Review

Ciro-Mazzoni ‘Stealth’ Antenna Review

As the owner of a Ciro-Mazzoni ‘Baby’ loop I was very intrigued when the ‘Stealth’ loop was announced, primarily for portable operations.

The Ciro-Mazzoni Stealth Antenna, chosen for portable operating on the Akamas peninsula.

As I often operate portable on the Akamas peninsula, west of Paphos, I decided to purchase one to compare it with my existing portable antennas, including a TransWorld Traveler, and Bravo 5 vertical dipoles.

The antenna was supplied by Martin Lynch & Sons, and arrived in a large sturdy box measuring 37cm wide by 64cm high by 144cm in length, with a total weight of 20kg. Inside, the antenna is securely packed in precision cut foam, and also inside is a box containing the antenna controller, 5m of control cable terminated in a 2-pin screw fix plug and a 2-pin plug, as well as a 24V/1A ‘wall-wart’ power supply, and the instruction manual on a CD in PDF format. The contents were well cushioned by substantial packing against the rigors of transit.

Connecting the antenna

It is a simple matter to set up. The antenna control cable is connected to the long pigtail cable via the screw fix plug, the other end is then plugged into the mating socket on the rear of the controller, a RF cable terminated in the ubiquitous PL-259 plugs connects the RF socket on the antenna to the RF socket on the rear of the controller. When the power supply coaxial plug is inserted into the mating socket, the controller powers up displaying the current hardware and software versions, and finally showing the last frequency to which it was tuned.

The controller initially needs to identify both the type of antenna to which it is connected, as well as the ‘sense’ of the motor connection. This is achieved by placing the antenna on the ground reasonably clear of any metalwork, and then pressing and holding the ‘–’ (minus) key on the keypad and using the plus and minus keys to select ‘SET ANT. TYPE?’ and then pressing the ENTER key. This will display the message: ANTENNA TYPE? AUTO DETECT? Pressing the ENTER key again will cause it to enter a search algorithm that will display a number of progress messages, finally ending with the message that the Baby/Stealth type has been saved. At this point the antenna will then be driven to its lowest tunable frequency of 6,600kHz, display the resultant SWR, and stop.

This can all be accomplished without having a transceiver connected to the antenna, as it generates its own tuning signal.

Using the antenna controller

Unlike most other loop antennas, the controller contains a Direct Digital Synthesiser and a small low-power amplifier giving about 10mW (+10dBm). When tuning, the internal antenna changeover relay disconnects the antenna from the transceiver and connects it to the tuning signal generator.

If the new frequency is well removed from the existing frequency then the actuator motor is driven at full speed in the required direction, opening the loop’s tuning capacitor to increase the frequency, or closing the loop to lower the frequency.

During this time the SWR is constantly being measured and, when the controller detects that the SWR is decreasing, it then switches into the fine tune mode.

In this mode the motor is pulsed, causing the actuator motor’s armature to move in small steps as the controller searches for the minimum SWR. There are two LEDs on the front panel: the right-hand red LED indicates that a tuning operation is in progress, whilst the left-hand blue LED shows the motor activity. When steadily illuminated the motor is being driven continuously, whereas when flickering it is being pulsed in the fine tune mode.

To manually tune to a particular frequency, press the ‘*’ key on the keypad, whereupon you will be prompted to enter

TABLE 1: Rear panel DB-9 male connector pinout.

PIN	NAME	DESCRIPTION	VOLTAGE	DIRECTION
1	DCD	Data Carrier Detect		← (In)
2	RXD	Receive Data		← (In)
3	TXD	Transmit Data	–8V	→ (Out)
4	DTR	Data Terminal Ready	+8V	→ (Out)
5	GND	Signal Ground	0V	
6	DSR	Data Set Ready		← (In)
7	RTS	Ready To Send	+8V	→ (Out)
8	CTS	Clear To Send		← (In)
9	RI	Ring Indicator		← (In)

