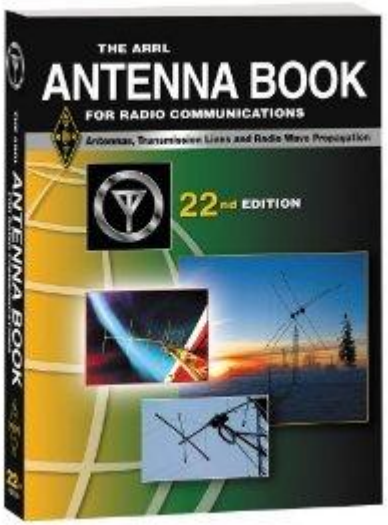
DXCC Honor Roll: The "Final Mile"

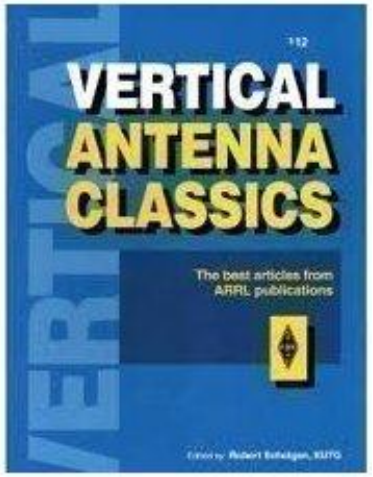
(or how HFTA saved my sanity!)

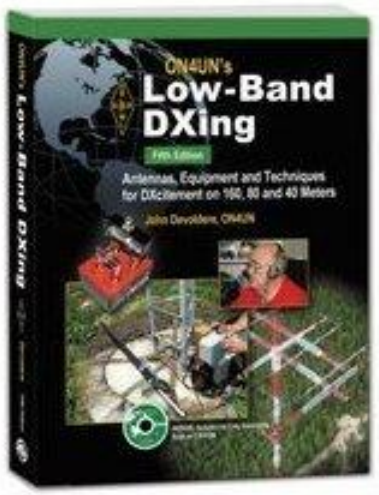
A "Little Pistol" Adventure

Rich Holoch, KY6R

And Now a Word from our Sponsor





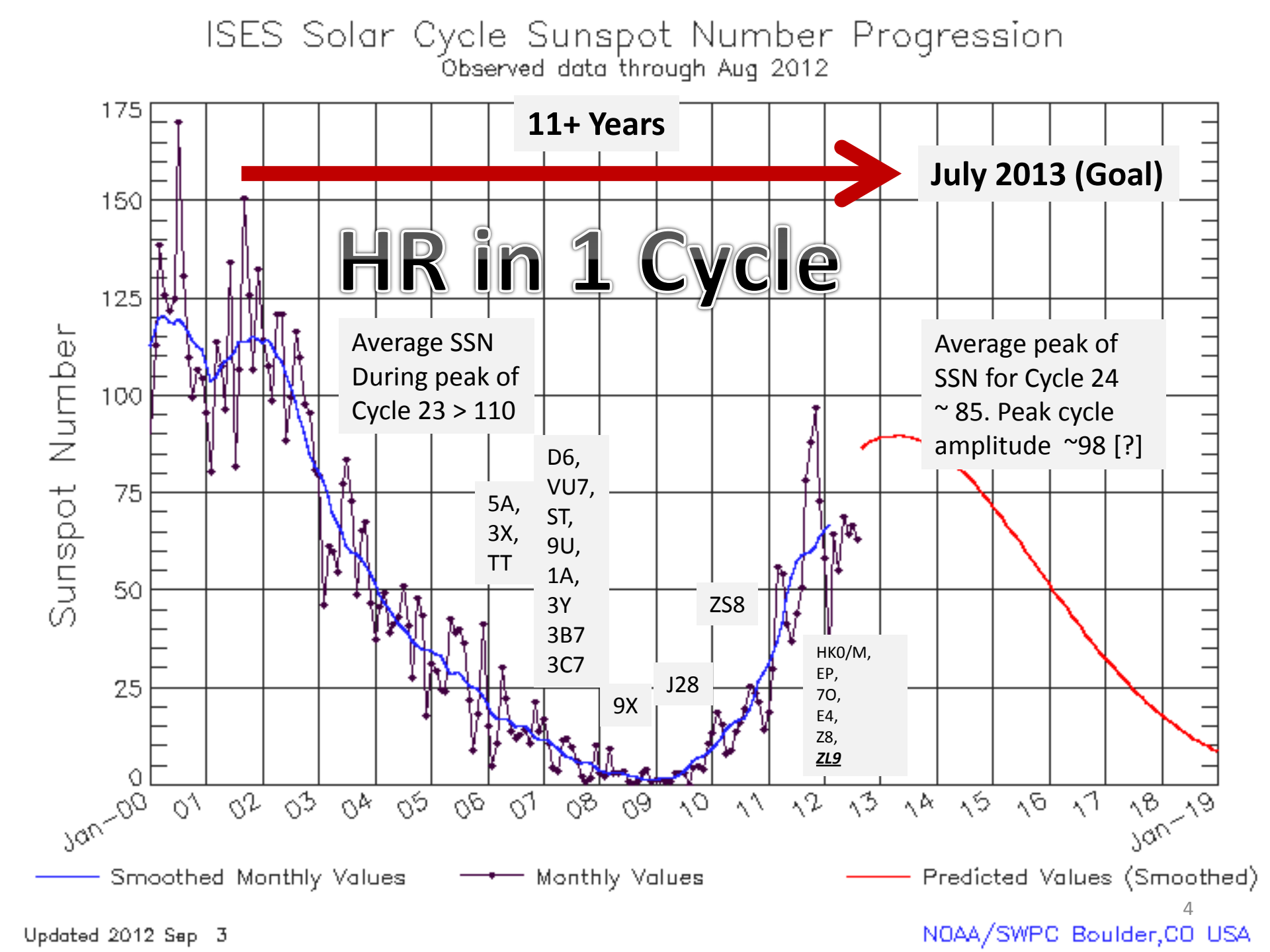


A big thanks to Dean Straw, N6BV, who has been the Chief Editor and contributor of the ARRL Antenna Book as well as many other ARRL publications.

Dean's HFTA and YW programs and propagation charts have made a noticeable improvement in my DX-ing "career" and are featured in this presentation.

Data Architect, Database Designer and Programmer for 31 years

- 130th employee at Oracle
- 30th at Gupta Technologies
- 474th at PeopleSoft
- Senior Data Architect at Macys.com
- “DXCC Sleuth”


ISES Solar Cycle Sunspot Number Progression
Observed data through Aug 2012
11+ Years
July 2013 (Goal)
HR in 1 Cycle
Average SSN During peak of Cycle 23 > 110
Average peak of SSN for Cycle 24 ~ 85. Peak cycle amplitude ~98 [?]
5A, 3X, TT
D6, VU7, ST, 9U, 1A, 3Y 3B7 3C7
9X
J28
ZS8
HK0/M, EP, 7O, E4, Z8, ZL9
Sunspot Number
175
150
125
100
75
50
25
0
Jan-00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
Jan-19
Smoothed Monthly Values
Monthly Values
Predicted Values (Smoothed)
Updated 2012 Sep 3
NOAA/SWPC Boulder,CO USA

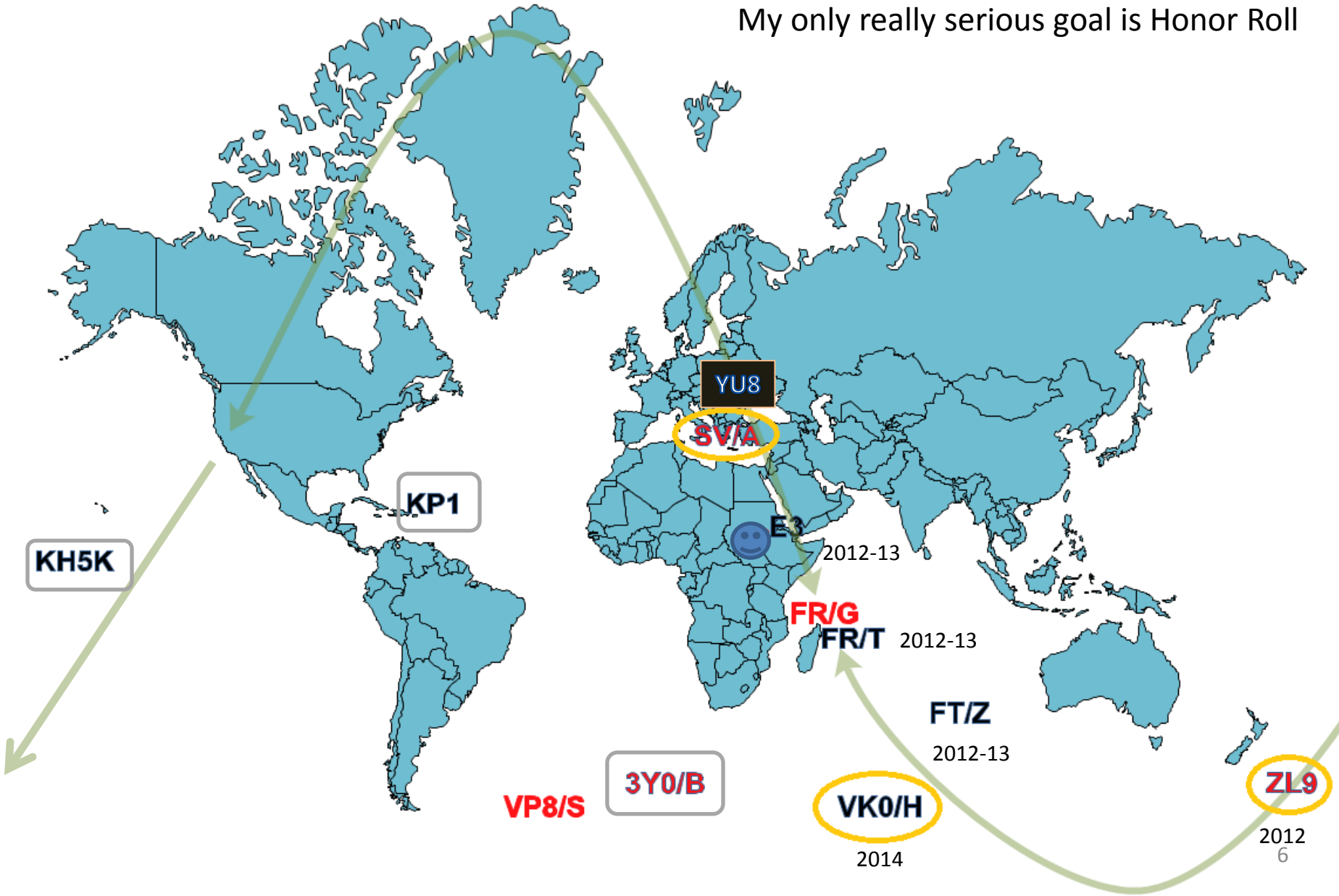
Lil' Pistol's Big DXCC Adventure!

- Started DX-ing in 2001
  - 333 entities confirmed
  - 329 count for Honor Roll (2 away)
  - 300 wire and < 200W
  - 8BDXCC
  - 1800 DXCC Challenge

I've taken the "minimalist approach" on purpose . . .

What I Need to Get Them All

My only really serious goal is Honor Roll



PROBLEM: DXCC "Log Jam" 2009 - 2011

As a reference – the SSN for June 2012 is 71 and estimated at 85 for the Cycle 24 peak – May, 2013 November 2001 – the second Cycle 23 peak reached 115. No wonder wire and 200 watts worked! I only worked 3 ATNO's between 2009 – 2011!

VP8THU

I Couldn't compete in these big pileups:

FT5GA

2009 - SSN = 7.1

E4X

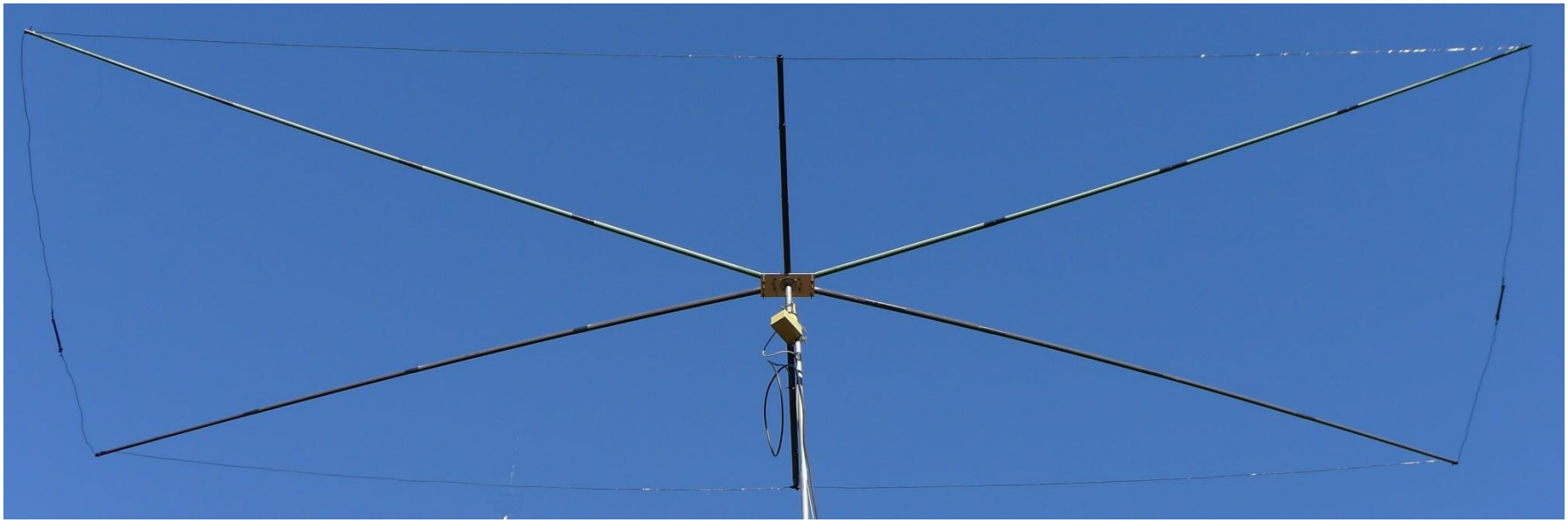
2010 - SSN = 16.3

ST0R

2011 - SSN = 57.3

My main goal is to not miss any more, and redeem myself on the ones I missed.

My Old High Band HF Antenna



Missing ST0R motivated me to replace wire 20M Moxon (3.8 dB gain and 24 dB F/B, up 30’). It is 6 dBi – free space. It was a rotatable dipole on the higher bands.

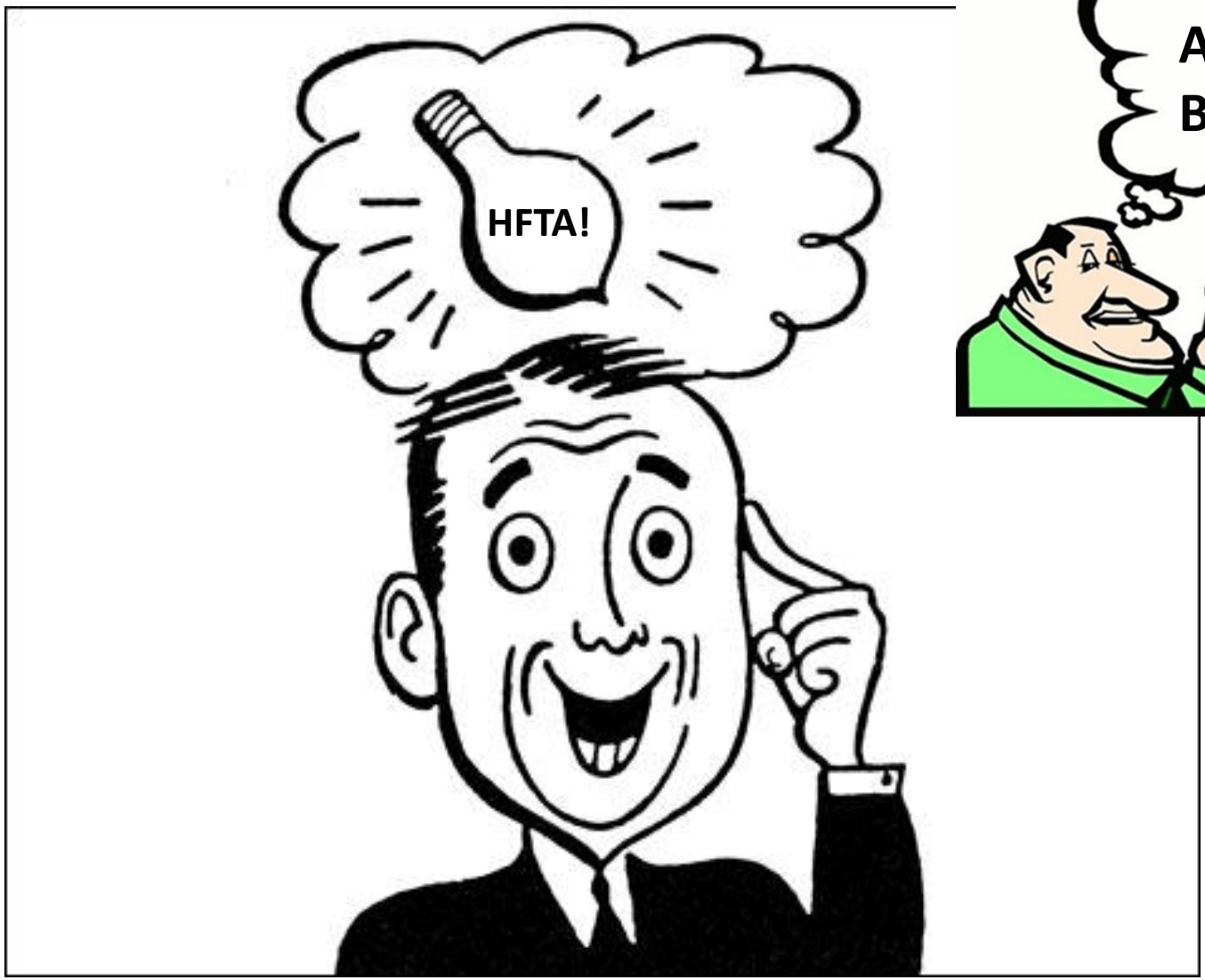
Enter HFTA . . .

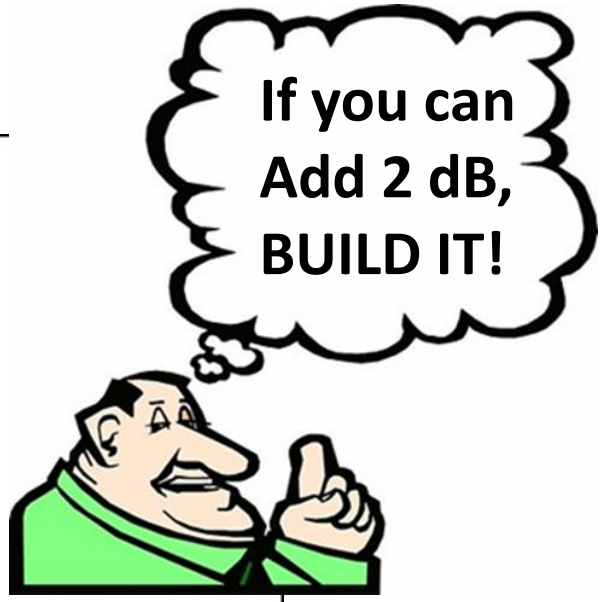
- Dean Straw, N6BV's Pacificon 2011 Antenna Forum Presentation:

  "How Does My Little Gun Compare to a Superstation?".

  "In a pileup, even 1 or 2 dB can make a difference in getting through"

My HFTA “Epiphany” . . .





“In a pileup, even 1 or 2 dB can make a difference in getting through”

What is HFTA?

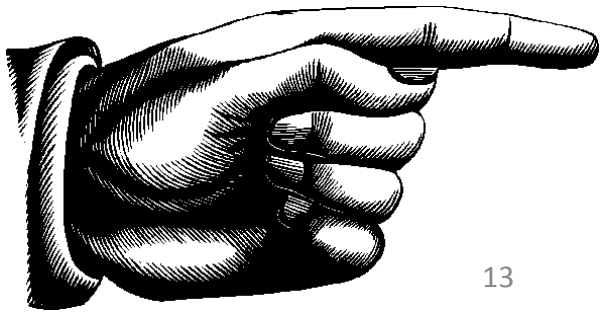
- High Frequency Terrain Assessment program written by N6BV, Dean Straw
- Documented in Chapter 14 of the latest ARRL Antenna Book – a must read!
- Used by contesters who build stacks

Why HFTA?

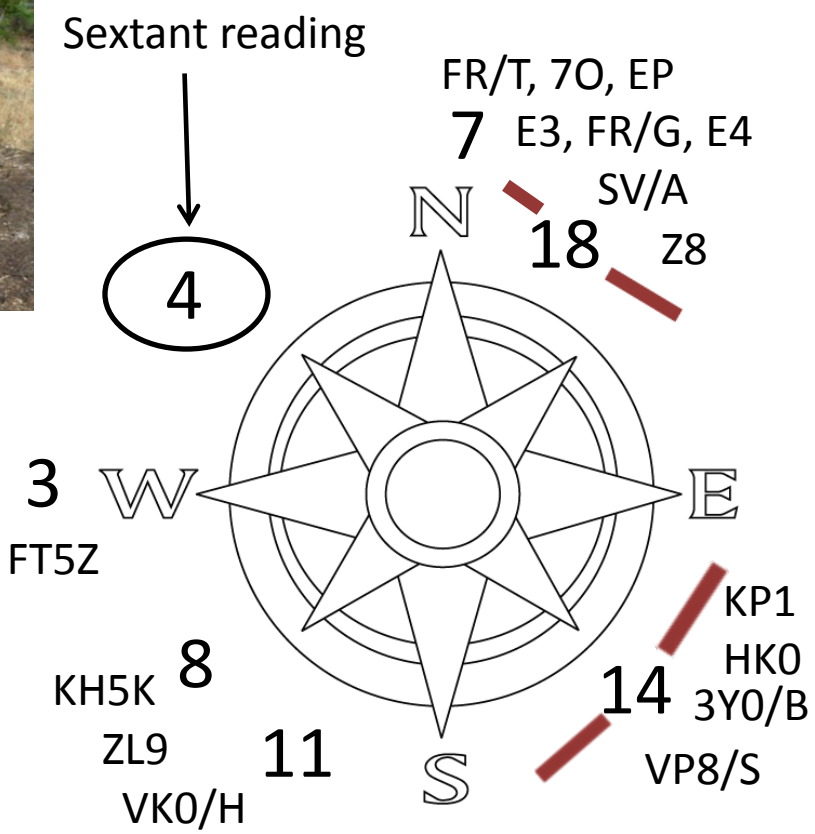
- EZNec is great, but assumes flat ground
- HFTA superimposes horizontal antenna models over your actual terrain
- HFTA lets you know if there is any way you can improve your antenna system
- HFTA tells what is the "best" antenna height
- HFTA is a multi-dimensional data visualization tool

My HFTA "Strategy"

- In December 2011 I ran simulations for the last 16 DXCC entities that I needed
- I wanted to answer why others were hearing what I was missing
- I analyzed my terrain to see what was going on



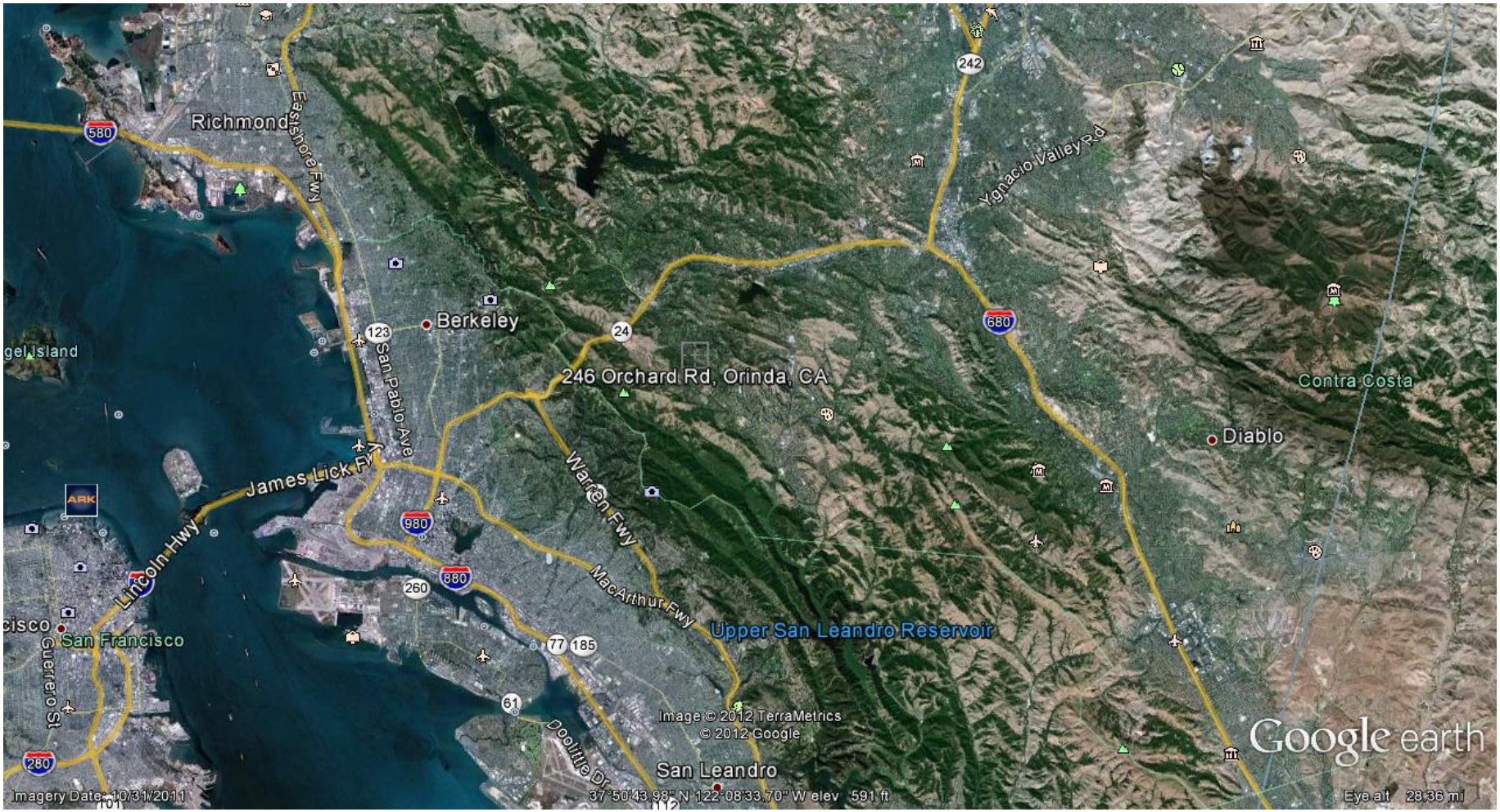
The $12 KY6R Sextant (Inclinometer)



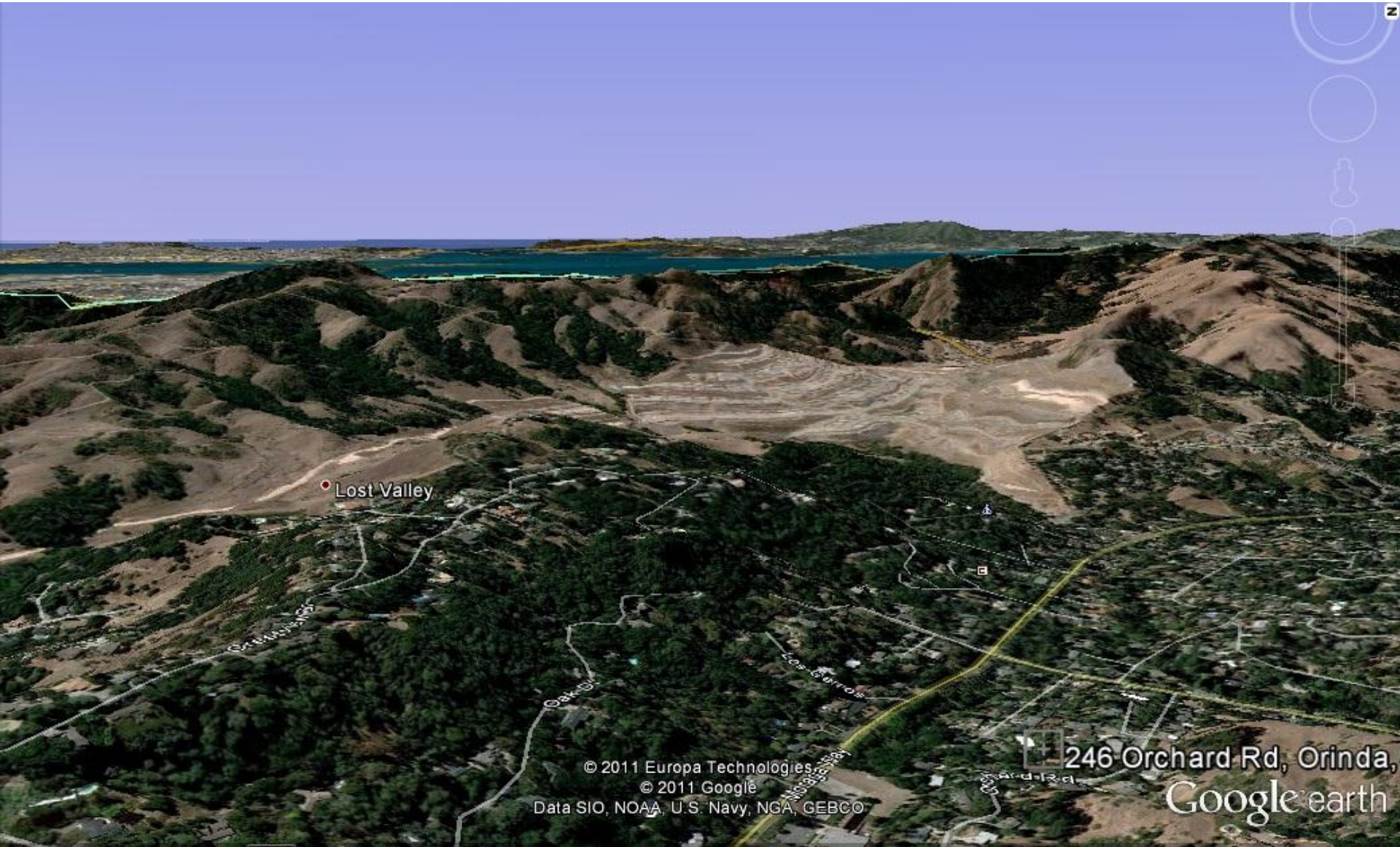
N by NE

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.

