

A large explosion is shown, with a massive fireball of orange and yellow flames at the bottom. Above the fireball, a dense shower of sparks and debris is being ejected into the dark sky, creating a fan-like pattern. The text is overlaid on this background.

# **IS FT8 DESTROYING AMATEUR RADIO?**

K5TRI / DK5TRI - [k5tri@arrl.net](mailto:k5tri@arrl.net) - @mschulz

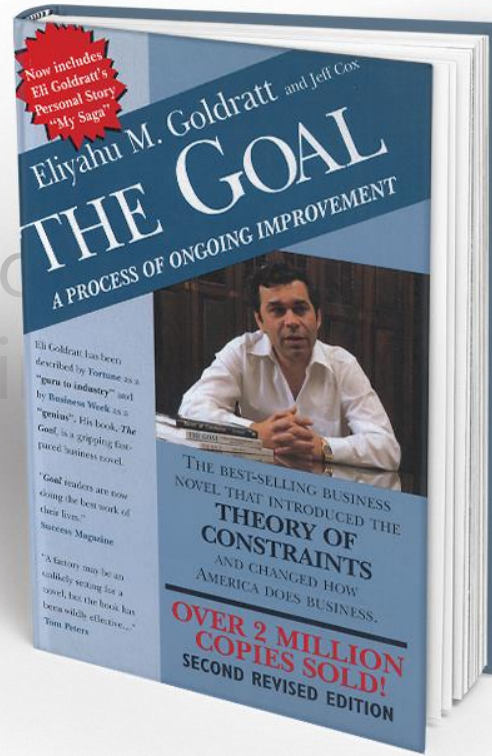
# DISCLAIMER

I'm not an expert.

I only play one on the Interwebz

“Technology only if, it diminishes benefits if, and  
only if, it diminishes innovation.”

—Eli Goldratt



# Technology (n)

## **dictionary.com:**

*the branch of knowledge that deals with the creation and use of technical means and their interrelation with life, society, and the environment, drawing upon such subjects as industrial arts, engineering, applied science, and pure science*

## **Merriam-Webster:**

*a: the practical application of knowledge especially in a particular area  
b: a capability given by the practical application of knowledge*

*2. a manner of accomplishing a task especially using technical processes, methods, or knowledge*

# FCC Title 47, PART 97

## AMATEUR RADIO SERVICE

- a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications.
- b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.
- c) Encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communication and technical phases of the art.
- d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.
- e) Continuation and extension of the amateur's unique ability to enhance international goodwill.

# FCC Title 47, PART 97

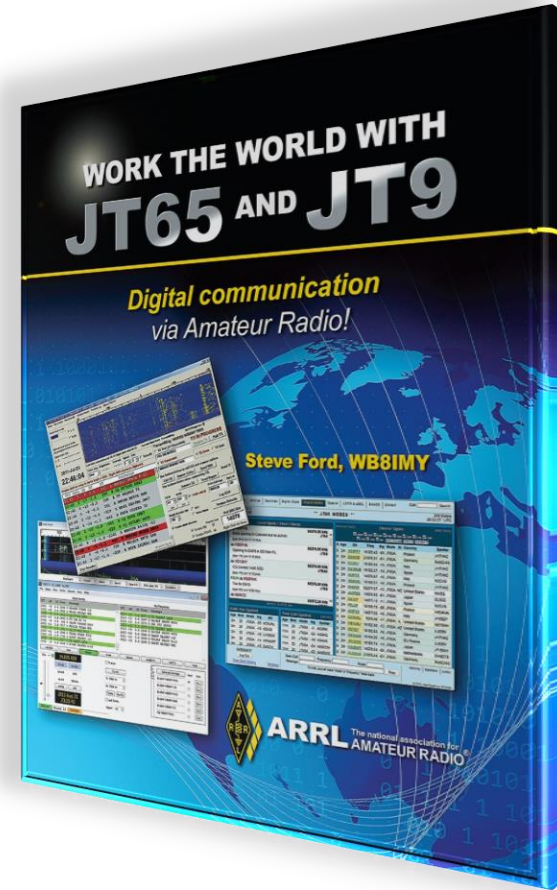
## AMATEUR RADIO SERVICE

- a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications.
- b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.**
- c) Encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communication and technical phases of the art.**
- d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.
- e) Continuation and extension of the amateur's unique ability to enhance international goodwill.



