

More Beverage Notes

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Originally printed in the YCCC *Scuttlebutt* newsletter, Issue 131, October 1997

This is a follow-up to my previous "Beverage Notes" article that appeared in the YCCC *Scuttlebutt*, April 1997; issue No.128. Back issues of the *Scuttlebutt* are archived on the YCCC web pages at <http://www.yccc.org> Enjoy!

A Midwest Contester: Lew Gordon, K4VX

Recently, I had an opportunity to chat with well-known contester (and ARRL Midwest Division Director), Lew Gordon, K4VX, about antennas. (What else would a couple of active contesters talk about?) For those that are not aware of Lew's accomplishments in the contest world, let me briefly introduce him as an active contester who owns a 10-tower antenna farm in the "Show Me" state of Missouri. In addition to turning in impressive scores, Lew always seems to be building upon and improving his own station: An active contestant antenna experimenter, his wire and Yagi-Uda antenna designs have been featured in *QST* and *NCJ* and field-tested throughout the world.

A Conversation with K4VX

Once Lew updated me on his current antenna-farm projects, we got around to the subject of Beverage antennas. After a quick read-through of my previous article, Lew offered some additional comments on the subject of Beverage's. I've asked him to elaborate here for the benefit of YCCCers. Here in a "Q&A" format is a summary of our Beverage-notes conversation held in July 1997:

KB1GW: First, Lew, can you provide a short rundown on your Beverage setup?

K4VX: My Beverage system consists of five Beverage wires. Two 1000-foot wires at 45 and 135°; one 700-foot wire at 320° (JA); and two 500-foot wires, one 90° and one 260° (used mainly for SS and domestic contests). All of my Beverages are in the woods.

In the shack I have independent selection of the Beverages between 80 meters and 160 meters. HI/LO pass filters divide the energy. Miniature relays make the selections remotely. I use W3LPL RX filters at both 80 and 160 meter positions.

The wires are suspended from insulated nails driven into trees. Most average about 6 feet off the ground to keep the deer from hitting them. Also, I can't reach any higher! I now use #18 galvanized wire which can be soldered. This removes the dissimilar metal problem which happens over time. I buy #18 galvanized wire which is sold as electric fence wire for \$8.99 per quarter mile at a local farm supply store. The resistance of 1000' of zinc covered wire at 1.8 MHz should be about 25 Ohms. In a circuit that exhibits an impedance of 400-600 Ohms, 25 Ohms is trivial. Also one could be fancy and use those orange or red plastic insulators instead of nails if aesthetically inclined.

KB1GW: Lew, you mentioned something about Beverage feed line placement in regards to any nearby towers. Can you run that by me again?

K4VX: Beverages should never be fed from a grounded tower. Since the tower acts as a vertical energy-capturing device, noise collected by the tower is directly fed into the Beverage. A test I made between the same Beverage wire fed at the tower and then fed 30 feet away from the tower indicated about one S unit more noise at the tower. The test was made midday using a preamp to allow usable S meter

readings. This was sky noise, as I have no manmade noise at my location.

KBIGW: Did you say you *don't* house your Beverage matching transformers in weather-proof enclosures? What's up with that?

K4VX: I like to see the transformer! I use ferrite toroids about 1.25-in diameter trifilar wound with about 10 turns. I series connect the three windings feeding 50-Ohm coax at the first winding and connecting the Beverage at the top. This produces a 9:1 impedance transformation.

KBIGW: You mentioned something about this helping in lightning-hit detection, too.

K4VX: Very small toroids are known to vaporize from lightning. The bigger ones wound with #18 wire seem to hold up much better. But if someone operating says they don't hear anything in some direction during the middle of the night, I don't want to have to open up a box and try to determine if the toroid or connections are OK. Let's face it at 1.8 and 3.5 MHz using a toroid core what difference does it make sealed or left to the weather?

I also terminate with 470-Ohm, 2-W carbon resistors. The 2-W jobs hold up better against lightning than smaller ones. I use a 4-foot ground rod from Radio Shack at the feed and termination. My soil has good conductivity so longer rods are not necessary. I recommend soldering braid to the copper flashed rods when they are new instead of the cheap clamps supplied.

KBIGW: Anything else you'd like to share on the subject with us YCCers, Lew?

K4VX: The real test is this: If you are able to hear more signals than hear you, "fancying up" the Beverage system won't help! Height is also unimportant. Err on the low side. In fact a Beverage at 5 feet performs better than one at 25 to 30 feet when it comes to SNR [signal to noise ratio]. The S-meter may read higher, but the very weak ones (ESP) will escape in the additional noise pickup. ***Why am I telling you guys on the East Coast this?????***

KBIGW: Thanks for sharing some of the things you're doing at your impressive station in Missouri, Lew. It's been fun and let us know if you come up with any other interesting insights on the subject on the "growing and feeding" of Beverage antennas.

