5 inch “Ultra Light” FSL Antenna

Maximum AM-DXing Performance from a Minimal Package

By Gary DeBock, Puyallup, WA, USA February 2012

Introduction Graham Maynard’s initial article describing an innovative ferrite sleeve antenna certainly caused a sensation among experimenters, who quickly realized that this new design was one of the major breakthroughs in the effectiveness of portable AM-DXing antennas. Massive orders were placed for Russian surplus ferrite rods and bars in a collective search for maximum FSL gain, while various design options were explored by individual experimenters going in their own chosen direction. Some very effective design models were created, but they all had one common characteristic—they were considered overpriced and inaccessible by the vast majority of the Ultralight radio enthusiast group. One of the major antenna discoveries in recent history was being enjoyed by only a select few.

Publication of a 7 Inch “Affordable” FSL design last October was an attempt to bridge the gap with these overlooked DXers, but it soon became obvious that the $150 target price of the antenna just wasn’t “affordable” enough for most of the target audience. Poor economic conditions had stretched hobby-related budgets very thin, and a radically different approach would be necessary to provide any practical kind of FSL antenna option for the scores of interested DXers still on the sidelines.

It was obvious that various design corners could be cut to provide a cheap and mediocre FSL antenna, but that certainly wasn’t anything worthy of the interested DXers, or of the testing resources available here. It became a fascinating challenge to design and create a potent but pint-sized antenna that would cost around $90 to build (as of January 2012), but deliver enough AM-DXing performance to make hobbyists completely forget that they were ever using an “economy model.” The target FSL would be a tiny thriller, with sufficient inductive coupling gain to provide a major boost in hobby excitement for all users.

Project Overview One of the major challenges in FSL antenna design is relating the performance of the new loops to a standard which is commonly known and accepted in the AM-DXing community. The author was fortunate to have PVC air core loops of various sizes on hand during the development of this 5” FSL model (and other models), making it possible to accurately judge its weak-signal reception capability against that of various air core loops (as in the testing process, shown at right). Despite the reduced scale of this FSL model, the highest quality Litz wire and vernier-drive variable capacitor were retained in an effort to provide maximum DXing performance for its size—and when this 5” FSL’s weak-signal reception was found to be equivalent to that of a full-sized 4’ air core box loop, the design challenge of creating a tiny thriller was considered a success.

In an effort to make construction as simple as possible the antenna’s components were chosen because of their plentiful supply, and most of them have been stockpiled by the author. The Russian surplus 140mm x 8mm ferrite rods are currently available in good quantity from at least two eBay sellers in the Ukraine (“Alexer1” and “Sovtube”), and the 660/46 Litz wire is also commonly available from the eBay seller “Mkmak222.”. There is no need to install pipe insulation layers—a 5” long “Big Boss Noodle” section (available from the author) simply slides into a 3” diameter rubber plumbing coupler with a vinyl liner locking strip, providing a soft, padded base for protection of the 45 ferrite rods. Finally, the antenna has slip-resistant rubber grips on the two PVC “legs” for operation on wet surfaces, and provisions have also been made for plugging in a protective “rain hood” assembly. A compact Sterilite plastic tote (14 ¼” x 9 5/8” x 12 1/8”, which is commonly available at Walmart stores) can transport the antenna to a DXpedition site, and double as a weather-proof operating space for the 5” FSL and inductively-coupled portable radio (see photo).

Although FSL antennas are commonly used to boost DX signals in Ultralight radios, they are also highly effective in providing gain enhancement for full-sized AM-DXing portables like the Sony ICF-2010, Panasonic RF-2200 and other classic radios. Any radio with an AM loopstick can benefit greatly from such inductive coupling, especially in outdoor environments where the 5” FSL’s superior signal-to-noise capability can really be enjoyed. But even if outdoor DXing is impossible or inconvenient for you, this compact FSL model will still provide plenty of indoor hobby fun.

Construction Parts List To assemble the 5”

FSL the following parts will be required. Material marked with an asterisk (*) has been stockpiled by the author, and is available to builders at cost as long as supplies last.

