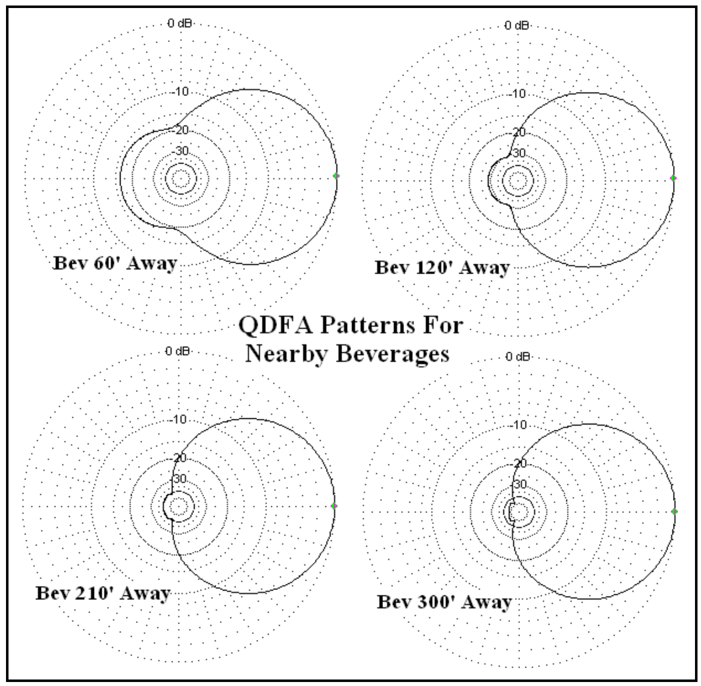
# Degraded Medium Frequency Receive Antennas

**Dallas Lankford, 8/10/2011, rev. 8/18/2011**

As I said in my Phased Delta Flag Arrays article in February 2009, the patterns of MW splatter reducing receive antennas with deep and wide null apertures such as the QDFA and DDFA are degraded by nearby antennas. Examples of EZNEC simulations of beverages near a QDFA were given in my article. I also stated that EZNEC simulations showed that the patterns of such high performance receive antennas are also degraded by nearby power lines. Although not explicitly stated, it follows from my simulations that any substantial amounts of nearby metal could and probably would degrade the MW splatter reducing patterns of DDFA's, QDFA's, and other splatter reducing MW antennas.

The next paragraph is a verbatim copy of what I said in the February 2009 article, including the graphic of EZNEC simulations in that February 2009 article.

## Nearby Antennas




Nearby antennas, especially beverages, can spoil the pattern of a QDFA or DDFA. EZNEC simulations at right, for an unterminated beverage, with open circuit input, illustrate some of the QDFA patterns for nearby beverages. For a beverage connected to an independent 450 ohm source, the QDFA pattern is not degraded as much. However, it is not known if these EZNEC simulations give an accurate description of the skewed QDFA patterns. As a rule of thumb I would recommend that no part of a beverage antenna be closer than 300 feet to a QDFA or DDFA, and even that may not be enough. I do not know of any way to settle these issues. Other antennas may not degrade the QDFA pattern as much as beverages, but who knows?. Personally, I would not use any other antenna near a QDFA. EZNEC simulation also shows that nearby power lines can significantly degrade a QDFA pattern, especially for a power line at one end of and perpendicular to a QDFA.

Such warnings sometimes fall on deaf ears. For example, an experienced MW DXer once asked me if it was OK to run a beverage diagonally under a delta flag antenna element of a QDFA. What do you suppose I told him?

Recently I came across an interesting simulation by IV3PRK of a metal fence near a QDFA via a link to a PDF file at the bottom of the page here. According to that simulation, the beautiful QDFA splatter reducing pattern was degraded into an omnidirectional pattern by the presence of a metal fence.