# In the beginning – JT65

- Originally developed by Joe Taylor (K1JT) for EME (Earth-Moon-Earth) Communication
- Opened up EME for lower equipped stations
- Quickly spread to other bands (HF) allowing DX for small stations
- WSJT-X provides nine weak signal modes
- Software available as open source under GPL v3



**JT65 IS SOOOOO EXCITING!!!!**





# FT8 – a new mode enters the world

**Joe Taylor, K1JT wrote on 6/29/17:**

Dear WSJT-X Beta-Test Colleagues, Steve (K9AN) and I have developed a potential new mode for WSJT-X. We're calling the mode "FT8" (Franken-Taylor design, 8-FSK modulation).

FT8 is designed for situations like multi-hop Es where signals may be weak and fading, openings may be short, and you want fast completion of reliable, confirmable QSOs.

# FT8 - Details

## Important characteristics of FT8:

- **T/R sequence length: 15 s**
- Message length: 75 bits + 12-bit CRC
- FEC code: LDPC(174,87)
- Modulation: 8-FSK, keying rate = tone spacing = 5.86 Hz
- Waveform: Continuous phase, constant envelope
- **Occupied bandwidth: 47 Hz**
- Synchronization: three 7x7 Costas arrays (start, middle, end of Tx)
- Transmission duration:  $79 \times 2048 / 12000 = 13.48$  s
- **Decoding threshold: -20 dB (perhaps -24 dB with AP decoding)**
- Operational behavior: similar to HF usage of JT9, JT65
- Multi-decoder: finds and decodes all FT8 signals in passband
- **Auto-sequencing after manual start of QSO**

## Modes over last 2 hours

Mode	Count
FT8	624559
JT65	3449
CW	2221
JT9	411
PSK31	391
VARA	94
SIM31	69
OPERA	32
MSK144	23
ROS	22
PSK	14
OLIVIA	10
PI4	9
RTTY	7
CONTESTI	2
PSK63	2
WSPR	1
SSB	1
T10	1

**Weak Signal not Low Power mode!**

# Block-Structured Messages

Information block size: 72 bits

Calls and locator:

**DK5TRI K5TRI CN87**

$$28 + 28 + 15 + 1 = 72$$

Free text:

**TNX MIKE 73**

$$71 + 1 = 72$$

# Standard minimal QSO

CQ K5TRI CN87

#K5TRI calls CQ

DK5TRI K5TRI K5TRI DK5TRI JO31

#DK5TRI answers

DK5TRI K5TRI -10

#K5TRI sends report

DK5TRI K5TRI K5TRI DK5TRI R-11

#DK5TRI sends R+report

DK5TRI K5TRI RRR

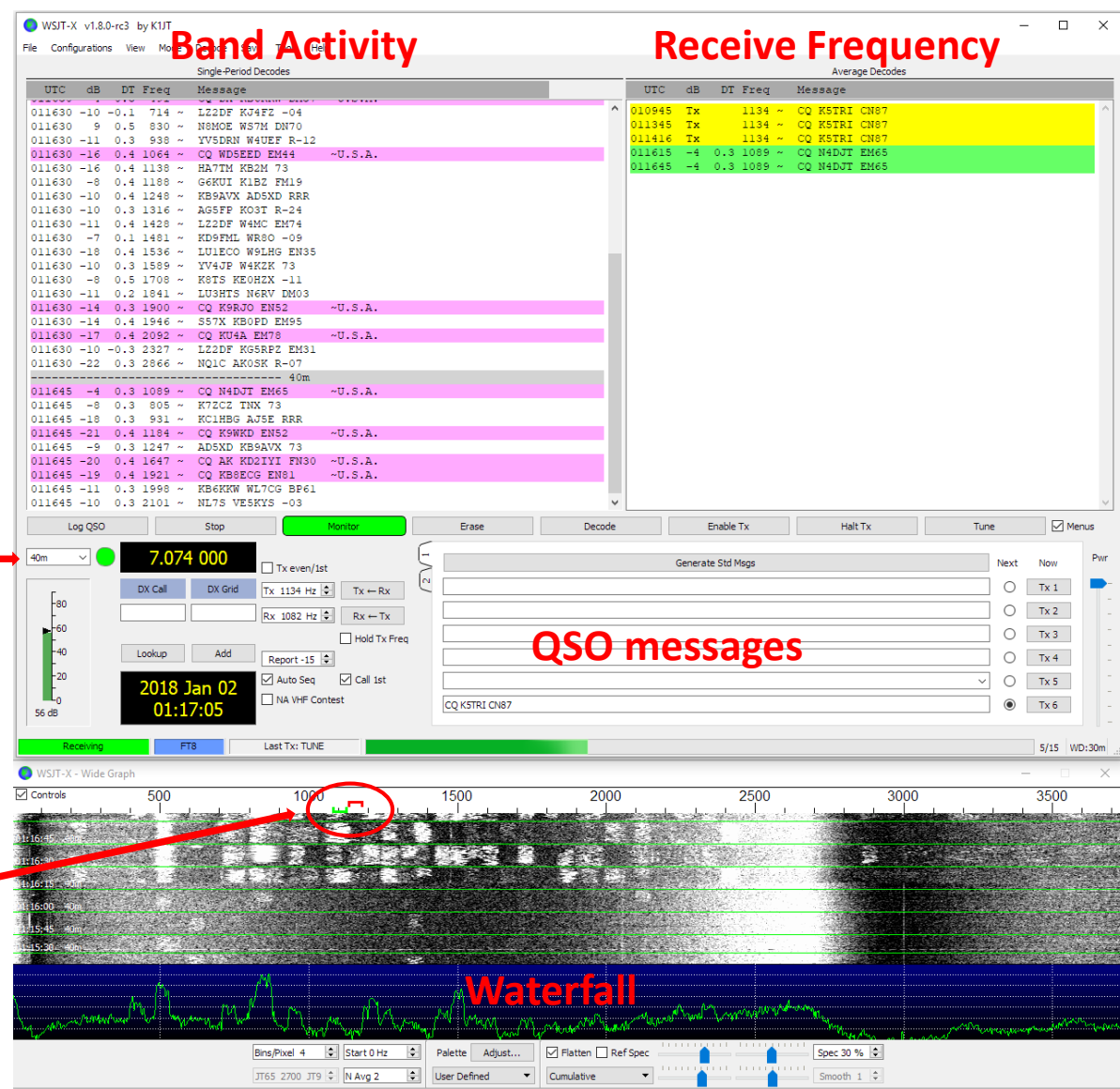
#K5TRI sends RRR

DK5TRI K5TRI K5TRI DK5TRI 73

#DK5TRI sends 73

*a priori* (known) decoding

# Main View







**KEEP  
CALM  
AND  
RTFM**

Ozh!

# Pre-QSO Checklist

- Your callsign and grid locator set to correct values
- PTT and CAT control (if used) properly configured and tested
- Computer clock properly synchronized to UTC within  $\pm 1$  s
- Audio input and output devices configured for sample rate 48000 Hz, 16 bits
- Radio set to USB (upper sideband) mode
- Radio filters centered and set to widest available passband (up to 5 kHz).

