



Ham Radio
in the 21st Century

Antennas for Restricted Spaces

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ARRL Midwest Convention

Lebanon, MO

Agenda

- Attic Antenna Evolution at ACØC
- Restricted Space Antennas Considerations
- Q&A

Attic Antenna Evolution at ACØC

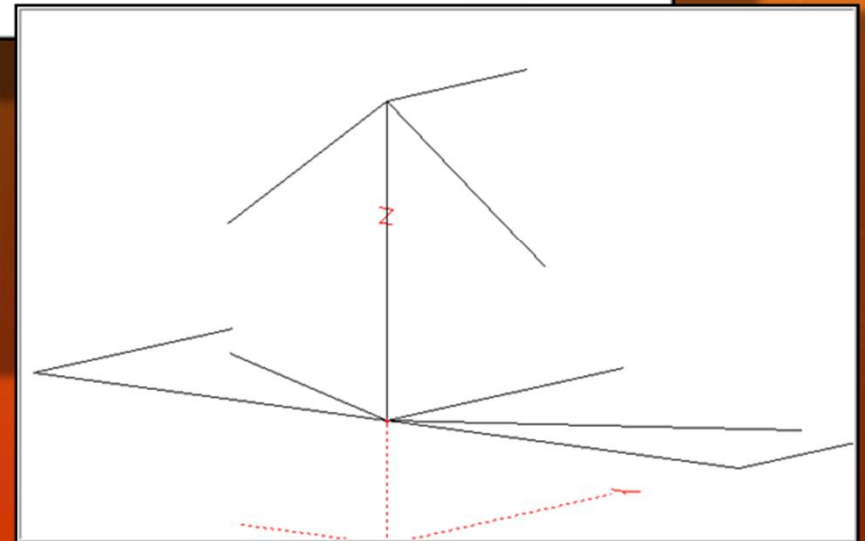
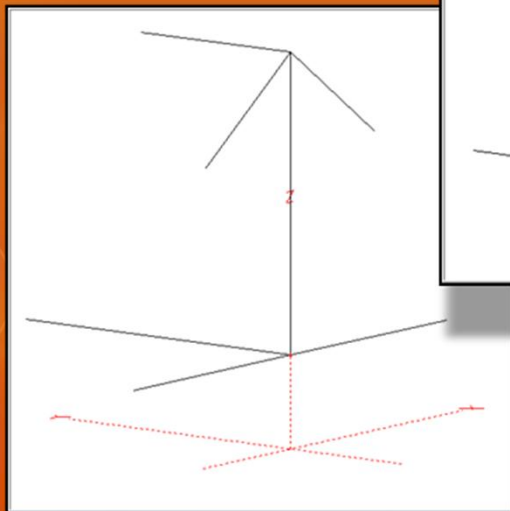
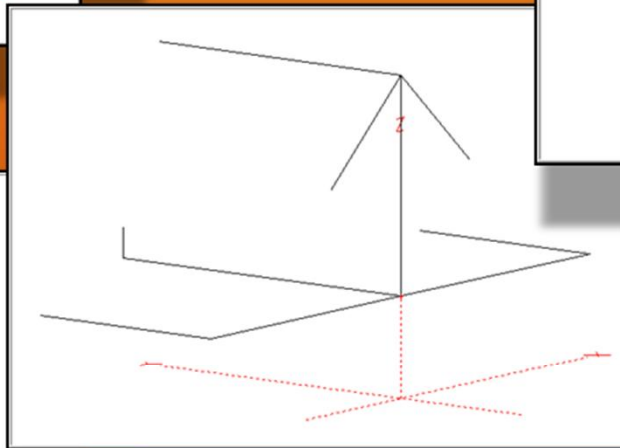
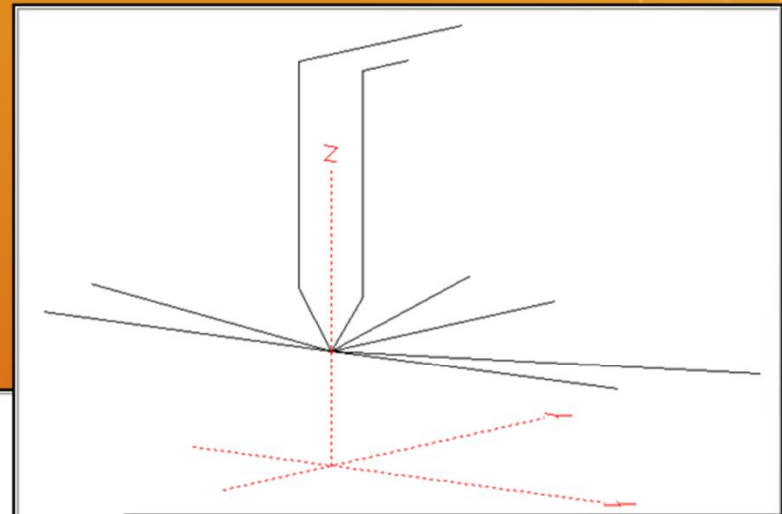
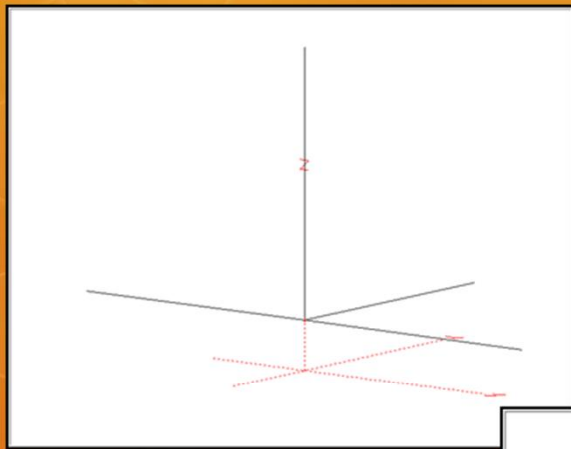
Fertile Antenna Farmland



