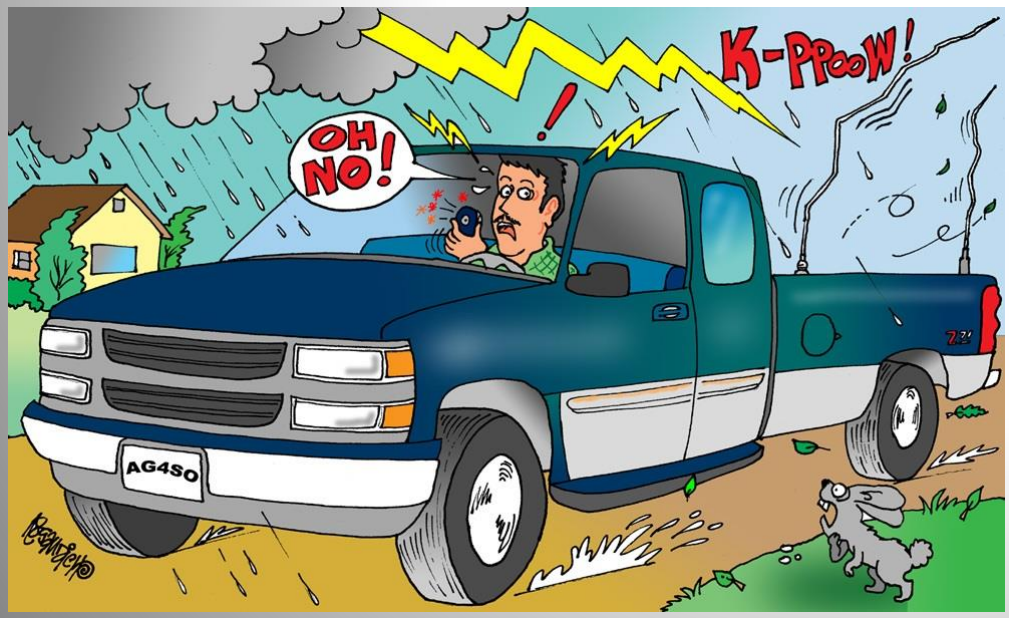
FLDIGI Training Net
K3EUI Barry
Updated May 2025



Overview

- FLDIGI setup and configuration
- What sound cards work best
- What modes can you use
- Where to look for help:
- FLGIDI IO Groups
- FLDIGI Training Net

  Saturdays on 3583 kHz and 7068 kHz

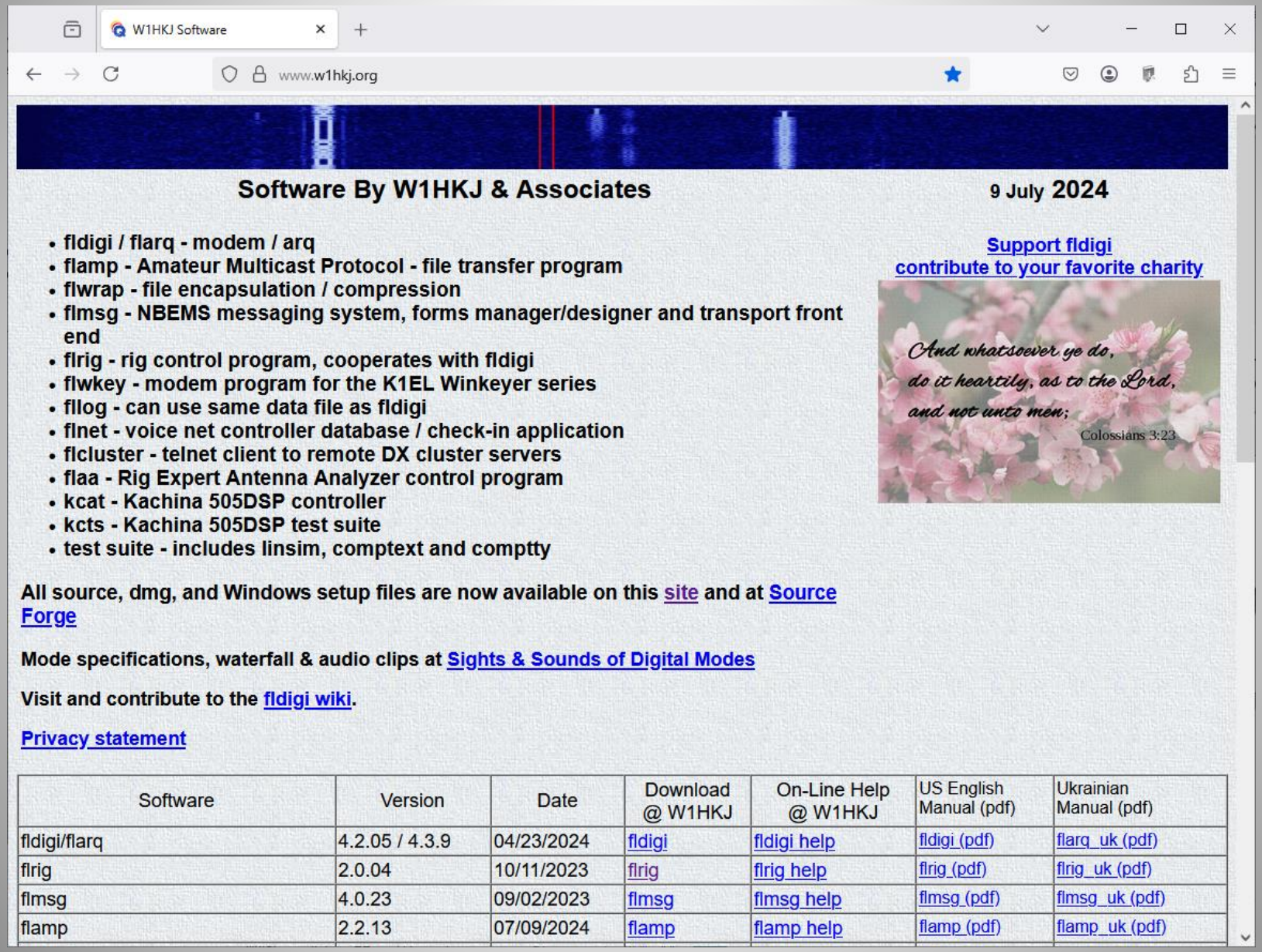
  (1st and 3rd Saturday of each month)

Zoom Link:
https://us02web.zoom.us/j/7950991313?pwd=NFVJN1lQaDVlZUZQNGFnYTRiR0orQT09

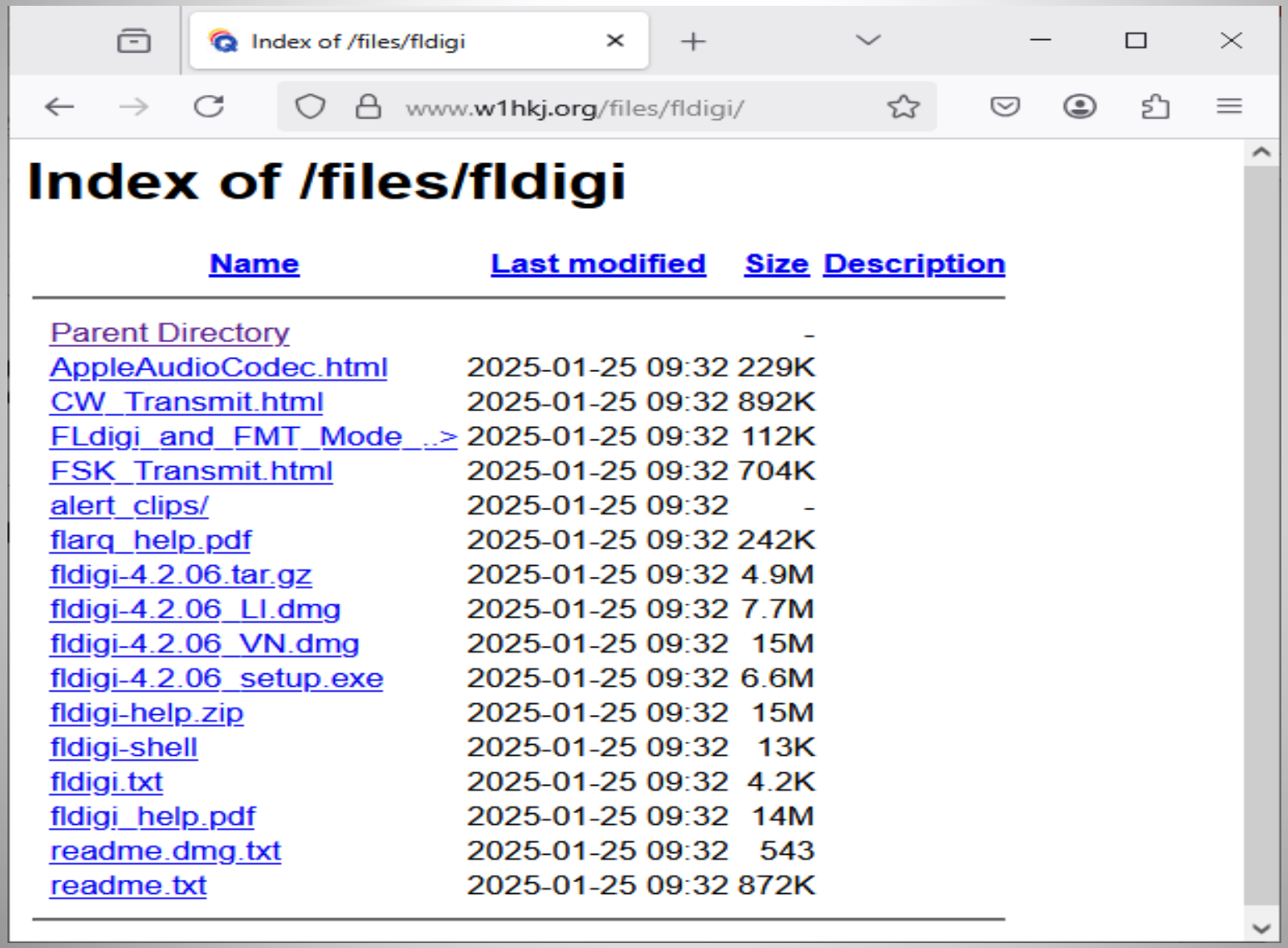
FLDIGI
(Fast Light Digi)

Narrow Bandwidth
Emergency Message System

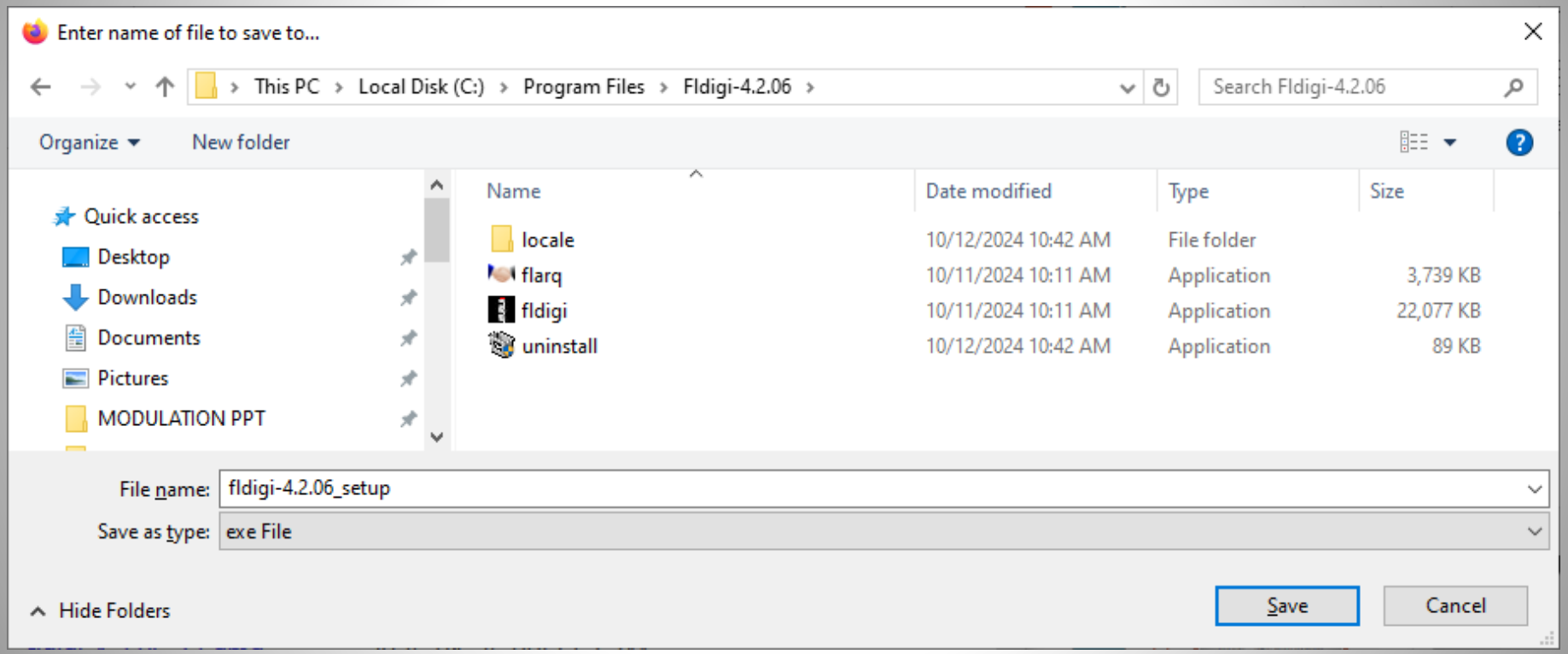
Download and Install FLDIGI: W1HKJ.com



Index of FLDIGI
Download appropriate file



Install in Windows: Program Files



FLDIGI

FREE program

Works on Windows, Linux, Macs

Updated regularly

Good for casual qso, DX or EMCOMM

Low memory required

Works on older laptops/desktops

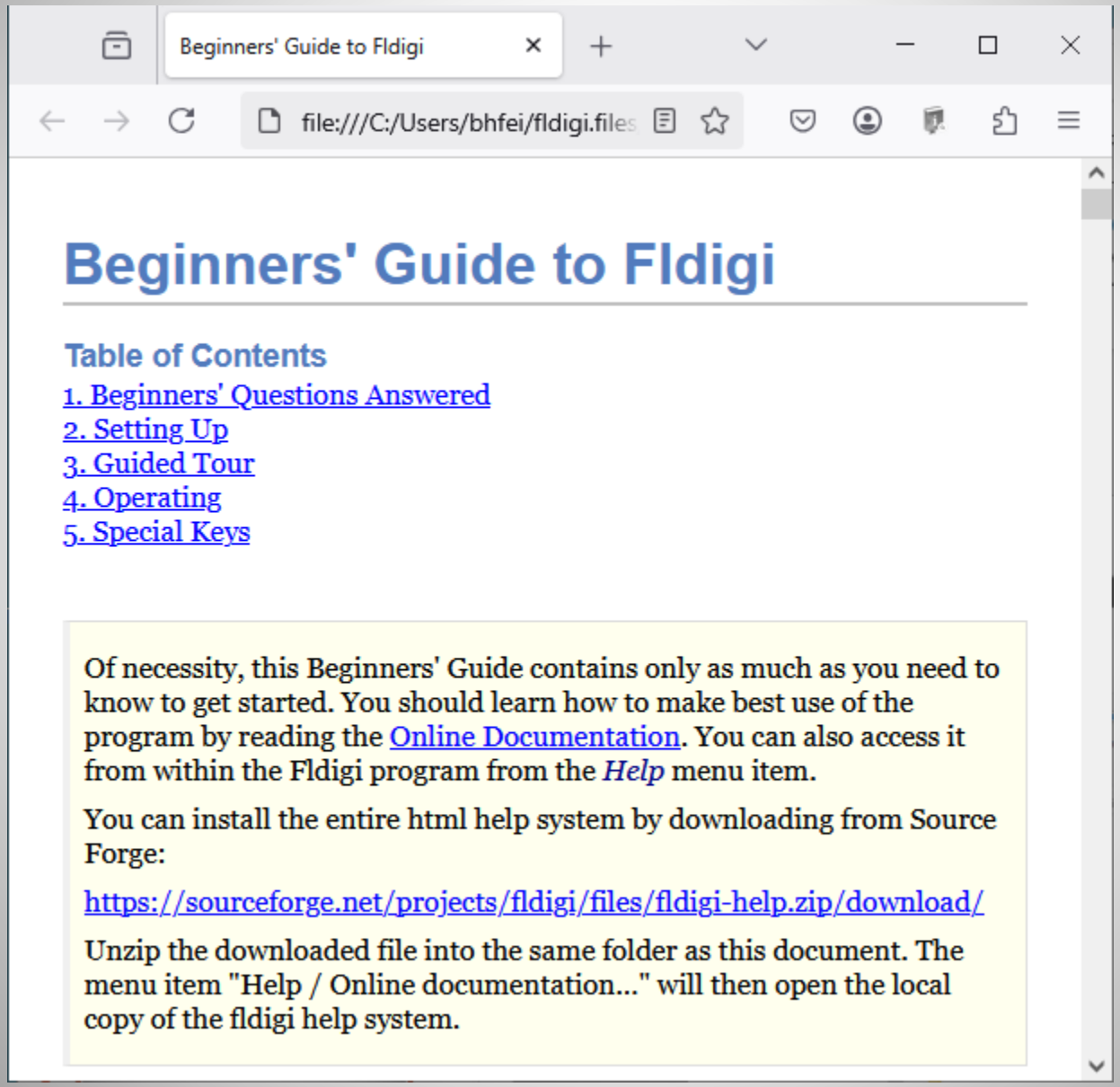
Does NOT do

VARA, Pactor, JT modes

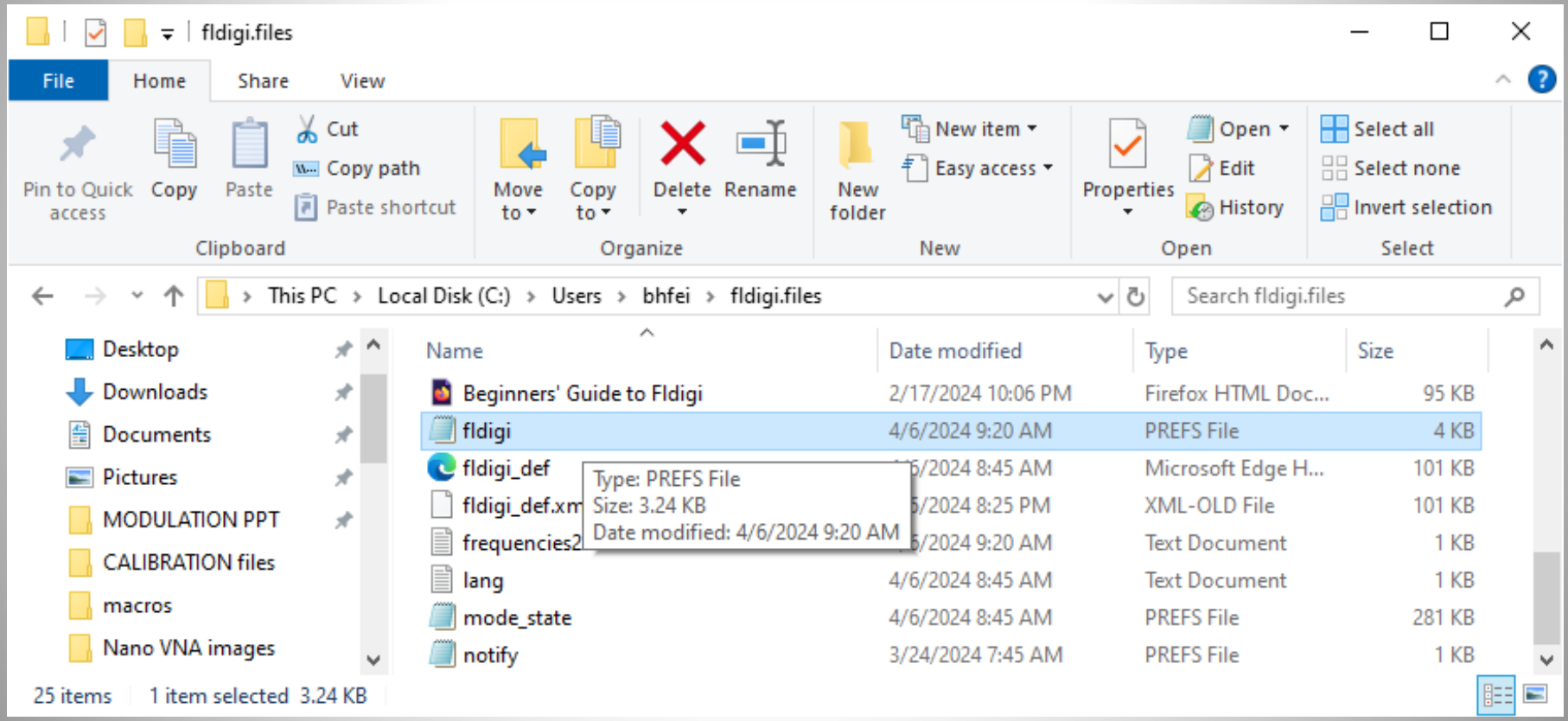
Components of FLDIGI

FLDIGI - main sound card program
FLMSG - preformed message types
FLAMP - sends longer files in blocks
FLRIG - CAT or Rig Control options
FLLOG - logging program

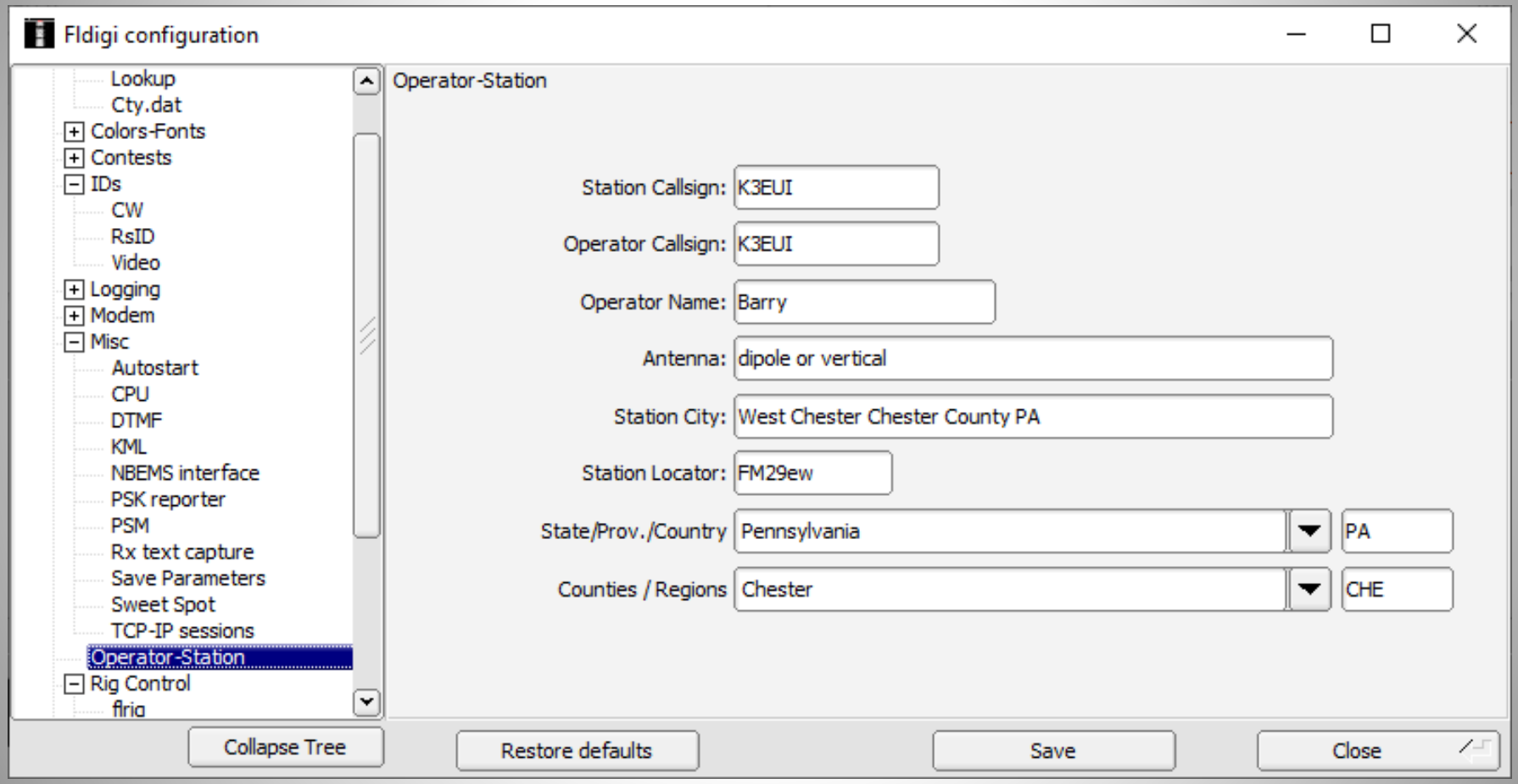
Beginner's Guide to Fldigi



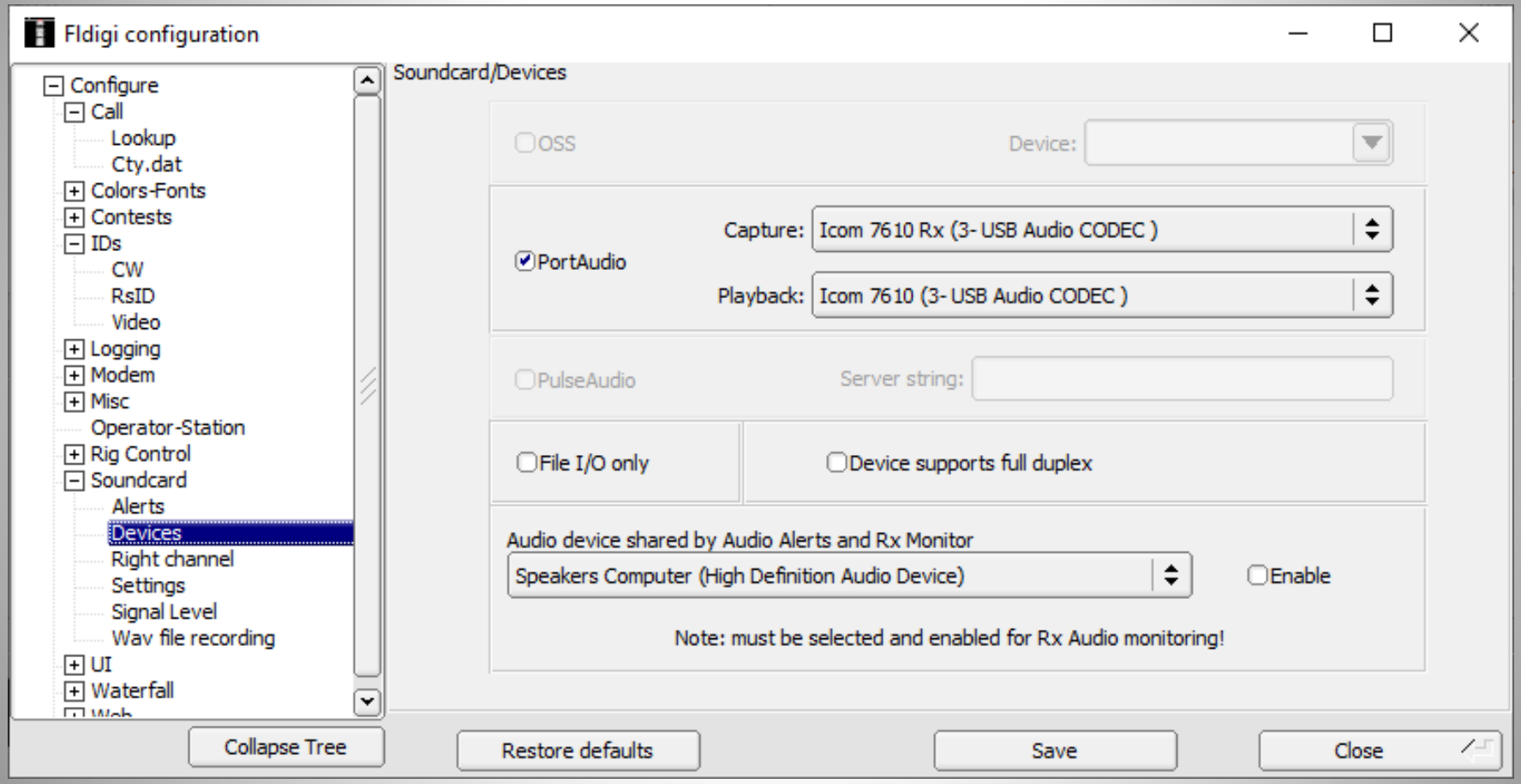
Fldigi **"prefs"** file
stores all of your <u>config setup</u>
updating Fldigi does not alter prefs file



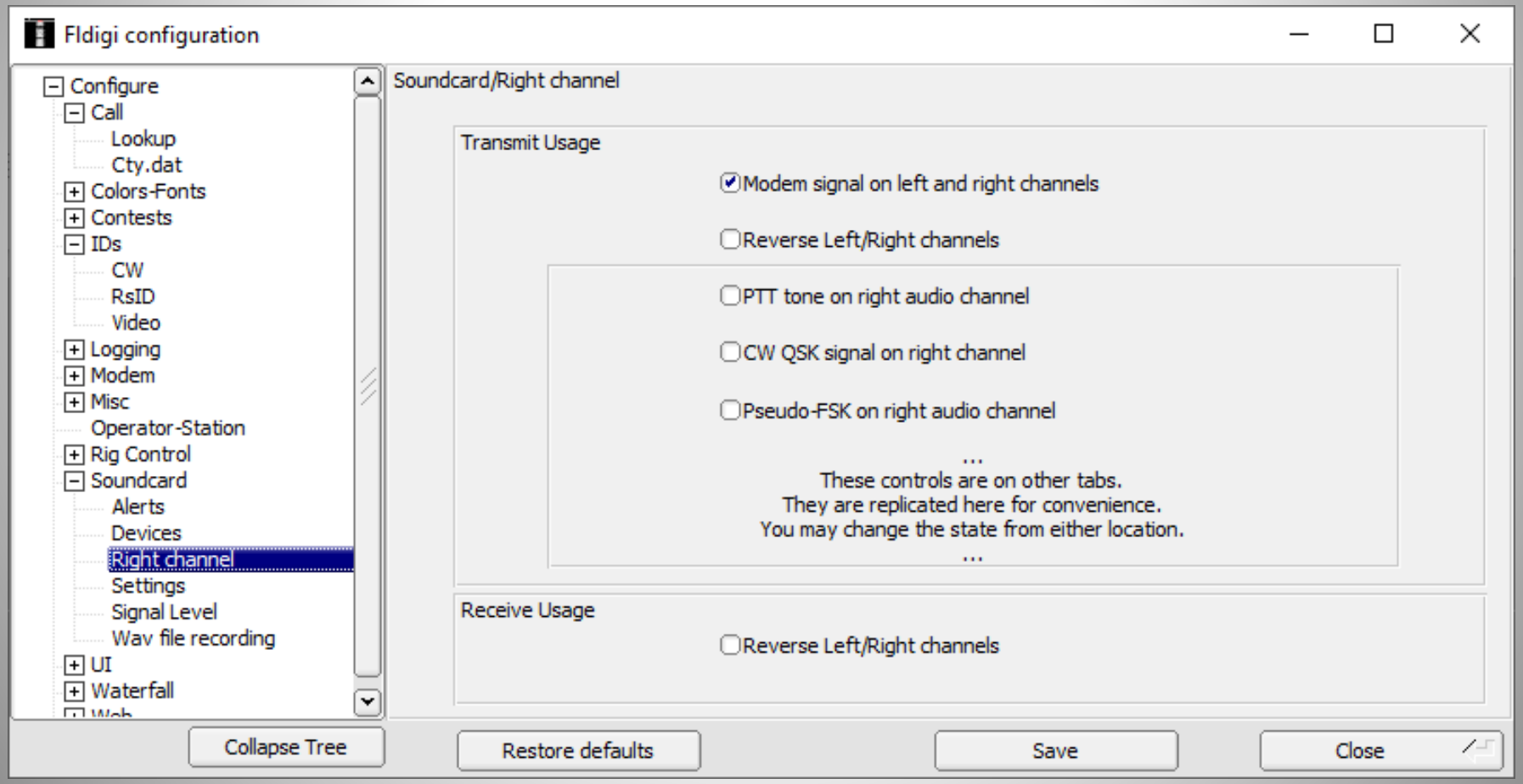
Configure Fldigi: operator and station



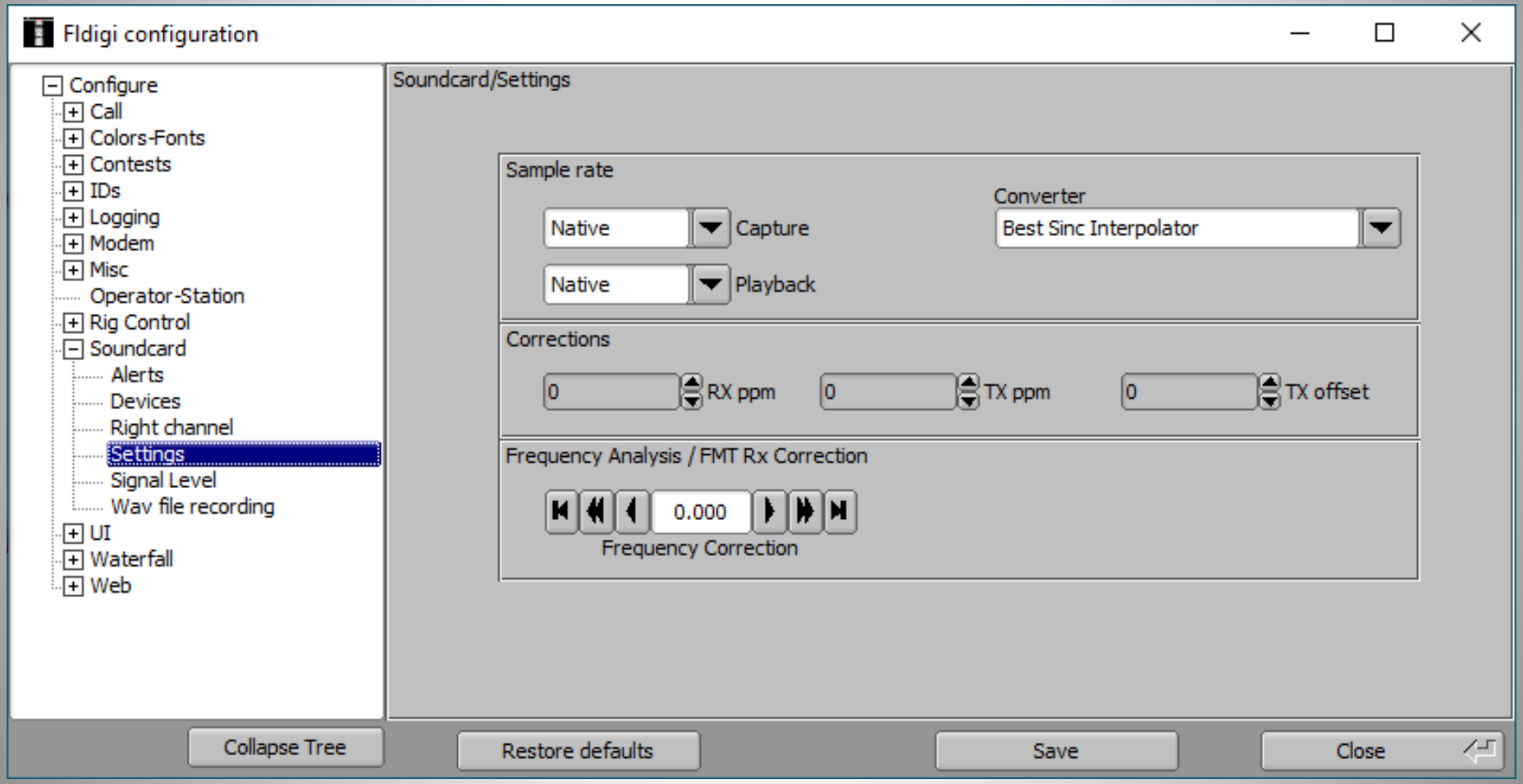
Pick your Sound "CARD"
Capture = RX Playback = TX



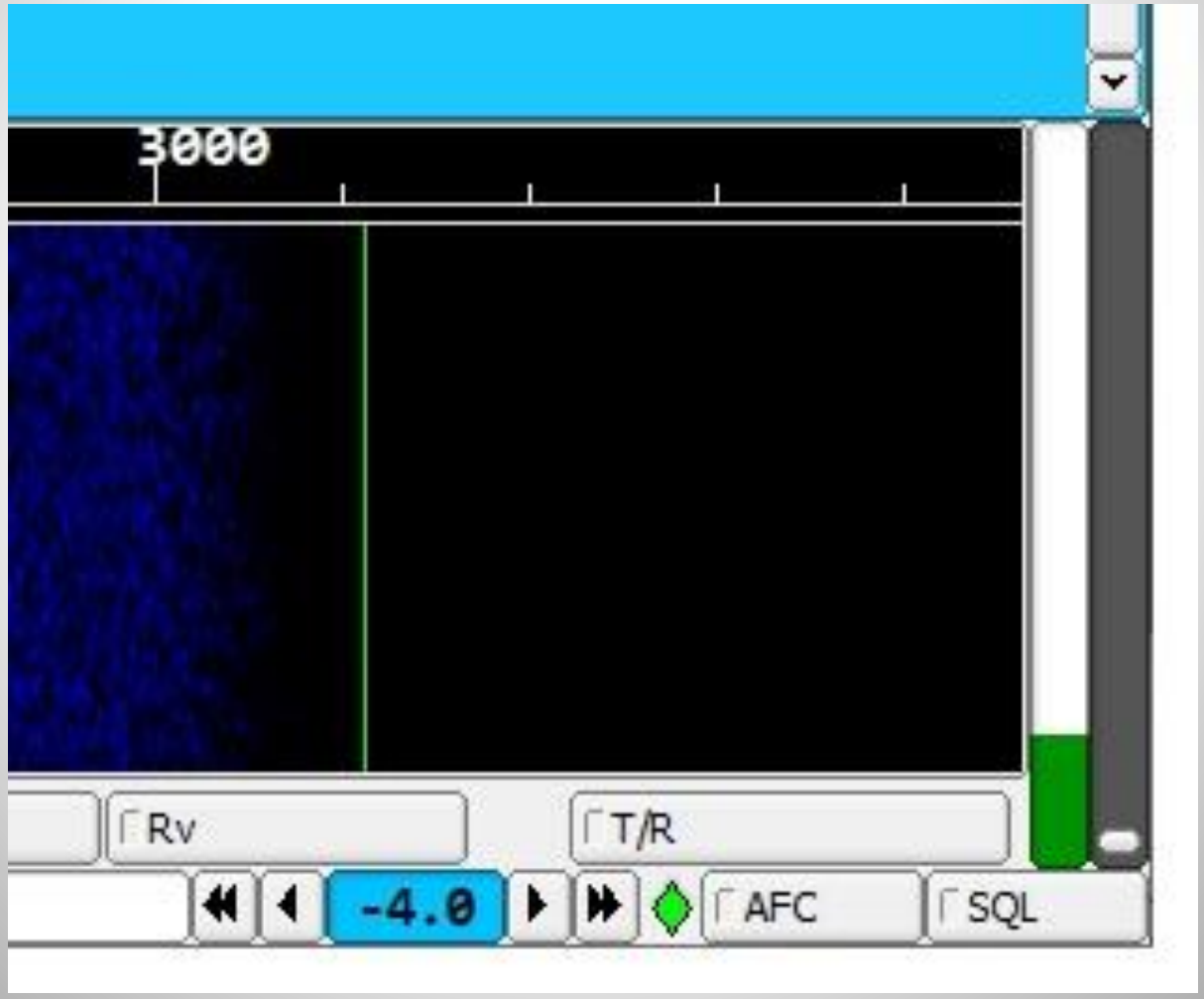
Enable TX audio on BOTH LEFT/RIGHT channels some sound cards are "MONO" SignaLink is LEFT channel only



