

## **Newcomers and Elmers Net: Hiding Antennas Inside and Out**

**By Robert Gulley AK3Q 5/25/14**

Indoor antennas represent a real challenge because of RFI issues—not only can the antenna cause interference in the shack, it can also cause interference to neighbors.

-- However, some judicious use of shielding can help immensely, as can some experimentation with bands/frequencies.

-- The harsh reality exists that there may be some bands or portions of bands which have to be off-limits, or bands where power levels must be reduced to QRP levels.

-- Another reality may be the need to operate at strategic times of the day, such as operating at night with an antenna mounted to the window sill or on a tripod on the apartment deck. (I didn't say operating would be convenient!)

-- While I would always prefer to have an antenna I can leave mounted in place, this may not be an option—but if the desire to operate is strong enough a bit of inconvenience will not be a burden.

### **Accepting Compromise**

The ham who has to operate under limited conditions must accept some compromise, whether in terms of band operation, power limitations, or radiation patterns.

-- If conditions are particularly difficult there may even need to be restrictions on the modes used or a juggling of operations to match the flow of activity in terms of neighbors or other interference-causing elements.

-- As radio folks we are already used to working within limitations, particularly propagation, band, and power restrictions.

-- On the positive side of things, the old saying applies—where there is a will there is a way. We just have to be willing to work with what we can, while at the same time look for ways to increase our potential.

### **Natural Indoor Camouflage**

Chances are good if we need to put an antenna indoors there are some natural camouflage solutions if we think hard enough.

-- Baseboard is a logical one, as chances are good a thin wire can be looped around a room (or along a long hallway, etc,) which can be hidden or disguised fairly well for the casual glance.

-- Carpets, floor runners, and furniture can hide a lot!

-- Following the rafters along the inside roof line may allow for a good antenna to be mounted indoors, such as a lazy H, Moxon, or a rhombic.

-- Wire antennas are not nearly as demanding as is often thought; they can be bent, angled, and even change direction if carefully done.

- A straight wire dipole may be ideal, but it is hardly the only shape a dipole can take.
- Another "natural" camouflage possibility might be to use a wall hanging, such as a large hanging area rug, to hide a zigzag wire antenna or a fan dipole.
- The back of a large china cabinet might be used in much the same way. Is there paneling in a room of the house? This might be able to be removed, an antenna put up, and the paneling returned with no one the wiser.
- I was inspired by one fellow's solution, [K2ZS](#), where he used a 12'x12' room to put up an antenna which when used in conjunction with a wideband tuner, has allowed him to work DXCC with a range of 160-10 meters.
- He uses an auto-tuner in the room with the antenna, and then runs coax out to another room where the radio is located.
- This provides a degree of separation between antenna and radio, and is a very good idea if possible.
- A Delta loop fed with ladder line (or coax) can be a great indoor antenna. Delta loops might fit quite well in an attic, especially if the roof shape follows a triangular pattern.
- Larger areas may benefit from an inverted "V", or logistics may require it since many attics are used for storage
- If space/design allow, a second Delta loop might be possible to cover both N/S, E/W directions with an antenna switch to move between the two in the shack.

### **The Laws of Physics Still Apply**

One of the first things we have to accept and even integrate into our thinking is that the laws of physics still apply regardless of where we put up an antenna.

- Metal still acts as a conductor or as a potential short-circuit for a radio signals, and radio waves will couple with nearby surfaces if possible.
- Similarly ground conditions, polarization issues, and electrical length/characteristics all still apply.
- There is nothing magical about stealth or hidden antennas—the magic is in the creativity we have in hiding things in plain sight.

A simple example from memory is a clothes line antenna.

- While a neighborhood might not allow poles and wire for an antenna, some folks have been able to use clotheslines for antennas, either as a temporary antenna or as a permanent one in the back yard.
- They can sometimes be attached between two buildings, or between a building and a tree. A little creativity might even allow the antenna to move on a pulley system.
- Another common antenna which can be found described all around the Internet is a flag pole or birdhouse antenna.

