CW
A great way to communicate

Bob Karz, K2OID
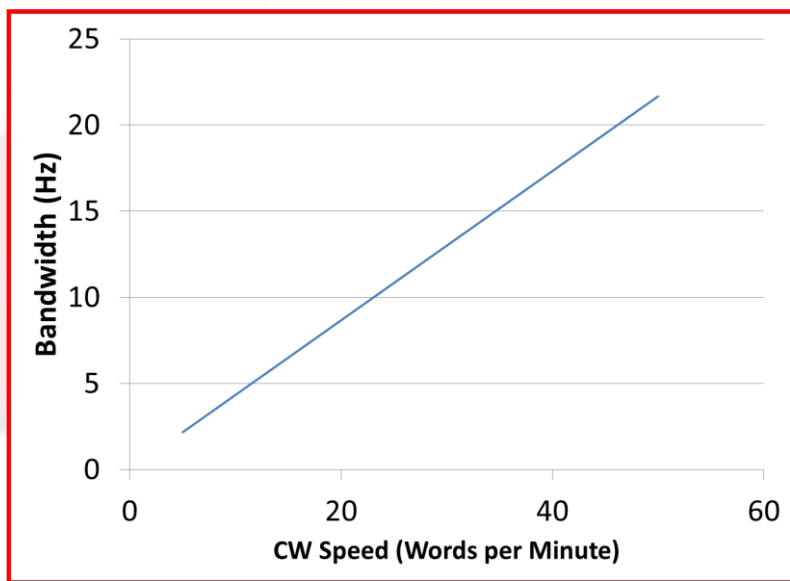# December 10, 2015

Why CW?

- Most spectrum efficient mode

- About 1% of the bandwidth of SSB
- Theoretically 2500 CW stations between 7.00 and 7.05 MHz
- Practically about 500 stations

Why CW

- Because of the narrow bandwidth, the gain over SSB is about 20db
  - That's more than 3 S units
- With state of the art DSP and roofing filtering, excellent rejection of interference from QRN and nearby signals
- CW sub-bands have fewer stations therefore less QRM
  - About 30% of stations on 40 Meters are on CW
- Contests like Field Day encourage CW with double points
- Morse Code is universal
  - You can QSO with stations with limited (or no) English
- CW is fun
  - Not something most people (even many hams) can do
- Simple (low cost or homebrew) gear is effective
- Fewer LIDS (Unfortunately there are some)

History

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  - Who worked with Morse
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  The relative frequency of movable type letters in a Morristown, NJ newspaper's print shop

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- Originally a stylus indented a clock motor driven paper tape

- Telegraphers soon learned that the tape wasn't needed.

Morse Code Structure

1. The length of a dot is one unit.
2. A dash is three units.
3. The space between parts of the same letter is one unit.
4. The space between letters is three units.
5. The space between words is seven units.

Barriers to Entry

- Learning CW requires effort
  - Kids learn much faster than adults
- Becoming proficient requires continuous commitment
- CW is a language. Once proficient (~20 WPM or more), copying CW is effortless

Learning the Code

- Formerly required one-on-one instruction

- Today, lots of internet resources. Start at:

  - http://www.cwops.org/resources.html
  - http://www.arrl.org/learning-morse-code
  - http://www.qsl.net/n1irz/finley.morse.html

- Helpful Hints

  - Don't count dits and dahs; listen for the "sound" of each letter (Farnsworth or Koch Method)
  - Your goal is to copy in "scrolling display" mode

- Increasing your speed

  - Practice using W1AW and on-line resources
  - Look into slow speed CW Group

    https://groups.yahoo.com/neo/groups/QRS-CW/info

  - Try the following unofficial low speed CW frequencies:
    1.850, 3.700, 7.124/**7.050**, 10.125, **14.050**, 21.150/21.125, 24.8915, 28.160

The Language of CW

- CW is a language.
  - Its "dictionary" is abbreviations
  - Borrowed from many languages (or none at all)
- Examples
  - "de" (from) – Spanish
  - "es" (and)
  - "gg" (going)
  - "I" (error) used in context
  - "DSW" (goodbye) - Russian

