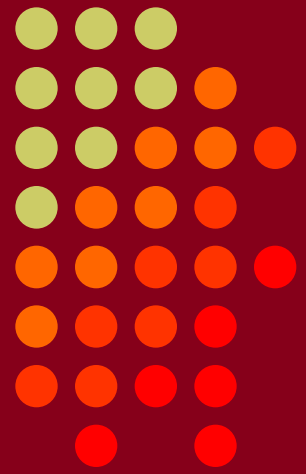
Tips to Improve Your RTTY Contest Performance

Ed Muns, W0YK / P49X



• CTU •
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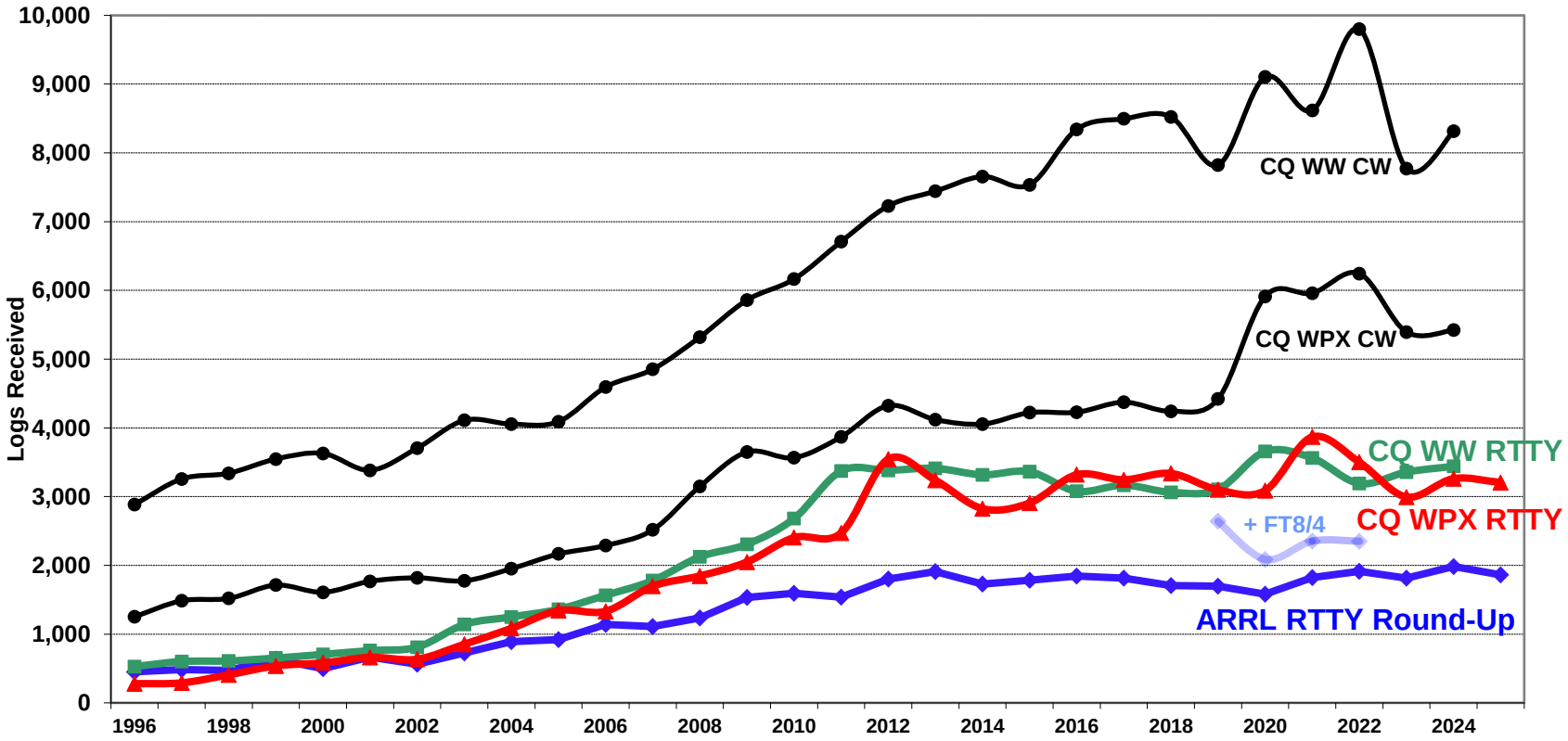
Three Largest RTTY Contests

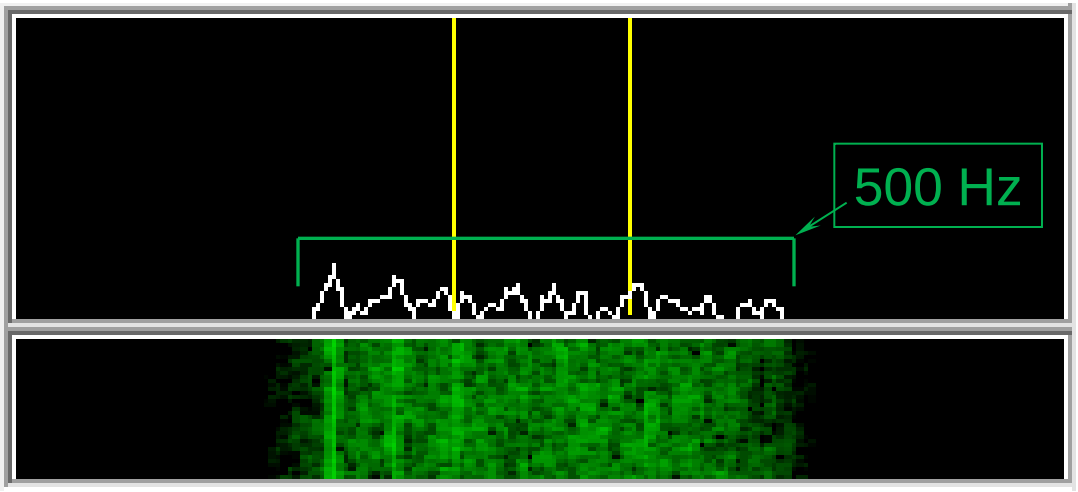


Tips

- Receiving
- Transmitting
  - AFSK vs. FSK
  - Bandwidth
- UOS
- Messages
- Sub-Bands
- RTTY Considerations
- Miscellaneous Tips
- Call Sign Queueing
- Multiple Decoders
  - MMTTY
  - 2Tone
  - Gritty
- Multiple Streams
  - SO2V
  - SO2R
  - SOnR

Receiving

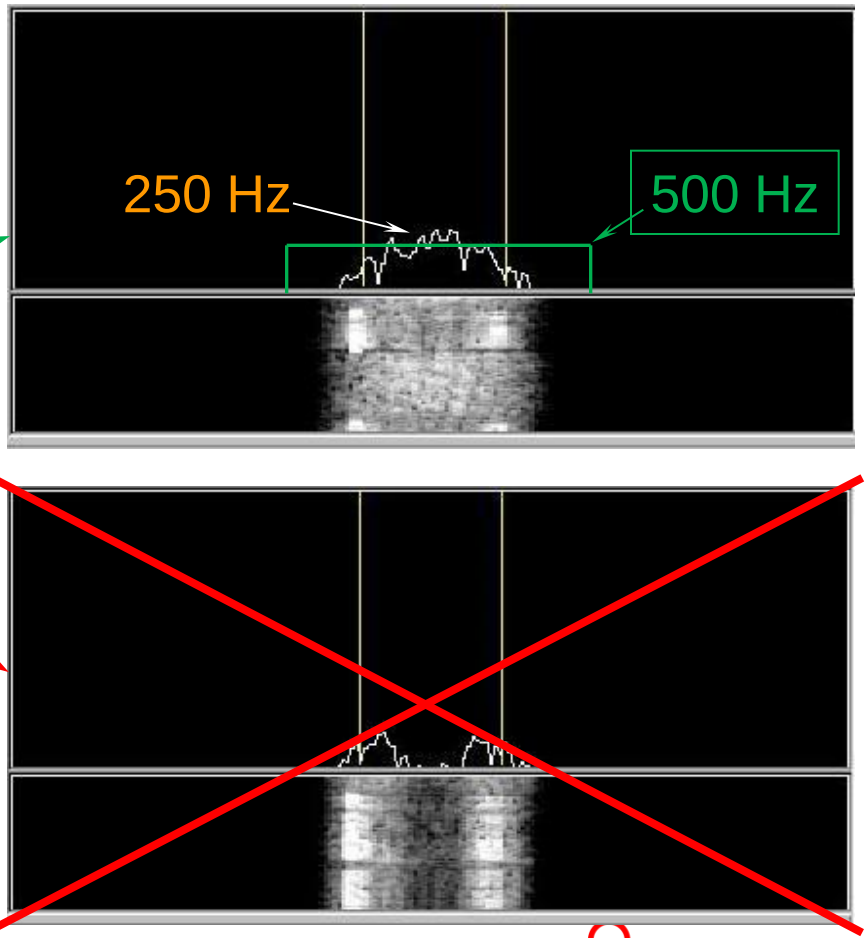
audio level



- Set RX audio level with no-signal at 5% of full-scale
  - Receiver audio out level control, and/or
  - *Windows* Recording Volume Control applet

