

The Pixel Technologies RF PRO-1A and Wellbrook Communications ALA1530 Active Loop Antennas Compared

By Guy Atkins KE7MAV

Introduced last year, the RF PRO-1A antenna from Pixel Technologies (a manufacturer and supplier to the satellite radio, cellular phone, and HD radio industries) is a direct competitor to Wellbrook Communications' ALA1530 broadband active loop antenna. Wellbrook is a vendor well known to SWLs and DXers, and their popular ALA1530 antenna has been used for over 10 years in commercial and government monitoring posts in addition to the hobbyist market.

How does the newcomer antenna from the USA stack up against one of the UK's best active loops? Over the last six months I've been medium wave and shortwave DXing with both of these antennas and have used a systematic, objective approach to compare them. This review presents summary diagrams generated from MS Excel spreadsheet data to clearly show each antenna's performance per-band.



MP3 Audio Files of Reception

After the comparison charts you will find a link to a ZIP file containing "A-B" MP3 audio recordings of actual reception with the two loops, plus the original XLS spreadsheet file to review if you are interested.

I won't comment much on the physical aspects of the antennas, as this information is found in-depth on the manufacturers' web sites. However, the RF PRO-1A and ALA1530 both use high quality materials and construction and are designed to last many years. The DXer and SWL will need to use "F" connectors or "F" adapters with the Pixel Technologies antenna, rather than the BNC variety on the Wellbrook product. BNCs are considered standard fare for professional HF equipment. Quad shielded RG-6 (QS-6) 75 ohm coaxial cable is recommended for the RF PRO-1A; it is an excellent choice for RFI rejection and a good value but harkens from the cable/satellite TV world rather than HF usage.

I used 125 feet of the quad shielded RG-6 feed-line with the RF PRO-1A, and 125 feet of 50 ohm, RG-58/U for the ALA1530, which is recommended by Wellbrook Communications for their antennas. The loops were oriented north-south, separated by 18 feet, and each loop was three feet off the ground on non-metallic masts. Both antennas were equally distant from the nearest building (my house) about 35 feet away. The nearest power lines were one half

mile away from the antennas, since my neighborhood has a below ground AC mains supply.

Indoors, the output of each antenna's interface box was fed into an Alpha-Delta antenna switch, with the switch's output sent directly to a Perseus Software Defined Receiver (SDR).

Evaluating Antennas with the Perseus SDR Receiver

Microtelecom's highly regarded Perseus is an excellent tool for examining antenna performance. The receiver is in many respects a very affordable spectrum analyzer, with two key benefits useful for comparing antennas:

- Highly linear and accurate signal strength measurement at the receiver's antenna input, unaffected by AGC, gain settings, or other circuits
- Automatic calculation of signal-to-noise (S/N) ratio for received stations, using the "Markers" and "Delta" (difference) functions (signal + noise, minus noise only)

What makes one antenna "better" than another, when compared using the same station heard with the same receiver settings and adjustments? It is simply a better S/N ratio.

Both loops are designed with very high IP2 and IP3 performance in mind, so they are essentially bullet-proof in high RF environments such as near transmitter sites. So, overload resistance is typically not a concern with either antenna; the bottom line is: which antenna can give clearer, more intelligible, and more noise-free signals?

Before receivers like Perseus became available to the hobbyist, antenna "A-B" comparisons have always been a matter of subjective listening for best reception (S/N) as determined by ear. The exacting S/N measurements made with the Perseus receiver make it possible to accumulate results for numerous individual frequencies in a Microsoft Excel spreadsheet (XLS) and output charts and diagrams to illustrate the antennas' performance.

It's important to remember that the Perseus receiver can accurately measure signal strength—or band noise (non-signal) measurement—at the antenna input, like a spectrum analyzer. The receiver's software compen-

sates for any changes in receiver gain (pre-amp / attenuation), AGC, etc. to consistently show the actual tuned signal strength at the antenna input. The "markers" function lets the user measure the strength of a chosen signal AND a nearby (out of passband) sampling of band noise. The "delta" (difference) button of Perseus subtracts the noise level from the signal+noise, and the S/N of the received station is shown.

