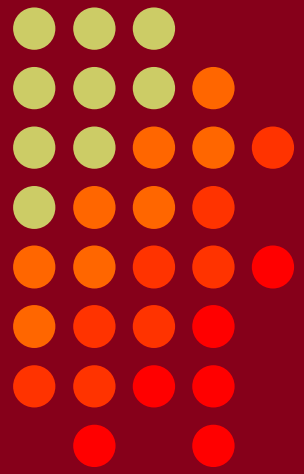
CTU Presents

Contesting Fun on That *Really Other* Mode (FT8)

Ed Muns, W0YK / P49X



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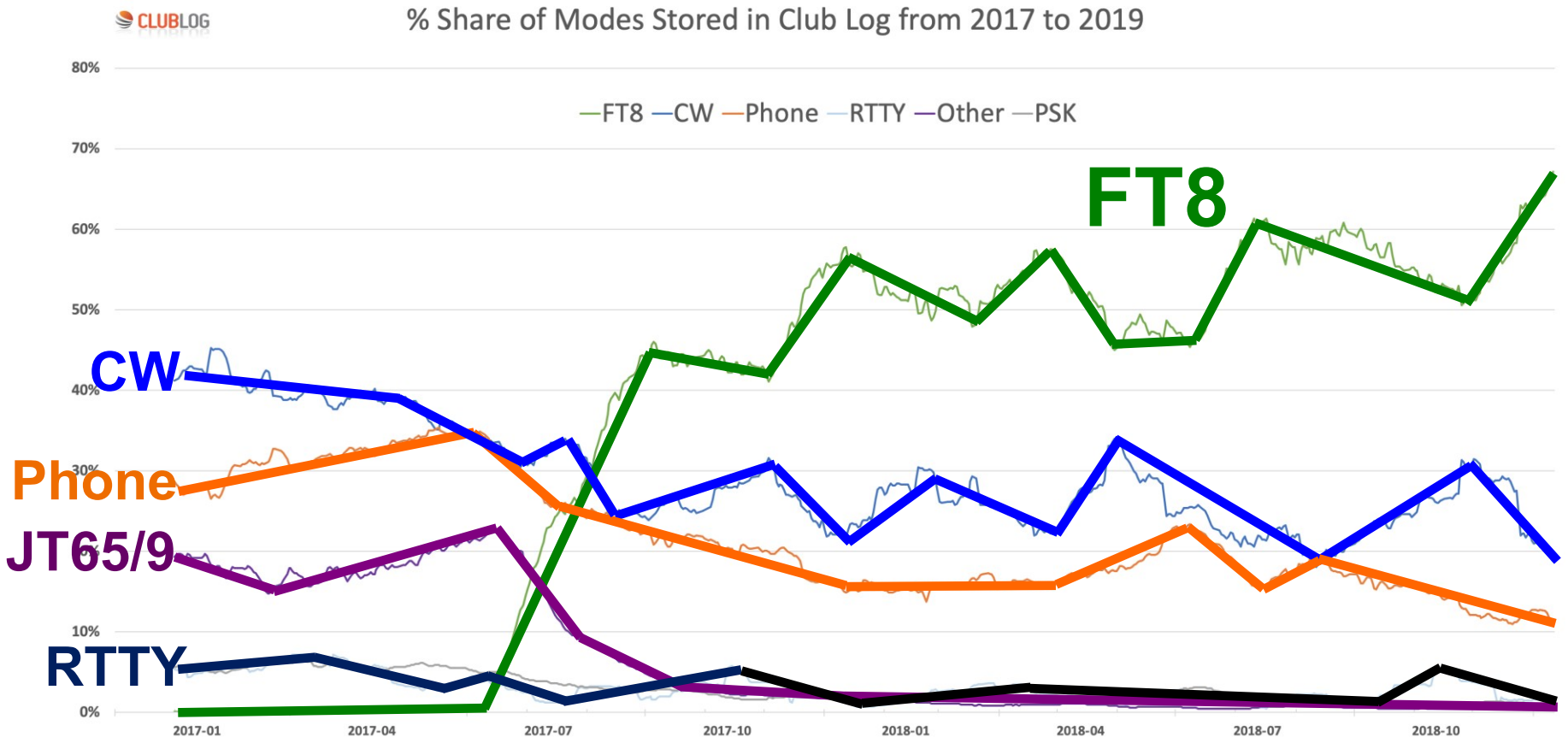
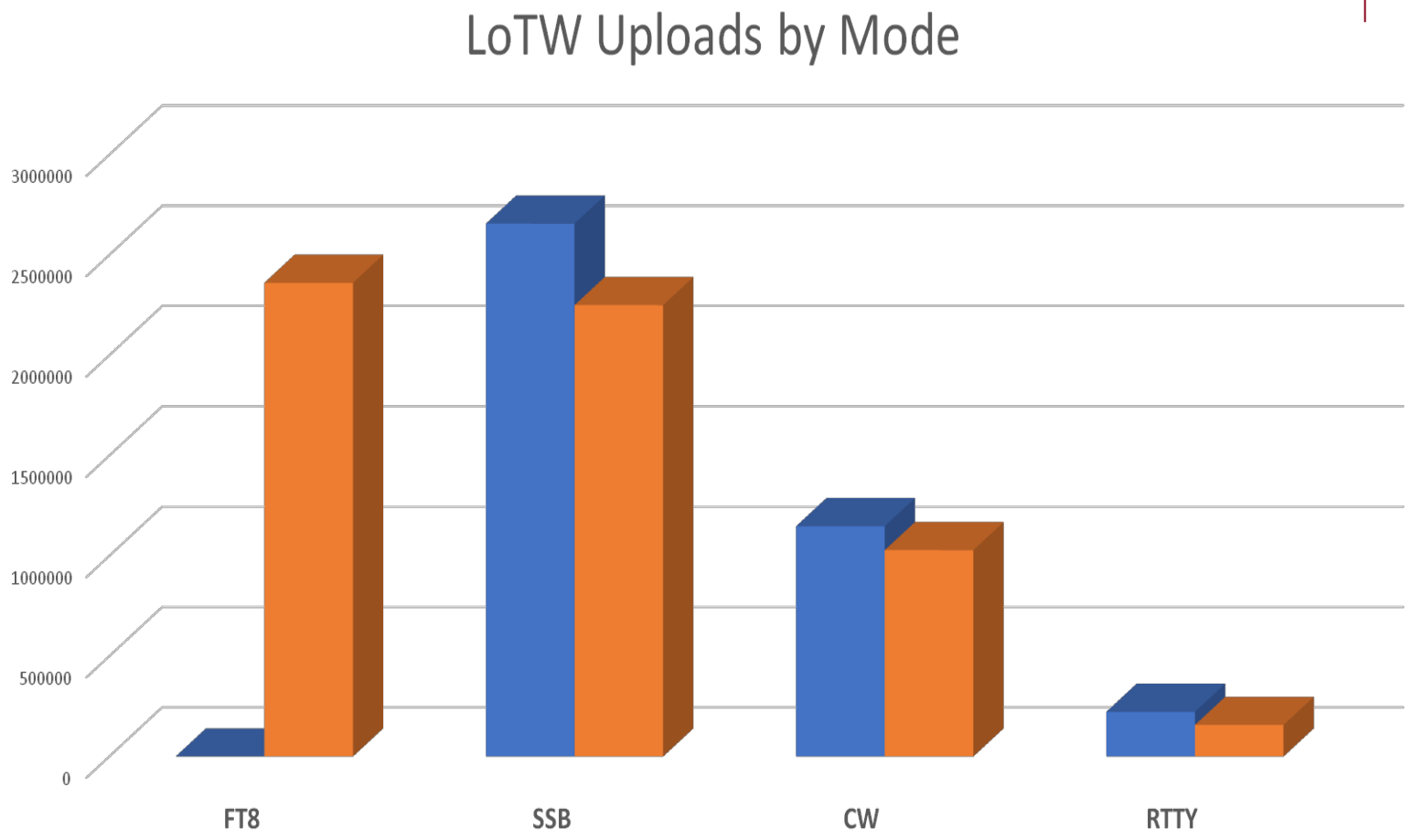
Digital Contesting is Fun!

