

Some Thoughts on a 75/80m Fan Dipole

Joe, WB9SBD, asked on the Ham-Antennas email reflector an interesting question concerning a 75/80m 2-wire fan-dipole:

What would happen if the lower wire connected 1/2 way along the top wire, instead of connecting at the center feed point?

I didn't know and thought it was an interesting question to investigate via modeling. (I used EZNEC+ 6.0)



Larry Banks, W1DYJ

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W1DYJ since 1966 – Amateur Extra

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Note: if you build an antenna with these dimensions, your results will be different. This is an “ideal” model and does not take into consideration your specific environmental situation.

W1DYJ ~ Larry Banks



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Some Thoughts on a 75/80m Fan Dipole

Discussion

The Question: What would happen if the lower wire connected 1/2 way along the top wire, instead of connecting at the center feed point?

Page 3 **The basic 80m dipole: 1 wire, 11 segments, at various heights**

I started with the standard 11-segment EZNEC dipole, resonant at 3.56 MHz in free space, and modeled it at $\sim\lambda/2$, $\sim\lambda/4$, and $\sim\lambda/8$ to show what happens at those heights.

Page 4 **The same dipole with 5 wires, redesigned to accept the “fan” wire, modeled to ensure it is the same as the basic dipole**

I remodeled the dipole of page 3, but broken into 5 wires with $\frac{1}{2}'$ segments, just to convince myself that this model was the same as the basic model of page 3, again at different heights.

Page 5 **Adding the 75m wires and searching for the a good length**

I then added the 75m “fan” wires and searched for a good 75m frequency in free space.

Page 6 **The above model at various heights**

I then modeled this “fan dipole” at $\sim\lambda/2$, $\sim\lambda/4$, and $\sim\lambda/8$ to show what happens at those heights. As expected, the results are similar to page 4.

Page 7 **Moving the 75m wires out half way, and the answer!**

Moving the connection point for the “fan” wires out half way changes the antenna back to a simple 80m dipole.



Basic 80m Dipole ~ at various heights

One #12 wire, 11 segments, 134.5' long

[67.25']

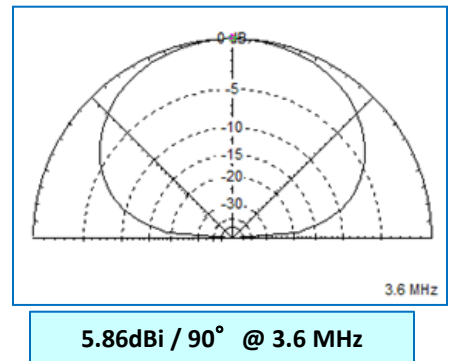
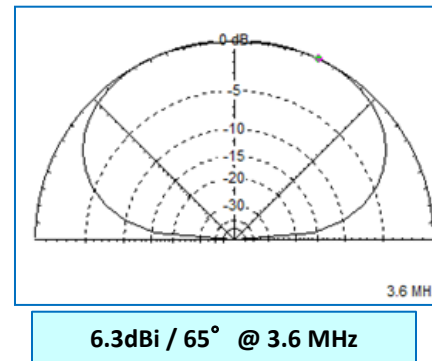
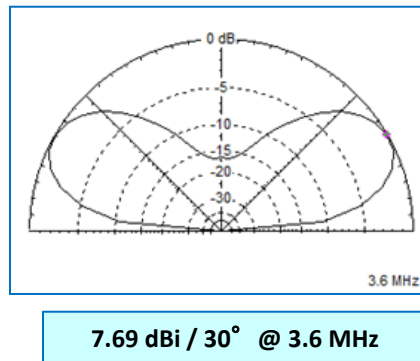
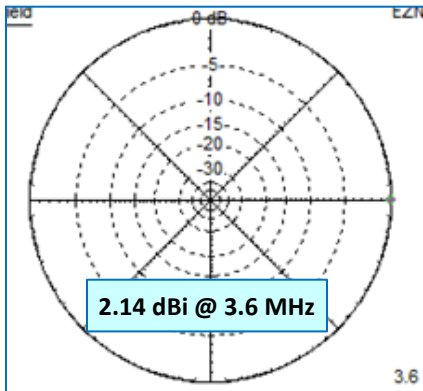
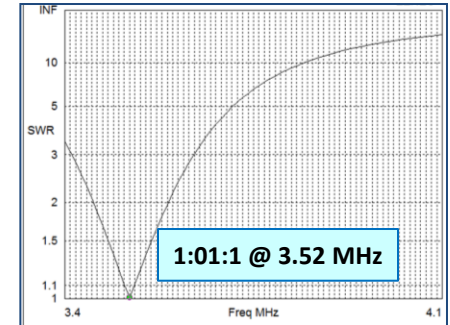
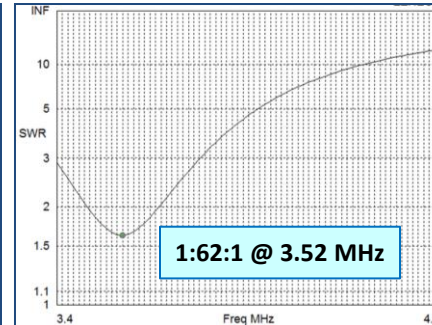
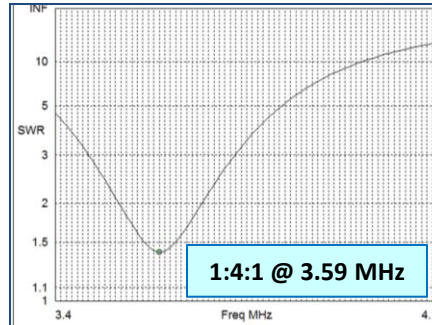
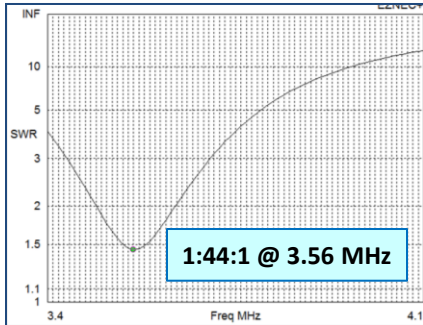
Height