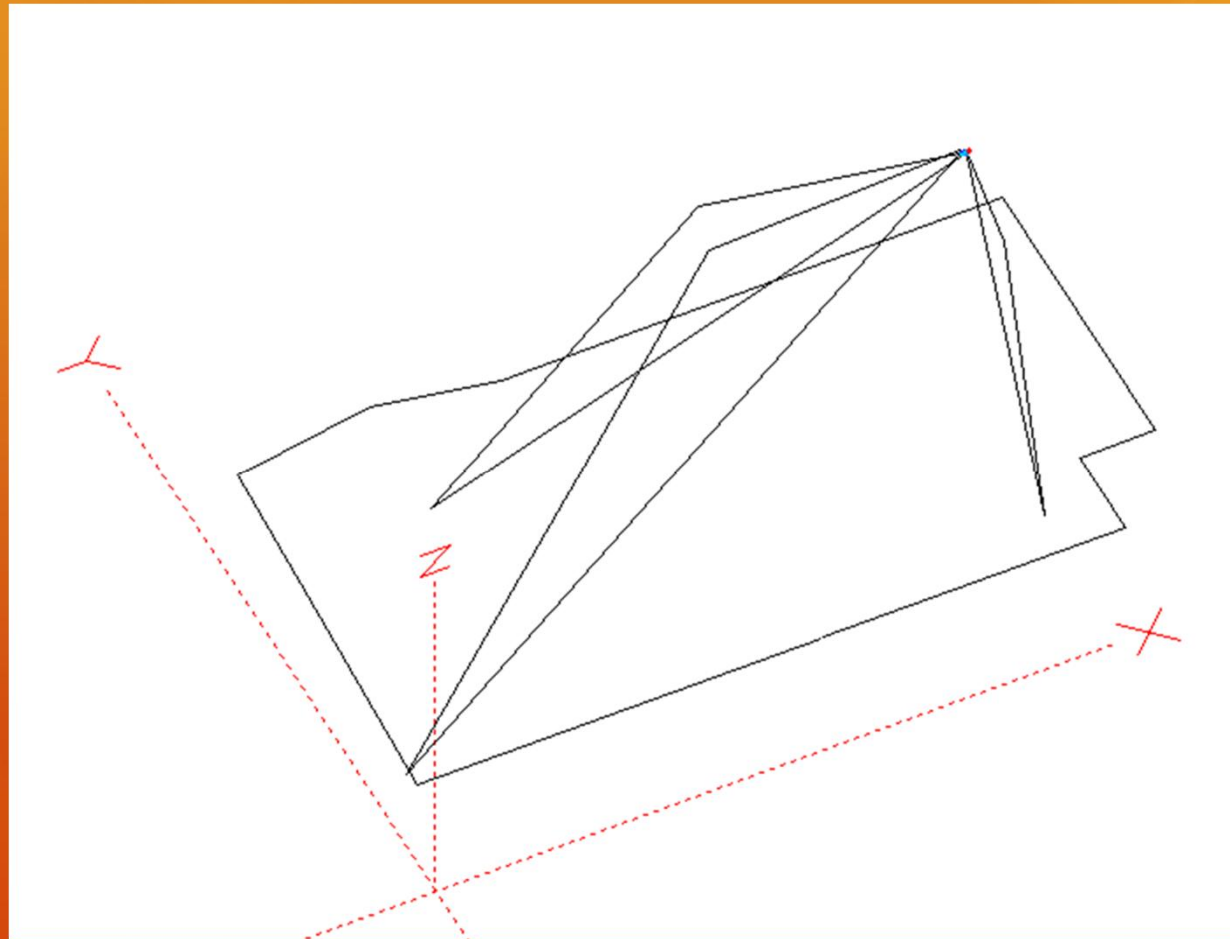
88' Zig-Zag Dipole



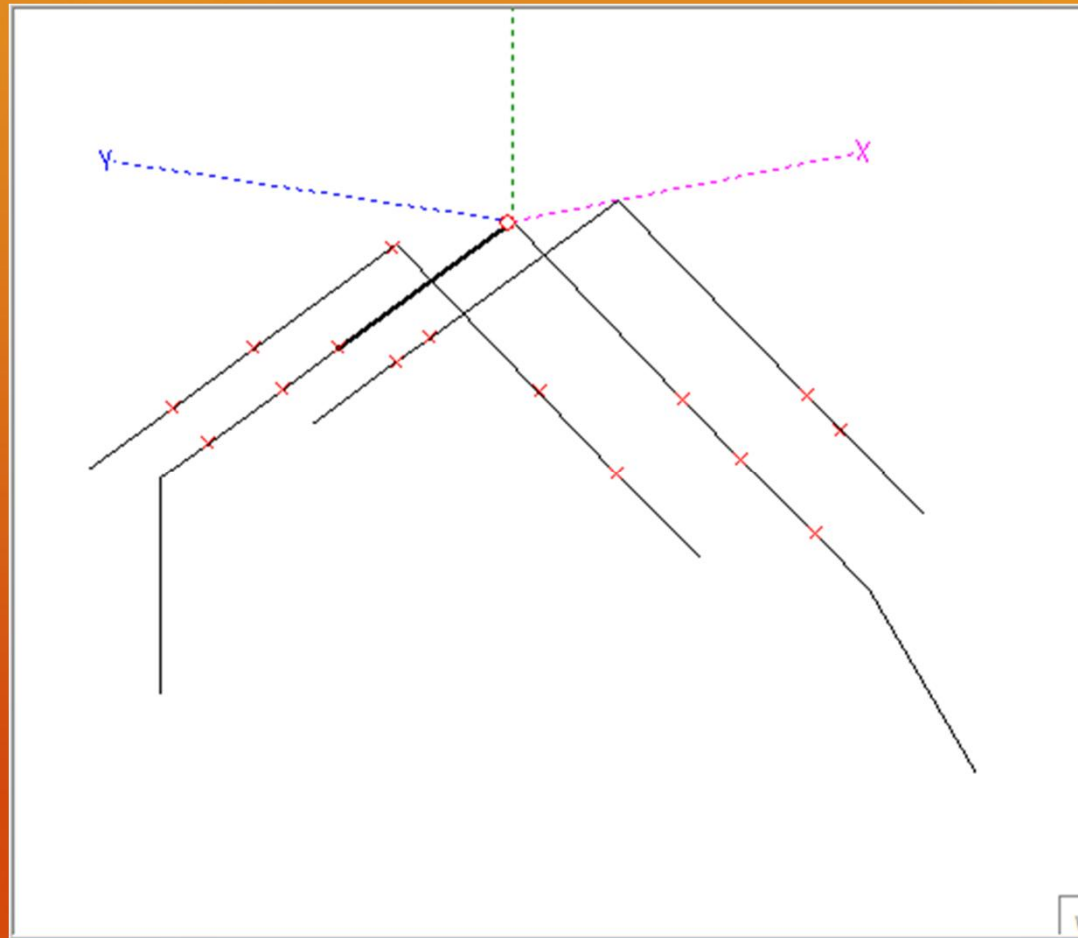
