“Stealth” Antennas

Antennas are ALWAYS a series of compromises

- Effectiveness – Bandwidth, impedance (SWR), resonance
- Cost
- Size, weight
- Deployability
- Make_ability

SIZE MATTERS!

- Bigger is generally better
- ¼ wave shortest resonance
- Bigger cross section wider bandwidth

“Stealth” Antennas - Considerations/Priorities

- Happy transmitter
  - SWR, Impedance, Loading
- Happy receiver
  - Efficient transducer – receive and transmit
- Happy neighbors & spouse
  - Visibility, Impact, Legal issues
- Happy wallet - cost
- Happy back – ease of construction, setup, takedown,
- Happy operating – tuning, dependabilty

“Stealth” Antennas - Happy transmitter - SWR

- Most transmitters want 50 ohm impedance load, mismatch reflects, reflected adds to transmitted, voltage and current can exceed component limits
  - Transmitter will reduce power or be damaged
  - EVERY transition reflects – adapters, bends
  - Impedance – R, C, I - varies with frequency
- SWR measurement critical for all antennas, especially homebuilts.
- You need an SWR meter! antenna analyzer, some radios
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“Stealth” Antennas - Happy receiver - resonance

- Antenna is a transducer - electrical signal in wire to electromagnetic wave in space
  - Like speaker is transducer - electrical signal to air pressure wave, or microphone, or temp, pressure
- Checking resonance
  - Antenna analyzer gives good indication of system (antenna/inductance/capacitance) resonance
  - Receiver noise floor (level away from any signal)
  - I use my SDR with small antenna when transmitting
  - Signal strength meter/indicator

Impedance (SWR)/resonance are independent

- Great transducer can be and often is far from 50 ohm impedance – ½ wave dipole very resonant and near 300 ohms.
- BALUN (BALanced/UNbalanced – twinlead or dipole to coax)
- UNUN (Unbalanced/UNbalanced – coax to whip)
- Tuners (variable inductor & capacitor) can make transmitter happy with pretty wrong impedance but resonant antenna, or make a great dummy load...

