DIL-TA Loop

No it is not DIL~~L~~-TA – It is DIL-TA Loop ☺

Single Wire vs Planned Three Elements - Triangle Shape ☺

Dec 15 – 2022 to Dec 25, 2022

Truly On the HF Air since Dec 25th – Now a Rooster Net on 80m – Honor is Mine – KC3SSG

Presented in March for the HAM Hobbyists, 2023

Antenna References: Monopole antenna – Wikipedia

ARRL –Antenna Books – And Yes I did peak at an Antenna Design Class – that looked intimidating!

Welcome to the hobby – Do you have first piece (ANTENNA) of the Hobby Figured ☺

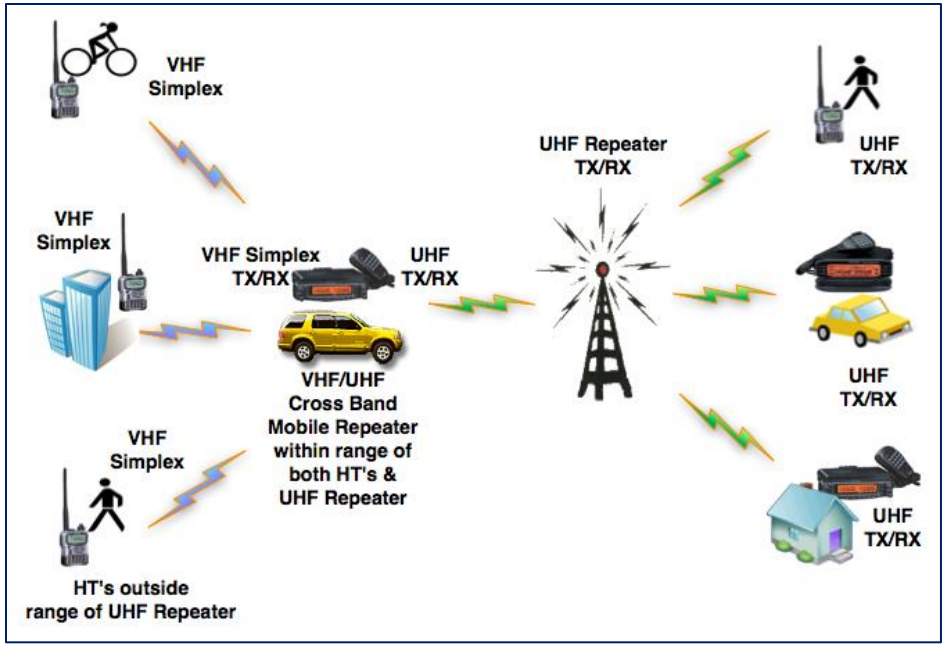
1. Many System Elements – Next Slide will talk

2. Logistics
    1. Systematically growing knowledge
    2. Timeline – Project Schedule – Understand Commitment – Applies to all things in life
    3. Designing – Parameters – Constraints – Absolute haves vs unnecessary
    4. Building it, Money, Effort and Time – Cables/Poles/Coax/Switches/Grounding/Wire
    5. Testing/Analysis
        1. Data Collection/Analysis/Tuner and Nano VNA and WebSDR for Operations
        2. Component Testing – Summer 23 – Some Theoretical Concept Understanding
    6. Sustainment – Mantainence Aspect, Safety Considerations, Replacement of Parts

3. Future Considerations
    1. Safety – Fixtures – Need to do more!
    2. Separate the Elements
    3. Do More Tests Grow Knowledge
        1. Tests involve Baluns/Ununs - Leakage

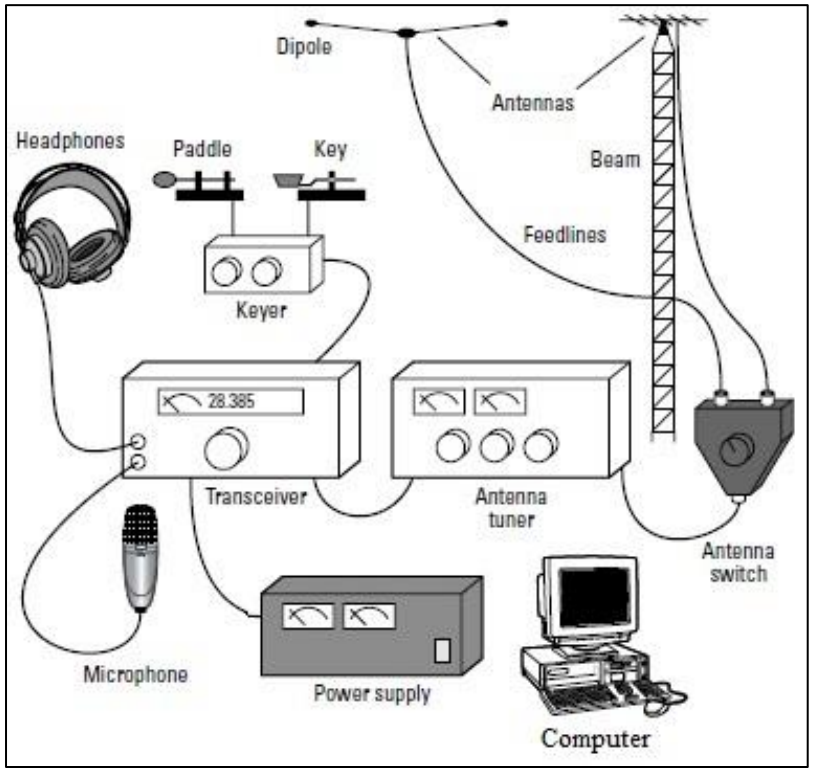
You have arrived as new HAM hobbyist – Congratulations – Many System Elements

1. How to go from License Holder to be on Air
2. Typically Two Routes are available
   a) Dive Right In – Waste Money
   b) Think This Through – Carefully Waste Money – It is expensive Hobby
3. Start with VHF/UHF
   a) Start with a VHF/UHF Capable Radio
   b) Invest in VHF/UHF Antenna



Typical VHF/UHF – Needs – Starting Point

4. Grow with HF
   a) Start Identifying what equipment you need
   b) Grow that need – take small steps



Typical HF – Needs – Little Involved

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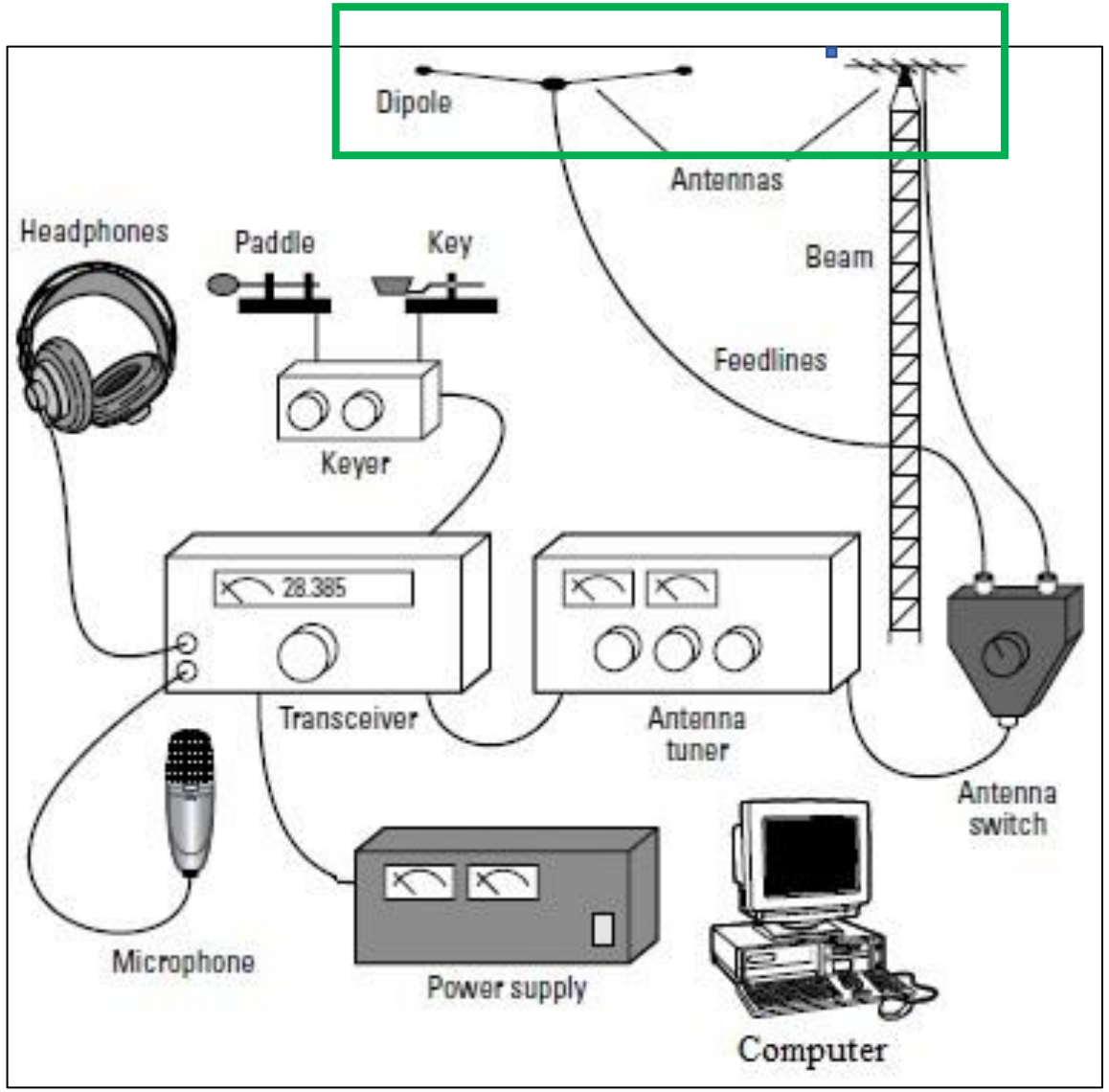
        1. Tests involve Baluns/Ununs - Leakage

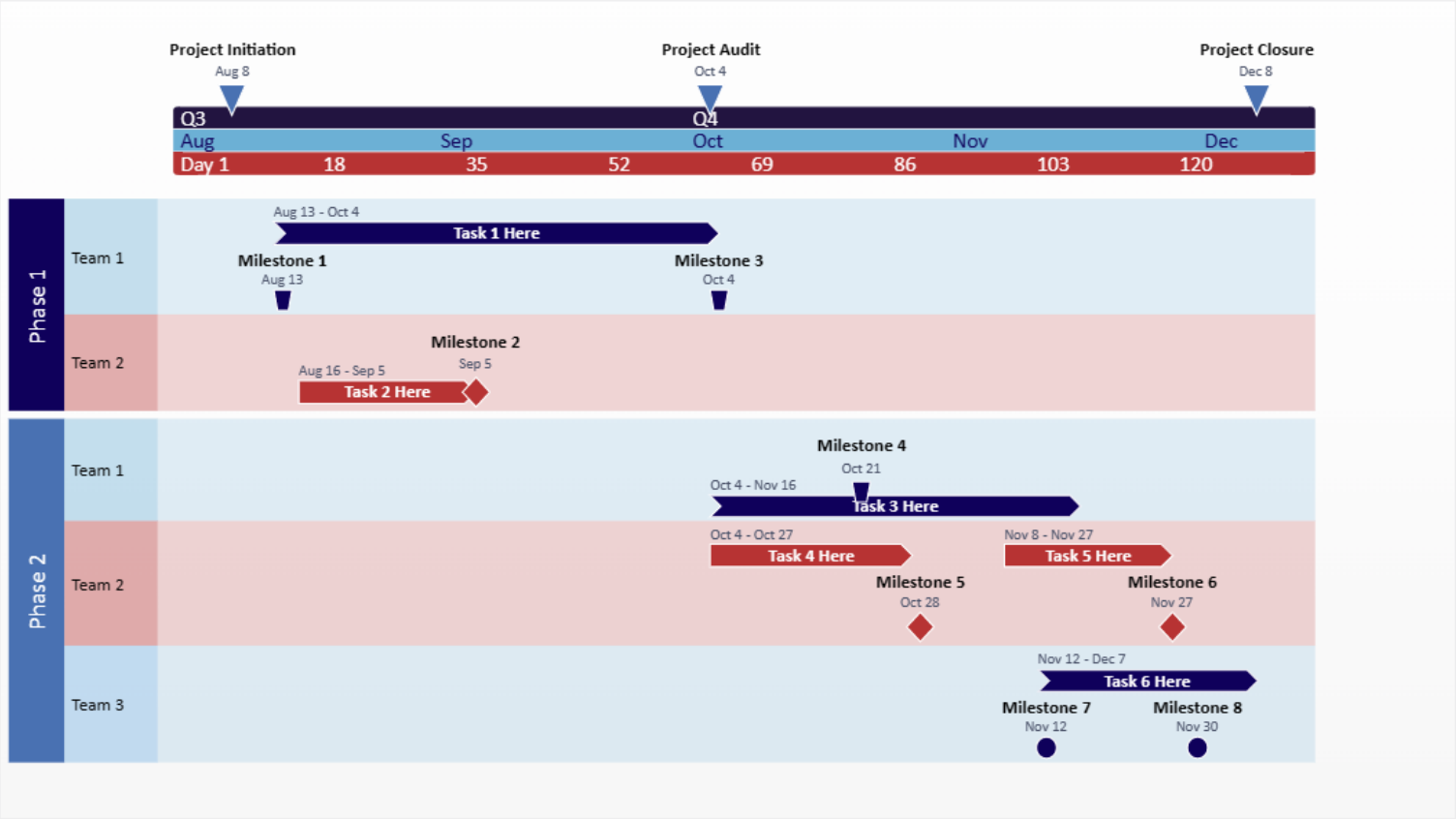
Logistics – Systematically Growing your knowledge Gradually



Many Pieces of the Puzzle in Hobby!

Only Antenna Knowledge Grown by this Project

Logistics – Timeline - Time Effort and Schedule – 200 Hrs vs 20 Hrs vs 2 Hrs – Consideration is Important!



How much time can you dedicate – be realistic!

Treat it as a Small Hobby Project – Specially for teaching Kids!

Let's Imagine

1. It Takes 200 Hours to Build this!
2. You think you can do it in 20 Hours
3. And Yet you only put in 2 Hours
4. No wonder it does not work ☹
5. Teach Kids, give up your Tablets and Internet for few days ☺

Logistics - Designing

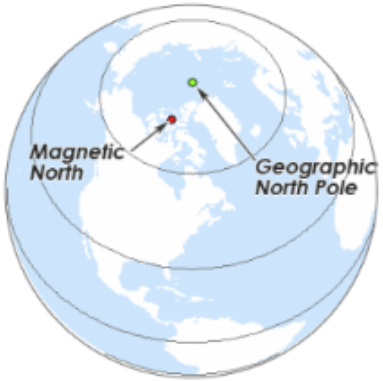
Perform Site Survey

1. Element Axis Locations – Survey Angles/Geometry
2. Antenna Patterns
3. Obscura Understanding
4. Alignment to Parts of Planet
   a) Radio Zones
   b) Geographic Locations
5. Logistics to Configurations
   1. Cables
   2. Connectors
   3. Operating Points
   4. Feed points
6. Tests and Configurations
7. Sustainment

Where are the Magnetic North Pole and Geographic North Pole?

The question is:

Where would a compass needle point if you were standing on the true North Pole?



