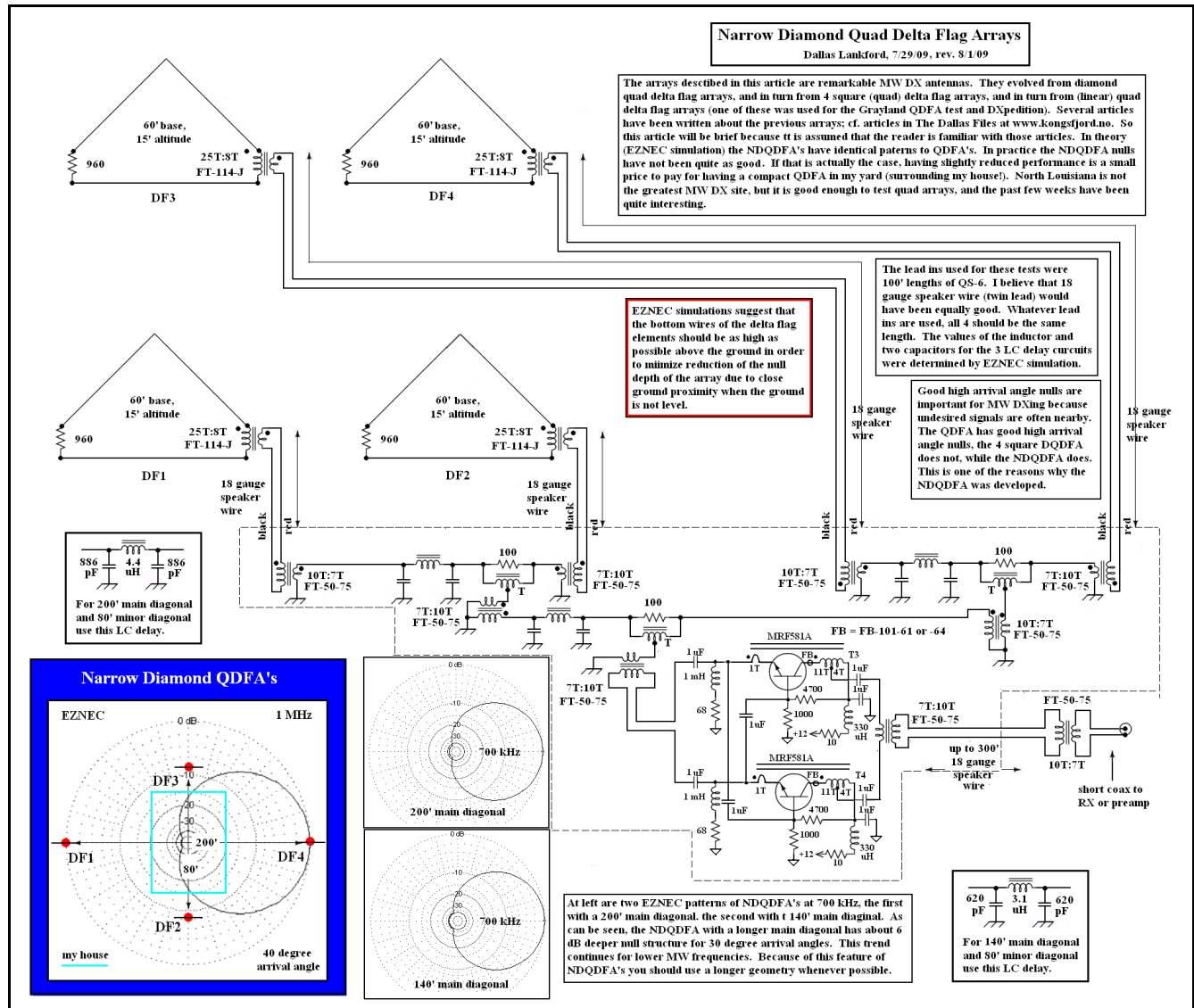


# Narrow Diamond Quad Delta Flag Arrays

Dallas Lankford, 7/29/09, rev 8/6/09

Narrow diamond quad arrays have not been discussed or implemented before at any frequency to the best of my knowledge. A 4 square array of K9AY's was implemented by the [SP3KEY Team](#) in Poland in 2005. Their article seems to indicate that their implementation was for 40 and 80 meters only. No details of the phasers for those arrays were given. An EZNEC pattern of a 4 square K9AY array was given at the end of a long [article](#) about K9AY arrays and there it was said that an array for 80 and 160 meters was operational in Poland. The 4 square arrays were not narrow diamond arrays. According to EZNEC simulations quad arrays made from delta flag elements are generally not as sensitive to geometry and phase perturbations as arrays made from other kinds of elements. Furthermore, as pointed out in the graphic below, according to EZNEC simulations square arrays generally do not have as good high arrival angle nulls and in some cases do not have as good nulls as narrow diamond quad delta flag arrays. EZNEC simulation also shows that the deep null structures of 4 square delta flag, flag, and K9AY arrays are not as good as the corresponding deep null structures of narrow diamond arrays. So it follows that narrow diamond quad delta flag or arrays are the best choices for compact quad MW arrays. Corresponding flag arrays are similar, but require more masts.



There is some indication that these arrays may be insensitive at quiet MW DX sites. If that is the case, then LINR variations of push-pull Norton transformer feedback amps shown in the graphics above and below and in the following paragraph should be used.

At right is a stand alone version of the LINR amp. Two of these, one included in the phaser as shown above, and one at the receiver, provide 25.2 dB gain as compared to 20.6 dB gain from two standard 11:4:1 Norton amps. The two LINR's may be sufficient to bring the low MW band signals back to an acceptable level for use with an insensitive receive like Perseus. Eventually this will be determined. The input and output impedances of the LINR at right are for 50 ohms. Appropriate changes of the turns ratios should be made for other impedances.

### Tests

The NDQDFA described in the graphic above became operational on 7/26/09. I used a NDQDFA with 140' main diagonal because a larger version will not fit on my lot. (For low band nulls equal to the 100' (linear) QDFA, a main diagonal of 220' is required.) After several nights of testing it was obvious that the nulls of the NDQDFA were not as good as the nulls of a QDFA even though at first I was in denial. For many days I was baffled by this situation, but now I am astonished that it took me so long to find the explanation. Of course, hindsight is always 20-20. My house sitting in the center of the diamond array should have been a big hint. And I seem to recall simulating some wires in the middle of the array. But I did not use any grounded wires.. Duuuhhh!!! Anyway, when I finally found a way to simulate house ground wires for the vertical array, EZNEC predicted that the resulting array pattern was significantly degraded as shown in the graphic at right. Well, sometimes you have to learn a lesson the hard way. If a NDQDFA is implemented away from extraneous wires, especially grounded wires, then there is no reason to believe that the array pattern will depart from the ideal.

### LC Delay

The NDQDFA uses the same kind of LC phasing as the standard QDFA. The delay required from front delta flag element (which will be denoted the maximum signal direction) to rear delta flag element (which will be denoted the maximum null direction) is twice the delay required from the front delta flag element to the two middle delta flag elements. Furthermore, the two middle delta flag elements are also phase shifted 180 degrees. All of this can easily be seen from the schematic of the NDQDFA above. An NDQDFA with a given spacing and LC delay circuits can be changed to a square quad delta flag array or 4 square delta flag array merely by repositioning the middle elements. The null pattern of the 4 square delta flag array array is not as good as the null pattern of the

