Bobby Brainwave

THE G5RV ANTENNA

BY BOBBY BRAINWAVE, N3VGS

One wire antenna for all HF bands. Sounds too good to be true, doesn't it? How could this be? Even though the HF ham bands are harmonically related, an antenna useable on one band is not resonant on even harmonics of that frequency. A half wavelength wire dipole resonant on 160 meters and current fed in the middle would have an impedance of 72 ohms. It would also be resonant on odd harmonics: for example, 40 meters or 1 1/2 wavelengths and 10 meters or 4 1/2 wavelengths. What about the other standard bands of 80 meters, 20 meters, and 15 meters? There, our original wire dipole is a full wavelength or multiples of a full wavelength and center feed finds a voltage node with a high impedance of approximately 2500 ohms. The new HF bands of 30 meters, 17 meters, and 12 meters aren't harmonically related to the others and center feed finds an impedance somewhere between the two extremes. How can the advertisements for one wire antenna for all HF bands be truthful? With one compromise and a few electrical tricks, it is possible. Such an antenna is the G5RV. A popular antenna with those hams who are financially or tower challenged. How does it work? Read on.

The G5RV compromise is in its length. It is not resonant on any of the HF ham bands! The length of the wire dipole portion is chosen to be close to a nominal impedance on these bands. In other words, on 160 meters, 40 meters, and 10 meters it is shorter than a half wavelength or odd multiples thereof. On 80 meters and 20 meters it is longer than even multiples of a half wavelength. The length is chosen so that the impedance is approximately the same on all bands, somewhere in the neighborhood of 600 ohms. Also, the impedance of a non-resonant antenna does not change as fast with frequency as an antenna element that is at or close to resonance. This wider bandwidth allows the G5RV to cover the "near" ham bands of 30 meters, 17 meters, and 12 meters adequately. What does this mean in terms of performance? Greater bandwidth and lower standing wave ratio across the ham bands are the products of this compromise and a slight loss of gain compared to a resonant antenna. Wider bandwidth, low SWR, one antenna for all bands, and a nearly all directional pattern are traded for a slight loss of gain. This slightly lower gain is made up by that great repeater in the sky known as the F layer.

The G5RV is a wire dipole that can be strung vertically, horizontally, as an "L", inverted V, or a sloper with great results. Just ask a ham who uses one. Remember, the ground below your G5RV acts as a reflector - usually a poor one unless you live in a salt marsh along the coast. The height above ground and the way the wire dipole is strung will determine the launch angle of your signal and distance possibilities will be different for each band.

If you have followed closely so far, you should be saying - OK you've got an all band antenna. How do you match the 600 to 900 ohm feed impedance to a transceiver? The G5RV has two other components beside the non-resonant wire dipole. It is center fed with a certain length of 450 ohm ladder line. This feed line is a quarter wave linear transformer (or multiple quarter waves) that reduces the feed impedance to a more manageable number. The end of this ladder line is terminated with a BALUN that matches the balanced feedline to unbalanced 50-ohm coaxial cable ready for connection to the transceiver output. The G5RV = one antenna for all HF bands.

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6 Meter J-Pole Antenna

By Ed Harris, KE4SKY

I came up with the following dimensions after considerable "cut and try" to scale a J-pole antenna of 450-ohm ladder line up from 2m to the 6 meter FM portion of the band. My antenna is direct feed with RG-8X with eight turns of coax forming an RF choke and has not "fried" with up to 90w from a converted RCA1000 low-band, high-split landmobile radio after three years of use. Others report it works fine without winding the BALUN.

Feed point. Solder outer braid to radiator 155" length from feed point
<--3"-><----------155"---------->
_____/_____
{_I_I_I_I_I_I_I_I_I_I_I_I_I_I _I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I
[<------46"--------->^
Notch. Solder center core to tuning stub, notched at 46" from feed point

Center frequency is 52.525 Mhz, VSWR <1.2:1
1.3:1 bandwidth is 52.0 to 53.0 Mhz.
2.0:1 bandwidth is 50.0 to 54.0 Mhz.

The ladder line I used came from RF Connection and has AWG14 conductor. With other ladder line your mileage may vary, but several folks who have copied mine were happy.

If you encase the antenna in Schedule 40 PVC pipe and use a 6" pigtail feed of RG8-X to a bulkhead connector on the pipe end cap, notch the tuning stub at 44" and trim the unotched radiator to 148."