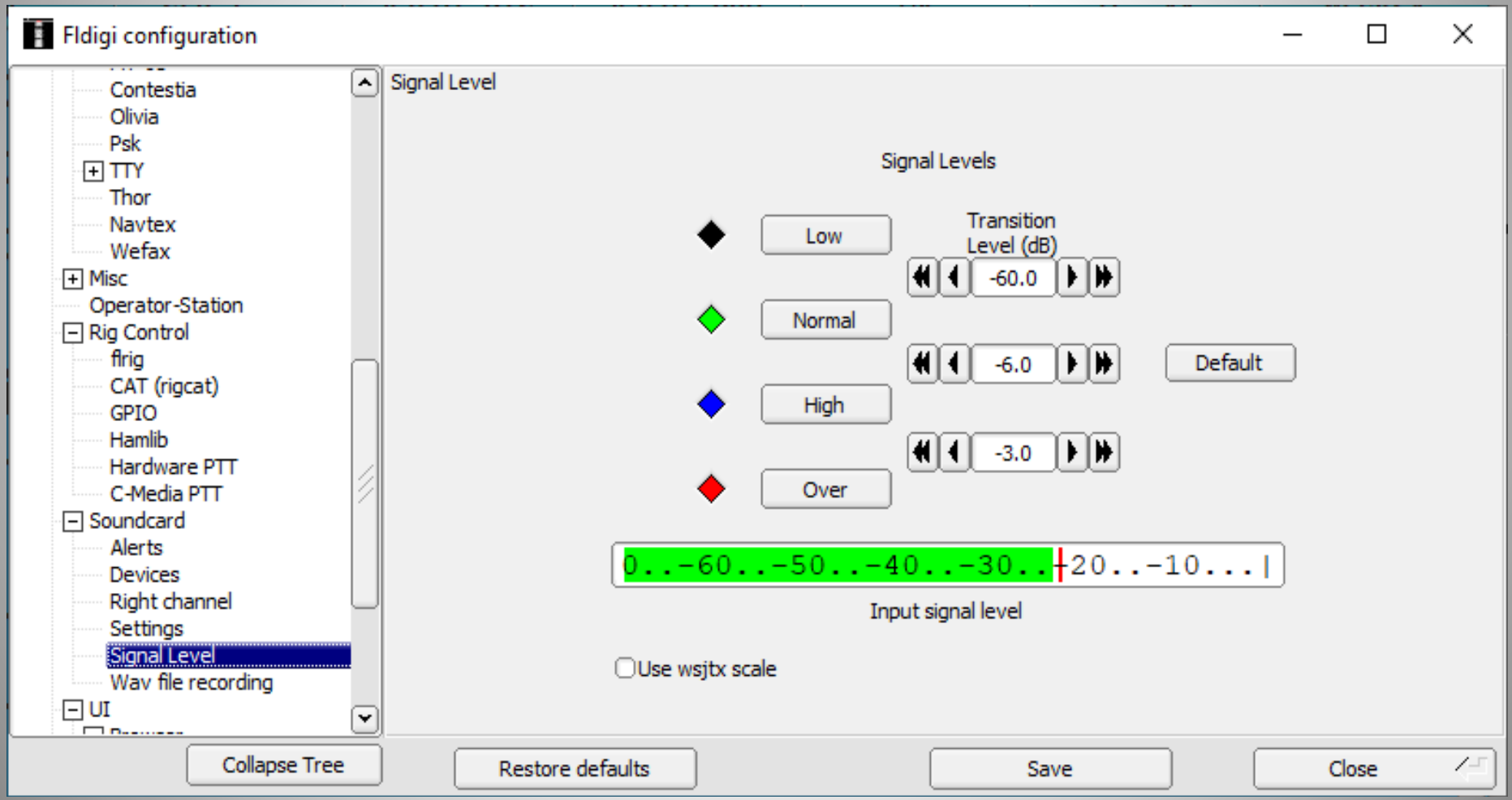
Choose "Sample rate" for your sound card (Native is best)



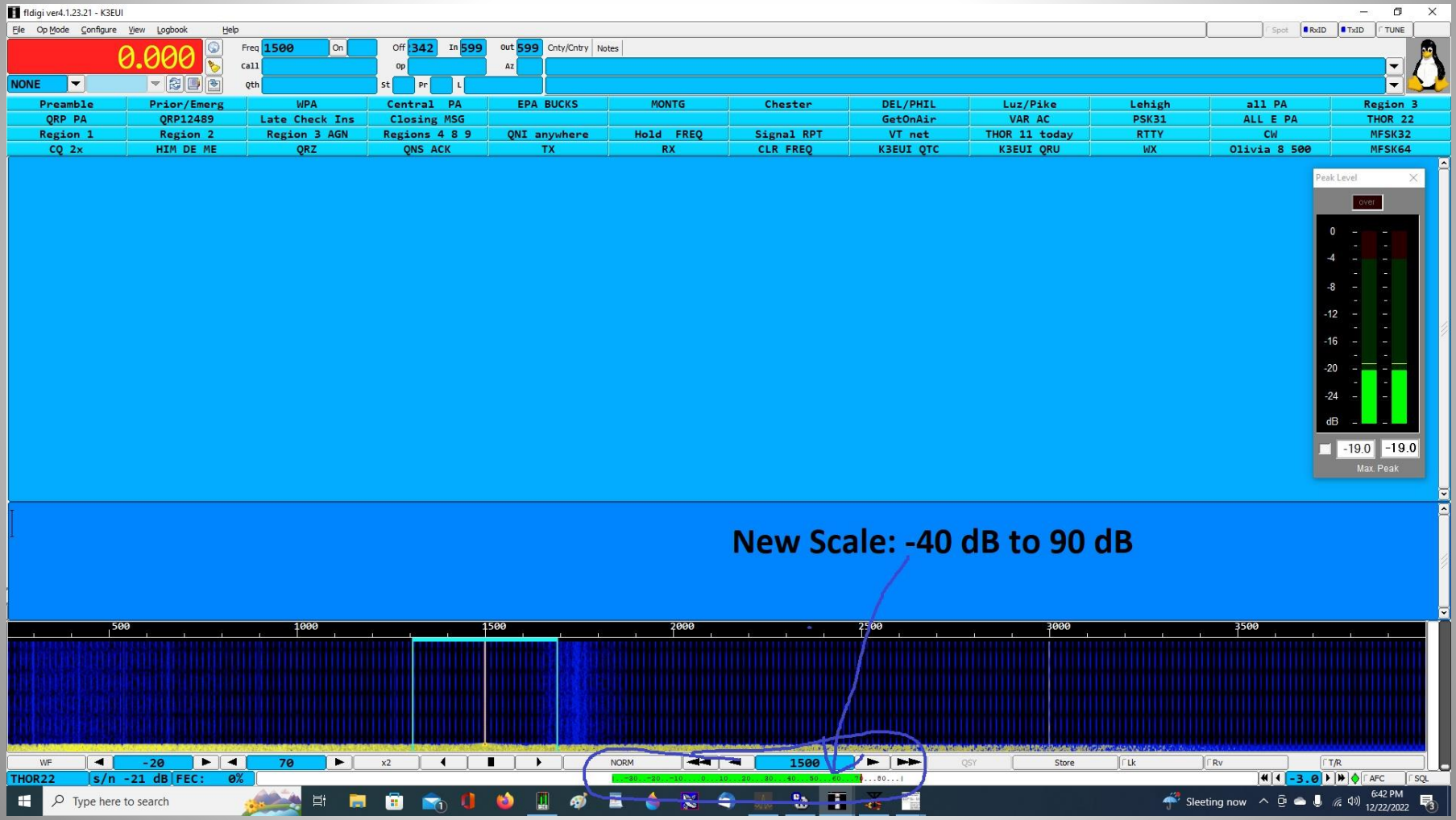
DIAMOND color indicates level of RX audio
AFC option (auto freq control) on SSB radios
Digital Squelch option: set slider into the white area



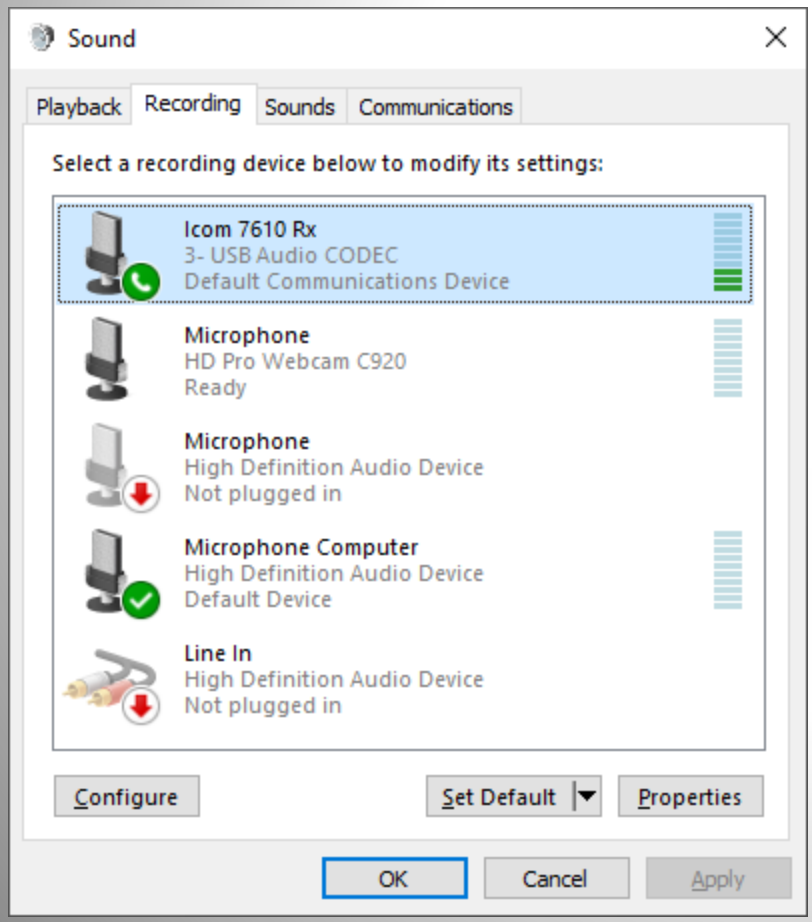
Receive LEVEL meter
(aim for a -20 dB INPUT)

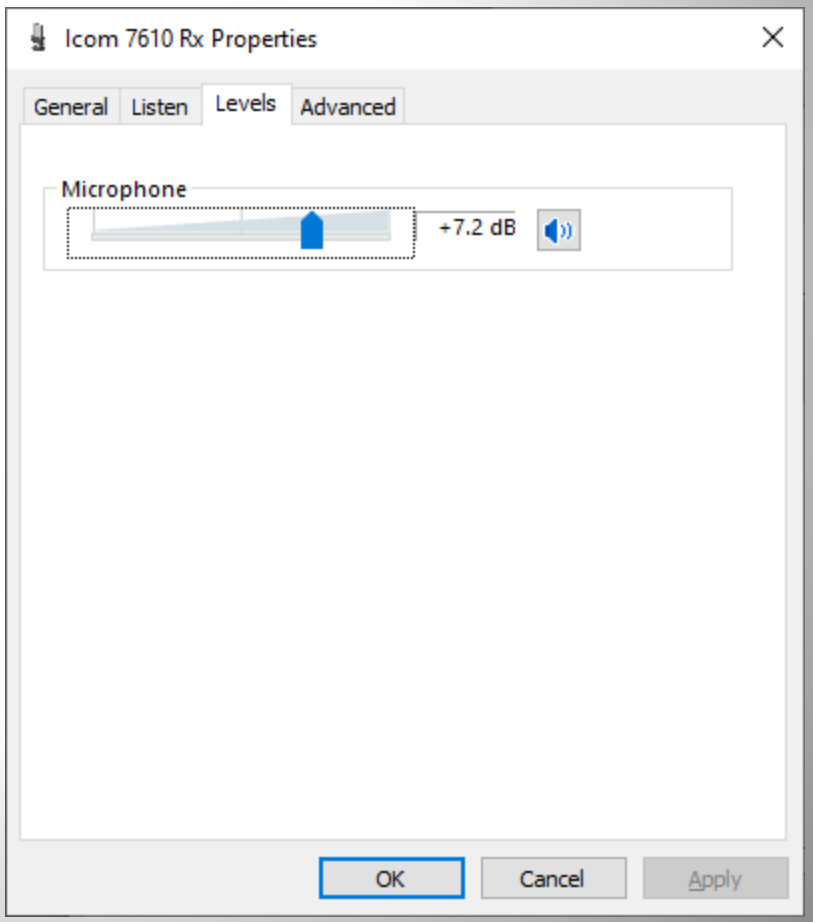


New RX audio scale in dB with 2nd Darkwood PEAK LEVEL meter

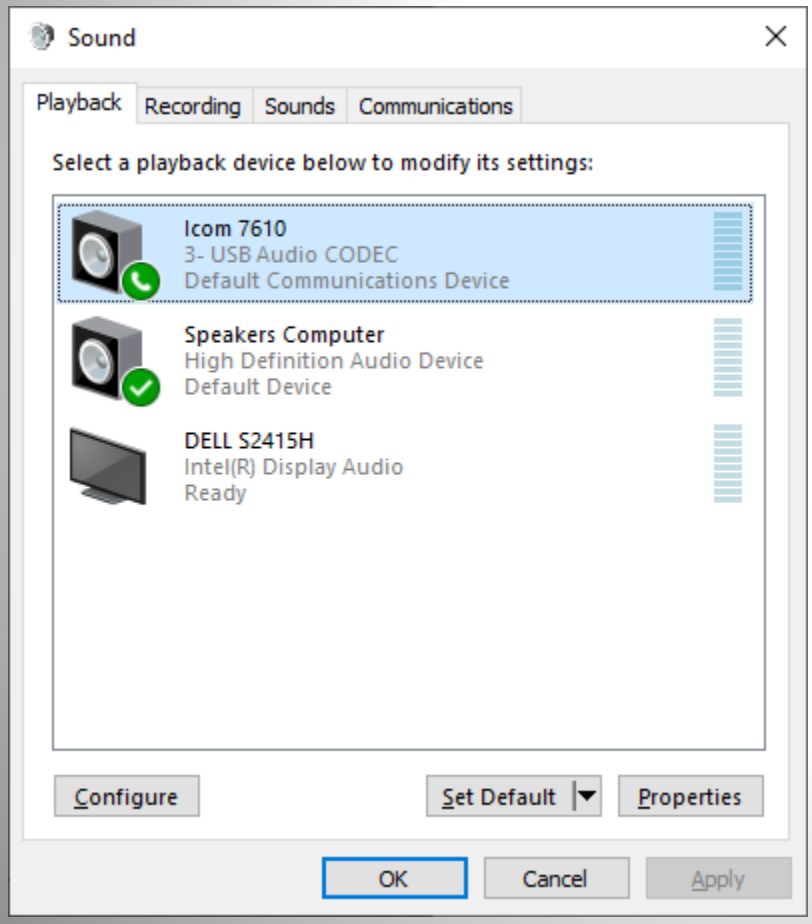


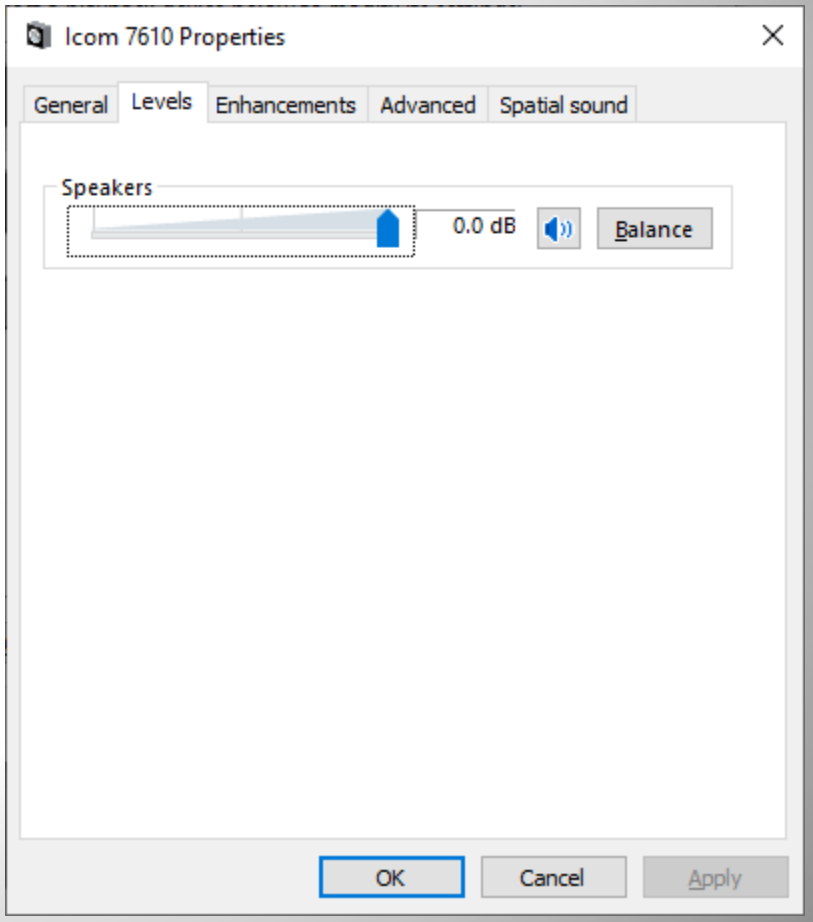
Set Windows **RECORDING** level (RX)
SET **DEFAULT** device as your computer MIC
Set **Default COM Device** as your sound card (radio)
Set **MIC level** as needed



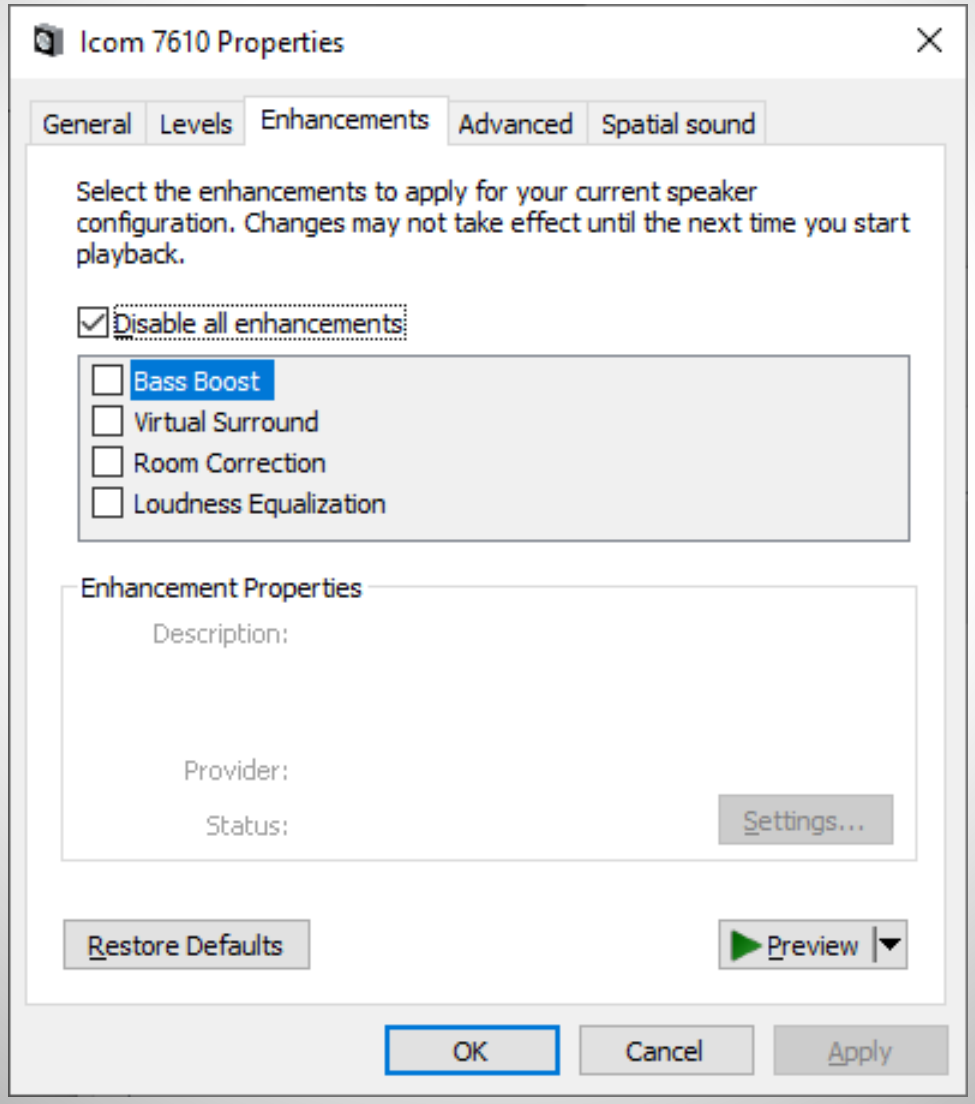


Set Windows **PLAYBACK** (TX) level
DEFAULT Device = computer speaker
DEFAULT COM device = sound card (radio)
Set **Speaker Level** as needed

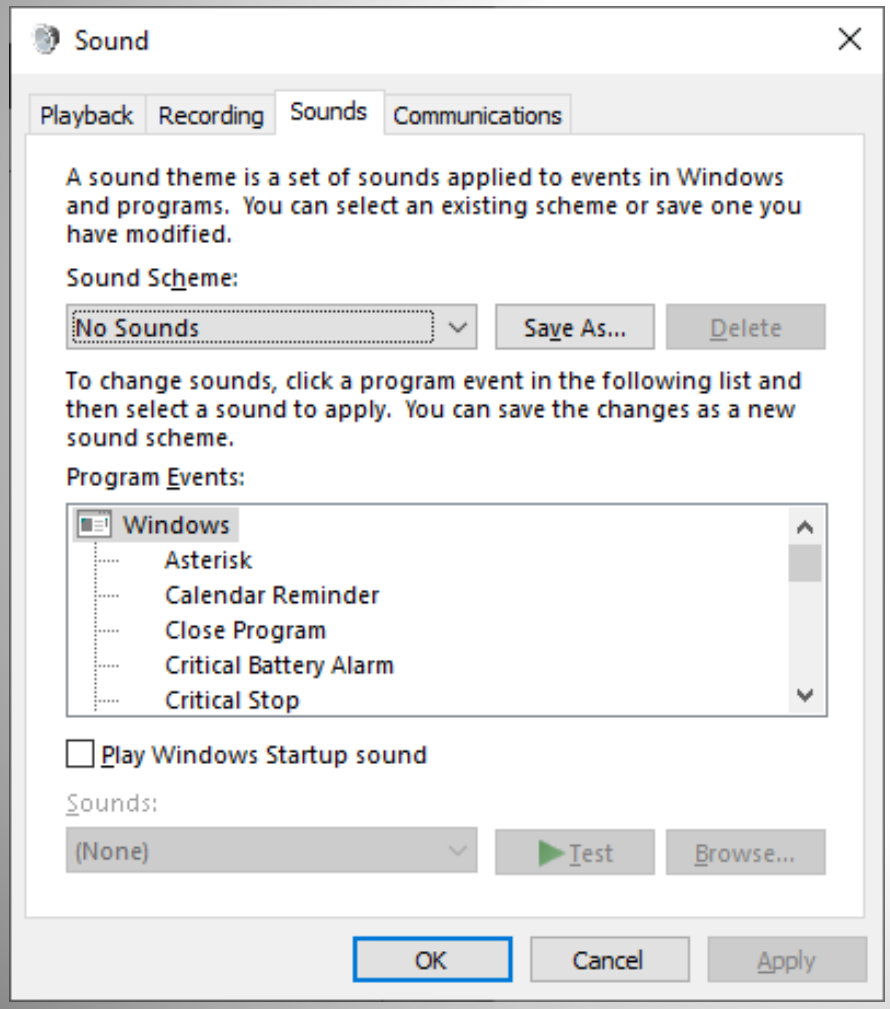


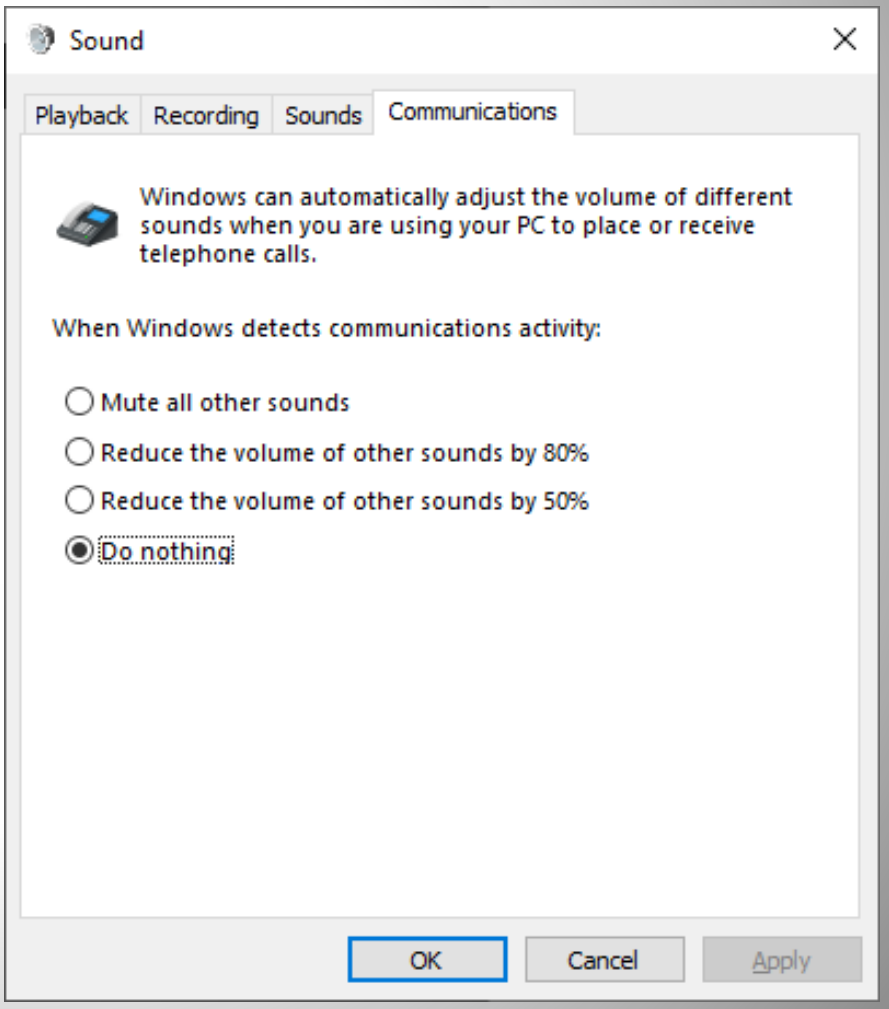


Windows Enhancements
check option: Disable enhancements for digi modes

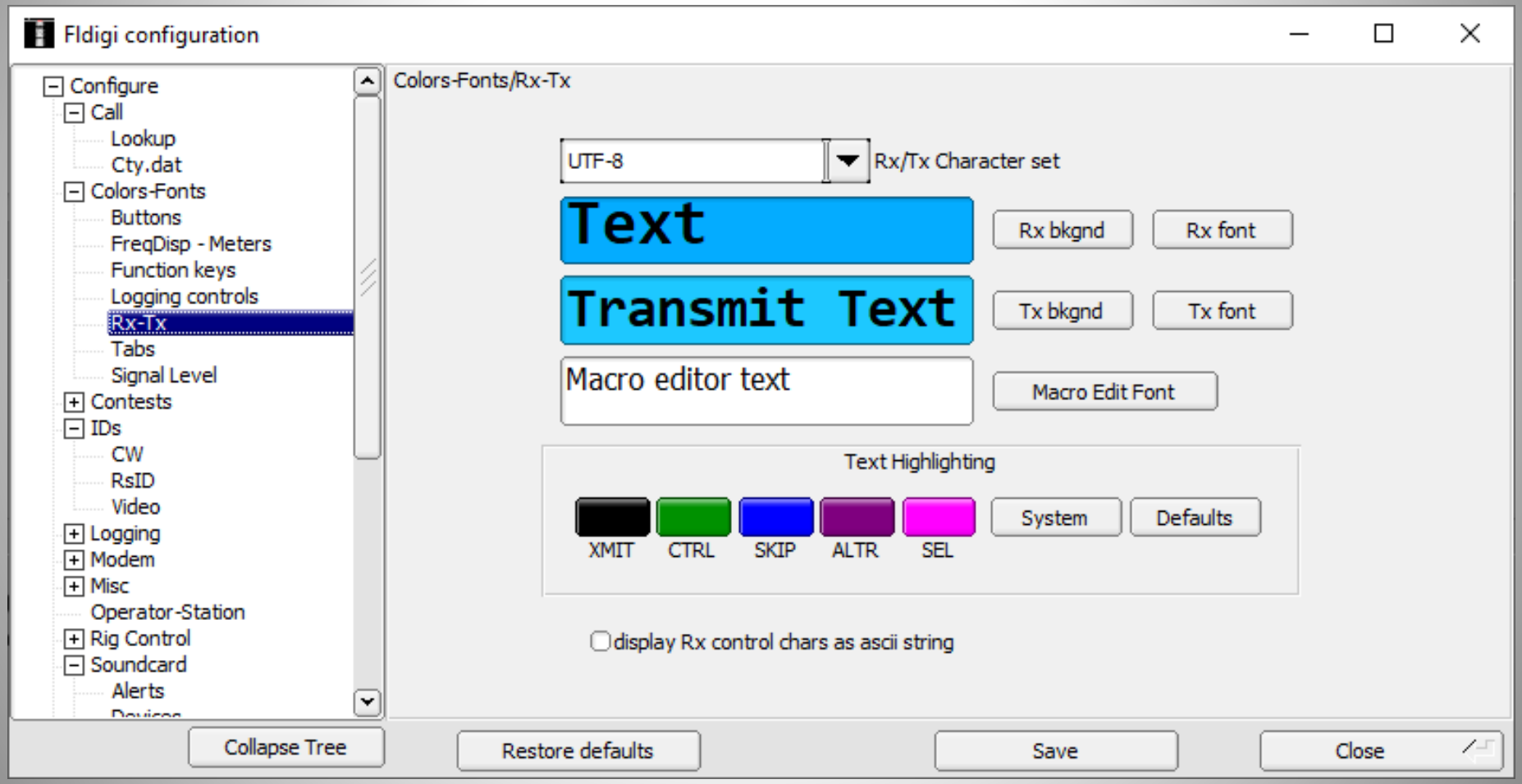


To AVOID any Windows sounds sent to your
radio's sound card => sound scheme = "NO SOUNDS"

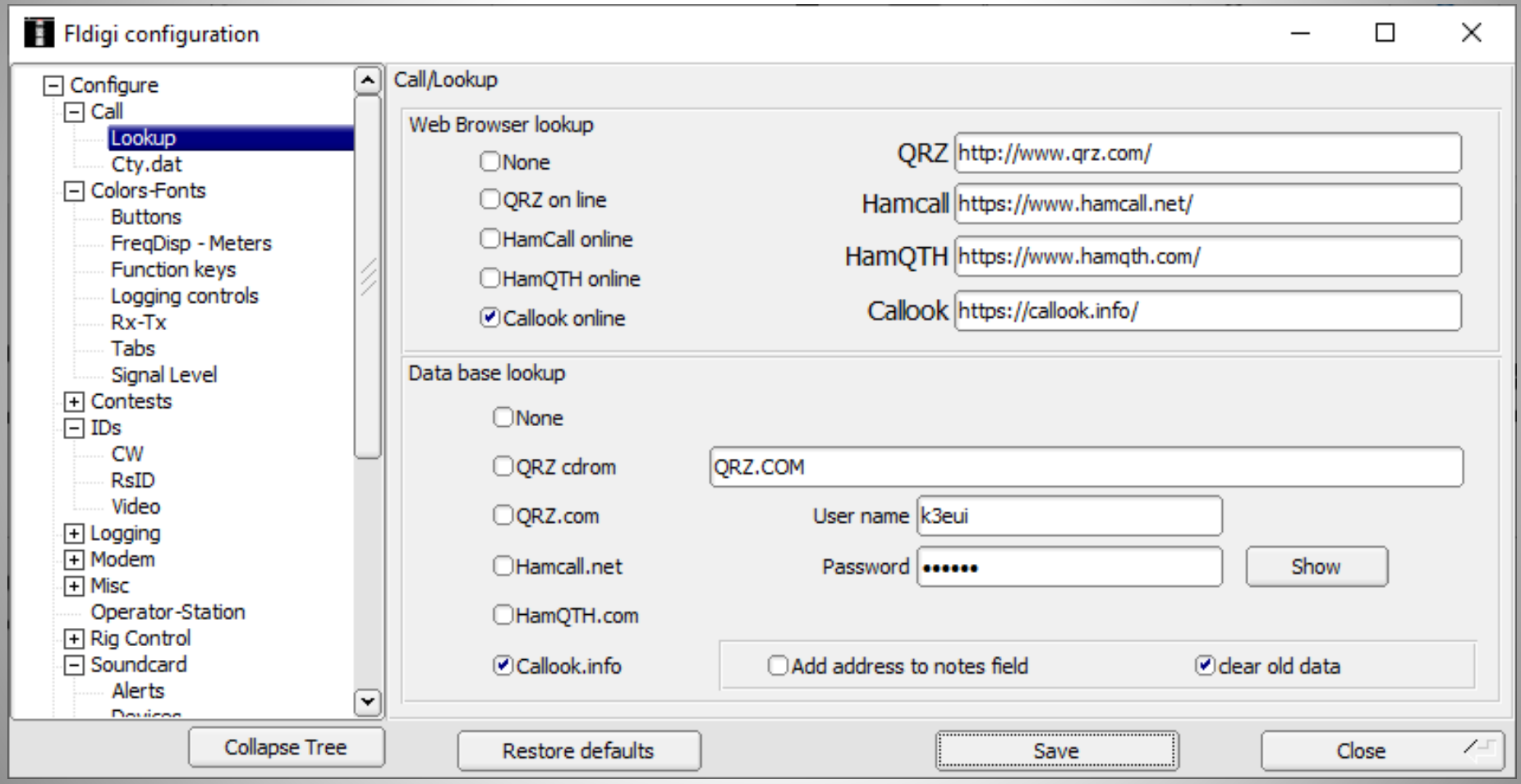




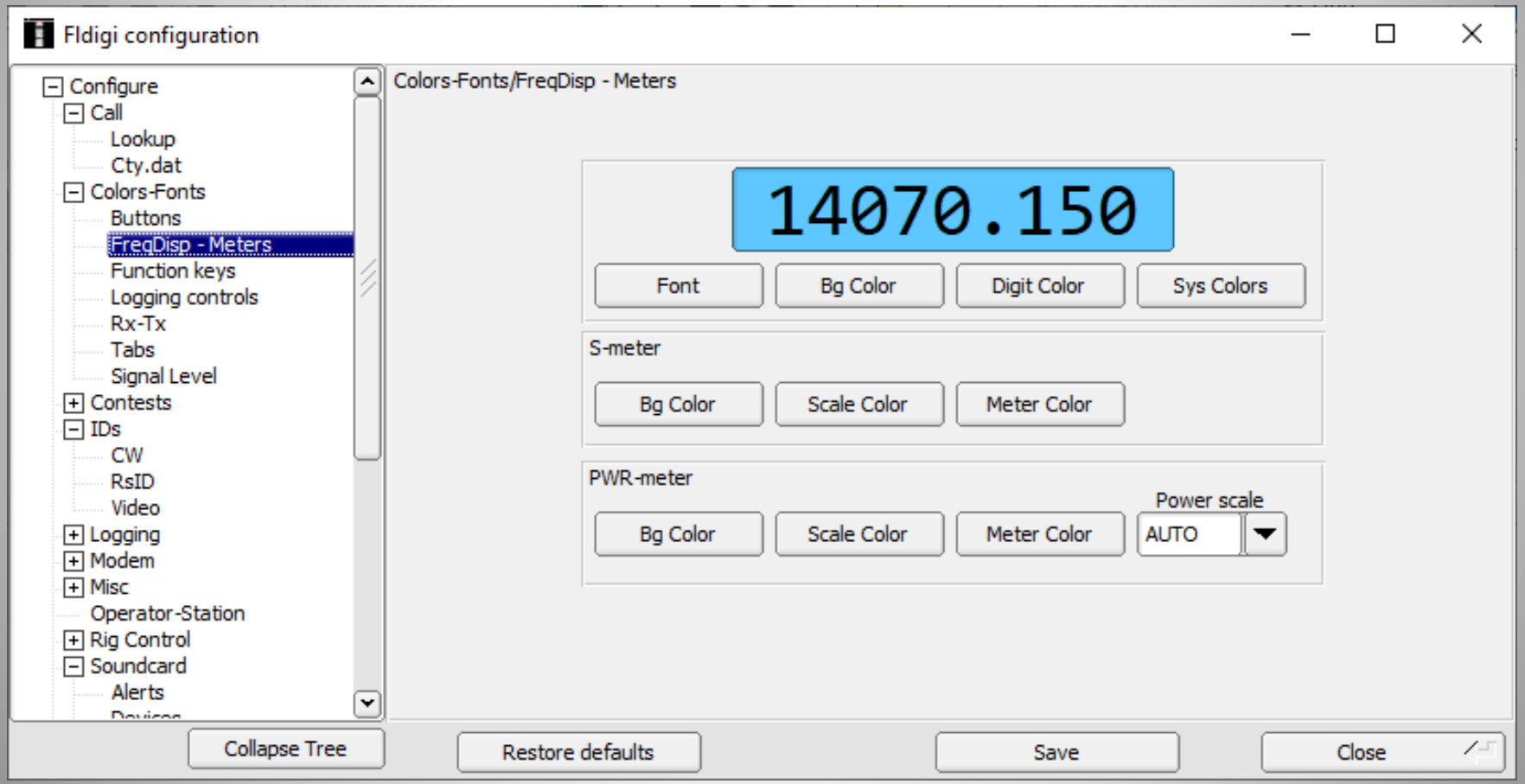
Set the size/color of fonts and background colors



