

## DX CENTRAL REVIEW: Airspy HF+ and the W6LVP Magnetic Loop



Figure 1: The author's W6LVP loop perched on a balcony overlooking the French Quarter in New Orleans, Louisiana.

### It is better to receive

Assembling a top-notch receiving station with the Airspy HF+ and the W6LVP magnetic loop

By Loyd Van Horn, W4LVH

Before I ever made my first QSO as a ham radio operator, I was a DXer. Specifically, mediumwave DX.



There has always been something satisfying about pulling a weak station out of the static using patience and a little ingenuity. But at some point, you have to stack the odds in your favor a bit with the right equipment.

For years, I had a modest setup: a portable shortwave radio such as the Panasonic RF-B300, or a shortwave radio such as a Kenwood R-2000 or ICOM R-72 with a random longwire antenna strung up in some trees. Later, I added things like a Quantum Loop indoor loop antenna, but I still couldn't seem to replicate the results of some of the 'big guns' I would read the logs of in the hobby publications.

Further, I would spend hours in front of the dials, hoping to pull in stations from elusive states or even countries. I spent many a bleary-eyed night and early morning trying to take advantage of the right propagation path or quiet conditions. This put a serious dent in my precious sleeping time. There had to be a better way.

Finally, came the SDR revolution. Software Defined Radios (SDR) were small receivers that you controlled from a computer. They offered extensive filtering options, a band-scope waterfall display, and my long sought after recording functionality. With SDRs, you could now set up a schedule to record entire swaths of a band for later review.

When I first heard about SDRs, I loved the concept, but wasn't sold on the execution. First, there was the price. While many SDRs were priced a bit under the usual cost of high-end receivers, they were still pretty expensive for my budget. Secondly, there was the interface. I just wasn't sold on the idea of ditching buttons and knobs for mouse clicks. It seemed as if you were disconnecting from the actual signals coming through the speakers in favor of a digitized replication.

Then, in the early part of 2018, I kept hearing people talk about the newest SDR to hit the market: the Airspy HF+. A tiny box that retailed for \$199 USD and promised outstanding performance not only on Mediumwave and Shortwave bands, but VHF as well. Throw in all of the usual benefits of an SDR receiver (recording, filtering, waterfall display) and I was definitely interested.

So, I set out researching all I could on this marvelous little box. How could they cram in so much performance at such a low price-point? Surely there had to be a catch.

For starters, I checked out the technical specs on the Airspy HF+ Web site. It boasted a pretty impressive set of numbers: full HF coverage from 9 kHz all the way to 31 MHz, VHF coverage from 60-260 MHz including the FM band, 150+ db of selectivity (between the hardware and downloaded software), market-leading noise reduction, a large



selection of filters, +15 dBm IIP3 on HF at maximum gain (+13 dBm on VHF), and it was plug and play, no messing about with drivers.

This could finally be the receiving solution I had been looking for: high-end receiving performance, at an affordable price point and in a compact and portable design. But there was one more thing I knew I needed to do to add a truly remarkable receiving station in my ham shack. I needed an outdoor loop antenna.

With not enough real estate at my QTH for any sort of beverage type solution, I have always turned to an indoor loop antenna, such as the Quantum. Through the years, I have achieved very pleasing results with the combination of my longwires and the loop. But, the loop was still susceptible to indoor noise pollution in an ever radio-noise-generating world. I needed to get my loop outside, away from the noise where I could effectively null it. All signs pointed to an outdoor magnetic loop, but which one?

There are a multitude of outdoor magnetic loop antennas on the market, each of them proclaims similar performance and are all priced a bit on the high-end of the spectrum for most DXers. There was one though that I found that offered comparable performance to the big names while coming well under their hefty price tag: the W6LVP magnetic loop from Larry Plummer.

Like the AirSpy HF+, the W6LVP loop boasts some impressive features: 1-meter loop (about 10 foot circumference), covers 135 kHz to 30 MHz with no tuning or adjustment needed, and furniture grade PVC provides sturdy construction while only weighing in at a light 2 pounds (minus the transmit/receive switch or the power adapter).

These are receive-only antennas and are designed for those with dedicated receivers or transceivers with a dedicated receive antenna input. However, Larry also has available a separate transmit/receive switch that allows you to switch between the loop and transmit antenna. This makes it a valuable addition for hams receiving weak stations – especially on the low bands of 75/80 meters and 160 meters.

The W6LVP currently sells for \$250 USD for the antenna without the power inserter, \$345 for the antenna with the transmit/receive switch and \$225 for the portable version. Even the higher-priced model is still considerably lower than many of the other magnetic loops on the market, especially when you consider shipping costs of the other antennas. The W6LVP ships much less expensively than the other antennas due to a compact design.

