

Horizontal Loop Modeling

For Dick Kinney, W1RKK, Pownal ME

1. What are the elevation and azimuth patterns for a full wave (260') 75M horizontal loop:
 - On 75, 40, and 20 meters
 - At two heights (10' and 25')
 - Over average ground and granite [average = .005/13 granite = .002/13]
 - Fed at a corner and at a side
2. What would be a better (larger) loop size to better tune 40, 30, and 20?

Agenda:

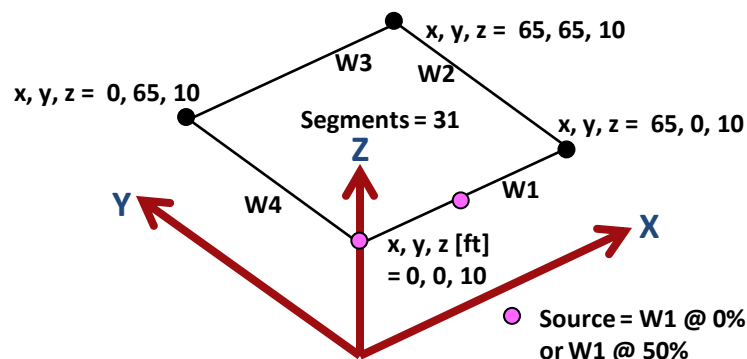
- Method
- Model Details
- Results
- Conclusion

***Remember – a model is just a
VERY simplified version of reality***



Horizontal Loop Modeling ~ Method

I – Build EZNEC Model



Sources

Corner Source

Sources								
No.	Specified Pos.		Actual Pos.		Amplitude	Phase	Type	
	Wire #	% From E1	% From E1	Seg	(V, A)	(deg.)		
1	1	0	0	1	1	0	SI	

Side Source

Sources								
No.	Specified Pos.		Actual Pos.		Amplitude	Phase	Type	
	Wire #	% From E1	% From E1	Seg	(V, A)	(deg.)		
1	1	50	48.3871	16	1	0	SI	

Wires

= 70' for larger loop

"Perfect" #16 wire [note: difference between Cu and 0Ω is less than model accuracy]

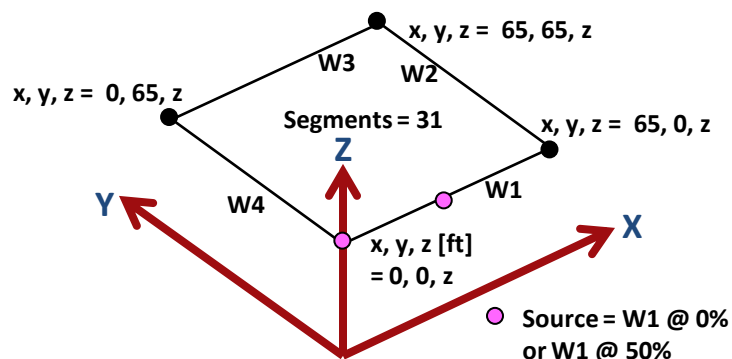
Wires										
No.	End 1			Conn	End 2			Conn	Diameter	Segs
	X (ft)	Y (ft)	Z (ft)		X (ft)	Y (ft)	Z (ft)		(in)	
1	0	0	10	W4E2	65	0	10	W2E1	#16	31
2	65	0	10	W1E2	65	65	10	W3E1	#16	31
3	65	65	10	W2E2	0	65	10	W4E1	#16	31
4	0	65	10	W3E2	0	0	10	W1E1	#16	31

260" length | 10' height | $z = 25$ for higher antenna



Horizontal Loop Modeling ~ Method

I – Build EZNEC Model



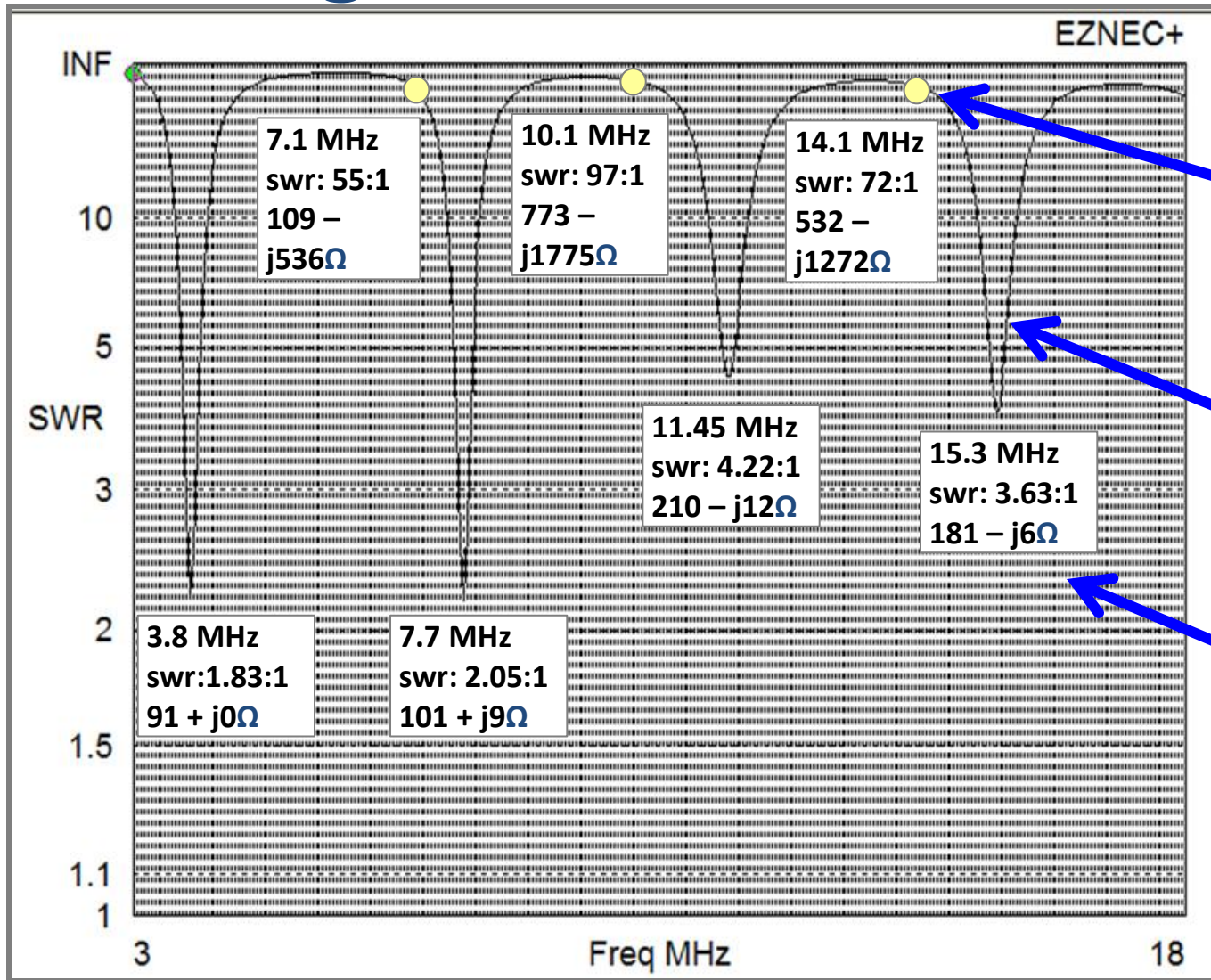
II – Run the model changing one parameter at a time