CALL letters "lookup" source options



Set Color/font of meters



FLDIGI - rig control

Options for Rig Control (vfo, mode, power)

- FLRIG
- RigCat
- HamLib

PTT (send) options with Fldigi

CAT "command" to transmit (if radio allows)

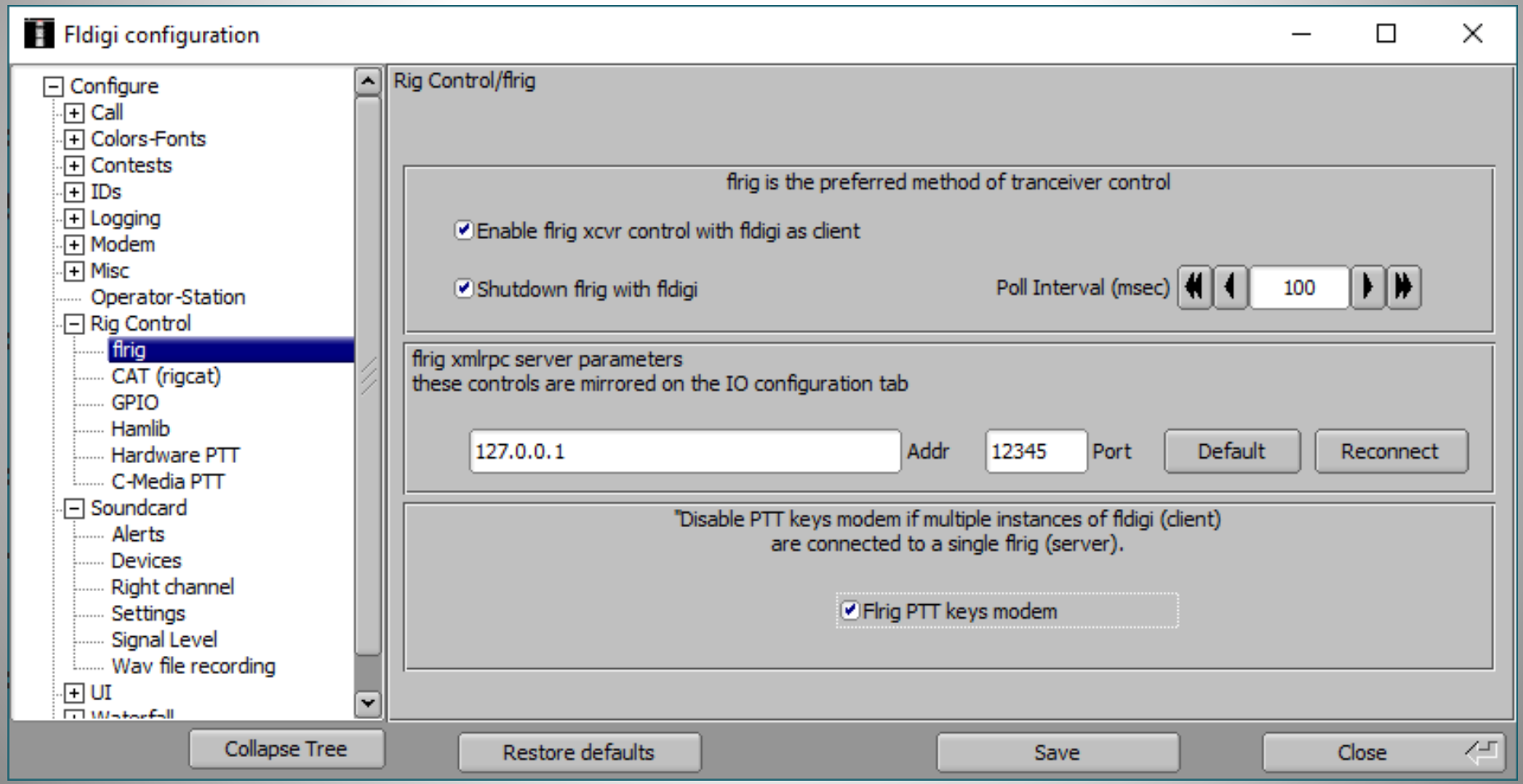
options: FLRIG, RigCAT, HamLib

(dumb) COM port: RTS pin if sound card can interpret RTS (+V) to trip PTT relay

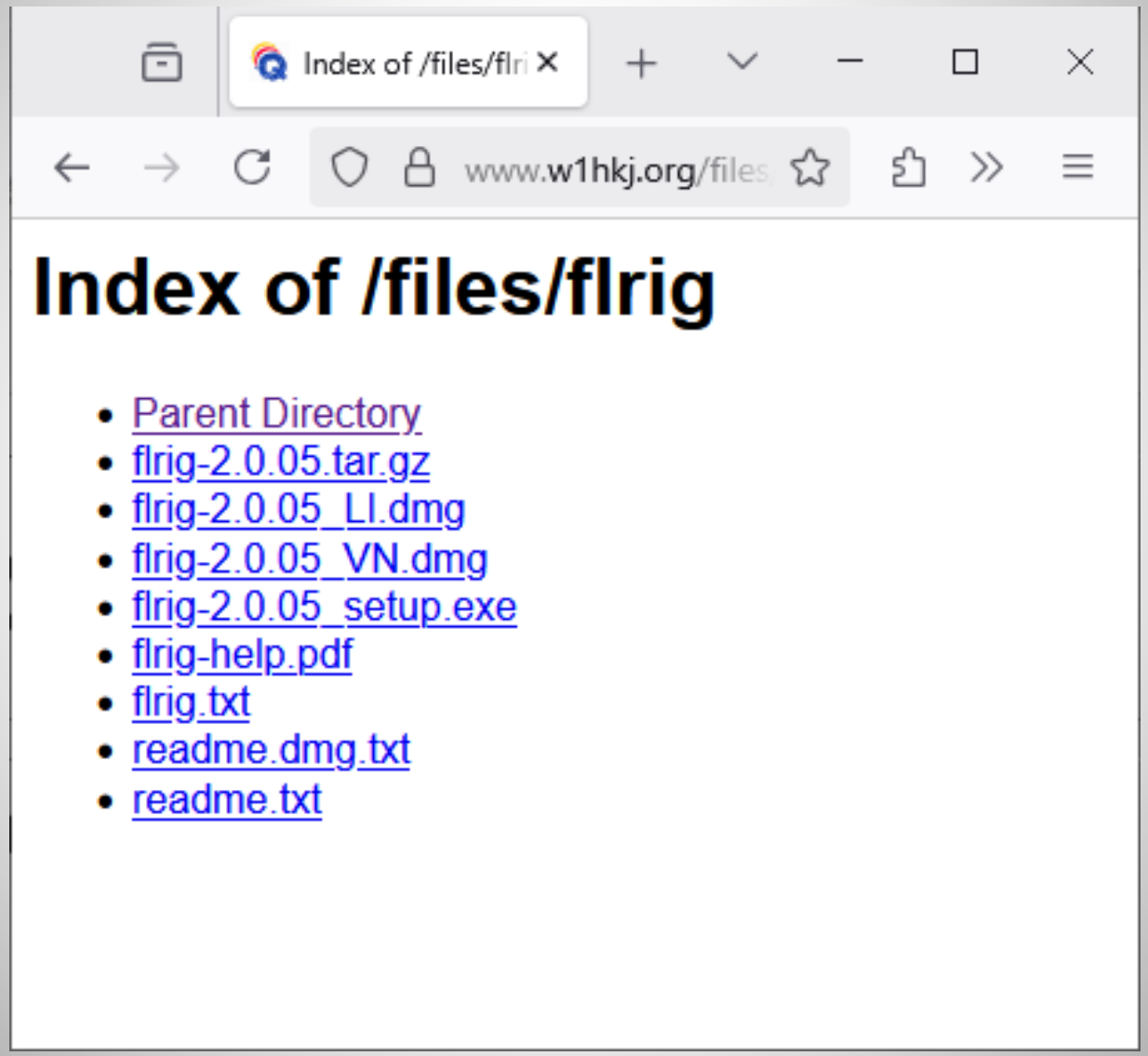
RA adapter – DRA sound cards (C-Media)

VOX – Tx audio trips a PTT relay (SignaLink)

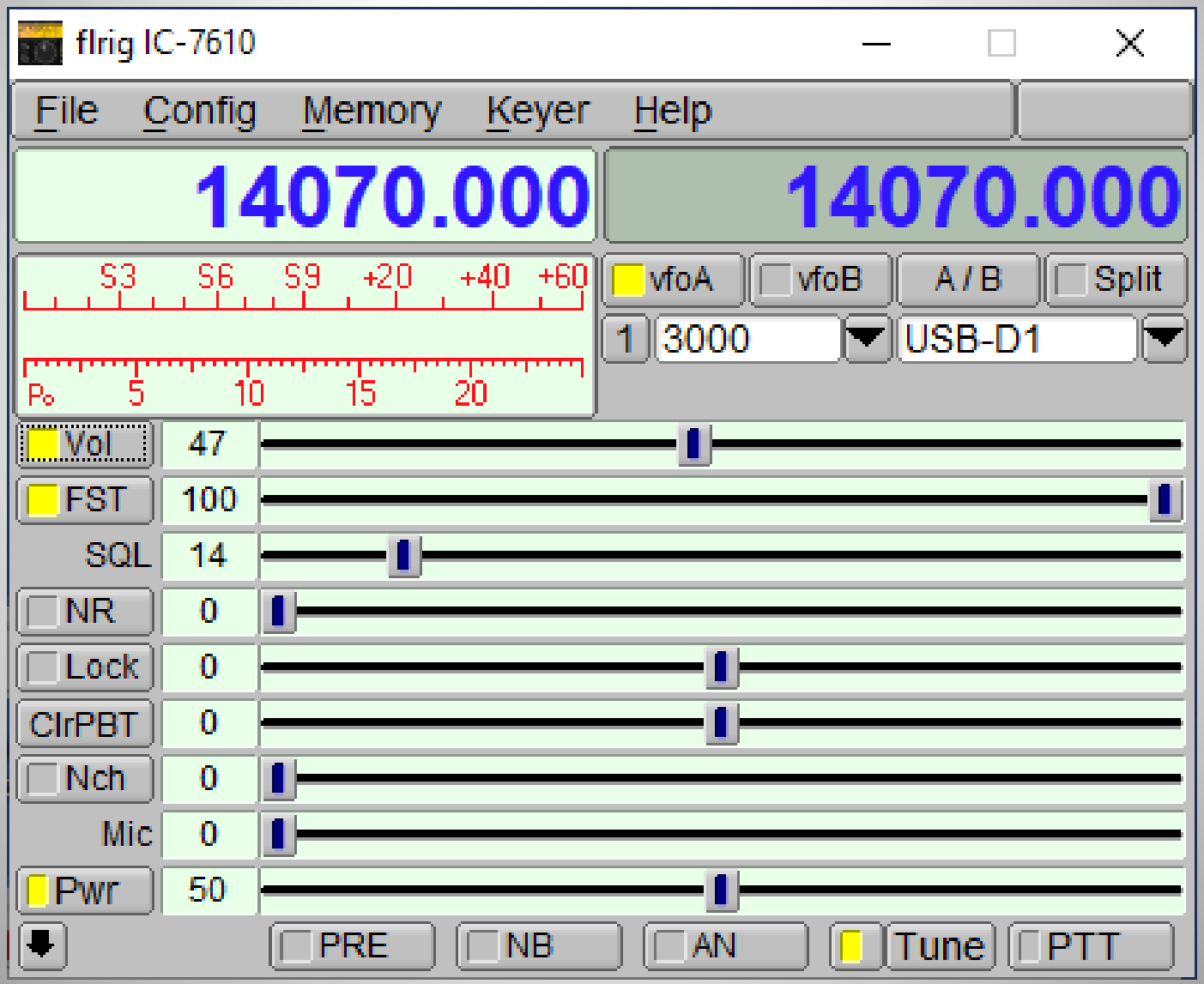
FLRIG ===> Rig Control option (requires installation of FLRIG first)



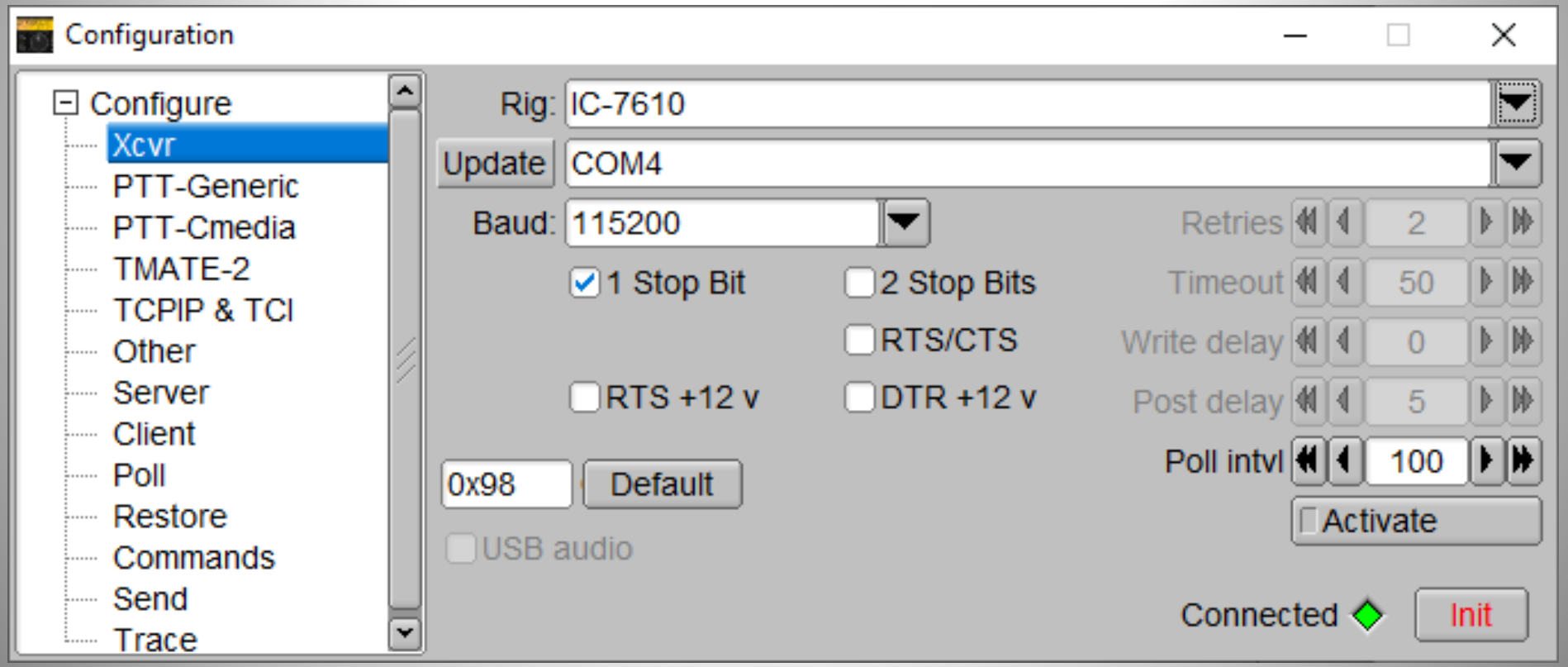
Download FLRIG



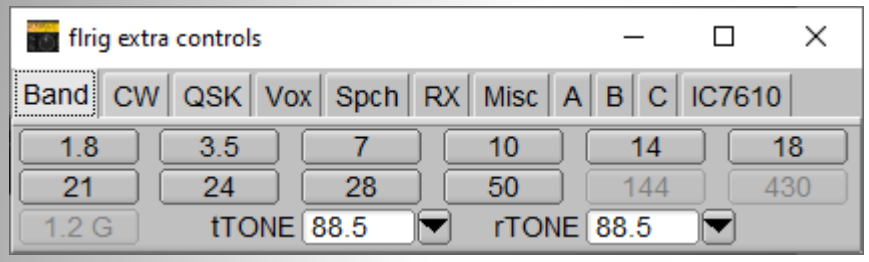
FLRIG creates a new Window
VFO/mode/bandwidth/noise reduction/tune

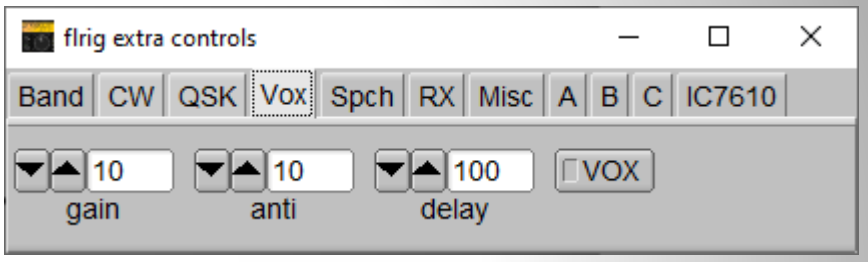


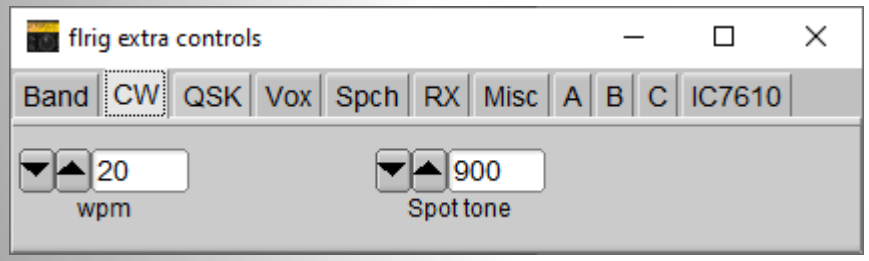
FLRIG - needs CONFIG to your rig
Set COM port, baud, stop bits
Icom rigs need a "CI-V" address
press INIT - look for yellow "connected" color

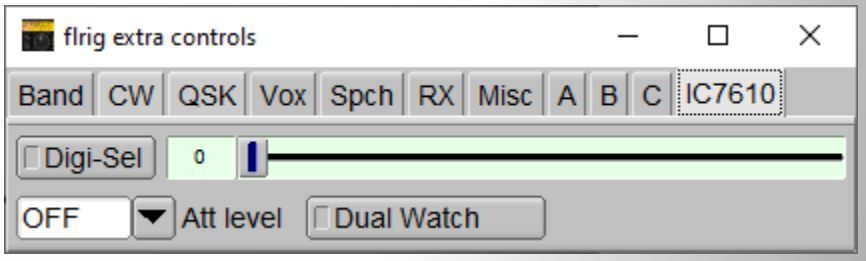


FLRIG - Options (depends on rig)
CW, Band, PL tone, VOX

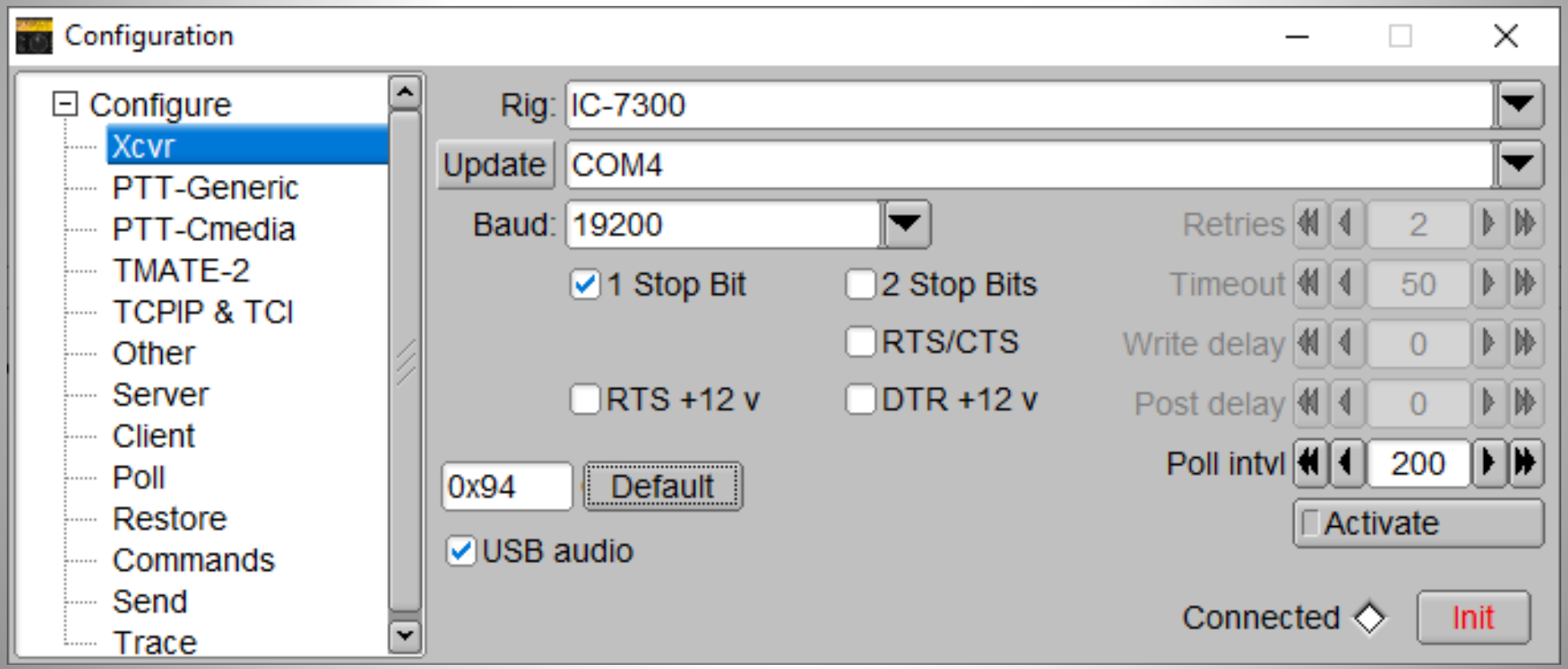






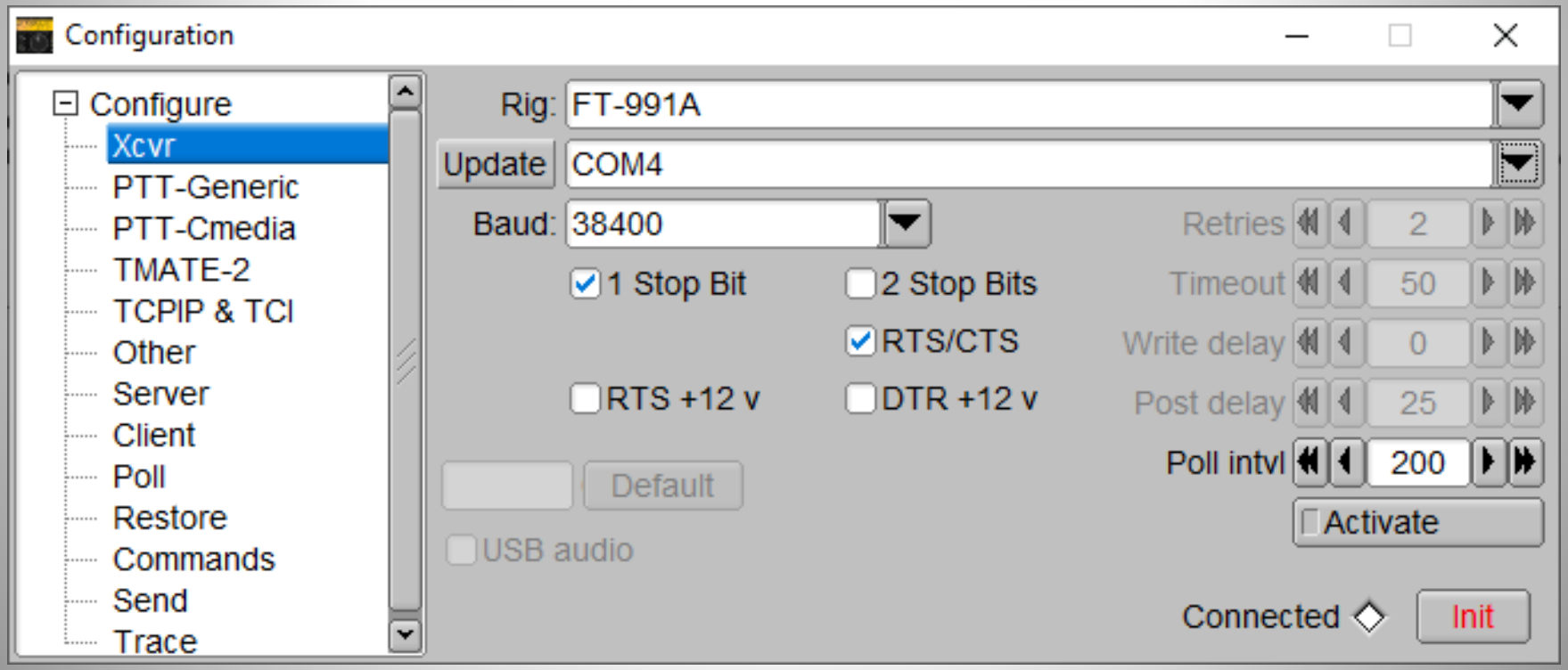


FLRIG config for Icom 7300
note the COM port number, Baud, CI-V address
USB audio checked
Click the INIT button

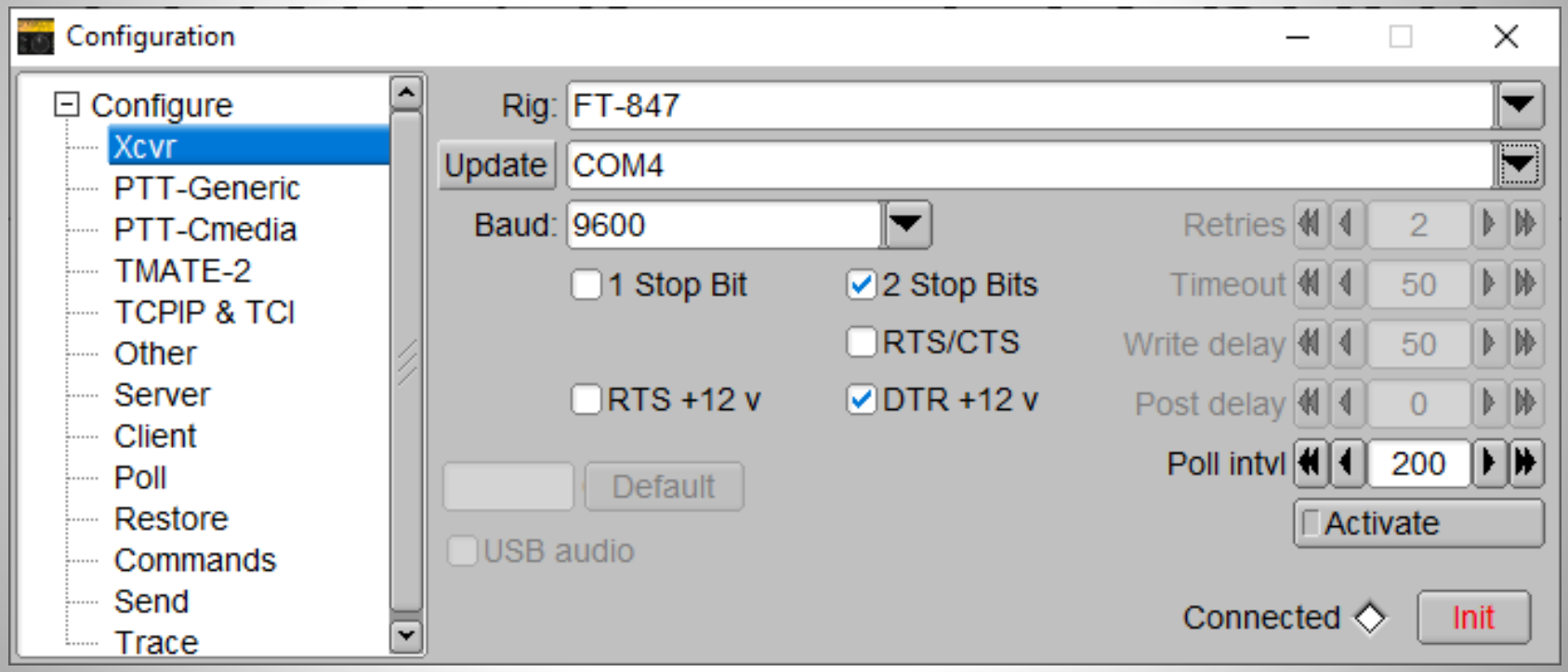


FLRIG: Config for Yaesu FT991A

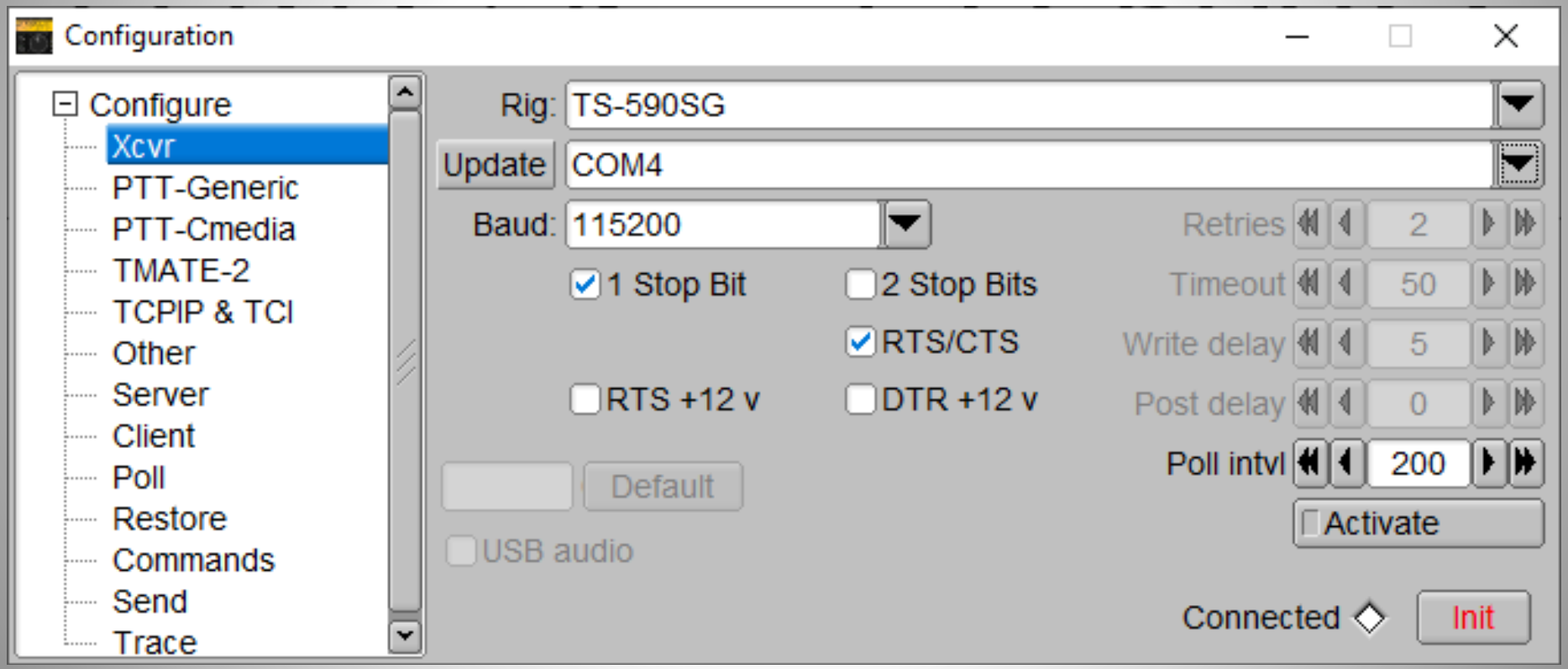
note the RTS/CTS pins are "enabled"
Yaesu prefers 38,400 baud on CAT port
Click on the INIT button



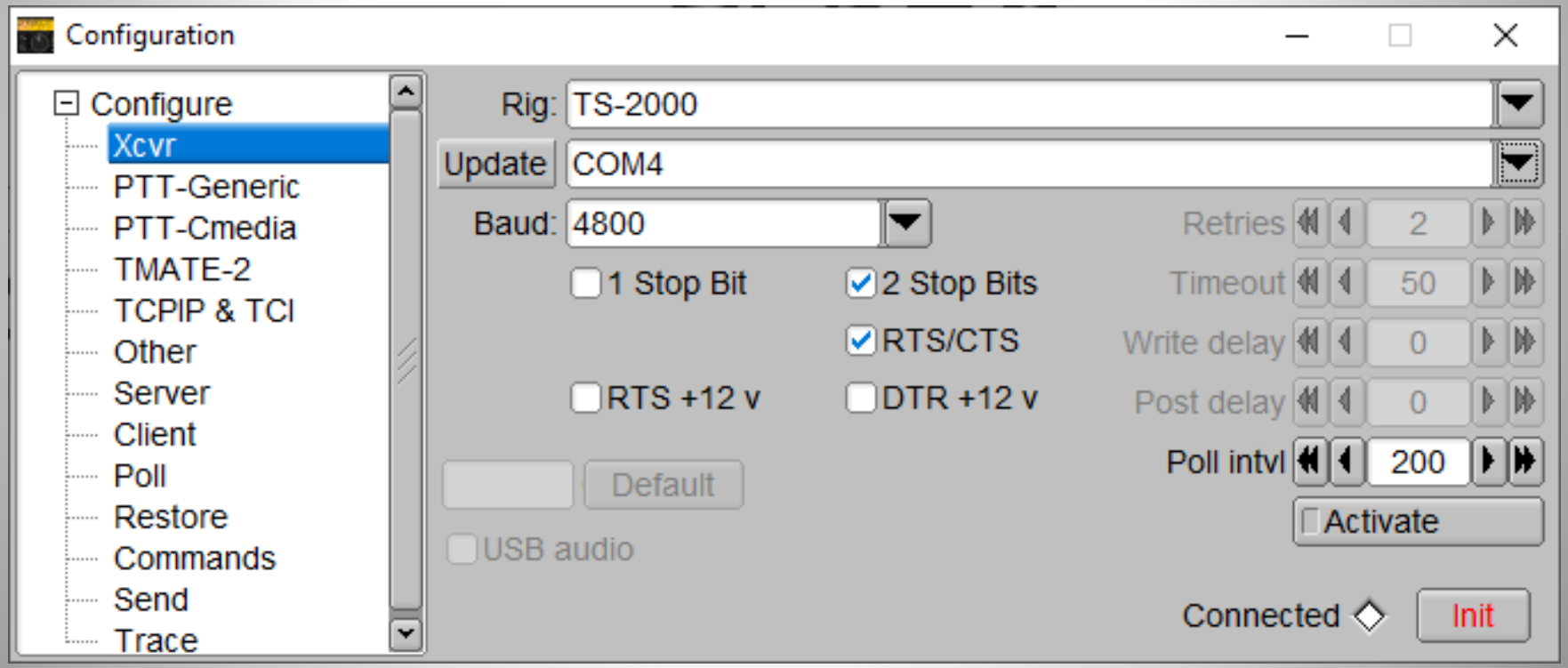
FLRIG Yaesu FT847
(older rigs have DB9 serial port)



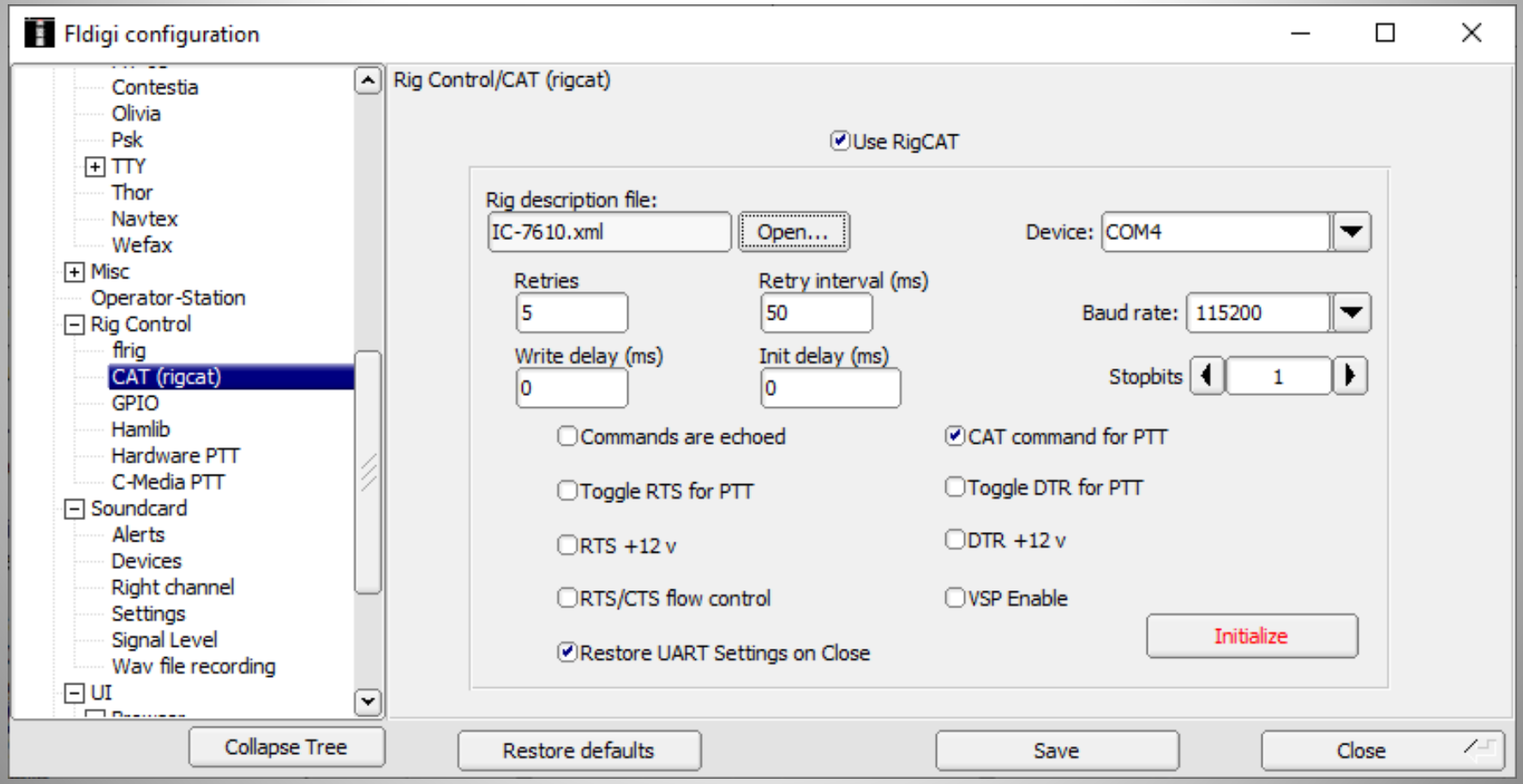
FLRIG: Knwd TS590SG
(try Default values first)
you may need to check RTS/CTS pins