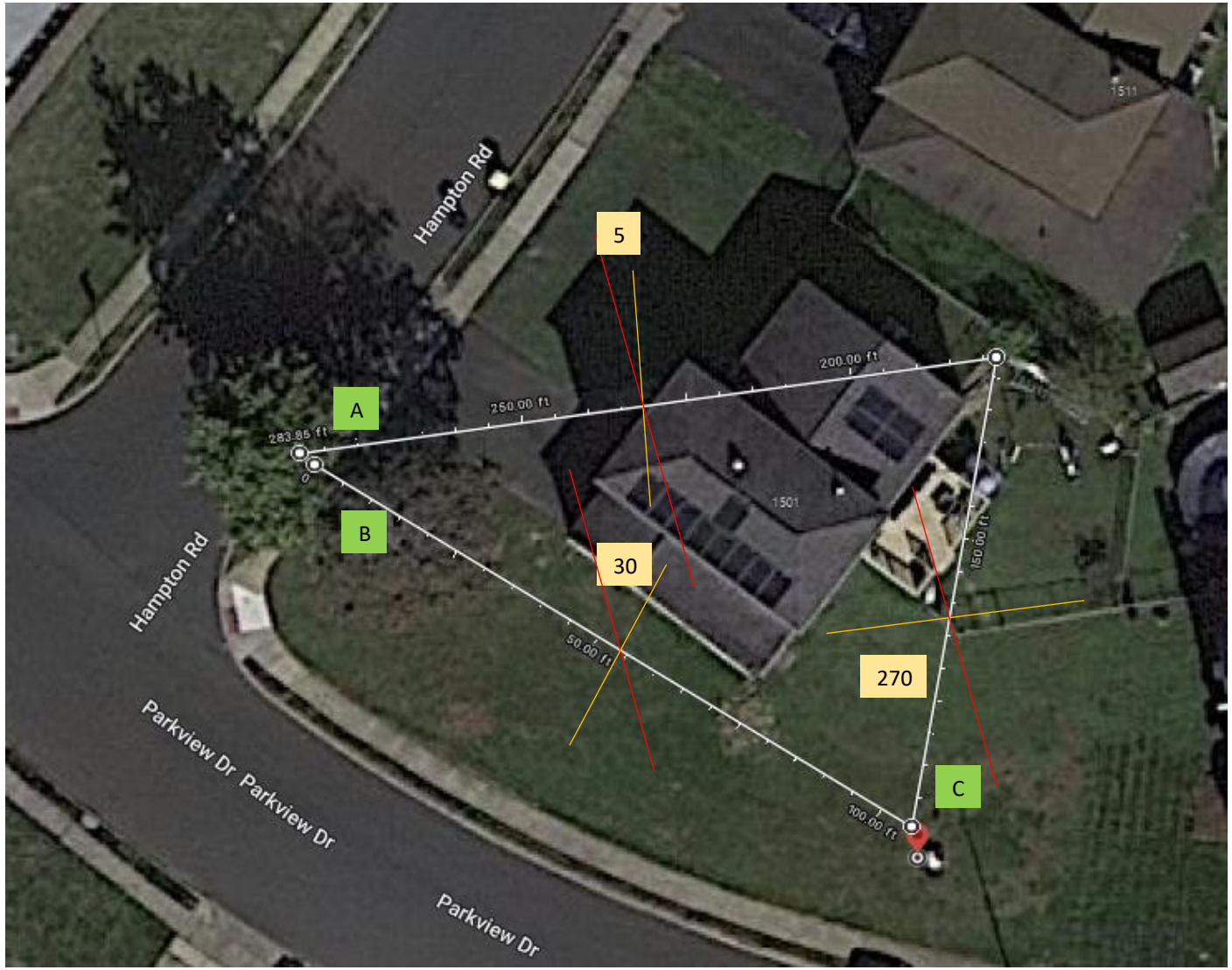
If you were standing on the geographic north pole holding your compass, it would point towards northern Canada at Ellesmere Island. This is a difference of about 500 kilometers between the Geographic North and Magnetic North poles!

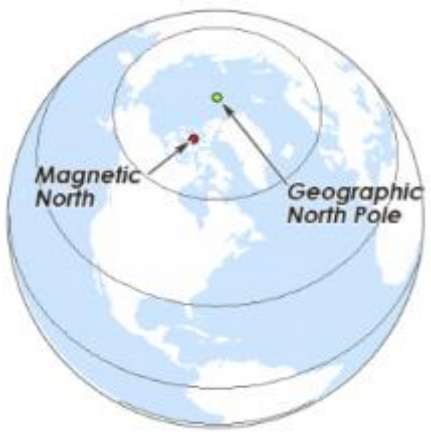
This difference is called the **magnetic inclination**. *Magnetic deviation* is the error of a compass needle including nearby metallic objects.

Magnetic inclination varies according to where you are located on the globe. In order to point you in the right direction, users can compensate for magnetic inclination by using charts of declination or local calibration.

The difference today is about 500 kilometers. But the Magnetic North Pole is actually moving kilometers every year. This phenomenon is known as the **Polar Shift Theory**.

Logistics – Designing – Physical Survey – Angles and Planned Elements – Takeaway – Planning/Modeling is not



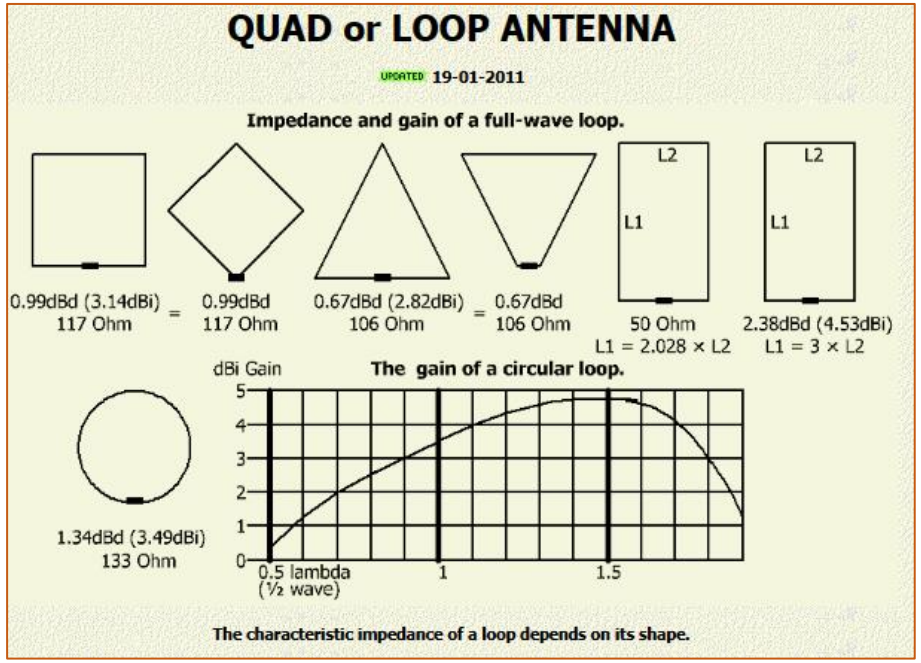


White = Antenna Elements (Wires)
Green = Antenna Element Names
Red = Magnetic North
Yellow = Midsection of Antenna Element = Bisection to Magnetic North

A, 5 degree = Length = 130 feet
B, 30 degree = Length = 120 feet
C, 270 degree = Length = 90 feet

A = Height = 45 feet
B = Height = 55 feet
C = Height = 55 feet

Logistics – Design - Parameters – Many - Takeaway – Planning/Modeling is not reality – Consideration is Important!



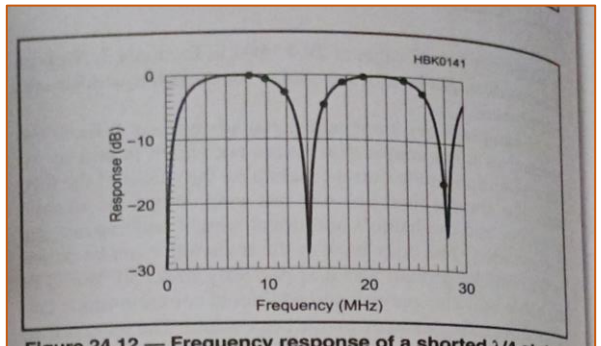


Figure 24.12 — Frequency response of a shorted λ/4 stub cut for 14 MHz.

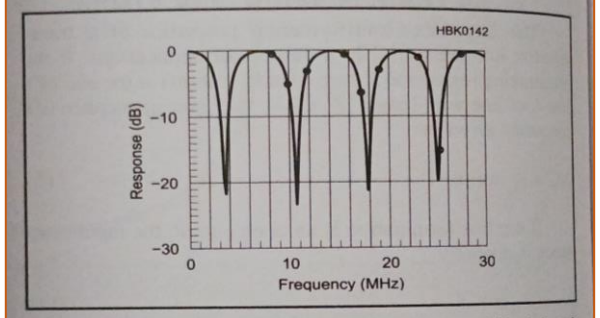
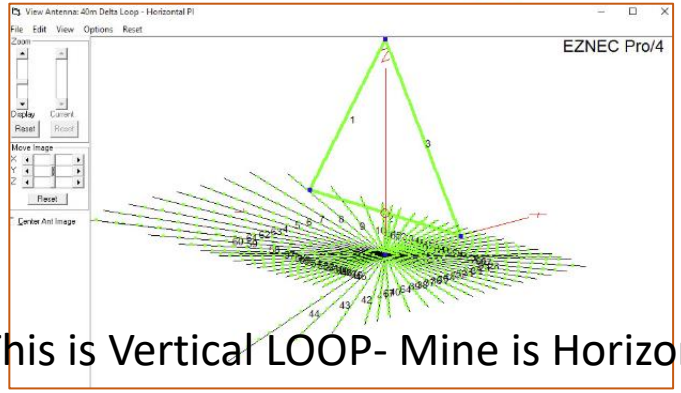


Figure 24.13 — Frequency response of an open λ/4 stub cut for 7 MHz.

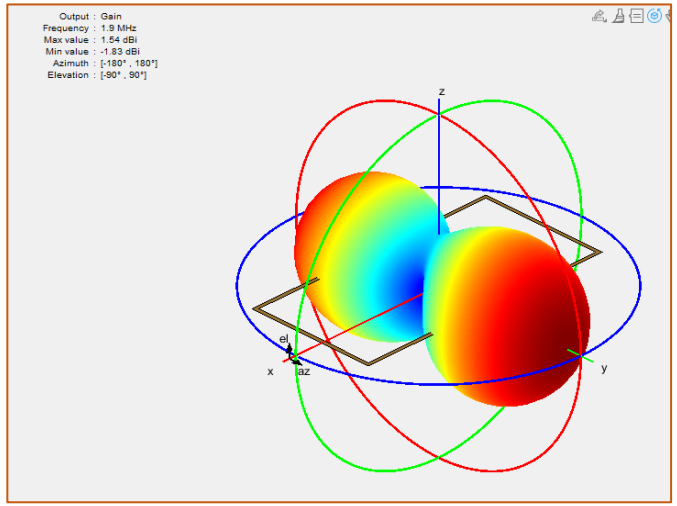
Table 24.10
Quarter-Wave Stub Lengths for the HF Contesting Bands

Freq (MHz)	*Length (L_e)**	*Remove per 100 kHz*
1.8	90 ft, 10 in	57⅜ in
3.5	46 ft, 9 in	15½ in
7.0	23 ft, 4 in	4 in
14.0	11 ft, 8 in	1 in
21.0	7 ft, 9 in	7/16 in
28.0	5 ft, 10 in	¼ in

*Lengths shown are for RG-213 and any similar cable, assuming a 0.66 velocity factor (L_e = 163.5/f).

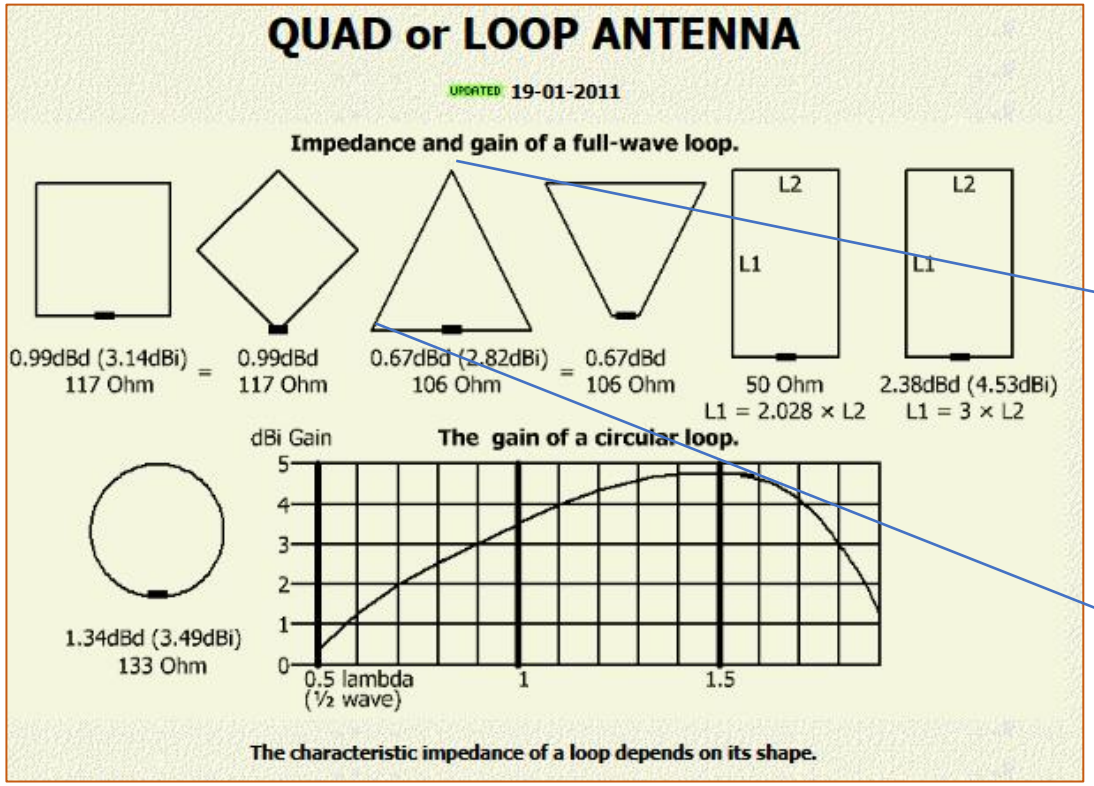


This is Vertical LOOP- Mine is Horizontal

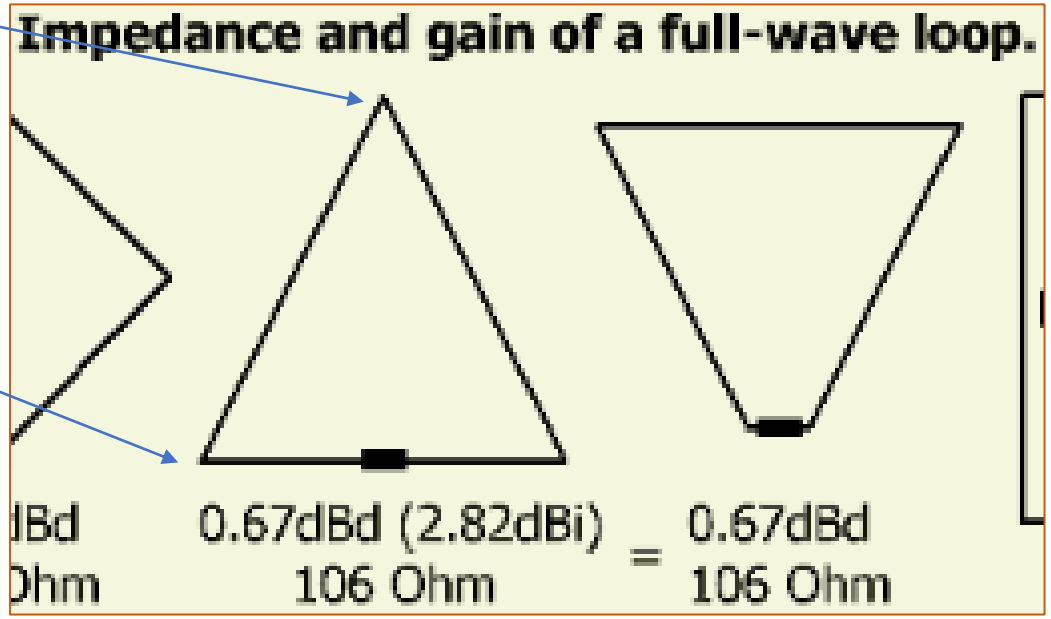


Let me say again ☺
Design Parameters – Many

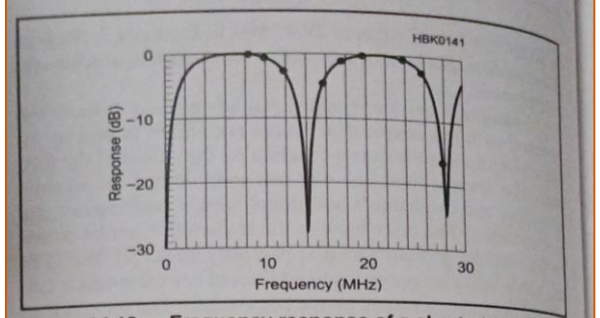
Logistics – Design Parameters – Shape and Gain - Takeaway – Planning/Modeling is not reality – Consideration is Important!