- FT8 Explosion
- WSJT-X History
- FT8 Contests
- WSJT-X & FT8 QSOs
- Setup
- Optimizing WSJT-X
- Superfluous 73 and NILs
- FT8 vs. FT4

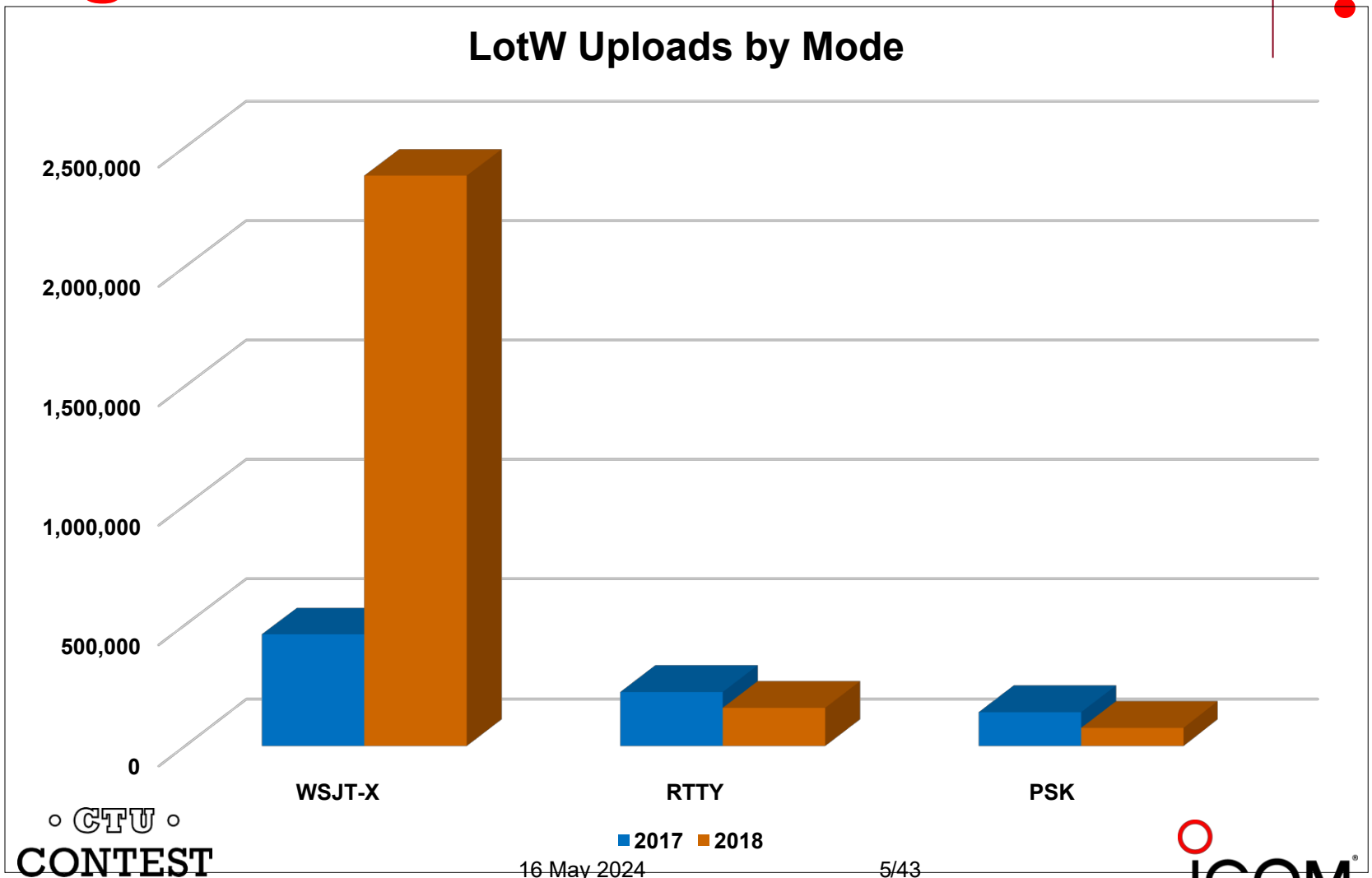
Clublog QSOs: 2017-2018



The FT8 Explosion



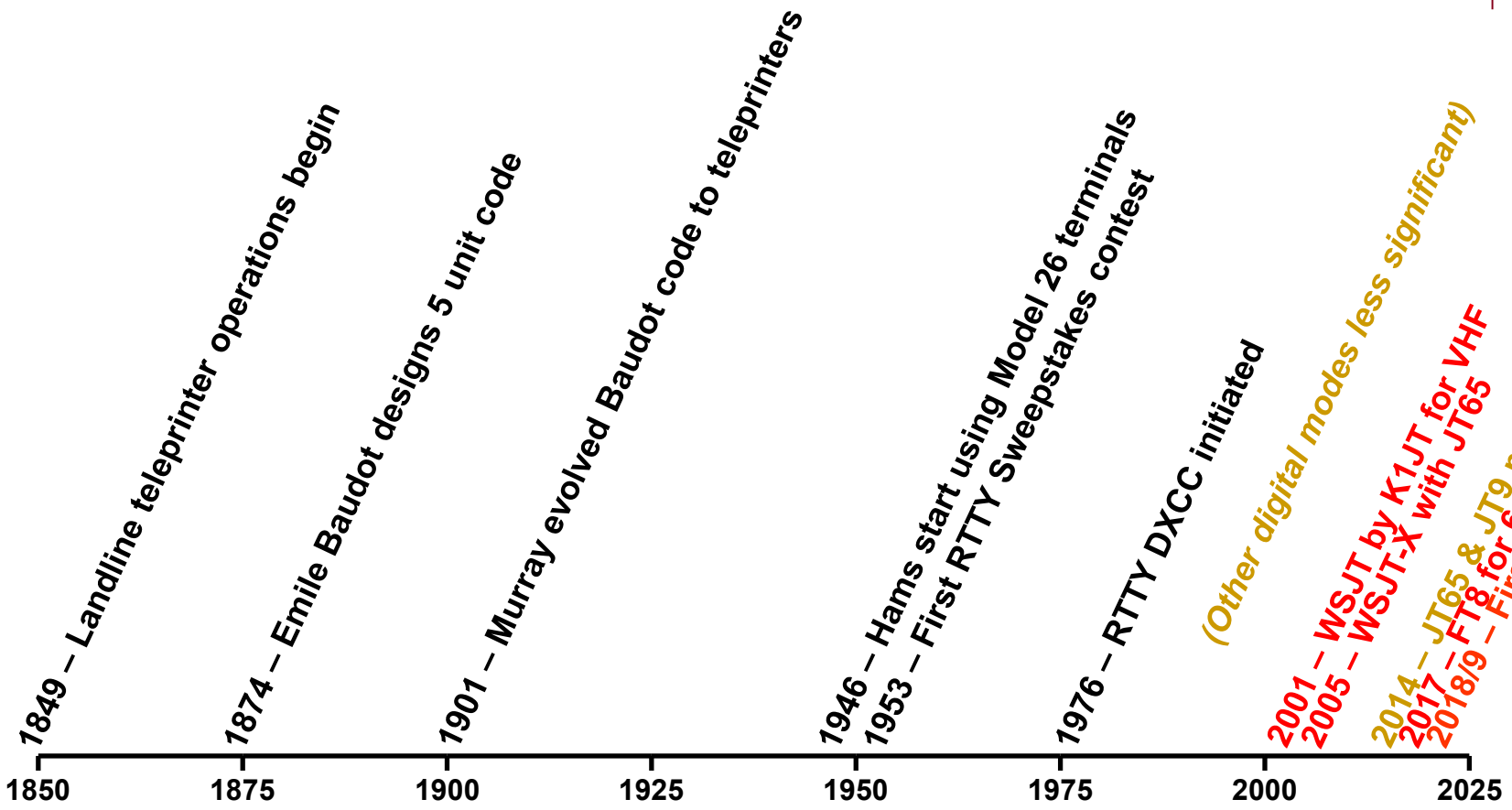
Digital Mode Trends



FT8 Software

- WSJT-X
- Derivatives:
  - WSJT-X Improved
  - JTDX
  - MSHV
  - DigiRite (WriteLog only)
  - WSJT-Z
  - JS8Call (conversational; non-contest)

