The New 630m and 2200m Amateur Bands

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New Amateur Bands

At the 2012 World Radio Conference (WRC) amateurs were allocated new LF/MF bands: 630m and 2200m. Roughly forty countries are on the air

On March 29, 2017 the FCC released a Report and Order authorizing the new bands. It defines the frequencies, power limits, modes and maximum antenna height. We expect regular operation to start soon.

The New Bands

- 630m= 472-479 kHz
- 2200m= 135.7-137.8 kHz
- Emissions: CW, phone and digital modes
- Radiated power limited to 5W EIRP (Effective Isotropic Radiated Power) on 630m and 1W EIRP on 2200m
- The maximum allowed antenna height is 60m (197').
- The maximum transmitter output is 500w on 630m and 1500W on 2200m

Common Misperceptions!

- A 2.1 kHz or even 7 kHz band is too narrow to be of use! The QRM will kill you!
- At such low frequencies with only 1-5W you can't be heard down the block!
- Manmade and atmospheric noise levels are so high you can't hear anything anyway!
- It's impossible to erect useful antennas on city lots .
- There's no amateur gear for these bands.

- None of this is true!

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Why go to 630m or 2200m?

- If you're a bit tired of the same old stuff LF-MF is a fresh challenge:
  - Very different propagation
  - New very narrow digital modes
  - But also the oldest digital mode – CW
  - Antennas are a challenge!
  - Boat anchor resurrection
  - Some home brewing is usually needed, especially for antennas

500 kHz History

- Maritime CW calling/distress frequency since 1906
- 415-495 kHz commercial ship-ship and ship-shore working frequencies also Navy and CG
- Amateurs banned for >100 years!
- Automated satellite reporting adopted in 1980s
- CW and monitoring of 500 kHz ceased in 1990s
- 500 kHz now unused except by museum stations

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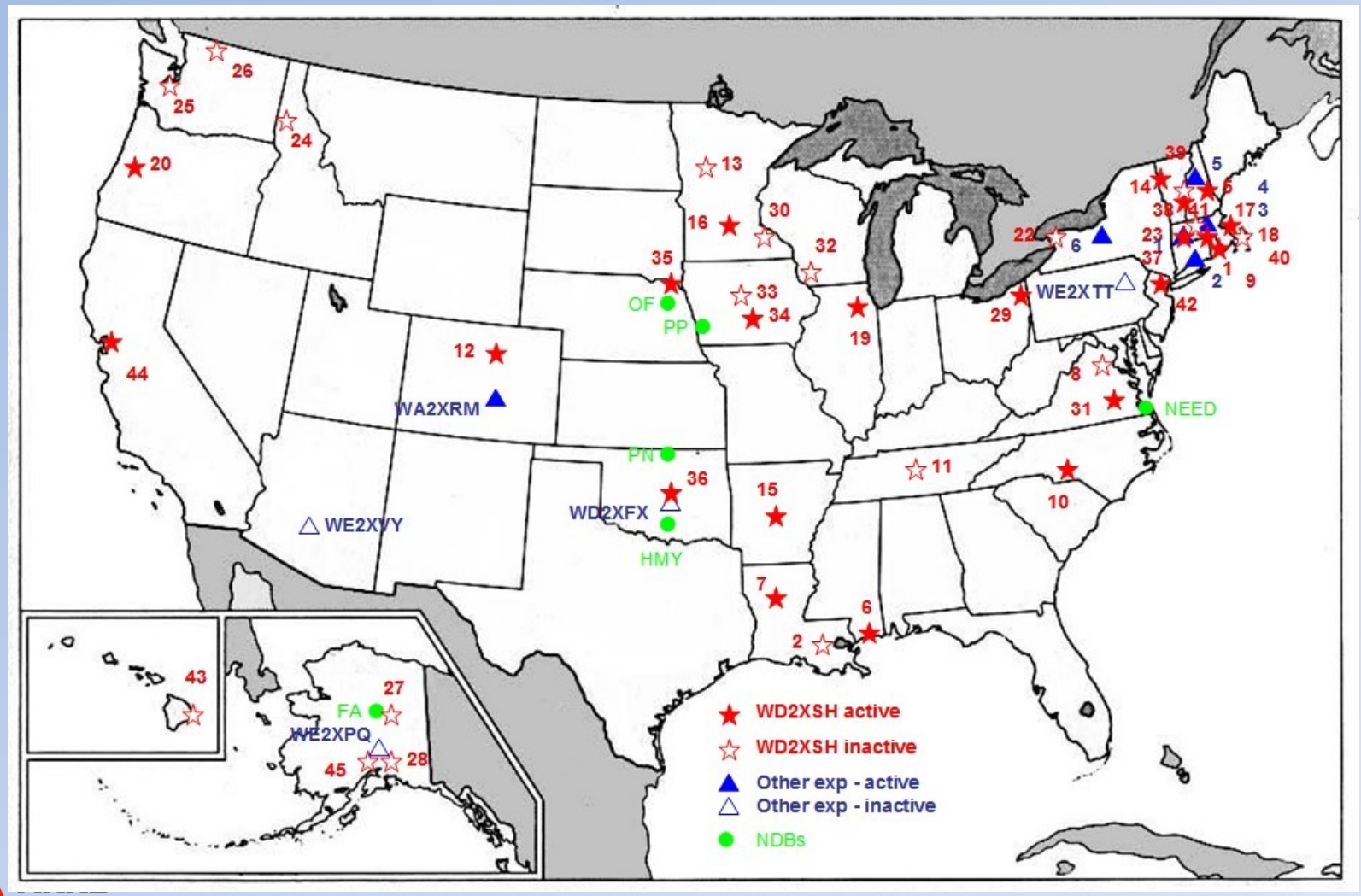
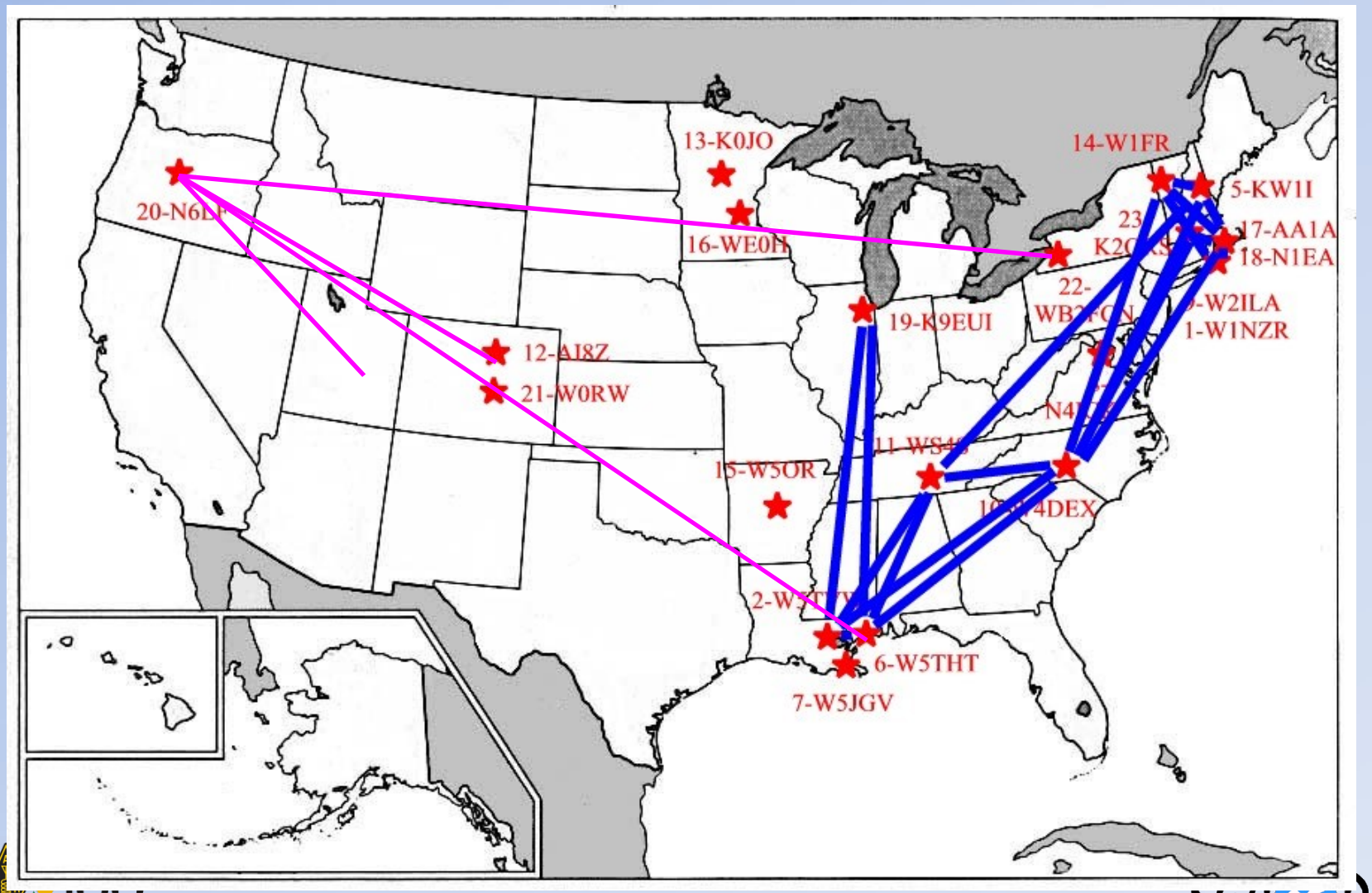
ARRL experimental group

- First operation September 2006, W1FR experiment coordinator
- Originally 23 stations were licensed (WD2XSH/1 thru WD2XSH/23). Ultimately expanded to 45 licensees
- Frequency allocations: 495-510 kHz and 461-478 kHz, 20W ERP
- This operation and that of many others provided the ammunition for the WRC allocation battle!