Orinda, California

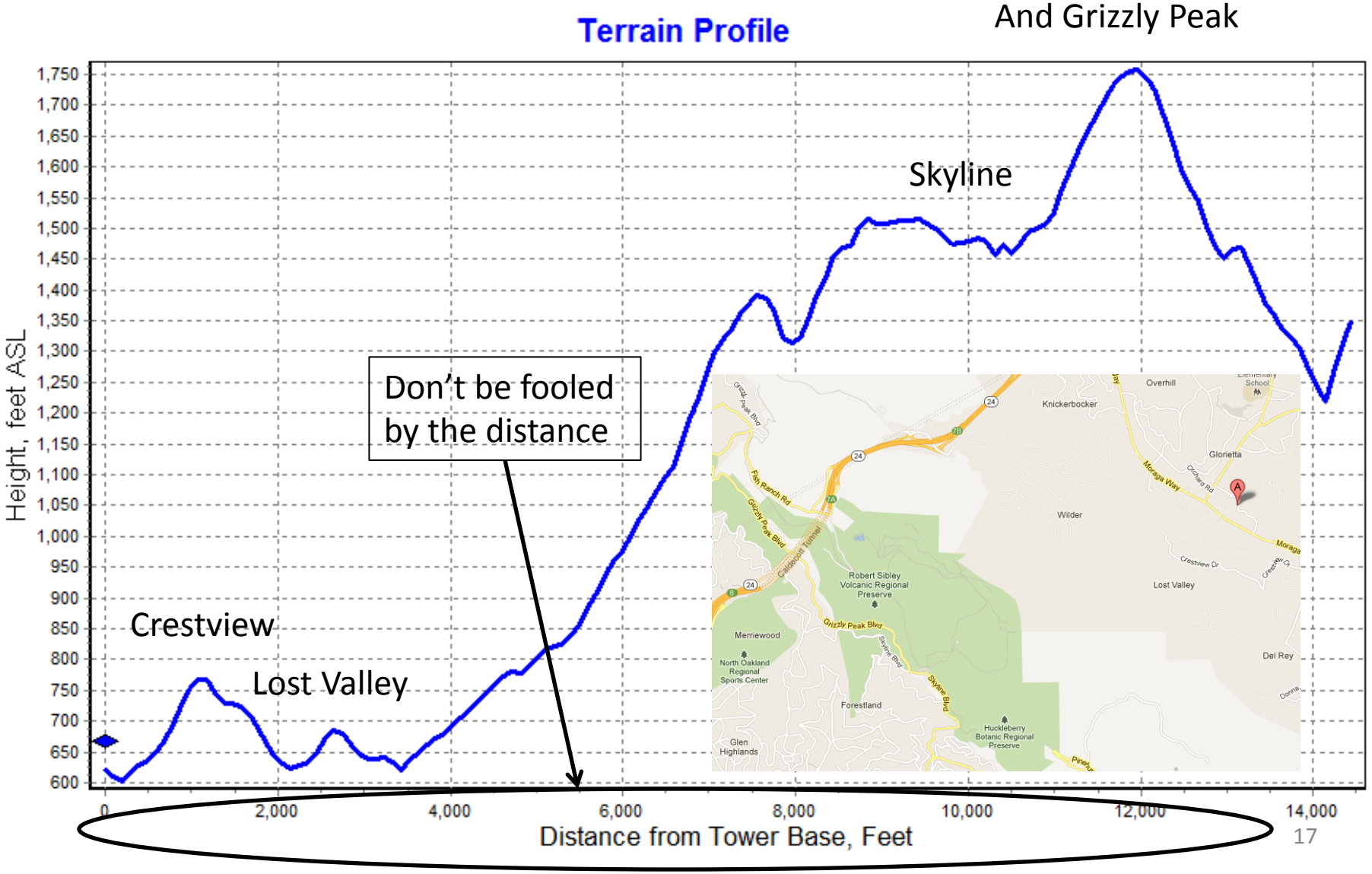


KY6R – Looking West

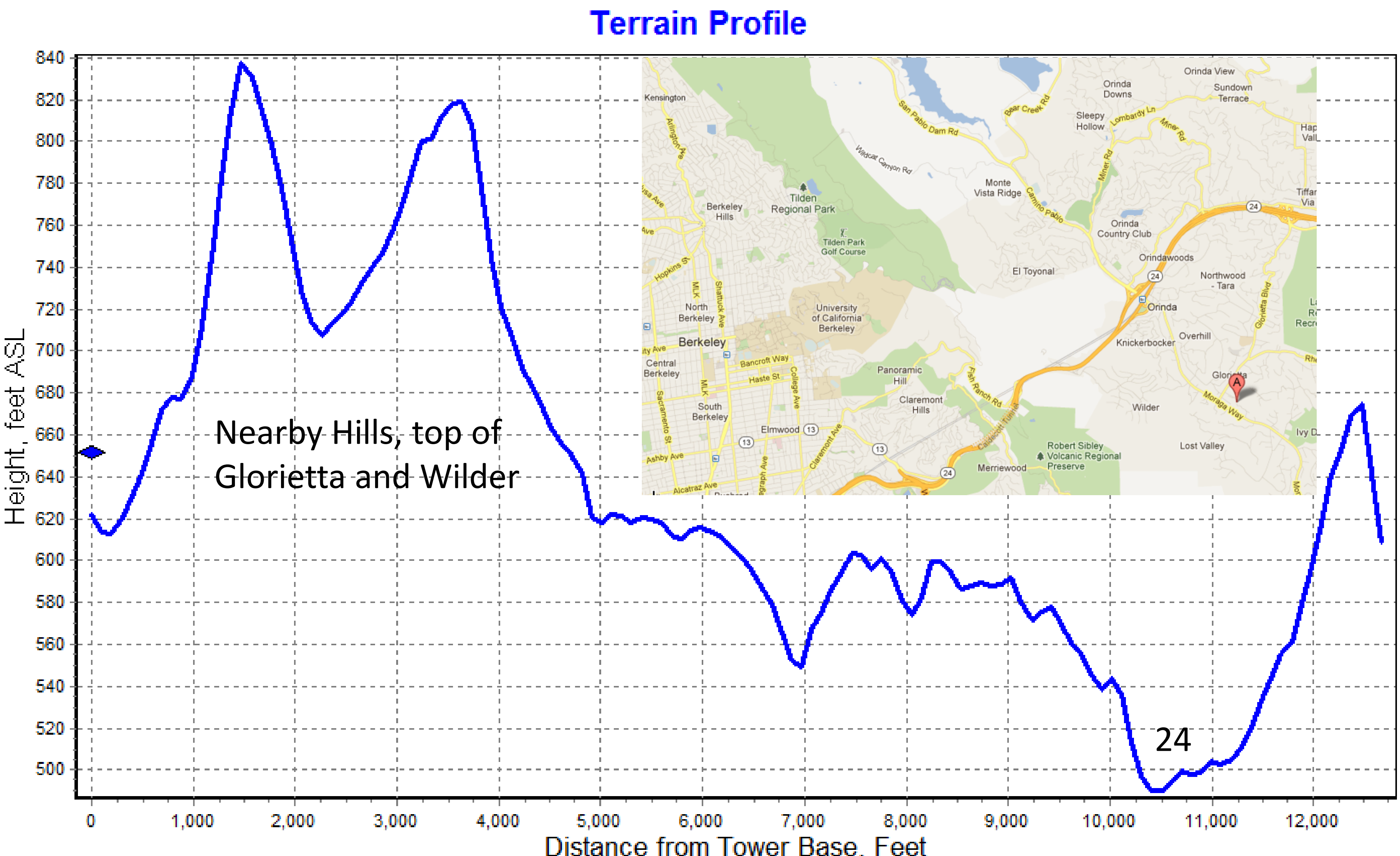


HFTA Says West Looks Like This

Round Top (Sibley)
And Grizzly Peak

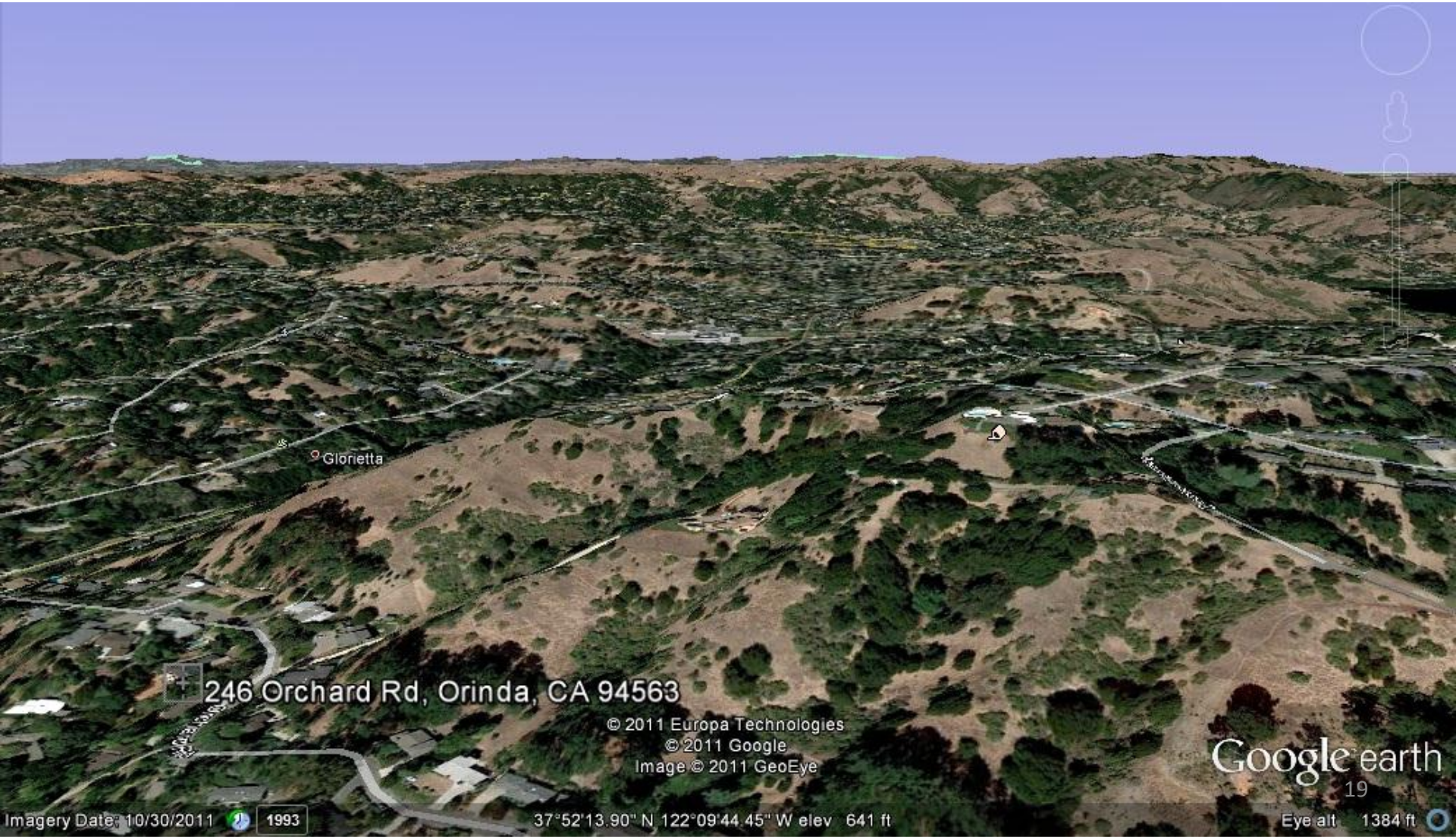


North West

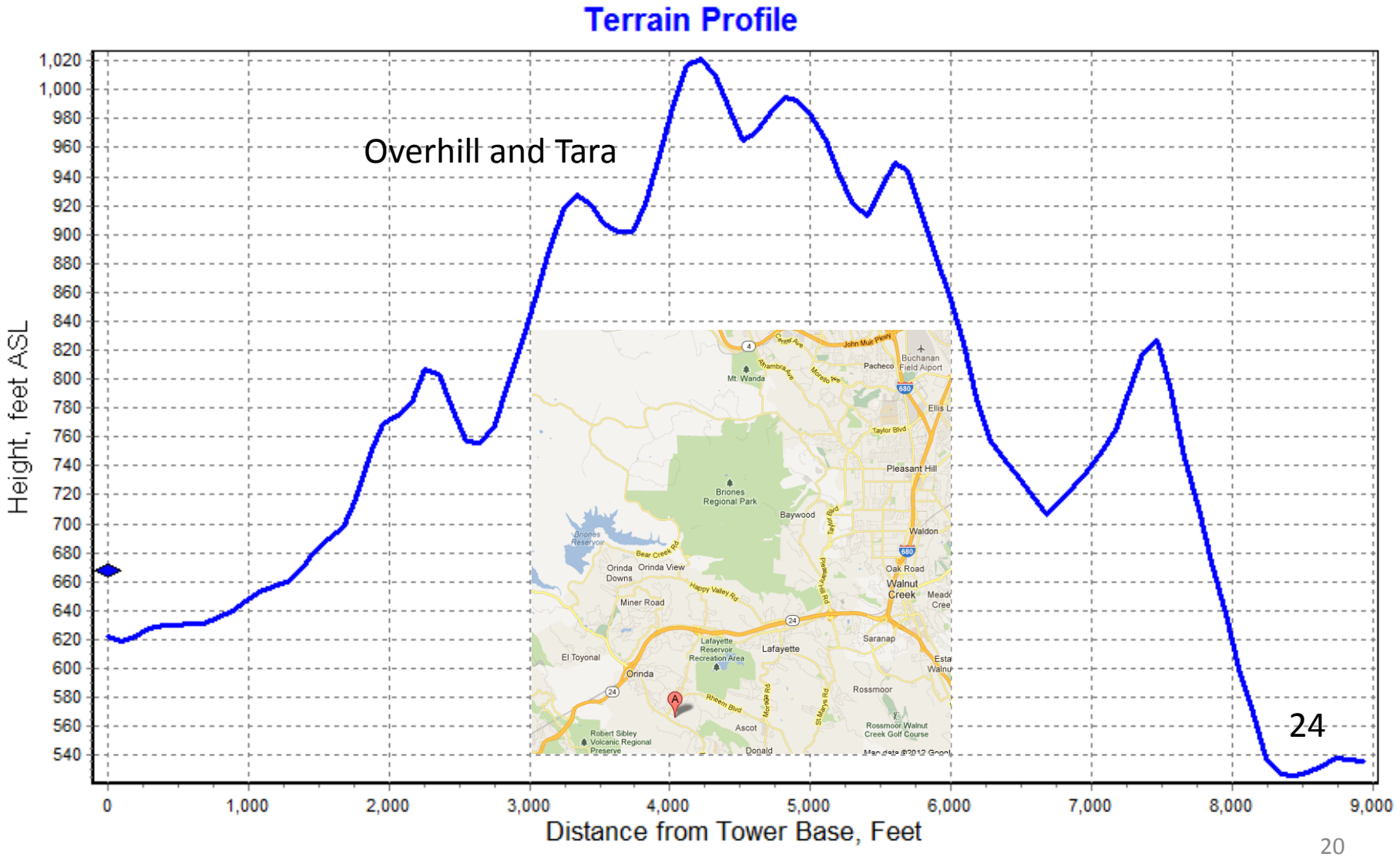


Terrain Profile
840
820
800
780
760
740
720
700
680
660
640
620
600
580
560
540
520
500
Height, feet ASL
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
11,000
12,000
Distance from Tower Base, Feet
Nearby Hills, top of
Glorietta and Wilder
24
Kensington
Berkeley Hills
Tilden Regional Park
Tilden Park Golf Course
Monte Vista Ridge
Orinda Downs
Sleepy Hollow
Orinda View
Sundown Terrace
Orinda Country Club
Orindawoods
El Toyonal
North Berkeley
University of California Berkeley
Berkeley
Central Berkeley
Panoramic Hill
Claremont Hills
South Berkeley
Elmwood
Orinda
Northwood - Tara
Knickerbocker
Overhill
Wilder
Robert Sibley Volcanic Regional Preserve
Merriewood
Lost Valley

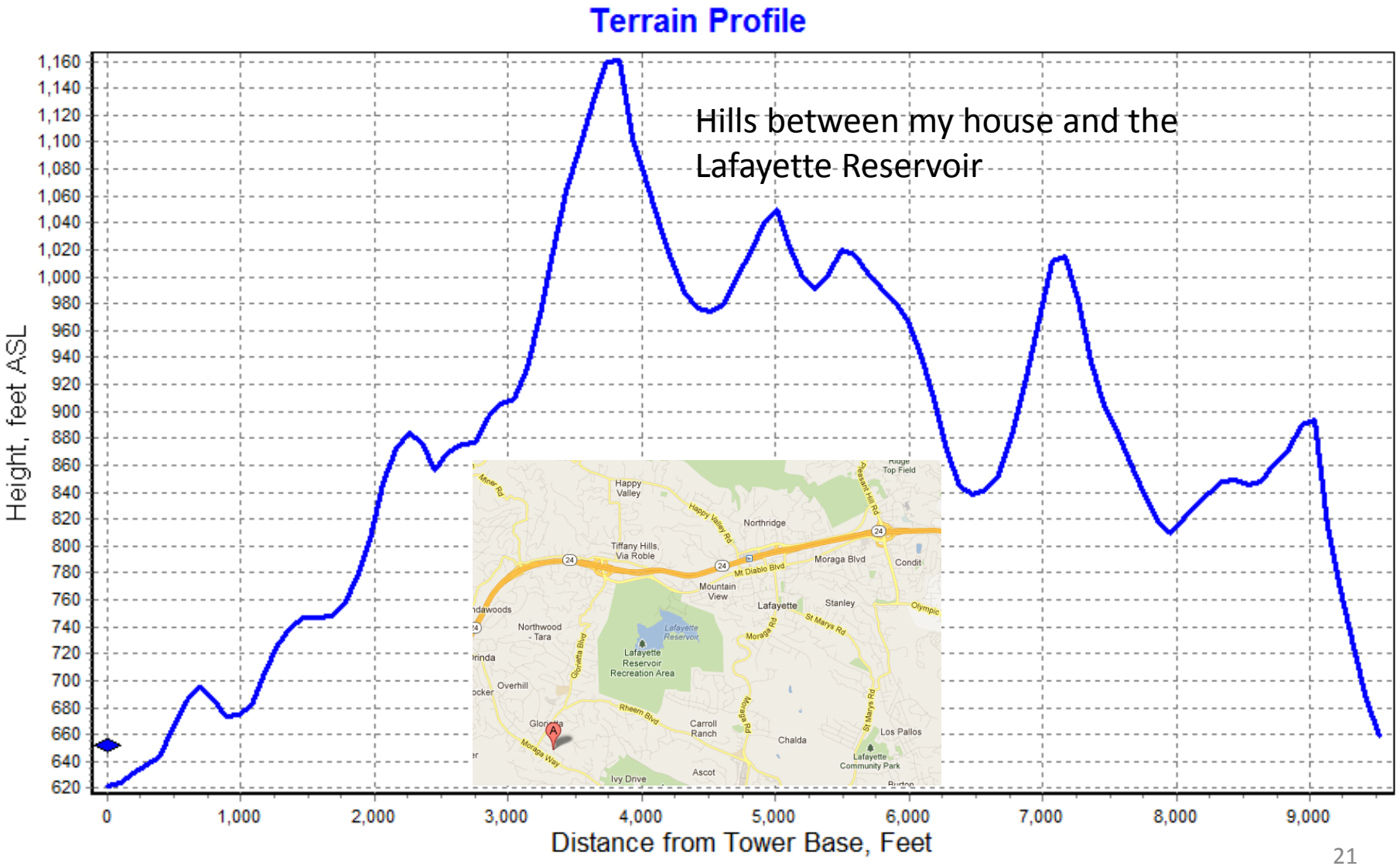
KY6R – Looking North



HFTA Says North Looks Like This

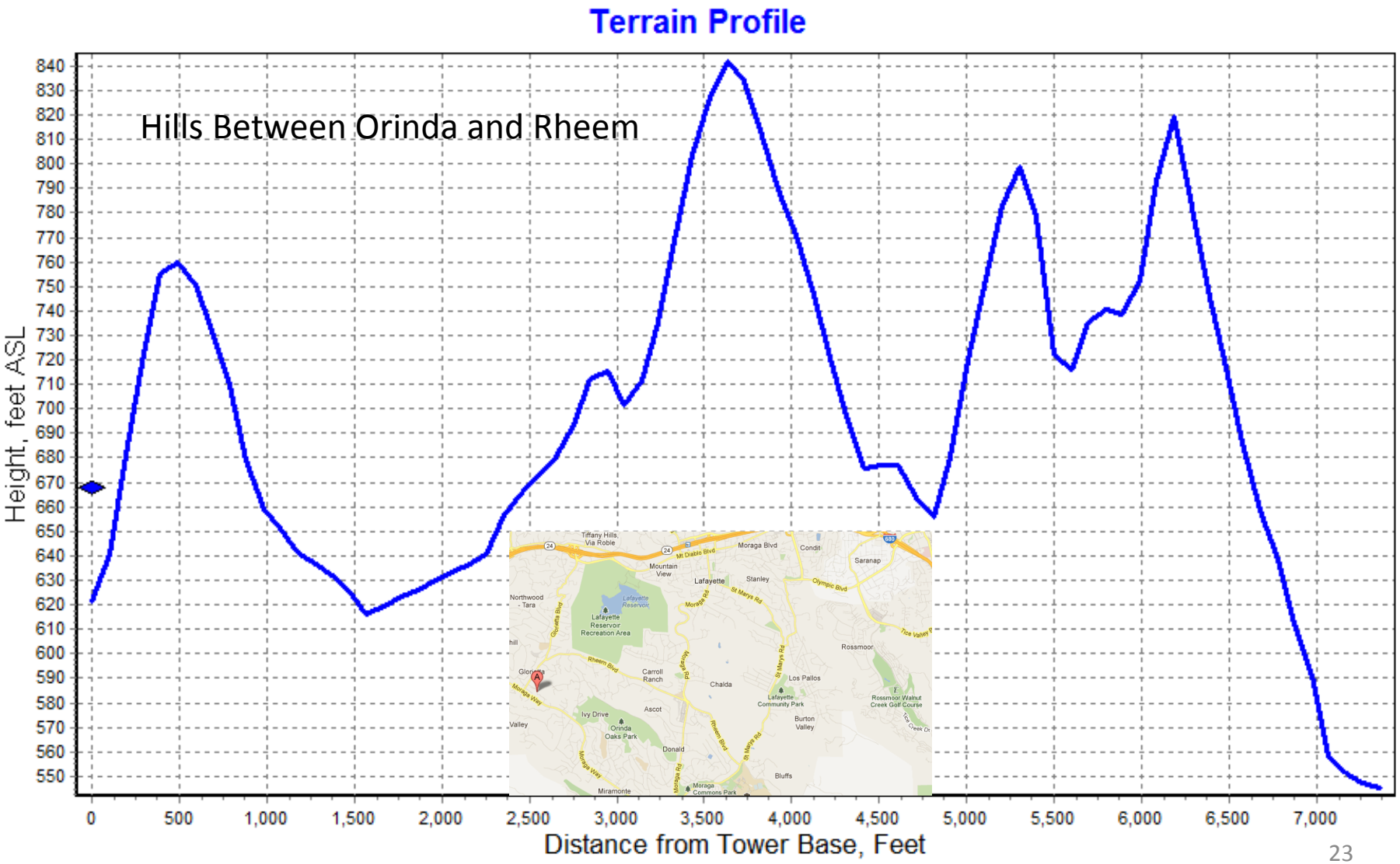


North East

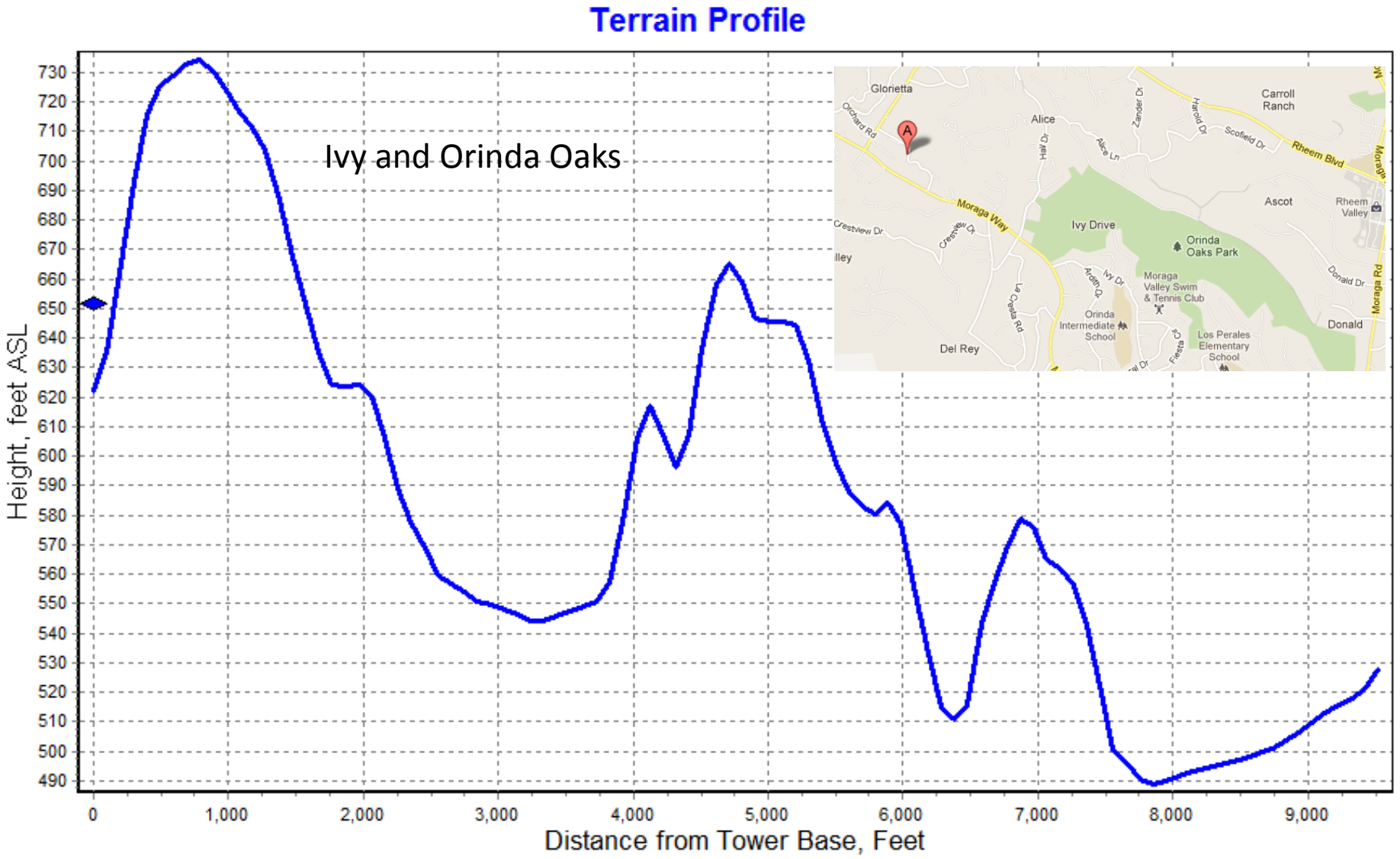

Terrain Profile
Hills between my house and the Lafayette Reservoir
Height, feet ASL
1,160
1,140
1,120
1,100
1,080
1,060
1,040
1,020
1,000
980
960
940
920
900
880
860
840
820
800
780
760
740
720
700
680
660
640
620
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
Distance from Tower Base, Feet
Happy Valley
Happy Valley Rd
Northridge
Tiffany Hills, Via Roble
Mt Diablo Blvd
Moraga Blvd
Condit
Mountain View
Lafayette
Stanley
Olympic
Northwood - Tara
Lafayette Reservoir
Lafayette Reservoir Recreation Area
Moraga Rd
St Marys Rd
Overhill
Gloria Ln
Rheem Blvd
Carroll Ranch
Chalda
Los Pallos
Lafayette Community Park
Ascot
Ivy Drive
Pleasant Hill Rd
Top Field

KY6R – Looking East

HFTA Says East Looks Like This

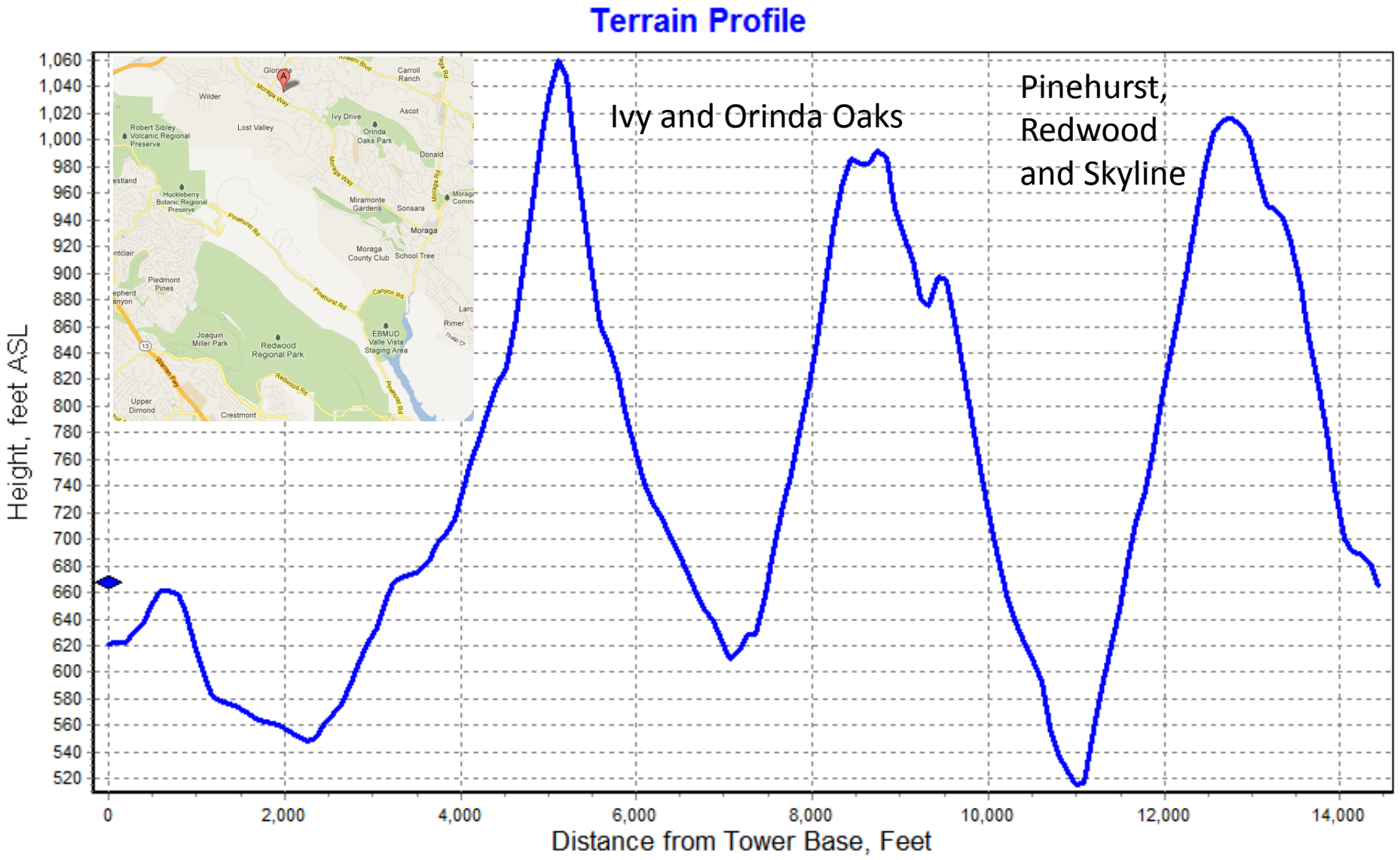


South East

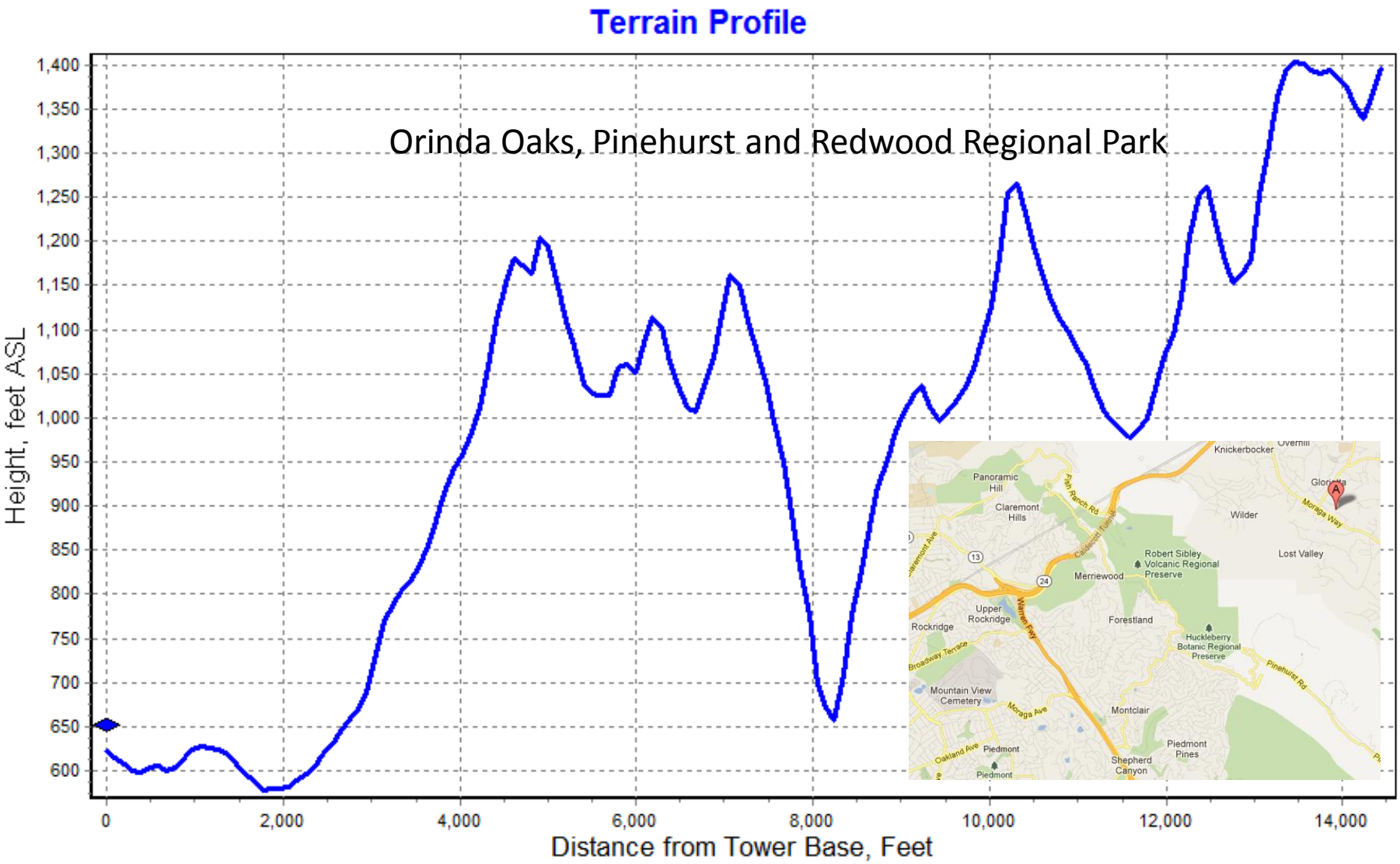

Terrain Profile
Ivy and Orinda Oaks
Height, feet ASL
730
720
710
700
690
680
670
660
650
640
630
620
610
600
590
580
570
560
550
540
530
520
510
500
490
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
Distance from Tower Base, Feet
Glorietta
Orchard Rd
Alice
Carroll Ranch
Scofield Dr
Rheem Blvd
Moraga
Moraga Way
Ascot
Rheem Valley
Crestview Dr
Ivy Drive
Orinda Oaks Park
Moraga Valley Swim & Tennis Club
Donald Dr
Moraga Rd
Donald
Orinda Intermediate School
Los Perales Elementary School
Del Rey