I used the method below to record reception data over a number of weeks and listening sessions. However, my hands-on use of the antennas spanned over six months so I could compare my subjective impressions of the loops to the measurable data collected.

The Test Procedure

These were the steps taken to measure the S/N of every signal tuned:

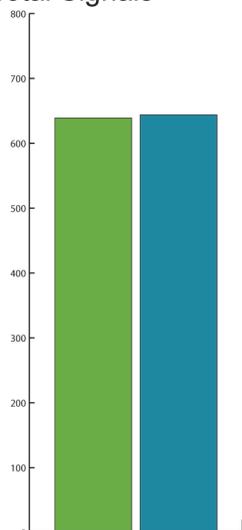
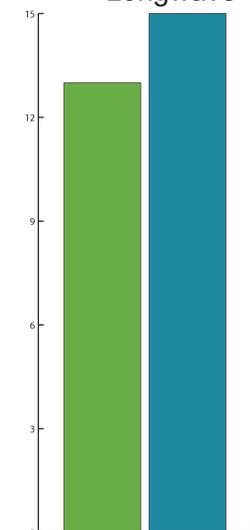
- Configure the Perseus SDR for general reception of broadcast stations: dBm units for signal strength and markers, 6.0 kHz max. BW button (adjust for 4.0 kHz bandwidth to start), AM mode, Slow AGC, 2000 kS/s sampling, 400 kHz span, PeakSrc (Peak Source) button, and maximum averaging of the primary spectrum display window. If any parameters are changed for the best reception of a station, the adjustments are kept constant for each loop's test on that station.
- After tuning a signal, place a signal marker #1 in the primary spectrum window at center carrier of the station. The "PeakSrc" button snaps the marker to the carrier's peak and follows it throughout any fades or variations. Place a signal marker #2 in a non-signal (band noise only) area, outside of the passband (I generally tried for 10-20 kHz away from the signal).
- Click the "Delta" button to display the difference between the (signal + noise) and noise values. A higher Delta result corresponds to a better sounding signal.
- Allow time for the averaged spectrum display to settle before determining the average reading, or turn the main display's AVG (Averaging) button off and back on to speed up the settling process.
- Record the value in the XLS spreadsheet for the tuned frequency, and repeat the above process for the other loop antenna. Press MKR Clr (Marker Clear) button to erase the signal markers before testing a new signal.

RF PRO-1A vs. ALA1530: Performance per Band

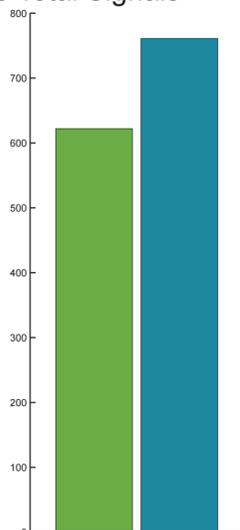
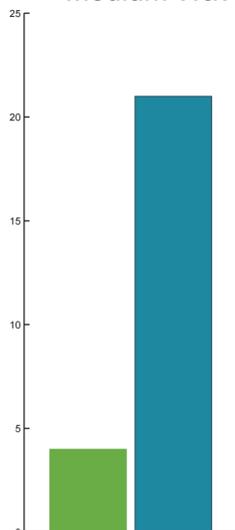
 = RF PRO-1A

 = ALA1530

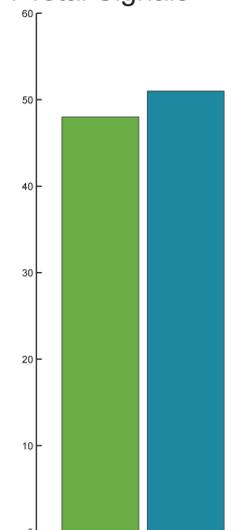
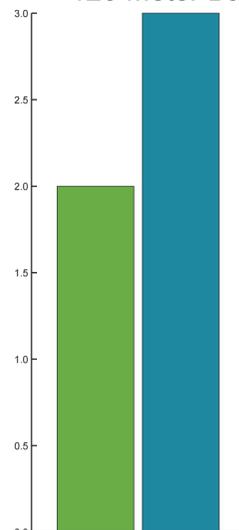
Longwave - 20 Total Signals