Impedance and Gain
Tests Later for Test Configuration



Logistics – Design Parameters – VSWR - Takeaway – Planning/Modeling is not reality – Consideration is Important!



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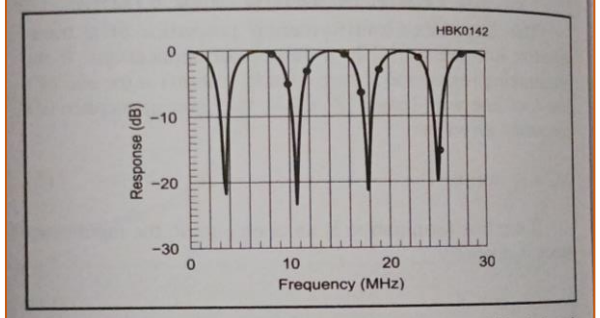

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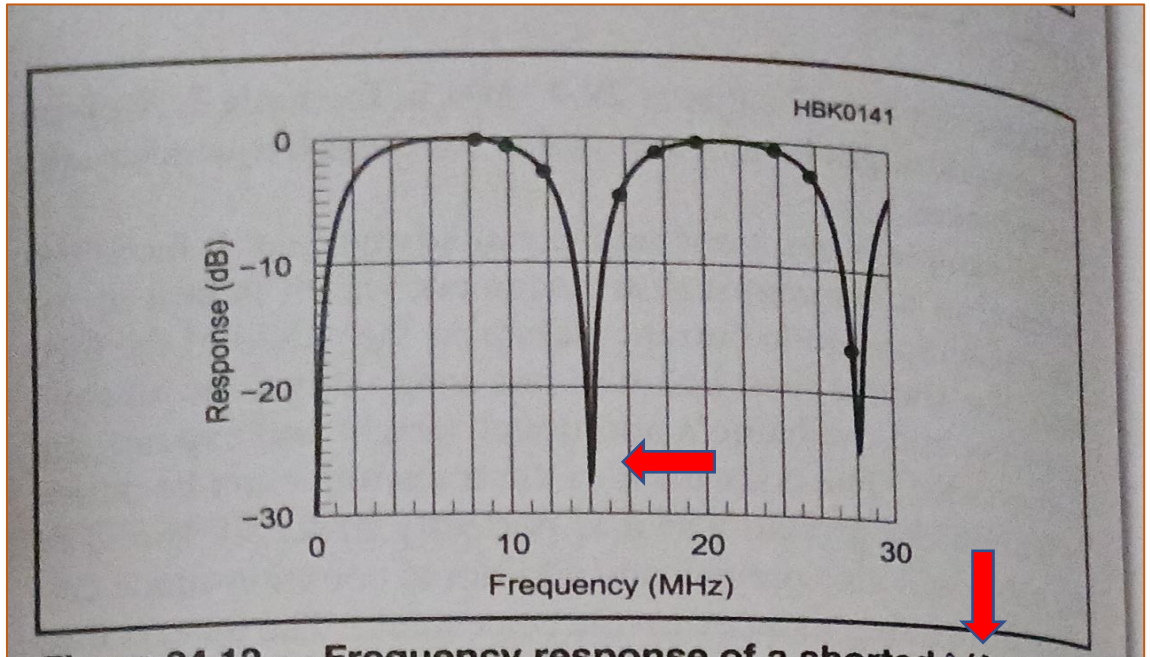

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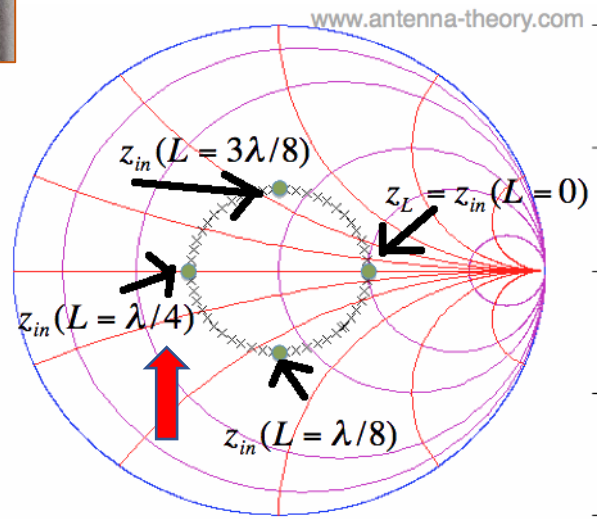
Physical Length

Electrical Length



Logistics – Design Parameters – VSWR - Takeaway – Planning/Modeling is not reality – Consideration is Important – How will Testing take shape!

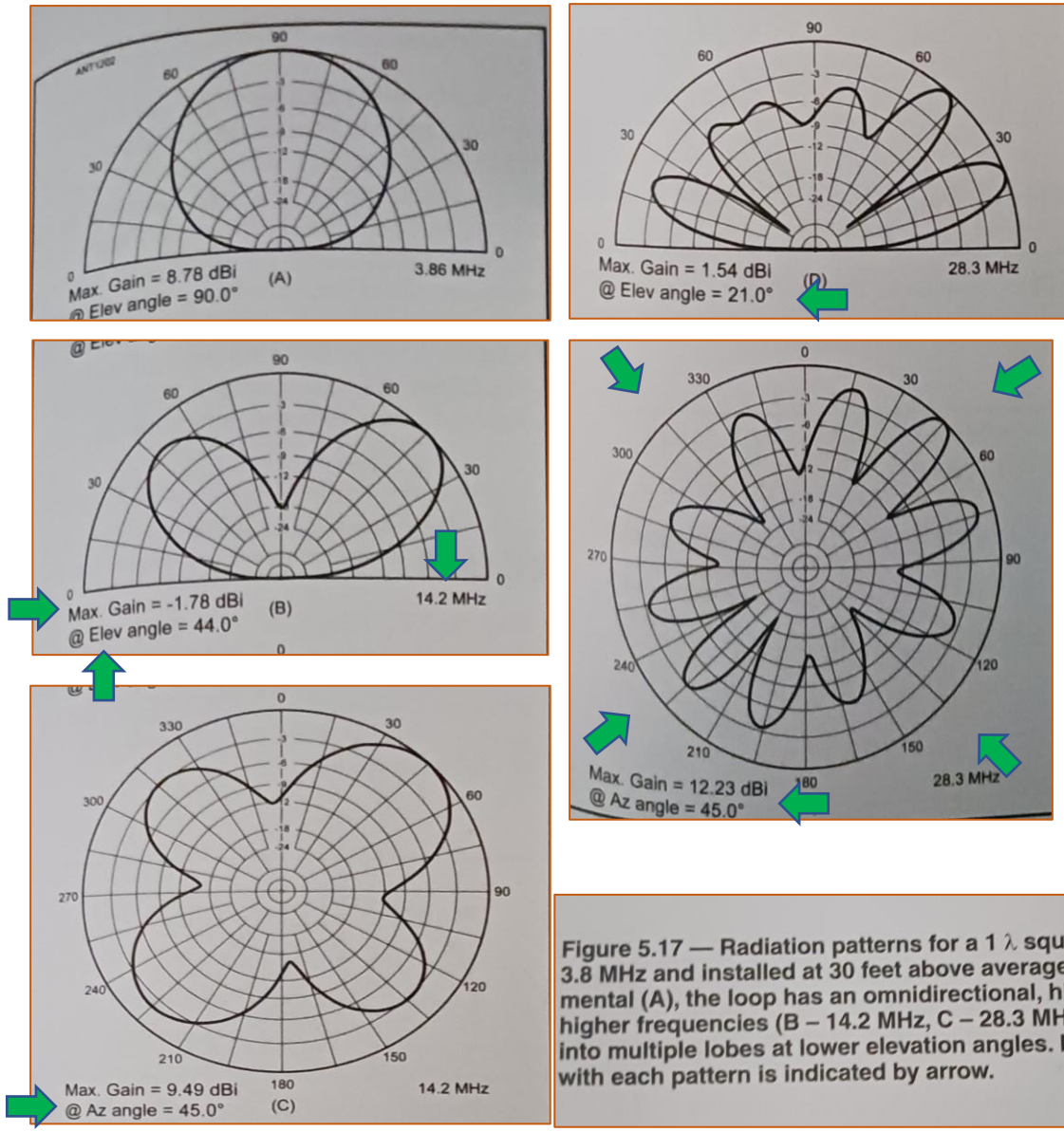
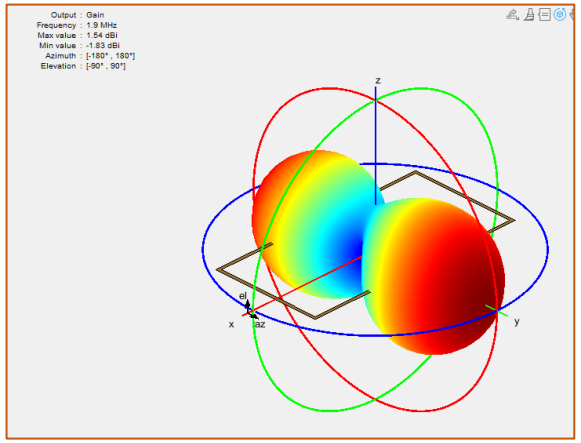


Figure 5.17 — Radiation patterns for a 1 λ square, horizontal loop cut for 3.8 MHz and installed at 30 feet above average ground. On the fundamental (A), the loop has an omnidirectional, high-angle pattern. At higher frequencies (B – 14.2 MHz, C – 28.3 MHz) the pattern breaks up into multiple lobes at lower elevation angles. NOTE: data to be included with each pattern is indicated by arrow.



Software Model Pictures only look pretty – is not the reality!

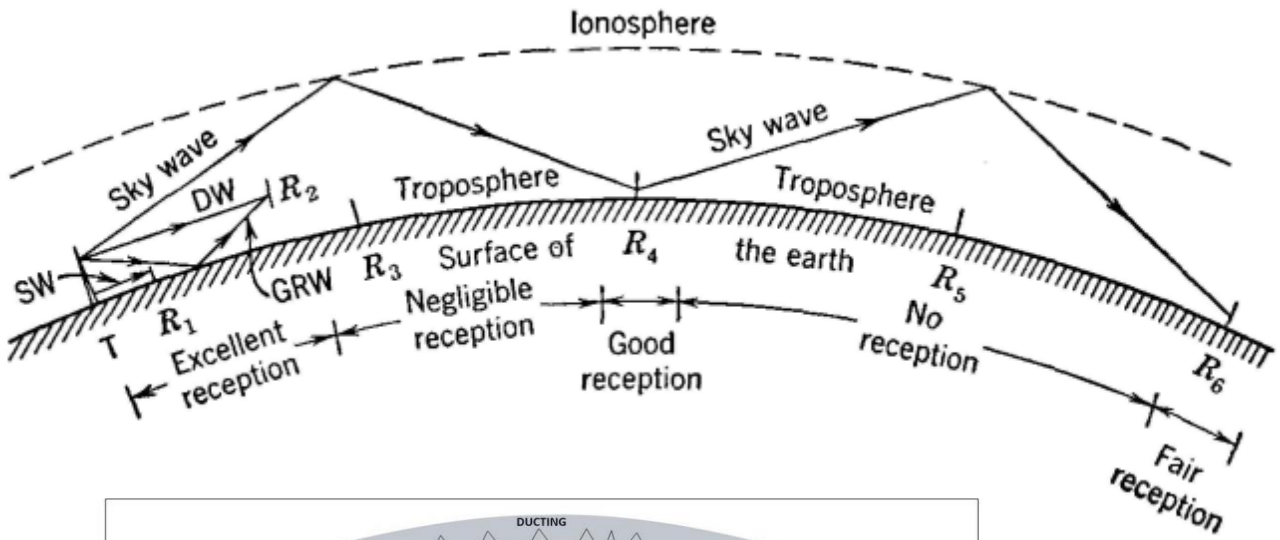
Takeaways

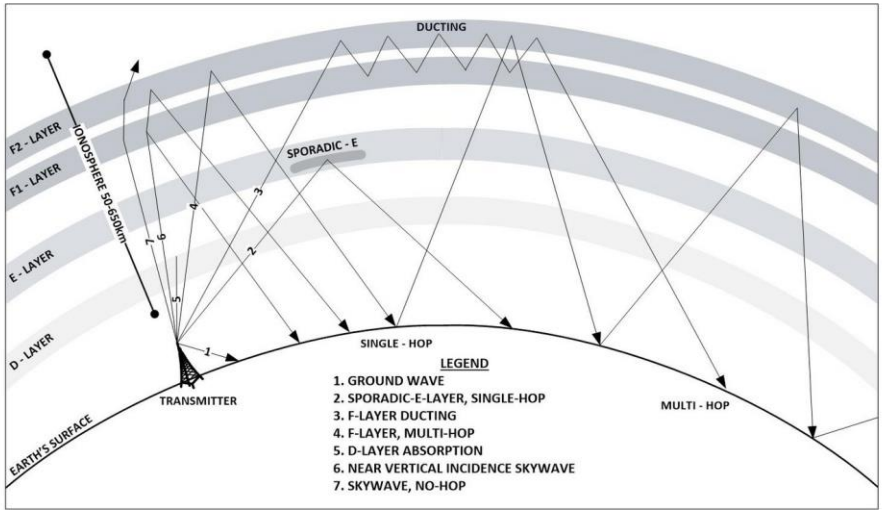
1. Parameters are important but are Many and Too Many
2. Consider Tradeoffs – stick to what you want most!

In my case – as long I have 80,40,20 I am good rest is bonus – no one Antenna is going to give you everything…Wire most likely will!