Looking for Something Better



15/20/30 Delta Loop



20/30/40m Reversible Wire V-Beam with 80m dipole

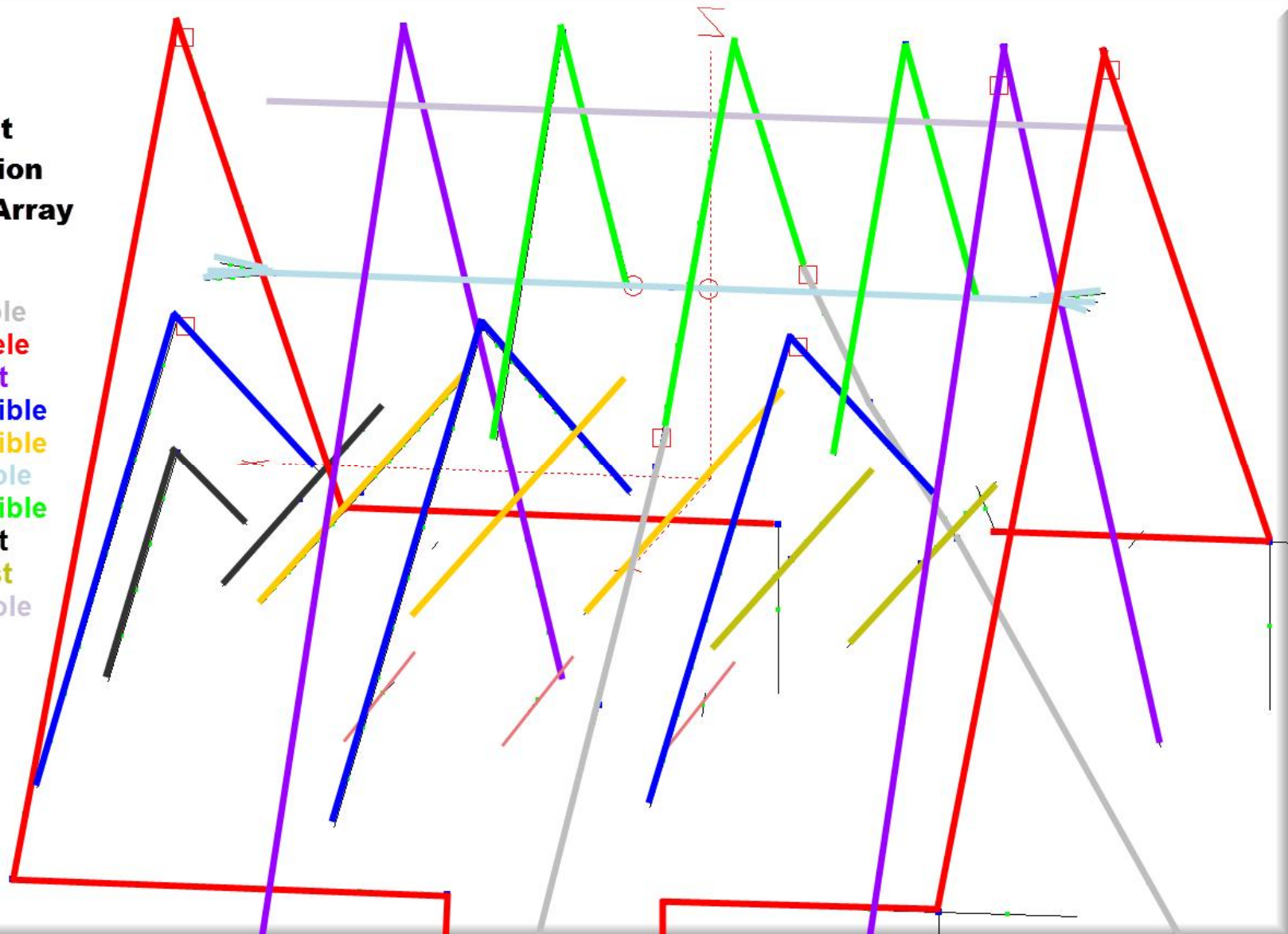


