RF Choke Coil (Made Easy)

By David - K3DAV **(4/18/2012)**

I have received many emails asking about my homebrew RF Choke coils under my antennas in the antenna photos. So it seems appropriate to do an article about these simple little wonders.

I was looking on the internet about different kinds of choke coils, and I came across this photo...

I looked at this photo for a while and I had to laugh.

Don't misunderstand my laughter. The coil in this photo will work just fine. There is nothing wrong with the design or construction of it. But you don't have to go through all of that trouble to build it.

The truth is, the wrapped up extra coax to the bottom right of the pic would probably do the same and equally effective job as the perfectly wound coax on the PVC tubing. Believe it or not, it's true.

Well.... actually the extra coax should be tightened up into more of a donut shape. Then it would work as well as the coax on the PVC tube would.

An RF choke coil is not rocket science, although many would like to make it seem that way. I have seen the many websites that tell you how to build a choke coil. They show charts of capacitance and inductance measurements and tell you the coil should be a specific length and size for different frequencies. They tell you where to mount the choke within the feedline.... blah blah blah blah blah...and so on.....

All of those charts and numbers make it sound so important to build it to their exact specifications or you will fail. But they are not important. All of those charts and calculations were made to make the author feel important and look like a real smart guy. Again, don't take my comments the wrong way. Most of those designs will work just fine. I am not calling them liars. I am only saying that those designs are overblown and do not have to be so complicated to work just as well.

The main purpose of an RF choke is very simple. It is used to prevent stray RF from traveling back down the surface of the coax shield conductor, and into the shack and your equipment. This problem can cause all kinds of troubles in the radio room. It can raise SWR a little, it can cause RF burns when you touch 2 pieces of equipment at the same time, it can let stray RF get into every electronic device in your home and cause interference, it can cause RF feedback which is what causes hum and squealing in your audio.....the list goes on. It is safe to say that you don't want RF from the antenna getting into your home. There is one very simple way to stop it in it's tracks at the antenna where it belongs. And it doesn't take a degree in engineering to figure it out.

The RF Choke Coil Solution

Here is the very simple way to make an RF choke coil that will remove your RF feedback troubles. You will be using the same piece of coax that is used for the feedline. In other words, do not make a choke coil, then splice it in later with PL-259's and couplers. This will lower the effectiveness of the choke. The choke and the feed coax should all be one uncut piece so the choke is a part of the feedline.

Put your PL-259 on the end of the coax that connects to the antenna. Measure down from the connector about 18 to 24 inches maximum. Do not go any longer than 24 inches. If you go longer than 2 feet, the RF has a much longer piece of coax to travel down to get to the choke, and all of that coax with RF on the surface starts to act like the antenna, and emits RF by it self.

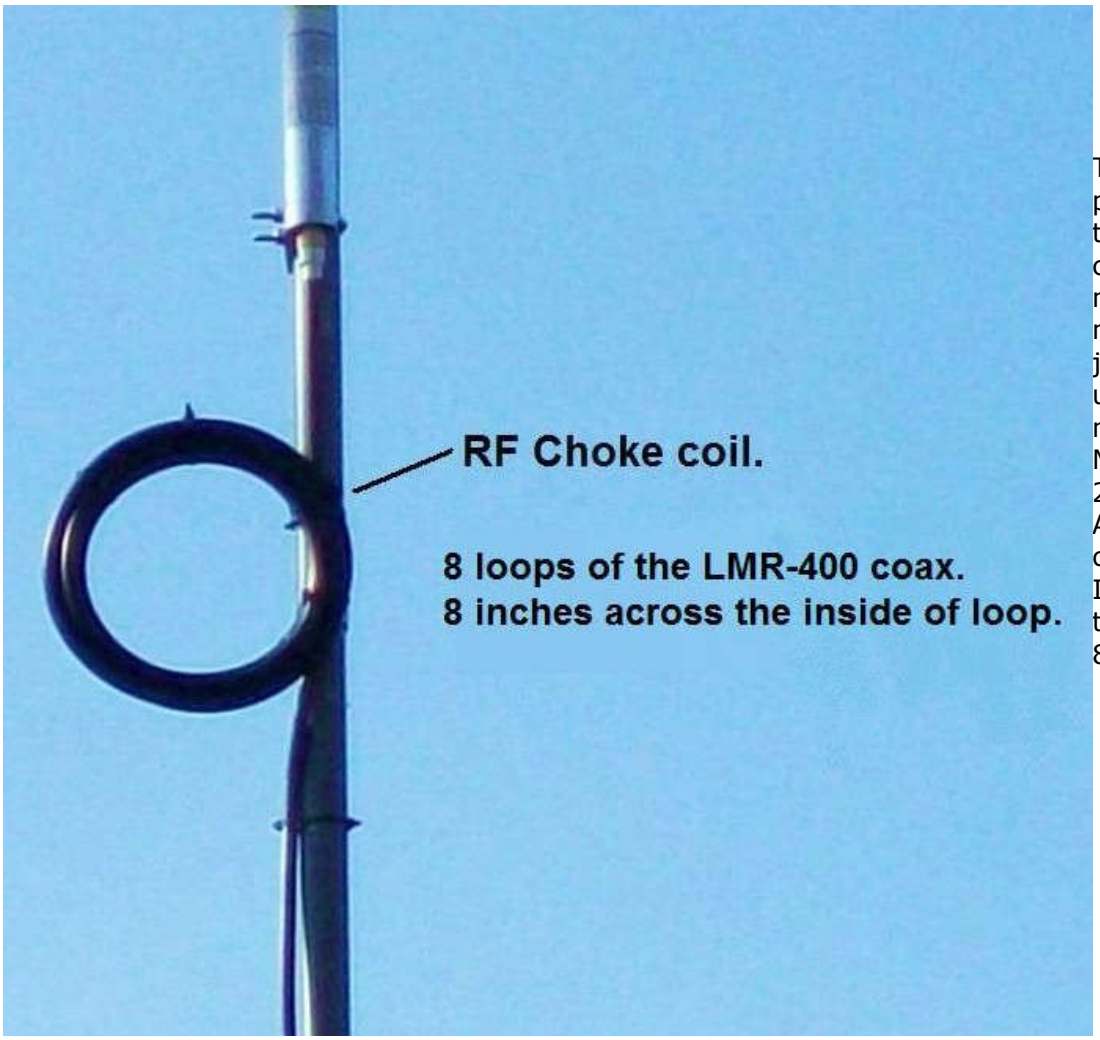
At the 18 to 24 inch mark, begin wrapping the coax in loops as if you are winding it up for storage. Now here is the really big difficult technical part, so please be careful. (That was a joke. Like I said, this isn't rocket science. So chill out.)

