

PRESENTATION



# HF in an HOA: The BBTD Attic Antenna

By: Corey Ruth - KD3CR

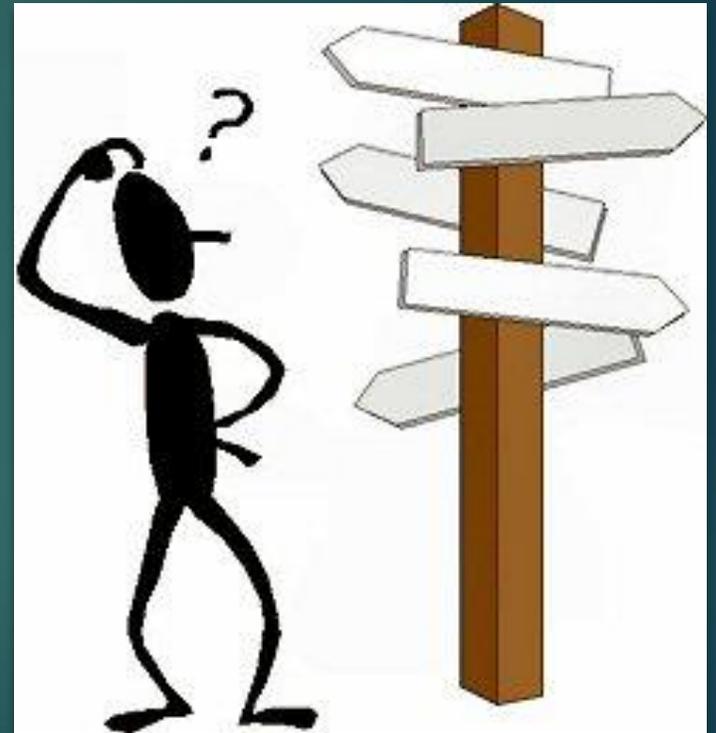
# Who Am I?

- ▶ Corey Ruth, KD3CR
- ▶ Amateur Extra-class
- ▶ President of the Queen Anne's Amateur Radio Club in Centreville, MD
- ▶ First licensed in Oct. 2016 as KG5PXQ



# What's this presentation about?

- ▶ An antenna that helped me get on HF in an HOA: the Broadband Butterfly Terminated Dipole (BBTD)
- ▶ This will NOT be a highly technical deep-dive
  - ▶ I'm not an engineer or a PhD
  - ▶ I'm not an antenna designer
  - ▶ I don't have decades of ham radio experience
- ▶ Rather, this will be a practical look at an antenna that worked for me, and may well work for you
  - ▶ If I can do it, you can do it!



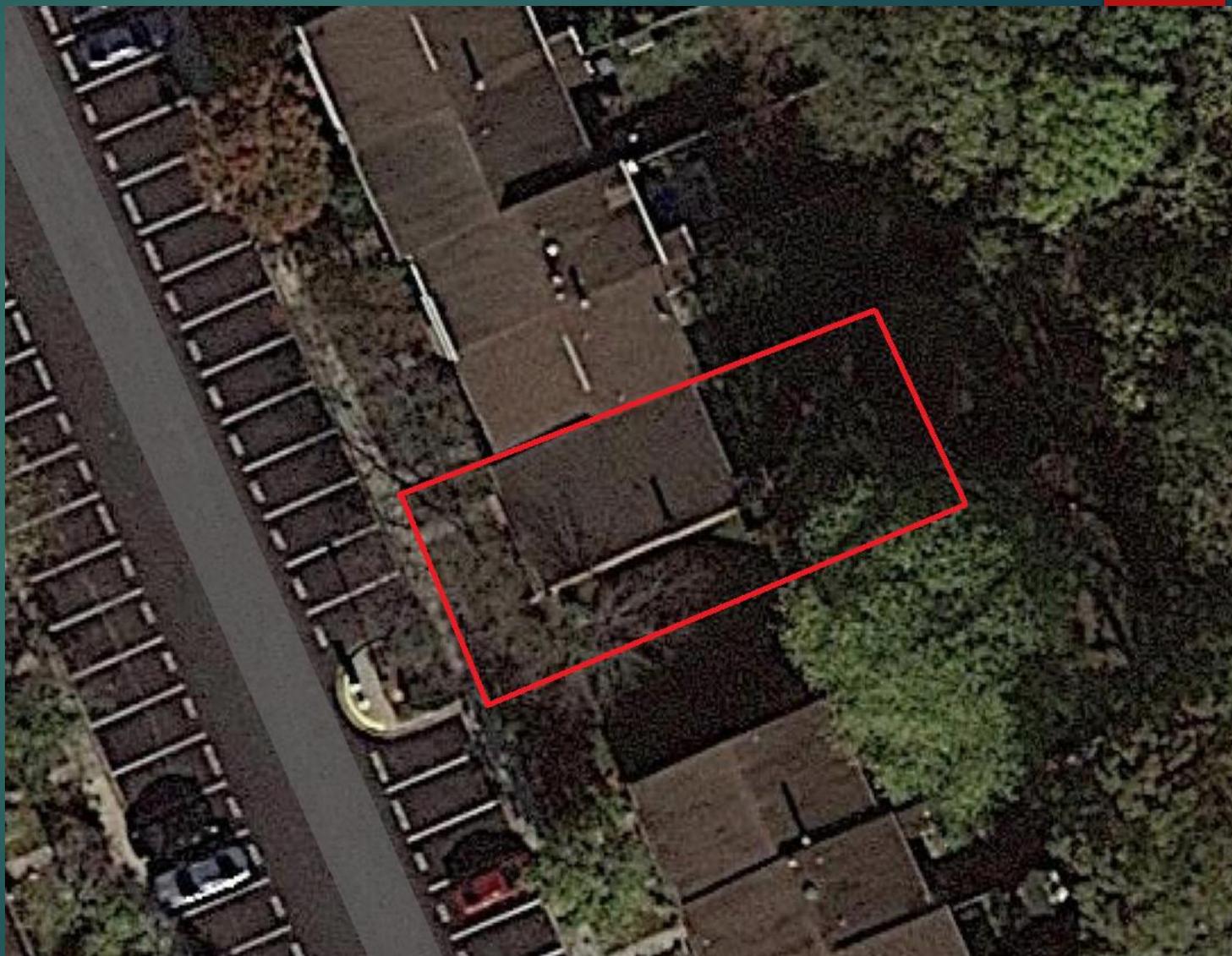
# What Will I Cover?