Experimental stations

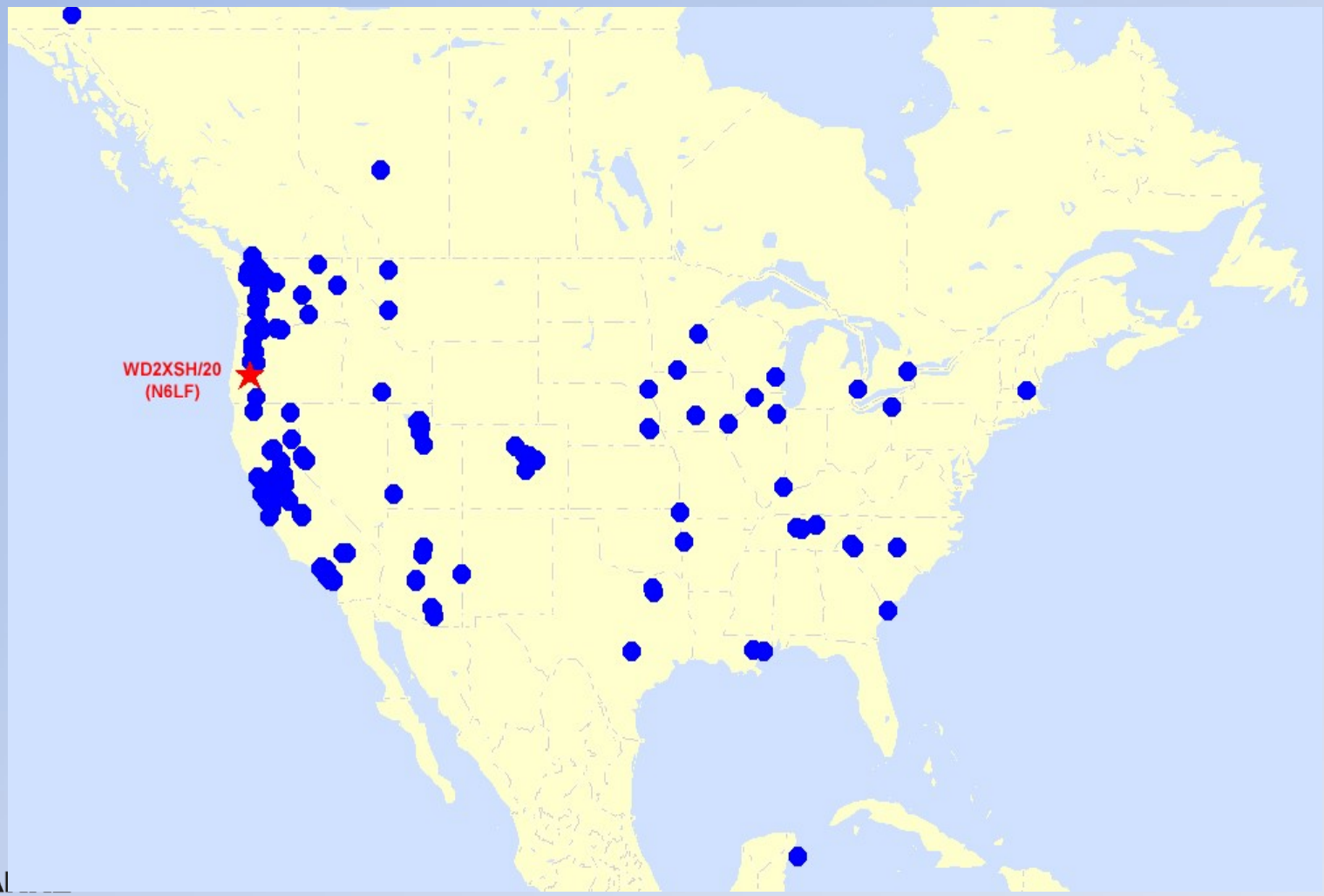


WD2XSH CW QSO's



CW Beacon DX reception reports

CW beacon reception reports /20



WSPR DX

- VE7 and experimental WSPR stations on the west coast and in Texas are regularly decoded in VK, ZL, KH6, KL7 and occasionally JA.
- East coast WSPR stations are regularly decoded in Europe.
- VE7SL and VK4YB have been trying for CW QSO's but not quite!

LF/MF amateur transceivers

- Kenwood TS590S and TS590SG
  - 4 mW output from the transverter port 100-500 kHz all modes.
- Flex Radio 1500
  - 2 mW from the transverter port, all modes
- Elecraft K3S with KBPF3A module
  - 0.5 mW
- All of these need an amplifier

Start by listening…

Transmission modes

- CW
- QRSS – ultra slow CW
- WSPR-2 & -15 (weak signal propagation reporter). SNR down to -30 dB or lower!
- 2-way digital modes: BPSK31, JT9, JT65, RTTY, hellschriber and a wide variety of new modes being created and tested almost daily!