Make between 6 to 10 loops of the coax. Wrap them close together so that the inside measurement of the loops are between 6 to 10 inches across the donut hole. This part is important to remember. You DO NOT have to make each loop side by side in a perfect order. Any of the loops can overlap next to, under, or over the other loops. Similar to the wrapped up extra coax in the first photo above. Except you want each loop to be close together like a fat donut. You get the idea. Doing this will have no change in how effective the choke is. Wrapping the loops side by side or overlapping is not what makes the choke work. It will still do it's job perfectly. I will explain this in a while.

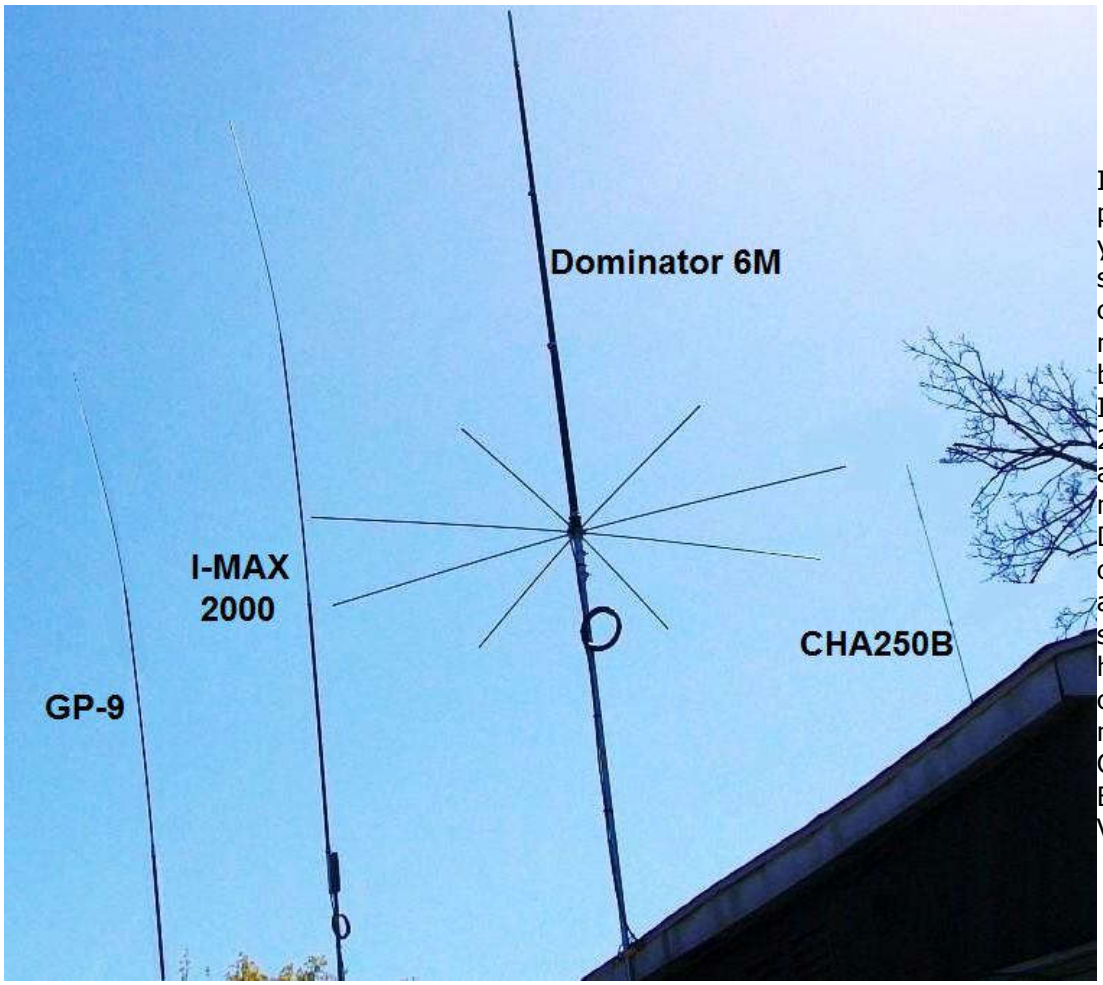
Even though you can make 6 to 10 loops at 6 to 10 inches across the hole, I always go by the 8-8 rule. That means you make 8 loops that are 8 inches across the inside of the donut hole. There is no significance to the 8-8 rule other than it is easy for me to remember and they work great for me. Remember, overlapping is fine. Once again, this is not rocket science. Once you have the loops made and they are about 8 inches across