Some other commonly used abbreviations

73	Goodbye	K	End of Transmission
88	Love and Kisses	KN	No breakers
AGN	Again	OM	Old Man
AR	End of Message	PSE	Please
BK	Break	R	Roger (short for QSL)
BT	Dash	RST	Signal Report
CU	See You	RX	Receiver
DWN	Down	SK	Signing Out
FB	Fine Business	TT	That
GA	Good Afternoon	TU	Thank You
GE	Good Evening	TX	Transmitter
GG	Going	WX	Weather
GM	Good Morning	YL	Young Lady
HI	Sarcasm	XYL	Wife

Morse Specific Q codes

- QRS "send slower"
  - QRS? "do you want me to slow down?"
  - PSE QRS. "please slow down"
- QRQ "send faster"
  - QRQ? "do you want me to speed up?"
  - PSE QRQ. "please send faster"
- QLF (sarcastic) "Q left foot"
  - QLF? "are you sending with your left foot?"
  - QLF. "your fist is truly awful. Try sending with your left foot."

CW QSO Format

A sample CW conversation between station 1 (S1) and station 2 (S2)

S1:
CQ CQ CQ DE S1 K
Calling anyone (CQ), this is (DE) S1, listening for any response (K)

S2:
S1 DE S2 KN
Calling S1, this is S2, listening for a response only from designated station (KN)
(Two-way connection established)

S1:
S2 DE S1 = GA DR OM UR RST 5NN HR = QTH TIMBUKTU = OP IS JOHN = HW? S2 DE S1 KN
Good afternoon dear old man. You are RST 599 here (the N's substitute for 9's;
signal is very readable (5) and very strong (9), with very good tone (9))
I'm located in Timbuktu. The operator's name is John.
How do you copy?

CW QSO Format

S2:

S1 DE S2 = TNX FB RPRT DR OM JOHN UR 559 = QTH HIMALAYA = NAME IS YETI S1 DE S2 KN

Thanks for the nice (fine-business) report dear old man John. I read you 559

(very readable (5), average strength (5), very good tone (9)).

I am in the Himalayas. My name is Yeti.

S1:

S2 DE S1 = OK TNX QSO DR YETI = 73 ES HPE CUAGN S2 DE S1 KN

Okay, thanks for this conversation (QSO), dear Yeti.

Best regards and hope to see you again.

S2:

S1 DE S2 = R TU CUAGN 73 S1 DE S2 SK

Understood. Thank you. Best regards. (signing off)

Contesting Exchanges

- From CQ WW DX Contest:
  - D4C QRZ
  - K2OID
  - K2OID 5NN 33
  - R 5NN T5 TU

- Elapsed time 13.73 seconds

Keys, Bugs, and Paddles

J-38

- Keys
  - Straight Key
  - In use since the beginning
  - J-38 WWII vintage
    - Still in use today
    - Could be had in '60s for $.50 each. Now $50!

Keys, Bugs, and Paddles

Vibroplex Original

- Bugs
  - "Side Swiper"
  - Dots with thumb
    - Pendulum and weight makes dots automatically.
    - If weights removed, sounds like a bug
  - Dashes made manually
  - Invented in 1904
  - Reduced fatigue
  - Allows for recognizable "fist" (your CW "accent")

