

2013 285 TechConnect Radio Club Fall TechFest, Lakewood, Colorado



***Working The Low Bands
from the Burbs! By Paul
Veal N0AH***



Today's Topics Include-



- **Checking Grounds**
- **Choice of Radio Features**
- **Receive Antenna Choices for Limited Space**
- **Transmit Antennas for Limited Space with Propagation Explanation**

Grounds



- In our shack, we reduced the average noise floor from S-9 to S-3 by using a single point ground from the rig to the ground rod and this also helped in eliminating 1430 A.M. BCS interference one mile away-
- If possible, access you main cold water pipe coming into the house to avoid PVC breaks in piping-

Invest In a Rig with a Dedicated RX Antenna Jack!



Use With-

- **K9AY Loop**
- **Magnetic Loop**
- **Other Antennas**

MAXIMIZE Attenuation!!

- **Advice from Dave, AA0RS, first ever UK station to receive 160M WAZ-**
- **Use YOUR RF Gain Control**
- **Use YOUR Attenuation**
- **Experiment with YOUR filters on every contact *PRIOR* to calling!**

Wisely Use Radio's Filters and DSP

- **250 Hz for CW**
- **500 Hz SSB**



Or

**Narrowest Filter You
Can Copy Signal-**

K9AY Loop

- Google Brings Up 22,400 results!
- Improved Our Low Power CQWW and ARRL 160 Meter Scores from an Average of 50-60 QSO's to 500-600 QSO's- (Low Power)



K9AY Dimensions

- **28 foot suggested apex**
- **86 feet of wire**
- **Each corner pulled 15 feet from center**
- **Each wire lead pulled back to K9AY box 1-2 feet off the ground-**
- **Have K9AY mounting bracket grounded to 8 foot ground rod**
- **Radials are typically not needed**
- **Use RF beads and bury coax to keep RF off feedline**
- **Can be used with or without unit's pre-amp**

The K9AY loop antenna can provide a cardioid (heart-shaped, single-null) pattern when one end of the antenna is connected to ground through a variable DC resistance. This occurs because of the interaction between electric and magnetic field pick-up patterns. The antenna was first described by Gary Breed, K9AY, in QST magazine-

