WØSJS 4-Band Portable HF Antenna System

The key to communications is being able to effectively put usable RF into the atmosphere. I have always felt that if you are going to compromise on something the antenna system is not the place to do it if you really want to have a usable signal.

Based on this premise I have designed and tested an HF antenna that will meet the following criteria that I believe are important for emergency or public service communications:

1. The antenna system must be portable.
2. The system should be easy enough to erect that a single person can manage it in a reasonable amount of time (20 minutes are less, 10 minutes or less for a team of two).
3. The system should provide maximum efficiency for the power available.
4. The system should be simple and straight forward.
5. The system should be relatively inexpensive.

To accomplish this I began thinking about some of the wire antennas that I had used and seen over the years. One that caught my attention was the butterfly dipole .. a simple dipole antenna that has individual radiators for each band and all fed using the same piece of coax. This antenna was simple and straight forward, and provided maximum efficiency for the power available so it met 3 of my 5 criteria. But its biggest drawback was its ability to be quickly and easily deployed by a single person. I am in a wheelchair and there was just no way that I could erect such an antenna – so I dismissed the antenna BUT NOT the concept.

I began thinking about a similar design but in a vertical configuration. My prototype vertical had three independent wires that would allow the antenna to work on 4 bands. It meet all 5 criteria but was still not simple enough as you had to plug and unplug different radiators to use different bands.

To solve this issue I created an Excel workbook that would use the standard formulary for calculating wire antennas and designed it to calculate odd multiples of the quarter wave (remembering that a 40 meter dipole or vertical would also work quite well on 15 meters). By elaborating on this idea I was able to design the Excel to calculate the two wire lengths necessary to create a 2-radiator wire vertical that would work effectively on 40, 30, 20, 17 and 15 meters.

Once the two radiator lengths were calculated I needed to find an effective way that one person could erect the antenna in a short amount of time. I decided to solve this problem by using MFJ's model 1910 which is a 33 foot fiberglass mast that collapses into itself creating a very manageable 4 foot package for portability but when extended would create a full-sized HF antenna system. To complete the antenna the two wire radiators were soldered to the same feeding point and then simply taped to the mast at intervals. The radial system was pre-made using 5 lengths of copper wire each 33 feet long (a quarter wave on 40 meters). The radial system has an additional grounding concept that being that far end of each of the radials is "tacked" to the ground using a metal landscape nail thus effectively grounding each radial and adding additional ground resistance to the radial network.

Coax to System Hookup Box

I initially connected the center and braid of the coax feed line to the 2-wire vertical radiators and radial network using alligator clips. This worked fine but with a little ingenuity from my friends Mark, KB5YZY, and Jim, N0OBG, a hook-up box was created so that the 2-wire radiator and radial network could each have a banana plug as the connection point and the box would accept the banana plugs and then connect them, in turn, to an SO-239 to accept a standard PL-259 piece of coax. (See image on bottom of page 1).

I can, by myself and in my wheelchair, put up the vertical and radial system in about 20-25 minutes and with the help of a friend its a simple 10 minute task. I have used this antenna as my patio portable vertical for numerous contacts on the target bands and always had good reports using 100 watts or less. And, at the recent ARES SET used this antenna effectively on both CW and SSB with reports of 579 to 599+ on CW and 58 to 59+ on SSB while running 45 watts out.

On the next page is a diagram of the antenna system. The mast is erected over a 5 foot piece of ¾ inch galvanized gas pipe that is driven into the ground about 18 inches. Once the radiator wires are taped to the fiberglass mast the mast is slipped over the galvanized pipe and I have found that even in severe weather this antenna has a low enough wind load that it will remain erect and usable even in moderate winds (30-50 mph) and in poor rainy weather with no problems at all.

To get an idea of what the vertical radiator looks like here is a picture looking up the fiberglass mast as it was all summer in my back yard at the edge of my patio.

To give you an idea of how this antenna works .. see the QSO log in **Appendix A**.

You can see the two wire radiators running up each side of the mast.

WØSJS 4 Band Portable Vertical System

Materials List:

(1) 33 foot piece of copper wire

(2) 26 foot piece of copper wire

(3) enough wire to make a 5-radial system, the best would be 5 quarter-wave radials for 40 meters, each 33 feet long. But any lenghts will work.

