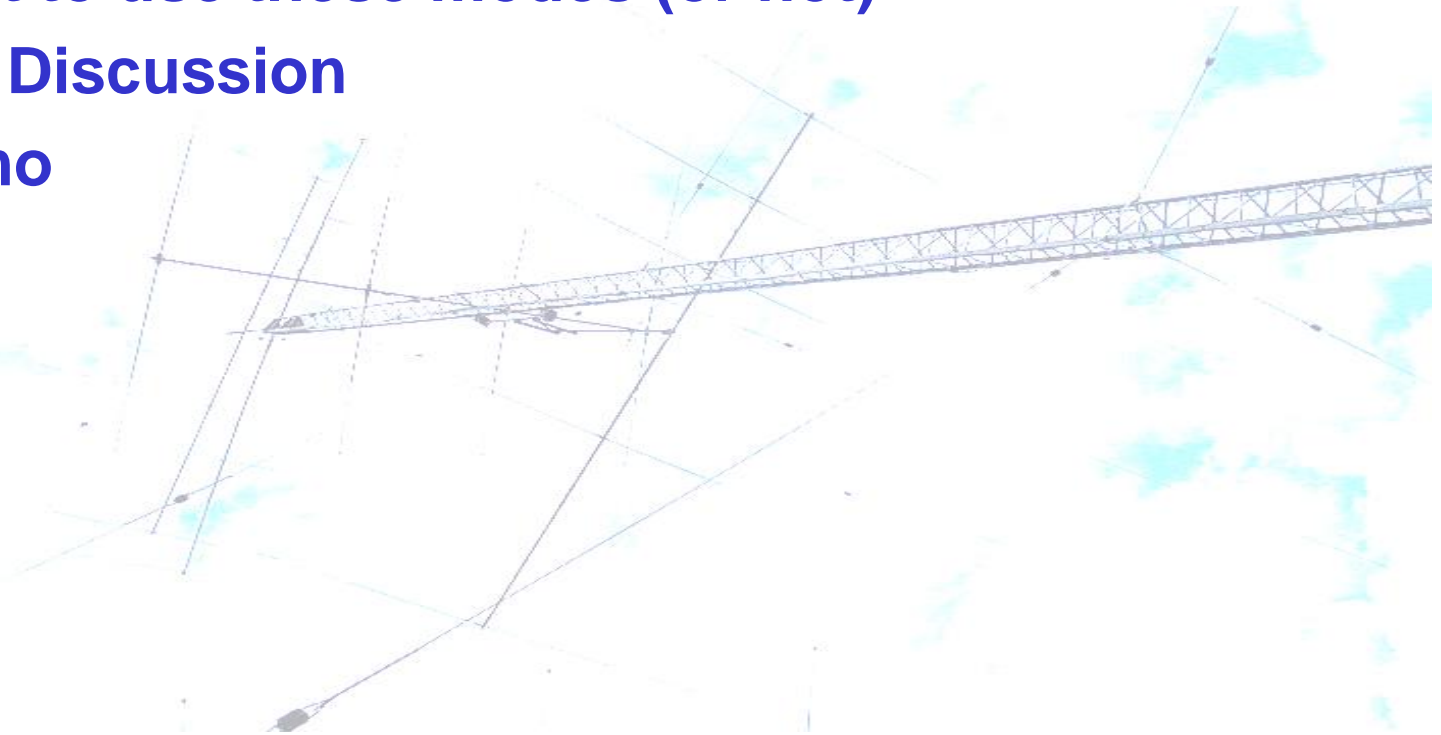


# FT8



- . - . - - . - - . . . . - . - - . . . - . . . . - .
- Background re the JT / FT modes Why might you want to use these modes (or not)
  - FT8 Discussion
  - Demo



# FT8

- FT8 is a new protocol developed by a team lead by Joe Taylor and is considered to be a JT mode.
- Part of the WSJT-x software suite.
- The original JT modes were used for Earth Moon Earth (EME)



# FT8



- Background - Why I use Digital Modes
- Fairly typical basic HF station with typical issues
  - ◆ 100 Watt radio(s), short (~23 ft) roof top vertical
  - ◆ Typical suburban lot in Burnaby
  - ◆ Lots of RFI, listening can be tedious at times
  - ◆ Some EMI issues at higher power, like to keep the wife and neighbors happy
- Wanted to be able to work some DX

# FT8



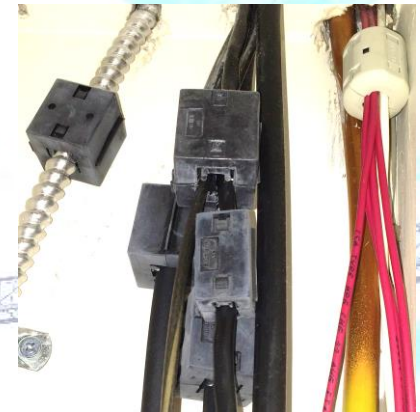
QRM for me at times from RFI from household Devices