RTTY & WSJT Timeline



WSJT & WSJT-X History

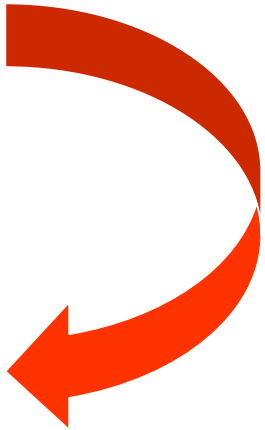
- 2001: WSJT (Weak Signal communication by Joe Taylor)
  - FSK441 for meteor scatter
- 2002: JT6M for ionospheric scatter
- 2003: JT65 VHF/UHF EME
  - Adopted for QRP HF DXing; 176 Hz bandwidth; 60 sec. transmission
- 2005: WSJT-X (-eXperimental)
  - Developed for EME; adapted by HF
  - Several modes (JT65, JT9, FT8, etc.)
  - TX/RX cycles synchronous with time servers
- 2014: JT9 for LF, MF and HF
  - 2 dB more sensitive than JT65; 16 Hz bandwidth
- Jun 2017: FT8 for 6m Es & HF
  - 50 Hz bandwidth; 15 second transmission
- May 2018: Baker Is. DXpedition > 11,000 FT8 HF QSOs
- Apr 2019: FT4 for “contesting”
  - 90 Hz bandwidth; 7.5 second transmission

WSJT-X Contest History

- 2005: WSJT-X
- Jun 2017: FT8 for 6m Es & HF
  - 50 Hz bandwidth; 15 second transmission
- May 2018: Baker Is. DXpedition > 11,000 FT8 HF QSOs
- *Dec 2018: FT8 Roundup (first WSJT-X HF contest)*
- *Jan 2019: ARRL RTTY Roundup (FT8 permitted)*
- *Apr 2019: FT8 DX Contest*
- Apr 2019: FT4 for "contesting"
  - 90 Hz bandwidth; 7.5 second transmission
- *Sep 2019: SCC RTTY Championship →WW Digi*
- *Jun 2022: ARRL International Digital*
- *Jan 2023: ARRL RTTY Roundup becomes RTTY-only*

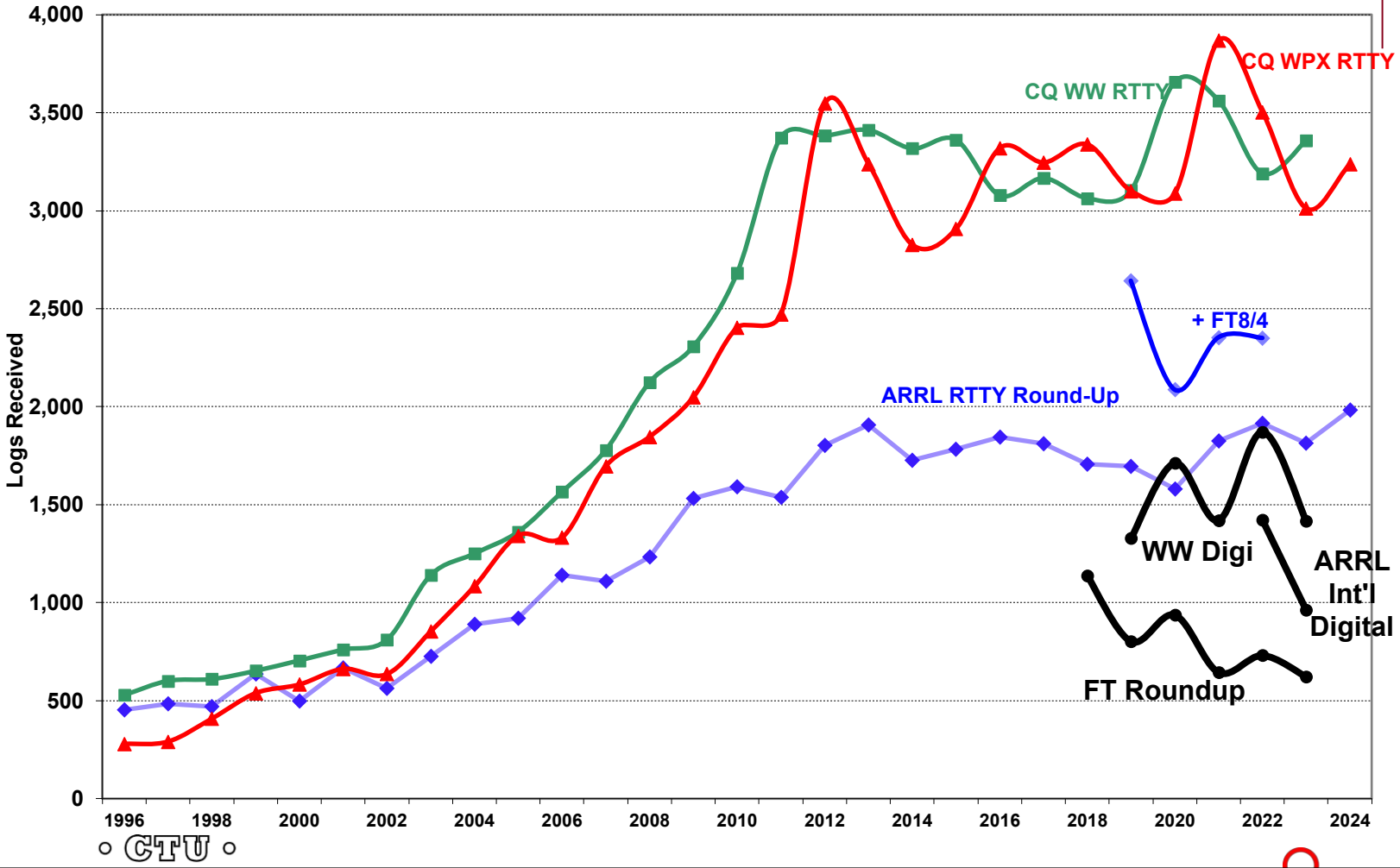
Three Major FT Contests

- ARRL RTTY Roundup [1st weekend in Jan]
  - 2019: FT8 added
  - 2020: FT4 added
  - 2022: RTTY-only or FT-only or Mixed
  - 2023: RTTY-only; no other modes



1. ARRL International Digital [1st weekend in Jun]
   - Distance-based scoring
2. WW Digi DX Contest [last weekend in Aug]
   - Same as ARRL Int'l Digital
     - plus Grid multipliers
     - minus 160m and 6m
3. FT Roundup [1st weekend in Dec]
   - RTTY Roundup rules →*New Format*

Three Largest FT4/8 Contests



FT4 NS (NCCC Sprint)

- https://www.ncccsprint.com/ft4ns.html
- Weekly practice
- Based on VE7AB's QSO rate increase
- Tim N3QE presentation in Digital Contest Forum Friday morning, Room 3, Xenia