After putting in my orders, a little over a week later I had both my new SDR and my new loop antenna and was ready to let the DX pour in.



## AIRSPY HF+ - SETUP AND INITIAL TESTING

One of the great parts about the Airspy HF+ was the promise of driverless plug-and-play setup. However, you still need to download SDR software to control the Airspy. It is compatible with most of the major SDR programs available on the market, some may require a little more tweaking to get them to work with the Airspy than others, though.

So, a quick word about the SDR software that you have available.

The Airspy HF+ is recommended to be paired with SDR# (SDR sharp) software, so I started my testing with that. I also downloaded HDSDR and SDR Console for my Windows laptop, and GQRX for my Macbook Pro.

Which software will work best for you is definitely a matter of personal preference. They are all free, so try them all and see which you like best. From my experience and desired usage, I found SDR Console to be my personal favorite. The ease of use, the filtering and most importantly the recording interface all seemed to perform better with SDR Console than the other software I tested. As pretty much the only option on my Mac, I liked GQRX, although I would drop it in a heartbeat for a Mac version of SDR Console.

For the purposes of this review, I will be focusing on use of the Airspy HF+ through the SDR Console software. Your experience may vary slightly depending on which program you choose.

Setup of the Airspy HF+ is incredibly easy. It is supplied with a USB cable, however you will need some sort of adapter to plug your antenna (VHF or HF) into the female SMA inputs on the Airspy HF+. Luckily, I already had an SO-239 to Male SMA adapter handy from use with my 2-meter handheld. So, after plugging in the USB cable and the antenna I was already receiving signals!

I first tested using the VHF antenna through a 2-meter vertical antenna. We have multiple high-power FM stations here in Charleston, South Carolina, most of which have their transmitter site within 5-10 miles of my QTH, so adjacent channel splatter was something I was keen to see how the Airspy would be able to handle.

The Airspy handled it with no problem. For any splatter on adjacent frequencies, I was able to use the software filtering to eliminate it at least to a point where it was no longer a serious problem. Were I using an outdoor FM antenna on a rotor, my results would be even better. On the few channels we have without a local or near-local station, I was able to pull out weak stations relatively easily. On the day of my testing we had a moderate



Tropo opening and I was pulling in Florida stations in Orlando and Miami with ease, even when adjacent to local or near local stations.

Even semi-local stations that on my standard FM stereo receiver were barely audible with the 2-meter vertical antenna received an audible boost on the Airspy. It does a great job at pulling weak stations out of the mud and not overloading from strong stations, a testament to both the selectivity and sensitivity being as good as advertised.

As another example of this, there are several low-power FM stations in downtown Charleston that are simply unreadable at my QTH, whether that be on my indoor equipment or even my car stereo. The Airspy HF+ did a great job at isolating these signals and making them readable.

Another bonus feature, is that the Airspy HF+ combined with SDR Console has RDS, with station and song title information displayed for stations broadcasting this data. This is of course a fantastic help with IDing a station, especially during Tropo or E-Skip conditions when stations are booming in but you have a finite window to get an ID.

Next, I switched to the HF antenna and went down to mediumwave. We have a handful of moderately strong stations in our area, but stations in Savannah, GA and Jacksonville, FL boom in like locals during the day. At night, we have a large number of Latin American stations – mostly from Cuba – filling the dial.

The Airspy handled all of it like a with ease. The filtering was simply amazing, especially with the SDR Console interface. You can either choose the buttons with preset filter widths, or use your mouse to manually adjust the filter width on the waterfall display.

Just like with FM, stations that had previously been weak to inaudible on my ICOM IC-7200 transceiver were suddenly fully readable. The filtering did a remarkable job at eliminating splatter from strong adjacent channel stations – noticeably better than the digital filtering on my ICOM IC-7200 which has always been excellent and served me well in amateur radio contesting.

Next I wanted to see how it handled truly weak stations. I took the receiver up to 20 meters to the FT8 transmit frequency. I compared it to my ICOM IC-7200 transceiver, which is a remarkably quiet radio to begin with. The results were stunning.

Stations that the IC-7200 wasn't even decoding were coming through with ease on the Airspy HF+, often around -19 or -22 dB – enough to be decoded. Even stations that were being decoded on the ICOM were still several dB stronger on the Airspy. This can be contributed to the lower noise floor introduced by the Airspy HF+.



