A139-2-1

LOOP SHOWDOWN: KIWA versus RSM-105
(with some comments on the Quantum)

Mark Connelly - WA1ION - 23 AUG 1995

The Kiwa Medium Wave Loop and the RSM-105 are two of the finest loop antennas available commercially today to professional monitors and serious medium wave DX hobbyists. They are both excellent performers even though they represent two distinctly different design philosophies. A month before I did this study, I purchased an RSM-105 from its builder, Ray Moore of Key Largo, FL. Tom Walsh of the "Boston Area DXers" had just acquired a Kiwa Loop which he was kind enough to let me borrow.

Before going further, it must be stated that the RSM-105 is a passive antenna and cannot be expected to have "S-meter gain" comparable to that obtainable from the amplified Kiwa. The true measure of a loop's weak-signal performance is signal-to-noise ratio. An S-4 signal masked by amplifier noise may be less readable than an S-1 signal from a passive antenna as long as the S-1 signal is still above the receiver's own noise floor. The passive 1-meter-square RSM-105, on some very weak signals, gave SLIGHTLY better signal-to-noise than the physically-smaller (amplified) Kiwa. But these threshold signals were often fighting with the Drake R8's own noise floor. The best signal-to-noise ratios were obtained by running the RSM-105's output through a low input impedance (inductively-coupled) Mini-MWT-3 regenerative preselector. This homebrew tuner - as described in my DL-1 Delay Line Phasing Unit article - has a lower noise figure than the Drake R8 and can improve the signal-to-noise performance of the receiver on very weak signals whether from a wire, the RSM-105, or the output of a passive phasing unit. The Kiwa's signal-to-noise was very impressive considering that it has substantially less pick-up area than the RSM-105. The differences in weak-station audibility (not S-meter reading) between the loops were minimal. A couple of checks were made with a Quantum Loop. It, for its miniscule size, made a good accounting of itself: as a rule, output levels observed on the Drake R8 S-meter were equal to those from the Kiwa (slightly greater on some frequencies, slightly less on others, usually about the same). However, the Quantum was noticeably more "hissy" on weak daytime stations. This is to be expected because of the physics of a small aperture antenna coupled to a high-gain amplifier. On non-auroral nights, there would be very little difference noted in DXability comparing the RSM-105, Kiwa, and Quantum. The Kiwa's regeneration might give some desired extra selectivity and bandpass tuning in some circumstances. This would be particularly useful with receivers having less than optimum IF filter selections.

Nulling with the Kiwa was a breeze because of its silky smooth mechanical design. It is a thing of beauty. The RSM-105 and the Quantum required more work to get a null, especially when tilting was required. Two phased wires, or Q-spoiled loop versus wire or amplified whip, can still outperform any stand-alone loop, especially for DX in the direction opposite to stations to be nulled. Here in the Boston area, DX from Europe and Africa is noticeably better on a properly-constructed phased-wires system than on any loop that I've ever tested.

The RSM-105 is the ultimate urban loop as it cannot be overloaded. When either the Kiwa or Quantum is tuned to frequencies other than the receiver's frequency, intermodulation products can be heard and inadvertantly peaked up. This can make peaking a bit dicey when operating one of these loops in less than optimum lighting - such as in the dark at a beach DXpedition site. This doesn't happen with the RSM-105 unless you're using a very poor receiver that causes intermodulation in its own circuitry.

At "nasty" RF-laden sites such as the New Jersey Meadowlands, active loops are likely to generate intermodulation products even when they are properly peaked for the receiver-selected frequency. These unwanted signals can be generated from FM, TV, SW, LW, and utility sources as well as from local medium wave AM stations. A passive loop is your only choice if you're in an RF "hot spot".

The RSM-105 is touted for its use in precision direction finding. Its balance is superb and I have no reason to dispute this claim. I did not find the Kiwa lacking in the symmetry of its nulls either. Both loops should give very good direction fixes - most likely superior to those taken with popular ferrite loops such as the Palomar, Radio West, SM-2 Space Magnet, Quantum, or McKay-Dymek.

The large size of the RSM-105 and the greater care required in its transportation rule it out for DXpeditions requiring air travel. A Quantum Loop and Sony ICF-2010 combination is probably your best choice on a plane trip.

