

Waller Flag



6W/EI6DX



CQWW 160

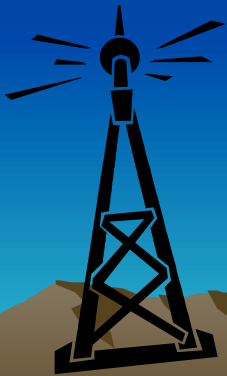
Low Band Low Noise Rotatable Receiving
Antenna for the Urban small lot Ham
160 – 15 meters

By

Doug Waller NX4D Jose Carlos N4IS

Presented By

Larry Pasma W8VVG



History of Flag RX antenna

- 1919 March 5, 1919, Roy A. Weagant, Chief Engineer of the Marconi Wireless Telegraph Co. of America, delivered a paper describing in detail his apparatus for the elimination of the great bug-bear of transoceanic wireless communication -- static interference. >> <http://infoage.org/html/wa-1919-04-p11.html>
- 1995 JF1DMQ wrote an [earlier article](#) about the Flag antenna in November 1995 in a Japanese magazine. His was only 3.3 feet by 16.4 feet long (1 by 5 m). K6SE's 160m optimized versions are 14 by 29 feet (4.3 by 8.8m).
- "Is This EWE for You?" (QST February, 1995, p.31) and "More EWES for You",
 - QST January, 1996, p. 32) both by WA2WVL.
- 1996
- The Pennant was originated by EA3VY and optimized for 160 meters by K6SE, who first wrote about them on the [Top Band Reflector](#) in 1998
- 1997 The K9AY Terminated Loop—A Compact, Directional Receiving Antenna By Gary Breed, K9AY
- W7IUV rotatable Flag and preamplifier >> <http://w7iuv.com/>



- 2000 QST Magazine, July 2000, page 34 for K6SE's classic article: "Flags, Pennants, and Other Ground- Independent Low-Band Receiving Antennas" ...
- 2003 NX4D developed the first dual flag vertical array
- 2006 N4IS developed the BIG flag vertical array >> www.n4is.com
- 2008 N4IS developed the Horizontal flag array
- Dr Dallas Lankford, wrote the Flag Theory and design the Quad Flag Array >> <http://www.kongsfjord.no/dl/dl.htm>
- 2009
- AA7JV George Wallner developed the DHDL (TX3A) >> 2009 http://tx3a.com/docs/TX3A_DOUBLE_HALF_DELTA_LOOP
- 2011
- Many more ideas and improvements are coming including but not limited to capacitive terminated loops, multiple turn loops and preamp per loop designs PPL.



Evolution of the Flag RX antenna

- To a large and enthusiastic audience composed of radio engineers and scientists of prominence, at a joint meeting of the Institute of Radio Engineers and the New York Electrical Society, held March 5, 1919, Roy A. Weagant, Chief Engineer of the Marconi Wireless Telegraph Co. of America, delivered a paper describing in detail his apparatus for the elimination of the great bug-bear of transoceanic wireless communication -- static interference