Keys, Bugs, and Paddles

Brown Brothers BTL
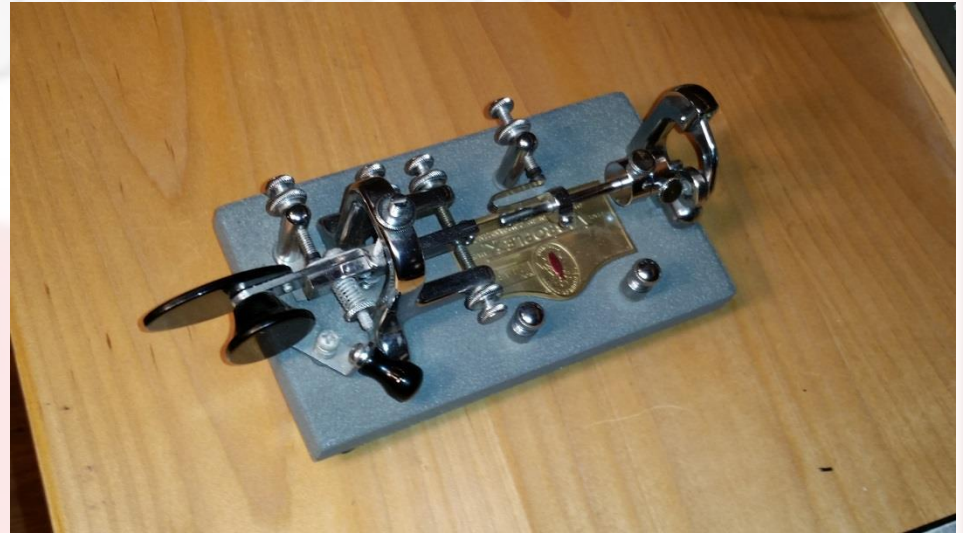
- Paddles
  - Also "Side Swiper"
  - Dots with thumb
    - Made electronically
  - Dashes with index finger
    - Made electronically
  - Iambic and single lever
    - Iambic has 2 separate paddle contacts and enables "squeeze keying"
    - Most paddles today are iambic
  - Used with electronic keyer
  - First used in 1940's
  - Became popular in 1960's after introduction of solid state keyers
  - In common use today

Paddle Construction

- Springs or magnets used as restoring force
- Contacts can be mechanical, optical, capacitance, strain gauges
- Some paddles:

March
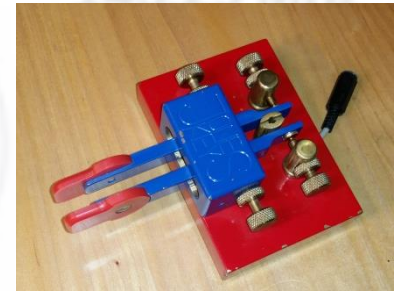
Jones
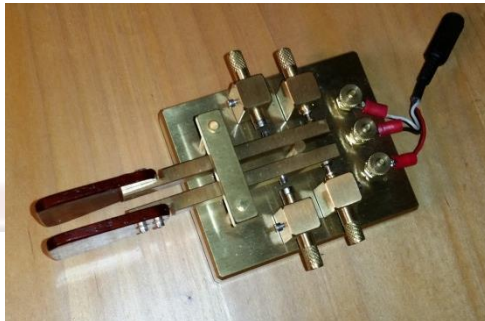
K8RA P4

Vibroplex Code Warrior

American Morse

More Paddles

- Homebrew optical interrupter
  - Mostly wood
 - Magnetic restoring force
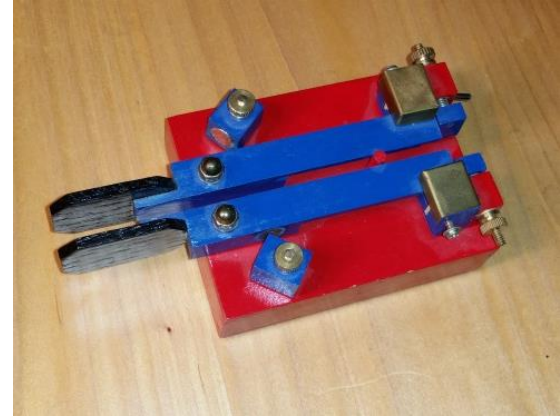
Homebrew (Optical)

- Homebrew touch key paddle
  - Uses P2 Capacitance PCB and gold plated paddles
 - Hard to make RFI immune

Homebrew (Capacitance)