- ▶ Situational Background and Possible Options
- ▶ What Didn't Work
- ▶ Let's Try a BBTD!
  - ▶ What is it?
  - ▶ Pros and Cons
  - ▶ Materials and Cost
  - ▶ My Build and Installation
  - ▶ Testing Results
  - ▶ Conclusions



# Background

- ▶ I want to work HF, but *this* is my QTH
- ▶ 100 x 37.5-foot lot
- ▶ Townhome
- ▶ In an HOA
- ▶ With very few trees



# Background

- ▶ Permanent outdoor antennas are a no-go
- ▶ Even well-hidden wires are risky – HOA inspection 2x a year
- ▶ Few trees to work with anyway, and a support mast would stand out
- ▶ If I ask permission to install an antenna, they may say no, and asking puts me on their radar



# Possible options?

## Mobile

- ✓ HOAs don't regulate antennas on cars
- ✗ Limited antenna size
- ✗ Battery power

## Portable

- ✓ Quieter RF environment
- ✗ Must travel to/from
- ✗ Set up/take down
- ✗ Battery power

## Temp. Backyard Outdoor Antenna

- ✓ Grid power
- ✓ No travel
  - Modest RF noise
- ✗ Set up/take down
- ✗ Few trees for supports

## Attic Antenna

- ✓ Grid power
- ✓ No travel
- ✓ Can leave it up and operate anytime
- ✗ Most RF noise
- ✗ Limited by attic size



# What Didn't Work: 33' Ultimax DXTREME End-Fed Random Wire

- ▶ Cost: \$124 (\$105 + \$19 for counterpoise set)
- ▶ Advertised to work 160-6M with a tuner
- ▶ Set up as a horizontal zigzag
- ▶ Very noisy in my attic, with and without counterpoise and MFJ-915 RF isolator
- ▶ Probably works much better outside in the clear



# Back to the Drawing Board

- ▶ Can I hide a wire along the cedar siding?
  - ▶ Small home limits wire length along wall
  - ▶ Could be spotted by HOA inspectors
- ▶ What about using the gutters?
  - ▶ Gutters are short and segmented
  - ▶ HOA might spot that too
- ▶ How about a flagpole antenna?
  - ▶ Tiny front yard limits radial field
  - ▶ “Poles” also prohibited by HOA



# Back to the Drawing Board

- ▶ Can I hide a wire in a bird feeder pole?
  - ▶ Inspectors haven't complained about that yet
  - ▶ But limited height before HOA would become suspicious
- ▶ What about an attic-mounted mag loop?
  - ▶ Expensive
  - ▶ Most limited to QRP power
  - ▶ Limited bandwidth



# So, What Now?

- ▶ Is there no BROADBAND attic antenna that would work? Am I chasing a unicorn?



Photo credit: Pearson Scott Foresman, Public domain, via Wikimedia Commons

# Let's Try a BBTD!

## But what is it?

- ▶ Designed by Bonnie Crystal KQ6XA  
<http://hflink.com/antenna/>
- ▶ A travelling wave antenna like a Terminated Folded Dipole (T2FD or TFD), but made of triangular or irregularly-shaped elements instead of narrow rectangular elements
- ▶ RF current travels in one direction in the antenna, unlike a dipole