WSJT-X v1.8.0-rc3 by K1JT

File Configurations View Mode Decode Save Tools Help

Band Activity

UTC	dB	DT	Freq	Message
-----	----	----	------	---------

Rx Frequency

UTC	dB	DT	Freq	Message
-----	----	----	------	---------

Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune ☒ Menus

20m **14.074 000** ☒ Tx even/1st

☒ DX Cal ☒ DX Grid Tx 899 Hz Tx ← Rx

☒ JA1KEY ☒ QM06 Rx 899 Hz Rx ← Tx

Az: 301 4707 mi ☐ Hold Tx Freq

Lookup Add Report -6 ☒ Auto Seq ☒ Call 1st

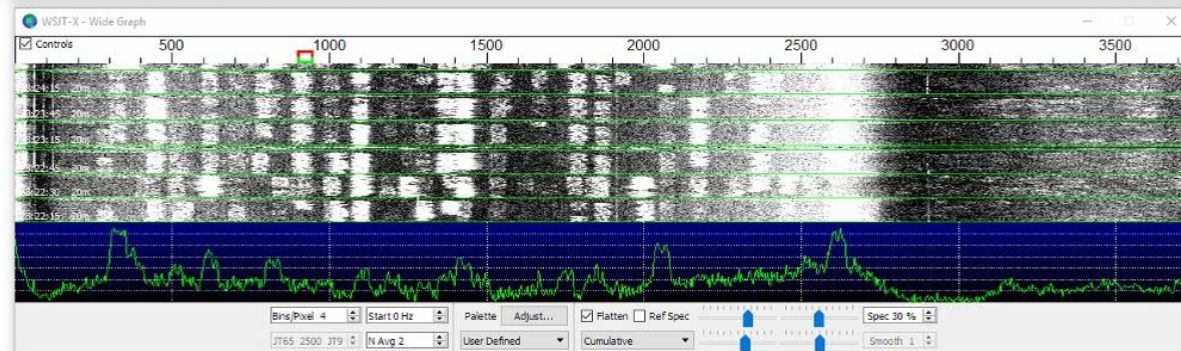
☐ NA VHF Contest

2018 Jan 01 23:24:35

Generate Std Msgs

Next	Now	Prev
<input checked="" type="radio"/> JA1KEY KSTRI CN87	<input checked="" type="radio"/> Tx 1	<input checked="" type="radio"/>
<input type="radio"/> JA1KEY KSTRI -06	<input type="radio"/> Tx 2	<input type="radio"/>
<input type="radio"/> JA1KEY KSTRI R-06	<input type="radio"/> Tx 3	<input type="radio"/>
<input type="radio"/> JA1KEY KSTRI RRR	<input type="radio"/> Tx 4	<input type="radio"/>
<input type="radio"/> JA1KEY KSTRI 73	<input type="radio"/> Tx 5	<input type="radio"/>
<input type="radio"/> CQ KSTRI CN87	<input type="radio"/> Tx 6	<input type="radio"/>

Receiving FT8 Last Tx: JA1KEY KSTRI CN87 S/15 WD:30m



# What you need

- A copy of WSJT-X, available at <http://physics.princeton.edu/pulsar/K1JT/wsjt.html> (Windows, Linux, macOS)
- A frequency stable radio
- A sound card interface to connect to your radio
- Computer clock synchronized  $\pm 1$  sec UTC

# Computer interfacing

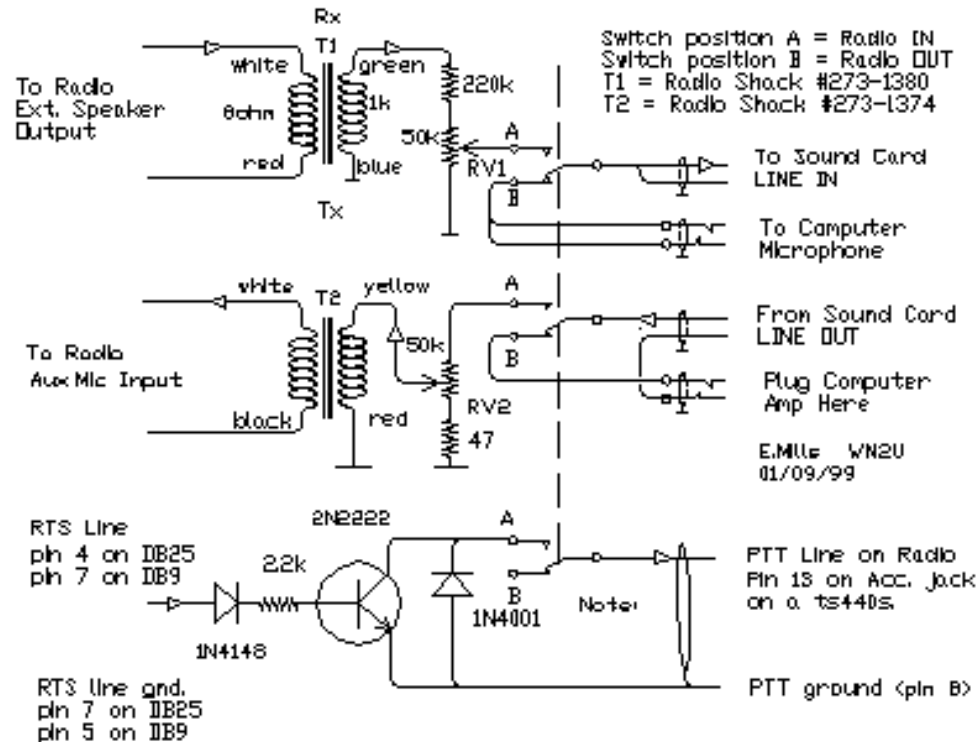
- If you are already setup for other audio based digital modes (e.g. PSK31, JT65, Olivia, Hell) you're already 99% there





