

Introduction to Digital Modes

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Digital Modes

- What is a “Digital Mode”?
- Examples
- Where can I find them?
- How do I use them?

What is a “Digital Mode”?

- CW was the first digital mode
- Frequency or Phase Shift Keying
- Encodes data as signals
- Decodes signals to text

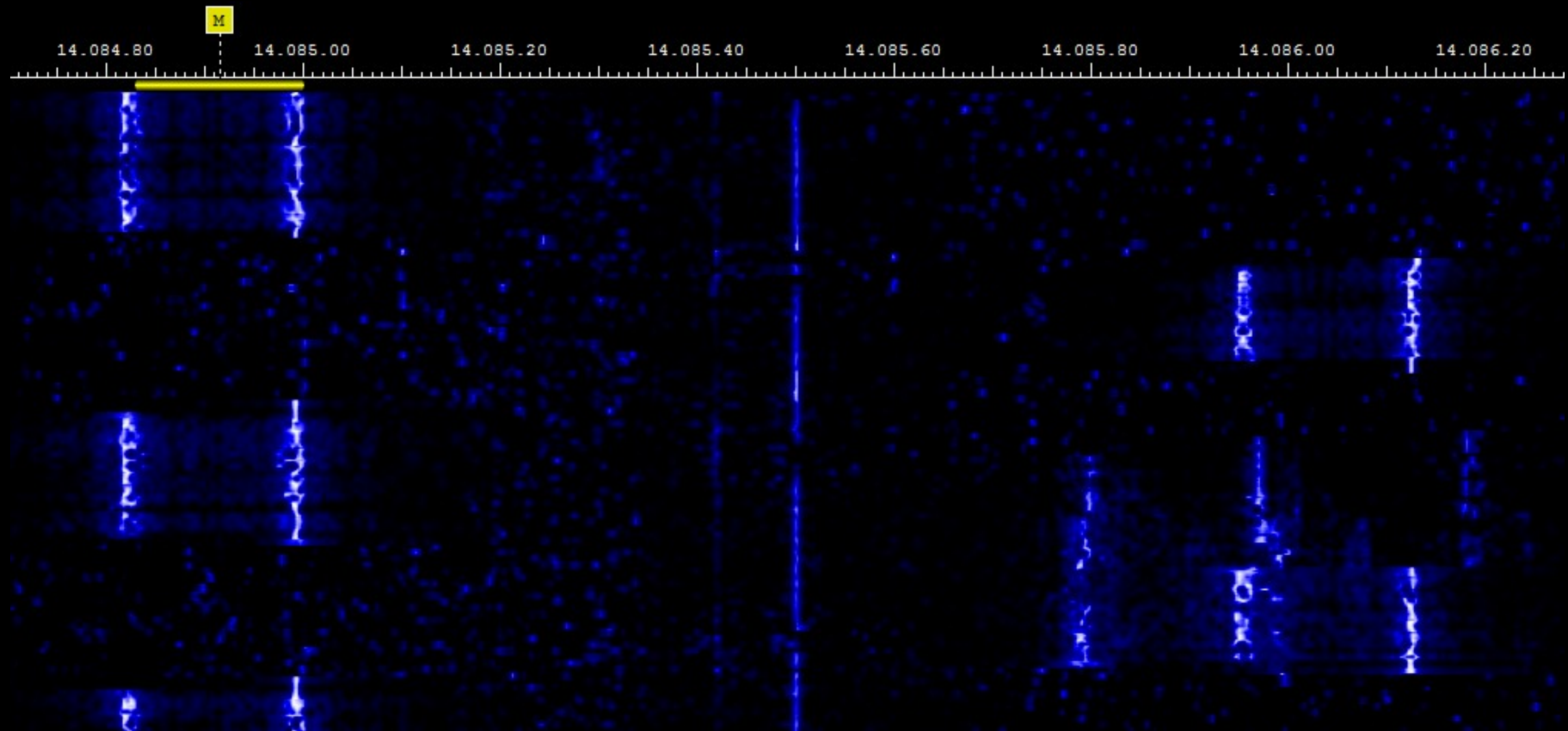
Popular Examples on HF

- RTTY
- PSK (31/63/125)
- JT65/JT9
- Olivia
- Contestia

RTTY

- RadioTeleTYpe
- FSK and AFSK
 - Frequency Shift Keying
- Based on Baldot coding
- Low spectral efficiency
- No error correction
- 170 Hz bandwidth