Same as any real-world experiment

#	Length	Height	Ground	Feed
1	260'	10	Average	Corner
2	260'	10	Granite	Corner
3	260'	10	Granite	Side
4	260'	25	Granite	Corner
5	280'	25	Granite	Corner



Following 5 Models – SWR Details



“In-band”
data point

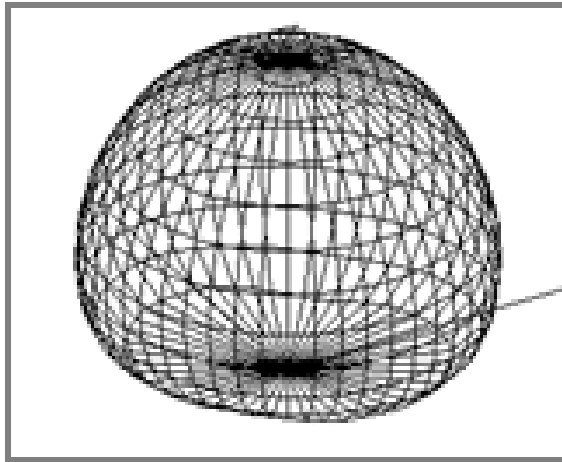
EZNEC
SWR
Curve

Data at
 $F_{\text{indicated}}$
or SWR_{min}

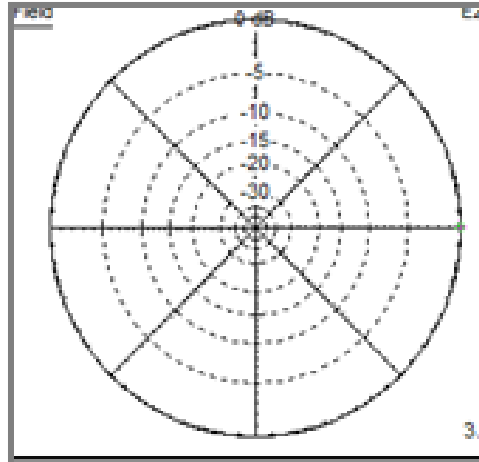


Following 5 Models – Pattern Details

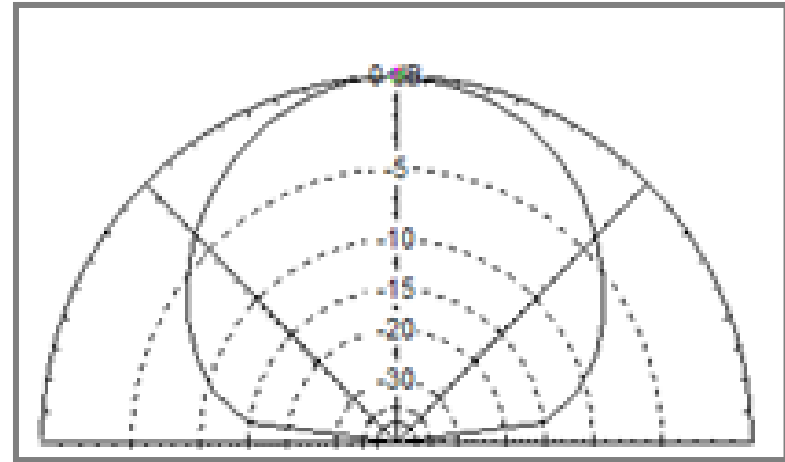
3.8 MHz Gain= +0.3 dBi @ 90°



“3D”