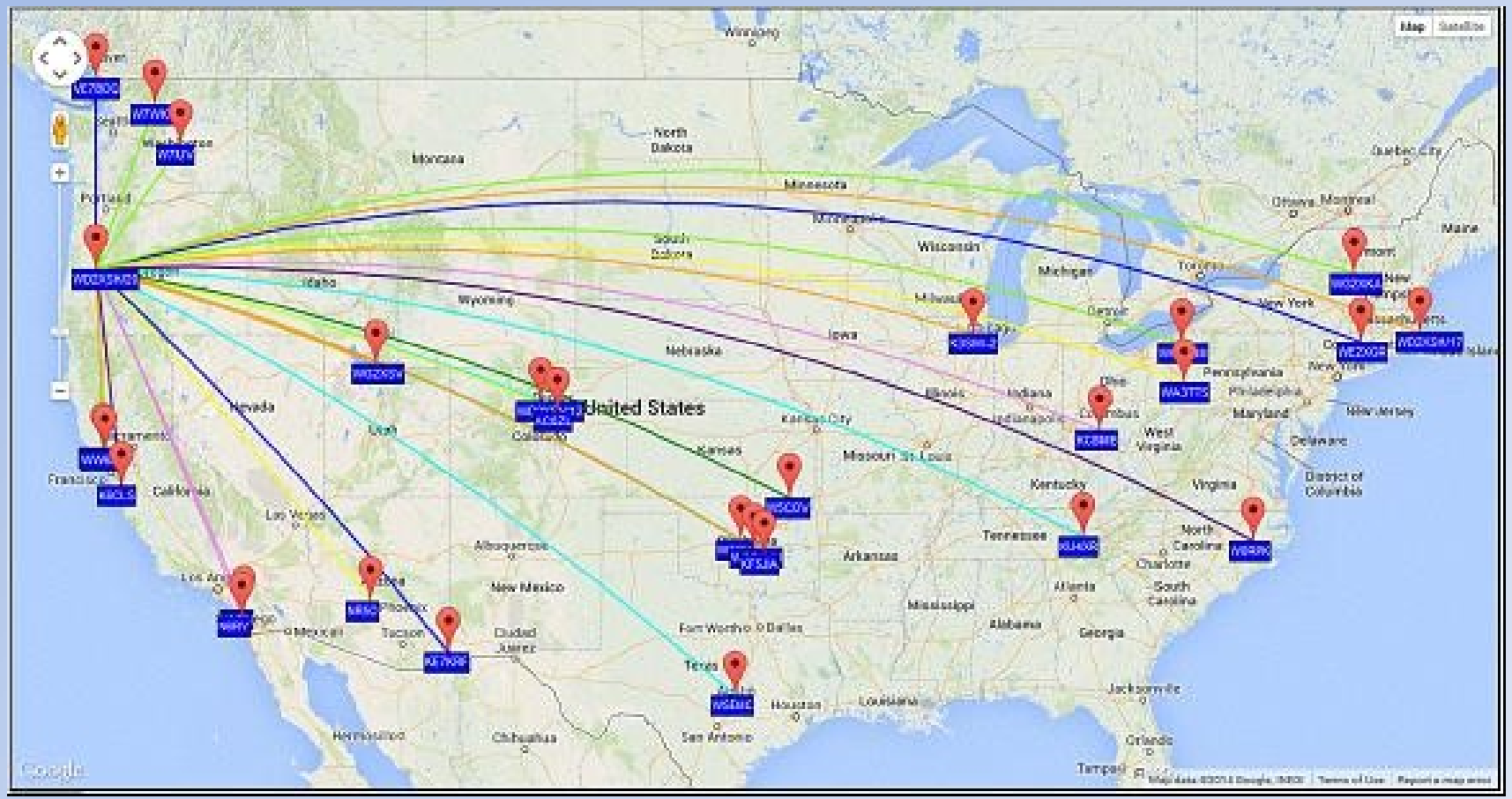
WSPR –K1JT

*www.physics.princeton.edu/pulsar/**K1JT**/wsjt.html*

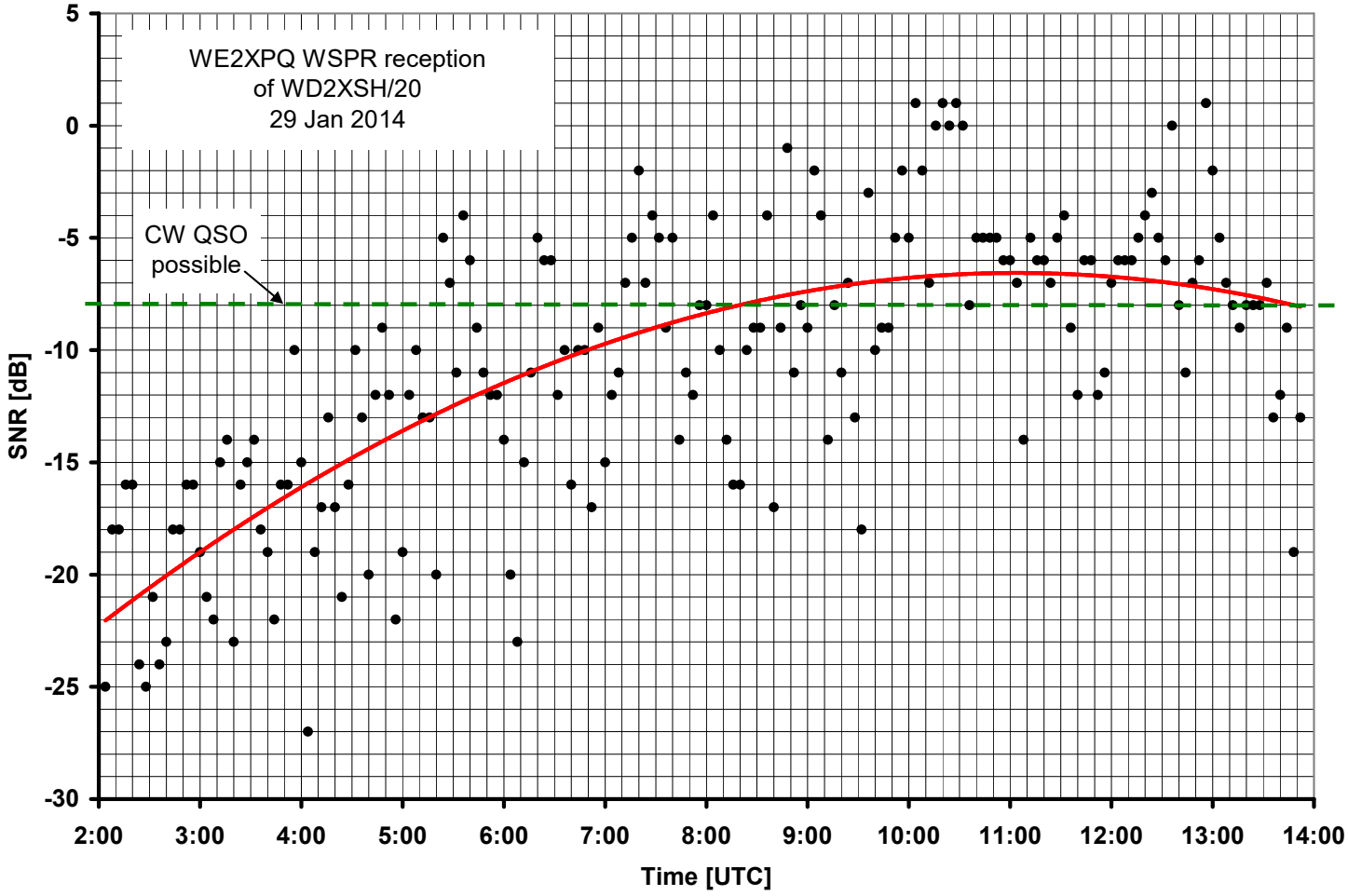
WSPR-2 and -15 is a tool for quantitatively testing propagation between a transmitting station and a receiving station. Typically the WSPR signals are transmitted periodically over a period of many hours with the receiving station recording the decodes and forwarding them on to WSPRnet.org where they are available in the database. Example:

Timestamp	Call	MHz	SNR	Drift	Grid	Pwr	Reporter	RGrid	km	AZ
2014-01-30 17:34	WG2XIQ	0.475666	-17	0	EM12mp	0.05	WG2XXM	EM15lj	306	359
2014-01-30 17:36	G3XIZ	0.475700	-29	0	IO92ub	0.5	DD7PC	JN49ax	627	108
2014-01-30 17:38	WG2XIQ	0.475666	-17	0	EM12mp	0.05	WG2XXM	EM15lj	306	359
2014-01-30 17:40	DL8YCA	0.475782	-11	-1	JO31or	0.01	PI4THT	JO32kf	60	338

WSPR Mapping



WSPR Data

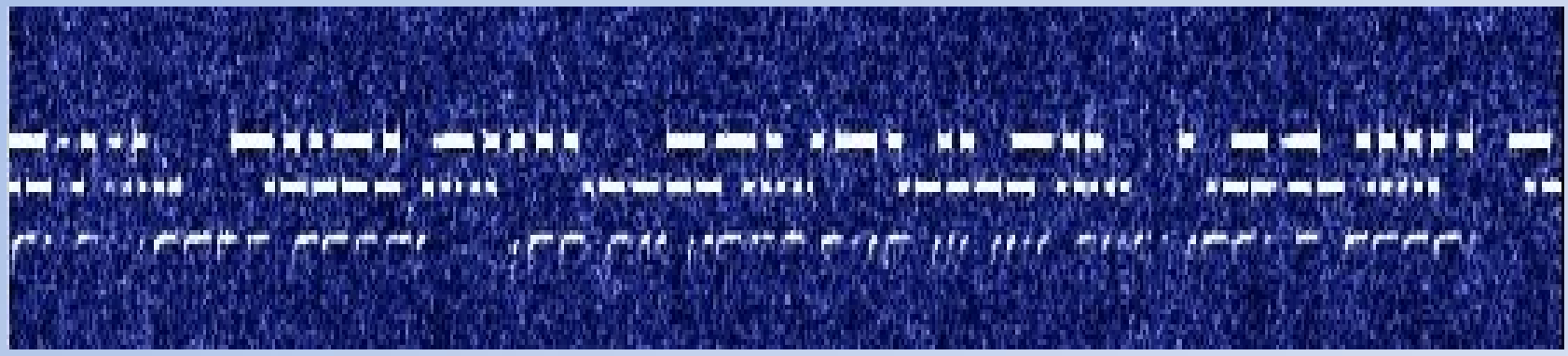

WE2XPQ WSPR reception
of WD2XSH/20
29 Jan 2014
CW QSO
possible
SNR [dB]
5
0
-5
-10
-15
-20
-25
-30
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
Time [UTC]

