The Reuter RLA4E Wide Band Active Magnetic Crossed Loop Aerial

Radio User REVIEW Radio User

Keith Rawlings reviews an exciting new high-quality indoor loop aerial from the Reuter stable, looking at the aerial's build-quality, some reception results, and specific features and accessories.

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Welcome to this month's column. It seems we are having a run on loops at present. This month I am pleased to say that our friend from Germany, Burkhard Reuter, has sent an RLA4E model for us to look at.

Readers may remember that I reviewed the excellent *Reuter Pocket C4* SDR transceiver in the May 2018 edition of RU (*RadioUser*, May 2018: 8). That radio impressed me with its innovative design, overall build quality and first-rate performance.
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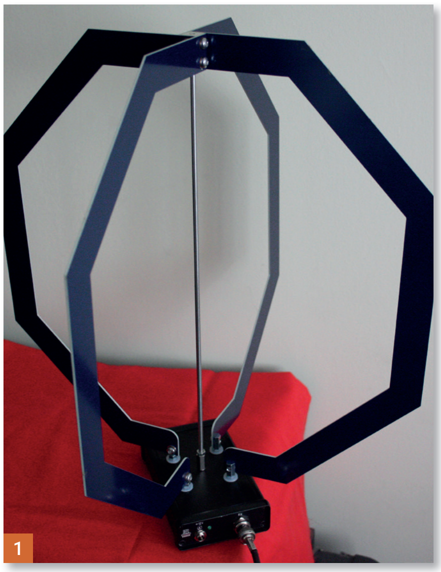
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Basic Description of the RLA4

A few years on, the new RLA4E is an active broadband receiving loop, covering the range of 50kHz to 71MHz. It is intended for indoor or (temporary) outdoor use (Fig. 1).

The two elements on the RLA4E, which are made from etched FR4 PCB, are arranged at an angle of 90 degrees to each other and are remarkably small, measuring a mere 360mm high, and with the same dimensions across. They have been designed to give a symmetrical and low-impedance feed to the differential amplifiers used in the loop. These elements sit on top of a smart anodized aluminium case, which houses the amplifier. This is also small, measuring just 80W x 130D x 25H (Fig. 2).

There are two connectors fitted to the case: A BNC socket for the lead to the receiver, and a 2.5mm DC socket for power. The unit may be powered from the DC connector or, in addition to this, via the RF cable, a very useful feature as we will see.

The assembly of the loop was easy enough. As I began the review, I had no documentation (I do now) so I simply looked at the supplied parts; cross-referencing this with the photos on the Reuter website, I began to lightly screw the supplied parts into place. Once in position, they were 'nipped' up using a Torx driver.

I found that once the aerial was assembled, it was physically stable and also looked quite stylish. I think if it was mounted in a living room it could pass for an architectural ornament!

The RSW3B Control Unit

Also supplied for the review was the RSW3B (Fig. 3). This unit is designed to operate the RLA4E remotely, providing control of mode and directional switching. It is built into the same type of case as the RLA4E.

With the RSW3B the RLA4E can be powered through the feeder.

On the front panel, there is a single rotary encoder and a nice clear OLED display.

On this display, information is given regarding the current draw of the amplifier (in mA), the nominal loop direction of 0-180°, and a position-indicator (fully-left is 0° and fully-right is 180°.

The encoder is used to shut down the RLA4E by rotating fully to the left. When turned to the right, towards maximum, the RSW3B gives directional control of the loop through 0-180°.

The controller works in this way: When the control is set to read 0°/180°, only loop 1 is in operation; and, when set to 90°/270°, only loop 2 is in operation. At 45°/ 225° (or 135°/ 315°) settings, both loops are active and have the same gain. When the loop is set in a direction that is between these main receiving directions, the loops (or their respective amplifiers) are varied with different gains and phase delays.

The control unit is also equipped with Wi-Fi. A Windows app enables the RSW3B to be remotely controlled over a network, and I am told that an Android and Linux APP will follow (Fig. 4).