Receiving

radio IF filtering

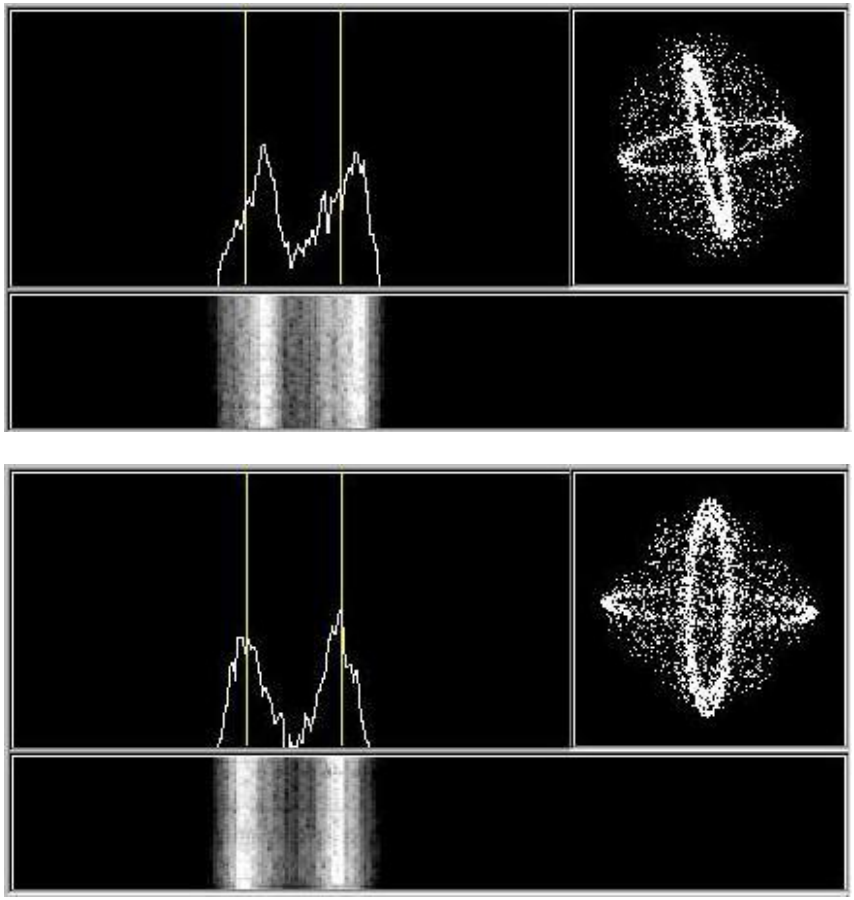


Narrow IF filters

- **500 Hz** - normal
- **250 Hz** - extreme QRM
- Tone filters – don't use!
  - Icom Twin Peak Filter
  - K3/K4 Dual-Tone Filter

Receiving

tuning a RTTY signal



Learn to tune by ear

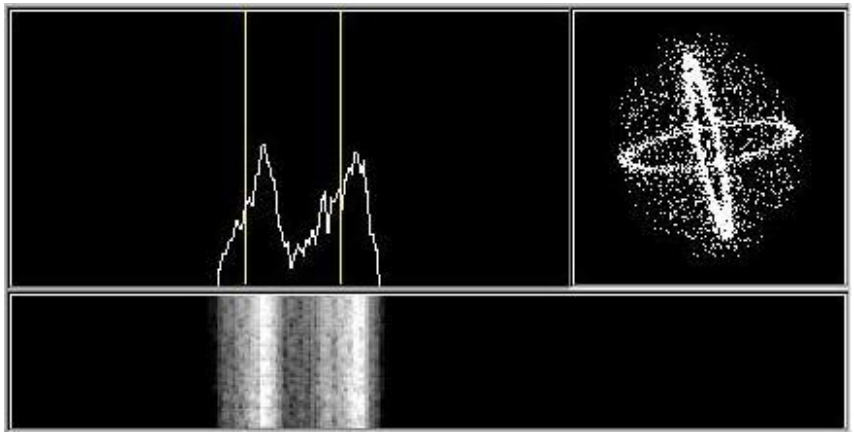
- practice with eyes closed
- get within 10-20 Hz

Receiving

AFC

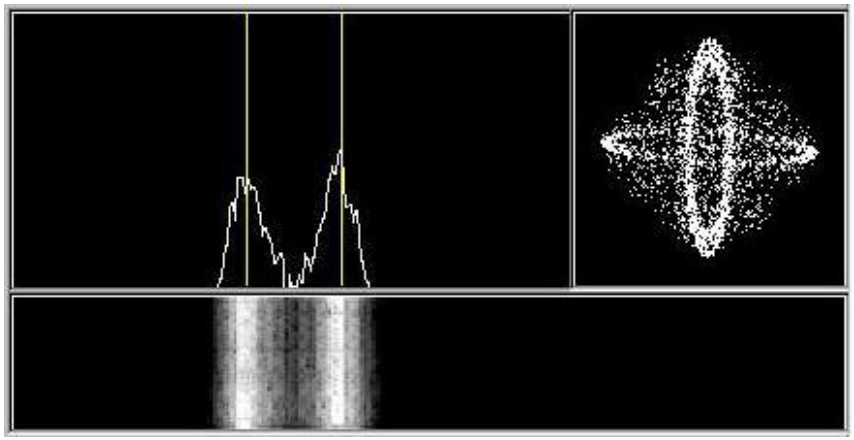
For AFSK, if AFC On:

- Run: NET Off
  - Locks TX freq.
- S&P: NET On
  - Moves TX freq. = RX freq.



For FSK:

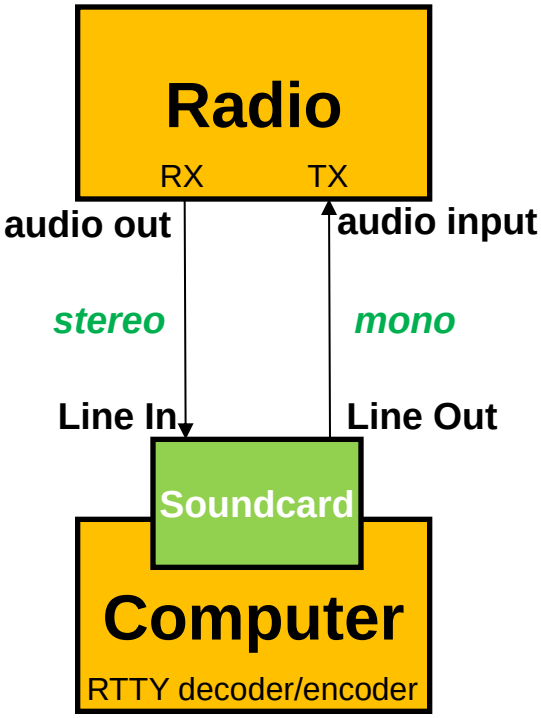
- Run: can use AFC
  - TX freq. always locked
- S&P: turn AFC off
  - Otherwise, TX freq. ≠ RX freq.



