Multiband Parallel Dipole Antenna

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For many city-based operators HF antenna space is a problem. There are many commercial multi-band vertical antennae on the market. Besides being expensive, these antennas can be a compromise, particularly on the lower frequency bands, where their effective length is very short in comparison to the ideal quarter wavelength. Therefore they are not very efficient and bandwidth is usually very narrow on the lower frequencies.

Lossy coils and traps are often used to achieve a reasonable 50Ω match. But remember, a 50Ω dummy load also presents a perfect match to the rig. However, how much DX will you work on a dummy load?

I am a great believer in wire dipoles. I would much rather erect the longest dipole possible in a small suburban garden and feed it with 300Ω twin feeder via an ATU for multiband HF coverage than spend money on a compromise commercial vertical. Remember that dipoles can have their ends dropping downwards and don't have to run fully in a horizontal line.

The formula for calculating a quarter wavelength antenna is 234 feet divided by the frequency. A half wave dipole is obviously twice that lengthy. For example, a quarter wave vertical for 3.6MHz would be 65 feet and a dipole 130. On 80 metres a quarter wave vertical mounted at ground level would be more than twice as tall as the average suburban house and it needs groundplane wires as well!

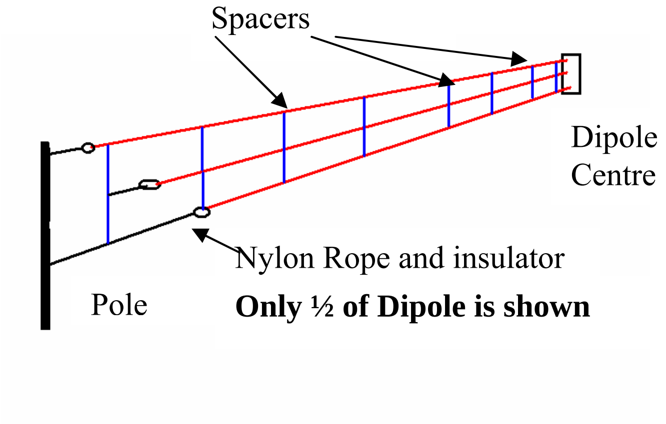
Now consider the lengths of some of the commercial verticals on the market claiming to cover up to 80 metres, and their limitations become obvious. Admittedly efficiency improves on the higher frequencies as the length approaches the ideal quarter wavelength.

Louis Varney's G5RV is the dipole of choice for many operators. The full size version is 102 feet long and obviously the half size 51 feet. It too need not run horizontally for its full length as the ends can drop downwards. Therefore, a half size G5RV could be accommodated in a length of less than 30 feet and would cover the amateur bands from 10 to 40 metres. The full size covers 10 to 80 metres.

The G5RV was designed before the 12, 17 and 30 metre bands were allocated to amateurs following WARC 79. In his Antenna Handbook, Bill Orr, W6SAI discusses in depth the performance of the G5RV (and its many derivatives) on all of the HF bands. One of his major conclusions is that the G5RV performs poorly on 12, 15 and 30 metres. Strangely it seems to perform well on 17 metres!

The 30 metre (10.1MHz) band is my favourite, and I have been unwittingly using a full size G5RV for several years as my sole HF antenna, I decided to put Bill's conclusions to the test on this particular band.

My initial intention was to construct a separate dipole for each of the 3 bands and erect each for a period of time and compare it with the G5RV. Then I remembered reading an article in my 1974 ARRL Antenna Book about an antenna comprised of several separate dipoles in parallel, all fed by the same single feeder at a common centre. I decided to kill 3 birds with 1 stone and construct a version to cover the 3 bands in question.



The principle of operation of this multiband antenna is that the rig will automatically select the appropriate resonant dipole at its operating frequency and deliver most of the RF power to it. The theory is that that the other dipoles will have only minimal effect.

I calculated the total dipole lengths for 10.12MHz, 21.10MHz and 24.90MHz. The calculations were 46'3", 22'2" and 18'10" respectively. A dipole centrepiece was fashioned from a small piece of Perspex, in which I drilled eight 11mm (0.45") in two rows of 4 to accommodate 10mm bolts. A bolt was inserted into each hole. Two washers were fitted under the head and another under the nut. Each bolt is a connection point for a dipole or feeder wire.