Unfortunately at the time of the review, I was unable to try out the Wi-Fi feature.

However, it will add to the versatility of the RLA4E/RSW3B combination.

The Loop In Use

First off, I mounted the RLA4E loop on a cabinet in my shack and placed the RWS3B controller next to my keyboard. I connected up a 12V supply and linked the aerial output of the control unit to a switch so that I could make comparisons to other aerials.

The first receiver I used was my RSP2. Already tuned, as it was, to the 20m amateur band I started there.

With a 2MHz bandwidth, I could see plenty of signals over the span between 13-14MHz, so much so that I had to check to make sure I had not mistakenly switched to my 66ft end fed as the

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ALL PICTURES: KEITH RAWLINGS, EXCEPT FIG. 8: GEORG WIESSALA

Station	Frequency	Max	Minimum	Indicated Difference
BBC R5	909 kHz	-35 dBm	-70 dBm	35 dBm
BBC R4	198 kHz	-44	-78	34 dBm
MSF	60 kHz	-91	-107*	16 dBm
DCF77	77.5 kHz	-85	-107*	22 dBm

* Noise Floor

Table 1: Signal strengths, as indicated on the RSP2 RSSI.

Single loop dimensions: 360 mm x 360 mm
Amplifier dimensions (W x H x D): 85 mm x 50 mm x 127 mm
Frequency range: 50kHz … 71 MHz
Average noise level (without loops): <= -139 dBm/Hz (at 10 MHz)
IP3: >= +30 dBm (2x -6 dBm measuring tone at 10 MHz)
IP2: >= +78 dBm (10.0 MHz + 10.2 MHz -6 dBm test tone, 0.2 MHz measured difference tone)
Output voltage: >= 1.1 Veff, 1 dB compression
Supply via DC jack: +12.0 V ±0.1 V, maximum +14.4 V!
Supply via HF cable: +7.0 V … +13.8 V, maximum +14.4 V!
Power supply: max. 100 mA
Power supply socket: DC-connector pin 2.5 mm (0,1")
HF output: BNC 50 Ohm
Weight: <= 1 kg (depending on loop material)
Environmental conditions: 0 ... +50 °C ambient temperature, <=90 % rel. humidity Non-condensing, indoor application, limited outdoor application
Compliance: CE according to DIN EN 55013, EN 55020, EN 60065 RoHS / WEEE directive, ear reg. nr. 27676700.

Table 2: Specifications of the RLA4E Loop Aerial.

Fig.1: The main loop.
Fig. 2: The loop base.
Fig. 3: The control unit.

number of signals I was seeing; their levels too were greater than expected.

By tuning the control unit, I found that I could reduce the noise floor by some 14dBm *as indicated* on the RSP2 RSSI with wanted signals staying at around the same levels.

Moving to the 5MHz region, I got a similar reduction in the indicated noise floor. However, at 4.9MHz I have an annoying source of local QRM, which is nearly 1 MHz wide (Fig. 5, Top).

I found that the RLA4E could reduce the QRM considerably with little effect on wanted signals (Fig. 5, Bottom). I also get some VDSL problems on HF, notably at 8.500MHz.

The image in Fig. 6 demonstrates this, with results from my end-fed in the garden at the bottom of the image. Above this is the RLA4E.

You can see that the levels are much reduced, but wanted signals are largely unaffected.

Across the Bands

Over a few evenings, I caught WRMI Miami on 7780kHz; while signals were generally about the same as on my end fed (S4-7), sometimes signals on the loop had a superior Signal to Noise Ratio (SNR).

This was something I found repeated on other bands.

I also found that I could effectively 'tune-out' strong PLT QRM on 11MHz and above.

Moving to medium wave, the RLA4E provided ample gain, and this necessitated the introduction of a 12dB in-line attenuator on the RSP2, as even with the gain adjusted down I was still getting the occasional overload warning.

