

# RX antennas at IV3PRK: the two-wire Beverage and the NOISE mystery to be solved

By Pierluigi "Luis" Mansutti IV3PRK

After reading the excellent article ["Building a reversible two wire Beverage" by OH2BEN](#), and well understood the theory of operation, thanks to Charlie N0TT, I decided to try also a similar one and I just duplicated everything in my only possible arrangement: the north/south direction.

I found in my junk a pair of twisted wires from a telephone cable 129 meters long and stretched it as a Beverage, two meters high, in the only possible place within my property, far enough from the elevated radials of the TX antenna. I used two copper rods as a ground connection at each termination

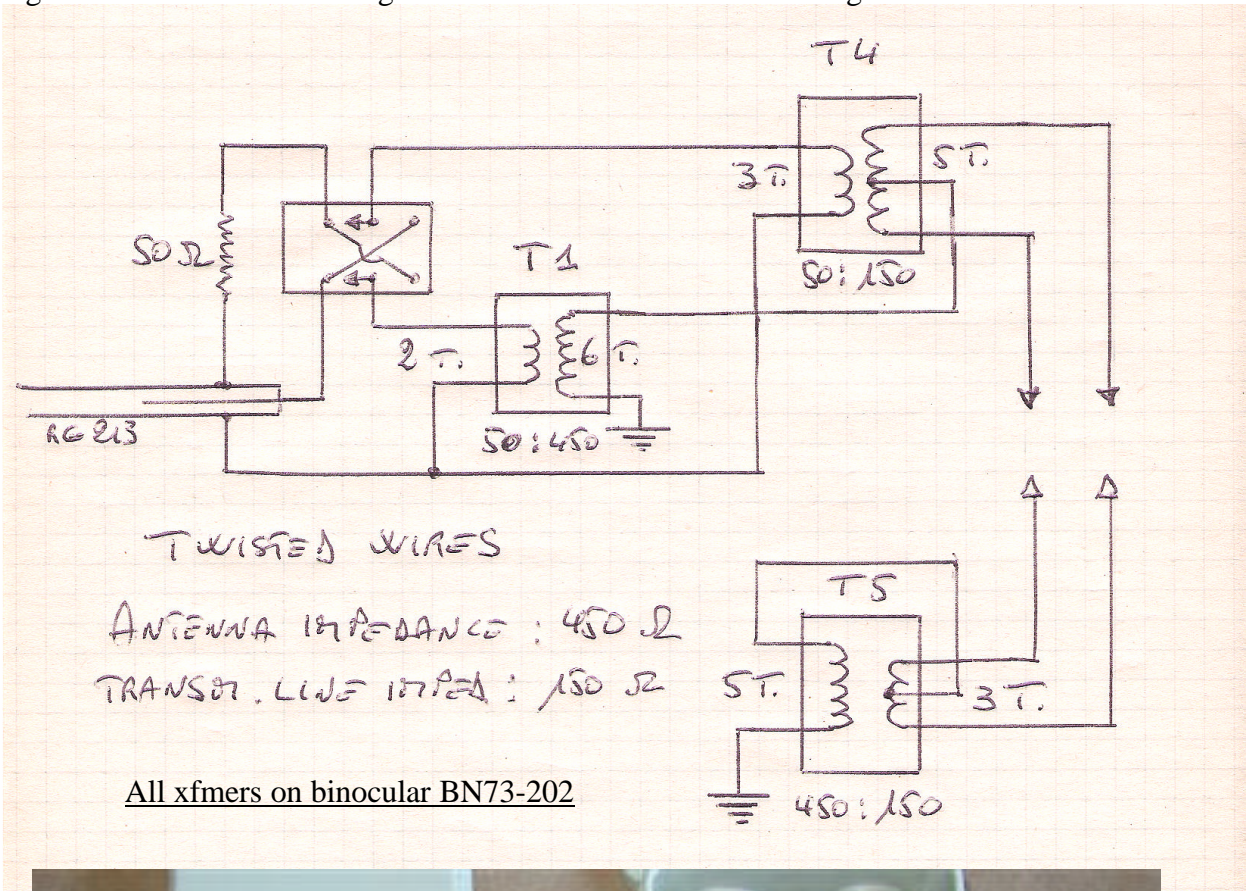
This is a Google Earth image of all my Rx antennas situation in March 2008.



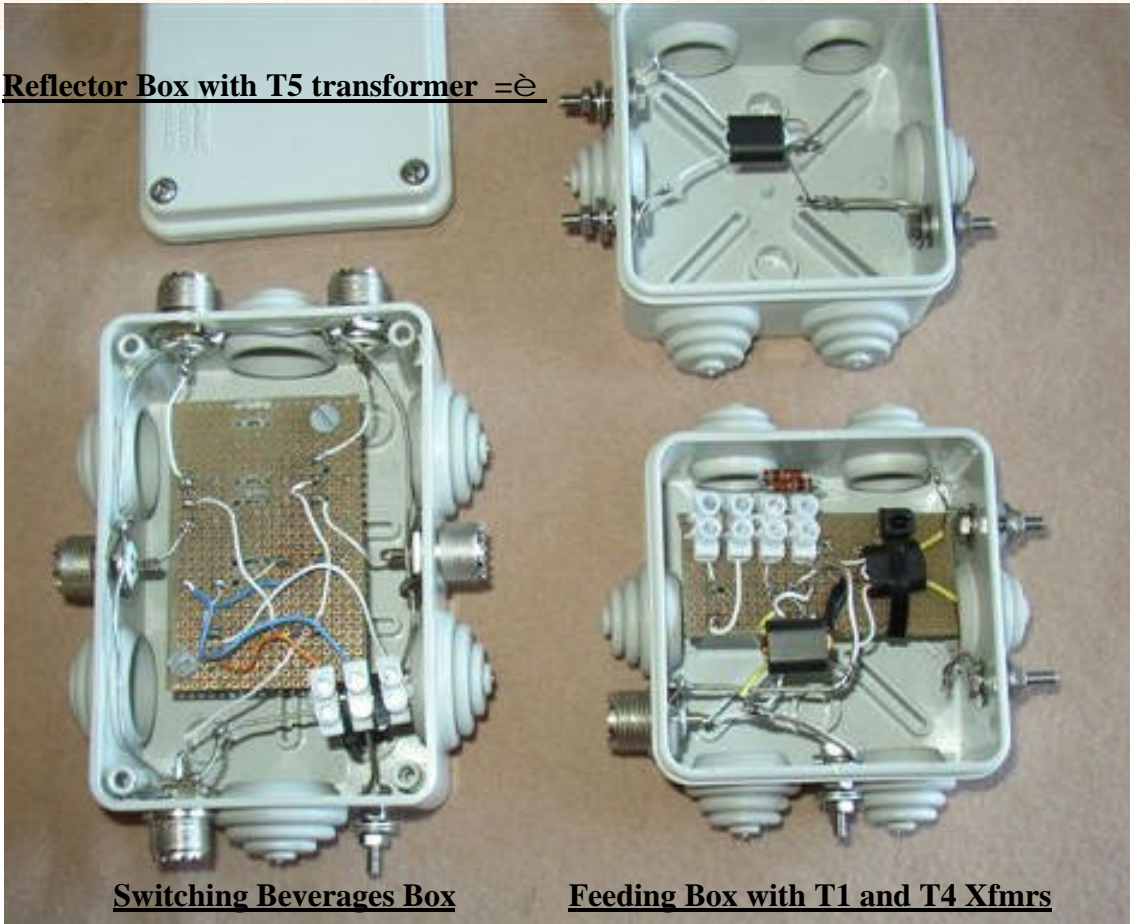
As the transmission line impedance of the twisted wires should be about 150 ohms and the Beverage antenna impedance could be around 450 ohms I used the same number of turns of OH2BEN for all the transformers, and wound them on the binoculars BN73-202, which I use now everywhere.