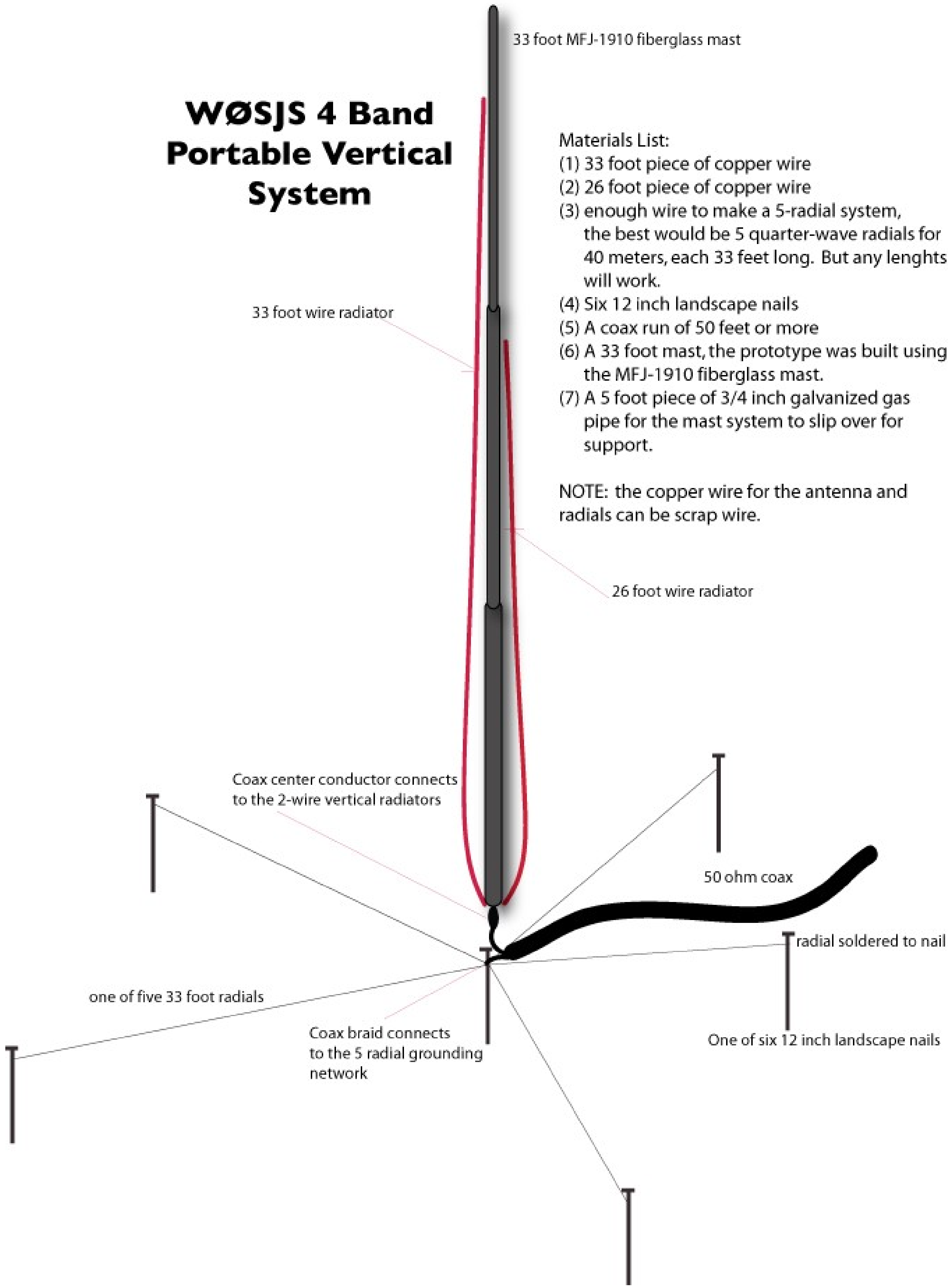
(4) Six 12 inch landscape nails

(5) A coax run of 50 feet or more

(6) A 33 foot mast, the prototype was built using the MFJ-1910 fiberglass mast.

(7) A 5 foot piece of 3/4 inch galvanized gas pipe for the mast system to slip over for support.

NOTE: the copper wire for the antenna and radials can be scrap wire.



APPENDIX A

CALLSIGN	BAND	MODE
AA1TJ	20	CW
AA3EJ	40	CW
AA5KV	40	CW
AB0BM	20	CW
EA5DY	20	CW
HC2SL	20	CW
K2MYQ	20	CW
K3JA	20	CW
K4EJG	30	CW
K5JGU	40	CW
K6PWP	20	CW
K6ZSR	20	CW
K8JPM	40	CW
K8LEN	40	CW
K8RNM	40	CW
K9JPL	20	CW
KA3P	40	CW
KA4MKF	40	CW
KA8WOG	40	CW
KB1CL	40	CW
KB5GXD	40	CW
KD8FME	30	CW
KK5ZK	20	CW
LY2ZE/PO	20	CW
N3SY	20	CW
N5ESE/m/qrp	30	CW
N5UA	20	SSB
N6OND	30	CW
NF0Z	30	CW
RA9LT	20	CW

CALLSIGN	BAND	MODE
S58AL	20	CW
SM3CCM	20	CW
VE2DHS	20	CW
VE2PID	80	CW
VE2TH/qrp	30	CW
VE2WU	20	CW
VE3GSI	15	CW
VE3KZ	20	CW
VE3XB	30	CW
VE6BBP	20	CW
VE6KC	20	CW
W0GMO	40	CW
W0OZJ	30	CW
W1BRA	20	CW
W1PO/m	20	CW
W2TOM	30	CW
W2XB	30	CW
W2YBN	40	CW
W3HGT	40	CW
W4SEZ	40	CW
W5APS	40	CW
W5LTJ	40	CW
W5LYO	20	CW
W8AV	40	SSB
W8BPB	40	CW
W9ZN	80	CW
WA2HYK	30	CW
WB6CRM	20	CW
WC5X/m	20	CW