We'll look for you in the contest wars-providing you can get through the East-Coast "wall" of YCCers--that is! Seriously, it was a pleasure to chat with Lew: If you ever want to talk about contest antennas, I'm sure you'll find a willing participant in K4VX!

Beverage Induced Foldback?

As I mentioned in my previous article on Beverages, we operated from the QTH of Peter, KB1HY, in the last ARRL DX (SSB) contest. Here are some things we learned at that time of initial checkout and operation of his ("short") 580-foot Beverage. At the time, we were using an ICOM radio that has a receive-antenna-input port (RCA-type jack) built into its rear panel. The radio also has a front-panel button that allowed us to select the receive antenna port (as opposed to receiving on the transmitting antenna), when desired. We used that receive antenna jack to feed the output of Peter's 580-foot Beverage into the radio.

In the process of using this setup, we made an interesting observation: When we transmitted into a 1/4-wavelength 160 meter antenna via the radio's SO-239 jack, and were receiving via the Beverage port, the radio began to fold back its output—and the front-panel SWR meter indicated a 3:1 SWR.

"Hmm, what's going on here?," we thought. We knew the transmitting antenna was resonant on 160, and the Beverage was at least 150 feet away from--and perpendicular to --the transmitting antenna.

Finally, it dawned on us that the Beverage must have been picking up RF from the transmitting antenna and feeding it into the radio (via its receive-antenna port). The radio reacted to this stray RF by reducing its output power--just as if we'd had a mismatched transmitting antenna!

Our next thought was, "How much power is coming from the Beverage into the radio?" Peter grabbed his Daiwa Model 720B (cross-needle-type) wattmeter, set it to its 20-W range and put it in line with the Beverage feedline. That is, the Beverage was hooked up as the RF source, and a dummy load connected to the antenna port on the meter (a different spin on using a wattmeter, to be sure). This way, the meter would read RF coming *from* the Beverage and going into the dummy load.

At 100 W output into the transmitting antenna, Peter measured 0.5 W to 0.75 watts of RF feedback. This minuscule power level, when fed into the receiveinput port (via the Beverage feedline) was enough to cause the radio to react by folding back its transmitted power.

When I related this story to Randy, K5ZD, he told me that he'd measured up to 3 W of RF on his Beverage feedline when running 1.5 kW output. (Randy says he uses a relay to isolate his Beverage feedline from his radio while transmitting.) And, if you recall, my earlier Beverage article noted that Dave, K1ZZ, had reported that his keyer "went crazy" when he switched his Beverage in line while transmitting.

To illustrate that this is not a brand-specific scenario, I tried the same setup (same 160 transmitting antenna, same Beverage), with my Kenwood TS-850. (I've modified this radio to allow for a direct path into its receive line--via its internal T/R relay--from a rear-panel BNC jack.) My '850 reacted to the RF feedback from the Beverage and did not operate properly. The display flashed and the radio seemed to basically "go crazy" (not unlike K1ZZ's keyer) from the RF floating around inside it. So although it's annoying, and possibly harmful to your radio, this phenomenon is apparently not unusual, nor does it seem to be limited to any one radio brand or model.

With the '850, I solved the problem by tapping into the 12 V dc that appears during transmit (on an 8-pin DIN plug) on the back of the '850--and used it to fire an external relay that sends the Beverage output to ground during transmit. With this relay in line, the radio works fine.

Interestingly, the "transmitter foldback" phenomenon did not occur with any radio when transmitting on an 80-meter, groundmounted, vertical, or with a 40-meter rotatable dipole (at the top of Peter's 55-foot-tall tower), and receiving with his Beverage. And, both the 40- and 80-meter antennas are no further than 40 feet from the 160 meter transmitting antenna.

Lew Gordon, K4VX, adds: "As far as transmitted energy being picked up by a Beverage, my 160M vertical is 500-600' from my Beverages, and my 80M dipole at 160' is also far away so it's a non-problem at my place. For those that may have a coupling problem I would suggest placing a 12V 25ma bulb (Available from Radio Shack) in series with the Beverage input on the RX. Mount two RCA plugs on a Radio Shack minibox and solder the bulb leads in between. The bulb will light with less than 1/2 watt of power which is usually not enough to do damage, but gives an indication something needs to be done such as grounding the Beverage during transmit. The bulb should burn out before RX damage would occur (hopefully)!"

The lesson learned here is that if protection is not built-in to a radio with a receive antenna input port,

that in some installations at least, such radios need some sort of "protection" from RF feedback. An external relay like I used, would do the trick. Or perhaps, you could wire up an internal relay to isolate the Beverage (or other type of receive antenna) feedline during transmissions.

Conclusion

To prevent Beverage users from finding out there's a problem during a contest (like we did!), measuring for RF on your receive antenna feedline might be an item to add to your pre-contest checklist: This will help to insure that you enjoy multiplier hunting—as opposed to hunting gremlins--during the contest!

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