Folded Beverage Antenna

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I have got a new job, and therefore I have moved again in a new place. I have moved from Richmond Hill to Niagara Falls, it is 150 km far from my old location. Of course on the new location the question about antenna arose again.

At first sight it seems to me like a simple matter because I have enough space on my backyard to install something big and real. But… while I have been lived in Niagara Falls for several autumn and winter months I discovered that there are very strong winds. At the winds trees on my backyard shake in different directions and sloped almost to ground, plastic garbage cans flying around… In winter time minus 20 C degree may suddenly change to plus 5 degree and again to minus 20 turning backyard to ice skate rink.

So I need antenna that can stand strong winds, do not require service in winter and (of course!) work on the Bands from 160 to 6 meter. Only one antenna can provide such requirements. It is the Beverage Antenna with wire stapled to fence. Winds cannot damage the wire, squirrels and raccoons do not interested in the fence wire and the Beverage antenna should work in a wide range.

However I cannot install straight Beverage Antenna. Wire that was installed on the fence around of my backyard has shape elongated along letter U. **Figure 1** shows design of the antenna. Wire was stapled to the fence at height of 1.8 meter above the ground. The total length of the wire was 41 meter.

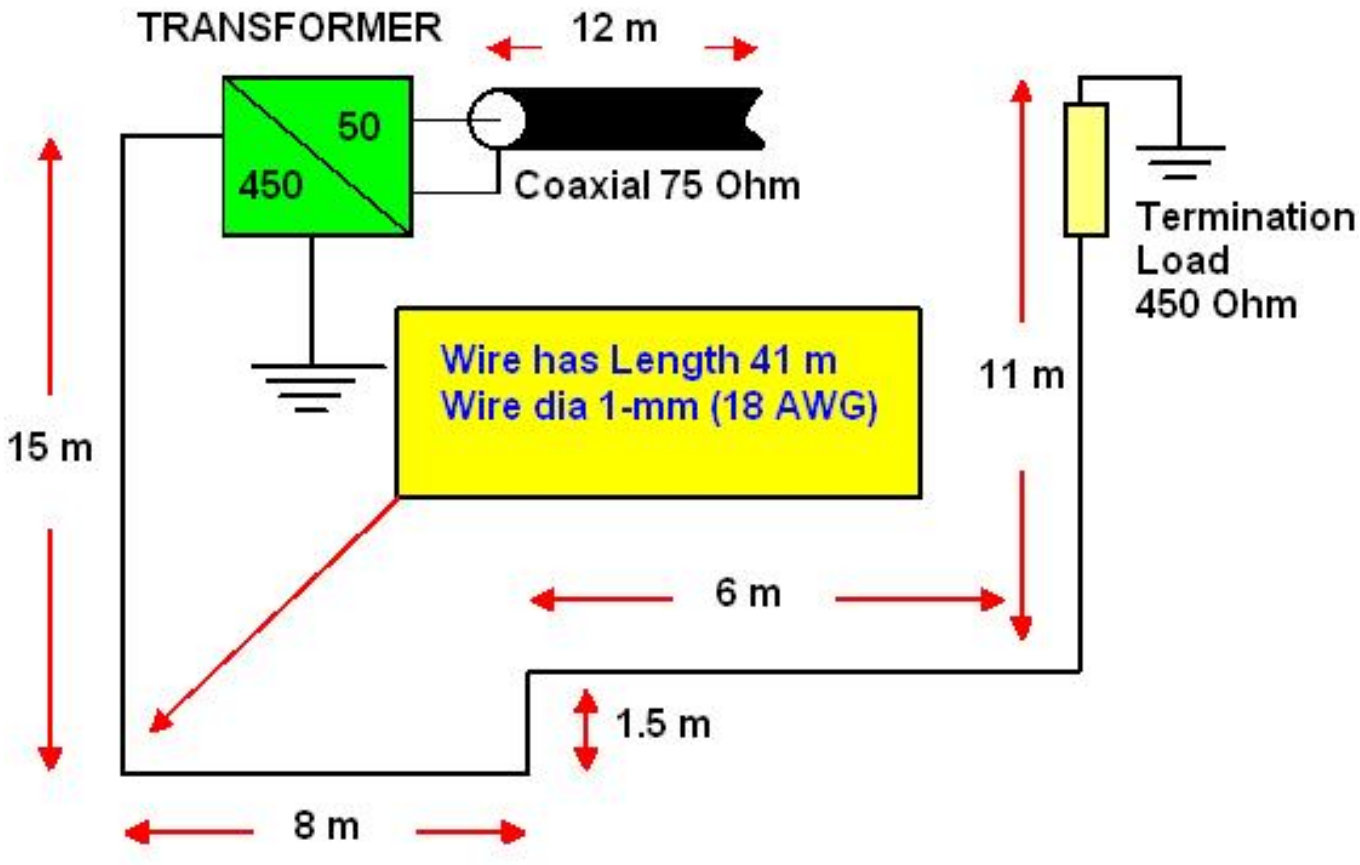

Figure 1 Folded Beverage Antenna

Several words about design of the antenna

Transformer of the antenna: Transformer 50/450-Ohm is the same as described at:
http://www.antentop.org/020html/020_p27.htm

Grounding: Grounding is very important part of the Beverage Antenna. I made both sides grounding from copper tube in diameter of half inch and 6 feet length. **Figure 2** shows design of the grounding. The pipe was bent in shape Z.

