DXCC Honor Roll in One Solar Cycle

A Little Pistol Adventure

KY6R – Rich Holoch

Pacificon 2013

Current KY6R Station

Elecraft K-Line and KX3

I am the Director of Customer Solutions for Splice Machine – a Big Data database company that makes a SQL on Hadoop database engine. I was the 127th employee at Oracle, 30th at Gupta and 470th at PeopleSoft.

KY6R Antennas – Very Simple, Effective and Flexible “System”

60’ Top Loaded Vertical, 160/80M. Great on 30 and 17M.

40M Vertical Array (also good on 30M and 17M)

20/15M Moxon up 55’ (also Good on 17, 12 & 10M)

K9AY Loops for 160/80M Receive

Antenna Siting

Goals:

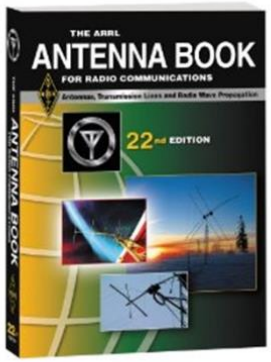
- Separation
- Height
- Stealth
- Best gain and F/B given my supports
- Easy maintenance

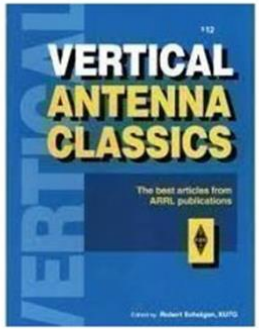
My DXCC Standings (336/331)

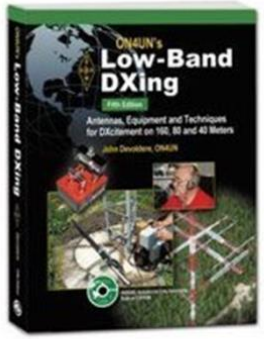
- Honor Roll January 1, 2013 (11 ½ years)
- 70% CW ATNO's, 30% SSB
- My final QSO was with SV2ASP/A
- First 300 were made w/100 - 200 watts & wire
- 8BDXCC and Challenge in first 3 years
- Working on 160M DXCC (50) and almost 1900 in Challenge
- *Huge thanks to Dean, N6BV for helping me get over the "325 hurdle" with HFTA*

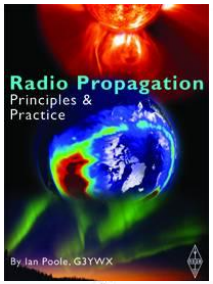
Resources

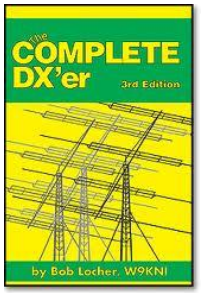
Drill Press and Pop Riveter

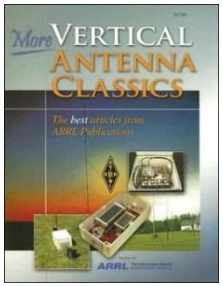


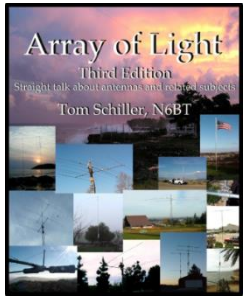


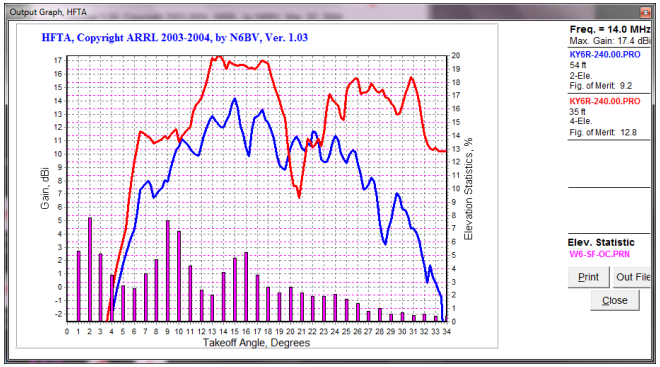




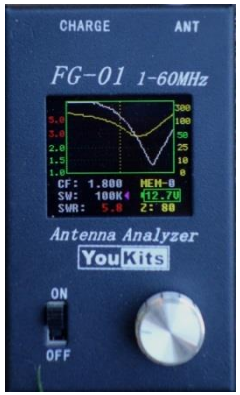




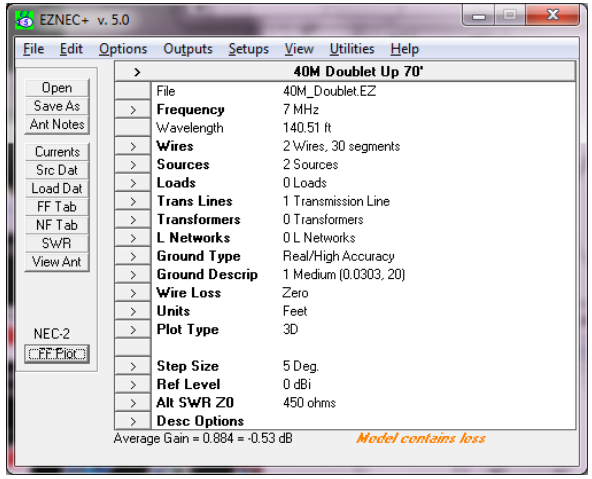




MFJ-269B



FG-01

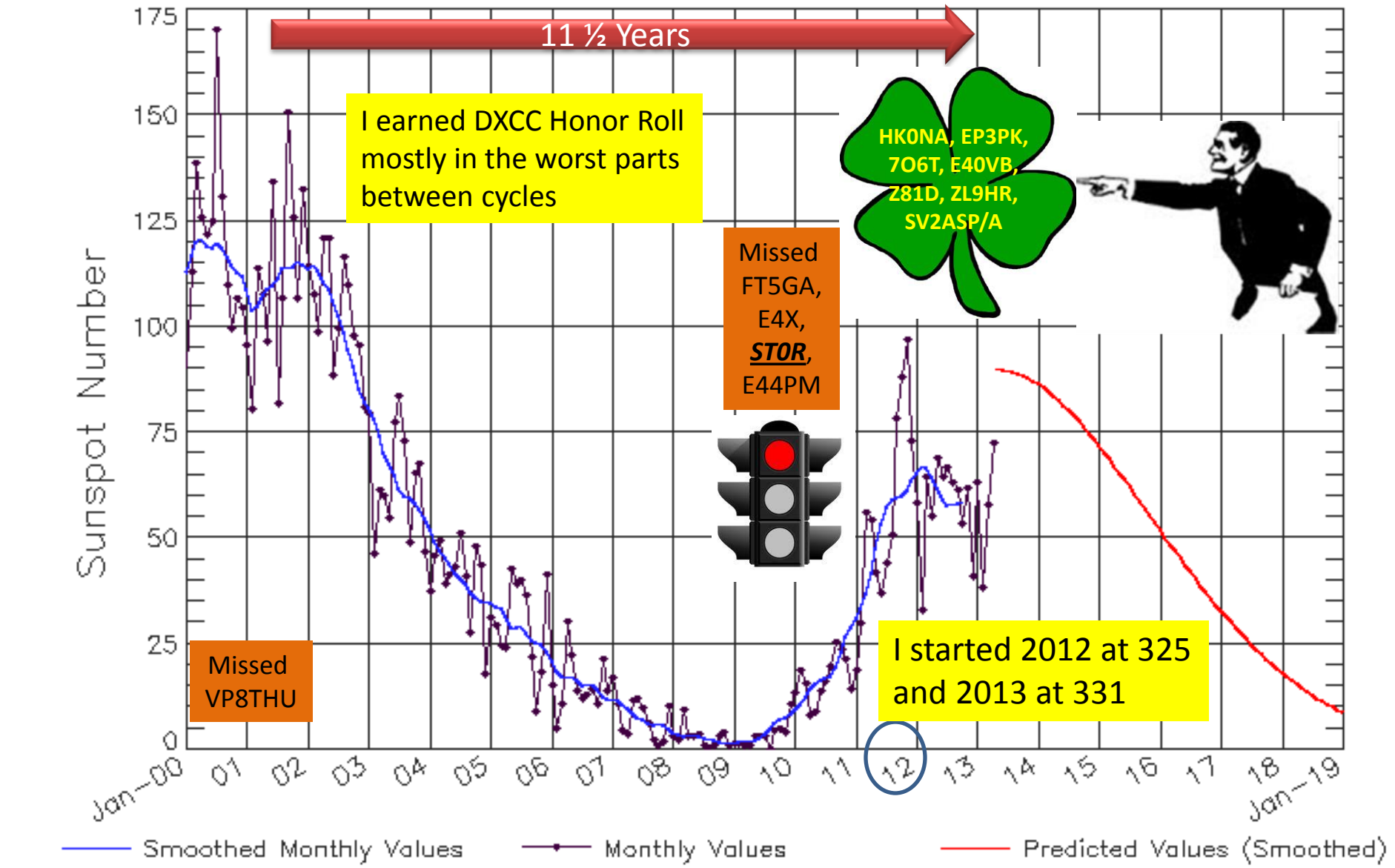


HFTA: Superimposes an EZNec like antenna model over your terrain. Used to get a more real world view of how your antennas perform at your QTH.

EZNec: Lets you design and optimize antennas given their real world dimensions (i.e. “taper schedule”)

ISES Solar Cycle Sunspot Number Progression

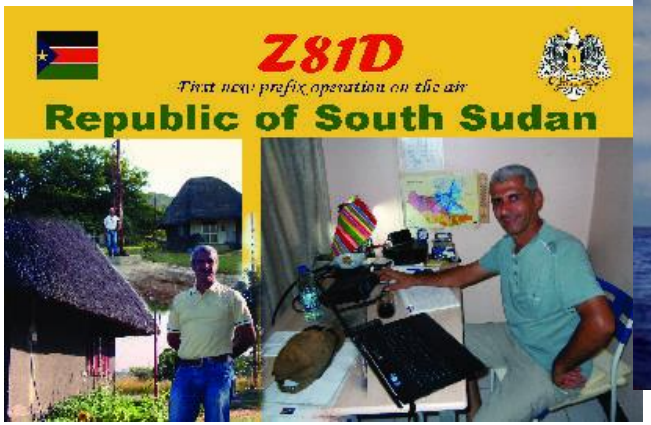
Observed data through Apr 2013

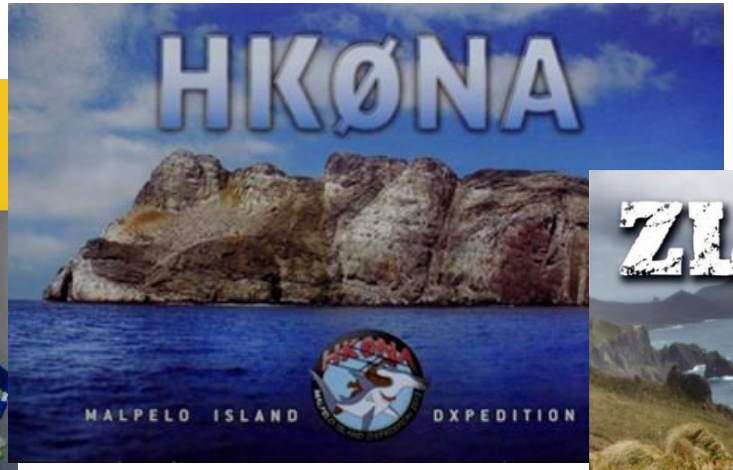


Updated 2013 May 6

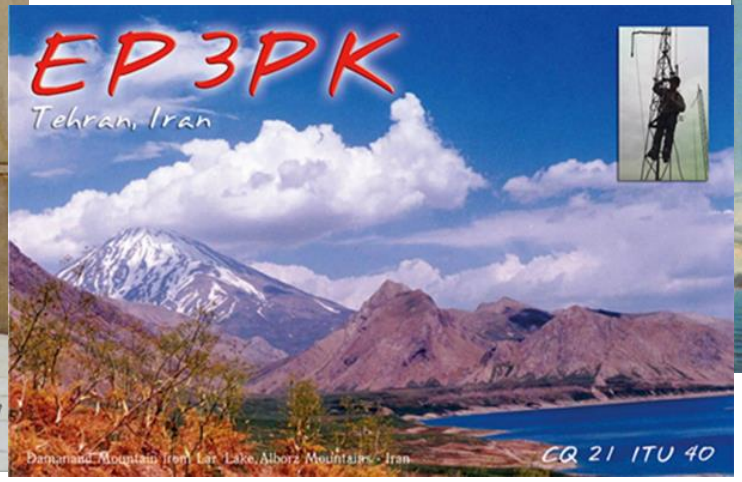
NOAA/SWPC Boulder,CO USA

Honor Roll!





2012: Mission Accomplished
Best DX-ing Year Ever!



2012 SSN Average = ~60

ATNO #336 - QSL 39 Years Later!

This confirms an amateur radio contact on
September 22, 1974 at 0350 Z hours
between

KZ5VV

Box 144, Gamboa, Canal Zone
and

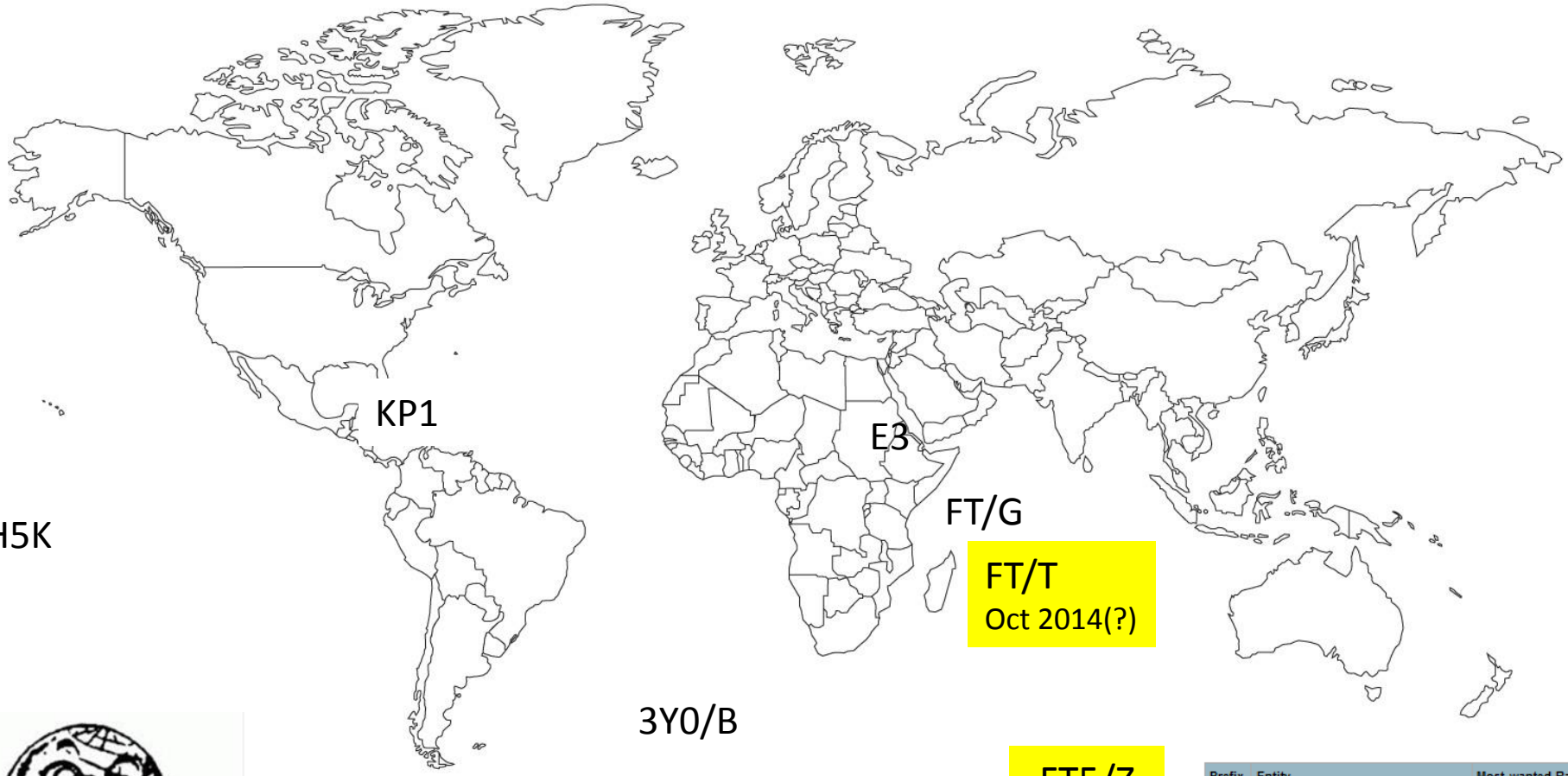
WN2QHN

on 15 meter CW

73

Ted Herrman

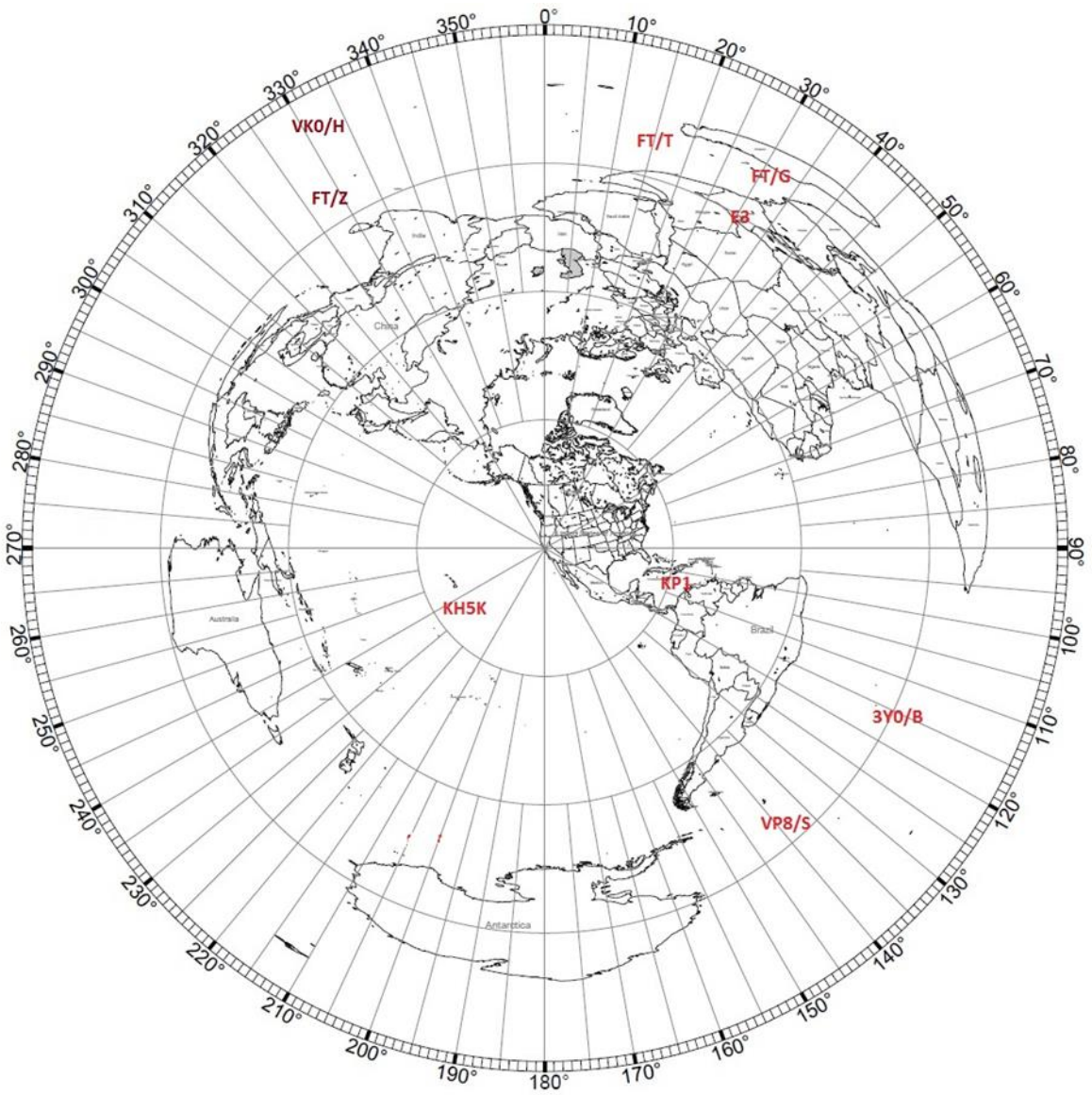
What I Need for DXCC HR #1



"Tell them to go activate what I need!"

Prefix	Entity	Most-wanted Rank
KP1	NAVASSA ISLAND	#1
3Y/B	BOUVET ISLAND	#3
VP8S	SOUTH SANDWICH ISLANDS	#4
VK0H	HEARD ISLAND	#6
FT5Z	AMSTERDAM & ST PAUL ISLANDS	#7
KH5K	KINGMAN REEF	#8
FR/T	TROMELIN ISLAND	#9
E3	ERITREA	#20
FR/G	GLORIOSO ISLAND	#31

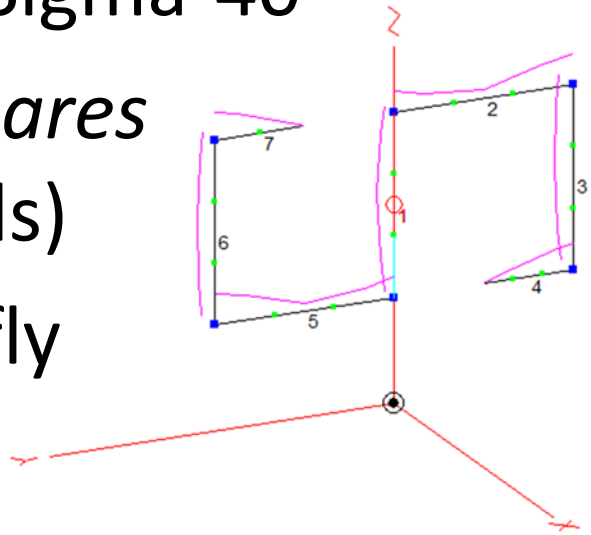
Another View



July 2001
Starting Out:
First DXCC Steps
Toward Honor Roll

Antennas Used For The First 325

- *Ladder line fed doublet* up only 35’ (w/tuner)
- Force-12 Sigma-5 and Sigma-40
- *Bruce Array & Half Squares* (simple phased verticals)
- MA5B and C3SS – briefly
- *20M Moxon up 30’*

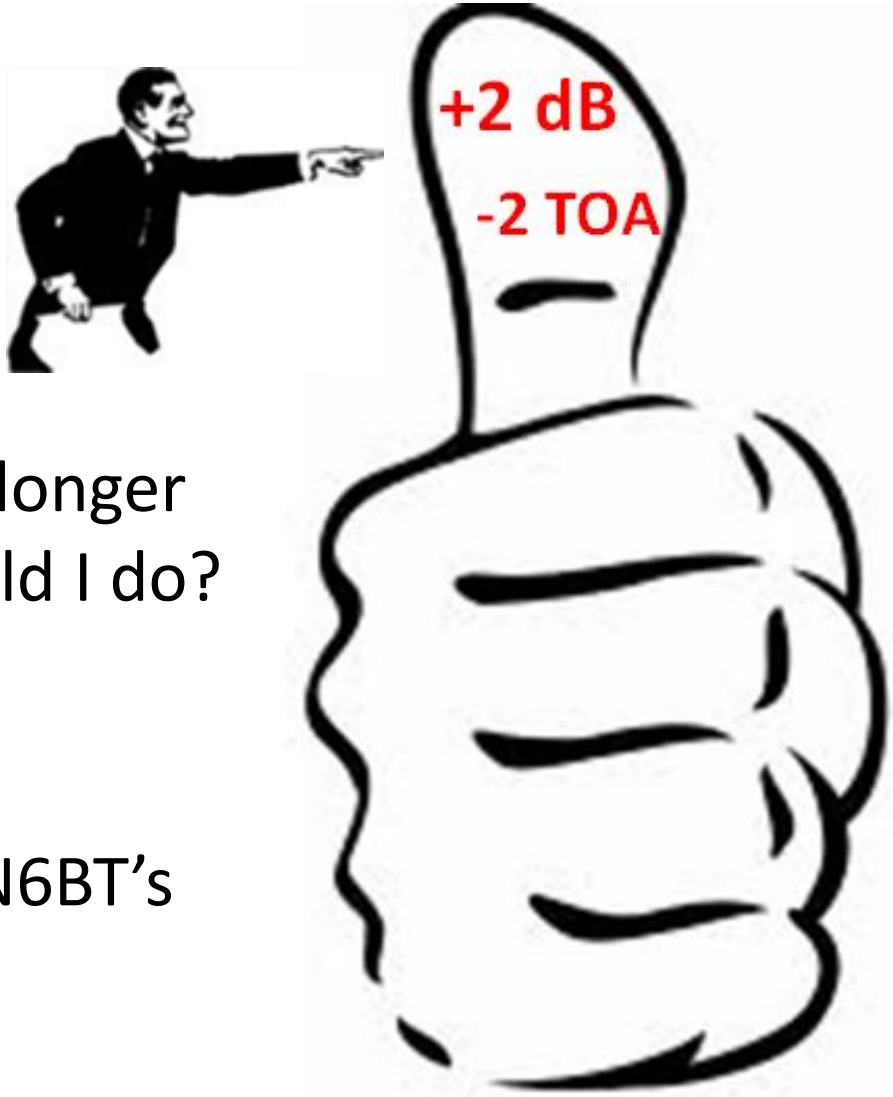


Hard to Believe This Was It . .

And Now . . .

