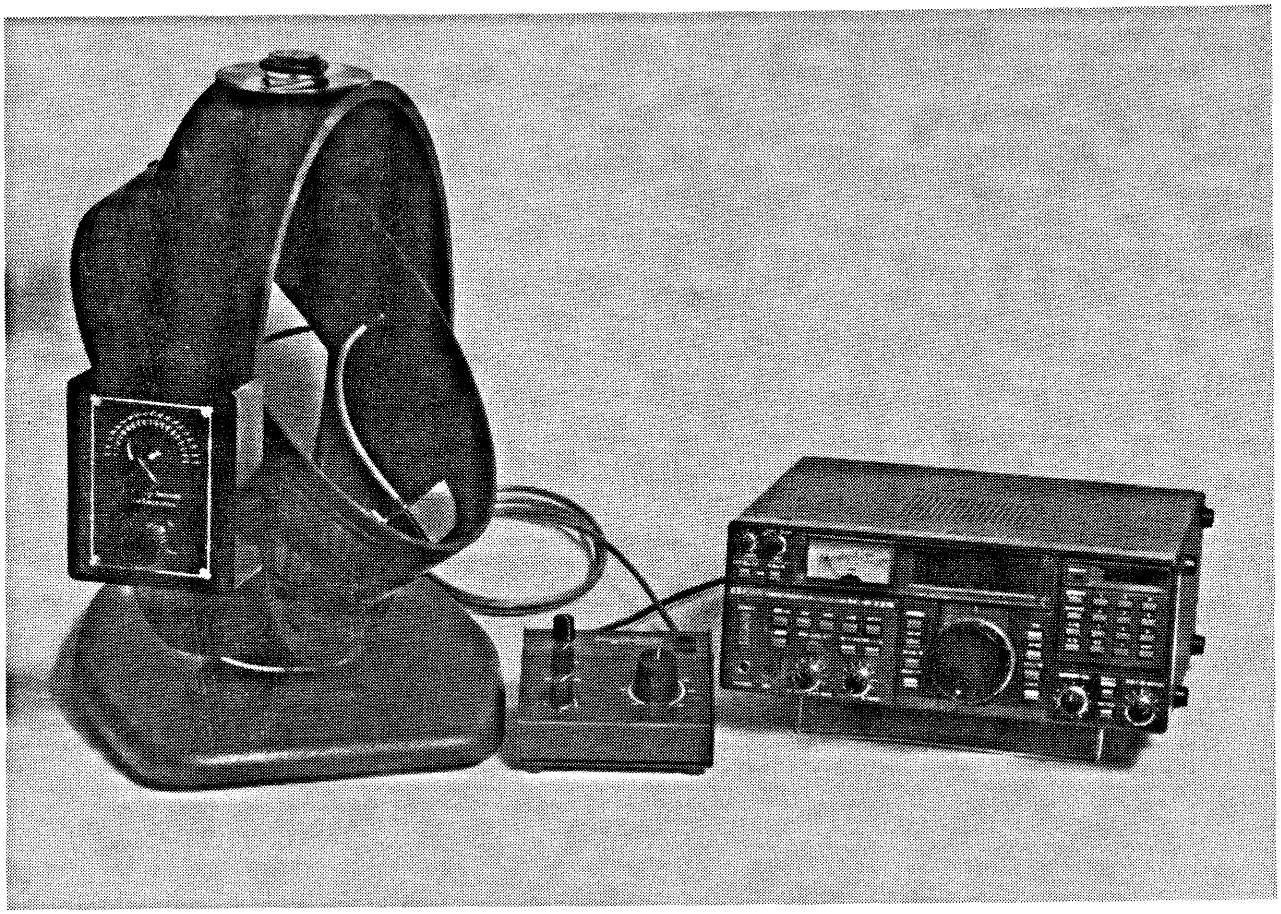
THE KIWA MEDIUMWAVE LOOP ANTENNA

Everything I ever wanted in a mediumwave loop and more

Werner Funkenhauser



PREAMBLE

Back in 1958, I bought a SONY 9 transistor BCB portable which taught me about loop antenna direction and nulling. Along the way, I also discovered that nulls could be improved by tilting the radio. My High School shop instructor just shook his head when I explained why I built a tilting "Lazy-Susan" cake-server with a SONY radio fastened atop. Since then, I have used all kinds of loops, air and ferrite core, shielded and unshielded. Most were unamplified but some had amplifiers, including the regenerative variety. Those were sensitive but generally unstable, easily breaking into uncontrolled oscillation. As well, they were critically sensitive to detuning because of hand capacitance. Over the years I came to prefer large air core loops. I found that unlike the ferrite variety, large loops seemed to provided deeper nulls and gave good signals without the need for amplification. This type performed well in noisy conditions and considering my engineering skills and carpentry methods, they were electrically if not physically stable.

The Kiwa Loop's advance publicity now almost two years ago, spoke in terms like "compact", "stable regeneration" and "balanced" design. The idea of a small, high-performance, circular loop with tilt capability and regeneration interested me. I wondered how it would compare to a Connelly wire/loop phasing unit which I used with a 1 meter air-core loop? Frankly, I didn't think that pair's performance could be improved. They had rewarded me with logs of Quito's HCRP1 on 880, and Buenos-Aires' LRA-1 on 870. The 1 meter loop with Connelly's phasing unit was my benchmark against which I compared all other loops. Still, I was curious.

SOME MORE OVERVIEWS AND OPINION

My friend George Hakiel, told me he suggested using regeneration to the Kiwa's designer, Craig Siegenthaler, at an IRCA Convention. At the time, Siegenthaler was still formulating his product. During preparation of this piece, Siegenthaler wrote me, *"The idea to develop a MW loop antenna began at an IRCA get together in Seattle when I had a chance to see a popular ferrite loop in operation. It performed well, but when studying the design, I thought there were ways to improve the mechanical requirements. The tilt control was difficult to use and often the presence of one's hand upset the null position due to body capacitance."*