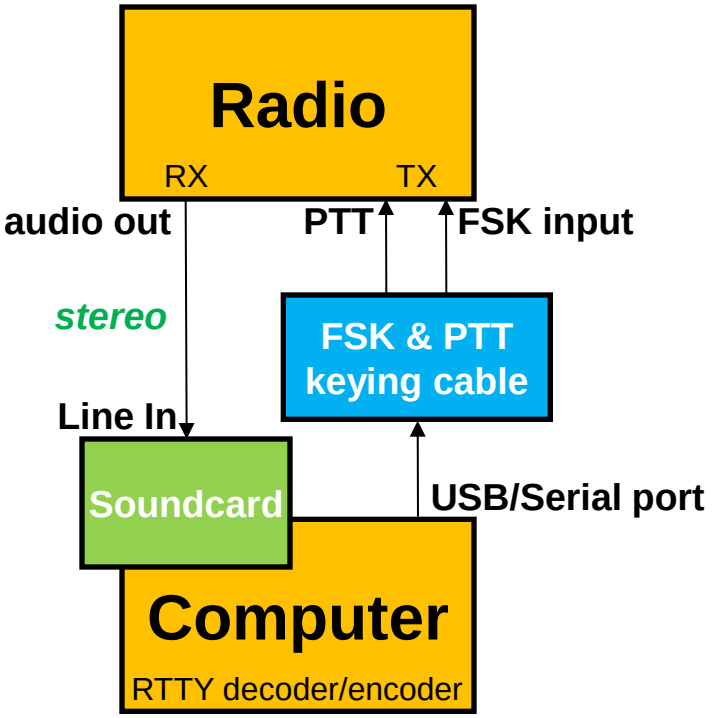
Transmitting

AFSK vs. FSK

AFSK



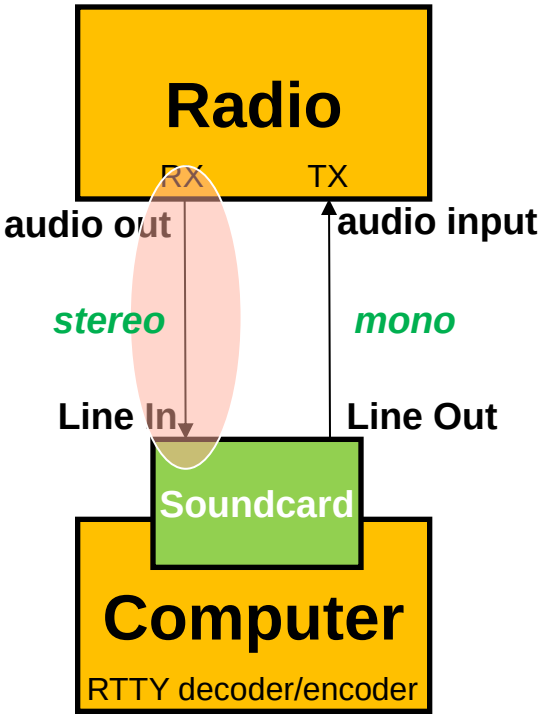
FSK



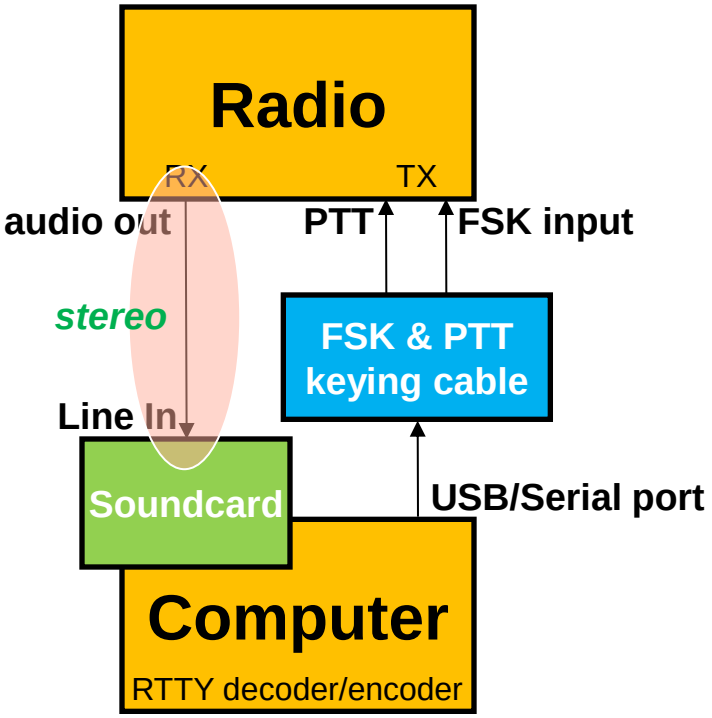
Transmitting

receive method identical

AFSK



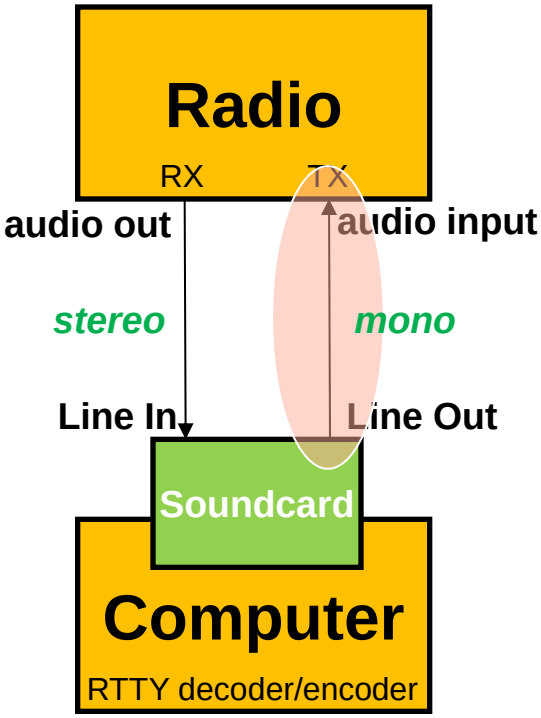
FSK



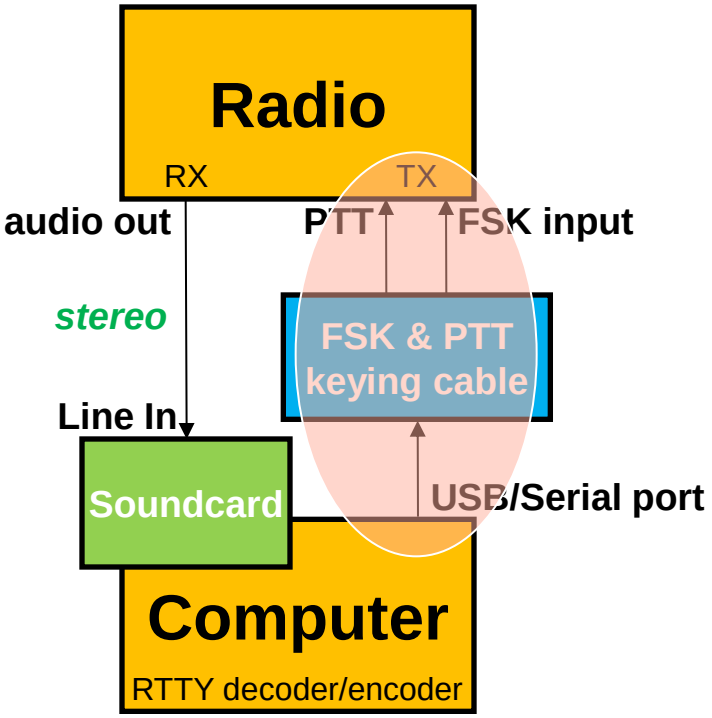
Transmitting

different transmitter method

AFSK



FSK



Transmitting

spots are often wrong

- RTTY frequency = Mark frequency
- RTTY radio frequency definition:
  - The higher RF frequency is the Mark *(14090.000 kHz)*
  - The lower RF frequency is the Space *(14089.830 kHz)*
  - The difference between the two is the shift *(170 Hz)*

Transmitting

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- RTTY frequency = Mark frequency
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- ***FSK*** displays Mark *(dial = 14090.000 kHz)*

Transmitting

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- RTTY frequency = Mark frequency
- RTTY radio frequency definition:
  - The higher RF frequency is the Mark *(14090.000 kHz)*
  - The lower RF frequency is the Space *(14089.830 kHz)*
  - The difference between the two is the shift *(170 Hz)*
- ***FSK*** displays Mark *(dial = 14090.000 kHz)*
- ***AFSK*** displays suppressed carrier (NOT the Mark*) which varies with local audio tones and sideband used!
  - For tones of 2125 Hz and 2295 Hz:
    - LSB: Mark = 2125, Space = 2295 *(dial = 14092.125 kHz)*
    - USB: Mark = 2295, Space = 2125 *(dial = 14087.005 kHz)*

**except for K3, K4, etc. AFSK mode*

Transmitting

AFSK adjustment

Insure SSB processor (compression) is Off.

- For desired power, adjust:
  - the *Windows* Playback Volume control, and/or
  - the transmitter Mic (or auxiliary audio input)
- Carefully adjust ALC:
  - Reduce ALC until power starts to decrease, then
  - advance ALC slowly, only until
  - power stops increasing:
    - ALC too low < full power output
    - ALC too high = distortion

Transmitting

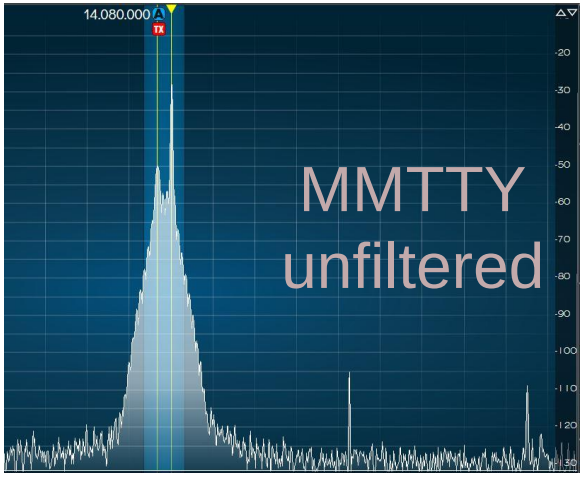
bandwidth

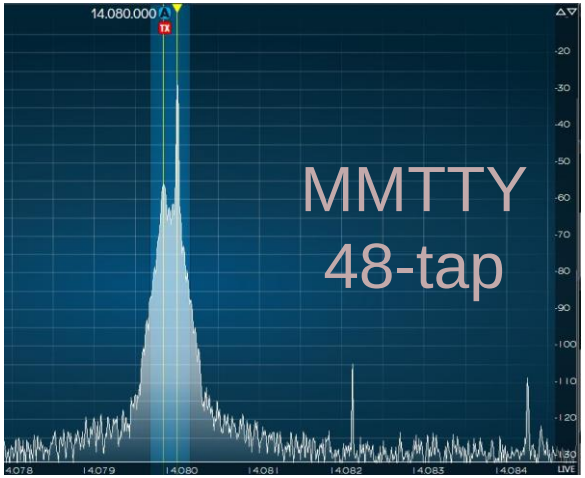
- Wasted power outside receiving decoder BW
  - Suitably narrow TX BW effectively amplifies signal
- Unnecessary QRM
  - Wide 1.5 KW RTTY can QRM 5-10 channels
  - Similar to CW key click problem

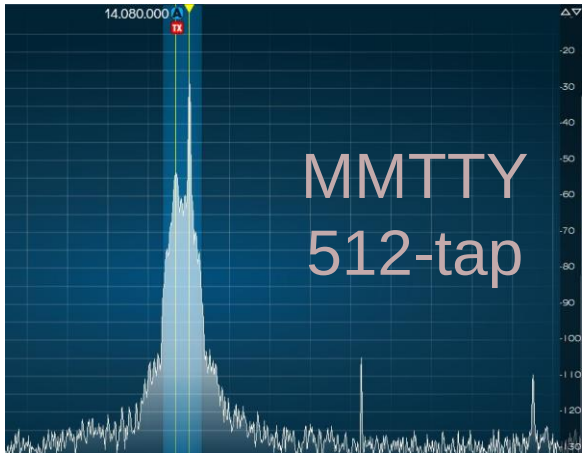
Why hurt yourself AND QRM close-by stations?