<http://infoage.org/html/wa-1919-04-p11.html>

This is a RX antenna Circa 1919

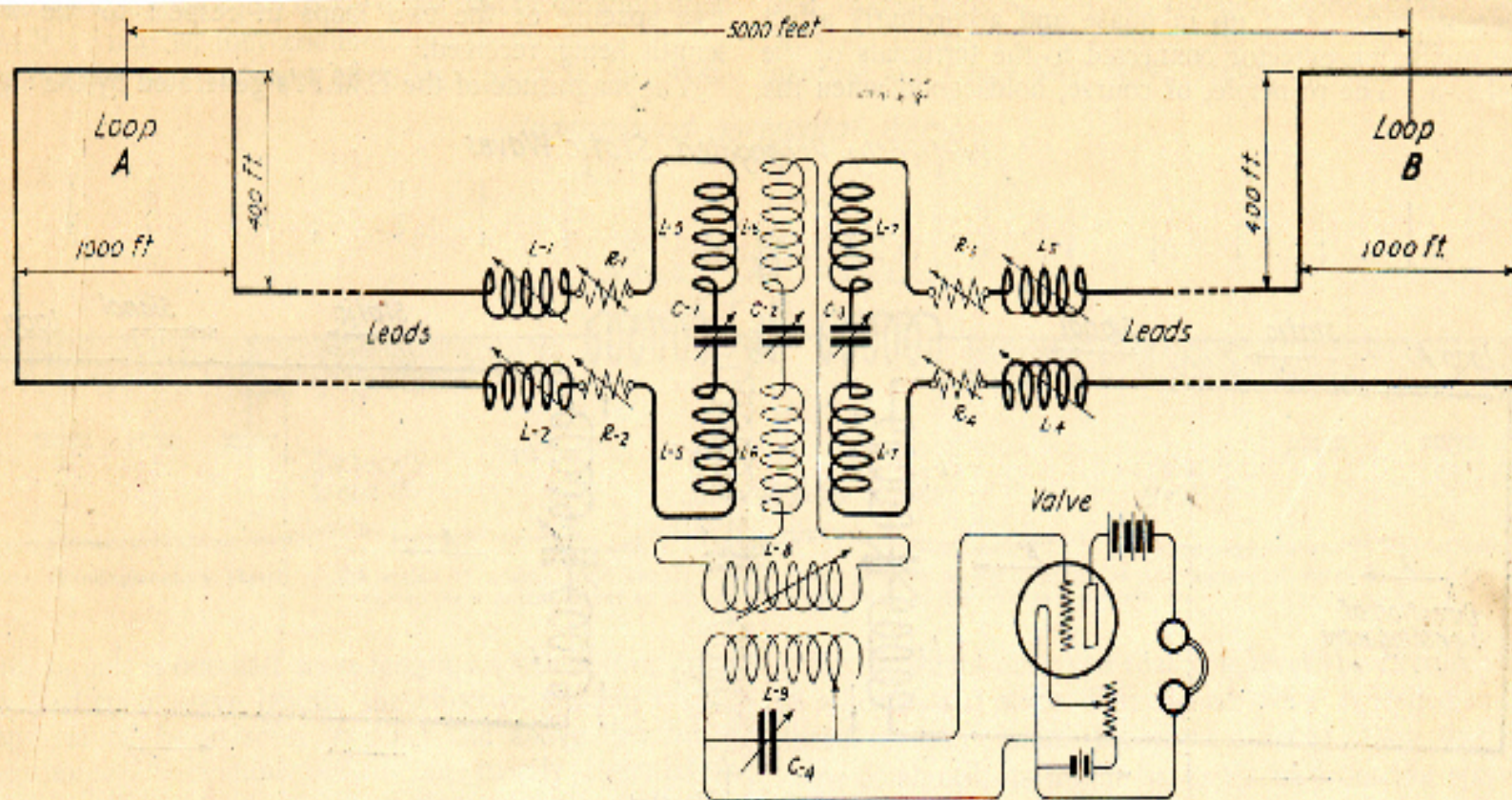


Figure 6—An early form of Weagant's system for eliminating static interference showing two single turn loop antennae spaced 5,000 feet apart. Each loop was 1,000 feet long at the base and 400 feet high. The leads from each loop were connected to the primary coils, L-5 and L-7, of the radio goniometer which were coupled to the secondary coil L-6. By rotating L-6, a position was found where the static currents neutralized and the signal currents were retained. This apparatus and antennae permitted the reception of signals from stations in Europe under conditions of static interference which with ordinary receiving apparatus and antennae would render reception impossible.

Waller Flag

- The Waller Flag antenna is very quiet and has a very good directivity. The performance is comparable with the BWF and it has -53 dB gain. Two 18—20 dB preamps are necessary to bring the signal at a comfortable level. The polar plot is from a 1680 KHz AM station 20 miles, the diagram represents what you can expect on directivity. The RDF is close to 12dB and better than a 800ft beverage. The WF does not have a high angle back lobe and this helps to attenuate local signals and QRN coming from high angle. The TOA is 20 degree and very good for DX.
- The VWF can be install at any height including the very top of your tower.



A bit about preamps

The Wall Flag requires about 30 to 40 db of preamp to be effective in digging out weak signals, the standard 18 to 20 db beverage preamps will work. However a single preamp is not enough for weak signals.

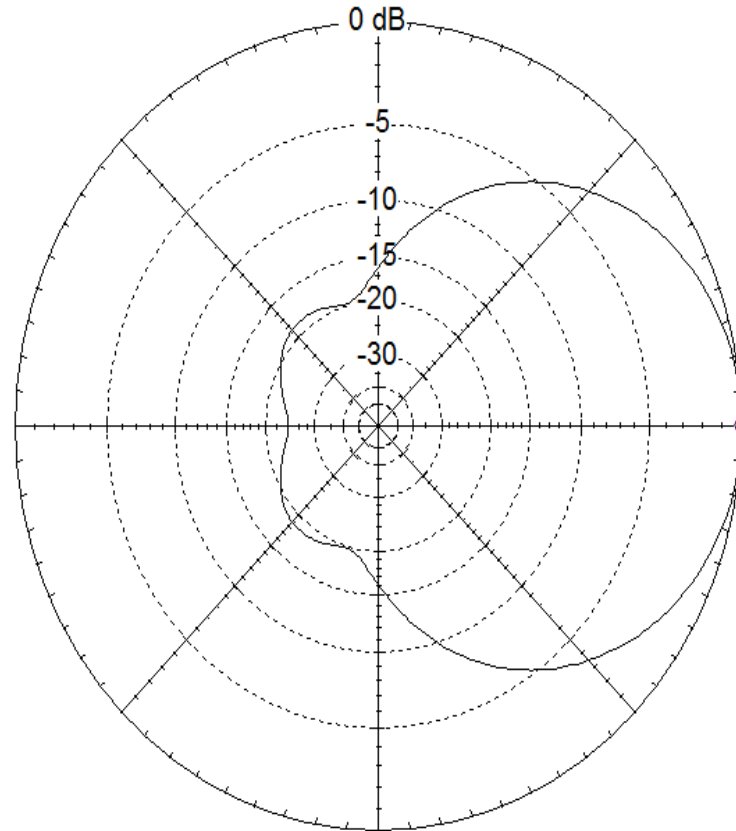
After much experimentation we have found its very difficult to cascade preamps without increasing the noise. If 2 preamps are necessary it works well with one being close to the WF feedpoint and the other in the shack. N4IS is developing a 40 db preamp with very low noise. Also KD9SV has build a couple of the 40 db preamps and are being tested now, However no production is planed at this point in time. KD9SV has been able to tweak about 30 db from his existing line of preamps.



Ez nec Data on Waller Flag

Total Field

EZNEC Demo



Azimuth Plot
Elevation Angle 22.0 deg.
Outer Ring -52.28 dBi

Slice Max Gain -52.28 dBi @ Az Angle = 0.0 deg.
Front/Back 23.96 dB
Beamwidth 84.4 deg.; -3dB @ 317.8, 42.2 deg.
Sidelobe Gain -70.95 dBi @ Az Angle = 129.0 deg.
Front/Sidelobe 18.67 dB