In the same letter he described the loop's theory of operation. *"It is a balanced design of two identical sets of coils. The antenna windings are tuned with a matched-pair of varactor diodes used as capacitors for tuning of the coils. This balanced assembly drives a matched pair of surface mounted FETs whose output drives the regenerative windings for bandwidth/gain control. The same FETs also drive a balanced (matched pair FET) differential amplifier where the outputs of each antenna coil/preamp is summed together, allowing the cancellation of noise that might be common to both antenna coils. Noise pickup from power lines is heavily filtered with circuitry that "scrubs" the AC before reaching the DC rectifier/filter. The summed signal is sent to the control surface from which two buffer amplifiers drive two isolated 50 ohm outputs. The preamplifier also acts as an active Balun."*

Craig designed his loop to overcome major shortcoming of many other loops. He addressed obvious problems and engineered stability, balance, and ruggedness among other features into the design. As well, he considered aesthetics, for which I'm glad. Some commercial loops look "home-brewed" and are just plain ugly. The Kiwa is stylish, "art-deco" in looks. Operating features, excellent performance and looks embodied in one design, undoubted factors considered by WRTH when granting the Kiwa Mediumwave Loop its prestigious "1994 Product Of The Year Award".

FIRST IMPRESSIONS

Harold Sellers obtained of one of the earliest Kiwas which he let me use for awhile during late Spring of 1993. *That test was an eye-opener!* The Kiwa was highly sensitive, very stable and suffered no hand capacity detuning unless touched. After coming away from my trial, my only complaint was that tuning was somewhat easier on lower frequencies than at the high end where it was more critical. However, using the antenna was simple. First I coarse tuned the frequency of a station, then fine-tuned it, adjusted the loop for maximum null, reduced RF gain then advance regeneration. Several tilt/aim trials with a little more fine-tuning/regeneration adjustment to tighten nulls and reduce noise/ QRM topped off the process. A lot of twiddling? Only the first few times, and much easier to do than to describe. The sequence quickly became automatic.

