FT8 Presentation

-David VE7KZ

- PowerPoint Presentation – Overview
- Walkthrough of WSJT-X program including set up
- Walkthrough of time syncing your computer
- Walkthrough of companion program Grid Tracker
- Demonstration of PSK Reporter website
- Demonstration of FT8 QSOs using Icom IC-7300

FT8

A digital Mode for HF QSO communication

Developers– Steve **F**ranke (K9AN) and Joe **T**aylor (K1JT)

Modulation - **8**-FSK

Designed for minimum amount of information for a QSO
-Callsign, -Gridsquare, -Signal Report

Why is FT8 so popular?

- When band conditions are marginal
- High noise levels in Urban Environment
- QRP Radios
- Compromised antenna installations
- Still able to have Worldwide QSOs.

Why some Hams disparage FT8?

- Minimum information exchange – callsign, gridsquare, signal
- No personalization
- Computer does the encoding and decoding
- Almost completely automated

FT8 HF Frequencies:

10m – 28.074 MHz
12m – 32.915 MHz
15m – 21.074 MHz
17m – 18.100 MHz
20m – 14.074 MHz
30m – 10.136 MHz
40m – 7.074 MHz
60m – 5.375 MHz
80m – 3.573 MHz
160m – 1.840 MHz

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RX: VE7KZ 3X3A 73

Computer and Rig requirements:

- Computer running program WSJT-X (**W**eak **S**ignal **J**oe **T**aylor)
- Computer time sync program (GPS “BktTimeSync” or “Net Time”)
- Computer controlling HF Rig (“Rig Control”) (WSJT-X handles)
- Computer and HF Rig interfaced with USB soundcard + PTT
- Optional program “Grid Tracker” recommended

FT8 decoding is very complicated:

Gaussian Shaping

WSJT-X 2.1 modified the modulation method used by FT8 from M-ary frequency shift keying (M-FSK) to M-ary gaussian frequency shift keying (M-GFSK), where M = 8.

M-GFSK is implemented by filtering the M-FSK stepped modulation waveform with a gaussian filter prior to modulation. A gaussian filter is a filter with the gaussian function as the impulse response:

$$G(t) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{t^2}{2\sigma^2}}$$

The 3dB bandwidth B of the gaussian filter is given by the expression:

$$B = \frac{\sqrt{\ln 2}}{2\pi\sigma}$$

and therefore:

$$\sigma = \frac{\sqrt{\ln 2}}{2\pi B}$$

In WSJT-X the Gaussian filter is implemented by considering each symbol in the modulation waveform as a separate pulse. The modulation waveform is then obtained by summing the gaussian filtered pulses corresponding to each symbol. As the pulse corresponding to each symbol is the same basic shape (a boxcar function), the gaussian filtered pulse shape only needs to be calculated once for a particular sample rate and baud rate. It can then be scaled and shifted in time to obtain the gaussian filtered pulse corresponding to each symbol.

The gaussian filtered pulse is the convolution of the boxcar function with the gaussian function, which can be expressed as an integral of the gaussian function:

$$p(t) = \frac{1}{\sigma\sqrt{2\pi}} \int_{t-0.5}^{t+0.5} e^{-\frac{t^2}{2\sigma^2}}$$