Keyers

- Early Keyers used tubes
- Integrated circuits in '70s
- Today use microprocessors
- Great homebrew project
  - Built at least 5 over the years
- Modern keyers have many useful features
  - Programable by morse
  - Memories
  - Automatic contact counters
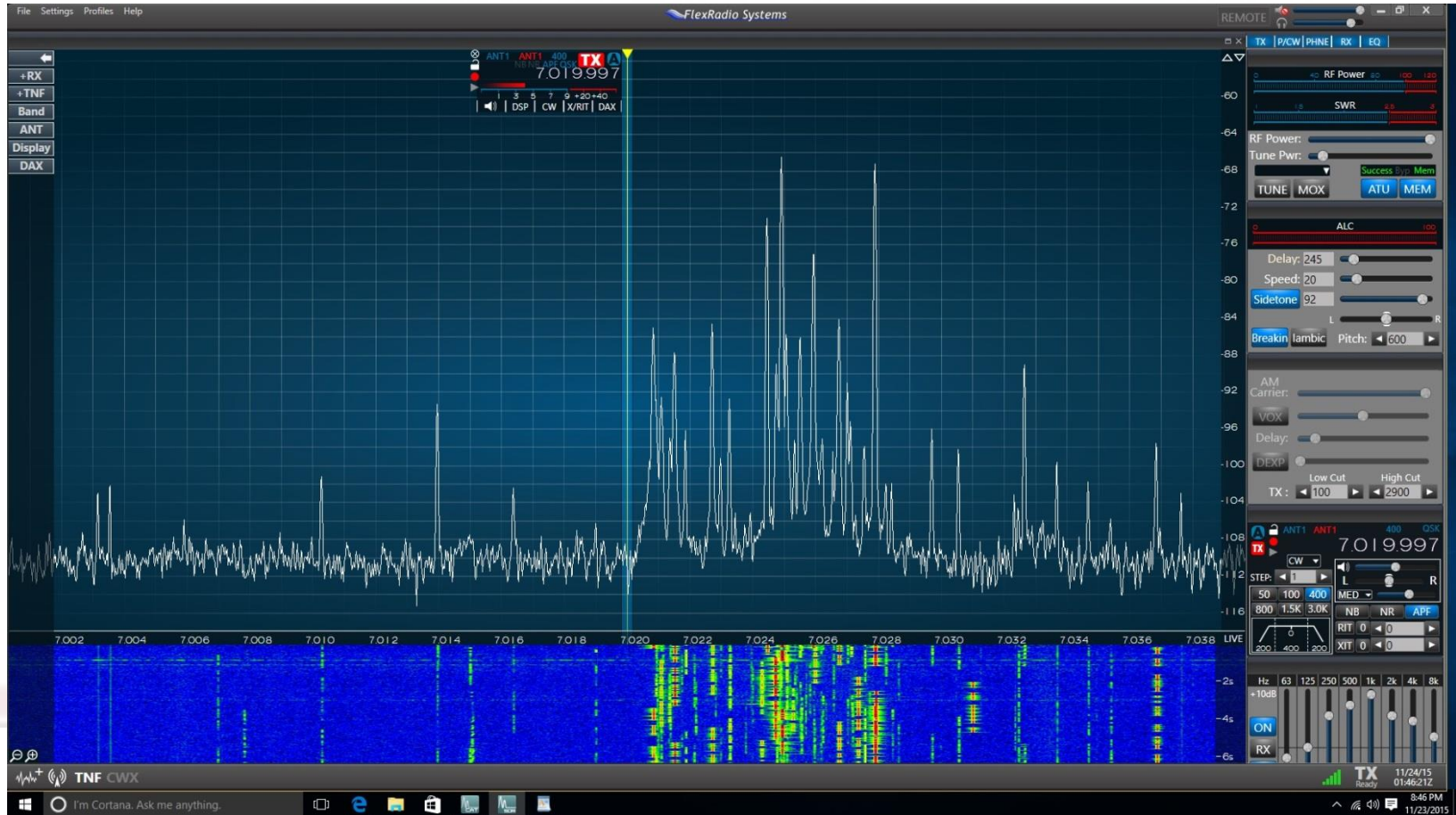 - Etc.
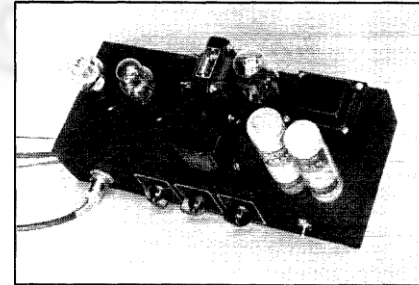
QST 1940