# Computer interfacing

## Build your own



:DI

# Operating Tips

- FT8 is 100% duty cycle, watch for transceiver limitations
- Audio settings are critical to not overdrive input stage
- Check ALC for optimal reading (depends on transceiver)
- Turn AGC off or reduce RF gain to minimize AGC action
- Shift-click on desired TX frequency to enable split operation
- Use auto sequencing for QSOs

# Myth: One must only run 20W or less

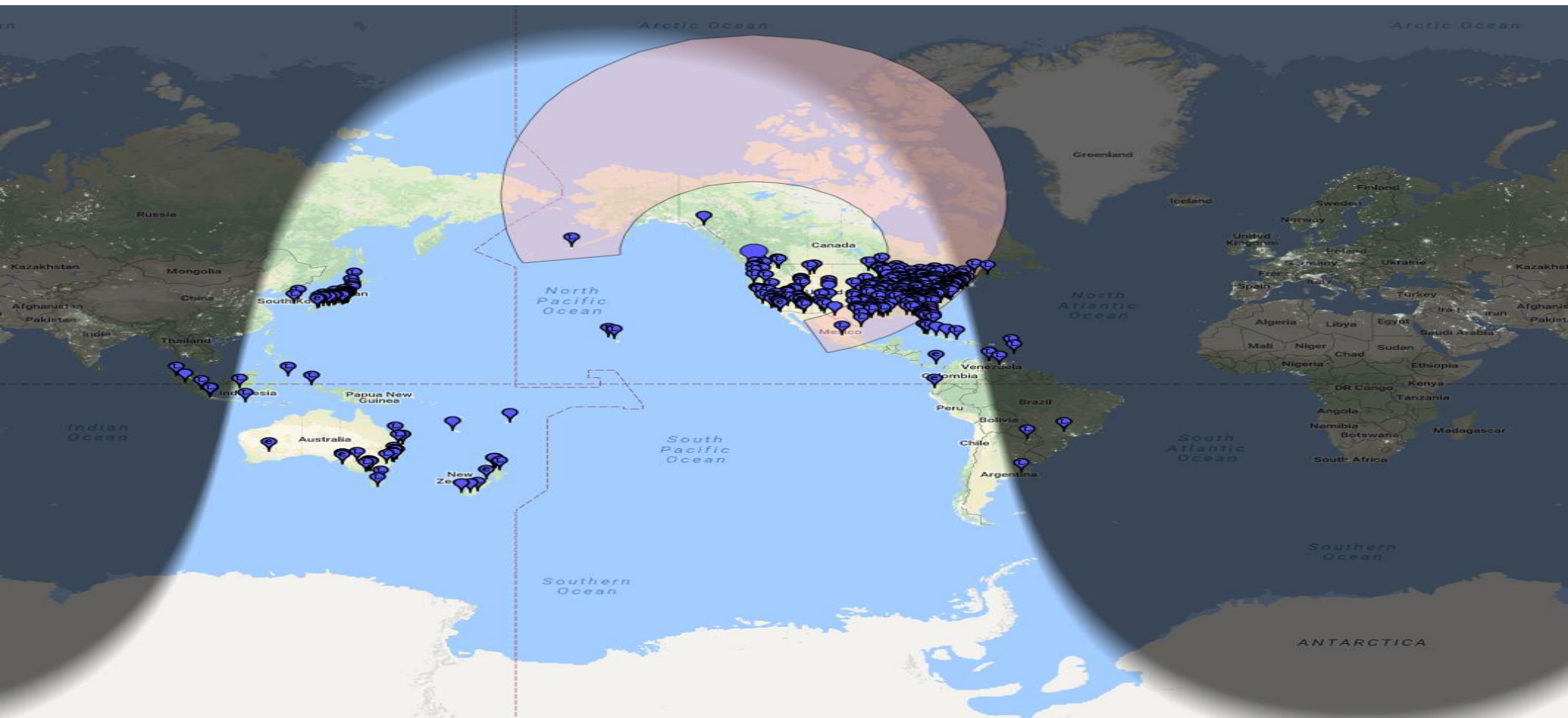
- FT-8 can be used with 100W, radio permitting without problems if your signal is clean.
- Problem with low input power is that the signal is weak. Here in Europe, I receive many FT8 signals registering +15 dB or more and they are no wider than the -18 or -19 dB signals on adjacent frequencies.
- FT-8 is not the only mode.
- Monitoring is important.
- Part 97 defines power regulations:

**An amateur station must use the minimum transmitter power necessary to carry out the desired communications.**

# Activity

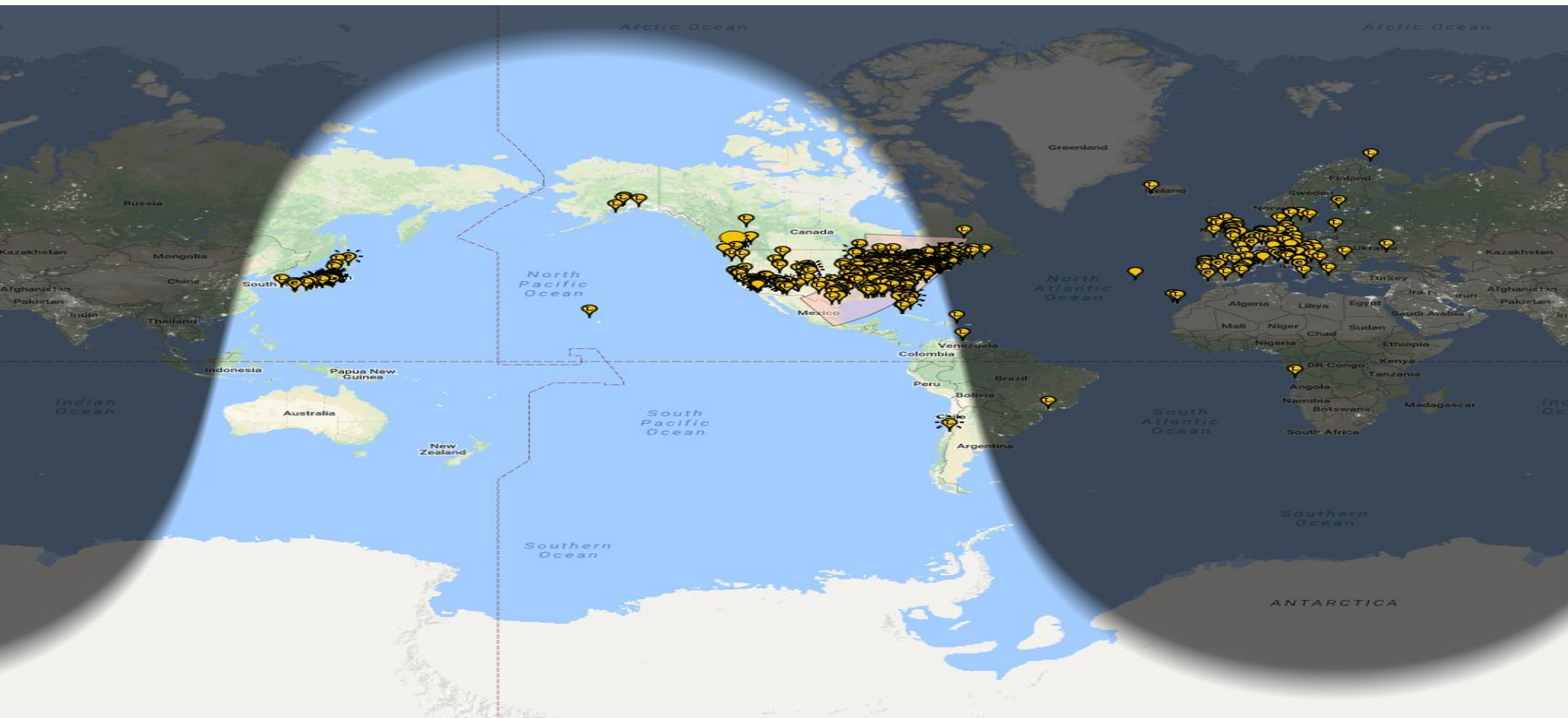
Lots of it

# PSKReporter 40m

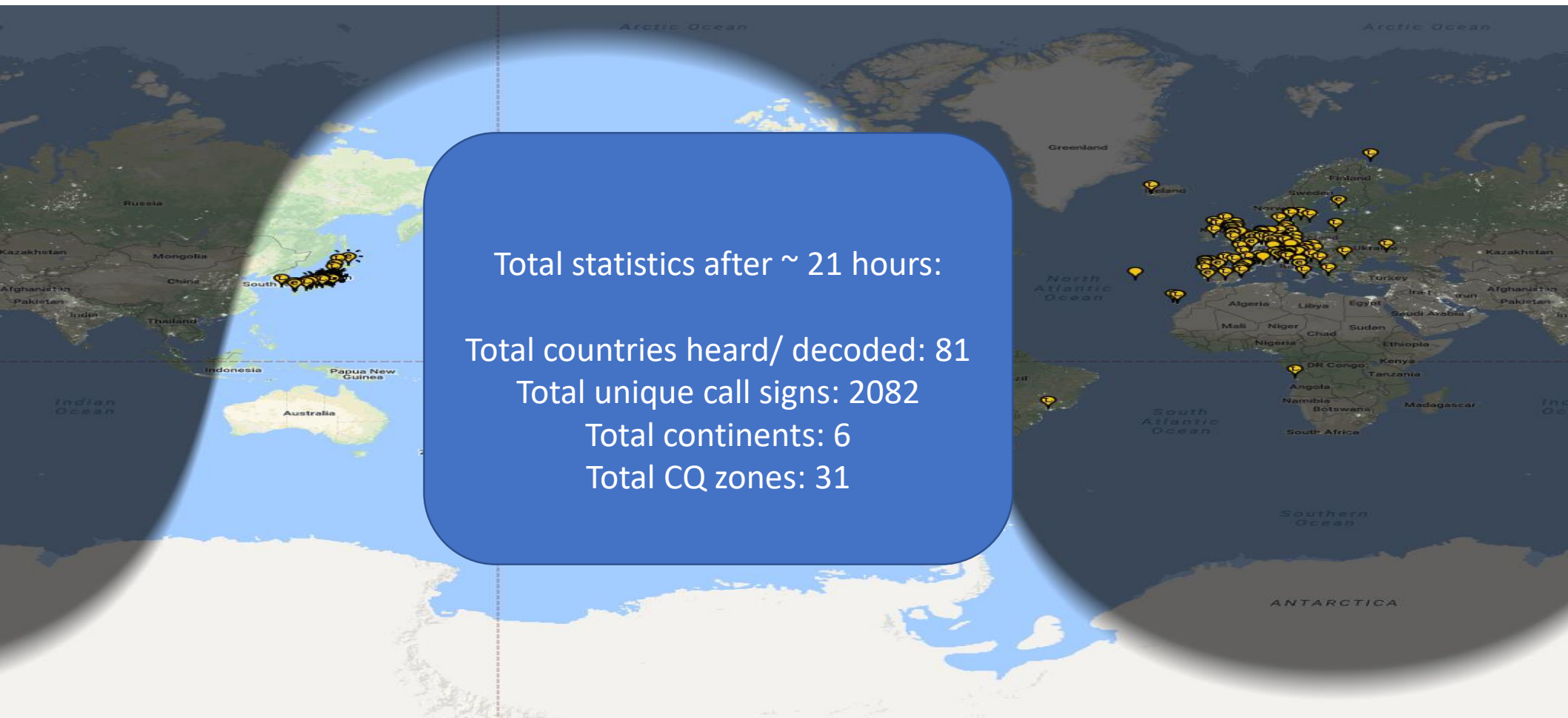




# PSKReporter 20m



# PSKReporter 20m



Total statistics after ~ 21 hours:

Total countries heard/ decoded: 81

Total unique call signs: 2082

Total continents: 6

Total CQ zones: 31

So everybody's happy, RIGHT?

Maybe?



**HATERS GONNA HATE**



# Voices from the arm chair experts

This stuff not Radio.....It`s noise crap.....

It now appears hams want to take the easy way out to making contacts.  
FT8 is one step closer to making qso's without human contact.