Among my logs, I counted HCRP1-880 and KPRM-870 on nighttime power of 1 kW (despite WWL and WHCU). I managed several 1610-TIS stations that were easily separated from the Caribbean Beacon. The Kiwa had features that I wanted without shortcomings that I had experienced with many other loops, including my beloved 1 meter unit. I was impressed and felt qualified to comment in my *DX Ontario* column "Mediumwave International", and also discussed it on the FIDO shortwave echo. I wanted one! After reading Phil Bytheway's "Kiwa MW Loop Antenna Review" in the NRC Bulletin, I wanted one even more but held off because of cost. The clincher was having to DX with a McKay Dymek DA-5 attached to my ICOM R71A. My 1 meter loop was gone, thrown out by my former landlady when I moved and forgot to bring it along. In fairness, the DA-5/R71A were very good together. After years of hearing time pips and tentative IDs on 870 kHz, in November 1993 I had a spectacular 20 minute reception with that setup. It earned me a much-treasured LRA-1 QSL. Based on my experiences with Harold's Kiwa, I was certain it would have performed better under similar circumstances. Shortly after Christmas I ordered one directly from Kiwa, and spent several weeks waiting for it come. Somehow they seemed longer.

DESCRIPTION

The loop arrived via UPS in a single box, protected with expanded foam and newspaper padding. There were four pieces – the antenna assembly and its cable, the base, a control box which Kiwa calls a "control surface" and a wall-plug power supply. Small parts and manual were in a separate bag. Everything was unpacked, assembled, and *ready to go in 10 minutes!* Mechanical installation involved attaching the loop to its base with a large nylon bolt and a lucite washer between the two pieces. Assembled, the Kiwa's black teflon-coated finish with its artistic white control labels reminded me, like Bytheway, of nostalgic equipment.

The antenna's eight foot cable attached to a DIN receptacle on the back of the control surface. This cable may be as long as fifty feet and custom lengths fitted with DIN hardware can be ordered from Kiwa. Longer cable allows remote operation in the event of electrical or receiver display noise.

The AC power supply plugged into the back of the control surface. The Kiwa may be powered with 13.7 VDC from an automotive battery through two polarity-marked terminals. The DC power source is diode-protected and impossible to damage through a reverse polarity error. The antenna just fails to work.

All that remained was the receiver connection. Output from the control surface is via two PL-259 sockets. Either 75 ohm or 50 ohm coaxial cable with appropriate connectors may be used, but 50 ohms is recommended. The receiver can be connected to either output, or two receivers can be connected to the antenna at the same time (handy on a DXpedition and for sideband-diversity reception). I connected both outputs to the Icom's two antenna inputs. The R71A's mediumwave range (antenna B) cuts off at precisely 1600 kHz and I often tune above that frequency for out-of-band mediumwave DX. Routing the cable to the Icom's antenna A (the PL-259 socket) through an antenna switch allows me to select between Kiwa or a random wire antenna for shortwave reception as I continually look for parallel programs on those bands.

AIMING AND OTHER CONSIDERATIONS

The Kiwa's reception pattern is the classic figure eight. Like Bytheway, I measured this simply by aiming for maximum signal on a local station then I swung the antenna around 180 degrees. S-meter readings were exactly the same! This test was conducted with local station signals during daytime, on the yard, and well away from house wiring and furnace ducts. Good equal nulls without the need for tilting occurred exactly 180 degrees apart in a similar swing-around test.

Mounted atop the loop is a compass which may be used to read station bearings directly. After I aligned the compass with true North, I could aim the antenna for maximum signal along its plane and read the station bearing in degrees. The accompanying manual gives good examples of how to determine true North. I photocopied and enlarged one of Cedric Marshall's ODXA Sunrise-Sunset azimuthal maps centered on Toronto. After trimming it I punched a hole at the centre and placed it between the lucite washer separating the antenna from its base. Aligned against the compass, the map provided a large scale that could easily be read with an indicator taped near the base of the loop.

