SMP Linked Dipole Antenna Designer - Friday, July 22 2016 04:09

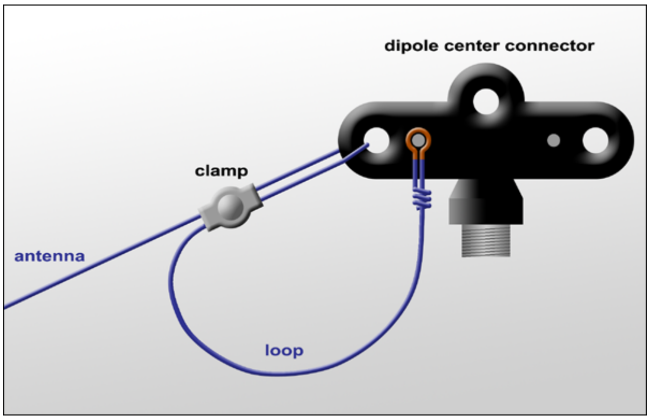
Number of antenna sections:	3
Wire type:	wire, un-insulated (standard) (95% length correction factor)
Length units:	ft/in

Antenna Sections

	Inner section	Mid section #1	Mid section #2	Mid section #3	Outer section
Frequency (kHz):	**18100**	**14175**	*	*	**7100**
Calculated radiator length:	12' 7"	16' 0"	*	*	32' 0"
Calculated element length:	12' 7"	3' 6"	*	*	16' 0"
Add 2x element connection length * :	1' 8"	1' 0"	*	*	1' 0"
Add 5% radiator length for adjustment:	0' 8"	0' 10"	*	*	1' 7"
Wire length (incl. adjustment + connection):	14' 10"	5' 3"	*	*	18' 7"

* *The innermost section of the antenna will often need to have a longer end-connection at the center connector to allow for strain relief.*

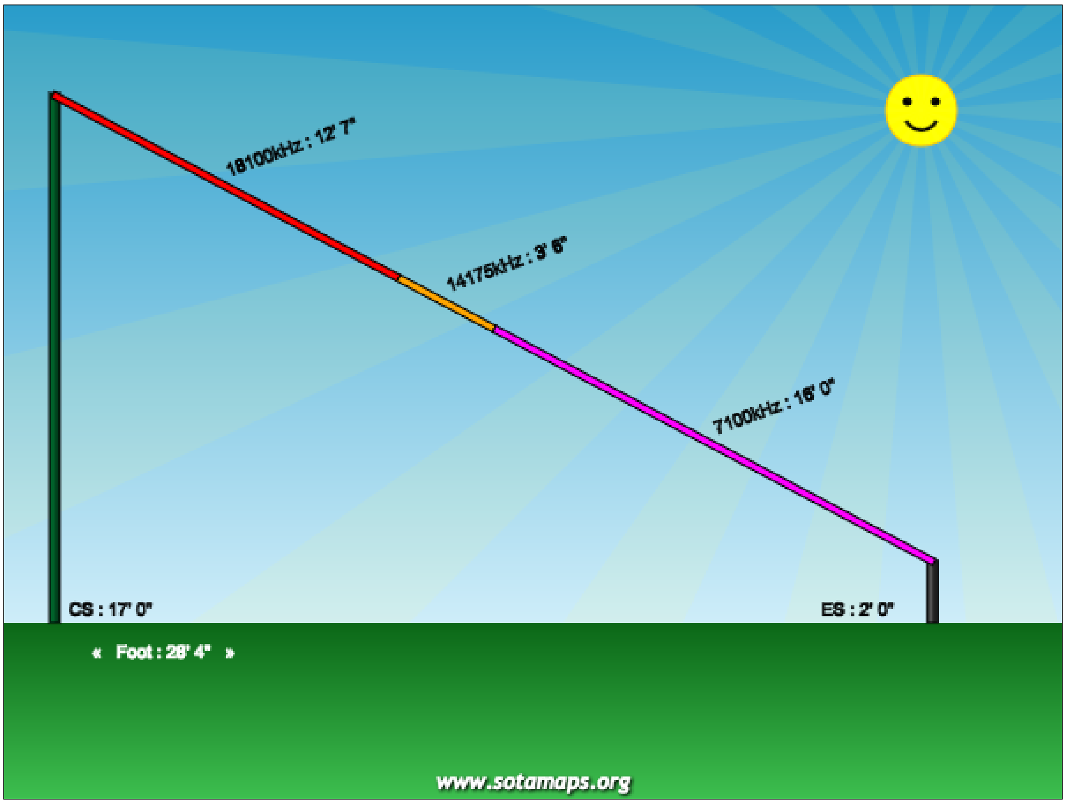
A length of about 300mm - 350mm (about 12 - 14 inches) may be required at this end to accommodate the clamp, loop and electrical attachment (see diagram right) if such a configuration is used.