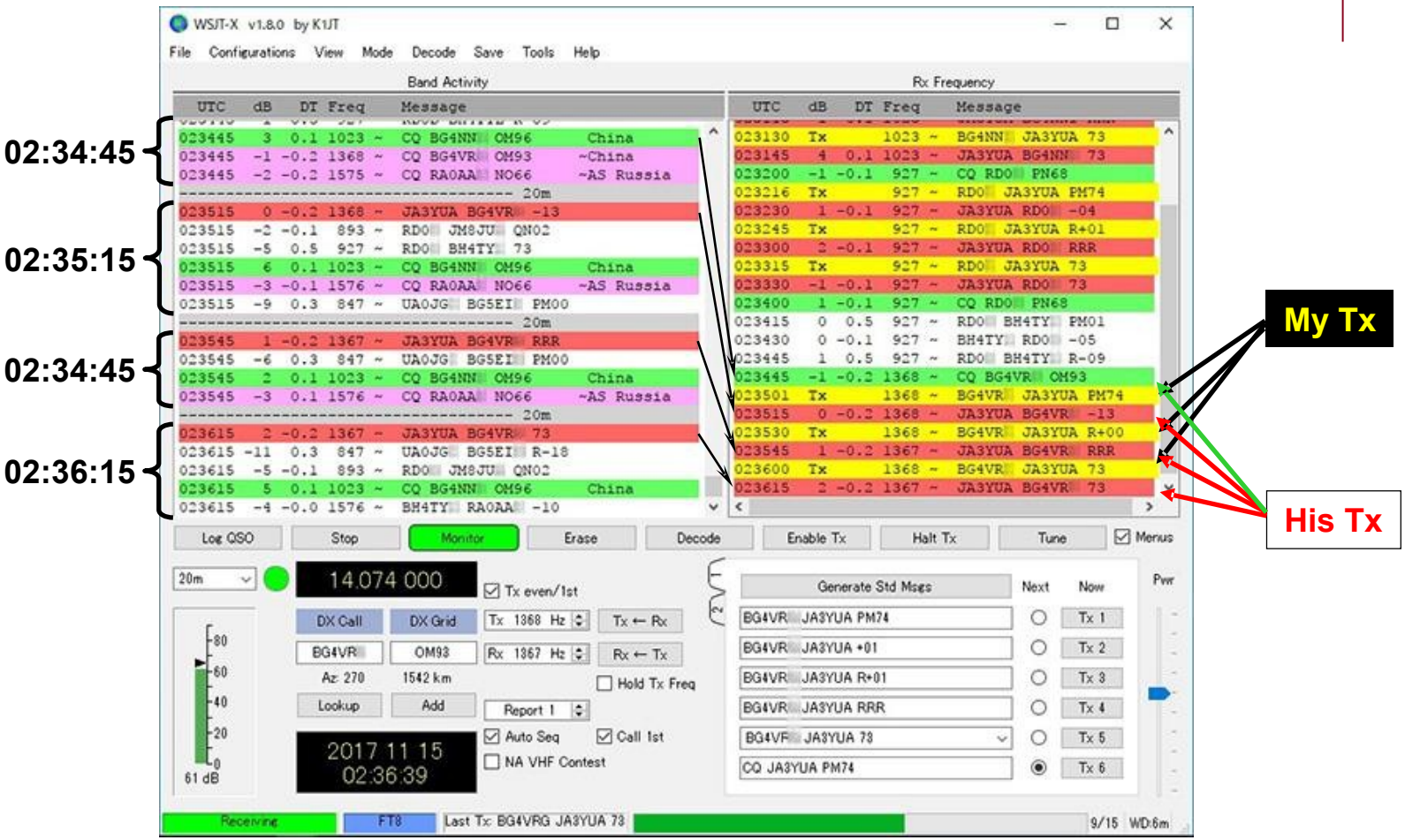
WSJT-X Overview

+ Multi-channel (external spotting and CQ vs. S&P irrelevant)
+ Weak signal (FT8 -13dB & FT4 -10dB compared to RTTY)
  + Longer DX
  + Lower power
  + Compromised antennas and/or QTH
+ Narrow bandwidth (4-176 Hz: FT8=50 Hz; FT4=90 Hz)
+ “Perfect” copy (Super Check Partial is irrelevant)

- Slow 1-6 minutes/QSO → 30 seconds (FT4)
- Limited, fixed messages → fine for contesting
- Minimal reaction time → message automation

FT8 Multi-Channel Reception

Run vs. S&P is irrelevant



FT8 Standard QSO

75-90 sec./QSO

- CQ K1ABC FN42
- W9XYZ K1ABC -11
- W9XYZ K1ABC RRR
- K1ABC W9XYZ EN37
- K1ABC W9XYZ R-09
- K1ABC W9XYZ 73 (superfluous 2nd QSL)

FT8 Short-Cycle QSO

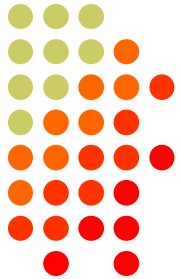
60 sec./QSO

- **CQ K1AB FN42**
- **W9XY K1AB R-11**
- **CQ K1AB FN42**, ***or***
  N5DEF K1AB R-07
- **K1AB W9XY -09** **(Tx2, not Tx1)**
- **K1AB W9XY RR73**, ***and***
  K1AB N5DEF -01

30 sec. rolling QSOs

FT8 DXpedition QSO

75 sec./QSO
60 sec./5 QSOs
(Fox/Hound)



QSO period 1
QSO period 2
QSO period 3

- CQ KH1/KH7Z
- K1ABC KH7Z -12
  <"CQ" for others>
- K1ABC RR73
  W9XYZ KH7Z -08
  W0YK KH7Z -13
  <"CQ" for others>
- W9XYZ KH7Z RR73
  W0YK KH7Z RR73

- KH7Z K1ABC FN42
- KH7Z K1ABC R-14
  KH7Z W9XYZ EN37
  KH7Z W0YK CM97
  etc.
- KH7Z W9XYZ R-11
  KH7Z W0YK R-15
  KH7Z K9YC CM87
  KH7Z W6OAT CN87
  etc.

WW Digi QSO

60-75 sec./QSO
30 sec./rolling QSO

QSO period 1
QSO period 2
QSO period 3

- CQ WW K1ABC FN42
- W9XYZ K1ABC R-FN42
  (implicit "CQ" for others)
- W0YK K1ABC R-FN42
  (implicit "2nd QSL" for W9XYZ)
  (implicit "CQ" for others)
- P49X K1ABC R-FN42
  (implicit "2nd QSL" for W0YK)
- P49X K1ABC 73
  (superfluous 2nd QSL)
- K1ABC W9XYZ EM05
- K1ABC W9XYZ RR73
  K1ABC W0YK CM97
- K1ABC W0YK RR73
  K1ABC P49X FK52
- K1ABC P49X RR73