KY6R – Looking South

What HFTA Says South Looks Like



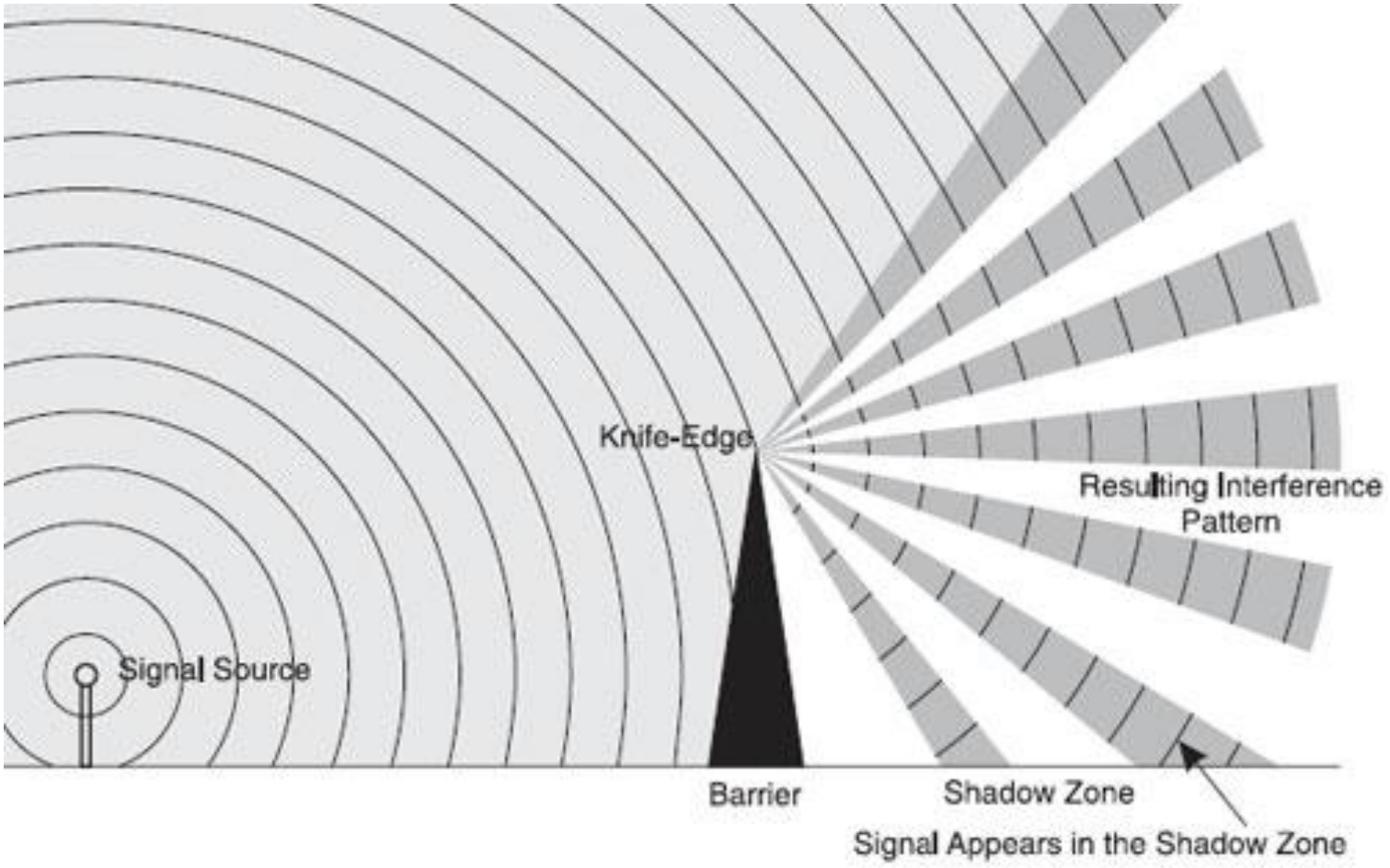
South West


Terrain Profile
Orinda Oaks, Pinehurst and Redwood Regional Park
Height, feet ASL
1,400
1,350
1,300
1,250
1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
Distance from Tower Base, Feet
Knickerbocker
Panoramic Hill
Claremont Hills
Fish Ranch Rd
Wilder
Moraga Way
Lost Valley
Robert Sibley Volcanic Regional Preserve
Merriewood
Upper Rockridge
Rockridge
Warren Fwy
Forestland
Huckleberry Botanic Regional Preserve
Broadway Terrace
Pinehurst Rd
Mountain View Cemetery
Moraga Ave
Montclair
Oakland Ave
Piedmont
Piedmont Pines
Shepherd Canyon
13
24

So What is My Problem?

- Hills, Hills and More Hills!
  - SP ME / AF suffers most
  - Low TOA needed at bottom of cycle
  - Nearby hills diffract low angle signals
  - No (or very low) sun spots – weak F2
  - I have worked stations in the same areas before – but either with higher SSN's and smaller pileups, and sometimes LP

Theory #1: Knife Edge Diffraction?



I actually posted on a forum asking if anyone knew about “selective propagation “. Then I came to my senses and realized this is science – not séance.

What Should I Do?

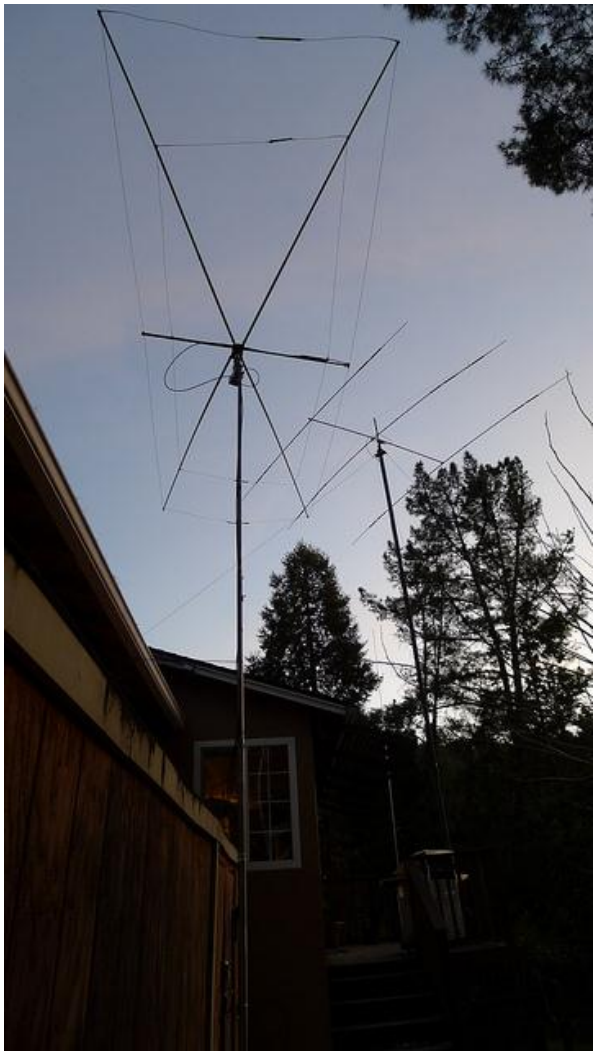
- Possibilities include:
  - Improve gain of low-band verticals
  - Increase height and gain of horizontally polarized antennas
  - Forget about low TOA SP polar paths – use LP, or, wait until a really lucky high TOA opening occurs
  - Drink heavily
- What is not possible:
  - Anything wider than a 40M half square (70')
  - More than 800 watts
  - Put up fixed tower
  - Bulldoze nearby hills

Testing an Assumption

- If I were to buy a portable / semi permanent Military Surplus Mast System (AB-952 or AB-577) what would be the best height?
- How does it compare to my A3S that (was originally) up 30’?
- How does it compare to what I had before (20M Moxon up 30’)
- Will it be worth investing $800?

Paid $1500 for >2+ dB gain > 20+ dB F/B

A3S + 30M at 46’ on AB-952
~ 3 dB gain improvement
(with the height increase)

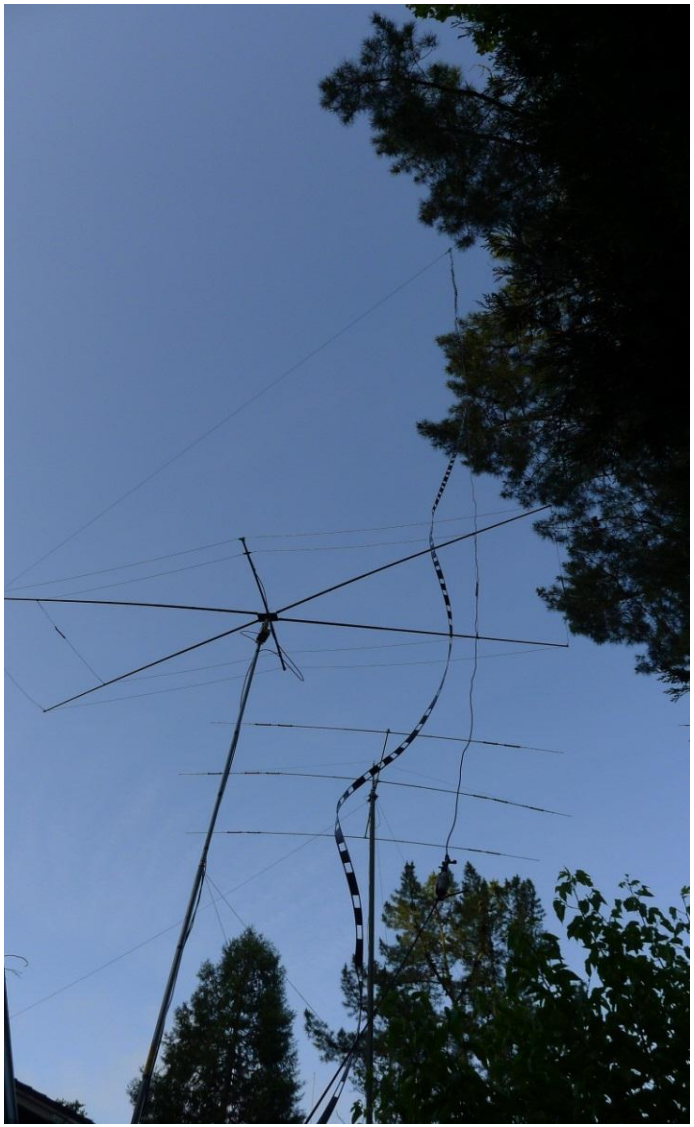


17/12M Nested Moxon
~ 3 dB gain improvement
(with the height increase)

Increased 33’ vertical to 45’
w/six 5’ top hats,
base loading for 160M

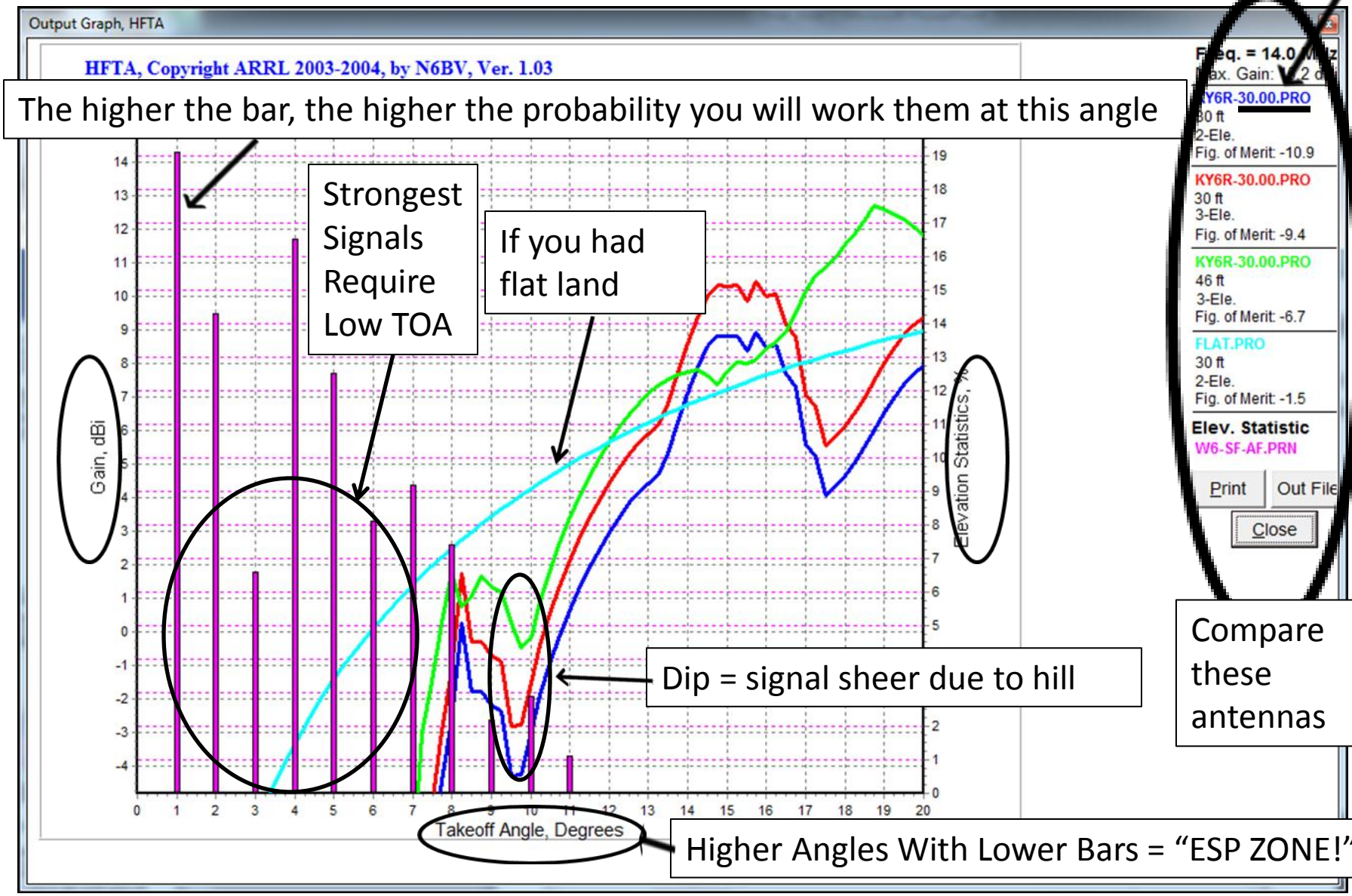
K9AY Loops for RX and 40M Half Square

Great on 160/80M RX

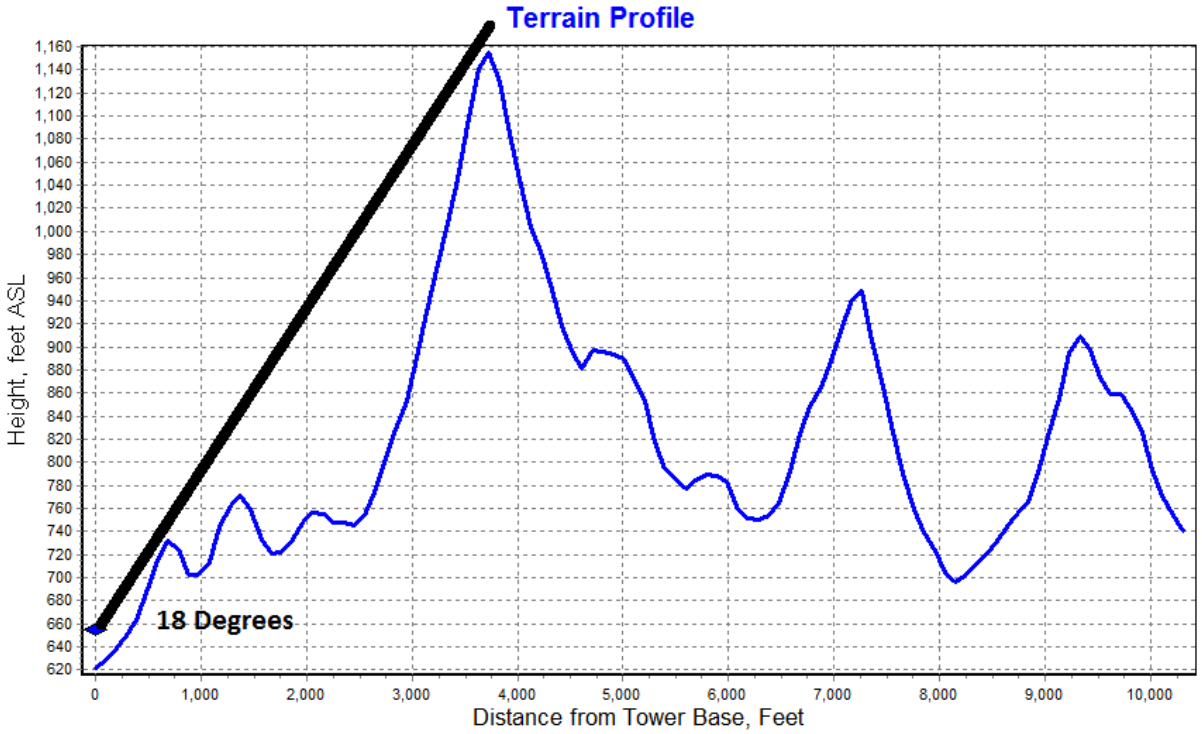


3 dB gain on 40M

How to Read an HFTA Chart



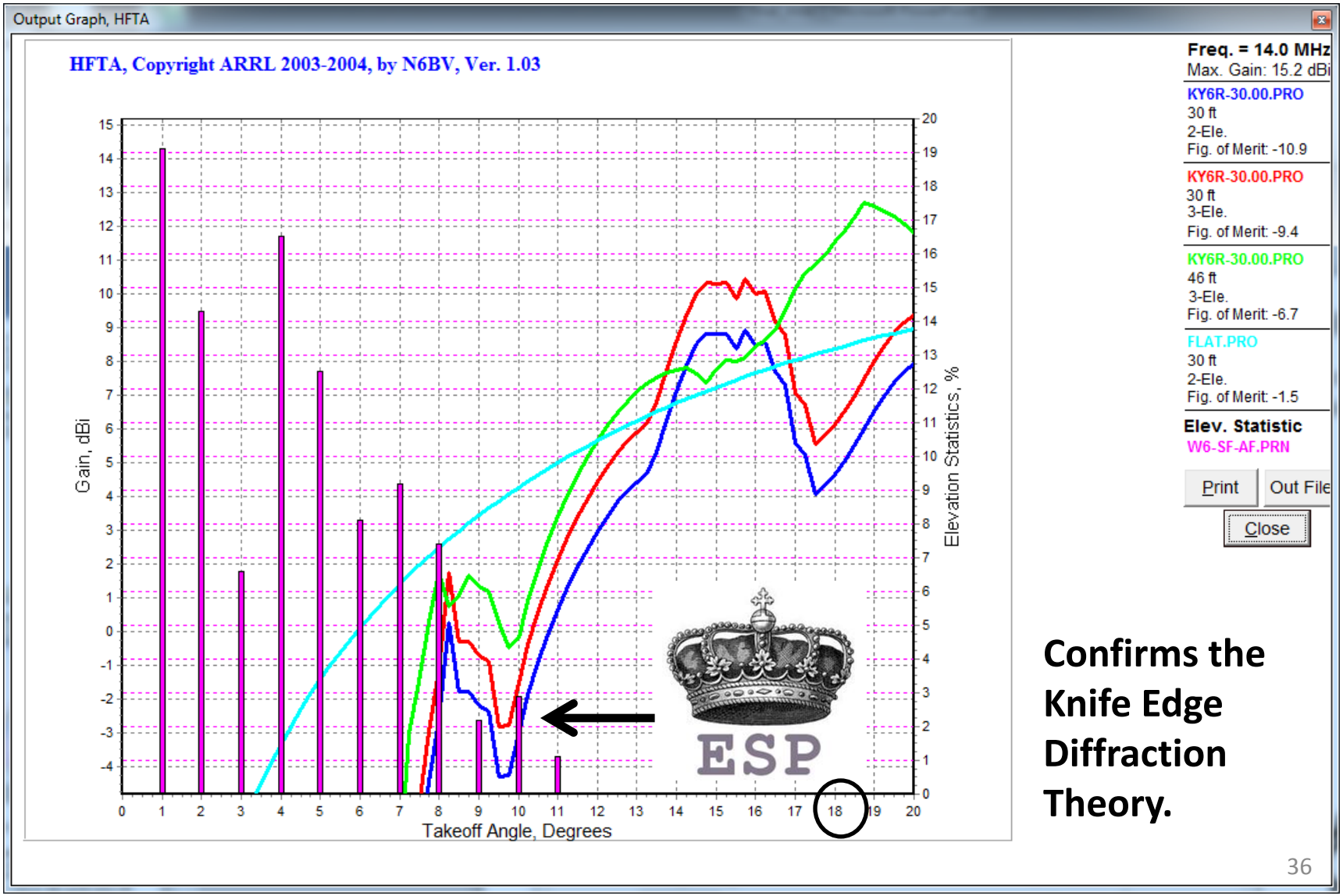
South Sudan Path Terrain at KY6R



11 degrees is almost at the absolute end of the range of angles that support communication between my QTH and stations that are in or near South Sudan (zones 34, 37 and parts of 21). When my neighbor who is on top of a hill facing the NE says the DX station is “S9” and I can’t hear them, now I know why. Orinda is plagued with many high tension towers and the one in the picture affects me. The lowest noise level I ever have is S5, many times its S9.

Sudan / South Sudan Case Study

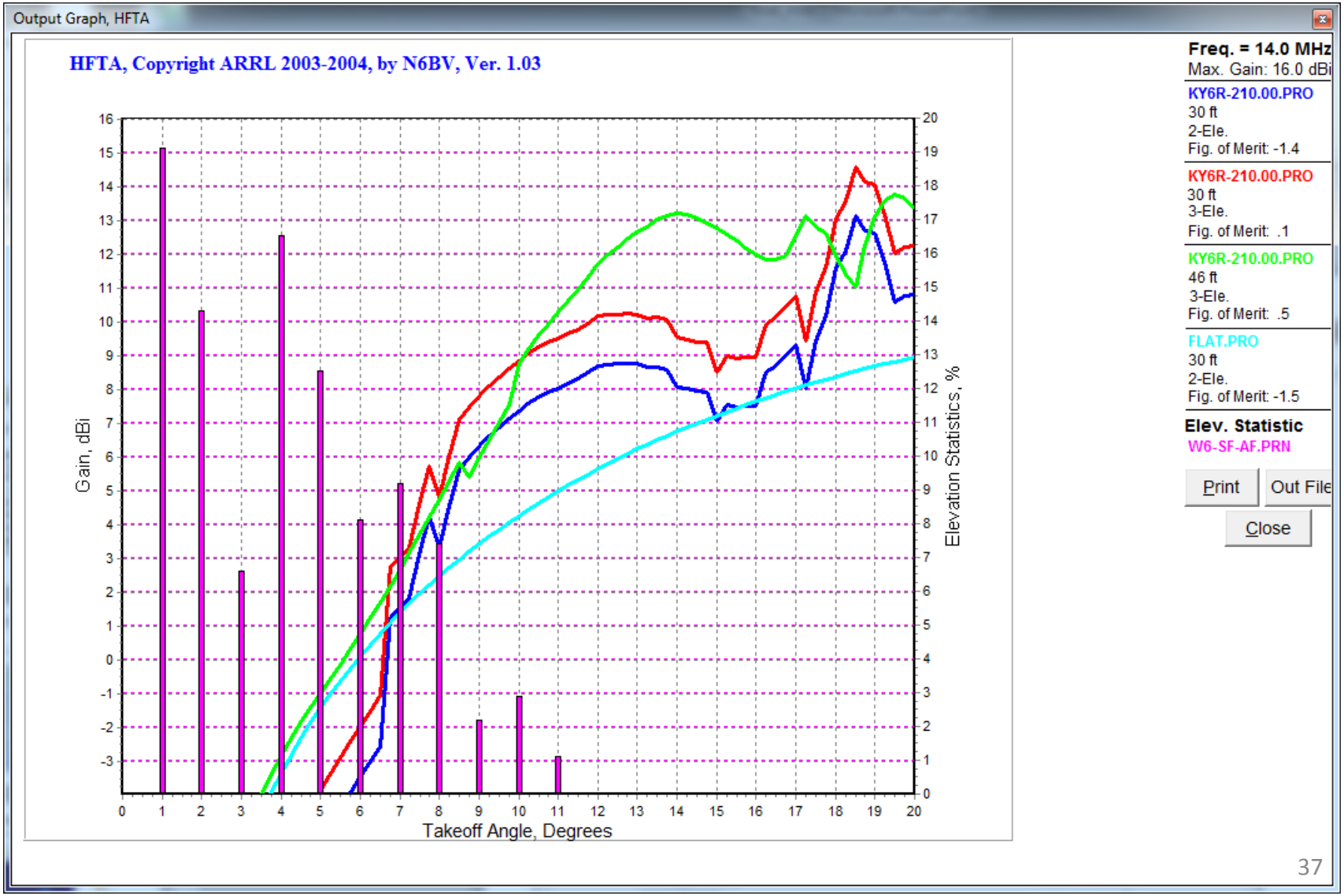
On the short path, it *would* have made the difference between working them or not. Notice the “shear” below 10 degrees TOA. I would have had a +3 dB better signal.



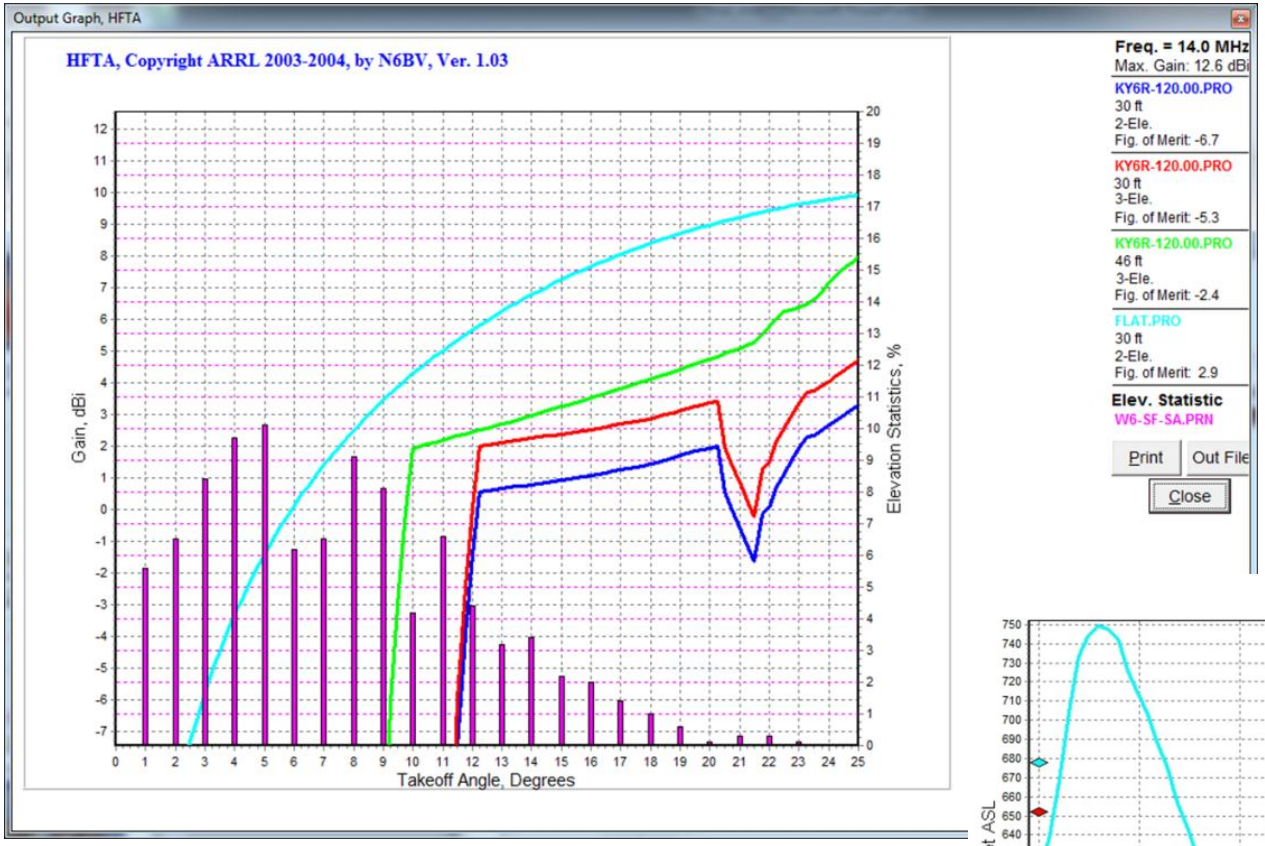
Confirms the Knife Edge Diffraction Theory.

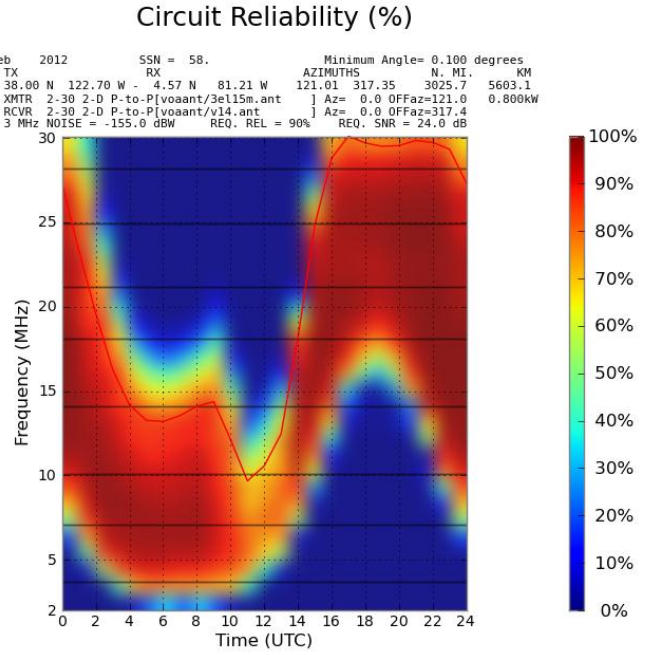
Sudan / South Sudan Case Study

The long path shows a 2dB improvement over my old 2 element 20M Moxon.
But the hills shear anything below 6 degrees off.