Azimuth

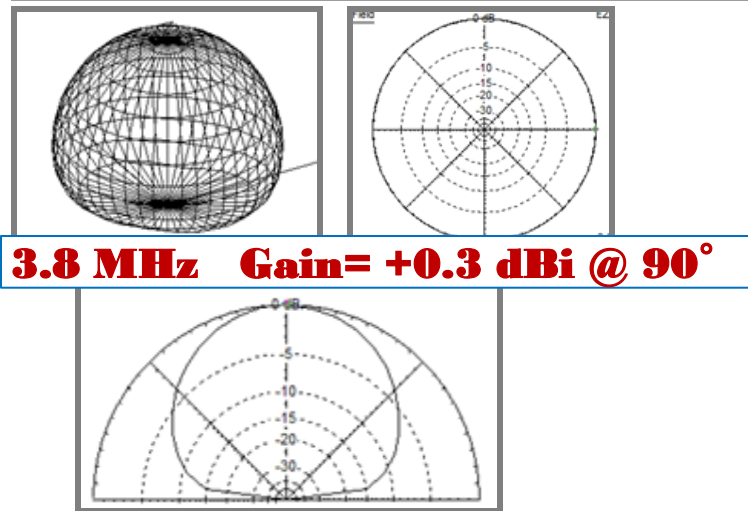
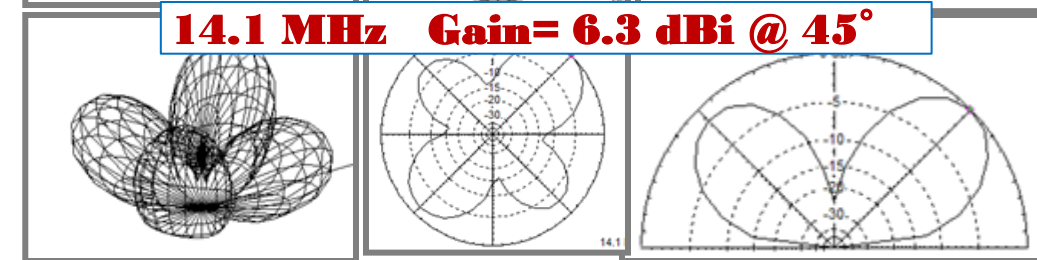
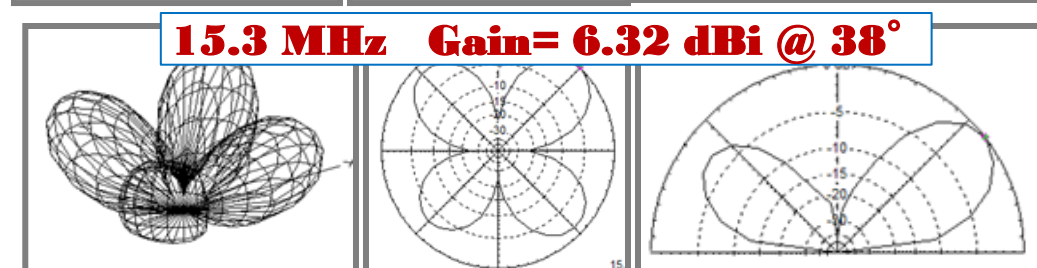
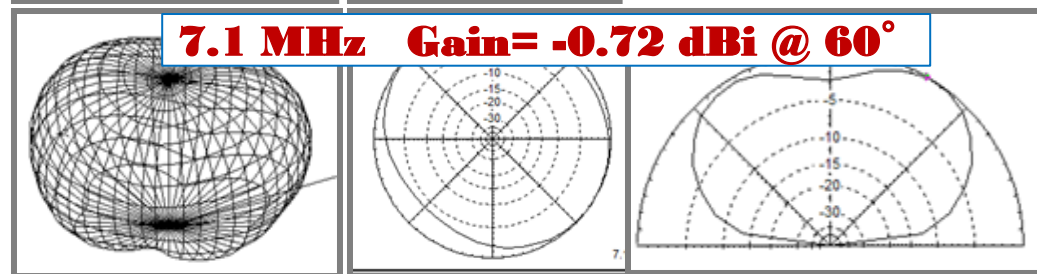
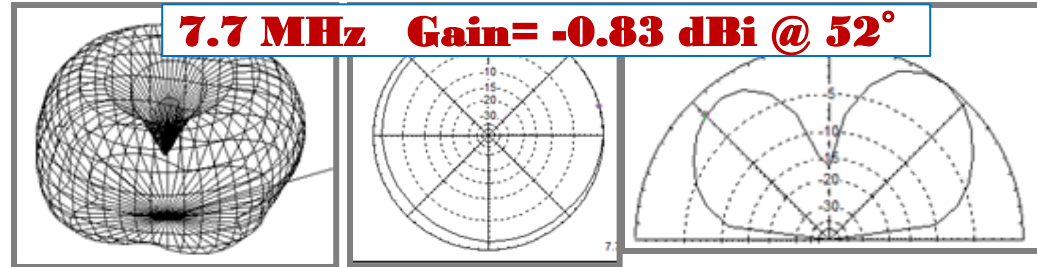
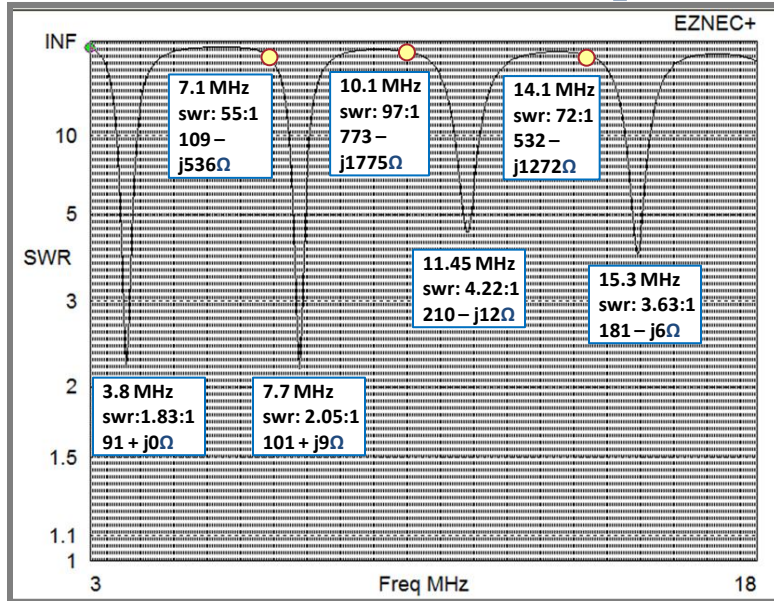


