

UNDERSTANDING END FED HALF WAVE ANTENNAS AND ITS HALF WAVE MULTIPLES

There is so much to find on the internet on End Fed Half Wave antennas. And yet...

In many publications on (smaller) End Fed Half Wave (EFHW) Antennas, often the 15m is shown between brackets. And the reason is simple, yet it took me some study and antenna comparison to understand why that is.

After I made my first EFHW (for 40m, with coil for 80m) and I prepared for my second one (in fact EFHW for 20m with max length of 16 meters, with two coils, for 40m and 80m), I suddenly realized that 15m would not give resonance in this antenna. Why?

When using an EFHW for 80m or 40m, there is a multiple of half waves for 15m. For the EFHW for 20m (with or without a coil and extension for 40 and/or 80m) there is no halve wave multiple. See the tables below for the explanation of the relations! And so I understood it, afterall.... and realized how wonderful a full EFHW antenna is!

Here below three examples:

First "my first", the EFHW for 40m with coil and extension for 80m

Then the full EFHW for 80m

Finally the antenna that will be my next project: EFHW for 20m, with coils and extensions for 40m and 80m.

All three Antennas have been built and adjusted (also the experimental EFHW for 20m with extensions).

This Library Webpage shows the publications on those measurements (in detail).

Note: "long wire" in the text below, means the resonant half wave length for the lowest frequency

END FED HALVE WAVE ANTENNA FOR 40m (WITH COIL FOR 80m) - LONG WIRE RELATION

speed of light in km/s	299.792,50
velocity factor antenna wire	0,96

<i>frequency</i> kHz	<i>wavelength</i> meter	<i>x velocity</i> factor	<i>halve wave</i> meter	<i>quarter wave</i> meter	<i>nr of</i> <i>halves</i>	<i>relation</i> <i>length</i>
3650	82,13	78,85	39,42	19,71	coil+ extra wire	
7100	42,22	40,54	20,27	10,13	1	20,27
14200	21,11	20,27	10,13	5,07	2	20,27
21250	14,11	13,54	6,77	3,39	3	20,32
28500	10,52	10,10	5,05	2,52	4	20,20

This table shows the relationship between the four frequency bands of a 40m End Fed Halve Wave Antenna (or such antenna with 110 μ H coil and 2m35 wire for 80m). It indicates how close the relations are.

It indicates why the antenna works on "15" meters (in fact 14 meters...).

END FED HALVE WAVE ANTENNA FOR 80m - FULL SIZE - LONG WIRE RELATION

speed of light in km/s 299.792,50
 velocity factor antenna wire 0,96

<i>frequency</i> kHz	<i>wavelength</i> meter	<i>x velocity</i> <i>factor</i>	<i>halve wave</i> <i>meter</i>	<i>quarter wave</i> <i>meter</i>	<i>nr of</i> <i>halves</i>	<i>relation</i> <i>length</i>
3650	82,13	78,85	39,42	19,71	1	39,42
5360	55,93	53,69	26,85	13,42	1,5 *)	40,27
7100	42,22	40,54	20,27	10,13	2	40,54
10130	29,59	28,41	14,21	7,10	3	42,62
14200	21,11	20,27	10,13	5,07	4	40,54
18125	16,54	15,88	7,94	3,97	5	39,70
21250	14,11	13,54	6,77	3,39	6	40,63
24950	12,02	11,54	5,77	2,88	7	40,37
28500	10,52	10,10	5,05	2,52	8	40,39

This table shows the relationship between the nine frequency bands of an 80m End Fed Halve Wave Antenna. It indicates why also the three WARC bands are close to a half wave multiple for that band. Note *): In spite of 1,5 x a half wave, the antenna tunes resonates perfectly on 5.360 kHz !

END FED HALVE WAVE ANTENNA FOR 20m (with/without coils for 40m/80m) - LONG WIRE RELATION

speed of light in km/s 299.792,50
 velocity factor antenna wire 0,96

<i>frequency</i> kHz	<i>wavelength</i> meter	<i>x velocity</i> <i>factor</i>	<i>halve wave</i> <i>meter</i>	<i>quarter wave</i> <i>meter</i>	<i>nr of</i> <i>halves</i>	<i>relation</i> <i>length</i>
14200	21,11	20,27	10,13	5,07	1	10,13
21250	14,11	13,54	6,77	3,39		
28500	10,52	10,10	5,05	2,52	2	10,10

This table shows the relationship between the three frequency bands of a 20m End Fed Halve Wave Antenna (with or without extension coils and wire lengths for 40 or 80m). It indicates that no 'multiple half' for the 15 meter band is available, so it will not resonate there.

With the last column it is relevant to understand if that (multiple of) half wave will resonate in, above or below the desired Amateur Band. Check on this page how cutting that "long wire" should be done: make sure it gives the best result on 10m. This may not give the best SWR on 15m, 20m or 40m, but inside these bands the SWR will well be within acceptable limits!

Hans, PAOSNY
 EndFedHalfWave relations.pdf
 (EndFedHalfWave relations.xlsx)