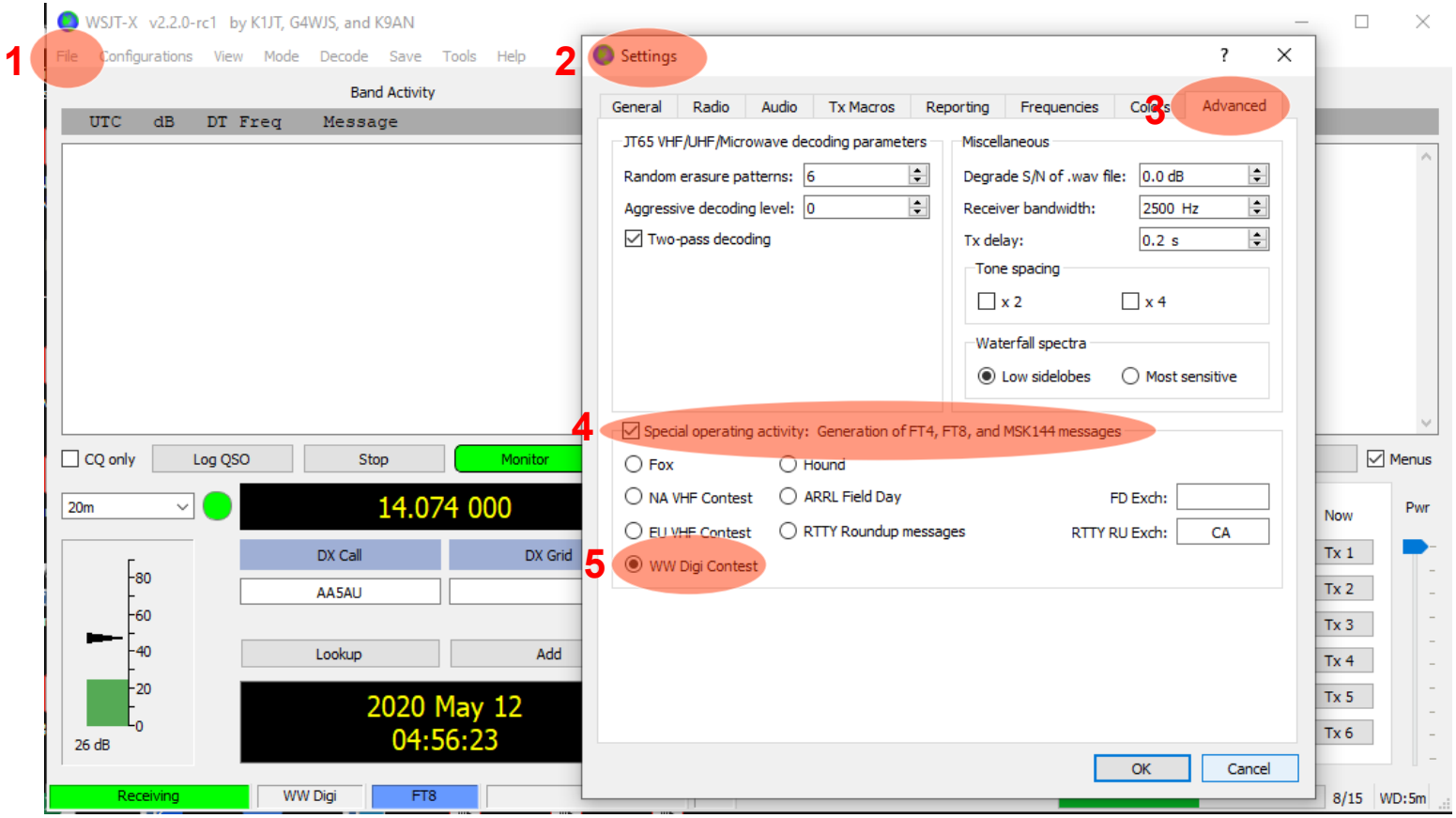
WW Digi QSO

60-75 sec./QSO
30 sec./rolling QSO

QSO period 1
QSO period 2
QSO period 3

- CQ WW K1ABC FN42
- W9XYZ K1ABC R-FN42
  (implicit "CQ" for others)
- K1ABC W9XYZ EM05
- K1ABC W9XYZ RR73
  K1ABC W0YK CM97
- W0YK K1ABC R-FN42
  (implicit "2nd QSL" for W9XYZ) ← W9XYZ may want 73
  (implicit "CQ" for others)
- K1ABC W0YK RR73 ← repeat K1ABC W9XYZ RR73
  K1ABC P49X FK52
- P49X K1ABC R-FN42
  (implicit "2nd QSL" for W0YK) ← W0YK may want 73
- K1ABC P49X RR73 ← repeat K1ABC W0YK RR73
- P49X K1ABC 73
  (superfluous 2nd QSL)

WW Digi DX Contest



Setting Up for FT8

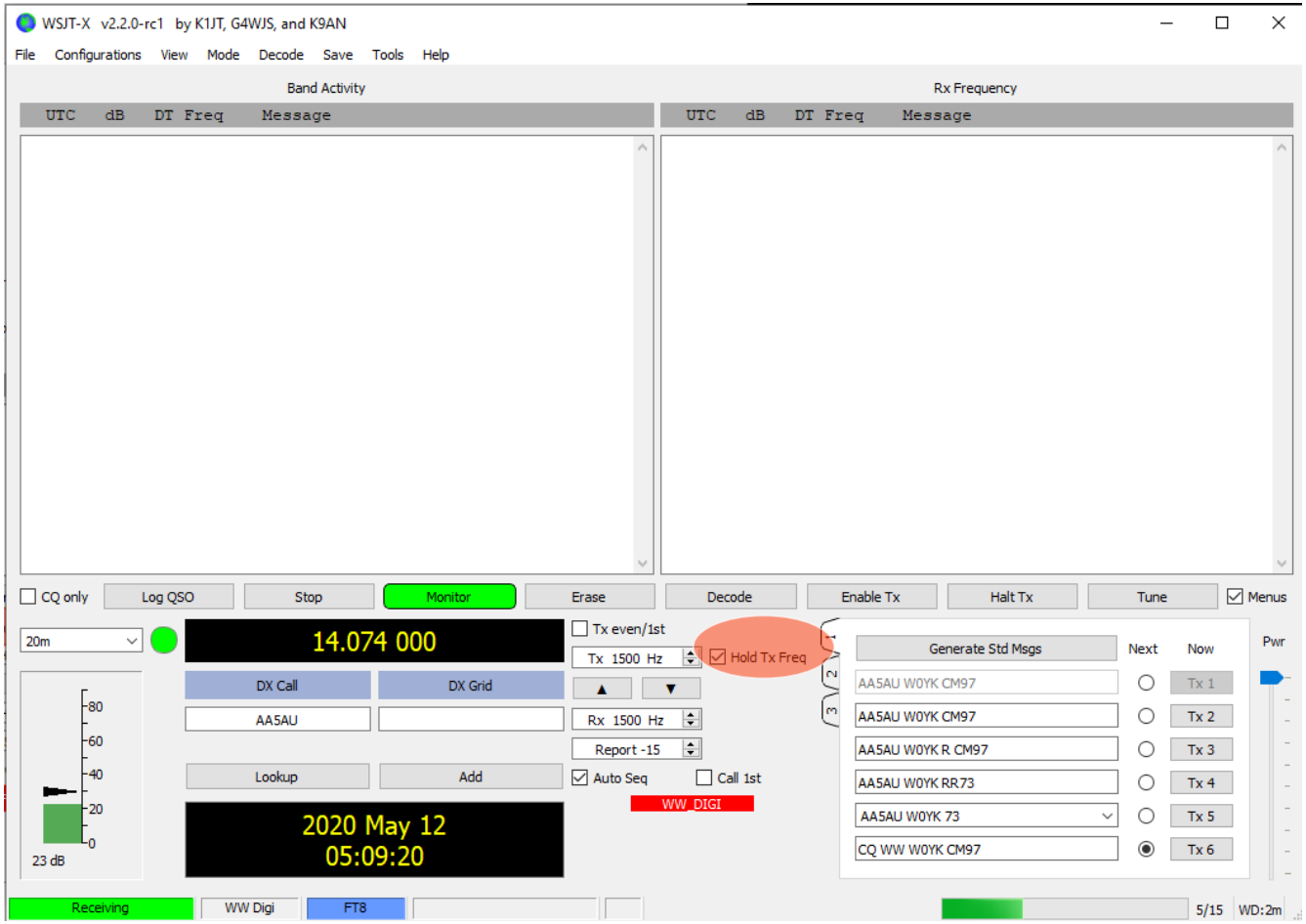
- Download/install WSJT-X
  - Alternatively one of the derivatives
- Hardware (radio and PC) same as AFSK
- Study the:
  - Quick Start Guide to WSJT-X 2.0, and
  - the WSJT-X User Guide

