Aziloop DF-72 VLF-HF multi-directional receive loop

The Aziloop DF-72 is a new product designed and sold by QuietRadio, run by Dave Evans, GW4GTE. Dave says that the Aziloop product development was started more than five years ago, the original requirement being for a multi-purpose antenna that could be remotely controlled.

Background

Nothing suitable existed, and so Aziloop was born (Azi is short for azimuth), with the DF-72 being the culmination of this long development cycle. The receive loop is highly innovative in that it can function in two modes, changing at the click of a mouse button.

The first mode is 'K9AY mode', where the Aziloop operates as a directional K9AY terminated loop giving a uni-directional cardioid pattern [1]. The second is 'loop mode', which produces a classic small-loop figure-of-eight bi-directional pattern at low angles, and an omni-directional pattern at higher angles.

The receive antenna is unique in using Dave's 'Stepped-Azimuth™' technology to produce up to 72 uni-directional headings in K9AY mode, or 36 bi-directional headings in loop mode, from a pair of orthogonal loops. The result is a choice of 108 heading and mode combinations, with headings controllable in five-degree increments. To be clear, the antenna does not move; rotation is achieved electronically, the whole antenna being controlled from a PC-based application. Microsoft Windows 10 and 11 are officially supported; however Windows 7 has been tested and found to work too.

FIGURE 1: The DF-X common interface unit (CIU).

So what do you get for your money?

The Aziloop DF-72 consists of a DF-X common interface unit (CIU – see **Figure 1**) and a DF-72 loop control unit (LCU – see **Figure 2**), together with a DC power lead, USB cable, 3.5mm-to-phone AUX cable, and two SMA to BNC adapters.

The DF-X CIU is a small metal box that has a dual role. The first is that it acts as a power supply for the antenna, feeding the power down the coaxial cable to the LCU. The second is that it also feeds the control signals to the loop, allowing you to select the mode, pre-amplifier status, K9AY impedance selection, and much more. The result is a tiny box that can sit somewhere in the shack, which is controlled locally by a USB or LAN connection to your PC. The DF-72 LCU is the loop controller itself, which is mounted outside, and has two wire loops attached (which you supply), one in a north-south orientation and the other east-west.

The LCU is housed in a high-quality IP67-rated waterproof enclosure made from acrylonitrile styrene acrylate (ASA) thermoplastic (as opposed to ABS) for excellent weather and UV resistance, zero corrosion, and minimal condensation. The lid of the enclosure is secured with six stainless-steel screws, which clamp it firmly in place via a waterproofing gasket. Cables are fed into the box via compression glands, and are clamped using rising-cage-type terminal blocks. The enclosure includes integrated pole mounts,

FIGURE 2: The DF-72 loop control unit (LCU).

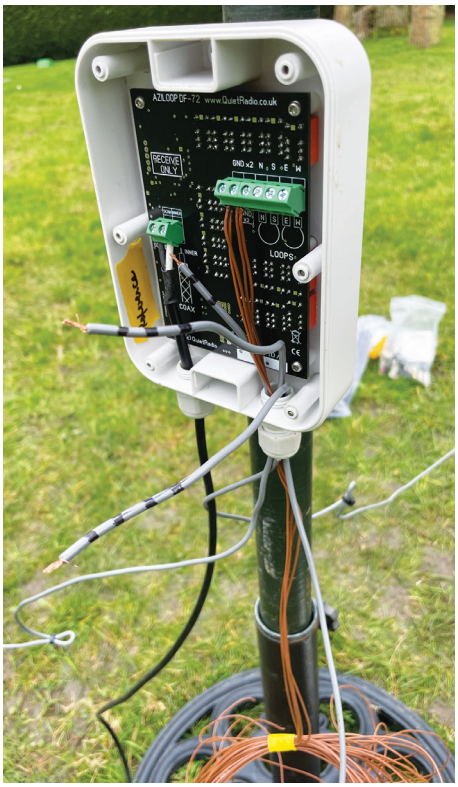

FIGURE 3: An internal view of the LCU.