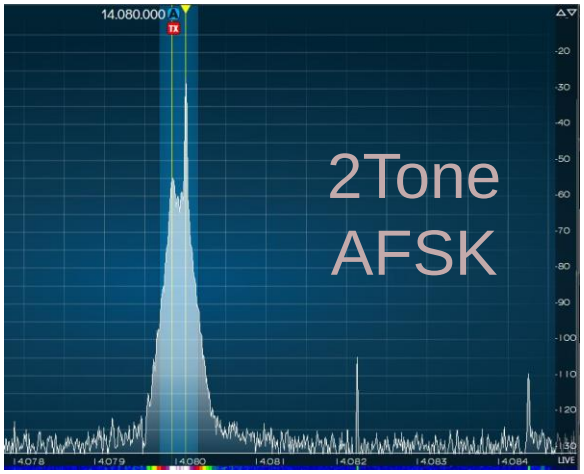
Transmitting

AFSK bandwith



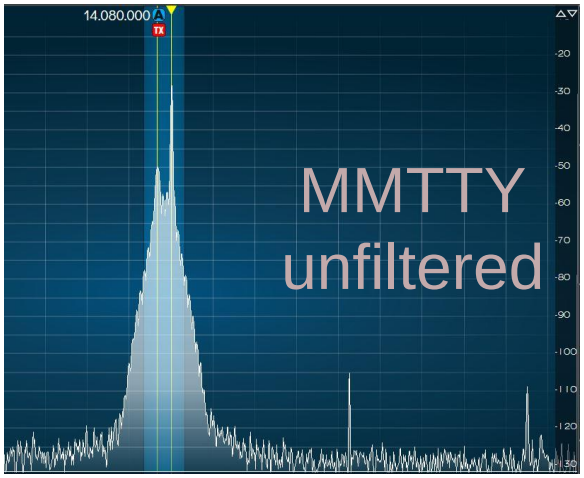


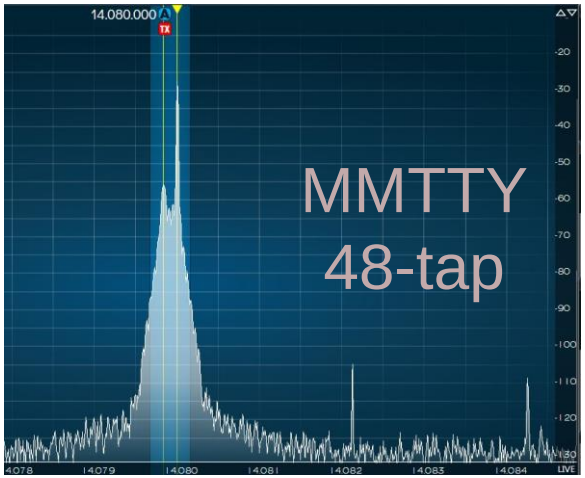


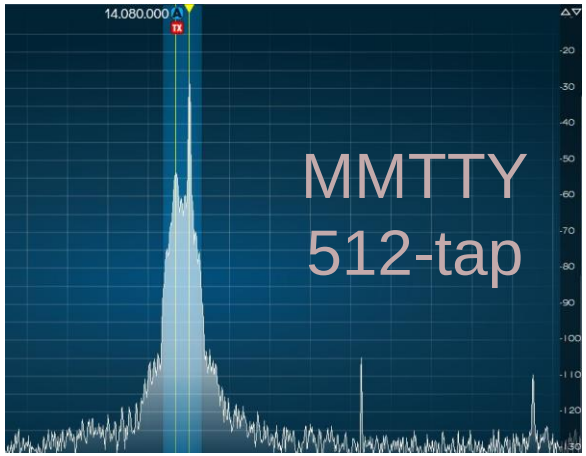


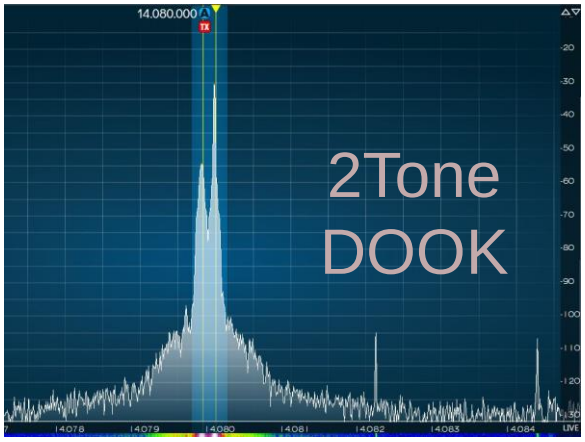
Transmitting

AFSK – DOOK bandwidth



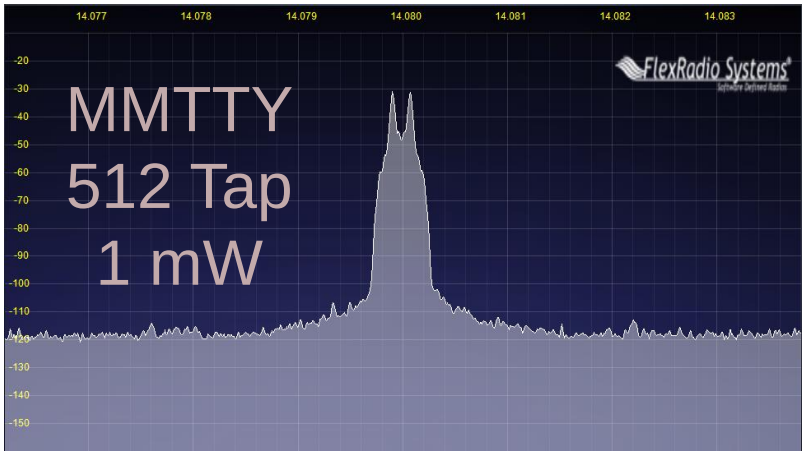


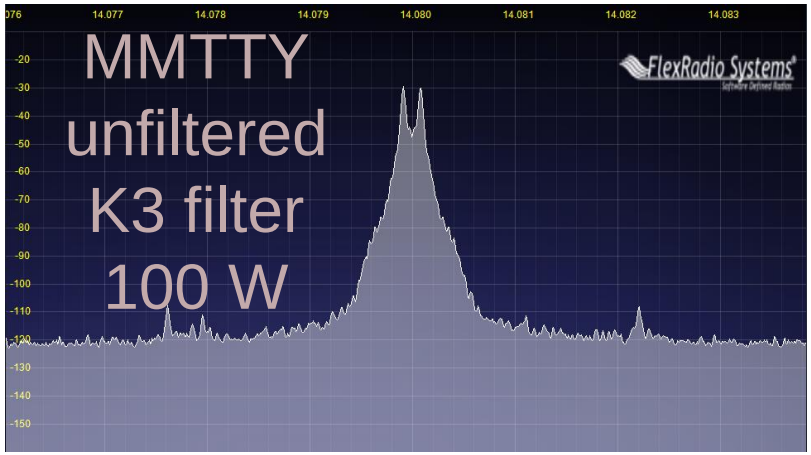




Transmitting

PA IMD effect

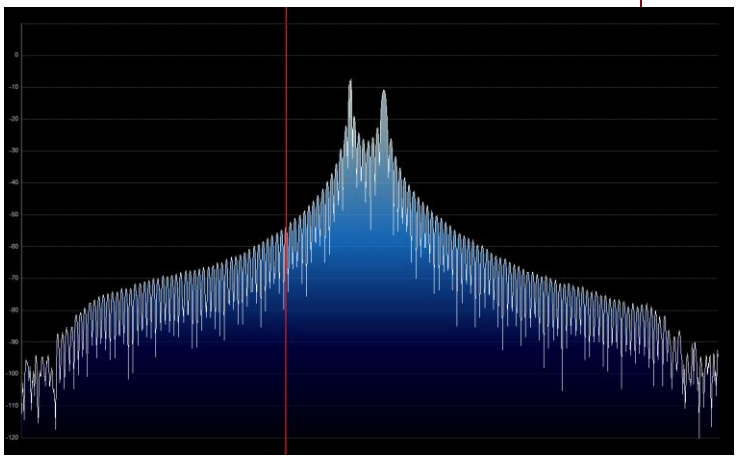




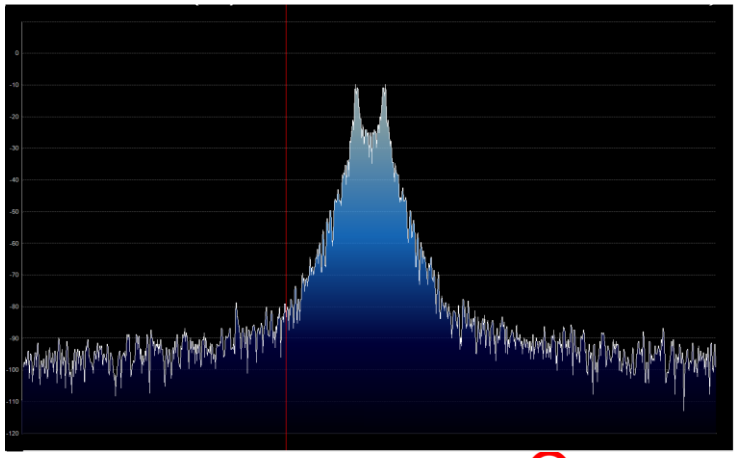
Transmitting

FSK bandwidth

- Old K3 FSK bandwidth
  - No waveshaping
  - < DSP281 firmware
  - Typical of all radios
  - 50 watts



