VE7CNF - 630m Sea and Land Portable Operation

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VE7CNF Ham Radio Page http://phasordesign.com/VE7CNFamateurRadio

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I've been experimenting with portable operation on 630m (472-479 kHz). Steve VE7SL once suggested that it should be possible to operate 630m from a sailboat, and that got me tinkering. Southwest British Columbia has an active group of 630m stations with transmit capability. We are close enough together to allow a portable QRP station to make a few QSO's via daytime ground wave propagation.

Mark, VA7MM, and I first did portable 630m operation from his sailboat Hakuna Matata. I have also transmitted 630m WSPR from my Ford Explorer on land. All operation has been while stationary since the antenna equipment is not rugged enough to use while moving.

My portable MF antennas have been a vertical wire or pipe. The usual arrangement of a loading coil, variometer, and transformer are used at the base of the antenna for matching. Ground on the sailboat was the metal keel and some wires along the gunwales. Connections to the vehicle chassis and radial wires laid on the ground were used for the car.

For a portable 630m radio, my Power Mixer Transverter has been used with an HF transceiver tuned to the 160m IF frequency near 1975 kHz. See "Power Mixer Transverter." The transverter produces about 20W TPO on 630m when used with a 100W HF transceiver running on 12V batteries.

Maritime Mobile on Hakuna Matata, August 2017

Sailboat Hakuna Matata

In early August I had the pleasure of sailing with Mark VA7MM and our XYLs May VA7MAY and Nancy on his 31 foot Beneteau sloop, the Hakuna Matata. I brought my 630m equipment and we used Mark's IC-746 Pro transceiver. We used the Canada sesquicentennial special event call sign CF7MM/MM.

QSOs were made at anchor from 3 locations during daylight hours. Stations worked on CW were VE7SL (Steve on Mayne Is, 12 to 48W TPO), VE7BDQ (John in Delta, 4 to 25W TPO), VE7VV (Roger in Victoria, 10W TPO), VA7CA (Markus in North Vancouver, 70W TPO), VA7JX (Jack in Campbell River, 100W TPO). Both VE7SL and VE7VV were also worked using LSB phone from Winter Cove. VE7VV was running a 630m CW skimmer that gave us an RBN spot. Here are some details:

Boho Bay (49 29.808N 124 13.857W near Lasqueti Is), UTC Aug 7, 2017
Worked VE7SL and VE7BDQ on CW 474.0 and 475.0 kHz

Silva Bay (49 09.047N 123 41.670W near Gabriola Is), UTC Aug 8 and 9, 2017
Worked VE7VV, VE7SL, VA7JX, VE7CA, VE7BDQ on CW 475.0 kHz

Winter Cove (48 48.621N 123 11.575W near Saturna Is), UTC Aug 10 and 11, 2017
Worked VE7VV, VE7SL, VE7CA, VE7BDQ on CW 475.0 kHz
Worked VE7VV, VE7SL on LSB 475.0 kHz

Operating on Hakuna Matata

I was impressed with the strength of ground wave signals given the low transmitter powers and EIRP's well below 5W. Received signals ranged from S1 to S9+10dB and copy was easy for all QSOs. QSO distances ranged from 10 to 142 km. We had low receive noise levels in all locations, with Silva Bay being a little noisier than the others due to nearby boats and some shore power lines.

The antenna was 14 gauge stranded insulated wire, 38 ft long, with plastic Unadilla "END-sulators" at each end. It was strung between a stanchion and the top of the mast. Ground was the boat's cast steel keel and a couple of 30 ft wires near the gunwales.

Sailboat Antenna and Loading Coil

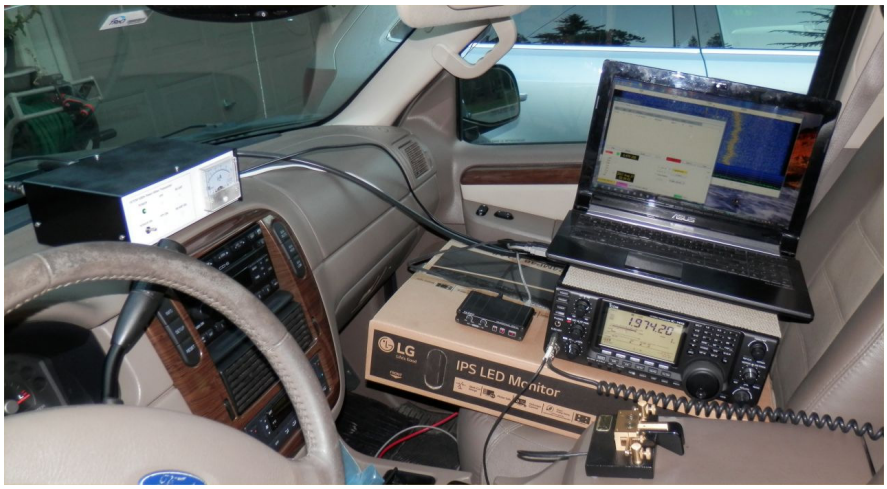
Variometer and Loading Coil on the Sailboat

We tried disconnecting the gunwales ground wires and leaving only the keel, and found that the antenna capacitance and resistance did not change. When we disconnected the keel and left only the gunwales wires, the antenna capacitance dropped to about 87pF and antenna resistance dropped by a few ohms. It appears that the keel provided most of our ground coupling to sea water and it would have been a sufficient ground on its own.