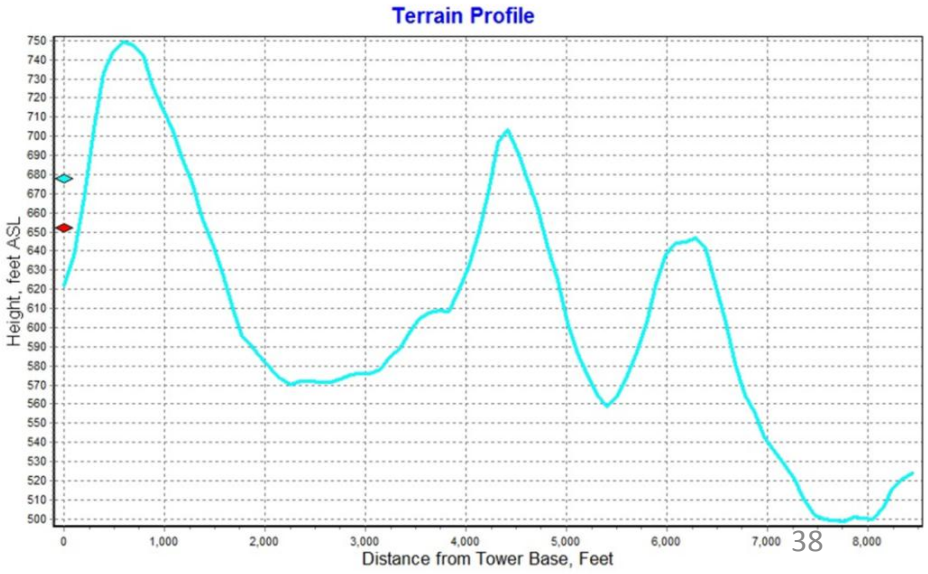


HK0NA:Malpelo January 2012



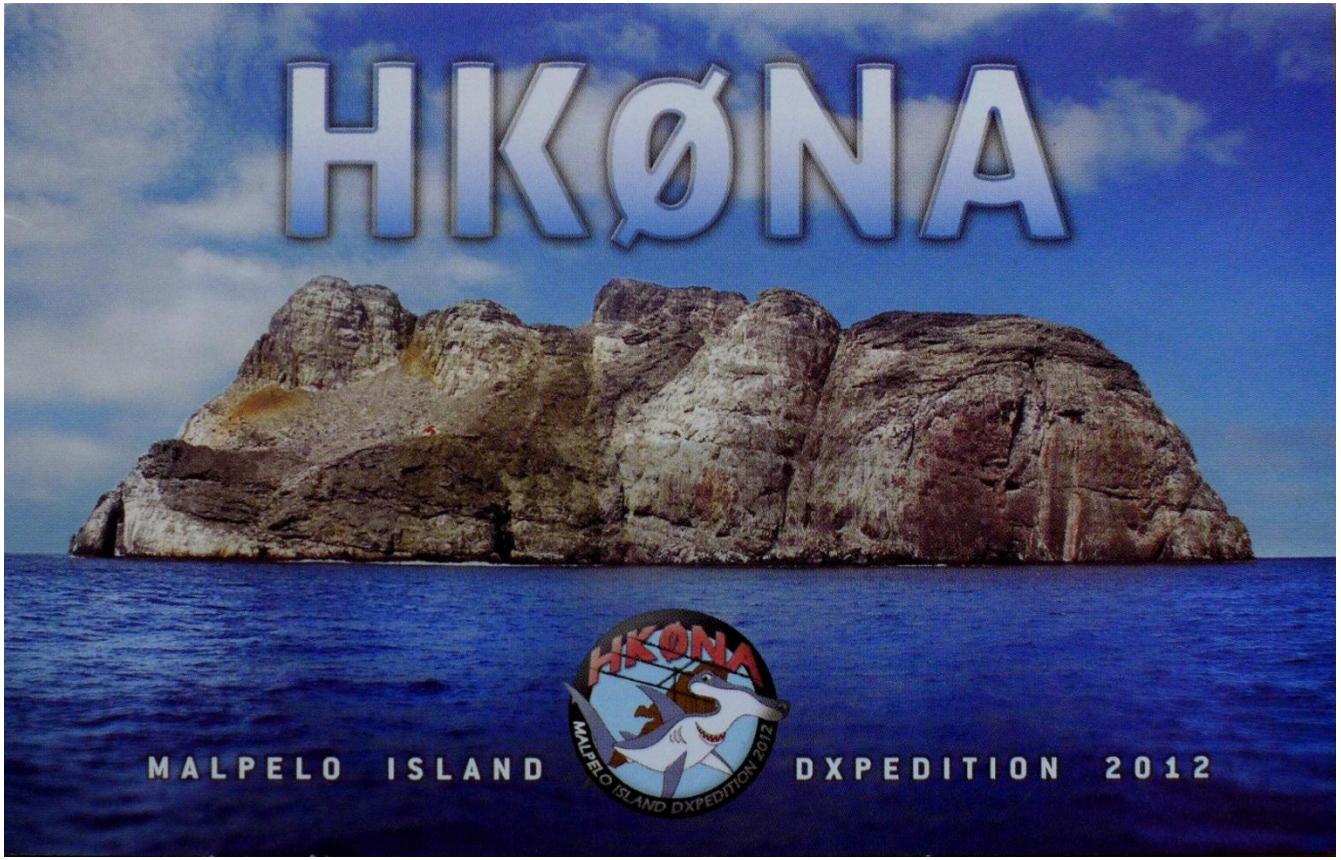


All bands were open



New antenna farm made easy work on all bands. The A3S is at least 2 dB better and opens up 2 critical degrees of TOA. The HK0NA team rocked!

HK0NA - #329/325– all bands and modes!



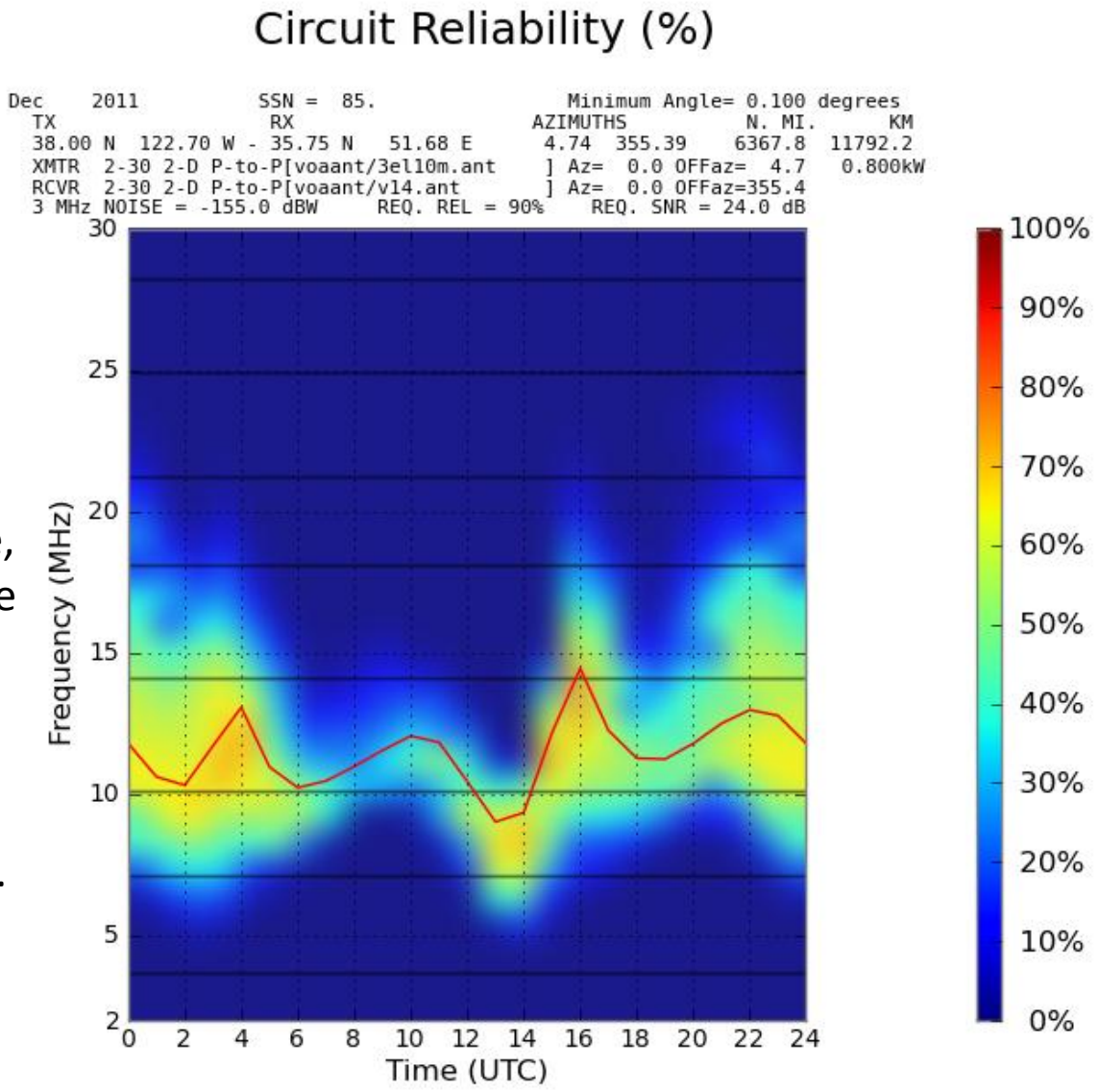
This is the first time I worked a rare DX-pedition first on 80M. The new vertical is the Best 80M antenna I have ever had. Once they activated “OP B” I had no problem on any band. This is a good indicator for working ZL9HR, and KP1 and KH5K . . .

EP3PK – Iran Case Study – 12/2011

This circuit requires a 90% probability, so 60% just didn't cut it.

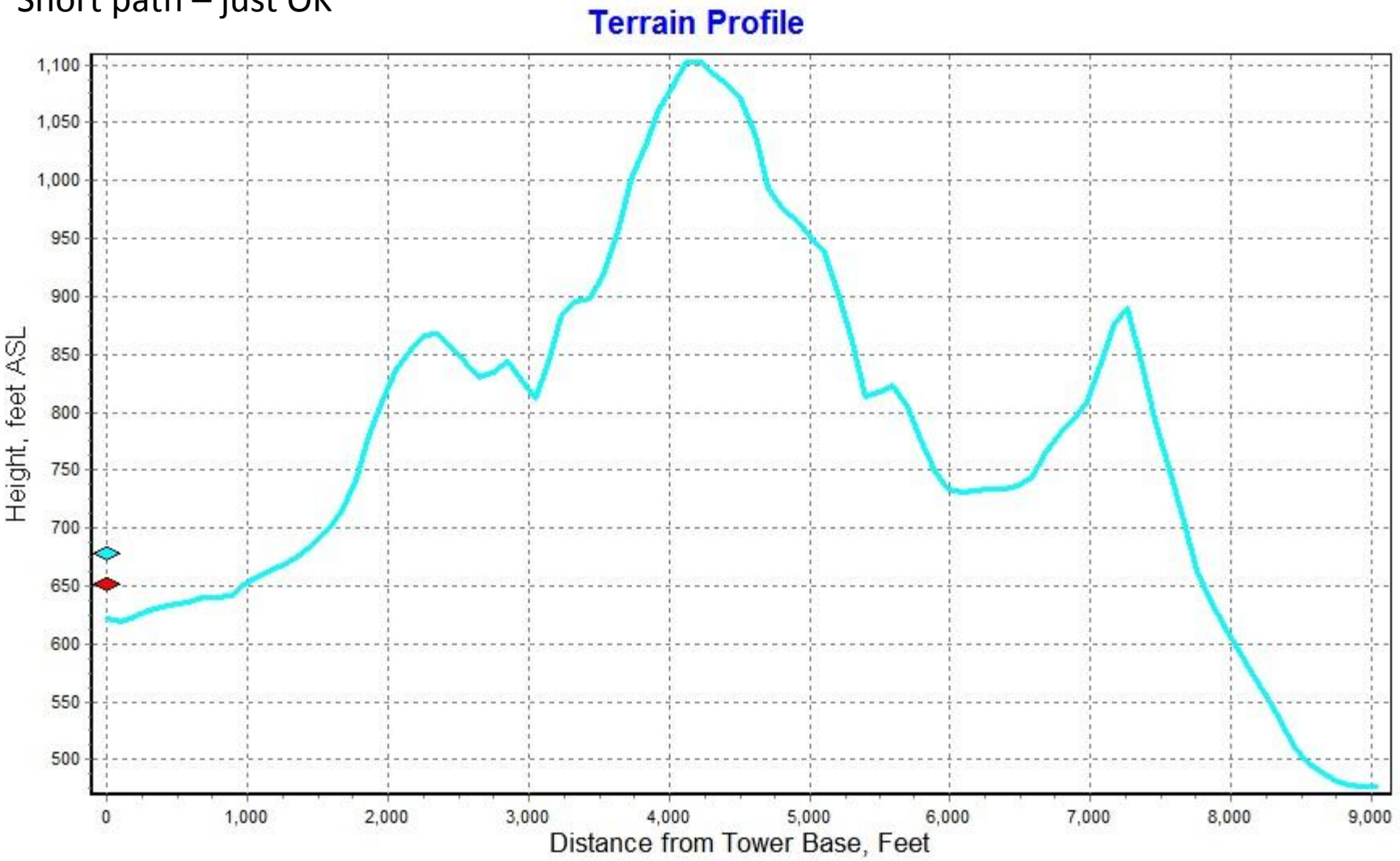
In the same timeframe, E44PM was in Palestine and never heard him either.

Some worked E44PM On 17M around 1600z.



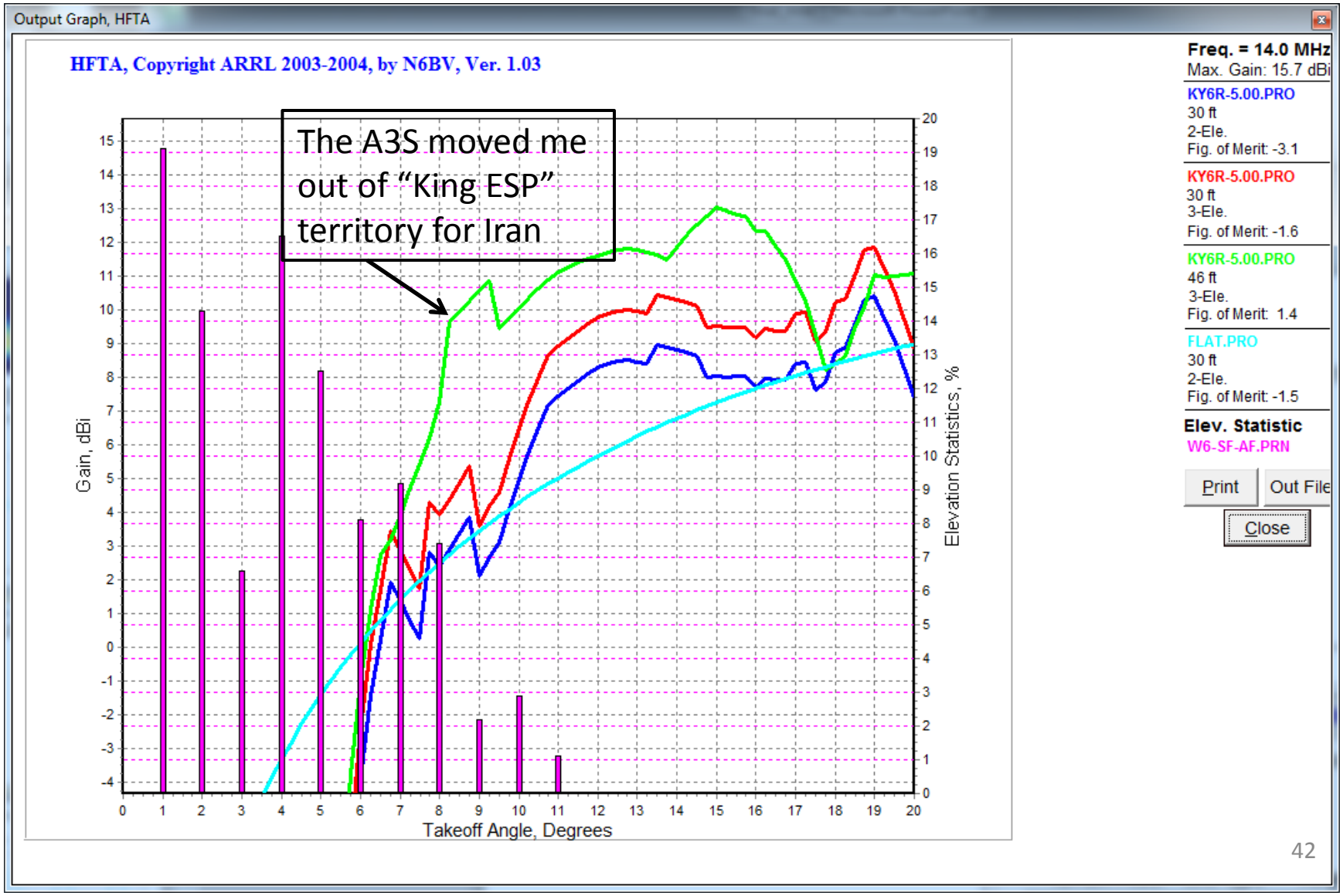
EP3PK – Iran Case Study

Short path – just OK



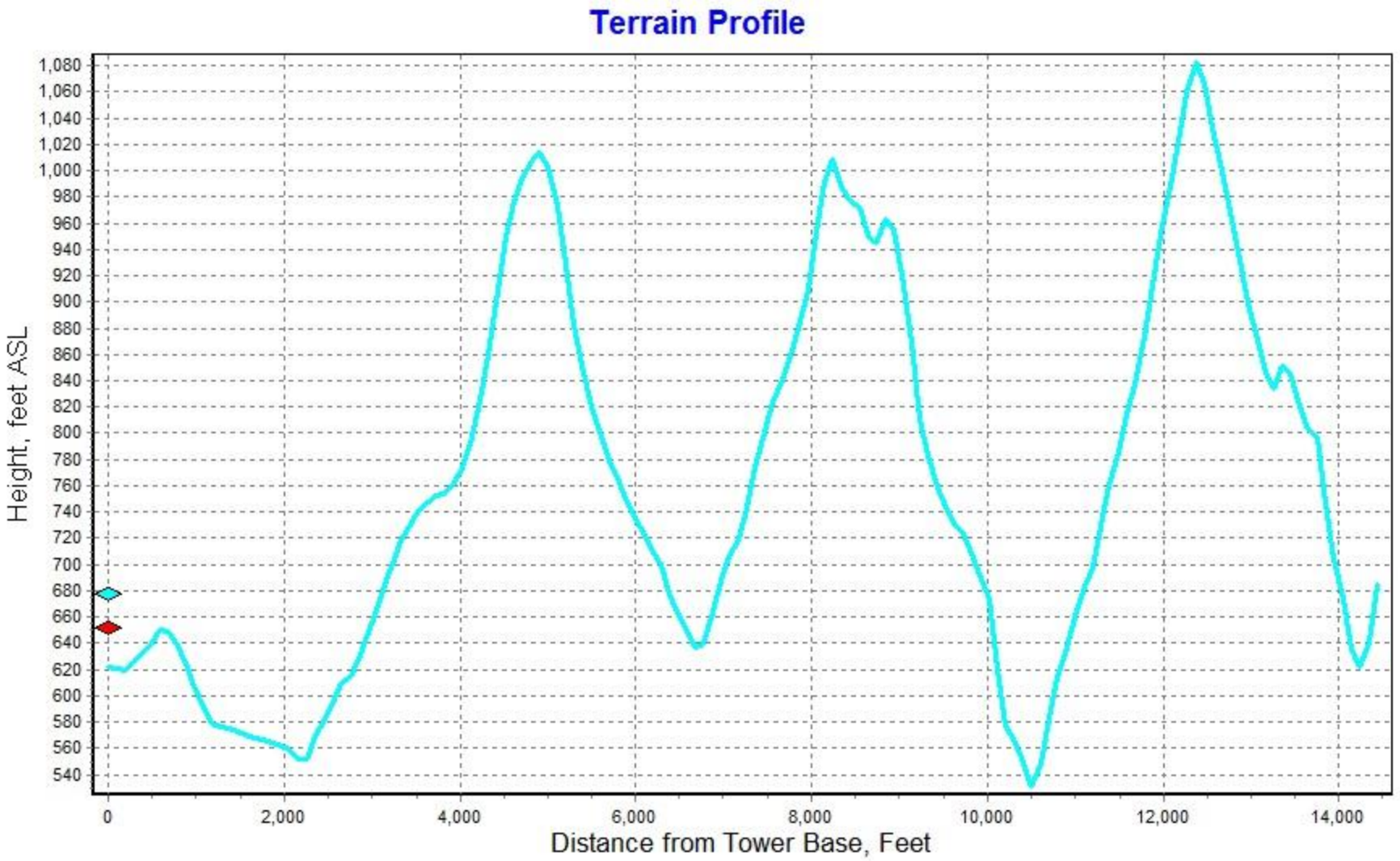
EP3PK – Iran Case Study

Short path – some angles will be possible with the right propagation . . At 46', EP will be 4 to 7dB stronger than a Moxon at 30'. Well worth the money, and it will make the difference.



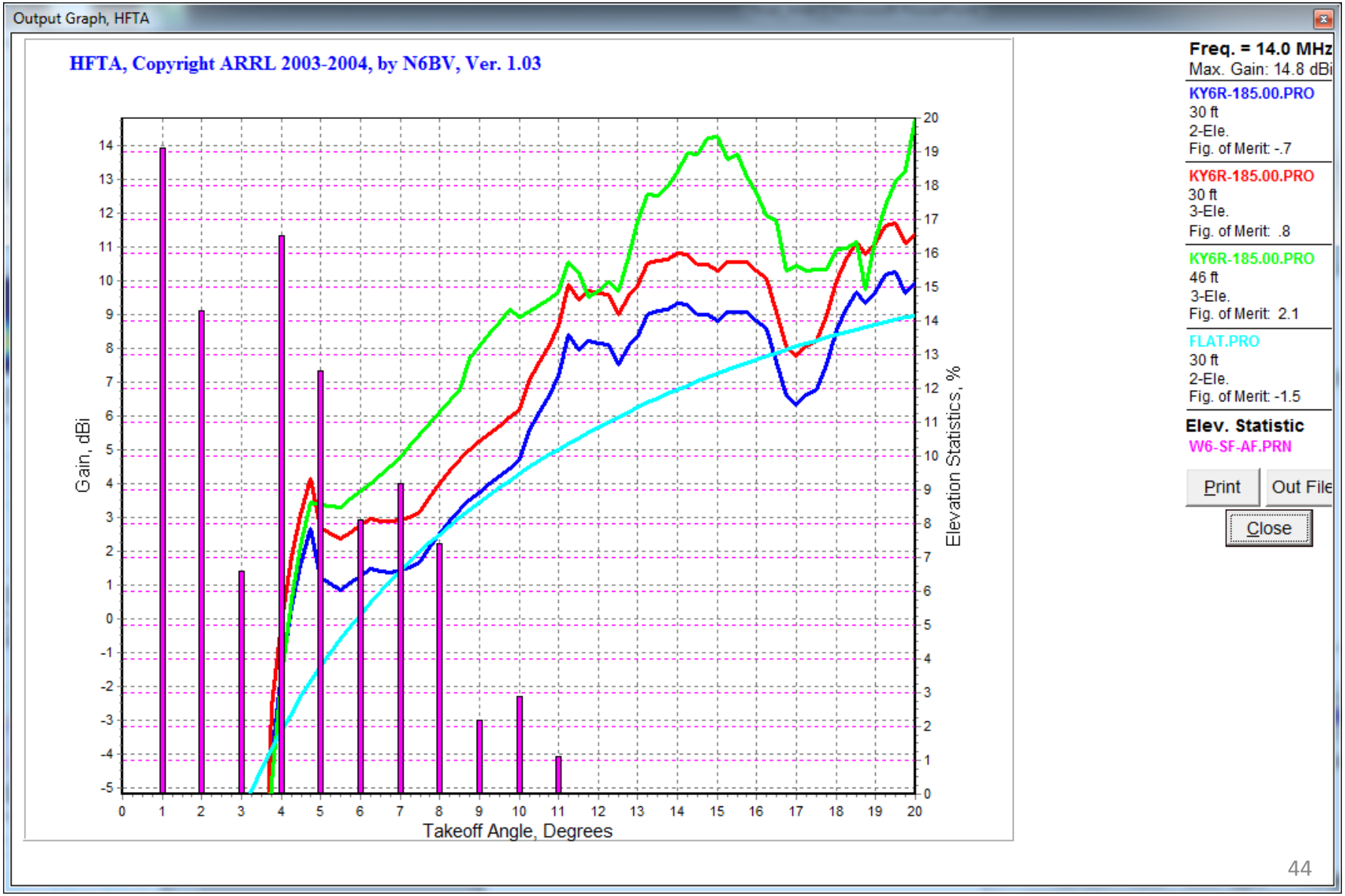
EP3PK – Iran Case Study

Long path – a bit better



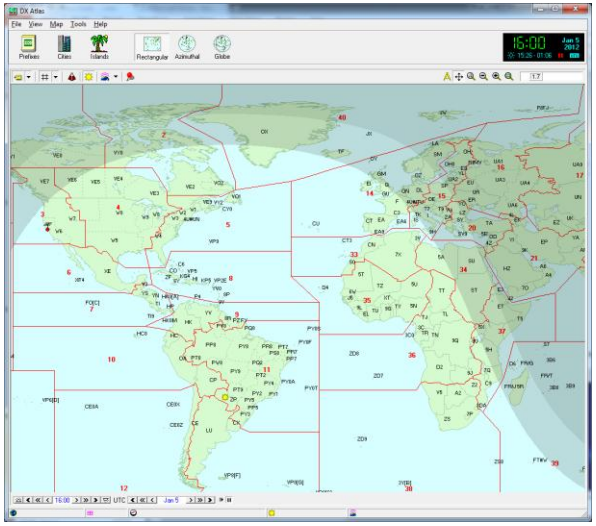
EP3PK – Iran Case Study

On the LP, 46’ will be 3 dB stronger on most angles. Worth the money.

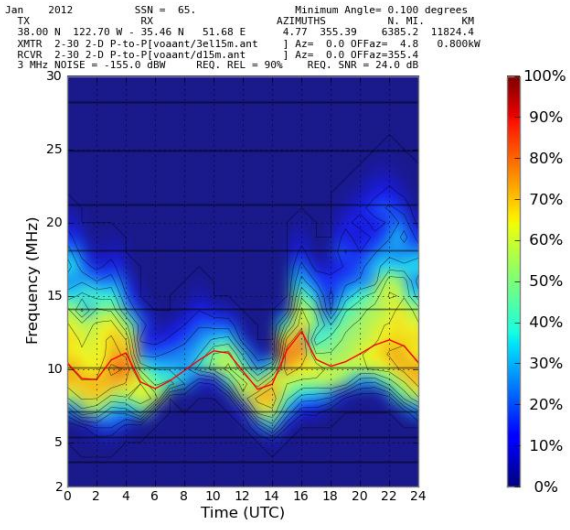


EP3PK

January 5, 2012 – 1609z

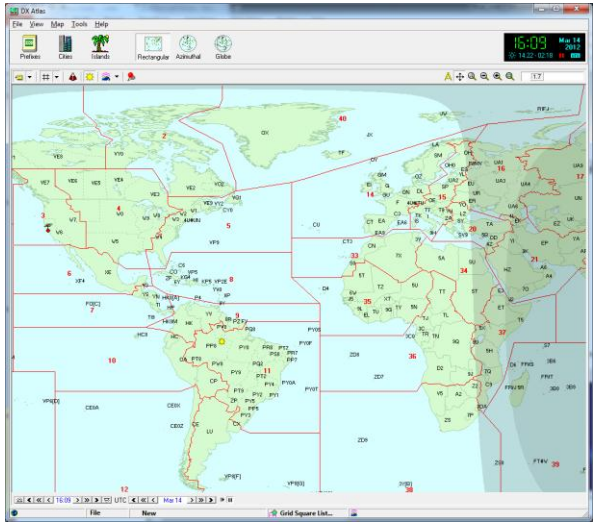


Circuit Reliability (%)

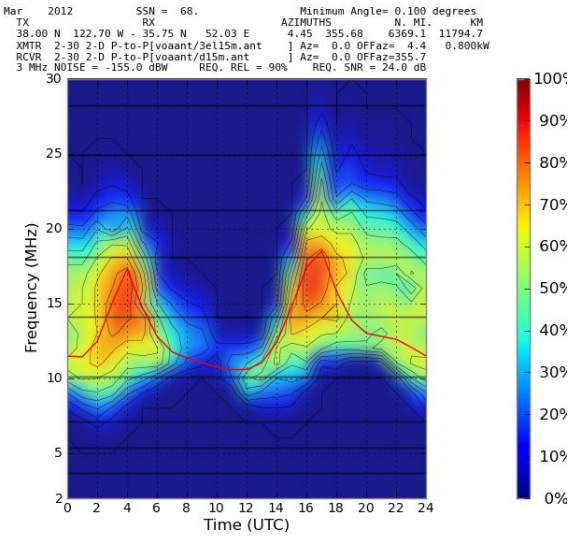


Did hear 4X via 20M LP

March 14, 2012 – 1609z

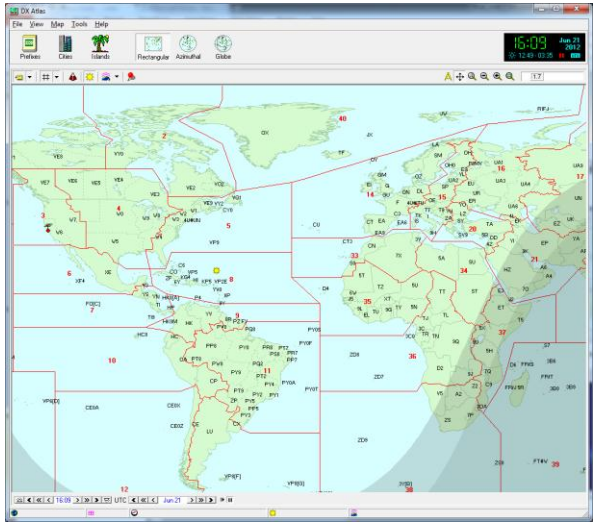


Circuit Reliability (%)