Logistics – Design Parameters – Which Band is Focus at any given Time Operational Aspect - Takeaway – Planning/Modeling is not reality – Considerations are Important!

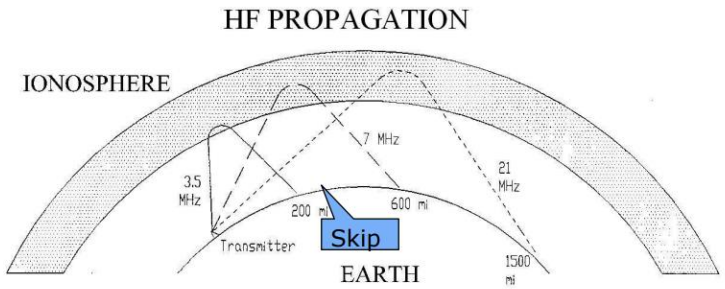
Propagation Considerations

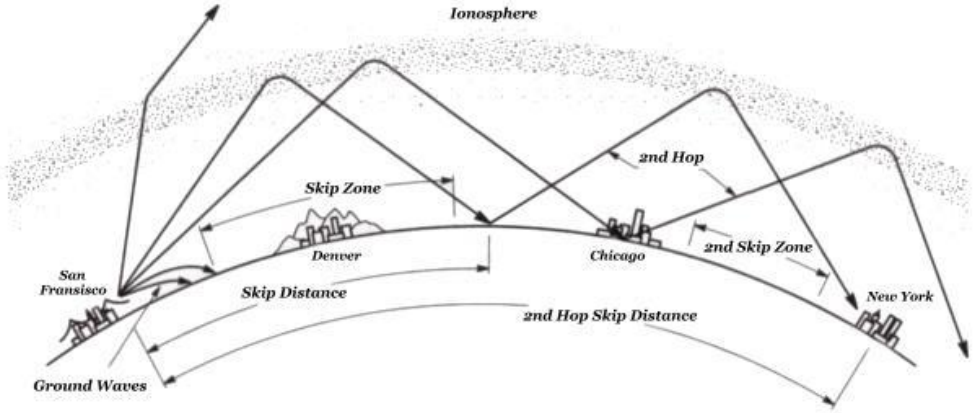




HF Propagation

* The ionosphere reflects HF radio waves





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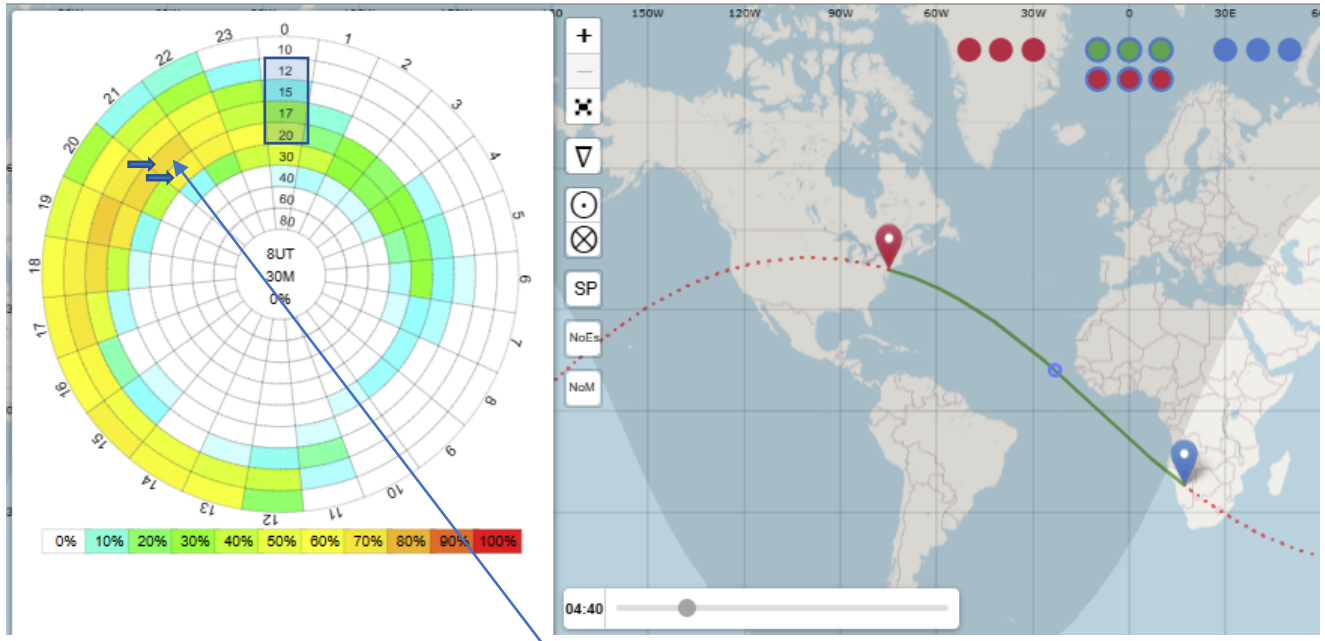
VOACAP Online for Ham Radio – 22:12:59 UTC (05:12 PM)

Select TX QTH: W Trenton NJ or set Grid: FN20of or Latitude: 40.2300 Longitude: -74.7700
Select RX QTH: V5 Namibia or set Grid: JG87nk or Latitude: -22.5700 Longitude: 17.1000



I made a contact in Namibia on 17m – 18.146 MHz at 21:12UTC
Then I did a little check using VOACAP Online Software and practice has been confirmed by what theoretical tool gives

VOACAP Analysis Gives – 17 & 20 m Band with ~70 to 80% probability to contact
20m was also seen fairly active in the UTC times of 22:20

Dotted Line indicates Long path – and California would have been reachable as well, and needless to say, a California Station was trying to get in touch with Namibian station

1 of 2 Search... Filter: All QSOs

	Date	Time	RX Call	TX Fre...	RX Mode	RX Grid	RX	RX Country	RX Operator Name	Comments	
1	2022-12-25	21:12	V51WH	18.146	SSB	JG88ap		Namibia	Gunter Hartmann		
2	2022-12-25	20:31	PV8AL	18.135	SSB	FJ92ns		Brazil	HELIO DE OLIVEIRA...		

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Predicted – Design Parameters

Only showing A
You Get the Idea – Length and Height

A = Length = 130 feet
B = Length = 120 feet
C = Length = 90 feet

A = Height = 45 feet
B = Height = 55 feet
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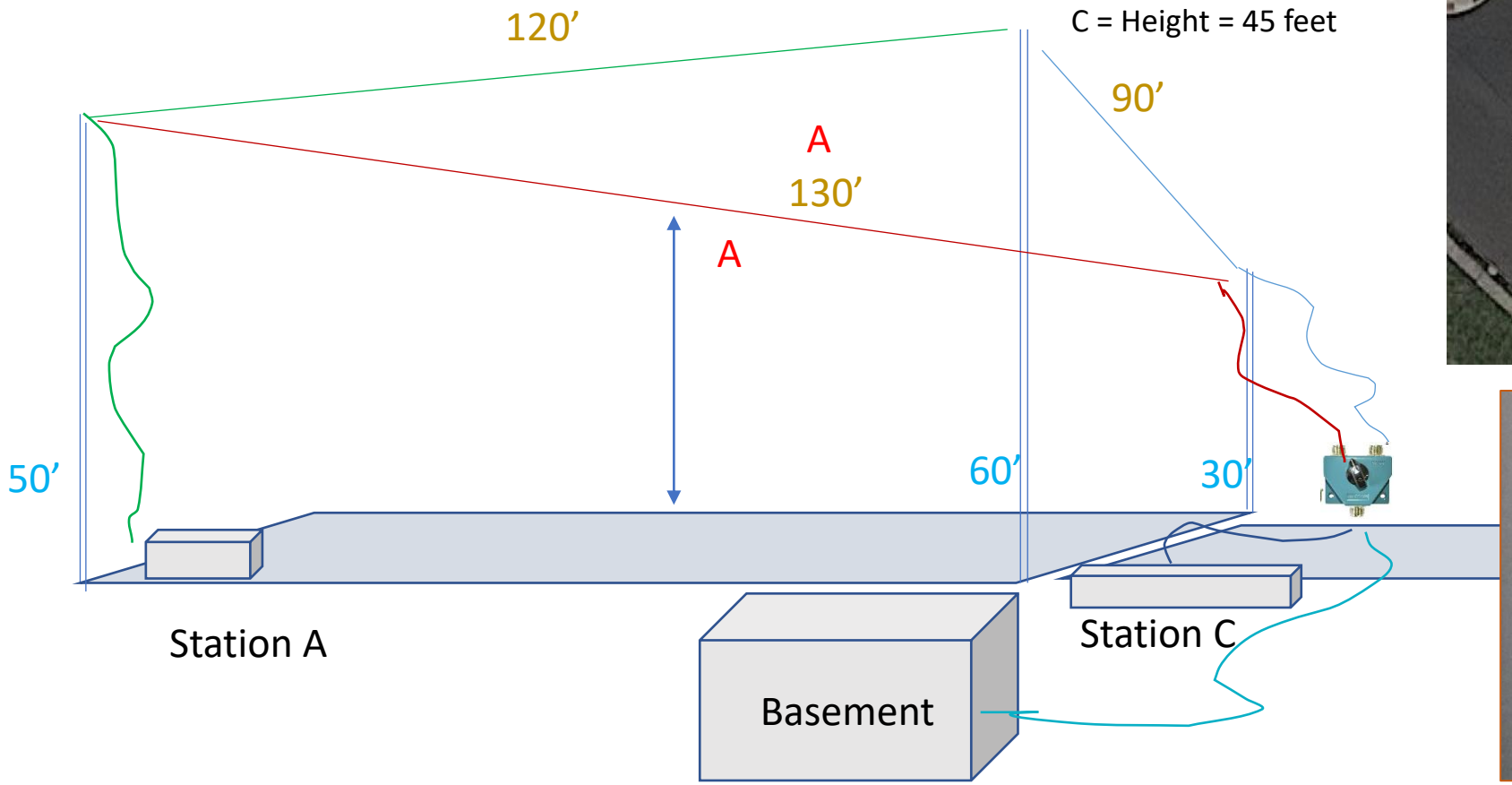

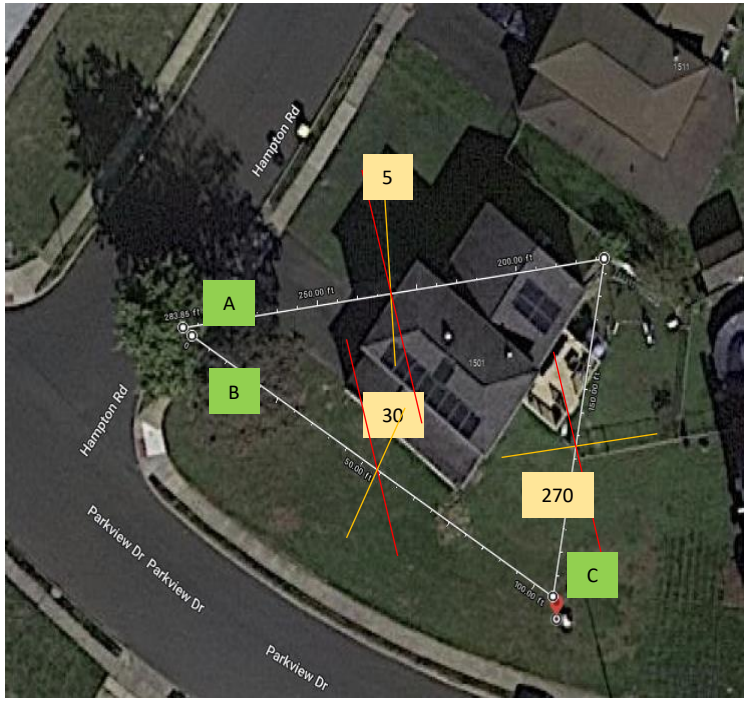

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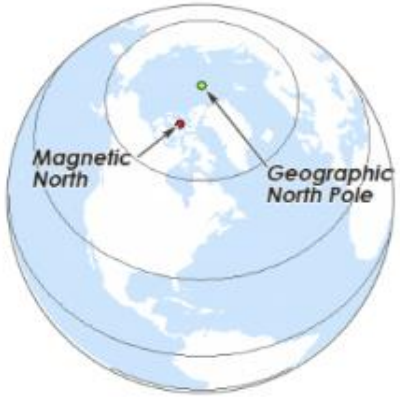
*Lengths shown are for RG-213 and any similar cable, assuming a 0.66 velocity factor (L_e = 163.5/f).

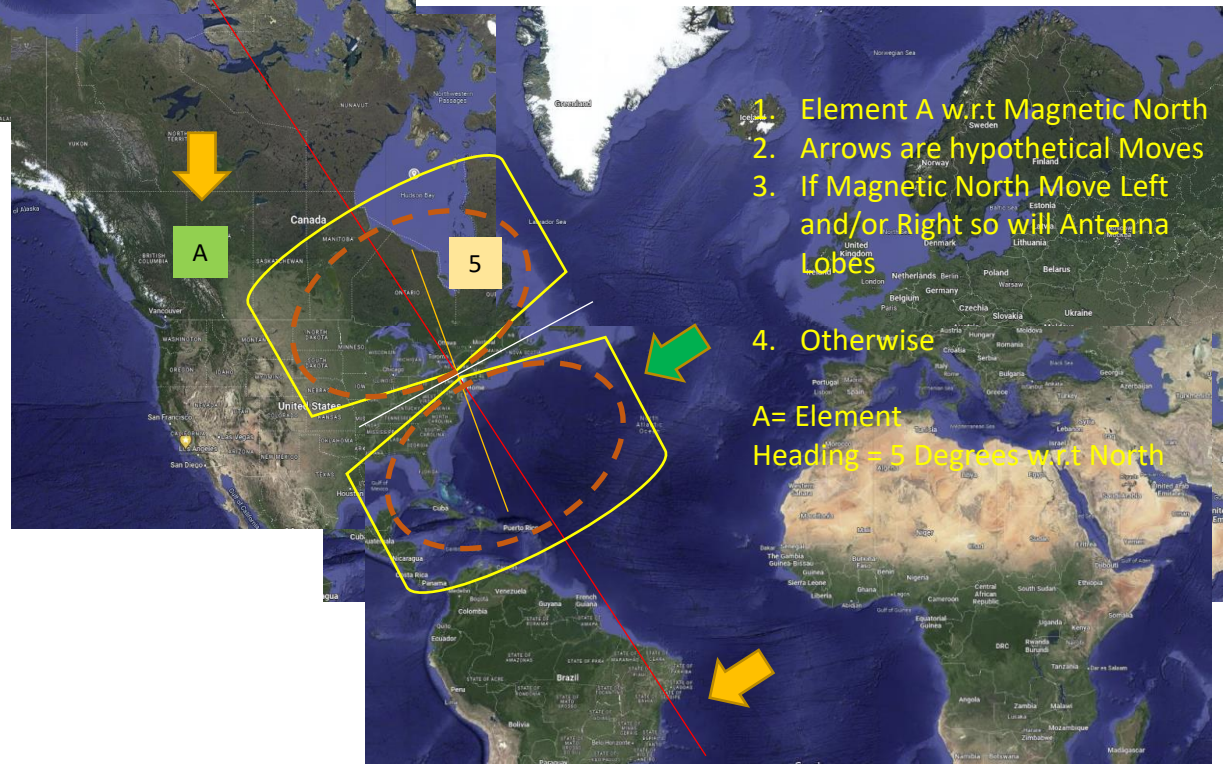
Length Table – ARRL Antenna Book

Element A - Analysis

What Geography am I going to Cover?