Main antenna dimensions for each side of the antenna

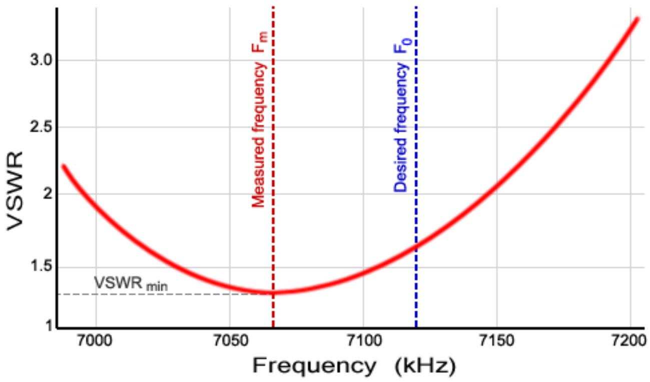
Total length of wire to cut * :	38' 8"
Calculated antenna total length * :	32' 0"
Rope extender length * :	0' 0"
Antenna center height * :	17' 0"
End support height * :	2' 0"
Antenna end height (REF.) * :	2' 0"
Antenna foot length (REF.) * :	28' 4"
Apex angle (degrees) * :	62.1

* *Dimensions in this table are for one side of the dipole antenna only; therefore you will need two of each section for the complete antenna.*



Tips:

- Tune the inner (highest frequency) section first, then each successive section in turn.



Since we cut the wire sections long, the first VSWR measurement will (hopefully!) be at a lower frequency than that desired.

Let the measured frequency of minimum VSWR be f_m , the desired resonant frequency be f_0 , and the measured *radiator* length (the length of one side of the antenna from the center out to, and including, this particular element) be L_m .

Then, the antenna length (one side) for resonance at the desired frequency,

$L_0 = f_m * L_m / f_0$

Hence, the *element* being adjusted must be shortened by an amount

$dL = L_m - L_0$

An example:
We wish to adjust a 40-meter band section of our antenna: we first set up with a total radiator length of 10.1 meters, which in this example is equal to a calculated radiator length of 9.62 meters, plus a 5% adjustment factor of 0.48 meters.
We then measure the frequency at minimum VSWR in the 40-meter band: this we find to be 7065 kHz. In our example, the desired minimum

VSWR frequency is 7120 kHz, so we need to make this radiator shorter to bring the minimum VSWR frequency up to 7120 kHz. Then, the antenna length (one side) for resonance at the desired frequency is:

L_0 = 7065 * 10.1 / 7120 = 10.022 meters

Therefore we need to cut off a length

dL = 10.1 - 10.022 = 0.078 meters or 78 mm.

Another way of looking at this is as follows: for one side of a dipole, the difference in length between two pieces of wire cut for different frequencies f_1 and f_2 is given by:

$dL = k * c * (f_2 - f_1) / (4 * f_1 * f_2)$,

where

- k = length-correction factor for the wire (~ 0.95)
- c = speed of light

Referring to the table on the right, which has values calculated using this equation for adjustments per 10kHz in various bands/frequencies, we see that a length-correction between the two frequencies 7065 kHz and 7120 kHz may be calculated as follows:

dL = 0.0141 * (7120 - 7065) / 10

dL = 0.0776 meters, or 77.6 mm,

in good agreement with the previous calculation.

Band	Frequency (kHz)	Adjustment per 10kHz (m)
160m	1860	0.2069
80m	3650	0.0536
60m	5350	0.0249
40m	7100	0.0141
30m	10135	0.0069
20m	14175	0.0035
17m	18120	0.0022
15m	21225	0.0016
12m	24940	0.0011
10m	28500	0.0009
6m	51000	0.0003

- When adjusting the length of each element, it is important to be aware of the fact that the "trailing end" of the element - i.e. that part of the element which is not directly suspended between the attachment points - also forms part of the radiator.
  A very useful tip is always to keep the trailing end, or connector tail, the same length as will finally be used when the antenna is finished. So if, during the tuning/adjustment process, you decide to reduce the length of an element by, say 20mm, you reduce the length of that part of the element which is between the suspension points by 20mm, and then reduce the connector tail also by 20mm to bring that part back to the desired constant connector tail length.
  In this way, you ensure that the entire element really has been reduced in length by the desired amount, and you will find the job of adjustment goes smoothly, and with no sudden surprises!

- How well the finished antenna will perform in use will depend to varying degrees on many factors, including the following:
  - the height of the antenna above ground - especially the center-height
  - the apex angle of the antenna
  - the conductivity of the ground - summits with bare rock or thin soil have poor conductivity
  - the presence (or absence) of objects - especially metallic objects - in the immediate vicinity of the antenna, i.e. in the near field
  - how steeply the surrounding ground drops away from the summit - this, along with the height of the antenna above ground, will affect the vertical radiation pattern:
    - steep-sided summits have lower vertical radiation patterns - good for DX
    - flat summits tend to have higher vertical radiation patterns - better for middle-distance (NVIS) contacts.

- Some commonly used connectors:
  - gold-plated bullet connectors
  - banana plugs
  - Anderson Powerpoles

- Attach waterproof labels to your connectors, so they can be easily identified when changing bands.

- Practice changing bands while wearing gloves, so that you can be sure of performing the operation in cold or bad weather!