On that same page there is also a link to an implementation of a 3 turn miniflag with a badly degraded pattern. The 3 turn miniflag was said to be a copy of my 3 turn miniflag which had a good flag pattern from one end of the MW band to the other. However, it was not a faithful copy. For example, the schematic in his PDF file of his degraded 3 turn miniflag was a schematic of my 2 turn miniflag. I also noticed a nearby vertical mast in the background of a photo of that 3 turn miniflag. And the miniflag itself was beside one wall of a house. Further investigation here revealed multiple transmitting and receiving antennas on the property. If I interpreted the graphic correctly, the transmitting antenna has multiple radials (underneath?) near most of his antennas. As is well known from experiences at Kongsfjord, radials on the ground can have a dramatic effect on the pattern of a flag antenna. EZNEC simulations show no difference between radials and no radials, consequently EZNEC simulations of wires near flags may or may not accurately describe what effect nearby wires have on flag antennas. So there are a multitude of potential explanations for why his 3 turn miniflag (or was it a degraded 2 turn miniflag?) had a degraded pattern. Without actually being there to examine the 3 turn miniflag (or was it a 2 turn miniflag?) with degraded pattern and the environment in which it was tested, it is impossible for me to say why its pattern was degraded. I do know that when a loop antenna has good nulls from one end of the MW band to the other, and poor nulls at 1.83 MHz as his was reported to have, then something is causing the poor null at 1.83 MHz, and it almost certainly is not the loop antenna.

Later (8/18/2011) I took another look at IV3PRK's so called copy of my 3 turn miniflag. The following is some of what I found:

all red mark-up added by DL

turns Flag

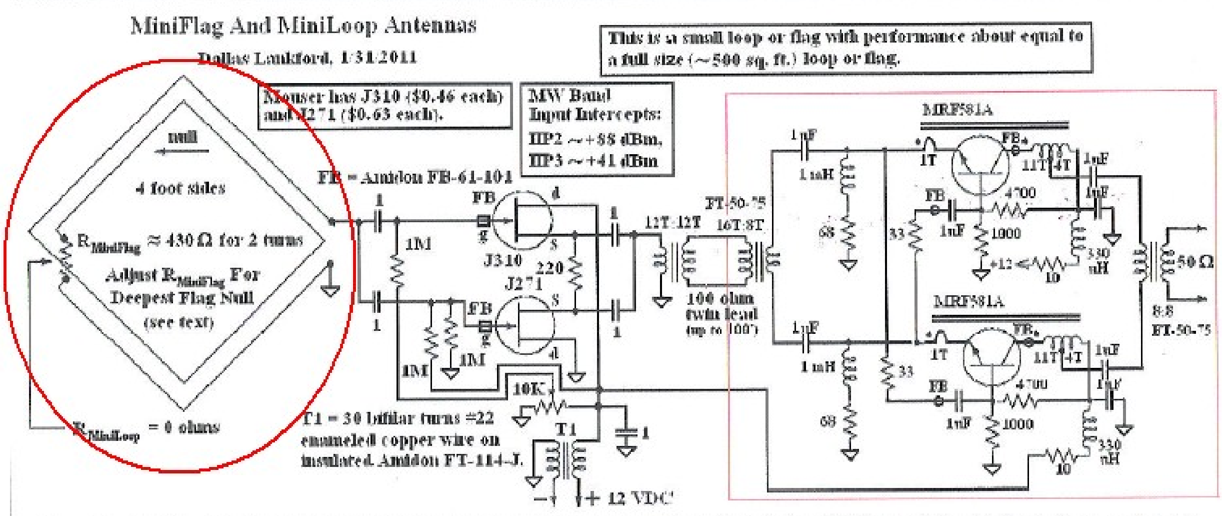
## Rx antennas at IV3PRK: the 3 wires MiniLoop

**Trying another innovative design by Dr. Dallas Lankford**

**by Pierluigi "Luis" Mansutti IV3PRK**

After given up with the Quad Delta Flag Array project, due to my lot constraints, (see this page) I turned my attention on a new small receiving loop, among all the Dr.Dallas Lankford designs, and decided to build it.