Elevation



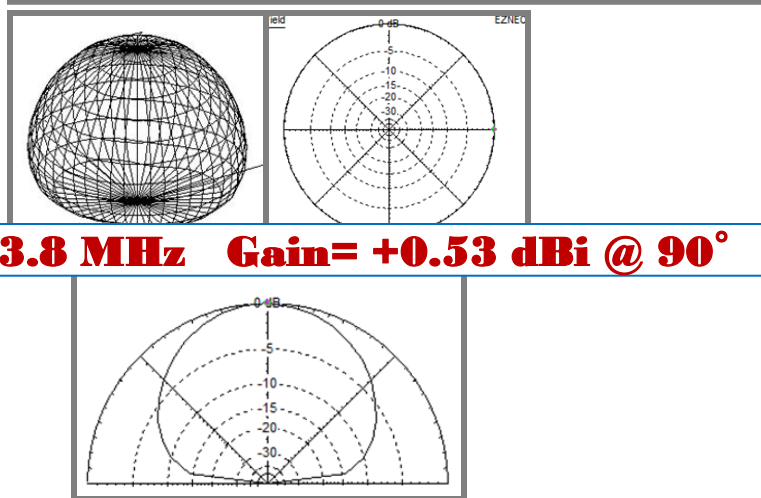
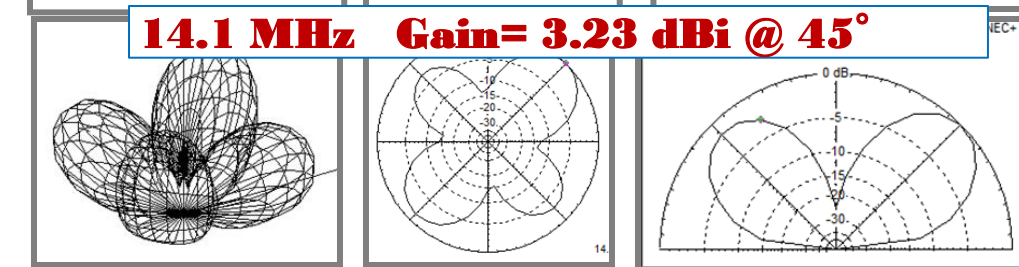
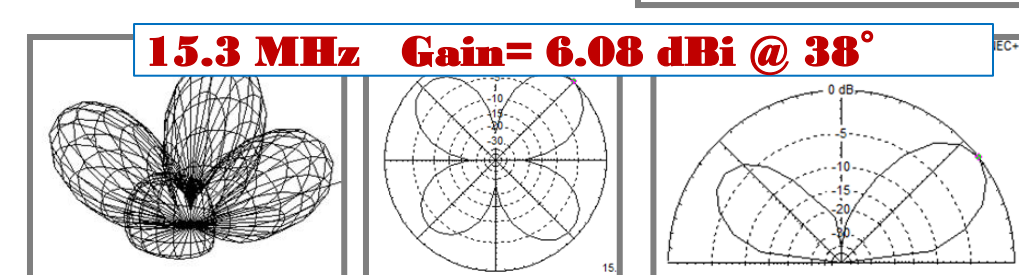
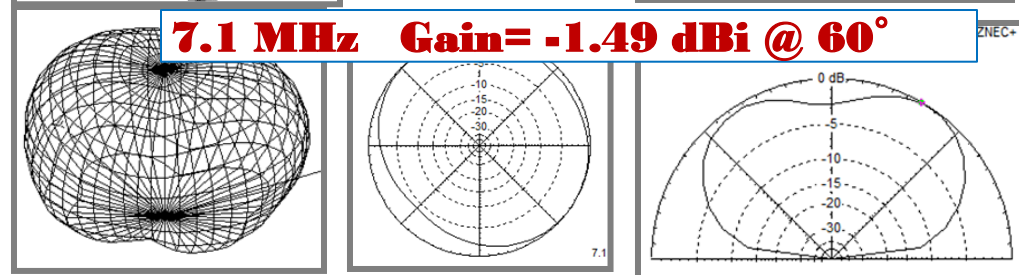
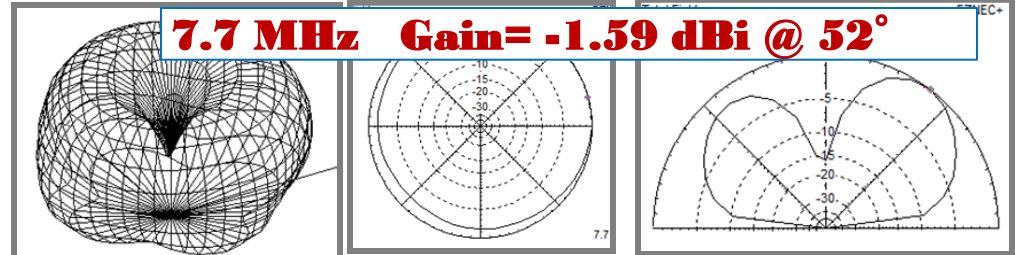
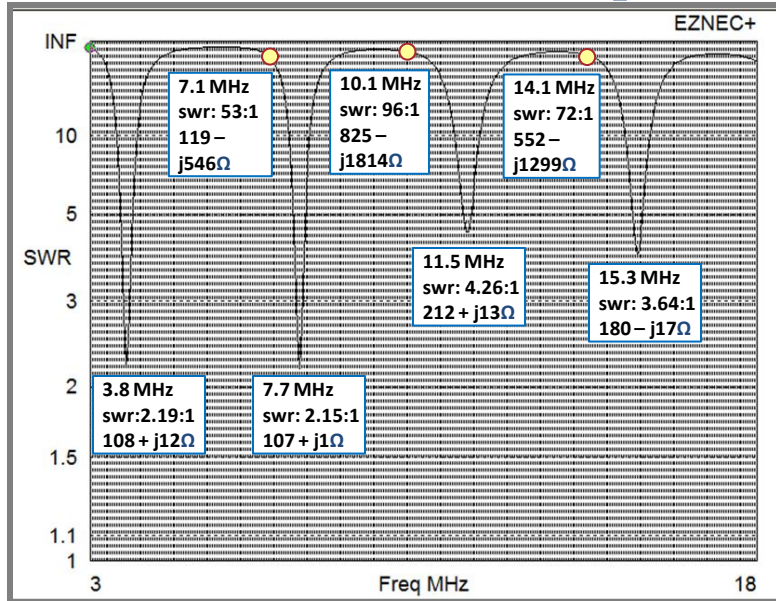
Horizontal Loop 1