Bruce Portzer, one of the original beta testers of the Kiwa loop, commented after reading my draft article. *"You might also talk about nulling locals by alternately tweaking the azimuth and tilt controls until the local loses out (hopefully) to the DX station. I've gotten my best nulls of all times on the Kiwa (after having previously used a Radio West 12" ferrite, 4 foot box loop and a Space Magnet)."*

Located inside the antenna hoop, at the bottom, is a plastic mini-box that houses a 25 db attenuator switch. A dummy box mounted inside, at the top, acts as a counterweight. The 25 db attenuator substantially reduces strong signals and thus the receiver's AGC action. That materially helps to find optimum tilt-angle and azimuth to null locals. Signal peaks and nulls are very sharp, but accurate adjustments which yield good results are easy to make. The antenna assembly with base are heavy and physically stable and the antenna rotates freely without binding on its base. Weight, size and action permit smooth direction adjustment. Tilt operations have little or no backlash. Smooth action of the knob-driven tilt mechanism on the front of the antenna is accomplished through a precision gear mechanism. A large tilt angle scale is marked 90 degrees left or right of vertical. As with aiming, the loop's sturdiness, weight, and size all contribute to stability and backlash free tilt procedure. All-in-all, repeated adjustment of tilt and direction is a snap. However, I found the location of the 25 db attenuator switch awkward. It's position on the antenna element made it too easy to inadvertently change the tilt-angle when switching it out.

OPERATING FEATURES AND PERFORMANCE

I've been using my Kiwa for over two months and it outperforms both the DA-5 and a new 1 meter loop. It consistently delivers stronger signals than either, and its excellent smooth tilting action helps reduces local electrical noise while providing excellent nulls.

Compared to the DA-5, the Kiwa's sensitivity seems markedly better without regeneration, but when regeneration is set at the maximum usable level (just below the point of oscillation), the Kiwa's weak signal capability is far superior to the DA-5's. When properly set in this mode, the amplifier showed no susceptibility to overload from strong local signals and I found no unexpected birdies or signals from strong locals appearing in odd places on the dial.

The manual warns about keeping the antenna away from nearby metal objects and interference sources, including the receiver. Metal objects may degrade the receiving pattern. Modern digital receivers often produce display noise and some older receivers with poor shielding may generate internal signals which the antenna is capable of receiving. I located my loop about 4-5 feet away from my Icom R71A and have few problems from its noisy display, except when signals are really weak. Then I get a little warble on certain frequencies. My listening location, in the basement of a "row-house" is very noisy because of many nearby electrical appliances. I operate below ground level, 20 feet away from the furnace whose ducting runs across the ceiling along with assorted TV, telephone and electrical cables some of which are also found in the walls. This speaks highly of the Kiwa's usefulness under degraded listening conditions. However, background noise may be masking some of the Icom's weaker display noises and so I want to try remote operation with the Kiwa on a rotator under some kind of dome and away from the townhouse. The possibility of having to forego the loop's tilt capability is an important impediment that has kept me from doing so yet. Tilting is absolutely essential for maximum nulls and noise cancellation.

The Kiwa performs very well to deliver DX in the presence of nearby co-channel stations. First, the local is nulled and then the DX signal is fine-tuned without readjusting the antenna. In this case, the antenna may not be aimed/tilted for maximum DX signal level, but it is often possible to raise its level substantially through a combination of regeneration and fine-tuning. As Ken Cornell stated in one of his articles describing the construction of a regenerative loop, *"If you've never used a regenerative amplified loop, you're in for a treat. Weak signals seems to pop up from beneath noise."* The Kiwa is not unlike other regenerative antennas in this regard. Unlike others however, the Kiwa remains stable at near-oscillation. In this mode, it behaves as a kind of passband device, like IF passband tuning or crystal phasing, but at RF frequencies. Near regeneration, the antenna is sharply frequency-selective. The signal may be made even more intelligible by fine-tuning either upper or lower sidebands for both audio shaping and QRM reduction. It is often possible to use a broader IF filter in this mode, increasing signal intelligibility even further.