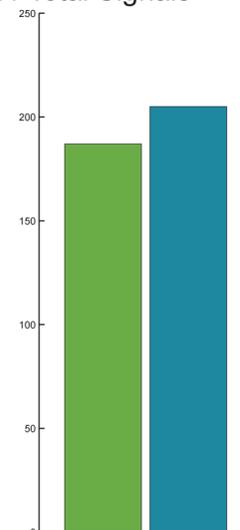
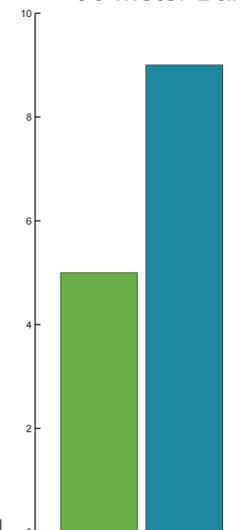
Medium Wave - 23 Total Signals



120 Meter Band - 4 Total Signals



90 Meter Band - 11 Total Signals



Best antenna on a signal, how many times per band

S/N ratio total of all tested signals, per antenna, per band

Best antenna on a signal, how many times per band

S/N ratio total of all tested signals, per antenna, per band

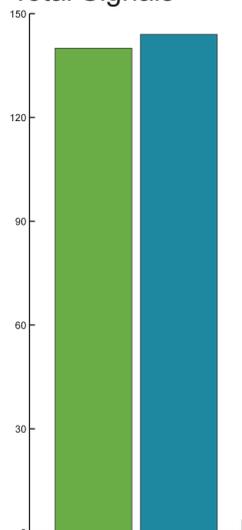
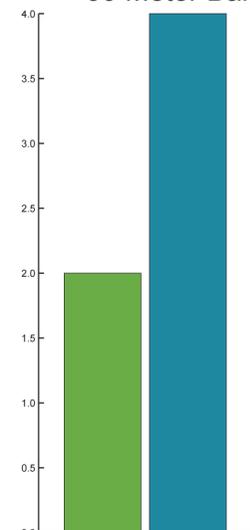
Best antenna on a signal, how many times per band

S/N ratio total of all tested signals, per antenna, per band

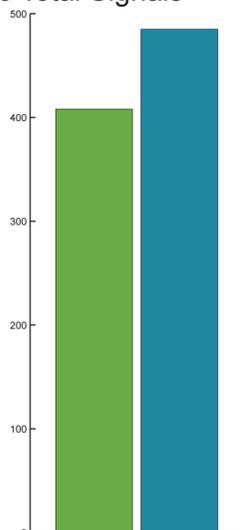
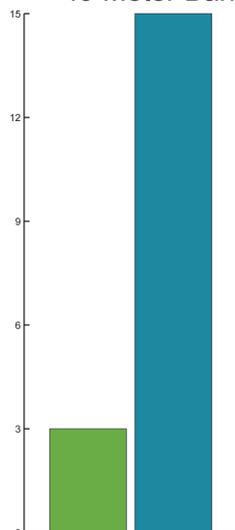
Best antenna on a signal, how many times per band

S/N ratio total of all tested signals, per antenna, per band

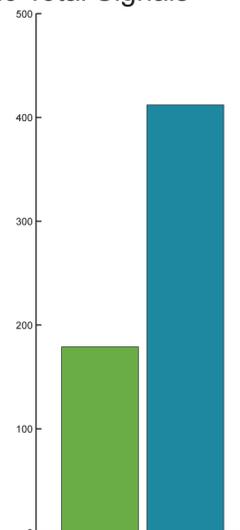
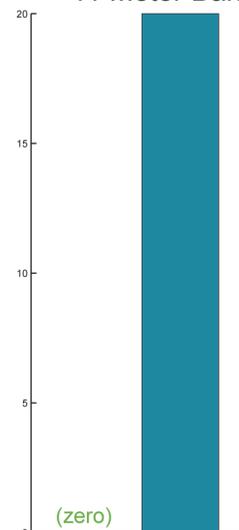
60 Meter Band - 6 Total Signals