22-element 160-6 Reversible Array

ACØC

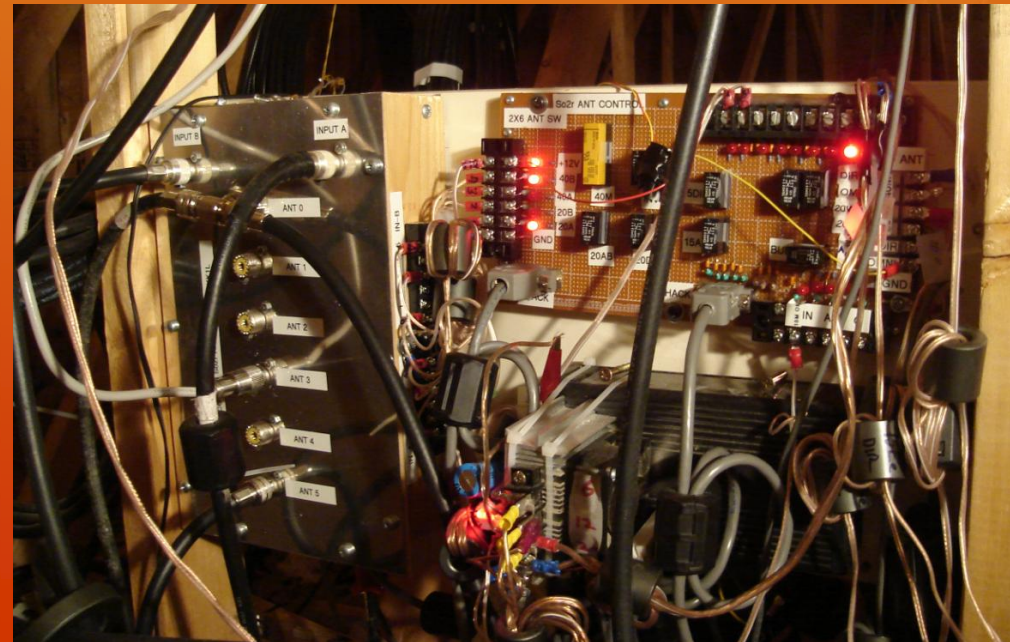