Time Synchronization

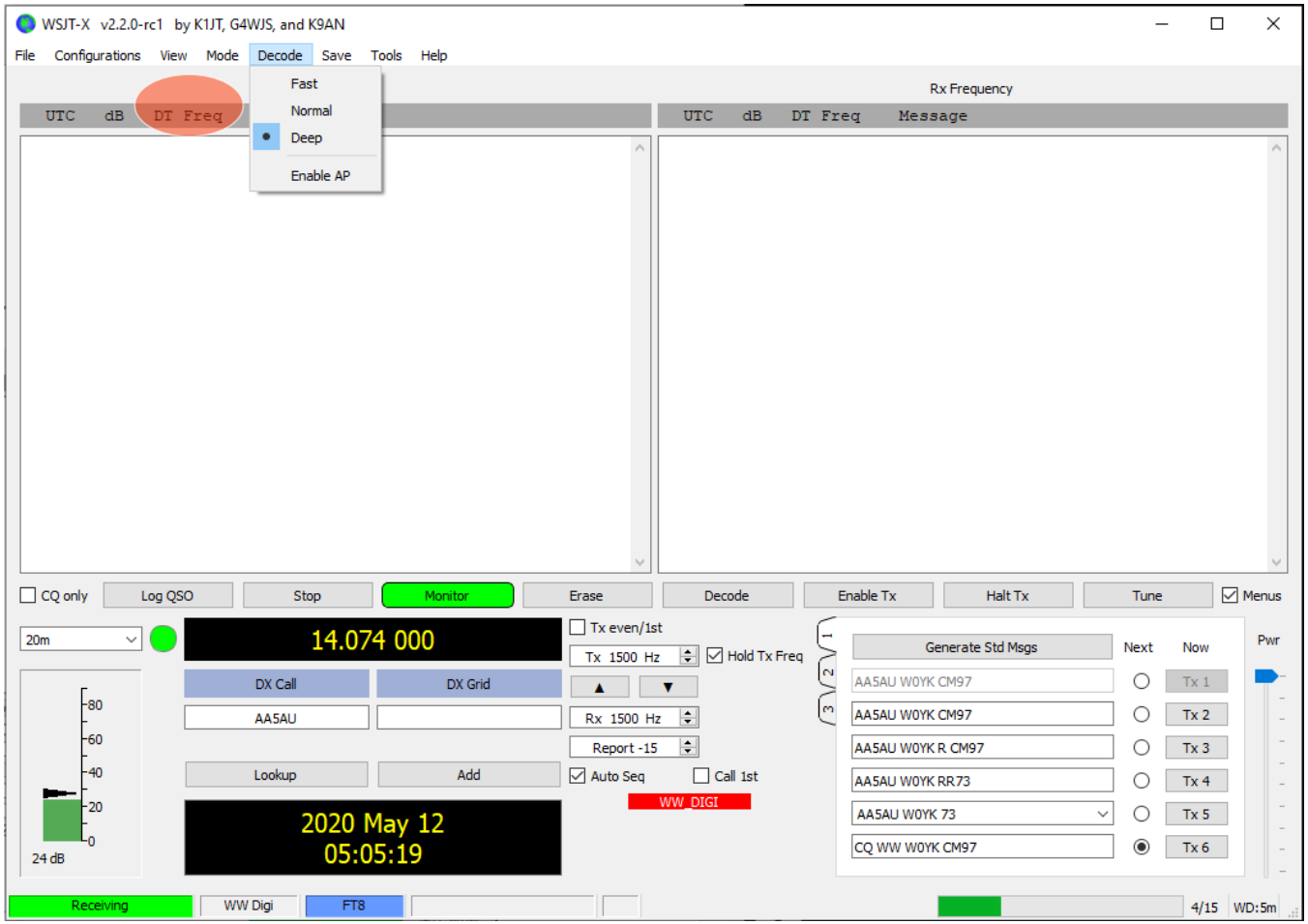
mandatory for reliable QSOs

- **Windows Internet Time Sync**
  - **Weekly updates**
  - **Can be unreliable**
- **Alternatives**
  - **Meinberg NTP (recommended by K1JT)**
  - **NetTime (recommended by W0YK)**
  - **Dimension 4**
  - **Atomic Clock Sync**

Split Transmit

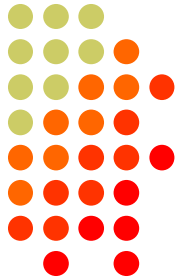


Deep Decode


WSJT-X v2.2.0-rc1 by K1JT, G4WJS, and K9AN
File Configurations View Mode Decode Save Tools Help
Fast
Normal
Deep
Enable AP
Rx Frequency
UTC dB DT Freq
UTC dB DT Freq Message
CQ only
Log QSO
Stop
Monitor
Erase
Decode
Enable Tx
Halt Tx
Tune
Menus
20m
14.074 000
Tx even/1st
Tx 1500 Hz
Hold Tx Freq
DX Call
DX Grid
AA5AU
Rx 1500 Hz
Report -15
Lookup
Add
Auto Seq
Call 1st
WW_DIGI
2020 May 12
05:05:19
24 dB
Generate Std Msgs
Next
Now
Pwr
AA5AU W0YK CM97
AA5AU W0YK CM97
AA5AU W0YK R CM97
AA5AU W0YK RR73
AA5AU W0YK 73
CQ WW W0YK CM97
Tx 1
Tx 2
Tx 3
Tx 4
Tx 5
Tx 6
Receiving
WW Digi
FT8
4/15
WD:5m