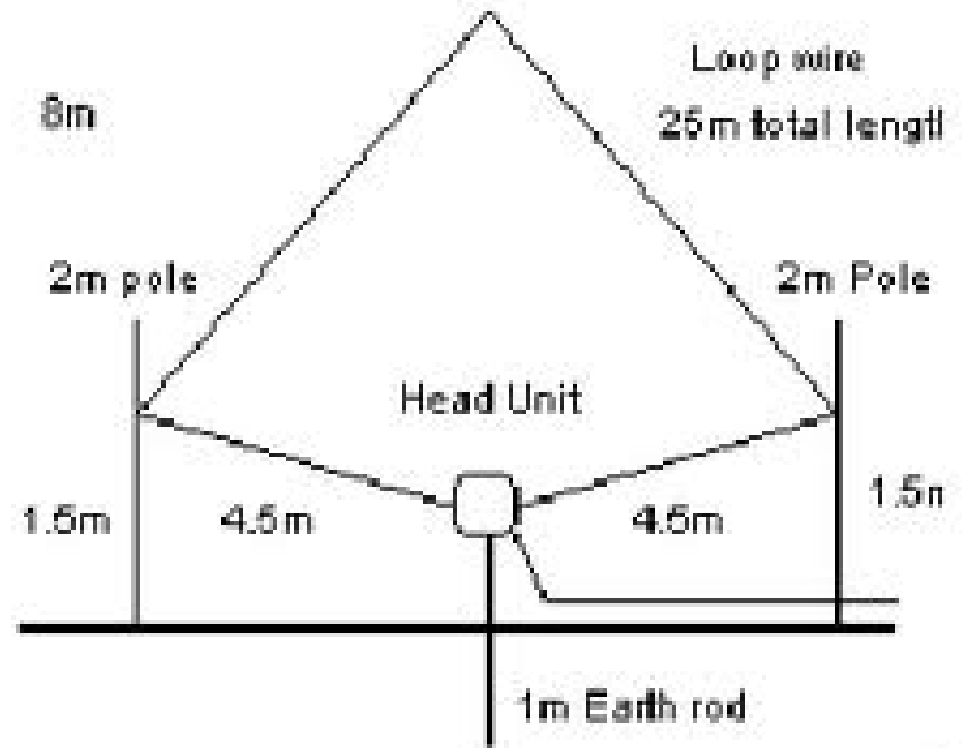


Figure 2. K9AY Antenna



The K9AY Loop takes up minimal space 30 feet across-26 feet high

K9AY Feed Point

note buried feed-line and beads/using fiberglass mast



8 foot ground rod tied with green wire leading up to mounting strap

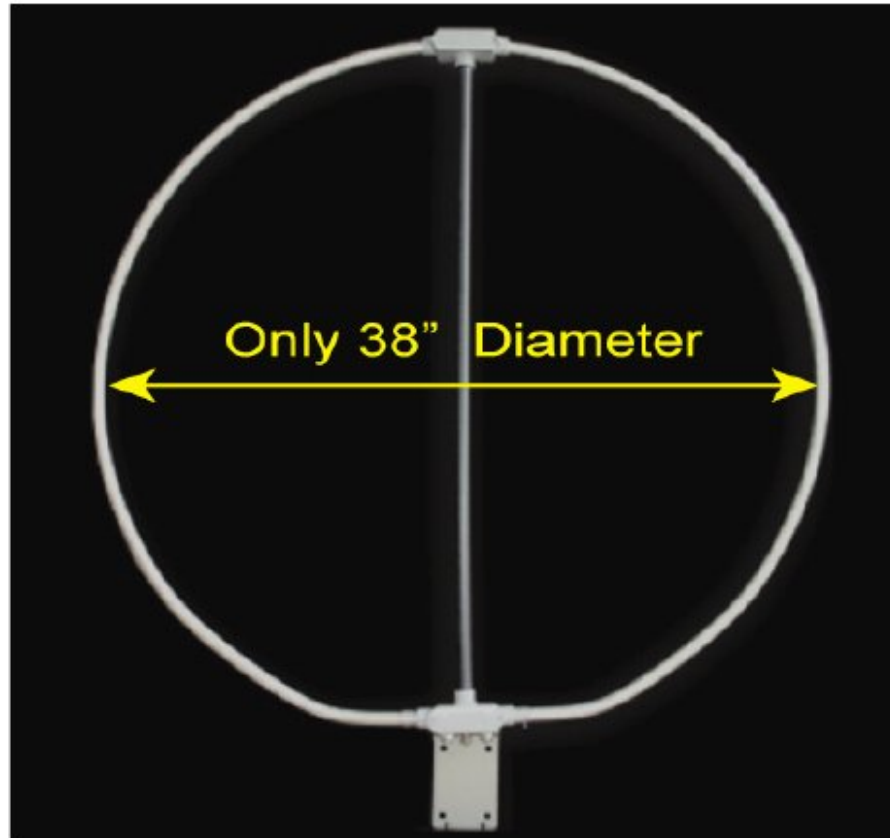
K9AY Loop Wire 15 feet away from center mounted on wood dowel



K9AY single loop installed at W0ANT



RF PRO-1B Shielded Active Magnetic Loop Antenna



Loop & Beverage Receiving Systems

Model RF PRO-1B

Shielded Active Magnetic Loop Antenna



- . Rejects Local Interference**
- . Outperforms much larger antennas**
- . Broadband Receive-Only Active Loop**
- . No tuning required. Covers 50 kHz to 30 MHz**
- . Works great at ground level**
- . Includes high performance low-noise preamp with super-low intermod distortion**
- . Includes internal T/R protection switch**