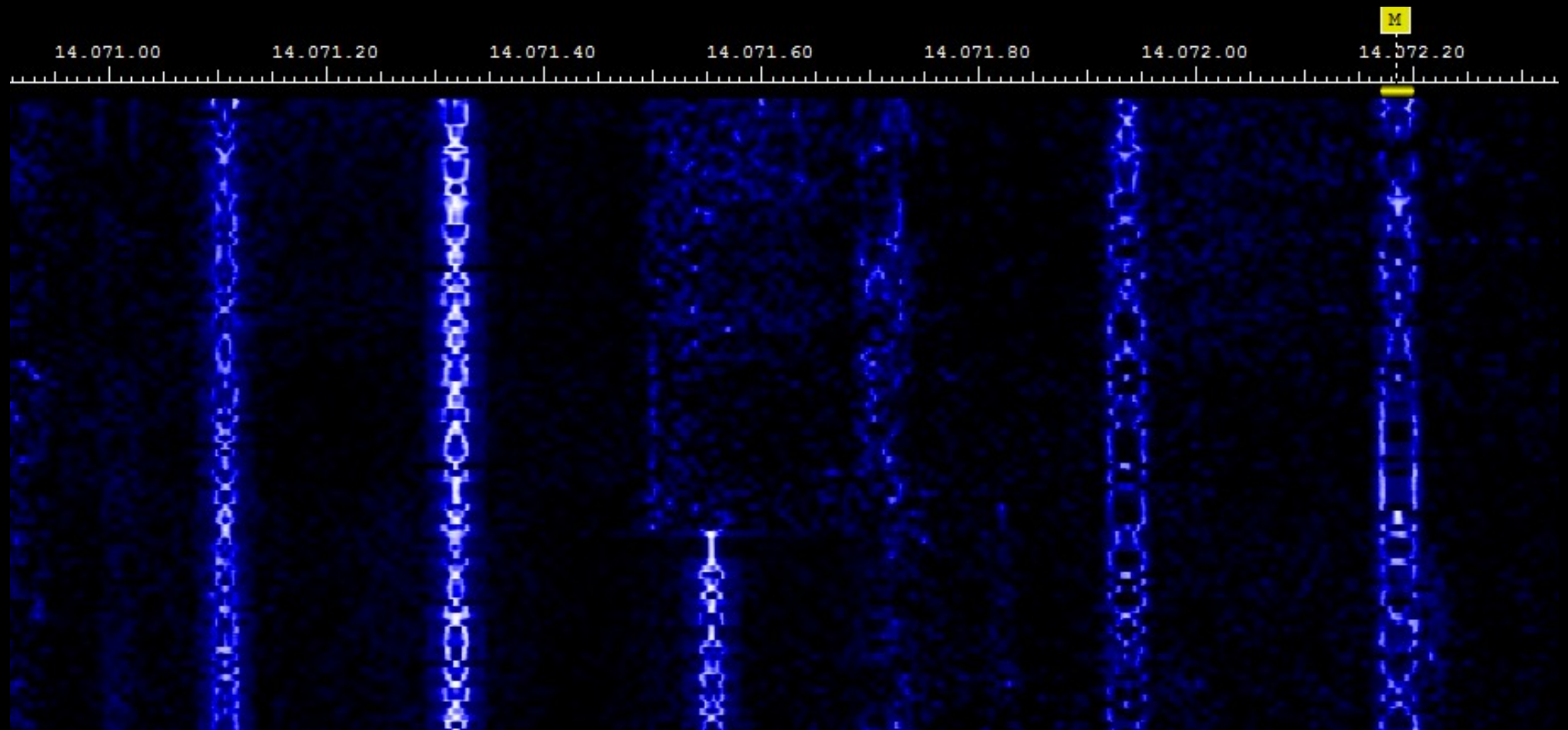
RTTY



PSK

- Phase Shift Keying
- Binary and Quadrature PSK
- Common Baud Rates for BPSK
 - 31
 - 63
 - 125
- No error correction
- 30-130 Hz bandwidth
- QPSK faster in same bandwidth