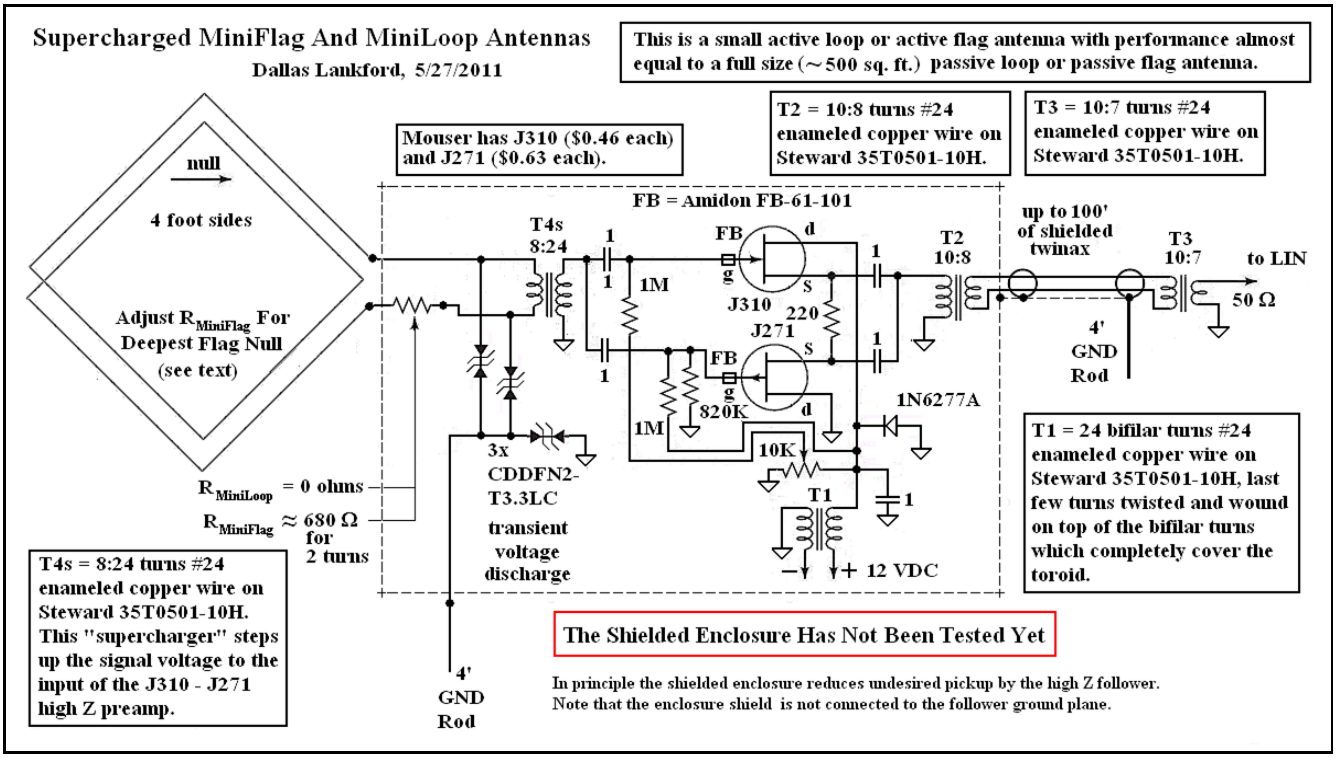
**Dallas Lankford, 2/6/2011, rev. 3/7/2011**