Free Space

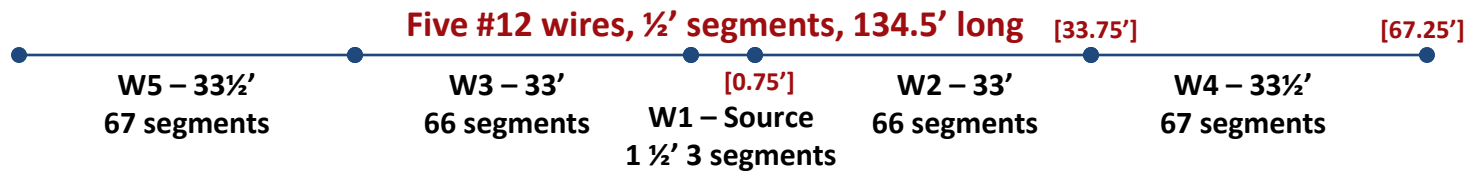
$\sim \lambda/2$ (132')

$\sim \lambda/4$ (66')

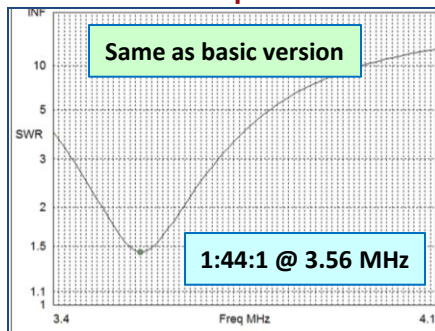
$\sim \lambda/8$ (32')



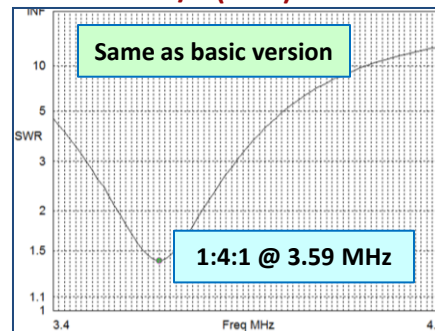
Basic 80m Dipole ~ multi-wire version: to prepare for fan design