A) 45 Russian surplus 140mm x 8mm ferrite rods, commonly available from the eBay sellers “Sovtube” and “Alexer1” (Note: Since about 10% of these rods come with noticeable bends or angles in them, it is advisable to order a total of about 50 rods so that 45 straight rods will be available.)
B) 40’ of 660/46 Litz wire, available from the eBay seller “Mkmak222” (Note: This seller commonly sells such wire in 60’ and 100’ lengths. Unless you need more such Litz wire for a second project, ask him to sell the 40’ length.)
C) A 381 pf, 8:1 drive variable capacitor from http://www.crystalradiosupply.com (Part #N50P), plus the control knob (control knob #3 from the same source)
D*) A 3” x 3” Fernco rubber plumbing coupler, Part #P-1056-33 (used to connect cast iron, plastic, copper, steel or lead), Available from McLendon’s hardware stores locally (source is http://www.fernco.com)
E*) A 5” long section of the “Big Boss Noodle” swimming floatation aide, 3.5” diameter
F*) One 12”, one 9”, two 3” and four 2.5” lengths of ¾” diameter Schedule 40 PVC pipe; four ¾” PVC “Tee” fittings (complete sets of precut PVC pipes and fittings are available from the author at cost)
G*) 1”, 2” or 4” wide Johnson & Johnson (or Rite Aid) waterproof tape roll
H*) One roll of Scotch brand “Extreme” strapping tape
I*) ½” wide Johnson & Johnson (or Rite Aid) waterproof tape roll
J*) A 12” x 4.5” section of “Magic Cover” vinyl top liner (source is http://www.kittrich.com)
K*) Three 120 pound-test, 18” long nylon cable tie wraps
L*) 12” length of 5/8” I.D. rubber heater hose
M*) One 6-32 x 3/8” machine screw, two 6-32 nuts, one #6 lockwasher, one #6 soldering lug
N*) 2 ½” long section of 3/32” shrink tubing
O*) Oatey 4” x 4” foam closet spacer
Miscellaneous: Oatey “Rain R Shine” blue PVC glue, Duro Super Glue, solder

Ferrite Ordering Notes The Russian surplus ferrite rods typically take several weeks to arrive in North America from the eBay sellers in the Ukraine. This particular size of ferrite rod has been ordered in serious quantities from both of these sellers during the past year, and was also the size used in the 7” “Affordable” FSL project. Current indications (as of February 2012) are that a very large stock of the 140mm x 8mm ferrite rods is still held by both of these Ukrainian sellers, which was one of the reasons why this particular size was chosen for the 5” FSL construction project.

Step By Step Construction 1) Refer to the photo at left. Take the

12” x 4.5” section of vinyl top liner and fold it in half lengthwise, so that it becomes a folded 12” x 2.25” section (ensure that the smoother side of the vinyl liner is on the inside, and the side with the gripping pattern is on the outside). Wrap this folded section as shown around the center of the Big Boss Noodle section, pulling it tightly so that one edge overlaps the other. Secure this overlapping section with a 2” strip of Scotch “Extreme” tape, as shown.

2) Face the folded edge of the liner toward the rubber coupler opening (as shown), and carefully insert the noodle/liner assembly into the rubber coupler edge by edge, so that the liner does not bind as it enters the rubber coupler. Using thumb pressure on both sides of the noodle/liner assembly, carefully work the assembly down (edge by edge) so that the liner stays flat against the inside of the rubber coupler. Continue this downward pressure (edge by edge) until the liner is completely hidden inside the coupler. Finally, push the Noodle edge downward until equal lengths of the Noodle are on each side of the rubber coupler, and both edges of the Noodle are exactly parallel with the edges of the rubber coupler (as shown in the photo at lower right).

3) Refer to the photo at right. Remove the paper label and any hose clamps from the rubber coupler, and using diagonal cutters, cut off any rubber tabs so that the rubber coupler has completely flat mounting surfaces for the ferrite rods. Using ½” waterproof tape, wrap 6 turns around both of the hose clamp slots so that an even, flat surface is created for mounting the ferrite rods.

4) Refer to the photo below. Using the wider waterproof tape (adhesive side out), tightly wrap several horizontal turns around the rubber coupler so that an evenly-spaced tape pattern is created to hold the ferrite rods. Overlap the end of each turn by about 2”, and ensure that each turn is wrapped tightly so that the turns will not slide up or down on the rubber coupler.

NOTE: It is common for the Russian surplus ferrite rods to have minor bends, but rods which are seriously bent or damaged should not be installed in the antenna. Perform a “roll test” on each individual rod (on a flat table) to check for serious flaws. Reject those that won’t roll.

5) Refer to the photo at left. Temporarily push the 9” PVC pipe section into the Noodle, so that the pipe’s lower edge is flush with the Noodle’s lower edge (and both are flat against a perfectly flat table). Choose a perfectly straight ferrite rod and press it tightly against the horizontal tape pattern, ensuring that it is exactly lined up vertically with the PVC pipe, and that the ferrite rod’s lower edge is flush against the flat table. This step is important in starting a tidy pattern.

