MT REVIEW

MFJ's 932 Mini Loop Tuner: SWL & Ham Antenna Options for Tight Spaces

By Ken Reitz KS4Z

Receiving signals on the HF bands on small antennas is easily done. Portable shortwave radios typically have a telescoping whip antenna to do the job. With that, it's possible to tune in all the big international and religious broadcasters which are melting the ether with tens of thousands of watts.

Tuning in smaller shortwave broadcasters and transmitting on the ham bands within the confines of your apartment or condo is not so easily done. There are several products on the market which can help. The MFJ-1020C Active Antenna, which I reviewed in the August 2002 issue of *MT,* is one example. It uses a small antenna together with a built-in antenna tuner and a broadband signal amplifier to improve reception. The problem with that product is that it's for reception only. What if you want to transmit, too?

Small loop antennas have been around for quite some time, especially for reception. Lately, small transmitting loop antennas have attracted quite a following among hams as an alternative antenna for small spaces. MFJ offers a series of small, high efficiency loop antenna tuners ranging in price from $99.95 to $329.95. I recently had the chance to use the MFJ 932 Mini Loop Tuner and here's what I found.

Experimenting with Loops

It's not particularly fair to try testing any antenna during what seems like interminably poor propagation conditions. But, it's what we have now. I first started experimenting with the 932 using 10 feet of 10 gauge wire as suggested in the 932 manual. I put it on a shelf behind the operating position at my desk and attached it to an antenna switch so that I could compare it to signals received on an antenna I use as a reference dipole. (It's a home brew, off-center fed dipole antenna, 137 feet long and 30-ft in the air, based on the G5RV and Carolina Windom designs.) I also had a portable shortwave radio nearby with only the built-in whip antenna to help confirm reception capabilities.

As stated in the manual: "...A transmitting loop antenna has a conductor length or circumference of less than 1/4 wavelength ... The small loop radiation pattern is maximum along the plane of the loop, with sharp nulls perpendicular to the plane of the loop ... Loop length (circumference) approaching a quarter wavelength and shaped as a circle is the most efficient configuration."

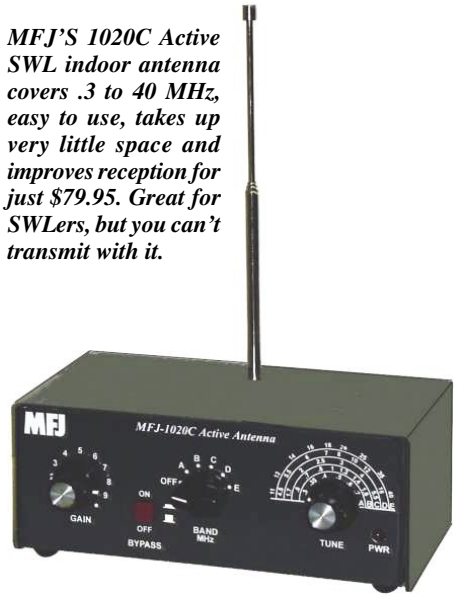
Efficiency also improves with elevation. The manual says it works better if you operate on a second floor. The higher in frequency the better it works, as you get away from ground loss.

MFJ's 932 Mini Loop Antenna Tuner: For hams and SWLers confined to indoor antennas. Low power only, fairly noisy, not easy to tune. Price is $99.95.

Reception, when compared to the reference dipole, was considerably less, but it did outperform the whip antenna on the portable. For example, tuning BBC's European service on 12.095 MHz at 1830UTC came in on the dipole at S9, S5 on the loop, while the portable could not receive the signal. WWV on 10.00 MHz was S1 on the dipole, just audible on the loop, and nonexistent on the portable.

For transmitting, I set up on the 15 meter BPSK31 digital frequency 21.070 MHz and tuned with the dipole. Several stations were on the frequency, but when I switched to the loop only one was copyable. With an output of just 5 watts on the 10-ft wire loop, I answered T94C's CQ call from Bosnia-Hercegovena. He came back on the second call.

I found similar results using 10 feet of 1/4-inch copper tubing, the ends of which I flattened and drilled to fit over the terminals on the back of the 932. The big advantage with the copper loop was that it was self-supporting and was easier to tune. Rotating the loop 90 degrees helped bring in stations and null out stronger signals from the side. Tuning any loop antenna is a process of adjusting the "tuning" and "matching" knobs for strongest signal. Small loops tend to be very sharp in tuning range, and it's easy to zip right past the point of resonance. You have to tune slowly.



MFJ'S 1020C Active SWL indoor antenna covers .3 to 40 MHz, easy to use, takes up very little space and improves reception for just $79.95. Great for SWLers, but you can't transmit with it.