The ability to precisely tune desired signals at near-oscillation finally allowed me to log Tahiti-738 kHz from my southwestern-Ontario location (after years of trying) one recent morning. Around 0830 UTC, I had listened to WIAC-Puerto Rico on 740 kHz, noting a familiar 2 kHz het caused by a carrier on 738 kHz. I had audio there only once or twice that late before (although Spain had appeared on 738 kHz as late as 0700+). A signal, sometimes as late as 0900+ had to be Tahiti. Bits of French and music bridges surfaced around 0845. A quick check with both the DA-5 and 1 meter loop allowed me to hear carriers in SSB, but no audio. With the Kiwa connected, I alternated between the Icom's dual VFOs where I had entered both RFO frequencies, 738 kHz and 11826.8 kHz (miraculously usable!). By 0852 the two signals were clearly the same! Typically, modulation level was poor relative to signal strength on both channels. Absurd as it sounds, WIAC which is itself a reasonable piece of DX, slopped RFO's 738 kHz signal. I nulled WIAC at some expense to the RFO signal. However, the Kiwa's extreme selectivity and sensitivity near the point of oscillation, and the ability to precisely fine-tune it, allowed me to peak RFO's lower 738 kHz sideband. I don't count hets or carriers as logs and so I owe this audible one to the Kiwa.

FREQUENCY	CALL	KIWA	DA-5
560	WHND	S5+	S3+
560	CFOS	S9 +20db	< S7
630	CFCO	S9 +20db	< S7
760	WJR	S9 +20db	S7 to S9
1010	CFRB	S9 +40db	S9 +
1460	CJOY	S9 +40db	< S9
1575	Spain-low power	S3+	only carrier heard w/SSB
1611	Vatican (Santa Maria de Galeria)	S5+	barely audible

Informal comparison of selected signals: RF gain at maximum on the DA-5, and RF gain/regeneration levels set for peak results with the Kiwa.

NITPICKINGS AND REBUTTALS

The Kiwa has been described by some as "monstrously huge". That makes me chuckle. A one meter loop is huge! Try tilting and aiming that smoothly. The Kiwa is heavy, larger than ferrite loop antennas, but hardly monstrous. Weight, size, and layout are optimum for effective operation; tilt and aim are easily adjusted (no need to grab at little elements or knobs.) The separate control surface with a 5 inch square panel has conveniently-sized and well-spaced knobs for tuning, RF-gain and regeneration. Their position on the control surface allows all operating adjustments at the receiver, save aim and tilt. Lack of other controls on the antenna surface allowed the tilt mechanism to be optimally designed with convenient sized control knob and large tilt angle scale.

I don't recommend using the Kiwa with a portable receiver like a GE Superadio. Such receivers are housed in plastic cases and the internal ferrite loop may offset the Kiwa's nulling/aiming capabilities. Portable receivers are also prone to overload from something as powerful as the Kiwa. I read a complaint on the FIDO Shortwave Echo about the Kiwa "overloading a Sangean-803A". The same complainant will attach a 200 foot longwire to the little Sangean and boast how it is now possible to daily hear The BBC on mediumwave. The Kiwa can overload even a receiver with a good front-end but not in the hands of a knowledgeable user. The trick always, is to use minimum RF gain and maximum usable regeneration. With too much RF-gain, the connected receiver will suffer front-end overload. Too much regenerating causes oscillation and the Kiwa may transmit minor QRM to nearby radios. It is probably less interference than from nearby TV oscillators but will overload the receiver even further.

Another note of detraction, this one in the Ham Radio conference of CompuServe complained about the Kiwa's size, cost, and questioned why the Kiwa wasn't made electrostatic. The writer inferred that the Kiwa had poor "E-field" performance compared to the SM-2 and McKay-Dymek but did not cite any good reasons, nor examples of why he held those views. The comment reminded me of some of the "near-technical" but nonobjective discussions that one sometimes hears on CB. My experiences have been the direct opposite. In sensitivity, and weak signal performance, the Kiwa simply blows away the DA-5 (and outperforms an SM-2 as cited elsewhere here). As for "E-field" performance, in one test the DA-5 delivered only light dimmer noise from the floor above, while the Kiwa gave me ZLS on 526 kHz. You have to learn to use it, but it works, believe me!