6) Refer to the photo at right. Carefully press each of the ferrite rods tightly against the adjacent rod, ensuring that each rod is flush with the table, and that each rod remains lined up with the PVC pipe. Any

rods with minor bends (that pass the “roll test”) should be installed so that maximum contact with the waterproof tape is made. When the rod assembly is nearing completion, check to ensure that the gap between the installed rods remains parallel, and that the rods all have the same approximate height against the rubber coupler. It is acceptable to have a minor gap (1/8” or less) between the final rod and the first rod, since the following steps will compress the ferrite sleeve, and tend to eliminate minor gaps.

7) Refer to the photo below. Using the wider waterproof tape (adhesive side out) tightly wrap several horizontal turns around the ferrite sleeve (starting with the exact center section of the rods), so that a 4” wide pattern centering on the middle of the ferrite rods is covered. Ensure that each of these tape turns is tight, and that they will not slide up and down the ferrite sleeve. Overlap the end of each turn by about 2”. These tape turns help to secure the ferrite sleeve assembly in a cylindrical shape, and should be installed immediately after completion of the ferrite rod installation.

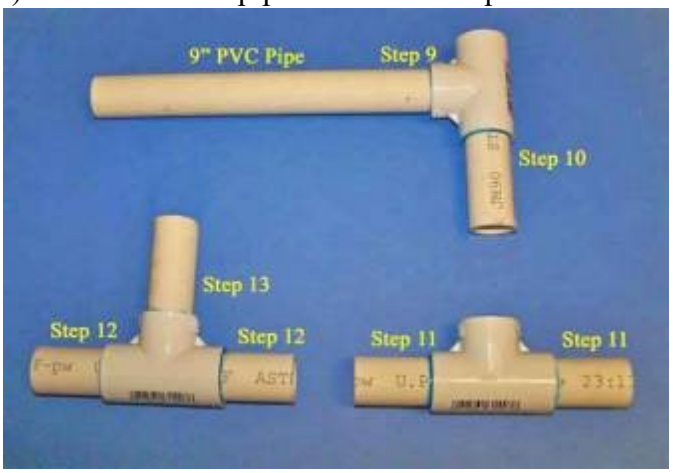
8) Refer to the photo at right. Using needle-nose pliers, carefully remove the stapler from the Oatey 4” x 4” foam closet spacer pack. Cut a 17” long section of foam spacer material (with straight, perpendicular edges), using foam spacer material which does not have serious gaps or holes. Tightly wrap this foam material around the 4” wide tape pattern on the ferrite sleeve assembly, ensuring that it is centered on the ferrite rods. Pull the foam material tightly (it has the ability to stretch, to some degree), and cut off any excess material on the ends so that the straight edges mate perfectly (see photo at right). While the foam material is still tightly stretched in this manner, secure the ends with a strip of the wider waterproof tape.

NOTE: The antenna’s PVC frame will be installed in the following steps. Detailed information on the preparation and gluing of PVC pipes and fittings is given in the PVC Loop article posted at http://www.am-dx.com/ThePVCLoopOverallArticle.pdf on Pages 3, 4 and 5. When performing the following steps, ensure that such instructions are understood and followed. Because of the inexpensive cost of the PVC fittings and pipes, it is advisable to practice making strong glue joints on a few scrap pieces before starting the assembly of the antenna’s frame. Each PVC gluing step should be read and understood completely before proceeding with the step. Because of strong glue fumes, all PVC gluing operations should be conducted outdoors.

9) Refer to the photo below. Remove the 9” PVC pipe from the ferrite sleeve assembly, and glue the center

opening of a PVC “Tee” fitting to one end of the pipe.

10) Glue a 3” PVC pipe to one of the open sides of the “Tee” fitting attached to the 9” PVC pipe.

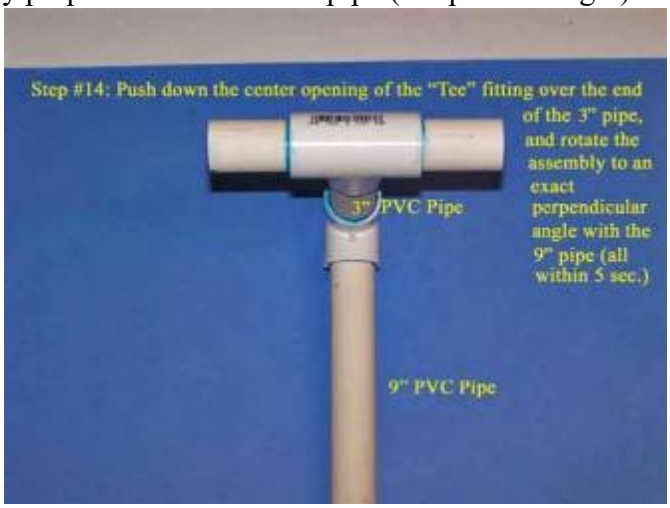


11) Glue a 2.5” PVC pipe to each of the open ends of another PVC “Tee” fitting.