I decided to try the recording scheduling functionality in the SDR Console software for some mediumwave DX and was not disappointed. I set it up to record from 4:30 am Eastern to 7:30 am Eastern each weekday during a full week. I set the bandwidth to 768 kHz, so set the center frequency to 900 kHz and was able to record the entire band from 530 kHz all the way to 1280 kHz (I wanted to give myself a little buffer on both ends of the recording bandwidth).

The SDR Console recording interface is phenomenal. When you pull your recordings for review, you are able to manipulate the interface exactly as you would if you were sitting in front of the dial when the recording was taking place. You can use the waterfall to look for split frequency stations such as Trans-Atlantics and Trans-Pacific stations. You can adjust the filtering and change modes (helpful for jumping between LSB and USB to reduce interference from adjacent channels).

My favorite part is how you are able to jump through the timestamps on the recording. The interface has a clickable box for each minute within the hour, so you can easily skip to the bottom or top-half of the hours for station IDs. This is especially helpful when you are reviewing multiple frequencies for stations, you can easily navigate to the timestamps you want to review (I usually would start about five minutes prior and five minutes after the bottom or top of the hour ID times, just to be safe).

So, what difference will the W6LVP loop make?

#### W6LVP MAGNETIC LOOP – SETUP AND INTIAL TESTING

Setting up the loop itself is fairly easy. You simply insert the upper PVC tube with the loop coax into the top of the lower PVC section. Uncoil and stretch the “loop” wire into a vaguely circular shape (it doesn’t have to be perfect) and plug both ends into BNC connections on the loop amplifier.

NOTE: If you are using this loop for a home/base operation, you will want a small TV rotor. You can find one at most of the big box-store home improvement stores for around \$120. You can also find them at many radio hobby suppliers for roughly the same price. You will also need a run of 3-conductor wire to run from the rotor to the control box. I am running an RCA VH126R I have used with my 6-meter beam in the past and picked up the wire from my local hardware store for about \$30 for roughly 100 feet.

Based on suggestions from Larry, I ran RG6 quad-shield from the antenna back to the shack. You will need BNC connections on both ends of this feedline run, although I had to use adapters to connect the feedline to my window panel with coax connectors. I then used jumper coax cables from the transmit/receive box to the window panel, from the T/R



box to my transmit antenna and from the T/R box to the antenna input on my Airspy HF+ (still using the SO-239 to Male SMA adapter jumper). To power the loop amplifier, the T/R box uses a wall-wart power adapter.

With everything connected, I flipped the T/R box to the 'receive' position, spun the antenna to due North and began to be amazed. The noise floor, already lowered by the Airspy, was nearly non-existent with the W6LVP loop connected. As an example, during the pre-Sunset hours, I turned to 1660 kHz with the T/R box switched to my transmit antenna, where WBCN in Charlotte, NC was audible but very weak and in the noise floor with Southern Rock music. I flipped the W6LVP loop to the receive position and immediately, the noise floor was both audibly and visibly (on the waterfall display of SDR Console) reduced, almost completely. Then, WBCN's audio sounded semi-local, with fully readable copy. This was before I had even tweaked the antenna orientation to maximize signal coming from Charlotte, which is to my northwest.

Later that evening, I put the loop to an even more telling challenge. I have never logged any Trans-Atlantic longwave stations in my entire DX career. I have heard carriers, but no discernible audio.

On the night of my testing, around midnight Eastern, it was more of the same as I tried to tune in 252 kHz in Algeria, with my T/R box set to the transmit antenna position. Algeria should be relatively easy as I have mostly ocean water in our signal path between my station and their transmit tower. They were there, I could tell there was modulation on the signal but it wasn't readable at all.

I swung the loop to roughly east/northeast and flipped to the receive position and was blown away. Fully readable audio, to the extent that if I spoke French I could understand every single word being spoken. Once again, the noise floor was nearly non-existent, just strong signal cutting through the night air. I checked a few other strong longwave stations with limited results, but the difference experienced through the loop compared to my stationary wire antenna was unbelievable.

Once again, I tried my hand at weak signal FT8 stations on both 40 and 20-meters. The loop brought stations to the surface that otherwise were completely hidden. Stations that were audible on my transmit antenna were at least 5-10 dB stronger on the loop.

I absolutely love this loop antenna. In addition to the on-air performance, it is built to withstand the elements. I have no worries about this antenna withstanding the assault of our notoriously strong summer thunderstorms or even weaker tropical storms.



In addition, it has a very low profile. I put it in a back corner of my backyard up against a shed and it is barely noticeable unless you are specifically looking for it. This is a huge benefit to keep me from running afoul of my neighborhood's HOA.