Software audio spectrum analyzers

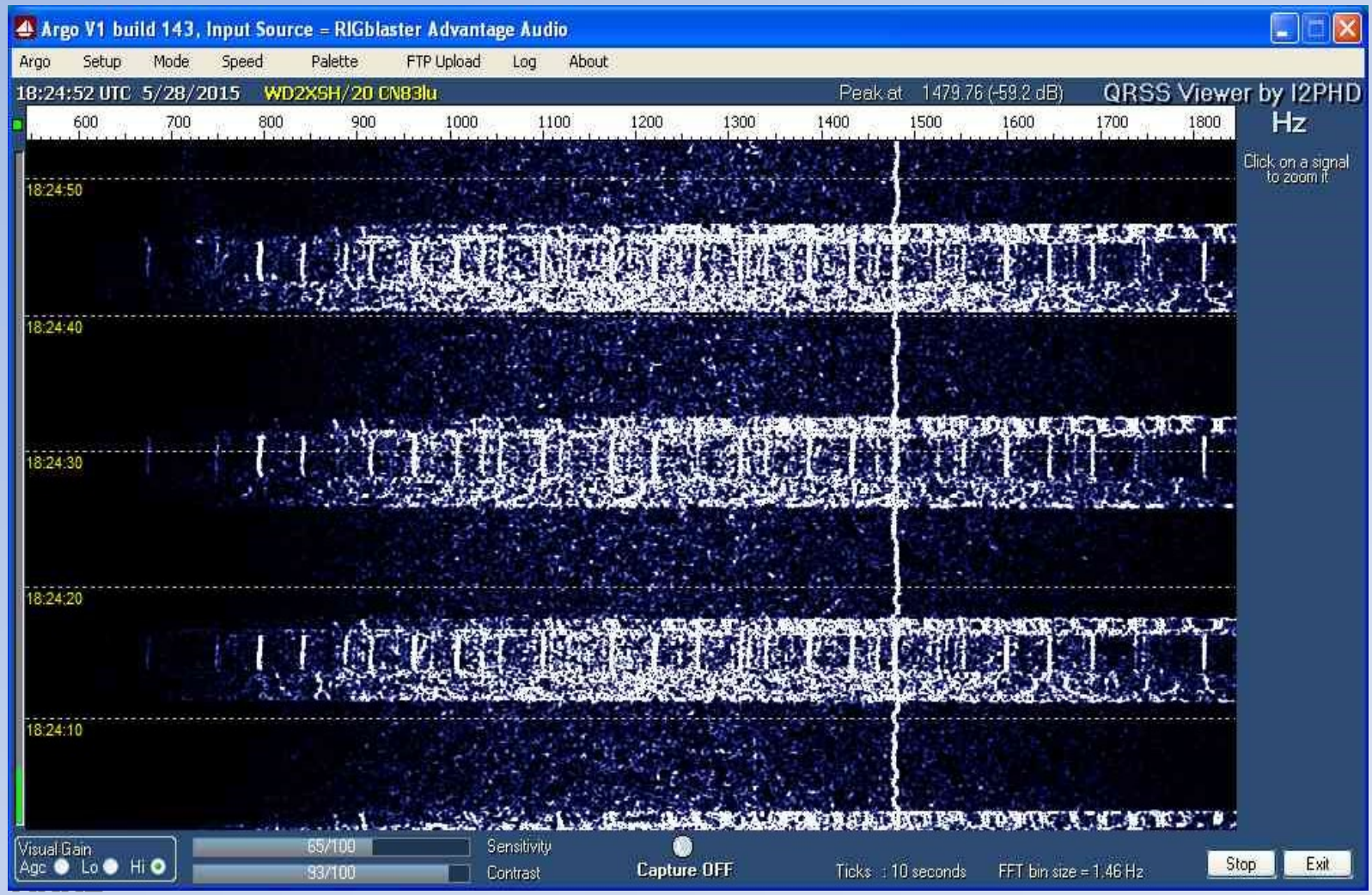
- Waterfall and spectrum displays
  - ARGO – I2PHD
  - Spectran – I2PHD, www.weaksignals.com
  - Spectrum lab – DL4YHF www.qsl.net/dl4yhf
- These are all freebies!
- All these require is an audio signal from your receiver.
- They work with modern or boat anchor rx

Waterfall displays

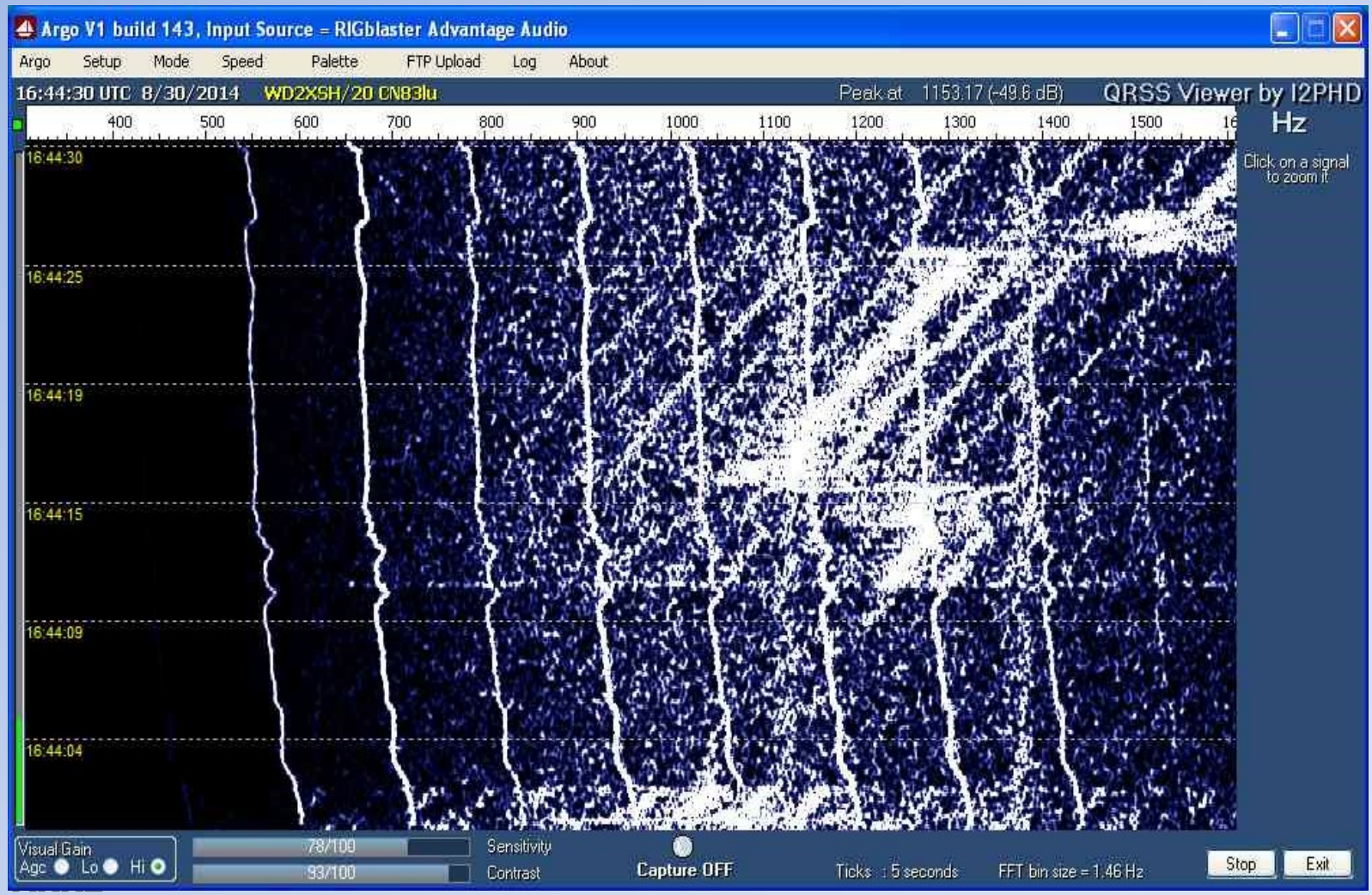
WD2XSH/6 MS, /15 AR and /19 IL



ARGO screen shot of WSPR



Noise sample with ARGO!



RX antennas

- Loops
  - vertical loops, shielded or not, a quad loop works well
  - K9AY, flag, etc, terminated loops and arrays of terminated loops
- E-probe (very short vertical) with or without amp
- Phased arrays of E-probes
- Existing HF Antennas – dipole, random end fed wires, etc.
- Beverages and “Snakes” (BOG)