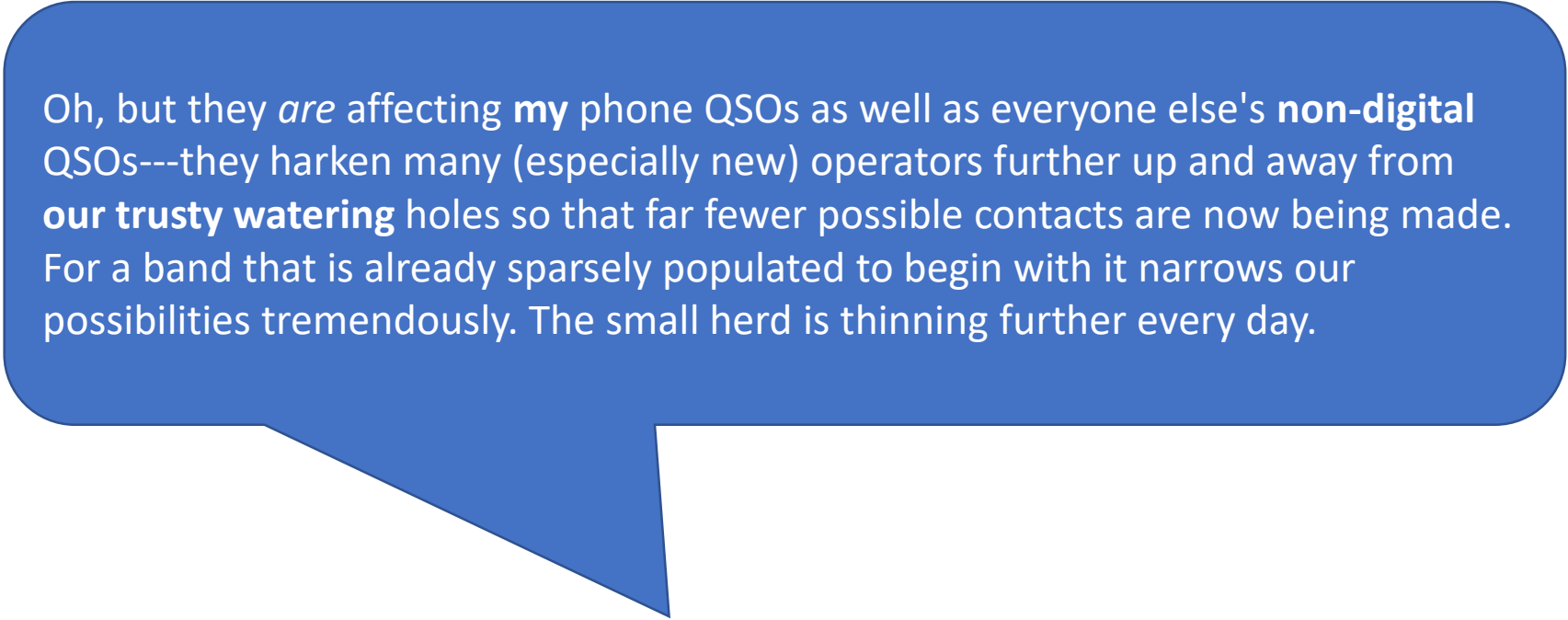
Why bother taking decades to achieve DXCC on 6 meters the difficult old-fashioned way when you can earn your wallpaper over a weekend or two spent in front of your computer monitors instead?

Sorry FT8 is not ham radio. Its machine to machine.

YES FT8 has turned the data modes into a zoo full of morons that have no idea about propagation or power and how to set up the radio.....

It's just another 599 TU 73 mode. ....  
Current FT8 activity levels are just a fad, and it will eventually fade and be like other digimodes. You can only say 599 TU 73 so many times before it gets old.





Oh, but they *are* affecting **my** phone QSOs as well as everyone else's **non-digital** QSOs---they harken many (especially new) operators further up and away from **our trusty watering** holes so that far fewer possible contacts are now being made. For a band that is already sparsely populated to begin with it narrows our possibilities tremendously. The small herd is thinning further every day.

Click on the map for info. of that location / Right-click for more options

Map

Satellite

© [WWW.DXMAPS.COM](http://WWW.DXMAPS.COM)

QSO/SWL from 01:46z to 02:45z

SFI=74 A=23 K=3-Active SWX=Quiet

ES! Best MUF=85MHz above DM56 at 02:30z. MR rep at 02:45z  
Multi-hop ES! MR rep at 02:44z

BO

CO

DO

EO

FO

BN

CN

DN

EN

FN

BM

CM

DM

EM

FM

BL

CL

DL

EL

FL

BK

CK

DK

EK

FK

Google

Map data ©2017 Google, INEGI Terms of Use

A close-up shot of Keanu Reeves as Neo from the movie The Matrix. He is wearing his iconic black sunglasses and a dark, textured jacket. The background is dark and out of focus, with a bright light source visible in the upper right corner.

**WHAT IF I TOLD YOU**

**THERE IS MORE THAN YOUR WAY TO  
ENJOY A HOBBY**

# Summary

- FT8 is not destroying Amateur Radio, it's making it more awesome
- FT8 provides amazing weak signal capabilities
- Strong adoption within the ham radio community equals more use of spectrum
- Continuous improvement of protocol and software
- There still many operators using other modes. Don't despair.



Questions?



# Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0)