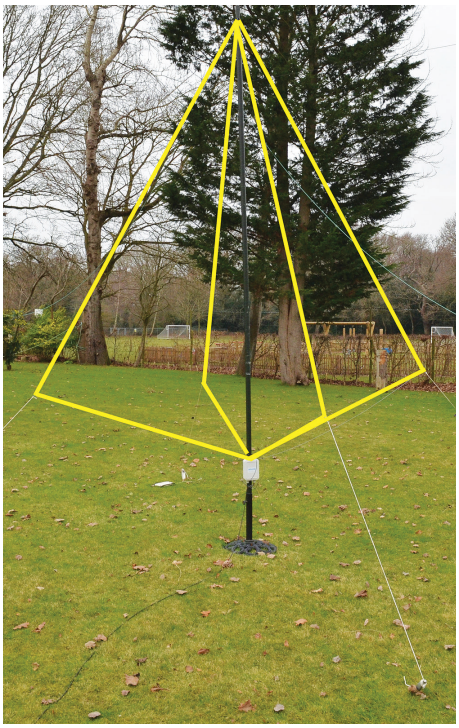

FIGURE 4: The completed assembly. The wires themselves are outlined in yellow to make them more visible.

allowing installation to be completed quickly and easily with just a couple of cable ties or jubilee clips (see **Figure 3** for an internal view). You have to supply a way of mounting the antenna. Chris, G0DWV, decided to use three fibreglass poles fitted into a cast-iron garden parasol support for our tests. This worked well, but you could also use a ground stake and the lower sections of a fibreglass fishing pole if you wished. Note that the pole must be non-metallic.

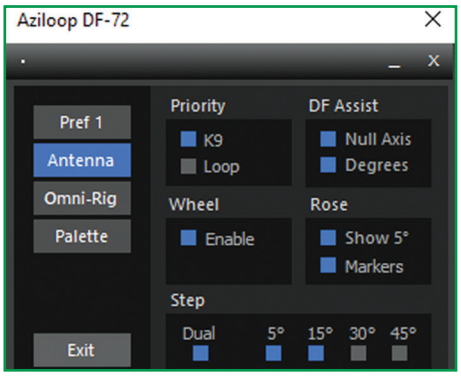

FIGURE 5: The computer application has a straightforward interface.

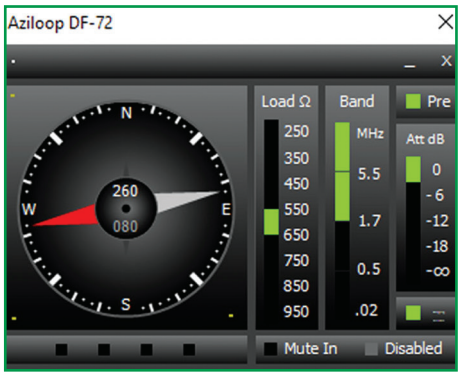

FIGURE 6: K9AY mode (uni-directional).

Assembly

Once you have cut two pieces of wire, typically each 9m in length, you can start to put the loop together. **Figure 4** shows the completed assembly. The wires themselves are outlined in yellow to make them more visible. I did not actually use yellow wires!

To connect the four loop cable ends to the LCU, you just have to take the cover off (six small crosshead screws), push the cables through the waterproof gland and connect them to the circuit board. A good tip is to mark the wires as north-south-east-west to make the job a little easier! Plastic cable ties are used to fasten the antenna to the pole. Once connected you then replace the waterproof lid, stake out the loop as shown, and connect up your coaxial cable.

You will also need to install four radials, which connect to the earth point in the LCU. Position them directly under the loop wires and extend them several feet beyond the footprint of each loop. This isn't critical, but keep to the same length for each radial. The instructions also have details of how to use ground stakes and elevated radials; you may need to experiment for the best results.

As I said earlier, everything is controlled through the coax, so you don't have to install a rotator or other control cables. That makes it easy to install and use.