For car-based DXpeditions, the Kiwa would be a better choice than the RSM-105 (or Quantum) because the control box can be located inside the vehicle while the loop is on the car roof. As one who has used homebrew remotely-tuned antennas on most of my car DXpeditions, I am glad to see a loop of this design now available commercially.

In August of 1995, I performed low-signal measurements from a field site in Tewksbury, MA near the Tew-Mac Airport / Route 38 / Shawsheen River. The site is away from power lines and it is about 4 miles / 6.4 km from my home in Billerica. Measurements were taken between 12:30 and 1:00 PM local time (1630-1700 UTC). There was no skip at the time: all signals were arriving via groundwave.

Stations selected were considered to be weak signals: at or below the noise level of typical consumer portable radios and marginal copy on many car radios.

The following antenna configurations were compared: Kiwa Loop to R8, RSM-105 loop to R8, and RSM-105 loop via (inductively-coupled) Mini-MWT-3 regenerative preamplifier to R8. The Drake R8, Mini-MWT-3, and Kiwa Loop were powered from the car battery. Amplified readings (Kiwa or RSM-105 via Mini-MWT-3) taken represent minimum regeneration. Add about 15 dB to get readings taken when the given regenerative amplifier was adjusted for maximum level of understandable-audio signal just before oscillation. It was noted that the ratio of signal to adjacent station "slop" was often improved by using regeneration set for intelligible audio coming from the sideband opposite to the "pest" station channel. Regeneration had little effect (good or bad) on weak station signal-to-noise ratio.

The R8 S-meter showed an S-1 reading for zero signal in. The empty-frequency S-meter reading with the Kiwa peaked was about half an S-unit (3 dB) over S-1: e.g. S-1.5 . All Kiwa readings were taken with the amp switch on "DX" and no attenuation on the control box.

RECEPTION DATA

Massachusetts Turnpike TIS - 530 / Weston, MA
Kiwa: S-6; good readability
RSM-105: S-2.5; fair to good readability, slight receiver noise
RSM-105 via Mini-MWT-3: S-9 + 5 dB; good readability

WLIX - 540 / Islip, NY
Kiwa: S-4; fair readability, slight amplifier hiss
RSM-105: S-2; fair readability, receiver noise floor only 6 dB down
RSM-105 via Mini-MWT-3: S-8; fair to good readability

CHTN - 720 / Charlottetown, PI
Kiwa: S-7; good readability
RSM-105: S-4; good readability
RSM-105 via Mini-MWT-3: S-9 + 10 dB; good readability
On all three set-ups, WRKO - 680 slop was a problem at times.

CFDR - 780 / Dartmouth, NS
Kiwa: S-3; audio in amplifier noise
RSM-105: S-1; in receiver noise, carrier only detectable with BFO on
RSM-105 via Mini-MWT-3: S-3.5; audio in amplifier noise

A139-2-2

On all set-ups, WCCM - 800 slop was a problem at times.
This station is received at fair level on wire antennas via Mini-MWT-3.

WNYC - 820 / New York, NY
Kiwa: S-8; good readability
RSM-105: S-5; good readability
RSM-105 via Mini-MWT-3: S-9 + 10 dB; good readability

WLAM - 870 / Gorham, ME
Kiwa: S-8; good readability
RSM-105: S-5; good readability
RSM-105 via Mini-MWT-3: S-9 + 10 dB; good readability

CKBW - 1000 / Bridgewater, NS
Kiwa: S-5.5; good readability, slight amp noise
RSM-105: S-3.5; fair to good readability, slight receiver noise
RSM-105 via Mini-MWT-3: S-8.5; good readability, negligible noise

WINS - 1010 / New York, NY
Kiwa: S-8; good readability
RSM-105: S-5; good readability
RSM-105 via Mini-MWT-3: S-9 + 10 dB; good readability

KYW - 1060 / Philadelphia, PA
Kiwa: S-2; carrier in amp noise
RSM-105: S-1 (not moving meter); carrier only detectable with BFO on
RSM-105 via Mini-MWT-3: S-3; bits of apparent talk, in amp noise

CBA - 1070 / Moncton - Sackville, NB
Kiwa: S-6; good readability
RSM-105: S-2; fair readability with receiver noise
RSM-105 via Mini-MWT-3: S-8; good readability
The Plattsburgh, NY co-channel station was audible in the background: its strength was about 10 dB weaker than CBA; it could be isolated from CBA by nulling northeast / peaking northwest.