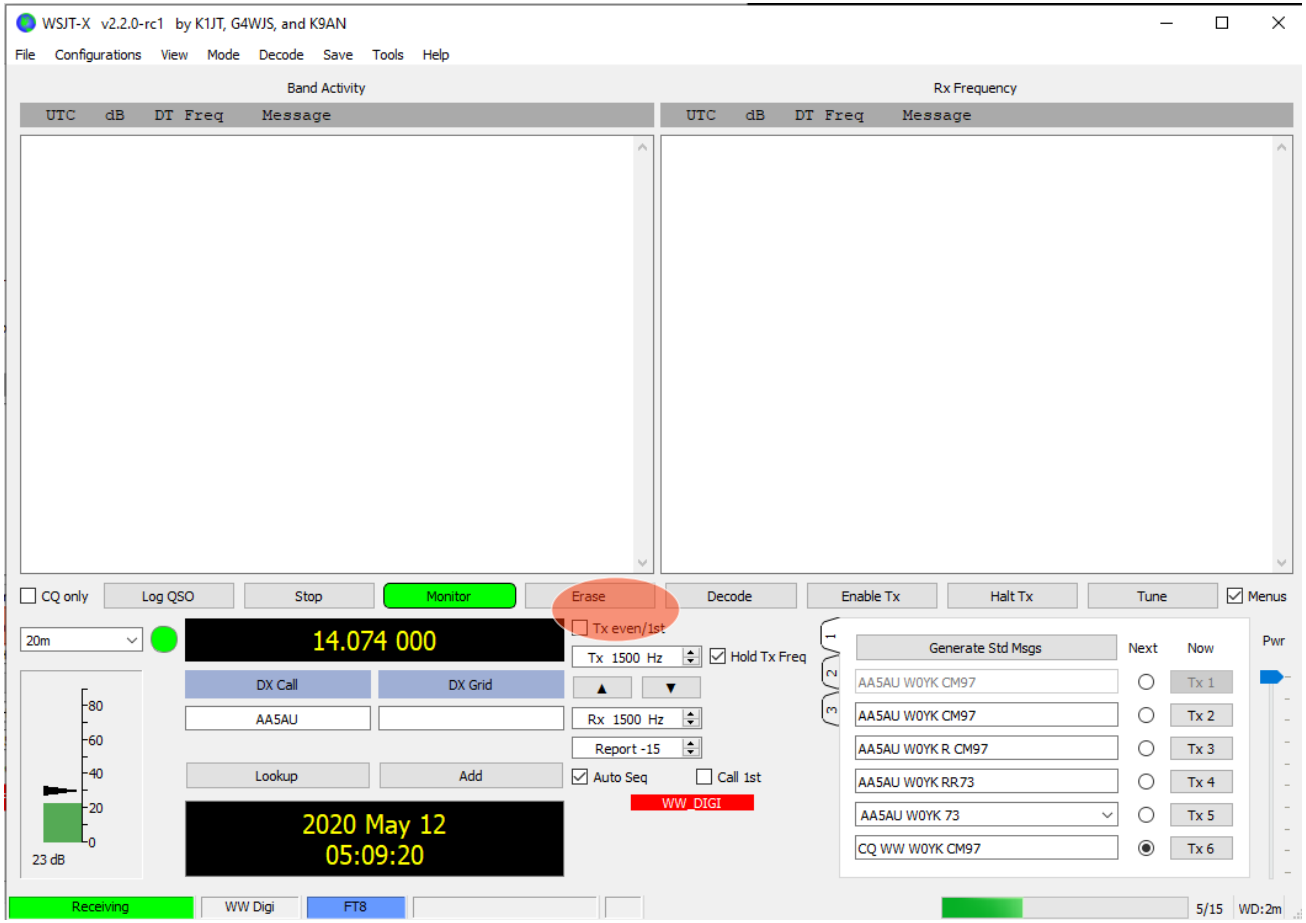
Sub-Band Choices

Int'l Digi, WW Digi, FT RU

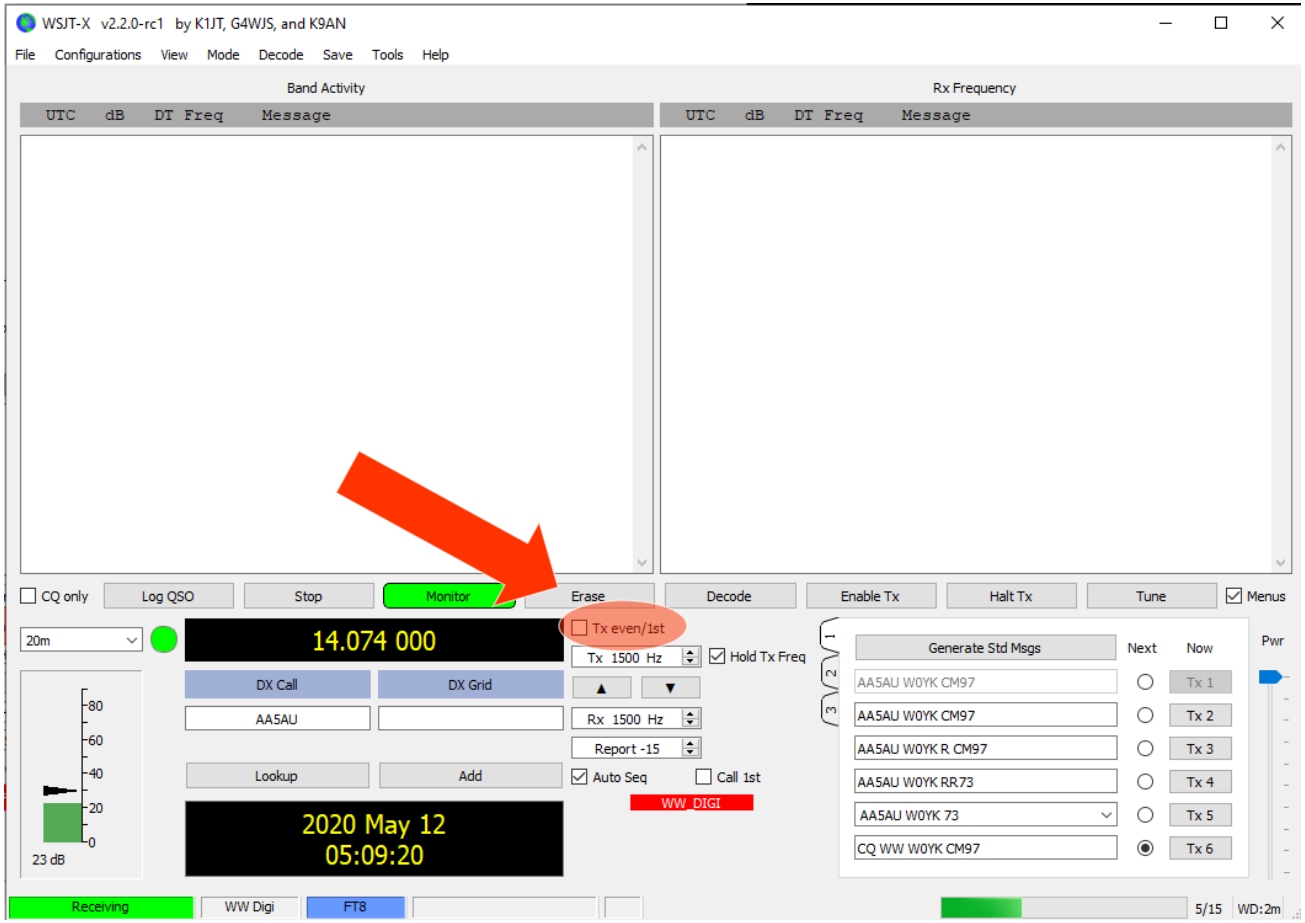


- Suppressed-Carrier dial frequency
  - FT4: 14080 *(now also the daily default)*
  - FT8: 14090
- Use receiver's maximum BW: 2.5-4 kHz
- QSO partner > 3 kHz … call above 3 kHz
- Move dial frequency up in 3 kHz increments

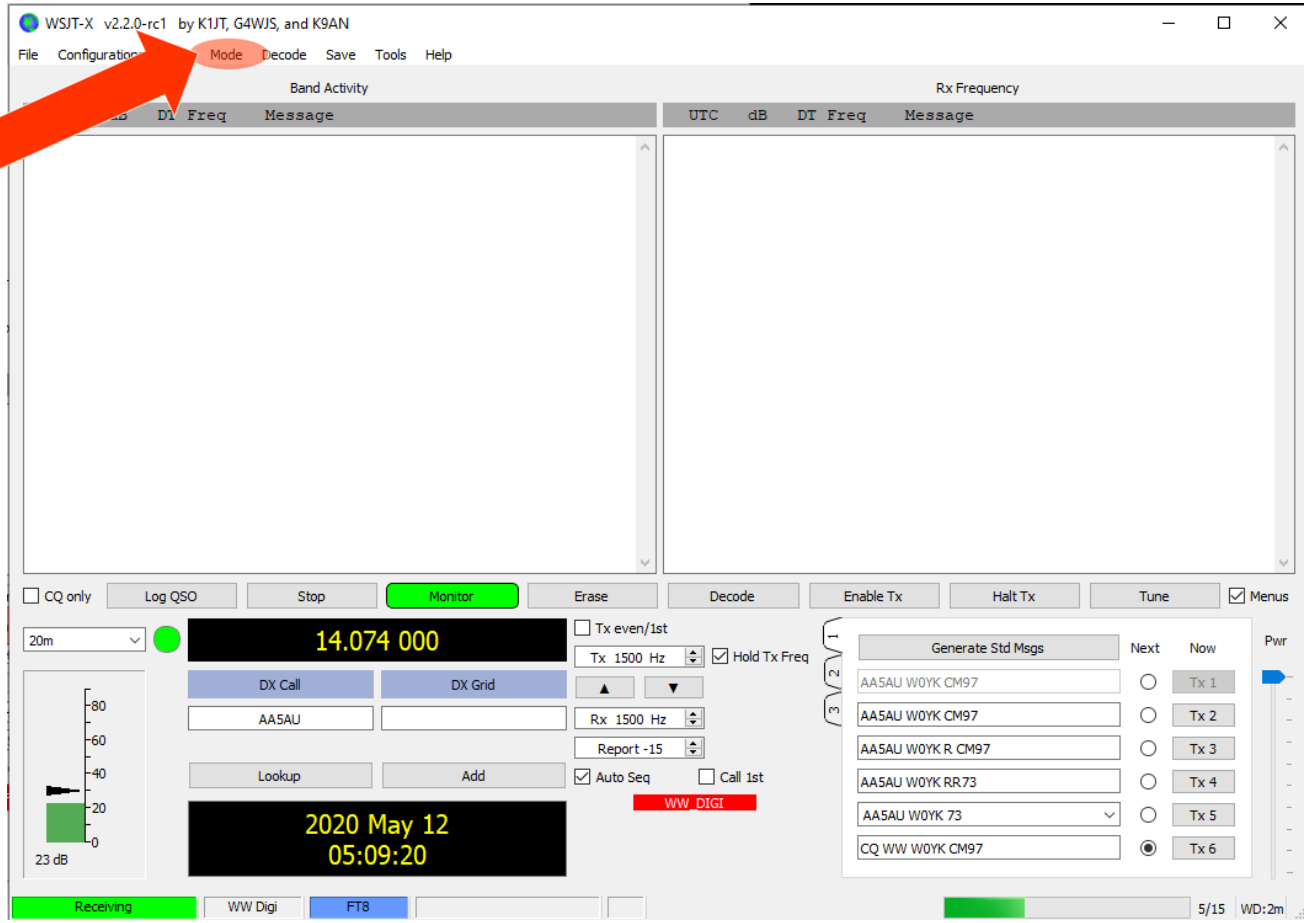
Utilize Odd/Even Cycles



Rotate Odd/Even Cycles



Rotate FT4/FT8 Modes



FT Repeat Protocol

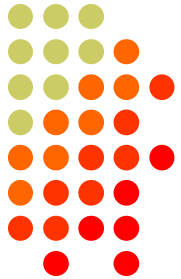
CQ W0YK CM97	
W0YK AA5AU EL92	*←AA5AU calls with exch*
AA5AU W0YK R CM97	*←W0YK QSL's with exch*
W0YK AA5AU RR73	*←AA5AU QSL's*
AA5AU W0YK R CM97	*←W0YK missed QSL msg*
W0YK AA5AU RR73	*←AA5AU repeats QSL*

Working Non-Contesters

- Depends on contest
  - SNR (no contests yet)
  - Grid Square exchange (S&P only)
  - QTH, serial number, name, etc.
- Transparant … unless
  - Non-contester skips Tx2, answering with Tx3
- *Recommendation: Don't call CQ, only answer CQs or messages with Grid Square*

Minimizing NILs

e.g. WW Digi

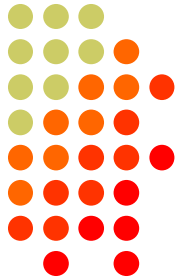


- **FT contest NILs are high**
  - **RTTY is 1-2%, FT is 5-6%**
- **QSO partners disagree on QSO completion**
  - **One doesn't log, the other logs (and, gets a NIL)**

CQ W0YK CM97	
W0YK AA5AU EL92	*←AA5AU answers with exch*
AA5AU W0YK R CM97	*←W0YK QSLs with exch*
W0YK AA5AU RR73	*←AA5AU QSLs*
AA5AU W0YK 73	*←W0YK QSLs AA5AU's QSL!*
	←when does it end?

Minimizing NILs

QSO Requirements



- **Each QSO partner sends:**
  - **Call sign**
  - **Exchange**
  - **QSL**

WW Digi QSO

CQ W0YK CM97	←*W0YK call*
W0YK AA5AU EL92	←*AA5AU call & exch*
AA5AU W0YK R CM97	←*W0YK QSL & exch*
W0YK AA5AU RR73	←*AA5AU QSL*
AA5AU W0YK 73	←*W0YK QSLs AA5AU's QSL!*

This wastes time because W0YK could have used the message to CQ or answer another caller.