Some Keyers

- **My first Keyer**
  - QST July '71
  - NMOS discrete chips

- **Super Keyer II**
  - QST Nov. '90
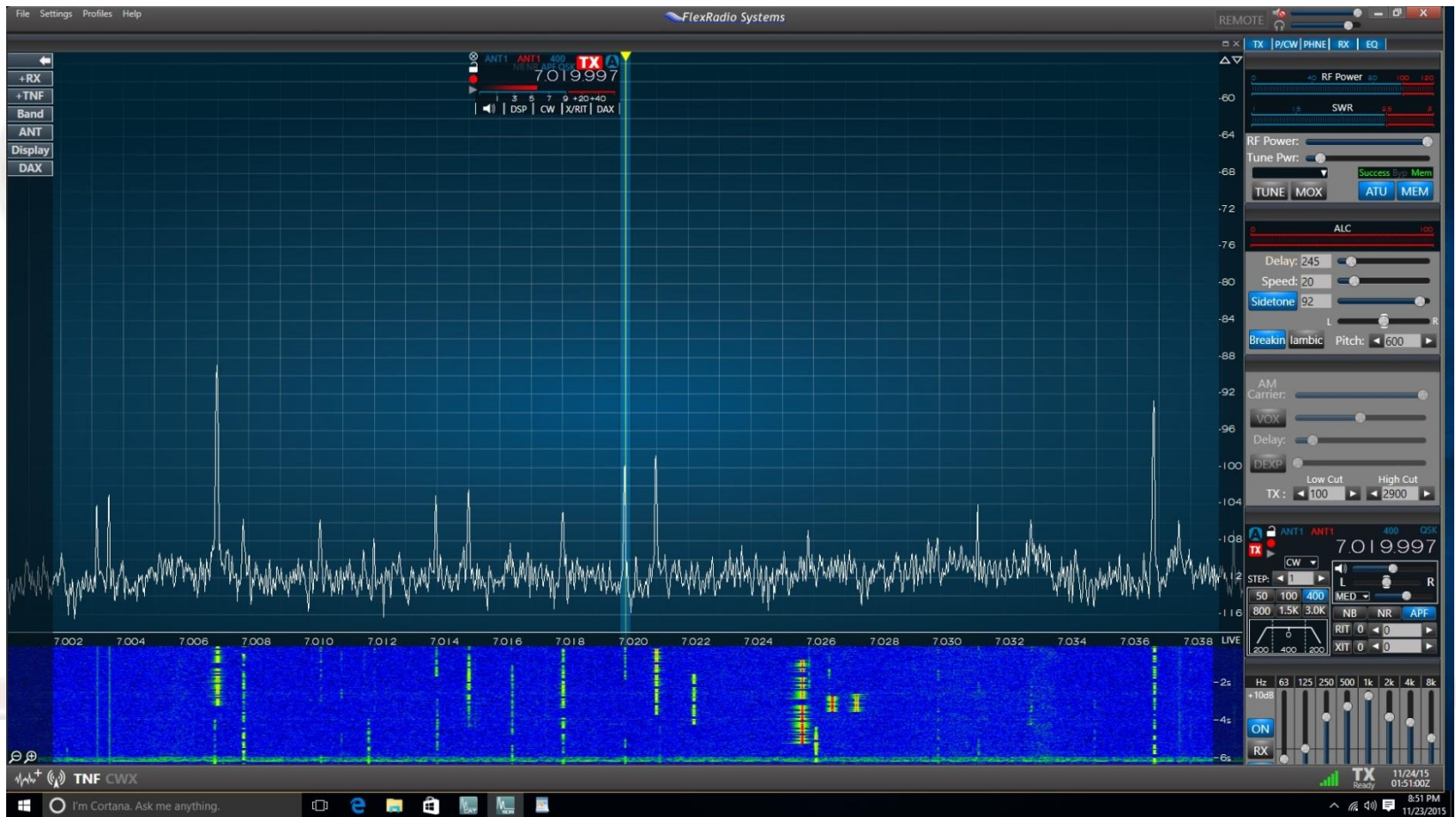 - Microprocessor