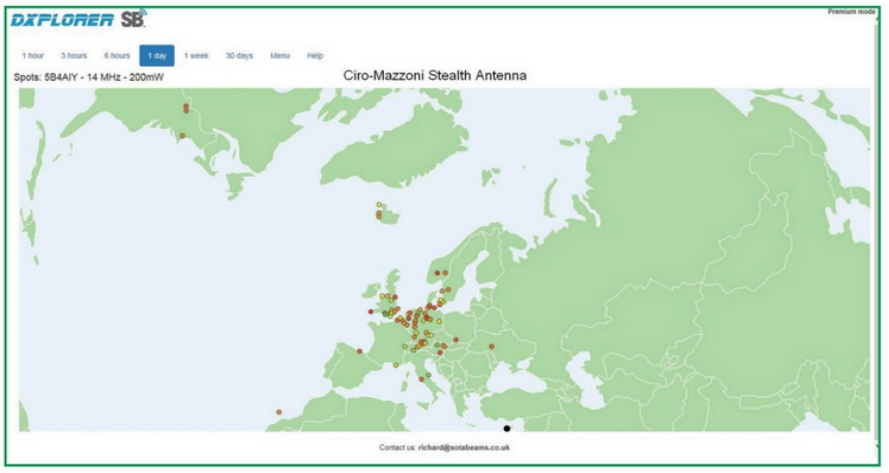

FIGURE 1: Map of where the 20m band signals of 200mW had been copied.

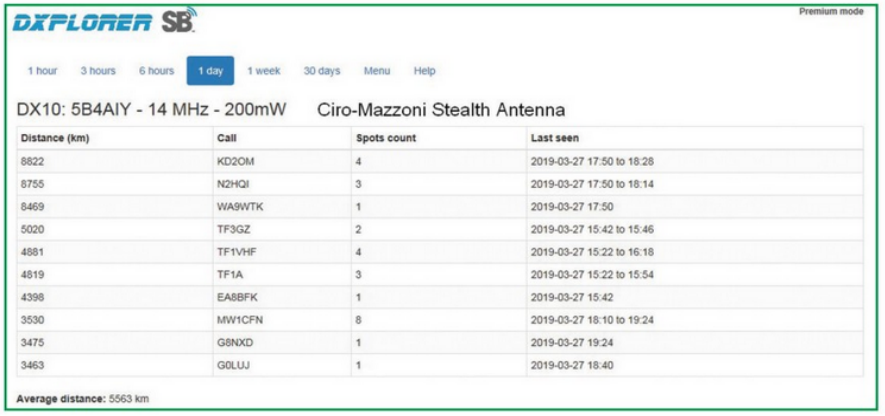

FIGURE 2: The top ten 20m band contacts in terms of distance.

a frequency in kHz, and then press the ENTER key. The controller will then attempt to tune the antenna to this new frequency.

There are also two other modes, FULL AUTO, and SEMI-AUTO. If FULL AUTO is selected, then the controller will query the connected transceiver to determine the required frequency, and if this frequency has been stable for 3 seconds, an automatic tuning cycle will commence.

In the SEMI-AUTO mode, the controller will query the connected transceiver and if the frequency differs from the antenna's then the red LED will blink indicating this mismatch. To correct, simply press the ENTER key, whereupon the controller will re-tune the antenna.

The transceiver is connected to the controller by means of the rear RS-232 connector. To select the type of transceiver the '–' (minus) key is pressed and held to enter the configuration mode, and using the + and – keys step to select the type of mode you wish, and press the ENTER key. You will then be required to select from ICOM MODE, CAT MODE 1, CAT MODE 2, or DISABLED.

If the Icom mode is selected, then the controller must either be connected via an Icom CT-17 level converter to the transceiver's 'Remote' port, or, if the transceiver is equipped with its own RS-232 port such as the IC-7700, then it can be connected to this. In either case, the Icom CI-V command set will be used. With the correct speed set, the controller will query the transceiver until it discovers its address, at which point it will store it.