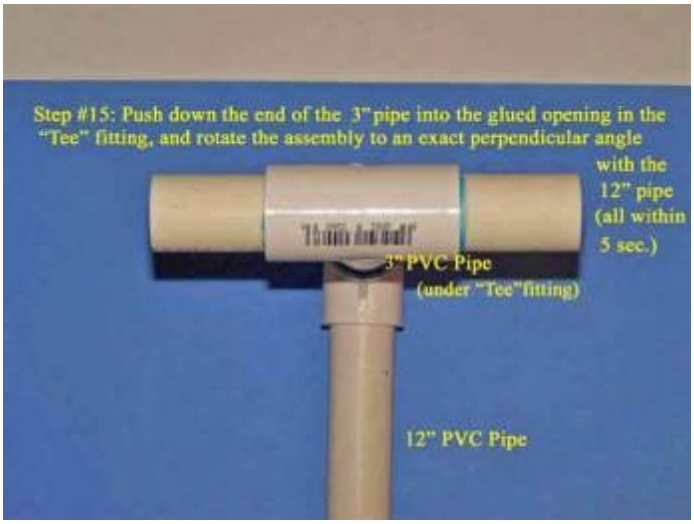
12) Take another PVC “Tee” fitting, and glue the remaining two 2.5” PVC pipes to each of the open ends of the fitting.

13) Glue the remaining 3” PVC pipe to the center opening of the “Tee” fitting used in Step #12.

14) Refer to the photo below. Take the 9” PVC pipe assembly and the PVC “Tee” assembly prepared in Step #11. Stand the 9” PVC pipe assembly on the open end of its “Tee” fitting (as shown). Apply PVC glue to the end of the 3” pipe (which is straight up), and then apply PVC glue to the center opening of the “Tee” fitting (prepared in Step #11). Perform the following steps within 5 seconds: push the “Tee” fitting down over the 3” pipe until the fitting bottoms out, and twist the “Tee” fitting until the 2 ½” pipes are exactly perpendicular to the 9” pipe (see photo at right).



15) Refer to the photo below. Insert the 12” PVC pipe securely into the center opening of the remaining “Tee” fitting (without glue) to be used as a perpendicular guide in this step. As in Step #14, stand the 12” PVC pipe assembly on one of the ends of the “Tee” fitting (in this case, so that the other open end of the “Tee” fitting is pointing upwards). Take the remaining PVC “Tee” assembly (prepared in Steps #12 and 13) and apply PVC glue to the edge of the 3” pipe, then apply PVC glue to the “Tee” opening (which is pointing upwards) of the 12” pipe assembly on the table. Perform the following steps within 5 seconds: push the 3” pipe assembly down into the glued end of the “Tee” fitting on the table until the pipe bottoms out, and twist the 3” pipe assembly until the 2 ½” pipes are exactly perpendicular to the 12” PVC pipe on the table. After this step, remove the 12” pipe from the assembly (it will not be used in the rest of the project).

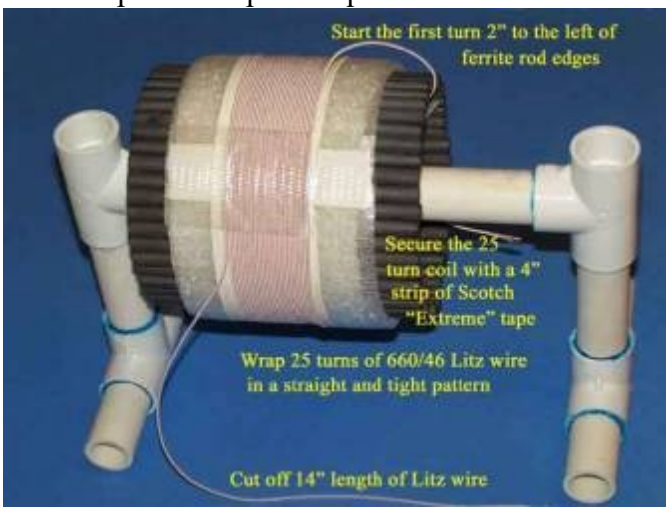


16) NOTE: The following step should be performed on a perfectly flat table. Refer to the photo at the top of the next page. Take the ferrite sleeve assembly, and reinsert the 9” PVC pipe (which now has a set of 2 ½” “legs” attached) into the side of the ferrite sleeve assembly which has the ferrite rods flush with the Noodle edge. Run the 9” pipe through the Noodle until the Noodle bumps up against the “Tee” fitting.