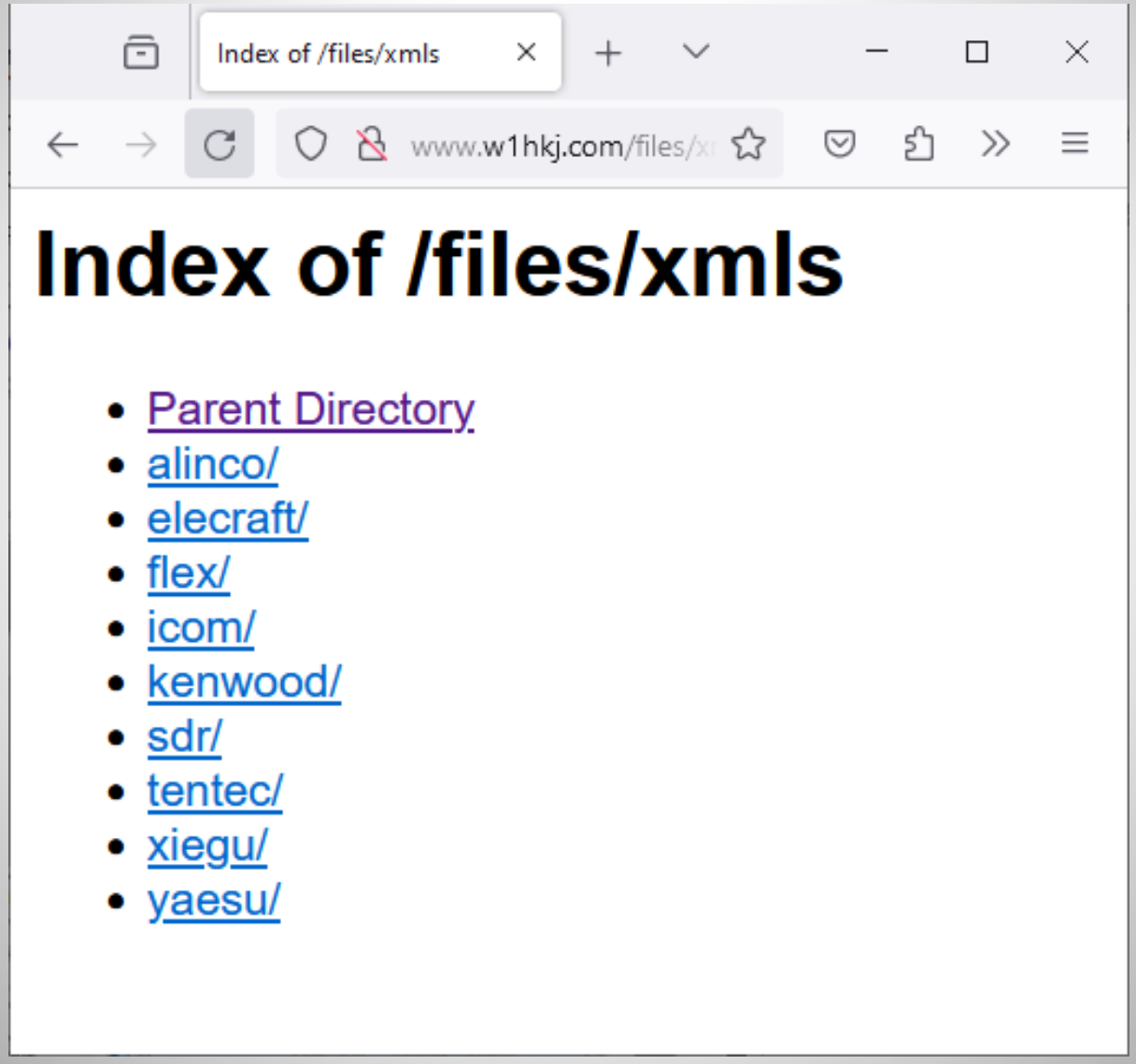
FLRIG: older Knwd TS2000
note: 4800 baud, 2 stop bit, RTS/CTS enabled



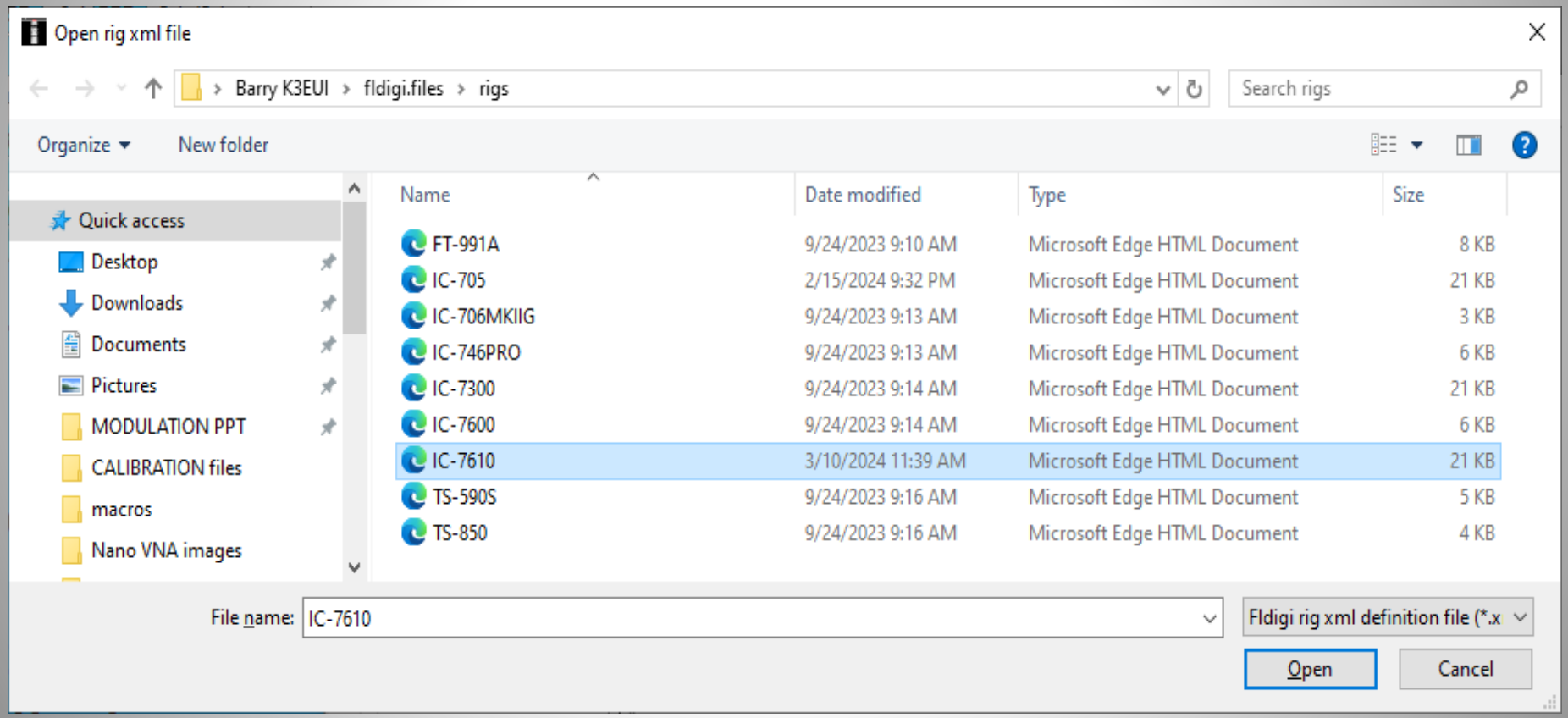
RigCat: CAT option in FLDIGI
Choose Rig.XML file, Com port, baud
Check CAT command for PTT



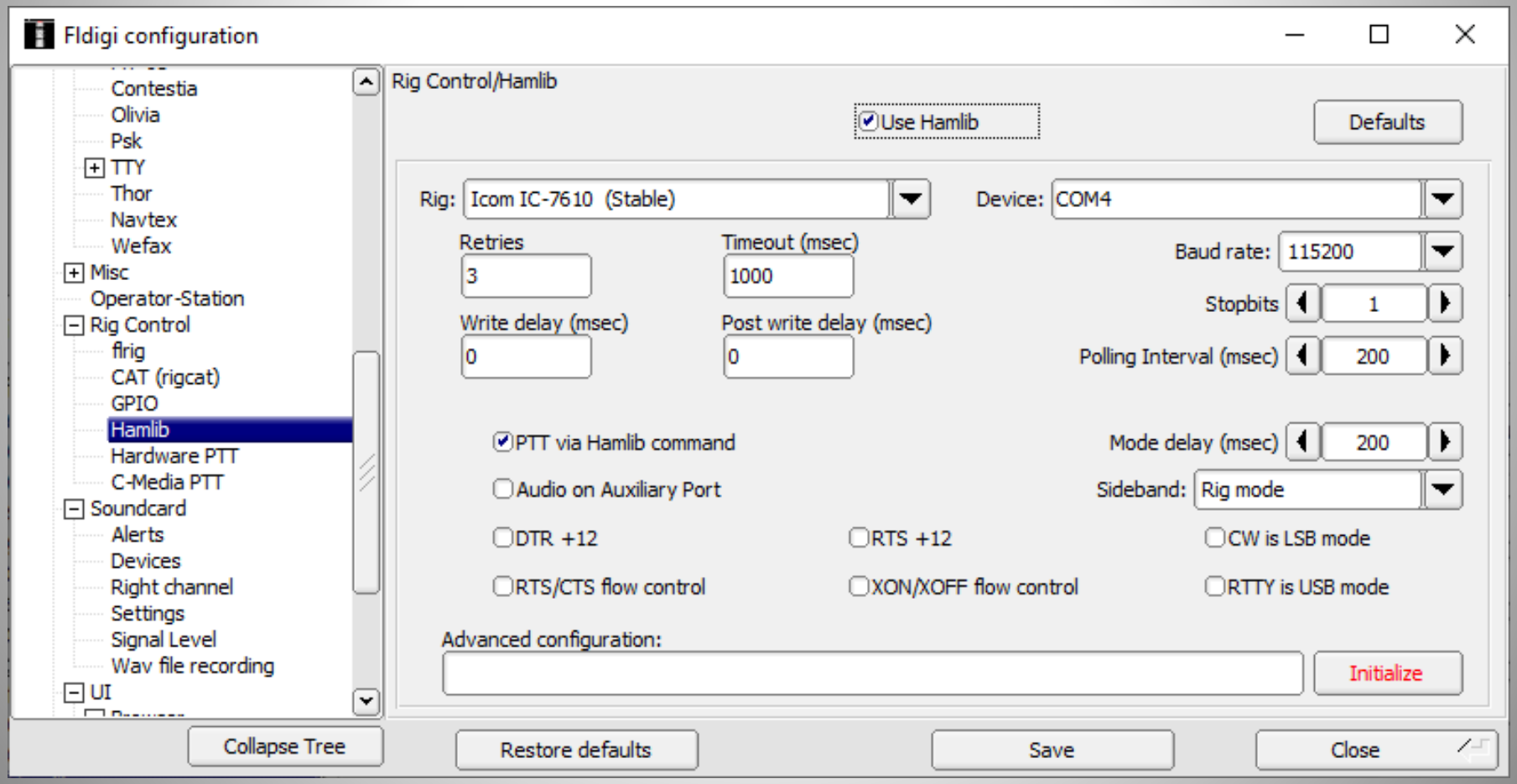
Download XML files for your rig at w1hkj.com



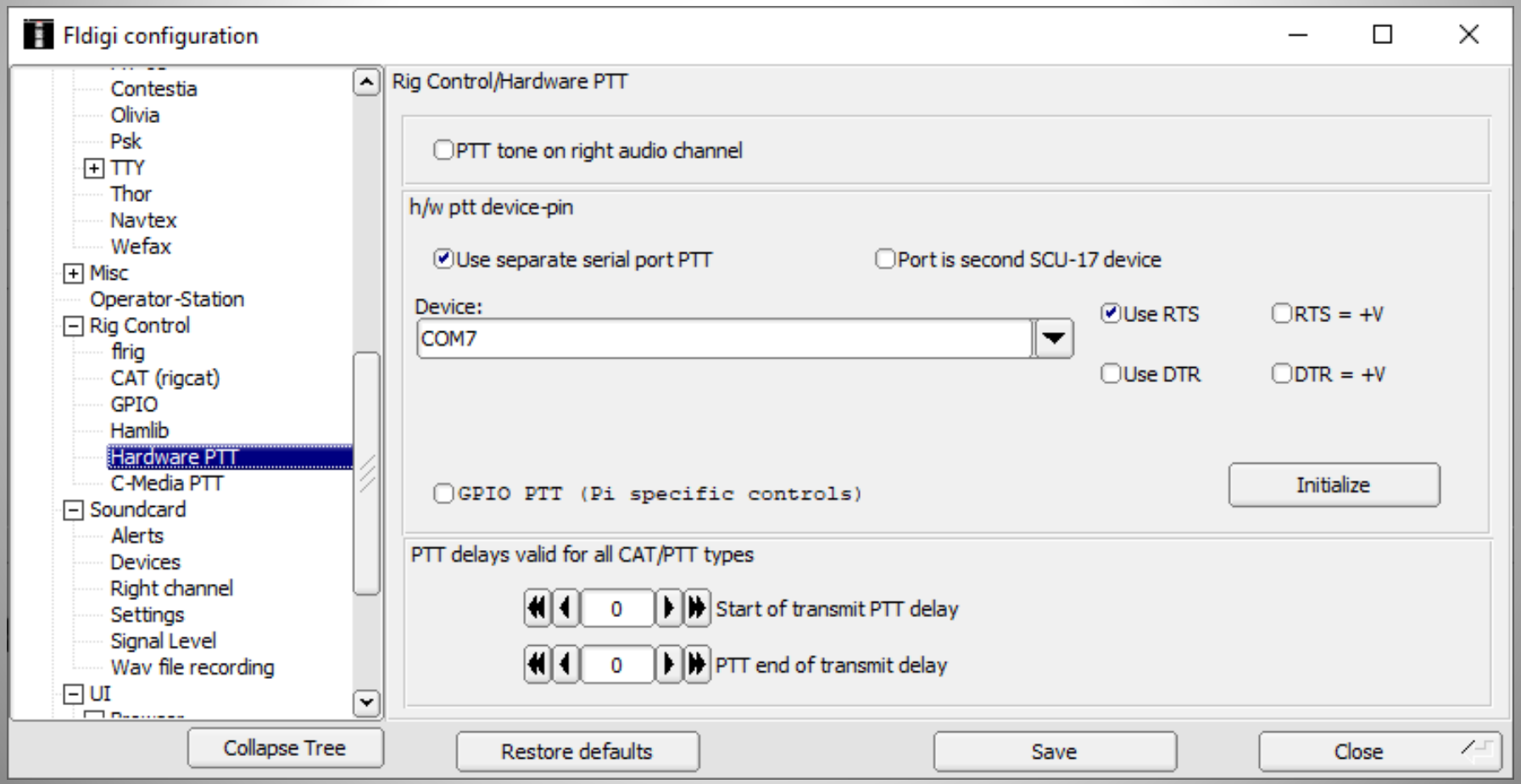
RigCAT requires proper XML files (stored in /fldigi.files/rigs)



Hamlib option for CAT control
Choose Rig and com port, baud, etc.
Pick **PTT** via **Hamlib command**



Simple choice: **Hardware PTT (send)** option to PTT via a "dumb" COM port
Pick either RTS pin or DTR pin
Press Initialize



Sound Card Options

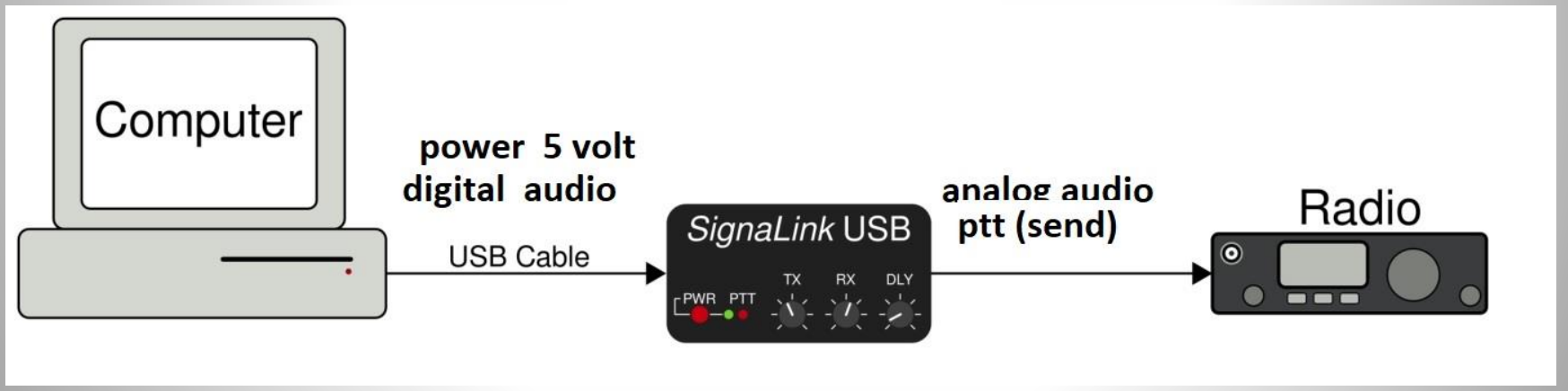
How does "digital" work?

- Computer generates the digital code
- Sound card converts digi to analog audio
- Interface treats audio levels and sets up a PTT (send)

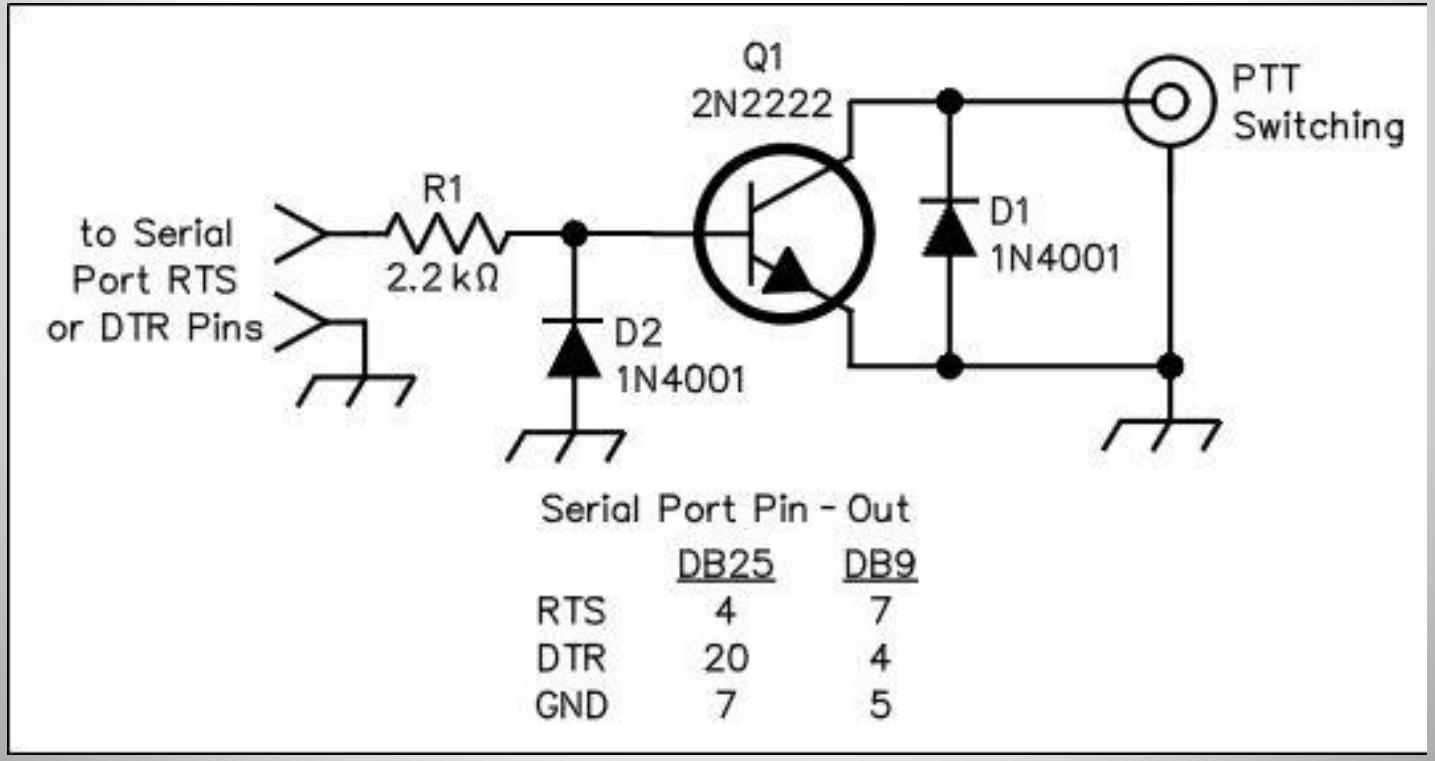
- Radio's often have a DATA port for Tx audio, Rx audio, PTT, and ground

Typical setup with external sound card
digital - usb cable to computer
analog - audio cable to radio

advantage: PTT by VOX (no COM port)



Simple PTT (send) Circuit using a serial COM port Positive voltage on pins (RTS or DTR) grounds the PTT switching circuit

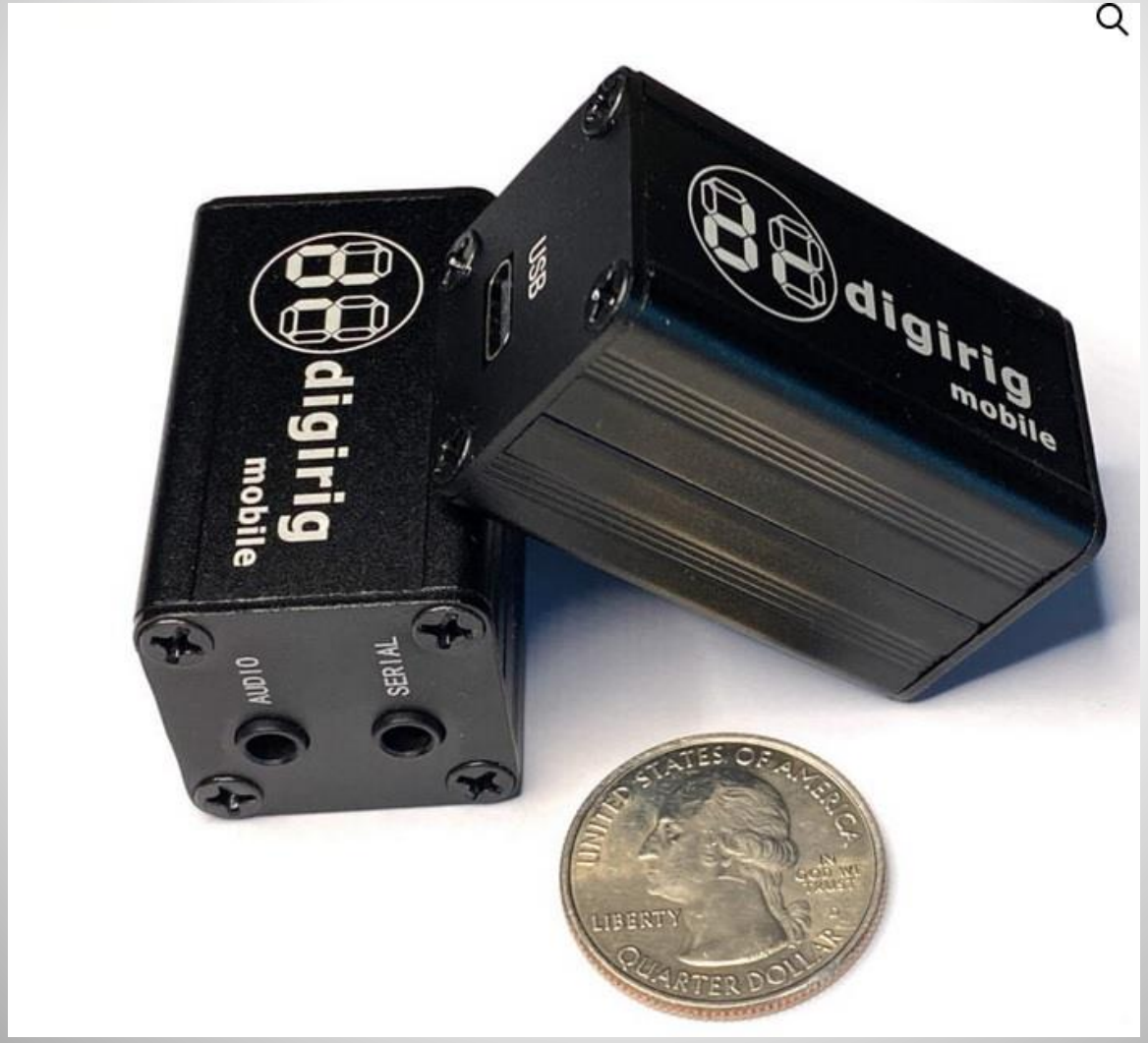


Serial Port Pin - Out

	DB25	DB9
RTS	4	7
DTR	20	4
GND	7	5

Many modern rigs have built-in sound cards (only cable is a USB from rig to computer)

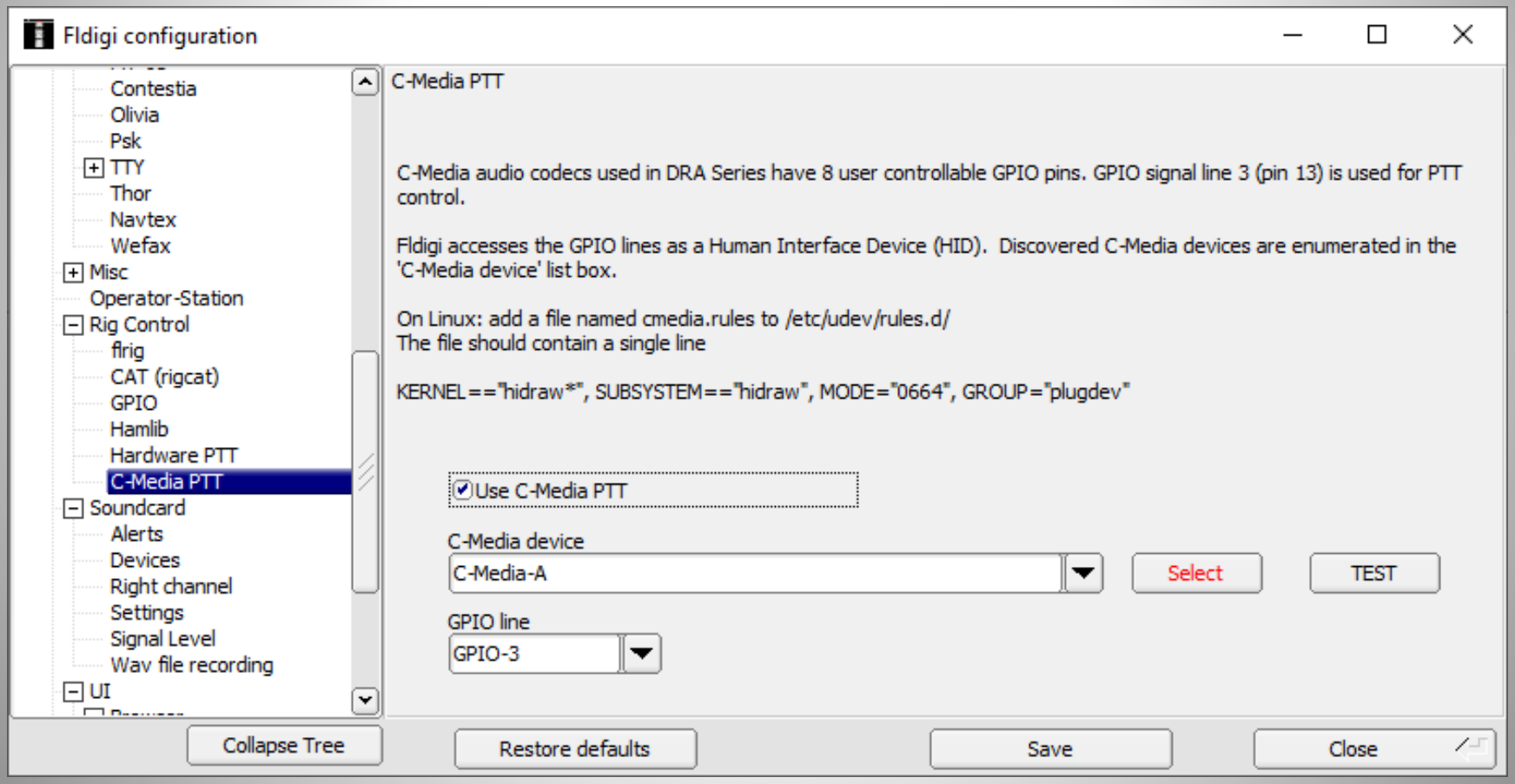
DigiRig Mobile complete sound card
with serial COM port and TX/RX audio and PTT
requires special TRRS cables



Simplest: DigiRig "lite" (no COM port) unique cable for each radio

Masters Communications: high performance

RA adapter for PTT
available on some newer sound cards with
C-Media sound chips
PRESS TEST button to check



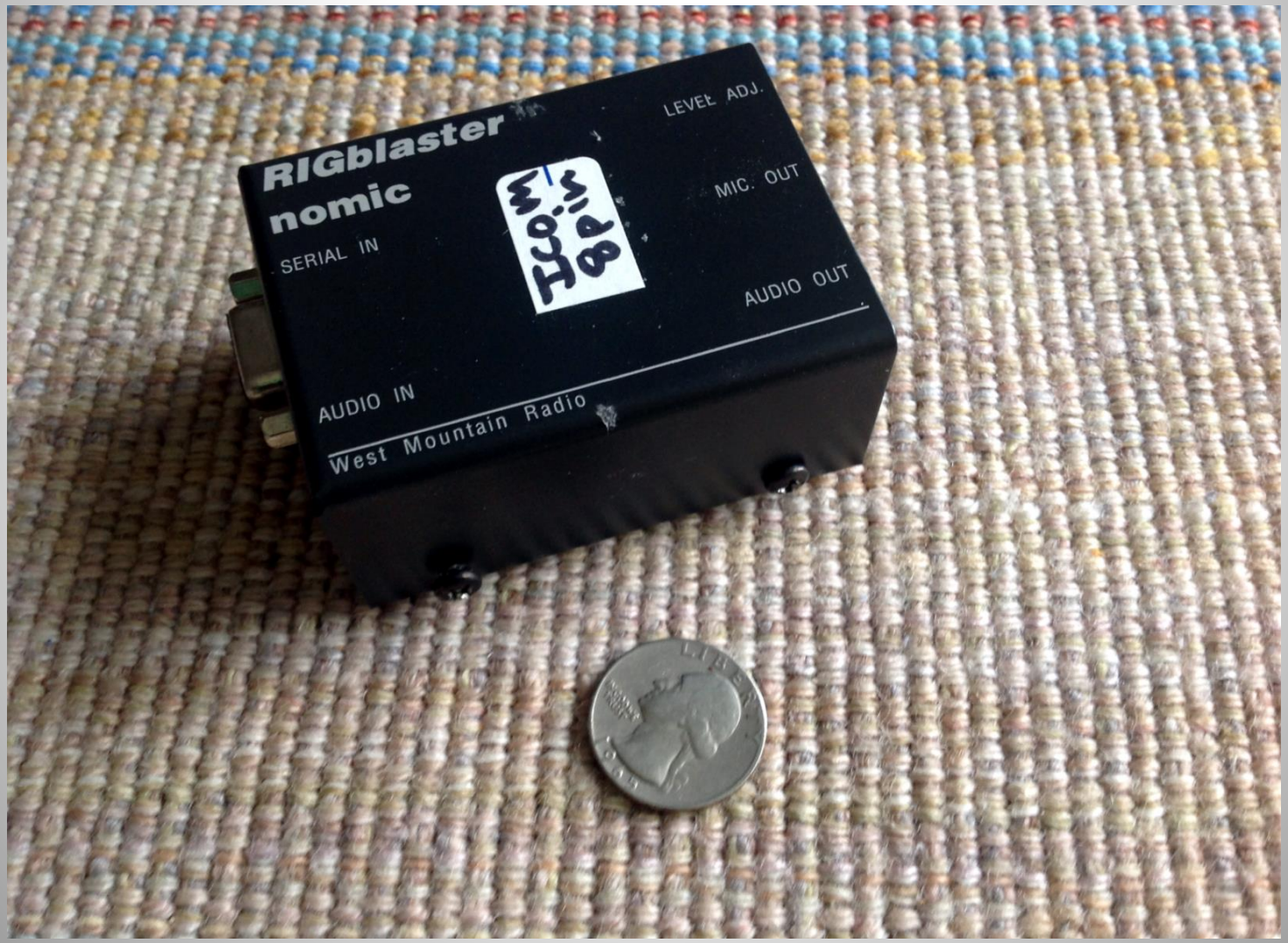
Simple Rigblaster interface and 2m FM rig uses radio's MIC and SPKR jacks

Rigblaster Advantage model sound card, COM port, CAT port CW keying, RTTY FSK keying

Rigblaster Advantage - rear view

USB or Serial RS232 Com Port
CAT (rig control)
CW keying or FSK keying for RTTY
LINE in (receive audio)
PTT (external switch) and MIC (to radio's MIC jack)

Rigblaster "nomic" interface COM port for PTT (uses your laptop's sound card)



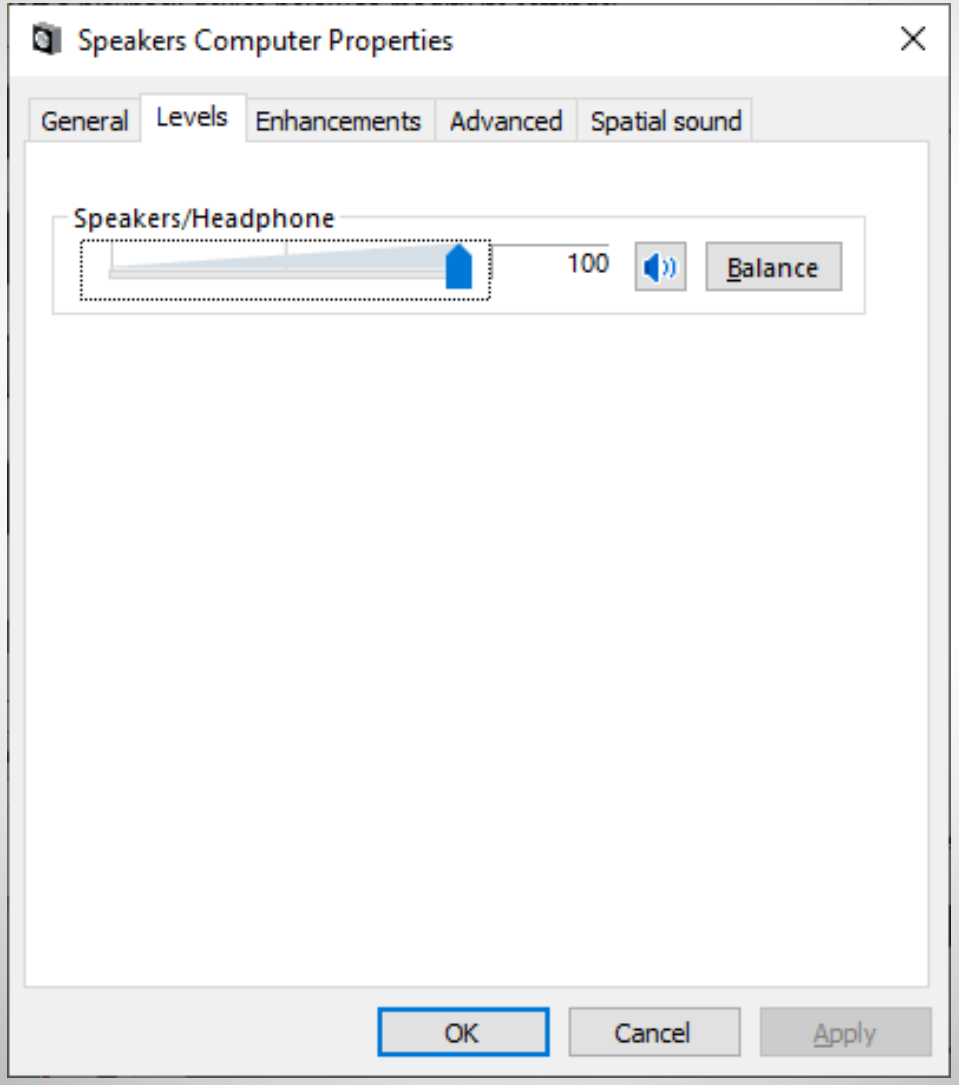
Simple USB Sound Card
but PTT may be a challenge

Tigertronics - **SignaLink (no COM port)**

USB sound card: adaptable to many radios
Has its own internal VOX circuit for PTT and Delay
Rx and TX audio level adjustments
Radio Cable: specific for radio model

In FLDIGI config => choose **NONE** of the options for PTT

Warning: SignaLinks are mono only (left) so keep the Windows Sound Control Panel for PLAYBACK (TX audio) at 100% level to have proper level PTT signal

