

# Helical Antenna for the 20- meter Band

Igor Grigorov, va3znw

The described below Helical Antenna for the 20- meter band has small sizes, as well it is very easy to tune and moreover the antenna has high performance at the band.

Let's see on the schematic of the Antenna (**Figure 1A**). Antenna consists of from a vertical radiator V1, helical inductor L1, antistatic resistor R1, antenna grounding and Antenna Tuning Unit. **Figure 1B** allows us understand the design of the antenna.

Vertical radiator V1 (**item 1**) is an automobile whip antenna in length 1.2- meter. It was bought by me on a sale in Canadian Tire for \$6. Helical Inductor L1 is wound on a plastic form (**item 3**). The plastic form is a water tube in 5-feet length and diameter 1-1/2 inch. I bought it in Canadian Tire for \$7. Inductor L1 is wound by electrical copper wire in diameter 18- AWG in strong black insulation (33-cent/m, Home Depot is supplier). The wire has initial length 10- meter. Coils spread uniformly on the form. A plastic water bottle (**item 2**) with cut bottom is inserted (through a hole in the cap: the hole should be a little smaller the diameter of the whip) on to the whip antenna. The bottle protected the water pipe from water and dust leaking inside in. Antenna wire is fixed on the tube (at several places) with help of a Vinyl Electrical Tape. I used to a special outdoor tape with temperature range – 35 + 90 C. The tape was bought by me in Sayal Electronics for \$2 for a reel.

The water pipe (**item 3**) was installed on to a surplus microphone stand (**item 4**). The microphone stand (I bought it in Sayal Electronics for \$10) has heavy metal circle base with a thick vertical pin. On to the pin the water pipe is inserted. On to the water pipe is installed an RF socket (SO- 239) (**item 6**) and antistatic resistor (**item 5**). Copper strip (**item 8**) is installed on to the water pipe. The copper strip is connected with iron microphone stand and with antenna grounding.

Antenna grounding includes 10 burred counterpoises. The counterpoises surrounded the antenna similar to the figure star. Each counterpoise (3- meter long) consists of two wires. There is copper wire in strong insulation (similar to antenna wire) and bared stainless steel wire in diameter 19- AWG (I bought it in Home Depot). (Antenna grounding system also is described at: [www.antentop.org/017wires\\_017.html](http://www.antentop.org/017wires_017.html))

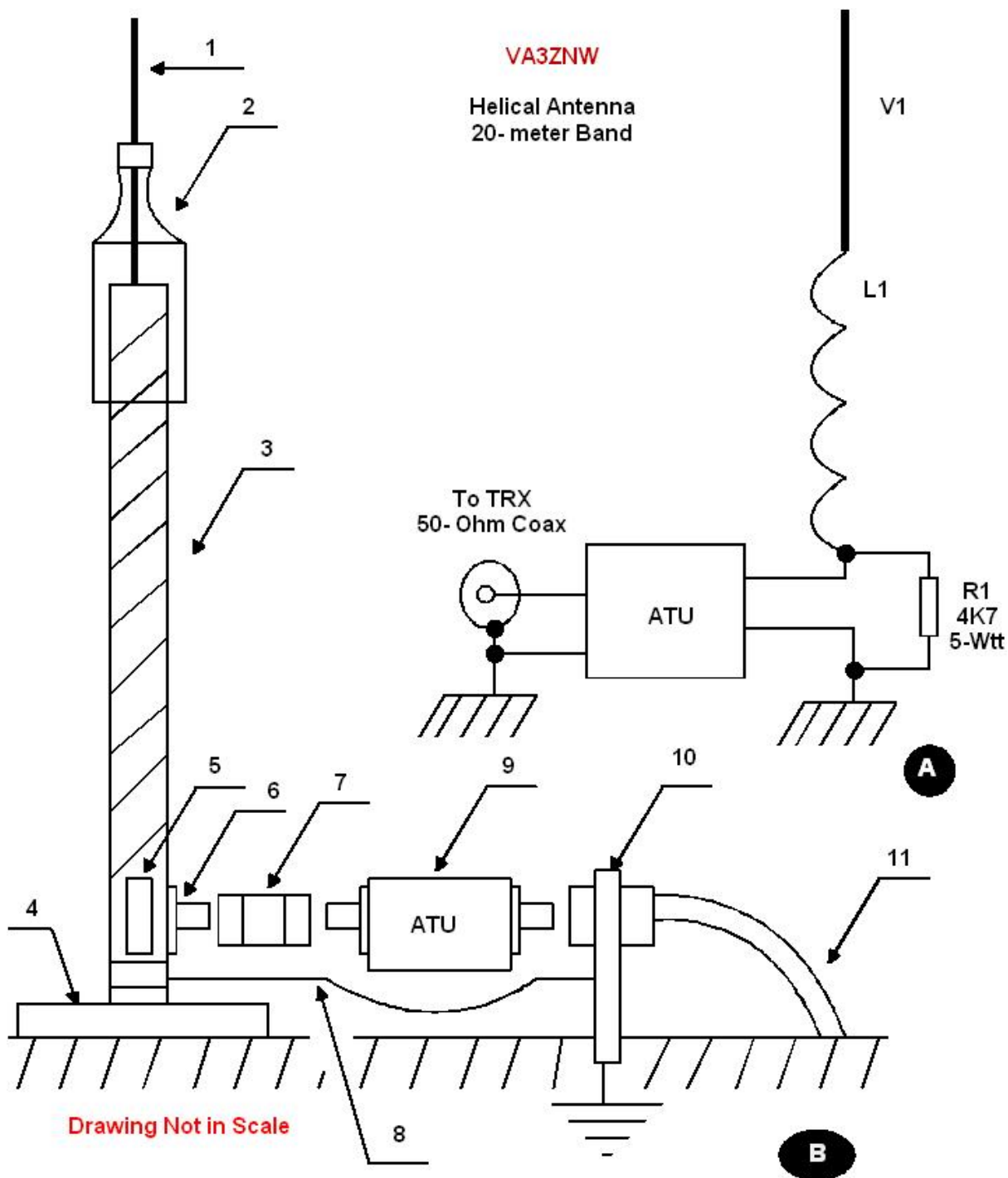
[www.antentop.org](http://www.antentop.org)



