New Magnetic Loop for Improved Reception and Noise Rejection
Model: RF PRO-1A (Receive-Only Antenna)
Shielded Active Broadband Magnetic “Moebius Loop” Antenna

MSRP: $399.99

- Unique Moebius Loop architecture provides enhanced performance over standard loops
- Very low IMD, 30 dB Low-Noise Preamp insures good performance in both strong and weak signal environments
- Up to 30 dB rejection of locally radiated noise compared to whip antennas
- Figure eight directivity and deep nulls to further reduce interference.
- Primary coverage range: 100 kHz to 30 MHz
- Rejects power line noise
- Rugged construction, easily mounts to a pole or flat vertical surface, 1m dia. aluminum loop, supplied with LNA, power inserter and DC power supply
- No manual tuning necessary
- No Home Owners Association problems; low profile, easy to camouflage and works at ground level
- Modular design for easy installation and maintenance
- Adjustable output level to optimize output for your radio
- Made in the USA

NOT YOUR FATHER’S LOOP ANTENNA
Based on the work of Dr Carl Baum for the US Air Force his “Moebius Strip Shielded Magnetic Loop Antenna” architecture provides superior performance over that of other commercially available wide-band loop antennas in the 100 kHz to 30 MHz range (see attached user evaluation).

Dr Baum was a Senior Scientist at the US Air Force Research Laboratory and is the recipient of several awards from the IEEE (Institute of Electrical and Electronic Engineers) for his work. Originally developed for a classified US Air Force project involving the measurement of EMP (Electro Magnetic Pulse) from nuclear weapons, this design has wide application to antennas for low-noise, interference-free radio reception over a wide frequency range. Pixel has coupled this antenna with a low-noise amplifier with very high intermodulation distortion (IMD) specifications (OIP3 = +46 dBm, OIP2 > +90 dBm) that can operate without saturating in high AM and FM broadcast band signal environments.

www.PixelSatRadio.com
Phone: (303) 526-1965
MAGNETIC LOOP ANTENNA ADVANTAGE
Most active antennas are the whip type and respond mainly to the electrostatic-field portion of an electro-magnetic radio wave. The Magnetic Loop responds primarily to the magnetic-field and this ensures high rejection of nearby electric-fields. The intensity of the electric field is usually higher than the magnetic-field when an antenna is close to interference sources such as TVs, florescent lamps, power line wiring etc. By rejecting the electric-field there is a reduction in local interference compared to other types of active and passive antennas. Interference reduction is further enhanced by the deep nulls of the antenna’s ‘Figure-Eight’ directivity pattern (see Figure 1) that can be used to null out or reduce interference coming from a specific localized direction.

INTERMODULATION
Some active antennas generate intermodulation products which can appear as spurious signals interfering with reception. This interference or second and third order intermodulation is caused by non linearity in the amplifier producing signals which are usually the sum and difference of strong AM or FM Broadcast stations and their harmonics. The RF PRO-1A Moebius Loop has been specifically designed to reduce intermodulation products to a minimum. The third order intercept point is typically +46 dBm (OIP3) and the second order intercept point is greater than +90 dBm (OIP2). The 1 dB compression point of this amplifier is + 26 dBm making the levels of the intermodulation products generally far below the atmospheric and man-made noise.

ANTENNA DESIGN
The RF PRO-1A Moebius Loop Antenna consists of a rigid light-weight ¾” diameter anodized aluminum 1 meter loop and a balanced broadband amplifier that is housed in a separate enclosure that can be mounted close to the antenna on its mast or to any nearby flat surface. This configuration permits the insertion of optional AM or FM broadcast band elimination filters (models BCB-1 and FMLPF-1) ahead of the amplifier. These are not normally required for good performance, but are available to provide the ultimate performance in extremely high RF signal environments. A 20 volt DC regulated wall-socket mounted power supply and a separate power inserter unit are provided. The antenna and amplifier have been designed to permit the use of low-cost 75 ohm cable (RG-6 quad-shield recommended). The maximum length is 1000 feet, but the frequency response will be a function of the cable loss vs. length specifications. For best results the antenna should be positioned approximately 15 feet away from any buildings or other sources of interference.