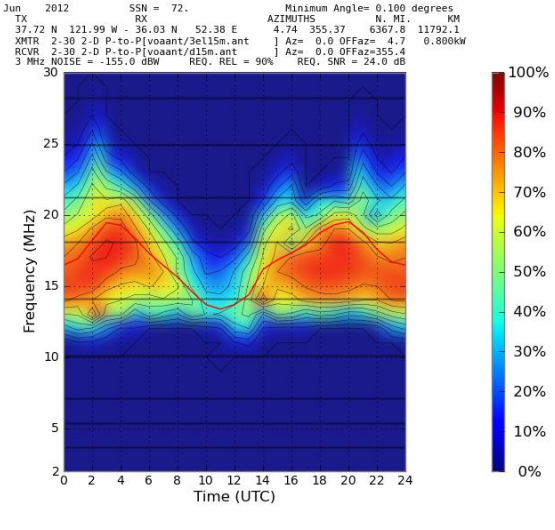


17M predicted, worked 20M

June 21, 2012 – 1609z

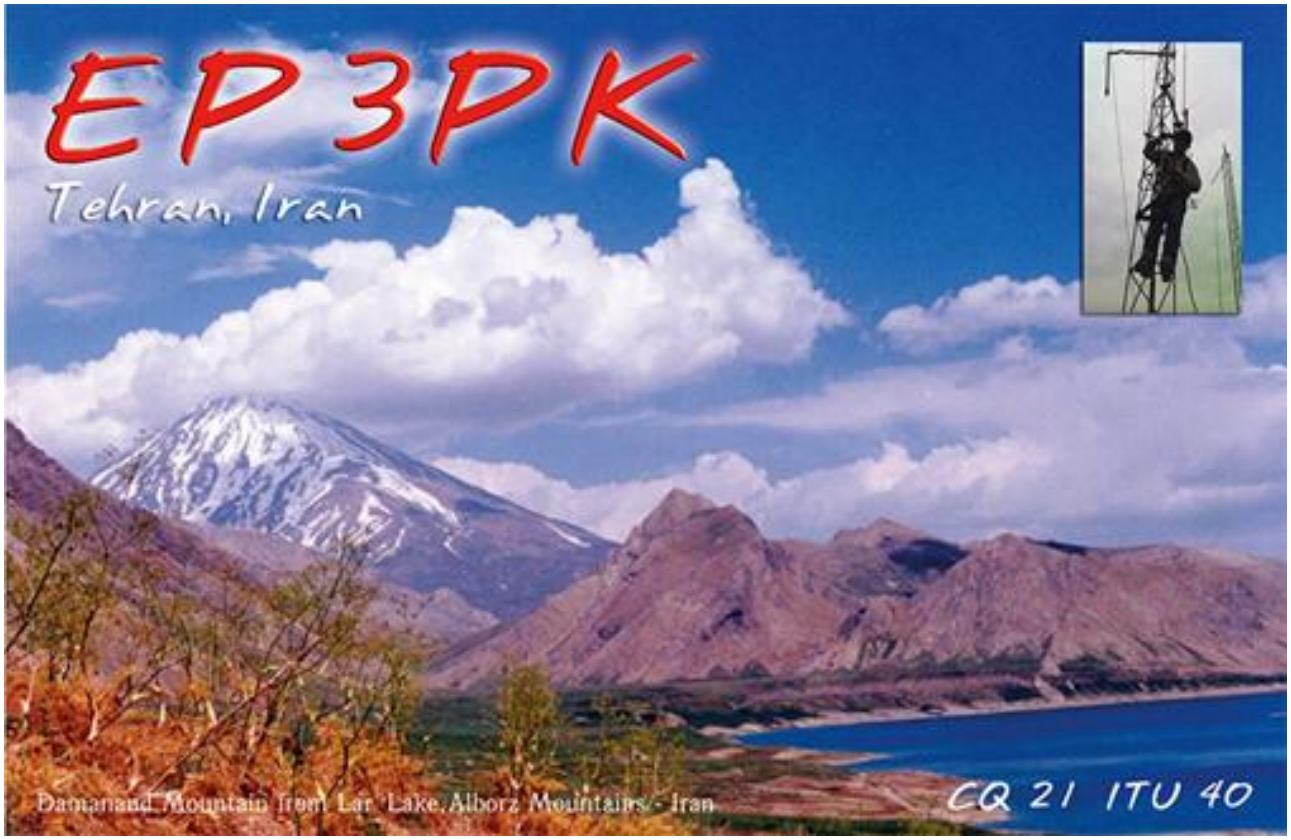


Circuit Reliability (%)



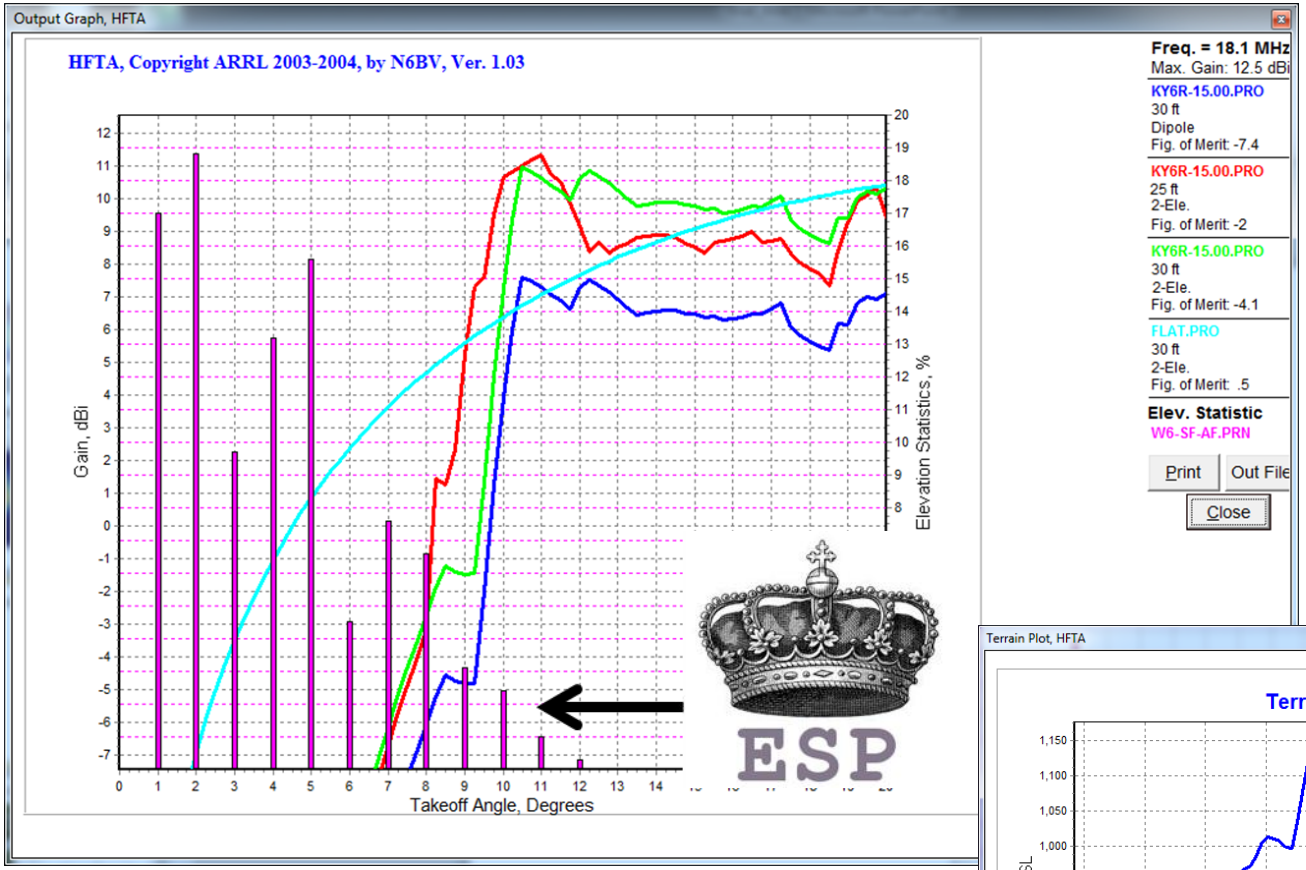
17M should be good

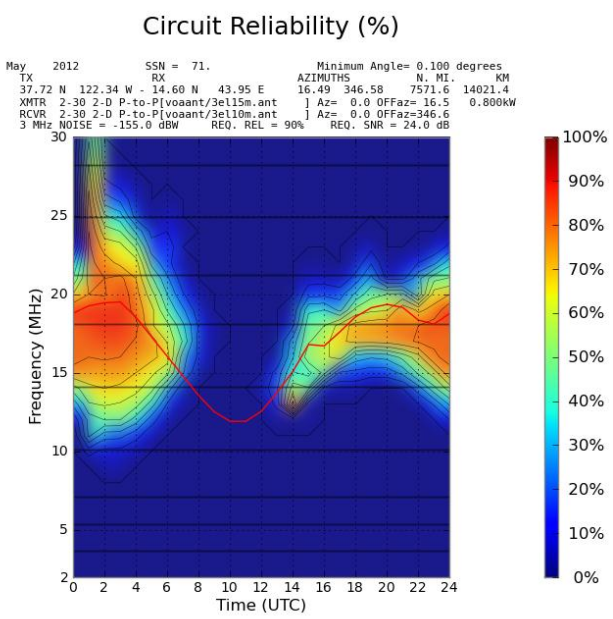
EP3PK - #330/326 - 3/14/12 1609z



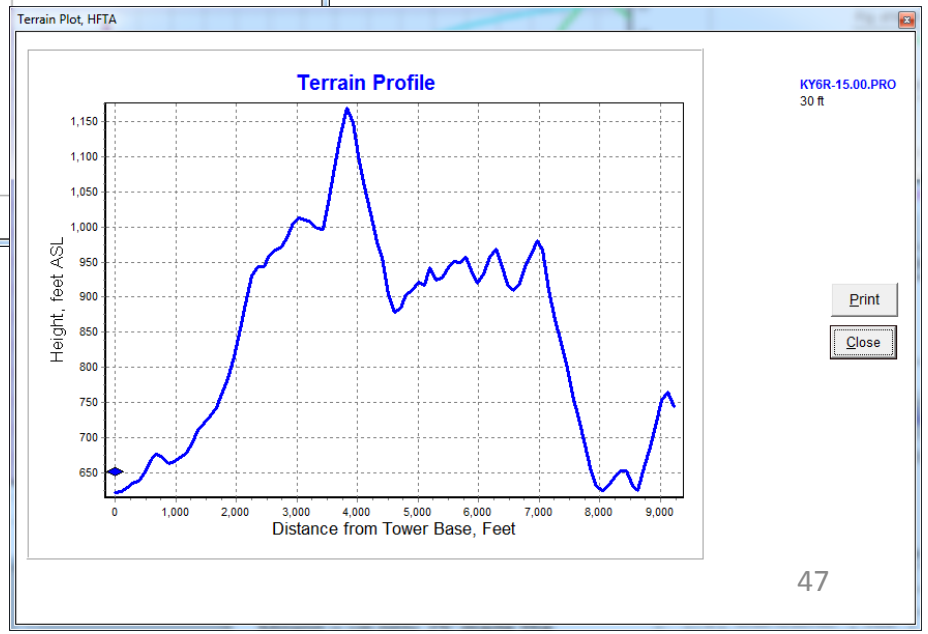
Pooyan is one of the nicest and most resourceful hams in the world. You should see his wonderful home brewed gear!

7O6T – Yemen – Biggest Surprise Ever!



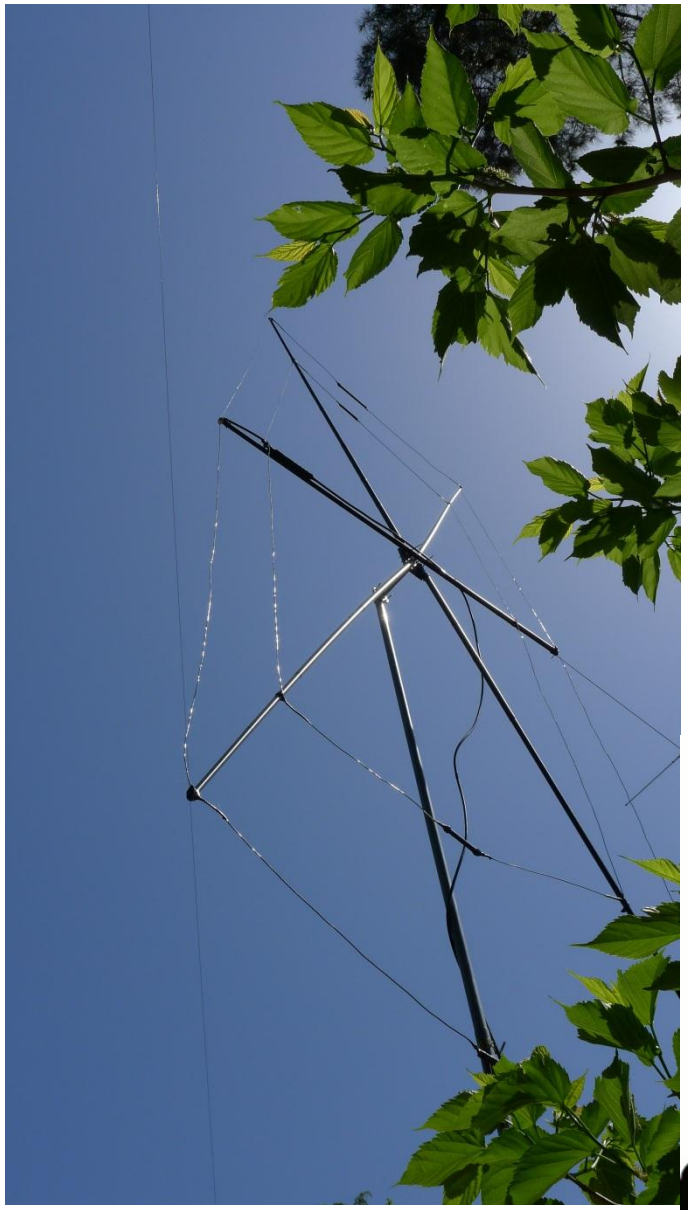


17M emerging as Important in Cycle 24

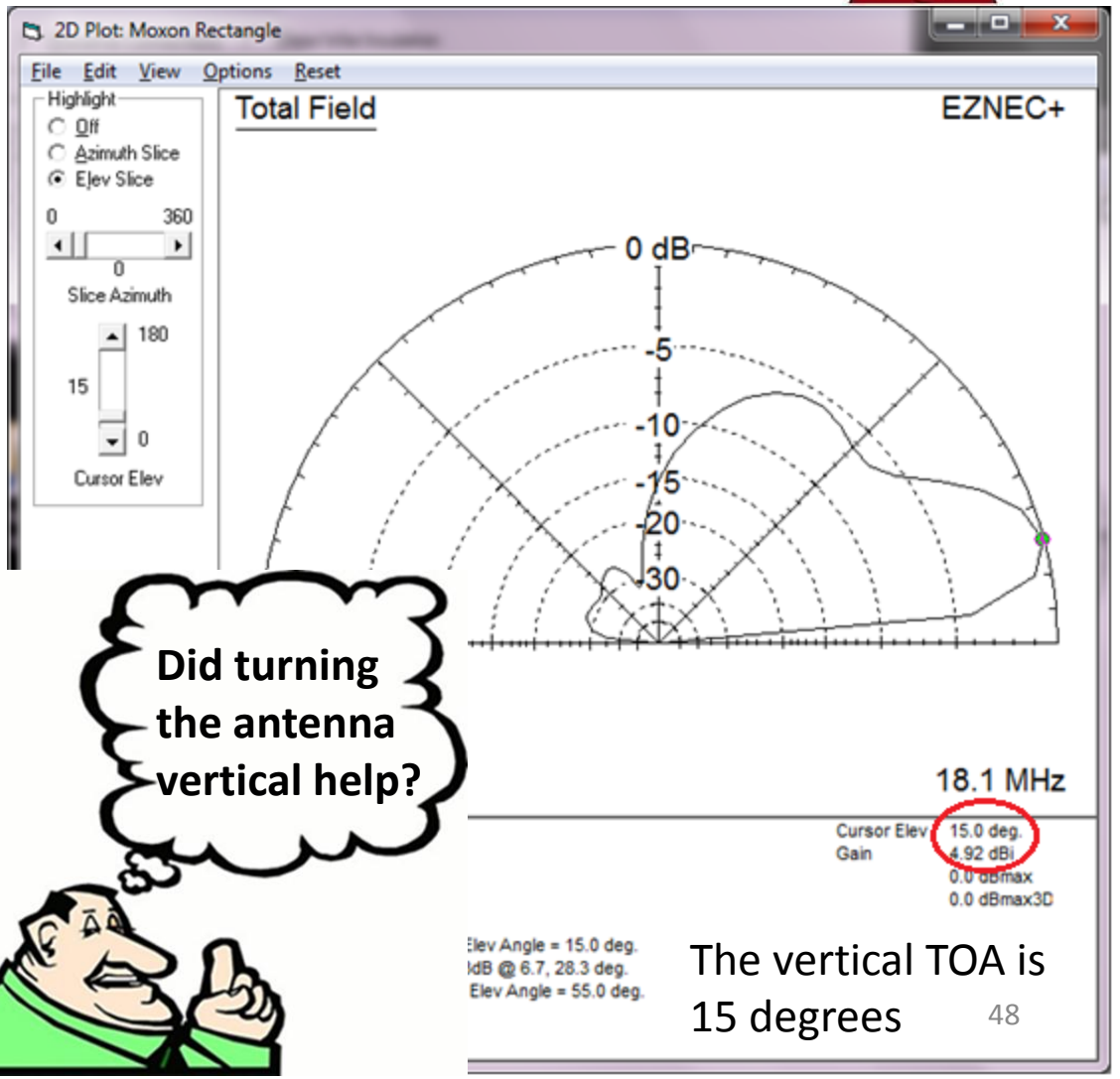


My old 20M Moxon up 30’ would have been a dipole on 17M. My new 17/12M Nested Moxon – up only 25’ made the difference in working Yemen. 3 - 4 dB for 10% more angles. A dramatic improvement.

7O6T – The Ghost of ST0R



VOACAP correctly Predicted 17M

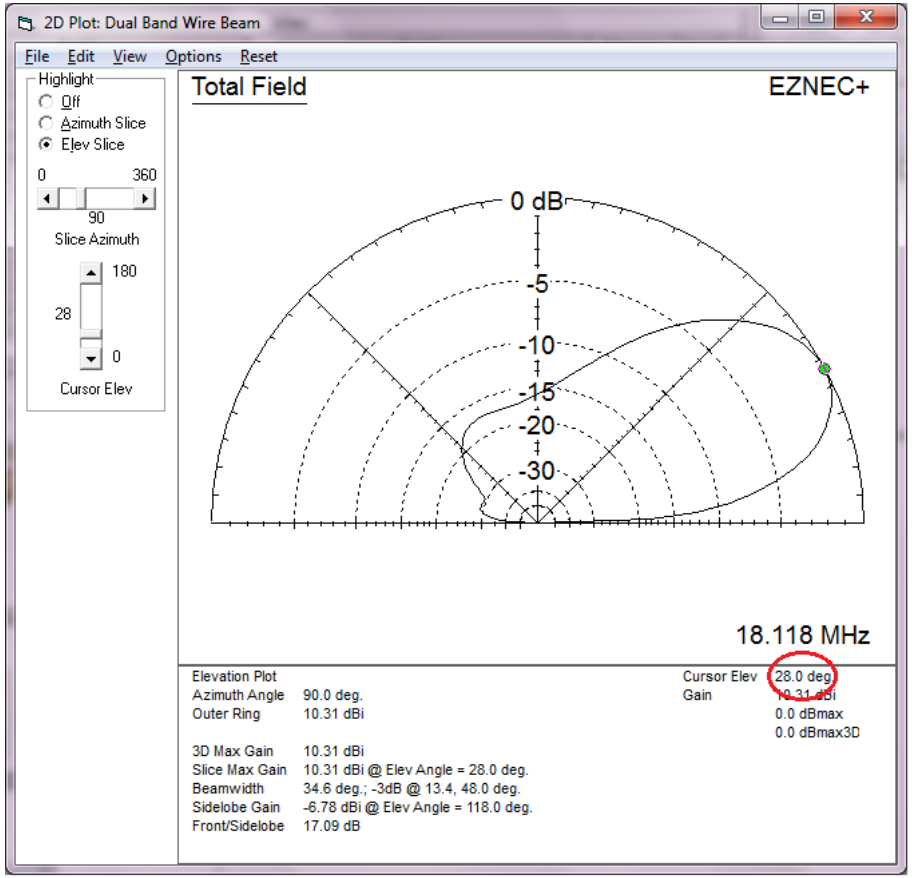


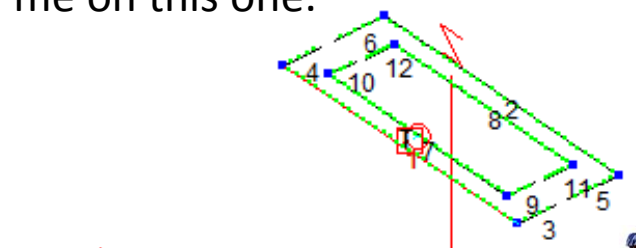
The vertical TOA is 15 degrees

7O6T = #331/327 0136z, 17M SSB

"Yes, I worked you. Your signal was probably the weakest of any I have worked. Propagation was outstanding. Even NE5EE on his screwdriver antenna in SF was louder than you." - Paul, N6PSE

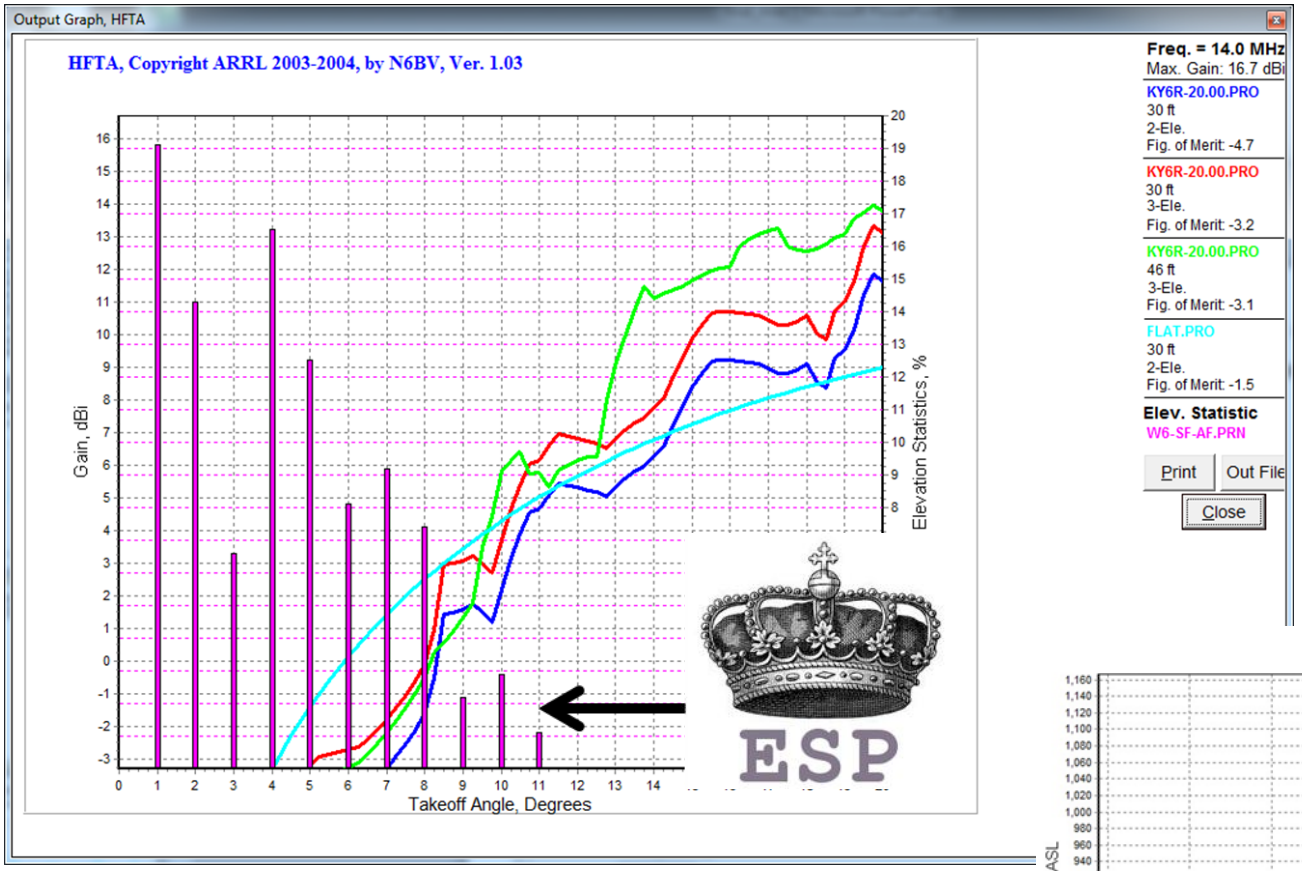
This was a good indicator for working Z8 and E3. A huge thanks to Paul who hung in there with me on this one.

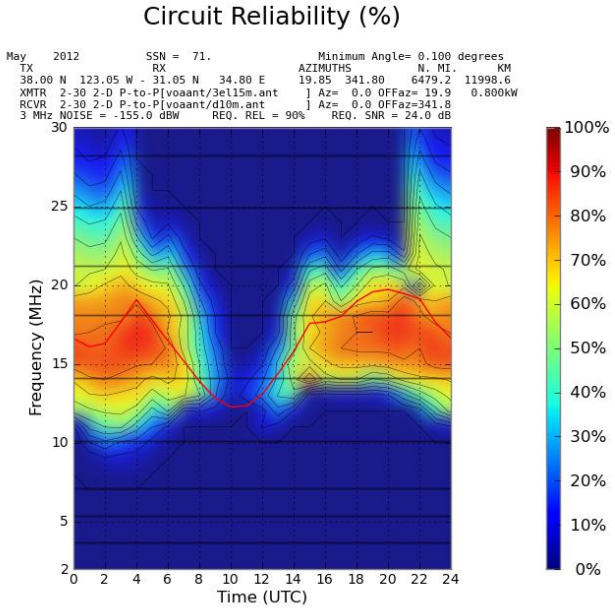


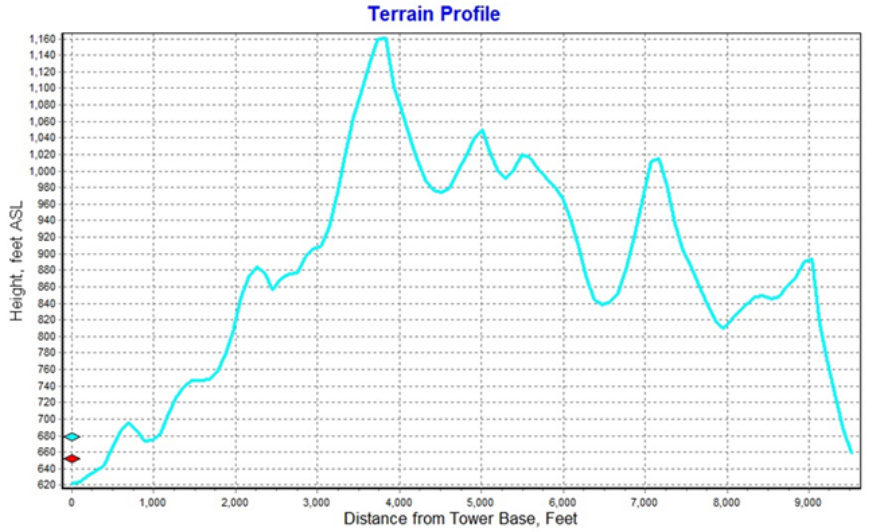


The horizontal TOA
At 25' is 28 degrees

E40VB - #332/328 – May 15, 2012 0429z

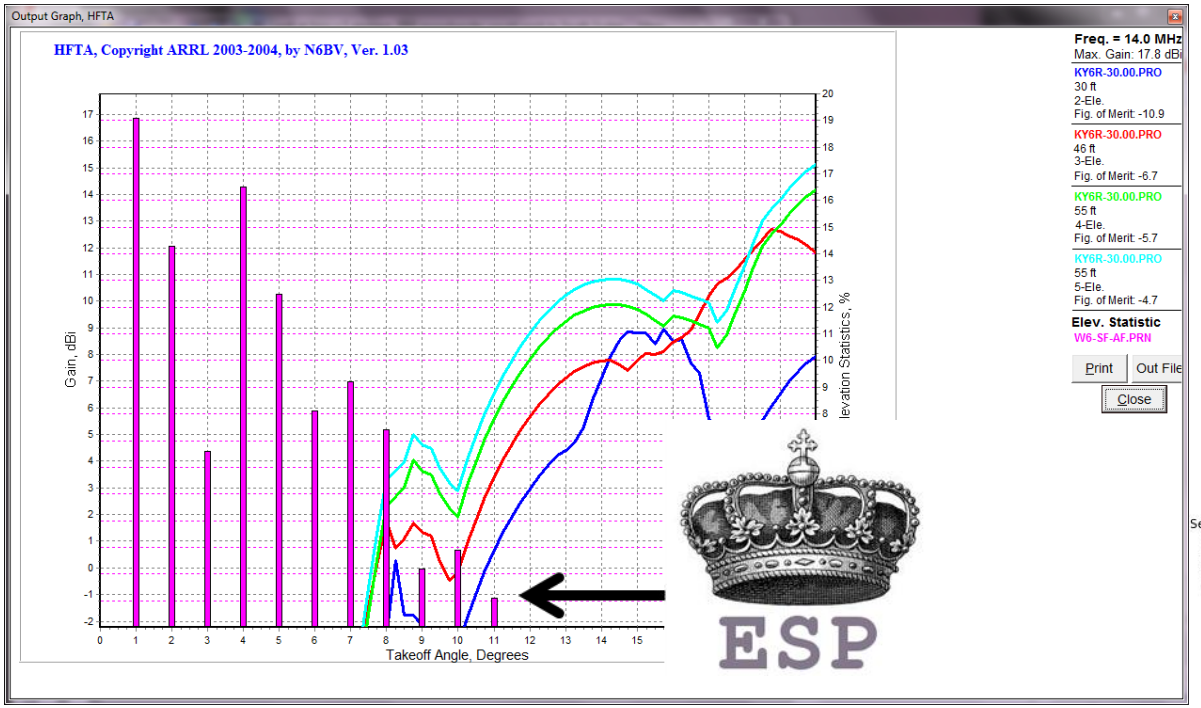




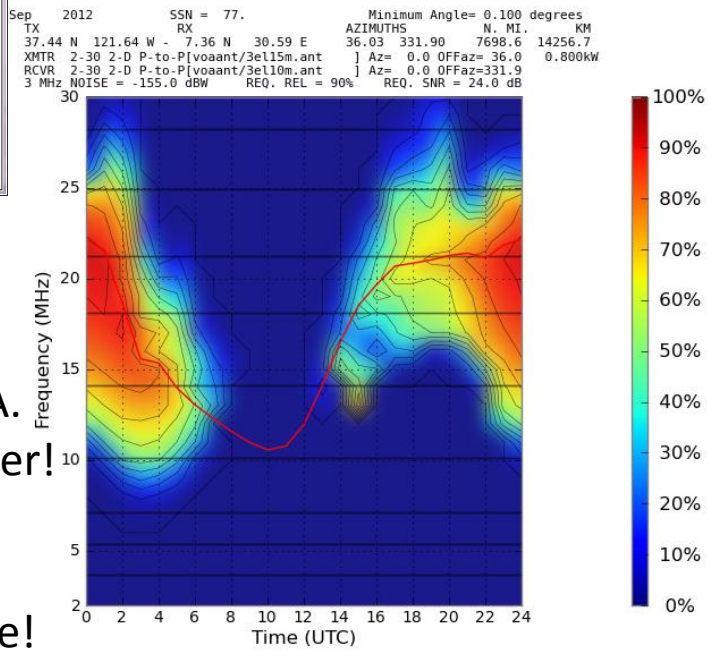


17M should have been good -
but worked him (ESP but easily) on the 20M evening greyline. Vlad is one of the most amazing operators.

Z81D – #333 / 329 - Sep. 13, 2357z



Circuit Reliability (%)



The SSN was 77 today, and for ST0R it was 57. The A3S at 46’ is 2 - 3 dB better than the Moxon at 30’, and a better TOA. A 4 element 20M monobander at 55’ would be 3 - 4 dB better!