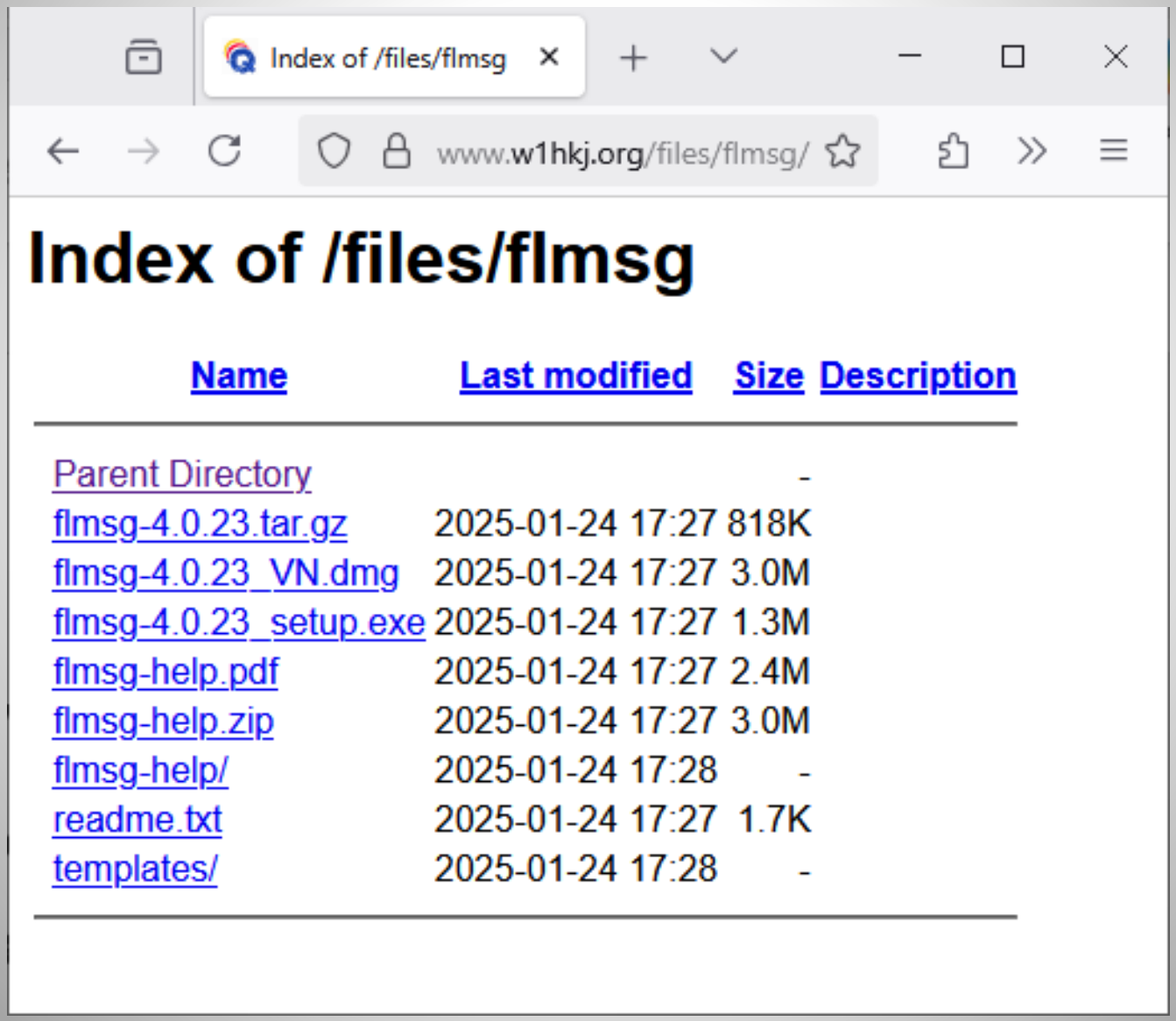


Rig Expert: lots of features

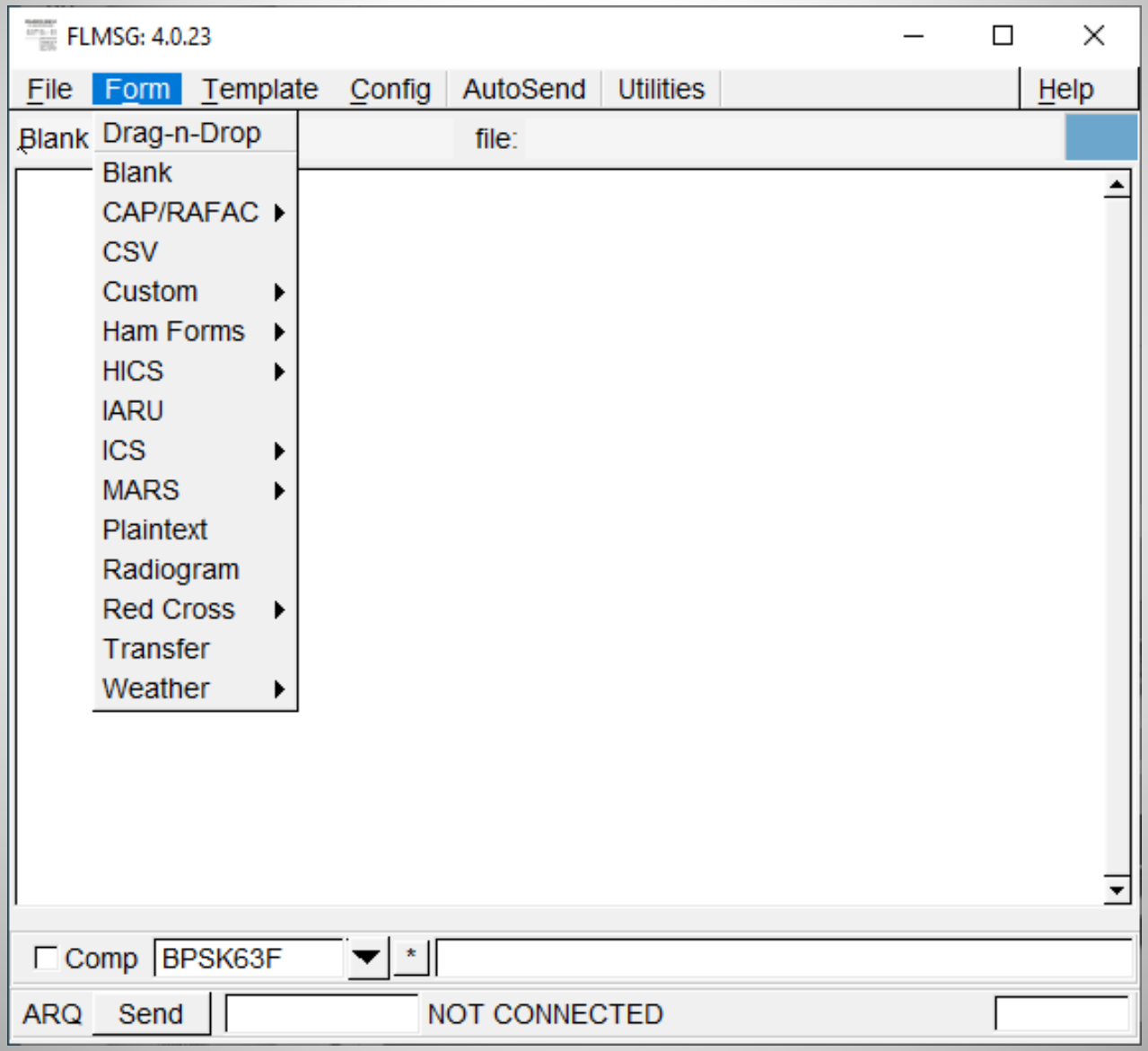
Sending FILES

- FLMSG – standard templates
- FLAMP – sending files in small 'blocks'

Download FLMSG



FLMSG Forms


FLMSG: 4.0.23
File
Form
Template
Config
AutoSend
Utilities
Help
Blank
Drag-n-Drop
Blank
CAP/RAFAC
CSV
Custom
Ham Forms
HICS
IARU
ICS
MARS
Plaintext
Radiogram
Red Cross
Transfer
Weather
file:
Comp
BPSK63F
*
ARQ
Send
NOT CONNECTED

FL Message: FLMSG

FILES are "**wrapped**" for **error detection**

Weather reports

American Red Cross messages

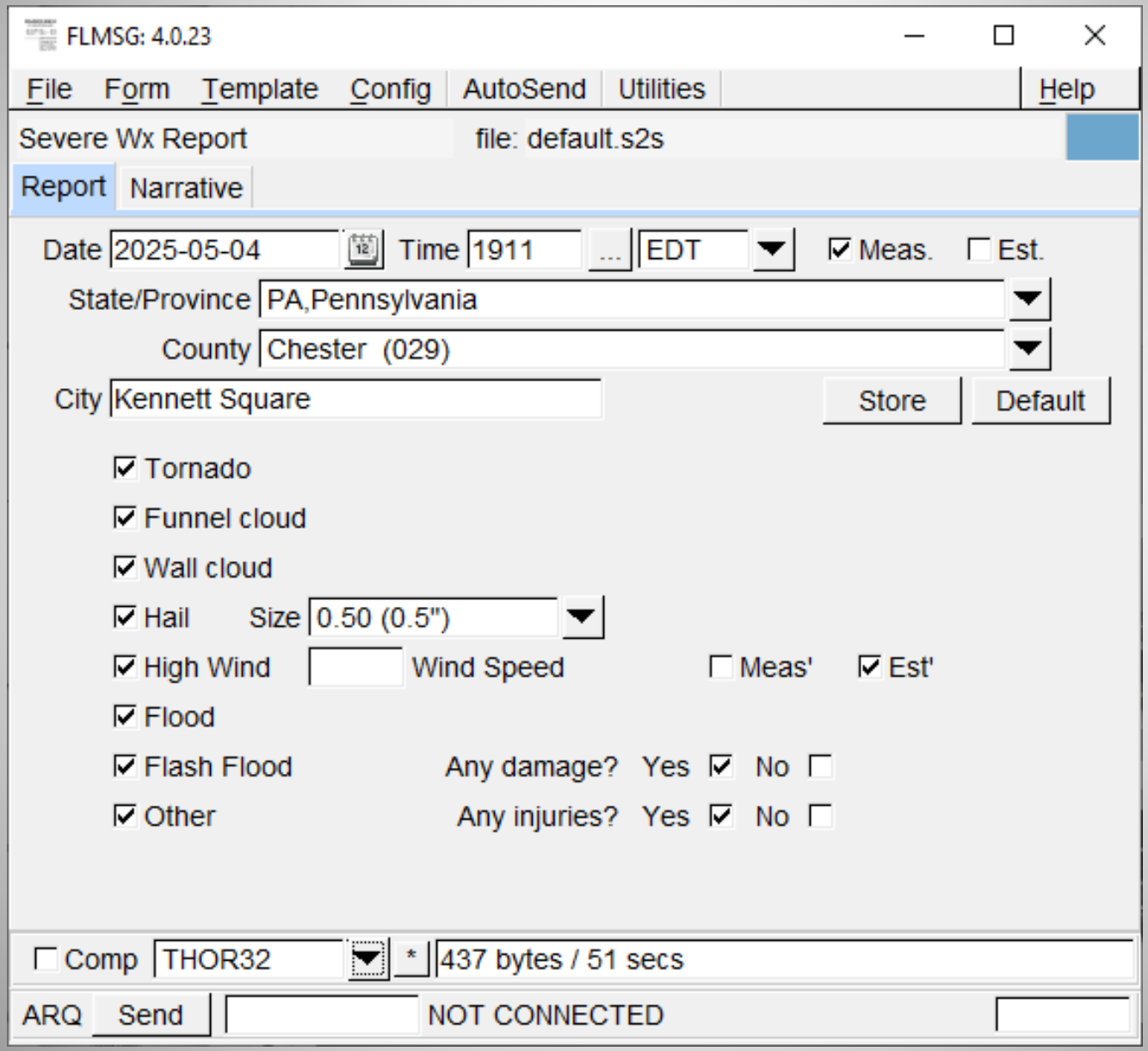
ICS emergency messages

Spreadsheets (CSV files)

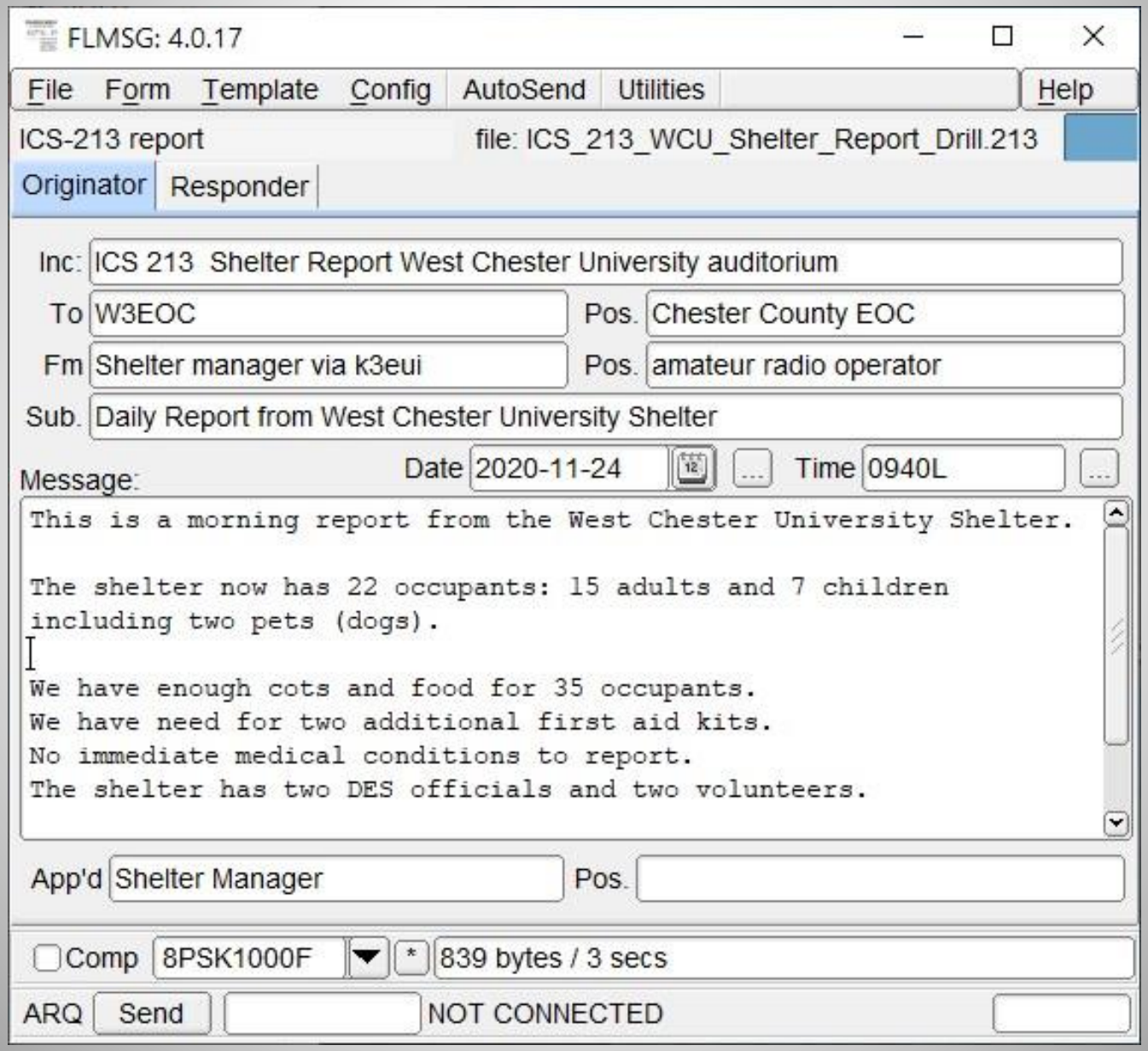
ARRL RadioGram

CUSTOM FORMS - (local WX)

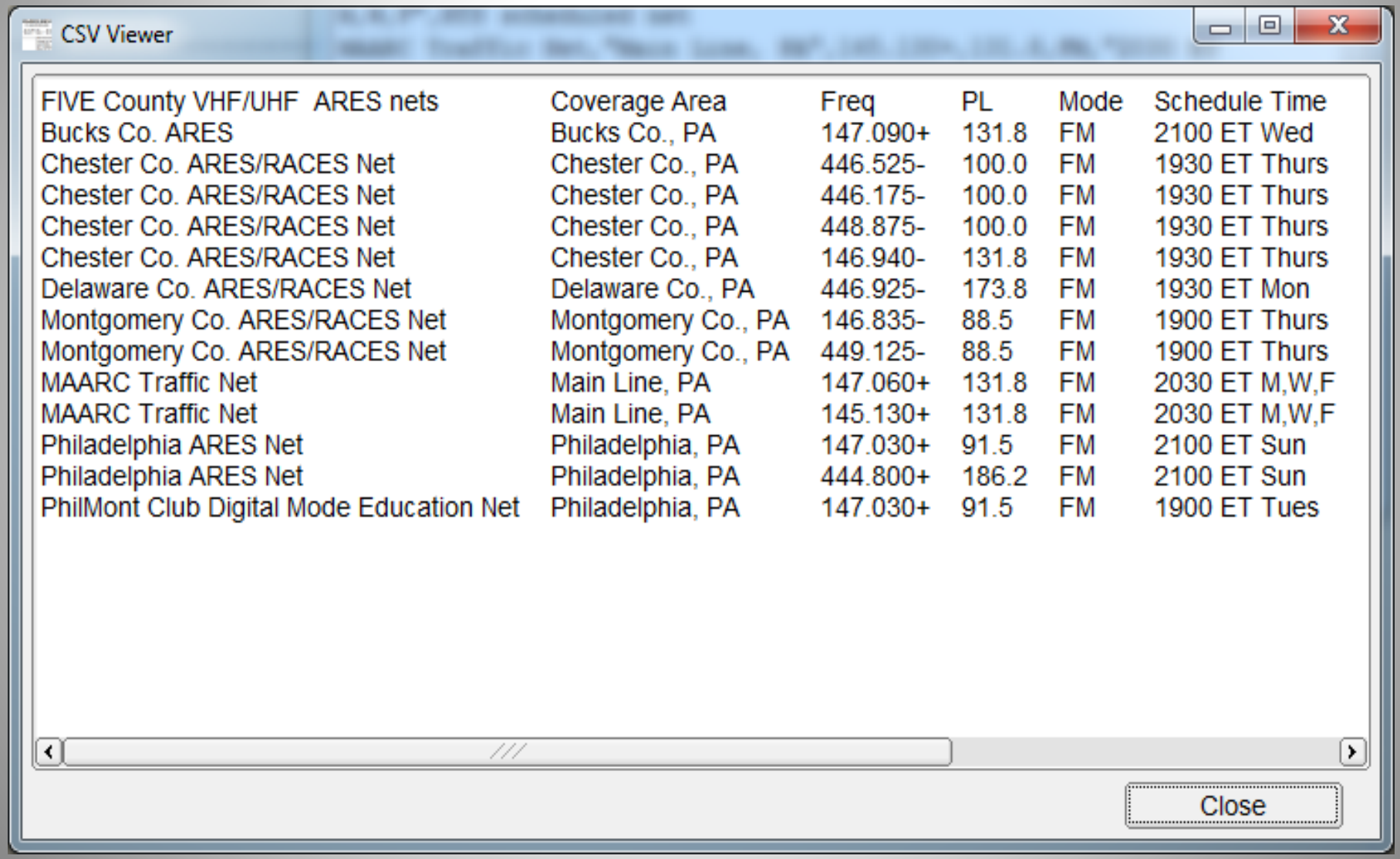
FLMSG: Severe Weather Reports



ICS 213 emergency message

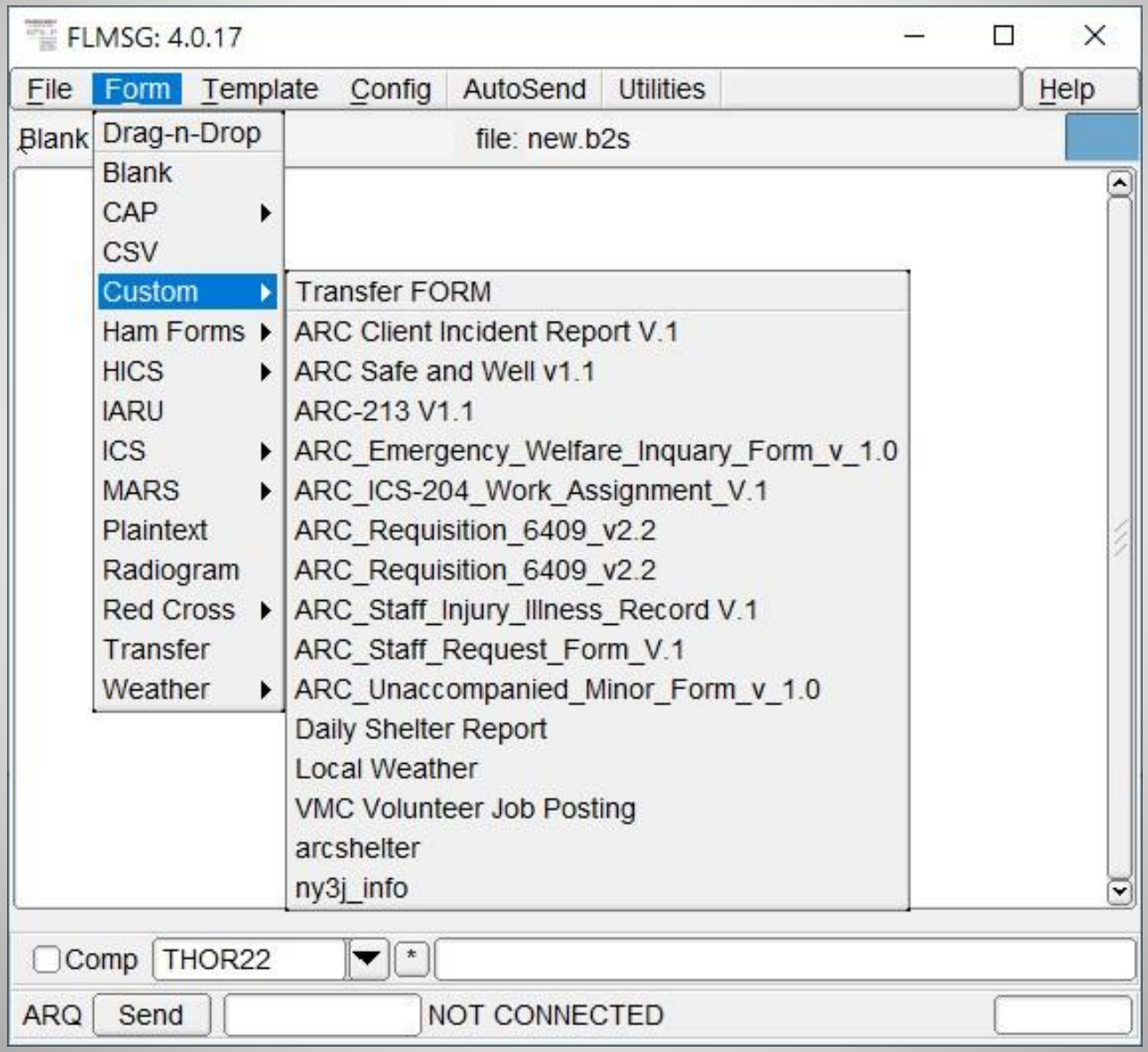


Spreadsheets (csv files)

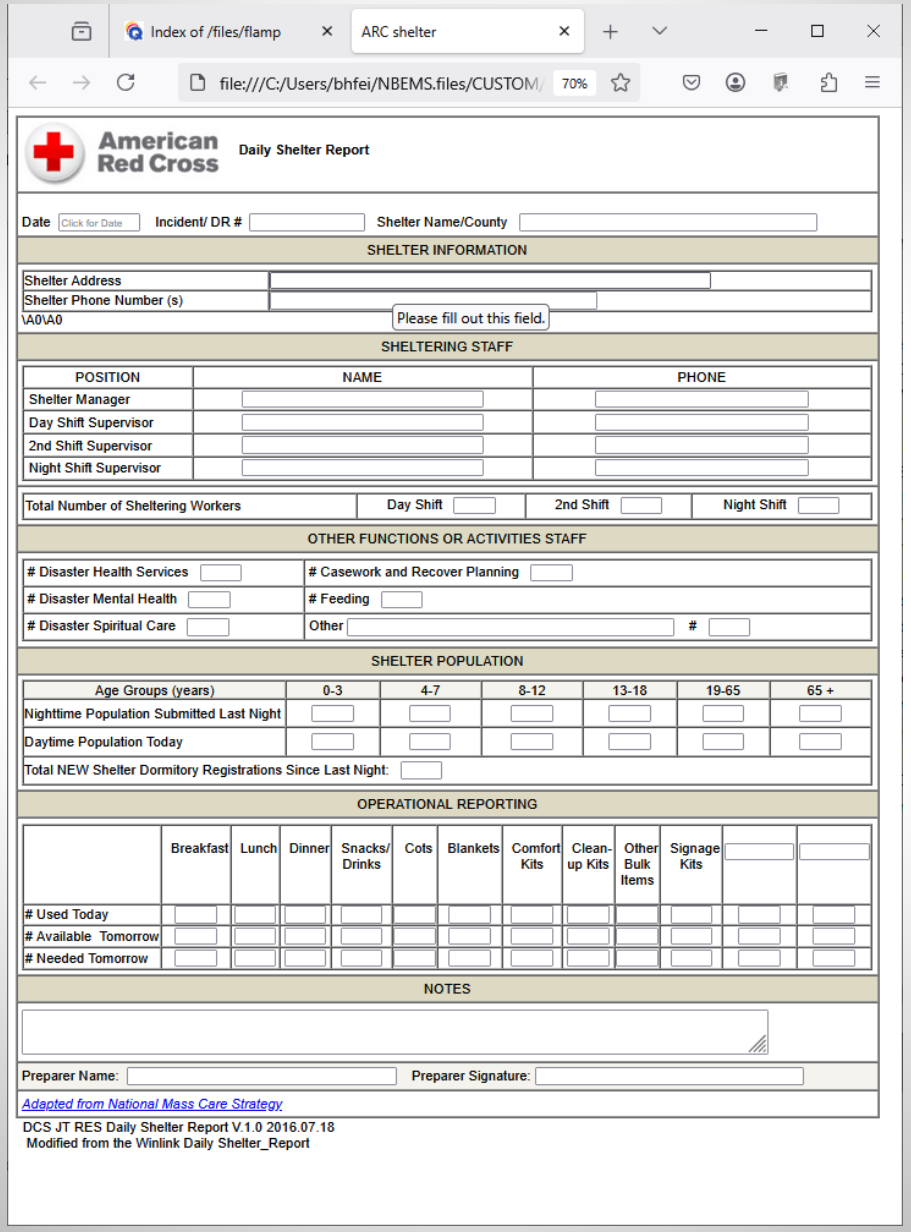


FIVE County VHF/UHF ARES nets	Coverage Area	Freq	PL	Mode	Schedule Time
Bucks Co. ARES	Bucks Co., PA	147.090+	131.8	FM	2100 ET Wed
Chester Co. ARES/RACES Net	Chester Co., PA	446.525-	100.0	FM	1930 ET Thurs
Chester Co. ARES/RACES Net	Chester Co., PA	446.175-	100.0	FM	1930 ET Thurs
Chester Co. ARES/RACES Net	Chester Co., PA	448.875-	100.0	FM	1930 ET Thurs
Chester Co. ARES/RACES Net	Chester Co., PA	146.940-	131.8	FM	1930 ET Thurs
Delaware Co. ARES/RACES Net	Delaware Co., PA	446.925-	173.8	FM	1930 ET Mon
Montgomery Co. ARES/RACES Net	Montgomery Co., PA	146.835-	88.5	FM	1900 ET Thurs
Montgomery Co. ARES/RACES Net	Montgomery Co., PA	449.125-	88.5	FM	1900 ET Thurs
MAARC Traffic Net	Main Line, PA	147.060+	131.8	FM	2030 ET M,W,F
MAARC Traffic Net	Main Line, PA	145.130+	131.8	FM	2030 ET M,W,F
Philadelphia ARES Net	Philadelphia, PA	147.030+	91.5	FM	2100 ET Sun
Philadelphia ARES Net	Philadelphia, PA	444.800+	186.2	FM	2100 ET Sun
PhilMont Club Digital Mode Education Net	Philadelphia, PA	147.030+	91.5	FM	1900 ET Tues

American Red Cross - Custom forms



American Red Cross: Daily Shelter Report



Index of /files/flamp | ARC shelter

file:///C:/Users/bhfei/NBEMS.files/CUSTOM/ 70%

American Red Cross — **Daily Shelter Report**

Date Click for Date | Incident/ DR # | Shelter Name/County

SHELTER INFORMATION

Shelter Address	
Shelter Phone Number (s)	

\A0\A0

Please fill out this field.

SHELTERING STAFF

POSITION	NAME	PHONE
Shelter Manager		
Day Shift Supervisor		
2nd Shift Supervisor		
Night Shift Supervisor		

Total Number of Sheltering Workers	Day Shift	2nd Shift	Night Shift

OTHER FUNCTIONS OR ACTIVITIES STAFF

# Disaster Health Services	# Casework and Recover Planning
# Disaster Mental Health	# Feeding
# Disaster Spiritual Care	Other #

SHELTER POPULATION

Age Groups (years)	0-3	4-7	8-12	13-18	19-65	65 +
Nighttime Population Submitted Last Night						
Daytime Population Today						

Total NEW Shelter Dormitory Registrations Since Last Night:

OPERATIONAL REPORTING

	Breakfast	Lunch	Dinner	Snacks/ Drinks	Cots	Blankets	Comfort Kits	Clean-up Kits	Other Bulk Items	Signage Kits		
# Used Today												
# Available Tomorrow												
# Needed Tomorrow												

NOTES

Preparer Name: | Preparer Signature:

Adapted from National Mass Care Strategy

DCS JT RES Daily Shelter Report V.1.0 2016.07.18
Modified from the Winlink Daily Shelter_Report