The Wall

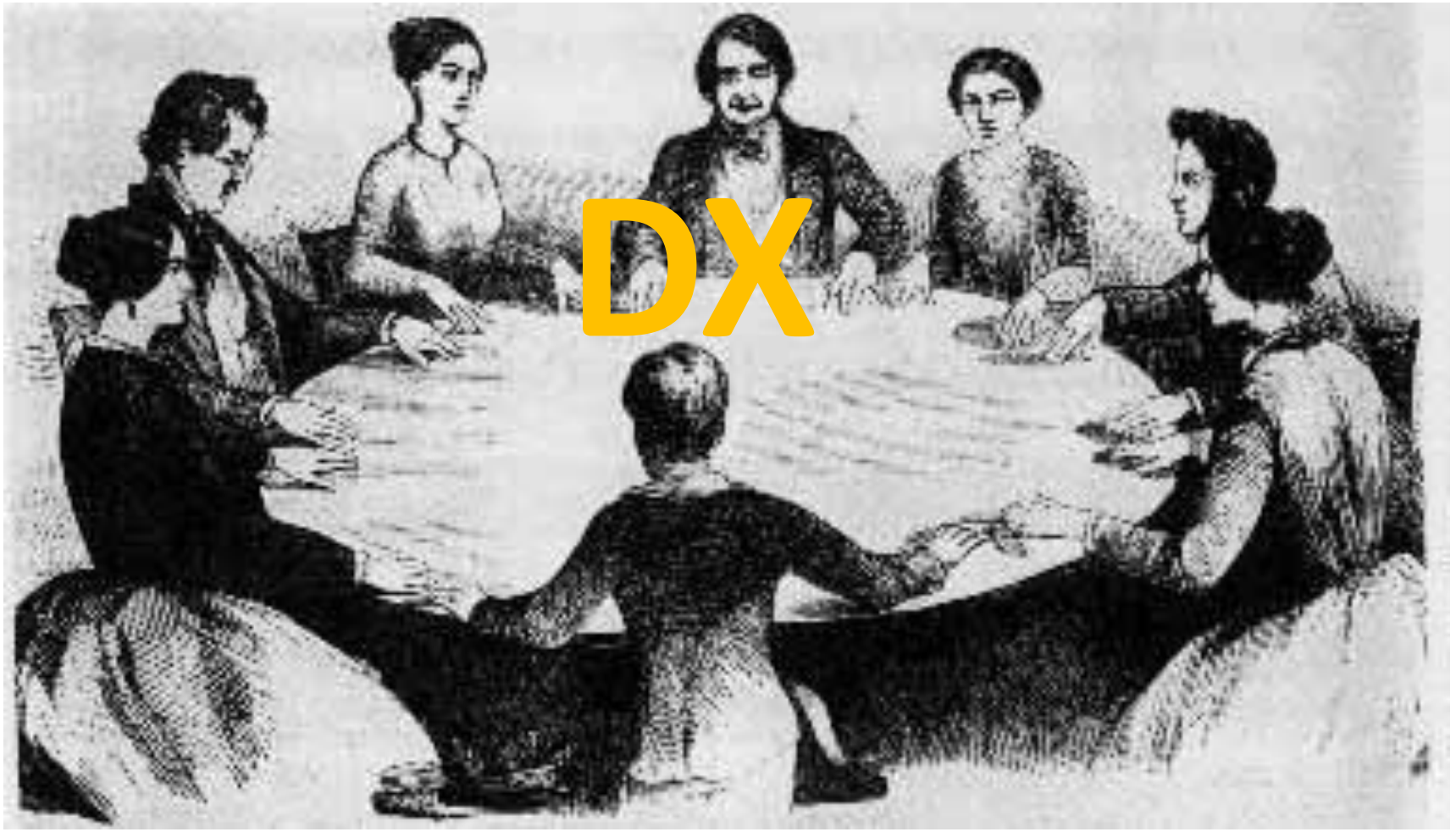
“The Wall” 2009 - 2011



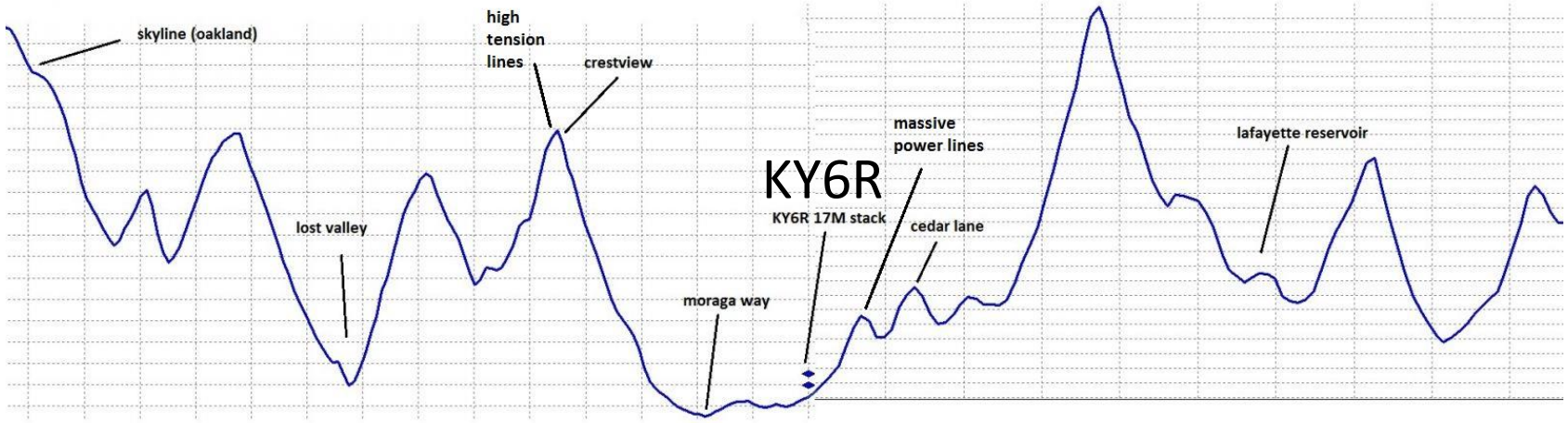
- **Stuck at 325**
- 20M Moxon at ~30 feet no longer worked for me – what should I do?
- Bottom of cycle – required lower angles and more gain
- Enter HFTA and N6BV and N6BT’s rule of thumb:

“If you can increase your gain by 2 dB and / or drop your TOA by 2 degrees, then you will open up a new layer of DX”

Science, Not Séance



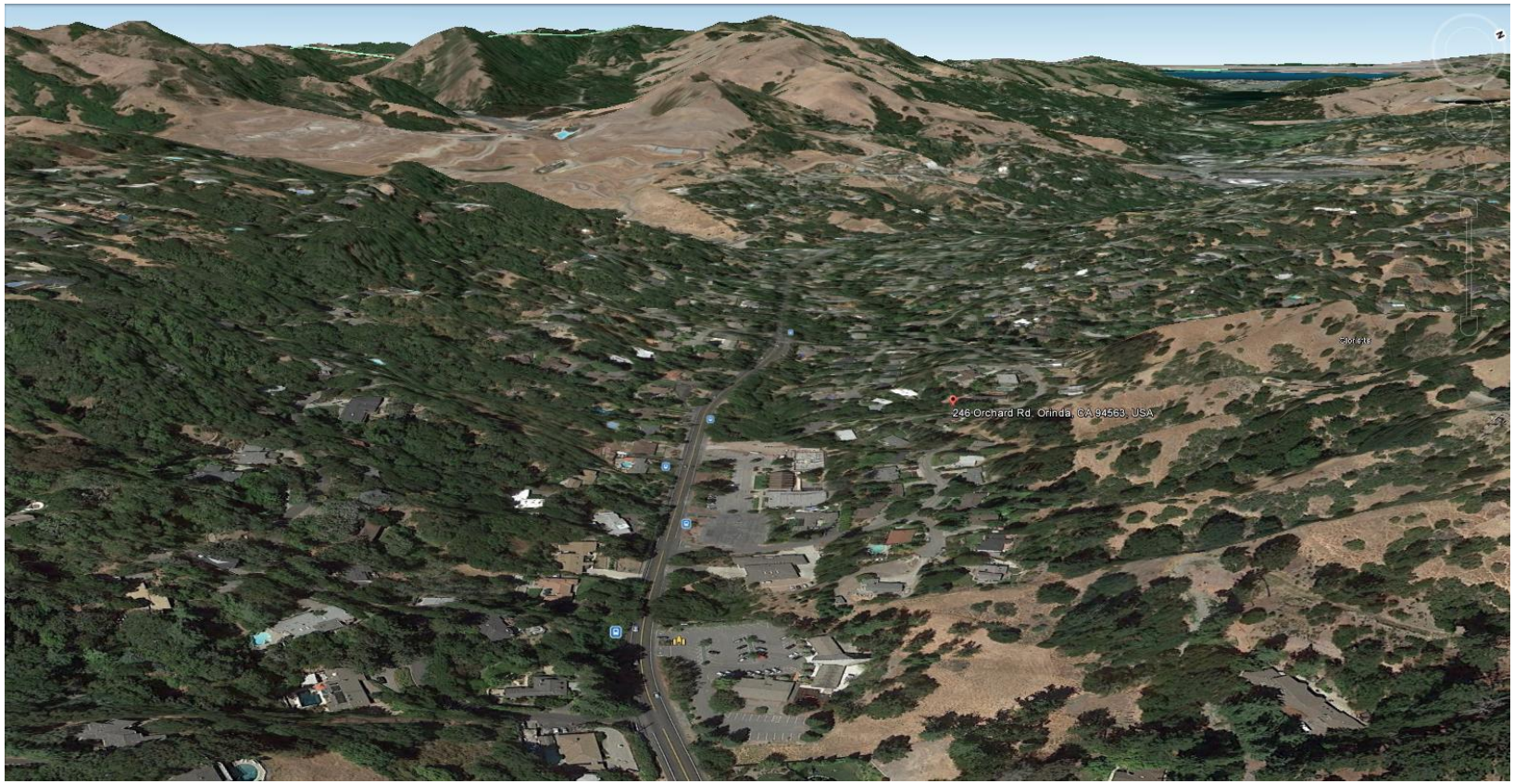
Its all about the antenna!



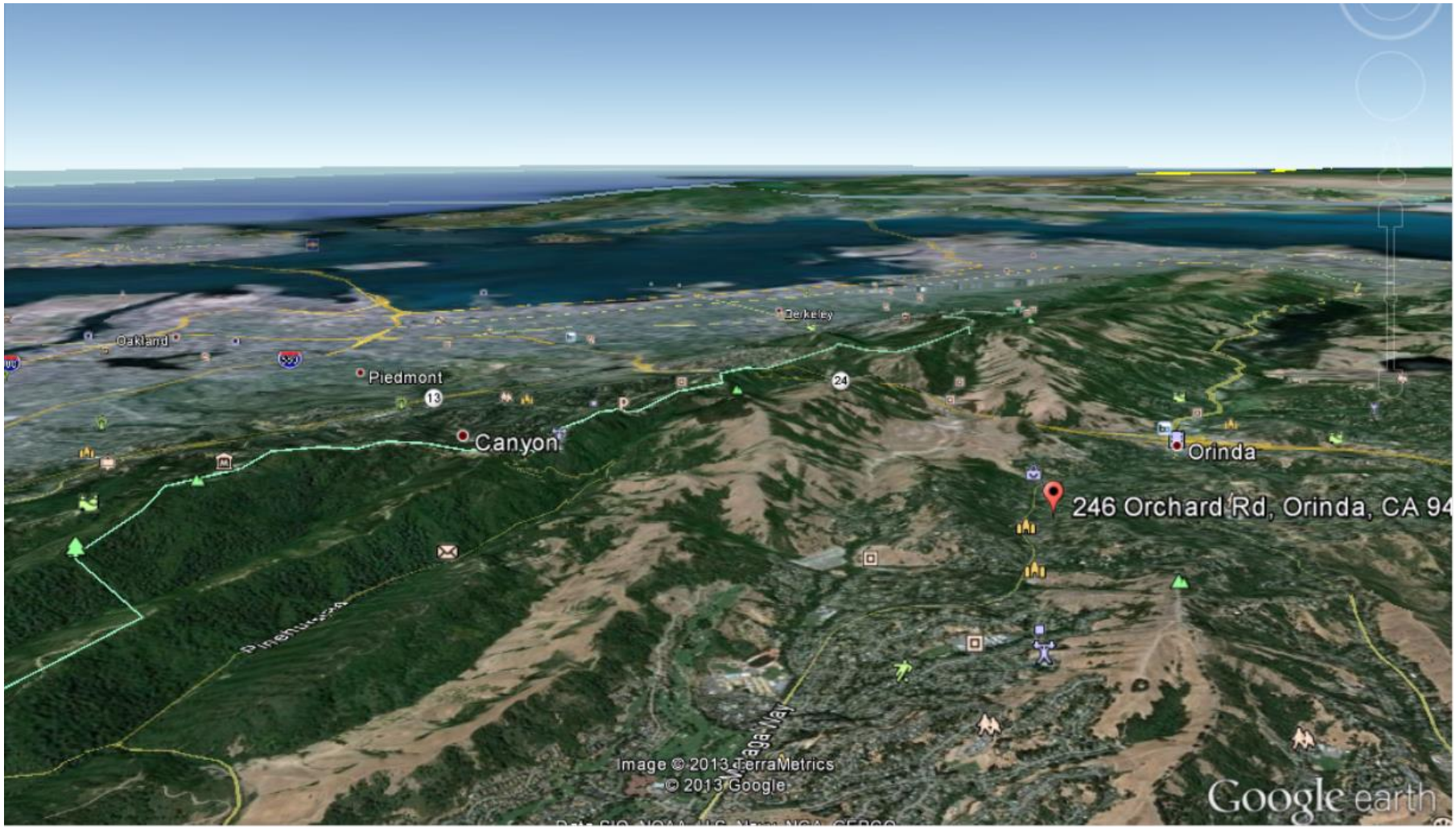
Shunts signals below 11 degrees

SW 220 degrees 30 degrees NE

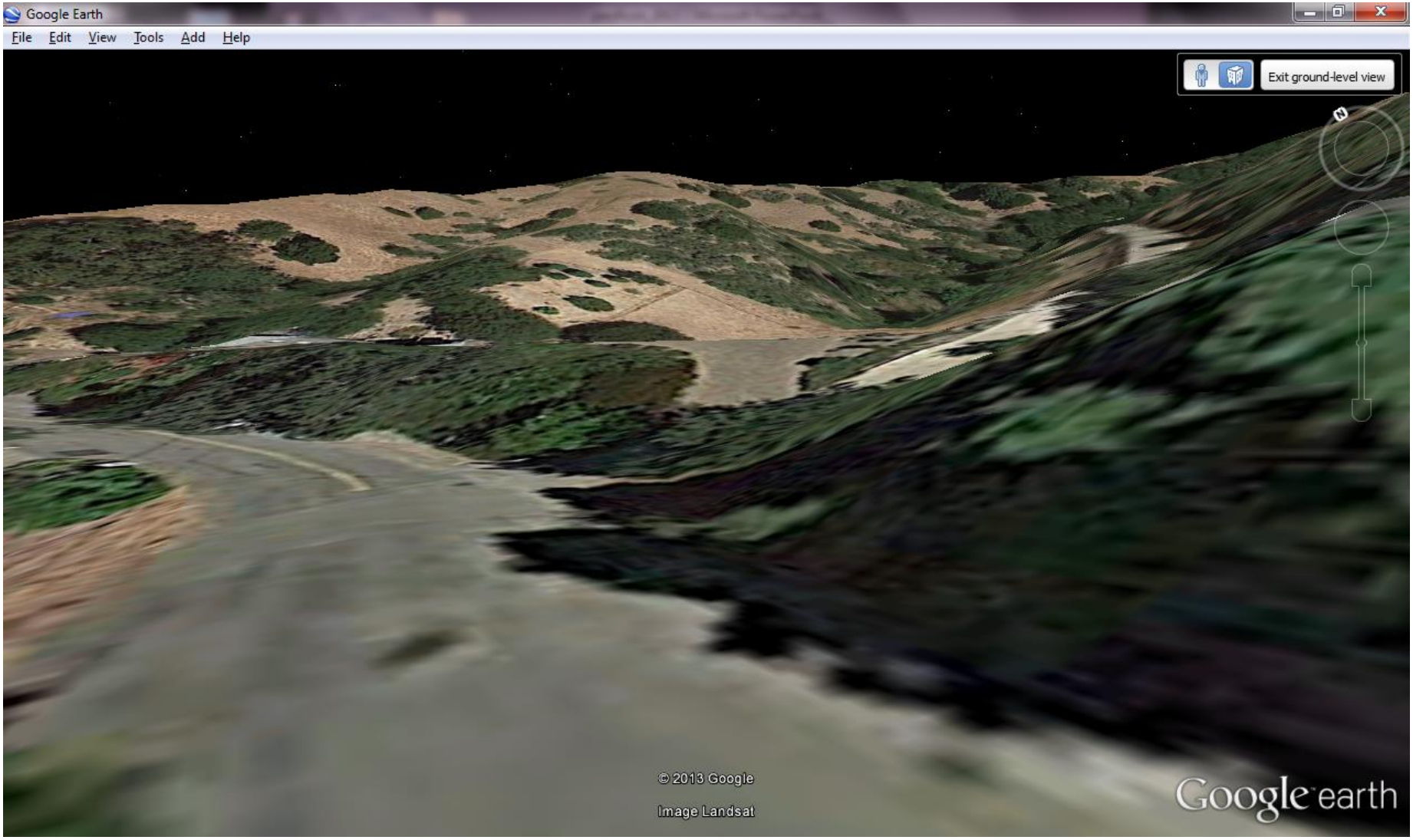
Shunts signals below 18 degrees



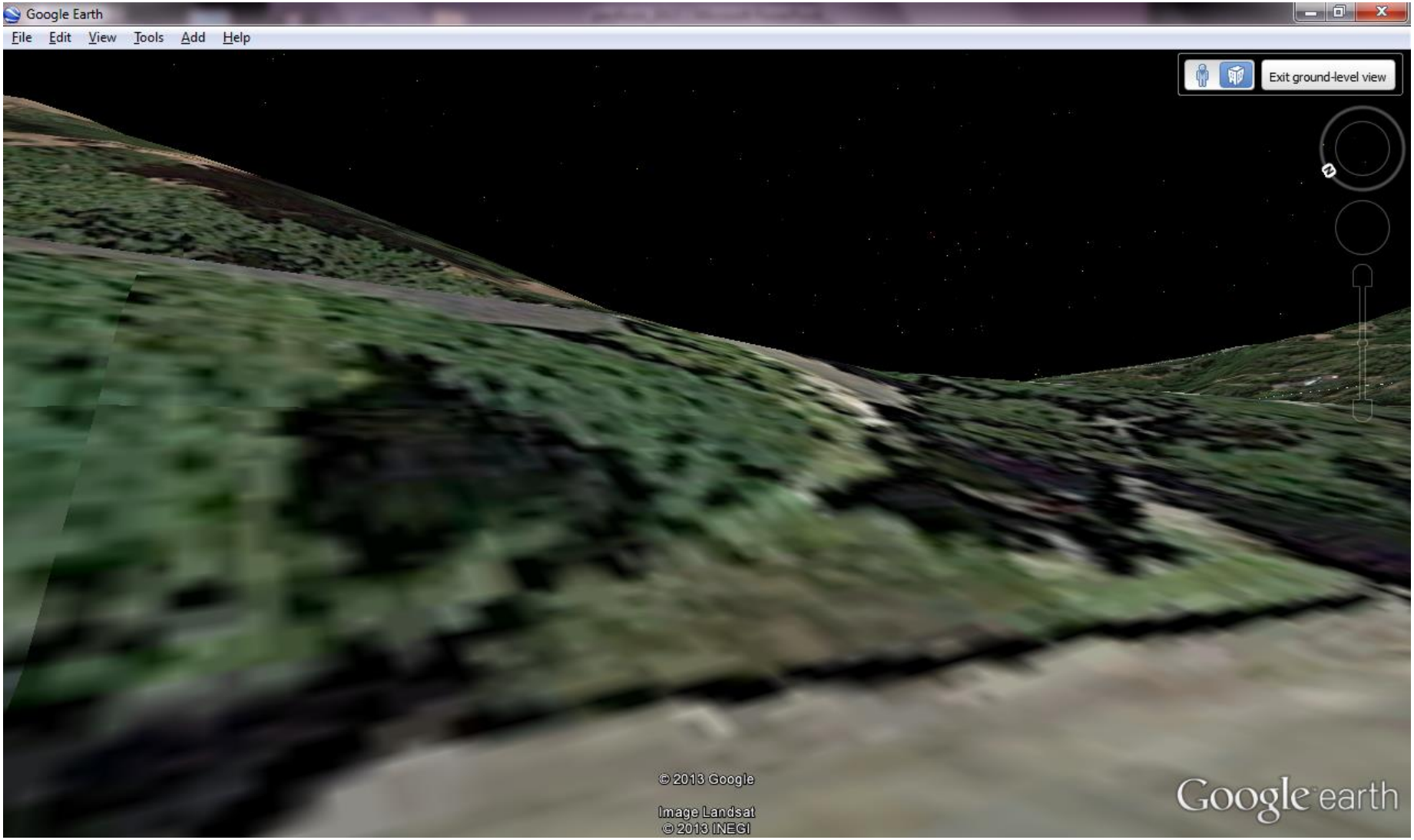
Another View



Looking FT/T, E3 – From My Moxon



Looking 3Y0/B, KP1 and VP8/S From My Moxon

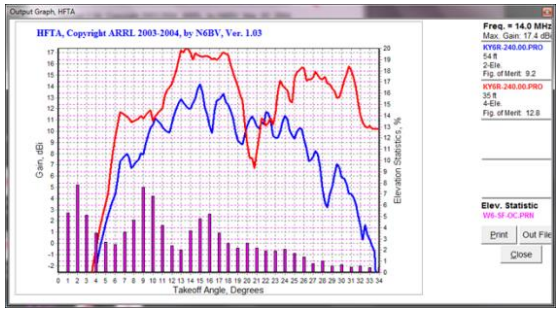


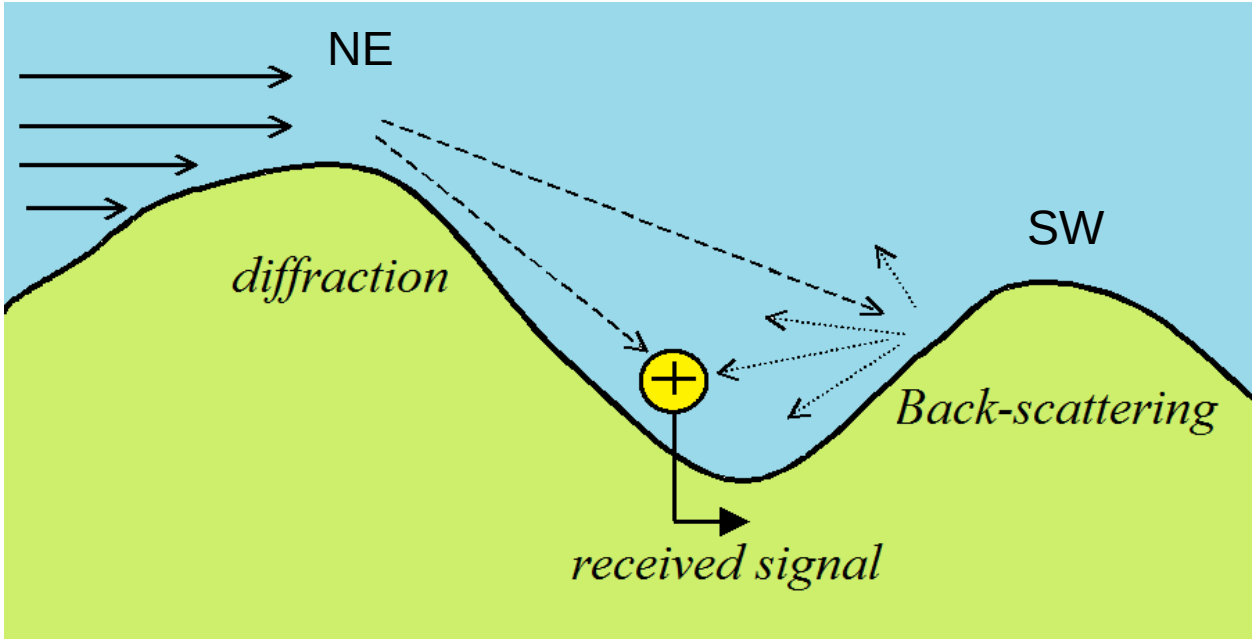
Looking FT/Z, KH5K, VK0/H From My Moxon

December 2012: Mission Impossible!

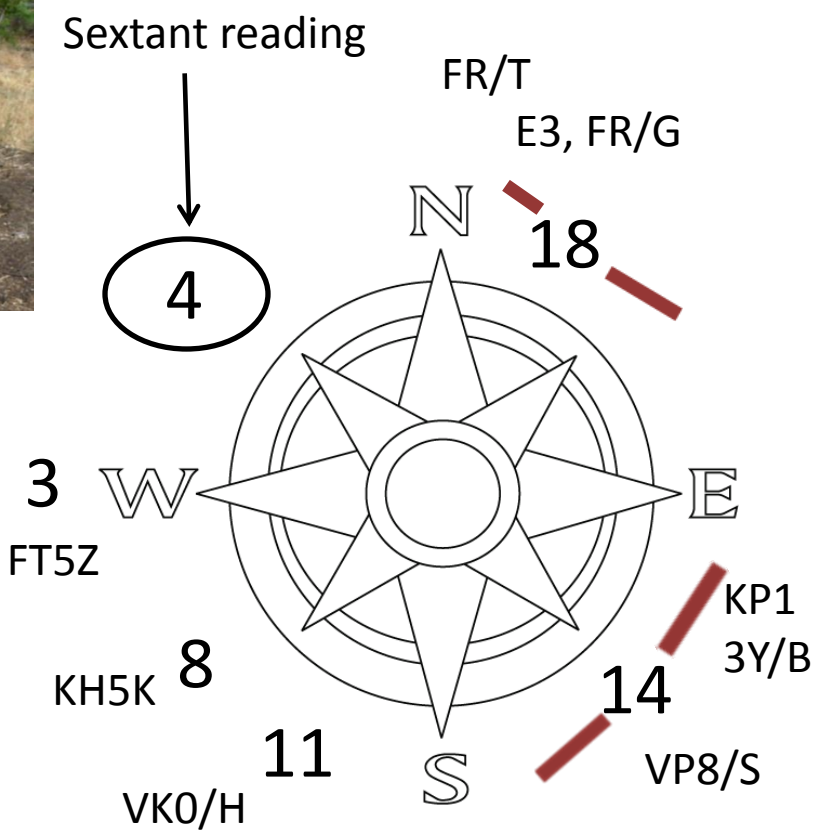
I needed 7 more for DXCC Honor Roll. I guessed it would take at least 2 – 3 more years

- I installed HFTA
- I learned ***why*** my 20M Moxon at ~30 feet was too low





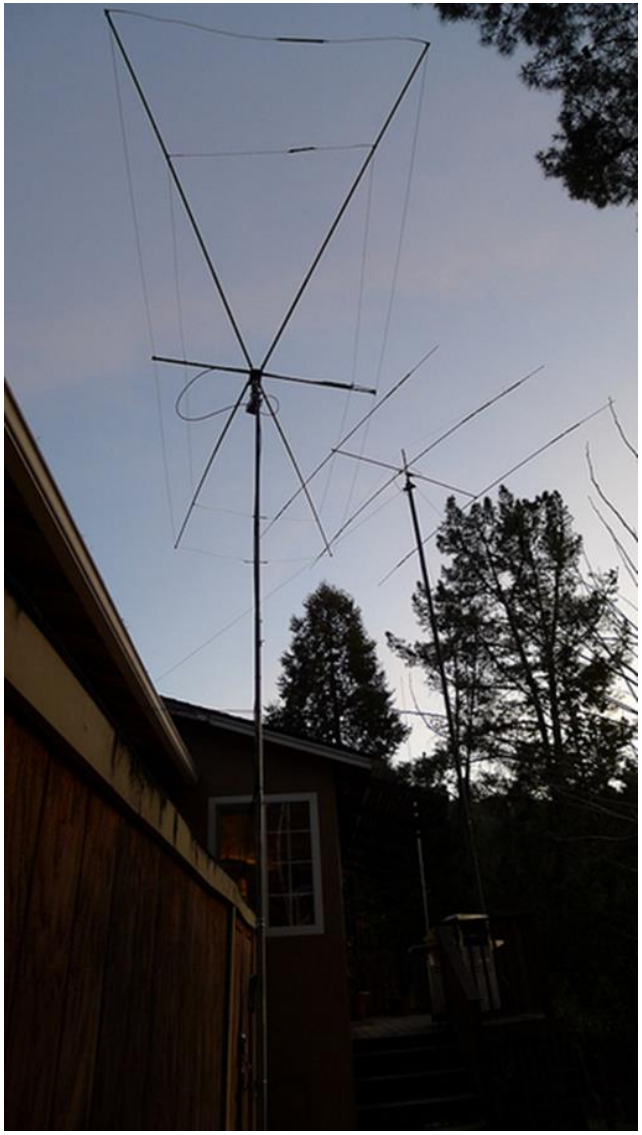
The $12 KY6R Sextant ("Angle Finder")



N by NE

These are readings from the street which is about 15' above the bottom of the tower base or 30' below the top.
This test proves that HFTA is correct.