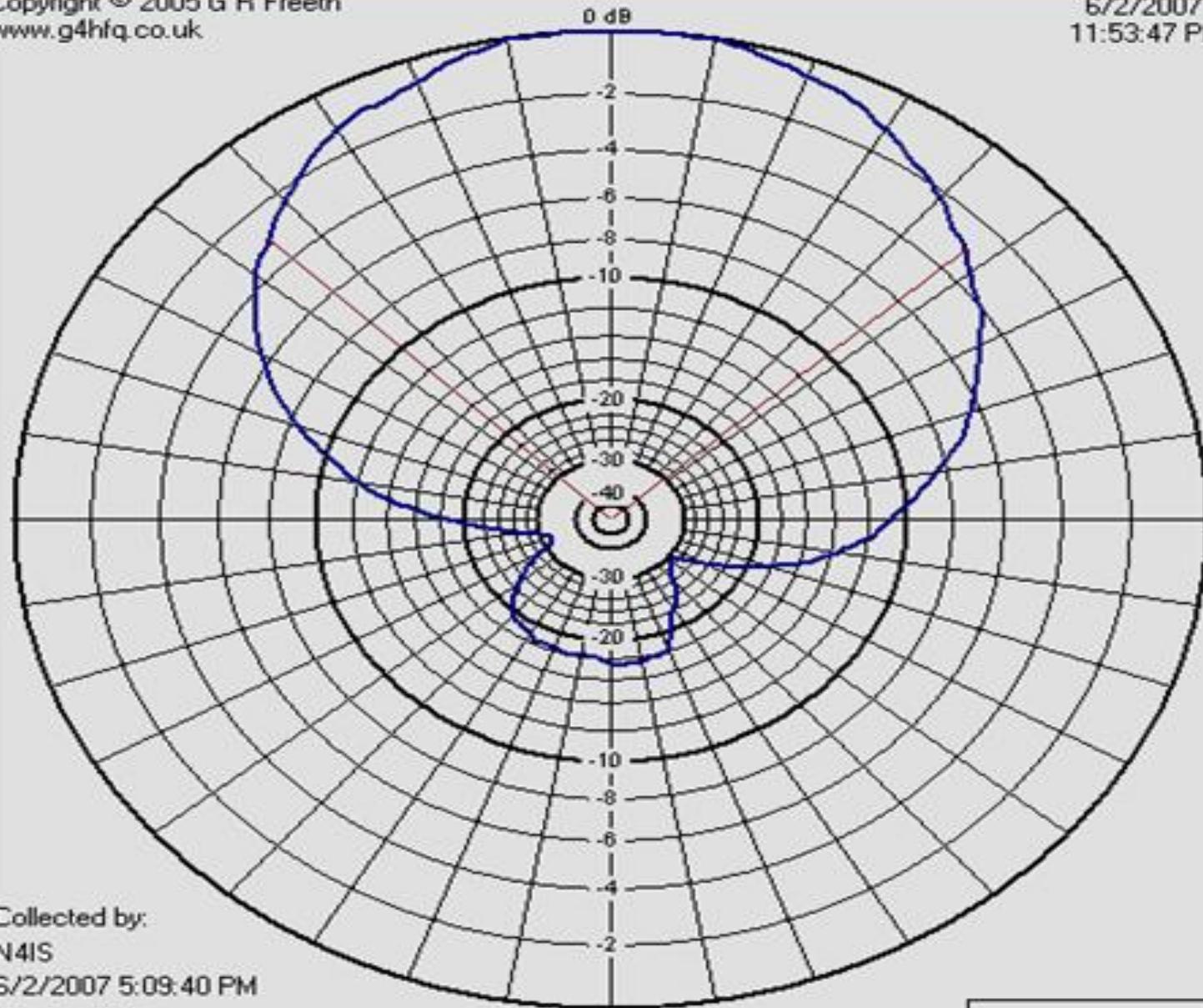
1.83 MHz

Cursor Az 0.0 deg.
Gain -52.28 dBi
0.0 dBmax

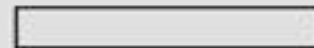
Actual Pattern

Copyright © 2005 G R Freeth
www.g4hfq.co.uk

