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The Alpha Antenna MicroTune magnetic loop

A compact loop antenna that has a lot to offer

INTRODUCTION. Portable HF operation seems to be getting more and more popular. This may have been helped by a rush of small, lightweight portable radios over the past few years, including the Yaesu FT-817, the Icom IC-703 and the Elecraft KX3. These are all very accomplished transceivers. But they are only as good as the antenna – and that is where people have found an answer in the magnetic loop antenna.

A decent HF antenna traditionally tends to be quite large, whether it is a vertical or a wire dipole that needs some supports. Conversely, a magnetic loop antenna is a decent HF antenna that tends to be quite small. Alpha Antenna from the USA had adopted the approach of producing a lightweight magnetic loop (or more correctly a small transmitting loop, STL) antenna that comes in its own carrying case, tipping the scales at just 6.6lbs (3kg). This is, therefore, ideal for holiday-type operations or even for carrying in the boot of the car for the occasional /P operation. Many Alpha Antenna customers also use it where outside antennas are difficult to install or where they are restricted.

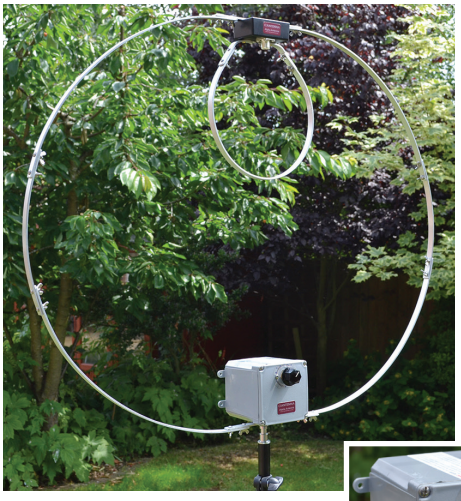
WHAT IS IT AND HOW DOES IT WORK?

The Alpha Loop is a magnetic loop antenna that is easy to tune, has acceptable bandwidths and offers coverage on the 40, 30, 20, 17 and 15 metre bands. Alpha Antenna also includes a small feed loop that has been optimised for 12 and 10 metres, for use after you make a small alteration to the largest loop.

The antenna appears to your transceiver as a large resonant circuit, consisting of a large single turn inductor tuned with a single-section variable air-dielectric butterfly capacitor. It is rated at 30 watts PEP SSB maximum and uses a 6:1 reduction drive to make tuning easier.

A nylon shaft has been placed between the knob on the front of the Alpha Match and the capacitor to prevent RF burns and minimise your body's capacitance interfering when tuning the antenna. The Alpha Match is placed inside a high voltage Underwriters Laboratory-rated outdoor waterproof housing.

The antenna comes in a very smart nylon holdall for its field bag, which is just under three feet (87cm) long. The holdall, which has the manufacturer's name and logo neatly embroidered on the side, includes a zip-fastened side pocket that is handy for carrying instructions. The pocket also contains a shoulder strap that can be affixed to the holdall.



The Alpha Antenna MicroTune magnetic loop.

The tuning box has a capacitor with a 6:1 reduction drive and a useful scale plate around the knob.

The supplied instructions are on two A4 pages, folded to give an eight-page A5 booklet.

Open up the holdall and you'll find a three-section, powder-coated tripod that can be extended up to more than six feet (2m). You'll also find the matching box, with a dial and knob to adjust the capacitor, the feed line box (complete with SO239) and a bag with curved aluminium strips that make up the loop.

Assembly is quite straightforward. You first affix the small aluminium loop to the feed line box with four supplied stainless steel bolts and wing nuts. This is the main feed loop, which is made from half inch x eighth inch (about 12 x 3mm) bar and with a diameter of about 8.75 inches (225mm). Having done that, you then connect the larger radiating loop to the feed point assembly, again using the supplied bolts and wing nuts.

The radiating loop is actually made up of six individual pieces of half inch x eighth inch bar that are bolted together. This gives you coverage from 40-15m (7–21MHz). The end result is an ellipse about 33 inches (84cm) in diameter.