TECHNICAL INFORMATION
Frequency response: 100 kHz – 30 MHz (Gain = 30 dB ±3 dB)
DC power: 20 volts at 200 mA
LNA OIP3: +46 dBm
LNA OIP2: > +90 dBm
1dB compression point: +26 dBm
NF: less than 2 dB (at 10 MHz)
Antenna Diameter: 38 inches
Maximum cable length between antenna and power inserter: 1000 feet

INCLUDED ITEMS

<table>
<thead>
<tr>
<th>QTY</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Loop Antenna</td>
</tr>
<tr>
<td>1</td>
<td>L-bracket pole mount</td>
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<tr>
<td>3</td>
<td>Saddle clamp</td>
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<tr>
<td>3</td>
<td>U-bolts</td>
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<td>mounting bolts and washers</td>
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<td>wall mount clamps</td>
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<td>power inserter</td>
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<td>Low Noise Amplifier unit</td>
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<td>F-female to male PL259 adapter</td>
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<tr>
<td>1</td>
<td>10 dB attenuator</td>
</tr>
<tr>
<td>1</td>
<td>6 dB attenuator</td>
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www. PixelSatRadio.com
Phone: (303) 526 – 1965
Golden, Colorado
Magnetic Shielded Loop Antenna User Review and Evaluation

Wellbrook Model ALA-1530+ vs. Pixel Technologies RF PRO-1

By Ned Mountain, WC4X 5/1/2010

Introduction

The objective of this evaluation was to perform a side-by-side unbiased comparison between the Wellbrook ALA1530+ broadband loop antenna and the Pixel Technologies RF PRO-1 loop (a pre-production prototype). Their performance was also compared to a 550 foot bi-directional Beverage antenna at my QTH 100 miles north of Atlanta in the North Georgia Mountains.

Both of these antennas are 1 meter diameter loops with low-noise high gain amplifiers and are designed to cover the range of 100 kHz to 30 MHz. The objective of this evaluation was to determine how well these antennas operate in the HF amateur bands up to 30 MHz and to identify the differences between each. Both of these antennas are the “receive- only” broadband variety that require no external manual tuning adjustments and are primarily designed for outdoor installation at ground level but also can be used indoors. (Many people install them in attics or lofts). Because these antennas are optimized to respond primarily to the magnetic component of electromagnetic radio waves, they exhibit excellent rejection of localized (near field) QRM from computers, flat panel TV’s, light dimmers, switching power supplies, etc. that is dominated by the electro-static component of the electromagnetic emissions. In this regard, the substantial QRM reduction advantages of these types of antennas have been well reviewed and documented:


http://www.wellbrook.uk.com/reviews/SWM2001Nov.pdf

Both loops have a broad figure-eight reception pattern (or more accurately a fat figure eight) with sharp 20 -30 dB nulls (about 2-5 degrees wide) at right angles to each side of the plane of the loop which are useful for nulling or reducing localized interference coming from a specific direction. Although to take advantage of this feature, you may need to mount the antenna on a standard rotor for precision alignment.

Wellbrook, a U.K company, has been producing the Model ALA 1530 since 1999 and the Model 1530+ is the latest version. The Wellbrook antenna has been well reviewed and is highly regarded in the amateur community. Pixel, located near Denver, Colorado is a manufacturer of antennas and RF distribution accessories for high-end home, professional and commercial applications. The RF PRO-1 is an extension of their highly regarded AM-1 MW shielded magnetic loop antenna and utilizes a “Moebius Loop” architecture that was originally developed for a US Air Force project in the sixties and declassified in 1994. (http://www.ece.unm.edu/summa/notes/SSN/note7.pdf). The Wellbrook is priced at $350 which includes a charge of $61 to ship it from England to the US via standard 3-4 week shipping. The Pixel loop is priced at $399.

The bottom line is that, as expected, neither loop antenna was as good as my 550 foot Beverage. But the loops were not that far behind and for their size, in locations with limited space, they provide remarkable reception capability. In every case (reception sensitivity, interference rejection, mechanical design, ease of use, and ease of installation) the Pixel antenna was the clear winner between the two loops.