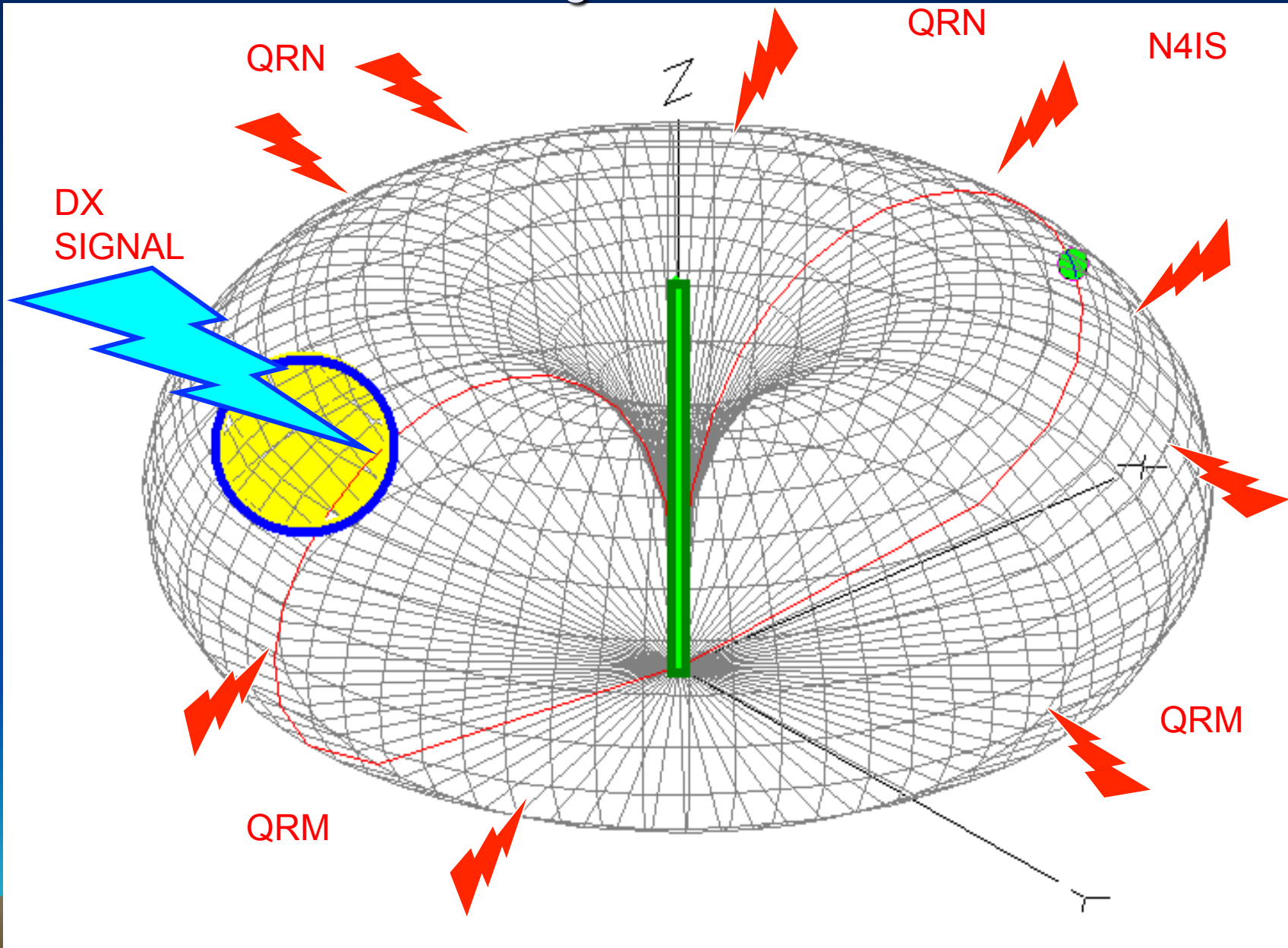
6/2/2007
11:53:47 PM



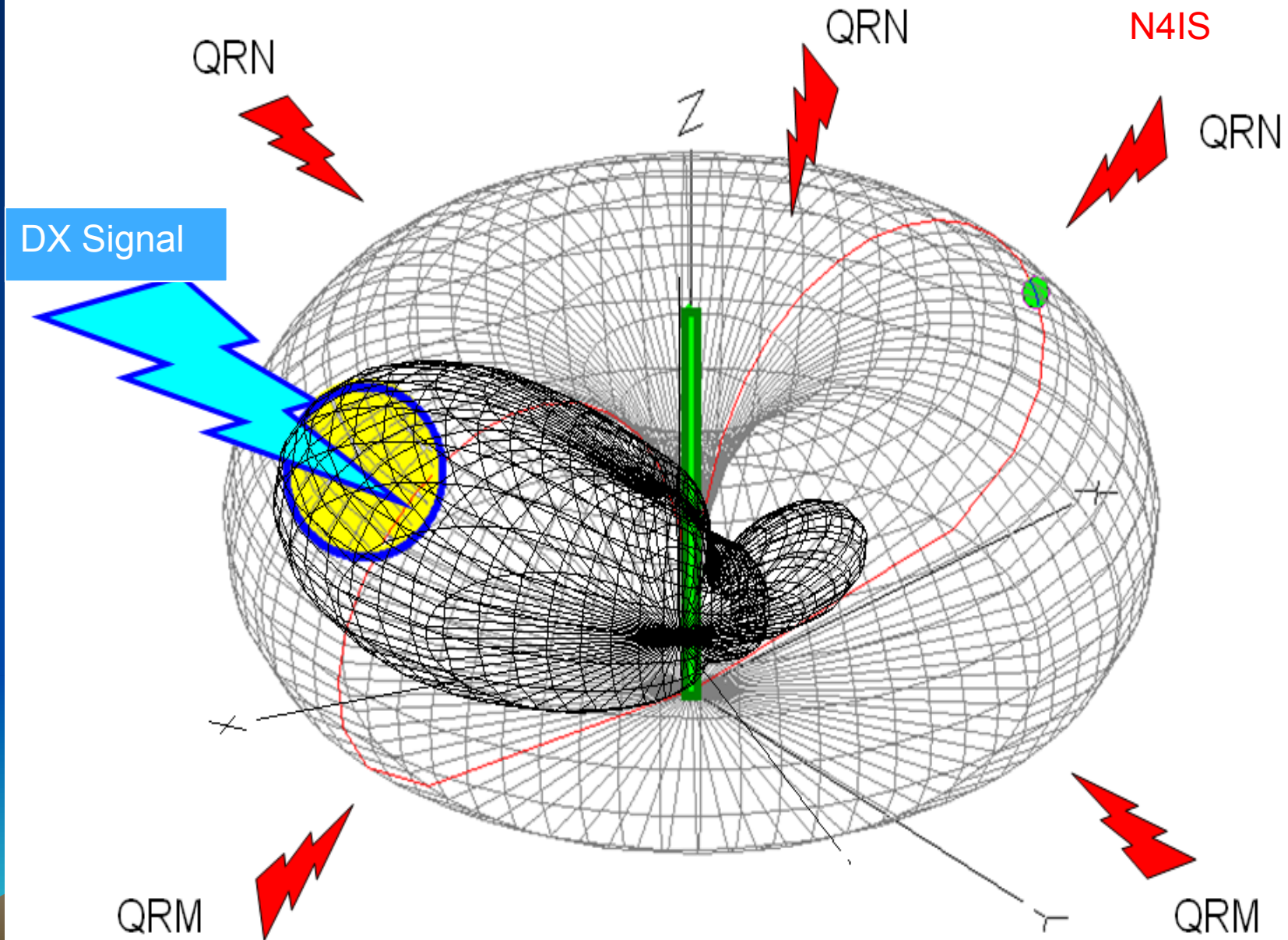
Collected by:
N4IS
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No description