The following is the drawing of the switching circuit and transformers info of my reversible Beverage and it mates also with Fig. 7-23 on ON4UN Low Band DXing book.



Reflector Box with T5 transformer =>



Switching Beverages Box

Feeding Box with T1 and T4 Xfmrs





Feeding point of the two wires Beverage

Towards the end termination in the south direction. Beneath and crossing the power line.



The following are the impedance readings taken on the AEA CIA-HF Analyzer directly at the antenna feeding point for two different Beverage highs.

**2 wire Beverage - Dir . SOUTH = default direct mode**

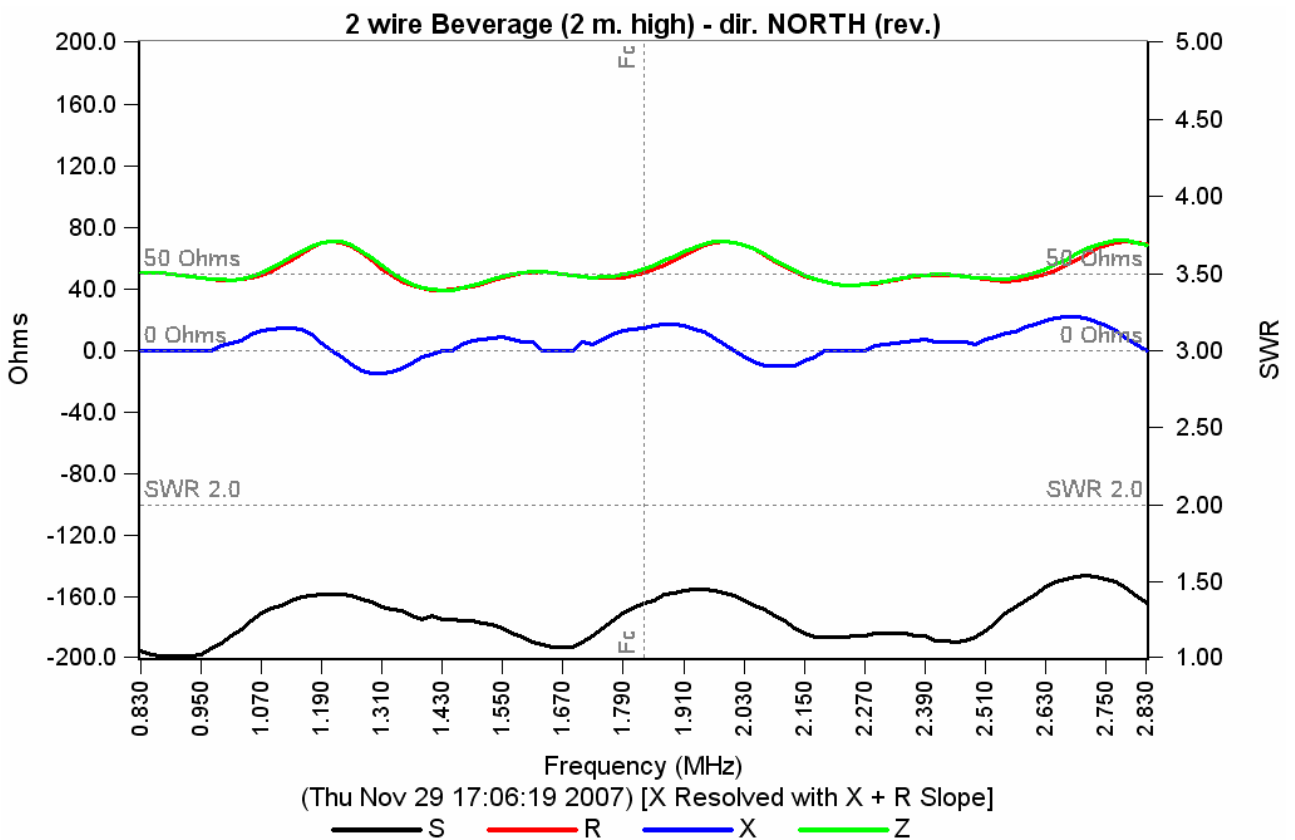
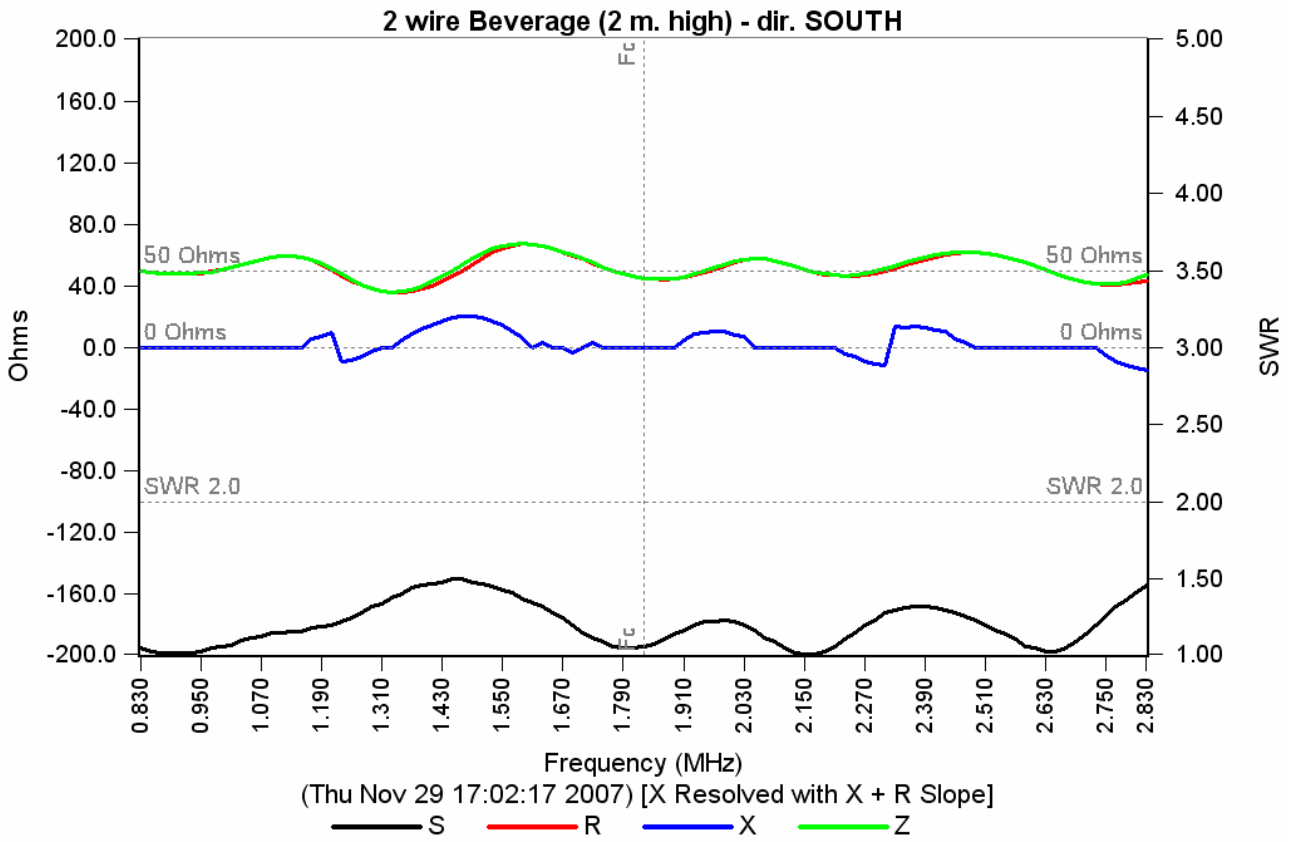
Freq. 1.830 MHz	<u>0,60 meters high</u>		<u>2,00 meters high</u>		
	R	56,1 ohms	R	62 ohms	
	X	6,7	X	9,9	
	Z	56,3	Z	62,6	
	SWR	1,18	(min. 1,00 max 1,50)	SWR	1,31

