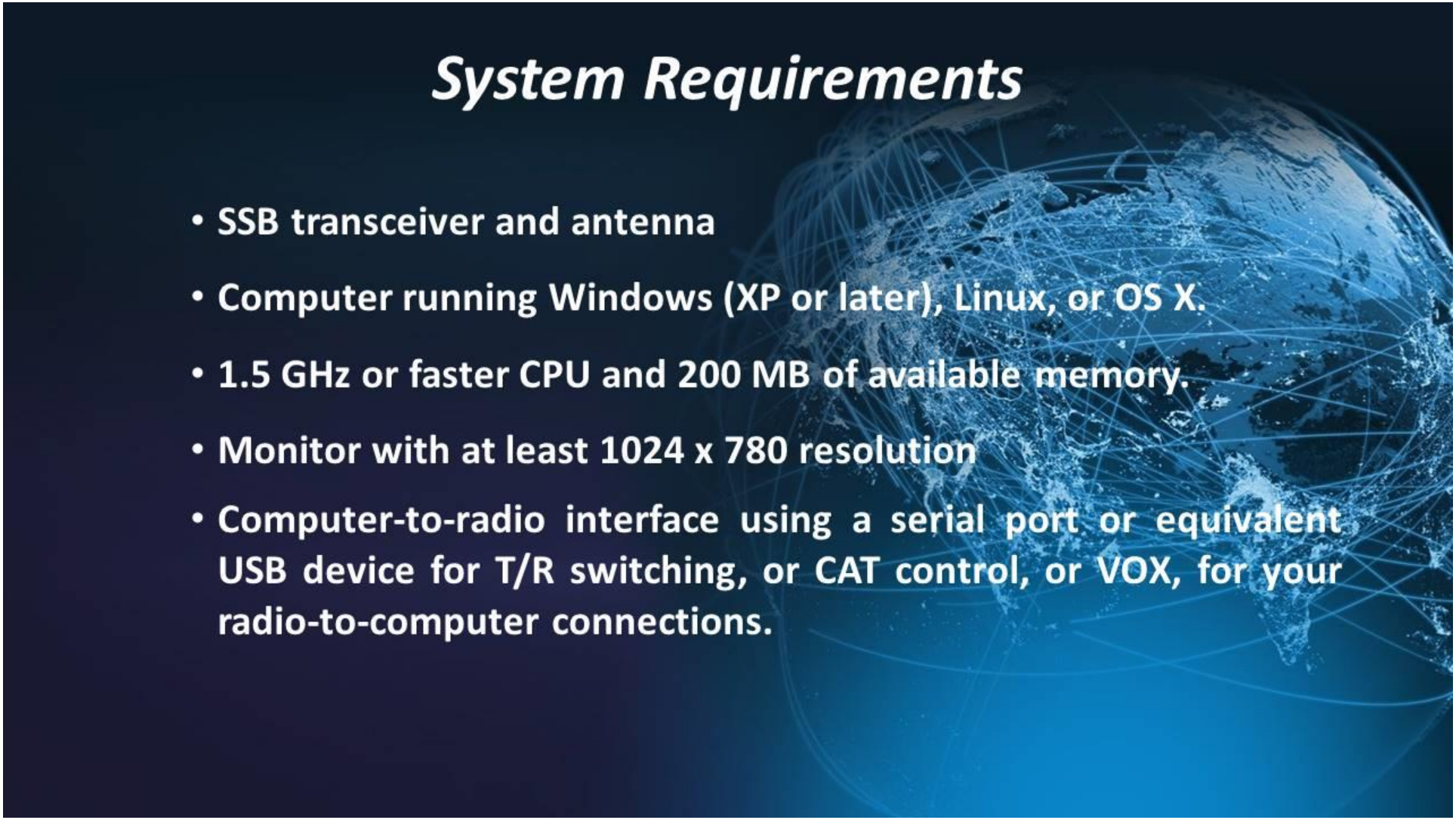

Protocols: JT4, JT9, JT65, QRA64, ISCAT, MSK144, WSPR and ECHO (cont'd)
• ISCAT, MSK144 are "fast" protocols designed to take advantage of brief signal enhancements from ionized meteor trails, aircraft scatter, and other types of scatter propagation.