10' height | average ground | corner source
260' length



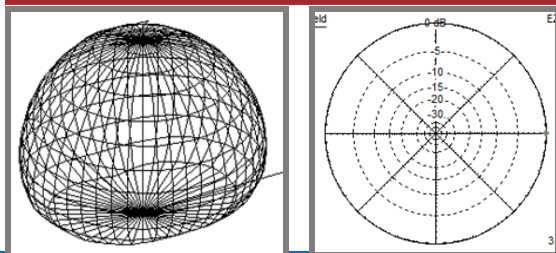
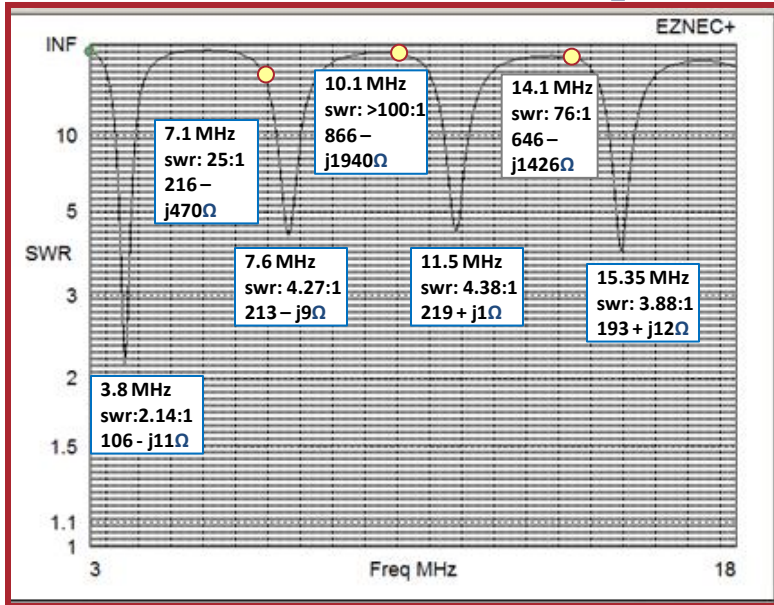
Horizontal Loop 2

10' height | granite ground | corner source
260' length

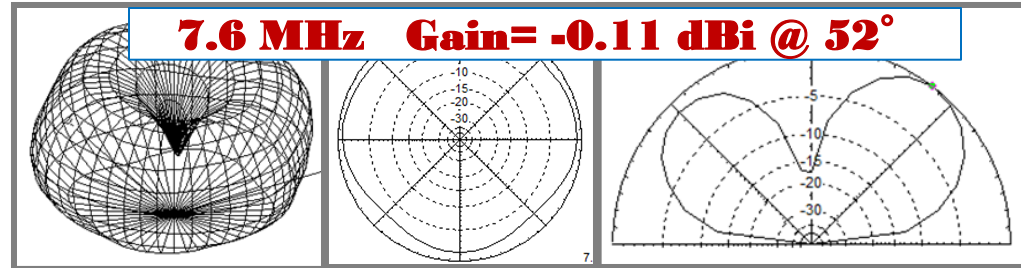
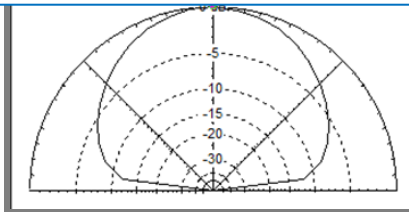


Horizontal Loop 3

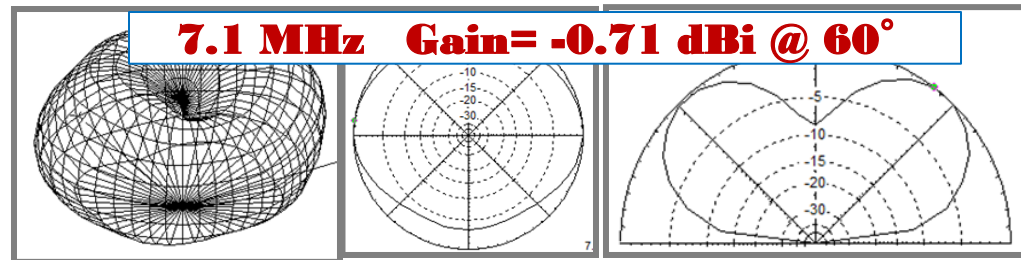
10' height | granite ground | side source
260' length