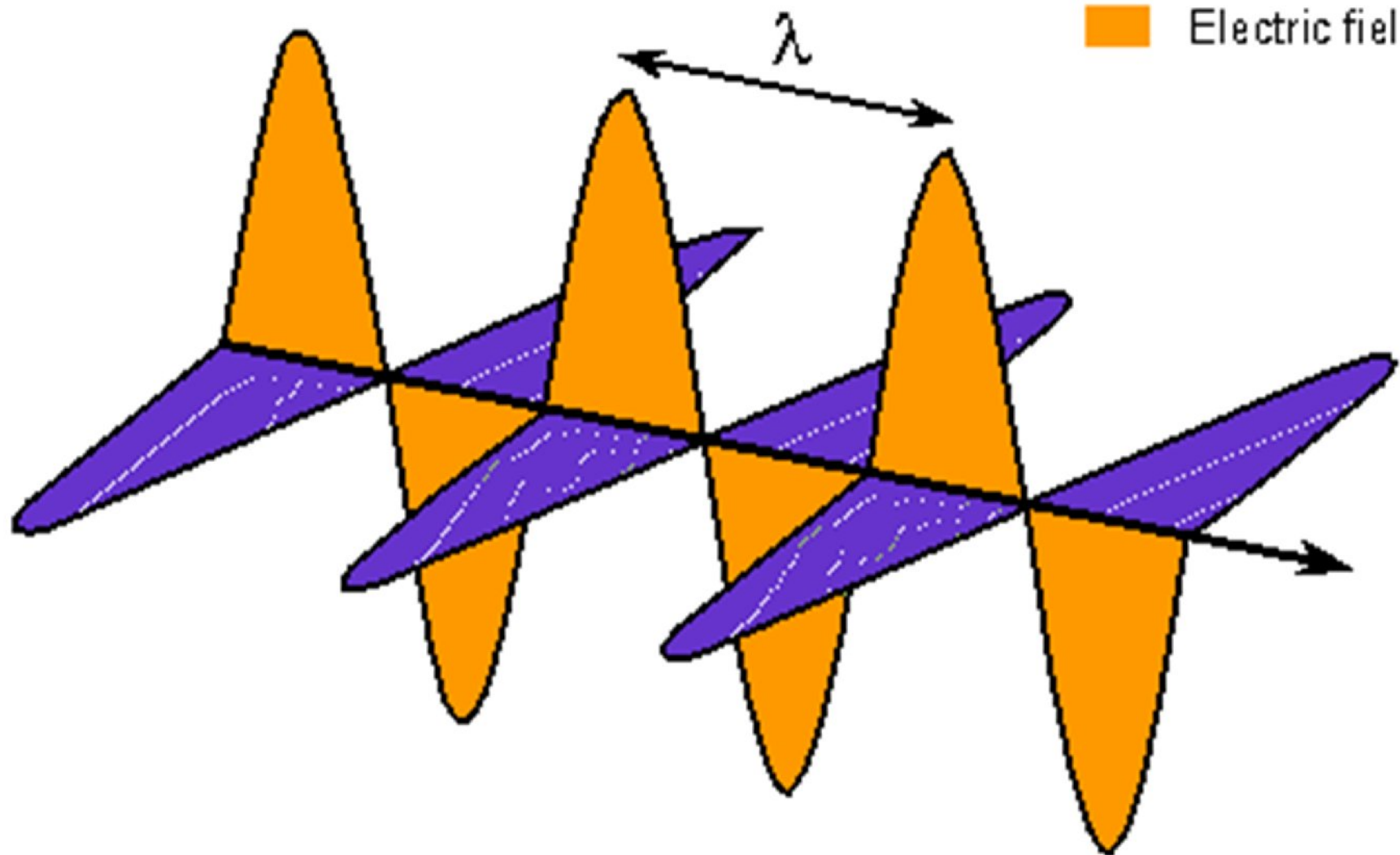
USA



Loop & Beverage Receiving Systems

Electromagnetic Wave

-  Magnetic field
-  Electric field



Highly Effective at Rejecting Near-Field Man-Made Noise

(Like Power Line Noise, Light dimmers, Plasma TV's , Computers, Fluorescent Lights. etc)

- This antenna takes advantage of the fact that every radio signal has two fields associated with it, a magnetic field and an electric field that both carry the same modulation and information.
- Normal antennas are optimized to receive the electric field.
- This Loop is exactly the opposite of a normal antenna. It is designed to reject as much of the electric field as possible. (Typically 40 dB rejection)
- Since the things that interfere with our reception the most have huge electric fields, this antenna is much quieter than a normal electric field antenna.
- Highly useful on bands such as 160, 80 and 40 M that have a lot of man-made noise. But is also a good reception antenna up through 10 M .



Loop & Beverage Receiving Systems

Pixel RF PRO-1B Shielded Magnetic Loop

- At the low end of the spectrum it will receive signals at very low frequencies (down to 50 kHz)
- No tuning or manual adjustments are required. It is virtually Plug & Play
- Many people use this antenna mounted on a rotator to take advantage of the antenna's reception pattern to gain additional noise rejection (up to 25 dB of additional noise rejection) by locating interfering signals within the nulls that are at right angles to the plane of the loop (low angle of arrival ground wave interference)
- Because the magnetic fields are much weaker than the electric fields, and this is an un-tuned loop, a preamp must be used that is mounted on the antenna mast to amplify the magnetic signals up to a level that is useable by the radio.



Loop & Beverage Receiving Systems





K9AY Loop vs. PIXEL

- Hi Paul,
- The loop from Pixel is a classic "magnetic" loop. As the demonstration showed, a dedicated RX antenna with useful directivity can be a big improvement. It looks like they did a nice job with mechanical construction and a good preamp. Something this small MUST have a really good preamp, since it doesn't capture a lot of signal. The H-field response of the loop reduces nearby noise, since electrical noise is predominantly E-field close to the source. The MFJ short vertical is an E-field antenna, with no properties that reduce noise -- a great way to show off the H-field advantage of the loop.
- Look up "direction finding loop with sense antenna" in the ARRL Antenna Book. You'll see a loop like the Pixel, plus a short vertical. Since a small loop alone has two nulls, one off each side, you can't tell which one is doing the work. When you combine the loop with the short vertical, the pattern changes to a cardioid and you can figure out what direction the unknown signal is arriving from. The K9AY Loop combines both the loop and vertical into a single structure, and has the same cardioid pattern.

