

# 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

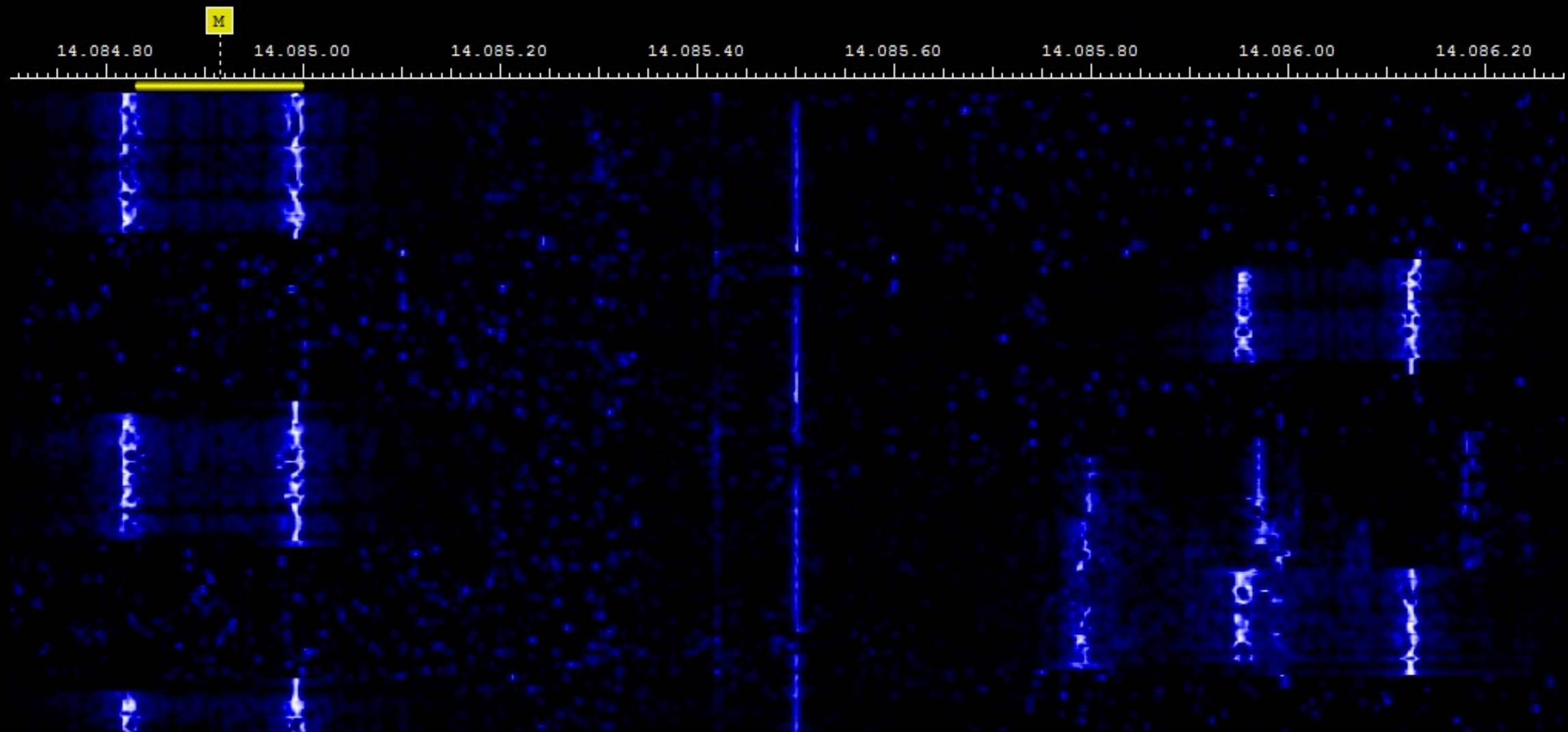
# Popular Examples on HF

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

# RTTY

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