Back in the shack, connect the coaxial cable to the CIU, connect that to a 13.8V supply via the supplied 2.1mm barrel connector, run a USB cable from the CIU to your PC and then run a piece of coaxial cable from the CIU to your receiver. The CIU also allows you to connect a PTT muting line, which removes power from the antenna when your PTT is pressed. One word of warning: if possible, use a receive-only input or run the coaxial cable to a separate receiver, rather than a transceiver, to avoid applying RF to the loop, which would probably destroy its delicate electronics.

If you have to connect the Aziloop directly to a transceiver's main antenna connector, be extremely careful. Remove the mic, turn the mic gain and RF level to zero, avoid AM or FM, and make sure the rig isn't on VOX. Be aware also that some transceivers can emit a high-power spike on transmit even on

Steve Nichols, G0KYA
steve@infotechcomms.co.uk

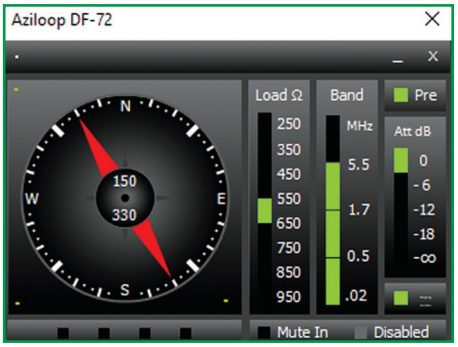

FIGURE 7: Loop mode (bi-directional).

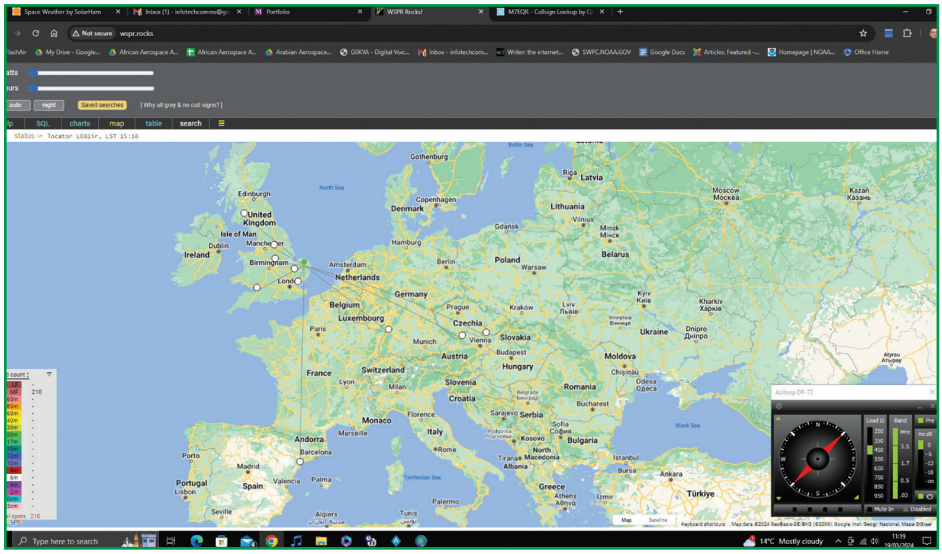

FIGURE 8: Impressive results using WSPR.

low power. Also, for locations with co-sited transmitters, place the loops as far away from hot antennas as possible, and make sure you use the Azuloop's built-in PTT muting function, especially if you run high power.

Now you just have to install the AziLoop software, get it to recognise the unit via the USB cable, and away you go. The current version of the software is 1.3.0, which now includes mouse-wheel tuning.

Running the Azuloop

The Azuloop software allows you to select classic loop or K9AY mode, five-position attenuator steps, an 18dB pre-amplifier, and much more (**Figure 5**). In K9AY mode (**Figure 6**) you can also select a different termination resistor value, adjustable in 50Ω increments from 250Ω to 950Ω. Ahead of the preamp are three selectable seven-pole filters, two low-pass and one high-pass. **Figure 7** shows the display in loop mode. The application displays a compass rose, within which you can change the loop direction with the mouse wheel or by clicking.