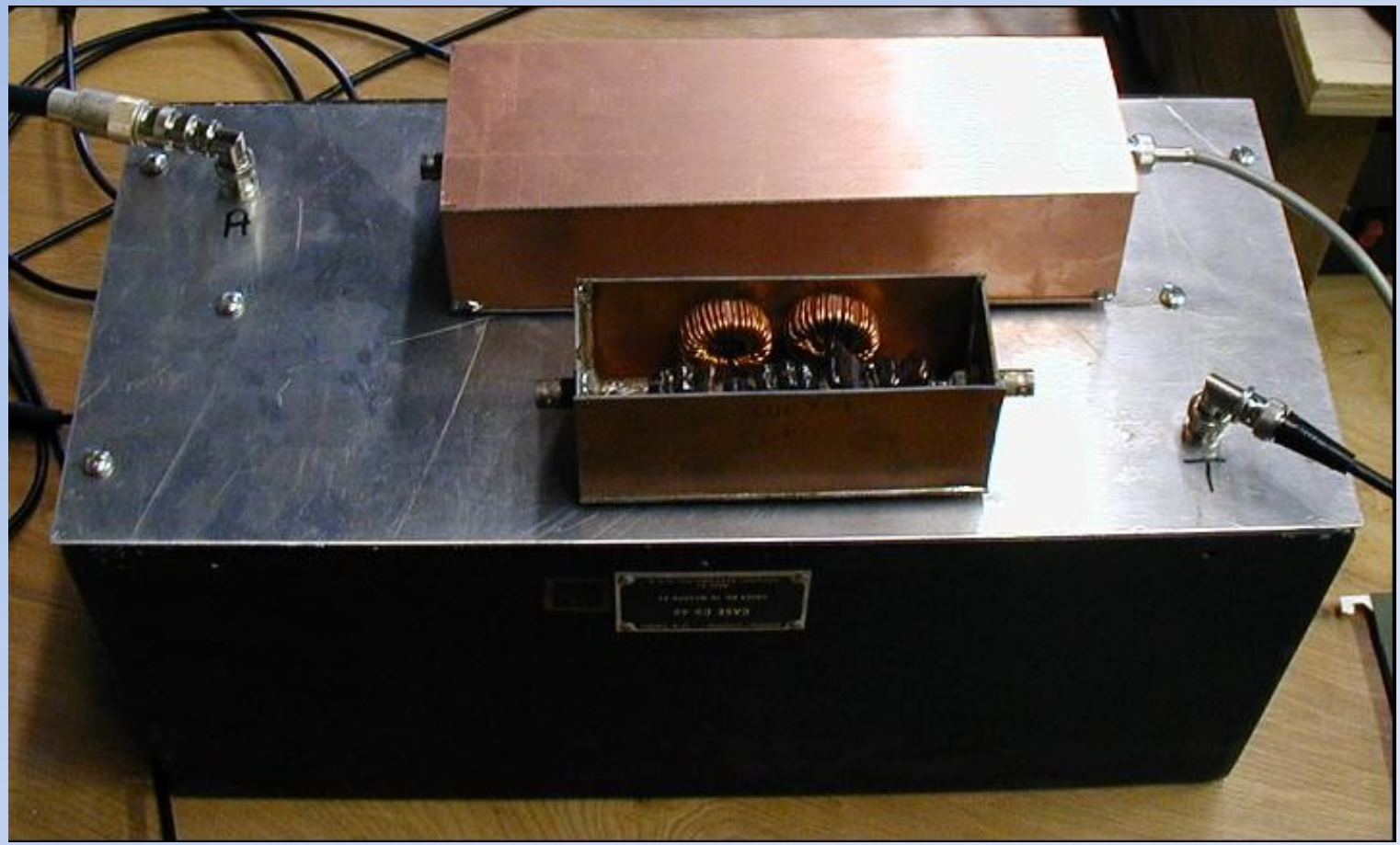
Testing your receiver

- NAVTEX
  - Maritime WX reports
  - 518 KHz and 490 KHz
  - RTTY
- Non-directional beacons (NDB)
  - Low power, omnidirectional
  - Numerous at 200-420 kHz
  - http://fivegulf.com/ndb/
- Part 5 Stations
  - CW and PC based digital modes – WSPR, FSK

Latest WD2XSH/20 (N6LF)

Latest WD2XSH/20 (N6LF)

Filters!



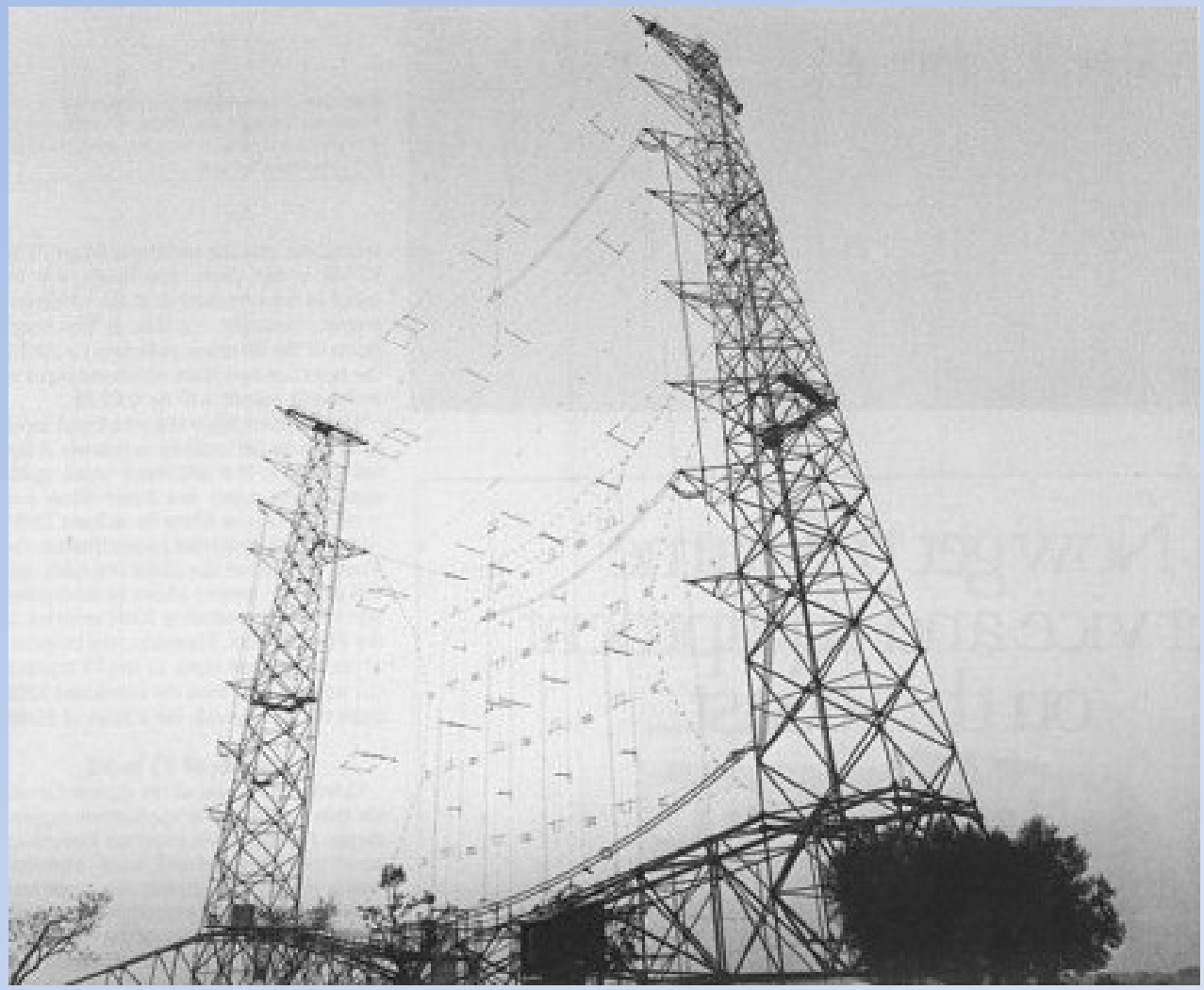
Boat anchors at N6LF

RAS, RAK, RBA, RBL, BC453, maritime rx/RBZ

WD2XSH/5 (KW1I)

RBA rx, ART13 tx, integrated with computer

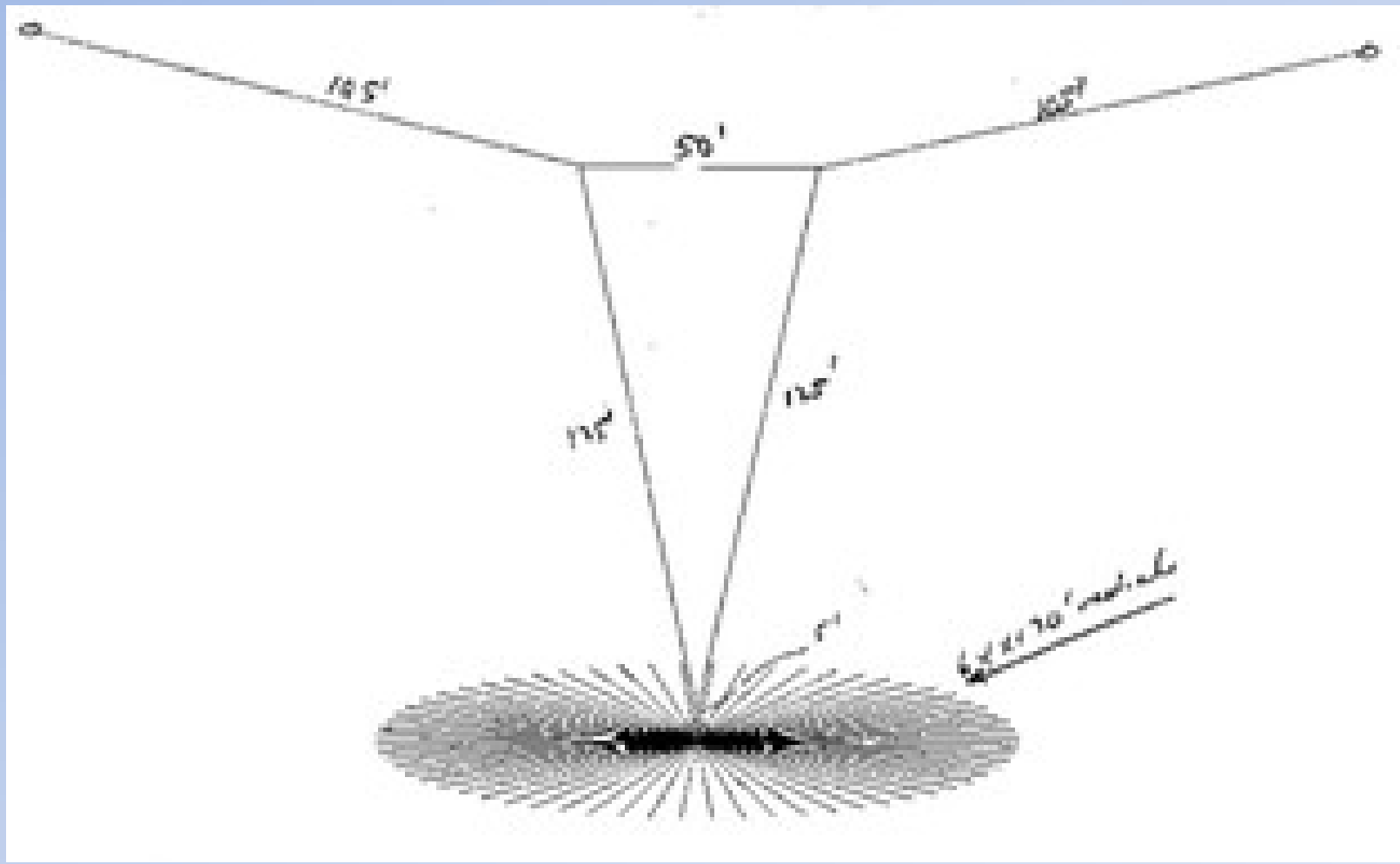
Nice but you don’t have to have it!