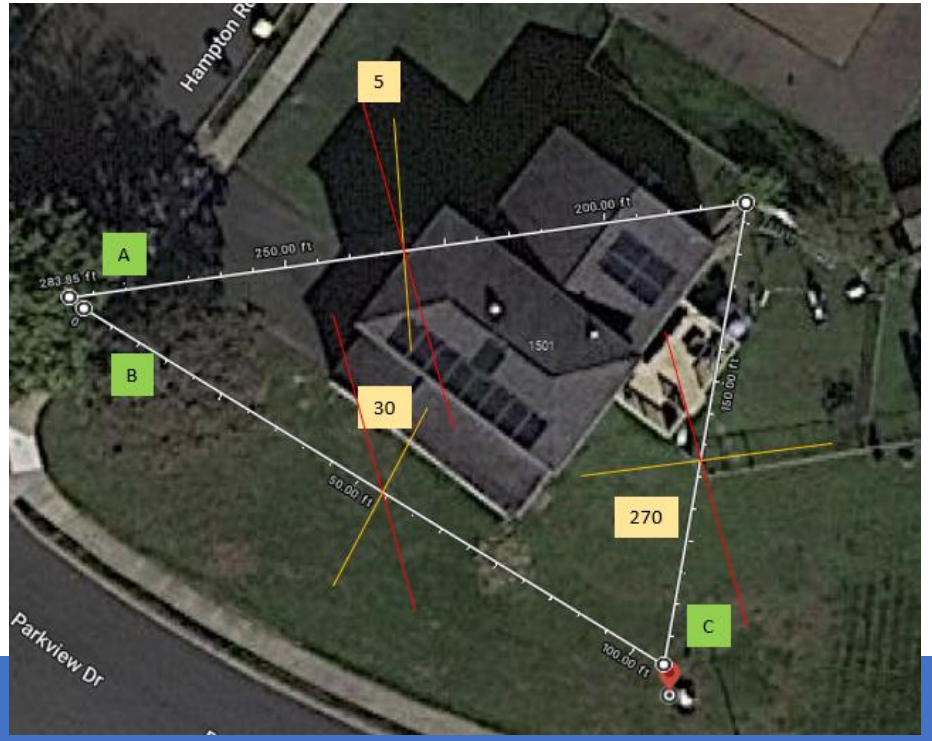
a) North
   a) NW USA
   b) NW Canada
b) South
   a) Brazil
   b) Africa



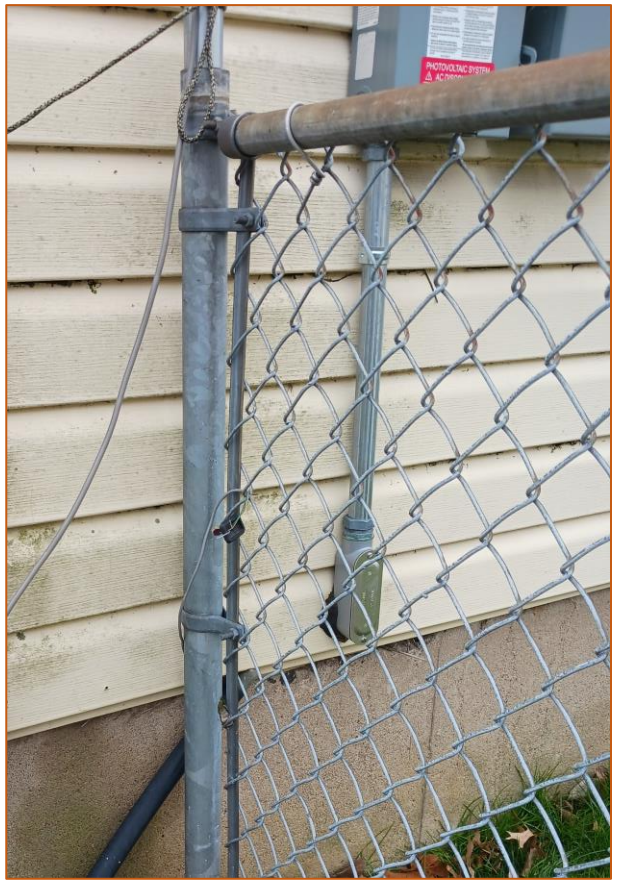


1. Element A w.r.t Magnetic North
2. Arrows are hypothetical Moves
3. If Magnetic North Move Left and/or Right so will Antenna Lobes
4. Otherwise

A= Element
Heading = 5 Degrees w.r.t North



Logistics – Building - Build Plan - Parameters – Physical Constraints – Considerations are Important!



Video – Show
Wind Loading
Guy Lines

The Whole Set of Things!

Let me say again ☺
Design Parameters
Many – Be Careful – Pick Tradeoffs – What is Absolute Must – What is not!
Consider Your Constraints!

Some Pictures of Finished work

Logistics – Building - Build Plan - Parameters – Physical Constraints – Considerations are Important!

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Configuration Considerations and Details – Element A

Element A – Planned View

Element A – Actual View

Element A – Key Outputs

	Element A	Element B	Element C
Element Height From Ground			
Element Length			
Balun or UnUn			
Unun Specs			
Balun Specs			
Feed Point Location Considerations			
Connect Under Tree			
Connect From Basement			
Connect from Deck			
Minimal Movement of Equipment			
Coax Length			
Nano VNA Tests Conducted			
160m			
80m			
60m			
40m			
30m			
20m			
17m			
15m			
12m			
10m			
6m			

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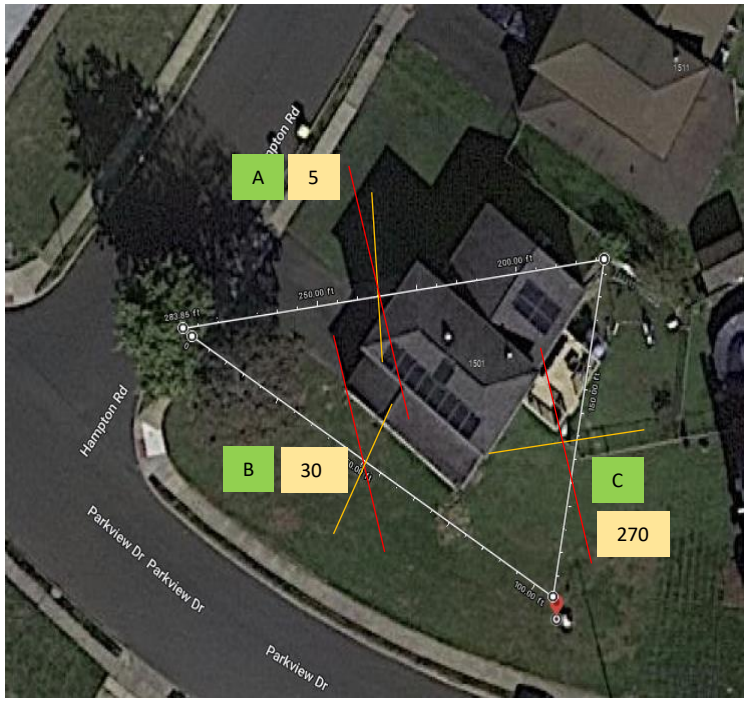
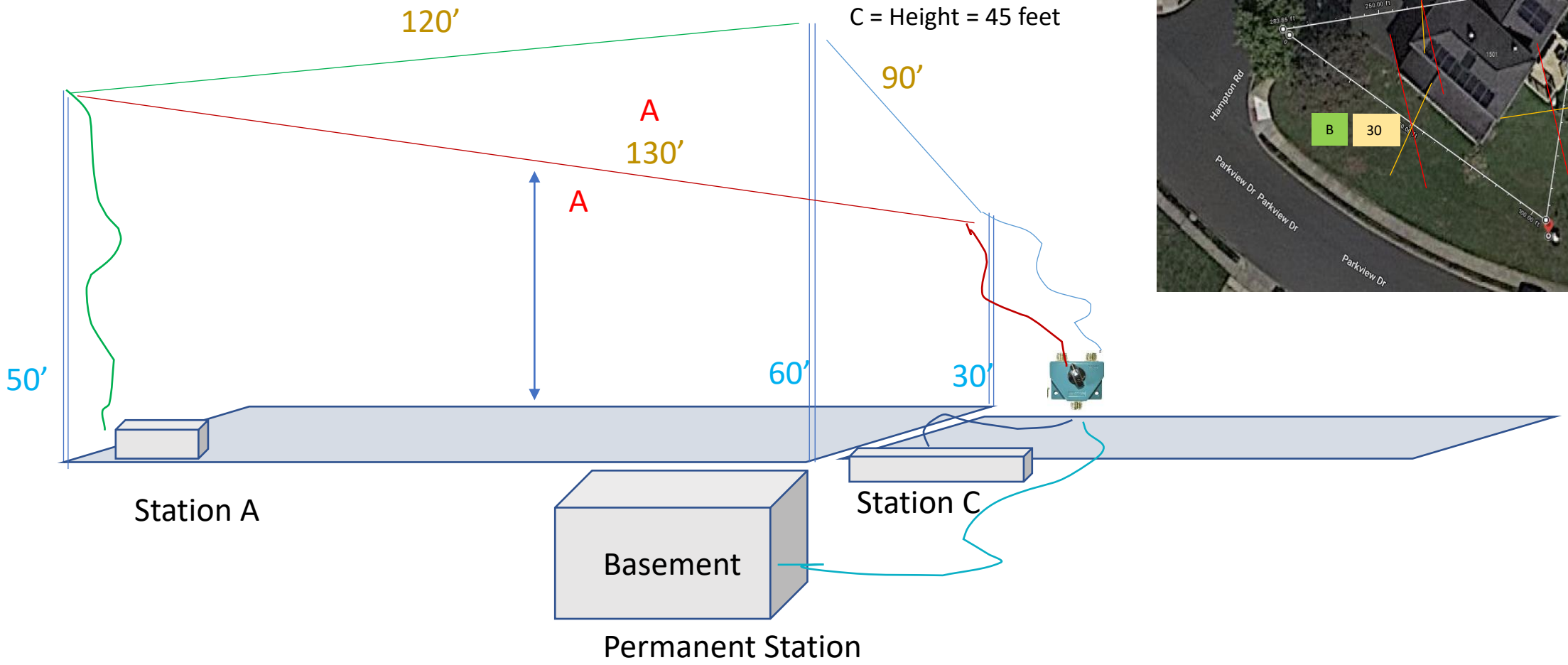
C = Height = 45 feet





Actual – Design Parameters – After Building…

Only showing A
You Get the Idea – Length and Height

And Lines have Angles – Which means bit of Directionality and Phasing then I will build – "Model" for Future

A = Length = 107 feet
B = Length = 114 feet
C = Length = 94 feet

A = Height = 34 feet
B = Height = 27 feet
C = Height = 30 feet

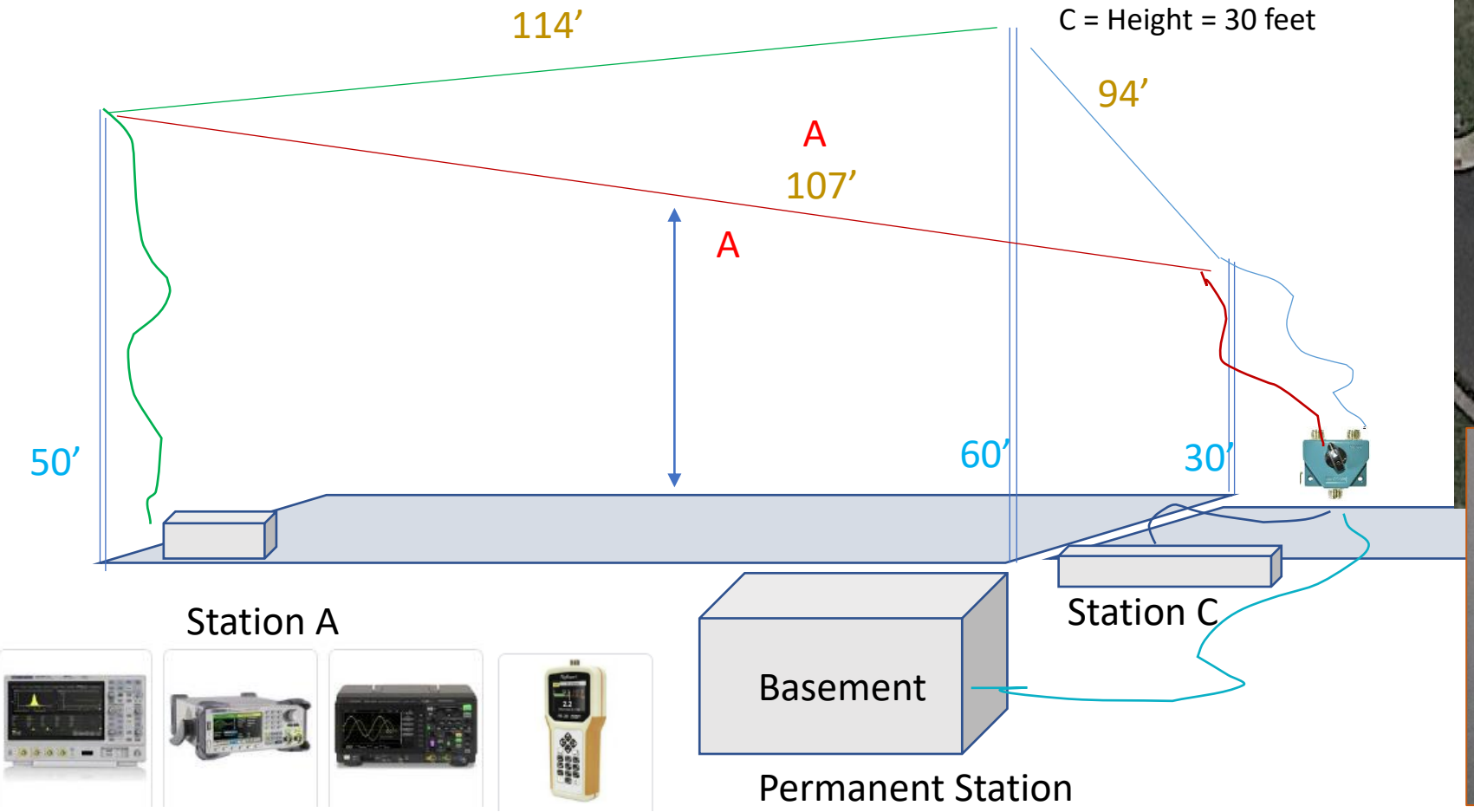


Table 24.10
Quarter-Wave Stub Lengths for the HF Contesting Bands

Freq (MHz)	*Length (L_e)**	*Remove per 100 kHz*
1.8	90 ft, 10 in	57⅜ in
3.5	46 ft, 9 in	15½ in
7.0	23 ft, 4 in	4 in
14.0	11 ft, 8 in	1 in
21.0	7 ft, 9 in	7⁄16 in
28.0	5 ft, 10 in	¼ in

*Lengths shown are for RG-213 and any similar cable, assuming a 0.66 velocity factor (L_e = 163.5/f).