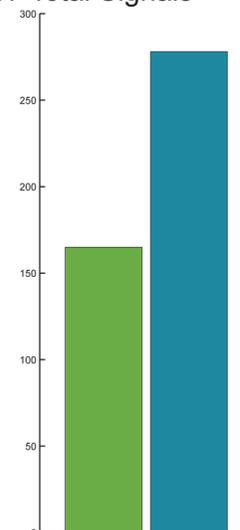
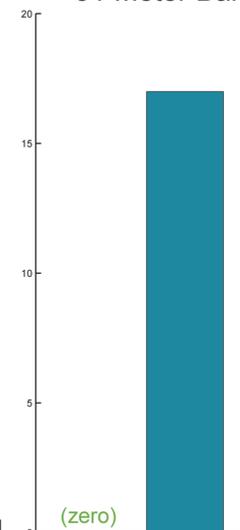
49 Meter Band - 16 Total Signals



41 Meter Band - 20 Total Signals



31 Meter Band - 17 Total Signals



Best antenna on a signal, how many times per band

S/N ratio total of all tested signals, per antenna, per band

Best antenna on a signal, how many times per band

S/N ratio total of all tested signals, per antenna, per band

Best antenna on a signal, how many times per band

S/N ratio total of all tested signals, per antenna, per band

Best antenna on a signal, how many times per band

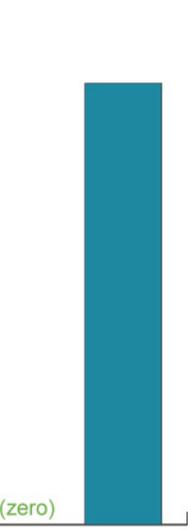
S/N ratio total of all tested signals, per antenna, per band