• WSPR ("Whisper") stands for Weak Signal Propagation Reporter
• WSPR protocol was designed for probing propagation paths using low-power transmissions.
• WSPR messages carry the transmitting station's callsign, grid locator, and transmitter power in dBm, and they can be decoded at signal-to-noise ratios as low as -28 dB in a 2500 Hz bandwidth.
• WSPR users can automatically upload reception reports to WSPRnet
• WSPRnet provides central database and a mapping facility, archival storage, and more.
• WSPR was utilized by the recent Heard Island DXpedition.

Protocols: JT4, JT9, JT65, QRA64, ISCAT, MSK144, WSPR and ECHO (cont'd)



- **Echo mode allows you to detect and measure your own station's echoes from the moon, even if they are far below the audible threshold.**


System Requirements
• SSB transceiver and antenna
• Computer running Windows (XP or later), Linux, or OS X.
• 1.5 GHz or faster CPU and 200 MB of available memory.
• Monitor with at least 1024 x 780 resolution
• Computer-to-radio interface using a serial port or equivalent USB device for T/R switching, or CAT control, or VOX, for your radio-to-computer connections.

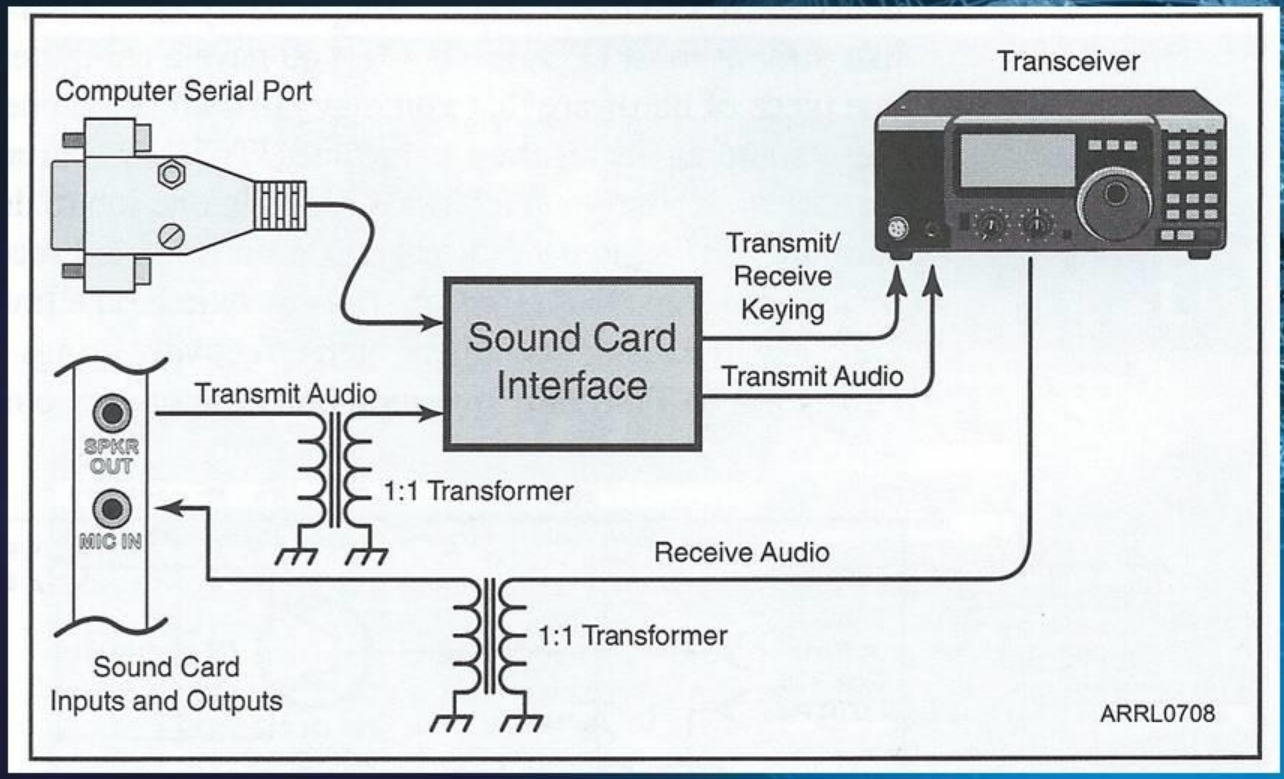
Radio Interface

- *WSJT-X* offers CAT (Computer Aided Transceiver) control of the relevant features of most modern transceivers.
- Alternatively, if you have configured your station for control by
  - DX Lab Suite Commander
  - Ham Radio Deluxe
  - OmniRig.
- You can select the program names from the Rig list during setup.