Temporarily lay the FSL assembly flat on the table, so that the open end of the 9” pipe is exposed for gluing. Take the remaining PVC 2 ½” “leg” assembly (prepared in Step #15), and apply PVC glue to the

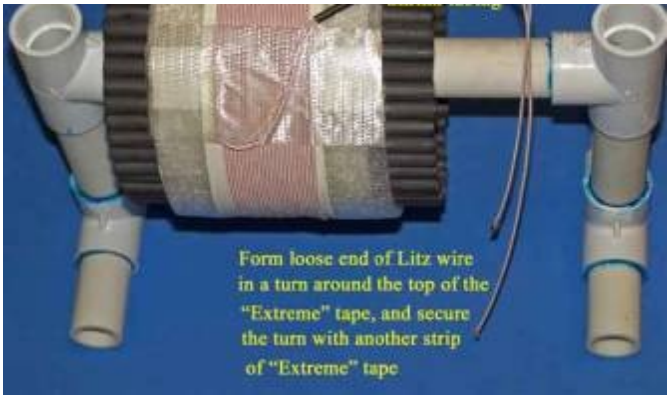
center opening of its “Tee” fitting, then apply PVC glue to the edge of the 9” pipe running through the ferrite sleeve assembly. Perform the following steps within 5 seconds: push the 9” pipe into the center opening of the “Tee” fitting until it bottoms out, pick up the entire assembly, and rotate the second “leg”assembly so that both sets of “legs” are fairly flat against the table. Force both sides of the frame hard downward against the table until the right side “leg” assembly is perfectly straight (while the glue is still wet, putting downward pressure on both sides of the frame will provide a perfectly straight match of the “legs,” as long as the table is perfectly flat). This completes the assembly of the antenna’s PVC frame—allow the glue fumes to vent outdoors before proceeding with the next steps.

17) Refer to the photo below for the following step. Place the FSL assembly in the position shown, and tightly wrap a turn of your wider waterproof tape around the center of the FSL assembly (adhesive side out), overlapping the ends by 2”. If you are using the 1” wide waterproof tape, wrap two turns, with the edges overlapping by ¼”. Temporarily tape one side of the 660/46 Litz wire to the right side of the Noodle (as shown) with a scrap of waterproof tape.



18) Refer to the photo below for the following step. Take the 660/46 Litz wire and start the first turn 2” to the left of the ferrite rod edges (so that the coil will be in the center of the rods). Press the first turn down tightly against the waterproof tape, ensuring that it is straight and taught (the FSL assembly will rotate freely on the pipe, to assist in wrapping turns). Continue wrapping the second turn tightly against the first turn, and continue this wrapping action until 25 full turns of Litz wire are wrapped straight and tight around the ferrite sleeve assembly. Secure the ends of the 25-turn coil with a 4” strip of Scotch “Extreme” tape (as shown), and cut off the Litz wire 14” from the taped section.

19) Refer to the photo at the top of the next page for the following step. Form the loose end of Litz wire into a curved turn over the top of the “Extreme” tape until it is adjacent to the other Litz wire (as shown), and secure this curved turn with another 4” strip of “Extreme” tape placed exactly on top of the previous one. Untape the other Litz wire end from the side of the Noodle and carefully run each of the Litz wire ends through the 2 ½ “ section of shrink tubing, as shown. Ensure that the two Litz wires are straight inside the shrink tubing, and that they are as tidy as possible between the shrink tubing and coil.