This is something I had to do when I looked at the CCW loop amplifiers (*RadioUser*, March 2020: 44-46; May 2020: 44-46).

The loop worked very well, and I spent most of one evening with the loop sitting just behind me, while I listened to a perfectly readable broadcast of BBC Radio Scotland on 810kHz.

The screenshot in Fig. 7 shows a weather facsimile image (WEFAX) received on the loop.

During an afternoon listening session, I made a few comparisons to demonstrate the loop's ability to create a null when steered by the RSW3B. The results are shown in Table 1.

As you can see the loop has respectable directional properties.

However, to get the best out of the RLA4E and RSW3B combination requires some careful tuning.

The nulls can be very sharp, and there is a slight delay before the commands reach the loop.

If tuning too quickly the user will get the impression that nothing is happening.

The RLA4E returned reasonable results here receiving NAVTEX, but signals on the NDB band were rather noisy (possibly a local issue).

Although it is not always fair to compare dissimilar aerials, overall, the RLA4E pretty much matched my Inverted-L End Fed throughout my tests – not bad going!

I found that, by using the minimum signal (i.e. a 'null'), it was possible to roughly determine the direction of some transmissions, allowing for the 180° ambiguity.

In Outdoor Use

I mounted the RLA3E at about 1m high on a plastic crate out in the middle of my lawn and ran a cable back to my operating position.

Once again using my RSP2, I was presented with a spectrum display of signals wherever I tuned.

The loop worked well. On HF, I noticed that signal levels were not hugely stronger than they were with the loop indoors, demonstrating the loop's good performance when used inside.

Reception on lower frequencies, such as NDBs, was much improved.

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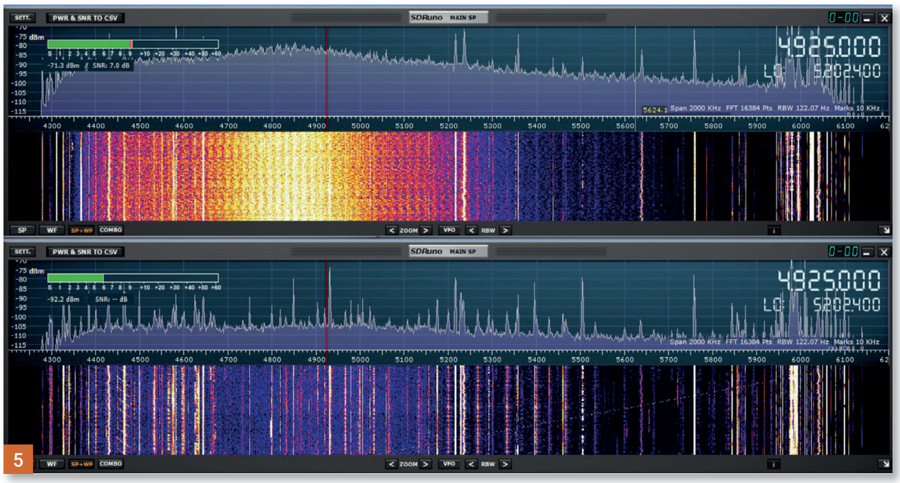