System Requirements (cont'd)

- Audio input and output devices supported by the operating system and configured for sample rate 48000 Hz.
- Audio or equivalent USB connections between transceiver and computer.
- A means for synchronizing the computer clock to UTC within ±1 second. ***This is IMPORTANT!***
  - To help with this:
    - Dimension 4
    - Meinberg NTP

Connection Diagram for JT Operation



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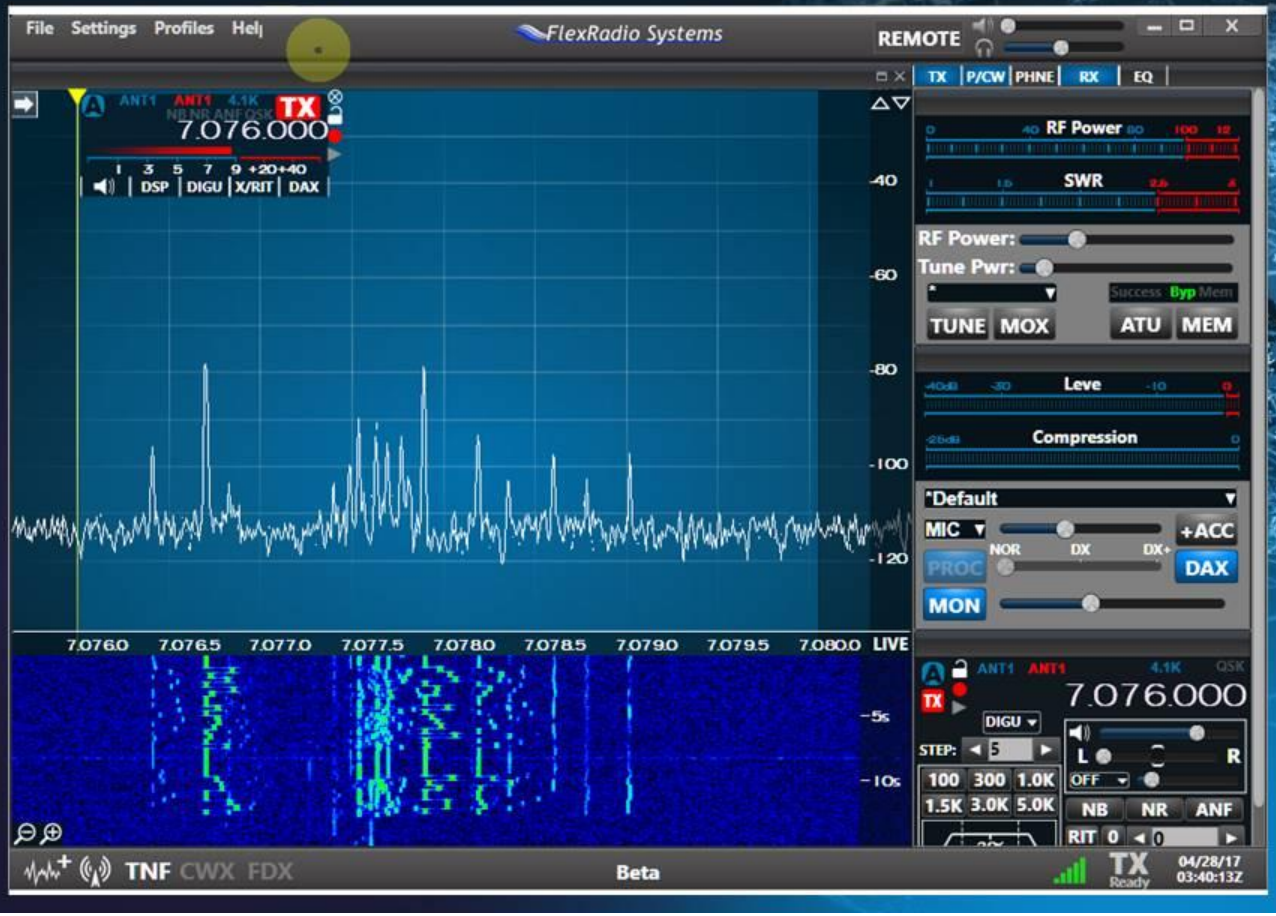
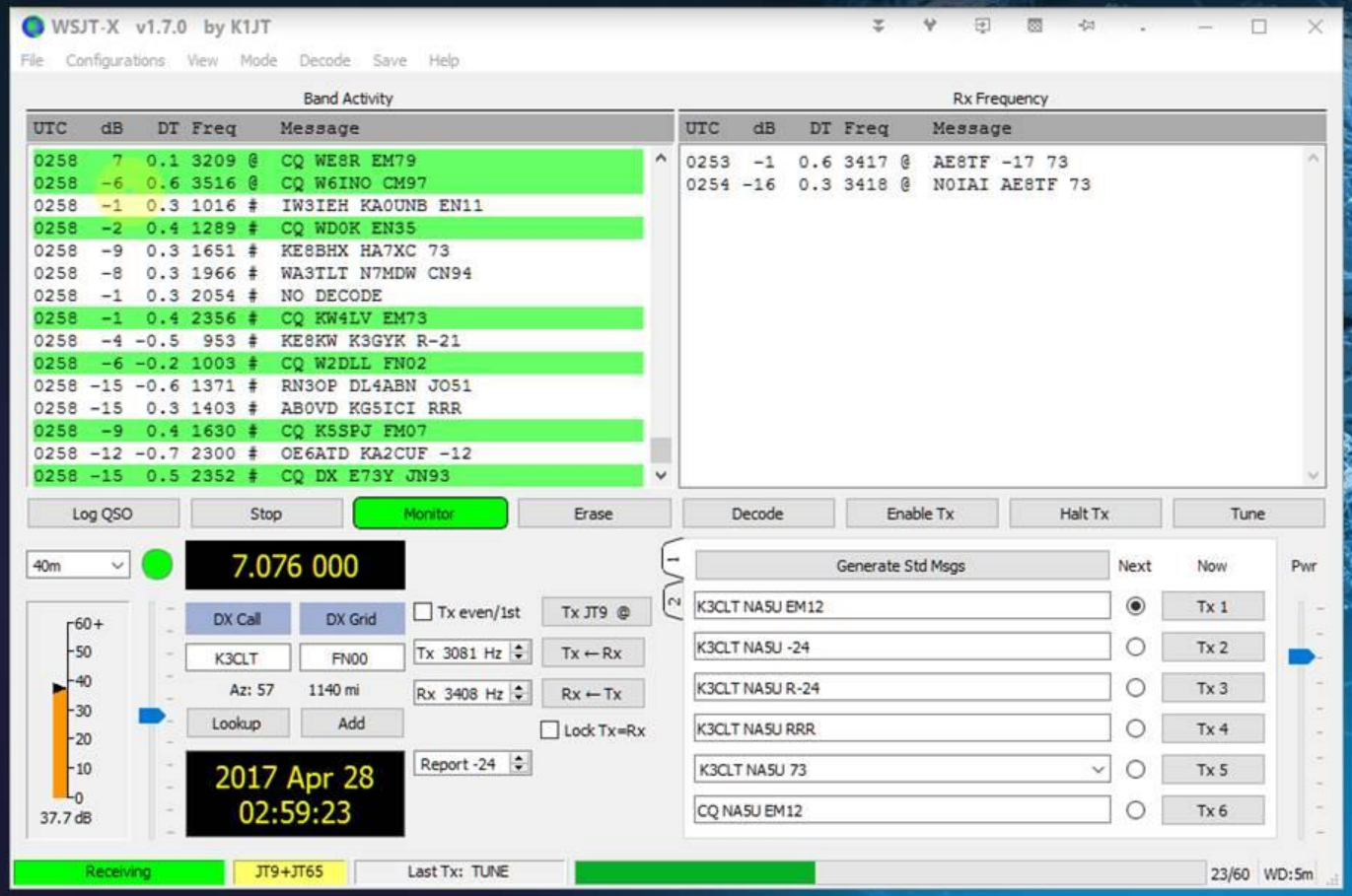
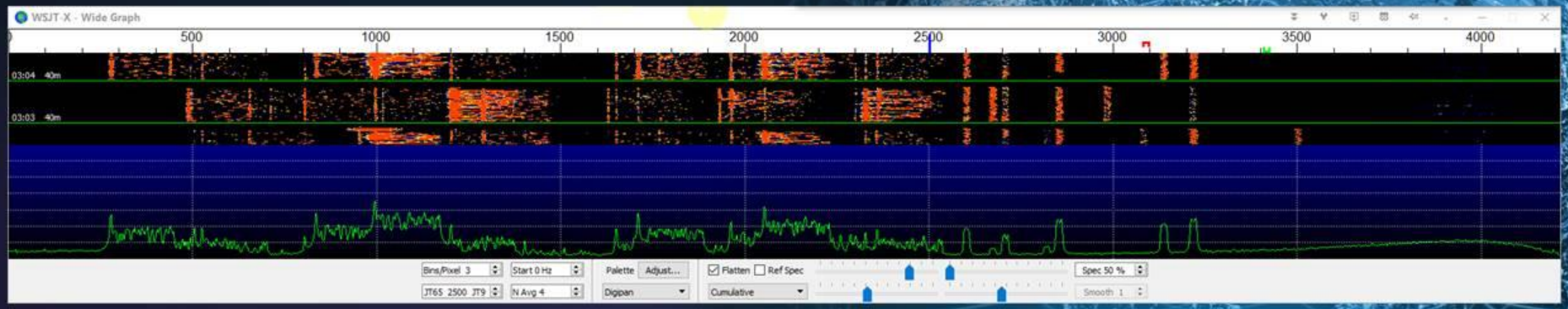
Radio Specturm of JT Signals