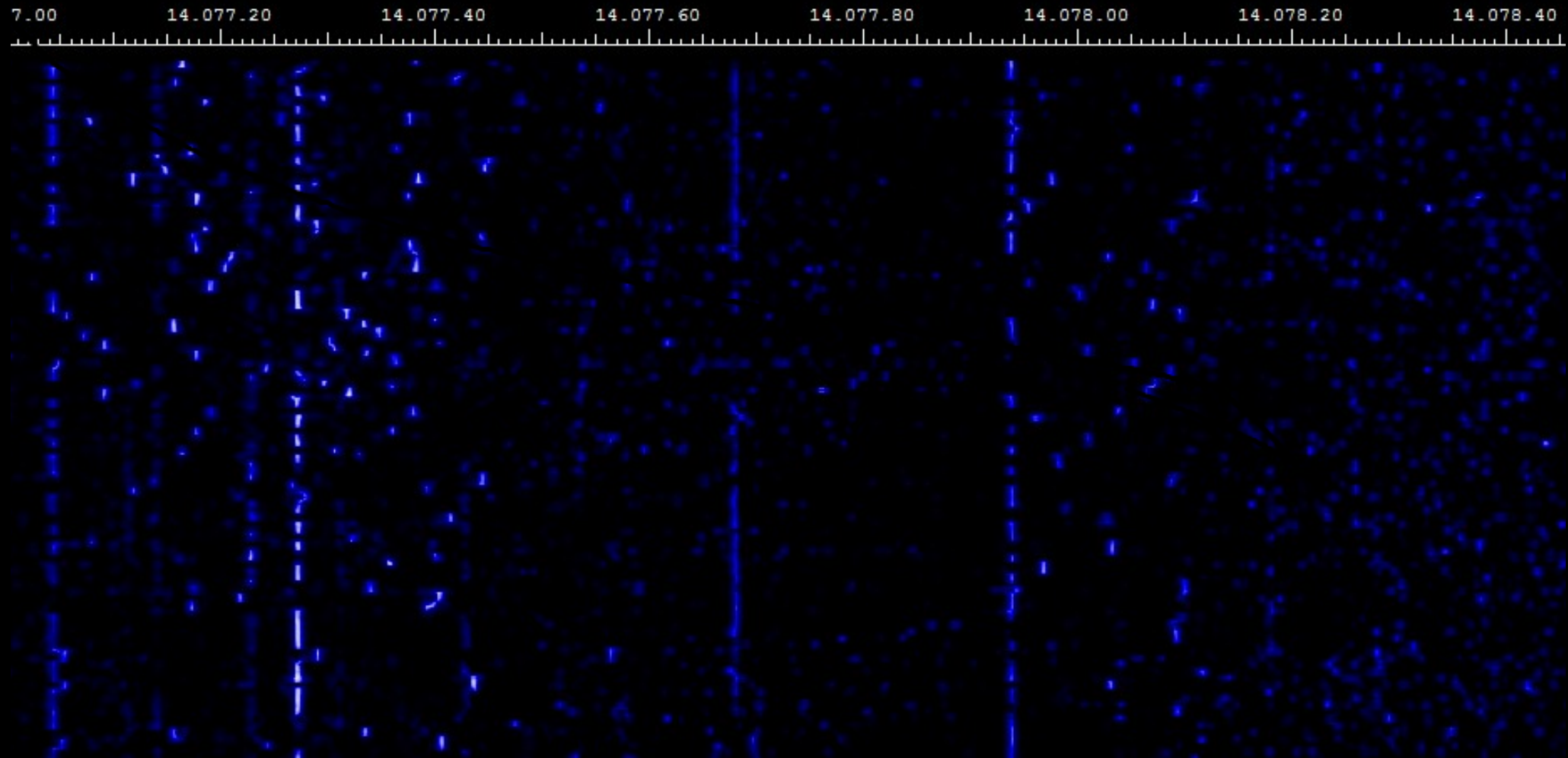
PSK



JT65

- Multiple Frequency Shift Keying (MFSK)
- Weak signal mode
- Intended for EME or Troposcatter
- Highly synchronized in minute intervals
- No error correction