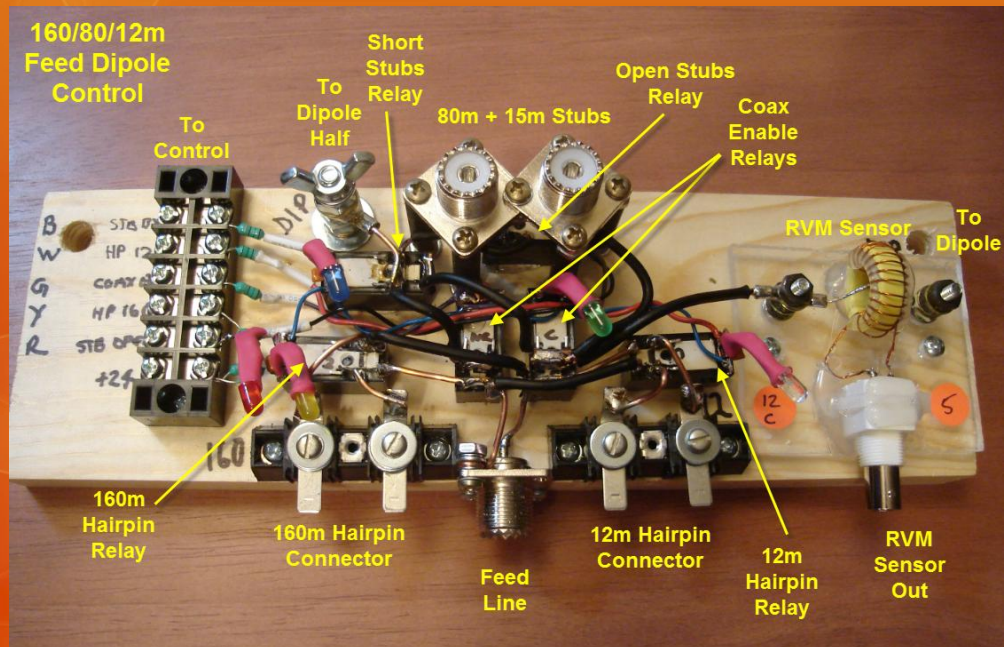
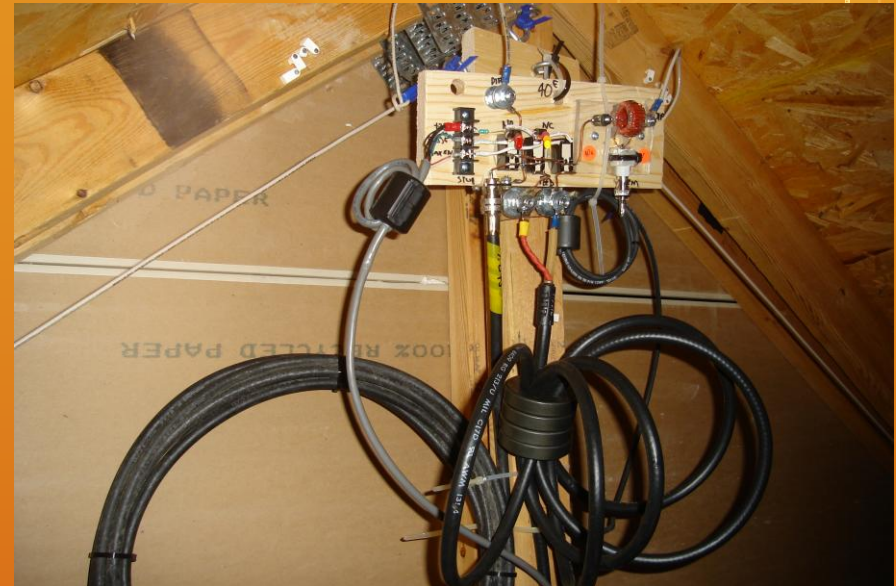
**22-element
5th Generation
Stealth Attic Array**