- New K3 FSK bandwidth
  - Optimal DSP filter
  - DSP281 firmware, March 2013



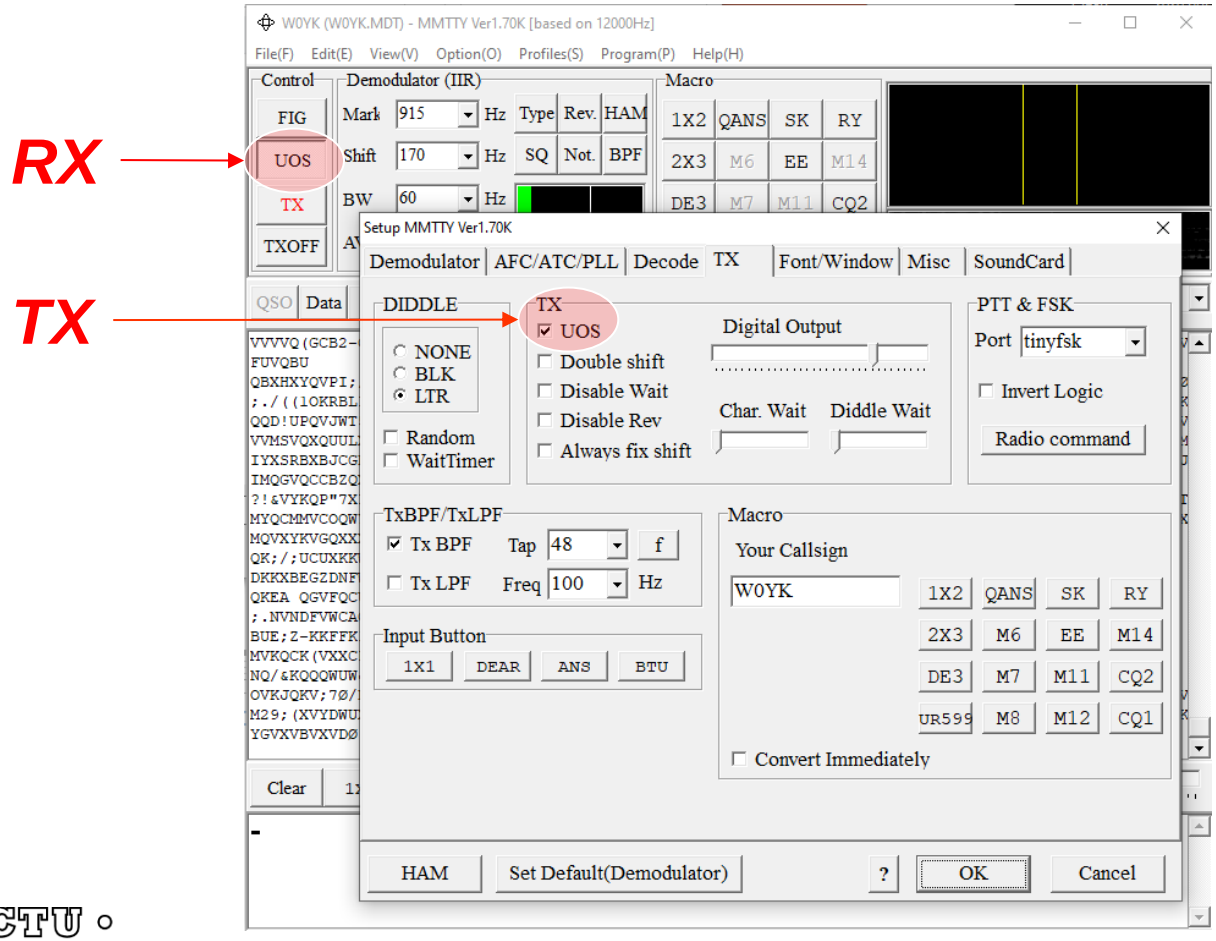
UOS

(Unshift-On-Space)

- Receive UOS:
  - Increases noise immunity for alpha text
  - Space character forces a shift to the Letters set
- Transmit UOS:
  - Sends Figures character after Space, before numeric “word”
- Contest exchanges are alpha and numeric
  - Should UOS be on or off?
  - Should Space or Hyphen delimit exchange elements?
    - 599 1234 1234 or 599-1234-1234
- *Recommendation:*
  - *Turn on both RX & TX UOS and use Space delimiters*

UOS

MMTTY



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Messages

basic sequence

- ***RU NW6P NW6P CQ***
- ***AA5AU AA5AU***
- ***AA5AU 599 CA CA***
- ***[NW6P] TU 599 LA LA***
- ***[AA5AU] TU NW6P CQ***

NW6P: running station

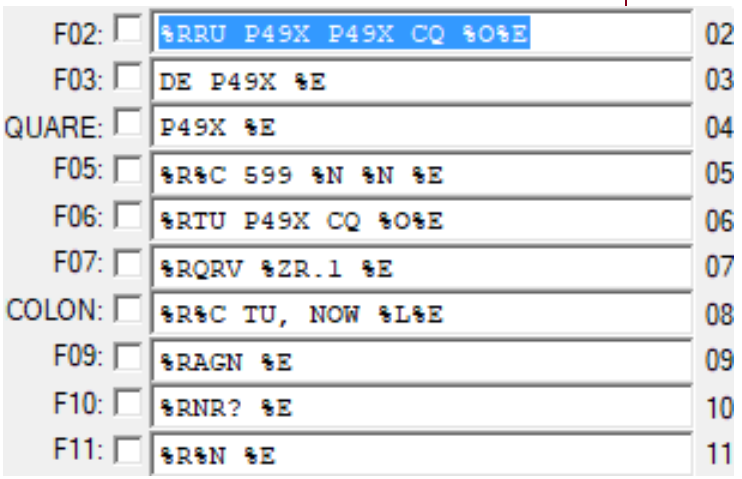
AA5AU: S&P station

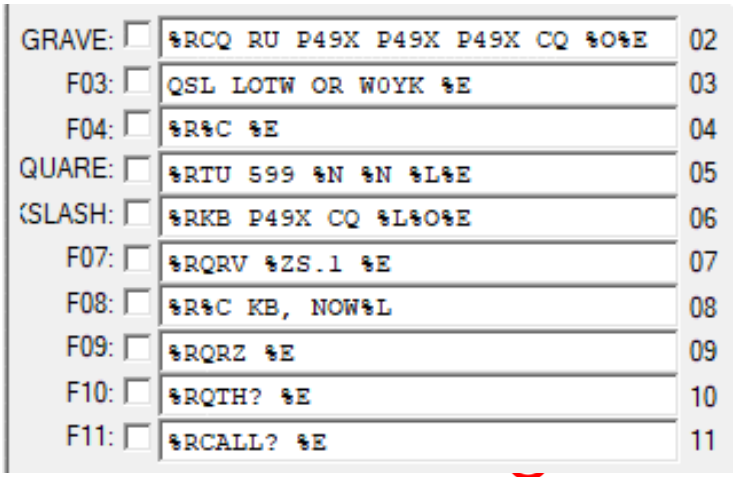
[call] optional

Messages

ARRL RTTY RoundUp

- Short, as with CW/SSB
- No extraneous info
- 599, not 5NN (or, ENN)
- Serial number twice
- Space (not hyphen)
- Omit ‘DE’
- RTTY chars (%R, %E)
- ***Modular***





www.rttycontesting.com/tutorials/messages

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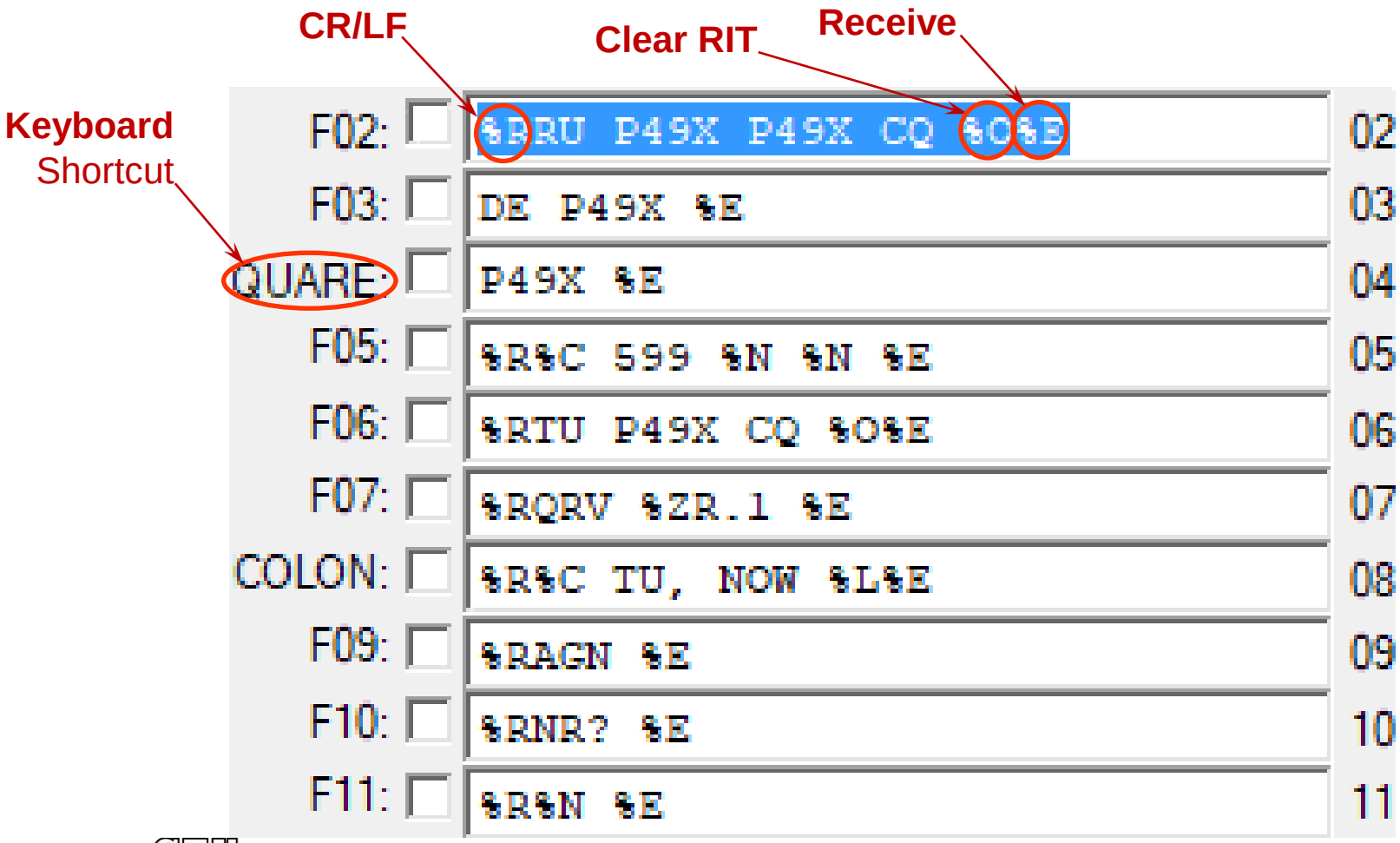
Messages

formatting



RTTY Sub-Bands

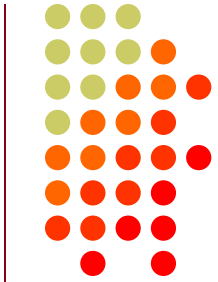
don't QRM!