WSJT-X GUI


WSJT-X v1.7.0 by K1JT
File Configurations View Mode Decode Save Help
Band Activity
UTC dB DT Freq Message
0258 7 0.1 3209 @ CQ WE8R EM79
0258 -6 0.6 3516 @ CQ W6INO CM97
0258 -1 0.3 1016 # IW3IEH KA0UNB EN11
0258 -2 0.4 1289 # CQ WD0K EN35
0258 -9 0.3 1651 # KE8BHX HA7XC 73
0258 -8 0.3 1966 # WA3TLT N7MDW CN94
0258 -1 0.3 2054 # NO DECODE
0258 -1 0.4 2356 # CQ KW4LV EM73
0258 -4 -0.5 953 # KE8KW K3GYK R-21
0258 -6 -0.2 1003 # CQ W2DLL FN02
0258 -15 -0.6 1371 # RN3OP DL4ABN JO51
0258 -15 0.3 1403 # AB0VD KG5ICI RRR
0258 -9 0.4 1630 # CQ K5SPJ FM07
0258 -12 -0.7 2300 # OE6ATD KA2CUF -12
0258 -15 0.5 2352 # CQ DX E73Y JN93
Rx Frequency
UTC dB DT Freq Message
0253 -1 0.6 3417 @ AE8TF -17 73
0254 -16 0.3 3418 @ N0IAI AE8TF 73
Log QSO
Stop
Monitor
Erase
Decode
Enable Tx
Halt Tx
Tune
40m
7.076 000
DX Call
DX Grid
Tx even/1st
Tx JT9 @
K3CLT
FN00
Tx 3081 Hz
Tx ← Rx
Az: 57
1140 mi
Rx 3408 Hz
Rx ← Tx
Lookup
Add
Lock Tx=Rx
Report -24
2017 Apr 28
02:59:23
60+
50
40
30
20
10
0
37.7 dB
Generate Std Msgs
Next
Now
Pwr
K3CLT NA5U EM12
K3CLT NA5U -24
K3CLT NA5U R-24
K3CLT NA5U RRR
K3CLT NA5U 73
CQ NA5U EM12
Tx 1
Tx 2
Tx 3
Tx 4
Tx 5
Tx 6
Receiving
JT9+JT65
Last Tx: TUNE
23/60
WD:5m

WSJT-X Display
Waterfall and Spectrum



Focus on JT65 & JT9

Warning!

JT65 is equivalent to 100% key down carrier for the 47 second TX duration. You can easily overheat your final amplifier if it can not handle this situation for the full duration. If you melt your finals you have only yourself to blame!

Running at full output power is seldom necessary or desirable due to the sensitivity of JT65/JT9. Most users find 5 to 10 watts (or less) highly effective and 25 to 30 watts is considered 'HIGH POWER'.