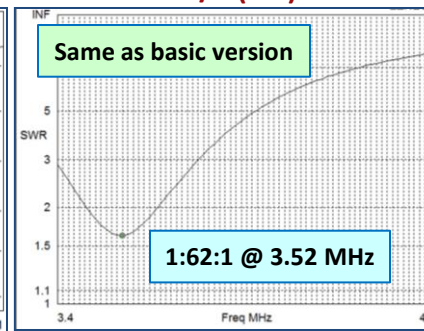
Free Space



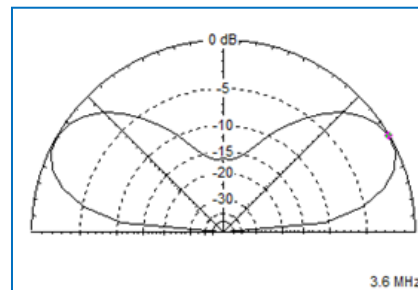
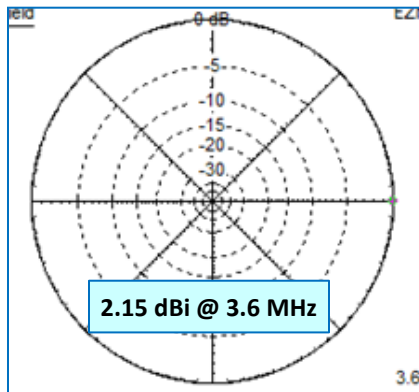
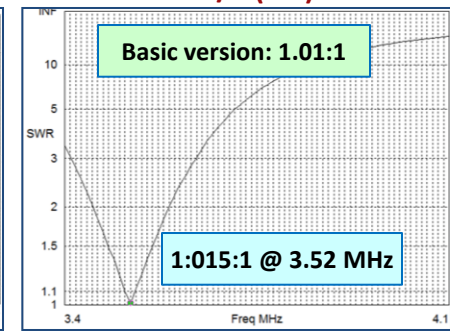
$\sim \lambda/2$ (132')



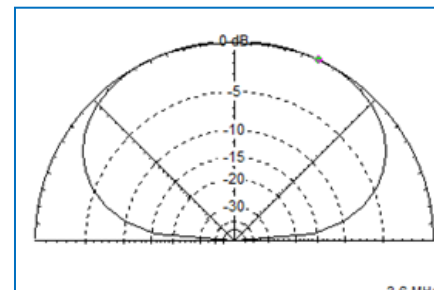
$\sim \lambda/4$ (66')



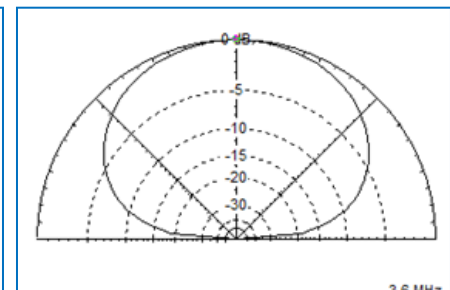
$\sim \lambda/8$ (32')



Basic version was 7.69 dBi



Basic version was 6.3 dBi

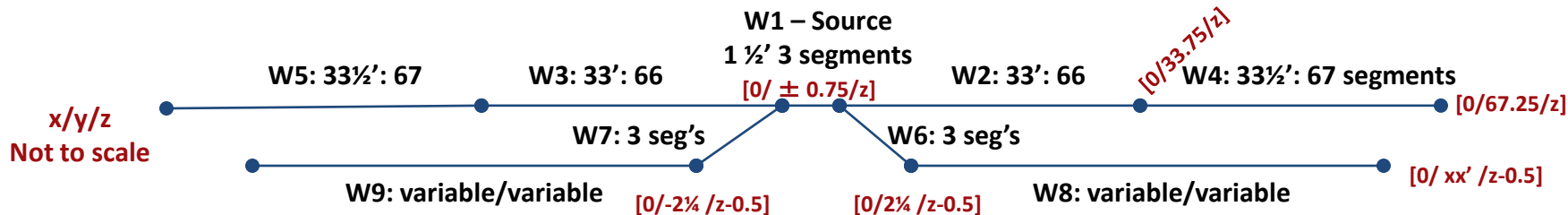


Basic version was 5.86 dBi

The fact that the differences are in the 3rd digit suggests that this model is equivalent to the basic – 1 wire 11 segment – version.

