Adjusting HF Antenna Lengths

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No, it's not an April Fool's joke. It is very handy if you can find out how much to adjust the length of a quarter wave whip or a half wave dipole rather than the outright cut-and-try method.

The values below are not "true space" calculated lengths, they have been modified by a value of 0.96 to compensate for the "end-effect" found in a physical antenna. Note that some configurations may reduce this even further, down to 0.92, thus making the physical antenna even shorter.

The values supplied are for a 100 KHz shift in frequency. If your shift is more or less, multiply the value given in the table by a suitable factor. (eg shift of 130 KHz = 1.3, 60 KHz = 0.6)

Please remember that this is a guide only - it is impossible to take into account all of the factors attributable to your particular installation.

The process of using the table below is simplistic.

- Measure the current resonant frequency of the whip or dipole by looking for the SWR minimum.
- Check that value against the desired (or target) frequency.
- Look up the length variation for that band from the table below to see how much you have to remove - or add (though this is sometimes physically difficult). Use "tails" for preference and adjust only their lengths.
- Re-check and re-adjust if necessary

The following is an example of it's use...

- A new (half-wave) dipole has an SWR minimum at 7035 KHz, good for CW but not for SSB..
- Desired centre point is 7085 KHz.
- From the table, the halfwave dipole length variation value is 28.97cm **FOR 100 KHz** so for 50 KHz, we need to halve that value = 14.5cm. Since we are using a dipole, half must be removed from each side so that means the dipole must be shortened by 7.25cm **per leg**.
- Re-measure the new lowest SWR frequency and adjust again as necessary.

There are a few things to note when making up new dipole or whip antennas :-

- Always make them longer than the calculated values - it is easier to shorten than lengthen

- Consider using "tails" so that the wire lengths to the supporting end insulators always stays constant and only the "tail" lengths are varied. { a good example of this is on my W8010 web page (http://www.vk4adc.com/web/index.php/hf-projects/45-hf-antennas/99-w8010-warc-band-mods.html) or the mutiband trapped inverted-V page (http://www.vk4adc.com/web/index.php/hf-projects/45-hf-antennas/104-trap-inv-v-for-hf.html) } This really simplifies tuning for each band when you have multiband trapped dipoles and the like.
- Always have them mounted at the final height and using the final mounting method when checking SWR values. Horizontal antennas (eg dipoles) closer to the ground than their final height will usually appear lower in frequency due to capacitance to ground effects.
- Check the SWR at the band edges (eg 7001 and 7299 in VK) and multiple places in between to figure out where the initial resonance point is. If the SWR is lower at 7001 than at 7020, and 7020 is lower than 7040, then the antenna is low of the band and needs to be shortened.
- Wire antennas often stretch over time. If your antenna has had a shift downward in resonant frequency over time, and nothing else has changed, "wire stretch" will be the culprit. Using the table (and assuming that you know where it was previously resonant), you can pre-determine how much it needs to be shortened to return it to the original frequency.

This info should make your task just that little bit easier.....

Calculation of length adjustments for quarter and half wave sections at various amateur bands			
	(300/4 = quarter wave radiator * end effect adjustment) :=		
Wavelength ref	72.000		
		Quarter wave	**Halfwave dipole**
	Qtr wavelength	**variation per 100KHz**	**variation per 100KHz**
Freq	**Metres**	**cm**	**cm**
50	1.440	0.29	0.57
28	2.571	0.92	1.83
24.9	2.892	1.16	2.31
21	3.429	1.62	3.25
18.1	3.978	2.19	4.37
14	5.143	3.65	7.29
10.1	7.129	6.99	13.98
7	10.286	14.49	28.97
3.5	20.571	57.14	114.29
1.8	40.000	210.53	421.05