Noise coming in from all directions



The Waller Flag can reduce the noise coming from many directions



First design of the Waller Flag at N4IS modified 4 element 10 meter yagi

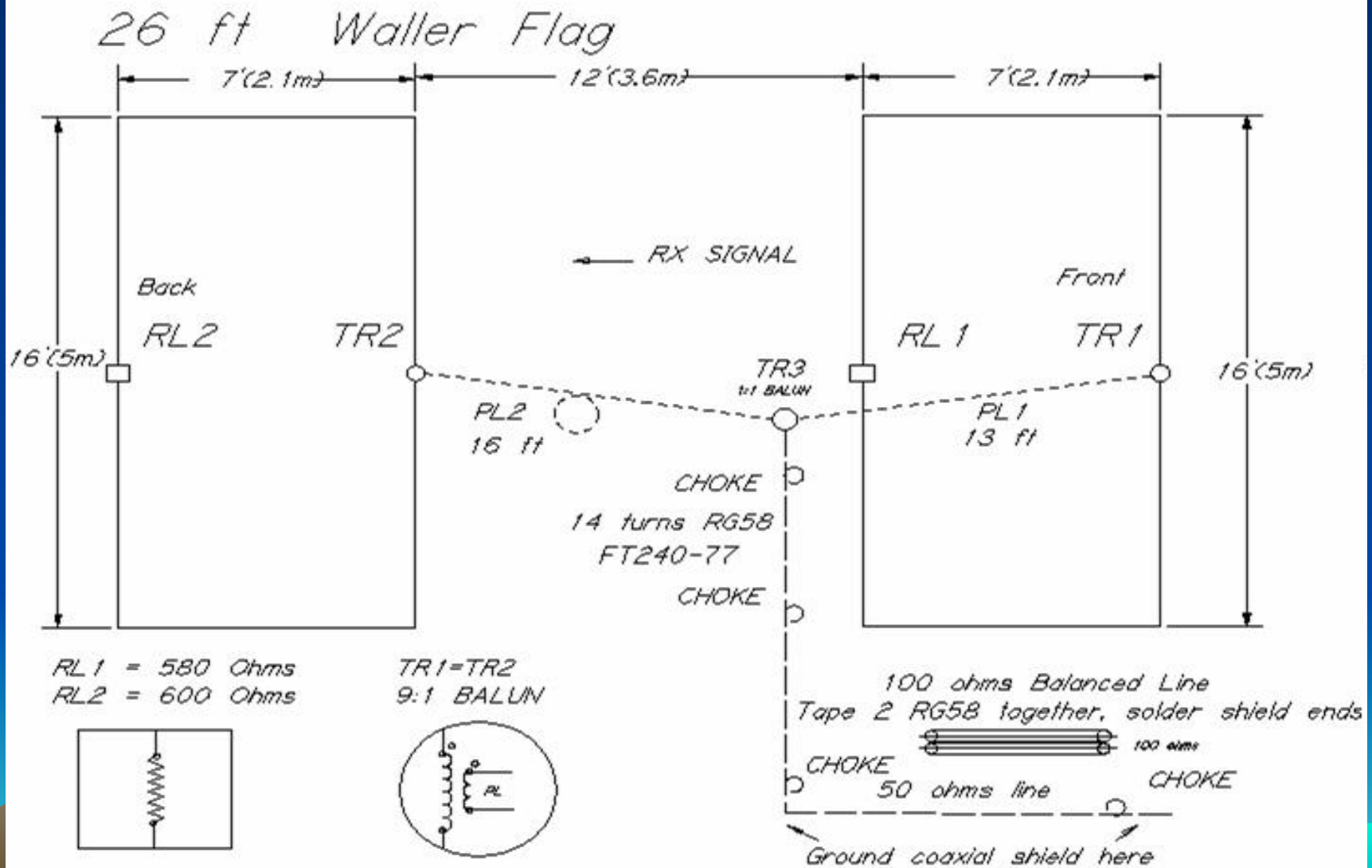


The Waller Flag can also be used horizontally

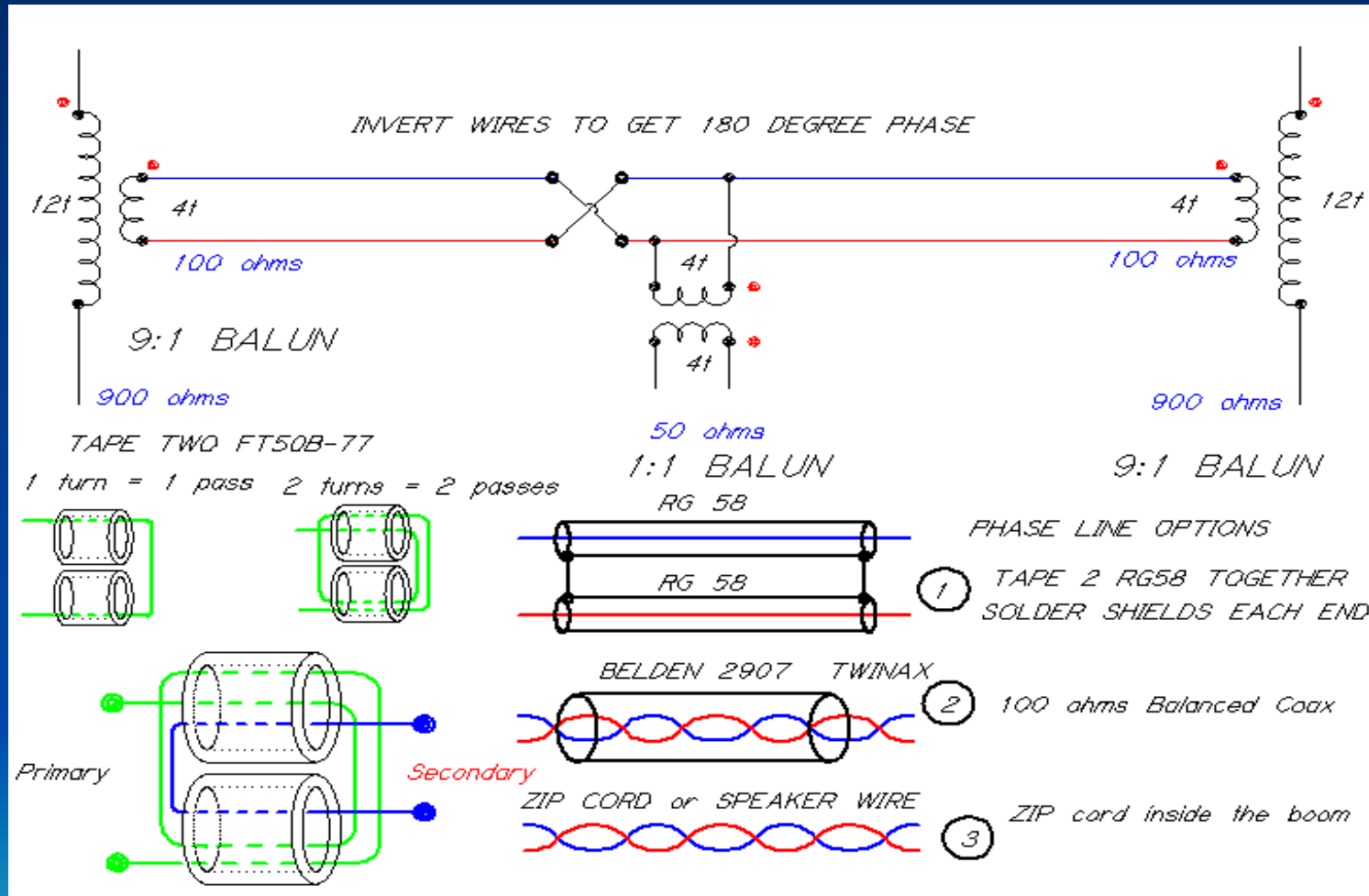


Most of the time there are no horizontal signals at 20ft high for 160m, the arriving signals are shorted circuited by the ground, Tests on 3.5 or 7 MHz shows a different situation and there are plenty of horizontal signals. For the Horizontal Wall Flag to be effective on 160 meters it needs to be 100 feet or better

Basic construction



180 degree phasing



Feed and phasing lines

- Coax such as RG 58 and RG6 are very good feedline, but are noisy unless several common mode chokes used.
- Cat Series 5 works well as a twisted pair balanced not requiring any common mode chokes but does not do well in weather.
- Twisted speaker will work, but again not good in weather.
- What we have found it that shielded Twinax (100 ohm balanced twisted pair) is very quiet, needs no common mode chokes, is very good in weather and cheap.