WJJF - 1180 / Hope Valley, RI
Kiwa: S-7; good readability
RSM-105: S-2.5; fair to good readability over receiver noise
RSM-105 via Mini-MWT-3: S-9 + 5 dB; good readability

WLIB - 1190 / New York, NY
Kiwa: S-7; good readability
RSM-105: S-2.5; fair to good readability
RSM-105 via Mini-MWT-3: S-9 + 5 dB; good readability
There was moderate slop at times from WKOX - 1200. The higher Q of the Kiwa gave it an edge over the unamplified RSM-105.

WGMP - 1210 / Philadelphia, PA
Kiwa: S-4; with audio but noisy, WKOX slop a problem until regen. tweaked
RSM-105: S-1.5; near receiver noise floor, bits of audio heard
RSM-105 via Mini-MWT-3: S-8; better readability than Kiwa

WEZS - 1350 / Laconia, NH over WINY - 1350 / Putnam, CT
Kiwa: S-9; good readability
RSM-105: S-6; good readability, but WLYN - 1360 slop worse because of lower Q than Kiwa.
RSM-105 via Mini-MWT-3: S-9 + 15 dB; good readability
6-dB-weaker WINY could be isolated by nulling north / peaking west.

WDJZ - 1530 / Bridgeport, CT
Kiwa: S-7; fair to good readability (some WNRB - 1510 slop)
RSM-105: S-2.5; fair readability with slop and receiver noise
RSM-105 via Mini-MWT-3: S-8.5; fair to good readability through WNRB slop

WLIM - 1580 / Patchogue, NY
Kiwa: S-5; fair readability
RSM-105: S-1.5; poor to fair readability with receiver noise
RSM-105 via Mini-MWT-3: S-7; fair readability
CBJ (Chicoutimi, PQ) and another signal (NJ ?) were audible in the background. Multiple station slop (WNSH - 1570, WSMN - 1590, and WUNR - 1600) was a problem on each set-up some of the time.

Home "reference test" on WZNN - 930 / Rochester, NH (not a weak station)
100 ft. / 30 m wire: S-8.5
100 ft. / 30 m wire via Mini-MWT-3: S-9 + 35 dB
Quantum: S-9 + 15 dB
Kiwa: S-9 + 12 dB
RSM-105: S-7.5
RSM-105 via Mini-MWT-3: S9 + 20 dB
Readability in all cases was very good.

Conclusions: The best loop choice for a given DXer will be determined by the receiver, location, and type of DXing to be done. Sensitivity is not critical for night use, except in auroral conditions or at exceedingly remote sites such as the Australian "outback". Strong signal handling is very important at an urban site, but less so in the country. The physical size of the loop is important to those who take it "in the field" or who have very small DX "shack" rooms. Good nulling is important to most of us, except perhaps for the steel-frame apartment dweller who can only receive stations with the loop pressed up against a window. And a not-insignificant factor is price. Some time ago, Elliot Straus contemplated the question "Is a Kiwa worth more than twice as much as a Quantum ?". For some the answer is "yes", for others "no". The RSM-105 is about twice the price of a Quantum, and a bit less than the Kiwa. For city DXers, the RSM-105 will be the hands-down choice. It is "bulletproof". Active loops are much more likely to generate intermodulation distortion products in the urban environment. Those with less-than-ultimate receivers may want to use a low-noise high-Q preamplifier (such as the Mini-MWT-3) between the RSM-105's output and their receiver inputs. For DXers who like parking at a beach, pier, or mountaintop for prime loggings, the Kiwa - with its remote tuning - wins. For the business or vacation traveller, the Quantum fits right in a suitcase when it's time to catch a flight somewhere. Some DXers will forego loops entirely and opt for phased wires. Those lucky enough to have land for Beverages will find them hard to beat.

As no one screwdriver can be used for every kind of screw, no single type of antenna is best for every DX situation. This article's discussions and test results should serve as a guide to allow DXers to make wise reception-improving choices for their specific circumstances. I hope that this article stimulates others to do similar testing and to publicize their findings.