14 Antennas for HOAs & Apartments



Start with some important background information

This talk applies to HF / VHF / UHF antennas

Reciprocity theorem

- Antennas work exactly as well or poorly, whether you receive or transmit.
- An antenna that picks up signals well-- will also transmit well.
- A better antenna will provide MORE POW-ER at its feedpoint terminals than a poor antenna --- and will create a stronger transmitted electromagnetic field when transmitting.

Aperture

EM field: a plane wave with a specific power density per square meter.
At microwave, dishes simply SCOOP UP power....more aperture = more signal.
Turns out that WIRE ANTENNAS don't work quite the same way (a shock to me).
A short antenna is not necessarily at a disadvantage from APERTURE....but....

Radiation Resistance

- Proportional to (Length/wavelength)²
- Shorter length ==> MUCH lower radiation resistance.
- Ohmic resistive losses due to wiring.....may suck up more and more of the power (on both receive and transmit)
- Really short antennas typically require bigger and bigger inductors---> more and more ohmic losses....lower efficiency

EFFICIENCY is what you want

- Minimize the losses in your transmission line and antenna.
- Highest radiation resistance possible
- Lowest losses in matching system(s) and transmission lines
- Minimize the lossy material right next to your antenna.
- Reduce lossy material
- Reduce coupling to substantial metal items nearby

Get OUTSIDE of concrete/metal buildings

Losses of 30-50 dB
NIST study of buildin
About to be destroy

Table 17. 50 MHz frequency band.											
		Ref.			Std.						
	Freq.	level	Median	Mean	Dev.						
Structure/Location	(MH)	(dBm)	(dB)	(dB)	(dB)						
New Orleans, LA apartment	5	-3.7	-35.9	-37.5	13.1						
Philadelphia, PA sports stadium											
First inside walk; horiz. polar.	50	0.0	-34.0	-29.5	15.5						
Second inside walk; horiz. polar.	50	0.0	-44.4	-42.8	8.8						
Inside walk; vert. polar.	50	0.0	-36.8	-32.8	14.2						
Outside walk; horiz. polar.	50	0.0	-32.8	-27.8	15.5						
Outside walk; vert. polar.	50	0.0	-41.8	-36.0	18.4						
Phoenix, AZ office											
Colorado Springs, CO, CO hotel complex											
First walk-through, Receive site 1	50	-23.7	-62.8	-58.0	17.6						
Second walk-through, Receive site 1	50	-29.2	-58.2	-56.2	11.1						
First walk-through, Receive site 2	50	-57.6	-14.9	-12.3	5.3						
Second walk-through, Receive site 2	50	-31.5	-62.9	-57.8	12.4						
Grocery Store (Boulder, CO)	50	-35.4	-45.1	-43.1	12.0						
NIST office (Gaithersburg, MD)	50	-21.3	-68.6	-62.1	16.5						
Shopping mall (Bethesda, MD)											
Receiver site 1	0	-47.3	-49.4	-47.2	5.9						
Receiver site 2	5	-48.9	-44.4	-42.2	9.7						
Discovery office (Silver Spring, MD)	50	-21.6	-64.2	-63.7	11.4						
Washington, DC convention center											
Receiver site 1	50	- 19.1	-63.9	-62.3	12.5						
Receiver site 2	50	-263	-50.6	-49.8	14						
Receiver site 3	50	-13.3	-67.4	-65.3	15.5						
Hard West American (Devilier)						1					

Not good at any frequency

DB of loss at different frea / diff. Bldas...

	50	150	225	450	900	1.8	2.4	
Scenario	MHz	MHz	MHz	MHz	MHz	GHz	GHz	4.9 GHz
1	-37.5	-27.9	-33.1	-39.7	-34.2	-34.0	NA	NA
2	-32.8	-39.2	-34.2	-28.7	-27.2	-26.5	NA	NA
3	-58.0	-37.6	-39.5	-30.0	-34.1	NA	NA	NA
4	-43.1	-36.0	-43.0	-29.2	-33.8	-39.3	NA	NA
5	-62.1	-41.6	-44.1	-46.9	-57.7	-55.6	NA	NA
6	-47.2	-46.5	-49.9	-52.8	-44.6	-33.3	NA	NA
7	-63.7	-55.7	-60.3	-52.4	-70.4	-67.2	NA	NA
8	-65.3	-66.0	-62.3	-57.3	-66.4	-58.2	NA	NA
9	NA	-24.9	-25.9	-25.4	-27.0	-25.6	-17.5	-36.3
10	-50.3	-33.7	-34.1	-37.8	-42.7	-39.7	-41.1	-48.5
11	-50.2	-54.8	-43.3	-37.9	-28.9	-26	-62.7	-59.9

Table 27. Mean values of scenarios used for structure/building attenuation statistics.

50-75 Ohms at its resonant frequency and odd harmonics

The Lowly Dipole



Droop the ends any old way you like if you don't have enough room --- it will still work!



You can bend it also --- it will still work.