**2 wire Beverage - Dir . NORTH = reversed mode**

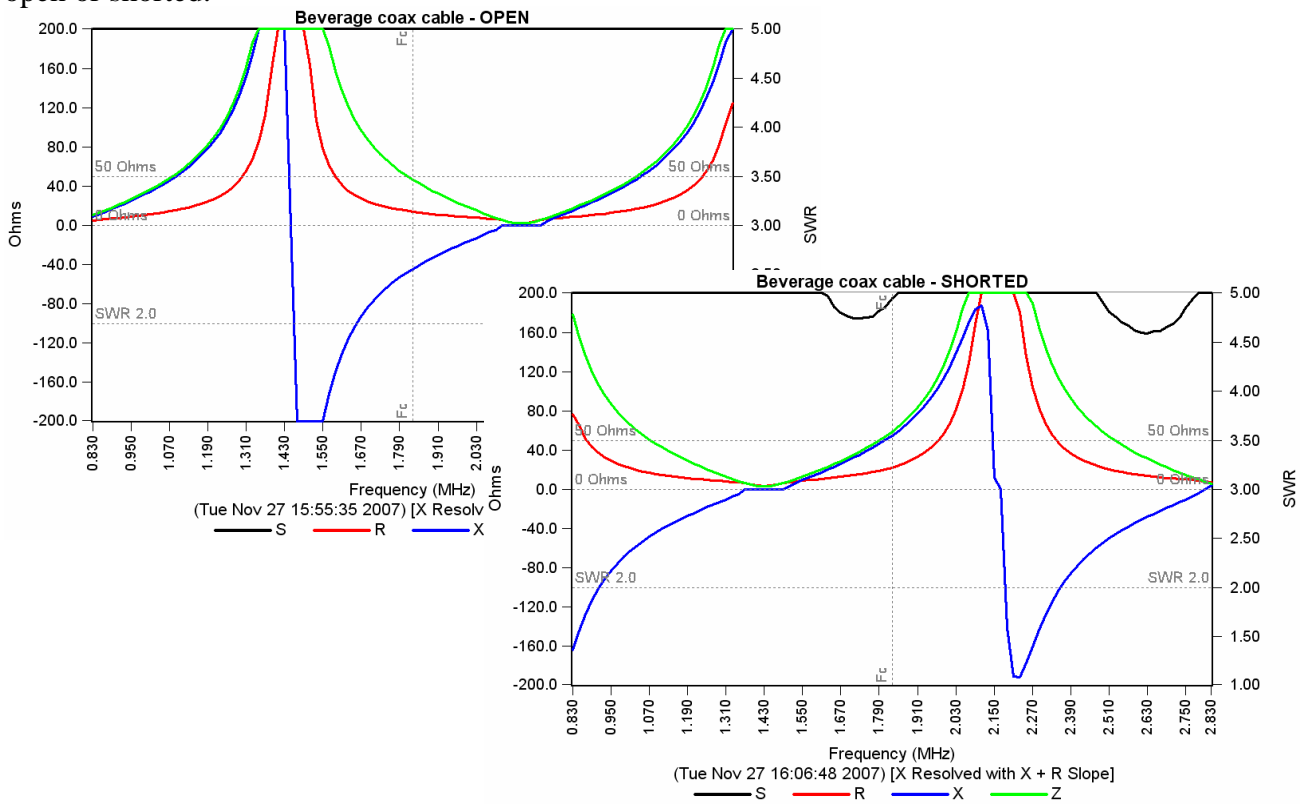
Freq. 1.830 MHz	<u>0,60 meters high</u>		<u>2,00 meters high</u>		
	R	39,7 ohms	R	39,3 ohms	
	X	0	X	5,6	
	Z	39,2	Z	39,8	
	SWR	1,26	(min. 1,10 max 1,50)	SWR	1,30

They appear not bad. The antenna impedance values were only estimated and of course they are neither 450 nor 150 ohms exactly and thus the difference in the resulting resistances, but the SWR is in the ballpark and acceptable.

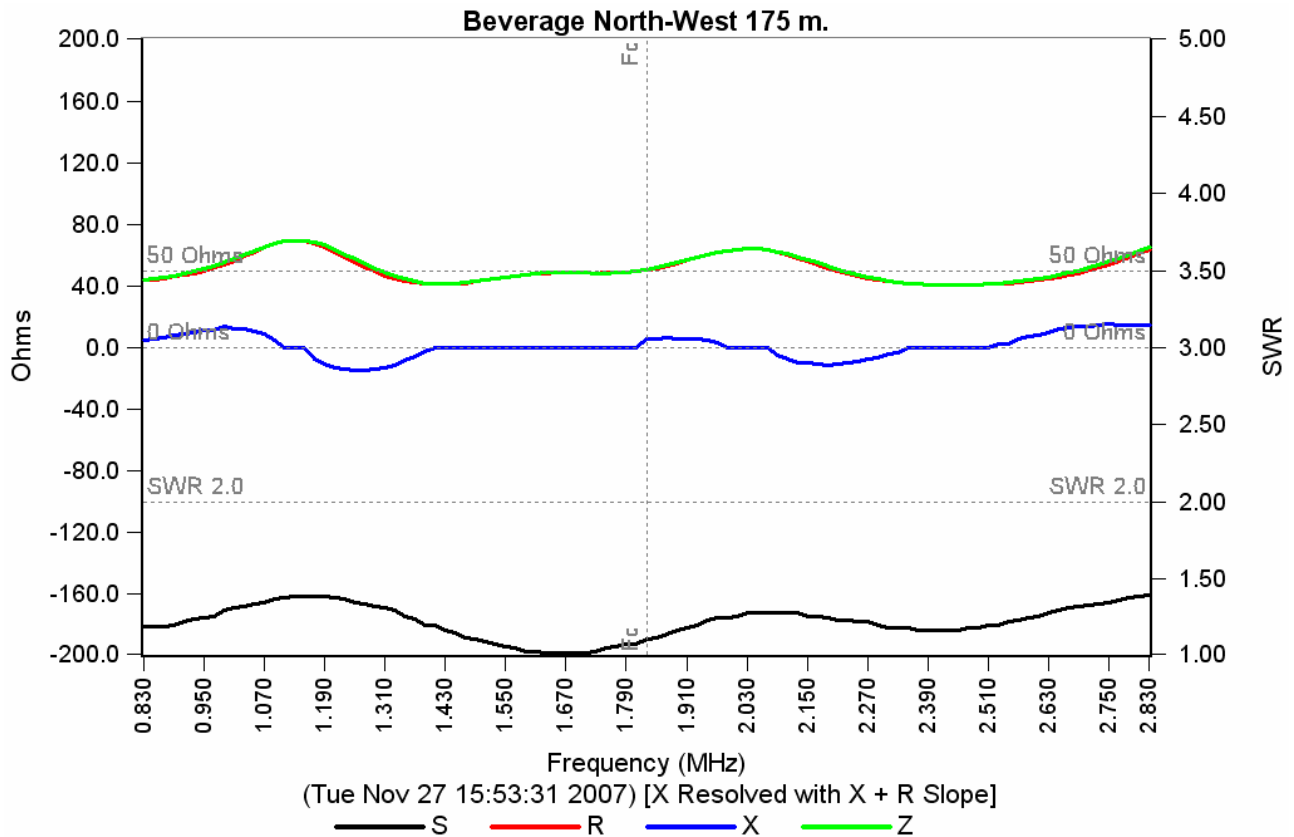
The following are the sweep readings taken with the same analyzer in the shack:



Everything seemed to be ok, but I wanted to check for any possible false reading, with either coax open or shorted.