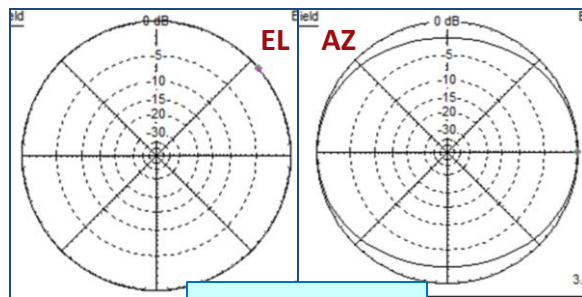
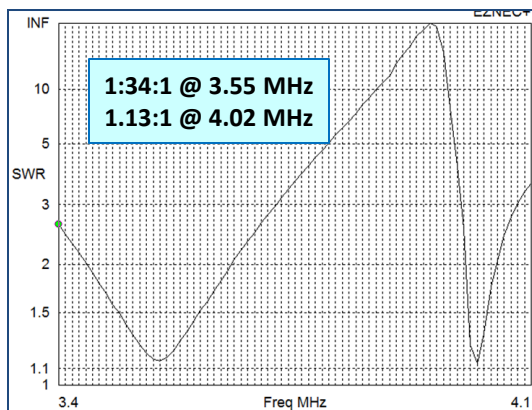


75/80m Fan Dipole ~ free space SWR with variable 75m dipole lengths



FILE: 75-80m-dipole_9-wires_v1.ez

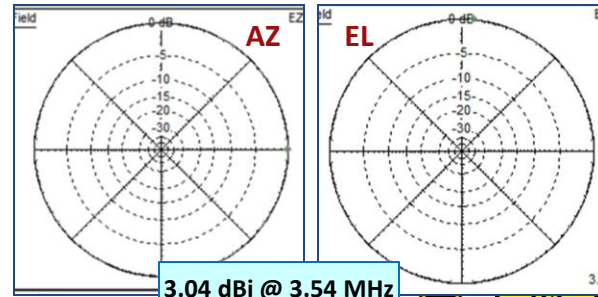
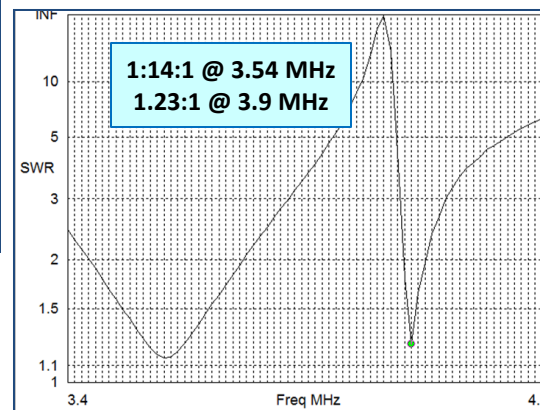
W8/W9 = 59'/118 segments
[ends = 0 / $\pm 61 \frac{1}{4}' / z - 0.5$]



Free Space

FILE: 75-80m-dipole_9-wires_v2.ez

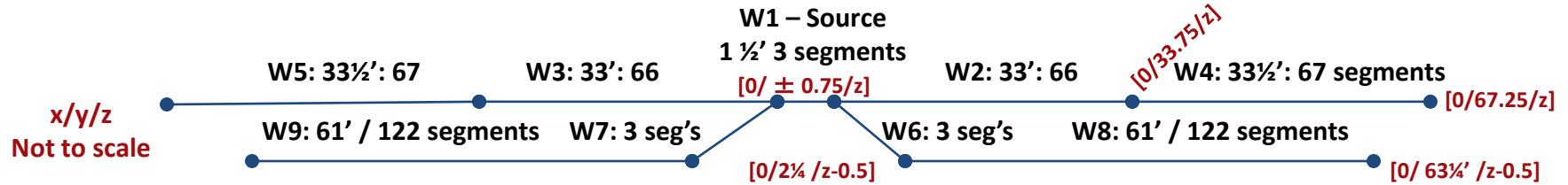
W8/W9 = 61'/122 segments
[ends = 0 / $\pm 63 \frac{1}{4}' / z - 0.5$]



Note that the close spacing of these two frequencies create an interesting phase issue in between the two frequencies, indicated by the very high SWR.