- **N0XAS Pico Keyer +**
  - Very Small
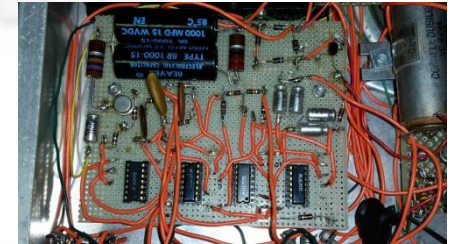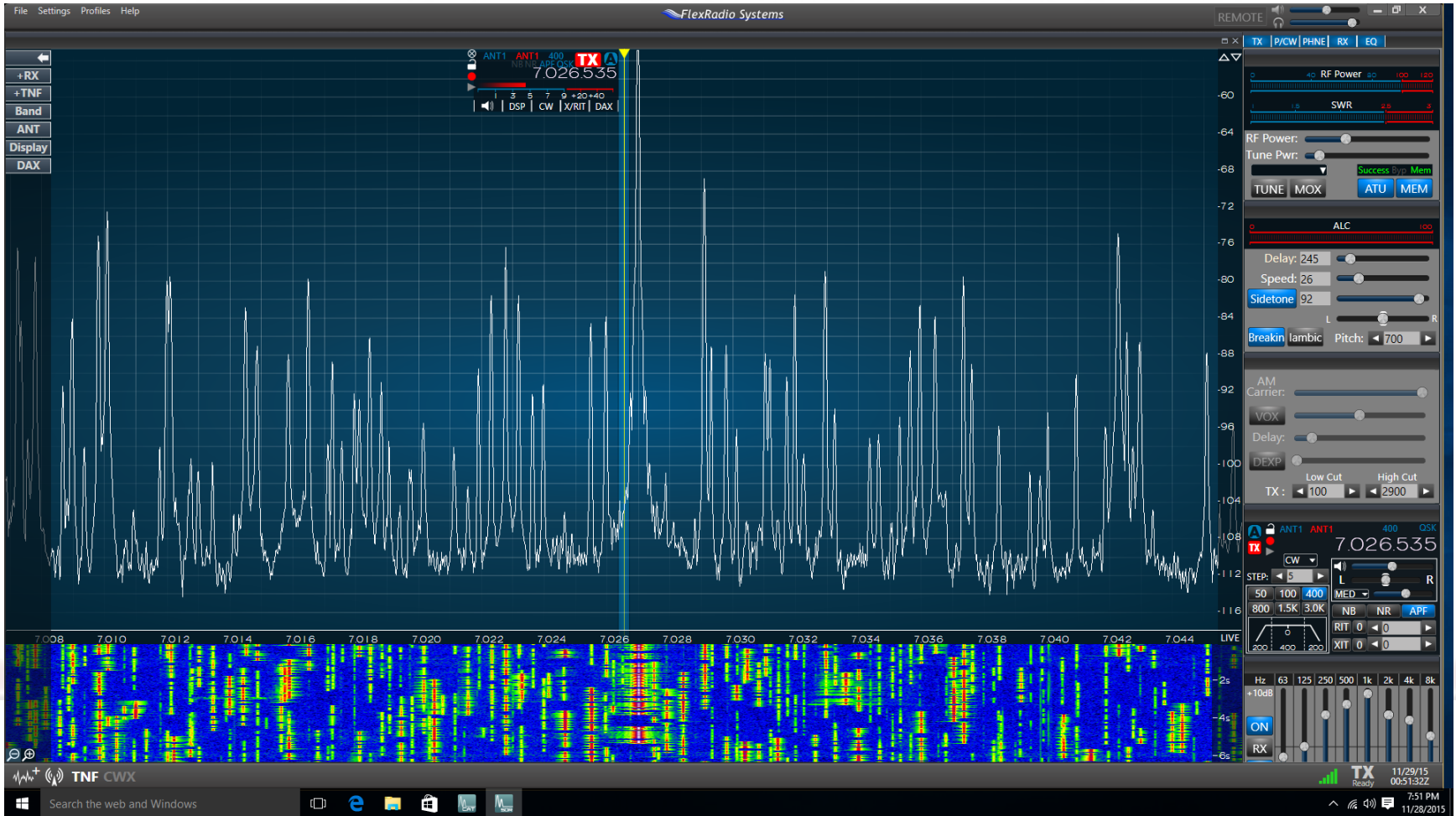
SV2ASP Pile-up