CAT MODE 1 is for transceivers using the ASCII command set, where the frequency query command is: 'FA;', and the response is of the form 'FA00014175000;' indicating 14.175MHz.

CAT MODE 2 is for Yaesu transceivers using the Yaesu 5-byte binary command set where the frequency query command is: '00 00 00 00 03' (Hexadecimal) and the response is of the form: '01 41 75 00 xx' (Hexadecimal) indicating 14.175MHz, where xx is the mode byte, which is not used by the controller.

The rear panel DB-9 male connector has the pinout shown in **Table 1**.

Of these pins, only the transmit data, receive data, and ground are actually necessary and normally used. With all the settings stored, the loop can now be used.

Using the stealth antenna

I have successfully used the RS-232 Auto and Semi-Auto modes with my Flex 6400M, Icom IC-7700, Elecraft KX3 and Juma TRX2 transceivers, as well as the ELAD FDM-DUO provided it is equipped with the optional Ext I/O 232 interface.

My initial tests were using a WSPRLite transmitter on 20m with the antenna outside my window on the ground. Because the loop uses a gamma match network to couple RF into it, this leads to a certain amount of asymmetry in the radiation pattern, so the antenna was oriented to point north-west. The main lobe is in the direction of the gamma match.

After 24 hours the spots were downloaded and **Figure 1** is the map of where the signals at 200mW had been copied.

As can be seen, despite its diminutive size in comparison to the wavelength being radiated, some quite remarkable coverage was obtained.

Figure 2 shows the top 10 contacts in terms of distance on the 20m band.

From the spreadsheet data that is also available, the signal to noise ratios in a 2.4kHz bandwidth for the furthest spot, KD2OM, was between –23dB and –28dB, and from G0LUJ it was –23dB. The highest SNR was –1dB from DK8FT at a distance of 2,294km, the lowest SNR was –30dB from G8NXD at a distance of 3,475km. The overall average distance during the 24 hour period was 2,759km, for a total of 504 contacts.

The same test was repeated on 40m, and **Figure 3** shows the spots map.

Although the maximum distance was less, again, bear in mind the very small size of the antenna in comparison to the wavelength. **Figure 4** shows the top 10 spots in terms of distance for the 40m band.

The signal to noise ratio for the furthest, EA8BFK, was –25dB, and from OZ2JBR it was –30dB. The highest SNR was –2dB from DJ0ABR at 2,218km, and the lowest SNR was –32dB from DK6UG at 2,559km. The overall average distance was 2,421km, for a total of 402 spots.

Final comments

Since this antenna is primarily intended

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for portable operation, I was somewhat surprised to find that the controller still required 24V for operation, just as it does for the 'Baby' loop. Testing with an adjustable laboratory bench power supply showed that operation is possible down to 15V, but regrettably not 12V. This makes it somewhat inconvenient for normal portable use as it means taking along another 12V battery to wire in series with the main battery used for the transceiver. I tried using a 12V to 24V converter from eBay, but sadly that proved to be a hash generator.

The author, Adrian, 5B4AIY, alongside the Ciro-Mazzoni 'Stealth' Antenna.

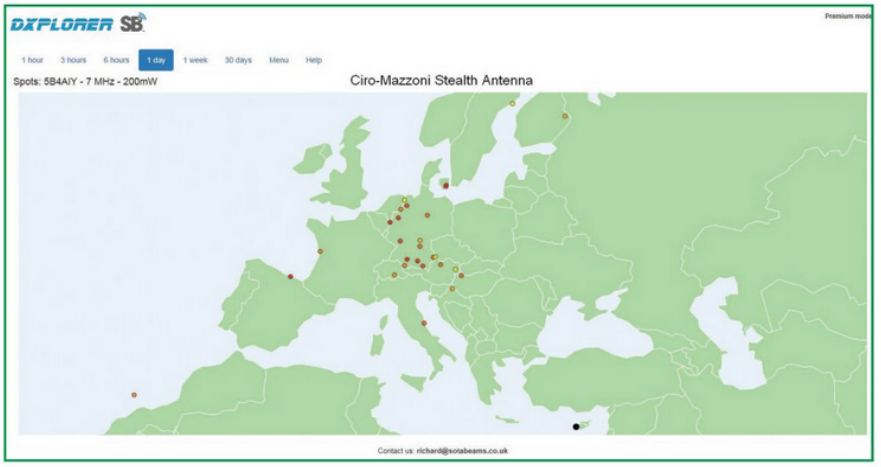

FIGURE 3: Shows the spots map for the 40m band.