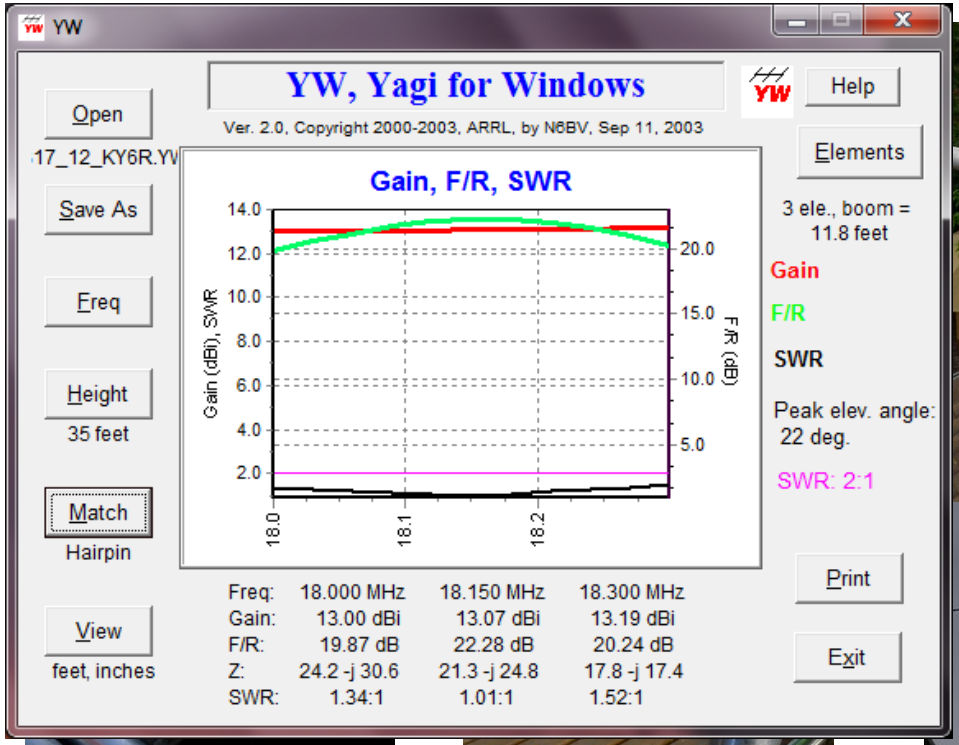
Conclusive proof that even a 1 – 2 dB improvement is worth the time and money spent. A huge thanks to Diya for this one!

And Now, The Final Mile!

Summer 2012 Antenna Fun: One Old Wilson M520 Yagi ($150)

Still have enough left over for a 3 element yagi!

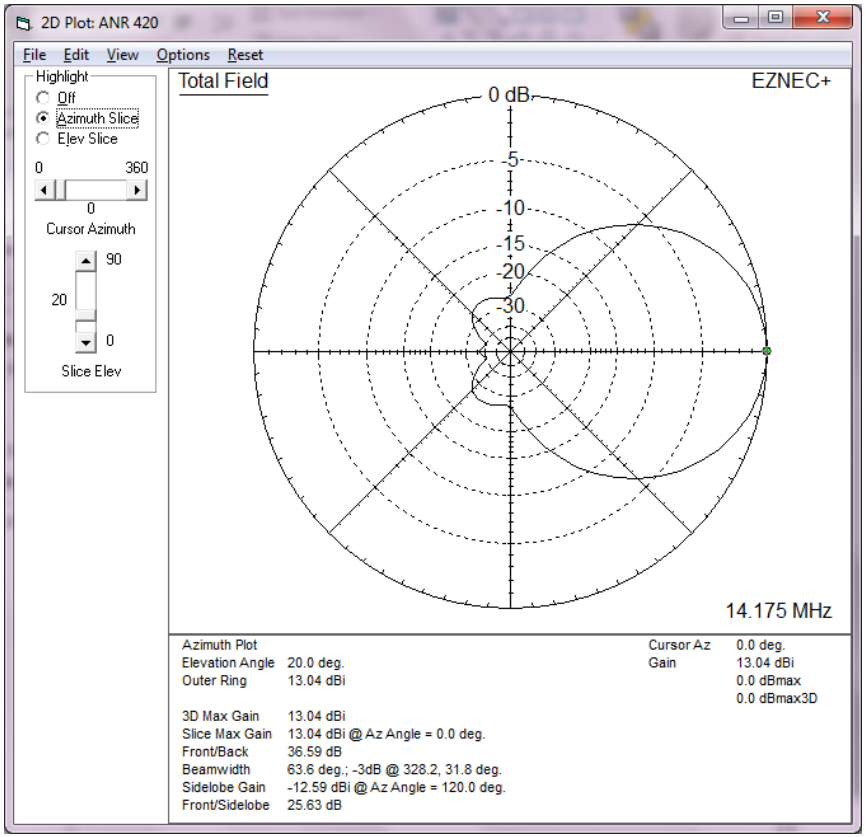
17M Seems to be “Emerging” in Cycle 24

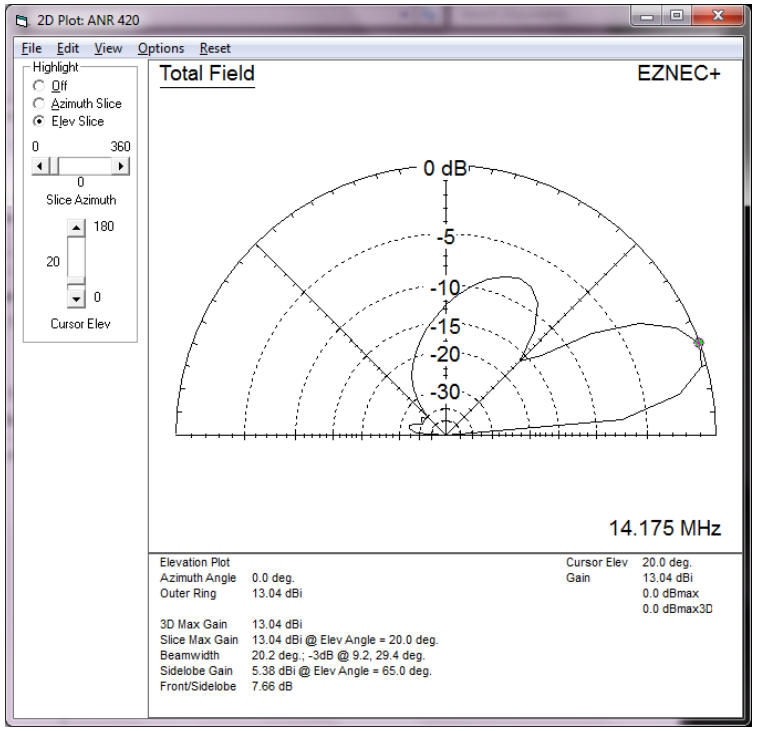


5 dB over a dipole

I keep seeing 17M as the band “open for business” in Cycle 24. So I designed and built a 3 element 17M mono band yagi using another N6BV program, Yagi for Windows (YW). This antenna is 2 dB better than my nested 17/12M Moxon – and willing to give up 12M gain.

4 Element 20M Monobander with a 24’ Boom?





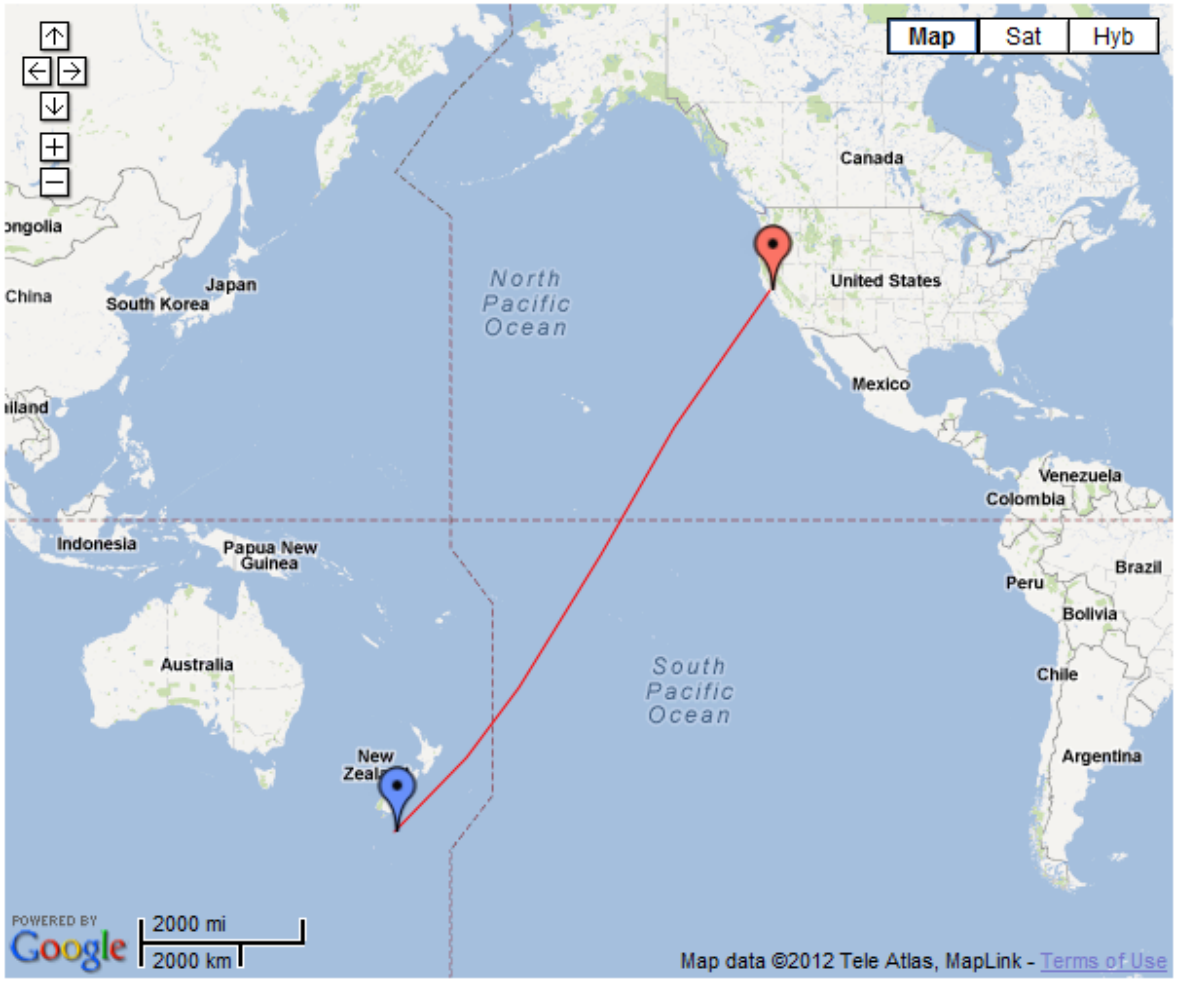
If I can raise it to 55’, its 5 dB over a dipole, 2 dB over the A3S – and drops the TOA by 2 degrees for all the entities that I need. I’d rather have two great mono band yagi’s – one on 17M and the other on 20M than the A3S. I would like to thank W6ANR for this design!

Old 27’ Boom 5 el 10M yagi

Why Replace the A3S with a Mono Bander?

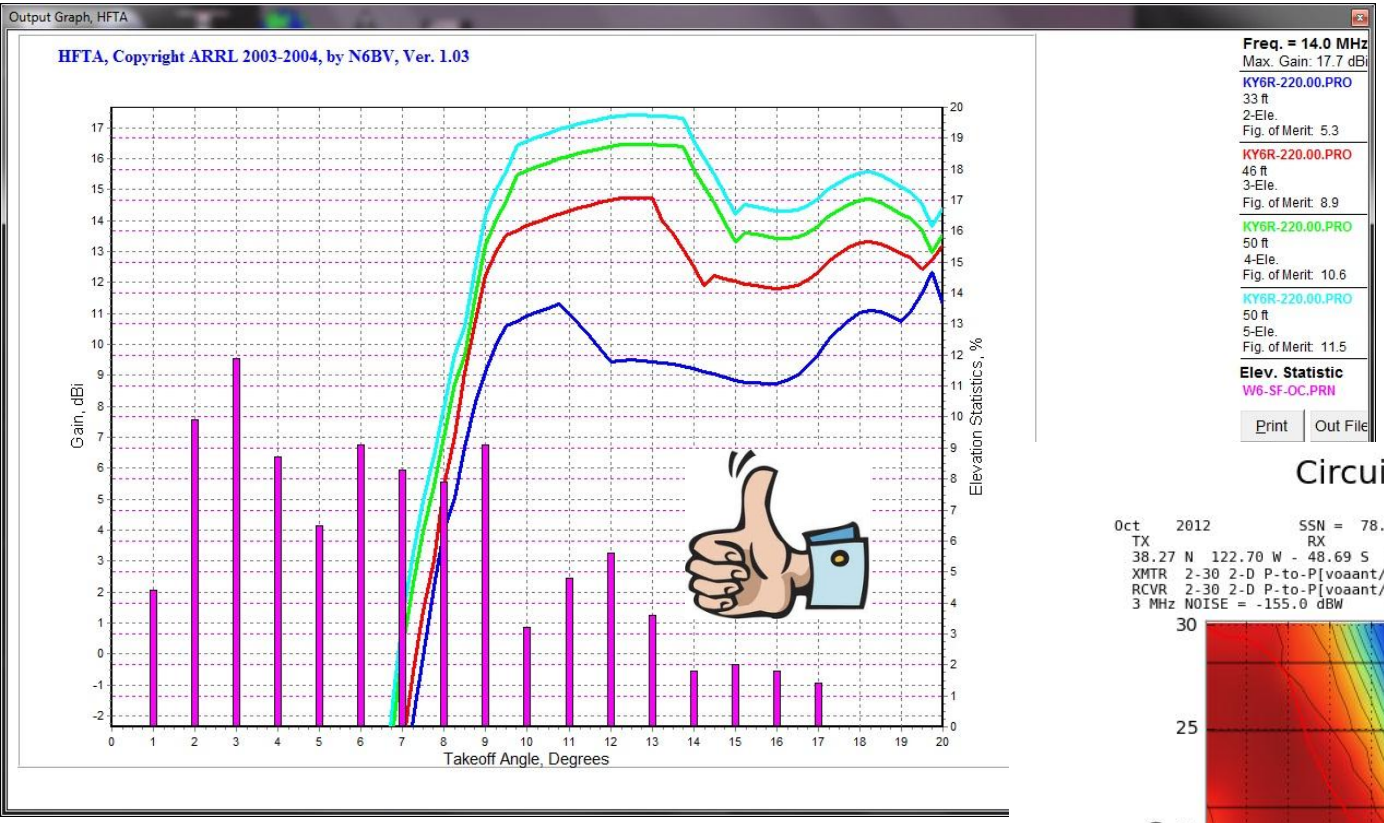
- The problem that I have had is not so much gain as available take off angles
- I have been the ESP king because the angles that I have been able to work are the weakest ones
- If I can drop the angles by 2 degrees and increase the gain by 2 dB, that will make a world of difference
- I'm really tired of being the "ESP King"!

ZL9HR – Campbell Island – Nov 2012

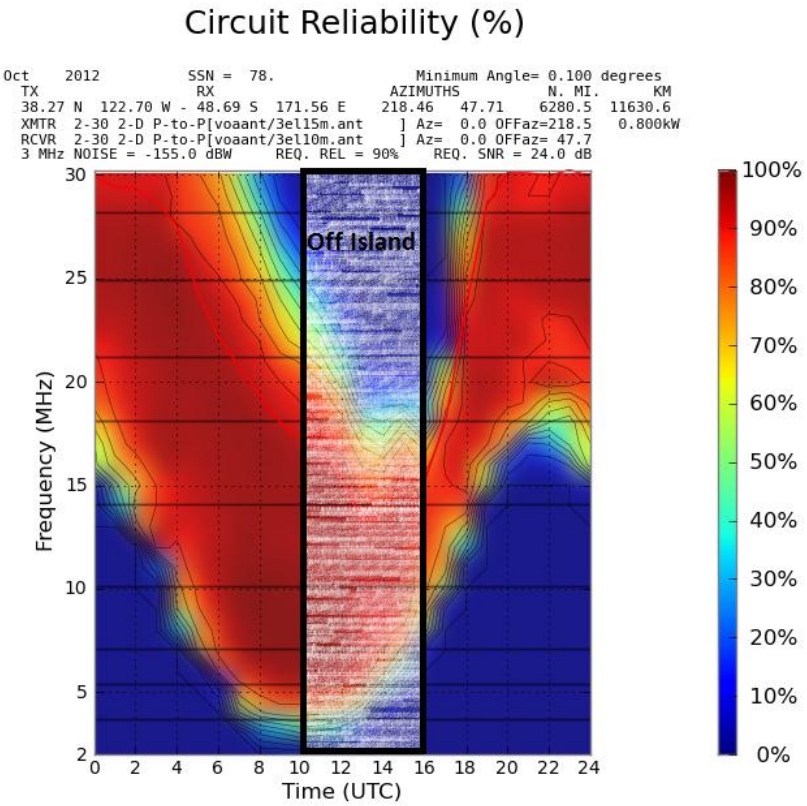


This team has done a fantastic job of pulling this rare activation off.

ZL9HR – Campbell Island

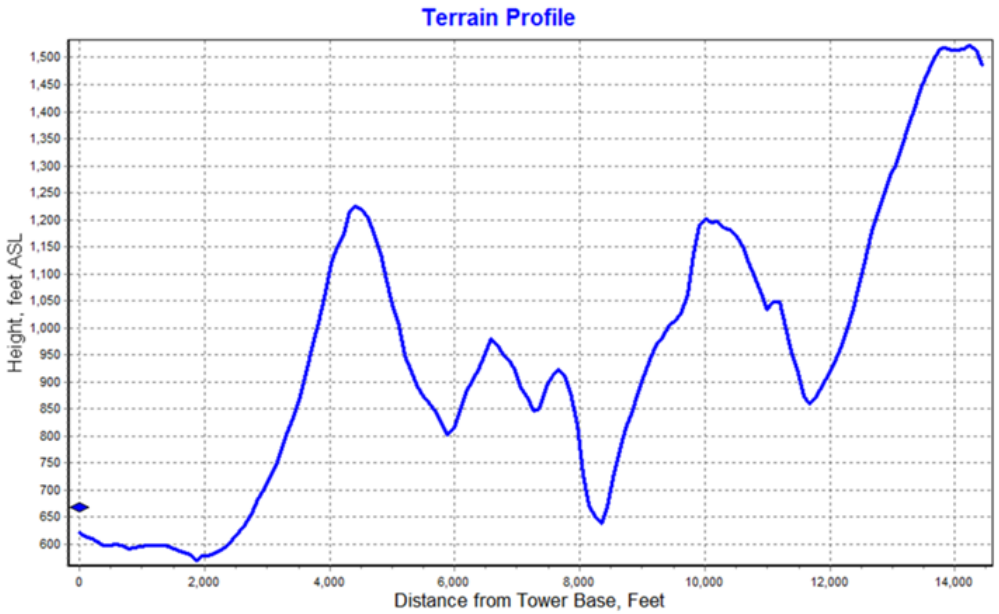


The ZL9HR Team has to be off island from (roughly) 1000 – 1600z

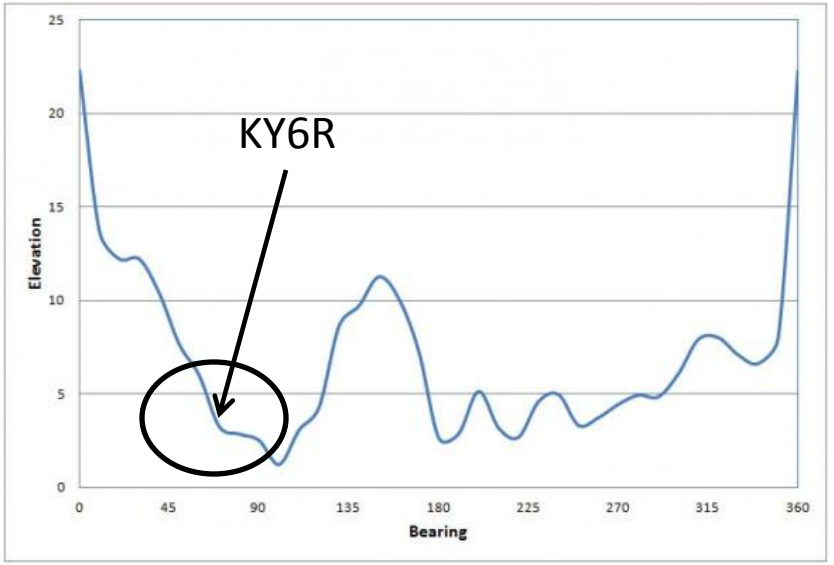


The A3S at 46’ is 3 - 5 dB better than what I had last year. A 4 element 20M yagi at 50’ would be 5 – 6 dB better, and a 5 element yagi up 50’ would be 6 – 7 dB better.

ZL9HR Terrain – to KY6R



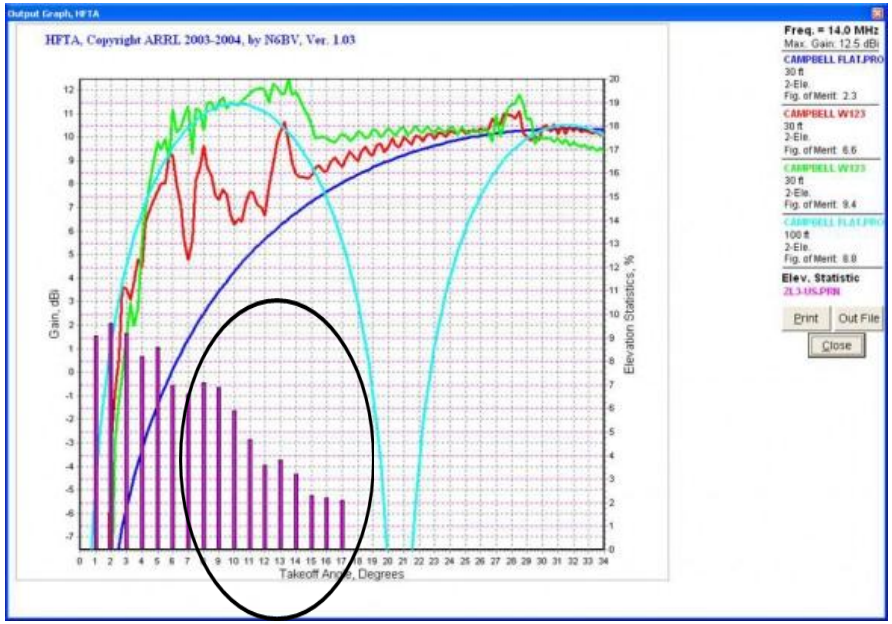
KY6R Terrain
"Side Slice Model"



ZL9HR Terrain
"Panoramic View"
(Diagram courtesy of K3EL)

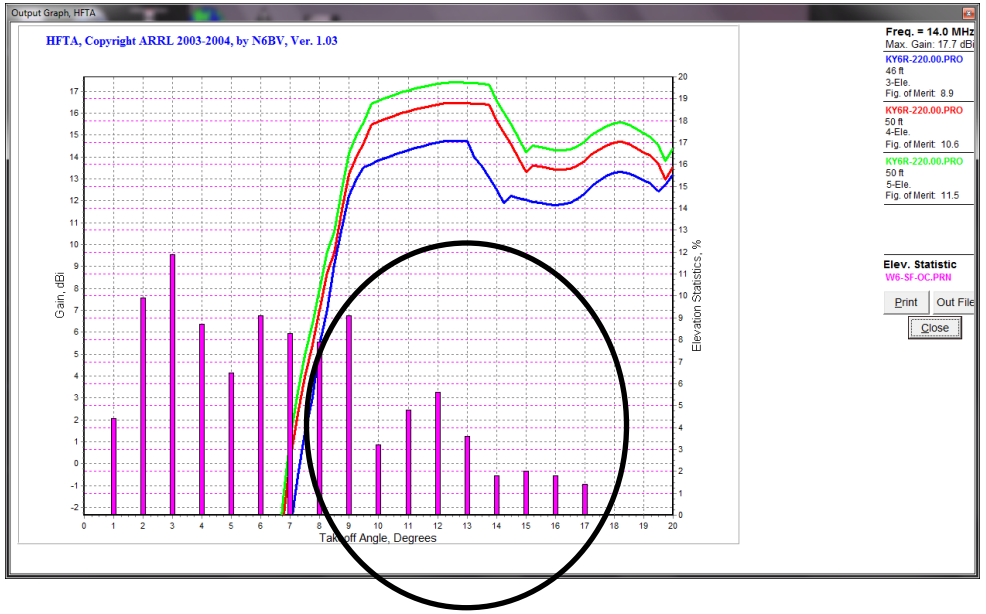
The path between ZL9HR and KY6R is really excellent. Much better than from KY6R to 7O6T!

ZL9HR to the West Coast



ZL9HR to North America

(HFTA diagram courtesy of K3EL)



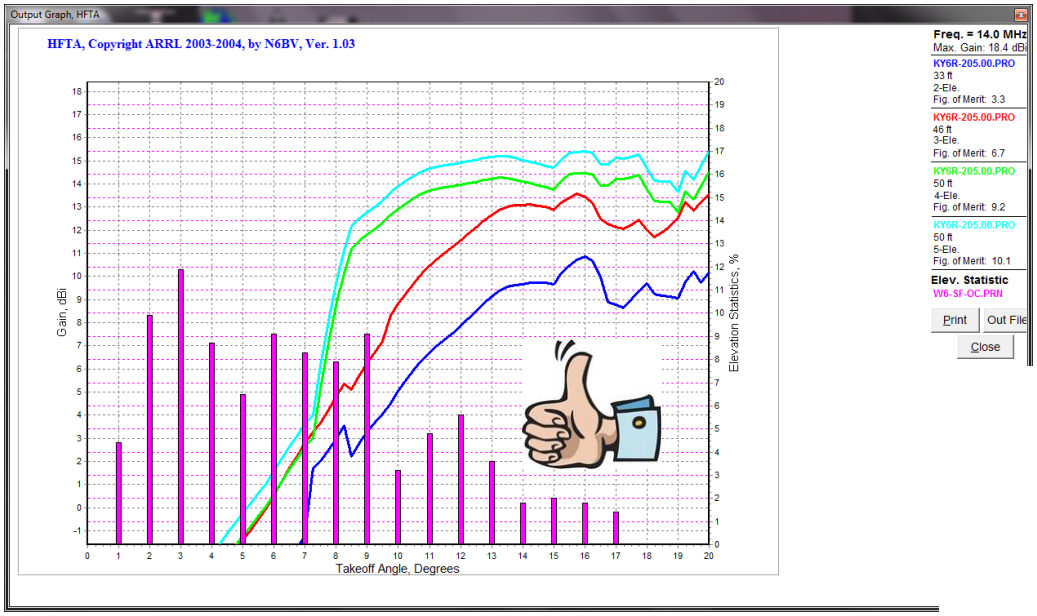
KY6R to ZL9HR

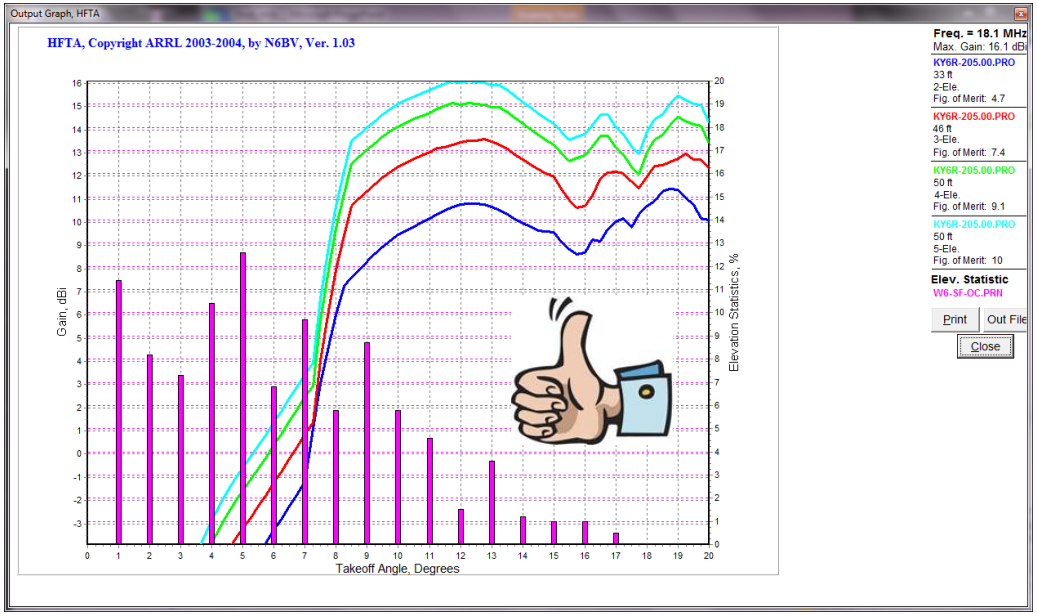
ZL9HR, being on an island and on a bluff overlooking salt water will support low angles From 1 – 17 degrees.

At KY6R, the hills surrounding my QTH block angles between 1 – 7 degrees, but support angles 8 – 17 very well and with substantial gain.

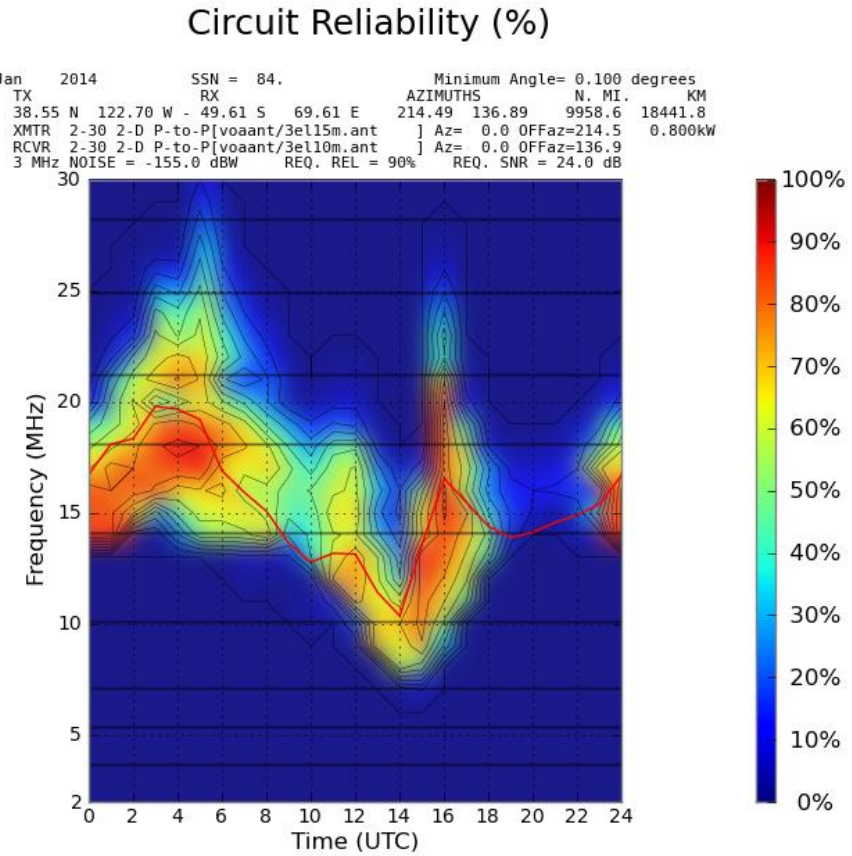
VK0/H Heard Island

VK0/H – Heard Island (Jan 2014)

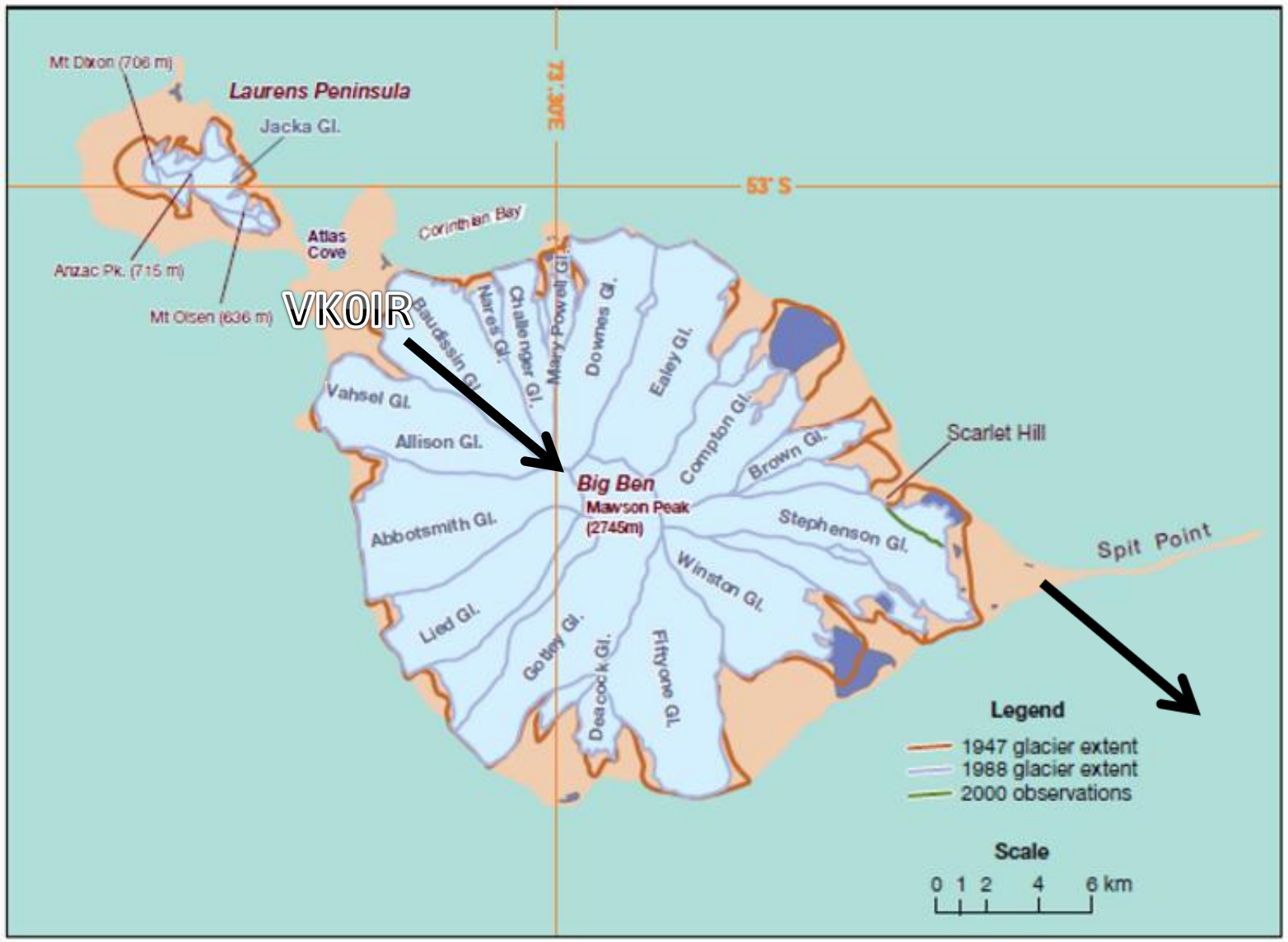




I will most definitely replace the A3S with a 4 element 20M yagi by the time Heard Island 2014 is activated. I will also most likely upgrade my 3 element 17M yagi to a 4 element OWA design.