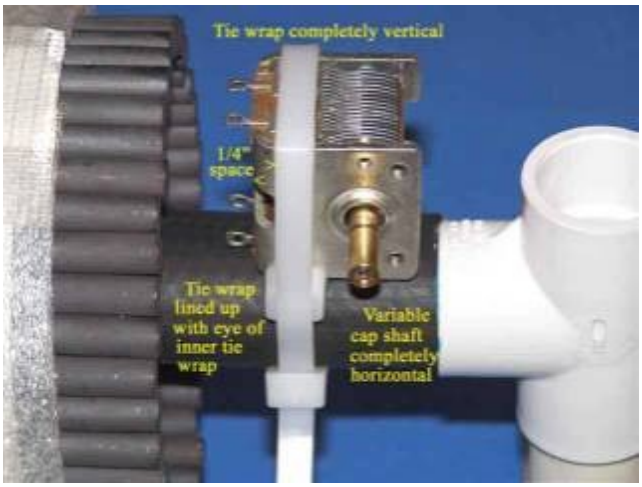
20) Refer to the photo below for the following step. Temporarily route the two Litz wires into the “Tee” opening at the left side of the frame (to avoid damage during the mounting of the variable cap). Cut a 2 7/8” long length of the 5/8” I.D. rubber hose with straight cuts on both sides, and then cut the rubber hose length with a single, straight cut lengthwise (Note: this rubber hose length is purposely longer than the remaining horizontal space on the 9” horizontal pipe, in order to lock the ferrite sleeve assembly into place, and stop its rotation). Trim any lose rubber strips from the sides of the air hose length, and then apply super glue sparingly along the inner center section of the hose. Ensure that the ferrite sleeve assembly is pushed as far left as it will go on the 9” pipe (and that the shrink tubing section is still on top of the assembly), and then attach the rubber hose section on the 9” pipe as shown, with the rubber hose gap along the bottom of the pipe. Press the rubber hose section securely down into place on the pipe, so that the glue makes a tight bond.

21) Refer to the photo below for the following step. Take two of the 18” cable tie wraps and pass the end of one through the eye of the other (engaging the “teeth”) until there is about 2” of space left between the “eyes” of the two tie wraps. Place this assembly on top of the rubber hose section in the position shown, and then place the variable capacitor on top of this tie wrap assembly with the shaft to the left (as shown in the photo). While holding the right side tie wrap eye steady, gently move the left side tie wrap eye up against the body of the variable cap until the two tie wrap eyes bracket the variable cap body (as shown). After this has been done, temporarily remove the variable cap and cut off the excess tie wrap lengths (taking care not to move the tie wrap eyes closer together).

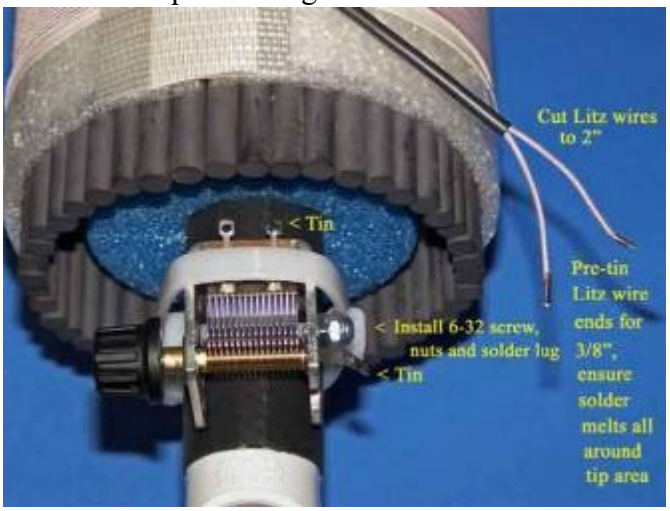
22) Refer to the photo at the top of the next page for the following step. Place the prepared tie wrap assembly in the position shown in the photo, with the center of the tie wrap exactly 1” from the outer edge of the rubber hose section. Place the variable cap back into position on the tie wrap assembly as shown, so that the variable cap shaft is ½” from the outer edge of the rubber hose section. Take the third 18” tie wrap and pass the end through the eye of the tie wrap assembly as shown for a length of 12” (up and over the body of the variable cap which is closest to the terminals), and pass the end through the eye of the same tie wrap as shown. Do not tighten the tie wrap completely until the next step.

23) Refer to the photo below for the next step. Ensure that the variable cap is in the position shown, with the shaft completely horizontal. Also ensure that the tie

wrap is completely vertical, that its left edge is ¼” away from the variable cap body’s left edge, and that it passes directly over the eye of the tie wrap in the base assembly. Slowly tighten the tie wrap, ensuring that the above conditions do not change. Finally, tighten the tie wrap securely to lock the variable cap permanently in place. Cut off the excess tie wrap length.