RF PRO-1A vs. ALA1530: Performance per Band

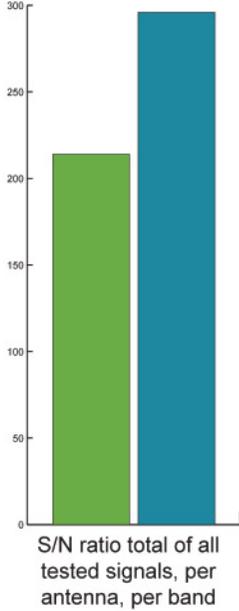
 = RF PRO-1A

 = ALA1530

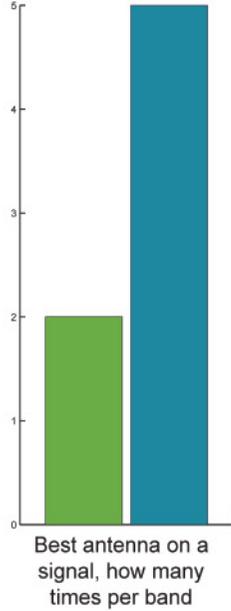
25 Meter Band - 17 Total Signals



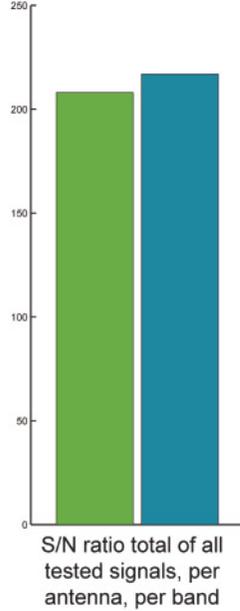
22 Meter Band - 6 Total Signals



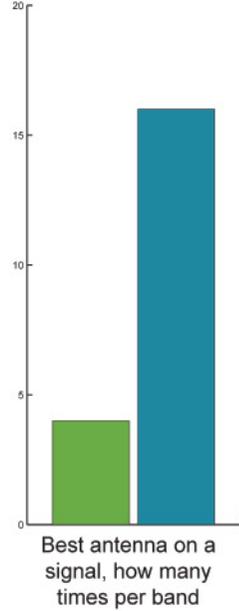
19 Meter Band - 19 Total Signals



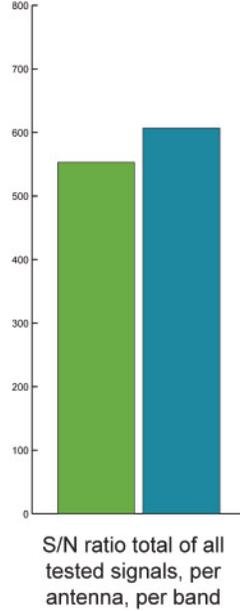
16 Meter Band - 9 Total Signals



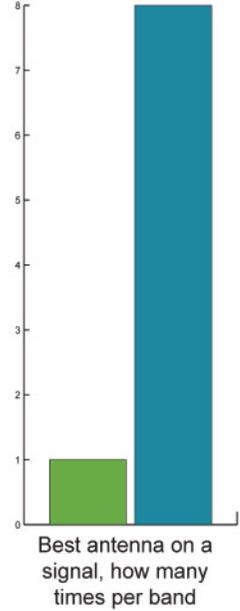
16 Meter Band - 9 Total Signals



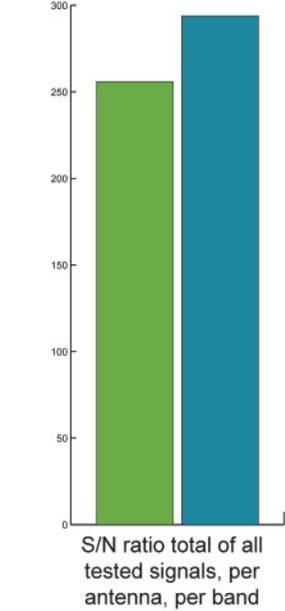
16 Meter Band - 9 Total Signals



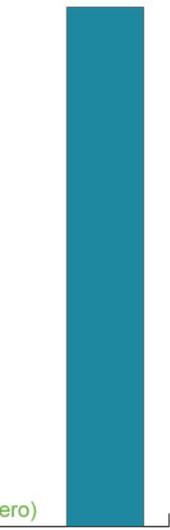
16 Meter Band - 9 Total Signals



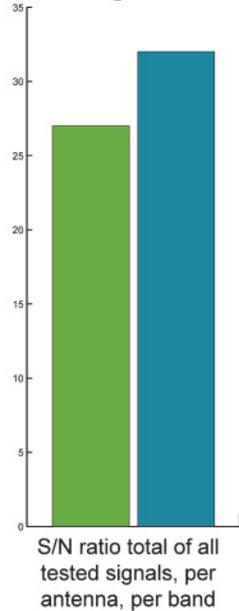
16 Meter Band - 9 Total Signals



13 Meter Band - 1 Total Signal

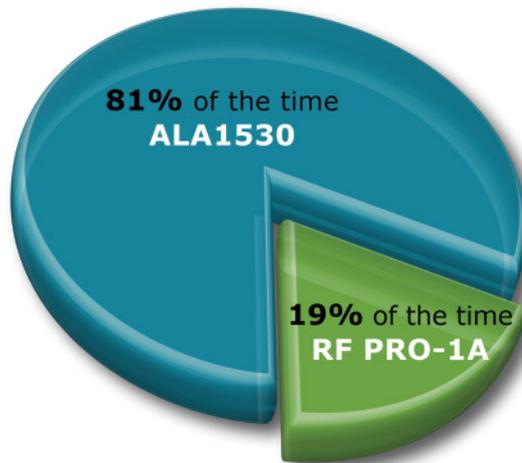


13 Meter Band - 1 Total Signal



Overall: Best Antenna per Frequency, LW-13 meters

169 total frequencies, longwave through 13mb. Ties count as a win for each antenna (i.e., +1)



Best antenna per frequency = the antenna which provided the highest signal-to-noise (S/N) ratio (as measured with the very linear Perseus SDR's signal meter (dBm units). See text for measurement method.



I made an effort to identify all broadcast stations used for loop antenna testing, except on long wave where I am unfamiliar with DXing that band. Medium wave tests were done approximately 3-1/2 hours before local sunset to receive steady ground wave signals. At the top of HF, only one lonely broadcast signal was found in the 13m band, the Voice of America's Northern Mariana Islands transmitter on 21580 kHz. Ample signals for loop testing were found in all other bands, and the grand total of stations used in the tests was 169.