WW Digi Alternative QSO

context

CQ W0YK CM97

W0YK AA5AU EL92 ←*AA5AU calls with exch*

AA5AU W0YK R CM97 ←*W0YK QSL's with exch*

W0YK AA5AU RR73 ←*AA5AU QSL's*

CQ W0YK CM97 ←*W0YK calls CQ,*

or

AC0C W0YK R CM97 ←*W0YK rolls into next QSO*

AA5AU then knows, by context,

that W0YK received his QSL message

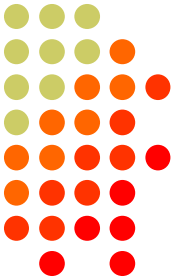
WW Digi Alternative QSO

message repeat

CQ W0YK CM97	
W0YK AA5AU EL92	←*AA5AU calls with exch*
AA5AU W0YK R CM97	←*W0YK QSL's with exch*
W0YK AA5AU RR73	←*AA5AU QSL's*
AA5AU W0YK R CM97	←*W0YK missed QSL msg*
W0YK AA5AU RR73	←*AA5AU repeats QSL*

Two Generals Problem [1,2]

unreliable communication



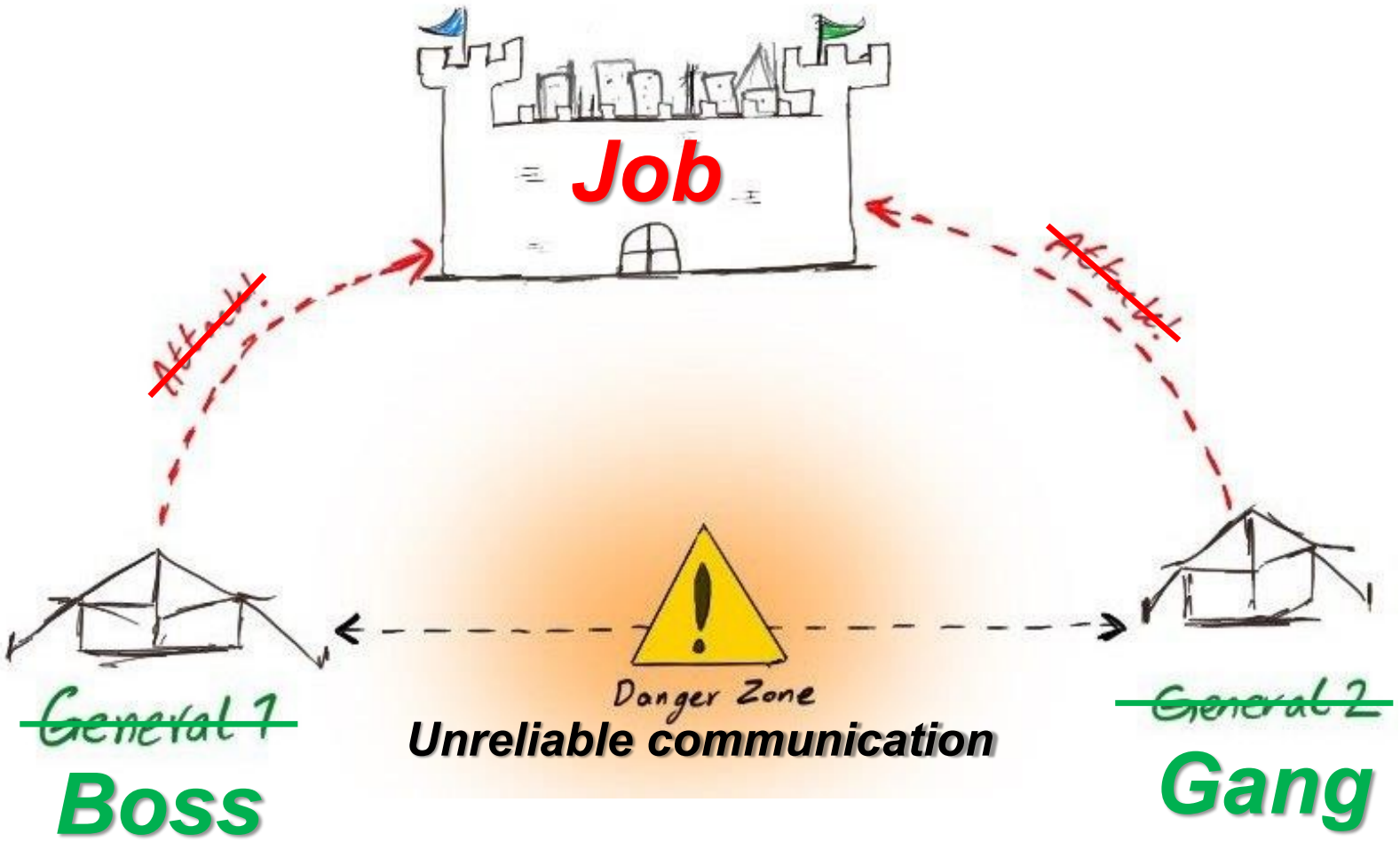
- 1975 computer science thought experiment
- Communication over an unreliable link
  - e.g., TCP
- ACKs could theoretically be infinite
- Solution
  - Accept some uncertainty; don't try to eliminate
  - Mitigate to reduce consequence(s)

[1] E. A. Akkoyunlu, K. Ekanadham, and R. V. Huber, 1975 "Some Constraints and Trade-offs in the Design of Network Communications", page 73

[2] Jim Gray, 1978 "Notes on Data Base Operating Systems", page 465

The Gangsters Paradox

~~Two Generals Problem~~



Radiosport Solution

CW, SSB & RTTY

- Each QSO partner QSLs the exchange ***once***
- Context reduces uncertainty
  - Other station doesn't repeat their last message
  - Other station doesn't ask for a repeat
  - Other station rolls into their next QSO

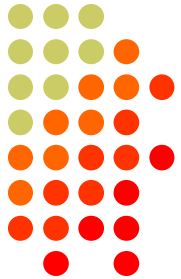
Radiosport Solution

FT4 & FT8

- One QSO partner QSLs the ***QSL***
- Implied by default WSJT-X logging behavior
- Defacto expectation
  - Many FT ops won't log the QSO without this superfluous QSL of the final QSL
  - Thus, NIL rate increases
    - CW, SSB & RTTY = 1-2%
    - FT = 5-6%

Minimizing NILs

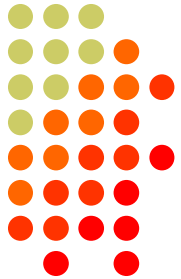
Recommendation #1



- **Develop skill to dynamically change message**
  - **e.g., use the Alternate F1-F6 keys in WSJT-X**
- **Always log the QSO when receiving a RRR, RR73 or 73 message.**
- **Always log the QSO when sending RRR, RR73 or 73 message.**
  - **Look for a clue that your message was not received, e.g., your QSO partner re-sends his report.**

Minimizing NILs

Recommendation #2



- **Give in!**
  - **Send the superfluous 73, but**
  - **Don’t require it from your QSO partner**
- **Yes, it’s unnecessarily slower, but**
  - **FT contesting is currently slow enough to absorb it**

FT8 vs. FT4 Strategy

- FT4 is faster; FT8 decodes better
  - Intrinsic vs. extrinsic speed
    - FT4 is intrinsically 2x the speed of FT8
    - FT8 is more likely to decode
    - Either might be extrinsically faster at a given time
  - Dynamically use the mode with:
    - the highest QSO rate, or
    - the most multipliers
- New stations & multipliers in each mode

Resources

- Thursday night practice
  - https://www.ncccsprint.com/ft4ns.html
- Software Email reflectors
  - wsjt-devel@lists.sourceforge.net (WSJT-X)
  - n1mmloggerplus@groups.io (N1MM Logger+)
  - digirite@groups.io (DigiRite)
  - writelog@contesting.com (WriteLog)
- Tutorials for WW Digi DX Contest
  - rttycontesting.com/tutorials/n1mm/operating-ww-digi-with-n1mm/ N1MM/WSJT-X
  - rttycontesting.com/tutorials/writelog3/digirite/ WriteLog/DigiRite
- Software web sites
  - physics.princeton.edu/pulsar/K1JT/wsjtx.html (WSJT-X)
  - n1mm.hamdocs.com/tiki-index.php (N1MM Logger+)
  - https://writelog.com/digirite (DigiRite)
  - www.writelog.com (WriteLog)