### Broadband Butterfly Terminated Dipole (BBTD) - Attic Version

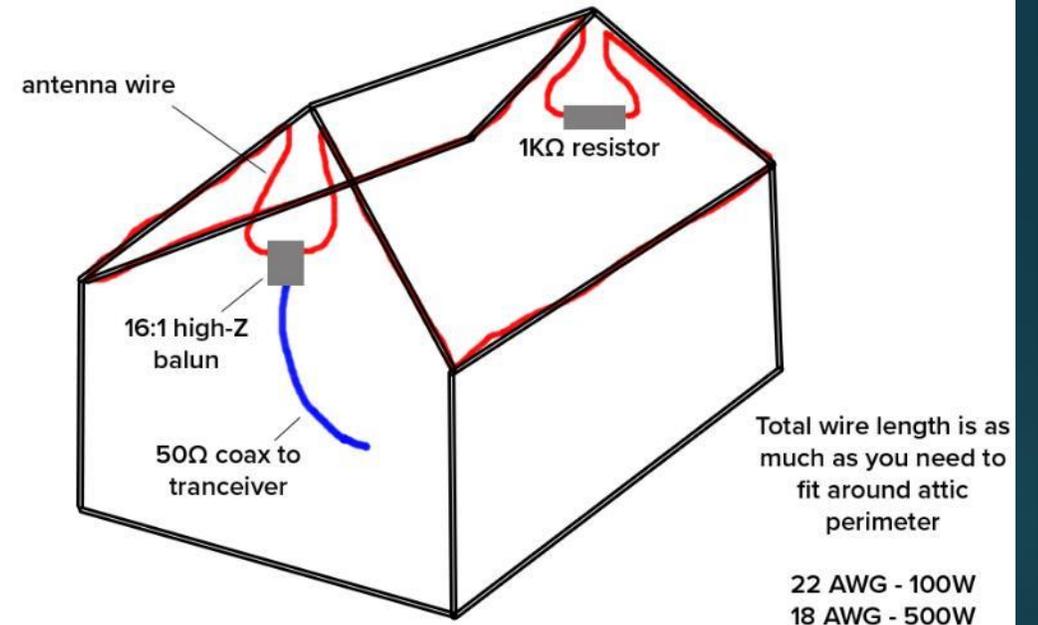


Image by Corey Ruth, KD3CR - Antenna Design by Bonnie Crystal, KQ6XA (hflink.com)



# Why a BBTD antenna?

## PROS:

- ▶ Inexpensive
- ▶ Easy to build
- ▶ Broadband (advertised <math><2:1</math> SWR from 160-6M continuous – no tuner!)
- ▶ Size is flexible
- ▶ Fed with 50 $\Omega$  coax
- ▶ Some gain on 20M and up (2-5 dbi)

## CONS:

- ▶ Zero or even negative gain on lower bands
  - ▶ 0 dbi on 40M and 60M
  - ▶ -3 dbi on 30M
  - ▶ -4 dbi on 80M
  - ▶ -16 dbi on 160M
- ▶ Mounted in attic, it's still noisier than an antenna in the clear



# Materials and Cost

- ▶ My cost: \$110
  - ▶ 150' of #14 antenna wire (\$26)
  - ▶ 16:1 High-Z balun (\$80)
  - ▶ 1K $\Omega$ , 100W resistor (\$4)
- ▶ Also:
  - ▶ Soldering iron and solder
  - ▶ Heat-shrink tubing
  - ▶ Electric fence insulators

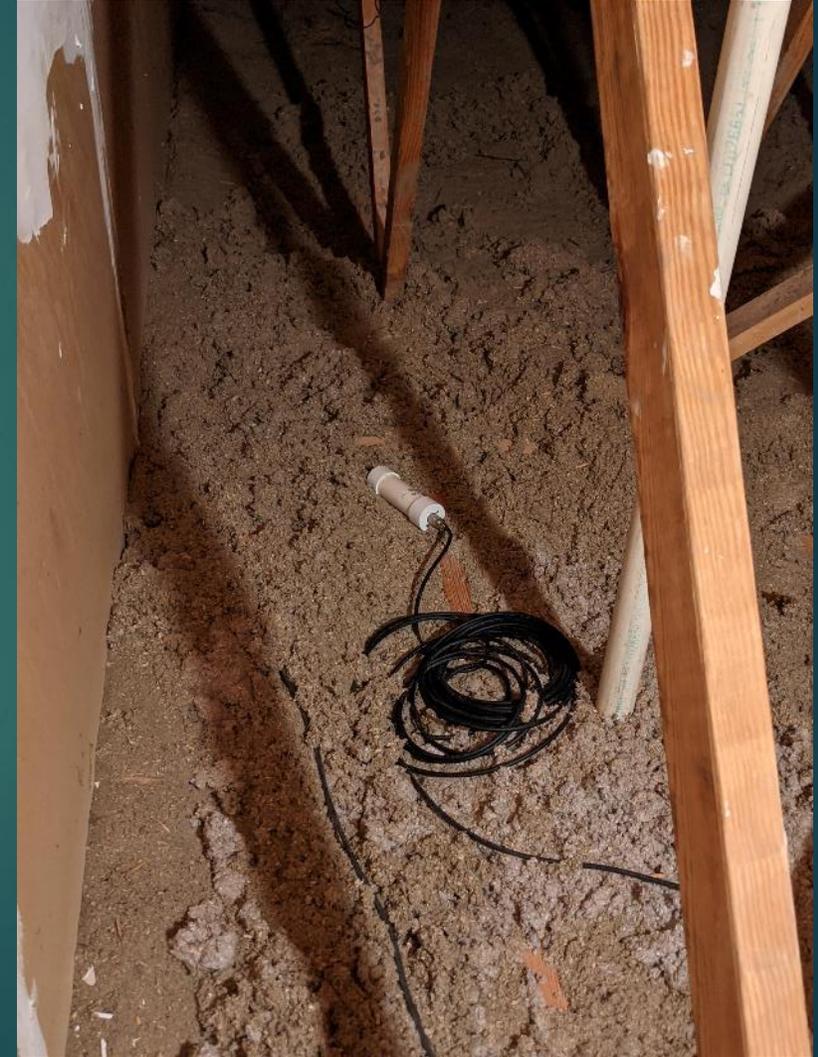


# My Installation

- ▶ In my attic (32x22' by 7'6" high at apex), I fit about 125' of wire without zig-zagging. Wire held with electric fence stand-offs.
- ▶ The more wire the better – just keep each side within 6' of the same length
- ▶ Height: Only about 25-30' AGL
- ▶ MFJ-915 RF Isolator at feed point
- ▶ Then coax to the shack room (length not critical)