Test Categories and Charts of Results

After a lot of consideration on how to present the S/N numbers I decided upon these two criteria:

- Which antenna provides the best signals (S/N ratio) the most often, per band? (In case of a S/N ratio tie on a frequency, both antennas "win" and each receive one "vote" in the totals for that band.)
- What is the S/N ratio grand total of all tested signals per band, per antenna?

These two questions provide a basis to objectively compare the RF PRO-1A and ALA1530 antennas. The data in the MS Excel spreadsheet was automatically summed to provide totals to show overall antenna performance for long wave through 13 meters. The raw numbers from Excel were copied to the chart data entry tool in Adobe Illustrator software, to create nicer looking charts than is possible in Excel directly.

The Verdict

Well before I finished comparing these commercial broadband loop antennas on all bands, my ears told me what the numbers were showing: The RF PRO-1A loop cannot keep up with the ALA1530's performance.

I was surprised at this outcome as I expected it to be a very close race. The antennas are serious products which sell for serious amounts of money, and both appear to target the same advanced DX hobbyist and commercial customer market.

Pixel Technologies claim their antenna "provides enhanced performance over standard loops", and employs a "Moebius Strip Shielded Magnetic Loop" design, based on the work of Dr. Carl Baum who was a Sr. Scientist at the US Air Force's Research Laboratory.

In contrast, Wellbrook Communications' literature states that shielded Moebius and multi-turn loops have problems with too much capacitance or inductance, resulting in reduced HF bandwidth, sub-optimal current transfer to the amplifier, and subsequent lower loop/amplifier power transfer (gain). Wellbrook also says their own antennas solve these issues with a low inductance loop element, and with an amplifier which has input impedance that matches (tracks) the loop's reactance over the design bandwidth.

Evidently Wellbrook's approach works, as their loop gave cleaner sounding, better S/N ratio signals the majority of the time, as shown in the charts and spreadsheet data. I wondered if there was a problem with my feedline, the connectors, or placement of the RF PRO-1A, so I temporarily substituted a different feedline & connectors as well as swapped the positions of the two loops. Neither change improved the Pixel Technologies' antenna.