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Now let's me say some words about tuning and matching of the antenna. When antenna was installed it should be tuned and matched for the 20- meter Band. The matching is very easy. At first you need to know the resonance frequency of the antenna and the antenna input impedance. It may be measured with help of an antenna analyzer or SWR- meter. The resonance frequency is measured across resistor R1. I used to a MFJ- 259B to find the resonance frequency. In my case I have got the resonance at 13900- kHz.

Then when near a 70- cm length of wire from the helical inductor was removed the resonance frequency of the antenna became 14.100- kHz. In my case the input impedance of the antenna on the resonance frequency was 8- Ohm.



**Figure 1** Schematic (A) and Design (B) of the Helical Antenna for the 20- meter Band

The input impedance of the helical antenna is strongly depends on the quality of the antenna grounding. With good antenna grounding the antenna should have input impedance around 8- 12- Ohm. For example, when I disconnected the antenna grounding system ([www.antentop.org/017wires\\_017.html](http://www.antentop.org/017wires_017.html)) and the antenna ground was only metal base of the microphone stand connected with the earth the antenna had input impedance 70- Ohm.

The low input impedance of the helical antenna is matched with 50- Ohm- coaxial cable with help of a simple ATU. **Figure 2** shows the schematic (A) and the design (B) of the ATU. Parameters of parts of the ATU are calculated by me with the help of the free antenna simulator MMANA.

Capacitor C1 has capacity 510- pF. I used a mica capacitor. Inductor L1 has inductance 0.21- uH. It contains 5.5- turns of bare strand copper wire (18- AWG) air coiled on a form with diameter 12-mm. Gap between turns is 1- mm. ATU is tuned by stretching – squeezing of the inductor. Antenna has SWR 1.0: 1.0 at 14.100- KHz. At the 14.000- kHz SWR was 1.2:1.0. At 14.450- kHz SWR was 2.0:1.0.

The ATU made inside of a clear plastic box (Food Box). With the antenna the ATU (item 9) is connected with help of M-M adaptor (item 7). Coaxial cable (item 11) is connected to the ATU. Copper strip (item 10) was attached to the RF- connector of the coaxial cable with help of a clamp. The strip was connected to the antenna grounding system. Antenna is fed through buried coaxial cable (BFLEX, DAVIS- RF is supplier). The coaxial cable then is going through a ventilation hole in to the basement where my shack is placed. Antenna works fine at the 20- meter Band. However, through some time I decided use to the antenna for other amateur bands.

At first the mostly effective solution was very clear for me. I need to install ATU made inside a big clear box with switch that could be match antenna at the used bands. The ATU circuits for should be similar to the 20- meter ATU. I have measured the antenna impedance at the other bands. New parts for other bands were calculated. Old ATU was removed for the modification and the antenna was fed directly by the coaxial cable. Temporary fed as I thought... But other deals distracted me from doing of the universal ATU... Then autumn and winter is coming...

So, the universal ATU still does not made. However, I discovered that the antenna works good at the 10-, 15-, 20-, 30-, 40- meter Bands with help just ATU between my transceiver and the coaxial cable going to the antenna. My MFJ VERSA TUNER II could match the antenna on the bands. Another one tuner, LDG Z- 11 PRO II also could match the antenna on the bands. Be truth my door on to backyard is frozen at the cold winter. So I could not go outside most of the cold days (as I planned to switch the bands). So, the direct feeding is preferable for me at the situation. But may be at the coming summer I will do the universal tuner...

73! de va3znw

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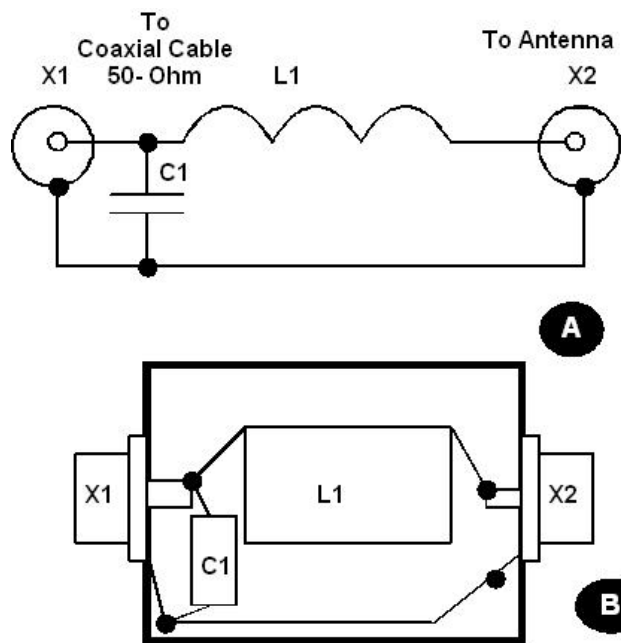


Figure 2 Schematic (A) and Design (B) of the Helical Antenna ATU



Helical Antenna for the 20- meter Band Winter Time.



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