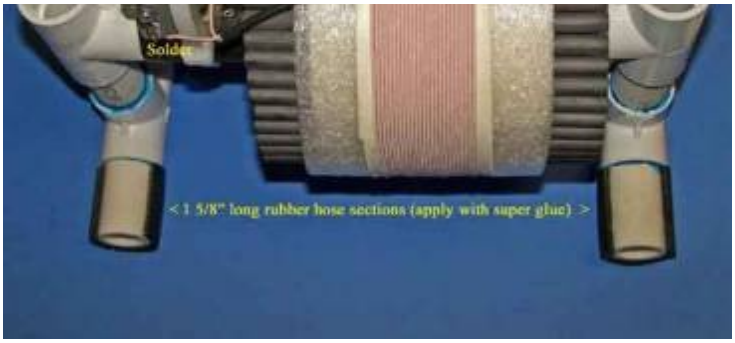


24) Refer to the photo below. Install (in this order) a #6 soldering lug and two 6-32 nuts onto a 6-32 screw, and thread this assembly into the variable cap chassis in the position shown, so that the soldering lug is pointing downwards. Tighten the hardware securely in this position. Install the control knob on the variable capacitor shaft, and remove the two Litz wires from the left side “Tee” opening. After ensuring that the shrink tubing section is still pushed back against the “Extreme” tape as closely as possible, cut each of the Litz wires to a length of 2”. NOTE: The two 660/46 Litz wires are composed of many individually-insulated conductors, and it is essential to use enough heat and solder to melt all of these conductors together for best performance results. Pre-tin the end of these leads with a hot soldering iron, working completely around the circumference of the tip for a length of about 3/8”. Ensure that solder melts all around this entire tip area, and that it includes all the individual conductors. Pre-tin the ends of the two Litz wire leads in this manner as shown, and also tin the upper right variable cap terminal and the solder lug, as shown.



25) Refer to the photo at the top of the next page for the following step. Solder one of the Litz wires to the variable cap’s near upper terminal as shown, and solder the other Litz wire to the solder lug. Ensure that both connections are electrically secure and clean. Cut four 1 5/8” lengths of the 5/8” I.D. rubber hose with straight, perpendicular cuts (these will be used as the slip-resistant “leg” grips). Cut each rubber hose section lengthwise with a straight cut, and trim off any loose rubber strips from the edges. Place each of the four rubber hose sections in place on the PVC “legs” as shown, and apply a small amount of super glue on both the left and right interior sides of each hose section to lock them in place on the PVC “legs.” Press down firmly on the sides of each rubber hose section after the super glue has been applied, while ensuring that the borders of each rubber hose section are aligned with the edges of the PVC “legs. This completes the assembly of the 5” FSL antenna, which is now ready for testing and operation.

Testing and Operation This antenna is designed to provide a high-gain inductive coupling boost to all portable radios having a loopstick, and unlike other similar-sized antennas, it will provide a very substantial signal boost even to



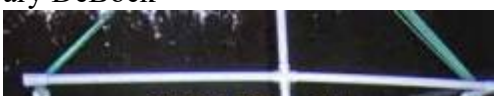
full-sized portables like the ICF-S5W and RF-2200. As designed, it will provide this inductive coupling boost on all frequencies from 460-1710 kHz, with signal gain approximately equal to that of a full-sized 4’ air-core box loop. Because of the sharper tuning and lower noise pickup of the FSL antenna design, however, it will occasionally outperform the 4’ box loop in the signal-to-noise ratio of weak DX signals —especially for weak DX stations adjacent to strong local transmitters received in outdoor environments (on a PVC base).

1) In a location free from RF noise, place the FSL antenna in a secure position on a flat surface, away from metal tables and other large electrical conductors.
2) Position your portable radio about 2” in front of the FSL coil for the initial test.
3) Tune in a weak signal (the weaker the better) at the low end of the AM band on your portable radio. It is important that the signal is just above the noise level, to demonstrate the effectiveness of the antenna.
4) SLOWLY tune the FSL antenna’s variable cap until the antenna’s resonant frequency matches that of the portable radio. Looking at the variable cap plates can give you a rough idea of your FSL’s tuned frequency, with its plates about half open on a center-band (1000 kHz) frequency. The FSL’s tuning sharpness is much greater than that of a typical air-core loop, and best results are obtained only when the FSL’s variable cap is carefully zeroed in on the correct frequency. When zeroed in on the weak station’s frequency, the FSL should give a VERY great inductive coupling boost.
5) After the correct frequency is matched, slowly vary the portable radio’s distance from the FSL coil to determine the distance for the best inductive coupling boost. This is also a fairly sharp adjustment, which will provide excellent results when optimized.
6) An FSL’s DXing performance can be increased by placing the antenna on a non-conducting stand up off of a table, such as on a PVC-framed base for DXpedition or shack usage. Information on such PVC bases and a protective “rain hood” PVC assembly may be obtained from the author.