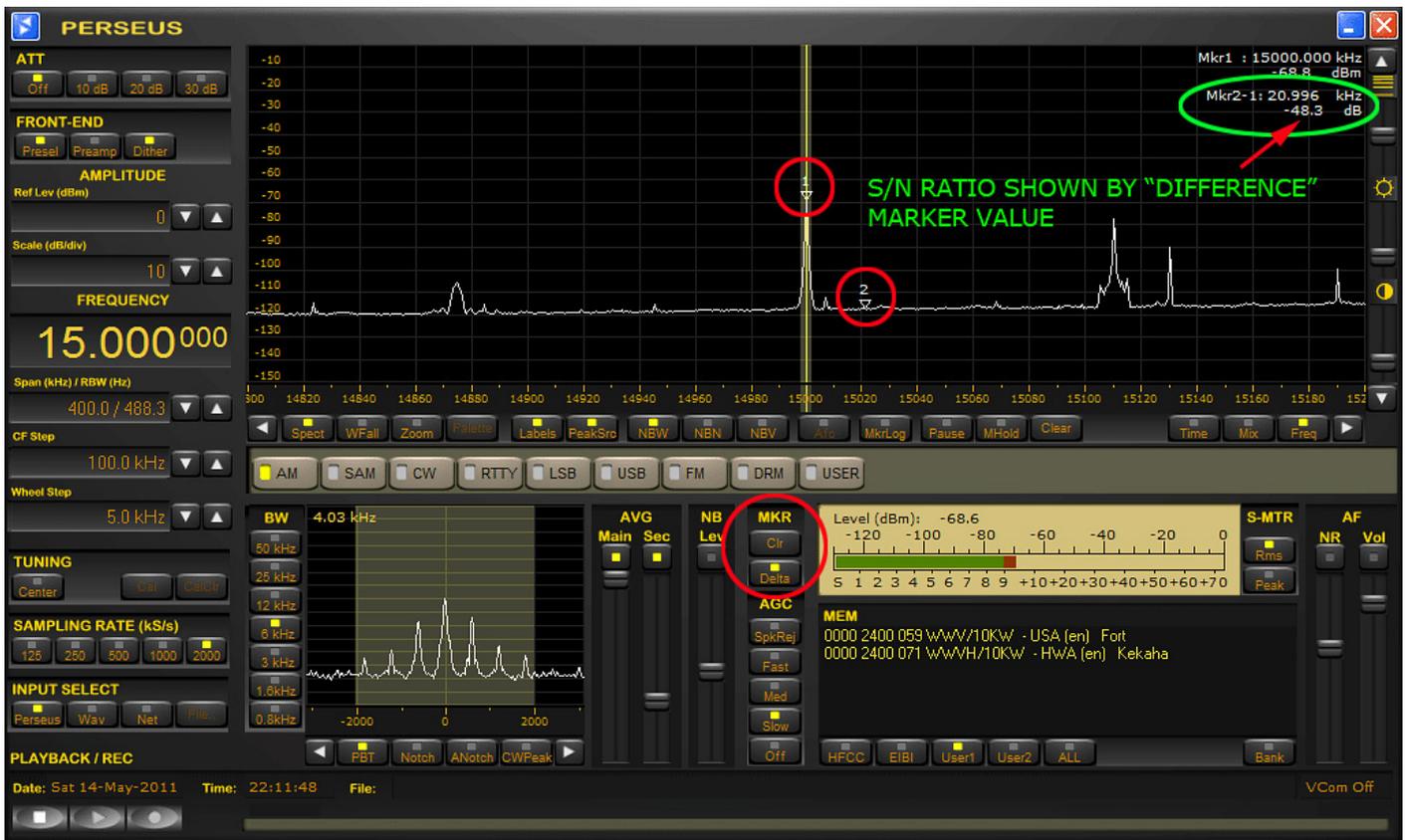
MP3 Recordings of Signals

You can hear for yourself in a sampling of the loop comparisons. Download this ZIP file from my MediaFire.com account to access 12 MP3 audio files I recorded during testing of the RF PRO-1A and ALA1530:

<http://www.mediafire.com/?edcn29ne31398sz>

Each recording is 20 seconds long. The first 10 seconds is always the RF PRO-1A's reception, and the second 10 seconds was made with the ALA1530.

The ZIP file also contains the raw S/N numbers from the antenna comparisons test in an Excel spreadsheet file.



Typical S/N ratio measurement settings for use with the Perseus SDR is shown above. A right-click with the computer's mouse places signal level markers where desired. The "Delta" button under MKR (marker) automatically calculates the real time difference.

Conclusion

I purchased the RF PRO-1A for \$399.99 USD plus shipping directly from Pixel Technologies (www.pixelsatradio.com).

Wellbrook Communications' ALA1530 is £200.00, which at the time of writing this review is \$325.68 USD. You can order it from their web site at www.wellbrook.uk.com. Taking international shipping charges for the

Wellbrook loop into consideration, the ALA1530 is still a less expensive antenna.

Based on results from my S/N ratio tests, signal comparison recordings, and the over 10 year history of continuous improvement Wellbrook has put into their loop antenna, I believe that DXers and SWLs will make a better choice with the ALA1530.

Active as a tropical bands and foreign medium wave DXer since 1980, Guy Atkins is best known for his efforts as an author and editor with the still-popular *Fine Tuning's* "Proceedings" series of books for the advanced radio enthusiast. More recently, for three years Guy ran an active and widely read blog devoted to the Perseus SDR receiver. Guy's in-depth technical articles and reviews have been published in *Monitoring Times* magazine and radio hobby resources *DXing.info*, *RadiolIntel.com*, *DXer.ca*, *Hard-Core-DX.com*, and elsewhere. He also enjoys antenna and receiver modifications along with trips to the well known coastal DXpedition sites in Grayland, Washington. Guy works as a graphic designer for the wireless firm T-Mobile USA.