- Avoid audio-digital operations near:
  - e.g., 14070-14083
- Avoid the NCDXF beacons:
  - e.g., 21150 and 14100

- More details:

  www.aa5au.com/rtty/rtty-sub-bands

RTTY Considerations



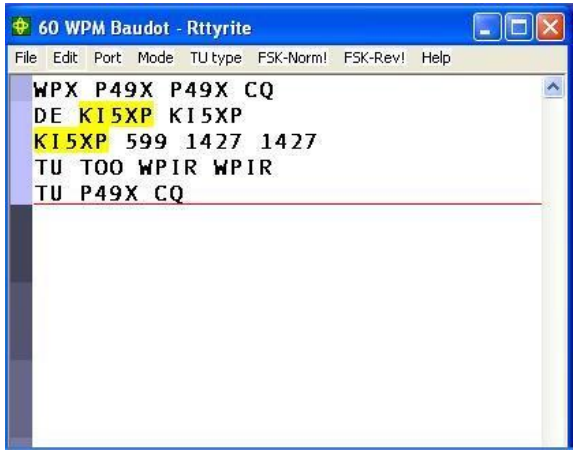
Much like CW and SSB, except:

- Non-human decoding implications
  - *serial number repeat*
- RTTY established practice
  - *'CQ' at end of CQ message*
- Whisper-level headphone volume; low tones
  - *just to detect presence & timing*
- Key-down transmission … 100% duty cycle
- Distractions are tempting
  - *watch TV, do email, read, etc.*

Miscellaneous Tips

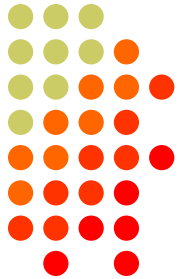
"All I receive is gibberish!"

- "Upside-down"
  - Reverse Mark & Space
  - LSB vs. USB
- Figures vs. letters
  - TOO=599, WPIR=2084
  - UOS should be on
  - Shift-click to convert, or look at top two rows
- Audio-In level, tones, flutter
- (Other station's signal)



Miscellaneous Tips

"They never answer me!"



- "Upside-down"
  - FSK: polarity switch in radio
  - AFSK: LSB vs. USB; polarity select in software
- Off frequency
  - AFC on with NET (AFSK only) off [recommend RIT instead]
  - AFC & NET are on by default; changes non-sticky
    - Change defaults in MMTTY userpara.ini file
- AFSK: Mic & SC levels; speech processor on
- Radio mode, tones, FSK interface

Miscellaneous Tips

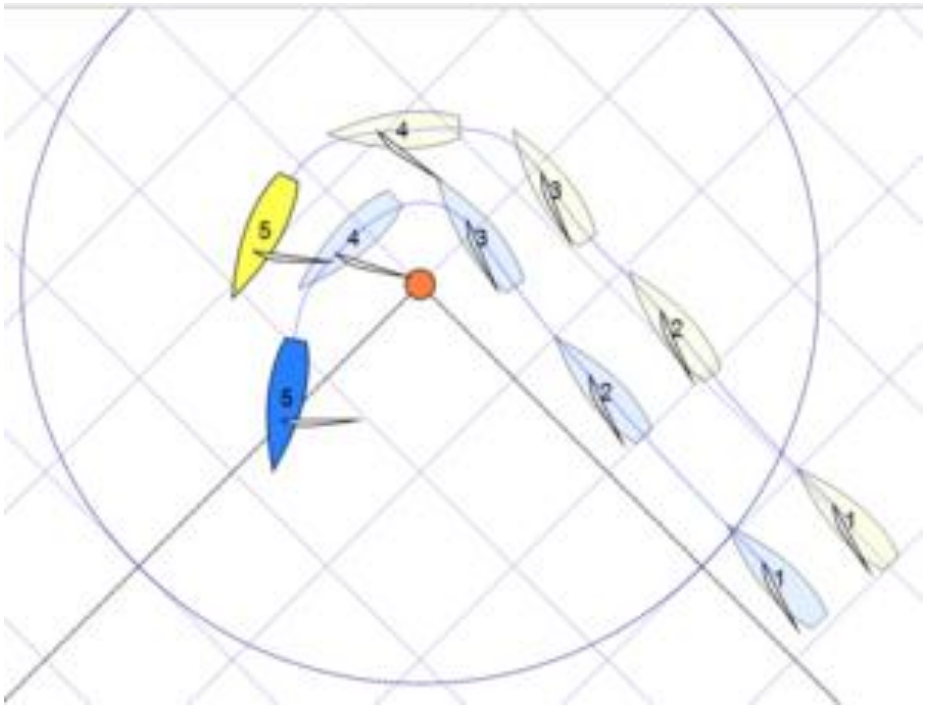
… more

- Practice Opportunities
  - ARRL Bulletins
    - Twice daily; receive only
  - During RTTY contests
    - ~ two per month
  - WRT (Weekly RTTY Test)
    - each Thursday night (30 min.)
- Multi-Ops

Call Sign Queuing

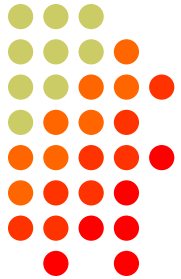
sailboat racing

Yellow falls behind by keeping up with Blue



Call Sign Queuing

"Slow Down to Win"



- Sailboat racing analogy:
  - Pinwheel effect at mark-rounding
- Let pile-up continue a "beat" after getting the first call sign
  - Increase chance for another call sign or two
  - Increase chance for QSO-phase-skip
- Apply same tactic for tail-enders … pause ½-second before sending TU/CQ message

Call Sign Queuing

The 4 Phases of a QSO

Normal Run mode flow:

1. CQ msg
   - repeat
   - AGN?
2. pile-up
3. Exchange msg
   - Send fill(s)
4. receive his Exchange
   - AGN? or NR? or QTH? or NAME?

1. TU/CQ msg (logs QSO)

Normal S&P mode flow:

1. CQ
2. <mycall> msg
   - repeat
3. receive his Exchange
   - AGN? or NR? or QTH? or NAME?
4. Exchange msg
   - send fill(s)

1. find next CQ

transmit

receive

Call Sign Queuing

Pileup

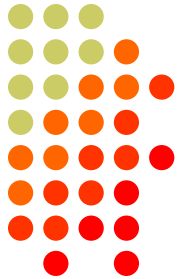
Normal	***Shortened***
1. *RU P49X P49X CQ, or TU P49X CQ*	1. (skip CQ)
2. *K3LR K3LR K5ZD K5ZD*	2. (skip pileup)
3. *K3LR 599 2419 2419*	3. *K3LR TU NW K5ZD 599 2420 2420*
4. *TU 599 PA PA*	4. *TU 599 MA MA*

transmit

receive

Call Sign Queuing

Tail-end



Normal	***Shortened***
1. *WPX P49X P49X CQ, or TU P49X CQ*	1. (skip CQ)
2. *K3LR K3LR*	2. (skip pileup)
3. *K3LR 599 2419 2419 K5ZD (tail-end)*	3. *K3LR TU NW K5ZD 599 2420 2420*
4. *TU 599 PA PA*	4. *TU 599 MA MA*

transmit

receive

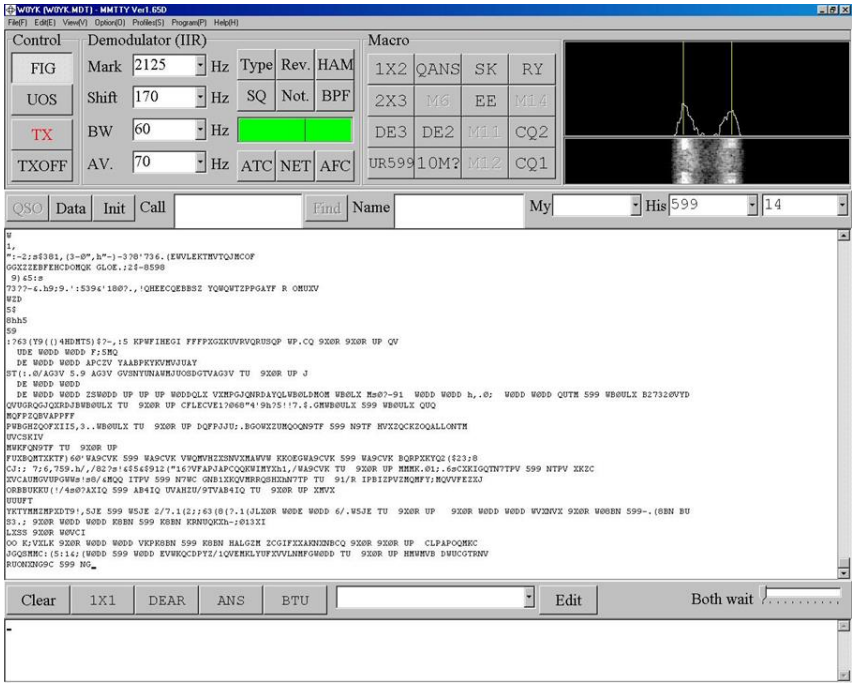
Call Sign Queuing

summary

- Efficiently work:
  - multiple callers in a pile-up, and
  - tail-enders to a completing QSO
- Calls pushed onto the queue as they arrive
  - recommend manual push, not automatic
- Message parameter pops call off of the queue into the Entry window
- Eliminates 2 of 4 QSO phases, which doubles short-term rate