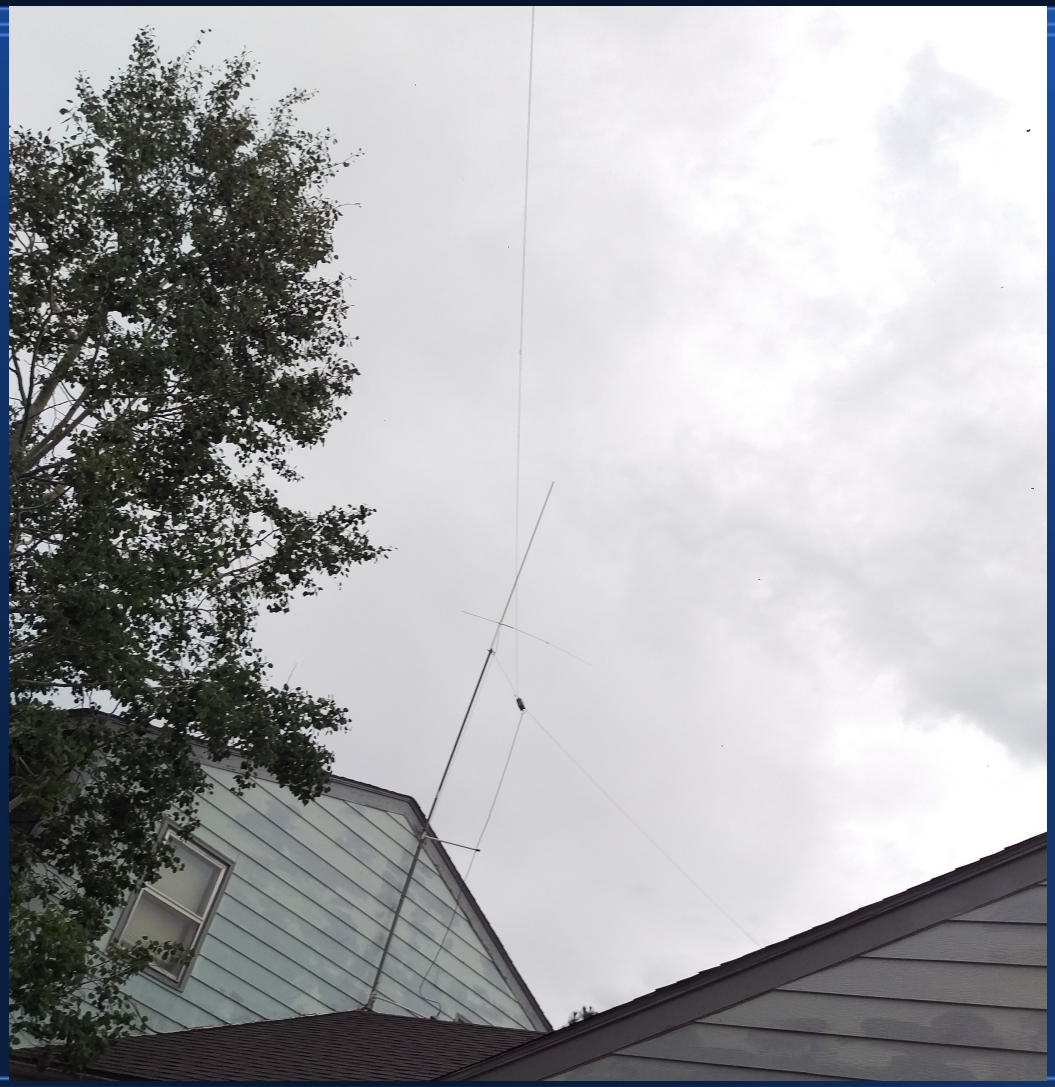
“Stealth” Antennas
HF vs VHF/UHF

- Above 50MHz – generally no tuners, tune antennas
  - Mobile – generally less about stealth than garaging
    - Shorties, foldovers, magmounts
  - Base – storm (lightning) ops, neighbor and spouse
    - J-pole in attic, magmount on cookie sheet
    - Metal roof – small mobile antenna almost invisible
- HF – BALUNS, UNUNS, TUNERS
  - Wire outside – tree hung can be almost invisible
  - Vertical in chain link fence
  - “Flagpole” classic and works!
  - Wire in attic

Antennas – legal, HOA, Covenants

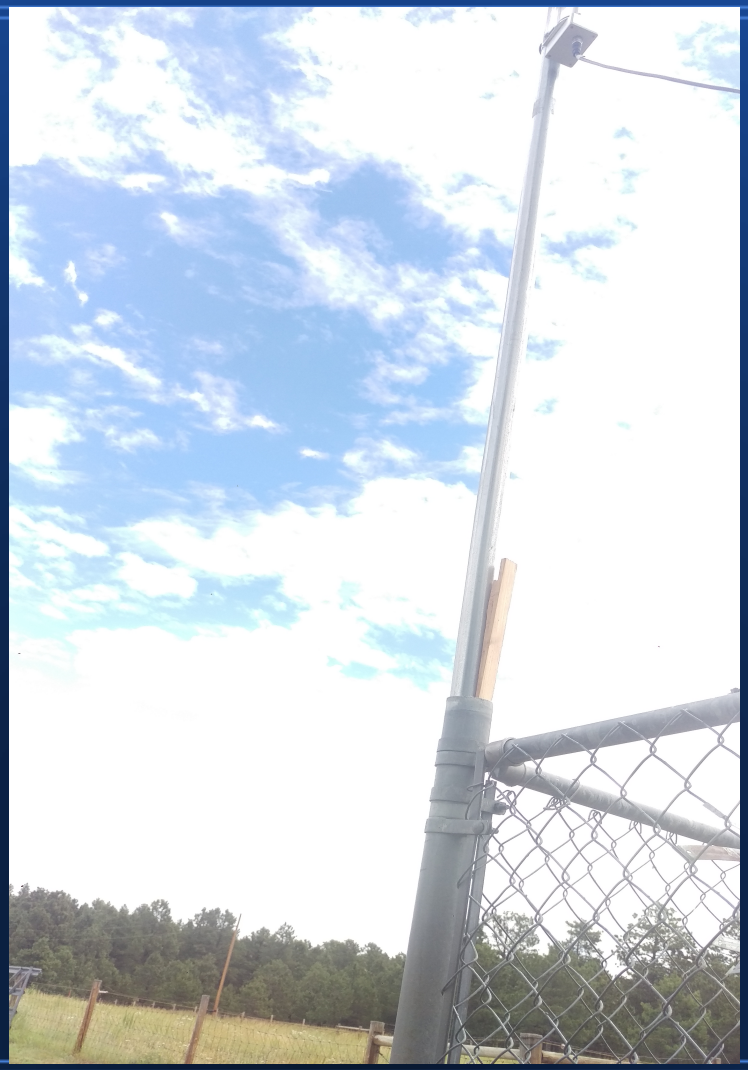
- HOA agreement, covenants - private contracts usually pretty toothless unless someone pays a lawyer – and you can pay a lawyer to state absolutely anything you want
- Federal – PRB-1 Federal Pre-emption, requires minimum practical regulation with reasonable accommodation for radio amateurs
- Colorado – signed law, Senate Bill 15-041 – no local government "shall enact or enforce an ordnance or resolution regulating Amateur Radio antennas that fails to conform " with PRB-1's "reasonable accommodation" provisions
- The Woodmoor Gestapo WIA is a law unto itself but especially Woodmoor should recognize the value of emergency fire communications
- RF Exposure! You are responsible!, but <100 Watts usually not an issue, just think about it!