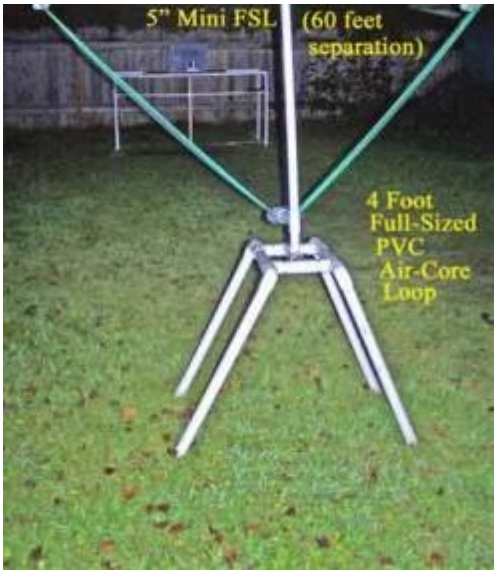
Conclusion The introduction of the FSL antenna last year provided DXers with a new option—high gain, low-noise performance from an extremely compact package (although with the “side effects” of concentrated weight and cost.). This particular FSL size was chosen because of its superior tradeoff of high gain with minimal weight and expense— especially in outdoor environments. Whether at an ocean coast cliff or at home in your shack, the author sincerely hopes that it will exceed your DXpectations!

73 and Best Wishes,

Gary DeBock



5” Mini-FSL Vs. 4’ PVC Air Core Loop Relative Performance Test
(Posted to Ultralightdx Yahoo Group on January 14, 2012)



Hello All,

The 5" diameter Mimi-FSL is another small AM-only model developed here this week in a continuing effort to reach out to those DXers who have felt that FSL antennas were too expensive or complicated. It has a construction cost of about $90, weighs about 5 pounds, and has the advantage of using parts that are readily available (several of which have been stockpiled here).

This afternoon the tiny new 5" FSL was given the tough challenge of going up against a full-sized 4 foot PVC air core loop in the reception of fringe daytime DX signals here in Puyallup, Washington (about 30 miles south of Seattle). The “David and Goliath” match up photo is attached. The only reason that this test was even attempted was because the slightly larger 7 inch "Affordable" FSL (with the construction article posted at http://www.mediafire.com/?dshnqlbydf6qu25) had previously proven that it could not only compete with the 4' air core loop, but deliver a slightly better signal-to-noise ratio on most of the test signals.

The midget FSL and the large air core loop faced off in the cold back yard, separated by about 60 feet. Fringe daytime DX stations were carefully tuned in on both loops, then a barefoot Tecsun PL-380 model was inductively coupled to the 4' air core loop for the first part of each test signal MP3, then to the 5" Mini-FSL within 5 seconds (so that the signals would not fade or increase between recordings) for the last part of each MP3. To ensure accuracy, both loops were directed at the same bearings for each test signal.

980-CKWX (50 kw at 160 miles) First 20 seconds with 4' air core loop
http://www.mediafire.com/?br4sw4q5325m8g1

1040-CKST (10 kw at 160 miles) First 15 seconds with 4' air core loop
http://www.mediafire.com/?oh62u7fpvlh3kt3

1070-CFAX (10 kw at 90 miles) First 20 seconds with 4' air core loop
http://www.mediafire.com/?uvg65m2j4i3ubl1

1520-KGDD (50 kw at 160 miles) First 18 seconds with 4' air core loop
http://www.mediafire.com/?c8284pol9bjglkd

Comments: The 980-CKWX recording was a typical display of the relative reception capabilities of the two loops in the absence of QRM or splatter. The 1040-CKST recording showed the ability of one of the loops to reject some serious 1050-Seattle splatter on the same loop bearing, and the inability of the other loop to do the same. The 1070-CFAX recording seemed to be the most puzzling, but since the signal came from a different direction, perhaps the propagation seemed to favor one loop at the expense of the other. The 1520-KGDD recording seems to be a complete deadlock (which, in the tester's opinion, could be a fairly accurate summary for the overall result in this bizarre match up :-) Thanks to my Ultralight NDB-DXing brother Rob Ross for a very generous gift of 140mm x 8mm ferrite rods to build these Mini FSL's, and to Dave Kellmer of Portland, Oregon for a very generous supply of Funnoodles.

73 and Good DX,
Gary DeBock (in Puyallup, WA, USA).