Cushcraft A3S up 45’



17/12M Nested Moxon Up 35’

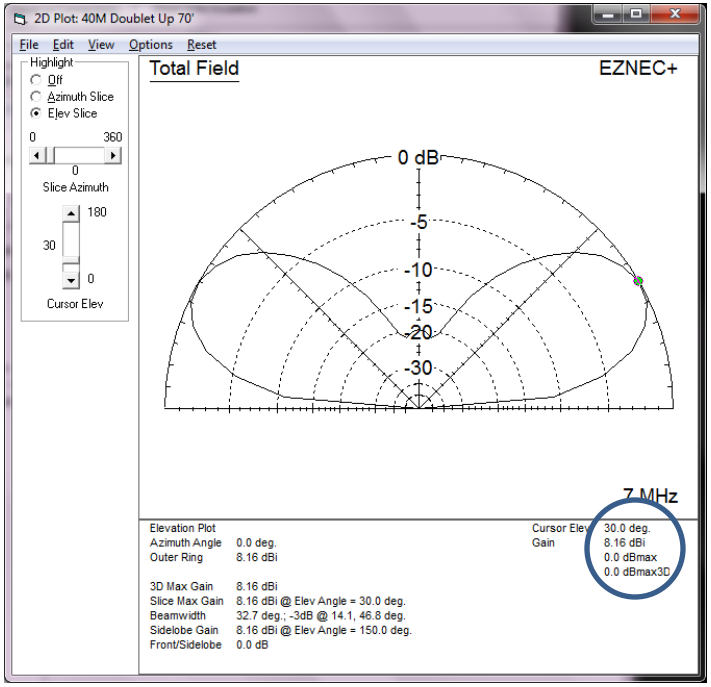
AB-952 Military Mast

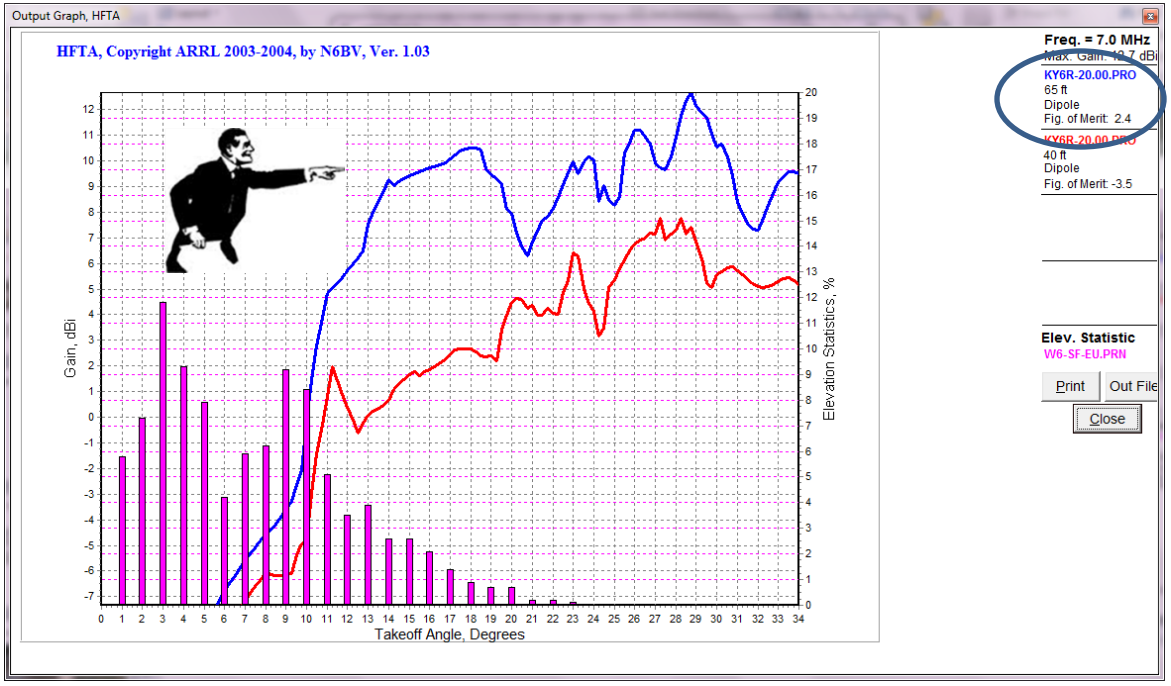
January, 2012
Serious Antenna Work

2012 New Years Resolution: Better Antennas, Not Miss Any ATNOs ….
These antennas moved me from 325 to 330 . . . . 1 away . . .

40M Dipole – High and in the Clear (Dec. 2012)

With an improvement of almost 6 dBi over the low dipole, and an 8 dBi improvement over a ¼ wl vertical..





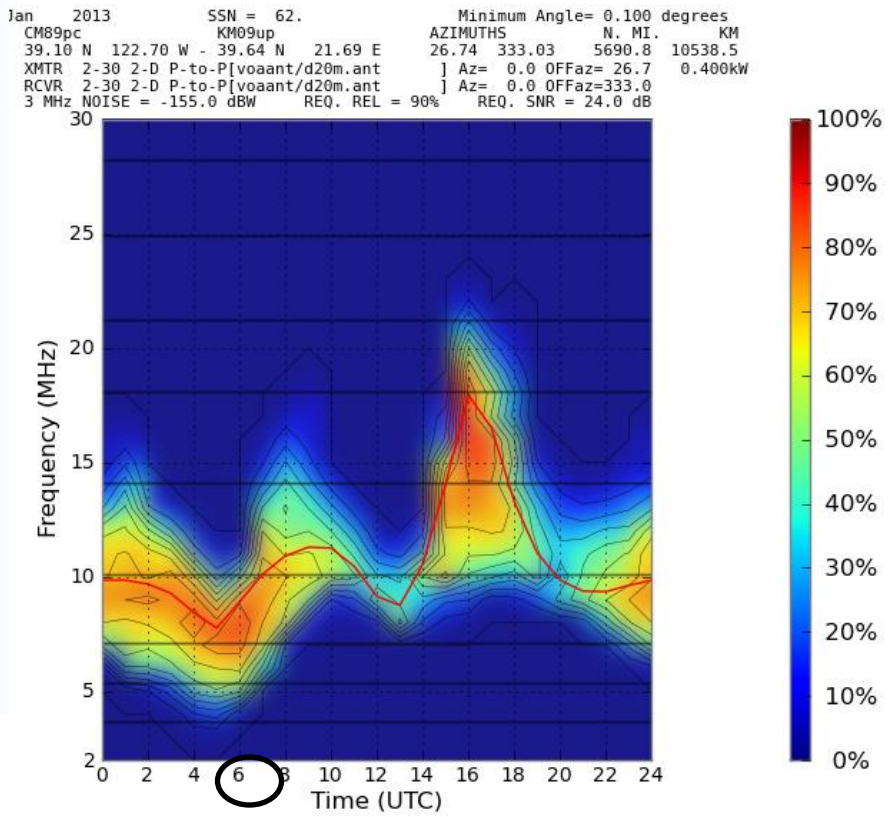
#331 / 335!

Antenna Launch at KY6R

Posted by Jack on December 9th, 2012

Rich, KY6R, wanted to hang a doublet for 40m up as high as he could get it. So he asked me to bring my pneumatic antenna launcher over to hang the wires.

Circuit Reliability (%)



Huge thanks to Jack, K6JEB and Peter, W6DEI for the fun antenna launch party!

Little Pistol Operating Tips

- You must be an expert at working split
  - 90% of the time I am right at where the last station was worked, or, if he is moving up or down by a “smidge”, I figure out what that “smidge” is
- Hand sent CW – gets through when other modes can’t. 24 wpm almost always
- I usually send my call twice, but sometimes put a lag between the first and second call
- Know the published frequencies and “camp out”. Be ahead of the “herd”

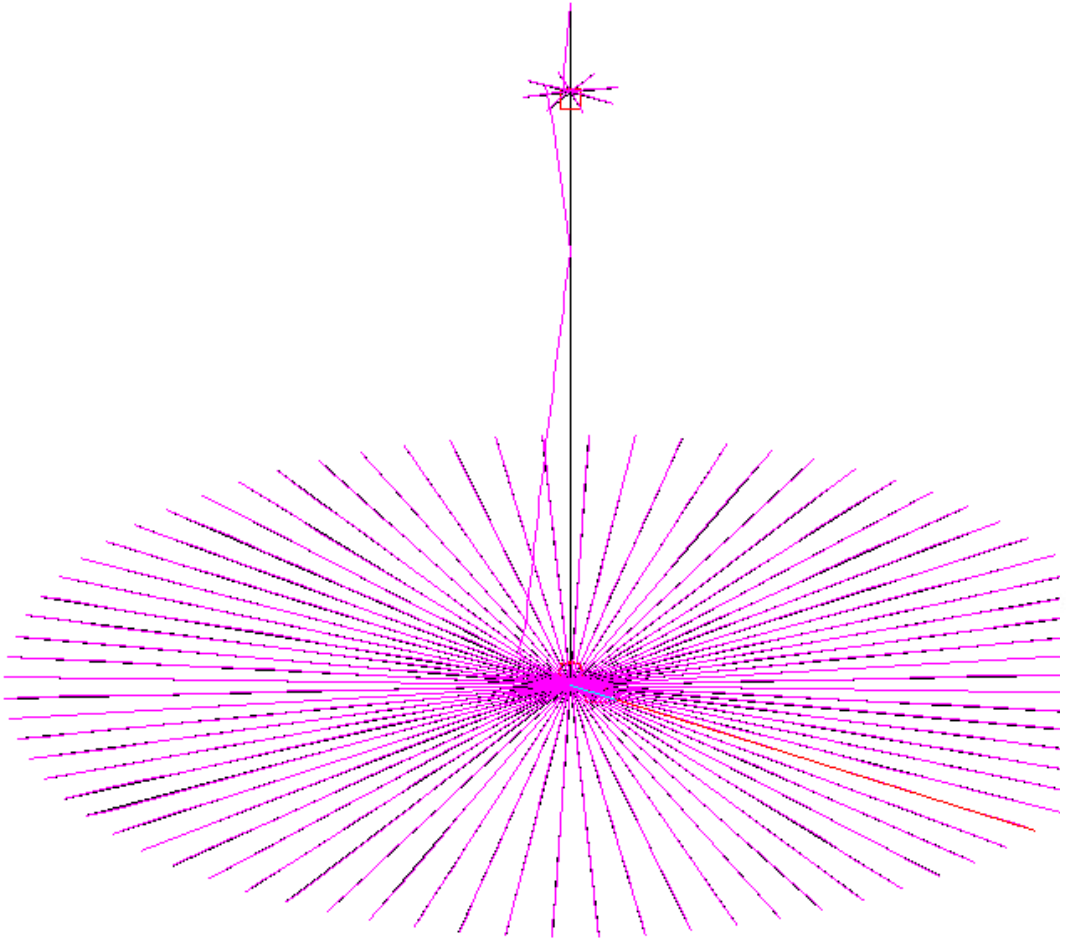
Post Honor Roll
Refining the “Farm”
The Low Bands:
160M and 80M

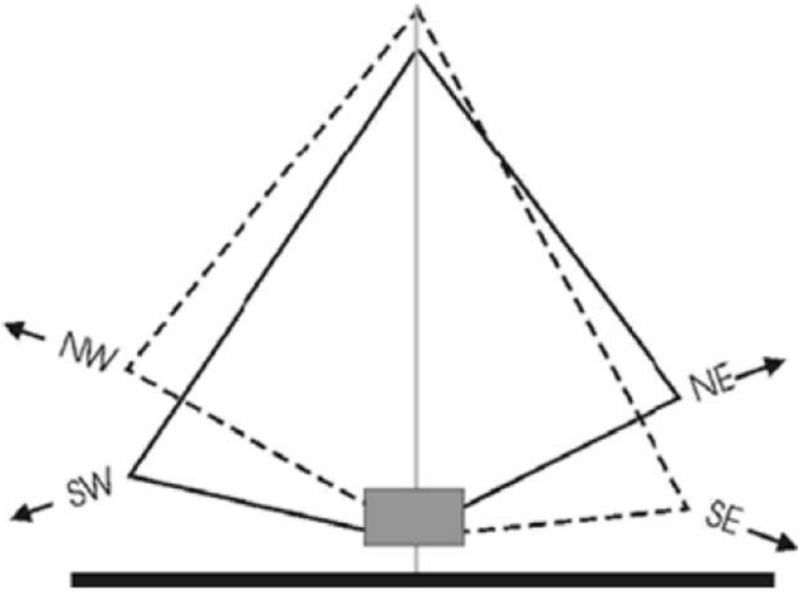
(goal = add 9th DXCC band – 160M)

KY6R 60’ Lowband Vertical

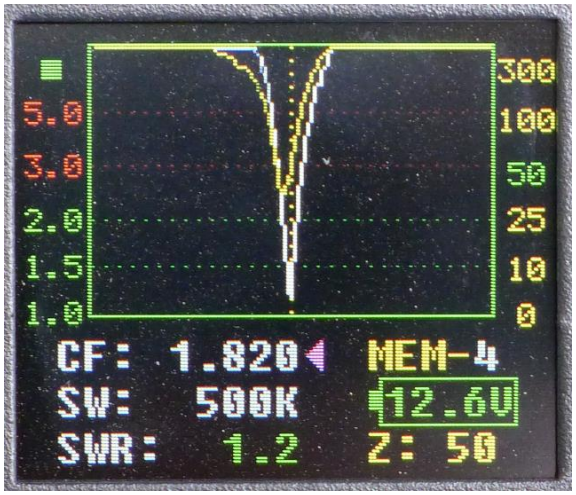
- Cushcraft MA-160V on top of a 30’ telescoping mast
- Top loaded (coil and hat) and base loaded (homebrewed LC)

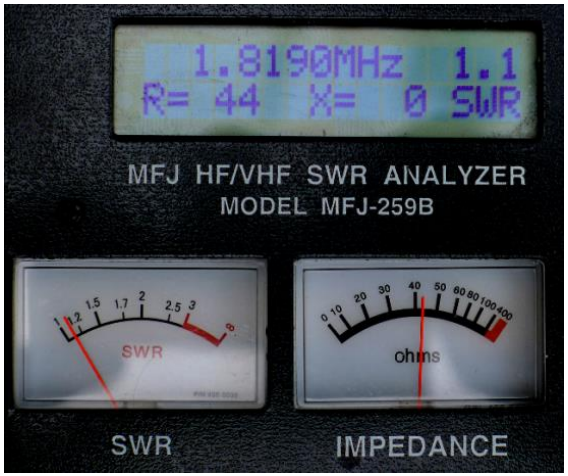
K9AY Loops on RX for 160 + 80M





KY6R 60’ Lowband Vertical

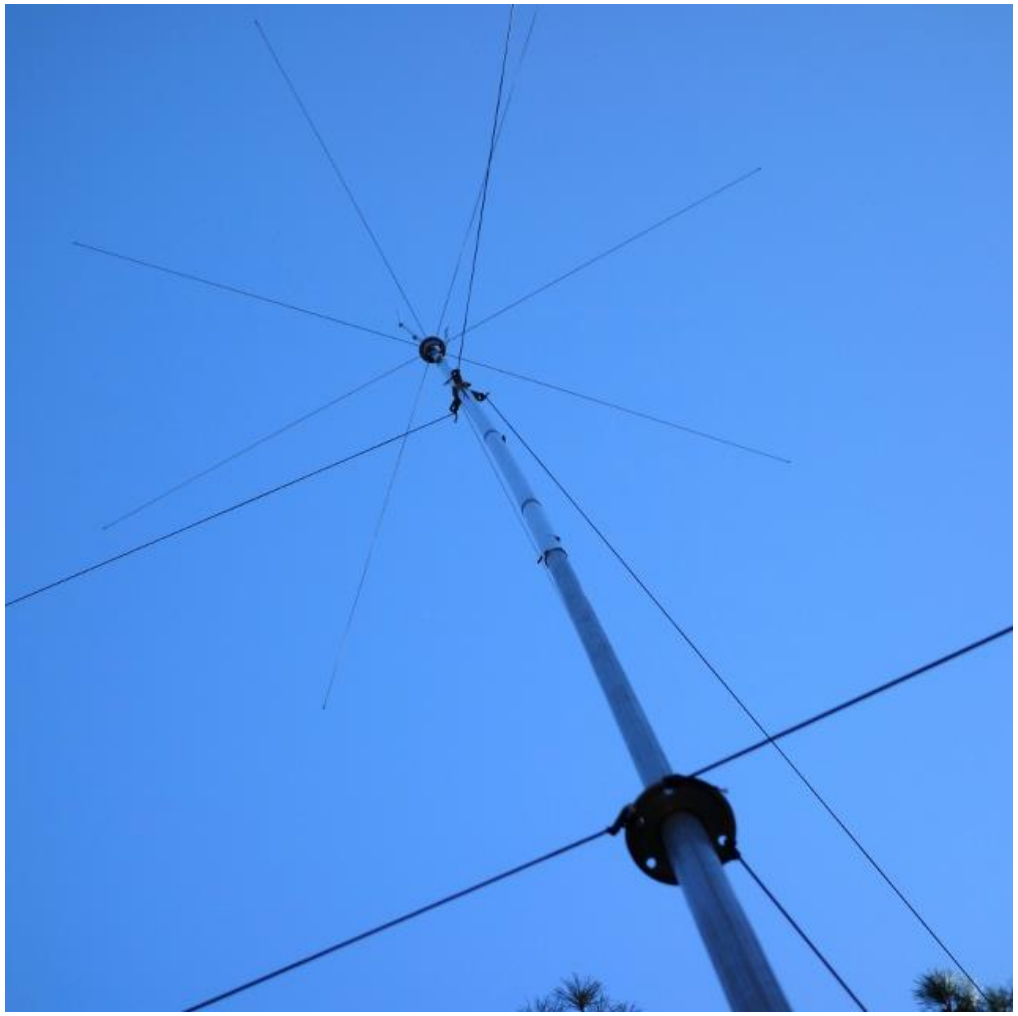




Variable Cap
Lets me tune
CF for 160M
Instead of
tuning the
“stinger”

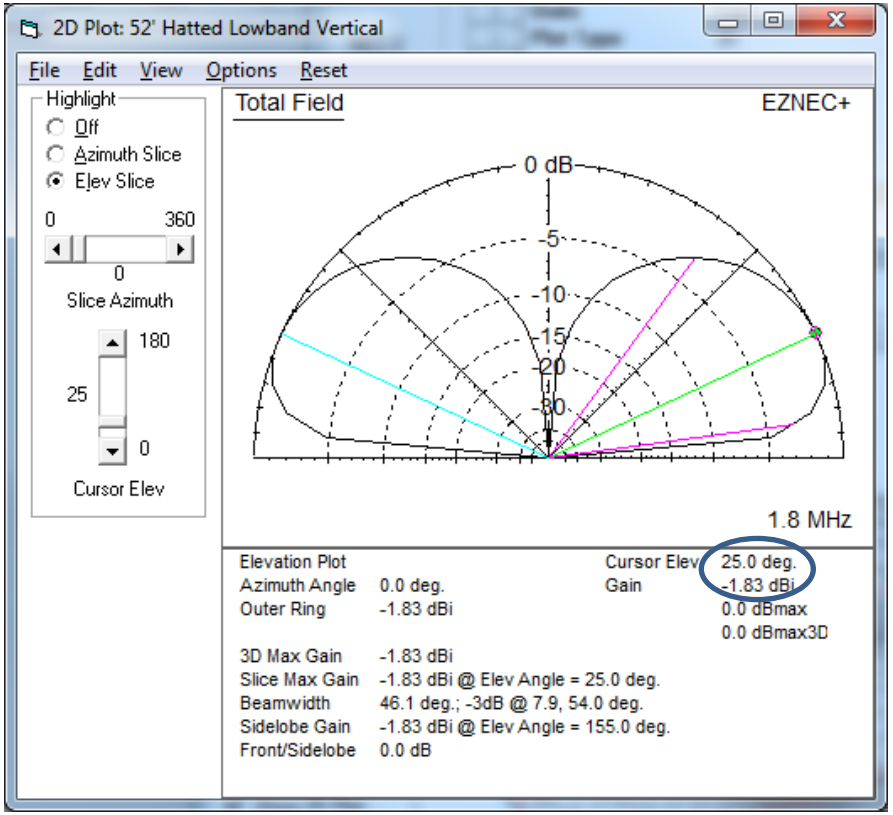
Resonant at 1.820 and 4:1 in the 80M band Covers the CW segment on 160, more on 80. Simple circuit – 1:1 Current Choke followed by a Ten Tec 40 – 500 pf variable cap and I use a KAT-500 in the shack.

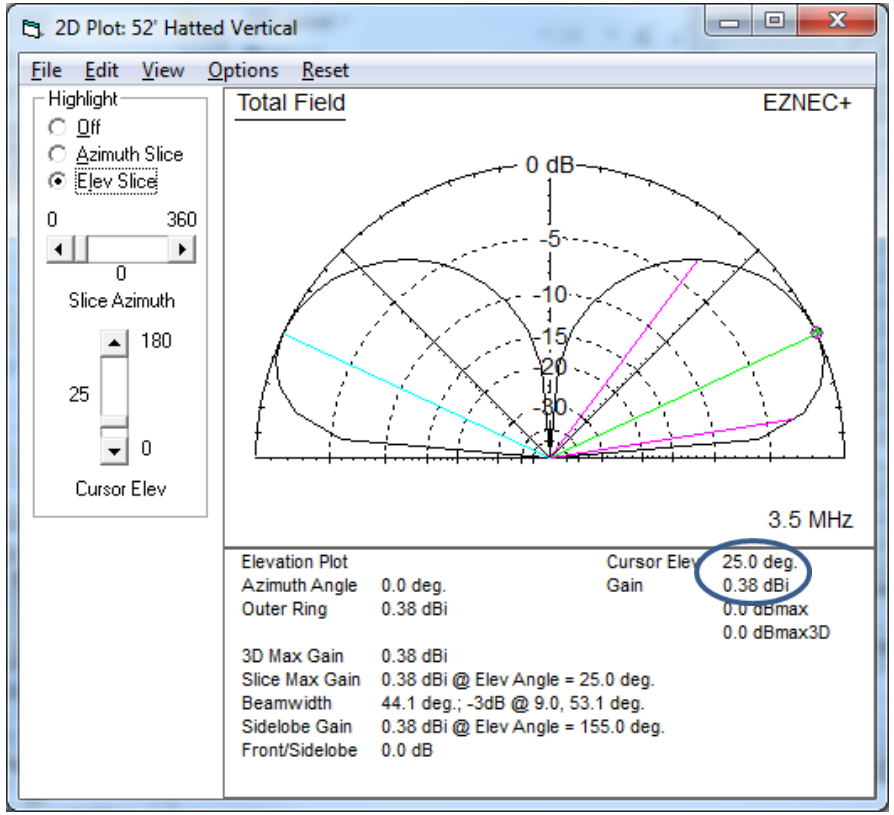
KY6R 60’ Lowband Vertical



I have 76 buried radials various sizes. My ground characteristics: Conductance (S/M) = .004, Dielectric Constant = 15, so considered “Average”.