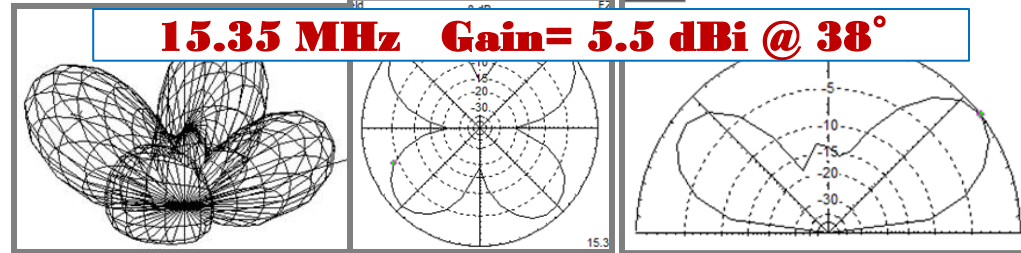
3.8 MHz Gain= -0.44 dBi @ 90°



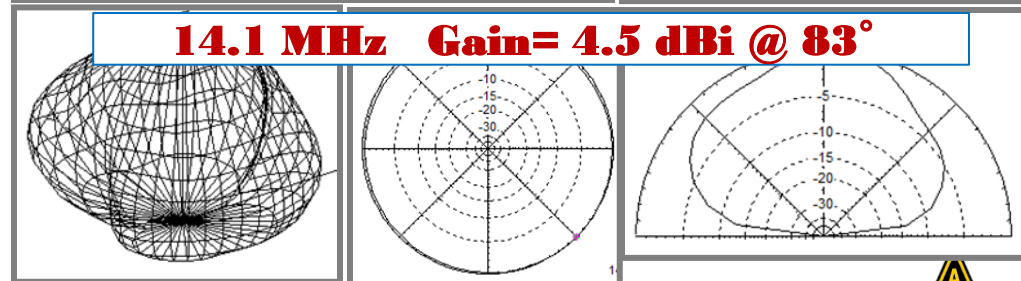
7.6 MHz Gain= -0.11 dBi @ 52°



7.1 MHz Gain= -0.71 dBi @ 60°



15.35 MHz Gain= 5.5 dBi @ 38°

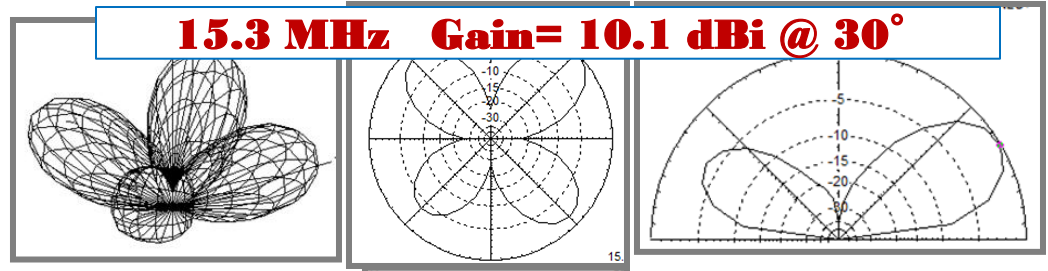
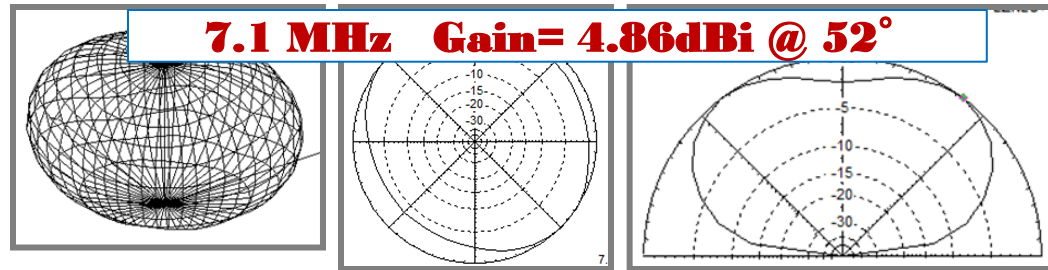
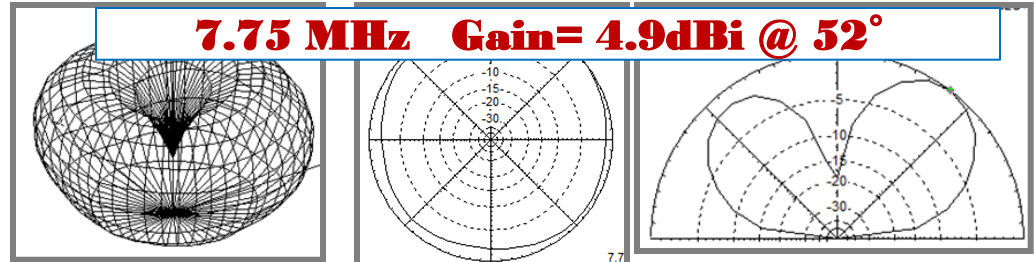
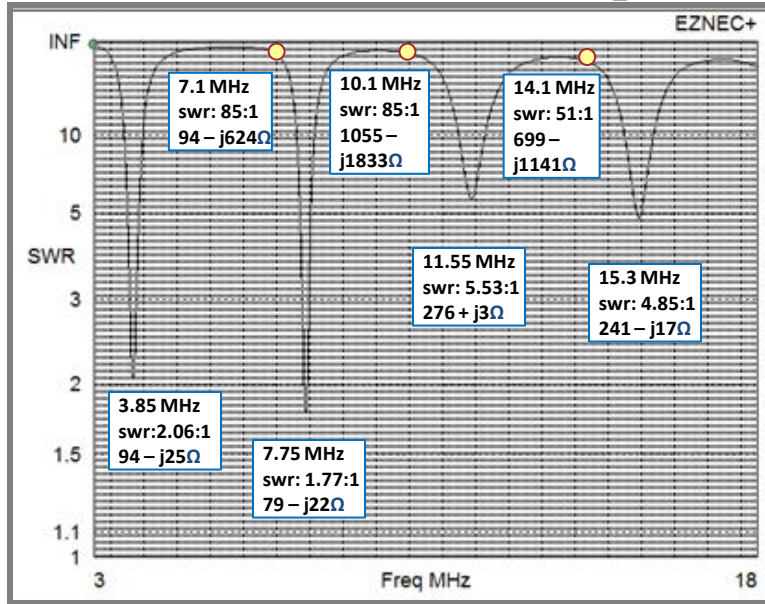