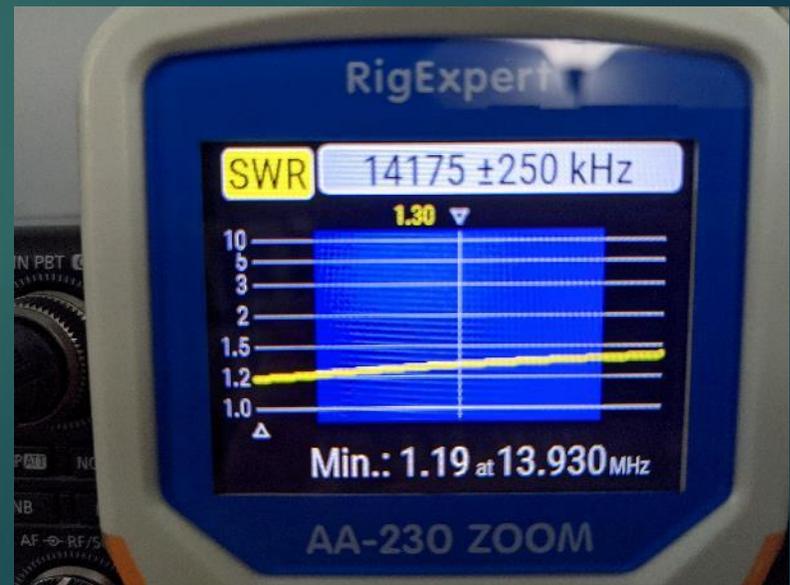
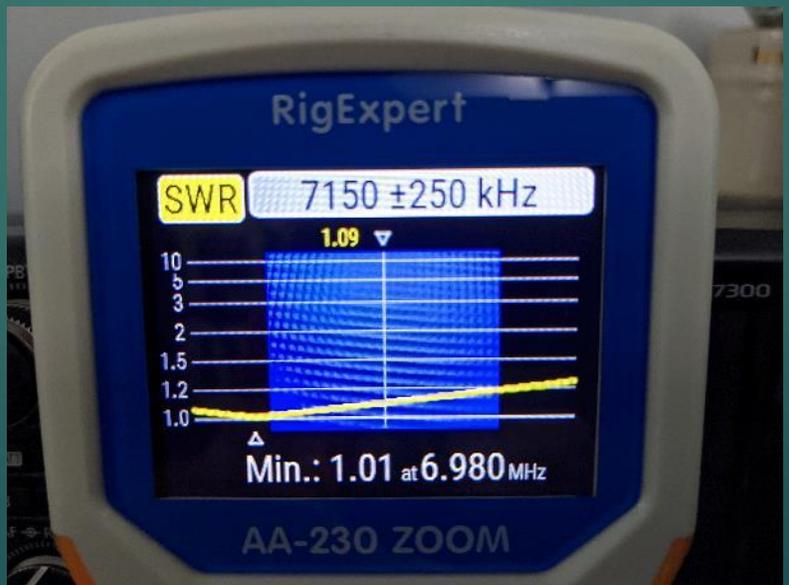
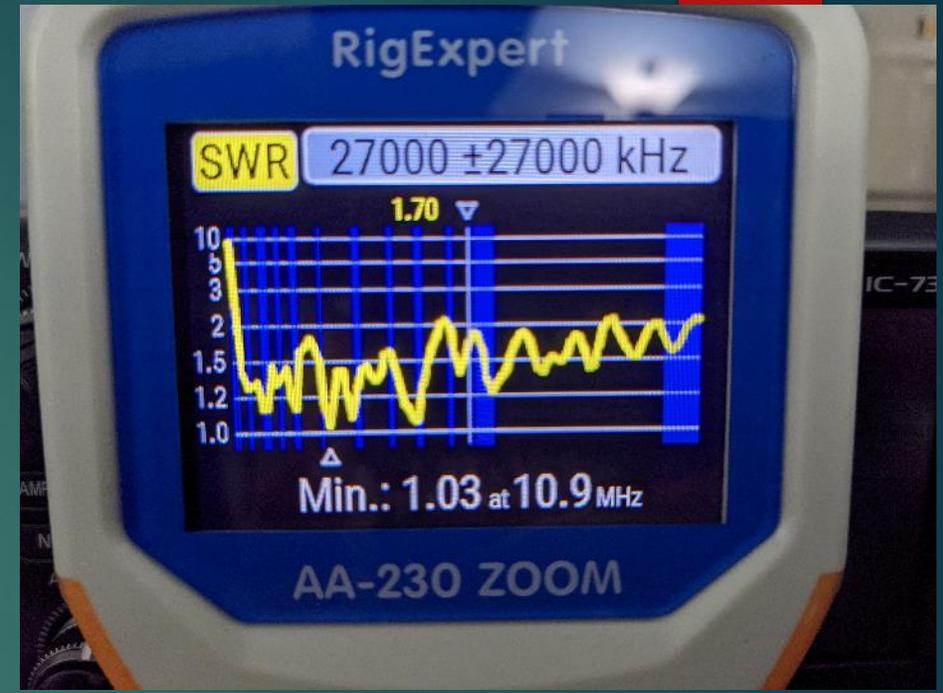


# My Installation



# SWR Testing

- ▶ As advertised, <2:1 SWR from 160-6M
- ▶ Many bands lower than that
- ▶ Even has usable SWR at the bottom of 2M (about 1.5:1 at 144 MHz)



# I can hear your criticisms...

- ▶ “A dummy load has low SWR too!”
- ▶ “At that height, it’s just a cloud warmer!”
- ▶ “There’s too much loss, it won’t work!”