Portable Antenna for Car

My portable car antenna is 24 ft high with a curved top loading section that extends about 8 ft horizontally.

630m Portable Antenna on Ford Explorer



630m Station in a Car

A 4 ft piece of fiberglass pipe is used as the base insulator. On my Ford Explorer this is clamped to a heavy duty bicycle rack on the trailer hitch. The rack allows the pipe to be tilted down for antenna assembly.

Fiberglass Pipe on Bicycle Rack

The conductive vertical section consists of two aluminum pipes topped by a fiberglass fishing rod. The lower pipe is inserted 2 feet into the fiberglass base pipe and held by a pin. The upper pipe is inserted 1 foot into the top of the lower pipe, held by a pin, and hose-clamped to the lower pipe to guarantee electrical connection. The fishing rod is inserted into the upper pipe and clamped. A wire from the top of the upper pipe runs through the fishing rod and out to an insulator to form the top of the antenna. A rope pulls the insulator down toward the front of the vehicle to bend the fishing rod and form the curved top loading section. Rope tension bends the pipes slightly forward to reduce swinging of the antenna in wind.

Antenna Pipes and Fishing Rod

To improve stability, two guy ropes run from insulators at the top of the lower pipe to the sides of the vehicle.

For ground radials I use two wires, each about 100 ft long, laid on the ground and running forward and back from the vehicle. I also connect to the vehicle chassis at a couple of points.

Portable Antenna Matching Circuit

See "630m Antenna Matching Using Just a Resistor" for a typical 630m antenna matching circuit and a tuning procedure.

The vertical wire and pipe antennas used so far have had capacitance near 100 pF and a system resistance (antenna, coil, variometer, ground losses, etc) near 50 ohms.

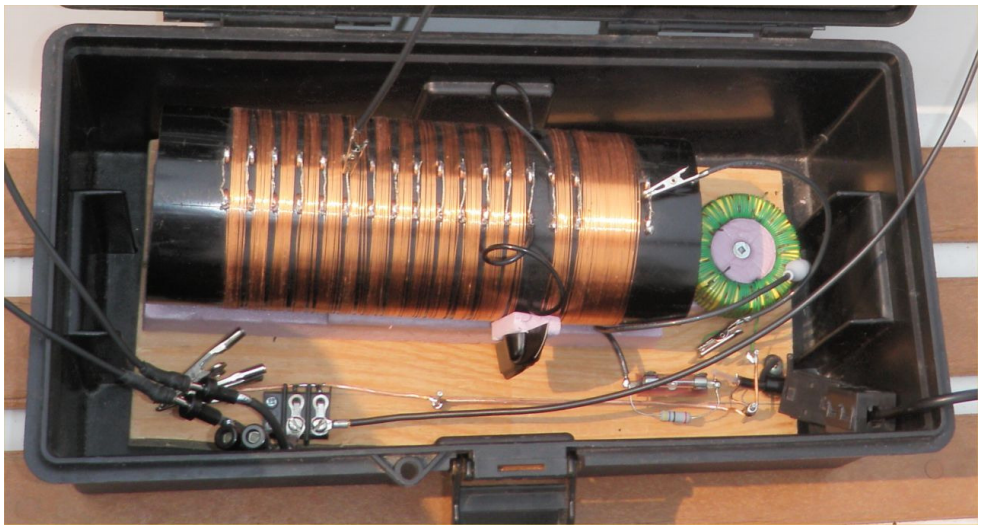
The antenna matching circuit uses a fixed loading coil at the antenna base, a variometer to provide enough inductance for resonance and to allow tuning adjustment, and an autotransformer to match the resonant antenna to 50 ohms. The base loading coil is approximately 170 uH and the variometer is 950 uH, for 1120 uH total inductance.

A separate base loading coil is not necessary if the variometer has enough inductance to resonate the antenna. I wasn't sure my variometer was large enough so I made a base loading coil. Adding a low-loss loading coil reduces the RF voltage at the top end of the variometer, but does not alter the final antenna current or efficiency.

Base Loading Coil on Ford Explorer

The variometer has taps every 10 turns down from the top. A clip lead connects the loading coil to the variometer, and the variometer tap is chosen that gives resonance near 475 kHz.

Rather than the usual 2-winding transformer, a single-winding autotransformer with taps is used for matching. Mine uses 100 turns on a powdered iron toroid and is tapped every 10 turns. Input and output connections are made with clip leads so that the autotransformer can be connected for step-up or step-down. The proper ratio can be chosen to transform the antenna resistance to 50 ohms.



Variometer and Matching Autotransformer

There are many online references for designing coils, variometers, and transformers. For portable operation the required values aren't known until you get set up, so use tapped coils and clip leads so you can tune a wide range of antenna capacitance and system resistance.

Portable or Mobile

The term "mobile" has been used to refer to operation of a station installed in a vehicle, or to operation in a vehicle while moving. "Portable" has been used to refer to operation of radio equipment being carried by a person, or to fixed operation at a location other than one's home QTH.

I've use "portable" to mean fixed operation of a station away from home, and I know I've confused things by also using "maritime mobile."

A more rugged antenna and tuner would be needed to achieve "mobile" 630m operation in a moving vehicle. It shouldn't be difficult on a sailboat, but a very tall antenna on a moving car would be tricky. For "portable" operation while carrying a 630m station in a backpack, you'd have to drag some ground wires and watch out for RF burns.