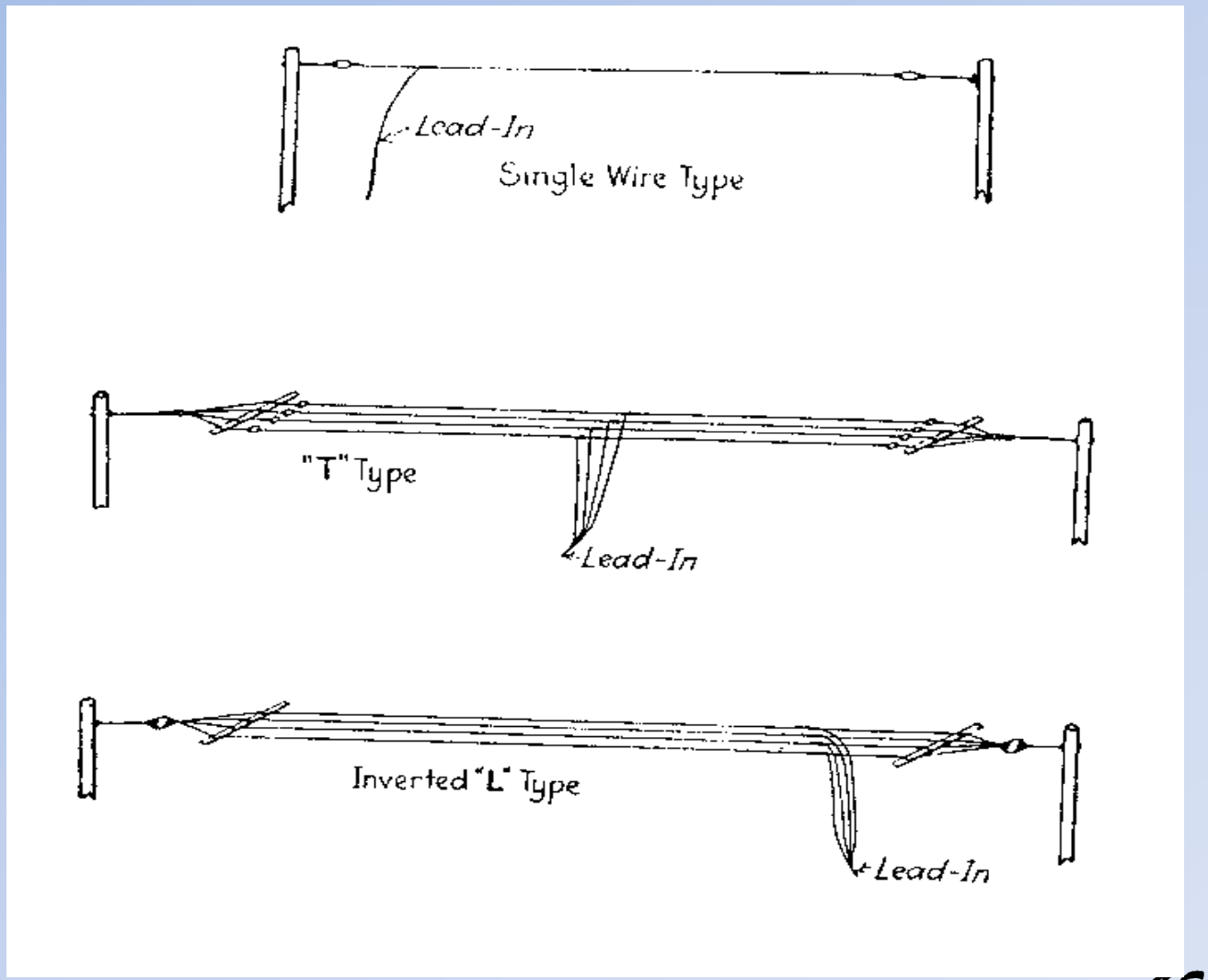
Antennas at LF and MF

- At 1.8 MHz a ¼-wl is 137’
- At 475 kHz a ¼-wl is 518’
- At 136 kHz a ¼-wl is 1809’
- Most antennas will be short top-loaded verticals
- You can find a set of LF-MF antenna notes (200 pages!) at: www.antennasbyn6lf.com