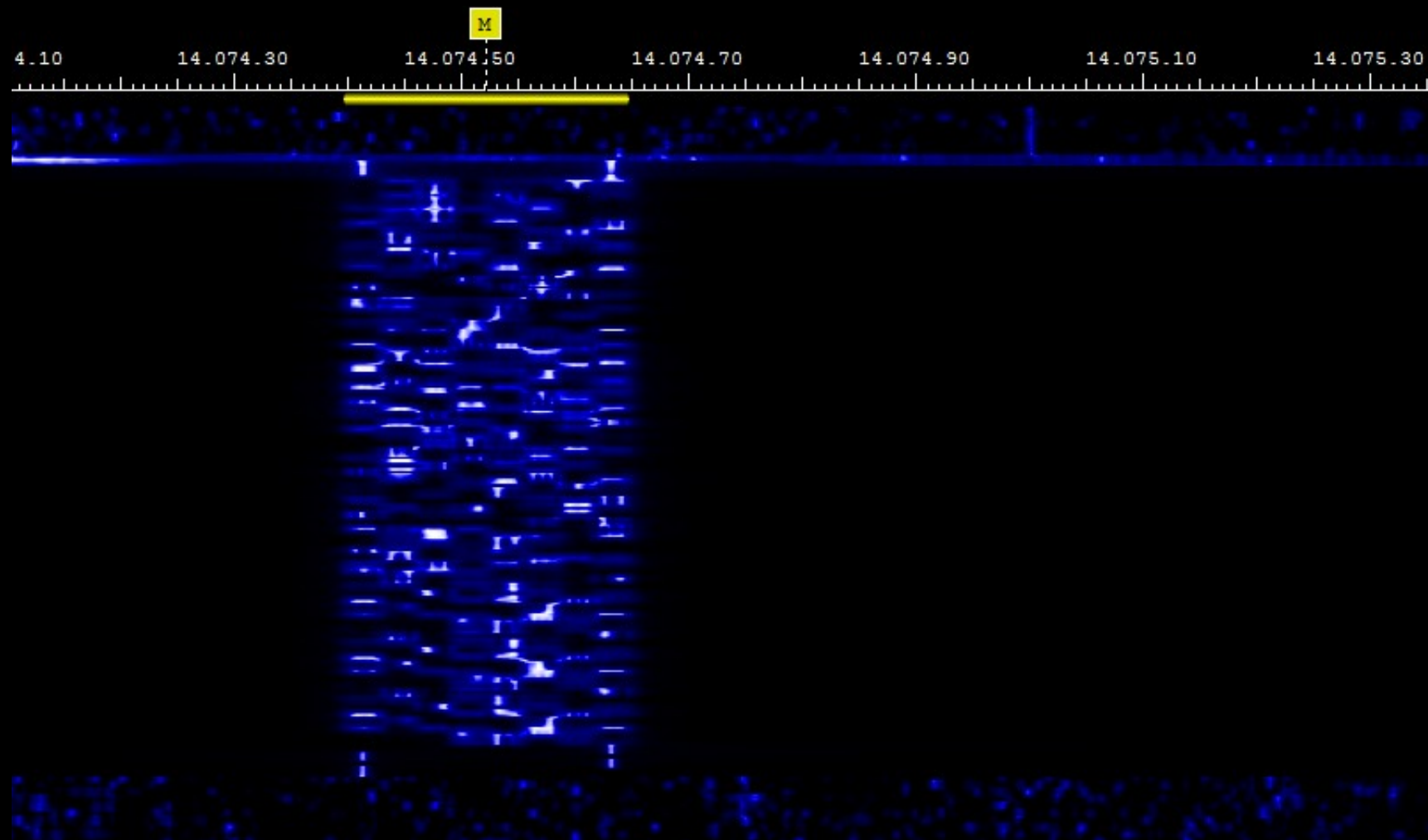
JT65



Olivia

- Multiple Frequency Shift Keying (MFSK)
- # of tones/bandwidth
 - ex Olivia 16/500 or 8/250
 - more tones == more redundancy
 - more tones == slower transmission
- Great in difficult conditions
 - 10-14dB below NF
- Error Correcting

Olivia 8/250



Other modes

- Pactor/Winlink
- Hellschreiber (Hell)
- Throb
- Domino
- Thor
- WSPR
- APRS

Where can I find them?