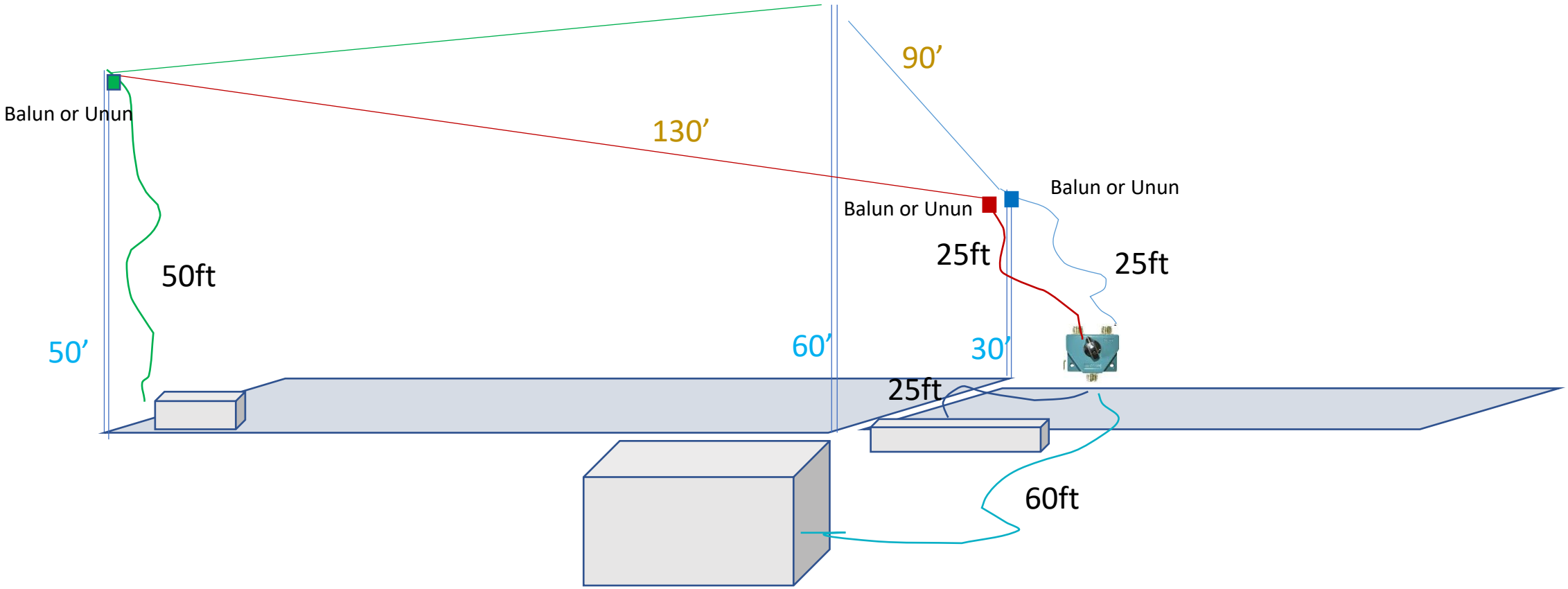
Cables and Connectors

Rope + Nut + Sling

Rope + Pully Element Wire

Hangers for Baluns

Only Metallic Pole inside Fence/Counterpoise

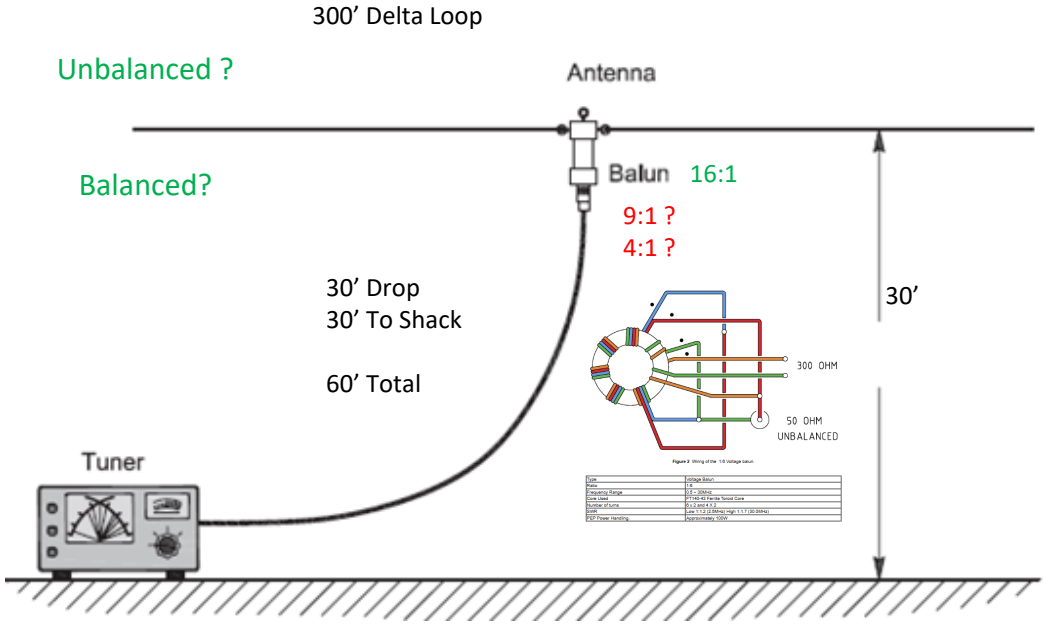


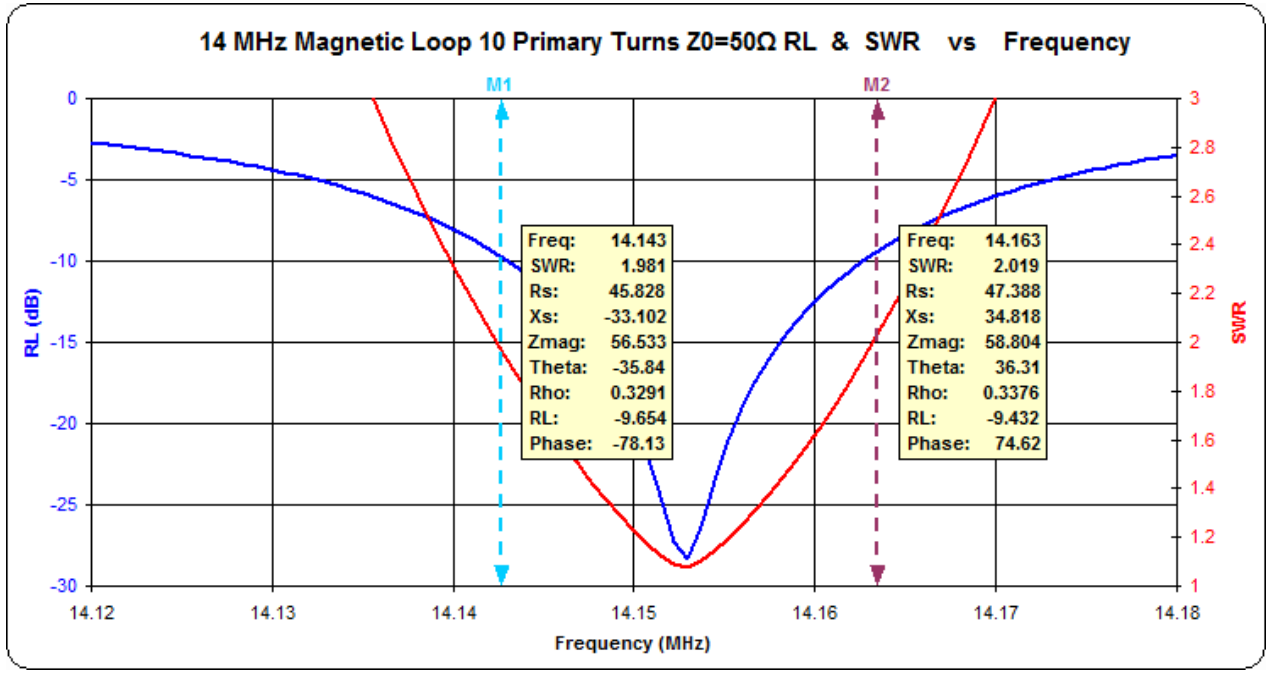
Logistics – Testing – What is most important – Matching and Leakage – So Only Two Tests – Need to Understand VNA/Baluns/RF Testing – which remains in view

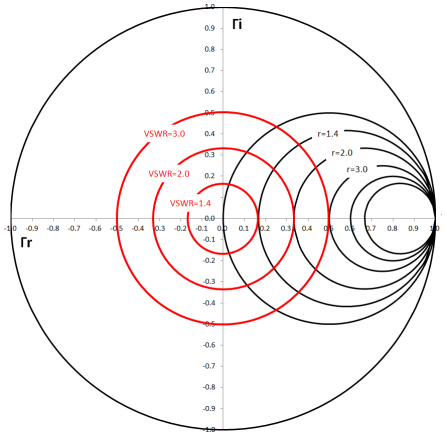
VSWR – Tests – Leakage Tests are Future Project

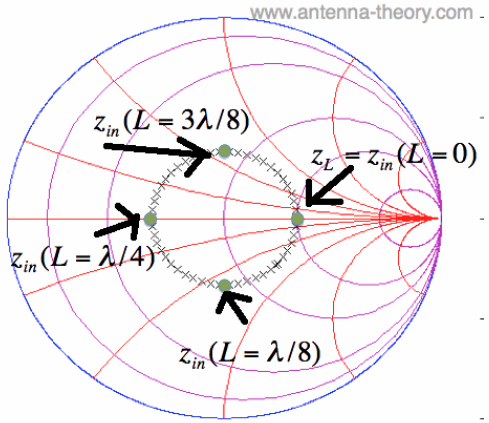
Excerpts

- Courtesy of ARRL 100th Edition
- ARRL Antenna Books

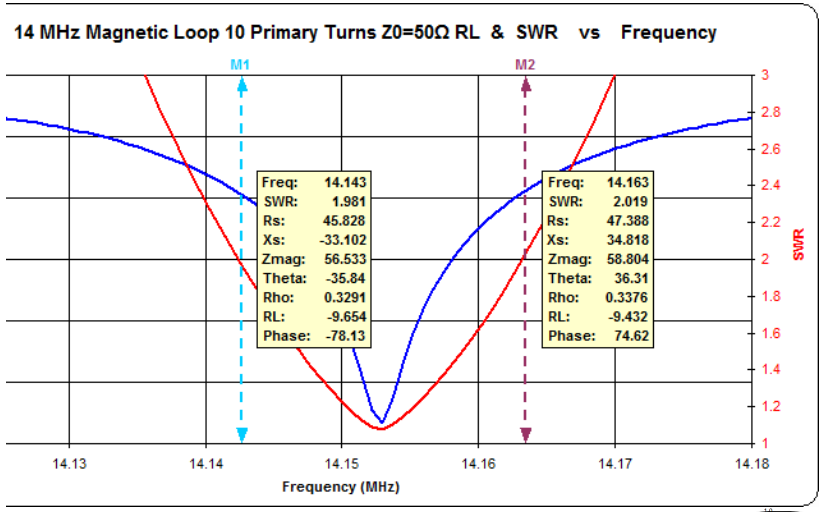




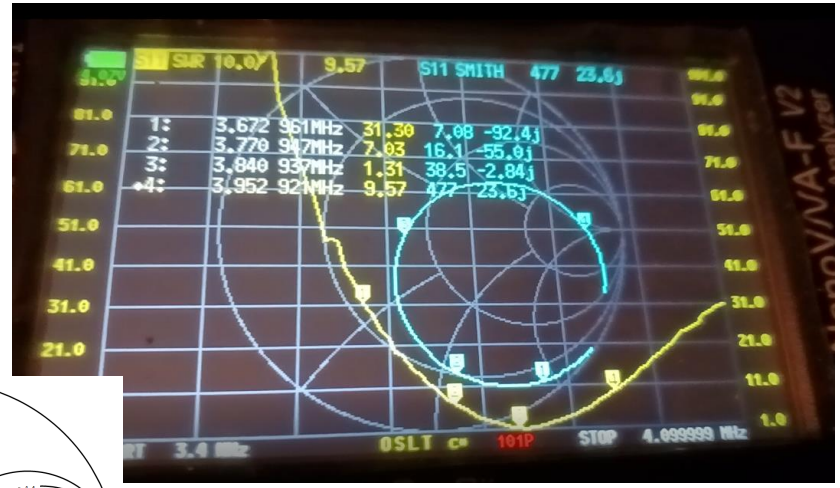




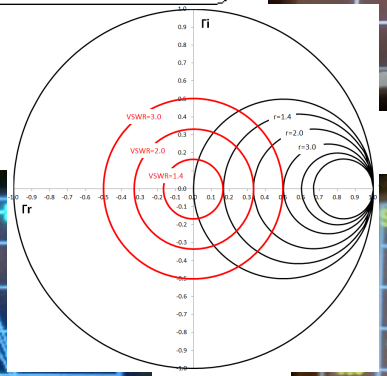
Data Collection and Band Analysis – Bottom Line – SWR => 3:1 or less – Performance