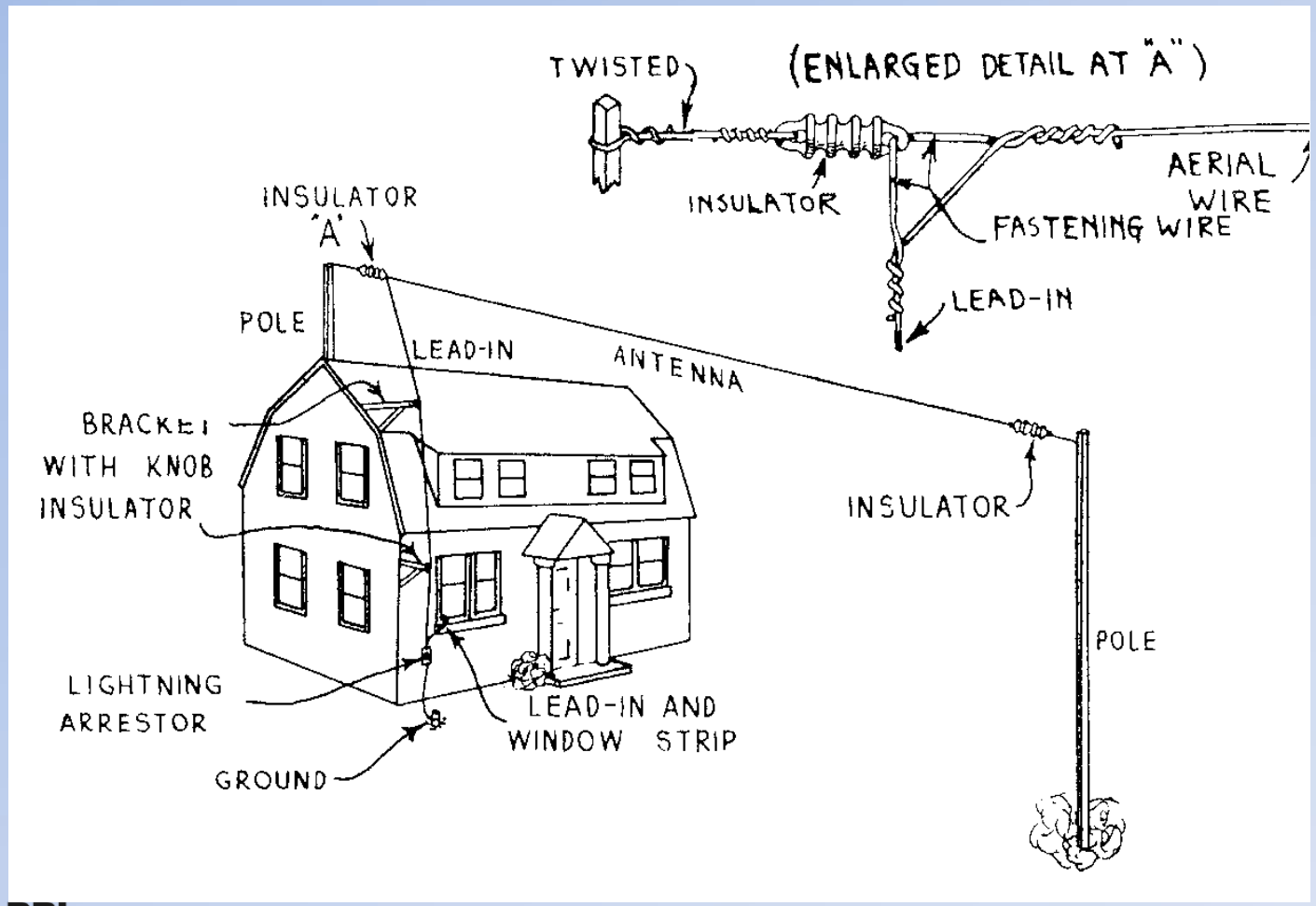
Initial WD2XSH/20 Antenna



T and L antennas

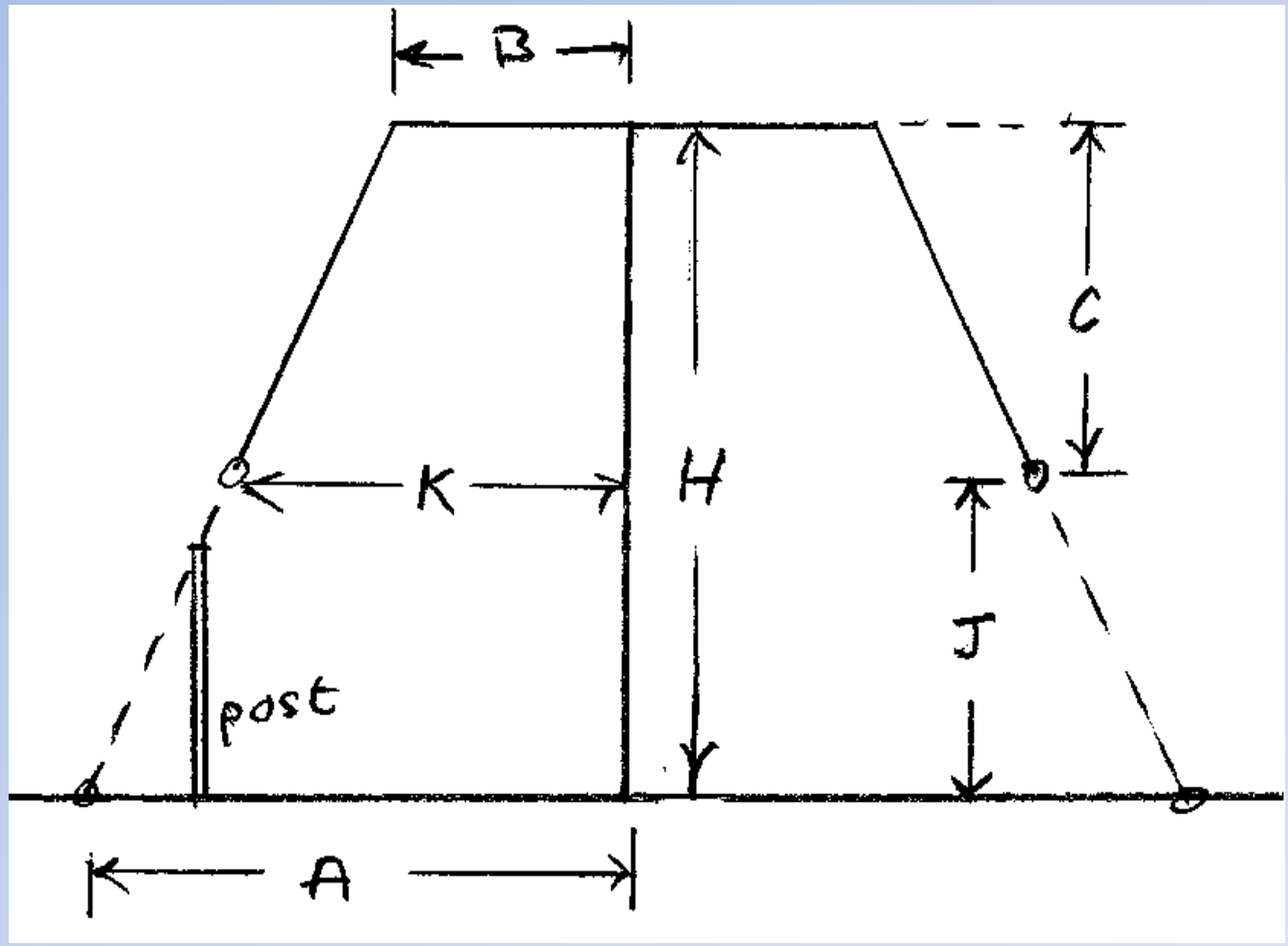


Use the available supports



Umbrella vertical

H=40’ is adequate, 60’ would be better



MF antenna basics!

- Succinct summary of LF/MF antennas by Woodrow Smith some 65 years ago:

"the main object in the design of low frequency transmitting antenna systems can be summarized briefly by saying that the general idea is to get as much wire as possible as high in the air as possible and to use excellent insulation and an extensive ground system."

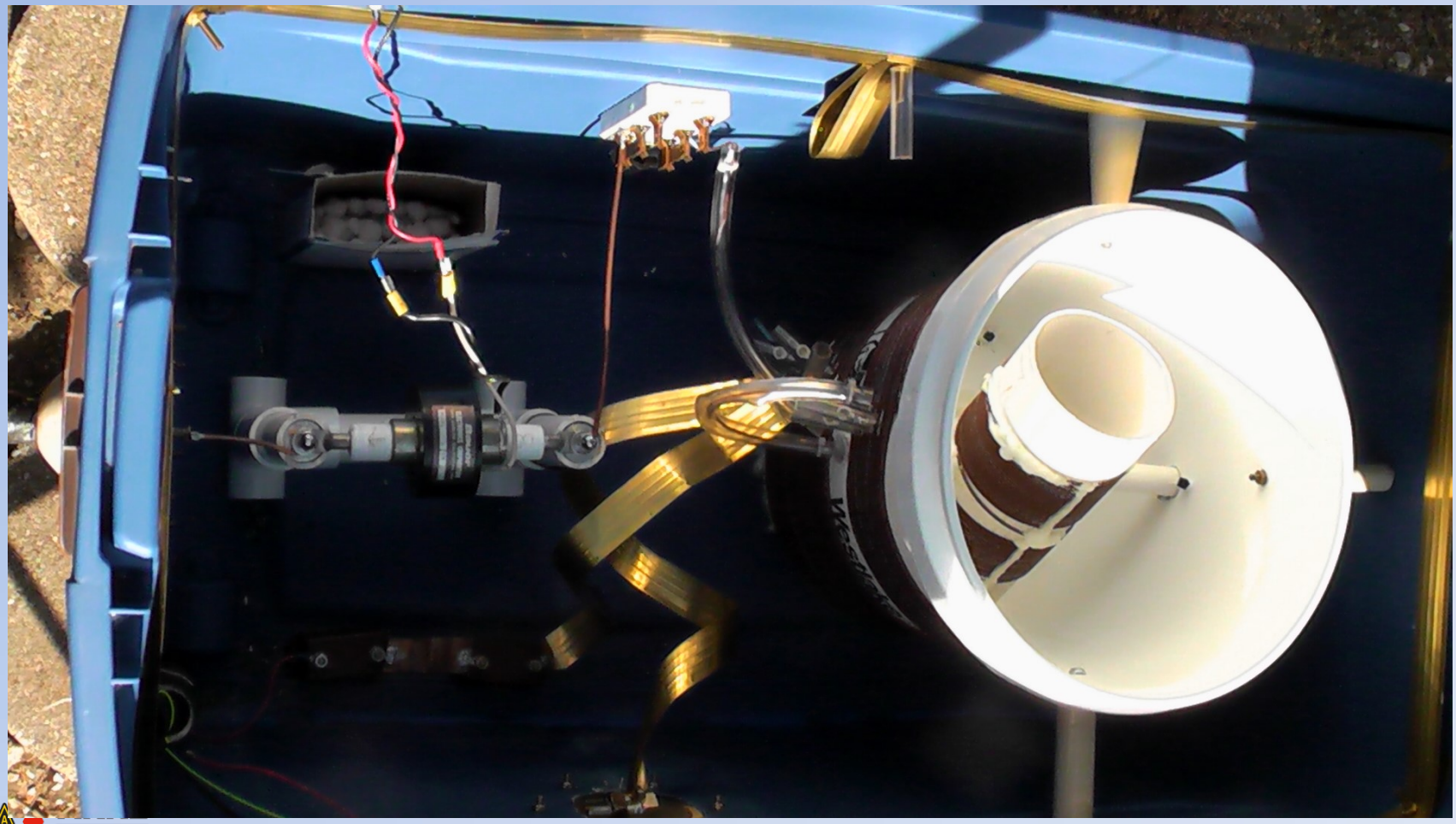
In order of priority

- Make the vertical as tall as you can.
- Use as much capacitive top-loading as practical.
- Use loading coils with as high a Q as possible.
- Put a lot of effort into the ground system, making the radial density high near the base of the vertical and under the top-loading hat.
- Try to minimize conductor losses by using multiple wires and/or large diameter conductors (tubing!)
- Use high quality insulators, both at the base and at wire ends.