Yup....this too



This also works



My public WINLINK gateway uses an inverted Vee and handles HUNDREDS of contacts per month. Inverted Vee has both horizontal AND vertical characteristics....

And this too!



What's the common theme?

- Put WIRE in space, run radio current through it....
- AND YOU'VE GOT AN ANTENNA!!!
- It might not have the exact pattern you like...
- It might not have the exact impedance you prefer....
- It might not resonate exactly where you wanted....
- BUT ALL OF THAT CAN BE HANDLED
- So just do it!

About the ONLY THING THAT DOESNT WORK....

Is not putting up an antenna.....

1. Attic Antennas

Plain wire antenna or rigid hamsticks

tennas Especially stealth models for those in an HOA

23 / 33

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Hamstick dipoles



Attic Antennas & Safety

- I have never in my life seen a spark from an antenna....
- But use insulated wire and hang the ends free from everything, with insulators and light rope.
 Fiberglass is fireproof.

Places to put antenna

2. Run an invisible wire up a pine or oak tree

- 3. Wire over the roof matching shingles
- 4. Balcony temporarily haul out loaded dual-Hamstick dipole



5. Flagpole Vertical



Antennas in Plain Sight – Invisible

- 6. Weather Instrument Antenna PVC pipe holding plastic weather vane etc.... vertical antenna wire is inside. Either ¼ wave vertical or end-fed half-wave (transformer) design – works on multiple bands.
- 7. Solar Powered Light Pole same idea, with solar powered light on top of PVC pole.

What a nice outdoor speaker!

 8. Back Patio Outside Speaker/Radio – (Empty) speaker boxes are hung high at opposite ends of Patio, "speaker wire" connecting to them is a dipole. Meets at center, coax or zipwire balanced line down to the "Radio" (and thence to tuner etc.) If you are REALLY clever you can actually have the speakers WORK also....just don't try it while you're transmitting!

9. Purple Martin Birdhouse

- Actually, my neighbor JUST PUT IN ONE OF THESE ---on a pole on the fence between us. Could easily have a vertical antenna. Want an Inverted Vee? "Guy Wires!" Feed line then goes
- Feed line then goes down the pole and slight slit trench to your house.



10. Crappie Pole



 In Florida, everyone fishes, right? Old 20foot crappie pole rod (with wire for fishing line) stored vertical off your back porch makes a nice antenna. Put an old tackle box out of the rain nearby for a nice effect.

www.alamy.com - BKR3EP

11. Tire Swing Vertical

Who doesn't want a tire swing from a 30' branch of the old oak tree? Weave the antenna wire into the rope before hanging your wonderful play toy. An auto-tuner can even go inside the tire! A "stablizing rope" holds the tire still when not being swung....and provides a place for your feedline to connect and go underground to your house.



12. Badmitton Net

 Yep – that wire woven into the netting is invisible and makes a nice dipole. Or end fed!



13. Magnolia Tree

- You could hide #10 WIRE inside a magnolia tree as a vertical and no one would ever find it.....#20 is impossible to see these things provide so much cover.
- I think you could hide an entire sniper team in some of them....

14. Lightning Arrestor

 Get a zinc or copper rod about a foot long, and hire someone to attach it in a tree near your home several feet higher than your roof as a "Lightning Rod" --- use ANY SIZE WIRE YOU WANT coming down from it..... Put in a standard Home Depot 8 foot ground rod....and a big hidden knife switch between the "ground wire" and the "ground rod". Feed with feedline, short to ground when not in use --- protects your house!!! Who can argue with that?

NEXT: Transmission line

- Losses a function of type and length
- ♦ 300 ohm twinlead low loss
- RG-174 high loss
- RG-58 tolerable at low frequencies

Baluns & Tuners

- Easy to make / purchase 1:1 current and 1:4 current/voltage baluns
- Both manual and auto-tuners available



What's in a WALL? Getting the transmission line out of the house

- Frames home egress is easy: drill a hole with a LONG drill bit (so the holes line up) then pass a coat hanger stiff wire and work up to transmission line.
- Drip loop outside!
- Caulk with waterproof caulk
- Easiest up HIGH just under the overhang (covered)



MFJ Window Pass Thru (6 models)





Or make it yourself with a pressure treated 2x2 and a drill.....for pennies

Lightning protection



Nice copper-coated STEEL ground rods are in abundance at home depot.... generaly use CLAMPs rather than soldered connections for grounding syste... avoids melting of solder by lightning. Clamps are at Home Depot/Lowes,

http://www.arrl.org/files/file/QST/This%20Month%20in%20QST/June2017/Chusid-Morgan.pdf

Other ways out!

- Drill thru ceiling, route through attic to exit louvered vent windows
- Or down out through a hole through the overhang
- Pick cool part of day/night to work in the attic and don't put foot thru ceiling....





Kenneth Carr: http://idlenot.com/?p=416

FIND: Attic Ant; Speaker Ant.; Birdhouse; Hamsticks, Hidden Wire (2); Rooftop Hidden