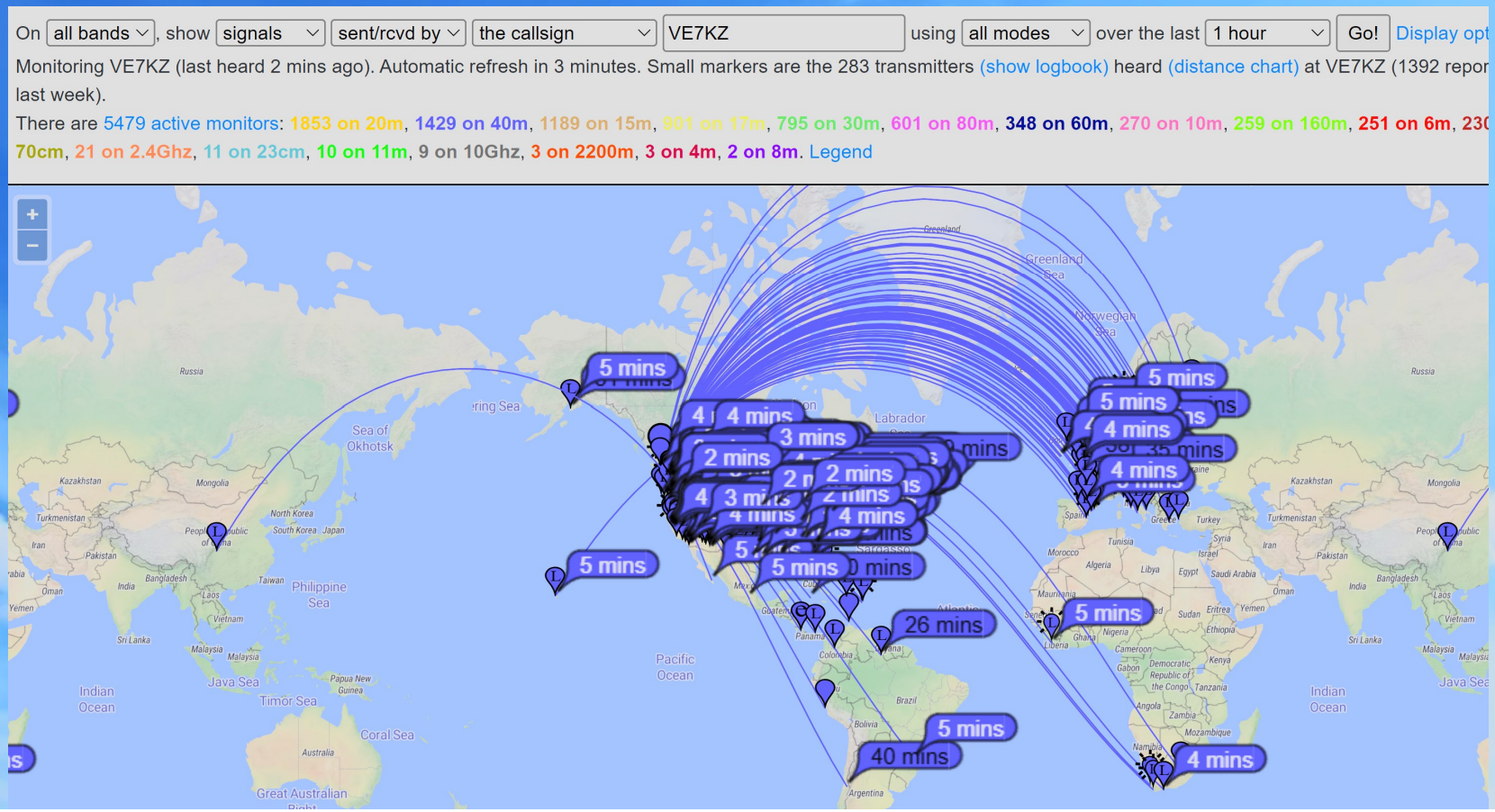
If we let:

$$c = \frac{1}{\sqrt{2}\sigma} = \frac{2\pi B}{\sqrt{2}.\sqrt{\ln 2}} = B\pi\sqrt{\frac{2}{\ln 2}}$$

we get:

$$p(t) = \frac{c}{\sqrt{\pi}} \int_{t-0.5}^{t+0.5} e^{-c^2t^2} dx = \frac{1}{2}(\mathrm{erf}(c(t+0.5) - \mathrm{erf}(c(t-0.5))$$

PSK reporter - PSK Website



Websites:

- WJST-X program: WSJTX download
- BktTimeSync (for both Internet + GPS): BktTimeSync
- NetTime: NetTime
- Grid Tracker: Grid Tracker
- PSK Reporter: PSK Reporter

Reference YouTubes:

Getting Started with FT8: Introduction

Configure IC-7300 for FT8: IC-7300