Remember, too, that, when transmitting, every time you change frequency (within 5 kHz) you'll have to re-touch the tuning. However, it isn't that critical for SWLing. Still, for that reason the 932 could be a great BPSK31 antenna. If you design the right loop for, say 14.070 MHz (the 20 meter BPSK31 frequency), you could work dozens of stations from around the world without having to change frequency. Once propagation to the higher frequencies improves, a loop designed specifically for 28.120 MHz, the 10 meter BPSK31 frequency, it should be no trick at all to work the world on 5 watts via this mode using the 932 loop. The digital modes are made to order for low power contacts.

MJF's 16010 Random Wire tuner. Turns your random wire SWL antenna into a low power all-band ham antenna for the attic for just $49.95.

And that's the big draw of loop antenna enthusiasts: a chance to design and perfect antennas for their particular frequencies and modes.

MFJ's Loop Tuner Tutorial

MFJ has made available on their web site a tutorial entitled "MJF Manual Loop Tuner Considerations." In it, their various loop tuner products are discussed in detail along with basic loop antenna theory, design, and general operating practices. There are details on constructing a loop holder from PVC parts, as well as pictures showing how they've built loop antennas. You can read this tutorial here: **www.mfjenterprises.com/antennatalk6.pdf**

There is also a reference to freeware antenna modeling programs which will help improve the efficiency of your loop design. The source is from G4FPQ's extensive and very friendly site: **www.btinternet.com/~g4fgq.regp/**.

Safety First!

If you're using a loop antenna for reception only on an HF receiver, there is no danger.

However, if you're planning on using a loop antenna for transmitting, there are several safety concerns of which you need to be aware. First, even with the MFJ 932 Mini-Loop Tuner at QRP (low power levels), the loop is "hot" while transmitting. You could get a serious RF burn by coming into contact with the loop.

Secondly, because the antenna is in the same room as the operator, you'll be in the RF field generated by the antenna. MFJ advises users to become familiar with FCC OET Bulletin 65 Version 97-01 **www.fcc.gov/oet/rfsafety**. This bulletin, an 84 page highly technical document, offers guidelines and suggestions for complying with human exposure to RF fields adopted, but not mandated, by the FCC. The relevant material regarding amateur radio is from pages 20 to 23.

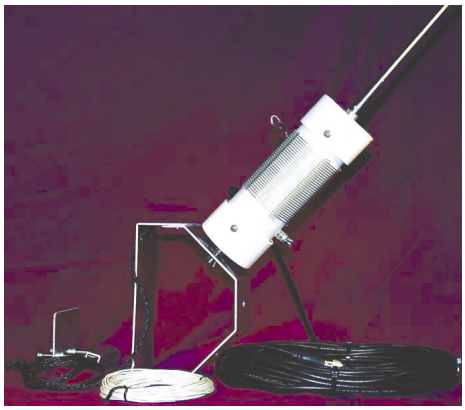
I operated using only 5 watts, which comes well under the safety concerns; still, I would not want pets sticking their noses on the antenna while I was transmitting or having children in the area. You'll have to use your best judgment operating a loop in your home.

❖ Last Word

The MJF 932 Mini Loop Antenna tuner is not cheap ($99.95 plus shipping), and you'll still have to make your own loop. For SWLers I would recommend the 1020C Active SWL indoor antenna rather than the 932. It's easier to use, takes up less desk space, improves reception even on portable shortwave radios, is effective over a broader range, and is $20 cheaper.

Hams seeking to transmit from the cramped confines of their apartment or condo may find the 932 just the ticket. But, at low operating power it will be frustrating, to say the least. Consider other alternatives such as an MFJ 1622 Apartment Antenna, which is the same price as the 932 and removes the antenna from the immediate living space. It also comes with coax feed line, RF choke, and mounting bracket. Or, you could use the MFJ 16010 Random Wire tuner in conjunction with a random wire antenna you may already be using as an SWL antenna or with the PAR High-Performance "End Fedz" shortwave antenna.

(All photos courtesy MFJ Enterprises)



MFJ 1622 Apartment Antenna covers 40 through 2 meters, mounts to windows or balcony railings and comes with mounting bracket, coax feed line and RF choke for $99.95.

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figure 9, and it wasn't surprising to see that this long circuit of nearly 12,000 km favored the higher frequencies. This was confirmed by the MUF (Maximum Usable Frequency) Chart, figure 10, which showed a median MUF of about 16 MHz at the current time-of-day (about 2100 UTC). And finally, the SNR chart, figure 11, for WWCR's 15.82 MHz frequency, predicted *good* connectivity at the current time.

Already, I was ahead of the game. I could now tune to 15.82 MHz with confidence, and the program should be heard loud and clear at my Riyadh listening post!