14.1 MHz Gain= 4.5 dBi @ 83°

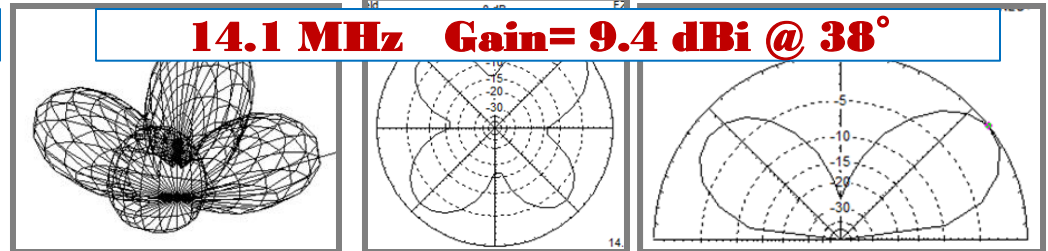
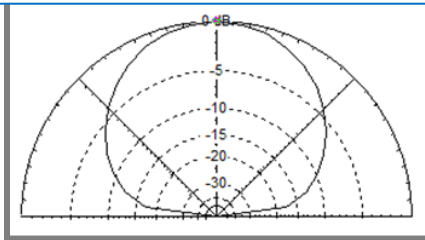


Horizontal Loop 4

25' height | granite ground | corner source
260' length

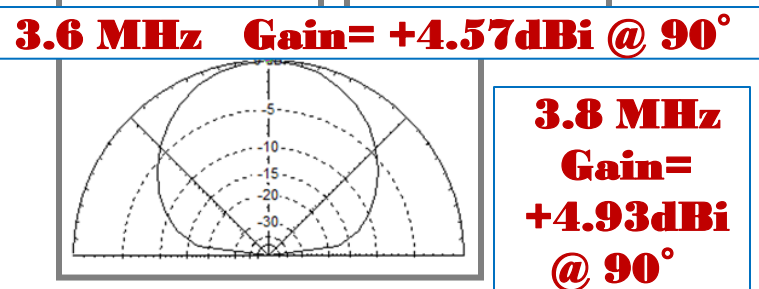
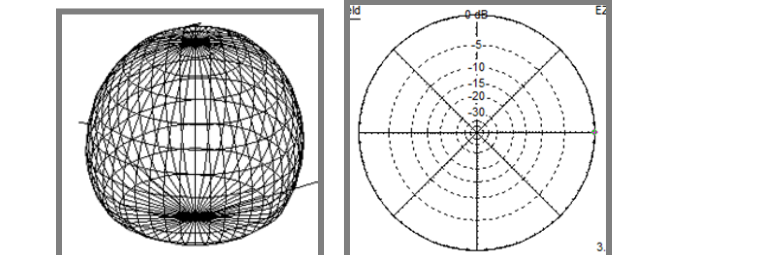
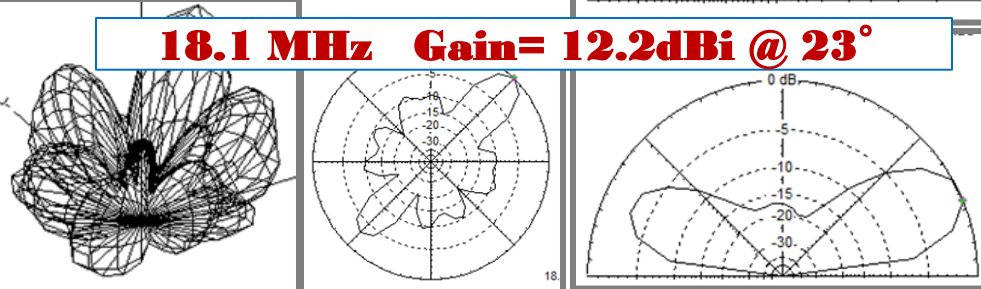
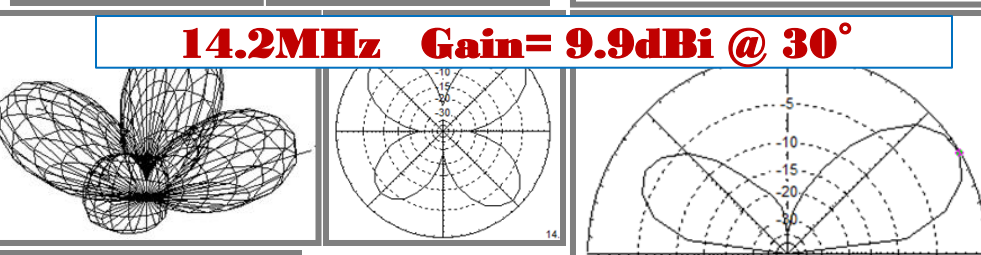
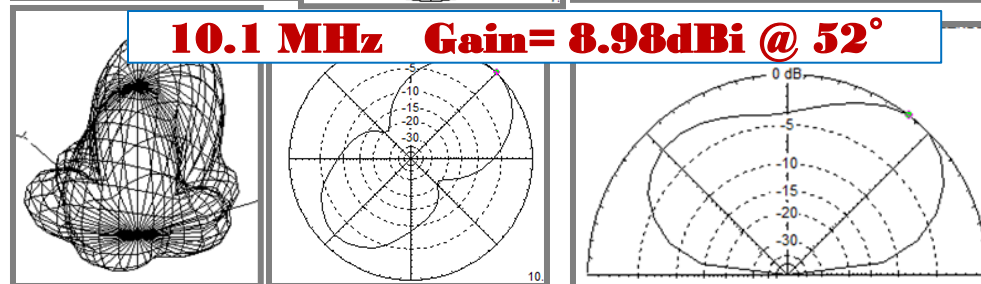
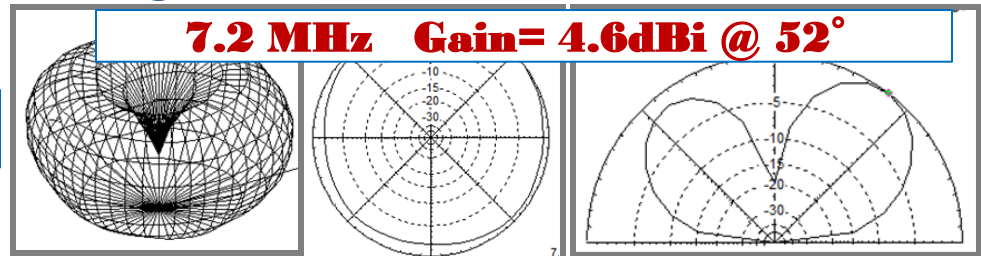
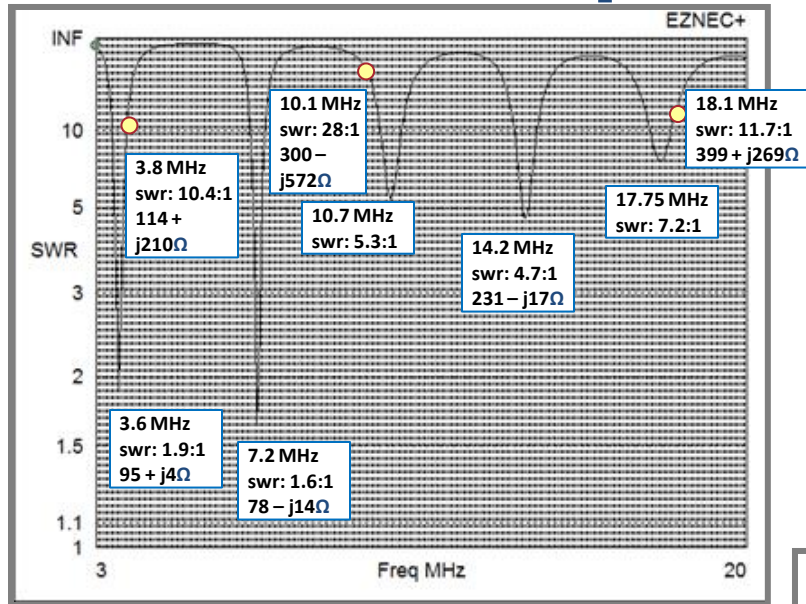