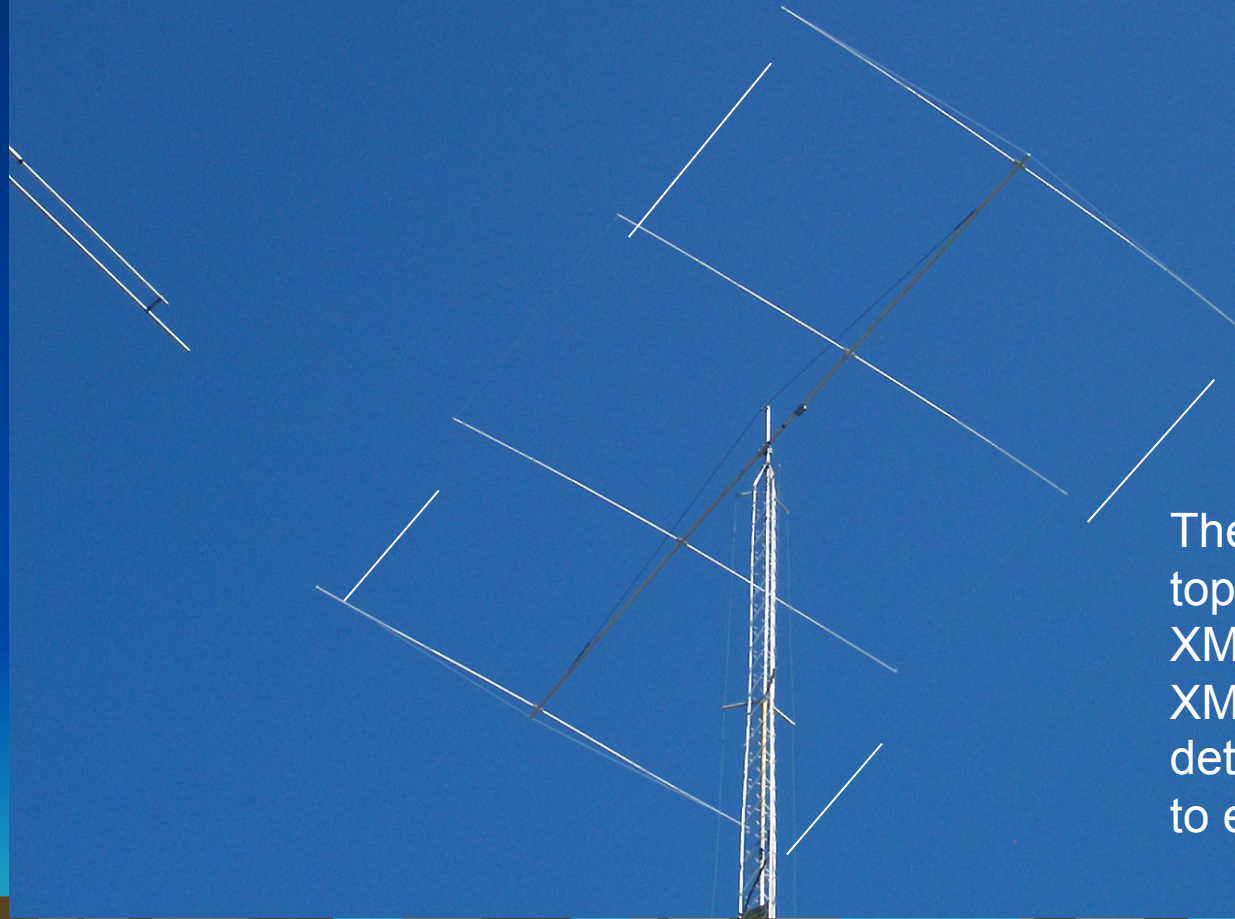
As the project grows





N4IS horizontal Waller Flag at 100'

9M2AX long
path 160M



The HWF is also
top loading for the
XMT antenna. The
XMT antenna is
detuned during RX
to eliminate noise

A few comments from Carlos N4IS

- I would like to add few comments about the HWF; it is terrific for long path pointing south, east and west. The VWF works better to North and sometimes E –W but never due south.
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- Last season during the month of Oct and Nov I worked 39 zones on 160m. 6 QSO's with XU7ACY. 3 QSO's with 9M2AX, 2 QSO's with BU2AQ, 2 QSO's with VU2PAI, also I worked HL5IVS, and I had a Q5 copy on B1Z, YC0LOW and JT5DX that could be my last zone. I was very close to 160m WAZ in 3 month.
-
- Not mentioned I worked all DX expeditions on 160m this season. Like; 5R8RJ, 5V7TT, C37N, 5X0CW, VP8ORK, S9DX, TJ9PF. T30YO, T31A.
-
- Since I install my HWF back in Nov 2006, I worked 243 countries in 160m and 39 zones and any given season or calendar year I worked over 150 DXCC on 160m.Total 160 last season.
- Carlos could hear and work XU7ACY, BU2AQ, and 9M2AX on the HWF when no one else could hear them.
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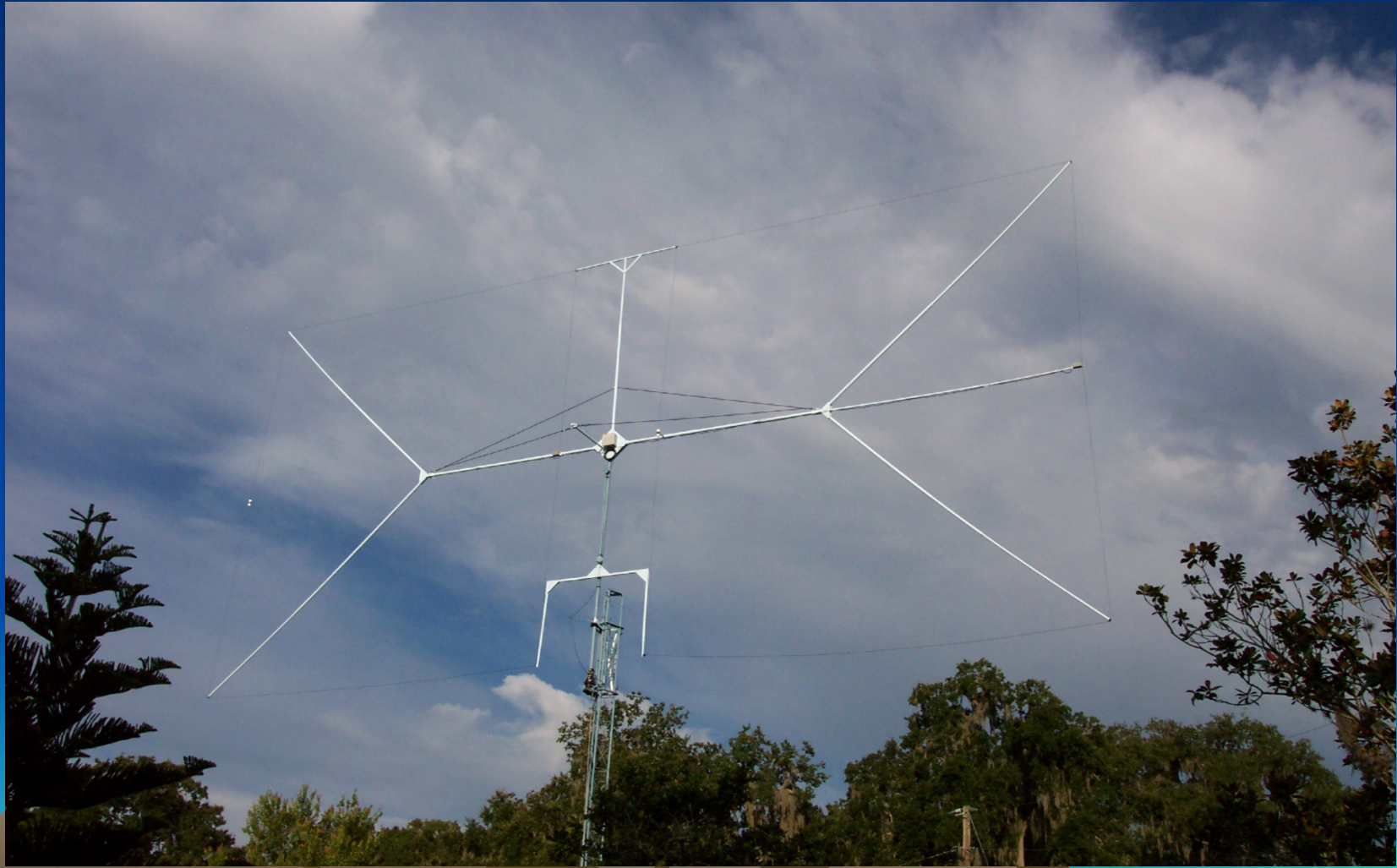