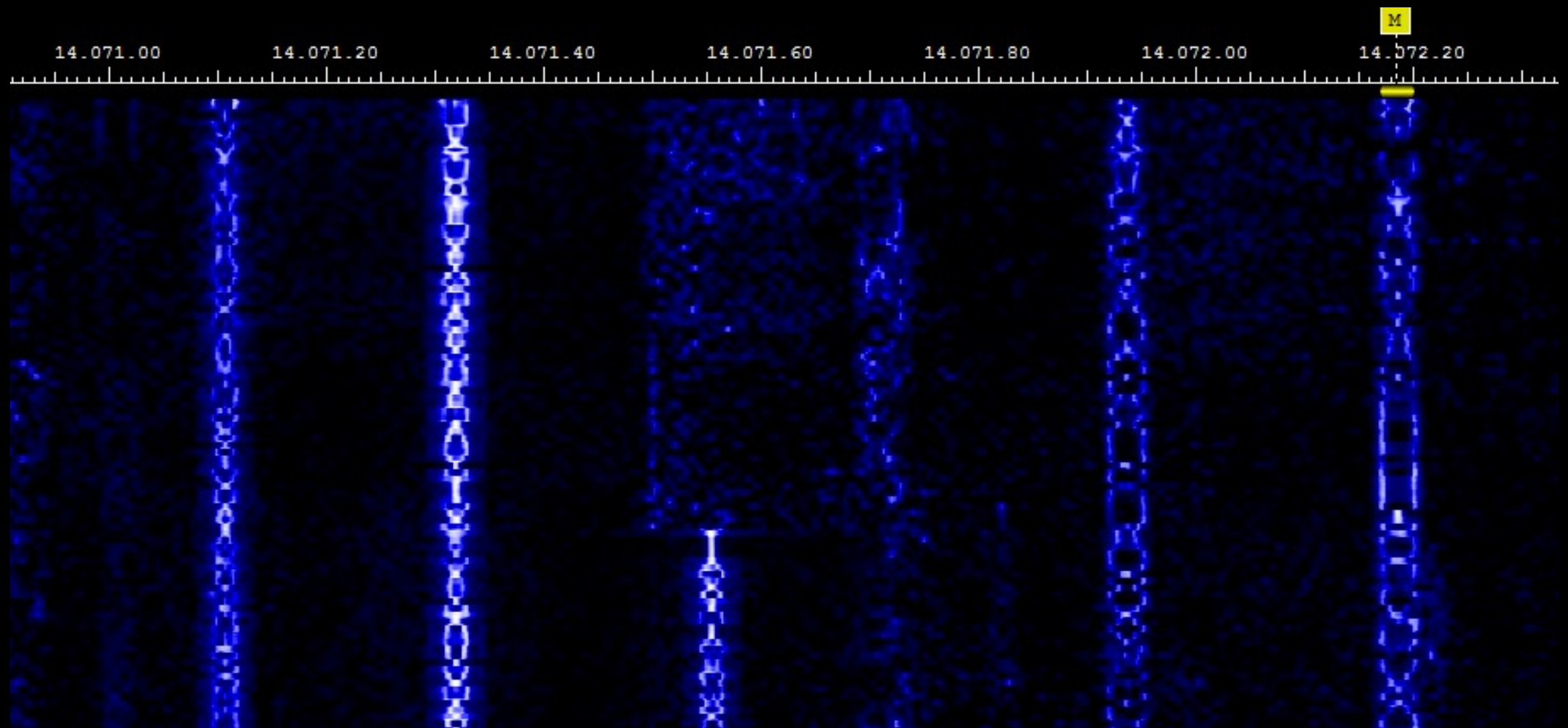
# RTTY



# PSK

- Phase Shift Keying
- Binary and Quadrature PSK
- Baud Rates
  - 31
  - 63
  - 125
- No error correction
- 30-130 Hz bandwidth