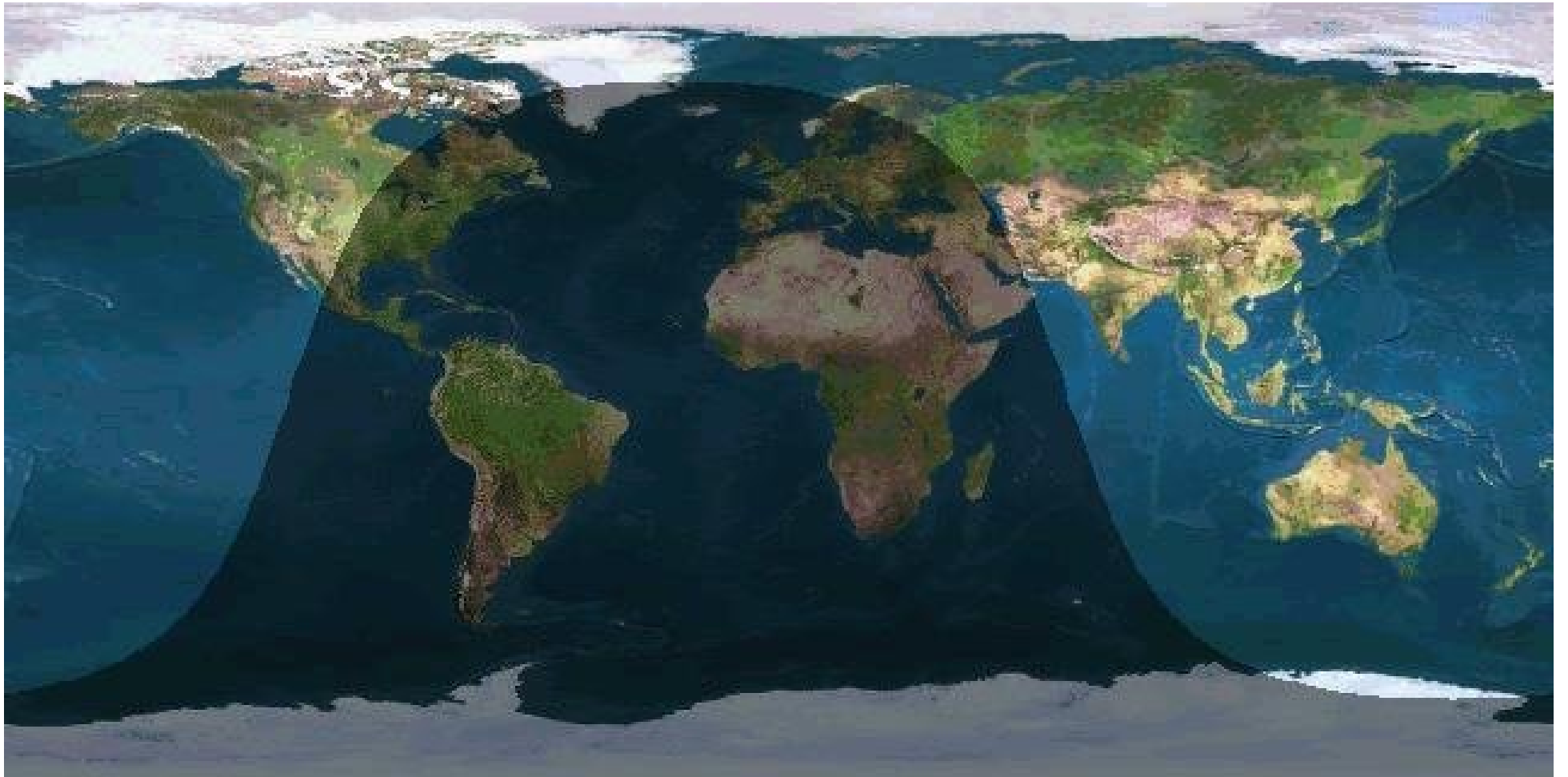
Consider Other Antennas for RX



What Is Gray Line-Simplified???

- Gray line is when an area is in the shadows of sunset or sunrise, twilight- when low band reception is enhanced
- Just prior to D-Line absorption setting up in daytime
- On Low bands, best to target working an area at its sunrise, ie: EU at 06:00Z or JT at 14:00Z
- Gray line, per ON4UN, usually at sunrise on the eastern end of the path (pg 1-11, 4th edt.)
- It is not equal width along terminator line, it is wider away from the equator
- Higher bands, wider gray line propagation