NX4D early Waller Flag on a 16' boom, loops 14'X7'



NX4D humongous Waller Flag

52' long loops 26'X23' weight 105 lbs.



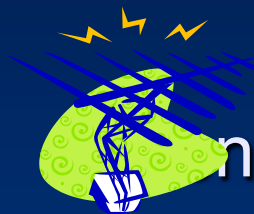
Summary by NX4D

- The BWF as Carlos calls them, has outstanding reception performance on 160m, as well as 80, 40 and 30m. I hear much more than I can work on 160m from my 1/3 acre lot. On 160m I am presently at 252 countries confirmed and 37 zones confirmed. I have heard approximately 40 new countries with the BWF that could not hear me calling them. I think it is very possible to work 300 countries and 40 zones on 160m from this small subdivision lot surrounded by power lines.
-
- This past winter season I worked JT1CO and heard 9M2AX and HS0ZEE several times, both long and short path. Several local Topbanders deploying Beverage antennas did not hear JT1CO or the others. I heard BU2AQ good enough to call two times. 9M2AX called NX? on several occasions. HS0ZEE and BU2AQ never did hear me calling them. I've had this problem with HL3IUA, YB0ARA/9 and many others due to the poor performance of my small xmit vertical radial field. Carlos, N4IS, did hear and work 9M2AX this winter with his horizontal WF mounted at 100 ft height. This blows many big gun myths that very long distance DX can not be heard using horizontal polarization.
-
- Having the ability to rotate this antenna allows one to determine that the performance is very near that of a rotatable 800 ft long Beverage antenna. Some of us believe that the ability to deploy these antennas at greater heights than that of Beverages allows improved reception of very weak sigs over similar RDF rated Beverages.
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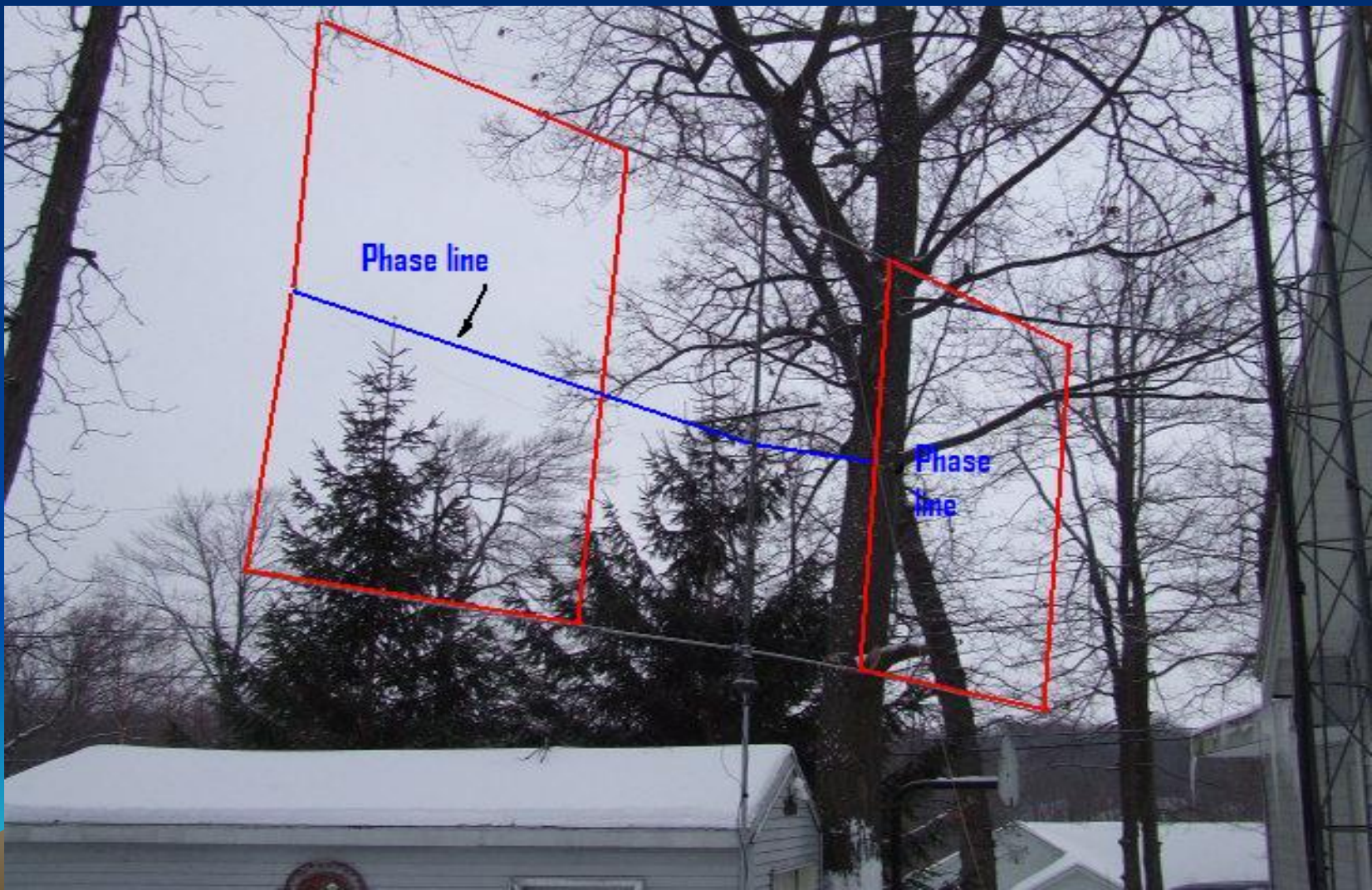
- My present BWF dimensions are 52 ft wide X 26 ft high. The loops are 26 ft tall X 23 ft wide and are separated from each other by only 6 ft. The total antenna weight is 105 pounds. It can be made much lighter using carbon fiber tubes and smaller wire. The boom is at 40 ft. My original WF was 31 ft wide with loops only 14 ft tall X 7 ft wide. It's picture is still on Buckmaster-HamCall.net. Although it eliminated much of the noise, it had a hard time hearing the weakest sigs in the noise. This summer we plan to see how small these antennas can be made for 160m by pre-amplifying each loop's output before the lossy 180 degree mixing. This preamp-per-loop, PPL config, will require a hybrid combiner/mixer between the preamps and the feeder coax. We think a single Op Amp with two 180 degree inputs, and the hybrid combiner can be made in one small unit.
-
- I rotate the BWF with a Yaesu G-2800DXA. The fiberglass tubing frame parts are from Max-Gain Systems. I used Wireman #13 copper-clad steel stranded wire for the loops. The insulated wire gave a nice reduction in wind, rain, and regional thunderstorm static build-up noise. In fact it was raining the morning I worked JT1CO. With the original WF and it's bare wire loops, the precipitation noise would have been too high to hear Chak.