Annoying to listen to



# FT8

- Bigger HF antennas, amp etc not really an option for me at home
- Eventually tamed the EMI issues in my house, but noise was still a problem when receiving
  - ◆ Wife can watch TV when I am using the radio



# FT8



- Started running RTTY approx. 10 years ago.
  - ◆ Made world wide contacts, could hold a frequency on 20M in a contest etc. Was fairly happy, had fun.
  - ◆ 80 and 160M were still a challenge
  - ◆ Needed to run 100 watts on occasion (EMI issues came back on occasion)
  - ◆ Tried PSK31, HF packet etc. wasn't hugely impressed
  
- A few years ago started running the JT modes on VHF and up. Was very impressed. Quickly tried them on HF and was pleased. Re kindled my interest in HF

# FT8



- JT9 made 80M and 160M viable for my small home station
- Operation is mostly on pre determined frequencies
  - ◆ No dial spinning needed, once band is chosen
- I prefer the JT modes to psk31 / RTTY
  - ◆ A better choice in my view for very weak signals and or low power levels on HF
  - ◆ I like the error correction
  - ◆ Don't really want to rag chew on HF digi modes
  
  - ◆ BUT.....

# FT8



- JT9 (And JT65) are slow..
- Other JT modes are fast but not as good with weak signals and not generally suited to HF (in my view.)
- FT8 is fast(er) (15 sec sequences vs 1 min sequences so essentially 4 times as fast as JT9)
- Still quite sensitive (maybe 6dB down from FT9 ?)
  - ◆ -20 dB decoding threshold per the release notes without AP decoding



# FT8



- • — • — • — • • • — • — • • • — • • • • — •
- **Optimized for typical HF Dxing and certain VHF DX**
  - **Narrow band**
    - ◆ 50 Hz BW
    - ◆ 6.25 Hz tone spacing
    - ◆ Lots of users can use the calling frequencies on each band
- 
- A faint, light blue background image of a radio tower structure is visible behind the text. The tower is a lattice tower with a horizontal boom extending from the top, supported by several diagonal struts.

# FT8



## ■ From the release notes

◆ [http://www.physics.princeton.edu/pulsar/K1JT/Release\\_Notes\\_1.8.0.txt](http://www.physics.princeton.edu/pulsar/K1JT/Release_Notes_1.8.0.txt)

## ■ Some 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, tone spacing 6.25 Hz - Constant-envelope waveform
- ◆ - Occupied bandwidth: 50 Hz

# FT8



## ■ From the release notes continued..

- ◆ [http://www.physics.princeton.edu/pulsar/K1JT/Release\\_Notes\\_1.8.0.txt](http://www.physics.princeton.edu/pulsar/K1JT/Release_Notes_1.8.0.txt)
- ◆ - Synchronization: 7x7 Costas arrays at start, middle, and end
- ◆ - Transmission duration:  $79 \times 1920 / 12000 = 12.64$  s
- ◆ - Decoding threshold: -20 dB; several dB lower with AP decoding
- ◆ - Multi-decoder finds and decodes all FT8 signals in passband
- ◆ - Optional auto-sequencing and auto-reply to a CQ response
- ◆ - Operational behavior similar to JT9, JT65

# FT8



- The program is designed to exchange certain info in a certain way during a QSO
- Know your grid square
- Standard messages currently are made up of 72 bits of information (currently 3 spare bits) as of Sept 2017
- 13 character free form messages can be sent
- Not a rag chew mode
- Usual JT mode caveats apply to FT8 (ie audio and RF power levels, radio PC interfacing etc.) See my prior digital mode presentation

# FT8



- Some things to be aware of
- FT8 is still using “RC” software (as of Sept 2017)
  - ◆ There may be issues / bugs
  - ◆ Important to keep up with new versions in my view
  - ◆ Changes with each version
- Accurate PC timing is important
- Radio Frequency accuracy and stability is important (TCXO is helpful in my view.)
- VHF contest mode may cause some confusion re grid squares and exchanges

# FT8



- Accurate PC timing has always been a stated requirement for the JT modes but the impact of poor PC timing is much greater with FT8 in my experience.
- I find I can usually quickly tell if I am on time when running the software, part of my timing approach:



# FT8



- AGC
- There is some debate about using AGC or not
- In my experience turning off AGC is somewhat helpful
- But can be painful to listen to



# FT8



- Filters / noise reduction etc.
- Running wide filters and turning off noise reduction usually seems to work best for me
- There is some debate about using noise blankers. I leave mine off.



# FT8



- TX Power
- JT modes are weak signal modes, not necessarily low power modes (at least in my view (: )
- Advice pertaining to modes such as PSK31 may not be applicable to FT8 (for example FT8 does not have the transmit linearity requirements of certain other modes..)
- The software provides feed back re the Signal to Noise ratio seen by your QSO partner