the donut hole, use heavy duty plastic (Not metal) wire ties in 3 or 4 places around the choke to hold it tightly together. It doesn't hurt to make a few loops of electrical tape just in case the ties ever break. I wrap 2 inch wide electrical tape right over the wire ties just for that extra added confidence. You should now have a nice tightly wound choke with about 18 to 24 inches of coax off one side terminated with a PL-259 connector. Off the other side is the rest of the coax that will go to the radio.

Insert and tighten the PL-259 into the antenna's SO-239. Wrap the connector with a few turns of electrical tape if you wish, to keep the connector waterproof. Tape or wire tie the coax to the mounting pole. Then use 2 or 3 more of the heavy duty plastic wire ties to mount the choke directly to the pole or mast as shown below. Then continue supporting the rest of the coax down the pole. When you are finished, your installation should look like this.



This photo is the choke I made, mounted just under my I-MAX 2000. As you can see, I stuck to the 8-8 rule.



In this photo, you can see the chokes I made on both the I-MAX 2000, and on my Dominator 6M antennas. I also have one on my CHA250B HF Vertical.

How Does It Do That? You may ask.

The way the choke works is very simple. A small amount of RF radiates from the shield wire in the coax. The RF emitting from the antenna surrounds the antenna with a very large pattern filled with RF. Some of it gets on to the coax and can travel down the entire length of the coax. Also, if there is a slight mismatch enough to cause even just a 1.4:1 SWR, some of that reflected RF comes back down the surface of the coax.

The RF choke creates an electromagnetic field on the chokes surface, and within the donut hole. This field attracts the stray RF and chokes it off before it travels down the coax, and it is dissipated within the EM field. Hence the term "Choke". In some ways, it almost acts like a ground radial and reflects slightly the RF radiated from the antenna, to a more upwards angle sending more of the signal towards the horizon where it belongs, and not in your radio room. But unlike a ground radial, the choke does not tune the antenna to any specific frequency. So it is good for all frequencies from 160 through 6 meters.

Antennas like the I-MAX 2000 that cover more than one band, and do not require ground radials, benefit greatly from an RF Choke. As the antenna is used on different bands and across a wide range of frequencies within those bands, the SWR can vary quite a lot. As the SWR goes up, more stray RF likes to seek out the source of the RF (Your Radio) by

the shortest and quickest route possible (The Coax). This RF choke prevents that from happening which helps your SWR a little, and keeps RF feedback out of your radio room.

Dipoles, Yagis, and single band antennas also benefit a lot from RF chokes for all the same reasons. Horizontals, verticals, slopers...etc. Every antenna of every design still emits RF, and it can travel along the coax.

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NOTE: *Before we go on, I need to make one thing clearly understood. An RF choke will not prevent the reflected RF caused by a high SWR from damaging your radio. Reflected RF caused by an impedence mismatch, and is reflected back to your radio through the center conductor of the coax, and can still hurt your equipment. So do not assume that a choke will cure your high SWR problems.*

An RF choke only stops the stray RF on the surface of the coax from traveling down it's length that causes RF feedback. Removing the STRAY RF can in many cases help the SWR, but just a little. Only correcting the impedence mismatch of the coax and antenna can fix your SWR problems.

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Now you know how to build and install an RF choke, the easy simple way. You may read about how chokes should be cut to a specific exact length, and each loop should be all side by side and spaced properly, then adjusted perfectly to a specific frequency then hung in a specific way to.....OH PLEASE! Give me a break. You are not building an antenna for the International Space Station. It's a simple RF choke to stop stray RF from traveling down the coax. The design I just walked you through will do exactly that. Can you count and make 8 loops, can you read the number 8 on a ruler, and do you understand how a wire tie works? If you answered yes to these 3 questions, you will do just fine. Just remember to add about 17 to 20 feet to your coax purchase, because each 8 inch loop uses just over 2 feet of coax (about 26 inches).

If you have any questions or comments about this article, please contact me at **k3dav@msn.com**

Thank you. Dave - K3DAV