And also with the single 175 m. Beverage as a reference on the other side.

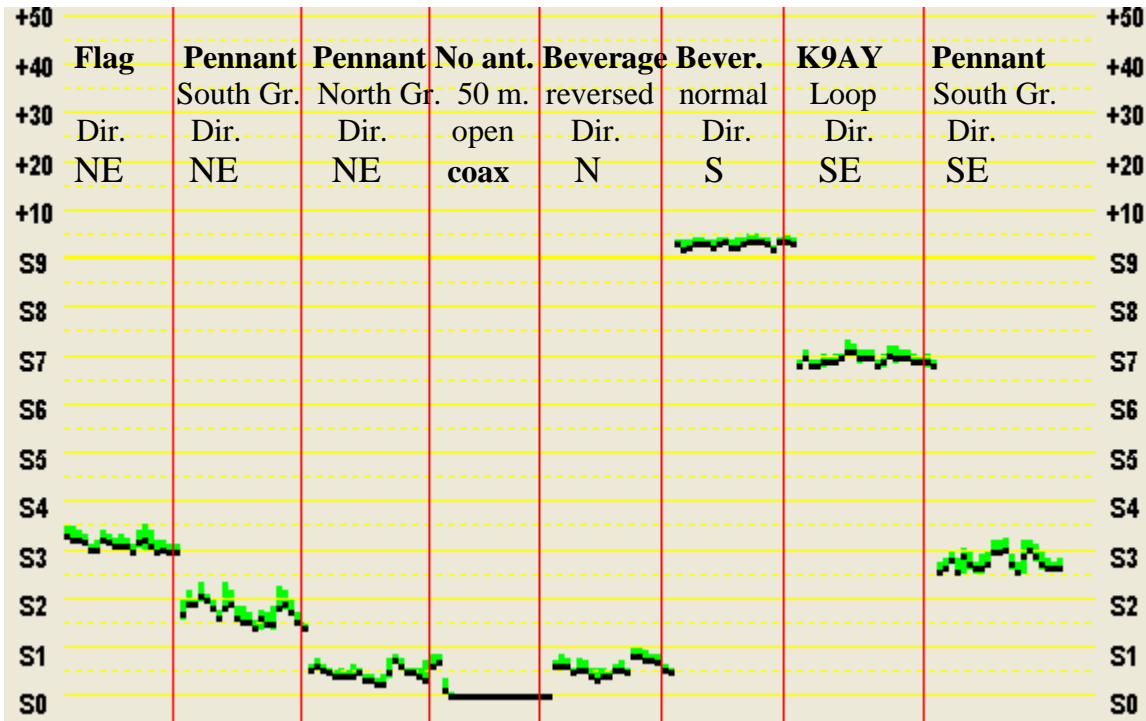


**On the air tests**

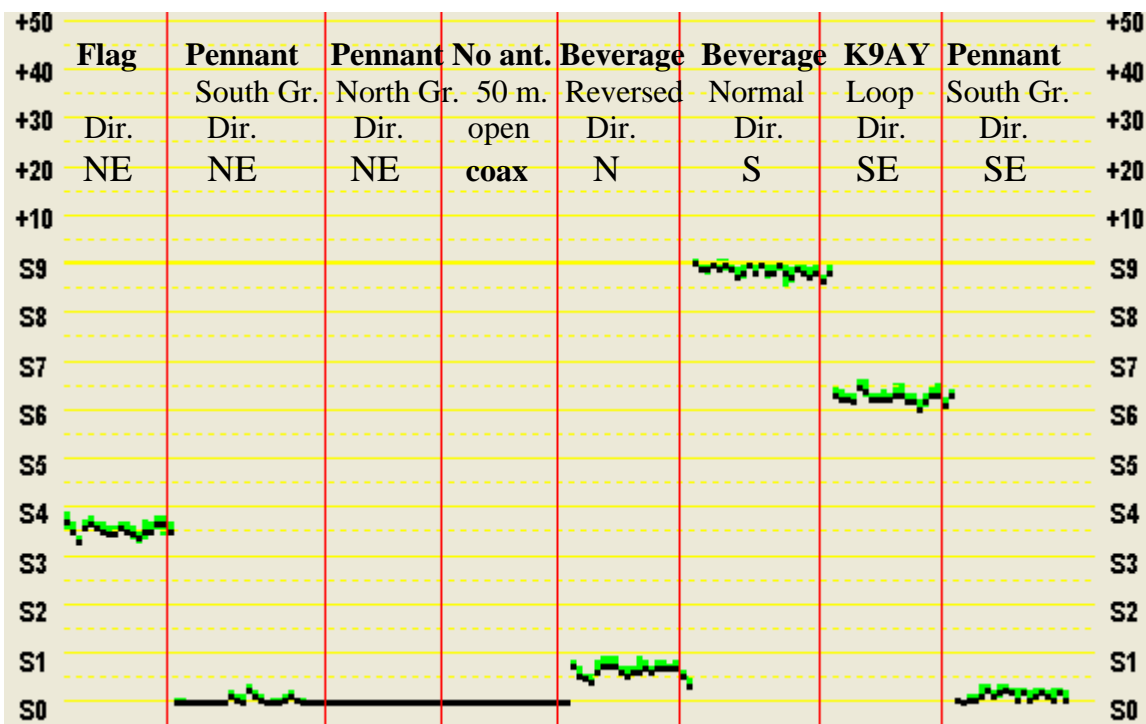
The 2-wire Beverage works very well in the northern “reversed” direction. Many times it outperformed the rotary Flag and, even not the right beaming, most of my JA’s of the last season have been heard better on the new antenna, thanks to its lower noise.

But on the opposite direction, “normal” to the south, the noise jumps up covering all the signals!

This is an S-Meter reading of the band noise taken today, April 13<sup>th</sup> at noon on 1.830 MHz on different Rx antennas.



Oh, I forgot a 10 dB preamp. on the Pennants line. The following are without that preamplifier:



**The Beverage has always 40 dB of noise difference between normal and reversed directions. Where could be the fault ?**

My friend Gary Nichols, KD9SV, wrote:

Luis, just one question to begin with. Does a single wire beverage in the same direction as the reversible beverage also have the same very high noise level? If not then perhaps we can discover what the problem is and find a cure. If it does have the same noise level then we need to look for the source of the noise...de gary

So, on April 15th 2008 between 10.00 and 11.30 a.m., I made the following tests:

1) Disconnected the reversing transformer and left one wire floating (bleu) and one wire to the ground stake (white). These are the readings on the AEA CIA analyzer:

A) Direct default mode to South				B) Reversed mode to North			
R = 51	X = 48	R = 21	X = 17	R = 21	X = 17	R = 21	X = 17
Z = 70	SWR = 2.5	Z = 27	SWR = 2.7	Z = 27	SWR = 2.7	Z = 27	SWR = 2.7