If you want to work 12-10m (24–28MHz), you have to take out two of the longer element pieces that make up the larger outer element. You also have the option to change the inner feed loop for the smaller one supplied, which will optimise SWRs on these bands.

You are given more than enough plated wing nuts and bolts to assemble the antenna.

To make a magnetic loop antenna as efficient as possible you need to reduce its ohmic losses. That is, elements should be made from copper or aluminium and all joints should be brazed or welded to keep the losses to a minimum. Alpha Antenna also offers a magnetic loop antenna with minimal ohmic losses made of two continuous solid elements called the Continuous Alpha Loop.

With this antenna however the main loop has up to eight joints (held fast with nuts and bolts), plus there are two further joints in the feed loop. Quite how these joints, and their associated losses, affect the overall performance of the antenna is hard to say. The loop elements overlap by just over an inch and half (40mm), which may help a little.

Once completely assembled, the antenna mounts on the included tripod by screwing it securely in place on a ¼ x 20 thread on the tripod. The whole assembly is reasonably sturdy, but it might be worth guying if using it outdoors in windy weather.

At this point you can attach your coax to the feed point at the top of the loop and tune the capacitor using the knob and its associated pointer. The coaxial feed point is outside of the plane of the antenna, to keep the voltages inside the loop from interacting with those in the coax. I would recommend tuning the antenna for maximum received noise first, which will put you in the ballpark area for resonance.

Note there is a warning label on the tuning box that warns you not to touch the antenna when transmitting as you may receive an RF burn. As someone who has grabbed hold of a magnetic loop antenna when transmitting 100W, I can attest to this. You'll probably only do it once! It also warns you not to operate the antenna if you have a pacemaker or to stand too close when transmitting.

With the transmitter switched to low power (bearing in mind you can't use more

than 30W anyway), transmit and peak the tuning capacitor for the lowest SWR. As you may have gathered this is not a 'fix and forget' antenna and on some bands you will have to tune it to resonance every time you QSY more than a few kHz or switch bands. Specifically, the manufacturer shows the Alpha Loop is able to provide a bandwidth of approximately 20% on 10 metres, 37% on 12 metres, 35% on 15 metres, 85% on 17 metres, 20% on 20 metres, 100% on 30 metres, and 20% of the 40 metre band while maintaining an SWR of between 1.1:1 and 3:1.

The instructions suggest that, if you are using an antenna analyser, it might be an idea to have an A-B antenna switch so that you can quickly move from the analyser to the radio when tuning. An antenna analyser, however, is not necessarily required, as modern day rigs often have a built in SWR meter. Needless to say, you need to have easy access to the antenna as you will be tuning it a lot. It is also not designed to be left outside all the time – this is strictly a portable antenna and not designed for permanent outdoor installations.

Using an MFJ analyser I found that the antenna would tune from 6.945 to 22.860MHz, achieving a near 1:1 SWR at both the bottom and top ends of its tuning range. Tuning is VERY sharp indeed, which is what you would expect from a magnetic loop, even with the 6:1 reduction drive. To help, the tuning dial does have some markings to help you get to a known rough tuning point quite quickly. There was some evidence of hand capacitance too, meaning the antenna de-tuned slightly when you took your hand away. This is indicative of an efficient magnetic loop that has a high Q.

Having ascertained that it would tune, I first wondered what the antenna's performance would be like when mounted indoors. After all, a lot of amateurs in flats struggle to put up *any* sort of antenna. As my book *Stealth Antennas* shows, although amateurs can be very inventive it can be a struggle to get an antenna that will work from 40–10m like this one.

So using the antenna indoors I ventured onto 40m (7MHz) – the band upon which the antenna is least efficient. The antenna was quite lively and although 2-3 S-points down on a dedicated outdoor antenna it could deliver CW and PSK contacts with less than 30W. Here you can watch a 5 watt SSB QSO on 40 metres: http://youtu.be/oPrPpONo-Vs

It was a similar story on 20m (14MHz) with many signals audible, but again down 2-3 S-points on an outdoor antenna. Often the difference was less marked – with some signals actually equal. Here you can watch a 1767 kilometre 5 watt SSB confined space QSO on 20 metres: http://youtu.be/AV7DV5a_RZ4

In essence, you could use this antenna indoors if you had no other choice, but with its limitations, and your power limit of 30W, don't expect miracles.