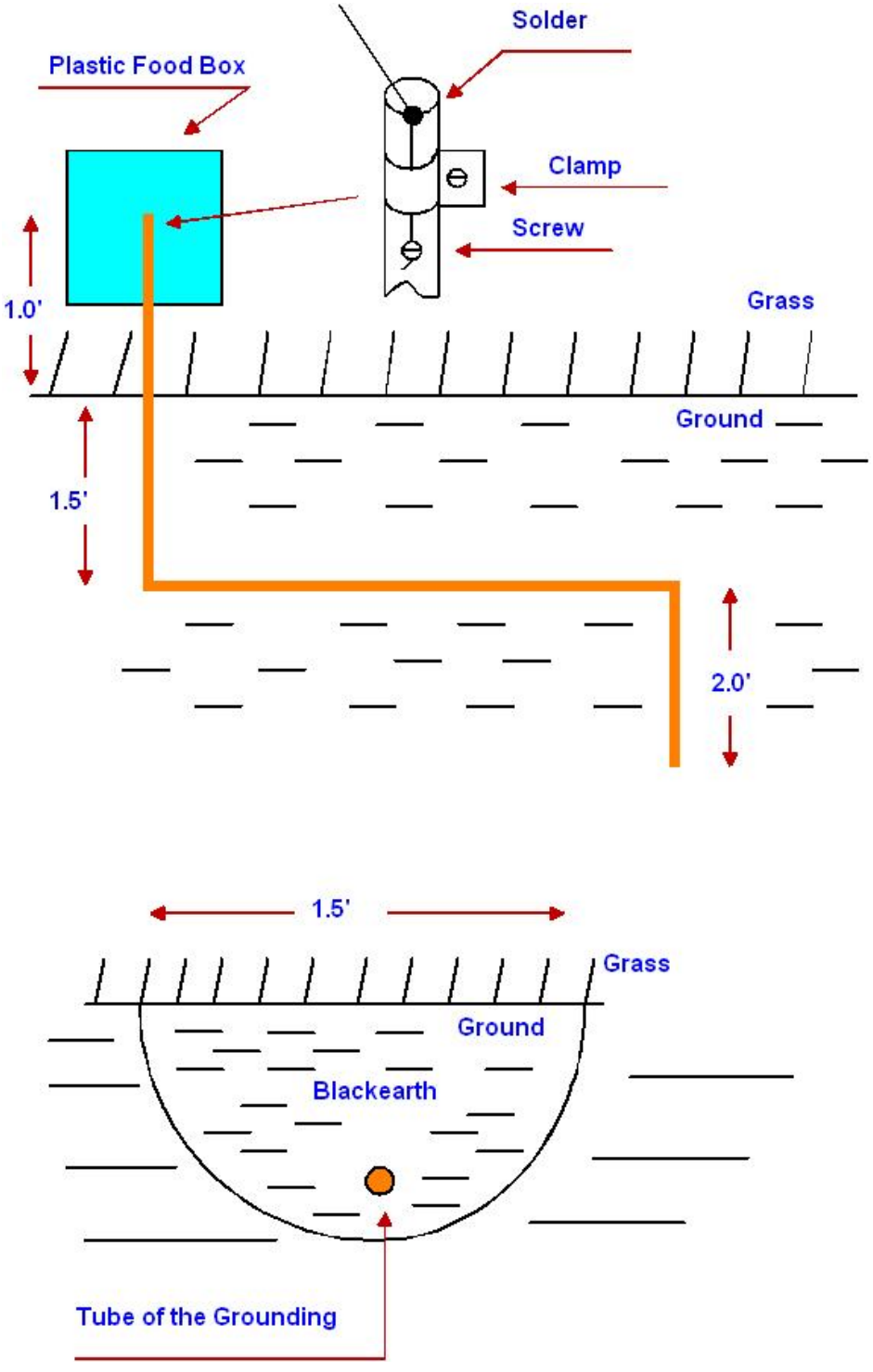

Figure 2 Grounding of the Folded Beverage Antenna

Tube was placed in trench of 1.5- feet wide and 1- feet depth. Upper part of the tube was connected to antenna. The trench was filled with black earth. Grass was planted at the earth.

The pipe was connected with antenna (transformer and termination load) in three ways: by soldering, clamp and with screw contact. This three ways connection was made to stand the weather conditions. **Picture 1** shows pipe before installation. **Picture 2** shows pipe in the trench. **Picture 3** shows pipe inside of the plastic food box.

Feeder: Feeder is important part of the antenna system. In my case in my location occupied by squirrel and raccoons that have interest to coaxial cable as a food it is very important.

Picture 1 Pipe Prepared for Installation

Picture 2 Pipe in Trench

Picture 3 Pipe Inside of the Plastic Food Box

So, as much length of the coaxial cable as I can I drive underground inside of a plastic water tube.

The plastic tube was buried on to 1 foot depth. **Figure 3** shows feeder of the Folded Beverage Antenna. For feeding of the Beverage antenna I use to an old coaxial cable RG-6. Yes, it was real RG-6 with real two layer outer and real underground plastic covering.

This cable was leaved on the external house wall from old CATV and this cable is going into basement and in the basement it is going exactly to my IC-7410 radio. This coaxial cable was made in USA, and this one is much better the most of modern coaxial cables (I have seen lots different modern coaxial cables). I must use that old one for feeding of the antenna.

The length of the coaxial cable from antenna transformer to the transceiver was 12 meters. The RG-6 was designed for CATV and it is 75- Ohm Coaxial Cable. However, as practice shows the coaxial cable can be used for feeding the Beverage

Antenna from transceiver that intended work with 50-Ohm load. **Picture 4** shows trench with plastic tube. Then several bricks were put down to the tube and the trench was filled with black earth. **Picture 5** shows the bricks on the tube. Transformer 50/450 Ohm was sitting in a plastic food box. **Picture 6** shows the transformer in the plastic food box.