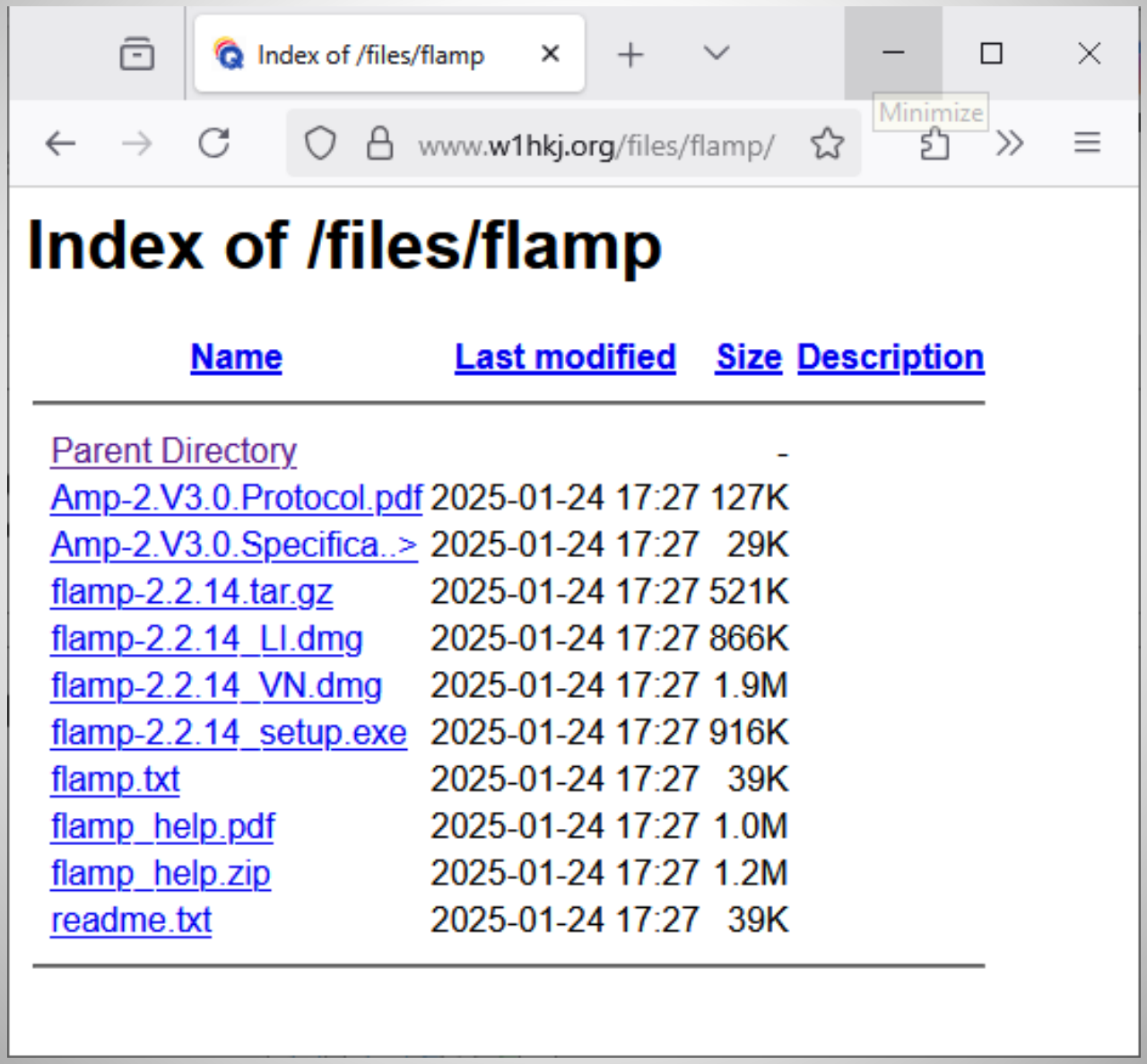
FLAMP

Larger File is broken into multiple smaller **BLOCKS**

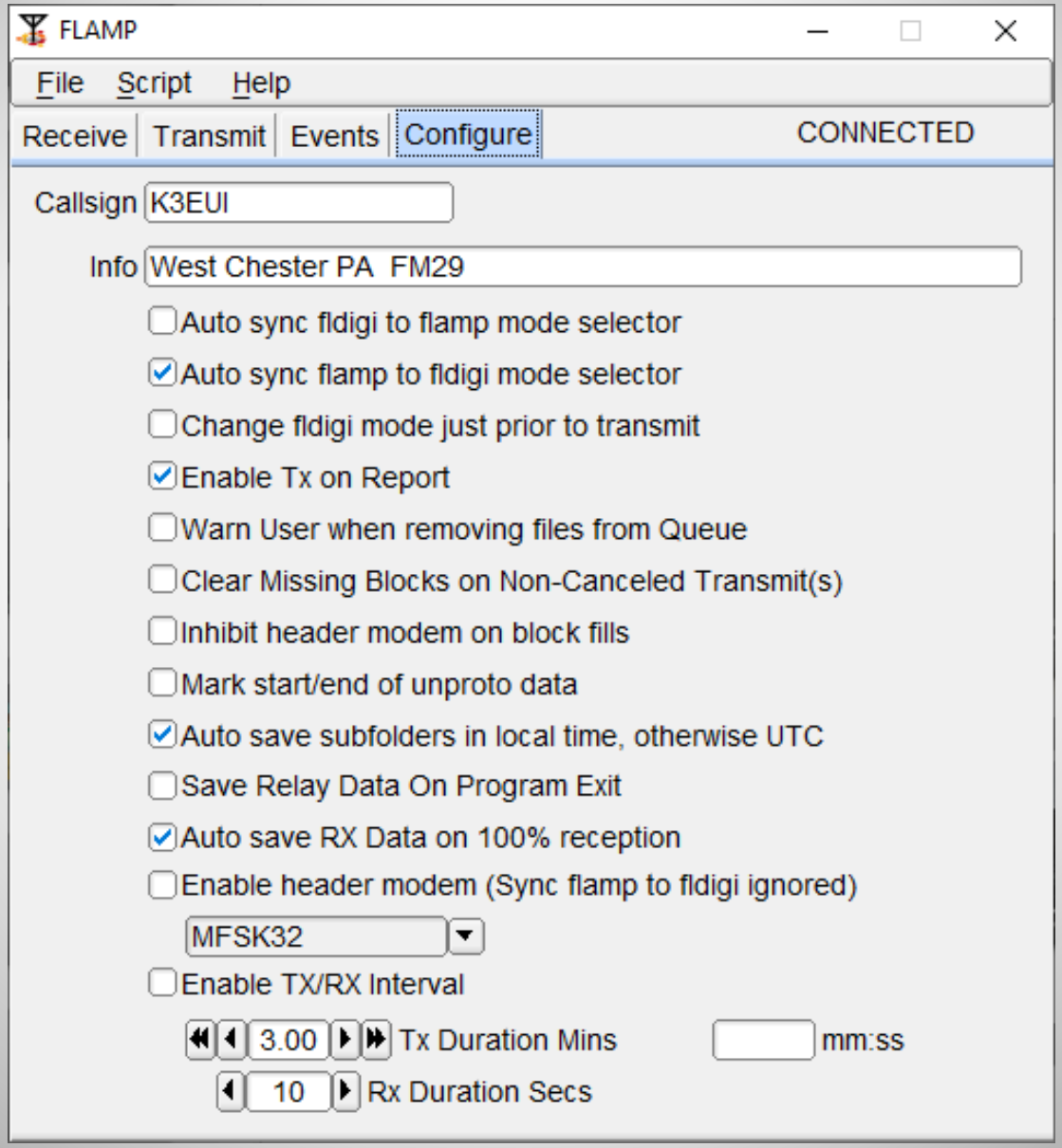
Each "BLOCK" has its own check-sum

Missing Blocks? Send a REPORT
Resend only the "missing blocks"
…… save time

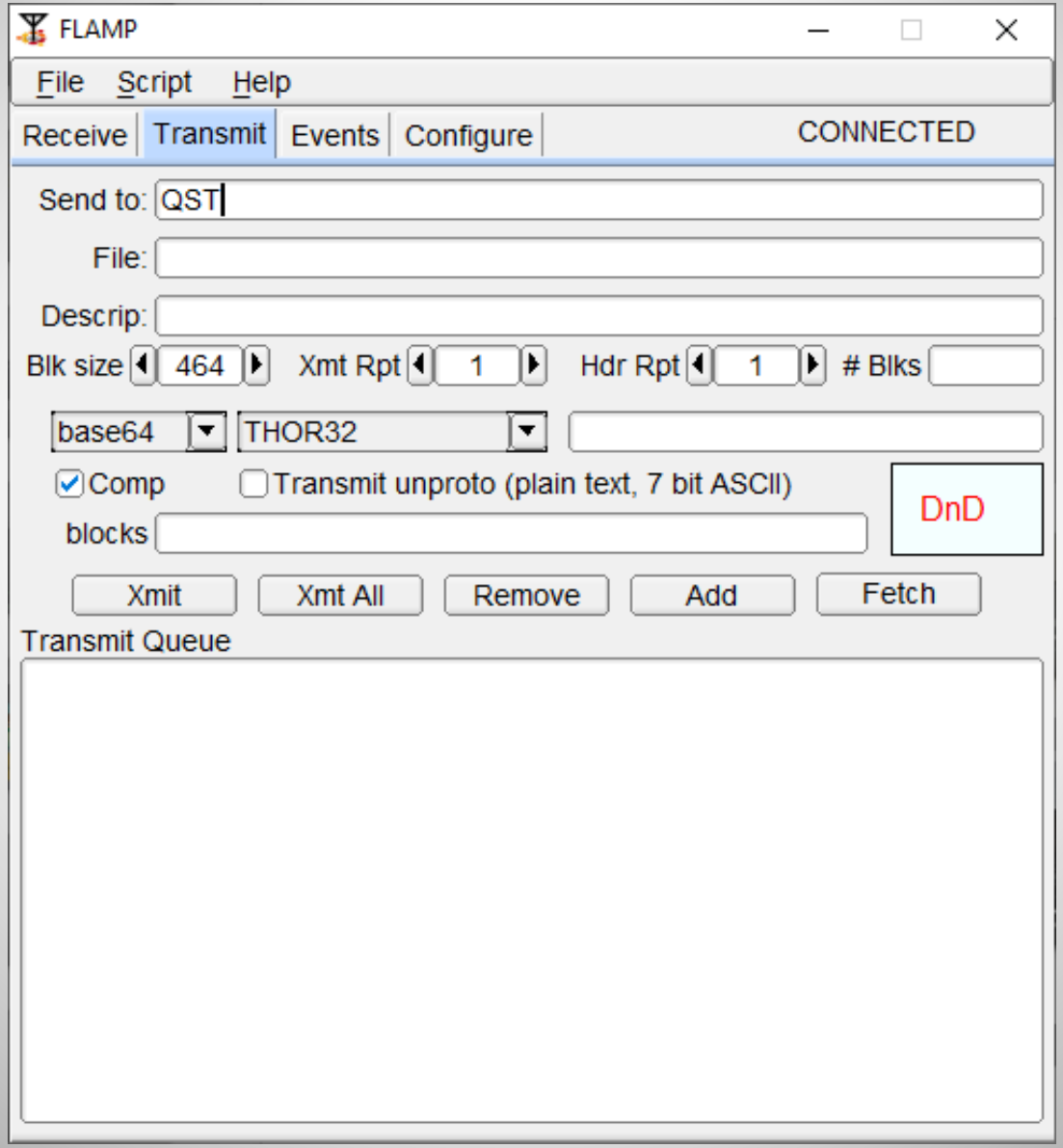
Download FLAMP



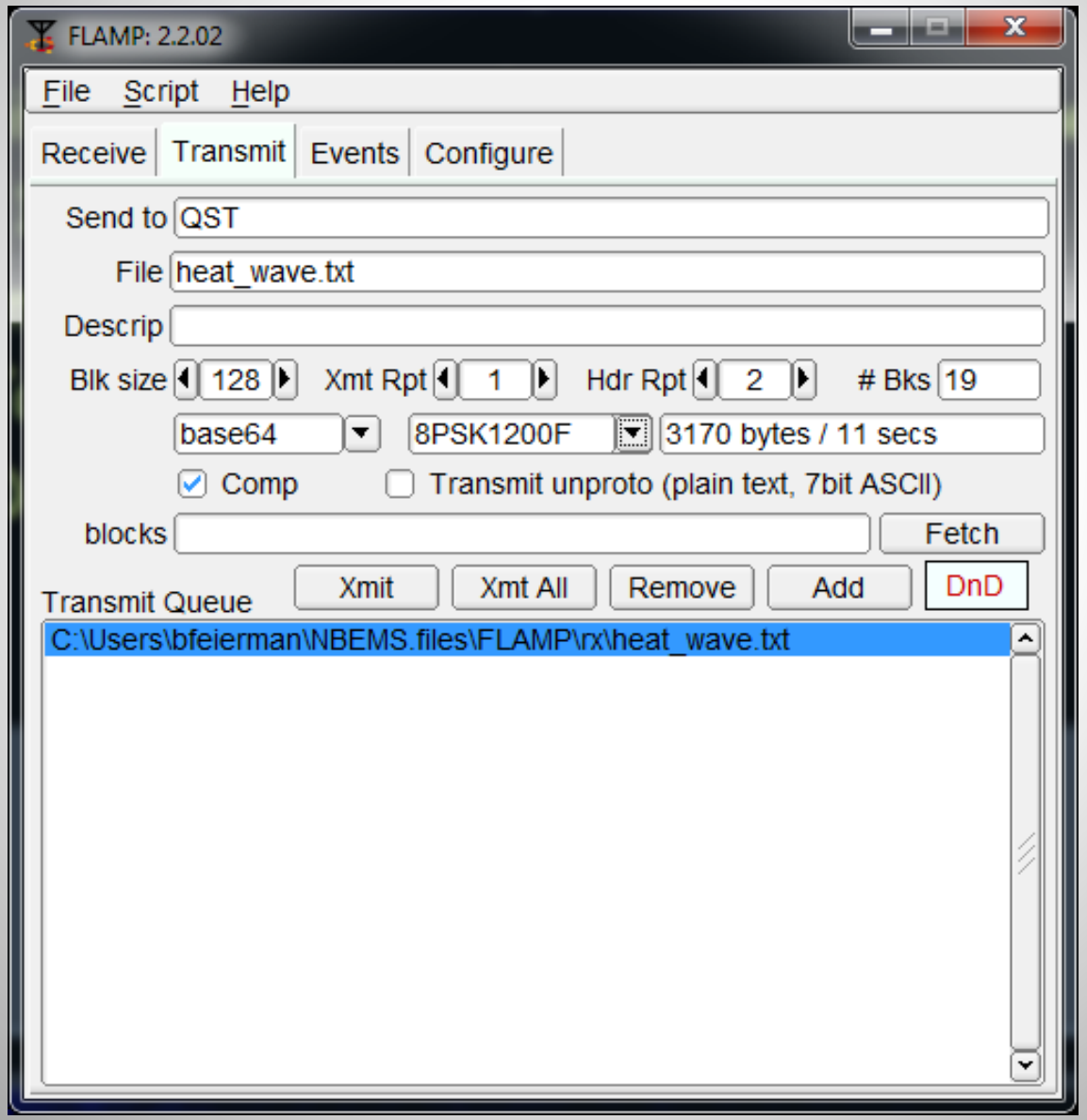
Configure FLAMP



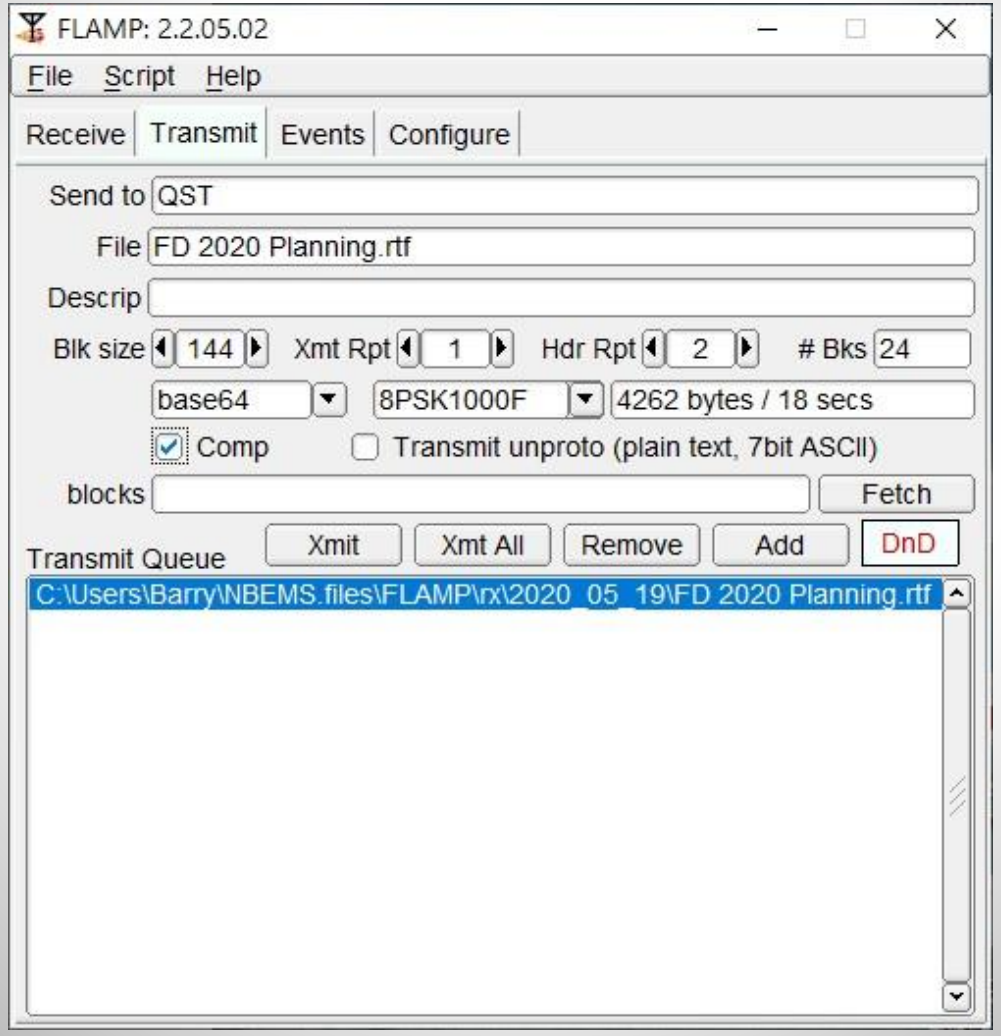
Click the Add button to load a file or drop file into the DnD box (drag n drop)



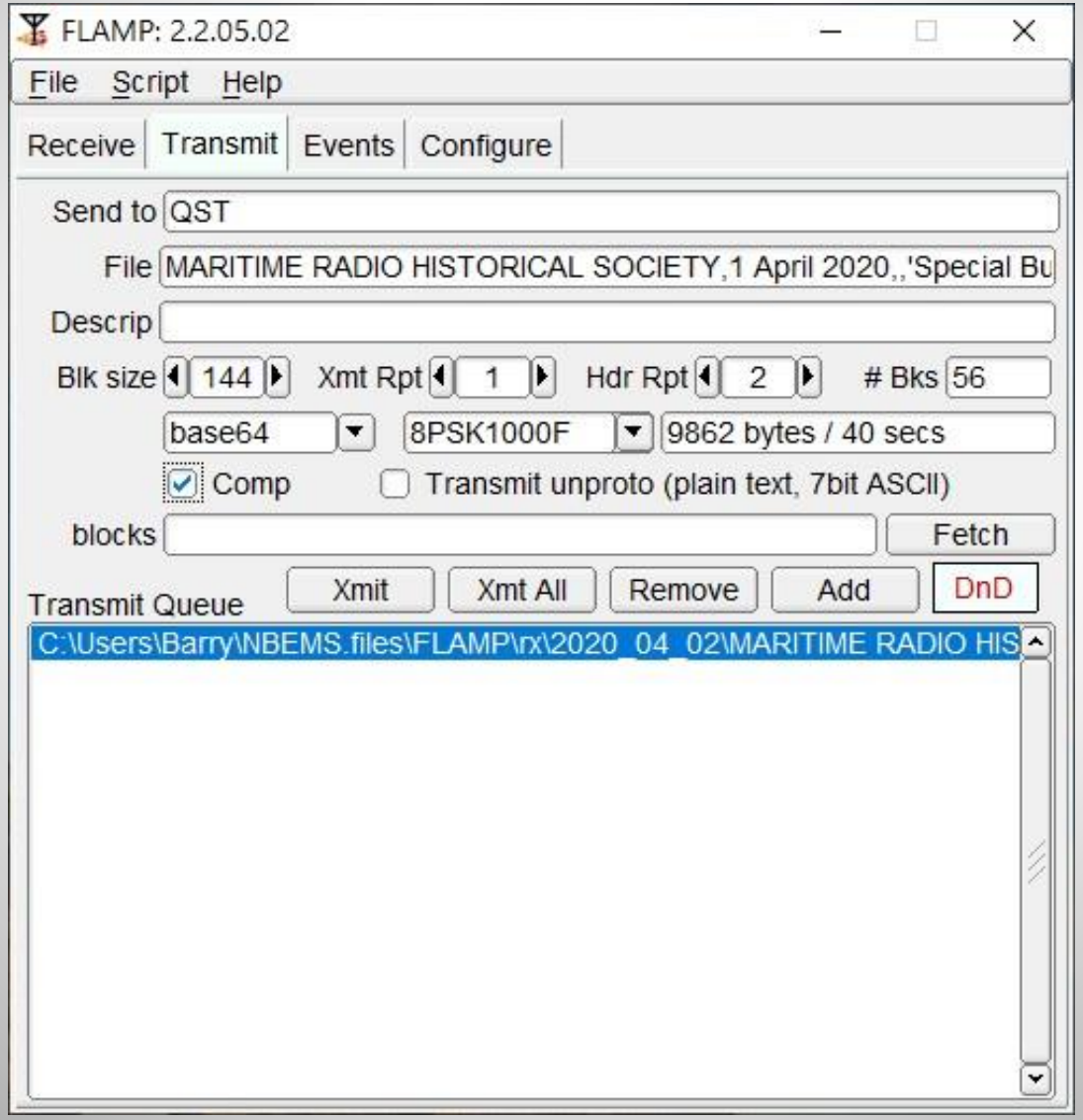
FLAMP: breaks a longer message into "blocks"
3.17 kB file is sent in 11 seconds with 8PSK1200F on FM



FLAMP: Rich Text Format 4.2 kB file (24 blocks) sent compressed via 2m FM repeater by 8PSK1000F in 18 seconds



FLAMP: 9.8 kB email (eml) file sent on UHF FM repeater 56 blocks sent in 40 seconds via **8PSK1000F**

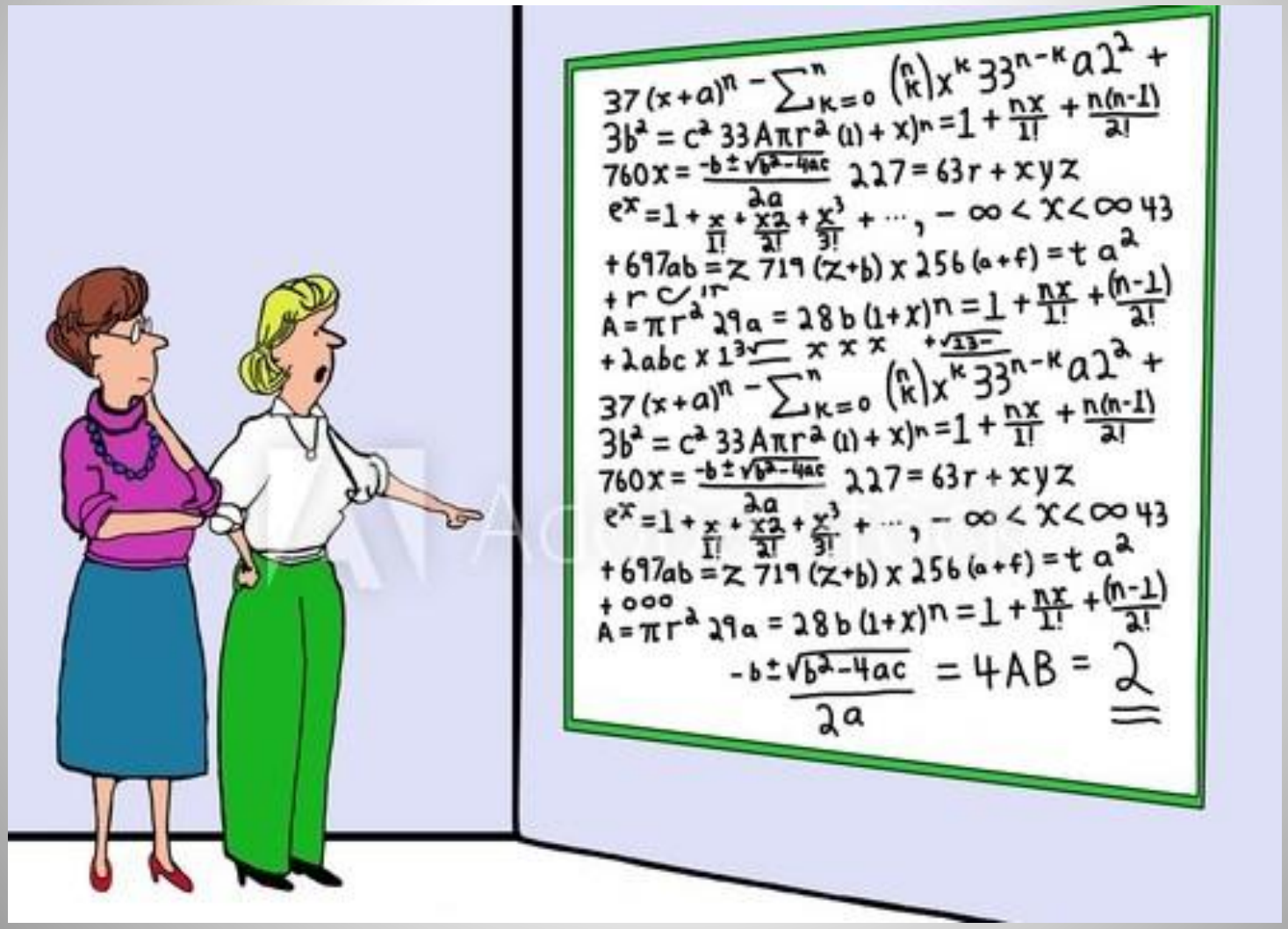


Popular FLDIGI Modes for EMCOMM

Thor - multi-tone, constant amplitude, strong FEC
MFSK – multi-tone, constant amplitude, strong FEC
Olivia - multi-tone, constant amplitude, strong FEC
MT63 64 carriers, PSK modulation
8PSK - very fast (up to 3000 wpm) for FM VHF/UHF

Modes not covered by FLDIGI
OFDM – Orthogonal Frequency Division Multiplex
VARA HF SSB and **VARA FM** (VHF/UHF)
Pactor III - requires a special TNC (hardware)

Symbols, Baud, Bits, Speed



Baud: number of **changes per second** made to a radio carrier's amplitude, frequency or phase

Also called "**symbol rate**"
(in a two-state system like RTTY or CW)

Current debate with FCC rules on HF bands
baud vs. bandwidth

BAUD and Word/minute

CW	20 baud	=	24 wpm
PSK31	31 baud	=	50 wpm
RTTY 45	45 baud	=	60 wpm
Olivia 8 / 500	63 baud	=	30 wpm
MFSK 32	32 baud	=	120 wpm
THOR 22	22 baud	=	78 wpm
8PSK 1000F	1000 baud	=	3386 wpm

Bandwidth (99% of energy)

AM phone	=	6 kHz (double sideband)
SSB phone	=	2-3 kHz
CW	=	100 – 300 Hz
PSK 31	=	50 Hz
Olivia 8/500	=	500 Hz
FT8	=	50 Hz
MT63-2K	=	2000 Hz
THOR 100	=	1800 Hz
MFSK 128	=	1920 Hz
Pactor III	=	2400 Hz
VARA	=	500 Hz or 2300 Hz

Modulation - adds information or content to a radio frequency (RF) electromagnetic wave by altering at least one of these

amplitude
frequency
phase

Modulation Methods

AM and CW are

amplitude shifts

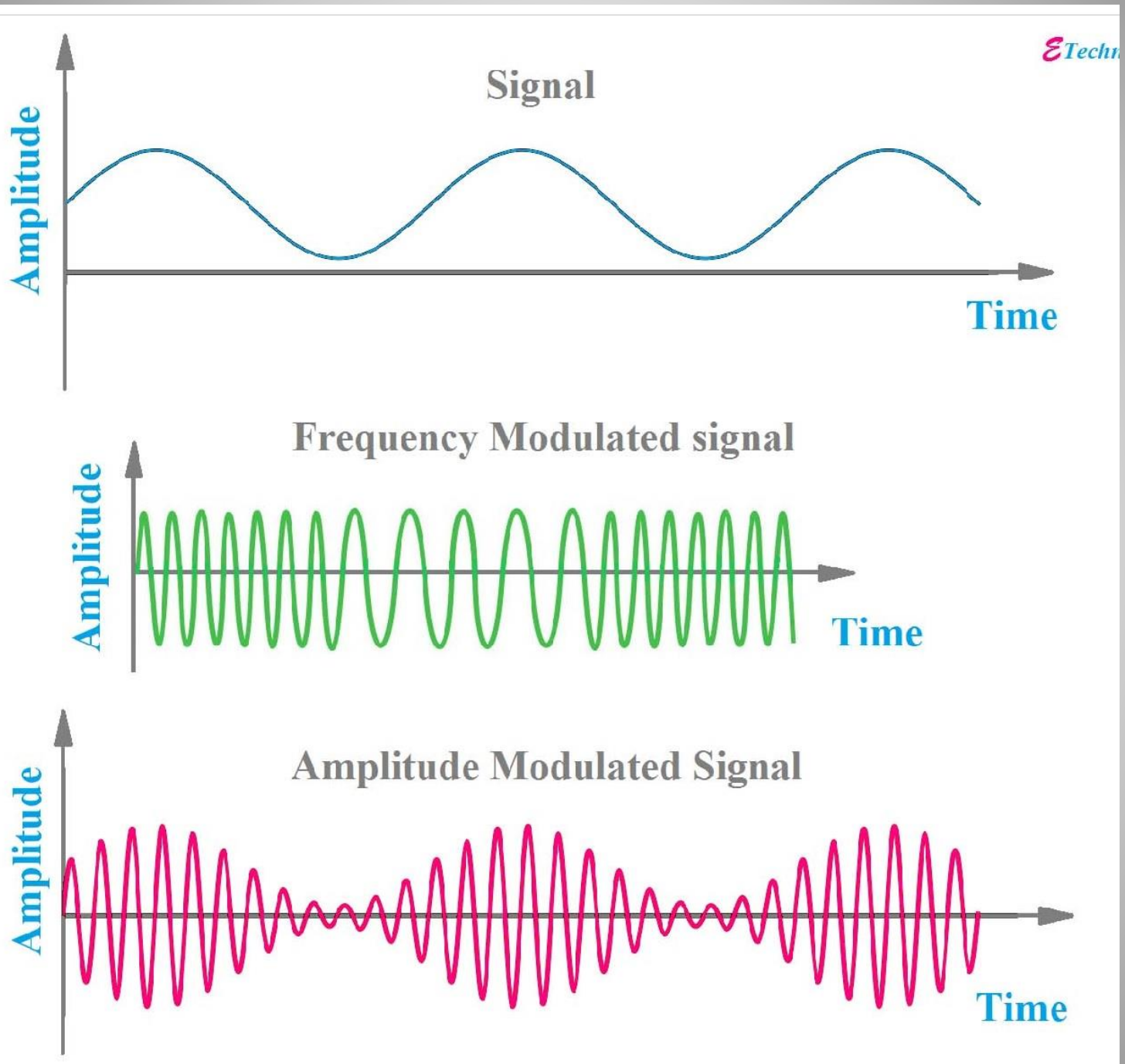
RTTY, Olivia, Thor, MFSK, FT8

frequency shifts

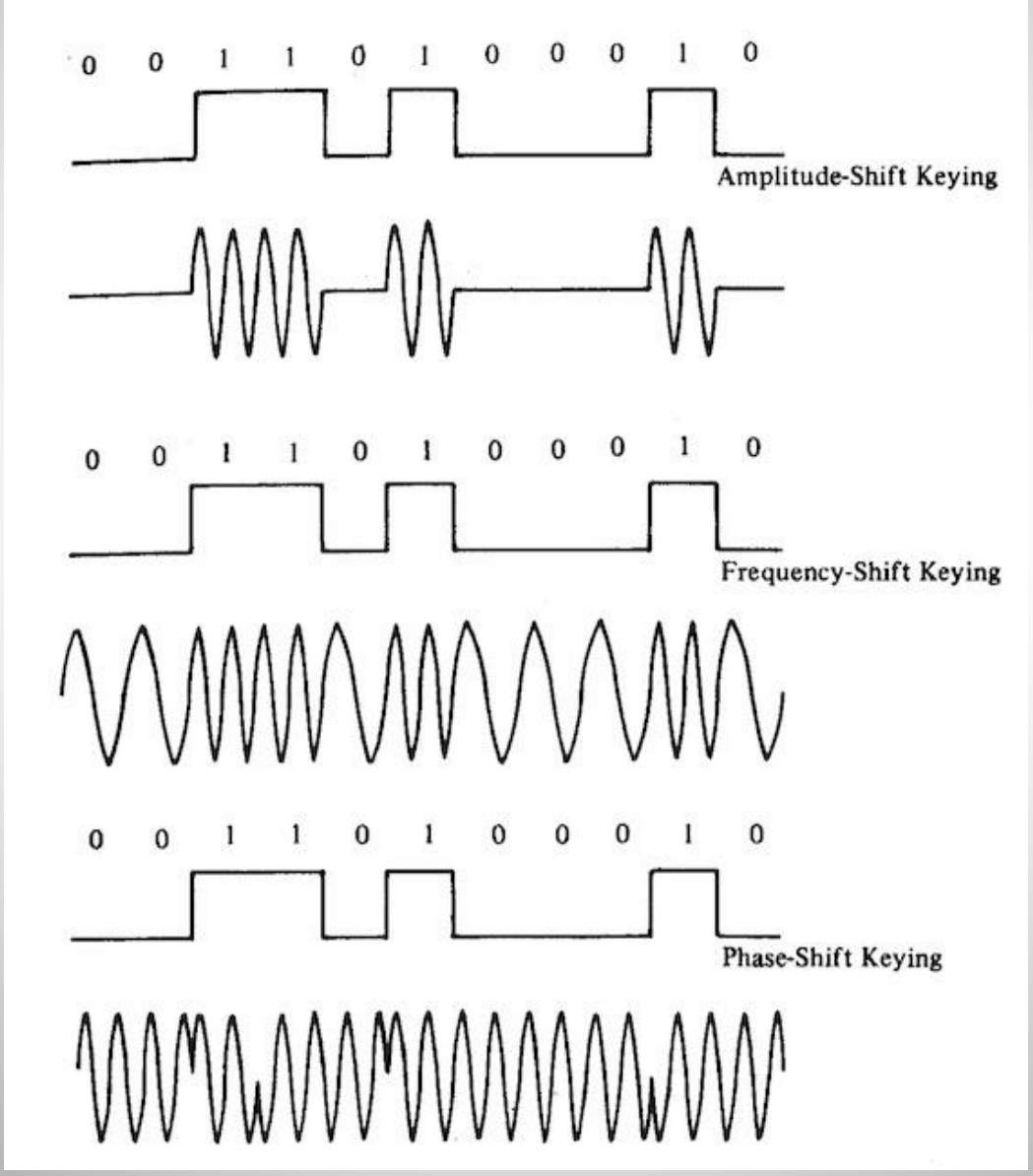
(mostly constant amplitude)

PSK, VARA, 8PSK, and MT63

phase and amplitude shifts

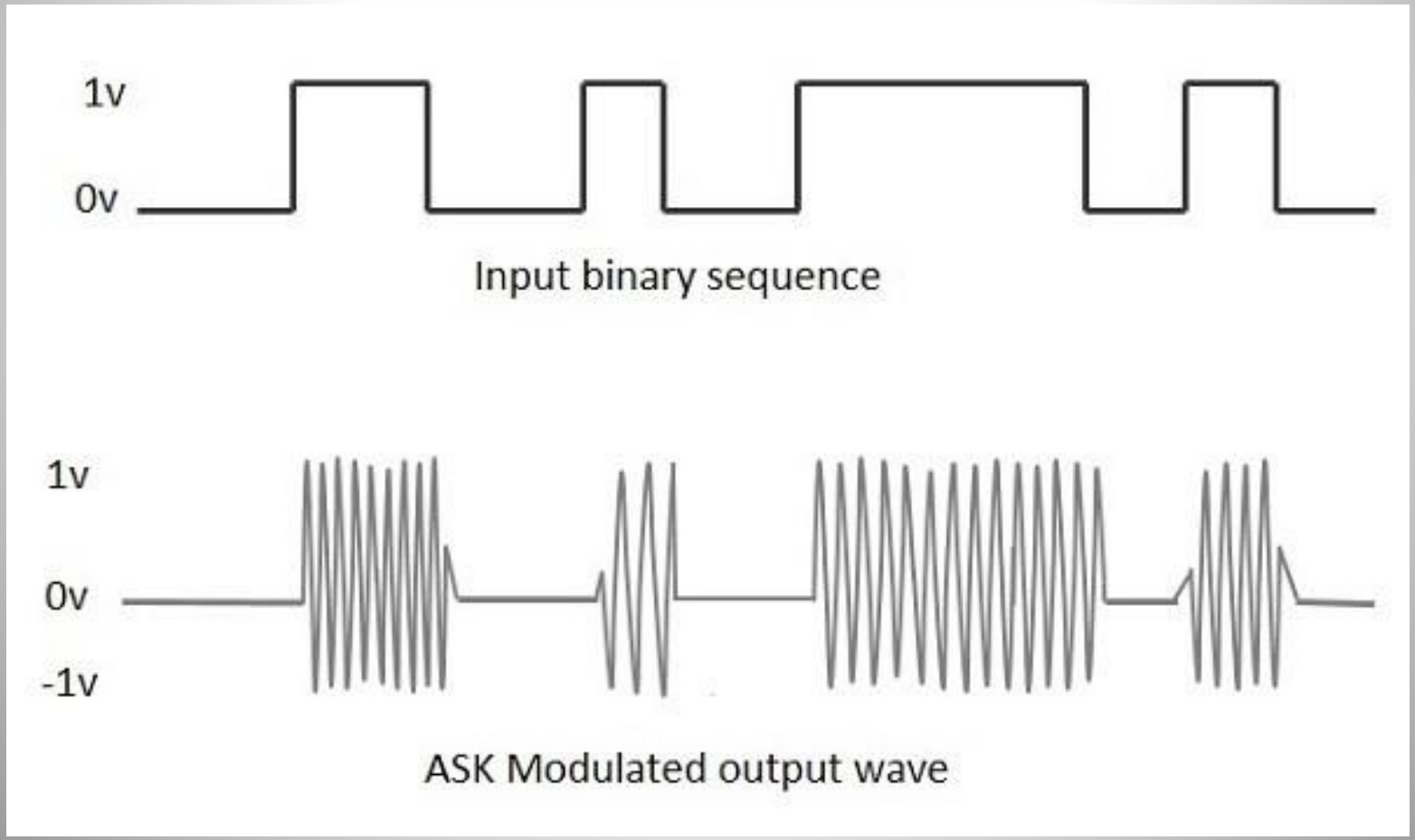

Signal
Amplitude
Time
Frequency Modulated signal
Amplitude
Time
Amplitude Modulated Signal
Amplitude
Time

Sending DATA via AM,FM,PM

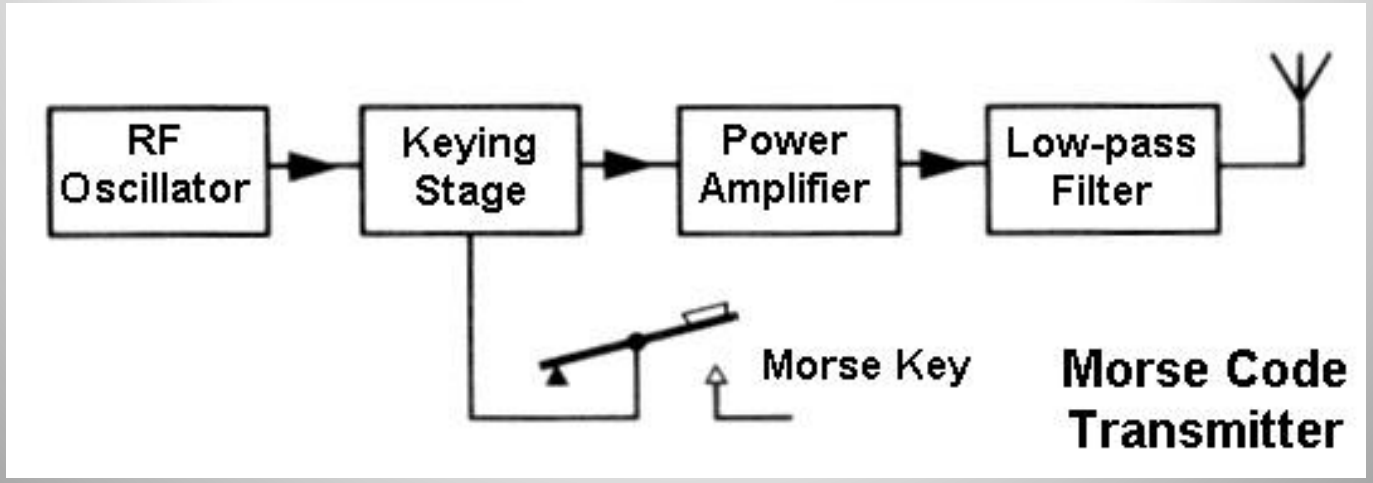


CW or ASK or OOK

(amplitude shift keying, on/off keying)



Typical method of generating a CW signal
Turn RF on/off by a mechanical switch

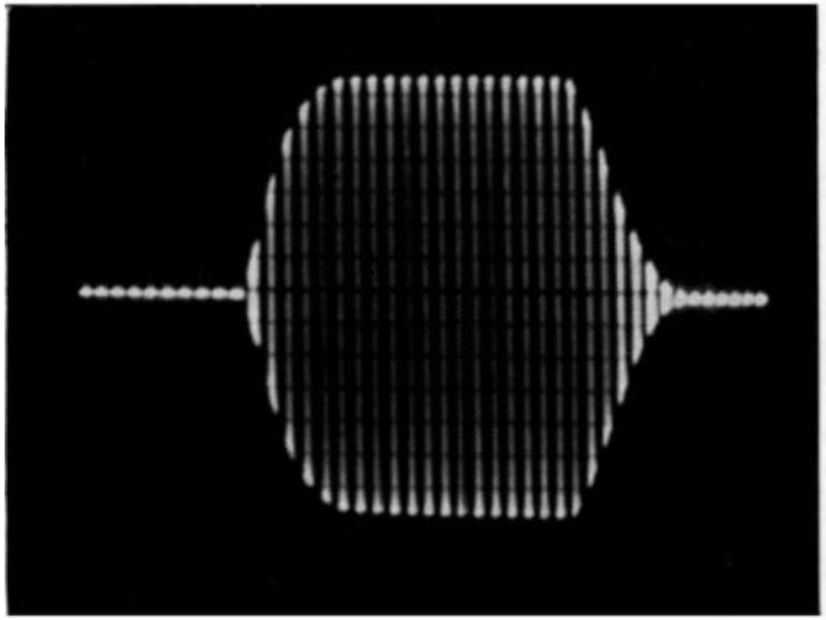


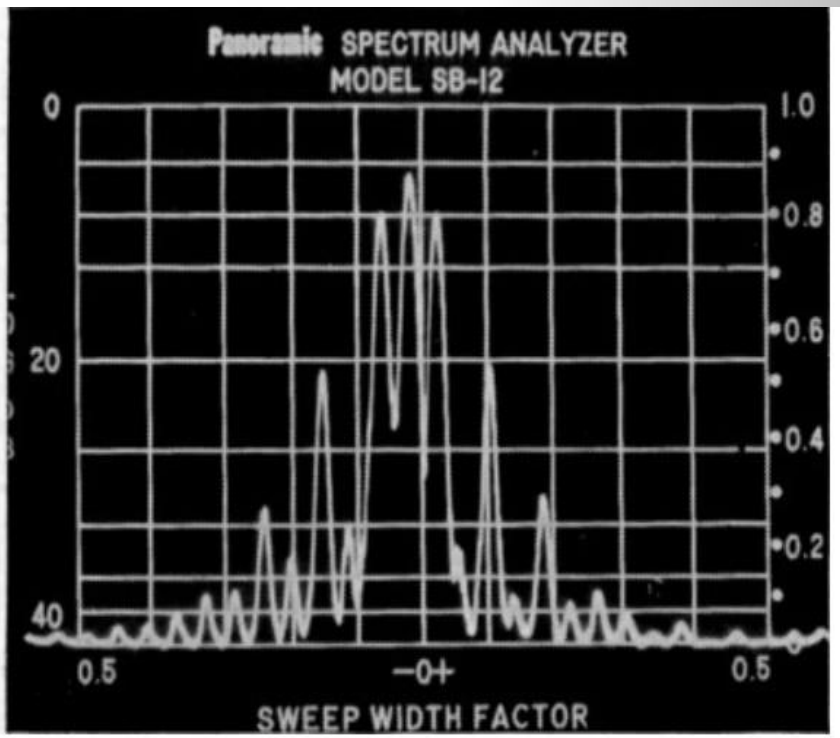
CW keying **shape** and **keying speed**

Rise and Fall times of RF about 4-6 milliseconds

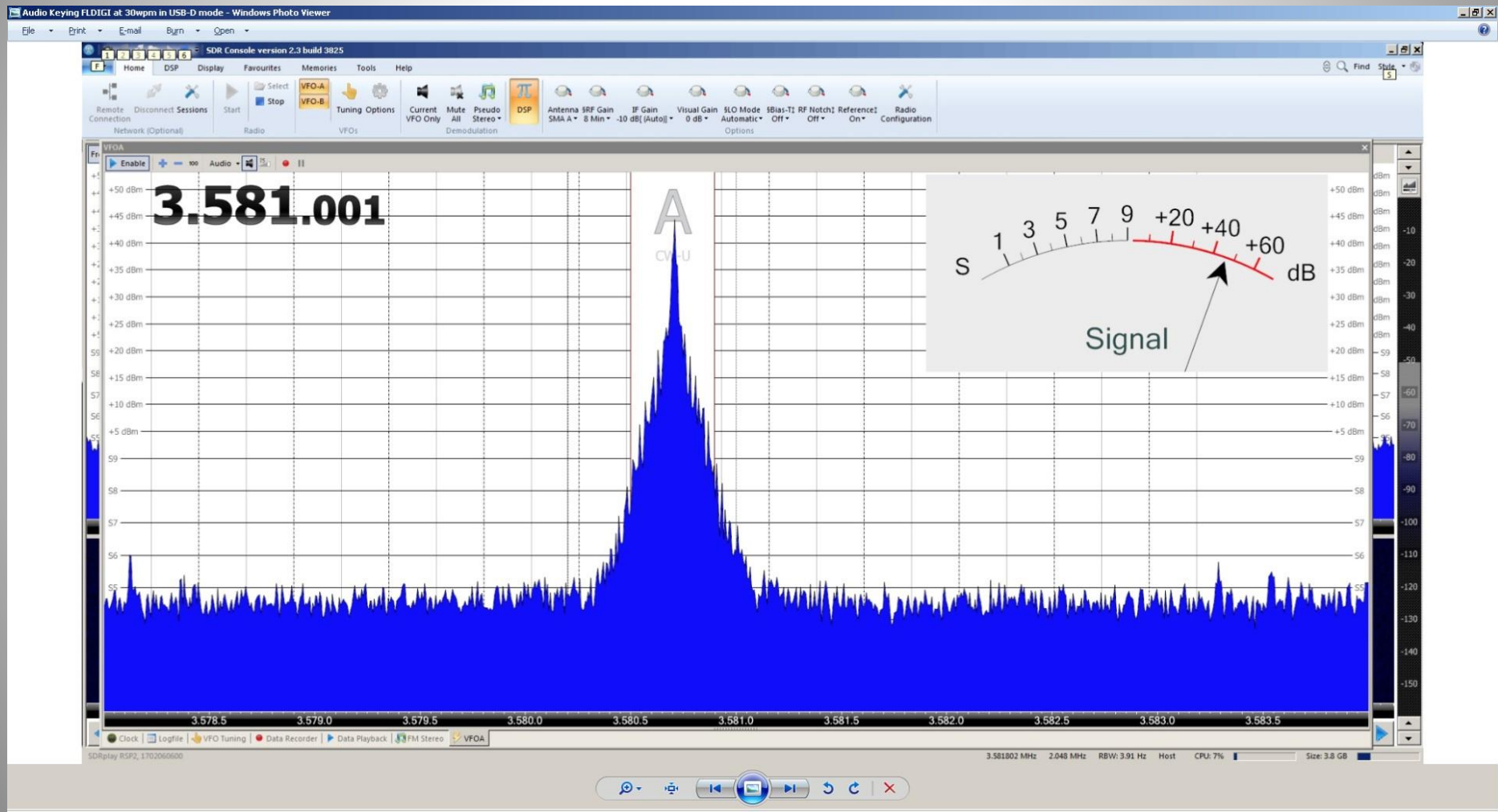
too long ==> mushy sound

too short ==> key clicks

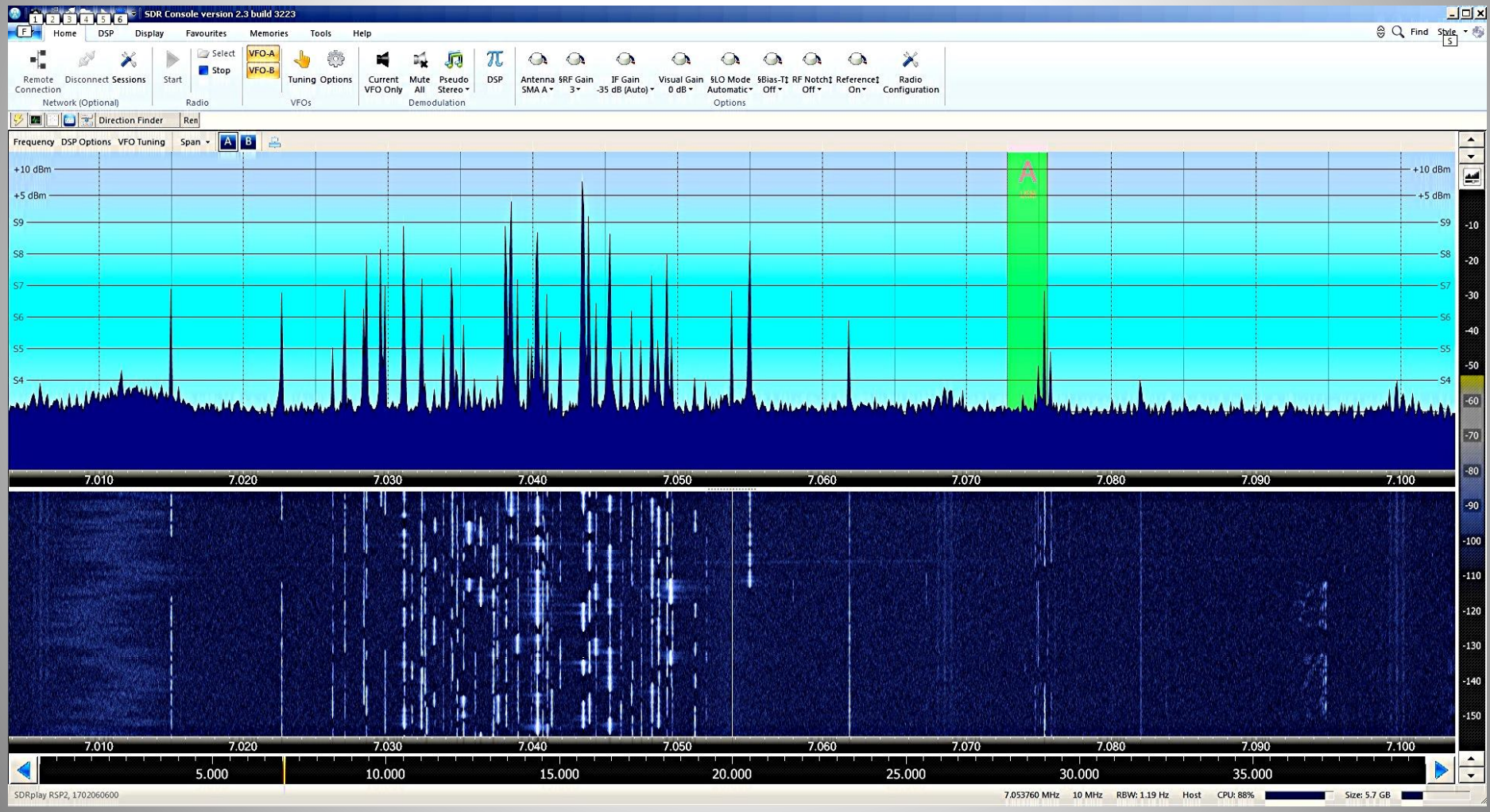




Bandwidth of W1AW CW RF signal (20 wpm) received at k3eui on 3581.5 kHz



CW is still "alive" on fickle 40 meters
Was this a CW contest?
(note only 2 CW signals 7000 - 7025 kHz)