Who else could I hear from my Riyadh location? ACE-HF can make Reception Area displays to show areas covered from your location, and an example is shown in figure 12. This figure shows 15.82 MHz at 2100 UTC, but the display can be animated over a range of frequencies or times of day. Since the receive location was fixed, the software, in its complex scientific number crunching, effectively moves the transmitter all over the world to create a display of good reception coverage. Using an average up-to-date computer with 1.8 GHz processing speed, I ran 61 by 61 points, times 10 frequencies, times 24 hours. That equals 893,040 equivalent point-to-point circuit predictions, which only took a little over 2 minutes to complete!

Folks often ask which propagation program is the most accurate. Some years ago, the U.S. Navy funded the authors of ACE-HF to determine which HF propagation program was the most suitable for their HF networks. The resulting study selected VOACAP as the most highly validated model. During its development, every potential improvement on VOACAP was subjected to more than 500,000 circuit path-frequency hours comparisons with field data for paths at all latitudes and ranges.

If you have questions about ACE-HF PRO, you may contact Dick Buckner at *RichardPBuckner@cs.com*. My in-depth reviews are provided at **http://hfradio.org/ace-hf/**.

What will Sunspot Cycle 24 be like?

In March 2006, a team led by Mausumi Dikpati of the National Center for Atmospheric Research (NCAR) announced that the next cycle, 24, will be the most intense solar maximum in fifty years. They forecast that the next sunspot cycle will be 30 percent to 50 percent stronger than the previous one. If this holds true, the solar activity in just a few years will be second only to the historic solar cycle maximum of 1958.

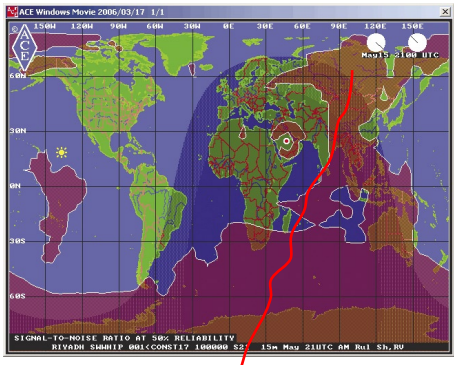

Figure 12: What areas can be heard in Riyadh, Saudi Arabia, on 15.82 MHz? ACE-HF PRO's Animated Coverage Maps can show you.

Veteran radio hobbyists remember that cycle, when solar activity was so strong that Aurora was sighted three times in Mexico. Propagation in the 50 MHz range was open world-wide and for great lengths of time. World-wide propagation was experienced on most of the HF spectrum, around the clock.

Next month, I will present the outlook for the rest of this year and a look into 2007. Let me know your questions and observations. Whether you are on a "fishing expedition" for any interesting catch that comes your way, or whether you are a dedicated hobbyist who enjoys sharpening your radio skills to achieve a specific goal, I hope you have found this month's discussion useful. To take the subject further, you may be interested in the space weather and radio propagation discussion at **http://hfradio.org/forums/**

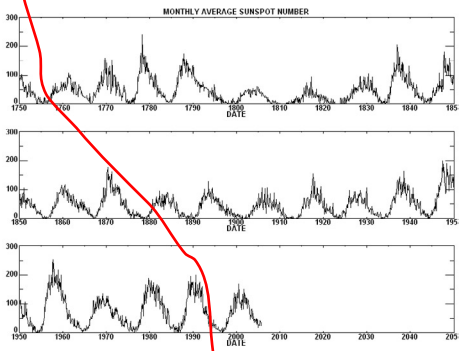

Figure 13: Sunspot cycles last an average of eleven years from start to finish. This graph shows the cycles since records were kept. Notice how the last two cycles have been less active than the one in the 1950's. The next cycle, Cycle 24, is expected to be as active as that one, making for great shortwave and low-VHF world-wide propagation. (Credit: NASA)

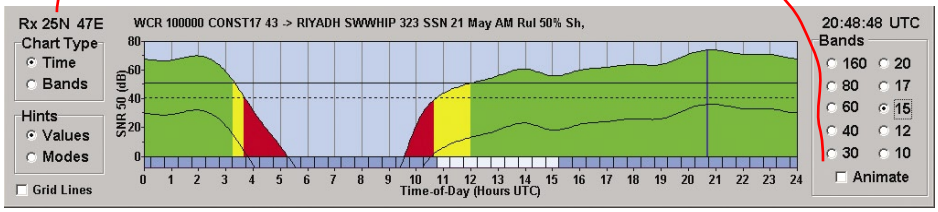

Figure 11: The ACE-HF PRO showing the SNR on the selected frequency of 15.82 MHz during one full 24 hour period, between WCR and Riyadh, Saudi Arabia.