75/80m Fan Dipole ~ using version II at various heights

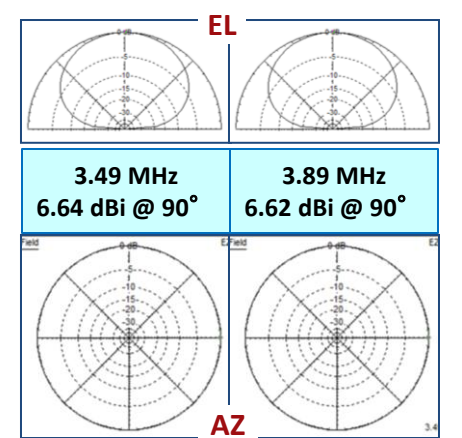
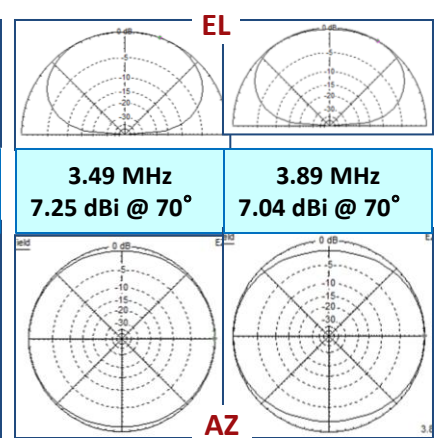
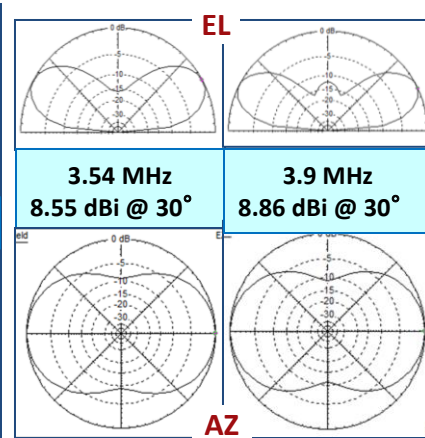
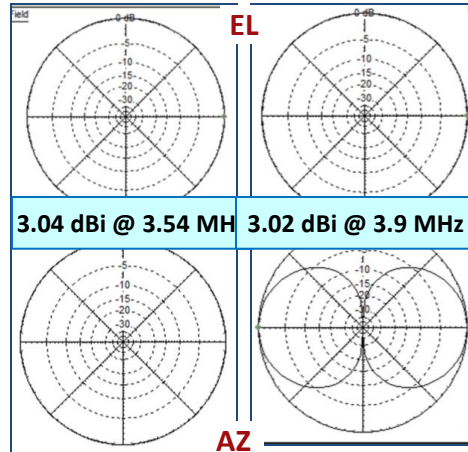
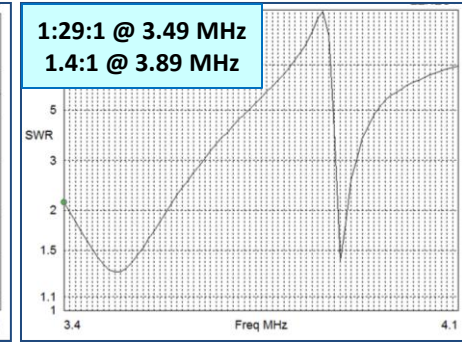
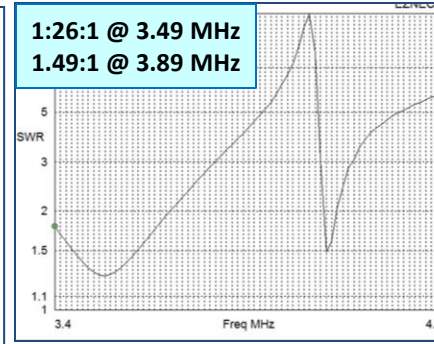
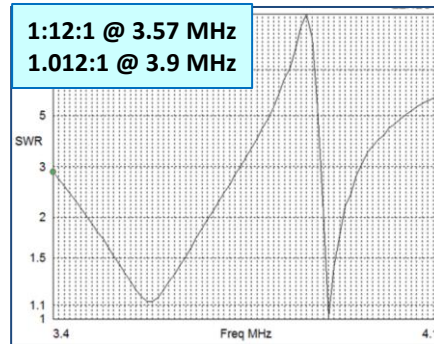
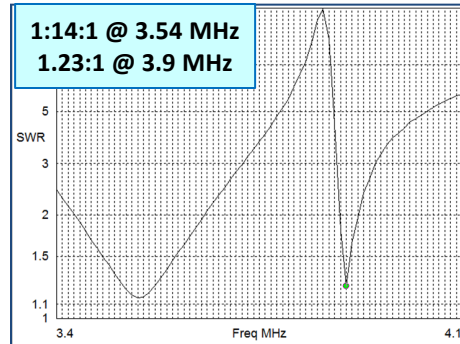