You can also configure the application to work over the internet using the CIU's RJ45 socket and built-in Ethernet server. The supplied instructions (which can be downloaded at **[2]**) run to 120 pages, so we have barely scratched the surface.

How does the Azuloop perform?

I started off by looking at LF, in particular the non-directional beacons (NDBs) around 350-450kHz. I soon spotted ONW (Antwerp, 355kHz), CWL (Cranwell 423kHz), and HEN (Henton, 434kHz). Later that evening I also spotted PLA (Pula, Croatia 352kHz). None of these was audible on a 132ft long-wire, showing how effective the low-noise characteristics of the antenna are. I think NDB hunters would be very pleased with the loop's performance.

Moving on to 472kHz, and using WSPR (see **Figure 8**), I soon had the loop receiving stations from around the UK and Europe. Leaving it running overnight, the best DX received was from EA3IHV at 835mi distance, OK0EMW at 754mi, and OE3EMC at 673mi. Most of these were inaudible at -20 to -29dB SNR. I think this antenna would be a valuable addition to those interested in LF.

Moving on to medium wave, and BBC Radio Wales on 882kHz sounded like a local station up here in Norfolk. Using the Azuloop's azimuth control, I could easily peak the signal or null it out. BBC Radio Scotland on 810kHz was equally strong, but I could also reverse the antenna direction and locate a Spanish MW station (COPE) on the same frequency with Radio Scotland becoming inaudible. Buoyed by those results, I checked 1130kHz, which is on the frequency for WBBR in New York, and by playing with the loop controls I was surprised to find that it was audible at 2300hrs in the middle of March. Nothing but noise could be heard on my long-wire antenna. The Azuloop is a very effective medium-wave antenna.

Moving to the 160m band, various German (DL) and Italian (I) stations could be heard on LSB around 2330hrs. By adjusting the direction of the loop, their signals could be reduced from S9 to S5 and from S5 to zero, showing how effective the loop is at nulling signals if needs be.

A quick check on 20m at 2230hrs on a different evening showed that, by orienting the loop in different directions, a number of different IBP beacons could be heard on 14100kHz, including 4U1UN (New York), YV5B (Venezuela) and 4X6TU (Israel). Given the time, this was quite impressive.

The benefit of having a receive-only antenna is often cited as the biggest improvement to making contacts on the low bands, especially 160 and 80m. When you install a beverage system or even a one-direction beverage or long wire, it is immediately apparent that you are hearing stations you wouldn't have heard before as they were probably in the noise of the TX antenna, especially with verticals. The signal-to-noise ratio (SNR) is the key component in this, but also the arrival angle of the signals. However, you can't rotate a beverage or even a dipole to null or peak signals, and this is where the Azuloop comes into its own.

There were many times in the three months of G0DWV's testing that showed the Azuloop to be a highly-effective receive antenna, maybe not a replacement for long beverages, but a very strong complement to them, for as signals dipped on one they peaked on the other. If you have a small garden it will transform the lower bands and give other options on the higher bands. The directionality is very effective, and you can usually find a direction that will allow the contact to be made even with strong QRM, and even if not beaming in the correct direction.

In summary, the Azuloop is an innovative receive antenna system that does away with the need to use a rotator, and can be fed with a single piece of coaxial cable. It may suit short-wave listeners and radio amateurs who operate on the lower bands. It offers a low-noise solution to the reception of signals from VLF to HF, and can be quite addictive to play with. It is currently available at a special UK price of £399 plus UK delivery of £6.00. Its future list price will be £459. The Azuloop is shipped in a small F5 size (8" x 6" x 4") package. Our thanks to Dave GW4GTE for the loan of the antenna. More details can be found at **[2]**.

References

[1] https://www.aytechnologies.com/TechData/LoopInstall.htm
[2] https://www.quietradio.co.uk