Multiple Decoders

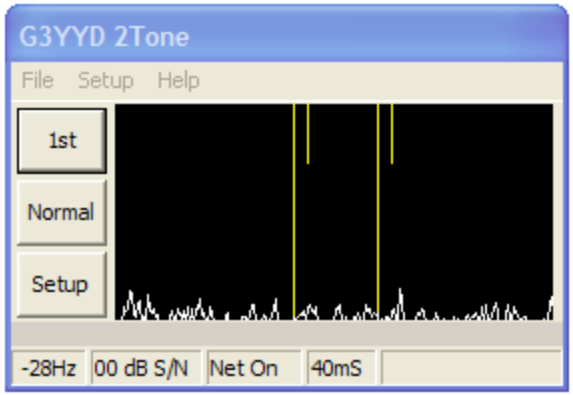
MMTTY

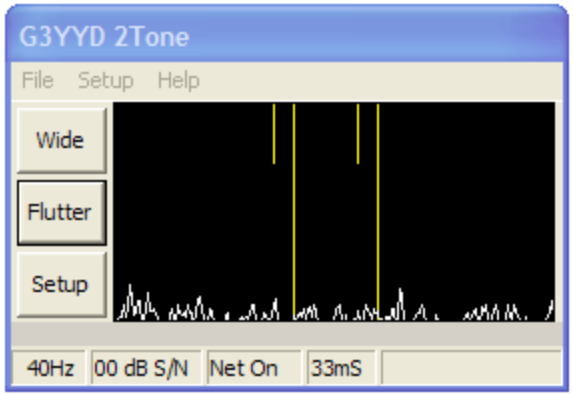


- Dominant SC MODEM
- Standalone, or …
- Contest loggers:
  - N1MM Logger+
  - WriteLog
  - Win-Test
- Introduced June 2000
- Mako Mori, JE3HHT

Multiple Decoders

2Tone

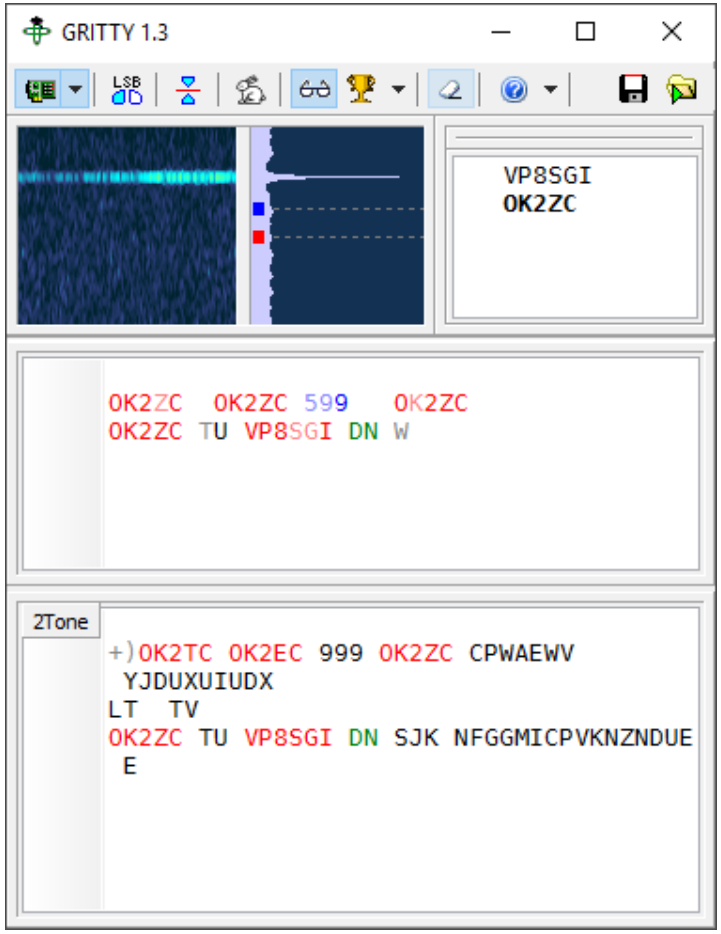




- Outperforms MMTTY ?
- Uses less CPU cycles
- Contest loggers:
  - N1MM Logger+
  - WriteLog
  - Win-Test
- Introduced late 2012
- David Wicks, G3YYD

Multiple Decoders

GRITTY

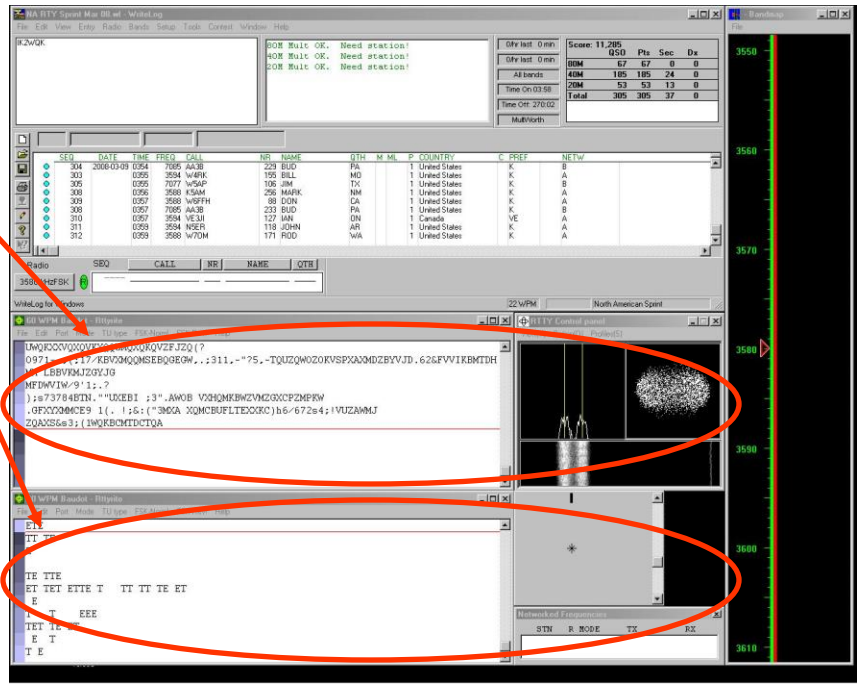


- Best accuracy ?
- Bayesian statistics
- Standalone, or …
- Contest loggers:
  - N1MM Logger+ only
- Introduced late 2015
- Alex Shovkoplyas, VE3NEA

Multiple Decoders

MMTTY & DXP38

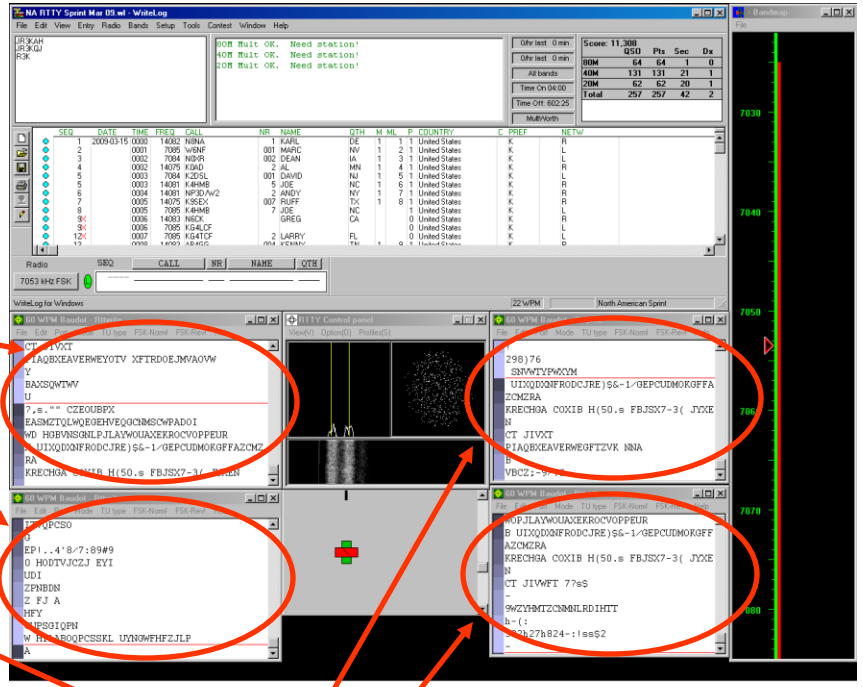
- Parallel decoding
  - Software, e.g., MMTTY
  - Hardware, e.g., DXP38
- Diverse conditions
  - Flutter
  - Multi-path
  - QRM, QRN
  - Weak signals
  - Off-frequency stations



Multiple Decoders

multiple MMTTY profiles

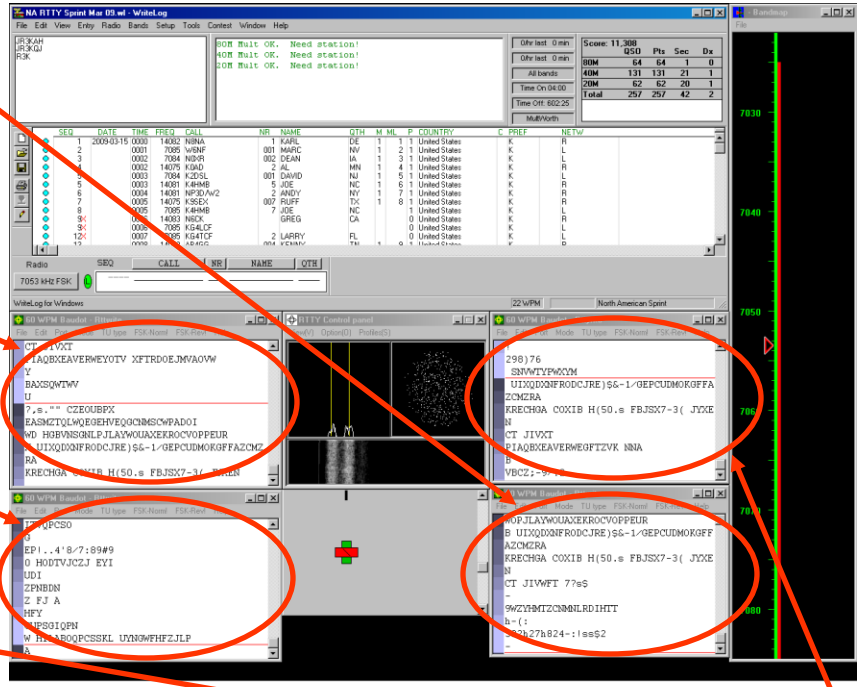
- Parallel decoding
  - same audio stream
  - switching takes too long
- Multiple profile windows
  - Standard
  - Fluttered signals
  - Fluttered signals (FIR)
  - Multi-path
  - hyper sensitive
  - EU1SA
  - AA6YQ-FIR-512
    - weak signals in QRN