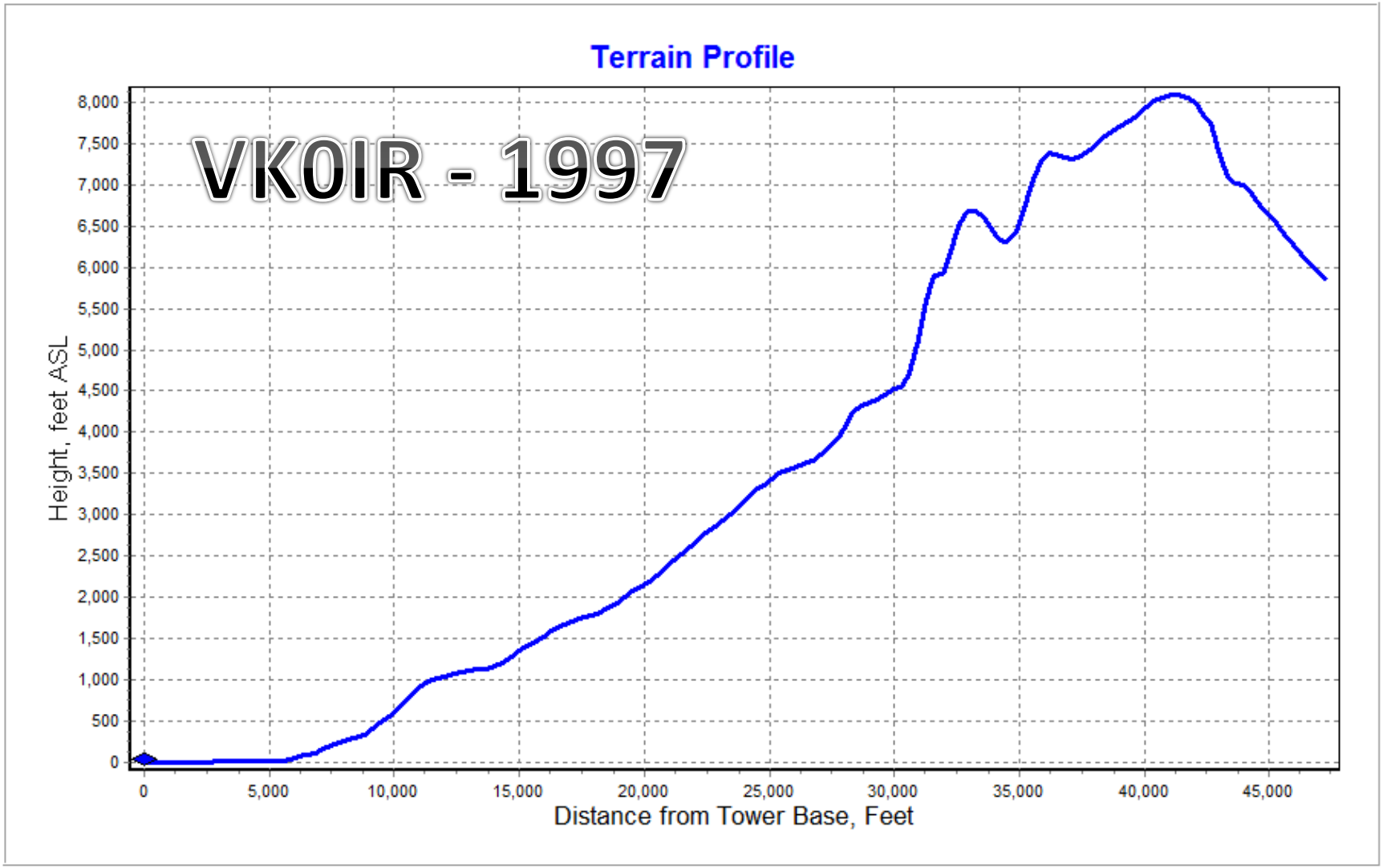


From VK0/H to KY6R = 138º



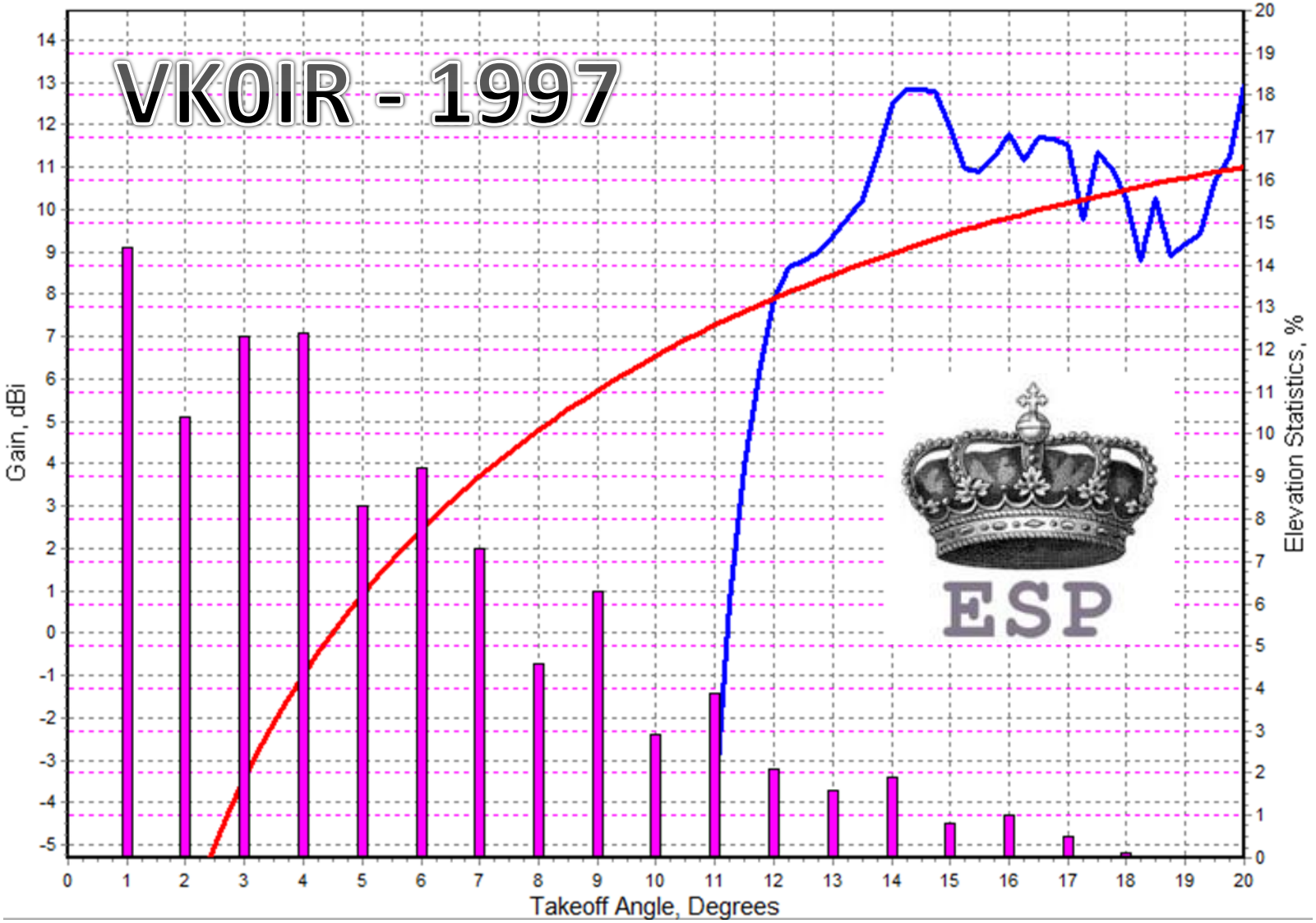
ANDREW RUDDELL

From “Atlas Cove” to KY6R = 138°



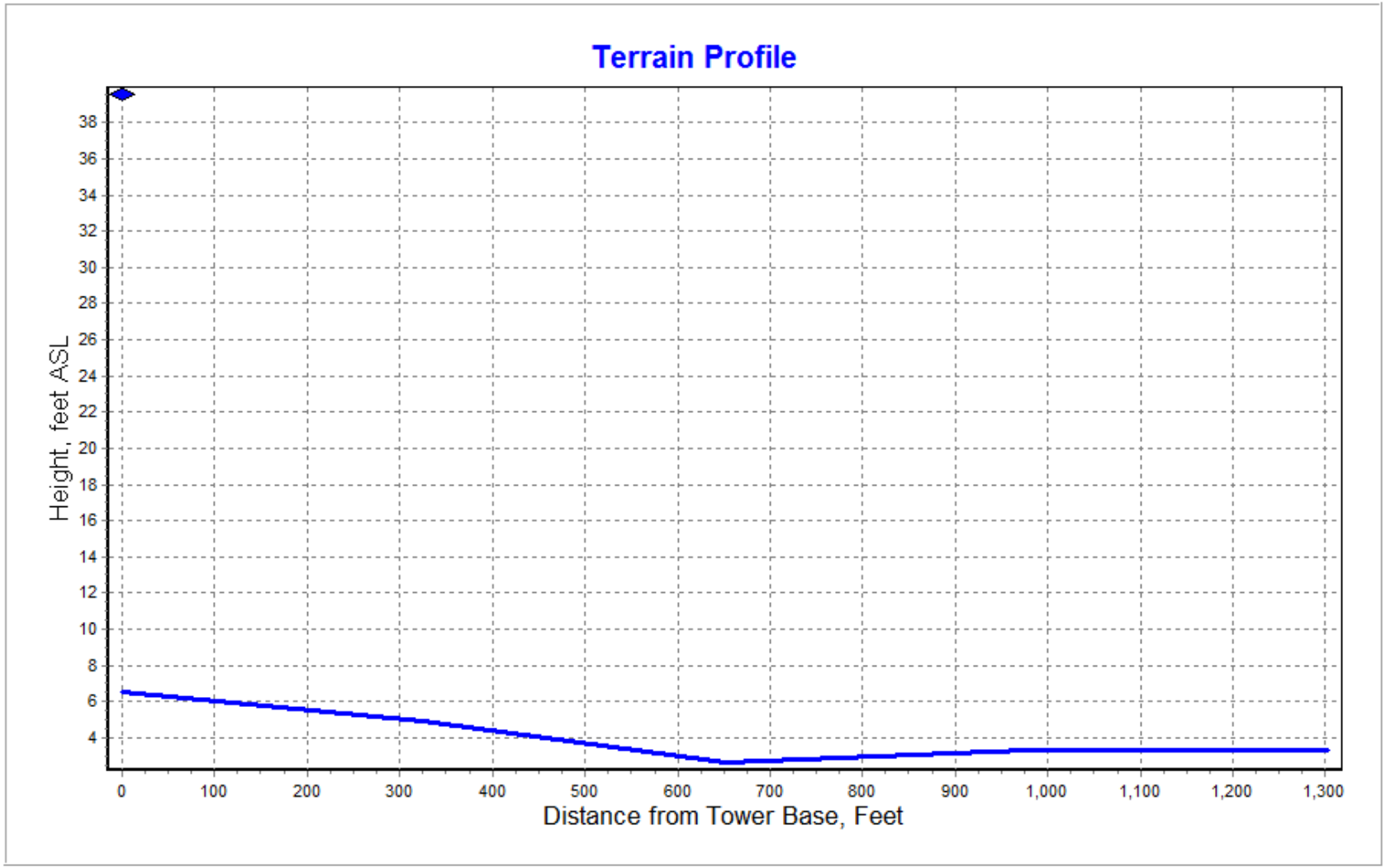
HFTA Data and Analysis provided by Dean Straw, N6BV

From “Atlas Cove” to KY6R = 138º



HFTA Data and Analysis provided by Dean Straw, N6BV

From “Spit Point” to KY6R = 138^{o}

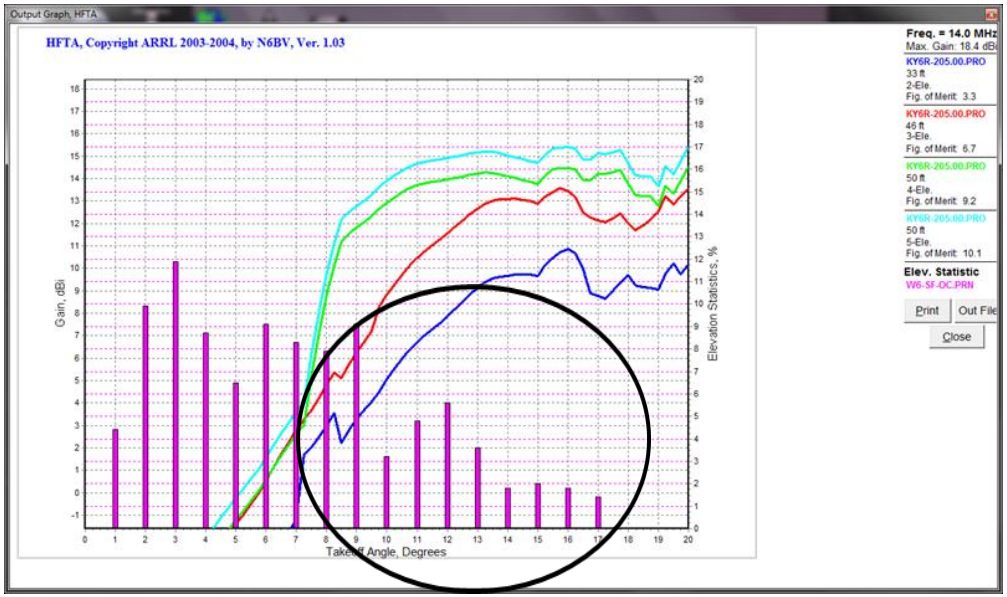


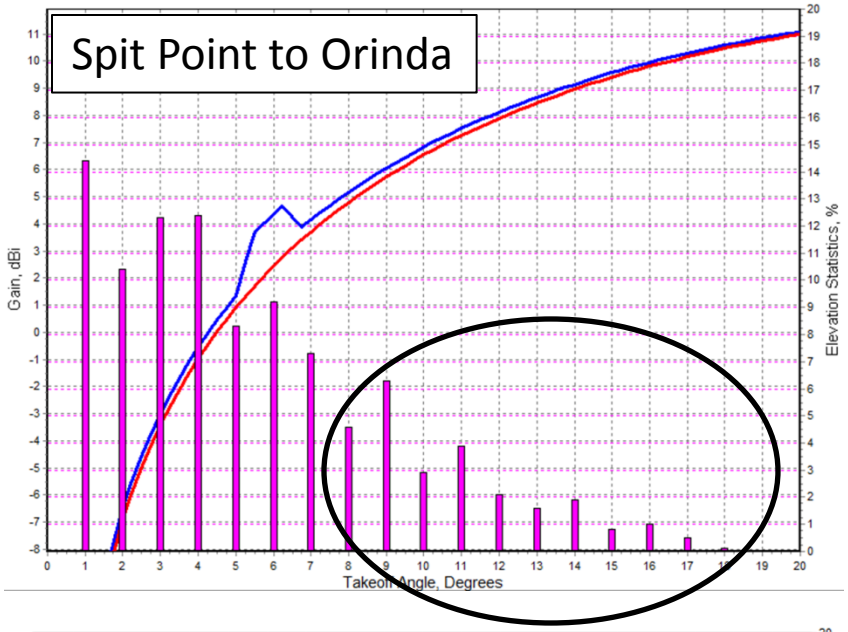
HFTA Data and Analysis provided by Dean Straw, N6BV

From “Spit Point” to KY6R = 138º

HFTA Data and Analysis provided by Dean Straw, N6BV

I Left My Heart at Spit Point



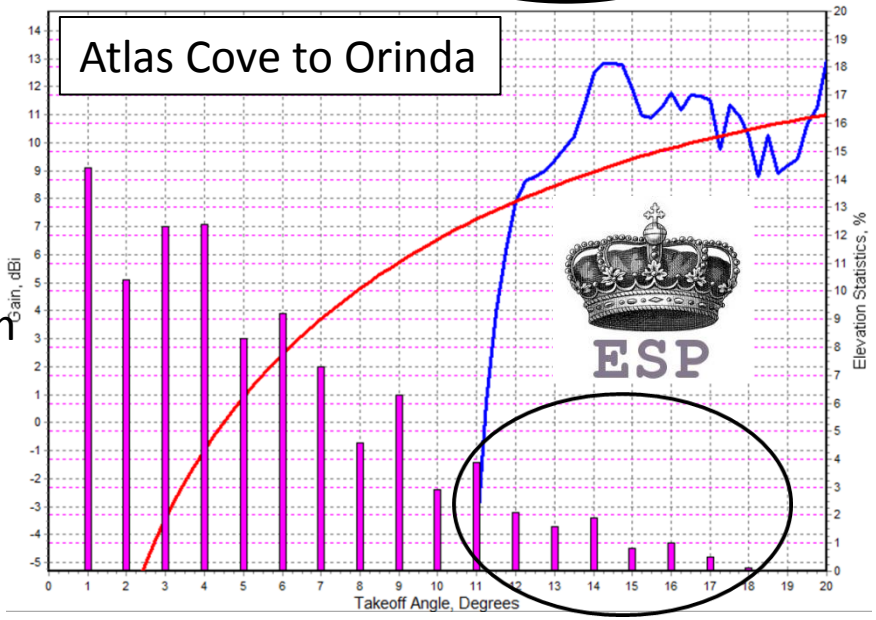


Orinda to Heard Island – 8 to 17 usable degrees TOA.

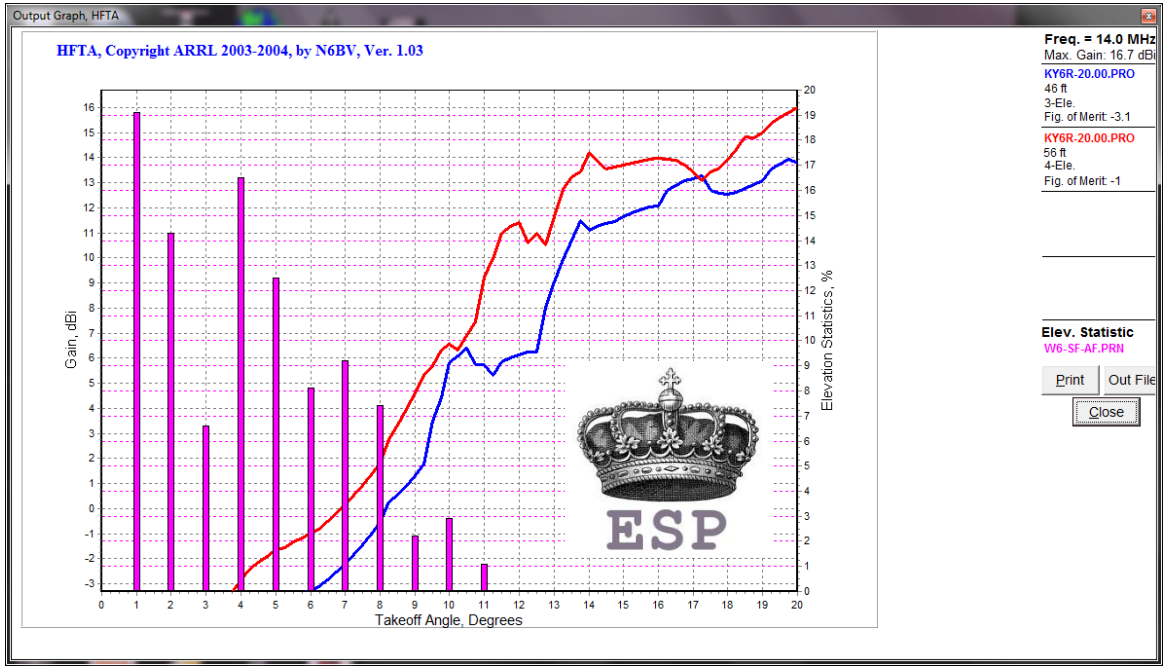
Spit Point supports Orinda usable angles from 8 – 17 degrees TOA – well out of the “ESP” range.

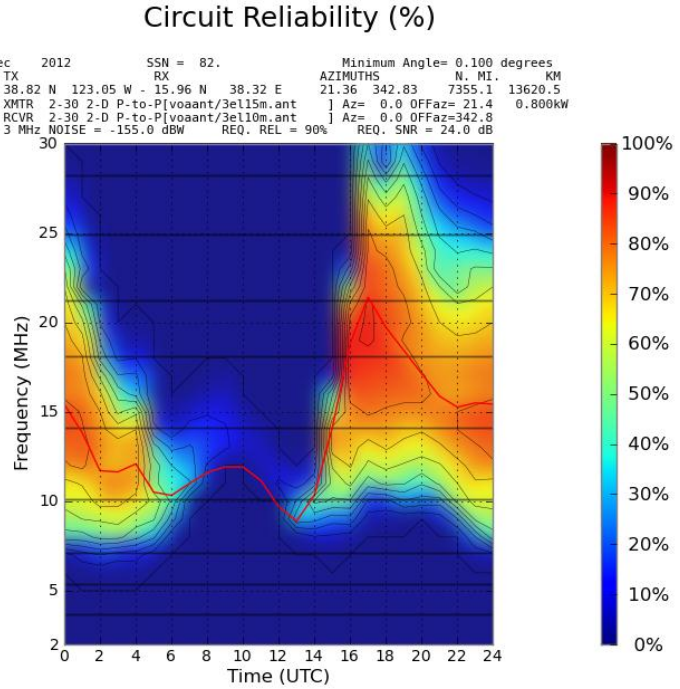
Atlas Cove only supports Orinda usable angles from 12 – 17 TOA, and this would be in the “ESP” range.

The best angles for KY6R are between 8 and 13.

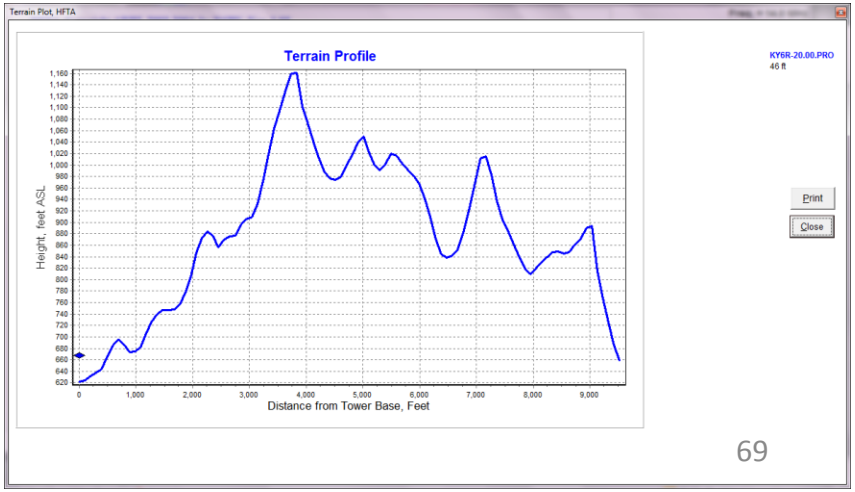


E3 - Eritrea

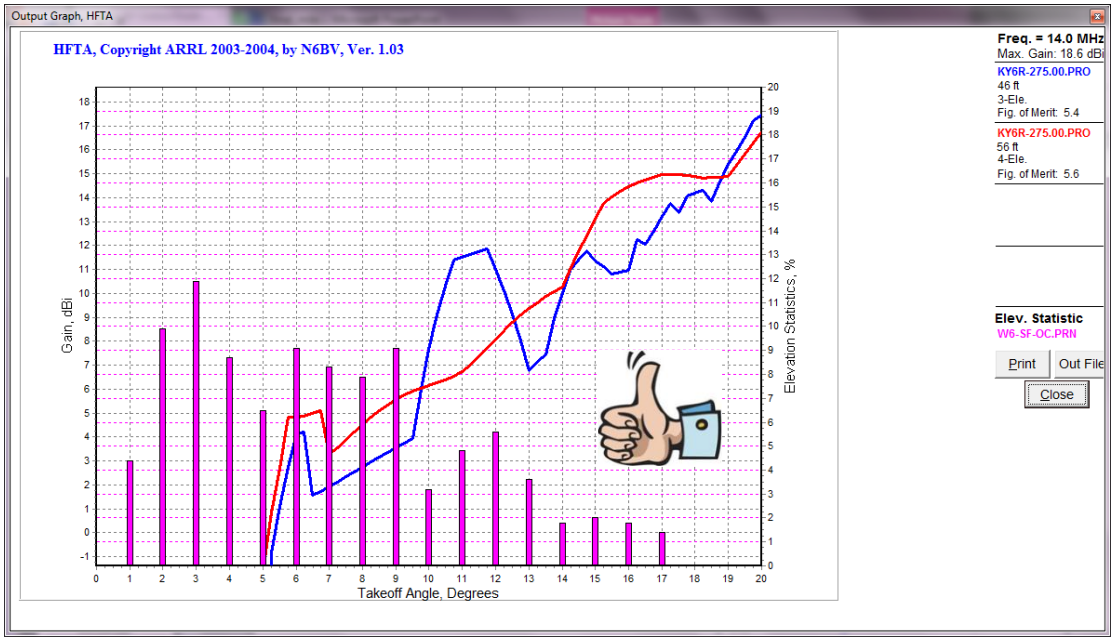


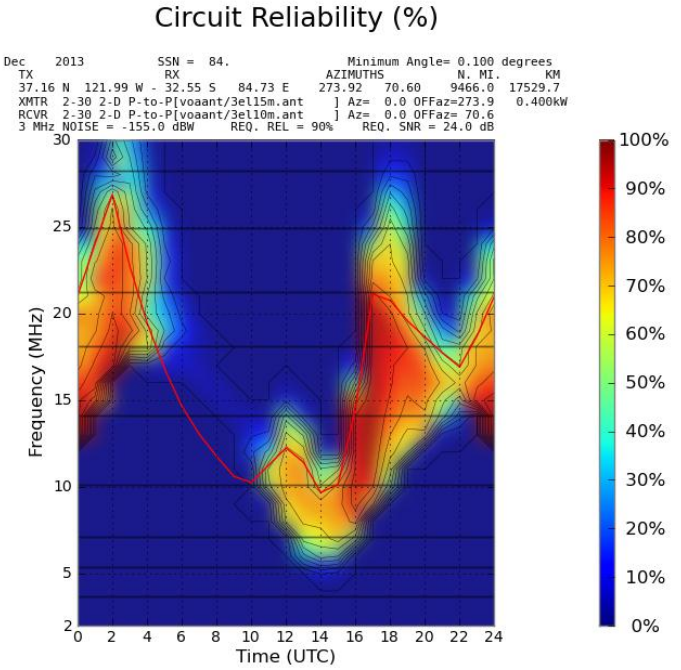


I'd love to replace the A3S with my new 4 element 20M OWA design yagi. The problem is that I would then degrade 15M – which would be a good band to work Eritrea – if it is activated in the next year or so. Recent security concerns will keep Eritrea very rare . . .