- Either design is based on the support structure hiding an antenna, while the outward appearance leads people to believe its use is for something else.
- Gutter antennas or antennas which run along the eaves of the roof line are two additional common example of hidden antennas.
- When I say hidden I am using the term somewhat loosely to mean either actually hidden or relatively hidden without careful examination.
- The homeowner has the distinct advantage over the apartment or condo dweller of course, because property rights means folks are not as like to be able to get up close to see a partially hidden antenna, and this can be a good thing.
- The apartment or condo dweller has to work under tougher conditions since anything outside of his or her living space is subject to examination/discovery.
- Since it really is usually easier to ask for forgiveness rather than permission, unless one is afraid of stiff fines or penalties, the best option is to come up with a hidden antenna design which is least likely to be discovered and then just start operating.
- If someone finds the antenna then it's time for a little diplomacy!

### **Natural Outdoor Camouflage**

Start looking around the house or operating area for natural camouflage.

- Trees are obvious choices, particularly in the summer, but they can also work in winter when the leaves are gone.
- The trick is to use wire which mimics or is an even smaller diameter than the upper branches of the tree.
- Keep in mind that our eyes tend to blur reality a bit, and we see what we expect to see. If a tree has a lot of branches, or there are several trees together, relatively thin antenna wire is not going to stand out.
- Even wire as thick as 14-gauge wire is thinner than most branches, and so all that is left is to deal with feedline connections and support ropes.
- An inverted V antenna is relatively simple to hide if the center support is in a tree.
- Depending on distance an design coax can be used, but making a ladder line feedline might actually be more inconspicuous, as well as working better for a multi-band antenna.
- One design I ran across by Alex (KR1ST) has no splices between the feedline and the antenna—he simply makes a continuous run between the two elements, making the last 60' of each wire into the feedline.
- The insulated wires run through a wooden board right to the tuner. Very economical and simple.
- Depending on what is around the area, an end-fed Zepp might be a good solution since this design allows for the feedline to become part of the antenna, and only one leg of the antenna needs to go out horizontally.

-- With an end-fed Zepp one side of the feedline is open, and so the ladder line has to follow the normal rules for that type of feedline—nothing metal nearby and no sharp bends.

Natural camouflage can also mean allowing distance to minimize what someone sees.

-- If there are no trees directly around the house, 18- or 22-gauge wire may be thin enough to not be seen if placed high enough or far enough away from nosy neighbors.

-- When using small diameter wire, try to use stranded wire for more strength, as solid wire, especially when thin, has a tendency to break.

-- If the wire is able to be placed in such a way that it is relatively free of branches, I have found it will last for several years or more without damage, even through some tough winds.

-- I have a random wire antenna like this for shortwave radio use, and it has been in place for 4 or 5 years now, thanks to its very low wind resistance.

-- An example of an antenna made from thin wire is the [NorCal Doublet](#) which uses 4-wire computer ribbon cable to make the antenna, with each arm equaling about 22' and a feedline of around 28' as needed. The thin ribbon cable is very hard to see, and QRP or more is possible.

### **Antennas as Art**

One of the best ways to hide an antenna in plain sight is to make it part of the design of the house or of the yard.

-- The aforementioned birdhouse antenna can be as artistic as one's creativity allows, but can also be highly functional.

-- Another artistic way of hiding an antenna is in a trellis or grape arbor.

-- Trellises can often be fairly large along a wall of a house, and it would be easy to hide an antenna along the frame, such as a vertical Moxon or a lazy-H antenna.

-- Gardens in general can be an artistic cover for antennas, such as a loop antenna or a sloper, OCF dipole or the like, particularly if there is the opportunity to use posts or trees in the garden.

-- On a smaller scale a bird feeder or a cleverly designed set of wind chimes might hide an antenna, as could almost any artistic hanging design.

-- What is inside the birdfeeder does not have to be birdseed—it could easily hide a feedpoint or balun or the like.

### **Vertical Antennas**

The advantage to a rectangular vertical design is that they are relatively easy to hide in plain sight.

-- While vertical antennas have some well-known limitations, they are far from useless when understood properly.

-- Since we are trying to hide our antennas, meaning our situation calls for some level of compromise already, a vertically polarized antenna is not at all a bad choice.

-- (Some antennas like a Quad or Delta loop can of course be mounted vertically and still have horizontal polarization.)