Gray line Map 8-1-2011 02:45z

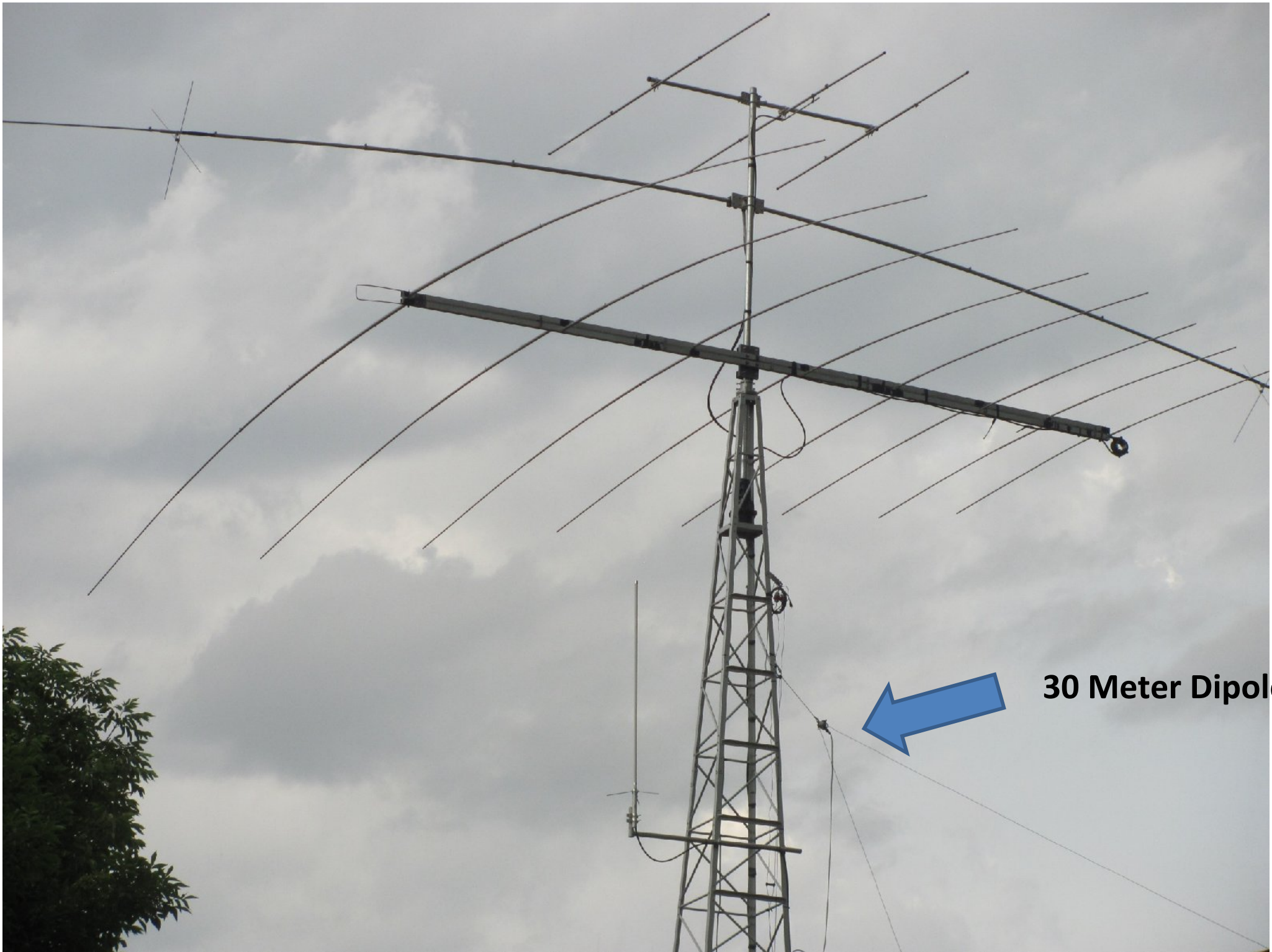


30 Meters



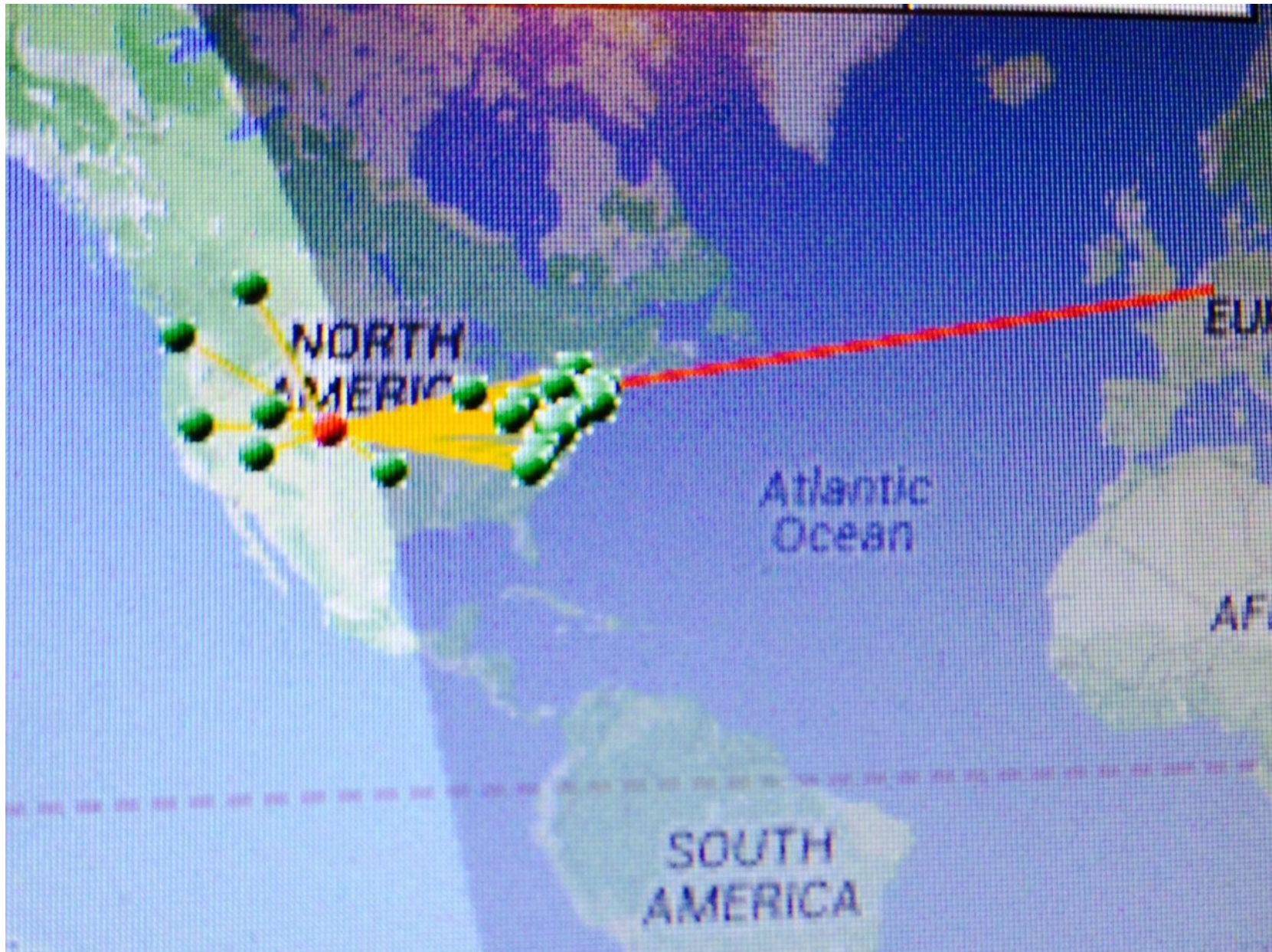
- Due to the higher frequency compared to other low bands, antennas take up less space/quieter in general-
- Often is open for longer hops during the day versus 40M for more stateside variety
- Competition lies along grayline and antennas, versus amplifiers- 100 Watts maximum
- Early afternoon-late morning, World Wide DX IS!
- While TI5/N0AH, worked Moscow 4 hours past their sunrise- 10 time zones away-