Waller Flag by W8VVG

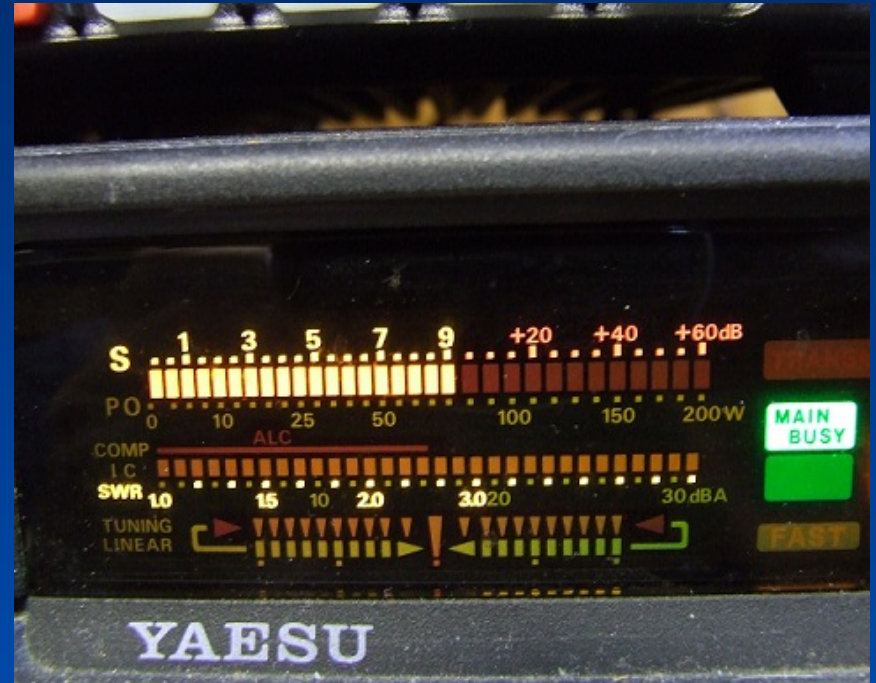
Generation 1 Loops 11' X 9' 26' in length



Waller Flag by W8VVG
Generation 2. Loops are 18'X 11' on a 26' boom



Front to back on W8VVG WF



Front to back using a AM broadcast station about 4 miles from QTH

Construction of the W8VVG WF

- The WF at W8VVG is constructed from a donated 15 meter Yagi (W8UVZ). The loops are 18' X 11' on a 26' boom.
- All elements are insulated from the boom. The horizontal wires are 12 ga. Teflon insulated wires pop riveted to the end of each element, then covered with liquid tape and painted to prevent static noises.
- The mast is reinforced fiberglass to prevent vertical metal noises within the antenna.
- All phasing and feed lines are Twinax. The matching transformers are all homebrew.
- Loop size is not critical as long as they are equal. The longer the vertical length the better the gain



Upcoming improvements for the Waller Flag

- Plans for this summer include:
- Making the loops 22' X 11' also each loop being 3 turns instead of a single loop.
- Capacitive loading instead of resistive.
- A Hi-z preamp per loop.
- Raising the tower to 30' from 20'
- See what happens



N2NL WF all PVC



TX3A (AA7JV) DHDL

DHDL on Chesterfield IS. TX3A by
George Waller AA7JV for Pacific
DXpeditions



Double DHDL constructed by W8UVZ,K8GG, and W8VVG
Tech assist by KD9SV ,N4IS, and IV3PRK

W8UVZ/W8TOP

Endfire double DHDL experimental RX array at
W8UVZ



A special thanks to

• N4IS

NX4D

AA7JV

W8UVZ

KD9SV

K8GG

CQ

DX

More info at

WWW.N4IS.com





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