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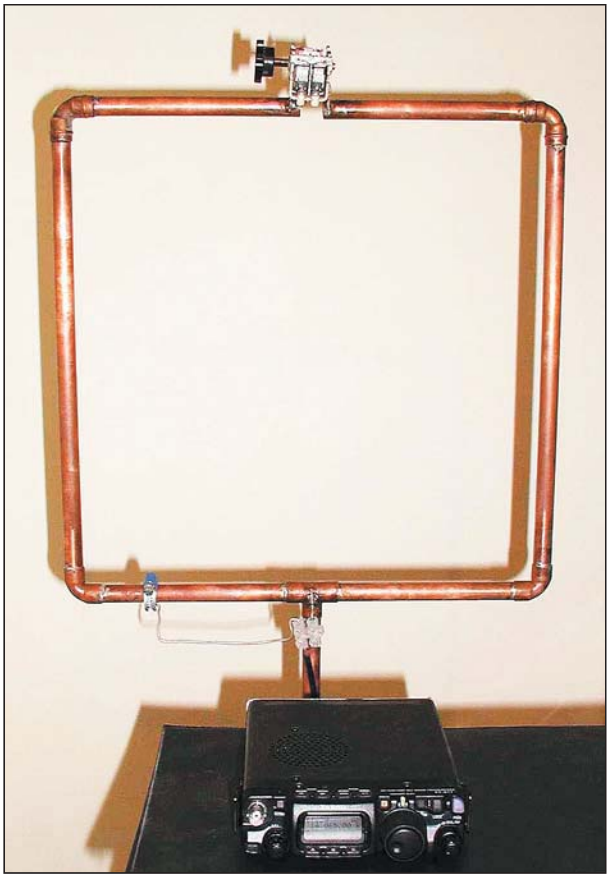
Antennas

G3LDO describes the construction of a simple antenna which he is using to track down interference



The loop shown operating with a Yaesu FT-817.

I recently received an e-mail asking if I knew of a design for a loop antenna suitable for tracking down some electrical QRM. Apparently, this QRM manifests itself as a broad-band rasping sound, very much like a Morse spark transmitter and centred roughly within the low end of 14MHz. By chance I, together with other local radio amateurs, have also suffered from the same QRM, which was described in detail in [1].

One of the advantages of a small self-powered transceiver like the FT-817 is that it can be used as a field strength meter for detecting QRM. A small tunable antenna is required and suitable candidates include the Wonder Wand, reviewed in [2], and the Miracle Whip. I used my bicycle-mobile equipment described in [3] and, while this was fine for detecting patches of the QRM in the vicinity, it was not good enough for locating the actual source of the interference.

LOOP PROBE ANTENNA

A small antenna with directivity was called for that could be used to locate or probe into less accessible QRM sources. The dimensions the loop that was constructed to were, to some extent, influenced by the size of the bits of 15mm OD copper tubing left over from a recent new kitchen installation. The loop had to tune the higher HF bands and the final ‘design’ comprised a square loop with outside dimensions 390mm and tuned with a broadcast receiver air-spaced dual-gang tuning capacitor of unknown pedigree. With one capacitor section of around 200pF, the loop easily covered all HF bands from 20 to 10m. The coax feed to the loop was shunt-coupled via a length of 2mm tinned copper wire.

The loop proved to be a sensitive receiving antenna and, while tuning up the antenna a couple of mornings ago, I received several VK3s and VK4s on 14MHz. The loop exhibited a conventional polar diagram pattern with approximately 20dB nulls.

CONSTRUCTION

The loop is constructed using standard 15mm copper plumbing fittings. The support structure comprises a 140mm length of 15mm copper tubing with a plumbing T-piece which forms part of the loop as shown in the photograph. The lower part of the support tube was soldered to a 22mm pole via a 15mm to 22mm adapter to form the ‘handle’ of the loop probe. Using four 90° angle couplings and lengths of 15mm copper tubing, a square loop was constructed with a 20mm gap in the top section of the square.

Short lengths of 2mm tinned copper wire were soldered to the ends of the copper tubing at the gap in the loop to take the variable capacitor. A further length of 2mm tinned copper wire was soldered to the T-piece on the lower section of the loop to support the terminal block used to connect the coax feeder to the loop. All the soldering described here was done using a small propane blowtorch.

All plumbing connection surfaces must be cleaned with emery cloth or wire wool and smeared with flux. The joint is heated with a blowtorch until the applied solder runs freely and into the joint through capillary action. Most large DIY stores have leaflets on how to make good plumbing soldered joints.

The variable capacitor was soldered to the wire ends on the loop gap using a 60W soldering iron. The coax braid was joined to the T-connector via a connector block and the short length of 2mm wire previously soldered to the T-connector. This arrangement also served to support the coax connector at the loop. The centre of the coax is connected to the shunt wire via the connecting block.

ADJUSTMENT

The only adjustment required is to match the coax feeder to the loop, and this is done by the usual method measuring the SWR using an MFJ-259 SWR Analyser. Obtaining a low SWR is not really necessary for an antenna that is to be used for receive-only, but if a good match is achievable without to much effort then it seemed sensible to go for it.

The best match was achieved using the shunt matching arrangement shown in the photograph. It comprises a short length of 2mm tinned copper wire whose connection to the copper tube element is made using a hose clamp; the position of this connection is selected at the point of minimum SWR. The spacing of the shunt connecting wire to the copper tube element also affected the SWR; the spacing in this case was 30mm. The minimum SWR was 1.2:1 on all bands, with 3:1 SWR bandwidths of 14.12MHz to 14.14MHz and 28.35MHz to 2850MHz.

FINALLY

At the time of writing, I had still not identified the cause or source of the interference. The reason is that it radiates from some underground source which, in turn, is re-radiated by other services such as telephone lines and even water pipes. I am still working on it. Reports of the type of interference described earlier, in your area, would be much appreciated. ♦

REFERENCES

[1] A 14MHz Mystery, ‘EMC’, *RadCom*, August 2004

[2] Miracle Whip reviewed, *RadCom*, June 2004

[3] ‘Antennas’, *RadCom*, August 2004