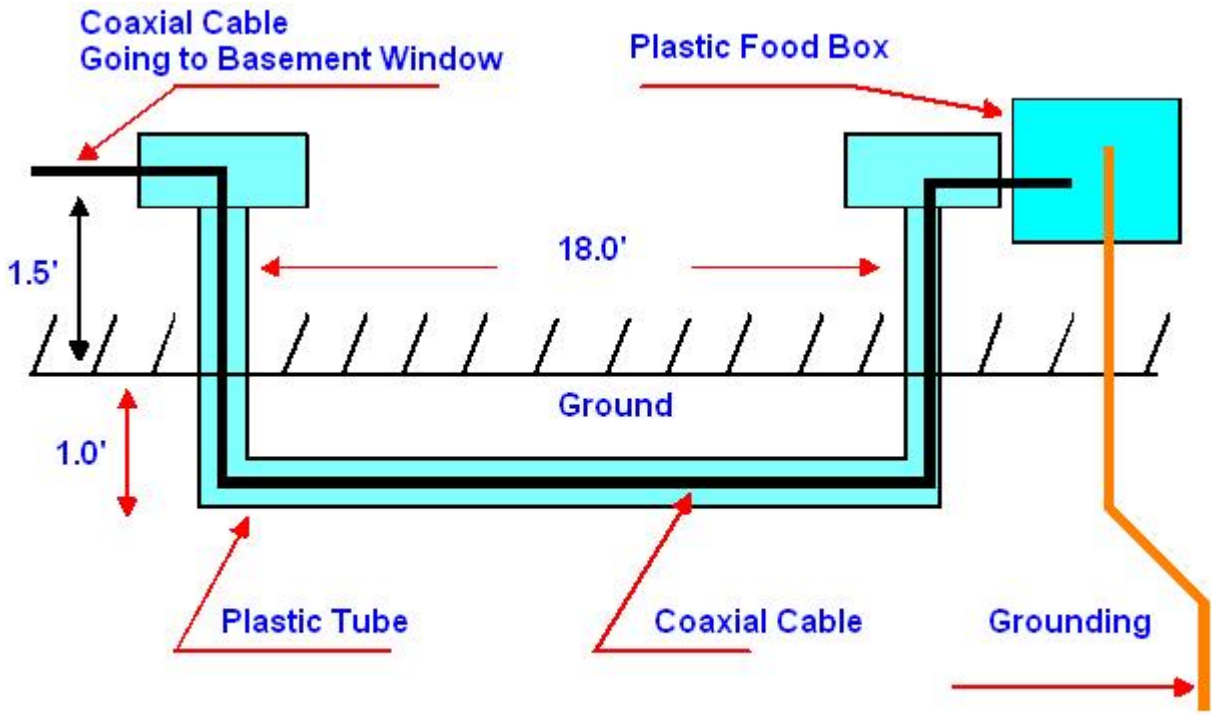

Figure 3 Feeder of the Folded Beverage Antenna

Picture 4 Trench with Plastic Tube

Picture 5 Bricks on the Tube

Termination Load: The termination load was made of from 100 resistors of 470 ohm-5 watts. . **Figure 4** shows the design of the load. I have bought the resistors from China (e- bay) and what I say that the resistors are identically that are at D- Key.

But I just save money… Anyway I have termination load for 10 USD that can stand 500 watts and should be alive at nearest lighting strike. I did taps at 460, 415 and 350 Ohm at the termination load to try best match of the antenna with transformer and transceiver. **Picture 7** shows the termination load placed inside of the food plastic box.