“Stealth” Antennas HF vs VHF/UHF



- Quad band vertical >50MHz, ~ $150 Ebay
- OFC long wire HF ~$80 Ebay, (~120ft/80ft) to trees, reversing BALUN makes vertical radiate, sloping/not straight line
- Trees crossbow shot, nylon string
- 160-10 meter with tuner, 100 Watts worked Europe, Japan

“Stealth” Antennas
HF vs VHF/UHF



- ~25ft vertical HF – 80m – 10m with tuner
- Radio tuner generally not enough
- UNON
- ~$100 on Ebay
- Mounted on chain-link line post in corner post – advertised as “no ground radials needed” but chain link fence improves greatly
- Worked all of US, Spain 100Watts
- 10 minutes setup/takedown

“Stealth” Antennas - > 100MHz, outdoor

- Easily invisible – usually less than 6ft -
- Complaints? Tell'm it's temporary!
- Steel roof? Mag mount a mobile! Or cookie sheet on roof....
- 144/440 easy! - multiple resonance, 220 NSM but inactive
- Hang J-pole from a tree or whatever – tell'm its a windchime
- Small cable lossy above ~50MHz, big cable hard to route

“Stealth” Antennas - > 100MHz, indoor

- Good as backup storm antenna anyway
- Steel roof? - probably OOL
- J-pole from rafters – my garage has three...plumbers J-pole about 10 minutes and $6..started and had 6 of them....
- 144/440 easy! - multiple resonance, 220 NSM but inactive
- Directionals – I have 6 element Yagi in attic for WP, works...
- Get as far from any material, esp metal, as possible

“Stealth” Antennas - < 100MHz, outdoor

- Think about hiding – bigger is better, wire can be pretty invisible
- Bent resonant wire is better than short tuned wire
- Complaints? Tell'em it's temporary!
- Tuners!
- Vertical vs horizontal
- Small cable generally not too lossy
- Steel poor conductor (electric fence, barbed wire), aluminum/copper good

“Stealth” Antennas - < 100MHz, indoor

- Good as backup for storms
- Bent resonant wire is better than short tuned wire, attics, pinned on walls, loops in a room, hanging from tree
- Complaints? Tell'em it's temporary! - till your tower arrives
- Tuners! - Highly resonant antennas, esp odd shapes, very narrow band!
- Vertical vs horizontal
- Loops!

“Stealth” Antennas - Wrap up

- Creativity!!! Antennas are “fiddly”, plan on it!
- Resonant always better than tuned, odd shapes can resonate
- Rather beg forgiveness than ask permission
- Tuners! Baluns, Ununs
- Meters!
- Cables! >100MHz bigger is better, <100MHZ NSM
- Ebay can be your friend....
- Lots, and lots, and lots of resources on-line