KY6R 60’ 160/80M Vertical





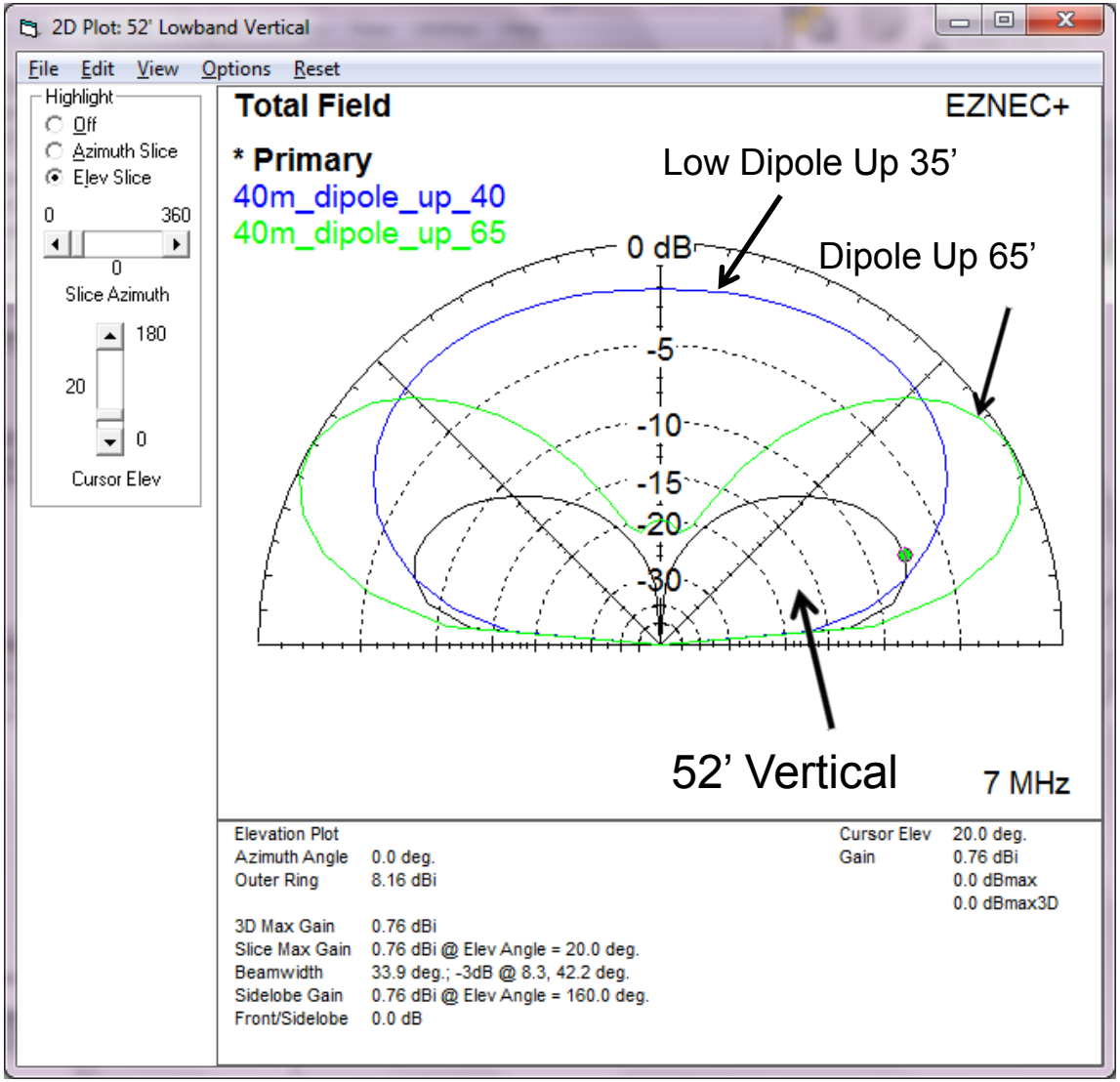
Some loss, but not too bad for a ~1/8th wl vertical. Only 25% efficient.

A quarter wavelength on 80M

Works surprisingly well on 30, 17 and 12M

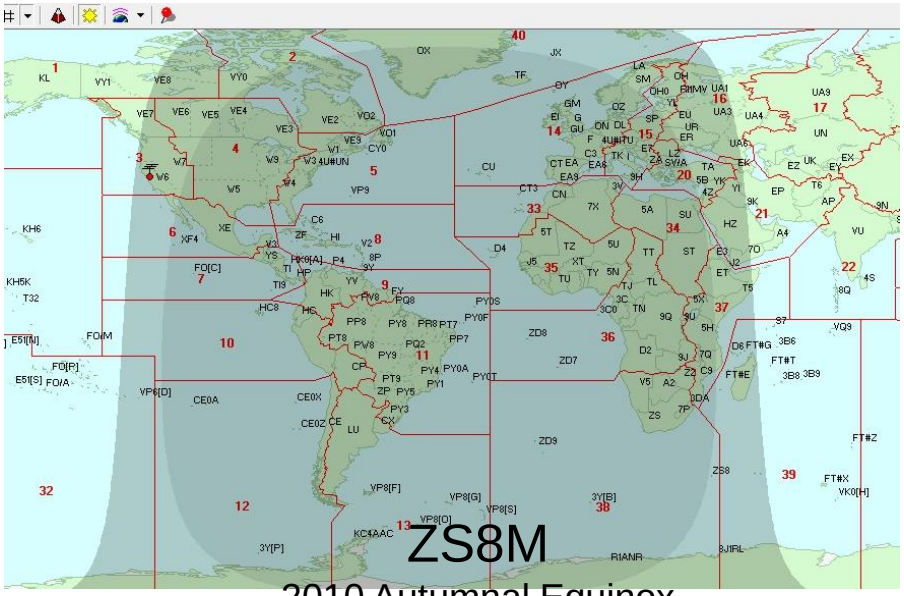
60’ Hatted Vertical Compared With . . .

- Consistently better than an R8 (up 15’) on 40M and 30M by 1 - 3 “S units”
- Not as good on 40M as a dipole up 65’ (or more)
- Better than a low dipole



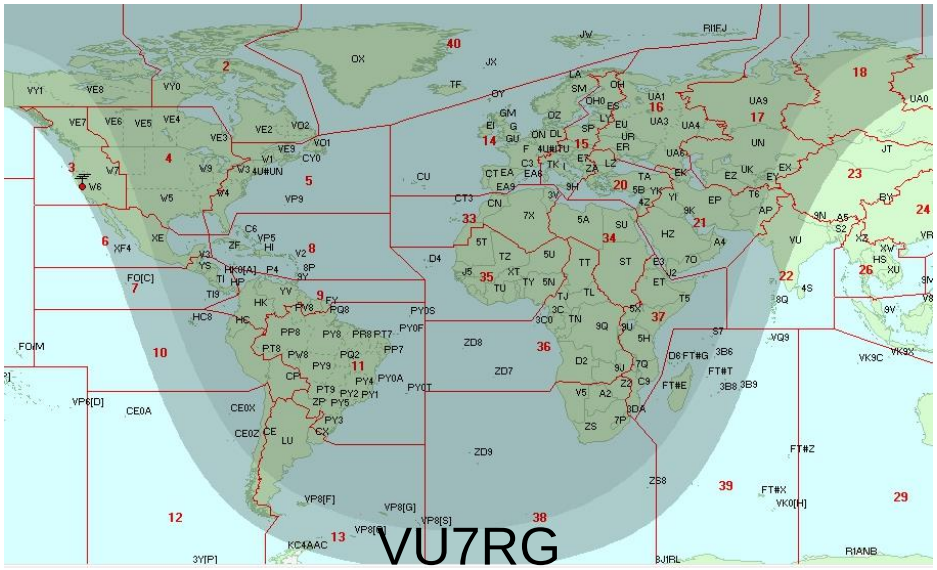
Post Honor Roll Refining the “Farm” The Low Bands: 40M and 30M

40M Greyline = My Favorite DX



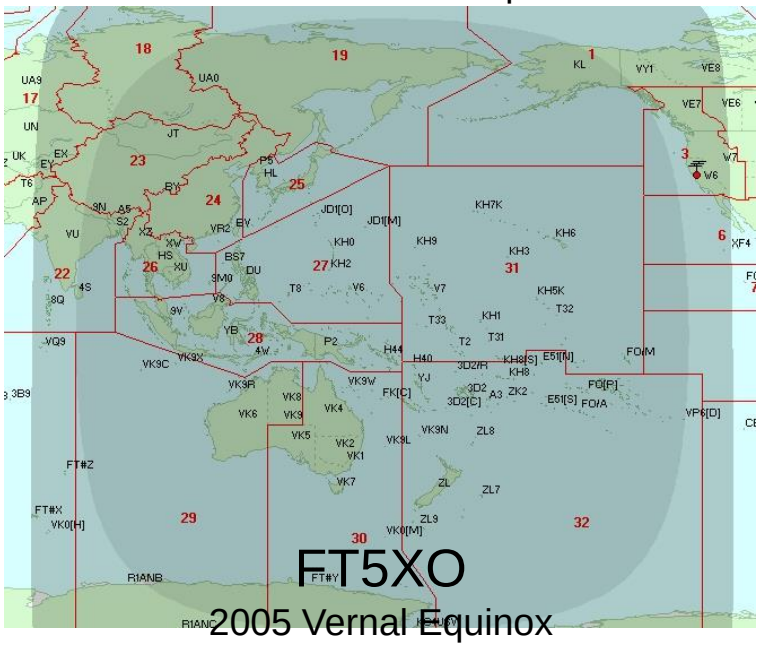
ZS8M

2010 Autumnal Equinox



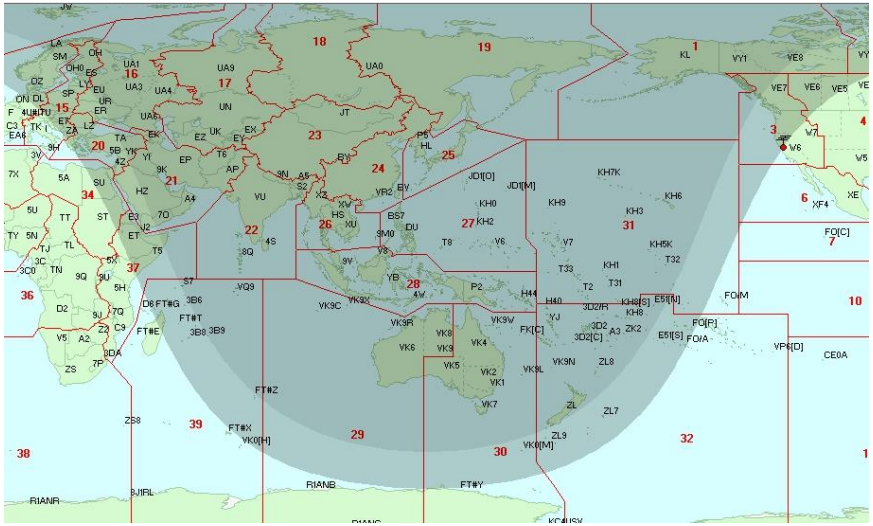
VU7RG

2007 January



FT5XO

2005 Vernal Equinox

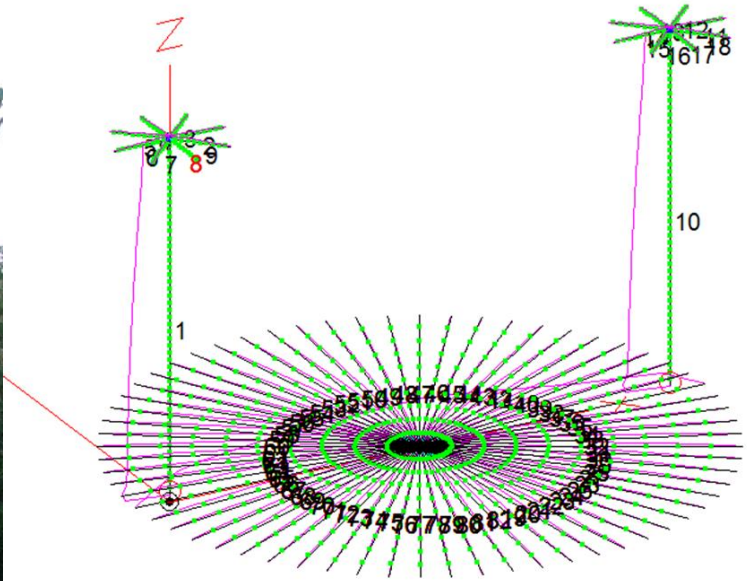


TO4E

2003 - December

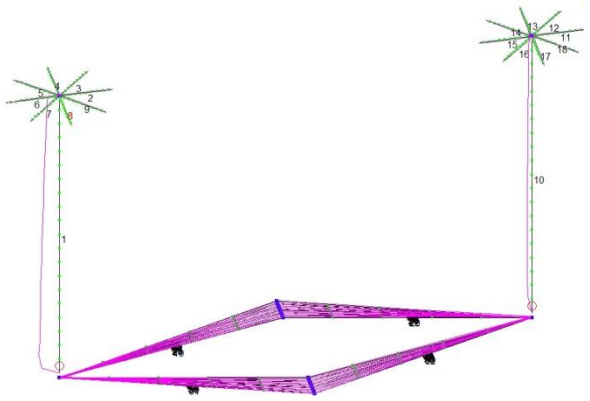
40M Phased Vertical Array

- ¼ w.l spacing (35’), end fire and broadside with Christman 90 and 180 degree phase shift
- Two 24’ top hatted verticals on redwood posts



Modeled in EZnec

Actual Radials



40M Vertical Array Pictures

44 buried radials
Plus Chicken wire

Christman Phasing Calculator

Operating frequency:

7.050 Mhz

Coax velocity factor:

0.85 Vf

Calculate

Measuring your 71-degree phasing line

The **71-degree** phasing line should be: **23.388 ft** or **7.129 m.**

The 71-degree phasing line is 90 degrees at **8.937 Mhz.**

Cut the coax to the suggested length plus a few inches, in case your velocity factor is not quite right.

Leaving one end of the coax open, set your RF analyzer to **8.937 Mhz** and trim the coax until you see minimum Z impedance. You now have a length of 71 degrees at your desired operating frequency.

Measuring your 84-degree feedlines

Each **84-degree** feedline should be: **27.670 ft** or **8.434 m.**

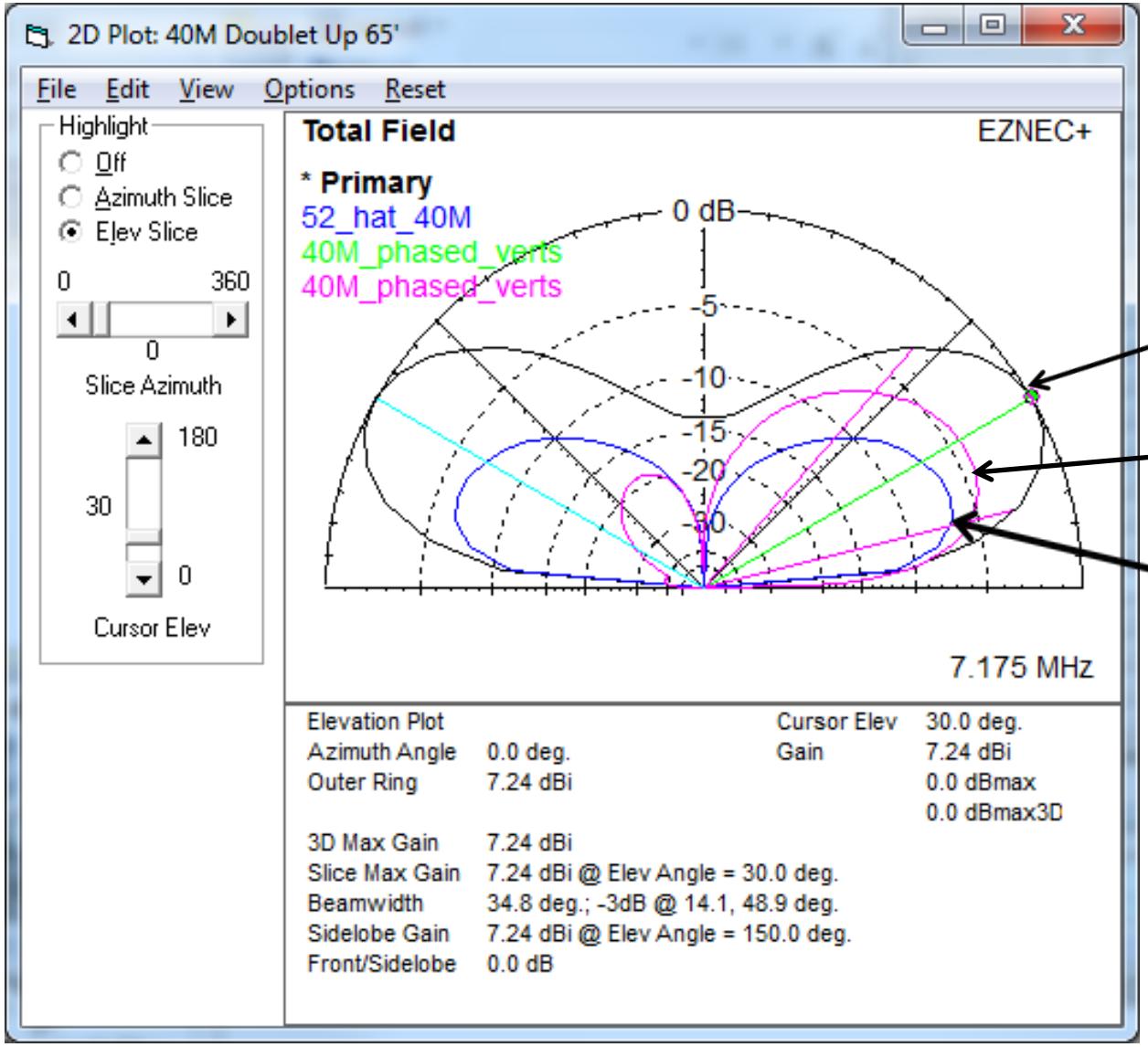
The 84-degree feedlines are 90 degrees long at **7.554 Mhz.**

Cut the coax to the suggested length plus a few inches, in case your velocity factor is not quite right.

Leaving one end of the coax open, set your RF analyzer to **7.554 Mhz** and trim the coax until you see minimum Z impedance. You now have a length of 84 degrees at your desired operating frequency.

http://www.va7st.ca/home.html/2009/11/christman-phasing-calculator/

60’ Vertical vs. Dipole vs. Array



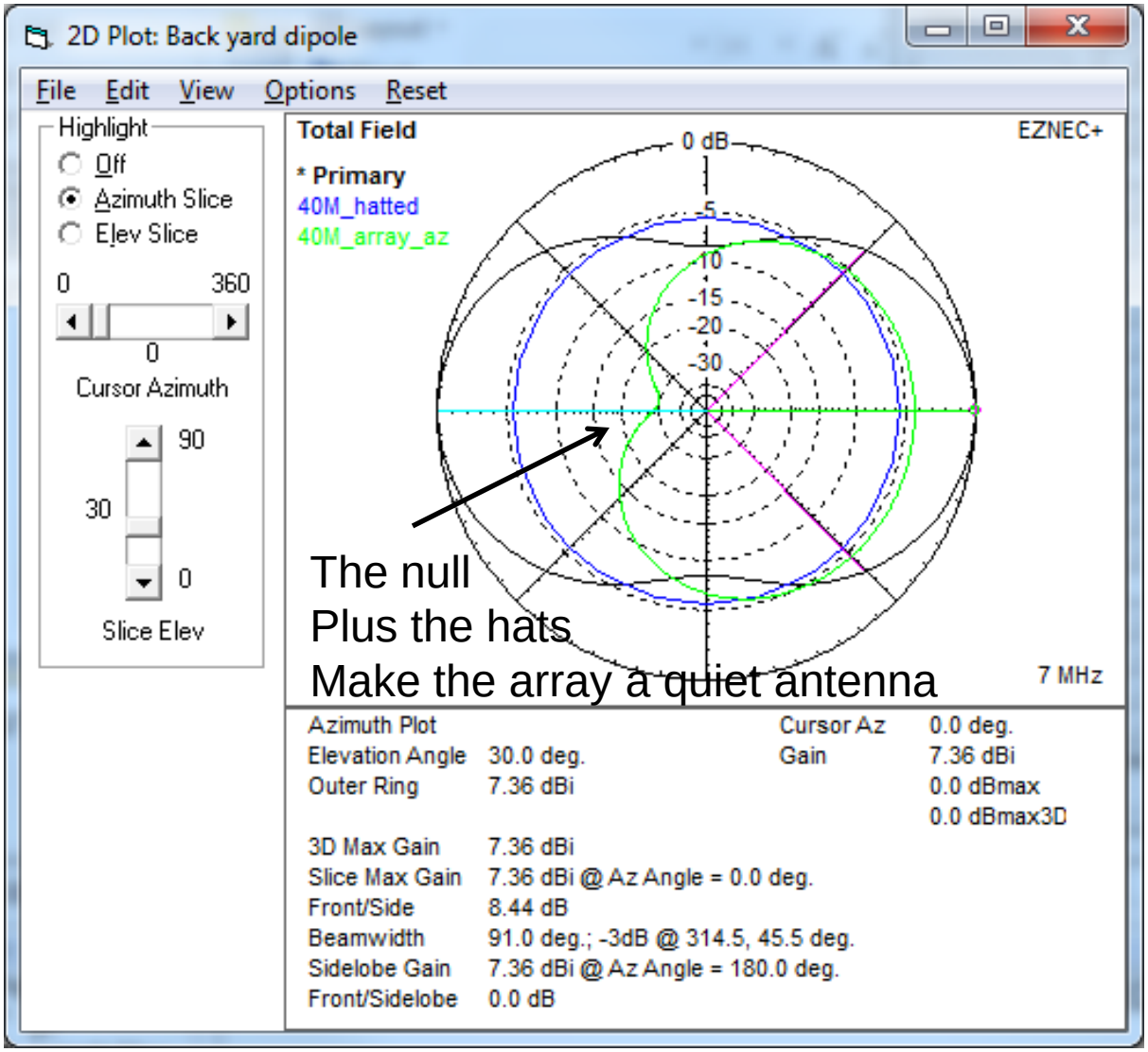
Dipole up 65’

Array 3 dBi

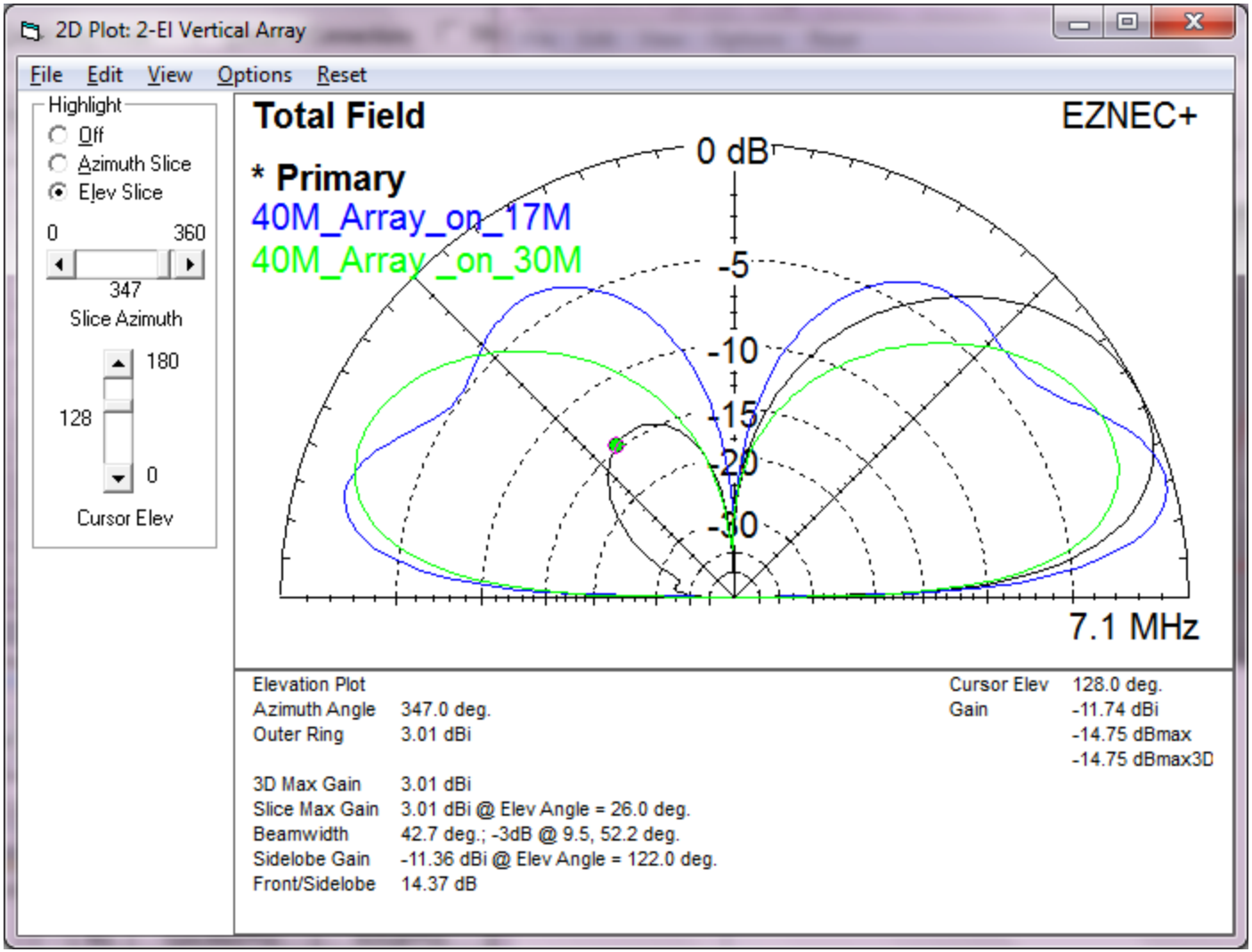
25 dB F/B

60’ Vert - .95 dBi

60’ Vertical vs. Dipole vs. Array



40M Array on Other Bands



The 40M Array Verticals work very well on 30 and 17M

How Does The 40M Array Play?

- Easily working ZS on the Long Path mornings in July (7/20/2013)
- Makes the difference between hearing ZS above the noise, because ZS is in the noise or buried below the noise on the 60’ vertical
- Much less noise than the 60’ vertical (or high dipole) for weak signal work
- VK-ZL’s report a full S Unit improvement over the single vertical, so at least 3 dB improvement. I see the same thing on RX

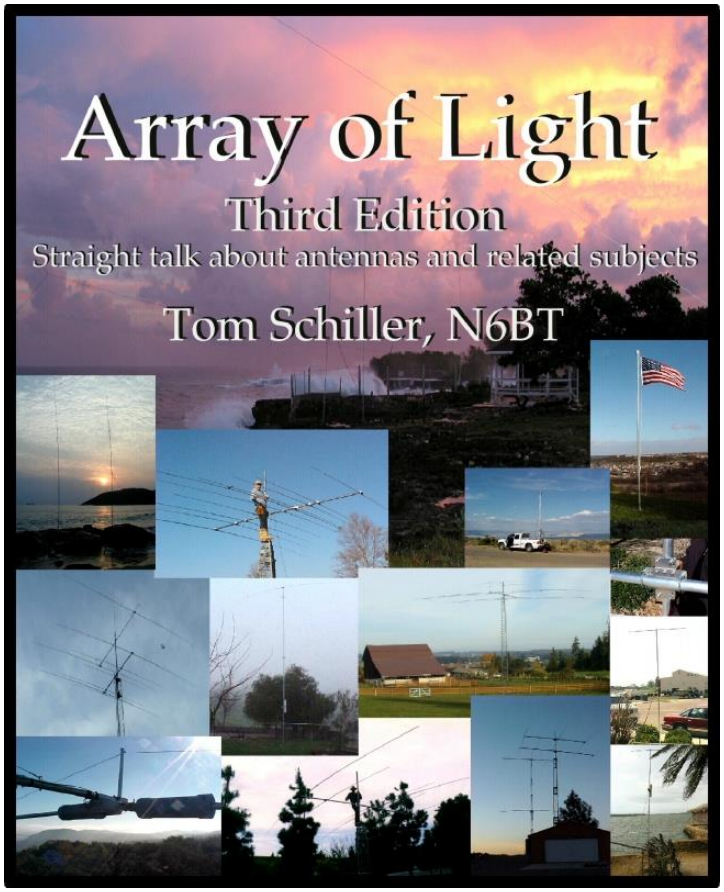
Post Honor Roll
Refining the “Farm”
The High Bands:
20 – 10M

Experiment: My 17 Meter “2X2” Stack

The Story Behind The Stack

I met Tom, N6BT at Pacificon 2012
and I bought his fantastic "Array of Light" book.