# PSK

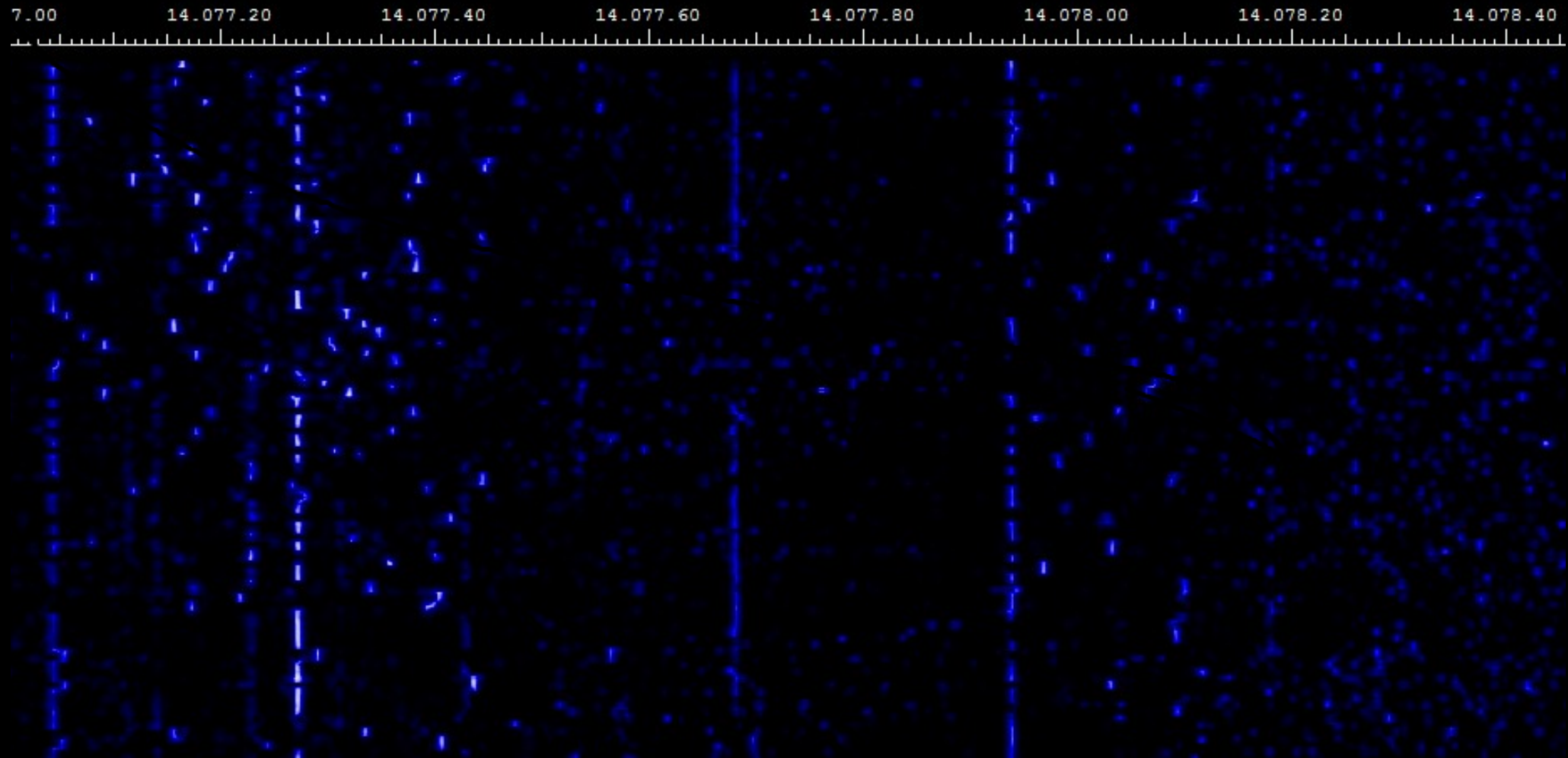




# JT65

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

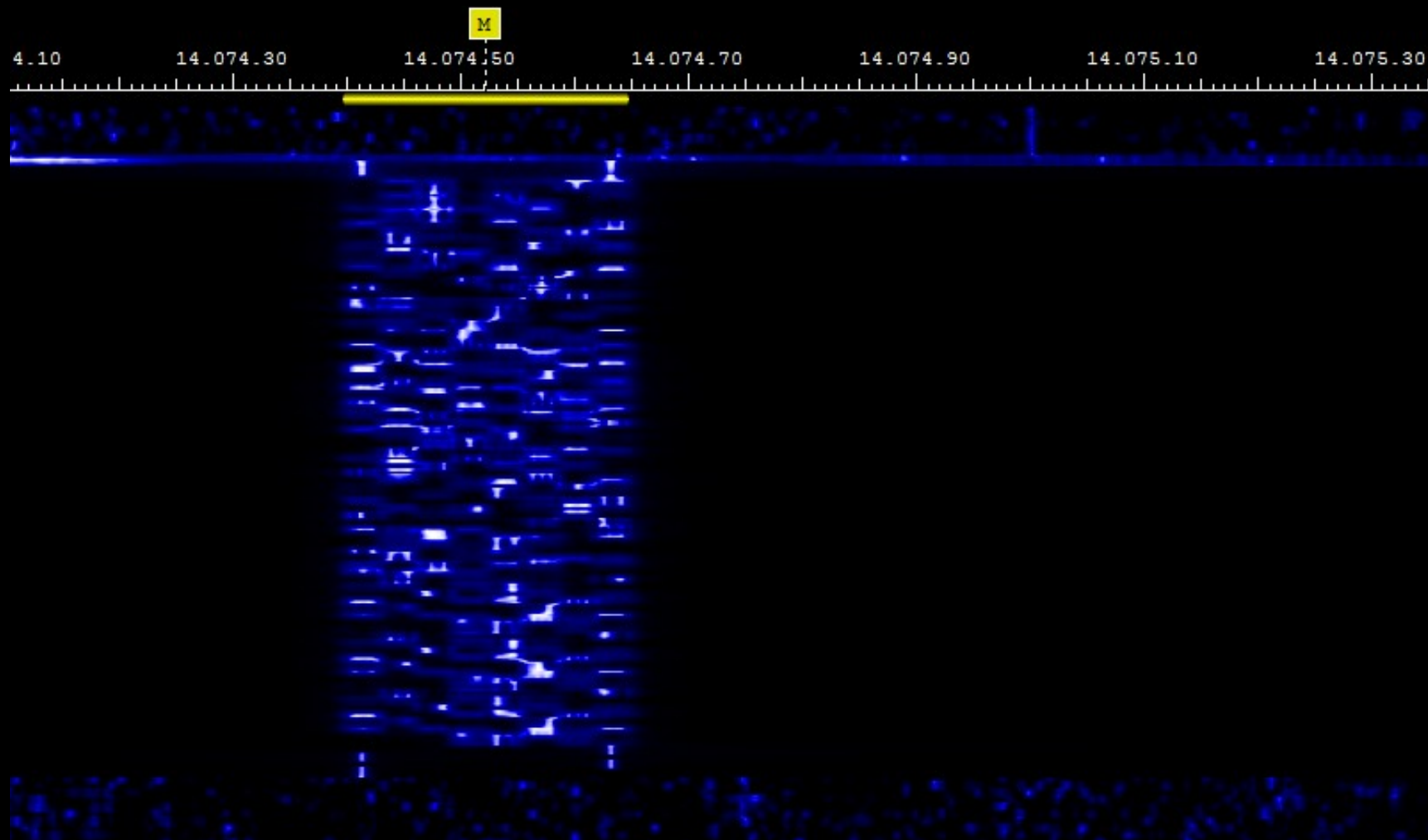
# JT65



# 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
- Contestia
- Hellschreiber (Hell)
- Throb
- Domino
- Thor
- WSPR
- APRS