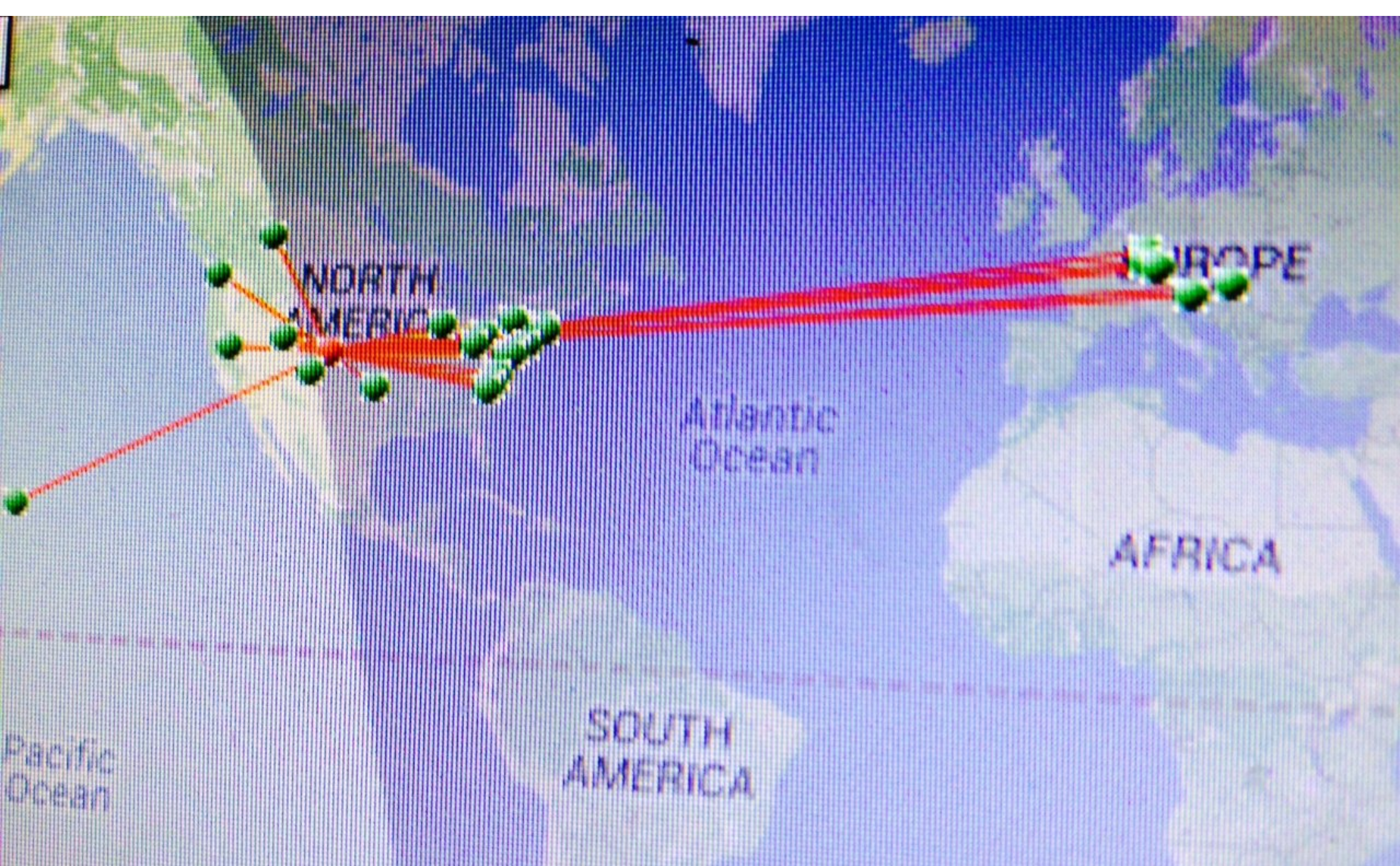




30 Meter Dipole

30 Meter Propagation Before Dusk

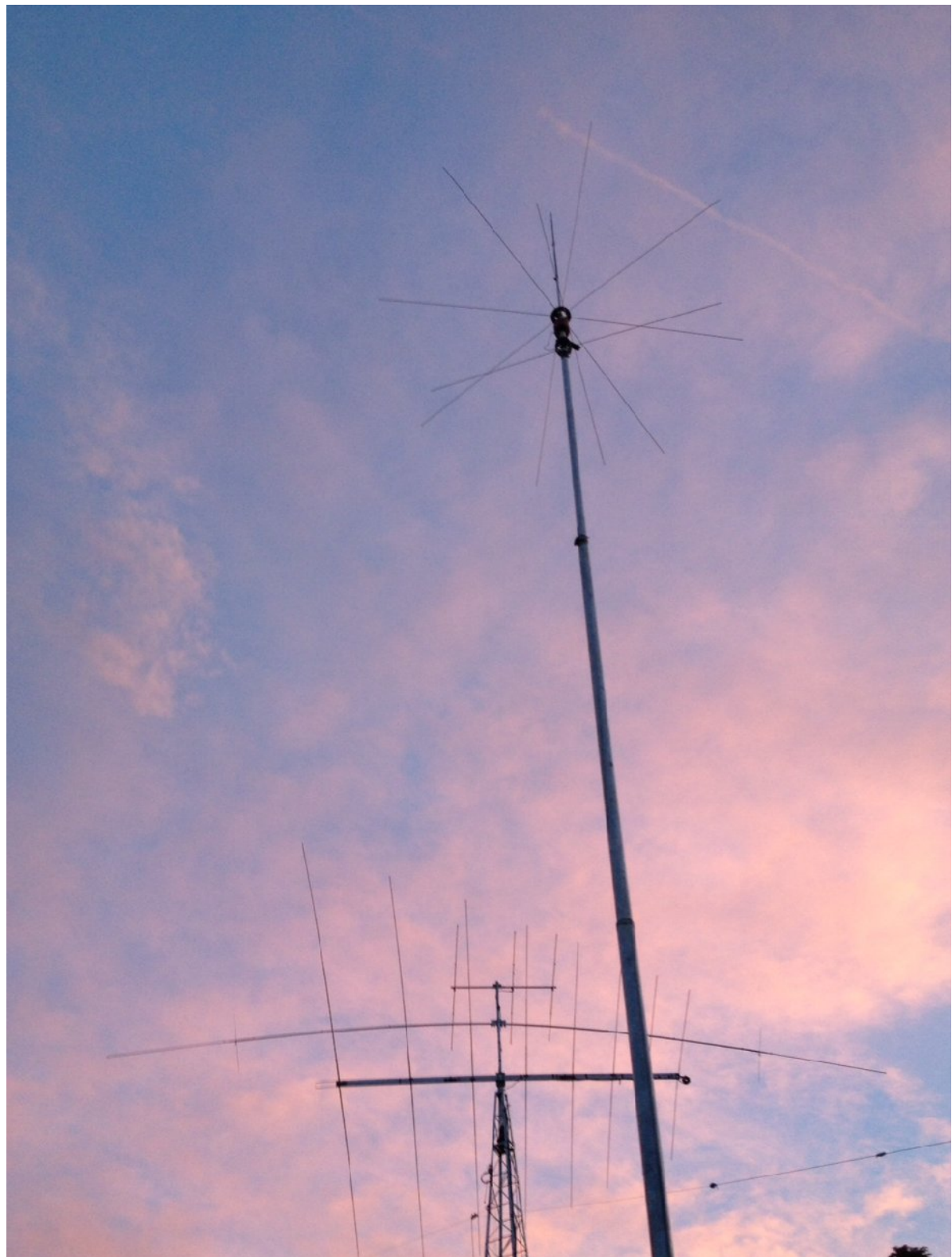




30 Meter Propagation Just After
Sunset-Grayline

40 Meters-

- Every DXCC has operated on 40M
- Practical antenna size
- If I only had one HF band to DX with.....
- Cushcraft MA8040V with Cushcraft 40M RTD mounted behind on tower