I finally learned how my A3S (probably) performed. It was a real eye opener!



I learned about "proximity", how cell drivers are designed and the gain you get from height over ground.

I Purchased Two Old Yagi's For $325

Wilson M520 5 element 20M on 40' 3" boom

I bought two of Carl, AI6V's old antennas from his "antenna graveyard" up in Nevada City.

KLM 5 element 10M yagi on 27' boom

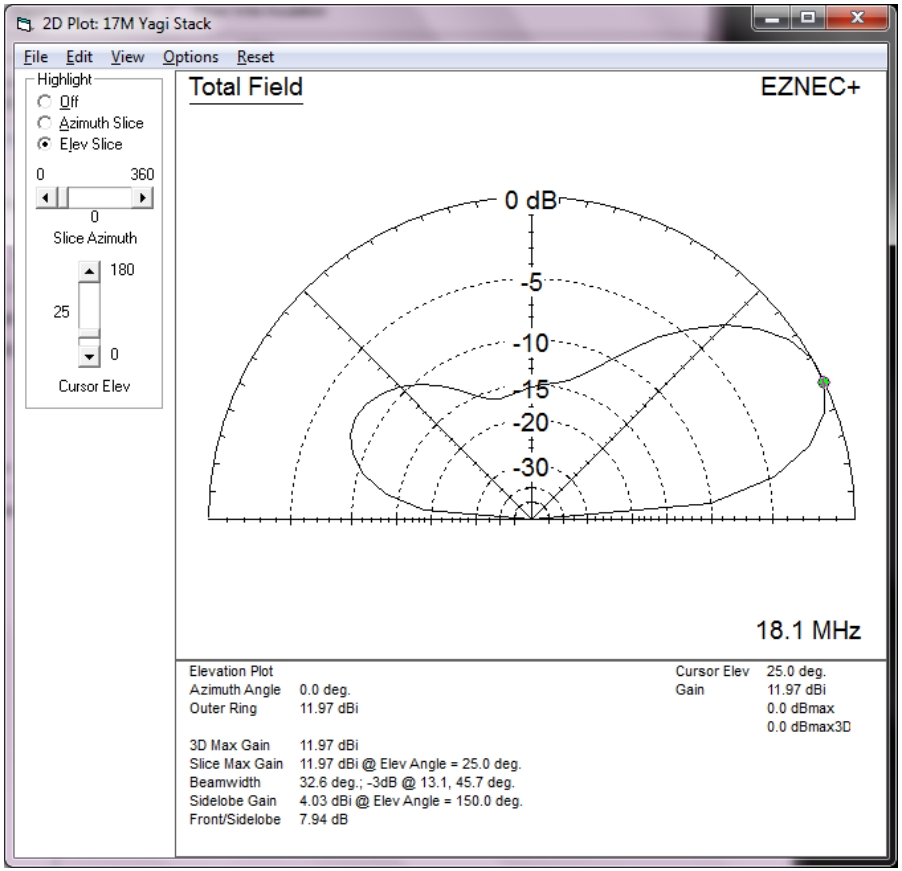
Tom Suggested a 2X2 Stack

- My AB-952 can go up to 55’
- 492/f = half wave stacking distance 492/18.1 = 27’
- 55’ was not enough for a 20M 2X2 Stack
- But its perfect for a 17M stack (27 + 27 = 54’)
- Must use “Armstrong Rotator” though . .

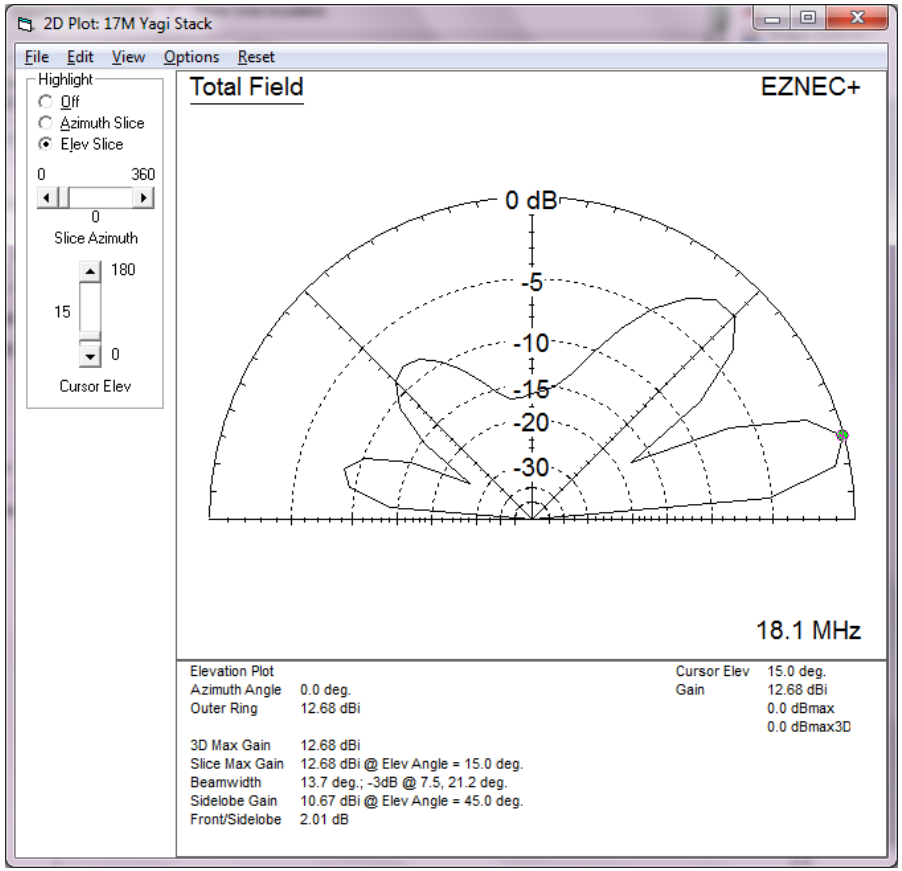
Why a Stack?

- Very good gain. First 2 elements give biggest gain (12+ dBi)
- Flexibility – switch for best angle / null
- Compressed lobes
- Broad banded
- Quiet due to the top yagi “shadowing” the bottom
- “Models well”, but more importantly, on air it works well on the other bands (with a tuner)
- Largest stack I can fit on my AB-952

Single 17M Yagi's

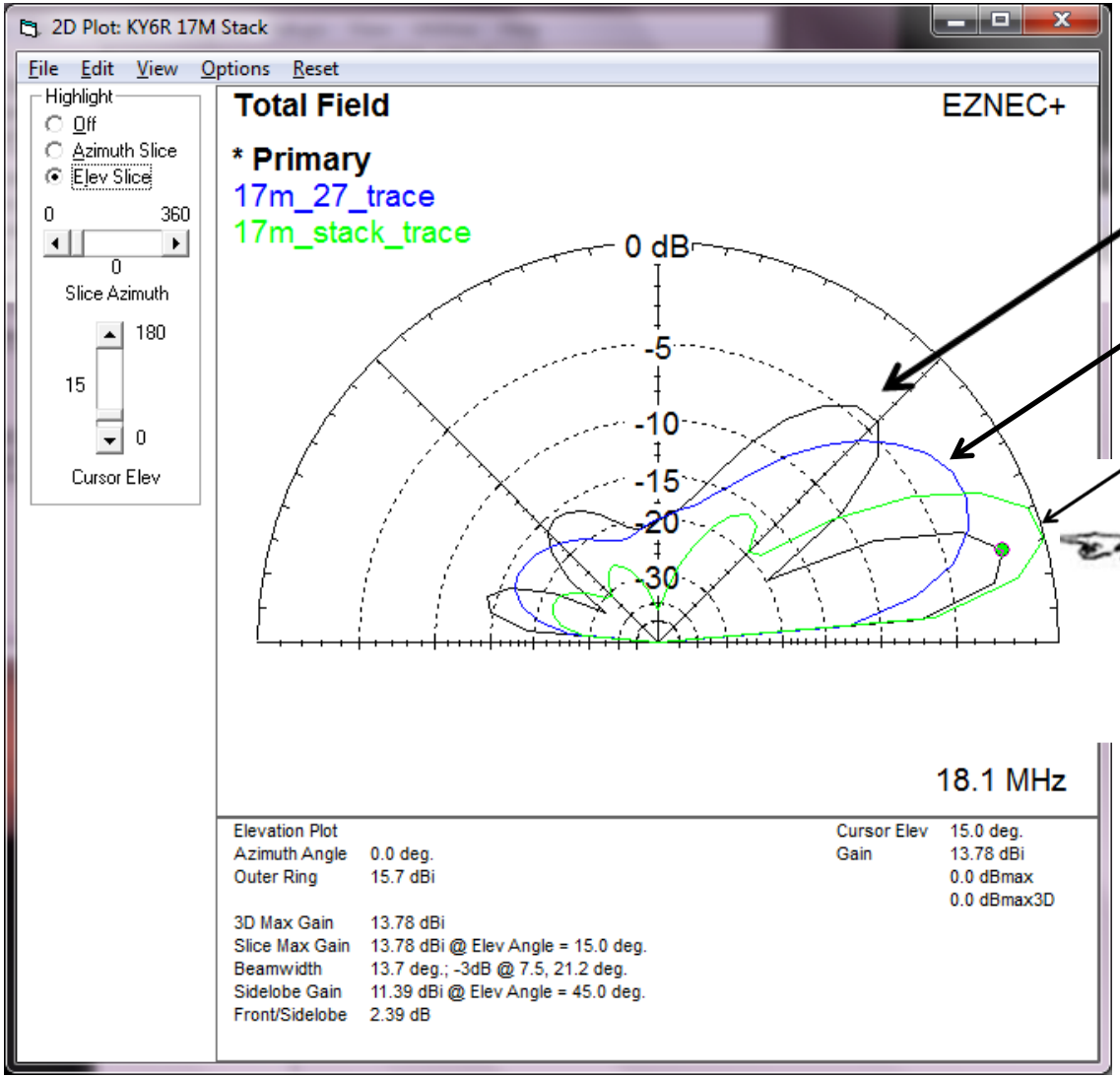


At 27' – ~ 12 dBi 25 deg TOA



At 54' – ~12.7 dBi 15 deg TOA

Combined Elevation Traces



54’

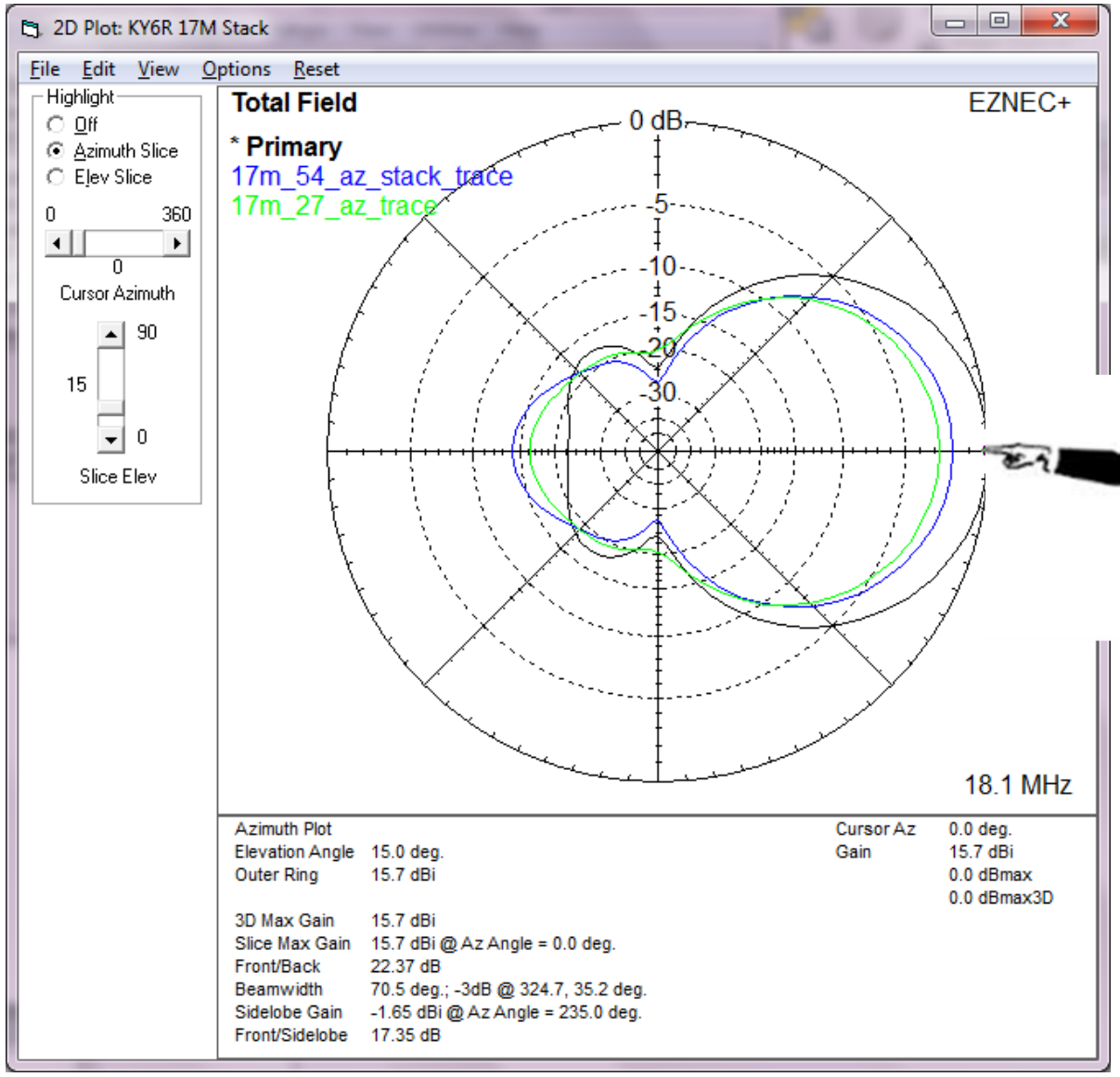
27’

Both

Compressed Lobes

13.8 dBi
15 deg TOA

Combined Azimuth Traces



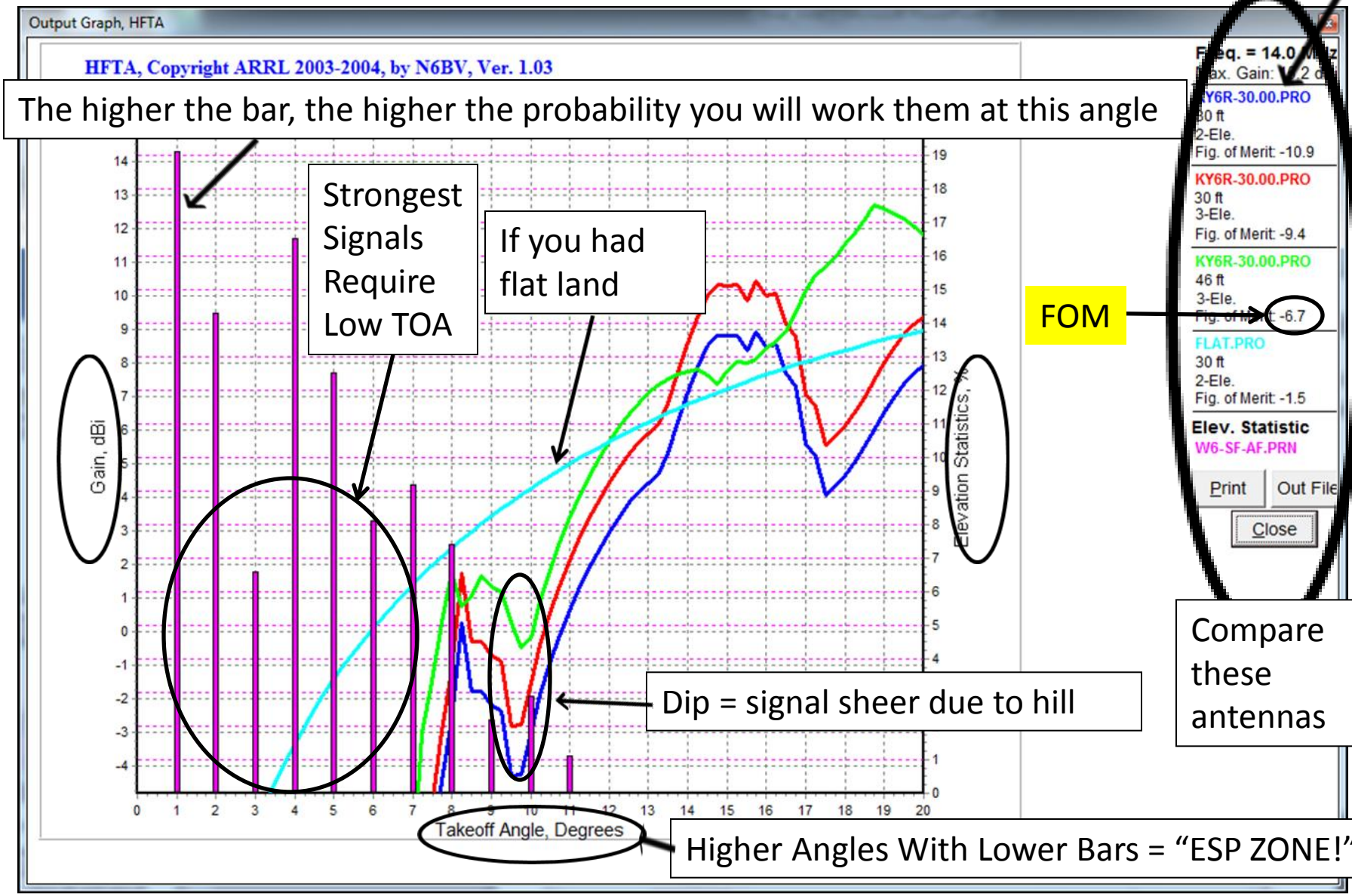
Additive Gain

Array Solutions Stackmatch II

StackMatch II Controller

Does a great job of phasing and “flattening” the SWR of the two yagis in a stack – contains an UNUN and switches Upper, Lower or Both using equal length 50 ohm coax

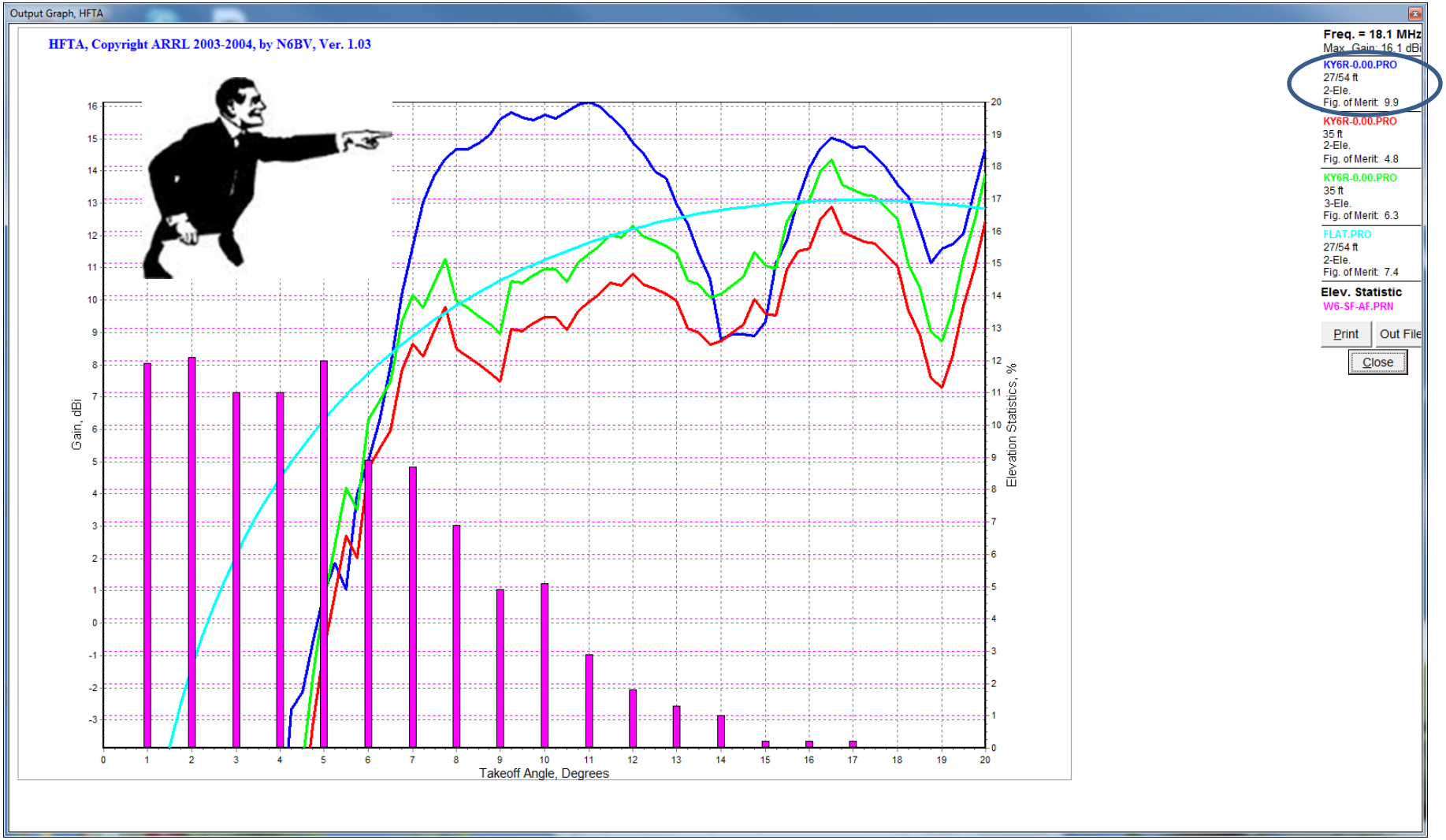
How to Read an HFTA Chart



HFTA “Figure of Merit”

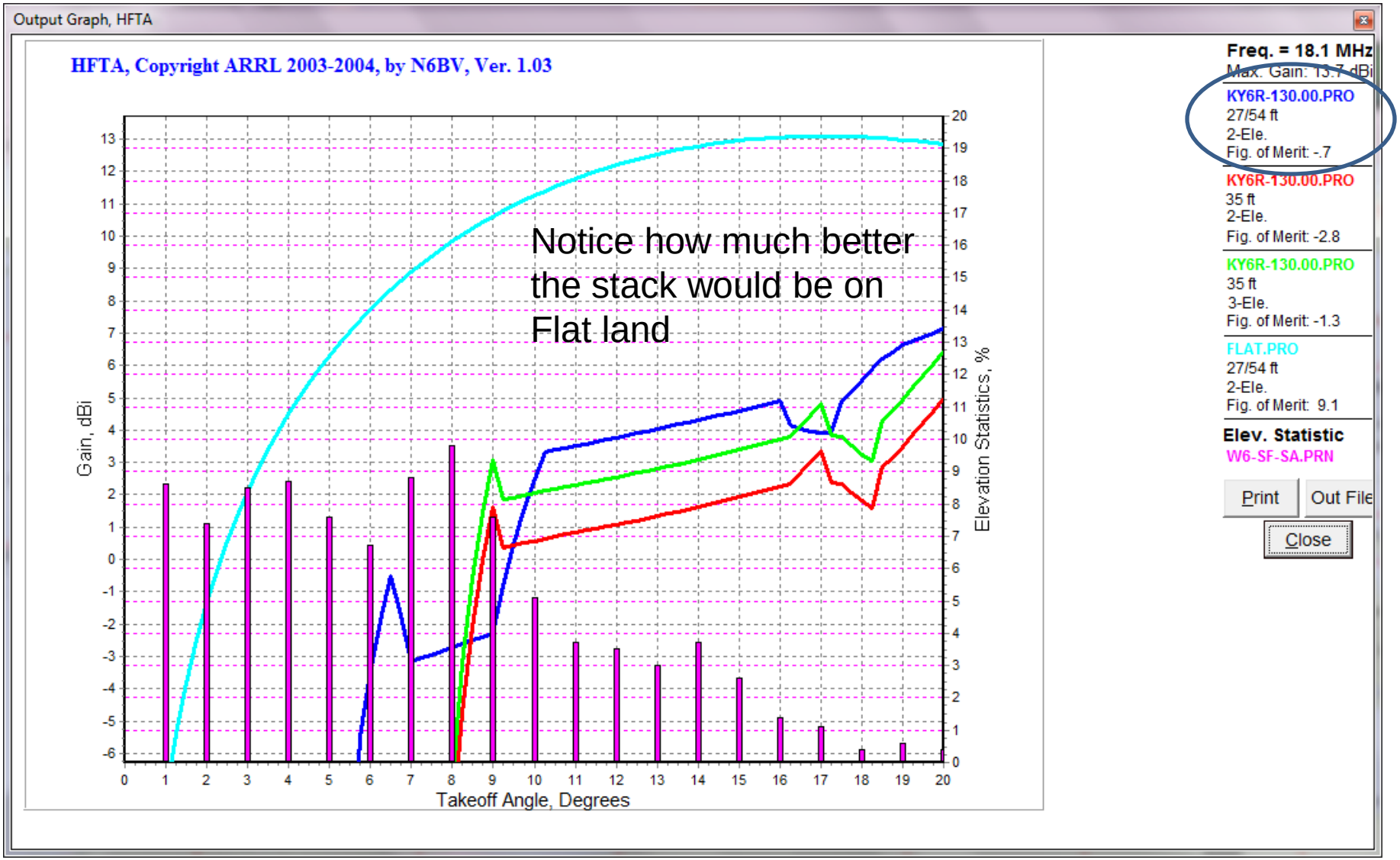
- “A ***weighted statistical average*** computed by multiplying the gain at each angle by the statistical percentage that the band is open at that angle. The products for all angles are averaged to compute the Figure of Merit, which is calibrated in dBi” – source = ARRL Antenna Book Addendum