Multiple Decoders

two IF bandwidths

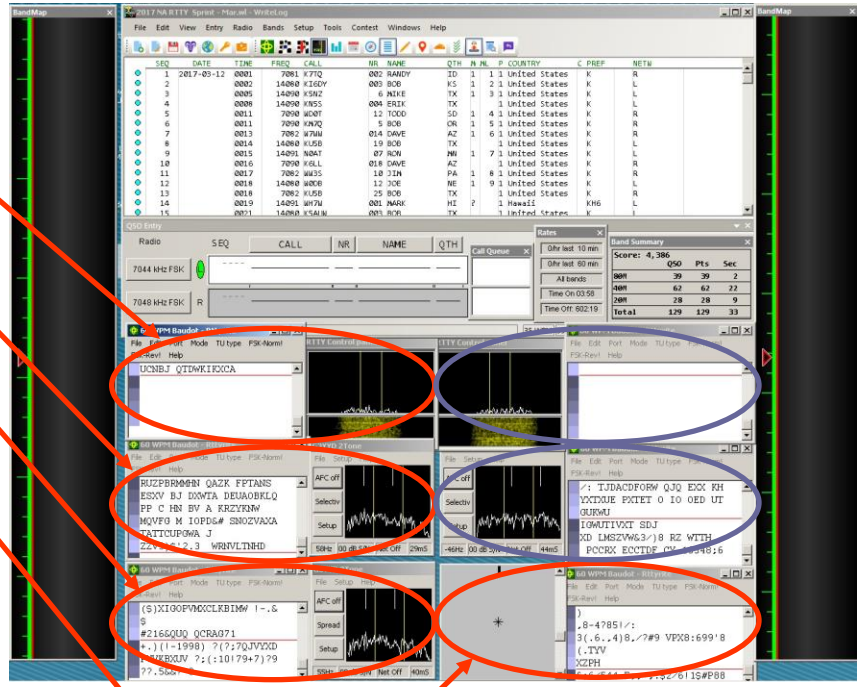
- Narrow IF filtering (main RX)
  - Hardware modem, i.e. DXP38
  - MMTTY profiles:
    - Standard
    - Fluttered signals
    - Fluttered signals (FIR)
    - Multi-path
    - hyper sensitive
    - EU1SA
- Wide IF filtering (sub RX)
  - MMTTY profile:
    - AA6YQ-FIR-512
      - Dual Peak Filter
      - “Matched filter”



Multiple Decoders

SO2V

- VFO-A (main RX)
  - MMTTY Standard profile
  - 2Tone Flutter profile
  - 2Tone Selective profile
  - DXP38
- VFO-B (sub RX)
  - MMTTY Standard profile
  - 2Tone Flutter profile
- 6 decoders
  - A→B



Multiple Decoders

Tone choices for monitoring

- Low tones are less fatiguing
  - Use high tones for secondary audio stream(s)
- Low/High tones can be mixed to put two audio streams in one ear:
  - SO2R plus SO2V per radio (4 streams)
  - SOnR (3+ streams)
  - Audio mixer, e.g. RigSelect Pro

SO2V

1. [single rcvr] If Assisted and running on VFO-A, then
   - A<>B, click spot, tune, ID station, work station
   - A<>B, resume running

   Toggle as needed
2. [dual rcvr] Set up decoder windows on VFO-A and VFO-B
   - Radio must have two true receivers
   - Monitor both frequencies simultaneously with right/left channels of sound card
     - Left-click call from 2nd RTTY window into VFO-B Entry Window
   - Two ways to transmit on VFO-B:
     I. A<>B, work the mult, A<>B
     II. SPLIT, work the mult, un-SPLIT, resume running
       - Requires “wire-OR’d” FSK or AFSK and two transmit RTTY windows
         - WriteLog Shared Com Port obviates the wire-OR
       - K3/WriteLog invokes SPLIT when VFO-B call is clicked

SO2R

- Eliminates SO1R RTTY boredom
- Think beyond run and S&P:
  - Dueling CQs; run on two bands simultaneously
  - S&P on two bands simultaneously, esp. w/Packet
  - SO2V on one or both radios (SO4V!)
- Two networked computers:
  - Eliminates swapping radio-focus
  - More display room for more decoder windows per radio
  - RTTY doesn't require much typing; mini-keyboards
  - 2 x SO2V=SO4V for picking up mults on both run bands
  - Easily extendible to SOnR

No time to watch TV or read spy novels!

SO2R

"M2" configuration

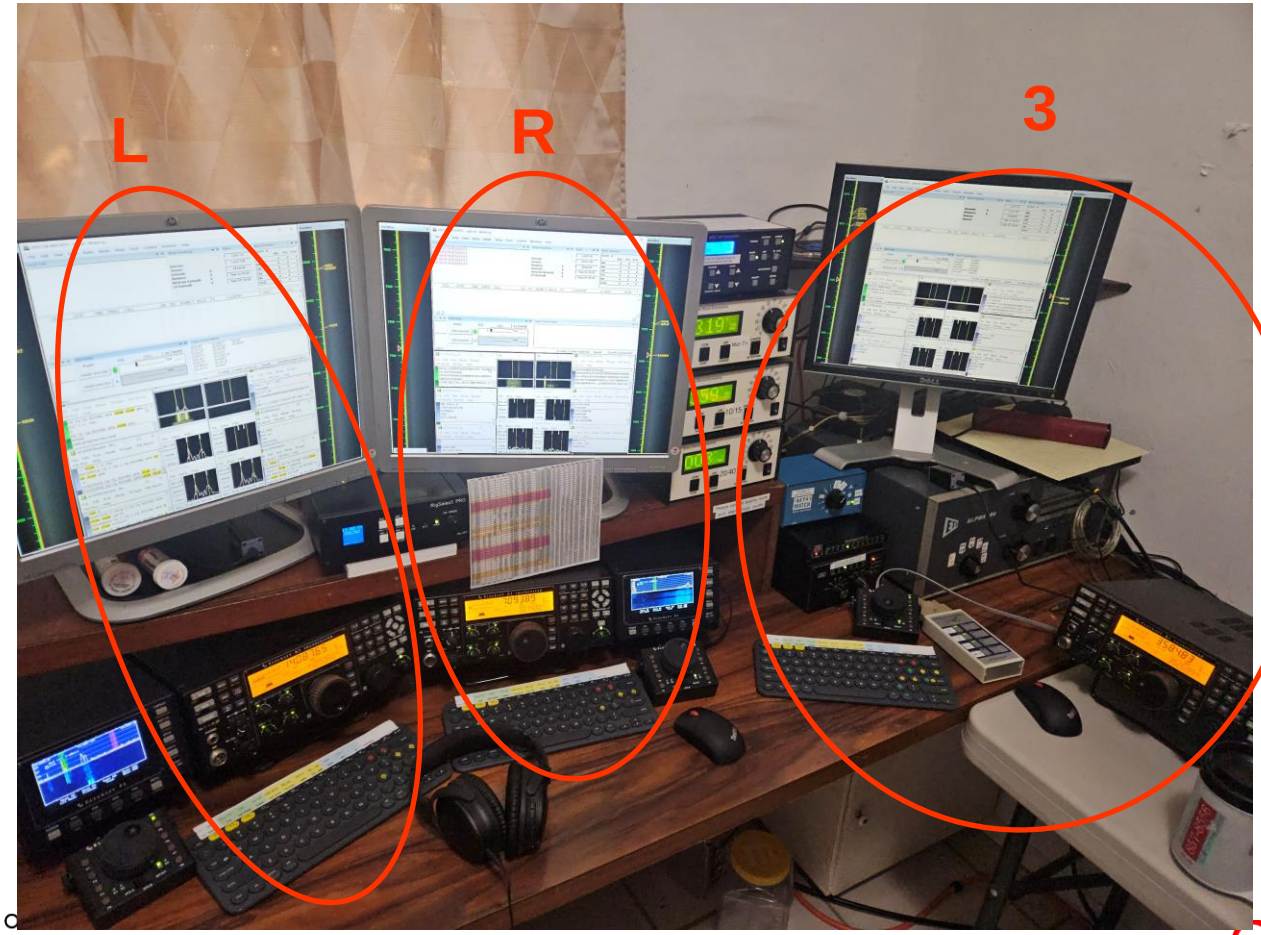
SOnR

> 2 radios

- Simplify antenna/filter band-decoding:
  - Dedicate a band/antenna to the 3rd (or 4th) radio
- Networked PC/radio simplifies configuration
- RTTY (vs. CW or SSB) easier for operator
  - PC decodes for operator
  - Low tones & high tones allows two radios per ear
    - Classic audio headphone mixer (per ear) provides radio A, radio B or both

SOnR

Multi-Multi configuration



Dedicated to 10/80 meters

Resources

- www.rttycontesting.com premier website
  - Tutorials and resources (beginner to expert)
  - WriteLog, N1MM Logger+ and MMTTY
- rtty@groups.io Email reflector
  - RTTY contester networking
  - Q&A
- Software web sites
  - hamsoft.ca/ (MMTTY)
  - n1mm.hamdocs.com/tiki-index.php (N1MM Logger+)
  - www.writelog.com (WriteLog)
  - www.win-test.com (Win-Test)
- Software Email reflectors
  - mmtty@yahoogroups.com (MMTTY)
  - N1MMLoggerplus@groups.io (N1MM Logger+)
  - Writelog@contesting.com (WriteLog)
  - support@win-test.com (Win-Test)