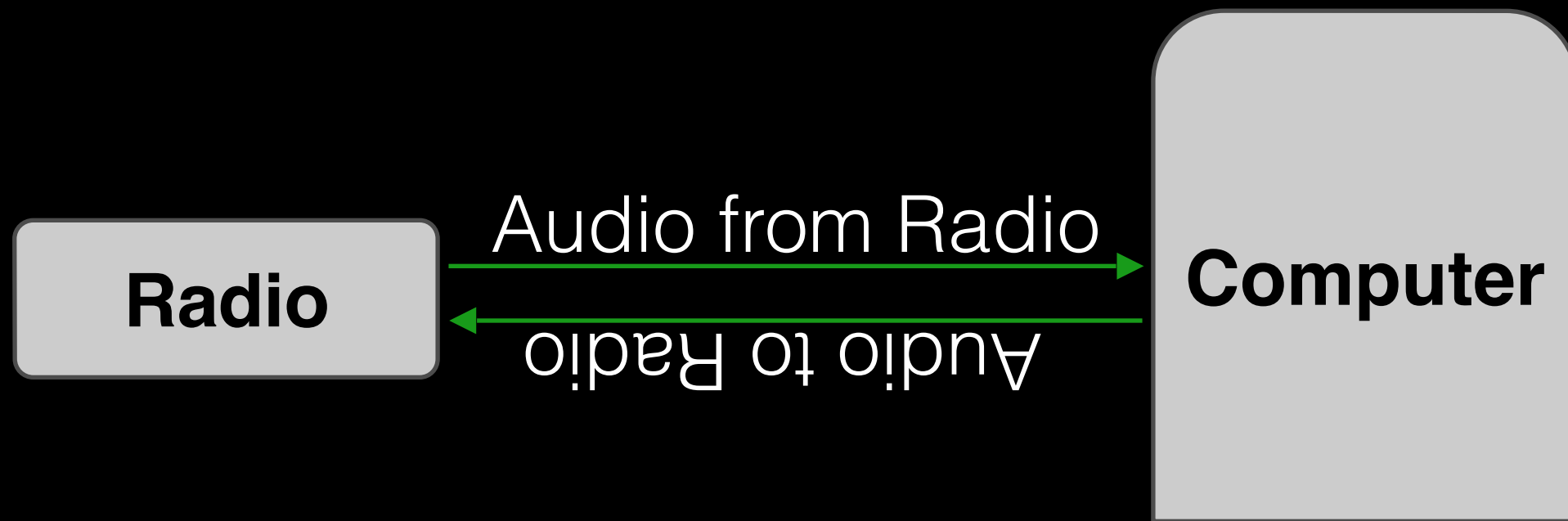
- Look at the ARRL band plans.
- Digital Modes fall in Data/RTTY space

Example for 3 bands			
Band	PSK	RTTY	JT65
10 m	28.070	28.070-28.150	28.076
15 m	21.070	21.070-21.100	21.076
20 m	14.070	14.070-14.095	14.076

How do I use them?

- You need:
 - Radio
 - Computer with sound card
 - Digital Mode Software
- Optional:
 - external sound card or Signalink

Basic Setup



From Radio

Audio Out == Data Out

Audio In == Data In

Software

- Ham Radio Deluxe
 - v6+ \$99
 - v5 Free
- FLDigi
 - OpenSource aka Free
- DXLab
 - Freeware

Ham Radio Deluxe

- Ham radio software package includes:
 - Radio control app
 - Digital modes app
 - Logging app
 - Satellite tracking app
 - Rotator control app
 - <http://www.ham-radio-deluxe.com/>

Ham Radio Deluxe

The screenshot displays the Ham Radio Deluxe software interface during a PSK-63 QSO session. The top menu bar includes File, Edit, View, QSO, Browser, Logbook, SSTV, SuperSweeper, World Map, Tools, Window, and Help. The top toolbar contains icons for QSO, SuperSweeper, Radio, Soundcard, Waterfall, Rig Control, Logbook, Rotator, Configure, and Program Options. The top status bar shows the time 01:34:40 and the frequency 14.070.000.