Tromelin – Short Path



2X2 Stack is 5 dB > nested 17/12M Moxon that was up 35’ and > 3dB better than 3 element Yagi up 35’. Even > 2 dB better than same stack if it were on FLAT ground (for higher angles)

Bouvet Island – Short Path

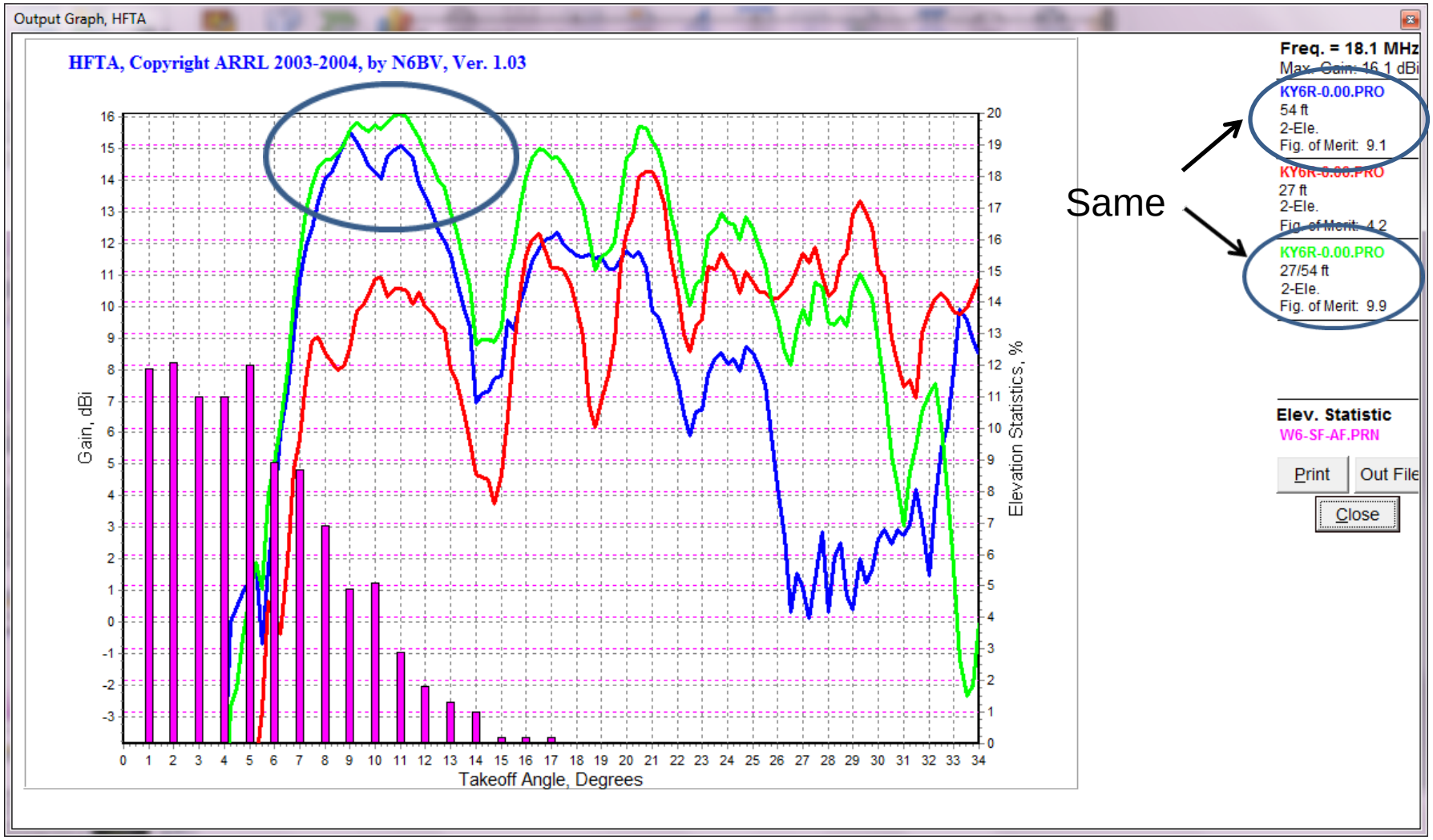


The stack is also more than 2 dB better than the previous 17/12M Moxon

On Air Tests – an Anomaly

- With 7 months of on air testing, receive between the top and both positions was always about the same
- The bottom was always significantly weaker
- On transmit, I usually heard that the top was 15dB stronger than the other two positions
- The stack ended up being a bust – just getting one yagi up as high as possible was best – and it most likely has everything to do with my hilly terrain
- It pushed the limits of my AB-952 mast . . .

Tromelin – Top as good as Both



Learning from the Stack

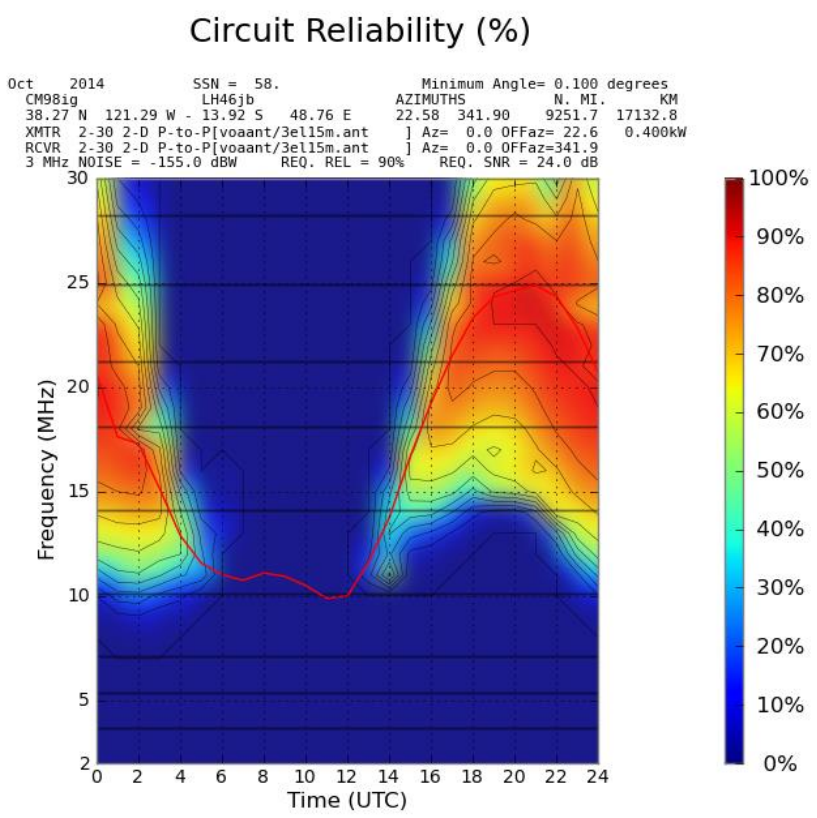
- A 2 element antenna up as high as I can go is the right answer (best “ROI”)
- A dual band, nested Moxon is inexpensive, easy to build and maintain, is lightweight and can be easily supported by the AB-952
- The Moxon has better F/B – (but a little less gain – 1 dBi) than the aluminum 2 element yagis

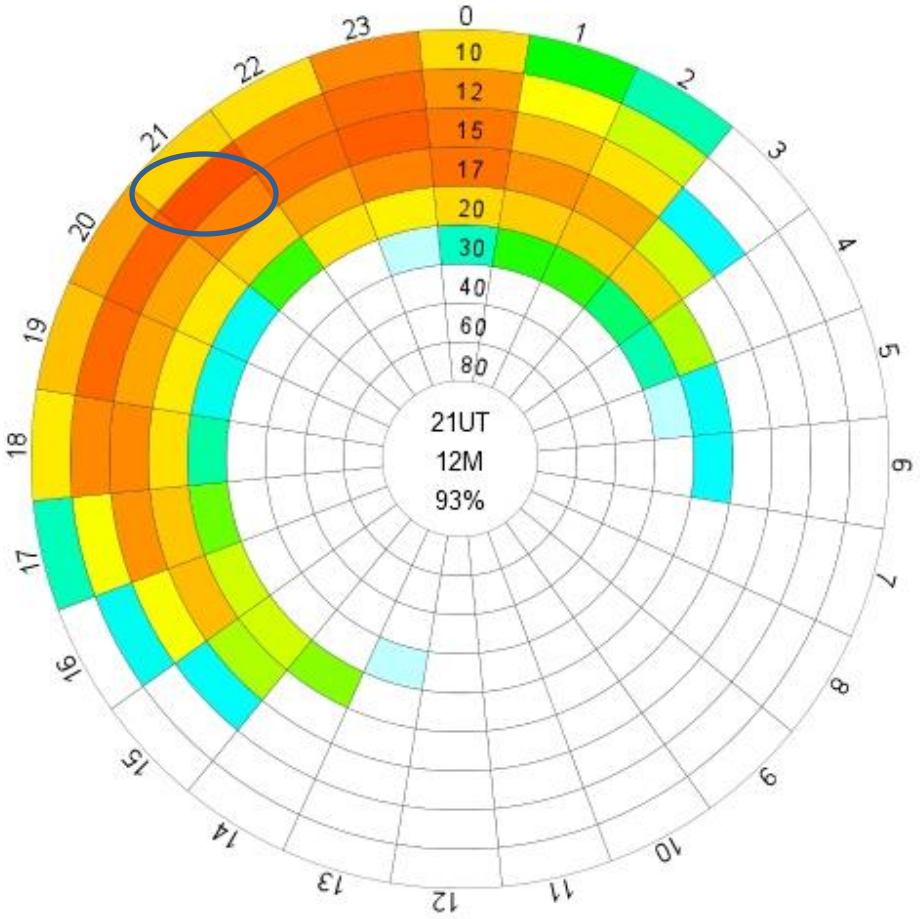
HFTA Height Analysis – For My "Needed"

ENTITY	HEADING	VOACAP	20M	17M	15M
FT/T – 10/13	0	15M	55	55	55
FT/G + E3 – 4/14	20	17M	55	55	55
KP1 – 1/15	100	17M	55	55	55
3Y0/B – 1/15	120	20M	55	55	55
VP8/S – 1/15	140	20M	55	55	55
VK0/H – 1/15	205	20M	45	45	45
KH5K – 10/14	240	20M	50	45	45

- The "money" band is 20M
- The predicted "best height" is 55'

VOACAP Data Visualization





I ran VOACAP for the last 9 I need. . .

http://www.voacap.com/prediction.html

Entity "Band – Hours" Analysis

ENTITY	BEARING	80M	40M	30M	20M	17M	15M	12M	10M	TOT
FT/T	0	0	0	0	0	6	8	0	0	14
E3	0	0	0	0	0	6	8	0	0	14
KP1	100	8	14	16	8	10	10	6	4	76
3Y0/B	130	0	2	4	6	4	4	4	2	26
VP8/S	140	0	4	8	10	6	6	10	8	52
VK0/H	205	0	0	1	2	2	0	0	0	5
KH5K	240	8	12	18	20	14	10	6	2	90
FT/Z	270	0	2	4	4	4	4	0	0	18
		16	34	51	50	52	50	26	16	

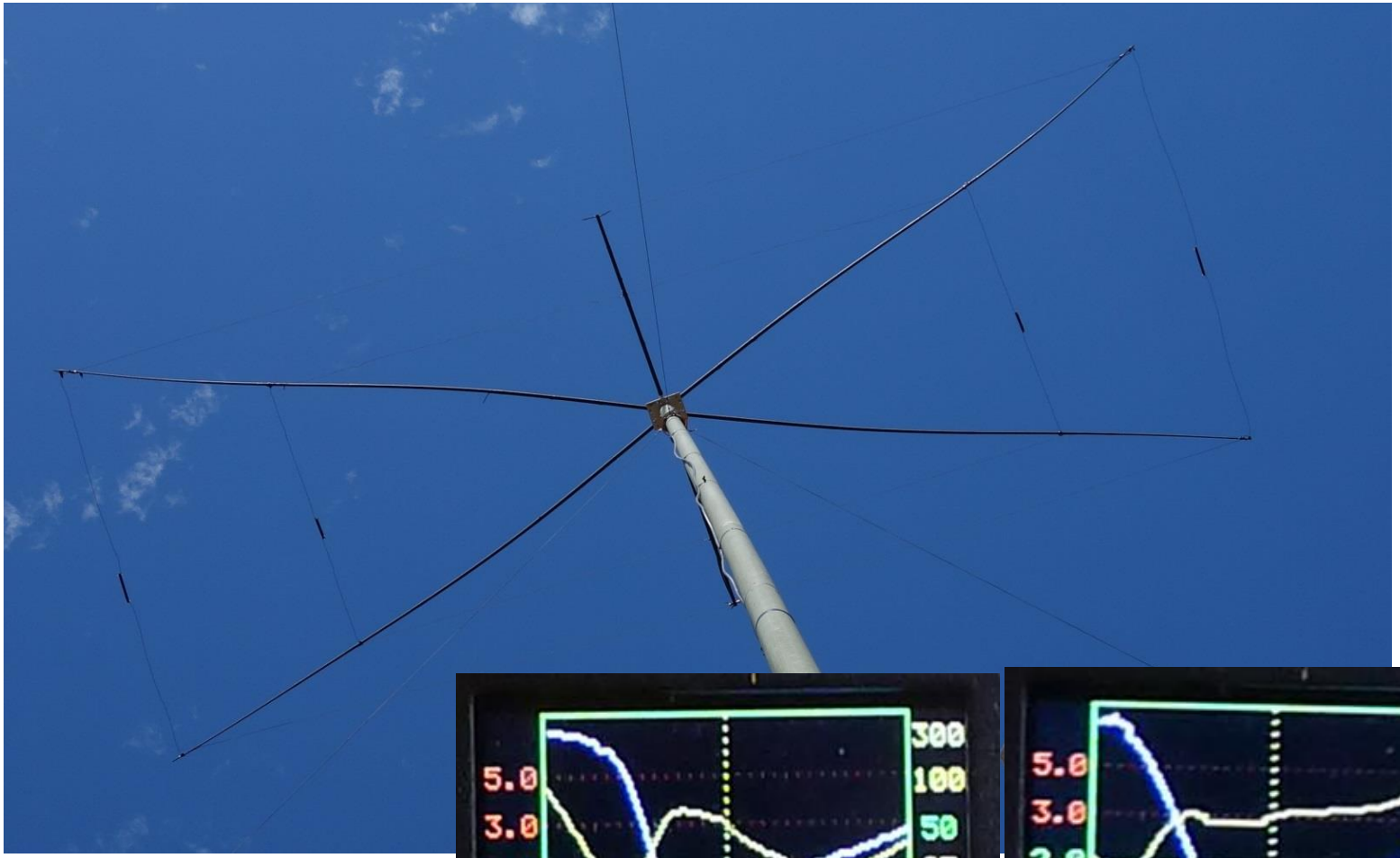
Based on actual planned activations or rumors of the remaining entities that I need:

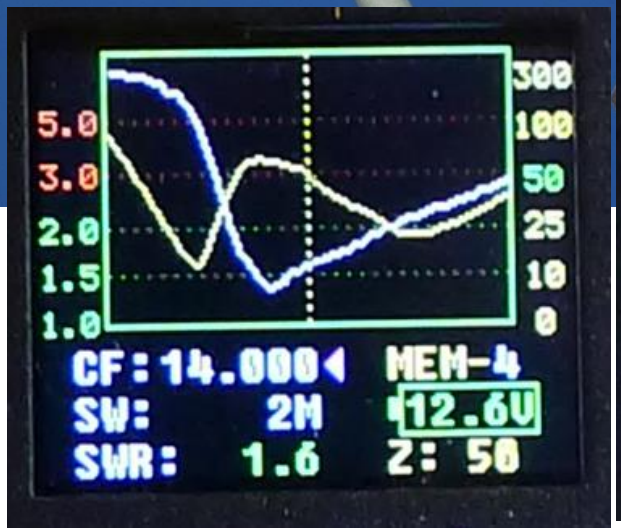
1) Southern Ocean activations would usually be activated January – February
   FT/Z, 3Y0/B, VP8/S, VK0/H
2) I know that FT/T and KH5K will most likely be activated in September – October (FT/T outside of cyclone season, which is December – March each year). FT/G would be like FT/T
3) KP1 probably will be like K5D – and activated in January or February. E3 – no hope now
4) 40 and 30M are the wild cards, money bands (in this order) – 20, 17 & 15M, based on the fact that a "rare one" will usually spend a lot of time giving out ATNO's on 20M . . .

Nested Moxons

- Nesting 2 bands works very well
- Adjacent bands do not model well
- Four bands nested and switched with RCS-4V does not model well
- Decided on 20/15M at 55’

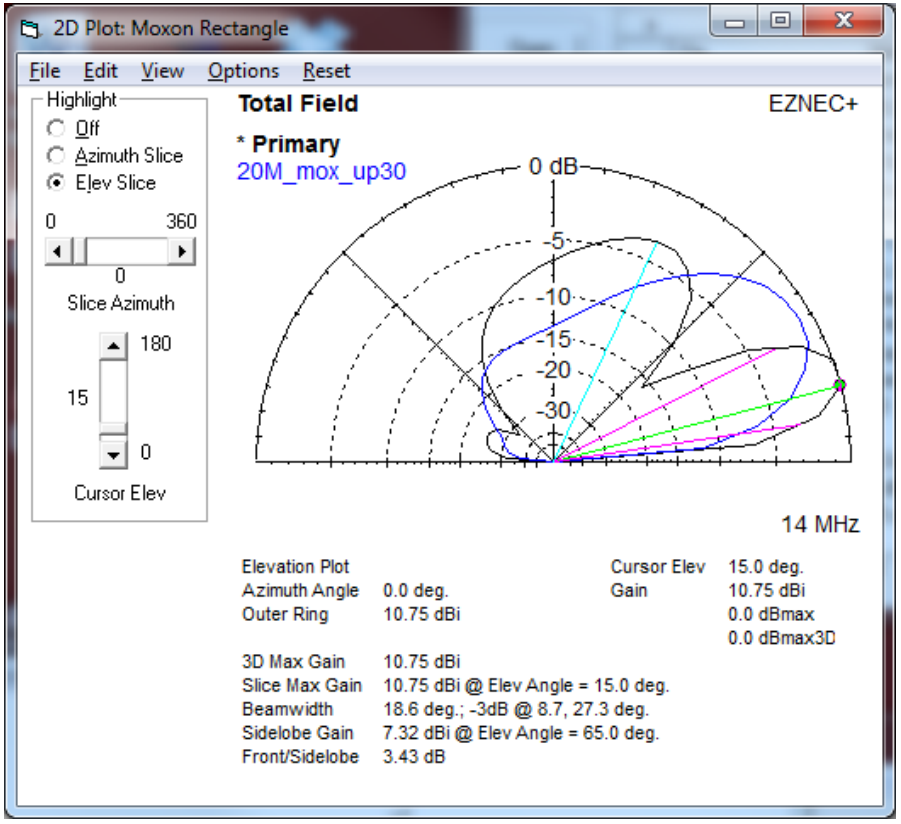
20/15M Nested Moxon

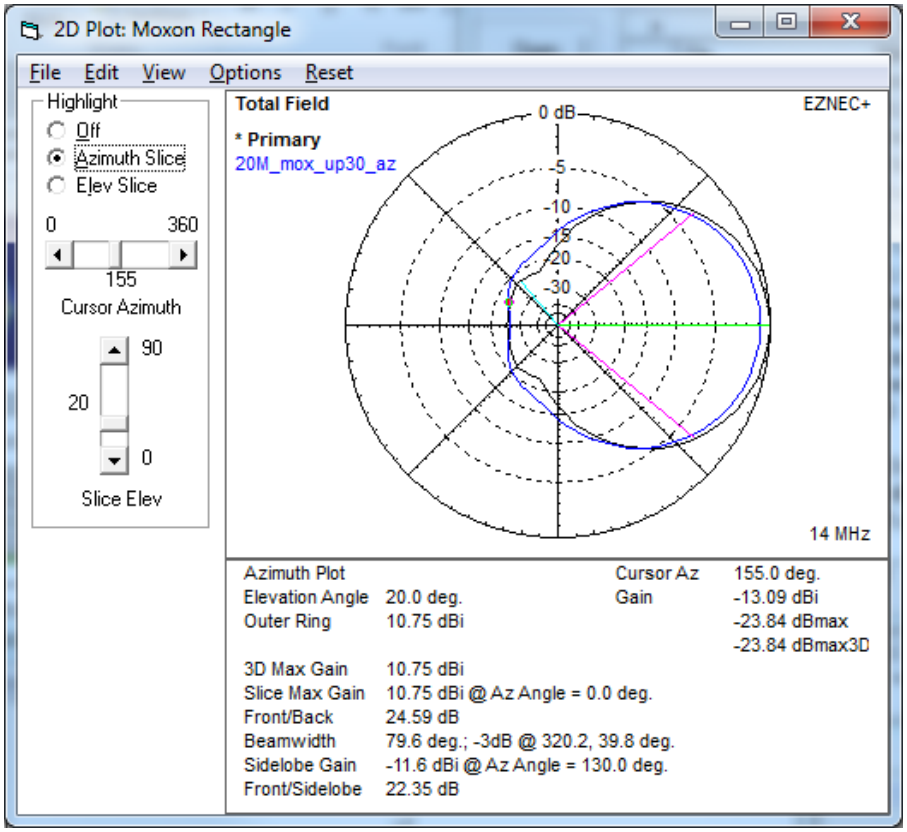




Broad banded on both bands. Better F/B than 2 element SteppIR. Great Antenna!

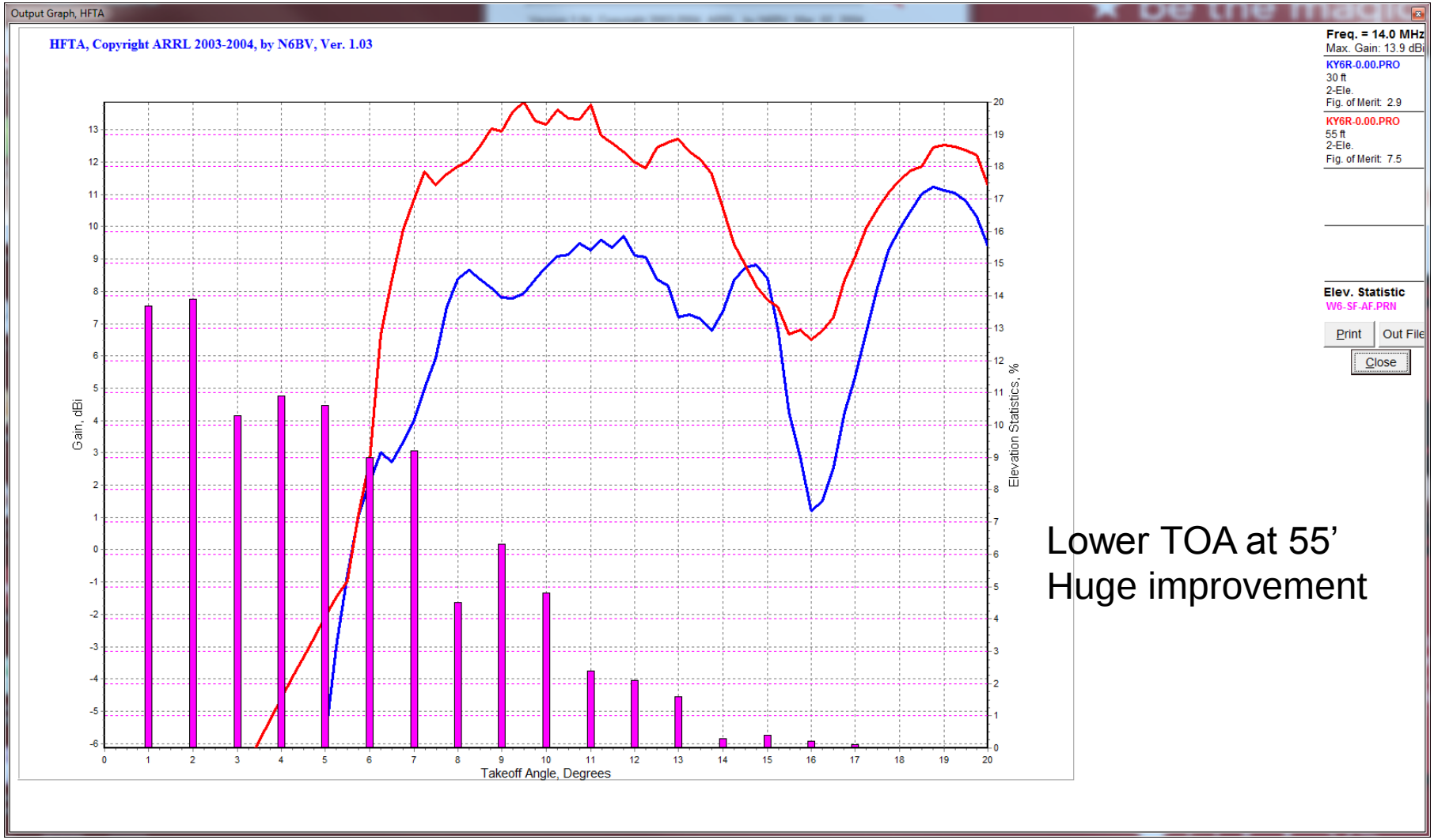
20M Moxon up 30’ vs. 55’





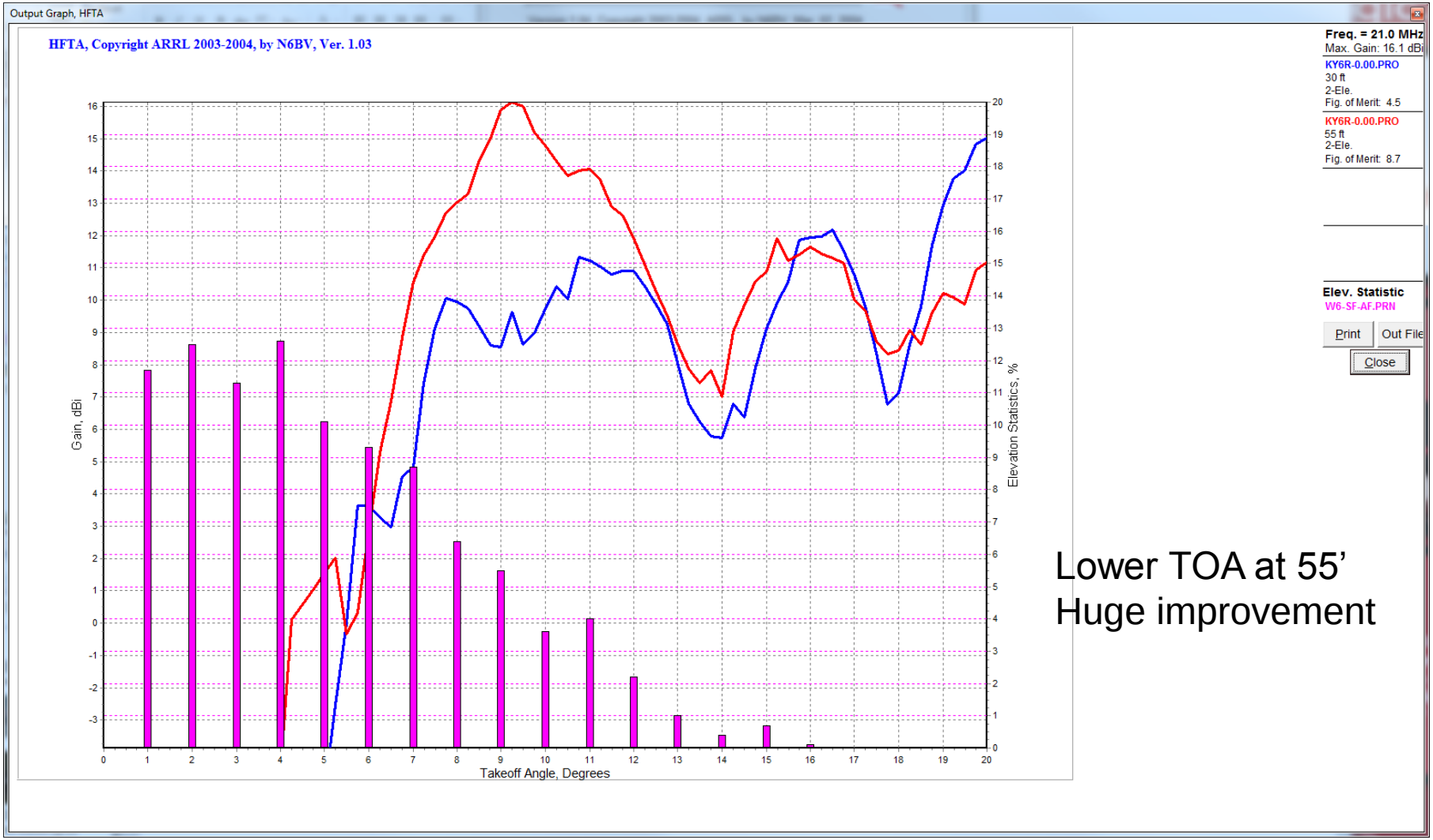
The number one thing I did to get on the Honor Roll. Raise the antenna!
Gain by itself means nothing. Gain at the right ***unobstructed*** TOA is everything.
Not all rare DX requires a low TOA, but this is the case more so than not.