Evaluation Details

Sensitivity and Signal-to-Noise

In my test setup I mounted both loops outdoors to a wooden fence about 5 feet high and oriented the loops in the exact same direction. They were connected to either of my transceivers (Kenwood TS870 and ICOM 756 Pro 3) through identical 50 foot runs of quad shield RG-6 cable via an A/B switch. I tested them both side by side for about a month in April 2010. Almost everything I was able to receive on the Beverage was also readable with the Pixel Loop except some very weak low frequency signals. As expected, the S/N was not as good as the Beverage. On the other hand, S-meter readings and listening tests confirmed that almost across the entire 100 kHz to 30 MHz spectrum, the Wellbrook’s performance was noticeably less than the Pixel loop. To be fair there were some cases where the Pixel and Wellbrook antennas were about equal below 1 MHz, but above this frequency, the Pixel Loop was the clear winner by as much as 10 dB. This seems to verify Pixel’s claims that their “Moebius Loop” architecture outperforms conventional loops.
### Interference Rejection, IMD and Noise Figure

To test interference rejection, I used a particularly noisy florescent light located in my shack to evaluate this. While not an exhaustive scientific test, the Pixel exhibited noticeably greater resistance to this noise source than the Wellbrook. As far as the capability of these antennas to operate well with low intermodulation distortion (IMD) in the presence of very high level RF signals (such as a typical local AM broadcast station), both antennas have impressive specifications better than most receivers. The Pixel IMD specs are some 10 dB to 7 dB better than the Wellbrook in this regard. Because the Wellbrook amplifier is integrated inside the loop in a sealed and potted enclosure, I was unable to verify its claimed IMD specifications. The Pixel amplifier was tested by an independent laboratory and certified to meet its published specs and it also exhibited a noise figure in the vicinity of 2 dB (at 10 MHz) which is excellent. Wellbrook does not publish its noise-figure specifications. The Pixel amplifier that was tested was pre-production prototype.

### Mechanical Integrity & Mounting Provisions

From a mechanical design perspective the Pixel Loop is much more rugged and easily mounts to any pole (up to 2 inches in diameter) with standard pole-mount hardware that is included. The Pixel Loop can also be mounted to any flat vertical surface with the included high strength L-bracket. On the other hand, the Wellbrook is particularly deficient in this regard. The user is advised in the Wellbrook instruction sheet to improvise a wooden or bamboo pole for mounting. Many previous reviewers have commented on this. The Wellbrook also utilizes a BNC connector to mate with the outdoor antenna. The BNC is a reasonable connector to use in low-stress indoor applications, but for outdoor use, its environmental and mechanical attributes are completely unacceptable. Many previous Wellbrook reviewers have also commented on this and have had to improvise various environmental improvements and had to performed frequent outdoor connector maintenance. The BNC connector is potted into the antenna’s base and there is no way to change or modify it. The Pixel Loop, on the other hand, uses readily available high quality F-connectors tried and proven by the DBS and Cable TV industries. The Pixel antenna can also be used with relatively low-cost quad-shield RG-6 cable. The Pixel interface / power inserter unit that mates with the radio has an internal 75 to 50 ohm matching transformer with a PL-259 or F-connector output to the radio.

### Service Features and Configuration Flexibility

Another positive note for Pixel is that because the Low Noise Amplifier (LNA) is a separate modular unit that mounts to the antenna mast or nearby flat surface, it’s much easier to replace if it ever goes bad. The Wellbrook requires replacing the entire antenna. Also AM or FM band reject filters can, in the case of extremely high-powered very close-by transmitters, be installed up-stream of the amplifier to make the antenna meet its ultimate specifications although these are generally not required. A few users have reported that the Wellbrook is inoperable in such situations, particularly when there are nearby high-powered commercial FM transmitters. With the Wellbrook there is no way to fix this problem.

### Summary

The loops do an impressive job of minimizing local QRM as advertised. The Pixel RF PRO-1 beats the Wellbrook across the board and although it’s not a 550 ft Beverage spread out over several acres, in most cases it’s not far behind the Beverage. Admittedly, additional quantitative measurements should be done to validate my qualitative observations, but in a smaller QTH with antenna restrictions, the Pixel RF PRO-1 would be my number one choice for a low frequency receive antenna.

Ned Mountain, WC4X

5/1/2010