REAL PROBLEMS

Instability and drifting isn't usually a problem in the Kiwa after it warms up. It will wander during the first half-hour or so. At times it may detune slightly as electrical devices turn on or off and it may even loose its null for the same reasons. The manual warns about this but when I first used mine, it really drifted off-frequency and would sometimes break into oscillation for no reason. When I powered it with an RV battery, the instability disappeared. I traced the problem to my AC source which according to volmeter readings fluctuated from 114.3 to 122.7 volts, especially after mid-evenings when I was doing most of my DXing. Craig offered to replace the control surface but suggested I first try a stable AC source like my computer battery backup system. It cured the problem. Even though the fault lies in my AC source (and is not the result of poor power supply design in the Kiwa) this may pose a problem to users who live in areas where AC service is unstable.

Harold Sellers transported his antenna on its side in the trunk of his car while travelling to the ODXA 1994 Bolton DXpedition. The Kiwa's wire loops unraveled after slipping off the form and he had to rewind them. On my Kiwa, the windings are tight and seated in deeply-machined grooves on the form surface. The wire loops on older Kiwas may not be as tight-wound as on newer ones. Craig suggests carefully dabbing epoxy across the windings near the antenna tilt axes, where the epoxy least affects the loop's appearance.

My postscript to this section on complaints is the critically sensitive tuning in the top end of the band. More important is the awkward position of the RF attenuator device inside the antenna hoop. However, I can live with both.

FINAL COMMENTS

Bill Bowers commented on my draft article, *"...I agree with the conclusions. It is the best, by far, commercially available loop!"* Kiwa products enjoy excellent reputations and The Kiwa Mediumwave Loop is no exception. This reputation is no accident. Instead it's the result of careful research, good design and excellent engineering. According to Siegenthaler, about 200 have been delivered at time of this writing (March 1994). Demand continues despite its fairly high cost which ranges between $320.00 to $330.00 (US) plus shipping, depending on the source. In Canada, brokerage, GST, and exchange add to the cost. It is pricey but you get what you pay for!

It is evident from this review that I am pleased by my Kiwa's performance. Aside from doing comparisons, I've used only the Kiwa since I got it. Was it worth the money? I've exhausted the DX potential of my existing equipment. Definitely! In fact, I am considering the purchase of a second Kiwa for remote use. It is a piece of gear for the serious mediumwave DXer. State-of-art performance and operating features don't come cheap but give a decided edge to the user who is willing to learn how to extract all the performance this unit is capable of. My benchmarks were proven performers but *the Kiwa is simply better, and beats anything I've ever used, hands-down!* As conditions continue to improve, I'll be ready with my Kiwa (or Kiwas) and you know, I might even finally hear Brazil.

KIWA LOOP SPECIFICATIONS

Tuning Range: 30-1700 kHz Continuous tuning using main and fine tuning controls.

Regeneration: Adjustable bandwidth control provides a 70-75% reduction in bandwidth from minimum position.

-6 db Bandwidth: (with regeneration control at minimum) The maximum -6db bandwidth occurs at 1700 kHz which -typically measures +/- 7.5 kHz (15 kHz). The -6db bandwidth narrows as the frequency decreases. At 650 kHz the -6db bandwidth is 6 kHz.

Attenuator: Adjustable from full sensitivity to an off condition.

Outputs: Two independent outputs capable of simultaneously driving two 50 ohm receiver inputs via PL-259 connectors.

Power source: 12 VAC @ 300 ma. wall-plug transformer or 13.7 VDC battery source for field operation (typical current drain 50 ma.).

Dimensions: Overall -height 17 in (43 cm), - width 18 in (46 cm). Antenna coil size - 12.75 in (32.5 cm) in diameter.

Total weight: Antenna, control surface and power transformer - 14 pounds or 6.3 Kg.