30’ vs. 55’ 20M to Tromelin



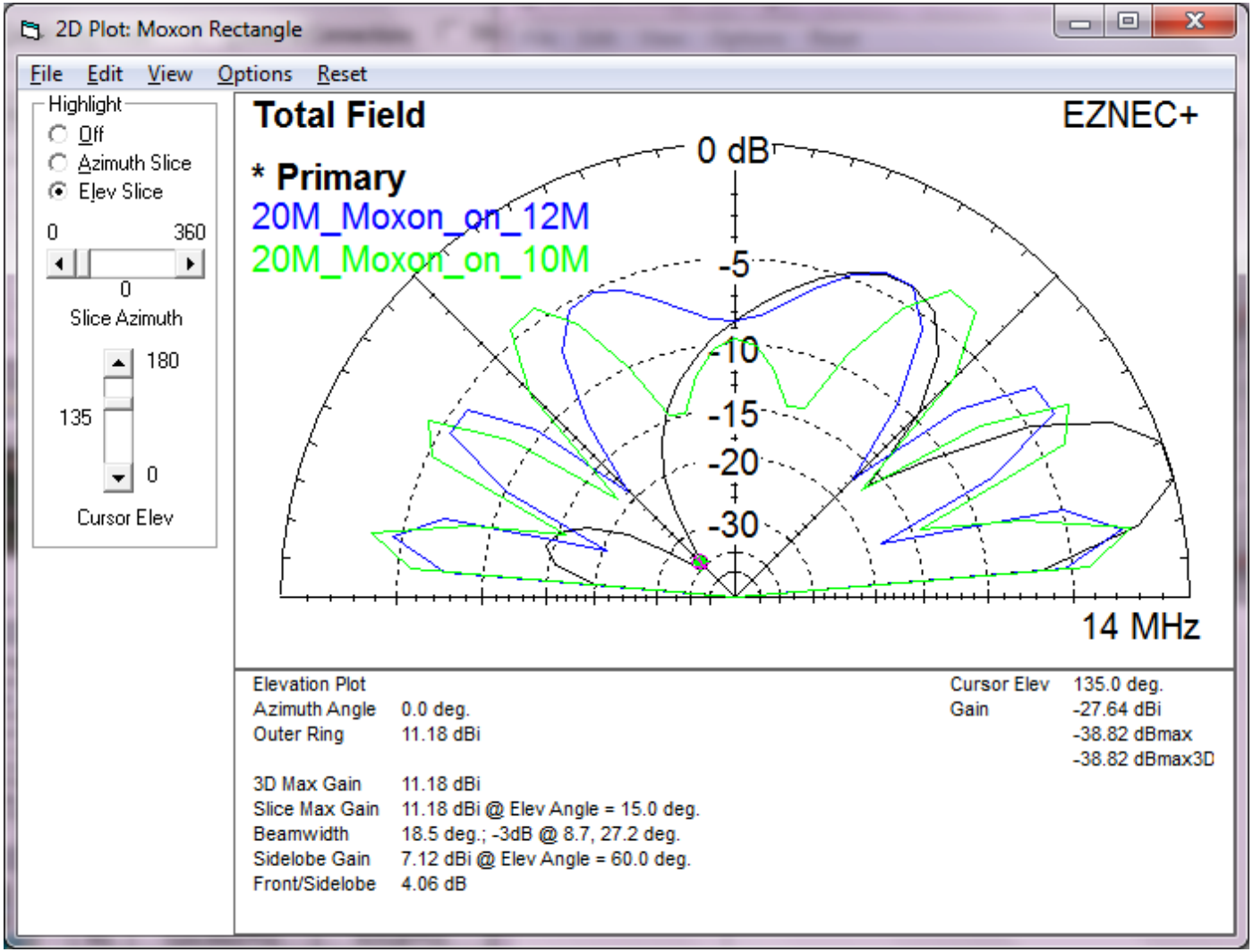
Lower TOA at 55’
Huge improvement

30’ vs. 55’ 15M to Tromelin



Lower TOA at 55’
Huge improvement

20/15M Moxon on 17, 12 and 10M

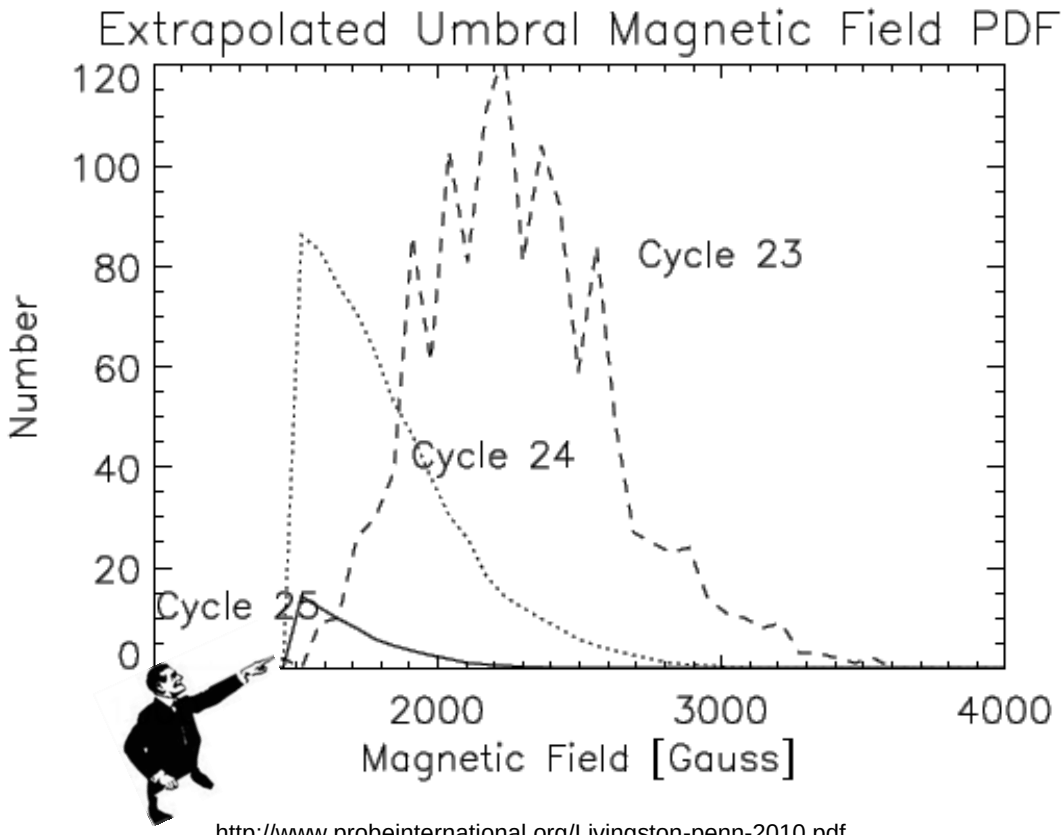


Nice Low TOA Rotatable Dipole with a little bit of Gain

Moxon Construction Photo's

The Future

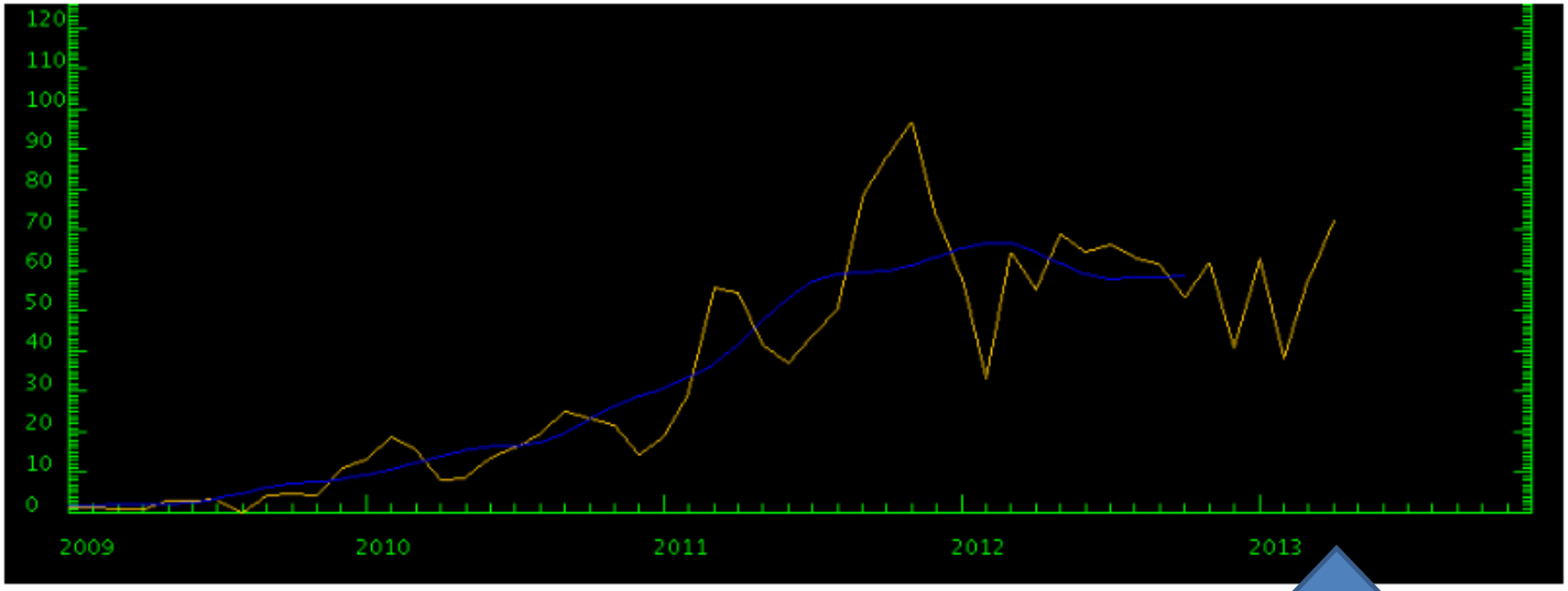
Future Possibilities



http://www.probeinternational.org/Livingston-penn-2010.pdf

- If Cycle 25 is as bad as predicted, then it will be a low(er) band cycle for sure
- This is fine with me – I prefer the low bands, especially 40M, 30M and 20M
- My AB-952 will continue to be dedicated to some antenna at 55’
- I will keep the 60’ vertical and the 40M vertical array

Where Are We?



http://www.ips.gov.au/Solar/1/6

From K7RA: “Much talk lately has centered around a possible dual peak in the current solar cycle. This would follow a patter established in recent solar cycles. If this is so, the first peak probably occurred in the Fall of 2011. Now it appears that perhaps the second peak was in Spring 2013.”

ATNO's Worked at the Bottom of Cycle 23

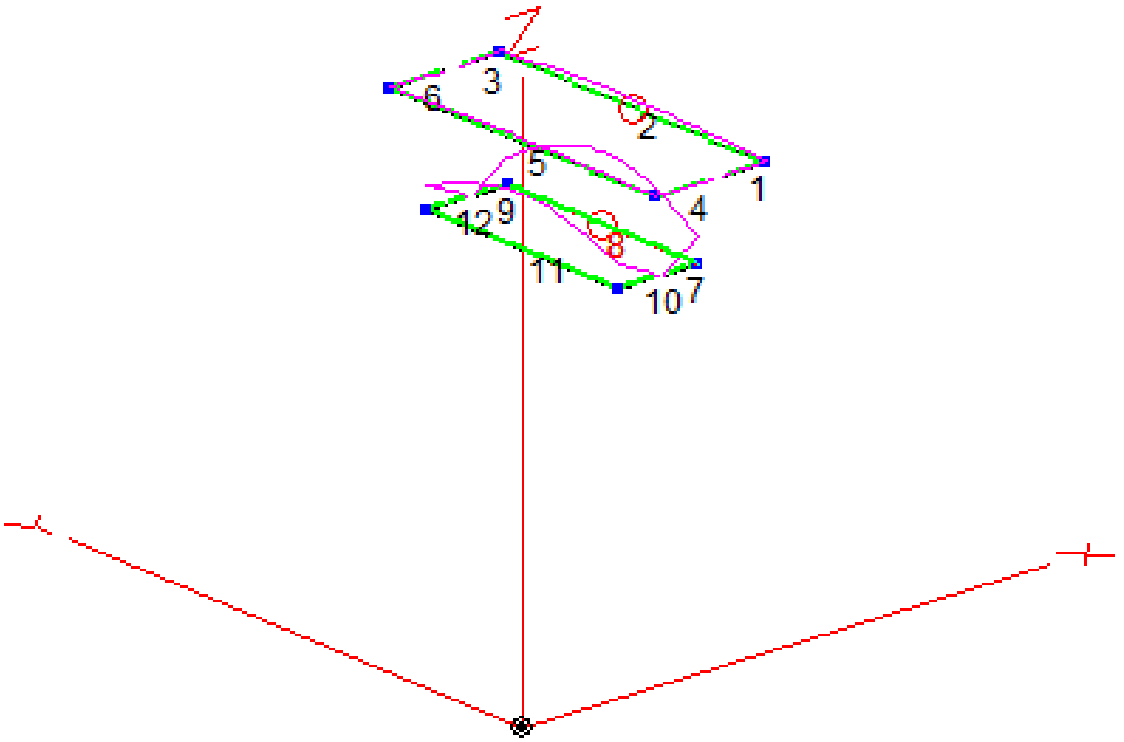
- 2007: VU7 – 40M, D6 – 17M, 9U – 17, BS7 – 20M, 1A – 20M, 3B7 – many, 3C – 20M, FJ – 20M
- 2008: 9X – 20M, FO0 – many, K5D – many
- 2009: J2 – 30M, K4M – many
- 2010: ZS8 – 40M, PJ's – many

Notice how this short list represents every "corner" of the world! 18 ATNO's total . . . Missed E4, Z8, FT5/G

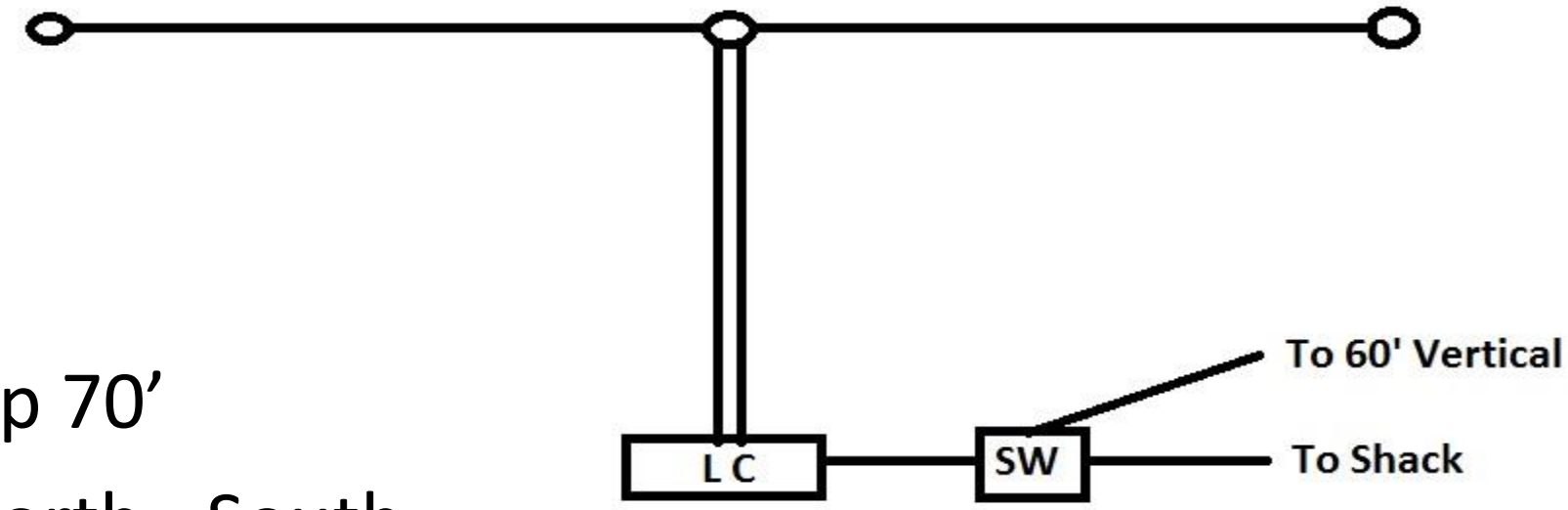
At the bottom of the cycle, make sure you have something decent up for 40 – 17M . . . . (at least)

Next Antenna Project(s)?

Stack of a 30-17M Nested Moxon over a Nested 20-15M Moxon

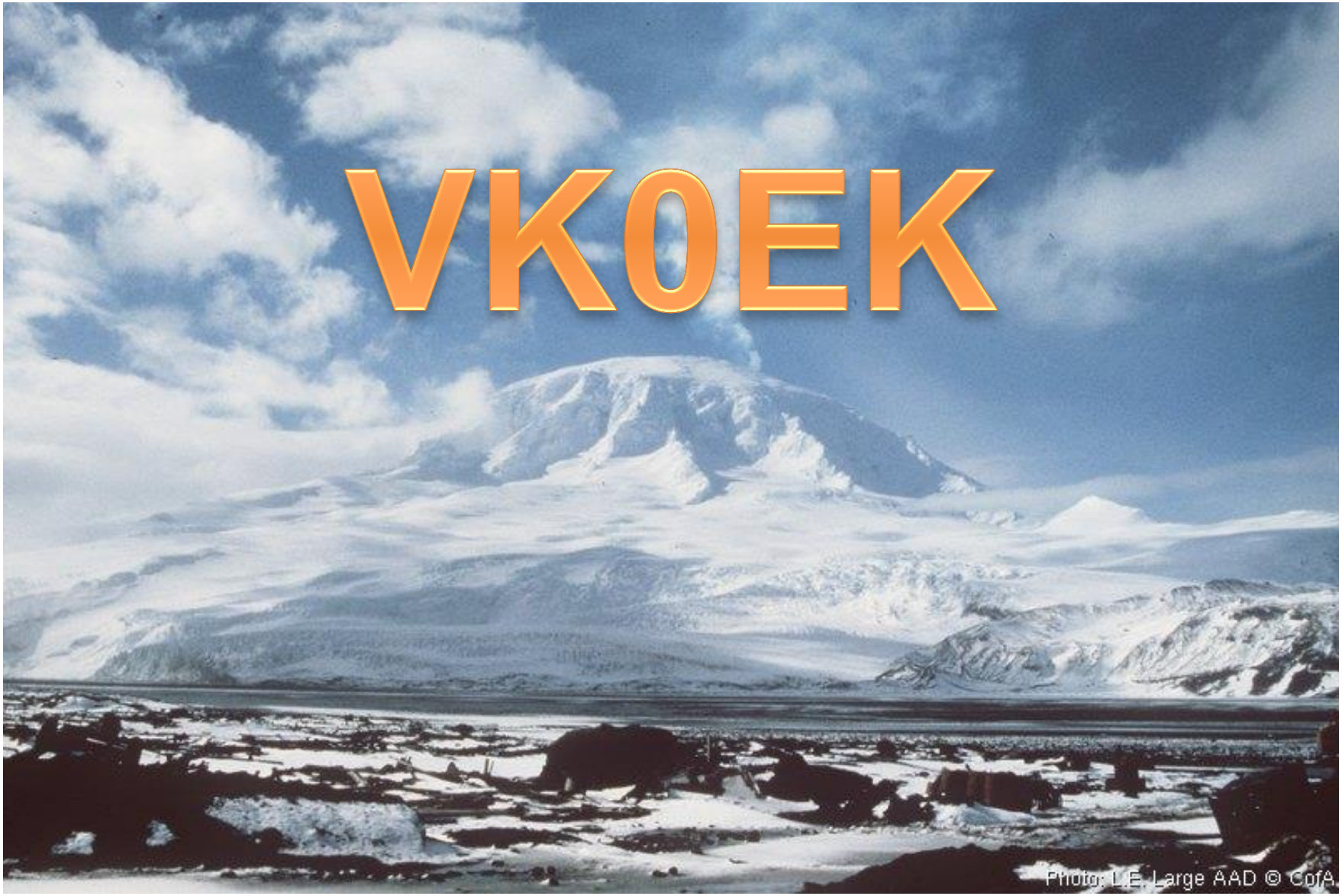


40M “One Element Yagi”

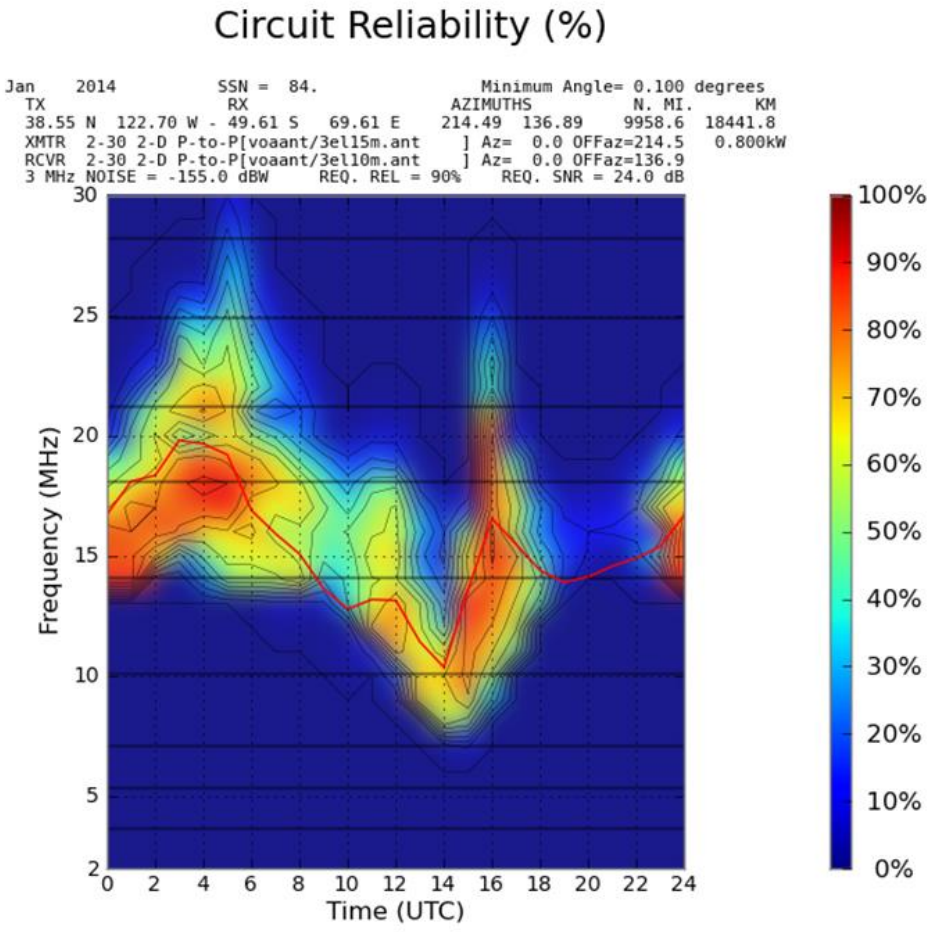


- Up 70’
- North - South
- Ladder line fed with 4:1 balun
- Remote switch
- Vinyl covered aircraft cable