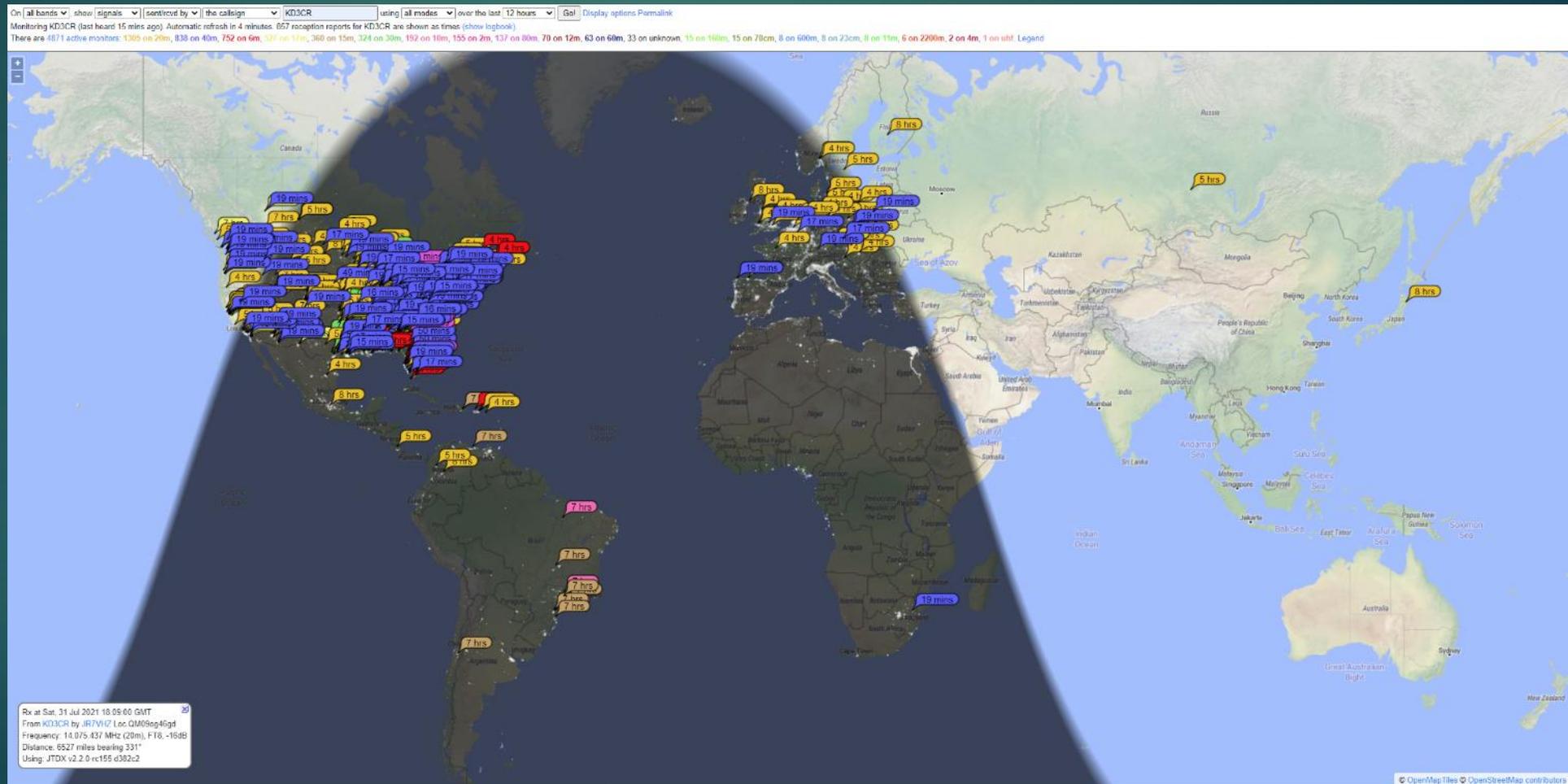


Photo credit: IMG Flip (<https://imgflip.com/memegenerator>)