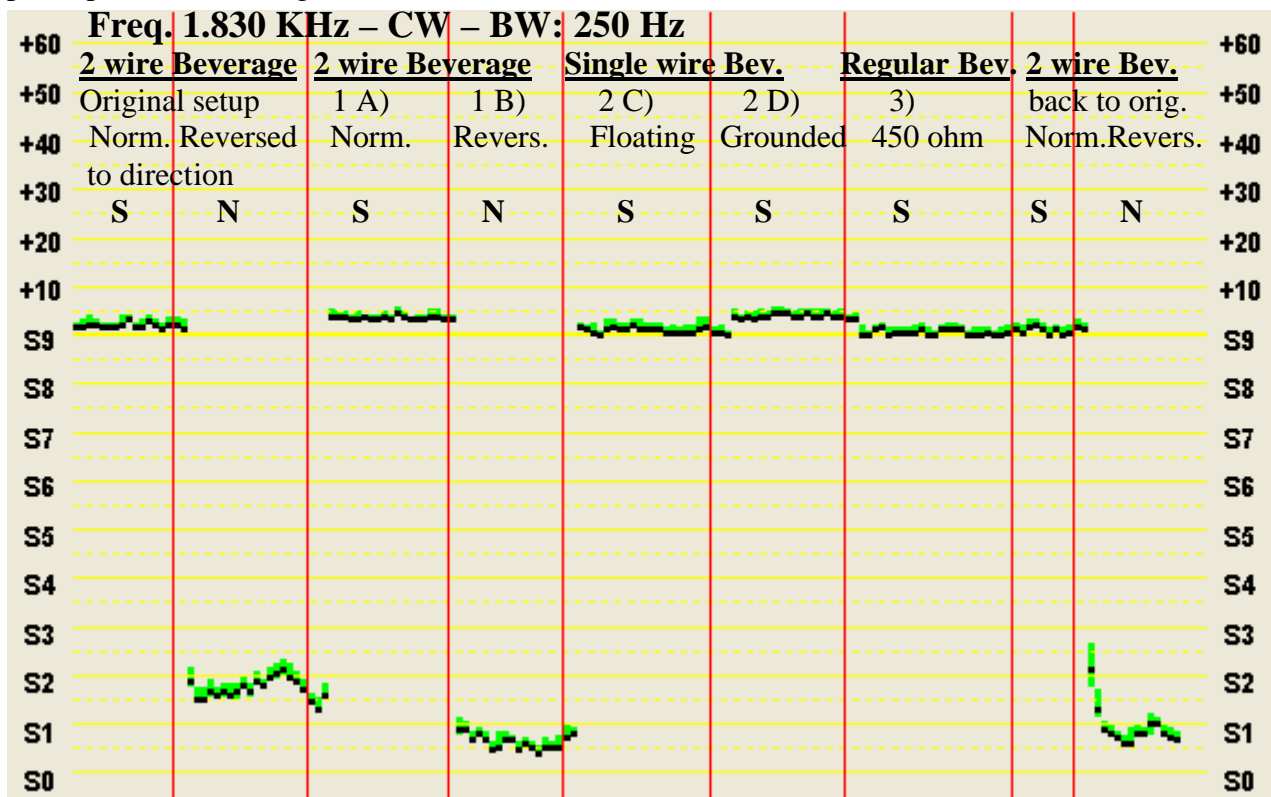
2) Substituted the reversible feeding box with an old tested 9:1 transformer box and left the far end wires as above. Two sets of readings while feeding each Beverage wire :

C) Connected the blue floating wire				D) Connected the white grounded wire			
R = 51	X = 75	R = 40	X = 57	R = 40	X = 57	R = 40	X = 57
Z = 90	SWR = 3.9	Z = 70	SWR = 3.3	Z = 70	SWR = 3.3	Z = 70	SWR = 3.3

3) Connected together the twisted wires at both ends as a single regular Beverage with a 9:1 xfmr and a 450 ohm termination.

R = 62      X = 0      Z = 62      SWR = 1.22

And the following are the S-meter readings of the Icom 756 Pro II (preamp. Off) + KD9SV preamplifier (at ¾ range)



The problem seems to be NEITHER in the two wire Beverage transformers NOR in the connectors/switching/coax feedline. So where to look for the source of noise ?



In the past I had been chasing for local noise with a portable AM receiver and also with the MFJ 852, Line Noise Meter, modified for a dedicated 3 elements Yagi. With such a set-up I could detect some buzz from the houses to the north (and a very weak also from my own furnace) but nothing from the power line or from the southern direction.



So I wrote to KD9SV:

The transformers are ok, so how could be such an increase of nearly 40 dB of noise ?? It is not pulse noise or something different ...it is just an increase in the normal background band noise.

I had the same on the other 175 m. Beverage along the road on the NW direction. Since a couple of years that Beverage became useless (and I tried everything: lowering near ground, changed xfmrs, loads, etc.)

So for me it's amazing that the reversible one works so well in the reversed northern direction. Many times it's really the best Rx antenna for Japan.

Gary answered:

Luis, this is probably a very dumb question but have you ruled out the possibility of a bad coax ground connection or coax connector causing the feedline to act as an antenna? I am assuming at this time you used the same coax for both the reversible and single wire antenna in the direction of higher noise. I suppose it is possible that you have high noise to the south and low noise to the north and the front-to-back of the antenna makes it a lot quieter in the north direction. Since the Pennant antenna do not appear to have this problem I would take a good at the connectors of your beverage coax.

I made also that last test and replied to him:

YES, of course I was using the same coax (and connectors) for both reversible and single wire antenna directions .... that's the mystery !

Anyway I just took the feedline going to the Pennants and brought it to the Beverage: NOTHING CHANGED, so I must give up.

FB on your K9AY loop. Also mine is working ok. Yesterday evening I was taking the S-meter readings on YR2TOP beacon: there was a very good F/B, but on the opposite direction the signal is masked by an S7 noise, so the printout is meaningless.

Now I am worrying about the worth of a new 4 square effort in that area.....

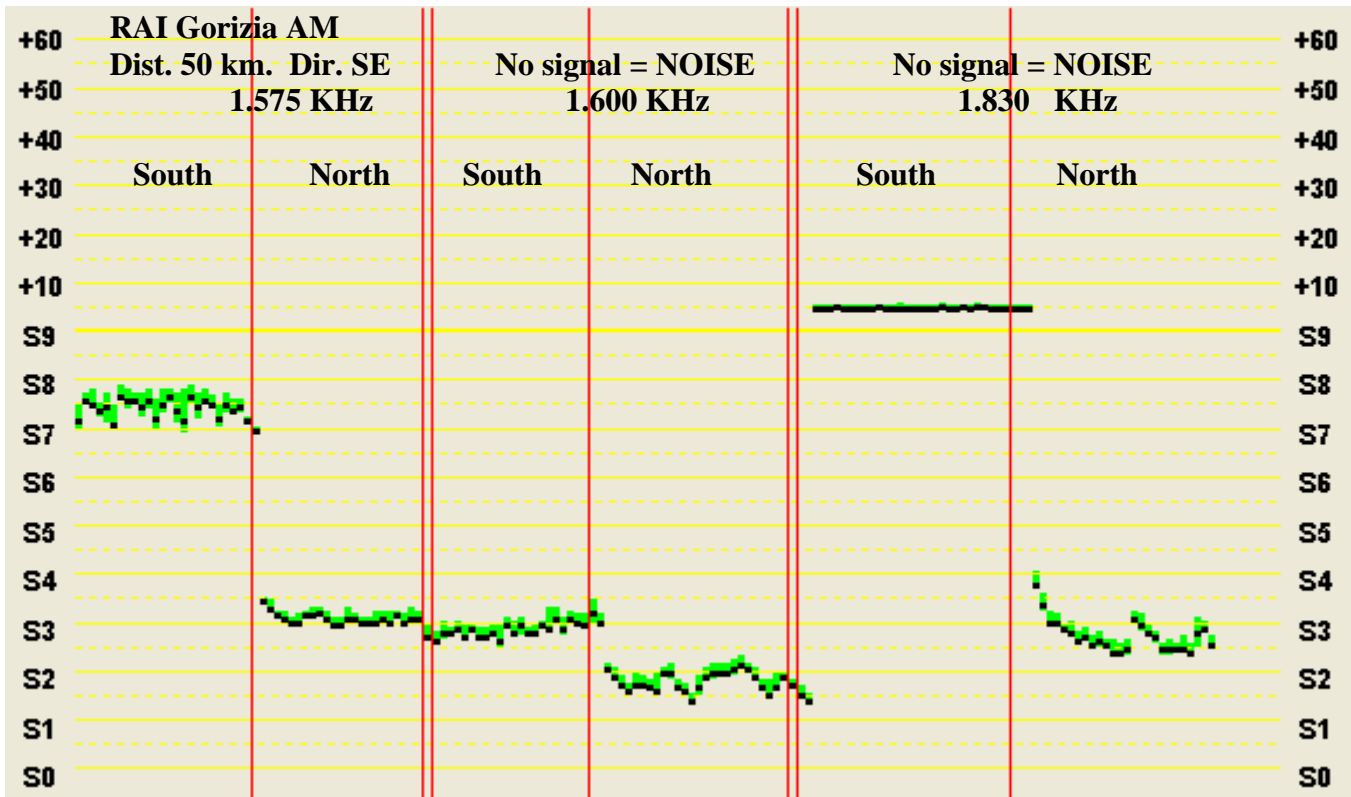
KD9SV wrote:

Luis, it sounds like there must be a real noise from that direction...if so then perhaps it could be canceled with a phase inverter/combiner like the MFJ 1025. Perhaps you could borrow one from another ham friend and try it. If the noise is always there it could be cancelled like power line noise...just a thought, de gary

I have the MFJ 1025 myself... but no way!

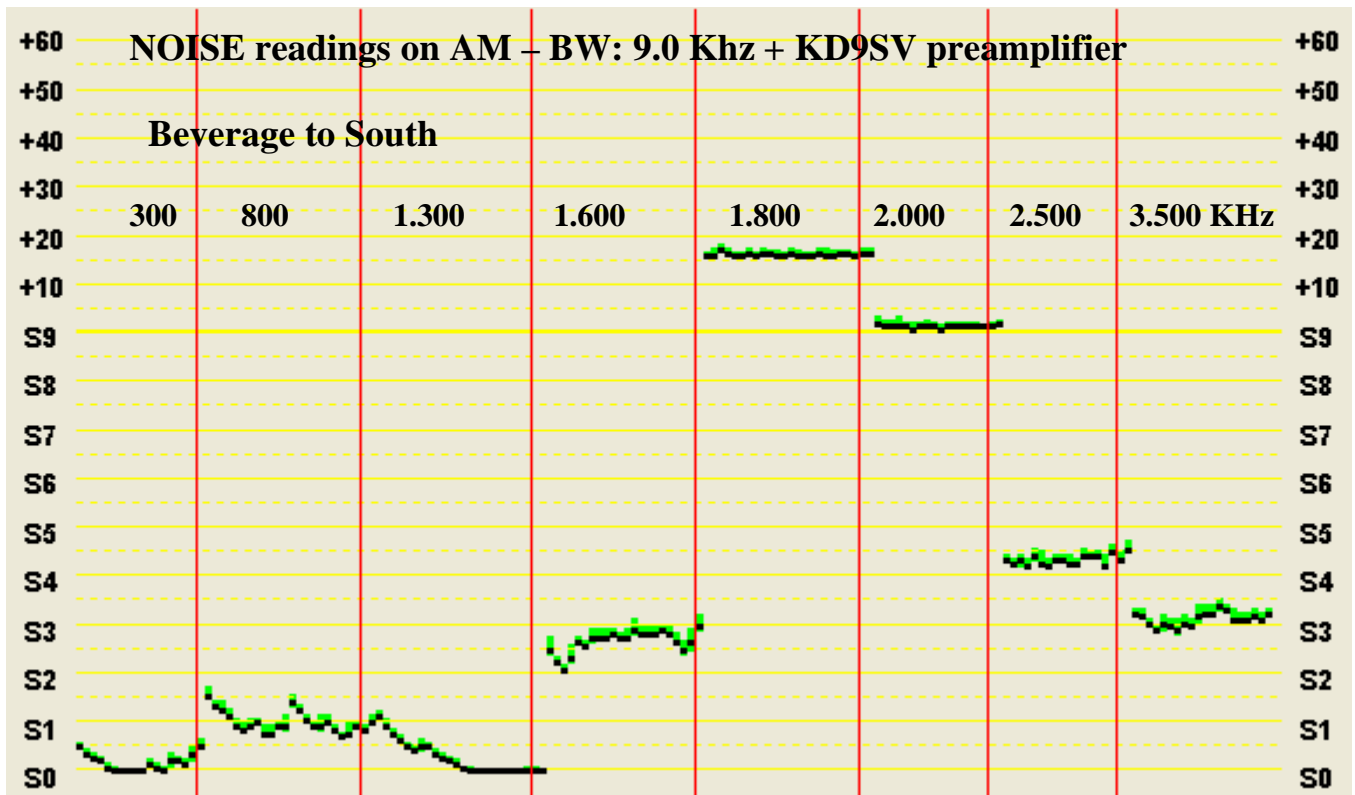


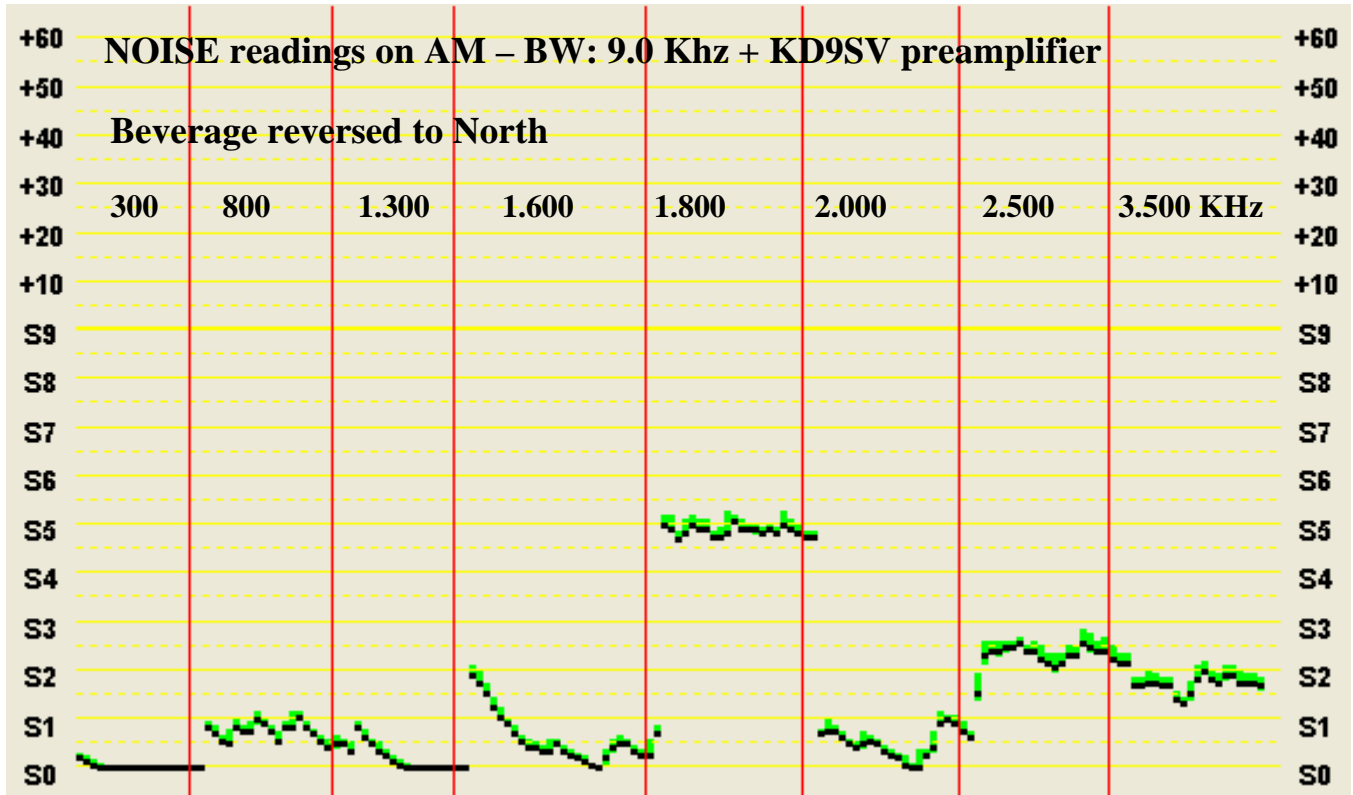
So I went ahead investigating how the Beverage was working down on the AM BC band:



Not bad! On the Broadcasting AM stations the Beverage works as it should: more than 20 dB FB (and not quite on the back). Here, on 1.575 KHz, the S-meter reads the Signal and not the noise! Just a little bit higher, on 1.600 KHz, without signals, the s-meter to south peaks S3, but on 1.830 it jumps again to S9+.