#### FINAL THOUGHTS

I have been searching for a scorching receive station my entire time as a DXer. Not only for mediumwave and shortwave, but also for my amateur radio pursuits. The combination of the Airspy HF+ and the W6LVP loop is an absolute game changer for me. One of my primary limitations, especially on the lower ham radio bands, has been my ability to hear weak stations. This should no longer be a problem. The only problem I will likely have now is that my ears will be stronger than my transmit signal. Not a terrible problem to have, since you can't work a station you can't hear in the first place. This at least gives me a chance.

I have even taken the Airspy HF+ on the road, bringing my beloved Quantum Loop with me and setting up in the back of my SUV. It worked magically. I haven't tried bringing the W6LVP loop portable yet, but a trip down the beach is absolutely in my near future. (EDIT: See below update note for recent information about this aspect)

The only thing that could make my receive station any better – and it is a step I will be taking soon – is adding a phaser to combine my transmit antenna and W6LVP loop to create breathtaking nulls and pull Trans-Atlantic stations and deep Latin American stations out to the top.

For the combined cost of what you would spend for most of the magnetic loops on the market, you can get both a high-performing SDR and an amazing loop antenna. You may need to spend a little extra for a small TV rotor, the feedlines for the antenna and rotor and the adapters, cables needed for hooking everything up, but you would need that for any magnetic loop antenna you would purchase. For my money, I simply could not find a better combination of performance and affordability than the Airspy HF+ paired with the W6LVP loop.

I highly recommend both of these as fantastic additions to your station. If you don't believe me, do what I did and do a search for YouTube videos of people demonstrating the performance of both the AirSpy and the loop.

UPDATE: March 2020 – This review was written nearly two years ago when I first purchased both my Airspy HF+ and the W6LVP loop. Since then I am pleased to announce that I am continually blown away by what both of these pieces of equipment can do.





I have added a SDR Play RSPdx SDR to my arsenal and it is my main SDR at this time (due to being able to record the entire MW band, rather than just 768 kHz at a time as on the Airspy HF+). I also added the phaser mentioned above, a Quantum Phaser from Gerry Thomas at Radio Plus. I have to say, the combination of an SDR, outdoor magnetic loop and phaser has blown me away.

Since adding the new SDR and phaser, I have captured DX I had never even heard whisper of before. Trans-Atlantic stations such as 891 – Algeria, 621 – Canary Islands and 1089 – United Kingdom have all been added thanks to this new equipment. I also have logged for the first time the countries of Haiti, Puerto Rico and Venezuela using this receive combination.

Each of these DX catches were audible on my Airspy HF+ as well, proving that with a capable SDR, adding the magnetic loop and the phaser unit were exactly the difference-makers I needed to push my DX over the top.

I mentioned at the start of this article that I have always longed for a receive station setup that would bring me closer to the level of the “big guns” for pulling in exotic DX. I still have some work to do to get fully at that level (and probably a larger lot of real estate to work with) but this new setup at least gets me closer.

## COSTS

As of printing, the Airspy HF+ is running for \$199 (it was out-of-stock when I last checked, but they did have their Airspy HF+ Discovery available at \$169. In many ways, the Discovery is an improvement on the HF+ design, with even better filtering and signal processing).

The W6LVP loop runs anywhere from \$250 (for the version with just the power inserter for the pre-amplifier) to \$345 for the version with the T/R switch. There is also a smaller portable version available for \$225.

## FINAL RATING

### **Airspy HF+**

### **4.75 out of 5.0**

It is hard to find much to fault here. This SDR is quiet and when combined with software that you are comfortable with, it can pull in DX that quite frankly you might not have ever heard otherwise. This is especially true when combined with a capable recording scheduler. My only beef is the 768 kHz bandwidth, which means you aren't able to capture the entire MW band at once. Other than that, I have really been impressed with this SDR!



## **W6LVP Loop Antenna**

**5.0 out of 5.0**

Honestly, is there anything detracting to say about an antenna that has low noise and is able to pull in signals with ease? Additionally, the portability of this antenna has been handy, including taking it on a recent vacation to New Orleans. Setup on a tripod on our balcony, the W6LVP was able to withstand not only Mardi Gras, but the harsh noise environment of an urban setting. When you factor in that the cost of this antenna is often half that of other loops that perform similarly, why wouldn't you add this to your arsenal? Don't walk, RUN to your laptop and go buy this antenna. Now.

### HELPFUL LINKS

Airspy HF+ : <https://airspy.com/airspy-hf-plus>

W6LVP Loop Antenna; <https://www.w6lvp.com/>