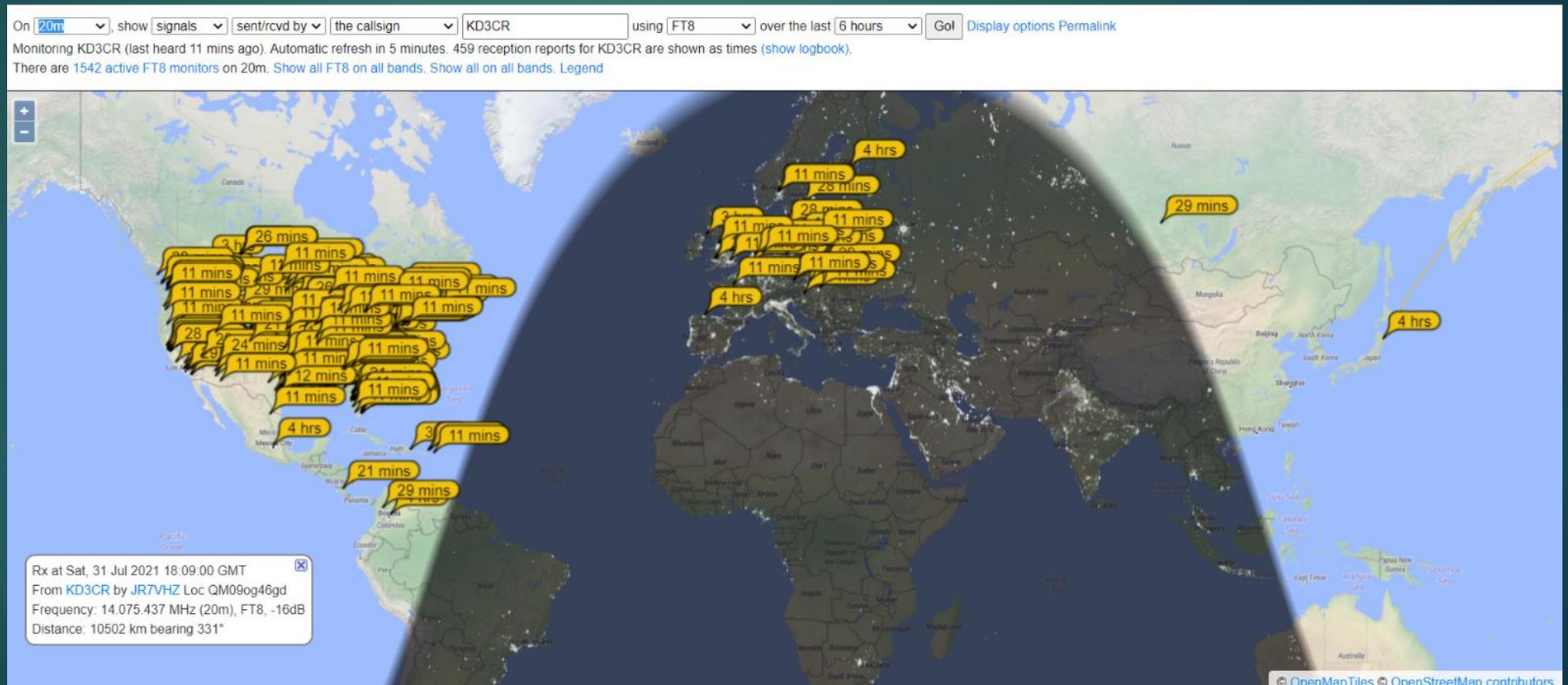
# On-Air Testing

► Yes... IT WORKS!



# On-Air Testing

- ▶ During the day, I was heard 6,527 miles (10,500 km) away in Japan!



# On-Air Testing

- I made contacts as far away as Venezuela and Estonia, from a MD attic with just 100W

192200	-11	0.4	445	~	CQ	YW200BC/1	SA
192215	Tx		445	~	<YW200BC/1>	KD3CR	FM19
192230	-10	0.4	445	~	KD3CR	<YW200BC/1>	-18
192245	Tx		445	~	<YW200BC/1>	KD3CR	R-10
192300	-8	0.4	445	~	<KD3CR>	YW200BC/1	RR73
192315	Tx		445	~	YW200BC/1	<KD3CR>	73

193145	-16	0.3	774	~	CQ	ES5QA	KO38	EU
193200	Tx		773	~	ES5QA	KD3CR	FM19	
193215	-15	0.4	772	~	KD3CR	ES5QA	-12	
193231	Tx		773	~	ES5QA	KD3CR	R-15	
193245	-17	0.3	773	~	KD3CR	ES5QA	-12	
193300	Tx		773	~	ES5QA	KD3CR	R-15	
193315	-17	0.4	772	~	KD3CR	ES5QA	RR73	
193330	Tx		773	~	ES5QA	KD3CR	73	

Estonia on 17M →



Enter Query... by Callsign Search Database News



SHOP NOW



## YW200BC

Venezuela

### BICENTENARIO BATALLA DE CARABOBO

Radio Club Valencia AC  
(24 Apr 2021 to 31 Dic 2021)  
Venezuela

QSL: QSL Manager: YV4KW  
Email: Use mouse to view..

Page managed by YV4KW Lookups: 14714

Biography Detail Logbook 597 Awards 6

← Venezuela on 15M



Enter Query... by Callsign Search Database



SHOP NOW



## ES5QA

Estonia

### VALERI KALJAGIN

KIVIREHE TALU  
KÕPU KÜLA 48208  
Estonia

QSL: HOME ADDRESS  
Email: Use mouse to view..

Ham Member Lookups: 83412

Biography Detail Logbook 8



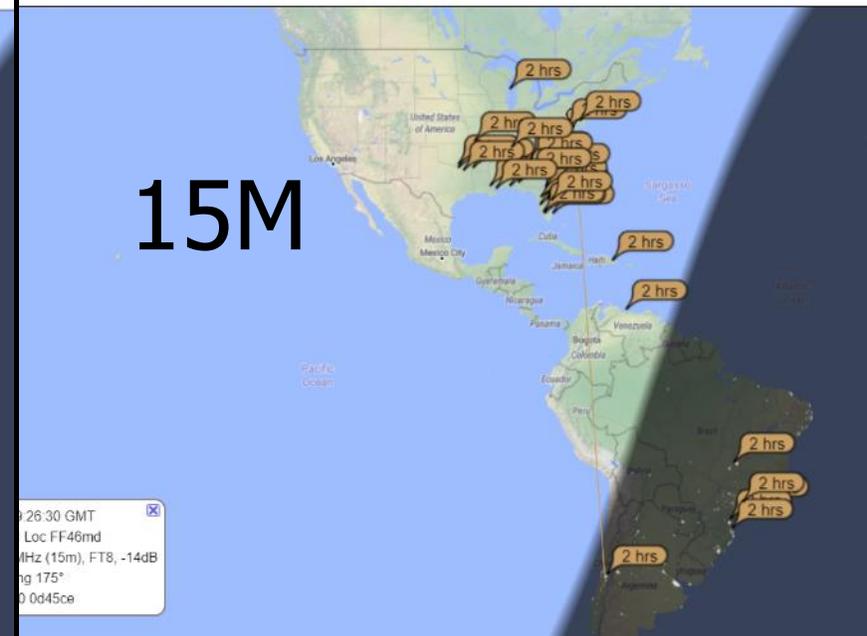
6M monitoring KD3CR (last heard 5 mins ago). Automatic refresh in 5 minutes. 48 reception reports for KD3CR are shown as times (show logbook). There are 1065 active FT8 monitors on 6m. Show all FT8 on all bands. Show all on all bands. Legend