Picture 6 Transformer in the Plastic Food Box

Picture 7 Termination Load Placed Inside of the Food Plastic Box

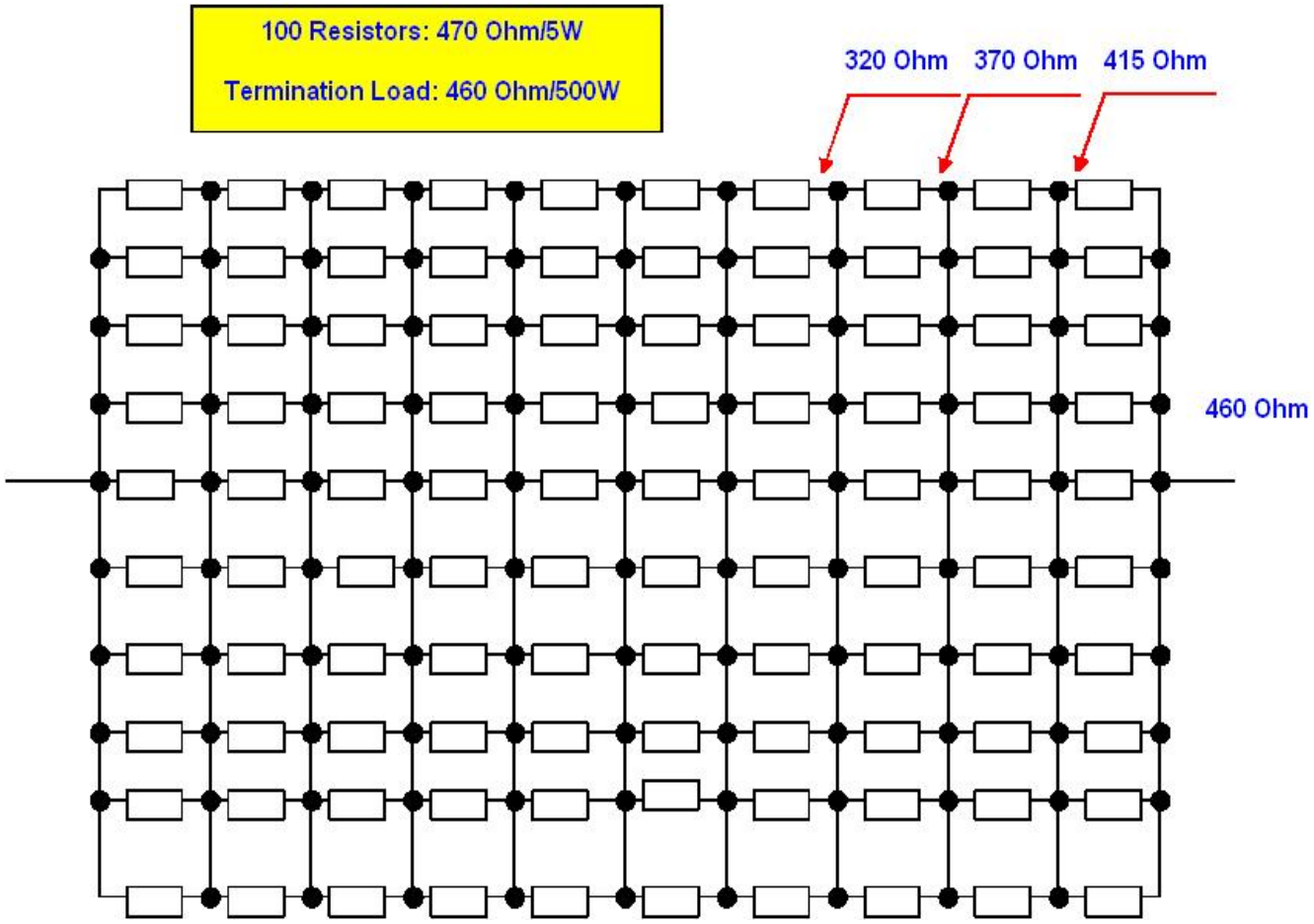

Figure 4 Termination Load of the Folded Beverage Antenna

Antenna Parameters: So, the antenna has been installed. After that I have measured the antenna parameters. **Figure 5** shows the schematic for the measurements. I test the antenna with antenna analyzer MFJ 259B and usual SWR meter HANDIC that was turn on in series with the transceiver IC-7410. Before the measurement, both devices, MFJ- 259B and SWR Meter HANDIC with SWR meter of the IC-7410 transceiver were verified with loads 25, 50, 75 and 100- Ohm.

However, real data for the Beverage Antenna were a little different with SWR meter of the MFJ-259B and the usual SWR meter. For measurement with the HANDIC and IC- 7410 I used 80-W at 160 and 80 meter Band and 50-W at others bands.