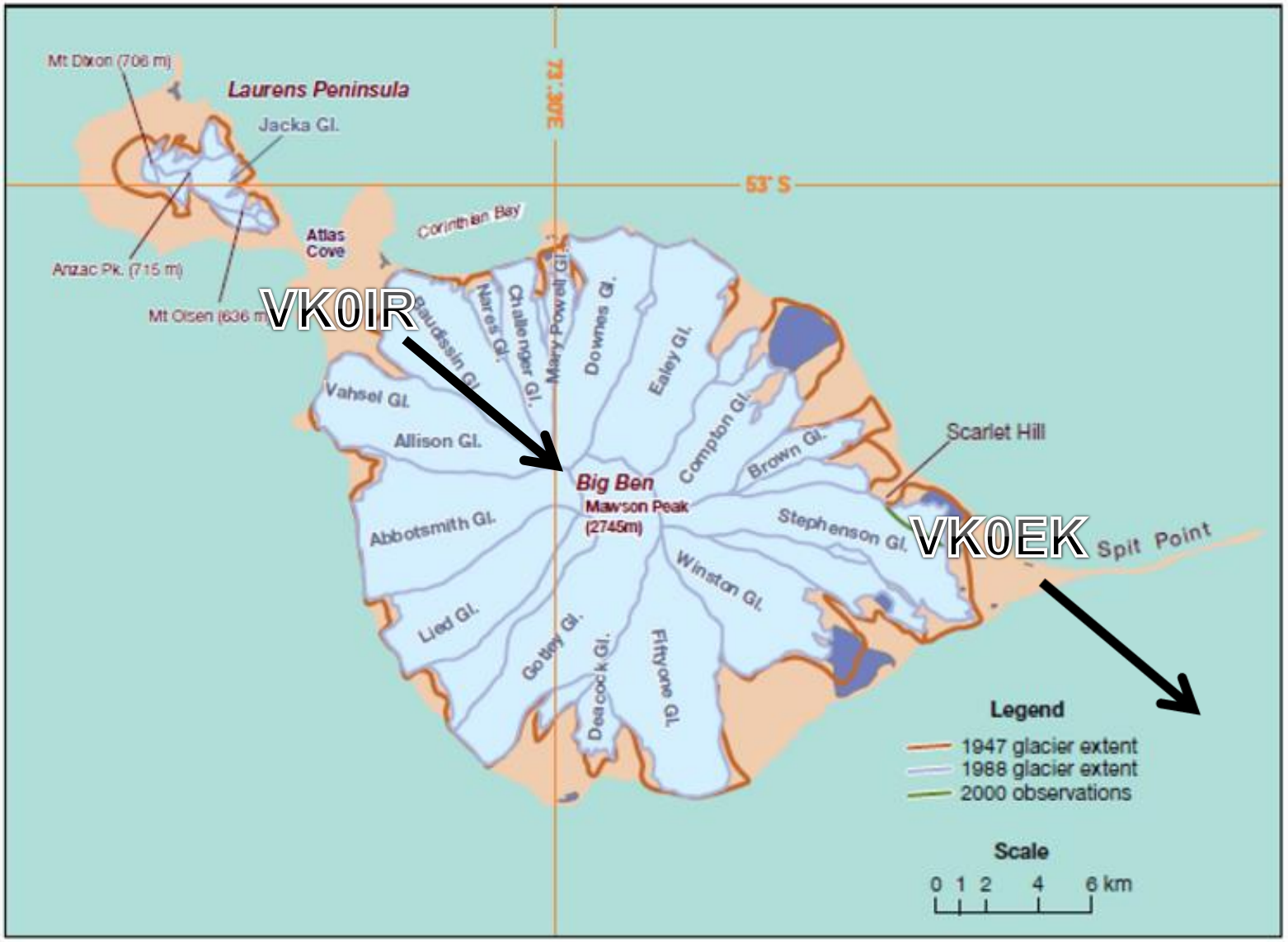
Squirrel Proofing


VK0EK
Photo: L.E. Large AAD © CofA

Heard Island - January 2015

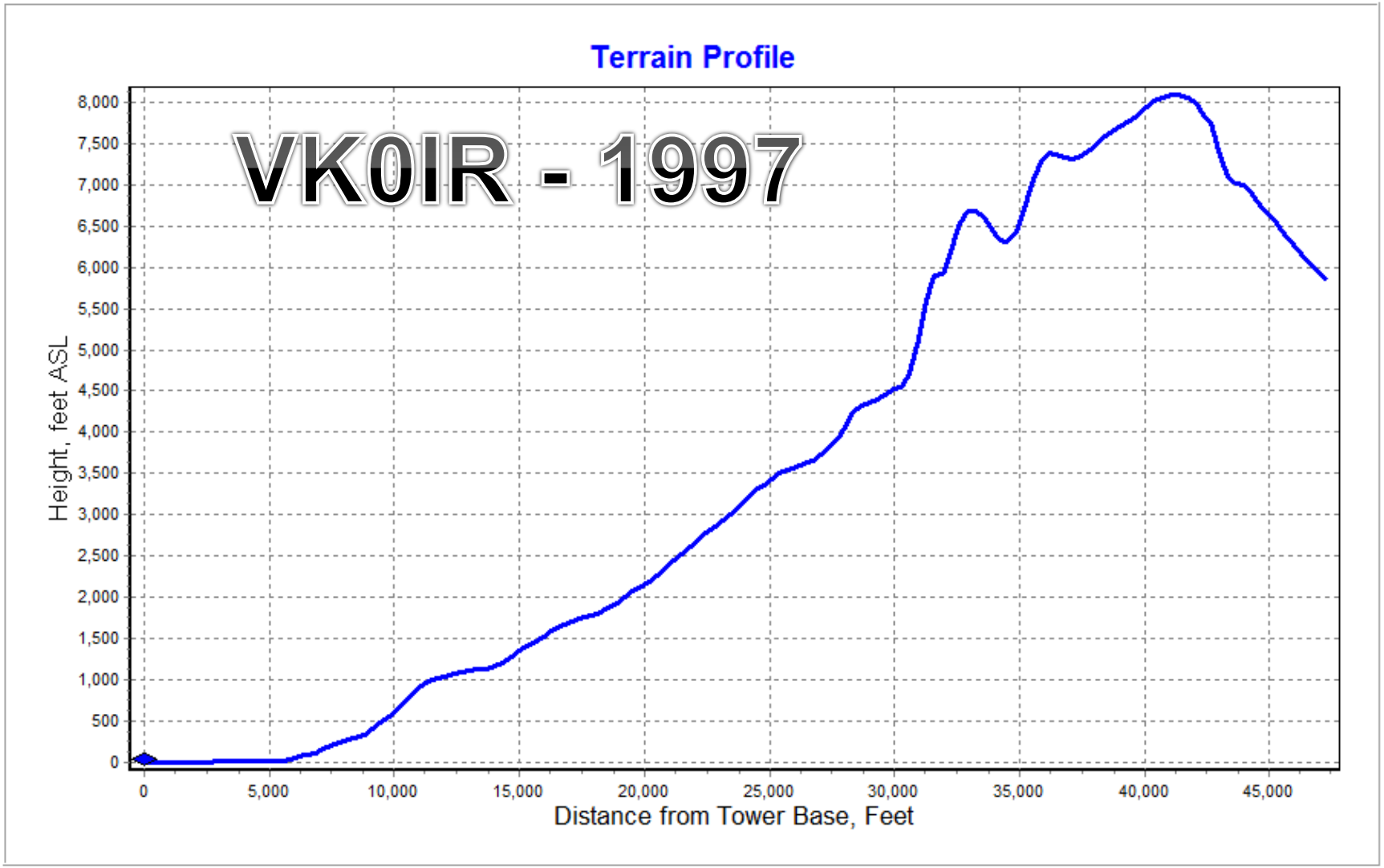


From VK0EK to KY6R = 138°



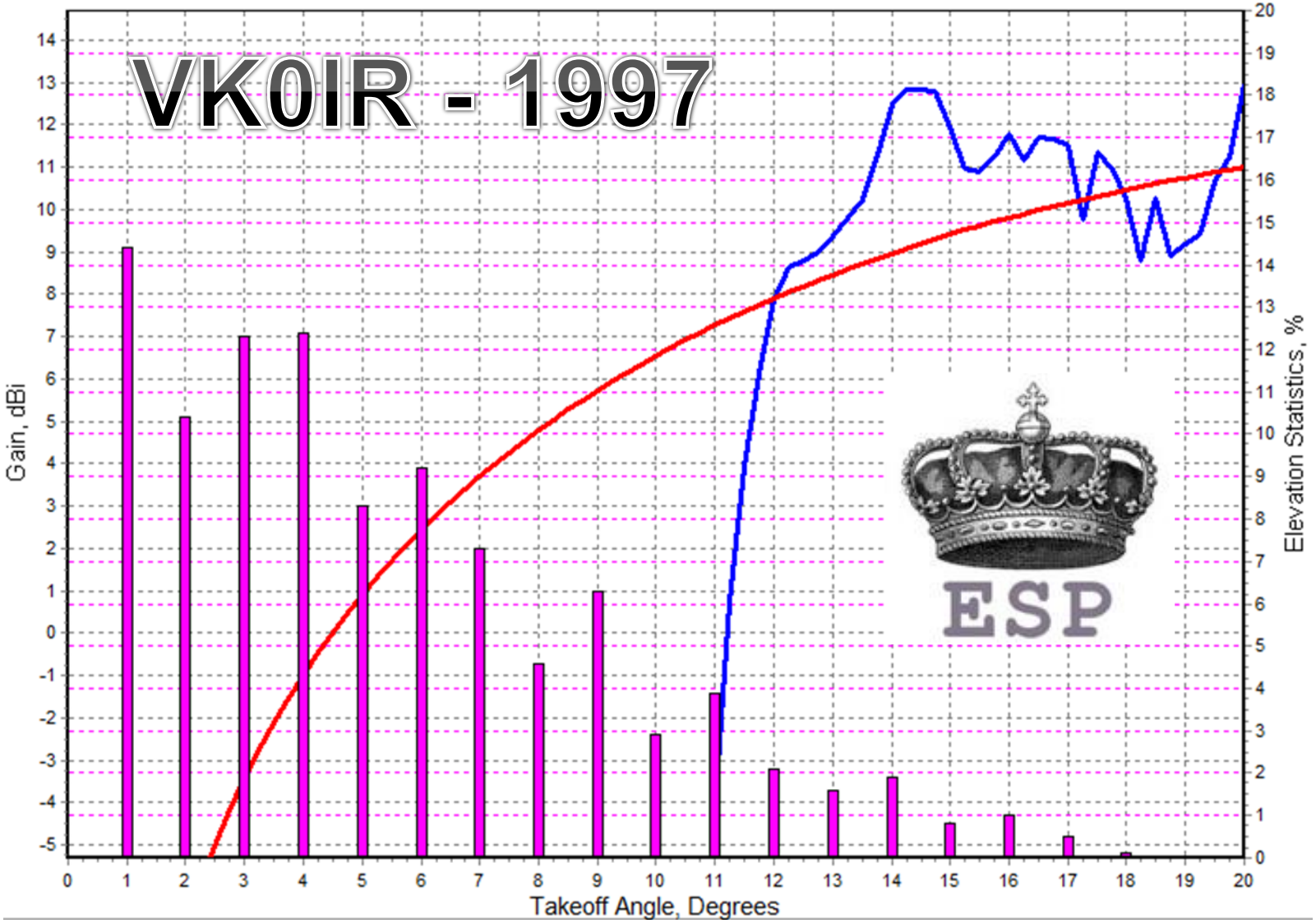
ANDREW RUDDELL

From “Atlas Cove” to KY6R = 138°



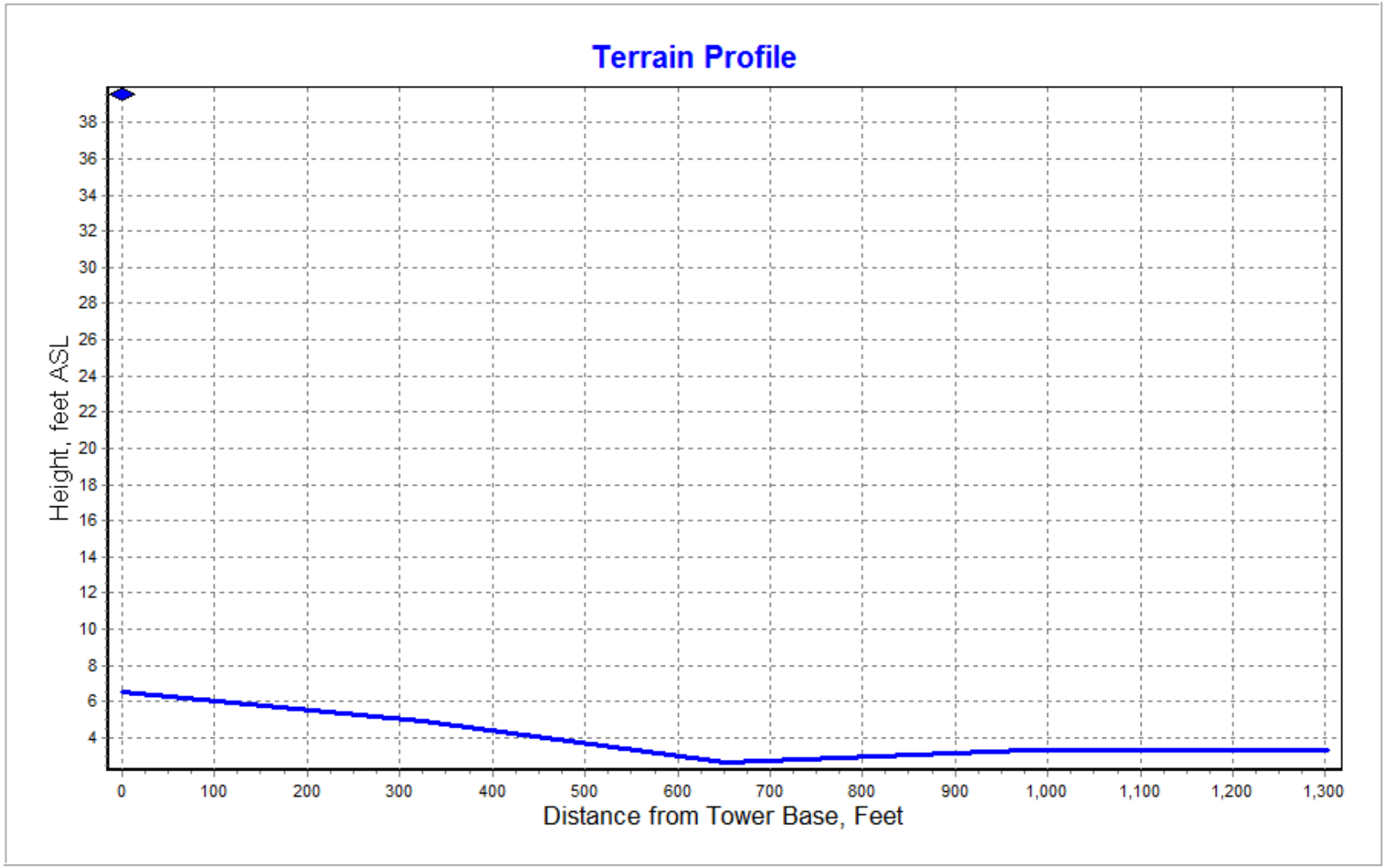
HFTA Data and Analysis provided by Dean Straw, N6BV

From “Atlas Cove” to KY6R = 138º



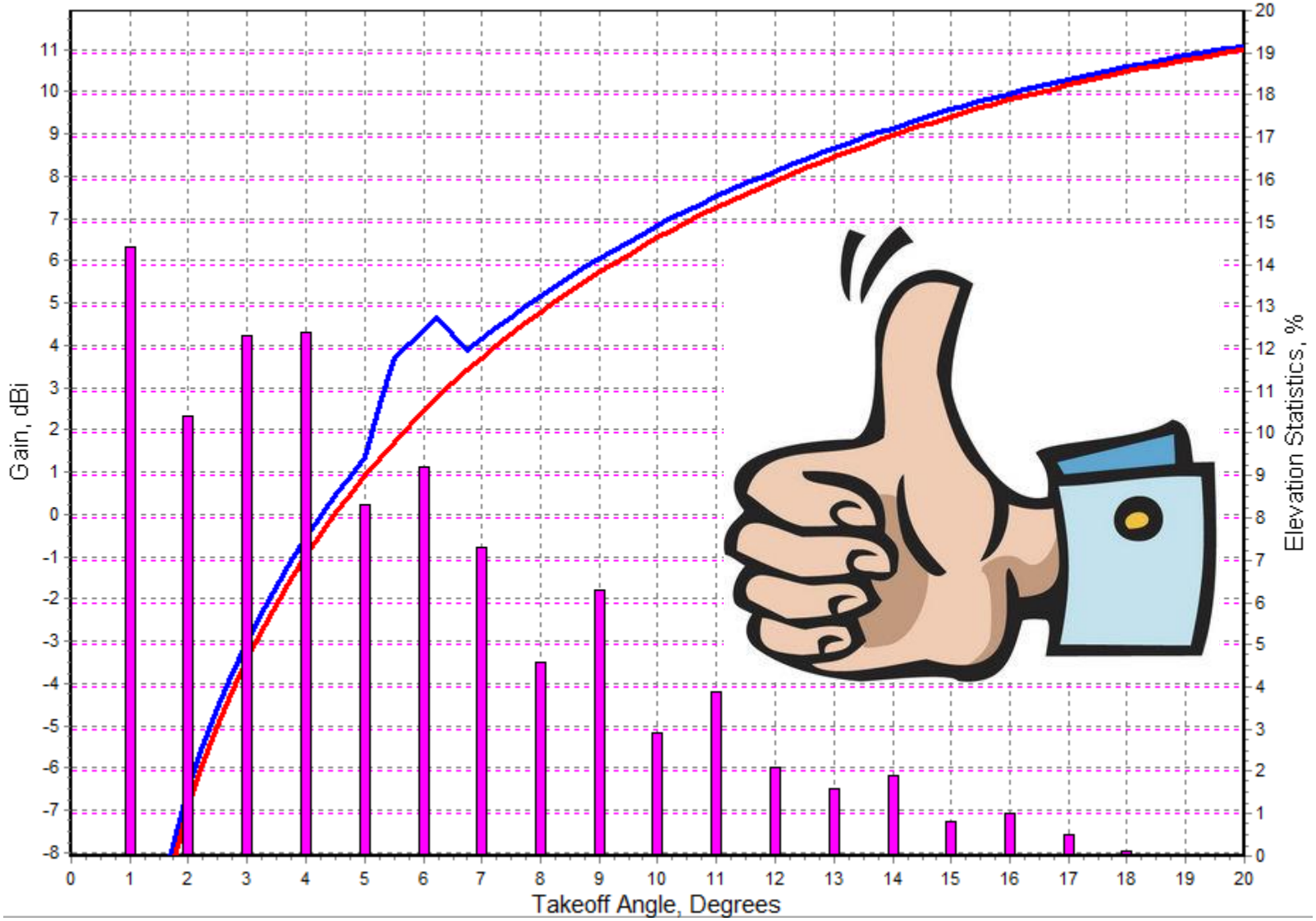
HFTA Data and Analysis provided by Dean Straw, N6BV

From “Spit Point” to KY6R = 138°



HFTA Data and Analysis provided by Dean Straw, N6BV

From “Spit Point” to KY6R = 138º



HFTA Data and Analysis provided by Dean Straw, N6BV

http://www.dxa2.org/ DXA2

=DXA= Version 2

Clipperton Island

2 Mar - 10 Mar 2013

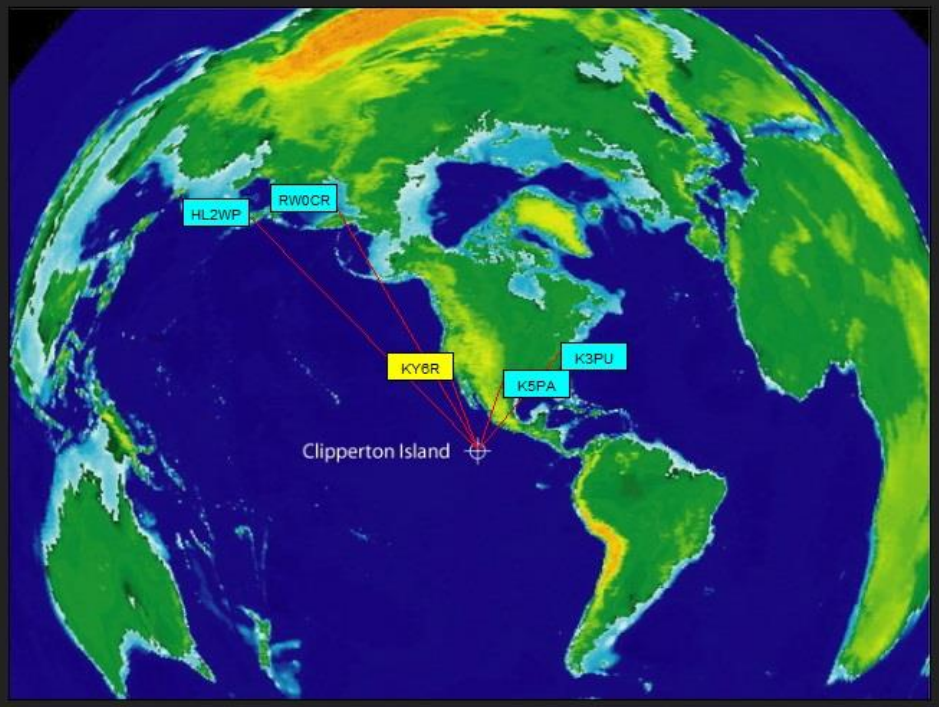
DXpedition Call Sign
TX5K

TX5K Home

TOGGLE MAPS
TOGGLE DATA

SOUND
Refreshes in 32
PAUSE

QUICK TIPS
HELP
DXA HOME
PRIVACY
ABOUT
CONTACT



CURRENT	PREVIOUS
K5PA	- 2345 UTC -
KY6R	JH6RKI
RW0CR	RW0CF
HL2WP	LU8EKC
K3PU	K0TZ
	JA7FWR
	JE1QYI
	- 2344 UTC -
	JA9BEK
	JA4DND
	W8JWN
	KF4BI
	JF2UPM
	- 2343 UTC -
	K0MN
	PY1SX
	W8LR
	JA1DUH
	HP1AVS
	- 2342 UTC -

MESSAGE FROM TX5K

Congratulations you just made a QSO with TX5K.

CALL SEARCH

KY6R
Please enter...
...a valid callsign

CONFIRM KY6R LOGGED

	160	80	40	30	20	17	15	12	10	6
CW										
SSB										
DIGI										

CURRENTLY TX5K WORKING

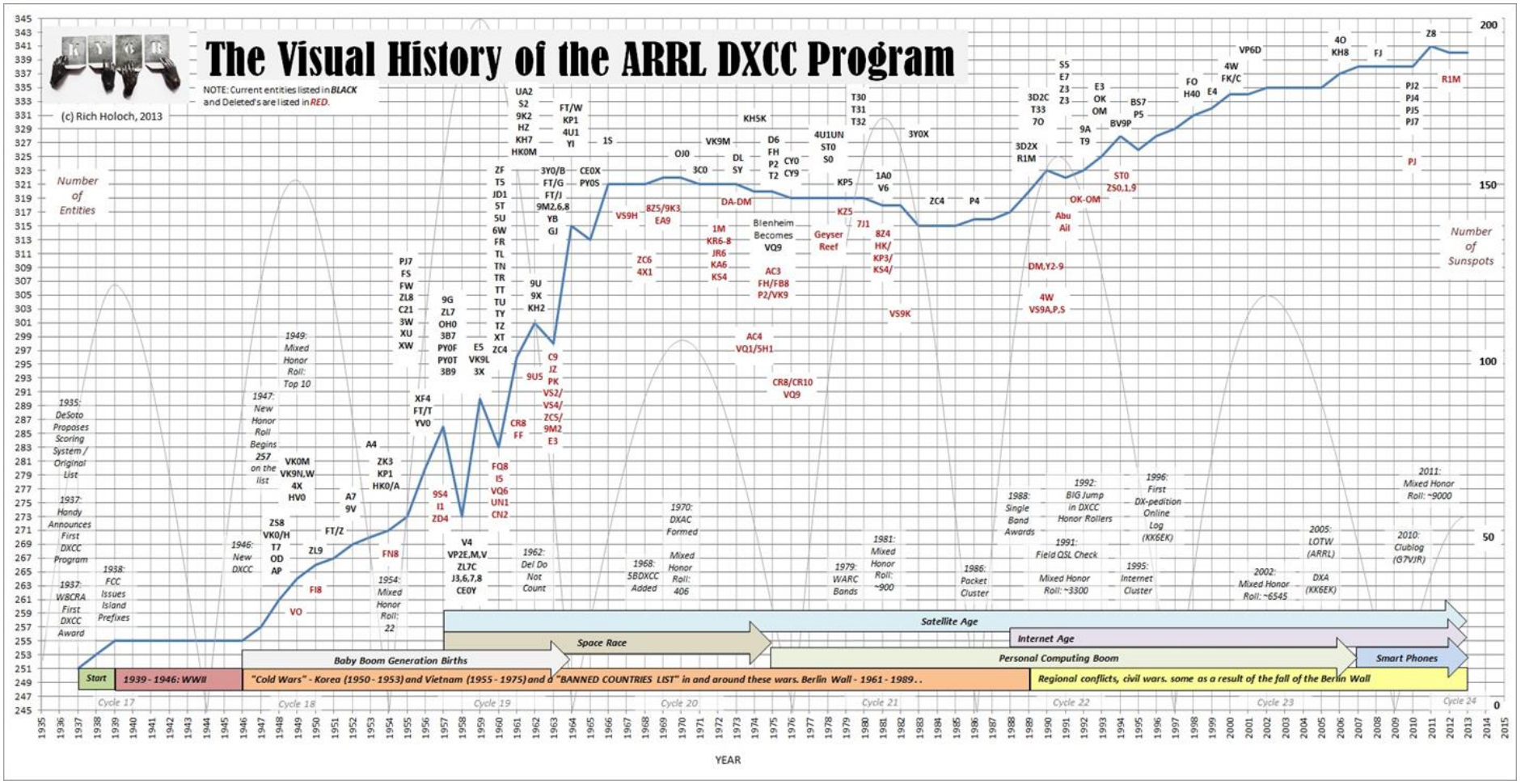
	160	80	40	30	20	17	15	12	10	6
CW										
SSB										
DIGI										

TIME REMAINING

7 d 19 h 14 m
Sat, 2 Mar 2013
23:45:45 UTC

TOTAL QSOs

2077
CW SSB DIGI
959 636 291



You can download a nice PDF of this diagram at http://dxccsleuth.wordpress.com/ and scroll down in the blog. If you print it on large A3 paper, it looks great!

References

- http://eastbayarc.org/pdf/final-mile.pdf
  for an updated copy of this presentation
- http://dxccsleuth.wordpress.com/
  for a history of DXCC entities
- http://www.ky6r.com/
  for a blog related to my “Pilot” communications
- Twitter = @KY6R, Skype is KY6R--
- My information on QRZ.COM is up to date