160m/80m dipole
40m phased 2-ele
30m 2-ele east
20m 2-ele reversible
15m 2-ele reversible
15m JA/SA dipole
12m 2-ele reversible
10m 2-ele east
10m 2-ele west
10m JA/SA dipole
6m 3-ele



Attic Insanity

- 3000' control and antenna wire
- 60 relays
- 1500' coax
- 200 T240 ferrites



Restricted Space Antenna Considerations

Inside vs. Outside

- **Away** is Always Better
- The closer the antenna is to the house, the bigger RFI problems are – both TX and RX
- A dipole outside 50' from the house beats an ideal beam in the attic!
- There is no free lunch. Everything gets harder the closer the antenna is to a house. Less space → more difficulty.

RX Limiting Factor : Noise

- Receive side noise is THE problem - not transmit side strength.
- Noise sources are dominated by gadget emission from your house.
- Put your focus on bug-hunting. Use the room-by-room breaker method. Switched power supplies are the worst offenders.
- The Twin Nightmares: AT&T Uverse and plasma TVs

TX Limiting Factor : RFI

- Overload and Common Mode
- No open wire feeders. Coax only.
- Use serious coax chokes K9YC shows how to build serious chokes.
- Naturally balanced resonant antennas (dipole type) give much less trouble than unresonant long-wire, etc types.
- Tuners in the shack are going to be more trouble from an RF control standpoint than antenna located remote tuners. These can be powered by bias tee or from attic AC tap to ceiling fixture, etc.
- Control the interference to local gear (and neighbors) by using serious type 31 ferrites.