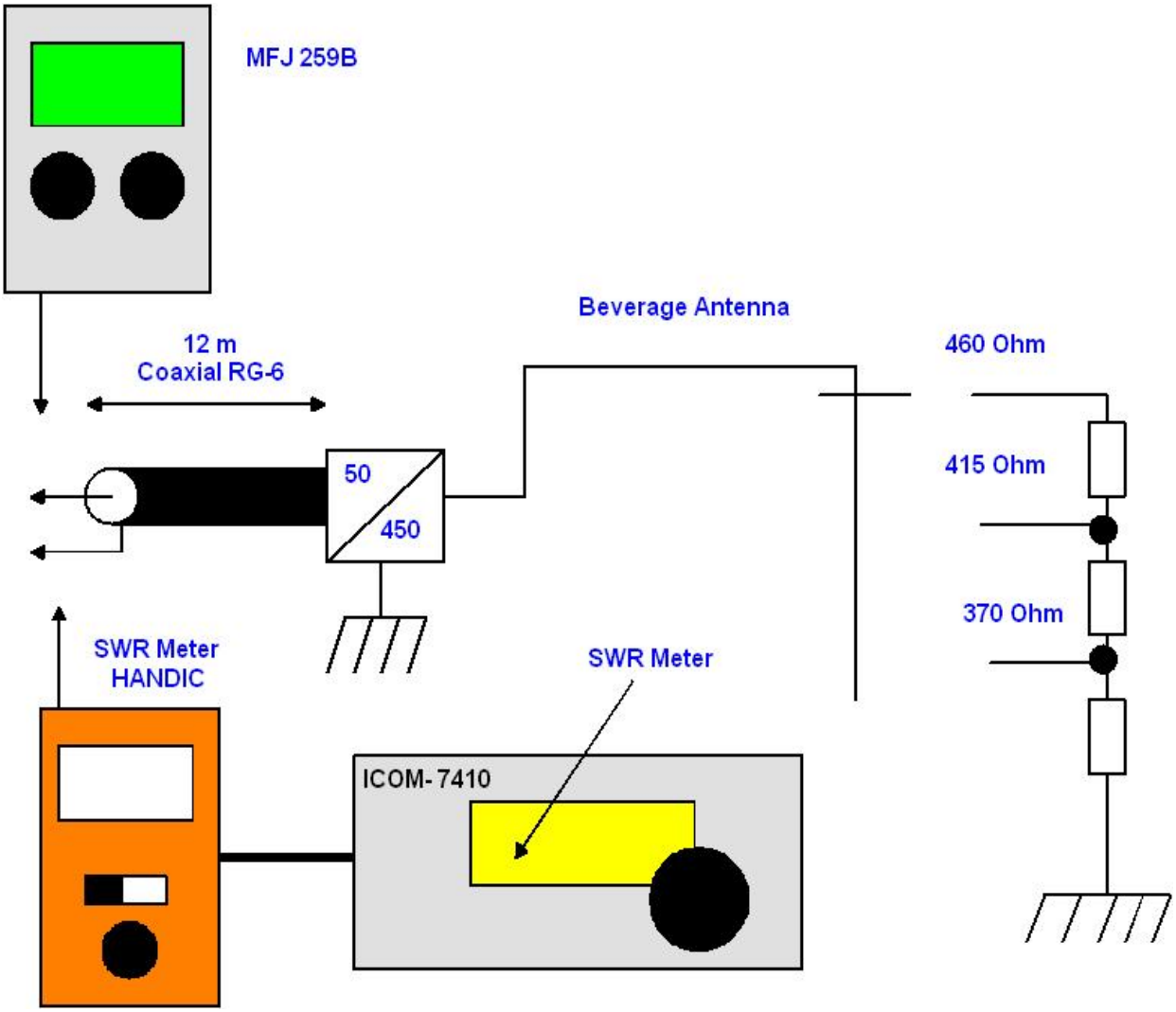

Figure 5 Schematic for the measurements of the Antenna Parameters

Table 1 shows parameters of the antenna with termination load of 460 ohms. **Table 2** shows the parameters of the antenna with termination load of 415 ohms. **Table 3** shows the parameters of the antenna with termination load of 370 ohms. Antenna with termination load of 460 Ohm had the best parameters so I decided use to the load for my antenna.