All 4 bolts in each row were then connected with a short piece of wire. A few extra holes were drilled into the Perspex and the dipole and feeder wires threaded through then to take the strain before being held in place between the two washers by the tightened nut and bolt.

The longest dipole supports the next longest which hangs from it, and it in turn supports the shortest. I used some short plastic strips to separate and support the 2 lower dipoles from the longest one.

To prevent the array from twisting and tangling in the breeze, the plastic strips at each of the ends of the 2 lower dipoles were tied or stayed off with plastic/ non-insulating rope to points near the ground.

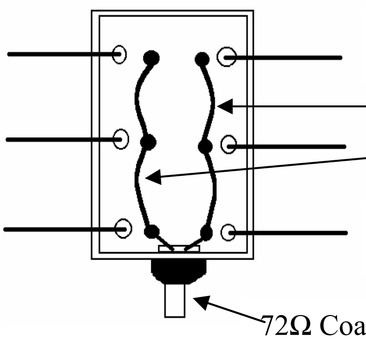
I fed the antenna with 72Ω twin feeder. Besides being a good match, this is light and prevents sagging at the centre. The feeder runs all the way into my shack. In the shack I sued a home brew 1:1 balun. From this I ran a short length of 50Ω coax to my K2's automatic ATU. I went through the auto ATU because it has 2 antenna inputs, which can be selected from the H2's front panel.

Of course 50Ω coax could have been used from the antenna and then a balun would not have been needed. However, as this is a balanced system I prefer to use a balun between the antenna feeder and the unbalanced input of the rig or ATU.

The G5RV was already connected to the other ATU input socket and I was ready to compare the two antennas. It was around 2100UTC on a June Saturday evening and 30 metres seemed lively on the G5RV. I switched over to the triband dipole and the sound level dropped giving an impression that reception was not good.

I tuned around until I found a fairly weak station calling CQ and then switched back to the G5RV. The sound level rose, but I couldn't hear the calling station at all. To make sure that he hadn't stopped calling, I switched back to the triband dipole and there he was clearly audible and with a much quieter background noise level.

I moved up the band and started calling CQ on the triband dipole. A W8 answered with a 569 report for me. I gave him a 589 and asked him to standby while I changed antennas. I was amazed when the respective reports dropped to 549 and 579 on the G5RV.



EI is fairly rare on 30, and as soon as I had finished to QSO several other US stations called me. I conducted several similar blind comparison tests and the triband dipole came up trumps by anything from 1 to 3 S points in each direction every time. It seems that Bill Orr was correct!

At about 0300 UTC I apologised to the pileup for going QRT. I was tired and had filled up over 2 pages of the logbook. I had worked stations all across from Labrador to Arizona and almost every station said that I was their first EI on the band. For weeks afterwards I received many QSL cards direct. I expect many more via the bureau.

I have had limited opportunities to carry out comparisons on 15 metres. Preliminary conclusions are similar, but I need to carry out more tests to arrive at amore definitive conclusion. I have not had an opportunity to compare both antennas on 12 metres yet as it hasn't been very active when I have been QRV. However, I am looking forward to having an opportunity before too long.

The multiband dipole described here can be cut for any combination/ number of bands. The 2 big advantages it has are that it only needs 1 feeder and secondly, the resonant dipole is automatically selected for he band of use.

With adjustment of the individual dipole lengths, the SWR can be optimised for each band. However the more dipoles that are attached the more fiddly and time consuming this becomes, as each adjustment can have a knock on effect on the other dipoles.

However, I must admit that I didn't spend any time doing this. I just calculated and cut the lengths to the formula and let the K2's automatic ATU take care of any minor mismatches. I am just very satisfied with my findings and results on my favourite 30 metre band.

A G5RV along with the triband antenna described above (12, 15 and 30 metres) could have been a good combination for efficient coverage of all HF bands from 10 to 80 metres in a suburban situation.

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