CW is binary because

0 = no RF (silence)

1 = RF (sound)

The dit (short sound) is represented by **1**

The dah (long sound) is represented by **111**

standard dash/dot radio is a 3:1

You need the 0 to represent <u>silence</u>

Binary nature of CW

E = 1

I = 101

S = 10101

H = 1010101

T = 111

M = 1110111

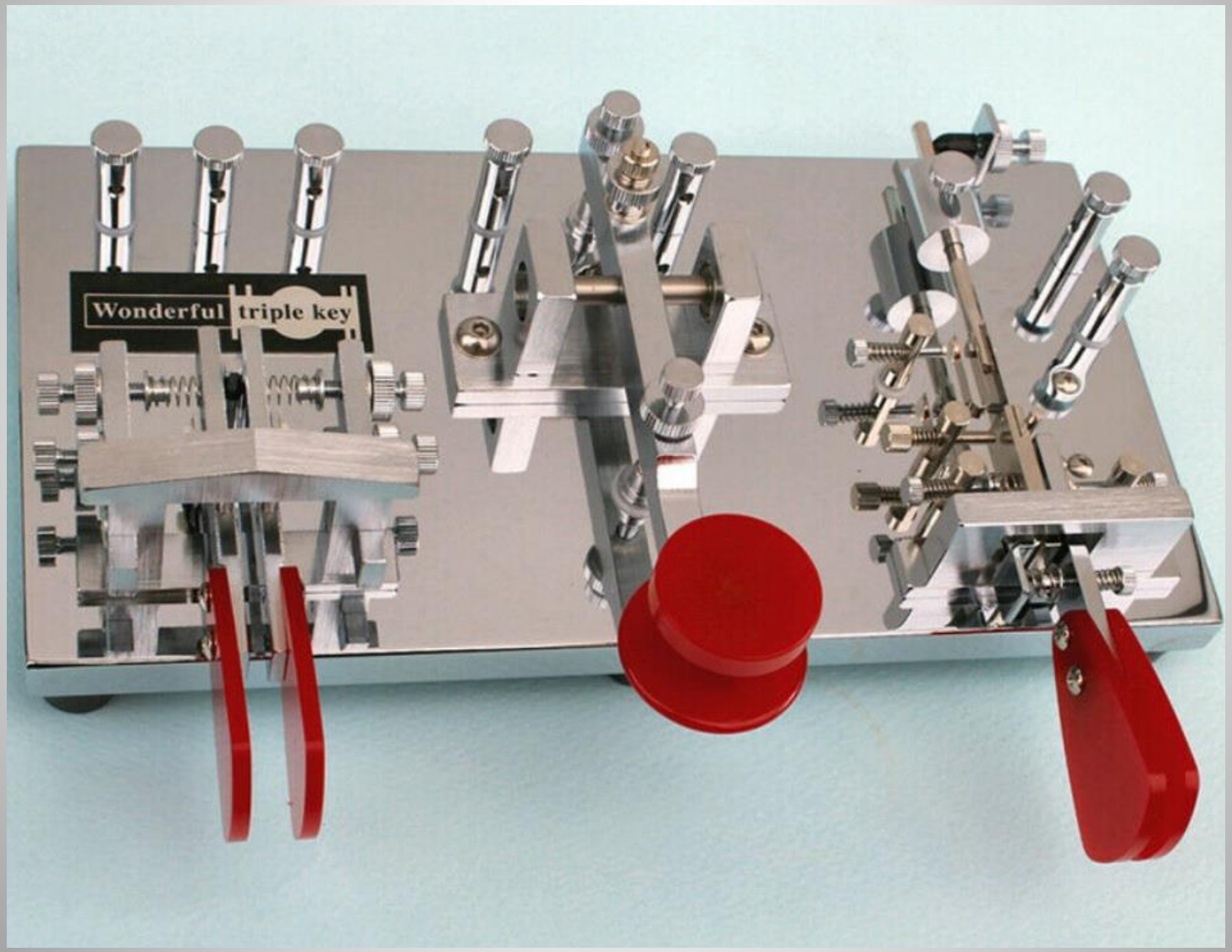
O =11101110111

Longer spaces between letters: 000

Longer spaces between words: 00000

More advanced: mechanical "bug" (sliding weight controls speed of the dits)

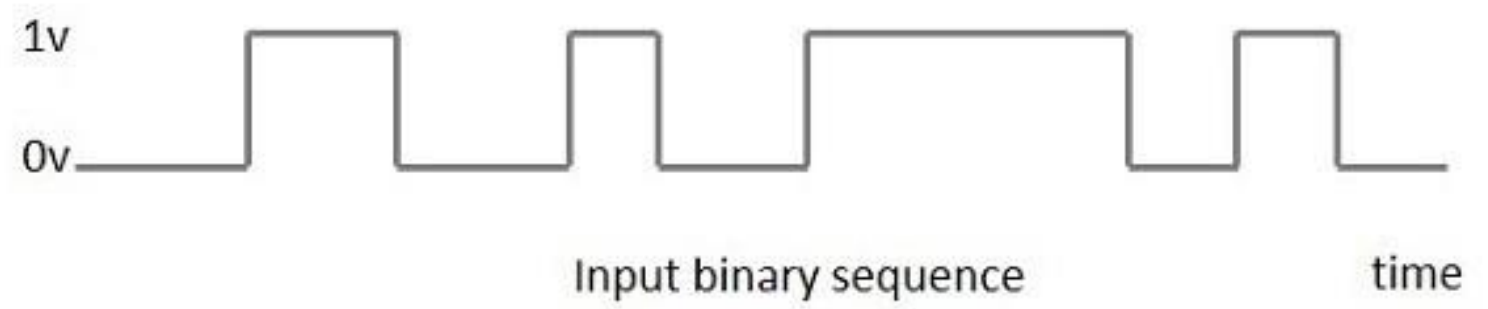
For those who like a choice in sending CW

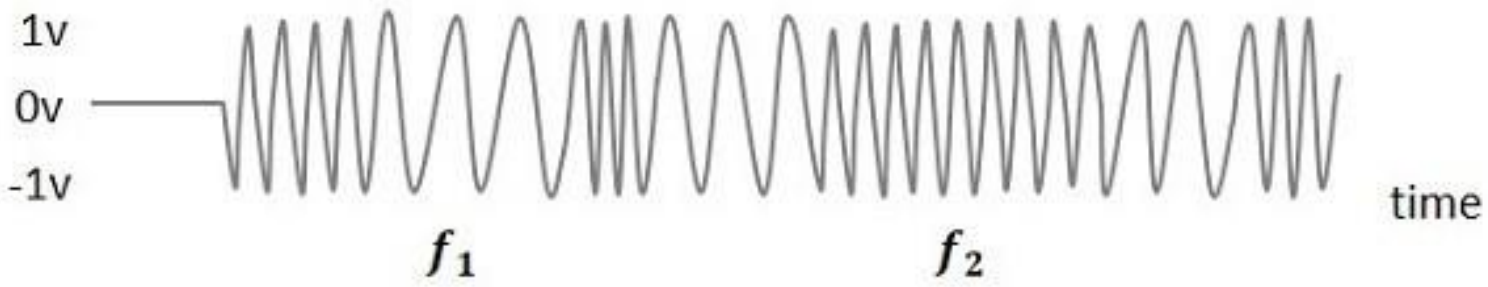


FREQUENCY modulation

0 = F1 1 = F2 (one at a time)

note: there is no time of silence





FSK Modulated output wave

Two methods to generate RTTY

FSK - **RTTY** - **direct** frequency shift keying by **DATA** pulses **TNC**
VFO changes by 170 Hz: MARK / SPACE
Note: not all HF rigs have FSK keying option

AFSK - **RTTY** - **audio** frequency shift keying
sound card emits two different audio frequencies (pitch)
audio fed to any **SSB rig** (either USB/LSB mode)

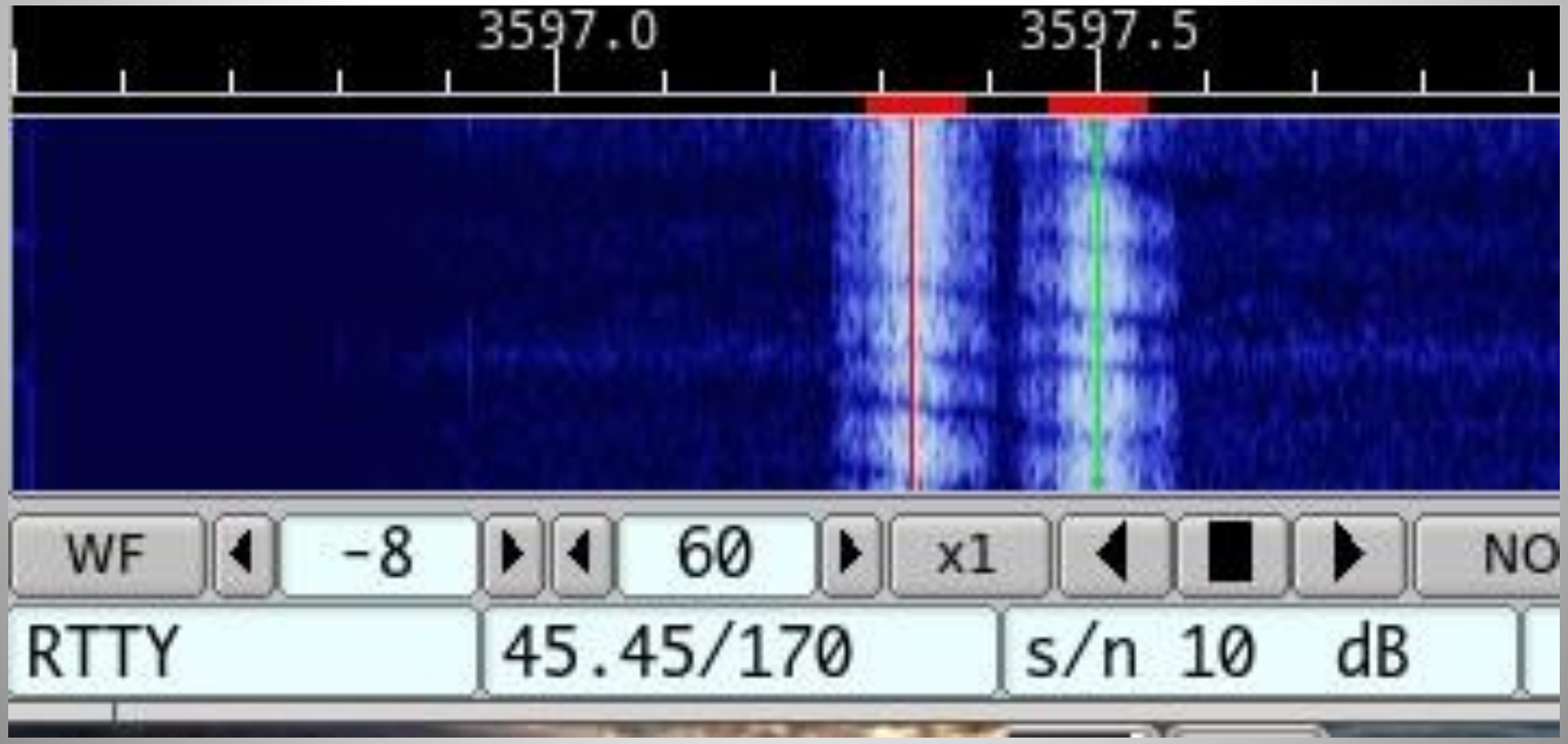
Results: FSK and AFSK are nearly identical (sort of)
(watch that transmitter ALC reads zero with AFSK)

Common **AFSK RTTY** - waterfall image

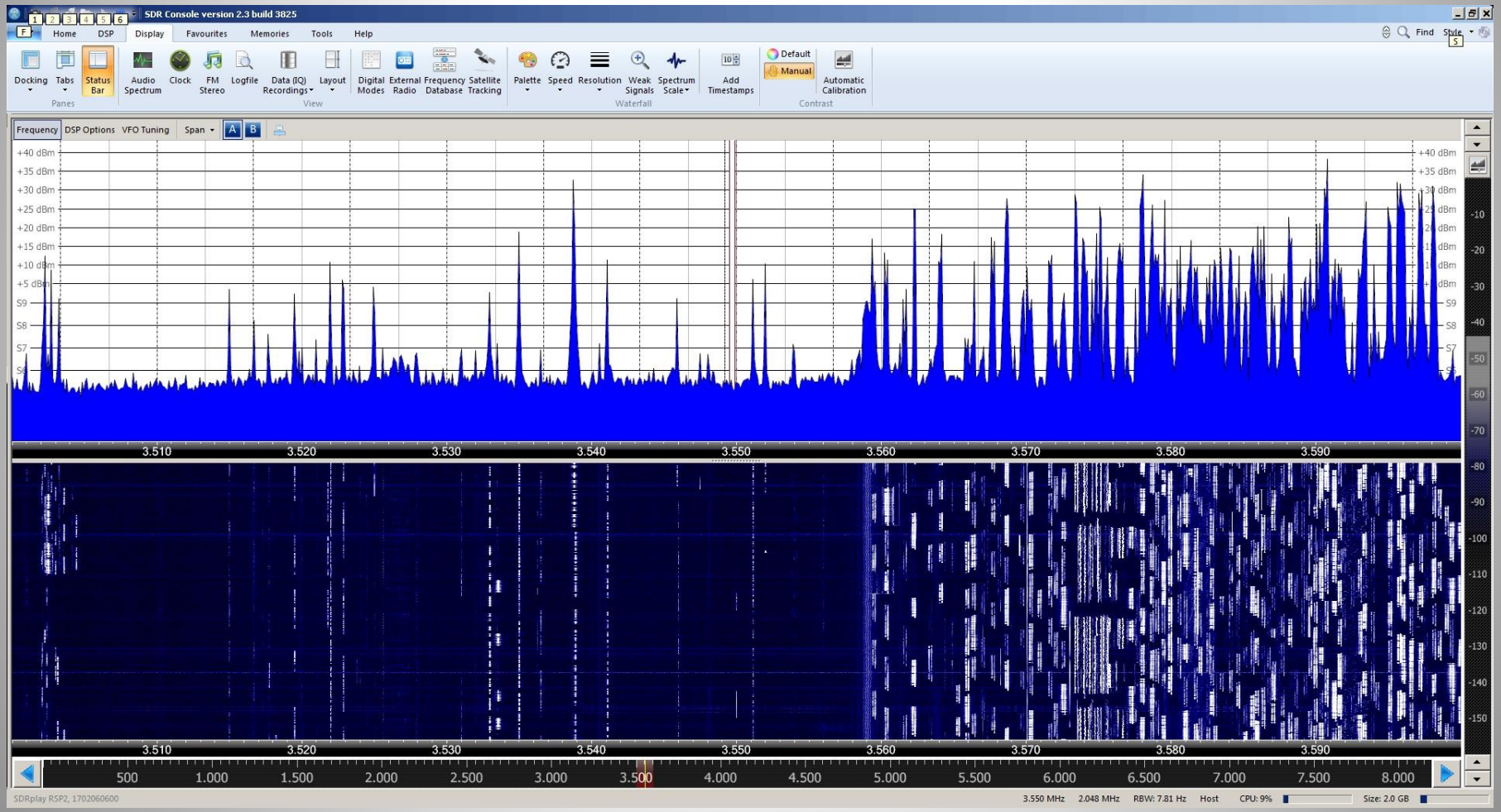
AFSK RTTY: **two** audio tones converted **two RF waves**

2 parallel tracks, 170 Hz separation

45.45 baud, 60 wpm



Was this a RTTY contest? 80 meters



Frequency Modulation: Multiple Tone Modes
sent one tone at a time

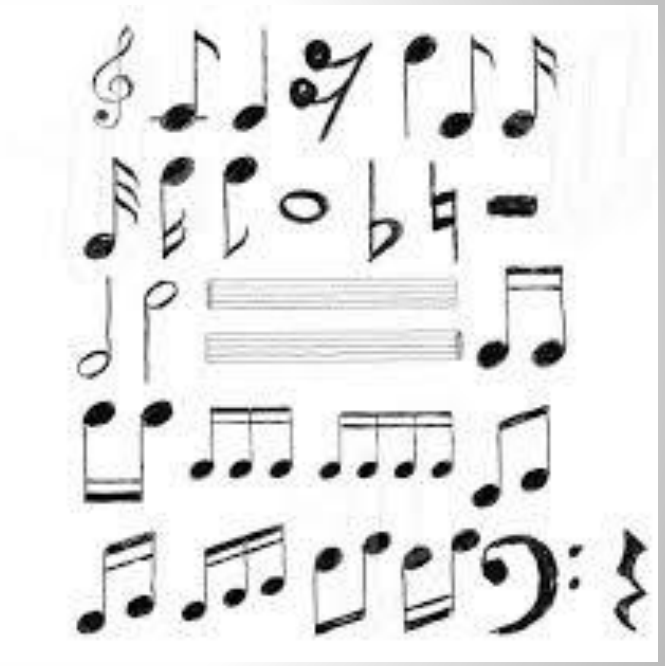
JT 65, FT8, FT4

MFSK

THOR

OLIVIA

MMSSTV



Multiple Tone modes common on HF SSB compare time to send a 1.6 kB file (Gettysburg Address txt file)

MODE	FILE size	Time	Bandwidth (Hz)	Emission Type
MFSK16	1.6 kB	4m 40s	316	16 FSK
MFSK32	1.6 kB	2min 20s	630	16 FSK
MFSK64	1.6 kB	1m 10s	1260	16 FSK
MFSK128	1.6 kB	36 s	1920	16 FSK
THOR 16	1.6 kB	4m 38s	355	18 carriers
THOR 22	1.6 kB	3m 22s	524	18 carriers
THOR 50x1	1.6 kB	1m 31s	900	18 carriers
THOR 25x4	1.6 kB	3m 02s	1800	18 carriers
THOR 100	1.6 kB	46s	1800	18 carriers
OFDM500F	1.6 kB	51	500	4-PSK
OFDM750F	1.6 kB	30	750	3-PSK

THOR (18 tones) and IFSK modulation

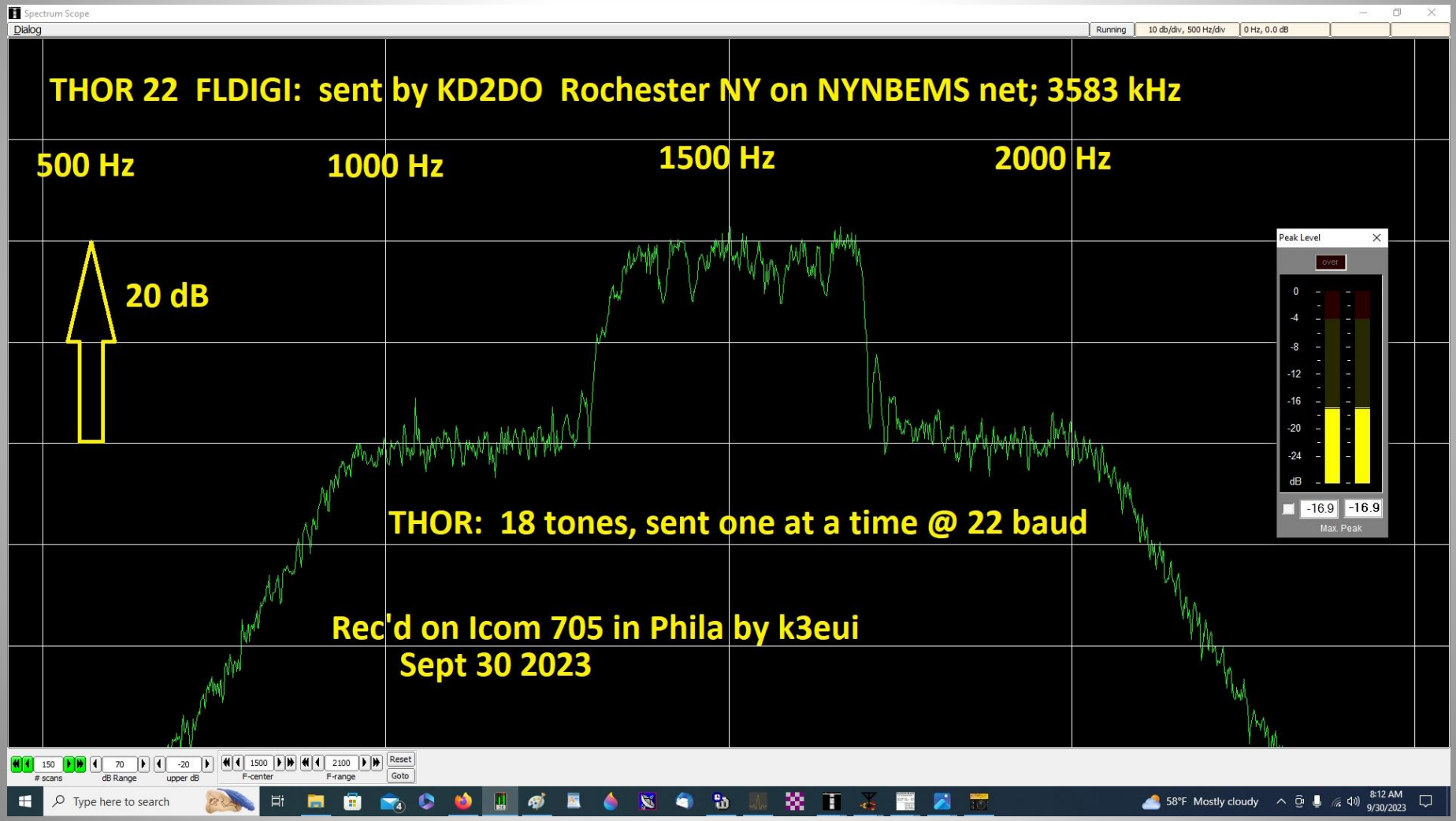
THOR - "**incremental frequency shift keying**"
CHANGE in frequency from one tone to the next tone determines the characters to be printed on screen

THOR has FEC (forward error correction)

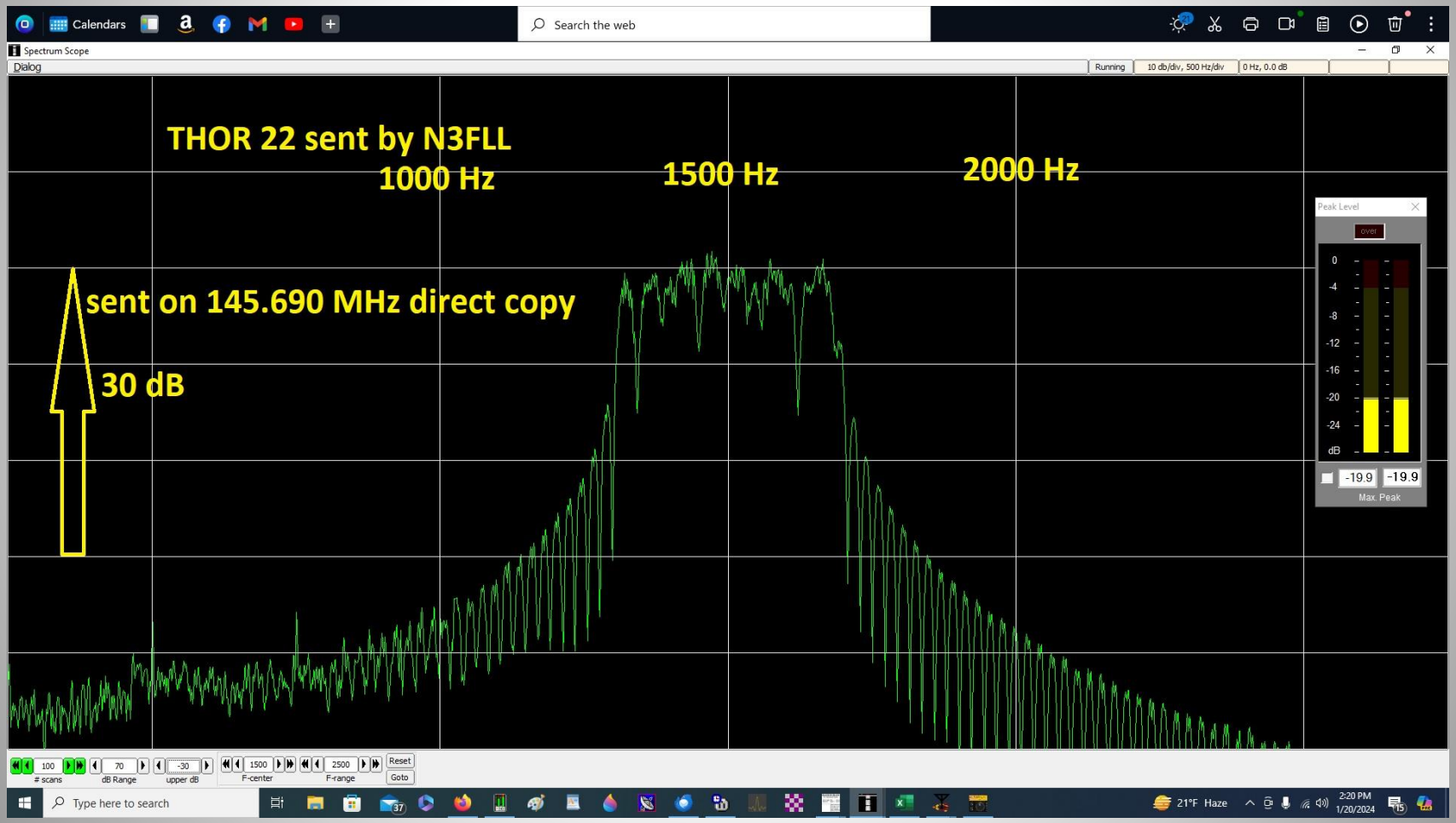
THOR has a "second" audio channel where you can display your call, name, qth

Thor can send small images

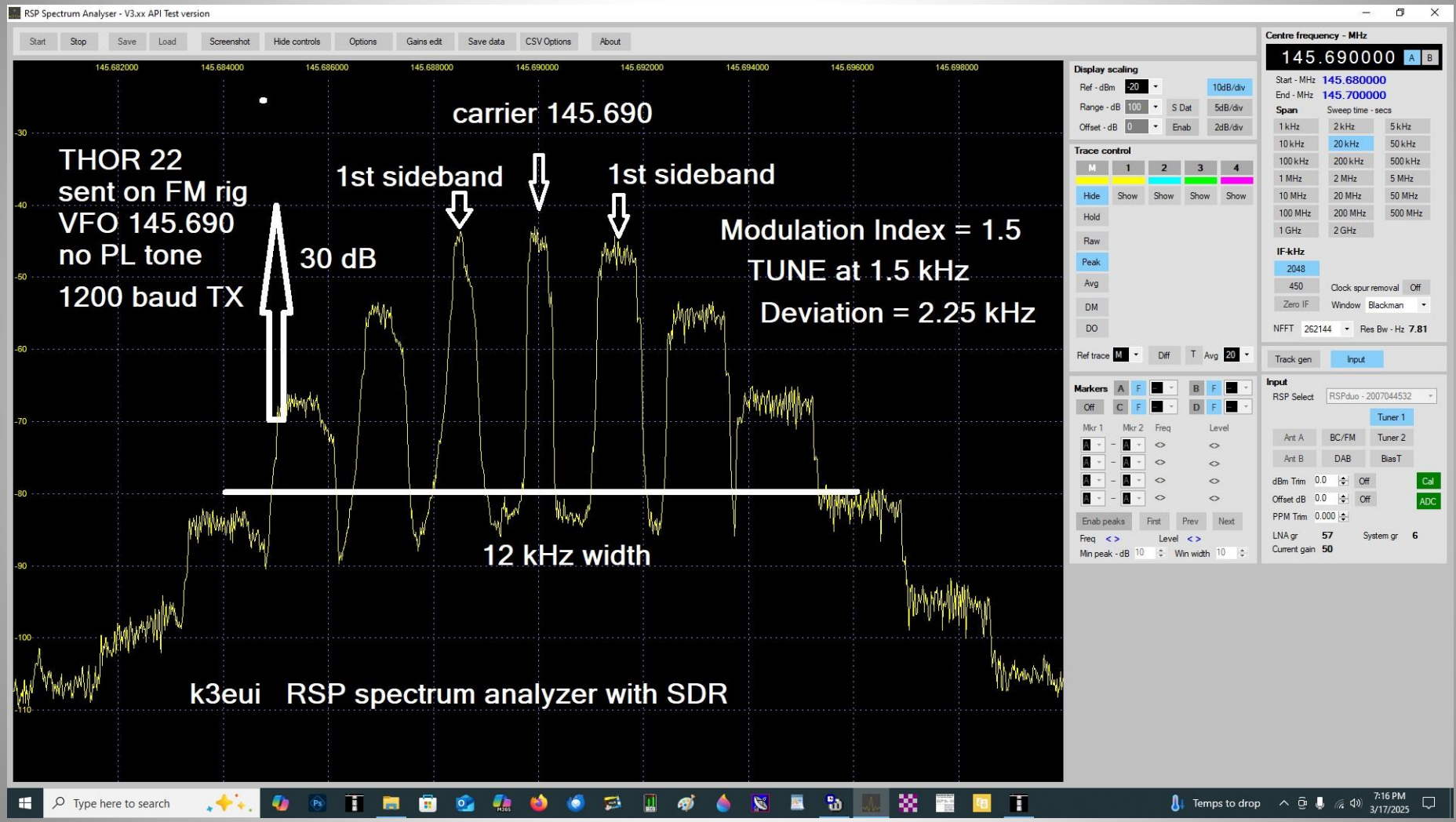
Audio Spectrum of THOR22 500 Hz Bandwidth sent on HF SSB 80m NY NBEMS net



Audio Spectrum THOR 22 - 500 Hz wide sent on 2m FM radio



Radio Spectrum: THOR 22 sent over 2 meter band FM note the wider bandwidth when sent via FM modulation

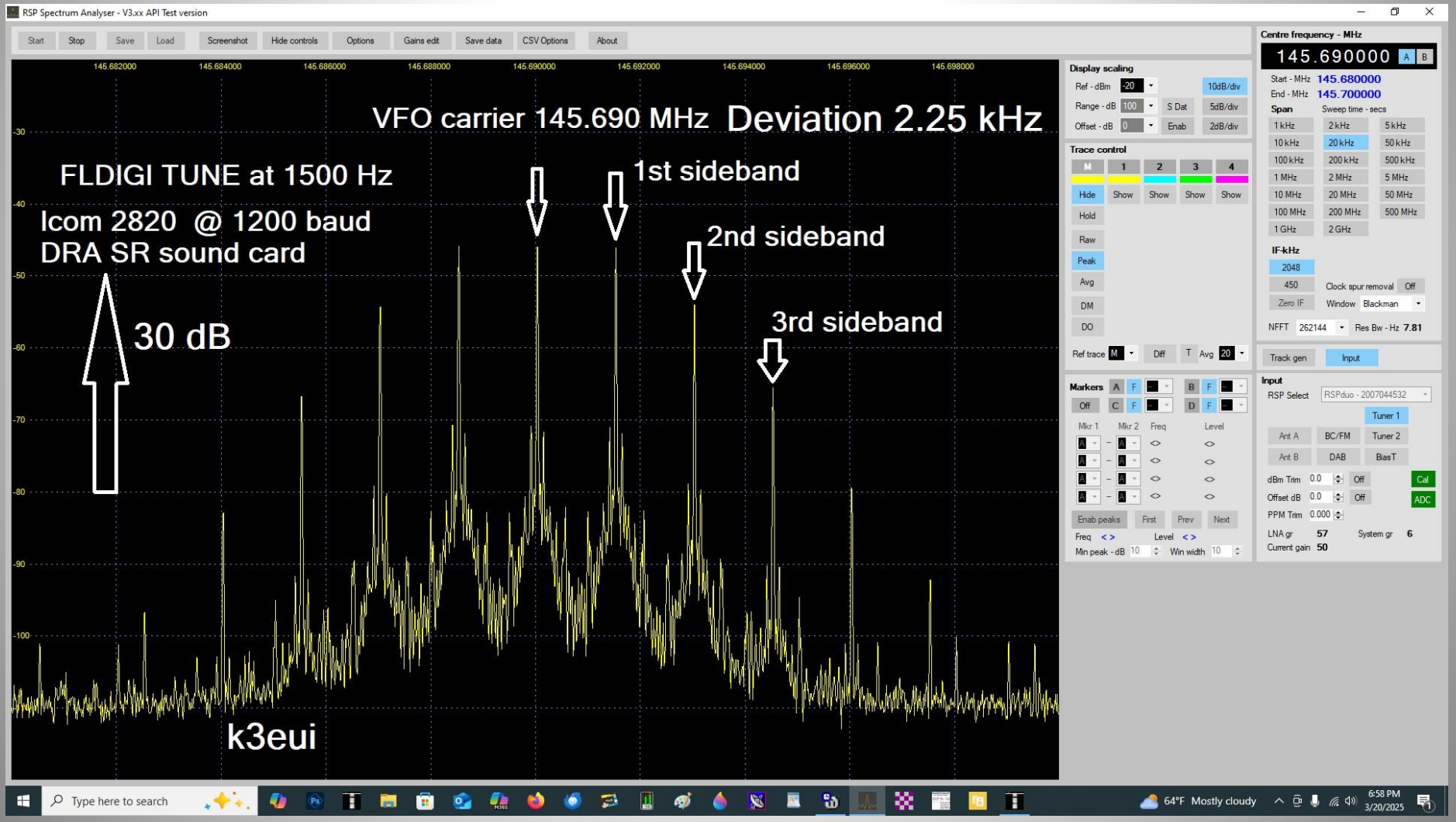


Setting optimum TX audio level

- On SSB, adjust for ZERO ALC
- Aim for a 25W TUNE with 100W PEP rig

- On FM, adjust for a 2 kHz deviation
  Use the Bessel Method to determine the deviation using the RF spectrum

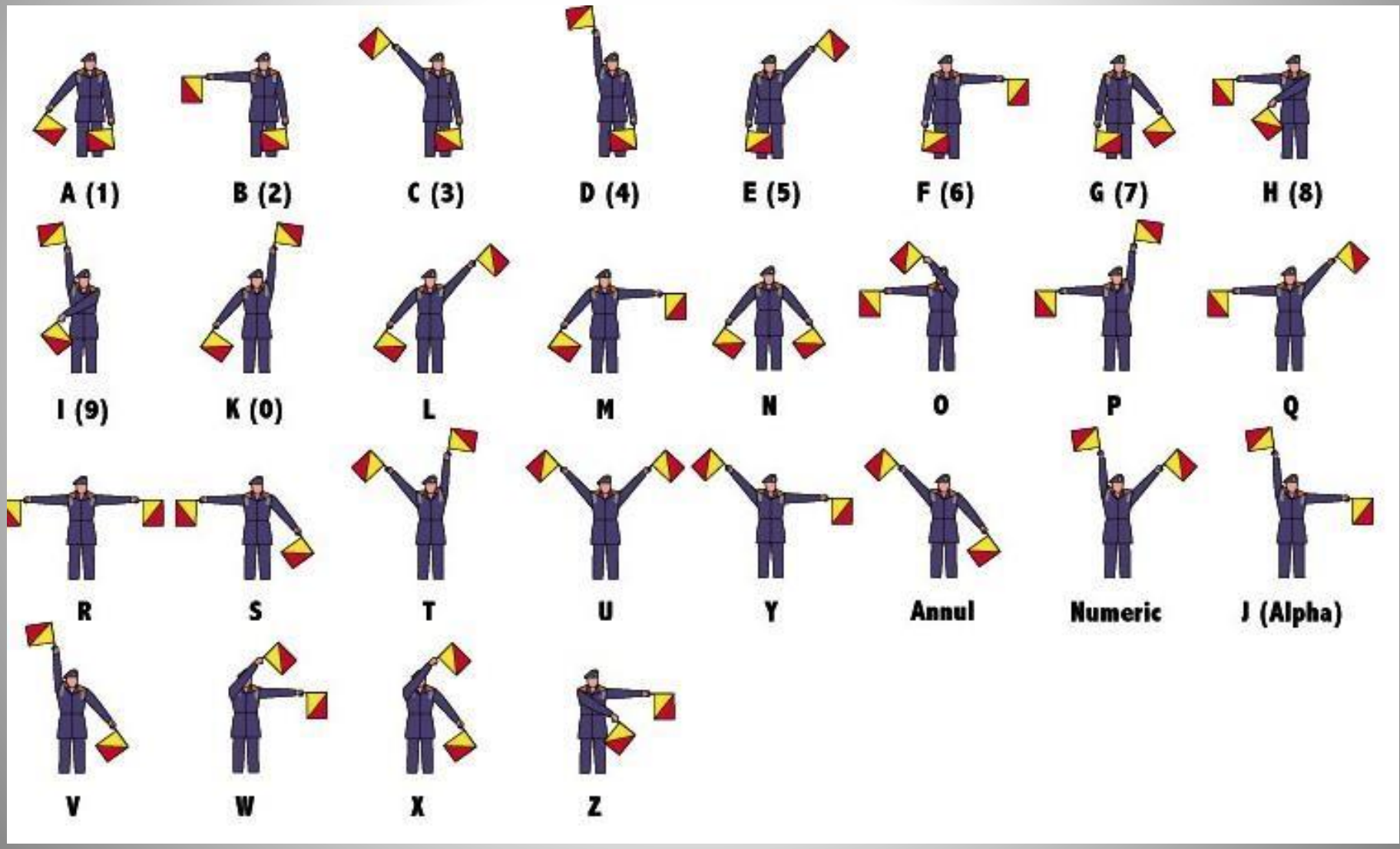
Setting proper TX levels on FM using TUNE when 1st pair sidebands amplitude equals carrier amplitude the deviation is 2.2 kHz at 1500 Hz audio



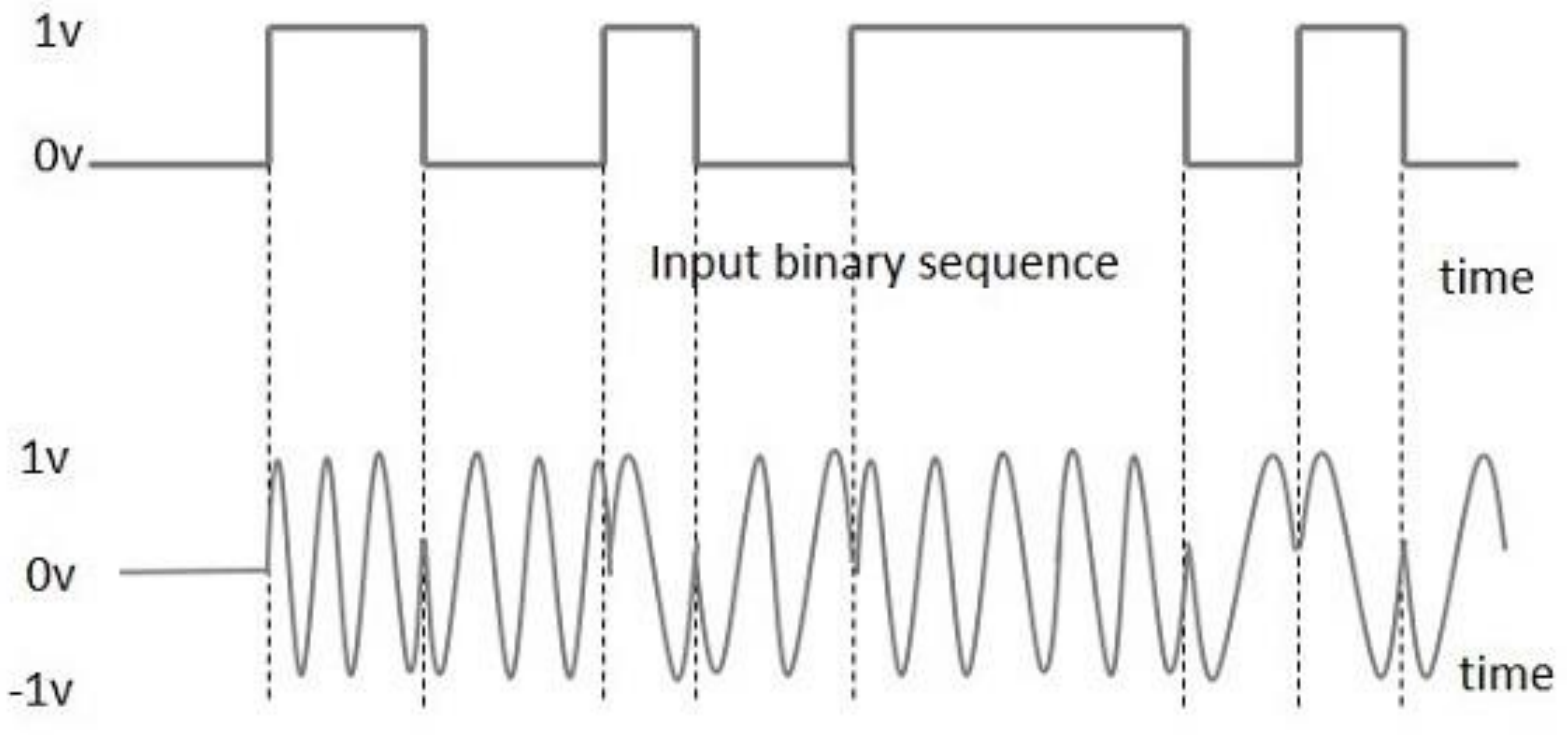
PHASE-SHIFT KEYING MODULATION

what is it?