I did not simulate the antenna parameters in my lovely MMANA because of lots of ambient (that I cannot simulated in the soft) may influence to the antenna.

Table 1

Parameters of the Folded Beverage Antenna with termination load of 460 Ohms, measurement with Antenna Analyzer MFJ- 259B and with SWR Meter HANDIC + IC-7410. Length of the coaxial cable between antenna and Transceiver is 12 meter

160 m	80 m	40m	30 m	20 m	17 m	15 m	12 m	10 m	6 m
Antenna Parameters measurement with Antenna Analyzer MFJ- 259B , MFJ 259B Impedance									
79 +108	129+ 19	42+26	64+0	46+ 52	41+10	65+ 44	25+ 7	76+ 2	24+ 18
Antenna Parameters measurement with Antenna Analyzer MFJ- 259B , MFJ 259B SWR									
4.0	2.4	1.8	1.2	2.6	1.3	2.2	1.9	1.5	2.5
Antenna Parameters measurement with SWR Meter HANDIC + IC-7410, SWR									
3.0	2.2	1.2	1.0	2.1	1.1	1.9	1.5	1.1	1.5

Table 2

Parameters of the Folded Beverage Antenna with termination load of 415 Ohms, measurement with Antenna Analyzer MFJ- 259B and with SWR Meter HANDIC + IC-7410. Length of the coaxial cable between antenna and Transceiver is 12 meter

160 m	80 m	40m	30 m	20 m	17 m	15 m	12 m	10 m	6 m
Antenna Parameters measurement with Antenna Analyzer MFJ- 259B , MFJ 259B Impedance									
65+ 112	131+ 19	42+ 27	64+0	45+52	42+ 10	62+ 44	25+ 7	76+2	24+ 18
Antenna Parameters measurement with Antenna Analyzer MFJ- 259B , MFJ 259B SWR									
4.2	2.5	1.8	1.2	2.6	1.3	2.2	1.9	1.5	2.5
Antenna Parameters measurement with SWR Meter HANDIC + IC-7410, SWR									
3.0	2.3	1.3	1.0	2.1	1.2	1.9	1.5	1.1	1.5

Table 3

Parameters of the Folded Beverage Antenna with termination load of 370 Ohms, measurement with Antenna Analyzer MFJ- 259B and with SWR Meter HANDIC + IC-7410. Length of the coaxial cable between antenna and Transceiver is 12 meter

160 m	80 m	40m	30 m	20 m	17 m	15 m	12 m	10 m	6 m
Antenna Parameters measurement with Antenna Analyzer MFJ- 259B , MFJ 259B Impedance									
82+ 106	131+ 19	44+ 26	62+0	44+ 51	41+9	64+ 44	25+6	75+2	23+17
Antenna Parameters measurement with Antenna Analyzer MFJ- 259B , MFJ 259B SWR									
3.8	2.5	1.7	1.2	2.6	1.3	2.2	1.9	1.5	2.6
Antenna Parameters measurement with SWR Meter HANDIC + IC-7410, SWR									
3.0	2.4	1.3	1.0	2.2	1.3	2.0	2.2	1.0	1.5

The antenna was tested in the Air. Of course it is not a 5 element beam but it is works perfect for me. I worked with the antenna in HF WORLD CHAMPIONSHIP, July 13-14. It was made 115 QSOs. Most interesting QSO was made with New Zealand, ZM1A**.** I worked with the antenna in RSGB IOTA CONTEST, July 27-28, 2019. It was made 57 QSOs. I worked with the antenna in WAE DX TEST, August 10-11, 2019. It was made 13 QSOs. These results are good for working at 100 watts and staying in the test for about 12 hours.

The antenna was tested in the 50 MHz ARRL VHF test where I successfully made one QSO with N4PN. On this Band I received lots beacons from the USA and Canada.

So, the antenna works. I will use the antenna in my operation in the Air and check the antenna behavior in the winter months.

73! de VA3ZNW