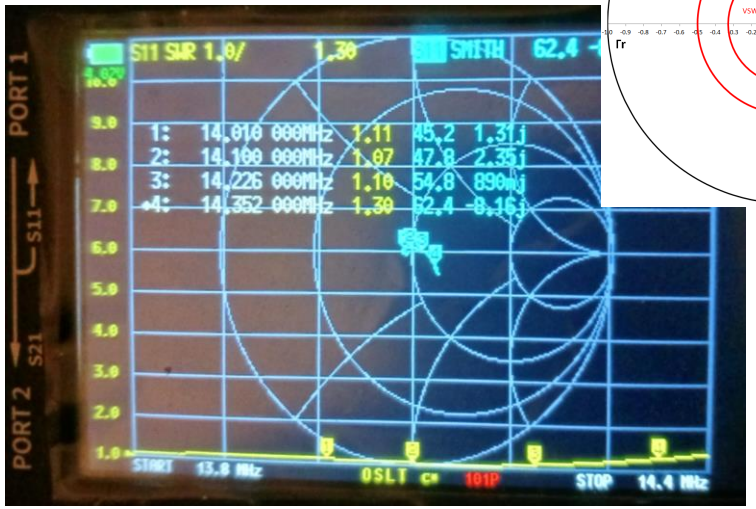
80m Behavior



40m Behavior

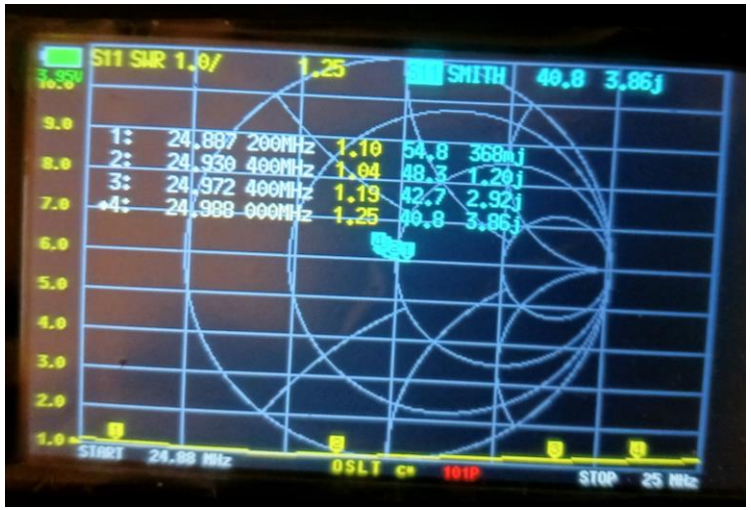


20m Behavior



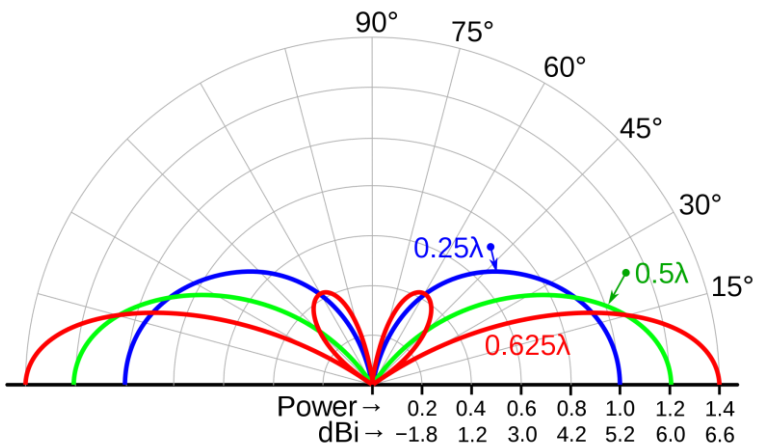
Behavior

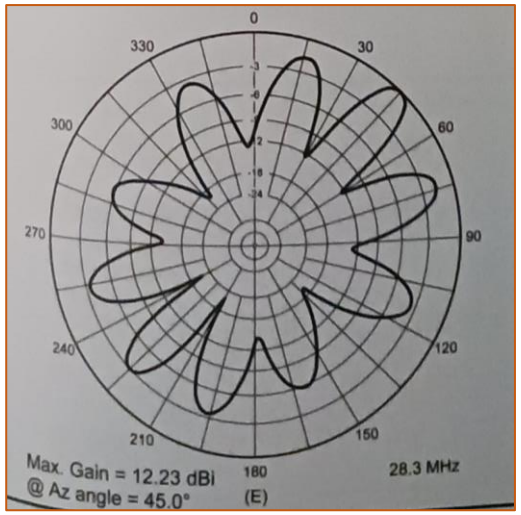
12m Behavior

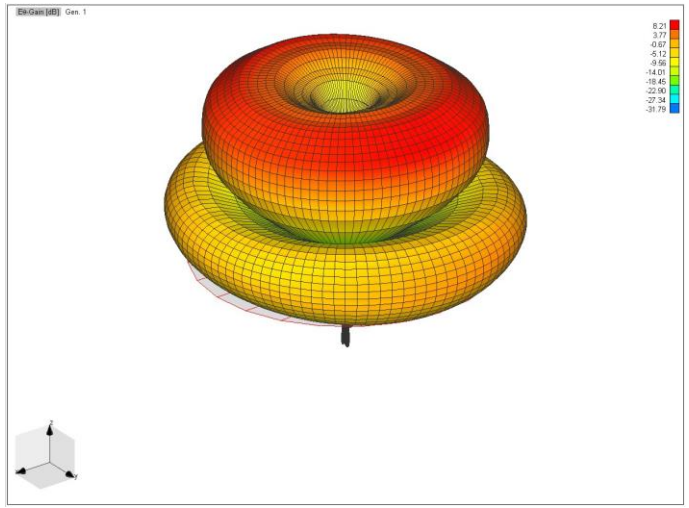


Testing – Data Collection and Link Loss Testing/Analysis– Element by Element – Summer 2023 Project

	Element A - Avg (m)	Element B
Element Height From Ground	13.64	
Element Length	39.39	
Element Wavelenth Analyzed		
Longest	160	
Long	80	
Shortest	40	
%of Wavelength Longest	0.25	
%of Wavelength Long	0.49	
%of Wavelength Shortest	0.98	
Balun or UnUn		
Unun Specs		
Balun Specs		
Nano VNA Tests Conducted	SWR, Impedence Without/With Balun/Unun	
160m		
80m		
60m		
40m		
30m		
20m		
17m		
15m		
12m		
10m		







Elevation Angle at 0.25 of Wavelength =____degrees ?

Power =_____ ?

dBi = _____?

Entire Analysis is to be – A Summer 2023 Project

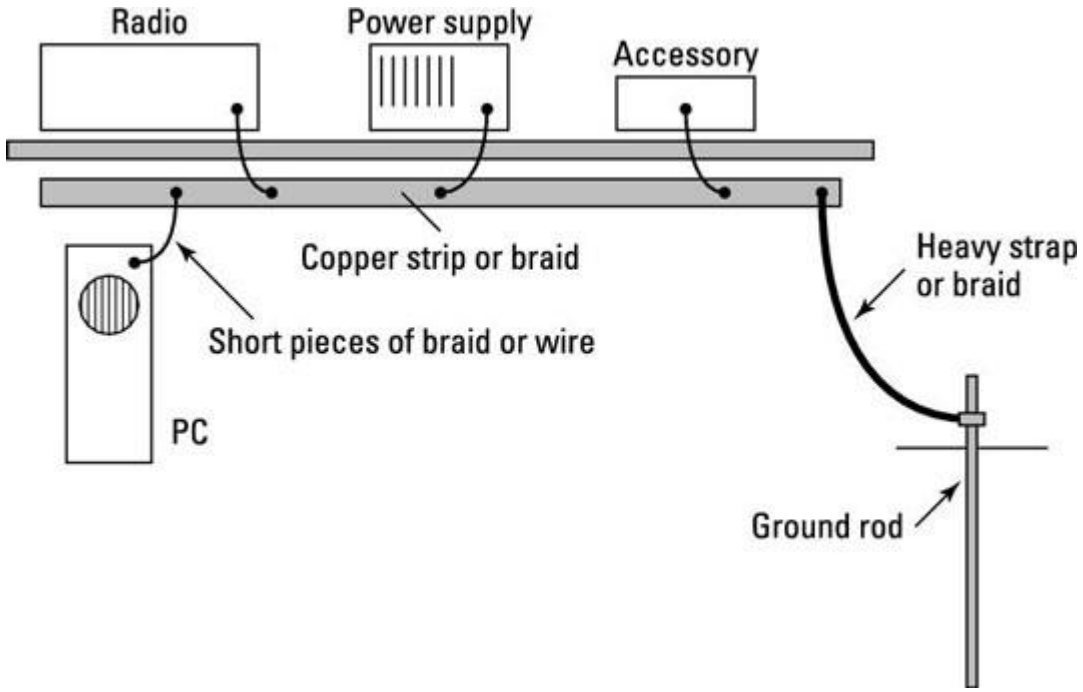
Welcome to the hobby – Do you have first piece (ANTENNA) of the Hobby Figured ☺

1. Many System Elements – Next Slide will talk

2. Logistics
    1. Systematically growing knowledge
    2. Timeline – Project Schedule – Understand Commitment – Applies to all things in life
    3. Designing – Parameters – Constraints – Absolute haves vs unnecessary
    4. Building it, Money, Effort and Time – Cables/Poles/Coax/Switches/Grounding/Wire
    5. Testing/Analysis
        1. Data Collection/Analysis/Tuner and Nano VNA and WebSDR for Operations
        2. Component Testing – Summer 23 – Some Theoretical Concept Understanding
    6. Sustainment – Mantainence Aspect, Safety Considerations, Replacement of Parts

3. Future Considerations
    1. Safety – Fixtures – Need to do more!
    2. Separate the Elements
    3. Do More Tests Grow Knowledge
        1. Tests involve Baluns/Ununs - Leakage

Sustainment – Mantainence Aspect, Safety Considerations, Replacement of Parts



I will be fixing few lose ends as soon Sprint hits…in another 15 days…

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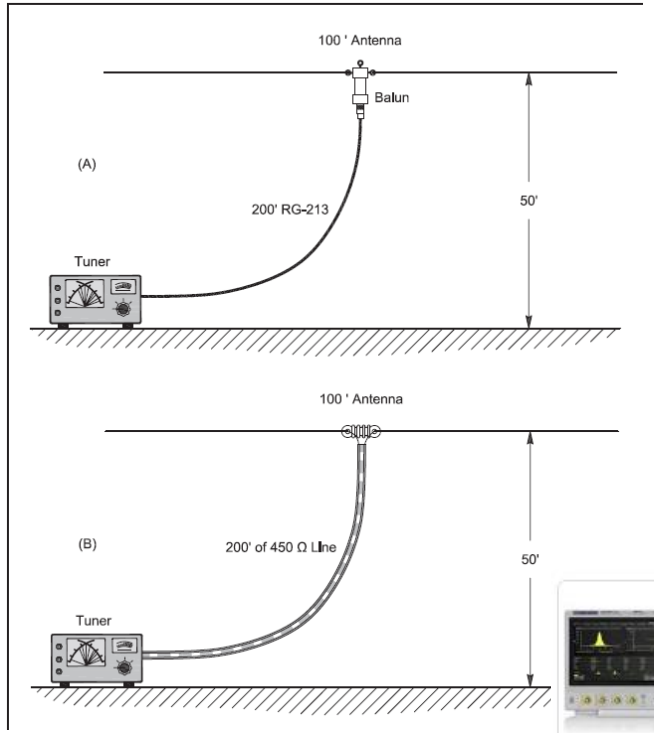
Testing – Data Collection and Link Loss Testing/Analysis– Element by Element – Summer 2023 Project

Band	PreSplit SWR	Pre Split Impedence	Post Split SWR	Post Split Impedence	At Transciever No Tuner	At Transciever Tuner Settings
160m						
80m						
60						
40						
30						
20						
10						



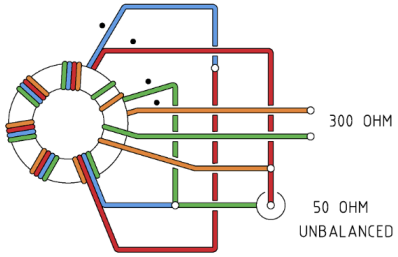
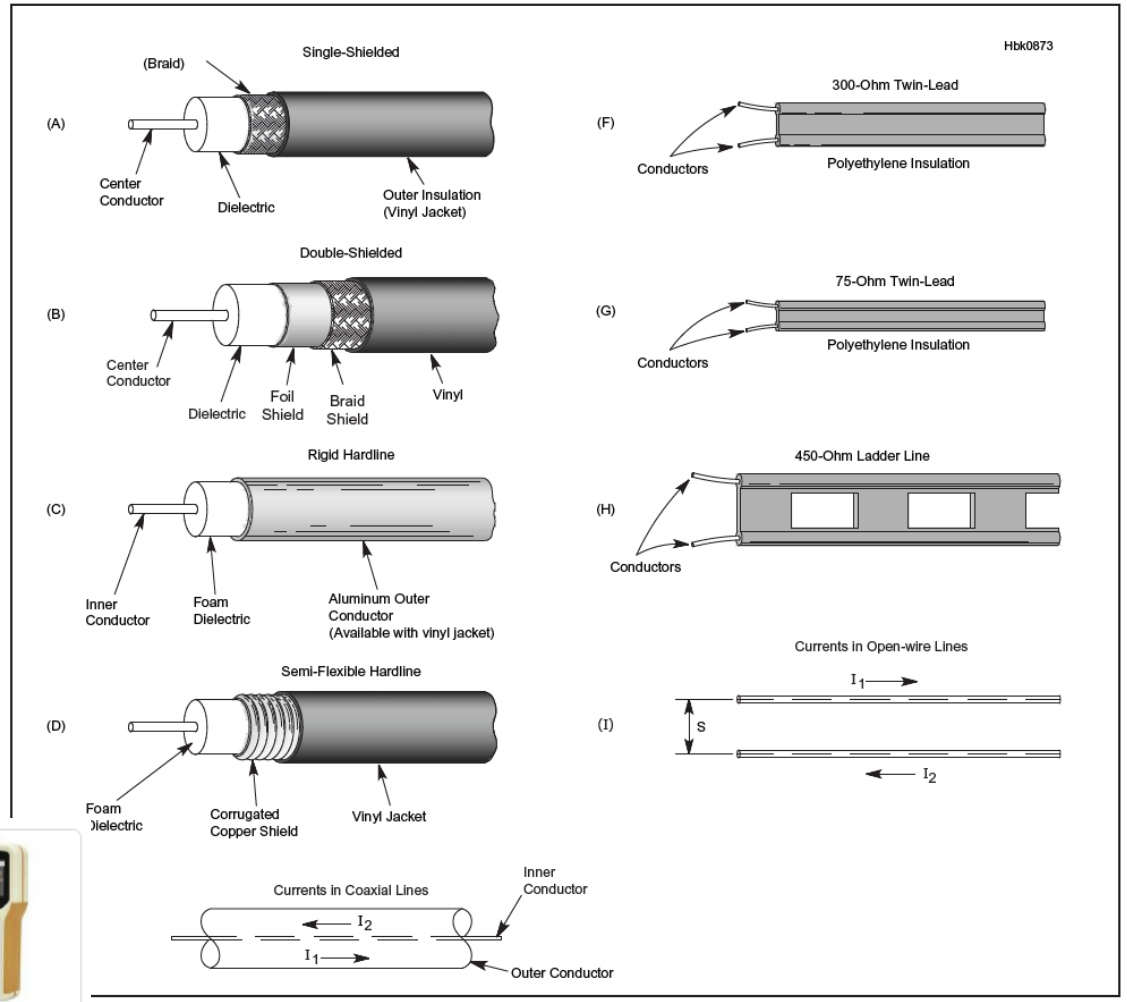


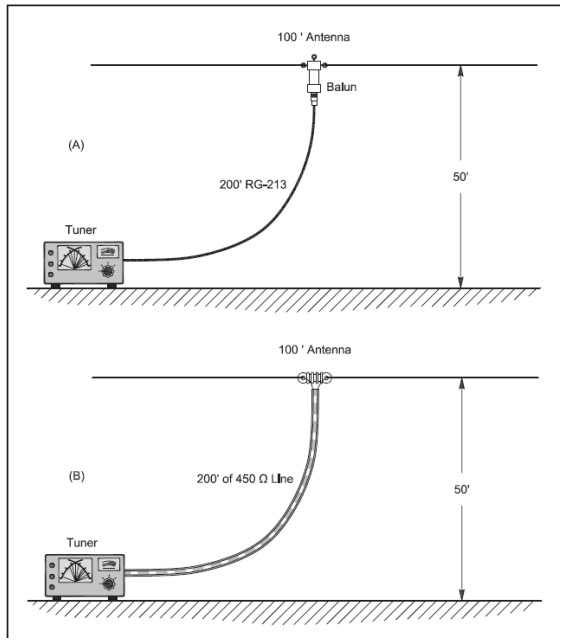
Figure 2 Wiring of the 1:6 Voltage balun.