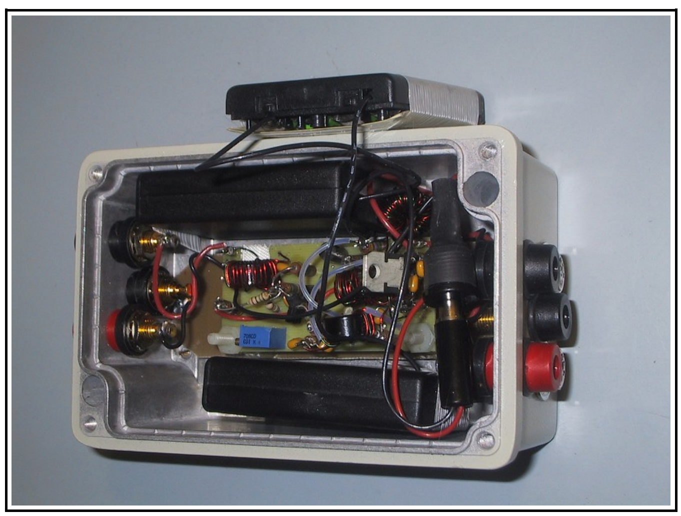

The amplifier inside the red box is a capacitor cross coupled push-pull Norton transformer feedback amplifier with about 13.5 dB gain and about 1.0 dB noise figure; see the article "Lankford-Ikin-Norton Feedback Amplifiers" in The Dallas Files at www.kongsfjord.no . An ordinary push-pull Norton transformer feedback amplifier with about 10.7 dB gain and 2.0 dB noise figure can be used instead... they are available from KIWA Electronics and Clifton Laboratories (do a Google search if you are not familiar with them). The complementary J310 - J271 amplifier you will have to build for yourself... not difficult to do using the "dead bug" construction method. How to adjust the 10 K ohm pot for maximum IIP2 is discussed in the article "Hi Z PPLs + Hi Z Loop And Flag Arrays" in The Dallas Files. Other mini flag antenna articles have been published before, but none like this one. The others used 16:1 step down transformers followed by traditional amplifiers, which cause about 18 dB voltage loss (6 dB loss due to the step down transformer impedance match, and 12 dB loss due to the voltage step down). The complementary high input impedance FET amplifier above has about -6 dB gain, which gives it a net gain of about 12 dB over the impedance matched transformer step down approach. This means that the signal to noise ratio for weak signals is as much a 16 dB better than the impedance matched step down transformer approach. This approach, discussed in detail in the article "Hi Z PPLs + Hi Z Loop And Flag Arrays", also improves the signal to noise ratio of full size loops and flags.

From the original design I duplicated the Hi-Z amplifier (actually I found J310 and J271 only by Mouser) with a couple of minor modifications: 0.1 µF instead of 1 µF and the number of turns on the FT50-75 output xfmr, which seemed to be wrong. I use 14T:8T to match the 100 ohm feedline. As a feedline I found a very cheap shielded CAT5 cable and used two twisted pairs for RF signal and 12 DCV, while the other two are left floating. With the CAT5 cable I

The 2 turn miniflag schematic he used above is one of the original schematics with an incomplete description of the 2 turn miniflag. A more recent schematic is given below.




The antennas in The Dallas Files are provided as is, and most of them are works in progress. Consequently, there are aspects of those designs which are not optimal. For example, the output impedance of the J310 – J271 complementary pair is about 150 ohms (measured). So the 12T:12T output transformer I used originally is not optimal. IV3PRK chose to use the word ***wrong*** (see his statement in his description above), and then proceeded to change the turns ratio to 14T:8T, which changed the impedance step down to 3.06. So he matched the output impedance to 50 ohms. I wonder why he did that.



The active head for my miniflags was installed in an RF tight box and was battery powered, first with the batteries very near the active head, and later with the batteries inside the RF tight box. This information was available to IV3PRK. Instead, IV3PRK used cheap (his word, not mine) CAT5 cable of unspecified length for both RF and DC feed. I also tried cheap CAT 5 cable at one point, and found it unacceptable. As you can see from my schematic above, I used shielded twinax for the RF feed, and powered the active head from a battery inside the RF tight box.

It is also curious why IV3PRK implemented his defective 3 turn (or was it 2?) miniflag long after both of my 2 turn and 3 turn miniflags were retired due to insensitivity and replaced by a one turn 10' x 10' miniflag; see here. A photo of the one turn 10' x 10' miniflag below shows the active head above attached to one arm of the of the miniflag frame. A more recent version of the 1 turn 10' by 10' miniflag used a VTL5C4 remote variable terminating resistor for improved adjustment of the null.

Remote DC feed is being investigated, but is not available yet.

As I said above, and have said numerous times in articles in The Dallas Files, all of my designs, not just the miniflags, are works in progress.

It is unseemly for IV3PRK to have rushed to judgment with his outdated defective design which he attributed to me.

A copy of a WF dual flag receive antenna array implemented at this same site failed to hear top band DX when other receive antennas did. For example, it was said, ***Unfortunately I am unable to get a polar plot, but for sure the Waller Flag has the right directivity and FB but the signal level is too low.*** I am unable to understand how it can be concluded that the degraded WF has the right directivity and FB without a measured polar plot of the degraded WF. It was also not explained why the signal level was said to be too low. Perhaps it was because he used a high noise figure preamp. Or perhaps he had a common mode or other noise problem?

Often when people make mistakes, they do not attempt to correct the mistakes, and frequently deny that they made mistakes. The sensitivity story here is an admirable exception. The moral of this story is that insensitivity of a receiving antenna system is probably caused by a defect, especially when similar receiving antenna systems elsewhere have not been found to be insensitive. Another moral of this story is that even experienced DXers can mistake additional noise due to a defect in their implementation of their antenna system for insensitivity.

Having said all of the above, let me say again that if you put a high performance receive antenna in the presence of other antennas or even in the presence of substantial amounts of extra metal, then do not be surprised if the high performance receive antenna becomes a low performance receive antenna. And I would add that if the high performance receive antenna which you tried to copy is insensitive compared to what others have experienced, then your copy is probably defective due to something you did or did not do.