So let's see on which frequency the noise is peaking:

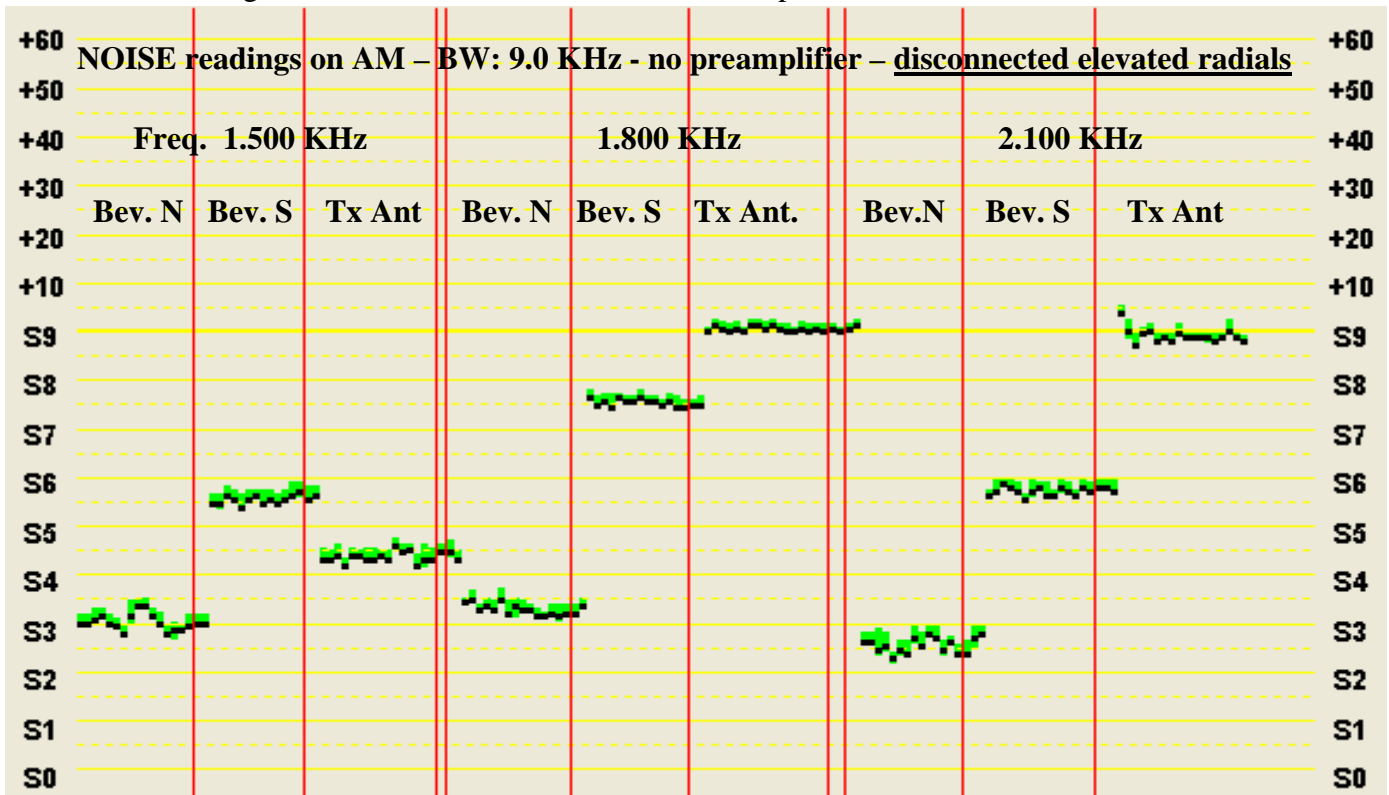




The 1.8 MHz pass-band filter in the KD9SV box is very effective, with such s-meter peaking there, but something strange happens **with almost 40 dB of difference between the two directions.**

Next I disconnected the four elevated radials – tuned at 1.830 MHz - from the base of my transmitting antenna (already detuned), in the hope to have found the problem...

The following test is without the KD9SV box and compared also with the TX antenna:

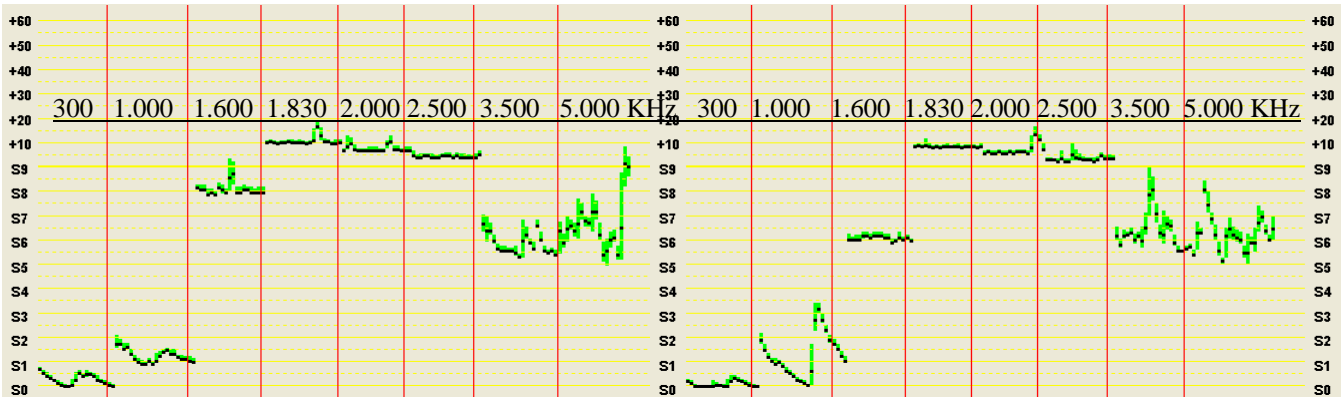


No way. The noise on Beverage to North is always around S3, while the noise to the South is S6 outside the 160 m. band and jumps to S8 on 1.8 MHz. There are no more 40 dB difference, but still a lot! (and the Tx antenna is even noisier).

Here is a complete set of noise s-meter readings taken from 300 KHz to 5 MHz on several antennas before (left), and after (right) detuning the Tx tower and disconnecting the elevated radials.