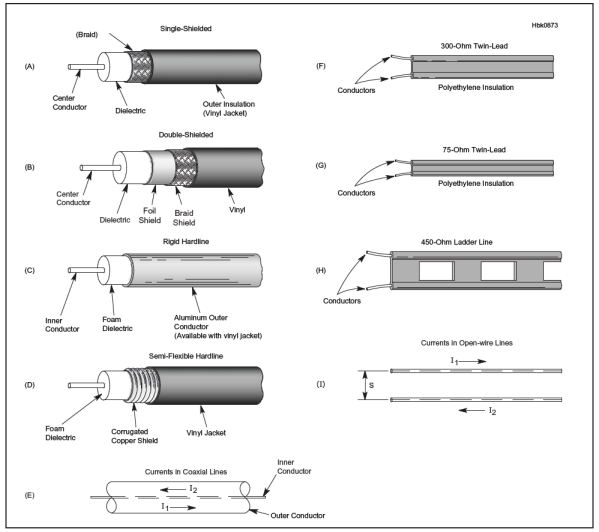
Type	Voltage Balun
Ratio	1:6
Frequency Range	0.5 ~ 30MHz
Core Used	FT140-43 Ferrite Toroid Core
Number of turns	6 x 2 and 4 X 2
SWR	Low 1:1.2 (2.5MHz) High 1:1.7 (30.0MHz)
PEP Power Handling	Approximately 100W

Excerpt - Courtesy of ARRL 100th Edition

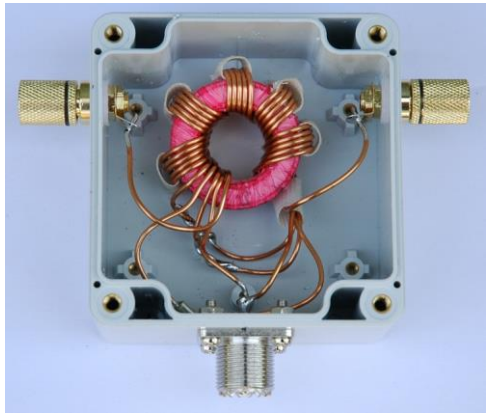


Unbalanced to Balanced – and RFI Considerations





Excerpt - Courtesy of ARRL 100th Edition



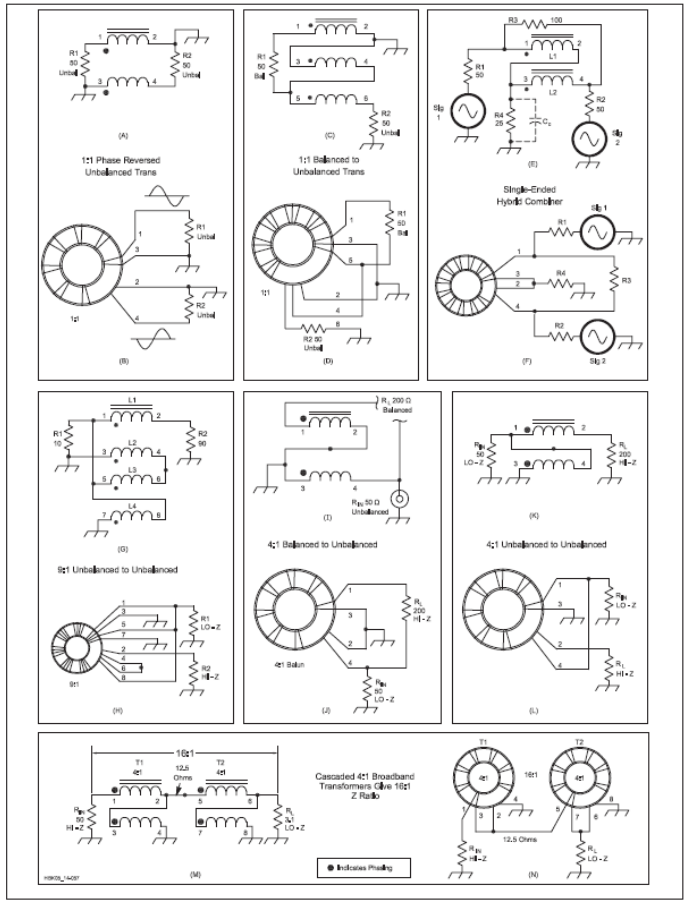
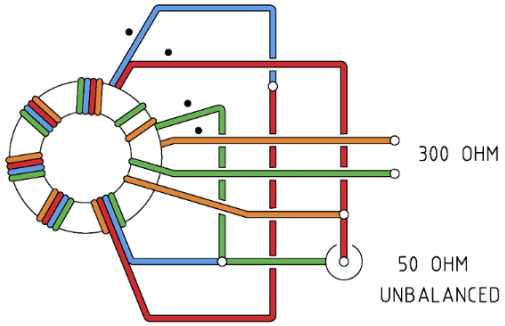


Figure 20.22 — Assembly instructions for some transmission-line transformers. See text for ferrite material type.

Transmission Lines 20.25



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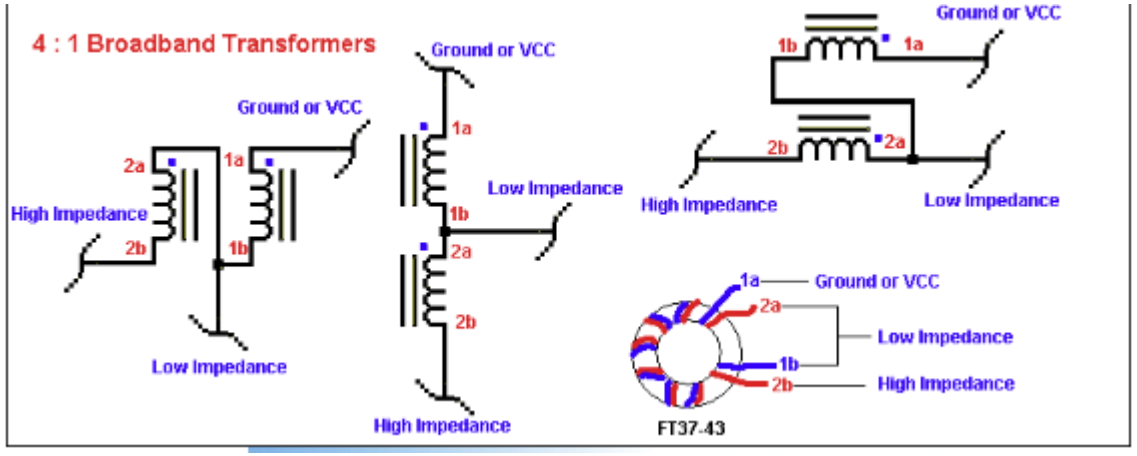

VSWR – Tests – Leakage Tests
Unbalanced to Balanced – and RFI Considerations

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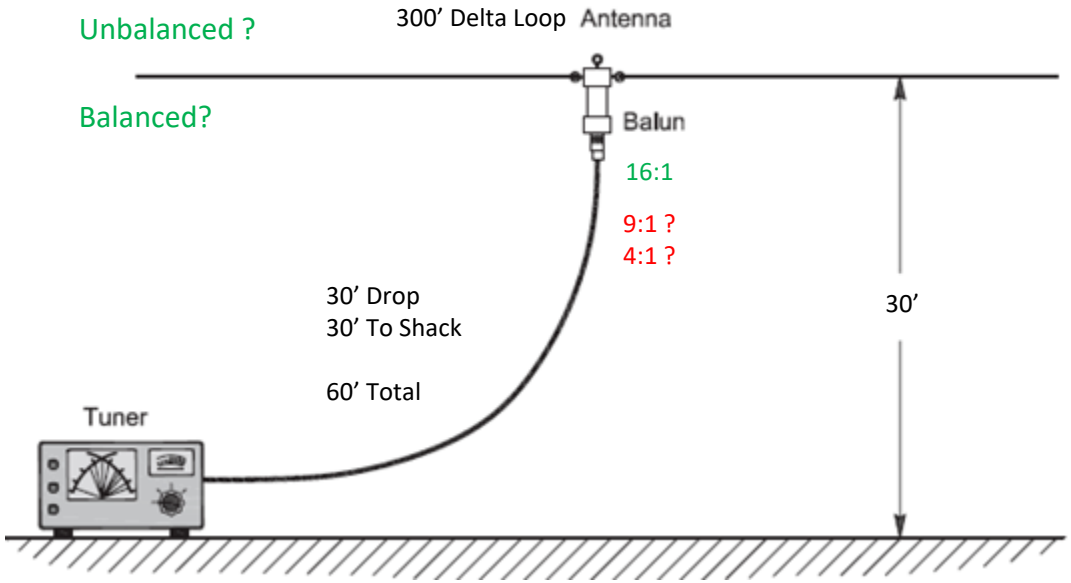

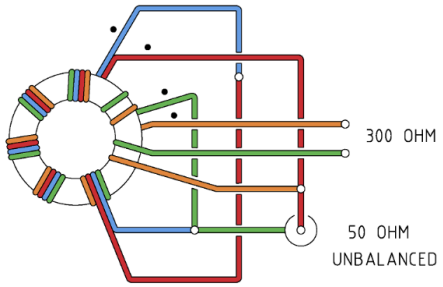

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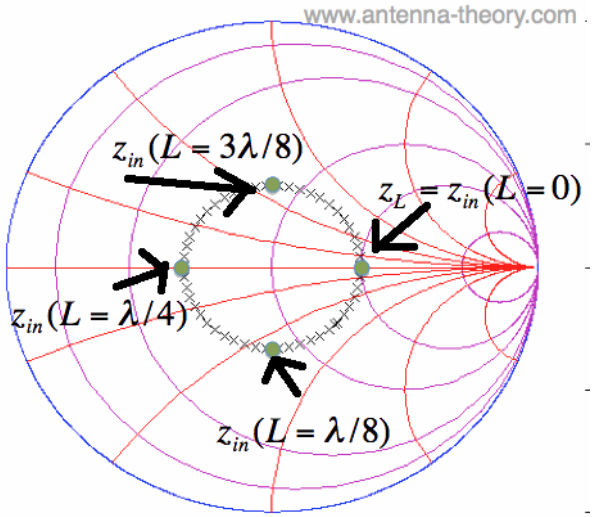

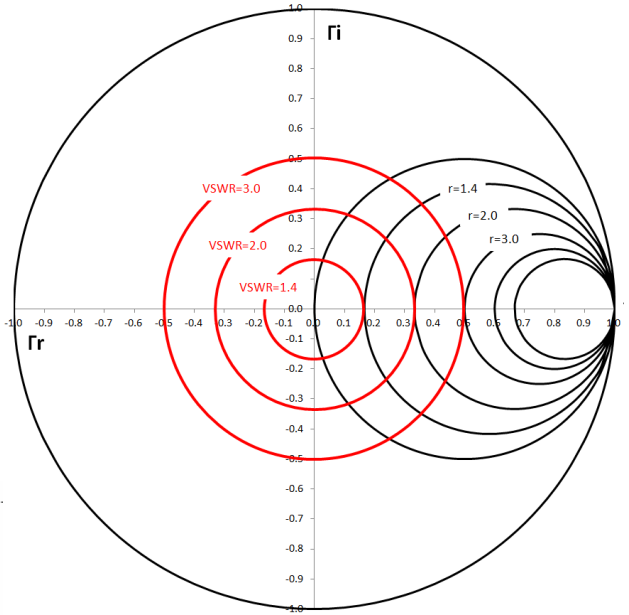

Link Loss and Testing – Element A

Band	PreSplit SWR	Pre Split Impedence	Post Split SWR	Post Split Impedence	At Transciever No Tuner	At Transciever Tuner Settings
160m						
80m						
60						
40						
30						
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10						

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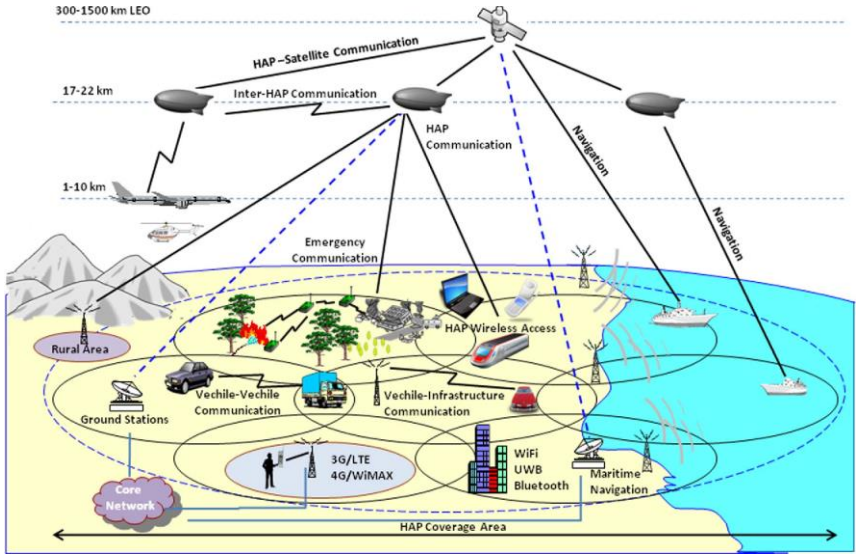
        1. Tests involve Baluns/Ununs – Leakage

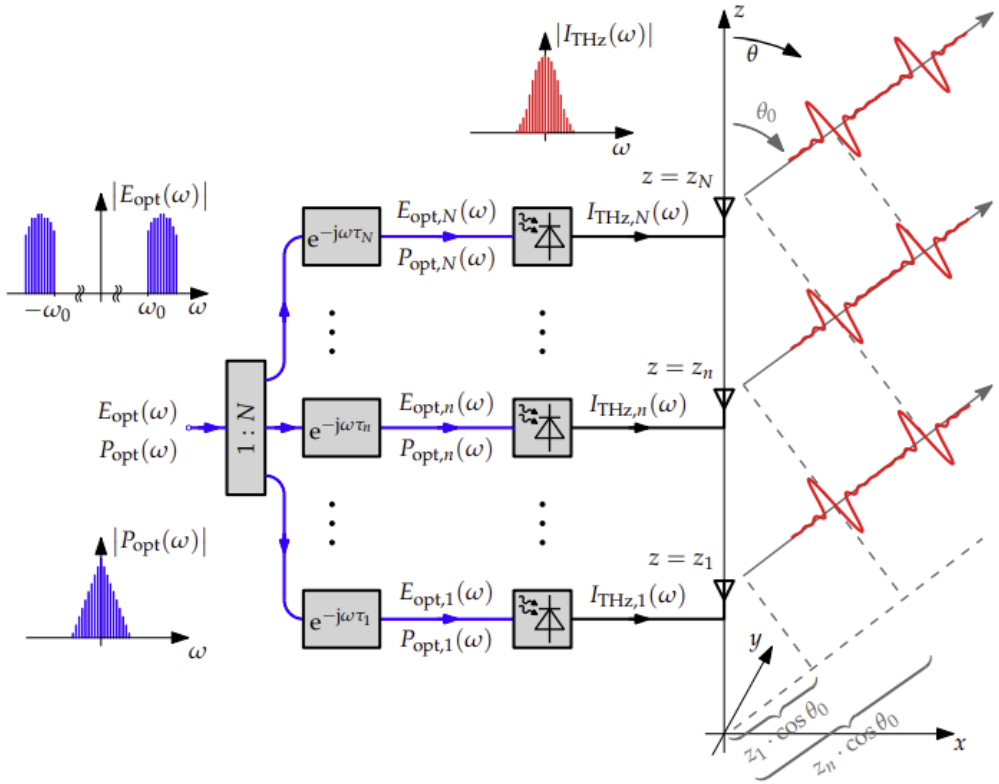
Why am I in Hobby – To Figure Few Things out – and control some future contractors!

Why am I in Hobby – To Figure Few Things out – and grow knowledge!

1. This was just ONE way to do it as Rookie I felt if I stick to theory I can make it work – but learned practice is slightly different than theory – You can throw a "A WIRE" Out there…it will work but may not behave as you expected, you need to understand what it will give back so you can adjust

2. Don't Forget Antenna is one of pieces in puzzle





Questions – Comments About these slides or Project

First stop is go to Philmont Website it be posted or

Let me (Dil - KC3SSG) know via our repeater 147.030 MHz PL Tone +91.5

Or

bajwa.dil@gmail.com

Visit Philmont Club Website for More – and Welcome to the Hobby!