- Mount Athos on 40CW (Monk Apollo)
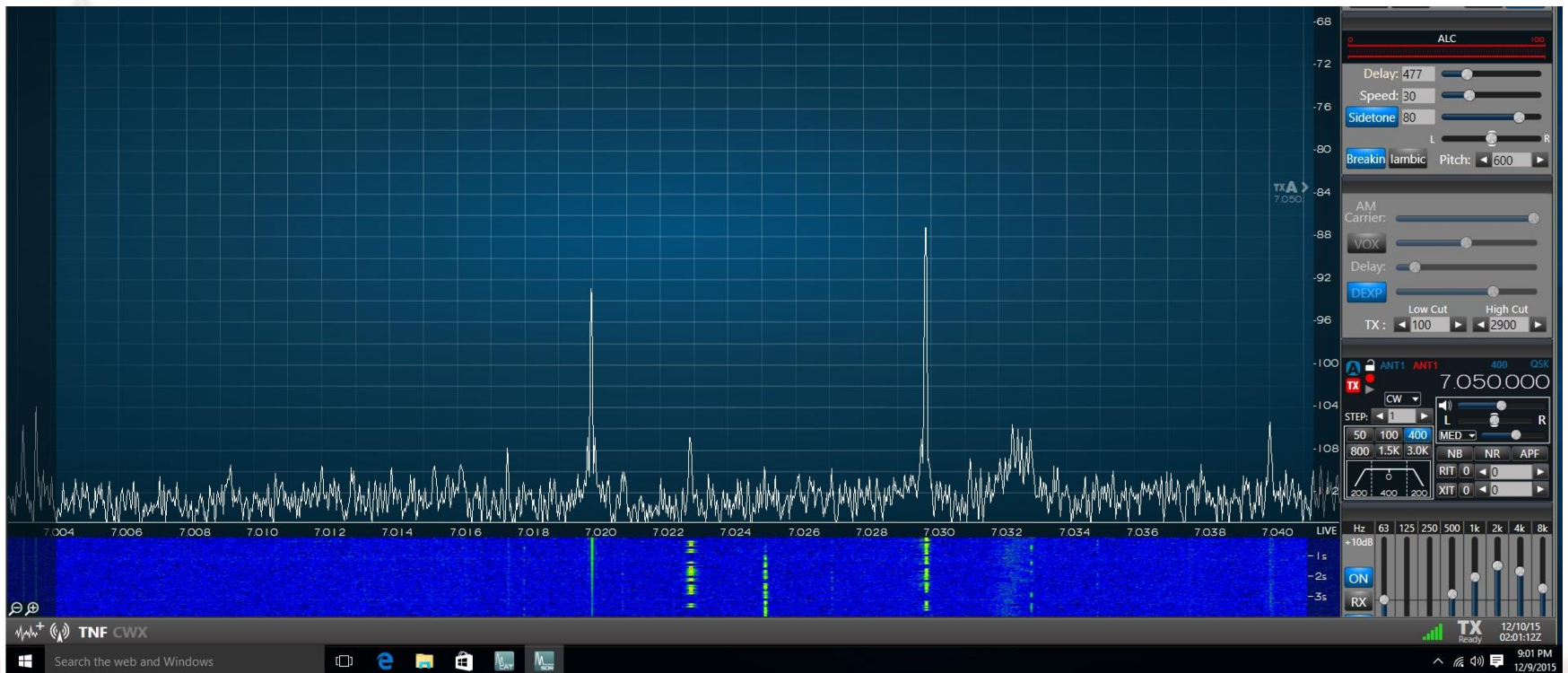
SV2ASP Pile-up

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CQ WW DX Contest

- More than 70 stations in about 40Khz

40 Meters on a typical night

CW Forever