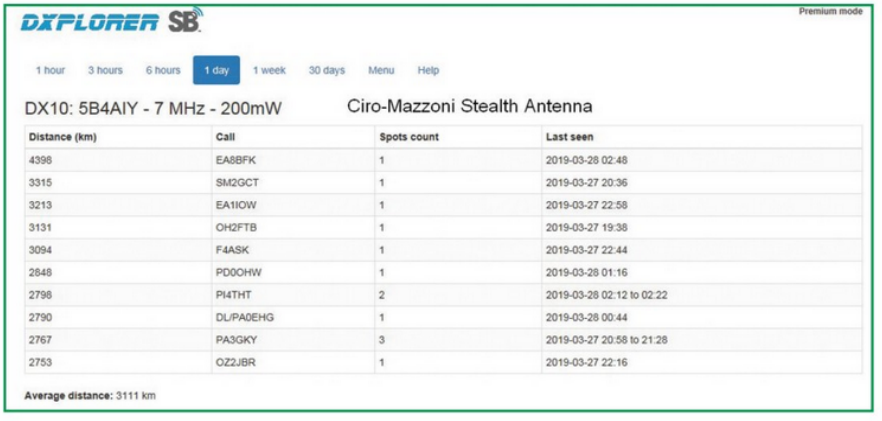

FIGURE 4: The top 10 40m band spots in terms of distance.

When using the antenna fixed station, the supplied 24V power supply is also essentially a hash generator. This was also true of the power supply included with my Ciro-Mazzoni 'Baby' loop and so I substituted a 24V linear power supply of my own design. In mitigation it should be added that the noise level at my home QTH is only about S2/S3, so *any* additional noise is audible.

The antenna current using a 24V supply is a maximum when driving in the fast mode, and is 350-370mA opening, and 410-430mA closing the loop. When idle, the controller consumes 72mA at 24V. Interestingly, when the controller is turned off from its front panel, it stil draws 50mA. The power supply does not need to be regulated as there is an internal switching regulator that steps down the input voltage to obtain the necessary logic voltages for the microprocessor and synthesiser, the 24V is only used by the actuator's motor, and in my case it would work perfectly well with as little as 15V.

The SWR was measured over 40m to 10m and was between 1.2:1 – 1.3:1 on all bands.

One of the characteristics of small transmitting loops is the fact that their radiation resistance is extremely low, fractions of an ohm. Consequently, in order to be reasonably efficient their losses must be even lower, and this leads to a very high 'Q' and narrow bandwidth. For this antenna, on 40m the bandwidth is of the order of 5kHz, which means that even a change of frequency of as little as 2kHz will cause the controller to re-tune. This should be borne in mind when using this antenna, as any QSY will require a re-tune operation.

I found the actuator control cable pigtail a nuisance, as on several occasions I managed to step on the connector, both when initially setting up and packing away. I have now modified my antenna with a small plastic box screwed to the plastic support in which is mounted a 2-pin SP-13/IP-68 waterproof socket and the cable now plugs in and screws to this socket in the same manner as the RF connection.

Overall I am quite pleased with this antenna. It certainly invokes some interest when I set it up, and for those encumbered by restrictive covenants, home owner association regulations, planning permissions, or who simply do not wish to advertise their presence, this compact antenna might well be the answer.

The Ciro-Mazzoni 'Stealth' Antenna is available for £1099.95 including VAT (plus shipping) from Martin Lynch & Sons, the sole UK distributor of the Ciro loops. See www.hamradio.co.uk for more details.