3.85 MHz Gain = +4.82dBi @ 90°



Horizontal Loop 5

25' height | granite ground | corner source
280' length



Horizontal Loop Modeling ~ Results

Model		80/75m	40m	30m	20m	17m
L=260 H=10 Gnd=Average Feed=Corner	MHz SWR dBi	3.8 1.83:1 +0.3	7.1 7.74 55:1 2.0:1 -0.77 -0.83	10.1 11.4 97:1 4.2:1	14.1 15.3 72:1 3.6:1 6.3 6.3	
L=260 H=10 Gnd=Granite Feed=Corner	MHz SWR dBi	3.8 2.2:1 +0.53	7.1 7.7 53:1 2.2:1 -1.49 -1.59	10.1 11.5 100:1 4.3:1	14.1 15.35 76:1 3.6:1 3.23 6.1	
L=260 H=10 Gnd=Granite Feed=Side	MHz SWR dBi	3.8 2.14:1 -0.44	7.1 7.6 25:1 4.3:1 -0.71 -0.11	10.1 11.55 85:1 5.5:1	14.1 15.35 76:1 3.8:1 4.5 5.5	
L=260 H=25 Gnd=Granite Feed=Corner	MHz SWR dBi	3.85 2.1:1 +4.82	7.1 7.75 85:1 1.8:1 4.9 4.9	10.1 11.55 85:1 5.5:1	14.1 15.3 51:1 4.9:1 9.4 10.1	
L=280 H=25 Gnd=Granite Feed=Corner	MHz SWR dBi	3.6 3.8 1.9:1 10:1 4.57 4.93	7.2 1.6:1 4.6	10.1 10.7 28:1 5.3:1 +8.9 -	14.2 4.7:1 9.9	17.71 18.1 7.2:1 4.7:1 . 12.7



Horizontal Loop Modeling ~ Conclusion

#	Length	Height	Ground	Feed
1	260'	10	Average	Corner
2	260'	10	Granite	Corner
3	260'	10	Granite	Side
4	260'	25	Granite	Corner
5	280'	25	Granite	Corner

My conclusion (W1DYJ) from these three models:

- Ground characteristics make little difference
- Corner source somewhat worse, but mechanically better

My conclusion (W1DYJ) from these two models:

- The extra height adds from 4 to 6 dB more gain, and at a lower angle on 40 and 20M

My conclusion (W1DYJ) from this model:

- Extending to 280' makes 40 & 20 work well and allows 30 and 17 to be usable. Moves 75 → 80

Remember – a model is just a **VERY** simplified version of reality