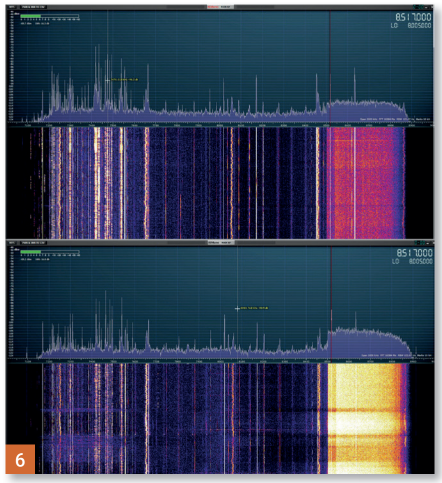

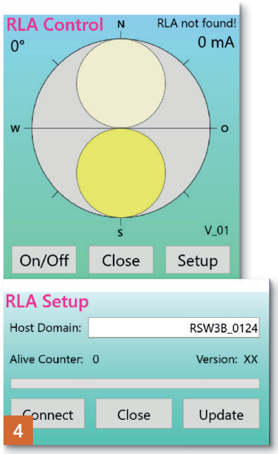

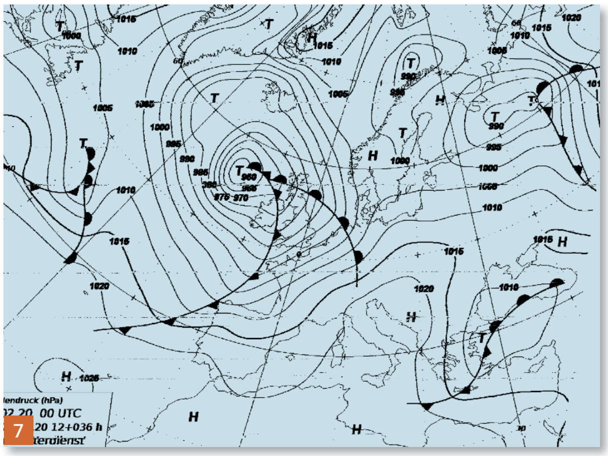

Fig. 4: The Wi-Fi App. Fig. 5: Effective reduction of local QRM. Fig. 6: Reduction in VDSL QRM between end-fed and Loop. Fig. 7: WEFAX reception was good. Fig. 8: A good-looking piece of shack equipment too…

Other than that, the RLA4E performed very much as it did when indoors.

Overall Conclusions

To sum up, I was surprised at the effectiveness of the RLA4E. The levels of interference picked up while being used indoors were remarkably low. Reception throughout its operating range was excellent, matching my 66ft Inverted-L End Fed in most cases, and exceeding it in some areas.

The remote controller was a valuable addition, making it easy to steer the loop for best results, be that tuning for optimum signal reception or a reduction of local noise.

The inclusion of Wi-Fi for remote computer tuning is a nice touch, and I wished I had been able to try it out.

At no time did I find any IMD problems that were due to the loop. All the receivers I used during my evaluation were happy with the RLA4E with no signs of overload. The exception was the RSP2, which benefited from some attenuation on the medium waves and below.

It is well documented that the best place for an aerial is outside and, usually, as high up as possible.

Modern electronics generate a lot of noise and signals are often attenuated by buildings, because of this it is fair to say that a small loop, especially when used indoors, could be not be expected to provide sparkling results. The RLA4E clearly has not been informed of this!

I was impressed with how well it performed, by how well it has been engineered, and by how ornamental it looks (Fig. 8) – not, of course, that the latter is the most important feature.

It would be an excellent choice for those limited to indoor HF aerials and a good choice for portable use and when taking a radio away on holiday.

Summed up in one word…Impressive!

My thanks go to Burkhard Reuter for the supply of the loop and his prompt answers to my questions.

Dimensions (W x H x D):
85 mm x 50 mm x 127 mm
Frequency range: 10 kHz … 156 MHz
Power supply: +10.0 … +15.0 V- / max. 150 mA
Connectors: BNC 50 Ohm, hollow pin 2.5 mm, SMA female (not "reversed")
Maximum cable length from control unit to antenna depends on HF cable, max. 10 ohm DC resistance
Weight: <= 500 g
Environmental conditions: 0 ... +40 °C ambient temperature, <=90 % rel. humidity
Non-condensing, indoor application
Compliance: CE according to DIN EN 55013, EN 55020, EN 60065
RoHS / WEEE Directive, ear-Reg. 27676700.

Table 3: Specifications of the RSW3B Control Unit.

The RLA4E retails at €499.00, and the RWS3B costs €199.00.
https://tinyurl.com/uvmvwk8

Table 2 shows the specifications of the RLA4E loop, while Table 3 contains those of the RSW3B unit.

Until next month, good listening!

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