Free Space

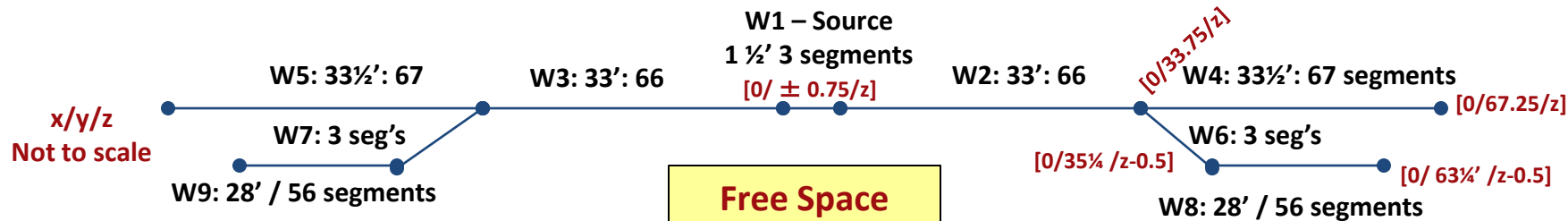
~λ/2 (132')

~λ/4 (66')

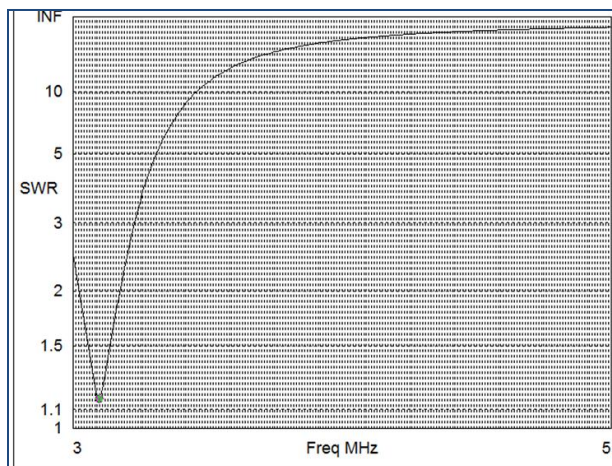
~λ/8 (32')



75/80m Fan Dipole ~ Moving 2nd wire half way out

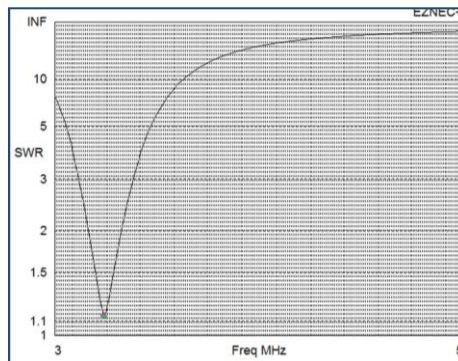


FILE: 75-80m-dipole_9-wires_half-way.ez



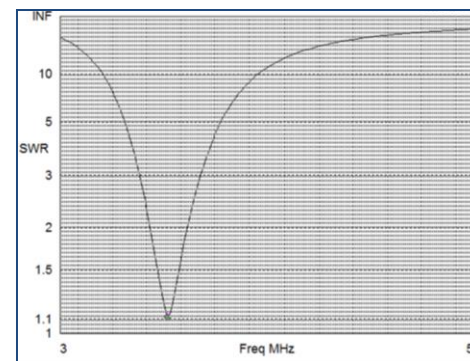
1:15:1 @ 3.1 MHz

With W2/W3 = $30'/62$ segments, and other wires the same length. Overall lengths of the two wires are $64 \frac{1}{4}'$ and $60 \frac{1}{4}'$.



1:13:1 @ 3.24 MHz

With W2/W3 = $25'/50$ segments, and other wires the same length. Overall lengths of the two wires are $59 \frac{1}{4}'$ and $55 \frac{1}{4}'$.



1:11:1 @ 3.52 MHz

Moving the connection point out half way essentially eliminates the effect of the “fan”. I am assuming it just makes the outer portion appear thicker, and therefore shorter.