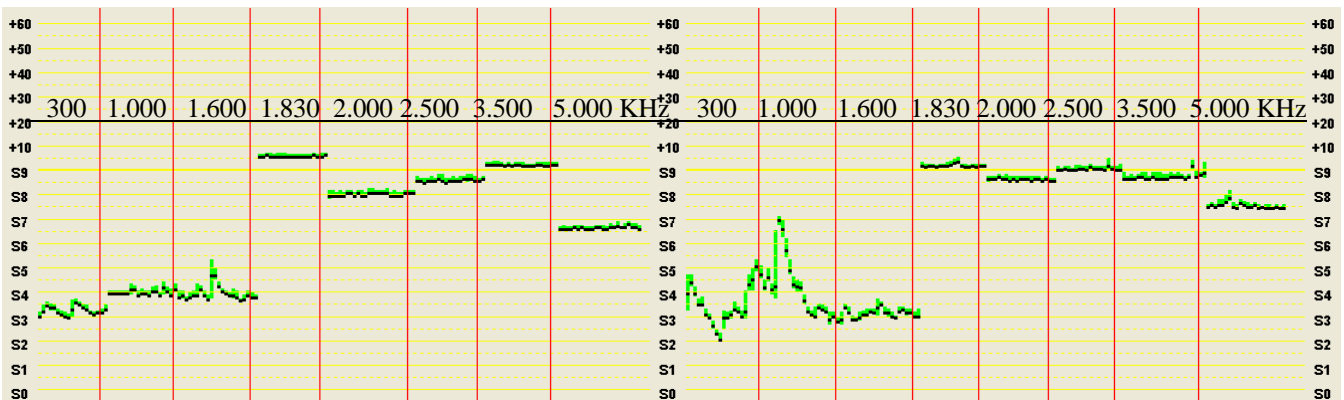
**Tx antenna**

== > disconnected elevated radials on Tx antenna



**Beverage to South**

== > disconnected elevated radials on Tx antenna



**Beverage to North**

== > disconnected elevated radials on Tx antenna

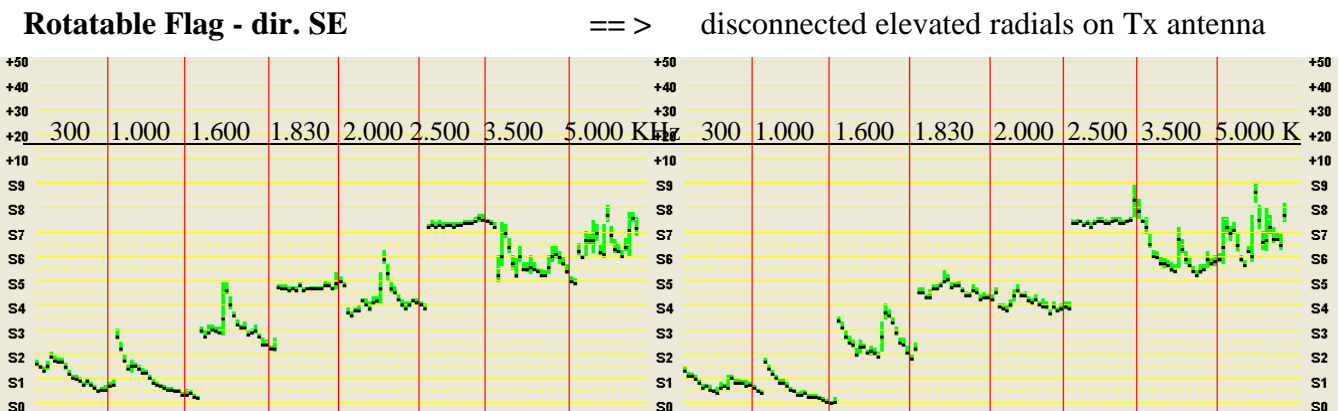
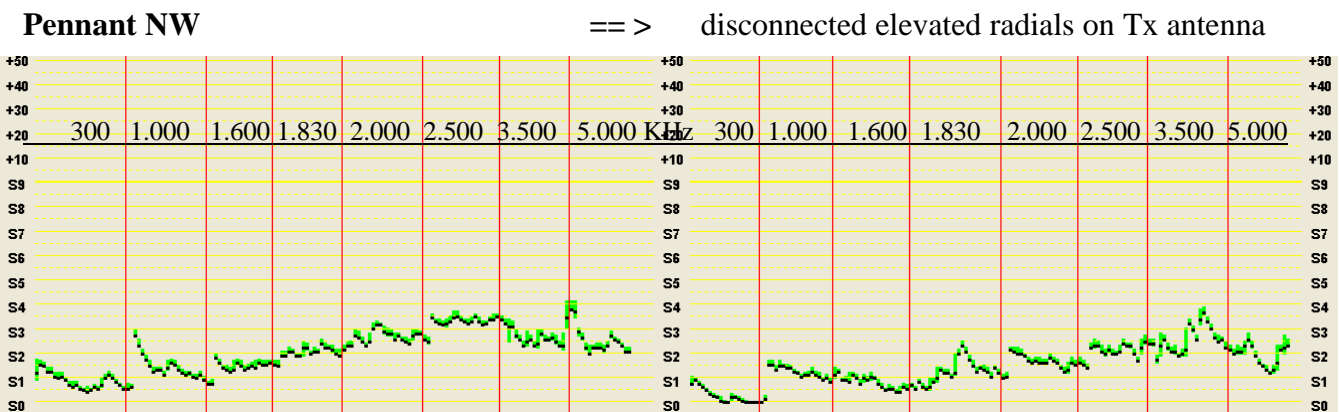
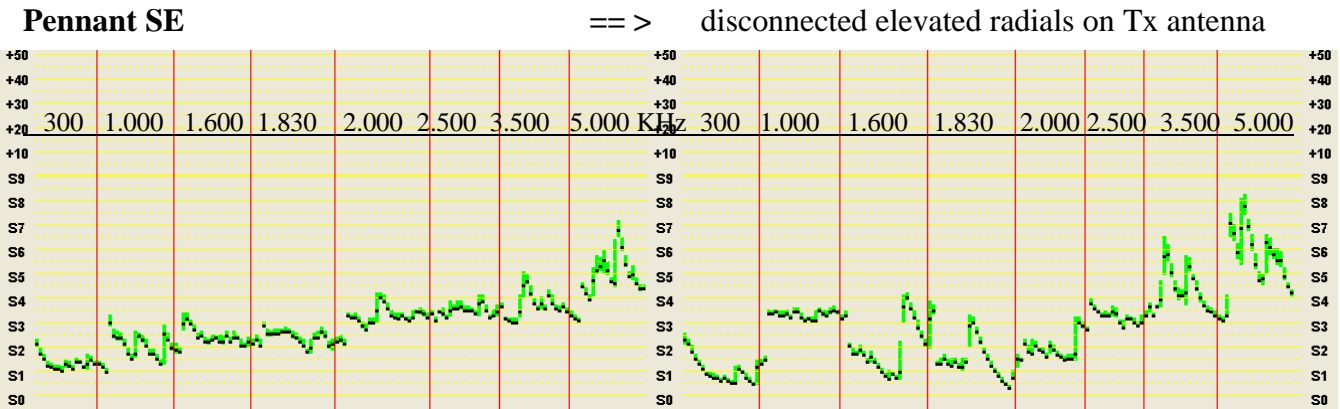


**K9AY Loop dir. SE**

== > disconnected elevated radials on Tx antenna







There are no meaningful differences, as far as noise pick up is concerned, from the left and right plots. Apparently there is no interaction with the elevated radials.....

KD9SV wrote in his last note:

Luis, just a parting thought...have you tried decoupling the coax from the beverage like the way you decoupled the coax on your square4? I wouldn't think common mode noise would only come from one direction though...de gary

Actually I didn't before, so I tried with 12 turns of RG58 through two FT140A-J toroids at the feeding box but, once again, nothing changed !

April 2008

Luis IV3PRK

**ADDEDNDUM - December 2008**

**This winter season I put the same Beverage in another position, with a 60 degrees offset (NNW and SSE directions) and it works correctly as it should on both ways ... to confirm that all my problems are only in the surrounding telephone and power lines !**

**See: RXant. Two wire Beverage\_ FOLLOW UP**