One example of a variation on a lazy-h antenna is called the Skeleton Slot antenna, which is a great small space antenna.

-- Don Wilks (G3VCG) has a very informative [page](#) with several designs, one which I have reproduced here to give the general idea of proportions.

-- This antenna can be scaled up or down, but is best used around 20 meters or above, on up into the VHF/UHF range.

-- The design can be a rectangle or more like the bowtie pictured here to increase gain slightly and lower take-off angles.

-- While a vertical dipole or even a vertical end-fed antenna may seem obvious, I mention it because there is such a bias against vertical antennas this option may have been overlooked by some.

-- Using thin wire and ladder line for a feedline, a vertical wire antenna may be just the thing. These antennas only need one support, they can be hung unobtrusively with a little imagination, and the feedline can be disguised as well.

-- The only thing to remember about the feedline is that it usually needs to be run at least  $1/4\lambda$  perpendicular to the vertical radiating wire, or as close to  $90^\circ$  as possible.

-- If using an end-fed antenna then the most logical spot for the feedline is near the ground so that the radials can be hidden along the ground.

-- Smaller antennas for 2 meters or above, can be easily hidden in trees or the like.

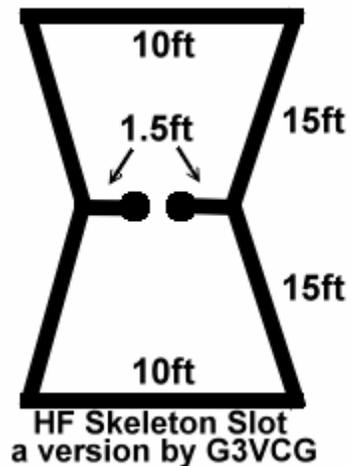
-- A wire J-pole or ground-plane antenna is hard to see unless right up on it.

-- A friend of mine has a rather large 2-meter J-pole antenna made from copper which is still hard to see from any real distance.

-- If using coax it may be the hardest part of the antenna to hide, but even here a little creativity will keep it hidden.

-- Try painting the coax a camouflage color, or hide the line with some brush or other naturally occurring material.

-- Even visual breaks can hide things such that if the whole wire cannot be hidden, partial covering at points may break up the visual pattern at a distance and keep prying eyes from seeing the antenna.



-- If satellite antennas are allowed in the neighborhood, a stealth VHF/UHF antenna may be able to be hidden behind the dish and the feedline run into the house along the same path as the satellite coax.

### **Inside/Outside**

Another stealth option is to run the radiating part of the antenna outside while running the counterpoise inside; this limits the antenna exposure, and therefore the risk of detection.

-- This can be a permanent fixture or one which is taken in and out as needed. The key is to get some height at the feedline point.

-- A second floor room or attic is ideal, as the feedpoint can be just inside the window and the counterpoise run along the inside of the house.

Each wire should be  $1/4\lambda$ , with the outdoor side connected to one side of a tuner and the counterpoise connected to the other side of the tuner.

-- The outside wire can be run horizontally or down at an angle, with any convenient support structure as a tie-off to keep the wire straight.

-- A balcony can present some interesting opportunities for antennas using this indoor/outdoor idea.

-- Depending on the decking material and the building material, a loop antenna could be run along the base of the deck with the coax coming in at floor level into the house.

-- A vertical antenna could be disguised as a potted tree if decorated such that the post for the "tree" can be made to look like a tree with artificial flowers.

-- Hobby/craft stores have all kinds of interesting decorations which the amateur radio operator might put to good use, and as a bonus, might be acceptable to one's significant other!

-- One option a balcony may give is the ability to use an outdoor tuner to balance a long-wire antenna.

-- With the tuner at the feedpoint of the antenna the coax going into the house will have little effect on the SWR, and this may allow the use of an antenna length which might not be optimal otherwise, particularly for multiple bands.

-- Similarly a privacy fence, if allowed, can easily hide a random-length antenna, or a loop antenna.

-- Again, while the setup might not be ideal in terms of height above ground, or directivity, something is better than nothing.

-- A portion of a band is better than not being on the band at all, and operating at opportune times is better than no operation.

-- Sacrifices will have to be made, but usually we can do more with what we have than we think we can.