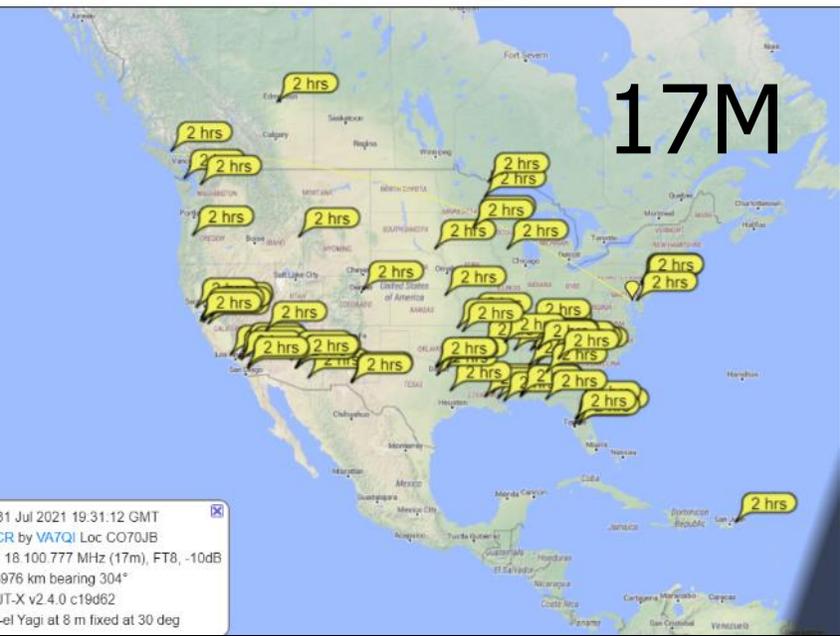
10M monitoring KD3CR (last heard 6 mins ago). Automatic refresh in 5 minutes. 13 reception reports for KD3CR are shown as times (show logbook). There are 1065 active FT8 monitors on 10m. Show all FT8 on all bands. Show all on all bands. Legend



15M monitoring KD3CR (last heard 8 mins ago). Automatic refresh in 5 minutes. 35 reception reports for KD3CR are shown as times (show logbook). There are 1065 active FT8 monitors on 15m. Show all FT8 on all bands. Show all on all bands. Legend



17M monitoring KD3CR (last heard 9 mins ago). Automatic refresh in 5 minutes. 85 reception reports for KD3CR are shown as times (show logbook). There are 448 active FT8 monitors on 17m. Show all FT8 on all bands. Show all on all bands. Legend



30M monitoring KD3CR (last heard 12 mins ago). Automatic refresh in 5 minutes. 41 reception reports for KD3CR are shown as times (show logbook). There are 448 active FT8 monitors on 30m. Show all FT8 on all bands. Show all on all bands. Legend