The main window is titled "BPSK-63" and features a left sidebar with "Add Log Entry" and "Default" tabs. The "Add Log Entry" tab is active, showing fields for (F2) Start, (F3) End, (F5) Call, Name, QTH, Locator, Country, Frequency, Band, Mode, Sent, Rcvd, and Remark. The "Default" tab is also visible, showing fields for Name, QTH, Locator, Country, Frequency, Band, Mode, Sent, Rcvd, and Remark.

The main text area displays the QSO log entry for BTU XE3VDK de KF5WAY pse kn. The log entry includes the call sign, name, QTH, locator, and a message: "73 Javier and thanks for the PSK63 QSO 18 on 20m. be safe and good luck out there!". The log entry is timestamped 01:34:29.

The bottom status bar shows the frequency 14.071.677 MHz, 30 secs, and S/N: 22dB. The bottom toolbar includes buttons for Zoom, Main, Signal, AFC, Decode, Options, and various modes (CW, RTTY, PSK, OLIVIA, etc.). The bottom status bar also shows CPU: 1%, Audio: 0%, Soundcard TX: 7999.60Hz, and HRD Logbook: My Logbook.

JT65 Software

- wsjtx
 - <http://physics.princeton.edu/pulsar/K1JT/wsjtx.html>
- JT65-HF
 - <http://jt65-hf.sourceforge.net/>

wsjtx

WSJT-X v1.3, r3673 by K1JT

File Setup View Mode Decode Save Help

Band Activity

UTC	dB	DT	Freq	Message
0139	-1	0.1	523	# CQ WA9THI EM69
0139	-1	0.5	746	# KA4HOT NOMHL -08
0139	-6	0.5	933	# N4OVQ KE7XE R-13
0139	-5	0.2	1227	# KG4VMF K4SHQ R-04
0139	-14	1.2	1375	# WL7CG KK4JSJ EM78
0139	-15	0.4	1514	# PP1ER KD8HHG 73
0139	-5	-0.8	1936	# CQ KI6CYT CM87
0139	-19	0.6	2614	@ CQ HC6PE FI08
0139	-3	0.4	2672	@ KM4BWU WB0N 73
0139	2	0.2	2916	@ CQ WB7CTI DN06
0139	-11	0.2	3034	@ KG4OXA N6TE DM12

Rx Frequency

UTC	dB	DT	Freq	Message
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Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune

20 m 14.076 000

☐ +2 kHz ☒ DX Call ☐ DX Grid

50
40
30
20
10
21 dB

Lookup Add

2014 Sep 03
01:39:53

☐ Tx even

Tx JT65 #

Tx 1626 Hz

Rx 1624 Hz

☐ Tx=Rx ☐ Rx=Tx

☐ Lock Tx=Rx

Report -15

Generate Std Msgs

Next Now

☐ ☐ Tx 1

☐ ☐ Tx 2

☐ ☐ Tx 3

☐ ☐ Tx 4

☐ ☐ Tx 5

☒ ☐ Tx 6

CQ KF5WAY EL09

Pwr

Receiving JT9+JT65

Useful Links

- Digital Modes, sound and pictures (http://hfradio.org.uk/html/digital_modes.html)
- ARRL Digital Modes (<http://www.arrl.org/digital-modes>)
- Digital Modes audio samples (<http://www.kb9ukd.com/digital/>)
- PSKReporter (<http://pskreporter.info>)

More Links

- Passband Modulation (<http://en.wikipedia.org/wiki/Modulation>)
- FLDigi (<http://www.w1hkj.com>)
- DX Lab Suite (<http://www.dxlabsuite.com>)
- Tigertronics, Signalink (<http://www.tigertronics.com>)