# Where can I find them?

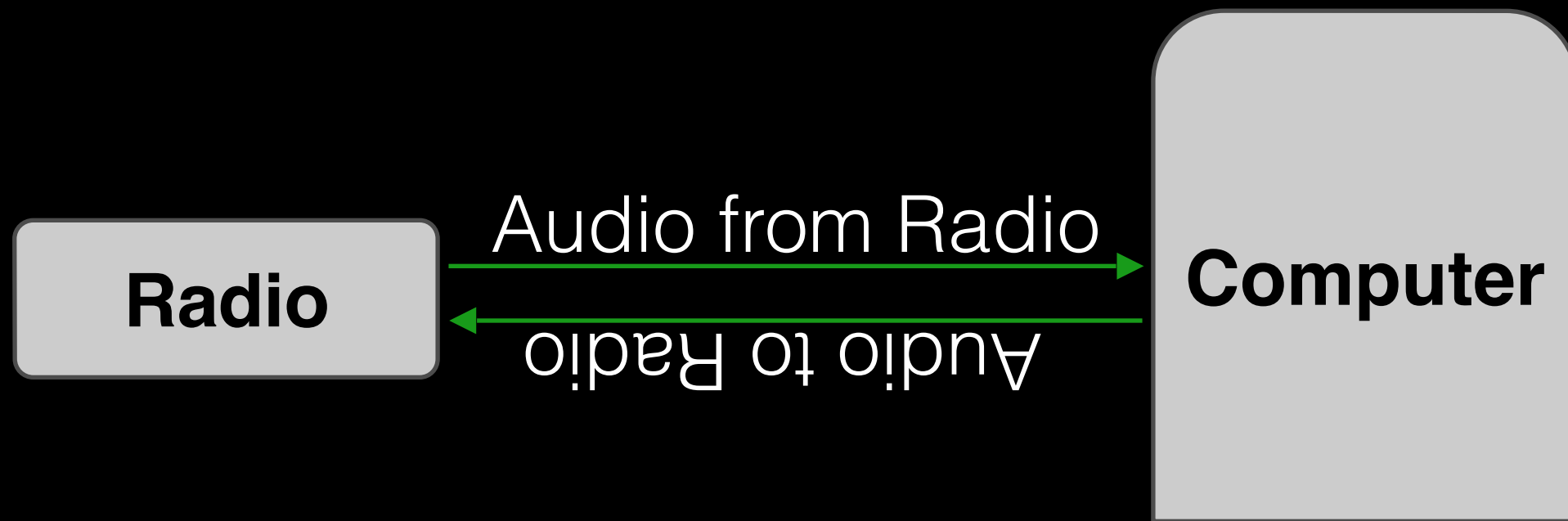
- Look at the ARRL band plans.
- Digital Modes fall in Data/RTTY space

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 soundcard or Signalink

# Basic Setup



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 shows icons for QSO, SuperSweeper, Radio, Soundcard, Waterfall, Rig Control, Logbook, Rotator, Configure, and Program Options. The top status bar displays the time 01:34:40 and the frequency 14.070.000.

The left sidebar contains a 'Default' tab and a 'Tags' tab. The 'Default' tab shows the 'Add Log Entry' form with fields for (F2) Start, (F3) End, (F5) Call, Name, QTH, State/prov, Locator, Country, Frequency, Band, Mode, Sent, Rcvd, and Remark. The 'Tags' tab shows the 'Add (F7)' button and 'Reset (F4)' button.

The main window displays the QSO log entry for BTU XE3VDK de KF5WAY pse kn. The log entry includes the following text:

```
BTU XE3VDK de KF5WAY pse kn
_F5WAY de XE3VDK
H o tt, Tnxieport: 599 599
Name: JAVIER JIVIER
QTH: Merida In The Peninla Of Yucatan Mexico
Locator: EL51EA [134.8° 821.4mi]
Qsl CardOnly Dnrect ,o My Qth u& B4REAH°lease.
Infoá el: www.qe.z.nom
BTU Sco Me KF5WA oVDbe
01:34:29> Main
XE3VDK de KF5WAY
73 Javier and thanks for the PSK63 QSO 18 on 20m.
be safe and good luck out there!
```

The bottom status bar shows the frequency 14.071.677 MHz, 30 secs, IMD, 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 displays CPU usage (1%), Audio usage (0%), Soundcard TX frequency (7999.60Hz), and other system information.

# 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

50

40

30

20

10

21 dB

DX Call

DX Grid

Lookup

Add

2014 Sep 03

01:39:53

Receiving

JT9+JT65

☐ 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

# Useful Links

- Digital Modes, sound and pictures ([http://hfradio.org.uk/html/digital\\_modes.html](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

- FLDigi (<http://www.w1hkj.com>)
- DX Lab Suite (<http://www.dxlabsuite.com>)
- Tigertronics, Signalink (<http://www.tigertronics.com>)