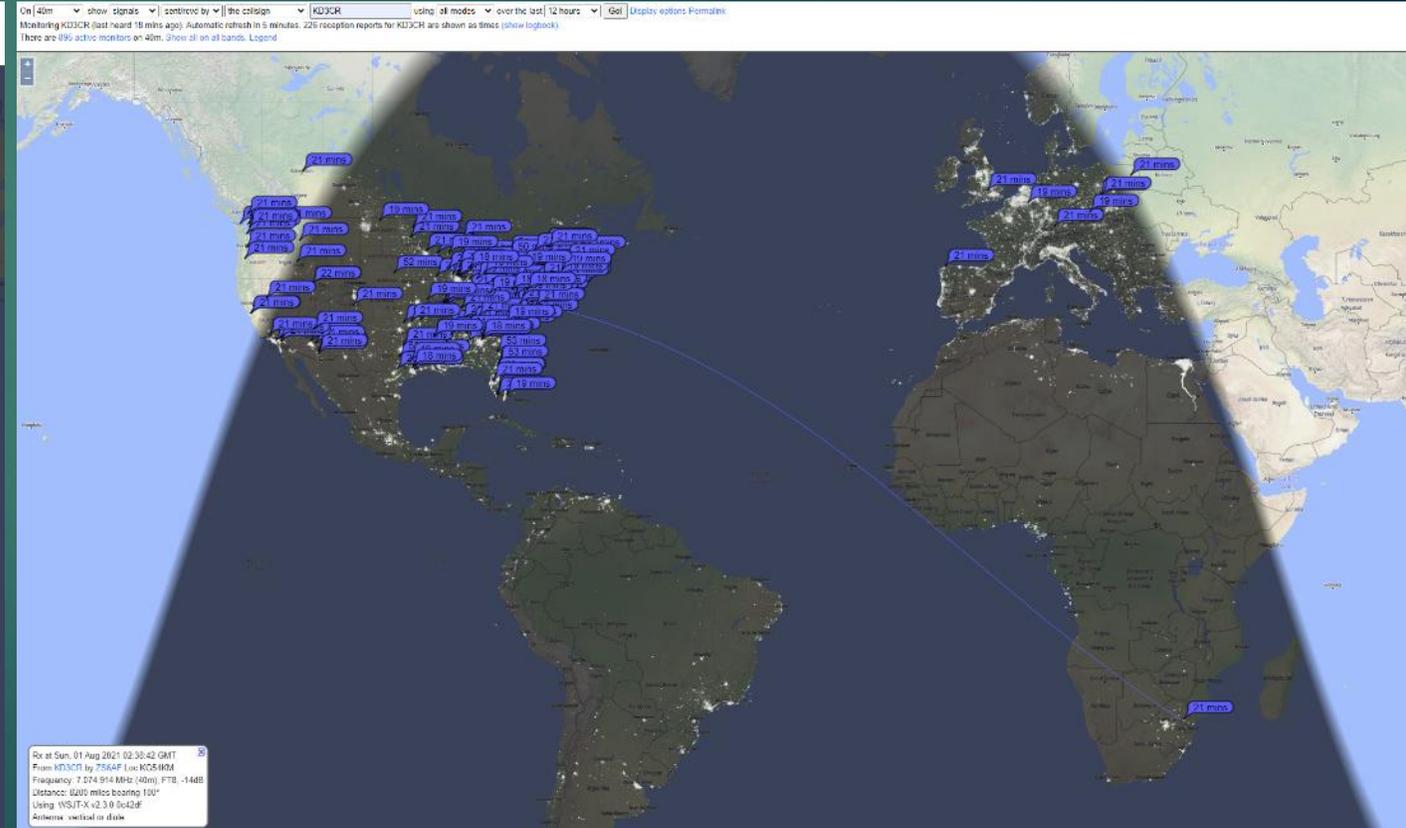
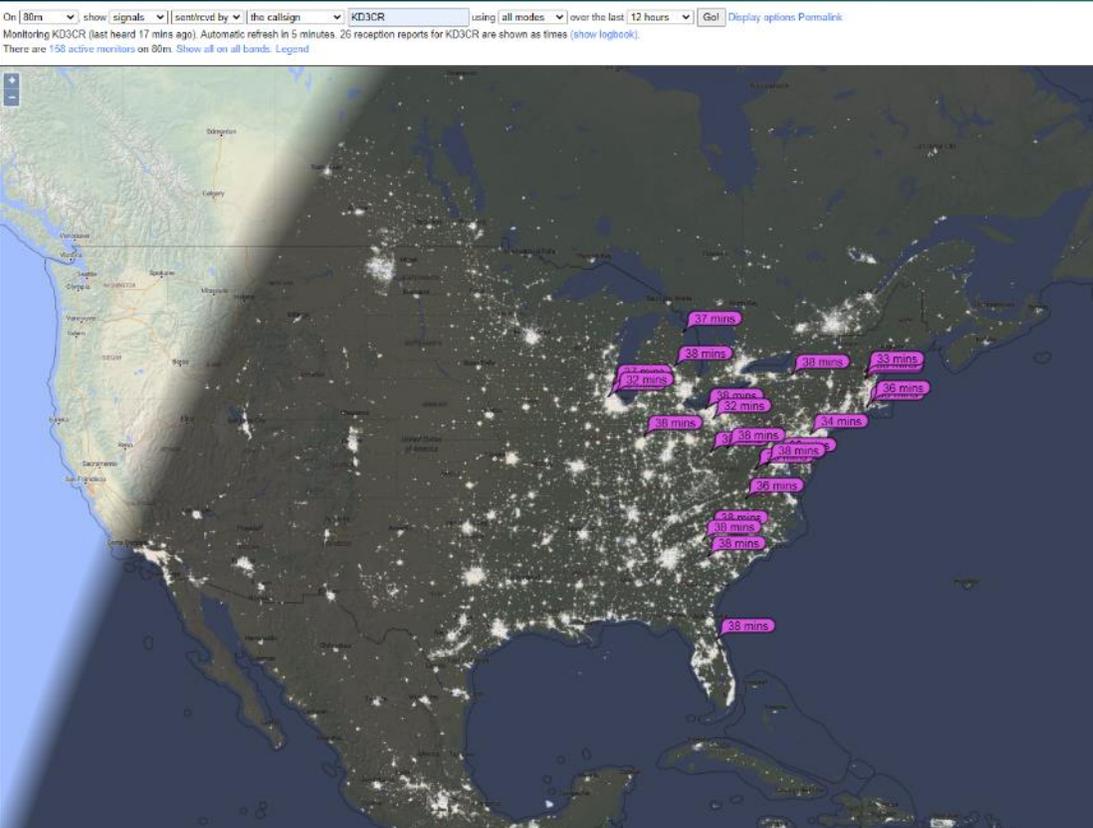


40M monitoring KD3CR (last heard 12 mins ago). Automatic refresh in 5 minutes. 61 reception reports for KD3CR are shown as times (show logbook). There are 448 active FT8 monitors on 40m. Show all FT8 on all bands. Show all on all bands. Legend



# Night Propagation Testing

- ▶ Only heard locally on 80M
- ▶ But heard 8200 miles (13,200 km) away in South Africa on 40M!



# Testing: What About SSB?

- ▶ I've made contacts on that mode too
- ▶ Worked the final 1.5 days of 13 Colonies and confirmed 8 of 13 across 20M, 40M, and 80M
- ▶ Other QSOs with stations up and down the East Coast, and as far west as Texas so far
- ▶ Heard stations as far away as Argentina on 20M SSB, but I more commonly hear North American stations



# Conclusions

- ▶ Does this antenna beat a Yagi on a big tower? No.
- ▶ Does it beat a dipole up high and in the clear? No.
- ▶ There's no free lunch, and any attic antenna is going to be a compromise
- ▶ But it DOES get me on the air, making contacts!
- ▶ It's the best attic antenna I've used so far, and the best solution for my HOA situation
- ▶ Will it work for you? It doesn't hurt to try!



# Thank You!

- ▶ QUESTIONS?
- ▶ Please connect to the Q&A segment starting now!
  
- ▶ Corey Ruth, KD3CR  
kd3cr@arrl.net