Running Power

- Proceed with Ferrites in Hand
- QRO can be done but it's harder to do on a stealth basis as the risk of neighborhood gadgets picking up RF really jumps. There are less problems with QRP than QRO.
- Keeping the QRO payoff in perspective...
100w vs. 1.5KW = 2 S-units. And 5w vs. 100w = 2 S-units
- With higher powers and increasing frequencies, the more important the FCC radiated field limits become
- You can spend a lot of money on ferrites

Antenna Comments

- Propagation always wins
- Limited only by imagination - experiment
- Caveat: Trying to reach the next step in antenna performance can take a big increase in time, money, and effort.
- 15-40m are the sweet spot - reasonable sizes
- Don't fear trees. They provide great camouflage - try to keep wires spaced a bit from limbs, especially toward the ends.
- Modeling is very good at showing what **won't** work

More Antenna Comments

- Wires are detuned by proximity to everything - higher F, worse the problem. Be careful with wire ends - especially QRO at high frequency.
- Think efficiency and use the space you have. A cap hat is more efficient than a loading coil.
- Attic enemies include anything metal - wiring up high, stucco mesh, and thermal foil.
- Health risks of attic construction are real - falling, snags and nails, and heat.
- Got a big attic and a single band focus? Consider a 3-element wire beam.

Feed the center element and put a relay in the center of the two end elements. Short the relay contacts to point in that direction. Wire beams take much more work.
- Don't obsess on SWR. Call CQ instead.

Generic Antenna Recommendation

- Non-resonant dipole (Cebik 88')
- Far away from the house
- High as possible
- With a remote tuner mounted at the dipole feedpoint
- Serious coax choke at the antenna
- Coax run to the shack

Keep It Green

- Consider what may be ***tolerated*** in the neighborhood.
- Can you blend the wire into the environment so it's less noticeable?
- Can you dual purpose the antenna with something that is allowed (e.g. Flagpole).
- A portable antenna may skirt the HOA. Put your antenna on a car or trailer and run quick connect coax to the house. Disconnect when QRT.
- EMCOM is a big part of amateur radio. If your neighbors are aware you are a ham, then you should ensure they know about your EMCOM efforts.

Care and Feeding of Neighbors

- Get to be friends with your neighbors as they are going to be less likely to complain to the HOA and more likely to talk to you personally.
- Consider joining the HOA board - especially if you have some area of expertise that may benefit the HOA somehow.
- Don't bet on FCC action any time soon. Proceed with the expectation that HOA regulations will never be preempted.
- If you want an objective legal opinion - consider engaging Fred Hopengarten K1VR.
- Warning: If you want to take the SOBs to court, make sure you have a lot of money and a long time. It can be literally cheaper to move to a less/unrestricted QTH than to fight. It's certainly faster.
- The worst problems may be solved with old fashioned \$\$ grease. Replace ancient analog telephones with digital types for neighbor. The only known successful Plasma TV RFI cure: buy your neighbor a LCD type and sell the plasma on Craigs list.

Keeping it in Perspective

- Set goals around realistic targets
 - Try a single band instead of multi band entry in a contest
 - Judge your scores against your state instead of the entire call district
 - Redefine rules to create a local challenge with others
- Mode matters if you want to work DX.
 - SSB is on one end, and JT65 on the other end of the "easy to work dx with marginal antennas and lower power" spectrum.
 - CW, PSK are the most common because SNR improves as bandwidth narrows.
- Still don't see a good solution? GOTA alternatives include:
 - Remote operation
 - Club stations
 - Buddies shack.

Key Points

- Noise is the limiting factor
- Think in terms of “AWAY FROM”
- Bug hunt often for new noise sources
- Experiment with different antennas to see what works best
- Relationships with neighbors are key
- Secret weapons: TIC and CALL-CQ



Thanks!



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