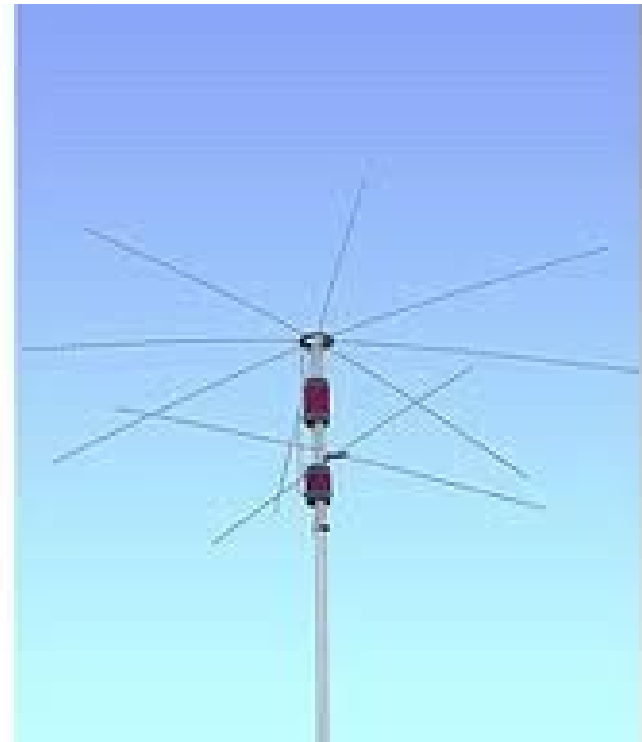




Cushcraft D40 rotatable Dipole

Cushcraft MA 80/40V multiband vertical for 40 and 80 meters

- 23 feet- 27 feet tall- 9 lbs
- 100Khz +-BW 40M, +-30Khz BW 80M
- Parallel L/C Resonators provides automatic band switching
- Works DX with low LTA!
- No guys required
- **NCJ MAR/APR 2006**
- Radials Required (We
Have 50 ranging from
5-50 feet)



80 Meters- Getting Serious



- Sunset/Sunrise Grayline Tolerance \pm 20 minutes
- Should start considering K9AY loop for RX or at least another antenna combination to have ready ie: dipole vs. vertical
- Working DX Through auroral zone is often possible with low powered stations, even in high sunspot periods
- Most multiband verticals have 80 meters

Cushcraft MA160V



- 30-36 feet tall- needs light 3 guys, weighs 12 lbs
- 20-25Khz 2.5:1 SWR bandwidth
- +/-50Khz bandwidth with Icom Pro III Tuner
- 24 Radials average length 50 feet, many folded back, all buried-
- Feedline RG-213 buried-
- Lowest SWR does vary- many factors
- Use W2FMI UnUn to match when needed-
- Resonant point drops when wet/ice +/-20KHz

Backyard Antennas for the Low Bands

TopBand- The Cushcraft MA160V

2010 160M CW

ARRL TEST

525 QSO's

82 out of 85

Mults

6 DXCC

LOW POWER



*4 house
Transformer
6 feet from mast!*

Cushcraft MA160V 160 meter vertical 36 feet tall

MA160V Top Section

**Anna, W0ANT, working on radials, note buried
Feedline covered in gravel-**



The Verticals are Only 66 Feet Apart

Note plastic barrels
Covering
Feedlines
To help
Keep dry
and from
Dog chew
Toys!



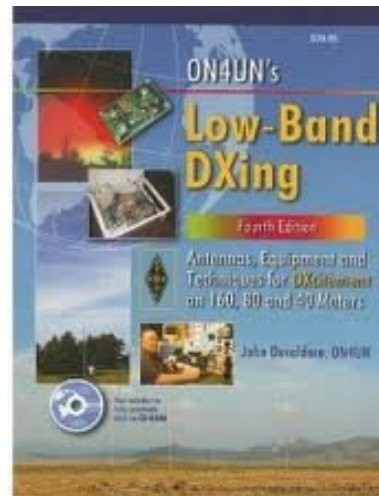
Looking from MA160V to MA80/40V and K9AY Loop

It Pays to Cut Noise!



Low Band Resources

- ON4UN Low-Band Dxing-any editions
- Mar/Apr 2006 National Contest Journal, A *Multiband Array for the Burbs*
- Alpha Delta Antennas
- MFJ/Cushcraft Antennas
- K9AY Google
- The Little Pistol's Guide to HF Propagation
- Elmers
- ARRL.ORG
- EHAM
- QRZ.COM



ALPHA DELTA