An example of PHASE-SHIFT KEYING
by altering position (**phase**) of two flags



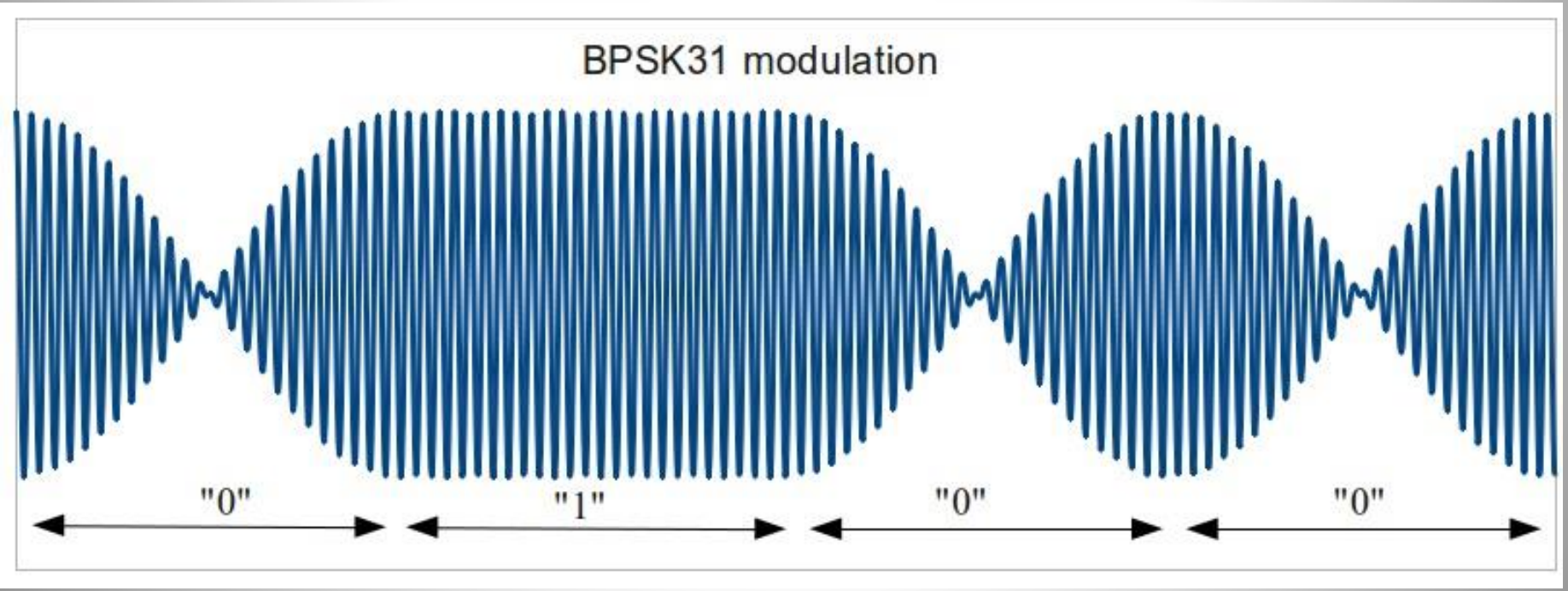
PSK (Phase Shift Keying)



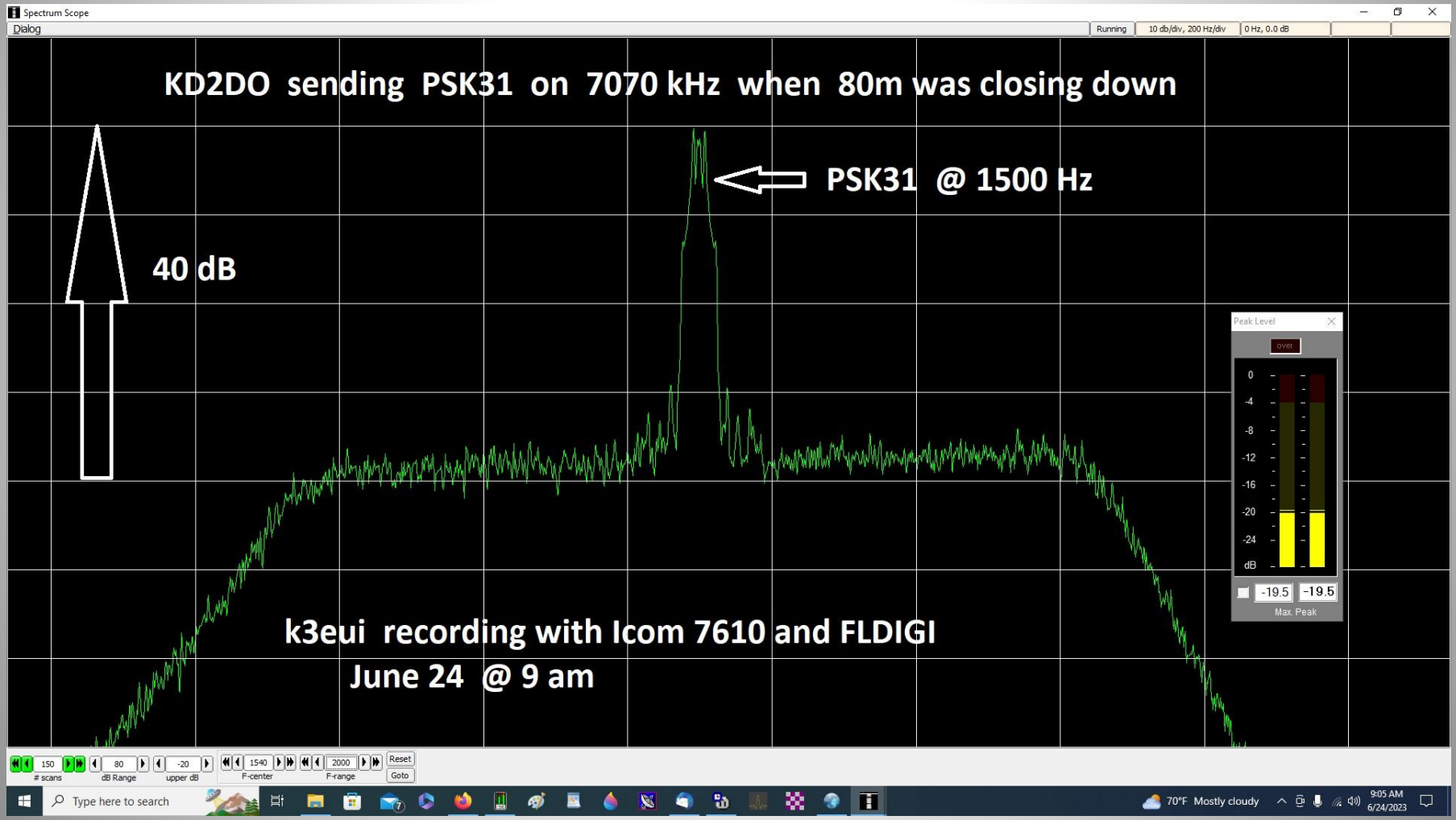
BPSK Modulated output wave

BPSK31 mode

Amplitude changes accompany phase changes to minimize the bandwidth



BPSK31 mode: <100 Hz BW and 50 word/minute sent over 40m SSB



Watering Holes for PSK31

Typical HF frequencies

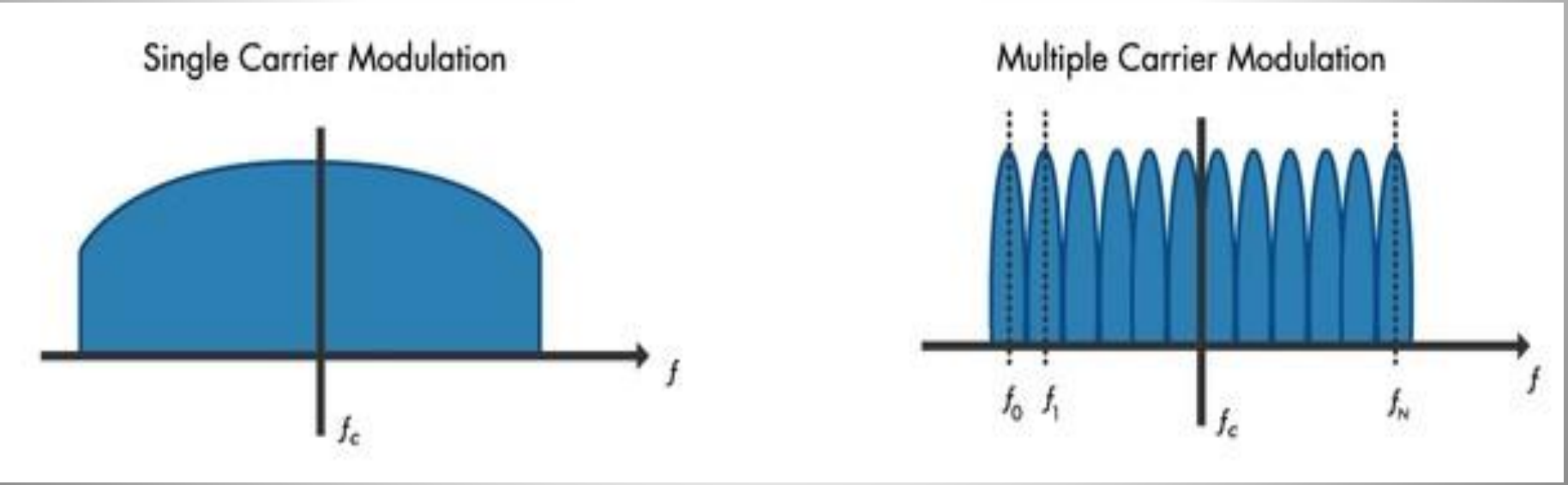
80 meters: 3.580 MHz
40 meters: 7.070 MHz
20 meters: 14.070 MHz
15 meters: 21.070 MHz
10 meters: 28.120 MHz

Multiple PSK "carriers"

multiple sub-carriers (parallel signals)

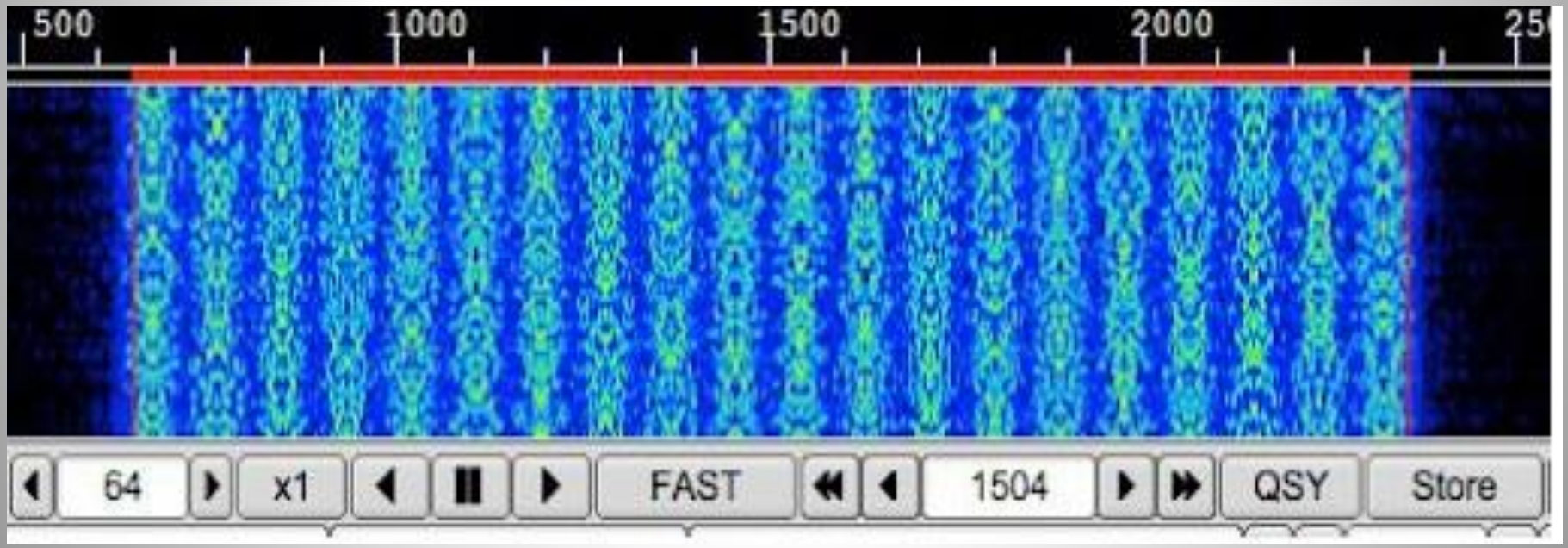
Each sub-carrier could be phase-shifted independently from its neighbor, but at a common baud

Thus, more information per second …. And more bandwidth !

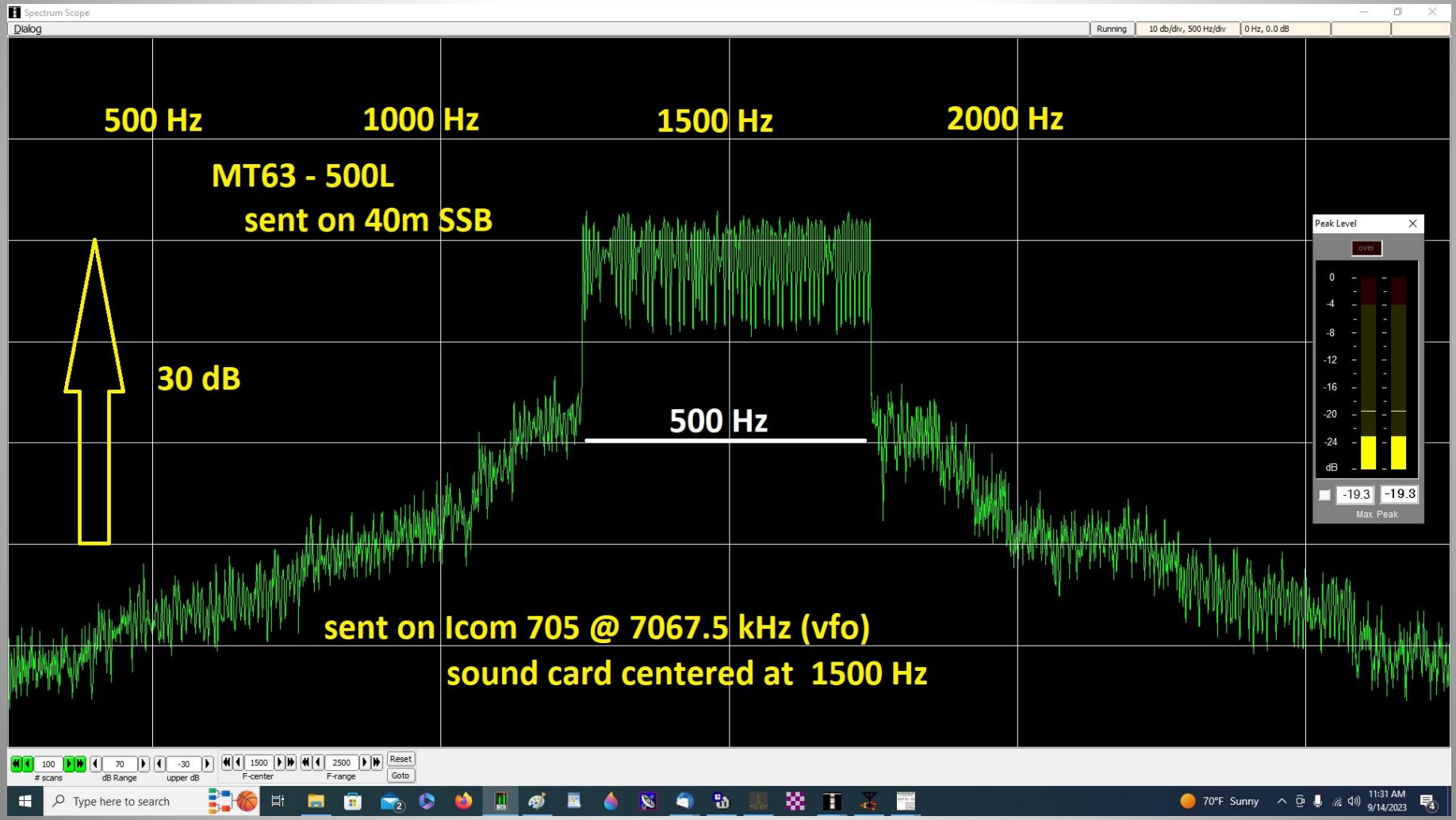


PSK modulation with 20 sub-carriers

More data per second
but at a cost of greater bandwidth

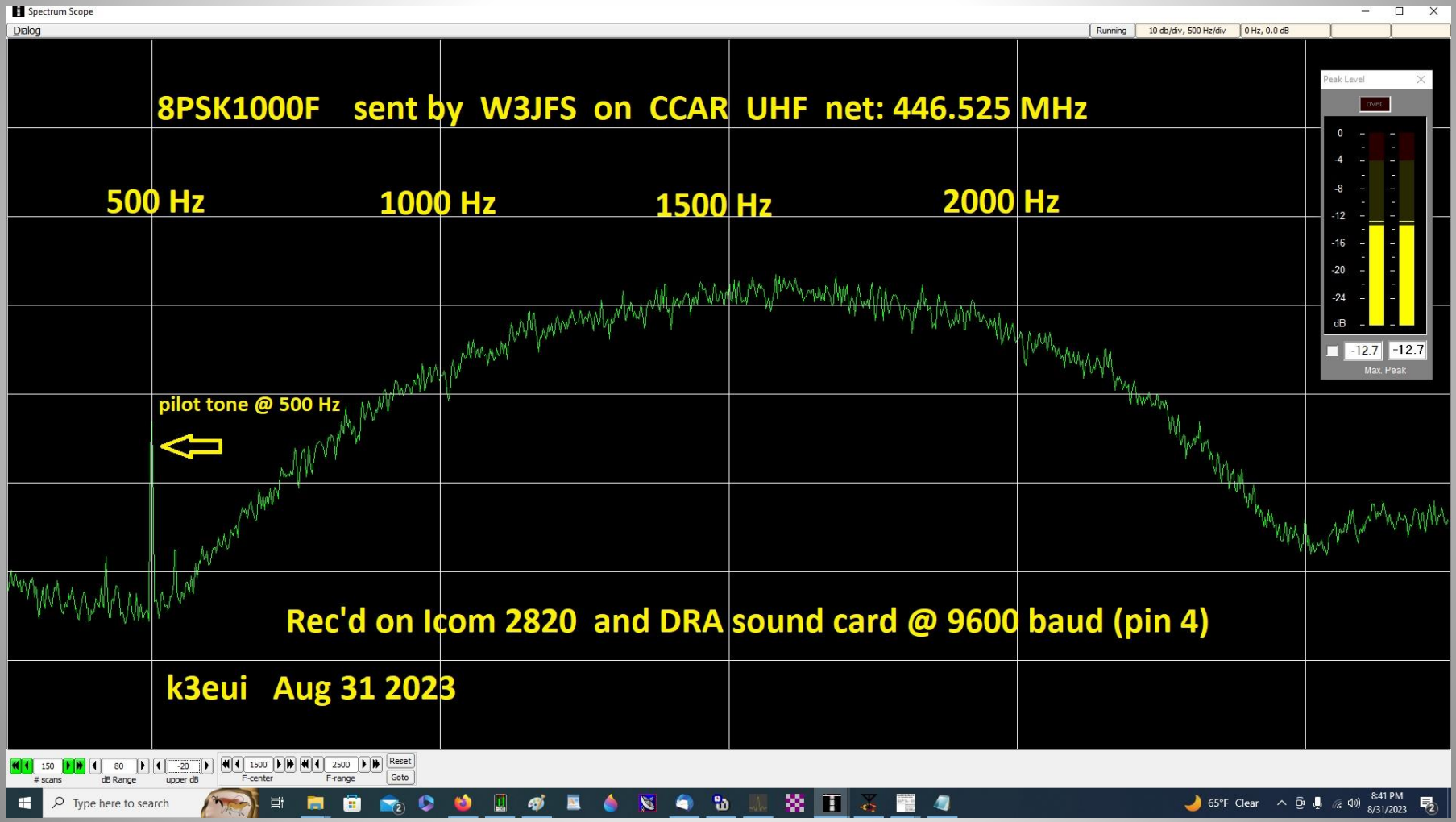


MT63-500L: 64 sub-carriers, 500 Hz bandwidth sent over 40m SSB

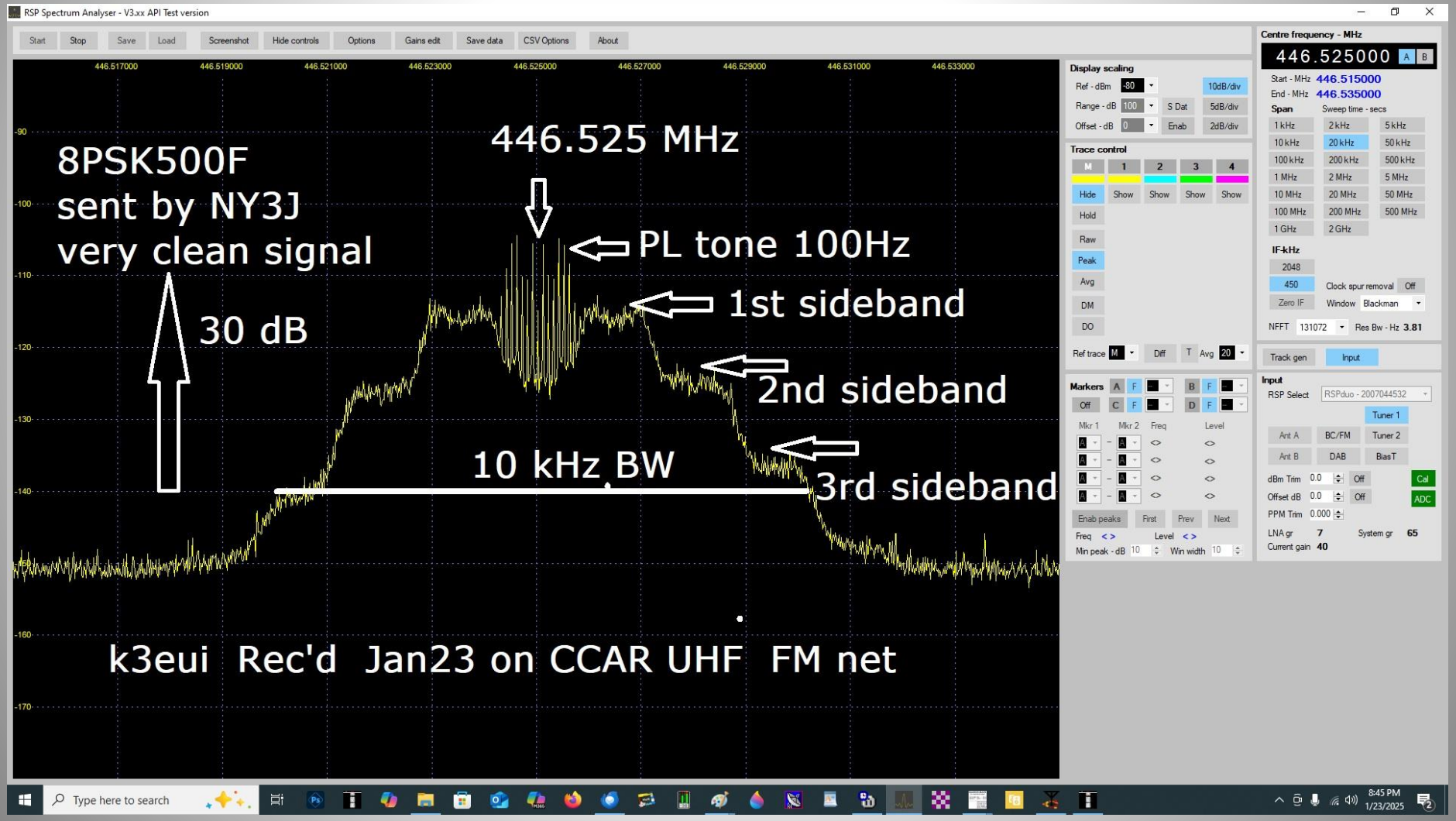


Change the amplitude as well as the phase for more data

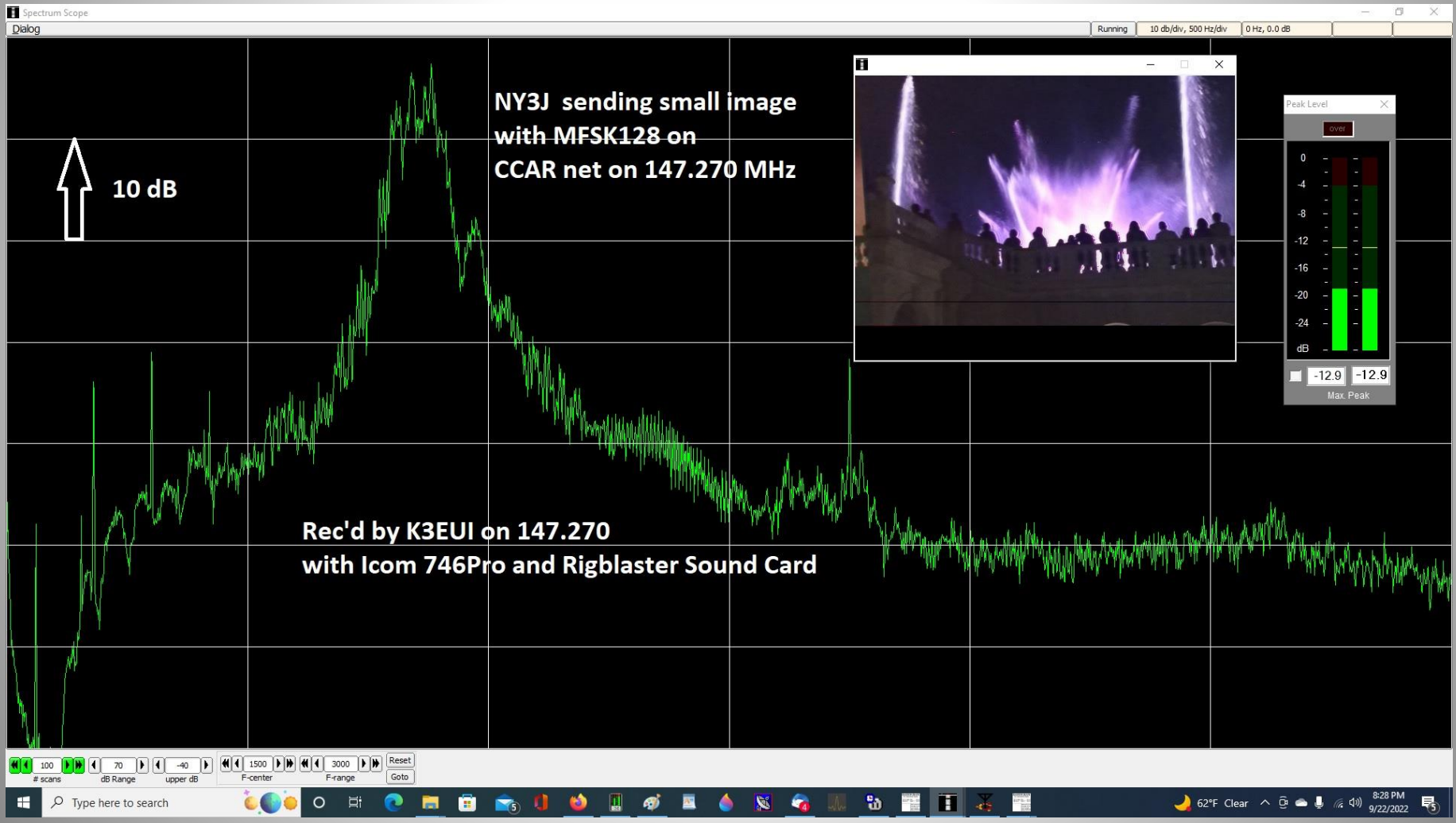
Audio Spectrum: 8PSK1000F (super fast) sent over 70cm FM band



Radio Spectrum: 8PSK500F
fast and robust mode used on FM
note larger bandwidth on FM



Sending small images with MFSK128 on 2m FM



Small image sent with MFSK128 on 2m FM in 2 minutes

PA NBEMS 80m net

Sunday mornings: 7:30 am to 9 am
Frequency: 3583.0 kHz (VFO / USB)
Mode: THOR 22 for check-in
MFSK32 and THOR32 for traffic

Propagation: NVIS (skywave) 10-300 miles
Many stations check in QRP (5W)
Antennas of choice: low elev dipole 130 ft

PA NBEMS net information

https://groups.io/g/panbems

Net control ops in Eastern PA

NY3J	Ron	Bucks County
K3EUI	Barry2	Chester County
W3JFS	John	Chester County
KC3DOW	Steven Gillette	Central PA

PA NBEMS net

Stations check in first from PA by region
- Emergency, QRP, EOC
- WPA, CPA, and EPA (by county)

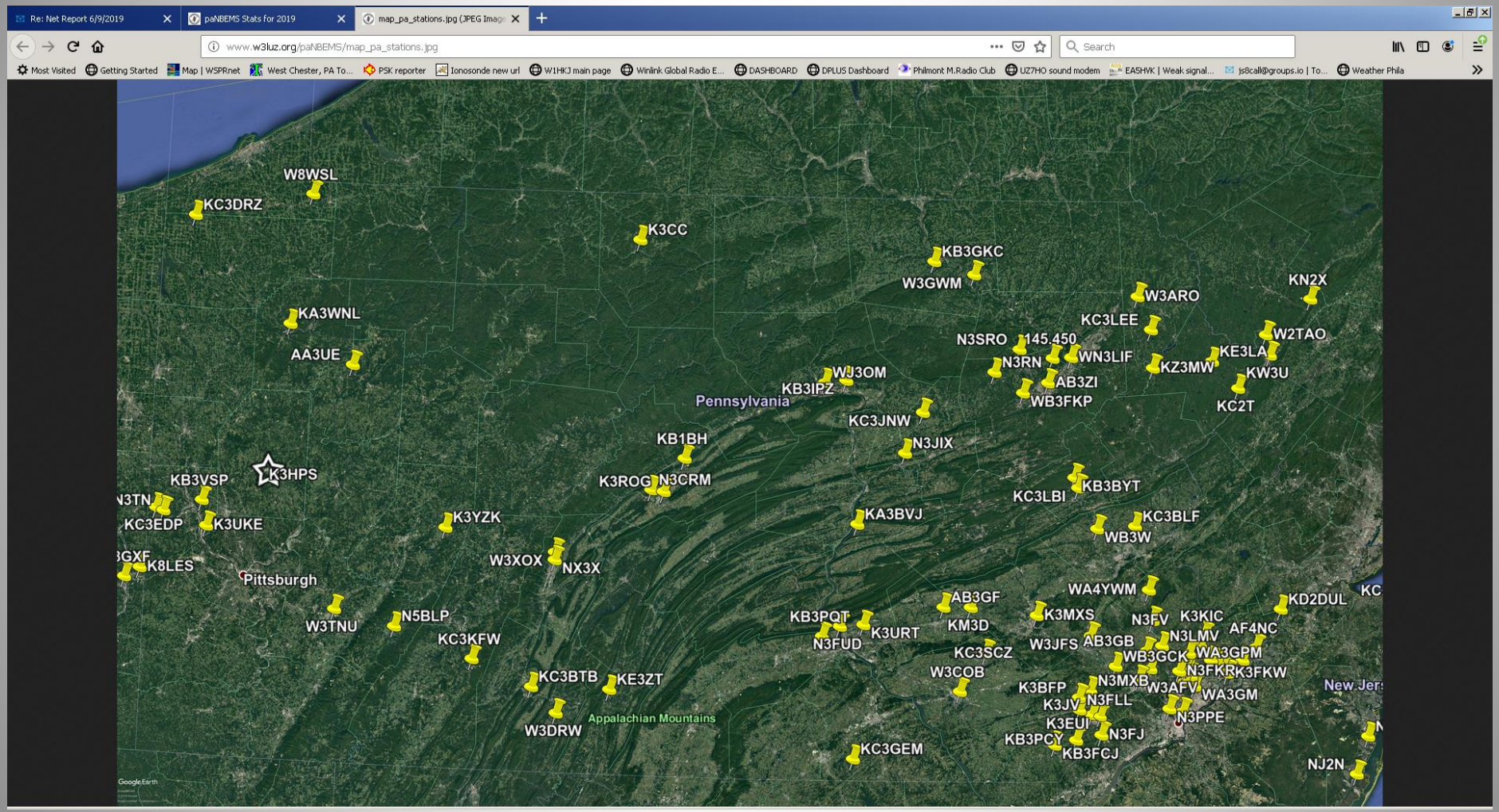
FCC call regions 1,2,3,4,8,9, Canada

Propagation via NVIS: 10 to 400 miles

Typical Log 30-60 stations

- **Group Email Addresses**
- Post: panbems@groups.io
- Subscribe: panbems+subscribe@groups.io
- Unsubscribe: panbems+unsubscribe@groups.io
- Group Owner: panbems+owner@groups.io
- Help: panbems+help@groups.io

Pa stations checking in regularly on 80m



HF NBEMS regional nets: all use upper sideband
Thor22 is checkin mode

NH Digital Net	Saturday 7:00 AM	3582 kHz
NY NBEMS	Saturday 8:00 AM	3583 kHz
Pa NBEMS	Sunday 7:30 AM	3583 kHz
NJ NBEMS	Sunday 9:00 am	3582 kHz
MidAtlantic	Sunday 10:00 AM	7068 kHz

Time for Questions