WD2XSH/6 (W5THT) antenna

ATU box

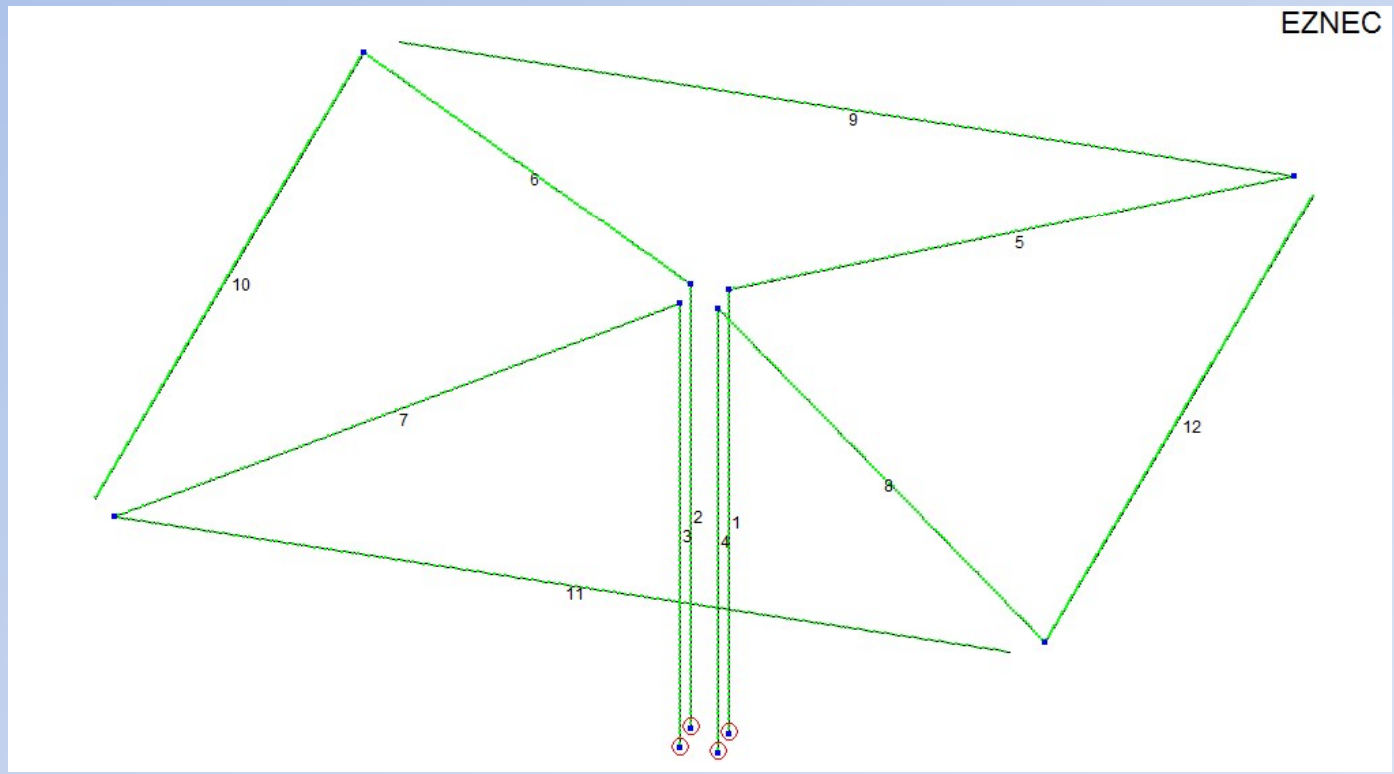
Inside the ATU



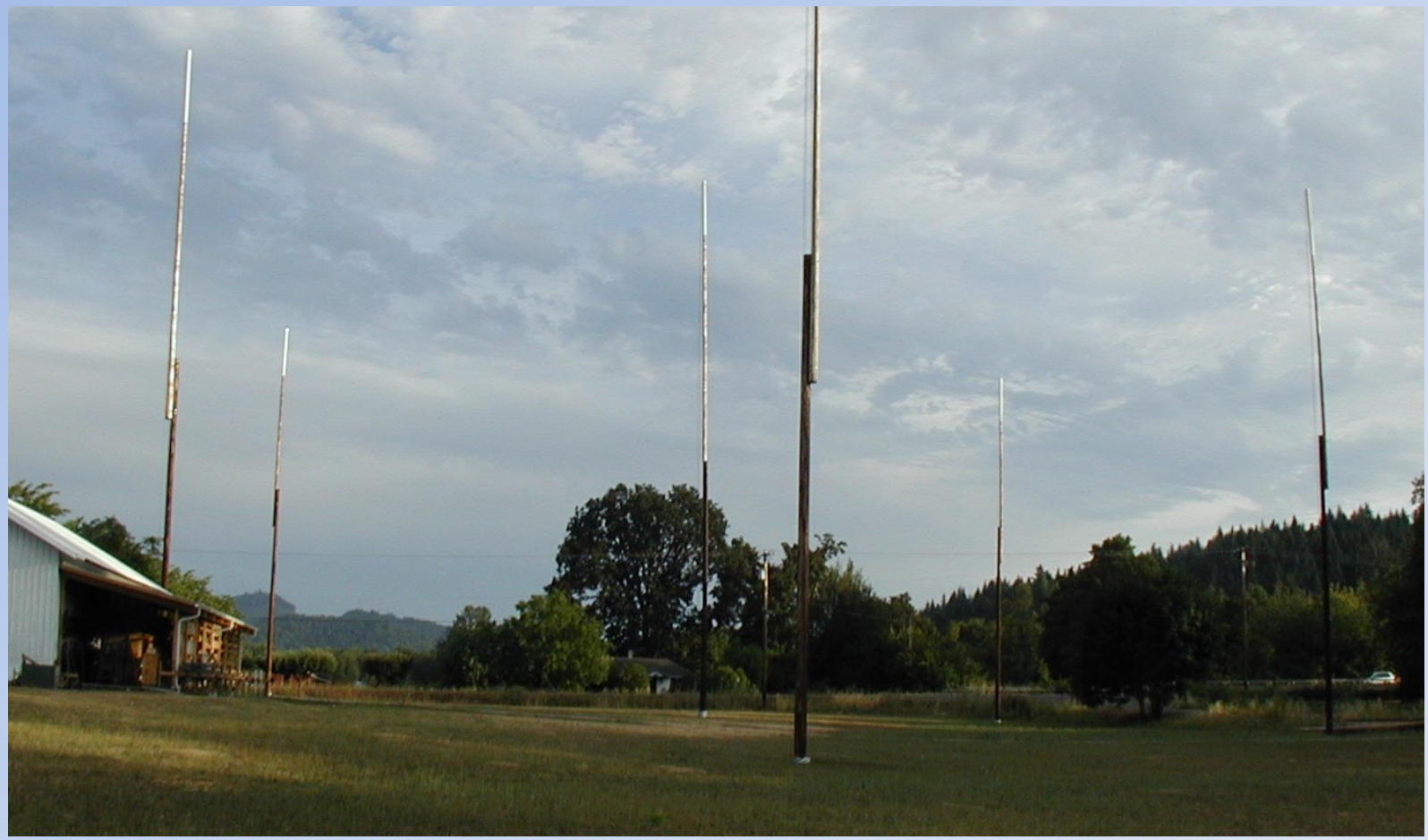
Tuning the ATU

Latest N6LF antenna

95’ high, 240’ across, 128 150’ radials on the ground
There’s a very extensive discussion of MF antennas at: www.antennasbyn6lf.com



Antenna poles at N6LF



Base tuning box

Tuning-matching inductor

Propagation

- Daytime – ground wave
  - WG2XIQ range at 1W ERP = about 225 miles on a quiet day for a typically equipped receive station
- Nighttime – sky wave dominates plus some ground wave
  - Sky wave can extend thousands of miles
- Behavior similar to bottom of the BC band at 630-meters
- Sometimes there are surprises

Useful internet sites

- www.500kc.com
- http://njdtechnologies.net
- http://qsl.net/ve7sl/
- http://wsprnet.org/drupal/
- www.antenannasbyn6lf.com

THE QUEST CONTINUES ...

Remember the history of 160m! More power to us!

Amateurs

commercial interests