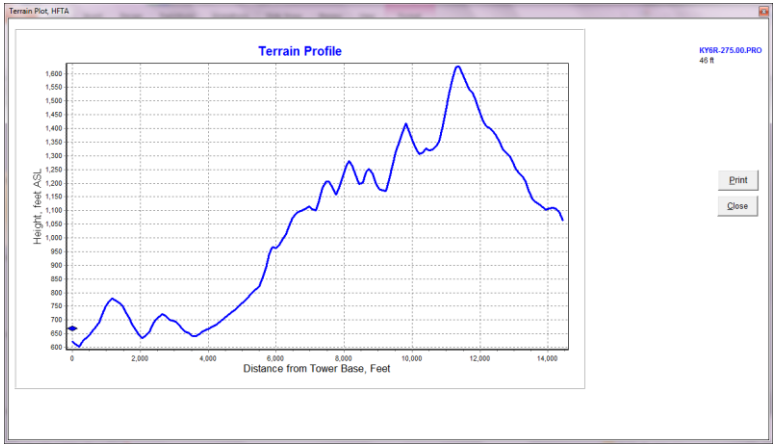
FT5Z – Amsterdam / St. Paul



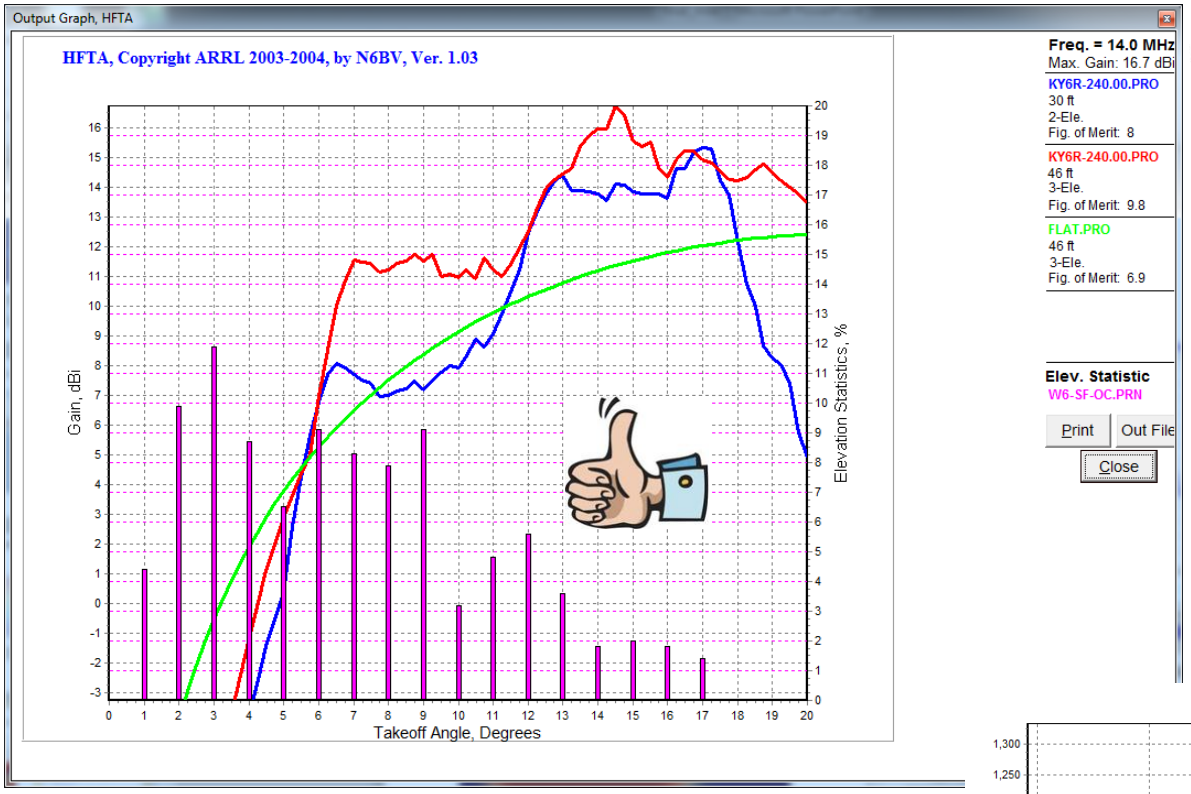


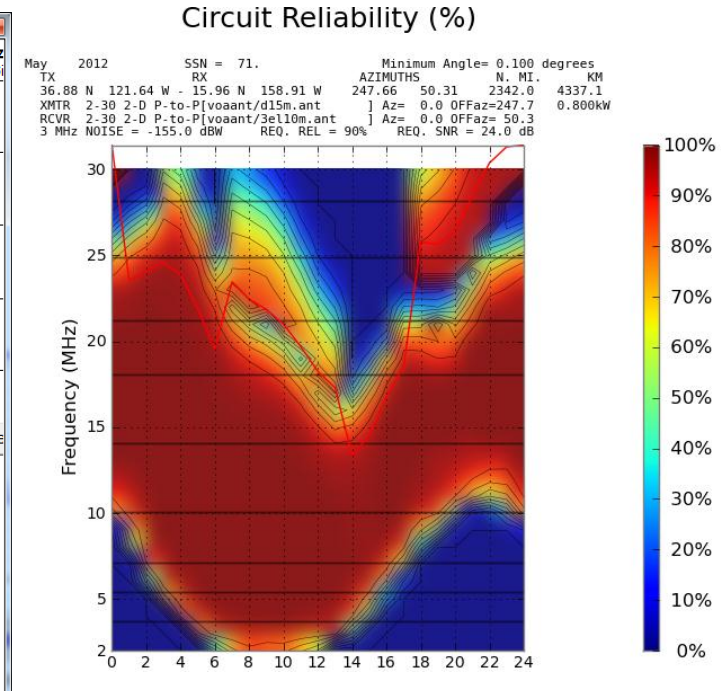
If FT5Z were to be activated in December 2013,
I would have short but high probability openings
On 40, 30, 20, 17 and 15M between 1600 – 1800z
and 20 or 17M between 0000 – 0300z.

To beat the rest of the USA, 40 or 30M at the West Coast sunrise would be awesome – like TO4E was in 2005. 20M might be a good bet after sundown, but not very likely to thwart the East Coasters.

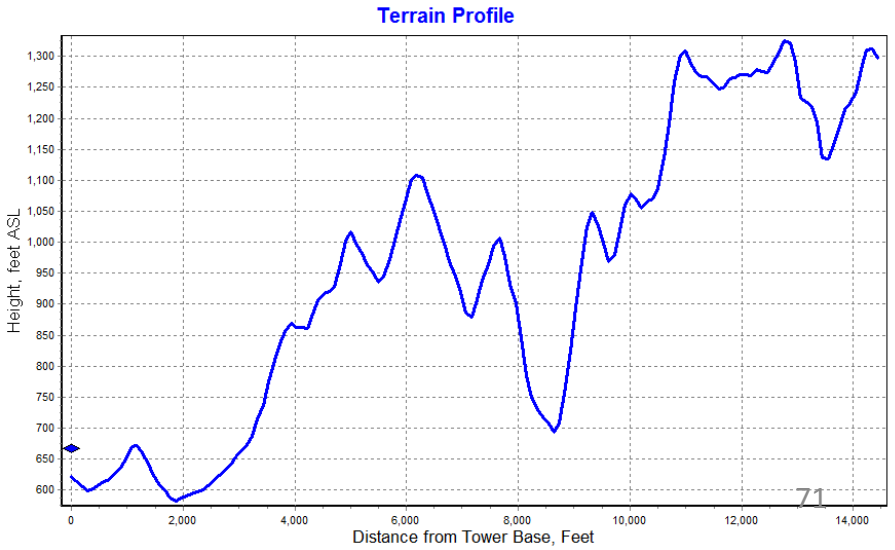


KH5K – Kingman Island

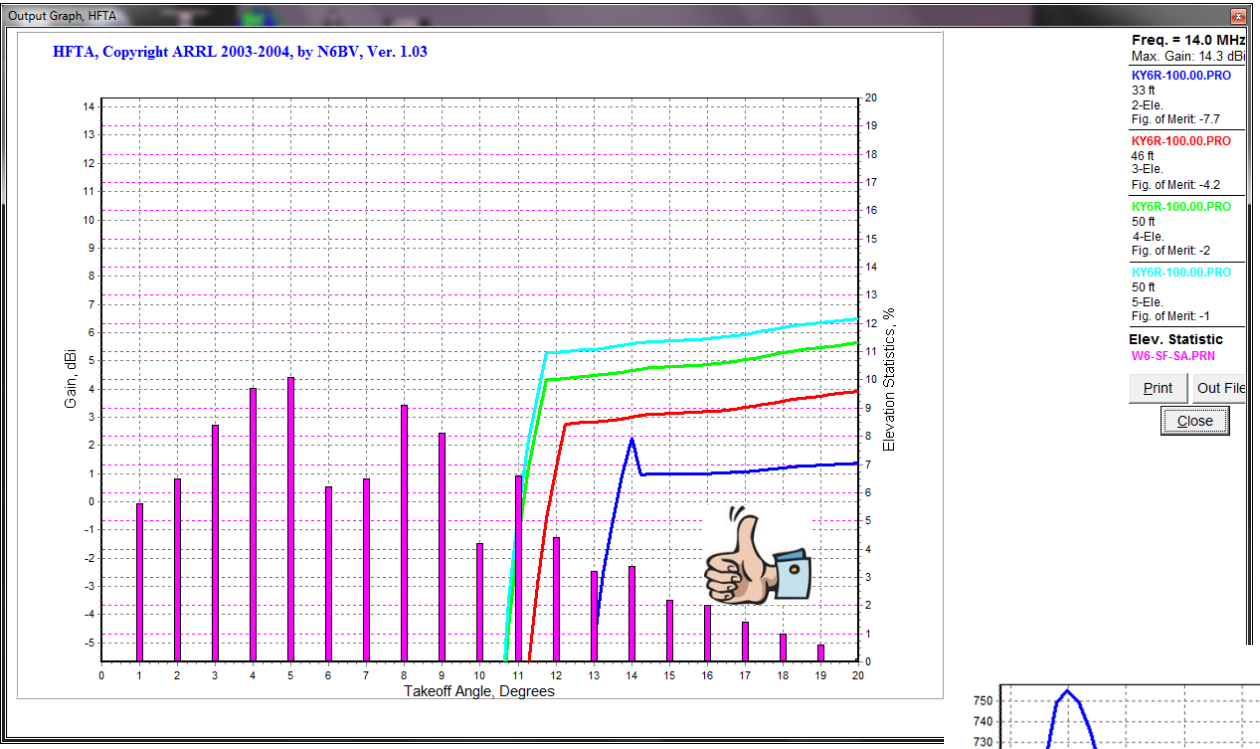


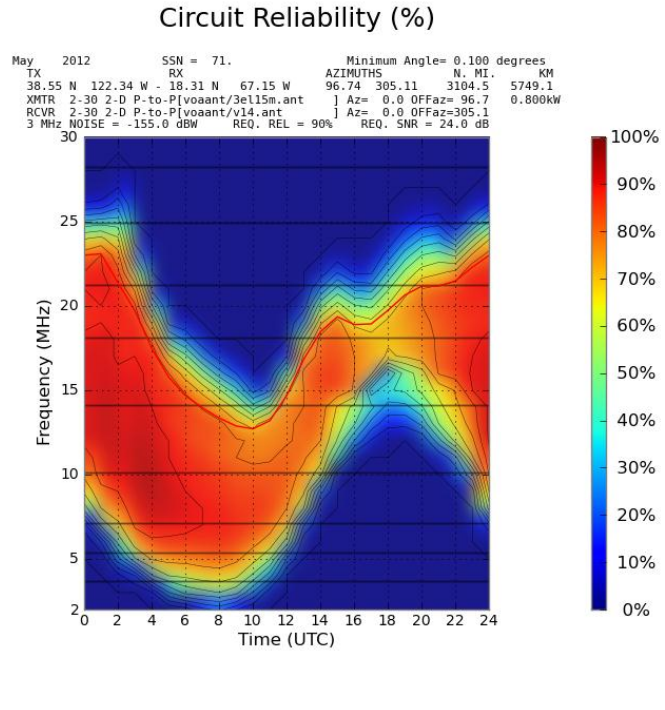


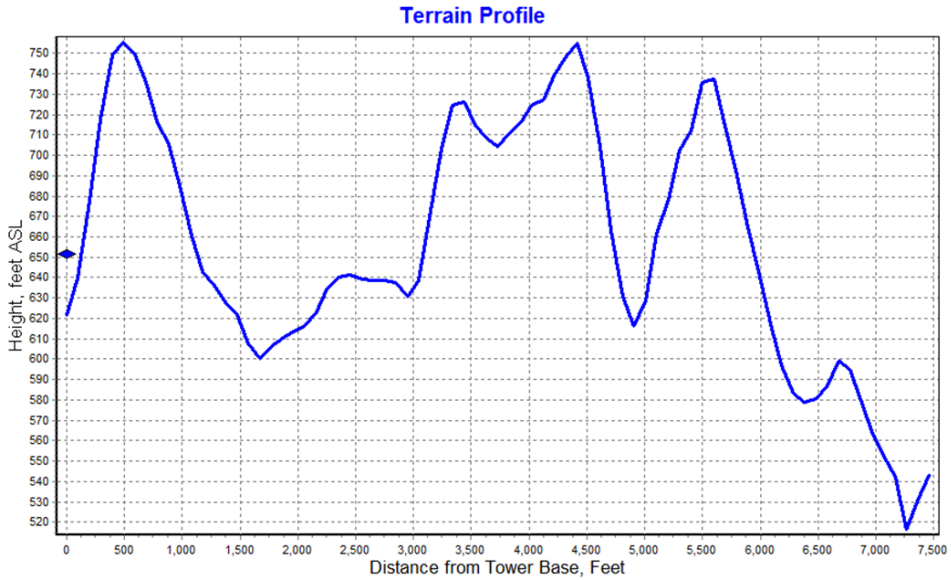
Will be 3 - 5 dB better with A3S up 46'.
Would have been easy from the West Coast with something as simple as a vertical.



KP1 - Navassa

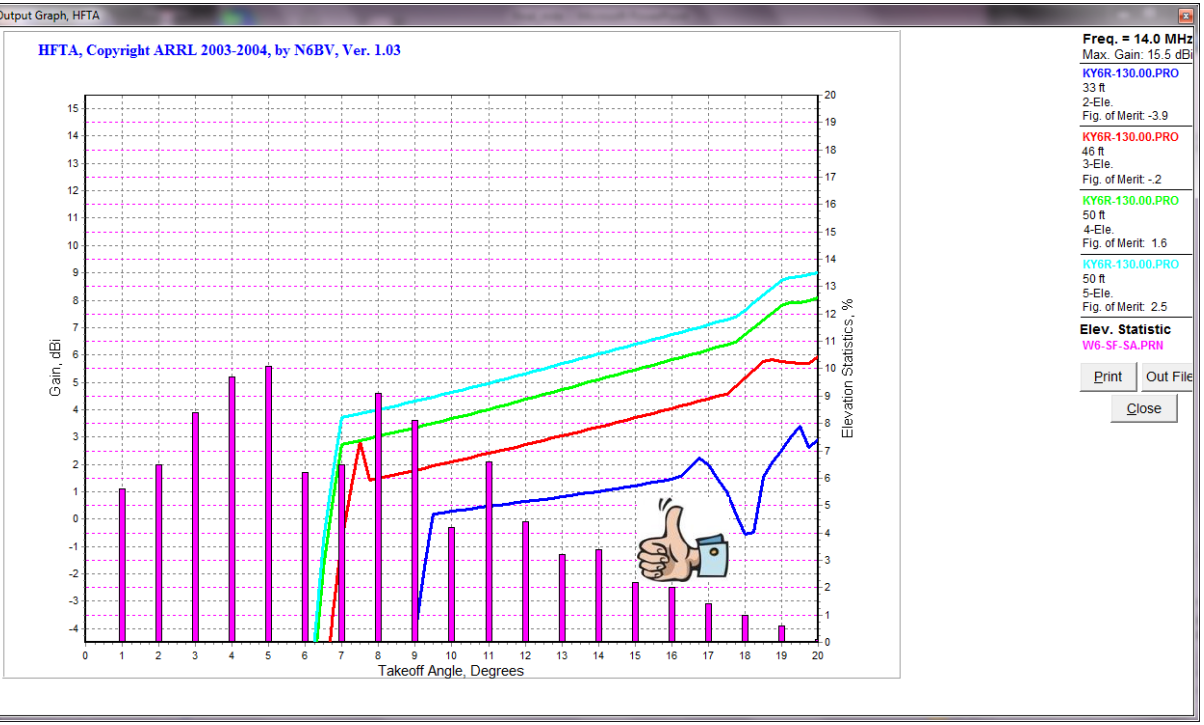


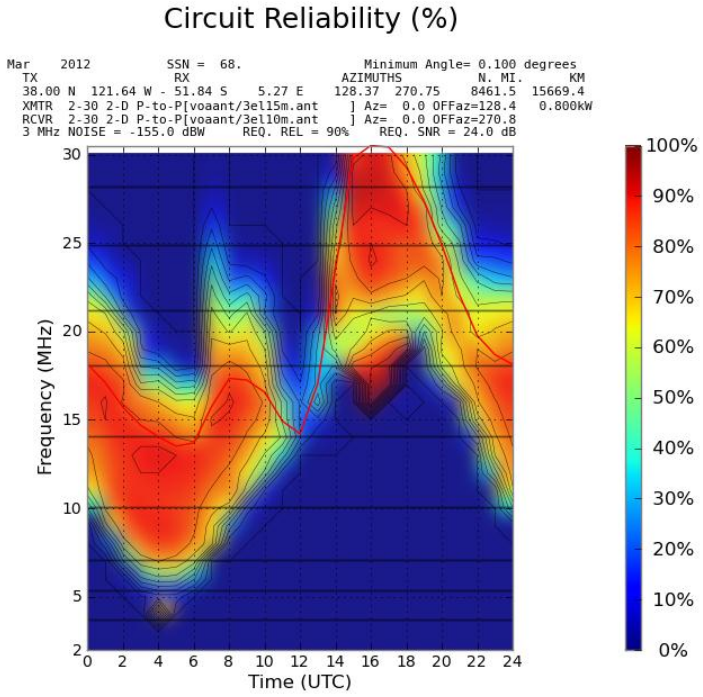




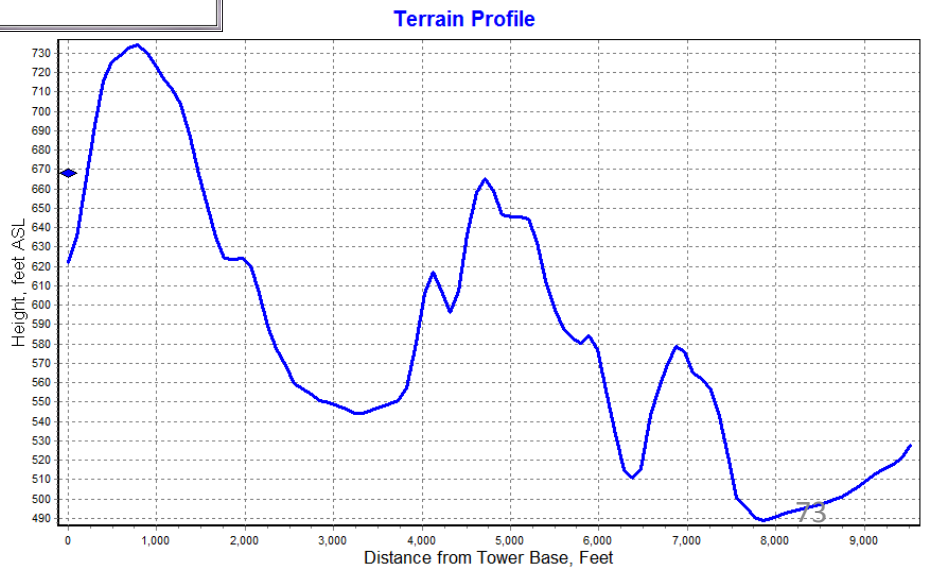
It was rumored that KP1 would be Activated in Spring 2012, SSN = 85. A3S at 46’ will make this much easier, but would have been pretty easy any way. The 4 element 20M yagi would be 2 dB better than that. Just a dream for now.

3Y0/B - Bouvet

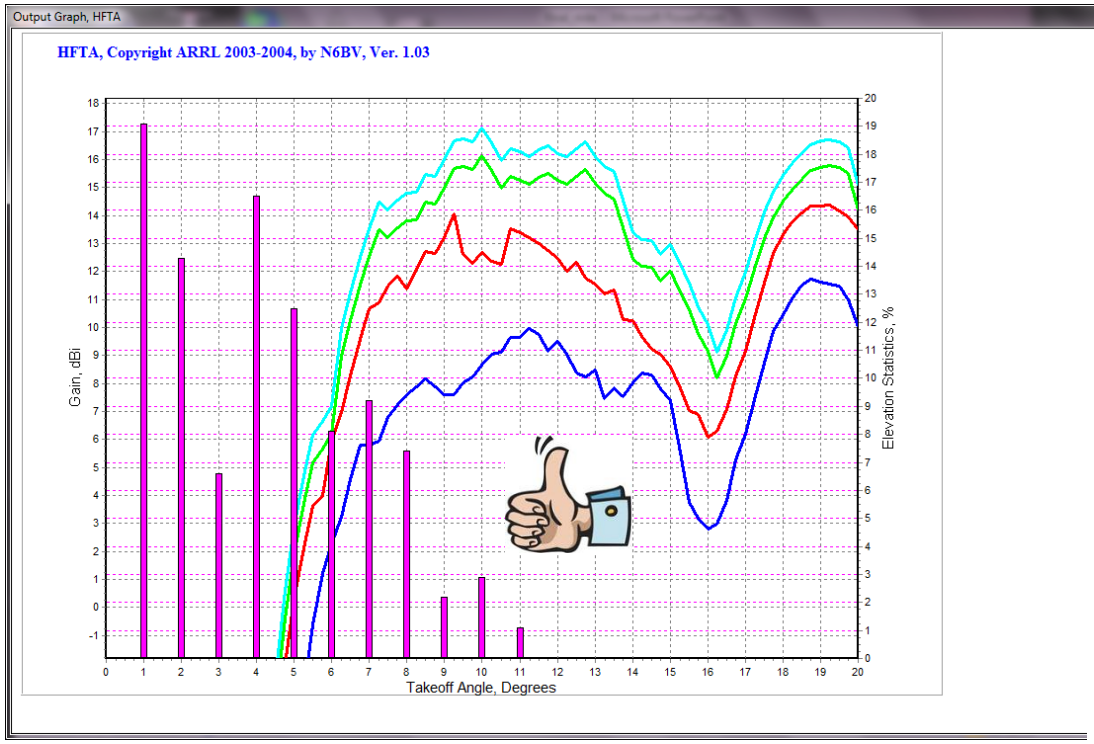


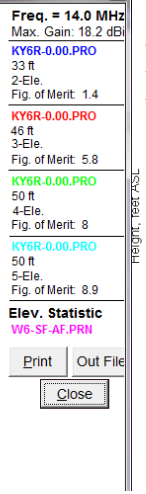


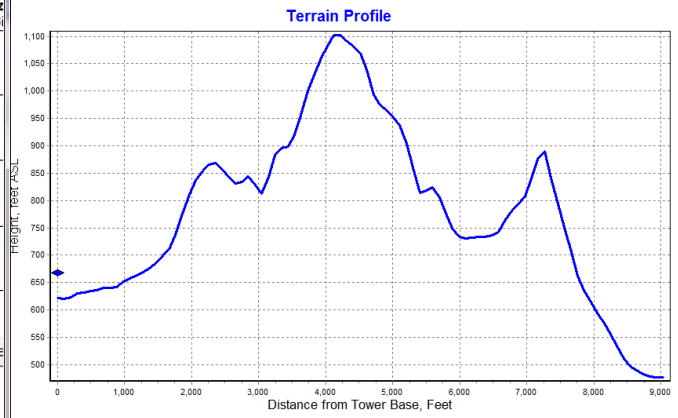
If Bouvet were activated in March 2012, my A3S would have out performed my old 20M Moxon by 2 dB and with 17% more angles Available. The 4 element 20M yagi would be 2 dB even better. Just a dream for now.

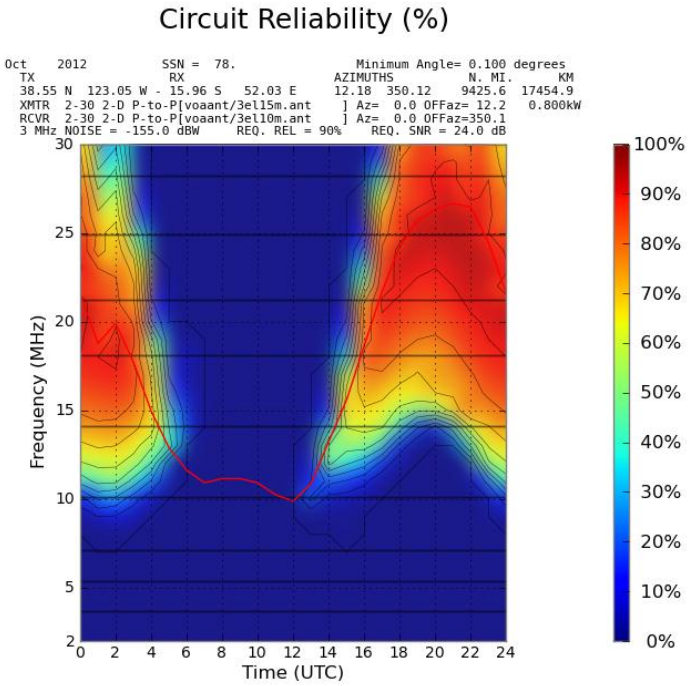


FR/T – Tromelin – Short Path



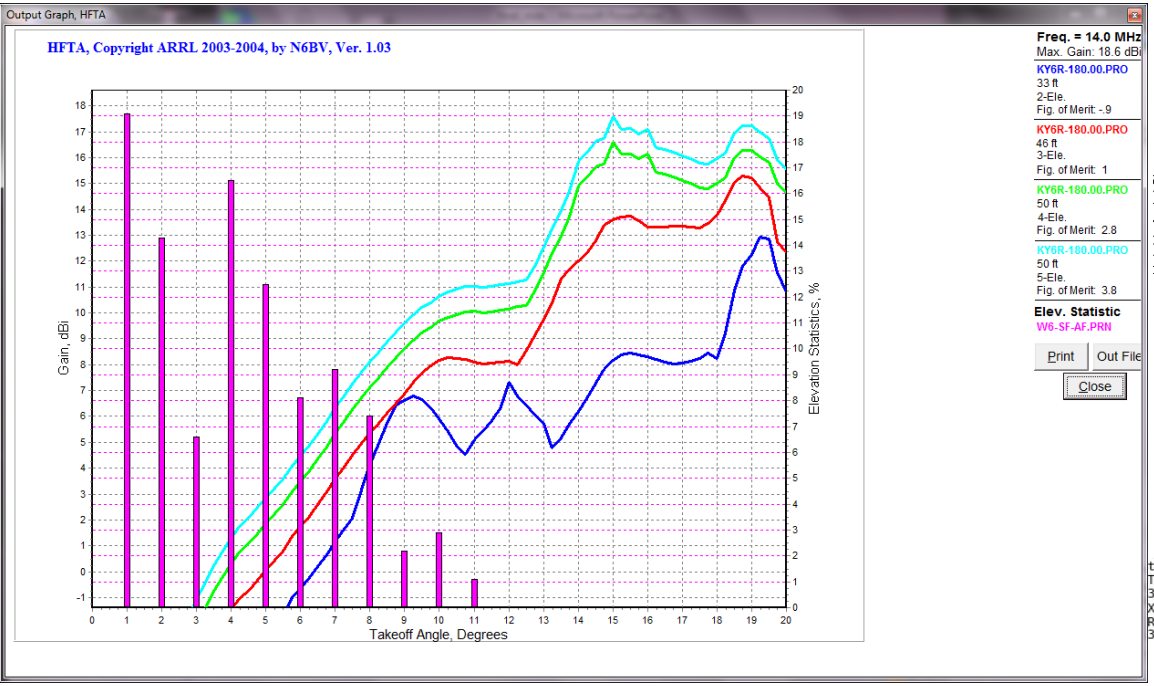


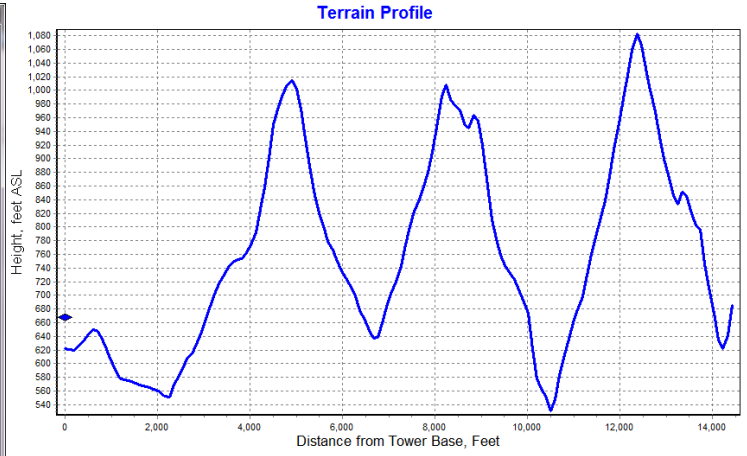


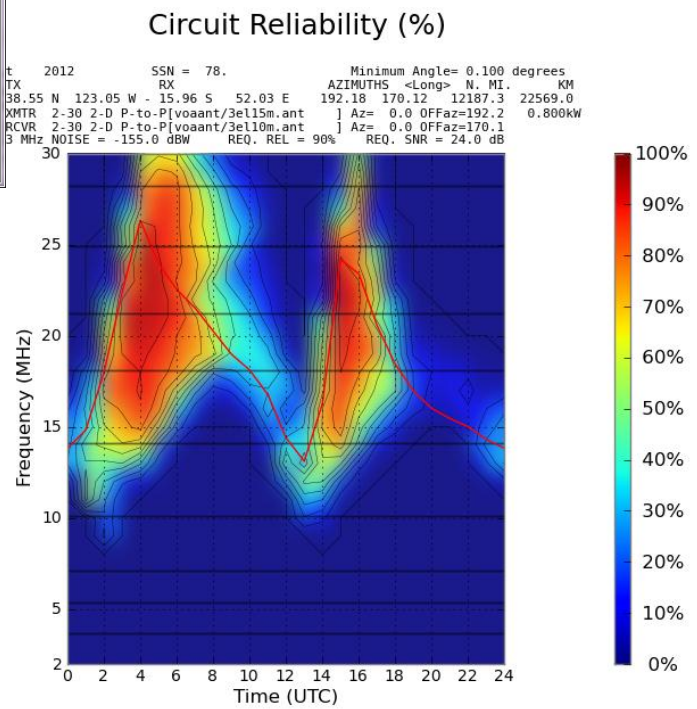


On the short path (zero degrees), I just skirt past the same hill and ridge that is in the way for anything between 5 and 30 degrees N-NE

Tromelin – Long Path





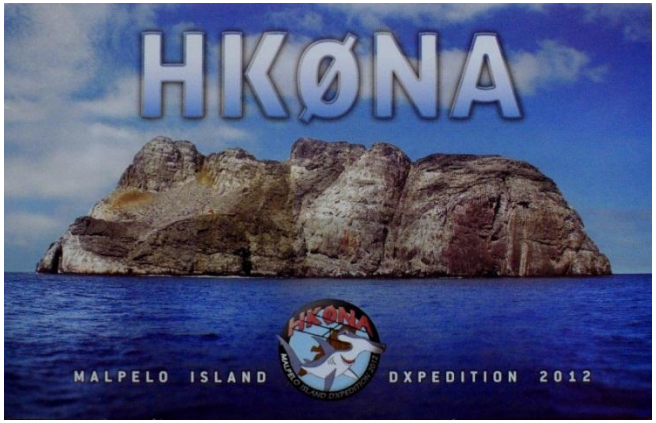


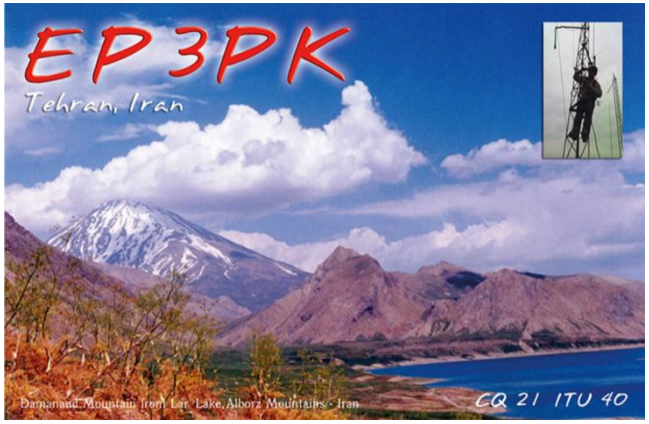
I worked TO4E on the Long Path easily on the low bands, and Tromelin could also support that path. It seems like the lowbands would be great during the morning LP and higher bands would be better on the SP.

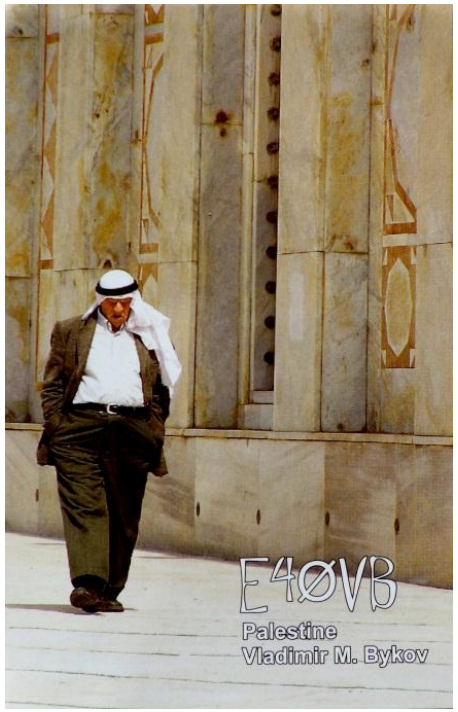
Conclusion

- HFTA, YW and VOACAP have helped me visualize:
  - My QTH constraints, and how to overcome these
    - What to improve in my antenna system
    - How much money to spend for best ROI
  - How a one to two dB gain improvement ***does*** help your chances of busting a pileup
    - How it has conclusively made the difference between working the DX or not at my QTH
  - How to get the DX-peds signals ***above*** the noise level and walk the DXCC HR “Final Mile”

Results!







Notice how half were major DX-peds and half were single ops.

I look forward to adding ZL9, FR/T, and FT5/Z in the next year. I should make Honor Roll in 2013, and will then prepare an antenna retrospective for next years Pacificon.

When I make Honor Roll . . . .

Links

- 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://ky6r.wordpress.com/
  for a blog related to my “Pilot” communications
- Twitter = @KY6R, Skype is KY6R--
- My information on QRZ.COM is up to date