What also soon became apparent was that tuning was tricky – you need to be quite close to the antenna to tune it, but you also need to be able to key the radio and see the SWR meter. Having an analyser on a switch, or sticking to known frequencies, such as the QRP calling frequencies, would make it easier.

The antenna is also directional in the plane of the loop, with which you can peak signals and also null out interference, which is useful when around high RFI environments.

So the next stage (once the rain had stopped) was to move the antenna outdoors and try it there.

I found the easiest way to set it up was to listen and 'peak' the capacitor in the middle of a desired band segment, such as the QRP calling frequency or near to some loud stations on SSB. This saved having to make minute adjustments each time you QSY. Setting it on 7.030MHz I found that signals on 40m were once again down about 2-3 S-points on a dipole, although the mag loop is a very quiet antenna and signal/noise ratios were often very similar. CQs on 7.030MHz (QRP) and 7.028 (FISTS) went unanswered unfortunately, although stations were heard on the band.

Setting it on 14.070MHz (PSK31), the antenna was again down about 2 S-points on a dipole, but capable of making contacts. It was a similar story when using CW on 20m. Lots of CQs and few replies, although I think a lot of this was due to the summer HF doldrums and poor band conditions. On SSB at least, I needed to find someone who was at least S7-S9 to be able to work them with my FT-817's five watts. Calling a Greek (SV) station who was S6 with me was a waste of time. You will probably have more luck on CW and PSK31 however. This is pretty typical of QRP activity in mid summer using a less than perfect antenna.


The feed loop is straightforward.

The antenna's performance on 21MHz was a little better, which is to be expected as it is at its most efficient on this band. It was only down about 1 S-point on the reference dipole antenna. I was able to have PSK31 QSOs with the louder stations, such as OM3ZAS. I then took two of the longer segments out of the loop as instructed to set it up for 10m and 12m. This gives a loop with a diameter of about 21.5 inches. I also changed the feed loop to the smaller one as instructed. The lowest SWR on 12m and 10m was about 1.5:1.

Tuning around 10m during a Sporadic-E opening found signals in the S8-S9+ range. The antenna was about 5-10dB down on a dipole, but with signals that strong it didn't really matter. Contacts were quite easy, even on SSB.

CONCLUSION. The Alpha Loop antenna is well built, comes in a nice nylon holdall and is easy to assemble with no tools required. It can be assembled in less than 10 minutes and works from 40-10m (once you have removed two of the aluminium segments and swapped the feed loop). Tuning is easy, but very sharp and hand capacitance effects are evident.

In terms of its performance, it will work better for you on CW and datamodes where all-out signal strength is not as important. But running 10W or so, you will not be the loudest station on the band, especially with SSB.

Some checks with the late G4FGQ's excellent RJELoop1.exe program suggests that the loop reaches maximum efficiency on 21MHz (15m) where it is perhaps around 73.5% efficient (0.2 S-points down on an 'ideal loop'). Its worst performance is on 40m (7MHz) where it is around 5.4% efficient (2.1 S-points down on an 'ideal loop').

If you are looking for a portable, lightweight, multi-band HF antenna then the Alpha Loop has a lot to offer. As long as you don't expect to work everything you can hear you won't be disappointed, after all this is QRP. The Alpha Loop antenna costs about £240 delivered to the UK (depending upon the current exchange rate). It can be ordered from the Alpha Antenna eCommerce website at www.AmateurRadioStore.com. Our thanks to the manufacturers for the loan of the Alpha Antenna loop.

TABLE 1: Bandwidth (between 3:1 SWR points)

40m (7MHz)	25kHz
30m (10MHz)	38kHz
20m (14MHz)	54kHz
17m (18MHz)	82kHz
15m (21MHz)	110kHz
12m (24MHz)	105kHz*
10m (28MHz)	135kHz*

Note: The above were measured at the feed point. Typical operating bandwidths will be slightly larger due to coax losses. Measurements marked * were taken with the smaller feed and reduction of the main loop.